Structural Calculations

PREPARED FOR:

Jason Cornell
Site Director
Step By Step / Farm12

PROJECT:

Step By Step Greenhouse Expansion
2220149.20

PREPARED BY:

Andrew McEachern, P.E., S.E.
Principal

DATE:

March, 2022

City of Puyallup
Development & Permitting Services
ISSUED PERMIT
Building | Planning
Engineering | Public Works
Fire | Traffic

Structural Calculations

Step By Step
Greenhouse Expansion

Project # 2220149.20

Project Principal Andrew D. McEachern, P.E., S.E.

Design Criteria

Design Codes and Standards

Codes and Standards: Structural design and construction shall be in accordance with the applicable sections of the following codes and standards as adopted and amended by the local building authority: International Building Code, 2018 Edition.

Structural Design Criteria:

Live Load Criteria:

Roof (Min Blanket Snow):	25 psf
Slab on Grade:	125 psf

Wind Load Criteria:

Basic Wind Speed:	97 mph
Risk Category:	II
Wind Exposure:	B
Topographic Factor:	1.0

Seismic Criteria:

Risk Category:	II
Seismic Importance Factor:	1.0
S_s = 1.252	S_{ds} = 1.001
Site Class:	D - default
Seismic Design Category:	D

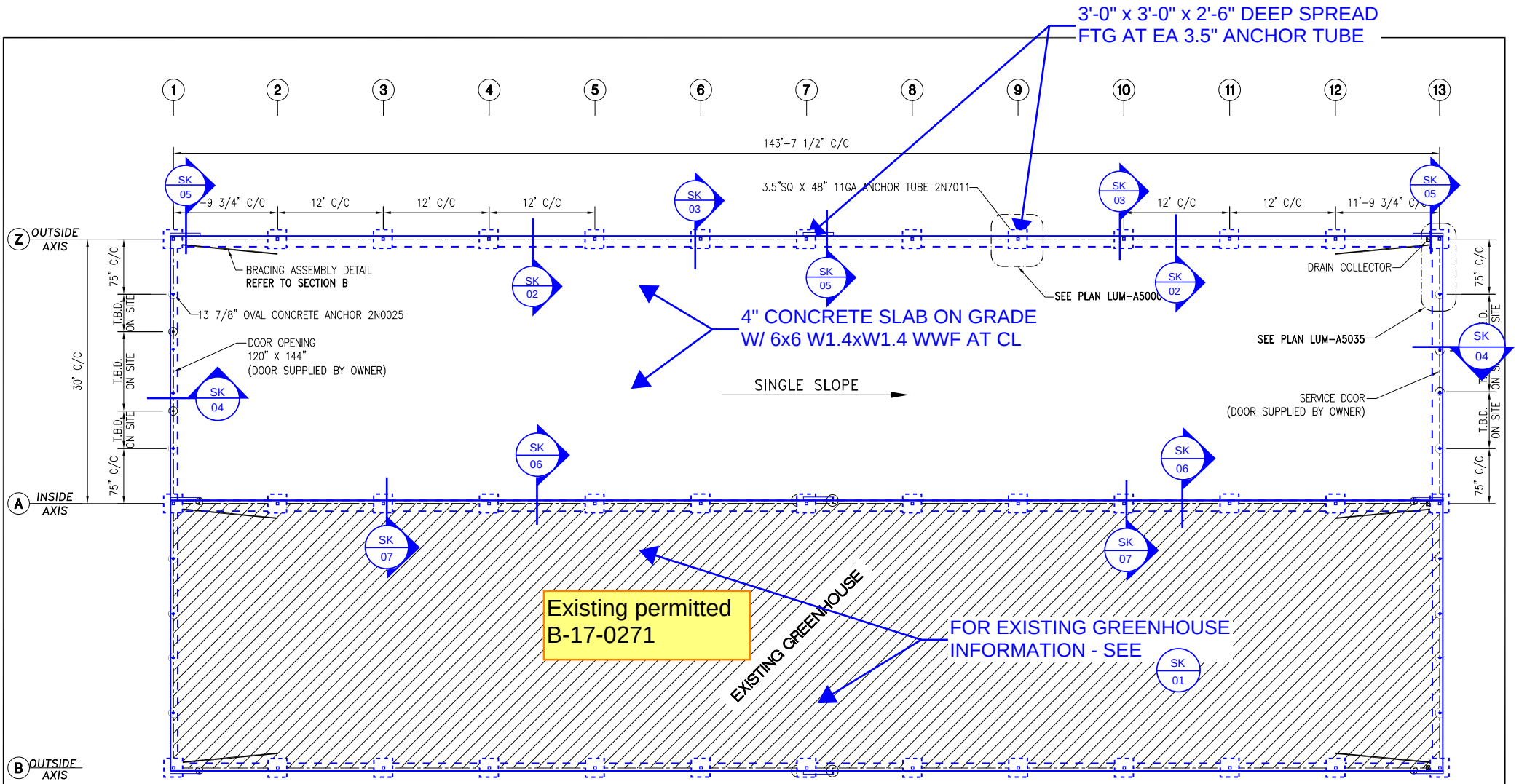
SHEET 11/52:STRUCTURAL NOTE DESIGN CRITERIA IS STRUCTURALLY ACCEPTABLE

Project Description

The structural scope of work for this project involves the structural design of alternate foundations for an expansion to an existing pre-engineered greenhouse structure. It is the intention of the structural design to satisfy the force levels of the IBC 2018. The structural design of the greenhouse framing

The methodology for the design of alternate foundations consists of determining the capacity of the proposed foundations (26" diameter x 60" deep), and designing new foundations that meet or exceed the capacity of the proposed foundation. We also evaluated the capacity of the proposed 3 ½" square anchor tubes at each of the greenhouse columns, and ensured that the proposed and alternate foundations were capable of developing the axial and flexural strength of the anchor tubes.

The proposed pier foundations were sized as cantilevered columns, using a non-constrained footing methodology. The alternate foundations have been sized as cantilevered columns, using a constrained footing methodology that utilizes the interior concrete slab on grade.



TO OBTAIN APPROPRIATE DIMENSIONS OF THE FOUNDATIONS, SEE TABLE OF THEORICAL DEADWEIGHT CAPACITY OF SOIL SECTION "A" PLAN #STEP-A705 & STEP-A800

-THE SPACINGS BETWEEN THE OVAL GABLE FRAMING TUBES ARE BEING SUGGESTED, DEPENDING ON THE EQUIPMENT THAT YOU HAVE (FAN,DOOR, ECT...)

CODE	DESCRIPTION	QTY
2N7011	3.5"SQ X 48" 11GA ANCHOR TUBE	13
2N0025	13 7/8" OVAL CONCRETE ANCHOR	8

FOUNDATION PLAN

3/8/2022

SK A

ISSUED FOR:
- INFORMATION ☐
- APPROVAL ☐
- PERMIT ☐
- CONSTRUCTION ☑
- AS BUILT ☐

REVISIONS	DATE	BY
5		
4		
3		
2		
1		

SERPACK:

REF: STEP-A2000

DRAWN BY: PL BEAUDRY
APPROVED BY:
DATE: JUNE 21, 2021
SCALE: N.T.S.

GREENHOUSES HARNOIS
TEL.(450)756-1041
1-888-427-6647
FAX.(450)756-8389

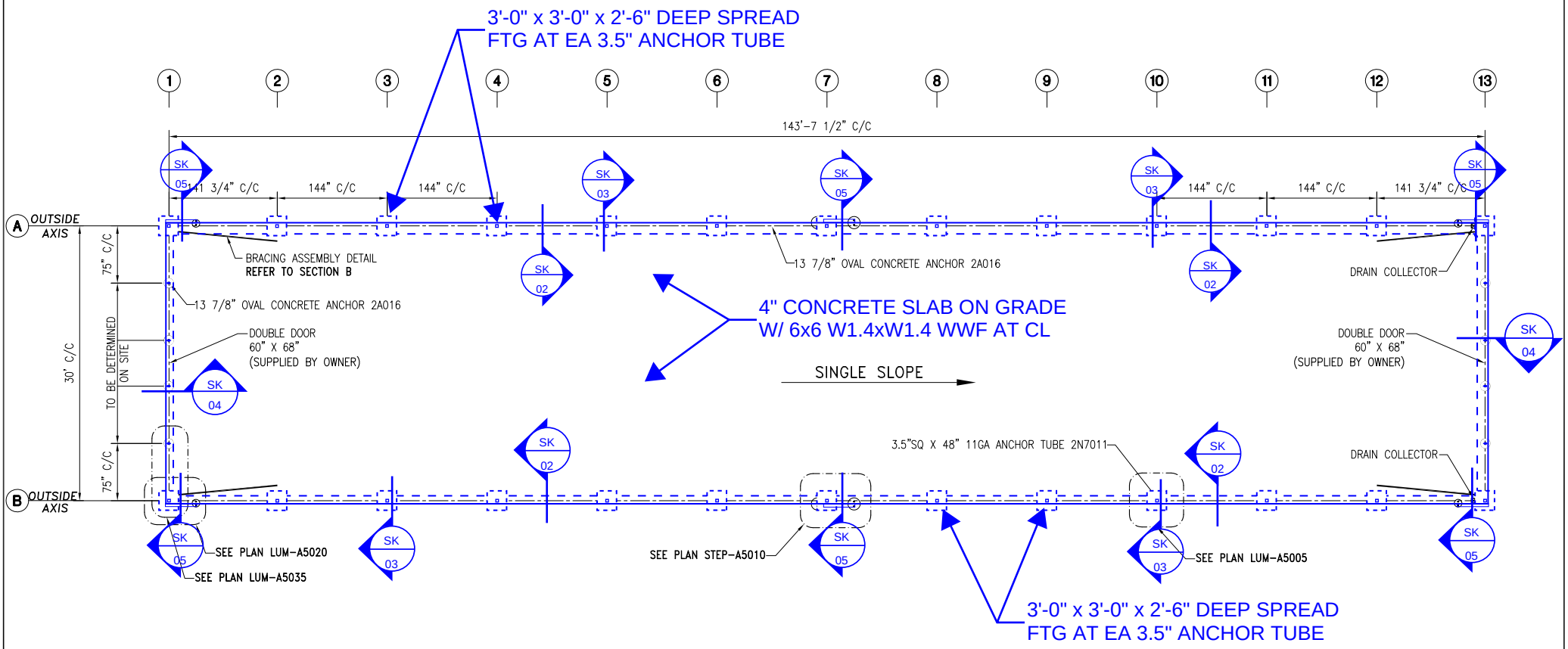
STEP BY STEP

PLAN: STEP-A2000

TITLE: LAYOUT OF FOUNDATION PLAN
(1) LUMINOSA (S9) 30' X 144'

ORIGINAL GREENHOUSE CONSTRUCTION

Existing permitted
B-17-0271



FOUNDATION PLAN
10/4/2017
SK 01

TO OBTAIN APPROPRIATE DIMENSIONS OF THE FOUNDATIONS, SEE TABLE OF THEORICAL DEADWEIGHT CAPACITY OF SOIL SECTION "A" PLAN #STEP-A900

-THE SPACINGS BETWEEN THE OVAL GABLE FRAMING TUBES ARE BEING SUGGESTED, DEPENDING ON THE EQUIPMENT THAT YOU HAVE (FAN,DOOR, ECT...)

ISSUED FOR:
- INFORMATION ☐
- APPROVAL ☐
- PERMIT ☐
- CONSTRUCTION ☑
- AS BUILT ☐

	REVISIONS	DATE	PAR
5			
4			
3			
2	CHANGE CENTER MOTORISATION BOX DIMENSION	2017-03-16	LMB
1	ADD CENTER ROLL-UP ANCHORS + ADD 2 DOUBLE DOOR	2017-02-02	C.L.

SERPACK:
REF: STEP-A2000

DRAWN BY: Louis-M Buissieres
APPROVED BY:
DATE: DEC 16, 2016
SCALE: N.T.S.

HARNOIS

TEL.(450)756-1041
1-888-427-6647
FAX.(450)756-8389

STEP BY STEP

PLAN: STEP-A2000

TITLE: LAYOUT OF FOUNDATION PLAN
(1) LUMINOSA (S9) 30' X 144'

Project STEP BY STEP

Subject

With/To

Address

Date 9/27/17

Project No. 2170703.2

Phone

Fax #

Faxed Pages

By SDM

☐ Page ____ of ____
☒ Calculations
☐ Fax
☐ Memorandum
☐ Meeting Minutes
☐ Telephone Memo

AHBL

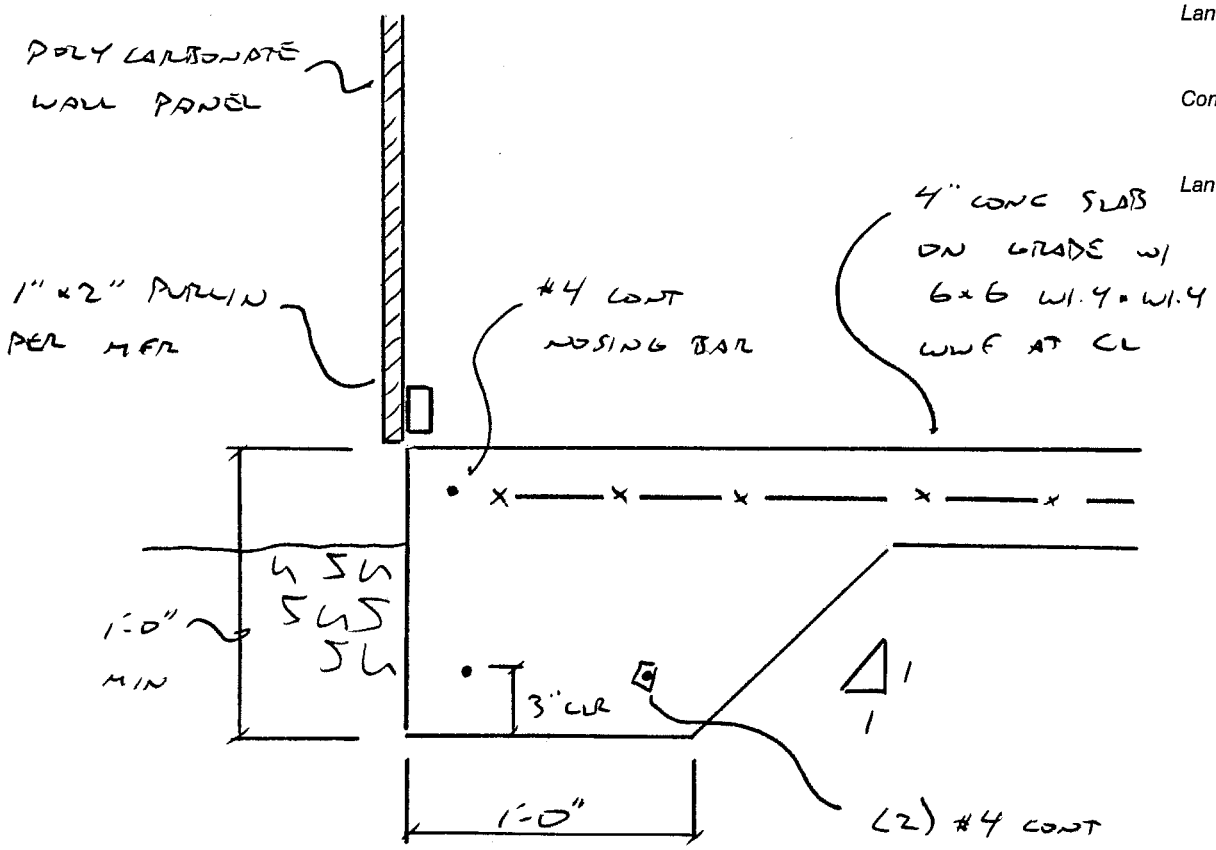
Civil Engineers

Structural Engineers

Landscape Architects

Community Planners

Land Surveyors



SK 02

If this does not meet with your understanding, please contact us in writing within seven days. THANK YOU.

Project STEP BY STEP

Subject

With/To

Address

Date 9/27/17

Project No. 2170708.2

Phone

Fax #

Faxed Pages

By ADM

☐ Page ____ of ____
☒ Calculations
☐ Fax
☐ Memorandum
☐ Meeting Minutes
☐ Telephone Memo

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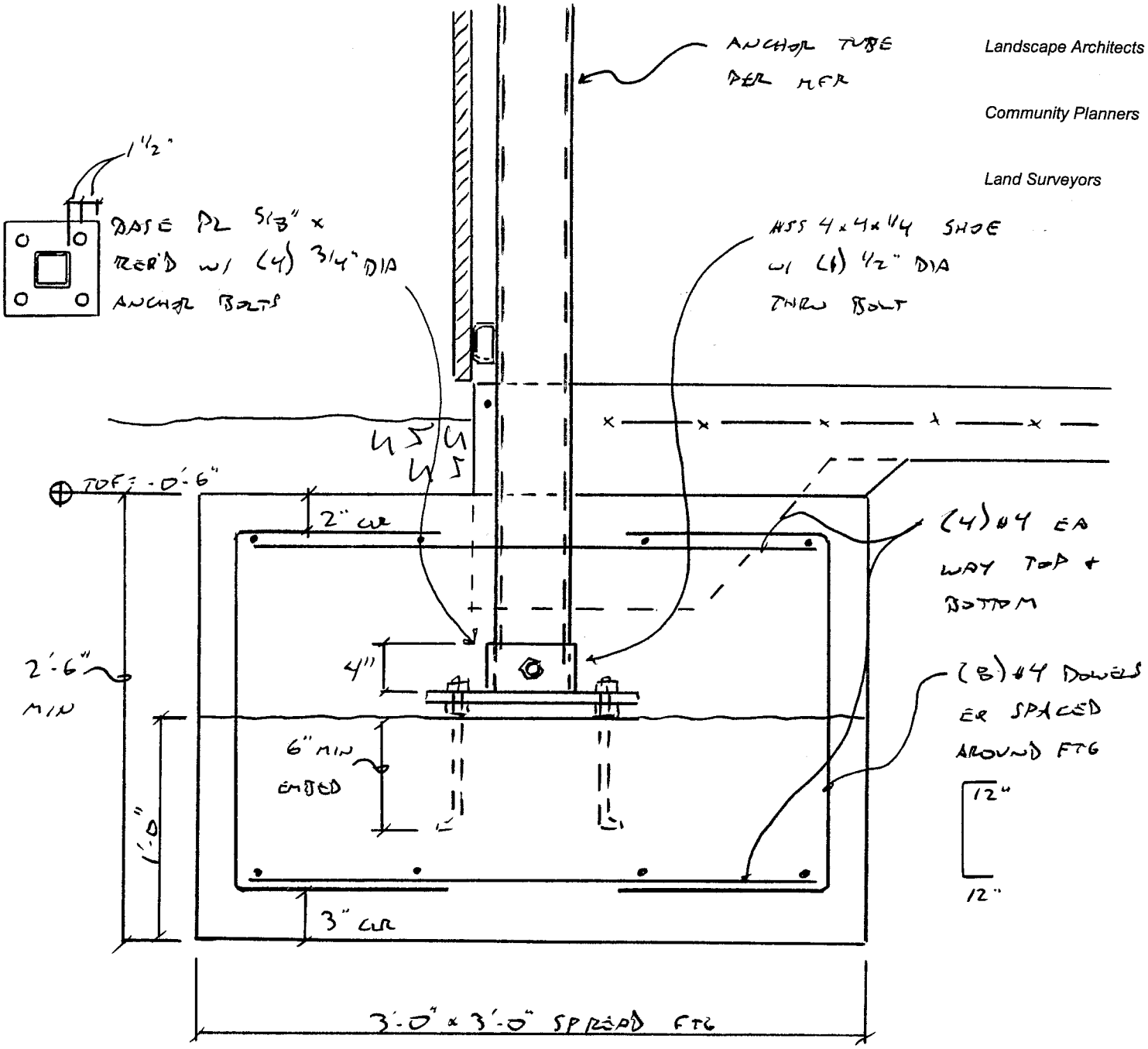
Structural Engineers

Landscape Architects

Community Planners

Land Surveyors



SK 03

If this does not meet with your understanding, please contact us in writing within seven days. THANK YOU.

