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AIRTEX RADIANT CEILING PANELS

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INTRODUCTION

Airtex brings to your project experience in proven radiant heating technology with millions of square feet of Airtex Ceiling Systems successfully installed across North America since the early 1960's.

Engineered Air, as manufacturer of the Airtex products, is dedicated to providing the highest quality radiant systems available and to continue setting the standard in hydronic radiant heating for performance, efficiency, architectural aesthetics and value.

Airtex Radiant Systems are applicable to virtually any type of commercial or institutional application, and have become a new standard in perimeter hydronic heating for educational and health care facilities, office buildings, and research centres.

This Airtex engineering catalogue provides descriptive and design information for both the Linear HEF-2 aluminum extruded system (red tabs) and Modular HPH metal panels (yellow tabs).

AIRTEX LINEAR HEF-2 RADIANT SYSTEM

Airtex Linear panels form a continuous architectural perimeter band constructed to virtually any width from interlocking aluminum extrusions. The thermally optimized mechanical bonding technique maximizes heat transfer between copper circulating coils and aluminum extrusions.

AIRTEX MODULAR HPH PANELS

The Modular HPH panels are sized to fit ceiling grid openings and incorporate an efficient metallurgical bonding technique between the copper coil and aluminum sheet. The panel face can be custom coloured or silk-screened to match adjacent acoustic ceiling tiles. Modular panels may also be provided with aluminum mounting frames for recessing or surface mounting to gypsum wallboard ceilings.

LINEAR SYSTEMS

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AIRTEX RADIANT CEILING PANELS

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NOMINAL PANEL WIDTH (INCHES)																
	6	8	9	10	12	15	16	18	18	20	24	25	30	30	36	
	1 TUBE	2 TUBE	2 TUBE	2 TUBE	2 TUBE	3 TUBE	4 TUBE	3 TUBE	4 TUBE	4 TUBE	4 TUBE	5 TUBE	5 TUBE	6 TUBE	6 TUBE	
MEAN WATER TEMPERATURE (DEG. F.)	120	47	60	62	64	69	87	89	96	117	124	145	146	153	160	198
	125	55	70	74	77	83	105	107	116	136	144	170	171	183	190	231
	130	63	81	86	90	98	122	125	135	154	163	194	195	212	220	264
	135	71	91	97	102	112	140	143	154	173	183	218	220	241	249	297
	140	79	101	108	114	126	157	161	173	192	204	243	245	270	279	331
	145	87	111	119	126	140	175	179	192	210	223	267	269	299	309	364
	150	95	121	130	138	155	194	198	211	229	243	291	294	329	339	397
	155	104	131	141	150	169	211	216	231	248	264	316	319	358	369	430
	160	112	141	152	162	183	229	234	250	266	283	340	343	387	398	464
	165	120	151	163	175	198	246	252	269	285	303	364	367	416	428	497
	170	128	161	174	187	212	264	270	288	303	323	389	393	446	458	530
	175	135	171	185	199	226	282	288	307	322	343	413	417	475	488	563
	180	144	181	196	211	241	300	307	326	341	364	438	442	504	518	597
	185	152	191	207	223	255	318	325	345	359	383	462	467	533	547	630
	190	160	201	218	235	269	335	343	365	378	403	486	491	562	577	663
	195	168	211	230	248	284	353	361	384	397	423	511	516	592	607	696
	200	176	221	241	260	298	371	379	403	415	443	535	541	621	637	730
	205	184	231	253	272	312	388	397	422	434	463	559	565	650	667	763
	210	193	241	263	284	326	407	416	441	453	483	584	590	679	696	796
	215	201	252	275	297	341	424	434	460	471	503	608	615	708	726	829
	220	209	262	286	309	355	442	452	480	490	523	632	639	738	756	863

- HEATING PERFORMANCE IS BASED ON CEILING MOUNTED INSTALLATION.
- HEATING PERFORMANCE SHOWN IN BTUH/LINEAR FOOT OF PANEL.
- OUTPUTS FOR PANEL WIDTHS NOT SHOWN MAY BE INTERPOLATED.
- PERFORMANCE BASED ON 70°F AIR TEMPERATURE, 67°F AUST WITH NATURAL CONVECTION.

PERIMETER HEATING PERFORMANCE (IMPERIAL)

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		NOMINAL PANEL WIDTH (MILLIMETRES)													
MEAN WATER TEMPERATURE (DEG. C)		152	203	229	254	305	381	406	457	457	508	610	635	762	914
		1 TUBE	2 TUBE	2 TUBE	2 TUBE	2 TUBE	3 TUBE	4 TUBE	3 TUBE	4 TUBE	4 TUBE	4 TUBE	5 TUBE	5 TUBE	6 TUBE
	49	45	58	60	62	66	84	86	92	112	119	139	140	147	190
	52	53	67	71	74	80	101	103	112	131	138	163	164	176	222
	54	61	78	83	87	94	117	120	130	148	157	186	187	204	254
	57	68	88	93	98	108	135	137	148	166	176	210	211	232	285
	60	76	97	104	110	121	151	155	166	185	196	234	236	260	318
	63	84	107	114	121	135	168	172	185	202	214	257	259	287	350
	66	91	116	125	133	149	186	190	203	220	234	280	283	316	382
	68	100	126	136	144	162	203	208	222	238	254	304	307	344	413
	71	108	136	146	156	176	220	225	240	256	272	327	330	372	446
	74	115	145	157	168	190	236	242	259	274	291	350	353	400	478
	77	123	155	167	180	204	254	260	277	291	310	374	378	429	509
	79	131	164	178	191	217	271	277	295	309	330	397	401	457	541
	82	138	174	188	203	232	288	295	313	328	350	421	425	484	574
	85	146	184	199	214	245	306	312	332	345	368	444	449	512	605
	88	154	193	210	226	259	322	330	351	363	387	467	472	540	637
	91	162	203	221	238	273	339	347	369	382	407	491	496	569	669
	93	169	212	232	250	286	357	364	387	399	426	514	520	597	702
	96	177	222	243	261	300	373	382	406	417	445	537	543	625	733
	99	186	232	253	273	313	391	400	424	435	464	561	567	653	765
	102	193	242	264	285	328	408	417	442	453	483	584	591	680	797
	104	201	252	275	297	341	425	434	461	471	503	607	614	709	829

- HEATING PERFORMANCE IS BASED ON CEILING MOUNTED INSTALLATION.
- HEATING PERFORMANCE SHOWN IN WATTS/LINEAR METER OF PANEL.
- OUTPUTS FOR PANEL WIDTHS NOT SHOWN MAY BE INTERPOLATED.
- PERFORMANCE BASED ON 21.1°C AIR TEMPERATURE, 19.4°C. AUST WITH NATURAL CONVECTION.

PERIMETER HEATING PERFORMANCE (METRIC)

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IMPERIAL			
GPM/ TUBE	FT / 100ft		GPM/ TUBE FT / 100ft
0.05	0.01		1.55 7.34
0.10	0.05		1.60 7.78
0.15	0.10		1.65 8.24
0.20	0.17		1.70 8.71
0.25	0.25		1.75 9.19
0.30	0.35		1.80 9.68
0.35	0.47		1.85 10.18
0.40	0.60		1.90 10.70
0.45	0.74		1.95 11.22
0.50	0.91		2.00 11.76
0.55	1.08		2.05 12.31
0.60	1.27		2.10 12.87
0.65	1.47		2.15 13.45
0.70	1.69		2.20 14.03
0.75	1.92		2.25 14.63
0.80	2.16		2.30 15.23
0.85	2.42		2.35 15.85
0.90	2.68		2.40 16.48
0.95	2.97		2.45 17.12
1.00	3.26		2.50 17.77
1.05	3.57		2.55 18.44
1.10	3.89		2.60 19.11
1.15	4.23		2.65 19.80
1.20	4.57		2.70 20.49
1.25	4.93		2.75 21.20
1.30	5.30		2.80 21.92
1.35	5.68		2.85 22.65
1.40	6.08		2.90 23.99
1.45	6.49		2.95 24.14
1.50	6.91		3.00 24.90

METRIC			
l/sec TUBE	Pa/m		l/sec TUBE Pa/m
0.003	0.98		0.098 719.8
0.006	4.90		0.101 762.9
0.009	9.81		0.104 808.0
0.013	16.67		0.107 854.1
0.016	24.52		0.110 901.2
0.019	34.32		0.114 949.2
0.022	46.09		0.117 998.3
0.025	58.84		0.120 1049
0.028	72.56		0.123 1100
0.032	89.23		0.126 1153
0.035	105.9		0.129 1207
0.038	124.5		0.132 1262
0.041	144.1		0.136 1319
0.044	165.7		0.139 1376
0.047	188.3		0.142 1435
0.050	211.8		0.145 1493
0.054	237.3		0.148 1554
0.057	262.8		0.151 1616
0.060	291.2		0.155 1679
0.063	319.7		0.158 1743
0.066	350.1		0.161 1808
0.069	381.5		0.164 1874
0.073	414.8		0.167 1942
0.076	448.1		0.170 2009
0.079	483.4		0.173 2079
0.082	519.7		0.177 2149
0.085	557.0		0.180 2221
0.088	596.2		0.183 2352
0.091	636.4		0.186 2367
0.095	677.6		0.189 2442

- WATER PRESSURE DROP IN HEIGHT OF WATER COLUMN PER LENGTH OF PANEL TUBING FOR A GIVEN FLOW RATE.
- **TO ENSURE AIR REMOVAL AT START-UP, DESIGN FLOW RATES BELOW 0.5 USGPM (0.032 l/s) ARE NOT RECOMMENDED.**
- FOR AIRTEX PIGTAIL INTERCONNECTS ADD 18" (457mm) TO TUBING LENGTH.
- PRESSURE DROP IN AIRTEX RETURN BENDS MAY BE IGNORED.
- ADJUST FLOW FOR GLYCOL SOLUTIONS COMPENSATING FOR SPECIFIC HEAT AND SPECIFIC GRAVITY.

PRESSURE DROP TABLES

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GENERAL NOTES

1. This supplier is responsible only for the supply of radiant panels.
Others are to supply and install the following:
 - (a) Necessary piping between panels. (other than Airtex 360° Interconnects and 180° return U-Bends where indicated).
 - (b) Piping from panels to supply and return mains.
 - (c) Specified insulation and hanger wires unless otherwise noted.
 - (d) Suspended ceiling grids and panel support mouldings.
2. Ensure shop drawings are available to installers prior to start of piping rough-in. Run-off location may vary from mechanical drawing.
3. Read radiant panel drawings in conjunction with architectural and mechanical drawings.
Supply and return piping may have been offset for clarity. Refer to mechanical drawings for pipe sizes and proper locations of main distribution piping, valves and thermostats. For panels installed against an exterior wall, the first tube supplied should be nearest the wall.
4. Airtex panel lengths have been determined from architectural reflected ceiling plans when available. Align panel ends with grid members only where indicated.
Coordinate with ceiling contractor.
5. All linear panels to be Airtex design – HEF-2 extruded aluminum with copper tubes, and output in accordance with Airtex Heating Performance Chart.
6. Install radiant panels with male tang towards perimeter wall as per details given, with special attention to panel lengths and expansion allowances. Contractor is responsible for verifying all site dimensions before manufacture and installation.
7. Mechanical contractor to ensure coordination with ceiling contractor regarding:
 - a) Ceiling opening schedule.
 - b) Types of panel support mouldings required.
 - c) Panel end locations.
8. Panel extrusions are provided at the lengths indicated in the radiant panel schedule. Extrusions are supplied with copper tubing positioned 7 in. (178mm) from each end – unless otherwise noted. Assemble panels from radiant extrusions as per Assembly and Installation Instructions. All cutting of panels can be done using a circular saw with carbide tip blade for non-ferrous metal.
If the copper tubing requires cutting:
 - a) Carefully lift copper from saddle and cut back as required.
 - b) End of tubing can be raised with tube bender (available from supplier).
 - c) Clean heat transfer paste from copper using a solvent before soldering.
 - d) Press tubing back into saddle as required.
9. Care must be taken at all times not to mar or soil panel face. It is recommended that installers wear clean white gloves when handling radiant extrusions.
10. Panels will be supplied in the manufacturer's standard white colour.

GENERAL NOTES

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LE-4

CEILING OPENING AND CROSS CHANNEL INFORMATION

NOMINAL PANEL WIDTH		CEILING OPENING Add dimension below to nominal width.	
(inches)	(mm)	(inches)	(mm)
Less than 15"	Less than 381	1/4"	6
15" to 19"	381 to 483	3/16"	5
20" to 24"	508 to 610	1/8"	3
25" to 29"	635 to 737	1/16"	2
30" to 36"	762 to 914	0	0

NOTE: For panels wider than 36" (914 mm), contact ENGINEERED AIR.

Ensure coordination with ceiling contractor regarding panel joint location, ceiling openings and panel support mouldings. Airtex shop drawings must be made available to installers prior to start of piping rough-in. Run-out locations may vary from mechanical drawings.

CROSS CHANNEL SCHEDULE			
PANEL LENGTH	NUMBER OF CROSS CHANNELS PER PANEL		
	PANEL WIDTH 24" OR LESS		PANEL WIDTH 25" TO 36"
LESS THAN 10'	3		4 
10' - 13'	4		5 
OVER 13' - 16'	5		6 

IMPORTANT: ONE CROSS CHANNEL IS REQUIRED WITHIN 2" OF EACH END OF PANEL.

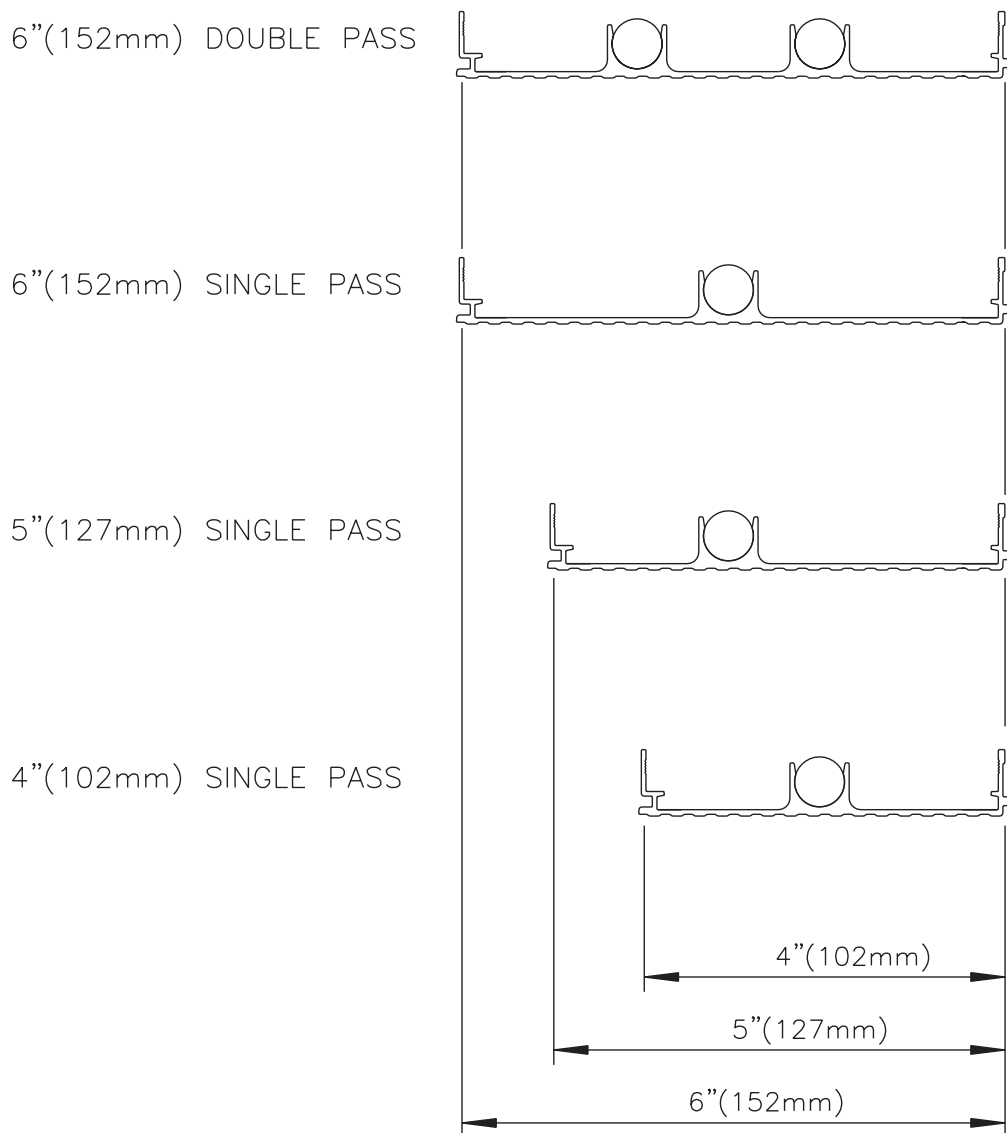
AIRTEX HEF-2 LINEAR PANEL CEILING OPENING SCHEDULE

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LE-5



Airtex HEF-2 Linear Radiant Panels are constructed from the aluminum extrusions shown above. Any 1"(25mm) incremental panel width from 8"(203mm) to 48"(1219mm) wide can be constructed from a combination of 4"(102mm), 5"(127mm) or 6"(152mm) radiant extrusions. Splice lines between extrusions are hidden from view when male edge is installed toward perimeter wall. Panel lengths can be provided to suit perimeter planning modules up to 16' (4870mm) long. For additional custom extruded sections, see LM-2 or contact Engineered Air.

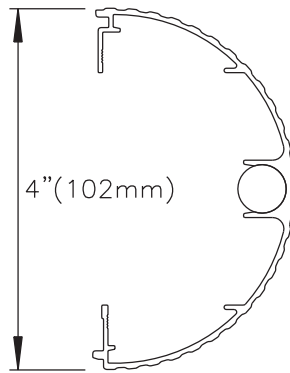
STANDARD HEF-2 LINEAR EXTRUDED SECTIONS

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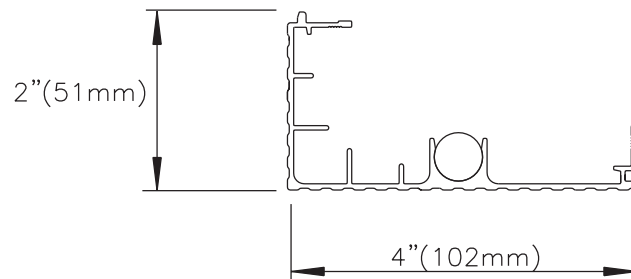
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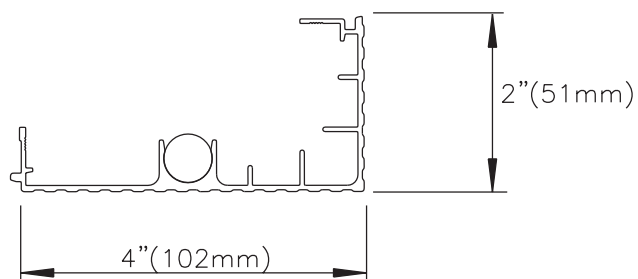
LM-1



4"(102mm) SINGLE PASS BULL NOSE



2"(51mm) MALE x 4"(102mm) FEMALE
SINGLE PASS CORNER
(2Mx4F)



2"(51mm) FEMALE x 4"(102mm) MALE
SINGLE PASS CORNER
(2Fx4M)

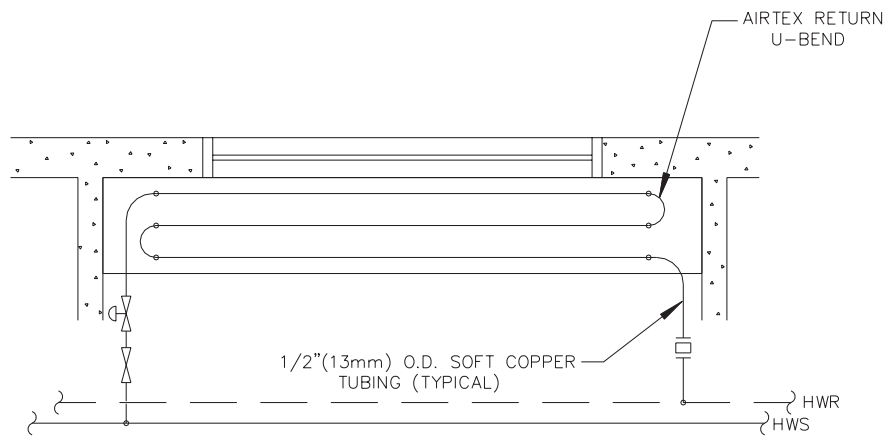
OPTIONAL HEF-2 LINEAR EXTRUDED SECTIONS

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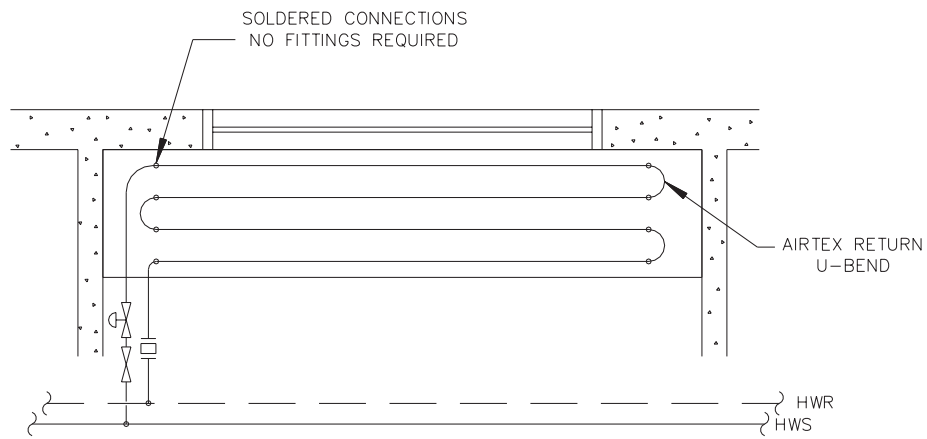
ENGINEERED AIR®

