

VIRGINIA ENERGY CONSERVATION CODE COMPLIANCE : IN ACCORD WITH VIRGINIA ENERGY CONSERVATION CODE (VECC), THE BUILDING COMPONENTS IN PROJECT SCOPE OF WORK COMPLY WITH VECC 2015 PRESCRIPTIVE SECTIONS C402, C403, C404 & C405. THE PERFORMANCE OF REPLACEMENT HIGH-EFFICIENCY MULTI-ZONE VAV SYSTEM EXCEEDS THE MINIMUM EFFICIENCY REQUIREMENTS LISTED IN TABLE C403.2.3(2).





VICINITY MAP





WINCHESTER PUBLIC SCHOOLS

RTU REPLACEMENT

48 S. PURCELL AVENUE WINCHESTER, VA 22601

WORKING DRAWINGS FEBRUARY 09, 2024

DRAWING LIST:

DRAWING NO:	TITLE:		
GENERAL		ELECTRICAL	
G-000	COVER SHEET	E-001 E-002 E-101 E-102 E-202	LEGEND, ABBREVIATION AND GENERAL NOTES SPECIFICATIONS PARTIAL PLANS - AREA 5 & 6 - ELECTRICAL PARTIAL ROOF DEMOLITON PLANS - AREAS 5 & 6 - ELECTRICAL PARTIAL ROOF NEW WORK PLANS - AREAS 5 & 6 - ELECTRICAL
MECHANICAL		ARCHITECTU	JRAL
M-001 M-002 M-003 M-102 M-202 M-501 M-701	LEGENDS, ABBREVIATIONS AND GENERAL NOTES SPECIFICATIONS SPECIFICATIONS PARTIAL ROOF DEMOLITION PLANS - AREAS 5 & 6 - HVAC PARTIAL ROOF NEW WORK PLANS - AREAS 5 & 6 - HVAC DETAILS SCHEDULES	A-100 A-101 A-102 STRUCTURAI	ROOF KEY PLAN, SPECIFICATION & DRAWING INDEX ENLARGED ROOF PLANS - DEMO & NEW WORK DETAILS
		S-001 S-103 S-401	DESIGN NOTES ROOF FRAMING PLAN TYPICAL FRAMING SECTIONS AND DETAILS



PROJECT INFORMATION:

PROJECT SCOPE:

PARTIAL REPLACEMENT AND MODERNIZATION OF THE BUILDING HVAC SYSTEMS TO INCLUDE REMOVAL OF EXISTING ROOFTOP UNITS RTU-1, RTU-1 CONDENSING UNIT, RTU-2 AND RTU-3. MODERNIZATION INCLUDES NEW ROOFTOP UNITS (RTU-2, RTU-3), NEW SPLIT SYSTEM ROOFTOP AIR HANDLING UNIT (RTU-1) AND ASSOCIATED NEW AIR-COOLED CONDENSING UNIT (CU-1) WITH ACCESSORIES AND NEW DIGITAL CONTROLS, EXTERIOR DUCTWORK, NATURAL GAS PIPING MODIFICATIONS, AND ANY ADDITIONAL ACCESSORIES REQUIRED. ARCHITECTURAL AND STRUCTURAL BUILDING ELEMENTS SHALL BE REPAIRED, AND/OR MODIFIED AS REQUIRED FOR THE HVAC MODERNIZATION. THE WORK TO BE PERFORMED SHALL CONSIST PROVIDING ALL LABOR, EQUIPMENT, AND MATERIALS NECESSARY TO SERVICE TO REPLACE ROOF TOP MECHANICAL UNITS AT DANIEL MORGAN MIDDLE SCHOOL. ARCHITECTURAL CEILING REMOVAL/REINSTALLATION FOR REQUIRED STRUCTURAL

REINFORCEMENT AND REPAIRS/MODIFICATIONS TO EXISTING ROOF/BUILDING SHALL BE COMPLETED BY OWNER-CONTRACTED VENDOR. THE SELECTED CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MECHANICAL, ELECTRICAL, AND STRUCTURAL WORK ASSOCIATED WITH THE REPLACEMENT OF THE ROOF TOP UNITS, AND COORDINATING WITH OTHER OWNER-CONTRACTED VENDORS FOR ASSOCIATED WORK, INCLUDING DRYWALL, PAINTING, CEILING REPLACEMENT, AND ROOF PATCHING.

GOVERNING CODES:

VIRGINIA UNIFORM STATEWIDE BUILDING CODE 2018 VIRGINIA EXISTING BUILDING CODE, 2018 VIRGINIA PLUMBING CODE, 2018 VIRGINIA MECHANICAL CODE, 2018

VIRGINIA ENERGY CONSERVATION CODE, 2018 NATIONAL ELECTRIC CODE/NFPA 70: NEC 2017

BUILDING DATA: CONSTRUCTION TYPE: USE GROUP:

FIRE PROTECTION:

III - B E - EDUCATION EXISTING AUTOMATIC SPRINKLER TO REMAIN

NUMBER OF STORIES:

BUILDING AREA:

275,000 SF PERCENTAGE SPRINKLED: FULLY SPRINKLED

BUILDING





PROJECT LOCATION MAP



Daniel Morgan Middle School

48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMENT



ENERGY BY DESIGN 2677 PROSPERITY AVE. SUITE 275 FAIRFAX, VA 22031 T) 703.718.4355 2RW.com

KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703.771.3362

LINTON ENGINEERING 46090 LAKE CENTER PLAZA, SUITE 309 POTOMAC FALLS, VA 20165 571.323.0320





	MECH	ANICAL LEGEND		
		TEMPERATURE & HUMIDITY SENSOR WITH SET		DUCTWORK
	SP	POINT CONTROL, 48" AFF. COORDINATE EXACT LOCATION WITH A/E PRIOR TO ROUGH-IN.	×/x	RECTANGULAR DUCT, FIRST DIMENSION IS SIDE SHOWN. DIMENSION IN INCHES
	Ţ	TEMPERATURE SENSOR WITH SET POINT		ROUND DUCT, DIMENSION IN INCHES
	SP	CONTROL, 48" AFF. COORDINATE EXACT LOCATION WITH A/E PRIOR TO ROUGH-IN.		FLAT OVAL DUCT, DIMENSION IN INCHES
	TH	TEMPERATURE & HUMIDITY SENSOR WITHOUT SET POINT CONTROL, 48" AFF. COORDINATE EXACT LOCATION WITH A/E PRIOR TO ROUGH- IN.		FLEXIBLE CONNECTION
X		SECTION / CALLOUT DESIGNATION X SECTION / DETAIL NUMBER		DOUBLE WALL DUCT. REFER TO GENERAL NOTES FOR DUCT REQUIREMENTS FOR EQUIPMENT ACOUSTICAL LINING, UNO. REFER TO GENERAL
\bigcirc	\mathbf{X}	VIEWPORT DESIGNATION	ÈÌ	NOTES FOR DUCT REQUIREMENTS FOR EQUIPMENT
		X SECTION / DETAIL NUMBERD SHEET NUMBER- REFERENCE SHEET NUMBER		
	T	LINE-VOLTAGE THERMOSTAT	<u>}' ' ' ' </u>	
	\bigcirc	CARBON DIOXIDE SENSOR		4-TO-1. FOT = FLAT ON TOP, FOB = FLAT ON BOTTOM
		EXISTING TO BE REMOVED		CHANGE OF ELEVATION IN DIRECTION OF
_		EXISTING TO REMAIN		AIR FLOW (R = RISE, D = DROP)
_	→	DIRECTION OF FLOW INSIDE PIPE		TURNING VANES
		PIPING		STANDARD BRANCH, SUPPLY OR
	CD	CONDENSATE DRAIN		RETURN, NO SPLITTER
_		REFRIGERANT LINES (# OF LINE SETS)		MANUAL VOLUME DAMPER
		FITTINGS		MOTORIZED DAMPER
		CAP	. 🔻 .	
_		CONNECTION, BOTTOM		FIRE DAMPER WITH SLEEVE PROVIDE ACCESS DOOR.
_		CONNECTION, TOP		
	o	ELBOW, 90° TURNED UP	SD	SINORE DETECTOR
			AD	DUCT ACCESS DOOR
		ISOLATION VALVE PIPE ANCHOR	\boxtimes	RECTANGULAR DUCT SECTION (SUPPLY)
		VALVES		RECTANCI II AR DUCT SECTION (RETURN)
_	—	BALL VALVE		RECTANGULAR DUCT SECTION (RETORN)
_		BUTTERFLY VALVE	\square	RECTANGULAR DUCT SECTION (EXHAUST)
_		BALANCING VALVE AUTOMATIC BALANCING FLOW CONTROL CHECK VALVE		RECTANGULAR ELBOW TURNING UP (SUPPLY)
_		CHECK VALVE		RECTANGULAR ELBOW TURNING UP
_		PRESSURE REDUCING		RECTANGULAR ELBOW TURNING UP
_		AUTOMATIC 2-WAY CONTROL VALVE	<u> </u>	
_		ISOLATION VALVE		(SUPPLY)
		PIPING SPECIALTIES		RECTANGULAR ELBOW TURNING DOWN (RETURN)
		FLEXIBLE CONNECTOR		RECTANGULAR ELBOW TURNING DOWN (EXHAUST)
	VFD	VARIABLE FREQUENCY DRIVE	\otimes	ROUND DUCT SECTION (SUPPLY)
	 ዊ	PRESSURE GAUGE	\oslash	ROUND DUCT SECTION (RETURN)
	I		\otimes	ROUND DUCT SECTION (EXHAUST)
				ROUND ELBOW TURNING UP (SUPPLY)
			$\square \bigcirc$	ROUND ELBOW TURNING UP (RETURN)

ABBREVIATIONS

A/E ARCHITECT/ENGINEER

ACCESS DOOR

INSTITUTE

AIR HANDLING UNIT

AIR PRESSURE DROP

ABOVE FINISHED FLOOR

ABOVE FINISHED ROOF

AIR FLOW MONITORING STATION

AIR FLOW UTILIZATION EFFICIENCY

AIR-CONDITIONING, HEATING, AND REFRIGERATION

AMERICAN NATIONAL STANDARDS INSTITUTE

AMPERE

ABOVE

Α

ABV

AD

AFF

AFMS

AFUE

AFR

AHRI

AHU

ANSI

APD

В

CUH

CV

dB

DB

DDC

DIA

DP

DX

EA

EAL

EAT

EMS

EF

DPS

ANGULAR DUCT, FIRST DIMENSION SHOWN. DIMENSION IN INCHES

OVAL DUCT, DIMENSION IN INCHES

SITION, SLOPE NOT TO EXCEED . FOT = FLAT ON TOP, FOB = FLAT

OARD BRANCH, SUPPLY OR

L VOLUME DAMPER

IGULAR DUCT SECTION (RETURN)

(EXHAUST)

IGULAR ELBOW TURNING UP

IGULAR ELBOW TURNING UP (EXHAUST)

(SUPPLY)

D DUCT SECTION (SUPPLY)

D DUCT SECTION (EXHAUST)

D ELBOW TURNING UP

(SUPPLY)

D ELBOW TURNING UP (RETURN)

ROUND ELBOW TURNING UP

(EXHAUST) ROUND ELBOW TURNING DOWN

(SUPPLY)

ROUND ELBOW TURNING DOWN (RETURN)

ROUND ELBOW TURNING DOWN

 $\Box \oslash$

(EXHAUST)

APPROX APPROXIMATELY ARCH ARCHITECT ARCH'L ARCHITECTURAL AMERICAN REFRIGERATION INSTITU ARI ASHRAE AMERICAN SOCIETY OF HEATING AN AND AIR-CONDITIONING ENGINEERS AUTOMATIC TEMPERATURE CONTRO ATC AIR TERMINAL UNIT ATU AUX AUXILIARY BOILER BAS BUILDING AUTOMATION SYSTEM BLDG BUILDING BOD BASIS OF DESIGN BTUH BRITISH THERMAL UNITS PER HOUR CD CONDENSATE DRAIN CFM CUBIC FEET PER MINUTE CKT CIRCUIT CEILING CLG CO CARBON DIOXIDE CONC CONCRETE

COND CONDENSATE CABINET UNIT HEATER CONSTANT VOLUME DECIBELS DRY BULB DIRECT DIGITAL CONTROL DIAMETER DIFFERENTIAL PRESSURE DIFFERENTIAL PRESSURE SENSOR

DIRECT EXPANSION EACH; EXHAUST AIR

EAD EXHAUST AIR DUCT EXHAUST AIR LOUVER

ENTERING AIR TEMPERATURE EXHAUST FAN

ENERGY MANAGEMENT SYSTEM EQPT EQUIPMENT

ESP EXTERNAL STATIC PRESSURE EWT ENTERING WATER TEMPERATURE

DEGREE FAHRENHEIT FD FIRE DAMPER

	LBS, #	POUN
	LBS/HR	POUN
	LWT	LEAVI
JTE	MA	MIXED
ID REFRIGERATION	MAX	MAXIN
6	MBH	THOU
OL	MCA	MINIM
	MFR	MANU
	MOP	MAXIN
	MTD	MOUN
	NOM	NOMI
	NPT	NATIC
	NTS	NOT T
	OA	OUTD
	OAD	OUTS
	OAU	OUTS
	OBD	OPPO
	OED	OPEN
	PD	PRES
	PI	PRES
	PIC	PRES
	PRV	PRES
	PSI	POUN
	RA	RETU
	RAD	RETU
	RCP	REFLE
	REFR	REFR
	RHC	REHE
	RL	REFR
	RPM	REVO
	RTU	ROOF
	SA	SUPP
	SAD	SUPP
	SD	DUCT
	SENS	SENS
	SF	SUPP
	SFD	SMOK

V-PH

VFD

WB

WC

WPD

WWM

VOLTAGE-PHASE

WATER COLUMN

WOVEN WIRE MESH

WATER PRESSURE DROP

WATT

WET BULB

VARIABLE FREQUENCY DRIVE

FLA FULL LOAD AMPS

FLOOR

FINS PER INCH

FEET PER MINUTE

FLR

FPI

FPM

FT	FEET OR FOOT	
GAL	GALLON	
GALV	GALVANIZED	
GPH	GALLONS PER HOUR	
GPM	GALLONS PER MINUTE	
HP	HORSEPOWER	
HVAC	HEATING VENTILATION & AIR CONDITIONING	
IN	INCH INCHES	
LAT		
LBS #	POUNDS	
LBC, //	POLINDS PER HOUR	
LDO/TIIX	I FAVING WATER TEMPERATURE	
ΜΔΥ	ΜΔΥΙΜΙΙΜ	
MRH		
MCA		
NIS OA		
OAD		
OAU		
ORD		
OED	OPEN END DUCT W/ 1/2" WIRE MESH	
PD	PRESSURE DROP	
PI		
PIC	PRESSURE INDEPENDENT CONTROL	
PRV	PRESSURE REDUCING VALVE	
PSI	POUNDS PER SQUARE INCH	
RA	RETURNAIR	
RAD	RETURN AIR DUCT	
RCP	REFLECTED CEILING PLAN	
REFR	REFRIGERANT	
RHC	REHEAT COIL	
RL	REFRIGERANT LINES	
RPM	REVOLUTIONS PER MINUTE	
RTU	ROOFTOP HVAC UNIT	
SA	SUPPLY AIR	
SAD	SUPPLY AIR DUCT	
SD	DUCT SMOKE DETECTOR	
SENS	SENSIBLE	
SF	SUPPLY FAN	
SFD	SMOKE-FIRE DAMPER	
SIM	SIMILAR	
SP	STATIC PRESSURE	
TOD	TOP OF DUCT	
TRNS	TRANSITION	
TTL	TOTAL	
TU	TERMINAL UNIT	
TYP	TYPICAL	
UNO	UNLESS NOTED OTHERWISE	

GENERAL NOTES (NEW WORK)

- 1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH VECC 2018 AND VMC 2018. 2. THE WORK TO BE PERFORMED SHALL CONSIST PROVIDING ALL LABOR, EQUIPMENT, AND MATERIALS NECESSARY TO SERVICE TO
- REPLACE ROOF TOP MECHANICAL UNITS AT DANIEL MORGAN MIDDLE SCHOOL. ARCHITECTURAL CEILING REMOVAL/REINSTALLATION FOR REQUIRED STRUCTURAL REINFORCEMENT AND REPAIRS/MODIFICATIONS TO EXISTING ROOF/BUILDING SHALL BE COMPLETED BY OWNER-CONTRACTED VENDOR. THE SELECTED CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MECHANICAL. ELECTRICAL, AND STRUCTURAL WORK
- ASSOCIATED WITH THE REPLACEMENT OF THE ROOF TOP UNITS, AND COORDINATING WITH OTHER OWNER-CONTRACTED VENDORS FOR ASSOCIATED WORK, INCLUDING DRYWALL, PAINTING, CEILING REPLACEMENT, AND ROOF PATCHING. 3. PROVIDE SINGLE THICKNESS, 1-1/2 INCHES SPACED TURNING
- VANES IN ALL MITERED DUCTWORK ELBOWS. 4. COORDINATE LOCATIONS OF ALL DEVICES, ACCESS PANELS,
- DIFFUSERS, GRILLES, & LOUVERS WITH ARCHITECTURAL REFLECTED CEILING PLANS, INTERIOR & EXTERIOR ELEVATIONS PRIOR TO INSTALLATION.
- 5. ALL DUCTWORK DIMENSIONS CITED ARE THE INSIDE CLEAR DIMENSIONS. CONTRACTOR SHALL MAKE ALLOWANCE FOR DUCT LINER INSTALLATIONS.
- ALL PIPING AND CONTROL WIRING SHALL BE CONCEALED IN WALLS OR ABOVE CEILINGS OF FINISHED SPACES, UNLESS NOTED OTHERWISE. WIRING OR CONDUIT SHALL NOT BE LAID ON THE CEILING SYSTEM OR ATTACHED TO THE CEILING SUSPENSION WIRE. IN FINISHED SPACES WITH EXPOSED STRUCTURE CEILINGS, CONTRACTOR SHALL CLOSELY COORDINATE ROUTING WITH OTHER TRADES.
- 7. CONTRACTOR SHALL COORDINATE LOCATION OF ALL EQUIPMENT, PIPING, AND DUCTWORK WITH OTHER TRADES. MAINTAIN REQUIRED SERVICE ACCESS.
- 8. AIRFLOW QUANTITIES INDICATED ON THE PLANS ARE FOR OCCUPIED OPERATING MODE, UNO.
- 9. HVAC CONTRACTOR(S) SHALL COORDINATE THEIR WORK WITH ALL OTHER TRADES PRIOR TO FABRICATIONS OF SYSTEMS AND COMMENCEMENT OF INSTALLATION. IT SHALL BE THE RESPONSIBILITY OF EACH CONTRACTOR TO REVIEW THE WORK OF OTHER TRADES (INCLUDING, BUT NOT LIMITED TO ARCHITECTURAL, CIVIL, ELECTRICAL, EQUIPMENT, FIRE PROTECTION, FIRE ALARM, PLUMBING, AND STRUCTURAL) TO ENSURE THAT THE
- CONSTRUCTION DOCUMENTS ARE CLOSELY FOLLOWED. WHERE DISCREPANCIES ARISE, THEY SHALL BE REFERRED TO THE A/E FOR RESOLUTION BEFORE PROCEEDING WITH THE WORK.
- 10. FLEX-DUCT RUNS SHALL BE 3' MINIMUM AND 5' MAXIMUM LENGTH. PROVIDE STAINLESS STEEL ADJUSTABLE BANDS TO FASTEN FLEX TO DUCTWORK COLLAR AND EQUIPMENT SERVED. PLASTIC TIES ARE UNACCEPTABLE.

- 10. PROVIDE MANUAL BALANCING DAMPERS IN EACH BRANCH OF SUPPLY, RETURN, VENTILATION, AND EXHAUST DUCTWORK. INSTALL DAMPERS IN ACCESSIBLE LOCATIONS. PROVIDE ACCESS PANELS WERE REQUIRED.
- 11. PENETRATIONS THRU FIRE RATED CEILINGS, FLOORS, PARTITIONS, OR WALLS SHALL BE SEALED TO MAINTAIN FIRE RATING INTEGRITY. PROVIDE RATED FIRE DAMPERS AS SHOWN ON THE PLANS AND AS REQUIRED.
- 12. PENETRATIONS THRU SMOKE RATED CEILINGS, FLOORS, PARTITIONS, BARRIERS, OR WALLS SHALL BE SEALED TO MAINTAIN SMOKE RATING INTEGRITY. PROVIDE RATED COMBINATION FIRE AND SMOKE DAMPERS AS SHOWN ON THE PLANS AND AS REQUIRED.
- 13. COORDINATE WORK PRIOR TO INSTALLATION OF ARCHITECTURAL FINISHES AS REQUIRED.
- 14. COOLING COIL CONDENSATE DRAINS SHALL BE A MINIMUM OF 1", UNO.
- 15. CONTRACTOR SHALL PROVIDE COORDINATED 2-D SHOP DRAWING OF DIVISION 23 SYSTEMS. SHOP DRAWINGS SHALL BE PREPARED AND SUBMITTED IN ELECTRONIC FORMAT.
- 16. INSTALL ALL HVAC WALL MOUNTED SENSORS 48" AFF, MEASURED FROM TOP OF OUTLET BOX, UNO. PROVIDE SINGLE UNIT WHERE MULTIPLE SENSORS ARE SHOWN.
- 17. THE DESIGN IS BASED ON MANUFACTURERS AND MODELS INDICATED, AND IS INTENDED TO SHOW THE GENERAL SIZE, CONFIGURATION, LOCATION, CONNECTIONS AND/OR SUPPORT FOR EQUIPMENT OR SYSTEM OR SYSTEMS SPECIFIED WITH RELATION TO THE OTHER BUILDING/SYSTEMS. SEE SPECIFICATION SECTIONS FOR TECHNICAL REQUIREMENTS.
- 18. NOMENCLATURE FOR FINAL ROOM NAMES AND NUMBERS MAY VARY FROM THE CONSTRUCTION DOCUMENTS. FINAL NAMES AND NUMBERS USED IN THE SHOP DRAWINGS, EQUIPMENT TAGS, BAS LABELING AND CLOSEOUT DOCUMENTATION SHALL BE COORDINATED WITH FINAL ROOM NAMES AND NUMBERS ASSIGNED BY THE OWNER AND ARCHITECT.
- 19. ALL CEILING PLENUM EQUIPMENT SUSPENDED FROM STRUCTURE TO BE INSTALLED NO HIGHER THAN 2 FEET FROM THE CEILING

GRID.

GENERAL NOTES (DEMO)

- 1. PRIOR TO BIDDING, THE CONTRACTOR SHALL VISIT THE SITE TO BECOME FAMILIAR WITH EXISTING CONIDTIONS, AND TO VERIFY LOCATION, SIZE AND QUANTITY OF ITEMS TO BE REMOVED. SUBMITTAL OF A BID SHALL SIGNIFY WILLINGNESS TO COMPLY WITH THE DESIGN AND ACCEPTANCE OF ON-SITE CONDITIONS AS THEY EXIST.
- THE WORK TO BE PERFORMED SHALL CONSIST PROVIDING ALL LABOR, EQUIPMENT, AND MATERIALS NECESSARY TO SERVICE TO REPLACE ROOF TOP MECHANICAL UNITS AT DANIEL MORGAN MIDDLE SCHOOL. ARCHITECTURAL CEILING REMOVAL/REINSTALLATION FOR REQUIRED STRUCTURAL REINFORCEMENT AND REPAIRS/MODIFICATIONS TO EXISTING ROOF/BUILDING SHALL BE COMPLETED BY OWNER-CONTRACTED VENDOR. THE SELECTED CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MECHANICAL, ELECTRICAL, AND STRUCTURAL WORK ASSOCIATED WITH THE REPLACEMENT OF THE ROOF TOP UNITS, AND COORDINATING WITH OTHER OWNER-CONTRACTED VENDORS FOR ASSOCIATED WORK, INCLUDING DRYWALL, PAINTING, CEILING REPLACEMENT, AND ROOF PATCHING.
- 3. PRIOR TO DEMOLITION, CONTRACTOR SHALL ARRANGE A MEETING WITH THE WINCHESTER CITY FIRE MARSHALL TO REVIEW SCOPE OF WORK, AND FIRE SAFETY PRECAUTIONS REQUIRED FOR OCCUPIED SCHOOL BUILDING AND CONTRACTOR AREA.
- 4. PRIOR TO COMMENCING DEMOLITION, PRE-CONSTRUCTION TESTING, ADJUSTING AND BALANCING (TAB) AIRFLOW AND WATERFLOW READINGS SHALL BE TAKEN AT ALL TERMINAL DEVICES AND AIRFLOW READINGS SHALL BE TAKEN AT ALL SUPPLY AND RETURN DIFFUSERS WITHIN AREAS OF WORK. SUBMIT PRE-CONSTRUCTION TAB REPORT TO THE A/E FOR REVIEW.
- 5. DOCUMENTATION OF EXISTING SYSTEMS IS BASED ON AVAILABLE RECORD DRAWINGS AND CASUAL FIELD OBSERVATION. MAJOR DISCREPANCIES SHALL BE REFERRED TO THE ARCHITECT/ENGINEER FOR RESOLUTION PRIOR TO PROCEEDING WITH THE WORK.
- 6. EXISTING COMPONENTS EMBEDDED WITHIN OR BENEATH THE EXISTING STRUCTURE MAY BE ABANDONED IN PLACE, CUT BEHIND WALL/FLOOR/CEILING/ROOF SURFACE AS REQUIRED FOR PATCHING OF FINISH. SYSTEMS SHALL BE CAPPED WATER TIGHT.
- 7. WHERE EXISTING MECHANICAL SYSTEMS BEING REMOVED PENETRATE EXTERIOR WALLS/ROOF, CONTRACTOR SHALL BE RESPONSIBLE FOR PATCHING SUCH PENETRATIONS TO MATCH EXISTING, UNO.
- 8. CONTRACTOR SHALL COORDINATE WITH OWNER TO SALVAGE AND RETURN MECHANICAL EQUIPMENT AND/OR CONTROLS PRIOR TO COMMENCEMENT OF DEMOLITION AND REMOVAL FROM SITE.
- 9. PROVIDE TEMPORARY SUPPORT AND/OR MODIFY EXISTING MECHANICAL COMPONENTS WHERE ROOF DECK IS REPLACED TO ENSURE CONTINUED SYSTEM OPERATION DURING CONSTRUCTION. REFER TO ARCH'L DRAWINGS FOR SCOPE OF ROOFING WORK AND ADDITIONAL DETAILS.

DESIGN COND	DITIONS			
LOCATION	OUTDOOR SUMMER, dB/wB	INDOOR SUMMER, dB	OUTDOOR WINTER, dB	INDOOR WINTER, dB
WINCHESTER, VA	95/78	75	15	70
<u>NOTES:</u> 1. OUTDOOR DE 2. INDOOR DESI	SIGN CONDITIONS	BASED ON ASHR ASED ON ASHRAI	AE CLIMATIC	DESIGN DATA. 55-2010.



Daniel Morgan Middle Schoo

48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMEN



ENERGY BY DESIGN 2677 PROSPERITY AVE. SUITE 275 FAIRFAX, VA 22031 T) 703.718.4355 2RW.com

> KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703.771.3362





SPECIFICATIONS

SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL 1.1 RELATED DOCUMENTS

- Requirements of the General Conditions, Supplementary General Conditions, and Special Conditions apply to this and all HVAC sections. B. This Section applies to all HVAC specification Sections.
- 1.2 JOB CONDITIONS A. The drawings show the general scope and arrangement of the HVAC systems and shall be followed as closely as actual conditions allow. B. Give consideration to all other trades. Make arrangements to avoid conflicts and interference with other work. Fully coordinate all components of HVAC systems with minor adjustments as required, including provision
- of offsets, transitions, fittings, and accessories to meet actual conditions. 1.3 ELECTRICAL WORK A. Electrical equipment and electrical motor-driven equipment specified herein shall be provided complete with motors, integral motor starters
- where indicated, and controls. B. Electrical equipment and wiring shall conform to the requirements of Division 26 - Electrical.
- C. Manual or automatic control and protective or signal devices required for the operation specified herein, and any control wiring required for control devices but not shown on the electrical plans shall be provided under this Section.
- 1.4 CONFORMANCE TO REGULATIONS A. All work shall conform to the regulations of the applicable federal, state, and local laws, ordinances and codes. 1.5 REGULATORY REQUIREMENTS
- A. All products shall be listed by the Underwriters Laboratories. Inc. (UL), and shall bear the UL label. Where UL labels are not provided from the factory, the contractor shall be responsible for having the equipment or materials tested by a UL testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.
- 1.6 QUALITY ASSURANCE A. Reference to the standards of any technical society, organization, or association, or to the laws, ordinances, or codes of governmental authorities shall mean the latest standard, code, or specification adopted, published, and effective at the date of taking bids. B. The specifications, codes, and standards referenced in these specifications (including addenda, amendments, and errata) shall govern in all cases where references thereto are made. In case of conflict between the referenced specifications, the more stringent requirement shall govern unless otherwise permitted by the Architect/Engineer. Major
- conflicts shall be referred to the Engineer for resolution. 1.7 MATERIALS AND EQUIPMENT A. Unless specifically provided otherwise, all materials and equipment furnished for permanent installation in the Work shall conform to applicable standards and be new, current design, unused, and undamaged. B. Individual parts shall be manufactured to standard sizes and gauges
- so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate equipment shall be interchangeable. 1.8 UTILITIES AND CONNECTIONS
- A. Verify location of all existing utilities before laying out and making connections. Report any inconsistencies to Engineer before commencing work. Contractor shall be responsible for any error resulting from failure to exercise these precautions. 1.9 WIRING DIAGRAMS
- A. All mechanical equipment shall be provided with complete wiring diagrams showing all power and control connections. The diagrams shall be placed in a clear plastic pouch that is permanently affixed to the equipment.
- 1.10 PRODUCT DELIVERY, STORAGE, AND HANDLING
- A. Refer to Division 01 requirements. B. Protect products from damage, marring, and soiling. C. Any marring of factory finishes shall be touched up to match the
- original factory fini 1.11 SUBMITTALS

Refer to Division 01 requirements. B. General: The Contractor shall submit information, for Architect/Engineer's review, to demonstrate compliance of proposed Products and/or installations with the Contract Documents. This information shall include, but not be limited to: catalog data; performance data; noise levels; etc. Proposed Products that are not in compliance with the Contract Documents may be rejected. Information must be submitted on all required Products, including proposed Products that appear to be in compliance with the Contract Documents. C. Contractor preparation:

1. The Contractor shall review and approve each submittal and coordinate all other related or affected Work before submitting for review. All copies of each submittal shall bear the Contractor's stamp, with signature or initials, certifying review and approval; verification of field dimensions; and coordination with adjacent Work

are in compliance with the requirements of the Contract Documents. 2. The Contractor shall identify variations from the requirements of the Contract Documents on all copies of applicable submittals. No extra charges shall be paid for the providing of Products or furnishing of Work required as a result of failure to comply with this requirement. D. Submittal Format:

1. Contractors' submittals shall be provided digitally (e.g., CAD, portable document files, etc) in electronic binders by discipline. 2. Each submittal shall be accompanied by a letter of transmittal listing Project Title, Contractor, Subcontractor or supplier, submitted Products, pertinent drawing and detail number, and specification section number, as appropriate.

