### General

The structural engineer shall arrange a pre-construction meeting to discuss various design requirements and expectations. The owner, superintendent, framer and other design consultants will be required to attend.

The use of these drawings is limited to that identified in the revision column. Any revisions made to the design drawings prior to "issue for tender" \$ "Issued for construction" resulting in construction cost changes are the responsibility of the owner/contractor.

Contractors are to ensure they are working from current "Issued for Construction" plans.

The contractor shall check and verify all dimensions and details on the structural drawings for compatibility with architectural and other consultants' drawings before commencing with the work.

The contractor shall inform the engineer in writing during the bidding period of any discrepancies or omissions noted on the drawings or in the specifications. Upon receipt of such information the engineer will provide additional instructions. Any such discrepancy, omission, or variation not reported shall be the responsibility of the contractor, and corrective work shall be performed as directed by the engineer.

The contractor is responsible for all costs associated with the correction of deficiencies, as determined by the engineer.

All dimensions to take precedence over scale shown on plans, sections, and detalls.

Engineering services presented on these drawings are for permanent structure only. The contractor is responsible for all temporary bracing required for structure stability and for construction loading until the project is completed.

Drawings to be read in conjunction with Honombo drawings project # HONO(14-2016) dated August 16, 2016 & Kerkhoff Engineering drawings of the container structure dated August 19, 2016. All structural specifications to take precedence over architectural.

Refer to architecutral/building envelope consultant drawings for all specifications regarding water proofing (roof, exterior walls, below grade foundation walls, suspended slabs, etc). Any special concrete mix designs required for water proofing is the responsibility of the materials consultant

Architectural Design, Electrical, Mechanical, Civil, and Geotechnical Engineering are the responsibility of others.

All formwork, shoring for the excavation, and underpinning of adjacent structures, if required, is the responsibility of the contractor and shall be designed and inspected by others to current Worker's Compensation Board requiations.

The contractor is responsible for safety on the job site during construction and shall ensure compliance to current WorkSafe BC regulations.

See mechanical, electrical, and/or manufacturer's drawings for size, location, and anchor bolt requirements of all machine bases and holes in walls and floors. All design of machine and equipment bases responsibility of others, unless specifically detailed on drawings. Subcontractors to furnish templates to general contractor showing anchor bolt location for equipment furnished by them. Co-ordinate with architectural, mechanical, and electrical drawings for openings, slopes, curbs, drainage, and waterproofing, etc.

In cases of discrepancies on structural drawings, the more stringent

The completed base structural components have been designed to Part 4/Part 9 of B.C.B.C. 2012.

Refer to additional notes regarding "Elements Designed By Others" for items not the direct responsibility of Kerkhoff Engineering.

#### Desian Loads

This structure has been designed for the following superimposed, service loads:

Roof Snow	Live Loads(psf) Roof Snow Ss = 50 (2.4kPa) Sr = 8.4 (0.4kPa) S (Part 4) = 48.4 (2.32kPa)			
Floor	40 (1.9kP	40 (1.9kPa)		
Wind (q50)	8.4 (0.40	O7kPa)		
Seismic	Rd = 1.5	Ro = 1.3		

Sa (0.2) = 1.183 Sa(0.5) = 0.7915a(1.0) = 0.3715a(2.0) = 0.185PGA = 0.59

## Foundations

Kerkhoff Engineering has designed the base structure to support the intended load of the secondary elements assuming generally accepted construction practices. Adequate separation shall be provided between the base structure and secondary components so as not to provide additional rigidity to the primary structural resisting system. Expansion \$ deflection mechanisms shall be built into the structure, and shall be clearly shown on component drawings.

Foundation design based on the following geotechnical assumptions: SLS = 1500 psf (72kPa) Soll bearing pressure Site Class

Prepare site for foundations in accordance with geotechnical report

Copies of all field review reports and materials testing (compaction tests, etc), shall be forwarded to Kerkhoff Engineering minimum 24hrs. prior to placement of concrete and/or backfilling.