LM-2



ODD NUMBER TUBING PASSES

A



EVEN NUMBER TUBING PASSES

B

- MAXIMUM SINGLE PANEL LENGTH: 16 FT. (4870 mm)
- REFER TO ARCHITECTURAL DETAILS FOR TYPICAL SECTIONS

- MAXIMUM SINGLE PANEL LENGTH: 16' (4870mm)
- REFER TO ARCHITECTURAL DETAILS FOR TYPICAL SECTIONS

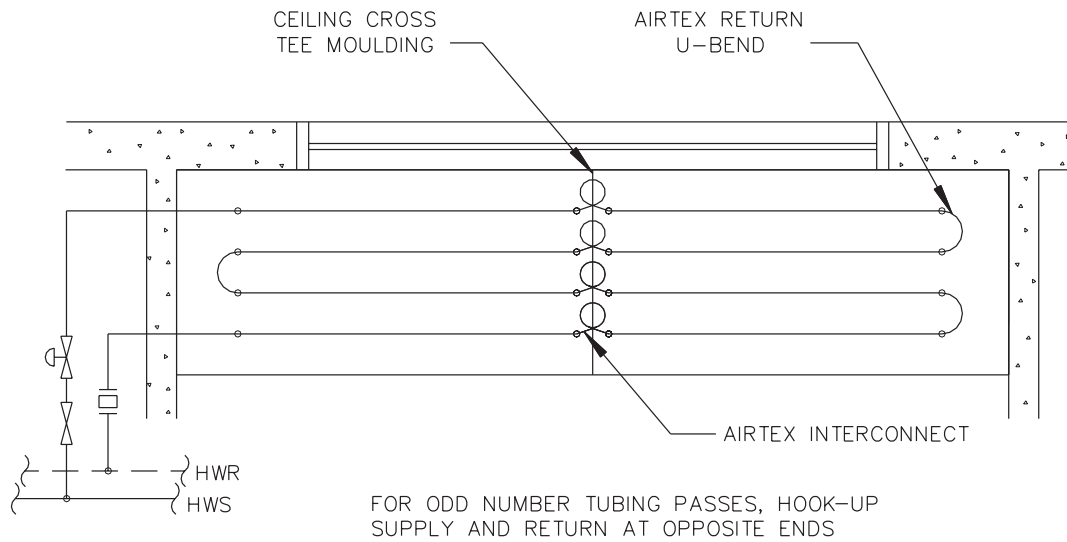
SINGLE LINEAR PANEL INSTALLATION

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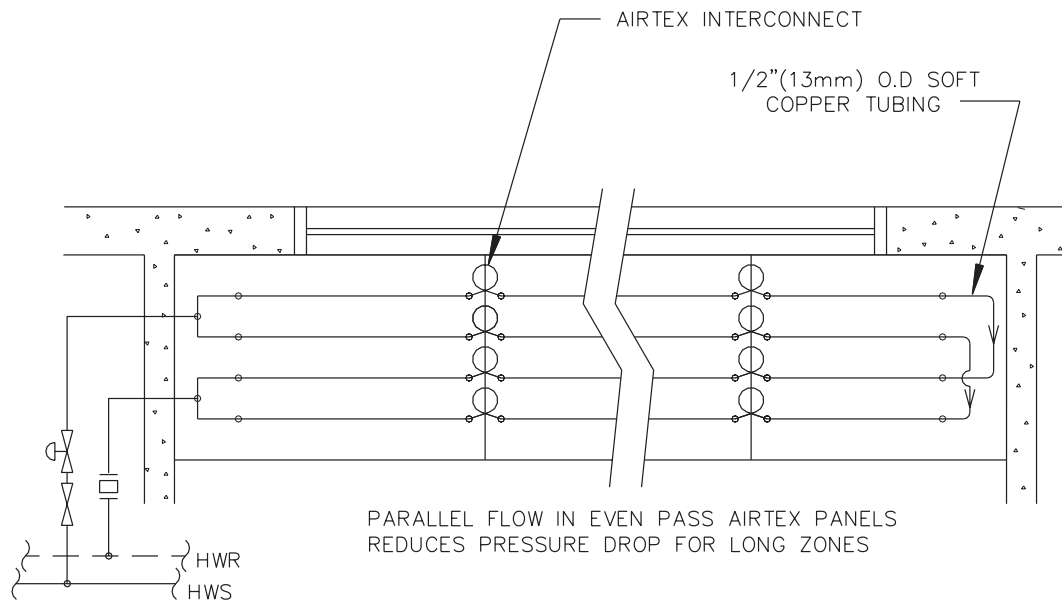
ENGINEERED AIR®

LM-3



MULTIPLE PANEL TUBING CIRCUITRY

A



TUBING CIRCUITRY FOR LONGER ZONES

B

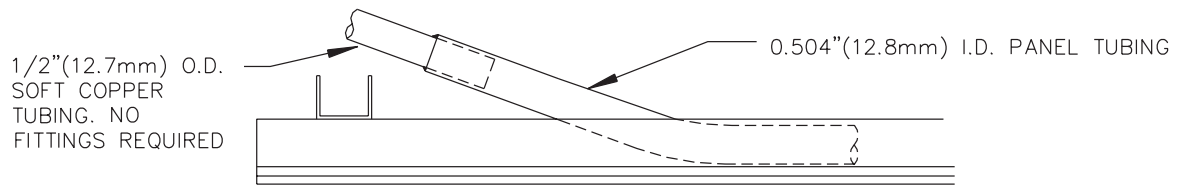
MULTIPLE LINEAR PANEL HOOK-UP DETAILS

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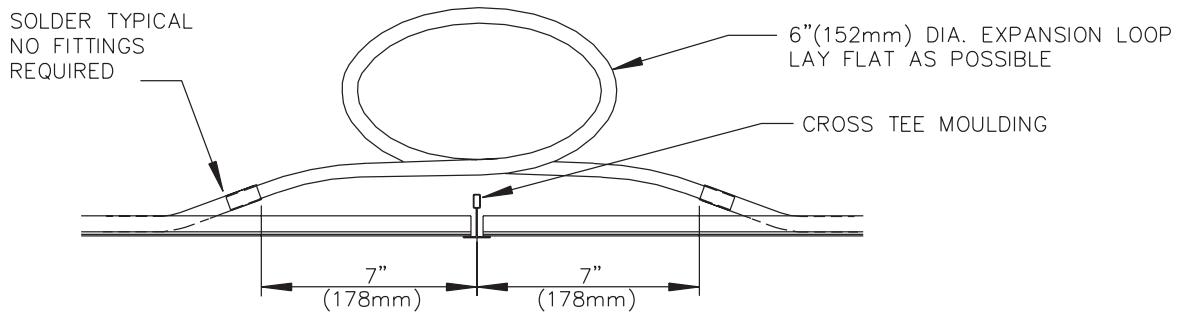
ENGINEERED AIR®

LM-4



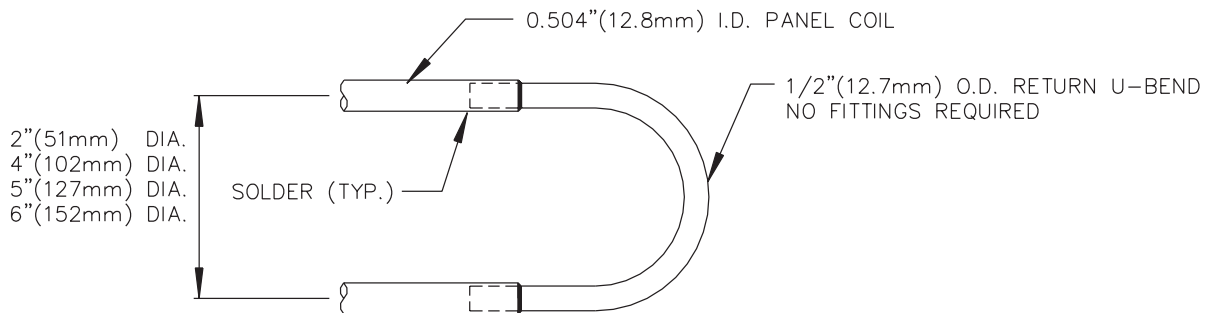
CONNECTION TO AIRTEX PANEL TUBING

A



AIRTEX 360° INTERCONNECT

B



AIRTEX RETURN U-BEND

C

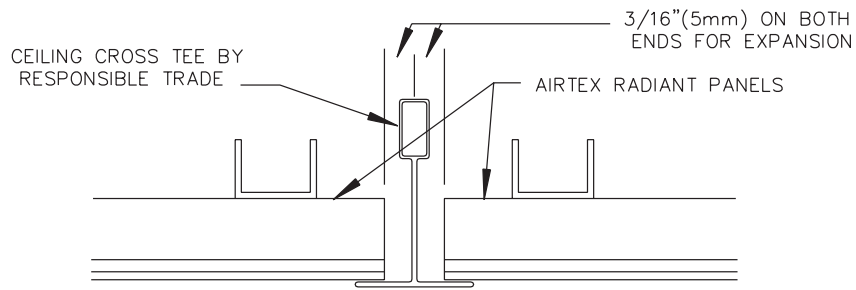
LINEAR RADIANT PANEL CONNECTION DETAILS

AIRTEX
RADIANT SYSTEMS®

EngA®

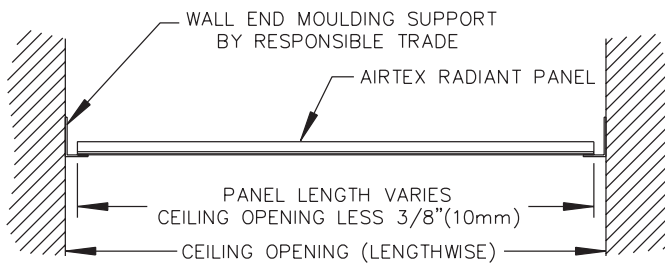
ENGINEERED AIR®

LM-5



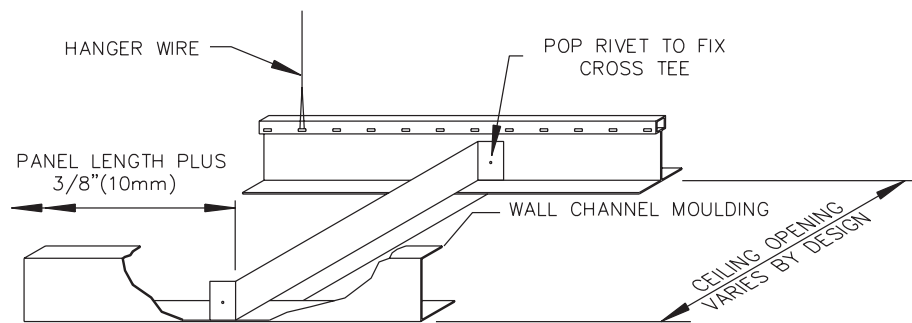
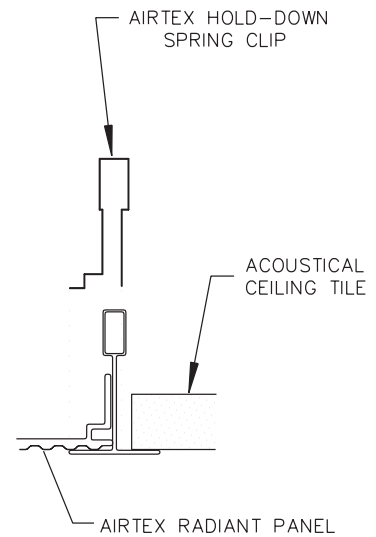
EXPANSION GAP FOR RADIANT PANEL

A



CLEARANCE REQUIRED FOR RADIANT PANEL

B



CROSS TEE BETWEEN PANEL ENDS

C

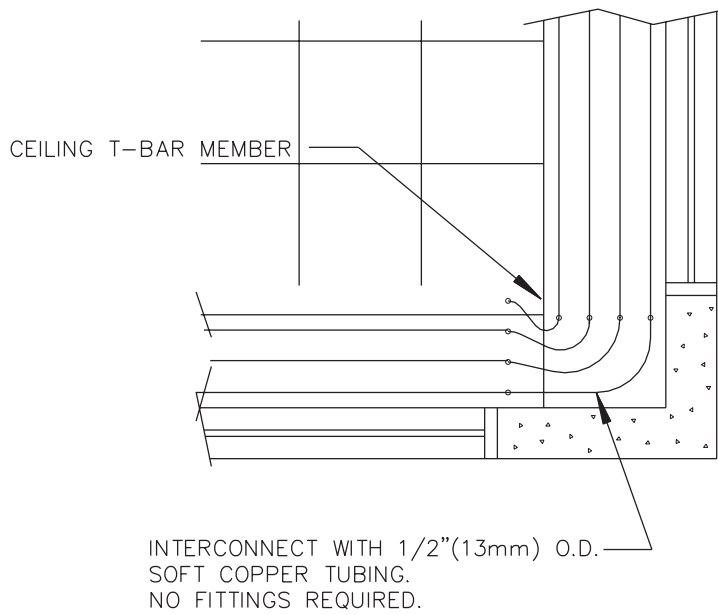
LINEAR PANEL INSTALLATION AND EXPANSION DETAILS

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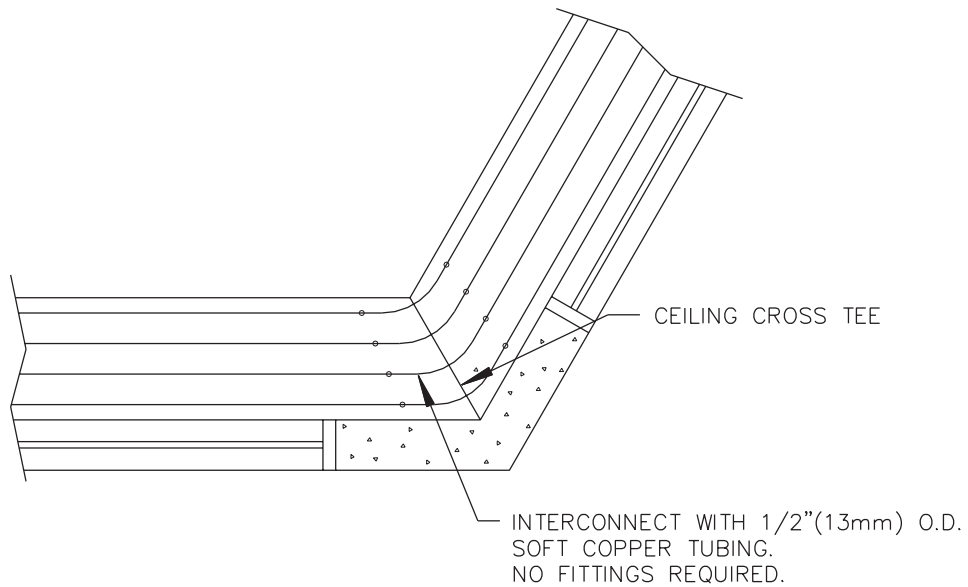
ENGINEERED AIR®

LM-6



PANEL INTERCONNECT AT SQUARE CORNER

A



PANEL INTERCONNECT AT MITRED CORNER

B

LINEAR PANEL INTERCONNECTION AT CORNERS

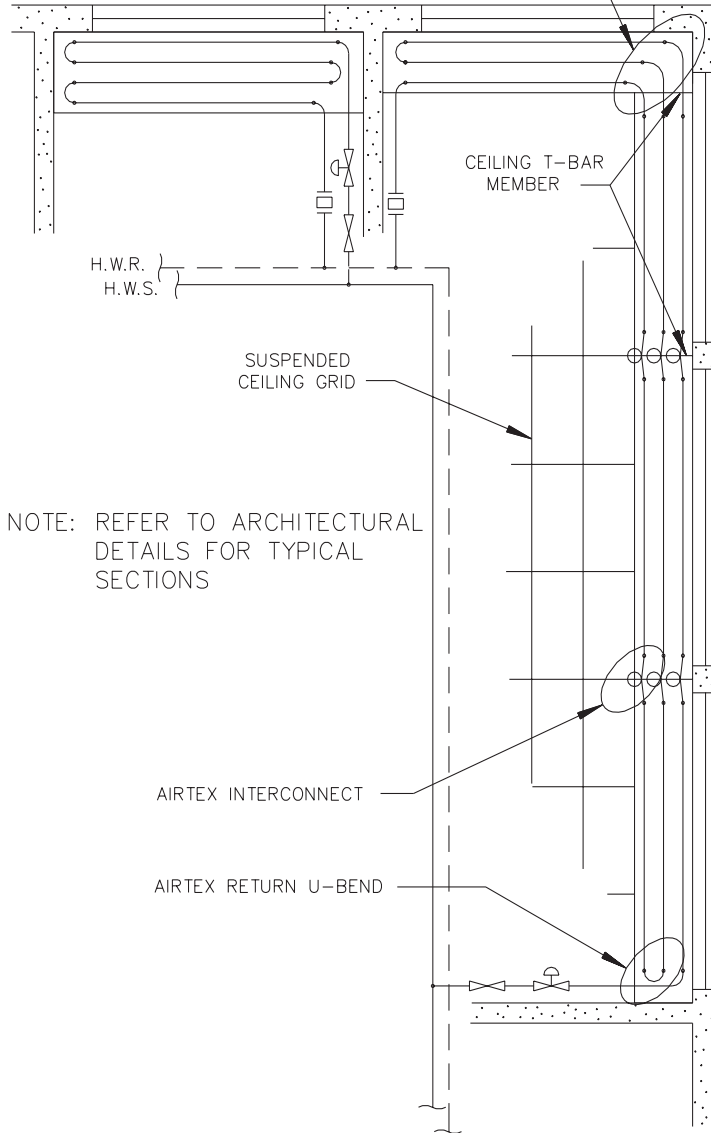
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LM-7

INTERCONNECT WITH 1/2"(13mm) O.D. SOFT COPPER TUBING

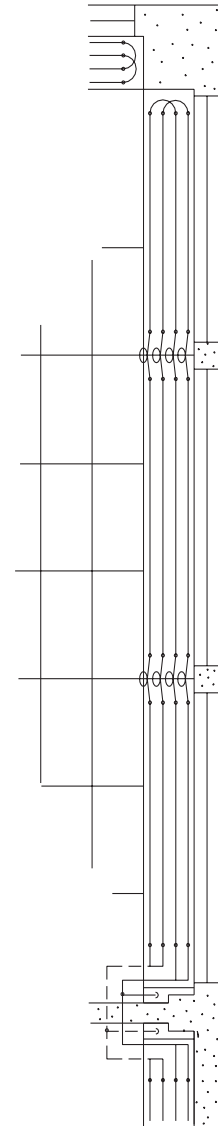


NOTE: REFER TO ARCHITECTURAL
DETAILS FOR TYPICAL
SECTIONS

AIRTEX INTERCONNECT

AIRTEX RETURN U-BEND

ZONES FED FROM
HORIZONTAL DISTRIBUTION



LONG ZONES FED
FROM RISERS

LINEAR HEF-2 RADIANT PANELS - SCHEMATIC LAYOUT

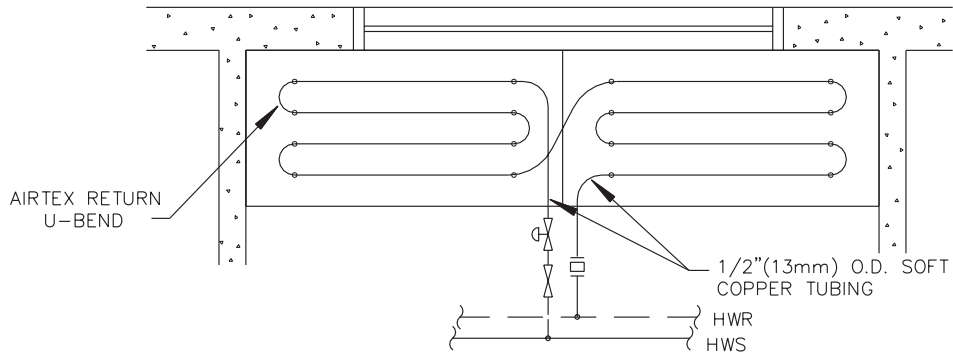
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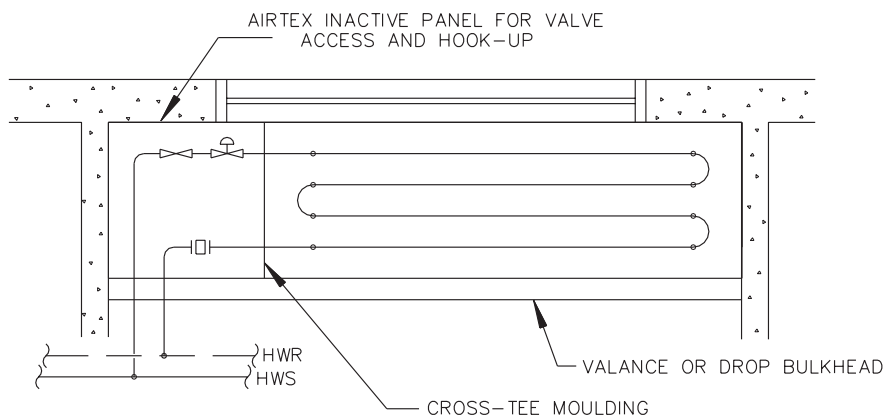
LM-8

REV MAR 31 04



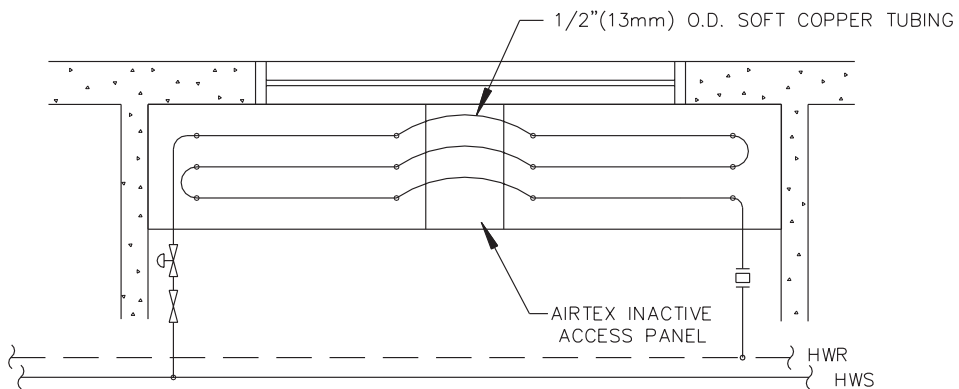
TWO PANEL EVEN PASS

A



SINGLE PANEL EVEN PASS

B



MULTIPLE PASS INTERCONNECT

C

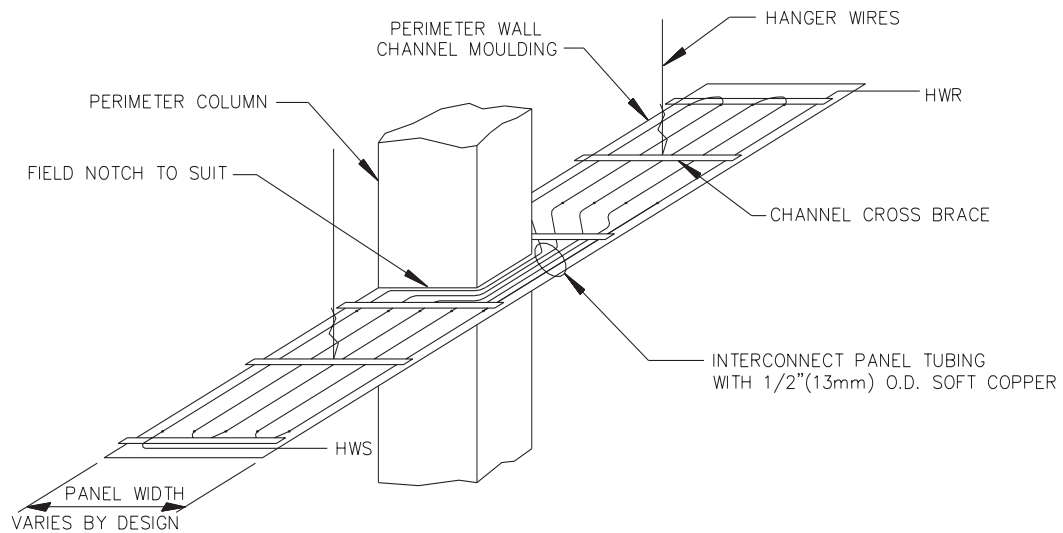
INACCESSIBLE G.W.B. CEILING INSTALLATIONS

