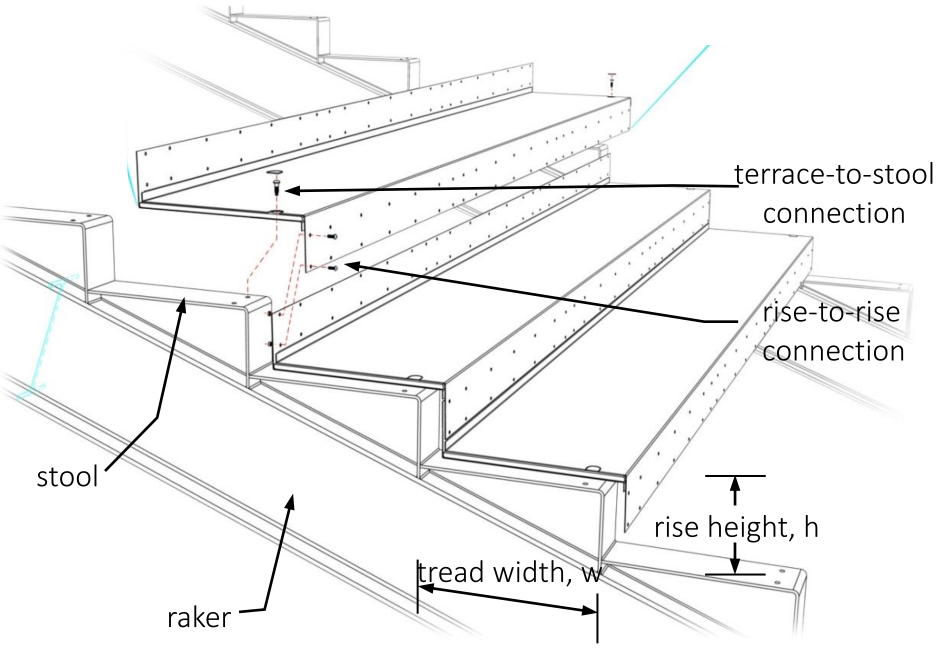
SPS Terrace Load Span Tables

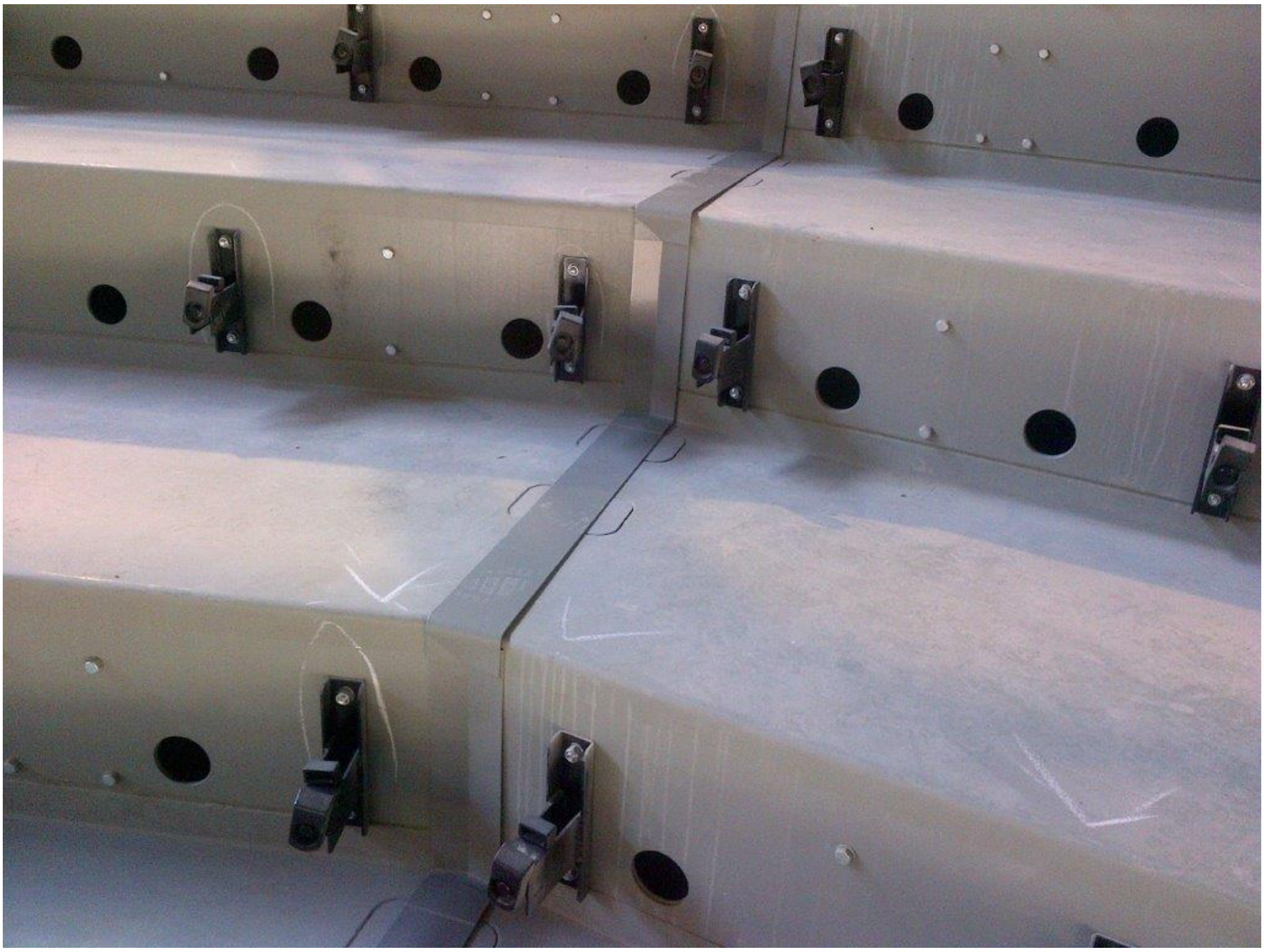


Introduction

Sandwich Plate System (SPS) Terraces are a structural floor product comprised of two steel faceplates bonded together with a polyurethane elastomer core. Integrated steel perimeter bars and returning faceplates create a hermetically sealed assembly to whatever geometry is required in a Stadium Terrace. The terraces are generally bolted through the perimeter bars at the stool/raker support and interconnected between each terrace unit at the rise-rise plate junction, a characteristic that allows the system to create diaphragms to adequately resist in plane loading. SPS is an alternative to both stiffened steel (with low sound absorption properties) and precast concrete (with inherent heavy weights and possible downturns). SPS delivers a high stiffness to weight ratio with improved performance.

SPS achieves a thin profile and low weight by utilizing the elastomer core to transfer shear between each faceplate thereby preventing local buckling. Flexural strength and stiffness meet the project design requirements. This datasheet assists in the selection the SPS Terrace for different deflection criteria.

Generally, SPS Terrace plates are rectangular in plan but other shapes are possible (trapezoidal, curved edge etc).



Picture 1.0 - SPS Terraces for the National Gymnastic stadium in Azerbaijan.
In this picture you can clearly see:

- Round Holes are used for ventilation in an Indoor Arena.
- Rise-Rise bolted connection
- SPS Joint Detail
- Seat bracket