Soil conditions to be inspected by the geotechnical engineer to verify the conditions and confirm the allowable bearing pressure after excavation and prior to construction of formwork for foundations. Site report and recommendations shall be forwarded to Structural Engineer.

Approval to pour concrete during an inspection does not imply assurance of assumed bearing capacity or subgrade conditions used in the structural design of footings and foundations for this project.

Bottom of footings to be minimum 18" below final finished grade for frost

Footing elevations and sizes are subject to revision where site conditions differ from anticipated soil conditions. Where footings are stepped down for mechanical and electrical services (where allowances have not been provided for in the drawings), additional structural requirements may be required at the discretion of the engineer.

All footings to bear on firm, undisturbed material. Grass, roots, top soil, etc., are to be removed from foundation area.

Footings or slab-on-grade bearing on compacted, granular structural fill shall be compacted to a standard proctor as outlined in the geotechnical engineer's report. Standard proctor value to be verified by compaction testing and results to be submitted to the engineer.

All footings shall be centred below walls and columns unless detailed otherwise. Dowels to match vertical bars.

Backfill walls only after a minimum of 7 days following the completion of interior level floor system (unless walls are adequately braced) with clean, free-draining, moderately compacted, granular material or as specified by the geotechnical engineer and slope grade to drain away from building.

Coordinate with architectural and other consultants' drawings for ground elevations, openings, drainage slopes, waterproofing, etc.

Inspection of foundation drainage, waterproofing, excavation and shoring is the responsibility of others.

## Concrete Embedments:

Install conduits and ducts embedded in concrete in accordance with the following quidelines except with the approval of the Structural Engineer.

#### Conduits

Locate between reinforcing steel layers.

Maximum size in one layer to be 1/3 of the concrete slab thickness. Maximum size in two layers crossing to be 1/4 of the slab thickness. Crossing of three layers will not be permitted.

Clear space between parallel conduits shall be one diameter or 1 1/2" minimum horizontally and vertically.

Locate between reinforcing steel layers. Maximum size to be 1/3 of the slab thickness. Crossing of ducts will not be permitted. Clear space between ducts to be 12".

#### Columns

The maximum size of conduit or fittings not to exceed 4 percent of the column area. Embedded piping will not be allowed unless approved by Engineer.

#### Beams

The maximum size of conduit not to exceed 4 percent of the area. Sleeves and embedded piping as directed by Engineer.

Co-ordinate with architectural and mechanical drawings for openings, curbs, sleeves, waterproofing, etc.

The contractor shall provide 1000 pounds of 15M steel reinforcement for the engineer to use at his discretion during construction. The contractor shall reimburse the owner for the unused portion.

### Concrete:

Provide concrete and perform work to CAN/CSA A23.3-04. Provide copy standard at site for reference.

The contractor shall arrange for the taking and testing of concrete cylinders by an independent testing agency in accordance with CSA CAN3-A23.2-04 at the expense of the contractor. A minimum of 3 test culinders shall be cast for each 100 c.m. (minimum 3 test cylinders for each day's pour), and each class of concrete. Test I cylinder at 7 days and 2 cylinders at 28 days. One cylinder shall be field cured and tested at 7 days. Copies of all

requirements shall govern. HONOMOBO CLIENT: PROJECT: HO4 FOUNDATION 1537 BEDDIS RD. DN BH OCT. 25, 2016 ISSUED FOR PERMIT/CONSTRUCTION SALT SPRING ISLAND, BC BY: REVISIONS



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 $\boldsymbol{v}$ 

- XII. Concrete shall not be placed on or against any surface which is at temperature less than 5 degrees C.
- xiii. Slabs shall be covered with canvas or similar, kept a few inches clear of surface.
- xiv. Storey below slab shall be enclosed.
- xv. Protection shall be maintained for at least 5 days.
- xvi. Temperatures below O degrees C
- xvII. See item III above for a, b, c, d.
- xviii. Storey below shall be enclosed and supplementary heat provided.
- xix. Heating to be started at least one hour ahead of pouring and maintained for a minimum of 3 days after.
- xx. Temperature of the concrete at all surfaces shall be kept at 10 degrees C for 7 days.
- xxi. Enclosure to be constructed so that air can circulate around all structural members.