AIRTEX
RADIANT SYSTEMS®

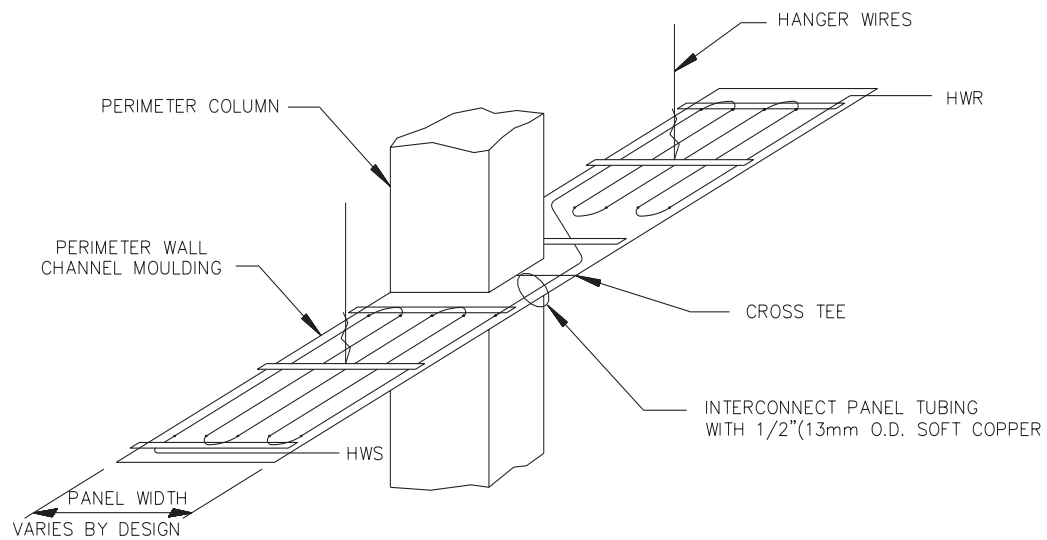
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SINGLE PANEL NOTCHED AT COLUMN (A)



TWO PANELS MEET AT COLUMN CENTERLINE (B)

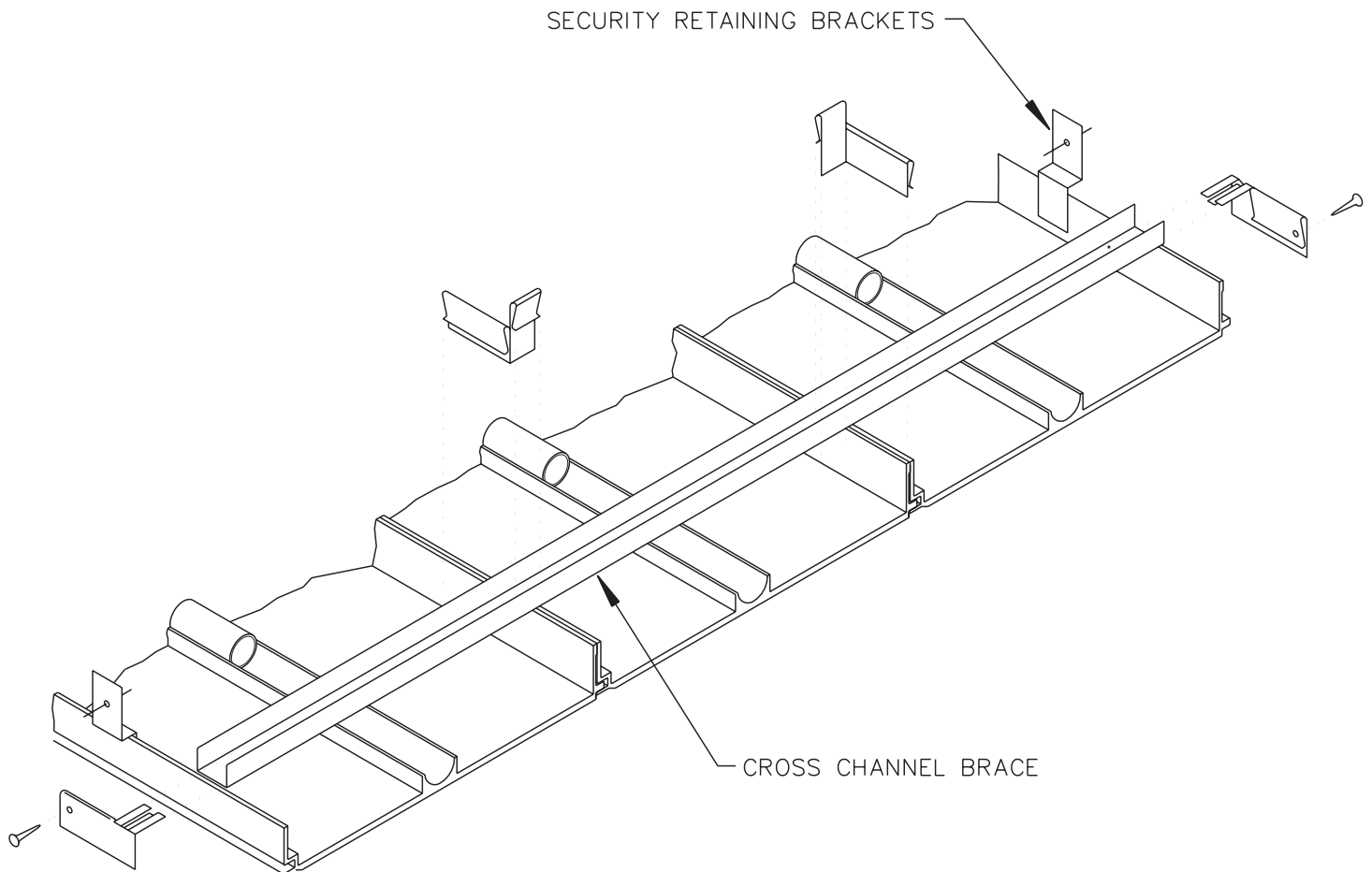
LINEAR PANELS AT PERIMETER OBSTRUCTIONS

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LM-10



NOTE: INSTALLATION OF SECURITY RETAINING BRACKETS WILL REQUIRE ACCESS TO REVERSE SIDE OF PANEL AFTER INSTALLATION.

SECURITY INSTALLATION

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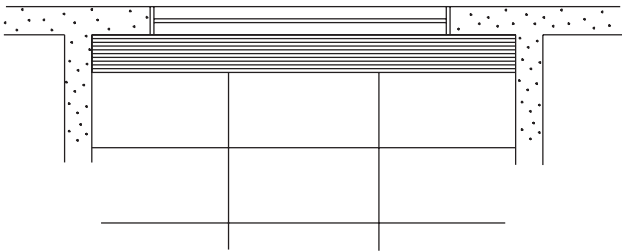
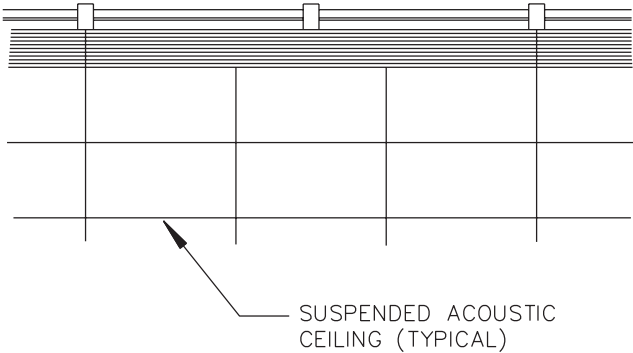
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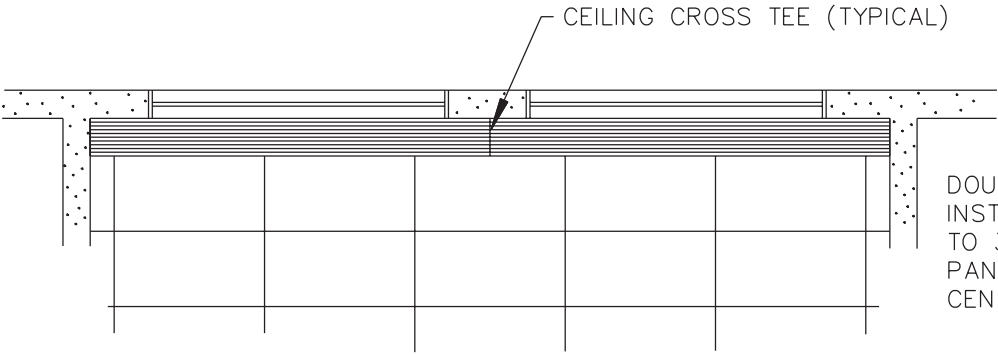
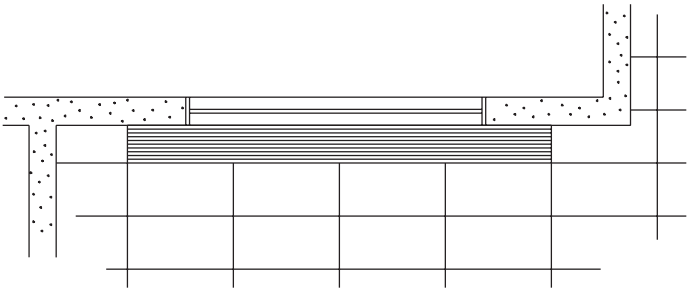
LM-11

REV MAR 31 04

MULTIPLE PANEL
INSTALLATION WITH
ENDS ALIGNED TO
CEILING GRID AND
WINDOW MULLIONS



SINGLE PANEL INSTALLATIONS
UP TO 16 FT. (4870mm).



DOUBLE PANEL
INSTALLATION UP
TO 32 FT. (9750mm).
PANEL JOINT
CENTERED IN ROOM.

TYPICAL REFLECTED CEILING PANEL ARRANGEMENTS

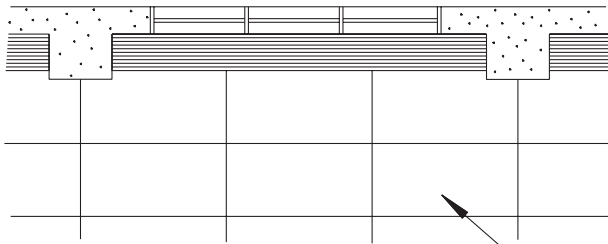
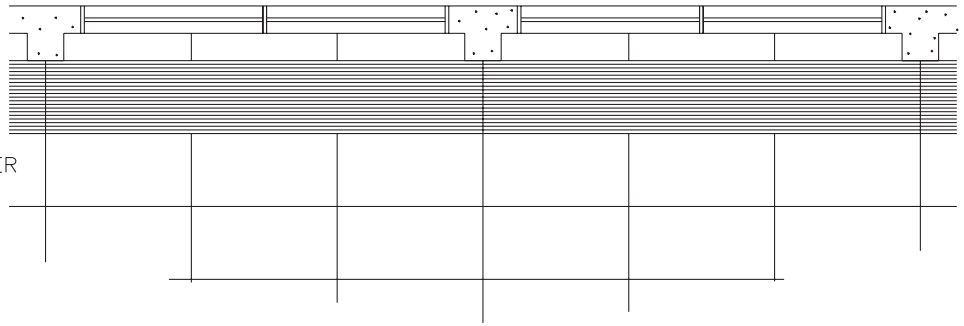
AIRTEX
RADIANT SYSTEMS

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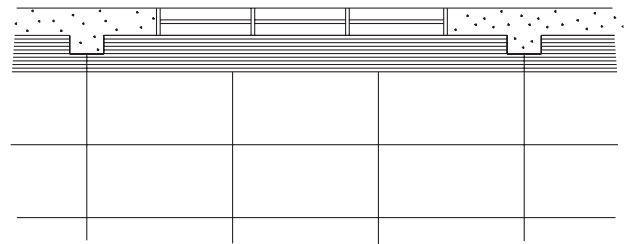
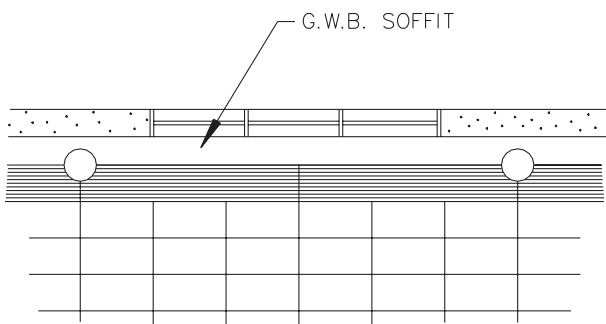
LA-1

AIRTEX PANELS LAYED
OUT CLEAR OF PERIMETER
COLUMNS



AIRTEX PANELS SET
BETWEEN COLUMNS

SUSPENDED ACOUSTIC
CEILING



AIRTEX PANELS NOTCHED
AT PERIMETER COLUMNS

REFLECTED CEILING PANEL ARRANGEMENTS AT COLUMNS

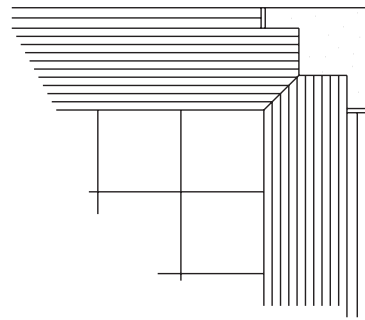
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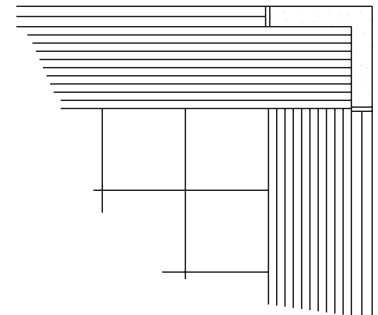
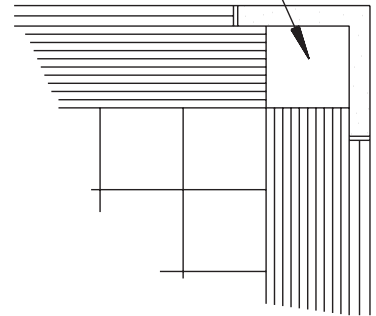
LA-2

REV MAR 31 04

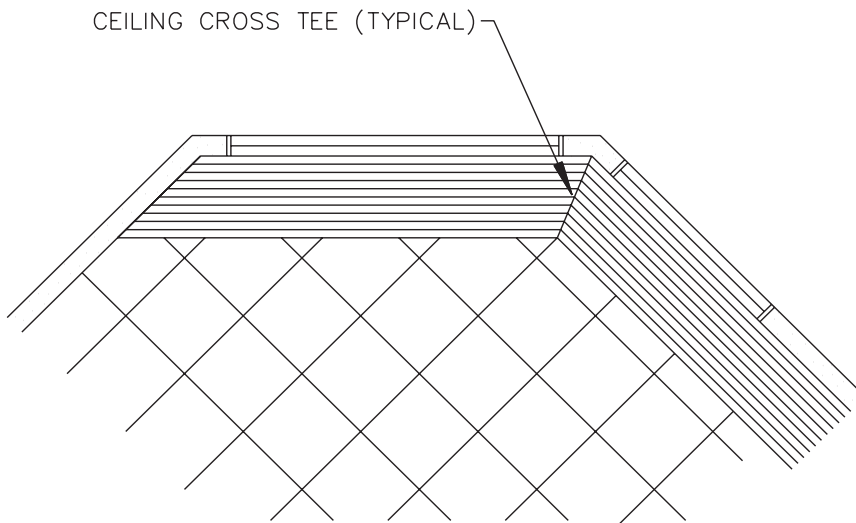


NOTCHED AND MITRED
CORNER DETAIL

ACOUSTIC TILE FILLER



STANDARD SQUARE
CORNER DETAILS



CEILING CROSS TEE (TYPICAL)

AIRTEX PANELS MAY BE FIELD-TRIMMED
TO SUIT ALMOST ANY CEILING LAYOUT

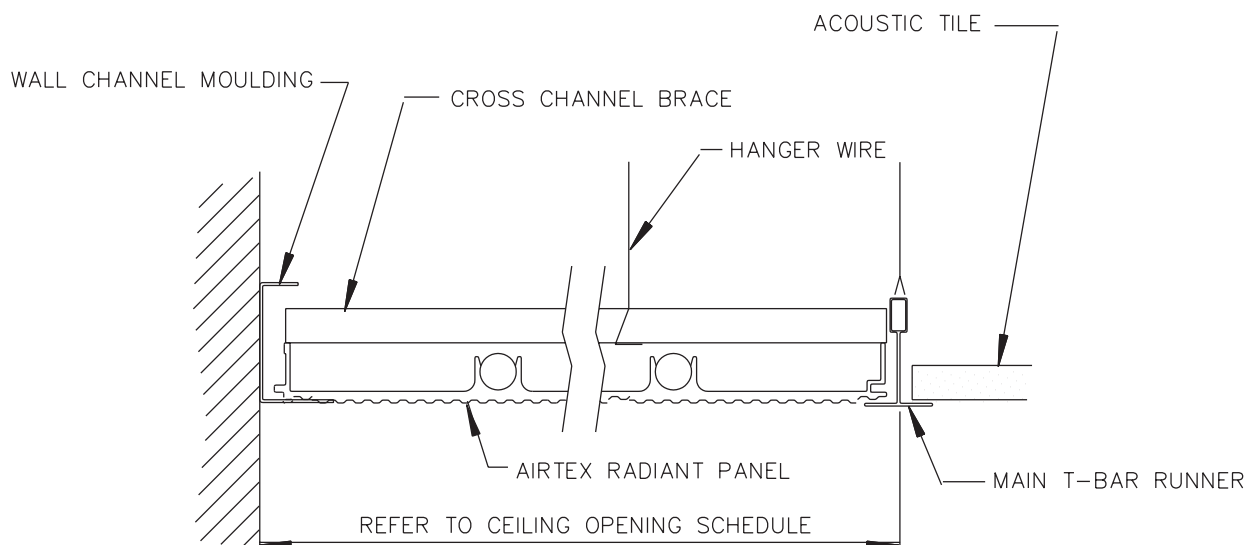
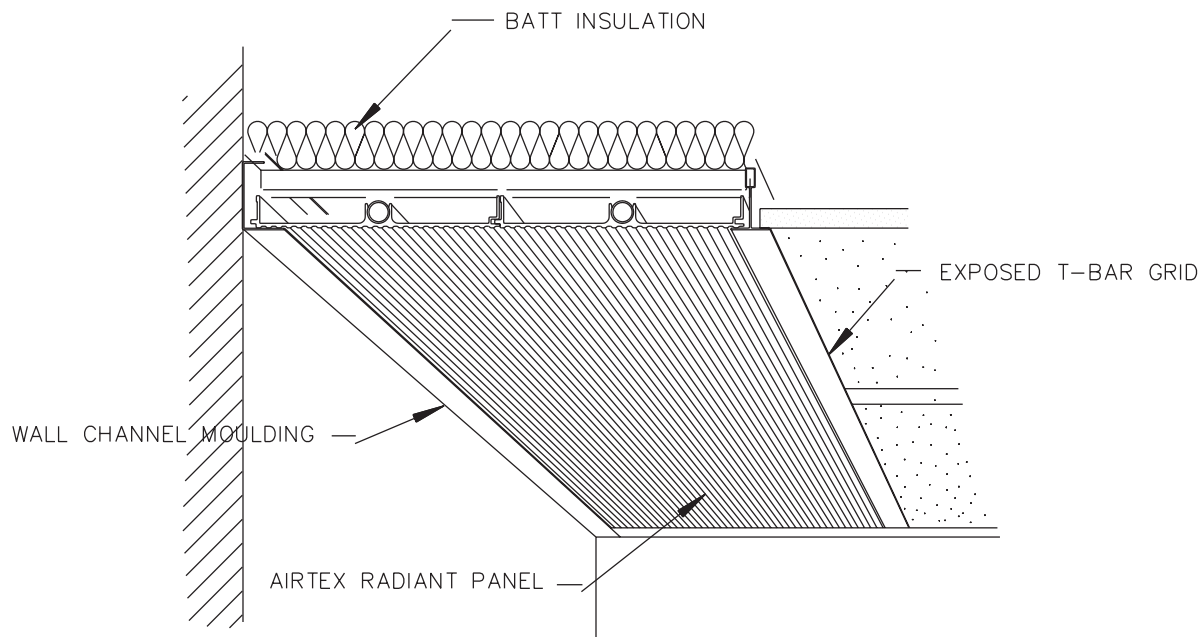
TYPICAL PANEL CORNER ARRANGEMENTS

