	PERFORMANCE TESTS												
	Factory Mutual Research Corporation	**Underwriters Laboratories Inc. UL 580 Class 90 Wind Uplift** (Refer to Panel Section for Construction Number)	**Air Infiltration (ASTM E 283)**	**Air Infiltration (ASTM E 1680)**	**Water Resistance (ASTM E 331)**	**Water Resistance (ASTM E 1646)**	**ASTM E 1592**	**Underwriters Laboratories Inc. UL 2218 Class 4 Impact Resistance**	**Underwriters Laboratories Inc. UL 790 Standard Test Resistance Ratings Class A** (Refer to Panel Section for Application)	**Miami-Dade County Product Control Approved** (Refer to Panel Section for NOA#)	**Texas Wind Storm**	**Structural Performance of Exterior Windows, Curtin Walls, and Doors by Uniform Static Air Pressure Difference. ASTM E 330**	**Florida Approval** (Refer to Panel Section for FL#)
Magna-Loc	●	●		●		●	●	●	●	●	●		●
Magna-Loc 180°		●		●		●	●	●	●				●
Seam-Loc 24®	●	●		●		●	●	●	●				●
Snap-Loc 24®		●		●		●	●	●	●			●	●
Vertical Seam		●		●		●	●	●	●	●			●
Clip-Loc		●		●		●	●	●	●				
Pro-Loc I, II		●					●***	●	●				
Mini-Batten		●*	●		●		●*	●	●	●*			
Maxi-Batten / Box-Batten		●	●		●			●	●				
Stile®		●						●	●	●	●		●
Image II		●					●	●	●	●	●		●
5V-Crimp		●						●	●	●	●		●
IC72-Panel		●	●	●	●	●	●	●	●			●	
7/8" Corrugated			●	●	●	●	●	●	●			●	●
Soffit Panel			●		●							●	●**
V-Line 32		●						●	●				
Verti-Line Panel Series			●		●							●	
Exposed Fastened Panel Series			●		●							●	
Commercial-Industrial / Deep Rib			●		●							●	
Flush Face / Interior Liner Panel			●		●							●	
R-Panel / PBR-Panel		●	●		●		●	●	●	●	●	●	●
Span-Line 36A										●**		●	●**
U-Panel, PBU-Panel		●						●	●		●		
Classic Rib®		●					●	●	●	●	●	●	●
Pro-Panel II®								●	●				●
2.5" Corrugated Panel											●		●

***1" Mini-Batten only** ****Wall Application only** *****Pro-Loc II only**

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PRODUCT APPROVAL SUMMARY (CONT.)

	PERFORMANCE TESTS													
	Factory Mutual Research Corp. FM 1-90	Underwriters Laboratories Inc. Class 90 Wind Uplift. (Refer to Panel Section for Application and Construction No.)	Air Infiltration (ASTM E-283)	Air Infiltration (ASTM E-1680)	Water Resistance (ASTM E-331)	Water Resistance (ASTM E-1646)	Corps of Engineers General Specification ASTM E1592	Underwriters Laboratories Inc. 2218 Impact Resistance	Underwriters Laboratories Inc. 790 Standard Test Resistance Ratings Class A (Refer to Panel Section for Application.)	Dade County, FL Building Code Compliance (Wind Driven Rain Infiltration and Static Pressure Structural Uplift Resistance)	Underwriters Laboratories Inc. 263 Fire Resistance Ratings (Refer to Panel Section for Application and Construction No.)	Texas Department of Insurance Windstorm Resistant Construction Guide Section 120	Structural Performance of Exterior Windows, Curtin Walls, and Doors by Uniform Static Air Pressure Difference. ASTM E-330	Underwriters Laboratories Inc. 1897: Uplift Resistance of Roofing Systems (excluding the roof deck attachment).
TL21														
T3														
T6A			●		●									
T11A														
R-Panel / PBR-Panel		●						●	●			●		
Span-Line® 36A														
Classic Rib®								●	●			●		
Pro-Panel II®								●	●	●**		●		
Delta-Rib														
U-Panel / PBU-Panel		●						●	●			●		

** Wall Application only

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MATERIALS

Steel materials shall conform to ASTM A792 Acrylic Coated Galvalume® (ACG) with an AZ55 coating for unpainted material and an AZ50 coating for painted material. Yield strength will vary by panel profile and gauge (Inquire with Metal Sales for specific minimum yield strength). (Differential appearance of Acrylic Coated Galvalume roofing materials is not a cause for rejection). OR

to ASTM A653 (or A446) and be hot dipped galvanized with a substrate coating as per ASTM A525 (or A924).

Oil canning is not a cause for rejection. Oil canning can be described as the amount of waviness found in the flat areas of metal panels. Oil canning is an inherent characteristic of light gauge cold formed metal products, particularly those with broad flat areas. There are many factors which may contribute to oil canning that Metal Sales is not able to control. These factors include: misalignment of the support system, over-driving of fasteners used on the panels, stress (whether inherent in the panel or induced), thermal expansion and contraction of the panel, improper material handling, width, gauge, length, color of panels, and improper installation. (Reference Metal Construction Association "Oil Canning Position Paper" - Appendix A).

PAINT SYSTEMS

Metal Sales uses high quality paint systems designed to provide long term performance and protection. Each coating is formulated with thoroughly researched, tested, and field proven pre-treatments, primers, resins, and pigments that can meet your design and performance requirements.

PVDF (Fluorocarbon)

This paint system combines ceramic pigmentation with polyvinylidene fluoride for a superior, long-lasting performance. PVDF finishes are respected for their durability, resistance to chalking and fading, chemical resistance, and color retention. Please note: PVDF finishes meet both Kynar 500 and Hylar 5000 specifications; Kynar and Hylar are produced under license from Elf Atochem North America, Inc. and Ausimont, respectively. See color chart for available colors.

MS Colorfast45®

This is a thermoset coating system composed of polyester resin which has been modified with a silicone resin. Much like the PVDF finishes, the MS Colorfast45® finishes offer good protection to the elements with special consideration to chalk and fade resistance, durability, and chemical resistance. See color chart for available colors.

Touch-up paint

Touch-up paint is used to cover and protect unexpected scratches on the paint finish that may occur during installation of panel. Touch-up paint will not weather as well or at the same rate as the original coating or finish. When applying, use in small inconspicuous and separate areas. Test in an area that will not be noticeable.

Metallic colors

Minor differences in color and appearance are normal and to be expected with metallic coatings, as it is impossible to match one metallic coating to another. A phenomenon known as "metallic color flop" occurs when there is a difference in alignment in the planes of metallic pigments. This will result in a different visual appearance. Coil application process, striations and longitudinal patterning may also show this phenomenon. To minimize the possible visual effects of the normal minor differences in paint and its application, an entire job should be painted at one time, from one batch of paint at one coater, using the same application equipment. Additionally, fabricated panels, flat sheet, and flashings manufactured from coil coated materials should be oriented in the same direction for installation.

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PAINT PERFORMANCE

	TEST METHOD	MS Colorfast45®	PVDF (Fluorocarbon)
Dry Film Thickness	NCCA II-4 OR ASTM D 1005	Topside finish: Primer 0.2 mil Topcoat 0.8 mil Total DFT (Dry film thickness) for system 1.0 mil Reverse side finish: Primer .2 mil Backer .3 mil Total Backer Coat .5 mil	Topside finish: Primer 0.2 mil Topcoat 0.8 mil Total DFT (Dry film thickness) for system 1.0 mil Reverse Side finish: Primer .2 mil Backer .3 mil Total Backer Coat .5 mil
Specular Gloss (60°)	ASTM D 523	25°-40°	20°-30°
Pencil Hardness	ASTM D 3363 or Eagle Turquoise Pencil per NCCA II-12	F	HB Minimum
Reverse Impact	ASTM D 2794	No Loss of Adhesion	No Loss of Adhesion
Formability T-Bend Mandrel	ASTM D 4145 ASTM D 522 (180° Bend around 1/8" mandrel)	2T No Loss of Adhesion	1T No Loss of Adhesion
Cross Hatch Adhesion	ASTM D 3359	No Loss of Adhesion	No Loss of Adhesion
Abrasion Resistance	ASTM D 968	30 liters/mil minimum of falling sand	65 ± 5 liters/mil minimum of falling sand
Humidity Resistance	ASTM D 2247 (100% Relative Humidity at 100°F)	1000 hours	2000 hours (1)
Salt Spray Resistance	ASTM B 117	1000 hours (2)	1000 hours (2) (3)
Weatherometer Test	ASTM D 822/G23	2000 hours (4) (5)	2000 hours (4) (5)
Color Change	ASTM D 2244	Not greater than 5 Hunter units at 2000 hours	Not greater than 5 Hunter units at 5000 hours
Chalking Resistance	ASTM D 659	Rating not less than #8 at 2000 hours	Rating not less than #8 at 5000 hours
Flame Spread Rate	ASTM E 84	Displays a flame spread classification of A (Class 1)	Displays a flame spread classification of A (Class 1)

(1) Test rating of 10, no blisters.

(2) Scribe rating of 6 ($^1/_8$").

(3) Field rating of 10, no blisters.

(4) No checking, blistering, or adhesion.

(5) No objectionable chalking or color change.

