San Bernardino City Unified School District

PROPOSITION 39
ENERGY EFFICIENCY UPGRADES
EEP3

793 North E St, San Bernardino,
CA 92410

ADDENDUM 06

February 27, 2019

Prepared By

JOHN SERGIO FISHER & ASSOCIATES
5567 Reseda Blvd., Suite 209, Los Angeles, CA 91356
(818) 344-3045; FAX (818) 344-0338
ADDENDUM 6

To: All bidders
From: John Fisher, AIA, Principal
Project: SBCUSD Proposition 39 Energy Efficiency Upgrades EEP3
         Phase 2 - Energy Upgrades
Date: February 27, 2019

NOTICE TO BIDDERS
This Addendum forms a part of the Contract and modifies the original documents. It is intended that all work affected by the following modifications shall conform with related provisions and general conditions of the contract of the original drawings and specifications. Modify the following items wherever appearing in any drawing or sections of the specifications. Acknowledge receipt of Addendum No. 6 in the space provided on the Bid Form. Failure to do so may subject bidder to disqualification.

• Please see attached drawing and files for:
  1. Bid Package #1 (Phase 2) – Pacific High School Pool Heaters - Revisions - Sheet M202
  2. Bid Package #1 (Phase 2) – Pacific High School Pool Heaters - Structural calculation for pool heaters’ supporting rack.

End of Addendum
**SureRack® Kit**

Stacking System for Hi Dets® Boilers

Models 9015-24020

**Features**

- Two boiler vertical stack
- No vent offset required
- Small footprint
- No support required
- Heavy duty construction

See installation manual 240782

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1. Remove existing pool heater control panel.
2. Disconnect existing control and wiring for new control panel connection.
3. Connections to provide auxiliary/cover for the new connection.

**Photo #5** - (E) BOILER CONTROL PANEL

**Photo #4** - (E) COLD WATER, GAS, ELEC. CONNECTIONS

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**BOILER SUERACK KIT AND ANCHORAGE**

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**GENERAL NOTES**

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**SUBJECT**

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**DRAWING NO.**

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**S.F.**

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**CONSTRUCTION-OWNER RESPONSIBILITY**

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**ARCHITECTURE & PLANNING**

---

**CONTRACTOR**

---

**S.F.**

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**ELEPHANT DESIGN GROUP**

---

**DRAWING TITLE**

---

**DISTRICT UNIFIED**

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**PROJECT**

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**CONTRACTOR**

---

**S.F.**

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**S.F.**

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**CONSTRUCTION-OWNER RESPONSIBILITY**

---

**ARCHITECTURE & PLANNING**

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**CONTRACTOR**

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**S.F.**

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**ELEPHANT DESIGN GROUP**

---

**DRAWING TITLE**

---

**DISTRICT UNIFIED**

---

**PROJECT**

---

**CONTRACTOR**

---

**S.F.**

---

**S.F.**

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Note(s):
1. Use 1/2" A-307 M.B. SW TYP. nut, min. 4" embedment, min. 6" edge distance, & min. 8" conc. thickness (4" thick HKP + 4" thick slab) in min. 3000 psi hardrock concrete. Install with hammer drill & carbide bit & set w/ HIT-RE 500-SD adhesive as per the ICC ESR-2322. Install with special inspection per the ICC-2322.
2. M.W. Saussé & Co. Inc. is not responsible for structural integrity of the equipment/unit when anchored as shown.
3. All hardware & materials to be supplied by others.
4. This design is only applicable for unit installed on grade.
5. Raypak surerack X-2 add-on not needed for installation.

M.W. Saussé & Co., Inc.
28744 WITHERSPoon Pkwy, VALENCIA, CA 91355
PHONE: (661) 257-3311 FAX: (661) 257-7673

Vibrex STEEL FRAME STAND

Job Name: PACIFIC HIGH SCHOOL POOL HEATER - SURERACK SUPPORT FRAME ANALYSIS
Cust: MAROKO & SHWE, INC.
Cust. P.O.: MECH. ENGR.: MARK: RAYPAK SURERACK SUPPORT FRAME

Revisions: DRN: FS ENG: FS
A: DATE: 2/12/19 DRAWING NO.: 63592-1
CALCULATIONS FOR RIGID ANCHORAGE; 2016 CBC & ASCE 7-10
CALCULATED WORST CASE: LOADING FOR (4) ANCHOR POINTS, (UNITS: LB & INCHES)
USING COMBINED LOAD EQUATIONS 16-9: U = 1.20 + 1.60 & 16-7: U = 0.80 + 1.00

HORIZONTAL SEISMIC FORCE:
15.3-2: \( F_{\text{h1}} = U \cdot 0.05 \cdot 0.05 \cdot W \) (MAX) = 2987.76
15.3-3: \( F_{\text{h2}} = 0.4 \cdot 0.05 \cdot 0.05 \cdot (U_{\text{h1}} + 2 \cdot U_{\text{h2}}) \cdot W \) (MIN) = 2987.76