3. Electronic binders shall be indexed by specification section and item to allow ready reference to each Product. 4. Product data shall be clearly marked to identify the applicable Products or models. Options or modifications required by the

Contract Documents shall be clearly identified. Submittals shall be complete with all associated Products. Submittals on portions of a Product or system shall not be reviewed. PART 2 PRODUCTS 6. Provide Manufacturer's start-up procedures, testing and

checklists 7. Contractor shall provide coordinated shop drawings of Division 23 systems. Provide 3-D shop drawings of major mechanical rooms indicating equipment, duct, piping, and service

access clearances. Shop drawings shall be prepared in electronic format and submitted in electronic and printed form. Architect/Engineer Procedures: Submittals will be reviewed with

reasonable promptness. The Contractor shall allow 15 days for review of each submittal. The Architect/Engineer's comments will be indicated on a Submittal Review Comments form, which will be attached to each copy of the submittal. Contractor shall be responsible for distributing copies of reviewed submittals as appropriate F. Resubmission: Contractor shall change or correct submittals as

required by the Architect/Engineer and resubmit until approved. The Contractor shall identify any changes other than those required by the Architect/Engineer on all copies of the resubmittal. G. Approval required: The ordering, fabrication and/or installation of Products before approval of all relevant submittals shall be at the Contractor's risk. Any damage to new or existing Work resulting from the installation of unapproved Products shall be repaired or replaced by the Contractor at no additional cost. Payment will not be recommended for any Work that does not have an approved submittal.

1.12 SUBSTITUTIONS A. Refer to Division 01 requirements.

B. For a Product specified by naming one or more manufacturer and model, and followed with the statement "or approved equal," the Contractor may submit a Product other than the Product specified by manufacturer and model, that Product shall be considered a Substitute Product and shall comply with the following conditions:

- The Contractor shall verify the Substitute Product is equal or superior in all respects to the Specified Product. 2. The Contractor shall submit data on the Substitute Product in compliance with the "Submittals" paragraph herein.
- 3. After the Substitute Product has been approved by the Architect/Engineer, the Contractor shall be responsible for coordinating the installation of the Substitute Product with all trades. The Contractor shall be responsible for any changes
- required to incorporate the Substitute Product into the Work. 4. The Contractor waives all claims for additional costs related to the Substitute Product that becomes apparent before, during or after installation.

1.13 OPERATING AND MAINTENANCE MANUAL SECTION 23 05 29 - HANGERS AND SUF EQUIPMENT Refer to Division 01 requirements. General: The Contractor shall submit one digital copy of the Operation and Maintenance Manual to the Architect/Engineer for review a minimum of 60 days prior to Instruction and Training Sessions. This copy will be returned to the Contractor with Architect/Engineer's comments or approval. The Contractor shall revise and resubmit, as required, one digital copy of the O&M Manual. Instruction and Training Sessions shall begin 30 days after receipt of the final approved O&M Manuals. Refer to "Instruction and Training Sessions" paragraph herein. C. Binders (digital): Include cover page stating '(PROJECT NAME) OPERATION AND MAINTENANCE MANUAL'; applicable volume number; and project title. Provide tabbed dividers for each Product and system, with typed description or applicable Specification Section. Provide a table of contents for the entire manual and insert at the

PART 1 GENERAL

- front of each binder. D. Contents: The manual shall consist of three parts as follows: 1. Part 1: Directory listing names, addresses, and telephone numbers of Architect, Engineer, Contractor, Subcontractors, and major equipment suppliers.
- 2. Part 2: Operation and maintenance instructions including, but not limited to, the following: a. General description and specifications of each component and of each system as a whole.
- b. Manufacturer's catalog description of each component supplemented by approved equipment submittals. c. Detailed electrical and logic descriptions. d. Installation and start-up instructions, including
- complete calibration procedures for each component and for system as a whole. e. Operating instructions including:
- Sequence of operation 2. Shutdown procedure
- Emergency operating procedures Trouble shooting guide with service instructions
- Preventive maintenance schedules Parts list with names, addresses, and telephone
- numbers of local parts suppliers. Names, addresses, and phone numbers of nearest service organizations
- Interface requirements and capabilities.
- Detailed schematics of equipment. Complete equipment schedules.
- a. Part 3: Project documents including, but not limited to, the following Testing, adjusting, and balancing report
- Certificates Copies of warranties.
- Quality: The manual will be reviewed by the Architect/Engineer to determine accuracy, completeness and quality of printing. Deficiencies will necessitate resubmittals by the Contractor. Refer to "Submittals" paragraph herein. 1.14 INSTRUCTION AND TRAINING SESSIONS
- Refer to Division 01 requirements. After all equipment and services are in operation and receipt of the approved Operation and Maintenance Manuals, Instruction and Training Sessions shall be conducted for representatives of the
- Instruction Session shall be conducted during the Owner's normal working periods and at times satisfactory to the Owner. A. Session shall be sufficient to address all instruction and training for the installed systems and shall last not less than
- one 8-hour working day. D. The Training Session shall address the operation and maintenance of each piece of equipment and of the system as a
- whole. Preventative maintenance techniques shall be included. Instructions and training shall be given by competent, factorytrained service and operating personnel from the appropriate manufacturer(s). The Contractor shall record the names of all personnel present at each Instruction and Training Session and shall forward a copy of the attendance log to the Architect/Engineer
- within seven days after each session. 1.15 RECORD DRAWINGS Refer to Division 01 requirements.
- 1.16 PROJECT/SITE CONDITIONS
- A. Install work in locations shown on Drawings, unless prevented by Project conditions. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding
- WARRANTIES Refer to Division 01 requirements.

1.1

- Warranty periods shall begin from Date of Substantial Completion. All equipment shall be warranted for a minimum of one (1) year. Refer to individual Sections for other requirements. 1.18 CONTRACTOR COORDINATION
- Nomenclature for final room names and numbers may vary from the construction documents. Final names and numbers used in the shop drawings shall be coordinated with final room names and numbers assigned by the Owner and Architect.
- HVAC contractor(s) shall coordinate their work with all other trades prior to fabrication of systems and commencement of installation. It shall be the responsibility of each contractor to review the work of other trades (including, but not limited to civil, structural, architectural, food service, special equipment, fire alarm, fire suppression, plumbing, and electrical) as it affects their work, and as their work affects other trades, to insure that the construction documents are closely followed. Where discrepancies arise, they shall be referred to the Architect/Engineer for resolution before proceeding with the Work.

NOT USED

- PART 3 EXECUTION 3.1 GENERAL
- A. Unless otherwise noted, install equipment in accordance with manufacturer's printed instructions for application indicated. Install, operate, and adjust systems in accordance with the plans
- and specifications. All work for this division shall conform to the regulations of the applicable federal, state, and local laws, ordinances, and codes.
- A Request For Information (RFI) shall be submitted to the Architect/Engineer for any portion of the Work that the Contractor determines a clarification is required. Prior to submitting a RFI the Contractor shall thoroughly research the Contract Documents to ensure information has not been overlooked. The RFI shall include references to the portion of the Contract Documents that requires a clarification. The Contractor shall allow a minimum of three business days for the Architect/Engineer to respond to the RFI. The Contractor shall not proceed with that portion of the Work until a response has been returned.
- All Products delivered to the site(s) shall be stored in accordance with the manufacturer's printed instructions. If a manufacturer does not have printed instructions then the Product shall be adequately housed and otherwise protected against damage or corrosion. If any Product stored at the site(s) is not protected as specified herein, the Contractor shall not receive payment for that Product. That Product shall be stored by the Owner at the expense of the Contractor. Any Product damaged as a result of failure to comply with this requirement shall be replaced by the Contractor at no additional cost to the Owner.
- 3.2 ACCESSIBILITY Locate all equipment, which must be serviced, operated, or maintained in fully accessible positions in accordance with manufacturer's recommendations and subject to approval of Architect. Provide a minimum of two feet of clearance in front of equipment access doors and components requiring service. 3.3 FIRESTOPPING
- Refer to Division 07 requirements. B. For all penetrations or openings in or through fire-rated assemblies including, but not limited to, walls, floors, ceilings, shafts, etc. the Contractor will provide approved UL listed "through penetration
- firestop" systems to ensure integrity of rated assembly. Refer to architectural drawings and details for approved options and confirm final selection with Architect/Engineer before proceeding with this portion of the Work. 3.4 PROTECTION OF OPENINGS A. Openings in partially installed systems, including equipment and
- piping, shall be plugged, capped, or otherwise closed with approved methods and materials or devices until connections are made. 3.5 PROTECTION FROM MOVING PARTS
- A. Belts, shafts, couplings, and other rotating or moving parts, located so that any person may come in proximity thereto, shall be fully enclosed or properly guarded.
- 1.1 SECTION INCLUDES A. Support and attachment 1.2 ADMINISTRATIVE REQUIRE A. Coordination: 1. Coordinate sizes the actual equipment an Coordinate the work framing and materials re 3. Coordinate compa components with mount Coordinate the arr equipment and other por sections or by others. Notify Architect/Er from Contract Documen work. 1.3 SUBMITTALS A. See Section 01 30 00 - / procedures. B. Product Data: Provide r data sheets for channel (strut) supports, post-installed concre insulated pipe supports. C. Shop Drawings: Include where materials or methods of substitution. D. Manufacturer's Instruction limitations of use stipulated by instructions for storage, handli and installation of product. 1.4 DELIVERY, STORAGE, AND A. Receive, inspect, handle manufacturer's instructions. PART 2 PRODUCTS 2.1 SUPPORT AND ATTACHMEN A. General Requirements: 1. Provide all require fittings, accessories, and installation of plumbing 2. Provide products the purpose intended, w 3. Where support an are not indicated, select application criteria as re consideration for vibration where applicable. Steel Components for the environment whe a. Zinc-Plated ASTM B633. b. Galvanized in accordance wit A153/A153M. PART 3 EXECUTION 3.1 EXAMINATION A. Verify that field measure B. Verify that mounting sur attachment components. C. Verify that conditions are work. 3.2 INSTALLATION A. Install products in accor B. Provide independent s support from piping, ductwork, C. Do not penetrate or other without approval of Structural I D. Secure fasteners accord E. Remove temporary support of the second SECTION 23 05 48 - VIBRATION AND SE PART 1 GENERAL 1.1 SECTION INCLUDES A. Equipment support base Vibration isolators. Roof curbs. 1.2 SUBMITTALS Refer to Division 01 requ B. Product Data: Provide manufac compliance with PART 2 Manufacturer's Instruction special procedures and setting 1.3 QUALITY ASSURANCE A. Perform design and inst B. Manufacturer Qualificati manufacturing products specif documented experience. Member of Vibrati Manufacturers Associati PART 2 PRODUCTS 2.1 MANUFACTURERS A. Kinetics Noise Control, Mason Industries Vibration Eliminator Cor D. Substitutions: See Sect 2.2 PERFORMANCE REQUIREM A. General: All vibration isolat conform to all uniform de operating loads. 2.3 EQUIPMENT SUPPORT BAS 2.4 VIBRATION ISOLATORS A. Non-Seismic Type: All Elastomeric-Fi a. Configuration b. Thickness: Assembly: galvanized sheet with load plate pro surface. Elastomeric Mour a. Material: O b. Assembly: equipment and ba supporting structu Neoprene Pad Isc a. Hardness: b. Thickness: Maximum L Rib Height: 2.5 ROOF CURBS A. Vibration Isolation Curbs Non-Seismic Curb a. Location: b. Constructio c. Integral vibi this section. d. Weather ex resistant materials Non-Seismic Curb a. Location: E b. Constructio Integral vib this section. d. Weather ex resistant materials Roof Mounting Curb: 1 lower section containing adju isolators, steel upper section to elastomeric membrane extend over roofing. Provide acoustic angles and cross members to board.Refer to any required tra drawings necessary for conne all curbs as required by roof ed equipment and as required for PART 3 EXECUTION 3.1 INSTALLATION - GENERAL A. Install in accordance with 3.2 FIELD QUALITY CONTROL A. See Section 01 40 00 - 0

requirements.

PPORTS FOR HVAC PIPING AND	SECTION 2 EQUIPMEN	3 05 53 - IDENTIFICATION FOR HVAC PIPING AND IT			2.	Details of how TOTAL flow will be determined; for example:	6.	AIR S 1.	SYSTEM F Adjust ai
	PART 1.1	1 GENERAL SECTION INCLUDES				1. Air: Sum of terminal flows via control system calibrated readings or via hood readings of all		2.	design s Make air
t components. MENTS		A. Nameplates. B. Tags.				terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: Pump curves, circuit setter, flow station		3. 1	entire cro Measure
and arrangement of supports and bases with ad components to be installed.	ו 1.2	D. Pipe markers. REFERENCE STANDARDS			3.	ultrasonic, etc. Specific procedures that will ensure that both air and water		4. 5.	from obje
ork with other trades to provide additional equired for installation.		A. ASME A13.1 - Scheme for the Identification of Piping Systems 2020.				side are operating at the lowest possible pressures and methods to verify this.			adjustme levels. E
atibility of support and attachment ting surfaces at the installed locations.	1.3	SUBMITTALS A. Refer to Division 01 requirements.			4.	Confirmation of understanding of the outside air ventilation criteria under all conditions.		6.	and split Vary tota
rangement of supports with ductwork, piping stential conflicts installed under other	,	 B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification. C. Chart and Schedule: Submit value chart and schedule including. 			5.	Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total		7	drive cha regulatio
ingineer of any conflicts with or deviations		valve tag number, location, function, and valve manufacturer's name and model number.			6.	Method of checking building static and exhaust fan and/or relief damper capacity.		7. 8.	recorded
J		D. Product Data: Provide manufacturers catalog literature for each product required.			7.	Proposed selection points for sound measurements and sound measurement methods.			filter and allowanc
Administrative Requirements for submittal		E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.			8.	Methods for making coil or other system plant capacity measurements, if specified.		9.	Adjust ou exhaust
manufacturer's standard catalog pages and framing systems, nonpenetrating rooftop	PART	Project Record Documents: Record actual locations of tagged valves. PRODUCTS			9. 10	Time schedule for TAB work to be done in phases (by floor, etc.).		10.	Measure exhaust
e details for fabricated hangers and supports	2.1	IDENTIFICATION APPLICATIONS A. Air Handling Units: Nameplates.			10.	specified. Exhaust fan balancing and capacity verifications, including		11.	air syster
ther than those indicated are proposed for		B. Automatic Controls: Tags. Key to equipment served.C. Control Panels: Nameplates.			12.	any required room pressure differentials. Procedures for formal progress reports, including scope		12.	entries. Check m
ons: Indicate application conditions and / product testing agency. Include		 D. Ductwork: Stenciled painting. E. Major Control Components: Nameplates. Divisor: Divisor markets 			13.	and frequency. Procedures for formal deficiency reports, including scope, frequency, and distribution		10	quantities modulatin
HANDLING	2.2	NAMEPLATES A. Description: Laminated three-laver plastic with engraved letters.	1.		Field Log Authoritv	s: Submit at least twice a week to the Commissioning		10.	air flow s
e, and store products in accordance with		 Letter Color: White. Background Color: Black. 	2.		Control S controls i	System Coordination Reports: Communicate in writing to the nstaller all setpoint and parameter changes made or problems	7.	SCOF	control. PE
NT COMPONENTS		3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 70 inch as and gave at increase to be apprendiced by the result of the result.	0		and discr control sy	epancies identified during TAB that affect, or could affect, the ystem setup and operation.		1.	Test, adj a. Pa
ed hangers, supports, anchors, fasteners, d hardware as pecessary for the complete		to 72 incres, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering	3. 4.		Progress Final Rep proper te	Reports. port: Indicate deficiencies in systems that would prevent sting, adjusting, and balancing of systems and equipment to			 D. Pa c. Air d Fa
work. listed, classified, and labeled as suitable for		 4. Label Content: a. Principal lettering: Include equipment's unique 			achieve s a. Su	specified performance. bmit to the the Commissioning Authority within two weeks	SECTION 2	3 07 1	e. Air 3 - DUCT
where applicable. Ind attachment component types and sizes		equipment number/mark. b. Secondary lettering: Electrical panel and circuit			afte b. Re	er completion of testing, adjusting, and balancing. vise TAB plan to reflect actual procedures and submit as part	PAR 1.1	1 GE SECT	ENERAL TON INCL
t in accordance with manufacturer's equired for the load to be supported. Include	23	serving unit, and specification section number and title where equipment is specified.			oft c. Su	final report. bmit draft copies of report for review prior to final acceptance Project – Provide final copies for Architect/Engineer and for	1 0	A. B. SURIN	Duct insu Insulation
ts: Use corrosion resistant materials suitable	2.0	A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2			inc d. Pro	susion in operating and maintenance manuals.	1.2	ЗОБІ А. В.	Refer to I Product I
ere installed. I Steel: Electroplated in accordance with	-	inch diameter. B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2			cor ide	mplete with index page and indexing tabs, with cover entification at front and side. Include set of reduced drawings		of mat C.	terials and Manufact
Steel: Hot-dip galvanized after fabrication		inch diameter with smooth edges. C. Chart: Typewritten letter size list in anodized aluminum frame.			wit she	h air outlets and equipment identified to correspond with data eets, and indicating thermostat locations.	4.0	to ens	sure accep ved.
th ASTM A123/A123M or ASTM	2.4	A. Stencils: With clean cut symbols and letters of following size:			e. Inc nui f Fo	Clude actual instrument list, with manufacturer name, serial mber, and date of calibration.	1.3	QUAL A.	Manufac
ements are as indicated.		inch long color field, 1/2 inch high letters. 2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8			rec Sto	commends a report format use that; otherwise, follow ASHRAE		B. of wor	Applicato
faces are ready to receive support and		inch long color field, 3/4 inch high letters.2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12			g. Un h. Inc	its of Measure: Report data in I-P (inch-pound) units only. clude the following on the title page of each report:	1.4	by ma DELI\	anufacture /ERY, ST
e satisfactory for installation prior to starting		 inch long color field, 1-1/4 inch high letters. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 			1. 2.	Name of Testing, Adjusting, and Balancing Agency. Address of Testing, Adjusting, and Balancing Agency.		A. manu ^r	Accept m facturer's
rdance with manufacturer's instructions.	2	5. Ductwork and Equipment: 2-1/2 inch high letters. Stencil Paint: As specified in Division 09, semi-gloss enamel			3. 4	Agency. Project name	15	B. chemi FIFI I	Protect Ir ical, and r
, conduit, or other systems. erwise notch or cut structural members	2.5	colors conforming to ASME A13.1. PIPE MARKERS			5. 6.	Project location. Project Architect.	1.0	A. manu	Maintain facturers
Engineer. ding to manufacturer's recommended torque		A. Color: Conform to ASME A13.1.B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid			7. 8.	Project Engineer. Project Contractor.		B. 24 ho	Maintain urs.
ports.		plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid	F		9. 10. Drojoct P	Project altitude. Report date. Jacour Degumento: Record actual locations of helenoing	PAR 2.1	2 PR REGL	
EISMIC CONTROLS FOR HVAC	PART 3.1	73 EXECUTION PREPARATION	J. PART 2 PROD	JUC	valves ar TS	nd rough setting.		A. develo E84 c	oped inde or UL 723.
es.		A. Degrease and clean surfaces to receive adhesive for identification materials.	1. NC PART 3 EXEC	DT L	JSED ON		2.2	PRE-I A.	INSULATI Manufaci
	3.2	A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent	1. GE 1.		RAL REC Perform t a AA	JUIREMENTS total system balance in accordance with one of the following: BC (NSTSB) AABC National Standards for Total System		applic	able prod Insulation
uirements.		adhesion and seal with clear lacquer. B. Install tags with corrosion resistant chain.			Ba b. NE	lance. BB Procedural Standards for Testing Adjusting Balancing of		high ir	mpact stre 1. R-
turer's product literature documenting 2 PRODUCTS.		C. Install plastic pipe markers in accordance with manufacturer's instructions.	2.		En Begin wo	vironmental Systems. why after completion of systems to be tested, adjusted, or learn complete work prior to Substantial Completion of the			2. 'K' 3. Ma
g dimensions.		tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.	3.		project. Where H	VAC systems and/or components interface with life safety		C.	 De 5. Clo Vapor Ba
tallation in accordance with applicable codes ions: Company specializing in	5.	E. Identify control panels and major control components outside panels with plastic nameplates.			systems, coordinat	including fire and smoke detection, alarm, and control, te scheduling and testing and inspection procedures with the			1. Au vinyl.
ion Isolation and Seismic Control		 rag automatic controls, instruments, and relays. Key to control schematic. G. Install ductwork with stencilled painting. Identify with air handling. 	4.		TAB Age a. Co	ncy Qualifications: mcy Qualifications: mpany specializing in the testing, adjusting, and balancing of			2. Fia a. b.
ion (VISCMA).		unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and			sys b. Ha	stems specified in this section. ving minimum of three years documented experience.			3. Fir developm
Inc	SECTION 2	at each obstruction. 3 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC			c. Ce 1.	rtified by one of the following: AABC, Associated Air Balance Council: www.aabc.com/			4. Mo 5. Se
mpany, Inc tion 01 60 00 - Product Requirements.	1.1	SECTION INCLUDES A Testing, adjustment, and balancing of air systems.			2.	Guaranty.	PAR	73 EX	6. Co
IENTS	1.2	B. Measurement of final operating condition of HVAC systems. REFERENCE STANDARDS	5.		TAB Sup	Bureau: www.nebb.org/#sle. ervisor and Technician Qualifications: Certified by same	3.1	EXAN A.	/INATION Verify that
tors, base frames and inertia bases to eflection and stability requirements under all		A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition 2016.	2. EX	(AM	organizat INATION	tion as TAB agency. I	3.2	B. INST/	Verify that ALLATION
SES		Blance; Associated Air Balance Council; 2002. C ASHRAF Std 111 - Measurement Testing Adjusting and	Ι.	1	work. En a Sv:	a systems are complete and operable before commencing isure the following conditions: stems are started and operating in a safe and normal		A. B. C	Install in Install in
iber Glass Pads:		 Balancing of Building HVAC Systems 2008, with Errata (2019). D. NEBB (TAB) - Procedural Standard for Testing Adjusting and 			cor b. Te	ndition. mperature control systems are installed complete and		•	1. Pro 2. Fir
on: Flat or molded. 0.25 inch minimum.		Balancing of Environmental Systems 2019. E. SMACNA (TAB) - HVAC Systems Testing, Adjusting and			ope c. Pro	erable. oper thermal overload protection is in place for electrical			3. Co duct pen
Single or multiple layers using bonded, metal separation plate between each layer oviding evenly distributed load over pad	1.3	Balancing 2002. SUBMITTALS A Refer to Division 01 requirements			eqı d. Fin	upment. nal filters are clean and in place. If required, install temporary adia in addition to final filters		П	4. Ins dampers External
nts:		 B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of 			e. Du f. Fa	ict systems are clean of debris. ns are rotating correctly.		υ.	1. Se joints wit
Dil, ozone, and oxidant resistant compounds. Encapsulated load transfer plate bolted to		Contract. C. TAB Plan: Submit a written plan indicating the testing, adjusting,			g. Fin h. Air	e and volume dampers are in place and open. coil fins are cleaned and combed.			2. Se wires.
ase plate with anchor hole bolted to ure. plators:		and balancing standard to be followed and the specific approach for each system and component.			i. Aci j. Air	cess doors are closed and duct end caps are in place. outlets are installed and connected.			3. Ins mechanic
30 durometer. Minimum 1/2 inch.		 Submit to the Commissioning Authority. Submit six weeks prior to starting the testing, adjusting. 	2.		K. Du Submit fi prevent p	eld reports. Report defects and deficiencies that will or could proper system balance.			4. Se
∟oading: 50 psi. : Maximum 0.7 times width.		and balancing work.4. Include certification that the plan developer has reviewed	3. 3. PR	REP	Beginning ARATION	o f work means acceptance of existing conditions. N			5. Sto
S:		the contract documents, the equipment and systems, and the control system with the Architect/Engineer and other installers to	1.	,	Hold a pr work.	e-balancing meeting at least one week prior to starting TAB	SECTION 2 PART	3 11 2 1 GE	3 - FACIL ENERAL
b Rail: Between existing roof and rooftop equipment		 5. Include at least the following in the plan: a Preface: An explanation of the intended use of the 	2	i	a. Re adj Provide i	quire attendance by all installers whose work will be tested, justed, or balanced.	1.1	A.	Pipe, pip
ration isolation to conform to requirements of	f	control system. b. List of all air flow, water flow, sound level, system			operation facilitate	is. Make instruments available to Architect/Engineer to spot checks during testing.	1.2	REFE A.	RENCE S ANSI Z2
xposed components consist of corrosion s. b.		capacity and efficiency measurements to be performed and a description of specific test procedures, parameters,	3. 4. AD	JUS	Provide a	additional balancing devices as required. TOLERANCES		B. C.	ANSI Z2 ASME B
u. Between structure and rooftop equipment. on: Aluminum		tormulas to be used. c. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and	1.		rur Handl design fo return an	nng Systems: Adjust to within plus or minus 5 percent of or supply systems and plus or minus 10 percent of design for d exhaust systems		∠∪21. D. F	ASME B
ration isolation to conform to requirements of	f	balanced with the data cells to be gathered for each. d. Identification and types of measurement instruments	2.		Air Outlet 5 percent	ts and Inlets: Adjust total to within plus 10 percent and minus t of design to space. Adjust outlets and inlets in space to		F. Hot-D	ASTM A
xposed components consist of corrosion s.		to be used and their most recent calibration date. e. Discussion of what notations and markings will be	3.		within plu Hydronic	us or minus 10 percent of design. Systems: Adjust to within plus or minus 10 percent of design.		G. Galva	ASTM A
4 inches minimum height with rigid steel stable spring pockets with restrained spring to support potton equipment and continuous	s	 made on the duct and piping drawings during the process. f. Final test report forms to be used. a Detailed step by step procedures for TAP work for 	5. RE 1.	-00	RDING A Field Log	AND ADJUSTING is: Maintain written logs including: inning log of events and issues		H. Wroug Service	ASTM A2 ght Carbo
ding from upper section for counterflashing cal package consisting of interior perimeter	-	 g. Detailed step-by-step procedures for TAB WOR for each system and issue, including: 1. Terminal flow calibration (for each terminal 			a. ru b. Dis c. Co	screpancies, deficient or uncompleted work by others. Intract interpretation requests.		I. Groov	MSS SP- /ed and F
support up to two layers of gypsum ansition adaptor curbs as indicated on the		type). 2. Diffuser proportioning.	2.		d. Lis Ensure re	ts of completed tests. ecorded data represents actual measured or observed	1.3	SUBN A.	/ITTALS See Sect
ection to exposed roof ductwork. Coordinate quipment manufacturers for supplied		 Branch/submain proportioning. Total flow calculations. Bechecking 	3.		condition Permane	s. Intly mark settings of valves, dampers, and other adjustment allowing settings to be restored. Set and look memory stars		proced B.	aures. Product I
		 Recreating. Diversity issues. Expected problems and solutions, etc. 	4.		Mark on o measure	drawing setungs to be restored. Set and lock memory stops. drawings the locations where traverse and other critical ments were taken and cross reference the location in the final	14	acces and ra QUAI	atings. TTY ASS
th manufacturer's instructions.			5.		report. After adju	ustment, take measurements to verify balance has not been		А. В.	Perform Valves:
Quality Requirements, for additional			6.		disrupted Leave sy	or that such disruption has been rectified. stems in proper working order, replacing belt guards, closing oors, closing doors to electrical switch horses sealing test		body. C.	Identify p

