



Quick Design Guide

Designing With Helix Based on Slab Loading

k = 100 psi/in f _c = 4000 psi	Maximum Applied Unfactored Load											
	Uniform Load - lb/ft ²			Rack Post Load - lb			Forklift Axle Load - lb			Truck Axle Load - lb		
Slab Thickness	9 lb/yd ³	13.5 lb/yd ³	22.5 lb/yd ³	9 lb/yd ³	13.5 lb/yd ³	22.5 lb/yd ³	9 lb/yd ³	13.5 lb/yd ³	22.5 lb/yd ³	9 lb/yd ³	13.5 lb/yd ³	22.5 lb/yd ³
5.5	800	900	1,000	6,250	6,500	9,000	12,000	14,000	24,000	18,000	20,000	30,000
6.0	900	1,000	1,100	7,000	7,500	10,000	14,000	16,000	30,000	20,000	22,000	35,000
6.5	1,000	1,050	1,200	8,000	8,500	11,000	18,000	20,000	35,000	24,000	26,000	40,000
7.0	1,100	1,150	1,400	9,000	9,250	12,500	20,000	24,000	40,000	28,000	30,000	48,000
7.5	1,200	1,200	1,500	10,000	10,250	13,500	25,000	28,000	45,000	32,000	36,000	54,000
8.0	1,300	1,350	1,700	11,000	11,250	15,000	30,000	32,000	50,000	36,000	40,000	60,000

Assumptions

- Subgrade: k=100 psi/in or CBR = 3 (values are typically provided in geotechnical report/investigation)
- Concrete Strength: 4000 psi
- Control Joint Spacing: max of 24 to 36 times the concrete thickness, and not exceeding 20'

*If assumptions change, Helix can provide alternate designs

Uniform Loading

- If pallet is 2500 lb, can be stacked three pallets high, and dimensions are 4' x 3.5', the uniform load would be $2500 \text{ lb} \times 3 / (4' \times 3.5') = 536 \text{ lbs/ft}^2$.
- With this loading requirement, a minimum 5.5" slab with 9 lb/yd^3 of Helix 5-25 can be used.
- Uniform load rarely controls a slab design but a "typical value" from 100 psf to 1000 psf may be given.
- An example of a uniform load that control the slab design is steel coil storage, see website example:
- Case Study: <https://www.helixsteel.com/project/steel-plant/>

Rack Post Load

- If a typical pallet is 2500 lb and racking requirements are 5 racks high & 2 pallet per bay, a 12,500 lb post capacity would be required ($2500 \text{ lb per pallet} \times 2 \text{ pallets per bay per level} \times 5 \text{ levels} / 4 \text{ posts per bay} \times 2 \text{ for shared interior posts}$).
- With this requirement, a 7" slab with 22.5 lb/yd^3 would be required.
- Be aware the Helix table assumes "back-to-back" racking, which is conservative if racking is single row.
- Also, consider if the first level of pallets is placed on the ground. If so, this level would NOT add to the rack load.
- Case Study: <https://www.helixsteel.com/project/distribution-warehouse/>

Forklift Axle Load

- A maximum axle load can be typically found on the data sheet of a forklift. However, most commercial forklifts have axle loads of between 5000-20,000 lb.
- For a forklift with a 20,000 lb axle load, a 7" slab with 9 lbs/yd^3 would be adequate but a 6.5" slab with 13.5 lbs/yd^3 could also be utilized.
- An axle load chart based on rated lifting capacity is include below (REF: ACI 360R-10; Table 5.1).
- Another simple rule is that the axle load is about 2X to 2.5X the rated capacity of the forklift.
- Case Study: <https://www.helixsteel.com/project/fedex-distribution-facility/>

Truck Axle Loads

- A typical semi-truck would carry a maximum axle load of ~20,000-28,000 lb.
- For this design, a 7" slab with 9 lb/yd^3 would be adequate or could be thinned to 6.5" with 13.5 lb/yd^3 .
- Case Study: <https://www.helixsteel.com/project/terex-utilities-plant/>

**Note: slabs typically have multiple load scenarios.

The Helix Design will be controlled by the highest load requirement.

Table 5.1—Representative axle loads and wheel spacings for various lift truck capacities

Truck rated capacity, lb	Total axle load static reaction, lb	Center-to-center of opposite wheel tire, in.
2000	5600 to 7200	24 to 32
3000	7800 to 9400	26 to 34
4000	9800 to 11,600	30 to 36
5000	11,600 to 13,800	30 to 36
6000	13,600 to 15,500	30 to 36
7000	15,300 to 18,100	34 to 37
8000	16,700 to 20,400	34 to 38
10,000	20,200 to 23,800	37 to 45
12,000	23,800 to 27,500	38 to 40
15,000	30,000 to 35,300	34 to 43
20,000	39,700 to 43,700	36 to 53

Designing Using Rebar Equivalencies

Single Layer Rebar, Helix® Micro Rebar™ Reinforcement Design

3,000 psi Concrete Compressive Strength		Slab Thickness					
		4"	5"	6"	7"	8"	10"
Grade 60 Rebar		Minimum Helix® Micro Rebar™ Reinforcement Dosage (lb/yd ³)					
#3	24" OC	7.1	5.7	4.8	4.5	4.5	4.5
#3	18" OC	9.4	7.6	6.3	5.4	4.8	4.5
#3	16" OC	10.6	8.5	7.1	6.1	5.3	4.5
#3	12" OC	15.7	11.3	9.4	8.1	7.1	5.7
#4	24" OC	14.4	10.3	8.6	7.4	6.4	5.2
#4	18" OC	18.5	15.2	11.4	9.8	8.6	6.9
#4	16" OC	20.5	16.9	14.4	11.0	9.6	7.7
#4	12" OC	35.0	21.7	18.5	16.7	14.3	10.2
#5	12" OC	DR	47.2	27.2	23.7	21.1	17.3

