T 67 TECHNICAL BULLETIN

Comparing Noise Reduction Coefficients of Acoustical Steel Deck to Tectum™ Roof Decks

Rev. April 2006

TECTUM Inc. • P.O. Box 3002 • Newark, OH 43058 • www.tectum.com • 1-888-977-9691

It is important to have a basic knowledge of the competitors roof deck system and how they advertise and promote the products performance.

TYPES OF ACOUTICAL STEEL DECKS

Acoustical steel decks (perforated tin) are identified by different manufacturers as either type B, B1A, BW or N, 3NA or N1A (wide ribbed roof decks).

Acoustical steel decks advertise to absorb up to 90 percent of the sound. How do they get 90 percent absorption with a metal surface - or do they? The acoustical data must be carefully analyzed. The literature (See attached) from the manufacturer states in their footnotes that 1 7/8" or 2" of glass fiber roof insulation was used in each test in addition to the glass fiber normally placed in the flutes. The fiberglass is supposed to be installed by a second party - the roofing contractor.

CELLULAR DECKS ACOUSTICAL DATA

A second type of metal deck is the cellular deck. The cellular deck has a flat perforated surface. The typical thickness ranges from 1 1/2" to 3" with 5.71^2/cell to 17.82"^{2}/cell. The acoustical data for the cellular deck gives you insight into the effectiveness of the B and N systems. The cellular type deck without insulation has an NRC .15 to .30 as a result of the airspace. The addition of fiberglass insulation raises the NRC to .65 to a maximum of .80.

ACOUSTICAL PERFORMANCE MUST BE BASED ON THE SYSTEM

Why the difference? The difference is that 2" fiberglass roof insulation used in the test and the size of the test chamber. Seldom, if ever, is an acoustical steel roof deck (perforated tin) installed with a 2" rigid fiberglass roofing insulation - it is too expensive. In addition, codes may require a thermal barrier to protect the insulation and the roofing materials and a 5/8" or thicker gypsum panel must be installed over the deck. Where humidity is a problem, a vapor retarder would be required in addition, which would further negate the effect of the 2" fiberglass rigid insulation.

PERFORATIONS ON VERTICAL SURFACES PERFORM LESS EFFICIENTLY

The type B or N surfaces perforation in the flutes performs less efficiently than perforations in the flat plate cellular metal deck. At certain angles of incident the sound waves do not enter the perforations. Therefore, these decks reflect more sound. See Tectum Inc. Technical Bulletins T-12 and T-53 for additional information.

TECTUM INC.
The Noise Control Solution

THE MOST EFFECTIVE ACOUSTICAL ROOF DECK SYSTEM

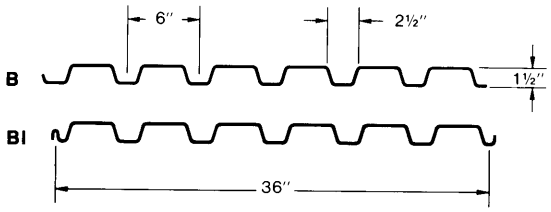
Tectum Roof Deck systems continue to outperform all structural acoustical roof decks including the acoustical steel deck (perforated tin). Note: The acoustical tests published on page four in the Tectum Inc. catalog are attached. They address the actual methods and systems used in roof deck construction. Field tests have verified the consistent performance of TECTUM roof deck systems. An NRC up to 1.00 on specific systems can be frequencies of 125 and 250 hertz are obtainable (.69 to 1.17 absorption). Steel deck absorption values for greater that 1000 hertz consistently are lower (less absorption) than any TECTUM roof deck system. A natural white surface is available and the TECTUM roof decks can be painted up to seven times without the loss of the acoustical performance. The first coat of paint often fills some perforations in a steel deck. This reduces the noise absorption effectiveness of the acoustical steel deck.

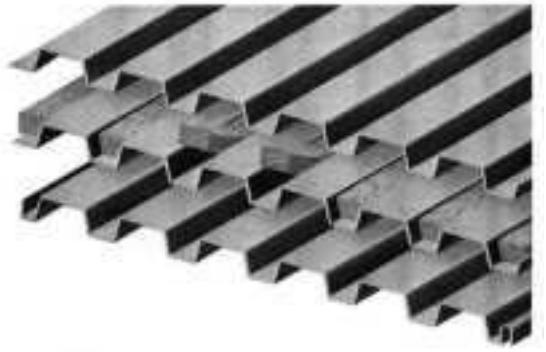
Call Tectum Inc. or the local representative for additional information.

