



Roof and Floor Deck F.A.Q.

Answers to specifications, code and construction practices not specifically addressed in the SDI standards

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Polling Questions

- Requirement to earn PDH credits
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Webinar Description

Codes, standards and SDI commentary provide guidance for traditional design and construction, but unique applications are not uncommon. This presentation clarifies the “intent” of the standard, offers solutions to unique problems, and answers questions often asked of suppliers.

Learning Objectives

- Review of existing codes, commentary and SDI standards.
- Answer common questions regarding deck design and specifications.
- Review construction questions from contractors, erectors and design professionals.
- Provide rational answers based on historical practices, precedent from alternative codes or deck supplier capabilities.

Outline

Specifying

- Standards
- Gage and Yield
- Properties
- Finishes
- Venting

Design

- Delegated
- Un-shored Spans
- Fasteners
- Fibers

Construction

- Concentrated Loads
- Cantilevers
- Damage
- Camber / Warping
- Field painting / Fireproofing

Service

- Retrofit (old profiles)
- Acoustics
- Factory Mutual
- UL
- LEED



Standards



AMERICAN NATIONAL STANDARDS INSTITUTE/STEEL DECK INSTITUTE
RD - 2017 Standard for
Steel Roof Deck



AMERICAN NATIONAL STANDARDS INSTITUTE/STEEL DECK INSTITUTE
NC - 2017 Standard for
Non-Composite Steel Floor Deck



AMERICAN NATIONAL STANDARDS INSTITUTE/STEEL DECK INSTITUTE
C - 2017 Standard for
Composite Steel Floor Deck-Slabs

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<https://www.sdi.org/publications-2/standards/>



Gage and Yield

ASTM A1008 – Cold Rolled Steel

ASTM A653 – Galvanized Steel
(ASTM A924 – Zinc Coating)

- A. Prime Painted Cold Rolled Steel Sheet for deck and accessories: ASTM A1008 SS Grade 33 (minimum) with minimum yield strength of 33ksi (230MPa). Surface in contact with concrete (typically top) to be phosphatized. Exposed surface (typically bottom) to have oven cured gray or white lead- and chromate-free rust-inhibitive primer to 0.3 mil nominal dry film thickness.
- B. Galvanized Steel: roof steel deck, floor galvanized steel deck and all closures and flashings shall be formed from steel sheets conforming to ASTM A653, Structural Quality Grade 33 (minimum) with minimum yield strength of 33 ksi (230MPa). Before forming, the steel sheet shall be coated with a zinc coating conforming to ASTM A653 Zinc coated per ASTM A653 G60.

Typical Gages

Roof Deck – 22 thru 16 gage
Composite Deck – 22 thru 16 gage
Form Deck – 28 thru 16 gage

Minimum Yield Strength

Roof Deck – 33 ksi
Composite Deck – 33 ksi
Form Deck – 60 ksi (< 22 Gage)
-- 33 ksi (\geq 22 Gage)

Gage and Yield

Can higher grade steel be specified?



RD-2017 2.1C . . . Minimum yield stress that meets or exceeds 33 ksi.

NC-2017 2.1C . . . Minimum yield stress that meets or exceeds 33 ksi.

C-2017 2.1C . . . Maximum yield stress shall not exceed 50 ksi.

Gage and Yield

Mill ID:	0411353	OP ID:	0411353	Heat Number:	R62913
Order/Item:	GC43687-01	PLT:	FRLS	Weight UOM:	23310.0 Lbs
Part Number:	GR40G80.0290X46.000	Gauge UOM:	.0290 IN	SID:	DC00490
PO Number:	52707-SP	Width UOM:	46.0000 IN	Ship Date:	04/02/2008
Coated Seq:		Length UOM:	COIL	Base Met Thick UOM:	

Specifications:
 ASTM A653-07 GR 40 APPROVED SS AS COATED GP40S56 EXPOSED PRIME SIDE OUT G60 MIN SPANGLE CHEM TREAT DRY PICKLE WELD OK-LIMIT 1 YS MIN 40. KSI T5 MIN 55. KSI EL MIN 16. % EL DIST 2 INCHES

Inspection Notes:
 01 MILL INSPECTION RA/SN ALSO RALT REPORT TENSILES-KSI, COATING WEIGHT.

Physical and Mechanical Test Results

Test Type	Results	UOM	Direction	Position
COATING WEIGHT TOP	.321	OZ PER SQ. FOOT		RIGHT/EAST
COATING WEIGHT TOP	.328	OZ PER SQ. FOOT		CENTER
COATING WEIGHT TOP	.327	OZ PER SQ. FOOT		LEFT/WEST
COATING WEIGHT BOTTOM	.326	OZ PER SQ. FOOT		RIGHT/EAST
COATING WEIGHT BOTTOM	.339	OZ PER SQ. FOOT		CENTER
COATING WEIGHT BOTTOM	.311	OZ PER SQ. FOOT		LEFT/WEST
YIELD STRENGTH - 0.2 % OFFSET	49	KSI		
YIELD STRENGTH - 0.2 % OFFSET	340	MPA		
TENSILE STRENGTH (UTS)	62	KSI		
TENSILE STRENGTH (UTS)	426	MPA		
ELONGATION % - 2 INCHES	29	PERCENT		
N VALUE	.178	TEST SPECIFIC SCALE		
YIELD STRENGTH - 0.2 % OFFSET	49	KSI		
YIELD STRENGTH - 0.2 % OFFSET	335	MPA		
TENSILE STRENGTH (UTS)	62	KSI		
TENSILE STRENGTH (UTS)	429	MPA		
ELONGATION % - 2 INCHES	30	PERCENT	LONG.	
N VALUE	.181	TEST SPECIFIC SCALE	LONG.	

$F_y = 49 \text{ ksi}$

$F_u = 62 \text{ ksi}$

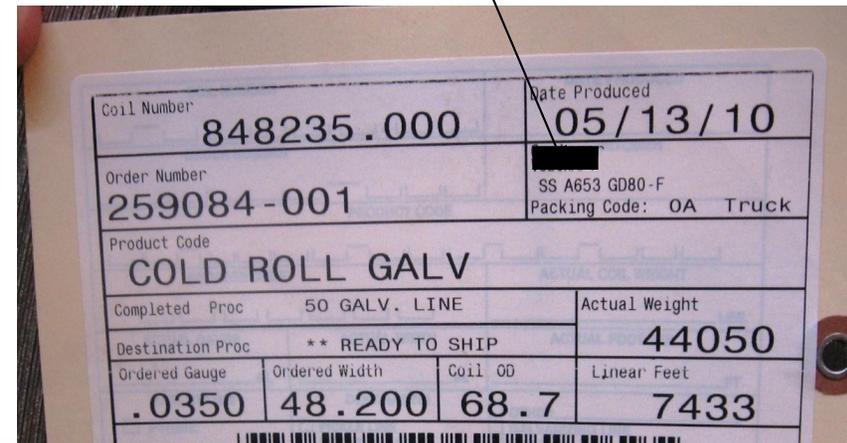
Heat Chemistry for Heat Number R62913, Order Number GC43687, CHEMICAL ANALYSIS - HEAT

C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Sn
.11	.40	.010	.010	.009	.03	.02	.04	.004	.004
Al	N	V	B	Ti	Cb				
.033	.004	.000	.0000	.001	.000				

Chemical analysis in weight %.

A653

GD80-F



$F_y > 33$ ksi for Lateral Loads.

$$S_{ni} = [2A(\lambda - 1) + \beta] \frac{P_{nf}}{L}$$

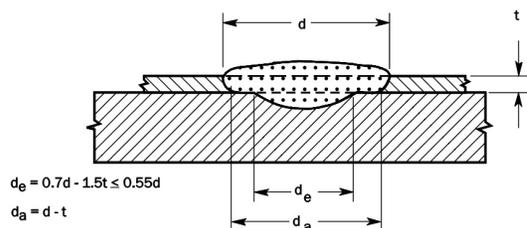
$$S_{nc} = \left[\frac{N^2 \beta^2}{L^2 N^2 + \beta^2} \right]^{0.5} P_{nf}$$

$$S_{ne} = \frac{(2\alpha_1 + n_p \alpha_2) P_{nf} + n_e P_{nf}}{L}$$

If Yield Strength F_y increases, fastener strength P_{nf} increases and diaphragm strength increases.

