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LPIOM	Linear Radiant Panel Installation, Operation & Maintenance Instructions

DESCRIPTION

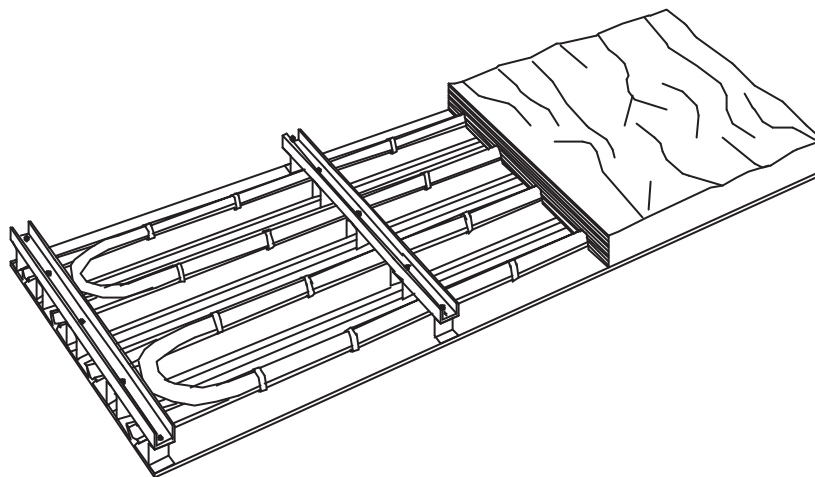
Linear panels are an established approach to radiant heating. The linear panel is an extruded aluminum radiant heating strip that provides exceptionally high heat transfer. Linear panels are available in virtually any width and length up to a maximum of 16'. This product, while offering an up-to-date visual appearance, is suitable for both ceiling or wall mounting. Linear panels are also available with a range of mounting accessories providing flexible setup.

ADVANTAGES

The system, being flexible, is easily designed into any heating scheme with few dimensional constraints. Installation is straightforward and, as found through independent tests, the heat output of linear panels is equal to or better than other radiant heating products.

APPLICATIONS

Linear panels can be used in hospitals, nursing homes, daycares, commercial office developments, schools, museums, security facilities, airports, churches, banks, condominiums, laboratories, swimming pools, factories and workshops.



GENERAL SPECIFICATIONS

Material Specification

Linear panel extrusions combine outstanding aesthetic quality with excellent design flexibility as individual planks can be fastened together to form panels of virtually any width.

The aluminum planks incorporate a tube saddle channel as an integral part of the profile. The tubing is clipped into this channel and held in direct thermal contact with the extrusion. A non-hardening heat paste between the tubing and the aluminum face plate ensures even heat distribution to the active face, providing overall thermal efficiency.

Panel planks are tongue-and-grooved to provide a clean joint longitudinally. They are held together using a special clipping system.

Dimensions and Weight

Linear panels can be provided in a variety of lengths of up to 16' and widths in multiples of 6". An operating weight of 2 lb/ft² should be used when calculating the requirements for clipping and suspension components

Materials of Construction

Pipework:	⁵ / ₈ " O.D. copper tubing.
Panels:	Extruded aluminum planks.
Panel joint clips:	Cadmium or zinc-plated steel springs.
Panel suspension clips:	Cadmium or zinc-plated steel springs.
Pipework clips:	Cadmium or zinc-plated steel springs.
Support channel:	Extruded aluminum 1 ¹ / ₂ " x ³ / ₄ " x ¹ / ₈ " thick.
Paint finish:	White polyester powder coating.
Suspension system:	Standard t-bar or drywall installation, the panels can be suspended with or without a frame for custom applications.
Insulation:	As per consultant's specifications, usually a minimum of 1" thick foil backed batt insulation.

OPERATION AND MAINTENANCE

Linear panels are incorporated into a building's heating/cooling systems and will remain trouble free provided the following procedures are followed and inspections performed during start up and maintenance.

Operation

Heating mains should be flushed prior to connection to the radiant panels. After connection, the hydronic system should be flushed again and then dry pressure tested to isolate any leaks. Any remaining air should be vented from the system and boiler temperature should be brought up gradually.

Maintenance

Apart from cleaning any strainers, little maintenance should be required on the pipework system. Any descaling of pipework should be carried out in the same way as for other hydronic heating systems. The panels are robust and should resist damage. If for some reason a panel has been damaged, the pipework should be inspected to ensure that no clips have been displaced and that extruded planks are still securely fastened.

Cleaning

The surface of linear panels is best cleaned using an industrial vacuum cleaner to remove dust. However, if the panels become soiled they can be cleaned using a damp cloth and mild detergent.

SYSTEM DESIGN (IMPERIAL)

Radiant panel system design is fundamentally similar to that of other perimeter heating systems. The design procedure is as follows:

1. Perimeter heat losses for the space are calculated using standard ASHRAE methods and good engineering practice.
2. Water temperature drop across panel system (T) is chosen, usually 20°F.
3. Mean water temperature is determined by subtracting (T/2) from the entering water temperature.
4. Determine the linear output required for the space by dividing the total required output by the available panel length.
5. Determine the required panel width and number of passes by consulting the radiant panel linear output chart on L-5.
6. The required flow rate through the panel is based on the required panel output, the temperature drop across the system (T), and specific heat capacity of water. It can be calculated using the following formula:

$$\text{FLOW RATE} = \frac{\text{PANEL OUTPUT}}{(T \times \text{HEAT CAPACITY})}$$

(T) is in °F
Panel Output is in BTUH
Heat Capacity is Btu/lb x °F
Flow Rate is in gpm

7. The pressure drop across the panel system is dependent on the length of the panel circuit, the number of flexible interconnectors, and the flow rate of the water through the panel. A table of the pressure drops created by the copper tubing can be found on page L-16, and the pressure drops for the flexible interconnectors can be found on page L-17.

When designing a radiant panel heating job there are a few rules of thumb to keep in mind:

- try to supply 50% of the total perimeter heat required (as calculated in step 1) within 1m of the perimeter wall.
- design piping configuration such that the "hottest" water is always supplied closest to the perimeter wall.
- odd number of passes cannot be supplied and returned at the same end.
- even number of passes cannot be supplied and returned at opposite ends without the use of headers.

We provide a free design/consulting service. For assistance with complex applications or for in-depth information regarding radiant panel system design please contact our engineering department.

SYSTEM DESIGN (METRIC)

Radiant panel system design is fundamentally similar to that of other perimeter heating systems. The design procedure is as follows:

1. Perimeter heat losses for the space are calculated using standard ASHRAE methods and good engineering practice.
2. Water temperature drop across panel system (T) is chosen, usually 11°C.
3. Mean water temperature is determined by subtracting (T/2) from the entering water temperature.
4. Determine the linear output required for the space by dividing the total required output by the available panel length.
5. Determine the required panel width and number of passes by consulting the radiant panel linear output chart on L-5.
6. The required flow rate through the panel is based on the required panel output, the temperature drop across the system (T), and specific heat capacity of water. It can be calculated using the following formula:

$$\text{FLOW RATE} = \frac{\text{PANEL OUTPUT}}{(\text{T} \times \text{HEAT CAPACITY})}$$

(T) is in °C

Panel Output is in Watts or (J/s)

Heat Capacity is 4180 Watts/Litres x °C

Flow Rate is in Litres/s

7. The pressure drop across the panel system is dependent on the length of the panel circuit, the number of flexible interconnectors, and the flow rate of the water through the panel. A table of the pressure drops created by the copper tubing can be found on page L-16, and the pressure drops for the flexible interconnectors can be found on page L-17.

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LINEAR PANEL IMPERIAL OUTPUTS

PASSES	1	2	2	2	4	3	4	4	5	6	
PANEL WIDTHS * (INCHES)	6	8	10	12	16	18	20	24	30	36	
M E A N W A T E R T E M P E R A T U R E (°F)	120	54	63	-	78	94	109	-	163	196	224
	125	62	73	-	93	111	128	-	188	226	258
	130	71	85	-	106	129	148	-	213	256	292
	135	79	94	-	121	147	166	-	238	285	327
	140	87	104	125	134	165	186	227	263	315	361
	145	96	114	137	149	185	205	245	288	345	394
	150	104	124	151	162	202	225	264	313	375	428
	155	112	134	163	177	219	246	282	338	406	463
	160	121	145	177	190	238	263	301	363	436	497
	165	129	154	189	205	255	282	320	389	466	531
	170	137	164	203	218	276	302	340	413	495	565
	175	146	175	215	233	292	320	360	438	525	599
	180	154	186	229	246	312	340	380	463	555	633
	185	162	197	241	261	329	359	404	488	586	668
	190	171	207	255	275	348	379	427	513	615	702
	195	179	216	267	289	365	397	452	538	645	736
200	187	226	281	303	384	417	471	563	675	771	
205	195	236	293	317	401	436	490	588	705	805	
210	204	248	307	330	420	456	509	613	735	839	
215	212	258	319	345	439	474	527	638	764	874	

OUTPUTS EXPRESSED IN BTUH/LINEAL FOOT OF PANEL AND ARE BASED ON 70°F ROOM TEMPERATURE. FOR EVERY 1°F DECREASE IN ROOM TEMPERATURE BELOW 70°F, THE OUTPUT INCREASES BY 0.9%. FOR EVERY 1°F INCREASE IN ROOM TEMPERATURE ABOVE 70°F, THE OUTPUT DECREASES BY 0.9%.

ANY PANEL WIDTH CAN BE CONSTRUCTED BY COMBINING 4" AND 6" EXTRUSIONS AND INTERPOLATING THE APPROPRIATE OUTPUTS.

***REFER TO PAGE L-7 FOR ACTUAL PANEL WIDTHS & FINISHED OPENINGS**

Note: Table for ethylene and propylene 50/50 glycol also available upon request.

LINEAR PANEL IMPERIAL OUTPUTS NON STANDARD PASSES

PASSES		1	2	2	3	4	3	4	5	6
PANEL WIDTHS		6" PANEL		12" PANEL			18" PANEL			
MEAN WATER TEMPERATURE (°F)	95	13	15	9	9	10	13	14	15	16
	100	21	25	23	25	27	33	35	37	39
	105	30	35	37	40	44	52	55	59	62
	110	38	45	51	56	61	71	76	80	85
	115	46	55	65	71	78	90	96	102	108
	120	54	65	79	86	94	109	117	124	131
	125	63	75	93	102	111	129	137	146	154
	130	71	85	107	117	128	148	158	168	177
	135	79	95	121	133	145	167	178	189	200
	140	88	105	135	148	162	186	199	211	223
	145	96	115	149	163	178	205	219	233	246
	150	104	125	163	179	195	225	240	255	270
	155	113	135	177	194	212	246	262	279	295
	160	121	145	191	210	229	263	281	298	316
	165	129	155	205	226	246	282	301	320	338
	170	137	164	218	240	262	302	322	342	362
175	146	175	233	256	280	320	341	363	384	
180	154	185	246	271	295	340	363	385	408	
185	162	194	261	287	313	359	383	407	431	
190	171	205	275	303	330	379	404	430	455	
MEAN 50/50 ETHYLENE TEMPERATURE (°F)	95	11	13	7	8	9	11	12	13	14
	100	18	22	19	21	23	28	30	31	33
	105	25	30	31	34	37	44	47	50	53
	110	32	39	43	47	52	60	64	68	72
	115	39	47	55	60	66	77	82	87	92
	120	46	55	67	73	80	93	99	105	112
	125	53	64	79	87	94	109	117	124	131
	130	60	72	91	100	109	126	134	142	151
	135	67	81	103	113	123	142	151	161	170
	140	74	89	114	126	137	158	169	179	190
	145	82	98	126	139	152	175	186	198	210
	150	89	106	138	152	166	191	204	216	229
	155	96	115	150	165	180	209	223	237	251
	160	103	123	162	178	194	224	239	253	268
	165	110	132	174	192	209	240	256	272	288
	170	116	140	185	204	222	257	274	291	308
175	124	149	198	218	238	272	290	308	326	
180	131	157	209	230	251	289	308	328	347	
185	138	165	222	244	266	305	326	346	366	
190	145	174	234	257	281	322	344	365	387	
MEAN 50/50 PROPYLENE TEMPERATURE (°F)	95	12	14	8	9	9	12	13	14	15
	100	19	23	21	23	25	30	32	34	36
	105	27	32	33	37	40	47	50	53	57
	110	34	41	46	51	55	65	69	73	78
	115	42	50	59	65	71	82	88	93	98
	120	50	59	72	79	86	100	106	113	119
	125	57	68	84	93	101	117	125	133	140
	130	65	78	97	107	116	134	144	152	161
	135	72	87	110	121	132	152	162	172	182
	140	80	96	122	135	147	169	181	192	203
	145	87	105	135	149	162	187	199	212	224
	150	95	114	148	163	178	204	218	232	245
	155	102	123	161	177	193	224	239	254	269
	160	110	132	173	191	208	239	255	271	287
	165	117	141	187	205	224	257	274	291	308
	170	125	150	198	218	238	273	293	311	330
175	133	159	212	233	254	291	311	330	349	
180	140	168	224	246	269	309	330	351	371	
185	147	177	238	261	285	327	349	370	392	
190	156	187	250	275	300	345	368	391	414	

OUTPUTS EXPRESSED IN BTUH/LINEAL FOOT OF PANEL AND ARE BASED ON 70°F ROOM TEMPERATURE. FOR EVERY 1°F DECREASE IN ROOM TEMPERATURE BELOW 70°F, THE OUTPUT INCREASES BY 0.9%. FOR EVERY 1°F INCREASE IN ROOM TEMPERATURE ABOVE 70°F, THE OUTPUT DECREASES BY 0.9%

LINEAR PANEL IMPERIAL OUTPUTS NON STANDARD PASSES

PASSES		4	5	6	4	5	6	7	8
PANEL WIDTHS		20" PANEL			24" PANEL				
M E A N W A T E R T E M P E R A T U R E (°F)	95	55	58	62	39	41	43	45	47
	100	74	79	84	64	68	71	74	77
	105	93	99	105	89	94	98	103	107
	110	112	119	127	114	120	126	131	137
	115	131	140	148	139	146	153	160	167
	120	150	160	170	164	172	180	189	197
	125	169	180	192	189	198	208	217	227
	130	188	201	213	214	225	235	246	257
	135	207	221	235	239	251	263	275	287
	140	227	242	257	264	277	290	303	316
	145	245	261	278	289	303	318	332	346
	150	264	282	299	313	329	344	360	376
	155	282	301	320	338	355	372	389	406
	160	301	321	341	363	381	399	417	436
	165	320	341	363	389	408	428	447	467
	170	340	363	385	413	434	454	475	496
175	360	384	408	438	460	482	504	526	
180	380	405	431	463	486	509	532	556	
185	404	431	458	488	512	537	561	586	
190	427	456	484	513	539	564	590	616	
M E A N 5 0 / 5 0 E T H Y L E N E T E M P E R A T U R E (°F)	95	46	50	53	34	35	37	39	40
	100	63	67	71	55	57	60	63	66
	105	79	84	89	76	80	84	87	91
	110	95	101	108	97	102	107	112	117
	115	111	119	126	118	124	130	136	142
	120	128	136	145	139	146	153	160	167
	125	144	153	163	161	169	177	185	193
	130	160	171	181	182	191	200	209	218
	135	176	188	199	203	213	223	233	244
	140	193	206	219	224	235	247	258	269
	145	208	222	236	245	258	270	282	294
	150	224	239	254	266	279	293	306	319
	155	240	256	272	288	302	316	331	345
	160	256	273	290	309	324	339	355	370
	165	272	290	308	331	347	364	380	397
	170	289	308	328	351	369	386	404	421
175	306	327	347	372	391	410	428	447	
180	323	345	366	394	413	433	453	472	
185	343	366	389	415	436	456	477	498	
190	363	387	411	436	458	480	501	523	
M E A N 5 0 / 5 0 P R O P Y L E N E T E M P E R A T U R E (°F)	95	50	53	56	36	38	40	41	43
	100	67	72	76	59	62	64	67	70
	105	84	90	96	81	85	89	93	98
	110	102	109	115	104	109	114	120	125
	115	119	127	135	127	133	139	146	152
	120	137	146	155	149	157	164	172	179
	125	154	164	174	172	181	189	198	206
	130	171	183	194	195	204	214	224	234
	135	188	201	214	217	228	239	250	261
	140	207	220	234	240	252	264	276	288
	145	223	238	253	263	276	289	302	315
	150	240	256	272	285	299	313	328	342
	155	257	274	291	308	323	339	354	370
	160	274	292	310	330	347	363	380	396
	165	291	311	330	354	372	389	407	425
	170	309	330	351	376	395	413	432	451
175	328	350	371	399	419	438	458	478	
180	346	369	392	421	442	463	485	506	
185	368	392	417	444	466	488	511	533	
190	389	415	440	467	490	514	537	560	

OUTPUTS EXPRESSED IN BTUH/LINEAL FOOT OF PANEL AND ARE BASED ON 70°F ROOM TEMPERATURE. FOR EVERY 1°F DECREASE IN ROOM TEMPERATURE BELOW 70°F, THE OUTPUT INCREASES BY 0.9%. FOR EVERY 1°F INCREASE IN ROOM TEMPERATURE ABOVE 70°F, THE OUTPUT DECREASES BY 0.9%

LINEAR PANEL IMPERIAL OUTPUTS NON STANDARD PASSES

PASSES		5	6	7	8	9	10
PANEL WIDTHS		30" PANEL					
M E A N W A T E R T E M P E R A T U R E (°F)	95	47	49	51	52	54	56
	100	77	80	83	86	89	92
	105	107	111	115	119	124	128
	110	137	142	147	153	158	164
	115	166	173	180	186	193	200
	120	196	204	212	220	228	236
	125	226	235	244	253	263	272
	130	256	266	277	287	297	307
	135	286	298	309	320	332	343
	140	316	329	341	354	367	379
	145	346	360	374	387	401	415
	150	375	390	405	420	435	450
	155	406	422	438	454	471	487
	160	436	453	471	488	506	523
	165	466	485	503	522	541	559
	170	495	515	535	554	574	594
175	525	546	567	588	609	630	
180	555	577	599	622	644	666	
185	586	609	633	656	680	703	
190	615	640	664	689	713	738	
M E A N 5 0 / 5 0 E T H Y L E N E T E M P E R A T U R E (°F)	95	40	41	43	45	46	48
	100	65	68	70	73	76	78
	105	91	94	98	102	105	109
	110	116	121	125	130	135	139
	115	142	147	153	158	164	170
	120	167	174	180	187	194	200
	125	192	200	208	215	223	231
	130	218	227	235	244	253	261
	135	243	253	263	272	282	292
	140	269	279	290	301	312	322
	145	294	306	318	329	341	353
	150	319	332	344	357	370	383
	155	345	359	373	386	400	414
	160	371	385	400	415	430	445
	165	396	412	428	444	459	475
	170	421	438	454	471	488	505
175	446	464	482	500	518	536	
180	472	491	509	528	547	566	
185	498	518	538	558	578	598	
190	523	544	565	585	606	627	
M E A N 5 0 / 5 0 P R O P Y L E N E T E M P E R A T U R E (°F)	95	43	44	46	48	49	51
	100	70	73	75	78	81	84
	105	97	101	105	109	113	116
	110	124	129	134	139	144	149
	115	152	158	164	170	176	182
	120	179	186	193	200	207	214
	125	206	214	222	231	239	247
	130	233	242	252	261	270	280
	135	260	271	281	292	302	312
	140	288	299	311	322	334	345
	145	315	327	340	353	365	378
	150	341	355	369	382	396	410
	155	369	384	399	414	428	443
	160	397	413	429	444	460	476
	165	424	441	458	475	492	509
	170	450	468	486	505	523	541
175	478	497	516	535	554	573	
180	505	525	545	566	586	606	
185	533	555	576	597	619	640	
190	560	582	604	627	649	672	

OUTPUTS EXPRESSED IN BTUH/LINEAL FOOT OF PANEL AND ARE BASED ON 70°F ROOM TEMPERATURE. FOR EVERY 1°F DECREASE IN ROOM TEMPERATURE BELOW 70°F, THE OUTPUT INCREASES BY 0.9%. FOR EVERY 1°F INCREASE IN ROOM TEMPERATURE ABOVE 70°F, THE OUTPUT DECREASES BY 0.9%

LINEAR PANEL IMPERIAL OUTPUTS NON STANDARD PASSES

PASSES		6	7	8	9	10	11	12
PANEL WIDTHS		36" PANEL						
MEAN WATER TEMPERATURE (°F)	95	52	54	55	57	59	61	62
	100	86	89	92	95	98	101	103
	105	120	124	128	132	136	141	144
	110	155	160	165	170	175	180	186
	115	189	195	201	208	214	220	227
	120	223	230	238	245	253	260	268
	125	257	266	274	283	291	300	309
	130	291	301	311	321	330	340	350
	135	326	336	347	358	369	380	391
	140	360	372	384	396	408	420	432
	145	394	407	420	433	446	460	473
	150	428	442	457	471	485	500	514
	155	463	478	494	509	525	540	556
	160	497	513	530	546	563	580	596
	165	531	549	567	584	602	620	637
	170	565	584	603	622	640	659	678
	175	599	619	639	659	679	699	719
180	633	654	675	696	717	739	760	
185	668	690	713	735	757	780	802	
190	702	725	749	772	795	819	842	
MEAN 50 / 50 ETHYLENE TEMPERATURE (°F)	95	44	46	47	49	50	52	53
	100	73	76	78	81	83	86	88
	105	102	106	109	113	116	119	123
	110	131	136	140	145	149	153	158
	115	160	166	171	177	182	187	193
	120	190	196	202	209	215	221	227
	125	219	226	233	240	248	255	262
	130	248	256	264	272	281	289	297
	135	277	286	295	304	314	323	332
	140	306	316	326	336	347	357	367
	145	335	346	357	368	379	391	402
	150	364	376	388	400	412	425	437
	155	394	407	420	433	446	459	472
	160	422	436	450	464	478	493	507
	165	451	466	482	496	511	527	542
	170	480	496	512	528	544	560	576
	175	509	526	543	560	577	594	611
180	538	556	574	592	610	628	646	
185	568	587	606	625	643	663	681	
190	597	616	637	656	676	696	716	
MEAN 50 / 50 PROPYLENE TEMPERATURE (°F)	95	47	49	50	52	54	55	57
	100	78	81	84	86	89	92	94
	105	110	113	117	121	124	128	131
	110	141	145	150	155	159	164	169
	115	172	177	183	189	195	200	206
	120	203	210	217	223	230	237	244
	125	234	242	250	257	265	273	281
	130	265	274	283	292	300	309	318
	135	296	306	316	326	336	346	356
	140	327	338	349	360	371	382	393
	145	359	370	383	394	406	418	430
	150	390	403	416	429	441	455	468
	155	421	435	450	463	477	492	506
	160	452	467	482	497	512	527	542
	165	483	499	516	532	547	564	580
	170	514	531	549	566	583	600	617
	175	545	563	582	600	618	636	654
180	576	595	615	634	653	672	691	
185	608	628	649	669	689	709	729	
190	639	660	682	703	724	746	767	

OUTPUTS EXPRESSED IN BTUH/LINEAL FOOT OF PANEL AND ARE BASED ON 70°F ROOM TEMPERATURE. FOR EVERY 1°F DECREASE IN ROOM TEMPERATURE BELOW 70°F, THE OUTPUT INCREASES BY 0.9%. FOR EVERY 1°F INCREASE IN ROOM TEMPERATURE ABOVE 70°F, THE OUTPUT DECREASES BY 0.9%

LINEAR PANEL METRIC OUTPUTS

PASSES		1	2	2	2	4	3	4	4	5	6
PANEL WIDTHS * (mm)		150	200	250	300	400	450	500	600	750	900
M E A N W A T E R T E M P E R A T U R E (°C)	48.9	52	61	-	75	90	105	-	157	188	215
	51.7	60	70	-	89	107	123	-	181	217	248
	54.4	68	82	-	102	124	142	-	205	246	281
	57.2	76	90	-	116	141	160	-	229	274	314
	60.0	84	100	120	129	159	179	218	253	303	347
	62.8	92	110	132	143	175	197	236	277	332	379
	65.6	100	119	145	156	194	216	254	301	361	412
	68.3	108	129	157	170	211	234	271	325	390	445
	71.1	116	139	170	183	229	253	289	349	419	478
	73.9	124	148	182	197	245	271	308	373	448	511
	76.7	132	158	195	210	264	290	327	397	476	543
	79.4	140	168	207	224	281	308	346	421	505	576
	82.2	148	179	220	237	300	327	365	445	534	609
	85.5	156	189	232	251	316	345	388	469	563	642
	87.8	164	199	245	264	335	364	411	493	591	675
	90.6	172	208	257	278	351	382	435	517	620	708
93.3	180	217	270	291	369	401	453	541	649	741	
96.1	188	227	282	305	386	419	471	565	678	774	
98.9	196	238	295	318	404	438	489	589	707	807	
101.7	204	248	307	332	422	456	507	613	735	840	

OUTPUTS EXPRESSED IN WATTS/LINEAL METRE OF PANEL AND ARE BASED ON 21°C ROOM TEMPERATURE. FOR EVERY 1°C DECREASE IN ROOM TEMPERATURE BELOW 21°C, THE OUTPUT INCREASES BY 2%. FOR EVERY 1°C INCREASE IN ROOM TEMPERATURE ABOVE 21°C, THE OUTPUT DECREASES BY 2%.

ANY PANEL WIDTH CAN BE CONSTRUCTED BY COMBINING 100mm AND 150mm EXTRUSIONS AND INTERPOLATING THE APPROPRIATE OUTPUTS.

***REFER TO PAGE L-7 FOR ACTUAL PANEL WIDTHS & FINISHED OPENINGS**

PANEL OUTPUTS – 50/50 ETHYLENE – (IMPERIAL)

LINEAR PANEL IMPERIAL OUTPUTS - 50/50 ETHYLENE

PASSES		1	2	2	2	3	4	3	4	4	5	6
PANEL WIDTHS [inches]		6	8	10	12	15	16	18	20	24	30	36
M E A N W A T E R T E M P E R A T U R E (°F)	120	45	53	-	65	-	79	91	-	136	164	187
	125	52	61	-	78	-	93	107	-	157	189	216
	130	60	71	-	89	-	108	124	-	179	215	245
	135	67	79	-	102	-	124	140	-	201	240	276
	140	75	88	106	113	135	139	157	192	222	266	305
	145	81	96	116	126	151	157	174	207	244	292	334
	150	88	105	128	137	166	171	191	224	265	318	363
	155	95	114	139	151	180	186	209	240	288	345	394
	160	103	124	151	162	197	203	225	257	310	373	425
	165	110	132	162	176	212	218	242	274	333	399	455
	170	117	141	174	187	227	237	259	291	354	425	485
	175	126	151	185	198	242	251	276	310	377	452	516
	180	133	161	198	213	260	270	294	329	400	480	547
	185	140	171	209	226	274	285	311	350	423	508	574
	190	148	180	221	239	290	302	329	371	445	534	609
	195	156	188	233	251	307	318	346	394	468	562	641
	200	163	198	246	265	323	336	305	412	493	591	675
	205	171	207	257	278	339	352	382	430	516	618	706
210	179	218	269	290	355	369	400	447	529	645	737	
215	187	227	281	304	372	387	418	464	562	673	770	

Outputs expressed in BTUH/Lineal foot of panel and are based on 70°F room temperature. Any panel width can be constructed by combining 4", 6" and 8" extrusions.

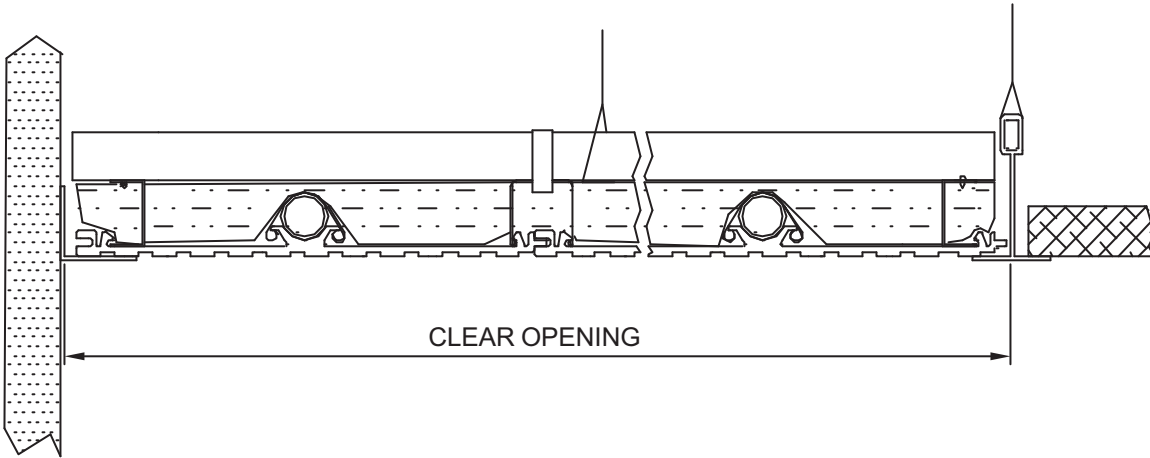
PANEL OUTPUTS – 50/50 PROPYLENE – (IMPERIAL)

LINEAR PANEL IMPERIAL OUTPUTS - 50/50 PROPYLENE

PASSES		1	2	2	2	3	4	3	4	4	5	6
PANEL WIDTHS [inches]		6	8	10	12	15	16	18	20	24	30	36
M E A N W A T E R T E M P E R A T U R E (°F)	120	47	55	-	68	-	82	95	-	143	172	196
	125	54	64	-	82	-	98	113	-	165	199	227
	130	63	75	-	93	-	114	130	-	188	226	257
	135	70	83	-	107	-	130	147	-	210	252	289
	140	79	92	111	119	142	146	165	201	233	279	319
	145	85	101	122	132	158	164	182	217	255	306	349
	150	92	110	134	144	174	180	200	235	278	333	380
	155	100	119	145	158	189	195	219	251	301	362	413
	160	108	129	158	170	205	213	235	269	324	389	444
	165	116	138	169	184	222	228	253	287	349	418	476
	170	123	147	182	196	238	248	271	305	371	445	507
	175	131	158	194	210	253	263	288	324	395	473	540
	180	139	168	207	222	272	282	307	343	418	501	572
	185	147	178	218	236	286	298	325	366	442	531	605
	190	155	188	232	250	303	316	344	388	466	558	637
	195	163	197	243	263	322	332	362	412	490	588	670
	200	171	206	257	277	337	351	381	430	514	616	704
205	178	216	268	290	354	367	399	449	539	646	737	
210	187	228	282	303	372	386	419	467	563	675	770	
215	195	237	293	317	388	404	436	485	587	703	804	

Outputs expressed in BTUH/Lineal foot of panel and are based on 70°F room temperature. Any panel width can be constructed by combining 4", 6" and 8" extrusions.