Summary of SPS Terrace Benefits

Characteristic	Benefit	Result
Lighter	Structural frame is lighter	Steel cost savings
	Reduced foundations	Cost savings Shorter programme
	Camber of raker beams considerable reduced (often not required)	Simple beam fabrication
	Reduced Logistic of Transportation of materials and wastage	Faster construction Improved Carbon Footprint
Slender profile for same geometry	Reduced overall Terrace thickness giving more space for arch/MEP elements,	Added space for onsite work Potential extra rows
Full structural capacity upon installation	Reduced activities at site	Faster construction time
	Improved tolerances and Terrace quality	Earlier start for follow up trades
	Provides material storage, acts as an erection platform and protects works below and above	Shorter programme
	Eliminates programme lag for concrete and curing	
	Less weather dependent	
Fixings, penetrations and inserts pre-installed	Interfaces more controlled and accurate locations to match BIM designs. Includes pre-set holes for seat assembly.	Faster construction
	Leading edge protection can be incorporated	Improved safety
Single trade erection	Simpler site control and coordination	Management cost savings
Sustainability	Reduced total material; reduced construction waste; fewer vehicle movements	Reduced carbon footprint to other forms of Terrace construction
	Reusable Terrace	Upon reaching the design life of the main structure. Terraces bolts can be removed, a new coating applied and reused.
	Re-useable faceplates with large percentage of recyclable material	
Diaphragm action	Interconnectivity of terrace units creates diaphragm bays.	Eliminates the horizontal bracing.
Flexible design	Allows for client modifications of the terrace for openings in the elements as required	Easily includes opening for columns Allows for vent holes in Rise Plates for indoor arenas

Important Shipping, fabrication and constructability notes for designers of SPS.

More than 1,000,000 ft^2 of SPS Terrace has been successfully used in Sport complexes. All structures are designed and produced to relevant codes and standards. SPS Terraces provide an effective economic alternative to typical precast construction or composite concrete/aluminium terrace. Experience has shown us that the following external factors will assist in reducing cost of the SPS Terrace and share for the benefit of the designers.

Shipping and transportation of SPS Panels

- The maximum SPS Terrace length that will fit in a standard shipping container is 39’3”. Longer panels are produced with a premium shipping cost.

Fabrication of SPS Panels

- Commonly available coil width of a 3/16” (4mm) is 72”. Unfolded plate widths that are wider than the maximum coil width require faceplates that are joined with seam welding. Wider coils can be obtained subject to material availability.

Constructability of SPS Panels

- Due to the current size of the available impact guns on the market minimum stool width 5.25” is required to adequately bolt and provide minimum code edge distance.

- SPS Terraces supported by HSS members require a one-sided fastener (Hollo bolts/Box bolts or similar) that currently have a premium supply cost.

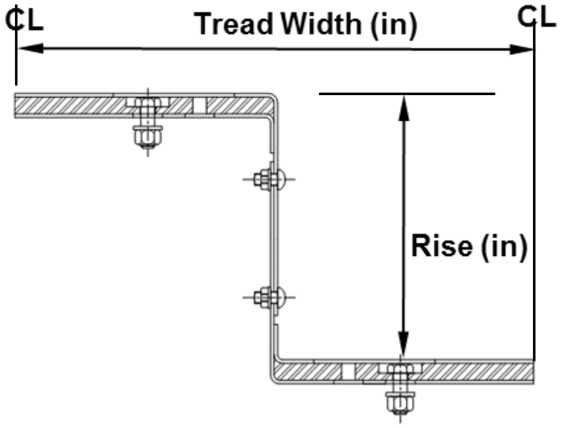
Notes for the Load Span Tables:

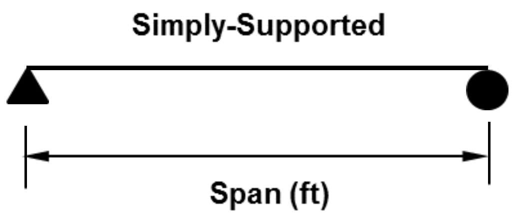
- These load span tables can be used for preliminary selection of SPS Terrace Sections. The spans given are based on deflection criteria chosen by the designer (mostly mandated by code) as these govern the design. The span is defined as the clear distance between supporting beams.
- SPS Terrace are design using beam theory. It also behaves as a 2 way bending element and bay width will reduce the overall deflection. The effects of bay width are ignored in these tables deeming the results conservative.
- Applied loads are service and include all superimposed dead and live loads other than SPS panel self weight.
- Unit mass of SPS panels is based upon an elastomer density of 71.8 lbs/ft^3 and a steel density of 490 lbs/ft^3.
- Tables are included for deflection limits of L/240 and L/360. Recommended limits for different uses are given. Dynamic performance should be checked by the engineer of record with the appropriate jurisdictional guideline.
- Tables are for different support conditions of SPS Terraces.
- SPS Terrace provide diaphragm capacity (rigid diaphragm) and adequately restrain the top (supporting) flange from buckling, LTB need not be considered for positive moment elements. For Negative moment conditions (cantilever/continuous beam) SPS can serve to support bottom flange bracing elements accordingly.
- For continuous support case the calculation assumes loading on 1 span only for worst case scenario.