CONTROLLING HORIZ SEISMIC FORCE: \( F_{\text{h1}} \) = 2987.76

OVERTURNING MOMENT: \( M = F_{\text{h1}} \cdot R_{\text{h1}} \) = 36210.68
VERTICAL SEISMIC FORCE: \( F_{\text{v}} = 0.25 \cdot W \) = 570.76
SPECTRAL RESPONSE ACCERN: \( R_{\text{h}} = 0.25 \cdot R_{\text{h1}} \) = 1.14
SPECTRAL RESPONSE ACCERN (FIG. 168(5)): \( R_{\text{s}} \) = 2.18
IMPORTANCE FACTOR: \( I_{\text{i}} \) = 1.00
COMPONENT AMPLIFICATION FACTOR: \( k_{\text{i}} \) = 1.00
COMP RESPONSE MODIFICATION FACTOR: \( k_{\text{c}} \) = 2.50
EQUIPMENT ELEVATION / ROOF ELEVATION: \( z_{\text{h}} \) = 0.00

EQUIPMENT STORED HEIGHT: \( W_{\text{h}} \) (lbs) = 15869.00
\( L_{\text{i}} \) = 43.50
\( B_{\text{i}} \) = 18.75
\( E_{\text{i}} \) = 4.30
\( E_{\text{v}} \) = 1.68

HEIGHT TO GROUND: \( H_{\text{g}} \) = 43.75
HEIGHT OF STAND: \( H_{\text{s}} \) = 21.88

\( \gamma \) (DIR. OF VERT-ORI. ANCHOR) \( \gamma = \tan(\theta) \) = 23.32
\( \alpha \) (DIR. OF VERT-ORI. ANCHOR) \( \alpha = \tan(\theta) \) = 23.32
\( \beta \) = \( 180 \)°
\( \theta \) (DIR. OF \( F_{\text{h1}} \) FOR MAX UPLIFT): \( \theta = (\L_{\text{h}} \cdot \gamma \cdot \beta) \) = 23.32

VERTICAL REACTIONS (WITH 0.80 or 1.20):
\( F_{\text{h1}} \) (ACTS IN MOST SENSITIVE DIRECTION):
\( R_{\text{h1}} \) (DUE TO OVERTURNING MOMENT) = 5301.68
\( R_{\text{v1}} \) (DUE TO ECCENTRICITY) = 38.80
\( R_{\text{s1}} \) (DUE TO VERTICAL LOADS) = 61.20
\( R_{\text{v2}} \) (DUE TO VERTICAL LOADS) = 57.35
\( R_{\text{v3}} \) (MAX DOWNWARD REACTION) = 2890.88
\( R_{\text{v4}} \) (MAX UPWARD REACTION) = 1220.00

HORIZONTAL REACTIONS:
\( V_{\text{h1}} \) (SHEAR DUE TO ECCENTRICITY) = 7.40
\( V_{\text{h2}} \) (DIRECT SHEAR) = 129.11
\( V_{\text{h3}} \) (TOTAL SHEAR/ANCH. POINT) = 146.05
\( V_{\text{h4}} \) (TOTAL SHEAR/ANCH. POINT) = 366.19

ANCHOR BOLTS:
SEE SHEET 0307-014 FOR ANCHOR BOLT DESIGN.

ANCHOR BOLT DIAMETER: \( d \) = 1/2
TYPE OF ANCHOR BOLT: CARBON STEEL HL1 HIT-RE 500 V3 ADHESIVE ANCHOR BOLT IN MIN.
5000 psi HACRECK CONCRETE; SEE THE FOLLOWING SHEETS FOR ANCHOR BOLT DESIGN AND
COMBINED LOADING CHECK.

FOR DESIGN OF THE VERTICAL MEMBERS/LEGS OF THE STAND:
\( F_{\text{v1}} \) = 1200.06
\( V_{\text{v1}} \) = 146.53

M. W. SAUSSE' & CO., INC.
PREPARED BY : P6
DATE : 11-Feb-19
SHEET NO : 63562-C1.0

JOE NAME: PACIFIC HIGH SCHOOL POOL HEATER - SUERACK SUPPORT FRAME ANALYSIS
CUST: MARIKO & SWAE, INC.
MECH. ENG: RAYPAK SUERACK SUPPORT FRAME

M. W. SAUSSE' & CO., INC.
PREPARED BY : P6
DATE : 11-Feb-19
SHEET NO : 63562-C1.0
CALCULATIONS FOR RIGID ANCHORAGE TO CONCRETE; 2015 IBC/2016 CBC & ASCE 7-10, LRFD
CALCULATES WORST CASE LOADING FOR (4) ANCHOR POINTS. (UNITS: LBS & INCHES)
USING COMBINED LOAD EQUATIONS 16-4, 16-5, 16-6, & 16-7
SEISMIC/WIND FORCES - CH 13, 26, & 20 OF ASCE 7

