

**VARIABLE REFRIGERANT FLOW FAN COIL SCHEDULE**

DESIGNATION	FC B9	FC B7	FC B4, L7	L4	FC B8, B10	FC B3, B5, B6, L2, L3, L5, L6	FC B1, L1	FC B2	FC-M1 thru M4	FC C1 thru C8 D1 thru D8 E1 thru E8 F1 thru F8 G1 thru G8 N1 thru N16 P1 thru P12	G 11, G12	FC C9, C10, D9, D10, E9, E10, F9, F10, G9, G10, M5, M6, N17, N18, N19, N20, P13, P14, P15
SUPPLY AIR (CFM)	2,000	1,300	1,100	880	650	480	450	300	1,500	1,300	565	350
MAX EXT. SP (IN WC)	0.64	0.64	0.64	0.64	0.64	0.64	0.80	0.20	0.50	0.50	0.00	0.00
MBH COOLING CAPACITY (NOMINAL)	72.0	48.0	36.0	30.0	24.0	18.0	15.0	8.0	54.0	48.0	18.0	12.0
MBH HEATING CAPACITY (NOMINAL)	80.0	54.0	40.0	34.0	27.0	20.0	17.0	9.0	60.0	54.0	20.0	13.5
MAX INPUT POWER (WATTS)	1352	683	683	360	245	188	188	60	410	380	50	60
DRIVE	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT
POWER INPUT AMPS	4.5	3.4	3.4	1.8	1.3	1.0	1.0	0.5	2.8	2.3	0.4	0.3
VOLTS/PHASE	208/1	208/1	208/1	208/1	208/1	208/1	208/1	208/1	208/1	208/1	208/1	208/1
MANUFACTURER	MITSUBISHI	MITSUBISHI	MITSUBISHI	MITSUBISHI	MITSUBISHI	MITSUBISHI	MITSUBISHI	MITSUBISHI	MITSUBISHI	MITSUBISHI	MITSUBISHI	MITSUBISHI
MODEL NUMBER	PEFY-P72NMHJ-E	PEFY-P48NMHJ-E	PEFY-P36NMHJ-E	PEFY-P30NMHJ-E	PEFY-P24NMHJ-E	PEFY-P18NMHJ-E	PEFY-P15NMHJ-E	PEFY-P8NMHJ-E	PVFFY-P4E00A	MITSUBISHI	PLFY-P18NMJ-E	PLFY-P12NMJ-E
OPER. WT. (LBS)	221	155	155	111	100	100	98	42	188	160	51	44
ACCESSORIES	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	2, 3, 4	5, 6, 7	5, 6, 7	8, 9	8, 9

1. DRAIN PUMP KIT. FIELD INSTALL AND WIRE UNDER SPEC. SECTION 15800.
2. INSTALL CANVAS CONNECTION AT SUPPLY AND RETURN DUCT CONNECTIONS.
3. FILTER LOCATED AT RETURN GRILLE. SEE GRILLE SCHEDULE.
4. FACTORY MOUNTED AND WIRED CONDENSATE LIFT PUMP.
5. FIELD BUILT FILTER RACK - SEE PLANS.
6. THREE SPEED FAN WITH FIELD CONTROLS FOR MULTI-SPEED (V.A.V.) OPERATION. SEE CONTROL NOTES AND SEQUENCE OF OPERATION.
7. FIELD CONTACTS FOR CONDENSATE OVERFLOW SWITCH.
8. FACTORY FILTER INSIDE UNIT.
9. FACTORY CONDENSATE LIFT KIT (19-11/16" LIFT).