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LA-3



NOTE: PANEL SUPPORT MOULDINGS BY DIVISION 9

PERIMETER INSTALLATION IN A SUSPENDED T-BAR CEILING

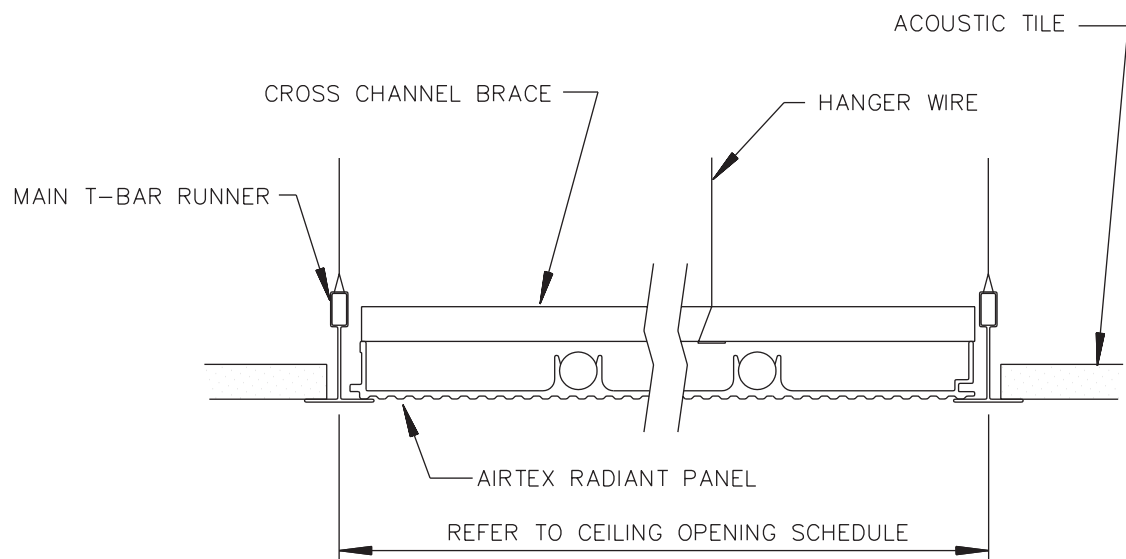
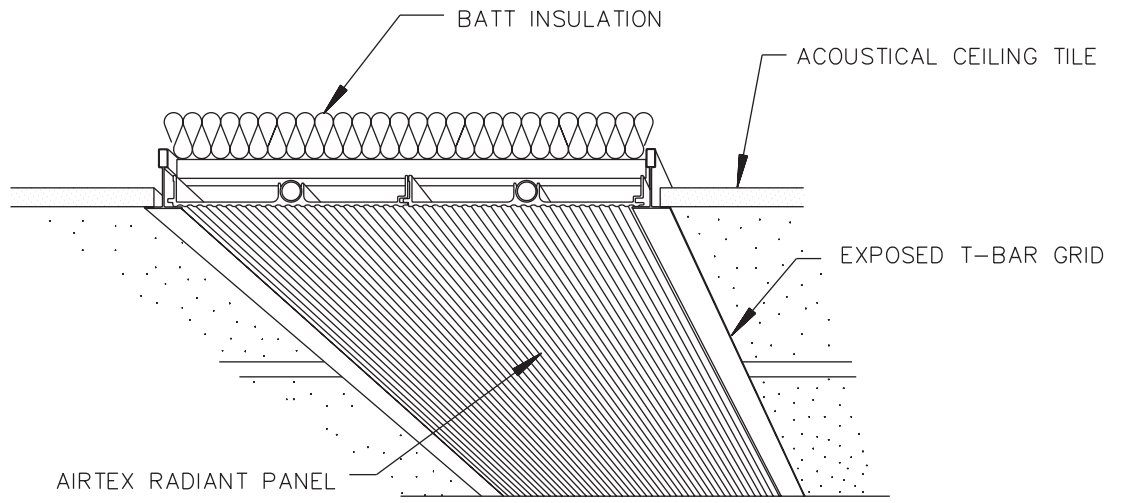
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LA-4

REV MAR 31 04



NOTE: PANEL SUPPORT MOULDINGS BY DIVISION 9

INTERIOR INSTALLATION IN A SUSPENDED T-BAR CEILING

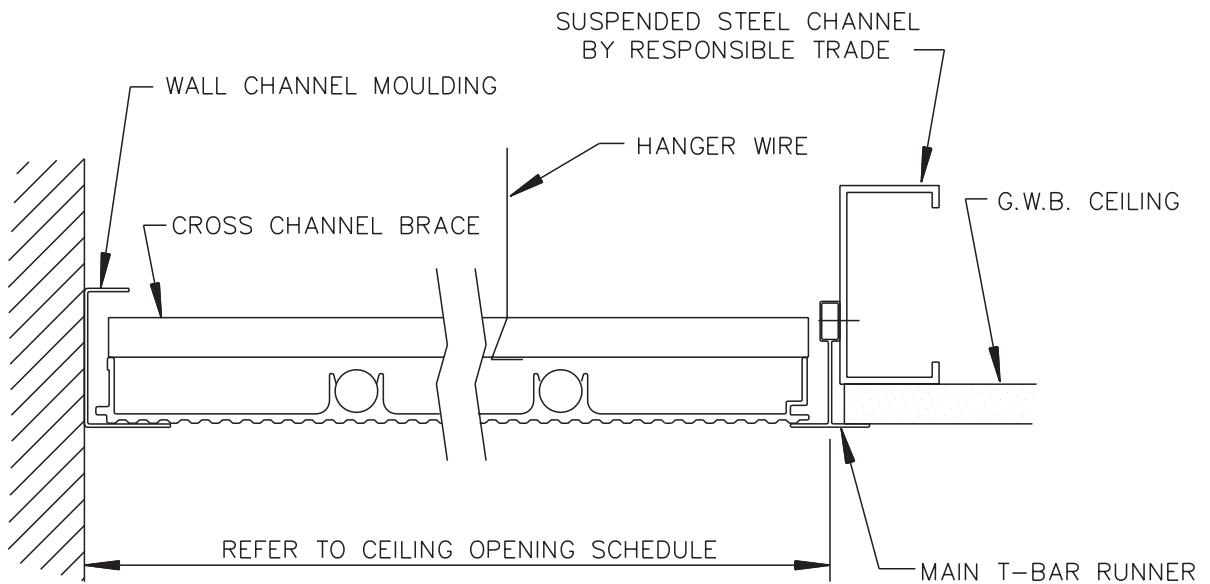
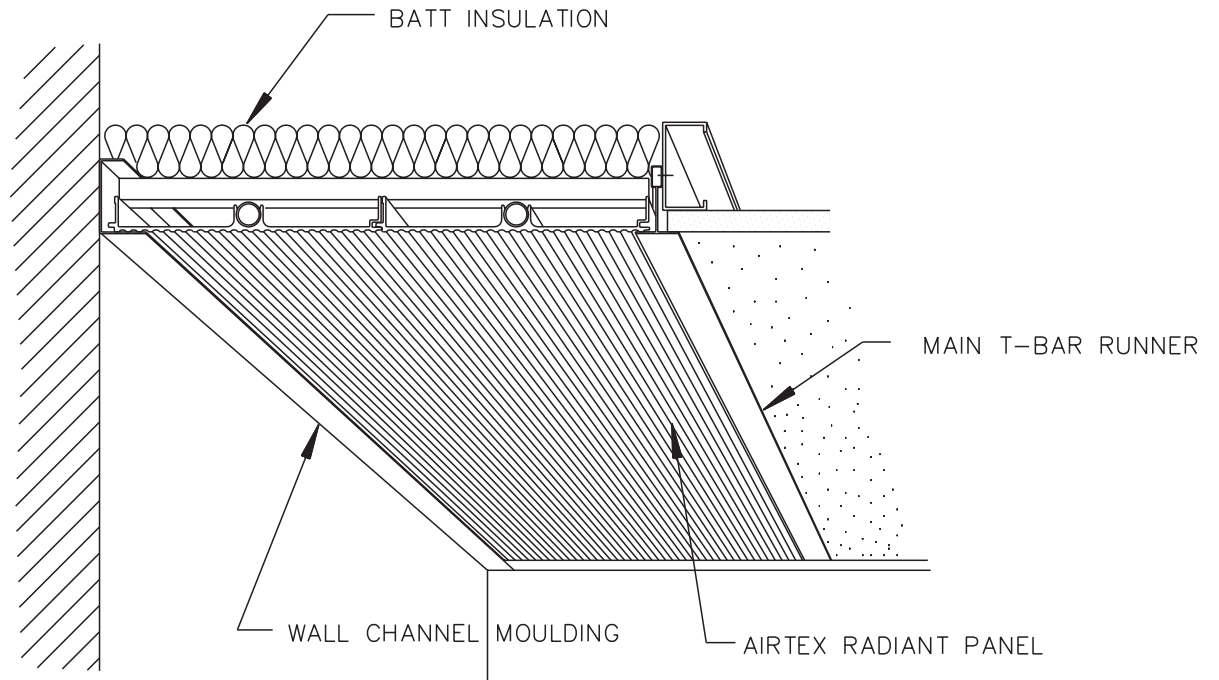
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REV MAR 31 04



NOTE: PANEL SUPPORT MOULDINGS BY DIVISION 9

LINEAR PANELS AT PERIMETER OF G.W.B. CEILING

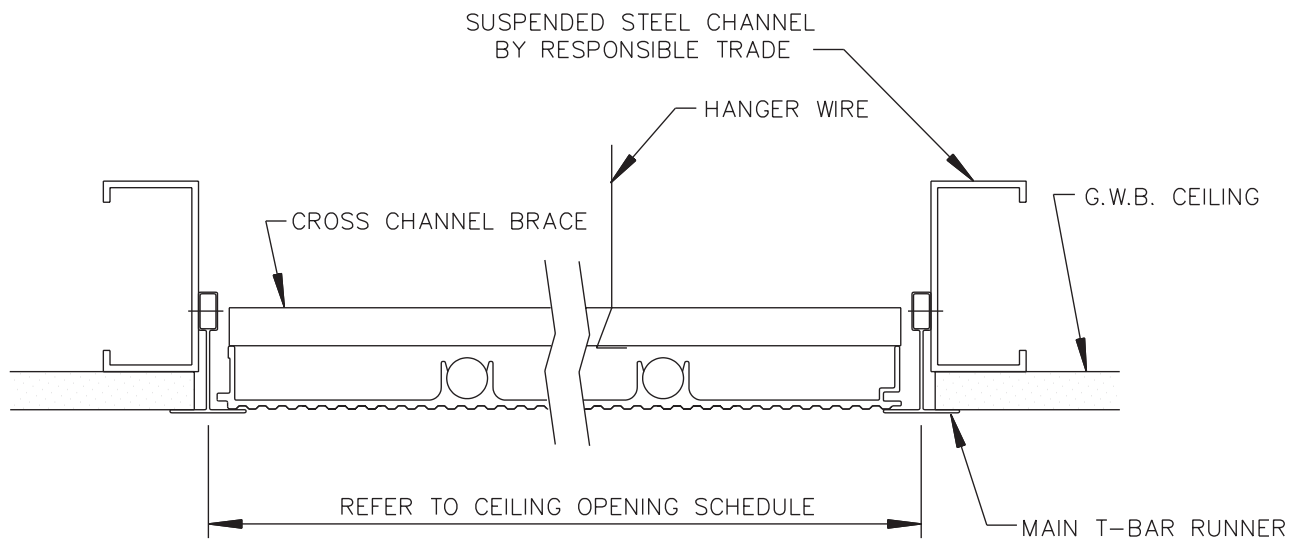
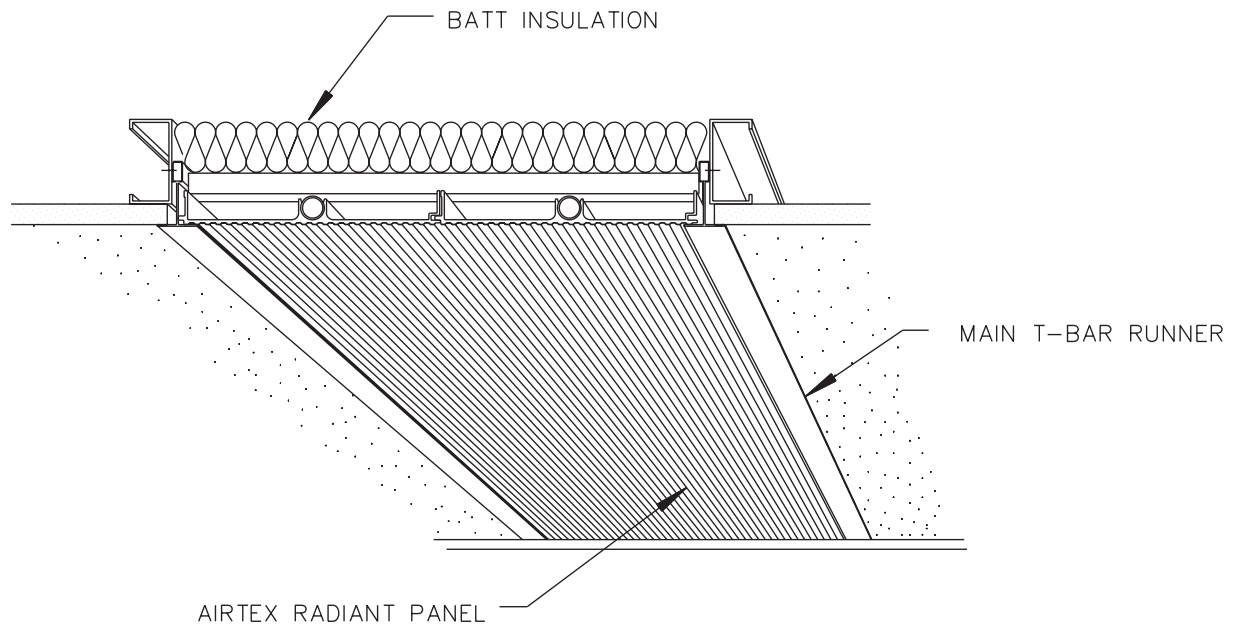
AIRTEX
RADIANT SYSTEMS®

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LA-6

REV MAR 31 04



NOTE: PANEL SUPPORT MOULDINGS BY DIVISION 9

LINEAR PANEL RECESSED FLUSH WITH G.W.B. CEILING

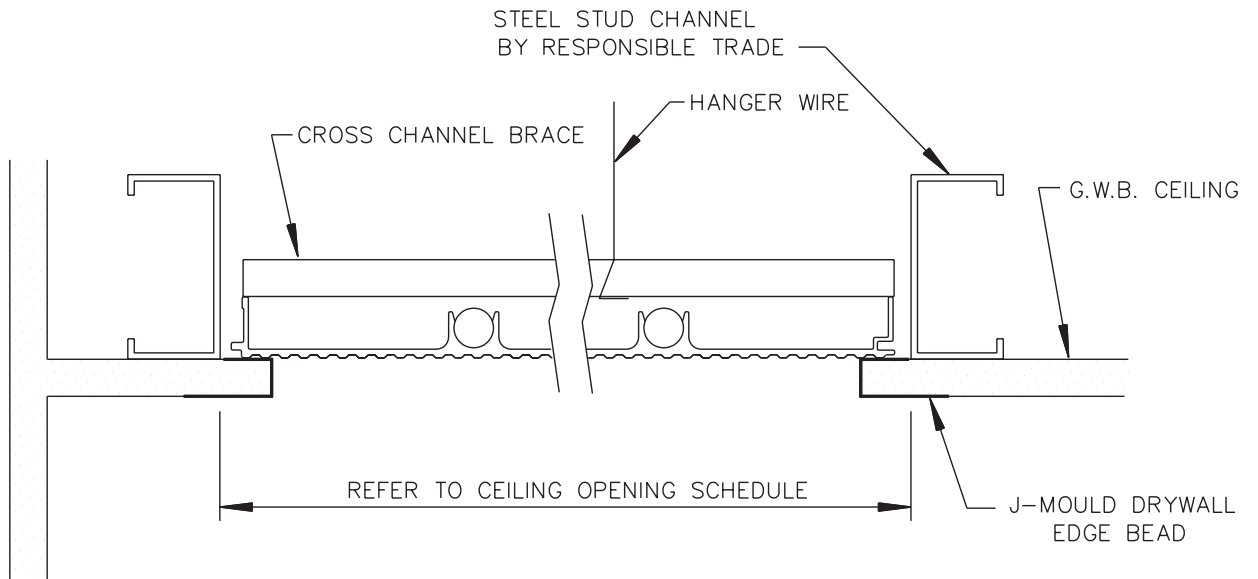
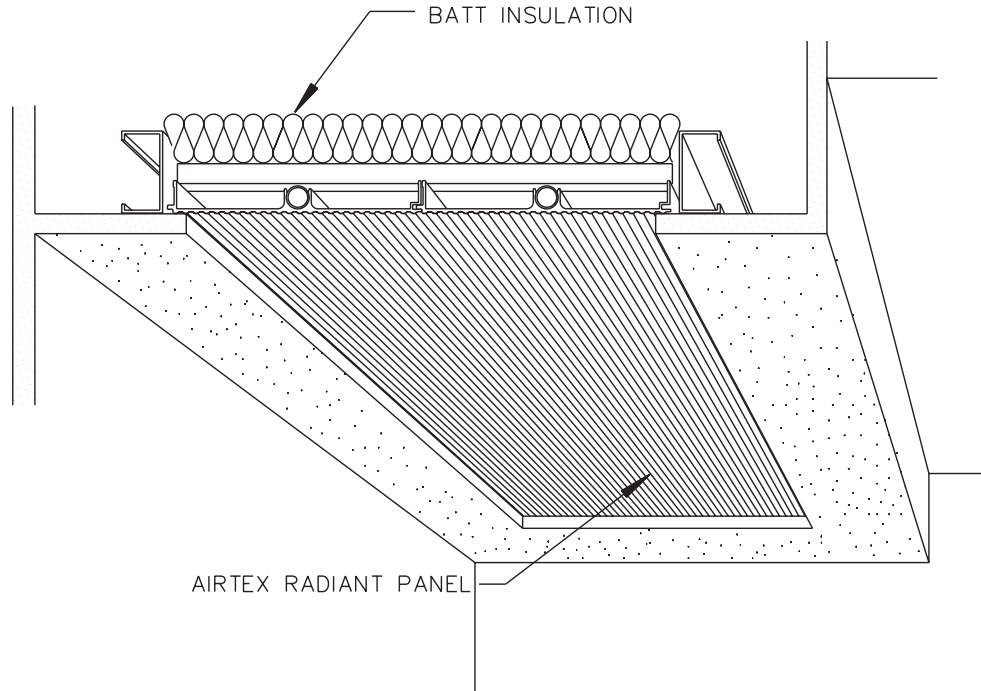
AIRTEX
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REV MAR 31 04



NOTE: PANEL SUPPORT MOULDINGS BY DIVISION 9

LINEAR PANEL RECESSED UP INTO G.W.B. CEILING

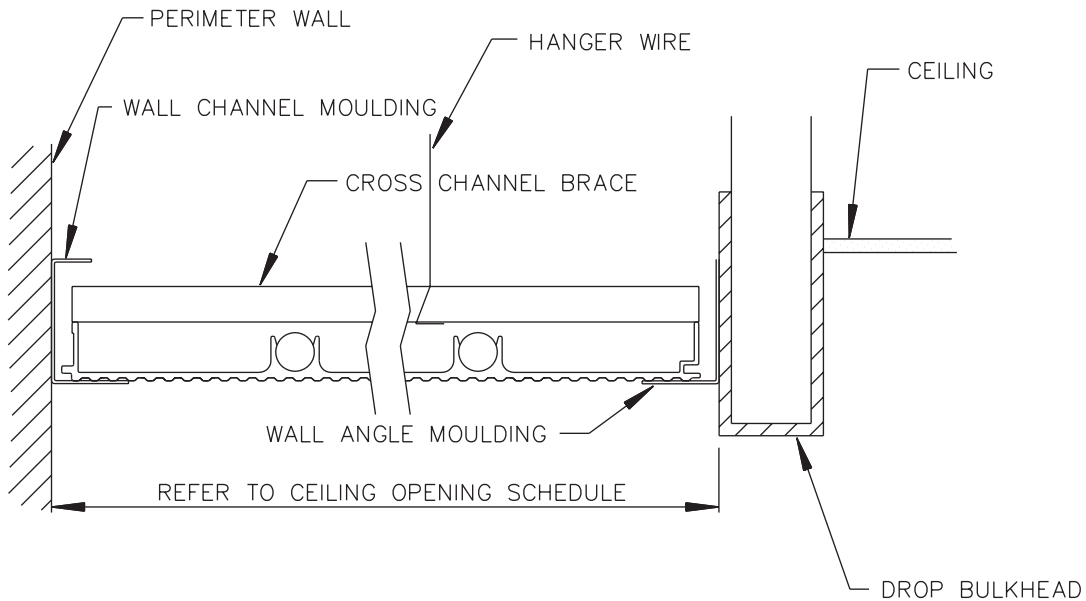
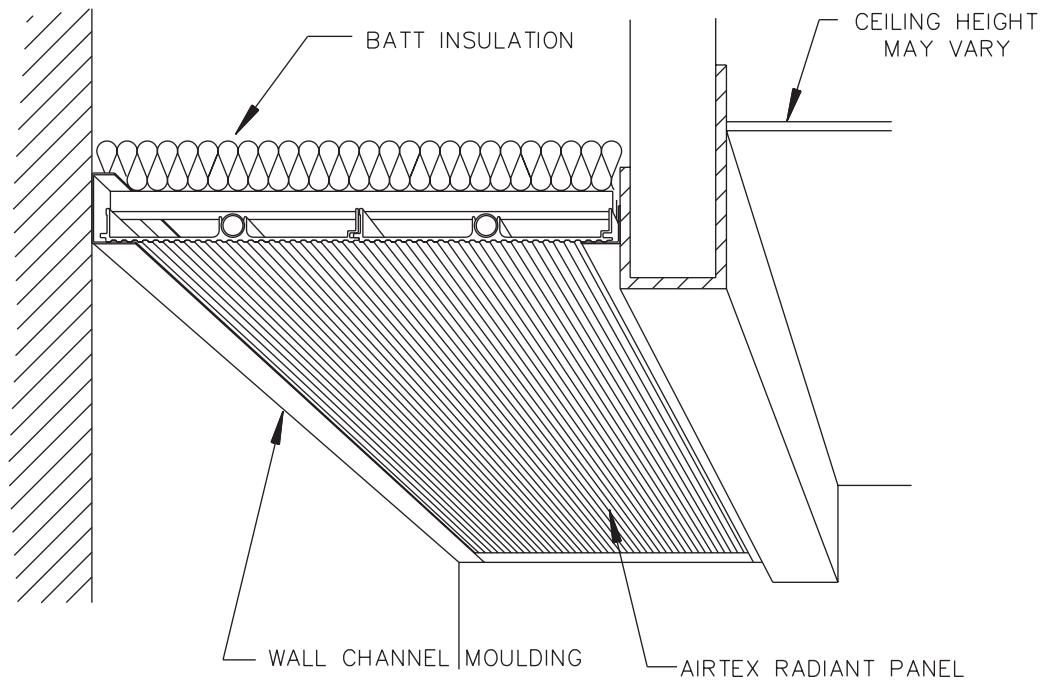
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REV MAR 31 04