#### Hot Weather Requirements

- a. Place and protect concrete in accordance with CAN/CSA-A23.1-O9. When air temperature is greater than 25 degrees C, protect concrete so that it's temperature does not exceed 30 degrees C.
- b. Protect from drying, which causes shrinkage cracking, by effective means as required by conditions. Effective measures include windshield, dampen, cover, place and finish at night.

Do not remove forms for footings and walls until a minimum of 48 hours after placing concrete and after the concrete has attained a strength of at least 10 MPA. Forms for suspended slabs may be removed and reshoring installed after the concrete has attained at least 75% of the specified strength. Strength of concrete at time of stripping forms to be determined by testing field cured concrete cylinders.

Recess walls to full width of wall where required to support beams.

Construction joints to be keyed and doweled. Joints below grade to have continuous 6" P.V.C. "RB6-316" waterstop. The location of construction joints shall be approved by the engineer and additional reinforcement and keys added as requested.

All concrete slabs on grade shall be placed on 6 mil polyethylene lapped 12", on 6" minimum approved granular material compacted to geotechnical engineers' recommendations (minimum 95% standard proctor density). Provide 1/8" by 1 1/4" DP. perforated or sawcut control joints around columns and at 20' o.c. maximum spacing.

Openings in slabs to be as far away as possible from columns. No openings or cans for pipes in any case to be closer than 16" to face of column without prior approval from the engineer. Reinforcing at openings shall not be cut or bent but shall be fanned where possible or crowded to either side to clear opening.

#### REINFORCING REQUIREMENTS

Use clean new deformed reinforcing bars conforming to CSA 630.18, grade 400 MPa unless noted. Welded wire fabrics to CSA 630.5. At the engineer's discretion, rebar mill certificates shall be provided. Reinforcement that is suspect may be required to be tested as directed by the engineer at the expense of the contractor.

Fabricate and place reinforcing steel to CSA A23.3-04.

All reinforcing steel to be secured in final position before concrete is placed.

Support reinforcing steel on approved supports, spacers, or hangers provided.

Maximum free end of reinforcing bars to be 4'-0".

OCT. 25, 2016

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Where concrete surfaces are to be exposed, only non-corrosive type

reinforcing chairs shall be used to support reinforcing.

Reinforcing steel must be inspected by the Engineer before concrete is placed.

Formwork shall be inspected by Temporary Works Engineer and copies of report to be forwarded to Kerkhoff Engineering Ltd.

Clear concrete cover for reinforcing (unless otherwise noted):

Bottom	Footings	Top and sides
Walls outside face and exposed surfaces	Bottom	
Walls outside face and exposed surfaces	Walls inside	face
Beams to stirrups		
Column to ties	Beams to st	:Irrups
Slabs top and bottom	Column to ti	es '
	Slabs top a	nd bottom

#### Designation of reinforcing bars:

(solid line) denotes top steel or near face of wall

\_\_\_\_ (dashed line) denotes bottom steel or far face of wall

Straight bar lengths: 4-15M 5000 means 4-15M bars 5000 long (metric)

4-15M 10.9 means 4-15M bars 10'-9" long (imperial)

Splice Reinforcement as follows (unless otherwise noted):

Bar Size	Comp Splice	Tension Splice Concrete Strenath			
5120	Splice	20MPa	25MPa	30MPa	35MPa
15M	19"	30"	27"	25"	23"

Welded wire mesh ----- 12 inches.

No splices are permitted without the engineer's approval where the length of bars has been given on the drawings.

All slabs to have temperature steel perpendicular to and immediately above slab bottom reinforcing as follows:

greater than 6"-7" slab IOM @ 12" o.c./15M @ 20" o.c.

Temperature reinforcement shall have a lap of 18" and splices in adjacent bars shall be staggered to be no less than 4' apart.