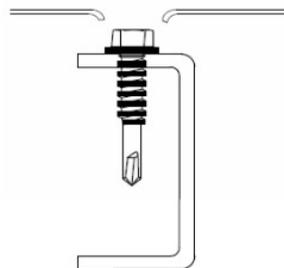
$F_y > 33$ ksi for Tension Loads.

$$P_{nt} = 0.8(F_u/F_y)^2 t d_a F_u$$

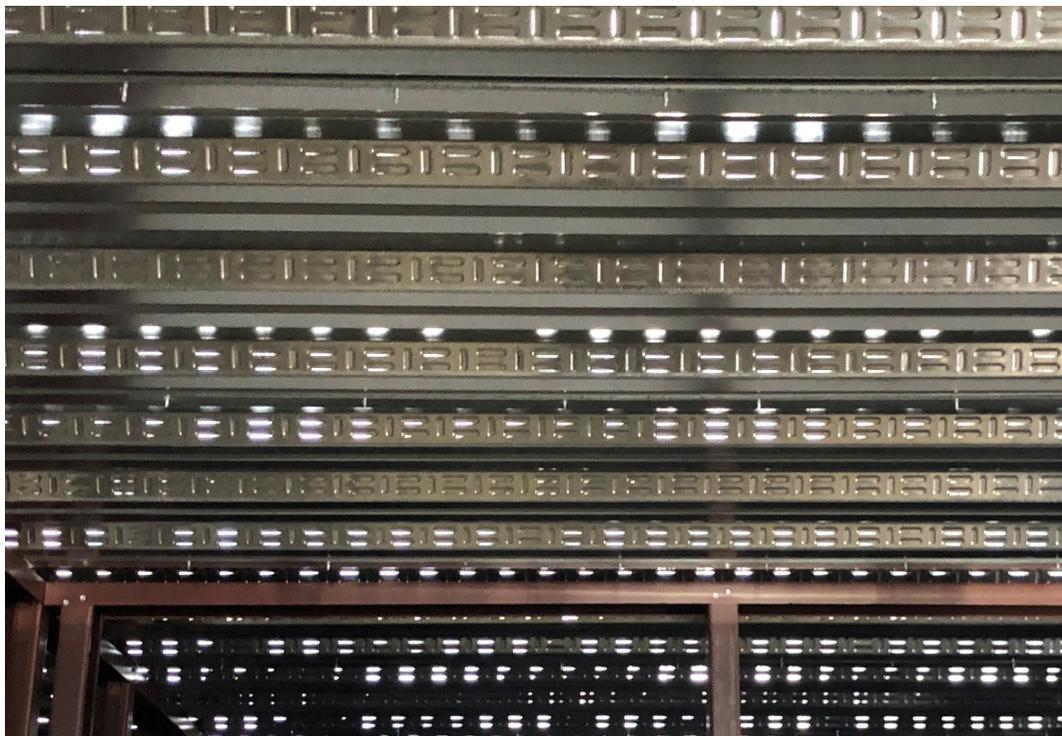


If Yield Strength F_y increases, fastener strength P_{nt} and P_{nov} increase.

$$P_{nov} = 1.5 t_1 d'_w F_{u1}$$



$F_y \leq 50$ ksi for Deck-Slabs



$F_y > 50$ ksi = Embossment cracks. Ductility.

Gage and Yield

Profile	Gage Number	Design Thickness (inches)
NR	22	0.0295
NR	20	0.0358
NR	18	0.0474
NR	16	0.0598
IR	22	0.0295
IR	20	0.0358
IR	18	0.0474
IR	16	0.0598
WR	22	0.0295
WR	20	0.0358
WR	18	0.0474
WR	16	0.0598
DR	22	0.0295
DR	20	0.0358
DR	18	0.0474
DR	16	0.0598

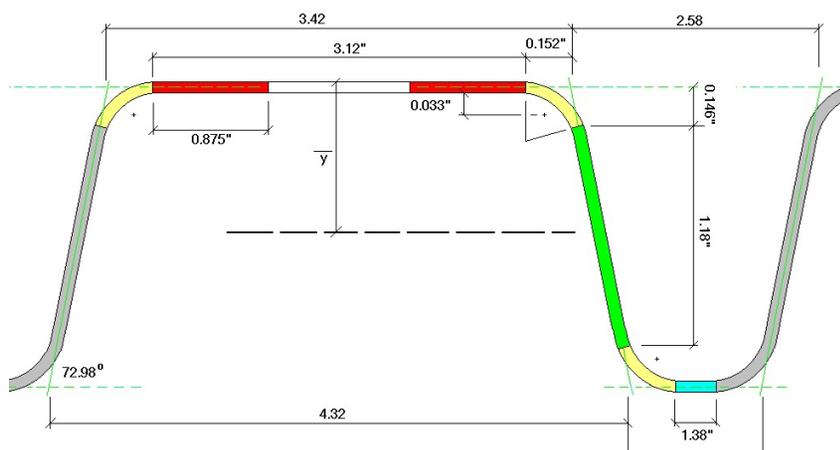
Are 21, 19 and 17 gages available?

Yes, but specify with discretion.

- Supplier coil inventory is limited,
- Mill rolling schedule may be extended,
- If order < 20 tons, heavier gage may be cheaper.

Section Properties

Deck products should NOT be specified by section properties.



Properties are calculated using AISI S100 and “effective” flange widths. As F_y increases, the effective flange width and properties decrease.

Specify performance specifications if desired.

Finishes

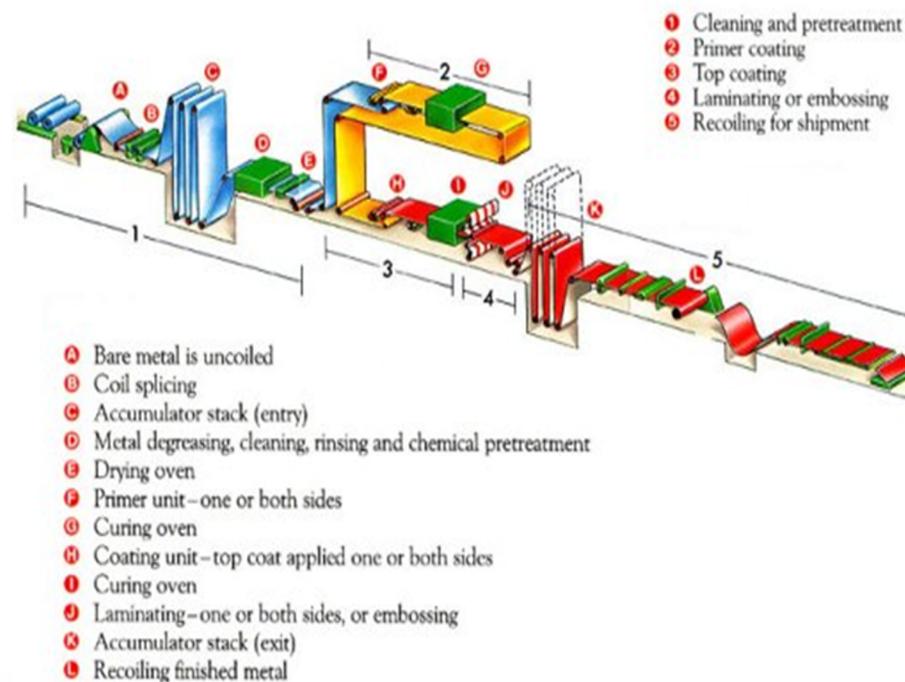
What finishes can be specified?

- Prime Painted
- Galvanized
- Galvanized + Primed

Commentary . . . The finish of the steel deck must be specified by the designer and be suitable for the environment to which the deck is exposed . . .

Prime Painted

- Deck primer is a coil coated application
- It is NOT sprayed or brushed
- Coil coat cannot be used for touchup
- Gray or White

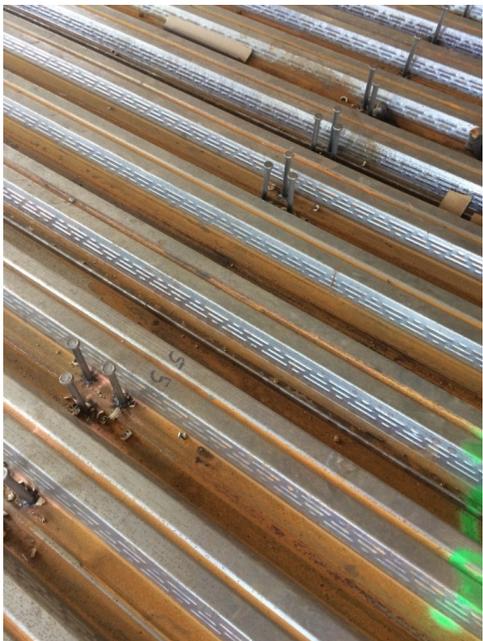


Prime Painted



A primer coat is intended to protect the steel for only a short period of exposure in ordinary atmospheric conditions and should be considered an impermanent and provisional coating.