Air c 1	SYSTEM PROCEDURE Adjust air bandling and distribution systems to provide required or	2 1
1.	design supply, return, and exhaust air quantities at site altitude.	2.1
2.	Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.	
3. ⊿	Measure air quantities at air inlets and outlets.	~
4.	from objectionable drafts and noise.	2.2
5.	Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound	2.3
	and splitters.	
6.	Vary total system air quantities by adjustment of fan speeds. Provide	
	regulation.	
7.	Provide system schematic with required and actual air quantities	
8.	Measure static air pressure conditions on air supply units, including	
	filter and coil pressure drops, and total pressure across the fan. Make	
9.	Adjust outside air automatic dampers, outside air, return air, and	
10	exhaust dampers for design conditions.	
10.	exhaust dampers to check leakage.	
11.	Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain	
	approximately 0.05 inches positive static pressure near the building	
12.	entries. Check multi-zone units for motorized damper leakage. Adjust air	2.4
	quantities with mixing dampers set first for cooling, then heating, then	
13.	For variable air volume system powered units set volume controller to	
	air flow setting indicated. Confirm connections properly made and	2.5
	control.	
SCO	PE	
1.	a. Packaged Roof Top Heating/Cooling Units.	
	b. Packaged Outdoor Central-Station Air-Handling Units	2.6
	d. FanS	INDIC
3 07 1	e. Air Inlets and Outlets.	
1 GI	ENERAL	
SEC ⁻ A.	TION INCLUDES Duct insulation.	
В.	Insulation jackets.	
SUBI A.	NITTALS Refer to Division 01 requirements.	PART 3.1
В.	Product Data: Provide product description, thermal characteristics, list	••••
of ma C.	aterials and thickness for each service, and locations. Manufacturer's Instructions: Indicate installation procedures necessary	
to en	sure acceptable workmanship and that installation standards will be	
achie QUAI	eved. LITY ASSURANCE	
A.	Manufacturer Qualifications: Company specializing in manufacturing	
produ B.	Acts of the type specified in this section with documented experience. Applicator Qualifications: Company specializing in performing the type	
of wo	rk specified in this section, with documented experience and approved	
by ma DELI	ANUTACTURER. SEC	PART
A.	Accept materials on site in original factory packaging, labelled with	1.1
manu B.	Protect insulation from weather and construction traffic, dirt, water,	
chem	nical, and mechanical damage, by storing in original wrapping.	
A.	Maintain ambient temperatures and conditions required by	
manu R	Ifacturers of adhesives, mastics, and insulation cements. Maintain temperature during and after installation for minimum period of	
24 hc	nice and and and and and another instantiation for miniman ported of	10
	Juis.	I.Z
2 PF REG	RODUCTS ULATORY REQUIREMENTS	Ι.Ζ
2 PF REG	RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke	1.2
2 PF REG A. devel E84 (RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723.	1.2
2 PF REG A. devel E84 0 PRE-	RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM	Ι.Ζ
2 PF REG A. devel E84 0 PRE- A. subst	RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with	1.2
2 PF REG A. devel E84 (PRE- A. subst applic	RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE.	1.2
2 PF REG A. devel E84 (PRE- A. subst applie B. high i	RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell.	1.3
2 PF REG devel E84 o PRE- A. subst applie B. high i	RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type.	1.2
2 PF REG A. devel E84 (PRE- A. subst applid B. high i	 RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 	1.3
2 PF REG A. devel E84 c PRE- A. subst applid B. high i	RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%	1.3
2 PF REG A. devel E84 c PRE- A. subst applic B. high i	 RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 	1.3 1.4 PART
2 PR REG A. devel E84 (PRE- applid B. high i C.	 RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable 	1.3 1.4 PART 2.1
2 PF REG A. devel E84 (PRE- applid B. high i	 RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: 	1.3 1.4 PART 2.1
2 PP REG A. devel E84 c PRE- A. subst applid B. high i	 RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UI -94 	1.3 1.4 PART 2.1 2.2
2 PP REG A. devel E84 c PRE- A. subst applic B. high i	 RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke 	1.3 1.4 PART 2.1 2.2
2 PR REG A. devel E84 c PRE- subst applid B. high i	 RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 	1.3 1.4 PART 2.1 2.2 2.3
2 PR REG A. devel E84 c PRE- applid B. high i	 RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated 	1.3 1.4 PART 2.1 2.2 2.3
2 PP REG A. devel E84 c PRE- A. subst B. high i	 RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. 6. Color: White 	1.3 1.4 PART 2.1 2.2 2.3
2 PP REG A. devel E84 (PRE- A. subst applid B. high i C.	 RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. 6. Color: White KECUTION 	1.3 1.4 PART 2.1 2.2 2.3
2 PP REG A. devel E84 c PRE- subst applic B. high i C. 3 EX EXAI A.	 RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. R-12 Construction Type. YK Value: 0.146 BTU/IN/SQFT/HR/degree F. Maximum Service Temperature: 185 degrees F. Density: Shell tensile strength 6,350 PSI. Closed Cell Content: >90%. Vapor Barrier Jacket: Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. Moisture Vapor Permeability: Zero permeability. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. Color: White KECUTION VIINATION Verify that ducts have been tested before applying insulation materials.	1.3 1.4 PART 2.1 2.2 2.3 2.4
2 PP REG A. devel E84 c PRE- A. subst applid B. high i C. 3 EXAT A. B.	 RODUCTS QULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. R-12 Construction Type. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. Maximum Service Temperature: 185 degrees F. Density: Shell tensile strength 6,350 PSI. Closed Cell Content: >90%. Vapor Barrier Jacket: Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. Moisture Vapor Permeability: Zero permeability. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. Color: White KEUTION VINATION Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dry.	1.3 1.4 PART 2.1 2.2 2.3 2.4
2 PF REG A. devel E84 c PRE- A. subst applid B. high i C. 3 E2 EXAl A. B. INST A.	ADD. RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. 2. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50	1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5
2 PF REG A. devel E84 (PRE- A. subst applid B. high i high i C. 3 EXAF A. B. INST A. B. C.	 ADD. RODUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed litution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. 6. Color: White KECUTION VINATION Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dry. ALLATION Install in accordance with MAIMA National Insulation Standards. Insulated ducts conveving air below ambient temperatures.	1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5
2 PF REG A. devel E84 c PRE- A. subst B. high i high i C. 3 EXAN A. B. C. C.	ADS: ACOULCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. 6. Color: White KECUTION VINATION Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dry. ALLATION Install in accordance with MAIMA National Insulation Standards. Insulated ducts conveying air below ambient temperature: 1. Provide insulation with vapor barrier jackets.	1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5
2 PP REG A. devel E84 c PRE- A. subst B. high i high i C. 3 EXAI A. B. INST A. B. C.	ADS: ADDUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. 6. Color: White KECUTION VINATION Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dry. ALLATION Install in accordance with manufacturer's instructions. Install in accordance with NAIMA National Insulation Standards. Insulated ducts conveying air below ambient temperature: 1. Provide insulation with vapor barrier jackets. 2. Finish with tape and vapor barrier jackets. 3. Continue insulation through write scleavers performed where 3. Continue insulation through write scleavers and others.	1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5
2 PF REG A. devel E84 c PRE- A. subst applid B. high i high i C. 3 EXAt A. B. INST A. B. C.	ADS: ADDUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. 6. Color: White KECUTION VinNATION Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dry. ALLATION Install in accordance with manufacturer's instructions. Install in accordance with NAIMA National Insulation Standards. Insulated ducts conveying air below ambient temperature: 1. Provide insulation with vapor barrier jacket. 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.	1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5
2 PF REG A. devel E84 c PRE- A. subst applid B. high i high i C. 3 EXAN A. B. INST A. B. C.	AUS. ACDUCTS ULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. 6. Color: White KECUTION VINATION Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dy. ALLATION Install in accordance with MAIMA National Insulation Standards. Install in accordance with NAIMA National Insulation Standards. Insulated ducts conveying air below ambient temperature: 1. Provide insulation with vapor barrier jacket. 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations. 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections and expansion inite	1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5
2 PP REG A. devel E84 c PRE- applic B. high i high i C. 3 EXAI A. B. TNST A. B. C. D.	 AUDICIS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. R-12 Construction Type. YK Value: 0.146 BTU/IN/SQFT/HR/degree F. Maximum Service Temperature: 185 degrees F. Density: Shell tensile strength 6,350 PSI. Closed Cell Content: >90%. Vapor Barrier Jacket: Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. Flammability: Core: 25/50 compliant. Shell: V-0 per UL-94 Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. Moisture Vapor Permeability: Zero permeability. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. Color: White KECUTION Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dry. ALLATION Install in accordance with NAIMA National Insulation Standards. Insulated ducts conveying air below ambient temperature: Provide insulation with vapor barrier jacket. Continue insulation with vapor barrier jacket. Finish with tape and vapor barrier jacket. Continue insulation through walls, sleeves, hangers, and other duct penetrations. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints. External Duct Insulation Application:	1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5
2 PF REG A. devel E84 c PRE- A. subst B. high i high i C. 3 EXAF A. B. INST A. B. C. D.	ADD. SULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50.	1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5
2 PF REG A. devel E84 d PRE- A. subst applid B. high i high i C. 3 EXAF A. B. INST A. B. C. D.	AUX. ADDUCTS SULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. 6. Color: White KECUTION WINATION Verify that ducts have been tested before applying insulation materials. Verify that ducts have been tested before applying insulation materials. Verify that ducts have been tested before applying insulation materials. Verify that ducts nave been tested before applying insulation materials. Verify that ducts nave been tested before applying insulation materials. Verify that ducts nave been tested before applying insulation materials. Verify that ducts nave been tested before applying insulation materials. Verify that ducts nave been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dy. ALLATION Install in accordance with manufacturer's instructions. Install in accordance with manufacturer's instructions. Install in accordance with manufacturer's instructions. Installi in accordance with wa	1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5
2 PF REG A. devel E84 c PRE- A. subst applid B. high i high i C. EXAN A. B. C. D.	Autors ADDUCTS SUFACE SUPERATES SUFACE SUPERATES SUPACES SUPACES SUPERATES SUPERATES SUPERATES SUPERATES SU	1.2 1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5
2 PP REG A. devel E84 c PRE- A. subst B. high i high i C. 3 EXAF A. B. INST A. B. C. D.	Autor Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed itution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior -25/50. 4. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. <	1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5 2.6
2 PF REG A. devel E84 d PRE- A. subst applid B. high i high i C. 3 EXAF A. B. INST A. B. C. D.	 ADDICTS QDUCTS QULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. R-12 Construction Type. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. Maximum Service Temperature: 185 degrees F. Density: Shell tensile strength 6,350 PSI. Closed Cell Content: >90%. Vapor Barrier Jacket: Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. Flammability: a. Core: 25/50 compliant. b. Shell: '\0 per UL-94 Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. Moisture Vapor Permeability: Zero permeability. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. Color: White KECUTION WINATION Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dry. ALLATION Install in accordance with MAIMA National Insulation Standards. Insulated ducts conveying air below ambient temperature: Provide insulation with vapor barrier jackets. Finish with tape and vapor barrier jackets. Insulate on through walls, sleeves, hangers, and other duct penetrations. Insulate on pericens, and expansion joints. External Duc	1.2 1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5 2.6
2 PF REG A. devel E84 (PRE- A. subst applid B. high i C. EXAN A. B. C. D.	 ADDUCTS VODUCTS VULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with table product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-O per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. 6. Color: White KECUTION With that ducts have been tested before applying insulation materials. Verify that ducts have been tested before applying insulation materials. Insulated ducts conveying air below ambient temperature: 1. Provide insulation with vapor barrier jacket. 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints. External Duct Insulation Application: 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket. 2. Secure insulation without vapor barrier with	1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5 2.6
2 PF REG A. devel E84 c PRE- A. subst B. high i C. 3 EXAF A. B. INST A. B. C. D.	AUDIONTS SODUCTS SULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacture: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. 6. Color: White KECUTION VINATION Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dry. ALLATION Install in accordance with Manufacturer's instructions. Install in accordance with NAIMA National Insulation Standards. Insulated ducts conveying air below ambient temperature: 1. Provide insulation through walls, sleeves, hangers, and other duct penetrations. 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints. External Duct Insulation Application: 1. Secure insulation with vapor barrier with staples, tape, or wires. 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers. 4. Sel vapor barrier penetrations by mechani	1.2 1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5 2.6
2 PF REG A. devel E84 c PRE- A. subst applie B. high i C. 3 EXAF B. INST A. B. INST A. B. C. D.	AUDUCTS SOUCTS SULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. 6. Color: White KECUTION WINATION Verify that ducts have been tested before applying insulation materials. Verify that ducts have been tested before applying insulation materials. Verify that ducts have been tested before applying insulation materials. Verify that ducts have been tested before applying insulation standards. Insulated ducts conveying air below ambient temperature: 1. Provide insulation with vapor barrier jacket. 3. Continue insulation with vapor barrier jacket. 3. Continue insulation with vapor barrier jacket. 4. Finish with tape and vapor barrier jacket. 3. Continue insulation with vapor barrier jacket. 4. Finish with tape and vapor barrier jacket. 5. Socure insulation with vapor barrier jacket. 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints. External Duct Insulation Application: 1. Secu	1.2 1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5 2.6 2.6
2 PF 2 PF REG A devel E84 c PRE- A devel E84 c PRE- A subst applid B high i C. 3 EXAF B. INST B. INST B. C. 3 EXAF D. 3 1 C	 AUDUCTS VODUCTS VULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RF1 with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K' Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. 6. Color: White KECUTION WINATION Verify that ducts have been tested before applying insulation materials. Verify that ducts have been tested before applying insulation materials. Insulated ducts conveying air below ambient temperature: Provide insulation with vapor barrier jacket. Continue insulation through walls, sleeves, hangers, and other duct penetrations. Install in accordance with NAIMA National Insulation Standards. Insulate ducts conveying air below ambient temperature: Provide insulation with vapor barrier jacket. Continue insulation through walls, sleeves, hangers, and other duct penetrations. Install in accordance	1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5 2.6 PART 3.1
2 PF 2 PF A. develor EA dev	 ACDUCTS VULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. R-12 Construction Type. 'K' Value: 0.146 BTU/IN/SQCFT/HR/degree F. Maximum Service Temperature: 185 degrees F. Density: Shell tensile strength 6.350 PSI. Closed Cell Content: >90%. Vapor Barrier Jacket: Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. Moisture Vapor Permeability: Zero permeability. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. Color: White ECUTION WINATION Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dry. ALLATION Insulated ducts conveying air below ambient temperature: Provide insulation with vapor barrier jacket. Continue insulation through walls, sleeves, hangers, and other duct penetrations. Insulate ducts connections, and expansion joints. External Duct Insulation Application: Secure insulation with vapor barrier mict hat staples, trape, or wires. Insulate ontire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints. External Duct I	1.2 1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5 2.6 PART 3.1 3.2
2 PF 2 PF A. de84 c ERE d ERE d	ACDUCTS VLATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foram insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K Value: 0.146 BTU/IN/SQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensite strength 6.350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 3. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior -225/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. 6. Color: White CECUTION WINATION Verify that ducts have been tested before applying insulation materials. Verify that ducts have been tested before applying insulation materials. Verify that ours have been tested before applying insulation materials. Verify that ours have been tested before applying insulation standards. Install in accordance with MAIMA National Insulation Standards. Install in accordance with MAIMA National Insulation Standards. Install in accordance with Manufacturer's instructions. Install in accordance with Maufan Autional Insulation Standards. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansio joints. External Duct Insulation Application: 1. Secure insulation with vapor barrier jacket. 2. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match ja	1.2 1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5 2.6 PART 3.1 3.2
2 PF 2 REG 2 REG 4 devel E84	AUX. SUDUCTS VLATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bondet to a impact strength UV stable 1000 micron exterior vinyl shell. 1. R-12 Construction Type. 2. 'K Value: 0.146 BTU/INSQFT/HR/degree F. 3. Maximum Service Temperature: 185 degrees F. 4. Density: Shell tensile strength 6,350 PSI. 5. Closed Cell Content: >90%. Vapor Barrier Jacket: 1. Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. 2. Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. 4. Moisture Vapor Permeability: Zero permeability. 5. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. 6. Color: White 4CCUTION Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dy. ALLATION Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dy. ALLATION Varify that ducts nonveying air below ambient temperature: 1. Provide insulation with vapor barrier jacket. 3. Continue insulation with vapor barrier jacket. 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints. External Duct Insulation Application: 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket. 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hapoint insulation around access doors and damper operat	1.2 1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5 2.6 PART 3.1 3.2
2 PFG 2 REA de84 de PA. usfi applid bigh i C. 3 EXA B. INST A. usfi bigh i C. 3 EXA B. INST D. 3 EXA B. INST A. usfi B.	 ADDUCTS VULATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. R-12 Construction Type. 'K Value: 0.146 BTU/IN/SQFT/HR/degree F. Maximum Service Temperature: 185 degrees F. Density: Shell tensile strength 6,350 PSI. Closed Cell Content: >90%. Vapor Barrier Jacket: Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. Flammability: a. Core: 25/50 compliant. b. Shell: 'O per UL-34 Fire/Smoke Performance: UL 723 Flame spread/smoke development interior <25/50. Moisture Vapor Permeability: Zero permeability. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. Color: White Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dry. ALLATION Verify that surfaces are clean, foreign material removed, and dry. ALLATION Verify that application: University and vapor barrier jacket. Finish with tape and vapor barrier with wires and seal jacket ipints with vapor barrier adhesive or tape to match jacket. Finish with tape and vapor barrier with wires and seal jacket ipints with vapor barrier panetration joints. Externa	1.2 1.3 1.4 PART 2.2 2.3 2.4 2.5 2.6 PART 3.1 3.2
2 PF 2 REG level de EA substitution de la construction de la construc	Automotive Section 2015 Section	1.2 1.3 1.4 PART 2.1 2.2 2.3 2.4 2.5 2.6 PART 3.1 3.2
2 PFG 2 REG elevel 2 REG elevel 2 REG elevel 2 REG elevel 2 REG elevel 3 REG elevel 3 EN 3 EN 3 EN 5 EN	AUXION STANDARY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke loped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacturer: Basis of Design R-12 Thermaduct. Any proposed titution shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. I. R-12 Construction Type. View: 0.146 BTU/IN/SOFT/HR/degree F. Maximum Service Temperature: 185 degrees F. Density: Shell tensile strength 6,330 PSI. Closed Cell Content: >90%. Vapor Barrier Jacket: Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 Simplement interior <25/50. Flammability: Coscure with cohesively bonded seams per the pre-insulated manufacturer system. Color: White CCUTION WINATION Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dry. ALLATION Install in accordance with Manufacturer's instructions. Insulation: Fishwith tape and vapor barrier jackets. Fishwith tape and vapor barrier jackets. Continue insulation with vapor barrier jackets. Continue insulation Application: Secure insulation with vapor barrier jackets. Continue insulation and vapor barrier jackets. Continue insulation with vapor barrier jackets. Continue insulation and vapor barrier jacket. Continue insulation with va	1.2 1.3 1.4 PART 2.2 2.3 2.4 2.5 2.6 PART 3.1 3.2
2 PF 2 REG 4 de84 de PA. usf 8 applid 1 SE 3 EXAF 5 A. B. INST B. C. 3 EXAF 5 A. State 5 A.	 ACDUCTS QUATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke oped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacture: Basis of Design R-12 Thermaduct. Any proposed ituition shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. R-12 Construction Type. Y K Value: 0.146 BTU/INSQFT/HR/degree F. Maximum Service Temperature: 185 degrees F. Density: Shell tensile strength 6,350 PSI. Closed Cell Content: >90%. Vapor Barrier Jacket: Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 Fire/Smoke Performance: UL 723 Flame spread/smoke development Interior <25/50. Moisture Vapor Permeability: Zero permeability. Secure with cohesivley bonded seams per the pre-insulated manufacturer system. Color: White Color: White Verify that ducts have been tested before applying insulation materials. Verify that surfaces are clean, foreign material removed, and dy. ALLATION Veridy insulation through walls, sleeves, hangers, and other duct sonveying air below ambient temperature: Provide insulation with vapor barrier jacket. Continue insulation through walls, sleeves, hangers, and other duct penetrations. Install in accordance with manufacturer's instructions. Install in acourdance, and expansion joints. External Duct Insu	1.2 1.3 1.4 PART 2.2 2.3 2.4 2.5 2.6 PART 3.1 3.2
2 REA. de84 cE - ship PFG el c	 ADDUCTS QUATORY REQUIREMENTS Surface Burning Characteristics: Flame spread index/Smoke oped index of 25/50, maximum, when tested in accordance with ASTM or UL 723. INSULATED OUTDOOR DUCT INSULATION SYSTEM Manufacture: Basis of Design R-12 Thermaduct. Any proposed ituition shall be presented as a BID RFI with preliminary submittal with cable product data for review and approval by the owner and AE. Insulation: Fiber-free closed cell foam insulation, factory bonded to a impact strength UV stable 1000 micron exterior vinyl shell. R-12 Construction Type. Y K Value: 0.146 BTU/INSQFT/HR/degree F. Maximum Service Temperature: 185 degrees F. Density: Shell tensile strength 6,350 PSI. Closed Cell Content: >90%. Vapor Barrier Jacket: Autohesively bonded aluminum foil with 1000 micron UV stable vinyl. Flammability: a. Core: 25/50 compliant. b. Shell: V-0 per UL-94 Fire/Smoke Performance: UL 723 Flame spread/smoke development Interior <25/50. Moisture Vapor Permeability: Zero permeability. Score: With cohesivley bonded seams per the pre-insulated manufacturer system. Color: White Color: White Color: White Color: White Color: White and vapor barrier jackets. Finish mith tape and vapor barrier jackets. Finish with tape and vapor barrier jackets. Finish with age and vapor barrier jackets. Finish with age on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct of trappers. Insulation with vapor barrier instension joints. External Duct Insulation around access doors and damper operators to alow operation without vapor barrier with wiss and seal jacket<td>1.2 1.3 1.4 PART 2.2 2.3 2.4 2.5 2.6 PART 3.1 3.2</td>	1.2 1.3 1.4 PART 2.2 2.3 2.4 2.5 2.6 PART 3.1 3.2

holes, restoring insulation, and restoring thermostats to specified

report. Recheck points or areas as selected and witnessed by the

7. At final inspection, recheck random selections of data recorded in

8. Provide a drawing indicating actual locations of all balancing dampers.

Architect/Engineer.

Salvanized) Coatings on Iron and Steel Products 2017. ASTM A234/A234M - Standard Specification for Piping Fittings of ought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2023a. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint,

Grooved and Flared Ends 2010, with Errata. See Section 01 30 00 - Administrative Requirements, for submittal

Product Data: Provide data on pipe materials, pipe fittings, valves, and ccessories. Provide manufacturers catalog information. Indicate valve data

QUALITY ASSURANCE Perform work in accordance with applicable codes.

Valves: Manufacturer's name and pressure rating marked on valve Identify pipe with marking including size, ASTM material classification, and ASTM specification.

- 2 PRODUCTS NATURAL GAS PIPING, ABOVE GRADE A. Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black. 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M,
- wrought steel welding type. Joints: Threaded or welded to ASME B31.1
- FLANGES, UNIONS, AND COUPLINGS A. Unions for Pipe Sizes 3 Inches and Under:
- 1. Ferrous Pipe: Class 150 malleable iron threaded unions.
- PIPE HANGERS AND SUPPORTS A. Provide hangers and supports that comply with MSS SP-58. 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations. 2. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
 - a. Bases: High density polypropylene. b. Base Sizes: As required to distribute load sufficiently to
 - prevent indentation of roofing assembly. c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports: corrosion resistant material.
- e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing. BALL VALVES
- A. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port. Teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder, threaded, or grooved ends with union.
- STRAINERS A. Size 2 inch and Under:
- 1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen. 2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen. LINE PRESSURE REGULATORS AND APPLIANCE REGULATORS
- CATORS A. Compliance Requirements:
- Appliance Regulator: ANSI Z21.18/CSA 6.3. Line Pressure Regulator: ANSI Z21.80/CSA 6.22.
- B. Materials in Contact With Gas:
- Housing: Aluminum, steel (free of non-ferrous metals). Seals and Diaphragms: NBR-based rubber.
- C. Maximum Inlet Operating Pressure: 5 psi.
- 3 EXECUTION INSTALLATION
- A. Install in accordance with manufacturer's instructions. B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to equipment and walls.
- C. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. D. Prepare exposed, unfinished pipe, fittings, supports, and accessories
- ready for finish painting. E. Install valves with stems upright or horizontal, not inverted.
- F. Pipe Hangers and Supports:
- 1. Install in accordance with ASME B31.9. 3 33 00 - AIR DUCT ACCESSORIES
- 1 GENERAL
- SECTION INCLUDES A. Air turning devices/extractors.
- B. Duct access doors.
- C. Duct test holes. Flexible duct connection
- Volume control dampers.
- F. Miscellaneous products: 1. Duct opening closure film.
- SUBMITTALS A. Refer to Division 01 requirements.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements. C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers. D. Project Record Drawings: Record actual locations of access doors and
- test holes. E. Maintenance Materials: Furnish the following for Owner's use in
- maintenance of project. 1. Extra Fusible Links: Two of each type and size. QUALITY ASSURANCE
- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated
- DELIVERY, STORAGE, AND HANDLING A. Protect dampers from damage to operating linkages and blades. 2 PRODUCTS
- AIR TURNING DEVICES/EXTRACTORS A. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.
- DUCT ACCESS DOORS A. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and guick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
- DUCT TEST HOLES A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps. B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.
- FLEXIBLE DUCT CONNECTIONS A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip. VOLUME CONTROL DAMPERS A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Single Blade Dampers: C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime
- coated or galvanized channel frame with suitable hardware. D. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings. E. Quadrants:
- Provide locking, indicating quadrant regulators on single and multiblade dampers 2. On insulated ducts mount quadrant regulators on stand-off mounting
- brackets, bases, or adapters 3. Where rod lengths exceed 30 inches provide regulator at both ends. MISCELLANEOUS PRODUCTS A. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep
- debris out of ducts during construction.
- 1. Thickness: 2 mils. 2. High tack water based adhesive.
- 3. UV stable light blue color.
- 4. Elongation Before Break: 325 percent, minimum. 3 EXECUTION
- PREPARATION A. Verify that electric power is available and of the correct characteristics.
- INSTALLATION A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 31 00 for duct construction and pressure class.
- B. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 8 by 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch for
- balancing dampers only. Review locations prior to fabrication. C. Provide duct test holes where indicated and required for testing and balancing purposes D. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- E. At equipment supported by vibration isolators, provide flexible duo connections immediately adjacent to the equipment. F. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air
- balancing. Install minimum 2 duct widths from duct take-off. G. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly. C. Provide duct test holes where indicated and required for testing and
- balancing purposes. D. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment. E. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- F. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off. G. Provide balancing dampers on duct take-off to diffusers, grilles, and

registers, regardless of whether dampers are specified as part of the diffuser,

grille, or register assembly

- SECTION 232300 REFRIGERANT PIPING PART 1 GENERAL
- 1.1 SECTION INCLUDES A. Piping.
- B. Refrigerant. 1.2 REFERENCE STANDARDS
- A. ASHRAE Std 15 Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants; 2019.
- ASME B31.5 Refrigeration Piping and Heat Transfer Components; 2020. ASME B31.9 - Building Services Piping: 2017. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2020.
- 1.3 SYSTEM DESCRIPTION A. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
- B. Provide piping accessories and specialties as recommended and required by the refrigeration equipment manufacturer. 1.4 SUBMITTALS
- A. See Section 013000 Administrative Requirements, for submittal procedures B. Shop Drawings: Indicate schematic layout of system, including
- equipment, critical dimensions, and sizes. Test Reports: Indicate results of leak test, acid test.
- Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings REGULATORY REQUIREMENTS
- A. Conform to ASME B31.9 for installation of piping system. B. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.
- 1.6 DELIVERY, STORAGE, AND HANDLING A. Deliver and store piping and specialties in shipping containers with
- labeling in place. B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation. C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.
- PART 2 PRODUCTS 2.1 PIPING
- A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
- Fittings: ASME B16.22 wrought copper. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper allov
- B. Pipe Supports and Anchors: Provide hangers and supports that comply with MSS SP-58. a. If type of hanger or support for a particular situation is not
- indicated, select appropriate type using MSS SP-58 recommendations Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Malleable
- iron adjustable swivel, split ring. 3. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adiustable, clevis,
- 4. Wall Support for Pipe Sizes to 3 Inches (75 mm): Cast iron hook. Vertical Support: Steel riser clamp. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- 8. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods. 9. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support
- fixtures as specified: and as follows: a. Bases: High density, UV tolerant, polypropylene or reinforced PVC.
- b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
- c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M
- Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers
- and supports; corrosion resistant material. e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.
- 2.2 REFRIGERANT
- Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50. 2.3 MOISTURE AND LIQUID INDICATORS
- A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable
- element cartridge and plastic cap; for maximum temperature of 200 degrees F (93 degrees C) and maximum working pressure of 500 psi (3450 kPa). PART 3 EXECUTION 3.1 PREPARATION
- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe. Remove scale and dirt on inside and outside before assembly. Prepare piping connections to equipment with flanges or unions. 3.2 INSTALLATION
- A. Install refrigeration specialties in accordance with manufacturer's instructions
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient. C. Install piping to conserve building space and avoid interference with use of
- D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

finished covering and adjacent work.

independently of connected horizontal piping.

elevation, provide multiple or trapeze hangers.

H. Flood piping system with nitrogen when brazing.

K. Fully charge completed system with refrigerant after testing.

B. Test refrigeration system in accordance with ASME B31.5.

and for disposal of refrigeran

leak detector. Test to no leakage.

