MEMORANDUM

TO:	Erik Voris Conrad Romano Architects 514 28th Avenue East Seattle, WA 98112
FROM:	Jim Harriott Kathy Warner Jack Hupp
DATE:	05/26/21
PAGES:	(14) incl. cover
RE:	Vanderwall Residence Remodel, City of Mercer Island Permit Number: 2101-202

Erik:

This memo summarizes my responses to the various structural items shown on the City of Mercer Island Corrections Notice dated May 6, 2021.

Sheet	Comment and Response
S2.0	1) *Please indicate how the now foundation wall and grade beam are attached to the existing structure.* Foundation Note 1 outlines doweling requirements. Plan callout has been added for clarification.
S2.0	2) *Do these holdowns include the reactions from the holdown transfer beams above? Where holdowns don't align with holdowns above (i.e. at ends of holdown transfer beams), detail and provide supporting calculations as necessary to resolve additional holdown load into adjacent holdowns. Alternatively, provide continuity for holdowns to foundation.* See **Attachment A** calculations for verification of holdown strap capacity including dead load resistance.
S2.1	1) *Provide support for stringers at base of stairs.* Detail has been added to show connection to slab at base of stairs.
S2.1	2) *Please provide detail through partial height wall. Are studs continuous? Are the braced to the stair diaphragm?* Detail has been added to show wall bracing at stairs and landing

S2.1 3) *Provide complete load path to foundation as necessary to fully resolve uplift reactions at the ends of all holdown transfer beams.*

Straps and related details have been added to S2.1 to communicate uplift reactions to jambs at the lower level. Additionally, another foundation strap has been added to S2.0 at the south end.

S2.1 4) *Provide complete load path to foundation as necessary to fully resolve uplift reactions at the ends of all holdown transfer beams. Provide hanger capable of resolving uplift force.*

See **Attachment B** calculations for verification of holdown strap capacity including dead load resistance.

S2.1 5) *Please include existing roof wind load in the lateral design or demonstrate additional load is not critical.*

Wind loads to the roof were included on Page 52 of the calculations and are demonstrated to be less than or approximately equal to seismic loads. Due to the weight of the deck pavers, the lower level was purely seismic controlled.

S2.1 6) *Indicate how interconnectedness between portions of the structure (deck and house) is be provided.*

Details 7, 8 and 12 on S3.0 show various conditions where the deck and house structure interface.

S2.1 7) *Provide lateral connection at deck as required by IRC Section R507.2.4 and as required to resolve rotational forces.*

Post in southwest corner was changed to a steel HSS cantilevered column. This provides an additional resisting line.

S2.2 1) *Please clarify construction this area. What are the existing rafters? Are they notched? What is the minimum backspan?*

Notes have been changed to clarify framing intent.

S2.2 2) *This doesn't appear to structurally sound. Please provide calculations and detailing demonstrating capacity of roof framing to resolve forces, including uplift.*

Notes have been changed to clarify framing intent.

S2.3 1) *Please review anchor design. Shouldn't applied moment be My, not Mz?*

See **Attachment C** calculations showing applied moment in correct direction.

S2.3 *2) Please indicate how eccentricity is resolved.*

Wall above is partial height with negligible loading, eccentricity is not expected to be an issue.

S3.0 *1) Indicate maximum overhang. Please confirm capacity of LVL outrigger connection to resolve load into roof rafters.*

LVL outrigger is designed as member R9 in calculations. Max uplift is 370lbs at backspan. Detail has been modified to indicate maximum overhang and connection with SDS screws (allowable load = 340lbs).

S3.0 *2) Provide wind uplift connections, typical.*

Details have been revised to include H2.5A hurricane ties.

S3.0 *3) Is this connection capable of resolving uplift?*

Detail has been revised to show hanger per schedule in lieu of A35.

S3.0 *4) At 24" o.c. elsewhere?*

Detail has been revised to indicate spacing of 16”oc elsewhere.

S3.1 *1) Indicate how the strap is attached to the post cap.*

Detail has been revised to show weld applied to strap.

S3.1 *2) Indicate maximum height of stanchion and spacing requirements.*

Detail has been revised to indicate max height and spacing of stanchions.

S4.0 *1) Provide uplift continuity to foundation or provide justifying calculations.*

Straps and related details have been added to S2.1 to communicate uplift reactions to jambs at the lower level. Reactions at ends of transfer beams are communicated through hangers into the ledger and SDS screws into the double top plate and headers.

S4.0 *2) Note full depth and width blocking at all holdown and concentrated loads.*

Detail has been revised to include solid blocking callout.