ASTM - American Society Testing and Materials
NCCA - National Coil Coaters Association

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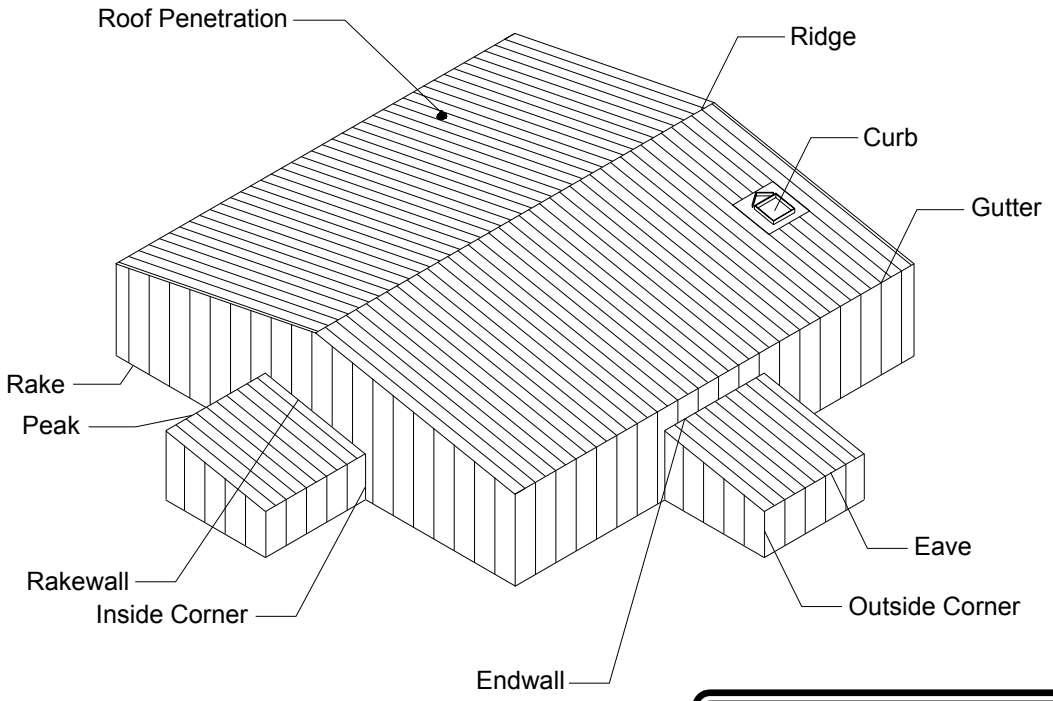
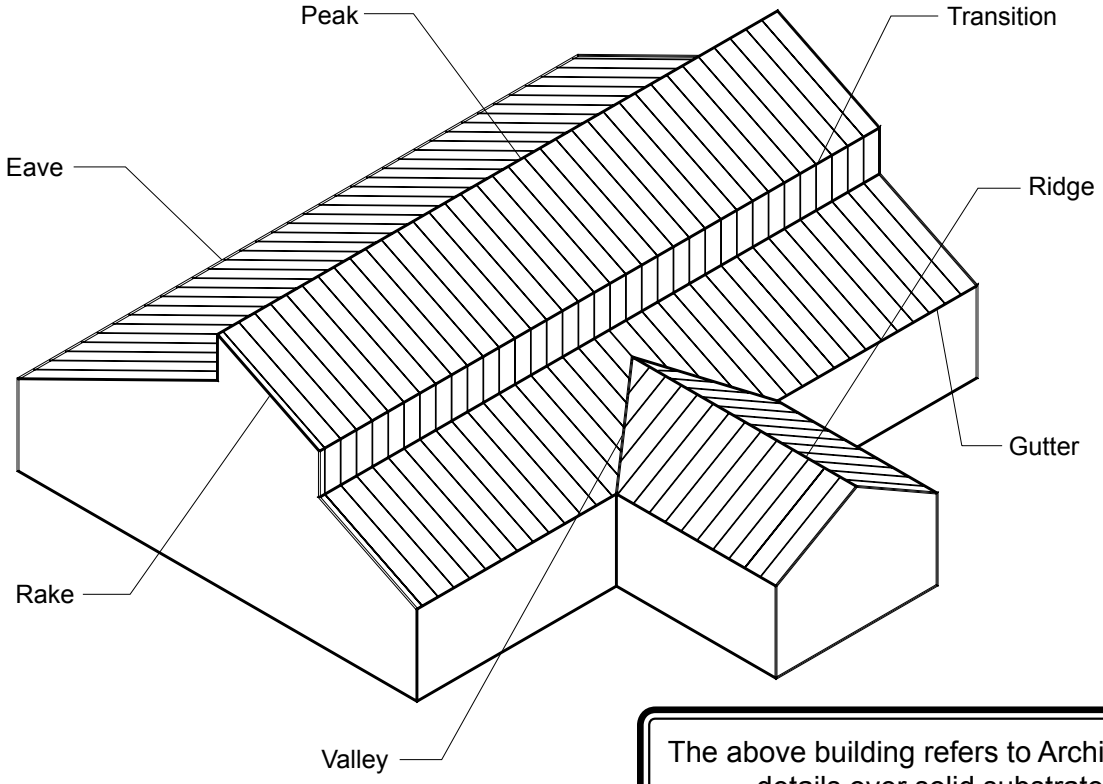


The above building refers to Commercial details over open framing.



The above building refers to Architectural details over solid substrate.

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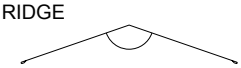
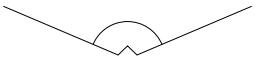
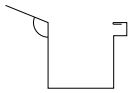
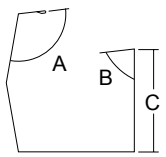
FLASHING ANGLE SPECIFIER CHART

This chart should be used to determine the required specified angle when considering the following flashings.

PROFILE/FLASHING	1/4:12	1/2:12	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12
RIDGE 	178°	175°	170°	161°	152°	143°	135°	127°	120°	113°	106°	100°	95°	90°
SSR RIDGE 	178°	175°	170°	161°	152°	143°	*135°	*127°	*120°	*113°	*106°	*100°	*95°	*90°
VENTED RIDGE COVER 	178°	175°	170°	161°	152°	143°	*135°	*127°	*120°	*113°	*106°	*100°	*95°	*90°
HIP 	178°	177°	173°	167°	160°	154°	*148°	*143°	*138°	*134°	*130°	*126°	*123°	*120°
SSR SCULPTURED EAVE 	91°	92°	95°	99°	104°	108°	113°	117°	120°	124°	127°	130°	133°	135°
EAVE 	91°	92°	95°	99°	104°	108°	113°	117°	120°	124°	127°	130°	133°	135°
EXTENDED EAVE 	91°	92°	95°	99°	104°	108°	113°	117°	120°	124°	127°	130°	133°	135°
SSR SCULPTURED HIGH SIDE EAVE 	99°	98°	95°	91°	86°	82°	*77°	*73°	*70°	*66°	*63°	*60°	*57°	*55°
PEAK 	89°	88°	85°	81°	76°	72°	67°	63°	60°	56°	53°	50°	47°	45°
VALLEY 	178°	177°	173°	167°	160°	154°	148°	143°	138°	134°	130°	126°	123°	120°
PITCH BREAK 	91°	92°	95°	99°	104°	108°	113°	117°	120°	124°	127°	130°	133°	135°
SSR HIGH SIDE PITCH BREAK 	91°	92°	95°	99°	104°	108°	113°	117°	120°	124°	127°	130°	133°	135°
GUTTER DRIP 	91°	92°	95°	99°	104°	108°	113°	117°	120°	124°	127°	130°	133°	135°
BOX GUTTER 	91°	92°	95°	99°	104°	108°	113°	117°	120°	124°	127°	130°	133°	135°
SSR SCULPTURED GUTTER 	A	101°	102°	105°	109°	114°	118°	123°	127°	130°	134°	137°	140°	143°	145°
	B	89°	88°	85°	81°	76°	72°	67°	63°	60°	56°	53°	50°	49°	45°
	C*	5 5/8"	5 3/4"	6"	6 1/2"	7"	7 1/2"	8"	8 1/2"	9"	9 1/2"	10"	10 1/2"	11"	11 1/2"
	C**	5 1/8"	5 1/4"	5 1/2"	6"	6 1/2"	7"	7 1/2"	8"	8 1/2"	9"	9 1/2"	9 7/8"	10 1/4"	10 5/8"
	C***	5"	5 1/8"	5 3/8"	5 7/8"	6 3/8"	6 7/8"	7 3/8"	7 3/4"	8 1/8"	8 5/8"	9"	9 3/8"	9 3/4"	10 1/4"

C* = Magna-Loc Sculptured Gutter C** = Seam-Loc 24 Sculptured Gutter C*** = Snap-Loc 24 Sculptured Gutter

*Note: Metal Sales standard flashing dimensions may not accommodate all situations, please inquire about custom flashings to cover high slopes.

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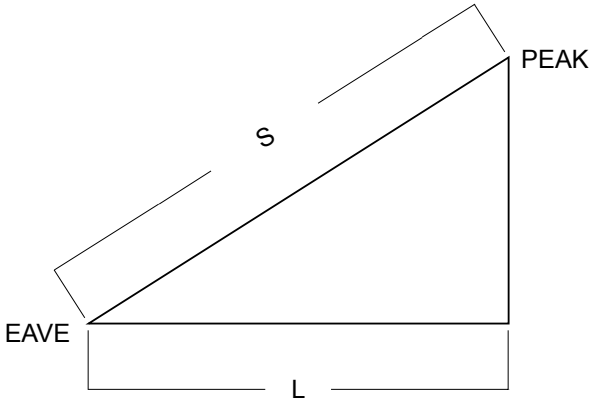
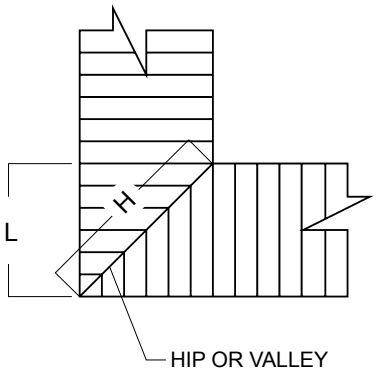
ROOF SLOPE FACTOR CHART

This chart should be used when specifying and ordering panels and flashings. It will help you determine overall required length of material on sloped applications.



