EPIC METALS®

Envista®

Roof and Floor Deck Ceiling Systems

Featuring Timberlok®
Woodgrain Options

inspiring
CREATIVITY
through
PERFORMANCE®

Montague Area Childhood Center–Montague, Michigan
Envista U4.5LA

Envista®

Roof & Floor Deck Ceiling System

EPIC Metals' Envista® is an architectural design innovation with both visual interest and structural capabilities.

Envista provides the structural system to support the roofing or concrete floor and supplies an attractive ceiling appearance.

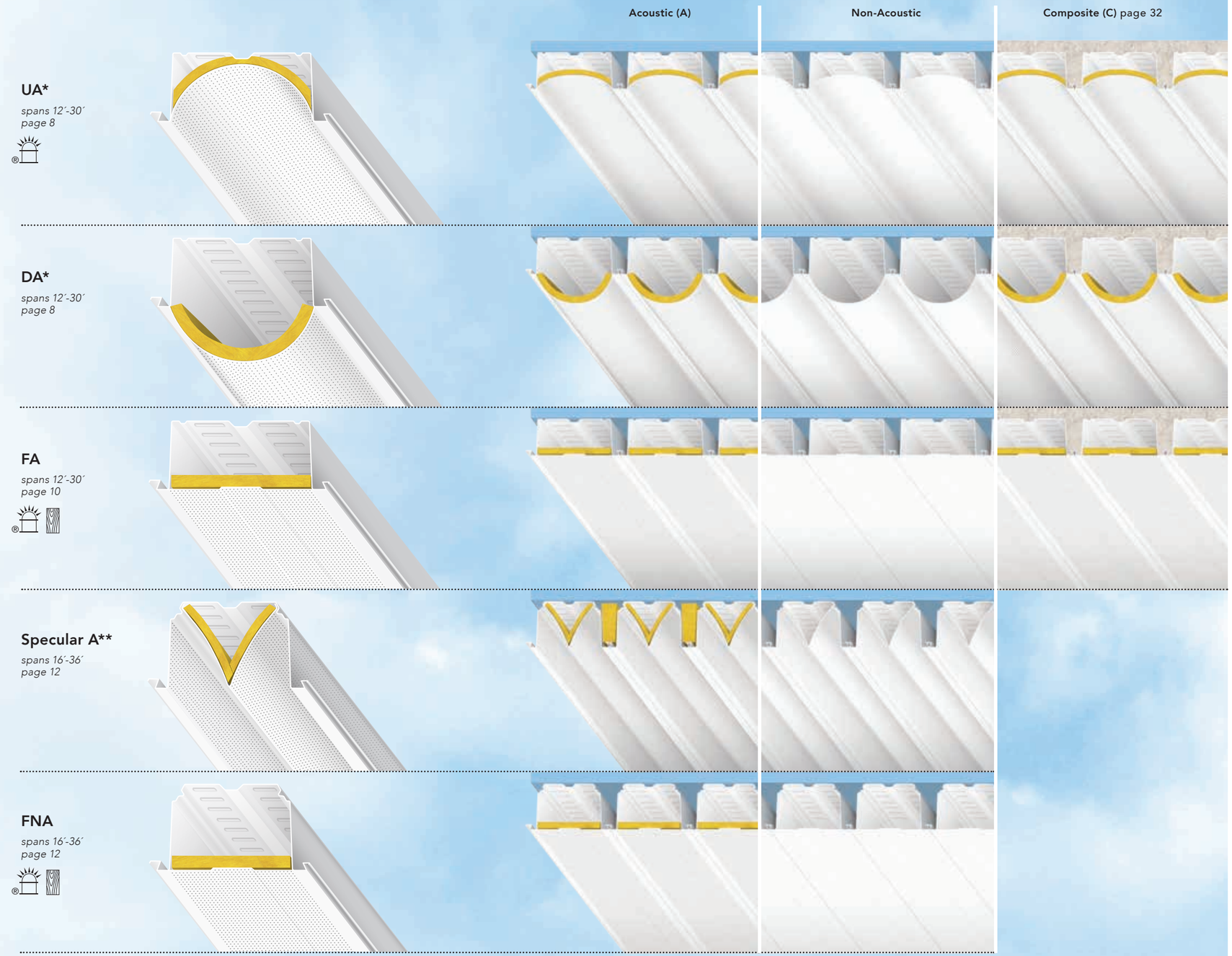
The Envista System is comprised of five distinctive and interactive components to give architects the ability to arrange the panels to achieve customized architectural ceilings. Envista panels UA, DA, FA, Specular A and FNA have four different appearances and may be specified in many depths to span 12-36 feet. Identical panels can be used repeatedly to create a uniform ceiling appearance (shown right) or artfully blended to design virtually unlimited ceiling patterns (see page 10 and 17).

The ceiling contours available with Envista improve the absorption of sound waves, lowering the reverberation time to improve the clarity of speech and music. Specify Envista systems as the structural roof/floor deck and decorative ceiling for your next project.

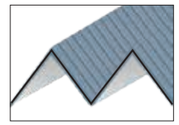
Four Timberlok® woodgrain finishes are available: Dark Cherry, Colony Maple, Light Maple, and Pine.

Skydeck® option: UA, FA & FNA may be specified to accommodate Solatube® daylighting systems to bring natural light into any design (see page 17).

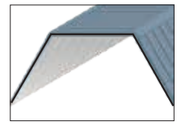
*U.S. Patent Numbers 7,146,920, 7,328,667
**U.S. Patent Numbers D661,410.



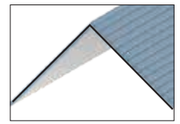
Design Examples:



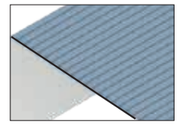
Cathedral Folded Plate



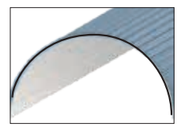
Gambrel Folded Plate



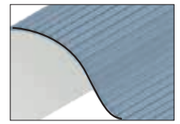
Cathedral



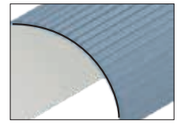
Half Cathedral



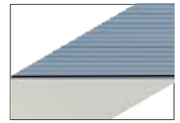
Barrel Vaulted



Serpentine



Half Vaulted



Flat

Niagara University, Clet Hall – Tonawanda, New York
Envista F4.5A

Envista®
UA & DA

The Envista designations of H (high), M (medium) and L (low) refer to the curved depth of the ceiling surfaces of the panels. The H designation provides the sharpest curve. The M designation displays the middle curvature and the L designation, the softest curve.

The concave, vaulted appearance of Envista UA provides an ideal surface to reflect light into the public spaces of any building. The unique convex shapes of Envista DA provide large areas for the concealment of sprinkler lines, wiring, and speakers.

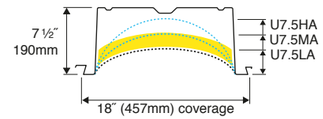
These systems achieve high noise reduction coefficients (NRC) when specified with the acoustic option. For specialized applications outdoors or where musical/vocal sound reflection is desirable, Envista can be specified without an acoustic option.

Envista **Designation**

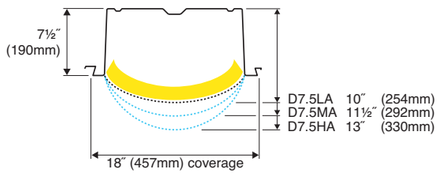
Envista UC6.0MA — Acoustic

- Panel Curve: **L** (low), **M** (medium) and **H** (high)
- Panel Depth of Top Section: **4.5**, **6.0** and **7.5** (in inches)
- Composite (with concrete slab, omission of C = roof deck)
- Product Shape: **U** (up), **D** (down) and **F** (flat)