Project STEP IT STEP

Subject

With/To

Address

Date 9/27/17

Project No. 2170708.20

Phone

Fax #

Faxed Pages

By ADH

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☒ Calculations
☐ Fax
☐ Memorandum
☐ Meeting Minutes
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Civil Engineers

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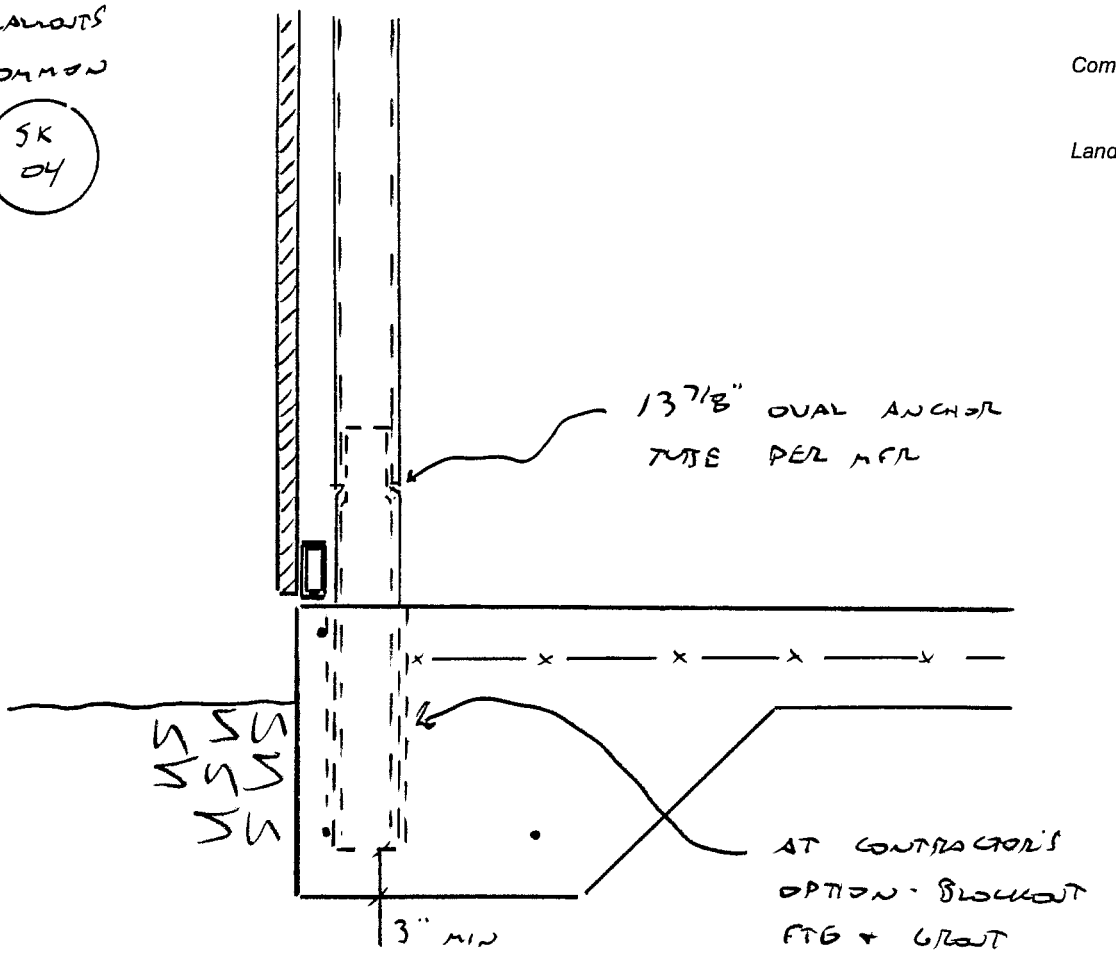
Landscape Architects

Community Planners

Land Surveyors

FOR CAISSONS IN COMMON SEE SK 04



SK 04

If this does not meet with your understanding, please contact us in writing within seven days. THANK YOU.

Project _____ Project No. _____ ☐ Page ____ of ____

Subject _____ Phone _____ ☐ Calculations

With/To _____ Fax # _____ ☐ Fax

Address _____ # Faxed Pages _____ ☐ Memorandum

Date _____ By _____ ☐ Meeting Minutes

☐ Telephone Memo

AHBL

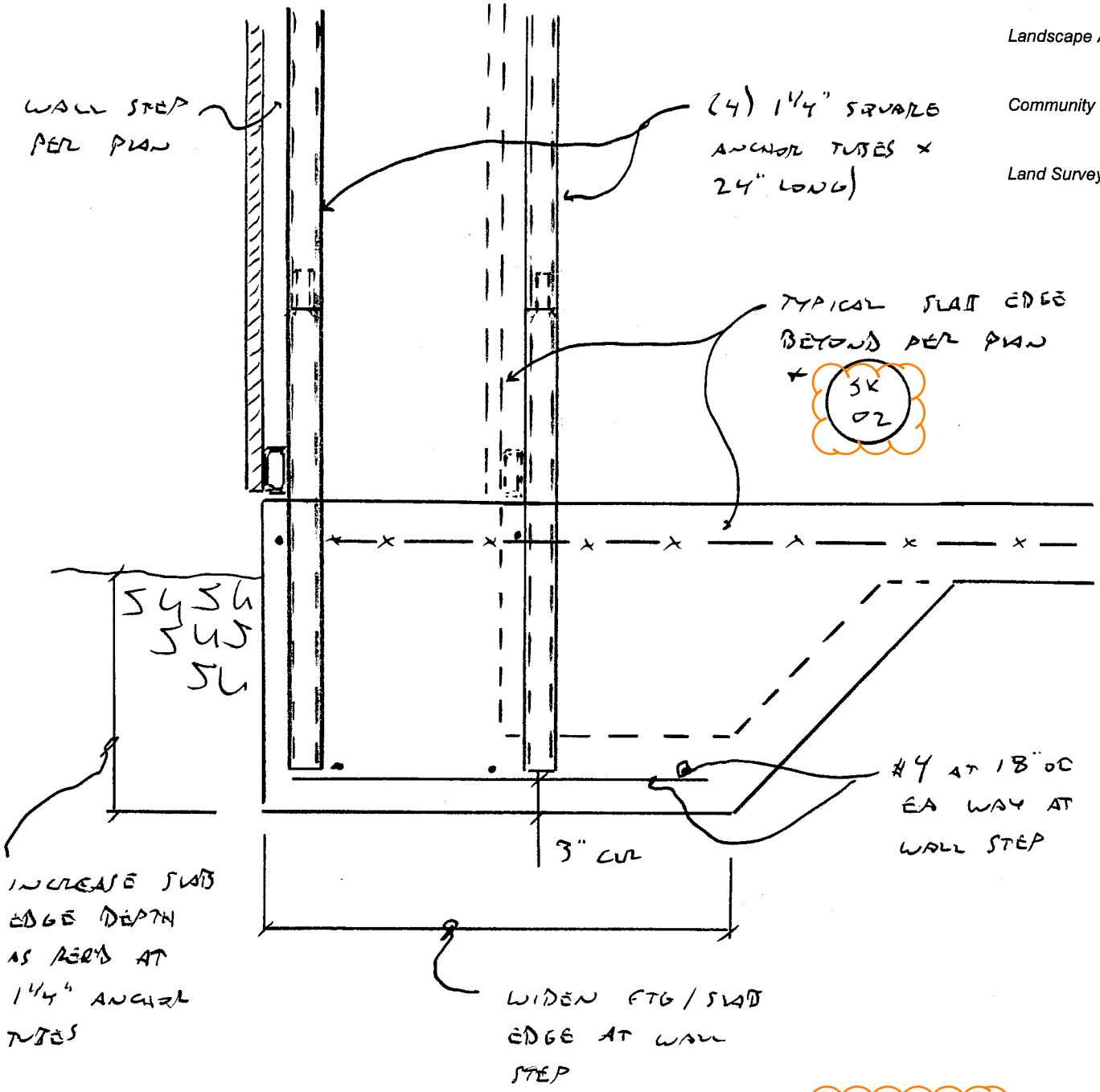
Civil Engineers

Structural Engineers

Landscape Architects

Community Planners

Land Surveyors



SK 05

If this does not meet with your understanding, please contact us in writing within seven days. THANK YOU.

Project STEP BY STEP

Subject

With/To

Address

Date 3/8/22

Project No. 2220149.20

Phone

Fax #

Faxed Pages

By ADM

- ☐ Page ____ of ____
- ☒ Calculations
- ☐ Fax
- ☐ Memorandum
- ☐ Meeting Minutes
- ☐ Telephone Memo

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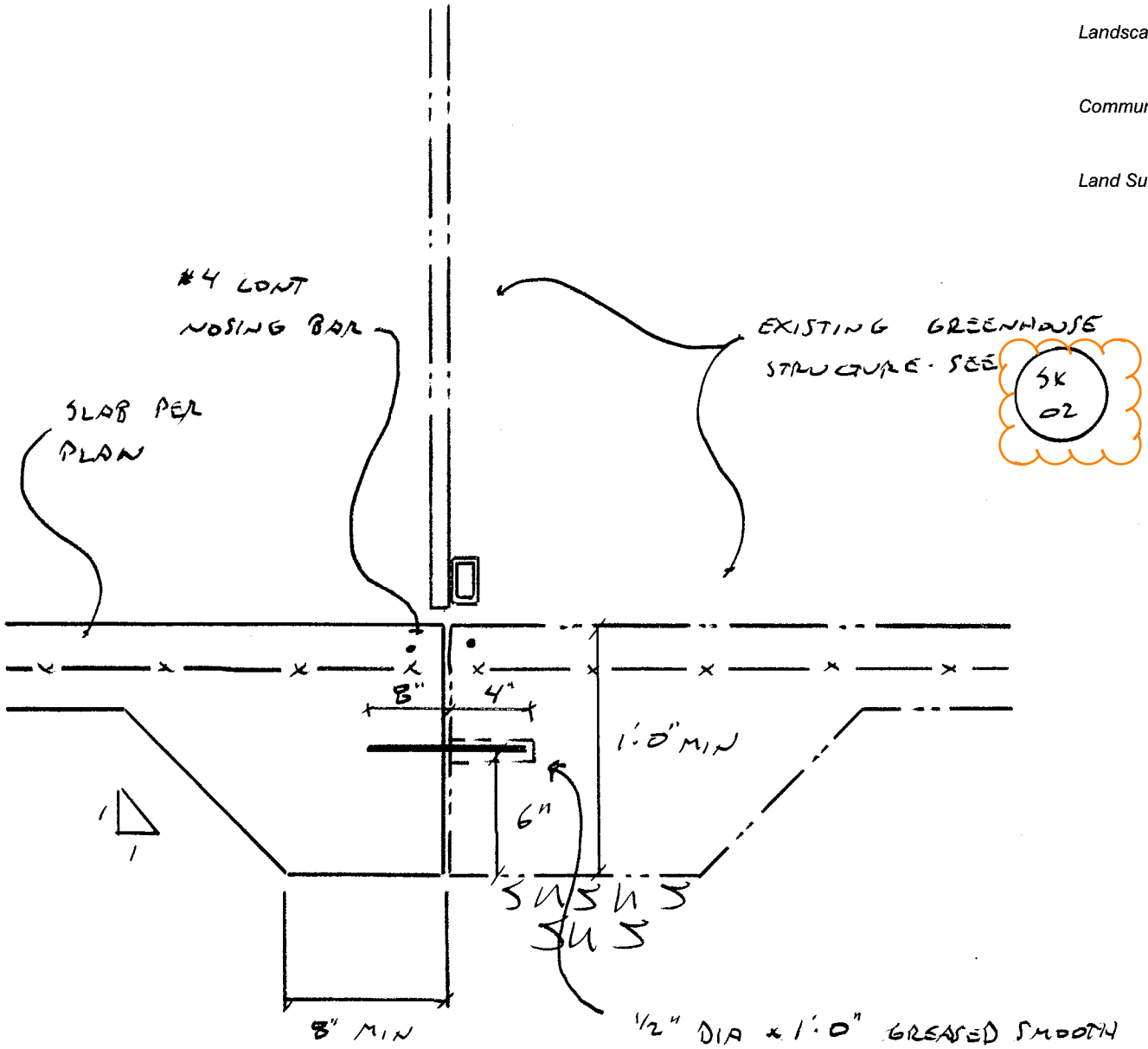

If this does not meet with your understanding, please contact us in writing within seven days. THANK YOU.

Project STEP BY STEP

Subject

With/To

Address

Date 3/8/22

Project No. 2220149.20

Phone

Fax #

Faxed Pages

By SDM

- ☐ Page ____ of ____
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- ☐ Fax
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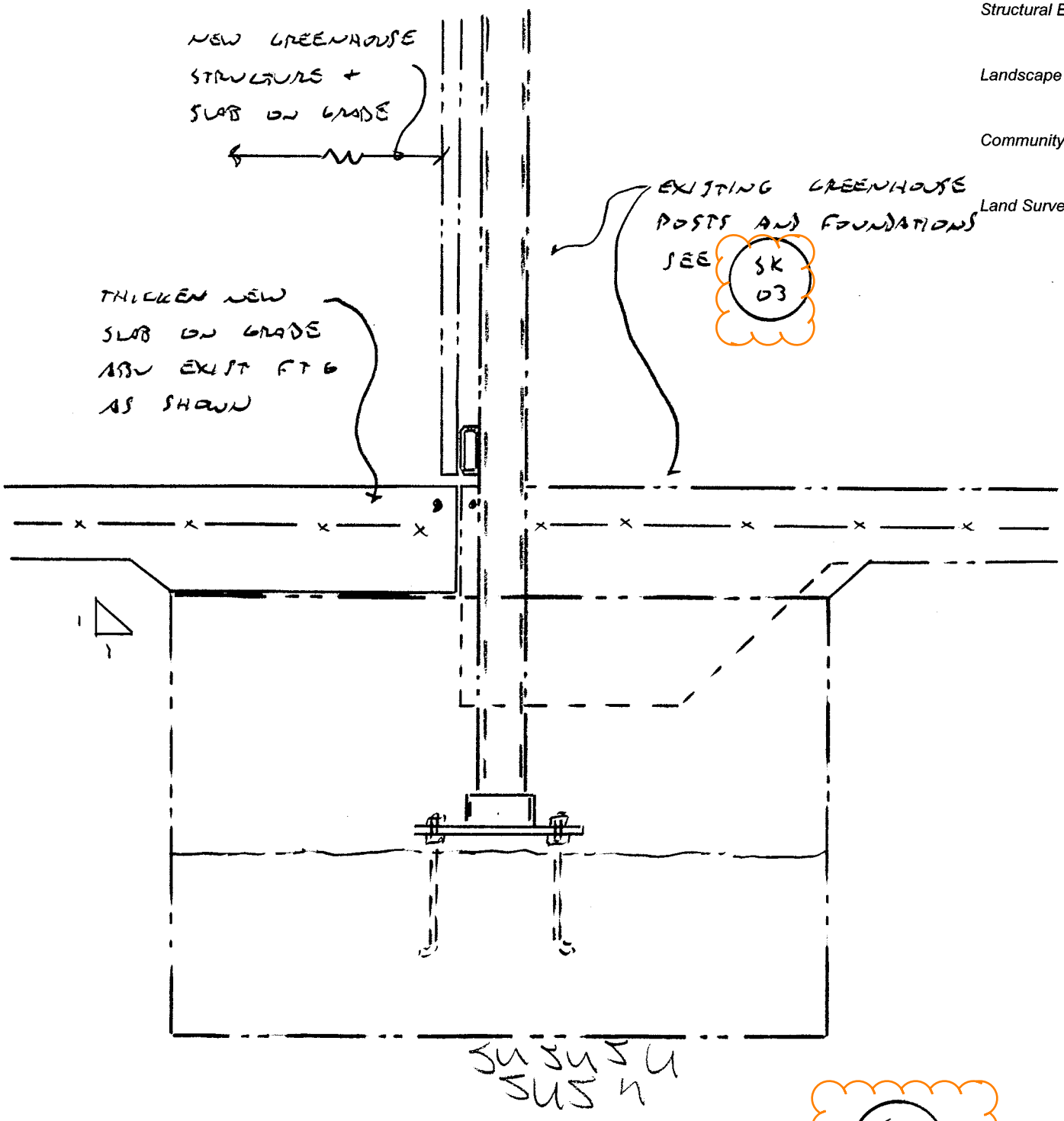


SK 07

If this does not meet with your understanding, please contact us in writing within seven days. THANK YOU.