REFERENCED ATTACHED: Page 3 & 4 - Vulcraft Acoustical Deck
Page 5 - Wheeling Roof Deck Acoustical Information
Page 6 - United Steel Deck Acoustical Information

1.5 B, BI, BA, BIA

Maximum Sheet Length 42'-0
Extra Charge for Lengths Under 6'-0
Factory Mutual Approved (No. 0C847.AM, 0G1A4.AM, and 3Y1A6.AM) **
ICBO Approved (No.3415)





SECTION PROPERTIES

Deck Type	Design Thick.	Weight (PSF) Ptd.	Weight (PSF) Galv.	I in^4/ft	Sp in^3/ft	Sn in^3/ft	Fy KSI
B24	0.0239	1.36	1.46	0.121	0.120	0.131	60
B22	0.0295	1.68	1.78	0.169	0.186	0.192	33
B21	0.0329	1.87	1.97	0.192	0.213	0.221	33
B20	0.0358	2.04	2.14	0.212	0.234	0.247	33
B19	0.0418	2.39	2.49	0.253	0.277	0.289	33
B18	0.0474	2.72	2.82	0.292	0.318	0.327	33
B16	0.0598	3.44	3.54	0.373	0.408	0.411	33

ACOUSTICAL INFORMATION

Deck Type	Absorption Coefficient 125	250	500	1000	2000	4000	Noise Reduction Coefficient*
1.5BA, 1.5BIA	.11	.20	.63	1.04	.66	.36	.65

* Source: Riverbank Acoustical Laboratories — RAL™ A94–185. Test was conducted with 1.5 inches of 1.65 pcf fiberglass insulation on 3 inch EPS Plaza deck for the SDI.

Type B (wide rib) deck provides excellent structural load carrying capacity per pound of steel utilized, and its nestable design eliminates the need for die-set ends.

1" or more rigid insulation is required for Type B deck.

Acoustical deck (Type BA, BIA) is particularly suitable in structures such as auditoriums, schools, and theatres where sound control is desirable. Acoustic perforations are located in the vertical webs where the load carrying properties are negligibly affected (less than 5%).

Inert, non-organic glass fiber sound absorbing batts are placed in the rib openings to absorb up to 65% of the sound striking the deck.

Batts are field installed and may require separation.

VERTICAL LOADS FOR TYPE 1.5B

No. of Spans	Deck Type	Max. SDI Const. Span	Allowable Total (Dead + Live) Uniform Load (PSF) Span (ft.-in.) C. to C. of Support 5'-0	5'-6	6'-0	6'-6	7'-0	7'-6	8'-0	8'-6	9'-0	9'-6	10'-0
1	B 24	4'-8	66	52	42	36	30	27	24	21	20		
	B 22	5'-7	91	71	57	47	40	34	30	27	24	22	20
	B 21	6'-0	104	81	64	53	44	38	33	29	26	24	22
	B 20	6'-5	115	89	71	58	48	41	36	31	28	25	23
	B 19	7'-1	139	107	85	69	57	48	41	36	32	29	26
	B 18	7'-8	162	124	98	79	65	55	47	41	36	32	29
	B 16	8'-8	206	157	123	99	81	68	58	50	44	39	34
2	B 24	5'-10	126	104	87	74	64	55	47	41	36	32	29
	B 22	6'-11	102	85	71	61	52	46	40	35	32	28	26
	B 21	7'-4	118	97	82	70	60	52	46	41	36	33	29
	B 20	7'-9	132	109	91	78	67	59	51	46	41	36	33
	B 19	8'-5	154	127	107	91	79	69	60	53	48	43	39
	B 18	9'-1	174	144	121	103	89	78	68	60	54	48	44
	B 16	10'-3	219	181	152	130	112	97	86	76	68	61	55
3	B 24	5'-10	130	100	79	65	54	45	39	34	31	27	25
	B 22	6'-11	128	106	89	76	65	57	50	44	39	34	31
	B 21	7'-4	147	122	102	87	75	65	56	49	42	38	34
	B 20	7'-9	165	136	114	97	84	72	61	53	46	41	36
	B 19	8'-5	193	159	134	114	98	84	71	61	53	47	41
	B 18	9'-1	218	180	151	129	111	96	81	69	60	52	46
	B 16	10'-3	274	226	190	162	140	119	100	85	73	64	56