GRILLE SCHEDULE		
MARK	DUTY	DESCRIPTION
CD-1	CEILING SUPPLY	TITUS MCD MODULAR CORE DIFFUSER WITH T-BAR CEILING FRAME AND O.B.D. SEE DIFFUSER SIZING CHART FOR NECK SIZE.
CD-2	CEILING SUPPLY	TITUS MODEL MCD MODULAR CORE DIFFUSER WITH FLAT SURFACE MOUNT FRAME AND O.B.D. SEE DIFFUSER SIZING CHART FOR NECK SIZE.
CD-3	CEILING SUPPLY	TITUS MODEL TDC LOUVERED FACE DIFFUSER WITH T-BAR CEILING FRAME AND O.B.D. SEE DIFFUSER SIZING CHART FOR NECK SIZE.
CD-4	CEILING SUPPLY	TITUS MODEL TDC LOUVERED FACE DIFFUSER WITH FLAT SURFACE MOUNT FRAME AND O.B.D. SEE DIFFUSER SIZING CHART FOR NECK SIZE.
WS-1	WALL SUPPLY	TITUS 300 RL DOUBLE DEFLECTION GRILLE WITH O.B.D. HORIZONTAL FRONT BLADES.
DS-1	DUCT SUPPLY	TITUS 3300FL SPIRAL DUCT MOUNTED SUPPLY GRILLE WITH ALUMINUM CONSTRUCTION, CLEAR ANODIZE FINISH, COUNTERSUNK SCREW HOLES, GASKETS, ASD SCOOP/DAMPER.
LS-1	LINEAR SUPPLY	TITUS 10-JT FLO BAR JET FLO DIFFUSER. LUSTER CLEAR FINISH WITH NON ADJUSTABLE (BLACK) PATTERN CONTROLLER. EXPOSED FLANGE FOR SIDEWALL MOUNTING. MANUFACTURE TO MATCH CURVED WALL RADII.
CR-1	CEILING RETURN	TITUS 50F EGGRATE RETURN GRILLE WITH T-BAR CEILING FRAME.
CR-2	CEILING RETURN	TITUS 50F EGGRATE RETURN GRILLE WITH SURFACE MOUNTING FRAME.
CR-3	FILTER RETURN	EGGRATE FILTER RETURN GRILLE WITH T-BAR CEILING FRAME AND 20"x20"x2" PLEATED FILTER. USE CAMFIL FARR AP11, MERV 11.
CR-4	FILTER RETURN	EGGRATE FILTER RETURN GRILLE WITH SURFACE MOUNT FRAME AND 20"x20"x2" PLEATED FILTER. USE CAMFIL FARR AP11, MERV 11.
CE-1	CEILING EXHAUST	TITUS 50F EGGRATE EXHAUST GRILLE WITH SURFACE MOUNT FRAME AND O.B.D.
CE-2	CEILING EXHAUST	TITUS 30RL HEAVY DUTY EXHAUST GRILLE WITH SURFACE MOUNT FRAME, O.B.D., 14 GAUGE BLADES, AND 18 GAUGE FRAME, 0 DEGREE DEFLECTION, STEEL CONSTRUCTION.
CR-3	CEILING EXHAUST	TITUS 50F EGGRATE EXHAUST GRILLE WITH T-BAR CEILING FRAME AND O.B.D.
SG-1	SOFFIT GRILLE	TITUS 30RL HEAVY DUTY INTAKE/RELIEF GRILLE WITH SURFACE MOUNT FRAME, PRIME COAT FINISH 14 GAUGE BLADES, AND 18 GAUGE FRAME, 0 DEGREE DEFLECTION, STEEL CONSTRUCTION.
DD-1	DISPLACEMENT GRILLE	PRICE DF-1C WITH 4" BASE TO MATCH BASEBOARDS AND DUCT COVERS TO CEILING, 1-WAY PATTERN.
WR-1	WALL RETURN GRILLE	TITUS 355ZRL ZERO DEFLECTION SIDEWALL GRILLE.
RG-1, RG-1	RELIEF GRILLE & INTAKE GRILLE	TITUS 30RL HEAVY DUTY RELIEF GRILLE WITH SURFACE MOUNT FRAME, PRIME COAT FINISH 14 GAUGE BLADES, AND 18 GAUGE FRAME, 0 DEGREE DEFLECTION, STEEL CONSTRUCTION.
L-1	LOUVER	RUSKIN ELF167D DRAINABLE BLADE EXTERIOR WALL LOUVER WITH FLANGE FRAME AND BIRD SCREEN. PRIME COAT FOR FIELD PAINTING.

NOTE: PAINT ALL VISIBLE SURFACES BEHIND DIFFUSERS AND GRILLES FLAT BLACK.