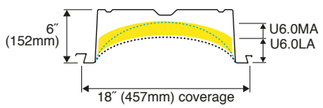
Envista U7.5A



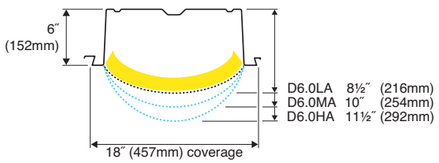
Envista D7.5A



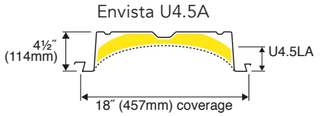
Envista U6.0A



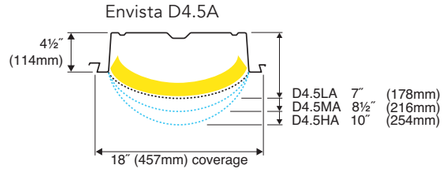
Envista D6.0A



Envista U4.5A

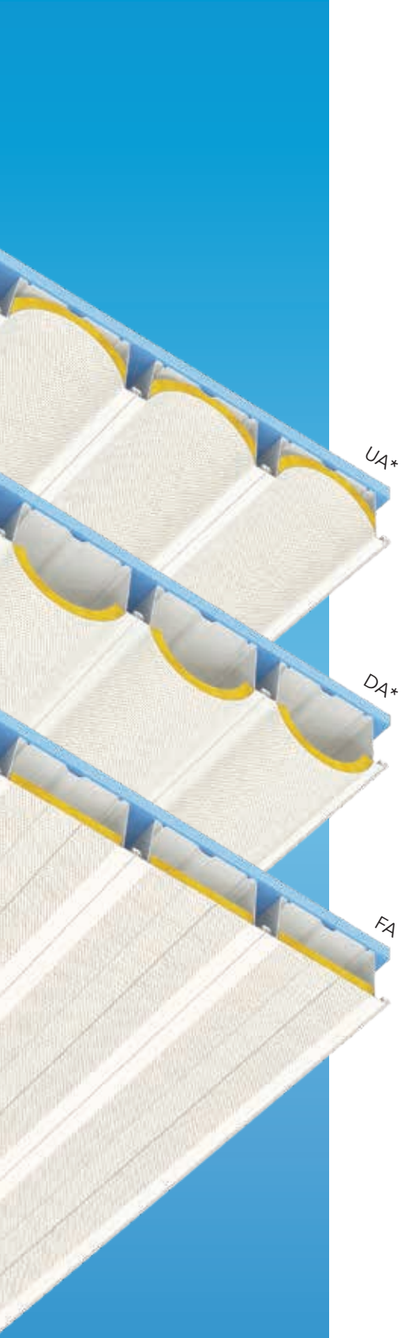


Envista D4.5A



U.S. Patent Numbers
7,146,920, 7,328,667

Metro College and Career Center, Oklahoma City, Oklahoma
Envista® U7.5HA



*U.S. Patent Numbers
7,146,920, 7,328,667

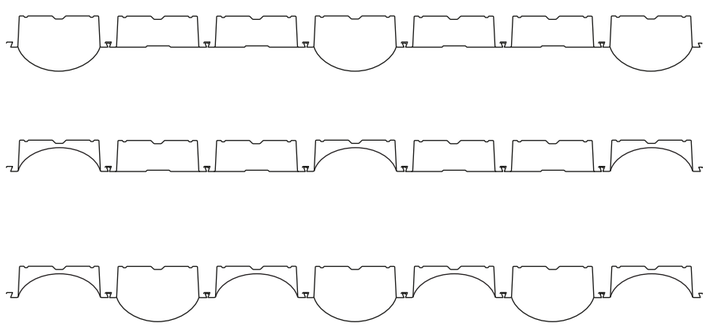
Envista®
UA, DA & FA

EPIC Envista UA, Envista DA, and Envista FA panels have been designed to interchange with a myriad of combinations available to create a unique architectural focal point (see below and page 17). Three curved plate depths (L, M, H) offer options for a dramatic or subtle curved appearance (see pages 8). The acoustic option provides NRC values up to 1.00. NRC Values are the noise reduction coefficients that indicate the average sound absorption over a broadband frequency.

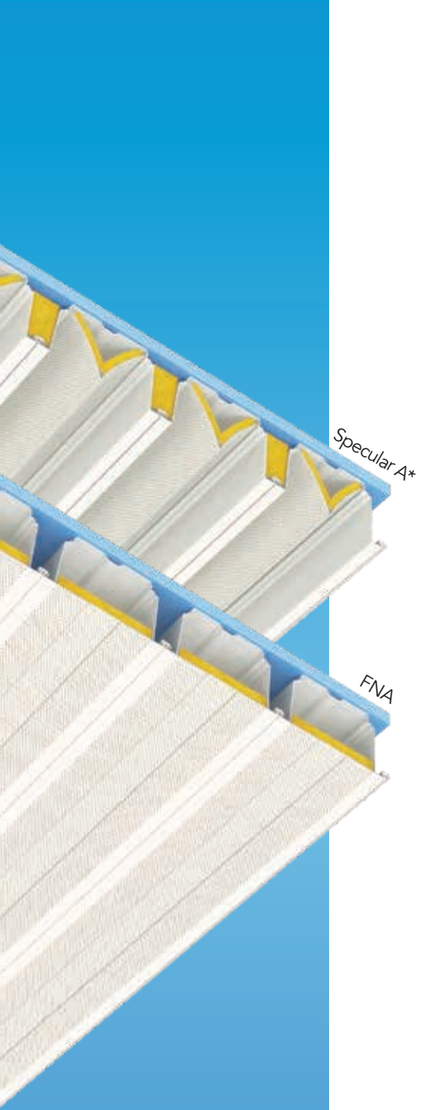
EPIC Envista UA, DA, and FA are designed to clear span up to 30 feet while providing a unique ceiling appearance, whether different panels are designed in combination or the same panel is used to create a uniform, consitent appearance. These panels are offered in three different depths (4½˝, 6˝, and 7½˝) and various gages depending on the span requirements.

Envista Skydeck can be specified with UA and FA panels utilizing factory cut openings to insert Solatube® tubular daylighting devices. This high performance lighting solution introduces natural daylight to an environment, in many designs without the need for additional exposed reinforcement. Lighting with natural daylight contributes to reduced energy costs and LEED rating points (see page 17).

The flat plate on Envista FA used exclusively can create a dramatic visual expanse (opposite image). When concealing utilities in the roof deck ceiling system, a factory installed hinged access panel can be specified with Envista FA. The result is a simple and convenient access to hidden utilities (see page 17). Below are curved Envista UA&DA profiles combined with flat Envista FA panels offers unlimited architectural combinations.



North Dallas Community Bible Fellowship, Plano, Texas
Envista F7.5A with hinged access panels



Envista®
Specular A & FNA

EPIC Envista Specular A is designed for clear spans up to 36 feet while providing a unique ceiling appearance. The ceiling provides economic multi-functional acoustic performance in controlling sound in building interiors without the addition of a suspended finished acoustic ceiling or specialized acoustic panels.

NRC values are the traditional noise reduction coefficients indicating the average sound absorption over a broadband frequency. The higher the NRC, the greater amount of sound (noise) is absorbed. An NRC of 1.00 means that 100% of the noise that strikes a relatively flat object is absorbed. Likewise an NRC of 0.60 only absorbs 60% of the sound leaving 40% to continue reverberating (echo effect) making speech less intelligible and creating a sense of noise amplification. Many building factors such as room size, layout, shape, materials specified, windows, the number of occupants, and noise sources also effect noise levels. Therefore, EPIC Metals recommends that these factors be considered prior to the preparation of acoustic design specifications.

The other acoustic function of Envista Specular A is to absorb direct sound, which is different than reverberated sound. Specular reflection is the sound reflected in a reflection free zone and time isolated from the source sound and reverberated sound. The specular factors range from 0 to 1 where 0 is a near perfect absorber and 1 is a near perfect reflector. Envista Specular A has an extremely low specular factor, meaning it absorbs a high percentage of the sound energy that initially strikes the surface allowing less sound to propagate into the general building interior. See Envista Specular A Reflection Coefficients table on page 15.

One of the main acoustic advantages of EPIC Envista Specular A compared to other ribbed acoustic decks is that the perforation pattern on the ceiling resembles the sound wave pattern they are intended to absorb from various angles of incidence. The design of Envista Specular A allows for multiple reflections within the boundary of the ceiling providing greater absorption.

Envista FNA provides a flat appearance with a high-performance acoustic option, similar to Envista FA. The FNA panels are capable of spanning further, up to 36 feet. Envista FNA is also available with factory mounted hinged access panels to enable the installation or modification of hidden utility systems within the cells of the panels (see page 17).

*U.S. Patent Numbers D661,410

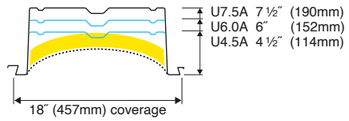
Dickies Arena, Fort Worth, Texas
Envista Specular A

Envista® UA, DA, FA
Technical Tables

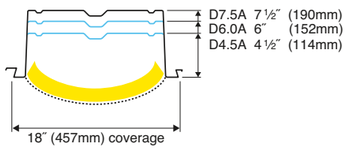
SPANS
12′–30′

ACOUSTIC (NON-ACOUSTIC AVAILABLE)

Envista ULA*

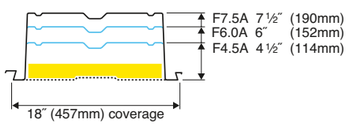


Envista DLA*



*U.S. Patent Numbers
7,146,920, 7,328,667

Envista FA



Envista Approvals

IAPMO 0226
Evaluation Report Number 0226 applies to U, D & F

Envista Section Properties of the Structural Element (per foot of width)

Depth	Gage	Weight (psf)	I_D (in.⁴)	S_P (in.³)	S_N (in.³)	Allowable Support Reaction (PLF)	
						End*	Int.*
4.5	18	3.4	2.86	0.99	1.06	662	1283
	16	4.3	3.78	1.28	1.34	1021	1955
	14	5.4	4.84	1.62	1.68	1523	2893
6.0	18	3.7	5.61	1.49	1.46	629	1276
	16	4.7	7.47	1.94	2.03	978	1946
	14	5.9	9.56	2.46	2.54	1467	2881
7.5	18	4.0	9.44	2.04	1.91	600	1269
	16	5.1	12.61	2.67	2.53	939	1937
	14	6.4	16.18	3.40	3.31	1417	2870