Galvanized



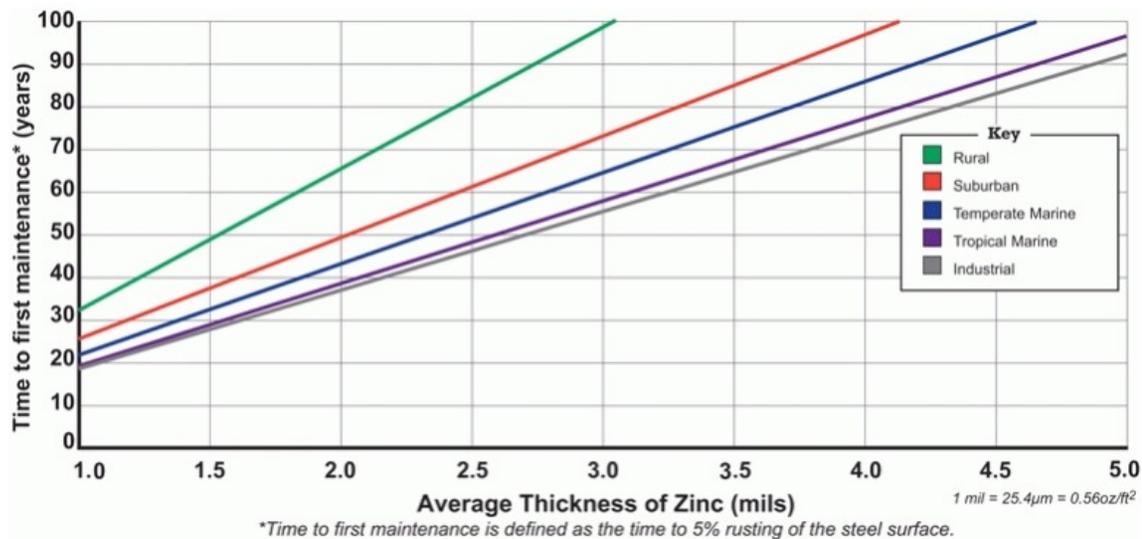
Surface Rust



Excessive Rust

Composite decks **MUST** not be painted on top side. Black or Galvanized only.

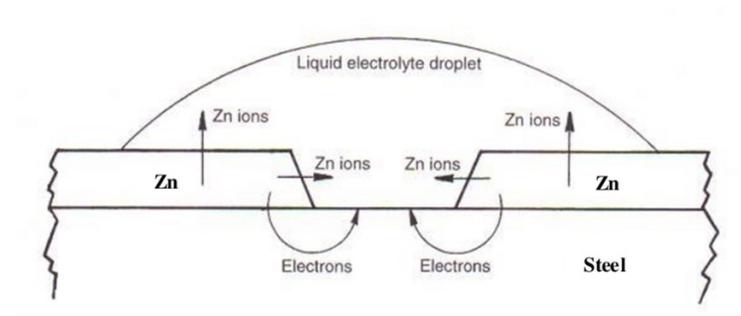
Galvanized



- G30 0.15 oz (0.27 mil) zinc / side
- G60 0.30 oz (0.54 mil) zinc / side
- G90 0.45 oz (0.81 mil) zinc / side
- > G90 check with supplier

Galvanized + Primed (Duplex)

The primer protects the zinc coating from moisture and life expectancy to first maintenance increases 150% to 230%.

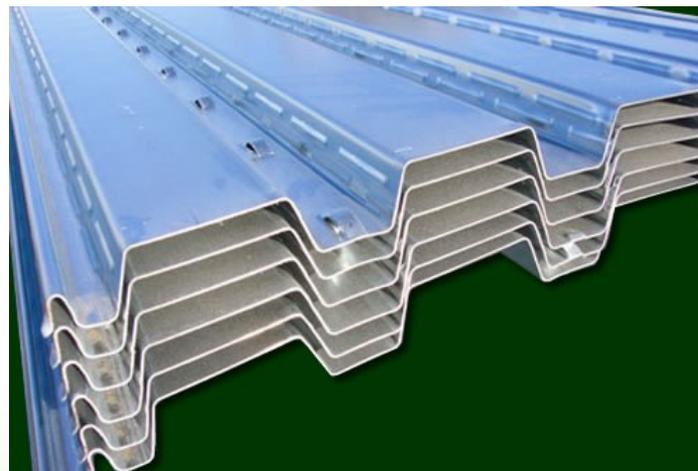


G90 (rural) \approx 14 yrs.

G90 + Ptd \approx 21-32 yrs.

Venting

What venting options are available and when is venting required?





Venting



STEEL DECK INSTITUTE

Technical Note - No.4

VENTING OF COMPOSITE STEEL FLOOR DECK

Venting of thin elevated slabs is rarely required. Exceptions include LWIC and roofing membranes. Venting % varies by deck type and supplier.

Delegated Design?

Can Design be Delegated ?

ANSI/SDI 1.3C . . . The construction document shall describe . . .



1. Depth, type and design thickness
2. Deck material (including yield strength) and deck finish
3. Deck attachment type, spacing, and details



The building structural design documents shall include the type and spacing of the fasteners connecting the steel deck to the supporting structure.

Delegated Design?

If delegated, deck suppliers may assist in selecting profile, gage or fasteners, but not accept design liability; SDI members are manufacturers, not structural engineering firms. Who accepts liability?



GC



Delegated Design?

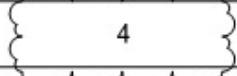
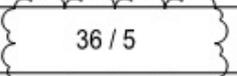
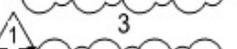
If delegated, performance specs may include:



- Profile depth
- Concrete depth, f'_c or WWR
- Construction loads, w_c and P_c
- Superimposed Service loads, w_d , w_l and w_w
- S_n , S_a or S_u
- G' or F
- NRC, IIC or STC
- Finish

Delegated Design – Fastener Substitution

4. AT CONTRACTORS OPTION, AN ALTERNATE METHOD OF ATTACHMENT MAY BE SUBMITTED TO _____ FOR APPROVAL. THE PROPOSED SUBSTITUTION SHALL BE ENGINEERED, DETAILED, DRAWN AND SEALED BY A LICENSED ENGINEER REPRESENTING THE COMPANY SUPPLYING THE SUBSTITUTE FASTENER. SUBSTITUTED FASTENER AND PATTERN SHALL MEET THE MINIMUM SHEAR STRENGTH AND STIFFNESS REQUIREMENTS INDICATED IN THE TABLE. WELDING DECK TO SUPPORTS SHALL NOT BE PERMITTED.

METAL DECK SCHEDULE					
ROOF AREA	DECK THICKNESS	PATTERN IN 36" WIDE SHEETS	SIDE LAP FASTENERS PER SPAN	DIAPHRAGM SHEAR, V (PLF) ULT. WIND	MIN SHEAR MODULUS G' (k/in)
A	20 GAUGE	36 / 7 	 4 	960	79.4
B	22 GAUGE	 36 / 5	 3 	450	17.8
C	20 GAUGE	36 / 7 	 6	1170	85.2

Un-Shored Spans

If spans are unequal or loading unbalanced, what is the allowable construction span?

Construction / un-shored span tables assume industry minimum loads and equal spans.

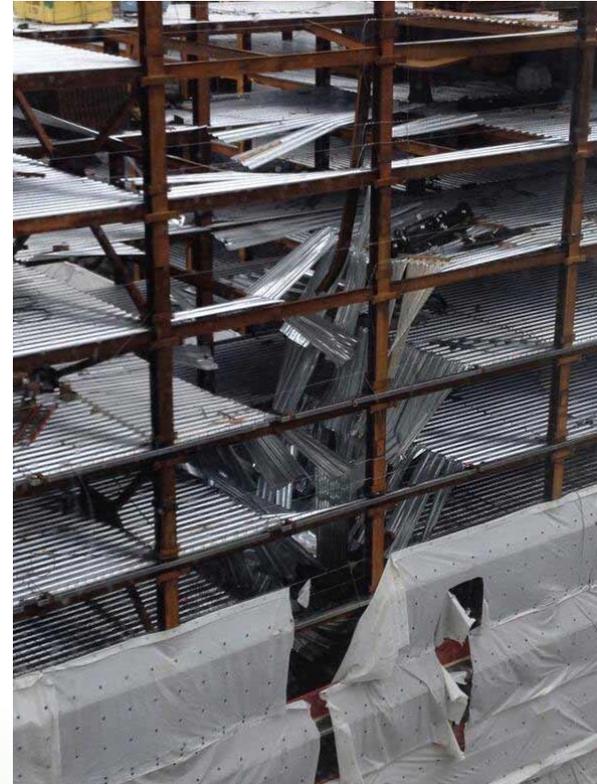
Gage Number	Span Cond.	ASD Span	Span Cond.	ASD Span	Span Cond.	ASD Span
22	Single	6'-7"	Double or Triple	8'-1"	Cantilever	1'-8"
20		8'-1"		9'-11"		2'-1"
18		10'-8"		13'-0"		2'-8"
16		13'-2"		16'-1"		3'-4"

Normal Weight Concrete (145 pcf)