All concrete to be reinforced. Reinforce unspecified slab areas with 15M @ 18" o.c. each way bottom. Minimum wall reinforcing (including planters, sumps, pits, trenches, architectural walls, etc.) unless noted otherwise:

6" wall	IOM @ IB" E.M.
8" wall	15M @ 20" E.W.
10" wall	15M @ 16" E.W.
12" wall	15M @ 20" E.W./E.F.

Cross-lap strip footing steel 12" minimum at corners or provide corner bars.

All walls and columns shall be doweled into footings, walls, beams, or slabs with bars of the same size and spacing as the bars above.

#### Unless noted, provide:

- Corner bars to match horizontal wall reinforcement at all wall intersections.
- 2. Two 15M bars at ends of walls.
- 3. Two I5M bars at all free edges of suspended slab.
- 4. Two 15M bars around all wall and slab openings extending 2'-0" past corners, plus 2-15M by 4'-0" diagonal bars at corners and placed at centre of wall or slab.

install column reinforcement accurately with templates.

Hooks shown are to be CSA standard hooks, unless otherwise noted.

Unless shown otherwise:

- a. Top reinforcing in slabband to be centered over columns.
- b. Top slab reinforcing to be centered over slabband.
- Bottom reinforcing to be centered between supports except at end spans where all bars shall extend a minimum of 6" into exterior

## Structural Steel

Fabrication and erection of structural steel work shall conform to CAN/CSA-SI6-O9, and in accordance with the following standards:

General Requirements for Rolled or Welded Structural Quality Steel: 640.20-04/640.21-04

Standard spec for Steel for Structural Shapes for use in bldg framing A992/A992M-OI

Structural steel fabricators to be certified by C.W.B. to CAN/CSA W47.I-1983, Division 2.1 minimum.

All arc welding to conform to CSA-W59 by C.W.B. approved welders. All fabrication and erection shall be certified by C.W.B. to CSA-W47.1(division I or 2).

Contractor shall submit shop drawings for all structural steel work for review prior to fabrication. These shop drawings shall bear the seal and signature of the Professional Engineer registered in B.C. responsible for the design of connections and prefabricated members.

#### Materials

300W (44ksi)
350W (50ks1)
350W (50ksl)
ASTM A36
ASTM A325
ASTM A307
ASTM-AIO8

All connections shall be designed by the fabricator unless otherwise noted.

Design bolted connections to ASTM-A325 assuming threads included in shear plane.

Unless detailed, all connections to be designed by the fabricator as bearing type to CAN CSA-SI6. I for force shown on drawing or for 60% of allowable U.D.L. from handbook beam span table. Provide a minimum of (2) 3/4" diam. bolts in each connected member.

Provide minimum 3/8" thick web stiffeners each side of all beams continuous over columns. Provide 2 stiffeners each side of beams aligned with walls of HSS column/flanges of W columns supporting point load from above or at full moment connections.

Shop drawings for all connections shall be sealed by a qualified professional engineer registered in the province of British Columbia who is familiar with this type of construction and is responsible for the design of the connections.

Review of shop drawings by Kerkhoff Engineer does not guarantee any dimensioning, and/or miscellaneous steel required by architectural drawings. All roof & floor slopes shall be in accordance with architectural specifications and are to be approved by such parties.

If Kerkhoff Engineering determines the welds or structural members to be inadequate based on visual inspection, such melds/components shall be

CLIENT: HONOMOBO

PROJECT: HO4 FOUNDATION

ISSUED FOR PERMIT/CONSTRUCTION

REVISIONS

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Unless shown otherwise:

- a. Top reinforcing in slabband to be centered over columns.
- b. Top slab reinforcing to be centered over slabband.
- c. Bottom reinforcing to be centered between supports except at end spans where all bars shall extend a minimum of 6" into exterior

# Structural Steel

Fabrication and erection of structural steel work shall conform to CAN/CSA-516-09, and in accordance with the following standards:

General Requirements for Rolled or Welded Structural Quality Steel: 640.20-04/640.21-04

Standard spec for Steel for Structural Shapes for use in bldg framing A992/A992M-01

Structural steel fabricators to be certified by C.W.B. to CAN/CSA W47.1-1983, Division 2.1 minimum.

