### NOTICE TO BIDDERS

Sealed bids will be received in the office of the Ottawa County Clerk, Robyn Mitchell, at 102 East Central Avenue, suite 103 in Miami, Oklahoma 74354 until 9:05 on January 10, 2022. Bids will then be opened and read aloud by the Ottawa County Board of Commissioners.

### OTTAWA COUNTY SHERIFF'S DEPT BUILDING ROOF

Bid specifications attached.

Title 61 O.S. 107 Contractors must submit a bid bond equal to 5% of the bid submitted, or a certified check which shall be deposited with the awarding public agency.

Title 61 O.S. 113 B (3) Contract must submit a warranty bond in a sum equal to the contract price

Title 61 O.S. 113 B (4) Contractor must provide evidence of public liability and workers' compensation

Title 61 O.S. 113 C Contractor may provide a single bond that covers payment, performance and warranty. Contract will not be excused until all bonds and insurance are provided

Bids submitted must be clearly marked on outside of a sealed envelope:

### BID 2021-2022.19 OTTAWA COUNTY SHERIFF'S DEPT BUILDING ROOF

### OPEN: JANUARY 10, 2022 @ 9:05

And must be accompanied by a complete and notarized "**Statement of Non-Collusion**" as required by O.S. 74, Section 85.22

The successful bidder must comply with O.S. 19, Chapter 33 (Purchasing Procedures).

Bids received late will be returned unopened.

The Board of County Commissioners reserves the right to reject and or all Bids and/or select other than the low Bid, if such an Award is deemed to be in the County's best interest

Robyn Mitchell

Ottawa County Clerk

S A & I 1-4040 (1982) MODIFIED

### **OTTAWA COUNTY CLERK**

### **102 EAST CENTRAL AVENUE, SUITE 103**

### **MIAMI, OKLAHOMA 74354**

### (918) 542-3332

countyclerk@ottawa.okcounties.org

### **INVITATION TO BID**

### BID 2021-2022.19: OTTAWA COUNTY SHERIFF'S DEPT BUILDING ROOF

ISSUED: DECEMBER 6, 2021

### OPEN: JANUARY 10, 2022

Business Name	 
Contact Name	 
Address	 
Phone Number	

### DESCRIPTION

Cost for Material	\$
Cost for Labor	\$

Cost for Subcontractors \$\_\_\_\_\_

Total Cost for Project \$\_\_\_\_\_

### **CONDITIONS OF BID**

Sealed bids will be opened in the Office of the County Commissioners located in the Ottawa County Courthouse at 102 East Central Avenue, Suite 104 in Miami, Oklahoma, at the time and date shown on the Invitation to Bid.

Late bids will not be considered. Bids must be received in sealed envelopes (one to an envelope) with Bid Number, Date and Time written on the outside of the envelope.

Unit prices will be guaranteed correct by the bidder.

Firm prices will be FOB Ottawa County.

Purchases by Ottawa County, Oklahoma is not subject to State or Federal taxes.

This bid is submitted as legal offer and any bid, when accepted by the County, constitutes a firm contract.

### Oklahoma laws require each vendor submitting a bid to a County for goods or services to furnish a notarized sworn Statement of Non-Collusion (form supplied below).

NOTE: Other terms and conditions may be added at the discretion of county officers.

### **STATEMENT OF NON-COLLUSION**

AFFIDAVIT: I, the undersigned, of lawful age, being first duly sworn on oath say that he (she) is the agent authorized by the bidder to submit the above bid. Affiant further states that the bidder has not been a party to any collusion among bidders in restraint of freedom of competition by agreement to bid at a fixed price or to refrain from bidding; or with any state official or employee as to quantity, quality or price in the prospective contract or any other terms of said prospective contract; or in any discussions between bidders and any state official concerning exchange of money or other thing of value for special consideration in the letting of a contract; that the bidder/contractor has not paid, given or donated or agreed to pay, give or donate to any officer or employee of the State of Oklahoma (or other entity) any money or other thing of value, either directly or indirectly, in the procuring of the award of a contract pursuant to this bid.

Subscribed and sworn to this	day of	, 20
(Seal)	Firm:	
	Signed:	
	Address:	
Notary Public	City:	State:
My commission expires		Zip:

### I CERTIFY COPIES OF **BID 2021-2022.19: OTTAWA COUNTY SHERIFF'S DEPT BUILDING ROOF** WERE MAILED TO THE FOLLOWING VENDORS ON December 10, 2021

Shannon Walker- P.O. Box 274 Welch Ok 74369

Crosby Roofing- crosbyroofing@gmail.com

Arbuckle Roofing & Contracting- 603 SW 1st St Afton, OK 74331

Perry Roofing- 1141 P St NW Miami, OK 74354

Rockin' G Roofing- 704 Henley Ave Miami, OK 74354

Crossland Construction Company- P.O. Box 45 Columbus, KS 66725

Universal Roofing Tulsa- 2615 W 40th Place Tulsa, OK 74107

Sooner Recon- 1515 Carson Ave. Tulsa, OK 74119

Lewis Roofing- 8730 E 43<sup>rd</sup> Street Tulsa, OK 74145

Turner Roofing- 1200 E Memphis St Broken Arrow, OK 74012

Allwine Roofing- 3815 S 79th E Ave Tulsa, OK 74145

### SHEET LIST:

PAGE NO.	SHEET NAME	SHEET NO.
GENERAL 01	COVER SHEET	G0-00
02	GENERAL NOTES, ABBREVIATIONS AND SYMBOLS	
ARCHITECTUR	AL	
03	ROOF PLAN	A1-01
04	ENLARGED DETAILS	A2-01
05	ENLARGED DETAILS	A2-02
MECHANICAL		
06	SYMBOLS, NOTES, AND ABBREVIATIONS	M0-01
07	OVERALL MECHANICAL PLAN	M1-01
08	SCHEDULES AND DETAILS	M5-01
09	OVERALL DEMO MECHANICAL PLAN	MD-01

# **OTTAWA COUNTY JAIL**

### **ROOF REPLACEMENT**

# **BID DOCUMENTS** 11/10/21



28 B ST. SE MIAMI, OK 74354

48 HOURS BEFORE YOU DIG ... CALL OKIE: 1-800-522-6543

CALL OKIE: 1-800-522-6543 LOCATIONS OF UNDERGOIND UTILITY LINES WERE OBTAINED FROM THE UTILITY OWNERS AND HAVE BEEN SHOWN TO THE EXTENT KNOWN. THE CONTRACTOR IS SPECIALLY CATTRED THE LOCATION AND/OR ELEVATION OF EXISTENCILLY CATTRED THE LOCATION AND/OR ELEVATION OF EXISTENCILLY CATTRED THE LOCATION AND/OR ELEVATION OF THE VARIOUS UTILITY COMPANIES AND WHERE POSSIBLE. MARSUREMENTS WERE TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS EXACT OR COMPLETE IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CALL "OKIE" 48 HOURS PRIOR TO ANY EXCAVATION TO DETERMINE AND VERIFY THE EXACT LOCATION AND DEFTH OF ALL EXISTING UTILITIES AND TO NOTIFY THE ENGINEER OF ANY DISCREPANCIES HEREIN, PRIOR TO FURTHER CONSTRUCTION.

### **ARCHITECT:**



### **ARCHITECTURE | CIVIL | STRUCTURAL**

C.A. 0049 (ARCH) RENEWAL DATE: 06-30-2023 C.A. 00262 (PE) RENEWAL DATE: 06-30-2022

1623 E. 6TH ST. TULSA, OK 74120 918.835.9588 hammock@bklinc.com

#### PREPARED BY:

JENNIFER HAMMOCK PROJECT MANAGER **BKL, INCORPORATED** 

PREPARED FOR:

Ottawa County Board of Commissioners Attn: Comm. Russ Earls

### **CONSULTANTS:** greenacorn

### MECHANICAL | ELECTRICAL | PLUMBING

C.A. 8292 RENEWAL DATE: 06-30-2022

1820 S BOULDER AVE STE #500 TULSA, OK 74119 918.629.4291 ktm@greenacornllc.com

#### ABBREVIATIONS:

ABV	
ABV	
	ABOVE
AFF	ABOVE FINISH FLOOR
AC	ACOUSTICAL
ACT	ACOUSTICAL CEILING TILE
ASASS	ABOVE FINISH FLOOR ACOUSTICAL ACOUSTICAL CEILING TILE ADA SHOWER SEAT
ADD	ADDENDUM
ADDI	ADDENVIONAL ADDITIONAL ADJUSSTABLE ADJUSSTABLE ADMINISTRATION AIR CONDITIONING AIR HANDI ING UNIT
	ADUESIVE
AD1	
ADJ	ADJUSTABLE
ADMIN	ADMINISTRATION
A/C	AIR CONDITIONING
AHU	AIR HANDLING UNIT ALUMINUM ALUMINUM ALUERNATE
AL	ALUMINUM
ALUM	ALUMINUM
ALT	ALTERNATE
ANCH	ANCHOR ANCHOR BOLT ANGLE ANODIZED
AB	ANCHOR BOLT
ANG	ANGLE
ANOD	ANODIZED
APPROX	APPROXIMATE ARCHITECT, ARCHITECTURAL ARCHITECT-ENGINEER AREA DRAIN
ARCH	ARCHITECT, ARCHITECTURAL
A/E	ARCHITECT-ENGINEER
AD	AREA DRAIN
ASB	ASBESTOS
ASP	ASPHALT
ASSY	ASSEMBLY
AUTO	AUTOMATIC
AU I U	AGTOMATIC
BCS	BABY CHANGING STATION
BD	BABY CHANGING STATION BOARD
BDRM	BEDROOM
BEL	BELOW
BK	BRICK BRACKET
BKT	BRACKET
BI	BUILDING LINE
BLDG	BUILDING LINE BUILDING
BLUG	BLOCK BLOCKING
BLK	BLOCK, BLOCKING BEAM BENCH MARK BY OWNER
ВМ	BEAM
BNCHMK	BENCH MARK
BO	BY OWNER
BOD	BOTTOM OF DECK BOTTOM OF MULLION BOTTOM BOTTOM
BOM	BOTTOM OF MULLION
BOT	BOTTOM
BP	BRICK PAVER
DD	BACKER BOD
DR	BACKER ROD BATH STATION PULL CORD
BS	BATH STATION PULL CORD
BSM1	BASEMENT
BT	BENT
	MITUMINOUS
BTM	MITOMINOUU
BTM BTRM	BATHROOM
BTM BTRM	BATHROOM BETWEEN
BTM BTRM BTW	BETWEEN
BTM BTRM BTW BUT	. BETWEEN . BUTT JOINT
BTM BTRM BTW	. BETWEEN . BUTT JOINT
BTM BTRM BTW BUT BVL	BETWEEN BUTT JOINT BEVELED
BTM BTRM BTW BUT BVL CAB	BETWEEN BUTT JOINT BEVELED CABINET
BTM BTRM BTW BUT BVL CAB CO2	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE
BTM BTRM BTW BUT BVL CAB CO2 CPT	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET
BTM BTRM BTW BUT BVL CAB CO2 CPT	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET
BTM BTRM BTR BUT BVL CAB CO2 CO CSG	BETWEEN BUTT JOINT BEVELED CABINET CARREN CASED OPENING CASING
BTM BTRM BTW BUT BVL CAB CO2. CPT CSG CL.	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CASED OPENING CASED OPENING CAST IRON
BTM BTRM BTW BUT BVL CAB CO2. CPT CSG CL.	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CASED OPENING CASED OPENING CAST IRON
BTM BTRM BTW BUT BVL CAB CO2. CPT CSG CL.	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CASED OPENING CASED OPENING CAST IRON
BTM BTRM BTW BUT BVL CAB CO2. CPT CSG CL.	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CASED OPENING CASED OPENING CAST IRON
BTM	BETWEEN BUTT JOINT BEVELED CARBON DIOXIDE CARPET CASED OPENING CASING CASING CELING CLG HUNG PLASTIC TLT PARTITION CELING SUPPORT SYSTEM
BTM	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASING CAST IRON CEILING CLG HUNG PLASTIC TLT PARTITION CEILING SUPPORT SYSTEM CEMENT
BTM	BETWEEN BUTT JOINT BEVELED CARBON DIOXIDE CARPON DIOXIDE CARPET CASED OPENING CASING CASING CELLING CLG HUNG PLASTIC TLT PARTITION CELLING SUPPORT SYSTEM CEMENT CENTER
BTM	BETWEEN BUTT JOINT BEVELED CARBON DIOXIDE CARPON DIOXIDE CARPET CASED OPENING CASING CASING CELLING CLG HUNG PLASTIC TLT PARTITION CELLING SUPPORT SYSTEM CEMENT CENTER
BTM.           BTRM	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASING CAST IRON CELLING PLASTIC TLT PARTITION CELLING SUPPORT SYSTEM CEMENT CENTRE CENTRE LINE CENTRE TO CENTER
BTM	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASING CASING CASING CELLING CLG HUNG PLASTIC TLT PARTITION CEILING SUPPORT SYSTEM CEMENT CENTER CENTER CENTER LINE CENTER TO CENTER CERAMIC
BTM.           BTRM	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASING CASED OPENING CASING CELLING CLG HUNG PLASTIC TLT PARTITION CELLING SUPPORT SYSTEM CEMENT CENTRE CENTRE CENTER CENTER CENTER LINE CENTER TO CENTER CERTRET TO CENTER CERTRET TO CENTER CERTRET TO CENTER
BTM.           BTRM	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASING CASED OPENING CASING CELLING CLG HUNG PLASTIC TLT PARTITION CELLING SUPPORT SYSTEM CEMENT CENTRE CENTRE CENTER CENTER CENTER LINE CENTER TO CENTER CERTRET TO CENTER CERTRET TO CENTER CERTRET TO CENTER
BTM.           BTRM	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASING CASED OPENING CASING CELLING CLG HUNG PLASTIC TLT PARTITION CELLING SUPPORT SYSTEM CEMENT CENTRE CENTRE CENTER CENTER CENTER LINE CENTER TO CENTER CERTRET TO CENTER CERTRET TO CENTER CERTRET TO CENTER
BTM.           BTRM.           BTRM.           BTRM.           BTW.           BWL.           BVL.           CAB.           CO2.           CFT.           CSG.           CLG.           CHPTP.           CSS.           CI.           CI.G.           CHPTP.           CSS.           CI.           CI.           CI.           CI.           CI.           CC.           CER.           CT.           CR.           CHKBD.           BI K	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASING CASING CELLING CLG HUNG PLASTIC TLT PARTITION CELLING SUPPORT SYSTEM CEMENT CELLING SUPPORT SYSTEM CEMENT CENTER CENTER CENTER CENTER CENTER CENTER CERAMIC CERAMIC CERAMIC CERAMIC CHAIR RAIL CHAIL ROARD BLOCK ING COKING
BTM.           BTRM.           BTRM.           BTRM.           BTW.           BWL.           BVL.           CAB.           CO2.           CFT.           CSG.           CLG.           CHPTP.           CSS.           CI.           CI.G.           CHPTP.           CSS.           CI.           CI.           CI.           CI.           CI.           CC.           CER.           CT.           CR.           CHKBD.           BI K	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASING CASING CELLING CLG HUNG PLASTIC TLT PARTITION CELLING SUPPORT SYSTEM CEMENT CELLING SUPPORT SYSTEM CEMENT CENTER CENTER CENTER CENTER CENTER CENTER CERAMIC CERAMIC CERAMIC CERAMIC CHAIR RAIL CHAIL ROARD BLOCK ING COKING
BTM.           BTRM.           BTRM.           BTRM.           BTW.           BWL.           BVL.           CAB.           CO2.           CFT.           CSG.           CLG.           CHPTP.           CSS.           CI.           CI.G.           CHPTP.           CSS.           CI.           CI.           CI.           CI.           CI.           CC.           CER.           CT.           CR.           CHKBD.           BI K	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASING CASING CELLING CLG HUNG PLASTIC TLT PARTITION CELLING SUPPORT SYSTEM CEMENT CELLING SUPPORT SYSTEM CEMENT CENTER CENTER CENTER CENTER CENTER CENTER CERAMIC CERAMIC CERAMIC CERAMIC CHAIR RAIL CHAIL ROARD BLOCK ING COKING
BTM.           BTRM.           BTRM.           BTRM.           BTW.           BWL.           BVL.           CAB.           CO2.           CFT.           CSG.           CLG.           CHPTP.           CSS.           CI.           CI.G.           CHPTP.           CSS.           CI.           CI.           CI.           CI.           CI.           CC.           CER.           CT.           CR.           CHKBD.           BI K	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASING CASING CELLING CLG HUNG PLASTIC TLT PARTITION CELLING SUPPORT SYSTEM CEMENT CELLING SUPPORT SYSTEM CEMENT CENTER CENTER CENTER CENTER CENTER CENTER CERAMIC CERAMIC CERAMIC CERAMIC CHAIR RAIL CHAIL ROARD BLOCK ING COKING
BTM.           BTRM.           BTRM.           BTRM.           BTRM.           BVL           BVT.           BVT.           CAB           CO2.           CPT.           CO.           CSG           CLG           CLG           CLC           CKR           CTR           CHKBD           EIK           BM           BNC.HMKK	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASTIRON CEILING CLG HUNG PLASTIC TLT PARTITION CEILING SUPPORT SYSTEM CEMTENT CENTER LINE CENTER LINE CENTER LINE CENTER TO CENTER CERAMIC TILE CHALK BOARD BLOCK, BLOCKING BEAM BENCH MARK BENCH MARK
BTM.           BTRM.           BTRM.           BTRM.           BTRM.           BTRM.           BVL.           BVL.           CAB.           CO2.           CPT.           CO.           CSG.           CLG.           CLG.           CLG.           CLG.           CCR.           CTR.           CR.           CR.           CR.           BLK.           BMCHMK.           BOD.	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASING CASTIRON CELLING CLG HUNG PLASTIC TLT PARTITION CELLING SUPPORT SYSTEM CEMENT CENTER CENTER CENTER CENTER CENTER LINE CENTER TO CENTER CERTER TO CENTER CERTER TO CENTER CERTER TO CENTER CERTARIO CERTARIO CERTARIO CERTARIO CERTARIO CERTARIO CENTER DENCH MARK BY OWNER BOTTOM OF DECK
BTM.           BTRM.           BTRM.           BTRM.           BTRM.           BWL           BVL.           CAB.           CO2.           CPT.           CO.           CSG.           CI.G.           CLG.           CHPTP.           CSS.           CER.           CT.           CR.           CHKBD.           BK.           BM.           BNCHMK.           BD.           BD.           BD.           BD.           BD.	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASTIRON CEILING CLG HUNG PLASTIC TLT PARTITION CEILING SUPPORT SYSTEM CEMTER CENTER LINE CENTER LINE CENTER LINE CENTER LINE CENTER TO CENTER CERAMIC TLE CHALK BOARD BLOCK, BLOCKING BEAM BENCH MARK BY OWNER BOTTOM OF DECK BOTTOM OF DECK
BTM.           BTRM.           BTRM.           BTRM.           BTRM.           BWL           BVL.           CAB.           CO2.           CPT.           CO.           CSG.           CI.G.           CLG.           CHPTP.           CSS.           CER.           CT.           CR.           CHKBD.           BK.           BM.           BNCHMK.           BD.           BD.           BD.           BD.           BD.	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASTIRON CEILING CLG HUNG PLASTIC TLT PARTITION CEILING SUPPORT SYSTEM CEMTER CENTER LINE CENTER LINE CENTER LINE CENTER LINE CENTER TO CENTER CERAMIC TLE CHALK BOARD BLOCK, BLOCKING BEAM BENCH MARK BY OWNER BOTTOM OF DECK BOTTOM OF DECK
BTM.           BTRM.           BTRM.           BTRM.           BTRM.           BWL           BVL.           CAB.           CO2.           CPT.           CO.           CSG.           CI.G.           CLG.           CHPTP.           CSS.           CER.           CT.           CR.           CHKBD.           BK.           BM.           BNCHMK.           BD.           BD.           BD.           BD.           BD.	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASTIRON CEILING CLG HUNG PLASTIC TLT PARTITION CEILING SUPPORT SYSTEM CEMTER CENTER LINE CENTER LINE CENTER LINE CENTER LINE CENTER TO CENTER CERAMIC TLE CHALK BOARD BLOCK, BLOCKING BEAM BENCH MARK BY OWNER BOTTOM OF DECK BOTTOM OF DECK
BTM.           BTRM.           BTRM.           BTRM.           BTRM.           BWL           BVL.           CAB.           CO2.           CPT.           CO.           CSG.           CI.G.           CLG.           CHPTP.           CSS.           CER.           CT.           CR.           CHKBD.           BK.           BM.           BNCHMK.           BD.           BD.           BD.           BD.           BD.	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASTIRON CEILING CLG HUNG PLASTIC TLT PARTITION CEILING SUPPORT SYSTEM CEMTER CENTER LINE CENTER LINE CENTER LINE CENTER LINE CENTER TO CENTER CERAMIC TLE CHALK BOARD BLOCK, BLOCKING BEAM BENCH MARK BY OWNER BOTTOM OF DECK BOTTOM OF DECK
BTM.           BTRM.           BTRM.           BTRM.           BWL           BVL           CAB.           CO2.           CPT.           CO.           CSG.           CLG.           CLG.           CLG.           CLG.           CCC.           CSS.           CFR.           CL.           C/C.           CFR.           CI.           C/C.           CFR.           CH.           BNCHMK.           BNCHMK.           BNCHMK.           BOD.           BOM.           BOT.           BR.	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASED OPENING CASING CELLING CELLING CELING PLASTIC TLT PARTITION CELING SUPPORT SYSTEM CEMTER CENTER CENTER CENTER CENTER LINE CENTER TO CENTER CERTER TO CENTER CERTER TO CENTER CERTRE TO CENTER CERAMIC CERTRE TO CENTER CERAMIC TILE CHALK BOARD BLOCK, BLOCKING BEAM BLOCK, BLOCKING BEAM BY OWNER BOTTOM OF DECK BOTTOM OF MULLION BOTTOM BRICK PAVER BACKER ROD
BTM.           BTRM.           BTRM.           BTRM.           BWL           BVL           CAB.           CO2.           CPT.           CO.           CSG.           CLG.           CLG.           CLG.           CLG.           CCC.           CSS.           CFR.           CL.           C/C.           CFR.           CI.           C/C.           CFR.           CH.           BNCHMK.           BNCHMK.           BNCHMK.           BOD.           BOM.           BOT.           BR.	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASED OPENING CASING CELLING CELLING CELING PLASTIC TLT PARTITION CELING SUPPORT SYSTEM CEMTER CENTER CENTER CENTER CENTER LINE CENTER TO CENTER CERTER TO CENTER CERTER TO CENTER CERTRE TO CENTER CERAMIC CERTRE TO CENTER CERAMIC TILE CHALK BOARD BLOCK, BLOCKING BEAM BLOCK, BLOCKING BEAM BY OWNER BOTTOM OF DECK BOTTOM OF MULLION BOTTOM BRICK PAVER BACKER ROD
BTM.           BTRM.           BTRM.           BTRM.           BWL           BVL           CAB.           CO2.           CPT.           CO.           CSG.           CLG.           CLG.           CLG.           CLG.           CCC.           CSS.           CFR.           CL.           C/C.           CFR.           CI.           C/C.           CFR.           CH.           BNCHMK.           BNCHMK.           BNCHMK.           BOD.           BOM.           BOT.           BR.	BETWEEN BUTT JOINT BEVELED CABINET CARBON DIOXIDE CARPET CASED OPENING CASED OPENING CASTIRON CELLING CLG HUNG PLASTIC TLT PARTITION CELLING SUPPORT SYSTEM CEMENT CENTER LINE CENTER LINE CENTER TO CENTER CENTER TO CENTER CERAMIC TILE CHALK BOARD BLOCK, BLOCKING BEAM BENCH MARK BY OWNER BOTTOM OF DECK BOTTOM OF MULLION BOTTOM OF MULLION BOTTOM OF MULLION BOTTOM DE MULLION BACKER ROD BACKER ROD BASEMENT

**GENERAL NOTES:** 

ARCHITECTURAL SHEETS ARE DRAWN ACCORDING TO A PLAN NORTH.

CAB	CABINET CARBON DIOXIDE CARPET CASED OPENING CASING CASING CELLING UNG PLASTIC TOILET PARTITION CELLING UNG PLASTIC TOILET PARTITION CELLING SUPPORT SYSTEM CEMENT CENTER CENTER CENTER CENTER CENTER CERTER LINE CERTER TO CENTER CERAMIC CERAMIC TILE CHAIK BOARD CHANNEL CHAIK BOARD CHANNEL CIRCLE_CIRCULAR CLEAR. CLEARANCE CLOSET COAT HOOK
202	CARBON DIOXIDE
JPT	CARPEI
	CASED OPENING
236	CASTIDON
21 21.G	CELING
	CEILING HUNG PLASTIC TOILET PARTITION
299	CEILING SUPPORT SYSTEM
CEM	CEMENT
	CENTER
21	CENTER LINE
C/C	CENTER TO CENTER
CER	CERAMIC
ст	CERAMIC TILE
CR	CHAIR RAIL
CHKBD	CHALK BOARD
C, CHAN	CHANNEL
CIR	CIRCLE, CIRCULAR
CLOUT	CLEAN OUT
CLR	CLEAR, CLEARANCE
CLO	CLOSET
СН	COAT HOOK
CR	COLD ROLLED
UL	COLUMN
J-FRZ	COMMERCIAL FREEZER
-rKG	COMPARTMENT
JOMPT	CLEAN OUT CLEAR, CLEARANCE CLOSET COAT HOOK COLD ROLLED COLD ROLLED COLUMN COMMERCIAL REFRIGERATOR COMMERCIAL REFRIGERATOR CONTRACTOR CONTRACTOR PROVIDED / CONTRACTOR CONTRACTOR PROVIDED / CONTRACTOR CONTRACTOR CONTRACTOR CONTRACTOR CONTRACTOR CONTRENCE CORNER GUARD CORRIENCE COUNTER FLASHING COUNTER FLASHING COUNTER FLASHING COUNTERSUNK COURTES CUBICAL CURTAINVALL CURTAINVALL
	COMMERCIAL REEDICERATOR
-FRG	
SONG	CONCRETE MANONRY LINIT
MP	COMPOSITE METAL PANEL
	CONDITION
CONN	CONNECTION
CONST	CONSTRUCTION
CP/CI	CONTRACTOR PROVIDED / CONTRACTOR
CPI	CONTRACTOR PROVIDED AND INSTALLED
CJ	CONTROL JOINT
CONT	CONTINUE, CONTINUOUS
CONTR	CONTRACTOR
20NV	CONVENIENCE
JOR	CORNER
	CORNER GUARD
	COUNTER
2N I R	COUNTER ELASHING
21 L	
CRS	COURSES
	CUBICAL
CW	CURTAINWALL
TRK	CURTAIN TRACK
DP	DAMPROOFING DEFORMED BAR ANCHOR
DBA	DEFORMED BAR ANCHOR
JEMO	DEMOLISH, DEMOLITION
	DEPARTMENT
DTL	DETAIL
DIAGM	
JIAGL	DIAGONAL DIAMETER
DO	DIMENSION
טעוכ עור	DIVISION
)R	DIVISION DOCK BUMPER
DR	DOOR
DBL	DOUBLE
DN	DOWN
DS	DOWNSPOUT
DRN	DRAIN
DWG	DRAWING
DWGS	DRAWINGS
A	EACH EACH WAY
VV	EACH WAY
- 	
	ELECTRIC
-LEC	EAST ELASTIC, ELASTOMERIC ELECTRIC ELECTRIC WATER COOLER ELEVATION
=1	ELEVATION

ENCL. .. ELNCLOSED, ENCLOSURE . END TO END ENGR... ENT..... ENGINEER ENTRY ENTRANCE EM... ENTRY MAT ... EPOXY ... EQUAL ... EQUIPMENT ... ESCUIPMENT ... ESCULATOR ... EXISTING TO REMAIN ... EXISTING TO REMAIN ... ETHYLENE PROPYLENE DIENE MONOMER ... EXCAVATE EXHAUST FAN EQ..... EQMT. EQMT... ESC..... ESCL.... ETR..... EPDM... EXC..... . EXHAUST FAN EF..... EXIST... .. EXISTING EXPAN.... .. EXPANSION EJ..... EXPANSION JOINT EXP JT..... EXPANSION JOINT EXP..... EXPOSED .. EXTERIOR EIFS...... EXTERIOR INSULATION FINISH SYSTEM EB, EXB..... EXPANSION BOLT EWC FABRIC WALL COVERING .. FABRIC WALL COVERING ... FABRICATE, FABRICATED, FABRIC ... FACE BRICK ... FACE OF STUD ... FACE OF STUD ... FASTENER ... FIBERGLASS EICL D VEDICY FAB... FB.... FOS... F/F.... FSTN. FG.. FV. FIELD VERIFY FIN. FINISH FINISH FLOOR ... FIRE ALARM ... FIRE DEPARTMENT CONNECTION ... FIRE EXTINGUISHER ... FIRE EXTINGUISHER ON WALL BRACKET FA.. FDC. RINSTALLED FEB... ...FIRE EXTINGUISHER ON WALL BRACKE' ...FIRE EXTINGUISHER IN WALL CABINET ...FIRE HOSE VALVE CABINET ...FIRE RATED ...FIRE RETARDANT ...FILSTURE ...FLASH ...FLASH ...FLOOR DRAIN ...FLOOR DRAIN ...FLOOR DRAIN FEC..... FHVC... FRTD FKTD.... FIXT..... FLASH... FLEX..... FD..... FLRG..... FMPTP..... FLOUR..... ... FLOORING ... FLOOR MOUNTED PLASTIC TOILET PARTITI ....FLUORESCENT FW.. ... FOOD WELL ....FOOT, FEET FT FTG... FDN... FRM.. FS.... FOOTING ...FOUNDATION FRAME FRAMING FURNISH FURR. ... FURRED, FURRING ... GALVANIZED ... GALVANIZED IRON ... GAS ... GAUGE ... GENERAL CONTRACTOR ... GLASS FIBER REINFORCED CONCRETE ... GLASS, GLAZED, GLAZING ... GRAB BARS ... GRADE GALV. GA GC..... GFRC. GL. GB. GR..... GRA.. GRADE GRANITE GND.. GRT... . GROUND . GROUT GB.... GYP BD.... GYPSUM BOARD GYPSUM BOARD GMGSB...... GLASS-MAT GYPSUM SHEATHING BOARD HDCP... HANDICAP .. HANDICAP .. HANDRAIL .. HAND SINK . HARDWARE .. HARDWOOD .. HEAD, HEADER HS.... HDW HDWD.. HD.....

.. ELEVATOR

ELEV.....

	HTR	HEATER	MTL
	HVAC	HEATING, VENTILATION, & AIR CONDITIONING	MEZZ MLWK
	HVY		
	HT HPT	HIGH POINT	MIN MIR
	HC	HIGH POINT HOLLOW CORE	MU
	HM	HOLLOW METAL	MISC
	HSS	HOLLOW STRUCTURAL SECTIONS	MD
	HORZ	HORIZONTAL	MD MONO
	HB	HOSE BIB	MBHUS
	HOSP	HOSPITAL	MTD
	HVV	HOT WATER HYDROGEN	MILL MULT
	11	IIIBROGEN	WOLT
	IM	ICE MACHINE	NAT
	IMPR	IMPREGNATE	NEO
	INCAND	INCANDESCENT	N
	INCIN	INCINERATOR INCH, INCHES	N20
	IN	INCH, INCHES	NRC
	INEO	INDUSTRIAL INFORMATION	NOM NC
	ID.	INSIDE DIAMETER	N
	INST	INSULATE, INSULATION	NA
	INT	INTERIOR, INTERNAL	NIC
	INV		NTS
	ISOL	ISOLATION	NO, #
	JAN		OFF
	JT	JOINT	
	JST	JOIST	OPNG
	JCT	JUNCTION JUNCTION BOX	OPP
	JB, J-BOX	JUNCTION BOX	OH ORIG
	VIT	KITCHEN	URIG
	KIT	KIICHEN KNOCK DOWN	OD O/O
	K/O	KNOCK OUT	O/A
	KOP	KNOCK OUT KNOCK OUT PANEL	OFRD
			O/H
	LAB	LABORATORY	OFOI
	LAM	LAMINATE, LAMINATED	OFCI
	LAND	LANDING	OX, O2.
	HI AV	LAVATORY, HANDICAPPED	PNT
	L	LEFT	PNTD
	LH	LEFT HAND LEFT HAND REVERSE	PTS
	LHR	LEFT HAND REVERSE	PNL
	LT	LIGHT	PTD PTWD
TION	LTG	LIGHTING	PTWD
ION	LGIVIF	LIGHT GAUGE METAL FRAMING LIGHT WEIGHT	PARA
	LWTC	LIGHT WEIGHT CONCRETE	PAR
	LIN	LINEAR	PBD
	LDIF	LINEAR DIFFUSER LIQUID	PTN
	LIQ	LIQUID	PED
	LKS	LOCAL KEY SWITCH	PERF
	LOC LKR	LOCATION	PERP PC WKS
	LG	LONG	PC WKS
	LLH	LONG LONG LEG HORIZONTAL	PLAS, P
	LLV	LONG LEG VERTICAL	PLAM
	LOUV	LOUVER	PL
	LP	LOW POINT	PLAT
	LBR	LUMBER LUXURY VINYL TILE	PLB PLWD
	∟√1		PTS
	MACH	MACHINE	PT
	MAN	MANUAL	POL
	MH	MANHOLE	PSF PWR
	MFR	MANUFACTURER	PWR
	MK	MANUFACTURED MARK MARKER BOARD	PC
	MKBD	MARKER BOARD	PEMB PRE FA
	MAS	MASONRY	PEN
	MO	MASONRY OPENING	PREP
	MAT MAX	MATERIAL	PRT PROD
	MAX	MAXIMUN	PROD
	MECH	MECHANICAL	PROJ
	MED		PS PI
	MG	MEDICAL AIR MEDICAL GAS	PL PUR
	MV	MEDICAL VACUMM	POLYS.
	MCF	MEDIUM DENSIY FIBER BOARD	
	MEMB	MEMBRANE	

HTR HEATER

.. MEZZANINE ... MILLWORK MLWK. MIN... MINIMUM MIRROR MU.... MIRROR UNIT MINDELLANEOUS MODEL, MODULE MONOLITHIC MOP/BROOM HOLDER UNIT W/ SHELF MOUNT, MOUNTED MD..... MBHUS.. MTD..... MILL..... MULT.... MULLION NAT . NATURAL NEO. NEOPRENE . NITROGEN N20 NITROGEN OXIDE NOISE REDUCTION COEFFICIENT NRC NOM. . NOMINAL NON-SLIP NORTH .. NORTH . NOT APPLICABLE .. NOT IN CONTRACT .. NOT TO SCALE NIC... NTS.. NO, #. . NUMBER OFF..... OC..... OPNG.. OPP.... OH.... ORIG... . OFFICE ... ON CENTER ... OPENING ... OPPOSITE OPPOSITE HAND ORIGINAL OUTSIDE DIAMETER OD.. 0/0... 0/A... OUT TO OUT OVERALL ... OVERFLOW ROOF DRAIN OFRD.. O/H., . OVERHEAD . OTHER FURNISH/OTHER INSTALL ... OTHER FURNISH/CONTRACTOR INSTALLED OFOL OFCL OX. 02. .. OXYGEN ... PAINT ... PAINTED ... PAINT STAIN ... PAPER TOWEL DISPENSER ... PAPER TOWEL DISPENSER... PAPER TOWEL DISPENSER.WASTE DECEDTACIE PNT.... PNTD... PTS..... PNL.... PTD..... PTWD... RECEPTACLE PARAGRAPH PARA. PAR... .. PARALLEL .. PARTICLE BOARD PBD. PTN. PARTITION PARTITION PEDESTAL, PEDESTRIAN PED. PERF PERFORATE (D) PERF PERPENDICULAR PC WKST.. PERSONAL COMPUTER WORKSTATION PIECE POL.. PSF.. POLISH POUNDS PER SQUARE FOOT PWR.. POWER PRECAST CONCRETE PC. PRT.... PRINTER ... PRODUCTION ... PROJECT, PROJECTOR ... PROJECTION SCREEN ... PROPERTY LINE ... PURLIN (S) ... POLYSTYRENE PROJ PS.... PL.... PUR..... POLYS....

