VARIABLE VOLUME FAN CONTROL SYSTEM SCHEDULE

FLOW MEASURING STATIONS: Casings of gauge galvanized steel with sheet metal duct connecting flanges on entering and leaving sides and expanded aluminum honeycomb air straighteners. Fan-E units shall have capability to accurately measure (± 1%) static pressure and total pressure measurement and shall consist of multiple static pressure sensor located along unit casing and interconnected by external header to produce single average static pressure measurement, and total pressure sensors arranged in a network of interconnected tubes with sensors positioned to represent an equal measuring area. System Static Totalizers (SST) shall be capable of accurately measuring (± 1%) system static pressure and shall consist of a network of interconnected tube headers each with a series of multiple static pressure sensors positioned to represent an equal measuring area. Tube header shall be interconnected to produce an average static pressure measurement. Air Monitor Corp. or Air Sentinel.

Symbol	Max. CFM	Model	Size, In.	Static Pressure Drop, In. w.g.	Function	Location
FM-1	26,150	Fan-E	48" Dia.	.12	TP & SP	AC Unit #1 - Cold Deck
FM-2	9,110	Fan-E	30" Dia.	.13	TP & SP	AC Unit #1 - Hot Deck
FM-3	5,130	SST	22" Dia.	.06	SP	Level 1 Cold Duct
FM-4	1,600	SST	14" Dia.	.04	SP	Level 1 Hot Duct
FM-5	23,340	Fan-E	48" x 48"	.07	TP & SP	Return Air Fan (8)
FM-6	7,710	Fan-E	36" x 36"	.03	TP & SP	Exhaust Fan (10)
FM-7	1,350	SST	22" x 10"	.02	SP	Level 1 Exhaust Duct
FM-8	8,640	Fan-E	36" x 24"	.08	TP & SP	Min. Outside Air Fan (11)
FM-9	36,520	Fan-E	66" x 36"	.14	TP & SP	AC Unit #2 - Cold Deck
FM-10	5,930	SST	24" Dia.	.06	SP	Level 4 Cold Duct
FM-11	14,370	Fan-E	36" Dia.	.12	TP & SP	AC Unit #3 - Hot Deck
FM-12	2,860	SST	18" Dia.	.05	SP	Level 4 Hot Duct
FM-13	32,230	Fan-E	72" x 72"	.03	TP & SP	Return Air Fans (9)
FM-14	4,290	Fan-E	28" x 18"	.05	TP & SP	Min. Outside Air Fan (35)

CONTROL CENTERS: Control Centers CC-1 and CC-3 shall control the operation of their individual central fan system (AC #1 - First Level and AC #2/3 - Second thru Fourth Levels, respectively). Operation shall be controlled from a package factory assembled system control center capable of the following functions: Control of cooling system supply fan and heating system supply fan airflow capacity by positioning eddy current clutch or inlet vane dampers as required to maintain respective supply system at a constant static pressure. Control of return fan system capacity by positioning eddy current clutch as required to track the total heating and cooling supply air delivery while maintaining a constant CFM differential (equal to the fixed minimum outside air CFM) between the total supply and return fan air volumes regardless of changes in the supply fan capacity, i.e.: return CFM = (Clg. Supply CFM + Htg. Supply CFM) - Min. Outside Air CFM. In addition to the control function the control center shall continously monitor the heating supply, cooling supply, return, and minimum outside air capacities, supply and return system static pressures and air filter resistance. Control Center CC-2 shall control the operation of A/C System #1 exhaust fans by positioning the eddy current clutch as required to maintain the exhaust system at a constant static pressure. The operation of the minimum outside air fan shall be controlled by CC-2 to track the exhaust fan CFM + a fixed differential required for building pressurization. Fan CFM and system pressures shall be indicated on meter mounted in Control Center. The Control Centers (as applicable) shall be furnished complete with all components necessary for system operation, including static pressure controllers, air volume controllers with manual reset for minimum outside air, air volume meters, static pressure meters, filter resistance meter, control pressure indicating gauges, complete operating and maintenance instructions, component identification plates, all mounted and internally connected in a surface mounted galvanized steel panel. Furnish initial start-up supervision by factory trained operator in cooperation with controls contractor and testing and balancing contractor. All external interconnecting control and signal tubing shall be furnished and installed by the controls contractor. Control Center shall be Air Monitor "Vari-Master", or Air Sentinel, or Johnson Controls.