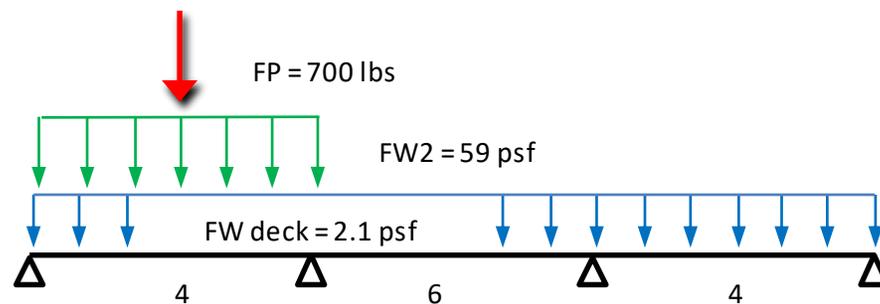
Total Slab Depth	Deck Type	Maximum Unshored Clear Span		
		1 span	2 span	3 span
3.50 (t=2.00) 34 PSF	1.5x6x22 ga	5'-7"	6'-7"	6'-8"
	1.5x6x20 ga	6'-6"	7'-8"	7'-9"
	1.5x6x18 ga	8'-0"	9'-4"	9'-6"
	1.5x6x16 ga	9'-4"	10'-5"	10'-9"

Un-Shored Spans (Deck as a Working Surface)

- Deck provides convenient working surface prior to the pour
- Be mindful of capacity
 - Denting and damage can impact capacity
 - Storage of construction materials
 - Concentrated loads on bare deck



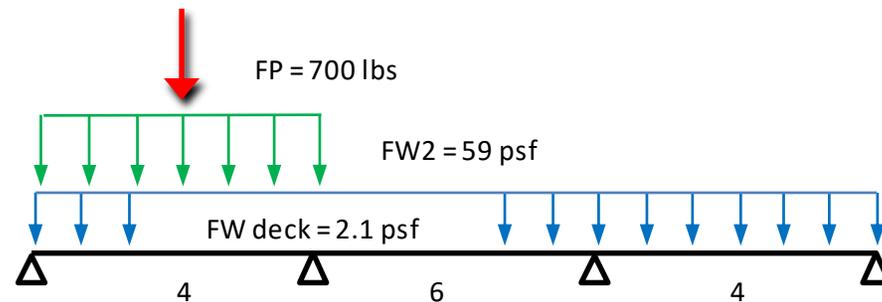
Un-Shored Spans



Using continuous span beam software and desired loading, define maximum demands:

- Flexure, $+\phi M_p - \phi M_n$
- Shear, ϕV_u
- Web Crippling, ϕP_n

Un-Shored Spans



From “generic” properties tables, select profile and gage. Check additional limit states:

Shear Bending Interaction < 1.0

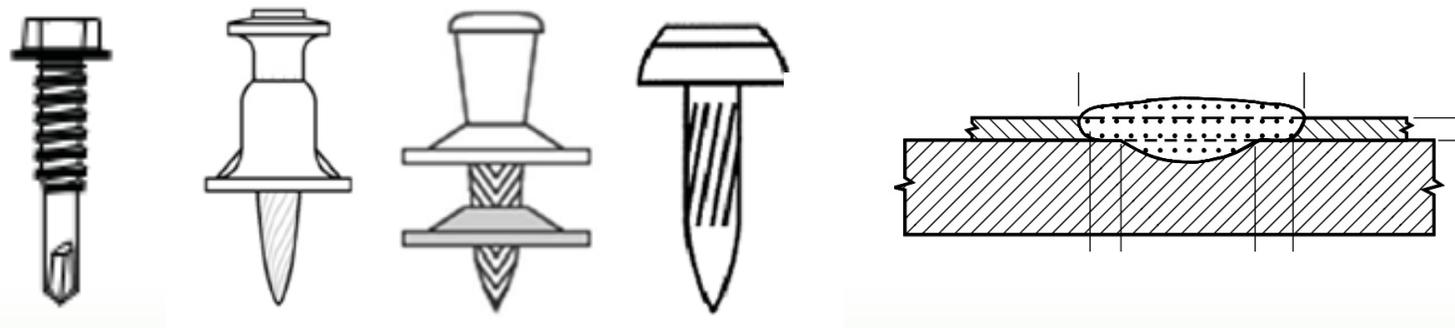
Deflection $< L/180$ or $\frac{3}{4}$ ”

If profile and gage based on a “unique” supplier, define performance specifications on contract drawings.

Fasteners

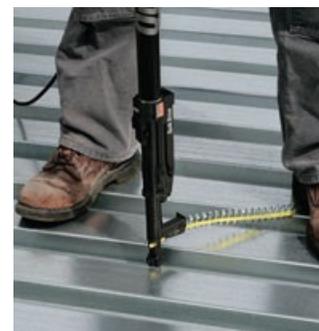
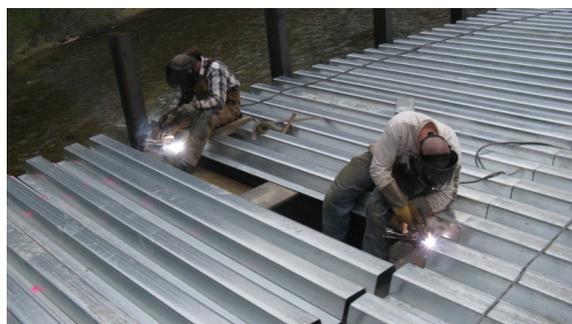
Which fastener should I specify?

Every market has different structural demands and preferred deck fasteners; some prefer self drilling screws, others pneumatic pins or arc spot welds.



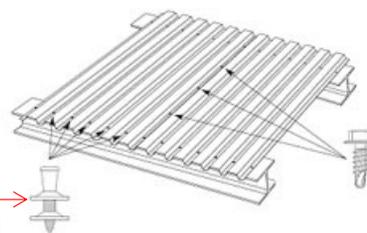
Fasteners

- ✓ During construction they secure the sheets from sliding
- ✓ Critical for horizontal (diaphragm) shear loads and/or uplift



Supports

- Welds
- Screws
- Pins (Powder Actuated or Pneumatic)



Side Laps

- Welds
- Screws
- Button Punches

Fasteners

Fastener selection depends on:

- Shear demand (diaphragm),
- Stiffness requirements (G'),
- Tensile demand (uplift),
- Code compliance (IES, IAPMO, FM), and most importantly
- *Comfort level* of the Specifying Professional.

Contract documents MUST specify fastener type and pattern. Adding “or equivalent” or performance specs is beneficial for the GC and erector. Performance specs allow the erector to substitute fasteners based on their *comfort level*.

Fasteners

On-line tools from SDI, fastener suppliers and deck suppliers provide the user with detailed calculations of alternate fasteners and patterns. These calculations should be submitted with an appropriate RFI.



SDI Diaphragm Interaction Calculator V1

Last Revision 3 / 21 / 2018

Per AISI S-100-16, AISI S-310-16, AISI S-310-13, SDI DDM04

Deck Profile
Deck Gage
Deck Fy1, Fu1
MWFRS
(-) Uplift, ASCE 7-10 (16)

1.5 x 6	WR
22	
50, 62	ksi
25	psf

Support Fastener	5/8" arc spot	
Support Fastener Pattern	36/4	
Sidelap Fastener	#12 screw	
Substrate thickness, t2	1/8"	
Substrate Fy2, Fu2	33, 45	ksi
Number of Spans	3	
AISI S-310	2016	

Uplift = 0

Pnf = 2.147 kips

Pns = 0.613 kips

Sidelaps per Span	Nominal Shear Strength, Sn, plf								
	Span, ft								
	4.50	5	5.5	6	6.5	7	7.5	8	8.5
1	785	707	638	580					
2	891	815	749	682	626	578	536	499	468
3	990	910	840	780	720	665	617	575	540
4	1082	998	924	860	804	753	699	652	612
5	1166	1080	1004	937	877	824	777	729	684
6	1243	1156	1079	1009	947	892	842	796	755
7	1314	1227	1148	1077	1014	956	904	857	814

Fasteners (Weld Washers)

- Weld washers are for 24 gage or thinner
- Negative impact to weld strength for 22 gage and thicker



WELDING WASHERS FOR STEEL DECK

This document has been published by the Steel Deck Institute as a position paper in response to discussions taking place in the engineering community on the feasibility of welding steel deck to structural supports when the weld includes a washer. This statement is based on the Steel Deck Institute previous document on the subject and addresses the testing carried out at Ecole Polytechnique and McGill University in Montreal, Canada, and subsequent published papers. (See document references listed below.)

The reports and papers published at Ecole Polytechnique and McGill University in Montreal, Canada, were based on research for a way to dissipate seismic forces through the use of **inelastic behavior of steel deck**. The existing design methods with their safety or performance factors for steel deck diaphragm are based on elastic response of the steel deck to the seismic forces applied to the deck diaphragm. Inelastic behavior of steel deck under seismic loads implies that some of the roof deck would need to be replaced after an earthquake strong enough to require the inelastic behavior of the deck.

The capacity values for welds used in the Diaphragm Design Manual tables published by the Steel Deck Institute (SDI) and the Canadian Sheet Steel Building Institute (CSSBI) are **based on welds without washers** for material thickness equal or greater than 0.0280 in. (0.71mm). The appropriate safety and resistance factors allow for normal variability in workmanship.