Linear Radiant Panel



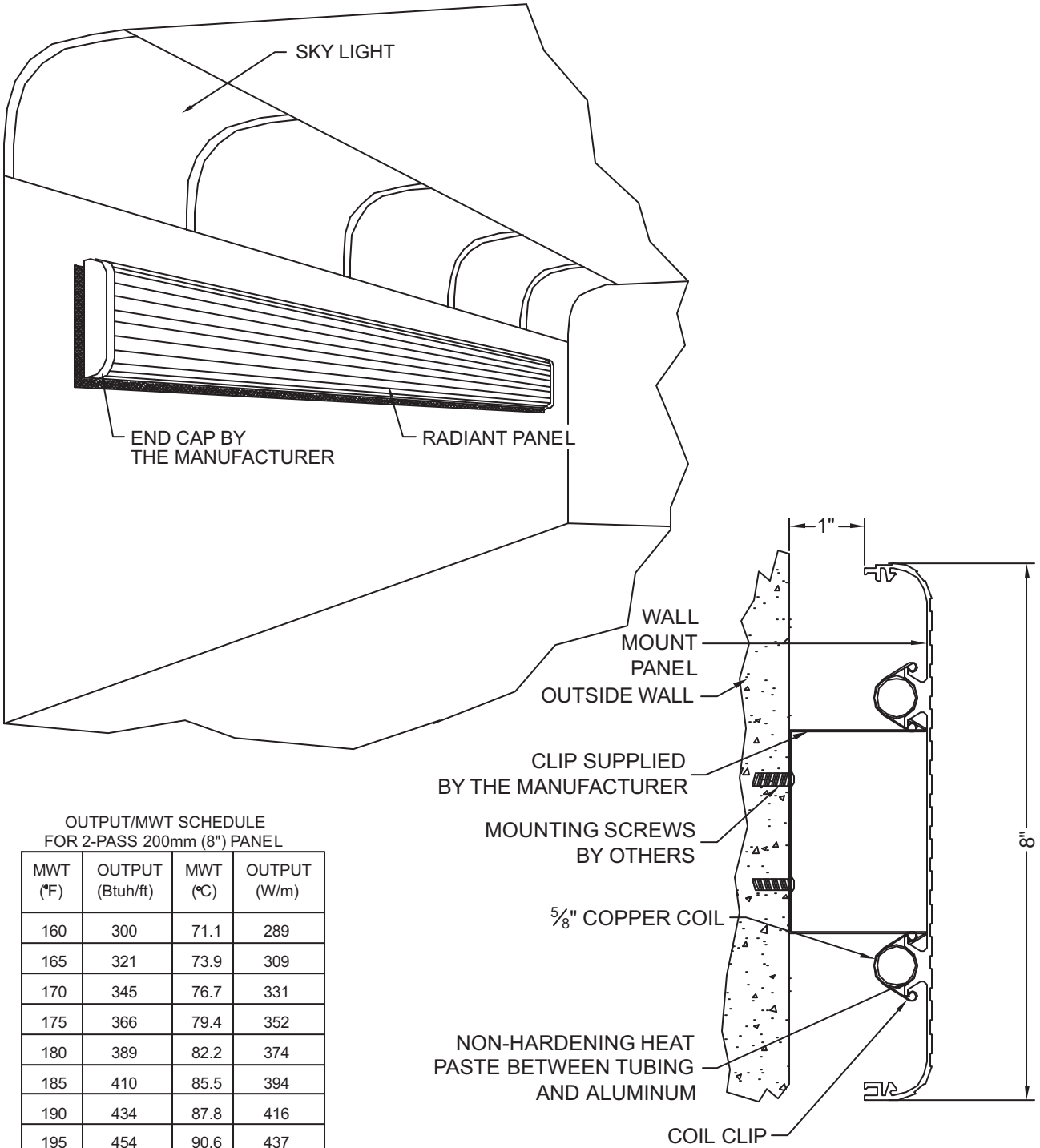
RADIANT PANEL WIDTHS & FINISHED OPENINGS

PANEL WIDTH (IMPERIAL-INCHES)	FINISHED OPENING (IMPERIAL-INCHES)	PANEL WIDTH (METRIC - mm)	FINISHED OPENING (METRIC - mm)
6	6-1/4	154	160
8-1/4	8-1/2	208	214
10	10-1/4	256	262
12	12-1/4	304	310
15	15-1/4	383	389
16-1/8	16-3/8	410	416
17-3/4	18-1/8	454	460
19-7/8	20-1/8	506	512
23-3/4	24	604	610
29-5/8	29-7/8	754	760
35-1/2	35-3/4	902	908

NOTE: FINISHED OPENINGS DO NOT INCLUDE SUPPORT ANGLE THICKNESS.

Linear Radiant Panel

8" WALL MOUNT PANEL



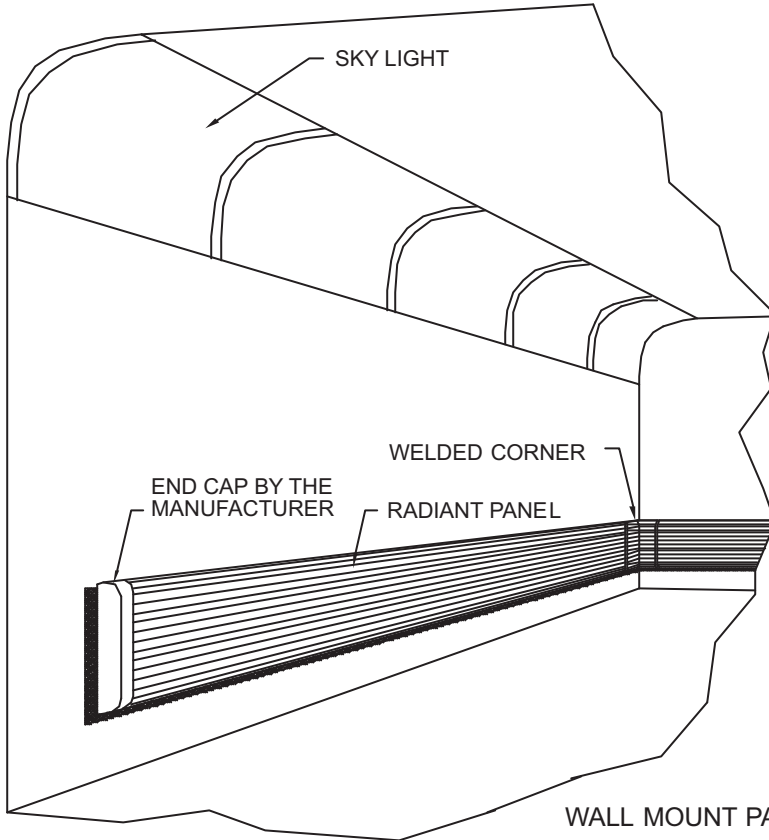
OUTPUT/MWT SCHEDULE
FOR 2-PASS 200mm (8") PANEL

MWT (°F)	OUTPUT (Btuh/ft)	MWT (°C)	OUTPUT (W/m)
160	300	71.1	289
165	321	73.9	309
170	345	76.7	331
175	366	79.4	352
180	389	82.2	374
185	410	85.5	394
190	434	87.8	416
195	454	90.6	437
200	478	93.3	459
205	498	96.1	479

Linear Radiant Panel



8" LOWER WALL MOUNT PANEL



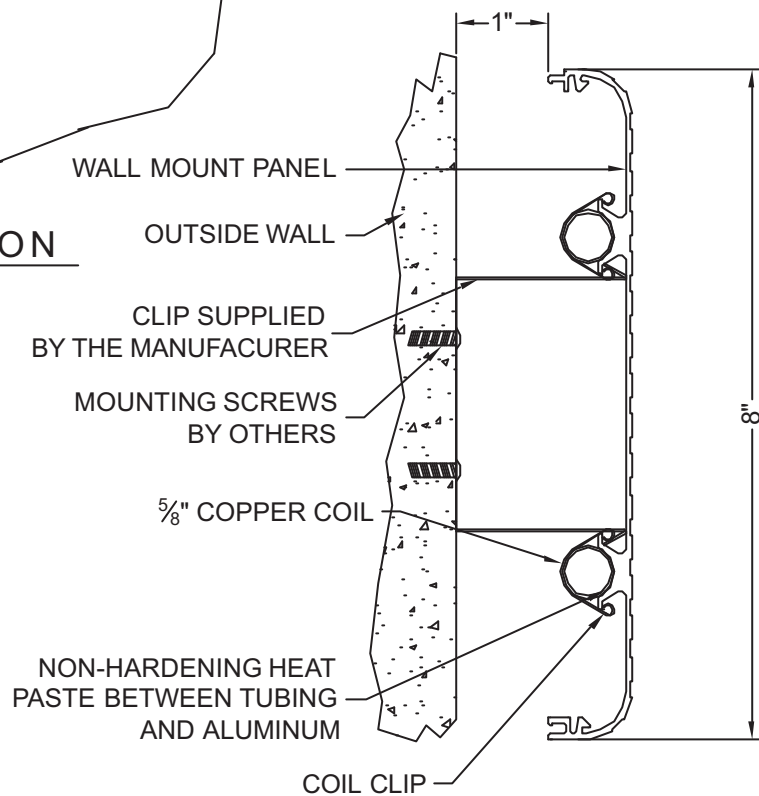
TYPICAL INSTALLATION

NOT TO SCALE

OUTPUT/MWT SCHEDULE
FOR 2-PASS 8" PANEL

MWT (°F)	OUTPUT (Btuh/ft)
120	124
125	146
130	168
135	190
140	212
145	234
150	256
155	278
160	300

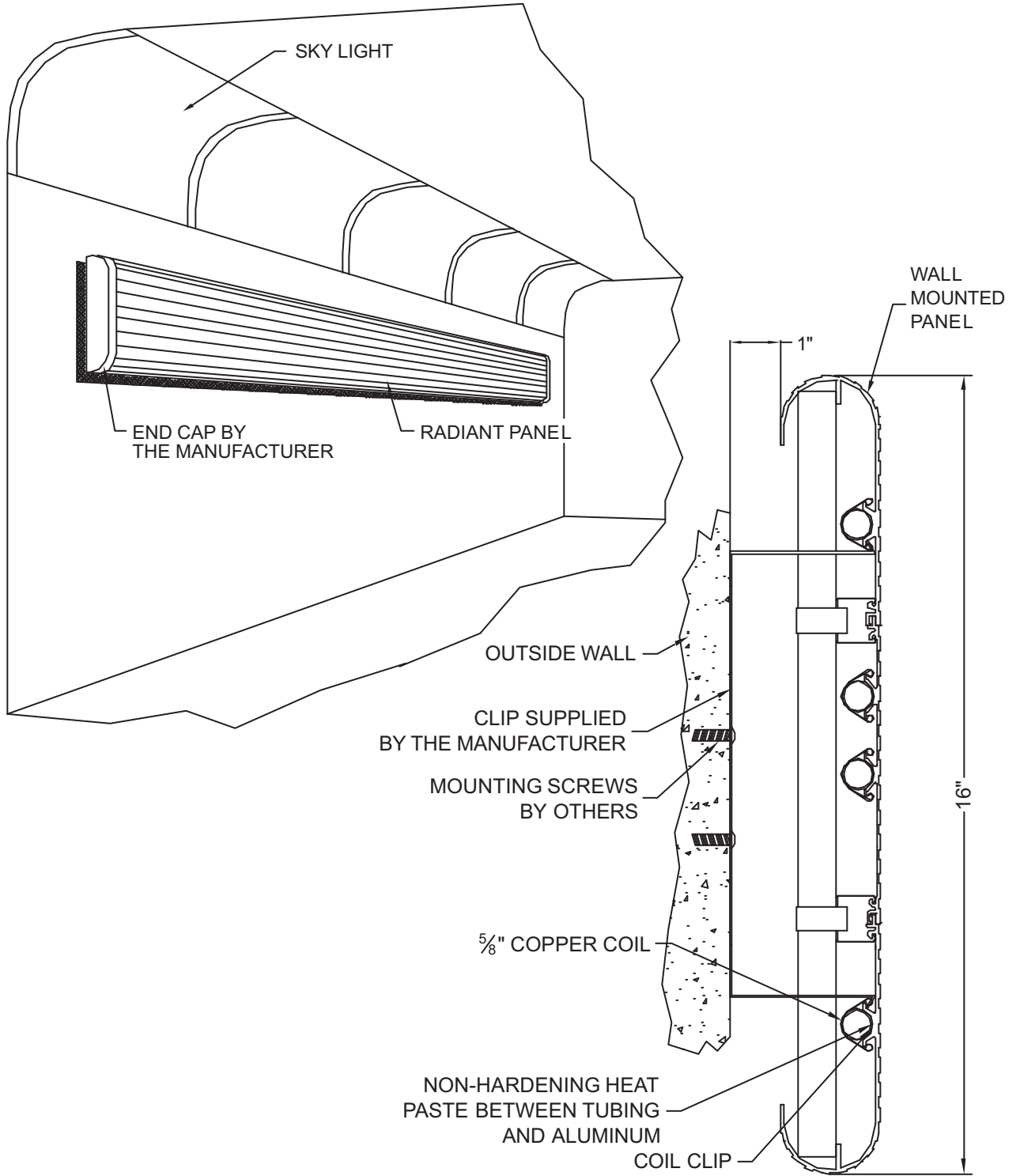
MWT (°F)	OUTPUT (Btuh/ft)
165	321
170	345
175	366
180	389
185	410
190	434
195	454
200	478
205	498



Linear Radiant Panel



16" WALL MOUNT PANEL



STANDARD CASTELLATED LINEAR EXTRUSIONS

4" (102mm) 1 PASS



6" (154mm) 1 PASS



6" (154mm) 2 PASS



LINEAR CURTAIN TRACK

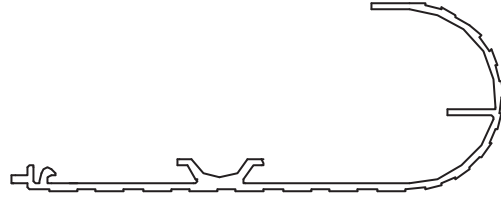


152mm (6") 1-PASS CURTAIN TRACK

MISCELLANEOUS LINEAR EXTRUSIONS



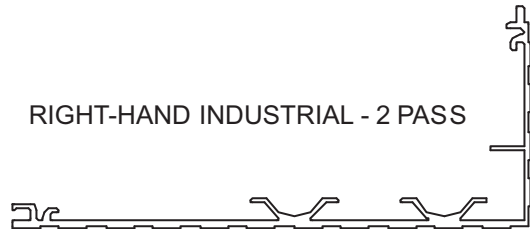
2" BULLNOSE - 1 PASS - LEFT



2" BULLNOSE - 1PASS - RIGHT



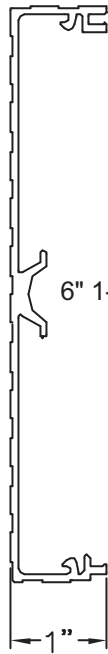
LEFT-HAND INDUSTRIAL - 2 PASS



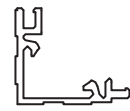
RIGHT-HAND INDUSTRIAL - 2 PASS



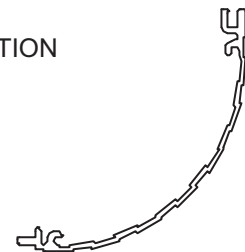
4" 1-PASS
C-SECTION



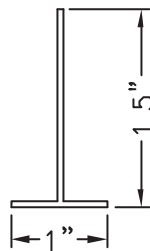
6" 1-PASS C-SECTION



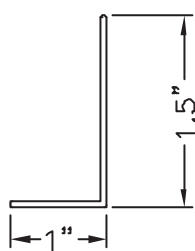
1" CORNER



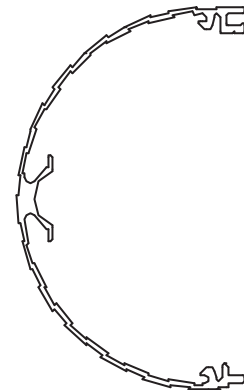
2" J-SECTION



EXTRUDED ALUMINUM
T-ANGLE



EXTRUDED ALUMINUM
L-ANGLE

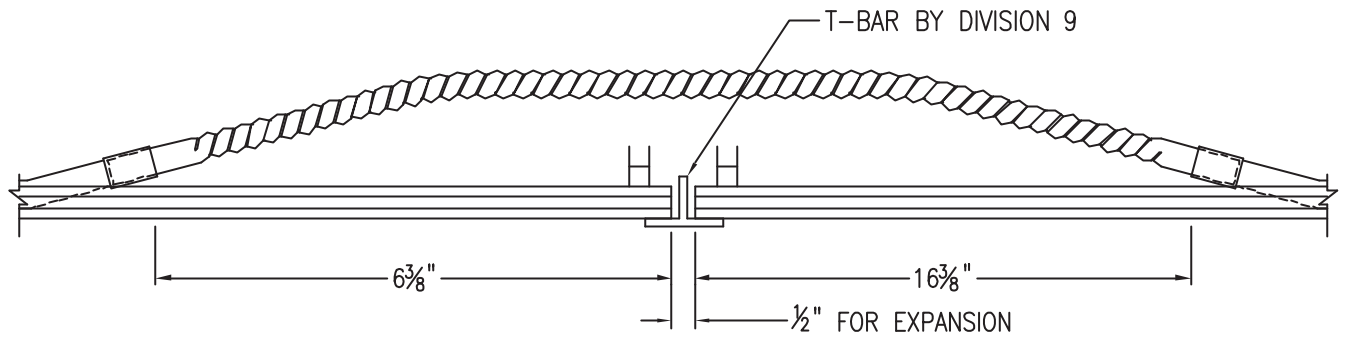
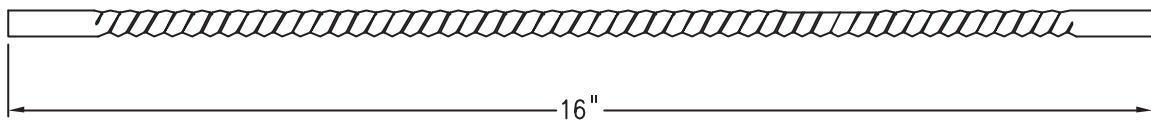
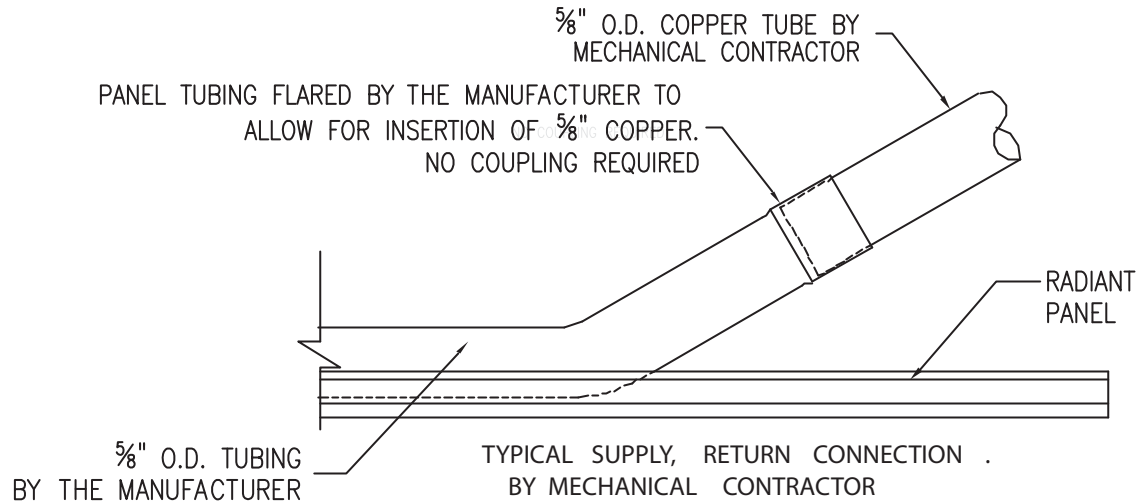


4" 1-PASS BULLNOSE

Linear Radiant Panel



COPPER CONNECTION DETAILS



INTERCONNECTORS
SUPPLIED BY THE MANUFACTURER WHEN PANELS
ARE INSTALLED IN SERIES IN THE SAME ROOM

GENERAL NOTES

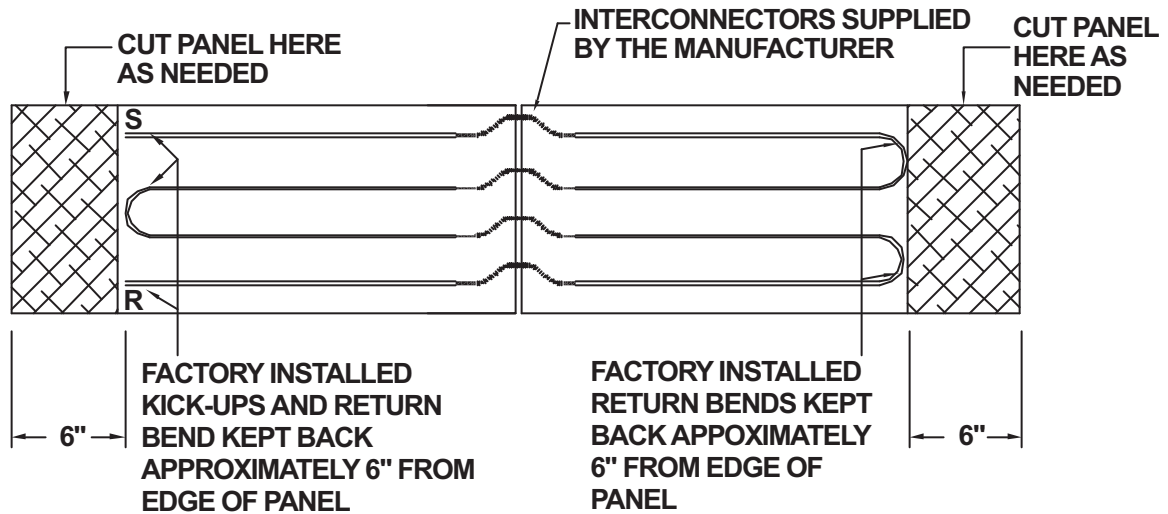
1. SHOP DRAWINGS MUST BE AVAILABLE TO THE INSTALLERS PRIOR TO THE START OF PIPING ROUGH IN. PIPING FOR RADIANT PANEL MUST NOT CHANGE FROM THE MECHANICAL DRAWINGS FOR PROJECT.
2. RADIANT PANEL DRAWING, ARCHITECTURAL DRAWING AND MECHANICAL DRAWINGS MUST BE CONSULTED BEFORE INSTALLATION BEGINS. REFER TO MECHANICAL DRAWINGS FOR PIPE SIZES AND VALVE LOCATIONS. ANY PANEL INSTALLED AGAINST EXTERIOR WALLS SHOULD HAVE THE FIRST TUBE SUPPLIED NEAREST THE WALL.
3. INSTALL RADIANT PANELS WITH FEMALE EDGE TOWARD EXTERIOR WALL. PLEASE NOTE THAT ALL PANELS ARE MADE WITH A RED LABEL INDICATING FEMALE EDGE.

FEMALE EDGE — 

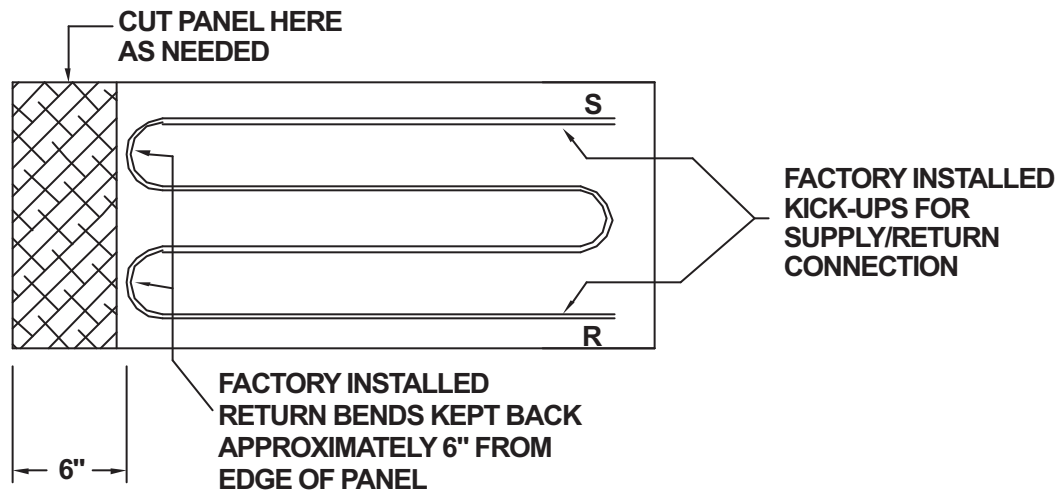
4. ALL RADIANT PANELS MUST HAVE AT LEAST ONE TIE WIRE ON EACH CROSS BRACE.
5. BRACING ON RADIANT PANELS:
 - 2 BRACES - UP TO 5 feet
 - 3 BRACES - 5 feet TO 10 feet
 - 4 BRACES - 10 feet TO 14 feet
 - 5 BRACES - 14 feet TO 16 feet
6. FOR CUTTING OF RADIANT PANELS USE A CIRCULAR SAW WITH A CARBIDE TIPPED BLADE. CUT WITH THE FINISH SURFACE FACING THE SAW. ENSURE YOU PROTECT THE FINISH SURFACE BEFORE CUTTING BEGINS.
7. WHEN PANELS REQUIRE SITE CUTTING, FOLLOW THESE STEPS:
 1. Install all but the last panel, measure length required,
 2. Cut last panel to required length using procedure listed in part 6 above,
 3. Install final panel in ceiling.
8. VULCAN IS RESPONSIBLE ONLY FOR THE SUPPLY OF RADIANT PANELS. OTHERS ARE TO SUPPLY AND INSTALL THE FOLLOWING:
 1. Necessary piping between panels (other than interconnectors, as indicated on plan)
 2. Piping from panels to supply and return mains.
 3. Specified insulation and hanger wires.
 4. Suspended ceiling grids and panel support moldings.

CUTTING INSTRUCTIONS

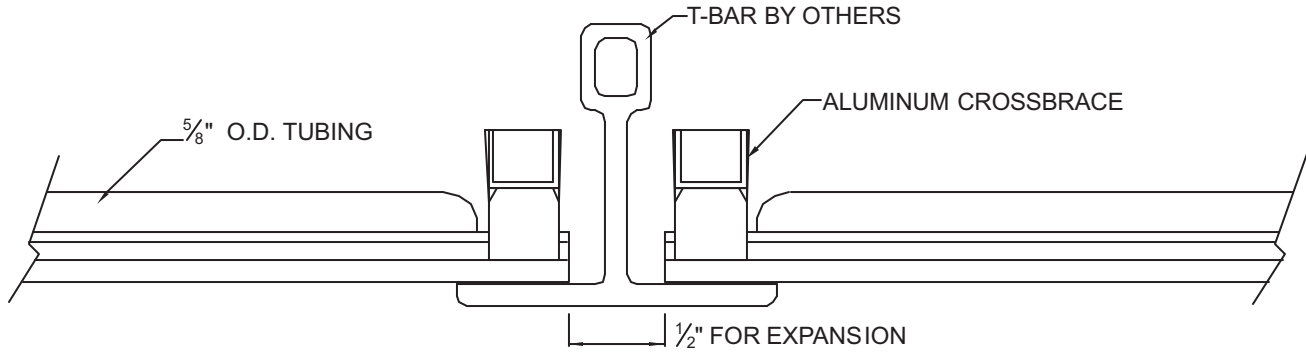
MULTI-PANEL INSTALLATION



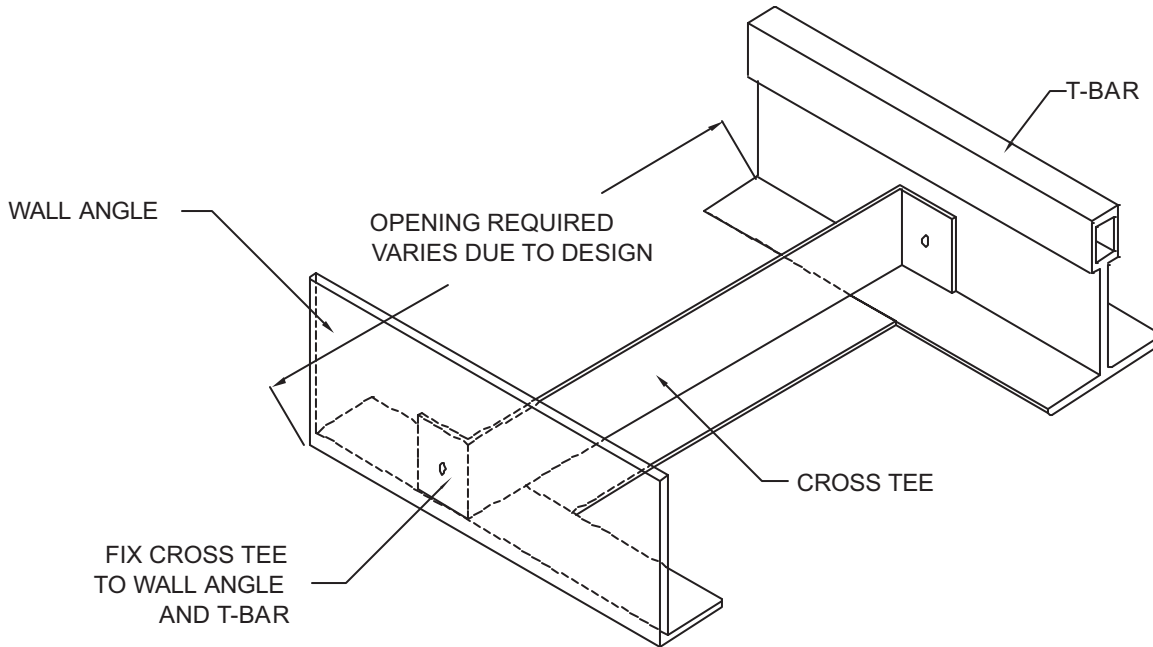
SINGLE PANEL INSTALLATION



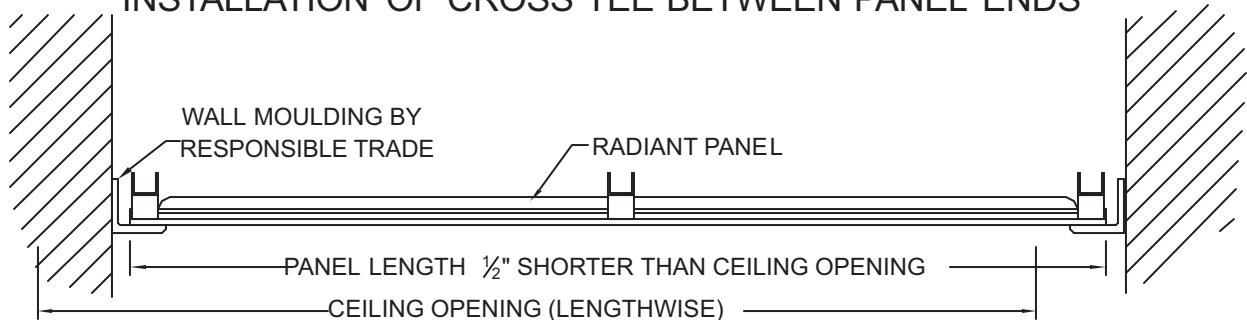
LINEAR PANEL EXPANSION DETAILS



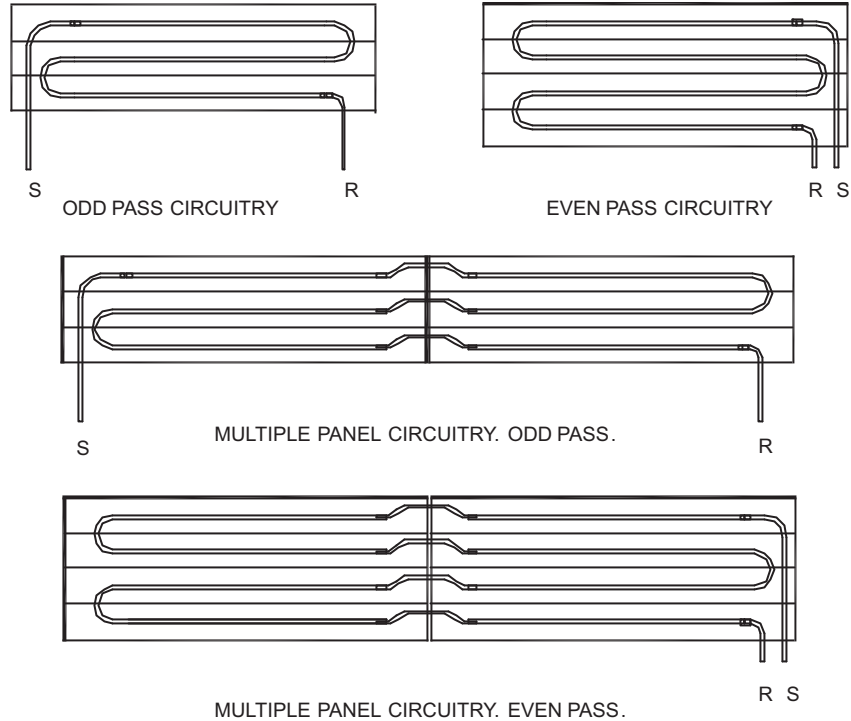
EXPANSION GAP FOR RADIANT PANEL



INSTALLATION OF CROSS TEE BETWEEN PANEL ENDS



LINEAR CIRCUITRY AND PRESSURE DROPS



Single panel length to a maximum of 16 feet

Pressure drop for $\frac{5}{8}$ " O.D. tubing:

at 0.5 GPM is 0.5 foot drop per 100 feet (Flow rate US gal/min)

at 1 GPM is 2 feet drop per 100 feet

at 2 GPM is 7 feet drop per 100 feet

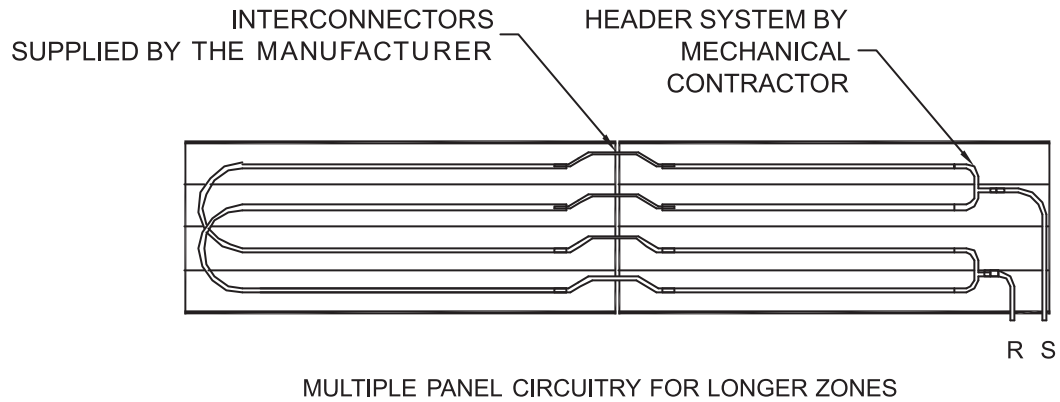
at 2.5 GPM is 10 feet drop per 100 feet

at 3 GPM is 14 feet drop per 100 feet

Refer to L-17 for additional pressure drop info.

