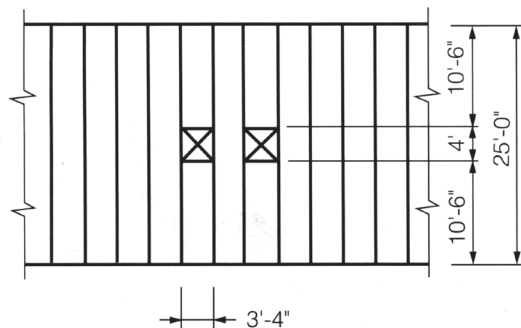


## LOAD DISTRIBUTION AROUND MULTIPLE CENTRAL OPENINGS

Tests were conducted to study the lateral distribution of loads in a Spancrete® hollowcore system containing two full plank openings closely spaced at midspan. In the first test, the openings were saw cut after the planks were grouted to evaluate the influence of overcut. For the second test, the openings were created with short slabs supported by angle headers in order to evaluate the distribution of slab weight prior to grouting.



**Test Assembly**

### CONCLUSIONS:

1. The Spancrete planks exhibited sufficient flexural ductility to develop the capacity of the entire system.
2. Overcut adjacent to sawn openings has no adverse affect on performance or ultimate strength.
3. Self weight may be distributed as superimposed load even if headers are used prior to grouting.
4. The previously recommended flexural distribution width of 0.55L is valid for both working load and ultimate conditions. (Distribution factors are listed in the Research Note entitled "**Load Distribution**")
5. Based on the excellent ductility shown by these tests, the same conclusions may be applied and the results extrapolated for 48" and 60" and 96" Spancrete widths.

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

# DESIGN EXAMPLE

## LOAD DISTRIBUTION AROUND MULTIPLE CENTRAL OPENINGS

### GIVEN:

8" Spancrete® hollowcore system shown; plank dead load = 64 psf  
 Superimposed dead load = 15 psf and live load = 50 psf

### PROBLEM:

Select a Spancrete section to support the given loads;  
 Check working and ultimate conditions based on flexure

### SOLUTION:

Effective distribution width of midspan =  
 $0.55(25) + 3.33 = 17.08$  ft

Effective self weight  $W_D = 64 + 2(3.33)64 = 89$  psf

Effective superimposed  $W_D = 15 + 2(3.33)15 = 21$  psf

Effective live load  $W_L = 50 + 2(3.33)50 = 70$  psf

Try: 8608 (3/4" clear cover, 8-3/8" 250 ksi strands,  
 65% initial tension, 20% losses,  $f_{PU} A_{PS} = 20K$ )

$M_w = 25^2 (.089 + .021 + .070) 3.33 = 46.9$  ft-k/slab

Check tension:  $f_t = 8 \times 20 \times .65 \times .8 \left( \frac{1}{218} + \frac{3.98 \times 3.04}{1515} \right)$   
 $.46.9 \times 12 \times 3.98 = 0.432$  ksi

Check LL deflection:  $\Delta = \frac{5}{384} \left( \frac{1515}{4300 \times 1515} \right) 3.33 (.070) 25^4 (1728) = 0.31" = L/950$

Check ultimate  $M_u = 25^2 [1.2 (.089 + .021) + 1.6 (.070)] 3.33 = 63.54$  ft-k/slab

$M_n = \frac{.9}{12} (.98 \times 8 \times 20) \left( 7.06 - \frac{.98 \times 8 \times 20}{2 \times .85 \times 4 \times 40} \right) = 76.25$  ft-k/slab ( $> M_u$ )

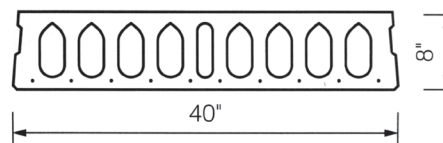
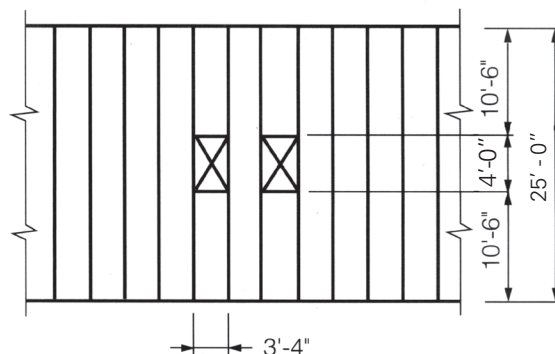
Check slab between openings for headered construction loads of 20 psf before grouting

Header reactions  $R = \frac{10.5 \times 3.33}{4} (.064 + .02) = 0.74k$

$M = 25^2 (.064 + .020) 3.33 + 10.5 (2) (.74) = 37.4$  ft-k/slab ( $< M_w$ )

$M_u = \frac{8}{1.2} [(1.2) [(1.2) (3.33) \left( \frac{25^2}{8} \right) + (10.5) (2) (.74)] + (1.6) (.020) (3.33) \left( \frac{25^2}{8} \right)] = 46.96$  ft-k ( $< 63.54$ )

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



$A = 218$  in<sup>2</sup>       $I = 1515$  in<sup>4</sup>  
 $Y_b = 3.98$  in       $e = 3.04$  in

### 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

### EGYPT

Samcrete Egypt  
 Ahram, Giza

### MEXICO

ITISA  
 Mexico City, Mexico

Spancrete Noreste  
 Monterrey, Mexico

### CROATIA

Mucic & Co  
 Dugopolje, Croatia

### CARIBBEAN

Preconco Limited  
 Barbados, West Indies

### TURKEY

Yapi-Merkezi  
 Camlica-Istanbul, Turkey

### UAE

Hi-Tech Concrete  
 Products LLC  
 Abu Dhabi, UAE

### MACHINE

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### SPANCRETE IS ALSO MANUFACTURED IN:

Armenia	Ireland
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Denmark	Russia
Guatemala	South Korea
Hungary	Switzerland

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