3.3 FIELD QUALITY CONTROL

- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Pipe Hangers and Supports: Install in accordance with ASME B31.5 Install hangers to provide minimum 1/2 inch (13 mm) space between

3. Place hangers within 12 inches (300 mm) of each horizontal elbow.

4. Support vertical piping at every other floor. Support riser piping

5. Where several pipes can be installed in parallel and at same

6. Provide copper plated hangers and supports for copper piping.

Provide clearance for installation of insulation and access to valves and

Follow ASHRAE Std 15 procedures for charging and purging of systems

Provide replaceable cartridge filter-driers, with isolation valves and valved

Provide electrical connection to solenoid valves. Refer to Section 260583.

A. See Section 014000 - Quality Requirements, for additional requirements.

C. Pressure test system with dry nitrogen to 200 psi (1380 kPa). Perform

final tests at 27 inches (92 kPa) vacuum and 200 psi (1380 kPa) using electronic



Daniel Morgar Middle Schoo

48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMENT



ENERGY BY DESIGN 2677 PROSPERITY AVE. SUITE 275 FAIRFAX, VA 22031 T) 703.718.4355 2RW.com

> KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703.771.3362





SPECIFICATIONS

SECTION 23 63 13 - AIR COOLED REFRIGERANT CONDENSERS PART 1 GENERAL

1.1 SECTION INCLUDES A. Manufactured units.

- B. Casing.
- C. Condenser coils.
- D. Fans and motors.
- E. Controls. 1.2 REFERENCE STANDARDS

2013.

- A. AHRI 210/240 Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment 2008, Including All Addenda.
- B. ASHRAE Std 15 Safety Standard for Refrigeration Systems C. ASHRAE Std 20 - Methods of Testing for Rating Remote
- Mechanical-Draft Air-Cooled Refrigerant Condensers 1997 (R2006), with Errata 2014. D. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except
- Low-Rise Residential Buildings Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements. E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts
- Maximum) 2014. F. NEMA MG 1 - Motors and Generators 2021. G. UL 207 - Standard for Refrigerant-Containing Components and
- Accessories, Nonelectrical Current Edition, Including All Revisions. 1.3 SUBMITTALS
- A. Refer to Division 01 requirements. B. Product Data: Provide rated capacities, weights, accessories,
- electrical requirements, and wiring diagrams. C. Shop Drawings: Indicate components, assembly, dimensions, weights and loading, required clearances, and location and size of field connections. Include schematic layouts showing condenser, refrigeration compressors, cooling coils, refrigerant piping and accessories required for complete system.
- D. Manufacturer's Instructions: Submit manufacturer's complete installation instructions. E. Operation and Maintenance Data: Include start-up instructions, maintenance instructions, parts lists, controls, and accessories. F. Warranty Documentation: Submit manufacturer warranty and
- ensure that forms have been completed in Owner's name and registered with manufacturer. G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
- See Division 01 requirements. Extra Fan Belts: One set for each unit. 1.4 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified
- and indicated. 1.5 DELIVERY, STORAGE, AND HANDLING A. Comply with manufacturer's installation instruction for rigging,
- unloading and transporting units. B. Protect units on site from physical damage. Protect coils.
- PART 2 PRODUCTS 2.1 MANUFACTURERS
- A. Carrier (Basis of Design) B. Trane

2.3 CASING

- C. Daikin/McQuay. D. Project is based on the specified equipment. Any re-engineering or installation costs associated with using alternate manufacturer's equipment shall be borne by the installing contractor. E. Any proposed substitutions from basis of design shall be
- communicated during the bid process for review/approval. 2.2 MANUFACTURED UNITS A. Provide packaged, factory assembled, pre-wired unit, suitable for outdoor use consisting of casing, condensing coil and fans, integral sub-cooling coil liquid accumulator. B. Construction and Ratings: In accordance with AHRI 210/240
- and UL 207. Testing shall be in accordance with ASHRAE Std 20. C. Performance Ratings: Energy Efficient Rating (EER)/Coefficient of Performance (COP) not less than prescribed by ASHRAE Std 90.1 I-P, in combination with compressor units. D. Refrigerant: Use only refrigerants that have ozone depletion
- potential (ODP) of zero and global warming potential (GWP) of less
- A. House components in welded steel frame with steel panels with weather resistant, baked enamel finish. B. Mount starters, disconnects, and controls in weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened. C. Provide removable access doors or panels with guick fasteners.
- 2.4 CONDENSER COILS A. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Provide sub-cooling circuits. Air test under water to 425 psig, and vacuum dehydrate. Seal with holding charge of nitrogen. B. Coil Guard: Expanded metal with lint screens. C. Configuration: Single refrigeration circuit with receiver.
- 2.5 FANS AND MOTORS A. Vertical discharge direct driven propeller type condenser fans with fan guard on discharge, equipped with roller or ball bearings with grease fittings extended to outside of casing. B. Weatherproof motors suitable for outdoor use, single phase permanent split capacitor or 3 phase, with permanent lubricated ball bearings and built-in current and thermal overload protection; refer to
- Section 23 05 13. 2.6 CONTROLS A. Provide factory wired and mounted control panel, NEMA 250, containing fan motor starters, fan cycling thermostats, compressor interlock, and control transformer.
- B. Provide controls to permit operation down to 0 degrees F ambient temperature. C. Provide thermostat to cycle fan motors in response to outdoor
- ambient temperature. D. Provide head pressure switch to cycle fan motors in response to refrigerant condensing pressure.
- E. Provide solid state control to vary speed of one condenser fan motor in response to refrigerant condensing pressure. F. Provide electronic low ambient control consisting of mixing
- damper assembly, controlled to maintain constant refrigerant condensing pressure. PART 3 EXECUTION
- 3.1 INSTALLATION A. Install in accordance with manufacturer's instructions.
- B. Provide cooling season start-up, winter season shut-down service, for first year of operation. C. Shut-down system if initial start-up and testing takes place in winter and machines are to remain inoperative. Repeat start-up and testing operation at beginning of first cooling season.
- 3.2 SCHEDULES A. Refer to Drawings.

- UNITS PART 1 GENERAL
- 1.1 SECTION INCLUDES A. Modular roof top unit.
- B. Unit controls. C. Roof mounting curb and base.
- 1.2 PERFORMANCE REQUIREMENTS A. Refer to drawing schedule.
- 1.3 SUBMITTALS A. Refer to Division 01 requirements.
- B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- C. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- D. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions. E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and
- repair data, and parts listing. F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer. G. Maintenance Materials: Furnish the following for Owner's use in
- maintenance of project. 1. Extra Filters: One set for each unit.
- 1.4 QUALITY ASSURANCE A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with documented experience. B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- 1.5 DELIVERY, STORAGE, AND HANDLING A. Protect units from physical damage by storing off site until roof mounting curbs are in place, ready for immediate installation of units.
- 1.6 WARRANTY A. Warranty period shall begin at Date of Substantial Completion. B. Provide three year warranty to include coverage for refrigeration compressors.
- PART 2 PRODUCTS 2.1 MANUFACTURERS
- A. Carrier (basis of design)
- Trane Daikin/McQuay.
- D. Project is based on the specified equipment. Any re-engineering or installation costs associated with using alternate manufacturer's equipment shall be borne by the installing contractor. E. Any proposed substitution from the Basis of Design shall be
- communicated during the Bid process for review/approval. 2.2 MODULAR ROOFTOP UNITS
- A. General 1. The units shall be downflow, horizontal, or mixed airflow. The operating range shall be between 115F and 0F in cooling as standard from the factory for all units.
- 2. Cooling performance shall be rated in accordance with ARI testing procedures. 3. All units shall be factory assembled, internally wired, fully charged with R-410A refrigerant and 100% run tested to check cooling operation, fan and blower rotation and control sequence before leaving the factory.
- 4. Wiring internal to the unit shall be numbered for simplified identification. 5. Units shall be UL listed to U.S. and Canadian safety standards. B. Evaporator Coils
- Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave
- 2. All coils shall be leak tested at the factory to ensure pressure integrity. The evaporator coil shall be pressure tested to 450 psig and the condenser coil at 650 psig. 3. All dual circuit evaporator coils shall be of intertwined row split
- configuration (dual circuit). 4. Condensate drain pans shall be sloped. D. Refrigerant Circuits
- 1. Each refrigerant circuit shall have independent thermostatic expansion devices, service pressure ports and refrigerant line filter driers factory-installed as standard. 2. An area shall be provided for replacement suction line driers.
- E. Air Filters 1. Provide 2-inch high efficiency MERV 8 filters.
- Indoor Fan, 60 Hz Supply Motor
- 1. Unit shall have ECM direct driven, forward curve, centrifugal fans that are statically and dynamically balanced. 2. The supply fan motors shall be circuit breaker protected. All 60 Hz supply fan motors shall meet the Energy Independence and Security Act of 2009 (EISA).
- G. Gas Burner 1. Gas Burner: Forced draft type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100
- percent shut-off pilot. 2. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven and slight delay, allow gas valve to open. 3. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive bonnet
- temperature and energize burner when temperature drops to lower safe value. H. Outdoor Fans 1. The outdoor fan shall be direct-drive statically and dynamically balanced, draw through in the vertical discharge position.
- 2. The fan motors shall be permanently lubricated and have built-in thermal overload protection. 2.3 CONTROLS A. All controls shall be furnished by the manufacturer of the equipment for
- factory mounting and wiring. The controls shall be capable of achieving the sequence of operations as programmed/desired by WPS to match existing system operation.
- B. All controls shall be coordinated for connection to the respective existing to remain BAS systems for the building. PART 3 EXECUTION
- 3.1 EXAMINATION A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings. B. Verify that proper power supply is available.
- 3.2 INSTALLATION
- A. Install in accordance with manufacturer's instructions. 3.3 MANUFACTURER'S FIELD SERVICES
- A. Provide the services of the equipment manufacturer technician or factory trained authorized equipment mechanic/ technician for starting and testing unit. B. The equipment manufacturer technician or factory trained authorized equipment mechanic/ technician.shall provide start-up and instruction for each unit. The manufacturer may dispatch factory-trained technicians in the direct employ of the manufacturer's local authorized representative for field services as specified herein. C. Start-up and instruction shall cover all components assembled and furnished by the manufacturer whether or not of his own manufacture.
- 3.4 CLOSEOUT ACTIVITIES A. Demonstrate operation to Owner's maintenance personnel.
- 3.5 SCHEDULES A. Refer to the drawings.

- SECTION 23 73 13 MODULAR OUTDOOR CENTRAL-STATION AIR-HANDLING SECTION 23 74 13 PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS PART 1 GENERAL
 - 1.1 SECTION INCLUDES A. Packaged roof top unit.
 - B. Unit controls. Roof mounting curb and base. 1.2 PERFORMANCE REQUIREMENTS
 - A. Refer to drawing schedule.
 - 1.3 SUBMITTALS A. Refer to Division 01 requirements. B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections. C. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections. D. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions. E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing. F. Warranty: Submit manufacturer's warranty and ensure forms
 - have been filled out in Owner's name and registered with manufacturer. G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project. 1. Extra Filters: One set for each unit.
 - 1.4 QUALITY ASSURANCE A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with documented experience. B. Products Requiring Electrical Connection: Listed and
 - classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
 - 1.5 DELIVERY, STORAGE, AND HANDLING A. Protect units from physical damage by storing off site until roof
 - mounting curbs are in place, ready for immediate installation of units. 1.6 WARRANTY A. Warranty period shall begin at Date of Substantial Completion.
 - B. Provide three year warranty to include coverage for refrigeration compressors.
 - PART 2 PRODUCTS 2.1 MANUFACTURERS
 - Carrier (basis of design) Trane
 - Daikin/McQuay. Project is based on the specified equipment. Any reengineering or installation costs associated with using alternate
 - manufacturer's equipment shall be borne by the installing contractor. E. Any proposed substitution from the Basis of Design shall be communicated during the Bid process for review/approval. 2.2 PACKAGED ROOFTOP UNITS A. General
 - 1. The units shall be downflow, horizontal, or mixed airflow . The operating range shall be between 115F and 0F in cooling as standard from the factory for all units. 2. Cooling performance shall be rated in accordance with ARI testing procedures.
 - 3. All units shall be factory assembled, internally wired, fully charged with R-410A refrigerant and 100% run tested to check cooling operation, fan and blower rotation and control sequence before leaving the factory. Wiring internal to the unit shall be numbered for simplified identification.
 - 5. Units shall be UL listed to U.S. and Canadian safety standards.
 - Compressors 1. Compressors shall be direct-drive scroll type, 3600 rpm, suction gas cooled hermetic motor. Dependent on the compressor model, motor protection shall be provided by either a patented motor cap and integral line break motor protector or an external 24 VAC module which provides protection against incorrect phase sequence, excess motor temperatures, over current protection, and phase loss. 2. Compressor shall include centrifugal oil pump, scroll tips seals, internal heat shield that lowers the heat transfer from discharge and suction gas, oil level sight glass and oil charge
 - valve. 3. Some compressor models also provide a dip tube that allow s for oil draining, in addition to a low leakage internal discharge check valve to help prevent refrigerant migration. 4. Each compressor shall have a crankcase heater installed, properly sized to minimize the amount of liquid

2. Evaporator coils shall be internally finned copper tubes

3. All coils shall be leak tested at the factory to ensure

mechanically bonded to high performance aluminum plate fins.

pressure integrity. The evaporator coil shall be pressure tested

4. All dual circuit evaporator coils shall be of intermingled

Each refrigerant circuit shall have independent

refrigerant line filter driers factory-installed as standard.

Provide 2-inch high efficiency MERV 8 filters.

Unit shall have ECM direct driven, forward curve,

centrifugal fans that are statically and dynamically balanced. The supply fan motors shall be circuit breaker protected.

All 60 Hz supply fan motors shall meet the Energy

combustion air supply, pressure regulator, gas valves, manual

shut-off, intermittent spark or glow coil ignition, flame sensing

2. Gas Burner Safety Controls: Energize ignition, limit time for

establishment of flame, prevent opening of gas valve until pilot

blower motor, and after air flow proven and slight delay, allow

3. High Limit Control: Temperature sensor with fixed stop at

maximum permissible setting, de-energize burner on

temperature drops to lower safe value.

have built-in thermal overload protection.

capable of achieving the sequence of operations as

excessive bonnet temperature and energize burner when

1. The outdoor fan shall be direct-drive statically and

dynamically balanced, draw through in the vertical discharge

2. The fan motors shall be permanently lubricated and

A. All controls shall be furnished by the manufacturer of the

equipment for factory mounting and wiring. The controls shall be

programmed/desired by WPS to match existing system operation. B. All controls shall be coordinated for connection to the respective existing to remain BAS systems for the building.

A. Verify that roof is ready to receive work and opening

A. Install in accordance with manufacturer's instructions.

A. Provide the services of the equipment manufacturer technician or factory trained authorized equipment mechanic/ technician for

and instruction for each unit. The manufacturer may dispatch factorytrained technicians in the direct employ of the manufacturer's local authorized representative for field services as specified herein. C. Start-up and instruction shall cover all components assembled and furnished by the manufacturer whether or not of his own

B. The equipment manufacturer technician or factory trained authorized equipment mechanic/ technician.shall provide start-up

A. Demonstrate operation to Owner's maintenance personnel.

dimensions are as indicated on shop drawings. B. Verify that proper power supply is available.

3.3 MANUFACTURER'S FIELD SERVICES

starting and testing unit.

flame is proven, stop gas flow on ignition failure, energize

1. Gas Burner: Forced draft type burner with adjustable

Independence and Security Act of 2009 (EISA).

device, and automatic 100 percent shut-off pilot.

thermostatic expansion devices, service pressure ports and

2. An area shall be provided for replacement suction line

refrigerant present in the oil sump during off cycles. Evaporator and Condenser Coils Condenser coils shall have all aluminum micro-channel coils.

to 450 psig and the condenser coil at 650 psig.

Condensate drain pans shall be sloped.

configuration.

driers.

Air Filters

Gas Burner

gas valve to open.

H. Outdoor Fans

2.3 CONTROLS

PART 3 EXECUTION 3.1 EXAMINATION

3.2 INSTALLATION

manufacture.

3.5 SCHEDULES

3.4 CLOSEOUT ACTIVITIES

A. Refer to the drawings.

Refrigerant Circuits

Indoor Fan, 60 Hz Supply Motor

D.

E.



Daniel Morgan Middle School

48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMEN



ENERGY BY DESIGN 2677 PROSPERITY AVE. SUITE 275 FAIRFAX, VA 22031 T) 703.718.4355 2RW.com

> KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703.771.3362

LINTON ENGINEERING 46090 LAKE CENTER PLAZA, SUITE 309 POTOMAC FALLS, VA 20165 571.323.0320





. ____ . ____ . ____ . ____ . ____ -----==== └╶<u>ु</u>=<u></u>_<u></u> M-102 _ . ___ . ___ . ___ . ___ . PARTIAL ROOF DEMOLITION PLAN - AREAS 5 & 6 - HVAC -- M-102 SCALE: 3/32" = 1'-0"



ENLARGED ROOF DEMOLITION PLAN - RTU-1 & COND. - HVAC

GENERAL NOTES (DEMO)

- 1. REMOVE ALL DASHED EQUIPMENT, SUPPORTS, AND ALL RELATED ACCESSORIES.
- 2. REMOVE ALL DASHED DUCTWORK, CONNECTORS, SUPPORTS AND ALL RELATED ACCESSORIES.
- 3. REMOVE ALL DASHED PIPING, SUPPORTS, AND ALL RELATED ACCESSORIES.
- 4. FIELD VERIFY EXISTING CONDITIONS AND BRING ANY DISCREPANCIES TO THE DESIGN TEAM'S NOTICE IMMEDIATELY. EXISTING LAYOUT IS BASED ON NON-INTRUSIVE FIELD SURVEY AND ASSUMPTIONS. VERIFY ACTUAL LAYOUT PRIOR TO CONNECTION OR DISCONNECTION.
- 5. CONTRACTOR SHALL TAKE CARE TO SALVAGE ANY EXISTING EQUIPMENT AND CONTROLS FOR REUSE AS SHOWN OR HAND THEM OVER TO THE OWNER.
- 6. COORDINATE WITH ARCHITECT AND STRUCTURAL ENGINEER FOR PATCHWORK, REPAIR WORK WHERE APPLICABLE. REFER TO ARCHITECTURAL, STRUCTURAL DRAWINGS AND SPECIFICATIONS FOR MORE INFORMATION.
- 7. PRIOR TO COMMENCING DEMOLITION, PRE-CONSTRUCTION TESTING, ADJUSTING AND BALANCING (TAB) AIRFLOW READINGS SHALL BE TAKEN AT ALL SUPPLY AND RETURN DIFFUSERS WITHIN AREAS OF WORK. SUBMIT PRE-CONSTRUCTION TAB REPORT TO THE A/E FOR REVIEW.
- 8. PRIOR TO DEMOLITION, CONTRACTOR SHALL ARRANGE A MEETING WITH THE WINCHESTER CITY FIRE MARSHALL TO REVIEW SCOPE OF WORK, AND FIRE SAFETY PRECAUTIONS REQUIRED FOR OCCUPIED SCHOOL BUILDING AND CONTRACTOR AREA.
- 9. THE WORK TO BE PERFORMED SHALL CONSIST PROVIDING ALL LABOR, EQUIPMENT, AND MATERIALS NECESSARY TO SERVICE TO REPLACE ROOF TOP MECHANICAL UNITS AT DANIEL MORGAN MIDDLE SCHOOL. ARCHITECTURAL CEILING REMOVAL/REINSTALLATION FOR REQUIRED STRUCTURAL REINFORCEMENT AND REPAIRS/MODIFICATIONS TO EXISTING ROOF/BUILDING SHALL BE COMPLETED BY OWNER-CONTRACTED VENDOR. THE SELECTED CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MECHANICAL, ELECTRICAL, AND STRUCTURAL WORK ASSOCIATED WITH THE REPLACEMENT OF THE ROOF TOP UNITS, AND COORDINATING WITH OTHER OWNER-CONTRACTED VENDORS FOR ASSOCIATED WORK, INCLUDING DRYWALL, PAINTING, CEILING REPLACEMENT, AND ROOF PATCHING.

I KEY NOTES (DEMO)

- 1. DEMOLISH EXISTING RTU-1 ALONG WITH ALL ASSOCIATED DUCTWORK, SUPPORTS, ROOF CURB, PIPING, AND ALL RELATED ACCESSORIES TO THE LIMITS OF DEMOLITION SHOWN. PREPARE LOCATION TO RECIEVE NEW RTU.
- 2. DEMOLISH EXISTING CU-1 ALONG WITH ALL ASSOCIATED PIPING, SUPPORTS, ROOF CURB AND ACCESSORIES TO THE LIMITS OF DEMOLITION SHOWN. PREPARE LOCATION TO RECEIVE NEW CU.
- 3. DEMOLISH EXISTING RTU-2 ALONG WITH ALL ASSOCIATED DUCTWORK, SUPPORTS, ROOF CURB, PIPING, AND ALL RELATED ACCESSORIES TO THE LIMITS OF DEMOLITION SHOWN. PREPARE LOCATION TO RECIEVE NEW RTU.
- 4. DEMOLISH EXISTING RTU-3 ALONG WITH ALL ASSOCIATED DUCTWORK, SUPPORTS, ROOF CURB, PIPING, AND ALL RELATED ACCESSORIES TO THE LIMITS OF DEMOLITION SHOWN. PREPARE LOCATION TO RECIEVE NEW RTU.
- 5. DEMOLISH EXISTING EXTERIOR DUCTWORK TO THE LIMITS OF DEMOLITION SHOWN. PREPARE DUCTWORK WALL OR ROOF PENETRATIONS FOR RECONNECTION TO NEW EXTERIOR DUCTWORK.
- 6. EXISTING GAS PRV SHALL REMAIN. DEMOLISH GAS PIPING ASSOCIATED WITH RTU UP TO POINT OF CONNECTION TO DOWNSTREAM OF PRV.
- 7. DEMOLISH GAS PIPING ASSOCIATED WITH RTU TO THE LIMITS OF DEMOLITION SHOWN. DEMOLISH EXISTING GAS PRV. CAP PIPE AT POINT OF DEMOLITION.





ENLARGED ROOF DEMOLITION PLAN - RTU-2 - HVAC

0 1' 2' 4' 8'

0 1' 2' 4' 8'

_ _ _ _

5

4

L_____

2

7



Daniel Morgan Middle School

48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMENT



ENERGY BY DESIGN 2677 PROSPERITY AVE. SUITE 275 FAIRFAX, VA 22031 T) 703.718.4355 2RW.com

> KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703.771.3362



2 M-202 PARTIAL ROOF NEW WORK PLAN - AREAS 5 & 6 - HVAC -- M-202 SCALE: 3/32" = 1'-0" 0 3' 5.3' 11' 21'





3 M-202 M-202 SCALE: 1/4" = 1'-0"

GENERAL NOTES (NEW WORK)

- 1. ENSURE EDGE OF EQUIPMENT IS A MINIMUM OF 10'-0" FROM EDGE OF ROOF.
- 2. CONTRACTOR SHALL CONFIRM AIR BALANCE FOR ALL EXISTING HVAC SYSTEMS.
- 3. CONTRACTOR SHALL COORDINATE NEW DUCTWORK LAYOUT AND DUCT CONNECTIONS TO EXISTING WITH EXISTING STRUCTURE, AND OTHER TRADES. COORDINATE ANY ADJUSTMENTS TO STRUCTURE WITH ARCHITECT/STRUCTURAL ENGNEER, AS NEEDED.
- 4. COORDINATE DUCT FLOOR, WALL, ROOF PENETRATIONS FOR FPME BASED ON EXISTING STRUCTURE. REFER TO DESIGN TEAM
- 5. RECOMMENDATIONS FOR ANY REQUIRED ADJUSTMENTS MUST BE SUBMITTED FOR DESIGN TEAM'S APPROVAL IN A TIMELY MANNER
- 6. PROVIDE ACCESS PANELS FOR FIRE-DAMPERS WHERE NEEDED. COORDINATE DIMENSIONS AND LOCATIONS WITH ARCHITECT.
- 7. FIELD VERIFY EXISTING CONDITIONS AND BRING ANY DISCREPANCIES TO THE DESIGN TEAM'S NOTICE IMMEDIATELY.
- 8. THE WORK TO BE PERFORMED SHALL CONSIST PROVIDING ALL LABOR, EQUIPMENT, AND MATERIALS NECESSARY TO SERVICE TO REPLACE ROOF TOP MECHANICAL UNITS AT DANIEL MORGAN REMOVAL/REINSTALLATION FOR REQUIRED STRUCTURAL REINFORCEMENT AND REPAIRS/MODIFICATIONS TO EXISTING ROOF/BUILDING SHALL BE COMPLETED BY OWNER-CONTRACTED VENDOR. THE SELECTED CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MECHANICAL, ELECTRICAL, AND STRUCTURAL WORK ASSOCIATED WITH THE REPLACEMENT OF THE ROOF TOP UNITS, AND COORDINATING WITH OTHER OWNER-CONTRACTED VENDORS FOR ASSOCIATED WORK, INCLUDING DRYWALL, PAINTING, CEILING

- 1. INSTALL NEW RTU ON FACTORY SUPPLIED PRE-MANUFACTURED STANDARD OR CUSTOM ROOF CURB. REFER TO ARCHITECTURAL DRAWINGS FOR ROOF CURB FLASHING DETAILS AND OTHER INFORMATION. RECONNECT CONDENSATE DRAIN TO EXISTING
- 2. VERIFY IN FIELD LOCATION OF DEMOLISHED RTU MADE READY
- 5. REUSE EXISTING DUCTWORK PENETRATIONS. CONNECT NEW EXTERIOR DUCTWORK TO EXISTING INTERIOR DUCTWORK AND MAKE REQUIRED DUCT TRANSITIONS AS NEEDED TO MEET EXISTING DUCT OPENINGS. PATCH AND SEAL OPENINGS



Daniel Morgan Middle School

48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMENT



ENERGY BY DESIGN 2677 PROSPERITY AVE. SUITE 275 FAIRFAX, VA 22031 T) 703.718.4355 2RW.com

> KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703.771.3362

LINTON ENGINEERING 46090 LAKE CENTER PLAZA, SUITE 309 POTOMAC FALLS, VA 20165 571.323.0320







Daniel Morgan Middle School

48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMENT



ENERGY BY DESIGN 2677 PROSPERITY AVE. SUITE 275 FAIRFAX, VA 22031 T) 703.718.4355 2RW.com

> KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703.771.3362







23 8126: SPLIT SYSTEM AIR HANDLER SCHEDULE (BASIS OF DESIGN)

		NOM.	PERFORM
MARK	SERVICE	TONS	MIN EER
RTU-1	AUDITORIUM	60	SEE CU SCHEDULE BELO
NOTES:			
1.	DESIGN AND PER	RFORMANCE	BASED ON CARRIER.
2.	COOLING PERFO	RMANCE BA	SED ON 95°F/78°F DB/WB AMBIE
3.	UNITS SHALL US	E ONLY R410	A HFC REFRIGERANTS.
4.	PROVIDE SUPPLY	Y FAN (AND E	EXHAUST FAN WHERE APPLICA
5.	PROVIDE VARIAE	BLE SPEED C	OMPRESSOR, WHERE AVAILAB
6.	PROVIDE CONDE	NSATE DRAI	N SIZED TO MATCH DRAIN PAN
7.	PROVIDE SINGLE	-POINT POW	ER CONNECTION, AND ALL NE
8.	DDC CONTROLS	COMPLETE V	WITH TXV, AND FREEZESTAT S
9.	PROVIDE ALUMIN	NUM BIRD SC	REEN ON OUTDOOR AIR INTAK
10.	PROVIDE FLEXIB	LE DUCT COI	NNECTORS AT ALL DUCT CONN
11.	PROVIDE CONDE	NSER COIL H	HAIL GUARDS.
12.	PROVIDE LOW LE	EAKAGE MOT	ORIZED OUTSIDE AIR , RETUR
10			

- 14. PROVIDE MANUFACTURER'S PREFABRICATED FULL UNIT SUPPORTING ROOF CURB.

