REVIEW NOTES
BRATTLEBORO BRO 1442(35) – BRIDGE NO. 7
LIFTING ANCHORS
September 12, 2014

RE: Substitution of Lifting Loops Submittal received from Renaud Bros. Inc. on 9/09/2014.

VHB Project No.: 57428.00

These notes accompany the review of the Lifting Loops reviewed by VHB on 9/11/2014.

1. *In accordance with Note 56 on the Project Notes Sheets (2 of 2) on page 7 of the Contract Documents the contractor is responsible for the design of the lifting loops.*

SUBMITTAL REVIEW

☒ Reviewed and approved but only for conformance to the Construction Contract Documents.

☐ Revise and Resubmit

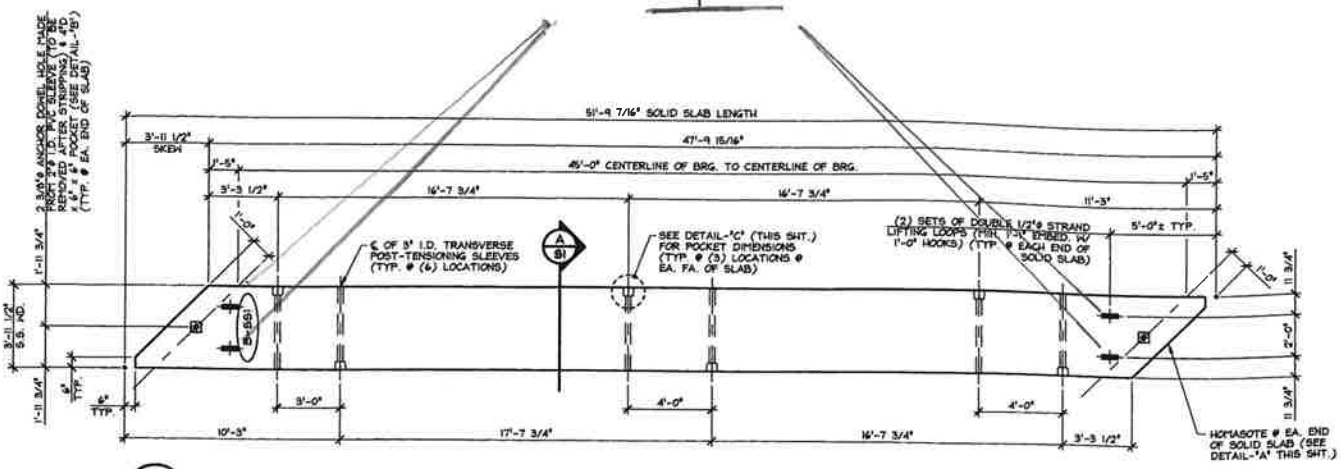
Corrections or comments made during this review do not relieve the Contractor or his Designer from compliance with professional requirements or for responsibility for the adequacy of the submittal information. This check is only for review of general conformance with industry standards and general compliance with the information given in the Contract Documents. VHB has not conducted a detailed review of the submittal and has not performed calculations or assessed the adequacy of loads, design criteria, quantities, dimensions, etc. Approval of the submittal does not constitute VHB's approval of any construction means, methods or techniques. These remain the responsibility of the Contractor.

Vanasse Hangen Brustlin, Inc.
7056 US Route 7 • Post Office Box 120
North Ferrisburgh, VT 05473
802.425.7788

Job Number: 57428.00
Reviewed By: S.E. Burbank
Date: September 12, 2014

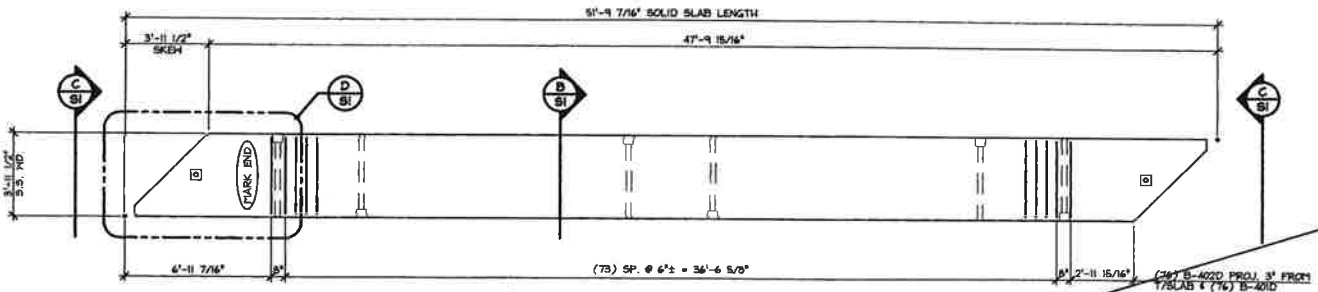
This submittal is for sheets 1-4, inclusive, of the "Lifting Loops" submittal received on 9/09//2014.