Typical recommended code maximum values for deflections for service live loads

Building Type	Design Load	Application	Maximum Deflection
All other buildings	Live load	simple span members supporting construction and finishes susceptible to cracking	L/360
	Live load	simple span members supporting construction and finishes not susceptible to cracking	L/240

Load-Span Table SPS 4-19-4 Terraces 33" Tread Width			SPS Span in ft. for a deflection limit of L/240				
SPS Rise (in)	Unit Mass (psf)		Applied Service Load, psf				
		Span (ft)	50	75	100	125	150
7	20.8		27.8	24.3	22.1	20.5	19.3
8	21.1		30.6	26.7	24.2	22.5	21.2
9	21.4		33.3	29.1	26.4	24.5	23.1
10	21.8		36.0	31.4	28.5	26.5	24.9
11	22.1		38.6	33.7	30.7	28.5	26.8
12	22.5		41.3	36.0	32.7	30.4	28.6
13	22.8		42.5	38.3	34.8	32.3	30.4
14	23.2		42.5	40.6	36.9	34.2	32.2
15	23.6		42.5	42.5	38.9	36.1	34.0
16	23.9		42.5	42.5	41.0	38.0	35.8
17	24.3		42.5	42.5	42.5	39.9	37.5
18	24.7		42.5	42.5	42.5	41.8	39.3
19	25.0		42.5	42.5	42.5	42.5	41.1
20	25.4		42.5	42.5	42.5	42.5	42.5
21	25.8		42.5	42.5	42.5	42.5	42.5
22	26.2		42.5	42.5	42.5	42.5	42.5
23	26.6		42.5	42.5	42.5	42.5	42.5
24	27.0		42.5	42.5	42.5	42.5	42.5

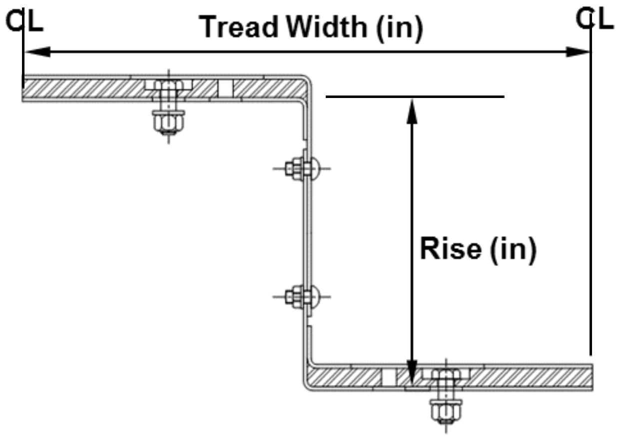


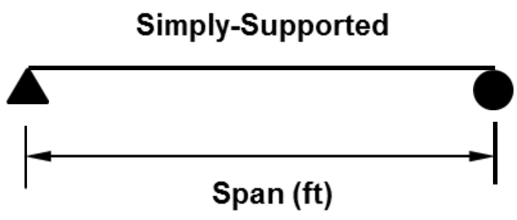


*Spans Longer than 40’ are available with increased shipping cost.