13.3-2: \( F_p = 1.0 \times (0.75 \times \frac{V_{S30}}{V_{S30,0}})^{0.5} \) \( \text{MPa} \) = 5694.49 lbs
13.3-1: \( F_p = \frac{Q_{0} \times A_{p} \times S_{a} \times (R_{p})}{(1.5 \times z_{h} \times W_p)} \) = 5688.49 lbs
13.3-3: \( F_p = 0.25 \times S_{a} \times \frac{W_p}{(z_{h} \times z_{h})} \) \( \text{MPa} \) = 1067.11 lbs

\( Q_{0} \) PER ASCH 7-10, NOTE C, TABLE 13-6-1 = 2.50
CONTROLLING HORIZ. SEISMIC FORCE: \( F_p \) = 1067.11 lbs

SEISMIC OVERTURNING MOMENT: \( M_{w} = F_p \times H_{w} \) = 23386.16 ft-lbf
VERTICAL SEISMIC FORCE: \( F_v = 0.25 \times M_{w} \) = 2247.72 lbs

SPECTRAL RESPONSE ACCELERATION FACTOR: \( S_{a} \) = 1.00
IMPORTANCE FACTOR: \( I \) = 1.00
COMPONENT AMPLIFICATION FACTOR: \( A_{p} \) = 1.00
COMP. RESPONSE MODIFICATION FACTOR: \( R_{p} \) = 2.50
EQUIPMENT ELEVATION / ROOF ELEVATION: \( z_{h} \) = 0.00
(WITH RESPECT TO GRADE)

EQUIPMENT WEIGHT & GEOMETRY
EQUIPMENT WEIGHT: \( W_p \) = 1225.00 lbs
\( L \) = 43.50 in
\( B \) = 12.75 in
\( E_v \) = 4.35 in
\( E_w \) = 3.90 in
HEIGHT TO COH: \( H_{w} \) = 21.88 in
NO. OF ANCHORS PER POINT (N) = 1.00

ANCHOR GROUP FORCES

\( b = 4\frac{3}{8} \) in
\( d = 4\frac{1}{8} \) in
\( \gamma \) (DIR. OF VRT-CRIT. ANCHOR): \( \tan^{-1}(E_v/E_w) \) = 22.32
\( \alpha \) (DIR. OF VERT-CRIT. ANCHOR): \( \tan^{-1}(E_v/E_w) \) = 22.32
\( \beta \) (DIR. OF F_p FOR MAX UPLIFT): \( \tan^{-1}(L_{h} / (E_v * E_w)) \) = 22.32

FROM SEISMIC LOADS (LOAD APPLIED TO CRITICAL ANGLE)

VERTICAL REACTIONS (WITH 1/2D OR 0.8D):
\( R_{u} \) (DUE TO OVERTURNING MOMENT) = 339.11 lbs
\( R_{max} \) (DUE TO ECCENTRICITY) = 87.74 lbs
\( R_{min} \) (DUE TO ECCENTRICITY) = 40.89 lbs

\( R_{max} \) (DUE TO VERTICAL LOADS) = 428.68 lbs
\( R_{min} \) (DUE TO VERTICAL LOADS) = 204.44 lbs

\( P_{max} \) (MAX DOWNWARD REACTION): \( R_{u} + R_{max} + R_{max} \) = 865.53 lbs
\( P_{min} \) (MAX UPLIFT/ANCH. POINT - IF POS.): \( R_{u} + R_{min} \) = 755.66 lbs
\( P_{min} \) (NO OVERTRENGTH): \( R_{u}/\gamma \) = 0.00 lbs

HORIZONTAL REACTIONS:
\( V_{uw} \) (SHEAR DUE TO ECCENTRICITY) = 26.69 lbs
\( V_{uw0} \) (DIRECT SHEAR) = 266.95 lbs
\( V_{uw} \) (TOTAL SHEAR/ANCH. POINT) = 283.82 lbs
\( V_{uw} \) (NO OVERTRENGTH) = 117.49 lbs

ANCHOR BOLT DIAMETER: \( \frac{1}{2} \)
TYPE OF ANCHOR BOLT: CARBON STEEL HILTI HIT-RE 500 VS ADHESIVE ANCHOR BOLT IN MIN. 3000 psi HARDROCK CONCRETE. SEE THE FOLLOWING SHEETS FOR ANCHOR BOLT DESIGN AND COMBINED LOADING CHECK.

M.W. SAUSSE & CO., INC.

<table>
<thead>
<tr>
<th>JOB NAME</th>
<th>PACIFIC HIGH SCHOOL POOL HEATER - SURERACK SUPPORT FRAME ANALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUST.</td>
<td>MAROKO &amp; SHIME, INC.</td>
</tr>
<tr>
<td>MECH. ENG.</td>
<td></td>
</tr>
<tr>
<td>MARK</td>
<td>RAYPAK SURERACK SUPPORT FRAME</td>
</tr>
</tbody>
</table>

PREPARED BY: F5
DATE: 1-2-Feb-19
SHEET NO.: 03592-C1.1
# COLUMN CHECK - 2016 CBC & ASCE 7-10 - LRFD DESIGN

## COLUMN HEIGHT AND FORCES

<table>
<thead>
<tr>
<th>From Sheet: 63592-C1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_u = V_{u,x} = 146.63$ lbf</td>
</tr>
<tr>
<td>$P_v = P_{ux} = 1200.064$ lbf</td>
</tr>
<tr>
<td>$H_{column} = 43.75$ in</td>
</tr>
</tbody>
</table>