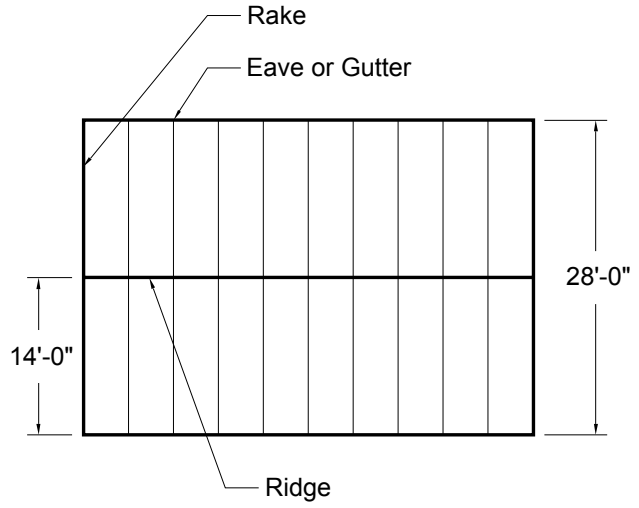
(L) X (SLOPE FACTOR) = S

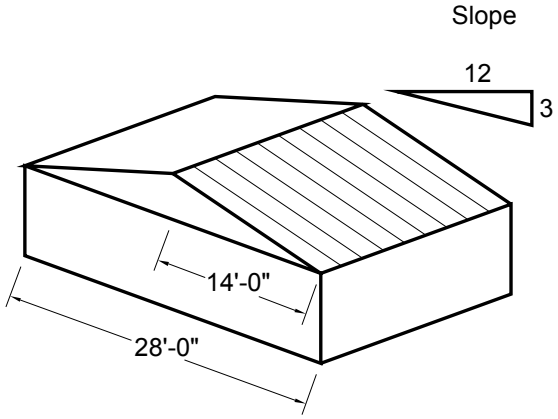


(L) X (HIP VALLEY MULTIPLIER) = H

SLOPE	SLOPE FACTOR	HIP / VALLEY MULTIPLIER	SLOPE	SLOPE FACTOR	HIP / VALLEY MULTIPLIER
1:12	1.0035	1.4167	7:12	1.1577	1.5298
2:12	1.0138	1.4240	8:12	1.2019	1.5635
3:12	1.0308	1.4362	9:12	1.2500	1.6008
4:12	1.0541	1.4530	10:12	1.3017	1.6415
5:12	1.0833	1.4743	11:12	1.3566	1.6853
6:12	1.1180	1.5000	12:12	1.4142	1.7320

EXAMPLE:





Your building is 28'-0" wide with a 3:12 pitch
To determine the panel lengths for each side: (L) X (SLOPE FACTOR) = S

14'-0" x 1.0308 (from chart above for 3:12 slope) = 14.4312' OR 14'-5"

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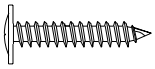
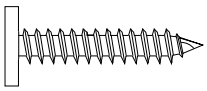
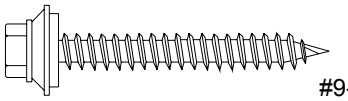
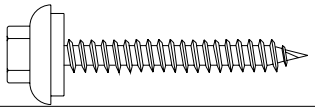
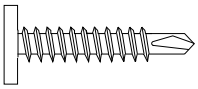
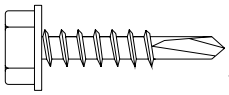
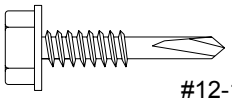
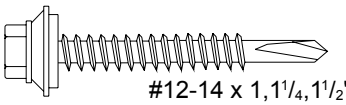
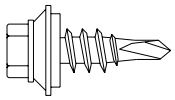
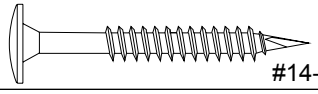
PHYSICAL PROPERTIES

FASTENER	HEAD DIA/TYPE	THREAD DIA. O.D.	THREAD DIA. I.D.	MIN. TENSILE	MIN. TORSIONAL	NOM. SHEAR
TRUSS HEAD WOODSCREW  #8-18 x 3/4"	Truss Hd. #2 Phlps	.162 .168	.109 .115	1150	50	850
PANCAKE HEAD WOODSCREW  #10-12 x 1"	.447 IN. #2 Phlps	.194-.188	.133-.126	1825 lbs	48 In lbs	1535 lbs
WOODSCREW  #9-15 x 1",1 1/2"	1/4" HWH	.181 .175	.133 .127	1500	60	933
WOODSCREW . ABMP (STILE PANEL)  1/4-14 x 1",1 1/2"						
PANCAKE HEAD DRILLER  #10-16 x 1" SELF DRILLING	#2 Phlps	.189 .183	.141 .135	2100	.215 .209	1690
SELF DRILLER NO WASHER  1/4-14 x 1 1/2" SELF DRILLING	3/8" HWH	.246 .240	.192 .185	3800	150	2850
SELF DRILLER NO WASHER  #12-14 x 1",1 1/2" SELF DRILLING	5/16" HWH	.211 .209	.183 .180	3450	100	2420
SELF DRILLER  #12-14 x 1,1 1/4,1 1/2" SELF DRILLING	5/16" HWH	.215 .209	.164	2900	92	2050
STITCH  1/4-14 x 7/8" SELF DRILLING	5/16" HWH	.246 .240	.192 .187	2800	150	2850
DECK SCREW  #14-13 x 4",5",6",8"	#3 phlps .448 Max	NOM. 263	NOM .204	4350	140	3700

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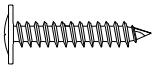
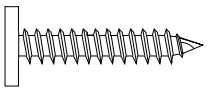
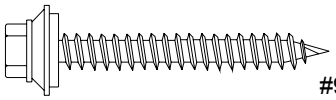
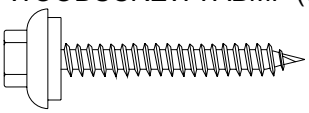
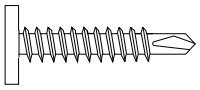
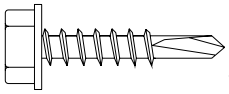
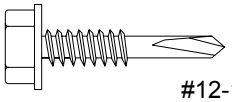
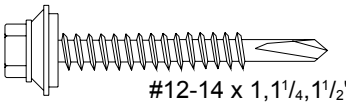
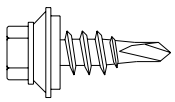
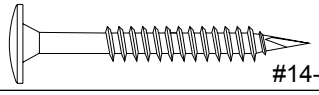
PULL OUT STRENGTH VALUES (POUNDS ULTIMATE)

FASTENER	Plywood 3/4"	Plywood 5/8"	Plywood 1/2"	OSB 19/32"	OSB 7/16"	Hard/Soft Wood Spruce	Hard/Soft Wood Fir	Hard/Soft Wood Oak	Hard/Soft Wood Pine
TRUSS HEAD WOODSCREW  #8-18 x 3/4"	658	469	351	367	217	375	405	593	464
PANCAKE HEAD WOODSCREW  #10-12 x 1"	703	460	391	363	218				
WOODSCREW  #9-15 x 1",1 1/2"	706	478	397	393	235	1537			723
WOODSCREW . ABMP (STILE PANEL)  #1/4-14 x 1",1 1/2"	770	560	407	419	167				

FASTENER	3/8"	1/4"	3/16"	STEEL 10 GA	STEEL 12 GA	STEEL 14 GA	STEEL 16 GA	STEEL 18 GA	STEEL 22 GA
PANCAKE HEAD DRILLER  #10-16 x 1" SELF DRILLING					1570	956	707	492	254
SELF DRILLER NO WASHER  1/4-14 x 1 1/2" SELF DRILLING					1608	980	697	488	227
SELF DRILLER NO WASHER  #12-14 x 1",1 1/2" SELF DRILLING					1510	860	644	460	238
SELF DRILLER  #12-14 x 1,1 1/4,1 1/2" SELF DRILLING					1510	860	644	460	238
STITCH  1/4-14 x 7/8" SELF DRILLING								752	372
DECK SCREW  #14-13 x 4",5",6",8"								806 50ksi	415 80ksi

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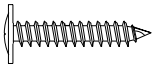
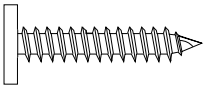
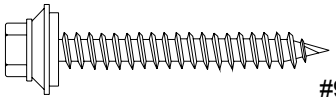
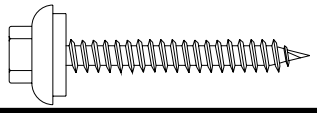
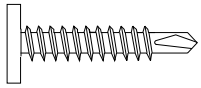
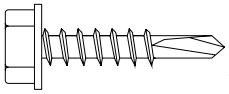
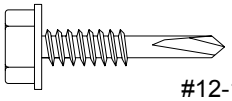
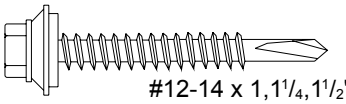
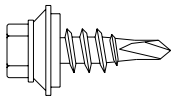
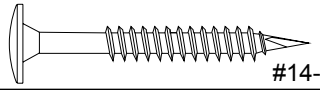
PULL OVER STRENGTH VALUES (POUNDS ULTIMATE)

FASTENER	STEEL 18 GA	20 GA	22 GA	24 GA	26 GA	29 GA
TRUSS HEAD WOODSCREW  #8-18 x 3/4"			N/A	883	745	643
PANCAKE HEAD WOODSCREW  #10-12 x 1"			N/A	898	682	620
WOODSCREW  #9-15 x 1",1 1/2"			N/A	810	570	556
WOODSCREW . ABMP (STILE PANEL)  1/4-14 x 1",1 1/2"			1694	1526	1083	947

FASTENER	STEEL 18 GA	20 GA	22 GA	24 GA	26 GA	29 GA
PANCAKE HEAD DRILLER  #10-16 x 1" SELF DRILLING	N/A	1500	1238	1050	651	694
SELF DRILLER NO WASHER  1/4-14 x 1 1/2" SELF DRILLING	2571	1854	1354	1147	675	638
SELF DRILLER NO WASHER  #12-14 x 1",1 1/2" SELF DRILLING	1947	1469	1036	880	561	556
SELF DRILLER  #12-14 x 1,1 1/4,1 1/2" SELF DRILLING	2087	1660	1272	978	833	642
STITCH  1/4-14 x 7/8" SELF DRILLING	1969	1395	1143	956	741	808
DECK SCREW  #14-13 x 4",5",6",8"	2036	1501	1111	891	633	541

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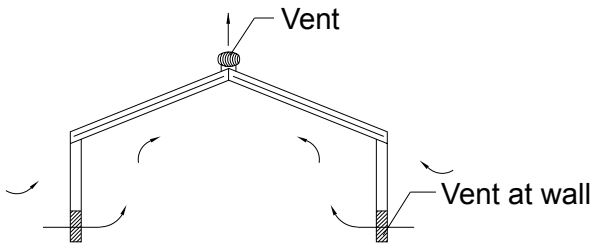
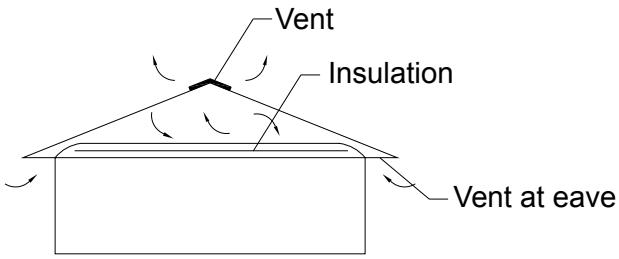
GENERAL

Proper design and installation of vapor barriers and ventilation systems are important to prevent condensation and the resulting problems of moisture damage and loss of insulation efficiency.