VRF HEAT PUMP SCHEDULE					
DESIGNATION	HP B1	HP L1	HP C1, C2, D1, D2, E1, E2, F1, F2, G1, G2, N1, N2, N3, N4, P1, P3	HP M1, M2	HP P2, P4
VOLTS/PHASE	460/3	460/3	460/3	460/3	460/3
MCA	40 (20 + 20)	20	30 (19 + 11)	19	16
MAXIMUM OVER CURRENT PROTECTION	50 (25 + 25)	25	40 (20 + 20)	25	20
NOMINAL COOLING CAPACITY (MBH)	240	120.0	192	120.0	96
NOMINAL HEATING CAPACITY (MBH)	240	120.0	192	120.0	96
BTU/WATT COOLING	1.08	1.08	0.98	1.01	1.05
BTU/WATT HEATING	11.5	11.33	13.0	12.95	12.5
COMPRESSOR KW & QTY.	8.1 x 2	8.1 x 1	8.1 x 1 + 5.1 x 1	8.8 x 1	6.8 x 1
STARTING METHOD	DIRECT ON LINE INVERTER	DIRECT ON LINE INVERTER	DIRECT ON LINE INVERTER	DIRECT ON LINE INVERTER	DIRECT ON LINE INVERTER
CAPACITY CONTROL	0 - 100%	17 - 100%	6 - 100%	18 - 100%	13 - 100%
CONDENSER FAN KW & QTY	0.92 X 2	0.92 X 1	0.92 X 2	0.92 X 1	0.92 X 1
RUNNING CURRENT HEAT / COOL (AMPS)	29.1 / 30.1	14.1 / 14.7	21.4 / 22.0	12.9 / 14.0	12.0 / 11.7
MANUFACTURER	MITSUBISHI	MITSUBISHI	MITSUBISHI	MITSUBISHI	MITSUBISHI
TYPE	HEAT RECOVERY	HEAT RECOVERY	HEAT PUMP	HEAT PUMP	HEAT PUMP
MODEL NUMBER	PURY-P24YSHMLA	PURY-P120YHMLA	PURY-P120YSHMLA	PURY-P120YHMLA	PURY-P52YHMLA
OPER. WT. (LBS)	618 + 618	618	574 + 280	574	474
ACCESSORIES	1 THRU 5	1 THRU 4	1 THRU 4	1 THRU 4	1 THRU 4

1. INSULATED REFRIGERANT PIPING LINE SET. SEE SPECIFICATIONS.
2. HIGH PRESSURE SWITCH, FAN DRIVER OVERLOAD PROTECTOR, OVER CURRENT RELAY, INVERTER OVERLOAD PROTECTOR, FUSIBLE PLUGS.
3. PERFORM PIPING AIR TIGHT TEST AND VACUUM DRYING PROCEDURES AS OUTLINED IN MANUFACTURER'S INSTALLATION MANUAL.
4. INCLUDE FACTORY STARTUP AND COMMISSIONING OF ENTIRE SYSTEM.
5. TWINNING KIT FOR FIELD PIPING OF TWO UNITS INTO SINGLE MANIFOLD.

ENERGY RECOVERY VENTILATOR SCHEDULE		
DESIGNATION	ERV B1	ERV L1
SUPPLY AIR (CFM)	1,700	880
EXTERNAL SP (IN WC)	0.5	0.5
HP/BRAKE HP	.58 / 1.00	0.50 / 0.28
R.P.M.	884	1,054
EXHAUST AIR (CFM)	1,500	780
EXTERNAL SP (IN WC)	0.5	0.5
HP/BRAKE HP	.46 / .75	0.50 / 0.21
R.P.M.	830	966
SUMMER AMBIENT CONDITIONS	105 / 73	105 / 73
SUMMER INDOOR CONDITIONS	75 / 50% RH	75 / 50% RH
WINTER AMBIENT CONDITIONS	30 / 27	30 / 25.3
WINTER INDOOR CONDITIONS	72 / 35% RH	72 / 35% RH
SUMMER SUPPLY CONDITIONS	81.8 / 65.1	81.8 / 65.1
WINTER SUPPLY CONDITIONS	63.0 / 50.5	62.9 / 50.4
VOLTS / PHASE	460/3	208/1
MCA	5	13.2
MOCP	15	15
MANUFACTURER	GREENHECK	GREENHECK
ARRANGEMENT	B	B
MODEL NUMBER	ERV-521S-15-B	ERV-361S-15-B
OPER. WT. (LBS)	1,300	875
ACCESSORIES	1 THRU 10	1 THRU 10