SUBSTITUTE 8TON x 6 3/4" LONG SWIFT LIFT LIFTING ANCHORS FOR STRAND LIFING LOOPS



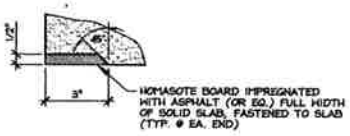
1 / S1 DIMENSIONAL PLAN VIEW IN FORM
1/4" = 1'-0"

Vermont Agency of Transportation
RECEIVED
CK'D BY MJC OK'D BY TAS
April 24, 2014
RESUBMIT No Approved AsNoted
BY M. J. Chenette DATE 04/29/2014

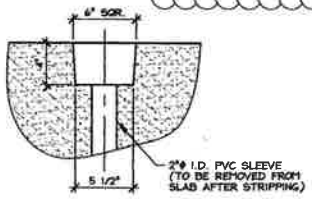


3 / S1 REINFORCING PLAN VIEW IN FORM
1/4" = 1'-0"

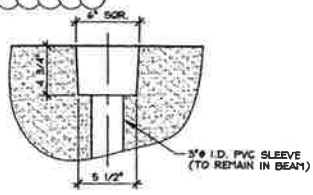
SHOP NOTE:
ADJUST REINFORCING AS REQUIRED TO CLEAR INSERTS, SLEEVES, ETC.



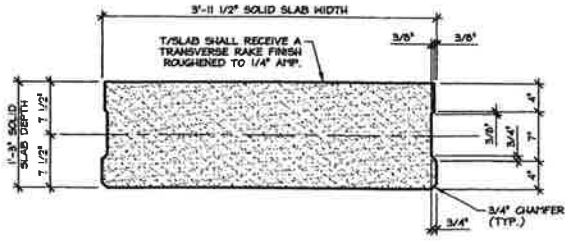
DETAIL - "A"
3" = 1'-0"



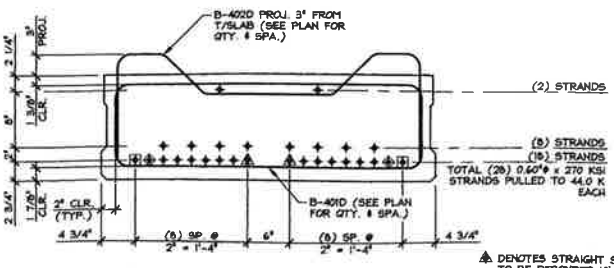
DETAIL - "B"
1 1/2" = 1'-0"



DETAIL - "C"
1 1/2" = 1'-0"

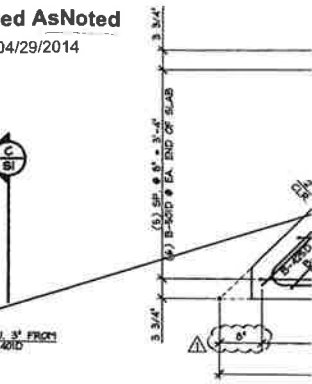


A / S1 DIMENSIONAL SECTION
1" = 1'-0"

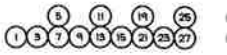


B / S1 REINFORCING SECTION
1" = 1'-0"

▲ DENOTES STRAIGHT STRANDS TO BE DEBONDED 10'-0" FROM EA. END OF EA. SLAB
◆ DENOTES STRAIGHT STRANDS TO BE DEBONDED 12'-0" FROM EA. END OF EA. SLAB
⊞ DENOTES STRAIGHT STRANDS TO BE DEBONDED 14'-0" FROM EA. END OF EA. SLAB



C / S1 END BLOCK R
SECTION



DETENSIONING

* JH 12, CLASS III OVER HARADAY BR.
BRATTLEBORO, VT

STATE OF VERMONT ERNEST J. BRG No. 3816 REGISTERED PROFESSIONAL ENGINEER

LIFTING DESIGN CALCULATIONS

EVALUATE ALTERNATE LIFTERS IN SOLID SLAB BEAMS.

FROM 4/2/14 LIFTING LOAD DESIGN CALCULATIONS,

DESIGN LOAD / LIFT LOCATION = 10K

USE 8 TON × 6 3/4" S.L. SWL 11,200 LB > 10K, O.K.

SEE ATTACHED PRODUCT LITERATURE.

PROVIDE ADDITIONAL EVALUATION BASED ON PCI 6.5.3 & 6.5.4.
EVALUATE SWIFT LIFTERS AS A SOLID.