On buildings that have an attic space, vents should be placed at both the eave and peak of the roof in order to prevent a buildup of moisture (humidity) in the attic space.



Typical Metal Building (No Attic)



Building with Attic or Retrofitted

In hot weather, proper ventilation prevents the attic from becoming a "hot-box" that radiates unwanted heat down through the attic floor into the living area. Attic temperatures can reach 150 degrees.

In cold weather, proper ventilation helps prevent moisture from condensing on the insulation, rafters, and roof deck. Trapped moisture can rot wood members and rob insulation of it's R-value.

NATURAL VENTILATION

EXAMPLE:
To find the exact free area needed to properly ventilate a home, find the length of the area to be ventilated in the vertical column of the chart below and the width of the area in horizontal column. The total net free area required is shown where these two columns intersect. This free area is expressed in square inches (chart utilizes 1/300 ratio, double the number for 1/150 ratio, i.e. multiply by two).

For example, suppose the total area to be ventilated is 1200 sq.ft. such as a house 30' x 40'. By looking at the chart, we find that we would need a total of 576 sq.in. If roof or gable end and under-eave vents are used, 50% of the 576 sq.in., or 288 sq.in. are required for the roof or gable end vents and the same amount would be required for the under-eaves. This is equivalent to the 1/300 ratio.

If under-eave vents are not used, the above total free area requirements must be doubled. This is equivalent to 1/150 ratio. Even if the attic is recently vented, it should be carefully checked to determine whether or not the present vent arrangement is adequate to provide proper ventilation.

Length in Feet	Width in Feet										
	20	22	24	26	28	30	32	34	36	38	40
20	192	211	230	250	269	288	307	326	346	365	384
22	211	232	253	275	296	317	338	359	380	401	422
24	230	253	276	300	323	346	369	392	415	438	461
26	250	275	300	324	349	374	399	424	449	474	499
28	269	296	323	349	376	403	430	457	484	511	538
30	288	317	346	374	403	432	461	490	518	547	576
32	307	338	369	399	430	461	492	522	553	584	614
34	326	359	392	424	457	490	522	555	588	620	653
36	346	380	415	449	484	518	553	588	622	657	691
38	365	401	438	474	511	547	584	620	657	693	730
40	384	422	461	499	538	576	614	653	691	730	768
42	403	444	484	524	564	605	645	685	726	766	806
44	422	465	507	549	591	634	676	718	760	803	845
46	442	486	530	574	618	662	707	751	795	839	883
48	461	507	553	599	645	691	737	783	829	876	922
50	480	528	576	624	672	720	768	816	864	912	960

Chart uses 1/300 ratio; Double for 1/150 ratio; Divide by 5 for 1/1500 ratio.

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GENERAL

The purpose of this section is to provide information for gutter sizing and the spacing of drainage downspouts.

Note that requirements for drainage contained in codes or ordinances enacted by governing jurisdictions take precedence over these guidelines.

Gutter and downspout sizing and spacing is a function of the drainage area of the roof and the anticipated rainfall intensity. Rainfall is measured by the Weather Bureau recording the accumulation at 5 minute intervals throughout a storm. The largest 5 minute accumulation is then extrapolated to an hour. This is rainfall intensity in inches per hour, and is recorded for 5 years recurrence and 25 year recurrence.

EXTERIOR GUTTER SIZING

In sizing gutters, the following considerations apply for typical sections:

- Spacing and size of outlet openings (the gutter can never be any more effective than the outlet and downspout selected to drain it. Downspout sizes must not exceed the bottom width of the gutter).
- Slope of the roof (the gutter must be of such a design and location that water from a steep pitched roof will not by its own velocity tend to overrun the front edge).
- Style of gutters to be used (all gutters are not effective for their full depth and width).
- Maximum length of gutter (between ends or expansion joints is the limit unless the system is especially designed to accommodate the greater expansion, the larger flow and the need for special supports).
- Gutter support capability (supports should be based on full capacity of the gutter. Ice load capacity also affect the size and strength of the system).

The size of rectangular gutters depends upon these factors:

1. Area to be drained in inches per hour.
2. Rainfall intensity per hour.
3. Length of gutter in ft.
4. Ratio of depth to width of gutter.

Level gutters may be sized by the chart on the following page. This chart was experimentally determined by the National Institute of Standards and Technology (NIST) formerly known as the National Bureau of Standard. It is plotted from $W = 0.0106\ M^{-4/7}\ L^{3/28}\ (IA)^{5/14}$ with W in Feet. Where:

W = Width of gutter
M = Ratio of depth to width of gutter
L = Length of gutter
I : Rain intensity (in/hr)
A : Drained area (ft^2)

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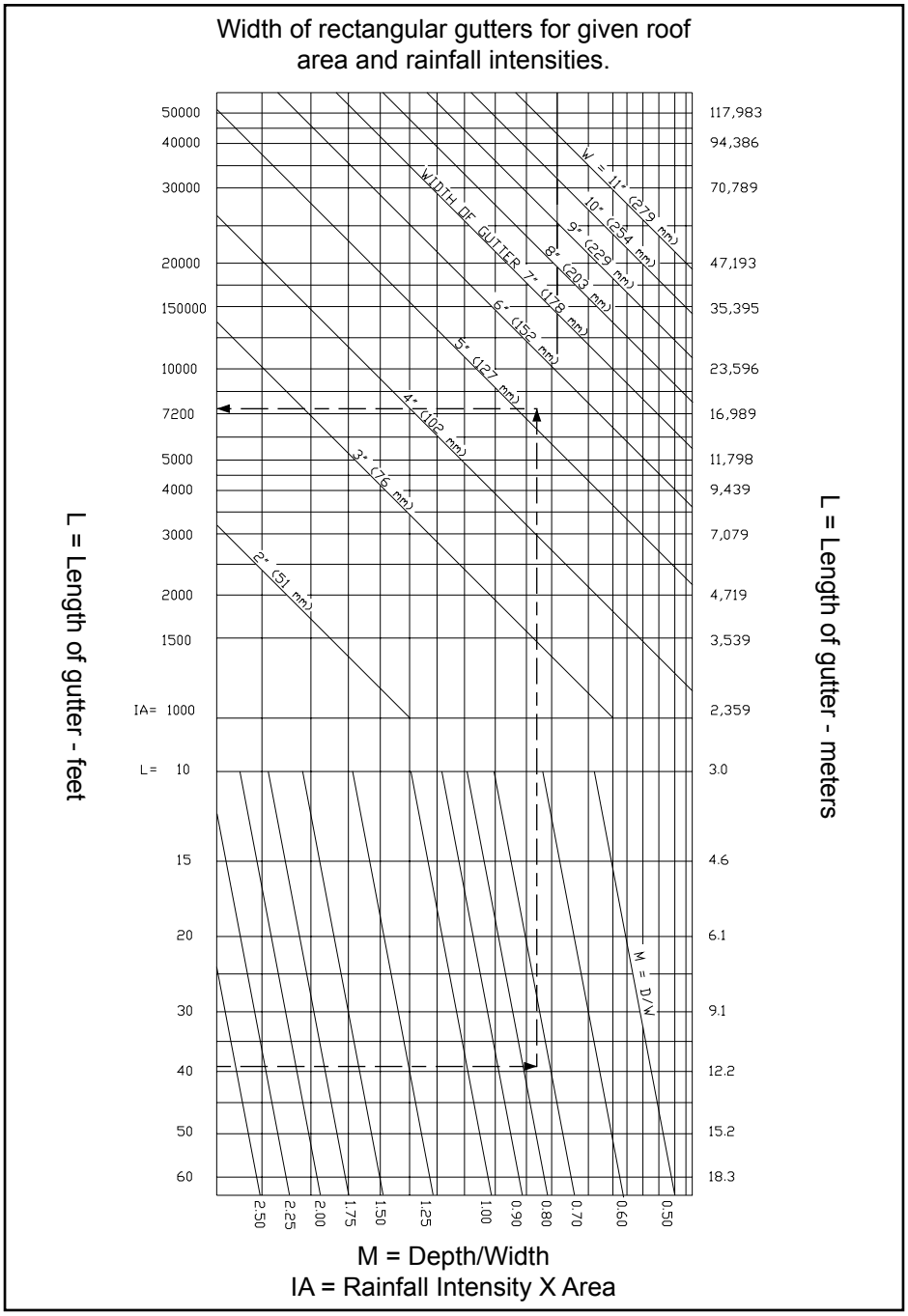

To size rectangular gutter for a building 120 x 30 ft. located in Buffalo, NY. A gutter is to be located on one of the 120 ft. sides. So that each section will not exceed 50 ft., downspouts will be located at each end of drained area. The area to be drained by each section of gutter will be 1200 sq. ft., the rainfall intensity is 6 in/hr, the length of each gutter section is 40 ft., and the ratio of gutter depth to width is 0.75. On the chart above find the vertical representing L = 40. Proceed vertically along this line to its intersection with oblique line representing M = 0.75. Pass to B vertically to the intersect of the horizontal line representing IA = 7200. The point of intersection occurs between the oblique line representing gutter widths of 5 and 6 in. The required width of gutter is, therefore, 6 in. and its depth need only be 4.5 in.

Gutter length served by a downspout (L) in feet
Width of roof to be drained (R) in feet
Gutter width (W) in inches
Gutter depth (D) in inches
Rain Intensity (I)
Area to be drained (A)
Ratio of depth to width of gutter (M)

Area (A) = L x R
M = D / W
(W) is determined from the chart above after finding IA (rainfall intensity x area) and M.