## COLUMN PROPERTIES

**ANGLE 2-1/2 X 2-1/2 X 3/8**

- $K = 2.0$
- $r = 0.749$ in
- $A_o = 1.73$ in$^2$
- $Z_{xx} = 1.010$ in$^3$
- $I_{xx} = 0.972$ in$^4$
- $f_{y,steel} = 360000$ psi

## COLUMN CHECK

**DEMAND -**

- $P_v = P_u = 1200$ lbf
- $M_v = P_u * H_{column} = 6411$ lbf-in

**CAPACITY -**

- $K(H_{column})/r = 117$
- $0.9F_p = 38300$ psi
- $P_n = 0.9A_o * F_p = 66259$ lbf
- $M_n = f_{y,steel} / Z_{xx} = 32724$ lbf

**COMBINED LOAD CHECK -**

- $1.02P_u M_v / P_n M_n = 0.21$ OK

## CHECK DEFLECTIONS

**COLUMN -**

- $\Delta_{xx} = H_{column}/180 = 0.243$ in
- $\Delta_{column} = \frac{P_u * I_{xx}}{3E_{steel}} = 0.145$ DEFLECTION OK

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*USE 2-1/2 X 2-1/2 X 3/8" ANGLE FOR STAND LEGS.*

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**JOB NAME:** PACIFIC HIGH SCHOOL POOL HEATER - SURERACK SUPPORT FRAME ANALYSIS  
**CUSTOMER:** MAROKO & SHWE, INC.  
**MECH. ENG:**  
**MARK:** RAYPAK SURERACK SUPPORT FRAME  
**PREPARED BY:** FS  
**DATE:** 11-Feb-19  
**SHEET NO:** 63592-C1.2
ANCHOR BOLT FORCE CALCULATION FOR CUSTOM RML5 BASEPLATE LAYOUT

ISOILATER FORCES AND DIMENSIONS

<table>
<thead>
<tr>
<th>MOUNTING HOLE</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2.00</td>
<td>5.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3.00</td>
<td>5.00</td>
<td>5.00</td>
</tr>
<tr>
<td>4.00</td>
<td>0.00</td>
<td>5.00</td>
</tr>
<tr>
<td>#N/A</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>#N/A</td>
<td>0.00</td>
<td>0.00</td>
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<td>#N/A</td>
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</tr>
<tr>
<td>#N/A</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

PLATE FORCES SHEET 63592-C1.0 THRU C1.2 (W/ \( \Omega_2 \))

\( V_u \) (UPPER + LOWER UNITE) = 648.81
\( P_u \) (UPPER + LOWER UNITE) = 1296.88
\( V_l \) (UPPER + LOWER UNITE) = 0.00
\( M_1 \) = 0.00
\( M_2 \) = 0.00
\( M_3 \) = 16026.33
\( N \) # OF MOUNTING HOLES IN BASEPLATE = 4

X       Y
BOLT PATTERN DIM      5.00  5.00
LOADING CENTER #     0.56  0.56
CTR. OF RIGIDITY:     2.50  2.50
MOM. OF INERTIA:     25.00 25.00

VERTICAL REACTIONS:

\( T_1 = M_1 * \left[ \left( \frac{a_1}{b_1} \right)^2 * \cos(\theta) \right] + \left( \frac{a_1}{h_1} \right) * \sin(\theta) \right) = 0.00 \) DUE TO MOMENT, \( M_1 \)
\( T_2 = M_2 * \left[ \left( \frac{a_2}{b_2} \right)^2 * \cos(\theta) \right] + \left( \frac{a_2}{h_2} \right) * \sin(\theta) \right) = 250.78 \) DUE TO MOMENT, \( M_2 \)
\( T_3 = P_1 / h = 325.97 \) DUE TO UPLIFT, \( P_u \)
\( T_4 = P_1 * \left( \frac{a_1}{b_1} \right) / \left( \frac{a_2}{b_2} \right) \) = 491.4 \) DUE TO ECCENTRICITY, \( P_v \)
\( T_{\text{total}} = T_1 + T_2 + T_3 + T_4 = 1045.80 \) TOTAL TENSION / BOLT

HORIZONTAL REACTIONS:

\( V_1 = V_1 / h = 162.20 \) DIRECT SHEAR, \( V_x \)
\( V_2 = V_2 / h = 0.00 \) DIRECT SHEAR, \( V_x \)
\( V_3 = V_3 * \left[ \left( \frac{a_1}{b_1} \right)^2 + \left( \frac{a_2}{b_2} \right)^2 \right] ^{1/2} / \left( \frac{a_1}{b_1} \right) = 123.97 \) SHEAR DUE TO ECCENTRICITY, \( V_x \)
\( V_4 = V_4 * \left[ \left( \frac{a_1}{b_1} \right)^2 + \left( \frac{a_2}{b_2} \right)^2 \right] ^{1/2} / \left( \frac{a_1}{b_1} \right) = 0.00 \) SHEAR DUE TO ECCENTRICITY, \( V_x \)
\( V_5 = M_1 / \left( b_1 \right) \) = 0.00 \) SHEAR DUE TO ROTATION, \( M_1 \)
\( V_{\text{total}} = V_1 + V_2 + V_3 + V_4 \) = 204.15 TOTAL SHEAR / BOLT