Load-Span Table
SPS 4-19-4 Terraces
33" Tread Width

SPS Span in ft. for a deflection limit of L/360





SPS Rise (in)	Unit Mass (psf)		Applied Service Load, psf				
			50	75	100	125	150
7	20.9	Span (ft)	24.3	21.2	19.3	17.9	16.8
8	21.2		26.7	23.3	21.2	19.7	18.5
9	21.5		29.1	25.4	23.1	21.4	20.1
10	21.9		31.4	27.4	24.9	23.1	21.8
11	22.2		33.7	29.5	26.8	24.9	23.4
12	22.5		36.0	31.5	28.6	26.6	25.0
13	22.9		38.3	33.5	30.4	28.2	26.6
14	23.3		40.6	35.5	32.2	29.9	28.1
15	23.6		42.5	37.4	34.0	31.6	29.7
16	24.0		42.5	39.4	35.8	33.2	31.3
17	24.3		42.5	41.3	37.6	34.9	32.8
18	24.7		42.5	42.5	39.3	36.5	34.3
19	25.1		42.5	42.5	41.1	38.1	35.9
20	25.5		42.5	42.5	42.5	39.7	37.4
21	25.8		42.5	42.5	42.5	41.4	38.9
22	26.2		42.5	42.5	42.5	42.5	40.4
23	26.6		42.5	42.5	42.5	42.5	41.9
24	27.0		42.5	42.5	42.5	42.5	42.5

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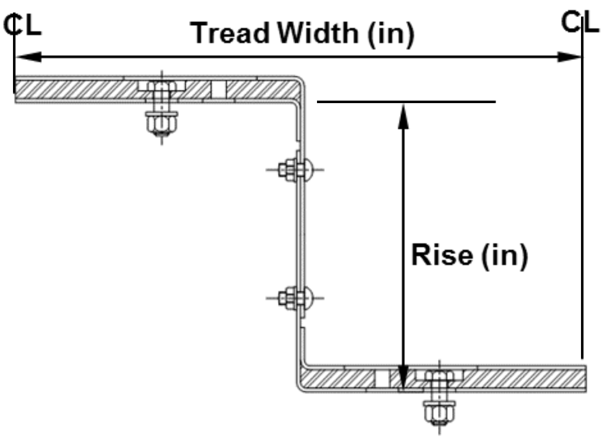
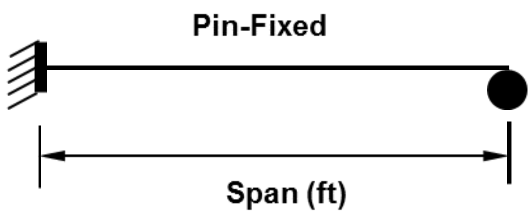
Load-Span Table SPS 4-19-4 Terraces 33" Tread Width	SPS Span in ft. for a deflection limit of L/240





SPS Rise (in)	Unit Mass (psf)		Applied Service Load, psf				
			50	75	100	125	150
7	20.6	Span (ft)	37.3	32.6	29.6	27.4	25.8
8	20.9		41.0	35.8	32.5	30.2	28.4
9	21.3		42.5	39.0	35.4	32.9	30.9
10	21.6		42.5	42.1	38.3	35.5	33.4
11	22.0		42.5	42.5	41.1	38.1	35.9
12	22.3		42.5	42.5	42.5	40.7	38.3
13	22.7		42.5	42.5	42.5	42.5	40.8
14	23.1		42.5	42.5	42.5	42.5	42.5
15	23.5		42.5	42.5	42.5	42.5	42.5
16	23.9		42.5	42.5	42.5	42.5	42.5
17	24.2		42.5	42.5	42.5	42.5	42.5
18	24.6		42.5	42.5	42.5	42.5	42.5
19	25.0		42.5	42.5	42.5	42.5	42.5
20	25.4		42.5	42.5	42.5	42.5	42.5
21	25.8		42.5	42.5	42.5	42.5	42.5
22	26.2		42.5	42.5	42.5	42.5	42.5
23	26.6		42.5	42.5	42.5	42.5	42.5
24	27.0		42.5	42.5	42.5	42.5	42.5