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EXTERIOR DOWNSPOUT SIZING

In sizing downspouts, the following considerations apply for typical sections:

1. The size of the downspout should be constant throughout its length.
2. The gutter outlet capacity should suit the downspout capacity.
3. The downspout size must suit the bottom width of the gutter.
4. Assuming that using the fewest number of downspouts is desirable, their locations will be affected by:

a. Gutter capacity and length. To limit the effects of thermal expansion in gutters 50 ft (15.3m) is a practical maximum length of gutter to be served by a downspout. Unless special provisions are made for flexibility in downspouts, gutters and their support systems, gutters should expand away from downspouts and downspouts should not be located near gutter expansion joints.

b. The capacity of the inlet tube.

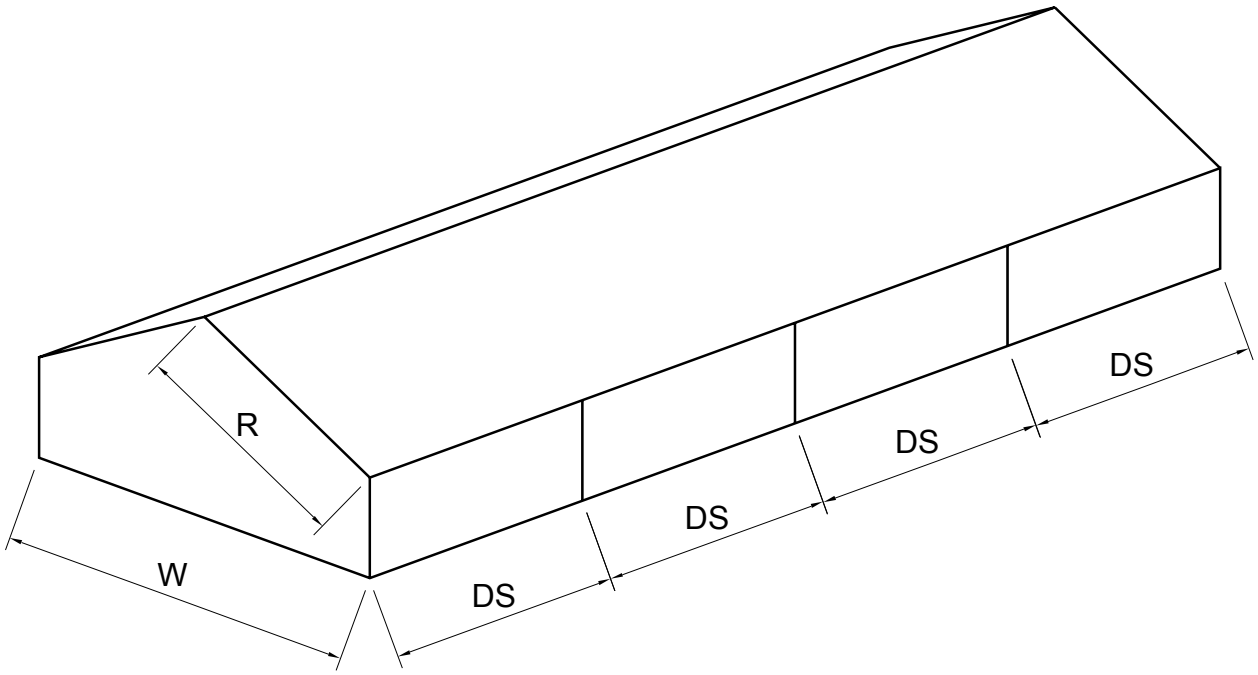
c. Potential for water freezing in downspouts. Locating downspouts on the north side of building is not recommended for such area.

d. The appearance of the downspout system and a potential need for concealment.

e. The greater capacity of a pitched roof.

f. The downspout discharge locations. Water disposal at this location should be acceptable.

g. The quick risk of gutter overflow from insufficient drainage capacity.



Downspout spacing is based on the following formula:

$$\text{Downspout Spacing (DS)} = \frac{1200(A)}{R\ I}$$

A = Area of downspouts (sq. in.)
R = Width of roof to be drained
I = Rainfall intensity in inches/hour with a 5 minute duration

CAUTION
Gutter and downspout sizing is controlled by the least value from gutter and downspout equations.

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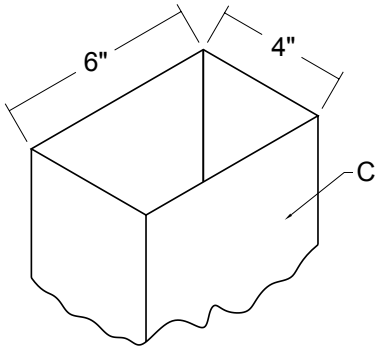
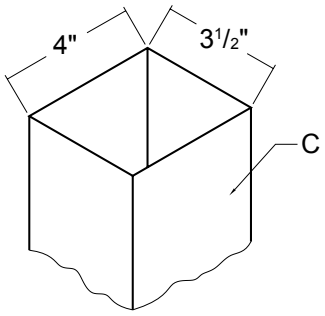
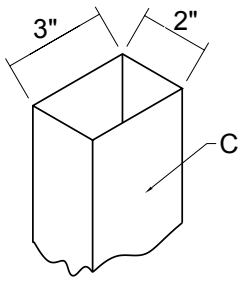
Maximum recommended downspout spacing is 50'-0' to limit the effects of thermal expansion. The lengths listed in the charts below apply to slopes up to 3:12.



STANDARD 4" x 6" DOWNSPOUT MAXIMUM RECOMMENDED DOWNSPOUT SPACING IS 50'-0"						
LENGTHS EAVE TO PEAK FT (R)	RAINFALL INTENSITY (I)					
	4 in/hr	6 in/hr	8 in/hr	10 in/hr	12 in/hr	14 in/hr
40					60	52
50				58	48	42
60				48	40	35
70			52	42	35	30
80			45	36	30	26
90		54	40	32	27	23
100		48	36	29	24	21



STANDARD 4" x 3 1/2" DOWNSPOUT MAXIMUM RECOMMENDED DOWNSPOUT SPACING IS 50'-0"						
LENGTHS EAVE TO PEAK FT (R)	RAINFALL INTENSITY (I)					
	4 in/hr	6 in/hr	8 in/hr	10 in/hr	12 in/hr	14 in/hr
30				56	47	40
40			53	42	35	30
50		56	42	34	28	24
60		47	35	28	24	20
70		40	30	24	20	18
80	53	35	27	21	18	15
90	47	32	24	19	16	14
100	42	28	21	17	14	12



STANDARD 3" x 2" DOWNSPOUT MAXIMUM RECOMMENDED DOWNSPOUT SPACING IS 50'-0"						
LENGTHS EAVE TO PEAK FT (R)	RAINFALL INTENSITY (I)					
	4 in/hr	6 in/hr	8 in/hr	10 in/hr	12 in/hr	14 in/hr
15				48	40	34
20		60	45	36	30	25
25		48	36	28	24	20
30		40	30	24	20	17
35	51	34	25	20	17	14
40	45	30	22	18	15	12

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RECEIVING MATERIAL

It is the responsibility of the installer to unload material from the delivery truck. The installer shall be responsible for providing suitable equipment for unloading of material from the delivery.

After receiving material, check the condition of the material, and review the shipment against the shipping list to ensure all materials are accounted for. If damages or shortages are discovered, it should be noted on the Bill of Lading at the time of delivery. A claim should be made against the carrier as soon as possible. Metal Sales is not responsible for any damages or shortages unless they are documented in writing and presented to Metal Sales within 48 hours.

GENERAL HANDLING

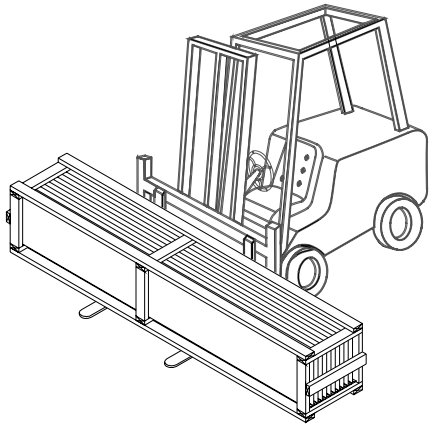
Each bundle should be handled carefully to avoid being damaged. Care should be taken to prevent bending of the panel or abrasion to finish. Whenever possible, the bundle should remain crated until it is located in its place of storage. If bundles must be opened, we recommend you re-crate them before lifting. To avoid damage please lift the bundle at its center of gravity.

CAUTION

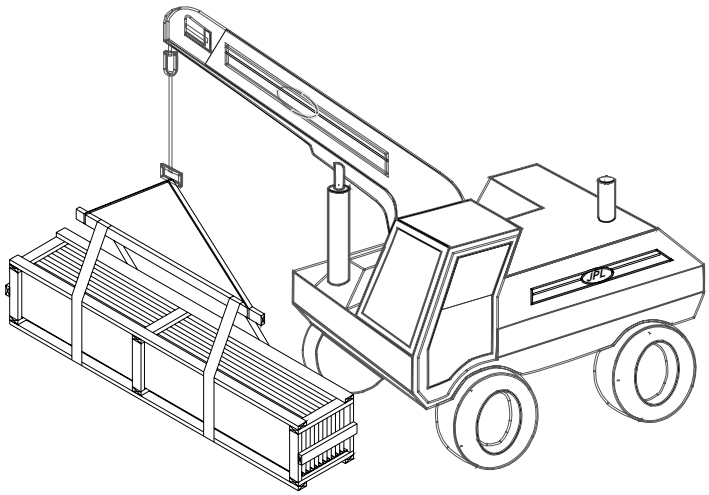
Improper loading and unloading of bundles and crates may result in bodily harm and/or material damage. Metal Sales is not responsible for bodily injuries and/or material damages resulting from improper loading and unloading.

MECHANICAL HANDLING

Forklift - A forklift may be used for panels up to 20'-0" long. Please make sure the forks are at their maximum separation. Do not transport open bundles. When transporting bundles across rough terrain, or over a longer distance, some means of supporting the panel load must be used.



Crane - A crane should be used when lifting panels with lengths greater than 20'-0". Please be sure to utilize a spreader bar to ensure the even distribution of the weight to the pick up points. As a rule when lifting panels, no more than $^1/_3$ of the length of the panel should be left unsupported. Never use wire rope because this will damage the panels.