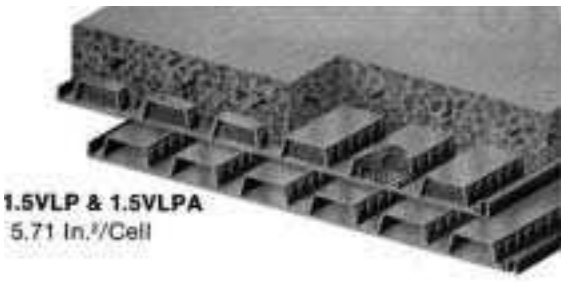
Notes:
1. Load tables are calculated using sectional properties based on the steel design thickness shown in the Steel Deck Institute (SDI) Design Manual.
2. Loads shown in the shaded areas are governed by the live load deflection not in excess of 1/240 of the span. A dead load of 10 PSF has been included.
3. ** Acoustical Deck is not covered under Factory Mutual

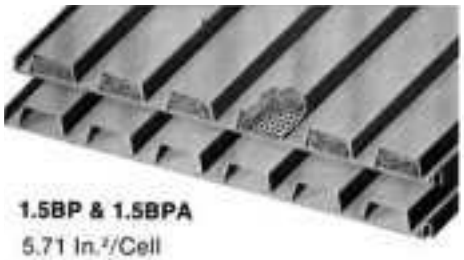
CELLULAR DECK

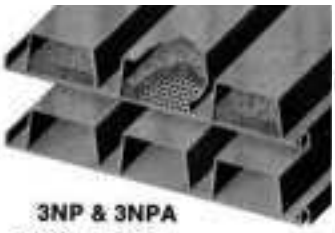
Galvanized Only
For: Electrified Raceways — Canopies — Long Spans
Heavy Forms — Flat Acoustical Ceilings

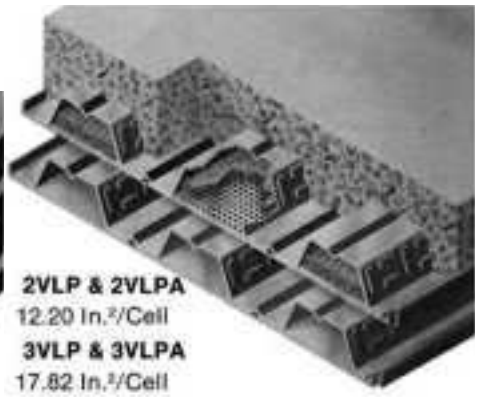
Vulcraft Cellular Units are approved by U.L. for use as Electrical Raceways.

NOTE:
Insulation not installed by Vulcraft.









ACOUSTICAL DATA

Deck Type	Absorption Coefficients 125	250	500	1000	2000	4000	Noise Reduction Coefficient	RAL™ Test No.
1.5BPA	0.34	0.42	0.36	0.22	.017	0.17	0.30 W/O Insulation	A85-154
3NPA	0.40	0.38	0.47	0.19	0.11	0.17	0.30 W/O Insulation	A85-156
1.5VLPA	0.09	0.11	0.25	0.14	0.16	0.28	0.15 W/O Insulation	A86-317
2VLPA	0.12	0.24	0.20	0.14	0.07	0.18	0.15 W/O Insulation	A86-319
3VLPA	0.33	0.31	.030	0.14	0.09	0.01	0.20 W/O Insulation	A86-321
1.5BPA	0.38	0.49	0.63	0.98	0.74	0.54	0.70 W/ Insulation	A85-155
3NPA	0.48	0.56	0.98	0.92	0.72	0.58	0.80 W/ Insulation	A85-157
1.5VLPA	0.14	0.21	0.61	0.99	0.69	0.27	0.65 W/ Insulation	A86-318
2VLPA	0.31	0.41	0.94	0.88	0.56	0.44	0.70 W/ Insulation	A86-320
3VLPA	0.40	0.56	1.07	0.78	0.57	0.35	0.75 W/ Insulation	A86-322

W/Insulation indicates rigid insulation in the cells. Source: Riverbank Acoustical Laboratories.