Symbol	Peak System Supply CFM Cooling	Heating	Max. Return Air, CFM	Outside Air Max.	Min.	Exhaust Max.	Min.	Service
CC-1 & 2	26,150	9,110	23,340	8640	3740	7710	2810	A/C System-1st Level
CC-3	36,520	14,370	32,230	4290	2520	2830	1060	A/C System-2nd - 4th Levels

VIBRATION ISOLATOR SCHEDULE

TYPE MS: Floor mounted open spring type without housings or snubbers equipped with leveling bolts and with two layers of ribbed or waffled neoprene pad separated by a 1/16" galvanized steel plate under the base plate. The design static deflection under load shall be as scheduled.

TYPE HS: Suspension type hangers having a steel frame and spring element in series with a neoprene pad or washer. The design deflection under load shall be as scheduled. The isolator shall be designed so hanger rod may be misaligned 15° relative to the vertical without touching hanger box frame.

TYPE MN: Neoprene isolator unit having a minimum static deflection of 1/4 inch.

	Amber/Booth	Consolidated Kinetics	Mason	Sausse
Type MS	SW	FDS w/NPD Pad	SLF	RMS
Type HS	-	SHC	30	-
Type MN	RV	R	N	FH

Isolator Symbol	Symbol Served	Isolator Type	Static Deflection, Inches	Type of Base
I-1	1	MS	0.5"	Integral with Unit
I-2	2	MS	0.5"	Integral with Unit
I-3	3	MS	0.5"	Integral with Unit
I-4	4	HS	1.0"	Integral with Unit
I-5	5	HS	1.0"	Integral with Unit
I-6	6	MS	0.5"	Integral with Unit
I-7	7	MS	0.5"	Integral with Unit
I-8	8	HS	1.0"	Integral with Unit
I-9	9	MS	0.5"	Integral with Unit
I-10	10	HS	1.0"	Integral with Unit
I-11	11	HS	1.0"	Integral with Unit
I-12 thru I-20	12 thru 20	HS	0.75"	Integral with Unit
I-21	21	MS	1.0"	Rigid Steel
I-22	22	MN (Hanger)	0.25"	Integral with Unit
I-23	26	HS	0.50"	Integral with Unit

AIR TERMINAL BOX SCHEDULE

VARIABLE VOLUME - SINGLE DUCT TERMINAL UNIT: Furnish and install single duct variable air volume control assembly of sizes and capacities shown on the drawings. Assembly shall be arranged for either hot or cold ducts, as indicated on the drawings, with control sequence to allow for variable cooling through the cold valve (8-13 psi) with complete shut-off at 8 psi, and variable heating through the hot valve (3-7 psi) with complete shut-off at 8 psi. Hot and cold valve assemblies shall be normally open arrangement, pressure independent and shall be capable of field reset to any air flow between zero and the maximum scheduled cfm. Valves shall be constructed of 22 gauge galvanized steel and shall be internally lined with 1" thickness, 1-1/2 pound density acoustical lining conforming to NFPA-90A and UL-181 requirements. Damper blade shall be constructed of extruded aluminum with rustproof self-lubricating bearings. Damper shall seat against gasketed stops. The damper leakage shall be certified to not exceed 2% leakage at 6" inlet static pressure as determined by Air Diffusion Council Standards. Control components including pneumatic operators (8-13#), reversing relays and adjustable velocity controllers, shall be furnished and piped complete by manufacturer. Control assembly shall be mounted externally on box in arrangement as indicated on the drawings. Control Subcontractor shall furnish and install two-pipe, direct acting room thermostat and shall connect main air (20 psi) and thermostat branch single to each valve assembly. The control assembly shall contain an acoustical Vortex filter for sound reduction. Sound ratings shall not exceed those scheduled at one-inch pressure. Airborne NC ratings are based on units installed with attenuator section assuming a room absorption of 10 db, re 10^{-12} watts. Radiated noise criteria additionally assumes a ceiling STC of 35-39. Each single duct terminal unit shall be factory calibrated to deliver the specified quantity of air shown on the drawings at 5000 ft. elevation with a minimum upstream static pressure scheduled below. All terminals shall be end outlet. Terminals shall be shipped with appropriate identification including model, size, cfm, marked on the unit. Terminal units shall be Titus ESV-3000 Single Duct, Carnes, Tuttle & Bailey, Trane, or approved equal.