MTL..

. METAL

	QUANTITY	TBD
QT	QUARRY TILE	TEL
		TV
R, RAD	RADIUS	TEMP
RCV	RECIEVER	THK
DECEDT	RECERTACIE	TRHD
RECEPT	RECEPTACLE	TRHU
REC	RECESSED	THRU
RE, REF	REFERENCE REFRIGERATOR	TGL
RFGR	REFRIGERATOR	TLT, TOIL.
REG	REGISTER, REGULATOR	TTD
REBAR	REINFORCING BAR	T&G
DEINE	REINFORCE REIN FORCING	T&B
	REINFORCE, REIN FORCING REPRODUCE	Τασ
REPRU	REPRODUCE	то
REQ	REQUIRE (D)	TBM
RESIL	REQUIRE (D) RESILIENT	TOC
RESI	RESISTANT	том
RW	RETAINING WALL	TOS
DET	DETLIDN	TOW
DEV/	REVISE, REVISION RIGHT RIGHT HAND	тв
DT	NEVISE, NEVISION	TD
KI	RIGHT	TRK
RH	RIGHT HAND	TRK T, TRD
RHR	RIGHT HAND REVERSE	TRTD
R	RIGHT HAND REVERSE RISER	TD
RBHK	ROBE HOOK	TS
RD	ROOF DRAIN	TS TYP
DTII	ROOF TOP UNIT	
D/L		110
к/H	ROOF HATCH	UC
RM	ROOM	UG
RO	ROUGH OPENING	DL
RB	RUBBER BASE	UNF
		UH
SNDU	SANITARY-NAPKIN DISPOSAL UNIT	UNO
3NDU	SANITART-NAFKIN DISPUSAL UNIT	UNO
55	SANITARY SEWER SCHEDULED	UR UTIL
SCHED	SCHEDULE, SCHEDULED	UTIL
SCW	SCREW (S)	
SLNT	SEALANT	VS
SCD	SEAT COVER DISPENSER	V
SECTION	SECTION	VB
	SEPARATE	VAR
SEF	SEFARATE	VAR
SHING	SHEATHING	VIC
SHT	SHEET SHEET VINYL SHELF, SHELVES SHOWER CURTAIN, ROD, AND HOOKS	VIF
SV	SHEET VINYL	VTR
SHL	SHELF, SHELVES	VERT
SCR	SHOWER CURTAIN, ROD, AND HOOKS	VEST
SHWR	SHOWER ROD	VIN
SIM	SIMILAR	VT
0.01	SIMILAR	VT VCT
5GL	SINLED PLY	VCT
150	SINLED PLY SINK UNIT - SINGLE SINK UNIT - DOUBLE SINK UNIT - TRIPLE	VWC
2SU	SINK UNIT - DOUBLE	VOL
3SU	SINK UNIT - TRIPLE	
		WSCT
SC	SOLID CORE	WCAB
SDSE		
3D3F		
	COUND ATTENUATING FIDE DATTO	WAD
SAI D	SOUND ATTENUATING FIRE BATTS	W RCPT
STC	SOUND ATTENUATING FIRE BATTS SOUIND TRANSMISSION COEFFICIENT	W RCPT WC
	SOLID CORE SOLID SURFACE SOUND ATTENUATING FIRE BATTS SOUND TRANSMISSION COEFFICIENT SOUTH	W RCPT WC WH
		W RCPT WC WH WP
		W RCPT WC
		W RCPT WC WH WP WR
		W RCPT WC WH WP WR WS
S SP SPEC SQ SQFT, SF	SPANDREL SPECIFICATION (S) SQUARE SQUARE FOOT	W RCPT WC WH WP WR WS WWF
SPEC SPEC SQ SQFT, SF STAG	SOUTH SPANDREL SPECIFICATION (S) SQUARE SQUARE FOOT STAGGERED	W RCPT WCWH WP WR WS WWF W
SPECSQ. SQFT, SF STAG SST	SOUTH SPANDREL SPECIFICATION (S) SQUARE SQUARE FOOT STAGEGRED STAINLESS STEEL	W RCPT WCWH WP WR WS WWF W WHC.
SPECSQ. SQFT, SF STAG STT STD	SOUTH SPANDREL SPECIFICATION (S) SQUARE SQUARE FOOT STAGGERED STAMDARD STANDARD	W RCPT WC WH WP WR WS WWF W. WHC WF
S. SPECSQ. SQFT, SF STAG SST STD STA	SOUTH SPANDREL SPECIFICATION (S) SQUARE SQUARE FOOT STAGGERED STAINLESS STEEL STAINLESS STEEL STAINDARD STATION	W RCPT WC WH WR WS WWF WHC WF WF WF WF WF WF WF WF WF WF
S. SPECSQ. SQFT, SF STAG SST STD STA	SOUTH SPANDREL SPECIFICATION (S) SQUARE SQUARE FOOT STAGGERED STAINLESS STEEL STAINLESS STEEL STAINDARD STATION	W RCPT WC WH WR WS WWF WHC WF WF WF WF WF WF WF WF WF WF
S. SPECSQ. SQFT, SF STAG. SST STD STA STL	SOUTH SPANDREL SPECIFICATION (S) SQUARE SQUARE FOOT STAGGERED STANDARD STATION STATION STEEL	W RCPT WC WH WP WS WWF WHC WHC W WF W WDW
S	SOUTH SPANDREL SPECIFICATION (S) SQUARE SQUARE FOOT STAGGERED STAMLESS STEEL STAINDARD STATION STEEL STIFFENER	W RCPT WC WH WR WR WR WWF WHC WF WF WF WF WF WGU
SPECSPECSQ. SQET, SF. STAGSTAG. SSTSTDSTA. STLSTL. STIFF. STIR.	SOUTH SPANDREL SPECIFICATION (S) SQUARE SQUARE FOOT STAGGERED STANDARD STATION STATION STEEL STIFFENER STIFFENER STIFFENER STIFRUP	W RCPT WCWH WHWP WR WS WWF WHC WHC WHC WGL WGL
SP SPECSQFT, SF. SQFT, SF. STAGSST. STDSTASTL STILFSTIFFSTIR. STIRSTIR.	SUDINE SPANDREL SPECIFICATION (S) SQUARE SQUARE FOOT STAGGERED STANDARD STAGERED STAINDARD STATION STEEL STIFFENER STIFFENER STIFFENER STIFFENER STONE	W RCPT WCWH. WPWR. WS WWF. WWF. WHC. WHC. WHC. WGL. W/O. W/O.
SP SPECSQFT, SF. SQFT, SF. STAGSST. STDSTASTL STILFSTIFFSTIR. STIRSTIR.	SUDINE SPANDREL SPECIFICATION (S) SQUARE SQUARE FOOT STAGGERED STANDARD STAGERED STAINDARD STATION STEEL STIFFENER STIFFENER STIFFENER STIFFENER STONE	W RCPT WCWH. WPWR. WS WWF. WWF. WHC. WHC. WHC. WDW. WGL W/O. W/O. WD.
SP	SUDINE SPANDREL SPECIFICATION (S) SQUARE SQUARE FOOT STAGGERED STANDARD STATION STATION STEEL STIFFENER STIFFENER STIFFENER STORE STORE STORE STOREFRONT	W RCPT WCWH. WPWR. WS WWF. WWF. WHC. WHC. WHC. WGL. W/O. W/O.
SP	SUDINE SPANDREL SPECIFICATION (S) SQUARE SQUARE FOOT STAGGERED STANDARD STATION STATION STEEL STIFFENER STIFFENER STIFFENER STORE STORE STORE STOREFRONT	W RCPT WCWH WP WR WS WWF WHC WF WF WDW WGL W/ WJ WJ WD WI
SPSP. SPECSQ. SQFT, SF. STAGSTDSTA. STLSTLSTI. STIRSTIFFSTIR. STSTORSTORSTORSTR	SUDIN SPANDREL SPANDREL SPECIFICATION (S) SQUARE SQUARE SQUARE STAGGERED STANDARD STAGGERED STANDARD STANDARD STANDARD STANDARD STANDARD STANDARD STORE STAGGERED STANDARD STAGGERED STANDARD STANDARD STAGGERED STANDAR	W RCPT WCWH. WPWR. WS WWF. WWF. WHC. WHC. WHC. WDW. WGL W/O. W/O. WD.
SPSP. SPECSQ. SQFT, SF. STAGSTDSTA. STLSTLSTI. STIRSTIFFSTIR. STSTORSTORSTORSTR	SUDIN SPANDREL SPANDREL SPECIFICATION (S) SQUARE SQUARE SQUARE STAGGERED STANDARD STAGGERED STANDARD STANDARD STANDARD STANDARD STANDARD STANDARD STORE STAGGERED STANDARD STAGGERED STANDARD STANDARD STAGGERED STANDAR	W RCPT WCWH WP WR WS WWF WHC WF WF WDW WGL W/ WJ WJ WD WI
SPSP. SPECSQFT, SF. SQFT, SF. STAG. SST. STD. STASTD. STASTIFF. STIFF. STIR. STORFT. SD. STRSUP.	SUDIN SPANDREL SPECIFICATION (S) SQUARE SQUARE SQUARE STAGGERED STARGERED STARGERED STARGERED STARGERED STATION STEEL STIFFENER STIFFENER STIFFENER STORE STORE STORE STORE STOREFRONT STOREFRONT STORM DRAIN STRUCTURE, STRUCTURAL SUPPLY, SUPPORT	W RCPT WC WP WP WR WR WWF WWC WHC WDW WOW WOW WOW WOW XT
SP	SUDINEL SPANDREL SPANDREL SPECIFICATION (S) SQUARE SQUARE SQUARE STAGGERED STANDARD STANDARD STANDARD STANDARD STANDARD STANDARD STANDARD STORMES STORE STORE STOREFRONT STORMES STORMESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STATON STACTORIC STORMESTORIC STORME	W RCPT WC WH WR WR WR WWF W WHC WF W WGL WI WI XT YD
SP	SUDINEL SPANDREL SPANDREL SPECIFICATION (S) SQUARE SQUARE SQUARE STAGGERED STANDARD STANDARD STANDARD STANDARD STANDARD STANDARD STANDARD STORMES STORE STORE STOREFRONT STORMES STORMESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STAGGESTORIC STATON STACTORIC STORMESTORIC STORME	W RCPT. WCWH. WPWR. WSWWF. WWF. WWWF. WHCWWF. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ
SP	SUDIN SPANDREL SPANDREL SPANDREL SUDARE SQUARE SQUARE STAGGERED STANDARD STATON STATION STATION STATION STEEL STIFFENER STORE STORE STORE STORE STORE STORE STORE STORE STORE STORE STORE STORE STORE STORE STORE SUBSENCE	W RCPT WC WH WR WR WR WWF W WHC WF W WGL WI WI XT YD
SP	SUDIN SPANDREL SPANDREL SPANDREL SPANDREL SUDARE SUDARE SUDARE STAGGERED STANDARD STATON STANDARD STANDARD STANDARD STANDARD STANDARD STONE STORE STORE STORE STORE STORE STORE STORE STORE STORE STORE STORE STORE SUBSEND SU	W RCPT. WCWH. WPWR. WSWWF. WWF. WWWF. WHCWWF. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ
S. SP. SPEC SQ. SQTAG. STAG. STAG. STAG. STA. STA. STA. STA. STA. STA. STA. STA. STA. STA. STA. STA. STA. STA. STA. ST. STA. ST. ST. ST. ST. ST. ST. ST. ST	SUDIN SPANDREL SPANDREL SPANDREL SPANDREL SUDARE SQUARE FOOT STAGGERED STANDARD STATON STATION STANDARD STANDARD STANDARD STANDARD STORES STIFEL STORES STORE STORE STORE STOREFRONT STOREFRONT STOREFRONT STOREFRONT STOREFRONT STOREFRONT STOREFRONT SUDEFRONT	W RCPT. WCWH. WPWR. WSWWF. WWF. WWWF. WHCWWF. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ
S. SP	SUDIN SPANDREL SPANDREL SPANDREL SPANDREL SPANDREL SUDARE SQUARE SQUARE SQUARE STANDARO STAGGERED STANDARO STATION STATION STATION STATION STEL STIFFENER STIFFENER STIFFENER STIFFENER STIFFENER STORE STORE STORE STORE STORE SURGE SURGICAL LIGHT SUSPEND CELLING GRID SWITCH SYMMETRICAL	W RCPT. WCWH. WPWR. WSWWF. WWF. WWWF. WHCWWF. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ
S. SP. SPEC SQ. SQTAG. STAG. STAG. STAG. STA. STA. STA. STA. STA. STA. STA. STA. STA. STA. STA. STA. STA. STA. STA. ST. STA. ST. ST. ST. ST. ST. ST. ST. ST	SUDIN SPANDREL SPANDREL SPANDREL SPANDREL SPANDREL SUDARE SQUARE SQUARE SQUARE STANDARO STAGGERED STANDARO STATION STATION STATION STATION STEL STIFFENER STIFFENER STIFFENER STIFFENER STIFFENER STORE STORE STORE STORE STORE SURGE SURGICAL LIGHT SUSPEND CELLING GRID SWITCH SYMMETRICAL	W RCPT. WCWH. WPWR. WSWWF. WWF. WWWF. WHCWWF. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ. WJ

 ARCHITECTURAL SHEETS ARE DRAWN ACCORDING TO A PLAN NORTH.
 FOR TIEMS PROVIDED "BY OTHERS" PROVIDE AND INSTALL BLOCKING, MECHANICAL, ELECTRICAL, AND PLUMBING. REFERENCE MEP DOCUMENTS. CONTRACTOR IS RESPONSIBLE FOR INSTALLATION COORDINATION.
 ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CURRENT APPLICABLE CITY AND COUNTY STANDARDS. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS GOVERNING SAFETY, HEALTH AND SANITATION. THE CONTRACTOR SHALL PROVIDE ALL SAFEGUARDS, SAFETY DEVICES, AND PROTECTIVE EQUIPMENT AND TAKE ANY OTHER NEEDED ACTIONS TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACT.
 AREAS DISTURBED BY THE CONSTRUCTION OUTSIDE THE LIMITS OF THE CONSTRUCTION SHALL BE RETURNED TO THEIR PREVIOUS CONDITION AT CONTRACTOR'S EXPENSE AS DIRECTED BY ENGINEER. ORANGE PROTECTIVE FENCING SHALL BE INSTALLED AROUND THE DRIP LINE OF ALL TREES TO REMAIN WITHIN THE LIMITS OF CONSTRUCTION AND STALED AROUND THE DRIP LINE OF ALL TREES TO REMAIN WITHIN THE LIMITS OF CONSTRUCTION AND STALED AROUND THE DRIP LINE OF ALL TREES TO REMAIN WITHIN THE LIMITS OF CONSTRUCTION AND STALED AROUND AREA WITH THE OWNER'S REPRESENTATIVE. IF REQUIRED THE AREA SHALL BE RE-VEGETATED.
 COORDINGTE THE CONSTRUCTION STAGING REA. ALL AREAS DISTURBED WITHIN AND BEYOND THE LIMIT OF CONSTRUCTION UNS SHALL BE RE-VEGETATED.
 COORDINGTE THE CONSTRUCTION STAGING REA WITH THE OWNER'S REPRESENTATIVE. IF REQUIRED THE AREA SHALL BE STABILIZED WITH AGGREGATE BASE TO A DEPTH OF 6". THE GRAVEL IS TO BE REMOVED AT THE COMPLETION OF PROJECT. ALL COSTS TO BE INCLUDED IN LINE ITEM MOBILIZATION, DEMOBILIZATION, AND MISCELLANEOUS. CONCRETE 1.1 KEY NOTE SECTION KEY CONCRETE MASC PARTITION TYPE EXTERIOR ELEVATION REVISION INDICATION AND KEY INTERIOR ELEVATION GYPSUM, PLAST LEVEL AND ELEVATION INDICATION CONTRETION OF PROJECT. ALL COSTS TO BE INCLODED IN LINE THEM INDULLATION, DEMOBILIZATION, AND MISCELLANEOUS.
THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE INCURRED TO THE EXISTING ROADWAY PAVEMENT, CURBS, SIDEWALKS, VEGETATION, DRIVEWAYS, LIGHTING, AND AMENITIES DURING CONSTRUCTION IF CAUSED BY CONSTRUCTION ACTIVITIES PERFORMED BY THE CONTRACTOR OR SUBCONTRACTORS.
FIELD VERFY ALL EXISTING CONDITIONS TO DETERMINE, SIZE, LOCATION, TYPE, AND CONFIGURATIONS OF ALL ITEMS ON ROOF AND RELATED TO THE SCOPE OF WORK.
REMOVE ALL ORGANIC DEBRIS FROM ROOF AND ROOF DRAINS.
REMOVE EXISTING ROOFTOP EQUIPMENT FOR CURB SIZE WITH EXISTING UNIT. COORDINATE REMOVAL/REINSTALLED. COORDINATE ON ROOF AND AWAREN CONSTRUCTION. CONTRACTOR WILL BE RESPONSIBLE FOR ANY WATER INFILTRATION INTO BUILDING DURING CONSTRUCTIONS OFFRATIONS.
IF EXISTING STRUCTURAL DECK IS SHOWING SIGNS OF RUST OR FAILURE, NOTIFY ARCHITECT PRIOR TO PRECEEDING. MISCELLANEOUS DRAWING KEY, INDICATION AND SCALE DETAIL SECTION KEY AGGREGATE BA PLAN NORTH ARROW DETAIL PLAN KEY STEEL A WINDOW TAG PRECEEDING PRECEEDING. 12. REMOVE ANY ABANDONED ROOFTOP EQUIPMENT OR ITEMS - COORDINATE WITH OWNER. 13. COORDINATE ANY MECHANICAL FASTENERS WITH ELECTRICAL CONDUIT THAT MAY BE REINSTALLED. 14. CONTRACTOR WILL BE RESPONSIBLE TO REPAIR ANY EXISTING ELECTRICAL DAMAGED DURING REROOFING -----DEMOLISHED PARTITION. (CMU) CONCRETE MASONRY UNIT OPERATIONS. 15. SUBMIT TAPERED INSULATION SHOP DRAWING PLANS PRIOR TO INSTALLATION. GYPSUM BOARD PARTITION \_ \_ \_ \_ \_ \_ \_ GRID LINE D. SUDWIT LARGED INSULATION STAFF DAVING FLANS FARM TO INSTALLATION.
 FLASH ANY PENETRATIONS THROUGH ROOF.
 ALL METAL OR PVC PIPING AND CONDUITS SHALL BE ELEVATED ABOVE ROOF MEMBRANE AT ALL POINTS ON SUPPORT UNITS. \_\_\_\_ CENTER LINE EXISTING PARTITION

**SYMBOLS** 

### **MATERIALS**

BRICK

TACKBOARD TELEPHONE TELEVISION TEMPERED THICK THRESHOLD TRACK TREAD TREATED TRENCH DRAIN TUBULAR STEEL UNDERCOUNTER ... UNDERCOUNTER ... UNDERGROUND ... UNDERWRITERS LABORATORIES, INC. ... UNFINISHED ... UNIT HEATER UNLESS NOTED OTHERWISE .. URINAL .. VACUUM SLIDE VALVE . VALVE BOX VARIES, VARIABLE VARIABLE INTENSITY CONTROL ... VARIABLE INTENSITY CC ... VERIFY IN FIELD ... VENT THROUGH ROOF ... VERTICAL ... VESTIBULE ... VINYL ... VINYL TILE VINYL COMPOSITION TIL ... VINTE TILE ... VINYL COMPOSITION TILE .... VINYL WALL COVERING VOLUME .... WAINSCOT .... WALL CABINET .. WARM-AIR DRYERS ... WASTE RECEPTACLE WATER CLOSET WATER HEATER ... WATER PROOFING ... WEATHER STRIP(ING) ... WELDING SIRE FABRIC ...WELDING SIRE I ...WEST ...WHEEL CHAIR ...WIDE FLANGE ...WIDE WIDTH ...WINDOW WIRE GLASS WITH WITHOUT .WOOD WROUGHT IRON X-RAY TRACK SUPPPORT YARD

... YIELD POINT ... YIELD STRENGTH

		ALUMINUM
ONRY UNIT		RIGID INSULATION
		INSULATION BATT
ER, MORTAR		BLOCKING
		BLOCKING - SHIM
SE		PLYWOOD
	<i>81919191</i> 9	WOOD



JAIL 74354 REPLACEMENT COUNTY ЯÓ MIAMI, S OTTAWA ROOF ST. ш 28

PRO	JECT NO.:	787	
SUB	MITTAL:	FINAL	
ISSL	JE DATE:	11/10/21	
	. MANAGER: J SIGNED BY: K DRAWN BY: A	(DR	
REVIS	SIONS:		
No.	Descrip	otion	Date
No.	Descrip	otion	Date
No.	Descrip	otion	Date
No.	Descrip	otion	Date
No.	Descrip	otion	Date
No.	Descrip	otion	Date
No.	Descrip	otion	Date



SHEET 02 OF 09 **GENERAL NOTES, ABBREVIATIONS** AND SYMBOLS

G1-01









PIPE SEAL MUST HAVE INTACT RIB AT TOP OF EDGE, REGARDLESS OF PIPE

FASTENERS AND PLATES CANNOT BE INSTALLED AS SHOWN, THEY MAY PIPE MAX. 12" O.C. AND FLASHED WITH MEMBRANE/ CUT EDGE SEALANT. UNLESS PIPE DIAMETER EXCEEDS 18"

ROOF MEMBRANE

LIGHTWEIGHT CONCRETE INSULATING SYSTEM

SBS MODIFIED **BITUMINOUS SHEET** 

EXISTING CONCRETE

NOTES:

2

3.

- THE HOLE IN THE MEMBRANE SHALL EXCEED THE DIAMETER OF THE DRAIN PIPE BUT SHALL BE NO LESS THAN 1/2" FROM THE ATTACHMENT POINTS OF THE DRAIN CLAMPING RING. REMOVE EXISTING LEAD FLASHING MATERIAL IF IN PLACE AND ENSURE THE DRAIN RING IS COMPLETELY CLEAN DOWN TO THE BARE
- METAL. ALL BOLTS OF CLAMPS MUST BE IN PLACE TO PROVIDE CONSTANT COMPRESSION
- ON WATER CUT OFF MASTIC. ADJUST DRAIN HEIGHT IF NEEDED.



**COUNTY JAIL** SE MIAMI, OK 74354 REPLACEMENT OTTAWA ROOF B ST. 28

PROJECT NO.: 787 SUBMITTAL: FINAL ISSUE DATE: 11/10/21 PROJ. MANAGER: JDH DESIGNED BY: KDR DRAWN BY: AMS REVISIONS: Description



SHEET 05 OF 09

ENLARGED DETAILS



### MECHANICAL ABBREVIATIONS:

AAV AC ACH AFF AHU APD APPROX ARCH	AUTOMATIC AIR VENT (VALVE) AIR CONDITIONING UNIT OR AIR COMPRESSOR AIR CHANGES PER HOUR ABOVE FINISHED FLOOR AIR HANDLING UNIT AIR PRESSURE DROP APPROXIMATE ARCHITECTIARCHITECTURAL	ID IN OR " IN W.C. IN W.G. INSUL. KW LAT
AVG BAS BDD BF BHP BOD BOP	AVERAGE BUILDING AUTOMATION SYSTEM BACK DRAFT DAMPER BOILER FEED BRAKE HORSEPOWER BOTTOM OF PUCT BOTTOM OF PIPE	LBS LDB LVG LWB LWT MAINT
BTUH CA CAV CC CCW CD CFH	BRITISH THERMAL UNIT PER HOUR COMPRESSED AIR CONSTANT AIR VOLUME TERMINAL UNIT COOLING COIL COUNTER CLOCKWISE CONDENSATE DRAIN CUBIC FEET PER HOUR	MAX MBH MCA MD MECH MIN MISC MOCP
CFM CH CL CONT CR CT CU CU CU CU CU CU CU CU FT	CUBIC FEET PER MINUTE CHILLER CAST IRON CENTER LINE CONTINUOUS, CONTINUATION CONDENSATE RETURN COOLING TOWER CONDENSING/ER UNIT CUBIC FEET	NC NIC NK NO NO. OR NR NTS
CUH CW	CABINET UNIT HEATER CLOCKWISE	OA OBD OD
DB DDC DEG.F DH DIA DIM DN DP DWG DX	DRY BULB TEMPERATURE DIRECT DIGITAL CONTROL DEGREE FARENHEIT DUAT HEATER DIAMETER DIMENSION DOWN DIFFERENTIAL PRESSURE DRAWING DIRECT EXPANSION	P PA PC PH PLBG PRESS PRV R
(E) EA EAT EBB EC EDB EER EF EF	EXISTING EACH OR EXHAUST AIR ENTERING AIR TEMPERATURE ELECTRIC BASEBOARD HEATER ELECTRICAL CONTRACTOR ENTERING DRY BULB TEMPERATURE ENERGY EFFICIENCY RATIO EXHAUST FAN EFFICIENCY	RA RCQ'D RF RH RM RPM RTU S
ELEV ELEC ENT EQUIP ESP ET EUH EWB EWB EWT EXIST	ELEVATION ELECTRIC/ELECTRICAL ENTERING EQUIPMENT EXTERNAL STATIC PRESSURE EXPANSION TANK ELECTRIC UNIT HEATER ENTERING WET BULB TEMPERATURE ENTERING WATER TEMPERATURE EXISTING	SA SD SF SPECS SQ SQFT SS STM STM
F&T FC FD FLA FPB FPB FPM FPS FRP FSD FT FTR FTR FV	FLOAT & THERMOSTATIC STEAM TRAP FAN COIL FIRE DAMPER FULL LOAD AMPERES FLEXIBLE FLEXIBLE FAN POWERED TERMINAL UNIT FEET PER MINUTE FEET PER SECOND FIBERGLASS REINFORCED PLASTIC FIRE/SMOKE DAMPER FEET OR FLASH TANK FIET TOR FLASH TANK FIN TUBE RADIATION (HOT WATER) FACE VELOCITY	TEF TEMP TSP TYP UC UGRD UH V VAV VD
GAL GC GD GPH GPM	GALLON GENERAL CONTRACTOR GRAVITY DAMPER GALLONS PER HOUR GALLONS PER MINUTE	VEL VERT VFD VSD VTR
H HC HPPA HR HRP HTG HUM HVAC HX HZ	HUMIDISTAT HEATING COIL HIGH EFFICIENCY PARTICULATE AIR FILTER HORSEPOWER OR HEAT PUMP HOUR HYDRONIC RADIANT PANEL HEATING HUMIDIFIER HEATING, VENTILATION & AIR CONDITIONING HEAT EXCHANGER HERTZ	W WB WC WPD WT

INSIDE DIAMETER INCH INCHES WATER COLUMN INCHES WATER GAUGE INSULATION KILOWATT
LEAVING AIR TEMPERATURE POUNDS LEAVING DRY BULB TEMPERATURE LANDLORD LEAVING WET BULB TEMPERATURE LEAVING WATER TEMPERATURE
MAINTENANCE MAXIMUM THOUSAND BTU PER HOUR MINIMUM CIRCUIT AMPACITY MOTORIZED DAMPER MECHANICAL MINIMUM OR MINUTE(S) MISCELLANEOUS MAXIMUM OVERCURRENT PROTECTION
NORMALLY CLOSED OR NOISE CRITERIA NOT IN CONTRACT NECK NORMALLY OPEN NUMBER NOT REQUIRED NOT TO SCALE
OUTSIDE AIR OPPOSED BLADE DAMPER OUTSIDE DIAMETER
PUMP PASCAL PLUMBING CONTRACTOR PHASE PLUMBING PRESSURE PRESSURE PRESSURE REDUCING VALVE
RETURN RETURN AIR REHEAT COIL REQUIRED RETURN FAN RELATVE HUMIDITY ROOM REVOLUTIONS PER MINUTE ROOFTOP TERMINAL UNIT
SUPPLY SUPPLY AIR OR SOUND ATTENUATOR SUPPLY FAN STATIC PRESSURE SPECIFICATIONS SOUARE SOUARE FEET STANLESS STEEL STANDARD STEAM STEAM STRUCTURE/STRUCTURAL
THERMOSTAT TOILET EXHAUST FAN TEMPERATURE TOTAL STATIC PRESSURE TYPICAL
UNDER-CUT (DOOR) UNDERGROUND UNIT HEATER (HYDRONIC OR STEAM)
VOLT VARIABLE AIR VOLUME VOLUME DAMPER VELOCITY VERTICAL VARIABLE FREOUENCY DRIVE VARIABLE SPEED DRIVE VENT THROUGH ROOF
WATT WITH WET BULB TEMPERATURE WATER COLUMN WATER PRESSURE DROP WEIGHT

### **GENERAL MECHANICAL NOTES**

- PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS AND AS REQUIRED BY CODE.
- DRAWINGS ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY.
- INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS, AND APPLICABLE CODES AND REGULATIONS.
- COORDINATE CONSTRUCTION OF ALL MECHANICAL WORK WITH ARCHITECTURAL. STRUCTURAL, CIVIL, ELECTRICAL WORK, ETC., SHOWN ON OTHER CONTRACT DOCUMENT DRAWINGS
- TESTING, ADJUSTING, AND BALANCING AGENCY SHALL BE A MEMBER OF THE ASSOCIATED AIR BALANCE COUNCIL (AABC) OR THE NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB). TESTING, ADJUSTING AND BALANCING SHALL BE PERFORMED IN ACCORDANCE WITH AABC STANDARDS.
- CONTRACTOR TO COMPLY WITH ALL LOCAL CODES AND REQUIREMENTS: 2018 IMC AND 2018 IFGC. 2006 IECC. 6.
- ALL OUTSIDE AIR INTAKES TO BE A MINIMUM OF 10' FROM ANY MECHANICAL EXHAUST, OR PLUMBING VENTS.
- 8. DUCTWORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH MOST RECENT SMACNA STANDARDS
- ALL DUCT DIMENSIONS SHOWN ARE CLEAR INSIDE DIMENSIONS. INCREASE DUCT SIZE AS NECESSARY TO ACCOUNT FOR DUCT LINER
- SUPPORTS FOR MECHANICAL SYSTEM PIPING MUST MEET THE HORIZONTAL AND VERTICAL SPACING PROVISIONS IN RESPECTIVE MECHANICAL CODE. 10.
- 11. EACH DUCT BRANCH TAKE-OFF SHALL HAVE A MANUAL VOLUME DAMPER.
- COORDINATE DIFFUSER, REGISTER, AND GRILLE LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS, LIGHTING, AND OTHER CEILING ITEMS AND MAKE MINOR DUCT 12. MODIFICATIONS TO SUIT.
- REFER TO SPECIFICATIONS AND PROJECT MANUAL FOR ADDITIONAL INFORMATION AND 13. REQUIREMENTS
- 14. THESE DRAWINGS REFLECT A SYSTEM DESIGNED AROUND SPECIFIED REFERENCE THESE DRAWINGS REFLECT A SYSTEM DESIGNED AROUND SPECIFIED REFERENCE PRODUCTS, THE SELECTION OF WHICH HAS INFLUENCED THE DESIGNS OF OTHER TRADES. IF SUBSTITUTE MANUFACTURERS, SIZES, OR MODEL NUMBERS ARE BID OR SUBMITTED, IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE ALL DIFFERENCES PRIOR TO BID, ALL COSTS OF ALL TRADES ASSOCATION WITH THE SUBSTITUTIONS SHALL BE INCLUDED IN THE BID.
- COORDINATION OF ALL MODIFICATIONS TO EACH DISCIPLINE WHICH RESULT FROM SUBSTITUTION OF EQUIPMENT OR MATERIALS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. SUBSTITUTIONS WHICH ARE INSTALLED AND SUBSEQUENTLY ARE PROVEN 15. UNAATISFACTORY BY OWNER AND/OR ENGINEER WITHIN THE WARRANTY PERIOD, SHALL BE REMOVED COMPLETELY BY THE CONTRACTOR AND REPLACED WITH THE ORIGINAL DESIGN OR CORRECTED AS DIRECTED BY THE ENGINEER WITHOUT ADDITIONAL COST TO OWNER
- CONTRACTOR SHALL PROVIDE AND INSTALL ALL AIR DEVICES WITH MOUNTING SYSTEM 16. DESIGNED FOR MOUNTING SUBFACE TYPE
- COORDINATE FINAL PLACEMENT OF ALL THERMOSTATS WITH WALL-MOUNTED DEVICES AND OWNER'S REPRESENTATIVE. MOUNT PER ADA REQUIREMENTS. ANY THERMOSTAT THAT IS REQUIRED TO BE MOUNTED ON AN EXTERIOR WALL SHALL BE MOUNTED ON AN INSULATED PAD.