I trust this summarizes the issues adequately.

Sincerely,

James A. Harriott, P.E.

Attachment A

Structural Calculations for Correction Notice Item 2 for S2.0 and 4 for S2.1)

1932 First Avenue, Suite 720
Seattle, Washington 98101-2447
tel 206 624 4760 | fax 447 6971

DRAWING S2.0 / COMMENT 2 (ALSO S2.1 / COMMENT 4)

TRANSFER LOAD REACTION ('FORTE BEAM D4)

T/C = (ΩE = 5714#) / 2.5 = 2286# (1.0E)

HUCQ HANGER PER SCHEDULE

OK

TOTAL UPLIFT TO HD STRAPS AT DOOR JAMBS / END OF WALL

Vu = 3735 (per calc) / .7 = 5335#
sidestrap (ASD)

+ TRANSFER = 2286#

= 7622# gross (1.0E)

DL AT "REPLACE HDR" IN 'FORTE

= 1964#

NET V = 7622# − .9(1964#) = 5854#

SIMPSON ANCHOR DESIGNER

Vcap = 6565# CONTROLLING – OK ✓

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VANDERWALL Project

Date

Page ___ of ___

Attachment B

Structural Calculations for Correction Notice Item 3 for S2.1)

DRAWING S2.1 / COMMENT 3

NET Tu (ASD) AT WALL INTERSECTION

Tgross = 1880# (calc pg 50)

DL RESIST FROM INTERSECTN ROOF/BEAMS:

RAFTERS E/W OVER S.W. - (2' TRIB × 8' SPAN + OH) × 15 PSF = 240#

SOFFIT / HEADER BEAMS
SUPPORTING RAFTERS N/S

11' TRIB × 4' SPAN TRIB × 15 PSF = 660#

Tnet = 1880# - .6(240+660) = 1340#
net uplift

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Attachment C

Structural Calculations for Correction Notice Item 1 for S2.3)

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

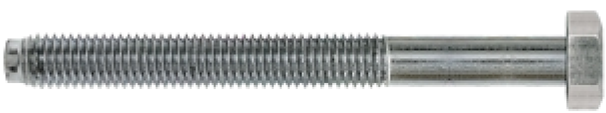
General
Design method:ACI 318-11
Units: Imperial units

Anchor Information:
Anchor type: Cast-in-place
Material: F1554 Grade 36
Diameter (inch): 0.750
Effective Embedment depth, h_{ef} (inch): 8.000
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 9.50
C_{min} (inch): 1.22
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 12.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Yes
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 11.00 x 11.00 x 0.50

Recommended Anchor
Anchor Name: Heavy Hex Bolt - 3/4"Ø Heavy Hex Bolt, F1554 Gr. 36

