

TAG	SYMBOL	DESCRIPTION
A/C		ABOVE CEILING
AHU		AIR HANDLER
B/D		BACKDRAFT DAMPER
B/F		BELOW FLOOR
CD	☒	CEILING DIFFUSER
CWSR		CONDENSER WATER SUPPLY & RETURN
CFM		CUBIC FOOT PER MIN.
DB		DRY BULB
	—	NEW DUCT WORK
EXIST.	----	EXISTING DUCT / PIPE
EAT		ENTERING AIR TEMPERATURE
EWT		ENTERING WATER TEMPERATURE
EF		EXHAUST FAN
ER	☒	EXHAUST REGISTER
ESP		EXTERNAL STATIC PRESSURE
FD	→	FIRE DAMPER
FSD	→	COMBINATION FIRE & SMOKE DAMPER
	→	VERTICAL FIRE DAMPER
	→	VERTICAL COMBINATION FIRE & SMOKE DAMPER
HP		HORSEPOWER
LAT		LEAVING AIR TEMPERATURE
LWT		LEAVING WATER TEMPERATURE
MD		MANUAL DAMPER
	☒	MOTOR OPERATED DAMPER
OA		OUTSIDE AIR
RA		RETURN AIR
RAG	☒	RETURN AIR GRILLE
SA		SUPPLY AIR
SR		SUPPLY REGISTER
	⊖	THERMOSTAT
	⊕	BALL VALVE
WSP		WATER SOURCE HEAT PUMP

**SECTION 230100 - GENERAL:**

- A. GENERAL
  - CONTRACTOR SHALL PROVIDE ALL MATERIALS, EQUIPMENT, TOOLS AND LABOR NECESSARY TO PROVIDE A COMPLETE MECHANICAL SYSTEM COMPLIANT WITH ALL REQUIRED CODES & STANDARDS.
  - DRAWINGS ARE SCHEMATIC IN NATURE AND SHALL NOT BE SCALED.
  - ALL REQUIRED PERMITS & INSPECTIONS SHALL BE SECURED & PAID FOR UNDER THIS CONTRACT. INSPECTION CERTIFICATIONS SHALL BE PROVIDED TO THE OWNER.
  - CONTRACTOR SHALL VISIT THE SITE TO THOROUGHLY EXAMINE EXISTING CONDITIONS PRIOR TO SUBMITTING BID. IF EXISTING CONDITIONS DIFFER FROM DESIGN DOCUMENTS IN SUCH A MANNER THAT AFFECTS PRICING, THE CONTRACTOR SHALL ADJUST THE BID ACCORDINGLY AND NOTIFY THE OWNER & ENGINEER PRIOR TO SUBMITTING THE BID. NO ALLOWANCES WILL BE MADE FOR LACK OF KNOWLEDGE REGARDING THE EXISTING CONDITIONS.
- B. VIBRATION ISOLATION
  - VIBRATION ISOLATION SHALL BE PROVIDED FOR ALL MOTOR DRIVEN EQUIPMENT SUSPENDED FROM STRUCTURE OR MOUNTED ON FLOOR. VIBRATION ISOLATORS SHALL BE SIZED PER EQUIPMENT MANUFACTURER'S REQUIREMENTS.
- C. IDENTIFICATION
  - PERMANENT BAKELITE TAGS WITH 1" TALL LETTERS SHALL BE PROVIDED FOR ALL EQUIPMENT. EQUIPMENT NUMBERING SHALL MATCH BUILDING STANDARDS.
- D. STARTERS
  - ALL MOTORS SHALL BE PROVIDED WITH MAGNETIC MOTOR STARTERS WITH OVERLOAD PROTECTION.
  - STARTERS SHALL BE PROVIDED WITH HAND-OFF-AUTO SWITCHES.
  - INDOOR MOTOR STARTERS SHALL BE FURNISHED WITHIN A NEMA 1 ENCLOSURE.
  - OUTDOOR MOTOR STARTERS SHALL BE FURNISHED WITHIN A NEMA 3R ENCLOSURE.
- E. SUBMITTALS & SHOP DRAWINGS
  - CONTRACTOR SHALL SUBMIT SHOP DRAWINGS & PRODUCT DATA FOR ALL MECHANICAL EQUIPMENT & SYSTEMS TO BE PROVIDED AND/OR INSTALLED.
- F. SUBSTITUTE MANUFACTURERS
  - CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION & COST OF ALL CHANGES REQUIRED FOR INSTALLATION OF EQUIPMENT & PRODUCTS MANUFACTURED BY THOSE OTHER THAN WHAT IS SPECIFIED IN THE CONTRACT DOCUMENTS.
  - CAREFULLY COORDINATE SUBSTITUTE MANUFACTURERS' INSTALLATION REQUIREMENTS WITH ALL OTHER TRADES INCLUDING BUT NOT LIMITED TO STRUCTURE, ELECTRICAL, PLUMBING AND ARCHITECTURAL. ALL INSTALLATION COSTS ASSOCIATED WITH INSTALLATION OF SUBSTITUTE MANUFACTURER SHALL BE INCLUDED IN BID. NO ALLOWANCES SHALL BE GIVEN FOR CHANGES ASSOCIATED WITH INSTALLATION OF SUBSTITUTE EQUIPMENT & SYSTEMS.
  - LISTING OF A MANUFACTURER AS AN "EQUAL" DOES NOT RELIEVE CONTRACTOR'S RESPONSIBILITY OF COORDINATION & COST ASSOCIATED WITH CHANGES REQUIRED TO OTHER TRADES.