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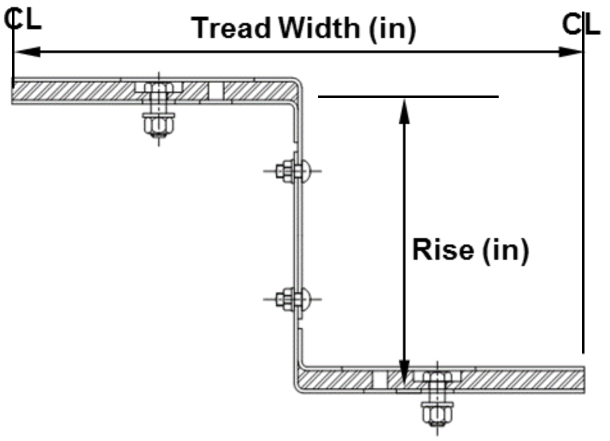
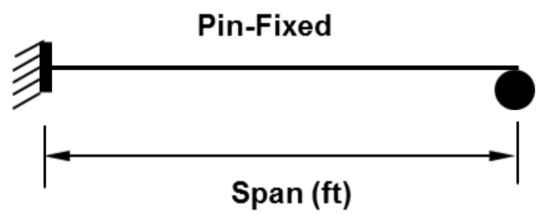
Load-Span Table SPS 4-19-4 Terraces 33" Tread Width	SPS Span in ft. for a deflection limit of L/360





SPS Rise (in)	Unit Mass (psf)		Applied Service Load, psf				
			50	75	100	125	150
7	20.7	Span (ft)	32.6	28.4	25.8	24.0	22.6
8	21.0		35.8	31.3	28.4	26.4	24.8
9	21.3		39.0	34.0	30.9	28.7	27.0
10	21.7		42.1	36.8	33.4	31.0	29.2
11	22.0		42.5	39.5	35.9	33.3	31.4
12	22.4		42.5	42.2	38.3	35.6	33.5
13	22.8		42.5	42.5	40.8	37.8	35.6
14	23.1		42.5	42.5	42.5	40.1	37.7
15	23.5		42.5	42.5	42.5	42.3	39.8
16	23.9		42.5	42.5	42.5	42.5	41.9
17	24.2		42.5	42.5	42.5	42.5	42.5
18	24.6		42.5	42.5	42.5	42.5	42.5
19	25.0		42.5	42.5	42.5	42.5	42.5
20	25.4		42.5	42.5	42.5	42.5	42.5
21	25.8		42.5	42.5	42.5	42.5	42.5
22	26.2		42.5	42.5	42.5	42.5	42.5
23	26.6		42.5	42.5	42.5	42.5	42.5
24	27.0		42.5	42.5	42.5	42.5	42.5

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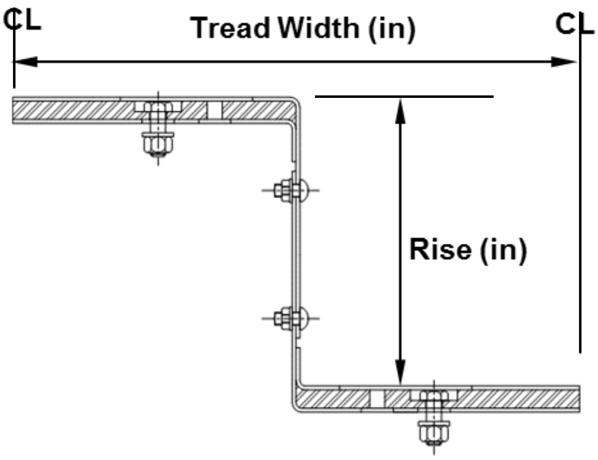
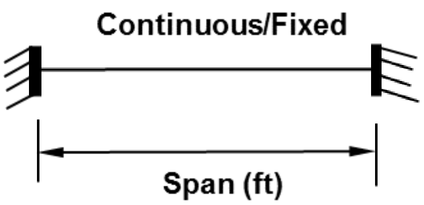
Load-Span Table SPS 4-19-4 Terraces 33" Tread Width	SPS Span in ft. for a deflection limit of L/240