23 7413: PACKAGED ROOFTOP UNIT SCHEDULE (BASIS OF DESIGN)

		NOM.	
MARK	SERVICE	TONS	N
RTU-2	STAGE	7.5	1
RTU-3	CLASSROOMS	15	1
<u>NOTES:</u>			
1.	DESIGN AND PER	RFORMANCE	BASE
2.	COOLING PERFO	RMANCE BAS	SED C
3.	UNITS SHALL USI	E ONLY R410	A HFC
4.	PROVIDE SUPPLY	Y FAN (AND E	XHAL
5.	RTU-3: PROVIDE	POWERED E	XHAU
6.	PROVIDE VARIAE	BLE SPEED DI	GITA
7.	PROVIDE CONDE	NSATE DRAI	N SIZ
8.	RTU-3: PROVIDE	CONTROLS F	
9.	PROVIDE SINGLE	-POINT POW	ER C
10.	RTU-2, 3: DDC CC	ONTROLS CO	MPLE
11.	RTU-2,3: PROVID	E 0-100% EC0	NONC
12.	PROVIDE ALUMIN	IUM BIRD SC	REEN
13.	PROVIDE FLEXIB	LE DUCT COI	NNEC
14.	PROVIDE CONDE	INSER COIL H	HAIL O
15.	PROVIDE LOW LE	EAKAGE MOT	ORIZ
16.	DESIGN OA CFM	SCHEDULED	IS T⊢
17.	PROVIDE MANUF	ACTURER'S I	PREF
1			

23 3100: DUCT & INSULATION SCHEDULE

		PRESSURE		INSULATION										
LOCATION	MATERIAL	CLASS IN. MC	TYPE	THICKNESS,IN	JACKET									
EXTERIOR	GALV	2	VINYL-CLADDING	2	ALUMINUM									
EXTERIOR	GALV	2	VINYL-CLADDING	2	ALUMINUM									
	LOCATION EXTERIOR EXTERIOR	LOCATIONMATERIALEXTERIORGALVEXTERIORGALV	CT & INSOLATION SCILDULLLOCATIONMATERIALEXTERIORGALVEXTERIORGALV2	CT & THOOLATION SCITLIDULLLOCATIONMATERIALPRESSURE CLASS IN. MCTYPEEXTERIORGALV2VINYL-CLADDINGEXTERIORGALV2VINYL-CLADDING	CT & THOOLATION SCITL/DOLLPRESSUREINSULATIONLOCATIONMATERIALCLASS IN. MCTYPEEXTERIORGALV2VINYL-CLADDING2EXTERIORGALV2VINYL-CLADDING2									

23 2113/2300: PI SYSTEM

REFRIGERANT PIPING CONDENSATE PIPING GAS PIPING

NOTES:

1. ALL DUCT - PROVIDE DUCT PRESSURE CLASS IN ACCORDANCE WITH EQUIPMENT SCHEDULES AND ASSOCIATE SMACNA RECOMMENDATIONS. SPECIAL ATTENTION SHALL BE PAID DURING TESTING, ADJUSTING, AND BALANCING TO ENSURE ENTIRE DUCTWORK SYSTEM IS INSTALLED AND OPERATIONAL PRIOR TO START-UP OF EQUIPMENT.

2. ALL EXTERIOR DUCTWORK SHALL BE PRE-FABRICATED WITH INSULATION AND VINYL CLADDING. BOD: THERMADUCT OR EQUIVALENT. 3. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

73	CHEDUL																											
NCE			S	UPPLY FA	N		VENTILA	TION		DX	COOLING COIL	_	NATURAL GAS HEATING					FILTERS ELECTRICAL			MAX	DIMENSI	ONS	TTL WEIGHT				
	MIN GAS	MAX	MIN	ESP, IN			DESIGN OA	MIN OA	TOTAL	SENS	DESIGN EAT	DESIGN LAT	MAX INPUT	MAX OUTPUT		DESIGN EAT	DESIGN LAT	STAGES/MAX	MA, IN	V-PH	MCA	MOP	LENGTH	WIDTH	HEIGHT	(INCL. CURB)		
	EFFICIENCY %	CFM	CFM	WC	QTY	HP	CFM	CFM	MBH	MBH	DB/WB °F	DB/WB °F	MBH	MBH	HEATING CFM	DB °F	DB °F	TURN DOWN	(MERV-13)				IN	IN	IN	LBS.	MFR	MODEL NUMBER
/	80.0	14350	4938	2.50	3	5.8	6460	4938	693.0	446.0	84.0/70.1	55.6/55.1	500	400	7500	36.2	85.6	10:1	2	460-3	34.3	50	257	113	76	6,770	CARRIER	39MW30WMXB

BIENT, 75°F/61.7°F DB/WB RETURN TEMPERATURES, AND NET OPERATING CAPACITIES. HEATING PERFORMANCE BASED ON 15°F DB AMBIENT, 75°F DB RETURN TEMPERATURE AND NET OPERATING CAPACITIES. IEER/EER BASED ON ARI/AHRI CONDITIONS.

ABLE) COMPLETE WITH VARIABLE FREQUENCY DRIVES.

ABLE. AT LEAST ONE COMPRESSOR SHALL BE DIGITAL OR INVERTER RATED. UNITS SHALL HAVE CONTROLS FOR LOW AMBIENT OPERATION TO 0°F. PROVIDE CRANKCASE HEATER. I DISCHARGE AT EACH UNIT. DISCHARGE ONTO SPLASH BLOCK ON ROOF.

ECESSARY STARTERS, VFDS, AND CONTROL PANEL. ELECTRICAL TO PROVIDE DISCONNECTS TO BE FIELD WIRED.

SHALL BE PROVIDED, INSTALLED, TESTED, AND CALIBRATED BY MANUFACTURER. MANUFACTURER SHALL PROVIDE TERMINAL STRIP FOR CONTROL WIRING TERMINATIONS. AKE AND EXHAUST AIR OUTLET.

NECTIONS.

IRN AIR DAMPERS, AND GRAVITY BACKDRAFT EXHAUST DAMPER. OUTSIDE AIR DAMPERS SHALL BE OPPOSED BLADE AND EXHAUST DAMPERS SHALL BE PARALLEL BLADE. ALL OTHER DAMPERS SHALL BE PER MANUFACTURER RECOMMENDATIONS. 13. DESIGN OA CFM SCHEDULED IS THE VENTILATION AIR REQUIRED BY CODE FOR OCCUPANCY PER OWNER SPECIFICATIONS SHOWN ON VENTILATION CALCS SHEET. MIN OA CFM SCHEDULED (WHERE APPLICABLE) IS THE BASE LEVEL OA CFM PROVIDED DURING ALL OCCUPIED TIMED FOR UNITS WITH DEMAND CONTROL VENTILATION.

	PERFORMA	ANCE		S		AN .		VENTILA	TION	COMPRESSORS		DX COOLING COIL				NATURAL GAS HEATING FIL			FILTERS	KS ELECTRICAL			MAX	DIMENSI	ONS	TTL WEIGHT		
MIN	MIN	MIN GAS	MAX	MIN	ESP, IN			DESIGN OA	MIN OA		TOTAL	SENS	DESIGN EAT	DESIGN LAT	MAX INPUT	MAX OUTPUT	DESIGN EAT	DESIGN LAT	MA, IN	V-PH	MCA	MOP	LENGTH	WIDTH	HEIGHT	(INCL. CURB)		
EER	IEER	EFFICIENCY %	CFM	CFM	WC	QTY	HP	CFM	CFM	NO.	MBH	MBH	DB/WB °F	DB/WB °F	MBH	MBH	DB °F	DB °F	(MERV-13)				IN	IN	IN	LBS.	MFR	MODEL NUMBER
12.8	18.9	80.0	2500	-	1.90	1	3.5	375	-	2	86.4	61.5	78/65.2	55.2/53.7	150	120	61.8	106.3	1	460-3	28	30	116	63	59	2,175	CARRIER	48LCD008J4A6
12.5	18.4	80.0	4960	-	1.83	1	4.3	1350	1010	2	180.5	128.6	80.4/67.3	56.4/55.7	220	178	55.0	88.3	1	460-3	57.3	70	142	86	59	2,900	CARRIER	48LCD017L4A6

SED ON CARRIER.

ON 95°F/78°F DB/WB AMBIENT, 75°F/61.7°F DB/WB RETURN TEMPERATURES, AND NET OPERATING CAPACITIES. HEATING PERFORMANCE BASED ON 15°F DB AMBIENT, 75°F DB RETURN TEMPERATURE AND NET OPERATING CAPACITIES. HEATING CAPACITIES. HEATING PERFORMANCE BASED ON 15°F DB AMBIENT, 75°F DB RETURN TEMPERATURE AND NET OPERATING CAPACITIES. HEATING CAPACITIES. HEATING PERFORMANCE BASED ON 15°F DB AMBIENT, 75°F DB RETURN TEMPERATURE AND NET OPERATING CAPACITIES. C REFRIGERANTS.

UST FAN WHERE APPLICABLE) COMPLETE WITH VARIABLE FREQUENCY DRIVES.

UST FOR RELIEF AIR. ALL OTHER RTUS: PROVIDE BAROMETRIC RELIEF.

AL OR INVERTER RATED COMPRESSOR, WHERE AVAILABLE. UNIT SHALL BE CAPABLE OF MULTI-STAGE CAPACITY CONTROL. UNITS SHALL HAVE CONTROLS FOR LOW AMBIENT OPERATION TO 0°F. PROVIDE CRANKCASE HEATER. ZED TO MATCH DRAIN PAN DISCHARGE AT EACH UNIT. DISCHARGE ONTO SPLASH BLOCK ON ROOF.

DEMAND CONTROL VENTILATION AND OUTSIDE AIRFLOW MONITORING STATION.

CONNECTION, AND ALL NECESSARY STARTERS, VFDS, AND CONTROL PANEL. ELECTRICAL TO PROVIDE DISCONNECTS TO BE FIELD WIRED. ETE WITH TXV, AND FREEZESTAT SHALL BE PROVIDED, INSTALLED, TESTED, AND CALIBRATED BY MANUFACTURER. MANUFACTURER SHALL PROVIDE TERMINAL STRIP FOR CONTROL WIRING TERMINATIONS.

MIZER WITH REFERENCE ENTHALPY CONTROL. N ON OUTDOOR AIR INTAKE AND EXHAUST AIR OUTLET.

CTORS AT ALL DUCT CONNECTIONS.

GUARDS.

ZED OUTSIDE AIR, RETURN AIR DAMPERS, AND GRAVITY BACKDRAFT EXHAUST DAMPER. OUTSIDE AIR DAMPERS SHALL BE OPPOSED BLADE AND EXHAUST DAMPERS SHALL BE PARALLEL BLADE. ALL OTHER DAMPERS SHALL BE PER MANUFACTURER RECOMMENDATIONS. HE VENTILATION AIR REQUIRED BY CODE FOR OCCUPANCY PER OWNER SPECIFICATIONS SHOWN ON VENTILATION CALCS SHEET. MIN OA CFM SCHEDULED (WHERE APPLICABLE) IS THE BASE LEVEL OA CFM PROVIDED DURING ALL OCCUPIED TIMED FOR UNITS WITH DEMAND CONTROL VENTILATION. FABRICATED FULL UNIT SUPPORTING ROOF CURB.

23 8126: SPLIT SYSTEM CONDENSING UNIT SCHEDULE (BASIS OF DESIGN)

EQP MARK SERVICE LOCATION SERVE CU-1 AUDITORIUM ROOF RTU-

- NOTES: 1. DESIGN, MODEL NUMBERS AND PE
- 2. COOLING PERFORMANCE BASED 3. EER AND IEER BASED ON ARI 365.
- 4. CONDENSING UNIT TO BE INSTALL
- 5. REFRIGERANT LINES SHALL BE SIZ 6. CONDENSING UNIT SYSTEM SHALL HAVE R410-A REFRIGERANT.

	ING AND INSULATION SCHEDULE									
LOCATION	MATERIAL	INSULATION TYPE	PIPE SIZE, IN	THICKNESS, IN	JACKET	NOTES				
EXTERIOR	HARD COPPER	ELASTOMERIC CELLULAR	ALL	1	UV RESISTANT POLYETHELENE	1,2,4,5				
EXTERIOR	PVC	-	ALL	-	-	3-5				
EXTERIOR	SCH 40 BLACK STEEL	-	ALL	-	-	4,5				

1. PROVIDE MATERIAL AND SIZE REFRIGERANT PIPES IN ACCORDANCE WITH MFR'S RECCOMENDATIONS. REFER TO REFRIGERANT PIPING SYSTEMS SPECIFICATION FOR FURTHER DETAILS. 2. INSULATE EQUIPMENT SIMILAR TO PIPING SYSTEM

3. INSULATION FOR PVC CD PIPING IS NOT REQUIRED 4. INSTALL INSULATION IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS.

5. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS

						•										
Г	COMP	NOMINAL	TOTAL	MIN	MIN	ELECTRICAL					DIMENSIONS WEIGHT BASIS OF DESIGN					
ED	QTY	TON.	CAPACITY	EER	IEER	V	PH	FREQ	MCA	MOCP	LENGTH	WIDTH	HEIGHT	LBS	MFR	MODEL
1	4	60	708 MBH	11	17.5	460	3	60	118.3	125	92	88	79	2350	CARRIER	38APD060
ERF	ORMANC	E BASED O	N CARRIER.													
ΟN	95°F/78°F	DB/WB AME	BIENT OUTDOOI	R AIR.												
LED	D ON PREMANUFACTURED ROOF CURB.															
ZEC	IN ACCO	RDANCE W	ITH MANUFACT	URER'S RI	ECOMMEN	DATIONS.										
	<u>.</u>															

CONDENSING UNIT SHALL HAVE SINGLE POINT POWER CONNECTION WITH NON-FUSED DISCONNECT.

. PROVIDE MANUFACTURER VIBRATION ISOLATION PACKAGE.

9. DDC CONTROLS COMPLETE WITH TXV, AND FREEZESTAT SHALL BE PROVIDED, INSTALLED, TESTED, AND CALIBRATED BY MANUFACTURER. MANUFACTURER SHALL PROVIDE TERMINAL STRIP FOR CONTROL WIRING TERMINATIONS.



Daniel Morgan Middle School

48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMENT



ENERGY BY DESIGN 2677 PROSPERITY AVE. SUITE 275 FAIRFAX, VA 22031 T) 703.718.4355 2RW.com

> KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703.771.3362





ELECTRICAL LEGEND

0	CONDUIT OR CABLE UP
•	CONDUIT OR CABLE DOWN
\sim	CIRCUIT HOMERUN
	CONDUIT UNDERGROUND OR UNDERSLAB
	EXISTING TO BE REMOVED
	EXISTING TO REMAIN
\sim	BREAK
	WIRING DEVICES
₽	DUPLEX RECEPTACLE AT 18" AFF OR GRADE, 120V/20A UNO. SUBSCRIPTS INDICATE THE FOLLOWING: GF GROUND FAULT CIRCUIT INTERRUPTER WP WEATHERPROOF AND GFCI TYPE
Ē	EQUIPMENT CONNECTION.
J	JUNCTION BOX
Ŷ	JUNCTION BOX, WALL MOUNTED
	POWER DISTRIBUTION
	PANELBOARD, SURFACE MOUNTED, 120/208V
	PANELBOARD, SURFACE MOUNTED, 277/480V
	DASHED LINES REPRESENT ELECTRICAL EQPT REQUIRED CLEARANCES (PER NEC)
마	DISCONNECT SWITCH, NEMA TYPE '3R', UNO.

ABBREVIATIONS

AMPERE

AFF

AFG

ABOVE FINISHED FLOOR

AFG	ABOVE FINISHED GRADE
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
A/E	ARCHITECT/ENGINEER
BAS	
BLDG	BUILDING
BRKR	BREAKER
CIRC	CIRCULATION
CKT	
	CONTACTOR
COMB	COMBINATION
CONC	CONCRETE
C,CND	
CTR	CENTER
CTRL	CONTROL
CU	COPPER
dB	DECIBELS
DIA	DIAMETER DISCONNECT
DIV	DIVISION
DN	DOWN
DWG	
ETR	EXISTING EXISTING TO REMAIN
ELEC	ELECTRIC
ELEV	ELEVATION
EQPT	EQUIPMENT
ERV	ENERGY RECOVERY VENTILATOR
FDISC	FUSED DISCONNECT SWITCH
FLR FT	FLOOR FOOT FEFT
GEC	GROUNDING ELECTRODE CONDUCTOR
GF	GROUND FAULT
HOA	HAND-OFF-AUTO
HP	HORSEPOWER
HVAC	HEATING, VENTILATION, AIR CONDITIONING
IG	ISOLATED GROUND
IP	INTERNET PROTOCOL
JB	
kcmil	THOUSAND CIRCULAR MILS
KW	KILOWATT
KVA	
LIG	
LV	LOW VOLTAGE
MAX	MAXIMUM
MB MER	MAIN BREAKER MANUEACTURER
MH	MOUNTING HEIGHT (AFF UNO)
MIN	MINIMUM
MLO	MAIN LUGS ONLY
N	NEUTRAL
NEMA	NATIONAL ELECTRICAL MFRS ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NFSS NTS	NON-FUSED SAFETY SWITCH NOT TO SCALE
OCPD	OVER CURRENT PROTECTIVE DEVICE
P	POLE
РН РН	PULL BOX PHASE
PNL	PANEL
PWR	POWER
REC	
RM	ROOM
ST	SHUNT TRIP
STRTR	STARTER
SURF	SURFACE SWITCHBOARD
TYP	TYPICAL
UL	UNDERWRITER LABORATORIES
UNO V	UNLESS NOTED OTHERWISE
VFD	VARIABLE FREQUENCY DRIVE
VUSBC	VIRGINIA UNIFORM STATEWIDE BUILDING CODE
W	WATTS WITH
W/O	WITHOUT
WP	WEATHERPROOF
XFMR	TRANSFORMER

GENERAL NOTES (NEW WORK)

- 1. THESE NOTES APLY TO ALL ELECTRICAL DRAWINGS.
- 2. PERFORM ALL WORK IN ACCORDANCE WITH IBC 2018/VUSBC 2018, 2017 NEC AND LOCAL CODES/AMENDMENTS AS REQUIRED BY AUTHORITY HAVING JURISDICTION (AHJ).
- 3. THE WORK TO BE PERFORMED SHALL CONSIST PROVIDING ALL LABOR, EQUIPMENT, AND MATERIALS NECESSARY TO SERVICE TO REPLACE ROOF TOP MECHANICAL UNITS AT DANIEL MORGAN MIDDLE SCHOOL. ARCHITECTURAL CEILING REMOVAL/REINSTALLATION FOR REQUIRED STRUCTURAL REINFORCEMENT AND REPAIRS/MODIFICATIONS TO EXISTING ROOF/BUILDING SHALL BE COMPLETED BY OWNER-CONTRACTED VENDOR. THE SELECTED CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MECHANICAL, ELECTRICAL, AND STRUCTURAL WORK ASSOCIATED WITH THE REPLACEMENT OF THE ROOF TOP UNITS, AND COORDINATING WITH OTHER OWNER-CONTRACTED VENDORS FOR ASSOCIATED WORK, INCLUDING DRYWALL, PAINTING, CEILING REPLACEMENT, AND ROOF PATCHING.
- 4. COORDINATE ALL WORK WITH THE CONSTRUCTION COMPLETION SCHEDULE SPECIFIED FOR THE PROJECT AND WITH ALL OTHER TRADES TO ENSURE THAT PROJECT IS COMPLETED ON SCHEDULE. INCLUDE AFTER HOURS LABOR AND / OR WEEKEND LABOR AS REQUIRED TO MEET MILESTONE DEADLINES AND CONSTRUCTION COMPLETION SCHEDULE.
- 5. PAY FOR AND OBTAIN ALL PERMITS UPON COMPLETION OF WORK. PRESENT THE OWNER WITH A CERTIFICATE FOR FINAL INSPECTION FROM THE LOCAL AUTHORITY.
- 6. IN THE PANELBOARD SCHEDULES, THE ROOM NUMBER INDICATES THE LOCATION ON THE DRAWING OF THE FIRST ITEM TO BE ENERGIZED BY THE CIRCUIT. FINAL PANEL DIRECTORIES SHALL REFLECT ALL FINAL ROOM NUMBERS FOR LOADS SERVED.
- 7. MOUNTING HEIGHTS, UNLESS OTHERWISE NOTED, ARE TO CENTER LINE OF EQUIPMENT, EXCEPT MOUNTING HEIGHTS OF LIGHTING FIXTURES WHICH IS TO BOTTOM OF FIXTURE. UNLESS NOTED OTHERWISE. IN ALL CASES, COMPLY WITH ADA REQUIREMENTS FOR MAXIMUM OR MINIMUM ALLOWABLE HEIGHT WHETHER INDICATED ON DRAWINGS OR NOT.
- 8. ALL CONDUIT AND WIRING SHALL BE RUN CONCEALED ABOVE FINISHED CEILINGS, WITHIN WALLS, OR BELOW FLOORS IN FINISHED SPACES.
- 9. INSTALL ALL PULL AND JUNCTION BOXES IN ACCESSIBLE LOCATIONS. DO NOT LOCATE PULL OR JUNCTION BOXES ABOVE INACCESSIBLE CEILINGS (I.E. DRYWALL. OR AS INDICATED ON THE ARCHITECTURAL RCP). ALL ACCESS PANELS LOCATIONS MUST BE COORDINATED AND APPROVED BY THE ARCHITECT PRIOR TO INSTALLATION.
- 10. MECHANICAL EQUIPMENT IS SHOWN IN APPROXIMATE LOCATIONS. REFER TO THE MECHANICAL, PLUMBING, AND FIRE PROTECTION DRAWIGNS FOR EXACT EQUIPMENT LOCATIONS.
- 11. ELECTRICAL CONTRACTOR SHALL INCLUDE IN THE BID COORDINATION AND CONNECTION OF ALL HVAC, AND OTHER CONTRACTOR OR OWNER FURNISHED EQUIPMENT. CHECK EQUIPMENT SHOP DRAWINGS AND COORDINATE WITH HVAC, AND ALL OTHER EQUIPMENT CONTRACTORS FOR DISCONNECT SWITCH, CONDUIT, WIRING REQUIREMENTS, FUSE AND BREAKER SIZES AND VOLTAGE REQUIREMENTS. ADDITIONAL PAYMENT FOR CONTRACTOR'S FAILURE TO COORDINATE OVERCURRENT PROTECTION WITH NAMEPLATE DATA REQUIREMENTS OF ACTUAL EQUIPMENT PURCHASED WILL NOT BE CONSIDERED.
- 12. ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL ALL EXTERNAL STARTERS FOR MECHANICAL EQUIPMENT, UNLESS OTHERWISE NOTED ON MECHANICAL DRAWINGS.
- 13. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH MECHANICAL CONTRACTOR AND SHALL PROVIDE NEUTRAL CONDUCTORS WHERE REQUIRED.
- 14. THE ELECTRICAL CONTRACTOR(S) SHALL COORDINATE THEIR WORK WITH ALL TRADES PRIOR TO FABRICATION OF SYSTEMS AND COMMENCEMENT OF INSTALLATION, AND PRIOR TO ANY PROCUREMENT OF MATERIALS. IT SHALL BE THE RESPONSIBILITY OF THIS CONTRACTOR TO REVIEW THE WORK OF OTHER TRADES (INCLUDING, BUT NOT LIMITED TO STRUCTURAL, ARCHITECTURAL, CIVIL, FIRE ALARM, MECHANICAL, PLUMBING, TELE/DATA, KITCHEN, SECURITY, THEATRICAL AND A/V) AS IT AFFECTS THE ELECTRICAL WORK. AND AS THE ELECTRICAL WORK AFFECTS OTHER TRADES TO ENSURE THE CONSTRUCTION DOCUMENTS ARE CLOSELY FOLLOWED. WHERE DISCREPANCIES ARISE, THEY SHALL BE REFERRED TO THE A/E FOR RESOLUTION BEFORE PROCEEDING WITH THE WORK.
- 15. THE DESIGN IS BASED ON MFRS AND MODELS INDICATED AND IS INTENDED TO SHOW THE GENERAL SIZE, CONFIGURATION, LOCATION, CONNECTIONS, AND/OR SUPPORT FOR EQUIPMENT OR SYSTEMS WITH RELATION TO THE OTHER BUILDING/SYSTEMS. SEE SPECIFICATION SECTIONS FOR TECHNICAL REQUIREMENTS.
- 16. DIVISION 26 CONTRACTOR SHALL INCLUDE IN THE BID, COORDINATION AND PROVISION OF DISCONNECT SWITCH, CIRCUIT BREAKER, AND WIRE SIZES AND OVERCURRENT PROTECTION IN ACCORDANCE WITH NAMEPLATE DATA FOR ACTUAL EQUIPMENT SUPPLIED. ADDITIONAL PAYMENT FOR CONTRACTOR'S FAILURE TO COORDINATE OVERCURRENT PROTECTION WITH NAMEPLATE DATA REQUIREMENTS OF ACTUAL EQUIPMENT PURCHASED WILL NOT BE

CONSIDERED. INCREASE CONDUIT AND WIRE SIZE AS REQUIRED.

GENERAL NOTES (DEMO)

- 1. PRIOR TO BIDDING, THE CONTRACTOR SHALL VISIT THE SITE TO BECOME FAMILIAR WITH THE EXISTING CONDITIONS AND TO VERIFY LOCATION, SIZE AND QUANTITY OF ITEMS TO BE REMOVED. SUBMITTAL OF A BID INDICATES ACCEPTANCE OF THE DEMOLITION PLANS AND ON-SITE CONDITIONS AS THEY EXIST.
- 2. THE WORK TO BE PERFORMED SHALL CONSIST PROVIDING ALL LABOR, EQUIPMENT, AND MATERIALS NECESSARY TO SERVICE TO REPLACE ROOF TOP MECHANICAL UNITS AT DANIEL MORGAN MIDDLE SCHOOL. ARCHITECTURAL CEILING REMOVAL/REINSTALLATION FOR REQUIRED STRUCTURAL REINFORCEMENT AND REPAIRS/MODIFICATIONS TO EXISTING ROOF/BUILDING SHALL BE COMPLETED BY OWNER-CONTRACTED VENDOR. THE SELECTED CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MECHANICAL, ELECTRICAL, AND STRUCTURAL WORK ASSOCIATED WITH THE REPLACEMENT OF THE ROOF TOP UNITS, AND COORDINATING WITH OTHER OWNER-CONTRACTED VENDORS FOR ASSOCIATED WORK, INCLUDING DRYWALL, PAINTING, CEILING REPLACEMENT, AND ROOF PATCHING.
- 3. UNO, ALL EXISTING ELECTRICAL SYSTEMS, APPURTENANCES, CONTROLS, ETC SHALL BE REMOVED IN THEIR ENTIRETY, WHETHER SHOWN ON THE DEMOLITION PLANS OR NOT. DOCUMENTATION OF EXISTING SYSTEMS IS BASED ON AVAILABLE RECORD DRAWINGS AND READILY VISIBLE FIELD OBSERVATION. MAJOR DISCREPANCIES SHALL BE REFERRED TO THE ARCHITECT/ENGINEER FOR RESOLUTION.
- 4. COMPONENTS EMBEDDED WITHIN OR BENEATH THE EXISTING STRUCTURE MAY BE ABANDONED IN PLACE, CUT BEHIND WALL/FLOOR/CEILING SURFACE AS REQUIRED FOR PATCHING OF FINISH. SYSTEMS EXPOSED TO MOISTURE SHALL BE CAPPED WATERTIGHT.
- 5. WHERE DEMOLISHED ELECTRICAL SYSTEMS PENETRATED EXTERIOR WALLS, CONTRACTOR SHALL BE RESPONSIBLE FOR PATCHING SUCH PENETRATIONS TO MATCH EXISTING, UNO.
- 6. SALVAGED ITEMS AND MATERIALS SHALL REMAIN THE PROPERTY OF THE OWNER AND AS A PART OF THIS CONTRACT, THE CONTRACTOR SHALL DELIVER THESE TO A DESTINATION AS DIRECTED BY THE PROJECT MANAGER.
- 7. REMOVE EACH ITEM OF EQUIPMENT, DEVICE, AND FIXTURE INDICATED ON DEMOLITION PLANS AND ITS ASSOCIATED CIRCUITRY BACK TO THE PROTECTIVE DEVICE IN THE SOURCE PANEL, SWITCHBOARD, OR CONTROLLER, UNLESS NOTED OTHERWISE
- 8. ASSOCIATED CIRCUITRY INCLUDES CONDUIT, CONDUCTORS, BOXES, WIRING DEVICES, COVERPLATES, LAMPS, FIXTURES WIREWAYS, SWITCHES, STARTERS, ETC., WHICH ARE ASSOCIATED WITH THE ITEM TO BE REMOVED.
- 9. DISCONNECT ELECTRICAL SYSTEMS IN WALLS, FLOORS AND CEILINGS TO BE REMOVED.
- 10. REMOVE ABANDONED WIRING TO SOURCE OF SUPPLY.
- 11. REMOVE EXPOSED ABANDONED CONDUIT, INCLUDING ABANDONED CONDUIT ABOVE ACCESSIBLE CEILING FINISHES. CUT CONDUIT FLUSH WITH WALLS AND FLOORS. PATCH SURFACES.
- 12. DISCONNECT ABANDONED OUTLETS AND REMOVE DEVICES. REMOVE ABANDONED OUTLETS IF CONDUIT SERVICING THEM IS ABANDONED AND REMOVED. PROVIDE BLANK COVER FOR ABANDONED OUTLETS THAT ARE NOT REMOVED.
- 13. DISCONNECT AND REMOVE ABANDONED PANELBOARDS AND DISTRIBUTION EQUIPMENT.
- 14. DISCONNECT AND REMOVE ELECTRICAL DEVICES AND EQUIPMENT SERVING UTILIZATION EQUIPMENT THAT HAS BEEN REMOVED.
- 15. DISCONNECT AND REMOVE ABANDONED LUMINAIRES. REMOVE BRACKETS, STEMS, HANGERS AND OTHER ACCESSORIES.
- 16. REPAIR ADJACENT CONSTRUCTION AND FINISHES DAMAGED DURING DEMOLITION AND EXTENSION WORK.
- 17. EXACT CIRCUITING FOR EXISTING RECEPTACLES, AND OTHER LOADS NOTED FOR DEMOLITION SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO DEMOLITION.
- 18. CLEAN AND REPAIR EXISTING MATERIALS AND EQUIPMENT THAT ARE TO REMAIN OR THAT ARE TO BE REUSED.
- 19. CAREFULLY REMOVE ALL EQUIPMENT AND DEVICES THAT ARE INDICATED TO BE RELOCATED. THIS INCLUDES ALL SUPPORTING EQUIPMENT, DEVICES, ETC, THAT IS CONSIDERED PAR T OF A FULLY FUNCTIONAL SYSTEM. INCLUDE SECURE STORAGE OF ITEMS UNTIL READY FOR INSTALLATION. PROVIDE WRITTEN NOTIFICATION TO THE OWNER REGARDING ALL EXISTING DAMAGE TO ITEMS OR ITEMS THAT ARE NON-FUNCTIONAL, PRIOR TO REMOVAL. ONCE REMOVED, THE CONTRACTOR IS REPONSIBLE FOR ALL NON-DOCUMENTED DAMAGES AND/OR FUNCTIONAL DEFICIENIES.