N	IECHANICAL S	YMBO	DL LEGEND
IФI	ISOLATION VALVE - BALL		EXHAUST GRILLE - CEILING
$\mathbb{I}$	Y-STRAINER WITH VALVE & HOSE CONNECTION	þ	WALL GRILLE
Ψ	THERMOMETER		MANUAL VOLUME DAMPER
Ţ	CONTROL WELL / TEST PORT	ς	CONTINUATION
×	TRIPLE DUTY VALVE - ISOLATION, CHECK, CIRCUIT SETTER		CLEANOUT
$\triangleright$	REDUCER		FLOW ARROW
СH	ELBOW DOWN	$\bigcirc$	PUMP - FLOW IN DIRECTION OF ARROW
9	PRESSURE GAUGE	#	KEY NOTE
4	AIR VENT	$\begin{pmatrix} XX \\ XX \end{pmatrix}$	EQUIPMENT TAG
₽¥	MOTORIZED 3-WAY VALVE		SUPPLY DIFFUSER - CEILING
$ \diamondsuit $	CIRCUIT SETTER		RETURN GRILLE - CEILING
٢	CONNECT TO EXISTING		FAN AND AIR CURTAIN CONTROLS

- 1. 2. 3.
- 4. 5

- 1. NATURAL GAS PIPING. 3.

### JOB SPECIFIC MECHANICAL NOTES

- 1. WITHIN 12" OF EVERY CHANGE OF DIRECTION. ALL NEW GAS PIPING SHALL BE PAINTED YELLOW
- 4. 5.

6.

10. 11. 12.

1.

2.

3.

4

5

- 7. ON THE EQUIPMENT SCHEDULES.
- 8.

	(	CON
	OCK MAKEU	
	EN EXHAUST	
	ER MANUFAC	
	DE NEW DDC .OCK RTU'S V	
A.	CONTROL S	
А.	COMPUTER	
B.	PROVIDE BA	
D.	SYSTEM	
C.	PROVIDE BA	
0.	SYSTEM	
D.	PROVIDE TE	MPERATU
	EN LIEU OF	SPACE SE
E.	ENSURE CO	NTROL SY
	HUMIDITY, A	ND ECONO
	MODES.	
F.	SET UP TRE	NDS FOR F
	UNIT.	
G.	SET UP ALA	
	MORE THAT	
Н.	PROVIDE 2 H	
I.	PROVIDE 2 H	
J.	SUBSTANTIA PROVIDE 20	
J.	THEIR DISCH	
	ADDITIONAL	
INTERI	OCK RTU-5.	
	OWN AND IN	
	M WHEN SMO	
	OCK FIRE AL	
	MIZER DAME	
SMOKE	ALARM IS A	





### MECHANICAL DEMO SCOPE

DEMOLISH EXISTING RTU'S AS SHOWN TO MAKE READY FOR 20" NEW ROOF CURBS. A. REMOVE AND RETAIN RTU-1, AND RTU-2. REMOVE ALL ROOF MOUNTED FANS AND HOODS, RETAIN FOR REUSE, AND MAKE READY

FOR 20" NEW ROOF CURBS. A. DEMO ALL EXISTING ROOF CURBS AND MAKE READY FOR 20" NEW ROOF CURBS. DEMO EXISTING MAKEUP AIR UNIT AND MAKEUP AIR UNIT CURB.

DEMO EXISTING MAKEUP AIR UNIT CONDENSING UNIT.

CAPTURE REFRIGERANT FROM WALK-IN COOLER REFRIGERANT CIRCUIT. REMOVE AND RETAIN EXISTING WALK-IN COOLER CONENSING UNIT FOR REUSE. PROVIDE NEW CONTROL SYSTEM AND NEW CONTROLS FOR RTU'S.

### MECHANICAL SCOPE

PERFORM MECHANICAL DEMO SCOPE. PROVIDE NEW RTUS AND NEW 20" ROOF CURBS IN THE SAME LOCATIONS AS THE PREVIOUS RTUS AND CONNECT TO EXISTING DUCTWORK, ELECTRICAL POWER, AND

RECONFIGURE EXISTING DUCTWORK, ELECTRICAL POWER, AND NATURAL GAS PIPING AS NECESSARY TO ACCOMODATE NEW UNITS. FIFTING AS INCLESSANT 10 ACCUMUDATE NEW UNTIS. PROVIDE NEW ROOF MOUNTED FAN, HOOD, AND 20° ROOF CURBS. INSTALL RETAINED EXHAUST FANS AND HOODS ON NEW 20° ROOF CURBS, RECONNECT TO ELECTRICAL DOMED

EXHAUST FARS AND HOUDS ON NEW 20 KOUF CORBS, RECOMMENT TO ELECTINGAL POWER. PROVIDE NEW MAU-1, MAU-1 CONDENSERS, AND 20' ROOF CURB AS SHOWN PER M1-01. REINSTALL WALK-IN COOLER CONDENSING UNIT, PROVIDE NEW 20' ROOF CURB OR ROOF MATERIAL COMPATIBLE ROOF RAILS. RECONNECT WALK-IN COOLER CONDENSING UNIT TO ELECTRICAL POWER, PROVIDE NEW REFRIGERANT LINES FROM WALK-IN COOLER TO CONDENSING UNIT AND RECHARGE WITH REFRIGERANT. PROVIDE NEW CONTROLS SYSTEM PER CONTROL NOTES BELOW.

GAS PIPING ON THE ROOF SHALL BE SUPPORTED WITH EATON DURA-BLOK OR SIMILAR SUPPORTS. GAS PIPING SHALL BE SUPPORTED AT CODE REQUIRED INTERVALS AND

ALL NEW OUTDOOR DUCTWORK SHALL HAVE DUCT LINE WITH INSULATION VALUE OF

ALL NEW OUTDOOR DUCTWORK SHALL HAVE DUCT LINE WITH INSULATION VALUE OF R-8 OR GREATER. ALL NEW INDOOR DUCTWORK SHALL BE WRAPPED OR LINED WITH INSULATION VALUE OF R-6 OR GREATER. PROVIDE NEW CONDENSATE LINES FOR NEW AND EXISTING RTU'S. TRAP CONDENSATE LINES AND ROUTE TO ROOF DRAIN OR SCUPPER. PROVIDE CLEANOUTS AT EVERY CHANGE OF DIRECTION LARGER THAN 45°. CONDENSATE LINES SHALL BE 1° OR LARGER. ALL OUTSIDE AIR INTAKES SHALL BE GREATER THAN 10° FROM ANY POINT OF EXHAUST OP ANY D'I MINING VENTS. PROVIDE OUTTOOR DATE PUICTMORP EVENSIONS AS

OR ANY PLUMBING VENTS. PROVIDE OUTDOOR AIR DUCTWORK EXTENSIONS AS NECESSARY TO ACCOMPLISH THE REQUIRED DISTANCE. PROVIDE TEST AND BALANCE ON ALL RTU'S AND MAU TO MATCH THE AIRFLOWS SHOWN

ON THE EQUIPMENT SCHEDULES. ALL NATURAL GAS PIPING IS LOW PRESSURE. VERIFY POWER FEEDS FOR ALL NEW EQUIPMENT PRIOR TO SUBMITTING EQUIPMENT SUBMITTALS FOR APPROVAL AND REPORT POWER FEEDS TO ARCHITECT/ENGINEER IF POWER FEEDS ARE NOT ADEQUATE. IF OVERCURRENT PROTECTION IS HIGHER THAN

POWER FEEDS ARE NOT ADEQUATE. IF OVERCURRENT PROTECTION IS HIGHER THA ALLOWED BY THE EQUIPMENT PROVIDE A NEW BREAKER WITH THE PROPER OVER CURRENT PROTECTION. VERIFY EXISTING CONVENIENCE RECEPTACLES ARE INSTALLED WITHIN CODE REQUIRED DISTANCES FROM EQUIPMENT AND PROVIDE NEW CONVENIENCE RECEPTACLES AND POWER AS REQUIRED TO COMPLY WITH CODE. PROVIDE NEW ELECTRICAL DISCONNECTS FOR EACH PIECE OF NEW EQUIPMENT. ALL NEW ROOF CURBS SHALL BE 20° AND INSULATED.

### ONTROL NOTES

AR UNIT WITH KITCHEN EXHAUST FAN SO MAKEUP AIR UNIT TURNS IN IS ON. PROVIDE TEMPERATURE CONTROLS FOR MAKEUP AIR RER'S INSTRUCTIONS ONTROL SYSTEM FOR ALL NEW AND EXISTING RTU'S AND

UNI ROL STSTEM FOR ALL NEW AND ENDING RTUS AND THE CONTROL SYSTEM. STEM TO HAVE A WEB-BASED FRONT END SET UP ON EXISTING OCATED IN THE TOWER. NET CARD FOR ALL NEW RTU'S AND CONNECT TO CONTROL

NECT CARD FOR ALL EXISTING RTU'S AND CONNECT TO CONTROL

PERATURE AND HUMIDITY SENSOR IN RETURN DUCT OF EACH RTU ACE SENSORS ROL SYSTEM HAS THE ABILITY TO CONTROL TEMPERATURE

ECONOMIZER CYCLE WITH AUTOMATIC CHANGEOVER BETWEEN

S FOR RETURN AIR TEMPERATURE AND HUMIDITY FOR EACH

IS TO ALARM FRONT END IF TEMPERATURE OR HUMIDITY ARE

MS TO ALARM FRONT END IF TEMPERATURE OR HUMIDITY ARE SF OR 5% RH OUTSIDE OF TEMPERATURE OR HUMIDITY SETPOINT. OURS OF OWNER TRAINING AFTER SUBSTANTIAL COMPLETION. OURS OF OWNER FOLLOW-UP TRAINING SIX MONTHS AFTER LOMPLETION. HOURS OF ON-CALL CONTROL LABOR TO BE USED BY OWNER AT ESSION WITHIN FIRST YEAR AFTER SUBSTANTIAL COMPLETION FOR TRAINING OR RECONFIGURING/REPROGRAMING OF CONTROLS. TU-6, RTU-8 RTU-9 RETURN AIR SMOKE DETECTORS FOR FAN ERLOCK WITH FIRE ALARM SYSTEM TO ENUNCIATE FIRE ALARM KE ALARM IS ACTIVATED. KE ALARM SACTIVATED. WITH RTI-1, RTU-2, RTU-4, & RTU-7 ER TO OPEN ECONOMIZER DAMPERS 100% AND RUN FAN WHEN

TO OPEN ECONOMIZER DAMPERS 100% AND RUN FAN WHEN

ENSURE EXISTING SMOKE EXHAUST FANS AND SMOKE EXHAUST FAN CONTROLS ARE INTERLOCKED WITH SMOKE ALARM SYSTEM TO TURN ON WHEN SMOKE ALARM IS ACTIVATED.



### **COUNTY JAIL** 74354 REPLACEMENT g MIAMI, ROOF/RTU SП OTTAWA ST. Ш 28

PRC	JECT NO .:	787	
SUB	MITTAL:	FINAL	
ISSL	JE DATE:	11/10/21	
	. MANAGER: K SIGNED BY: N DRAWN BY: N	IER	
REVIS	SIONS:		
No.	Descrip	otion	Date
No.	Descrip	otion	Date
No.	Descrip	otion	Date
No.	Descrip	otion	Date
No.	Descrip	otion	Date
No.	Descrip	otion	Date
No.	Descrip	otion	Date



SHEET

SYMBOLS. NOTES, AND **ABBREVIATIONS** 

OF

M0-01



787 PRINT DATE: 11/11/2021 11:26:25 AM

PLAN **MD-01** 

MECHANICAL



PRINT DATE: 787



### **OTTAWA COUNTY JAIL** SE MIAMI, OK 74354 ROOF/RTU REPLACEMENT B ST. 28

PRO	JECT NO.:	787	
SUB	MITTAL:	FINAL	
ISSU	JE DATE:	11/10/21	
	MANAGER: H SIGNED BY: M DRAWN BY: M	NER	
REVIS	IONS:		
No.	Descrip	ntion	Date
	200011		Dute
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			Dute



SHEET OF OVERALL MECHANICAL

PLAN M1-01

### MECHANICAL SCHEDULES

RTU-5: PACKAGED 6 TON ROOFTOP UNIT MANUFACTURER & MODEL: DAIKIN, DRG0723W125FABACN ELECTRICAL: 208/V3PH/MCA = 31.7 A/MOCP = 45 A FAN: 2400 CFM, 0.5° ESP, OUTSIDE AR = 600 CFM COOLINC: 72,632 BTUH TOTAL, 55,259 BTUH SENSIBLE, 17,373 BTUH LATENT, EAT 
 MAU-1:
 MAKE-UP AIR UNIT

 MANUFACTURER & MODEL:
 CAPTIVE AIRE, A2-IBT-300-20D-MPU

 ELECTRICAL:
 208/3PH, MGA = 10.4, MOCP = 20A

 FAN:
 3250 CFM, 0.750° ESP, HP=2, 1423 RPM
 RTU 5

WEIGHT: 2052 COOLING: 88,200 BTUH TOTAL, 64,400 BTUH SENSIBLE, 17,800

COOLING: 88,200 BTUH TOTAL, 64,400 BTUH SENSIBLE, 17,800 BTUH LATENT, EAT(DBWB) = 94,0°F/6°F HEATING: NATURAL GAS, INPUT = 266,078 BTUH, OUTPUT = 212862, 55°F TEMPERATURE RISE (MINIMUM) OPTIONS: MOTORIZED BACKDRAFT DAMPER (2) CONDENSING UNITS (SEE BELOW FOR CONDENSER INFORMATION)

INFORMATION). VAV SUPPLY FAN WITH INTEGRAL VFD (FACTORY MOUNTED AND

STAINLESS STEEL HEAT BURNER AND EXCHANGER WITH MODULATING NATURAL GAS HEAT AT 6:1 TURNDOWN AND 25 YEAR PARTS WARRANTY

20" INSULATED ROOF CURB

20 INSOLATED ROOF OURS INSTALLATION NOTES: PROVIDE PROGRAMMABLE THERMOSTAT TO CONTROL HEATING AND COOLING BASED ON SPACE TEMPERATURE TO MAINTAIN 70°F IN THE SPACE. INSTALL THERMOSTAT IN KITCHEN. COORDINATE EXACT LOCATION WITH OWNER

THERMOSTAT IN KITCHEN. COORDINATE EXACT LOCATION WITH OWNER. PROVIDE NEW 20° ROOF CURB PROVIDE ROOF RAILS (ROOFED INTO ROOF) TO PLACE CONDENSING UNITS. TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER. PROVIDE NEW ISOLATION VALVE, DIRT LEG, AND UNION AT GAS CONNECTION

CONNECTION. PROVIDE REFRIGERANT PIPING, POWER, AND CONTROL WIRING BETWEEN THE CONDENSING UNITS AND THE MAKEUP AIR UNIT PER THE MANUFACTURER'S INSTRUCTIONS.

PROVIDE SEPARATE 120V ELECTRICAL POWER FOR STANDING POWER. 120V MUST BE RUN BY ELECTRICAL FROM BUILDING PANEL TO MALLSWITCH

PROVIDE SUPPLY AIR SMOKE DETECTOR, INTERLOCK WITH UNIT FOR FAN SHUTDOWN, AND INTERLOCK WITH FIRE ALARM.

CONDENSING UNIT ; AND INTERCOCK WITH FIRE ALARM. CONDENSING UNIT ; ELECTRICAL: 208V(3PH, MCA = 14.5A, MOCP = 20A (CONDENSER WILL NEED IT'S OWN POWER FEED. REFER TO CONDENSER ELECTRICAL NOTES BELOW)

COOLING: 3 TONS

EFFICIENCY: 14 SEER WEIGHT: 133 LBS

CONDENSING UNIT 2: COL CONDENSING UNIT 2: ELECTRICAL: 208/J3PH, MCA = 21.4A, MOCP = 30A (CONDENSER WILL NEED IT'S OWN POWER FEED. REFER TO CONDENSER ELECTRICAL NOTES BELOW)

COOLING: 5 TONS EFFICIENCY: 14 SEER

WEIGHT: 156 LBS

WEIGHT: 156 LBS CONDENSING UNIT ELECTRICAL NOTES: BOTH CONDENSING UNITS SHALL BE FED FROM POWER THAT WAS FEEDING THE EXISTING 10-TON CONDENSING UNIT THAT WAS REMOVED. THE EXISTING BREAKER IS A 2080/3PH BREAKER RATED FOR 70A. PROVIDE NEW NEMA 3 FUSED DISCONNECTS FOR EACH CONDENSING UNIT

BTUH, HIGH OUTPUT = 101,300 BTUH, 40°F TEMP RISE WEIGHT = 750 LBS EFFICIENCY: 17.1 IEER / 12.1 EER OPTIONS/ACCESSORIES: PROVIDE BACNET CARD AND CONTROLS PER CONTROL NOTE ON MO-01, HAIL GUARD, HOT GAS REHEAT, LOW AMBIENT CONTROL, RETURN AIR SMOKE DETECTOR, LOW-LEAK DOWNFLOW ECONOMIZER FOR DDC CONTROLS WILFDITHAU SERVICED FOR DDCC CHORE ON TROLS WILFDITHAU SERVICED FOR DDCC CHORE CONTROLS WILFDITHAU SERVICED FOR DDCC CHORE CONTROLS WILFDITHAU SERVICED FOR DDCC CHORE MILEDITHAU SERVICED FOR DDCC CHORE ON TROLS ON WILFDITHAU SERVICED FOR DDCC CHORE FOR DDCC CHORE FOR DDCC CHORE FOR DDCC FOR DDCC CHORE FOR DDCC FOR DDCC CHORE FOR DDCC FOR DCC FOR

BTUH, HIGH OUTPUT = 101.300 BTUH, 40°F TEMP RISE

CONTROLS W/ ENTHALPY SENSOR, 20" INSULATED ROOF CURB INSTALLATION NOTES: PROVIDE NEW 20" ROOF CURB, TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER, PROVIDE NEW ISOLATION VALVE, DIRT LEG, AND UNION AT GAS CONNECTION. PROVIDE NEW ELECTRICAL DISCONNECT. INTERLOCK RETURN AIR SMOKE DETECTOR TO SHUT DOWN FAN AND INTERLOCK WITH FIRE ALARM SYSTEM

HEATING: 2-STAGE NATURAL GAS INPUT=125.000 BTUH LOW OUTPUT = 75.900

RTU-6: PACKAGED 15 TON ROOFTOP UNIT RTU 6

(DB/WB) = 80°F/67°F

MANUFACTURER & MODEL: DAIKIN, MFS0158 ELECTRICAL: 208V/3PH/MCCA = 81.0 AMOCP = 100 A FAN: 6000 CFM, 0.5° ESP, 726 RPM, 2.5 HP, OUTSIDE AIR=1,500 CFM COOLING: 134,435 BTUH TOTAL, 138,913 BTUH SENSIBLE, 45,522 BTUH LATENT, EAT (DB/WB) = 80°F67°F HEATING: 2-STAGE NATURAL GAS, INPUT=350,000 BTUH, OUTPUT = 284,000 BTUH, 54°F

TEMP RISE WEIGHT = 2146 LBS

EFFICIENCY: 14.8 IEER / 11.1 EER

EFFICIENCY: 14.8 IEER / 11.1 EER OPTIONS/ACCESSORIES: PROVIDE BACNET CARD AND CONTROLS PER CONTROL NOTE ON M0-01, HAIL GUARD, HOT GAS REHEAT, LOW AMBIENT CONTROL, RETURN AIR SMOKE DETECTOR, LOW-LEAK DOWNFLOW ECCNOMIZER FOR DDC CONTROLS WI ENTHALPY SENSOR, 20' INSULATED ROOF CURB INSTALLATION NOTES: PROVIDE NEW 20' ROOF CURB, TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER, PROVIDE NEW ISOLATION VALVE, DIRT LEG, AND UNION AT GAS CONNECTION. PROVIDE NEW ELECTRICAL DISCONNECT. INTERLOCK RETURN AIR SMOKE DETECTOR TO SHUT DOWN FAN AND INTERLOCK WITH EIRE ALAPM SYSTEM

WITH FIRE ALARM SYSTEM.

RTU-7: PACKAGED 4 TON ROOFTOP UNIT MANUFACTURER & MODEL: DAIKIN, DRG0483D115FABACN ELECTRICAL: 208V/3PH/MCA = 25.4 A/MOCP = 35.A FAN: 1600 CFM, 0.5° ESP, OUTSIDE AIR = 400 CFM COOLING: 47,763 BTUH TOTAL, 35,683 BTUH SENSIBLE, 12,080 BTUH LATENT, EAT (DRANE) = 905/E672\*

(DB/WB) = 80°F/67°F (DB/WB) = 50 F/07 F HEATING: 2-STAGE NATURAL GAS, INPUT=115,000 BTUH, LOW OUTPUT = 69,900 BTUH, HIGH OUTPUT = 93,200 BTUH, EAT = 55°F

WEIGHT = 692 LBS

EFFICIENCY: 17 SEER / 13 EER

EFFICIENCY: 17 SEER / 13 EER OPTIONSIACCESSORIES: PROVIDE BACNET CARD AND CONTROLS PER CONTROL NOTE ON M0-01, HAIL GUARD, HOT GAS REHEAT, LOW AMBIENT CONTROL, RETURN AIR SMOKE DETECTOR, LOW-LEAK DOWNFLOW ECONOMIZER FOR DDC CONTROLS W ENTHALPY SENSOR, 20' INSULATED ROOF CURB INSTALLATION NOTES: PROVIDE 20' NEW ROOF CURB, TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER, PROVIDE NEW ISOLATION VALVE, DIRT LEG, AND UNION AT GAS CONNECTION. PROVIDE NEW ISOLATION VALVE, DIRT INTERLOCK RETURN AIR SMOKE DETECTOR WITH FIRE ALARM SYSTEM. RUN FAN AND OPEN ECONOMIZER DAMPER 100% UPON ACTIVATION OF SMOKE DETECTOR.

RTU-8: PACKAGED 15 TON ROOFTOP UNIT MANUFACTURER & MODEL: DAIKIN, MPS015B ELECTRICAL: 208V/3PH/MCA = 81.0 A/MCOP = 100 A FAN: 6000 CFM, 0.5° ESP, 728 RPM, 2.5 HP, OUTSIDE AIR=1,500 CFM COOLING: 184,435 BTUH TOTAL, 138,913 BTUH SENSIBLE, 45,522 BTUH LATENT, EAT (DB/WB) = 80°F/67°F HEATING: 2-STAGE NATURAL GAS, INPUT=350,000 BTUH, OUTPUT = 284,000 BTUH, 54°F

TEMP RISE WEIGHT = 2146 | BS

WITH FIRE ALARM SYSTEM.

WEIGHT = 2146 LBS EFFICIENCY: 14.8 IEER / 11.1 EER OPTIONSIACCESSORIES: PROVIDE BACNET CARD AND CONTROLS PER CONTROL NOTE ON M0-01, HAIL GUARD, HOT GAS REHEAT, LOW AMBIENT CONTROL, RETURN AIR SMOKE DETECTOR, LOW-LEAK DOWNFLOW ECONOMIZER FOR DDC CONTROLS WI ENTHALPY SENSOR, 20' INSULATED ROOF CURB INSTALLATION NOTES: PROVIDE NEW 20' ROOF CURB, TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER, PROVIDE NEW ISOLATION VALVE, DIRT LEG,AND UNION AT GAS CONNECTION. PROVIDE NEW ELECTRICAL DISCONNECT. INTERLOCK RETURN AIR SMOKE DETECTOR TO SHUT DOWN FAN AND INTERLOCK WITH LIPE ALADM SYSTEM

RTU-9: PACKAGED 3 TON ROOFTOP UNIT
 MANUFACTURER & MODEL: DAIKIN, DRDG0363D070FABACN
 ELECTRICAL: 208/J3PH/MCA = 21.2 A/MOCP = 30 A
 FAN: 1200 CFM, 0.5° ESP. OUTSIDE ALIR = 300 CFM
 COQLING: 36,024 BTUH TOTAL, 27,064 BTUH SENSIBLE, 8,960 BTUH LATENT, EAT
 (DRDMD) = 090CF8726

(DB/WB) = 80°F/67°F HEATING: 2-STAGE NATURAL GAS, INPUT=70,000 BTUH, LOW OUTPUT = 42,500 BTUH, HIGH OUTPUT = 56,700 BTUH, 44°F TEMP RISE.

FEFICIENCY: 17 0 SEER / 12 8 EER

EFFICIENCY: 17.0 SEER / 12.8 EER OPTIONS/ACCESSORIES: PROVIDE BACNET CARD AND CONTROLS PER CONTROL NOTE ON M0-01, HAIL GUARD, HOT GAS REHEAT, LOW AMBIENT CONTROL, RETURN AIR SMOKE DETECTOR, LOW-LEAK DOWNFLOW ECCNOMIZER FOR DDC CONTROLS WI ENTHALPY SENSOR, 20" INSULATED ROOF CURB INSTALLATION NOTES: PROVIDE NEW 20" ROOF CURB, TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER, PROVIDE NEW ISOLATION VALVE, DIRT LEG, AND UNION AT GAS CONNECTION. PROVIDE NEW ELECTRICAL DISCONNECT. INTERLOCK RETURN AIR SMOKE DETECTOR TO SHUT DOWN FAN AND INTERLOCK WITH EIRE ALAPM SYSTEM

WITH FIRE ALARM SYSTEM.

ACC: 1: EXISTING AIR-COOLED CONDENSING UNIT MANUFACTURER & MODEL: REFRIGERATED DESIGN TEXAS ELECTRICAL: 208/03PH, MCA = 15A, MOCP = 22A COOLING: LOW TEMPERATURE COMPRESSOR = 4,000 BTUH, MEDIUM TEMPERATURE COMPRESSOR = 7.000 BTUH INSTALLATION NOTES: EXISTING WALK-IN COOLER CONDENSING UNIT TO INSTALLATION NOTES: EXISTING WALK-IN COOLER CONDENSING UNIT TO REMAIN. CONDENSING UNIT SHALL BE REMOVED AND RETAINED DURING CONSTRUCTION. EVACUATE REFRIGERANT LINES AND RETAIN REFRIGERANT FOR REUSE. DEMO EXISTING ROOF CURB AND PROVIDE NEW 20° ROOF CURB OR ROOF MATERIAL COMPATIBLE ROOF RAILS, REINSTALLATION REQUIRED UPON COMPLETION OF ROOF WORK. RECONNECT TO POWER. PROVIDE NEW ELECTRICAL DISCONNECT. RECONNECT TO REFRIGERANT PIPING, RECHARGE SYSTEM, AND INTERLOCK CONTROLS. ENSURE PROPER OPERATION OF SYSTEM RESUMES AFTER REINSTALLATION.

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- RTU 4

WEIGHT = 1237 LBS EFFICIENCY: 17 IEER /12.2 EER OPTIONS/ACCESSORIES: PROVIDE BACNET CARD AND CONTROLS PER CONTROL NOTE ON MO-01, HAIL GUARD, HOT GAS REHEAT, LOW AMBIENT CONTROL, RETURN AIR SMOKE DETECTOR, LOW-LEAK DOWNFLOW ECONOMIZER FOR DDC CONTROLS WI ENTHALPY SENSOR, 20' INSULATED ROOF CURB INSTALLATION NOTES: PROVIDE NEW 20' ROOF CURB, TRAP CONDENSATE AND POLITE TO POGE DRAIN OB SCUIDED PROVIDE NEW JOID ATON VALVE ONT ROUTE TO ROOF DRAIN OR SCUPPER, PROVIDE NEW ISOLATION VALVE, DIRT LEG, AND UNION AT GAS CONNECTION. PROVIDE NEW ELECTRICAL DISCONNECT IINTERLOCK RETURN AIR SMOKE DETECTOR WITH FIRE ALARM SYSTEM. RUN FAN AND OPEN ECONOMIZER DAMPER 100% UPON ACTIVATION OF SMOKE DETECTOR

EF-EX: ROOF MOUNTED EXHAUST FAN MANUFACTURER & MODEL: VARIES ELECTRICAL: VARIES PERFORMANCE: VARIES

FEATURES: VARIES

NOTES: EXISTING EXHAUST FAN AND BACKDRAFT DAMPER TO BE REMOVED NOTES: EXISTING EXHAUST FAN AND BACKDRAFT DAMPER TO BE REMOVED AND RETAINED FOR REUSE. REMOVE EXISTING ROOF CURB AND PROVIDE NEW 20° INSULATED ROOF CURB, AND REINSTALL EXHAUST FAN AND BACKDRAFT DAMPER ON NEW 20° ROOF CURB UPON COMPLETION OF ROOF WORK. IF EXISTING BACKDRAFT DAMPER IS MOTORIZED, RECONNECT MOTORIZED DAMPER TO ELECTRICAL POWER.

RH-EX: ROOF MOUNTED ROOF HOOD MANUFACTURER & MODEL: VARIES ELECTRICAL: VARIES PERFORMANCE: VARIES

(RH) EX

SF EX

2

FEATURES: VARIES NOTES: EXISTING ROOF HOOD AND BACKDRAFT DAMPER TO BE REMOVED AND RETAINED FOR REUSE. REMOVE EXISTING FOR CLINID LET DU LEMOVED AND RETAINED FOR REUSE. REMOVE EXISTING ROOF CURB AND PROVIDE NEW 20° INSULATED ROOF CURB, AND REINSTALL ROOF HOOD AND BACKDRAFT DAMPER ON NEW 20° ROOF CURB UPON COMPLETION OF ROOF WORK. IF EXISTING BACKDRAFT DAMPER IS MOTORIZED, RECONNECT MOTORIZED DAMPER TO ELECTRICAL POWER.

SF-EX: ROOF MOUNTED SUPPLY FAN MANUFACTURER & MODEL: VARIES ELECTRICAL: VARIES

PERFORMANCE: VARIES FFATURES: VARIES

FEATURES: VARIES NOTES: EXISTING ROOF HOOD AND BACKDRAFT DAMPER TO BE REMOVED AND RETAINED FOR REUSE. REMOVE EXISTING ROOF CURB AND PROVIDE NEW 20" INSULATED ROOF CURB, AND REINSTALL ROOF HOOD AND BACKDRAFT DAMPER ON NEW 20" ROOF CURB UPON COMPLETION OF ROOF WORK. IF EXISTING BACKDRAFT DAMPER IS MOTORIZED, RECONNECT MOTORIZED DAMPER TO ELECTRICAL POWER.

 
 RTU-1: EXISTING PACKAGED 12.5 TON ROOFTOP UNIT

 MANUFACTURER & MODEL: CARRIER, 48TCED14A2A5-0A0G0

 ELECTRICAL: 208V/3PH/MCA = 65 A/MOCP = 80 A

 FAN: 5000 CFM, 0.6° ESP

 CODLING: 147,950 BTUH TOTAL, 103,340 BTUH SENSIBLE, 44,610 BTUH LATENT, EAT
 (DB/WB) = 80°F/67°F HEATING: 2-STAGE NATURAL GAS, LOW OUTPUT = 147,000 BTUH, HIGH OUTPUT =

184.000 BTUH, EAT = 70°F WEIGHT = 1220 LBS

EFFICIENCY: 12.2 IEER / 10.8 EER

EFFICIENCY: 12.2 IEER / 10.8 EER OPTIONSIACCESSORIES: EXISTING UNIT INSTALLATION NOTES: REMOVE AND RETAIN EXISTING RTU. PROVIDE NEW 20" INSULATED ROOF CURB AND REINSTALL EXISTING UNIT ON NEW 20" ROOF CURB. TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER. RECONNECT TO ELECTRICAL POWER, NATURAL GAS PIPING, AND CONTROL WIRING. PROVIDE NEW ELECTRICAL DISCONNECT. PROVIDE NEW BACNET CARD FOR EXISTING RTU AND CONNECT TO NEW CONTROL SYSTEM. INTERLOCK RETURN AIR SMOKE DETECTOR WITH FIRE ALARM SYSTEM. RUN FAN AND OPEN ECONOMIZER DAMPER 100% UPON ACTIVATION OF SMOKE DETECTOR

DETECTOR

RTU-2: EXISTING PACKAGED 12.5 TON ROOFTOP UNIT

 RTU2:
 EXSTINCER & MODEL: CARRIER, 48TCE01442A5-0A0G0

 ELECTRICAL:
 208V/3PH/MCA = 65 A/MOCP = 80 A

 FAN:
 500 CM, 0.6° ESP

 COOLING:
 147.950 BTUH TOTAL, 103,340 BTUH SENSIBLE, 44,610 BTUH LATENT, EAT

 (DB/WB) = 80°F/67°F
 HEATING:

 124.000 BTUH LATE-70AC GAS, LOW OUTPUT = 147,000 BTUH, HIGH OUTPUT =

184.000 BTUH, EAT = 70°F WEIGHT = 1220 LBS

FEFICIENCY: 12.2 IEER / 10.8 EER

EFFICIENCY: 12.2 IEER / 10.8 EER OPTIONS/ACCESSORIES: EXISTING UNIT INSTALLATION NOTES: REMOVE AND RETAIN EXISTING RTU. PROVIDE NEW 20" INSULATED ROOF CURB AND REINSTALL EXISTING UNIT ON NEW 20" ROOF CURB. TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER. RECONNECT TO ELECTRICAL POWER, NATURAL GAS PIPING, AND CONTROL WIRING. PROVIDE NEW ELECTRICAL DISCONNECT.

ELECTRICAL DISCONNECT. PROVIDE NEW BACNET CARD FOR EXISTING RTU AND CONNECT TO NEW CONTROL SYSTEM. INTERLOCK RETURN AIR SMOKE DETECTOR WITH FIRE ALARM SYSTEM, RUN FAN AND OPEN ECONOMIZER DAMPER 100% UPON ACTIVATION OF SMOKE DETECTOR .