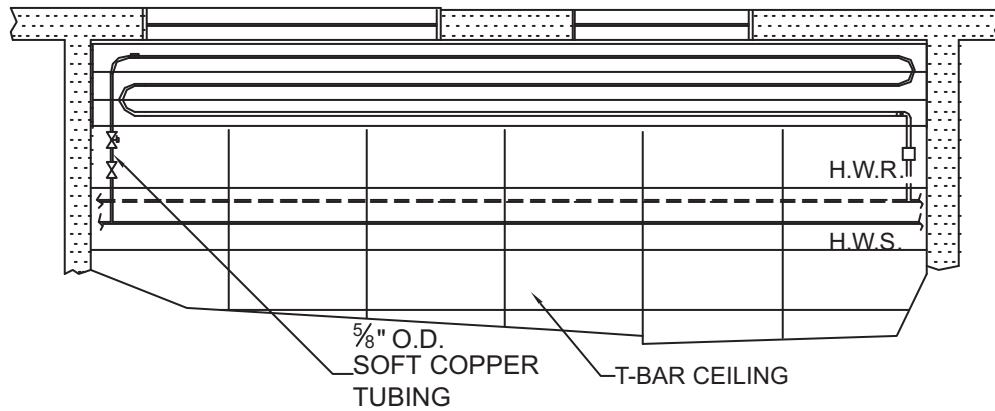
INTERCONNECTOR PRESSURE DROPS

HEADER CIRCUITRY

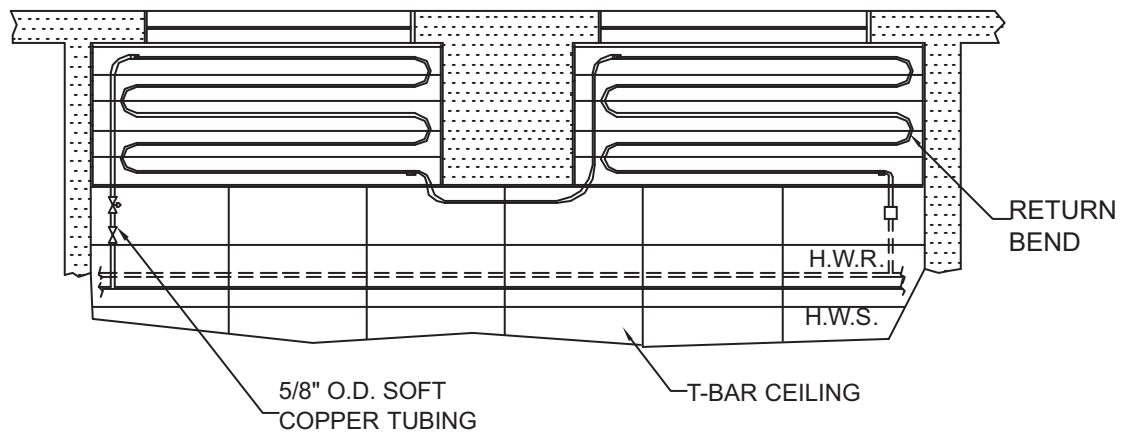


INTERCONNECTORS	
Flow Rate (US gal/min)	Interconnector Pressure Drop (psi)
0.5	0.0505
1.0	0.168
2.0	0.559
2.5	0.823
3.0	1.13

LINEAR PANELS IN T-BAR CEILING

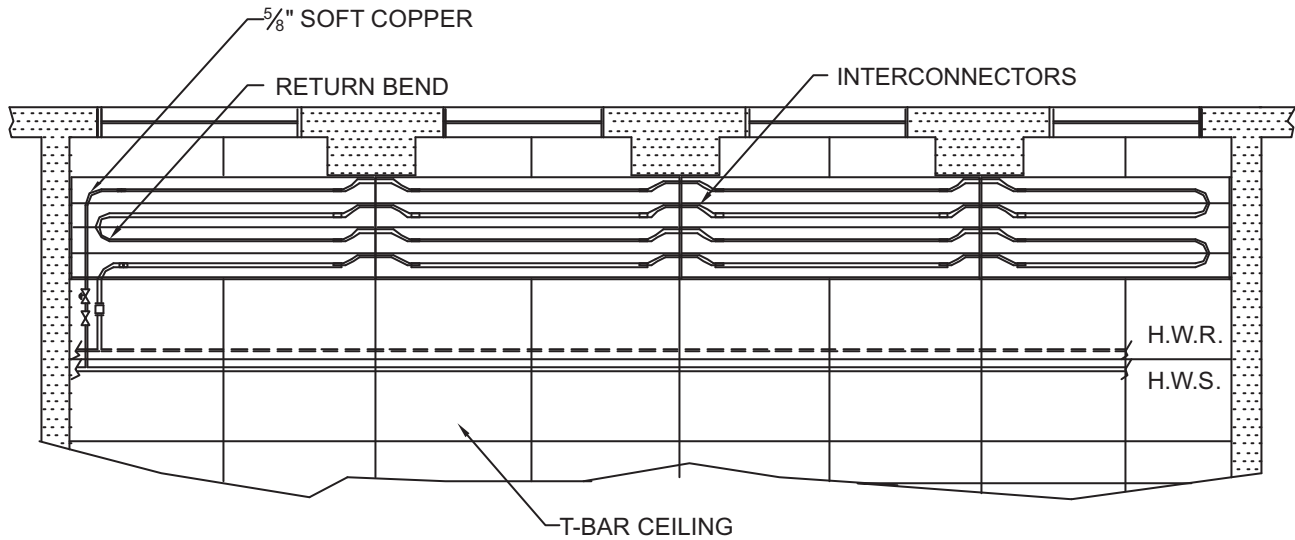


ODD NUMBER OF PASSES SINGLE PANEL,
LENGTH UP TO 16 FEET

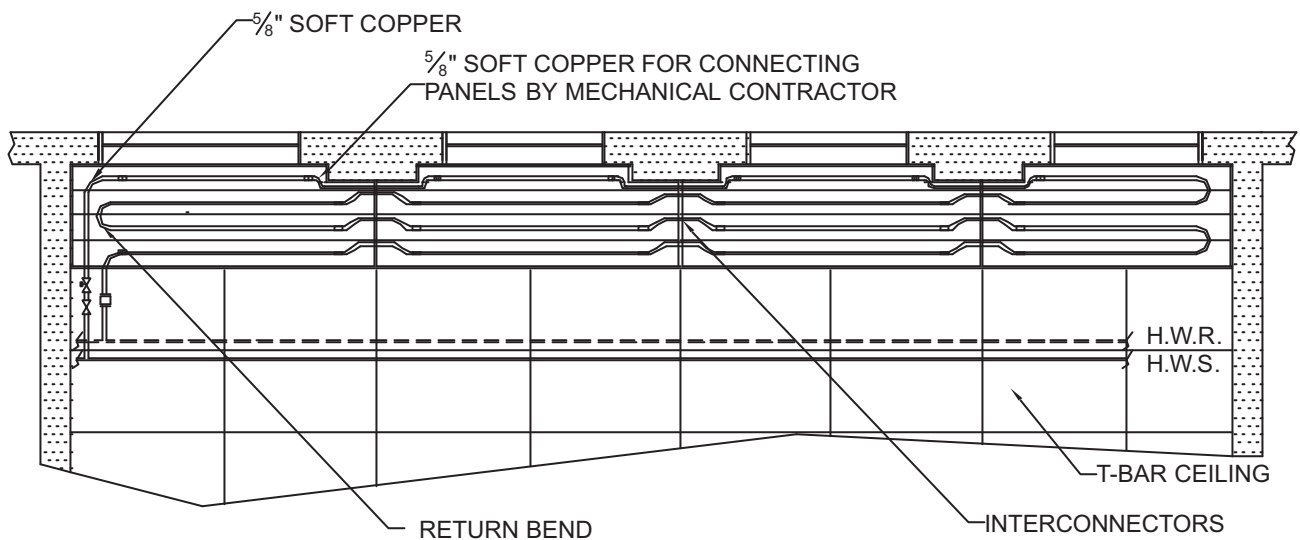


TWO ODD NUMBER PASS PANELS PIPED AROUND COLUMN

PERIMETER PANELS WITH COLUMN INTERFERENCE

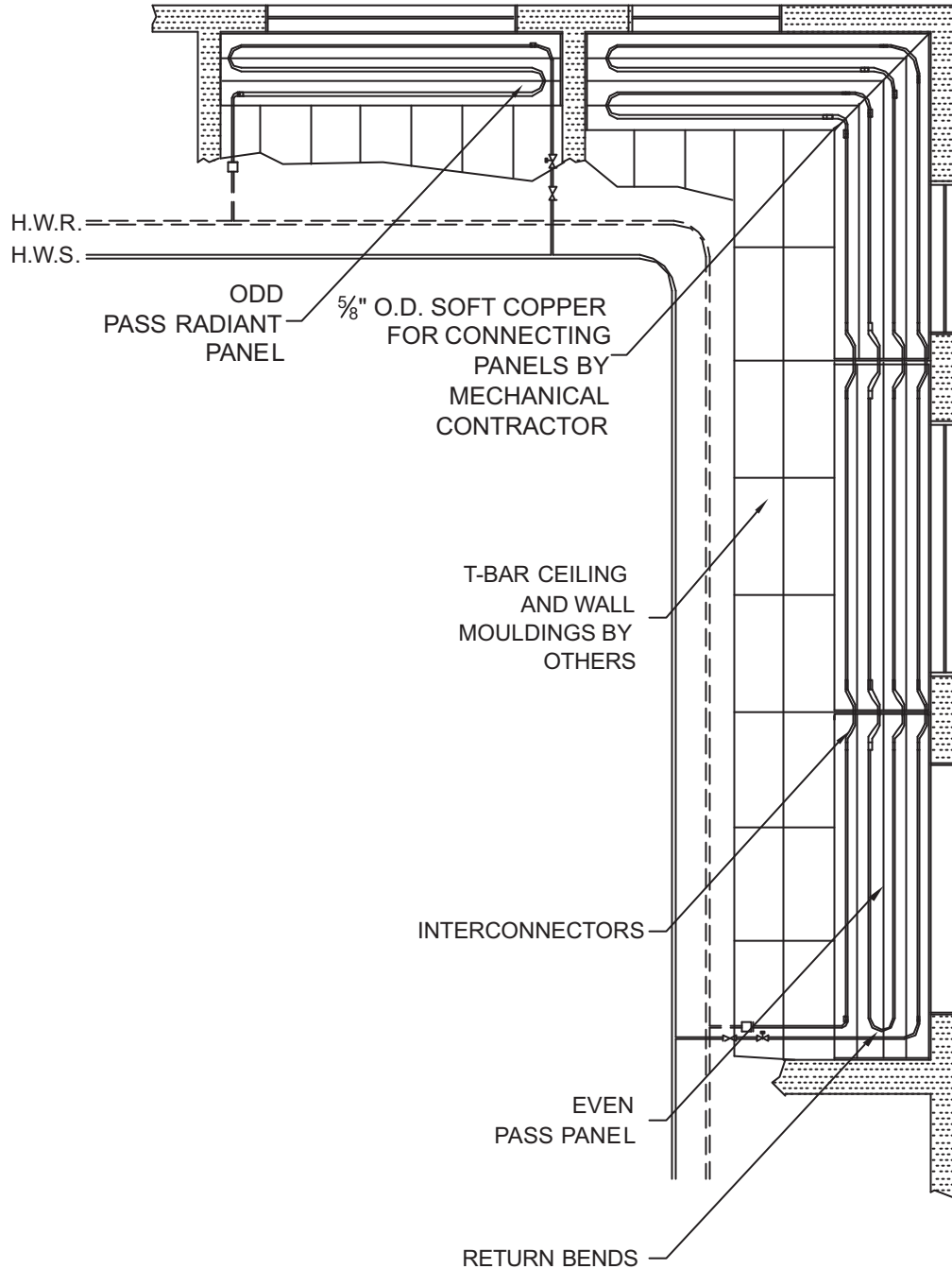


RADIANT PANELS POSITIONED CLEAR OF PERIMETER COLUMNS. EVEN PASS COILING SHOWN

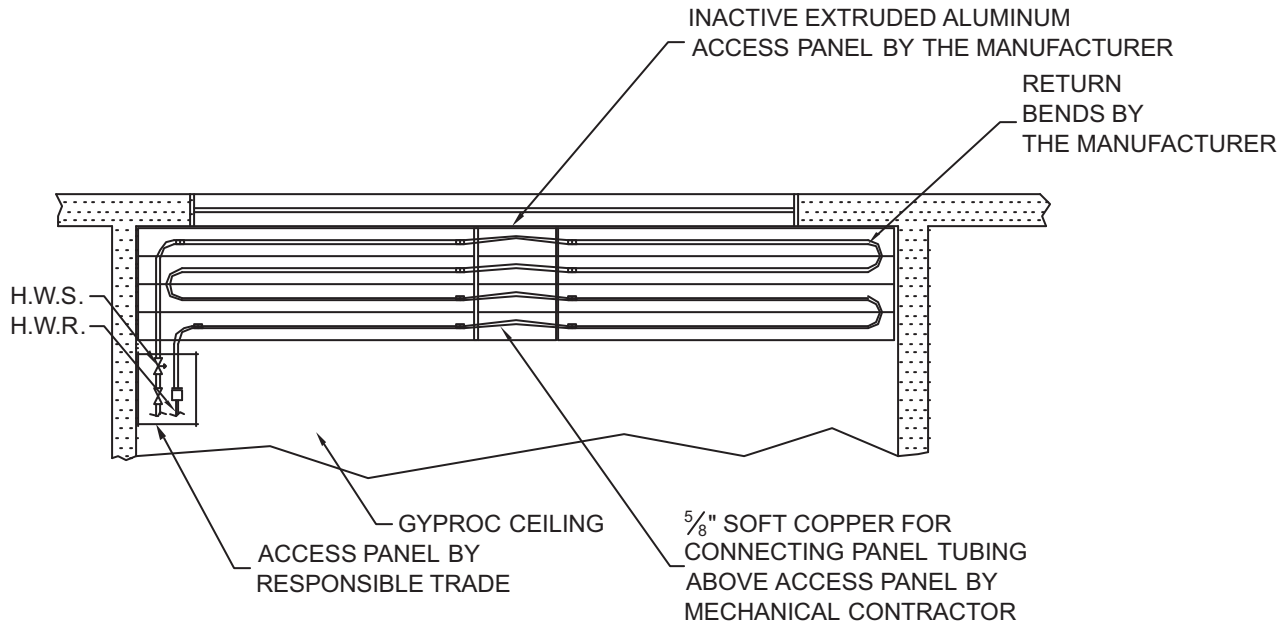


RADIANT PANELS NOTCHED AROUND PERIMETER COLUMNS. EVEN PASS COILING SHOWN

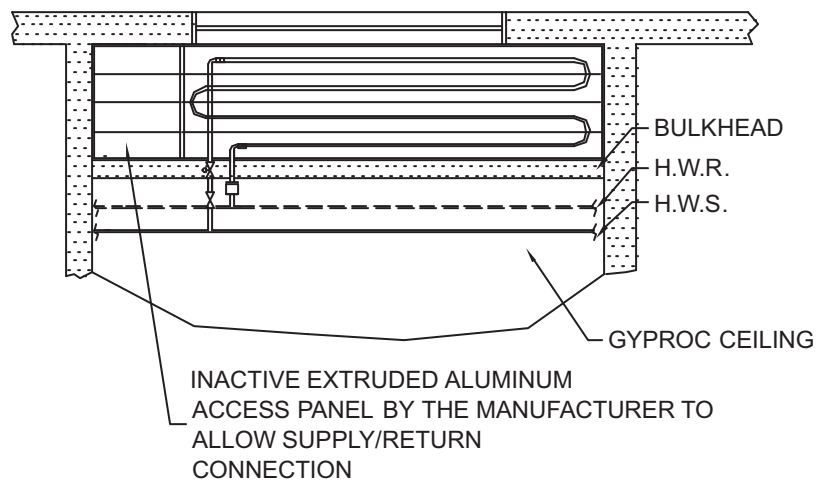
PIPING DETAIL FOR ODD AND EVEN PASS LINEAR PANELS



ACCESS PANELS WHERE ACCESSIBILITY IS REQUIRED

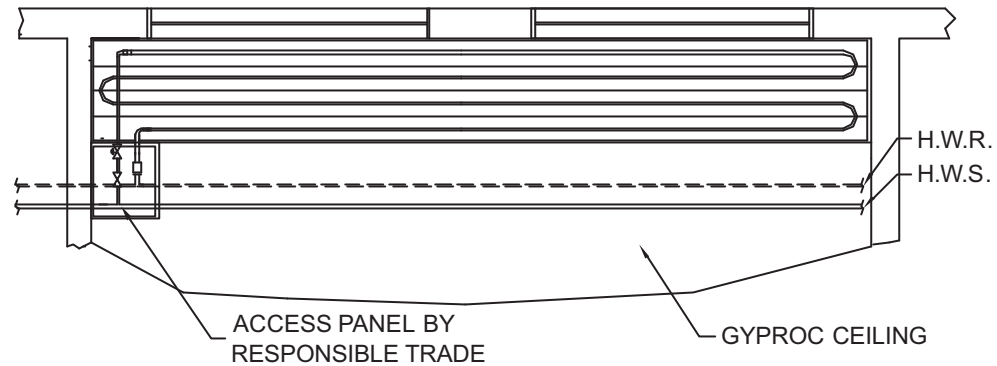


TWO PANEL EVEN PASS CONFIGURATION

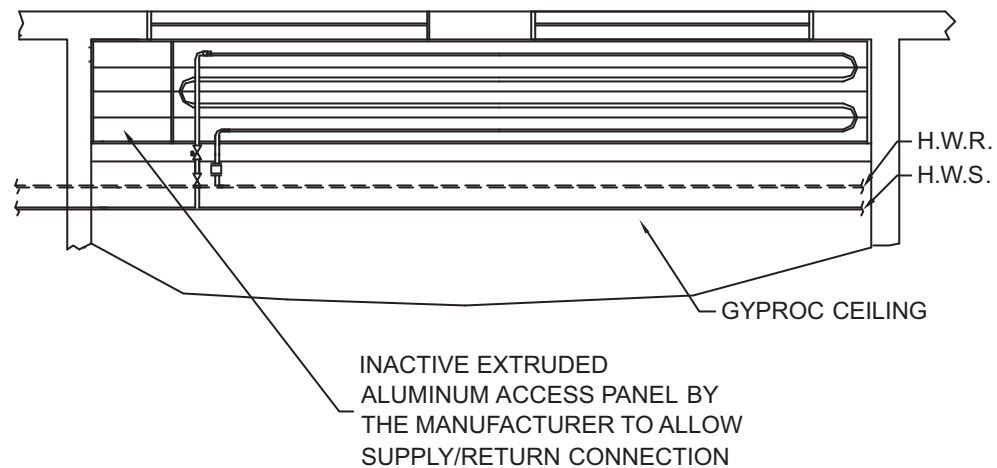


SINGLE PANEL EVEN PASS CONFIGURATION

ACCESS PANELS WHERE ACCESSIBILITY IS REQUIRED



ACCESS PANEL BY OTHERS

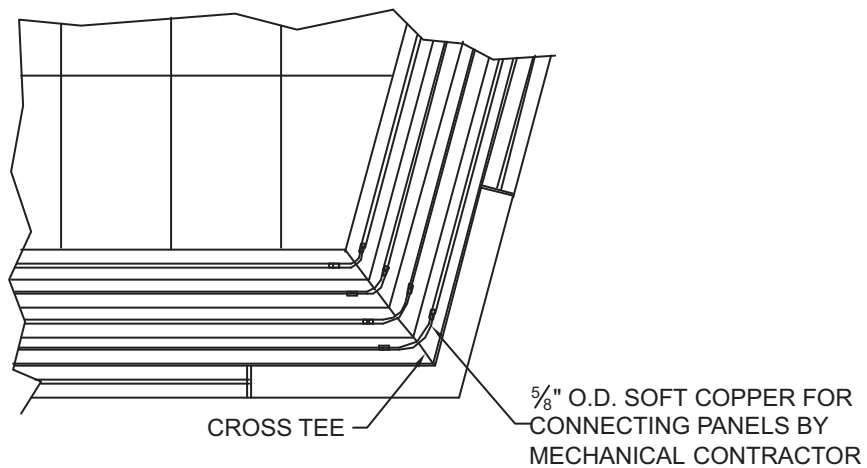
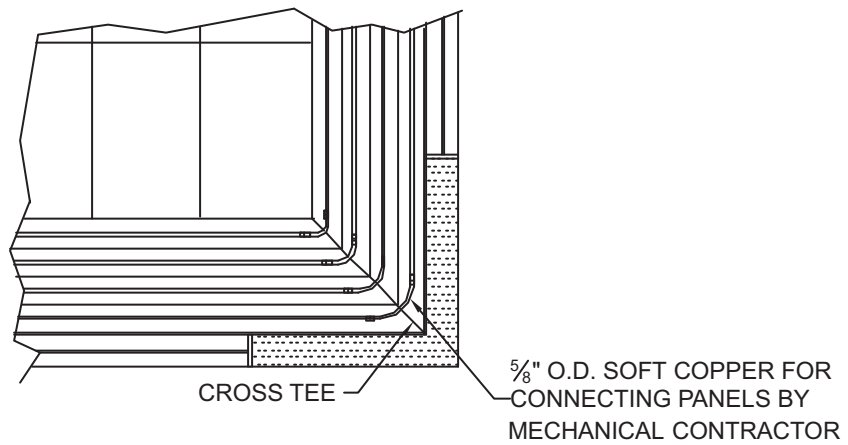
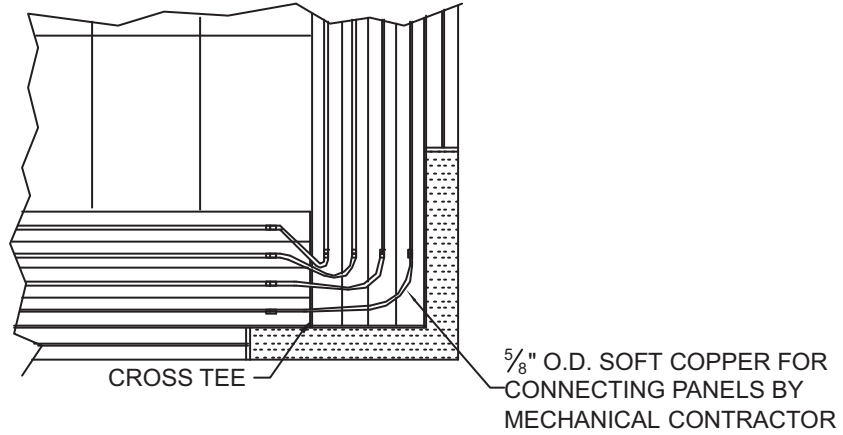


ACCESS PANEL BY THE MANUFACTURER

Linear Radiant Panel

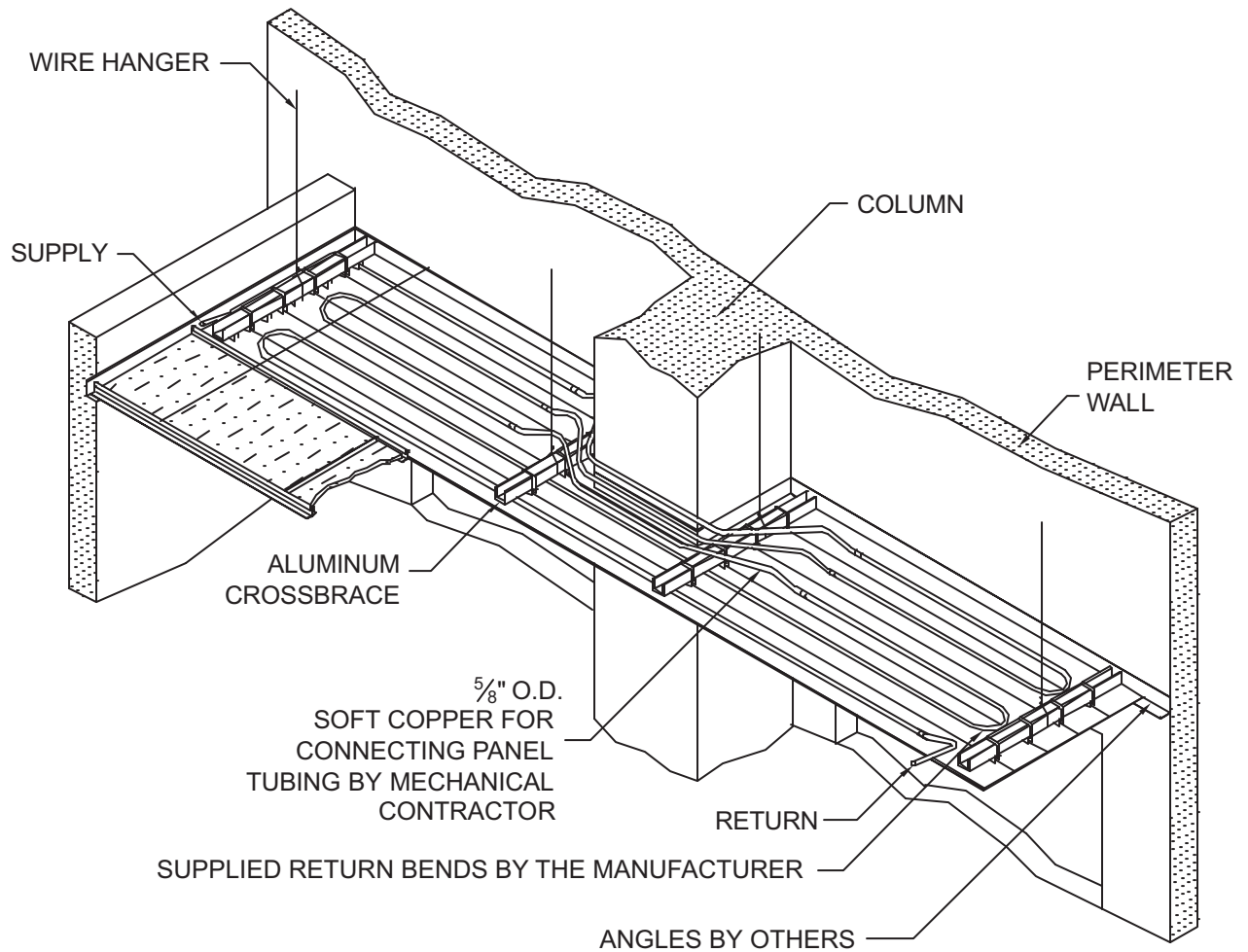


CORNER DETAILS



Linear Radiant Panel

SERPENTINE CIRCUITING AROUND COLUMN

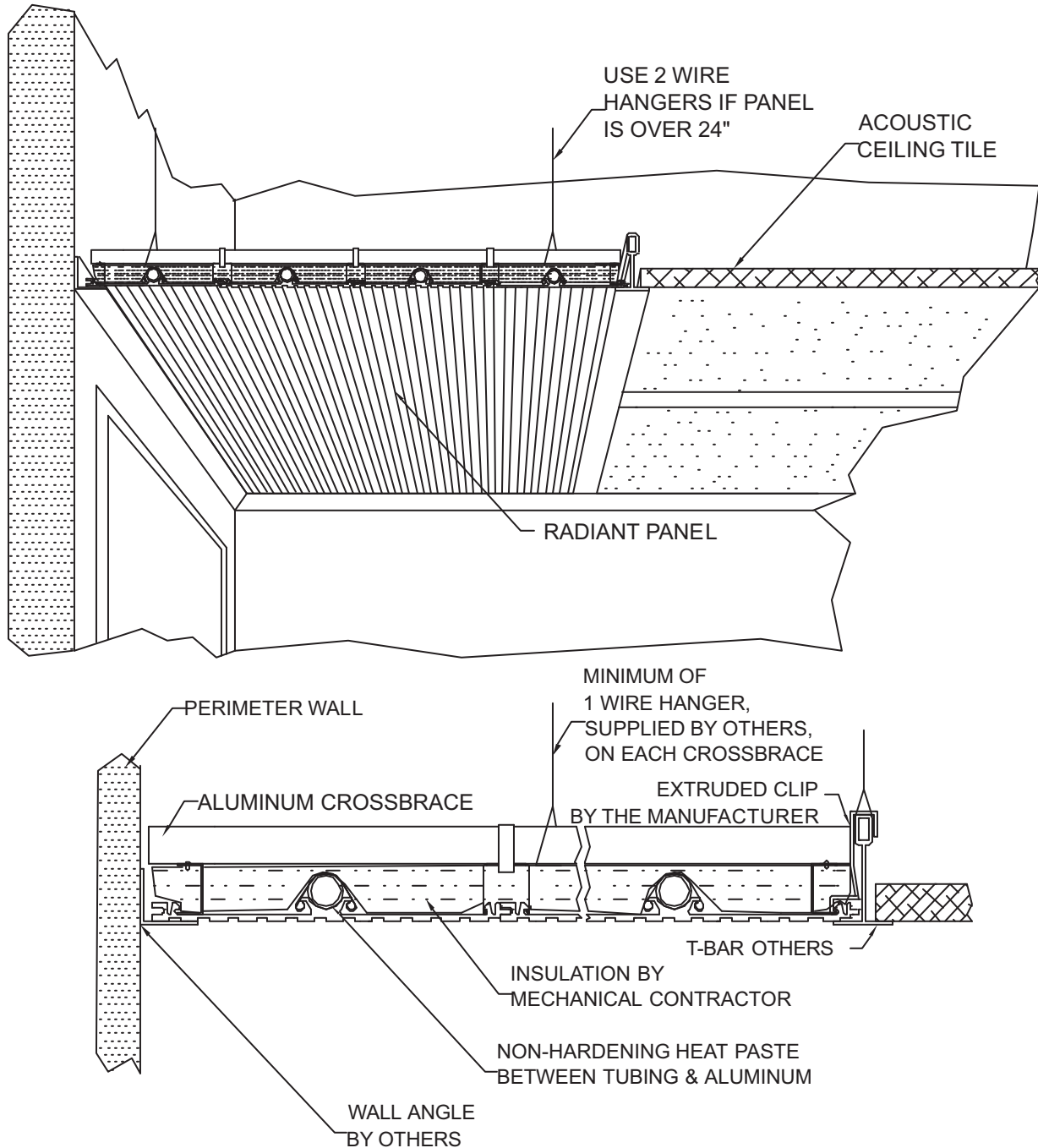


NOTE: PANEL WIDTH VARIES DUE TO DESIGN.