Daniel Morgan Middle School

48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMENT



ENERGY BY DESIGN 2677 PROSPERITY AVE. SUITE 275 FAIRFAX, VA 22031 T) 703.718.4355 2RW.com

> KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703.771.3362





SECTION 26 0500 - COMMON WORK RESULTS FOR ELECTRICAL

JOB CONDITIONS: THE CONTRACT DOCUMENTS SPECIFY THE SCOPE AND ARRANGEMENT OF THE WORK AND SHALL BE FOLLOWED AS CLOSELY AS ACTUAL CONDITIONS ALLOW. THE CONTRACTOR SHALL GIVE CONSIDERATION TO ALL OTHER TRADES, AND MAKE ARRANGEMENTS TO AVOID CONFLICTS AND INTERFERENCE WITH OTHER WORK, NEW OR EXISTING. CONTRACTOR SHALL COORDINATE ALL COMPONENTS OF THE WORK, AND PROVIDE MINOR ADJUSTMENTS AS REQUIRED, INCLUDING OFFSETS, TRANSITIONS, FITTINGS, AND ACCESSORIES TO MEET ACTUAL CONDITIONS. THE CONTRACTOR SHALL VISIT THE JOB SITE PRIOR TO BID DATE TO EXAMINE THE CONDITIONS UNDER WHICH THE WORK IS TO BE PERFORMED. NO EXTRA CHARGES SHALL BE PAID FOR PROVIDING OF PRODUCTS OR FURNISHING OF WORK RESULTING FROM FAILURE TO COMPLY WITH THIS REQUIREMENT.

REGULATORY REQUIREMENTS: ALL WORK SHALL CONFORM TO THE REGULATIONS OF THE APPLICABLE FEDERAL, STATE, AND LOCAL LAWS, ORDINANCES AND CODES. ALL APPLICABLE WORK SHALL CONFORM TO THE REQUIREMENTS OF NFPA 70. ALL PRODUCTS SHALL BE LISTED BY THE UNDERWRITERS LABORATORIES, INC. (UL), AND SHALL BEAR THE UL LABEL. WHERE UL LABELS ARE NOT PROVIDED FROM THE FACTORY, THE CONTRACTOR SHALL BE RESPONSIBLE FOR HAVING THE EQUIPMENT OR MATERIALS TESTED BY A UL TESTING FIRM, ACCEPTABLE TO AUTHORITY HAVING JURISDICTION, TO DETERMINE SUITABILITY OF THE PRODUCT FOR PURPOSE SPECIFIED.

MATERIALS AND EQUIPMENT: UNLESS SPECIFICALLY NOTED OTHERWISE, ALL MATERIALS AND EQUIPMENT FURNISHED FOR PERMANENT INSTALLATION IN THE WORK SHALL CONFORM TO APPLICABLE STANDARDS, BE OF A CURRENT DESIGN, NEW, UNUSED, AND UNDAMAGED.

UTILITIES AND CONNECTIONS: VERIFY LOCATION OF ALL EXISTING UTILITIES BEFORE LAYING OUT AND MAKING CONNECTIONS. REPORT ANY INCONSISTENCIES TO ARCHITECT/ENGINEER BEFORE COMMENCING WORK. CONTRACTOR SHALL BE RESPONSIBLE FOR CORRECTING ANY ERRORS, AND REPAIRING OR REPLACING ALL MATERIALS AND EQUIPMENT DAMAGED AS A RESULT OF FAILURE TO COMPLY WITH THIS REQUIREMENT.

PRODUCT DELIVERY, STORAGE, AND HANDLING: PROTECT PRODUCTS FROM DAMAGE, MARRING, AND SOILING. ANY MARRING OF FACTORY FINISHES SHALL BE REPAIRED OR REPLACED AS NECESSARY TO MATCH THE ORIGINAL FACTORY FINISH.

INSTALLATION: INSTALL PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. INSTALL PRODUCTS IN A NEAT AND WORKMANLIKE MANNER IN ACCORDANCE WITH APPLICABLE NECA, NEMA OR OTHER STANDARD.

CLEANING: CLEAN INTERIOR OF CONDUITS, BOXES, WIREWAYS AND OTHER RACEWAYS PRIOR TO PULLING WIRE AND INSTALLING COVERS OR SEALING. AFTER THE EQUIPMENT, WIRING, AND CONDUIT HAS BEEN PROVEN OPERATIONAL, CAREFULLY CLEAN ALL INTERIORS OF CABINETS AND EXTERNAL PARTS OF EACH PIECE OF EQUIPMENT, THOROUGHLY REMOVING ALL TRACES OF DIRT, OIL, GREASE, AND OTHER FOREIGN SUBSTANCES OR OBJECTS.

SECTION 26 0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

COORDINATION: COORDINATE SIZES OF RACEWAYS, BOXES, AND EQUIPMENT ENCLOSURES INSTALLED UNDER OTHER SECTIONS WITH THE ACTUAL CONDUCTORS TO BE INSTALLED, INCLUDING ADJUSTMENTS FOR CONDUCTOR SIZES INCREASED FOR VOLTAGE DROP.

SUBMITTALS: PRODUCT DATA: PROVIDE MANUFACTURER'S STANDARD CATALOG PAGES AND DATA SHEETS FOR CONDUCTORS AND CABLES, INCLUDING DETAILED INFORMATION ON MATERIALS, CONSTRUCTION, RATINGS, LISTINGS, AND AVAILABLE SIZES, CONFIGURATIONS, AND STRANDING.

CONDUCTOR AND CABLE APPLICATIONS: PROVIDE SINGLE CONDUCTOR TOGGLE BOLTS. BUILDING WIRE INSTALLED IN SUITABLE RACEWAY UNLESS OTHERWISE INDICATED, PERMITTED, OR REQUIRED. ARMORED CABLE AND METAL-CLAD IS PERMITTED ONLY WHERE CONCEALED ABOVE ACCESSIBLE CEILINGS, WHERE CONCEALED IN HOLLOW STUD WALLS, FOR BRANCH CIRCUITS UP TO 30 A.

CONDUCTOR AND CABLE GENERAL REQUIREMENTS: PROVIDE PRODUCTS THAT COMPLY WITH REQUIREMENTS OF NFPA 70 AND APPLICABLE UL REQUIREMENTS. UNLESS SPECIFICALLY INDICATED TO BE EXCLUDED, PROVIDE ALL REQUIRED CONDUIT, BOXES, WIRING, CONNECTORS, ETC. AS REQUIRED FOR A COMPLETE OPERATING SYSTEM. COMPLY WITH NEMA WC 70. PROVIDE COPPER CONDUCTORS ONLY. ALUMINUM CONDUCTORS ARE NOT ACCEPTABLE FOR THIS PROJECT. CONDUCTOR SIZES INDICATED ARE BASED ON COPPER. COPPER CONDUCTORS SHALL BE SOFT DRAWN ANNEALED, 98 PERCENT CONDUCTIVITY, UNCOATED CONDUCTORS COMPLYING WITH ASTM B3, ASTM B8, OR ASTM B787/B 787M UNLESS OTHERWISE INDICATED.

MINIMUM CONDUCTOR SIZE: 12 AWG. EXCEPTIONS: 20 A, 120 V CIRCUITS LONGER THAN 75 FEET (23 M): 10 AWG; 20 A, 120 V CIRCUITS LONGER THAN 150 FEET (46 M): 8 AWG; 20 A, 277 V CIRCUITS LONGER THAN 150 FEET: 10 AWG.

CONDUCTOR COLOR CODING: 208Y/120 V, 3 PHASE, 4 WIRE SYSTEM: PHASE A: BLACK; PHASE B: RED; PHASE C: BLUE; NEUTRAL/GROUNDED: WHITE. 240/120 V, 1 PHASE, 3 WIRE SYSTEM: PHASE A: BLACK; PHASE B: RED; NEUTRAL/GROUNDED: WHITE. EQUIPMENT GROUND, ALL SYSTEMS: GREEN. SINGLE CONDUCTOR BUILDING WIRE: SIZE 10 AWG AND SMALLER: SOLID; SIZE 8 AWG AND LARGER: STRANDED. INSULATION: 600 V, TYPE THHN/THWN OR THHN/THWN-2, XHHW.

INSTALLATION: UNLESS DIMENSIONED, CIRCUIT ROUTING INDICATED IS DIAGRAMMATIC. WHEN CIRCUIT DESTINATION IS INDICATED AND ROUTING IS NOT SHOWN, DETERMINE EXACT ROUTING REQUIRED. ARRANGE CIRCUITING TO MINIMIZE SPLICES. INCLUDE CIRCUIT LENGTHS REQUIRED TO INSTALL CONNECTED DEVICES WITHIN 10 FT (3.0 M) OF LOCATION SHOWN. SHARING OF NEUTRAL/GROUNDED CONDUCTORS AMONG UP TO THREE SINGLE PHASE BRANCH CIRCUITS OF DIFFERENT PHASES INSTALLED IN THE SAME RACEWAY IS NOT PERMITTED. PROVIDE DEDICATED NEUTRAL/GROUNDED CONDUCTOR FOR EACH INDIVIDUAL BRANCH CIRCUIT. TAPE ENDS OF CONDUCTORS

AND CABLES TO PREVENT INFILTRATION OF MOISTURE AND OTHER CONTAMINANTS. PULL ALL CONDUCTORS AND CABLES TOGETHER INTO RACEWAY AT SAME TIME. DO NOT DAMAGE CONDUCTORS AND CABLES . USE SUITABLE WIRE PULLING LUBRICANT WHERE NECESSARY, EXCEPT WHEN LUBRICANT IS NOT RECOMMENDED BY THE MANUFACTURER. INSTALL PARALLEL CONDUCTORS OF THE SAME LENGTH AND TERMINATE IN THE SAME MANNER. SECURE AND SUPPORT CONDUCTORS AND CABLES IN ACCORDANCE WITH NFPA 70 USING SUITABLE SUPPORTS AND METHODS APPROVED BY THE AUTHORITY HAVING JURISDICTION. PROVIDE INDEPENDENT SUPPORT FROM BUILDING STRUCTURE. DO NOT PROVIDE SUPPORT FROM RACEWAYS, PIPING, DUCTWORK, OR OTHER SYSTEMS. INSTALL CONDUCTORS WITH GALVANIZED STEEL RIGID METAL CONDUIT OR INTERMEDIATE METAL

A MINIMUM OF 12 INCHES (300 MM) OF SLACK AT EACH OUTLET. UNLESS SPECIFICALLY INDICATED TO BE EXCLUDED, PROVIDE FINAL CONNECTIONS TO ALL EQUIPMENT AND DEVICES. INCLUDING THOSE FURNISHED BY OTHERS, AS REQUIRED FOR A COMPLETE OPERATING SYSTEM

SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

SUBMITTALS: PROVIDE MANUFACTURER'S STANDARD CATALOG PAGES AND DATA SHEETS FOR GROUNDING AND BONDING SYSTEM COMPONENTS

GROUNDING AND BONDING REQUIREMENTS: PROVIDE ALL REQUIRED COMPONENTS, CONDUCTORS, CONNECTORS, CONDUIT, BOXES, FITTINGS, SUPPORTS, ACCESSORIES, ETC. AS NECESSARY FOR A COMPLETE GROUNDING AND BONDING SYSTEM. WHERE CONDUCTOR SIZE IS NOT INDICATED. SIZE TO COMPLY WITH NFPA 70 BUT NOT LESS THAN APPLICABLE MINIMUM SIZE REQUIREMENTS SPECIFIED.

BONDING AND EQUIPMENT GROUNDING: PROVIDE BONDING FOR EQUIPMENT GROUNDING CONDUCTORS, EQUIPMENT GROUND BUSSES, METALLIC EQUIPMENT ENCLOSURES, METALLIC RACEWAYS AND BOXES, DEVICE GROUNDING TERMINALS, AND OTHER NORMALLY NON CURRENT-CARRYING CONDUCTIVE MATERIALS ENCLOSING ELECTRICAL CONDUCTORS/EQUIPMENT OR LIKELY TO BECOME ENERGIZED AS INDICATED AND IN ACCORDANCE WITH NFPA 70. PROVIDE INSULATED EQUIPMENT GROUNDING CONDUCTOR IN EACH FEEDER AND BRANCH CIRCUIT RACEWAY. DO NOT USE RACEWAYS AS SOLE EQUIPMENT GROUNDING CONDUCTOR.

WHERE CIRCUIT CONDUCTOR SIZES ARE INCREASED FOR VOLTAGE DROP. INCREASE SIZE OF EQUIPMENT GROUNDING CONDUCTOR PROPORTIONALLY IN ACCORDANCE WITH NFPA 70. USE BARE COPPER CONDUCTORS WHERE INSTALLED UNDERGROUND IN DIRECT CONTACT WITH EARTH. USE BARE COPPER CONDUCTORS WHERE DIRECTLY ENCASED IN CONCRETE (NOT IN RACEWAY).

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

COORDINATION: COORDINATE SIZES AND ARRANGEMENT OF SUPPORTS AND BASES WITH THE ACTUAL EQUIPMENT AND COMPONENTS TO BE INSTALLED. COORDINATE THE WORK WITH OTHER TRADES TO PROVIDE ADDITIONAL FRAMING AND MATERIALS REQUIRED FOR INSTALLATION. COORDINATE COMPATIBILITY OF SUPPORT AND ATTACHMENT COMPONENTS WITH MOUNTING SURFACES AT THE INSTALLED LOCATIONS. COORDINATE THE ARRANGEMENT OF SUPPORTS WITH

DUCTWORK, PIPING, EQUIPMENT AND OTHER POTENTIAL CONFLICTS INSTALLED UNDER OTHER SECTIONS OR BY OTHERS. SUBMITTALS: PRODUCT DATA: PROVIDE MANUFACTURER'S STANDARD

CATALOG PAGES AND DATA SHEETS FOR METAL CHANNEL (STRUT) FRAMING SYSTEMS, NON-PENETRATING ROOFTOP SUPPORTS, AND POST-INSTALLED CONCRETE AND MASONRY ANCHORS.

SUPPORT AND ATTACHMENT COMPONENTS: PROVIDE ALL REQUIRED HANGERS. SUPPORTS, ANCHORS, FASTENERS, FITTINGS, ACCESSORIES, AND HARDWARE AS NECESSARY FOR THE COMPLETE INSTALLATION OF ELECTRICAL WORK. PROVIDE PRODUCTS LISTED, CLASSIFIED, AND LABELED AS SUITABLE FOR THE PURPOSE INTENDED, WHERE APPLICABLE. DO NOT USE PRODUCTS FOR APPLICATIONS OTHER THAN AS PERMITTED BY NFPA 70 AND PRODUCT LISTING. USE CORROSION RESISTANT MATERIALS SUITABLE FOR THE ENVIRONMENT WHERE INSTALLED. CONDUIT STRAPS: ONE-HOLE OR TWO-HOLE TYPE; STEEL OR MALLEABLE IRON. CONDUIT CLAMPS: BOLTED TYPE UNLESS OTHERWISE INDICATED. OUTLET BOX SUPPORTS: HANGERS, BRACKETS, ETC. SUITABLE FOR THE BOXES TO BE SUPPORTED. METAL CHANNEL (STRUT) FRAMING SYSTEMS: FACTORY-FABRICATED CONTINUOUS-SLOT METAL CHANNEL (STRUT) AND ASSOCIATED FITTINGS, ACCESSORIES, AND HARDWARE REQUIRED FOR FIELD-ASSEMBLY OF SUPPORTS. HANGER RODS: THREADED ZINC-PLATED

ANCHORS AND FASTENERS: UNLESS OTHERWISE INDICATED AND WHERE NOT OTHERWISE RESTRICTED. USE THE ANCHOR AND FASTENER TYPES INDICATED FOR THE SPECIFIED APPLICATIONS. CONCRETE: USE PRESET CONCRETE INSERTS, EXPANSION ANCHORS, OR SCREW ANCHORS. SOLID OR GROUT-FILLED MASONRY: USE EXPANSION ANCHORS OR SCREW ANCHORS. HOLLOW MASONRY: USE

HOLLOW STUD WALLS: USE TOGGLE BOLTS. STEEL: USE BEAM CLAMPS, MACHINE BOLTS, OR WELDED THREADED STUDS. SHEET METAL: USE SHEET METAL SCREWS. WOOD: USE WOOD SCREWS. PLASTIC AND LEAD ANCHORS ARE NOT PERMITTED. PRESET CONCRETE INSERTS: CONTINUOUS METAL CHANNEL (STRUT) AND SPOT INSERTS SPECIFICALLY DESIGNED TO BE CAST IN CONCRETE CEILINGS, WALLS, AND FLOORS.

CHANNEL MATERIAL: USE GALVANIZED STEEL

STEEL UNLESS OTHERWISE INDICATED.

INSTALLATION: PROVIDE INDEPENDENT SUPPORT FROM BUILDING STRUCTURE. DO NOT PROVIDE SUPPORT FROM PIPING, DUCTWORK, OR OTHER SYSTEMS, DO NOT PROVIDE SUPPORT FROM SUSPENDED CEILING SUPPORT SYSTEM OR CEILING GRID. DO NOT PROVIDE SUPPORT FROM ROOF DECK. DO NOT PENETRATE OR OTHERWISE NOTCH OR CUT STRUCTURAL MEMBERS WITHOUT APPROVAL OF STRUCTURAL ENGINEER.

EQUIPMENT SUPPORT AND ATTACHMENT: USE METAL FABRICATED SUPPORTS OR SUPPORTS ASSEMBLED FROM METAL CHANNEL (STRUT) TO SUPPORT EQUIPMENT AS REQUIRED. USE METAL CHANNEL (STRUT) SECURED TO STUDS TO SUPPORT EQUIPMENT SURFACE-MOUNTED ON HOLLOW STUD WALLS WHEN WALL STRENGTH IS NOT SUFFICIENT TO RESIST PULL-OUT. USE METAL CHANNEL (STRUT) TO SUPPORT SURFACE-MOUNTED EQUIPMENT IN WET OR DAMP LOCATIONS TO PROVIDE SPACE BETWEEN EQUIPMENT AND MOUNTING SURFACE. SECURELY FASTEN FLOOR-MOUNTED EQUIPMENT. DO NOT INSTALL EQUIPMENT SUCH THAT IT RELIES ON ITS OWN WEIGHT FOR SUPPORT.

SECTION 26 0533.13 - CONDUIT

SUBMITTALS: PROVIDE MANUFACTURER'S STANDARD CATALOG PAGES AND DATA SHEETS FOR CONDUITS AND FITTINGS.

CONDUIT APPLICATIONS: USE THE CONDUIT TYPES INDICATED FOR THE SPECIFIED APPLICATIONS. WHERE MORE THAN ONE LISTED APPLICATION APPLIES, COMPLY WITH THE MOST RESTRICTIVE REQUIREMENTS. WHERE CONDUIT TYPE FOR A PARTICULAR APPLICATION IS NOT SPECIFIED, USE GALVANIZED STEEL RIGID METAL CONDUIT

CONCEALED WITHIN HOLLOW STUD WALLS: USE MC CABLING, GALVANIZED STEEL RIGID METAL CONDUIT, INTERMEDIATE METAL CONDUIT (IMC), OR ELECTRICAL METALLIC TUBING (EMT).

CONCEALED ABOVE ACCESSIBLE CEILINGS: USE MC CABLING, GALVANIZED STEEL RIGID METAL CONDUIT, INTERMEDIATE METAL CONDUIT (IMC), OR ELECTRICAL METALLIC TUBING (EMT).

METAL CONDUIT OR INTERMEDIATE METAL CONDUIT (IMC).

EXPOSED. INTERIOR. SUBJECT TO PHYSICAL DAMAGE: USE CONDUIT (IMC).

INTERMEDIATE METAL CONDUIT (IMC), OR PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT.

CONNECTIONS TO VIBRATING EQUIPMENT: DRY LOCATIONS: USE FLEXIBLE METAL CONDUIT.

METAL CONDUIT.

BRANCH CIRCUITS: 3/4 INCH (21 MM) TRADE SIZE. INSTALLATION: CONCEAL ALL CONDUITS UNLESS SPECIFICALLY INDICATED TO BE EXPOSED. ARRANGE CONDUIT TO MAINTAIN

PROVIDE PROTECTION FROM ENTRY OF MOISTURE AND FOREIGN

SECTION 26 0533.16 - BOXES

CONDUCTORS.

UNDERGROUND BOXES/ENCLOSURES. REQUIRED FOR A COMPLETE RACEWAY SYSTEM AND TO

ACCORDANCE WITH NFPA 70. DO NOT PROVIDE SUPPORT FROM PIPING,

0526

OF CONDUCTORS.

SUBMITTALS: PROVIDE MANUFACTURER'S STANDARD CATALOG PAGES AND DATA SHEETS FOR EACH PRODUCT.

COMPONENTS.

PANELBOARDS: USE TYPEWRITTEN CIRCUIT DIRECTORY TO IDENTIFY LOAD(S) SERVED FOR PANELBOARDS WITH A DOOR.

ENCLOSED SWITCHES: IDENTIFY POWER SOURCE AND CIRCUIT NUMBER. INCLUDE LOCATION WHEN NOT WITHIN SIGHT OF EQUIPMENT. IDENTIFY LOAD(S) SERVED. INCLUDE LOCATION WHEN NOT WITHIN SIGHT OF EQUIPMENT.

APPROVED EQUIVALENT.

IDENTIFY COLOR CODE FOR UNGROUNDED AND GROUNDED POWER CONDUCTORS INSIDE DOOR OR ENCLOSURE AT EACH PIECE OF FEEDER OR BRANCH-CIRCUIT DISTRIBUTION EQUIPMENT WHEN PREMISES HAS FEEDERS OR BRANCH CIRCUITS SERVED BY MORE THAN ONE NOMINAL VOLTAGE SYSTEM.

INTERIOR, DAMP OR WET LOCATIONS: USE GALVANIZED STEEL RIGID ALL RECEPTACLES.

EXPOSED, EXTERIOR: USE GALVANIZED STEEL RIGID METAL CONDUIT,

DAMP, WET, OR CORROSIVE LOCATIONS: USE LIQUIDTIGHT FLEXIBLE

MAXIMUM LENGTH: 6 FEET (1.8 M) UNLESS OTHERWISE INDICATED.

CONDUIT REQUIREMENTS: PROVIDE ALL CONDUIT, FITTINGS, SUPPORTS, AND ACCESSORIES REQUIRED FOR A COMPLETE RACEWAY SYSTEM. PROVIDE PRODUCTS LISTED, CLASSIFIED, AND LABELED AS SUITABLE FOR THE PURPOSE INTENDED. MINIMUM CONDUIT SIZE, UNLESS OTHERWISE INDICATED:

ADEQUATE HEADROOM, CLEARANCES, AND ACCESS. ARRANGE CONDUIT TO PROVIDE NO MORE THAN THE EQUIVALENT OF FOUR 90 DEGREE BENDS BETWEEN PULL POINTS. ARRANGE CONDUIT TO PROVIDE NO MORE THAN 150 FEET (46 M) BETWEEN PULL POINTS. SECURE AND SUPPORT CONDUITS IN ACCORDANCE WITH NFPA 70 AND SECTION 26 0529 USING SUITABLE SUPPORTS AND METHODS APPROVED BY THE AUTHORITY HAVING JURISDICTION. PROVIDE INDEPENDENT SUPPORT FROM BUILDING STRUCTURE. DO NOT PROVIDE SUPPORT FROM PIPING, DUCTWORK, OR OTHER SYSTEMS. PROVIDE INSULATING BUSHINGS OR INSULATED THROATS AT ALL CONDUIT TERMINATIONS TO PROTECT CONDUCTORS. SECURE JOINTS AND CONNECTIONS TO PROVIDE MAXIMUM MECHANICAL STRENGTH AND ELECTRICAL CONTINUITY. PROVIDE GROUNDING AND BONDING IN ACCORDANCE WITH SECTION 26 0526. CLEAN INTERIOR OF CONDUITS TO REMOVE MOISTURE AND FOREIGN MATTER. IMMEDIATELY AFTER INSTALLATION OF CONDUIT. USE SUITABLE MANUFACTURED PLUGS TO

MATERIAL AND DO NOT REMOVE UNTIL READY FOR INSTALLATION OF SUBMITTALS: PROVIDE MANUFACTURER'S STANDARD CATALOG PAGES

AND DATA SHEETS FOR CABINETS AND ENCLOSURES, BOXES FOR HAZARDOUS (CLASSIFIED) LOCATIONS, FLOOR BOXES, AND BOXES: PROVIDE ALL BOXES, FITTINGS, SUPPORTS, AND ACCESSORIES

ACCOMMODATE DEVICES AND EQUIPMENT TO BE INSTALLED. PROVIDE PRODUCTS LISTED, CLASSIFIED, AND LABELED AS SUITABLE FOR THE PURPOSE INTENDED. WHERE BOX SIZE IS NOT INDICATED, SIZE TO COMPLY WITH NFPA 70 BUT NOT LESS THAN APPLICABLE MINIMUM SIZE REQUIREMENTS SPECIFIED. PROVIDE GROUNDING TERMINALS WITHIN BOXES WHERE EQUIPMENT GROUNDING CONDUCTORS TERMINATE.

INSTALLATION: ARRANGE EQUIPMENT TO PROVIDE MINIMUM CLEARANCES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND NFPA 70. SECURE AND SUPPORT BOXES IN ACCORDANCE WITH NFPA 70 AND SECTION 26 0529 USING SUITABLE SUPPORTS AND METHODS APPROVED BY THE AUTHORITY HAVING JURISDICTION. PROVIDE INDEPENDENT SUPPORT FROM BUILDING STRUCTURE EXCEPT FOR CAST METAL BOXES (OTHER THAN BOXES USED FOR FIXTURE SUPPORT) SUPPORTED BY THREADED CONDUIT CONNECTIONS IN

DUCTWORK, OR OTHER SYSTEMS. INSTALL BOXES PLUMB AND LEVEL. FLUSH-MOUNTED BOXES: INSTALL BOXES IN NONCOMBUSTIBLE MATERIALS SLICH AS CONCRETE THE GYPSHIM PLASTER FTC SO

THAT FRONT EDGE OF BOX OR ASSOCIATED RAISED COVER IS NOT SET BACK FROM FINISHED SURFACE MORE THAN 1/4 INCH (6 MM) OR DOES NOT PROJECT BEYOND FINISHED SURFACE. INSTALL BOXES IN COMBUSTIBLE MATERIALS SUCH AS WOOD SO THAT FRONT EDGE OF BOX OR ASSOCIATED RAISED COVER IS FLUSH WITH FINISHED SURFACE. REPAIR ROUGH OPENINGS AROUND BOXES IN NONCOMBUSTIBLE MATERIALS SUCH AS CONCRETE, TILE, GYPSUM, PLASTER, ETC. SO THAT THERE ARE NO GAPS OR OPEN SPACES GREATER THAN 1/8 INCH (3 MM) AT THE EDGE OF THE BOX.

PROVIDE GROUNDING AND BONDING IN ACCORDANCE WITH SECTION 26 IMMEDIATELY AFTER INSTALLATION, PROTECT BOXES FROM ENTRY OF

MOISTURE AND FOREIGN MATERIAL UNTIL READY FOR INSTALLATION

SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

IDENTIFICATION REQUIREMENTS: USE IDENTIFICATION NAMEPLATE TO

IDENTIFY EACH PIECE OF ELECTRICAL DISTRIBUTION AND CONTROL EQUIPMENT AND ASSOCIATED SECTIONS, COMPARTMENTS, AND

ARC FLASH HAZARD WARNING LABELS: USE WARNING LABELS TO IDENTIFY ARC FLASH HAZARDS FOR ELECTRICAL EQUIPMENT, SUCH AS SWITCHBOARDS, PANELBOARDS, INDUSTRIAL CONTROL PANELS,

METER SOCKET ENCLOSURES, AND MOTOR CONTROL CENTERS THAT ARE LIKELY TO REQUIRE EXAMINATION, ADJUSTMENT, SERVICING, OR MAINTENANCE WHILE ENERGIZED. INCLUDE ORANGE HEADER THAT READS "WARNING", FOLLOWED BY THE WORD MESSAGE "ARC FLASH AND SHOCK HAZARD; APPROPRIATE PPE REQUIRED; DO NOT OPERATE CONTROLS OR OPEN COVERS WITHOUT APPROPRIATE PERSONAL PROTECTION EQUIPMENT; FAILURE TO COMPLY MAY RESULT IN INJURY

OR DEATH; REFER TO NFPA 70E FOR MINIMUM PPE REQUIREMENTS" OR IDENTIFICATION FOR CONDUCTORS AND CABLES: COLOR CODING FOR POWER CONDUCTORS 600 V AND LESS: COMPLY WITH SECTION 26 0519. USE IDENTIFICATION NAMEPLATE OR IDENTIFICATION LABEL TO

IDENTIFICATION FOR DEVICES: USE IDENTIFICATION LABEL OR ENGRAVED WALLPLATE TO IDENTIFY SERVING BRANCH CIRCUIT FOR IDENTIFICATION NAMEPLATES AND LABELS:

IDENTIFICATION NAMEPLATES: TWO-LAYER OR THREE-LAYER LAMINATED ACRYLIC OR ELECTRICALLY NON-CONDUCTIVE PHENOLIC WITH BEVELED EDGES: MINIMUM THICKNESS OF 1/16 INCH (1.6 MM): ENGRAVED TEXT.