SERRES HARNOIS GREENHOUSES

EMIS POUR / ISSUED FOR:

- INFORMATION ☐
- APPROBATION / APPROVAL ☐
- PERMIS / PERMIT ☐
- CONSTRUCTION ☒
- PLANS FINAUX / AS BUILT ☐

(1) FOUNDATION LUMINOSA (S9) 30' x 144'
(12' UNDER GUTTER)

Step by Step
13407 80th Street East
Puyallup,
WA, USA
98271

No.Commande/Order No. **212503**

No.Client/Customer No. **U1S018**

PJ-5251

AHBL: DESIGN CRITERIA INDICATED IS STRUCTURALLY ACCEPTABLE

Description / Structure

Largeur / Width	30'
Longueur / Lenght	144'
Espacement / Spacing	12' C/C
Modèle / Model	LUMINOSA S9 30' – HD14 – 12GI
Fondation / Foundation	CONCRETE PIERS
Recouvrement de Structure / Structure Recovery	PCSS
Recouvrement de Pignon / Gables Recovery	PCSS

Charge de Vent / Wind Load	110 mph, ASCE 7-10, cat II Exp B
Charge de Neige / Snow Load	30 psf, HEATED GREENHOUSE
Autre / Other	

21-juin-2021

Sheet 11/52: Structural Engineers Seal did not print on plans.

GREENHOUSES HARNOIS

Luminosa Serie 8 - Serie 9 Plan Booklet's Structures;

The plan booklet is customized to the type of structure you ordered. It is divided in sections. Each of them will show how to assemble parts and their assembly sequence. Look for notes referring to other plans or sections of the booklet(depending on chosen options).If the structure is installed parallel to another structure, make sure you have enough space in between to processd with snow removal and prevent accumulation.Proximity to structure may act as a wind breaker, causing unusual snow accumulations that may require particular actions.

ZM SECTION : Special equipment information & instructions
This section indicates how to operate certain parts and equipment such as the method to secure the plastic, advice on polycarbonate sheet's handling etc…

SECTION A : Foundations.
This section will indicate how to prepare the foundation for your structure. Pay attention to the different types of anchors used and to their elevation.

SECTION B : Posts and Gutters
This section will indicate how to assemble the posts and gutters. It is very important to identify the different gutters and where are installed before final assembly. It is also very important to respect the position of the different bracings such as the “X”, “V” bracings or any other type of reinforcement included in your structure.

Section C : Roof
In this section you will find general views showing the assembly of the roof type for your structure and those plans will show more detailed plans for assembly. Because the plans are full of information it is strongly recommended to read and understand all notes and tables. This section may also include plans for different equipment.

Section D : Side Walls
In this section you will find general views showing the assembly of wall type for your structure and those plans will show more detailed plans for assembly. Because the plans are full of information it is strongly recommended to read and understand all notes and tables. This section may also include plans for different equipment.

Section E : Gable Ends
In this section you will find general views showing the assembly of gable end type for your structure and those plans will show more detailed plans for assembly. Because the plans are full of information it is strongly recommended to read and understand all notes and tables. This section may also include plans for different eqipment.

Take the time to read and understand each note.

LES INDUSTRIES HARNOIS INC.
1044, Principale, St-Thomas (Joliette), QC, J0K 3L0, Canada
Tel:(450) 756-1041 * 1-888-HARNOIS (1-888-427-6647) * Fax:(450) 756-8389
info@harnois.com * www.harnois.com

OWNER'S MANUAL
GUTTER-CONNECTED and/or TUNNEL TYPE GREENHOUSES

The following use and maintenance recommendations apply for all gutter connected type and/or tunnel type greenhouses. Tunnel type greenhouses comprise our Ovaltech and Cold Frame models. Gutter connected greenhouses include our Luminosa model S8, S9, S11 along with our Nordique NG models.

1. INTRODUCTION

This guide will provide you with general tips on how to inspect and ensure a proper maintenance for optimal use of your greenhouse structures, be it either gutter connected and/or tunnel type. Unless otherwise indicated, the term "greenhouse" in this guide comprises both models previously outlined. By following these recommendations, you will maximize the life expectancy of your structure and ensure years of good and hassle-free service. We recommend to inspect your structure at least twice yearly in order to swiftly detect any anomaly, thus giving you the opportunity to promptly correct the situation. As well, an inspection must be done after an important storm (strong winds or significant snow accumulation).

We recommend using the enclosed form "Annex A" to document your inspection. It will also serve as a memory aid to cover all structure components.

When in doubt, call our Customer Service Department at 1-888-427-6647. Our Agents will help you conduct a safe and efficient maintenance of your structure.

To report a problem or address a claim issue, the following information concerning your structure shall be required and should be noted below to have them at hand when you contact our Customer Service Department.

Your authorized Representative: _____

Purchase date of your Greenhouse: _____

Project or Order Number : _____

2. FOUNDATION

Reference Structural Engineers sealed design.

2.1 CONCRETE PIERS / CONCRETE RETAINING WALL/ CONCRETE BEAM / FLOATING FOUNDATION/ CONCRETE SLAB

- Check the concrete foundation of your structure for any cracks. They can show sooner or later and are generally due to shrinkage. All concrete, even shrinkage-compensating concrete, shrinks due to a loss in volume as it dries. This is a normal situation and does not require any corrective measures to be undertaken. Mostly all concrete foundation types (except for concrete piers) are reinforced, thus preserving their strength.

- However, should you note a level variation between both sides of your structure, or that some cracks either expand or that they are located directly under the anchors, contact the company which has performed the foundation work for your structure without further delay. These signs could be the symptoms of a more serious failure and your supplier will know how to deal with it.

- Concrete piers which tend to slump indicate that the ground bearing capacity has been under evaluated. Contact your Harnois Representative to obtain his advice before undertaking any restoration work.

- Check soil erosion around your foundations as it may reduce its bearing capacity. If required, add some backfill and compact it.

- Ensure that the French drain around your foundation is functioning properly in order to avoid any frost heave.

- If your greenhouse is designed with an insulated retaining wall, make sure that there is no frost heave.

3. STEEL STRUCTURE

Unless otherwise indicated, the steel structure of your building has been designed according to the Building Code's regulations and standard requirements of your province/locality along with the usage and engineering information provided and confirmed by the buyer during the purchasing process. Harnois shall not be held responsible for any change in usage and/or basic parameters used for design and which could influence the structure's resistance. These modifications include, without being limited to:

- The addition of any equipment, conduits/pipes or other installations fixed to the structure which would add weight to the structure, without having been validated by our engineering department first;
- The addition of openings and/or doors other than those originally planned;
- A relocation in another town;
- A change in use;
- A modification to the structure's environment such as the construction of new building, planting tree(s), or the addition or removal of any other element which could act as windbreaker, etc.

3.1 STRUCTURAL INTEGRITY

A visual inspection should also be conducted twice a year and after a storm. Pay close attention to any functioning anomaly for panels or door openings. The structural inspection of the greenhouse should comprise, without being limited to, the following items:

a) Axial deformation in columns, braces, gutters, arches, which appear permanent or abnormal
b) Water which does not evacuate from the gutter
c) Deformation of the stiffener or truss
d) Deformation of the stiffener's plates support (tunnel type greenhouse)
e) Sliding of the U-bolt on the stiffener (tunnel type greenhouse)
f) Junction of the stiffener in the arch
g) Deformation and state of the stiffener and/or beams' brackets
h) Deformation of the curved braces
i) Deformation of the gable ends' bracings
j) Deformation of the X-bracings at the end of the greenhouses
k) Bolted fasteners of the X-bracings
l) Alignment of the racks
m) Panels alignment and their proper functioning
n) Any other items which appear to be damaged or which raise any questioning

Refer to the control list provided in Annex A (page 9) and make copies of it.

These elements being vital to your greenhouse's structural integrity, you must repair them as soon as possible, if need be. If you must tighten bolts, please refer to the pertinent chart provided in your set of plans. Contact your greenhouse Representative or our Customer Service Department in order to obtain parts or a price quotation to perform the repair.

3.2 MANAGEMENT OF CORROSIVE ENVIRONMENTS

When you purchased your greenhouse, your Representative will have validated with you whether the intended application of the structure would create a highly corrosive environment, such as the use of fertilizer, manure, etc. The steel we use is protected by a surface galvanization process which considerably increases its resistance to corrosion. Despite such protection, there exists no steel structure entirely rust free and the following recommendations are valid for all structures.

A regular inspection and bringing swift corrective measures, if necessary, will ensure that your structure preserves its strength and durability for years to come.

3.2.1 The greenhouse posts embedded in concrete must be coated with bitumen as specified in the drawings provided to the customer.

3.2.2 Check regularly that corrosives are not in direct contact with any of the structure's components, especially the posts or any other structural elements close to the ground. Potentially corrosive elements could be, amongst other things: fertilizer, manure, saline mist (sea side), etc.

3.2.3 Should you find rust on some components, thoroughly clean the rusted surface with an abrasive element and cover it with zinc rich paint. This type of paint is available in hardware stores or through your greenhouse Representative. This procedure will ensure that your pre-galvanized structure or your hot-dip galvanized structure will serve you carefree for several years.

4. GREENHOUSE COVERING

4.1 POLYETHYLENE COVERING

4.1.1 Polyethylene must be inspected at the same frequency as your structure and must be replaced if there is any breakage or tears which cannot be repaired.

4.1.2 The air pressure between the double polyethylene films must be adjusted to 0.15'' of water and must never go beyond 0.20''. Overpressure could entail breakage/tears in the polyethylene and damage the wirelocks retaining the film. It could as well prevent the proper functioning of the vent panels or even damage them. Inspect the air blower polytubes, the blower itself and clean, if necessary. Check that the pressure regulator is also functioning properly.

4.1.3 The condensation in a greenhouse can result from a climate control problem. However, when the surface tension of the polyethylene film is incorrect, it can create corrugated or wrinkled areas. These areas could prevent the condensation from scaling down by capillary action toward the condensation gutter or along the polyethylene. It is recommended to pull the polyethylene towards the extremity of the greenhouse. Please refer to your set of plans for the polyethylene's installation.

4.1.4 Polyethylene's physical properties along with its light transmission effectiveness decrease with time. Thus, polyethylene should be replaced within its warranty period.

4.2 POLYCARBONATE COVERING

4.2.1 The polycarbonate should be inspected at the same time as the structure and must be replaced when damage is found.

4.2.2 Polycarbonate is further subjected to vibrations and wears due to the winds. It is important to check the screws and moldings which retain the polycarbonate in place. Clean the condensation drain holes to prevent any mold. Refer to drawings in "Annex B" (page 10).

4.3 GLASS COVERING

4.3.1 Glass must be inspected with the same frequency as the structure and must be replaced if damaged.

4.3.2 The moldings which retain the glass must be inspected for any damage and ensure that the seals remain waterproof.

4.3.2 Glass is a fragile component and will not provide early warning signs of breakage. A deformation of the structure close to a glass panel must be treated with priority.

5. VENTILATION

5.1 INSPECTION AND VENTILATION SYSTEMS MAINTENANCE

5.1.1 Center roll-up

- Roll the polyethylene film in the correct direction. To roll it in the opposite direction would add friction to it and wear the film out faster.
- However, during winter, it would be preferable to keep the polyethylene film closed using the opposite direction to prevent water from reaching the rollup tubes.

5.1.2 Roll-up

- Roll the polyethylene film in the correct direction. To roll it in the opposite direction would add friction to it and wear the film out faster.
- However, during winter, it would be preferable to keep the polyethylene film closed using the opposite direction to prevent water from reaching the rollup tubes.

5.1.3 Motorized rollup system

- Please refer to the control's instruction manual.
- Inspect the motor according to the manufacturer's instructions.
- Adjust the limit switches, if necessary.
- Verify the tubing guide and the actuator.

5.1.4 Roof Ventilation (single panel, double panel, mid-roof panel)

- Activated by an electrical motor, the end limit of the panel's opening is set by integrated power switches and it is activated by a temperature monitor or a manual override.
- An abnormal grinding noise could result from a misalignment of the racks or from a lack of lubricant which could cause overvoltage and stop the motor.
- Investigate the causes, adjust the mechanical elements, if necessary, reset the electrical overload relay and test the opening.
- It is important to **not activate the opening** while there is snow on the roof or during high winds.
- Verify the seals.
- Verify the adjustment of the panel on the sill along with the racks, if necessary.
- Lubricate the racks and pinions while you conduct your semi-annual inspection (Food Grade Lubricant, class 6D025-1, as specified in our plan booklet).

6. WEATHER CONDITIONS MANAGEMENT

6.1 SNOW MANAGEMENT

In certain conditions, you may notice an unusual snow accumulation. This section explains which conditions might cause such an accumulation and which actions would provide the best solution according to the situation at hand.

6.1.1 Verify regularly the snow accumulation on the greenhouse and around its periphery.

6.1.2 Several factors influence snow accumulation on and around the structure:

- Wind direction and wind force
- Orientation of the structure
- The presence of windbreakers or buildings around the structure. Either one is always taken into consideration in structure design to ensure adequate snow load anticipated resistance.

6.1.3 Accumulations could be uniform throughout the surface or be disproportionate from one side to the other or on one end or the other extremity of the structure.

6.1.4 As concerns non heated greenhouses in particular, weather conditions such as freeze-thaw cycles, spells of warm weather followed by intense cold, alternating rain/ice storm/snow, all influence snow accumulation on the structure. The water contained in the snow (or liquid precipitations) will form an ice patch which will tend to stick to the covering.

6.1.5 Ensure that all sides of the tunnel type greenhouse be cleared in a way to allow the snow on the roof to slide down according to the structure design.

6.1.6 The snow load on the heated greenhouse structures is lighter and presents a lower structural resistance since the snow will melt. Should the snow accumulate faster than it melts, you may accelerate the melting process by increasing the greenhouse temperature, if possible, before the snow starts falling. **Do not place any heat source near the covering. Do not use any heat source generating toxic fumes.**

6.1.7 It is important to keep the heating system well maintained. Besides maintaining an adequate climate for the plants, it helps preserving the structure for the abovementioned reasons. Always keep the critical components within reach in case of system breakage. It is also a good idea to anticipate a backup heating system, especially if the greenhouse functions with only one (1) heating unit. It is recommended to have a service contract with a licensed heating contractor.

SNOW REMOVAL PROCEDURE FOR TUNNEL TYPE GREENHOUSES ONLY:

In order to safely remove the snow from your structure, the following procedure should be complied with:

1. Start by removing the snow on both sides (mechanically).
2. Proceed to snow removal from the exterior, starting at the bottom. When both sides of the covering are completely clear, it could force the snow remaining on the roof to slide down on its own. Be careful of potential snowfalls.
3. Remove the snow no more than 20-25 ft at a time on one side, then alternating with the other side for the same length, before moving further ahead for an equivalent distance. This will prevent any unbalanced load on the structure.
4. Do not come in contact with the covering with a blunt object.

5. Do not stand directly under the load.

6.2 WIND MANAGEMENT

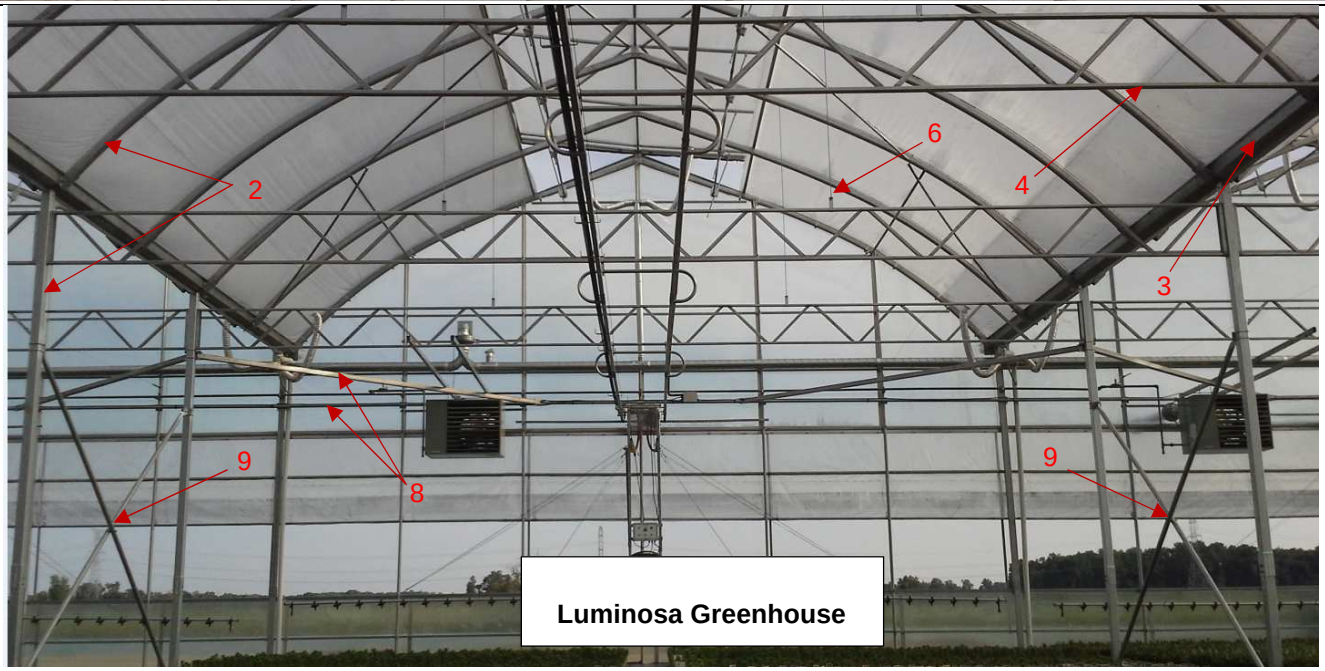
- Load carrying capacity and resistance of your greenhouse have been calculated for a structure with closed openings (when applicable). Just ensure to keep all doors closed as much as possible, especially during high winds. This will considerably reduce the stress bearing on the structure and the covering and will increase your components' life expectancy.

