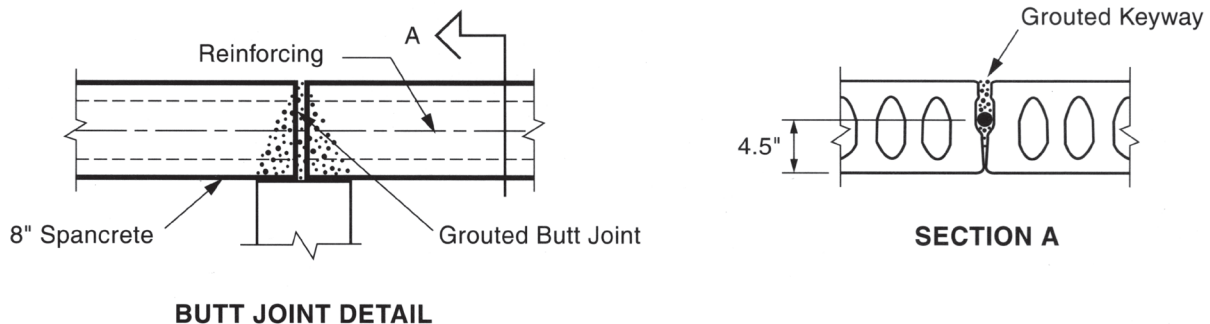


BARS IN GROUT KEYS

Mild steel reinforcement in the grout keys is commonly used to “tie a building together.” Tests were conducted to determine whether this reinforcement was capable of developing negative moments for continuity.



CONCLUSIONS:

1. Bars placed in grout keys can develop their full negative moment capacity.
2. The largest size bar that practically fits in the keyway is #4, and the width of Spancrete® hollowcore plank used (40", 48", 60", 96" depending on locality) limits the spacing available. Therefore, the negative moment capacity available is small, and deflections approach those of a simple span system.
3. The testing showed that #4 bars placed in the grout keys would yield and that negative moments would redistribute so that flexural failure in the positive moment region controlled.

A design example is given on the reverse side.

BARS IN GROUT KEYS

GIVEN:

An 8" untopped Spancrete® hollowcore system as shown.
 Assume plank weight = 64 psf, superimposed
 dead load = 20 psf and live load = 50 psf.



PROBLEM:

Determine reinforcing requirements of plank if #4 bar is used in all grout keys.
 [This example is based on 40" wide plank]

SOLUTION:

$$M_u = [1.2 (DL) + 1.6 (LL)] L^2 \div 8 \times 1000$$

$$= [1.2 (64 + 20) + 1.6 (50)] 26.67^2 \div 8000 = 16 \text{ k-ft/ft}$$

The negative moment capacity provided by one #4 bar @ 40" is

$$\phi M_n^- = \phi A_s f_y (d - a/2) \text{ where } a = A_s f_y \div 0.85 \times f_c \times b$$

$$= .9 \times .2 \times 60 (4.5 - [.2 \times 60 \div .85 \times 4 \times 40] \div 2) \div 12 \times 3.33$$

$$= 1.20 \text{ k-ft/ft}$$

A hinge will form at the center support, since the negative moment potential is greater than the negative moment capacity ($M_u^- > \phi M_n^-$)

$$R = [wL^2/2 - \phi M_n^-] \div L = [.181 \times 26.67^2 \div 2 - 1.20] \div 26.67 = 2.37 \text{ k-ft/ft}$$

$$X = 2.37 \div .181 = 13.09'$$

$$M_u^+ = 2.37 \times 13.09 \div 2 = 15.51 \text{ k-ft/ft}$$

Select the appropriate series plank from your load tables ≥ 15.51 k-ft/ft

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.

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 Green Bay, Wisconsin

Spancrete Industries, Inc.
 Waukesha, Wisconsin

Spancrete of Illinois, Inc.
 Arlington Heights, Illinois

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