MOUNTING HOLES FOR MECHANICAL FASTENERS: TWO, CENTERED ON SIDES FOR SIZES UP TO 1 INCH (25 MM) HIGH; FOUR, LOCATED AT CORNERS FOR LARGER SIZES.

RECEPTACLE IDENTIFICATION LABELS: SELF-ADHESIVE LAMINATED PLASTIC LABELS; UV, CHEMICAL, WATER, HEAT, AND ABRASION RESISTANT. INDICATE PANEL AND CIRCUIT NUMBER.

INSTALLATION: INSTALL IDENTIFICATION PRODUCTS CENTERED, LEVEL, AND PARALLEL WITH LINES OF ITEM BEING IDENTIFIED. SECURE NAMEPLATES TO EXTERIOR SURFACES OF ENCLOSURES USING STAINLESS STEEL SCREWS AND TO INTERIOR SURFACES USING SELF-ADHESIVE BACKING OR EPOXY CEMENT. INSTALL SELF-ADHESIVE LABELS AND MARKERS TO ACHIEVE MAXIMUM ADHESION, WITH NO BUBBLES OR WRINKLES AND EDGES PROPERLY SEALED. MARK ALL HANDWRITTEN TEXT, WHERE PERMITTED, TO BE NEAT AND LEGIBLE.

SECTION 26 2717 - EQUIPMENT WIRING

ELECTRICAL CONNECTIONS: MAKE ELECTRICAL CONNECTIONS IN ACCORDANCE WITH EQUIPMENT MANUFACTURER'S INSTRUCTIONS MAKE CONDUIT CONNECTIONS TO EQUIPMENT USING FLEXIBLE CONDUIT. USE LIQUIDTIGHT FLEXIBLE CONDUIT WITH WATERTIGHT CONNECTORS IN DAMP OR WET LOCATIONS. CONNECT HEAT PRODUCING EQUIPMENT USING WIRE AND CABLE WITH INSULATION SUITABLE FOR TEMPERATURES ENCOUNTERED. PROVIDE RECEPTACLE OUTLET TO ACCOMMODATE CONNECTION WITH ATTACHMENT PLUG. PROVIDE CORD AND CAP WHERE FIELD-SUPPLIED ATTACHMENT PLUG IS REQUIRED. INSTALL SUITABLE STRAIN-RELIEF CLAMPS AND FITTINGS FOR CORD CONNECTIONS AT OUTLET BOXES AND EQUIPMENT CONNECTION BOXES. INSTALL DISCONNECT SWITCHES, CONTROLLERS, CONTROL STATIONS, AND CONTROL DEVICES TO COMPLETE EQUIPMENT WIRING REQUIREMENTS. INSTALL TERMINAL BLOCK JUMPERS TO COMPLETE EQUIPMENT WIRING REQUIREMENTS. INSTALL INTERCONNECTING CONDUIT AND WIRING BETWEEN DEVICES AND EQUIPMENT TO COMPLETE EQUIPMENT WIRING REQUIREMENTS.

SECTION 26 2726 - WIRING DEVICES

COORDINATION: COORDINATE THE PLACEMENT OF OUTLET BOXES WITH MILLWORK, FURNITURE, EQUIPMENT, ETC. INSTALLED UNDER OTHER SECTIONS OR BY OTHERS. COORDINATE WIRING DEVICE RATINGS AND CONFIGURATIONS WITH THE ELECTRICAL REQUIREMENTS OF ACTUAL EQUIPMENT TO BE INSTALLED. COORDINATE THE PLACEMENT OF OUTLET BOXES FOR WALL SWITCHES WITH ACTUAL INSTALLED DOOR SWINGS. DO NOT INSTALL WALL SWITCHES, INCLUDING OCCUPANCY SENSORS BEHIND DOOR SWINGS. IF INDICATED ON PLANS, VERIFY WITH ARCHITECT PRIOR TO ROUGHING IN. COORDINATE THE INSTALLATION AND PREPARATION OF UNEVEN SURFACES, SUCH AS SPLIT FACE BLOCK, TO PROVIDE SUITABLE SURFACE FOR INSTALLATION OF WIRING DEVICES.

SUBMITTALS: PROVIDE MANUFACTURER'S CATALOG INFORMATION SHOWING DIMENSIONS, COLORS, AND CONFIGURATIONS.

WIRING DEVICE FINISHES: PROVIDE WIRING DEVICE FINISHES AS DESCRIBED BELOW UNLESS OTHERWISE INDICATED.

WIRING DEVICES, UNLESS OTHERWISE INDICATED: WHITE WITH STAINLESS STEEL PLATES.

RECEPTACLES: SELF-GROUNDING, COMPLYING WITH NEMA WD 1 AND NEMA WD 6, AND LISTED AS COMPLYING WITH UL 498, AND WHERE APPLICABLE, FS W-C-596; TYPES AS INDICATED ON THE DRAWINGS WIRING PROVISIONS: TERMINAL SCREWS FOR SIDE WIRING OR SCREW ACTUATED BINDING CLAMP FOR BACK WIRING WITH SEPARATE GROUND TERMINAL SCREW.

CONVENIENCE RECEPTACLES: STANDARD CONVENIENCE RECEPTACLES: INDUSTRIAL GRADE, 20A, 125V, NEMA 5-20R; SINGLE OR DUPLEX AS INDICATED ON THE DRAWINGS.

GFCI RECEPTACLES: SELF-TESTING, WITH FEED-THROUGH PROTECTION AND LIGHT TO INDICATE GROUND FAULT TRIPPED CONDITION AND LOSS OF PROTECTION; LISTED AS COMPLYING WITH UL 943, CLASS A.

STANDARD GFCI RECEPTACLES: SAME GRADE AS CONVENIENCE RECEPTACLES, DUPLEX, 20A, 125V, NEMA 5-20R, RECTANGULAR DECORATOR STYLE.

WALL PLATES: STANDARD SIZE. STAINLESS STEEL WALL PLATES: BRUSHED SATIN FINISH, TYPE 302 STAINLESS STEEL.

INSTALLATION: COORDINATE LOCATIONS OF OUTLET BOXES PROVIDED UNDER SECTION 26 0537 AS REQUIRED FOR INSTALLATION OF WIRING DEVICES PROVIDED UNDER THIS SECTION. UNLESS OTHERWISE INDICATED, CONNECT WIRING DEVICE GROUNDING TERMINAL TO BRANCH CIRCUIT EQUIPMENT GROUNDING CONDUCTOR AND TO OUTLET BOX WITH BONDING JUMPER. INSTALL WIRING DEVICES PLUMB AND LEVEL WITH MOUNTING YOKE HELD RIGIDLY IN PLACE. INSTALL WALL SWITCHES WITH OFF POSITION DOWN. INSTALL VERTICALLY MOUNTED RECEPTACLES WITH GROUNDING POLE TO MATCH EXISTING. INSTALL WALL PLATES TO FIT COMPLETELY FLUSH TO WALL WITH NO GAPS AND ROUGH OPENING COMPLETELY COVERED WITHOUT STRAIN ON WALL PLATE. REPAIR OR REINSTALL IMPROPERLY INSTALLED OUTLET BOXES OR IMPROPERLY SIZED ROUGH OPENINGS. DO NOT USE OVERSIZED WALL PLATES IN LIEU OF MEETING THIS REQUIREMENT. INSTALL BLANK WALL PLATES ON JUNCTION BOXES AND ON OUTLET BOXES WITH NO WIRING DEVICES INSTALLED OR DESIGNATED FOR FUTURE USE.

SECTION 26 2818 - ENCLOSED SWITCHES

SUBMITTALS: PROVIDE MANUFACTURER'S STANDARD CATALOG PAGES AND DATA SHEETS FOR ENCLOSED SWITCHES AND OTHER INSTALLED COMPONENTS AND ACCESSORIES.

SHOP DRAWINGS: INDICATE OUTLINE AND SUPPORT POINT DIMENSIONS, VOLTAGE AND CURRENT RATINGS, SHORT CIRCUIT CURRENT RATINGS, CONDUIT ENTRY LOCATIONS, CONDUCTOR TERMINAL INFORMATION, AND INSTALLED FEATURES AND ACCESSORIES.

ENCLOSED SAFETY SWITCHES: QUICK-MAKE, QUICK-BREAK ENCLOSED SAFETY SWITCHES LISTED AND LABELED AS COMPLYING WITH UL 98; HEAVY DUTY; RATINGS, CONFIGURATIONS, AND FEATURES AS INDICATED. HORSEPOWER RATING SHALL BE SUITABLE FOR CONNECTED LOAD, VOLTAGE RATING SHALL BE SUITABLE FOR CIRCUIT VOLTAGE. PROVIDE ENCLOSED SAFETY SWITCHES, WHEN PROTECTED BY THE FUSES OR SUPPLY SIDE OVERCURRENT PROTECTIVE DEVICES TO BE INSTALLED, WITH LISTED SHORT CIRCUIT CURRENT RATING NOT LESS THAN THE AVAILABLE FAULT CURRENT AT THE PANEL FEEDING THE SWITCH. PROVIDE WITH SWITCH BLADE CONTACT POSITION THAT IS VISIBLE WHEN THE COVER IS OPEN. PROVIDE SOLIDLY BONDED EQUIPMENT GROUND BUS IN EACH ENCLOSED SAFETY SWITCH, WITH A

SUITABLE LUG FOR TERMINATING EACH EQUIPMENT GROUNDING

CONDUCTOR.

ENCLOSURES: INDOOR CLEAN, DRY LOCATIONS: TYPE 1, OUTDOOR LOCATIONS: TYPE 3R.

PROVIDE SAFETY INTERLOCK TO PREVENT OPENING THE COVER WITH THE SWITCH IN THE ON POSITION WITH CAPABILITY OF OVERRIDING INTERLOCK FOR TESTING PURPOSES.

HEAVY DUTY SWITCHES: PROVIDE MECHANICAL LUGS, COPPER. PROVIDE EXTERNALLY OPERABLE HANDLE WITH MEANS FOR LOCKING IN THE OFF POSITION, CAPABLE OF ACCEPTING THREE PADLOCKS.

INSTALLATION: ARRANGE EQUIPMENT TO PROVIDE MINIMUM CLEARANCES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND NFPA 70. PROVIDE REQUIRED SUPPORTS IN ACCORDANCE WITH SECTION 26 0529. EXCEPT WHERE INDICATED TO BE MOUNTED ADJACENT TO THE EQUIPMENT THEY SUPPLY, MOUNT ENCLOSED SWITCHES SUCH THAT THE HIGHEST POSITION OF THE OPERATING HANDLE DOES NOT EXCEED 79 INCHES (2000 MM) ABOVE THE FLOOR OR WORKING PLATFORM. PROVIDE GROUNDING AND BONDING IN ACCORDANCE WITH SECTION 26 0526.



Daniel Morga Middle Schoo

48 S. Purcell Ave. Winchester, VA 2260

RTU REPLACEMEN



ENERGY BY DESIGN 2677 PROSPERITY AVE. SUITE 27 FAIRFAX, VA 22031 T) 703.718.4355 2RW.com

> KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SV LEESBURG, VIRGINIA 2017 (V) 703.771.3990 (F) 703.771.3362

LINTON ENGINEERING 46090 LAKE CENTER PLAZA, SUITE 309 POTOMAC FALLS, VA 20165 571.323.0320





	PANE	L NO.:	DP4	(EXIS	TING)	BUS AMPS:	600A	SQUA	RED		_			FED F	ROM:	SWBI	D (EXISTING)	INTEGRAL S	SPD:		I
	PHAS	ES:	3			MAIN TYPE:	MLO	SERIE	S E1: I	-LIN	E			MOUN	NTING:	SURF	ACE	LOCATION:			I
	VOLTS	S	480V			AIC RATING:	EXISTING							PANE	L TYPE	POW	ER DISTRIBUTION	USAGE:			I
CIRCI	JIT				LOAD	DESCRIPTION		NOTES	BREA	KER	CKT.		CKT.	BRE	AKER	NOTES	DESCRIPTION	L	DAD	CIRC	ະບ
SETS	WIRE	NEUT.	GND.	CND.	AMPS				POLE	AMP.	#		#	AMP.	POLE			A	MPS.	SETS	۱
					0.0	(E) SPARE (OFF	POSITION)		3	15	1	Α	2	20	3		(E) SPARE (OFF POSITION)		0.0		
					0.0						3	В	4						0.0		
					0.0						5	С	6						0.0		
					0.0	(E) SPARE (OFF	POSITION)		3	20	7	Α	8	30	3	2,4	NEW RTU #2	1	9.2	1	
					0.0						9	В	10	-				1	9.2		
					0.0						11	С	12					1	9.2		
					0.0	(E) SPARE (OFF	POSITION)		3	15	13	Α	14	50	3	3,4	NEW RTU #1	3	5.9	1	
					0.0						15	В	16	-				3	5.9		
					0.0						17	С	18					3	5.9		
					0.0	(E) SPARE (OFF	POSITION)		3	40	19	Α	20	40	3		(E) PAC2-1	3	31.9		
					0.0						21	В	22	-				3	81.9		
					0.0						23	С	24					3	81.9	<u> </u>	
1	#4	#4	#8	1-1/4"	57.2	NEW RTU-3		1,4	3	70	25	Α	26	60	3		(E) SPARE (OFF POSITION)		0.0		
					57.2						27	В	28	-					0.0		
					57.2						29	С	30						0.0	<u> </u>	_
					118.1	NEW CU-1		2,4	3	125	31	Α	32	150	3		(E) PANEL "LB"	8	9.9		
					118.1						33	В	34	-				8	9.9		
					118.1						35	С	36					8	9.9	<u> </u>	
					104.8	(E) XFMR VIA T2			3	175	37	Α	38	30	3		(E) SPARE (OFF POSITION)		0.0		
					104.8						39	В	40	-					0.0		
					104.8						41	С	42						0.0		

TOTAL KVA

TOTAL AMPS

PANEL NOTES:

1. REMOVE EXISTING BREAKER AND WIRING. INSTALL NEW BREAKER AND WIRING AS SHOWN. AIC RATING TO MATCH THE EXISTING BREAKER.

REMOVE EXISTING BREAKER. INSTALL NEW BREAKER AS SHOWN, AIC TO MATCH EXISTING BREAKER. RE-USE EXISTING WIRE/CONDUIT.
 REMOVE EXISTING BREAKER. INSTALL NEW BREAKER AS SHOWN, AIC TO MATCH EXISTING BREAKER. RE-USE EXISTING WIRE /CONDUIT.

CONTRACTOR TO FIELD VERIFY EXISTING WIRE SIZE FOR RE-USE AS BASE BID. PROVIDE ADD ALTERNATE PRICE TO

PROVIDE NEW WIRE IN EXISTING CONDUIT AS SPECIFIED. UPDATE PANEL DIRECTORY. 4. UPDATE PANEL DIRECTORY.





		GENERAL NOTES
ELEC RM. 1513		1. THE WORK TO BE PERFORMED SHALL CONSIST PROVIDING ALL LABOR, EQUIPMENT, AND MATERIALS NECESSARY TO SERVICE TO REPLACE ROOF TOP MECHANICAL UNITS AT DANIEL MORGAN MIDDLE SCHOOL. ARCHITECTURAL CEILING REMOVAL/REINSTALLATION FOR REQUIRED STRUCTURAL REINFORCEMENT AND REPAIRS/MODIFICATIONS TO EXISTING ROOF/BUILDING SHALL BE COMPLETED BY OWNER-CONTRACTED VENDOR. THE SELECTED CONTRACTOR SHALL BE RESPONSIBLE
EXISTING		FOR ALL MECHANICAL, ELECTRICAL, AND STRUCTURAL WORK ASSOCIATED WITH THE REPLACEMENT OF THE ROOF TOP UNITS, AND COORDINATING WITH OTHER OWNER-CONTRACTED VENDORS FOR ASSOCIATED WORK, INCLUDING DRYWALL, PAINTING, CEILING REPLACEMENT, AND ROOF PATCHING.
DP4	FLOOR	

- 1. OWNER'S (WPS) VENDOR/CONTRACTOR SHALL PERFORM THE WORK DESCRIBED IN THIS KEYNOTE AND NEED NOT BE INCLUDED IN CONTRACTOR'S BID. OWNER'S VENDOR/CONTRACTOR SHALL THOROUGHLY COORDINATE THEIR WORK WITH OTHER TRADES PRIOR TO, DURING AND AFTER ANY DEMOLITION OR NEW WORK: REMOVE EXISTING GYPSUM CEILING SYSTEN AND PREPARE SPACE FOR INSTALLATION OF NEW ACT CEILING SYSTEM WITHIN THE BOUNDARY SHOWN. REFER TO NEW WORK FOR MORE INFROMATION.
- 2. OWNER'S (WPS) VENDOR/CONTRACTOR SHALL PERFORM THE WORK DESCRIBED IN THIS KEYNOTE AND NEED NOT BE INCLUDED IN CONTRACTOR'S BID. OWNER'S VENDOR/CONTRACTOR SHALL THOROUGHLY COORDINATE THEIR WORK WITH OTHER TRADES PRIOR TO, DURING AND AFTER ANY DEMOLITION OR NEW WORK: REMOVE EXISTING ACT CEILING SYSTEM (INCUDING CEILING GRIDS, ACT CEILING TILES ETC.), AND SALVAGE THE EXISTING SYSTEM (INCUDING CEILING GRIDS, ACT CEILING TILES ETC.) FOR RE-INSTALLATION IN NEW WORK. PREPARE SPACE FOR INSTALLATION OF SALVAGED EXISTING ACT CEILING SYSTEM (INCUDING CEILING GRIDS, ACT CEILING TILES ETC.) WITHIN THE BOUNDARY SHOWN. REFER TO NEW WORK PLANS.
- 3. REMOVE EXISTING TO REMAIN LIGHT FIXTURE, EXISTING TO REMAIN CEILING DIFFUSER/GRILLE, SPRINKLER HEAD AND ESCUTCHEON, AND ANY OTHER EXISTING CEILING DEVICE CURRENTLY INSTALLED FOR RE-USE AND RE-INSTALLATION IN NEW CEILING.

1. EXISTING PANEL "DP4" TO REMAIN.

- 2. OWNER'S (WPS) VENDOR/CONTRACTOR SHALL PERFORM THE WORK DESCRIBED IN THIS KEYNOTE AND NEED NOT BE INCLUDED IN CONTRACTOR'S BID. OWNER'S VENDOR/CONTRACTOR SHALL THOROUGHLY COORDINATE THEIR WORK WITH OTHER TRADES PRIOR TO, DURING AND AFTER ANY DEMOLITION OR NEW WORK: INSTALL NEW ACT CEILING SYSTEM (INCUDING CEILING GRIDS, ACT CEILING TILES ETC.) AS SHOWN, INC ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. NEW ACT CEILING SYSTEM (INCUDING CEILING GRIDS, ACT CEILING TILES ETC.) BASIS OF DESIGN SHALL BE COORDINATED WITH THE OWNER (WPS). REPAIR ANY DAMAGED PORTIONS OF WALL IN OCCUPIED SPACE AND TOUCH UP WALL PAINT AS REQUIRED TO MATCH EXISTING.
- 3. OWNER'S (WPS) VENDOR/CONTRACTOR SHALL PERFORM THE WORK DESCRIBED IN THIS KEYNOTE AND NEED NOT BE INCLUDED IN CONTRACTOR'S BID. OWNER'S VENDOR/CONTRACTOR SHALL THOROUGHLY COORDINATE THEIR WORK WITH OTHER TRADES PRIOR TO, DURING AND AFTER ANY DEMOLITION OR NEW WORK: RE-INSTALL SALVAGED ACT CEILING SYSTEM (INCUDING CEILING GRIDS, ACT CEILING TILES ETC.) WITHIN THE BOUNDARY SHOWN. REPLACE ANY DAMAGED CEILING TILES WITH NEW TILES TO MATCH ADJACENT UNDAMAGED CEILING TILES.
- 4. REINSTALL EXISTING TO REMAIN LIGHT FIXTURE, EXISTING TO REMAIN CEILING DIFFUSER/GRILLE, SPRINKLER HEAD AND ESCUTCHEON, AND ANY OTHER EXISTING CEILING DEVICE SALVAGED DURING DEMOLITION BACK IN THE NEW CEILING AS SHOWN. RESTORE FIXTURE/EQUIPMENT'S OPERATION TO THE CONDITION IT IN WAS PRIOR TO DEMOLITION. REBALANCE AIRFLOW ON DIFFUSERS/REGISTERS TO THE EXISTING VALUES.



Daniel Morgan Middle School

48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMENT



ENERGY BY DESIGN 2677 PROSPERITY AVE. SUITE 275 FAIRFAX, VA 22031 T) 703.718.4355 2RW.com

> KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703.771.3362

LINTON ENGINEERING 46090 LAKE CENTER PLAZA, SUITE 309 POTOMAC FALLS, VA 20165 571.323.0320



_____ <u>2</u> E-102 PARTIAL ROOF DEMOLITION PLAN - AREAS 5 & 6 - ELECTRICAL -- E-102 SCALE: 3/32" = 1'-0" 0 3' 5.3' 11'





Daniel Morgan Middle School

48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMENT



ENERGY BY DESIGN 2677 PROSPERITY AVE. SUITE 275 FAIRFAX, VA 22031 T) 703.718.4355 2RW.com

> KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703.771.3362







GENERAL NOTES (NEW WORK)

- 1. RECONNECT ALL NEW RTU(S) TO THE EXISTING FIRE ALARM SYSTEM/SMOKE DETECTION SHUTDOWN WIRING.
- 2. THE WORK TO BE PERFORMED SHALL CONSIST PROVIDING ALL LABOR, EQUIPMENT, AND MATERIALS NECESSARY TO SERVICE TO REPLACE ROOF TOP MECHANICAL UNITS AT DANIEL MORGAN MIDDLE SCHOOL. ARCHITECTURAL CEILING
- REMOVAL/REINSTALLATION FOR REQUIRED STRUCTURAL REINFORCEMENT AND REPAIRS/MODIFICATIONS TO EXISTING ROOF/BUILDING SHALL BE COMPLETED BY OWNER-CONTRACTED VENDOR. THE SELECTED CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MECHANICAL, ELECTRICAL, AND STRUCTURAL WORK

ASSOCIATED WITH THE REPLACEMENT OF THE ROOF TOP UNITS, AND COORDINATING WITH OTHER OWNER-CONTRACTED VENDORS FOR ASSOCIATED WORK, INCLUDING DRYWALL, PAINTING, CEILING REPLACEMENT, AND ROOF PATCHING.



Daniel Morgan Middle School

48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMENT



ENERGY BY DESIGN 2677 PROSPERITY AVE. SUITE 275 FAIRFAX, VA 22031 T) 703.718.4355 2RW.com

> KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703.771.3362

LINTON ENGINEERING 46090 LAKE CENTER PLAZA, SUITE 309 POTOMAC FALLS, VA 20165 571.323.0320







DRAWI	DRAWING LIST - ARCHITECTURAL							
A-100	ROOF KEY PLAN, SPECIFICATION & DRAWING INDEX							
A-101	ENLARGED ROOF PLAN - DEMO & NEW WORK							
A-102	DETAILS							

* THE SCOPE OF WORK DESCRIBED IN THIS DOCUMENT INCLUDING BUT NOT LIMITED TO EXTERIOR WALL, AND ROOF WORK SHALL BE COMPLETED BY **OWNER-CONTRACTED VENDOR. THE CONTRACTOR RESPONSIBLE FOR ALL** MECHANICAL, ELECTRICAL, AND STRUCTURAL IS ASSOCIATED WITH THE REPLACEMENT OF THE ROOF TOP UNITS SHALL USE THIS DOCUMENT FOR COORDINATION PURPOSES. ADDITIONAL ARCHITECTURAL WORK ASSOCIATED WITH THE REPLACEMENT OF ROOFTOP UNITS INCLUDING DRYWALL, PAINTING, AND CEILING REPLACEMENT (NOT DESCRIBED IN THIS DOCUMENT, REFER TO MEP DRAWINGS), SHALL BE COMPLETED BY OTHER OWNER-CONTRACTED VENDORS. OWNER'S VENDORS SHALL THOROUGHLY COORDINATE THEIR WORK WITH OTHER TRADES PRIOR TO, DURING AND AFTER ANY DEMOLITION OR NEW WORK

WPS DANIEL MORGAN MIDDLE SCHOOL TRU REPLACEMENT SPECIFICATIONS

01-GENERAL REQUIREMENTS

01.01 SPECIFICATION SECTIONS BELOW SHOW WHICH PRODUCTS AND SYSTEMS REQUIRE ACTION SUBMITTALS OF THE TYPES INDICATED BY INCLUDING ONE OR MORE OF THE FOLLOWING AFTER ITS TITLE: [PRODUCT DATA], [SHOP DRAWINGS], [SAMPLE], [PRODUCT SCHEDULE], [COORDINATION DRAWINGS], [WARRANTY], [DELEGATED DESIGN], [INSTALLER CERTIFICATION].

01.02 SPECIFICATION SECTIONS BELOW SHOW WHICH PRODUCTS AND SYSTEMS REQUIRE MOCKUPS BY INCLUDING [MOCKUP] AFTER THE SECTION TITLE.

- 01.03 ADDITIONAL DEFINITIONS FOR TERMS USED IN THESE DOCUMENTS: a. "PATCH": INFILL INDICATED AREA(S) WITH MATERIALS TO MATCH ADJACENT CONSTRUCTION INCLUDING THEIR SEQUENCING, TEXTURES, SUBSTRATES, SUPPORT, FINISH, AND COLORS SO THAT THE FINAL, DRY "PATCH" IS FLUSH WITH AND NOT DISCERNABLE FROM ADJACENT SURFACES WHEN VIEWED 10 FEET AWAY UNDER THE PROJECT'S FINAL LIGHTING CONDITIONS.
 - b. "MATCH": PROVIDE AND INSTALL INDICATED ITEM(S) OR ASSEMBLY(IES) THAT, 1) ARE NEW, 2) MEET CURRENT CODE REQUIREMENTS AND 3) UNLESS OTHERWISE NOTED, MATCH REPLACED ITEM(S) OR ASSEMBLY(IES) IN PERFORMANCE, SIZE, QUALITY, MATERIAL, COLOR, AND FASTENING - ALL SUBMITTED FOR ARCHITECT'S APPROVAL PRIOR TO MATERIAL PURCHASE OR INSTALLATION.
 - c. "BEST PRACTICES": CONTRACTOR'S OBLIGATION TO FOLLOW MANUFACTURER'S BEST PRACTICES ALSO APPLIES TO REFERENCED MANUFACTURER'S OR REFERENCED STANDARDS' INSTALLATION INSTRUCTIONS WHERE PHRASES LIKE "RECOMMENDED PRACTICES", "SHOULD", "HIGHEST QUALITY" OR "SUGGESTED" ARE USED.

01.04 CUTTING AND PATCHING OF ROOFING a. SCOPE : CUTTING AND PATCHING OF EXISTING TPO ROOFING AS PER PROJECT REQUIREMENTS.