- In all cases when winds exceed 50 km/h, all doors and vents must remain closed when not used.

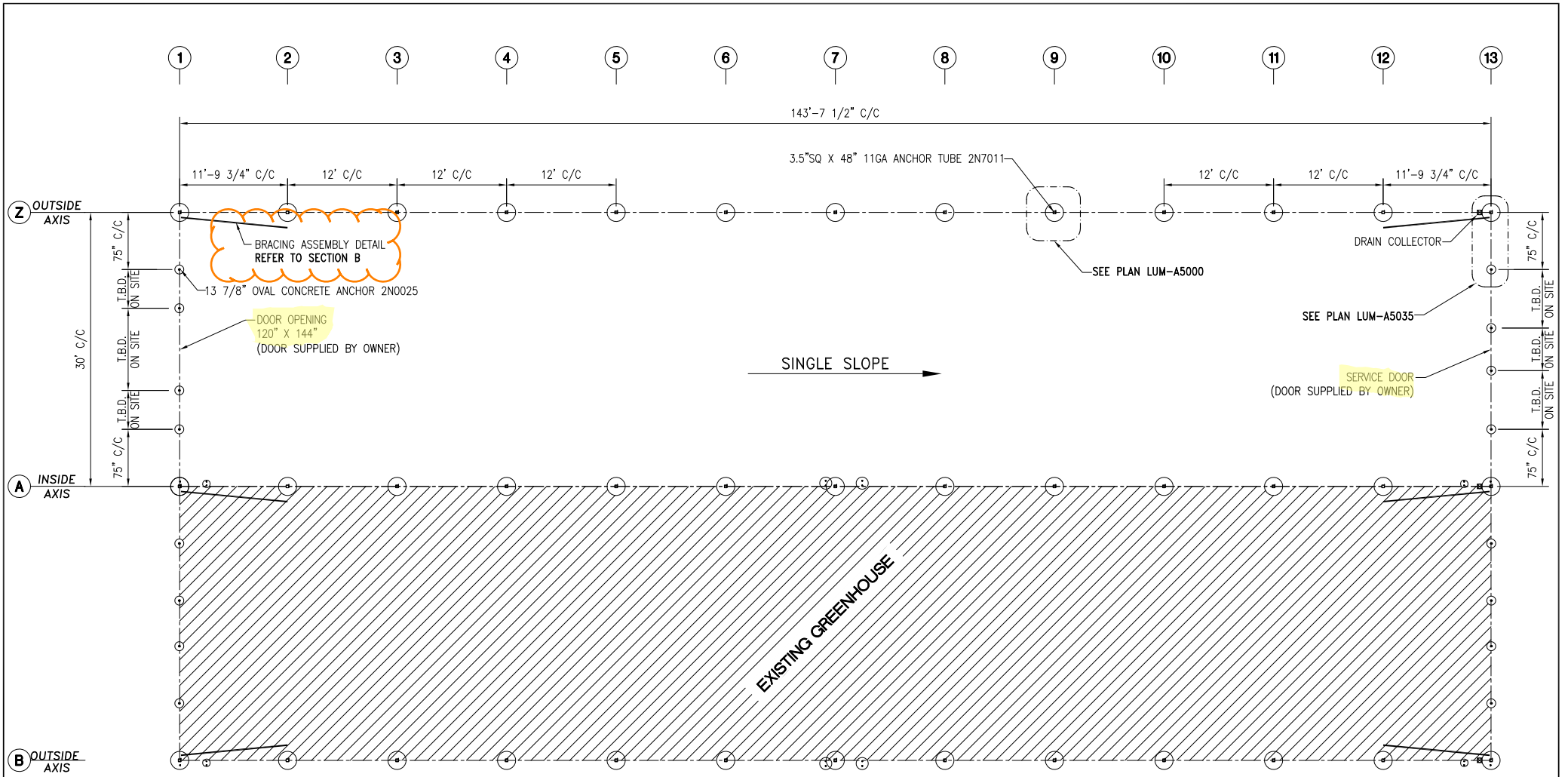
ANNEX A : Inspection Sheet

Items numbered below refer to items numbered in Memory Aid Chart (page 11)

Ovaltech Greenhouse



Luminosa Greenhouse



CODE	DESCRIPTION	QTY
2N7011	3.5"SQ X 48" 11GA ANCHOR TUBE	13
2N0025	13 7/8" OVAL CONCRETE ANCHOR	8

TO OBTAIN APPROPRIATE DIMENSIONS OF THE FOUNDATIONS, SEE TABLE OF THEORICAL DEADWEIGHT CAPACITY OF SOIL SECTION "A" PLAN #STEP-A705 & STEP-A800

-THE SPACINGS BETWEEN THE OVAL GABLE FRAMING TUBES ARE BEING SUGGESTED, DEPENDING ON THE EQUIPMENT THAT YOU HAVE (FAN,DOOR, ECT...)

ISSUED FOR:
- INFORMATION ☐
- APPROVAL ☐
- PERMIT ☐
- CONSTRUCTION ☑
- AS BUILT ☐

5				
4				
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2				
1				
	REVISIONS	DATE	BY	

SERPACK:

REF: STEP-A2000

DRAWN BY: PL BEAUDRY
APPROVED BY:
DATE: JUNE 21, 2021
SCALE: N.T.S.

GREENHOUSES HARNOIS
TEL.(450)756-1041
1-888-427-6647
FAX.(450)756-8389

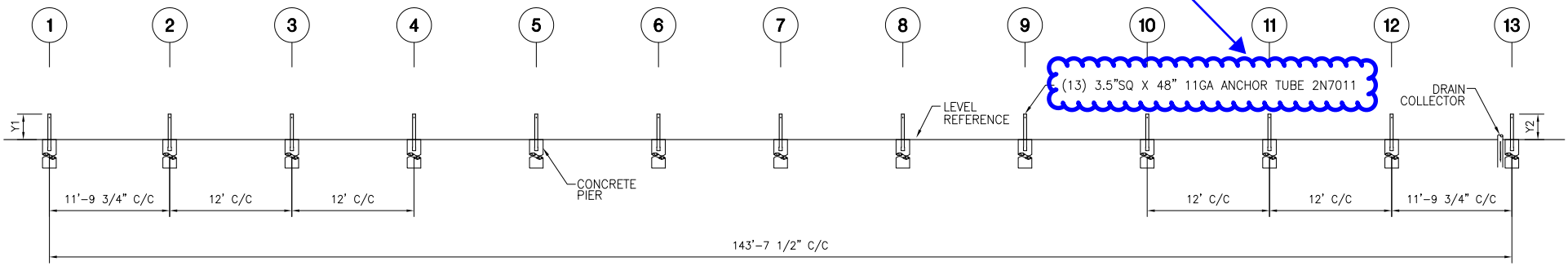
STEP BY STEP

PLAN: STEP-A2000

TITLE: LAYOUT OF FOUNDATION PLAN
(1) LUMINOSA (S9) 30' X 144'

ALTERNATE FOUNDATIONS DESIGNED TO MEET THE CAPACITY OF THE PROPOSED PIER FOUNDATION - SEE ATTACHED CALCULATIONS

FOLLOW EXISTING GREENHOUSE SLOPE
REFER TO PLAN LUM-AI000



ISSUED FOR:
- *INFORMATION* ☐
- *APPROVAL* ☐
- *PERMIT* ☐
- *CONSTRUCTION* ☑
- *AS BUILT* ☐

REVISIONS	DATE	BY
5		
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SERPACK:
REF: *STEP-A2100*

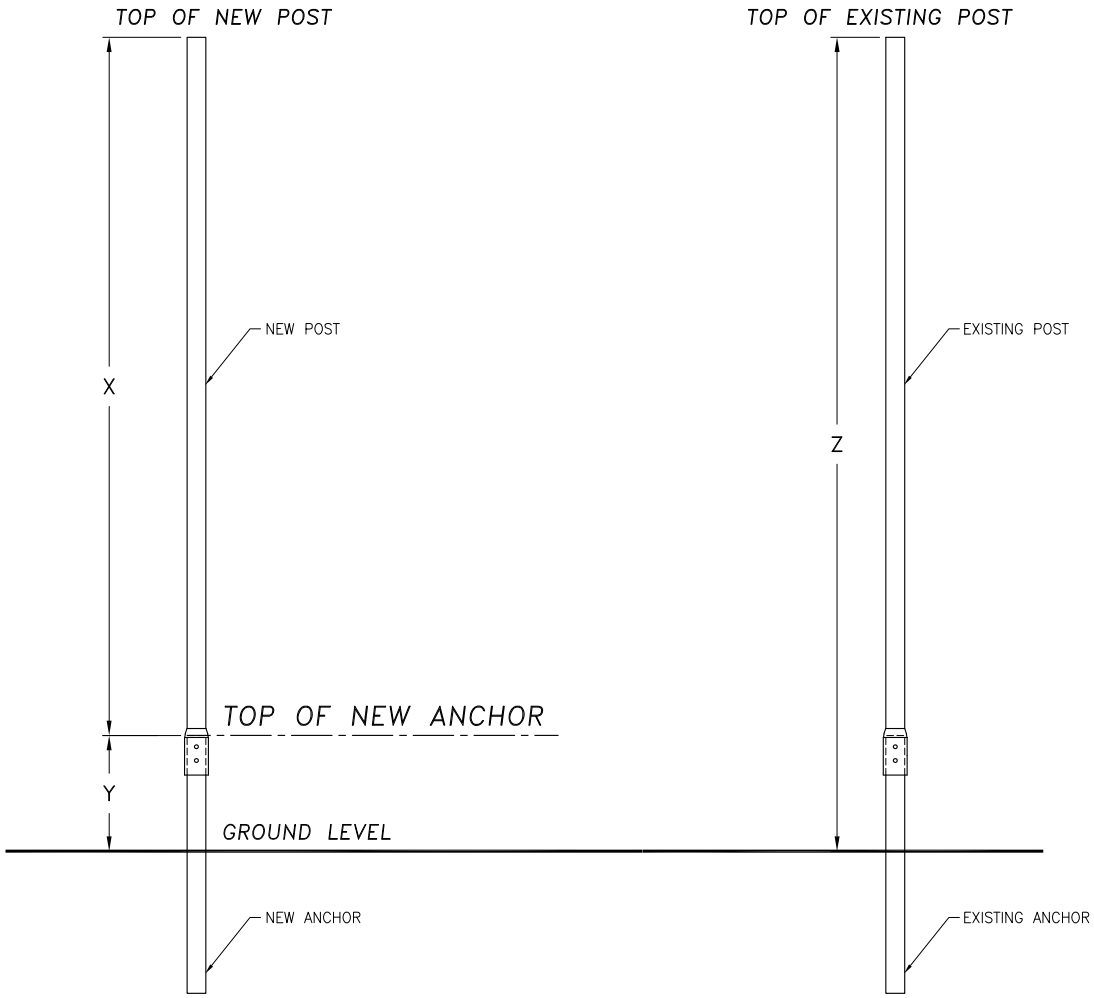
DRAWN BY: *PL BEAUDRY*
APPROVED BY:
DATE: *JUNE 21, 2021*
SCALE: *N.T.S.*

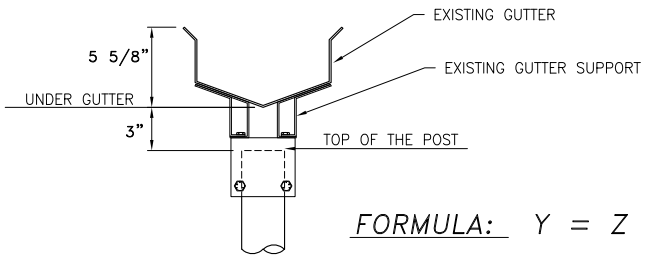
GREENHOUSES HARNOIS
TEL.(450)756-1041
1-888-427-6647
FAX.(450)756-8389

STEP BY STEP

PLAN:*STEP-A2100*

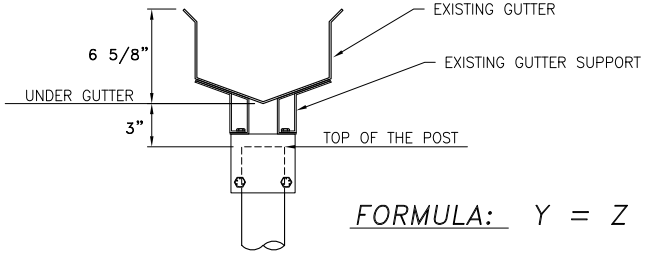
TITLE: *ELEVATION VIEW*





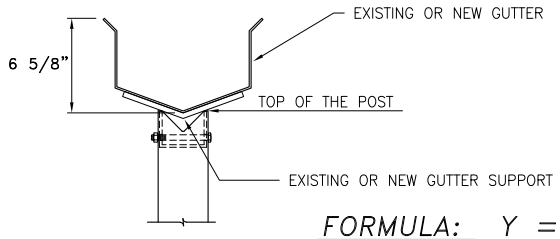
FORMULA: $Y = Z - X + 2"$

TYPE A



FORMULA: $Y = Z - X + 3"$

TYPE B



FORMULA: $Y = Z - X$

TYPE C

HEIGHT UNDER GUTTER	X VALUE
10'	84 1/8"
12'	108 1/8"
14'	138 1/8"
16'	162 1/8"
18'	174 1/8"
6M	194 1/8"

IMPORTANT

VERIFY THE DIMENSION AND THE TYPE OF THE EXISTING GUTTER AND THE GUTTER SUPPORT

* THE NEW GREENHOUSE SLOPE MUST FOLLOW THE EXISTING GREENHOUSE SLOPE.

** THE LENGHT OF THE NEW ANCHORS ARE DIFFERENT.
THE DIMENSIONS MUST BE VERIFIED ON SITE.

*** SUGGESTED SLOPE:
3/4" IN 144" OR 3/4'' IN 4M

5				SERPACK:	DRAWN BY: C. BRANCONNIER
4					APPROVED BY:
3					DATE: FEB 12, 2015
2					SCALE: N.T.S
1				REF: LUM-A1000	
	REVISIONS	DATE	PAR		

GREENHOUSES HARNOIS

TEL.(450)756-1041
1-888-427-6647
FAX.(450)756-8389

LUMINOSA SERIE 8 - 9 - 11

PLAN: LUM-A1000

TITLE: ELEVATION ANCHOR REFERENCE FOR NEW GREENHOUSE VS EXISTING GREENHOUSE

ALTERNATE FOUNDATIONS DESIGNED TO MEET THE CAPACITY OF THE PROPOSED PIER FOUNDATION - SEE ATTACHED CALCULATIONS

TYPE OF SOIL*	BEARING SOIL CAPACITY FOR SERVICE LOAD (Pound/Ft²)**	ø PIER X 60" DEPTH (SEE DETAIL–1) PLAN STEP–A800	PIER ø16" X 60" WITH SQUARE BASE AND REBAR (SEE DETAIL–2) PLAN STEP–A800
SOFT CLAY	1000	–	28" x 28" x 10" & REBARS
CLAY AND FINE SAND	1500	26"	–
↓	2000	24"	–
CLAY AND COARSE SAND	2500	24"	–
↓	3000	24"	–
GRAVEL	4000	24"	–
USE CONCRETE CLASS F2: 3000 PSI AT 28 DAYS			

* THE SOIL TYPES LISTED ABOVE ARE BASED ON REFERENCE BOOKS. PROPER SOIL IDENTIFICATION REQUIRES A SPECIAL EXPERTISE. IT IS THE CUSTOMER'S RESPONSABILITY TO HAVE THE INSTALLATION SITE'S SOIL INVESTIGATED AND HAVE ITS LOAD CAPACITY CONFIRMED.

** A GEOTECHNICAL ANALYSIS OF THE CONSTRUCTION SITE EXECUTED BY A PROFESSIONAL ENGINEER IS REQUIRED TO DETERMINE THE BEARING SOIL CAPACITY FOR THE FOUNDATION DESIGN.