* Minimum end and interior support bearing lengths (see Note 5 below):
End = 4″ Interior = 6″

UHA, DHA & FA Noise Reduction Coefficients

Type	Absorption Coefficients						NRC
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	
F6.0A*	0.68	1.18	1.06	0.89	0.80	0.61	1.00
F4.5A*	0.58	0.99	1.14	0.92	0.82	0.61	0.95
U7.5HA	0.47	0.78	0.87	0.92	0.89	0.72	0.85
D7.5HA	0.92	1.24	0.95	1.01	1.03	0.81	1.00
D7.5HA U7.5HA	0.78	1.02	0.93	0.99	0.99	0.83	1.00
F 7.5 A	0.73	1.16	1.05	0.91	0.89	0.72	1.00

In accordance with ASTM C423 and E795.
Consult EPIC Metals Corporation for other test results and individual reports.
The NRC is the average of the absorption coefficients at 250, 500, 1000, and 2000 Hz., rounded off to the nearest .05.
*Estimated Values

Envista Load Table — Uniform Total Load (Dead and Live) in Pounds Per Square Foot

Depth	No. Spans	Gage	Span Length Center to Center of Supports (ft.)																	
			12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
4.5	1	18	110/109	94/85	81/68	70/56	62/46	55/38	49/32	44/27	–	–	–	–	–	–	–	–	–	–	–
		16	142/144	121/113	104/90	91/74	80/61	71/51	63/43	57/36	51/31	–	–	–	–	–	–	–	–	–	–
		14	180/184	153/145	132/116	115/94	101/78	90/65	80/54	72/46	65/40	59/33	54/27	–	–	–	–	–	–	–	–
	2	18	86/262	79/206	73/165	68/134	64/110	59/92	52/78	47/66	42/57	38/46	35/39	32/32	–	–	–	–	–	–	–
		16	130/346	120/272	109/218	95/177	84/146	74/122	66/102	59/87	54/75	49/61	44/51	41/43	37/36	34/31	–	–	–	–	–
		14	187/443	159/348	137/279	119/227	105/187	93/156	83/131	74/112	67/96	61/79	56/65	51/55	47/46	43/39	40/33	37/29	–	–	–
6.0	1	18	105/213	97/168	90/134	84/109	79/90	74/75	70/63	66/54	60/46	54/38	49/31	45/26	–	–	–	–	–	–	–
		16	163/284	150/223	140/179	130/145	121/120	107/100	96/84	86/72	78/61	70/50	64/42	59/35	54/30	50/25	–	–	–	–	–
		14	245/363	226/286	201/229	175/186	154/153	136/128	121/108	109/92	98/78	89/65	81/54	74/45	68/38	63/32	58/27	54/24	–	–	–
	2	18	85/500	79/404	73/323	68/263	64/216	60/180	57/152	54/129	51/111	49/91	46/76	44/63	41/53	37/45	35/39	32/33	–	–	–
		16	130/500	120/500	111/430	104/350	97/288	92/240	86/202	82/172	78/148	74/121	67/101	61/84	56/71	52/60	48/52	45/44	–	–	–
		14	192/500	177/500	165/500	154/448	144/369	136/308	125/259	113/220	102/189	92/155	84/129	77/108	71/91	65/77	60/66	56/57	52/49	48/43	45/37
7.5	1	18	100/359	92/282	86/226	80/184	75/151	71/126	67/106	63/90	60/77	57/64	55/53	52/44	50/37	48/32	46/27	–	–	–	–
		16	157/479	144/377	134/302	125/245	117/202	110/169	104/142	99/121	94/103	89/85	85/71	81/59	74/50	68/42	63/36	59/31	54/27	–	–
		14	236/500	218/484	202/387	189/315	177/259	167/216	157/182	149/155	136/133	123/109	112/91	103/76	94/64	87/54	80/46	75/40	69/35	65/30	60/26

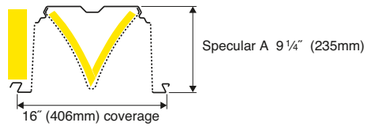
If higher loads or longer spans are required, contact EPIC Metals.
NOTES: 1. Loads are based on ASD Design.
2. Uniform load values listed on the left side of the box, 100/50, are governed by stress or web crippling and the values listed on the right side, 100/50, are governed by deflection.
3. The deflection criteria used for generating the tables above were L/240 or 1″ maximum. The Engineer of Record shall calculate the allowable uniform load if a different deflection criteria is required.
4. Stress governed values assume a maximum allowable stress of 24 ksi.
5. Minimum end support bearing lengths are shown above. If shorter bearing lengths are used, consult EPIC Metals.

Envista® Specular A, FNA
Technical Tables

SPANS
16′–36′

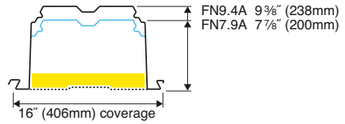
ACOUSTIC (NON-ACOUSTIC AVAILABLE)

Envista Specular A*



*U.S. Patent Number D661,410

Envista FNA



Specular A Reflection Coefficients

Incidence	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Wideband
Normal	0.081	-0.078	0.385	0.461	0.710	0.377	0.323
30 Degree	0.161	0.011	0.411	0.367	0.727	0.338	0.336

Values have been authenticated by tests conducted by an independent acoustician.

Envista Specular A & FNA Section Properties of the Structural Element (per foot of width)

Deck Type	Gage	Weight (psf)	I_D (in.⁴)	S_P (in.³)	S_N (in.³)	Allowable Support Reaction (PLF)	
						End*	Int.*
Specular A	18	4.5	14.33	2.77	2.49	643	1257
	16	5.8	18.56	3.68	3.33	1003	1918
	14	7.2	23.68	4.66	4.37	1509	2841
FN7.9A	18	4.2	9.96	2.19	2.16	708	1435
	16	5.3	12.92	2.90	2.90	1100	2189
	14	6.6	16.50	3.67	3.82	1650	3241
FN9.4A	18	4.5	15.24	2.83	2.65	731	1428
	16	5.8	19.74	3.75	3.54	1140	2180
	14	7.2	25.19	4.75	4.65	1715	3228

*Allowable reactions for FN7.9A based on 4″ and 6″ bearing length at end and interior supports, respectively.
*Allowable reactions for Specular A & FN9.4A based on 5″ and 6″ bearing length at end and interior supports, respectively. (see Note 5 below)

Specular A & FNA* Noise Reduction Coefficients

Type	Absorption Coefficients						NRC
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	
Specular A	0.65	1.05	0.86	0.93	0.84	0.77	0.90
FN7.9A FN9.4A	0.73	1.16	1.05	0.91	0.89	0.72	1.00

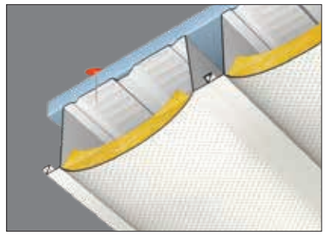
In accordance with ASTM C423 and E795.
Consult EPIC Metals for other test results and individual reports.
*Estimated Values

Envista Specular A & FNA Load Table — Uniform Total Load (Dead and Live) in Pounds Per Square Foot

Deck Type	No. Spans	Gage	Span Length Center to Center of Supports (ft.)																		
			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	36
Specular A	1	18	80/230	76/192	71/161	68/137	64/118	61/102	58/88	56/77	54/68	51/60	49/54	48/48	46/43	44/39	43/35	41/31	–	–	–	–
		16	125/298	118/248	111/209	106/178	100/152	96/132	91/114	87/100	84/88	80/78	77/69	74/62	72/56	69/50	65/45	61/40	58/35	54/31	–	–
		14	189/380	178/316	168/267	159/227	151/194	144/168	137/146	131/128	126/112	119/100	110/88	102/79	95/71	89/64	83/58	78/51	73/44	68/39	64/35	58/28
	2	18	63/500	59/461	56/388	53/330	50/283	48/245	46/213	44/186	42/164	40/145	39/129	37/115	–	–	–	–	–	–	–	–
		16	96/500	90/500	85/500	81/428	77/367	73/317	70/276	67/241	64/212	61/188	59/167	57/149	–	–	–	–	–	–	–	–
		14	142/500	134/500	126/500	120/500	114/468	108/404	103/352	99/308	95/271	91/240	87/213	84/190	–	–	–	–	–	–	–	–
FN7.9A	1	18	89/160	83/133	79/112	75/95	71/82	67/71	64/61	62/54	59/47	56/42	52/37	48/33	45/30	–	–	–	–	–	–	–
		16	138/207	129/173	122/145	116/124	110/106	105/92	96/80	88/70	81/61	74/54	69/48	64/43	59/39	55/35	52/31	–	–	–	–	–
		14	206/265	194/221	181/186	163/158	147/135	133/117	121/102	111/89	102/78	94/69	87/62	81/55	75/49	70/44	65/40	61/35	57/31	–	–	–
	2	18	72/384	68/320	64/270	60/230	57/197	55/170	52/148	50/129	48/114	46/101	44/90	43/80	–	–	–	–	–	–	–	–
		16	109/499	103/416	97/350	92/298	88/255	83/221	80/192	76/168	73/148	70/131	67/116	64/104	–	–	–	–	–	–	–	–
		14	162/637	153/531	144/447	136/380	130/326	123/282	118/245	113/214	106/189	98/167	90/148	84/133	–	–	–	–	–	–	–	–
FN9.4A	1	18	91/244	86/204	81/172	77/146	73/125	70/108	66/94	64/82	61/72	58/64	56/57	54/51	52/46	50/41	49/37	47/33	44/29	–	–	–
		16	143/316	134/264	127/222	120/189	114/162	109/140	104/122	99/107	95/94	91/83	88/74	82/66	77/59	71/53	67/48	62/42	59/37	55/33	52/29	–
		14	214/404	202/337	191/284	181/241	172/207	163/179	156/155	144/136	132/120	122/106	112/94	104/84	97/75	90/68	84/61	79/54	74/47	70/42	66/37	59/30
	2	18	71/500	67/490	63/413	60/351	57/301	54/260	52/226	50/198	48/174	46/154	44/137	42/122	–	–	–	–	–	–	–	–
		16	109/500	103/500	97/500	92/455	87/390	83/337	79/293	76/256	73/226	70/200	67/178	65/159	–	–	–	–	–	–	–	–
		14	161/500	152/500	143/500	136/500	129/498	123/430	117/374	112/327	108/288	103/255	99/227	96/202	–	–	–	–	–	–	–	–