**G. WARRANTY**

- 1. CONTRACTOR SHALL WARRANT ALL EQUIPMENT, MATERIALS AND WORKMANSHIP FOR A PERIOD OF NOT LESS THAN ONE (1) YEAR.
  - 2. ALL HVAC COMPRESSORS SHALL BE WARRANTED FOR A PERIOD OF NOT LESS THAN 5 YEARS.
- H. AS-BUILT DRAWINGS**
- 1. CONTRACTOR SHALL KEEP COMPLETE SET OF DRAWINGS ON SITE DURING CONSTRUCTION TO UPDATE LOCATION OF ALL EQUIPMENT AND SYSTEMS AS THE CONSTRUCTION PROGRESSES. REDLINE SET OF DRAWINGS SHALL BE TURNED OVER TO OWNER AT COMPLETION OF CONSTRUCTION.
- I. OPERATION & MAINTENANCE MANUALS**
- 1. CONTRACTOR SHALL PROVIDE AN ELECTRONIC SET AND ONE (1) SET OF HARD COPIES OF INSTALLATION AND MAINTENANCE MANUALS FOR ALL EQUIPMENT & SYSTEMS PROVIDED UNDER THIS CONTRACT.
- J. INSTRUCTION**
- 1. CONTRACTOR SHALL THOROUGHLY INSTRUCT OWNER ON OPERATION AND RECOMMENDED MAINTENANCE PROCEDURES OF ALL INSTALLED EQUIPMENT & SYSTEMS.

**SECTION 230600 PIPING SYSTEMS**

- A. CONDENSATE PIPING SHALL BE SCHEDULE 40 CPVC WITH SOLVENT WELDED FITTINGS.
- B. REFRIGERANT PIPING SHALL BE TYPE ACR CLEANED COPPER FOR REFRIGERANT SERVICE WITH WROUGHT COPPER JOINTS AND SILPHOS BRAZED JOINTS. REFRIGERANT PIPING SHALL BE PURGED WITH NITROGEN DURING BRAZING OF JOINTS.

**SECTION 231810 INSULATION**

- A. SUPPLY, RETURN & OUTSIDE AIR DUCTWORK SHALL BE WRAPPED WITH 2" THICK, 3/4 LB DENSITY, R-8 FOIL BACKED INSULATION. JOINTS SHALL BE LAPPED A MINIMUM OF 2" AND SECURED WITH FLARE TYPE STAPLES.
- B. REFRIGERANT PIPING SHALL BE INSULATED WITH 1" THICK, CLOSED CELL, NEOPRENE INSULATION. INSULATION SHALL BE SELF ON TYPE. ALL JOINTS SHALL BE SEALED WITH AN ADHESIVE APPROVED BY THE INSULATION MANUFACTURER.
- C. ALL REFRIGERANT PIPING INSTALLED OUTDOORS SHALL BE COATED WITH TWO (2) COATS OF UV RESISTANT COATING.
- D. CONDENSATE PIPING SHALL BE INSULATED WITH 1/2" THICK FIBERGLASS INSULATION WITH WHITE ALL SERVICE JACKET AND MITERED ELBOWS. ALL JOINTS SHALL BE SEALED WITH SELF ADHESIVE OVERLAP.