Linear Radiant Panel



INSTALLED IN PERIMETER T-BAR CEILING

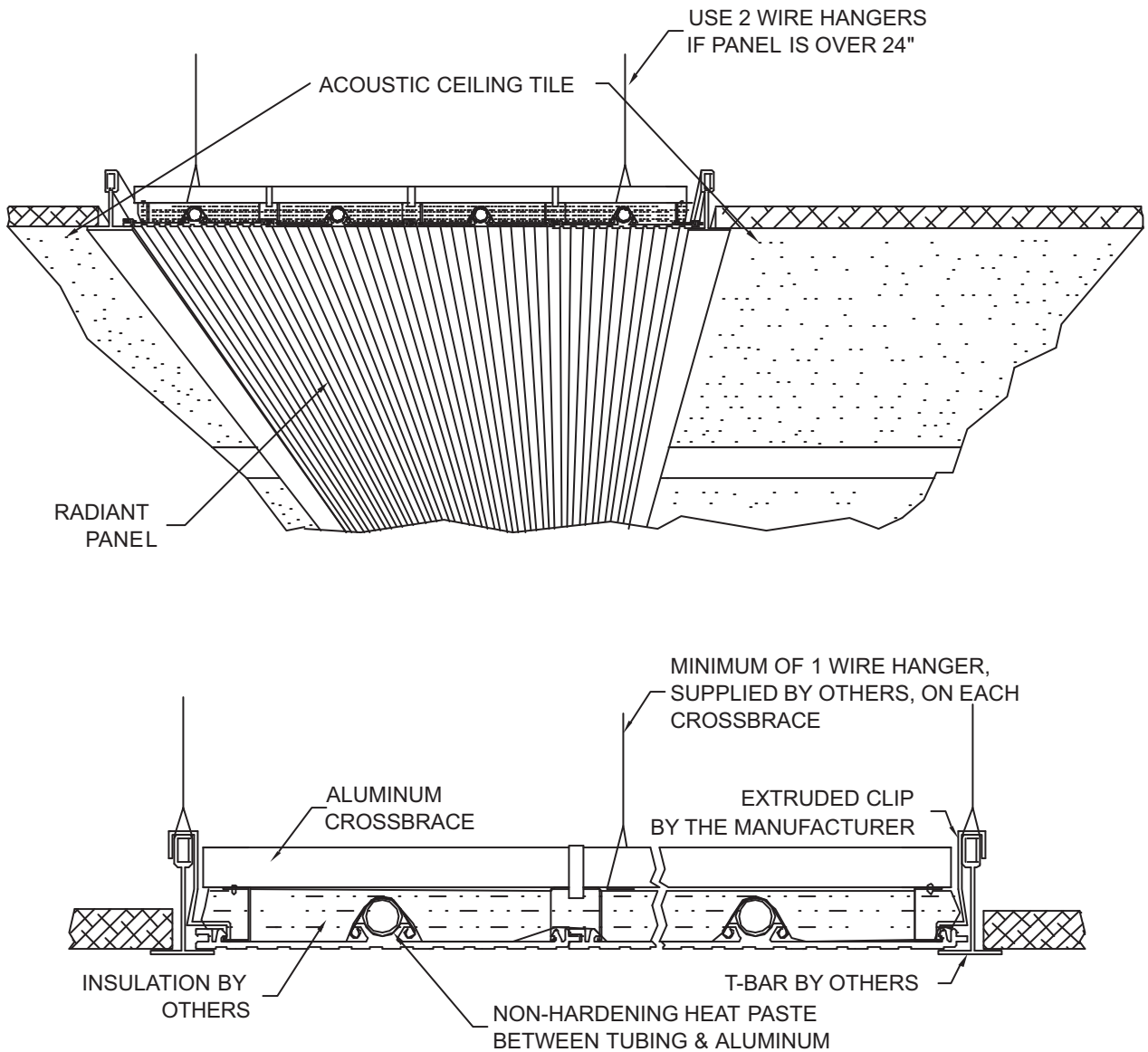


NOTE: OPENING FOR RADIANT PANEL OBTAINED FROM L-7.

Linear Radiant Panel

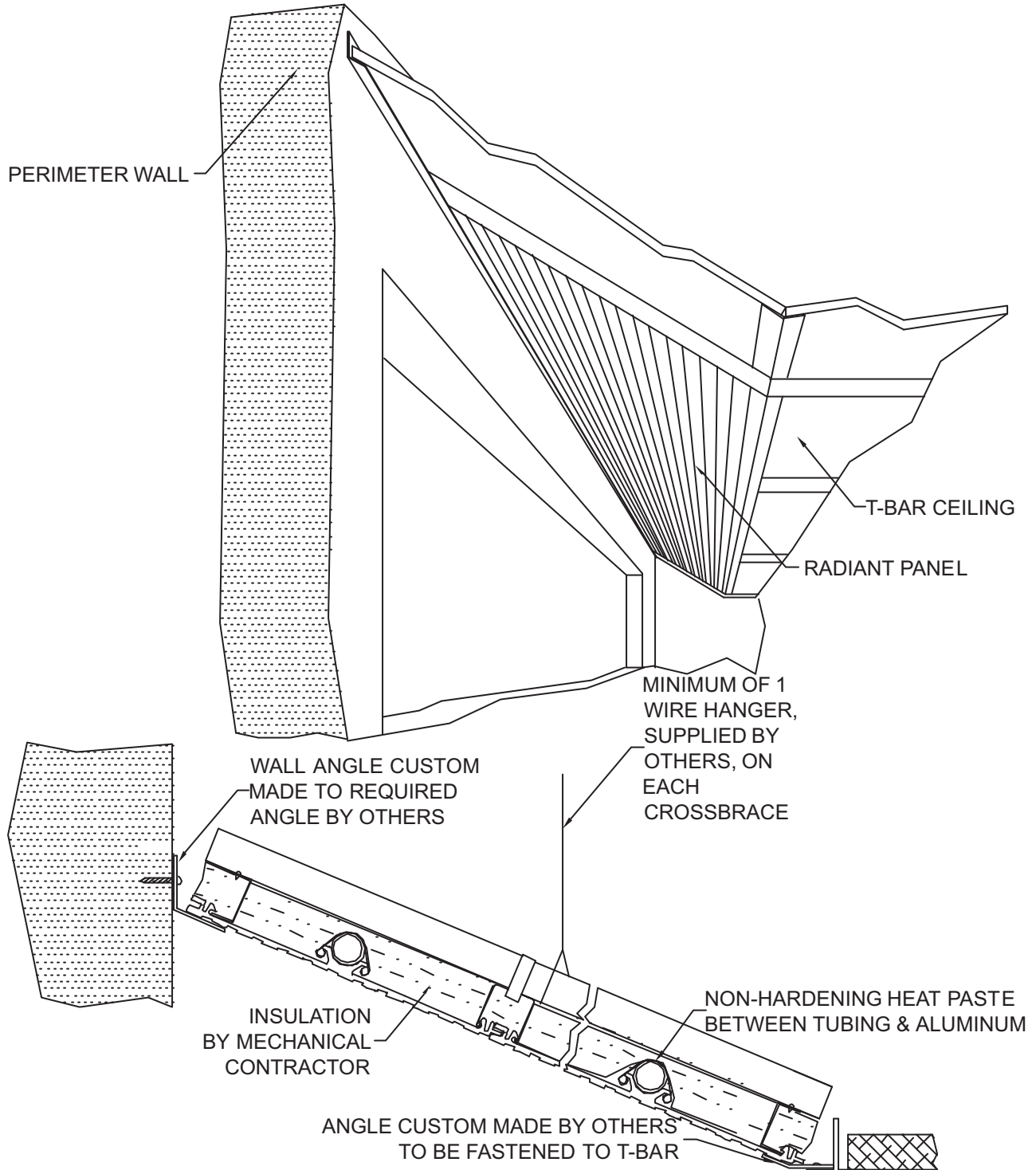


INSTALLED IN INTERIOR T-BAR CEILING



NOTE: OPENING FOR RADIANT PANEL OBTAINED FROM L-7.

SLOPED LINEAR PANEL IN T-BAR CEILING

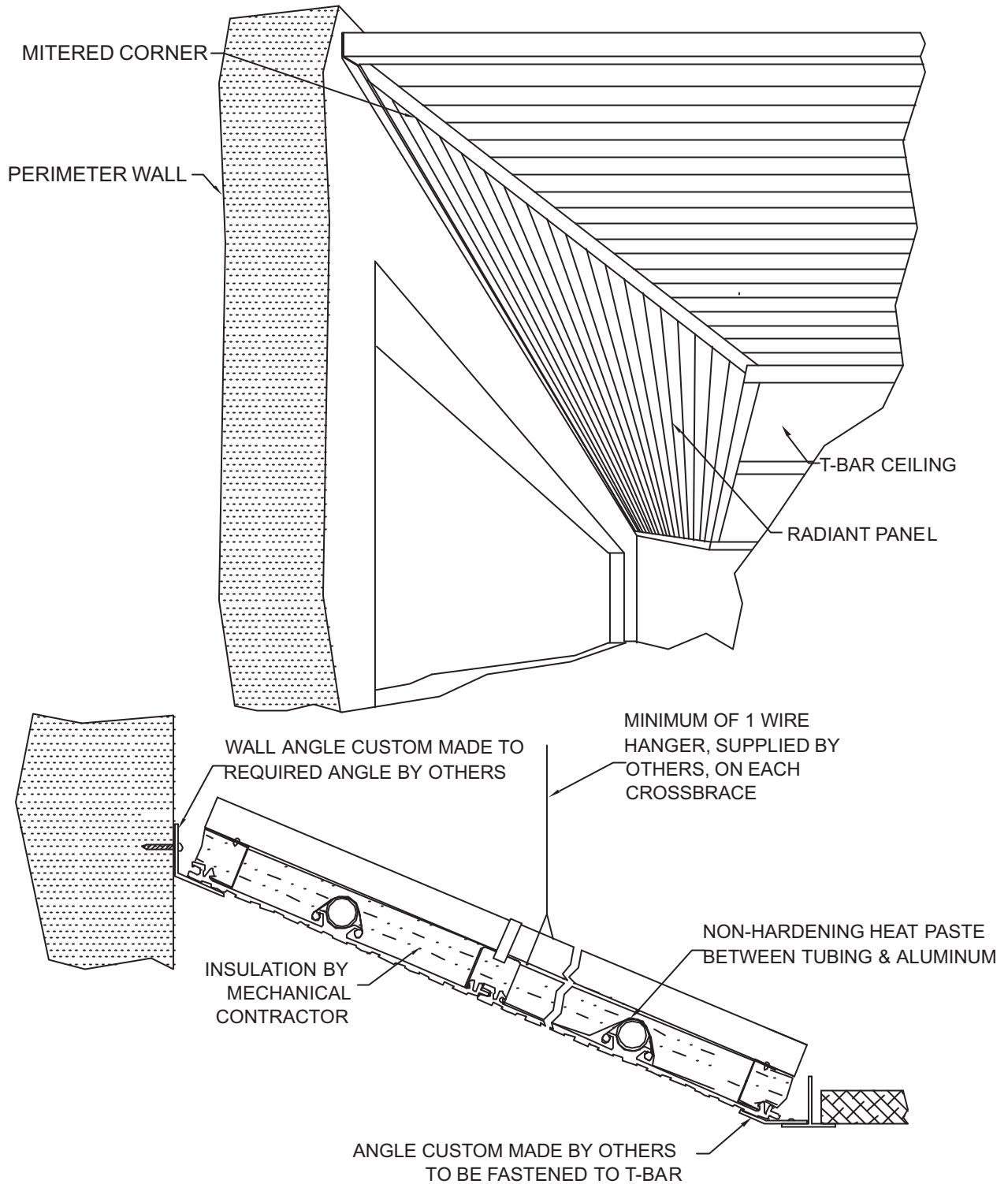


NOTE: OPENING FOR RADIANT PANEL OBTAINED FROM L-7.

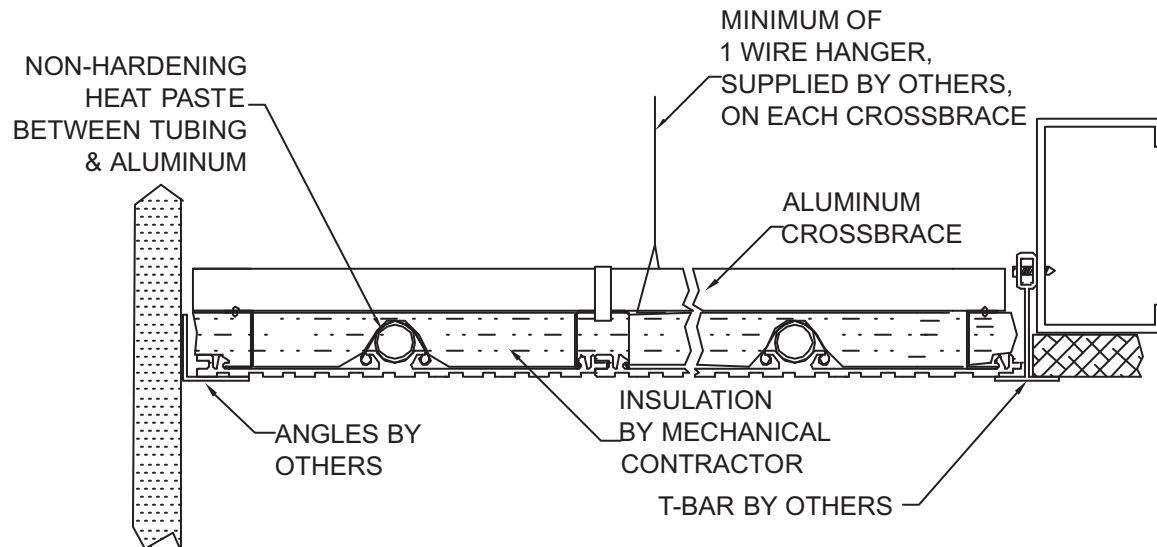
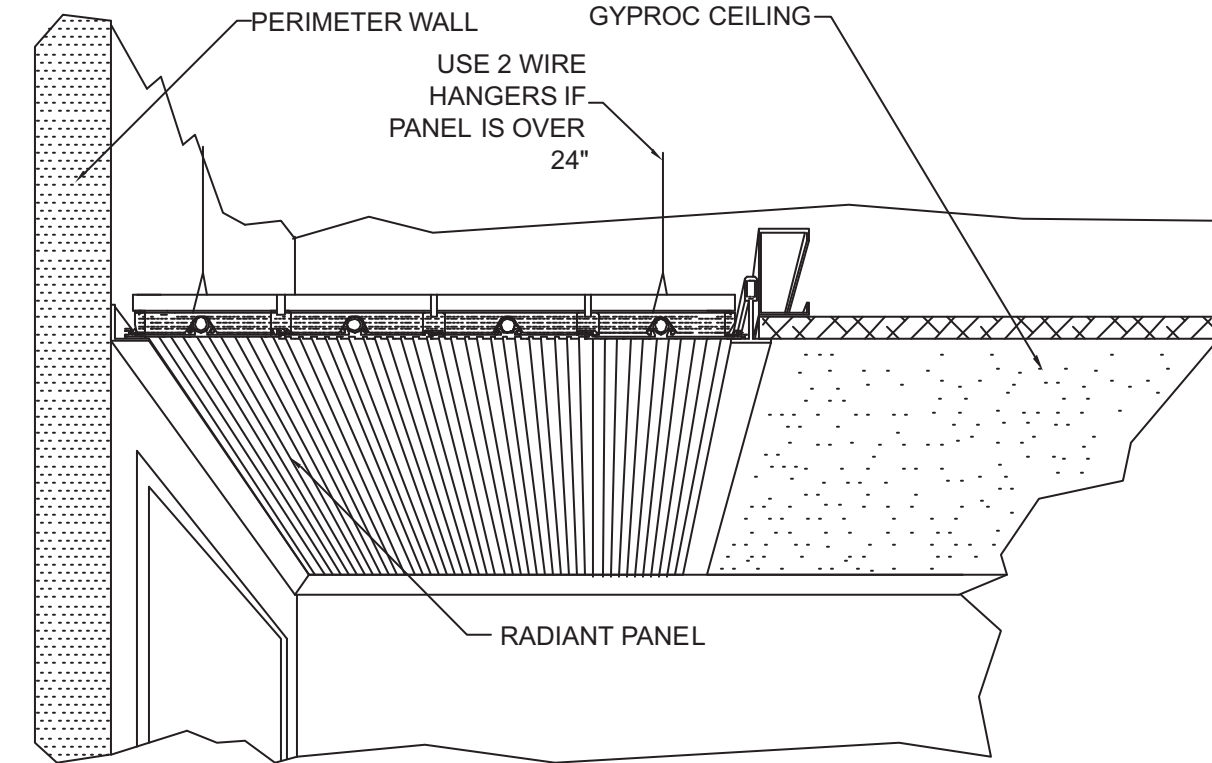
Linear Radiant Panel



SLOPED LINEAR PANEL IN T-BAR CEILING WITH CORNER

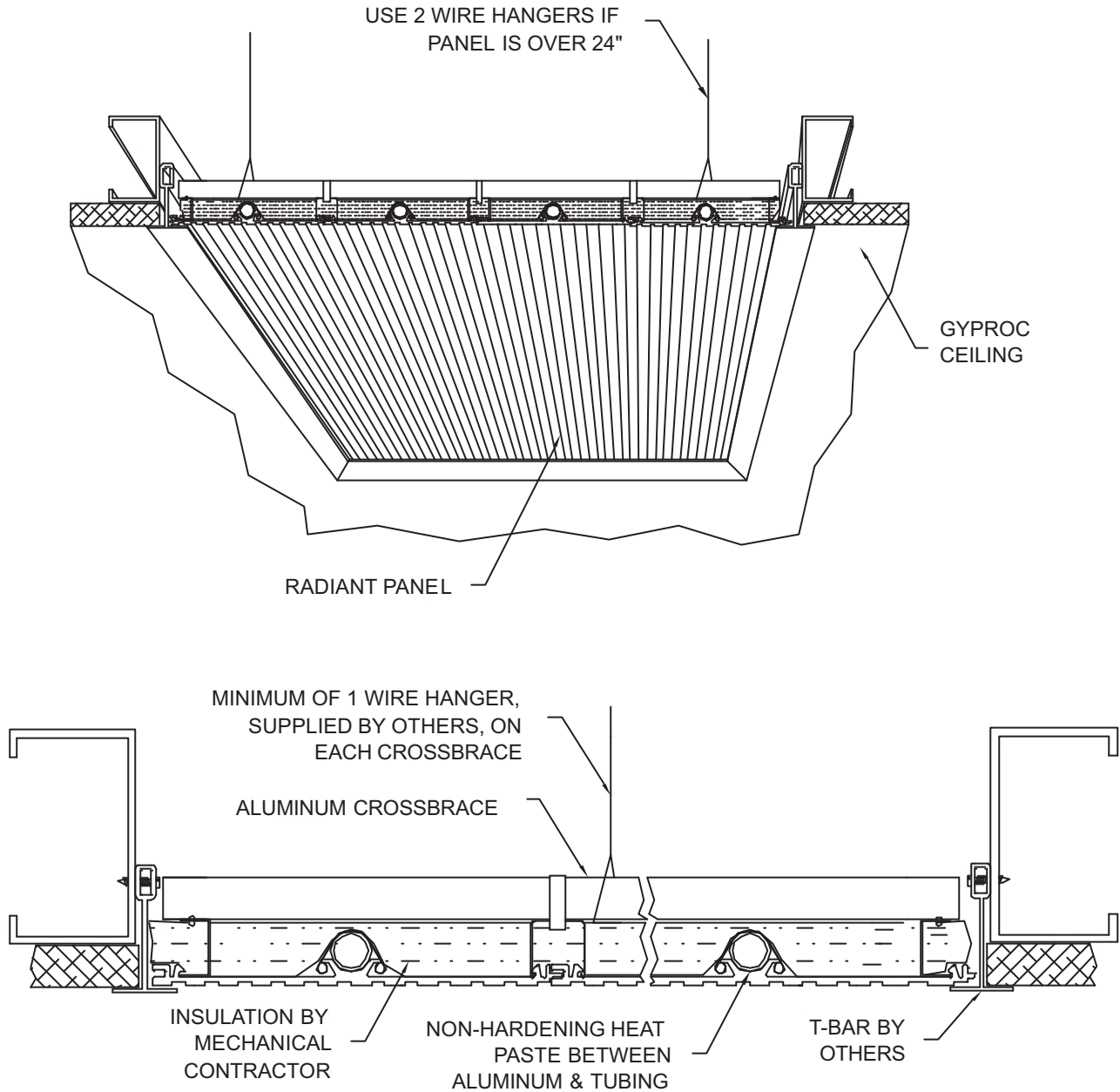


LINEAR PANELS AT PERIMETER WALL IN GYPROC CEILING



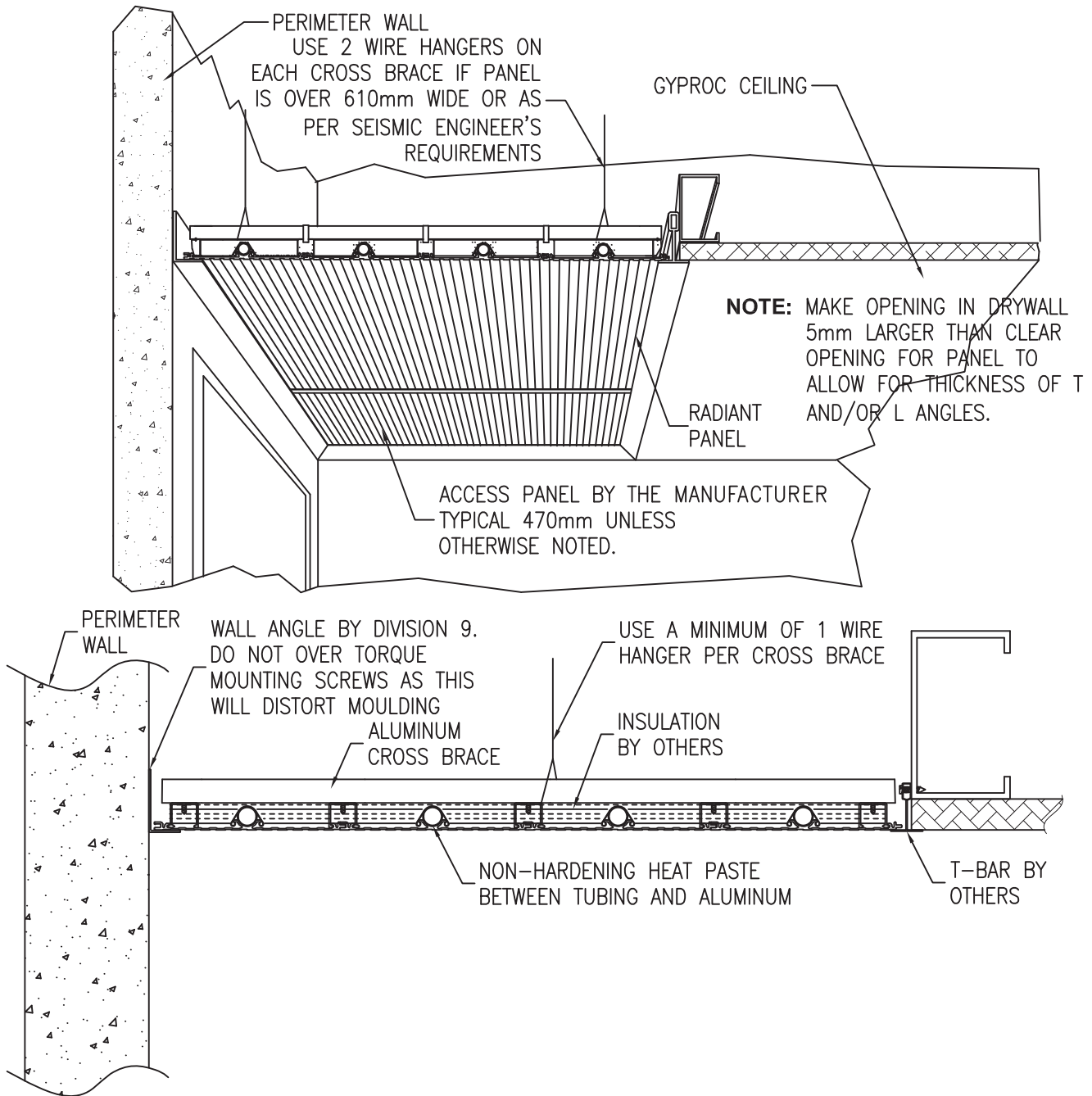
NOTE: OPENING FOR RADIANT PANEL OBTAINED FROM L-7. ACCESS TO SUPPLY, RETURN AND INTERCONNECTION BETWEEN PANELS WILL BE REQUIRED.

LINEAR PANELS IN GYPROC CEILING

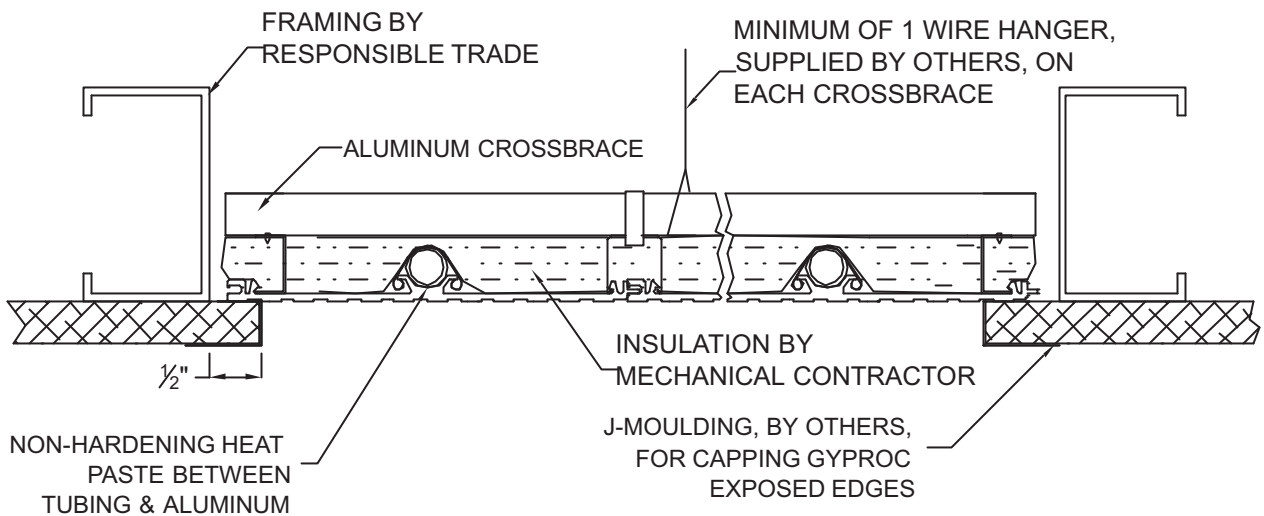
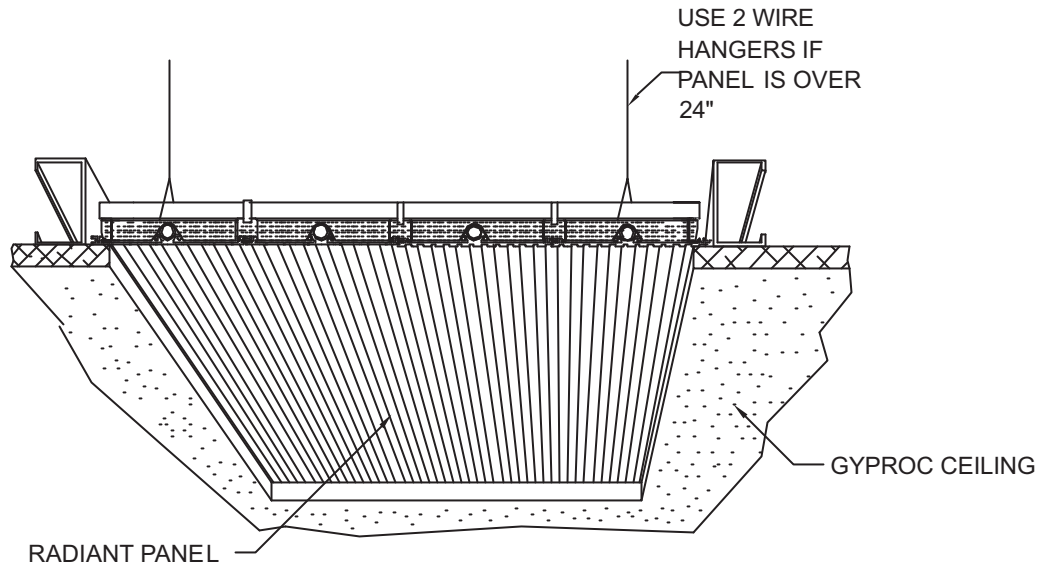


NOTE: OPENING FOR RADIANT PANEL OBTAINED FROM L-7. ACCESS TO SUPPLY, RETURN AND INTERCONNECTION BETWEEN PANELS WILL BE REQUIRED.

LINEAR PANELS AT PERIMETER WALL IN GYPROC CEILING



RECESSED LINEAR PANEL IN GYPROC CEILING



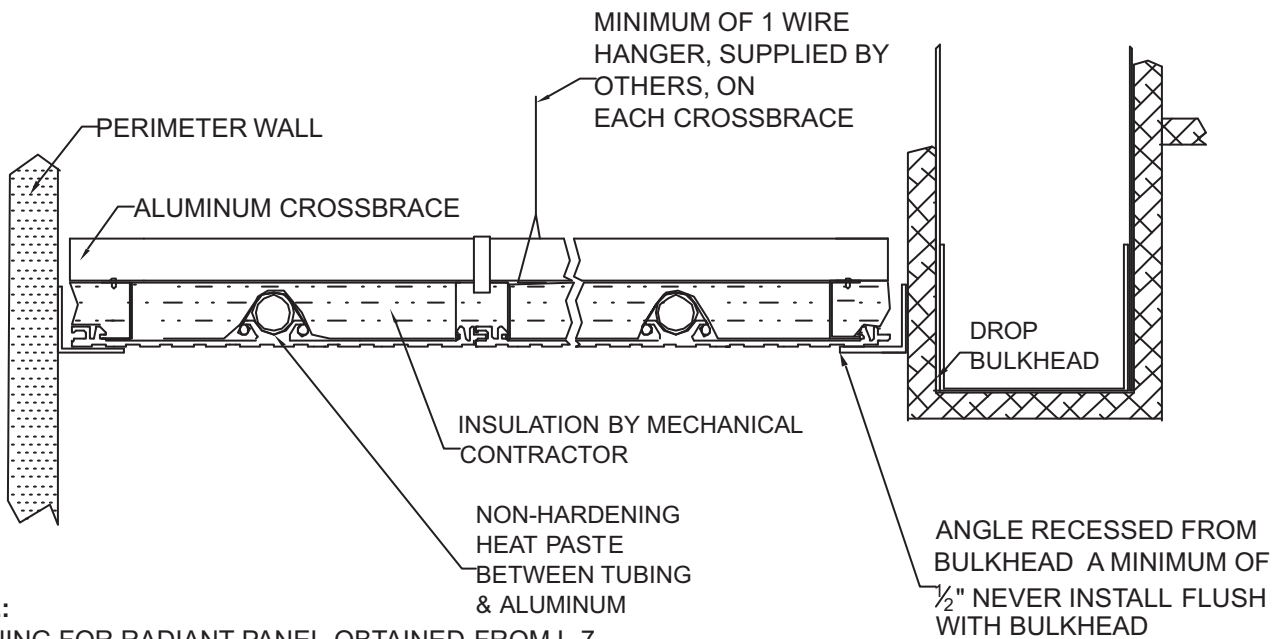
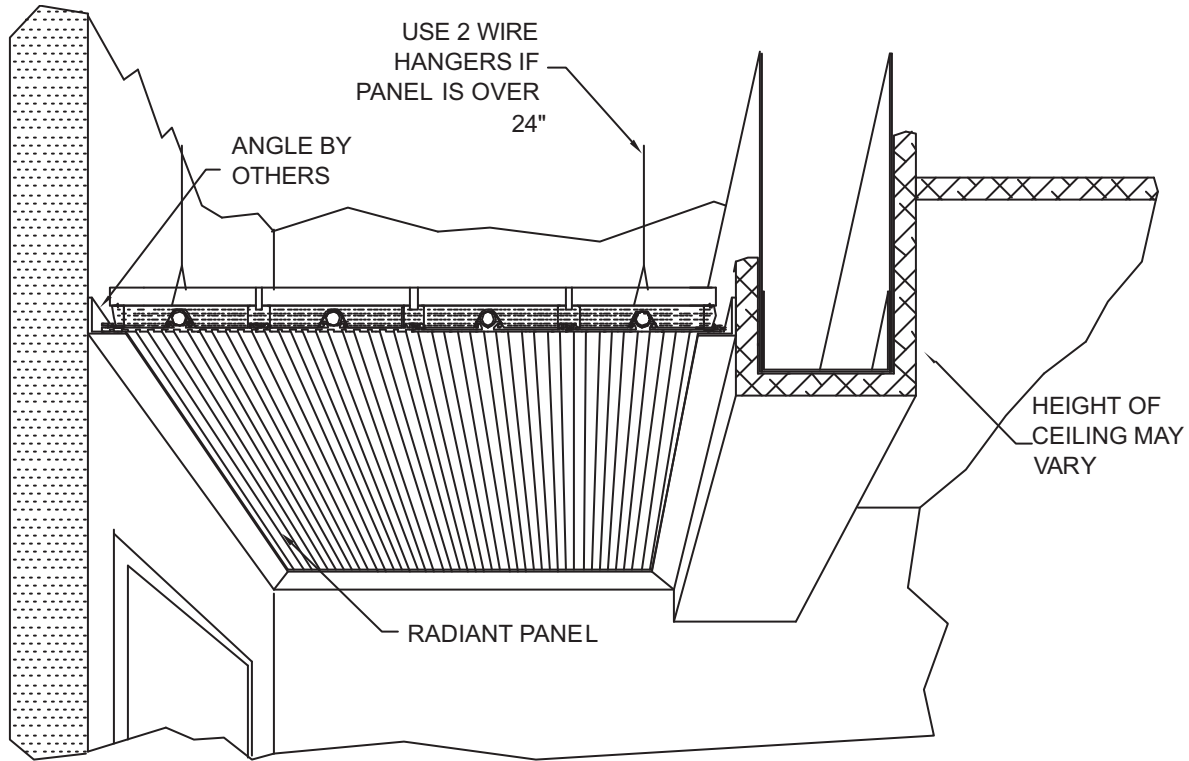
NOTE:

ACCESS TO SUPPLY, RETURN AND INTERCONNECTION BETWEEN PANELS WILL BE REQUIRED. OPENING FOR RADIANT PANEL OBTAINED FROM L-7.