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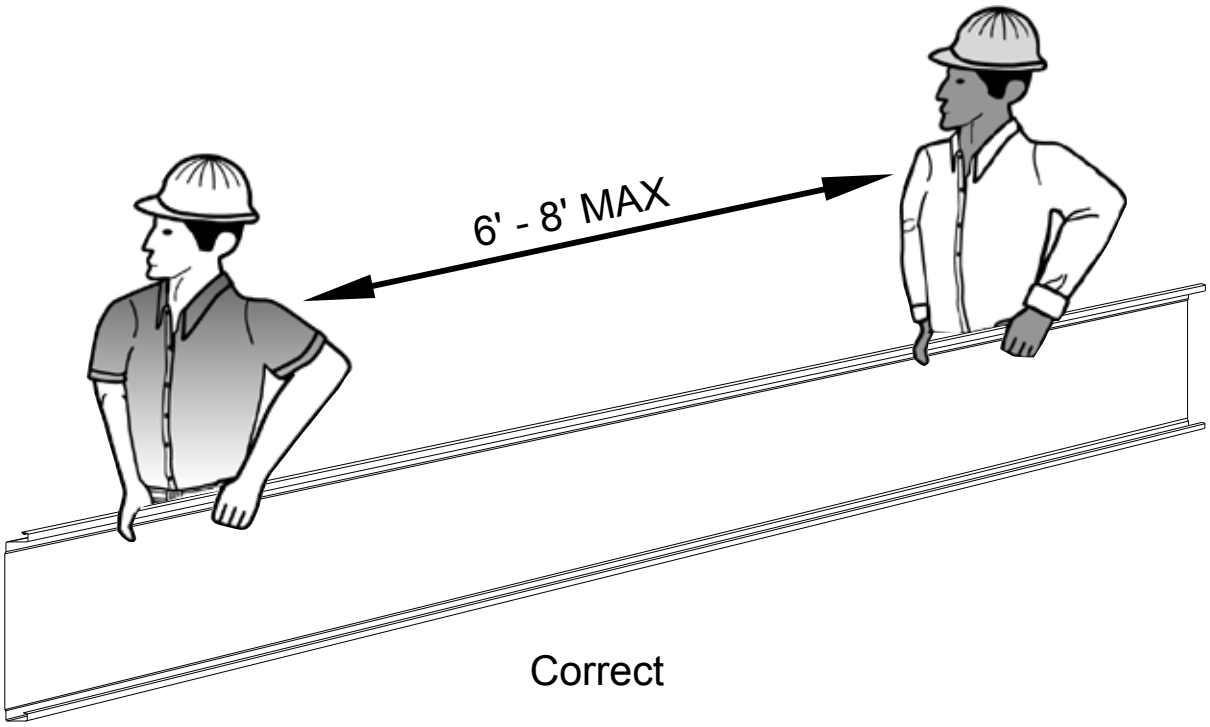
MANUAL HANDLING

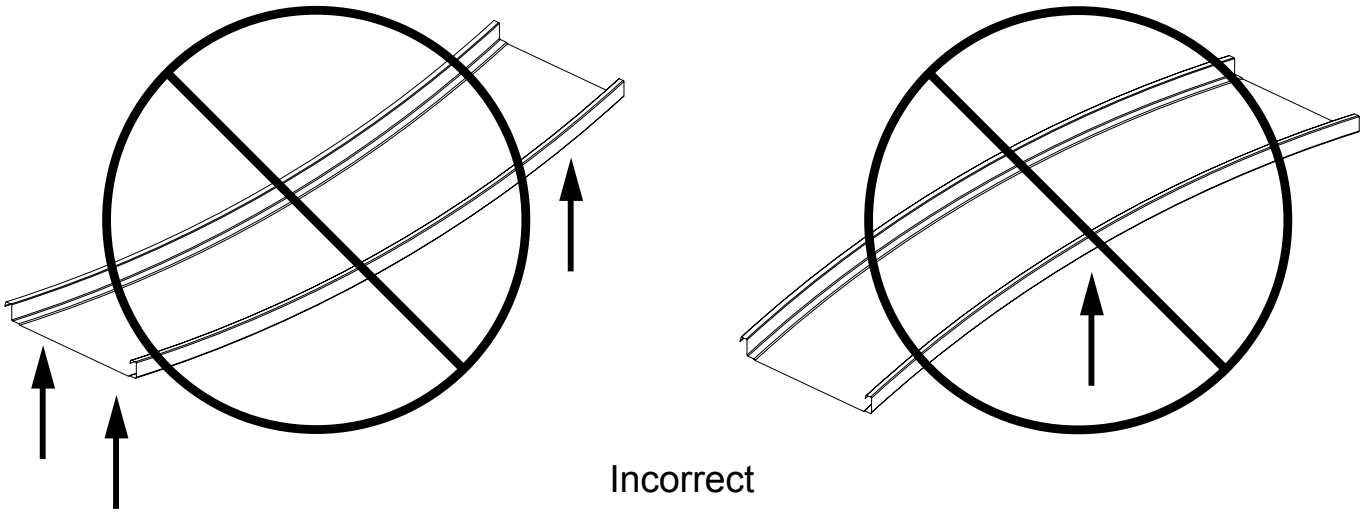
When handling supplied material, care should be taken to prevent scratching of panels. Clean gloves should be worn at all times to prevent a reaction with salts found on bare skin. Installers should wear rubber sole shoes to keep from scuffing material while walking on the roof.

Handling of individual panels should be done carefully and properly to avoid bending or damaging. Panels should be carried by grasping the edge of the panel so that the panel is vertical to the ground. The panel should not be carried horizontal to the ground as this could cause the panel to buckle or bend in the center.

Normally individual panels can be handled by people placed every 6'-0" to 8'-0" along the length of the panel.



Correct



Incorrect

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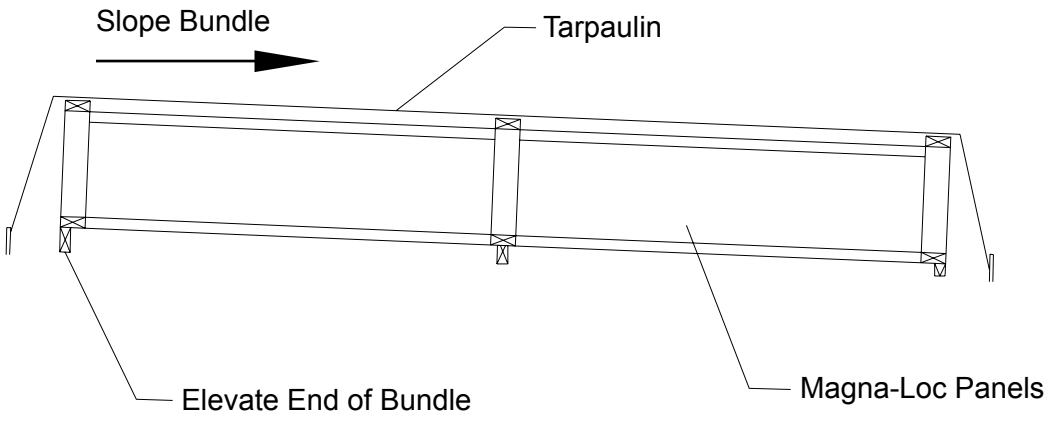
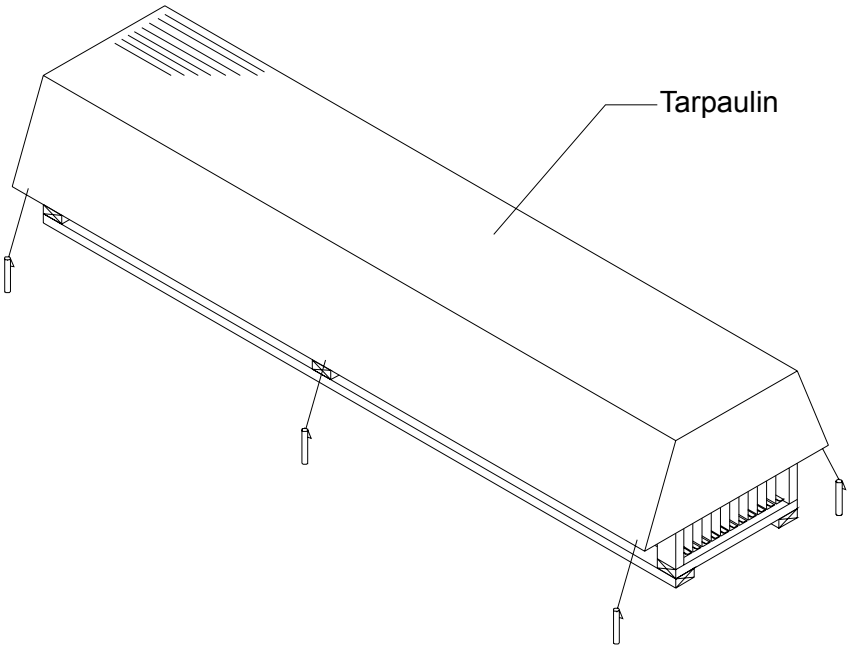
GENERAL

Please inspect panels for moisture accumulation. If moisture has formed, the panels should be unbundled, wiped dry, and allowed to dry completely. Once dry, carefully re-stack the panels and loosely recover allowing for ample air circulation.

Bundled sheets should be stored high enough off of the ground to allow for air circulation and prevent contact with accumulating water. If possible, elevate one end of the bundle to allow any moisture to run off the panels. Metal Sales recommends covering the bundle with a tarpaulin. Do not use tight fitting plastic-type tarpaulins as panel bundle covers. While they may provide protection from heavy downpours, they can also retard necessary ventilation and trap heat and moisture that may accelerate metal corrosion. If panels are to be stored in possible bad weather, we suggest they be stored inside. Extended storage of panels in a bundle is not recommended. Under no circumstances should the sheets be stored near or come in contact with salt water, corrosive chemicals, ash, or fumes generated or released inside the building or nearby plants, foundries, plating works, kilns, fertilizer, and wet or green lumber.