$\phi P_c = 10.7\, l_e (l_e + d_h) \lambda \sqrt{f'_c}$ where $l_e = 6\frac{3}{4}$"

$= 10.7(6\frac{3}{4})(6\frac{3}{4} + 2\frac{5}{8})(1.0)\, 4800^{0.5}/1000$ $d_h = 2\frac{5}{8}$"

$\lambda = 1.0$

$= 46.9$K $f'_{ci} = 4{,}800$ psi

$d_e = 11\frac{3}{4}$" ($d_e = 8\frac{3}{4}$" FOR 3'-0" WIDE BEAMS)

$C_{es} = \frac{d_e}{l_e} \leq 1.0$

$= 1.0$

FOR S.F. = 4:1

SWL = 46.9/4 = 11.8K > 10K, O.K.

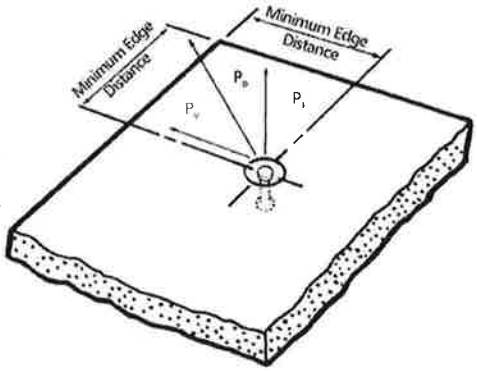
TOPS 35500

Swift Lift® System

DAYTON® SUPERIOR

P-52 Swift Lift® Anchor Tensile and Shear Capacity

When anchors are used in the face of thin concrete elements



The following table lists the P-52 Swift Lift Anchors that are currently manufactured. Other sizes and lengths are available on special order. However, the sizes and lengths of anchors shown will handle the majority of flat precast concrete elements.

When the P-52 Swift Lift Anchor is properly embedded in normal weight concrete, the tabulated working loads are applicable for any direction of load. This applies even if the direction of load is parallel to the axis of the anchor, perpendicular to it or at any other angle.

Minimum distance between anchors is twice the minimum edge distance.

It is critical to remember that in order to obtain the safe working loads listed in the table below, the normal weight concrete must have obtained the minimum concrete strength shown, prior to initial load application.

Swift Lift Anchor Ton x Length	Safe Working Load	Minimum Concrete Strength	Minimum Edge Distance
1 ton x 2-5/8"	1,700 lbs.	3,500 psi	8"
1 ton x 3-3/8"	**2,000 lbs.**	**2,200 psi**	**10"**
1 ton x 4-3/8"	2,000 lbs.	1,600 psi	10"
1 ton x 8"	**2,000 lbs.**	**1,600 psi**	**10"**
1 ton x 9-1/2"	2,000 lbs.	1,600 psi	10"
2 ton x 2-3/4"	**2,100 lbs.**	**3,500 psi**	**8"**
2 ton x 3-3/8"	2,900 lbs.	3,500 psi	10"
2 ton x 5-1/2"	**4,000 lbs.**	**1,600 psi**	**13"**
2 ton x 6"	4,000 lbs.	1,600 psi	13"
2 ton x 6-3/4"	**4,000 lbs.**	**1,600 psi**	**13"**
2 ton x 11"	4,000 lbs.	1,600 psi	14"
4 ton x 3-3/4"	**4,000 lbs.**	**3,500 psi**	**12"**
4 ton x 4-1/4"	4,900 lbs.	3,500 psi	13"
4 ton x 4-3/4"	**5,800 lbs.**	**3,500 psi**	**14"**
4 ton x 5-1/2"	7,400 lbs.	3,500 psi	17"
4 ton x 5-3/4"	**7,900 lbs.**	**3,500 psi**	**17"**
4 ton x 7-1/8"	8,000 lbs.	1,800 psi	20"
4 ton x 9-1/2"	**8,000 lbs.**	**1,600 psi**	**17"**
4 ton x 14"	8,000 lbs.	1,600 psi	18"
4 ton x 19"	**8,000 lbs.**	**1,600 psi**	**20"**
8 ton x 4-3/4"	6,400 lbs.	3,500 psi	16"
8 ton x 6-3/4"	**11,200 lbs.**	**3,500 psi**	**21"**
8 ton x 10"	16,000 lbs.	3,500 psi	19"
8 ton x 13-3/8"	**16,000 lbs.**	**1,600 psi**	**23"**
8 ton x 26-3/4"	16,000 lbs.	1,600 psi	27"
20 ton x 10"	**25,000 lbs.**	**3,500 psi**	**24"**
20 ton x 19-3/4"	40,000 lbs.	3,500 psi	31"

Safe Working Loads provide a factor of safety of approximately 4 to1 in normal weight concrete. Safe Working Load is based on anchor setback from face of concrete "X" dimension, as shown on page 26.

ability of headed stud design. The design methods used here should be considered an interim step toward a final headed stud design procedure. It is recommended that this procedure be limited to headed studs with an embedment not greater than 8 in.