Linear Radiant Panel



LINEAR PANEL BEHIND BULKHEAD

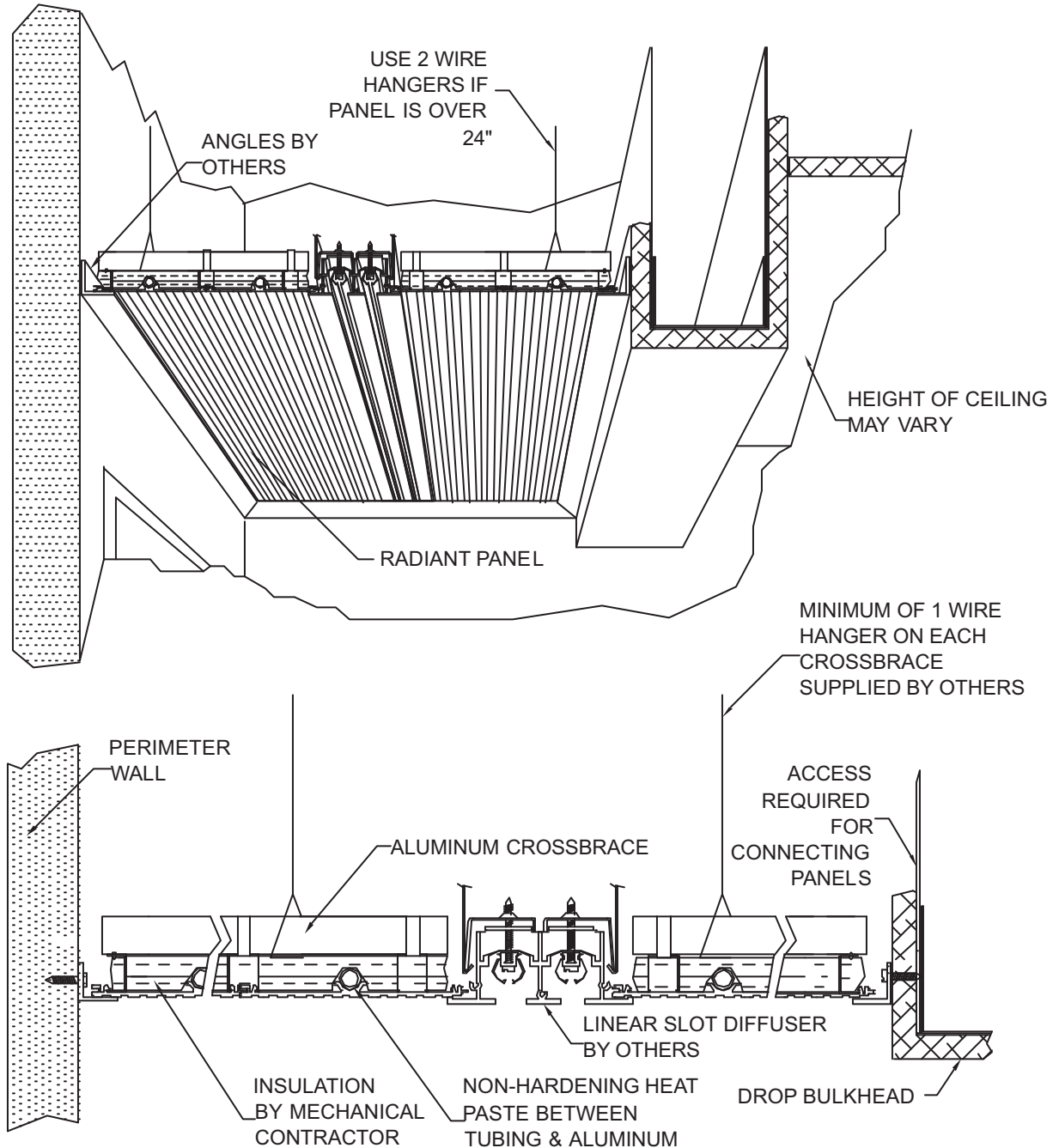


NOTE:
OPENING FOR RADIANT PANEL OBTAINED FROM L-7.
ACCESS THROUGH BULKHEAD REQUIRED FOR CONNECTION

Linear Radiant Panel



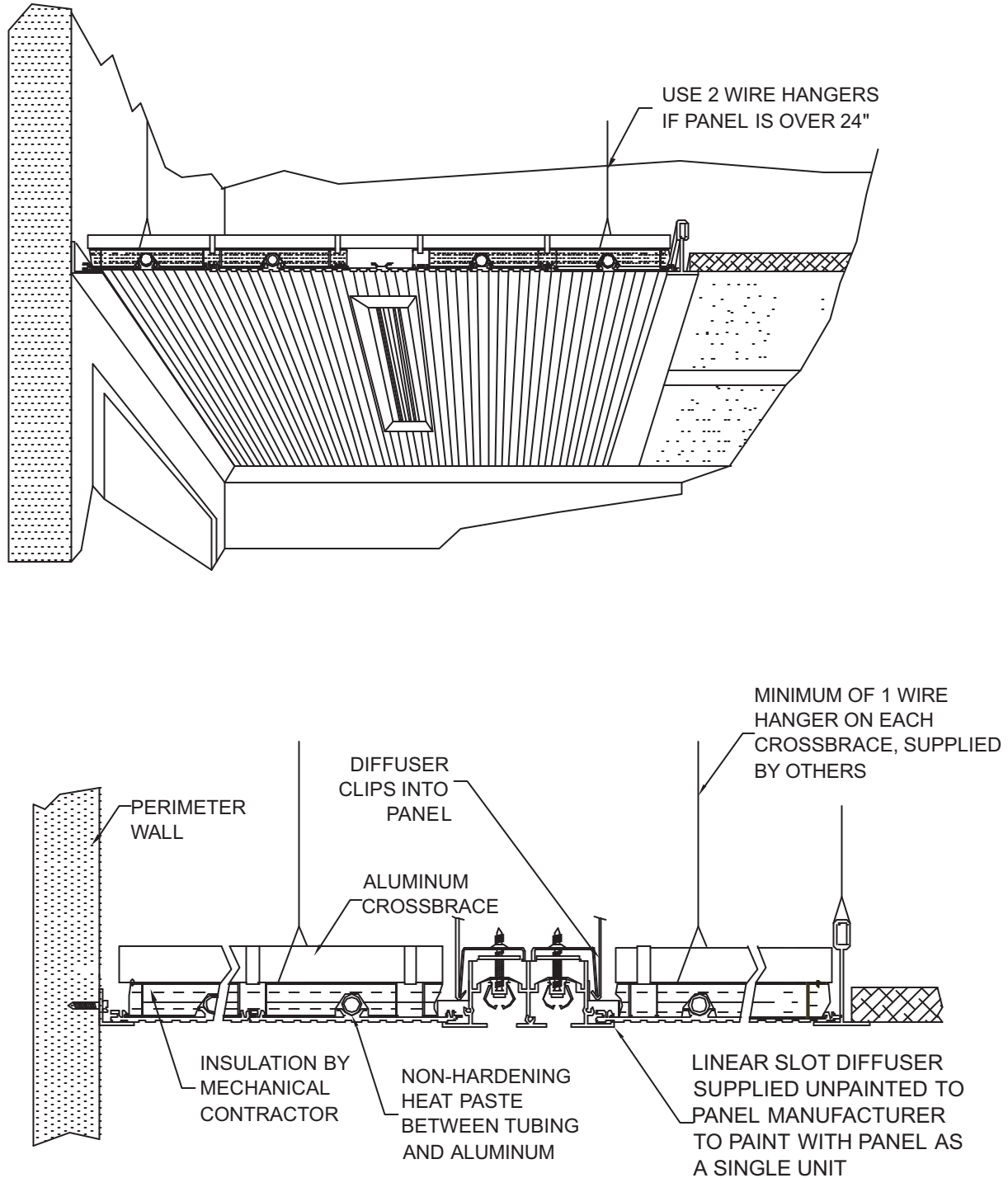
SLOT DIFFUSER IN LINEAR PANEL BEHIND BULKHEAD



Linear Radiant Panel



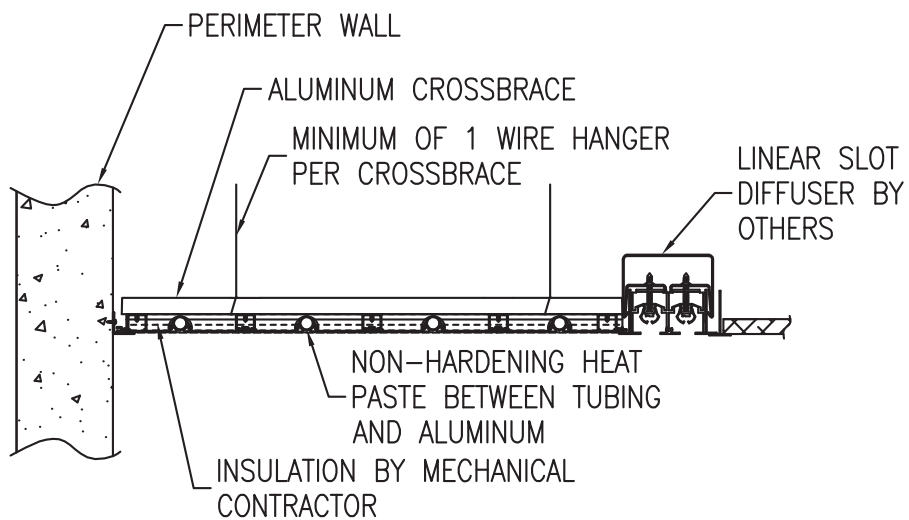
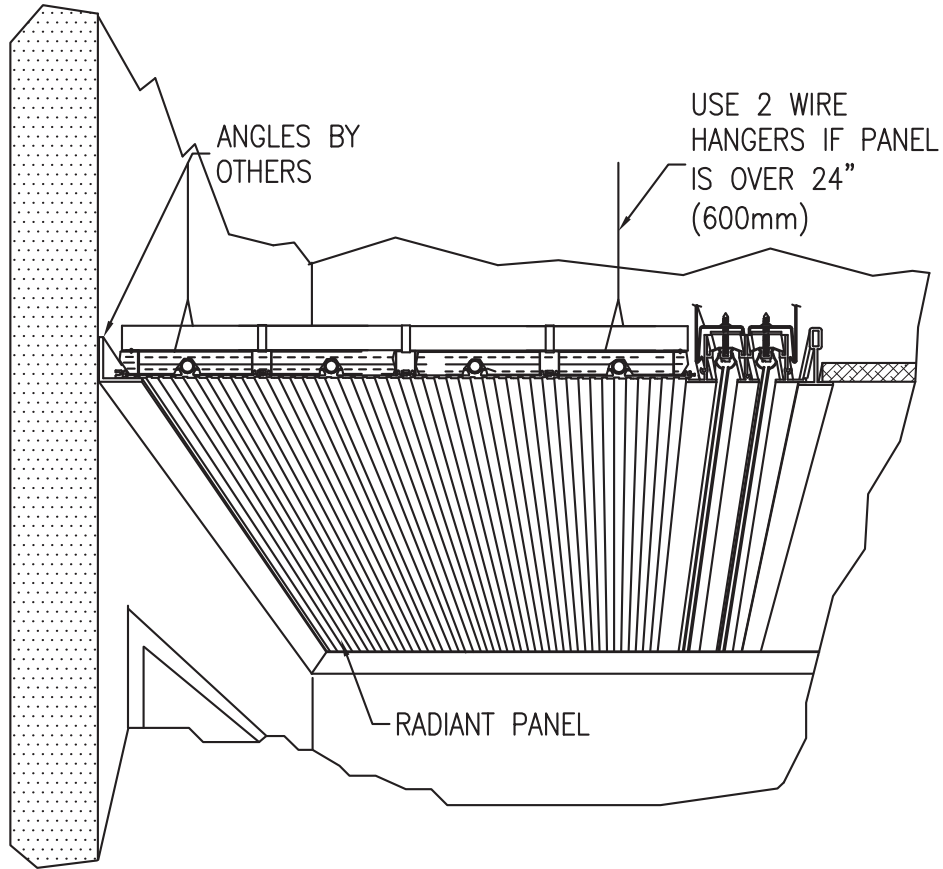
SLOT DIFFUSER IN LINEAR PANEL IN T-BAR



Linear Radiant Panel



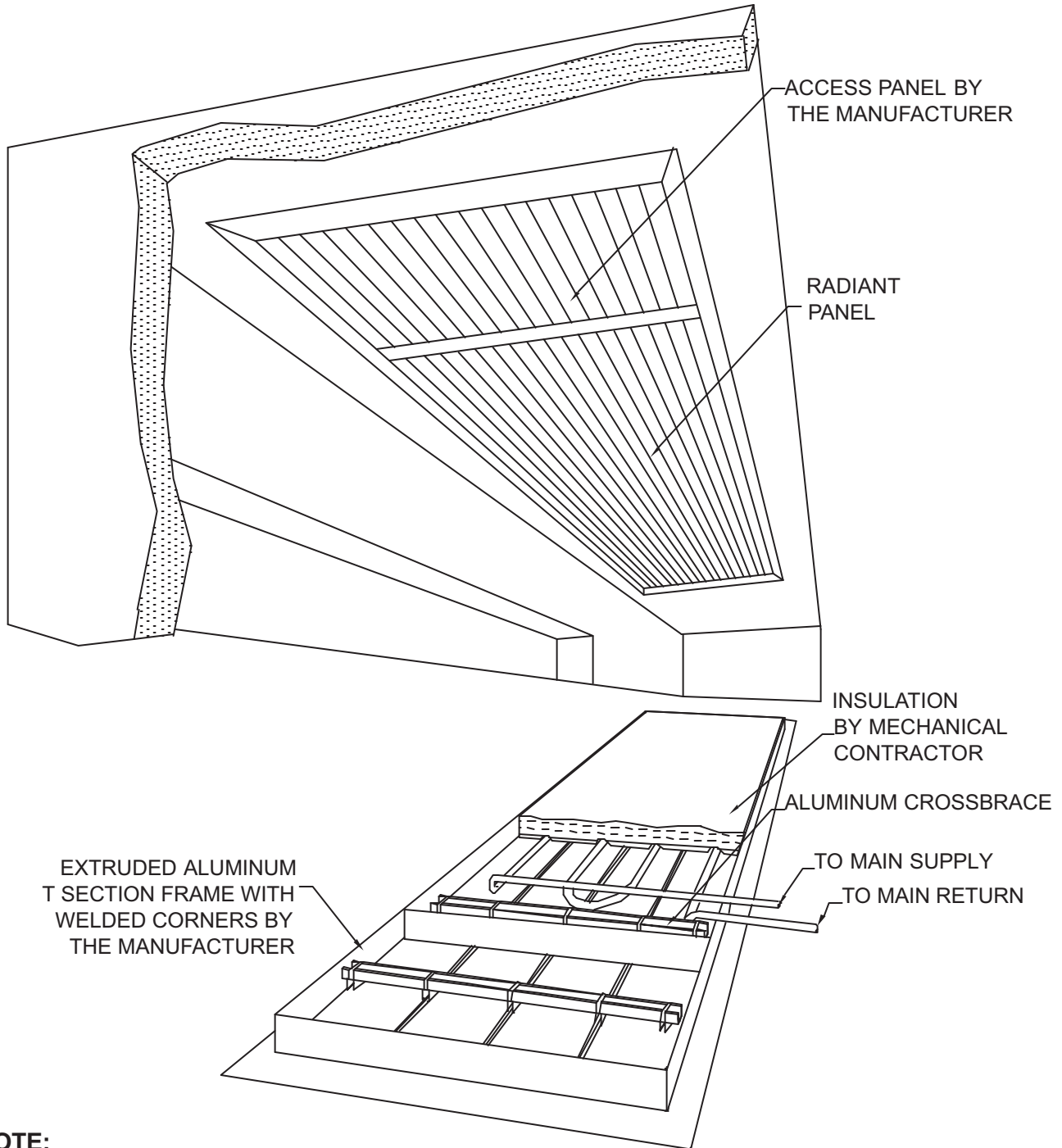
SLOT DIFFUSER IN LINEAR PANEL



Linear Radiant Panel



FRAMED PANEL WITH ACCESS PANEL IN GYPROC CEILING



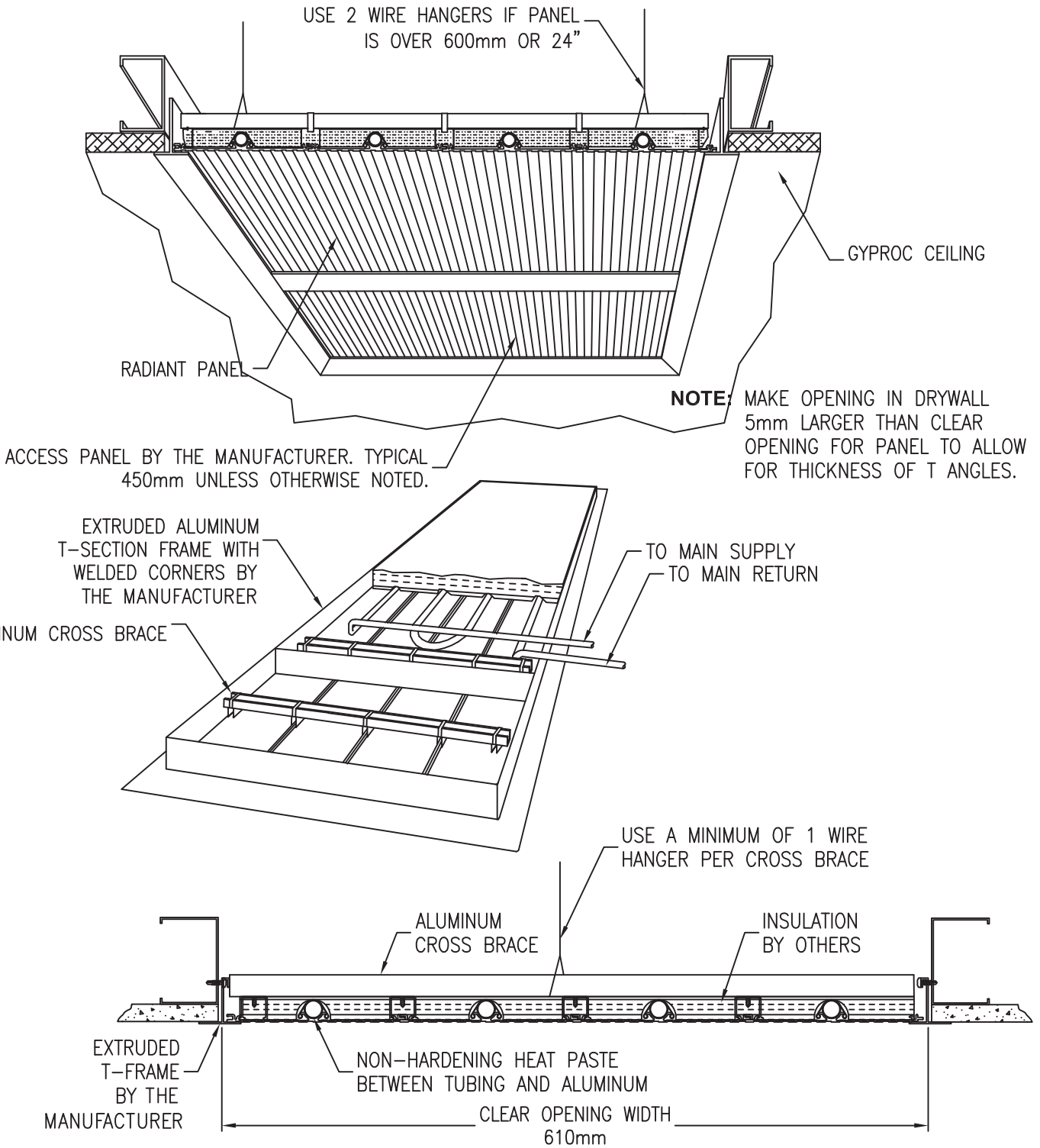
NOTE:

CONNECTIONS TO VALVES DONE ABOVE ACTIVE PANEL TO ALLOW FOR ACCESS PANEL PLACEMENT. OPENING FOR RADIANT PANEL OBTAINED FROM L-7.

Linear Radiant Panel



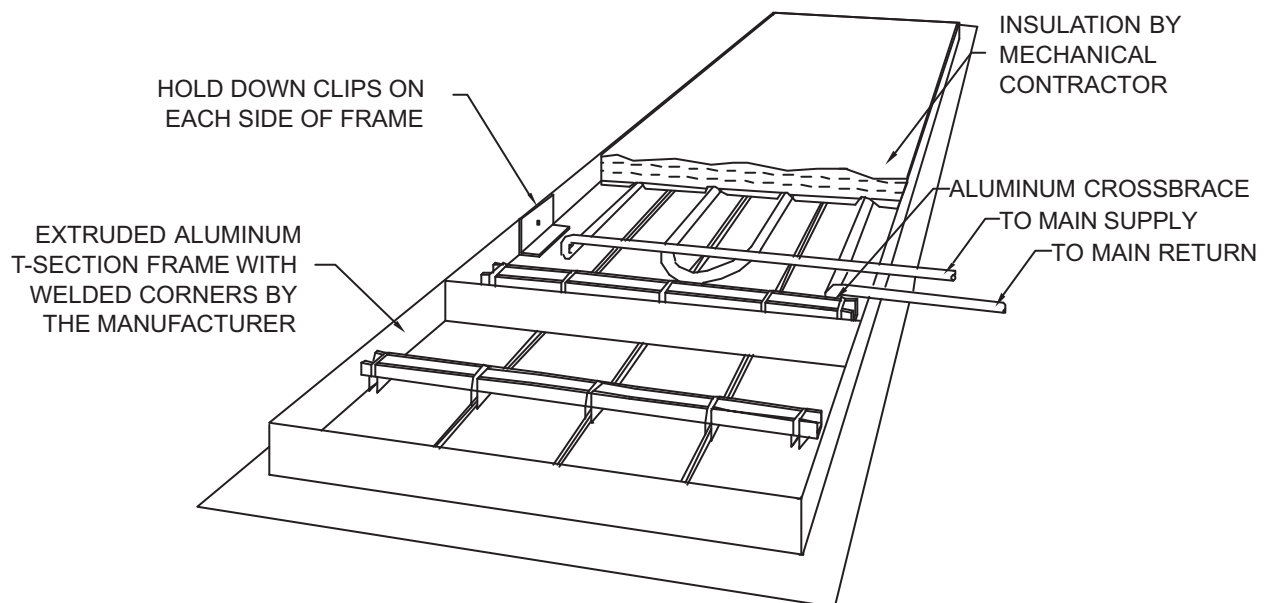
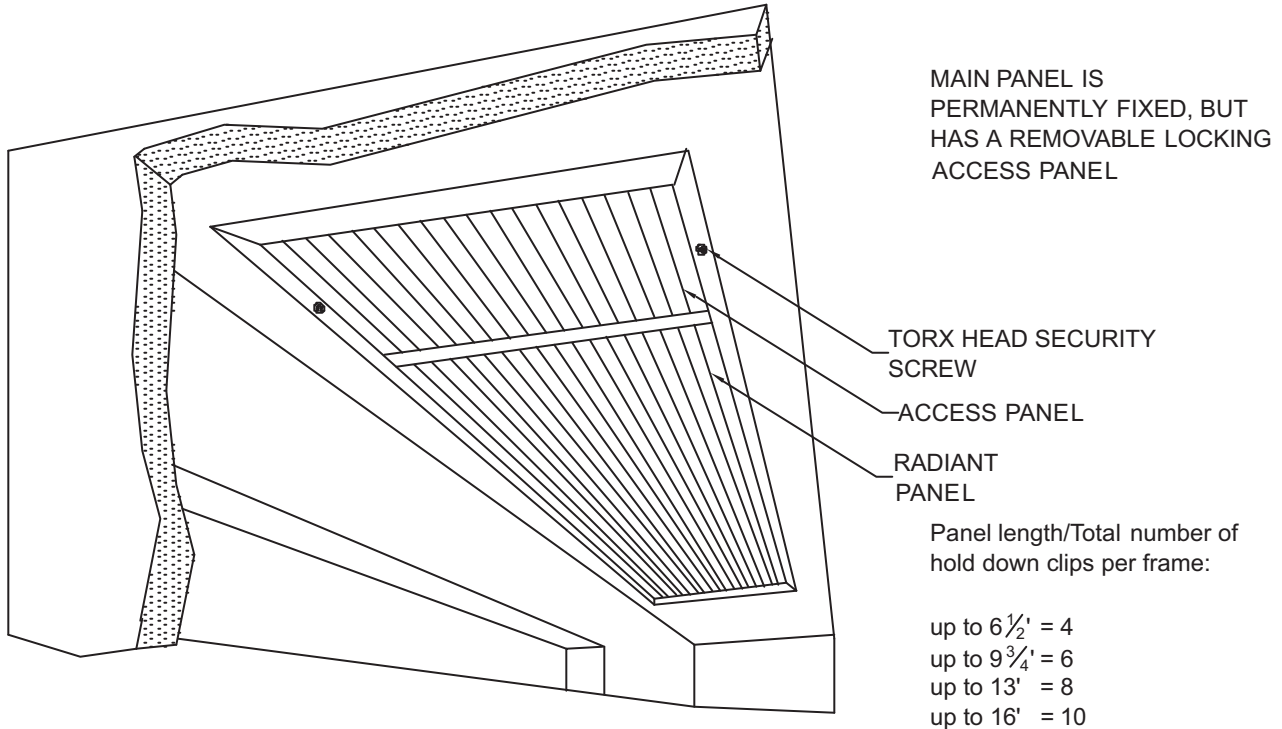
FRAMED LINEAR PANEL IN GYPROC CEILING



Linear Radiant Panel



FRAMED LINEAR SECURITY PANEL WITH ACCESS PANEL IN GYPROC CEILING

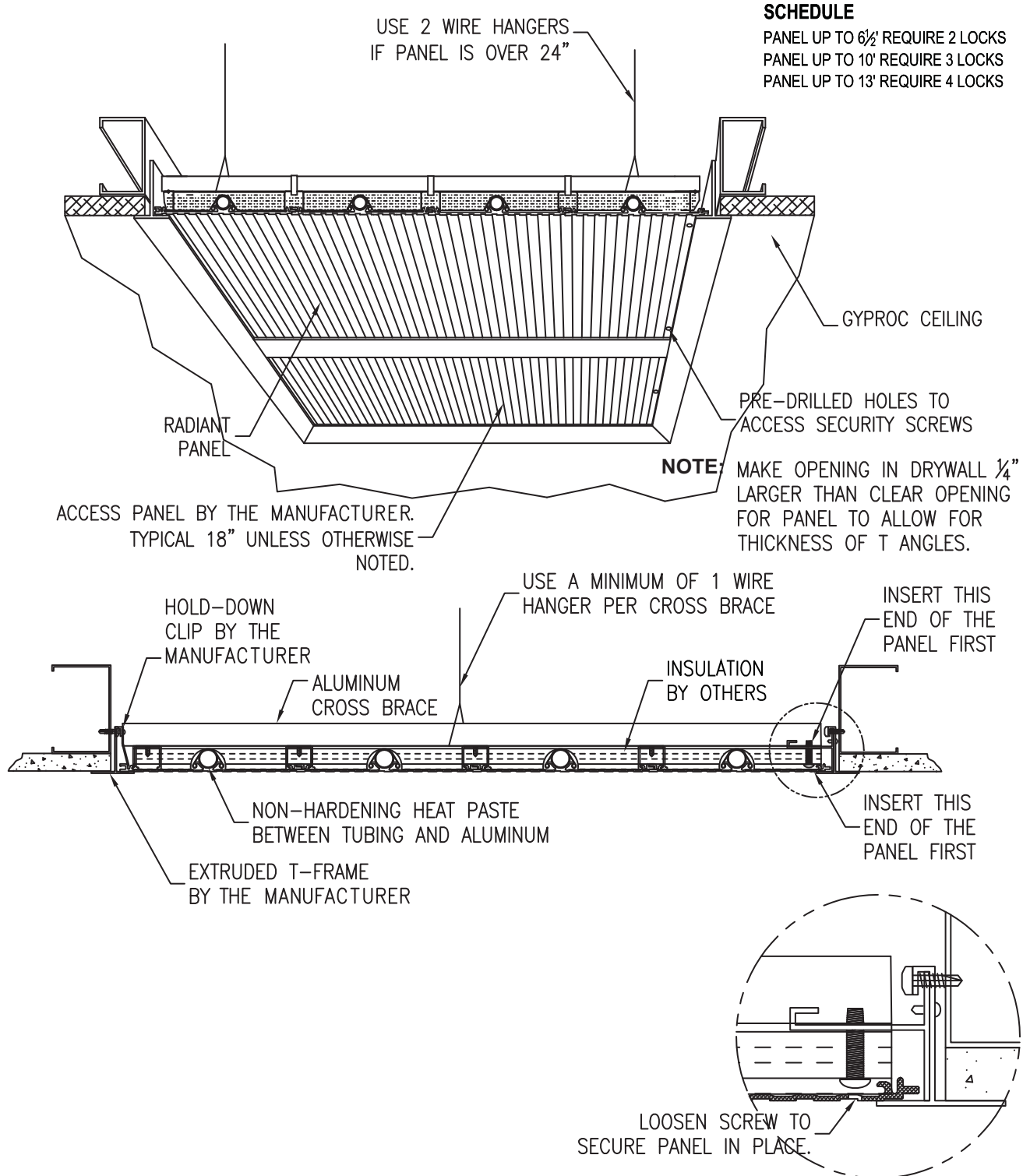


NOTE: OPENING FOR RADIANT PANEL OBTAINED FROM L-7. CONNECTIONS TO VALVES DONE ABOVE ACTIVE PANEL TO ALLOW FOR ACCESS PANEL PLACEMENT