RTU-3: PACKAGED 8.5 TON ROOFTOP UNIT
 MANUFACTURER & MODEL: DAIKIN, DRG1023D180FABACN
 ELECTRICAL: 208V/3PH/MCA = 44.6 A/MOCP = 50 A
 FAN: 3400 CFM, 0.5° TESP, OUTSIDE AIR = 850 CFM
 COOLING: 102,816 BTUH TOTAL, 75,104 BTUH SENSIBLE, 27,712 BTUH LATENT,
 EAT (0BWB) = 80°F/67°F
 HEATING: 2-STAGE NATURAL GAS, INPUT=180,000 BTUH, LOW OUTPUT =
 109,350 BTUH, HIGH OUTPUT = 145,800 BTUH, 40°F TEMP RISE.
 WFIGHT = 1327 LBS

WEIGHT = 1237 LBS EFFICIENCY: 17 IEER / 12.2 FER

EFFICIENCY: 17 (EEK / 12.2 EER OPTIONS/ACCESSORIES: PROVIDE BACNET CARD AND CONTROLS PER CONTROL NOTE ON MO-01, HAIL GUARD, HOT GAS REHEAT, LOW AMBIENT CONTROL, RETURN AIR SMOKE DETECTOR, LOW-LEAK DOWNFLOW ECONOMIZER FOR DDC CONTROLS W/ ENTHALPY SENSOR, 20" INSULATED ROOF CURB

ROOF CURB INSTALLATION NOTES: PROVIDE NEW 20° ROOF CURB, TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER, PROVIDE NEW ISOLATION VALVE, DIRT LEG, AND UNION AT GAS CONNECTION. PROVIDE NEW ELECTRICAL DISCONNECT. INTERLOCK RETURN ANS MOKE DETECTOR WITH FIRE ALARM SYSTEM, RUN FAN AND OPEN ECONOMIZER DAMPER 100% UPON ACTIVATION OF CONDUC DETECTOR. OF SMOKE DETECTOR .

 

 RTU-4: PACKAGED 8.5 TON ROOFTOP UNIT

 MANUFACTURER & MODEL: DAIKIN, DRG1023D180FABACN

 ELECTRICAL: 208V/3PH/MCA = 44.6 A/MOCP = 50 A

 FAN: 3400 CFM, 0.5\* ESP, OUTSIDE ALIR = 850 CFM

 CODLING: 102,816 BTUH TOTAL, 75,104 BTUH SENSIBLE, 27,712 BTUH LATENT, EAT

 (DB/WB) = 80°F/67°F

HEATING: 2-STAGE NATURAL GAS. INPUT=180.000 BTUH. LOW OUTPUT = 109.350 BTUH, HIGH OUTPUT = 145,800 BTUH, 40°F TEMP RISE WFIGHT = 1237 | BS



JAIL 74354 REPLACEMENT COUNTY ЯÓ MIAMI, **ROOF/RTU** SП OTTAWA ST. ш

28

PROJECT NO .:	787
SUBMITTAL:	FINAL
ISSUE DATE:	11/10/21
PROJ. MANAGER: DESIGNED BY:	KTM NER

DRAWN BY: NFR

REVIS	SIONS:	
No.	Description	Date



OF SHEET

SCHEDULES AND DETAILS

### **SHEET LIST:**

PAGE NO.	SHEET NAME	SHEET NO.
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02 ARCHITECTUR		
03 04	ROOF PLAN ENLARGED DETAILS	A1-01 A2-01
05	ENLARGED DETAILS	A2-02
MECHANICAL		
06	SYMBOLS, NOTES, AND ABBREVIATIONS	M0-01
07	OVERALL MECHANICAL PLAN	M1-01
08	SCHEDULES AND DETAILS	M5-01
09	OVERALL DEMO MECHANICAL PLAN	MD-01

### 48 HOURS BEFORE YOU DIG... CALL OKIE: 1-800-522-6543

LOCATIONS OF UNDERGROUND UTILITY LINES WERE OBTAINED FROM THE UTILITY OWNERS AND HAVE BEEN SHOWN TO THE EXTENT KNOWN. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS ARE BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE, MEASUREMENTS WERE TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS EXACT OR COMPLETE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CALL "OKIE" 48 HOURS PRIOR TO ANY EXCAVATION TO DETERMINE AND VERIFY THE EXACT LOCATION AND DEPTH OF ALL EXISTING UTILITIES AND TO NOTIFY THE ENGINEER OF ANY DISCREPANCIES HEREIN, PRIOR TO FURTHER CONSTRUCTION.

# **OTTAWA COUNTY JAIL ROOF REPLACEMENT**

# **BID DOCUMENTS** 11/10/21



28 B ST. SE MIAMI, OK 74354

### **ARCHITECT:**



### ARCHITECTURE | CIVIL | STRUCTURAL

C.A. 0049 (ARCH) RENEWAL DATE: 06-30-2023 C.A. 00262 (PE) ŔENEWAL DATE: 06-30-2022

1623 E. 6TH ST. TULSA, OK 74120 918.835.9588 hammock@bklinc.com

### **PREPARED BY:**

JENNIFER HAMMOCK **PROJECT MANAGER BKL, INCORPORATED** 



**PREPARED FOR:** 

Ottawa County Board of Commissioners Attn: Comm. Russ Earls

# **CONSULTANTS:** greenacorn

### MECHANICAL | ELECTRICAL | PLUMBING

C.A. 8292 RENEWAL DATE: 06-30-2022

1820 S BOULDER AVE STE #500 TULSA, OK 74119 918.629.4291 ktm@greenacornllc.com

### **ABBREVIATIONS:**

ABV ABOVE	CAB CABINET	ELEV ELEVATOR	HTR HEATER	MTL METAL G
AFF ABOVE FINISH FLOOR	CO2 CARBON DIOXIDE	ENCL ELNCLOSED, ENCLOSURE	HVAC HEATING, VENTILATION, & AIR CONDITIONING	
AC ACOUSTICAL	CPT CARPET	E/E END TO END	HVY HEAVY	MLWK MILLWORK
ACT ACOUSTICAL CEILING TILE	CO CASED OPENING	ENGR ENGINEER	HT HEIGHT	MIN MINIMUM
ASASS ADA SHOWER SEAT	CSG CASING	ENT ENTRY, ENTRANCE	HPT HIGH POINT	MIR MIRROR
ADD ADDENDUM	CI CAST IRON	EM ENTRY MAT EPX EPOXY	HCHOLLOW CORE	MU MIRROR UNIT
ADDL ADDITIONAL ADH ADHESIVE	CLG CEILING CHPTP CEILING HUNG PLASTIC TOILET PARTITION		HM HOLLOW METAL HSS HOLLOW STRUCTURAL SECTIONS	MISC MISCELLANEOUS R MD MODEL, MODULE R
ADH ADHESIVE ADJ ADJUSTABLE	CSS CEILING SUPPORT SYSTEM	EQ EQUAL EQMT EQUIPMENT	HORZ HORIZONTAL	MD MODEL, MODULE F MONO MONOLITHIC F
ADMIN ADMINISTRATION	CEM CEMENT	ESC ESCAPE	HB HOSE BIB	MBHUS MOP/BROOM HOLDER UNIT W/ SHELF
A/C AIR CONDITIONING	CTR CENTER	ESCL ESCULATOR	HOSP HOSPITAL	MDHOS MOL/DROOM HOEDER ON W/ SHEEP
AHU AIR HANDLING UNIT	CL CENTER LINE	ETR EXISTING TO REMAIN	HW HOT WATER	MILL MULLION
AL ALUMINUM	C/C CENTER TO CENTER	EPDM	H HYDROGEN	MULT MULIPLE
ALUM ALUMINUM	CER CERAMIC	EXC EXCAVATE		R
ALT ALTERNATE	CT CERAMIC TILE	EF EXHAUST FAN	IM ICE MACHINE	NAT NATURAL
ANCH ANCHOR	CR CHAIR RAIL	EXIST EXISTING	IMPR IMPREGNATE	NEO NEOPRENE
AB ANCHOR BOLT	CHKBD CHALK BOARD	EXPAN EXPANSION	INCAND INCANDESCENT	N NITROGEN R
ANG ANGLE	C, CHAN CHANNEL	EJ EXPANSION JOINT	INCIN INCINERATOR	N2O NITROGEN OXIDE
ANOD ANODIZED	CIR CIRCLE, CIRCULAR	EXP JT EXPANSION JOINT	IN INCH, INCHES	NRC NOISE REDUCTION COEFFICIENT
APPROX APPROXIMATE	CLOUT CLEAN OUT	EXP EXPOSED	IND INDUSTRIAL	NOM NOMINAL
ARCH ARCHITECT, ARCHITECTURAL	CLR CLEAR, CLEARANCE	EXT EXTERIOR	INFO INFORMATION	NC NON-SLIP F
A/E ARCHITECT-ENGINEER	CLO CLOSET	EIFS EXTERIOR INSULATION FINISH SYSTEM	ID INSIDE DIAMETER	N NORTH F
AD AREA DRAIN	CH COAT HOOK	EB, EXB EXPANSION BOLT	INST INSULATE, INSULATION	NA NOT APPLICABLE F
ASB ASBESTOS	CR COLD ROLLED		INT INTERIOR, INTERNAL	NIC NOT IN CONTRACT
ASP ASPHALT	COL COLUMN	FWC FABRIC WALL COVERING	INV INVERT	NTSNOT TO SCALE
ASSY ASSEMBLY	C-FRZ COMMERCIAL FREEZER	FAB FABRICATE, FABRICATED, FABRIC	ISOL ISOLATION	NO, # NUMBER
AUTO AUTOMATIC	C-FRG COMMERCIAL REFRIGERATOR	FBFACE BRICK		
		FOS FACE OF STUD	JAN JANITOR	OFF OFFICE
BCS BABY CHANGING STATION		F/FFACE TO FACE	JT JOINT	OC ON CENTER F
BD BOARD BDRM BEDROOM	C-FRG COMMERCIAL REFRIGERATOR C-FRZ COMMERCIAL FREEZER	FSTN	JSTJOIST	OPNG OPENING F OPP OPPOSITE
		FG FIBERGLASS FV FIELD VERIFY		
BEL BELOW BK BRICK	CONC CONCRETE CMU CONCRETE MANONRY UNIT	FV FIELD VERIFY	JB, J-BOX JUNCTION BOX	OH OPPOSITE HAND S ORIG ORIGINAL S
BK BRICK BKT BRACKET	CMD CONCRETE MANONRY UNIT CMP COMPOSITE METAL PANEL	FIN FINISH FF FINISH FLOOR	KIT KITCHEN	ORIGINAL S
BL BUILDING LINE	COND COMPOSITE METAL PANEL	FA FIRE ALARM	KD KNOCK DOWN	O/O OUT TO OUT
BLDG BUILDING	COND CONDITION	FA FIRE DEPARTMENT CONNECTION	K/O KNOCK DOWN	O/A OVERALL
BLK BLOCK, BLOCKING	CONST CONSTRUCTION	FE FIRE EXTINGUISHER	KOP KNOCK OUT PANEL	OFRD OVERFLOW ROOF DRAIN
BM BEAM	CP/CI CONTRACTOR PROVIDED / CONTRACTOR INSTALLED	FEBFIRE EXTINGUISHER ON WALL BRACKET	KOI KNOOK OUT TANEE	O/H OVERHEAD
BNCHMK BENCH MARK	CPI CONTRACTOR PROVIDED AND INSTALLED	FEC	LAB LABORATORY	OFOI OTHER FURNISH/OTHER INSTALL
BO BY OWNER	CJ CONTROL JOINT	FHVC FIRE HOSE VALVE CABINET	LAMLAMINATE, LAMINATED	OFCI OTHER FURNISH/CONTRACTOR INSTALLED
BOD BOTTOM OF DECK	CONT CONTINUE, CONTINUOUS	FRFIRE RATED	LAND LANDING	OX, O2 OXYGEN
BOM BOTTOM OF MULLION	CONTR CONTRACTOR	FRTD	LAV LAVATORY	S
BOT BOTTOM	CONV CONVENIENCE	FIXT FIXTURE	HLAV LAVATORY, HANDICAPPED	PNT PAINT S
BP BRICK PAVER	COR CORNER	FLASH FLASH	LLEFT	PNTD PAINTED S
BR BACKER ROD	CG CORNER GUARD	FLEX FLEXIBLE	LH LEFT HAND	PTS PAINT STAIN S
BS BATH STATION PULL CORD	CORR CORRIDOR, CORRUGATED	FLFLOOR	LHR LEFT HAND REVERSE	PNL PANEL S
BSMT BASEMENT	CNTRCOUNTER	FD FLOOR DRAIN	LT LIGHT	PTD PAPER TOWEL DISPENSER S
BT BENT	CFL COUNTER FLASHING	FLRG FLOORING	LTG LIGHTING	PTWD PAPER TOWEL DISPENSER/WASTE 1
BTM MITUMINOUS	CS COUNTERSUNK	FMPTP FLOOR MOUNTED PLASTIC TOILET PARTITION		RECEPTACLE 2
BTRM BATHROOM	CRS COURSES	FLOURFLUORESCENT	LWT LIGHT WEIGHT	PARA PARAGRAPH 3
BTW BETWEEN	CUBECUBICAL	FWFOOD WELL	LWTC LIGHT WEIGHT CONCRETE	PAR PARALLEL S
BUT BUTT JOINT	CW CURTAINWALL	FTFOOT, FEET	LIN LINEAR	PBD PARTICLE BOARD S
BVL BEVELED	CTRK CURTAIN TRACK	FTGFOOTING	LDIF LINEAR DIFFUSER	PTN PARTITION S
		FDNFOUNDATION	LIQ LIQUID	PED PEDESTAL, PEDESTRIAN S
CAB CABINET	DP DAMPROOFING	FRMFRAME, FRAMING	LKSLOCAL KEY SWITCH	PERF PERFORATE (D) S
CO2 CARBON DIOXIDE	DBA DEFORMED BAR ANCHOR	FSFURNISH		PERP PERPENDICULÁR S
	DEMO DEMOLISH, DEMOLITION	FURRFURRED, FURRING	LKRLOCKER	PC WKST PERSONAL COMPUTER WORKSTATION S
CO CASED OPENING CSG CASING	DEPT DEPARTMENT DTL DETAIL	GALV GALVANIZED	LG LONG LLH LONG LEG HORIZONTAL	PCPIECE S PLAS, PL PLASTER S
CI CASTIRON	DIAGM DIAGRAM	GALV	LLVLONG LEG VERTICAL	PLAS, PL PLASTER S PLAM PLASTIC LAMINATE S
CLG CEILING	DIAGM DIAGNAM DIAGL DIAGNAL	G GAS	LOUV LOUVER	PL PLASTIC LAMINATE
CHPTP CLG HUNG PLASTIC TLT PARTITION		GA GAUGE	LPLOW POINT	PLAT PLATFORM
CSS CEILING SUPPORT SYSTEM	DIM DIMENSION	GC GENERAL CONTRACTOR	LBR LUMBER	PLB PLUMBING
CEM CEMENT	DO DITTO	GFRC	LVT LUXURY VINYL TILE	PLWD PLYWOOD
CTR CENTER	DIV DIVISION	GL GLASS, GLAZED, GLAZING		PTS PNEUMATIC TUBE STATION
CL CENTER LINE	DB DOCK BUMPER	GB GRAB BARS	MACH MACHINE	PT POINT
C/C CENTER TO CENTER	DR DOOR	GR GRADE	MAN MANUAL	POL POLISH
CER CERAMIC	DBL DOUBLE	GRA GRANITE	MH MANHOLE	PSF POUNDS PER SQUARE FOOT
CT CERAMIC TILE	DN DOWN	GND GROUND	MFR MANUFACTURER	PWR POWER S
CR CHAIR RAIL	DS DOWNSPOUT	GRT GROUT	MFD MANUFACTURED	PC PRECAST CONCRETE S
CHKBD CHALK BOARD	DRN DRAIN	GB GYPSUM BOARD	MK MARK	PEMB PRE-ENGINEERED METAL BUILDING
BLK BLOCK, BLOCKING	DWG DRAWING	GYP BD GYPSUM BOARD	MKBD MARKER BOARD	PRE FAB PREFABRICATED S
BM BEAM	DWGS DRAWINGS	GMGSB GLASS-MAT GYPSUM SHEATHING BOARD	MAS MASONRY	PFN PREFINISHED S
BNCHMK BENCH MARK			MO MASONRY OPENING	PREP PREPARATION S
BO BY OWNER	EA EACH	HDCP HANDICAP	MAT MATERIAL	PRT PRINTER S
BOD BOTTOM OF DECK	EWEACH WAY	HR HANDRAIL	MAX MAXIMUN	PROD PRODUCTION S
BOM BOTTOM OF MULLION	EEAST	HS HAND SINK	MECH MECHANICAL	PROJ PROJECT, PROJECTOR
BOT BOTTOM	ELAST ELASTIC, ELASTOMERIC	HDW HARDWARE	MED MEDICAL	PS PROJECTION SCREEN S
BP BRICK PAVER		HDWD HARDWOOD	MA MEDICAL AIR	PLPROPERTY LINE
BR BACKER ROD		HD HEAD, HEADER	MG MEDICAL GAS	PUR PURLIN (S)
BS BATH STATION PULL CORD	EL ELEVATION			POLYS POLYSTYRENE
BSMT BASEMENT BT BENT			MCF MEDIUM DENSIY FIBER BOARD	

### **GENERAL NOTES:**

BT.....

..... BENT

- ARCHITECTURAL SHEETS ARE DRAWN ACCORDING TO A PLAN NORTH.
- 2. FOR ITEMS PROVIDED "BY OTHERS" PROVIDE AND INSTALL BLOCKING, MECHANICAL, ELECTRICAL, AND PLUMBING. REFERENCE MEP DOCUMENTS. CONTRACTOR IS RESPONSIBLE FOR INSTALLATION COORDINATION. 3. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CURRENT APPLICABLE CITY AND COUNTY STANDARDS. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS GOVERNING
- SAFETY, HEALTH AND SANITATION. THE CONTRACTOR SHALL PROVIDE ALL SAFEGUARDS, SAFETY DEVICES, AND PROTECTIVE EQUIPMENT AND TAKE ANY OTHER NEEDED ACTIONS TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACT. 4. AREAS DISTURBED BY THE CONSTRUCTION OUTSIDE THE LIMITS OF THE CONSTRUCTION SHALL BE RETURNED TO
- THEIR PREVIOUS CONDITION AT CONTRACTOR'S EXPENSE AS DIRECTED BY ENGINEER. ORANGE PROTECTIVE FENCING SHALL BE INSTALLED AROUND THE DRIP LINE OF ALL TREES TO REMAIN WITHIN THE LIMITS OF CONSTRUCTION AND STAGING AREA. ALL AREAS DISTURBED WITHIN AND BEYOND THE LIMIT OF CONSTRUCTION LINE SHALL BE RE-VEGETATED.
- 5. COORDINATE THE CONSTRUCTION STAGING AREA WITH THE OWNER'S REPRESENTATIVE. IF REQUIRED THE AREA SHALL BE STABILIZED WITH AGGREGATE BASE TO A DEPTH OF 6" . THE GRAVEL IS TO BE REMOVED AT THE COMPLETION OF PROJECT. ALL COSTS TO BE INCLUDED IN LINE ITEM MOBILIZATION, DEMOBILIZATION, AND MISCELLANEOUS.
- 6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE INCURRED TO THE EXISTING ROADWAY PAVEMENT, CURBS, SIDEWALKS, VEGETATION, DRIVEWAYS, LIGHTING, AND AMENITIES DURING CONSTRUCTION IF CAUSED BY CONSTRUCTION ACTIVITIES PERFORMED BY THE CONTRACTOR OR SUBCONTRACTORS.
- 7. FIELD VERIFY ALL EXISTING CONDITIONS TO DETERMINE, SIZE, LOCATION, TYPE, AND CONFIGURATIONS OF ALL ITEMS ON ROOF AND RELATED TO THE SCOPE OF WORK. REMOVE ALL ORGANIC DEBRIS FROM ROOF AND ROOF DRAINS. 8
- REMOVE EXISTING ROOFTOP EQUIPMENT FOR CURB REPLACEMENT/ HEIGHTENING IF NECESSARY. SECURELY STORE UNITS TO BE REINSTALLED. COORDINATE CURB SIZE WITH EXISTING UNIT. COORDINATE REMOVAL/REINSTALLATION TIMING WITH OWNER.
- 10. COORDINATE REROOFING OPERATIONS TO PREVENT WATER INFILTRATION INTO BUILDING DURING CONSTRUCTION. CONTRACTOR WILL BE RESPONSIBLE FOR ANY WATER DAMAGE TO CONTENTS OF THE BUILDING DURING REROOFING OPERATIONS.
- 11. IF EXISTING STRUCTURAL DECK IS SHOWING SIGNS OF RUST OR FAILURE, NOTIFY ARCHITECT PRIOR TO PRECEEDING. 12. REMOVE ANY ABANDONED ROOFTOP EQUIPMENT OR ITEMS - COORDINATE WITH OWNER.
- 13. COORDINATE ANY MECHANICAL FASTENERS WITH ELECTRICAL CONDUIT THAT MAY BE REINSTALLED.
- 14. CONTRACTOR WILL BE RESPONSIBLE TO REPAIR ANY EXISTING ELECTRICAL DAMAGED DURING REROOFING OPERATIONS.
- 15. SUBMIT TAPERED INSULATION SHOP DRAWING PLANS PRIOR TO INSTALLATION. 16. FLASH ANY PENETRATIONS THROUGH ROOF.
- 17. ALL METAL OR PVC PIPING AND CONDUITS SHALL BE ELEVATED ABOVE ROOF MEMBRANE AT ALL POINTS ON SUPPORT UNITS.

# **SYMBOLS**

MEMB..... MEMBRANE





ΟΤΛ		TBD
	QUANTITY QUARRY TILE	TEL
~		TV
R, RAD		TEMP
	RECIEVER	THK
	RECEPTACLE RECESSED	TRHD THRU
	REFERENCE	TGL
	REFRIGERATOR	TLT, TO
REG	REGISTER, REGULATOR	TTD
	REINFORCING BAR	T&G
	REINFORCE, REIN FORCING REPRODUCE	T&B
	REQUIRE (D)	ТО ТВМ
	RESILIENT	TOC
	RESISTANT	ТОМ
	RETAINING WALL	TOS
RET		TOW
REV RT	REVISE, REVISION	TB TRK
	RIGHT HAND	T, TRD
	RIGHT HAND REVERSE	TRTD
R		TD
	ROBE HOOK	TS
	ROOF DRAIN ROOF TOP UNIT	TYP
	ROOF HATCH	UC
RM		UG
	ROUGH OPENING	DL
RB	RUBBER BASE	UNF
	SANITARY-NAPKIN DISPOSAL UNIT	UH UNO
	SANITARY SEWER	UR
	SCHEDULE, SCHEDULED	UTIL
	SCREW (S)	
SLNT		VS
SCD	SEAT COVER DISPENSER	V
	SEPARATE	VB VAR
	SHEATHING	VIC
SHT		VIF
	SHEET VINYL	VTR
SHL	SHELF, SHELVES	VERT
	SHOWER CURTAIN, ROD, AND HOOKS SHOWER ROD	VEST VIN
SIM		VT
SGL	SINLED PLY	VCT
	SINK UNIT - SINGLE	VWC
	SINK UNIT - DOUBLE SINK UNIT - TRIPLE	VOL
	SOAP DISH	WSCT
	SOLID CORE	WCAB
	SOLID SURFACE	WAD
	SOUND ATTENUATING FIRE BATTS	W RCPT
	SOUIND TRANSMISSION COEFFICIENT	WC
S SP	SPANDREL	WH WP
	SPECIFICATION (S)	WR
SQ	SQUARE	WS
	SQUARE FOOT	WWF
	STAGGERED STAINLESS STEEL	W WHC
	STAINDARD	WF
STA		W
STL		WDW
	STIFFENER	WGL
STIR ST		W/ W/O
STOR		WD
STORFT	STOREFRONT	WI
	STORM DRAIN	
	STRUCTURE, STRUCTURAL	XT
SUP SUR	SUPPLY, SUPPORT	YD
	SURGICAL LIGHT	YP
SUS	SUSPEND (ED)	YS
	SUSPENDED CEILING GRID	
SW	SWITCH SYMMETRICAL	
SYM SYS		

SYMBOLS				MATERIALS
1.1	KEY NOTE	??	SECTION KEY	
~~?>	PARTITION TYPE	?	EXTERIOR ELEVATION	CONCRETE MASO
	REVISION INDICATION AND KEY	??	INTERIOR ELEVATION	BRICK
-	LEVEL AND ELEVATION INDICATION	;< ; ; ; ;		GYPSUM, PLASTE
	DRAWING KEY, INDICATION AND SCALE	?	DETAIL SECTION KEY	
	PLAN NORTH ARROW			AGGREGATE BAS
A	WINDOW TAG	-	DETAIL PLAN KEY	STEEL
	DEMOLISHED PARTITION.		(CMU) CONCRETE MASONRY UNIT	
	GRID LINE		GYPSUM BOARD PARTITION.	
	CENTER LINE		EXISTING PARTITION	

. TACKBOARD . TELEPHONE TELEVISION .. TEMPERED . THICK .. THRESHOLD THROUGH .. TINTED GLASS TLT, TOIL... TOILET .. TOILET TISSUE (ROLL) DISPENSER . TONGUE AND GROVE TOP AND BOTTOM . TOP OF TOP OF BEAM . TOP OF CURB . TOP OF MULLION . TOP OF STEEL . TOP OF WALL TOWEL BAR . TRACK ... TREAD . TREATED TRENCH DRAIN . TUBULAR STEEL .. TYPICAL .. UNDERCOUNTER .. UNDERGROUND .. UNDERWRITERS LABORATORIES, INC. ... UNFINISHED .. UNIT HEATER .. UNLESS NOTED OTHERWISE .. URINAL ... UTILITY .. VACUUM SLIDE .. VALVE ... VALVE BOX .. VARIES, VARIABLE . VARIABLE INTENSITY CONTROL .. VERIFY IN FIELD .. VENT THROUGH ROOF .. VERTICAL .. VESTIBULE ... VINYL . VINYL TILE ... VINYL COMPOSITION TILE ... VINYL WALL COVERING .. VOLUME WSCT...... WAINSCOT WCAB...... WALL CABINET .... WARM-AIR DRYERS W RCPT..... WASTE RECEPTACLE .. WATER CLOSET ... WATER HEATER ... WATER PROOFING ... WATER RESISTANT ... WEATHER STRIP(ING) ...WELDING SIRE FABRIC .. WEST ... WHEEL CHAIR .. WIDE FLANGE .. WIDE WIDTH ....WINDOW .. WIRE GLASS .. WITH ... WITHOUT ...WOOD .. WROUGHT IRON ..... X-RAY TRACK SUPPPORT

VOL.....

WAD.....

... YARD YIELD POINT .. YIELD STRENGTH

		ALUMINUM
SONRY UNIT		RIGID INSULATION
		INSULATION BATT
TER, MORTAR		BLOCKING
		BLOCKING - SHIM
ASE		PLYWOOD
	[]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]	WOOD



4 С С 7 4 CEMEN  $\sim$ Q Z **MIAMI**, 0 ٦ U ВК Ш S 4 ЧO AV ST Ó Ш 28 0

SUBMITTAL: FINAL
ISSUE DATE: 11/10/21
PROJ. MANAGER: JDH DESIGNED BY: KDR DRAWN BY: AMS
REVISIONS:
No. Description Date





G1-01









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SHEET	04	OF	09

ENLARGED DETAILS





NEW PREFINISHED METAL COPING WITH CONTINUOUS CLIP OVER EXISTING CONCRETE PARAPET CAP

**OPENING ABOVE SCUPPER** 

TOP EDGE OF MEMBRANE

EXISTING CONCRETE PARAPET CAP TO REMAIN

ROOF MEMBRANE WRAPPED UP INSIDE OF

**EXISTING CONCRETE** SCUPPER TO REMAIN

LIGHTWEIGHT CONCRETE INSULATING SYSTEM

SBS MODIFIED BITUMINOUS

**EXISTING CONCRETE** DOUBLE TEES

TREATED BLOCKING



# 2 TYP. COLD PIPE DETAIL 3" = 1'-0"

SEALANT, TYP.

STAINLESS STEEL CLAMPING RING

WATER CUT OFF MASTIC

TREATED WOOD BLOCKING AS NEEDED

CUT EDGE SEALANT, TYP.

NOTES:

- REMOVE ALL EXISTING LEAD 1. AND FLASHING MATERIAL BEFORE INSTALLING PIPE FLASHING.
- TEMPERATURE OF THE METAL 2. COLLAR MUST NOT EXCEED 180 DEGREES FAHRENHEIT.
- **APPROXIMATELY 1/8" DIAMETER** BEAD OF CUT EDGE SEALANT IS REQUIRED ON CUT EDGES OF MEMBRANE





TOP OF EDGE, REGARDLESS OF PIPE

FASTENERS AND PLATES AROUND THE FASTENERS AND PLATES CANNOT BE PIPE MAX. 12" O.C. AND FLASHED WITH UNLESS PIPE DIAMETER EXCEEDS 18"

ROOF MEMBRANE

LIGHTWEIGHT CONCRETE INSULATING SYSTEM

SBS MODIFIED **BITUMINOUS SHEET** 

EXISTING CONCRETE

DRAIN BOWL - ETR

DRAIN PIPE - ETR

NOTES:

4

- THE HOLE IN THE MEMBRANE 1 SHALL EXCEED THE DIAMETER OF THE DRAIN PIPE BUT SHALL BE NO LESS THAN 1/2" FROM THE ATTACHMENT POINTS OF THE DRAIN CLAMPING RING REMOVE EXISTING LEAD 2. FLASHING MATERIAL IF IN PLACE AND ENSURE THE
- DRAIN RING IS COMPLETELY CLEAN DOWN TO THE BARE METAL. 3.
  - ALL BOLTS OF CLAMPS MUST **BE IN PLACE TO PROVIDE** CONSTANT COMPRESSION ON WATER CUT OFF MASTIC. ADJUST DRAIN HEIGHT IF NEEDED.





PRO	JECT NO.:	787	
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SHEET 05 OF 09 **ENLARGED** 

DETAILS



### **GENERAL MECHANICAL NOTES MECHANICAL ABBREVIATIONS:** PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO DE DIAMETER INSTALL COMPLETE AND OPERABLE MECHANICAL SYSTEMS AS INDICATED ON THE IES WATER COLUMN DRAWINGS AND AS REQUIRED BY CODE. IES WATER GAUGE

		1	
A A) (			
AAV	AUTOMATIC AIR VENT (VALVE)	ID III	INSIDE DIAMETER
AC	AIR CONDITIONING UNIT OR AIR COMPRESSOR	IN OR "	INCH
ACH	AIR CHANGES PER HOUR	IN W.C.	INCHES WATER COLUMN
AFF	ABOVE FINISHED FLOOR	IN W.G.	INCHES WATER GAUGE
AHU	AIR HANDLING UNIT	INSUL.	INSULATION
APD	AIR PRESSURE DROP	KW	KILOWATT
APPROX	APPROXIMATE		
ARCH	ARCHITECT/ARCHITECTURAL	LAT	LEAVING AIR TEMPERATURE
AVG	AVERAGE	LBS	POUNDS
		LDB	LEAVING DRY BULB TEMPERATURE
BAS	BUILDING AUTOMATION SYSTEM		LANDLORD
BDD	BACK DRAFT DAMPER	LVG	LEAVING
BF		LWB	LEAVING LEAVING WET BULB TEMPERATURE
	BOILER FEED		
BHP	BRAKE HORSEPOWER	LWT	LEAVING WATER TEMPERATURE
BOD	BOTTOM OF DUCT		
BOP	BOTTOM OF PIPE	MAINT	MAINTENANCE
BTUH	BRITISH THERMAL UNIT PER HOUR	MAX	MAXIMUM
		MBH	THOUSAND BTU PER HOUR
CA	COMPRESSED AIR	MCA	MINIMUM CIRCUIT AMPACITY
CAV	CONSTANT AIR VOLUME TERMINAL UNIT	MD	MOTORIZED DAMPER
CC	COOLING COIL	MECH	MECHANICAL
CCW	COUNTER CLOCKWISE	MIN	MINIMUM OR MINUTE(S)
CD	CONDENSATE DRAIN	MISC	MISCELLANEOUS
CFH	CUBIC FEET PER HOUR	MOCP	MAXIMUM OVERCURRENT PROTECTION
CFM	CUBIC FEET PER MINUTE		
CH	CHILLER	NC	NORMALLY CLOSED OR NOISE CRITERIA
CI	CAST IRON	NIC	NOT IN CONTRACT
CL	CENTER LINE	NK	NECK
CONT		NO	NORMALLY OPEN
	CONTINUOUS, CONTINUATION		
CR	CONDENSATE RETURN	NO. OR #	NUMBER
CT	COOLING TOWER	NR	NOT REQUIRED
CU	CONDENSING/ER UNIT	NTS	NOT TO SCALE
CU FT	CUBIC FEET		
CUH	CABINET UNIT HEATER	OA	OUTSIDE AIR
CW	CLOCKWISE	OBD	OPPOSED BLADE DAMPER
		OD	OUTSIDE DIAMETER
DB	DRY BULB TEMPERATURE		
DDC	DIRECT DIGITAL CONTROL	Р	PUMP
DEG.F	DEGREE FARENHEIT	PA	PASCAL
DH	DUCT HEATER	PC	PLUMBING CONTRACTOR
DIA	DIAMETER	PH	PHASE
DIM	DIMENSION	PLBG	PLUMBING
DN	DOWN	PRESS	PRESSURE
DP	DIFFERENTIAL PRESSURE	PRV	PRESSURE REDUCING VALVE
DWG	DRAWING		
DX	DIRECT EXPANSION	R	RETURN
		RA	RETURN AIR
(E)	EXISTING	RC	REHEAT COIL
ÉÁ	EACH OR EXHAUST AIR	REQ'D	REQUIRED
EAT	ENTERING AIR TEMPERATURE	RF	RETURN FAN
EBB	ELECTRIC BASEBOARD HEATER	RH	RELATIVE HUMIDITY
EC	ELECTRICAL CONTRACTOR	RM	ROOM
EDB	ENTERING DRY BULB TEMPERATURE	RPM	REVOLUTIONS PER MINUTE
EER	ENERGY EFFICIENCY RATIO	RTU	ROOFTOP TERMINAL UNIT
EF	EXHAUST FAN		
EFF	EFFICIENCY	s	SUPPLY
ELEV	ELEVATION	SA	SUPPLY AIR OR SOUND ATTENUATOR
		SD SA	
ELEC	ELECTRIC/ELECTRICAL		SMOKE DAMPER OR SMOKE DETECTOR
ENT	ENTERING	SF	SUPPLY FAN
EQUIP		SP	STATIC PRESSURE
ESP	EXTERNAL STATIC PRESSURE	SPECS	SPECIFICATIONS
ET	EXPANSION TANK	SQ	SQUARE
EUH	ELECTRIC UNIT HEATER	SQFT	SQUARE FEET
EWB	ENTERING WET BULB TEMPERATURE	SS	STAINLESS STEEL
EWT	ENTERING WATER TEMPERATURE	STD	STANDARD
EXIST	EXISTING	STM	STEAM
		STRUC	STRUCTURE/STRUCTURAL
F&T	FLOAT & THERMOSTATIC STEAM TRAP		
FC	FAN COIL	Т	THERMOSTAT
FD	FIRE DAMPER	TEF	TOILET EXHAUST FAN
FLA	FULL LOAD AMPERES	TEMP	TEMPERATURE
FLEX	FLEXIBLE	TSP	TOTAL STATIC PRESSURE
FP	FIRE PROTECTION	TYP	TYPICAL
FPB	FAN POWERED TERMINAL UNIT		
FPM	FEET PER MINUTE	UC	UNDER-CUT (DOOR)
FPS	FEET PER SECOND	UGRD	UNDERGROUND
FRP	FIBERGLASS REINFORCED PLASTIC	UH	UNIT HEATER (HYDRONIC OR STEAM)
FSD	FIRE/SMOKE DAMPER		
FSD FT	FEET OR FLASH TANK	V	VOLT
FTR	FIN TUBE RADIATION (HOT WATER)	V VAV	VOLT VARIABLE AIR VOLUME
FIR FV	FIN TUBE RADIATION (HOT WATER) FACE VELOCITY	VAV VD	
	CALLON	VEL	VELOCITY
GAL	GALLON	VERT	
GC	GENERAL CONTRACTOR	VFD	VARIABLE FREQUENCY DRIVE
GD	GRAVITY DAMPER	VSD	VARIABLE SPEED DRIVE
GPH	GALLONS PER HOUR	VTR	VENT THROUGH ROOF
GPM	GALLONS PER MINUTE		
		W	WATT
Н	HUMIDISTAT	W/	WITH
HC	HEATING COIL	WB	WET BULB TEMPERATURE
HEPA	HIGH EFFICIENCY PARTICULATE AIR FILTER	WC	WATER COLUMN
HP	HORSEPOWER OR HEAT PUMP	WPD	WATER PRESSURE DROP
HR	HOUR	WFD WT	WEIGHT
	HOUR HYDRONIC RADIANT PANEL		
HRP			
HTG	HEATING		
HUM			
HVAC	HEATING, VENTILATION & AIR CONDITIONING		
HX	HEAT EXCHANGER		
HZ	HERTZ		
		1	



DRAWINGS ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY.

- INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS, AND APPLICABLE CODES AND REGULATIONS.
- COORDINATE CONSTRUCTION OF ALL MECHANICAL WORK WITH ARCHITECTURAL, STRUCTURAL, CIVIL, ELECTRICAL WORK, ETC., SHOWN ON OTHER CONTRACT DOCUMENT DRAWINGS.
- TESTING, ADJUSTING, AND BALANCING AGENCY SHALL BE A MEMBER OF THE ASSOCIATED AIR BALANCE COUNCIL (AABC) OR THE NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB). TESTING, ADJUSTING AND BALANCING SHALL BE PERFORMED IN ACCORDANCE WITH AABC STANDARDS.
- CONTRACTOR TO COMPLY WITH ALL LOCAL CODES AND REQUIREMENTS: 2018 IMC AND 2018 IFGC. 2006 IECC.
- ALL OUTSIDE AIR INTAKES TO BE A MINIMUM OF 10' FROM ANY MECHANICAL EXHAUST, OR PLUMBING VENTS.
- DUCTWORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH MOST RECENT SMACNA STANDARDS.
- ALL DUCT DIMENSIONS SHOWN ARE CLEAR INSIDE DIMENSIONS. INCREASE DUCT SIZE AS NECESSARY TO ACCOUNT FOR DUCT LINER.
- 10. SUPPORTS FOR MECHANICAL SYSTEM PIPING MUST MEET THE HORIZONTAL AND VERTICAL SPACING PROVISIONS IN RESPECTIVE MECHANICAL CODE.
- 11. EACH DUCT BRANCH TAKE-OFF SHALL HAVE A MANUAL VOLUME DAMPER.

15.

- 12. COORDINATE DIFFUSER, REGISTER, AND GRILLE LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS, LIGHTING, AND OTHER CEILING ITEMS AND MAKE MINOR DUCT MODIFICATIONS TO SUIT.
- REFER TO SPECIFICATIONS AND PROJECT MANUAL FOR ADDITIONAL INFORMATION AND 13. REQUIREMENTS.
- THESE DRAWINGS REFLECT A SYSTEM DESIGNED AROUND SPECIFIED REFERENCE 14 PRODUCTS, THE SELECTION OF WHICH HAS INFLUENCED THE DESIGNS OF OTHER TRADES. IF SUBSTITUTE MANUFACTURERS, SIZES, OR MODEL NUMBERS ARE BID OR SUBMITTED, IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE ALL DIFFERENCES PRIOR TO BID, ALL COSTS OF ALL TRADES ASSOCATION WITH THE SUBSTITUTIONS SHALL BE INCLUDED IN THE BID.
- COORDINATION OF ALL MODIFICATIONS TO EACH DISCIPLINE WHICH RESULT FROM SUBSTITUTION OF EQUIPMENT OR MATERIALS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. SUBSTITUTIONS WHICH ARE INSTALLED AND SUBSEQUENTLY ARE PROVEN UNSATISFACTORY BY OWNER AND/OR ENGINEER WITHIN THE WARRANTY PERIOD, SHALL BE REMOVED COMPLETELY BY THE CONTRACTOR AND REPLACED WITH THE ORIGINAL DESIGN OR CORRECTED AS DIRECTED BY THE ENGINEER WITHOUT ADDITIONAL COST TO OWNER.
- 16 CONTRACTOR SHALL PROVIDE AND INSTALL ALL AIR DEVICES WITH MOUNTING SYSTEM DESIGNED FOR MOUNTING SURFACE TYPE.
- 17. COORDINATE FINAL PLACEMENT OF ALL THERMOSTATS WITH WALL-MOUNTED DEVICES AND OWNER'S REPRESENTATIVE. MOUNT PER ADA REQUIREMENTS. ANY THERMOSTAT THAT IS REQUIRED TO BE MOUNTED ON AN EXTERIOR WALL SHALL BE MOUNTED ON AN INSULATED PAD.

# MECHANICAL SYMBOL LEGEND

		_	
IΦI	ISOLATION VALVE - BALL	$\boxtimes$	EXHAUST GRILLE - CEILING
Ľφ	Y-STRAINER WITH VALVE & HOSE CONNECTION	þ	WALL GRILLE
Ψ	THERMOMETER	Γ	MANUAL VOLUME DAMPER
Ŧ	CONTROL WELL / TEST PORT	ς	CONTINUATION
Ň	TRIPLE DUTY VALVE - ISOLATION, CHECK, CIRCUIT SETTER		CLEANOUT
$\triangleright$	REDUCER	$\sum_{i=1}^{n}$	FLOW ARROW
СН	ELBOW DOWN	$\bigcirc$	PUMP - FLOW IN DIRECTION OF ARROW
9	PRESSURE GAUGE	#	KEY NOTE
牟	AIR VENT	$\begin{pmatrix} XX \\ XX \end{pmatrix}$	EQUIPMENT TAG
弦	MOTORIZED 3-WAY VALVE	$\boxtimes$	SUPPLY DIFFUSER - CEILING
$ \diamondsuit $	CIRCUIT SETTER		RETURN GRILLE - CEILING
	CONNECT TO EXISTING		FAN AND AIR CURTAIN CONTROLS

1.	DEMOLISH EXISTING R
	A. REMOVE AND R
2.	REMOVE ALL ROOF MO
	FOR 20" NEW ROOF CU
	A. DEMO ALL EXIS
3.	DEMO EXISTING MAKEL
	A. DEMO EXISTING
4.	CAPTURE REFRIGERAN
	RETAIN EXISTING WALK
5.	PROVIDE NEW CONTRO

		ME	C
PERFOR			
PROVID			
PREVIO	US RTU	J'S AND	CO
NATURA	L GAS	PIPING.	
Α.	RECON	IFIGURE	ΕEX
	PIPING	AS NEC	ES
PROVID	E NEW	ROOF N	NOI
EXHAUS	ST FANS	S AND H	00
POWER			
PROVID			
REINST			
			ΡΔΤ

# JOB SPECIFIC MECHANICAL NOTES

- 1. WITHIN 12" OF EVERY CHANGE OF DIRECTION. 2. ALL NEW GAS PIPING SHALL BE PAINTED YELLOW. 3. **R-8 OR GREATER.** 4. OF R-6 OR GREATER. 5.
- LARGER. 6.
- 7. ON THE EQUIPMENT SCHEDULES.
- ALL NATURAL GAS PIPING IS LOW PRESSURE. 8. CURRENT PROTECTION.
- 10. 11.
- 12. ALL NEW ROOF CURBS SHALL BE 20" AND INSULATED.

### **CONTROL NOTES** INTERLOCK MAKEUP AIR UNIT WITH KITCHEN EXHAUST FAN SO MAKEUP AIR UNIT TURNS 1. ON WHEN EXHAUST FAN IS ON. PROVIDE TEMPERATURE CONTROLS FOR MAKEUP AIR UNIT PER MANUFACTURER'S INSTRUCTIONS. PROVIDE NEW DDC CONTROL SYSTEM FOR ALL NEW AND EXISTING RTU'S AND 2. INTERLOCK RTU'S WITH CONTROL SYSTEM. COMPUTER LOCATED IN THE TOWER. SYSTEM PROVIDE BACNECT CARD FOR ALL EXISTING RTU'S AND CONNECT TO CONTROL C. SYSTEM PROVIDE TEMPERATURE AND HUMIDITY SENSOR IN RETURN DUCT OF EACH RTU D. EN LIEU OF SPACE SENSORS HUMIDITY, AND ECONOMIZER CYCLE WITH AUTOMATIC CHANGEOVER BETWEEN MODES. SET UP TRENDS FOR RETURN AIR TEMPERATURE AND HUMIDITY FOR EACH UNIT G. SUBSTANTIAL COMPLETION. 3. INTERLOCK RTU-5, RTU-6, RTU-8 & RTU-9 RETURN AIR SMOKE DETECTORS FOR FAN SHUTDOWN AND INTERLOCK WITH FIRE ALARM SYSTEM TO ENUNCIATE FIRE ALARM SYSTEM WHEN SMOKE ALARM IS ACTIVATED. 4. INTERLOCK FIRE ALARM SYSTEM WITH RTU-1, RTU-2, RTU-3, RTU-4, & RTU-7 ECONOMIZER DAMPER TO OPEN ECONOMIZER DAMPERS 100% AND RUN FAN WHEN SMOKE ALARM IS ACTIVATED. ENSURE EXISTING SMOKE EXHAUST FANS AND SMOKE EXHAUST FAN CONTROLS ARE 5. INTERLOCKED WITH SMOKE ALARM SYSTEM TO TURN ON WHEN SMOKE ALARM IS ACTIVATED.

NECK SIZE

AIRFLOW

# MECHANICAL DEMO SCOPE

DEMOLISH EXISTING RTU'S AS SHOWN TO MAKE READY FOR 20" NEW ROOF CURBS. RETAIN RTU-1, AND RTU-2. OUNTED FANS AND HOODS, RETAIN FOR REUSE. AND MAKE READY

STING ROOF CURBS AND MAKE READY FOR 20" NEW ROOF CURBS. UP AIR UNIT AND MAKEUP AIR UNIT CURB.

G MAKEUP AIR UNIT CONDENSING UNIT. NT FROM WALK-IN COOLER REFRIGERANT CIRCUIT. REMOVE AND K-IN COOLER CONENSING UNIT FOR REUSE

ROL SYSTEM AND NEW CONTROLS FOR RTU'S.

## CHANICAL SCOPE

DEMO SCOPE. NEW 20" ROOF CURBS IN THE SAME LOCATIONS AS THE DNNECT TO EXISTING DUCTWORK, ELECTRICAL POWER, AND

XISTING DUCTWORK, ELECTRICAL POWER, AND NATURAL GAS SSARY TO ACCOMODATE NEW UNITS. UNTED FAN, HOOD, AND 20" ROOF CURBS. INSTALL RETAINED ODS ON NEW 20" ROOF CURBS, RECONNECT TO ELECTRICAL

AU-1 CONDENSERS, AND 20" ROOF CURB AS SHOWN PER M1-01. OLER CONDENSING UNIT. PROVIDE NEW 20" ROOF CURB OR ROOF MATERIAL COMPATIBLE ROOF RAILS. RECONNECT WALK-IN COOLER CONDENSING UNIT TO ELECTRICAL POWER. PROVIDE NEW REFRIGERANT LINES FROM WALK-IN COOLER TO CONDENSING UNIT AND RECHARGE WITH REFRIGERANT. PROVIDE NEW CONTROLS SYSTEM PER CONTROL NOTES BELOW.

GAS PIPING ON THE ROOF SHALL BE SUPPORTED WITH EATON DURA-BLOK OR SIMILAR SUPPORTS. GAS PIPING SHALL BE SUPPORTED AT CODE REQUIRED INTERVALS AND

ALL NEW OUTDOOR DUCTWORK SHALL HAVE DUCT LINE WITH INSULATION VALUE OF

ALL NEW INDOOR DUCTWORK SHALL BE WRAPPED OR LINED WITH INSULATION VALUE

PROVIDE NEW CONDENSATE LINES FOR NEW AND EXISTING RTU'S. TRAP CONDENSATE LINES AND ROUTE TO ROOF DRAIN OR SCUPPER. PROVIDE CLEANOUTS AT EVERY CHANGE OF DIRECTION LARGER THAN 45°. CONDENSATE LINES SHALL BE 1" OR

ALL OUTSIDE AIR INTAKES SHALL BE GREATER THAN 10' FROM ANY POINT OF EXHAUST OR ANY PLUMBING VENTS. PROVIDE OUTDOOR AIR DUCTWORK EXTENSIONS AS NECESSARY TO ACCOMPLISH THE REQUIRED DISTANCE. PROVIDE TEST AND BALANCE ON ALL RTU'S AND MAU TO MATCH THE AIRFLOWS SHOWN

VERIFY POWER FEEDS FOR ALL NEW EQUIPMENT PRIOR TO SUBMITTING EQUIPMENT SUBMITTALS FOR APPROVAL AND REPORT POWER FEEDS TO ARCHITECT/ENGINEER IF POWER FEEDS ARE NOT ADEQUATE. IF OVERCURRENT PROTECTION IS HIGHER THAN ALLOWED BY THE EQUIPMENT PROVIDE A NEW BREAKER WITH THE PROPER OVER

VERIFY EXISTING CONVENIENCE RECEPTACLES ARE INSTALLED WITHIN CODE REQUIRED DISTANCES FROM EQUIPMENT AND PROVIDE NEW CONVENIENCE RECEPTACLES AND POWER AS REQUIRED TO COMPLY WITH CODE. PROVIDE NEW ELECTRICAL DISCONNECTS FOR EACH PIECE OF NEW EQUIPMENT.

CONTROL SYSTEM TO HAVE A WEB-BASED FRONT END SET UP ON EXISTING

PROVIDE BACNET CARD FOR ALL NEW RTU'S AND CONNECT TO CONTROL

ENSURE CONTROL SYSTEM HAS THE ABILITY TO CONTROL TEMPERATURE,

SET UP ALARMS TO ALARM FRONT END IF TEMPERATURE OR HUMIDITY ARE MORE THAT 5°F OR 5% RH OUTSIDE OF TEMPERATURE OR HUMIDITY SETPOINT. PROVIDE 2 HOURS OF OWNER TRAINING AFTER SUBSTANTIAL COMPLETION. PROVIDE 2 HOURS OF OWNER FOLLOW-UP TRAINING SIX MONTHS AFTER

PROVIDE 20 HOURS OF ON-CALL CONTROL LABOR TO BE USED BY OWNER AT THEIR DISCRESSION WITHIN FIRST YEAR AFTER SUBSTANTIAL COMPLETION FOR ADDITIONAL TRAINING OR RECONFIGURING/REPROGRAMING OF CONTROLS.



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	SIGNED BY:	KTM NER NER	
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SYMBOLS, NOTES, AND **ABBREVIATIONS MO-01** 

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SUBMITTAL: FINAL			
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PROJ. MANAGER: KTM DESIGNED BY: NER DRAWN BY: NER			
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### MAU-1: MAKE-UP AIR UNIT

MANUFACTURER & MODEL: CAPTIVE AIRE, A2-IBT-300-20D-MPU **ELECTRICAL:** 208V/3PH, MCA = 10.4, MOCP = 20A **FAN:** 3250 CFM, 0.750" ESP, HP=2, 1423 RPM

WEIGHT: 2052 **COOLING:** 88,200 BTUH TOTAL, 64,400 BTUH SENSIBLE, 17,800 BTUH LATENT, EAT(DB/WB) = 94.0°F/76°F HEATING: NATURAL GAS, INPUT = 266,078 BTUH, OUTPUT = 212862,

55°F TEMPERATURE RISE (MINIMUM) **OPTIONS: MOTORIZED BACKDRAFT DAMPER** 

(2) CONDENSING UNITS (SEE BELOW FOR CONDENSER INFORMATION).

VAV SUPPLY FAN WITH INTEGRAL VFD (FACTORY MOUNTED AND WIRFD)

STAINLESS STEEL HEAT BURNER AND EXCHANGER WITH MODULATING NATURAL GAS HEAT AT 6:1 TURNDOWN AND 25 YEAR PARTS WARRANTY 20" INSULATED ROOF CURB

**INSTALLATION NOTES:** PROVIDE PROGRAMMABLE THERMOSTAT TO CONTROL HEATING AND COOLING BASED ON SPACE TEMPERATURE TO MAINTAIN 70°F IN THE SPACE. INSTALL THERMOSTAT IN KITCHEN. COORDINATE EXACT LOCATION WITH OWNER

PROVIDE NEW 20" ROOF CURB

PROVIDE ROOF RAILS (ROOFED INTO ROOF) TO PLACE CONDENSING UNITS.

TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER. PROVIDE NEW ISOLATION VALVE, DIRT LEG, AND UNION AT GAS CONNECTION

PROVIDE REFRIGERANT PIPING, POWER, AND CONTROL WIRING BETWEEN THE CONDENSING UNITS AND THE MAKEUP AIR UNIT PER THE MANUFACTURER'S INSTRUCTIONS.

PROVIDE SEPARATE 120V ELECTRICAL POWER FOR STANDING POWER, 120V MUST BE RUN BY ELECTRICIAN FROM BUILDING PANEL TO MAU SWITCH.

PROVIDE SUPPLY AIR SMOKE DETECTOR, INTERLOCK WITH UNIT FOR FAN SHUTDOWN, AND INTERLOCK WITH FIRE ALARM. **CONDENSING UNIT 1:** 

ELECTRICAL: 208V/3PH, MCA = 14.5A, MOCP = 20A (CONDENSER WILL NEED IT'S OWN POWER FEED. REFER TO CONDENSER ELECTRICAL NOTES BELOW)

COOLING: 3 TONS

**EFFICIENCY:** 14 SEER

WEIGHT: 133 LBS

**CONDENSING UNIT 2: ELECTRICAL:** 208V/3PH, MCA = 21.4A, MOCP = 30A

(CONDENSER WILL NEED IT'S OWN POWER FEED. REFER TO

CONDENSER ELECTRICAL NOTES BELOW) COOLING: 5 TONS

EFFICIENCY: 14 SEER

WEIGHT: 156 LBS

**CONDENSING UNIT ELECTRICAL NOTES:** 

BOTH CONDENSING UNITS SHALL BE FED FROM POWER THAT WAS FEEDING THE EXISTING 10-TON CONDENSING UNIT THAT WAS REMOVED. THE EXISTING BREAKER IS A 208V/3PH BREAKER RATED FOR 70A. PROVIDE NEW NEMA 3 FUSED DISCONNECTS FOR EACH CONDENSING UNIT.

## MECHANICAL SCHEDULES



EFFICIENCY: 17.0 SEER / 12.8 EER

OPTIONS/ACCESSORIES: PROVIDE BACNET CARD AND CONTROLS PER CONTROL NOTE ON M0-01, HAIL GUARD, HOT GAS REHEAT, LOW AMBIENT CONTROL, RETURN AIR SMOKE DETECTOR, LOW-LEAK DOWNFLOW ECONOMIZER FOR DDC CONTROLS W/ ENTHALPY SENSOR, 20" INSULATED ROOF CURB

**INSTALLATION NOTES:** PROVIDE NEW 20" ROOF CURB, TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER, PROVIDE NEW ISOLATION VALVE, DIRT LEG, AND UNION AT GAS CONNECTION. PROVIDE NEW ELECTRICAL DISCONNECT. INTERLOCK RETURN AIR SMOKE DETECTOR TO SHUT DOWN FAN AND INTERLOCK WITH FIRE ALARM SYSTEM.

ACC-1: EXISTING AIR-COOLED CONDENSING UNIT

MANUFACTURER & MODEL: REFRIGERATED DESIGN TEXAS **ELECTRICAL:** 208V/3PH, MCA = 15A, MOCP = 22A

**COOLING:** LOW TEMPERATURE COMPRESSOR = 4,000 BTUH, MEDIUM

TEMPERATURE COMPRESSOR = 7,000 BTUH

**INSTALLATION NOTES: EXISTING WALK-IN COOLER CONDENSING UNIT TO** REMAIN. CONDENSING UNIT SHALL BE REMOVED AND RETAINED DURING CONSTRUCTION. EVACUATE REFRIGERANT LINES AND RETAIN REFRIGERANT FOR REUSE. DEMO EXISTING ROOF CURB AND PROVIDE NEW 20" ROOF CURB OR ROOF MATERIAL COMPATIBLE ROOF RAILS, REINSTALLATION REQUIRED UPON COMPLETION OF ROOF WORK. RECONNECT TO POWER. PROVIDE NEW ELECTRICAL DISCONNECT. RECONNECT TO REFRIGERANT PIPING, RECHARGE SYSTEM, AND INTERLOCK CONTROLS. ENSURE PROPER OPERATION OF SYSTEM RESUMES AFTER REINSTALLATION.

**EF-EX:** ROOF MOUNTED EXHAUST FAN MANUFACTURER & MODEL: VARIES

ELECTRICAL: VARIES

FEATURES: VARIES

NOTES: EXISTING EXHAUST FAN AND BACKDRAFT DAMPER TO BE REMOVED AND RETAINED FOR REUSE, REMOVE EXISTING ROOF CURB AND PROVIDE NEW 20" INSULATED ROOF CURB, AND REINSTALL EXHAUST FAN AND BACKDRAFT DAMPER ON NEW 20" ROOF CURB UPON COMPLETION OF ROOF WORK. IF EXISTING BACKDRAFT DAMPER IS MOTORIZED, RECONNECT MOTORIZED DAMPER TO ELECTRICAL POWER.

RH-EX: ROOF MOUNTED ROOF HOOD MANUFACTURER & MODEL: VARIES

ELECTRICAL: VARIES **PERFORMANCE:** VARIES

FEATURES: VARIES

NOTES: EXISTING ROOF HOOD AND BACKDRAFT DAMPER TO BE REMOVED AND RETAINED FOR REUSE. REMOVE EXISTING ROOF CURB AND PROVIDE NEW 20" INSULATED ROOF CURB, AND REINSTALL ROOF HOOD AND BACKDRAFT DAMPER ON NEW 20" ROOF CURB UPON COMPLETION OF ROOF WORK. IF EXISTING BACKDRAFT DAMPER IS MOTORIZED, RECONNECT MOTORIZED DAMPER TO ELECTRICAL POWER.

**SF-EX:** ROOF MOUNTED SUPPLY FAN

MANUFACTURER & MODEL: VARIES ELECTRICAL: VARIES

PERFORMANCE: VARIES

FEATURES: VARIES

NOTES: EXISTING ROOF HOOD AND BACKDRAFT DAMPER TO BE REMOVED AND RETAINED FOR REUSE. REMOVE EXISTING ROOF CURB AND PROVIDE NEW 20" INSULATED ROOF CURB, AND REINSTALL ROOF HOOD AND BACKDRAFT DAMPER ON NEW 20" ROOF CURB UPON COMPLETION OF ROOF WORK. IF EXISTING BACKDRAFT DAMPER IS MOTORIZED, RECONNECT MOTORIZED DAMPER TO ELECTRICAL POWER.

RTU-1: EXISTING PACKAGED 12.5 TON ROOFTOP UNIT

MANUFACTURER & MODEL: CARRIER, 48TCED14A2A5-0A0G0 ELECTRICAL: 208V/3PH/MCA = 65 A/MOCP = 80 A

**FAN**: 5000 CFM, 0.6" ESP

COOLING: 147,950 BTUH TOTAL, 103,340 BTUH SENSIBLE, 44,610 BTUH LATENT, EAT (DB/WB) = 80°F/67°F **HEATING:** 2-STAGE NATURAL GAS, LOW OUTPUT = 147,000 BTUH, HIGH OUTPUT =

184,000 BTUH, EAT = 70°F

**WEIGHT =** 1220 LBS EFFICIENCY: 12.2 IEER / 10.8 EER

**OPTIONS/ACCESSORIES:** EXISTING UNIT

**INSTALLATION NOTES:** REMOVE AND RETAIN EXISTING RTU. PROVIDE NEW 20" INSULATED ROOF CURB AND REINSTALL EXISTING UNIT ON NEW 20" ROOF CURB. TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER. RECONNECT TO ELECTRICAL POWER, NATURAL GAS PIPING, AND CONTROL WIRING. PROVIDE NEW ELECTRICAL DISCONNECT.

PROVIDE NEW BACNET CARD FOR EXISTING RTU AND CONNECT TO NEW CONTROL SYSTEM. INTERLOCK RETURN AIR SMOKE DETECTOR WITH FIRE ALARM SYSTEM. RUN FAN AND OPEN ECONOMIZER DAMPER 100% UPON ACTIVATION OF SMOKE

**RTU-2:** EXISTING PACKAGED 12.5 TON ROOFTOP UNIT

MANUFACTURER & MODEL: CARRIER, 48TCED14A2A5-0A0G0

**ELECTRICAL:** 208V/3PH/MCA = 65 A/MOCP = 80 A FAN: 5000 CFM, 0.6" ESP

COOLING: 147,950 BTUH TOTAL, 103,340 BTUH SENSIBLE, 44,610 BTUH LATENT, EAT  $(DB/WB) = 80^{\circ}F/67^{\circ}F$ 

**HEATING:** 2-STAGE NATURAL GAS, LOW OUTPUT = 147,000 BTUH, HIGH OUTPUT = 184,000 BTUH, EAT = 70°F

EFFICIENCY: 12.2 IEER / 10.8 EER

**OPTIONS/ACCESSORIES:** EXISTING UNIT

**INSTALLATION NOTES:** REMOVE AND RETAIN EXISTING RTU. PROVIDE NEW 20" INSULATED ROOF CURB AND REINSTALL EXISTING UNIT ON NEW 20" ROOF CURB. TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER. RECONNECT TO ELECTRICAL POWER, NATURAL GAS PIPING, AND CONTROL WIRING. PROVIDE NEW ELECTRICAL DISCONNECT.

PROVIDE NEW BACNET CARD FOR EXISTING RTU AND CONNECT TO NEW CONTROL SYSTEM. INTERLOCK RETURN AIR SMOKE DETECTOR WITH FIRE ALARM SYSTEM. RUN FAN AND OPEN ECONOMIZER DAMPER 100% UPON ACTIVATION OF SMOKE DETECTOR .

**RTU-3:** PACKAGED 8.5 TON ROOFTOP UNIT

MANUFACTURER & MODEL: DAIKIN, DRG1023D180FABACN

ELECTRICAL: 208V/3PH/MCA = 44.6 A/MOCP = 50 A

**FAN**: 3400 CFM, 0.5" ESP, OUTSIDE AIR = 850 CFM COOLING: 102,816 BTUH TOTAL, 75,104 BTUH SENSIBLE, 27,712 BTUH LATENT,

EAT (DB/WB) = 80°F/67°F **HEATING:** 2-STAGE NATURAL GAS, INPUT=180,000 BTUH, LOW OUTPUT =

109,350 BTUH, HIGH OUTPUT = 145,800 BTUH, 40°F TEMP RISE.

EFFICIENCY: 17 IEER / 12.2 EER

**OPTIONS/ACCESSORIES:** PROVIDE BACNET CARD AND CONTROLS PER CONTROL NOTE ON M0-01, HAIL GUARD, HOT GAS REHEAT, LOW AMBIENT CONTROL, RETURN AIR SMOKE DETECTOR, LOW-LEAK DOWNFLOW ECONOMIZER FOR DDC CONTROLS W/ ENTHALPY SENSOR, 20" INSULATED ROOF CURB

**INSTALLATION NOTES:** PROVIDE NEW 20" ROOF CURB, TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER, PROVIDE NEW ISOLATION VALVE, DIRT LEG, AND UNION AT GAS CONNECTION. PROVIDE NEW ELECTRICAL DISCONNECT. INTERLOCK RETURN AIR SMOKE DETECTOR WITH FIRE ALARM SYSTEM. RUN FAN AND OPEN ECONOMIZER DAMPER 100% UPON ACTIVATION OF SMOKE DETECTOR .

RTU-4: PACKAGED 8.5 TON ROOFTOP UNIT

MANUFACTURER & MODEL: DAIKIN, DRG1023D180FABACN

ELECTRICAL: 208V/3PH/MCA = 44.6 A/MOCP = 50 A **FAN**: 3400 CFM, 0.5" ESP, OUTSIDE AIR = 850 CFM

COOLING: 102,816 BTUH TOTAL, 75,104 BTUH SENSIBLE, 27,712 BTUH LATENT, EAT (DB/WB) = 80°F/67°F

**HEATING:** 2-STAGE NATURAL GAS, INPUT=180,000 BTUH, LOW OUTPUT = 109,350 BTUH, HIGH OUTPUT = 145,800 BTUH, 40°F TEMP RISE. WEIGHT = 1237 LBS

EFFICIENCY: 17 IEER / 12.2 EER

DETECTOR .

OPTIONS/ACCESSORIES: PROVIDE BACNET CARD AND CONTROLS PER CONTROL NOTE ON M0-01, HAIL GUARD, HOT GAS REHEAT, LOW AMBIENT CONTROL, RETURN AIR SMOKE DETECTOR, LOW-LEAK DOWNFLOW ECONOMIZER FOR DDC CONTROLS W/ ENTHALPY SENSOR, 20" INSULATED ROOF CURB **INSTALLATION NOTES:** PROVIDE NEW 20" ROOF CURB, TRAP CONDENSATE AND ROUTE TO ROOF DRAIN OR SCUPPER, PROVIDE NEW ISOLATION VALVE, DIRT LEG, AND UNION AT GAS CONNECTION. PROVIDE NEW ELECTRICAL DISCONNECT. INTERLOCK RETURN AIR SMOKE DETECTOR WITH FIRE ALARM SYSTEM. RUN FAN AND OPEN ECONOMIZER DAMPER 100% UPON ACTIVATION OF SMOKE



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PROJECT NO.	: 787
SUBMITTAL:	FINAL
ISSUE DATE:	11/10/21
PROJ. MANAGER: DESIGNED BY: DRAWN BY:	KTM NER NER
REVISIONS:	

No.	Description	Date



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SCHEDULES AND DETAILS

# **OTTAWA COUNTY**

### JAIL ROOF/RTU REPLACEMENT

28 B Street SE, Miami, Oklahoma 74354

### BID DOCUMENT SPECIFICATIONS

**NOVEMBER 10, 2021** 

PREPARED BY:



ENGINEERS AND ARCHITECTS 1623 East 6<sup>th</sup> Street Tulsa, Oklahoma 74120 918-835-9588

C.A. 262 (PE) RENEWAL DATE: 06-30-2023 C.A. 0049 (ARCH) RENEWAL DATE: 06-31-2022

**BKL PROJECT NO: 787** 





11/10/21

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017823 OPERATION AND MAINTENANCE DATA

### **DIVISION 02 - EXISTING CONDITIONS**

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#### **DIVISION 03 - CONCRETE**

035200 LIGHTWEIGHT CONCRETE ROOF INSULATION

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### **SECTION 012500**

### SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

### **1.1 SUMMARY**

A. Section includes administrative and procedural requirements for substitutions.

### **1.2 DEFINITIONS**

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience are not allowed.
  - 3. All substitutions of a manufacturer not listed in the specifications must be submitted and receive approval prior to bid. Alternate manufacturers will not be considered after the bid.

### **1.3 ACTION SUBMITTALS**

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use standard CSI form or other form acceptable to Architect.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
    - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. Certificates and qualification data, where applicable or requested.

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- g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
- h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
- i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
- j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
- k. Cost information, including a proposal of change, if any, in the Contract Sum.
- 1. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
- m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- 3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
  - a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

### **1.4 QUALITY ASSURANCE**

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

### **1.5 PROCEDURES**

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

### **1.6 SUBSTITUTIONS**

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

- 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
  - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - b. Substitution request is fully documented and properly submitted.
  - c. Requested substitution will not adversely affect Contractor's construction schedule.
  - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
  - e. Requested substitution is compatible with other portions of the Work.
  - f. Requested substitution has been coordinated with other portions of the Work.
  - g. Requested substitution provides specified warranty.
  - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience are not allowed.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION (Not Used)

### **END OF SECTION**

### **SECTION 017700**

### **CLOSEOUT PROCEDURES**

### PART 1 - GENERAL

### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.
- B. Related Requirements:
  - 1. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.

### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

### **1.3 CLOSEOUT SUBMITTALS**

- A. MAINTANCE SUBMITTALS
  - 1. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.
  - 2. Remember to include the punch list form as an "Attachment A"
- B. Certificate of Insurance: For continuing coverage.

### **1.4 SUBSTANTIAL COMPLETION PROCEDURES**

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

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- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Submit closeout submittals specified in other Division 01 Sections, including operation and maintenance manuals.
  - 2. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
  - 3. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items. Label with manufacturer's name and model number.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 5 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Complete final cleaning requirements.
  - 2. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 5 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
  - 1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
  - 2. Results of completed inspection will form the basis of requirements for final completion.

### **1.5 FINAL COMPLETION PROCEDURES**

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
  - 1. Submit a final Application for Payment in accordance with General Conditions.
  - 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  - 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

### **1.6 SUBMITTAL OF PROJECT WARRANTIES**

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual. Provide the documents in electronic and paper format.
- C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
  - 1. Submit warranties on a thumb drive.
    - a. Include the Record Documents and Drawings on this same thumb drive. ..
- D. Warranties in Paper Form:
  - 1. Bind warranties and bonds in the same heavy-duty, three-ring, vinyl-covered, loose-leaf binders for the Operation and Maintenance Data. The binder thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
    - a. The maximum binder size is 2". Provide an additional Volume if the data requires more than 2".

### PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
  - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

### PART 3 - EXECUTION

### **3.1 FINAL CLEANING**

- A. Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning.

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- 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
  - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
  - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
  - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
  - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
  - e. Remove labels that are not permanent.
  - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
  - g. Clean roof drains.
  - h. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste-disposal requirements in General Conditions.

### **3.2 REPAIR OF THE WORK**

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

### **END OF SECTION**

### **SECTION 017823**

### **OPERATION AND MAINTENANCE DATA**

### PART 1 - GENERAL

### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory manuals.
  - 2. Product maintenance manuals.

### **1.2 CLOSEOUT SUBMITTALS**

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
  - 1. Submit on digital media acceptable to Architect or by email to Architect. Enable reviewer comments on draft submittals.
  - 2. Submit three paper copies. Architect, will return two copies.
- C. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

### **1.3 FORMAT OF OPERATION AND MAINTENANCE MANUALS**

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
  - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into

Ottawa County Jail Roof/RTU Replacement November 10, 2021 017823 - 1 individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
  - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
  - 2. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

### **1.4 REQUIREMENTS FOR MAINTENANCE MANUALS**

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- B. Title Page: Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name and contact information for Contractor.
  - 6. Name and contact information for Construction Manager.
  - 7. Name and contact information for Architect.
  - 8. Name and contact information for Commissioning Authority.
  - 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  - 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

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E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents.

## **1.5 PRODUCT MAINTENANCE MANUALS**

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

# PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION (Not Used)

# END OF SECTION

### **SECTION 024119**

### SELECTIVE DEMOLITION

### PART 1 - GENERAL

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Demolition and removal of selected portions of building or structure.
  - 2. Salvage of existing items to be reused or recycled.

#### **1.2 MATERIALS OWNERSHIP**

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

#### **1.3 INFORMATIONAL SUBMITTALS**

- A. Schedule of selective demolition activities with starting and ending dates for each activity.
- B. Predemolition photographs or video.

#### **1.4 CLOSEOUT SUBMITTALS**

A. Inventory of items that have been removed and salvaged.

#### **1.5 FIELD CONDITIONS**

- A. Owner will occupy the building during selective demolition. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. Hazardous materials will be removed by Owner before start of the Work.
  - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
- F. Arrange selective demolition schedule so as not to interfere with Owner's operations.

## PART 2 - PRODUCTS

#### **2.1 PERFORMANCE REQUIREMENTS**

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

## **PART 3 - EXECUTION**

#### **3.1 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS**

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

#### **3.2 PROTECTION**

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

#### **3.3 SELECTIVE DEMOLITION**

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
  - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  - 3. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  - 4. Dispose of demolished items and materials promptly.

- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
  - 1. Clean and repair items to functional condition adequate for intended reuse.
  - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  - 3. Protect items from damage during transport and storage.
  - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

### **3.4 CLEANING**

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
  - 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

# END OF SECTION

### **SECTION 035200**

### LIGHTWEIGHT CONCRETE ROOF INSULATION

### PART 1 - GENERAL

#### **1.1 SECTION INCLUDES:**

A. Lightweight Insulating Concrete Application to Prepared Surface

#### **1.2 RELATED SECTIONS**

A. Section 075300 Thermoset EPDM Roofing Membrane

#### **1.3 REFERENCE STANDARDS**

- A. References in these specifications to standards, test methods, and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references thought this specification.
  - 1. AMST American Society for Testing and Materials
  - 2. FM Factory Mutual Engineering and Research
  - 3. UL Underwriters Laboratories \

#### **1.4 SUBMITTALS**

- A. Submittal of Equals: Submit lightweight insulating concrete systems to be considered as equals to the specified roof system no less than 10 days prior to bid date. Primary lightweight insulating concrete systems which have been reviewed and accepted as equals to the specified system will be listed in an addendum prior to bid date; only then will equals be accepted at bidding. Submittals shall include the following:
  - 1. Submit manufacturer's instructions for proper placement of the proposed lightweight insulating concrete roof insulation system.
  - 2. Submit documentation confirming compliance with FM 1-90 Windstorm Resistance Classification utilizing the specific roof membrane system proposed for use on this project.
    - a. Submit documentation confirming that the specific expanded polystyrene proposed for use on this project is approved by Factory Mutual for use in conjunction with the proposed lightweight insulating concrete system.
  - 3. Submit a letter from the supplier of the proposed lightweight insulating concrete system confirming that the expanded polystyrene used as a component in the lightweight insulating concrete system is to be furnished by the supplier of the proposed lightweight insulating concrete system.
  - 4. Submit shop drawings including a roof plan, roof slopes, and thickness of insulation.
  - 5. Submit a sample copy of the warranty covering the proposed lightweight insulating concrete system.
  - 6. Submit a sample copy of the roof system guarantee covering the proposed lightweight insulating concrete system and roof membrane system.

- 7. Submit a letter from the roof membrane manufacturer confirming the intention to issue the roof system guarantee covering the proposed lightweight insulating concrete system and roof membrane system at project completion.
- 8. Submit a letter from the proposed lightweight insulating concrete system supplier confirming that the Contractor is approved to install the proposed lightweight insulating concrete system.

## **1.5 QUALITY ASSURANCE**

- A. Acceptable Contractor: The contractor must be certified in writing prior to bid by the supplier to install the proposed lightweight insulating concrete system.
- B. Agency Approvals: The proposed lightweight insulating concrete system shall conform to the following requirements. No other testing agency approvals will be accepted.
  - Underwriters Laboratories: Tested by Underwriters Laboratories in accordance with the procedures of ASTM E 119 and listed in the most recent Underwriters Laboratories Fire Resistance Directory. Lightweight insulating concrete roof insulation components are defined by Underwriters Laboratories under sections CCVW for foamed plastic and CJZZ for vermiculite aggregate in the latest edition of the Underwriters Laboratories Fire Resistance Directory.
  - 2. Factory Mutual: Tested by Factory Mutual Research and listed in the most recent FM Global RoofNav as non-combustible or Class 1, and for 1-90 windstorm classification utilizing the specific roof membrane system proposed for use on this project.

### 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials in the supplier's original unopened packages, fully identified as to manufacturer, brand or other identifying data and bearing the proper Underwriters Laboratories label.
- B. Storage: Store bagged concrete aggregate products in a dry location until ready for application. Expanded polystyrene board should not be stored in areas of standing water prior to application but can be exposed to rainwater before application. Boards must be clean and free from foreign substances.

#### **1.7 PROJECT/SITE CONDITIONS**

- A. Requirements Prior to Job Start
  - 1. Notification: Give a minimum of 5 days notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.
  - 2. Permits: Obtain all permits required by local agencies and pay all fees which may be required for the performance of the work.
  - 3. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.

- B. Environmental Requirements
  - 1. Precipitation: Do not apply materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials and building interiors are protected from possible moisture damage or contamination.
  - 2. Temperature Restrictions: When air temperatures of 40°F (4.4°C) or above are predicted to occur within the first 24 hours after placement, normal mixing and application procedures may be used. When air temperatures of 32°F to 40°F (0°C 4.4°C) are predicted to occur within the first 24 hours after placement, warm water may be used. The mix temperature should not exceed 100 degrees Fahrenheit (37.8°C) at the point of placement. Do not install the lightweight insulating concrete system when air temperatures are below 32°F (0°C).

### **1.8 GUARANTEE**

- A. Roof System Guarantee: Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the roof system manufacturer's 20-year labor and materials roof system guarantee. The roof system guarantee shall include both the roofing and flashing membranes, and the specified new lightweight insulating concrete system consisting of aggregate fill, patented-pre-formed polystyrene panels, and base sheet fasteners. All repair or replacement costs covered under the guarantee shall be borne by the roofing membrane manufacturer. The guarantee shall be a term type, without deductibles or limitations on coverage amount, and be issued at no additional cost to the Owner. Specific items covered under the roof system guarantee include:
  - 1. The actual resistance to heat flow through the roof insulation will be at least 80% of the design thermal resistance, provided that the roofing membrane is free of leaks;
  - 2. Should a roof leak occur, the insulating performance of the roof insulation will be at least 80% of the design thermal resistance within a 2 year period following repair of the leak.
  - 3. The roof insulation will remain in a reroofable condition should the roof membrane require replacement (excluding damage caused by fastener pullout during removal of the old membrane.)
  - 4. The roof insulation material will not cause structural damage to the building as a result of expansion from thermal or chemical action.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Acceptable Manufacturer: Provide a lightweight insulating concrete roof insulation system incorporating vermiculite aggregate and expanded polystyrene board supplied by a single manufacturer.
  - 1. Siplast, Inc.
  - 2. Other Manufacturers submit for approval prior to bid.

#### **2.2 SYSTEM DESCRIPTION**

A. Lightweight Concrete System Description: Provide materials used in the lightweight concrete roof insulation system conforming to the following.

- 1. Portland Cement: Portland cement conforming to Type I, II, or III as defined by ASTM C 150.
- 2. Vermiculite Aggregate: Vermiculite concrete aggregate conforming to ASTM C 332.
- 3. Expanded Polystyrene Insulation Board: Expanded polystyrene (EPS) insulation board having a nominal density of 1 pcf (16 kg/m<sup>3</sup>) defined as Type I by ASTM C 578 and containing approximately 3% open area. Each bundle of board shall be delivered to the job site with clear identification as to manufacturer and shall carry the Factory Mutual approval label and the Underwriter's Laboratories Classified label on each bundle.
- 4. Water: Potable water that is clean and free of deleterious amounts of acid, alkali and organic materials.

### 2.3 MIX DESIGN

A. Density: Mix Portland cement and vermiculite concrete aggregate in 1:3.5 volume ratio with water to achieve a wet density ranging from 60 to 68 pcf (960 to 1089 kg/m<sup>3</sup>), resulting in a minimum dry density of 35 pcf (561 kg/m<sup>3</sup>), and minimum compressive strength of 300 psi (2068 kPa).

### PART 3 - EXECUTION

#### **3.1 EXAMINATION**

- A. General: Ensure that all surfaces to receive lightweight insulating concrete are free of oil, grease, paints/primers, loose mill scale, dirt, or other foreign substances. Where necessary, cleaning or other corrections of surfaces to receive lightweight insulating concrete is the responsibility of the party causing the unacceptable condition of the substrate.
- B. Substrate Acceptance: With the general contractor present, examine surfaces to receive the roof insulation system and determine that the surfaces are acceptable prior to placement of the lightweight insulating concrete system.

#### **3.2 PREPARATION**

A. General: Remove water or any other substance that would interfere with bonding of the lightweight concrete system.

### **3.3 APPLICATION**

- A. General: Provide equipment and application procedures conforming to the material supplier's application instructions.
- B. Applications Incorporating Expanded Polystyrene Panels: When the specified expanded polystyrene insulation panels are to be incorporated into the lightweight insulating concrete system, place a 1/8 inch (3 mm) minimum thickness of insulating concrete slurry coat over top of the prepared substrate. Place the thickness of expanded polystyrene insulation panels shown in the approved shop drawings within 30 minutes of applying the insulating concrete slurry coat to the substrate. The maximum allowable panel step in a stair-step design is 1 inch (25 mm). Fill the

holes in the expanded polystyrene insulation panels and place a 1 inch (25 mm) minimum thickness of insulating concrete over top of the expanded polystyrene insulation panels within the same day's application.

- C. Thermal Resistance: Install the specified lightweight insulating concrete system to provide for a minimum thermal value of R25.
- D. Slope: Install the specified lightweight insulating concrete system to provide the roof slope as indicated on the architectural drawings.

### **3.4 FIELD QUALITY CONTROL**

- A. Protection: Avoid roof-top traffic over the roof insulation system until one can walk over the surface without creating surface damage.
- B. Application Monitoring: Monitor the thickness and wet density of the lightweight insulating concrete at the time of placement to determine conformance to the manufacturer's requirements. Monitor the placement of proper thickness of polystyrene insulation board in accordance with the contract documents.
- C. Fastener Withdrawal Testing: Conduct a base ply fastener pull test 3 or more days following the application of the lightweight insulating concrete to ensure a minimum withdrawal resistance of 40 pounds (18 kg) per fastener.

#### **3.5 PATCHING**

A. Patching: Perform all patching and repairing of insulating concrete using Zono-Patch or other materials approved by the lightweight insulating concrete supplier.

### END OF SECTION

### **SECTION 061000**

### **ROUGH CARPENTRY**

### PART 1 - GENERAL

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Framing with dimension lumber.
  - 2. Rooftop equipment bases and support curbs.
  - 3. Wood blocking and nailers.
  - 4. Wood furring.
  - 5. Wood sleepers.
  - 6. Plywood backing panels.

### **1.2 ACTION SUBMITTALS**

A. Product Data: For each type of process and factory-fabricated product.

#### **1.3 INFORMATIONAL SUBMITTALS**

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
  - 1. Wood-preservative-treated wood.
  - 2. Fire-retardant-treated wood.
  - 3. Power-driven fasteners.
  - 4. Post-installed anchors.
  - 5. Metal framing anchors.

### PART 2 - PRODUCTS

#### 2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

- 1. Factory mark each piece of lumber with grade stamp of grading agency.
- 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece
- 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent.
- C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
  - 1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

### 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat all rough carpentry unless otherwise indicated.

### 2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
  - 1. Exterior Type: Treated materials shall comply with requirements specified above for fireretardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.

- 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat all rough carpentry unless otherwise indicated.

### 2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  - 1. Blocking.
  - 2. Nailers.
  - 3. Rooftop equipment bases and support curbs.
  - 4. Cants.
  - 5. Furring.
  - 6. Grounds.
- B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any species.
- C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:
  - 1. Mixed southern pine or southern pine; No. 3 grade; SPIB.
  - 2. Eastern softwoods; No. 3, Common grade; NeLMA.
  - 3. Northern species; No. 3 Common grade; NLGA.
  - 4. Western woods; Standard or No. 3 Common grade; WCLIB or WWPA.

### 2.5 PLYWOOD BACKING PANELS

A. Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

#### 2.6 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction as appropriate for the substrate.

## 2.7 METAL FRAMING ANCHORS

- A. Allowable design loads, as published by manufacturer, shall meet or exceed those indicated of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.
  - 1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), highstrength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
  - 1. Use for wood-preservative-treated lumber and where indicated.

### 2.8 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

# PART 3 - EXECUTION

### **3.1 INSTALLATION**

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- D. Install shear wall panels to comply with manufacturer's written instructions.

- E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- G. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
  - Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
  - 3. ICC-ES evaluation report for fastener.

### **3.2 PROTECTION**

A. Protect rough carpentry from weather.

# **END OF SECTION**

## **SECTION 072713**

### SBS MODIFIED BITUMINOUS SHEET VAPOR RETARDER & AIR BARRIER

### PART 1 - GENERAL

#### **1.1 SUMMARY**

- A. Work shall include, but is not limited to the following:
  - 1. Preparation of existing concrete, roof deck, and all flashing substrates.
  - 2. SBS-modified bitumen roof vapor retarder.
  - 3. SBS-modified bitumen membrane flashings at penetrations
  - 4. Liquid-applied, reinforced flashings at penetrations.
  - 5. All related materials and labor required to complete specified roofing necessary to receive specified manufacturer's warranty.

#### **1.2 RELATED SECTIONS**

- A. Section 035200 "Lightweight Concrete Roof Insulation"
- B. Section 075300 "Thermoset EPDM Membrane Roofing"
- C. Section 076200 "Sheet Metal Flashings and Trim

#### **1.3 DEFINITIONS**

- A. ASTM D 1079-Definitions of Term Relating to Roofing and Waterproofing.
- B. The National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual, Fifth Edition Glossary.

#### **1.4 REFERENCES**

A. A. AMERICAN SOCIETY OF CIVIL ENGINEERS - Reference Document ASCE 7, Minimum Design Loads for Buildings and Other Structures

#### B. AMERICAN STANDARD OF TESTING METHODS (ASTM):

- 1. ASTM C 920 Standard Specification for Elastomeric Joint Sealants
- 2. ASTM D 41 Standard Specification for Asphalt Primer Used in Roofing, Damp proofing, and Waterproofing.
- 3. ASTM D 3019 Standard Specification for Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, Asbestos-Fibered, and Non-Asbestos-Fibered.
- 4. ASTM D 3746 Standard Test Method for Impact Resistance of Bituminous Roofing System.
- 5. ASTM D 4586 Standard Specification for Asphalt Roof Cement, Asbestos-Free.

- 6. ASTM D 5147 Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material.
- 7. ASTM D 5849 Standard Test Method for Evaluating Resistance of Modified Bituminous Roofing Membrane to Cyclic Fatigue (Joint Displacement)
- 8. ASTM D 6164 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
- 9. ASTM D 7379 Standard Test Methods for Strength of Modified Bitumen Sheet Material Laps Using Cold Process Adhesive.
- 10. ASTM E 108 Standard Test Methods for Fire Tests of Roof Coverings.
- C. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)::
  - 1. ANSI/SPRI FX-1, Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
  - 2. ANSI/FM 4474- American National Standard for Evaluating the Simulated Wind Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures.
- D. FACTORY MUTUAL (FM):
  - 1. FM 4470 Approval Standard Class I Roof Covers.
- E. NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA).
- F. UNDERWRITERS LABORATORY (UL):
  - 1. UL 790 Standard Test Methods for Fire Tests of Roof Coverings.
  - 2. UL 1256 Fire Test of Roof Deck Constructions.

### **1.5 ACTION SUBMITTALS**

- A. Product Data Sheets: Submit manufacturer's product data sheets, installation instructions and/or general requirements for each component.
- B. Safety Data Sheets: Submit manufacturer's Safety Data Sheets (SDS) for each component.
- C. Sample/Specimen Warranty from the manufacturer and contractor.
- D. Shop Drawings: Provide roof plan and applicable roof system detail drawings.

### **1.6 INFORMATION SUBMITTALS**

A. Contractor Certification: Submit written certification from roofing system manufacturer certifying that the applicator is authorized by the manufacturer to install the specified materials and system.

### **1.7 CLOSEOUT SUBMITTALS**

A. Warranty: Provide manufacturer's and contractor's warranties upon substantial completion of the roofing system.

### **1.8 QUALITY ASSURANCE**

#### A. MANUFACTURER QUALIFICATIONS:

1. Manufacture shall have 20 years of experience manufacturing SBS-modified bitumen roofing materials.

#### B. CONTRACTOR QUALIFICATIONS:

- 1. Contractor shall be authorized by the manufacturer to install specified materials prior to the bidding period through satisfactory project completion.
- 2. Applicators shall have completed projects of similar scope using same materials as specified herein.
- 3. 3. Contractor shall provide full time, on-site superintendent or foreman experienced with the specified roof system through satisfactory project completion.
- 4. Applicators shall be skilled in the application methods for all materials.
- 5. Contractor shall maintain a daily record, on-site, documenting material installation and related project conditions.
- 6. Contractor shall maintain a copy of all submittal documents, on-site, available at all times for reference.

### **1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Refer to each product data sheet or other published literature for specific requirements.
- B. Deliver materials and store them in their unopened, original packaging, bearing the manufacturer's name, related standards, and any other specification or reference accepted as standard.
- C. Protect and store materials in a dry, well-vented, and weatherproof location. Only materials to be used the same day shall be removed from this location. During cold weather, store materials in a heated location, removed only as needed for immediate use.
- D. When materials are to be stored outdoors, store away from standing water, stacked on raised pallets or dunnage, at least 4 in or more above ground level. Carefully cover storage with "breathable" tarpaulins to protect materials from precipitation and to prevent exposure to condensation.
- E. Carefully store roof membrane materials delivered in rolls on-end with selvage edges up. Store and protect roll storage to prevent damage.
- F. Properly dispose of all product wrappers, pallets, cardboard tubes, scrap, waste, and debris. All damaged materials shall be removed from job site and replaced with new, suitable materials.

### **1.10 SITE CONDITIONS**

#### A. SAFETY:

- 1. The contractor shall be responsible for complying with all project-related safety and environmental requirements.
- 2. Heat-welding shall include heating the specified membrane ply using propane roof torches or electric hot-air welding equipment. The contractor shall determine when and where

conditions are appropriate to utilize heat-welding equipment. When conditions are determined by the contractor to be unsafe to proceed, equivalent SBS-modified bitumen materials and methods shall be utilized to accommodate requirements and conditions.

- 3. Refer to NRCA CERTA recommendations, local codes and building owner's requirements for hot work operations.
- 4. The contractor shall review project conditions and determine when and where conditions are appropriate to utilize the specified liquid-applied, or semi-solid roofing materials. When conditions are determined by the contractor to be unsafe or undesirable to proceed, measures shall be taken to prevent or eliminate the unsafe or undesirable exposures and conditions, or equivalent approved materials and methods shall be utilized to accommodate requirements and conditions.
- 5. The contractor shall refer to product Safety Data Sheets (SDS) for health, safety, and environment related hazards, and take all necessary measures and precautions to comply with exposure requirements.

### B. ENVIRONMENTAL CONDITIONS:

- 1. Monitor substrate temperature and material temperature, as well as all environmental conditions such as ambient temperature, moisture, sun, cloud cover, wind, humidity, and shade. Ensure conditions are satisfactory to begin work and ensure conditions remain satisfactory during the installation of specified materials. Materials and methods shall be adjusted as necessary to accommodate varying project conditions. Materials shall not be installed when conditions are unacceptable to achieve the specified results.
- 2. Precipitation and dew point: Monitor weather to ensure the project environment is dry before, and will remain dry, during the application of roofing materials. Ensure all roofing materials and substrates remain above the dew point temperature as required to prevent condensation and maintain dry conditions.
- 3. Heat-Welding Application: Take all necessary precautions and measures to monitor conditions to ensure all environmental conditions are safe to proceed with the use of torches and hot-air welding equipment. Combustibles, flammable liquids and solvent vapors that represent a hazard shall be eliminated and primers shall be fully dry before proceeding with heat-welding operations. Refer to NRCA CERTA recommendations.

### **1.11 PERFORMANCE REQUIREMENTS**

#### A. FIRE CLASSIFICATION:

- 1. Vapor Retarder/Air Barrier included in system performance testing in accordance with UL 790, ASTM E108, FM 4450 or FM 4470.
  - a. Meets requirements of UL Class A or FM Class A.
- 2. Vapor Retarder/Air Barrier included in system performance testing in accordance with UL 1256, FM 4450 or FM 4470 to meet the specified requirements for interior flame spread and fuel contribution.
  - a. Meets requirements of UL 1256, or FM Class 1.

### 1.12 WARRANTY

A. The product manufacturer shall issue a written and signed document in the name of the owner, certifying the products will meet all the physical characteristics published by the manufacturer, for a period of 5 years, starting from the date of completion of installation of membranes. No

letter amending the manufacturer's standard warranty will be accepted and the warranty certificate must reflect these requirements.

B. The contractor shall guarantee the workmanship and shall provide the owner with the contractor's warranty covering workmanship for a period of 2 years from completion date.

## PART 2 - PRODUCTS

### **2.1 MANUFACTURER**

- A. A. PRODUCT QUALITY ASSURANCE PROGRAM: Manufacturer shall be an ISO 9001 registered company. A 'Quality Compliance Certificate (QCC) for reporting/confirming the tested values of the SBS-Modified Bitumen Membrane Materials will be supplied upon request.
- B. ACCEPTABLE MANUFACTURER:
  - 1. SOPREMA
  - 2. Other Manufacturers submit for approval prior to bid.

### 2.2 SBS – MODIFIED BITUMEN VAPOR RETARDER

#### A. VAPOR RETARDER, HEAT-WELDED, PARTIALLY ADHERED:

- 1. BASIS OF DESIGN: SOPREMA COLVENT 180 TG
  - a. SBS-modified bitumen membrane ply with 1 in wide factory-applied, heat activated bitumen strips on the underside and a sanded top surface. Non-woven polyester reinforced. Meets or exceeds ASTM D6164, Type I, Grade S, per ASTM D5147 test methods:
    - 1) Thickness: 118 mils
    - 2) ii. Peak load @ 73.4 °F, lbf/in
      - a) MD 85 lbf/in, XMD 65 lbf/in
    - 3) iii. Elongation at peak load @ 73.4°F, lbf/in:
      - a) MD 55%, XMD 60%
    - 4) Tear Strength @ 73.4°F, lbf:
      - a) MD 125 lbf, XMD 85 lbf
    - 5) Low temperature flexibility, °F:a) MD/XMD: -15°F

#### **2.3 ACCESSORIES**

- A. PRIMERS:
  - 1. SOPREMA ELASTOCOL 500 Primer: Asphalt cut-back primer. Primer for the preparation of roof membrane and flashing substrates for asphalt, heat-welded, hot asphalt and SOPREMA COLPLY ADHESIVE, solvent-based, cold adhesive-applied and cement applications.
    - a. Meets or exceeds ASTM D41
    - b. VOC content: 350 g/L or less.

#### B. GENERAL PURPOSE ROOFING CEMENT AND MASTIC

- 1. SBS Mastic. Fiber-reinforced, roofing cement. General purpose roofing cement for lowslope roofing used for sealing membrane T-joints and membrane edges along terminations, transitions and at roof penetrations.
  - a. VOC Content: 190 g/L or less.
  - b. Meets or exceeds ASTM D4586, Type I, Class II.

#### C. GENERAL PURPOSE SEALANT

- 1. General purpose, paintable, gun-grade, elastomeric, polyether moisture curing sealant for sealing SBS membrane terminations, Kynar 500 PVDF, horizontal and vertical construction joints.
  - a. VOC Content: 20 g/L or less.
  - b. Meets or exceeds ASTM C920, Type S, Grade NS, Class 50
  - c. Standard color

### D. LIQUID-APPLIED REINFORCED FLASHING SYSTEM:

- 1. Single-component, polyurethane-bitumen resin with polyester reinforcing fleece fabric fully embedded into the resin to form roof system flashings.
  - a. VOC Content: 250 g/L.
  - b. Liquid resin, Meets or exceeds ASTM C836.
  - c. Non-woven polyester reinforcement.

## PART 3 - EXECUTION

### **3.1 EXAMINATION**

- A. Examination includes visual observations, qualitative analysis, and quantitative testing measures as necessary to ensure conditions remain satisfactory throughout the project.
- B. The contractor shall examine all roofing substrates including, but not limited to: insulation materials, roof decks, walls, curbs, rooftop equipment, fixtures, and wood blocking.
- C. The applicator shall not begin installation until conditions have been properly examined and determined to be clean, dry and, otherwise satisfactory to receive specified roofing materials.
- D. During the application of specified materials, the applicator shall continue to examine all project conditions to ensure conditions remain satisfactory to complete the specified roofing system.

### **3.2 PREPARATION**

- A. Before commencing work each day, the contractor shall prepare all roofing substrates to ensure conditions are satisfactory to proceed with the installation of specified roofing materials. Preparation of substrates includes, but is not limited to, substrate repairs, securement of substrates, eliminating all incompatible materials, and cleaning.
- B. Where conditions are found to be unsatisfactory, work shall not begin until conditions are made satisfactory to begin work. Commencing of work shall indicate contractor's acceptance of conditions.

#### **3.3 PRIMER APPLICATION**

- A. Examine all substrates, and conduct adhesion peel tests as necessary, to ensure satisfactory adhesion is achieved.
- B. Apply the appropriate specified primer to dry, compatible substrates as required to enhance adhesion of new specified materials.
- C. Apply primer using brush, roller, or sprayer at the rate published on the product data sheet.
- D. Asphalt Primer: Apply primer to dry compatible masonry, metal, wood and other required substrates before applying asphalt and heat-welded membrane plies.
- E. Project conditions vary throughout the day. Monitor changing conditions, monitor the drying time of primers, and monitor the adhesion of the membrane plies. Adjust primer and membrane application methods as necessary to achieve the desired results.

#### **3.4 HEAT WELDING**

- A. The Contractor is responsible for project safety. Where conditions are deemed unsafe to use open flames, manufacturer's alternate membrane application methods shall be used to install SBS modified bitumen membrane and flashings. Acceptable alternate installation methods include hot asphalt, cold adhesive-applied, self-adhered membranes, and mechanically fastened plies. Hot-air welding equipment may be used in lieu of roof torches to seal membrane side and end laps where heat welding the laps is necessary. Refer to NRCA CERTA, local codes and building owner's requirements for hot work operations.
- B. Single or multi-nozzle, hand-held propane roof torches shall be used to install heat-welded plies. Multi-nozzle carts (dragon wagons) may also be utilized to install plies. Seven (7) nozzle carts are recommended for more uniform heat application in lieu of five (5) nozzle carts.

### 3.5 HEAT – WELDED, PARTIALLY – ADHERED VAPOR RETARDER APPLICATION

- A. Follow material product data sheets and published general requirements for installation instructions.
- B. Where partially-adhered membrane base ply is designed to vent vapor pressure, ensure the membrane base ply and flashings are installed to allow the venting channels on the underside of the membrane base ply to remain un-obstructed for venting pressure.
- C. Ensure environmental conditions are satisfactory, and will remain satisfactory, during the application of the partially-adhered, heat-welded membrane.
- D. Ensure all primers are fully dry before beginning heat-welding operations.
- E. Adhesion Testing: Before beginning membrane application, the applicator shall ensure conditions and torch methods are satisfactory to proceed.
  - 1. Inspect the substrate.
  - 2. Prime where necessary, allow primer to fully dry.
  - 3. Cut a 6 ft long membrane specimen from a roll.

- 4. Heat-weld the membrane specimen to the primed substrate, leaving a 6 in "dry tail" unadhered.
- 5. Allow the membrane to cool to ambient temperature
- 6. Attempt to peel the membrane from the substrate by pulling upward on the "dry tail."
- 7. Observe results to verify conditions and methods result in proper adhesion.
- F. Unroll membrane onto the roof surface and allow time to relax prior to installing the membrane.
- G. Starting at the low point of the roof, lay out the membrane to ensure the plies are installed perpendicular to the roof slope, shingled to prevent back-water laps.
- H. Ensure all roofing and flashing substrates are prepared and acceptable to receive the heat-welded membrane.
- I. Cut rolls to working lengths to conform to roof conditions, and lay out to always work to a selvage edge.
- J. In order to maintain the venting pattern on the underside of the membrane, the membrane shall be butted at each end, and the end joint shall be stripped-in using a fully-adhered heat-welded, stripin ply, not overlapped.
- K. As the membrane is un-rolled, apply heat to the underside of the membrane until the plastic burnoff film melts away from the ribbons of bitumen. Direct the torch high on the roll as required to prevent lifting the sheet.
- L. Continuously move the torch side-to-side across the underside of the roll as required melt the bitumen ribbons on the underside of the sheet while not melting the sanded bitumen between ribbons.
- M. While unrolling and heating the membrane, ensure the melted bitumen ribbons maintain contact with the substrate as necessary to adequately adhere the ribbons to the substrate.
- N. Adjust the application of heat as required for varying substrates and environmental conditions.
- O. At membrane terminations, ensure the venting pattern is maintained as required to continue the venting pattern to adjacent flashing details.
- P. At all side-laps, ensure side-laps are heat-welded across the full width, and there is approximately 1/8 to 1/4 in bleed-out.
- Q. Each day, physically inspect all side and end-laps, and ensure the membrane is sealed watertight. Where necessary, use a torch or hot-air welder and a clean trowel to ensure all laps and T-joints are sealed watertight.
- R. Inspect the installation each day to ensure the plies are sufficiently adhered. Repair all un-adhered areas, wrinkles, open laps and all other deficiencies.

### 3.6 CLEAN UP

A. Clean-up and properly dispose of waste and debris resulting from these operations each day as required to prevent damages and disruptions to operations.

# **END OF SECTION**

### **SECTION 075300**

## THERMOSET, EPDM, MEMBRANE ROOFING

### PART 1 - GENERAL

#### **1.1 SUMMARY**

- A. Remove existing TPO roof system including all insulation, flashing, etc. and replace with new system as specified.
- B. Work shall include, but is not limited to, the following:
  - 1. Preparation of existing concrete double tees and all flashing substrates.
  - 2. Lightweight Concrete Roof Insulation
  - 3. Fully adhered EPDM roof membrane.
  - 4. Fully adhered membrane flashing.
  - 5. Pre-manufactured edge metal systems.
  - 6. All related materials and labor required to complete specified roofing necessary to receive specified manufacturer's warranty.

#### **1.2 RELATED SECTIONS**

- A. Section 076200 "Sheet Metal Flashing and Trim"
- B. Section 035200 "Lightweight Concrete Roof Insulation"

#### **1.3 REFERENCES**

- A. American Society of Civil Engineers (ASCE) ASCE 7 Minimum Design Loads for Buildings and Other Structures, Current Revision.
- B. ASTM International (ASTM):
  - 1. ASTM C 578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation Board.
  - 2. ASTM D 412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
  - 3. ASTM D 624 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
  - 4. ASTM D 816 Standard Test Methods for Rubber Cements.
  - 5. ASTM D 4637 Standard Specification for EPDM Sheet Used In Single-Ply Roof Membrane.
  - 6. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials.
- C. Factory Mutual (FM Global):
  - 1. Approval Guide.
    - a. Factory Mutual Standard 4470 Approval Standard for Class 1 Roof Covers.
    - b. Loss Prevention Data Sheets 1-28, 1-29.
- D. International Code Council (ICC):
  - 1. International Building Code (IBC).
- E. National Roofing Contractors Association (NRCA) Low Slope Roofing and Waterproofing Manual, Current Edition.
- F. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) Architectural Sheet Metal Manual.
- G. Underwriters Laboratories (UL):

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- 1. TGFU R1306 "Roofing Systems and Materials Guide".
- 2. UL-790 Standard Test Method for Fire Tests of Roof Coverings.