1. 16 GAUGE SLOPED ROOF CURB.
2. PREMACTOR EXTERIOR FINISH.
3. DOUBLE WALL CONSTRUCTION WITH HINGED ACCESS DOORS.
4. SOLID STATE SPEED CONTROLLER, INTERNALLY MOUNTED AND WIRED.
5. 2" PLEATED OUTDOOR AND EXHAUST FILTERS. CAMFIL FARR AP11, MERV 11.
6. CONTROLS XFMR.
7. SINGLE POINT WIRING.
8. INTERNALLY MOUNTED CONTROL CENTER WITH DOOR INTERLOCKING DISCONNECT.
9. FAN UNIT BASE WITH NEOPRENE ISOLATORS.
10. MOTORIZED INTAKE AND EXHAUST DAMPERS.

**DIFFUSER SIZING CHART**

CFM	TITUS MCD, SQUARE NECK	CFM	TITUS TDC, SQUARE NECK
0 - 200	6" x 6"	0 - 125	6" x 6"
201 - 300	8" x 8"	126 - 300	8" x 9"
301 - 425	10" x 10"	301 - 500	12" x 12"
426 - 600	12" x 12"	501 - 750	15" x 15"
601 - 700	14" x 14"	751 - 1100	18" x 18"
701 - 850	16" x 16"	951 - 1250	21" x 21"
851 - 950	18" x 18"	1101 - 1500	24" x 24"
951 - 1200	20" x 20"	1501 - 1800	30" x 30"

**MEP Component Anchorage Note**

All mechanical, plumbing, and electrical components shall be anchored and installed per the details on the DSA approved construction documents. Where no detail is indicated, the following components shall be anchored or braced to meet the force and displacement requirements prescribed in the 2010 CBC, Sections 1615A.1.12 through 1615A.1.22 and ASCE 7-05 Chapter 6 and 13.

1. All permanent equipment and components.
2. Temporary or movable equipment that is permanently attached (e.g. hard wired) to the building utility services such as electricity, gas or water.
3. Movable equipment which is stationed in one place for more than 8 hours and heavier than 400 pounds are required to be anchored with temporary attachments.

The attachment of the following mechanical and electrical components shall be positively attached to the structure, but need not be detailed on the plans. These components shall have flexible connections provided between the component and associated ductwork, piping, and conduit.

- A. Components weighing less than 400 pounds and have a center of mass located 4 feet or less above the adjacent floor or roof level that directly support the component.
- B. Components weighing less than 20 pounds, or in the case of distributed systems, less than 5 pounds per foot, which are suspended from a roof or floor or hung from a wall.

For those elements that do not require details on the approved drawings, the installation shall be subject to the approval of the Structural Engineer or Record and the DSA District Structural Engineer. The project inspector will verify that all components and equipment have been anchored in accordance with above requirements.

**Piping, Ductwork, and Electrical Distribution System Bracing Note**

Piping, ductwork, and electrical distribution systems shall be braced to comply with the forces and displacements prescribed in ASCE 7-05 Section 13.3 as defined in ASCE 7-05 Section 13.6.8, 13.6.7, 13.6.5.6, and 2010 CBC, Sections 1615A.1.20, 1615A.1.21 and 1615A.1.22.

The bracing and attachments to the structure shall be detailed on the approved drawings or they shall comply with one of the OSHPD Pre-Approvals (OPA #) as modified to satisfy anchorage requirements of ACI 318, Appendix D.

Copies of the manual shall be available on the jobsite prior to the start of hanging and bracing of the pipe, ductwork, and electrical distribution systems.

The Structural Engineer of Record shall verify the adequacy of the structure to support the hanger and brace loads.