All arc welding to conform to CSA-W59 by C.W.B. approved welders. All fabrication and erection shall be certified by C.W.B. to CSA-W47.1(division I or

Contractor shall submit shop drawings for all structural steel work for review prior to fabrication. These shop drawings shall bear the seal and signature of the Professional Engineer registered in B.C. responsible for the design of connections and prefabricated members.

#### Materials

Structural steel to conform to CAN/CSA 640.21 W Shapes (CSA 640.21 & ASTM A992) ...... 350W (50ksi) (conforming to CSA 640.21 or ASTM 500) ..... ASTM A36 Rods & round bars ...... (36ksi) Bolts, Nuts & Washers (minimum size 3/4" dia.)..... ASTM A325 Anchor bolts, nuts \$ washers ...... ASTM A307 Shear stud connectors ...... ASTM-AIOB

All connections shall be designed by the fabricator unless otherwise noted.

Design bolted connections to ASTM-A325 assuming threads included in shear

Unless detailed, all connections to be designed by the fabricator as bearing type to CAN CSA-SI6. I for force shown on drawing or for 60% of allowable U.D.L. from handbook beam span table. Provide a minimum of (2) 3/4" diam. bolts in each connected member.

Provide minimum 3/8" thick web stiffeners each side of all beams continuous over columns. Provide 2 stiffeners each side of beams aligned with walls of H55 column/flanges of W columns supporting point load from above or at full moment connections.

Shop drawings for all connections shall be sealed by a qualified professional engineer registered in the province of British Columbia who is familiar with this type of construction and is responsible for the design of the connections.

Review of shop drawings by Kerkhoff Engineer does not guarantee any dimensioning, and/or miscellaneous steel required by architectural drawings. All roof & floor slopes shall be in accordance with architectural specifications and are to be approved by such parties.

If Kerkhoff Engineering determines the welds or structural members to be

examined by a non-destructive testing method. The cost of such testing and reporting shall be reimbursed by the contractor.

All anchor bolt locations shall be verified with the contractor prior to fabrication. Any modifications to base plates and or anchor bolts may be rejected, and upgrades required as determined by the engineer will be at the expense of the contractor.

All welded headed studs and welded deformed bar anchors shall be installed as per the manufacturer's specifications. Any fillet welded deformed bars or studs will be rejected.

Minimum welds for connections to be 3/16" fillet welds. Grind smooth where exposed.

One shop coat of primer shall be applied to all steelwork except where encased in concrete and field weld areas. Touch up welds after erection is

Hot dip galvanize those items exposed to weather, corrosive environments or ground.

Erection bracing during construction is the responsibility of the contractor.

Top flanges of beams shall be free of all paint, dirt, heavy rust, mill scale, sand and other materials which will interfere with welding of stud shear connections and steel deck to beams. Pre-drill flanges as necessary for bolted attachments of wood nallers etc. with 7/16" holes staggered @ 24"

No burning of holes or field cutting will be permitted in any structural steel element without the approval of the Engineer.

Welding and bolt torquing to be inspected in accordance with CAN/CSA-SI6-09. Connections to columns at floor and roof levels shall be designed to resist a stabilizing force in any direction equal to 2% of the capacity of the column.

Provide drainage holes in the bottom of all HSS columns.

## Field Reviews:

The Contractor's Superintendent is required to pre-inspect the work to confirm work is completed as per documents and provide the Engineer (Kerkhoff Engineering Ltd., 604-858-3730) or their representative with a minimum of 24 hours notice in accordance with B.C.B.C. 2012 and municipal bylaws for routine Field Reviews of:

- a. General site conditions prior to forming.
- b. Reinforcing steel and pour conditions prior to each concrete pour
- c. Installation of HO4 on completion prior to covering the connection

Field reviews performed by Kerkhoff Engineering are only for the base building structure as specified on these drawings. These reviews are periodic and are to be performed at the discretion of the engineer, in order to ascertain the construction is in general conformance with structural documents. Field reviews are performed on behalf of the client and not for the benefit of quality control of the contractor. The contractor retains full responsibility for ensuring all requirements specified on structural drawings and all amendments are strictly adhered too.

