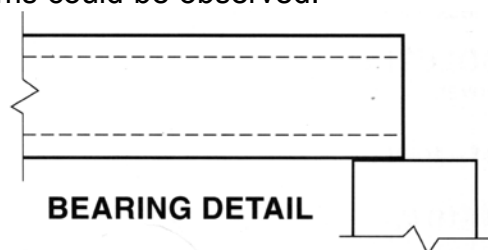
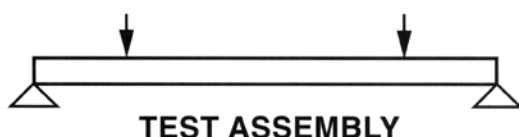


SHEAR STRENGTH

Tests were conducted to investigate the applicability of the ACI equations for shear in prestressed members to Spancrete® hollowcore plank. By varying the shear span, both web shear and inclined shear failure mechanisms could be observed.



CONCLUSIONS:

1. The ACI equations for shear in prestressed members apply to Spancrete.
2. Satisfactory performance was observed for $V_u = \phi V_c$ without shear reinforcing.

DESIGN EXAMPLE

SHEAR STRENGTH

GIVEN:

8" Spancrete reinforced with (12) 3/8" dia., 250 ksi strands; superimposed loads as shown.

PROBLEM:

Check the member for adequacy in shear.

SOLUTION:

Governing equations (from ACI 318-02)

$$(11 - 10) V_{ci} = 0.6 \sqrt{f'_c} b_w d + V_d + \frac{V_i M_{cr}}{M_{max}}$$

$$(11 - 11) M_{cr} = \frac{1}{y_b} (6\sqrt{f'_c} + f_{pe} - f_d)$$

$$(11 - 12) V_{cw} = (3.5 \sqrt{f'_c} + 0.3 f_{pc}) b_w d + V_p$$

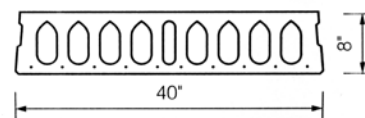
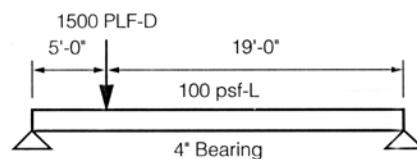
Investigate left 5' of span

$$V_d = \frac{24}{2} (3.33) (.064) - 3.33 (.064) X = 2.56 - .213 X \quad M_d = 2.56 X - \frac{.213 X^2}{2}$$

$$V_i = \frac{24}{2} (3.33) 1.6 (.1) + \frac{19}{24} (3.33) 1.2 (1.5) - 1.6 (3.33) (.1) X = 11.15 - .533 X \quad M_{max} = 11.15 X - \frac{.533 X^2}{2}$$

$$V_u = 1.2 (2.56) + 11.15 - [1.2 (.213) + .533] X = 14.22 - .789 X$$

M_{cr} is a function of the strand transfer length $l_t = 50 d_b = 18.75"$



$b_w = 17"$ $d = 7.06"$ $I = 1515 \text{ in}^4$
 $Y_b = 3.98"$ $W = 64 \text{ psf}$ $f'_c = 4000 \text{ psi}$
 (Approach similar for any other plank width)

This design example continues on the other side.



continued from reverse side

$$A_{ps} f_{se} = 12(.08) 250 (.65) .8 = 124.8^k \text{ (Tensioning to 65\% and assuming 20\% losses.)}$$

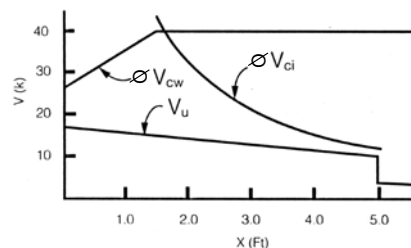
$$M_{cr} = 1515 \left[\frac{6 \sqrt{4000}}{1000} + 124.8 \left(\frac{1}{218} + \frac{3.04 \times 3.98}{1515} \right) \left(\frac{12X + 4}{18.75} \right) - \frac{M_d (12) 3.98}{1515} \right] \frac{1}{3.98}$$

$$= 12.04 + 49.78 \left(\frac{12X + 4}{18.75} \right) - M_d \text{ where } \left(\frac{12X + 4}{18.75} \right) \leq 1.0$$

$$f_{pc} = \frac{A_{ps} f_{se}}{A} = \frac{124.8}{218} \left(\frac{12X + 4}{18.75} \right) \text{ where } \left(\frac{12X + 4}{18.75} \right) \leq 1.0$$

From 0 to 5', the following table can be developed by varying x and evaluating the equations.

x (ft)	V _u (k)	V _d (k)	V _i (k)	M _{max} (ft-k)	M _{cr} (ft-k)	∅ V _{ci} (k)	∅ V _{cw} (k)
0.33	13.96	2.49	10.97	3.68	32.34	78.2	26.5
1.00	13.43	2.35	10.62	10.88	52.06	43.3	33.1
2.00	12.64	2.13	10.08	21.23	57.13	25.4	35.4
3.00	11.85	1.92	9.55	31.05	55.10	17.6	35.4
4.00	11.06	1.71	9.02	40.34	53.28	13.6	35.4
5.00	10.28	1.50	8.49	49.09	51.68	11.2	35.4



Beyond 5', $\emptyset V_{ci}$ is the minimum per code while V_u drops drastically and therefore need not be checked for this case.

$$(V_{ci} \text{ min} = 1.7 \sqrt{f'_c} b_w d)$$

Since $V_u < \emptyset V_c$, the section selected is adequate.

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® hollowcore. However, this concept applies to all Spancrete cross sections.

EAST

Oldcastle Precast, Inc.
South Bethlehem, NY

Oldcastle Precast, Inc.
Manchester, NY

Conewago Precast Building
Systems
Hanover, PA

MIDWEST
Spancrete, Inc.
Green Bay, WI

Spancrete Industries, Inc.
Waukesha, WI

Hanson Structural Precast
Midwest, Inc.
Maple Grove, MN

Spancrete of Illinois, Inc.
Arlington Heights, IL

WEST
Hanson Structural Precast
Pacific, Inc.
Inwindale, CA

KIE-CON
Div. of Kiewitt Pacific Co.
Antioch, CA

Owell Precast
Sandy, UT

SOUTHWEST
Manco Structures, Ltd.
Schertz, TX

SOUTH

Cement Industries, Inc.
Fort Myers, FL

Florida Precast Industries, Inc.
Sebring, FL

MC Precast, Inc.
Atlanta, GA

CANADA
Burnco Concrete Products Ltd.
Calgary, Canada

EGYPT
Samcrete Egypt
Ahram, Giza

MEXICO

ITISA
Mexico City, Mexico

Spancrete Noreste
Monterrey, Mexico

TURKEY
Yapi-Merkezi
Camlica-Istanbul, Turkey

CARIBBEAN
Preconco Limited
Barbados, West Indies

Spancrete Caribbean, Ltd.
Trinidad, West Indies

UAE
Hi-Tech Concrete Products, LLC
Abu Dhabi, UAE

MACHINE MANUFACTURER

Spancrete Machinery
Corporation
Waukesha, WI

Spancrete is also manufactured in

Armenia	Denmark	Russia
Australia	Guatemala	South Korea
Belgium	Hungary	Spain
Brazil	Ireland	Switzerland
China	Israel	
Croatia	Japan	