Welding and other type of **attachments should always be monitored on site** to verify that the proper size of attachment is provided and the proper procedures are followed to produce attachments that will behave in accordance with their theoretical capacity.

Furthermore the use of washers for welded attachment to steel supports can be detrimental for the following reasons:

- The size of the washers provided by the deck installer may not allow proper contact at the bottom of the standard flutes,
- There are no washers that will allow welding to the support on either side of an interlocking side lap which is a very important attachment since it is often a controlling failure mode for diaphragm action,
- Welding with washers require special welding procedures that require more welding time in order to produce the proper fusion between weld material, steel washer, steel deck, and steel support.

For those reasons, the **SDI does not recommend the use of welding washers to weld steel deck to support for sheet material thickness equal or greater than 0.0280 in. (0.71mm)** when using the existing SDI diaphragm resistance formulas.

Fibers

Can I use Fibers in lieu of WWR?



Under the current technology of fibers, structural steel designed with ACI 318 in girders, columns, **suspended decking systems** and cantilever sections cannot be reduced or replaced. It should be noted, however, that ACI 318 permits the use of steel fibers meeting specific criteria as shear reinforcement.

Can I use Fibers in lieu or WWR?



STRENGTH AND PERFORMANCE OF FIBER-REINFORCED CONCRETE COMPOSITE SLABS

By:

Marcela Guirola

Thesis submitted to the faculty of the
Virginia Polytechnic Institute and State University

Table 5.1 Experimental Results at 10-kip Concentrated Load at Mid-Span

Test Designation	f'_c (psi)	F_y (ksi)	Deflection Along Center Strip (in)			Bottom Flange Strain Along Center Strip ($\mu\epsilon$)		
			Mid-Span	Quarter Point-1	Quarter Point-2	Mid-Span	Quarter Point-1	Quarter Point-2
WWF	3400	50	0.068	0.045	0.046	266	70	108
XOREX-25	4000	50	0.058	0.037	0.041	129	71	115
XOREX-50	4200	50	0.053	0.032	0.043	127	79	62
Microfiber-MD	3800	50	0.063	0.051	0.046	251	77	110



Polling Question 1

Galvanized + Prime painted decks have what life expectancy to first maintenance under normal atmospheric conditions.

- A. 5-10 years
- B. 21-32 years
- C. More than 50 years

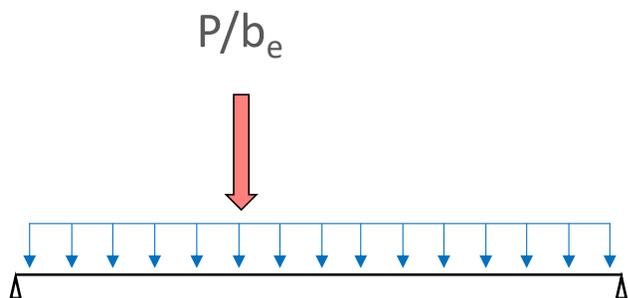
Concentrated Loads

Can profiled sheets / deck-slabs support concentrated loads?

Yes. Profiled panels are structural shapes with known shear, flexure and stiffness properties, so can be selected using traditional engineering mechanics. Additional checks may be required for web crippling and fastener strength.

Concentrated Loads

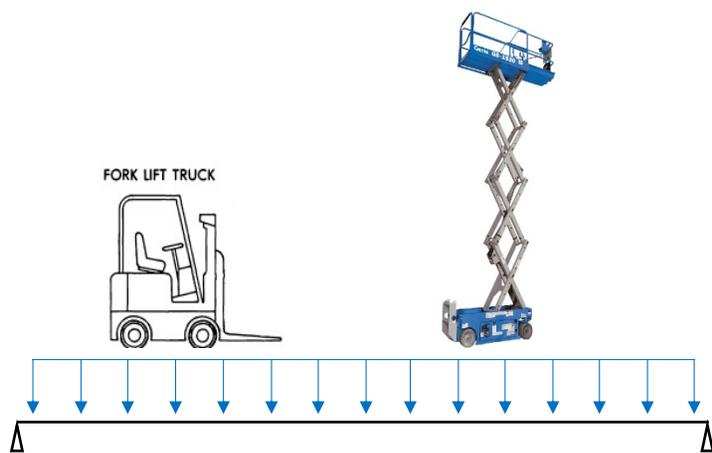
Can profiled sheets / deck-slabs support concentrated loads?



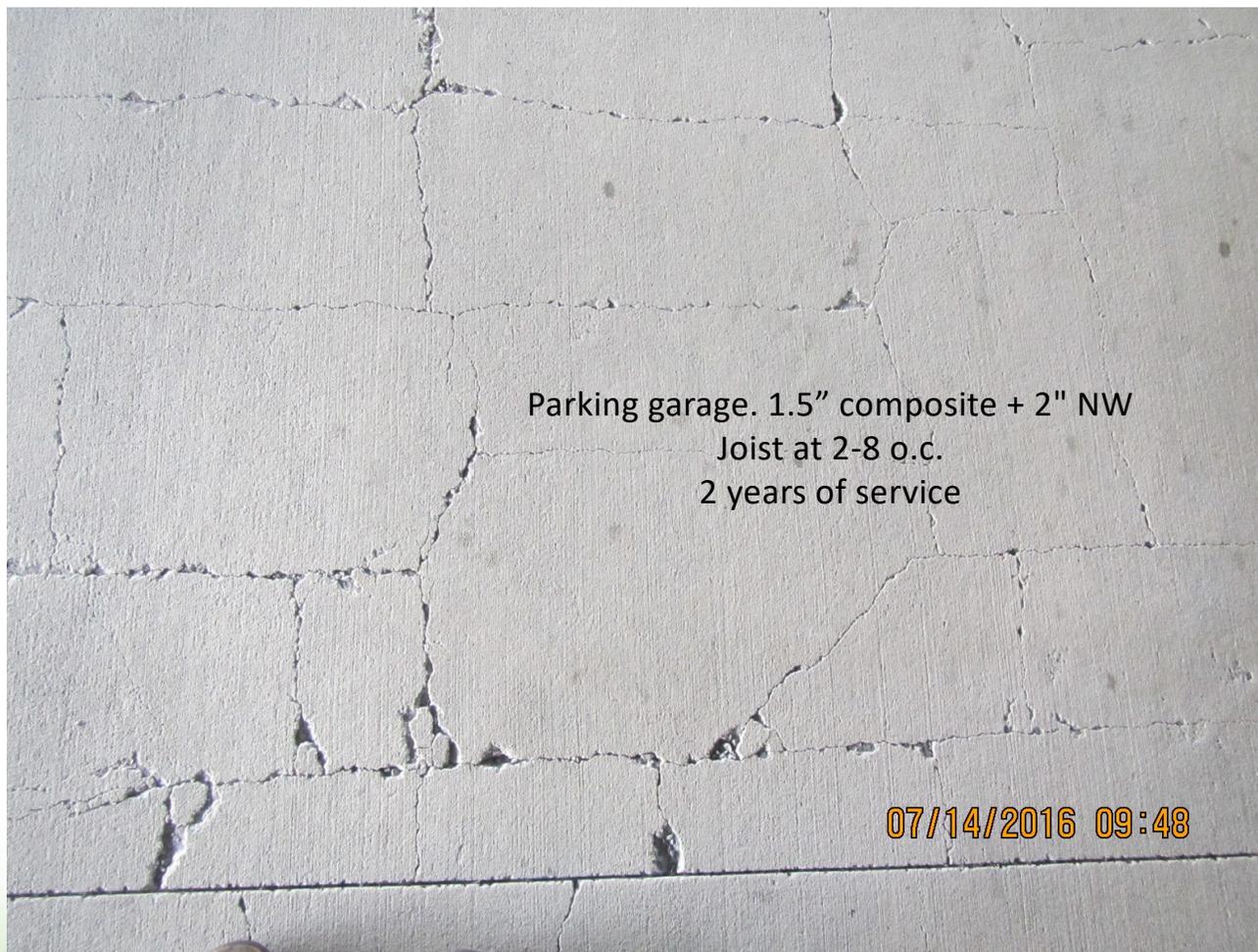
- Distribute concentrated, P/b_e .
- Develop load diagram / ft width.
- Calculate maximum demands; V and M
- Select appropriate profile and gage
- Check deflection, web crippling and interaction

Concentrated Loads

Can profiled sheets / deck-slabs support concentrated loads?



- Fork lifts/cars are fatigue loading resulting in shear-bond failure (Schuster). Do not use fork lifts/cars on deck-slabs.
- Scissor lifts are traditionally construction or maintenance and slab can be designed per SDI C-2017 with modifications to load distribution.