**SECTION 238000 - DUCTWORK**

- A. ALL DUCTWORK SHALL BE FABRICATED WITH GALVANIZED SHEET METAL.
- B. MEDIUM PRESSURE DUCTWORK, INSTALLED BETWEEN BUILDING AIR HANDLER & TERMINAL UNITS, SHALL BE SPIRAL, FLAT OVAL OR RECTANGULAR DUCT CONSTRUCTED FOR 4" PRESSURE SERVICE WITH CLASS A SEALS.
- C. LOW PRESSURE DUCTWORK, INSTALLED DOWN STREAM OF TERMINAL UNITS, SHALL BE CONSTRUCTED FOR 2" PRESSURE SERVICE WITH CLASS C SEALS.
- D. DUCTWORK CONSTRUCTION AND INSTALLATION SHALL CONFORM TO THE LATEST VERSION OF SMACNA DUCT STANDARDS.
- E. ALL ELBOWS SHALL BE FULL RADIUS TYPE OR MITERED WITH TURNING VANES. MITERED ELBOWS ARE NOT ACCEPTABLE FOR USE IN MEDIUM PRESSURE DUCTWORK.
- F. PROVIDE BELL MOUTH FITTINGS AT ALL MEDIUM PRESSURE BRANCH DUCT TAPS INTO MEDIUM PRESSURE MAIN DUCT.
- G. PROVIDE SPIN IN FITTING WITH SCOOP & LOCKING DAMPER AT ALL LOW PRESSURE BRANCH DUCT CONNECTIONS TO MAIN DUCT.
- H. DUCTWORK SHALL BE INSPECTED & SEALED AIR TIGHT TO BE FREE OF LEAKS PRIOR TO INSULATING OR COVERING UP THE DUCTWORK.
- I. FIRE DAMPERS SHALL BE TYPE B'UL LISTED DAMPERS WITH FIRE CURTAIN LOCATED OUTSIDE OF THE AIR STREAM. FIRE DAMPERS SHALL BE LISTED FOR USE IN THE WALL RATING WITH WHICH THE DAMPER IS INSTALLED.
- J. SMOKE DAMPERS SHALL BE UL LISTED. DAMPERS SHALL CLOSE UPON DETECTION OF SMOKE OR UPON POWER FAILURE UNLESS NOTED OTHERWISE. SMOKE DAMPERS SHALL BE AUTOMATIC RESET TYPE.
- K. SMOKE DETECTORS SHALL BE PROVIDED BY DIVISION 26 FOR INSTALLATION OF DIVISION 23.
- L. SMOKE DETECTORS SHALL CLOSE ALL ASSOCIATED SMOKE DAMPERS AND SHUT DOWN THE ASSOCIATED AIR MOVING DEVICE.

**SECTION 239500 - TEST & BALANCE**

- A. TEST & BALANCE AGENCY SHALL BE NEBB OR AABC CERTIFIED.
- B. TEST & BALANCE AGENCY SHALL BE HIRED DIRECTLY BY THE GENERAL CONTRACTOR.
- C. ALL EQUIPMENT SHALL BE LUBRICATED, TESTED, ADJUSTED & TUNED TO MEET THE MANUFACTURERS OPERATING & INSTALLATION GUIDELINES.
- D. AIR TERMINALS SHALL BE BALANCED TO CONDITIONS ON PLAN.
- E. TERMINAL UNITS SHALL BE BALANCED TO THE CONNECTED AIR DISTRIBUTION DEVICE.
- F. ALL DEFICIENCIES SHALL BE RECORDED AND SENT TO THE MECHANICAL CONTRACTOR FOR RESOLUTION.
- G. ONCE ALL DEFICIENCIES HAVE BEEN CORRECTED, TWO (2) COPIES OF THE FINAL REPORT SHALL BE DELIVERED TO THE OWNER. AN ELECTRONIC COPY IN PDF FORMAT SHALL BE SUBMITTED IN ADDITION TO THE HARD COPIES.