*** FOR GABLE END OVAL TUBE, A 12"ø X 60" PIER IS RECOMMANDED FOR ALL CONDITIONS

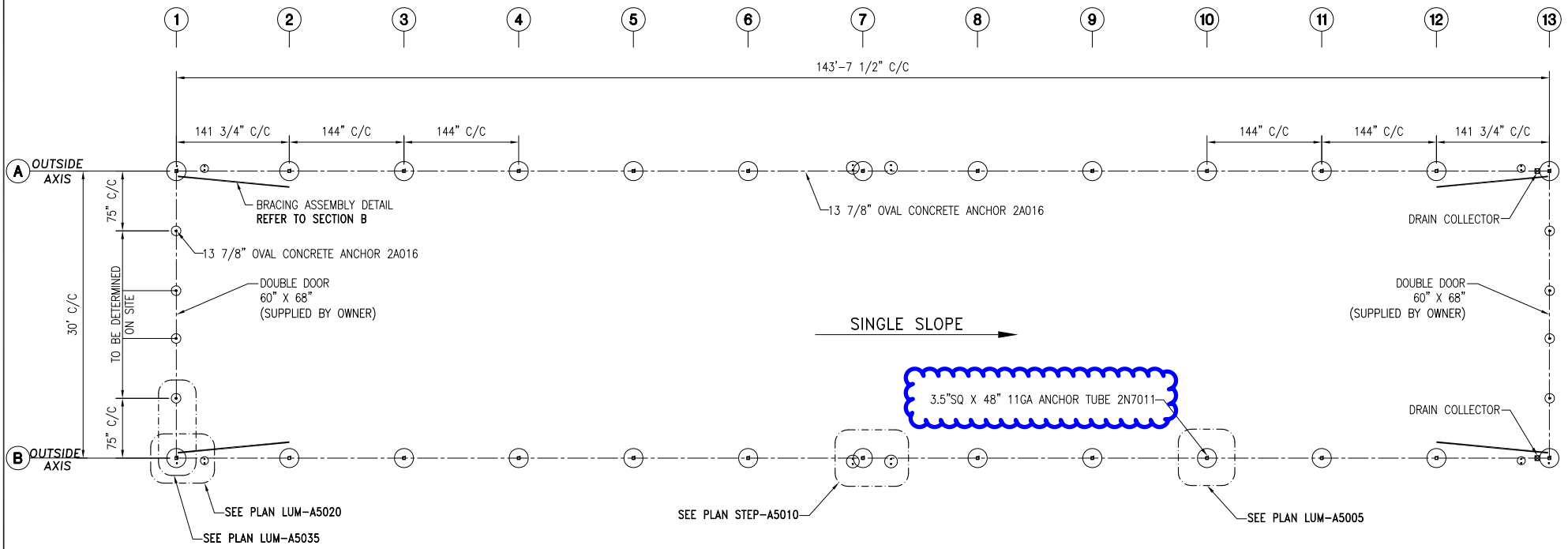
5				SERPACK:	DRAWN BY: PL BEAUDRY	GREENHOUSES HARNOIS
4					APPROVED BY:	TEL.(450)756–1041
3					DATE: JUNE 21, 2021	1–888–427–6647
2					SCALE: N.T.S.	FAX.(450)756–8389
1				REF: STEP–A705		
	REVISIONS	DATE	PAR			

STEP BY STEP

PLAN: STEP–A705

TITLE: DIMENSIONS OF THE FOUNDATIONS
(1) LUMINOSA 30' x 144'
12' UNDER GUTTER

ORIGINAL GREENHOUSE CONSTRUCTION



TO OBTAIN APPROPRIATE DIMENSIONS OF THE FOUNDATIONS, SEE TABLE OF THEORICAL DEADWEIGHT CAPACITY OF SOIL SECTION "A"
PLAN #STEP-A900

-THE SPACINGS BETWEEN THE OVAL GABLE FRAMING TUBES ARE BEING SUGGESTED, DEPENDING ON THE EQUIPMENT THAT YOU HAVE (FAN,DOOR, ECT...)

ISSUED FOR:
- INFORMATION ☐
- APPROVAL ☐
- PERMIT ☐
- CONSTRUCTION ☑
- AS BUILT ☐

	REVISIONS	DATE	PAR
5			
4			
3			
2	CHANGE CENTER MOTORISATION BOX DIMENSION	2017-03-16	LMB
1	ADD CENTER ROLL-UP ANCHORS + ADD 2 DOUBLE DOOR	2017-02-02	C.L.

SERPACK:
REF: STEP-A2000

DRAWN BY: Louis-M Buissieres
APPROVED BY:
DATE: DEC 16, 2016
SCALE: N.T.S.

HARNOIS

TEL.(450)756-1041
1-888-427-6647
FAX.(450)756-8389

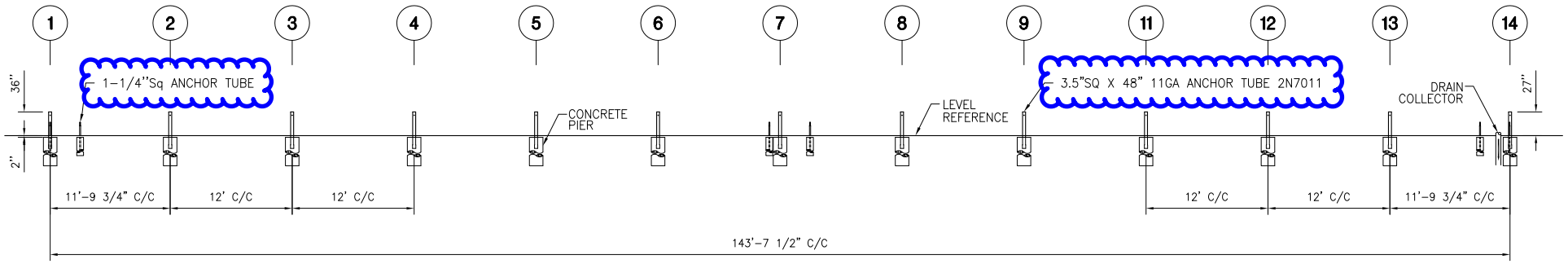
STEP BY STEP

PLAN: STEP-A2000

TITLE: LAYOUT OF FOUNDATION PLAN
(1) LUMINOSA (S9) 30' X 144'

ORIGINAL GREENHOUSE CONSTRUCTION

TOTAL SLOPE 9"
3/4" IN 12'



ISSUED FOR:
- INFORMATION ☐
- APPROVAL ☐
- PERMIT ☐
- CONSTRUCTION ☑
- AS BUILT ☐

REVISIONS	DATE	PAR
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SERPACK:

REF: STEP-A2100

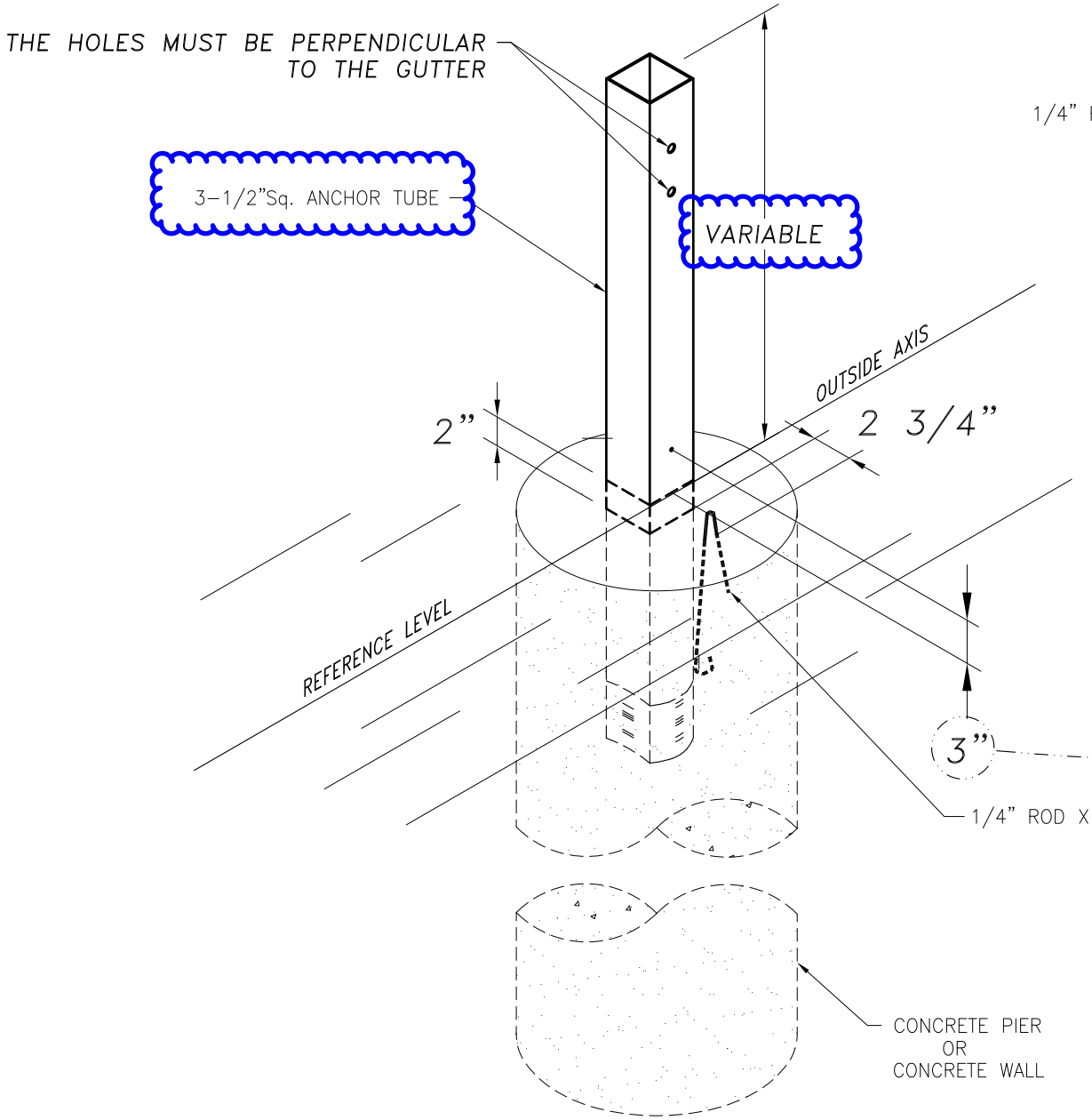
DRAWN BY: Louis-M Buissieres
APPROVED BY:
DATE: MARCH 03, 2017
SCALE: N.T.S.

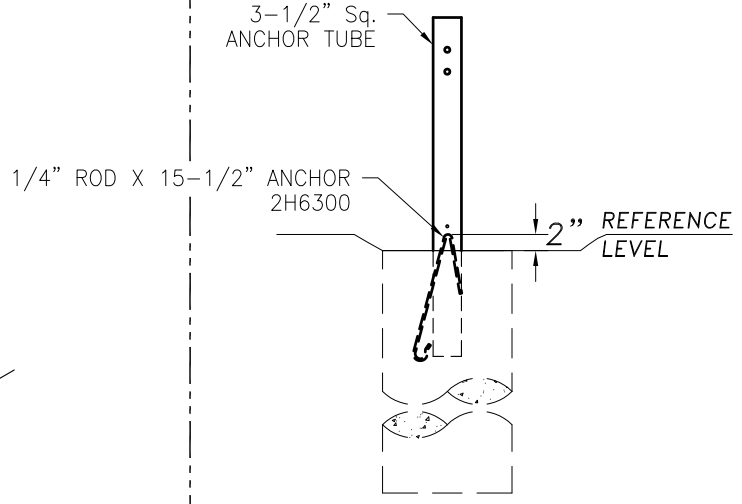
HARNOIS
TEL.(450)756-1041
1-888-427-6647
FAX.(450)756-8389

STEP BY STEP

PLAN: STEP-A2100

TITLE: ELEVATION VIEW





NOTE

CONCRETE MUST BE POURED 2" UNDER REFERENCE LEVEL FOR CENTER ROLL-UP INSTALLATION.

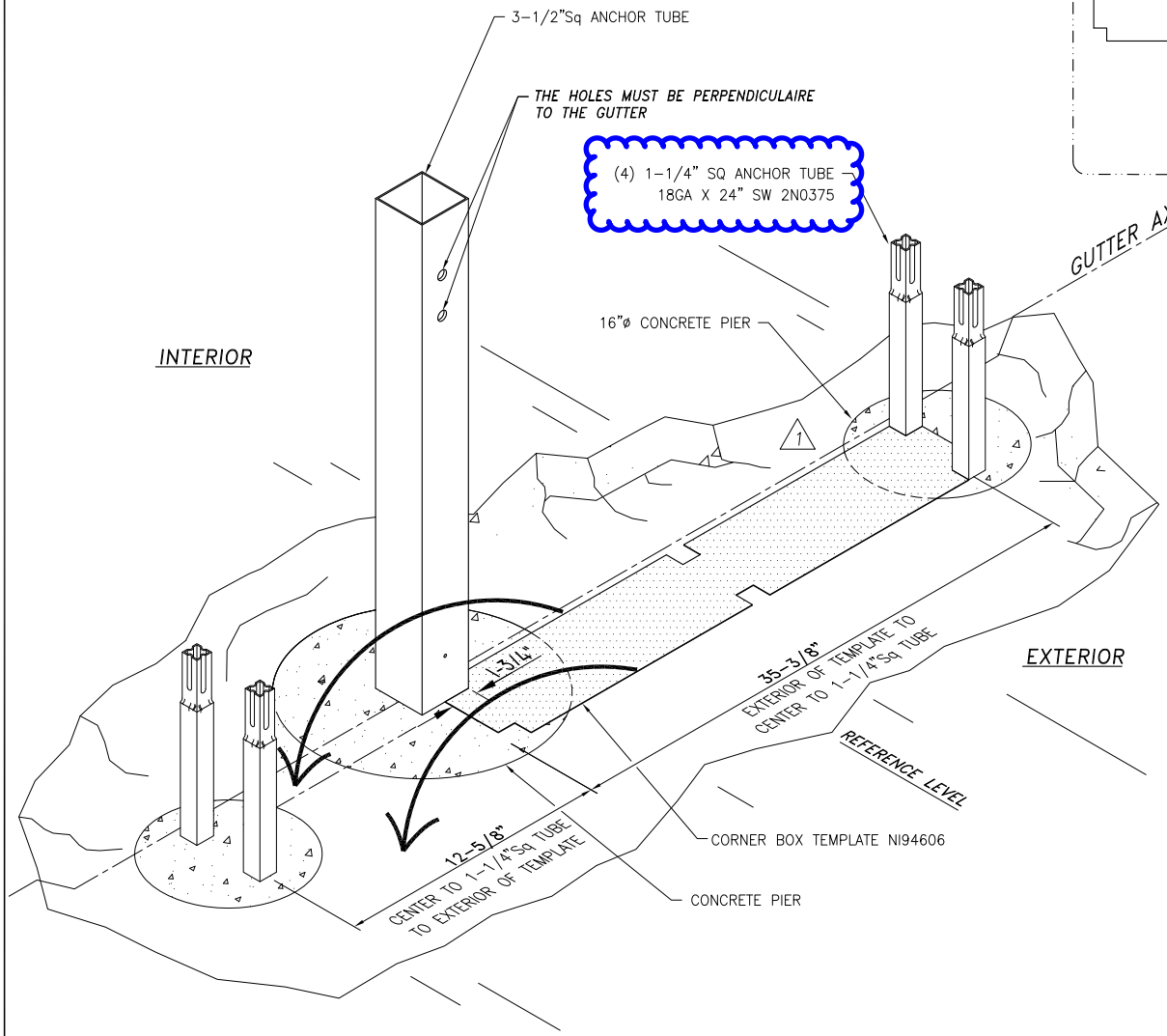
IMPORTANT

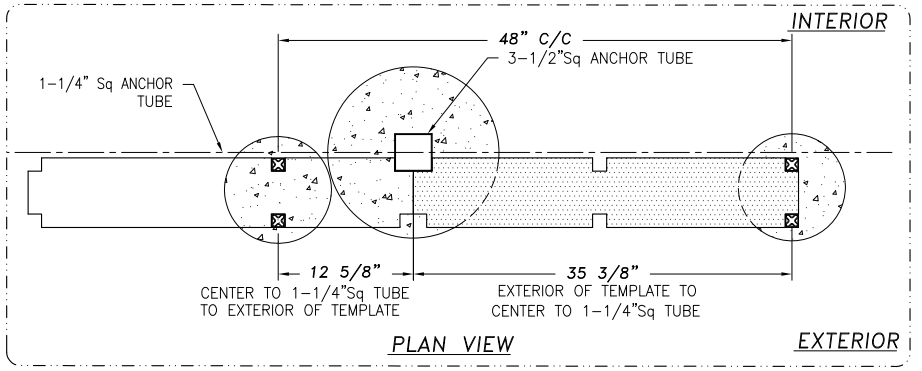
DRILL A 3/16" DIAMETER HOLE AT 3" FROM THE BOTTOM OF EACH POST TO EVACUATE ANY ACCUMULATED WATER TO PREVENT FREEZING DAMAGE.

DATE: FEB 12, 2015	DRAWN BY: C. BRANCONNIER	Tel.:(450) 756-1041 1-888-427-6647 Fax.:(450) 756-8389	LUMINOSA SERIE 8 - 9	PLAN # LUM-A5005
SCALE: N.T.S	APPROVED BY:	HARNOIS	TITLE: 3-1/2"Sq ANCHOR TUBE INSTALLATION DETAIL (FOR CENTER ROLL-UP AXIS)	
REF: LUM-A5005				

IMPORTANT

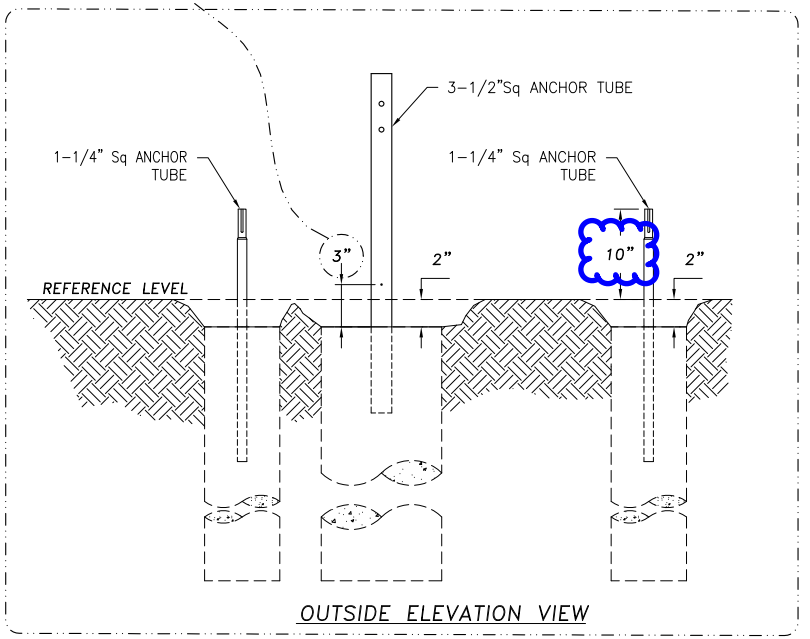
CONCRETE MUST BE POURED 2" UNDER REFERENCE LEVEL FOR CENTER ROLL-UP INSTALLATION.





IMPORTANT

DRILL A 3/16" DIAMETER HOLE AT 3" FROM THE BOTTOM OF EACH POST TO EVACUATE ANY ACCUMULATED WATER TO PREVENT FREEZING DAMAGE.