Symbol	Maximum CFM	Min. Supply Duct Diameter *	Box Inlet Size	Unit SPC, In. W.G.	Noise Criteria Airborne	Radiated
VC/VH-1	180	6"	4"	0.10	21	25
VC/VH-2	290	7"	5"	0.10	25	25
VC/VH-3	400	8"	6"	0.10	29	25
VC/VH-4	550	9"	7"	0.10	32	26
VC/VH-5	700	9"	8"	0.09	34	26
VC/VH-6	850	10"	9"	0.10	37	26
VC/VH-7	1110	11"	10"	0.10	39	26
VC/VH-8	1400	12"	12"	0.10	43	27
VC/VH-9	1870	14"	14"	0.10	44	26
VC/VH-10	2500	16"	16"	0.13	48	26

*Contractor shall provide reducer at box inlet as shown on Detail.

VARIABLE VOLUME - DOUBLE DUCT TERMINAL UNIT: Furnish and install double duct variable air volume control assembly of sizes and capacities shown on the drawings. Assembly shall be arranged for hot and cold ducts with control sequence to allow for variable cooling through the cold valve (8-13 psi), complete shut-off, and then variable heating through the hot valve (3-7 psi). Hot and cold valve assemblies shall be normally open arrangement, pressure independent and shall be capable of field reset to any air flow between zero and the maximum scheduled cfm. Valves shall be constructed of 22 gauge galvanized steel and shall be internally lined with 1" thickness, 1-1/2 pound density acoustical lining conforming to NFPA-90A and UL-181 requirements. Damper blade shall be constructed of extruded aluminum with rust-proof self-lubricating bearings. Damper shall seat against gasketed stops. The damper leakage shall be certified to not exceed 2% leakage at 6" inlet static pressure as determined by Air Diffusion Council Standards. Control components including pneumatic operators (8-13#), reversing relays and adjustable velocity controllers, shall be furnished and piped complete by manufacturer. Control Subcontractor shall furnish and install two-pipe, direct acting room thermostat and shall connect main air (20 psi) and thermostat branch single to each valve assembly. The control assembly shall contain an acoustical Vortex filter for sound reduction. Sound ratings shall not exceed those scheduled at one-inch static pressure. Airborne NC ratings are based on units installed with attenuator section assuming a room absorption of 10 db, re 10^{-12} watts. Radiated noise criteria additionally assumes a ceiling STC of 35-39. Each double duct terminal unit shall be factory calibrated to deliver the specified quantity of hot and cold air shown on the drawings at 5000 ft. elevation with a minimum upstream static pressure scheduled below. All terminals shall be end outlet. Terminals shall be shipped with appropriate identification including model, size, hot and cold cfm, marked on the unit. Dual duct terminal units shall be Titus ESV-3000 Dual duct. Carnes, Tuttle & Bailey, Trane, or approved equal.

Symbol	Max. CFM Hot	Cold	Min. Supply Duct Dia.* Hot	Cold	Box Inlet Size Hot	Cold	Unit SPD In. W. G.	Noise Criteria Airborne	Radiated
DV-1	180	180	6"	6"	4"	4"	0.10	21	25
DV-2	180	290	6"	7"	4"	5"	0.10	25	25
DV-3	180	400	6"	8"	4"	6"	0.10	29	25
DV-4	290	290	7"	7"	5"	5"	0.10	25	25
DV-5	290	400	7"	8"	5"	6"	0.10	29	25
DV-6	400	400	8"	8"	6"	6"	0.10	29	25
DV-7	550	550	9"	9"	7"	7"	0.10	32	26
DV-8	550	700	9"	9"	7"	8"	0.10	34	26
DV-9	700	700	9"	9"	8"	8"	0.09	34	26
DV-10	850	850	10"	10"	9"	9"	0.10	37	26
DV-11	850	1110	10"	11"	9"	10"	0.10	39	26
DV-12	1110	1110	11"	11"	10"	10"	0.10	39	26
DV-13	1400	1400			12"	12"	0.10	43	27
DV-14	1870	1870			14"	14"	0.10	44	26
DV-15	2500	2500			16"	16"	0.13	48	26

*Contractor shall provide reducer at box inlet as shown on Detail.