Linear Radiant Panel



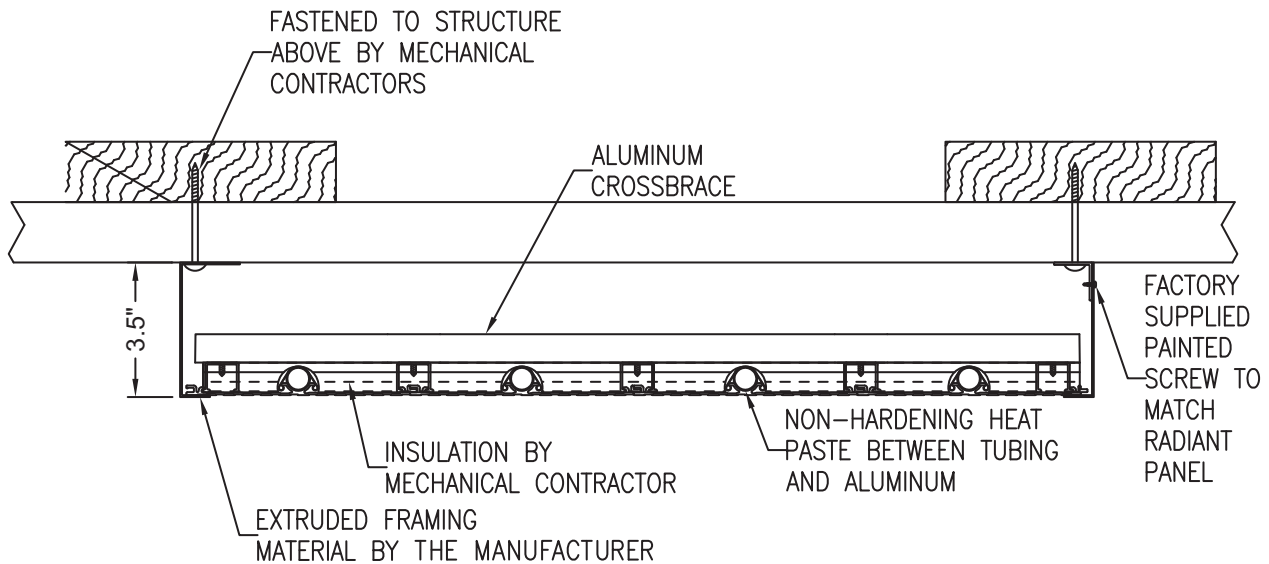
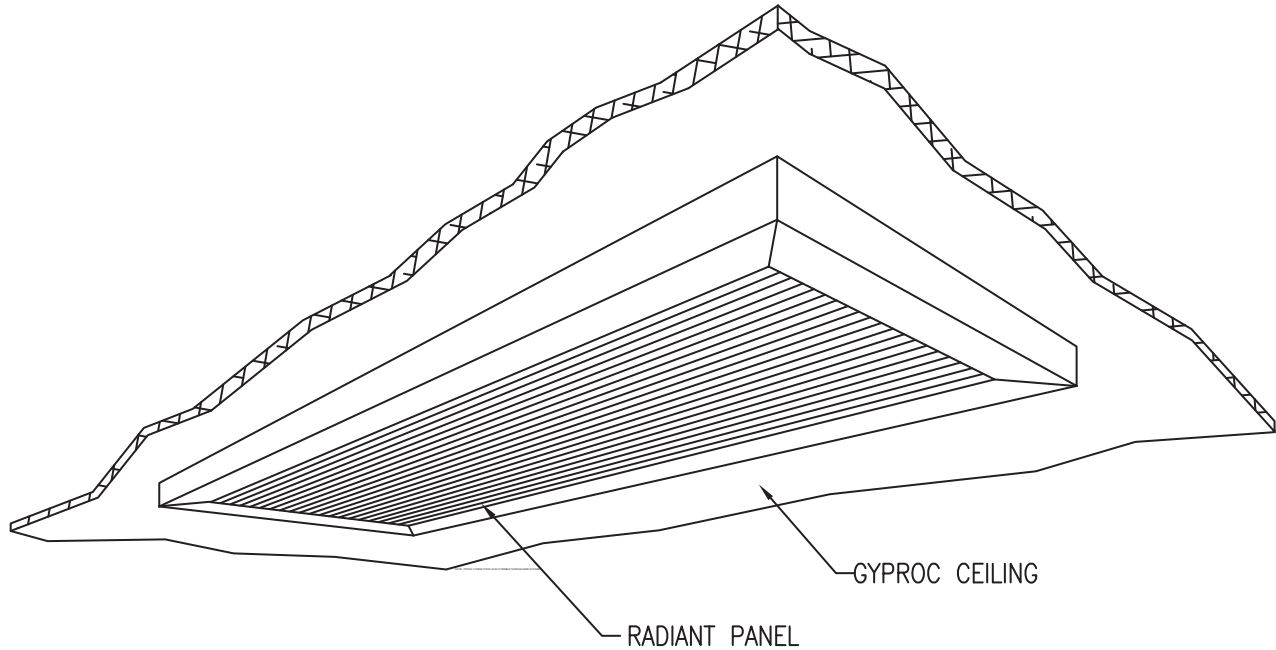
REMOVABLE LOCKING LINEAR PANEL IN GYPROC CEILING



Linear Radiant Panel



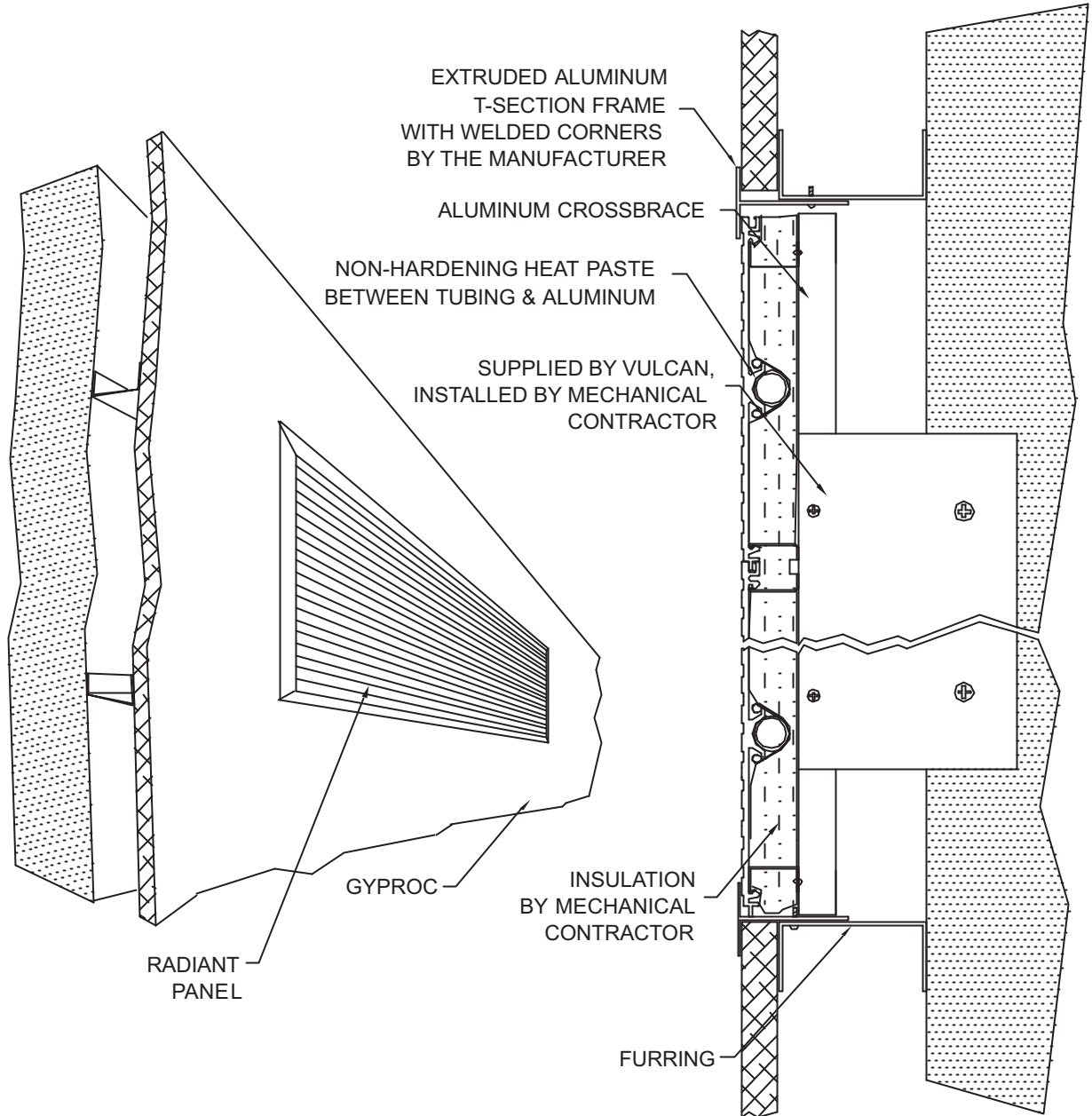
SURFACE MOUNTED LINEAR PANEL



Linear Radiant Panel



VERTICAL LINEAR PANEL IN GYPROC WALL



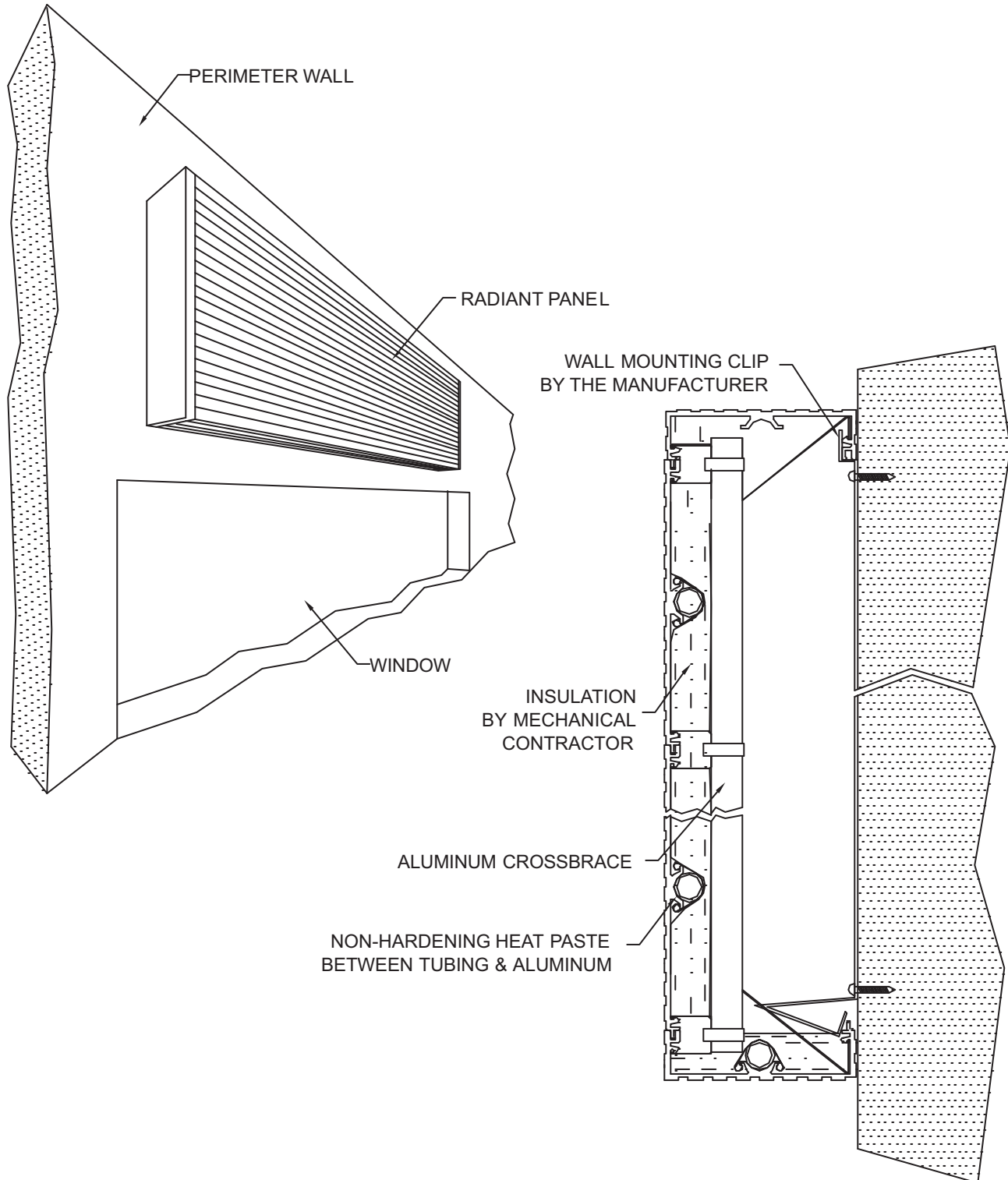
NOTE:

ACCESS REQUIRED TO THE BACK OF RADIANT PANEL TO ALLOW FOR CONNECTION OF PIPING AND HOLDING BRACKET.

OPENING FOR RADIANT PANEL OBTAINED FROM L-7.

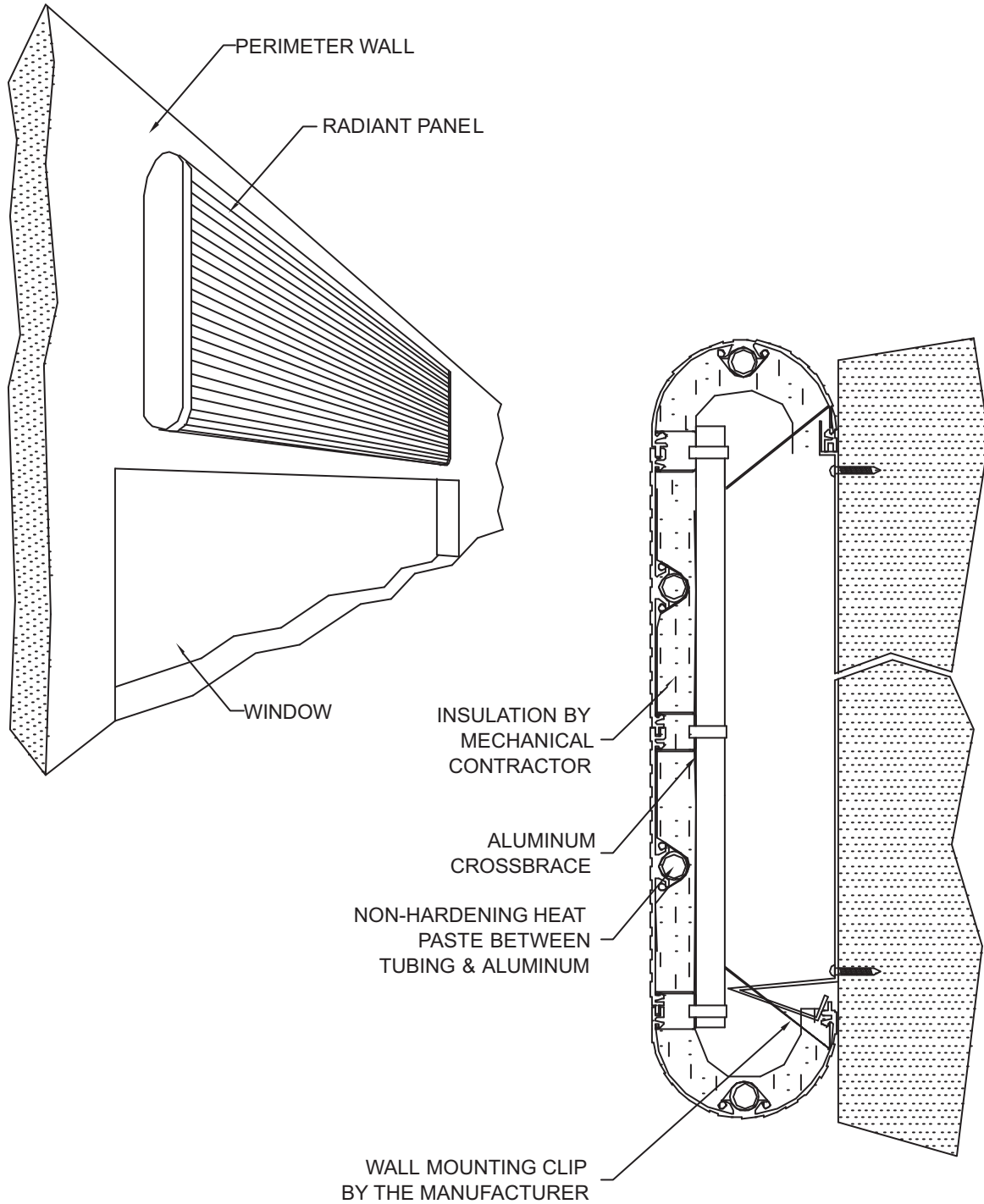
Linear Radiant Panel

SURFACE WALL MOUNTED LINEAR PANEL



Linear Radiant Panel

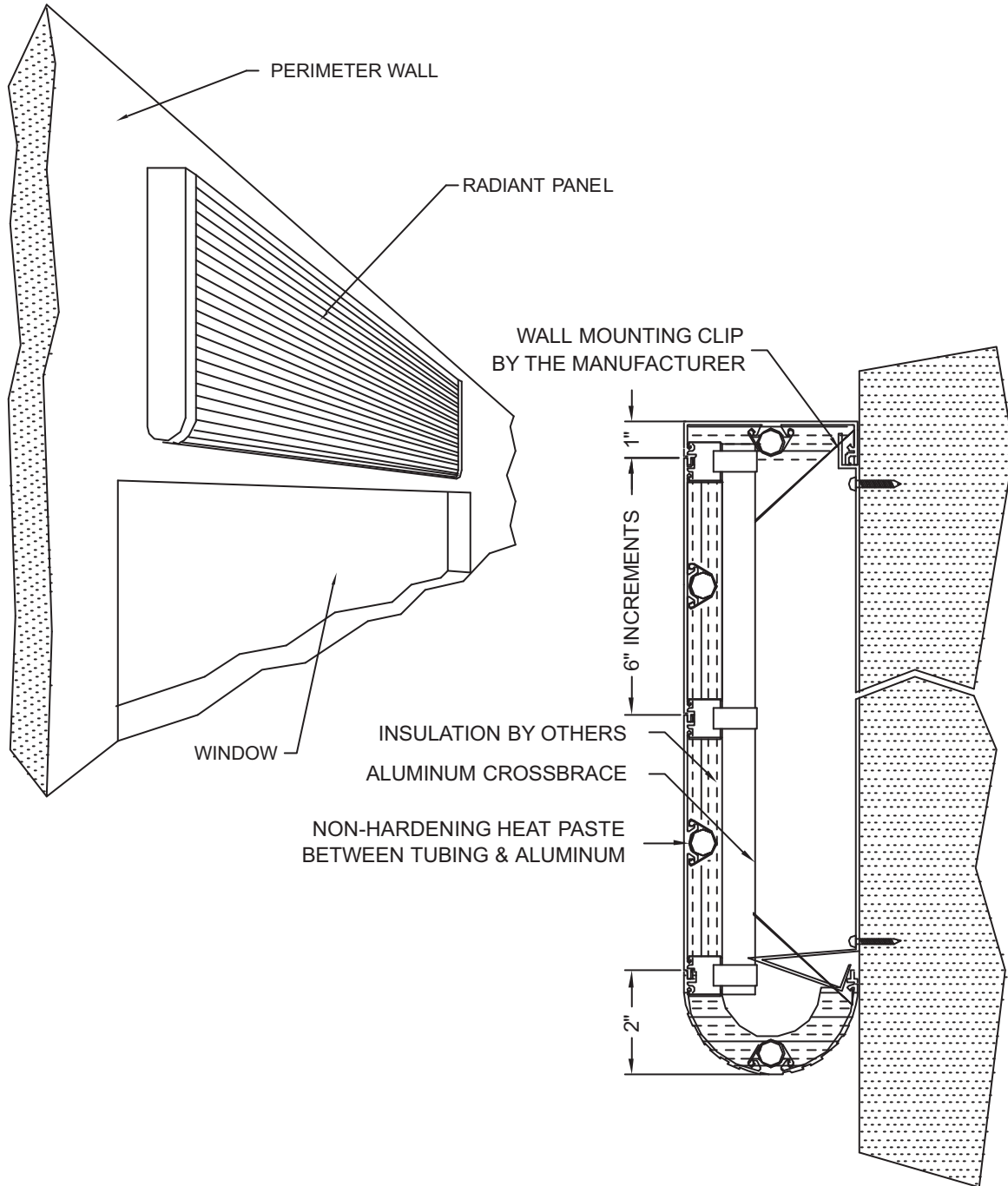
SURFACE WALL MOUNTED LINEAR PANEL



Linear Radiant Panel

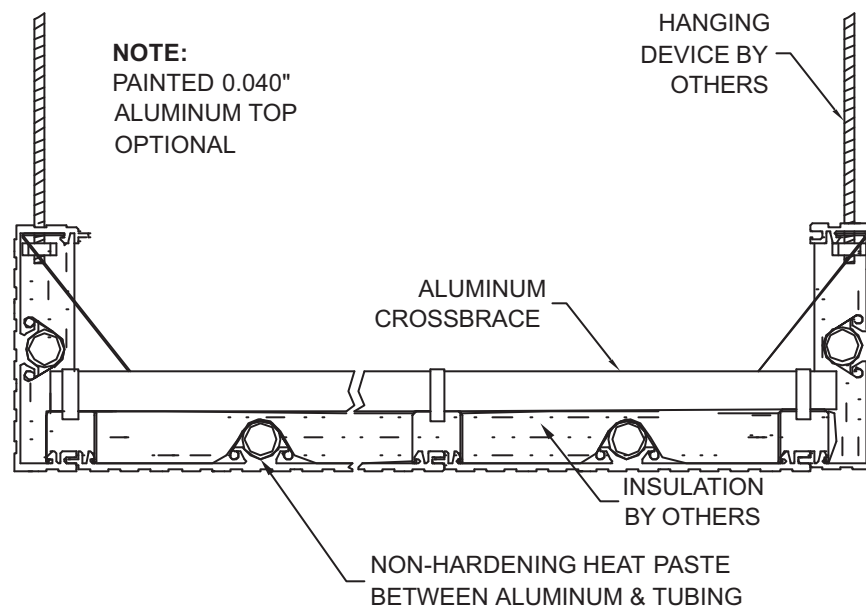
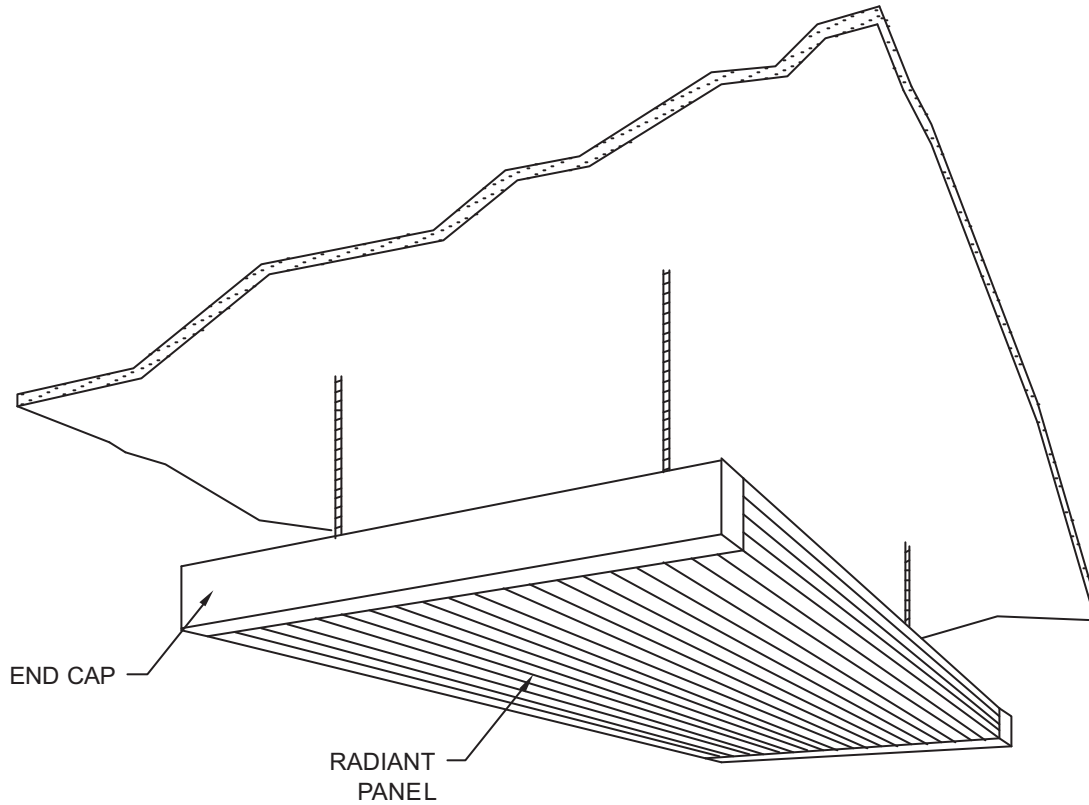


SURFACE WALL MOUNTED LINEAR PANEL



Linear Radiant Panel

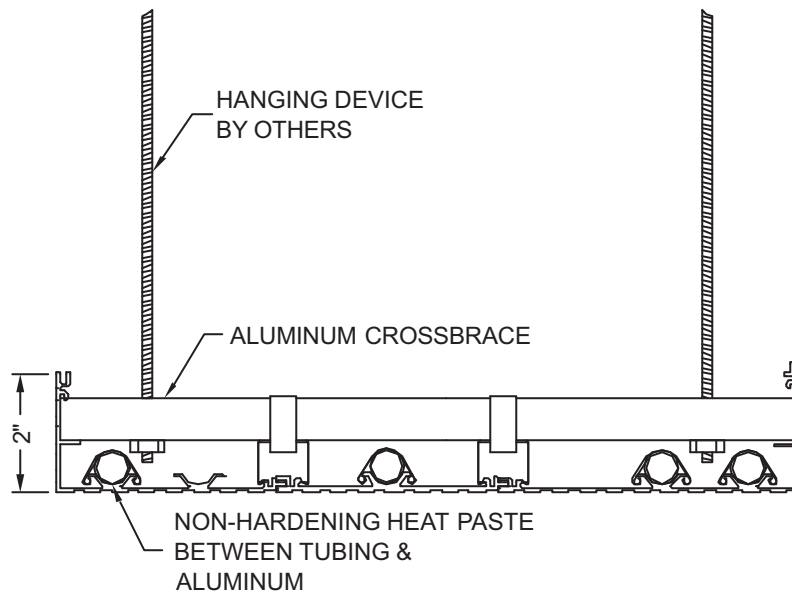
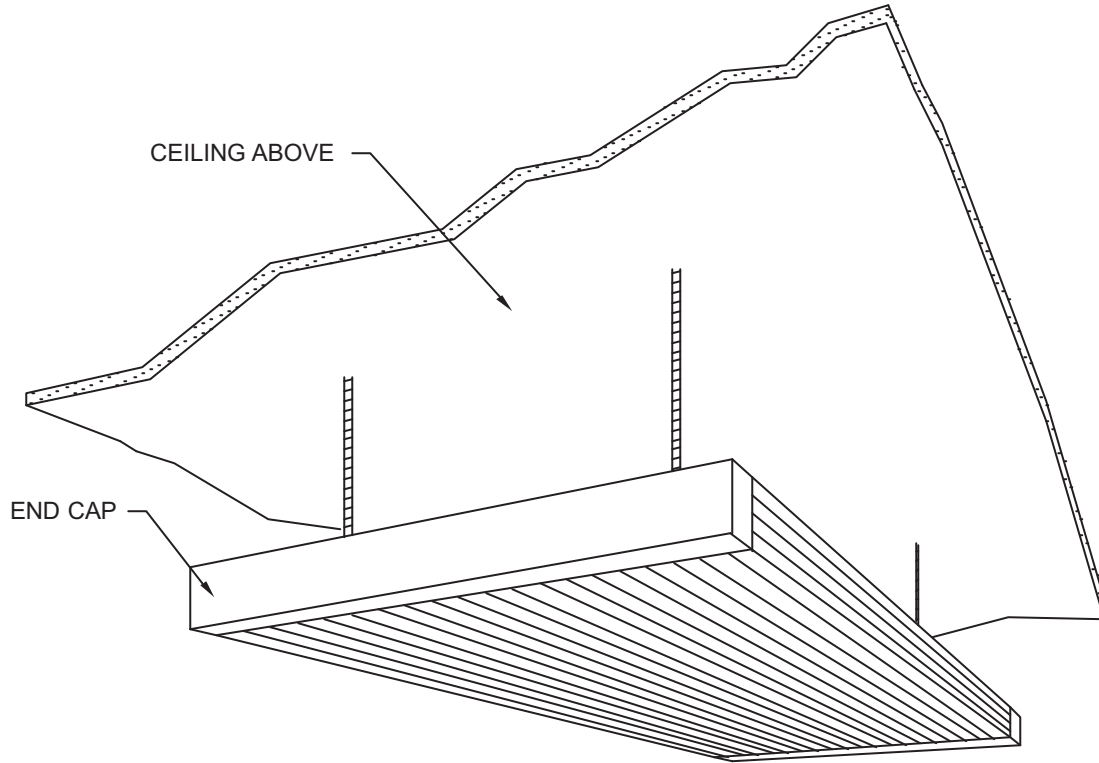
HANGING LINEAR PANEL IN EXPOSED AREA