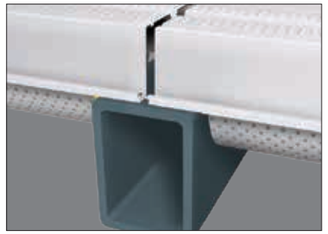
If higher loads or longer spans are required, contact EPIC Metals.
NOTES: 1. Loads are based on ASD Design.
2. Uniform load values listed on the left side of the box, 100/50, are governed by stress or web crippling and the values listed on the right side, 100/50, are governed by deflection.
3. The deflection criteria used for generating the tables above were L/240 or 1.5″ maximum. The Engineer of Record shall calculate the allowable uniform load if a different deflection criteria is required.
4. Stress governed values assume a maximum allowable stress of 24 ksi.
5. Minimum end support bearing lengths are shown above. If shorter bearing lengths are used, consult EPIC Metals.

Envista
Standard Features



Conceals Fasteners
All of the Envista panels conceal the roofing system fasteners.

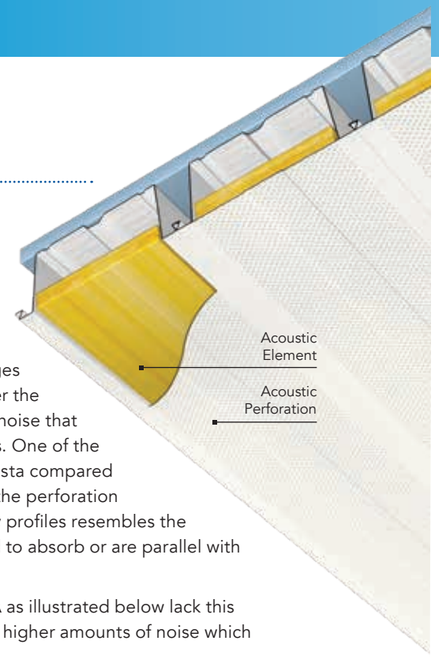
Sidelap
The dovetail ribs of the sidelaps conceal the fasteners.



Inset Bottoms of Envista D
The inset bottom of Envista saves height above the truss. The inset also allows the top to be welded to the structural supports with no special operations required.

Envista®
Options

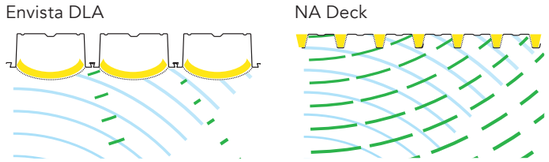
Envista's Superior **Acoustic Properties**

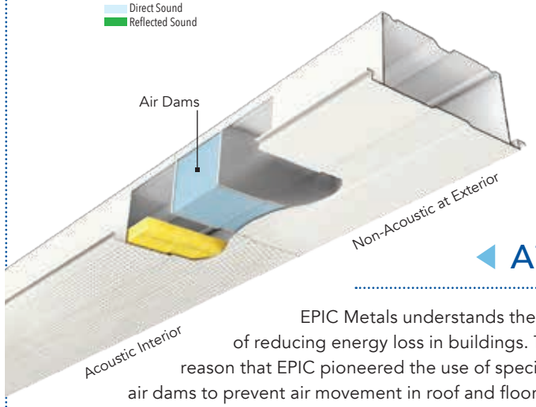


Acoustic roof and floor deck ceiling systems are specified as an economical means of reducing noise levels in building interiors, and offer an attractive appearance without adding an additional ceiling. NRC values are the noise absorption averages over a range of frequencies. The higher the NRC value, the greater the amount of noise that is absorbed over the frequency ranges. One of the main acoustic advantages of EPIC Envista compared to other ribbed acoustic decks is that the perforation pattern on the ceiling surface on many profiles resembles the soundwave patterns they are intended to absorb or are parallel with incident sounds.

Ribbed profile decks such as NA or BA as illustrated below lack this design feature and reflect significantly higher amounts of noise which can create an echo effect.

Sound Absorption Comparison





Air Dams

EPIC Metals understands the importance of reducing energy loss in buildings. This is the reason that EPIC pioneered the use of specially designed air dams to prevent air movement in roof and floor deck ceiling panels that cantilever outside of a building. Where these panels are partially inside the building and transition to the outside, a barrier is necessary to prevent the exterior unconditioned air from moving through the conditioned spaces.

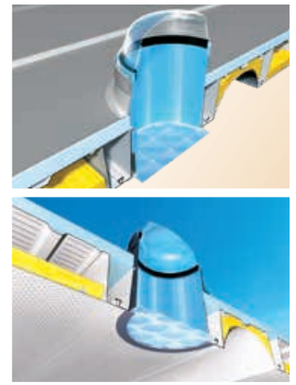
EPIC Metals specially designed air dams to help reduce the building energy usage when roof or floor deck ceiling panels extend from the interior of a building to the exterior of the building.

SkyDeck®

Natural light makes spaces appear larger and reveals true colors in the interior of buildings. Skydeck with Solatube® daylighting systems captures ambient light as well as direct light, enabling them to provide exceptional lighting even on cloudy days, and in the early morning and late afternoon when the sun is low in the sky. Lighting consumes approximately 40 percent of the energy used in commercial buildings, including air conditioning to cool lighting loads, according to the Electric Power Research Institute. Energy costs can be reduced in structures using Skydeck as one of the day-lighting techniques. Specification of Skydeck can be an important contributor to achieving Leadership in Energy and Environmental Design (LEED®) points.

EPIC Metals Skydeck specified in Envista systems featuring the Solatube Raybender® Light Intercepting Transfer Device (LITD®), and Spectralight® Infinity tubing transfers up to 500% more daylight than other tubular skylight systems. With Spectralight Infinity tubing, you receive the brightest, cleanest, and whitest natural light possible today. This advantage is particularly significant in low-angle light conditions, such as during the early morning and late afternoon, and in the winter months when the sun is low on the horizon. Skydeck has minimal heat loss or gain between the interior and exterior because the Solatubes work like a dual glazed window.

As an example each Solatube 290 DS 14 inch Solatube may create on average 6,150 lumens (dependent on the geographical location of the building) and up to 9,180 lumens. For comparison, the output of one light fixture with three 20 watt T8 LED 48 inch lamps would provide 5,160 lumens. The results of using Skydeck are remarkable.



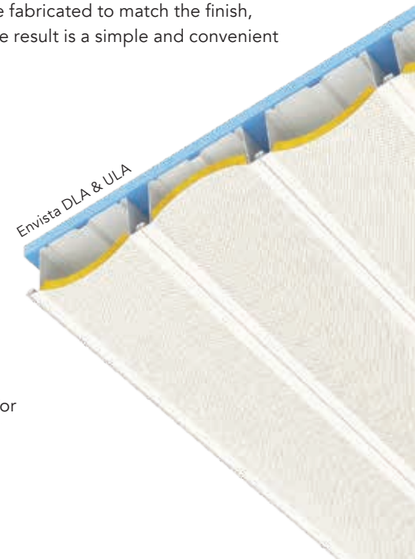
Envista UHA & FA with Skydeck Option

Hinged Access Panel

With Envista FA and FNA hinged access panels, it is possible to easily access utilities that have been located within the roof deck ceiling system. Access panels come in various sizes, are placed according to architectural drawings and are provided during the manufacturing process. The hinged panels are fabricated to match the finish, size, and shape of the adjacent ceiling surface. The result is a simple and convenient access to hidden utilities.