## **1.4 DESIGN CRITERIA**

- A. Wind Uplift Performance:
  - 1. Roof system is designed to achieve a FM 1-90 wind uplift rating.
  - 2. Warranted Wind Speed: 120 MPH.
- B. Fire Resistance Performance:
- 1. Roof system will achieve a UL Class A rating when tested in accordance with UL-790.
- C. Thermal Performance: Insulation thickness and slopes are shown on the drawings.
- D. Drainage: Provide a roof system with positive drainage where all standing water dissipates within 48 hours after precipitation ends.
- E. Building Codes:
  - 1. Roof system will meet the requirements of all federal, state and local code bodies having jurisdiction.

### **1.5 SUBMITTALS**

- A. Submit under provisions of Division 1 General Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Detail Drawings:
  - 1. Submit approved plan, section, elevation or isometric drawings which detail the appropriate methods for all flashing conditions found on the project.
  - 2. Submit tapered insulation layout indicating all slopes and thicknesses
  - 3. Coordinate approved drawings with locations found on the Contract Drawings.
- D. Selection Samples: For each finish product specified, two complete sets of chips representing manufacturer's full range of available colors, membranes, and thicknesses.
- E. Verification Samples: For each finish product specified, two samples, minimum size 4 inches (102 mm) square representing actual product, color, and patterns.

### **1.6 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of fifteen (15) years experience.
- B. Installer Qualifications:
  - 1. Contractor shall provide full time, on-site superintendent or foreman experienced with the specified roofing from beginning through satisfactory project completion.
  - 2. Applicators shall be skilled in the application methods for all materials.
  - 3. Contractor shall maintain a daily record, on-site, documenting material installation and related project conditions.
  - 4. Contractor shall maintain a copy of all submittal documents, on-site, available always for reference.
  - 5. Bidding installer must provide the following Contractor Qualification Documentation:
    - a. Proof of a minimum of two similar No Dollar Limit guaranteed jobs from the approved roofing system Manufacturer.

- b. Proof of Manufacturer's License Agreement from approved Manufacture dated at least three months prior to date of bid opening.
- c. Proof of a minimum \$1,000,000 workman com. / liability insurance umbrella.
- d. Documentation from NCCI stating an Experience Modification Rating (EMR) of 1.0 or less.
- e. Documentation stating that Project Manager, Job site Superintendent and all other roofing applicators are employed directly by the Installer. No subcontracting of roofing installation will be permitted.
- f. Evidence of compliance with Oklahoma Bill #2180 "Roofing Contractor Registration Act".
- 6. All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
- 7. Installer shall be capable of extending the Manufacturer's Labor and Materials guarantee.
- 8. Installer shall be capable of extending the Manufacturer's No Dollar Limit guarantee.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.
- C. When loading materials onto the roof, comply with the requirements to prevent overloading and possible disturbance to the building structure.
- D. Contaminants such as grease, fats and oils shall not be allowed to come in direct contact with the roofing membrane.

### **1.8 USE OF THE PREMISES**

- A. Before beginning work, the roofing contractor must secure approval from the building owner's representative for the following:
  - 1. Areas permitted for personnel parking.
  - 2. Access to the site.
  - 3. Areas permitted for storage of materials and debris.
  - 4. Areas permitted for the location of cranes, hoists, and chutes for loading and unloading materials to and from the roof.

### **1.9 PROJECT CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Refer to manufacturer's recommendations for general job site considerations.
- C. Safety Data Sheets (SDS) must be always on location during the transportation, storage and application of materials.
- D. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, new roof sections shall be protected and inspected upon completion for possible damage.
- E. New roofing shall be complete and weathertight at the end of every workday.

#### 1.10 WARRANTY

- A. Provide manufacturer's "Edge-to-Edge Total System Warranty" covering both labor and all materials with no dollar limitation. The maximum wind speed coverage shall be peak gusts of 90 mph measured at 10 meters above ground level. Certification is required with bid submittal indicating the manufacturer has reviewed and agreed to such wind coverage.
  - 1. Duration: Twenty (20) years.
  - 2. Coverage to be extended to include roof edge metal.
  - 3. Warranty shall also include 32 man-hours of accidental puncture leak repair.
  - 4. Warranty shall also include leaks caused by hail up to 3" in diameter.
  - 5. Pro-rated system warranties shall not be accepted.

# PART 2 - PRODUCTS

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturers:
  - 1. Versico Roofing Systems
  - 2. Carlisle SynTec Systems
  - 3. Firestone Roofing Systems

### **2.2 SCOPE / APPLICATION**

- A. Roof System: Provide a waterproof roof system, capable of withstanding uplift forces as specified in this section.
  - 1. Membrane Attachment: Fully Adhered.
- B. Base Flashing: Provide a waterproof, fully adhered base flashing system at all penetrations, plane transitions and terminations.
- C. Insulation: Provide a roof insulation system beneath the finish membrane.

### 2.3 INSULATION

A. Refer section 035200 "Lightweight Concrete Roof Insulation"

#### 2.4 INSULATION ADHESIVE

A. A spray or extruded applied, two-component polyurethane, low-rise expanding foam adhesive used for attaching approved insulations to compatible substrates.

#### 2.5 ETHYLENE, PROPYLENE, DIENE TERPOLYMER (EPDM) MEMBRANE

- A. Black Fleece back Membrane: Cured, fleece back EPDM membrane meeting the requirements of ASTM D 4637 Type I.
  - 1. Attachment Method: Fully Adhered.
  - 2. Color: Black
  - 3. Membrane Thickness: 90 mil nominal.
  - 4. Width: 10 feet (3.05 m) maximum.
  - 5. Performance:
    - a. Tensile Strength: 1685 psi (11.6 MPa) minimum.
    - b. Tear Resistance: 200 lbf per in (35 kN per m) minimum.

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c. Elongation: 480 percent.

## 2.6 FLASHING ACCESSORIES

- A. Pipe Seals: Factory applied adhesive tape on the deck flange, for use with white EPDM roofing systems.
- B. Pourable Sealer Pocket: Pre-fabricated Pourable Sealer Pocket consisting of a 2 inch wide plastic support strip with pre-applied, adhesive backed uncured EPDM Flashing.
- C. Inside/Outside Corner: A 7 inch by 9 inch precut 60-mil thick white Uncured EPDM Flashing with a 30-mil pre-applied adhesive tape.
- D. Coverstrip: A nominal 40-mil (1.1 mm) black, semi-cured EPDM membrane laminated to a nominal 30-mil (0.76 mm) cured, pre-applied adhesive tape for flashing gravel stops, metal edgings and Seam Fastening Plates.
- E. "T" Joint Covers: A factory cut 6 inch by 6 inch or 12 inch by 12 inch uncured 40-mil thick EPDM flashing laminated to a nominal 30-mil pre-applied adhesive tape, used to overlay field splice intersections and to cover field splices at angle changes.
- F. Black Cured Flashing: A cured .060 inch (1.5 mm) thick non-reinforced (seamless) black EPDM membrane used to flash gravel stops, metal edgings, walls/curbs and Seam Fastening Plates used for additional membrane securement when the use of RTS is not feasible.
- G. Uncured EPDM Flashing: Formable 60-mil (1.5 mm) thick uncured EPDM flashing.
- H. Provide any and all details required by the manufacturer to obtain a 20 year NDL warranty.

### 2.7 CLEANERS, PRIMERS, ADHESIVES AND SEALANTS

- A. Weathered Membrane Cleaner: Clear, solvent-based cleaner used to loosen and remove contaminants from the surface of exposed EPDM membrane prior to the application of Seam Adhesive or EPDM Primer.
- B. Splice Adhesive: A high-strength, butyl-based contact cement which is used for splicing adjoining sections of EPDM membrane (cured or uncured).
- C. QA Seam Tape: 3 inch (76mm) or 6 inch (152mm) wide by 100 foot (30.5 M) long splice tape used for splicing adjoining sections of EPDM membrane. Complies with the South Coast Air Quality Management District Rule 1168.
- D. Peel & Stick White Seam Tape: A 3 inch (76mm) wide by 100 foot (30.5 M) long, cream colored splice tape used with White Systems. Complies with the South Coast Air Quality Management District Rule 1168.
- E. Primer: A solvent-based primer used to prepare the surface of EPDM membrane for application of Seam Tape or QA products.
- F. Substrate Adhesive: A high-strength, yellow colored, synthetic rubber adhesive used for bonding EPDM membranes to various surfaces.
- G. Water Cut-Off Mastic: A one-component, low viscosity, self wetting, Butyl blend mastic used as a compression sealing agent between EPDM membranes or uncured flashing and applicable substrates.
- H. Universal Single-Ply Sealant: A 100 percent solids, solvent free, one-part, polyether sealant that provides a weather tight sealant to a variety of building substrates; used as a termination bar sealant. Available in white only.
- I. CAV-GRIP 3V Low-VOC Aerosol Contact Adhesive/Primer: a low-VOC, methylene chloride-free adhesive that can be used for a variety of applications including: adhering EPDM, horizontally, for the field of the roof and to vertical walls.

#### 2.8 EDGINGS AND TERMINATIONS

- A. Pre-manufactured Coping and Facia: Roof edge systems shall be included in the Membrane manufacturer's warranty. System shall be engineered to withstand wind warranty requirements. Tested to meet ANSI/SPRI/FM 4435/ES-1.
  - 1. Material and thickness: 24 gauge steel
  - 2. Color: Manufacturers full range
- B. Termination Bar: 1 inch (13 mm) wide, .098 inch (2.5mm) thick extruded aluminum bar prepunched 6 inches (152 mm) on center with sealant ledge to support Lap Sealant.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.
- B. The surface on which the insulation or roofing membrane is to be applied shall be clean, smooth, dry, and free of projections or contaminants that would prevent proper application of or be incompatible with the new installation, such as fins, sharp edges, foreign materials, oil and grease.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **3.2 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Do not commence work until all other work trades have completed jobs that require them to traverse the deck on foot or with equipment.

### **3.3 SUBSTRATE PREPARATION**

- A. Concrete Double Tees:
  - 1. Manufacturer shall approve existing concrete deck for attachment and warranty purposes.
  - 2. Decks shall comply with the span requirements in the current Factory Mutual Approval Guide and be installed in accordance with Loss Prevention Data Sheet 1-28 or specific FM approval.
  - 3. Properly fasten loose or inadequately secured decking.
  - 4. Identify any existing concrete decking that is damaged or corroded. Receive owner approval to replace.

### 3.4 MEMBRANE PLACEMENT AND ATTACHMENT (Fully Adhered)

- A. Unroll and position membrane without stretching. Allow the membrane to relax for approximately 1/2 hour before bonding. Fold the sheet back onto itself so half the underside of the membrane is exposed.
- B. Apply the Bonding Adhesive in accordance with the manufacturer's published instructions, to both the underside of the membrane and the substrate. Allow the adhesive to dry until it is tacky but will not string or stick to a dry finger touch.
- C. Roll the coated membrane into the coated substrate while avoiding wrinkles. Brush down the bonded half of the membrane sheet with a soft bristle push broom to achieve maximum contact.
- D. Fold back the unbonded half of the membrane sheet and repeat the bonding procedure.

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- E. Install adjoining membrane sheets in the same manner, overlapping edges appropriately to provide for the minimum splice width. It is recommended that all splices be shingled to avoid bucking of water.
- F. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.

### 3.5 MEMBRANE SPLICING (Adhesive Splice)

- A. Fold the top sheet back and clean the dry splice area (minimum 3 inches wide) of both membrane sheets by wiping with a clean rag.
- B. Apply Primer to the mating surfaces with a scrub pad, at a rate of approximately 450 square feet per gallon for a 3 inch (76 mm) wide seam, and allow to dry.
- C. Apply Seam Adhesive in accordance with the manufacturer's current application guidelines, and roll the top sheet onto the mating surface.
- D. Roll the splice with a 2 inch (51 mm) wide steel roller and wait at least 2 hours before applying Lap Sealant to the splice edge following the manufacturer's requirements.
- E. Field splices shall be overlaid with uncured flashing.

### **3.6 MEMBRANE SPLICING (Tape Splice)**

- A. Overlap adjacent sheets and mark a line 1/2 inch (13 mm) out from the top sheet.
- B. Fold the top sheet back and clean the dry splice area a minimum of 3 inches (76 mm) on both membrane sheets.
- C. Apply Primer to the mating surfaces with a scrub pad, at a rate of approximately 450 square feet per gallon for a 3 inch (76 mm) wide seam, and allow to dry.
- D. Apply 3 inch (76 mm) wide Seam Tape to bottom sheet with the edge of the release film along the marked line. Press tape onto the sheet using hand pressure. Overlap tape roll ends a minimum of 1 inch (25 mm).
- E. Remove the release film and press the top sheet onto the tape using hand pressure.
- F. Roll the seam toward the splice edge with a 2 inch (51 mm) wide steel roller.
- G. Install QA "T" Joint Cover, a 6 inch wide (152 mm) section of VersiGard QA Flashing or VersiGard Non-QA Flashing over all field splice intersections. When using Non-QA Flashing, seal edges of flashing with Lap Sealant.
- H. The use of Lap Sealant with tape splices is optional except at tape overlaps and cut edges of reinforced membrane where Lap Sealant is required. Refer to manufacturer for 30 year warranty requirements.

### **3.7 FLASHING**

- A. Wall and curb flashing shall be cured EPDM membrane. Continue the deck membrane as wall flashing where practicable.
- B. Follow manufacturer's typical flashing procedures for all wall, curb, and penetration flashing including metal edging/coping and roof drain applications.

### 3.8 WALKWAYS

- A. Install walkways at all traffic concentration points (such as roof hatches, access doors, HVAC units, rooftop ladders, etc.) and all locations as identified on the Contract Drawings.
- B. Adhere walkway pads to the EPDM membrane in accordance with the manufacturer's current application guidelines.

### **3.9 DAILY SEALS**

- A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the work day, a daily seal shall be performed to temporarily close the membrane to prevent water infiltration.
- B. Use Pourable Sealer or other acceptable membrane seal in accordance with the manufacturer's requirements.

### 3.10 CLEAN UP

- A. Perform daily clean-up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris shall be disposed of in a legally acceptable manner.
- B. Prior to the manufacturer's inspection for warranty, the applicator shall perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

### 3.11 PROTECTION

- A. Provide protection, such as 3/4 inch (19 mm) thick plywood, for all roof areas exposed to traffic during construction. Plywood must be smooth and free of fasteners and splinters.
- B. Protect installed products until completion of project.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

# END OF SECTION
### **SECTION 076200**

### SHEET METAL FLASHING AND TRIM

### PART 1 - GENERAL

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Manufactured reglets with counterflashing.
  - 2. Formed roof-drainage sheet metal fabrications.
  - 3. Formed low-slope roof sheet metal fabrications.

#### **1.2 PREINSTALLATION MEETINGS**

A. Preinstallation Conference: Conduct conference at Project site.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each of the following
  - 1. Underlayment materials.
  - 2. Elastomeric sealant.
  - 3. Butyl sealant.
  - 4. Epoxy seam sealer.
- B. Shop Drawings: For sheet metal flashing and trim.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
  - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
  - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
  - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
  - 6. Include details of termination points and assemblies.
  - 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
  - 8. Include details of roof-penetration flashing.
  - 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
  - 10. Include details of special conditions.
  - 11. Include details of connections to adjoining work.
- C. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.

### **1.4 INFORMATIONAL SUBMITTALS**

- A. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved.
- B. Evaluation Reports: For copings and roof edge flashing, from an agency acceptable to authority having jurisdiction showing compliance with ANSI/SPRI/FM 4435/ES-1.
- C. Sample warranty.

### **1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance data.
- B. Special warranty.

### **1.6 QUALITY ASSURANCE**

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance. Product must be approved by roofing material manufacturer in order to provide 20 year total systems warranty.
  - 1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

#### **1.7 WARRANTY**

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
    - b. Chalking in excess of a No.8 rating when tested in accordance with ASTM D4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.
  - 3. Roofing material manufacturer must approve product and include it in 20 year total systems warranty.

### PART 2 - PRODUCTS

#### **2.1 PERFORMANCE REQUIREMENTS**

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:

1. Design Pressure: 120 mph wind speed at 10 meters above ground and FM 1-90 wind uplift rating.

- D. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  1. Temperature Change: 120 deg F, ambient.

### **2.2 SHEET METALS**

- A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet in accordance with ASTM A792/A792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A755/A755M.
  - 1. Surface: Smooth, flat.
  - 2. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 3. Color: As selected by Architect from manufacturer's full range.

4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

# **2.3 UNDERLAYMENT MATERIALS**

A. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions. Product must be compatible with roof membrane system.

1. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

# 2.4 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

- a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM sealing washers under heads of exposed fasteners bearing on weather side of metal.
- b. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

#### 2.5 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
  - 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
  - 2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  - 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
  - 4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  - 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances:
  - 1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
  - 2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
  - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
  - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, non-expansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- G. Seams:
  - 1. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

# 2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint cover plates. Shop fabricate interior and exterior corners.
  - 1. Fabricate from the following materials:
    - a. Metallic-coated steel sheet: 0.040 inch thick.

B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.

1. Fabricate from the following materials:

a. Metallic-coated sheet steel: 0.040 inch thick.

- 2. Provide wood blocking as needed to properly install copings.
- C. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Metallic-coated sheet steel: 0.028 inch thick.

D. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Metallic-coated sheet steel: 0.040 inch thick.

E. Roof-Penetration Flashing: Fabricate from the following materials:1. Metallic-coated sheet Steel: 0.028 inch thick.

# **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF UNDERLAYMENT**

- A. Self-Adhering, High-Temperature Sheet Underlayment:
  - 1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
  - 2. Prime substrate if recommended by underlayment manufacturer.
  - 3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
  - 4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
  - 5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
  - 6. Roll laps and edges with roller.
  - 7. Cover underlayment within 14 days.
- B. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.
  1. Install in shingle fashion to shed water.
  - 2. Lap joints not less than 4 inches.

#### **3.2 INSTALLATION, GENERAL**

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
  - 1. Install fasteners protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.

- 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
- 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
- 5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
- 6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
- 7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
- 8. Do not field cut sheet metal flashing and trim by torch.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressuretreated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
  - 1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
  - 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
  - 1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
  - 2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
  - 3. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate concrete, wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for screws substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.1. Use sealant-filled joints unless otherwise indicated.
  - a. Embed hooked flanges of joint members not less than 1 inch into sealant.
  - b. Form joints to completely conceal sealant.
  - c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
  - d. Adjust setting proportionately for installation at higher ambient temperatures.

1) Do not install sealant-type joints at temperatures below 40 deg F.

- 2. Prepare joints and apply sealants to comply with manufacturer's warranty.
- G. Rivets: Rivet joints where necessary for strength.

# **3.3 INSTALLATION OF ROOF FLASHINGS**

- A. Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard.
  - 1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
  - 2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing:
  - 1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
  - 2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
  - Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- C. Copings:
  - 1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
  - 2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.
    - a. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
    - b. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.
  - 3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
  - 1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
  - 2. Extend counterflashing 4 inches over base flashing.
  - 3. Lap counterflashing joints minimum of 4 inches.
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

### **3.4 INSTALLATION OF WALL FLASHINGS**

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

### **3.5 INSTALLATION TOLERANCES**

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

### **3.6 CLEANING**

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

### **3.7 PROTECTION**

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

### END OF SECTION

#### **SECTION 079200**

### JOINT SEALANTS

### PART 1 - GENERAL

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Nonstaining silicone joint sealants.
  - 2. Urethane joint sealants.
  - 3. Mildew-resistant joint sealants.

### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each joint-sealant product.
- B. Samples: For each kind and color of joint sealant required.
- C. Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.

### **1.3 INFORMATIONAL SUBMITTALS**

- A. Product test reports.
- B. Preconstruction laboratory test reports.
- C. Preconstruction field-adhesion-test reports.
- D. Field-adhesion-test reports.
- E. Sample warranties.

# **1.4 QUALITY ASSURANCE**

A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

### **1.5 PRECONSTRUCTION TESTING**

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
  - 1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  - 2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
  - 3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with masonry substrates.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

### **1.6 WARRANTY**

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 JOINT SEALANTS, GENERAL

- A. Colors of Exposed Joint Sealants: As selected by Architect f rom manufacturer's full range.
  - 1. <u>Basis-of-Design Product:</u> Subject to compliance with requirements, provide product from one of the following or comparable product by one of the following:
    - a. Dow Corning Corporation
    - b. <u>Sika Corporation; Joint Sealants</u>.
    - c. <u>Tremco Incorporated</u>.

### **2.2 NONSTAINING SILICONE JOINT SEALANTS**

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

### **2.3 URETHANE JOINT SEALANTS**

A. Urethane, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

# 2.4 JOINT-SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

# 2.5 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

# PART 3 - EXECUTION

### **3.1 PREPARATION**

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove laitance and form-release agents from concrete.
  - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

# **3.2 INSTALLATION OF JOINT SEALANTS**

- A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Install sealants after walls have been painted.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

### **3.3 FIELD QUALITY CONTROL**

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
  - 1. Extent of Testing: Test completed and cured sealant joints as follows:
    - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
    - b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
  - 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

# **3.4 JOINT-SEALANT SCHEDULE**

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

- a. Expansion joints in CMU walls.
- b. Perimeter of all exterior window frames adjacent to roof and in walls that are to be painted.
- c. Miscellaneous locations as required.

2. Joint Sealant: Silicone, nonstaining.

- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Horizontal traffic surfaces.

1. Joint Locations:

- a. Miscellaneous locations as needed.
- b. Other joints as indicated on Drawings.
- 2. Joint Sealant: Urethane.
- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

# END OF SECTION

### **SECTION 086200**

### **UNIT SKYLIGHTS**

### PART 1 - GENERAL

#### **1.1 SECTION INCLUDES**

A. Domed plastic unit skylights

#### **1.2 REFERENCES**

- A. Aluminum Association (AA):
  - 1. AA M12C22A41 Anodized Plus Finish.
  - 2. AA M12C22A32/A34 Color anodized: Class II, Color Anodic Finish.
- B. American Architectural Manufacturer's Association (AAMA):
  - 1. AAMA 501.2 Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
  - 2. AAMA 605.2 Voluntary Specification for High Performance Organic Coatings.
  - 3. AAMA 607.1 Voluntary Guide Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.
  - 4. AAMA 612 Voluntary Specifications and Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Coatings on Architectural Aluminum, for Finishes such as Anodized Plus.
- C. ASTM International (ASTM):
  - 1. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 2. ASTM C1048 Standard Specification for Heat-Treated Flat Glass Kind HS, Kind FT Coated and Uncoated Glass.
  - 3. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
  - 4. ASTM E773 Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units.
  - 5. ASTM E774 Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units.
- D. American Welding Society (AWS): AWS Structural Welding Code.

#### **1.3 SUBMITTALS**

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Indicate materials, finishes and installation procedures recommended by manufacturer.
  - 4. Indicate compliance with specified design criteria.
  - 5. Indicate compliance with performance requirements.

- 6. Include product specific glazing details.
- B. Shop Drawings:
  - 1. Indicate material types, gauges and finishes, fabrication details and installation details.
  - 2. Show glazing types, methods of attachment and thermal movement provisions.
- C. Indicate compliance with specified structural design criteria.
  - 1. Submitted design calculations shall bear seal of a professional engineer licensed in the State in which the skylight is to be installed.
  - 2. Certify that engineer has reviewed shop drawings.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

### **1.4 QUALITY ASSURANCE**

- A. Manufacturer Qualifications:
  - 1. Skylight manufacturer shall have a minimum of ten years experience in design, fabrication and installation of custom aluminum skylight systems and shall have a certified quality assurance program.
- B. Installer Qualifications:
- C. Installer shall be trained and approved by manufacturer.
- D. Installer shall have five years experience with skylight type, size and complexity.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

# **1.6 PROJECT CONDITIONS**

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

### **1.7 WARRANTY**

- A. Performance Warranty: Provide manufacturer's written warranty covering skylight work. Warranty shall cover defective materials, workmanship and performance.
  - 1. 5 years.

# PART 2 - PRODUCTS

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturer: American Skylights, Inc.
- B. Other Manufacturers submit for approval prior to bid.

# 2.2 SKYLIGHT PERFORMANCE

#### A. Load:

- 1. Deflection of framing members shall not exceed L/180 or 1 inch (25 mm) whichever is less.
- 2. Polycarbonate unit skylights shall meet the requirements of uniform load test ASTM E330 that requires glazing to withstand a positive and negative test pressure of 30 psf.
- B. Air Infiltration:
  - 1. Polycarbonate unit skylights shall meet the requirements of ASTM E283 that allows a maximum air infiltration of 0.06 cfm (.0017 cu. m/m) of the total glazed surface area.
- C. Water Infiltration:
  - 1. Polycarbonate unit skylights shall meet the requirements of ASTM E547/E331 that allows for no water infiltration at a test pressure of 12 psf (571 Pa).

# 2.3 PLASTIC SKYLIGHT

- A. Dade County Thermally Broken Curb Mount: Double domed polycarbonate thermally broken curb mount skylight unit. Sizes as shown on drawings.
  - 1. Model DTCM-60 Dade County Thermal Break Curb Mount as manufactured by American Skylights.
  - 2. Performance Test: Report No. 65541.01-801-18. Architectural Testing, Inc., 130 Derry Court, York, PA 17402.
  - 3. NOA: Product Control Notice of Acceptance (NOA) 09-0316.02. Miami-Dade County Building Code Compliance Office.
  - 4. Performance Requirement:
    - a. Impact Resistance: Unit skylights shall meet the requirements of Protocol PA-201-94.
    - b. Static Air Pressure: Unit skylights shall meet the requirements of Protocol PA-202-94.
    - c. Water Infiltration: Unit skylights shall meet the requirements of Protocol PA-202-94.
    - d. Structural Loads: Unit skylights shall meet the requirements of Protocol PA-202-94; Design Load = 60.0 psf (2.9 kPa).
    - e. Cyclic Wind Pressure Loading: Unit skylights shall meet the requirements of Protocol PA-203-94; Design Load = 60.0 psf (2.9 kPa).
  - 5. Assembly: Skylights shall be factory assembled and factory glazed.
    - a. Polycarbonate Domes: As manufactured by Sheffield Hyzod.
    - b. Curb Mount Frame: Frame shall be fabricated from .060 inch by 1.5 inches by 1.75 inches (1.5 mm by 38 mm by 44 mm) T6063-T5/T6 aluminum extrusion. Frame shall have an integral condensation gutter. Corners shall be welded using the heliarc process.
    - c. Domes shall be secured to frame with a fully welded retainer cap, thickness of .060 inch (1.5 mm).

- d. Dow Corning 795 structural silicone sealant shall be applied continuously around perimeter of skylight between extruded aluminum retaining angle and top dome.
- e. Schnee-Morehead 5127 Sealant Tape shall be applied continuously between polycarbonate bottom dome and .080 inch (2.0 mm) T6063 extruded aluminum frame.
- f. Fasteners: Fasteners used in the factory assembly process shall be stainless steel. Fasteners and screws used for securing skylight to structure shall be stainless steel and shall be provided by the Contractor.

### **2.4 FABRICATION**

- A. Rectangular and Square Curb Mount:
  - 1. Thermally broken curb mount frame shall be fabricated from 6063-T5/T6 aluminum extrusion.
    - a. Thickness shall be minimum .060 inch (1.5 mm) with a polyurethane thermal break to reduce thermal transfer and reduce condensation on the interior of the frame.
  - 2. All corners shall be welded using the heliarc process.
  - 3. Aluminum Finish:
    - a. Mill finish.
- B. Polycarbonate Domes:
  - 1. Domes shall be secured to frame with a fully welded retainer cap, minimum thickness of .125 inch (3.0 mm).
  - 2. Polycarbonate domes shall be:
    - a. Double Dome Color: Bronze/Clear.
- C. Glazing Gaskets and Sealants: Glazing to be separated from frame by a continuous extruded black Santoprene gasket.
- D. Fasteners: Screws and fasteners used in the factory assembly process shall be stainless steel. Fasteners and screws used for securing skylight to structure shall be suitable for substrate.

### PART 3 - EXECUTION

#### **3.1 EXAMINATION**

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

#### **3.2 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

# **3.3 INSTALLATION**

A. Install in accordance with manufacturer's instructions.

### **3.4 CLEANING**

- A. General Cleaning: Installer shall remove all protective coverings from frames and domes and shall leave installation free from debris and sealant markings.
- B. Final Cleaning: Final cleaning in accordance with manufacturers recommendations. Cleaning instructions shall be located on manufacturer's label.

### **3.5 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

# END OF SECTION

# SECTION 0230593 TESTING, ADJUSTING, AND BALANCING FOR HVAC

#### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. Section Includes:
  - 1. Balancing Air Systems:
    - a. Constant-volume air systems.

#### 1.03 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

#### 1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 15 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB

strategies and step-by-step procedures as specified in "Preparation" Article.

- D. Certified TAB reports.
- E. Sample report forms.
- F. Instrument calibration reports, to include the following:
  - 1. Instrument type and make.
  - 2. Serial number.
  - 3. Application.
  - 4. Dates of use.
  - 5. Dates of calibration.

#### 1.05 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB, or TABB.
  - TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB, or TABB.
  - TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB, or TABB as a TAB technician.
- B. Certify TAB field data reports and perform the following:
  - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
  - Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use standard TAB contractor's forms approved by Architect.
- D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."
- E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 "Air Balancing."
- F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 "System Balancing."

#### PART 2 - PRODUCTS (Not Applicable)

#### **PART 3 - EXECUTION**

#### 3.01 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 233113 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
  - Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
  - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems Duct Design." Compare results with the design data and installed conditions.

- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- K. Examine operating safety interlocks and controls on HVAC equipment.
- L. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

#### 3.02 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
  - 1. Permanent electrical-power wiring is complete.
  - 2. Automatic temperature-control systems are operational.
  - 3. Equipment and duct access doors are securely closed.
  - 4. Balance, smoke, and fire dampers are open.
  - Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
  - 6. Windows and doors can be closed so indicated conditions for system operations can be met.

#### 3.03 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" and in this Section.
  - 1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum

extent necessary for TAB procedures.

- After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
- Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

#### 3.04 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling-unit components.
- K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

#### 3.05 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  - 1. Measure total airflow.
    - Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
  - 2. Measure fan static pressures as follows to determine actual static pressure:
    - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    - b. Measure static pressure directly at the fan outlet or through the flexible connection.
    - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
  - 3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
    - a. Report the cleanliness status of filters and the time static pressures are measured.
  - 4. Measure static pressures entering and leaving other devices, such as sound traps, heatrecovery equipment, and air washers, under final balanced conditions.
  - Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
  - 6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated

speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.

- 7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fanmotor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
  - 1. Measure airflow of submain and branch ducts.
    - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
  - Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
  - 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure air outlets and inlets without making adjustments.
  - Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
  - Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.

2. Adjust patterns of adjustable outlets for proper distribution without drafts.

#### 3.06 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
  - 1. Equipment with Fans: Plus or minus 10 percent.
  - 2. Air Outlets and Inlets: Plus or minus 10 percent.
  - 3. Exhaust fans: Plus 10 percent.
  - 4. Outside air: Minus 10 percent.

#### 3.07 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare weekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

### 3.08 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
  - Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
  - 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
  - 1. Fan curves.

- 2. Manufacturers' test data.
- 3. Field test reports prepared by system and equipment installers.
- 4. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
  - 1. Title page.
  - 2. Name and address of the TAB contractor.
  - 3. Project name.
  - 4. Project location.
  - 5. Architect's name and address.
  - 6. Engineer's name and address.
  - 7. Contractor's name and address.
  - 8. Report date.
  - 9. Signature of TAB supervisor who certifies the report.
  - 10. Table of Contents with the total number of pages defined for each section of the report.

Number each page in the report.

- 11. Summary of contents including the following:
  - a. Indicated versus final performance.
  - b. Notable characteristics of systems.
  - c. Description of system operation sequence if it varies from the Contract Documents.
- 12. Nomenclature sheets for each item of equipment.
- 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
- 14.Notes to explain why certain final data in the body of reports vary from indicated values.
- 15. Test conditions for fans and pump performance forms including the following:
  - a. Settings for outdoor-, return-, and exhaust-air dampers.
  - b. Conditions of filters.

- c. Cooling coil, wet- and dry-bulb conditions.
- d. Face and bypass damper settings at coils.
- e. Fan drive settings including settings and percentage of maximum pitch diameter.

f. Inlet vane settings for variable-air-volume systems.

- g. Settings for supply-air, static-pressure controller.
- h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
  - 1. Quantities of outdoor, supply, return, and exhaust airflows.
  - 2. Water and steam flow rates.
  - 3. Duct, outlet, and inlet sizes.
  - 4. Pipe and valve sizes and locations.
  - 5. Terminal units.
  - 6. Balancing stations.
  - 7. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
  - 1. Unit Data:
    - a. Unit identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and unit size.
    - e. Manufacturer's serial number.
    - f. Unit arrangement and class.
    - g. Discharge arrangement.
    - h. Sheave make, size in inches, and bore.
    - i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    - j. Number, make, and size of belts.

- k. Number, type, and size of filters.
- 2. Motor Data:
  - a. Motor make, and frame type and size.
  - b. Horsepower and rpm.
  - c. Volts, phase, and hertz.
  - d. Full-load amperage and service factor.
  - e. Sheave make, size in inches, and bore.
  - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
- 3. Test Data (Indicated and Actual Values):
  - a. Total air flow rate in cfm.
  - b. Total system static pressure in inches wg.
  - c. Fan rpm.
  - d. Discharge static pressure in inches wg.
  - e. Filter static-pressure differential in inches wg.
  - f. Preheat-coil static-pressure differential in inches wg.
  - g. Cooling-coil static-pressure differential in inches wg.
  - h. Heating-coil static-pressure differential in inches wg.
  - i. Outdoor airflow in cfm.
  - j. Return airflow in cfm.
  - k. Outdoor-air damper position.
  - I. Return-air damper position.
  - m. Vortex damper position.
- F. Apparatus-Coil Test Reports:
  - 1. Coil Data:
    - a. System identification.
    - b. Location.