BASEPLATE PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>2.5</td>
</tr>
<tr>
<td>W</td>
<td>5</td>
</tr>
<tr>
<td>c</td>
<td>0.25</td>
</tr>
<tr>
<td>f</td>
<td>360000</td>
</tr>
</tbody>
</table>

PLATE CHECK

\( a = 4.62 \) in \( \bar{e} \)
\( e = 3882.37 \) lb-in
\( Z_{\text{plate}} = W_{\text{plate}} \) in
\( M_{\text{plate}} = 0.95 \) lb-in \( \bar{e} \) OK

WELD FRAME BASE TO MIN. 8X8X1/4" ASD STEEL BASEPLATE WITH 3/16" FILLET WELDS MIN. (WELDS OK PER INSPECTION). SEE THE FOLLOWING SHEETS FOR ANCHOR BOLT DESIGN.

JOB NAME: PACIFIC HIGH SCHOOL POOL HEATER - SURERACK SUPPORT FRAME ANALYSIS
CUST: MAROKO & SHWE, INC.
MECH. ENG.: KAYS
MARK: RAYPAK SURERACK SUPPORT FRAME

M. W. SAUSSER & CO., INC.
PREPARED BY: F6
DATE: 11-Feb-19
SHEET NO.: 63592-C1.3
HILTI HIT-RE 500 1/2 ADHESIVE ANCHORS IN CONCRETE
(U.S. CUSTOMARY UNITS, ESR-3814 (REISSUED JANUARY '17) AND ACI-318 CHAPTER 17)

ANCHOR SPECIFICATIONS/PARAMETERS

ANCHOR TYPE: THREADED ROD
STEEL TYPE: CARBON
GRADE: A 30 GR. B 77
DIAMETER (d_a) = 0.5 in
n = 4 (NUMBER OF BOLTS PER ANCHOR POINT)
TEMPERATURE RANGE: A (A MAX LONG TERM TEMP = 110°F, SHORT TERM = 150°F; B MAX LONG TERM TEMP = 110°F, SHORT TERM = 176°F, NOTE 2, TABLE 8 OF ESR)
SEISMIC CONDITION: YE9

STEEL STRENGTH (TENSION AND SHEAR)

\[ \Phi_{sd} = \frac{0.75}{(\text{TABLE 6 OF ESR})} \]
\[ \Phi_{sv} = \frac{2.65}{(\text{TABLE 6 OF ESR})} \]
\[ \lambda_{sd} = 0.141 \text{ in} \] (TABLE 6 FROM ESR)
\[ N_{esd} = 17739 \text{ lbs (TABLE 6 FROM ESR)} \]
\[ V_{esd} = 10640 \text{ lbs (TABLE 6 FROM ESR)} \]
\[ N_{esd}V_{esd} \Phi_{sd} = 133013 \text{ lbs (ACI 318, Table 7.4.1.2) = DESIGN STEEL TENSION STRENGTH} \]
\[ N_{esd}V_{esd} \Phi_{sv} = 6916 \text{ lbs (ACI 318, Table 7.4.1.2) = DESIGN STEEL SHEAR STRENGTH} \]

CONCRETE

BREAKOUT TENSION

\[ h_{ac} = 5.20 \text{ in (MIN. CONCRETE THICKNESS, TABLE 7 OF ESR)} \]
\[ S_{ac} = 2.5 \text{ in (MIN. ANCHORAGE SPACING, TABLE 7 OF ESR)} \]
\[ C_{ac} = 2.5 \text{ in (MIN. ALLOWABLE EDGE DISTANCE, TABLE 7 OF ESR)} \]
\[ Y_{ac} = 2.375 \text{ in (MIN. ALLOWABLE EFFECTIVE EMBEDMENT, TABLE 7 OF ESR)} \]
\[ h_{ac} = 10 \text{ in (MAX. ALLOWABLE EFFECTIVE EMBEDMENT, TABLE 7 OF ESR)} \]
\[ b = 4 \text{ in (CHOSSEN EFFECTIVE EMBED, USE AT LEAST } h_{ac}, \text{ FROM ABOVE)} \]
\[ b = 8 \text{ in (MEMBER THICKNESS, IF UNKNOWN USE } h_{ac} \text{, TABLE 7 IN ESR)} \]

FOR CRITICAL EDGE DISTANCE FROM SECTION 4.1.10......