Create **Unique Combinations**

The applications for Envista UA & DA and the other profiles are only limited by the designer's imagination. Curved Envista panels combined with flat Envista panels offer an unmistakable architectural feature. With the acoustic option, panels can be combined to selectively tune the acoustics of a building for sound absorption at various frequencies (see page 16, Envista Superior Acoustic Properties). Virtually unlimited design combinations are possible with the Envista Roof Deck Ceiling Systems.

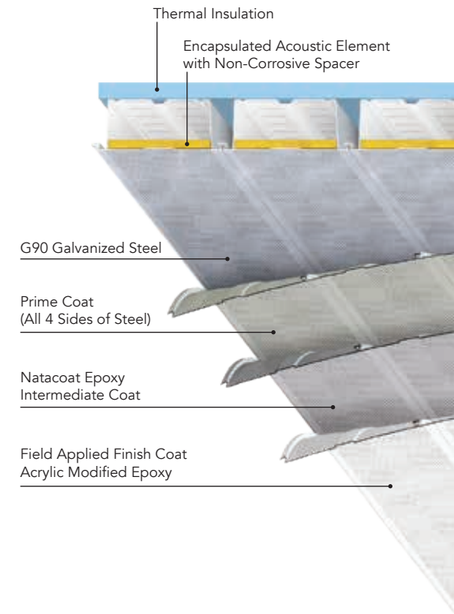


Envista®
Options

Natacoat®

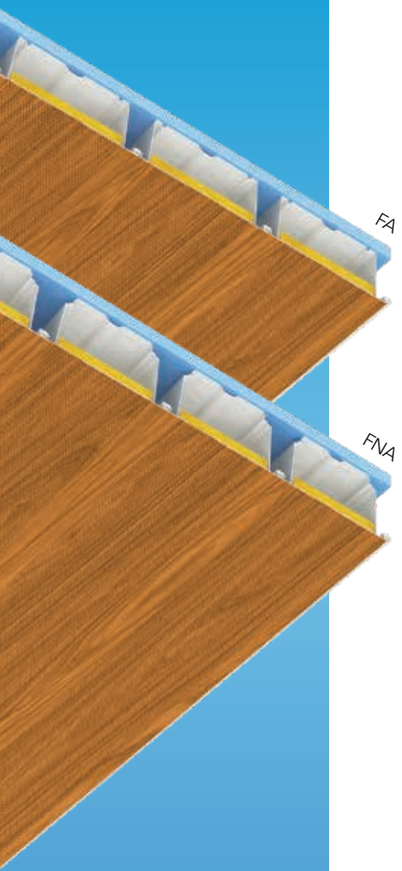
Natatoriums create a highly humid and corrosive interior environment for building materials. EPIC Natacoat is an innovative, specialized coating that has been applied to protect long span, acoustic roof and floor deck ceiling systems in such harsh settings for over 20 years.

Prior to panel fabrication, all surfaces of the galvanized steel are degreased and cleaned by a chemical conversion coating before applying a primer to increase bonding capabilities. Following the prime coat, the panels are fabricated and the Natacoat specialized coating is applied to the ceiling surface. Natacoat is a factory-applied, oven-baked polyamide epoxy. The finish coat is applied after installation. Contact EPIC for special paint specifications for natatoriums or other high humidity applications.



Seven Oaks Pool, Winnipeg, Manitoba, Canada
Envista® F4.5A, Natacoat®

Envista Options



Envista®
F(A) & FN(A) Timberlok®

Envista F(A) & FN(A) Roof & Floor Decking Ceiling Systems can clear span up to 36′, offering all the structural support of a steel roof deck panel while giving the warm, distinctive appearance of finished wood grain. Four finishes are available: Dark Cherry, Colony Maple, Light Maple, and Pine.

Dark Cherry

Colony Maple

Light Maple

Pine

Contact EPIC Metals for specifications on Timberlok finishes.

West Texas A&M University, AG Science Building, Canyon, Texas
Envista F7.5A, Dark Cherry

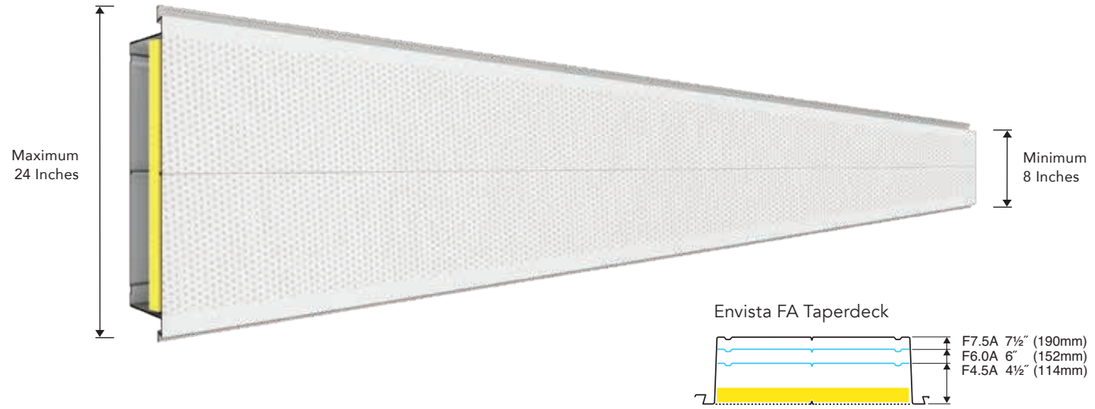
West Texas A&M University, AG Science Building, Canyon, Texas
Envista F7.5A, Dark Cherry

Spring Fire Department, Station 74, Spring, Texas
Envista® F7.5A, Timberlok Dark Cherry

Simulation, Envista FA Taperdeck

Envista®
Taperdeck

EPIC Taperdeck is designed to clear span up to 28′ and can be manufactured with the maximum tapering of 24″ to 8″. This innovative EPIC panel offers architects the ability to use an exposed roof deck ceiling system to follow forms, turn corners and create curves and circles. EPIC's tapered panels are available with acoustic features that can absorb up to 100% of the sound that strikes the panel. Contact EPIC Metals for consultation on Taperdeck.



Envista® Roof Deck Ceiling Systems
Specifications

Notes: Omit underlined areas for non-acoustic applications. Please fill in Envista type under 2.2 Materials, part A. For acoustic ceiling deck, please fill in required NRC under 2.3 Fabrication, part E.
For the additional specification language covering factory reinforced openings to accommodate sprinkler pipes, lights, speakers, or Skydeck® for Solatube® Daylighting Systems, contact EPIC Metals.

PART 1: GENERAL

1.1 SUMMARY

A. The requirements of this specification section include all materials, equipment, and labor necessary to furnish and install an EPIC Envista Roof Deck Ceiling System.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, section properties, load tables, diaphragm shear tables, dimensions, finishes, and noise reduction coefficients.

B. Shop Drawings: Submit panel placement drawings showing profiles, material thicknesses, finishes, layout, anchorage, and openings as dimensioned on the structural drawings. Show access openings and covers if required.

C. Samples: Submit full width sample if requested to verify compliance with the specifications and the level of quality.

1.3 REFERENCE STANDARDS

A. Section Properties: Shall be computed in accordance with the *American Iron and Steel Institute (AISI) Specification for Design of Cold-Formed Steel Structural Members.*

B. Welding: Shall comply with applicable provisions of the *American Welding Society (AWS) D1.3 Structural Welding Code—Sheet Steel.*

C. Superimposed Load and Diaphragm Shear Capacities: Shall be computed in accordance with the requirements of the Steel Deck Institute (SDI).

D. Noise Reduction Coefficients: Shall be verified by the results of sound absorption tests conducted in accordance with ASTM C423 and E795. For Envista Specular panels, specular acoustical tests shall be conducted by an independent acoustical laboratory.

E. Manufacturer shall have been regularly engaged in the production of the specified roof deck ceiling systems for a period of at least ten years.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Envista panels shall be protected from damage during delivery, storage, and handling.

B. If storage at the jobsite is required, Envista panels shall be elevated above the ground, sloped to provide drainage, and protected from weather with a ventilated covering.

1.5 COORDINATION

A. Coordinate length of fasteners for roofing and thermal insulation to avoid penetrating the finished bottom surface of the Envista panels.

B. Coordinate location and size of shop-cut access openings in bottom of Envista panels with affected trades.

1.6 QUALITY ASSURANCE

A. IAPMO Evaluation Report required for Envista U, D & F profiles.

PART 2: PRODUCTS

2.1 MANUFACTURER

A. In accordance with the requirements of this specification section, provide products manufactured by EPIC Metals, Rankin, PA.

B. The type of Envista panels, design thickness, section properties, and NRC shall be shown on the structural design drawings.

C. Substitutions: (Under provisions of Division 01.) Not permitted.

2.2 MATERIALS–STRUCTURAL ELEMENT

A. Type ___ Envista panels shall be cold-formed from steel coils conforming to ASTM A653, Structural Quality, Grade 40 with minimum yield strength of 40 ksi.

