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RLEP

RADIANT LINEAR EXTRUDED PANELS
AXO STANDARD

TECHNICAL MANUAL

INSTALLATION | OPERATION | MAINTENANCE | PERFORMANCE

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WATER PRESSURE DROP FOR RADIANT LINEAR EXTRUDED PANELS

Water Flow Rate (GPM)	Head Loss in Feet of Water Per 100 Feet of .505 ID Tube
2.5	17.90
2.4	16.50
2.3	15.30
2.2	14.10
2.1	12.90
2.0	11.90
1.9	10.70
1.8	9.60
1.7	8.70
1.6	7.80
1.5	7.00
1.4	6.30
1.3	5.70
1.2	5.10
1.1	4.60
1.0	4.10
0.9	3.10
0.8	2.40
0.7	1.90
0.6	1.50
0.5	1.10

To ensure proper system performance, design flow rates below 0.5 US gallons per minute are not recommended

HEATING PERFORMANCE FOR RADIANT LINEAR EXTRUDED PANELS

MWT (Deg. F)	Perimeter BTU/Hr Lineal Foot															Interior BTU/Hr Square Foot
	6" Wide		8" Wd	9" Wd	12" Wide Panels			16" Wd	18" Wide Panels				24" Wide Panels			
	1 Tube	2 Tube*	2 Tube	2 Tube	2 Tube	3 Tube*	4 Tube*	4 Tube	3 Tube	4 Tube	5 Tube*	6 Tube*	4 Tube	6 Tube*	8 Tube*	
120	47	56	62	69	90	99	108	117	129	138	146	154	164	180	197	70
125	53	64	70	78	102	112	122	131	145	155	164	173	183	201	220	78
130	60	72	78	87	113	124	135	145	161	172	182	192	202	222	242	86
135	66	79	86	96	125	137	149	161	178	190	202	213	225	248	270	96
140	72	87	94	105	137	150	163	177	196	209	222	234	248	271	295	105
145	78	93	103	115	149	163	178	192	213	227	241	255	269	296	323	114
150	84	101	111	124	161	176	192	207	229	244	259	274	290	319	348	123
155	91	109	120	134	174	191	208	224	247	264	278	295	312	343	374	133
160	98	118	129	144	187	205	223	240	265	283	300	317	334	368	401	142
165	104	125	137	153	199	218	234	256	283	302	321	338	357	393	428	152
170	111	133	145	162	211	231	252	272	301	321	341	360	380	418	456	162
175	118	142	155	173	225	246	267	290	321	343	364	384	405	446	486	172
180	126	151	165	184	239	262	286	308	341	364	386	407	430	473	516	183
185	133	160	175	195	253	277	302	326	361	385	409	431	455	501	546	193
190	141	169	184	206	267	292	319	344	381	407	432	455	480	528	576	204
195	148	178	194	216	280	307	335	361	399	426	452	477	502	552	602	213
200	155	186	203	226	294	322	351	377	417	445	472	498	524	576	623	223
205	162	194	213	237	308	337	368	396	437	466	495	522	550	605	660	234
210	170	204	223	249	323	354	386	415	458	487	519	547	576	634	691	245
215	177	212	232	259	337	369	403	433	478	510	542	571	601	661	721	255

Use these performance values directly in standard ASHRAE heat loss calculations. Performance values are from certified data based on 70 degree AUST (Average Unheated Surface Temperature), natural convection, and 1 inch, 3/4 Pounds/Cubic Foot insulation on top of panel.

***=NON STANDARD CONFIGURATIONS AVAILABLE AT ADDITIONAL COST.**

Radiant ceiling panel mounting heights above 12'-13' will cause a decrease in the BTU output of the panels as the radiative energy will be absorbed by the cooler surfaces in the ceiling area. A de-rating factor must be used to account for the reduction in performance (see chart below).

Panel Height A.F.F. Feet	De-rating %
14'	3
15'	6
16'	9
17'	12
18'	15
19'	18
20'	21

HEATING PERFORMANCE FOR RADIANT LINEAR EXTRUDED PANELS

MWT (Deg. F)	Perimeter BTU/Hr Lineal Foot													Interior BTU/Hr Square Foot
	30" Wide Panels						36" Wide Panels							
	5 Tube	6 Tube*	7 Tube*	8 Tube*	9 Tube*	10 Tube*	6 Tube	7 Tube*	8 Tube*	9 Tube*	10 Tube*	11 Tube*	12 Tube	
120	195	203	211	218	226	234	231	239	246	254	261	270	277	70
125	219	228	237	245	254	263	258	267	275	284	292	301	310	78
130	243	253	262	272	282	292	285	294	304	313	323	333	342	86
135	269	280	291	301	312	323	318	328	339	349	360	371	382	96
140	295	307	319	330	342	354	351	363	374	386	397	410	421	105
145	320	333	346	358	371	384	378	390	403	415	428	441	454	114
150	345	359	373	386	400	414	405	418	432	445	458	473	486	123
155	369	384	399	413	428	443	437	451	466	480	495	510	524	133
160	393	409	424	440	456	472	468	483	499	514	530	546	562	142
165	421	438	455	472	488	505	500	517	533	550	566	584	600	152
170	450	468	486	504	522	540	531	549	566	584	601	620	637	162
175	479	498	517	536	556	575	561	580	598	617	635	655	673	172
180	508	528	549	569	589	610	591	611	630	650	669	690	709	183
185	538	560	581	603	624	646	624	645	665	686	706	728	749	193
190	568	591	613	636	659	682	657	679	700	722	744	767	788	204
195	591	615	638	662	686	709	685	708	730	753	775	799	822	213
200	615	640	664	689	713	738	713	737	760	784	807	832	856	223
205	645	671	697	722	748	774	748	773	797	822	847	873	898	234
210	675	702	729	756	793	810	783	809	835	861	886	914	940	245
215	706	734	762	791	819	847	819	846	873	900	927	956	983	255

Use these performance values directly in standard ASHRAE heat loss calculations. Performance values are from certified data based on 70 degree AUST (Average Unheated Surface Temperature), natural convection, and 1 inch, 3/4 Pounds/Cubic Foot insulation on top of panel.

***=NON STANDARD CONFIGURATIONS AVAILABLE AT ADDITIONAL COST.**

Concept of Radiant Heating

Radiant heat transfer works much like sunlight: heat moves from the warm panel to the cooler objects in the room being heated until a temperature equilibrium is reached. Aero Tech Radiant Ceiling Systems function on the basis of providing a comfortable environment by controlling surface temperature and minimizing excess air motion and temperature within the conditioned space.

Like the light energy from a lighting fixture illuminates the room, a radiant ceiling panel emits thermal energy which is absorbed and re-radiated by all elements in the room.