The contractor shall notify the truss manufacturer to inspect all trusses and provide a sealed certificate for installation of trusses, bracing, hangers, and all pertinent hardware prior to installation of any roof membrane. See also additional requirements under "Pre-fabricated trusses/joists".

The geotechnical engineer shall review final plans and inspect the site preparation work to confirm that the soil conditions are consistent with design assumptions and design recommendations. Inspection to include the

- a. Base materials for confirmation of assumed soil bearing.
- b. Testing for compaction of any structural fill required under footings, slab-on-grade, or retaining walls.
- c. Backfill behind foundation & retaining walls.

The geotechnical engineer to be notified minimum 24 hours prior to any footing pours for inspection as noted above.

Reinspection required by the engineer due to incomplete work and/or deficiencies from previous Field Reviews, shall be at the expense of the contractor.

All work shall be made accessible for inspection. Failure to give required notification and accessibility may result in the Engineer requesting the removal and replacement of the work at the contractor's expense.

Review of the work, or any portion thereof, by the engineer shall not in any way relieve the contractor of his responsibility and obligation to comply with the contract drawings and specifications.

Schedule C will not be issued unless all required field reviews are performed. Work concealed by finishes or other work shall be removed and replace at no additional expense to the Owner, to allow the Structural Engineer to see all areas. All work must be field reviewed. Partial exposure will not be accepted.

## Elements Designed By Others

The architectural specifications require the review of a professional engineer for the structural capacity of all non-structural components. These components include interior & exterior steel studding, glazing & windows frames, skylights, guardralls/handralls, and masonry veneer. The design of these components is the responsibility of the general contractor's subtrades professional engineers. All shop drawings for these items are to be sealed and signed by the professional engineer who is responsible for these items.

Canoples may be specified as steel or aluminum framed in accordance with architectural specifications. All canoples to be designed by canopy contractor, to resist code snow loads and wind loads. Sealed shop drawings shall be submitted for review prior to fabrication.

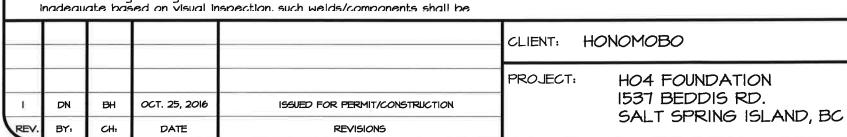
All shop drawings shall be submitted to Kerkhoff Engineering for review prior to fabrication. Shop drawings not bearing the seal of a Professional Engineer Registered in BC will not be reviewed. The sub-consultant shall submit schedules B & C-B upon satisfactory completion.

## <u>Limitations of Liability:</u>

Engineering Judgement has been applied in developing this design in an attempt to strike a reasonable balance between risk of failure and economic factors. Beyond a certain level of cost, increments of security are attained only by disproportionate increases in cost. A more conservative approach could be adopted in return for increased design and construction costs.

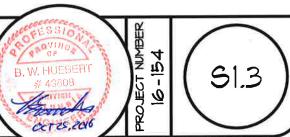
These designs have been prepared in accordance with generally accepted structural engineering practices and to the requirements of all applicable Codes. No other warranty is made, either expressed or implied.