B. Before forming, the steel coils shall have received a hot-dip protective coating of zinc conforming to ASTM A924, Class G60 or G90, as defined in ASTM A653.

C. The minimum uncoated thickness of materials furnished shall be within 5% of the design thickness.

2.3 FABRICATION

A. Envista panels shall be cold-formed by the continuous roll forming process and attached together to form an integral cellular panel.

B. Envista panels shall have interlocking type sidelaps suitable for screw or weld fastening.

C. Envista panels shall have roll-formed embossments located between the longitudinal stiffening ribs in the top flanges.

D. (Omit this paragraph if prime painting is not required.)

The bottom surfaces of Envista panels shall be prime painted at the factory. Before painting, the galvanized steel shall be chemically cleaned and coated with a pretreatment followed by a coat of manufacturer's standard prime paint and then oven-cured. Compatibility of field-applied finish paint with factory-applied prime paint shall be the responsibility of the painting contractor.

NOTE: CONTACT EPIC METALS FOR SPECIAL PAINTING SYSTEMS THAT ARE RECOMMENDED FOR NATATORIUMS OR OTHER HIGH HUMIDITY APPLICATIONS.

E. For Acoustic Envista Roof Deck Ceiling panels with convex, concave or flat sections, these areas shall be perforated for enhanced acoustic performance. Acoustical elements shall be factory installed in the cells of the panels in a manner that prevents them from being dislocated, or blown out of the cells during shipping, erection and until the finished roofing is installed. For acoustic Envista Specular panels. Additionally the webs shall be perforated for enhanced acoustic performance with uniform rows of holes. Acoustic insulation batts shall be provided. These shall be field-installed by the roofing contractor. The acoustical elements shall be supported above the perforated surface to avoid plugging the holes during field painting. A minimum NRC of ____ shall be provided.

2.4 ACCESSORIES

A. Where panels continue from the interior of the building through to the exterior of the building (for example as a cantilever canopy): the panels will be perforated on the interior and not perforated on the exterior, air dams will be provided to block the movement of conditioned air from the interior of the building to the exterior.

B. Manufacturer's standard ridge plates, valley plates, transition plates, and closures shall be provided as indicated on the structural drawings.

C. Openings and reinforcement for openings noted specifically by the deck manufacturer on the structural drawings shall be provided.

D. Envista F & FN ceiling panels requiring access openings shall be shown on the structural or architectural drawings. Access openings shall be factory-made hinged ceiling panels which can provide up to 14″ of opening width. Covers shall be factory-attached per manufacturing details. Access panels requiring penetrations shall have the penetrations made in the field.

Ross School, Ross, California, Envista D7.5HA & U7.5HA

PART 3: EXECUTION

3.1 GENERAL

A. The Envista Roof Deck Ceiling Systems shall be installed in strict accordance with the manufacturer's instructions, approved erection drawings, and all applicable safety regulations.

3.2 PREPARATION

A. Bundles of material shall be located on the supporting frame in such a manner that overloading of any of the individual framing members or Envista panels does not occur.

3.3 INSTALLATION

A. Before being permanently fastened, Envista panels shall be placed on the supporting frame and adjusted to final position with ends accurately aligned and adequately bearing on the supporting frame. Consistent coverage shall be maintained so that panels located in adjacent bays will be properly aligned.

B. Cutting of Envista panels to suit jobsite conditions shall be performed in a neat and workmanlike manner. Only those openings indicated on the structural drawings shall be cut. Other openings shall be cut and reinforced by those requiring the opening as approved by the structural engineer.

C. Envista panels shall be fastened to all supporting members with two ¾″ diameter puddle welds per 18″ wide or 16″ wide panel or as indicated on the manufacturer's erection drawings.

1. The sides of Envista panels located at the perimeter of the building shall be fastened to supporting members at a maximum spacing of 36″ on center or less as indicated on the manufacturer's erection drawings.

D. The sidelaps of Envista panels shall be fastened together with #12 x ¾″ maximum length screws at a maximum of 36″ on center or less as indicated on the manufacturer's erection drawings.

E. Construction loads shall not be applied to Envista panels until after the panels are permanently fastened to supporting members and sidelaps are attached, and shall not exceed the load-carrying capacity of the panels.

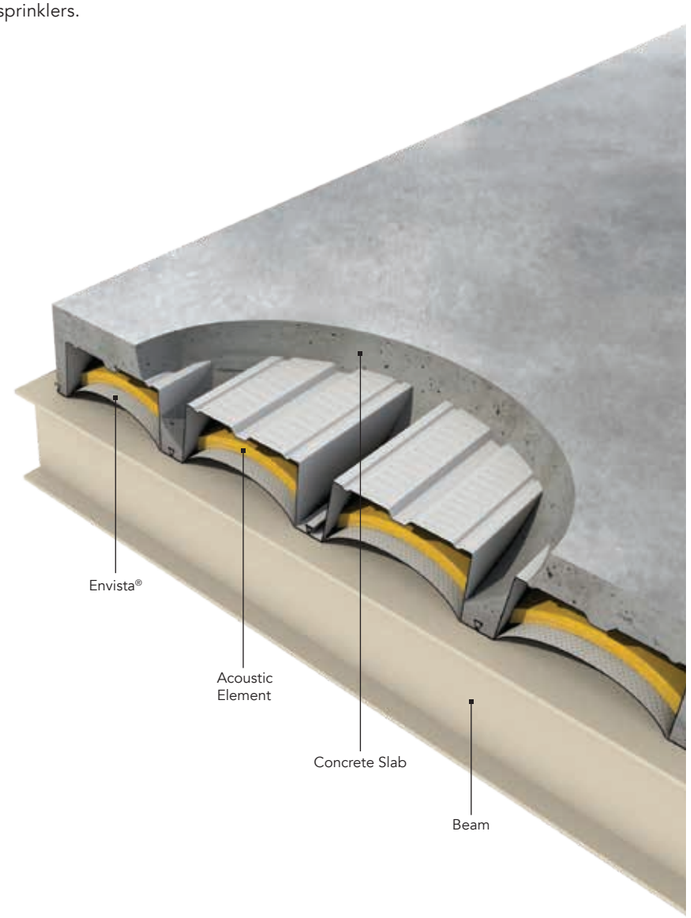
F. Items such as light fixtures, conduit, pipe, and ductwork shall not be suspended from Envista panels without specific approval of the structural engineer.

Providence College, Ruane Friar Development Center, Providence, Rhode Island
Envista® F6.0A

Envista® Composite Floor
DCLA, UCLA & FCA

Envista Floor Deck Ceiling Systems provide a composite floor slab with the ability to carry floor loads over long spans and can be selected to eliminate the need for intermediate supports used for temporary shoring during construction. Specifying composite Envista for the floors of the building enables the designer to maintain uniform ceiling appearances with the Envista Roof Deck Ceiling Systems.

Most of the composite slabs can also provide fire separation of up to three hours without the use of additional fireproofing materials or sprinklers.



U.S. Patent Numbers 7,146,920, 7,328,667

Envista® Composite DCLA, UCLA, FCA
Technical Tables

SPANS
13′–26′

Envista Section Properties of the Structural Element (per foot of width)

Depth	Gage	Weight (psf)	I_D ($in.^4$)	S_P ($in.^3$)	S_N ($in.^3$)
4.5	18	3.4	2.86	0.99	1.06
	16	4.3	3.78	1.28	1.34
	14	5.4	4.84	1.62	1.68
6.0	18	3.7	5.61	1.49	1.46
	16	4.7	7.47	1.94	2.03
	14	5.9	9.56	2.46	2.54
7.5	18	4.0	9.44	2.04	1.91
	16	5.1	12.61	2.67	2.53
	14	6.4	16.18	3.40	3.31

U.L. Fire Ratings*

Fire Rating Type–Hours	U.L. Design Number	Concrete Cover (in.)	Type & Weight of Concrete (PCF)	Bottom Protection	Required Welded Wire Fabric
RAR–1 HR.	D903	3	Reg. Wt. (147)	None	6 x 6 W1.4 x W1.4
		2¾	Lt. Wt. (110)		
RAR–2 HR.	D903	4¼	Reg. Wt. (147)	None	6 x 6 W2.1 x W2.1
		3½	Lt. Wt. (110)		
RAR–3 HR.	D903	4	Lt. Wt. (110)	None	6 x 6 W2.1 x W2.1

RAR – Restrained Assembly Rating

* Consult the latest U.L. Fire Resistance Directory for the specific system assembly requirements to achieve the above hourly fire ratings.