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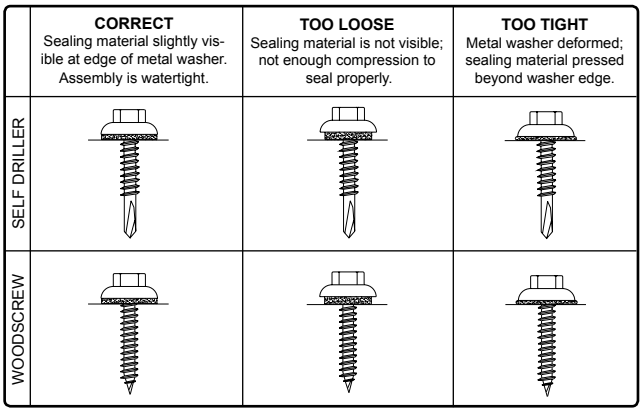
FASTENER INSTALLATION TECHNIQUE

Recommended Tool Type - Use depth locating nose or adjustable clutch on screw gun to prevent over-drilling and strip out. **Do not use impact tools or runners.**

Seating the washer - Apply sufficient torque to seat the washer - do not overdrive the fastener.



To prevent wobbling - Make sure fastener head is completely engaged in the socket. If the head does not go all the way in the socket - tap the magnet deeper into the socket to allow full head engagement. Metal chips will build up from drilling and should be removed from time to time.

Protect drill point - Push only hard enough on the screw gun to engage clutch. This prevents excess friction and burn out of the drill point. Correct pressure will allow screw to drill and tap without binding.

Drilling through sheet and insulation - Ease up on pressure when drilling through insulation to avoid striking the purlin or girt with the point - apply more pressure after drill point contacts purlin or girt.

Drilling through purlin overlaps - Drilling through lapped purlins requires extra care. Excessive voids between purlins sometimes damages drill points and two self-drillers might be necessary to complete the operation. It is sometimes advantageous to predrill.

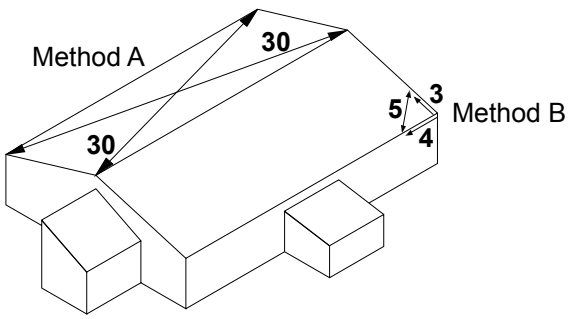
CONDITION OF SUBSTRUCTURE

Whether over solid substrate or open structural framing, panel distortion may occur if not applied over properly aligned and uniform substructure.

The installer should check the roof deck for squareness before installing Magna-Loc panels. Several methods can be used to verify squareness of the structure for proper installation of the panels.

METHOD "A" - One method for checking the roof for squareness is to measure diagonally across one slope of the roof from similar points at the ridge and eave and obtain the same dimension.

METHOD "B" - The 3-4-5 triangle system may also be used. To use this system measure a point from the corner along the edge of the roof at a module of three (3). Measure a point from the same corner along another edge at a module of four (4). Then by measuring diagonally between the two points established, the dimension should be exactly a module of five (5) to have a square corner. Multiple uses of this system may be required to determine building squareness. If the endwall cannot be made square, the roof system cannot be installed as shown in these instructions.



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FIELD CUTTING

Tin snips or a "nibbler" type electric tool are recommended for field cutting the panels. Cutting the steel generates slivers or metal chips. These slivers and metal chips must be immediately removed from the panels because they will damage the finish and shorten the life of the product.

One method of preventing this problem is to flip the panels over when cutting. This allows the slivers and metal chips to be brushed from the back side and avoids damaging the paint on the top side of the panels.

When cutting the panels, goggles must be worn for eye protection.

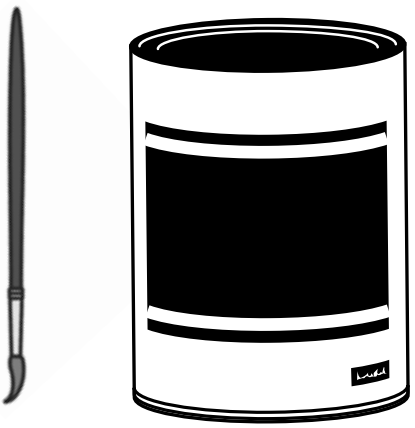
CAUTION

All product surfaces should be free of debris at all times. Installed surfaces should be wiped clean at the end of each work period. Never cut panels over metal surfaces. Metal shavings will rust on the surface, voiding the warranty.

TOUCH-UP PAINT

All painted panels and flashings have a factory applied baked on finish. Handling and installing panels may result in some small scratches or nicks to the paint finish. Touch-up paint is available in matching colors from Metal Sales. It is recommended that a small brush be used to apply touch-up paint to those areas that are in need of repair. Touch-up paint does not have the superior chalk and fade resistance of the factory applied paint finish and will normally discolor at an accelerated rate. Aerosol paint should not be used because of the over-spray that may occur.

Spray Paint



Touch-Up Paint

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Though factory applied pre-painted finishes are very durable and will last many years, eventually it may be desirable to thoroughly clean or repaint them.

Dirt pickup may cause apparent discoloration of the paint when it has been exposed in some dirt laded atmospheres for long periods of time. In areas of strong sunlight, slight chalking may cause some change in appearance. A good cleaning will often restore the appearance of these buildings and render repainting unnecessary. An occasional light cleaning will help maintain a good appearance.

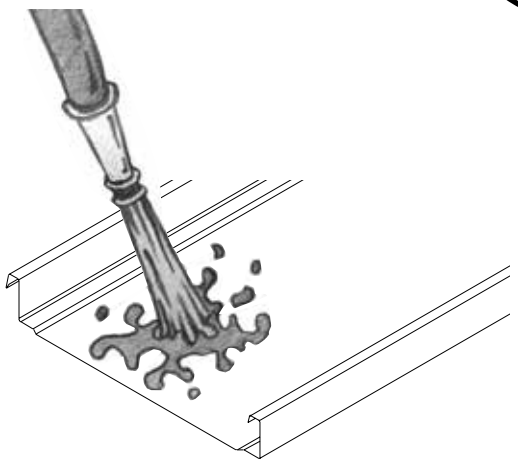
In many cases, simply washing the building with plain water using a hose or pressure sprayer will be adequate. In areas where heavy dirt deposits dull the surface, a cloth or soft bristle brush and solution of water and detergent ($^1/_3$ cup of laundry detergent per gallon of water for example) may be used. This should be followed by an adequate rinse of water. Do not use wire brushes, abrasives, or cleaning tools which will abrade the coating surface.

Mildew may occur in areas subject to high humidity but is not normally a problem due to the high inherent mildew resistance of the baked finish that is used. However, mildew can grow on dirt and spore deposits in some cases. To remove mildew along with the dirt, the following solution is recommended.

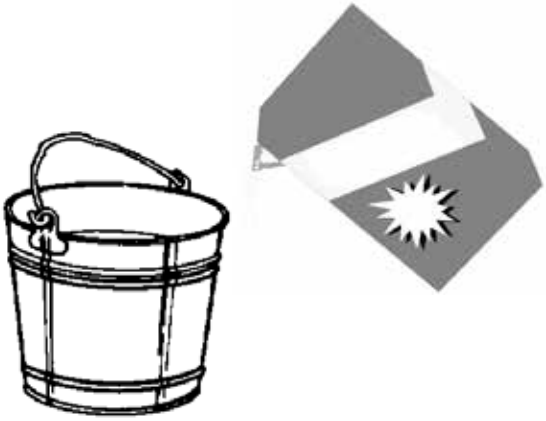
$^1/_3$ cup detergent (Tide® or equivalent)
$^2/_3$ cup trisodium phosphate (Solex® or equivalent)
1 quart of 5% sodium hypochlorite solution (Clorox® or equivalent)
3 quarts of water

Strong solvents and abrasive type cleaners should be avoided. Most organic solvents are flammable and toxic, and must be handled accordingly. When using a solvent, consult maintenance professionals and label instructions for proper handling and disposal of washings. If required, a mild solvent such as mineral spirits can be used to remove caulking compounds, oil, grease, tars, wax, and similar substances. Use a cloth dampened with mineral spirits and apply only to areas which are contaminated. Follow up the use of this mild solvent with detergent cleaning and rinsing.

DO NOT USE A WIRE BRUSH



HOSE OR PRESSURE SPRAY FOR ADEQUATE CLEANING



USE MILD DETERGENT AND WATER FOR HEAVY DIRT DEPOSITS

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Accessory: An extra building product which supplements a basic solid sheeted building such as door, window, skylight, ventilator, etc.

(ACG) Acrylic Coated Galvalume®: Improved surface corrosive resistance, see page PGI-7.

Aging: Changes in physical and mechanical properties that occur when low carbon steel is stored for some time. Aging is also accelerated by exposure of steel to elevated temperatures.

Architectural Panel: Intricately formed panel with special attention given to its appearance.

Backer: A coating applied to the back side of the strip. This coating is controlled for consistent color, gloss, and applied dry film thickness. Facilitates roll forming of coated strip.

Base Angle: An angle secured to the perimeter of the foundation to support and close wall panels.

Base Trim: Z-shaped trim designed to close off opening at base of wall around perimeter of building.

Bay: The space between frame center lines or primary supporting members in the longitudinal direction of the building.

Bevel Cut: To cut a panel at an angle other than 90^0.

Building Code: Regulations established by a recognized agency describing design loads, procedures and construction details for structures. Usually applying to designated political jurisdiction (city, county, state, etc.).

Camber: The deviation of side edge from a straight line, the measurement being taken on the concave side with a straight edge.

Canopy: Any overhauling or projecting root structure with the extreme end usually unsupported.

Cantilever: A projecting beam that is supported and restrained at one end only.

Capillary Attraction: The force that causes a liquid to be raised against a vertical surface.

CF45 (MS Colorfast45): See SMP.

Chalking: A process by which finishes develop a loose powdery surface resulting from decomposition of the binder. It occurs, principally, through the action of ultraviolet rays.

Closure Strip: A resilient strip, formed by the contour of ribbed panels used to close openings created by joining metal panels and flashing.

Column: Vertical support member for main framing system.

Coverage: The actual length of a panel after installation.

Cricket: Flashing used to prevent ponding water where a low side of roof meets a vertical wall i.e. chimney.