\[ C_{ac} \text{ MIN } C_{ac} \text{ MAX } \frac{[3.1-0.7 \sqrt{0.2}]h_{ac}}{14} \]
\[ h_{ac} = 7.87 \text{ in} \]
\[ \text{ GIVEN } h_{ac} = 10737.7 \text{ psi, WHERE } C_{ac} \text{ MIN } C_{ac} \text{ MAX } \frac{[3.1-0.7 \sqrt{0.2}]h_{ac}}{14} \]

\[ C_{ac} = 6 \text{ in (USE AT LEAST } C_{ac} \text{)} \]
\[ C_{ac} = 6 \text{ in (USE AT LEAST } C_{ac} \text{)} \]
\[ C_{ac} = 9 \text{ in (USE AT LEAST } C_{ac} \text{)} \]
\[ C_{ac} = 9 \text{ in (USE AT LEAST } C_{ac} \text{)} \]
\[ C_{ac} = 9 \text{ in (USE AT LEAST } C_{ac} \text{)} \]
\[ C_{ac} = 9 \text{ in (USE AT LEAST MIN. SPACING, ESR TABLE 7, USE 0 IF n=1)} \]
\[ S_{ac} = 9 \text{ in (USE AT LEAST MIN. SPACING, ESR TABLE 7, USE 0 IF n=1)} \]
\[ V_{ac} = 3000 \text{ psi (CONCRETE STRENGTH)} \]

HARDROCK CONCRETE

\[ \lambda_{ac} = 1.00 \text{ (ACI 318, 17.2.6)} \]

CRACKED CONCRETE CONDITION

\[ h_{ac, \text{CHECK}} = h_{ac} \text{ } \begin{cases} 
4 \text{ in (IF 3 OR MORE EDGES ARE LESS THAN 1.5} h_{ac}, \text{ 17.4.2.5 OF THE ACI 318)} \\
17 \text{ in} 
\end{cases} \]

\[ \psi_{\text{MAX}} = \begin{cases} 
1 \text{ (AC 17.4.2.4.1, 10 WHEN NO LOAD ECCENTRICITY)} \\
1 \text{ (AC 17.4.2.4.1, 10 WITH CRACKING AT SERVICE LEVELS)} 
\end{cases} \]

\[ \psi_{\text{MAX}} = 0.60 \text{ (TENSION CONCRETE BREAKOUT STRENGTH REDUCTION, TABLE 7)} \]

\[ \psi_{\text{MAX}} = 0.60 \text{ (TENSION CONCRETE BREAKOUT STRENGTH REDUCTION, TABLE 7)} \]

\[ S_{ac} \text{ MAX } = \psi_{\text{MAX}} C_{ac} \text{ MAX } \frac{[3.1-0.7 \sqrt{0.2}]h_{ac}}{14} \]

\[ S_{ac} \text{ MAX } = 7449.06 \text{ in} \]

\[ N_{ac} = \psi_{\text{MAX}} C_{ac} \text{ MAX } \frac{[3.1-0.7 \sqrt{0.2}]h_{ac}}{14} \]

\[ N_{ac} = 0 \text{ (MORE THAN ONE ANCHOR)} \]

\[ N_{ac} = 0 \text{ (MORE THAN ONE ANCHOR)} \]

\[ \Phi_{sd} = 185.15 \text{ lbs (DESIGN CONCRETE BREAKOUT STRENGTH IN TENSION)} \]

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JOB NAME: PACIFIC HIGH SCHOOL POOL HEATER - BURGERACK SUPPORT FRAME ANALYSIS
CUST: MARUKO & SIME, INC.
MECH. ENG: RAYPAK BURGERACK SUPPORT FRAME

M. W. SAUSSE & CO., INC.
PREPARED BY: FB
DATE: 11-Feb-19
SHEET NO: 635620-C1.4
CHECK SIDE-FACE BLOWOUT

\[ A_{\text{blow}} = 0.0148 \text{ in}^2 \] (BREAKING AREA OF CONCRETE AT ANCHOR BOTTOM, UBL: \( A_{\text{blow}} \) TO BE CONSERVATIVE)

FOR SINGLE ANCHORS -

CHECK \( C_{\text{blow}} \rightarrow C_{\text{blow}} \times 5C_{\text{blow}} \rightarrow 6 < 18 \)

REDUCTION FACTOR FROM \( C_{\text{blow}} \rightarrow \frac{1 + \frac{C_{\text{blow}}}{C_{\text{blow}}}}{4} = 0.6 \rightarrow \) WHERE \( 1.0 \leq \frac{C_{\text{blow}}}{C_{\text{blow}}} < 3.0 \) \( \rightarrow \) TRUE

\[ N_{\text{blow}} = 160C_{\text{blow}}\sqrt{A_{\text{blow}}} \sqrt{T_c} \rightarrow 19800.2 \text{ lbs} \rightarrow \text{REDUCED VALUE} = 9900.1 \text{ lbs (ACI 318-17,4.4.1)} \]

FOR MULTIPLE ANCHORS (GROUPS) -

CHECK BOLT SPACING \( \rightarrow 5 < 6C_{\text{blow}} \rightarrow 5 < 56 \)

\[ N_{\text{shear}} = \left( 1 + \frac{S}{6C_{\text{blow}}} \right) N_{\text{blow}} = 22560.2 \text{ lbs} \] (ACI 318-17,4.4.2)