Total Allowable Superimposed Loads in Pounds per Square Foot
Regular Weight Concrete (145 pcf) — Concrete Strength 4 ksi*

Deck Depth (in.)	Slab Depth Weight (psf*)	Concrete Volume ($ft.^3/ft.^2$)	Gage*	Max Clear Span Without Shoring (ft.-in.)		Uniform Service Load Slab Capacity (LRFD), psf Spans (ft.)												
				Simple	Double	13	14	15	16	17	18	19	20	21	22	23	24	25	26
4½	7″ (45)	.27	18	14-9	14-1	146	122	102	86	72	61	51	43	-	-	-	-	-	-
			16	17-1	17-6	155	138	123	110	96	82	70	60	51	44	-	-	-	-
			14	18-1	19-6	155	138	123	110	99	88	79	71	64	57	51	45	-	-
	7½″ (51)	.31	18	14-1	13-0	168	139	117	98	83	70	59	50	42	-	-	-	-	-
			16	16-5	16-10	178	158	141	126	110	94	80	69	59	50	43	-	-	-
			14	17-6	18-9	178	159	141	127	113	102	91	82	73	66	59	51	44	-
	8½″ (63)	.40	18	12-11	11-3	209	179	150	126	107	90	76	64	54	45	-	-	-	-
			16	15-0	15-7	223	198	176	157	141	121	104	89	76	66	56	48	40	-
			14	16-7	17-5	225	200	179	160	143	129	115	104	93	83	74	66	58	50
6	8½″ (48)	.29	18	16-6	13-4				98	87	78	70	63	54	46	-	-	-	-
			16	19-10	20-1				110	99	89	81	73	66	60	54	49	42	-
			14	21-0	23-5				112	101	92	83	76	69	62	57	51	47	42
	9″ (54)	.34	18	15-3	12-5				109	98	88	79	70	60	51	43	-	-	-
			16	19-3	18-8				123	111	101	91	82	75	67	61	54	46	40
			14	20-5	22-6				126	114	104	94	85	78	71	64	58	53	48
	10″ (66)	.42	18	13-4	10-10				133	119	106	95	85	73	62	52	44	-	-
			16	18-4	16-4				151	136	123	111	101	91	82	74	65	56	48
			14	19-5	21-0				155	141	127	116	105	95	87	79	72	65	59
7½	10″ (52)	.32	18	15-0	12-9					107	96	87	79	71	64	57	49	42	-
			16	22-3	19-2					122	111	101	92	84	77	70	64	59	53
			14	23-6	26-1					126	115	105	96	88	81	74	68	63	57
	10½″ (58)	.36	18	14-0	11-10					118	106	96	87	79	70	61	52	45	-
			16	21-7	17-10					135	123	112	102	94	85	78	71	65	57
			14	22-10	25-2					141	128	117	107	98	90	83	76	70	64
	11½″ (70)	.44	18	12-3	10-4					140	127	114	104	94	82	71	61	52	44
			16	19-0	15-8					162	147	134	123	112	102	93	85	75	66
			14	21-10	22-11					169	154	141	129	118	109	100	91	84	77

No Shoring Special Shoring Required in Shaded Areas

COMPOSITE SLAB DESIGN NOTES:

1. *Other concrete strengths, slab depths, and deck gages are available. Contact EPIC Metals.
2. Slab weight shown includes weight of heaviest deck gage.
3. All loads are assumed to be uniformly and statically applied. If loads greater than 200 psf are required contact EPIC metals
4. Superimposed loads for spans in shaded areas assume deck is shored.
5. Composite slab design is based on simple span analysis.
6. Deflection limit of the composite slab is L/360 under the superimposed load.
7. Load tables are in accordance with SDI recommendations.
8. See U.L. Fire Ratings for required welded wire fabric requirements.

DECK DESIGN AS A FORM NOTES:

1. Maximum clear spans without shoring are based on the Steel Deck Institute's recommendations for sequential loading and load resistance factor design. The table is based on 40 ksi steel yield stress and deflection limits of L/180 or ¾″, whichever is less. Loading includes slab weight plus either a 30 psf uniform construction load or a 250-pound concentrated construction load on a 1′– 0″ width section. If heavier construction loads or less form deflection are required, spans must be reduced. Contact EPIC Metals for recommendations.
2. Runways and planking must be used for all concrete placement.
3. Minimum bearing is 4″ at end supports and 6″ at interior support bearing lengths.

Envista® Composite Floor Deck Ceiling Systems
Specifications

NOTES: OMIT underlined areas for non-acoustic applications. Please fill in Envista type under 2.2 materials, part A. For acoustic ceiling deck, please fill in required NRC under 2.3 Fabrication, Part C.
For the additional specification language covering factory reinforced openings to accommodate sprinkler pipes, lights, speakers, or Skydeck® for Solatube® Daylighting Systems, contact EPIC Metals.

PART 1: GENERAL

1.1 SUMMARY

A. The requirements of this specification section include all materials, equipment, and labor necessary to furnish and install an EPIC Envista Floor Deck Ceiling System.

B. Related Work: The following related work is not part of this Specification Section.
   1. Cast-In-Place Concrete: Concrete fill, welded wire fabric, reinforcing steel and temporary shoring.
   2. Structural Steel: Supplementary framing, deck supports and shear studs.
   3. Painting: Preparation for and application of field painting.

1.2 SUBMITTALS

In accordance with the other applicable requirements of the contract documents, submit the following:

A. Product Data: Submit manufacturer's specifications, section properties, load tables, dimensions, finishes, fire rating and acoustic coefficients if applicable.

B. Erection drawings for Envista Composite Floor Deck and related accessory items showing profiles and material thicknesses, layout, anchorage, openings as dimensioned on the structural drawings and shoring requirements.

1.3 REFERENCE STANDARDS

A. Section Properties: Shall be computed in accordance with the American Iron and Steel Institute (AISI) Specification for Design of Cold-Formed Steel Structural Members.

B. Composite Slabs load capacities shall be computed in accordance with the ANSI/SDI Standard for Composite Steel Floor Deck-Slabs and shall be verified by full scale testing.

C. Welding: Shall comply with applicable provisions of the American Welding Society (AWS) D1.3 Structural Welding Code—Sheet Steel.

D. Fire Resistance Classification: Shall be acceptable for use in Underwriters Laboratories Fire Resistance Index. All Envista Composite Floor Deck panels used in rated fire resistance designs shall bear the appropriate U.L. Classification marking.

E. Cast-In-Place Concrete: Shall be in accordance with the applicable sections of ACI 318 Building Code Requirement for Reinforced Concrete. Minimum compressive strength shall be 3000 psi (4000 psi where required). Admixtures containing chloride salts shall not be used.

F. Noise Reduction Coefficients: Shall be verified by the results of sound absorption tests conducted in accordance with ASTM C423 and E795.

G. Manufacturer shall have been regularly engaged in the production of the specified composite floor deck ceiling systems for a period of at least ten years.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Envista Composite Floor Deck panels shall be protected from damage during delivery, storage, and handling.

B. If storage at the jobsite is required, panels shall be elevated above the ground, sloped to provide drainage, and protected from weather with a ventilated covering.

1.5 COORDINATION

A. Coordinate concrete type, strength, slump, shoring and reinforcing to assure composite slab performance and U.L. Ratings.

B. Coordinate field cleaning and painting to assure adhesion to shop coatings.

C. Coordinate steel stud spacing to deck rib spacing for steel stud bearing wall construction.

PART 2: PRODUCTS

2.1 MANUFACTURER

A. In accordance with the requirements of this specification section, provide products manufactured by EPIC Metals, Rankin, PA.

B. The type of Envista Composite Deck panels, design thickness, section properties, composite slab capacities, fire ratings and NRC rating shall be shown on the structural design drawings.

C. Substitutions: (Under provisions of Division 01.) Not permitted.

2.2 MATERIALS–STRUCTURAL ELEMENT

A. Type ____ Envista Composite Floor Deck panels shall be cold-formed from steel coils conforming to ASTM A653, Grade 40 having a minimum yield strength of 40 ksi.

B. Before forming, the steel coils shall have received a hot-dip protective coating of zinc conforming to ASTM A924, Class G60 or G90, as defined in ASTM A653.

C. The minimum uncoated thickness of materials furnished shall be within 5% of the design thickness.

2.3 FABRICATION

A. Envista Composite Floor Deck panels shall be cold-formed by the continuous roll forming process.

B. Envista Composite Floor Deck panels shall be roll-formed with continuous ribs and integral embossed locking lugs to provide a positive mechanical bond with the concrete.

C. For Acoustic Envista Composite Floor Deck panels with convex, concave or flat sections, these areas shall be perforated for enhanced acoustic performance. Acoustical elements shall be factory installed in the cells of the panels in a manner that prevents them from being dislocated, or blown out of the cells during shipping, erection and until the finished roofing is installed. The acoustical elements shall be supported above the perforated surface to avoid plugging the holes during field painting. A minimum NRC of _____ shall be provided.

D. (Omit this paragraph if prime painting is not required.)

The bottom surfaces of Envista Composite Floor Deck panels shall be prime painted at the factory. Before painting, the galvanized steel shall be chemically cleaned and coated with a pretreatment followed by a coat of manufacturer's standard prime paint and then oven-cured. Compatibility of field-applied finish paint with factory-applied prime paint shall be the responsibility of the painting contractor.

NOTE: CONTACT EPIC METALS FOR SPECIAL PAINTING SYSTEMS THAT ARE RECOMMENDED FOR NATATORIUMS OR OTHER HIGH HUMIDITY APPLICATIONS.