**GENERAL NOTES:**

1. All AC systems serving occupied zones shall be programmed so that the supply fan and minimum ventilation rates operate continuously during scheduled occupancy and one hour prior to scheduled occupancy or building flush-out. See mechanical roof plans for minimum outdoor air (ventilation) flow rates. Ventilation rates shall be no less than required by California Title 24, Part 6, §12.
2. All ceiling exhaust fans (with positively pressurized exhaust ducts) shall require the exhaust duct systems to be sealed as required to meet SMACNA Seal Class A standards.
3. All outside air intakes at HVAC units shall be located a minimum of Fifteen feet from any sewer vent or exhaust fan discharge in accordance with ASHRAE standard 62.1-2004, section 5.6 and table 5-1. Install bird screen over all outside air intakes.
4. All HVAC systems shall be equipped with a minimum 2" pleated filter bank with a filter efficiency of MERV 11 per ASHRAE standard 52.2-1999. Use Camfil / FARR AP-Eleven Filters, MERV 11 efficiency. CFM clean static pressure drop at 250 feet per minute face velocity.
5. The mechanical contractor (specification 15800) shall adhere to and implement all requirements under ASHRAE Standard 62.1-2004, section 7, Construction and System Startup. A copy of this standard must be kept on site and one copy provided to the IOR for review and enforcement. Include all documentation required under section 7.2.6.
6. Temporary construction ventilation: Continuously ventilate during installation of materials that emit Volatile Organic Compounds (VOC) and after installation until emissions dissipate. Ventilate areas directly to outside areas, do not ventilate to other enclosed spaces. Replace all filtration media immediately prior to occupancy except for in spent filters used to filter outside air. If continuous ventilation is not possible via the building's HVAC system(s), then ventilate via open windows and temporary fans that sufficiently provide no less than three air changes per hour.
7. Oil film on sheet metal should be removed before shipment to site. On-site, inspect ducts to confirm that no oil film is present. Remove any oil. If ducts contain dust and dirt, clean them immediately prior to substantial completion and prior to using the ducts to circulate air.
8. After construction ends, and with all interior finishes installed, flush-out the building by supplying continuous ventilation with all air handling units at their maximum outdoor air rate for at least 14 days while maintaining an internal temperature between 60°F and 70°F, and relative humidity no higher than 60%. Occupancy may start after 7 days, provided flush-out continues for the full 14 days. Do not "bake out" the building by increasing the temperature of the space. (If continuous ventilation is not possible, flush-out must total the equivalent of 14 days of maximum outdoor air.) Building flush-out shall be under the scope of the mechanical contractor (specification 15800).
9. All HVAC recirculating air systems shall have ducted returns. No return plenum systems will be allowed.
10. Dust protection: Turn the ventilation system off, and protect HVAC supply and return openings from dust infiltration during dust producing activities (e.g. drywall installation and finishing). Provide temporary ventilation as required.
11. Post-occupancy ventilation: When the contractor is required to perform touch-up work involving products with chemical emissions, provide temporary construction ventilation during installation and extend the building flush-out by a minimum of 4 days after touch-up installation, with 100% tempered outside air for 24 hours each day.

**CONTROL NOTES:**

1. HVAC controls shall be provided under spec section 15800.
2. A complete turn-key control system including all control components, wiring, cabling, programming, etc shall be provided.
3. All control wiring and / or cabling shall be routed in conduit when concealed in wall framing cavity.
4. Wiring routed in attic space may be routed through where codes permit. Install in a workman like manner with clips spaced appropriately to avoid sag in wiring. Do not install free flight.
5. Install all controls & control wiring, regardless of voltage, for all HVAC units, fan coils, heat pumps, ERV units, condensing units, exhaust fans, and MUA units.
6. Provide exhaust fan interlocks and controls as noted below the exhaust fan schedule, sheet M-501.
7. See scope of work on sheets M-505 thru M-511 for control work required for control of kitchen exhaust hood, MUA unit, and related fans.
8. Provide filter differential pressure monitoring at all AC units, classroom fan coils, and at MUA unit. Provide graphical alarm at web browser interface to alert operator when filter have reached a change out point.
9. Install and wire ductless split system units. Include extension of power wiring and controls from outdoor condensing unit to indoor fan coil and wiring of auxiliary condensation pumps.
10. See detail LMS-504 for wiring from fire alarm panel relay modules required at specific AC and MUA units).
11. Set all fans for continuous operation during occupied times as required to provide continuous ventilation of occupied spaces.
12. Program all mechanical units to start one hour prior to occupancy as required to flush the occupied space prior to occupancy. Stagger unit starts.
13. Provide a minimum of eight hours on-site training for the maintenance staff of Bakersfield City School District in the function and servicing of the controls system.
14. Demonstrate controls function to the inspector and to Bakersfield City School District maintenance staff for all mechanical equipment listed in schedule. Demonstration shall confirm sequence of operation as listed in mechanical schedule.