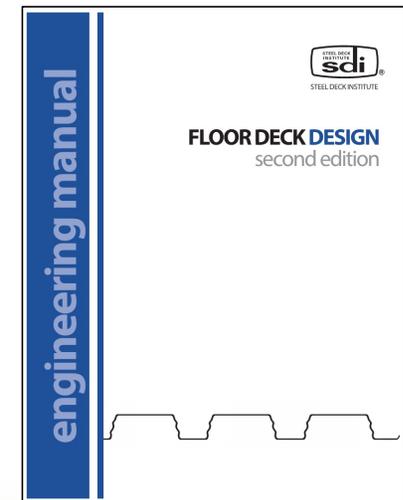
Parking garage. 1.5" composite + 2" NW
Joist at 2-8 o.c.
2 years of service

07/14/2016 09:48

Concentrated Loads – Engineered Tables

**Table 20.5 Maximum Allowable (ASD) Concentrated Moving Load, lbs
Concrete Topping + Concrete in the Flutes + Deck**

1.0 form + WWR	tc	Span, ft								
		3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
26 gage 6x6-W2.1xW2.1	2.5	984	835	710	600	499	405	-	-	-
	3	1118	948	806	682	569	464	363	265	156
	3.5	1258	1067	907	769	643	526	414	306	200
26 gage 6x6-W2.9xW2.9	2.5	1165	998	860	740	632	531	-	-	-
	3	1346	1154	996	859	736	622	514	410	309
	3.5	1538	1319	1139	984	845	717	597	482	369
26 gage 4x4-W2.9xW2.9	2.5	1480	1283	1123	985	862	750	-	-	-
	3	1747	1516	1329	1169	1028	899	779	664	553
	3.5	2031	1763	1546	1363	1202	1055	920	791	667

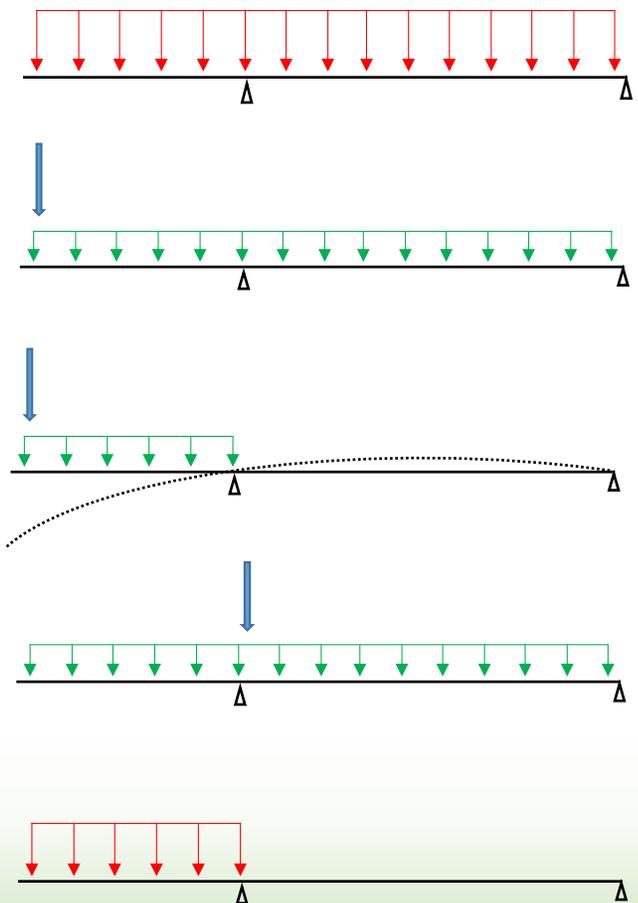


Cantilevers



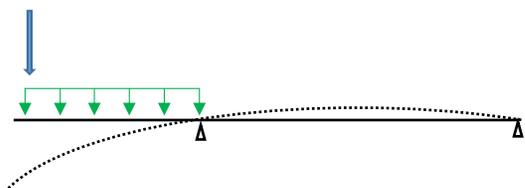
Would you?

Cantilevers



$$\Delta = \frac{Pa^2}{3EI} (L + a) + \frac{wa^3}{24EI} (4L + 3a)$$

Cantilevers



P, lbs	150
w, plf	20
L, ft	5

Cantilever Span, in

		I, in^4	a/240	a/180	a/90
WR	22	0.155	14.9	17.0	23.1
	20	0.201	16.7	19.0	25.9
	18	0.289	19.7	22.3	30.1
	16	0.373	22.1	25.0	33.8

Deflection, Ponding, Over-Pour



Deflection, Ponding, Over-Pour

Damaged . . . Should deck be replaced?



Damaged . . . Should deck be replaced?

SDI “Damaged Composite Steel Deck”

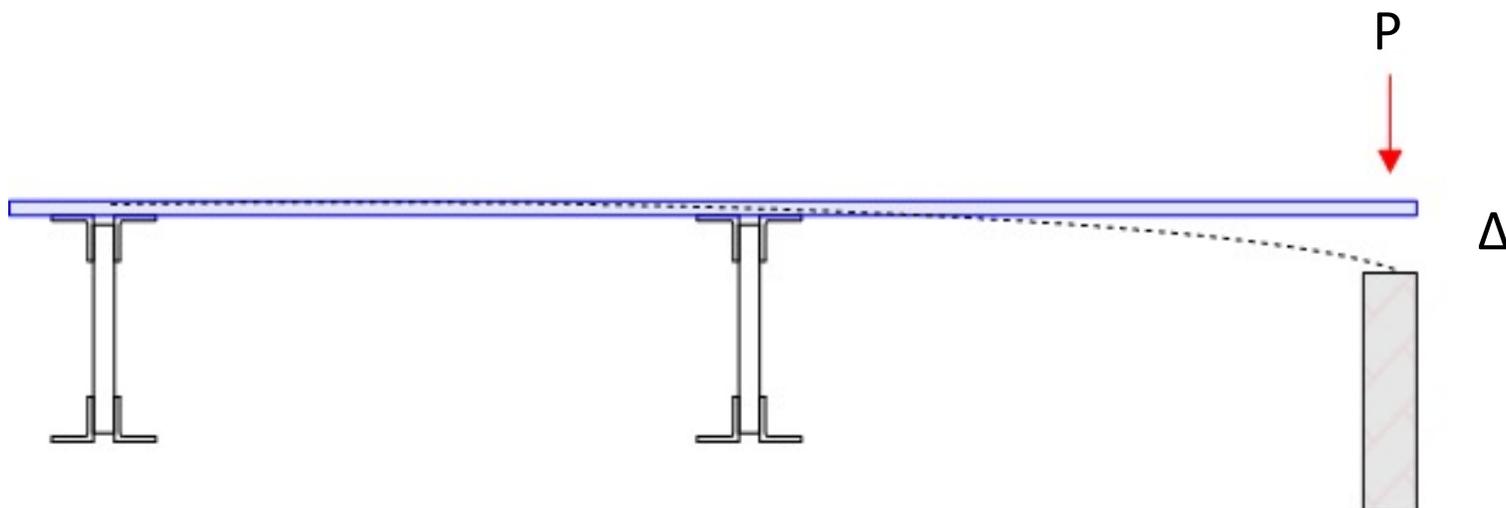
The slab depth at midspan exceeds design depth; hence, effective slab depth and section increases. Tensile strength on deck section has not changed.

Slab strength has increased, but supporting structure must be checked for additional dead load.

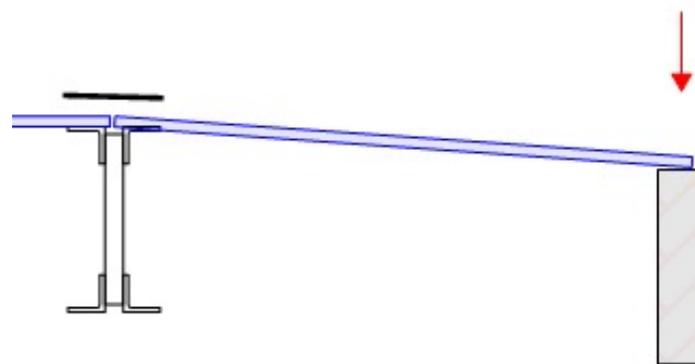
<https://www.sdi.org/publications-2/white-papers/>

Camber, Warping

Help! Joist are cambered and deck will not deflect

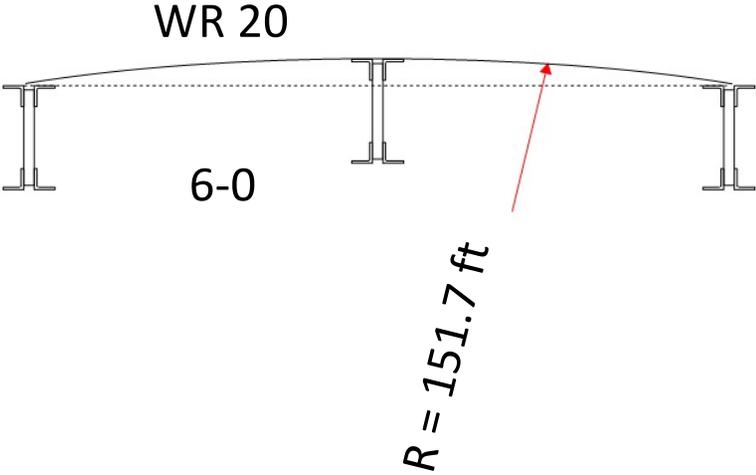


Camber, Warping



- Rip top flutes of deck.
- Add fasteners to both joist chords.
- Warp deck to exterior support.
- Check joist for shear transfer. If N.G., add cover plate.