TAG	AIRFLOW (CFM)	EXT. S.P. (IN W.C.)	OUTSIDE AIR (CFM)	MOTOR POWER (HP)	TOTAL COOLING CAPACITY (MBH)	SENSIBLE COOLING CAPACITY (MBH)	COOLING CAPACITY (MBH @ 17°F)	AUX. HEATING CAPACITY (MBH @ 17°F)	AUX. HEATING STAGES	MIN. SEER	MIN. HSPF	OUTDOOR DB (°F)	INDOOR UNIT VOLTS / PHASE	OUTDOOR UNIT VOLTS / PHASE	ORIENTATION	BASIS OF DESIGN	NOTES
FC/CU-1	2000	0.5	190	3/4	58.5	34.0	30	14.4	1	14	8.2	95	230/1	230/1	HORIZONTAL	TRANE TEM4*060 / 4TYWR4060	1, 2, 3
FC/CU-2	1600	0.5	175	3/4	47.1	27.0	30	14.4	1	14	8.2	95	230/1	230/1	HORIZONTAL	TRANE TEM4*048 / 4TYWR4048	1, 2, 3
FC/CU-3	1600	0.5	130	3/4	47.1	27.0	30	14.4	1	14	8.2	95	230/1	230/1	HORIZONTAL	TRANE TEM4*048 / 4TYWR4048	1, 2, 3

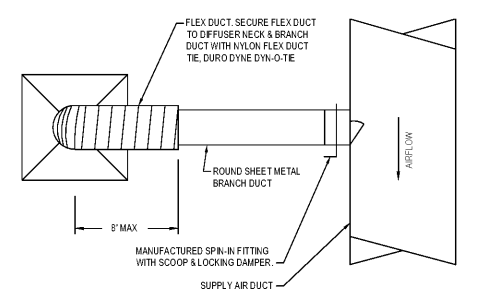
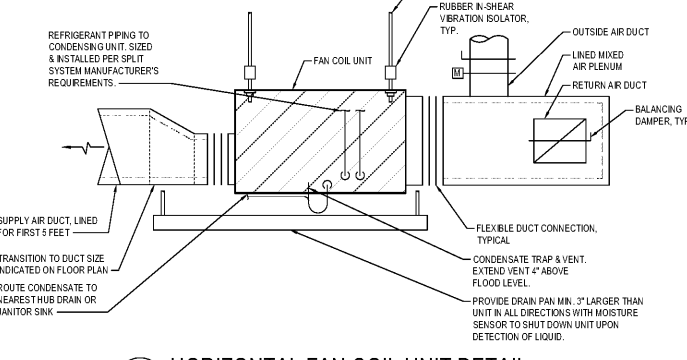
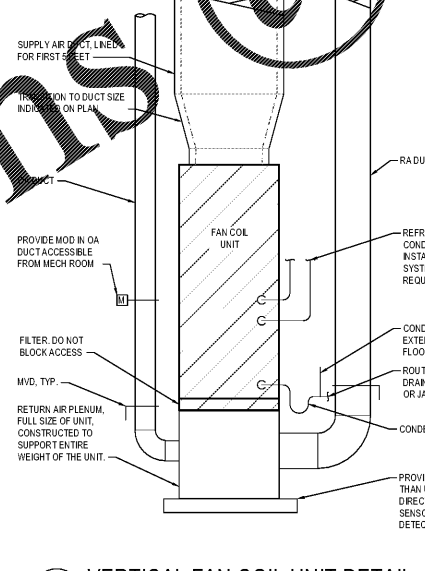
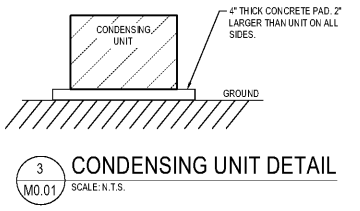
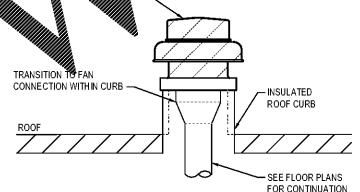
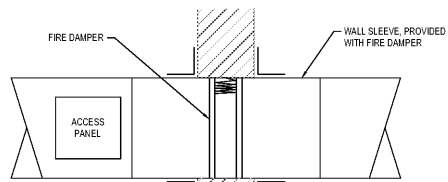
NOTES:  
 1. PROVIDE WITH 7-DAY PROGRAMMABLE THERMOSTAT. THERMOSTAT SHALL HAVE PROGRAMMABLE OCCUPANCY PERIODS TO ENERGIZE SUPPLY FAN DURING OCCUPIED PERIODS.  
 2. PROVIDE THERMAL EXPANSION VALVE (TXV).  
 3. PROVIDE SINGLE POINT CONNECTION.