NOTES: PANEL SUPPORT MouldINGS BY DIVISION 9
ACCESS MAY BE REQUIRED THROUGH BULKHEAD
FOR INTERCONNECTION OF PANELS

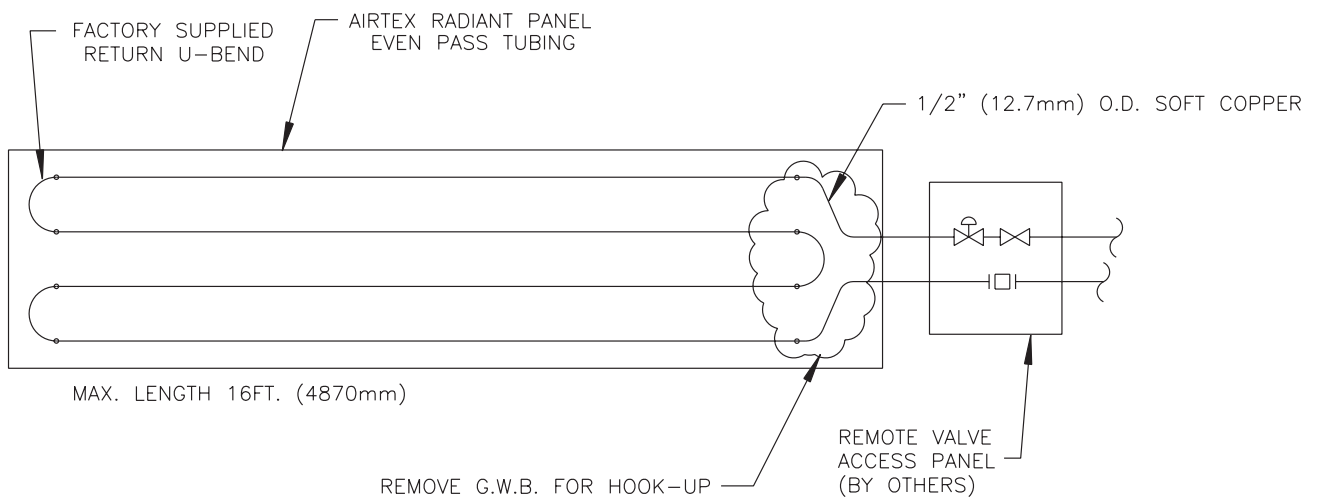
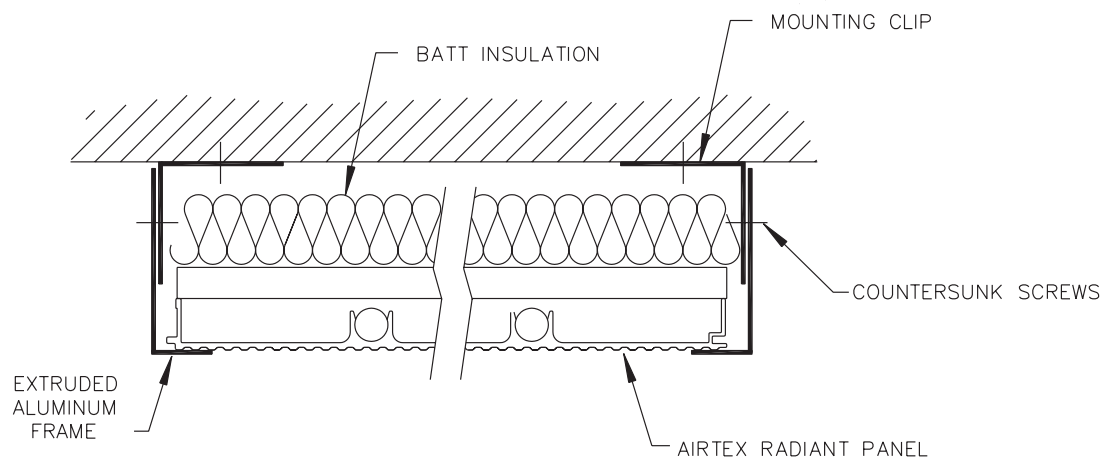
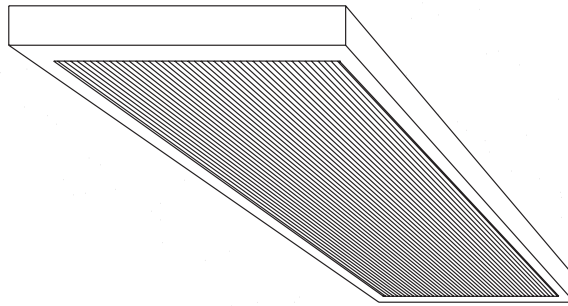
LINEAR PANELS BEHIND DROP BULKHEAD

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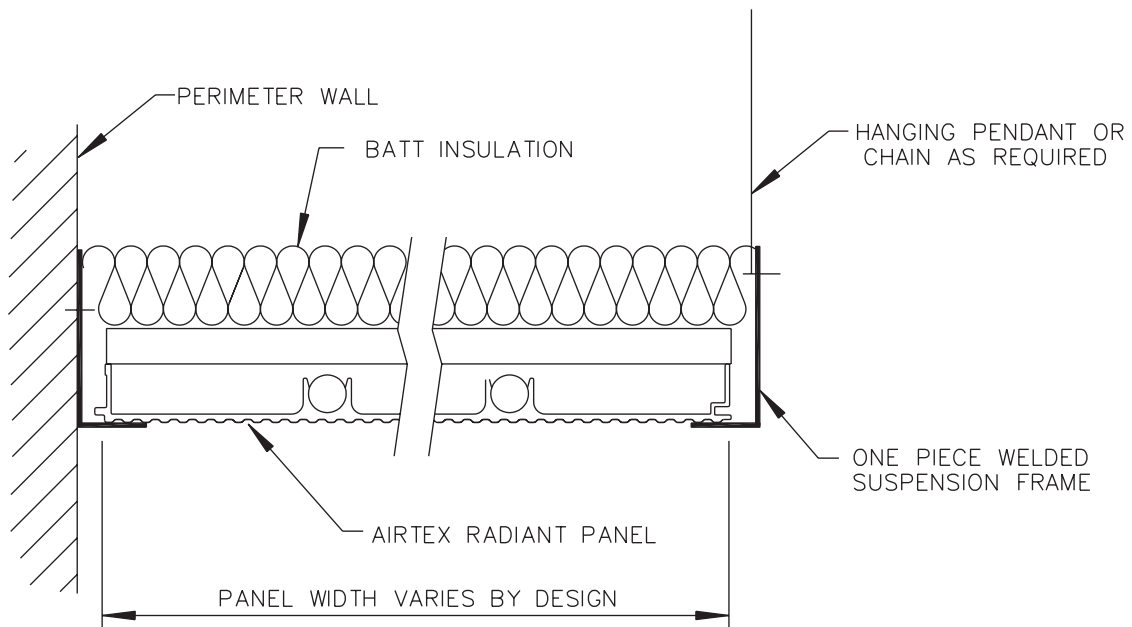
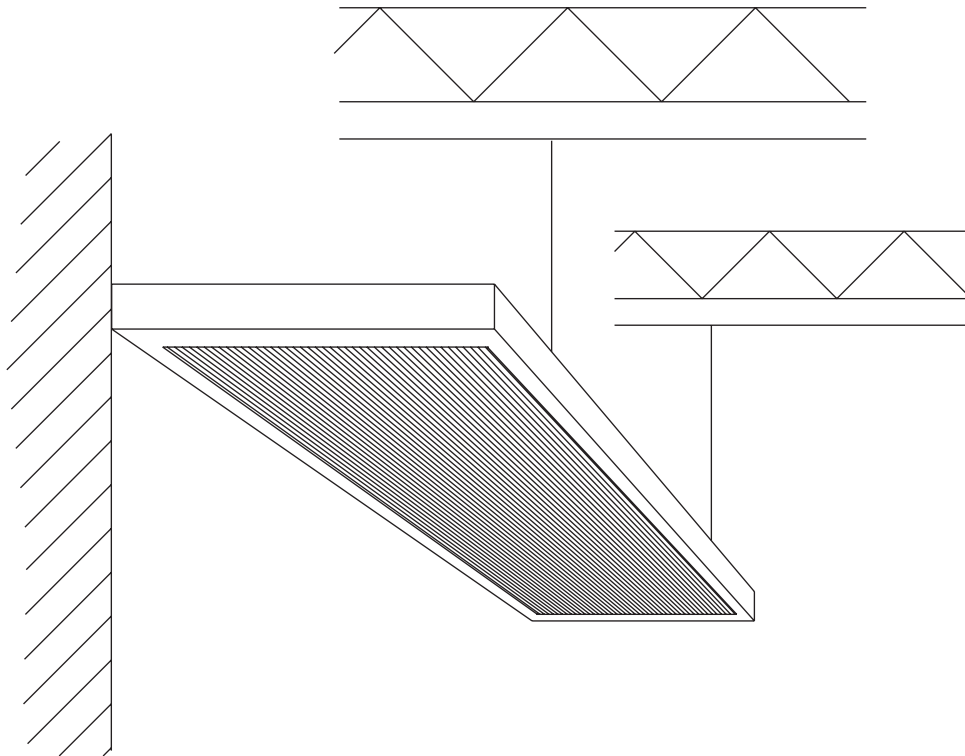
INDIVIDUAL SURFACE MOUNTED LINEAR RADIANT PANELS

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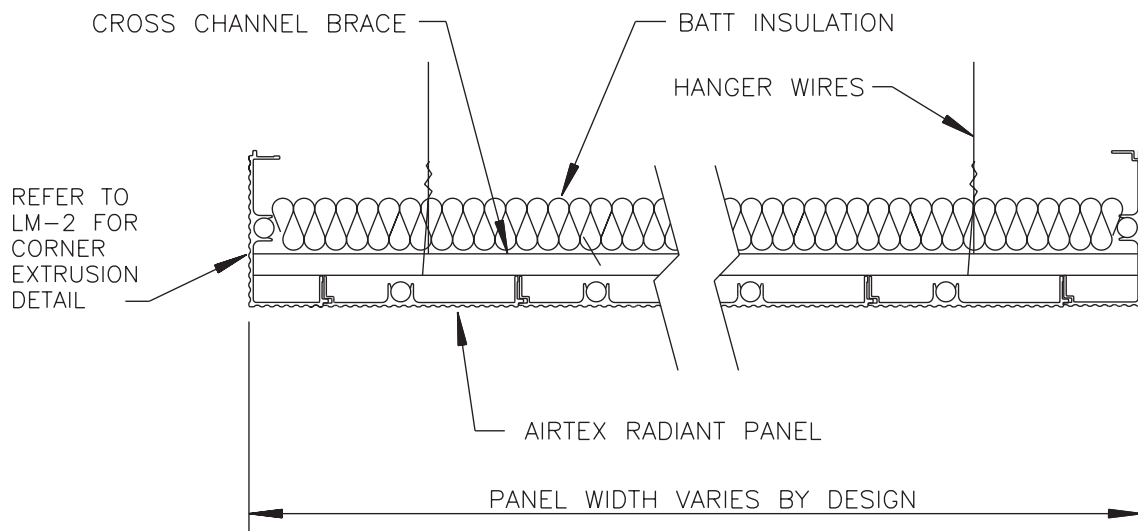
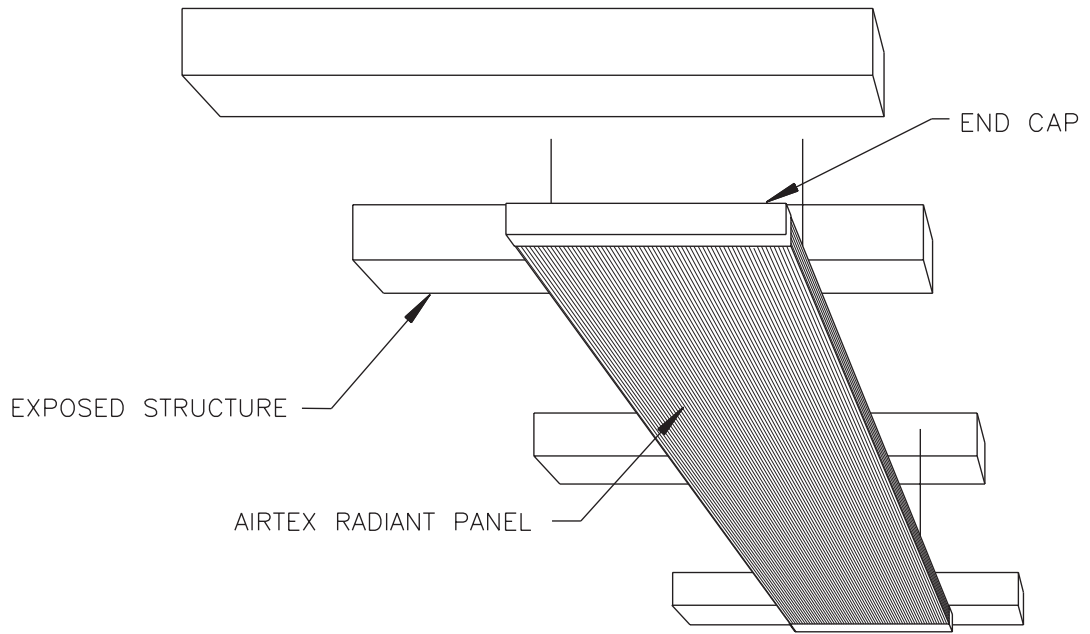
LINEAR PANELS IN SUSPENDED FRAMES

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RADIANT SYSTEMS®

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MAXIMUM SINGLE PANEL LENGTH IS 16 FT. (4870mm)

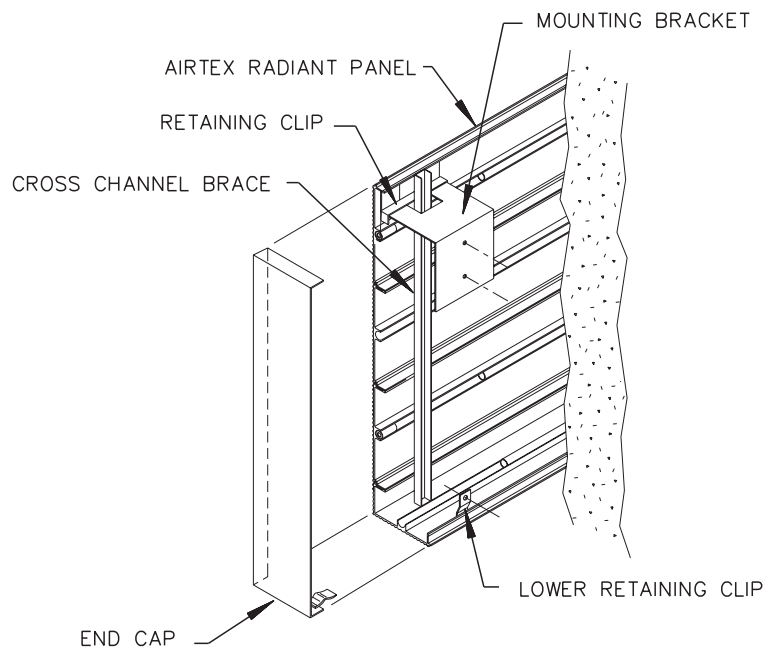
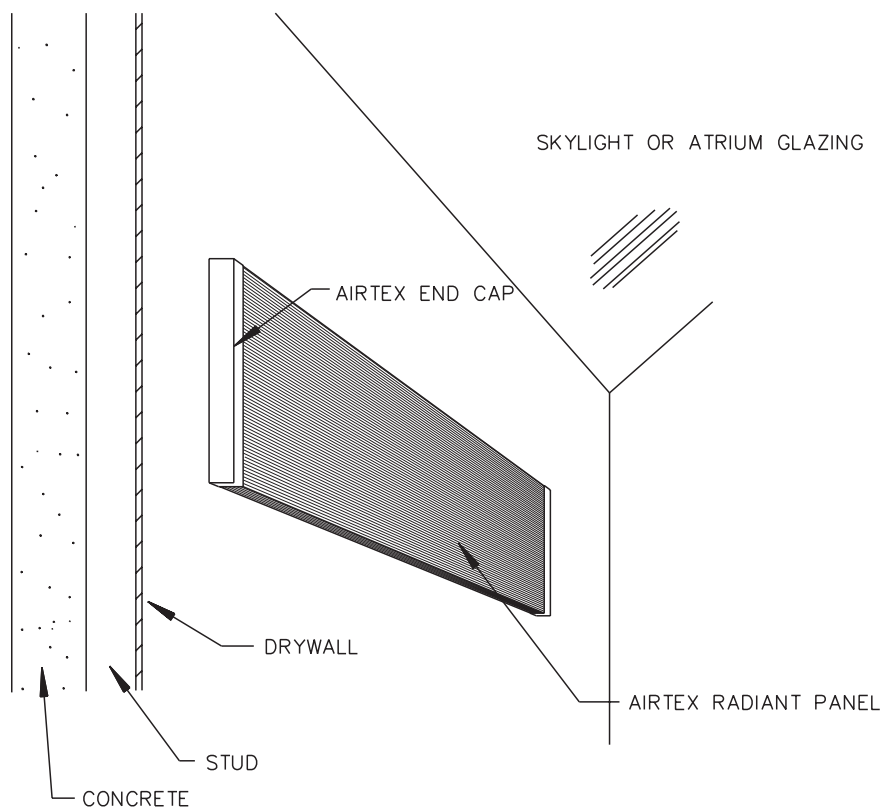
SUSPENDED PANEL UNDER EXPOSED STRUCTURE

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SURFACE WALL-MOUNTED PANEL

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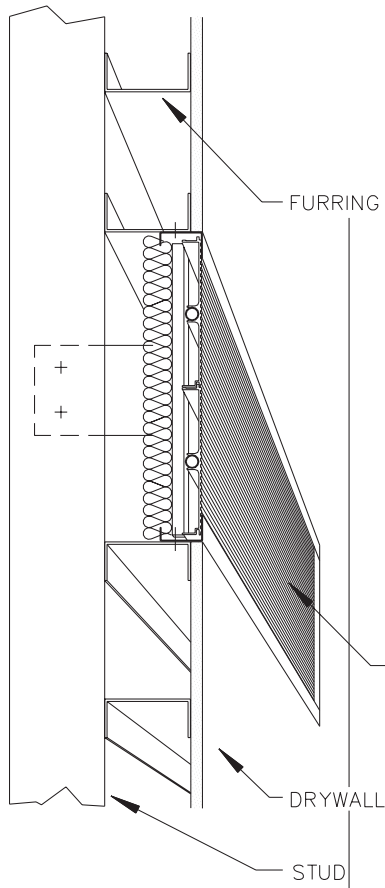
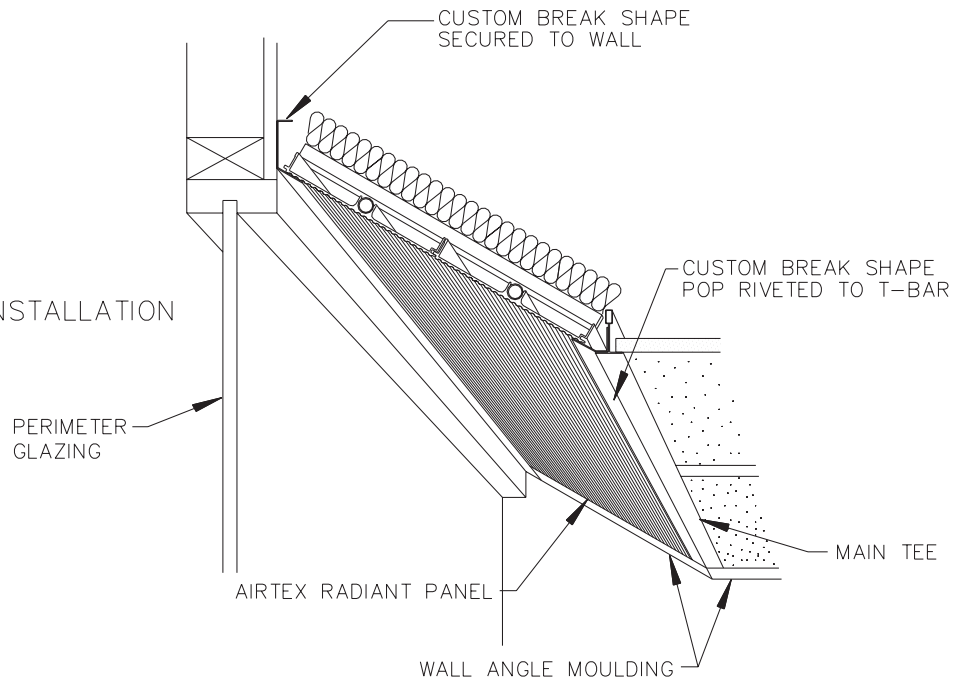
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REV MAR 31 04

SLOPED PANEL INSTALLATION



VERTICAL PANEL INSTALLATION

NOTE: ACCESS REQUIRED TO BACK OF PANEL FACILITATING HOOK-UP AND BRACING SUPPORT

SLOPED AND VERTICAL INSTALLATIONS

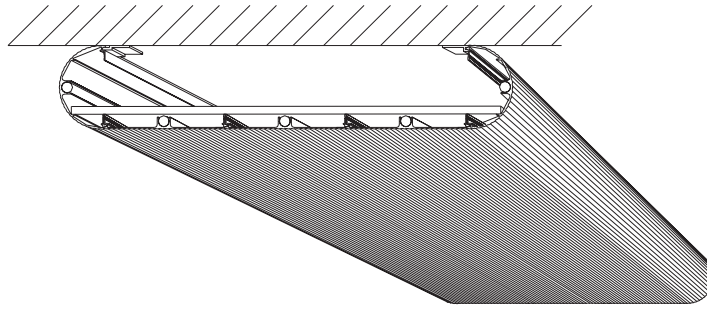
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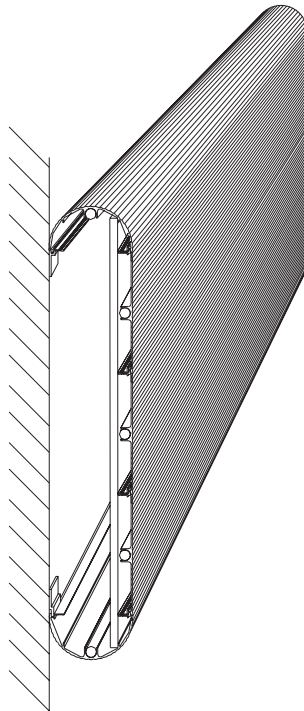
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REV MAR 31 04



SURFACE MOUNTED



WALL MOUNTED

AIRTEX BULLNOSE PANEL

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SECTION 15XXX
LINEAR RADIANT PANELS

**LINEAR HEF-2 PANEL
SPECIFICATIONS**

1.0 GENERAL

1.1 SCOPE

- .1 Linear Radiant Panels

1.2 QUALITY ASSURANCE

- .1 Panels shall be manufactured by a company regularly engaged in the manufacture of radiant panels having catalogue performance data and certified test data.

1.3 SUBMITTALS

- .1 Manufacturer shall submit complete scale shop drawings showing layouts and complete details of all areas where radiant panels are indicated. These drawings shall be co-ordinated with and interference shall be cleared with other trades.
- .2 Shop drawings shall indicate location of supply and return hook-ups in addition to interconnection details for each zone.