\( \Phi_n \cdot N_{\text{shear}} = 14657.7 \text{ lbs} \rightarrow \) CONCRETE SIDE-FACE BLOWOUT STRENGTH

SHEAR STRENGTH

\( A_0 = 0.5 \text{ in}^2 \) (OUTSIDE DIAMETER OF ANCHOR BOLT OR ROD)

\( C_0 = 6 \text{ in} \) (FROM PREVIOUS PAGE OF CALCULATIONS)

\( C_p = 6 \text{ in} \) (FROM PREVIOUS PAGE OF CALCULATIONS)

\( C_p = 9 \text{ in} \) (FROM PREVIOUS PAGE OF CALCULATIONS)

\( S_p = 5 \text{ in} \) (FROM PREVIOUS PAGE OF CALCULATIONS)

\( S = 4 \text{ in} \) (TYPICALLY = \( T_c \), NO MORE THAN \( 4\alpha \), ACI 318 SECTION 17.5,2.2)

\( \Psi_{p,A} = 1 \) (ACI 17.6.2.5, 1.0 WHEN NO LOAD ECCENTRICITY)

\( h = 8 \text{ in} \) (THICKNESS OF CONCRETE MEMBER)

\( \Phi_{p,n} = 0.70 \) (SHEAR CONCRETE BLOWOUT STRENGTH REDUCTION; ACI 318 & EER TABLE 9 OR 24)

\( \Psi_{p,A} = 1.2 \) (LO FOR CONG, WO REINFORCEMENT, 1.2 FOR CONG, W REINFORCEMENT, 1.4 SEE 17.5.2.7 OF ACI)

\( n_{A0} = 2 \) (NO. OF ANCHORS IN ROW CLOSEST TO EDGE OF CONCRETE)

\( C_{\text{blow}} = 6.00 \text{ in} \) (\( C_{\text{blow}} \) ADJUSTED WHEN \( C_{\text{blow}} \) & \( C_{\text{blow}} \) ARE LESS THAN \( 1.5C_{\text{blow}} \), 17.5.2.4)

\( H = \min(0.055C_{\text{blow}}) = 8 \text{ in} \)

\( B = \min(C_{\text{blow}} \times 15C_{\text{blow}}) + S_p + \min(C_{\text{blow}} \times 15C_{\text{blow}}) = 22,000 \text{ in} \)

\( \lambda_{A0} = \frac{B}{H} = \frac{180.0}{6} \rightarrow \text{(REFER TO ACI 318 17.5.2.1 AND 17.5.2.2)} \)

\( \lambda_{A0} = \frac{\lambda_{A0}}{\lambda_{A0} - 0.70 \times C_{\text{blow}} \times 15C_{\text{blow}}} = 1.0 \) (\( \lambda_{A0} \) FROM ACI 318 SECTION 17.5.2.8)

\( \Psi_{p,A} = 0.70 \times 0.70 \times C_{\text{blow}} \times 15C_{\text{blow}} \rightarrow 0.005 \) (IF \( \lambda_{A0} \leq 1.0 \), THEN = 1.0, ACI 318 17.5.2.6)

\[ V_n = \begin{cases} \frac{\lambda_{A0} \Psi_{p,A} C_{\text{blow}} S_p}{\lambda_{A0} - 0.70 \times C_{\text{blow}} \times 15C_{\text{blow}}} = 6039.3 \text{ OR} & V_n = 0.60393 \text{ lbs} \\ \Phi_{p,n} V_n = 1.0 \text{ (MORE THAN ONE ANCHOR)} & \text{VALUES ARE IN POUNDS} \end{cases} \]

\( \Phi_{p,n} V_n = 2281.45 \text{ lbs} \rightarrow \) DESIGN SHEAR CONCRETE STRENGTH

EPOXY BOND STRENGTH (PULLOUT)

PULLOUT STRENGTH

\( \tau_{c} = 1505.2 \text{ psi} \) (CHARACTERISTIC BOND STRENGTH, EER TABLE 9 & 11 & NOTE 11)

\( \tau_{n} = 254.5 \text{ psi} \) (CHARACTERISTIC BOND STRENGTH, EER TABLE 9 & 11 & NOTE 11)

\( S = 0.5 \text{ in} \) (STEEL ANCHOR DIAMETER)

\( \lambda_{A0} = 1 \) (LOAD ECCENTRICITY FACTOR, SEE EER 17.4.5.3 ACI 318)

\( \Phi_{p,A} = 0.69 \) (EPOXY BOND STRENGTH REDUCTION, EER TABLE 9 & 11)

\( \tau_{\text{max}} = 0.93 \) (TABLES 9 & 11 OF EER)

\( \lambda_{\text{max}} = 1.00 \) (ACI 318, 17.2.6)

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JOB NAME: PACIFIC HIGH SCHOOL, POOL HEATER - RACK SUPPORT FRAME ANALYSIS

CUST.: MAROKO & SHIHE, INC.

MECH. ENG.: M. W. SAUSSE & CO., INC.