TAG	DESCRIPTION	BASIS OF DESIGN
CD	CEILING SUPPLY DIFFUSERS (CD) SHALL BE STEEL, LOUVERED FACE DIFFUSER. FACE AREA SHALL BE SUITABLE FOR 24"X24" LAY-IN CEILING GRID. PROVIDE WITH BAKED ENAMEL FINISH IN A COLOR MATCHING THE CEILING GRID.	TITUS TDC
EG	EXHAUST GRILLE (EG) SHALL BE ALUMINUM EGGRATE WITH ALUMINUM BORDER SIZED FOR INSTALLATION IN A GYP BOARD CEILING. PROVIDE EACH EXHAUST GRILLE WITH ADAPTER TO TRANSITION FROM FULL SIZE OF GRILLE CONNECTION TO NECK SIZE INDICATED ON PLAN.	TITUS 50F
RAG	RETURN AIR GRILLES (RAG) SHALL BE ALUMINUM EGGRATE WITH ALUMINUM BORDER SIZED FOR INSTALLATION IN A 24x24 CEILING MODULE. PROVIDE EACH RETURN GRILLE WITH ADAPTER TO TRANSITION FROM FULL SIZE OF GRILLE CONNECTION TO NECK SIZE INDICATED ON PLAN.	TITUS 50F
RG	SURFACE MOUNT RETURN GRILLES (RG) SHALL BE STEEL WITH FIXED 35° DEFLECTION, BLADES PARALLEL TO THE LONG DIMENSION AND 3/4" BLADE SPACING. PROVIDE WITH WHITE, BAKED ENAMEL FINISH.	TITUS 350RL
SR	SUPPLY REGISTERS (SR) SHALL BE DOUBLE DEFLECTION TYPE PROVIDED WITH OPPOSED BLADE DAMPER AND OUTER MOST SET OF DEFLECTORS PARALLEL TO THE SHORT DIMENSION. PROVIDE WITH WHITE, BAKED ENAMEL FINISH.	TITUS 300RS

NOTES:  
 1. ALL SURFACE MOUNTED AIR DISTRIBUTION DEVICES SHALL BE PREPPED AND READY FOR PAINT.

TAG	AIRFLOW (CFM)	ESP (IN W.C.)	MOTOR POWER (W)	FAN RPM	DRIVE TYPE	VOLTS / PHASE	NOISE (SONES)	TYPE	BASIS OF DESIGN	NOTES
EF-1	550	0.25	70	900	DIRECT	120/1	8.5	ROOF MTD DOWNBLAST	GREENHECK G-085	1, 2
EF-2	50	0.125	20	900	DIRECT	120/1	1	CEILING EXHAUST	GREENHECK SP-A50	1, 2

NOTES:  
 1. PROVIDE WITH BACKDRAFT DAMPER, ROOF CURB, AND SPEED CONTROLLER FOR BALANCING.  
 2. FAN SHALL OPERATE CONTINUOUSLY.



**Order Plans @**

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DATE	REVISION

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M0.01

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