- b. STANDARDS : 1. ALL WORK MUST COMPLY WITH MANUFACTURER INSTRUCTIONS AND SPECIFICATIONS FOR TPO ROOFING MATERIALS TO MAINTAIN EXISTING ROOF WARRANTY.
- 2. ENSURE ADHERENCE TO LOCAL BUILDING CODES AND REGULATIONS 3. ONLY CURRENTLY LICENSED ELEVATE CONTRACTORS WILL BE ALLOWED TO MAKE ALTERATIONS OF A WARRANTED ROOF SYSTEM
- c. PRODUCTS : 1. TPO MEMBRANE: USE MATERIALS COMPATIBLE WITH THE EXISTING ROOFING SYSTEM. TPO SEAM PRIMER AND CLEANER: ADHERE TO MANUFACTURER RECOMMENDATIONS TPO FLASHING AND PATCHES: MATCH EXISTING MEMBRANE THICKNESS AND COLOR.
- 4. HOT AIR WELDING EQUIPMENT: MAINTAIN EQUIPMENT IN GOOD WORKING ORDER. d. INSTALLATION : 1. PREPARATION : IDENTIFY AND MARK AREAS FOR CUTTING AND PATCHING ; CLEAN THE WORK AREA TO ENSURE
- PROPER ADHESION OF PATCHES 2. CUTTING: UTILIZE MANUFACTURER-APPROVED CUTTING METHODS FOR TPO ROOFING, ; ENSURE CLEAN AND STRAIGHT CUTS TO FACILITATE SEAMLESS PATCHING.
- 3. PATCHING: APPLY TPO SEAM PRIMER TO PREPARED SURFACES. ; WELD PATCHES USING HOT AIR WELDING EQUIPMENT IN ACCORDANCE WITH MANUFACTURER GUIDELINES.; INSPECT SEAMS FOR PROPER BONDING AND WATERTIGHT INTEGRITY.
- 4. INSPECTION: CONDUCT A THOROUGH INSPECTION OF THE PATCHED AREAS; VERIFY THAT THE PATCHES MATCH THE EXISTING ROOFING SYSTEM IN APPEARANCE AND FUNCTIONALITY
- ACCORDANCE WITH LOCAL ENVIRONMENTAL REGULATIONS

02-EXISTING CONDITIONS 02.01 SELECTIVE DEMOLITION

- a. BEFORE WORK BEGINS, PHOTOGRAPH ALL EXTERIOR PROJECT SURFACES AND PROVIDE A COPY TO OWNER. b. UTILITIES IN PROJECT AREA - BEFORE WORK BEGINS: IN ADDITION TO THE FOLLOWING, SEE MEP/F DRAWINGS AND SPECIFICATIONS.
- MAINTAIN SERVICES/SYSTEMS INDICATED TO REMAIN AND PROTECT THEM AGAINST DAMAGE. 3. LOCATE, IDENTIFY, DISCONNECT, AND SEAL OR CAP OFF INDICATED UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS SERVING AREAS TO BE SELECTIVELY DEMOLISHED.
- c. PROTECT ADJACENT SPACES AND MATERIALS FROM DUST, DEBRIS, AND DAMAGE. d. TEMPORARY SHORING: PROVIDE AND MAINTAIN SHORING, BRACING, AND STRUCTURAL SUPPORTS AS REQUIRED TO PRESERVE STABILITY AND PREVENT MOVEMENT, SETTLEMENT, OR COLLAPSE OF CONSTRUCTION AND FINISHES TO REMAIN, AND TO PREVENT UNEXPECTED OR UNCONTROLLED MOVEMENT OR COLLAPSE OF CONSTRUCTION BEING DEMOLISHED,
- e. NEATLY CUT OPENINGS AND HOLES PLUMB, SQUARE, AND TRUE TO DIMENSIONS REQUIRED. USE CUTTING METHODS LEAST LIKELY TO DAMAGE CONSTRUCTION TO REMAIN OR ADJOINING CONSTRUCTION. USE HAND TOOLS OR SMALL POWER TOOLS DESIGNED FOR SAWING OR GRINDING, NOT HAMMERING AND CHOPPING, TO MINIMIZE DISTURBANCE OF ADJACENT SURFACES. TEMPORARILY COVER OPENINGS TO REMAIN TO PREVENT WATER AND PEST INTRUSIONS,
- f. ADDITIONAL DEFINITIONS FOR TERMS USED IN THESE DOCUMENTS: 1. "REMOVE": DETACH ITEMS FROM EXISTING CONSTRUCTION AND LEGALLY DISPOSE THEM OFF-SITE UNLESS
- INDICATED TO BE REMOVED AND SALVAGED OR REMOVED AND REINSTALLED. 2. "REMOVE AND REINSTALL": DETACH ITEMS FROM EXISTING CONSTRUCTION, PREPARE FOR REUSE, AND
- REINSTALL WHERE INDICATED. 3. "REMOVE AND SALVAGE": DETACH ITEMS FROM EXISTING CONSTRUCTION AND PLACE IN STORAGE IN
- LOCATION ON PROJECT SITE AS IDENTIFIED BY OWNER. 4. "RETAIN": EXISTING ITEMS OF CONSTRUCTION THAT ARE NOT TO BE PERMANENTLY REMOVED AND THAT ARE NOT OTHERWISE INDICATED TO BE REMOVED, REMOVED AND SALVAGED, OR REMOVED AND REINSTALLED.

06-WOOD, PLASTICS AND COMPOSITES

05.01 ROUGH CARPENTRY [PRODUCT DATA]:

a. SCOPE: AS INDICATED ON DRAWINGS b. STANDARD(S) OF CARE: IN ADDITION TO WHAT MAY BE REQUIRED ELSEWHERE IN THE CONTRACT DOCUMENTS, THE

- MOST RIGOROUS OR HIGHEST QUALITY REQUIREMENTS OR RECOMMENDATIONS FROM THE LATEST EDITIONS OF THE FOLLOWING:
- GENERAL: AMERICAN WOOD PROTECTION ASSOCIATION (AWP), BOOK OF STANDARDS
- AMERICAN WOOD COUNCIL (AWC), NATIONAL DESIGN STANDARDS FOR WOOD CONSTRUCTION iii. NATIONAL FIRE PROTECTION INSTITUTE (NFPA)
- c. PRODUCTS: 1. 2X WOOD BLOCKING
- 5/8" PLYWOOD
- 3. ALL NON-EXPOSED WOOD, PLYWOOD, OR WOOD USED FOR BLOCKING, SHIMMING, ETC. IS TO BE FIRE RETARDANT TREATED 4. ALL WOOD IN CONTACT WITH MASONRY OR CONCRETE TO BE PRESSURE TREATED
- d. INSTALLATION:
- 1. ALL MISCELLANEOUS WOOD CONNECTIONS SHALL BE FASTENED PER 2018 IBC, TABLE 2304.10.1 "FASTENING SCHEDULE"
- 2. ALL WOOD BLOCKING, NAILERS, ETC. ATTACHED TO STEEL OR CONCRETE SHALL BE FASTENED WITH POWDER ACTUATED FASTENERS OR 3/8" DIAM. BOLTS, UON. FASTENERS SHALL BE SPACED AT 24" OC MAX AND STAGGERED. FASTENERS SHALL HAVE A MINIMUM CAPACITY OF 100 POUNDS IN SHEAR AND PULLOUT, UON

07-THERMAL AND MOISTURE PROTECTION

- 07.01 JOINT SEALANTS [PRODUCT DATA] [SAMPLE] [WARRANTY] [MOCK UP]
 - a. SCOPE: WHERE SHOWN ON DRAWINGS OR WHERE RECOMMENDED/REQUIRED BY PRODUCT MANUFACTURERS AND A SPECIFIC SELECTION IS NOT OTHERWISE CALLED FOR.
 - b. BASIS OF DESIGN : TREMCO HTTP:// WWW. TREMCOSEALANTS.COM/ SEE DWGS FOR DESIGN INTENT c. SEALANT FOR USE IN/AT:
 - 1. EXTERIOR JOINTS: SINGLE-COMPONENT, NEUTRAL-CURING SILICONE SEALANT, ASTM C 920, TYPE S; GRADE NS; CLASS 50 OR CLASS 100/50 AS RECOMMENDED BY MANUFACTURER FOR LOCATION AND SUBSTRATE; FOR
 - USE NT. 2. INTERIOR JOINTS: PERIMETERS OF OPENING: ACRYLIC LATEX OR SILICONIZED ACRYLIC LATEX, ASTM C 834,
 - TYPE OP, GRADE NF.
 - ARCHITECT'S SELECTION e. MOCKUP: PROVIDE MIN. 12" LONG SAMPLE INSTALLATION FOR ARCHITECT'S APPROVAL OF COLOR.
 - f. ACCESSORIES:
 - 1. CYLINDRICAL SEALANT BACKINGS: ASTM C 1330, OF SIZE AND DENSITY TO CONTROL SEALANT DEPTH AND OTHERWISE CONTRIBUTE TO PRODUCING OPTIMUM SEALANT PERFORMANCE; ARE NONSTAINING; ARE COMPATIBLE WITH JOINT SUBSTRATES, SEALANTS, PRIMERS, AND OTHER JOINT FILLERS; AND ARE APPROVED FOR APPLICATIONS INDICATED BY SEALANT MANUFACTURER BASED ON FIELD EXPERIENCE AND LABORATORY
 - TESTING. 2. BOND-BREAKER TAPE: POLYETHYLENE TAPE OR OTHER PLASTIC TAPE RECOMMENDED BY SEALANT MANUFACTURER FOR PREVENTING SEALANT FROM ADHERING TO RIGID, INFLEXIBLE JOINT-FILLER MATERIALS
 - OR JOINT SURFACES AT BACK OF JOINT. PROVIDE SELF-ADHESIVE TAPE WHERE APPLICABLE. 3, 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.

g. INSTALLATION: FOLLOW MANUFACTURER'S WRITTEN INSTRUCTIONS FOR HIGHEST QUALITY INSTALLATION. 07.02 SHEET METAL FLASHING AND TRIM [PRODUCT DATA], [SHOP DRAWINGS], [SAMPLE], [WARRANTY]

- a. SCOPE: FLASHINGS AT MECH CURB & EXTERIOR WALL OPENING AND COUNTER FLASHING AS DETAILED ON THE DRAWINGS. b. ALUMINUM SHEET FLASHING: ASTM B209 (ASTM B209M), ALLOY AS STANDARD WITH MANUFACTURER FOR FINISH
- REQUIRED, WITH TEMPER AS REQUIRED TO SUIT FORMING OPERATIONS AND PERFORMANCE REQUIRED; WITH SMOOTH, FLAT SURFACE.
- 1. COLOR: MATCH EXISTING 2. THICKNESS : 0.032INCH (0.80mm)
- 3. EXPOSED COIL-COATED FINISH: TWO-COAT FLUOROPOLYMER; FACTORY FINISHED 4. CONCEALED FINISH : PRETREAT WITH MANUFACTURER'S STANDARD c. ACCESSORIES: AS REQUIRED TO OBTAIN ROOF MANUFACTURER'S WARRANTY INCLUDING BUT ARE NOT LIMITED TO
- THE FOLLOWING: AS SHOWN ON DRAWINGS d. STANDARD(S) OF CARE: IN ADDITION TO WHAT MAY BE REQUIRED ELSEWHERE IN THE CONSTRUCTION DOCUMENTS, THE MOST RIGOROUS OR HIGHEST QUALITY REQUIREMENTS OR RECOMMENDATIONS FROM THE
- LATEST EDITIONS OF THE FOLLOWING i. SMACNA: ARCHITECTURAL SHEET METAL MANUAL
- e. WARRANTY: PROVIDE OWNER WITH LIMITED WARRANTY FOR COLOR FASTNESS

5. CLEANUP: REMOVE DEBRIS AND SURPLUS MATERIALS FROM THE WORK AREA; DISPOSE OF WASTE IN

d. COLOR: PROVIDE SCHEDULE FOR SEALANT TYPE LOCATIONS AND MANUFACTURER'S FULL RANGE OF COLORS FOR

07.03 ROOFING SYSTEMS AND ACCESSORIES [PRODUCT DATA] [SHOP DRAWINGS] [SAMPLES] [WARRANTY] a. SCOPE: PATCHING AT EXISTING ROOF FOR MECH CURBS, EQUIPMENT SUPPORTS AND PIPE AND DUCT SUPPORTS, AS INDICATED ON DRAWINGS. b. ROOFING SYSTEM:

1. BASE OF DESIGN: ELEVATE ULTRAPLY TPO ROOFING SYSTEM AND FLASHING; 60 mils THICKNESS AT ALL ROOF AREAS

2. INSULATION MATERIALS : PROVIDE PREFORMED, ROOFING INSULATION BOARDS THAT COMPLY WITH MANUFACTURER'S REQUIREMENTS, SELECTED FROM MANUFACTURER'S STANDARD SIZES AND OF THICKNESSES INDICATED. INSULATION SYSTEM SHALL INCLUDE PREFORMED SADDLES, CRICKETS, TAPERED EDGE STRIPS, AND OTHER INSULATION SHAPES WHERE INDICATED FOR SLOPING TO DRAIN. FABRICATE TO SLOPES INDICATED.

AUXILIARY MATERIALS : FURNISH AUXILIARY MATERIALS RECOMMENDED by ROOFING SYSTEM MANUFACTURER FOR INTENDED USE AND COMPATIBLE WITH TPO MEMBRANE ROOFING. FURNISH LIQUID-TYPE AUXILIARY MATERIALS THAT MEET VOC LIMITS OF AUTHORITIES HAVING JURISDICTION.

 BONDING ADHESIVE: LVOC SINGLE-PLY BONDING ADHESIVE BY FIRESTONE BUILDING PRODUCTS. ii. SPLICE ADHESIVE AND CLEANER: SINGLE-COMPONENT BUTYL SPLICING ADHESIVE AND SOLVENT-BASED SPLICE CLEANER.

- 111. LAP SEALANT: MANUFACTURER'S STANDARD SINGLE-COMPONENT SEALANT. iv. WATER CUTOFF MASTIC: MANUFACTURER'S STANDARD BUTYL MASTIC SEALANT.
- v. METAL TERMINATION BARS: MANUFACTURER'S STANDARD ALUMINUM BARS, APPROXIMATELY 1 INCH WIDE, ROLL FORMED AND PRE-PUNCHED.
- vi. FASTENERS: FACTORY-COATED STEEL FASTENERS AND METAL OR PLASTIC PLATES MEETING CORROSION-RESISTANCE PROVISIONS OF FM 4470, DESIGNED FOR FASTENING SHEET TO SUBSTRATE, AND ACCEPTABLE TO ROOFING SYSTEM MANUFACTURER.
- vii. MISCELLANEOUS ACCESSORIES: PROVIDE POURABLE SEALERS, PREFORMED CONE AND VENT SHEET FLASHINGS, PREFORMED INSIDE AND OUTSIDE CORNER SHEET FLASHINGS, T-JOINT COVERS, IN-SEAM SEALANTS, TERMINATION REGLETS, AND OTHER ACCESSORIES RECOMMENDED BY ROOFING SYSTEM
- MANUFACTURER FOR INTENDED USE. 4. REQUIREMENTS: ROOFING MANUFACTURER FIELD REVIEW OF INSTALLATION W/ WRITTEN APPROVAL AND STATING NO CHANGE IN WARRANTY OF EXISTING ROOF & THAT PORTIONS OF ROOF PATCHED FOR THIS PROJECT WILL BE WARRANTED BY INSTALLER AND MANUFACTURED FOR NO LESS TIME THAN THAT FOR THE EXISTING ROOF AND UNDER NO LESS FAVORABLE (TO OWNER) TERMS

END OF SPECIFICATIONS





Daniel Morgan **Middle School** 48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMENT



KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703.771.3362

LINTON ENGINEERING 46090 LAKE CENTER PLAZA, SUITE 309 POTOMAC FALLS, VA 20165 571.323.0320



& DRAWING INDEX

A-100

CHECKED BY: KR

DRAFTED BY: CH

DATE: 02.09.2024





Daniel Morgan Middle School 48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMENT



KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703 771 3362

LINTON ENGINEERING 46090 LAKE CENTER PLAZA, SUITE 309 POTOMAC FALLS, VA 20165 571.323.0320





DATE

02.09.2024

SUBMISSION / REVISION

WORKING DRAWINGS





CURB DETAIL @ MECH. UNIT SCALE: NOT TO SCALE





ELEVATION @ DUCT PENETRATION SCALE: 1 1/2"=1'-0"





CURB DETAIL @ MECH. DUCT SCALE: 3"=1'-0"









2

DUCT PENETRATION SECTION DETAIL SCALE: 3"=1'-0"



TYP. CRICKET DETAIL @ MECH. CURB SCALE: 3"=1'-0" REFER TO 1/ A102 FOR TYP. NOTE AND DIMENSION



DUCT PENETRATION PLAN DETAIL 6 SCALE: 3"=1'-0"

 8 MECHANICAL DUCT, SEE MEP DWG 9 DUCT INSULATION. SEE MEP DWG 	
10 PACK SPACE TIGHT WITH MINERAL WOOL	
(11) MIN 3/8" X 1 1/2" ZINC PLATED MASONRY ANCHOR SCREW, SPACING MAX 6" O.C. SET IN SEALANT	
 (12) APPLY SEALANT ON ALL 4 SIDES OF THE DUCT INSULATION (13) CAULK ALL AROUND & SECURE FLASHING TO DUCT, 	
WATERTIGHT. (14) 18 GA GALV METAL FLASHING REFER TO HVAC DUCT	
15 ANGLE DUCT SUPPORT FASTEN TO DUCT & CURB	
(16) PREFABRICATED, INSULATED CURB, MOUNT AND SECURE ON WOOD NAILER	
17 1 1/2" RIGID FIBERGLASS INSULATION	
(19) ROOFING MEMBRANE EXTENDS UP AND OVER CURB	
$\begin{array}{c} \hline \textbf{20} \text{EXISTING ROOFING MEMBRANE} \\ \hline \textbf{21} \text{EXISTING RIGID INSULATION} \end{array}$	
22 EXISTING ROOF STRUCTURE	
23 WELDED SPLICE 24 TAPERED RIGID INSULATION AT CRICKET	
USE MIN. 1/2" PER FOOT TO BALANCE THE DOWNHILL SLOPE (25) CUT EDGE SEALANT	
(E) CONSTRUCTION TO REMAIN	
GENERAL NOTES	
ALL DIMENSIONS ARE TO FINISHED FACE VERIFY ALL DIMENSIONS IN THE FIELD	
COORDINATE ALL DEMOLITION WORK WITH PROPOSED NEW WORK & MEP	
SEE MEP FOR BALANCE OF DEMO AND ITEMS TO REMAIN	
THE SCOPE OF WORK DESCRIBED IN THIS DOCUMENT INCLUDING BUT NOT LIMITED TO EXTERIOR WALL, AND ROOF WORK SHALL BE COMPLETED BY OWNER-CONTRACTED	
VENDOR. THE CONTRACTOR RESPONSIBLE FOR ALL MECHANICAL, ELECTRICAL, AND STRUCTURAL WORK ASSOCIATED WITH THE REPLACEMENT OF THE ROOF TOP UNITS	
ADDITIONAL ARCHITECTURAL WORK ASSOCIATED WITH THE REPLACEMENT OF POOFTOP UNITS INCLUDING DEVALUATION	
PAINTING, AND CEILING REPLACEMENT (NOT DESCRIBED IN THIS DOCUMENT, REFER TO MEP DRAWINGS), SHALL BE	
OWNER'S VENDORS SHALL THOROUGHLY COORDINATE THEIR WORK WITH OTHER TRADES PRIOR TO, DURING AND AFTER	
ANY DEMOLITION OR NEW WORK	

NOTES FOR NEW WORK

(1) EXISTING EXTERIOR MASONRY WALL

(4) SEALANT ALL 4 SIDES OF THE OPENING

(3) ALUM. COUNTER FLASHING 3" MIN. WITH END CAP

(5) CONTINUOUS BEAD OF SEALANT @ HEAD & JAMB ONLY

(6) 2" X 4" 16 GA GALV HOT DIPPED G90 RETAINING ANGLE ON

(7) GALV. SHEET MTL SCREWS. SET IN SEALANT SPACING MAX 6"

ALL 4 SIDES ; FIELD TOUCH-UP WI/ZINC RICH PAINT

(2) CONTINUOUS BEAD OF SEALANT



Daniel Morgan Middle School 48 S. Purcell Ave. Winchester, VA 22601

RTU REPLACEMENT



KARL RIEDEL ARCHITECTURE, PC 4 LOUDOUN STREET, SW LEESBURG, VIRGINIA 20175 (V) 703.771.3990 (F) 703 771 3362

LINTON ENGINEERING 46090 LAKE CENTER PLAZA, SUITE 309 POTOMAC FALLS, VA 20165 571.323.0320





A-102

CHECKED BY: KR

DRAFTED BY: CH

DATE: 02.09.2024



DESIGN NOTES

- I. DESIGN LOADS FOR NEW WORK
- A. ROOF SNOW AND LIVE LOAD
 1. Pg = 35 PSF
- PF = 27 PSF + DRIFTING, MIN ROOF DESIGN LOAD = 20 PSF
 ROOF LIVE LOAD = 20 PSF + 300 LBS. CONCENTRATED LOAD.
- SNOW EXPOSURE FACTOR, Ce = 1.0
 SNOW LOAD IMPORTANCE FACTOR, Is = 1.1
- SLOPE FACTOR, Cs = 1.0
 THERMAL FACTOR, Ct = 1.0
- B. WIND LOAD
- Vult (3-second gust) = 117 MPH
 Vservice (10-YR. MRI) = 76 MPH
- EXPOSURE = B
 INTERNAL PRESSURE COEFFICIENT = 0.18GCpi
 COMPONENT AND CLADDING PRESSURE PER ASCE 7, TABLE 26.10-1 AND FIGURES 30.3-1.
- C. SEISMIC LOAD 1. RISK CATEGORY = III
- SEISMIC IMPORTANCE FACTOR, IE = 1.25
 MAPPED SPECTRAL ACCELERATION, SHORT PERIOD, Ss = 0.125
- MAPPED SPECTRAL ACCELERATION, 1-SEC. PERIOD, S1 = 0.044
 SITE CLASS = C
 SPECTRAL RESPONSE COEFFICIENT, SHORT PERIOD, SDS = 0.108
- SPECTRAL RESPONSE COEFFICIENT, SHORT PERIOD, SD3 = 0.108
 SPECTRAL RESPONSE COEFFICIENT, 1-SEC. PERIOD, SD1 = 0.044
 SEISMIC DESIGN CATEGORY = B
- 9. SEISMIC RESPONSE COEFFICIENT, CS = 0.098
 10. RESPONSE MODIFICATION FACTOR, R = 5
 11. ANALYSIS PROCEDURE USED: EQUIVALENT LATERAL FORCE
- D. CODE: THE STRUCTURE IS DESIGNED IN ACCORDANCE WITH: 2018 VIRGINIA UNIFORM BUILDING CODE AND THE INTERNATIONAL BUILDING CODE/2018.
- E. SUPERIMPOSED DEAD LOADS 1. ROOF
- a. TYPICAL = 15b. 10 PSF, APPLICABLE ONLY DURING WIND UPLIFT
- II. STRUCTURAL STEEL
- A. ALL STRUCTURAL STEEL SHALL BE FABRICATED AND ERECTED IN ACCORDANCE WITH AISC "STEEL CONSTRUCTION MANUAL" WITH MINIMUM YIELD STRENGTHS AS FOLLOWS:
- ANGLES AND RODS: Fy = 36 ksi PER ASTM A36.
 PLATES: Fy = 50 ksi, PER ASTM A572 GRADE 50.
 ANCHOR PODS: Fy = 56 ksi PER ASTM E4554 CRADE 55.
- ANCHOR RODS: Fy = 55 ksi PER ASTM F1554 GRADE 55 SUPPLEMENT S1.
 BOLTS: Fy = 120 ksi PER ASTM F3125 GRADE A325.
 NUTS: ASTM A563
 WASHERS: ASTM F436
- B. ALL EXTERIOR EXPOSED BOLTS SHALL BE HOT-DIPPED GALVANIZED CONFORMING TO ASTM A153, CLASS C.
- C. WELDING SHALL CONFORM TO THE REQUIREMENTS OF THE "STRUCTURAL WELDING CODE" AWS D1.1 CURRENT CODE. USE 70 KSI, LOW-HYDROGEN ELECTRODES.
- D. NO FABRICATION SHALL PROCEED PRIOR TO SHOP DRAWINGS APPROVAL.
- E. NO OPENINGS IN BEAMS OR COLUMNS ARE PERMITTED WITHOUT PRIOR APPROVAL.
- F. SPLICING OF STRUCTURAL STEEL MEMBERS WHERE NOT DETAILED ON THE CONTRACT DOCUMENTS IS PROHIBITED WITHOUT PRIOR APPROVAL OF LOCATION, TYPE OF SPLICE AND CONNECTION TO BE MADE.
- G. STRUCTURAL STEEL SHOP DRAWINGS SHALL INCLUDE DETAILS FOR APPLICATION AND ASSEMBLY OF ALL STRUCTURAL MEMBERS. INCLUDE DETAILS OF CUTS, CONNECTIONS, HOLES, AND OTHER PERTINENT DATA. INDICATE WELDS BY STANDARD AWS 2.1 SYMBOLS SHOWING SIZE, LENGTH AND TYPE OF EACH WELD. SHOP DRAWINGS SHALL BE SUBMITTED TO ARCHITECT FOR APPROVAL PRIOR TO FABRICATION.
- H. ALL MISCELLANEOUS STEEL CONNECTIONS SHALL BE WELDED ALL AROUND WITH ONE-QUARTER-INCH FILLET WELD UNLESS OTHERWISE NOTED, EXCEPT FOR SLOTTED CONNECTIONS.
- I. GC SHALL COVER ALL STORED MATERIAL FROM EXTERIOR EXPOSURE AS NEEDED TO PREVENT CORROSION PRIOR TO INSTALLATION.
- J. ALL WORK SHALL COMPLY WITH THE AISC CODE "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES".
- III. OPEN WEB STEEL JOISTS
- A. ALL CONCENTRATED LOADS ON OPEN WEB STEEL JOISTS EXCEEDING 100 LBS SHALL BE LOCATED AT PANEL POINTS. JOIST WEB REINFORCEMENT IS REQUIRED AT LOCATIONS WHERE POINT LOADS CANNOT BE COORDINATED WITHIN 3-INCHES OF PANEL POINT LOCATIONS. SEE <u>8/S401</u>.
- IV. GENERAL
- A. INFORMATION SHOWN REGARDING EXISTING CONDITIONS HAS BEEN FROM EXISTING DRAWINGS PREPARED BY WATKINS PARTNERSHIP DATED 12-01-2000 & REVISIONS DATED MARCH 2001 AND OBTAINED BY LIMITED VISUAL OBSERVATIONS. AREAS NOT VISIBLE HAVE BEEN ASSUMED TO BE TYPICAL WITH OBSERVED EXISTING CONDITIONS.
- B. THE CONTRACTOR SHALL EXPOSE AND CONFIRM ALL EXISTING STRUCTURAL CONDITIONS RELATIVE TO THE NEW CONSTRUCTION AND INFORM THE ENGINEER OF CONDITIONS AT VARIANCE WITH THOSE SHOWN ON THE DRAWINGS. VERIFICATION AND NOTIFICATION SHALL PROCEED PRIOR TO THE START OF WORK SO THAT ANY NECESSARY CHANGES CAN BE MADE WITHOUT DELAYING THE PROJECT SCHEDULE.
- C. THE CONTRACTOR SHALL MEASURE AND PROVIDE ALL EXISTING FIELD DIMENSIONS, ELEVATIONS AND CONDITIONS AT THE JOB SITE PRIOR TO CONSTRUCTION AND THE SUBMISSION OF SHOP DRAWINGS AND SHALL NOTIFY THE ARCHITECT IMMEDIATELY OF ANY DISCREPANCIES.
- D. WHENEVER THE LOADING FROM THE CONTRACTOR'S EQUIPMENT EXCEEDS THE ALLOWABLE LIVE LOAD CAPACITIES INDICATED ON THE DRAWINGS, TEMPORARY SHORING SHALL BE PROVIDED. THE SHORING DESIGN PROCEDURES SHALL CONFORM TO ALL GOVERNING CODES & SAFETY REQUIREMENTS, A RECORD COPY OF THE SIGNED & SEALED SHORING DRAWINGS AND CALCULATIONS SHALL BE SUBMITTED FOR REVIEW.
- E. DETAILS, SECTIONS, AND NOTES SHOWN ON THESE DRAWINGS ARE INTENDED TO BE TYPICAL AND SHALL APPLY TO SIMILAR CONDITIONS ELSEWHERE UNLESS OTHERWISE SHOWN OR NOTED.
- F. THE DEVELOPMENT AND IMPLEMENTATION OF JOB SITE SAFETY AND CONSTRUCTION PROCEDURES ARE SOLELY THE DESIGN RESPONSIBILITY OF THE GENERAL CONTRACTOR.
- G. CONTRACTOR SHALL PROVIDE INDEPENDENTLY PREPARED SHOP DRAWINGS AND SHALL NOT REPRODUCE ANY PORTION OF THE CONTRACT DOCUMENTS IN PREPARING SHOP DRAWINGS. THE SHOP DRAWINGS SHALL NOT SIMPLY BE A MARK-UP OF THE CONTRACT DOCUMENTS.
- H. WORKMANSHIP: THE GENERAL CONTRACTOR SHALL DESIGN AND CONSTRUCT MISCELLANEOUS NON-STRUCTURAL COMPONENTS IN A WORKMAN LIKE MANNER THAT IS CONSISTENT WITH GENERAL CONSTRUCTION STANDARDS. COMPLETE INSTALLATIONS ARE REQUIRED THAT ARE READY FOR SERVICE
- V. DEMOLITION
- A. ALL MEANS AND METHODS OF SAFELY REMOVING ALL EXISTING CONSTRUCTION SHALL BE SOLELY THE DESIGN RESPONSIBILITY OF THE CONTRACTOR.



MECH UNIT WEIGHT SCHEDULE										
MARK	SIZE (LxWxH)	WEIGHT (LBS)	CURB WEIGHT (LBS)	CURB ADAPTOR WEIGHT (LBS)						
RTU-1	21.5'x9.5'x6.35'	6100	375	N/A						
RTU-2	9.65'x5.3'x4.9'	2100	200	N/A						
RTU-3	11.8'x7.2'x4.9'	2770	200	N/A						
CU-1	7.7'x7.35'x6.5'	2230	200	150						

NOTES:

- 1. IF A MECHANICAL UNIT TO BE INSTALLED WEIGHS MORE THAN INDICATED IN ABOVE TABLE, UNIT SIZE AND WEIGHT SHALL BE SUBMITTED TO STRUCTURAL ENGINEER FOR REVIEW.
- 2. GC SHALL COORDINATE MECHANICAL EQUIPMENT SIZES AND LOCATIONS WITH MECHANICAL DRAWINGS & EQUIPMENT MANUFACTURER ROOF OPENINGS SHALL BE ADJUSTED AS NEEDED TO AVOID CONFLICT WITH EXISTING FRAMING WHICH IS NOT BEING SHOWN AS BEING CUT OR REMOVED ON PLAN. GC SHALL SUBMIT PROPOSED EQUIPMENT LOCATIONS TO ENGINEER FOR REVIEW PRIOR TO FABRICATION.
- 3. EXISTING DUCTWORK PENETRATION THROUGH ROOF OR EXTERIOR WALL WILL BE REUSED FOR NEW DUCTWORK. PER MEP DRAWINGS.





ROOF FRAMING NOTES:

1. DO NOT SCALE DRAWINGS FOR DETERMINING PLAN DIMENSIONS.

2. (EX. R) DESIGNATES EXISTING 1 1/2"x 22 GA TYPE B ROOF DECK (G60) SPAN DIRECTION.