SECTION PROPERTIES

Deck Type	Hat/Pan Gage	Design Thickness Hat	Pan	Wt PSF	I in^4/ft	SP in^3/ft	SN in^3/ft
1.5VLP and 1.5BP	20/20	.0358	.0358	3.83	.357	.301	.394
	20/18	.0358	.0474	4.36	.388	.310	.413
	18/20	.0474	.0358	4.47	.483	.446	.510
	18/18	.0474	.0474	5.00	.527	.458	.532
	18/16	.0474	.0598	5.56	.567	.468	.556
	16/18	.0598	.0474	5.68	.668	.631	.657
	16/16	.0598	.0598	6.24	.722	.664	.685
2VLP	20/20	.0358	.0358	3.59	.675	.417	.426
	20/18	.0358	.0474	4.10	.726	.425	.441
	18/20	.0474	.0358	4.16	.841	.585	.554
	18/18	.0474	.0474	4.67	.902	.595	.572
	18/16	.0474	.0598	5.22	.960	.606	.589
	16/18	.0598	.0474	5.28	1.083	.741	.709
	16/16	.0598	.0598	5.83	1.153	.754	.731
3VLP	20/20	.0358	.0358	3.75	1.484	.650	.657
	20/18	.0358	.0474	4.26	1.594	.662	.681
	18/20	.0474	.0358	4.36	1.840	.904	.853
	18/18	.0474	.0474	4.88	1.980	.922	.883
	18/16	.0474	.0598	5.43	2.103	.936	.910
	16/18	.0598	.0474	5.54	2.365	1.146	1.094
	16/16	.0598	.0598	6.09	2.517	1.166	1.128
3NP	20/20	.0358	.0358	4.30	1.465	.610	.976
	20/18	.0358	.0474	4.83	1.583	.624	1.017
	18/20	.0474	.0358	5.08	1.979	.892	1.266
	18/18	.0474	.0474	5.61	2.152	.913	1.315
	18/16	.0474	.0598	6.18	2.308	.933	1.367
	16/18	.0598	.0474	6.45	2.750	1.257	1.626
	16/16	.0598	.0598	6.98	2.962	1.285	1.682

Note: These Deck Types are only manufactured at the Nebraska Plant.

Acoustical Steel Roof Deck

Wheeling Roof Deck

Designed to serve as a sound-absorbing ceiling as well as a structural roof deck, Wheeling's acoustical roof deck is identical to its standard deck counterpart, except the webs of fluted profiles are perforated and the bottom plate of cellular deck is perforated. The perforation pattern is 5/32" diameter holes staggered 3/8" on center. Structural properties are negligibly affected by the web perforations in fluted deck or bottom plate perforations in cellular deck (less than 5%).

The sound absorbing elements consist of rolls of glass fiber, furnished by Wheeling, which are placed in the ribs between the perforated webs on the job site by the roofing contractor. Sound absorbing glass fiber elements are factory installed in cellular roof decks. Stand off clips, elevating the glass fiber in cellular decks are available only as a special order.

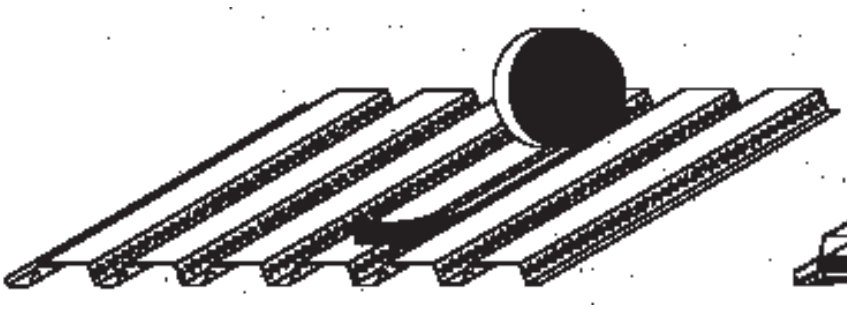
When painted acoustical deck is preferred, shop-applied primer over galvanized is recommended.

Sound Absorption Data

Panel Profile	Absorption Coefficient						NRC	Glass Fiber Roof Insulation
	125 HZ	250 HZ	500 HZ	1,000 HZ	2,000 HZ	4,000 HZ		
BW-A	.53	.95	1.02	.96	.55	.30	.85	1-7/8"
N-A	.93	1.26	1.09	.90	.56	.37	.95	2"
1-1/2" Cellular-A	.20	.33	.74	1.00	.57	.41	.65	2"
3" Cellular-A	.46	.64	1.12	.99	.76	.58	.90	2"

Performance values are based upon tests conducted by Riverbank Acoustical Laboratories.