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1	CHANGE CENTER MOTORISATION BOX TEMPLATE	2017-03-16	LMB		
	REVISIONS	DATE	PAR		

SERPACK:

REF: STEP-A5010

DRAWN BY: Louis-M Buissieres
APPROVED BY:
DATE: MARCH 15, 2017
SCALE: N.T.S

HARNOIS
TEL.(450)756-1041
1-888-427-6647
FAX.(450)756-8389

STEP BY STEP

PLAN: STEP-A5010

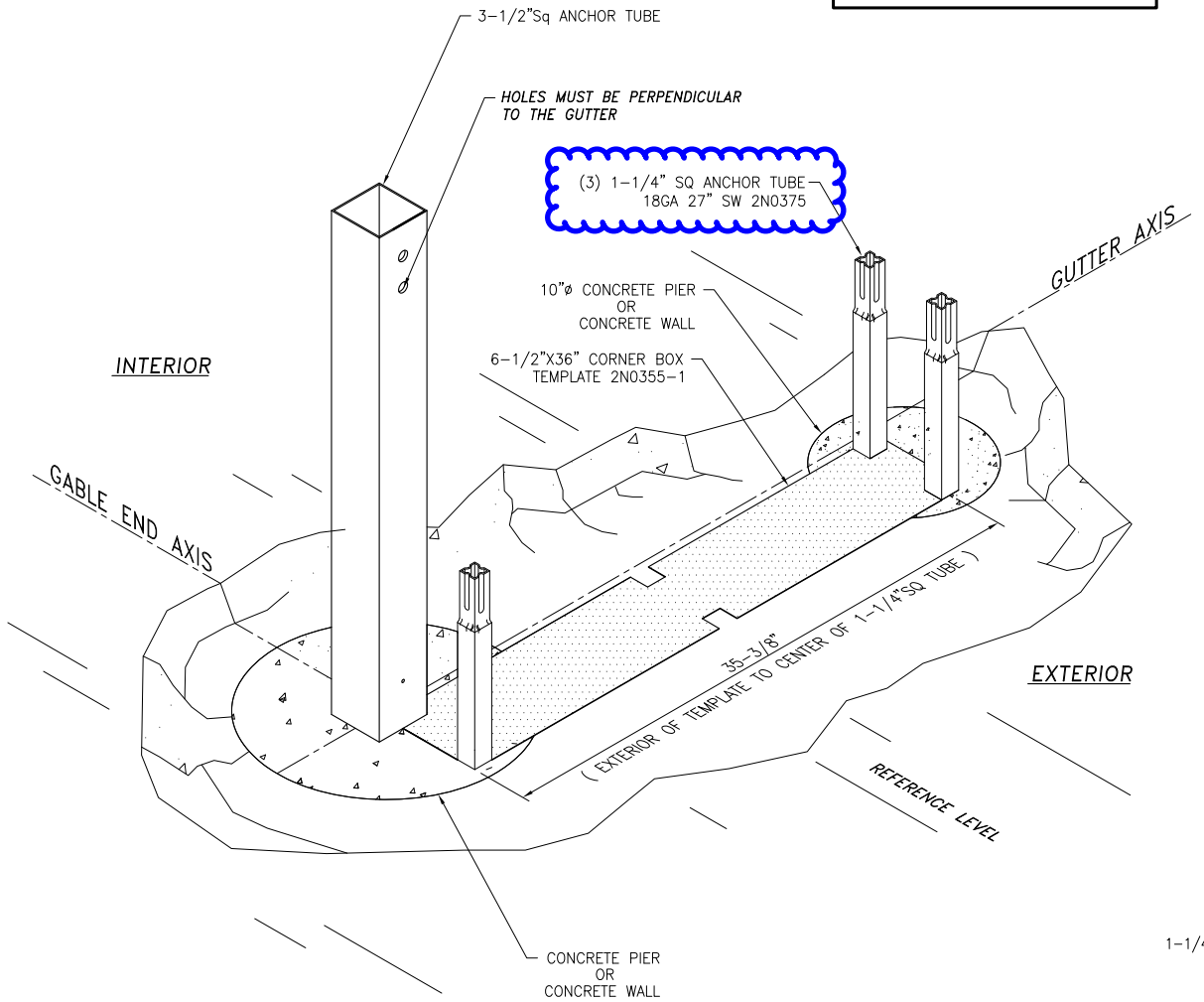
TITLE: ANCHOR TUBE DISPOSITION IN CONCRETE FOR CENTER ROLL-UP SIDE.

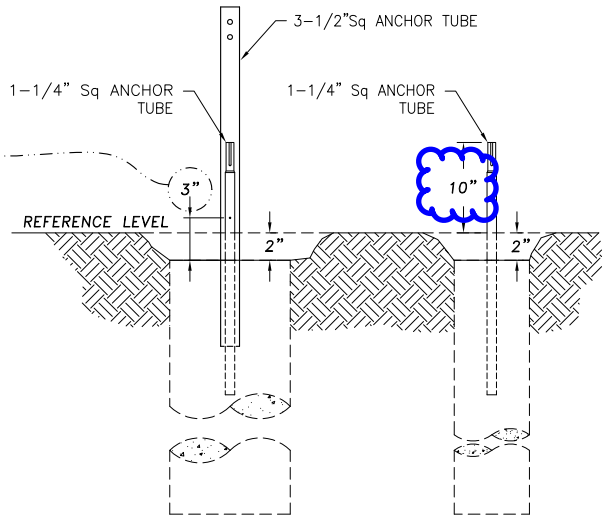
IMPORTANT

CONCRETE MUST BE POURED 2" UNDER REFERENCE LEVEL FOR CENTER ROLL-UP INSTALLATION.

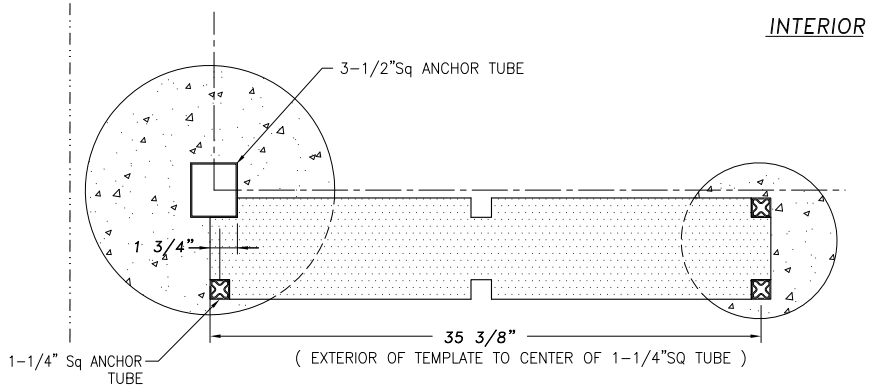
IMPORTANT

DRILL A 3/16" DIAMETER HOLE AT 3" FROM THE BOTTOM OF EACH POST TO EVACUATE ANY ACCUMULATED WATER TO PREVENT FREEZING DAMAGE.





OUTSIDE ELEVATION VIEW



PLAN VIEW

REVISIONS	DATE	PAR
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SERPACK:

REF: LUM-A5020

DRAWN BY: C. BRANCONNIER
APPROVED BY:
DATE: FEB 12, 2015
SCALE: N.T.S

HARNOIS

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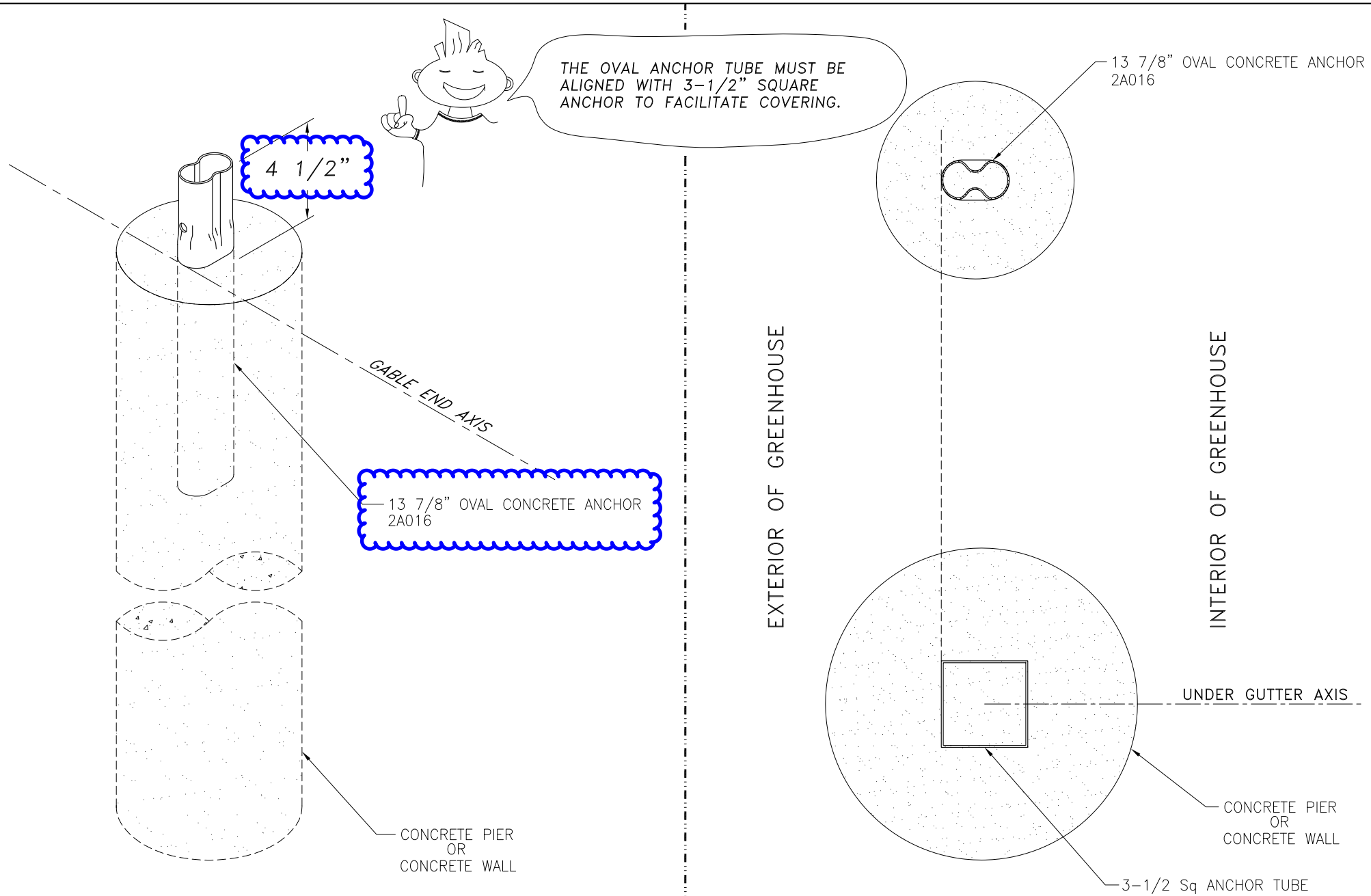
1-888-427-6647
FAX.(450)756-8389

LUMINOSA SERIE 8 - 9

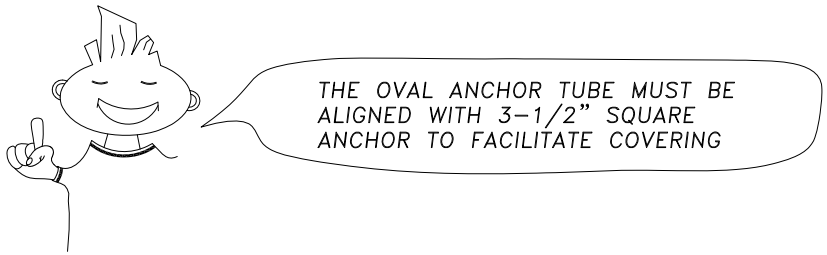
PLAN: LUM-A5020

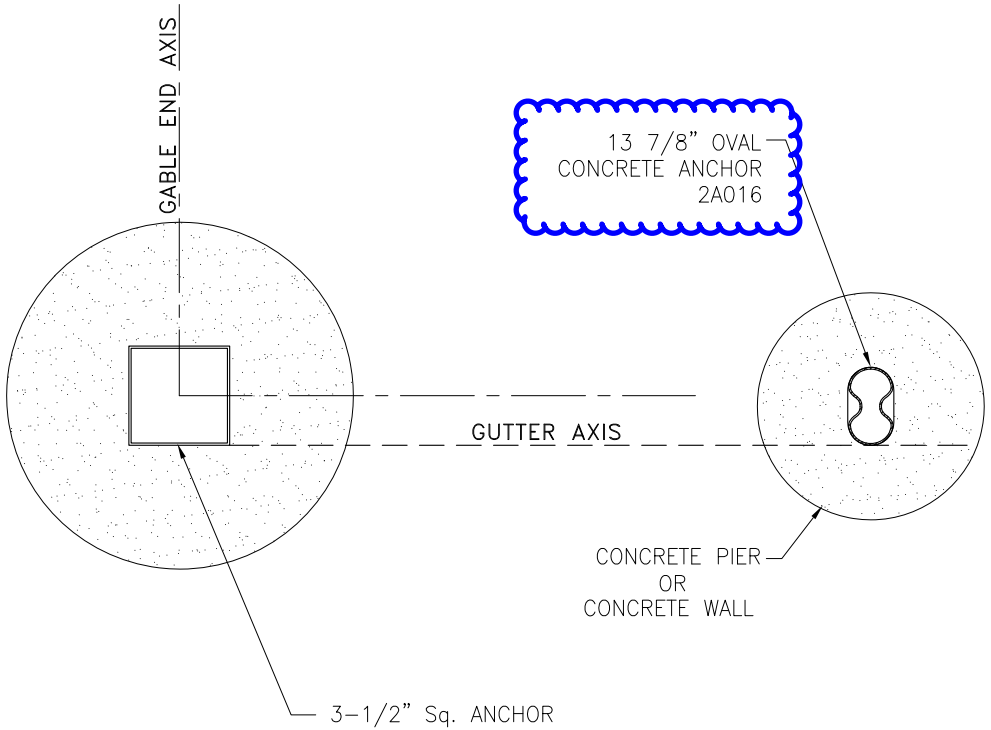
TITLE: ANCHOR TUBE DISPOSITION IN CONCRETE FOR CENTER ROLL-UP SIDE.

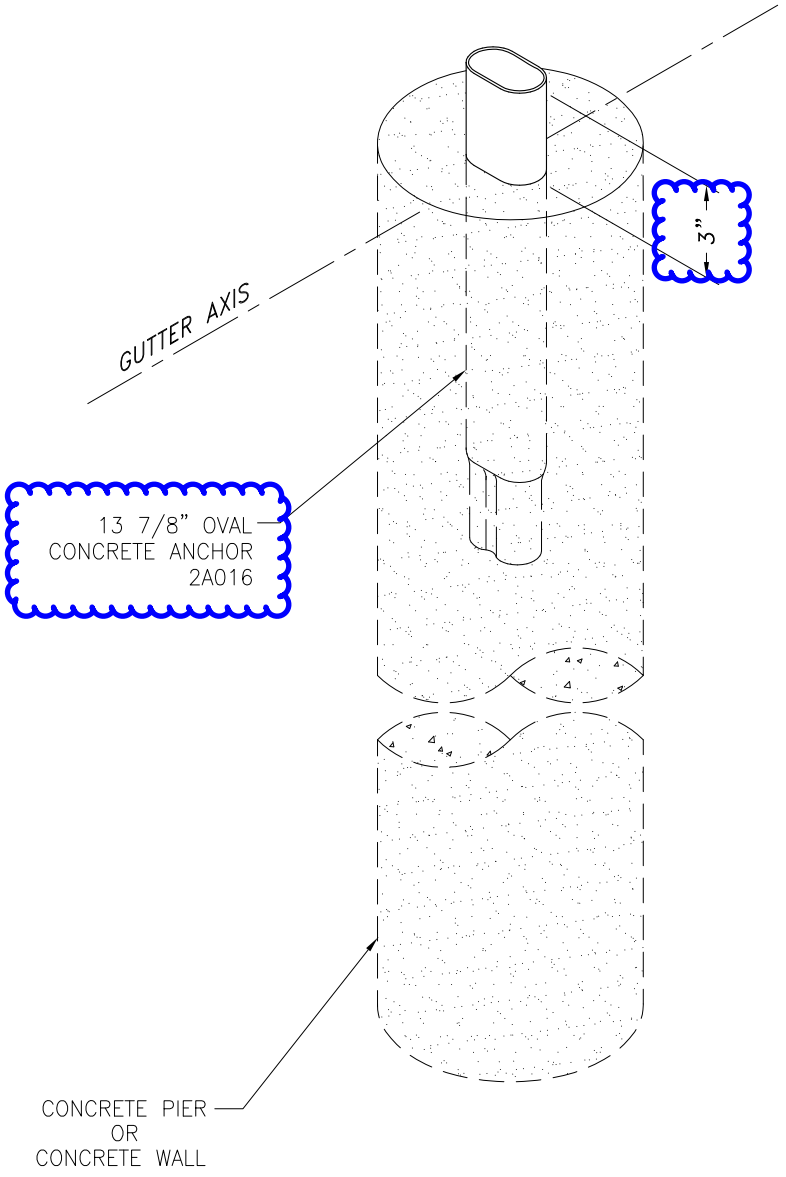


PLAN VIEW

DATE: FEB 13, 2015	DRAWN BY: C. BRANCONNIER	Tel.:(450) 756–1041 1–888–427–6647 Fax.:(450) 756–8389	LUMINOSA SERIE 8 – 9	PLAN # LUM–A5035
SCALE: N.T.S	APPROVED BY:	HARNOIS	TITLE: OVAL ANCHOR TUBE INSTALLATION DETAIL	
REF: LUM–A5035				







DATE: FEB 13, 2015	DRAWN BY: C. BRANCONNIER	Tel.:(450) 756–1041 1–888–427–6647 Fax.:(450) 756–8389	LUMINOSA SERIE 8 – 9	PLAN # LUM–A5045
SCALE: N.T.S	APPROVED BY:	HARNOIS	TITLE: OVAL ANCHOR TUBE INSTALLATION DETAIL FOR POLYETHYLENE SIDE	
REF: LUM–A5045				

Hazards by Location

Search Information

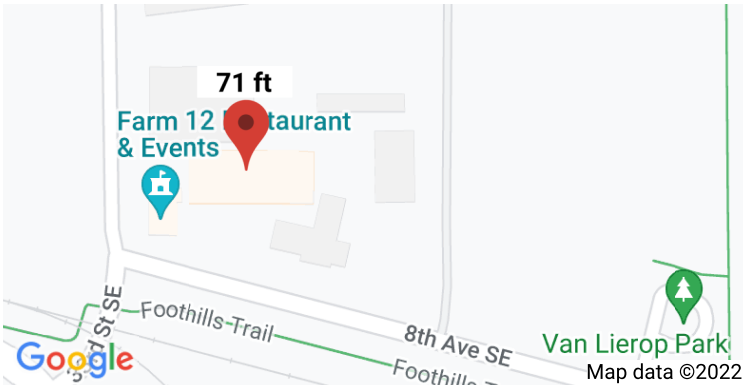
Address: 3303 8th Ave SE, Puyallup, WA 98372, USA

Coordinates: 47.1853144, -122.2500505

Elevation: 71 ft

Timestamp: 2022-03-08T05:26:03.523Z

Hazard Type: Wind



ASCE 7-16

MRI 10-Year	67 mph
MRI 25-Year	73 mph
MRI 50-Year	78 mph
MRI 100-Year	82 mph
Risk Category I	92 mph
Risk Category II	97 mph
Risk Category III	104 mph
Risk Category IV	108 mph

ASCE 7-10

MRI 10-Year	72 mph
MRI 25-Year	79 mph
MRI 50-Year	85 mph
MRI 100-Year	91 mph
Risk Category I	100 mph
Risk Category II	110 mph
Risk Category III-IV	115 mph

ASCE 7-05

ASCE 7-05 Wind Speed	85 mph

WIND SPEEDS SHOWN ARE EQUIVALENT BTWN ASCE 7-10 AND ASCE 7-16

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer. Per ASCE 7, islands and coastal areas outside the last contour should use the last wind speed contour of the coastal area – in some cases, this website will extrapolate past the last wind speed contour and therefore, provide a wind speed that is slightly higher. NOTE: For queries near wind-borne debris region boundaries, the resulting determination is sensitive to rounding which may affect whether or not it is considered to be within a wind-borne debris region.

Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

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Hazards by Location

Search Information

Address: 3303 8th Ave SE, Puyallup, WA 98372, USA

Coordinates: 47.1853144, -122.2500505

Elevation: 71 ft

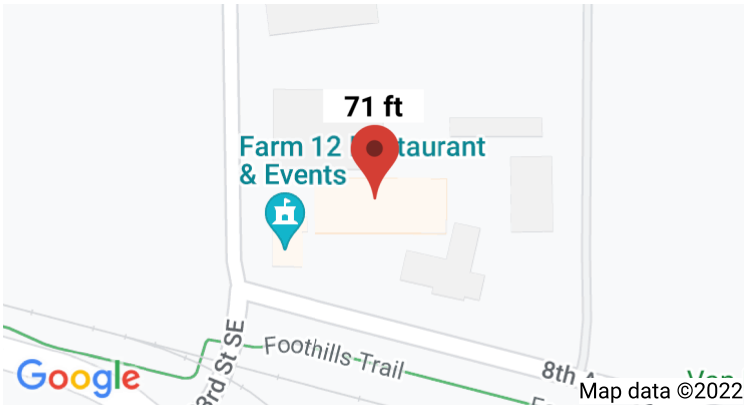
Timestamp: 2022-03-08T05:35:29.966Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: II

Site Class: D-default



Basic Parameters

Name	Value	Description
S_S	1.252	MCE_R ground motion (period=0.2s)
S_1	0.431	MCE_R ground motion (period=1.0s)
S_{MS}	1.502	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	1.001	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.914	Coefficient of risk (0.2s)
CR_1	0.898	Coefficient of risk (1.0s)
PGA	0.5	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.6	Site modified peak ground acceleration

T_L	6	Long-period transition period (s)
SsRT	1.252	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.369	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.431	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.48	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.5	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

While the information presented on this website is believed to be correct, ATC and its sponsors and contributors assume no responsibility or liability for its accuracy. The material presented in the report should not be used or relied upon for any specific application without competent examination and verification of its accuracy, suitability and applicability by engineers or other licensed professionals. ATC does not intend that the use of this information replace the sound judgment of such competent professionals, having experience and knowledge in the field of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the results of the report provided by this website. Users of the information from this website assume all liability arising from such use. Use of the output of this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the report.

ANALYSIS PERFORMED TO DETERMINE ALLOWABLE LOAD CAPACITY (VERTICAL AND LATERAL) OF PROPOSED GREENHOUSE POST SLEEVE. FOUNDATIONS TO BE DESIGNED TO DEVELOP THE POST CAPACITY.

Envelope Only Solution

AHBL	Greenhouse Post Capacity	1
ADM		Mar 8, 2022 at 9:48 AM
2220149.20		Greenhouse Post Capacity.r2d

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Merge Tolerance (in)	0.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th (360-10): ASD
Adjust Stiffness?	Yes(Iterative)
Cold Formed Steel Code	AISI S100-12: ASD
Wood Code	AWC NDS-15: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-14
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-10: ASD - Building
Number of Shear Regions	4
Region Spacing Increment (in)	4
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Cold Formed Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[k/ft^3]	Yield[ksi]	Fu[ksi]
1	A570_33	29500	11346	0.3	0.65	0.49	33	52
2	A607_C1_55	29500	11346	0.3	0.65	0.49	55	70

Cold Formed Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	I (90,270) ...	I (0,180) [i...
1	Post	Greenhouse Post	Column	CU	A607_C1_55	Typical	1.535	2.705	2.828

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	N1	0	0	0
2	N2	0	1	0
3	N3	0	4	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	N1	Reaction	Reaction	
2	N2	Reaction		

Member Primary Data

	Label	I Joint	J Joint	Rotate(de...	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N2		Post	Column	CU	A607_C1_55	Typical
2	M2	N2	N3		Post	Column	CU	A607_C1_55	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rati...	TOM	Inactive
1	M1						Yes	** NA **		
2	M2						Yes	** NA **		

Cold Formed Steel Design Parameters

	Label	Shape	Lengt...	Lb-out[ft]	Lb-in[ft]	Lcomp to...	Lcomp b...	L-tor...	K-out	K-in	Cm	Cb	R	a[ft]	Out ...	In sw...
1	M1	Post	1			Lb out										
2	M2	Post	3			Lb out										

Joint Loads and Enforced Displacements (BLC 1 : Dead Load)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k...	Inactive
1	N3	L	Y	-1.8	Active

Joint Loads and Enforced Displacements (BLC 2 : Live Load)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k...	Inactive
1	N3	L	Y	-3.6	Active

Joint Loads and Enforced Displacements (BLC 3 : Snow Load)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k...	Inactive
1	N3	L	Y	-4.5	Active

Joint Loads and Enforced Displacements (BLC 4 : Wind Load)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k...	Inactive
1	N3	L	X	2.3	Active

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]	Inactive
No Data to Print ...				

Member Distributed Loads

Member Label	Direction	Start Magnitude[k/ft,F,k...	End Magnitude[k/ft,F,k...	Start Location[ft,%]	End Location...	Inactive
No Data to Print ...						

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	Dead Load	DL		-1	1		
2	Live Load	RLL			1		
3	Snow Load	SL			1		
4	Wind Load	WL			1		

Load Combinations

	Description	S...	PD...	SR...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	IBC 16-8	Yes	C		DL	1																		
2	IBC 16-9	Yes	C		DL	1	LL	1	L...	1														
3	IBC 16-10 (a)	Yes	C		DL	1	R...	1																
4	IBC 16-10 (b)	Yes	C		DL	1	SL	1	S...	1														
5	IBC 16-10 (c)	Yes	C		DL	1	RL	1																
6	IBC 16-11 (a)	Yes	C		DL	1	LL	0.75	L...	0.75	R...	0.75												
7	IBC 16-11 (b)	Yes	C		DL	1	LL	0.75	L...	0.75	SL	0.75	S...	0.75										
8	IBC 16-11 (c)	Yes	C		DL	1	LL	0.75	L...	0.75	RL	0.75												
9	IBC 16-12 (a)	Yes	C		DL	1	WL	0.6																
10	IBC 16-13 (a)	Yes	C		DL	1	WL	0.45	LL	0.75	L...	0.75	R...	0.75										
11	IBC 16-13 (b)	Yes	C		DL	1	WL	0.45	LL	0.75	L...	0.75	SL	0.75	S...	0.75								
12	IBC 16-13 (c)	Yes	C		DL	1	WL	0.45	LL	0.75	L...	0.75	RL	0.75										
13	IBC 16-15	Yes	C		DL	0.6	WL	0.6																

Load Combination Design

	Description	ASIF	CD	Service	Hot Roll...	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless
1	IBC 16-8		0.9	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	IBC 16-9			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	IBC 16-10 (a)		1.25	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	IBC 16-10 (b)		1.15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	IBC 16-10 (c)		1.15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	IBC 16-11 (a)		1.25	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	IBC 16-11 (b)		1.15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8	IBC 16-11 (c)		1.15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9	IBC 16-12 (a)		1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10	IBC 16-13 (a)		1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11	IBC 16-13 (b)		1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12	IBC 16-13 (c)		1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
13	IBC 16-15		1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Envelope Node Reactions

	Node Label		X [k]	LC	Y [k]	LC	Moment [k-ft]	LC
1	N1	max	4.202	9	6.321	4	0	13
2		min	0	1	1.093	13	0	1
3	N2	max	0	8	0	13	0	13
4		min	-5.582	9	0	1	0	1
5	Totals:	max	0	8	6.321	4		
6		min	-1.38	9	1.093	13		

Envelope Node Displacements

	Node Label		X [in]	LC	Y [in]	LC	Rotation [rad]	LC
1	N1	max	0	8	0	13	0	8
2		min	0	9	0	4	-1.329e-4	9
3	N2	max	0	9	0	13	0	8
4		min	0	1	-0.002	4	-3.76e-3	9
5	N3	max	0.413	9	-0.001	13	0	8
6		min	0	1	-0.007	4	-1.464e-2	9

Envelope Member Section Forces

	Member	Sec		Axial[k]	LC	Shear[k]	LC	Moment[k-ft]	LC
1	M1	1	max	6.321	4	0	1	0	1
2			min	1.093	13	-4.202	9	0	1
3		2	max	6.32	4	0	1	1.051	9
4			min	1.092	13	-4.202	9	0	1
5		3	max	6.318	4	0	1	2.101	9
6			min	1.091	13	-4.202	9	0	1
7		4	max	6.317	4	0	1	3.152	9
8			min	1.09	13	-4.202	9	0	1
9		5	max	6.316	4	0	1	4.202	9
10			min	1.089	13	-4.202	9	0	1
11	M2	1	max	6.316	4	1.401	9	4.202	9
12			min	1.089	13	0	1	0	1
13		2	max	6.312	4	1.401	9	3.152	9
14			min	1.087	13	0	1	0	1
15		3	max	6.308	4	1.401	9	2.101	9
16			min	1.085	13	0	1	0	1
17		4	max	6.304	4	1.401	9	1.051	9
18			min	1.082	13	0	1	0	1
19		5	max	6.3	4	1.401	9	0	1
20			min	1.08	13	0	1	0	1

Envelope Member Section Stresses

	Member	Sec		Axial[ksi]	LC	Shear[ksi]	LC	Top Bendin...	LC	Bottom Ben...	LC
1	M1	1	max	4.119	4	0	1	0	1	0	1
2			min	0.712	13	-15.225	9	0	1	0	1
3		2	max	4.118	4	0	1	0	1	7.802	9
4			min	0.711	13	-15.225	9	-7.802	9	0	1
5		3	max	4.117	4	0	1	0	1	15.604	9
6			min	0.711	13	-15.225	9	-15.604	9	0	1
7		4	max	4.117	4	0	1	0	1	23.405	9
8			min	0.71	13	-15.225	9	-23.405	9	0	1
9		5	max	4.116	4	0	1	0	1	31.207	9
10			min	0.71	13	-15.225	9	-31.207	9	0	1
11	M2	1	max	4.116	4	5.075	9	0	1	31.207	9
12			min	0.71	13	0	1	-31.207	9	0	1
13		2	max	4.113	4	5.075	9	0	1	23.405	9
14			min	0.708	13	0	1	-23.405	9	0	1
15		3	max	4.111	4	5.075	9	0	1	15.604	9
16			min	0.707	13	0	1	-15.604	9	0	1
17		4	max	4.108	4	5.075	9	0	1	7.802	9
18			min	0.705	13	0	1	-7.802	9	0	1
19		5	max	4.105	4	5.075	9	0	1	0	1
20			min	0.704	13	0	1	0	1	0	1

Envelope Member Section Deflections Service

	Member	Sec		x [in]	LC	y [in]	LC	L/y' Ratio	LC
1	M1	1	max	0	13	0	1	NC	1
2			min	0	1	0	1	NC	1
3		2	max	0	13	0.003	9	NC	1
4			min	0	4	0	1	3529.121	9
5		3	max	0	13	0.005	9	NC	1
6			min	-0.001	4	0	1	2205.7	9
7		4	max	0	13	0.005	9	NC	1
8			min	-0.001	4	0	1	2520.8	9
9		5	max	0	13	0	1	NC	1
10			min	-0.002	4	0	1	NC	1
11	M2	1	max	0	13	0	1	NC	1
12			min	-0.002	4	0	1	NC	1
13		2	max	-0.001	13	0	1	NC	1
14			min	-0.003	4	-0.06	9	596.951	9
15		3	max	-0.001	13	0	1	NC	1
16			min	-0.004	4	-0.157	9	228.81	9
17		4	max	-0.001	13	0	1	NC	1
18			min	-0.005	4	-0.279	9	129.103	9
19		5	max	-0.001	13	0	1	NC	1
20			min	-0.007	4	-0.413	9	87.252	9

Member Suggested Shapes

	Section Set/Member	Current Shape	Suggested Shape	Controlling Member	Controlling Criteria	Use Suggested?
1	Post	Greenhouse Post	1000T125-97	M2	Strength	Yes

Envelope AISC 14th (360-10): ASD Steel Code Checks

Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	LC	Pnc/o...	Pnt/o...	Mn/o...	...	Eqn
No Data to Print ...												

Envelope AISI S100-12: ASD Cold Formed Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	She...	Loc...	LC	Pn/O...	Tn/Om...	Mn/O...	...	...	Eqn
1	M1	Greenhouse Post	0.996	1	9	0.308	1	9	46.587	50.539	4.434	...	...	C3.3...
2	M2	Greenhouse Post	0.989	0	9	0.103	3	9	44.241	50.539	4.434	...	...	C5.2...

Material Takeoff

	Material	Size	Pieces	Length[ft]	Weight[K]
1	Cold Formed Steel				
2	A607_C1_55	Greenhouse Post	2	4	0.021
3	Total CF Steel		2	4	0.021

Warning Log

Message
No Data to Print ...

ANALYSIS PERFORMED TO DETERMINE ALLOWABLE LOAD CAPACITY (VERTICAL AND LATERAL) OF PROPOSED GREENHOUSE POST SLEEVE. FOUNDATIONS TO BE DESIGNED TO DEVELOP THE POST CAPACITY.

AHBL	Greenhouse Interior Post Capacity	1
ADM		Mar 8, 2022 at 9:52 AM
2220149.20		Greenhouse Interior Post Capacity...

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Merge Tolerance (in)	0.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th (360-10): ASD
Adjust Stiffness?	Yes(Iterative)
Cold Formed Steel Code	AISI S100-12: ASD
Wood Code	AWC NDS-15: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-14
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-10: ASD - Building
Number of Shear Regions	4
Region Spacing Increment (in)	4
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Cold Formed Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[k/ft^3]	Yield[ksi]	Fu[ksi]
1	A570_33	29500	11346	0.3	0.65	0.49	33	52
2	A607_C1_55	29500	11346	0.3	0.65	0.49	55	70

Cold Formed Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	I (90,270) ...	I (0,180) [i...
1	Post	Greenhouse Post	Column	CU	A607_C1_55	Typical	1.535	2.705	2.828

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	N1	0	0	0
2	N2	0	1	0
3	N3	0	4	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	N1	Reaction	Reaction	
2	N2	Reaction		

Member Primary Data

	Label	I Joint	J Joint	Rotate(de...	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N2		Post	Column	CU	A607_C1_55	Typical
2	M2	N2	N3		Post	Column	CU	A607_C1_55	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rati...	TOM	Inactive
1	M1						Yes	** NA **		
2	M2						Yes	** NA **		

Cold Formed Steel Design Parameters

	Label	Shape	Lengt...	Lb-out[ft]	Lb-in[ft]	Lcomp to...	Lcomp b...	L-tor...	K-out	K-in	Cm	Cb	R	a[ft]	Out ...	In sw...
1	M1	Post	1			Lb out										
2	M2	Post	3			Lb out										

Joint Loads and Enforced Displacements (BLC 1 : Dead Load)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k...	Inactive
1	N3	L	Y	-3.6	Active

Joint Loads and Enforced Displacements (BLC 2 : Live Load)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k...	Inactive
1	N3	L	Y	-7.2	Active

Joint Loads and Enforced Displacements (BLC 3 : Snow Load)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k...	Inactive
1	N3	L	Y	-9	Active

Joint Loads and Enforced Displacements (BLC 4 : Wind Load)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k...	Inactive
1	N3	L	X	2.3	Active

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]	Inactive
No Data to Print ...				

Member Distributed Loads

Member Label	Direction	Start Magnitude[k/ft,F,k...	End Magnitude[k/ft,F,k...	Start Location[ft,%]	End Location...	Inactive
No Data to Print ...						