**Mitsubishi System:**

15. Provide a Mitsubishi PAC-SCS1KUA power pac module at each building with VRF heat pump systems with a model AG-150 central controller at each building EMS control panel. Extend 24v control wiring as required to controlled devices.
16. At building B provide a network hub that gathers all the communications from other buildings with AG-150 controllers and routes them to a stand alone computer workstation with desktop computer, keyboard & screen. Provide a stand alone desktop computer workstation with Mitsubishi TG2000 software and CAT 5 or CAT6 cable connection the campus LAN. Fully commission the work station for web access. Field coordinate connection to LAN with BCS computer services department.
17. Provide PAR30 deluxe MA controllers at all VRF fan coils.
18. Include factory supervised commissioning of all Mitsubishi heat pump controls including programming set points and testing of the system. Wiring and conduit shall be provided in accordance with division 16.
19. Provide DIDO (digital in/out) control boards located in flush mounted control panel (EMS panel) as required to control auxiliary equipment. Control start/stop of the following items and wire each through the VO circuits of the DIDO:
  - Dedicated outside air system (ERV units B-1 & L-1) supply fans, exhaust fans, and wheel motors. Schedule with occupancy, un-occupied by-pass and with one hour pre-occupancy purge. Lock out wheel rotation at each dedicated outside air system between 55 and 70 degrees outside air temperature (adjustable).
  - Domestic hot water circulating pumps at buildings B & L.
  - Outside air temperature monitoring.
20. Wiring between heat pumps, branch control units, fan coils, and DIDO modules for the purposes of communication and control shall be provided under spec section 15800. Daisy chain the wire back to each AG-150 panel. Follow guidelines provided by the manufacturer. A spare 1" conduit shall be provided between buildings under the data contract for the purposes of routing the wire.
21. Door switches!

**Carrier System:**

22. Provide controls system for Buildings A and H based Carrier Comfort Network (CCN) and i-Vu components and software.
23. All AC units shall have factory mounted and wired Carrier Comfort Controller.
24. Provide with web based software controls. Fully commission web access. Field coordinate connection to LAN with BCS computer services department.
25. Connect to the campus WAN and communicate between buildings utilizing WAN cabling. Local cabling (within building) for the purposes of communication and control shall be provided under spec section 15950.
26. Wiring between Carrier ENMS panels located in buildings A and H for the purposes of communication and control shall be provided under spec section 15800. Follow guidelines provided by the manufacturer. A spare 1" conduit shall be provided between buildings under the data contract for the purposes of routing the wire.
27. Provide Carrier 33UNIVCTRL (universal controller) at each building EMS panel. Extend control from each universal controller to the following items and wire each through Lon relays and programmed thru the CCN based on occupancy:
  - Exhaust fans listed on EF scheduled as controlled by EMS
  - MUA unit
  - Domestic hot water circulating pumps at building A
28. Provide 0-2 hour twist timer on the face of the make-up-air-unit control panel for unit operation during un-occupied hours. Label timer appropriately.
29. Provide static pressure controls and stage gym exhaust fans to maintain building static at gymnasium at building A. See plans for additional notes and details.

RFI 345

Mark Beakin - Mechanical Engineer - 67113  
The MUA units should not be interlocked with the Carrier system. Control of the MUA units via the CapWatre control panel.

Mark Beakin - Mechanical Engineer - 67113  
Journey Air - Single Controls - 6513  
CapWatre MUA Controls

Mechanical Sheet M-502, under "Carrier System" note #27, the specification requires that the MUA units be interlocked with the Carrier EMS. The interlocking is to be accomplished by the Carrier EMS. The Carrier EMS is a proprietary system and the interlocking is to be accomplished by the Carrier EMS. The Carrier EMS is a proprietary system and the interlocking is to be accomplished by the Carrier EMS.

Please advise appropriately regarding control of the MUA via the Carrier EMS.

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