Camber, Warping



Deck deflection with 300 lbs
(150 plf) on end

Field Painting and Fireproofing

- The best way of minimizing the chances of white rust formation during shipment and storage of galvanized coil is the application of a “surface **passivation** treatment” by the steel sheet manufacturer.
- Galvanized decking is the default in the UL Fire Resistance Directory.
- Fireproofing can only be applied directly to the painted floor if the specified decking and paint have been fire tested.
- Decking can be specified with no “chem-treat”, but recognize the potential for white rust.



Retrofit - Roof

I have old deck section. What's its capacity?

STEEL DECK INSTITUTE

MEMBER COMPANIES

AIRTHERM MANUFACTURING CO.
Box 7039, St. Louis, Mo. 63177

ARMCO STEEL CORPORATION, STEEL DIVISION
7000 Roberts, Kansas City, Mo. 64125

**BOWMAN BUILDING PRODUCTS DIV.,
CYCLOPS CORP.**
Box 2129, Pittsburgh, Pa. 15230

THE CECO CORPORATION
5601 West 26th St., Chicago, Ill. 60650

THE GOLDSMITH METAL LATH COMPANY
4501 Chickering Ave., Cincinnati, Ohio 45232

GRANCO STEEL PRODUCTS COMPANY
6506 N. Broadway, St. Louis, Mo. 63147

INLAND STEEL PRODUCTS COMPANY
Box 393, Milwaukee, Wis. 53201

MACOMBER INCORPORATED
Box 830, Canton, Ohio 44701

THE R. C. MAHON COMPANY
Box 4666, Detroit, Mich. 48234

PLASTEEL PRODUCTS CORPORATION
Box 481, Washington, Pa. 15301

**REPUBLIC STEEL CORPORATION,
MANUFACTURING DIVISION**
1315 Albert St., Youngstown, Ohio 44505

ROLL FORM PRODUCTS, INC.
89 State St., Boston, Mass. 02109

H. H. ROBERTSON COMPANY
Two Gateway Center
Pittsburgh, Pa. 15222

WHEELING CORRUGATING COMPANY
1134-40 Market St., Wheeling, W. Va. 26004

CATALOG NO. 17
JANUARY 1967
REVISED JUNE 1967

1967
NR only

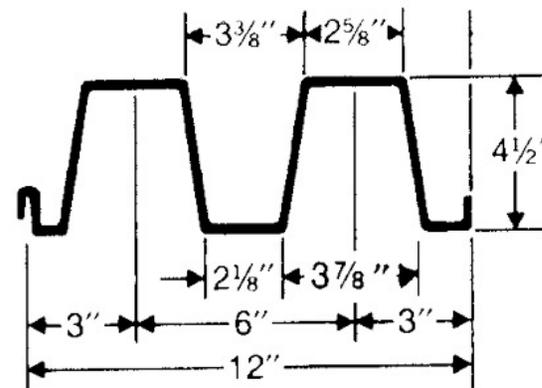
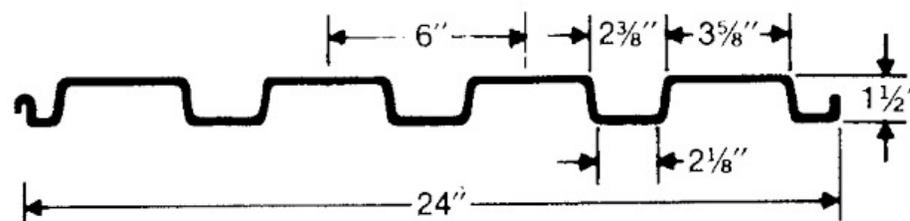
1969
IR, NR, WR

1984
DR

Retrofit

I have old deck section. What's its capacity?

Robertson Roofs



Retrofit

I have old deck section. What's its capacity?

NARROW RIB DECK

Uniform Total (Dead & Live) Load in Pounds Per Sq. Ft
Span Length – c. to c. Joists or Purlins

SPAN CONDITION	GAGE	5'-0"	5'-6"	6'-0"	6'-6"	6'-8"	7'-0"	7'-6"	8'-0"	8'-4"	8'-6"
			22	55	46	38	33	31			
	20	68	56	47	40	38	35				
	18	94	77	65	55	53	48	41	36	33	32
	22	55	46	38	33	31					
	20	68	56	47	40	38	35				
	18	94	77	65	55	53	48	42	37	34	32
	22	69	57	48	41	39	35	31			
	20	85	70	59	50	48	43	38	33	31	
	18	117	97	81	69	66	60	52	46	42	41

Retrofit - Floor

I have old deck section. What's its capacity?

COMPOSITE DECK DESIGN HANDBOOK

March 1997

R.B. Heagler, P.E.
L.D. Luttrell, Ph.D., P.E.
W.S. Easterling, Ph.D., P.E.

1997
Composite
Properties

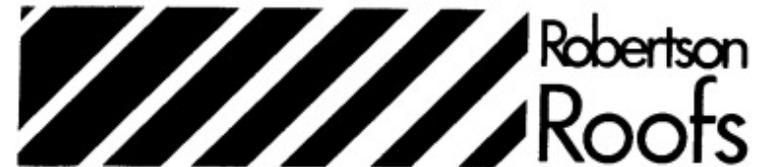


2014
Composite Load
Tables



2020
Form Deck
Load Tables

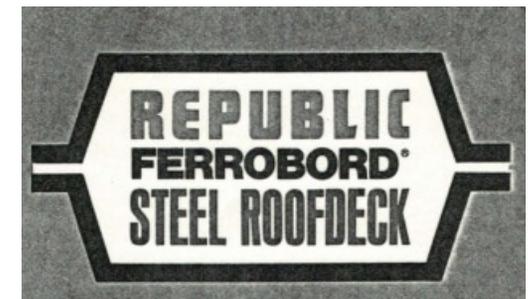
Retrofit – Archived Manufacturers Catalogs



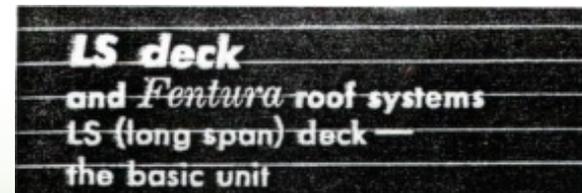
Inryco[®] Floor Systems
Catalog 21-1



INLAND*
RYERSON

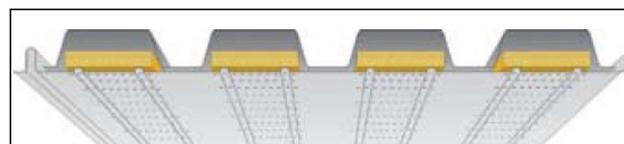
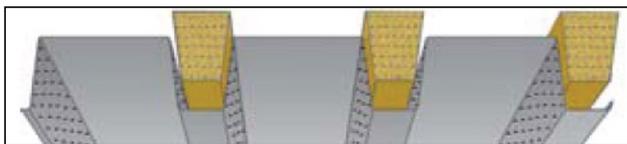


INSULROCK

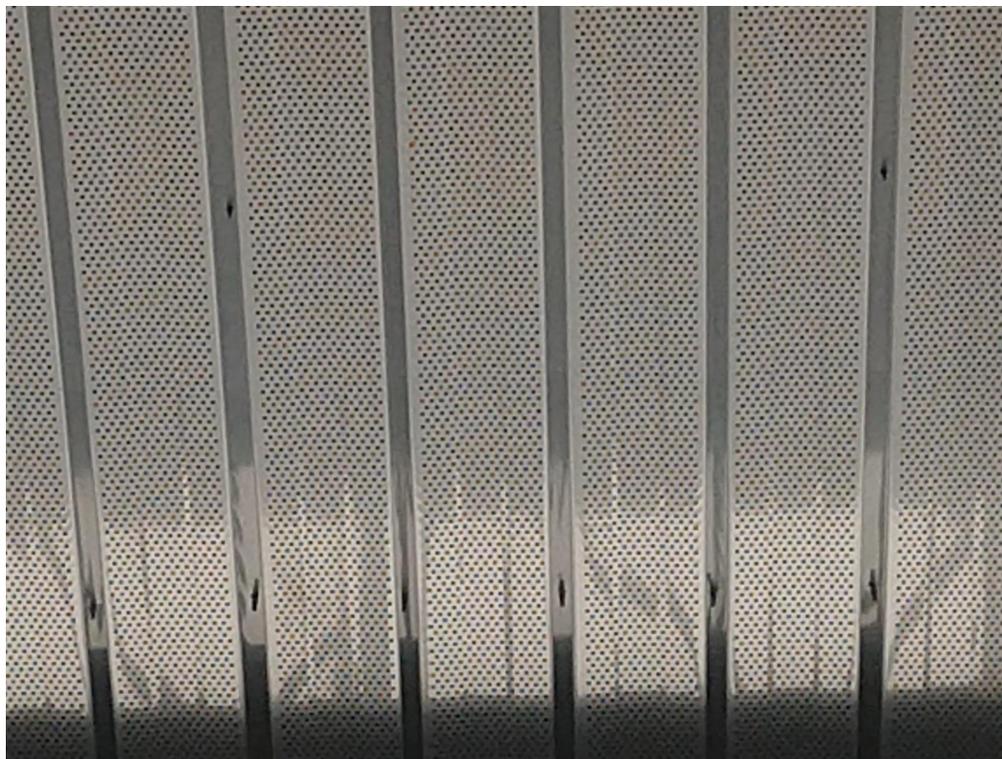


Acoustics

Can I specify NRC or STC ratings?