Radiant heat transfer results in an energy-efficient, cost-effective way to heat almost any kind of building

AXO PANEL CONSTRUCTION

AXO ceiling panels are constructed of 6", 8", or 9" wide extruded aluminum strips of approximately 0.080" overall thickness. Active strips have a 0.505 ID copper tube inserted into a "U" shaped channel on the back of the extrusion. This channel is formed more than 70% around the copper tube for increased thermal conduction and to eliminate any separation of the copper tube and the aluminum strip. Tube ends will accept a 3/8" Type "L" soft copper tube without the need for fittings. Heat paste is not required.

Standard panel maximum length is 12' (lengths up to 16' can be fabricated on special request only, and after reviewing for additional cost due to handling the extended lengths). Panels can be constructed in any width utilizing any combination of 6", 8" and 9" wide extruded aluminum strips

Matching non-radiant (inactive) panels can be provided on request.

AXO Panels are factory assembled and finished, in a large variety of standard or custom options. Including the ability to curve the panel along the length. (Please contact Aero Tech regarding curving guidelines).

Specification for Aero Tech Radiant Panels

MANUFACTURER QUALIFICATIONS

This specification is based on the Radiant Ceiling employing Radiant Panels and matching Non-Radiant Panels (as required) manufactured by AERO TECH MANUFACTURING INC. 395 West 1100 North, North Salt Lake, Utah, 84054.

Published performance data and dimensional specifications are included in this booklet, provided by the manufacturer. Performance and capacity data is to be based on testing performed by the manufacturer or confirmed by a testing laboratory recognized in the industry.

The manufacturer shall demonstrate his capability in engineering, manufacturing and financial resources to the satisfaction of the Architect and Engineer, and shall have continuously been in the business of manufacturing radiant panels for a minimum of five (5) years

RADIANT PANEL PERFORMANCE REQUIREMENTS

The Radiant Panel will have a minimum heating output of ____ BTU/HR LFT for _____-inch -wide panel at _____ °F mean water temperature when the room temperature is 70°F, the roof is of medium insulation value and natural convection prevails in the room.

CONTRACTOR QUALIFICATIONS

Installation of the Radiant and Non-Radiant Panels will be performed by a qualified contractor, and installed as recommended by the manufacturer. The contractor must be experienced in the installation of radiant ceilings and is to provide all labor, materials, tools, service and supervision for a complete functional system as shown on the mechanical and architectural plans. Materials furnished by the contractor shall include all components required for the ceiling as specified on the room finish schedule.

CONTRACTOR RESPONSIBILITIES

Install the Radiant and Non-Radiant Panels complete in accordance with the manufacturer's recommendations and to the satisfaction of the Architect and Engineer. Approximate wet weight of panels is 2.8 pounds per square foot.

Contractor shall abide by the architectural and mechanical drawings, room finish schedule and architectural details for correct placement of all panels. Shop drawings at 1/8" scale may be submitted by the contractor showing layouts and details of all areas where Radiant and Non-Radiant Panels are indicated. Aero Tech will create shop drawings that include the Mechanical plan and Architectural Reflected Ceiling plan.

Please contact our local Sales Rep for cost involved. In order to create the most accurate shop drawings, Aero Tech needs high-quality PDFs (no scans), or CAD files showing the mechanical piping and reflected ceiling plans.

Radiant Panel shop drawings should show a complete pre-engineered, designed and tested system, including Aero Tech Radiant and Non-Radiant Panels, suspension components, interconnecting piping, trim and all other details and materials (as required).

RADIANT PANELS

Radiant Panels shall be Aero Tech extruded aluminum with copper tube inserted into "U" shaped channel on back of extrusion and formed around the tube. Finished as specified.

NON-RADIANT PANELS (AS REQUIRED)

Non-Radiant Panels shall be Aero Tech extruded aluminum. Finish to match Radiant Panels.

INSULATION

Insulation on top of panels should be minimum of 1" thick 3/4 pound/cubic foot, glass fiber pad. All Aero Tech extruded panels ship with 1.5" insulation unless otherwise specified.

Chart 1: Width Opening Between Panel Supports	
Panel Width[1]	**Opening Dimension**
Panels Utilizing Any Combination of Stock Extrusion	See Chart Below

1) Panel widths can be fabricated from any combination of 6”, 8” and 9” strips (see extrusion drawings for types and styles available).

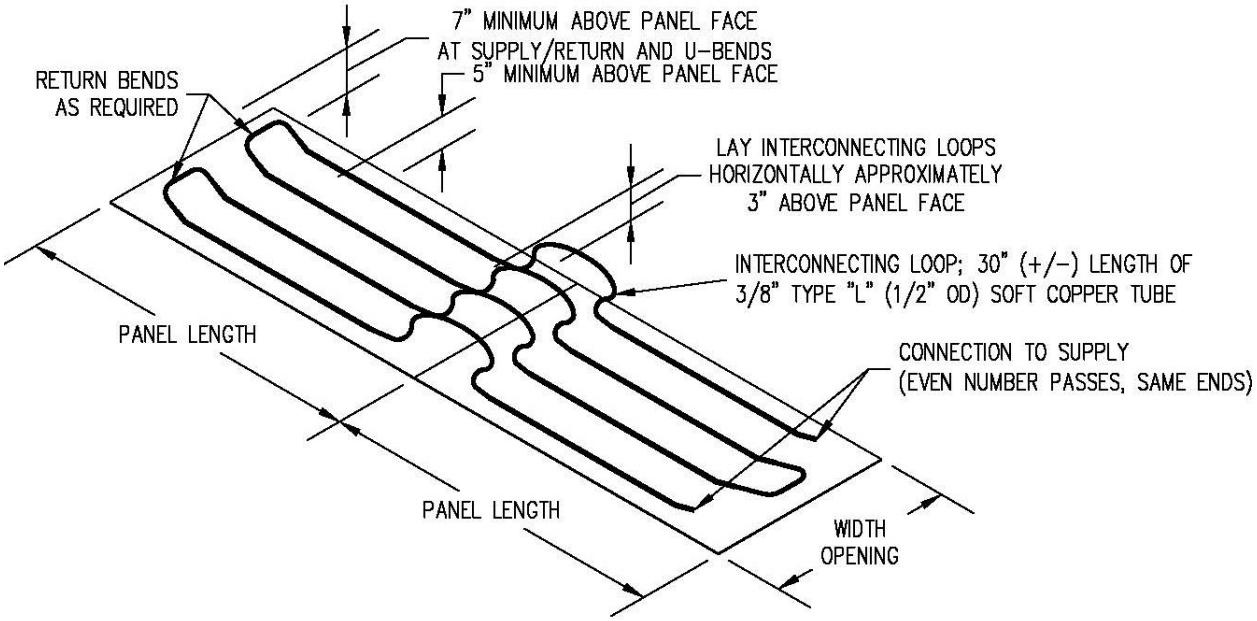
Chart 2: Panel Length[2]	
Scheduled Length	**Panel Finished Length**
1’-0” to 8’-0” Scheduled Lgt	Minus 1/4" From Scheduled Lgt
8’-1” to 12’-0” Scheduled Lgt [3]	Minus 3/8" From Scheduled Lgt
12’-1” to 16’-0” Scheduled Lgt	Minus 1/2" From Scheduled Lgt