SPS Rise (in)	Unit Mass (psf)		Applied Service Load, psf				
			50	75	100	125	150
7	20.4	Span (ft)	42.5	41.5	37.7	35.0	32.9
8	20.8		42.5	42.5	41.5	38.5	36.2
9	21.2		42.5	42.5	42.5	41.9	39.4
10	21.5		42.5	42.5	42.5	42.5	42.5
11	21.9		42.5	42.5	42.5	42.5	42.5
12	22.3		42.5	42.5	42.5	42.5	42.5
13	22.7		42.5	42.5	42.5	42.5	42.5
14	23.1		42.5	42.5	42.5	42.5	42.5
15	23.5		42.5	42.5	42.5	42.5	42.5
16	23.9		42.5	42.5	42.5	42.5	42.5
17	24.2		42.5	42.5	42.5	42.5	42.5
18	24.6		42.5	42.5	42.5	42.5	42.5
19	25.0		42.5	42.5	42.5	42.5	42.5
20	25.4		42.5	42.5	42.5	42.5	42.5
21	25.8		42.5	42.5	42.5	42.5	42.5
22	26.2		42.5	42.5	42.5	42.5	42.5
23	26.6		42.5	42.5	42.5	42.5	42.5
24	27.0		42.5	42.5	42.5	42.5	42.5

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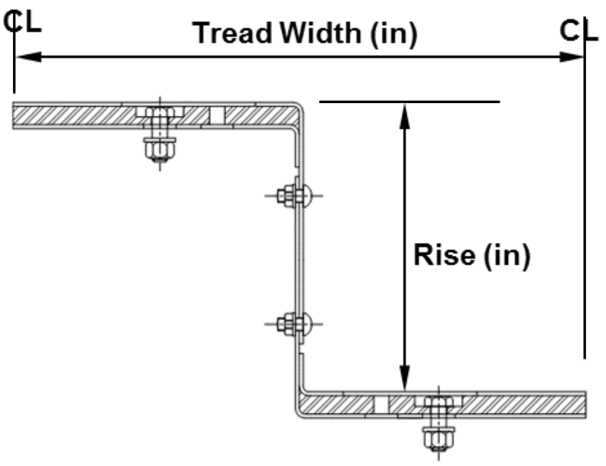
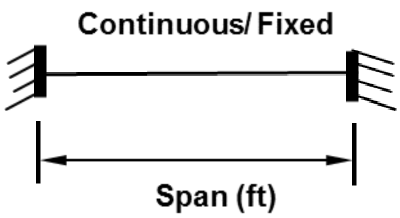
Load-Span Table
SPS 4-19-4 Terraces
33" Tread Width

SPS Span in ft. for a deflection limit of L/360





SPS Rise (in)	Unit Mass (psf)		Applied Service Load, psf				
			50	75	100	125	150
7	20.5	Span (ft)	41.5	36.3	33.0	30.6	28.8
8	20.9		42.5	39.9	36.2	33.6	31.6
9	21.2		42.5	42.5	39.4	36.6	34.5
10	21.6		42.5	42.5	42.5	39.6	37.2
11	21.9		42.5	42.5	42.5	42.5	40.0
12	22.3		42.5	42.5	42.5	42.5	42.5
13	22.7		42.5	42.5	42.5	42.5	42.5
14	23.1		42.5	42.5	42.5	42.5	42.5
15	23.5		42.5	42.5	42.5	42.5	42.5
16	23.9		42.5	42.5	42.5	42.5	42.5
17	24.2		42.5	42.5	42.5	42.5	42.5
18	24.6		42.5	42.5	42.5	42.5	42.5
19	25.0		42.5	42.5	42.5	42.5	42.5
20	25.4		42.5	42.5	42.5	42.5	42.5
21	25.8		42.5	42.5	42.5	42.5	42.5
22	26.2		42.5	42.5	42.5	42.5	42.5
23	26.6		42.5	42.5	42.5	42.5	42.5
24	27.0		42.5	42.5	42.5	42.5	42.5

*Spans Longer than 40' are available with increased shipping cost.

Revision Record

Revision Number	Date	Comments
Rev 0	03.02.2016	First issue
Rev 1	03.29.2016	First Rev. – Replace continuous case for fixed case.