Acoustics



Dovetail acoustical deck – Check with supplier

Acoustics

NRC (Noise Reduction Coefficient) and STC (Sound Transmission Coefficient) are ratings developed to rate the ability of a **building assembly** to attenuate sound. The deck and acoustical batts are only one part of this assembly.

NRC for traditional construction is well documented in manufacturer literature.

Panel	Sound Absorption Coefficients (Frequency)						NRC
	125	250	500	1000	2000	4000	
1 ½" Acoustic Deck	0.11	0.18	0.66	1.02	0.61	0.33	0.60
3 inch Deep Cell	0.47	0.57	0.95	0.98	0.82	0.69	0.85

Acoustics - STC

STC	What can be heard
25	Normal speech can be understood
30	Loud speech can be understood
35	Loud speech audible but not intelligible
40	Loud speech audible as a murmur
45	Loud speech heard but not audible
50	Loud sounds faintly heard
60+	Good soundproofing; most sounds do not disturb neighboring residents. ^[6]



STC data is limited due to the variety of concrete topping, floor covering, ceilings and insulation boards within the assemblies; hence, SDI has begun baseline testing . . . **STC = 50 is very attainable.**

Acoustics, STC



STC baseline test slabs are available. Contact Karen at (412) 487-3325 or Bob@SDI.org

Acoustics, STC



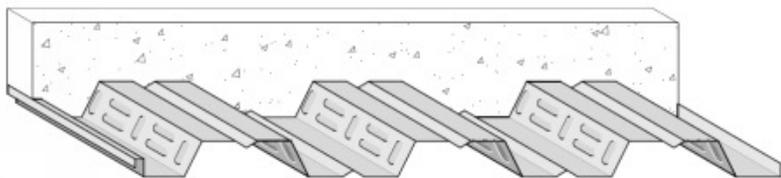
Top Side



Bottom Side

STC baseline test slabs are available. Contact Karen at (412) 487-3325 or Bob@SDI.org

Acoustics, STC



2x12 Composite Deck
2 ½" LW (112 pcf)

Test	Flooring	Underlayment	Ceiling	STC
1	None	None	None	49
2	None	None	1-1/2 inch deep, 25 gage furring channel + 5/8 inch thick gypsum board	49
3	1/2 inch thick carpet	7/16 inch thick carpet pad	1-1/2 inch deep, 25 gage furring channel + 5/8 inch thick gypsum board	49
4	3/8 inch thick engineered wood	None	1-1/2 inch deep, 25 gage furring channel + 5/8 inch thick gypsum board	48
5	1/8 inch thick VCT	None	1-1/2 inch deep, 25 gage furring channel + 5/8 inch thick gypsum board	49
6	5/16 inch thick ceramic Tile	None	1-1/2 inch deep, 25 gage furring channel + 5/8 inch thick gypsum board	50



Factory Mutual

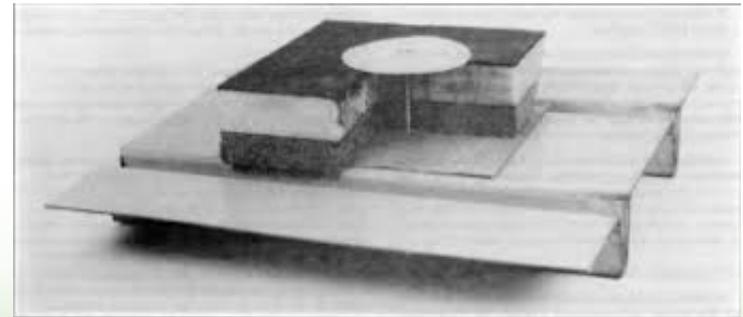
- Independent Product Safety Organization
- List Approved Products and Approved Assemblies for Construction Applications
- Test for Wind and Fire Resistance of Materials
- Mitigate Building Damage Risk for Insurance Companies
- Develop Rated Roof Assemblies for Wind Resistance

FM Global
Property Loss Prevention Data Sheets

1-29

August 2007
Page 1 of 40

ROOF DECK SECUREMENT AND ABOVE-DECK ROOF COMPONENTS

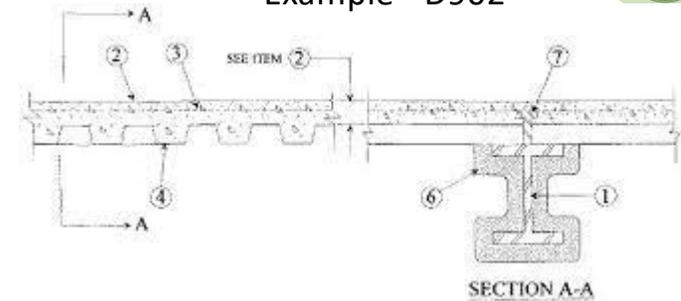




UL



Example - D902



- Independent Product Safety Organization
- List Approved Products and Approved Assemblies for Construction Applications
- Test for Fire Resistance of Materials
- Develop Fire Rated Assemblies for Floor and Roof Applications
- Deck is Only One Component of the Fire Rated Assembly

2. **Normal Weight or Light Weight Concrete** — Normal weight concrete, carbonate or siliceous aggregate, 3500 psi compressive strength, vibrated. Lightweight concrete, expanded shale or slate aggregate by rotary-kiln method or expanded clay aggregate by rotary-kiln or sintered-grate method, or pelletized expanded blast furnace slag aggregate, 3000 psi compressive strength, vibrated, 4 to 7 per cent entrained air.

Restrained Assembly Rating Hr	Concrete (Type)	Concrete Unit Weight pcf	Concrete Thkns In.
1	Normal Weight	147-153	3-1/2
1-1/2	Normal Weight	147-153	4
2	Normal Weight	147-153	4-1/2
3	Normal Weight	147-153	5-1/4
1	Light Weight	107-113	2-1/2
1	Light Weight	107-120	2-5/8
1-1/2	Light Weight	107-113	3
2	Light Weight	107-113	3-1/4
2	Light Weight	107-116	3-1/4*
2	Light Weight	114-120	3-1/2
3	Light Weight	107-113	4-3/16
3	Light Weight	114-120	4-7/16



LEED

- Recycled Content
 - Steel is one of the most recycled products available
 - Different mills use different amount of scrap [Basic Oxygen Furnace (BOF) vs Electric Arc Furnace (EAF)]
 - Specific manufacturers can provide recycled content
- Environmental Product Declaration (EPD)
 - Certified report about the sustainability of steel deck product as it relates to raw materials and manufacturing processes
 - SDI has industry report available on website

ENVIRONMENTAL PRODUCT DECLARATION

STEEL DECK

STEEL ROOF DECK
STEEL FLOOR DECK



Steel deck functions as the primary supporting surface for roofing materials and as form and/or positive reinforcement for concrete floor slabs.

This publication represents Steel Deck Institute's membership: ASC Steel Deck; Bushwick Metals, LLC; Canam; Cordeck; DACS, Inc.; Epic Metals Corp; Gooder-Henrichsen Co.; Marilyn Steel Decks, Inc.; Miami Metal Deck; New Millennium Building Systems; OEG Building Materials; Roof Deck, Inc.; Seyco Deck; Sloan Supply Company, Inc.; Tri-State Decking, Inc.; Valley Joist; Verco Decking, Inc.; and Vulcraft Group, Nucor Corporation.



The Member Companies of the Steel Deck Institute (SDI) believe that the sustainability of the products that they manufacture compares quite favorably to those of other building material manufacturers. Because of this, the SDI has decided to create an Industry Average Environmental Product Declaration (EPD) for steel deck so that building designers and owners would be able to easily compare their products to other building materials.

The ability to recycle steel has long been recognized. However, it is not the only attribute that makes steel a sustainable material. The intent of this document is to fully demonstrate the sustainability of steel deck.



Polling Question 2

What Limit state is not required for cantilever deck spans?

- A. Deflection
- B. Flexure
- C. Punching Shear

Questions