An important factor in the performance of headed studs when controlled by concrete capacity is the confinement of the failure area with reinforcement. In shear, design capacity is increased with such reinforcement. In tension, ductility can be provided. It is recommended that reinforcement be placed to cross failure planes around headed stud anchorages.

Welded headed studs are designed to resist direct tension, shear or a combination of the two. The design equations given below are applicable to studs which are welded to steel plates or other structural members, and embedded in unconfined concrete.

Where feasible, headed stud connections should be designed and detailed such that the connection failure is precipitated by failure (typically defined as yielding) of the stud material rather than failure of the surrounding concrete. The in-place strength should be taken as the smaller of the values based on concrete and steel.

6.5.2.1 Tension

The design tensile strength governed by concrete failure is [9]:

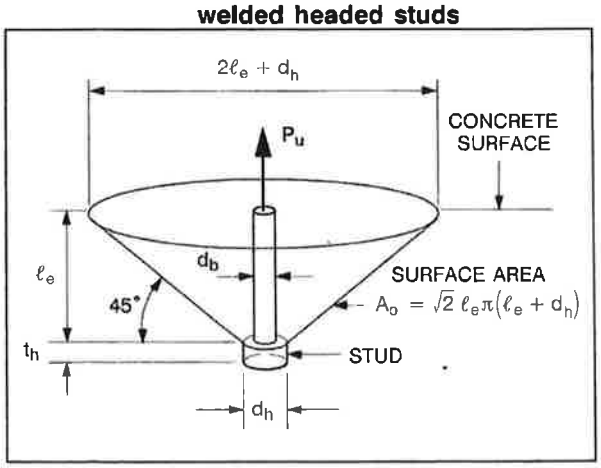
$$\phi P_c = \phi A_o(2.8\lambda\sqrt{f'_c}) \qquad \text{(Eq. 6.5.2)}$$

where:

ϕ = 0.85

A_o = area of the assumed failure surface which, for a single stud not located near a free edge, is taken to be that of a 45° truncated cone as shown in Figure 6.5.3.

Figure 6.5.3 Shear cone development for welded headed studs



Using the 45° cone area and ϕ = 0.85, Eq. 6.5.2 may be written as:

$$\phi P_c = 10.7\ell_e(\ell_e + d_h)\lambda\sqrt{f'_c} \qquad \text{(Eq. 6.5.3)}$$

Note: The stud length is often used in place of the actual embedment length, ℓ_e, which is equal to the stud length minus the thickness of the head. This simplification is generally acceptable except in short studs. In short studs (length ≤ 4 in.), the use of actual embedment length is recommended. It should also be noted that short stud capacities are also sensitive to fabrication tolerances. Thus, use of a larger overall factor of safety may be appropriate for short studs. See Sect. 6.3.

For a stud located closer to a free edge than the embedment length, ℓ_e, the design tensile strength given by Eq. 6.5.3, should be reduced by multiplying it by C_{es}:

$$C_{es} = \frac{d_e}{\ell_e} \leq 1.0 \qquad \text{(Eq. 6.5.4)}$$

where d_e is the distance measured from the stud axis to the free edge. If a stud is located in the corner of a concrete member, Eq. 6.5.4 should be applied twice, once for each edge distance. Figure 6.15.6 lists values based on Eqs. 6.5.3 and 6.5.4.

For a group of studs, the concrete failure surface may be along a truncated pyramid rather than separate shear cones, as shown in Figure 6.5.4.

For this case, the design tensile strength is:

$$\phi P_c = \phi\lambda\left(\frac{2}{3}\right)\sqrt{f'_c}\,(2.8A_{slope} + 4A_{flat}) \qquad \text{(Eq. 6.5.5)}$$

where:

A_{slope} = sum of the areas of the sloping sides

A_{flat} = area of the flat bottom of the truncated pyramid

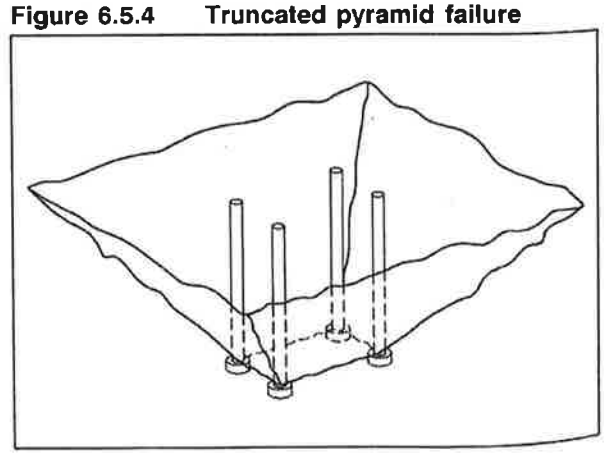



Figure 6.5.4 Truncated pyramid failure