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	Dead Load	DL		-1	1		
2	Live Load	RLL			1		
3	Snow Load	SL			1		
4	Wind Load	WL			1		

Load Combinations

	Description	S...	PD...	SR...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	IBC 16-8	Yes	C		DL	1																		
2	IBC 16-9	Yes	C		DL	1	LL	1	L...	1														
3	IBC 16-10 (a)	Yes	C		DL	1	R...	1																
4	IBC 16-10 (b)	Yes	C		DL	1	SL	1	S...	1														
5	IBC 16-10 (c)	Yes	C		DL	1	RL	1																
6	IBC 16-11 (a)	Yes	C		DL	1	LL	0.75	L...	0.75	R...	0.75												
7	IBC 16-11 (b)	Yes	C		DL	1	LL	0.75	L...	0.75	SL	0.75	S...	0.75										
8	IBC 16-11 (c)	Yes	C		DL	1	LL	0.75	L...	0.75	RL	0.75												
9	IBC 16-12 (a)	Yes	C		DL	1	WL	0.6																
10	IBC 16-13 (a)	Yes	C		DL	1	WL	0.45	LL	0.75	L...	0.75	R...	0.75										
11	IBC 16-13 (b)	Yes	C		DL	1	WL	0.45	LL	0.75	L...	0.75	SL	0.75	S...	0.75								
12	IBC 16-13 (c)	Yes	C		DL	1	WL	0.45	LL	0.75	L...	0.75	RL	0.75										
13	IBC 16-15	Yes	C		DL	0.6	WL	0.6																

Load Combination Design

	Description	ASIF	CD	Service	Hot Roll...	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless
1	IBC 16-8		0.9	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	IBC 16-9			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	IBC 16-10 (a)		1.25	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	IBC 16-10 (b)		1.15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	IBC 16-10 (c)		1.15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	IBC 16-11 (a)		1.25	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	IBC 16-11 (b)		1.15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8	IBC 16-11 (c)		1.15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9	IBC 16-12 (a)		1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10	IBC 16-13 (a)		1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11	IBC 16-13 (b)		1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12	IBC 16-13 (c)		1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
13	IBC 16-15		1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Envelope Node Reactions

	Node Label		X [k]	LC	Y [k]	LC	Moment [k-ft]	LC
1	N1	max	4.266	9	12.621	4	0	13
2		min	0	1	2.173	13	0	1
3	N2	max	0	8	0	13	0	13
4		min	-5.646	9	0	1	0	1
5	Totals:	max	0	8	12.621	4		
6		min	-1.38	13	2.173	13		

Envelope Node Displacements

	Node Label		X [in]	LC	Y [in]	LC	Rotation [rad]	LC
1	N1	max	0	8	0	13	0	8
2		min	0	9	0	4	-1.349e-4	9
3	N2	max	0	9	-0.001	13	0	8
4		min	0	1	-0.003	4	-3.817e-3	9
5	N3	max	0.419	9	-0.002	13	0	8
6		min	0	1	-0.013	4	-1.486e-2	9

Envelope Member Section Forces

	Member	Sec		Axial[k]	LC	Shear[k]	LC	Moment[k-ft]	LC
1	M1	1	max	12.621	4	0	1	0	1
2			min	2.173	13	-4.266	9	0	1
3		2	max	12.62	4	0	1	1.066	9
4			min	2.172	13	-4.266	9	0	1
5		3	max	12.618	4	0	1	2.133	9
6			min	2.171	13	-4.266	9	0	1
7		4	max	12.617	4	0	1	3.199	9
8			min	2.17	13	-4.266	9	0	1
9		5	max	12.616	4	0	1	4.266	9
10			min	2.169	13	-4.266	9	0	1
11	M2	1	max	12.616	4	1.422	9	4.266	9
12			min	2.169	13	0	1	0	1
13		2	max	12.612	4	1.422	9	3.199	9
14			min	2.167	13	0	1	0	1
15		3	max	12.608	4	1.422	9	2.133	9
16			min	2.165	13	0	1	0	1
17		4	max	12.604	4	1.422	9	1.066	9
18			min	2.162	13	0	1	0	1
19		5	max	12.6	4	1.422	9	0	1
20			min	2.16	13	0	1	0	1

Envelope Member Section Stresses

	Member	Sec		Axial[ksi]	LC	Shear[ksi]	LC	Top Bendin...	LC	Bottom Ben...	LC
1	M1	1	max	8.225	4	0	1	0	1	0	1
2			min	1.416	13	-15.456	9	0	1	0	1
3		2	max	8.224	4	0	1	0	1	7.92	9
4			min	1.415	13	-15.456	9	-7.92	9	0	1
5		3	max	8.223	4	0	1	0	1	15.84	9
6			min	1.415	13	-15.456	9	-15.84	9	0	1
7		4	max	8.222	4	0	1	0	1	23.76	9
8			min	1.414	13	-15.456	9	-23.76	9	0	1
9		5	max	8.221	4	0	1	0	1	31.68	9
10			min	1.414	13	-15.456	9	-31.68	9	0	1
11	M2	1	max	8.221	4	5.152	9	0	1	31.68	9
12			min	1.414	13	0	1	-31.68	9	0	1
13		2	max	8.219	4	5.152	9	0	1	23.76	9
14			min	1.412	13	0	1	-23.76	9	0	1
15		3	max	8.216	4	5.152	9	0	1	15.84	9
16			min	1.411	13	0	1	-15.84	9	0	1
17		4	max	8.214	4	5.152	9	0	1	7.92	9
18			min	1.409	13	0	1	-7.92	9	0	1
19		5	max	8.211	4	5.152	9	0	1	0	1
20			min	1.408	13	0	1	0	1	0	1

Envelope Member Section Deflections Service

	Member	Sec		x [in]	LC	y [in]	LC	L/y' Ratio	LC
1	M1	1	max	0	13	0	1	NC	1
2			min	0	1	0	1	NC	1
3		2	max	0	13	0.003	9	NC	1
4			min	-0.001	4	0	1	3476.441	9
5		3	max	0	13	0.006	9	NC	1
6			min	-0.002	4	0	1	2172.775	9
7		4	max	0	13	0.005	9	NC	1
8			min	-0.003	4	0	1	2483.172	9
9		5	max	-0.001	13	0	1	NC	1
10			min	-0.003	4	0	1	NC	1
11	M2	1	max	-0.001	13	0	1	NC	1
12			min	-0.003	4	0	1	NC	1
13		2	max	-0.001	13	0	1	NC	1
14			min	-0.006	4	-0.061	9	588.041	9
15		3	max	-0.001	13	0	1	NC	1
16			min	-0.008	4	-0.16	9	225.394	9
17		4	max	-0.002	13	0	1	NC	1
18			min	-0.011	4	-0.283	9	127.176	9
19		5	max	-0.002	13	0	1	NC	1
20			min	-0.013	4	-0.419	9	85.949	9

Member Suggested Shapes

	Section Set/Member	Current Shape	Suggested Shape	Controlling Member	Controlling Criteria	Use Suggested?
1	Post	Greenhouse Post	1000T200-97	M2	Strength	Yes

Envelope AISC 14th (360-10): ASD Steel Code Checks

Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	LC	Pnc/o...	Pnt/o...	Mn/o...	...	Eqn
No Data to Print ...												

Envelope AISI S100-12: ASD Cold Formed Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	She...	Loc...	LC	Pn/O...	Tn/Om...	Mn/O...	...	...	Eqn
1	M1	Greenhouse Post	1.04	1	9	0.312	1	9	46.587	50.539	4.434	...	...	C5.2...
2	M2	Greenhouse Post	1.044	0	9	0.104	3	9	44.241	50.539	4.434	...	...	C5.2...

Material Takeoff

	Material	Size	Pieces	Length[ft]	Weight[K]
1	Cold Formed Steel				
2	A607_C1_55	Greenhouse Post	2	4	0.021
3	Total CF Steel		2	4	0.021

Warning Log

Message
No Data to Print ...

AHBL Engineers
2215 North 30th Street
Suite 300
Tacoma, WA 98403
253.383.2422

Project Title: Step by Step Greenhouse Expansion
Engineer: ADM
Project ID: 2220149.20
Project Descr: Foundation Design for New Greenhouse Structure

Pole Footing Embedded in Soil

Project File: 2220149 calcs.ec6

LIC# : KW-06014847, Build:20.22.2.9 AHBL, INC (c) ENERCALC INC 1983-2022

DESCRIPTION: Proposed Footing Capacity (28" Dia x 5 ft)

Code References

Calculations per IBC 2015 1807.3, CBC 2016, ASCE 7-10
Load Combinations Used : ASCE 7-10

Sheet 47/52: Provide Calculations per current 2018 IBC adopted code for all calculations.

General Information

Pole Footing Shape
28.0 in

Calculate Min. Depth for Allowable Pressures
No Lateral Restraint at Ground Surface
Allow Passive . . . . . 300.0 pcf
Max Passive . . . . . 1,500.0 psf

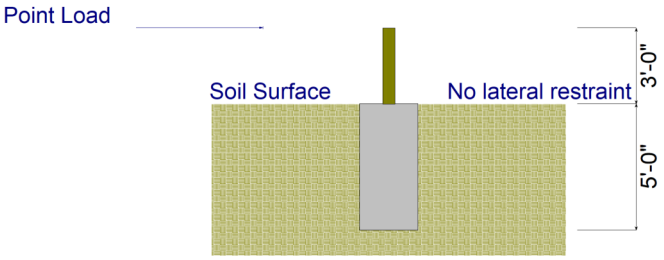
Controlling Values

Governing Load Combination +D+0.60W
Lateral Load 1.50 k
Moment 4.50 k-ft
NO Ground Surface Restraint

Pressures at 1/3 Depth
Actual **498.603** psf
Allowable **499.292** psf

Minimum Required Depth 5.0 ft

Footing Base Area 4.276 ft^2
Maximum Soil Pressure 1.473 ksf



Applied Loads

Lateral Concentrated Load (k)		Lateral Distributed Loads (kl		Vertical Load (k)	
D : Dead Load	k		k/ft	1.80	k
Lr : Roof Live	k		k/ft	3.60	k
L : Live	k		k/ft		k
S : Snow	k		k/ft	4.50	k
W : Wind	2.50 k		k/ft		k
E : Earthquake	k		k/ft		k
H : Lateral Earth	k		k/ft		k
Load distance above ground surface	3.0 ft	TOP of Load above ground surface	ft		
		BOTTOM of Load above ground surface	ft		

Load Combination Results

Load Combination	Forces @ Ground Surface Loads - (k)	Moments - (ft-k)	Required Depth - (ft)	Pressure at 1/3 Depth Actual - (psf)	Allow - (psf)	Soil Increase Factor
D Only	0.000	0.000	0.13	0.0	0.0	1.000
+D+Lr	0.000	0.000	0.13	0.0	0.0	1.000
+D+S	0.000	0.000	0.13	0.0	0.0	1.000
+D+0.750Lr	0.000	0.000	0.13	0.0	0.0	1.000
+D+0.750S	0.000	0.000	0.13	0.0	0.0	1.000
+D+0.60W	1.500	4.500	5.00	498.6	499.3	1.000
+D+0.750Lr+0.450W	1.125	3.375	4.50	442.8	442.9	1.000
+D+0.750S+0.450W	1.125	3.375	4.50	442.8	442.9	1.000
+0.60D+0.60W	1.500	4.500	5.00	498.6	499.3	1.000

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Pole Footing Embedded in Soil

LIC# : KW-06014847, Build:20.22.2.9 AHBL, INC (c) ENERCALC INC 1983-2022

DESCRIPTION: Proposed Footing Capacity (28" Dia x 5 ft)

+0.60D	0.000	0.000	0.13	0.0	0.0	1.000

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Pole Footing Embedded in Soil

Project File: 2220149 calcs.ec6

LIC# : KW-06014847, Build:20.22.2.9 AHBL, INC (c) ENERCALC INC 1983-2022

DESCRIPTION: Revised Sidewall Footing Capacity (3ft Square x 2.5 ft)

Code References

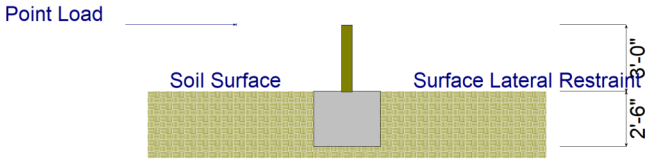
Calculations per IBC 2015 1807.3, CBC 2016, ASCE 7-10
Load Combinations Used : ASCE 7-10

General Information

Pole Footing Shape	Rectangular
	36.0 in
Calculate Min. Depth for Allowable Pressures	
Lateral Restraint at Ground Surface	
Allow Passive	300.0 pcf
Max Passive	1,500.0 psf

Controlling Values

Governing Load Combination	+D+0.60W
Lateral Load	1.50 k
Moment	4.50 k-ft
Restraint @ Ground Surface	
Pressure at Depth	
Actual	**723.40** psf
Allowable	**750.0** psf
Surface Retraint Force	5,325.0 lbs
Minimum Required Depth	**2.50 ft**
Footing Base Area	9.0 ft^2
Maximum Soil Pressure	0.70 ksf



Applied Loads

Lateral Concentrated Load (k)		Lateral Distributed Loads (kl		Applied Moment (kft)	Vertical Load (k)
D : Dead Load	k		k/ft	k-ft	1.80 k
Lr : Roof Live	k		k/ft	k-ft	3.60 k
L : Live	k		k/ft	k-ft	k
S : Snow	k		k/ft	k-ft	4.50 k
W : Wind	2.50 k		k/ft	k-ft	k
E : Earthquake	k		k/ft	k-ft	k
H : Lateral Earth	k		k/ft	k-ft	k
Load distance above ground surface	3.0 ft	TOP of Load above ground surface	ft		
		BOTTOM of Load above ground surface	ft		

Load Combination Results

	Forces @ Ground Surface		Required	Pressure at Depth		Soil Increase
Load Combination	Loads - (k)	Moments - (ft-k)	Depth - (ft)	Actual - (psf)	Allow - (psf)	Factor
D Only	0.000	0.000	0.13	0.0	37.5	1.000
+D+Lr	0.000	0.000	0.13	0.0	37.5	1.000
+D+S	0.000	0.000	0.13	0.0	37.5	1.000
+D+0.750Lr	0.000	0.000	0.13	0.0	37.5	1.000
+D+0.750S	0.000	0.000	0.13	0.0	37.5	1.000
+D+0.60W	1.500	4.500	2.50	723.4	750.0	1.000
+D+0.750Lr+0.450W	1.125	3.375	2.25	669.8	675.0	1.000
+D+0.750S+0.450W	1.125	3.375	2.25	669.8	675.0	1.000
+0.60D+0.60W	1.500	4.500	2.50	723.4	750.0	1.000

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Project Descr: Foundation Design for New Greenhouse Structure

Pole Footing Embedded in Soil

Project File: 2220149 calcs.ec6

LIC# : KW-06014847, Build:20.22.2.9 AHBL, INC (c) ENERCALC INC 1983-2022

DESCRIPTION: Revised Sidewall Footing Capacity (3ft Square x 2.5 ft)

+0.60D	0.000	0.000	0.13	0.0	37.5	1.000

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Pole Footing Embedded in Soil

Project File: 2220149 calcs.ec6

LIC# : KW-06014847, Build:20.22.2.9 AHBL, INC (c) ENERCALC INC 1983-2022

DESCRIPTION: Revised Interior Footing Capacity (3ft Square x 2.5 ft)

Code References

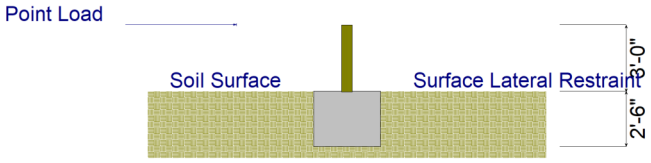
Calculations per IBC 2015 1807.3, CBC 2016, ASCE 7-10
Load Combinations Used : ASCE 7-10

General Information

Pole Footing Shape	Rectangular
	36.0 in
Calculate Min. Depth for Allowable Pressures	
Lateral Restraint at Ground Surface	
Allow Passive	300.0 pcf
Max Passive	1,500.0 psf

Controlling Values

Governing Load Combination	+D+0.60W
Lateral Load	1.50 k
Moment	4.50 k-ft
Restraint @ Ground Surface	
Pressure at Depth	
Actual	**723.40** psf
Allowable	**750.0** psf
Surface Retraint Force	5,325.0 lbs
Minimum Required Depth	**2.50 ft**
Footing Base Area	9.0 ft^2
Maximum Soil Pressure	1.40 ksf



Applied Loads

Lateral Concentrated Load (k)		Lateral Distributed Loads (kl		Applied Moment (kft)	Vertical Load (k)
D : Dead Load	k		k/ft	k-ft	3.60 k
Lr : Roof Live	k		k/ft	k-ft	7.20 k
L : Live	k		k/ft	k-ft	k
S : Snow	k		k/ft	k-ft	9.0 k
W : Wind	2.50 k		k/ft	k-ft	k
E : Earthquake	k		k/ft	k-ft	k
H : Lateral Earth	k		k/ft	k-ft	k
Load distance above ground surface	3.0 ft	TOP of Load above ground surface	ft		
		BOTTOM of Load above ground surface	ft		

Load Combination Results

	Forces @ Ground Surface		Required	Pressure at Depth		Soil Increase
Load Combination	Loads - (k)	Moments - (ft-k)	Depth - (ft)	Actual - (psf)	Allow - (psf)	Factor
D Only	0.000	0.000	0.13	0.0	37.5	1.000
+D+Lr	0.000	0.000	0.13	0.0	37.5	1.000
+D+S	0.000	0.000	0.13	0.0	37.5	1.000
+D+0.750Lr	0.000	0.000	0.13	0.0	37.5	1.000
+D+0.750S	0.000	0.000	0.13	0.0	37.5	1.000
+D+0.60W	1.500	4.500	2.50	723.4	750.0	1.000
+D+0.750Lr+0.450W	1.125	3.375	2.25	669.8	675.0	1.000
+D+0.750S+0.450W	1.125	3.375	2.25	669.8	675.0	1.000
+0.60D+0.60W	1.500	4.500	2.50	723.4	750.0	1.000

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DESCRIPTION: Revised Interior Footing Capacity (3ft Square x 2.5 ft)

+0.60D	0.000	0.000	0.13	0.0	37.5	1.000