Acoustical tests conducted by Riverbank Acoustical Laboratories for the Steel Deck Institute with 3" EPS Plaza Deck Form Roof Insulation found the NRC values to be .65 for 1-1/2" WR Deck and .70 for 3" DR Deck.

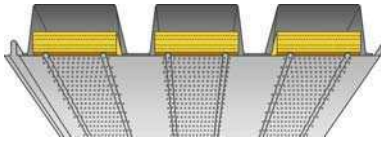


ACOUSTICAL ROOF DECK

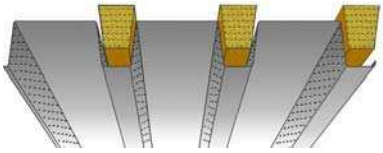
CELLULAR ACOUSTICAL ROOF DECK

YOU'LL LIKE WHAT YOU HEAR WHEN YOU SPECIFY USD'S ACOUSTIC ROOF DECK.

SUMMARY OF ACOUSTIC TEST DATA FOR STANDARD DECK CONSTRUCTIONS



CELLULAR TYPE (NCAS SHOWN)



STANDARD TYPE (NSA SHOWN)

ASTM C423 ACOUSTIC TEST REPORT	PRODUCT	FREQUENCY/SOUND ABSORPTION COEFFICIENT						NRC
		125	250	500	1000	2000	4000	
A76-125 (Non-Polyencapsulated)	BA, BIA	0.47	0.93	1.06	0.96	0.56	0.23	0.90
A76-124 (Non-Polyencapsulated)	NSA, NIA	0.59	1.00	1.05	0.95	0.60	0.34	0.90
A02-246 (Polyencapsulated)		0.84	1.08	1.03	0.79	0.44	0.35	0.85
A79-181 (Non-Polyencapsulated)	JA	0.83	0.99	0.97	0.78	0.53	0.43	0.80
A02-245 (Polyencapsulated)		1.09	1.14	1.12	0.78	0.56	0.50	0.90
A02-239 (Polyencapsulated)	HA6	1.15	1.10	1.02	0.61	0.52	0.40	0.80
A00-94 (Non-Polyencapsulated)	HA7.5	1.12	1.03	0.87	0.63	0.58	0.63	0.80
A02-241 (Polyencapsulated)		1.39	1.16	0.94	0.58	0.46	0.44	0.80
A02-237 (Non-Polyencapsulated)	BCAS	0.44	0.58	0.71	0.96	0.87	0.58	0.80
A03-108 (Polyencapsulated)		0.40	0.58	0.79	1.08	0.80	0.55	0.80
A02-238 (Non-Polyencapsulated)	NCAS	0.89	0.67	1.12	1.04	0.83	0.67	0.90
A03-107 (Polyencapsulated)		0.65	0.74	0.89	1.05	0.73	0.46	0.85
A04-007 (Non-Polyencapsulated)	JCAS	1.00	1.00	1.09	0.94	0.78	0.74	0.95
A03-129 (Non-Polyencapsulated)	HCA6S	1.23	1.01	1.10	0.88	0.84	0.75	0.95
A03-127 (Non-Polyencapsulated)	HCA7.5S	1.35	1.04	1.08	0.77	0.83	0.71	0.95

NOTE:

This table presents the acoustic test results for our Standard Products & Insulation Systems. Non-standard system test results are available for some products and normally include a variation in either insulation density or thickness, or deck perforation pattern. The standards are preferred. Contact the Summit, NJ office if greater performance is necessary.

The noise reduction coefficient (NRC) is the average of the sound absorption values for the 250, 500, 1000, & 2000 Hertz frequencies. The average is rounded to the nearest .05.

Polyencapsulated - Fiberglass insulation is enclosed in polyethylene. Normally specified in zones of high humidity.

See our website or catalog for product descriptions.

Insulation is shop installed in cellular decks.

Insulation is field installed in standard deck - normally by the roofing contractor.

We offer a wide array of acoustic deck products which offer significant noise reduction. *Call us on your next job.* JUST KEEP IT QUIET!

For further information on any of our products or for the nearest NJB sales representative, contact us at:

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