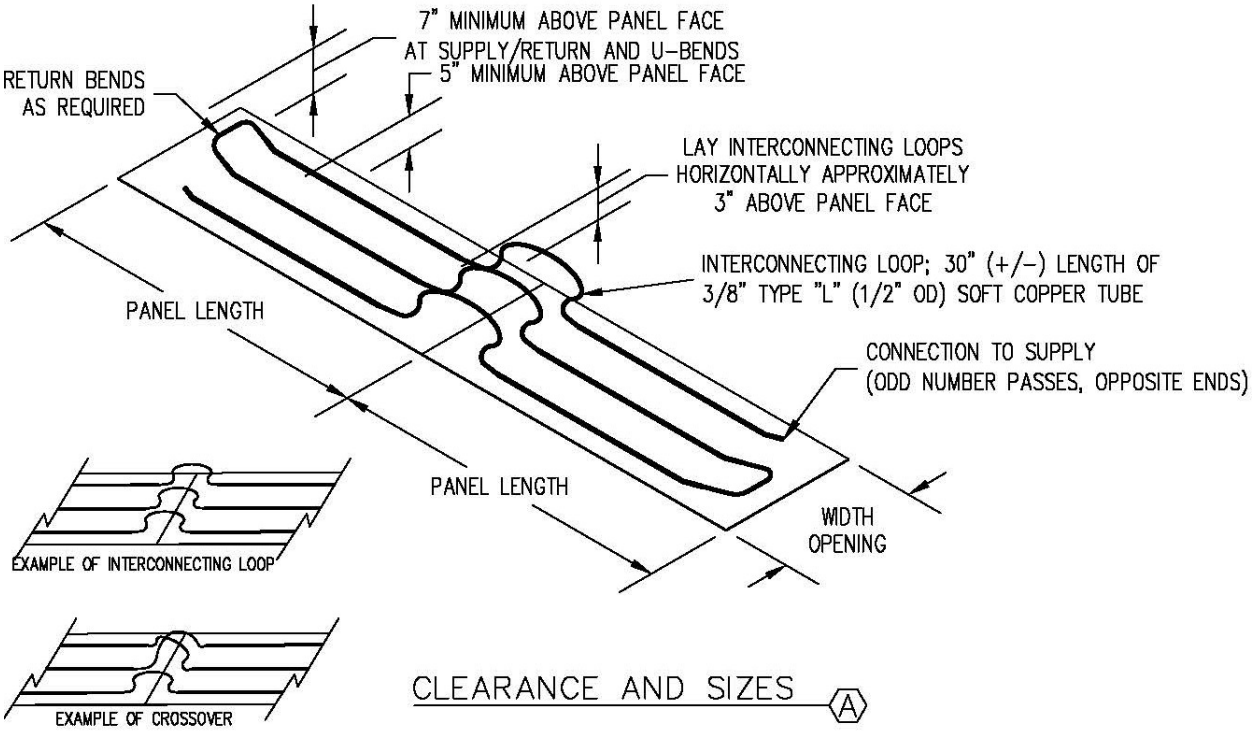
2) Panels are fabricated to a standard length rounded up to the nearest 6” for field cutting. *Upon request* panels will be fabricated to an actual length specified by others, minus the appropriate expansion allowance indicated in the “Panel Finished Length” column above.

3) Standard panel maximum length is 12’-0”. Panel runs longer than 12’-0” will be split into multiple panels (lengths up to 16’-0” can be fabricated on *special request only*, and after review for additional cost due to handling the extended lengths).

Panel	Clear Opening Width
6”	6-1/4”
8”	8-5/16”
9”	9-5/16”
12”	12-1/8”
16”	16-1/4”
18”	18-1/8”
20”	20-1/8”
24”	24-1/8”
30”	30-1/16”
36”	36”

Tubing Connection and Clearance Information

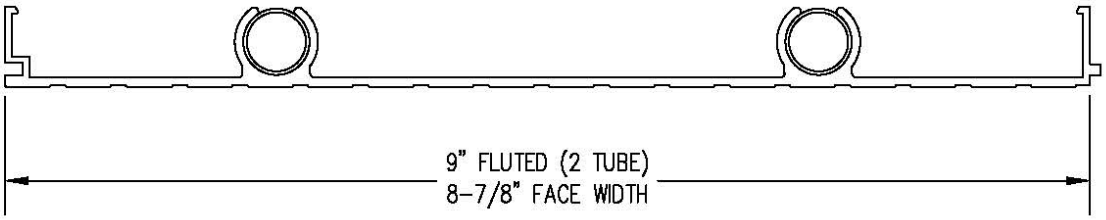


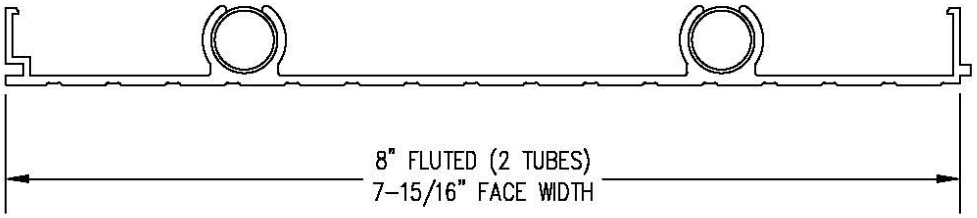


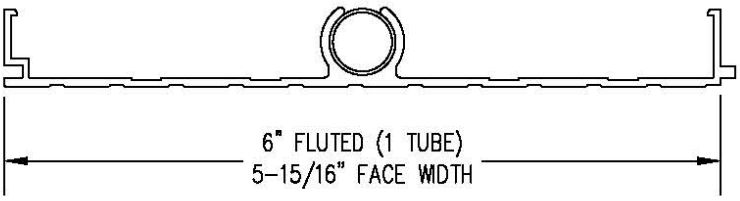
CLEARANCE AND SIZES (A)

– FOR WIDTH OPENING, SEE CHART 1; FOR PANEL LENGTH, SEE CHART 2 –
– STANDARD MAXIMUM SINGLE PANEL LENGTH 12'–0" (UP TO 16'–0" ON SPECIAL REQUEST) –
– ALL MITERS, NOTCHES AND CUTS TO BE PERFORMED IN FIELD BY INSTALLER –
– GROOVED EDGE OF PANEL ASSEMBLY TO BE TOWARD WALL –