2.0 LINEAR RADIANT CEILING PANELS

- 2.1 .1 Contractor shall refer to architectural reflected ceiling plans and room finish schedule in addition to mechanical drawings to determine location, quantity and finish of radiant panels.
- .2 This panel specification is based on the AIRTEX HEF-2 Linear radiant ceiling panel design. Refer to the contract drawings for details and dimensions. Panels shall run continuously from wall to wall and specified widths are minimum allowable.
- .3 The Airtex HEF-2 radiant ceiling extrusions shall be as manufactured by **Engineered Air**, and shall consist of extruded aluminum with copper tubing of 0.504in. (12.8mm) I.D. mechanically attached to the aluminum face plate. The copper tube shall be held in place by an aluminum saddle, which extends more than half way around the diameter of the tube. A non-hardening heat conductive paste shall be placed between the copper tubing and the aluminum face plate. Panels shall weigh no more than 2.15 lb/ft² (10.5 kg/m²) when operating. The use of adhesive and/or clips to attach the copper tube to the extrusion will not be acceptable.
- .4 Panels shall be finished in the manufacturer's standard white colour (or as selected by the consultant).

3.0 EXECUTION

3.1 INSTALLATION

- .1 The Mechanical Contractor shall co-operate with other trades working in the ceiling to achieve a neat, well co-ordinated overall installation. Refer to Architectural and Mechanical Details for installation requirements.

LINEAR PANEL SPECIFICATIONS (cont.)

- .2 All interconnecting of radiant panels by the mechanical contractor shall consist of 0.5in. (12.8mm) O.D. soft copper tubing or AIRTEX accessories as recommended by **Engineered Air**, i.e. factory supplied 360 deg. inter-connecting loops and 180 deg. return U-bends. Supply first to panel tubing pass closest to perimeter wall. Multiple panels shall be circuited to ensure serpentine flow over complete length of zone. Individual serpentine panel coils connected in series is unacceptable for multiple panel zones.
- .3 All radiant panels shall run continuously from wall-to-wall and shall be field trimmed to length ensuring adequate expansion allowance while maintaining panel end coverage by architectural mouldings. Inactive filler panels will be permitted only where indicated on drawings.
- .4 Ceiling support mouldings for Radiant Panels to be supplied and installed by Division 9. Ensure ceiling openings and wall mouldings are installed as per radiant panel shop drawings.
- .5 All radiant panels shall be installed by personnel wearing clean white gloves, to avoid soiling of panel face. Hanger wires for safety and seismic restraint shall be installed at 4ft. (1200mm) o.c. or as recommended by the manufacturer.
- .6 All system piping shall be thoroughly cleaned, flushed, drained and refilled before radiant panels are connected into the system.
- .7 Each group or zone of coils shall be given a pressure test in accordance with procedures specified elsewhere.
- .8 No installation of finished radiant panels shall begin until all glazing has been completed and all exterior openings closed in.
- .9 All active panels shall be covered with a minimum of 1in. (25mm) thick batt insulation (refer to insulation specifications).

MECHANICAL EQUIPMENT SCHEDULE

LINEAR RADIANT PANELS

Description:

All radiant panels to be a single manufacture, Airtex Linear HEF-2.

Designation	(Consultant's Designation)
Manufacturer	Airtex by Engineered Air
Model	Linear HEF-2
Performance	(BTU/Lin. Ft.)(W/Lin. m.)
Minimum Width	(Specify)

Notes:

- .1 Output based on _____ °F (____ °C) supply, _____ °F(____ °C) return, with 70°F(21°C) ambient air temperature and 67°F(19.5°C) AUST with natural convection.
- .2 Panel lengths and widths to be obtained from drawings.

MODULAR SYSTEMS

PERFORMANCE AND PRESSURE DROP TABLES
SINGLE HPH MODULAR PANEL INSTALLATION
DETAILS FOR HPH MODULAR PANEL INSTALLATION
MULTIPLE HPH MODULAR PANEL LAYOUTS
MODULAR HPH PANELS IN EXPOSED T-BAR CEILING GRID
MODULAR HPH PANELS IN A REGULAR CEILING
RECESSED MOUNTING WITH ARF FRAME
SURFACE MOUNTING WITH ASF FRAME
MODULAR HPH PANEL SPECIFICATIONS

AIRTEX RADIANT CEILING PANELS

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CONTENTS

**PERIMETER HEATING PERFORMANCE
FOR MODULAR HPH 2448 PANEL**

	BTUH/ PANEL	WATTS/ PANEL	
120	600	176	48.9
125	690	202	51.7
130	780	229	54.4
135	870	255	57.2
140	960	281	60.0
145	1050	308	62.8
150	1140	334	65.6
155	1230	360	68.3
160	1320	387	71.1
165	1410	413	73.9
170	1500	440	76.7
175	1590	466	79.4
180	1680	492	82.2
185	1770	519	85.0
190	1860	545	87.8
195	1950	572	90.6
200	2040	598	93.3
205	2130	624	96.1
210	2220	651	98.9

MEAN WATER TEMPERATURE (DEG. F.)

MEAN WATER TEMPERATURE (DEG. C.)

- HEATING PERFORMANCE FOR 2ft. (610) x 2ft. (610) PANELS IS 1/2 OF THE 2ft. (610) x 4ft. (1219) OUTPUT AS SHOWN ABOVE.
- PERFORMANCE BASED ON 70°F. (21.1°C) AIR TEMPERATURE, 67°F (19.5°C) AUST AND NATURAL CONVECTION. 1in. OF 3/4 lb/ft³ (12 kg/m³). FIBREGLASS INSULATION WAS PLACED ON THE BACK SIDE OF THE PANELS.
- HEATING PERFORMANCE FOR PANELS AT INTERIOR LOCATIONS ARE SHOWN ON PAGE 3 OF MODULAR DESIGN MANUAL.

WATER PRESSURE DROP

		WPD/PANEL (FT. OF WATER)	INTER- CONNECTING TUBING	
USGM PER CIRCUIT		2' x 4' HPH	2' x 2' HPH	1/2" O.D. FT/100 FT.
	0.2	0.04	0.02	0.36
	0.3	0.09	0.05	0.76
	0.4	0.15	0.08	1.30
	0.5	0.23	0.12	1.96
	0.6	0.32	0.17	2.75
	0.7	0.42	0.22	3.62
	0.8	0.54	0.28	4.68
	0.9	0.67	0.35	5.81
	1.0	0.82	0.42	7.07
	1.1	0.97	0.51	8.43
	1.2	1.14	0.59	9.90
	1.3	1.33	0.69	11.48
	1.4	1.52	0.79	13.17
	1.5	1.73	0.90	14.96
	1.6	1.95	1.01	16.86
	1.7	2.18	1.13	18.86
	1.8	2.42	1.26	20.96
	1.9	2.68	1.39	23.16
	2.0	2.94	1.53	25.47
	2.1	3.22	1.67	27.88
	2.2	3.51	1.82	30.38
	2.3	3.81	1.98	32.98
	2.4	4.12	2.14	35.69
	2.5	4.44	2.31	38.49

USGPM PER CIRCUIT

- BOTH PANEL AND CONNECTING TUBING PRESSURE DROPS MUST BE INCLUDED IN THE CIRCUIT PRESSURE DROP CALCULATION.
- TO ENSURE AIR REMOVAL FROM SYSTEM AT START UP, DESIGN FLOW RATES BELOW 0.5 USGPM ARE NOT RECOMMENDED.
- METRIC UNITS ARE SHOWN ON PAGE 3 OF MODULAR DESIGN MANUAL.

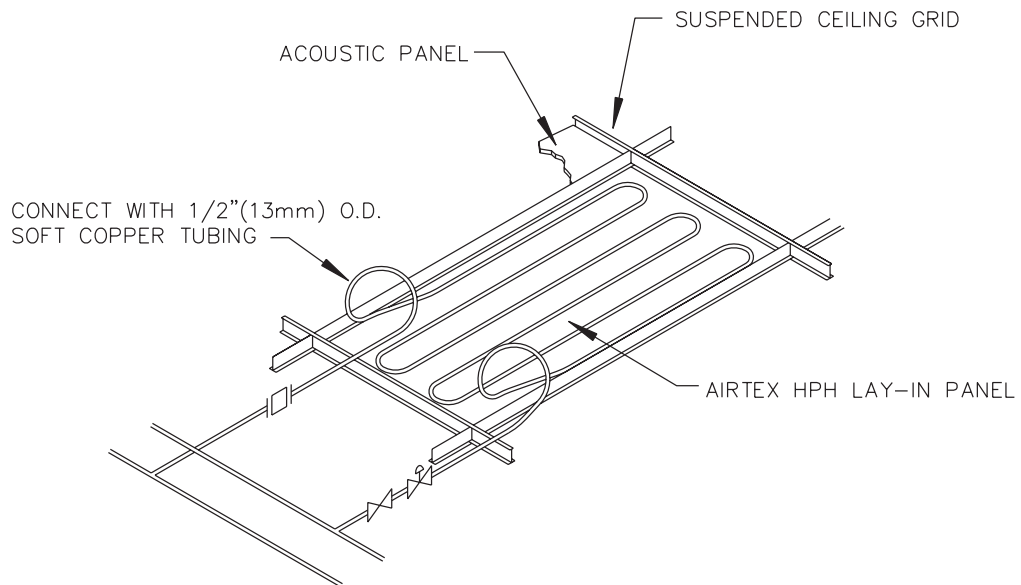
PERFORMANCE AND PRESSURE DROP TABLES

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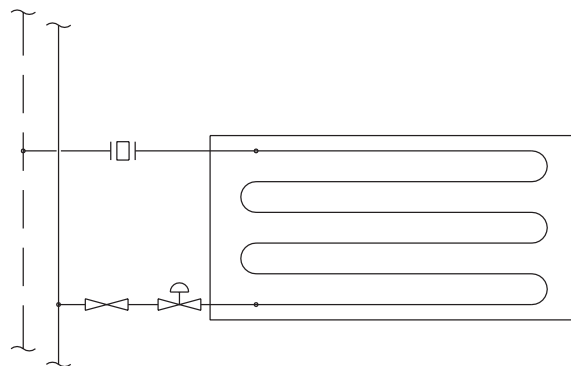
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ME-1



AIRTEX HPH MODULAR RADIANT PANEL
IN A SUSPENDED CEILING

A



TYPICAL SINGLE PANEL HOOK-UP

B

INDIVIDUAL MODULAR PANELS MAY BE
RECESSED INTO OR SURFACE MOUNTED
ONTO DRYWALL CEILINGS. REFER TO
ARCHITECTURAL DETAILS.

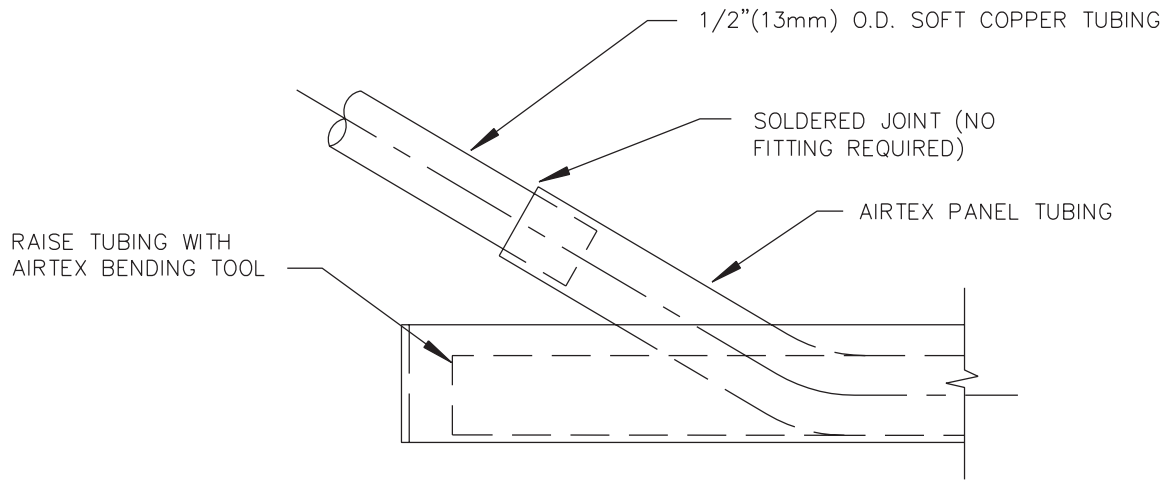
SINGLE HPH MODULAR PANEL INSTALLATION

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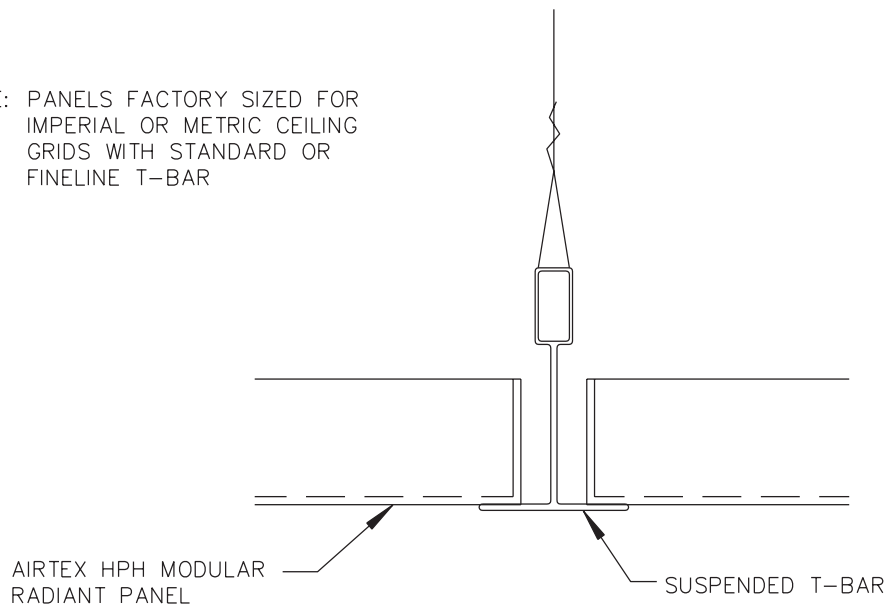
MM-1



TYPICAL PANEL CONNECTION



NOTE: PANELS FACTORY SIZED FOR IMPERIAL OR METRIC CEILING GRIDS WITH STANDARD OR FINELINE T-BAR



TYPICAL PANEL EXPANSION GAP



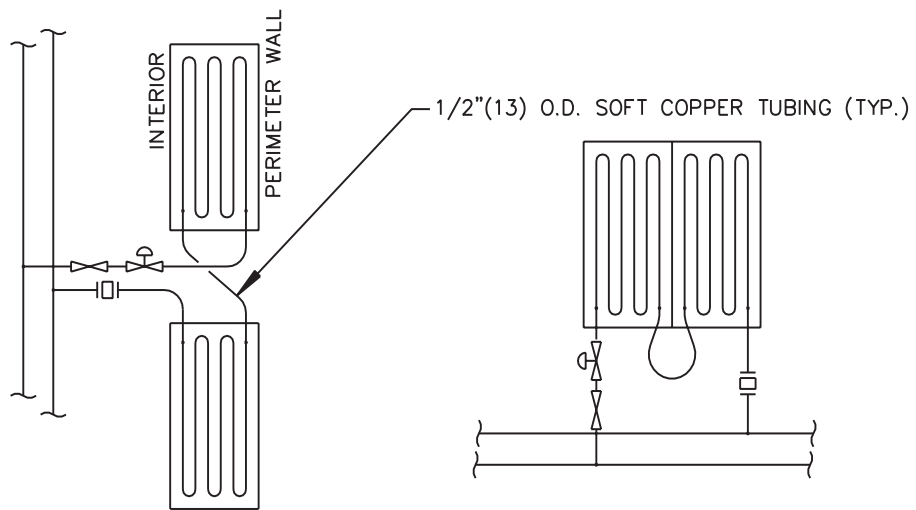
DETAILS FOR HPH MODULAR PANEL INSTALLATION

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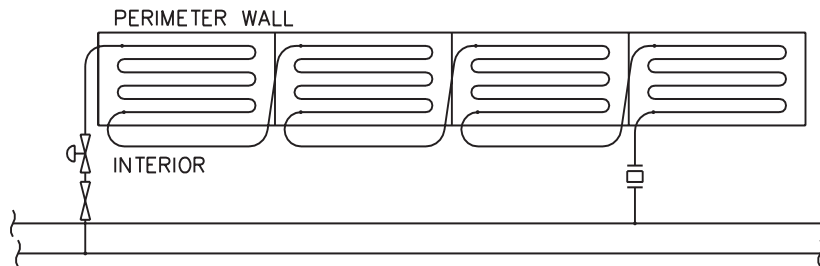
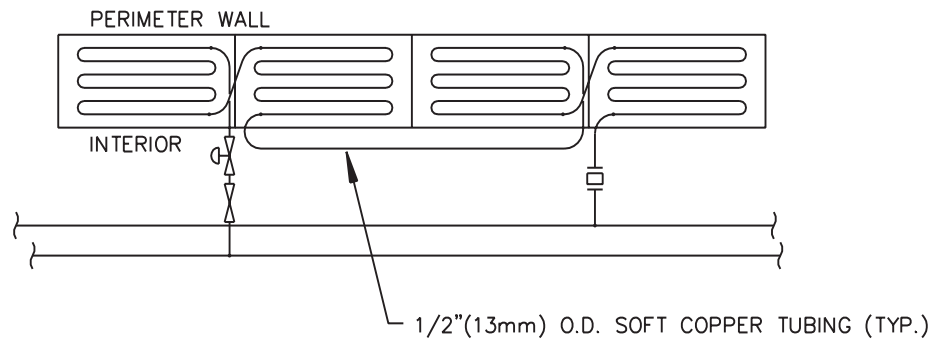
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MM-2



TYPICAL TWO PANEL HOOK-UPS

A



TYPICAL MULTIPLE PANEL HOOK-UPS

B

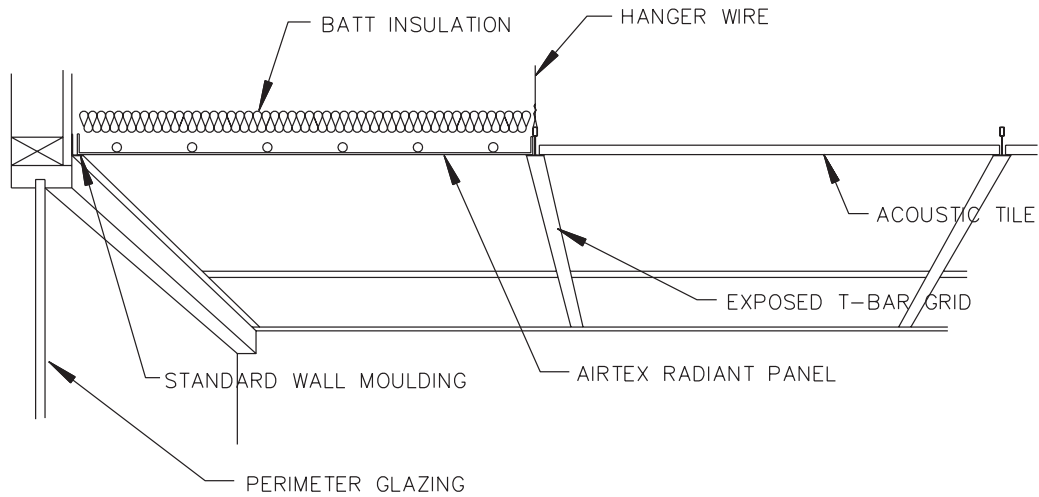
MULTIPLE HPH MODULAR PANEL LAYOUTS

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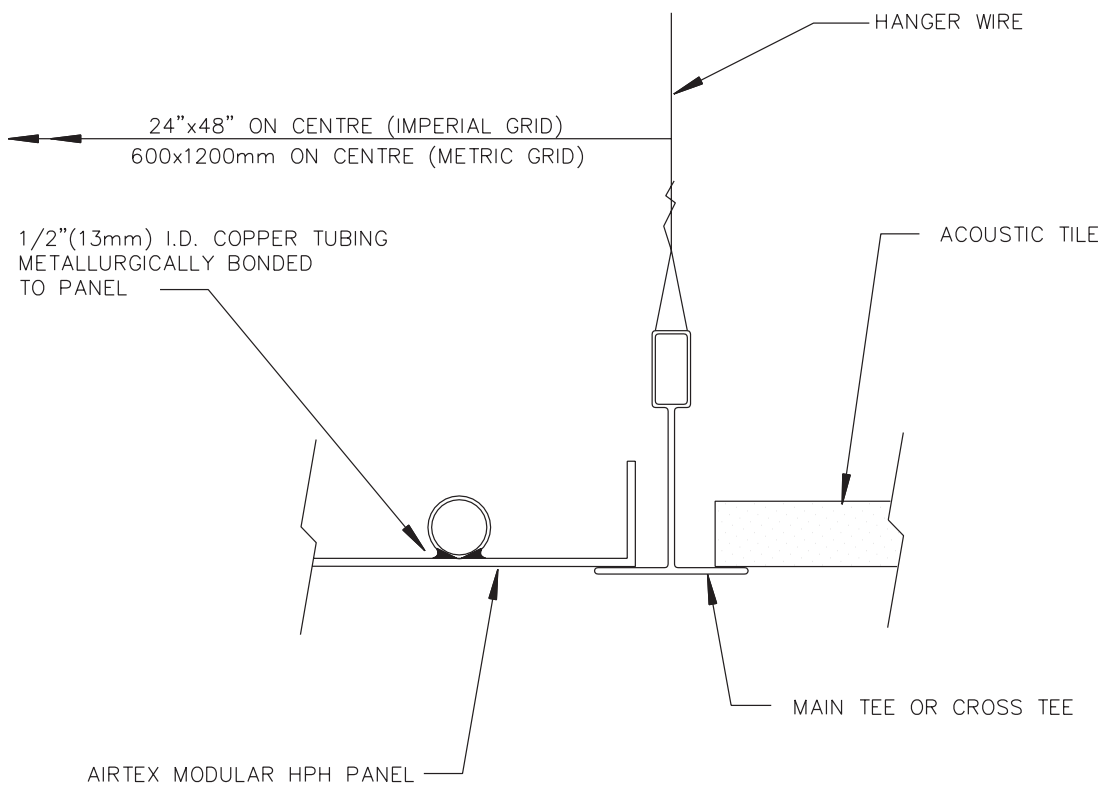
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NOTE: AIRTEX MODULAR PANELS CAN BE SILK-SCREEN FINISHED TO MATCH ADJACENT ACOUSTIC TILES



