SPANCRETE MANUFACTURERS ASSOCIATION

RESEARCH NOTES

NON-BEARING TOP CONNECTION DESIGN FOR SPANCRETE HOLLOWCORE WALL PANELS

Vertical Spancrete hollowcore wall panels in a non-Load-Bearing condition must be connected to a roof structure to tie the panels to the building. Additionally, the panels may be required to act as shear walls for the building. The top non-Load-Bearing connections may then be subjected to either normal forces or in-plane forces. At the same time, the roof structure will move vertically due to gravity loads or thermal gradients. The top, non-Load-Bearing connection should allow vertical slip so unintended vertical forces are not transferred into the panels.

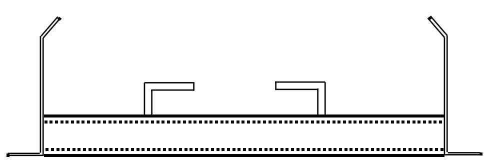
Tests were conducted on a specific insert to determine load capacities for both direct tension and in-plane shear. The insert selected was a Unistrut P3300 with special end caps and additional stud anchorage as shown in the figure below.

CONCLUSIONS:

1. When used with the notched steel strap shown, the insert will allow vertical movement, yet can also transfer both in-plane and out of plane forces.

2. The test capacity achieved was 2.75k in tension and 9k in shear.

3. A strength reduction factor of 0.70 and an extra conneciton factor of 1.3 are recommended for use with this insert.



P3300 Unistrut x 8" Long
with Special End Caps and
2-3/8" x 2-1/2" Studs

Notched Strap
3/8" x 1-3/8"
(2" wide strap sim.)

A design example is given on the reverse side.

Research Notes are produced periodically by the SMA Technical Committee. SMA Research Notes are based on testing done for the Spancrete Manufacturers Association. The information contained in these Research Notes should be used by those experienced in structural design and should not replace sound engineering judgment.

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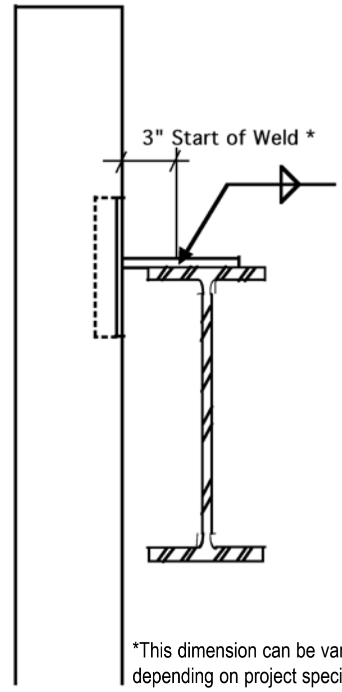
DESIGN EXAMPLE

NON-BEARING TOP CONNECTION DESIGN FOR SPANCRETE HOLLOWCORE WALL PANELS



*This dimension can be varied depending on project specific details.

GIVEN:

Wind Normal = .9 k

Wind Parallel = 1.4 k

PROBLEM:

Design the non-Load-Bearing connection.

SOLUTION:

For wind normal to the connection, $T_u = 1.6(.9) = 1.44$ k; applying the extra connection factor as recommended,
$T_u = 1.3(1.44) = 1.87 \text{ k} < \phi T_n = 0.7(2.75) = 1.93 \text{ k}$ OK

Check capacity of the strap in tension at the notch:
$\phi T_n = 0.9(36)(0.75)(0.375) = 9.11 \text{ k} > 1.44 \text{ k}$ OK

Check strap compressive capacity for 3" unbraced length:
$\frac{Kl}{r} = \frac{2(3)}{0.3(0.375)} = 53$; from AISC LRFD, $F_{au} = 26.39$ ksi;

Therefore, $\phi C_u = 0.375(1.375)(26.39) = 13.6 \text{ k} > 1.44 \text{ k}$ OK

For wind parallel to the connection, $V_u = 1.6(1.4) = 2.24$k; applying the extra connection factor as recommended,
$V_u = 1.3(2.24) = 2.91 \text{ k} < \phi V_n = 0.7(9) = 6.3 \text{ k}$ OK

At strap notch, $\phi V_n = 0.9(0.6)(36)(0.375)(0.75) = 5.47 \text{ k} > 2.24 \text{ k}$ OK

Check bending of strap for 3" moment arm to start of weld:
$M_u = 2.24(3) = 6.72$ in-k. Then req'd $Z = 6.72 / 0.9(36) = 0.207$. Therefore the width required =
$\sqrt{0.207(4)/0.375} = 1.49$ in. Use a 2" wide strap.

Design the amount of weld to beam: try 3/16" fillet weld 2" long. $f_{vux} = 2.24/2(2) = 0.56$ k/in and
$f_{vuy} = 2.24(3+1) / 2(2) = 2.24$ k/in $R_{wu} = \sqrt{(0.56^2 + 2.24^2)} = 2.32 \text{ k/in} < 4.18 \text{ k/in}$ OK

Note: Sample calculations are intended to illustrate the concept presented and do not represent all considerations necessary for the complete design.

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