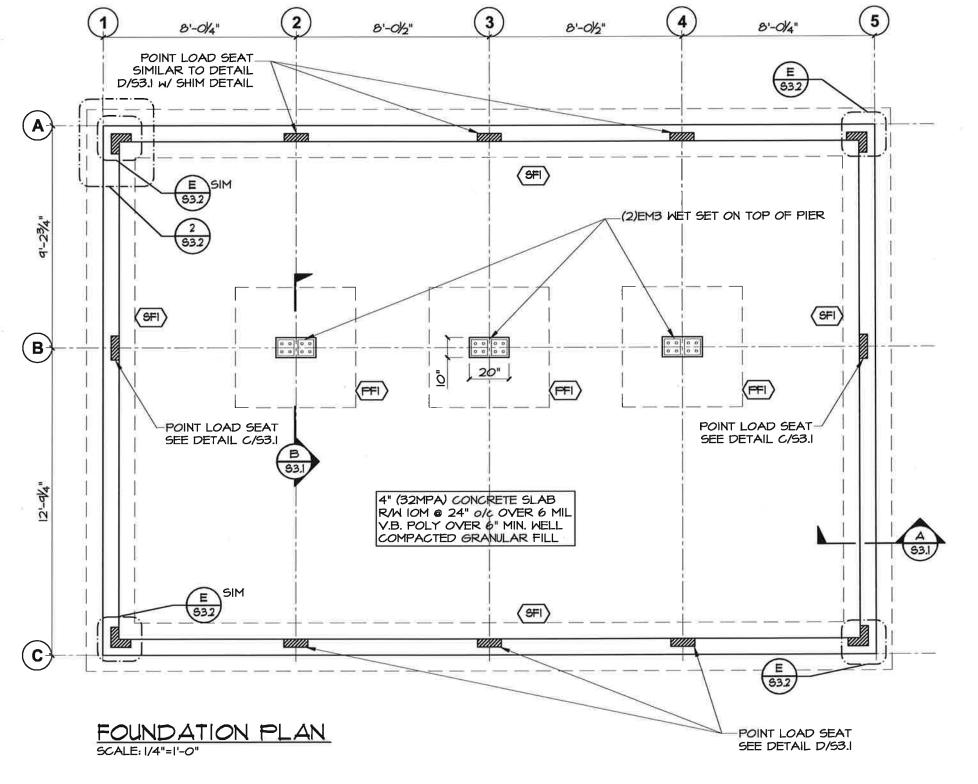
Structural design of all architectural components, and their seismic restraint is to be reviewed by others.





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FOOTING SCHEDULE				
TYP.	FOOTING SIZE	REINFORCING		
(9FI)	2'-0" x 8"dp. STRIP	2-15M CONT. & 15Mx12"Ig. STUDS @ 24" o/c DRILLED & EPOXIED INTO BEDROCK		
(PFI)	3'-0" x 3'-0" x 10"dp. PAD	3-15M E/W c/w (4)15Mx12"lg. STUDS DRILLED & EPOXIED INTO BEDROCK		