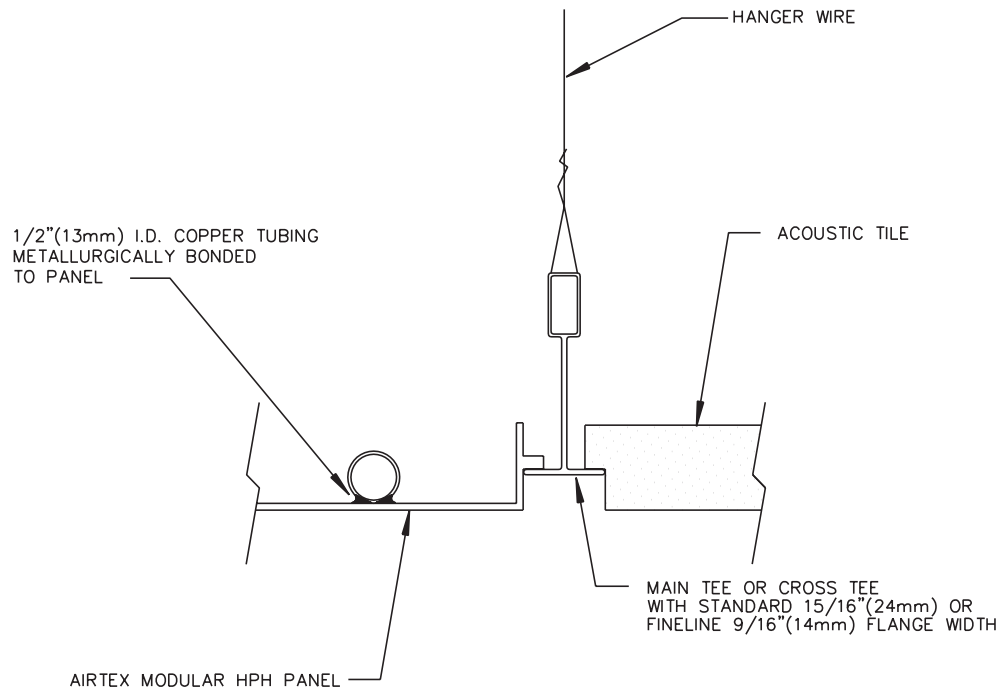
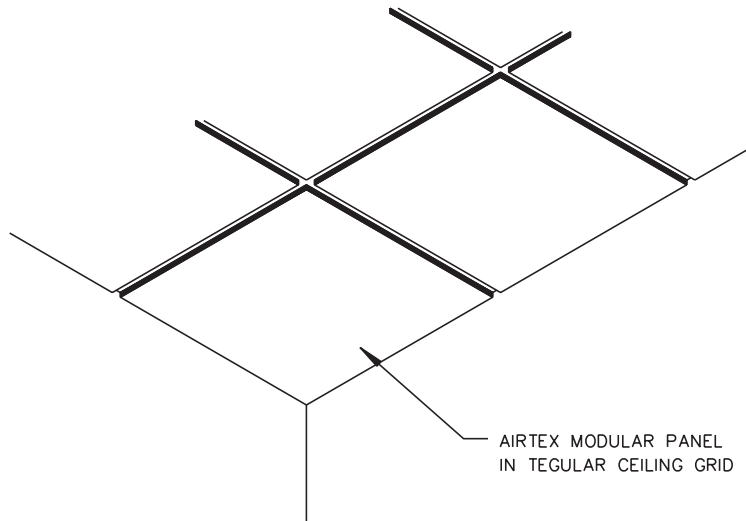
MODULAR HPH PANELS IN EXPOSED T-BAR CEILING GRID

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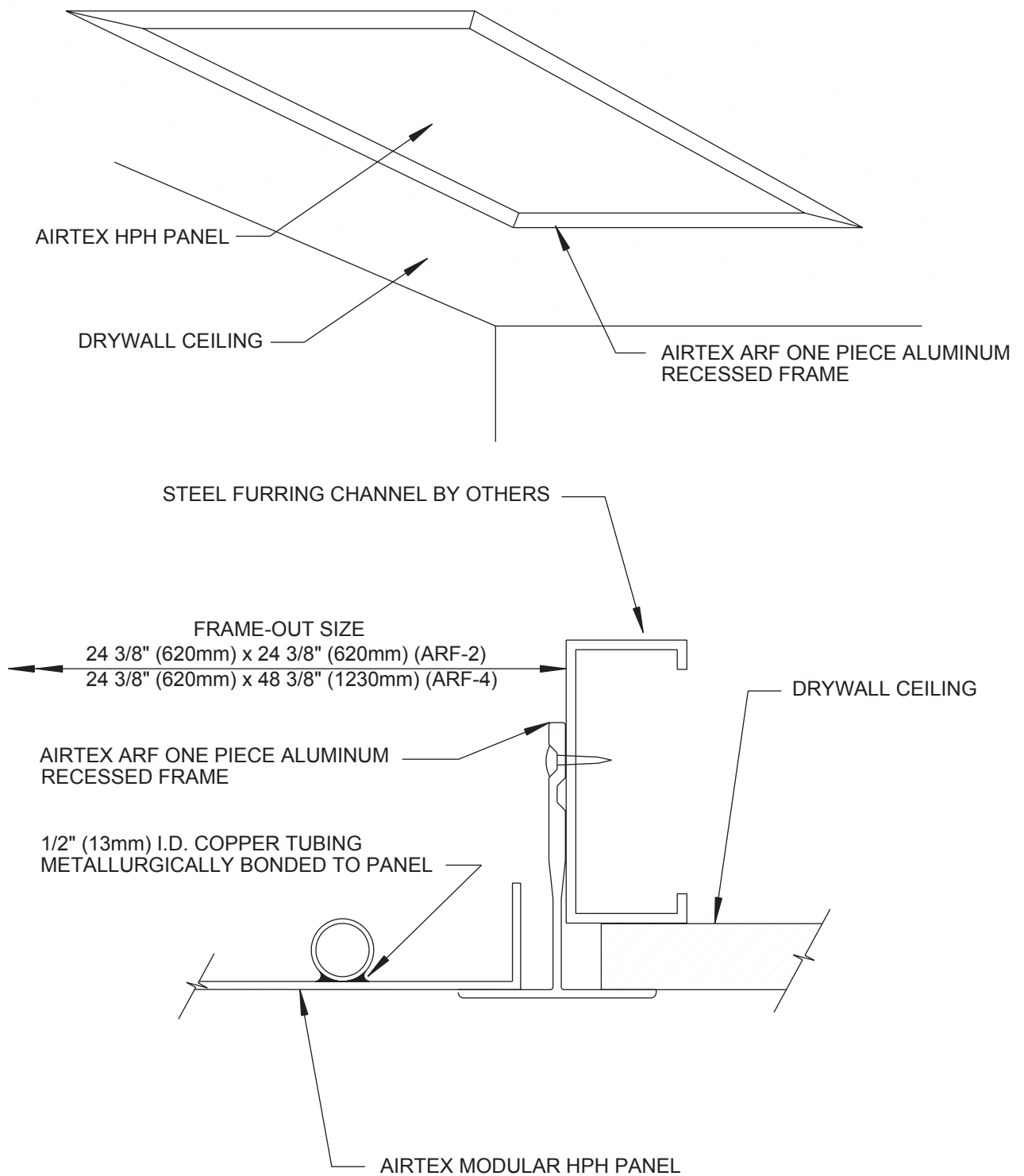
MODULAR HPH PANELS IN A REGULAR CEILING

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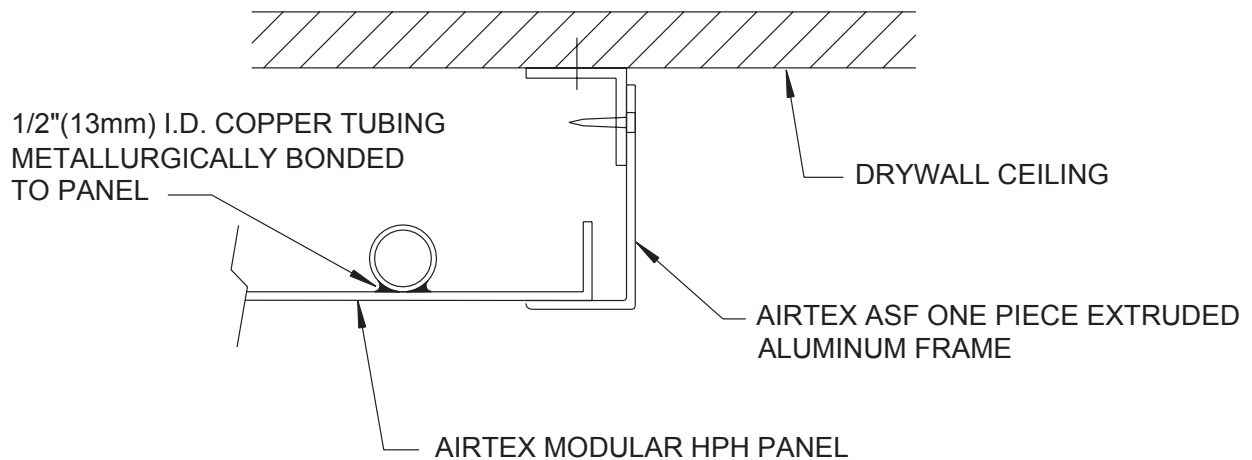
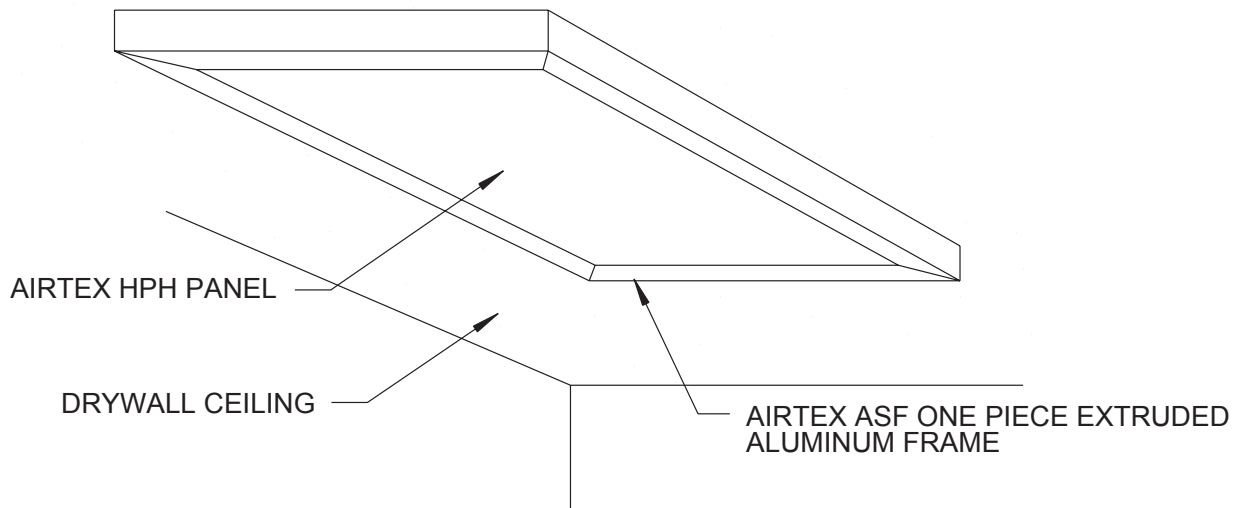
RECESSED MOUNTING WITH ARF FRAME

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SURFACE MOUNTING WITH ASF FRAME

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MODULAR HPH PANEL SPECIFICATIONS

AIRTEX MODULAR RADIANT CEILING PANELS

The contractor for this section of the specifications shall furnish all labour, materials, tools, equipment, and services necessary to deliver and install a complete radiant ceiling system.

SCOPE OF WORK

Provide a complete AIRTEX modular radiant ceiling system as shown on the architectural and mechanical drawings in all areas, as scheduled and as herein specified. The radiant panels shall be installed as per the manufacturer's recommendations, complete and satisfactory to the consultant.

MODULAR RADIANT CEILING PANELS

Radiant panels shall be AIRTEX Modular HPH radiant panels, as manufactured by Engineered Air, consisting of 0.040in. (1mm) aluminum face plate, 0.504in. (12.7mm) I.D. copper six-pass serpentine coil, metallurgically bonded to face plate. The panels shall weigh no more than 1.5 lbs/ft² (7.3 kg/m²) when operating.

Option - All panels in T-bar ceiling shall be silkscreen finished to match adjacent acoustic tile.

Where panels are mounted into or onto gypsum board ceilings, the panels shall be supplied with a one piece AIRTEX extruded aluminum frame. Model ARF for recessed installation or ASF for surface mounting.

HEATING PERFORMANCE

The AIRTEX Modular HPH panels shall produce a minimum heating output of _____ Btuh/ft² (____ W/m²) at _____ °F (____ °C) mean water temperature (MWT), in a room with 70°F (21°C) air temperature with natural convection.

INSTALLATION & TESTING

1. The mechanical contractor shall cooperate with other trades working in the ceiling to achieve a neat, well coordinated overall installation.
2. Where the AIRTEX Modular HPH panels are to lay in a suspended T-bar ceiling grid, coordinate metric or imperial sizing, standard or fineline grid flange.
3. Run-out piping shall terminate at the supply and return points, as detailed on the drawings, or within 2 ft. (600mm) of panel tube connections.
4. No installation of finished ceiling radiant panels shall begin until all glazing has been completed and all exterior openings closed in.
5. All radiant panels shall be installed by personnel wearing clean white gloves to avoid soiling the panel face.
6. All interconnecting of radiant panels by the mechanical contractor shall consist of 1/2in. (12.7mm) O.D. soft copper tubing.
7. All system piping shall be thoroughly cleaned, flushed, drained and refilled before radiant panels are connected into the system.
8. The mechanical contractor shall give each zone of interconnected radiant panels a pressure test, in accordance with procedures specified elsewhere.
9. All active panels shall be covered with a minimum of 1in. (25mm) thick insulation (refer to insulation specification).

COOLING SYSTEMS

COOLING DESIGN CONSIDERATIONS

COOLING PERFORMANCE CURVES

RADIANT PANEL INTERIOR HEATING PERFORMANCE

RADIANT FLOW CONTROL - 4 PIPE SYSTEM

4 PIPE SYSTEM WITH LINEAR AND MODULAR PANELS

4 PIPE SYSTEM FOR LINEAR PANELS

AIRTEX RADIANT CEILING PANELS

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COOLING DESIGN CONSIDERATIONS

Radiant cooling obeys the same physical laws of radiant energy transfer as radiant heating. The difference however, is that when a space is radiantly cooled, the ceiling is absorbing radiant energy from surroundings and occupants that are warmer than the ceiling. People under a cooled radiant ceiling radiate energy to the ceiling, losing heat in a more comfortable manner than blowing cold air across them.

A radiant comfort system is an air-water system. Water circulated through the radiant panels can provide all the heating and most of the sensible cooling. Air supplied to the space provides ventilation and dehumidification.

Selection of the design dry bulb and relative humidity should be based on good practice for the type of structure being designed. Maximum economy and comfort will result if summer design temperatures are somewhat higher and the relative humidities are slightly lower than those used on typical convective cooling systems. Cool ceiling panels lower the average surface temperature of the conditioned space and higher dry bulb temperatures are acceptable without decreasing occupant comfort.

The temperature of the chilled water circulating through the radiant panels must be above the room dew point temperature to prevent condensation. The lower the temperature of the water supplied to the radiant panels the more work the panels will do, consequently the design relative humidity and dew point should be specified as low as economically feasible. The use of radiant cooling panels results in a much lower air quantity as compared to all air systems. The latent cooling capacity should be checked to insure that air system has sufficient moisture removal capacity to maintain the design dew point.

The normal design would specify the supply water temperature 1°F (0.6°C) higher than the design dew point with a Water Temperature Rise (WTR) of 4 or 5°F (2 or 3°C) as the water passes through the radiant panel system. A good balance of these two factors will usually result in a temperature difference of about 20°F (11.1°C) between the design room dry bulb temperature and the mean water temperature.

The panel performance depends on the room air and surface temperature, type and intensity of lighting, amount of glass and shading devices used. The combined effect of these parameters has been summarized in the Performance Tables. Radiant cooling panels located in perimeter rooms will absorb heat from the same sources found in interior rooms but in addition will absorb additional energy because of the solar effect on the outside wall.

The cooling values in the performance table are for normal perimeter rooms with heat gains from solar, people, electrical loads and transmission. The performance values shown in columns B through F of the table are for typical perimeter rooms and should be used only for the first 10ft. (3048mm) of ceiling in from the outside wall. For interior rooms and panel areas more than 10ft. (3048mm) from the outside wall use the values in column A. The data in this manual may be used for rooms with ceiling heights from 8 to 12ft. (2438 to 3658mm) although any ceiling height can be handled using radiant panels. For designs involving ceiling heights in excess of 12ft. (3658mm), or any other assistance, please contact your Airtex representative.

BTUH/FT² (W/m²)
SELECT COLUMN FROM
CONDITIONS BELOW

	A	B	C	D	E	F
10 (5.6)	17 (53.6)	21 (66.3)	28 (88.3)	35 (110.4)	38 (119.9)	40 (126.2)
11 (6.2)	19 (60.0)	23 (72.6)	30 (94.7)	37 (116.7)	40 (126.2)	42 (132.5)
12 (6.7)	21 (66.3)	25 (78.9)	31 (97.8)	38 (119.9)	41 (129.4)	43 (135.7)
13 (7.3)	22 (69.4)	27 (85.2)	33 (104.1)	40 (126.2)	43 (135.7)	45 (142.0)
14 (7.8)	24 (75.7)	28 (88.3)	35 (110.4)	42 (132.5)	45 (142.0)	47 (148.3)
15 (8.4)	26 (82.0)	30 (94.7)	38 (119.9)	44 (138.8)	47 (148.3)	48 (151.4)
16 (9.0)	28 (88.3)	32 (101.0)	39 (123.1)	45 (142.0)	48 (151.4)	50 (157.8)
17 (9.5)	30 (94.7)	34 (107.3)	41 (129.4)	47 (148.3)	50 (157.8)	52 (164.1)
18 (10.5)	31 (97.8)	36 (113.6)	43 (135.7)	49 (154.6)	52 (164.1)	53 (167.2)
19 (10.6)	33 (104.1)	38 (119.9)	45 (142.0)	50 (157.8)	54 (170.4)	55 (173.5)
20 (11.2)	35 (110.4)	40 (126.2)	46 (145.1)	52 (164.1)	55 (173.5)	57 (179.8)
21 (11.8)	37 (116.7)	42 (132.5)	48 (151.4)	54 (170.4)	57 (179.8)	58 (183.0)
22 (12.3)	39 (123.1)	43 (135.7)	50 (157.8)	56 (176.7)	59 (186.2)	60 (189.3)
23 (12.9)	40 (126.2)	45 (142.0)	52 (164.1)	58 (183.0)	61 (192.5)	62 (195.6)
24 (13.4)	42 (132.5)	47 (148.3)	53 (167.2)	59 (186.2)	62 (195.6)	63 (198.8)
25 (14.0)	44 (138.8)	49 (154.6)	55 (173.5)	61 (192.5)	64 (201.9)	65 (205.1)
26 (14.6)	46 (145.1)	51 (160.9)	56 (176.7)	63 (198.8)	66 (208.2)	67 (211.4)
27 (15.1)	48 (151.4)	53 (167.2)	58 (183.0)	64 (201.9)	67 (211.4)	68 (214.5)
28 (15.7)	49 (154.6)	55 (173.5)	60 (189.3)	65 (205.1)	69 (217.7)	72 (227.2)

ROOM AIR TEMPERATURE MINUS MWT (DEG. F/DEG. C)

CONDITION

- A. INTERIOR ROOM
- B. NO GLASS EXTERIOR WALL IN
SUN OR FULLY SHADED GLASS
WALL
- C. 25% CLEAR GLASS EXTERIOR
WALL IN SUN
- D. 50% CLEAR GLASS EXTERIOR
WALL IN SUN
- E. 75% CLEAR GLASS EXTERIOR
WALL IN SUN
- F. 100% CLEAR GLASS EXTERIOR
WALL IN SUN

COOLING PERFORMANCE CURVES

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MEAN WATER TEMPERATURE °F (°C)	120 (48.9)	70 (220.9)	BTUH/FT ² (W/m ²) OF PANEL
	125 (51.7)	78 (246.1)	
	130 (54.4)	84 (265.0)	
	135 (57.2)	91 (287.1)	
	140 (60.0)	99 (312.4)	
	145 (62.8)	106 (334.4)	
	150 (65.6)	113 (356.5)	
	155 (68.3)	121 (381.8)	
	160 (71.1)	129 (407.0)	
	165 (73.9)	136 (429.1)	
	170 (76.7)	143 (451.2)	
	175 (79.4)	150 (473.3)	
	180 (82.2)	157 (495.3)	
	185 (85.0)	164 (517.4)	
	190 (87.8)	171 (539.5)	
	195 (90.6)	178 (561.6)	
	200 (93.3)	185 (583.7)	
	205 (96.1)	192 (605.8)	
	210 (98.9)	200 (631.0)	
	215 (101.7)	208 (656.2)	
	220 (104.4)	216 (681.5)	

USE THESE VALUES IN ROOMS WHERE THE PERIMETER PERFORMANCE TABLES ARE NOT APPLICABLE BECAUSE THE MODULAR AND LINEAR EXTRUDED PANELS ARE LOCATED MORE THAN 36in. (914mm) FROM PERIMETER WALL.

PRESSURE DROP NOTES

MODULAR PANEL TUBING LENGTH:

2ft. x 4ft. (610 x 1219mm) 30 EQUIVALENT FEET (9.15m)

2ft. x 2ft. (610 x 610mm) 18 EQUIVALENT FEET (5.49m)

TABLE HEATING PERFORMANCE VALUES FROM CERTIFIED CURVES BASED ON 70°F (21.1°C). AIR TEMPERATURE, 67°F (19.4°C) AUST AND NATURAL CONVECTION. 1in. (25mm) FIBERGLASS INSULATION IS USED ON THE TOP SIDE OF THE PANELS.