- c. Coil type.
- d. Number of rows.
- e. Fin spacing in fins per inch o.c.
- f. Make and model number.
- g. Face area in sq. ft..
- h. Tube size in NPS.
- i. Tube and fin materials.
- j. Circuiting arrangement.
- 2. Test Data (Indicated and Actual Values):
  - a. Air flow rate in cfm.
  - b. Average face velocity in fpm.
  - c. Air pressure drop in inches wg.
  - d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
  - e. Return-air, wet- and dry-bulb temperatures in deg F.
  - f. Entering-air, wet- and dry-bulb temperatures in deg F.
  - g. Leaving-air, wet- and dry-bulb temperatures in deg F.
  - h. Water flow rate in gpm.
  - i. Water pressure differential in feet of head or psig.
  - j. Entering-water temperature in deg F.
  - k. Leaving-water temperature in deg F.
  - I. Refrigerant expansion valve and refrigerant types.
  - m. Refrigerant suction pressure in psig.
  - n. Refrigerant suction temperature in deg F.
  - o. Inlet steam pressure in psig.
- G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:
  - 1. Unit Data:

- a. System identification.
- b. Location.
- c. Make and type.
- d. Model number and unit size.
- e. Manufacturer's serial number.
- f. Fuel type in input data.
- g. Output capacity in Btu/h.
- h. Ignition type.
- i. Burner-control types.
- j. Motor horsepower and rpm.
- k. Motor volts, phase, and hertz.
- I. Motor full-load amperage and service factor.
- m. Sheave make, size in inches, and bore.
- n. Center-to-center dimensions of sheave, and amount of adjustments in inches.
- 2. Test Data (Indicated and Actual Values):
  - a. Total air flow rate in cfm.
  - b. Entering-air temperature in deg F.
  - c. Leaving-air temperature in deg F.
  - d. Air temperature differential in deg F.
  - e. Entering-air static pressure in inches wg.
  - f. Leaving-air static pressure in inches wg.
  - g. Air static-pressure differential in inches wg.
  - h. Low-fire fuel input in Btu/h.
  - i. High-fire fuel input in Btu/h.
  - j. Manifold pressure in psig.
  - k. High-temperature-limit setting in deg F.
  - I. Operating set point in Btu/h.
  - m. Motor voltage at each connection.

- n. Motor amperage for each phase.
- o. Heating value of fuel in Btu/h.
- H. Fan Test Reports: For supply, return, and exhaust fans, include the following:
  - 1. Fan Data:
    - a. System identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and size.
    - e. Manufacturer's serial number.
    - f. Arrangement and class.
    - g. Sheave make, size in inches, and bore.
    - h. Center-to-center dimensions of sheave, and amount of adjustments in inches.
  - 2. Motor Data:
    - a. Motor make, and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
    - e. Sheave make, size in inches, and bore.
    - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    - g. Number, make, and size of belts.
  - 3. Test Data (Indicated and Actual Values):
    - a. Total airflow rate in cfm.
    - b. Total system static pressure in inches wg.
    - c. Fan rpm.
    - d. Discharge static pressure in inches wg.
    - e. Suction static pressure in inches wg. Ottawa County Jail Roof/RTU Replacement November 10, 2021 0231123 - 14
- I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
  - 1. Report Data:
    - a. System and air-handling-unit number.
    - b. Location and zone.
    - c. Traverse air temperature in deg F.
    - d. Duct static pressure in inches wg.
    - e. Duct size in inches.
    - f. Duct area in sq. ft.
    - g. Indicated air flow rate in cfm.
    - h. Indicated velocity in fpm.
    - i. Actual air flow rate in cfm.
    - j. Actual average velocity in fpm.
    - k. Barometric pressure in psig.
- J. Instrument Calibration Reports:
  - 1. Report Data:
    - a. Instrument type and make.
    - b. Serial number.
    - c. Application.
    - d. Dates of use.
    - e. Dates of calibration.

#### 3.09 INSPECTIONS

- A. Initial Inspection:
  - 1. After testing and balancing are complete, operate each system and randomly check

measurements to verify that the system is operating according to the final test and

balance readings documented in the final report. Ottawa County Jail Roof/RTU Replacement November 10, 2021 0231123 - 15

- 2. Check the following for each system:
  - a. Measure airflow of at least 10 percent of air outlets.
  - b. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
  - c. Verify that balancing devices are marked with final balance position.
  - d. Note deviations from the Contract Documents in the final report.
- B. Final Inspection:
  - After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
  - The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Architect.
  - Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
  - 4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
  - If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:
  - Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.

- If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.
- D. Prepare test and inspection reports.

## 3.010 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

#### END OF SECTION 23 05 93

# SECTION 0231123 FACILITY NATURAL-GAS PIPING

#### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. Section Includes:
  - 1. Pipes, tubes, and fittings.
  - 2. Piping specialties.
  - 3. Piping and tubing joining materials.
  - 4. Valves.
  - 5. Pressure regulators.
  - 6. Concrete bases.

#### 1.03 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

## 1.04 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

- 1. Piping and Valves: 100 psig minimum unless otherwise indicated.
- 2. Service Regulators: 65 psig minimum unless otherwise indicated.
- B. Natural-Gas System Pressure within Buildings: Not more than 2 psig.

#### 1.05 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
  - 1. Piping specialties.
  - 2. Corrugated, stainless-steel tubing with associated components.
  - Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
  - 4. Pressure regulators. Indicate pressure ratings and capacities.
  - 5. Dielectric fittings.
- B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
  - 1. Shop Drawing Scale: 1/4 inch per foot.
  - 2. Detail mounting, supports, and valve arrangements for pressure regulator assembly.

#### 1.06 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans and details, drawn to scale, on which natural-gas piping is shown and coordinated with other installations, using input from installers of the items involved.
- B. Site Survey: Plans, drawn to scale, on which natural-gas piping is shown and coordinated with other services and utilities.
- C. Qualification Data: For qualified professional engineer.
- D. Welding certificates.
- E. Field quality-control reports.

#### 1.07 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pressure regulators to include in emergency, operation, and maintenance manuals.

#### 1.08 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 1.09 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.
- B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.
- D. Protect stored PE pipes and valves from direct sunlight.

## 1.010 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements

indicated:

- Notify Owner no fewer than two days in advance of proposed interruption of natural-gas service.
- 2. Do not proceed with interruption of natural-gas service without Owner's written permission.

## 1.011 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.
- B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces.

## PART 2 - PRODUCTS

#### 2.01 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
  - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
  - 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
  - Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
  - 4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
    - a. Material Group: 1.1.
    - b. End Connections: Threaded or butt welding to match pipe.
    - c. Lapped Face: Not permitted underground.
    - d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    - e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

- 5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
  - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
- 6. Mechanical Couplings:
  - a. **Steel** flanges and tube with epoxy finish.
  - b. Buna-nitrile seals.
  - c. Steel bolts, washers, and nuts.
  - Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
  - e. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.
- 7. Anodeless Service-Line Risers: Factory fabricated and leak tested.
  - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
  - Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel,
     Type E or S, Grade B, with corrosion-protective coating covering. Vent casing aboveground.
  - c. Aboveground Portion: PE transition fitting.
  - d. Outlet shall be threaded or flanged or suitable for welded connection.
  - e. Tracer wire connection.
  - f. Ultraviolet shield.
  - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.
- 8. Transition Service-Line Risers: Factory fabricated and leak tested.
  - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet
     connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or

- S, Grade B, with corrosion-protective coating for aboveground outlet.
- b. Outlet shall be threaded or flanged or suitable for welded connection.
- c. Bridging sleeve over mechanical coupling.
- d. Factory-connected anode.
- e. Tracer wire connection.

f. Ultraviolet shield.

- g. Stake supports with factory finish to match steel pipe casing or carrier pipe.
- Plastic Mechanical Couplings, NPS 1-1/2 and Smaller: Capable of joining PE pipe to PE pipe.
  - Manufacturers: Subject to compliance with requirements, [provide products by one of the following:
    - 1) Lyall, R. W. & Company, Inc.
    - 2) Mueller Co.; Gas Products Div.
    - 3) Perfection Corporation; a subsidiary of American Meter Company.
  - b. PE body with molded-in, stainless-steel support ring.
  - c. Buna-nitrile seals.
  - d. Acetal collets.
  - e. Electro-zinc-plated steel stiffener.
- 10. Plastic Mechanical Couplings, NPS 2 and Larger: Capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Lyall, R. W. & Company, Inc.

- 2) Mueller Co.; Gas Products Div.
- 3) Perfection Corporation; a subsidiary of American Meter Company.
- b. Fiber-reinforced plastic body.
- c. PE body tube.
- d. Buna-nitrile seals.
- e. Acetal collets.

f. Stainless-steel bolts, nuts, and washers.

11. Steel Mechanical Couplings: Capable of joining plain-end PE pipe to PE pipe, steel pipe to

PE pipe, or steel pipe to steel pipe.

- Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) Dresser Piping Specialties; Division of Dresser, Inc.
  - 2) Smith-Blair, Inc.
- b. Steel flanges and tube with epoxy finish.
- c. Buna-nitrile seals.
- d. Steel bolts, washers, and nuts.
- e. Factory-installed anode for steel-body couplings installed underground.

## 2.02 PIPING SPECIALTIES

- A. Appliance Flexible Connectors:
  - 1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
  - 2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
  - 3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
  - 4. Corrugated stainless-steel tubing with polymer coating.

- 5. Operating-Pressure Rating: 0.5 psig.
- 6. End Fittings: Zinc-coated steel.
- 7. Threaded Ends: Comply with ASME B1.20.1.
- 8. Maximum Length: 72 inches.
- B. Quick-Disconnect Devices: Comply with ANSI Z21.41.
  - 1. Copper-alloy convenience outlet and matching plug connector.
  - 2. Nitrile seals.
  - 3. Hand operated with automatic shutoff when disconnected.
  - 4. For indoor or outdoor applications.
  - 5. Adjustable, retractable restraining cable.
- C. Y-Pattern Strainers:
  - 1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
  - End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
  - Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
  - 4. CWP Rating: 125 psig.
- D. Basket Strainers:
  - Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
  - End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
  - Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50
    percent free area.
  - 4. CWP Rating: 125 psig.
- E. T-Pattern Strainers:

- Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
- 2. End Connections: Grooved ends.
- Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
- 4. CWP Rating: 750 psig.
- F. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threadedend connection.

## 2.03 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

# 2.04 MANUAL GAS SHUTOFF VALVES

- A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff
   Valve Schedule" Articles for where each valve type is applied in various services.
- B. General Requirements for Metallic Valves, NPS and Smaller: Comply with ASME B16.33.
  - 1. CWP Rating: 125 psig.
  - 2. Threaded Ends: Comply with ASME B1.20.1.
  - 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
  - Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  - 5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for

valves 1 inch and smaller.

- Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.
- C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.
  - 1. CWP Rating: 125 psig.
  - 2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
  - Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  - 4. Service Mark: Initials "WOG" shall be permanently marked on valve body.
- D. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.
  - 1. Body: Bronze, complying with ASTM B 584.
  - 2. Ball: Chrome-plated brass.
  - 3. Stem: Bronze; blowout proof.
  - 4. Seats: Reinforced TFE; blowout proof.
  - 5. Packing: Separate packnut with adjustable-stem packing threaded ends.
  - Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  - 7. CWP Rating: 600 psig.
  - Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
  - 9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- E. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
  - 1. Body: Bronze, complying with ASTM B 584.
  - 2. Ball: Chrome-plated bronze.
  - 3. Stem: Bronze; blowout proof.

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- 4. Seats: Reinforced TFE; blowout proof.
- 5. Packing: Threaded-body packnut design with adjustable-stem packing.
- Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
- 7. CWP Rating: 600 psig.
- Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
- 9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- F. Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.
  - 1. Body: Bronze, complying with ASTM B 584.
  - 2. Ball: Chrome-plated bronze.
  - 3. Stem: Bronze; blowout proof.
  - 4. Seats: Reinforced TFE.
  - 5. Packing: Threaded-body packnut design with adjustable-stem packing.
  - Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  - 7. CWP Rating: 600 psig.
  - Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
  - 9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

## 2.05 PRESSURE REGULATORS

- A. General Requirements:
  - 1. Single stage and suitable for natural gas.
  - 2. Steel jacket and corrosion-resistant components.
  - 3. Elevation compensator.
  - 4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-

1/2 and larger.

- B. Service Pressure Regulators: Comply with ANSI Z21.80.
  - 1. Body and Diaphragm Case: Cast iron or die-cast aluminum.
  - 2. Springs: Zinc-plated steel; interchangeable.
  - 3. Diaphragm Plate: Zinc-plated steel.
  - 4. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
  - 5. Orifice: Aluminum; interchangeable.
  - 6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
  - 7. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
  - Pressure regulator shall maintain discharge pressure setting downstream, and not exceed
     150 percent of design discharge pressure at shutoff.
  - 9. Overpressure Protection Device: Factory mounted on pressure regulator.
  - 10. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
  - 11.Maximum Inlet Pressure: 100 psig.
- C. Line Pressure Regulators: Comply with ANSI Z21.80.
  - 1. Body and Diaphragm Case: Cast iron or die-cast aluminum.
  - 2. Springs: Zinc-plated steel; interchangeable.
  - 3. Diaphragm Plate: Zinc-plated steel.
  - 4. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
  - 5. Orifice: Aluminum; interchangeable.
  - 6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
  - 7. Single-port, self-contained regulator with orifice no larger than required at maximum

pressure inlet, and no pressure sensing piping external to the regulator.

- Pressure regulator shall maintain discharge pressure setting downstream, and not exceed
   150 percent of design discharge pressure at shutoff.
- 9. Overpressure Protection Device: Factory mounted on pressure regulator.
- 10.Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
- D. Appliance Pressure Regulators: Comply with ANSI Z21.18.
  - 1. Body and Diaphragm Case: Die-cast aluminum.
  - 2. Springs: Zinc-plated steel; interchangeable.
  - 3. Diaphragm Plate: Zinc-plated steel.
  - 4. Seat Disc: Nitrile rubber.
  - 5. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
  - 6. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
  - Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.

#### 2.06 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
  - 1. Description:
    - a. Standard: ASSE 1079.
    - b. Pressure Rating: 125 psig.
    - c. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
  - 1. Description:

- a. Standard: ASSE 1079.
- b. Factory-fabricated, bolted, companion-flange assembly.
- c. Pressure Rating: 125 psig.
- d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solderjoint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
  - 1. Description:
    - a. Nonconducting materials for field assembly of companion flanges.
    - b. Pressure Rating: 150 psig
    - c. Gasket: Neoprene or phenolic.
    - d. Bolt Sleeves: Phenolic or polyethylene.
    - e. Washers: Phenolic with steel backing washers.

#### 2.07 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

## **PART 3 - EXECUTION**

#### 3.01 EXAMINATION

- Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 PREPARATION

- A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- B. Inspect natural-gas piping according **to** NFPA 54 and the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.
- C. Comply with NFPA 54 and the International Fuel Gas Code requirements for prevention of accidental ignition.

## 3.03 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of naturalgas piping.
- B. Install underground, natural-gas piping buried at least 36 inches below finished grade.
  - If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.
- C. Install underground, PE, natural-gas piping according to ASTM D 2774.
- D. Steel Piping with Protective Coating:
  - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
  - Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
  - 3. Replace pipe having damaged PE coating with new pipe.
- E. Install fittings for changes in direction and branch connections.
- F. Install pressure gage **downstream** from each service regulator.

# 3.04 INDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of naturalgas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping

systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Verify final equipment locations for roughing-in.
- L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
  - Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.
  - Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
  - 2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
  - 3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
  - In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
    - Exception: Tubing passing through partitions or walls does not require striker barriers.
  - 5. Prohibited Locations:
    - Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    - b. Do not install natural-gas piping in solid walls or partitions.

- Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- R. Connect branch piping from top or side of horizontal piping.
- S. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- T. Do not use natural-gas piping as grounding electrode.
- U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- V. Install pressure gage downstream from each line regulator.
- W. Install sleeves for piping penetrations of walls, ceilings, and floors.
- X. Install sleeve seals for piping penetrations of concrete walls and slabs.
- Y. Install escutcheons for piping penetrations of walls, ceilings, and floors.

#### 3.05 SERVICE-METER ASSEMBLY INSTALLATION

- A. Install service-meter assemblies aboveground on concrete bases.
- B. Install metal shutoff valves upstream from service regulators. Shutoff valves are not required at second regulators if two regulators are installed in series.
- C. Install strainer on inlet of service-pressure regulator and meter set.
- D. Install service regulators mounted outside with vent outlet horizontal or facing down. Install screen in vent outlet if not integral with service regulator.
- E. Install metal shutoff valves upstream from service meters. Install dielectric fittings downstream from service meters.
- F. Install service meters downstream from pressure regulators.
- G. Install metal bollards to protect meter assemblies. Comply with requirements in Section 055000
   "Metal Fabrications" for pipe bollards.

#### 3.06 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install earthquake valves aboveground outside buildings according to listing.
- E. Install anode for metallic valves in underground PE piping.

## 3.07 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
  - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
  - 2. Cut threads full and clean using sharp dies.
  - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
  - Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
  - Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints:
  - Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
  - 2. Bevel plain ends of steel pipe.
  - Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

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- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
- F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.
- G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.
- PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
  - 1. Plain-End Pipe and Fittings: Use butt fusion.
  - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.

# 3.08 HANGER AND SUPPORT INSTALLATION

- A. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
  - 1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
  - 2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
  - 3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
  - 4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
  - 5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

## 3.09 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.

- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

## 3.010 LABELING AND IDENTIFYING

A. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except
 6 inches below subgrade under pavements and slabs.

## 3.011 PAINTING

- Comply with requirements in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for painting interior and exterior natural-gas piping.
- B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.
  - 1. Alkyd System: MPI EXT 5.1D.
    - a. Prime Coat: Alkyd anticorrosive metal primer.
    - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    - c. Topcoat: Exterior alkyd enamel flat.
    - d. Color: Gray.
- C. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.
  - 1. Latex Over Alkyd Primer System: MPI INT 5.1Q.
    - a. Prime Coat: Alkyd anticorrosive or Quick-drying alkyd metal primer.

- b. Intermediate Coat: Interior latex matching topcoat.
- c. Topcoat: Interior latex flat.
- d. Color: black.
- 2. Alkyd System: MPI INT 5.1E.
  - a. Prime Coat: Alkyd anticorrosive or Quick-drying alkyd metal primer.
  - b. Intermediate Coat: Interior alkyd matching topcoat.
  - c. Topcoat: Interior alkyd flat.
  - d. Color: black.
- D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

# 3.012 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
  - Test, inspect, and purge natural gas according to NFPA 54 and the International Fuel Gas Code and authorities having jurisdiction.
- C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

## 3.013 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain earthquake valves.

## 3.014 OUTDOOR PIPING SCHEDULE

- A. Underground natural-gas piping shall be the following:
  - 1. PE pipe and fittings joined by heat fusion, or mechanical couplings; service-line risers with

tracer wire terminated in an accessible location.

- B. Aboveground natural-gas piping shall be **one of** the following:
  - 1. Steel pipe with malleable-iron fittings and threaded joints.
  - 2. Steel pipe with wrought-steel fittings and welded joints.
- C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

# 3.015 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES UP TO 2 PSIG

- A. Aboveground, branch piping shall be **one of** the following:
  - Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
  - 2. Annealed-temper, tin-lined copper tube with flared joints and fittings.
  - 3. Annealed-temper, copper tube with wrought-copper fittings and brazed joints.
  - 4. Aluminum tube with flared fittings and joints.
  - 5. Steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be **one of** the following:
  - 1. Steel pipe with malleable-iron fittings and threaded joints.
  - 2. Steel pipe with wrought-steel fittings and welded joints.
- C. Underground, below building, piping shall not be allowed.

## 3.016 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping utility's gas mains and listed by an NRTL.
- B. Underground:
  - 1. PE valves.

- 2. NPS 2 (DN 50) and Smaller: Bronze plug valves.
- 3. NPS 2-1/2 (DN 65) and Larger: Cast-iron, lubricated plug valves.

## 3.017 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for pipe sizes NPS 2 and smaller at service meter shall be the following:
  - 1. One-piece, bronze ball valve with bronze trim.
- B. Valves for pipe sizes NPS 2-1/2 and larger at service meter shall be one of the following:
  - 1. Two-piece, full-port, bronze ball valves with bronze trim.
  - 2. Bronze plug valve.
  - 3. Cast-iron, nonlubricated plug valve.
- C. Distribution piping valves for pipe sizes NPS 2 and smaller shall be the following:
  - 1. One-piece, bronze ball valve with bronze trim.
- D. Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be **one of** the following:
  - 1. Two-piece, full-port, bronze ball valves with bronze trim.
  - 2. Bronze plug valve.
- E. Valves in branch piping for single appliance shall be the following:
  - 1. One-piece, bronze ball valve with bronze trim.

## END OF SECTION 23 11 23

# SECTION 0233113 METAL DUCTS

#### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. Section Includes:
  - 1. Single-wall rectangular ducts and fittings.
  - 2. Single-wall round ducts and fittings.
  - 3. Sheet metal materials.
  - 4. Duct liner.
  - 5. Hangers and supports.

#### 1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

## 1.04 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

- 1. Liners and adhesives.
- 2. Sealants and gaskets.
- B. Shop Drawings:
  - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
  - 2. Factory- and shop-fabricated ducts and fittings.
  - 3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
  - 4. Elevation of top of ducts.
  - 5. Dimensions of main duct runs from building grid lines.
  - 6. Fittings.
  - 7. Reinforcement and spacing.
  - 8. Seam and joint construction.
  - 9. Penetrations through fire-rated and other partitions.
  - 10. Equipment installation based on equipment being used on Project.
  - 11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
  - 12. Hangers and supports, including methods for duct and building attachment and vibration isolation.
- C. Delegated-Design Submittal:
  - 1. Sheet metal thicknesses.
  - 2. Joint and seam construction and sealing.
  - 3. Reinforcement details and spacing.
  - 4. Materials, fabrication, assembly, and spacing of hangers and supports.

#### 1.05 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Duct installation in congested spaces, indicating coordination with general construction,

building components, and other building services. Indicate proposed changes to duct layout.

- 2. Suspended ceiling components.
- 3. Structural members to which duct will be attached.
- 4. Size and location of initial access modules for acoustical tile.
- 5. Penetrations of smoke barriers and fire-rated construction.
- 6. Items penetrating finished ceiling including the following:
  - a. Lighting fixtures.
  - b. Air outlets and inlets.
  - c. Speakers.
  - d. Sprinklers.
  - e. Access panels.
  - f. Perimeter moldings.
- B. Field quality-control reports.

#### PART 2 - PRODUCTS

#### 2.01 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct

Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

#### 2.02 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction

Standards - Metal and Flexible."

# 2.03 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards -Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: **G60**.
  - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.

## 2.04 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
  - Maximum Thermal Conductivity: Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
- B. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.
- C. Insulation Pins and Washers:
  - Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
  - Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- D. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards -Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

- Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
- Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
- 3. Butt transverse joints without gaps, and coat joint with adhesive.
- Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
- 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
- 6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
- Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
- Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
  - a. Fan discharges.
  - b. Intervals of lined duct preceding unlined duct.
  - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
- Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
  - a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

#### 2.05 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- F. Trapeze and Riser Supports:
  - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

## **PART 3 - EXECUTION**

#### 3.01 DUCT INSTALLATION

- A. 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 on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers.

### 3.02 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

# 3.03 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
  - 1. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
  - 2. Outdoor, Supply-Air Ducts: Seal Class A.
  - 3. Outdoor, Exhaust Ducts: Seal Class C.
  - 4. Outdoor, Return-Air Ducts: Seal Class C.
  - Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
  - Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
  - 7. Unconditioned Space, Exhaust Ducts: Seal Class C.
  - 8. Unconditioned Space, Return-Air Ducts: Seal Class B.
  - Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
  - Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
  - 11. Conditioned Space, Exhaust Ducts: Seal Class B.
  - 12. Conditioned Space, Return-Air Ducts: Seal Class C.

# 3.04 HANGER AND SUPPORT INSTALLATION

Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5,
 "Hangers and Supports."

- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
  - 1. Where practical, install concrete inserts before placing concrete.
  - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
  - Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
  - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

#### 3.05 CONNECTIONS

- A. Make connections to equipment with flexible connectors.
- B. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

#### 3.06 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

# 3.07 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Duct System Cleanliness Tests:
  - 1. Visually inspect duct system to ensure that no visible contaminants are present.
  - Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
    - Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
- C. Duct system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

# 3.08 DUCT CLEANING

- A. Clean new and existing duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
  - Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer.
  - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
  - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
  - 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
  - 2. When venting vacuuming system to outdoors, use filter to collect debris removed from

HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

- D. Clean the following components by removing surface contaminants and deposits:
  - 1. Air outlets and inlets (registers, grilles, and diffusers).
  - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
  - Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
  - 4. Coils and related components.
  - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
  - 6. Supply-air ducts, dampers, actuators, and turning vanes.
  - 7. Dedicated exhaust and ventilation components and makeup air systems.
- E. Mechanical Cleaning Methodology:
  - Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
  - Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
  - 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
  - 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
  - Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational.
    Rinse coils with clean water to remove latent residues and cleaning materials; comb and

straighten fins.

- 6. Provide drainage and cleanup for wash-down procedures.
- Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

### 3.09 START UP

 A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

### 3.010 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel
- B. Supply Ducts:
  - Ducts Connected to Fan Coil Units, Furnaces, Constant-Volume Air-Handling Units, Heat Pumps, and Terminal Units:
    - a. Pressure Class: Positive 2-inch wg.
    - b. Minimum SMACNA Seal Class: A.
    - c. SMACNA Leakage Class for Rectangular: 12.
    - d. SMACNA Leakage Class for Round: 12.
  - 2. Ducts Connected to Variable-Air-Volume Air-Handling Units:
    - a. Pressure Class: Positive 4-inch wg.
    - b. Minimum SMACNA Seal Class: A.
    - c. SMACNA Leakage Class for Rectangular: 3.
    - d. SMACNA Leakage Class for Round and Flat Oval: 3.
- C. Return Ducts:
  - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, Air-Handling Units and Terminal Units:

- a. Pressure Class: Positive or negative 1-inch wg.
- b. Minimum SMACNA Seal Class: B.
- c. SMACNA Leakage Class for Rectangular: 24.
- d. SMACNA Leakage Class for Round: 24.
- D. Exhaust Ducts:
  - 1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
    - a. Pressure Class: Negative 1-inch wg.
    - b. Minimum SMACNA Seal Class: A.
    - c. SMACNA Leakage Class for Rectangular: 12.
    - d. SMACNA Leakage Class for Round and Flat Oval: 12.
- E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:
  - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, Air-Handling Units, and Terminal Units:
    - a. Pressure Class: Positive or negative 1-inch wg.
    - b. Minimum SMACNA Seal Class: A.
    - c. SMACNA Leakage Class for Rectangular: 12.
    - d. SMACNA Leakage Class for Round and Flat Oval: 12.
- F. Liner:
  - 1. Supply Air Ducts: Fibrous glass, Type I 1 inch thick.
- G. Elbow Configuration:
  - Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 4-2, "Rectangular Elbows."
    - a. Velocity 1000 fpm or Lower:
      - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.

- 2) Mitered Type RE 4 without vanes.
- b. Velocity 1000 to 1500 fpm:
  - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
  - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
  - Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
- c. Velocity 1500 fpm:
  - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
  - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
  - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
- Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 3-4, "Round Duct Elbows."
  - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
    - Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
    - Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
    - Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.

- H. Branch Configuration:
  - Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 4-6, "Branch Connection."
    - a. Rectangular Main to Rectangular Branch: 45-degree entry.
    - b. Rectangular Main to Round Branch: Spin in.
  - Round: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
    - a. Velocity 1000 fpm or Lower: 90-degree tap.
    - b. Velocity 1000 to 1500 fpm: Conical tap.
    - c. Velocity 1500 fpm or Higher: 45-degree lateral.

# END OF SECTION 23 31 13

#### **SECTION 237413**

#### PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

#### PART 1 - GENERAL

### 1.01 RELATED DOCUMENTS

 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:
  - 1. Direct-expansion cooling.
  - 2. Hot-gas reheat.
  - 3. Gas furnace.
  - 4. Economizer outdoor- and return-air damper section.
  - 5. Integral, space temperature controls.
  - 6. Roof curbs.

#### 1.03 DEFINITIONS

- A. DDC: Direct-digital controls.
- B. ECM: Electrically commutated motor.
- C. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.
- D. Outdoor-Air Refrigerant-Coil Fan: The outdoor-air refrigerant-coil fan in RTUs. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

- E. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, centralstation air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.
- F. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.
- G. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.
- H. VVT: Variable-air volume and temperature.

### 1.04 ACTION SUBMITTALS

A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

# 1.05 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Structural members to which RTUs will be attached.
  - 2. Roof openings
  - 3. Roof curbs and flashing.
- B. Field quality-control test reports.
- C. Warranty: Special warranty specified in this Section.

# 1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

### 1.07 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fan Belts: **One set** for each belt-driven fan.
  - 2. Filters: Two **sets** of filters for each unit.

### 1.08 QUALITY ASSURANCE

- A. ARI Compliance:
  - Comply with ARI 203/110 and ARI 303/110 for testing and rating energy efficiencies for RTUs.
  - 2. Comply with ARI 270 for testing and rating sound performance for RTUs.

### B. ASHRAE Compliance:

- 1. Comply with ASHRAE 15 for refrigeration system safety.
- 2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
- Comply with applicable requirements in ASHRAE 62.1, Section 5 "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 -"Heating, Ventilating, and Air-Conditioning."
- D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.
- E. UL Compliance: Comply with UL 1995.
- F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

### 1.09 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace

components of RTUs that fail in materials or workmanship within specified warranty period.

- Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
- Warranty Period for Gas Furnace Heat Exchangers: Manufacturer's standard, but not less than 10 years from date of Substantial Completion.
- Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three years from date of Substantial Completion.
- Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Substantial Completion.

# PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
  - 1. AAON, Inc.
  - 2. Carrier Corporation.
  - 3. Lennox Industries Inc.
  - 4. Daikin
  - 5. Trane; American Standard Companies, Inc.
  - 6. YORK International Corporation.

# 2.02 ROOF CURBS

A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factoryinstalled wood nailer; complying with NRCA standards.

- 1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
  - a. Materials: ASTM C 1071, Type I or II.
  - b. Thickness: 2 inch minimum.
- Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.
  - a. Liner Adhesive: Comply with ASTM C 916, Type I.
  - Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
  - c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
  - d. Liner Adhesive: Comply with ASTM C 916, Type I.
- B. Curb Height: 20 inches minimum.

# **PART 3 - EXECUTION**

# 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.
- Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.
- C. Examine roofs for suitable conditions where RTUs will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 INSTALLATION

- A. Equipment Mounting:
  - 1. Install RTUs on cast-in-place concrete equipment bases.
- B. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts. or ARI Guideline B. Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 075300 "THERMOSET, EPDM, MEMBRANE ROOFING." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.
- C. Unit Support: Install unit level on structural **curbs**. Coordinate wall penetrations and flashing with wall construction. Secure RTUs to structural support with anchor bolts.

#### 3.03 CONNECTIONS

- A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.
- B. Install piping adjacent to RTUs to allow service and maintenance.
  - Gas Piping: Comply with applicable requirements in Section 231123 "Facility Natural-Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.
- C. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
  - 1. Install ducts to termination at top of roof curb.
  - Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
  - 3. Connect supply ducts to RTUs with flexible duct connectors.
  - 4. Install return-air duct continuously through roof structure.

### 3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Perform tests and inspections and prepare test reports.
  - Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.
- C. Tests and Inspections:
  - After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
  - 2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
  - Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.

### 3.05 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
  - 1. Inspect for visible damage to unit casing.
  - 2. Inspect for visible damage to furnace combustion chamber.
  - 3. Inspect for visible damage to compressor, coils, and fans.

- 4. Inspect internal insulation.
- 5. Verify that labels are clearly visible.
- 6. Verify that clearances have been provided for servicing.
- 7. Verify that controls are connected and operable.
- 8. Verify that filters are installed.
- 9. Clean condenser coil and inspect for construction debris.
- 10.Clean furnace flue and inspect for construction debris.
- 11.Connect and purge gas line.
- 12. Remove packing from vibration isolators.
- 13.Inspect operation of barometric relief dampers.
- 14. Verify lubrication on fan and motor bearings.
- 15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
- 16. Adjust fan belts to proper alignment and tension.
- 17. Start unit according to manufacturer's written instructions.
  - a. Start refrigeration system.
  - b. Do not operate below recommended low-ambient temperature.
  - c. Complete startup sheets and attach copy with Contractor's startup report.
- 18. Inspect and record performance of interlocks and protective devices; verify sequences.
- 19. Operate unit for an initial period as recommended or required by manufacturer.
- 20.Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency.
  - a. Measure gas pressure on manifold.
  - b. Inspect operation of power vents.
  - c. Measure combustion-air temperature at inlet to combustion chamber.
  - d. Measure flue-gas temperature at furnace discharge.
  - e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.

- f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.
- 21.Calibrate thermostats.
- 22. Adjust and inspect high-temperature limits.
- 23. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
- 24. Start refrigeration system and measure and record the following when ambient is a minimum

of 15 deg F above return-air temperature:

- a. Coil leaving-air, dry- and wet-bulb temperatures.
- b. Coil entering-air, dry- and wet-bulb temperatures.
- c. Outdoor-air, dry-bulb temperature.
- d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

25. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.

26.Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

- a. Supply-air volume.
- b. Return-air volume.
- c. Relief-air volume.
- d. Outdoor-air intake volume.

27. Simulate maximum cooling demand and inspect the following:

- a. Compressor refrigerant suction and hot-gas pressures.
- b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

28. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the

following:

- a. High-temperature limit on gas-fired heat exchanger.
- b. Low-temperature safety operation.
- c. Filter high-pressure differential alarm.
- d. Economizer to minimum outdoor-air changeover.
- e. Relief-air fan operation.
- f. Smoke and firestat alarms.

29. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

### 3.06 CLEANING AND ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.
- B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

#### 3.07 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.

# END OF SECTION 23 74 13