AXO Fluted Face Options

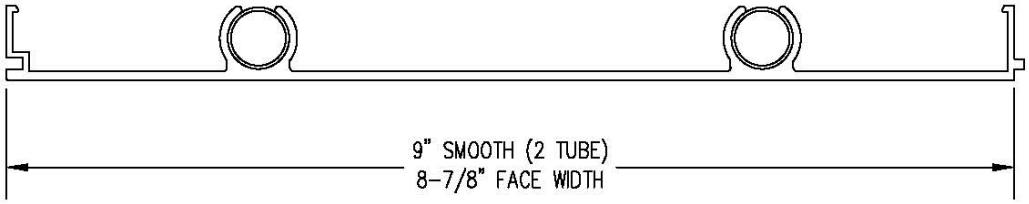


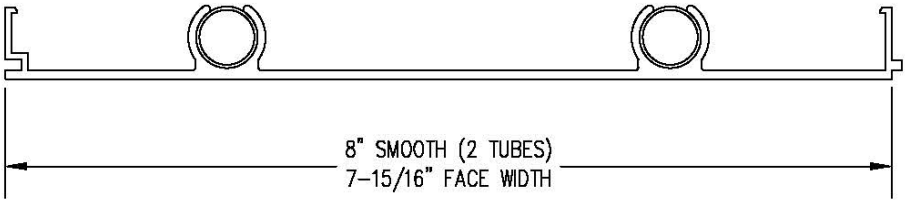


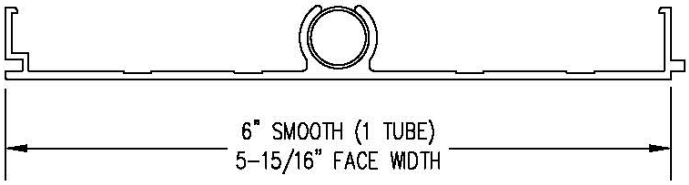


STOCK EXTRUSIONS Ⓐ

AXO Smooth Face Options

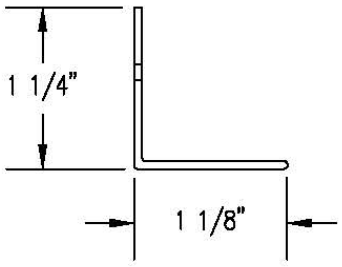




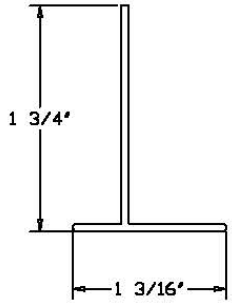


OPTIONAL EXTRUSIONS (A)