Linear Radiant Panel



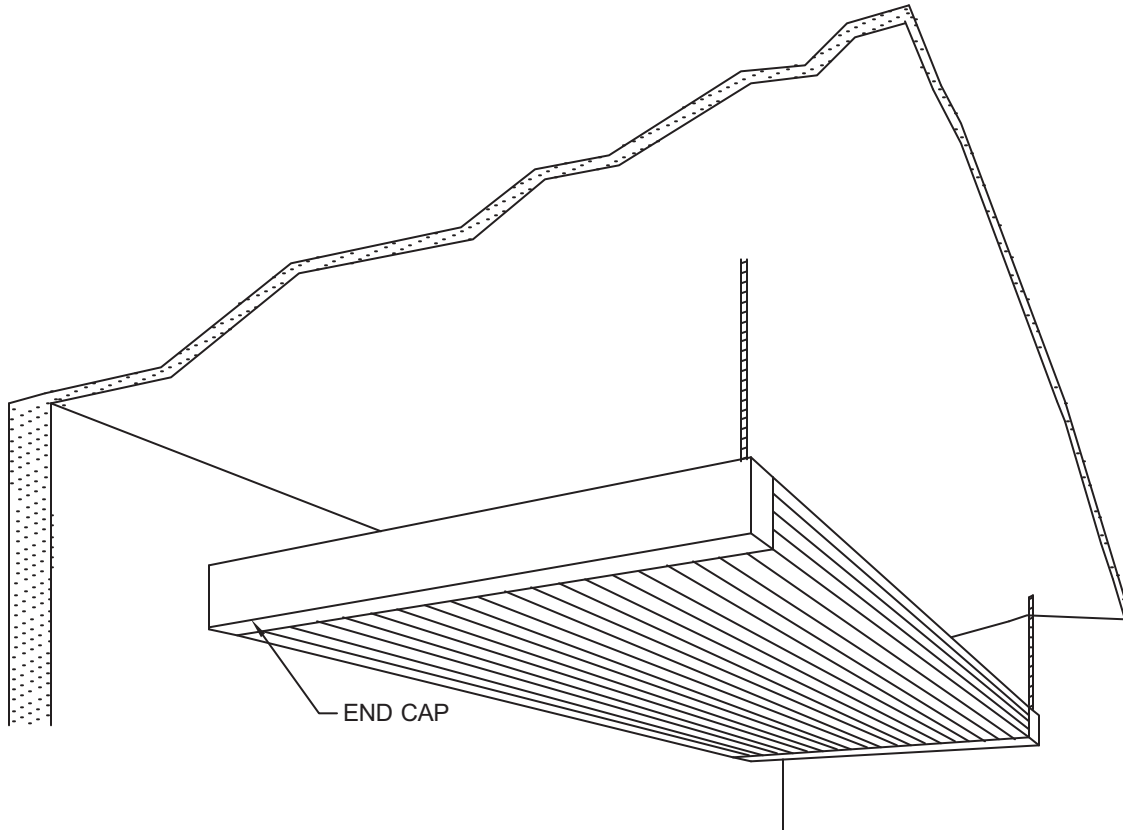
HANGING INDUSTRIAL LINEAR PANEL



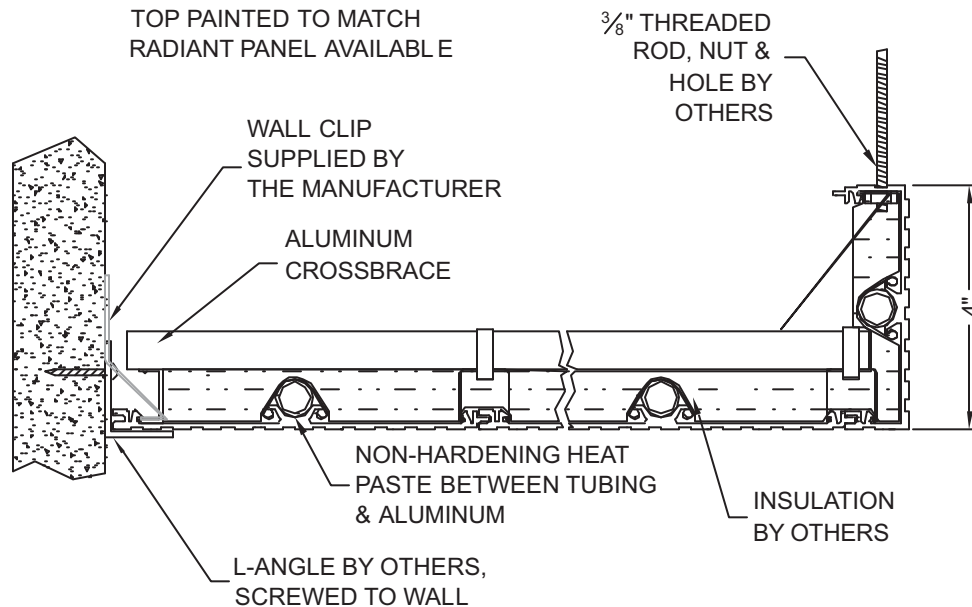
Linear Radiant Panel



HANGING LINEAR PANEL IN EXPOSED AREA



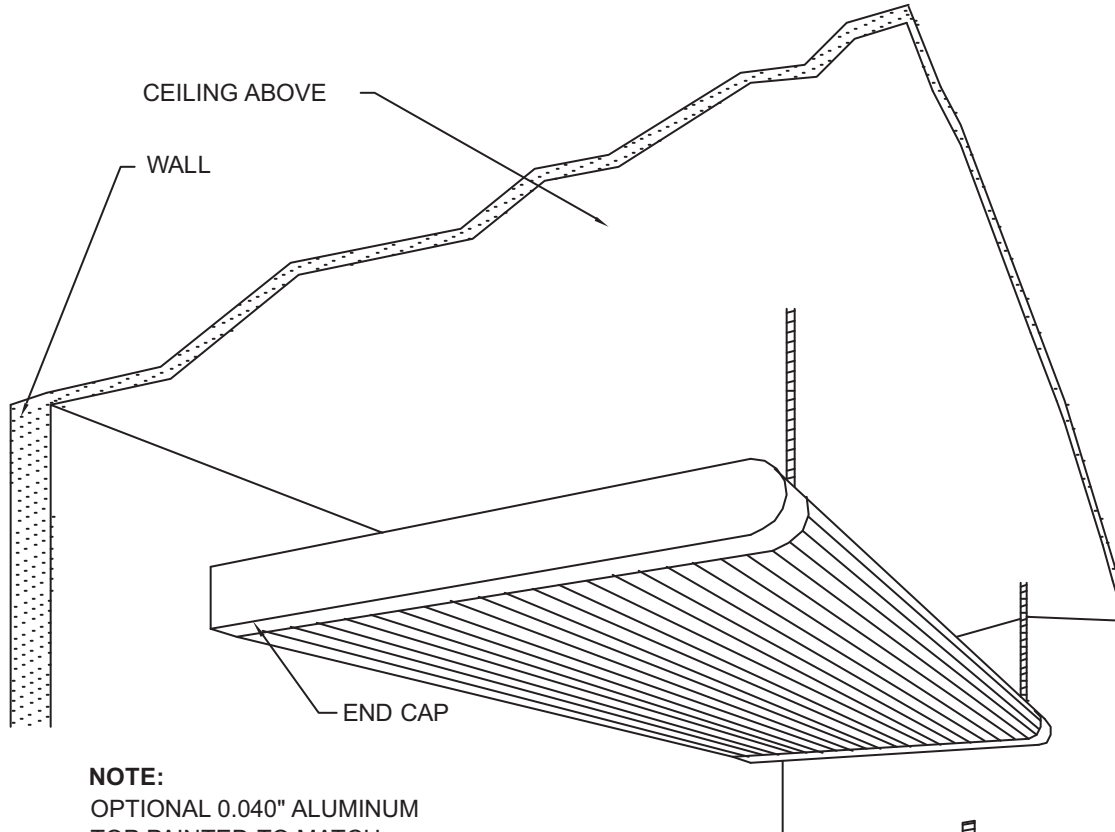
NOTE:
OPTIONAL 0.040" ALUMINUM
TOP PAINTED TO MATCH
RADIANT PANEL AVAILABLE



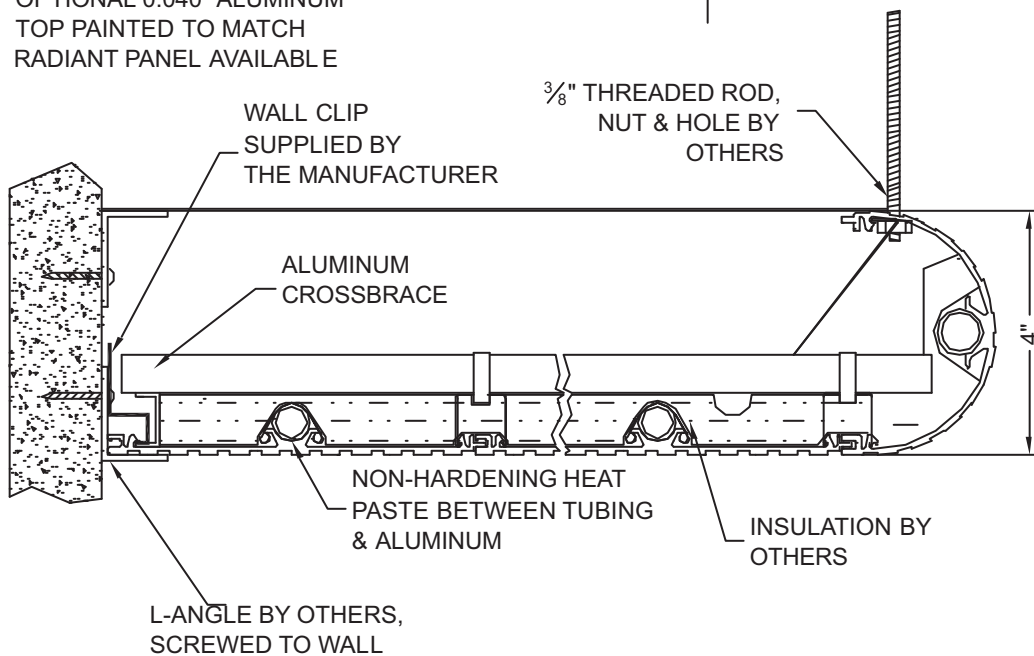
Linear Radiant Panel



HANGING LINEAR PANEL IN EXPOSED AREA



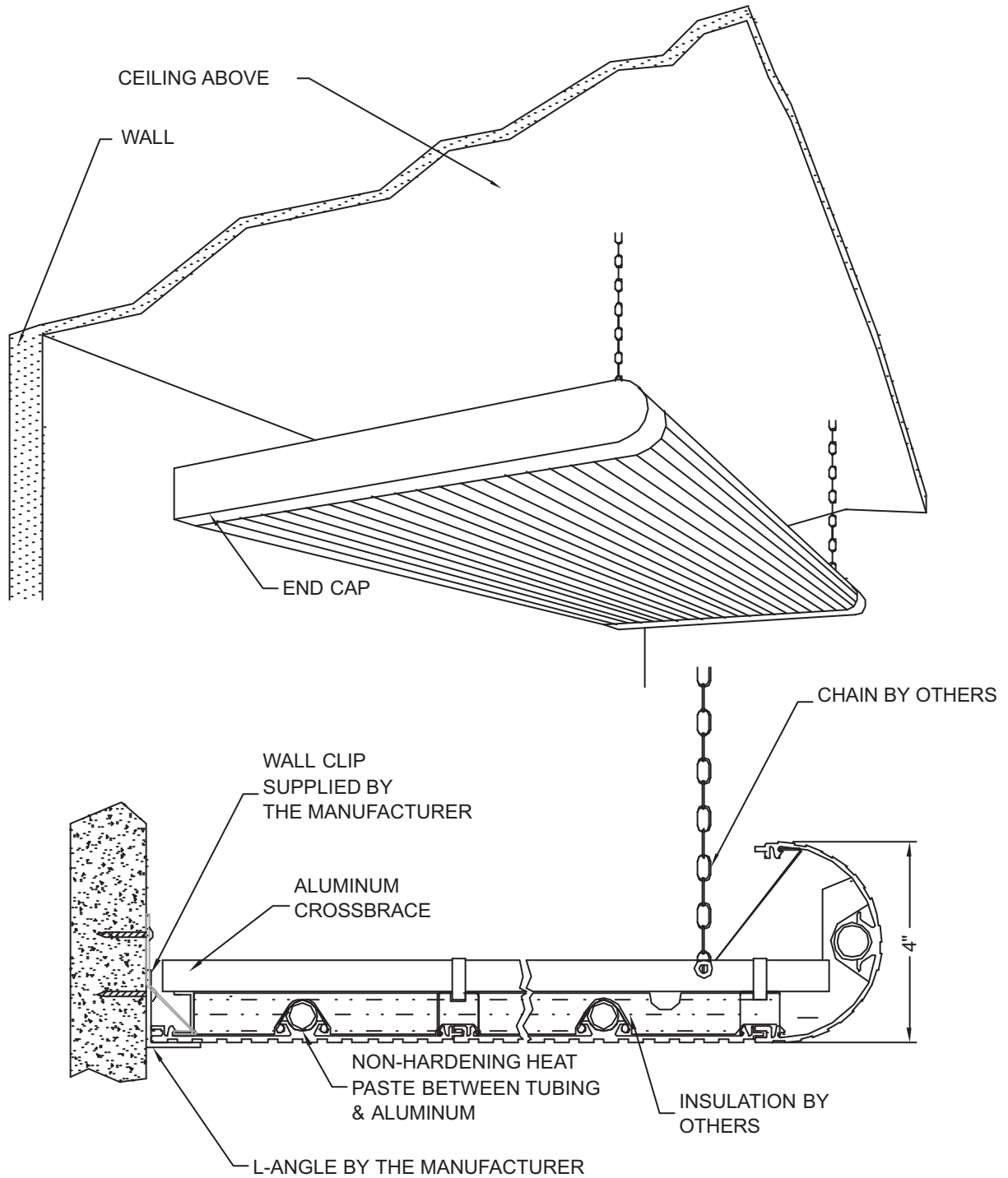
NOTE:
OPTIONAL 0.040" ALUMINUM
TOP PAINTED TO MATCH
RADIANT PANEL AVAILABLE



Linear Radiant Panel



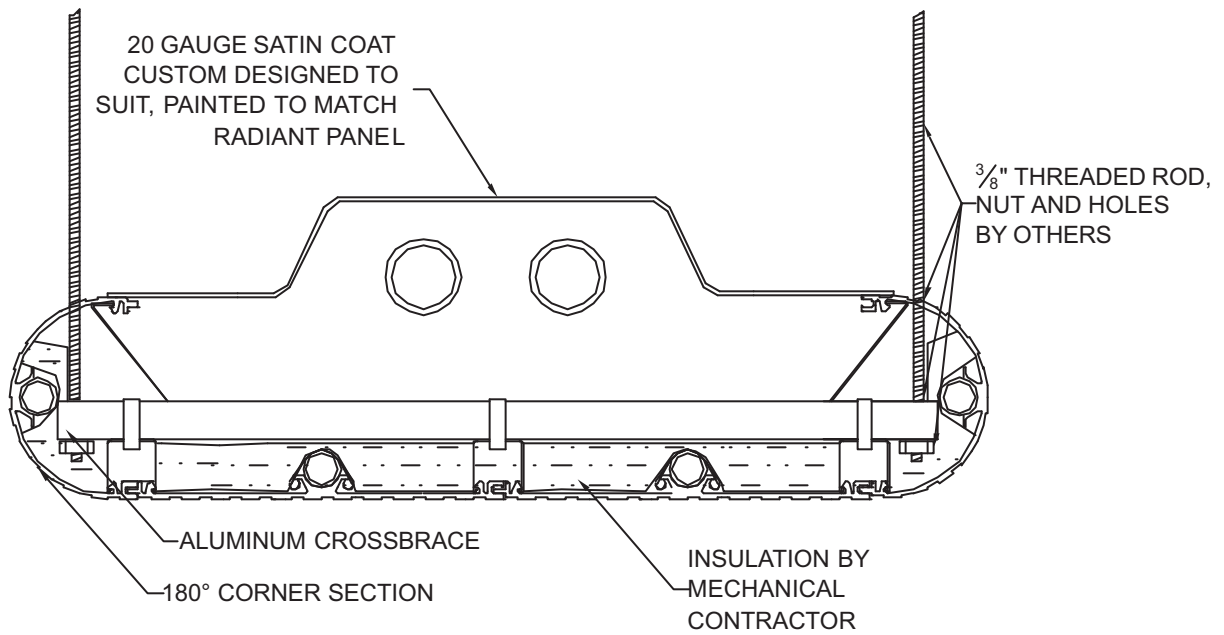
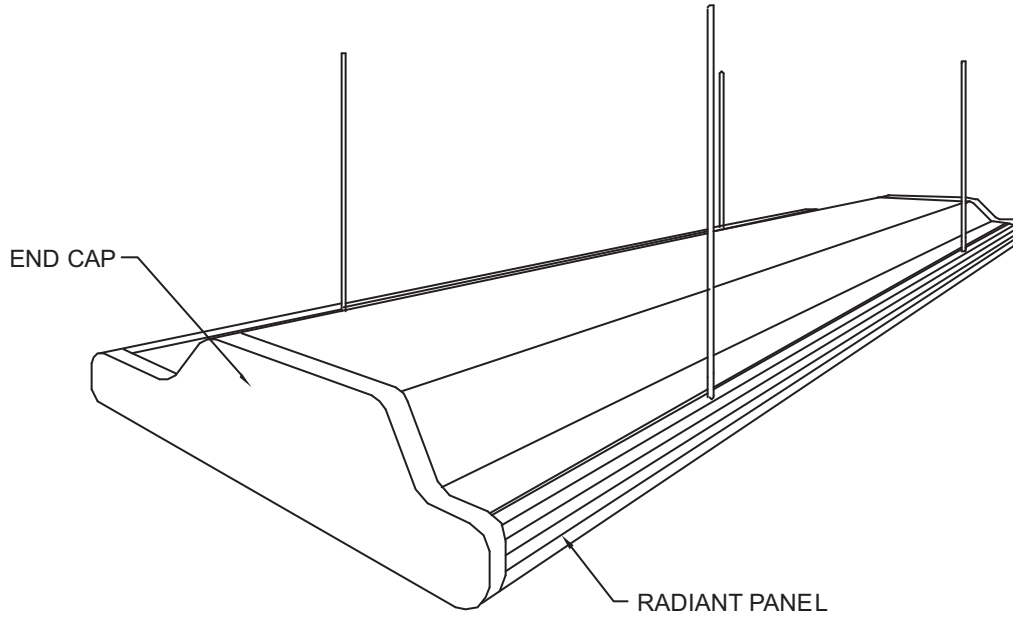
HANGING LINEAR PANEL IN EXPOSED AREA



Linear Radiant Panel



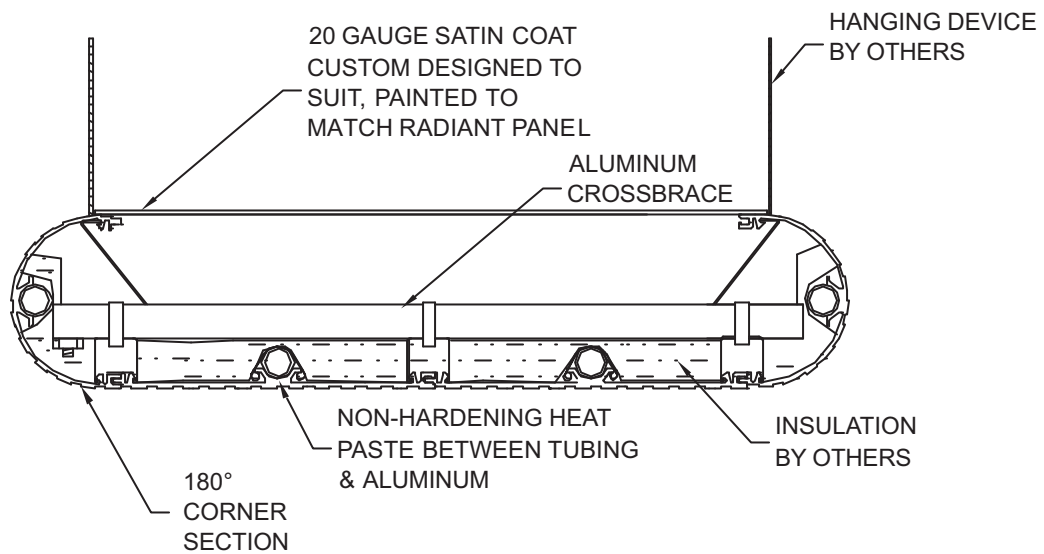
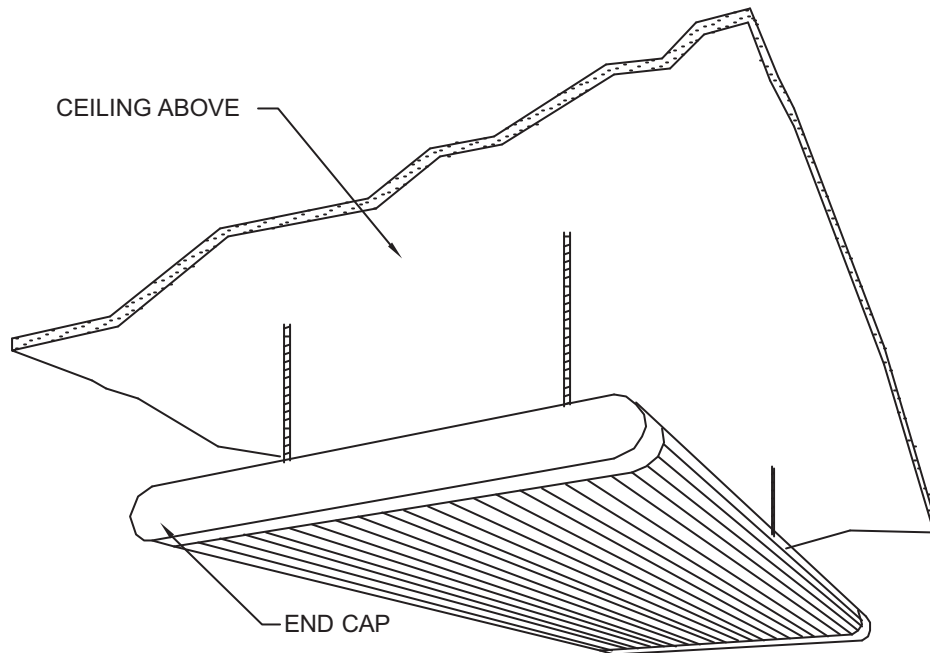
ENCLOSED LINEAR PANEL IN EXPOSED AREA