Double Layer Rebar, Helix Replacement

4000 psi Concrete Compressive Strength		Slab Thickness					
		8 inch	10 inch	12 inch	14 inch	16 inch	18 inch
Grade 60 Rebar		Minimum Helix® Micro Rebar™ Reinforcement Dosage (lb/yd ³)					
#4	24" T&B	10.8	9.4	9.0	9.0	9.0	9.0
#4	18" T&B	14.0	12.3	10.8	9.7	9.0	9.0
#4	16" T&B	15.6	13.7	12.1	10.8	9.8	9.0
#4	12" T&B	20.4	17.8	15.8	14.1	12.8	11.6
#5	16" T&B	23.2	20.3	18.0	16.1	14.6	13.3
#5	12" T&B	30.4	26.6	23.5	21.0	19.0	17.3
#6	16" T&B	32.0	28.0	24.8	22.2	20.1	18.3
#6	15" T&B	34.2	29.8	26.3	23.5	21.3	19.4
#6	12" T&B	DR	DR	DR	DR	26.3	24.0

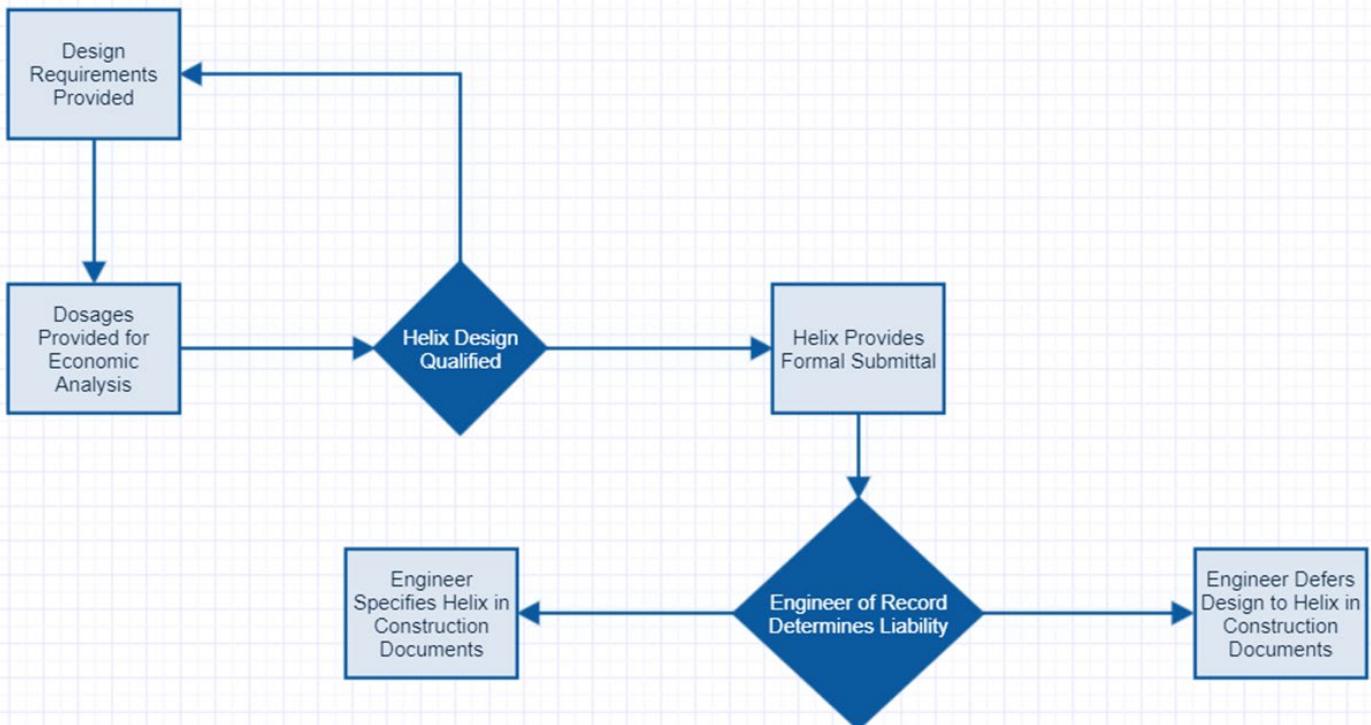
Other Design Options

- Interior/Exterior Applications (Helix Pavements: <https://www.helixsteel.com/pdfs/Helix-Pavements.pdf>)
- Extended Joint Spacing up to 100+ ft. (Helix Infinity Slab: <https://www.helixsteel.com/products-services/infinity-slab/>)

Examples of Other Applications

- **Foundations:** <https://www.helixsteel.com/project/al-172/>
- **Poured Walls:** <https://www.helixsteel.com/project/sunshine-childrens-home-addition/>
- **Tilt Panels:** <https://www.helixsteel.com/project/tiltwall-ontario-muskoka-bay-condominiums/>
- **Pavements:** <https://www.helixsteel.com/project/cattle-pen/>
- **Slab on Metal Deck:** <https://www.helixsteel.com/project/landmark-hospital/>

Helix Design-Build Process



Services

- Full Submittal Package (Stamped if needed)
- Specification Creation
- Construction Requirement Details
- Pre-Pour planning
- On-site support (if needed)
- Continuing Education/PDH credits