CONSTANT VOLUME - DOUBLE DUCT TERMINAL UNIT: Furnish and install double duct constant air volume control assembly of sizes and capacities shown on the drawings. Assembly shall be arranged for hot and cold ducts with control sequence to allow for constant volume heating and cooling. Hot and cold valve assemblies shall be normally open arrangement, pressure independent and shall be capable of field reset to any desired air flow between zero and the maximum scheduled cfm. Units shall be furnished with acoustically lined sound attenuator and mixing section. Valves shall be constructed of 22 gauge galvanized steel and shall be internally lined with 1" thickness, 1-1/2 pound density acoustical lining conforming to NFPA-90A and UL-181 requirements. Damper blade shall be constructed of extruded aluminum with rust-proof self-lubricating bearings. Damper shall seat against gasketed stops. The damper leakage shall be certified to not exceed 2% leakage at 6" inlet static pressure as determined by Air Diffusion Council Standards. Control components including pneumatic operators, reversing relays and adjustable velocity controllers, shall be furnished and piped complete by manufacturer. Control Subcontractor shall furnish and install two pipe, direct acting room thermostat and shall connect main air (20 psi) and thermostat branch single to each valve assembly. Sound ratings shall not exceed those scheduled at one-inch static pressure. Airborne NC ratings are based on units installed with attenuator section assuming a room absorption of 10 db, re 10^{-12} watts. Radiated noise criteria additionally assumes a ceiling STC of 35-39. Each double duct terminal unit shall be factory calibrated to deliver the specified quantity of supply air shown on the drawings at 5000 ft. elevation with a minimum upstream static pressure scheduled below. All terminals shall be end outlet. Terminals shall be shipped with appropriate identification including model, size, hot and cold cfm, marked on the unit. Dual duct terminal units shall be Titus ESV-3000 Dual duct, Carnes, Tuttle & Bailey, Trane, or approved equal.

Symbol	Maximum CFM	Min. Supply Duct Dia.*	Box Inlet Size	Unit SPD, In. W. G.	Noise Criteria Airborne	Radiated
DD-1	180	6"	4"	0.10	21	25
DD-2	290	7"	5"	0.10	25	25
DD-3	400	8"	6"	0.10	29	25
DD-4	550	9"	7"	0.10	32	26
DD-5	700	9"	8"	0.09	34	26
DD-6	850	10"	9"	0.10	37	26
DD-7	1110	11"	10"	0.10	39	26
DD-8	1400	12"	12"	0.10	43	27
DD-9	1870	14"	14"	0.10	44	26
DD-10	2500	16"	16"	0.13	48	26

*Contractor shall provide reducer at box inlet as shown on Detail.

SYMBOL

GRILLE AND DIFFUSER SCHEDULE

GENERAL NOTES: Grilles and registers shall be fabricated of steel or aluminum unless the material is specifically called out in the schedule below. Steel grilles and registers shall receive a zinc phosphate prime coat and a baked white enamel finish. Aluminum grilles and registers shall also be finished in baked white enamel unless a natural anodized aluminum finish is called out below. The type of grille or register is shown by symbol number on the plans. Should a symbol number be missing, the appropriate device shall be furnished after referring to the Architectural Room Finish Schedule. The Architectural Room Finish Schedule shall take precedence over the symbol designation; discrepancies shall be clearly noted on the submittals. Ceiling Subcontractor shall furnish additional T-bars or splines as required to support and finish around ceiling mounted diffusers and grilles. Equipment manufactured by Carnes, Anemostat/Waterloo, Krueger, Barber Colman, Titus, and Tuttle & Bailey will be acceptable if equal in quality, appearance and noise levels to that specified.

A CEILING DIFFUSER: For lay-in T-bar ceiling with outside frame dimensions as scheduled below, baked white enamel finish, adjustable pattern.

CFM Range	Outside Frame Dimensions	Min. Neck Size	Min. Duct Size	Carnes	Titus	Tuttle & Bailey
90	11-3/4" x 11-3/4"	5"	6"	SAAT	TMS-A-3	DA
91-139	11-3/4" x 11-3/4"	6"	7"	SAAT	TMS-A-3	DA
140-245	23-3/4" x 23-3/4"	8"	8"	SAAT	TMS-A-3	DA
246-350	23-3/4" x 23-3/4"	10"	10"	SAAT	TMS-A-3	DA
351-500	23-3/4" x 23-3/4"	12"	12"	SAAT	TMS-A-3	DA
501-610	23-3/4" x 23-3/4"	14"	14"	SAAT	TMS-A-3	DA
611-800	23-3/4" x 23-3/4"	16"	16"	SAAT	TMS-A-3	DA

B CEILING DIFFUSER: For use with gypboard ceiling, neck sizes as scheduled below, aluminum or steel construction, adjustable pattern, volume control and baked white enamel finish.