Linear Radiant Panel



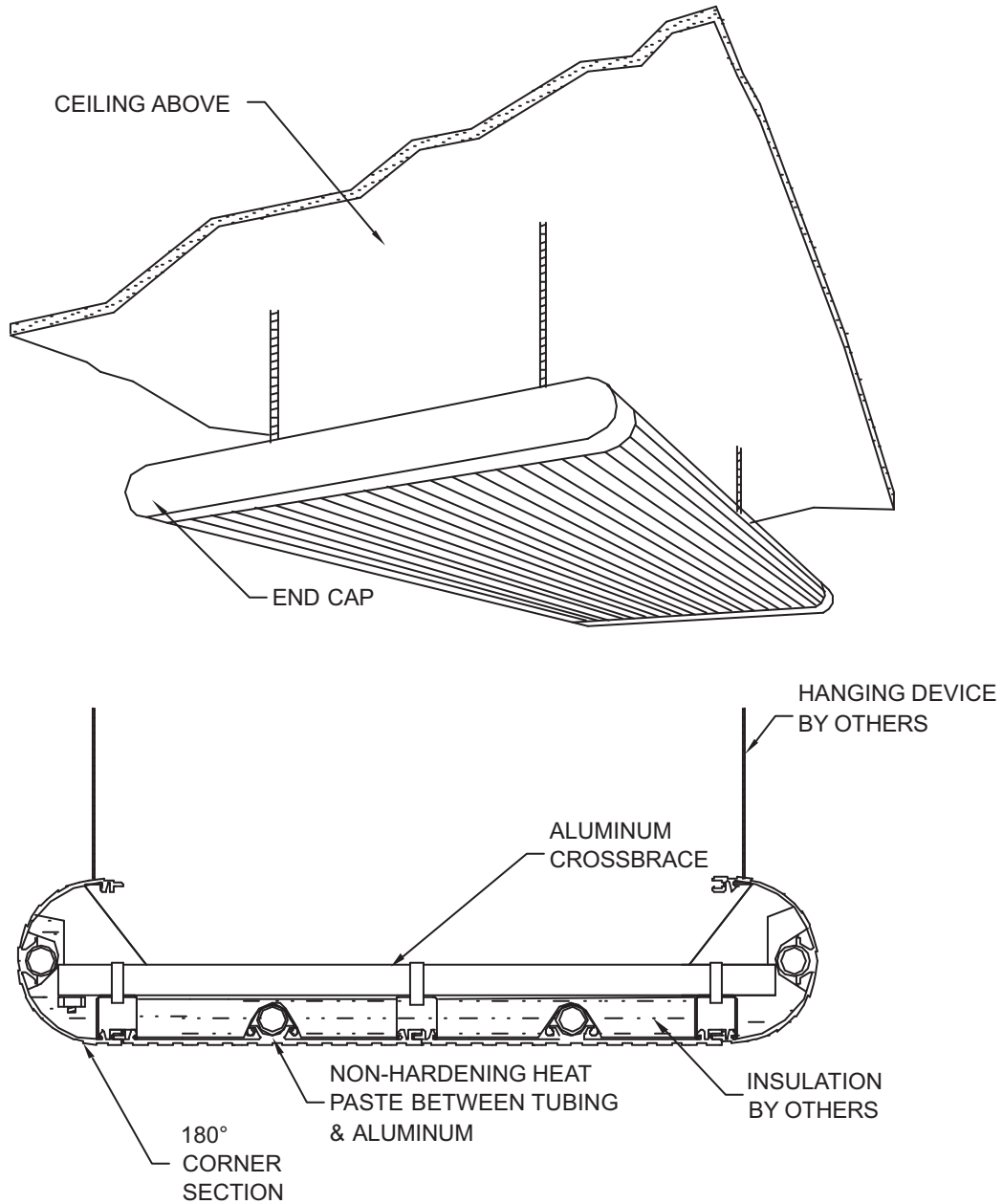
HANGING LINEAR PANEL IN EXPOSED AREA



Linear Radiant Panel



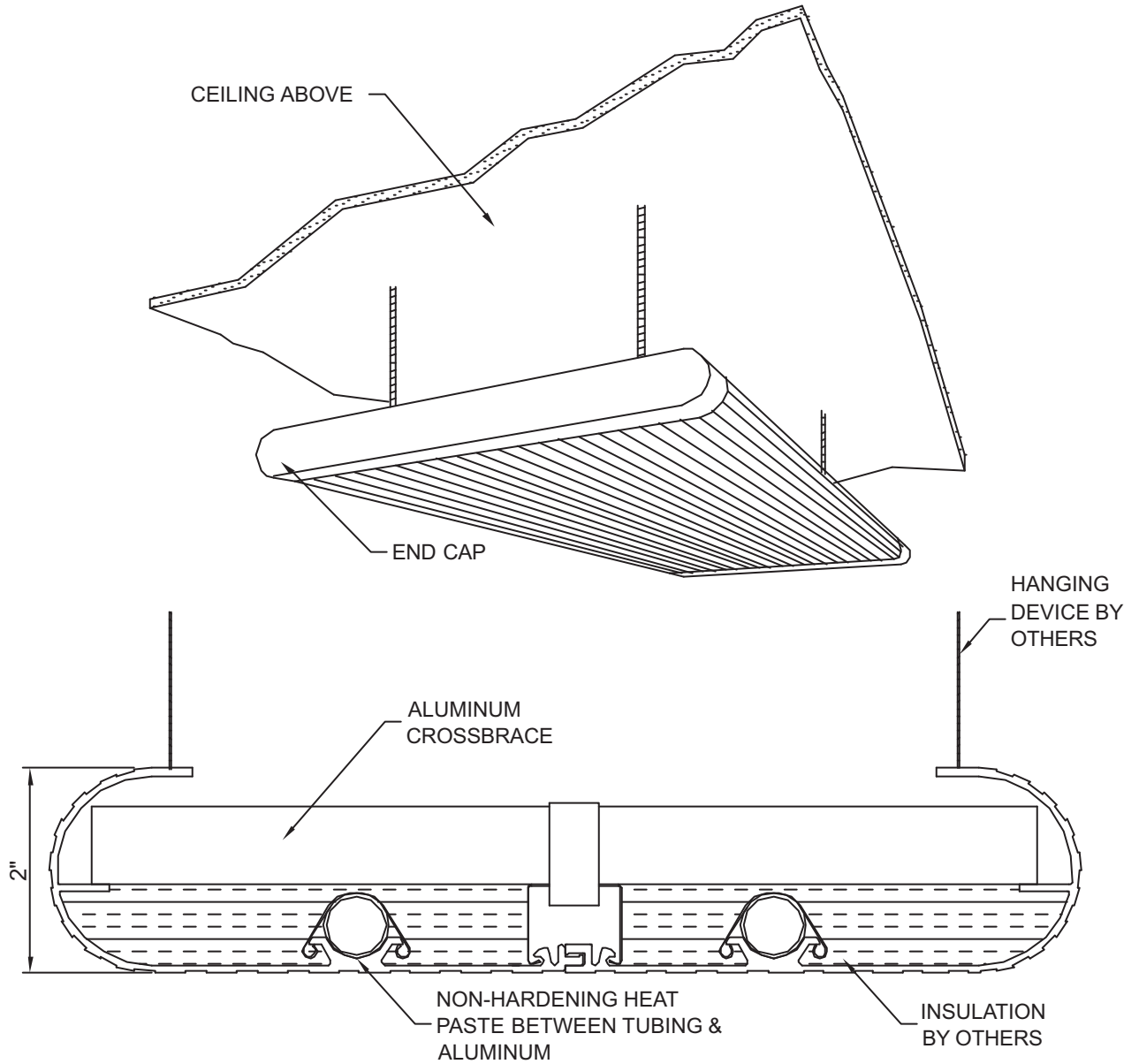
HANGING LINEAR PANEL IN EXPOSED AREA



Linear Radiant Panel



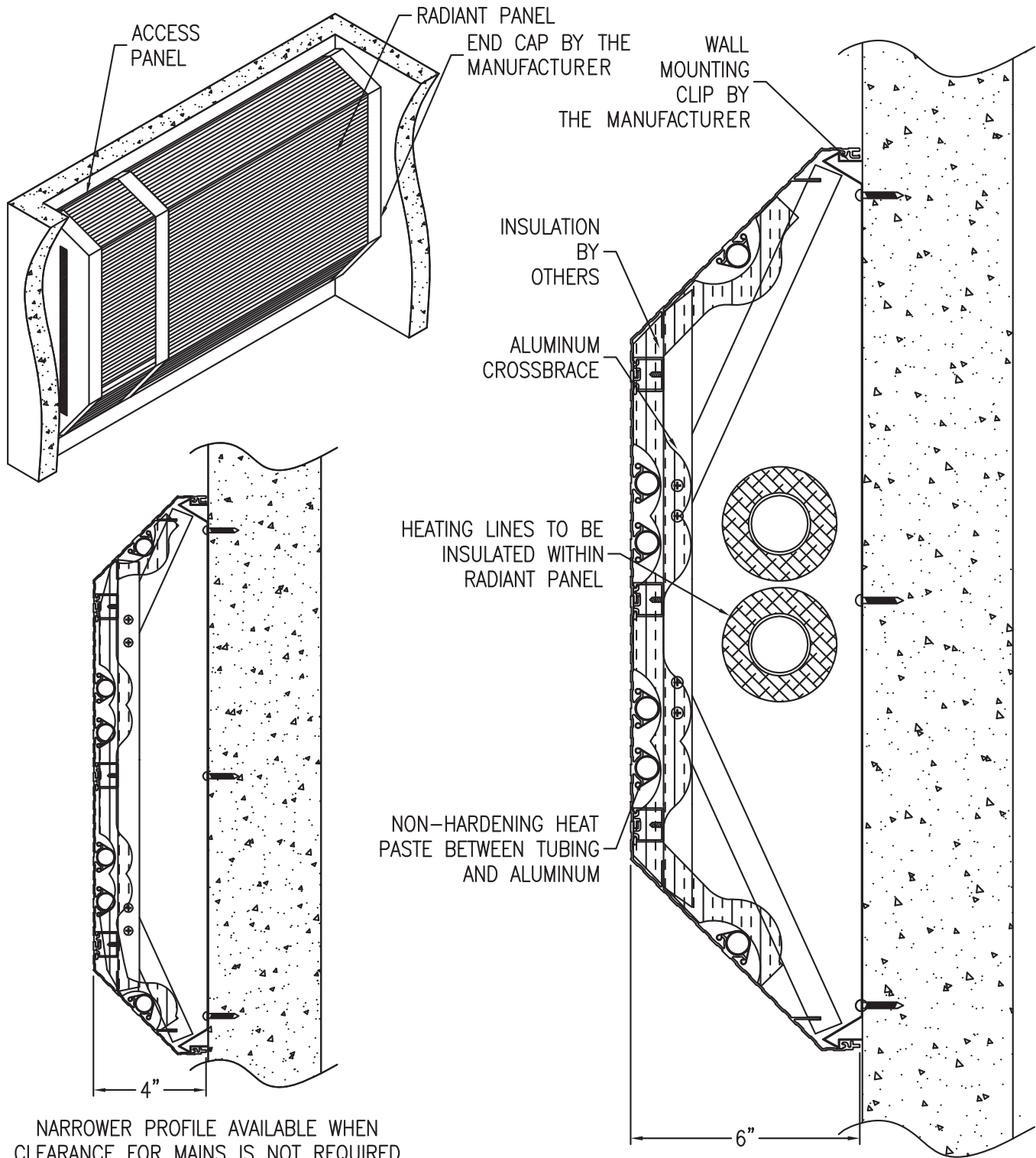
HANGING LINEAR PANEL IN EXPOSED AREA



Linear Radiant Panel



WALL MOUNTED LINEAR PANEL FOR GYMNASIUM

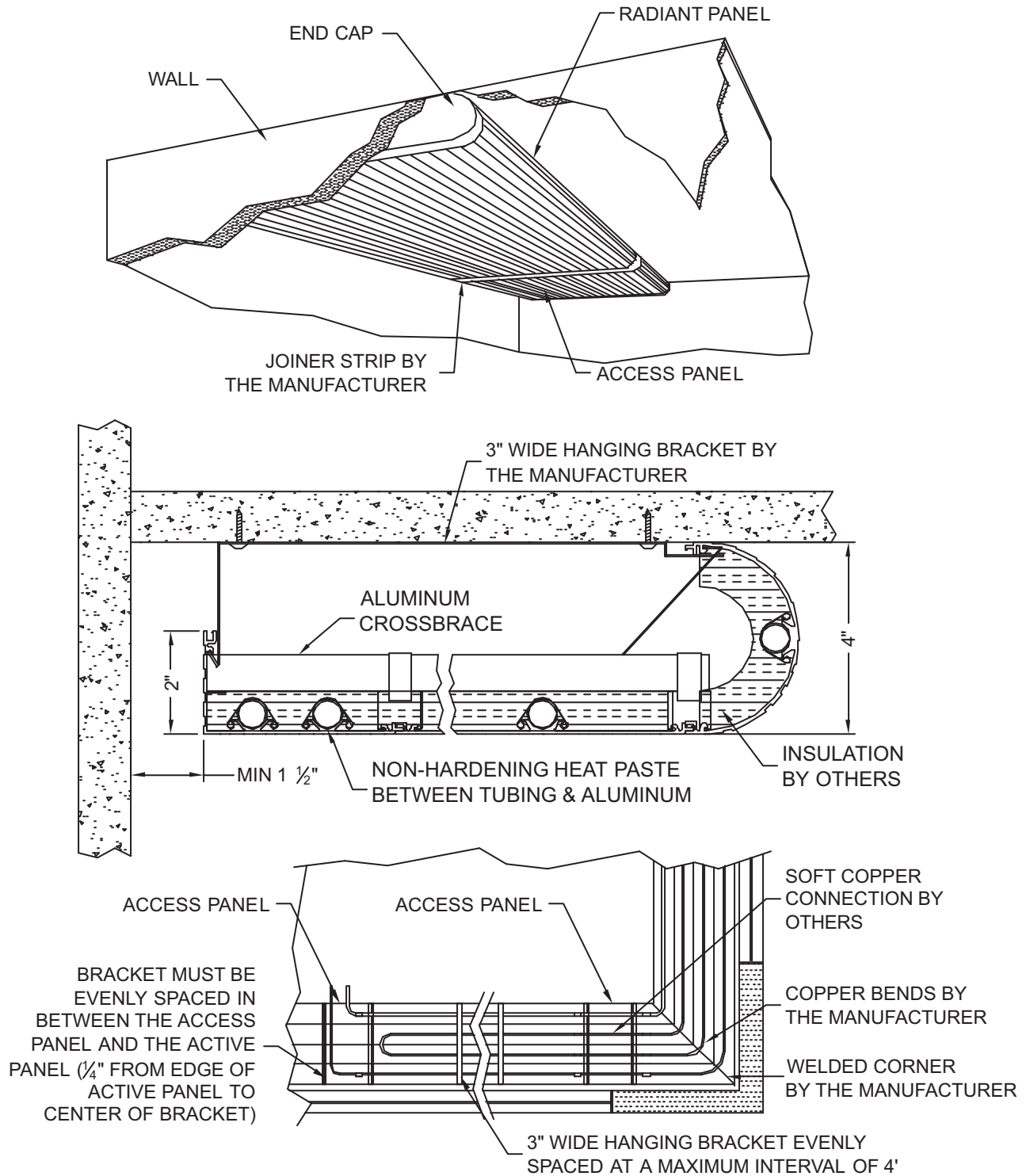


NARROWER PROFILE AVAILABLE WHEN CLEARANCE FOR MAINS IS NOT REQUIRED

Linear Radiant Panel



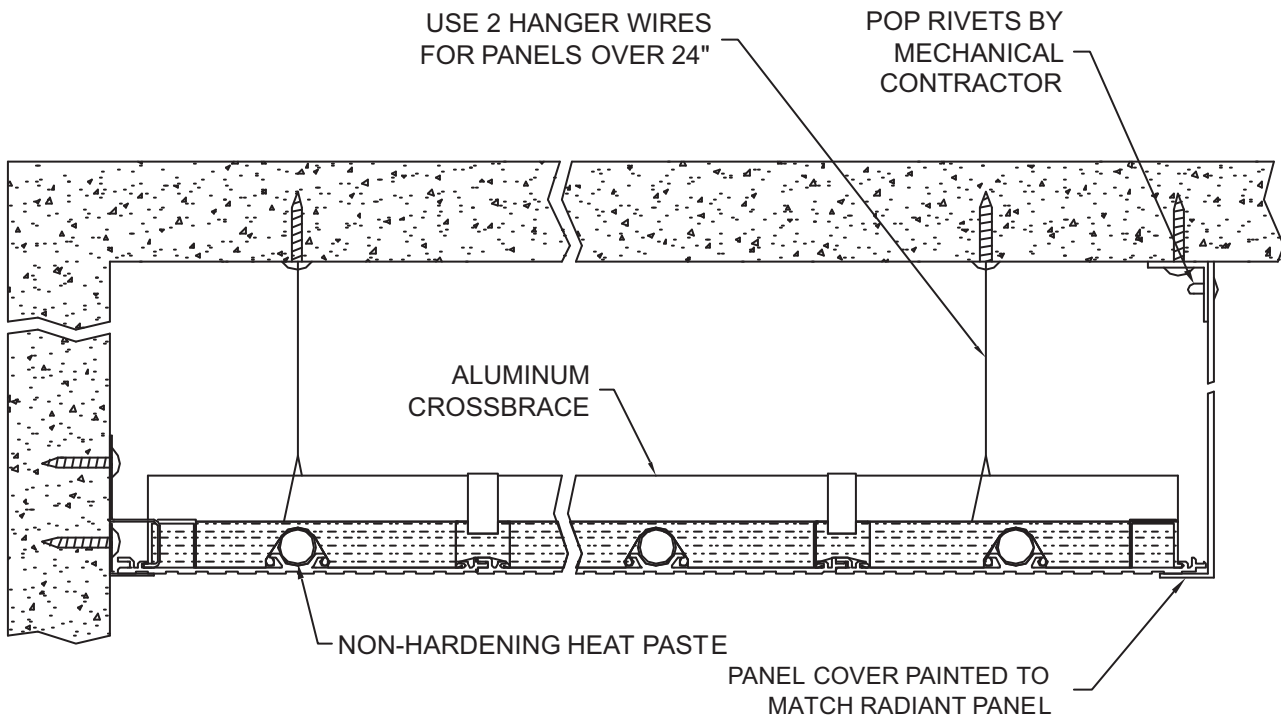
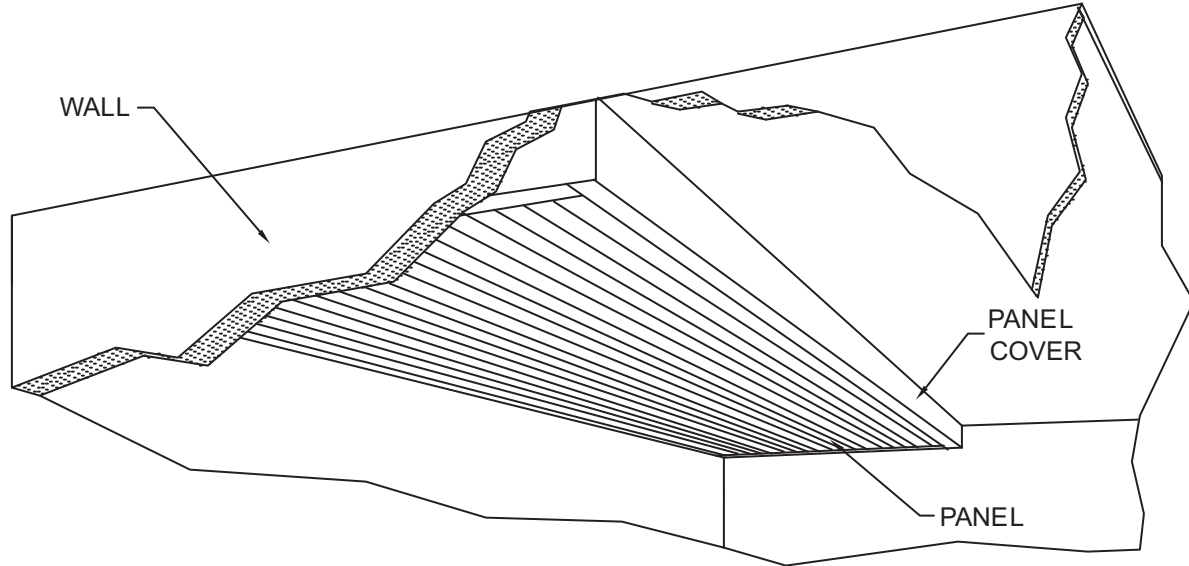
SURFACE MOUNTED LINEAR PANEL



Linear Radiant Panel



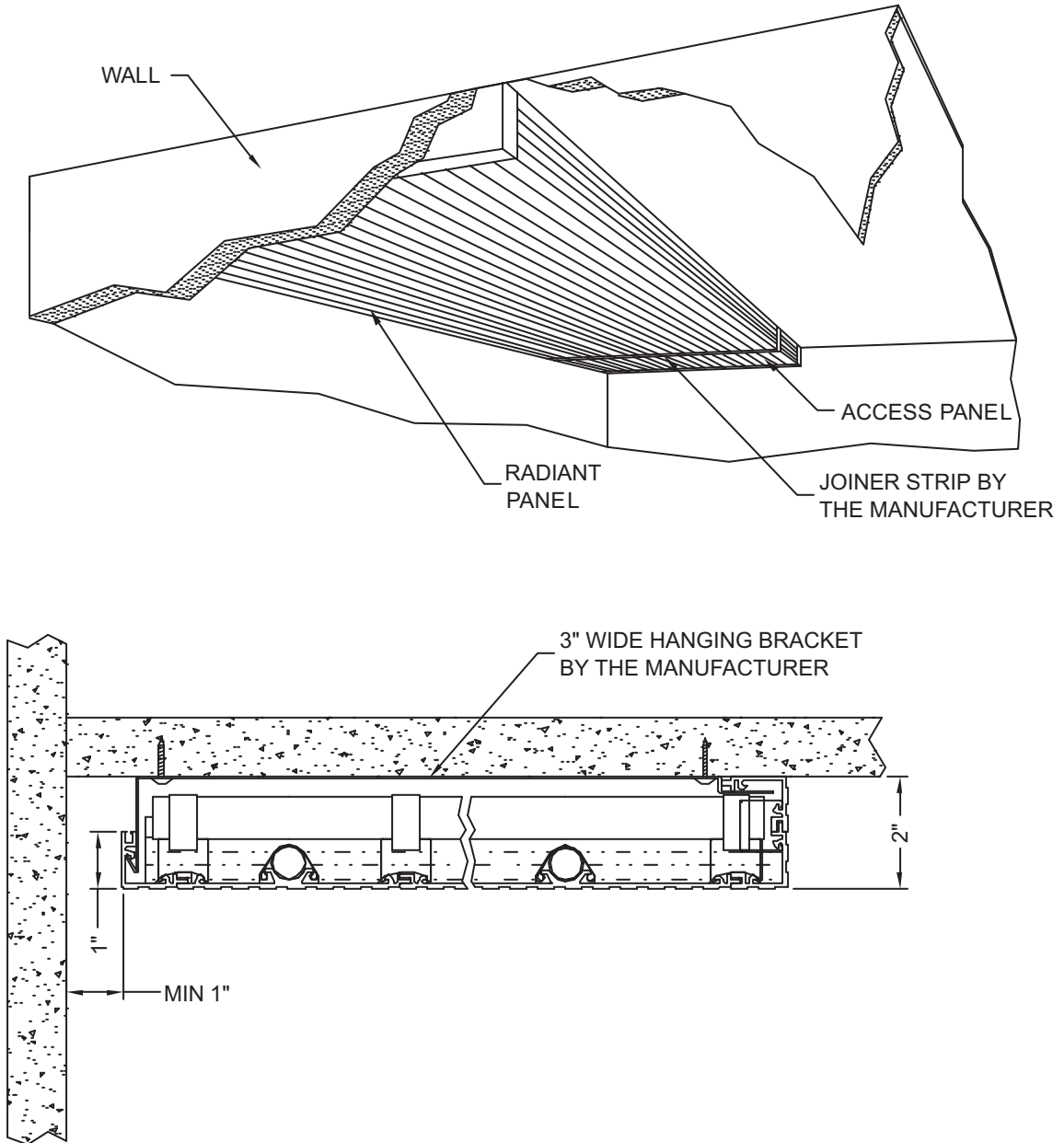
SURFACE MOUNTED LINEAR PANEL



Linear Radiant Panel



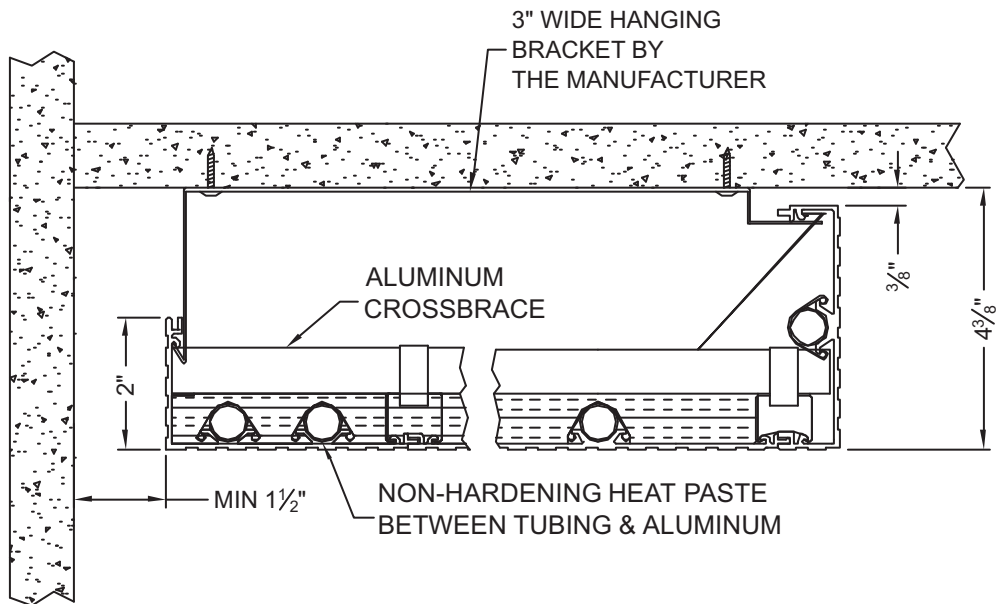
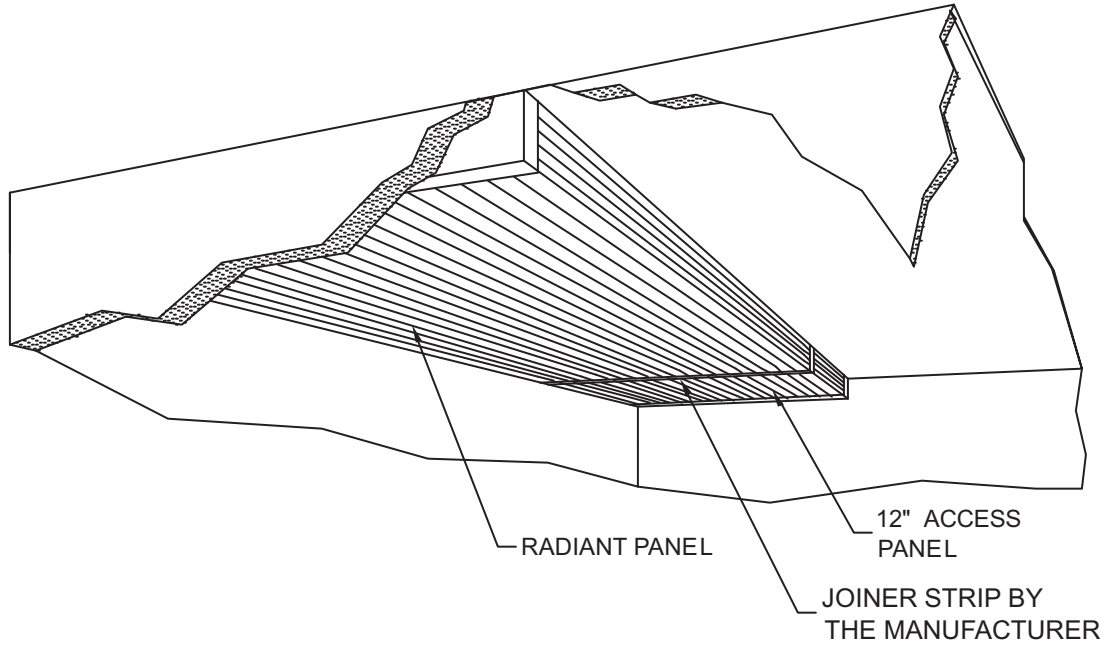
SURFACE MOUNTED LINEAR PANEL



Linear Radiant Panel



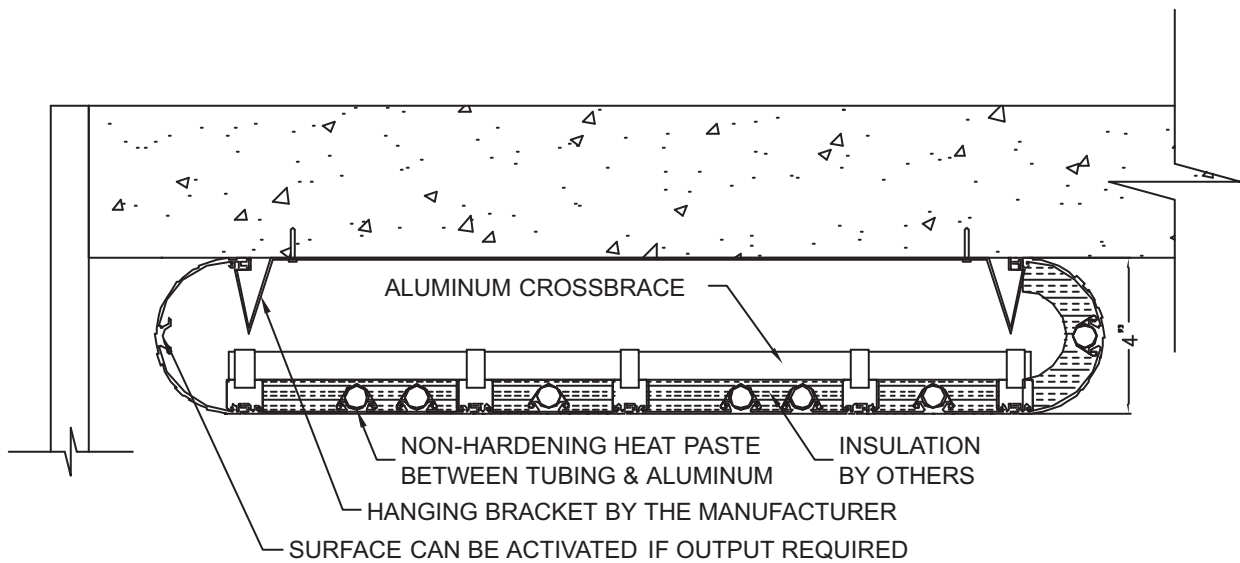
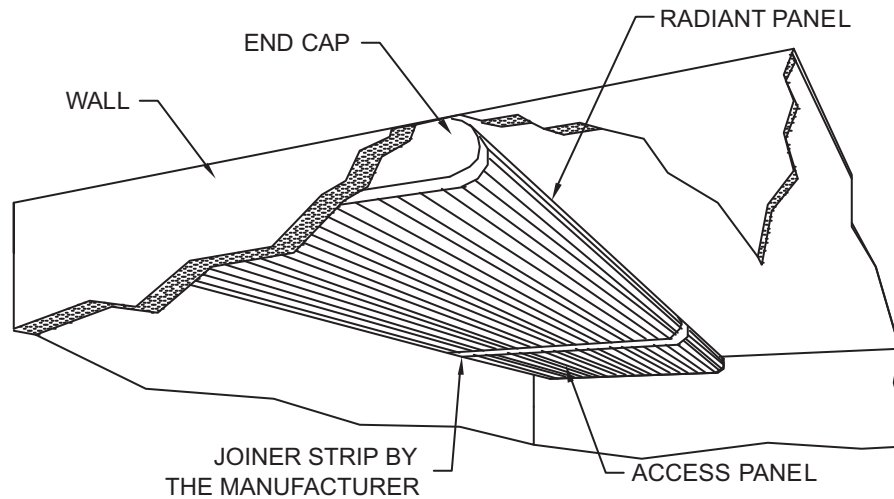
SURFACE MOUNTED LINEAR PANEL



Linear Radiant Panel



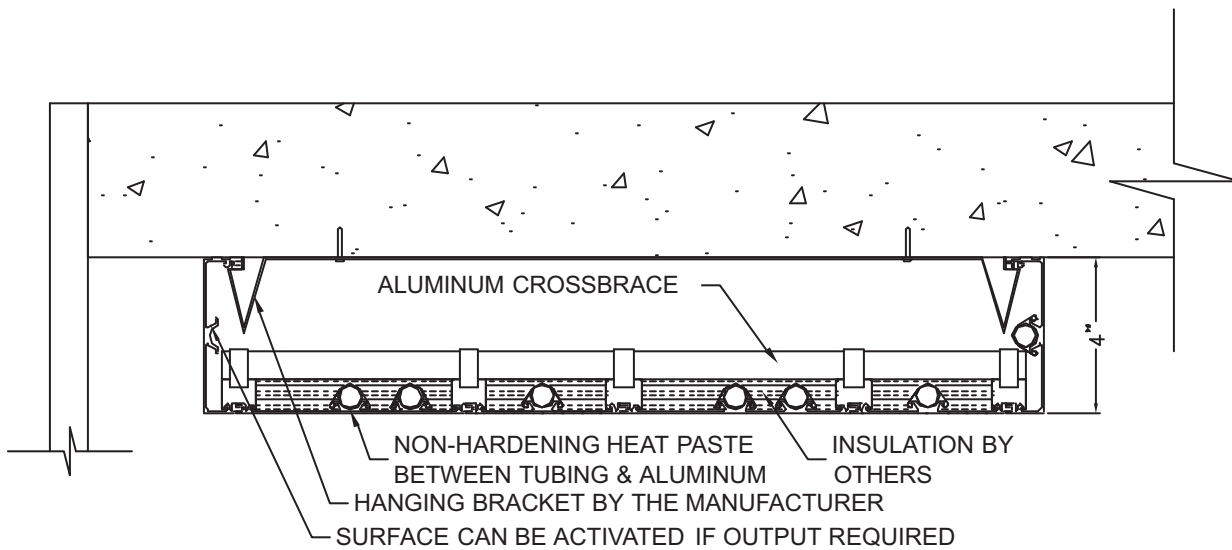
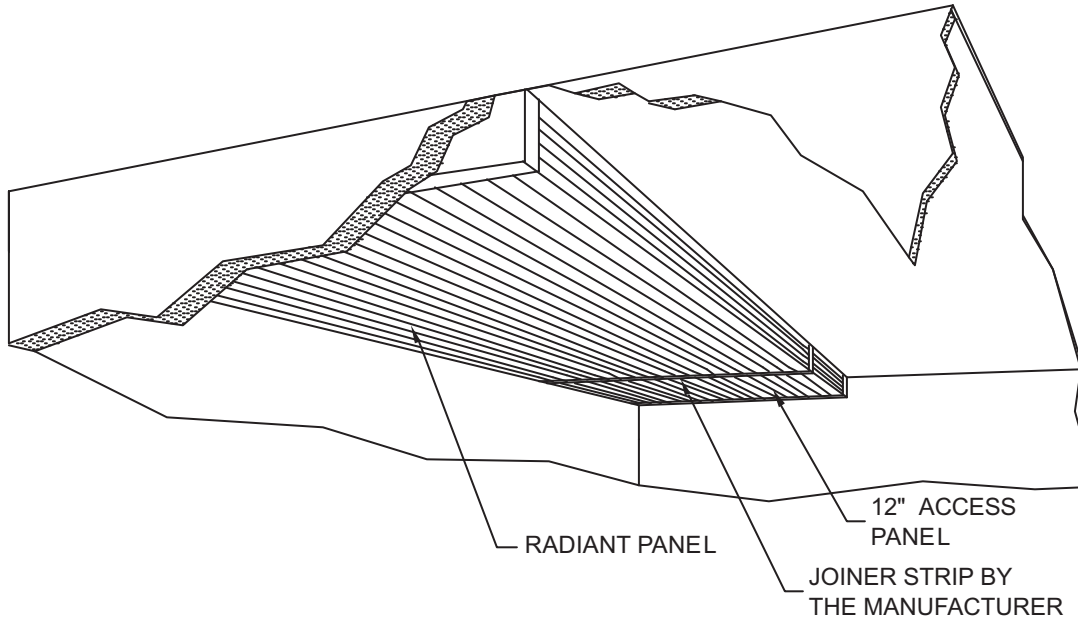
SURFACE MOUNT WITH 4" BULLNOSE



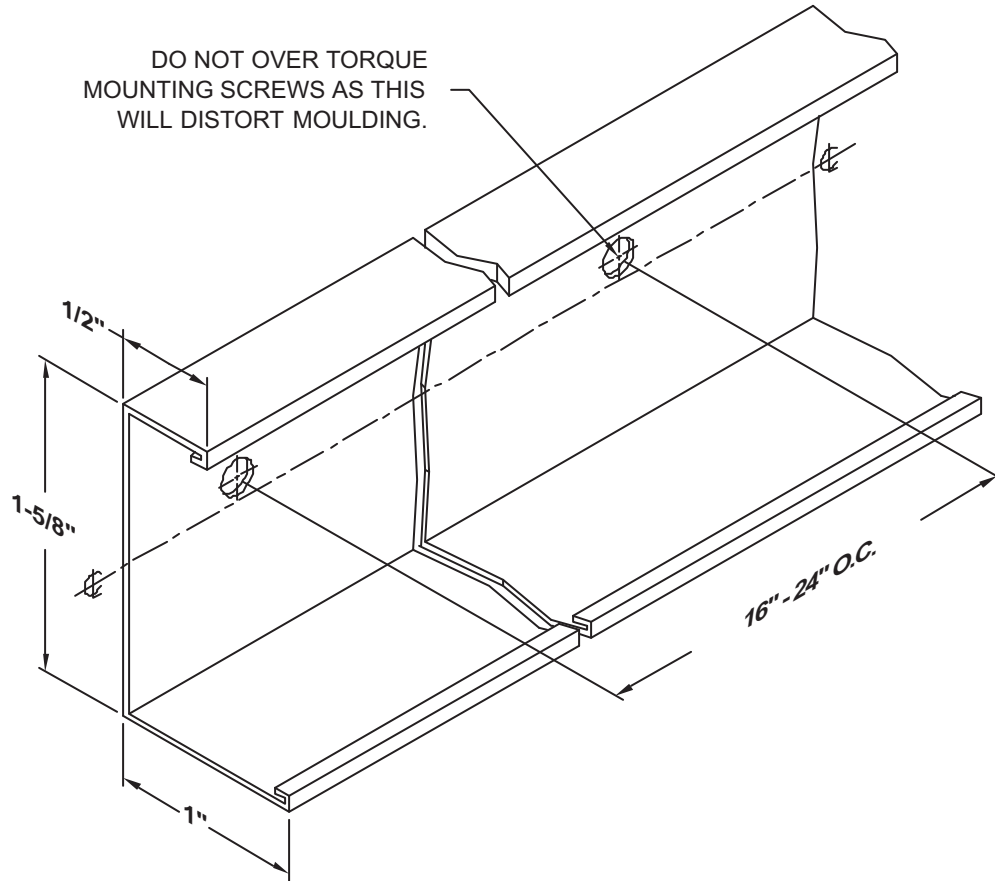
Linear Radiant Panel



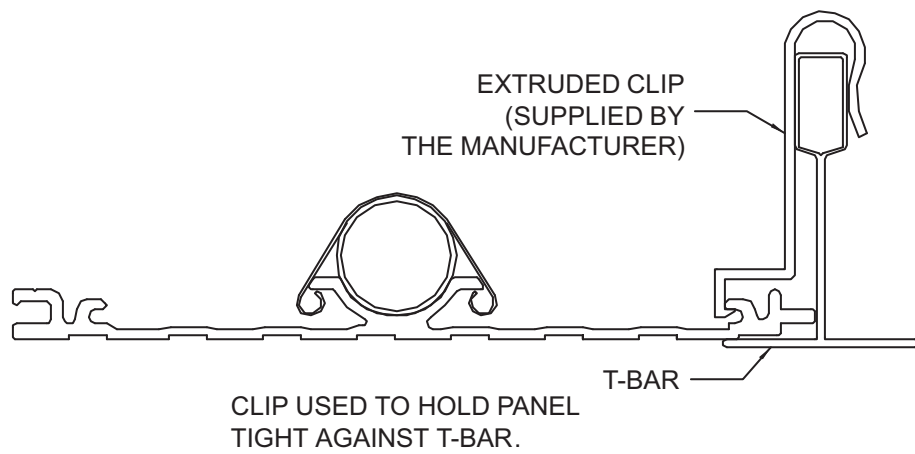
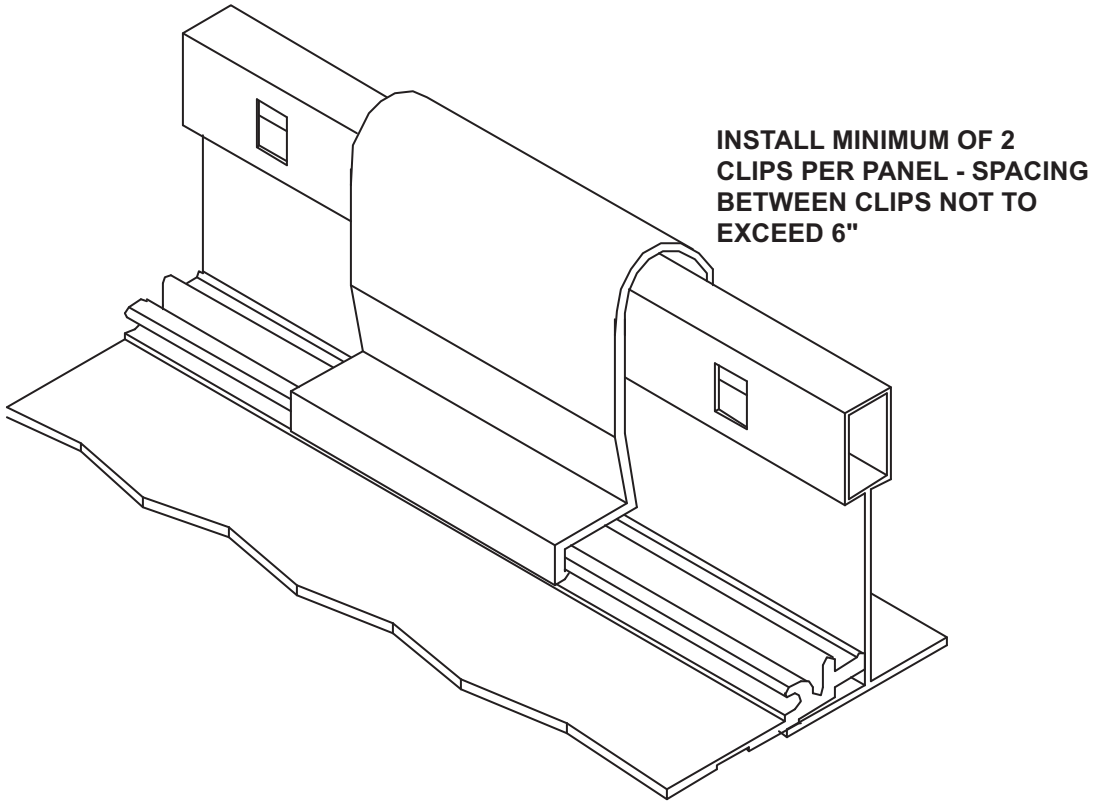
SURFACE MOUNT WITH 4" CORNER



PERIMETER CHANNEL ANGLE



T-BAR CLIP



INSTALLATION INSTRUCTIONS

LINEAR RADIANT HEATING PANELS ARE FINISHED WITH STANDARD WHITE POLYESTER POWDER COATING. HOWEVER, THE PANEL SURFACE MUST NOT COME IN CONTACT WITH THE BARE SKIN. PERSPIRATION OR GREASE FROM AN UNGLOVED HAND CAN POTENTIALLY LEAVE A MARK ON THE PANEL.

INSTALLATION PERSONNEL MUST WEAR CLEAN WHITE GLOVES WHEN HANDLING THE RADIANT PANELS.

USE A HEAT PAD BETWEEN RADIANT PANEL AND COPPER PIPE WHEN MAKING SOLDER CONNECTION. EXCESSIVE HEAT CAN DAMAGE THE PAINT FINISH.

