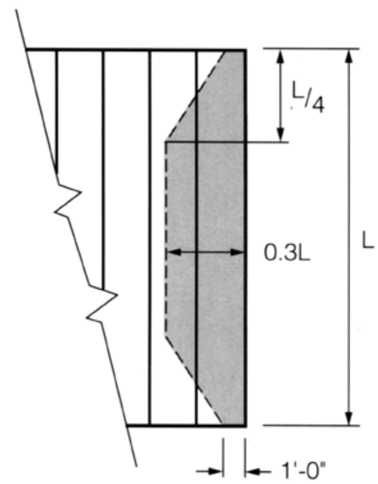
SPANCRETE MANUFACTURERS ASSOCIATION

RESEARCH NOTES

SHEAR DESIGN FOR EDGE LOADS

Research on load distribution has been a major part of the continuing testing program conducted by the Spancrete Manufacturers Association.



The shaded area represents the effective section carrying edge loads
FIGURE 1

CONCLUSIONS:

To account for torsional shear stresses in addition to direct shear stresses, it is recommended that an effective resisting section, as shown in Figure 1, be used to carry edge loads. The significant change from earlier recommendations is the reduction of the width at the support to one foot. Use of this resisting section will result in a prediction of the peak shear stress in the outermost webs.

A design example is given on the reverse side.

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DESIGN EXAMPLE

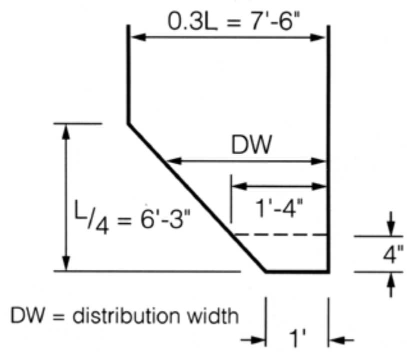
SHEAR DESIGN FOR EDGE LOADS

GIVEN:

An 8" x 40" Spancrete® hollowcore system as shown on the other side.
L = 25'; self weight = 64 psf; uniform superimposed live load = 40 psf and dead load = 10 psf.
A wall load on the outermost free edge represents line loads of 100 plf dead load and 350 plf live.

PROBLEM:

Select a prestressing level for the plank and check shear.



SOLUTION:

1. Select prestressing level on the basis of flexure

   $W_D = 10 + \left(\frac{100}{0.3 \times 25}\right) = 23$ psf $W_L = 40 + \left(\frac{350}{0.3 \times 25}\right) = 87$ psf

   From load tables, use eight 3/8" dia. 250 k stands, with initial stress = 65% of ultimate and clear bottom cover = 3/4"

2. Check web shear at h/2 = 0.33'

   $W_u = 1.2\,(10 + 64) + 1.6\,(40) + \frac{1.2\,(100) + 1.6\,(350)}{DW} = 153 + 680/DW$

   $DW = \frac{0.33}{6.25}\,(7.5 - 1) + 1 = 1.34'$

   $v_u = \left(\frac{25}{2} - 0.33\right)\left(.153 + \frac{.680}{1.34}\right) = 8.04k/'$ $\frac{v_u}{\varnothing} = \frac{8.04 \times 3.33}{.75 \times 17 \times 7.06} = .298$ ksi

   $v_{cw} = 3.5\sqrt{f'c} + 0.3\,f_{pc}$ Assume prestress loss = 20%, bearing = 3"

   $f_{pc} = \frac{8 \times 20 \times .65 \times .8}{218}\left(\frac{3 + 4}{50 \times .375}\right) = .142$ ksi (accounting for tranfer length)

   $v_{cw} = 3.5\sqrt{4000} \div 1000 + 0.3\,(.142) = 0.264 < 0.298$ NO GOOD

   Web shear capacity can be increased by grouting cores, (See Reserach Note, "**SHEAR STRENGTH WITH FILLED CORES**").

3. Check inclined shear at 2.75' from support. Starting with the same load values at h/2; $\frac{v_u}{\varnothing}$ will be 241 psi and v_{ci} will be only 220 psi. Therefore, recalculate the loads as would be distributed at 2.75'.

   $DW = \frac{2.75}{6.25}\,(7.5 - 1) + 1 = 3.86'$ $W_u = 153 + 680 \div 3.86 = 329$ #/ft

   Now a new check of inclined shear will show shear is OK at all points.

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