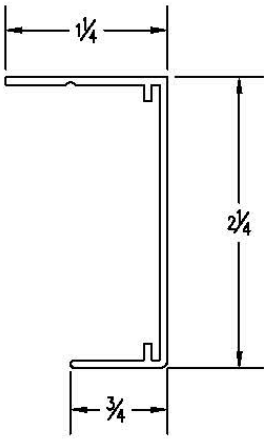
Aero Tech Stock Frames



WALL ANGLE (B)
CPEX–0006
10' LENGTHS

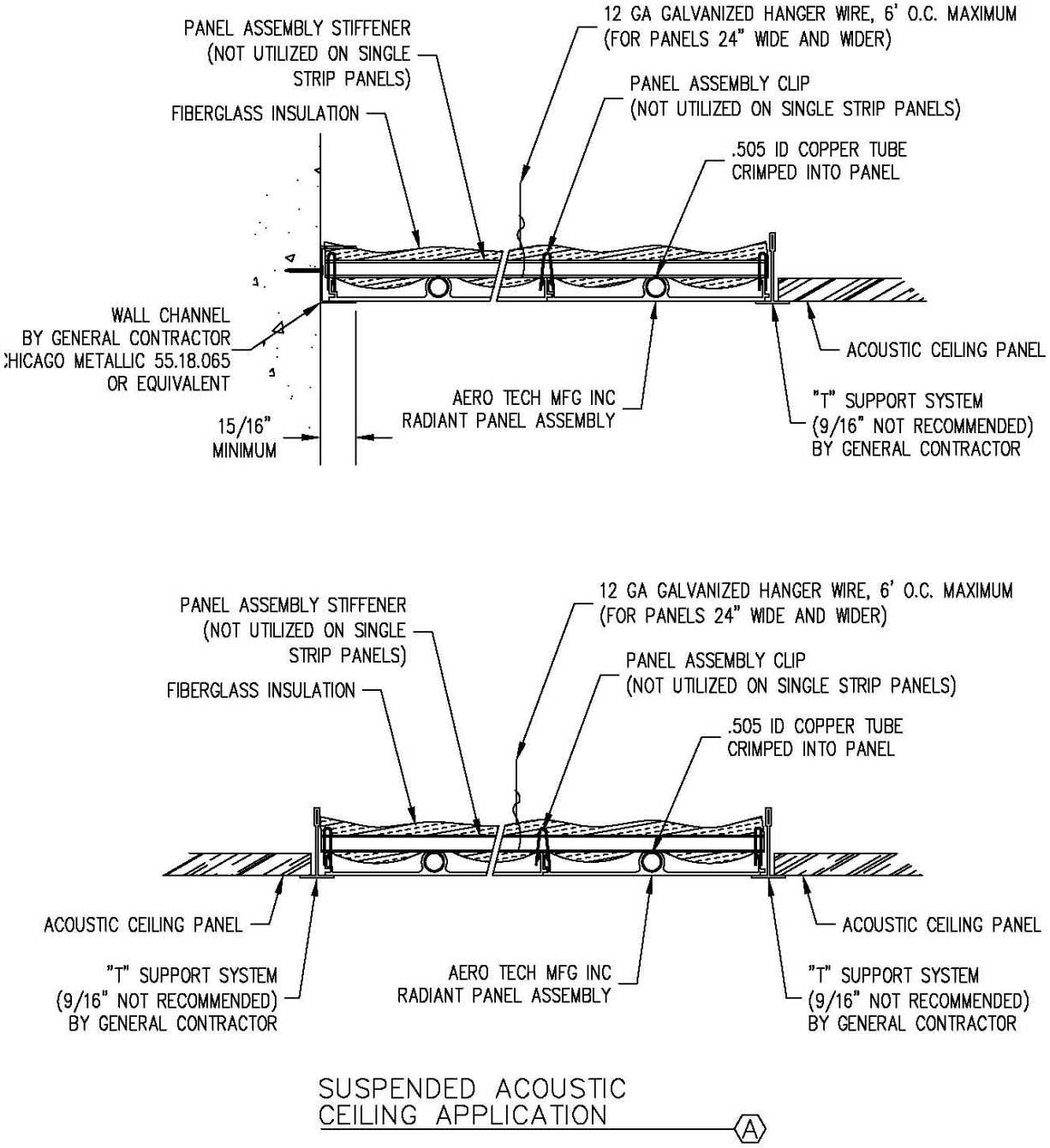


RECESS MOUNT FRAME (C)
CPEX–0004
10' LENGTHS



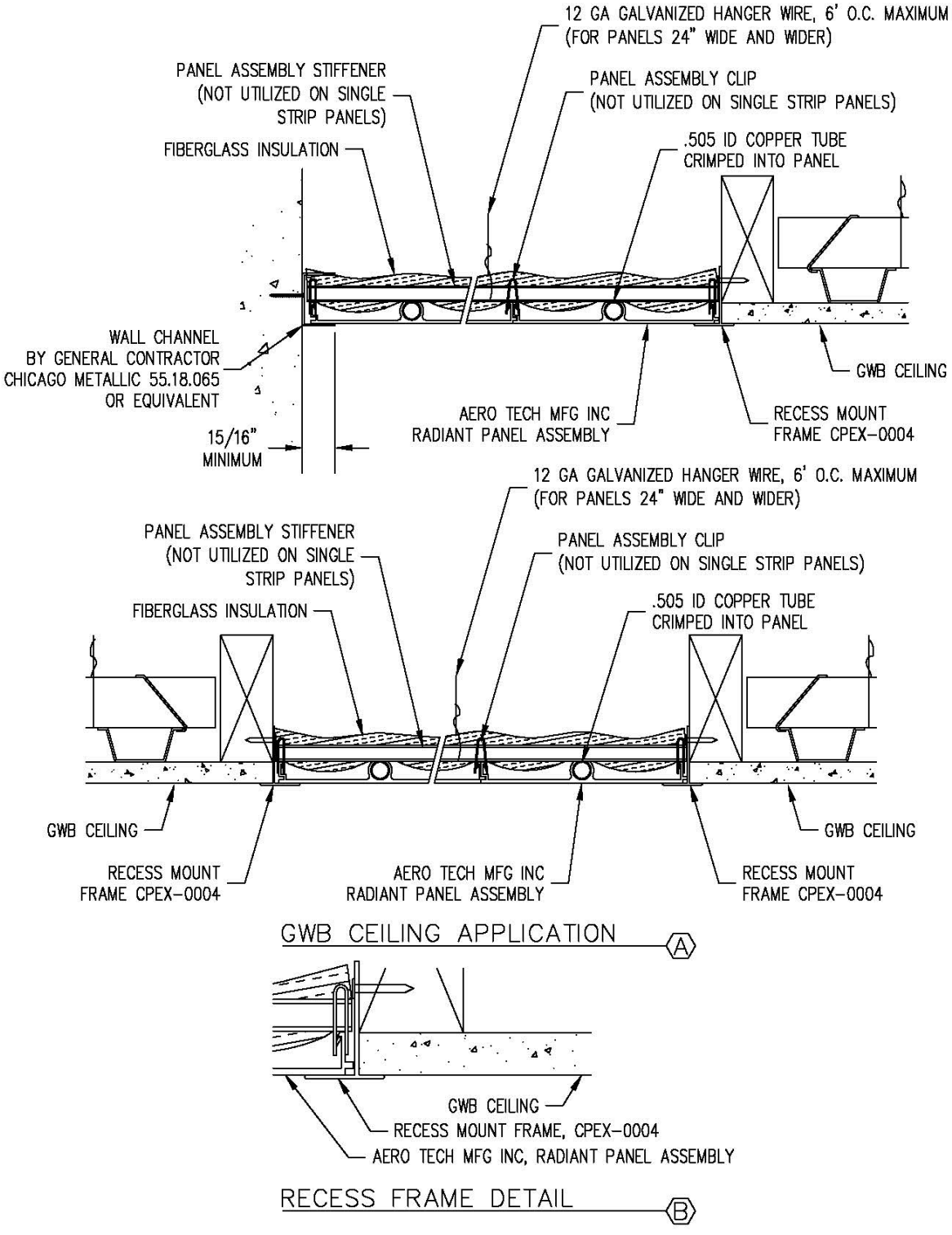
SURFACE MOUNT FRAME (D)
CPEX–0001
10' LENGTHS

Acoustic Ceiling Application



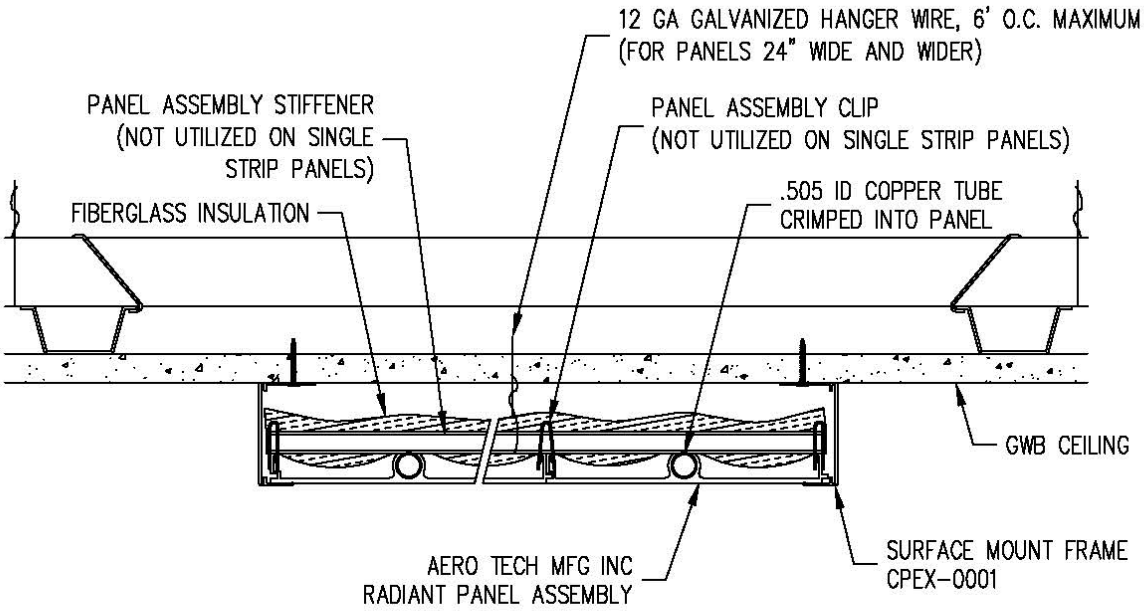
For width opening, see Chart 1. For panel length, see Chart 2.
Face Style as Selected