Dead Load: The dead load of a building is the weight of all permanent construction, such as supported floors, roof, framing and covering member.

Design Loads: Those loads specified in building codes published by Federal, State, or City agencies, or in owner's specifications to be used in the design of a building.

Diaphragm Action: The resistance to racking generally offered by the covering system.

Downspout: Rectangular and/or round tube used to channel water from gutter.

Eave: The line along the side wall formed by the intersection of the faces of the roof and wall panels.

Eave Height: The vertical dimension from finished floor to the eave.

Eave Strut: A structural member at the eave to support roof panels and wall panels. It may also transmit wind forces from roof brace rods to wall brace rods.

Eave Trim: L-shaped trim designed to close off top of sidewall panels. It also can be used to close off ends of soffit sheets.

Embossing: The process of decorating, or covering with design, by depressing the surface of the metal strip using a patterned or "coining" roll.

Expansion Joint: A break or space in construction to allow for thermal expansion and contraction of the materials used in the structure.

Fabrication: The manufacturing process performed in a plant to convert raw materials into finished metal building components. The main operations are cold forming cutting, punching, welding, cleaning and painting.

Fascia: A decorative trim or panel projecting from the face of a wall.

Flashing: A sheet metal closure which functions primarily to provide weather tightness in a structure and secondarily to enhance appearance.

Flatness: Flatness is a measure of a cut length sheet's ability to conform to a flat horizontal surface. Maximum deviation from that surface is the degree to which the sheet is out of flat.

Fluorocarbon Coatings: Thermoplastic coatings based on resins made by polymerizing polyvinyl fluoride, or polyvinylidene fluoride (PVDF).

Footing: A pad or mat, usually of concrete, located under a column, that is used to distribute the loads from that member into the supporting soil.

Frame: Primary structural support members that support the secondary framing.

Framing: The primary and secondary members (columns, rafters girts, purlins, brace rods, etc.) which go together to make up the skeleton of a structure to which the covering can be applied.

Galvalume®: See page PGI-7.

Galvanized: Steel coated with zinc for corrosion resistance.

Gauge: Thickness of steel or distance between holes punched or drilled in flanges.

Girt: A secondary horizontal structural member attached to sidewall or endwall columns to which wall covering is attached and supported horizontally.

Gutter: A channel member installed at the eave of the roof for the purpose of carrying water from the roof to the drains or downspouts.

Gutter End Closure: Metal insert provided with sealant and fasteners to close end of eave gutter.

Header: A horizontal framing structural member over a door, window or other framed opening.

Header and jamb flashing: Flashing designed to cover red iron frame around a framed opening.

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Hemming: The bending of the end of a panel to accept the offset cleat or extended eave.

Hip Roof: A roof which rises by inclined planes from all four sides of a roof.

Hot Rolled Products: Steel deoxidized by silicon or aluminum to reduce the oxygen content in the molten steel to a minimum prior to solidification of the metal. Killed steels have more uniform properties and chemical composition than other types.

Hylar 5000: See Kynar 500/Hylar 5000.

Insulated panel: Interlocking panels composed of two formed sheets with insulation between.

Insulation: Any material used in building construction to reduce head transfer.

Inside Corner Trim: Trim designed to flash inside corners.

Jamb Trim: A trim used vertically on each side of a framed opening to trim off edge of sheeting.

Jamb: Vertical members that frame openings in walls.

Kick-Out (Elbow): (Turn-Out) A lower downspout section used to direct water away from a wall.

Kynar 500/Hylar 5000: Brand names for the two common resin used in Fluorocarbon paints. “Kynar” paints are produced under license from Atochem or Ausimont, respectively. These paints are sometimes referred to as 70% Kynars and 50% Kynars. Due to the practice of diluting the Kynar with acrylic resin to make it less expensive - hence 50% Kynar.

Lean-To: A structure such as a shed, having only one slope or pitch and depending upon another structure for partial support.

LGSI: (Light Gauge Structural Institute), for light gauge structural steel.

Live Load: Live load means all loads, including snow, exerted on a roof, except dead, wind and lateral loads.

Liner Panel: A metal panel attached to the inside of the girts, or to the inside of a wall panel.

Loads: Any thing that causes a force to be exerted on a structural member. Examples are: (a) Dead Load, (b) Impact Load, (c) Roof Live Load, (d) Seismic Load, (e) Wind Load, (f) Crane Load, (g) Collateral Load.

Lock Forming Quality (LFQ): Sheet of this quality is intended primarily for use in fabrication where it is to be subjected to machine lock forming.

Mastic: Caulking or sealant furnished in rolls, normally used on sealing roof panels laps.

Mil: A unit of measure equal to 0.001-inch. It is used to describe film thickness.

Multispan Building: Buildings consisting of more than one span across the width of the building. Multiple gable buildings and single gable buildings with interior posts are examples.

Oil Canning: A dished distortion in a flat or nearly flat surface.

Oiled: Application of a suitable rust-preventive oil to flat rolled steel to retard rusting during shipment and storage. When surface is a consideration, it is also desirable in reducing friction.

Parapet: That portion of the vertical wall of a building which extends above the roof line at the intersection of the wall and roof.

Peak: The uppermost point of a gable.

Peak Cap: Prefabricated trim piece that trims rake fascia connection at peak of gable.

Plastisol Coatings: Thermoplastic coatings consisting of pigmented dispersions of finely divided polyvinyl chloride resins in suitable plasticizers. Curing the baking process the resin particles are solvated by the plasticizer and fuse to a continuous film.

Polyester Coatings: Thermosetting coatings based on the condensation products of polybasic acids and diols (dihydric alcohol's). Generally cross-linked with amino resins.

Primer Paint: This is the initial coat of paint applied in the shop to the structural framing of a building for protection against the elements during shipping and erection.

Pull Out Value: The amount of force needed to pull a fastener directly out of a substrate (see page PGI-13).

Purlin: A secondary structural member located in the roof that directly supports the sheeting and is in turn supported by the primary structural framing. They usually span from frame to frame.

PVDF: See Kynar 500/Hylar 5000.

Rake: The intersection of the plane of the roof and the plan of the gable. (As opposed to endwalls meeting hip roof.)

Rake Fascia: A flashing designed to close the opening between the roof and endwall panels.

Retrofit: The placing of new metal roof or wall systems over deteriorated roof or walls.

Ridge: Apex of building.

Ridge Cap: A transition of the roofing materials along the ridge of a roof, sometimes called ridge roll or ridge flashing.

Roll Forming: An operation used in forming metal strip. The metal is run progressively through rolls of definite setting that bend the strip to a final predetermined contour.

Roof Pitch or Slope: Degree of slope in roof. Expressed as a ratio to 12.

Roof Extension: Cantilevered continuation of roof at rake line.

Roof Overhang: A roof extension beyond the endwall/sidewall of a building.

Sag Angle: Small angle used to help reduce sag in purlins and girts in bolted building.

Salt Spray Tests: An accelerated corrosion test in which the metal specimens are exposed, either continuously or intermittently, to a fine mist of salt water.

Sandwich Panel: A panel assembly used as covering. It consists of an insulating core material with interior and exterior metal skins.

Sealant: Any material which is used to close up cracks or joints to protect against leaks.

Secondary Framing: That framing which consists of minor load carrying members of a structure, such as purlins, girts, struts, etc.

Self Drilling Screw: A fastener which combines the functions of drilling and tapping. It is used for attaching panels to purlins and girts.

Self Tapping Screw: A fastener which tapes its own threads in a predrilled hold. It is for attaching panels to purlins and girts and for connecting trim and flashing.

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Sill: The bottom horizontal framing member of an opening such as a window or door.

Sill: The bottom horizontal framing member of an opening such as a window or door.

Single Slope: A sloping roof with one surface. The slope is from one wall to the opposite wall or a rectangular building.

Skylight: Translucent panel used on roof or walls in place of certain rib sheets to supply natural light to building.

SMP (Siliconized Modified Polyester Coating): Thermosetting coatings based on the product of the reaction between an organo-siloxane-intermediate and a suitable polyester resin. Cross-linked with amino or epoxy resins.

Snow Load: A load imposed on buildings or other structures due to snowfall.

Soffit: The underside covering of any exterior portion of a metal building.

Span: The distance between supports of beams, girders or trusses.

Specifications: A statement of particulars of a given job, as to size of building, quality, and performance of mean and materials to be used, and the terms of the contract. The most common specification found in the metal building industry is the "Recommended Guide Specifications for Pre-Engineered Metal Buildings," published by the Metal Building Manufacturers Association.

Standing Seam: Longitudinal side joints of roof panels arranged in a vertical position above the roof line.

Stitch Screw: A fastener used to connect panels at the side lap.

Stripable: A coating applied over the topcoat to protect the finish during fabrication, transit and erection. The coating thickness is usually about 2 mils. It is specially formulated to peel off easily and without residue.

Structural Quality: Sheet of this quality should be specified when the strength of the finished part, usually in load bearing structures, is of importance and the mechanical properties required in the steel sheet must be specified.

Strut: A brace fitted into a frame work to resist force in the direction of its length.

Syphon Groove: Designed to channel water away from the rib of a panel to avoid capillary attraction.

Tensile Strength: The longitudinal pulling stress a material can bear without tearing apart.

Tension Leveling: A mechanical operation wherein sheet steel in coil form is passed through a unit which stretches the product beyond its yield point. The purpose is to provide a sheet with superior flatness characteristics.

Thermal Expansion: The expansion of panels and flashings due to heat, usually caused by direct sunlight.

Tolerance: Specified limits of deviation from a dimension.

Trim: The light gauge metal used in the finish of a building, especially around openings and at intersections of surfaces, often referred to as flashing.

Truss: A structure made up of three or more members, with each member designed to carry a tension or compression force. The entire structure in turn acts as a beam.

Uplift: Wind load on a building which causes a load in the upward direction.

Ventilator: An accessory usually used on the roof that allows air to pass through.

Wash Coat: See Backer.

Wainscot: Sheeting or liner panel on the inside of a building that goes from floor to girt and is below eave height (not full height).

Wind Load: A load caused by the wind blowing from any horizontal direction.

Yield Strength: The stress at which a material exhibits a specified deviation from proportionality of stress and strain.

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NOTES

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