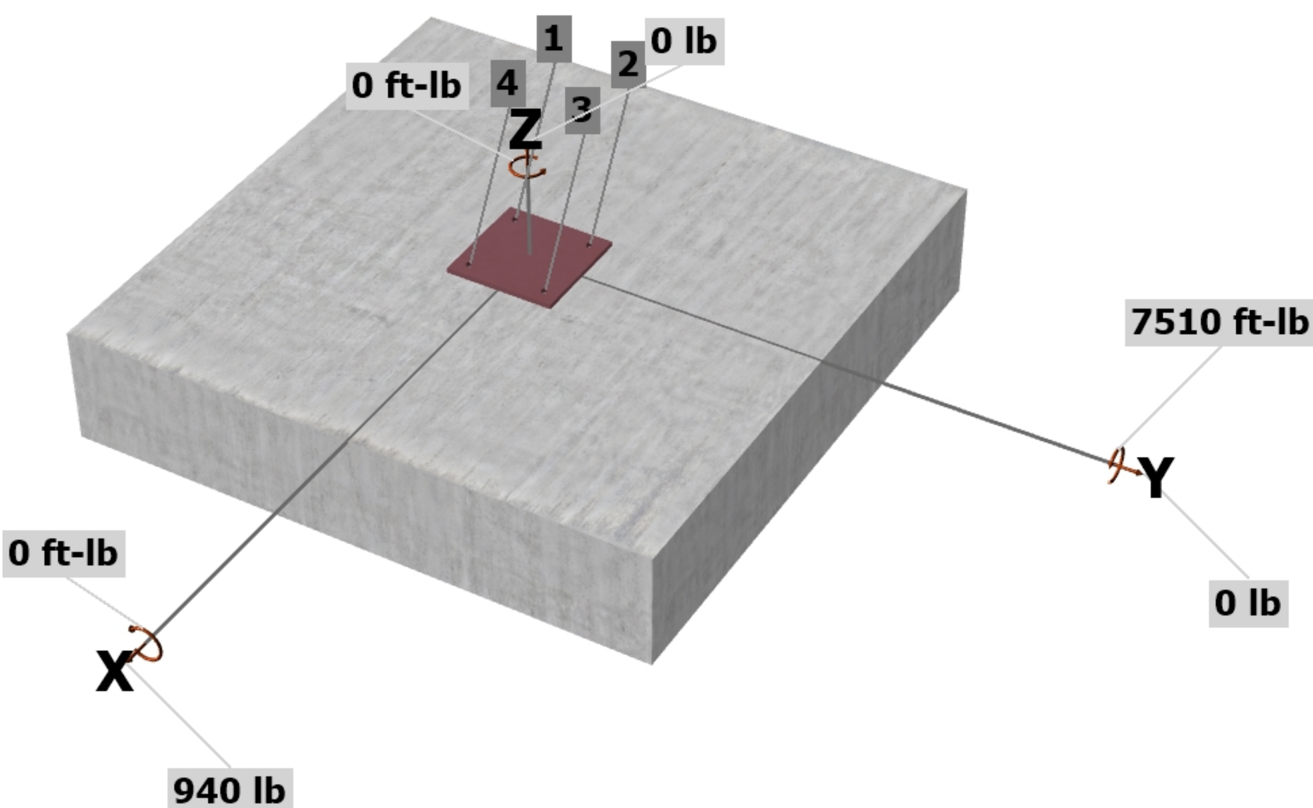


Load and Geometry
Load factor source: ACI 318 Section 9.2
Load combination: not set
Seismic design: Yes
Anchors subjected to sustained tension: Not applicable
Ductility section for tension: D.3.3.4.3 (c) is satisfied
Ductility section for shear: D.3.3.5.3 (b) is satisfied
Ω_0 factor: not set
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

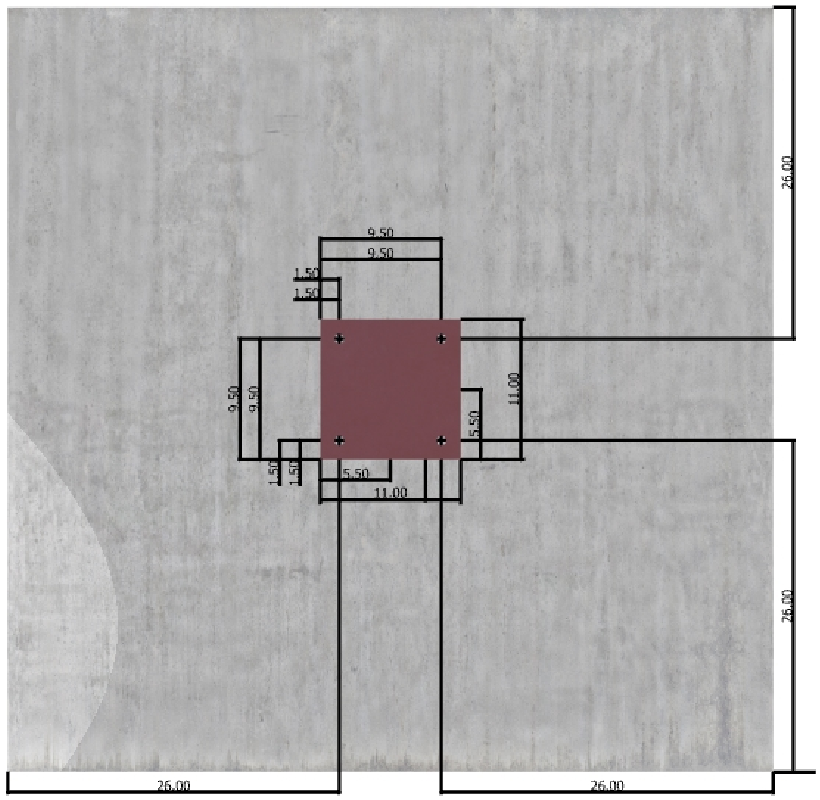
Strength level loads:

N_{ua} [lb]: 0
V_{uax} [lb]: 940
V_{uay} [lb]: 0
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 7510
M_{uz} [ft-lb]: 0