E. Whenever possible, Envista Composite Floor Deck panels shall be fabricated to provide a multiple span condition.

2.4 ACCESSORIES

A. Where panels continue from the interior of the building through to the exterior of the building (for example as a cantilever canopy): the panels will be perforated on the interior and not perforated on the exterior, air dams will be provided to block the movement of conditioned air from the interior of the building to the exterior.

B. Manufacturer's standard column closures, end closures, and side closures shall be provided as indicated on the structural drawings.

C. Slab edge forms of 10 gage or less material thickness shall be provided as indicated on the structural drawings.

D. Openings and reinforcement for openings in the structural element noted specifically by the deck manufacturer on the structural drawings shall be provided.

E. Envista F & FN ceiling panels requiring access openings shall be shown on the structural or architectural drawings. Access openings shall be factory-made hinged ceiling panels which can provide up to 14″ of opening width. Covers shall be factory-attached per manufacturing details. Access panels requiring penetrations shall have the penetrations made in the field.

PART 3: EXECUTION

3.1 GENERAL

A. Envista Composite Floor Deck panels and accessories shall be installed in strict accordance with the manufacturer's instructions, approved erection drawings and all applicable safety regulations

3.2 EXAMINATION

A. The supporting frame or other related work shall be inspected and accepted by the deck erector before the start of installation.

B. The need for temporary shoring shall be investigated. Shoring tables furnished by the manufacturer and shown on the approved erection drawings shall be consulted. Allowable unshored spans shall be reduced if greater construction loads are anticipated or if less deflection is allowable.

C. Temporary shoring, if required, shall be in-place prior to installation of Envista Composite Floor Deck panels and shall remain in-place until the concrete attains the required strength and stiffness.

3.3 PREPARATION

A. Bundles of materials shall be located on the supporting frame in such a manner that overloading of any of the individual members or Envista panels does not occur. Envista Composite Floor Deck panels shall not be placed on concrete supporting members until after the members have adequately cured or properly designed formwork is in place.

3.4 WORK BY OTHER TRADES

A. The slump of the concrete will determine the amount of concrete leakage and cleanup that will be required to the ceiling surface. On all projects some cleanup of the ceiling surface will be required.

3.5 INSTALLATION

A. Envista Composite Floor Deck panels and related accessories shall be installed in accordance with manufacturer's approved erection drawings, *SDI Manual of Construction with Steel Deck* and all federal and state regulations

B. Before being permanently fastened, Envista Composite Floor Deck panels shall be placed on the supporting frame and adjusted to final position with ends accurately aligned and adequately bearing on the supporting frame. Consistent coverage shall be maintained so that panels located in adjacent bays will be properly aligned.

C. Cutting of Envista Composite Floor Deck panels to suit jobsite conditions shall be performed in a neat and professional manner. Only those openings indicated on the structural drawings shall be cut. Other openings shall be cut and reinforced by those requiring the opening as approved by the structural engineer.

D. Envista Composite Floor Deck panels shall be fastened to all supporting members with two ¾″ diameter puddle welds per 18″ or 16″ wide panel or as indicated on the manufacturer's erection drawings.

E. The sidelaps of Envista Composite Floor Deck panels shall be fastened together with #12 x ¾″ maximum length screws at a maximum of 36″ on center or less as indicated on the manufacturer's erection drawings. Sides of the Envista Composite Floor Deck panels located at perimeter edges of the building shall be fastened to supporting members at a spacing of 36″ on center or less as indicated on the manufacturer's erection drawings.

F. Construction loads shall not be applied to Envista Composite Floor Deck panels until after panels are permanently fastened to supporting members and sidelaps have been attached and shall not exceed the load carrying capacity of the panels.

3.6 AFTER INSTALLATION

A. Construction loads that could damage the Envista Composite Floor Deck such as heavy concentrated loads and impact loads shall be avoided. Planking shall be used in all high traffic areas.

B. Prior to placement of concrete, the top surface of Envista Composite Floor Deck shall be cleaned of all debris, grease, oil and other foreign substances. Cleaning the bottom surface of the Envista Composite Floor Deck for field painting shall be the responsibility of the painting contractor.

C. Galvanized coatings that are significantly damaged shall be repaired. Appropriate galvanized repair paint shall be used and the paint manufacturer's application instructions shall be followed.

D. Temporary shoring, if required, shall remain in-place until after the Composite Floor slab has attained 75% of its design strength and approval of the structural engineer has been attained. Envista requires special shoring.

Designer's Responsibility & Warranty

Designer's Responsibility

The information presented in this brochure has been prepared in accordance with generally recognized engineering principles. We recommend that this information not be used or relied upon for any application without a thorough review by a licensed professional engineer, designer, or architect who will be competent to evaluate the significance and limitations of this material and who will accept responsibility for the application of this material for any specific application.

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Since hazards may be associated with the handling, installation, or use of steel and its accessories, prudent construction practices should always be followed. We recommend that the parties involved in such handling, installation, or use review all applicable manufacturer's material safety data sheets, applicable rules and regulations of the Occupational Safety and Health Administration and other government agencies having jurisdiction over such handling, installation, or use, and other relevant construction practice publications, including the Steel Deck Institute (SDI) *Manual for Construction with Steel Deck*.

Warranty

EPIC Metals warrants that materials to be furnished, insofar as they are manufactured by EPIC Metals, shall be free from structural defects. In the event of the failure of the material within one year from the date of delivery, and providing that such failure is attributed to defects found to have existed at the time of delivery, EPIC Metals' liability hereunder shall be limited to furnishing necessary replacement material. EPIC Metals Corporation assumes no liability for damages, losses, or injuries, direct or consequential, that may arise from use or inability to use the products.

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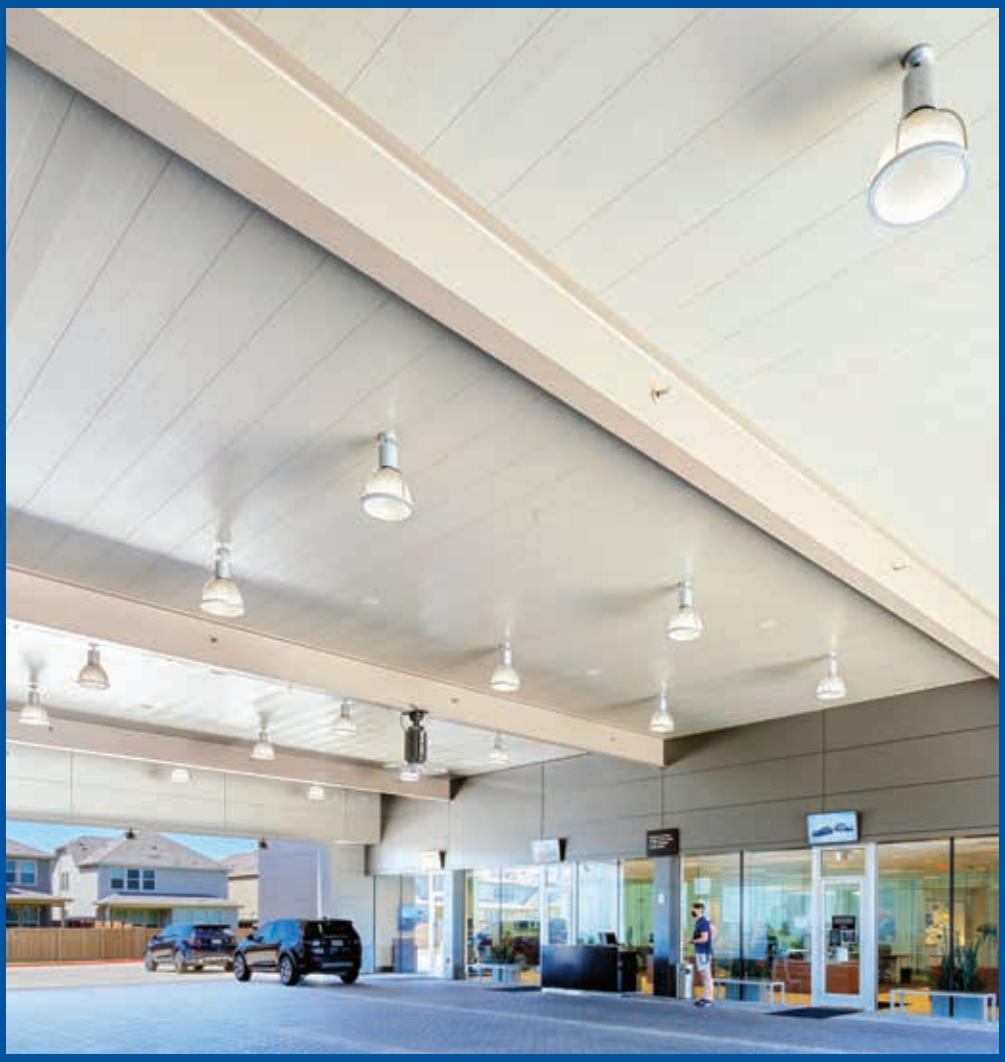

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