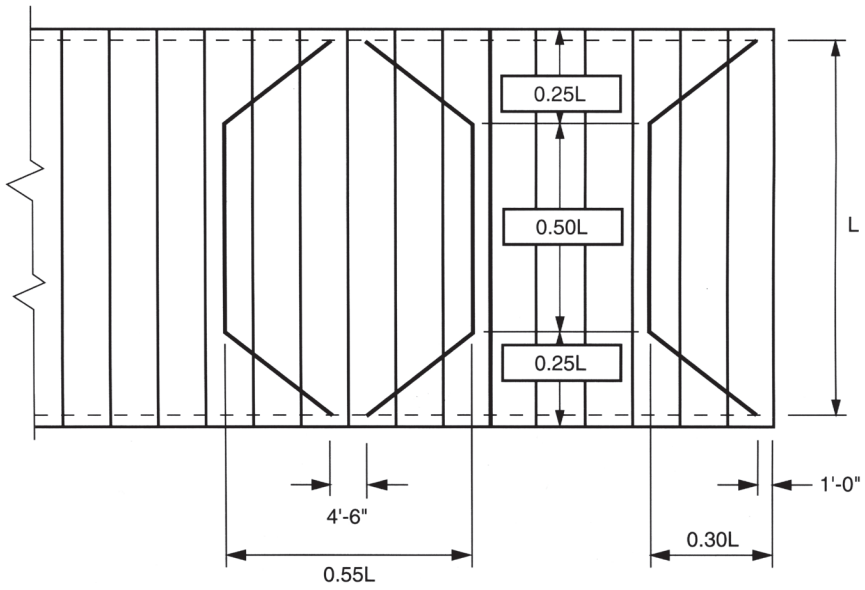
SPANCRETE MANUFACTURERS ASSOCIATION

RESEARCH NOTES

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.



Effective Distribution Area

A design example is given on the reverse side.

SPANCRETE MANUFACTURERS ASSOCIATION

DESIGN EXAMPLE

LOAD DISTRIBUTION

GIVEN:

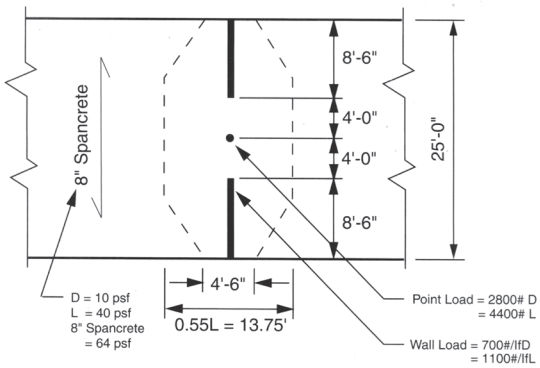
8" Spancrete® hollowcore floor with loads as shown.

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 ft

Uniform: w = 10 + 40 = 50 psf Wall: w = (700 + 1100) ÷ 13.75 = 131 psf

$M_w = (131 \times 8.5^2) \div 2 = 4732$ ft#/ft $w_w = (8 \times 4732) \div 25^2 = 60.6$ psf

Point Load: $w_p = 2\ (2800 + 4400) \div (25 \times 13.75) = 42$ 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 ft. Use this width to distribute loads

Uniform: $W_D = 10$ psf $w_L = 40$ psf Wall: $W_D = 700 \div 4.99 = 140$ psf $w_L = 1100 \div 4.99 = 220$ psf

Point: $P_D = 2800 \div 4.99 = 561$ #/ft $P_L = 4400 \div 4.99 = 882$ #/ft

Checking shear across the span using these distributed loads, we find that V_u is slightly greater than $\varnothing V_c$ at h/2 ($\Delta V_u = 1.10$ 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 ft. Using this width, the revised loadings are:

Wall:	$w_{dl} = 700/8.02 = 87$ PSF	$w_{ll} = 1100/8.02 = 137$ PSF
Point Load:	$P_{dl} = 2800/8.02 = 349$ PLF	$P_{ll} = 4400/8.02 = 549$ PLF

Recheck shear and find that $V_u < \varnothing V_c$ 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

WEST
Hanson Structural Precast Pacific, Inc.
Irwindale, California

KIE-CON
Division of Kiewit Pacific Co.
Anitoch, California

Owell Precast
Sandy, Utah

SOUTHWEST
Manco Structures, Ltd.
Schertz, Texas

SOUTH
Cement Industries, Inc.
Fort Myers, Florida

Florida Precast Industries, Inc.
Sebring, Florida

EAST
Mid-Atlantic Precast, LLC.
King George, Virginia

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Samcrete Eqypt
Ahram, Giza

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ITISA
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CROATIA
Mucić & Co
Dugopolje, Croatia

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Preconco Limited
Barbados, West Indies

TURKEY
Yapi-Merkezi
Camlica-Istanbul, Turkey

UAE
Hi-Tech Concrete Products LLC
Abu Dhabi, UAE

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China	*Japan*
Denmark	*Russia*
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Hungary	*Switzerland*