CFM Range	Nom. Outside Frame Dimensions	Min. Neck Size	Min. Duct Size	Carnes	Titus	Tuttle & Bailey
90	12" x 12"	5"	6"	SAAE	TMS-A-1	DAE
91-139	12" x 12"	6"	7"	SAAE	TMS-A-1	DAE
140-245	24" x 24"	8"	8"	SAAE	TMS-A-1	DAE
246-350	24" x 24"	10"	10"	SAAE	TMS-A-1	DAE
351-500	24" x 24"	12"	12"	SAAE	TMS-A-1	DAE
501-610	24" x 24"	14"	14"	SAAE	TMS-A-1	DAE
611-800	24" x 24"	16"	16"	SAAE	TMS-A-1	DAE

C ROUND DIFFUSER: For exposed duct mounting, neck sizes as scheduled below, aluminum or steel construction, adjustable pattern, volume control, and baked metalescent aluminum finish.

CFM Range	Min. Neck Diameter	Carnes	Titus	Tuttle and Bailey
-135	6"	DAS	TMA	PA
136-245	8"	DAS	TMA	PA
246-330	10"	DAS	TMA	PA
331-500	12"	DAS	TMA	PA
501-645	14"	DAS	TMA	PA
646-840	16"	DAS	TMA	PA

D CEILING RETURN GRILLE: 1/2" x 1/2" x 1/2" egg crate for lay-in T-bar ceiling, baked white enamel finish, and sized as scheduled.

Maximum CFM	Nom. Size, Inches	Carnes	Titus	Tuttle & Bailey
250	12" x 12"	6495	50-MFR	CR-500U
530	24" x 12"	6495	50-MFR	CR-500U
1,200	24" x 24"	6495	50-MFR	CR-500U
2,000	24" x 48"	6495	50-MFR	CR-500U

E CEILING EXHAUST REGISTER: For gypboard ceiling, 1/2" x 1/2" x 1/2", fabricated of aluminum with frame, baked white enamel finish, provided opposed blade damper, and sized as scheduled.

Maximum CFM	Nom. Size, Inches	Carnes	Titus	Tuttle & Bailey
130	8" x 8"	6295	50-F-115	CRE500PG
250	12" x 12"	6295	50-F-115	CRE500PG
530	24" x 12"	6295	50-F-115	CRE500PG

F LINEAR DIFFUSER: Extruded aluminum construction with baked white enamel frame suitable for surface mounting to a T-bar ceiling. Interior surfaces to be finished in dull black. Diffusers shall have a fully adjustable air pattern with flow control vanes that shall be capable of deflecting the air pattern from horizontal to vertical or at intermediate settings. Each diffuser shall have a self-aligning device (where length is greater than four feet) resulting in perfect alignment without being visible. Nominal design is 25 cfm per foot per 3/4" slot; see plans for actual cfm, diffuser length, and number of slots. Krueger 1900 series, or approved equal.

G SIDEWALL SUPPLY REGISTER: Heavy duty steel construction, baked white enamel finish, horizontal front bars, vertical rear bars, double deflection, key operated opposed blade damper, baked white enamel finish and sized as shown on the drawings. Krueger 880V.

H SIDEWALL RETURN OR TRANSFER GRILLE: Steel construction, baked white enamel finish, sized as shown on drawings. Provide horizontal front bars at 40° deflection. Carnes Sturdicore Model 6155H.

SOUND TRAP SCHEDULE

Perforated inner and outer casings shall not be less than 22 gauge galvanized sheet steel. Acoustical fill material shall be inorganic glass fiber not less than four pounds per cubic foot density. Refer to the specifications for Dynamic Insertion Loss Self Noise Limits. Each trap is identified by symbol number as scheduled and as shown on the drawings. Acceptable manufacturers and their model numbers are: Rink, I.A.C. 3L, Koppers 3LR, or equal by Anemostat, Demco, or Aerocoustics.

Symbol	CFM	Trap Length, Ft.	Trap Face High x Wide	Max. P.D., In.	DB "Class" (3rd Band)	Rink Model	Service
ST-1	23,340	3	54" x 60"	0.12	18	A-36	Return Air 1st Level
ST-2	13,970	3	48" x 60"	0.12	18	A-36	Return Air 2nd and 4th Levels
ST-3	13,970	3	48" x 60"	0.12	18	A-36	Return Air 2nd and 4th Levels

U.N.M. MECHANICAL ENGINEERING BLDG.

EQUIPMENT SCHEDULE - HVAC

pacheco and graham · architects

project	date	sheet
320/7627	11/20/78	M-3