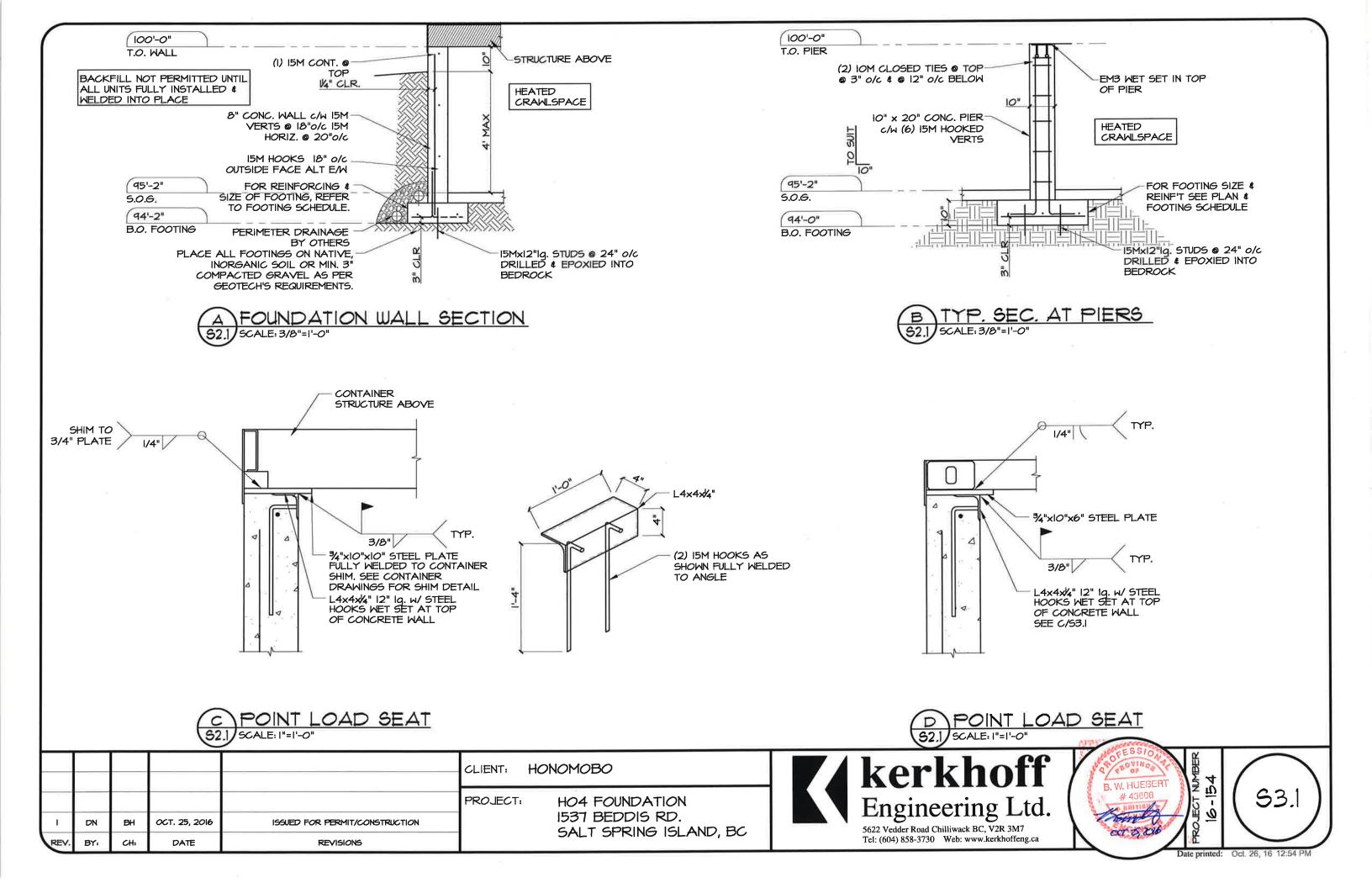
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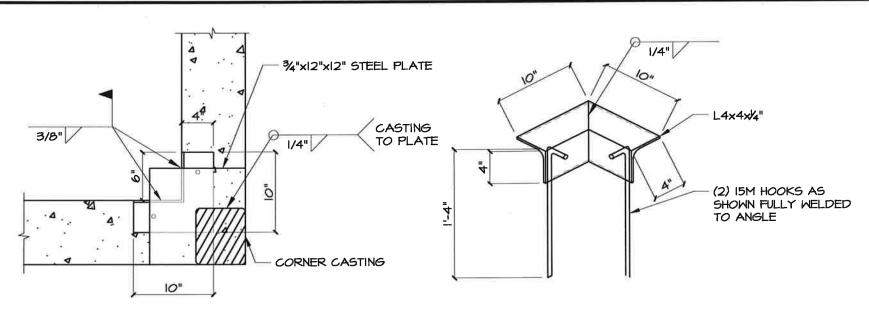




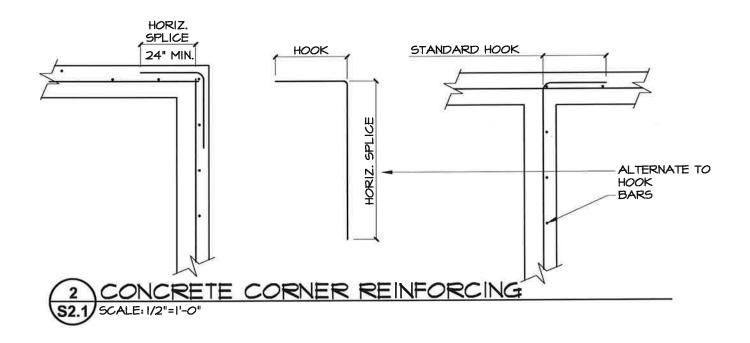
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E CORNER POINT LOAD SEAT



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