# RESEARCH NOTES

LOAD DISTRIBUTION AROUND CENTRAL OPENINGS

Tests were conducted to determine the effects of openings in the midspan area of a Spancrete® hollowcore system. These tests were one phase of the study of the distribution of non-uniform loads. For this test series, a central opening was defined as an opening located within the center quarter of the span and away from a free edge; the opening width used was 40".
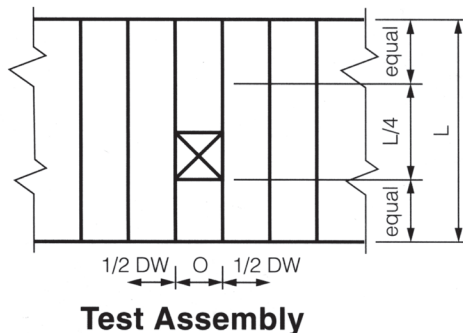
L = span length
O = opening width
DF = distribution factor*
DW = distribution width
   = L x DF

Test Assembly

CONCLUSIONS:

1. Central openings do not negate the ability of the Spancrete plank system to distribute loads.

2. Central openings affect the bending distribution width by reducing the stiffness of the system. In checking width to span ratio, subtract the opening width from the system width.

3. Central openings do not affect the distribution width for shear design near a support.

4. Central openings essentially cause additional loads on the adjoining plank which may be distributed as explained in the Research Notes entitled **"Load Distribution"** and **"Width To Span Ratio Effect On Load Distribution"**.

   *Distribution factors are listed in the *"Load Distribution"* Research Notes.

A design example is given on the reverse side.

DESIGN EXAMPLE

## LOAD DISTRIBUTION AROUND CENTRAL OPENINGS

GIVEN:
8" Spancrete® hollowcore floor shown; plank dead load = 64 psf
Superimposed dead load = 10 psf
Superimposed live load = 40 psf
Opening sawcut after grouting.

PROBLEM:
Determine the design loads for the plank
supporting the opening.

SOLUTION:
For flexural design, use a total distribution width of 0.55 L to distribute the load from the deck cut by the opening, and then add the factored uniform loads.
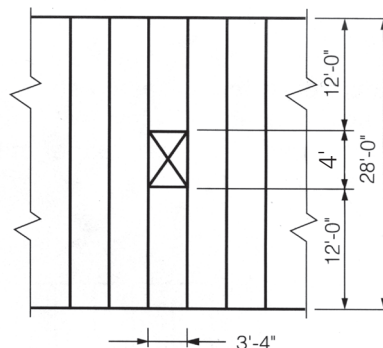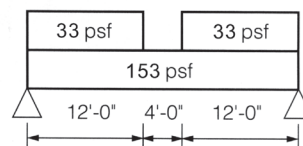
$$W_u = \frac{[1.2\,(64 + 10) + 1.6\,(40)]\,3.33}{0.55 \times 28} = 33 \text{ psf}$$

$$W_u = 1.2\,(64 + 10) + 1.6\,(40) = 153 \text{ psf}$$

$$M_u = 17{,}370 \text{ ft-lb/ft}$$

No special shear design is required, since the opening is located in the middle quarter of the span.

Factored Loads for Flexure
(Working stress conditions will also have to be checked)

33 psf   33 psf
153 psf
12'-0"   4'-0"   12'-0"

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.