GWB Ceiling Application

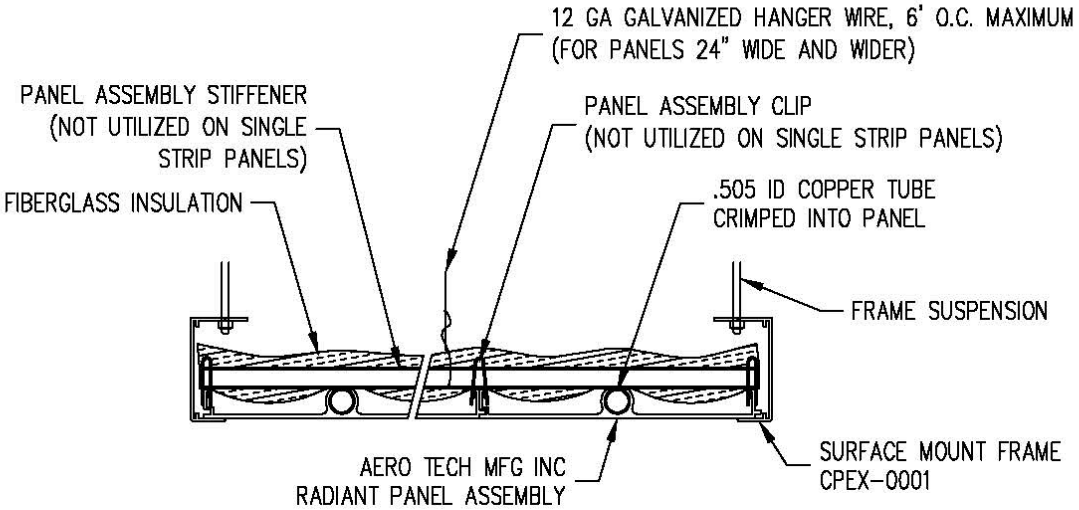


For width opening, see Chart 1. For panel length, see Chart 2.
Face Style as Selected

Surface Mount and Suspended Mount Applications



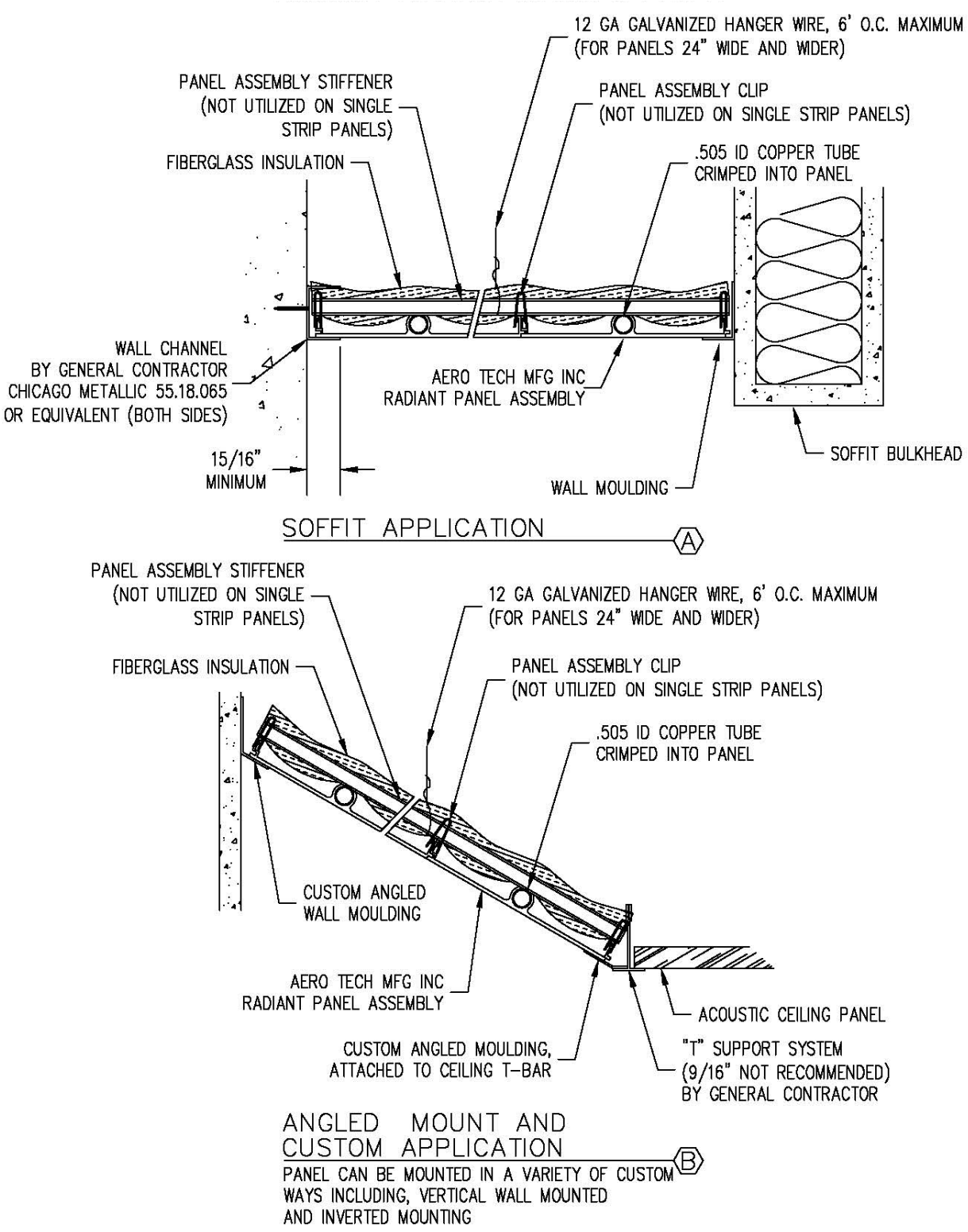
SURFACE MOUNT APPLICATION (A)



SUSPENDED MOUNT APPLICATION (B)

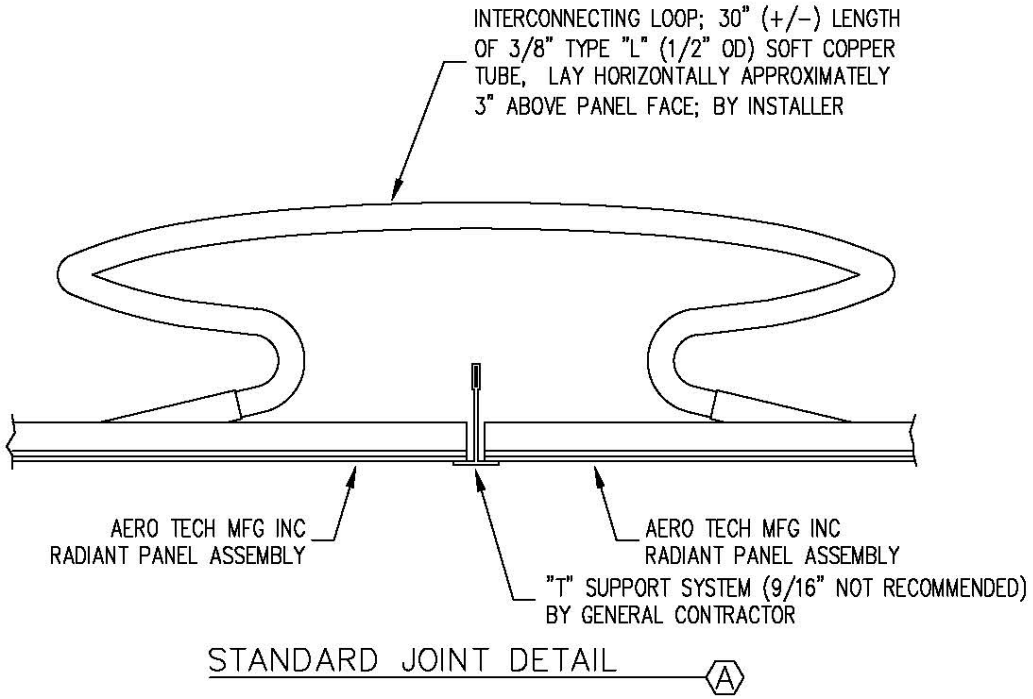
For width opening, see Chart 1. For panel length, see Chart 2.
Face Style as Selected