RADIANT PANEL INTERIOR HEATING PERFORMANCE

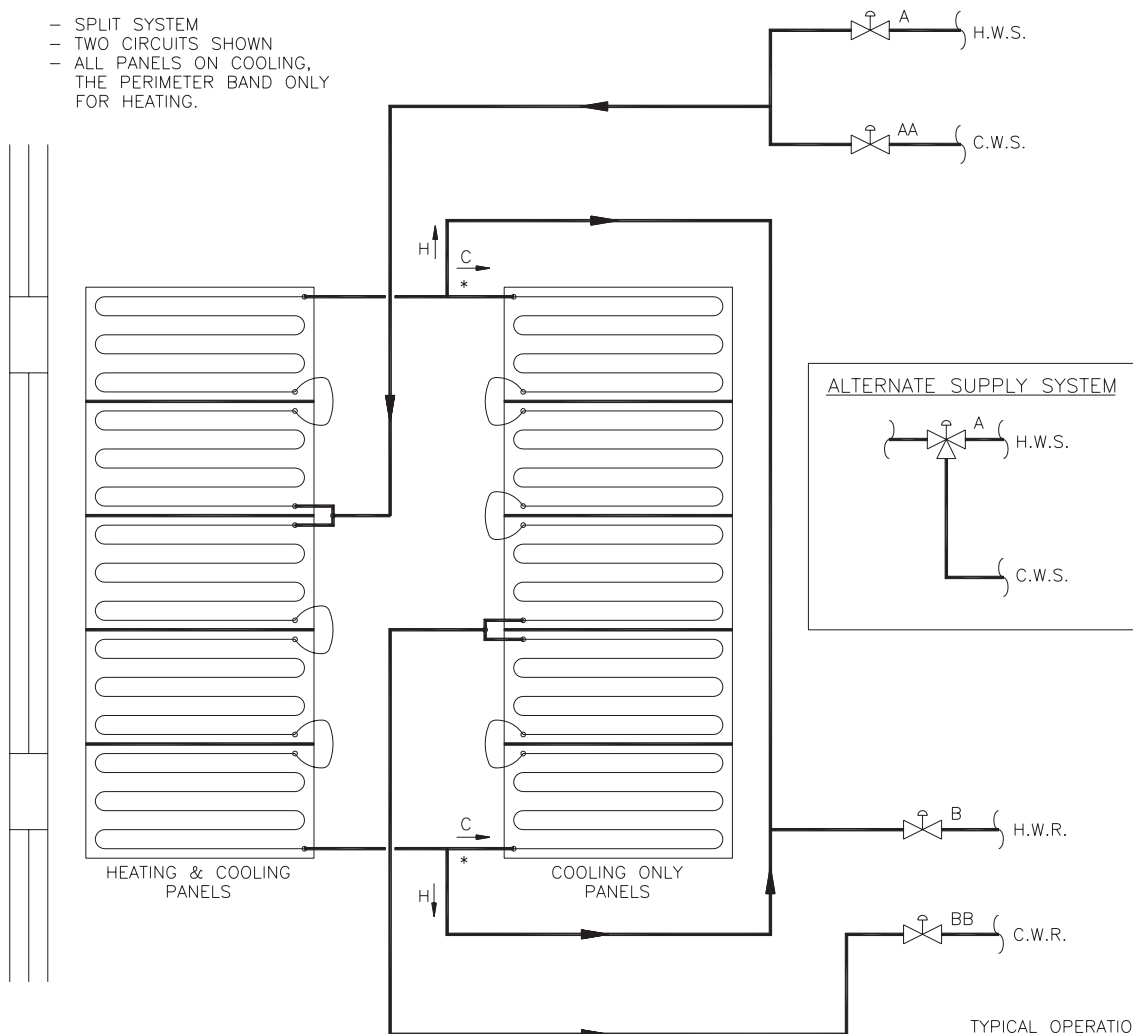
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- SPLIT SYSTEM
- TWO CIRCUITS SHOWN
- ALL PANELS ON COOLING, THE PERIMETER BAND ONLY FOR HEATING.



* AT THESE POINTS FLOW WILL BE TO THE H.W.R. ON HEATING CYCLE OR THROUGH THE REMAINING PANELS AND THEN TO C.W.R. ON COOLING CYCLE.

TYPICAL OPERATIONS

VALVES A AND AA ARE MODULATING WATER-VALVES USED TO CONTROL THE FLOW OF HOT AND COLD WATER TO THE PANEL COILS.

VALVES B AND BB ARE TWO POSITION DIVERTING RETURN WATER VALVES.

NOTES: - TO PROVIDE ACCESSIBILITY THE INTERCONNECTS BETWEEN PANELS SHOULD BE A MINIMUM OF 6' (1829mm) LONG. IF THE INTERCONNECTS ARE SOFT COPPER THE PANELS MAY BE LIFTED ABOVE OR PULLED BELOW THE GRID (DEPENDING ON PANEL TYPE) WITHOUT DISCONNECTING THE PANELS FROM THE DISTRIBUTION SYSTEM.

RADIANT FLOW CONTROL - 4 PIPE SYSTEM

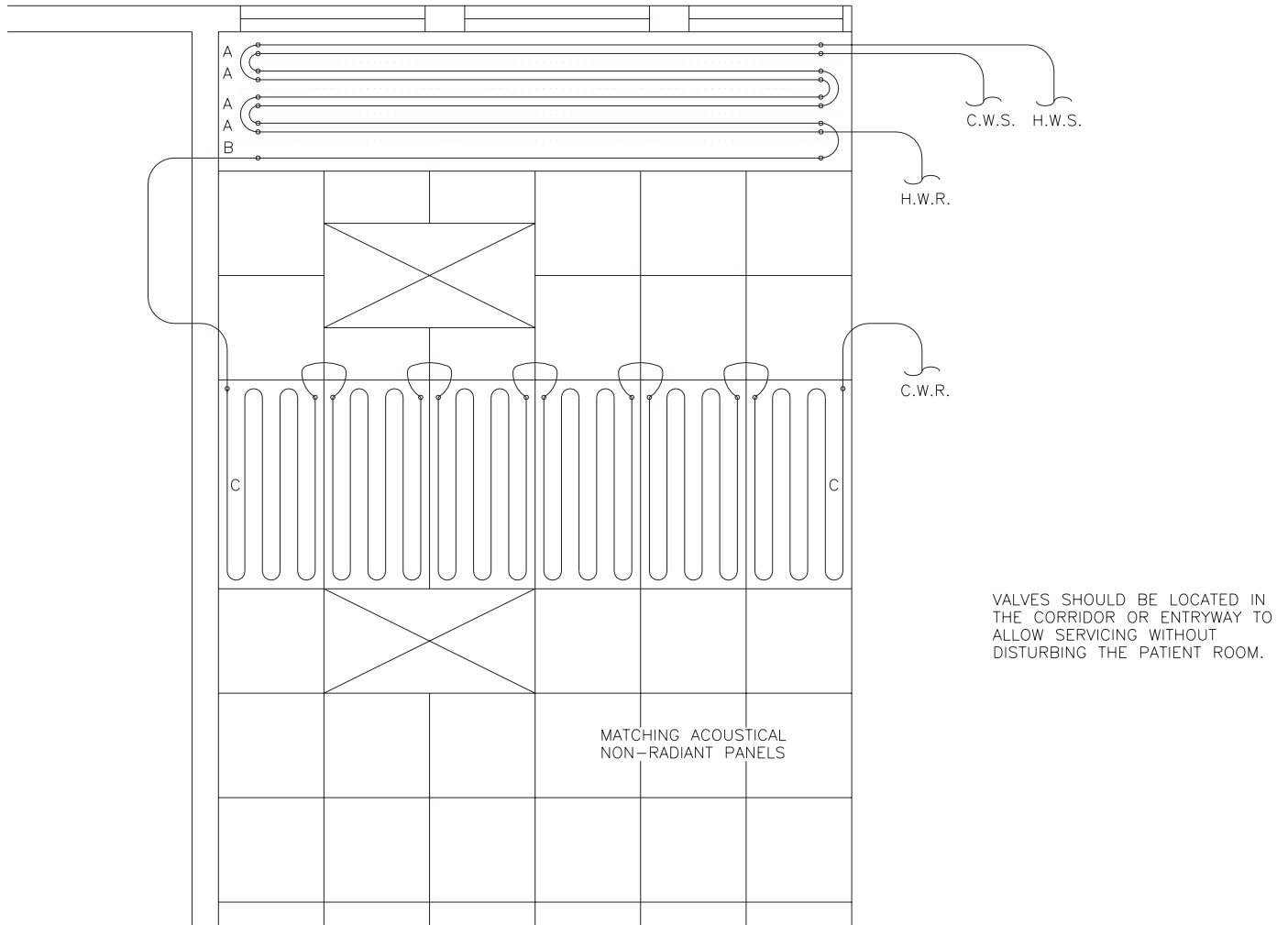
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- NO CROSS OVER OF WATER BETWEEN HOT AND COLD WATER SYSTEMS.
- TWO-WAY CONTROL VALVES ARE USED FOR POSITIVE SHUT OFF AND REDUCED COST.
- HEATING PANELS CAN BE LOCATED FOR MAXIMUM COMFORT AND EFFICIENCY.
- COOLING PANELS LOCATED FOR MAXIMUM COMFORT.
- THE TOTAL SYSTEM WILL OPERATE EFFICIENTLY AND COST LESS.
- THE ACOUSTICAL TILE PROVIDES SOUND ABSORPTION.



EXTRUSION 'A' IS 6"(152mm) 2-TUBE
EXTRUSION 'B' IS 6"(152mm) 1-TUBE
MODULAR 'C' IS 2' x 4' (610 X 1219mm) HPH PANELS

4-PIPE SYSTEM WITH LINEAR AND MODULAR PANELS

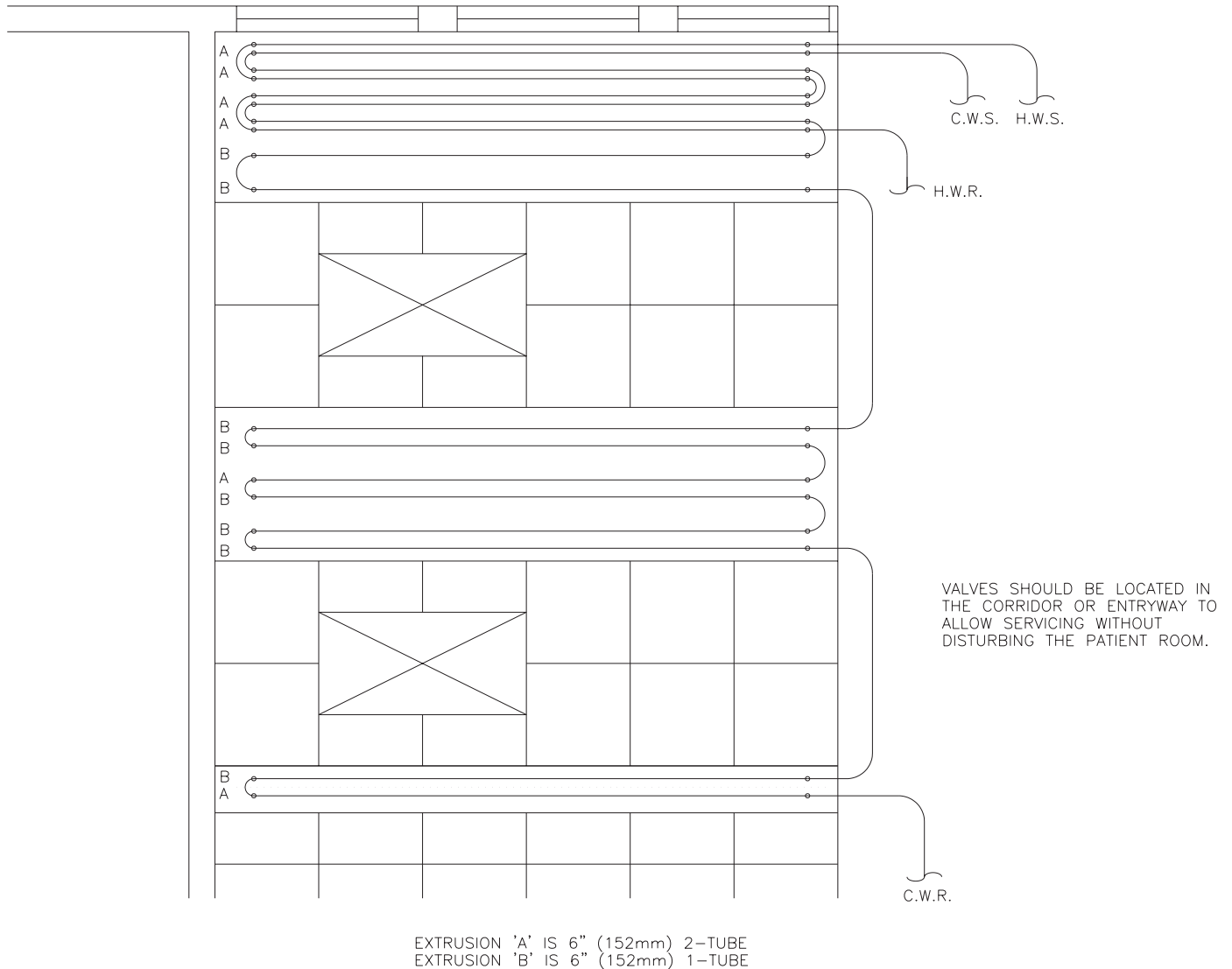
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- NO CROSS OVER OF WATER BETWEEN HOT AND COLD WATER SYSTEMS.
- TWO-WAY CONTROL VALVES ARE USED FOR POSITIVE SHUT OFF AND REDUCED COST.
- HEATING PANELS CAN BE LOCATED FOR MAXIMUM COMFORT AND EFFICIENCY.
- COOLING PANELS LOCATED FOR MAXIMUM COMFORT.
- THE TOTAL SYSTEM WILL OPERATE EFFICIENTLY AND COST LESS.
- THE ACOUSTICAL TILE PROVIDES SOUND ABSORPTION.



4-PIPE SYSTEM FOR LINEAR PANELS

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ADDITIONAL DATA

OPERATION AND MAINTENANCE
ASSEMBLY AND INSTALLATION
OTHER INFORMATION

AIRTEX RADIANT CEILING PANELS

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OPERATION AND MAINTENANCE

START UP

Each zone of Airtex radiant panels should be pressure tested for leaks as required in the specifications. All system piping should be thoroughly cleaned, flushed, drained and refilled before the radiant panels are connected into the system.

With boiler in operation and circulators on, set control valves to full flow position. Flow in excess of 0.5 USGPM (0.032 l/s) per circuit is required to remove air from tubing and interconnects on the panel. Gradually bring the system to design temperature. The actual temperature drop through the panel will only be achieved when building is under design load. Balancing the radiant ceiling system without calibrated balancing valves (CBV's) should be done during a cloudy day in the wintertime. After balancing, return the control valves to automatic operation.

MAINTENANCE

Maintenance is normally limited to cleaning of the Airtex panel face. Since there are no moving parts nothing else is required.

Loose dirt such as ordinary dust, should be removed from the surface of the panel with a soft brush or vacuum cleaner. The panel may be washed using a mild detergent cleaner applied with a cellulose sponge. The sponge should hold just enough solution to adequately wet the surface. The edge of the sponge can be used to clean out grooves. Rinse the panel with a damp sponge using clean rinse water.

Do not use an abrasive cleaner on the painted surface. Do not use excessive water on the radiant panels as it may go into panel joints and cause discoloration or loosening of paint finish.

Removing small scratches, abrasions and stains may be accomplished by use of a solvent such as trichloroethylene on a soft white cloth. Use caution not to remove the paint. Use only a small amount and be sure to follow label directions when using solvents.

REPAINTING

Airtex panel surfaces may be repainted, but only with a high temperature non-yellowing paint. Vinyl latex, oil or aluminum based paints may discolor and should not be used.

All surfaces should be thoroughly cleaned prior to repainting. Metallic finishes should not be applied to the Airtex radiant ceiling because they may have a low emissivity and therefore will reduce the radiant performance. The painter should test a sample of the paint in an inconspicuous place to assure compatibility of the new and old surfaces.



AIRTEX LINEAR RADIANT PANEL ASSEMBLY AND INSTALLATION

To ensure fast and efficient installation, it is important to read the following instructions in conjunction with the **ENGINEERED AIR** Shop Drawings provided.

Remove appropriate lengths and widths radiant extrusions from carton and place on a clean workbench. Assemble panels by setting male / female edges together.

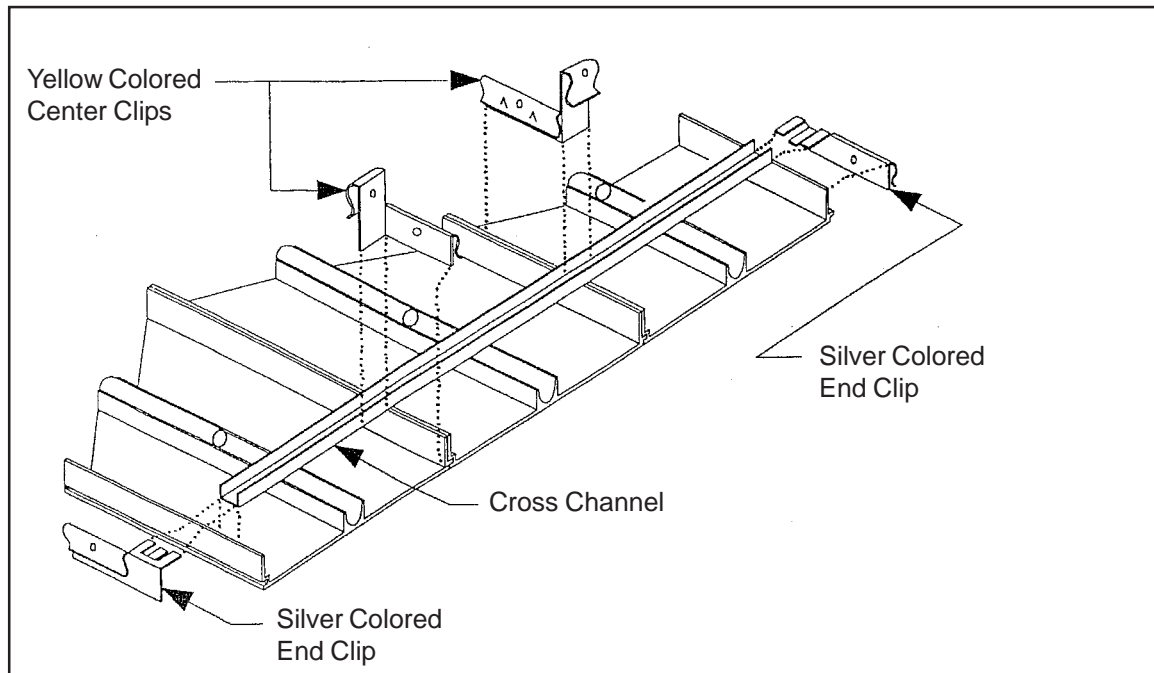


Fig. 1



Fig. 2

Install correct number of cross channel braces as per radiant extrusion schedule provided on shop drawings. Place one channel within 2" of each end of panel. Slip end clips onto channel. Hammer clips onto edge of panel (as illustrated in Fig. 1). Then install center clips to secure channel and male / female joint. Alternate direction of center clips (Fig. 2).

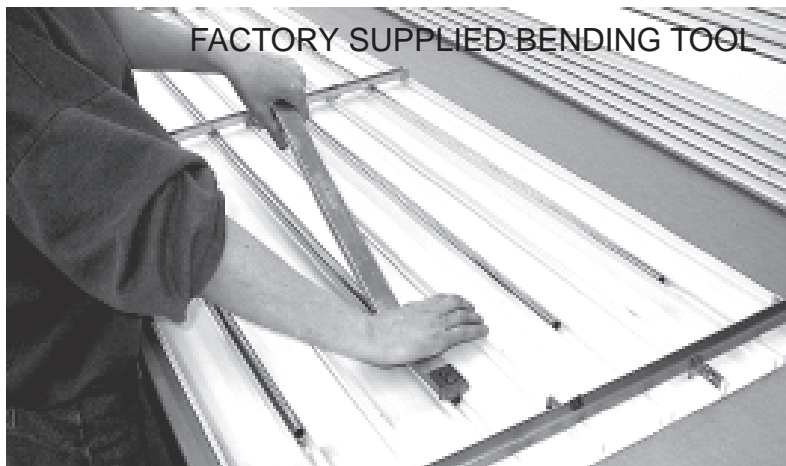


Fig. 3

Before making solder connections, raise ends of tubing using the Airtex bending tool. Place mandrel fully into end of panel tube and bend up tube as shown (Fig. 3). Do not attempt to bend or raise the panel tubing without the use of the factory supplied bending tool.

Trim panel to length allowing for expansion as per shop drawings provided. To cut panels, use a blade designed for non-ferrous metal only. For circular saws use carbide tip blade with approximately 40 teeth on 7 1/4" diameter. For jigsaws use blades with 8 to 12 teeth per inch.

Install and solder in place, factory supplied return bends as illustrated. No fittings are required (Fig. 4).

Place panel in ceiling grid with male edge toward perimeter wall.

Connect panel to supply and return pipes using 1/2" O.D. soft copper tubing. No fittings are required (Fig. 4).

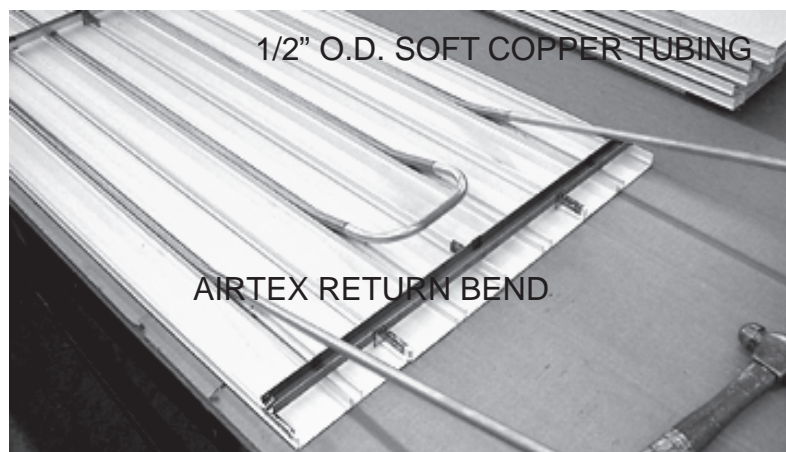


Fig. 4

When panels are to be connected in series, factory supplied 360° interconnects are to be installed as illustrated. No fittings are required. (Fig. 5)

Panel tubing is set back from extrusion ends. When field modification of tubing is required, raise the copper tubing from panel. Cut tubing with 32 tooth per inch reverse installed hacksaw blade as required.

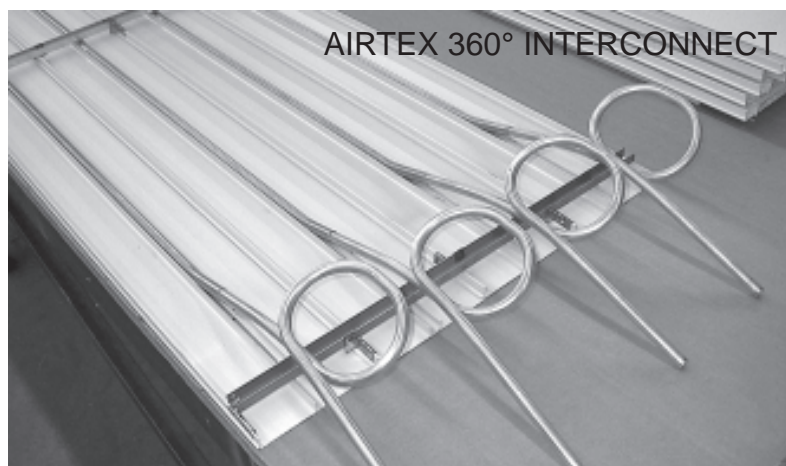


Fig. 5

