LOAD DISTRIBUTION

The Spancrete Manufacturers Association sponsored extensive research on the behavior of Spancrete® hollowcore plank subjected to non-uniform loads in the form of line loads and point loads, and the effect of openings.

It was determined from testing that non-uniform loads are resisted by multiple slabs and can be simply represented as a varying width of section, as shown below. This effective resisting section is used to determine peak moments and shears for design. The design method is similar to that presented in the PCI Design Handbook and the PCI Manual for the Design of Hollowcore Plank, except that testing on Spancrete plank established greater effective distribution widths as shown below. The relationship shown is applicable when the width to span ratio of the plank assembly is greater than 1.0.

A design example is given on the reverse side.
**LOAD DISTRIBUTION**

**GIVEN:**
8" Spancrete® hollowcore floor with loads as shown.

**PROBLEM:**
Determine the design loads, and check shear and flexure, for the plank example shown.

**SOLUTION:**
Flexural design is critical at midspan; use the maximum distribution width to find an equivalent uniform load

\[ DW = 0.55L = 13.75 \text{ ft} \]

Uniform: \( w = 10 + 40 = 50 \text{ psf} \)  
Wall: \( w = (700 + 1100) + 13.75 = 131 \text{ psf} \)

\[ M_w = (131 \times 8.5^2) + 2 = 4732 \text{ ft}#/\text{ft} \]

\[ w_w = (8 \times 4732) ÷ 252 = 60.6 \text{ psf} \]

Point Load: \( w_p = 2 (2800 + 4400) ÷ (25 \times 13.75) = 42 \text{ psf} \)

Total Equivalent Uniform Load = 50 + 61 + 42 = 153 psf

Use Spancrete series 8610 (3/4" clear cover, 10-3/8" 250 KSI strands)

Shear design is normally first evaluated at h/2 from the support.

\[ DW = 4.5 + 0.333 (0.55L - 4.5) ÷ 6.25 = 4.99 \text{ ft.} \]

Uniform: \( W_D = 10 \text{ psf} w_L = 40 \text{ psf} \)
Wall: \( W_D = 700 ÷ 4.99 = 140 \text{ psf} \)
\( W_L = 1100 ÷ 4.99 = 220 \text{ psf} \)

Point: \( P_D = 2800 ÷ 4.99 = 561 \text{ #/ft} \)
\( P_L = 4400 ÷ 4.99 = 882 \text{ #/ft} \)

Checking shear across the span using these distributed loads, we find that \( V_u \) is slightly greater than \( V_c \) at h/2 (\( \Delta V_u = 1.10 \text{ k} \)). The web shear capacity at this location can be increased by grouting cores (See Research Note 1007, “Shear Strength With Filled Cores”).

At \( x = 2.38 \), the shear capacity is also exceeded, but the loads can be recalculated using the wider distribution width at this location: \( DW = 4.5 + 2.38(13.75 - 4.5)/6.25 = 8.02 \text{ ft.} \) Using this width, the revised loadings are:

Wall: \( w_{d1} = 700/8.02 = 87 \text{ PSF} \)
\( w_{l1} = 1100/8.02 = 137 \text{ PSF} \)

Point Load: \( P_{d1} = 2800/8.02 = 349 \text{ PLF} \)
\( P_{l1} = 4400/8.02 = 549 \text{ PLF} \)

Recheck shear and find that \( V_u < V_c \) at 2.38 ft. and at all points in the span beyond.

Additional information for Shear Design is provided in Research Note titled, “SHEAR STRENGTH”.

**Note:** Sample calculations are intended to illustrate the concept presented and do not represent all considerations necessary for the complete. This research was done using 40” wide, 8” thick Standard Spancrete. However, this concept applies to all Spancrete cross sections.

**MIDWEST**
- Hanson Structural Precast Midwest, Inc. Maple Grove, Minnesota
- Spancrete, Inc. Green Bay, Wisconsin
- Spancrete Industries, Inc. Waukesha, Wisconsin
- Spancrete of Illinois, Inc. Arlington Heights, Illinois
- Wells Concrete Wells, Minnesota
- Midwest Hanson Structural Precast Pacific, Inc. Inverness, California

**SOUTH**
- Cement Industries, Inc. Port Myers, Florida
- Florida Precast Industries, Inc. Sebring, Florida
- Muci & Co Dugopodje, Croatia

**SOUTHWEST**
- Manco Structures, Ltd. Schertz, Texas
- Cement Industries, Inc. Port Myers, Florida
- Spancrete Noreste Monterrey, Mexico

**CROATIA**
- Muci & Co Dugopodje, Croatia

**CARIBBEAN**
- Preconco Limited Barbados, West Indies
- Hi-Tech Concrete Products LLC Abu Dhabi, UAE

**MACHINERY MANUFACTURER**

**SPANCRETE IS ALSO MANUFACTURED IN:**
- Armenia
- Ireland
- China
- Japan
- Denmark
- Russia
- Guatemala
- South Korea
- Hungary
- Switzerland

Spancrete® hollowcore is a registered trademark