Soffit and Custom Angle Applications

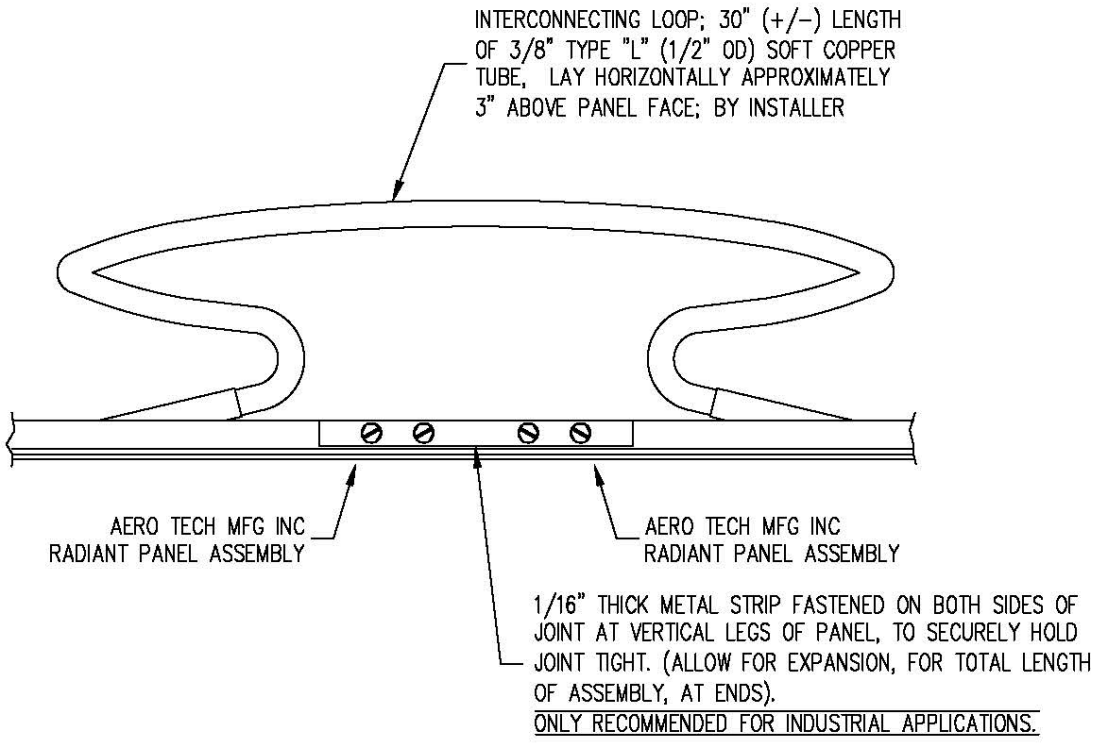


For width opening, see Chart 1. For panel length, see Chart 2.
Face Style as Selected

Typical Joints Between Panels



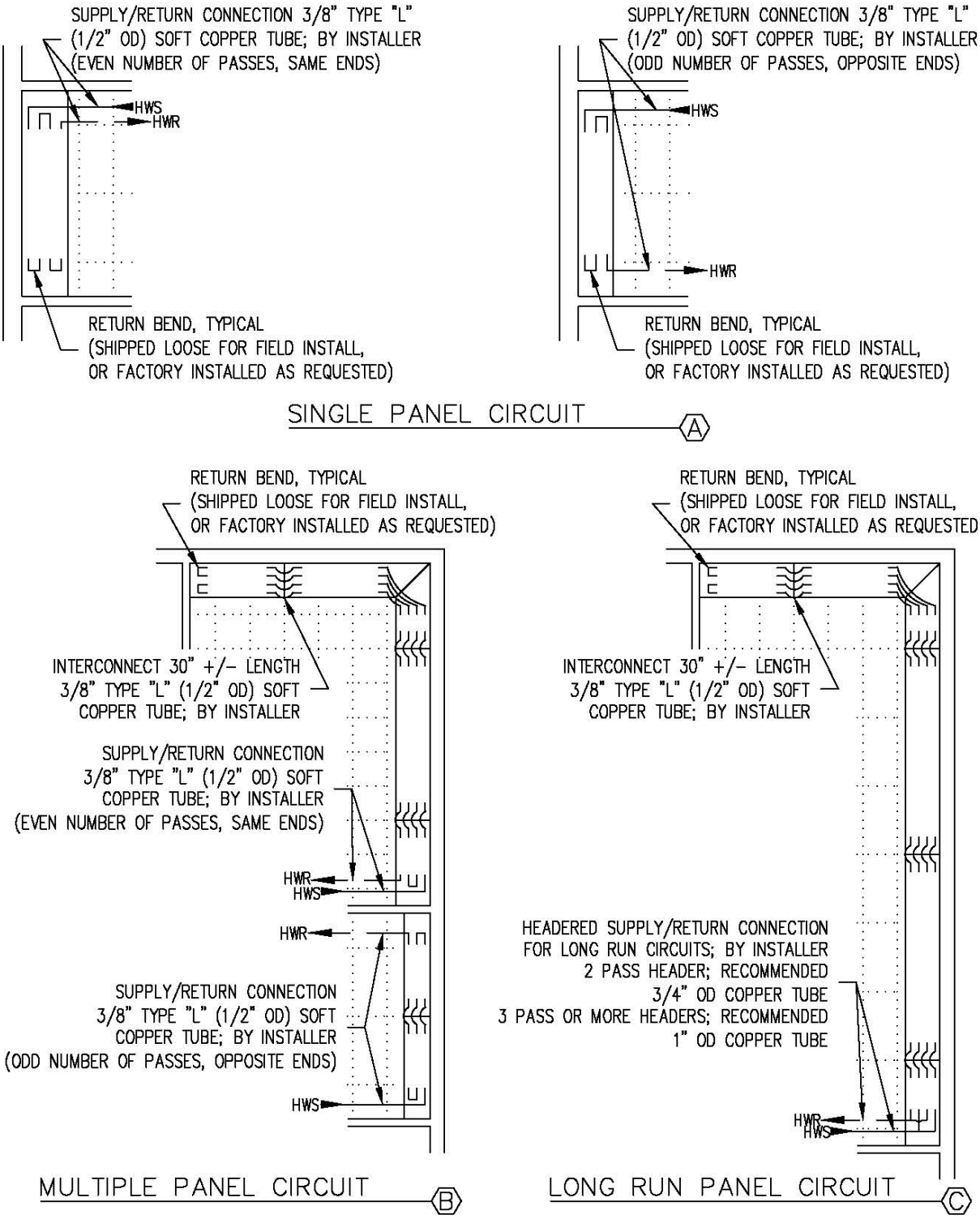
STANDARD JOINT DETAIL (A)



SPECIAL BUTT JOINT DETAIL (B)

For width opening, see Chart 1. For panel length, see Chart 2.
Face Style as Selected

Radiant Panel Circuit Examples



Standard maximum single panel length 12' – " (up to 16' – 0" on special request).
All miters, notches, and cuts to be performed in field by installer.
Grooved edge of panel assembly to be toward wall.