<Figure 1>



<Figure 2>

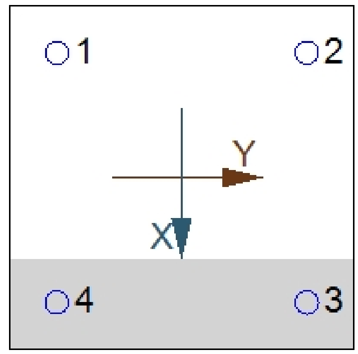

9.50
9.50
1.50
1.50
26.00
9.50
9.50
11.00
5.50
1.50
1.50
5.50
11.00
26.00
26.00
26.00

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	5272.8	235.0	0.0	235.0
2	5272.8	235.0	0.0	235.0
3	0.0	235.0	0.0	235.0
4	0.0	235.0	0.0	235.0
Sum	10545.6	940.0	0.0	940.0

Maximum concrete compression strain (‰): 0.15
Maximum concrete compression stress (psi): 670
Resultant tension force (lb): 10546
Resultant compression force (lb): 10546
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. D.5.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
19370	0.75	14528

5. Concrete Breakout Strength of Anchor in Tension (Sec. D.5.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. D-6)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
24.0	1.00	2500	8.000	27153

$0.75\phi N_{cbg} = 0.75\phi\,(A_{Nc}/A_{Nco})\,\Psi_{ec,N}\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b$ (Sec. D.4.1 & Eq. D-4)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	$0.75\phi N_{cbg}$ (lb)
768.00	576.00	26.00	1.000	1.000	1.00	1.000	27153	0.70	19007

6. Pullout Strength of Anchor in Tension (Sec. D.5.3)

$0.75\phi N_{pn} = 0.75\phi\Psi_{c,P}N_p = 0.75\phi\Psi_{c,P}8A_{brg}f'_c$ (Sec. D.4.1, Eq. D-13 & D-14)

$\Psi_{c,P}$	A_{brg} (in^2)	f'_c (psi)	ϕ	$0.75\phi N_{pn}$ (lb)
1.0	0.91	2500	0.70	9566

8. Steel Strength of Anchor in Shear (Sec. D.6.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
11625	1.0	0.65	7556

9. Concrete Breakout Strength of Anchor in Shear (Sec. D.6.2)

Shear perpendicular to edge in x-direction:

$V_{bx} = \min|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5};\ 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}|$ (Eq. D-33 & Eq. D-34)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
6.00	0.750	1.00	2500	17.33	32474

$\phi V_{cbgx} = \phi\ (A_{Vc} / A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. D.4.1 & Eq. D-31)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgx} (lb)
720.00	1352.00	1.000	1.000	1.000	1.472	32474	0.70	17819

Shear parallel to edge in y-direction:

$V_{bx} = \min|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5};\ 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}|$ (Eq. D-33 & Eq. D-34)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
6.00	0.750	1.00	2500	17.33	32474

$\phi V_{cbgy} = \phi\ (2)(A_{Vc} / A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. D.4.1 & Eq. D-31)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgy} (lb)
720.00	1352.00	1.000	1.000	1.000	1.472	32474	0.70	35638

10. Concrete Pryout Strength of Anchor in Shear (Sec. D.6.3)

$\phi V_{cpg} = \phi k_{cp}N_{cbg} = \phi k_{cp}(A_{Nc} / A_{Nco})\Psi_{ec,N}\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b$ (Sec. D.4.1 & Eq. D-41)

k_{cp}	A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cpg} (lb)
2.0	1024.00	576.00	1.000	1.000	1.000	1.000	27153	0.70	67581

11. Results

Interaction of Tensile and Shear Forces (Sec. D.7.)

Tension	Factored Load, N_{ua} (lb)	Design Strength, øN_n (lb)	Ratio	Status
Steel	5273	14528	0.36	Pass
Concrete breakout	**10546**	**19007**	**0.55**	**Pass (Governs)**
Pullout	5273	9566	0.55	Pass

Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	235	7556	0.03	Pass
T Concrete breakout x+	**940**	**17819**	**0.05**	**Pass (Governs)**
|| Concrete breakout y+	**470**	**35638**	**0.01**	**Pass (Governs)**
Pryout	940	67581	0.01	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7..1	0.55	0.00	55.5%	1.0	Pass

3/4"Ø Heavy Hex Bolt, F1554 Gr. 36 with hef = 8.000 inch meets the selected design criteria.

12. Warnings

- Minimum spacing and edge distance requirement of 6da per ACI 318 Sections D.8.1 and D.8.2 for torqued cast-in-place anchor is waived per designer option.

- Per designer input, ductility requirements for tension have been determined to be satisfied – designer to verify.

- Per designer input, ductility requirements for shear have been determined to be satisfied – designer to verify.

- Designer must exercise own judgement to determine if this design is suitable.