PREPARED BY: PS

DATE: 11-29-19

MARK: RAYPAK RACK SUPPORT FRAME

SHEET NO.: 05992-C1.0
\[ C_{nv} = 104(t_{C_nv} + 100)^{0.5} = 7.30 \text{ in (CRITICAL EDGE DISTANCE; ACI 318-11, EQ. 17.4.6.1)} \]

\[ \text{SIDE}_{1} = \min(C_{nv1}, C_{nv2}) + 5 + \min(C_{nv1}, C_{nv2}) = 18.30 \text{ in} \]

\[ \text{SIDE}_{2} = \min(C_{nv1}, C_{nv2}) + 5 + \min(C_{nv1}, C_{nv2}) = 18.30 \text{ in} \]

\[ \lambda_{nv1} = \text{SIDE}_{1} \times \text{SIDE}_{2} = 334.75 \text{ in}^2 \text{ (PROJECTED FAILURE SURFACE AREA, ESR SECTION 4.1.4, ACI 318-11, EQ. 17.4.5.3)} \]

\[ \lambda_{nv0} = n^2 \left( \frac{C_{nv0}}{C_{nv1}} \right)^2 = 364.75 \text{ in}^2 \text{ (PROJECTED FAILURE SURFACE AREA OF SINGLE ANCHOR WITHOUT INFLUENCE FROM BRIEFCASE SECTION 4.1.4, ACI 318-11, EQ. 17.4.5.1)} \]

\[ \Psi_{nv1} = 0.7 + 0.3 \frac{C_{nv1}}{C_{nv2}} \]

\[ \Psi_{nv0} = C_{nv0} \]

\[ N_{uv} = \lambda_{nv0} \Psi_{nv0} \Psi_{nv1} N_{u} = \frac{1.0}{\Psi_{nv1}} \text{ psi (ESR SECTION 4.1.4, EQ. 17.4.5.2)} \]

\[ N_{u} = \Lambda_{uv} \Psi_{nv1} \Psi_{nv0} N_{u} = \frac{3081.29}{(\text{VALUES ARE IN POUNDS})} \]

\[ \alpha_{uv} \Psi_{nv0} N_{u} = 1844.8 \text{ lbf \rightarrow DESIGN EPOXY BOND (PULLOUT) STRENGTH} \]

Preload from shear strength (ESR SECTION 4.1.2)

\[ V_{sp} = N_{u} = 1844.8 \text{ lbf} \]

Controlling strength for anchorage

Tensile strength -

<table>
<thead>
<tr>
<th>STEEL</th>
<th>13901.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONCRETE</td>
<td>1551.1</td>
</tr>
</tbody>
</table>

Epoxy bond -

1844.8 \text{ psi \rightarrow CONTROLLING STRENGTH} \]

Shear strength -

<table>
<thead>
<tr>
<th>STEEL</th>
<th>6916</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONCRETE</td>
<td>2391.4</td>
</tr>
</tbody>
</table>

Pullout strength -

5689.01 \text{ lbf} \]

For ASD adjustment factors and allowable loads

\[ \alpha = 1.00 \text{ (ASD CONVERSION FACTOR, IF APPLICABLE)} \]

Seismic tension factor \( (T_{seismic}) \)

0.76 \text{ (PER SECTION 17.2.3.4.4, REDUCE TO 0.75 FOR SEISMIC DESIGN TENSION WHEN CONCRETE CONTROLS)}

Dead load tension factor \( (T_{dead}) \)

0.75 \text{ WHEN ANCHOR IS UNDER SUSTAINED DEAD LOAD TENSION, SECTION 4.1.1 OF ESR)}

\[ T_{seismic} = N_{u} \cdot T_{dead} / \alpha \]

\[ V_{sp} = N_{u} \cdot T_{dead} / \alpha \]

Given bolt forces from shear:

63592-C1.3

Input here \[ V_{sp} = 5689.01 \text{ lbf} \]

Check combined loading (ACI 318-11, EQ. 17.6.2)

\[ \frac{T_{seismic} + V_{sp}}{T_{dead} + V_{sp}} = 0.94 \leq 1.2 \text{ ANCHOR OK} \]

Anchorage Summary:

1/2 in DIAMETER ASTM A 193 Gr 87 CARBON STEEL THREADROD W/ A 194 NUT,
4 in MIN. EMBEDMENT,
6 in MIN. EDGE DISTANCE,
8 in MIN. CONCRETE THICKNESS
3000 psi HARDROCK CONCRETE.
INSTALL IN CONCRETE WITH A HAMMER DRILL AND CARBIDE BIT AND SET WITH HILTI HIT-KE 500 V2 ADHESIVE AS PER THE ICC ESR-3614.
SPECIAL INSPECTION REQUIRED PER SECTION 4.4 OF THE ESR-3614.

Job Name: PACIFIC HIGH SCHOOL POOL HEATER - BURGERACK SUPPORT FRAME ANALYSIS

Cust.: MARX & SHWE, INC.

Mech. Eng.: RAYPAK BURGERACK SUPPORT FRAME

Prepared By: M. W. SAUSSE & CO., INC.

Date: 11-Feb-19

Sheet No.: 63592-C1.3