INSTALLATION

In a typical installation, the suspension system should consist of 3/4" wide wall molding and 15/16" wide main tees and butt cut cross tees. Other suspension systems may be used provided there is sufficient and uniform support around the periphery of the panel. The panel should lie on supports uniformly.

Cut panel to required length (panel standard maximum length is 12'-0", however lengths up to 16'-0" are provided upon special request), using a blade designed for non-ferrous metals (recommended, for circular saw use carbide tip blade with approximately 40 teeth on 7 1/4" diameter, for reciprocating saws use blade with 8 to 12 teeth per inch). Cut panels from face side, protecting the face from damage in all cases. Cut lengths allowing for expansion; panels up to 8'-0" should be 1/4" shorter than opening, panels 8'-1" to 12'-0" should be 3/8" shorter than opening (12'-1" to 16'-0" should be 1/2" shorter than opening).

Mark and cut any other features, miters, notches, etc. as required. Tubes that may be cut through can be lifted free from channel by carefully prying back the channel around the tube approximately 4 to 6 inches (do not puncture tubing).

Panels are supplied completely assembled, return bends shipped loose (unless specified otherwise) fabricated from 3/8" type "L" soft copper tubing.

Lift tube ends from channel, being careful not to kink tube, prior to placing panel in position

Place panel in ceiling suspension system with grooved edge toward wall.

For all panel assemblies opening should be panel face width plus 3/8" (for example: an 18" wide panel made from three, 6" strips = opening of 18-1/8").

Aero Tech recommends the use of soft cotton gloves when handling panels.

A 12 gauge, hanger wire should be attached to stiffeners on the back of panels 24 inches in width or wider at 6'-0" O.C. maximum or every other stiffener (minimum two per panel). Panels over 40 inches in width should have two hanger wires on stiffeners at each end of the panel.

Connect panel to supply and return run outs using 3/8" type "L" soft copper tubing. Because Aero Tech panels utilize a .505 ID panel tubing, the 3/8" type "L" tubing can be soldered directly inside without the need for fittings or flaring.

Panels connected in series are connected with approximately 30" of 3/8" type "L" tubing formed into an overbent horseshoe configuration. Make connection with interconnecting loop laying horizontally approximately 3" above the back of the panel. Install a ceiling tee at panel joints to allow for expansion and to cover cut edges. Make any additional connection as required, again using 3/8" type "L" soft copper tubing.

With panel installed; place insulation on back of panel, as specified.

OPERATION

START-UP

Once boilers are operating and circulators are functioning, set control valves to the full flow position and gradually allow the system to come up to design temperature. Design temperature drop will only be achieved at the design load.

BALANCING

Balancing for heating is most effectively done on a cloudy winter day.

Start at the farthest panel from the zone supply and establish the mean water temperature with a surface pyrometer. Adjust all other radiant panels to the same mean water temperature by adjusting the balancing valves.

Place automatic control valves in operation, calibrate room thermostat and set at design point. Check function of all valves.

Note: If any panel must be removed or repositioned during balancing, this should be done only by a qualified individual to prevent damage to panels and connections.

MAINTENANCE

Since there are no moving parts to the Aero Tech Radiant Ceiling System, there is normally no maintenance other than periodic cleaning. Aero Tech Panels have a wear-resistant, long-lasting baked enamel finish, which can be easily cleaned. They may be washed with a mild detergent cleaner applied with a sponge or other soft object. Avoid excessive moisture that can be trapped in joints. If dusty, a soft brush or vacuum should first be used. Rinse with a damp sponge using clean water. DO NOT use abrasives of any kind on the baked enamel finish.

Note: All Aero Tech products are packaged for interior storage only. Aero Tech ceiling products have an interior finish. Exercise care to protect panels from moisture and extremes in environmental conditions.

Benefits of Radiant Linear Extruded Aluminum (AXO) Panel

Since 1982 Aero Tech has developed and manufactured more than a million square feet of ceiling panels, which have been successfully installed in schools, universities, hospitals, laboratories, aircraft hangars, athletic facilities, office buildings and many other sites throughout the country.

Whether in original construction or modernization/remodeling, there are good reasons to choose Aero Tech radiant ceiling panels:

COMPATIBILITY

Aero Tech panels are available in a variety of combinations, allowing them to blend beautifully into virtually any architectural style.

COST-EFFECTIVE

Centrally located equipment simplifies and reduces maintenance and operating costs.

Minimized air requirements for ventilation and dehumidification reduce costs for ductwork, fans and filters.

EASE OF CONSTRUCTION

Mechanical equipment is not required at the outside walls. Mechanical equipment need not be located within the occupied space.

PERMANENCE

Metal ceiling panels will last for the life of the building in which they are installed. There is no need to replace panels over the years.

EASY MAINTENANCE

Aero Tech ceiling panels retain their original beauty with just an occasional cleaning.

APPEARANCE

Aero Tech's top quality, baked-on finishes resist fading and discoloration.

INCOMBUSTIBILITY

Aero Tech's aluminum panels are non-combustible.

- All Aero Tech Radiant Ceiling Panels are manufactured in a certified ISO9001:2015 facility.
- All Aero Tech Radiant Ceiling Panels are made and assembled in North Salt Lake, Utah, USA.
- All raw components are of US or NAFTA origin.
- All panel components are 100% recyclable.

Hydronic Radiant Panel Performance Certification

Aero Tech certifies that its Radiant Panels will perform equivalent to or exceed that of other hydronic radiant panels, under identical conditions.

Aero Tech has performed extensive testing of competitive panels in a test room with temperature control of walls and floors to provide a constant average unheated surface temperature (AUST). All panels were tested under identical conditions with regards to room, insulation, temperature control and instrumentation.

Performance values are intended for use directly in standard heat loss calculations and are from certified data based on 70 degrees F. AUST, natural convection and 1", 3/4 PCF insulation on top of panel. Due to actual conditions, stated performance values can vary plus or minus 3%.

AERO TECH MANUFACTURING

RADIANT CEILING PANEL SYSTEMS

395 West 1100 North
North Salt Lake, UT 84054

866-390-2376
aerotechmfg.com

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