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STRUCTURAL: B. WEATHERDON

C CLIENT

U.S. DEPARTMENT OF ENERGY

SOLAR DECATHLON 2013

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01 10/11/12 80% DOE/NREL SUBMISSION 02 11/20/12 80% DOE/NREL RESUBMISSION

03 02/14/13 95% DOE/NREL SUBMISSION
04 07/04/13 STRUCTURAL SET STAMPED
05 08/22/13 AS-BUILT DRAWING SUBMISSION

MARK DATE DESCRIPTION

LOT NUMBER: 120

DRAWN BY: W.KLASSEN & G.BERGA

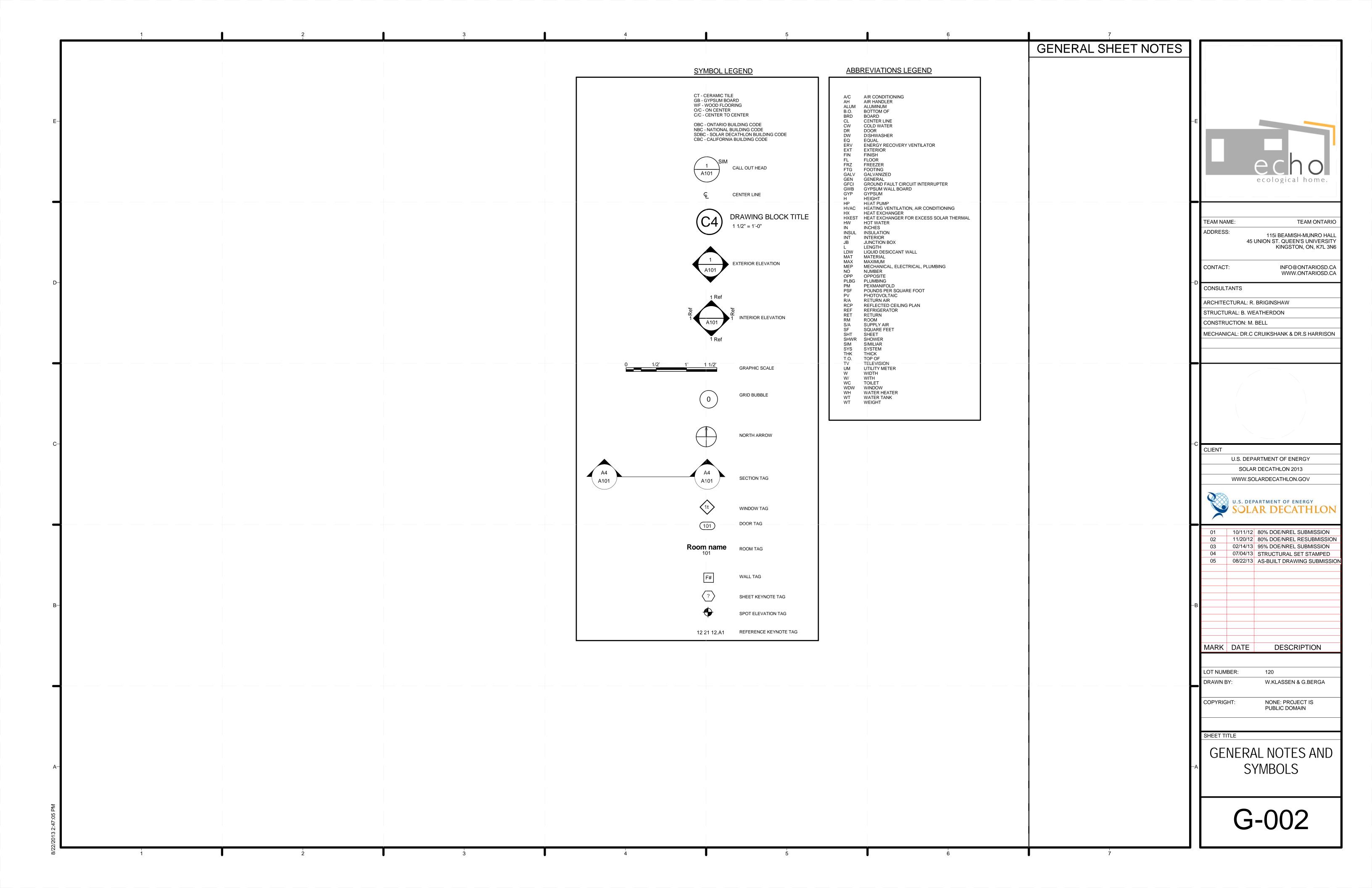
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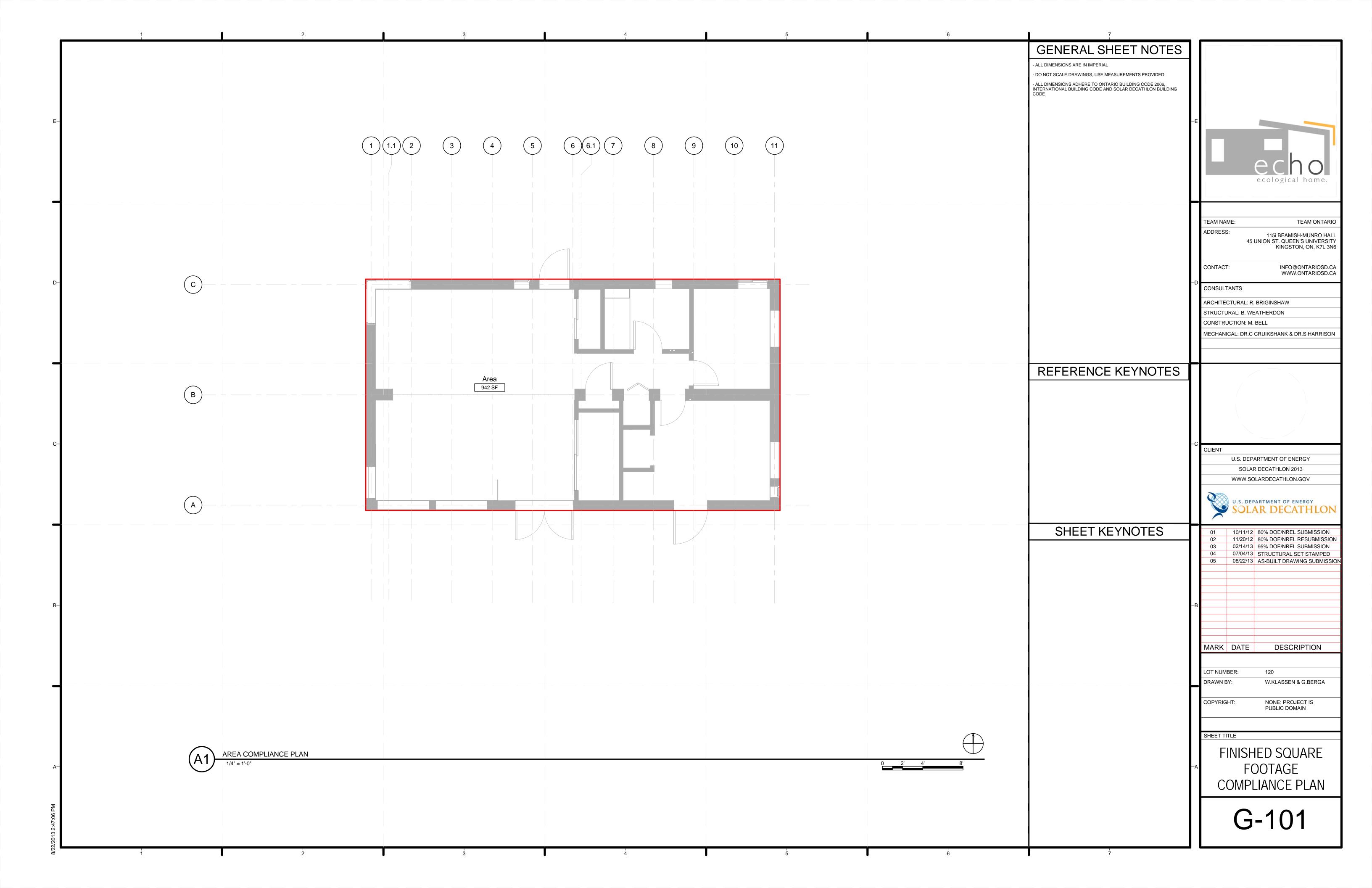
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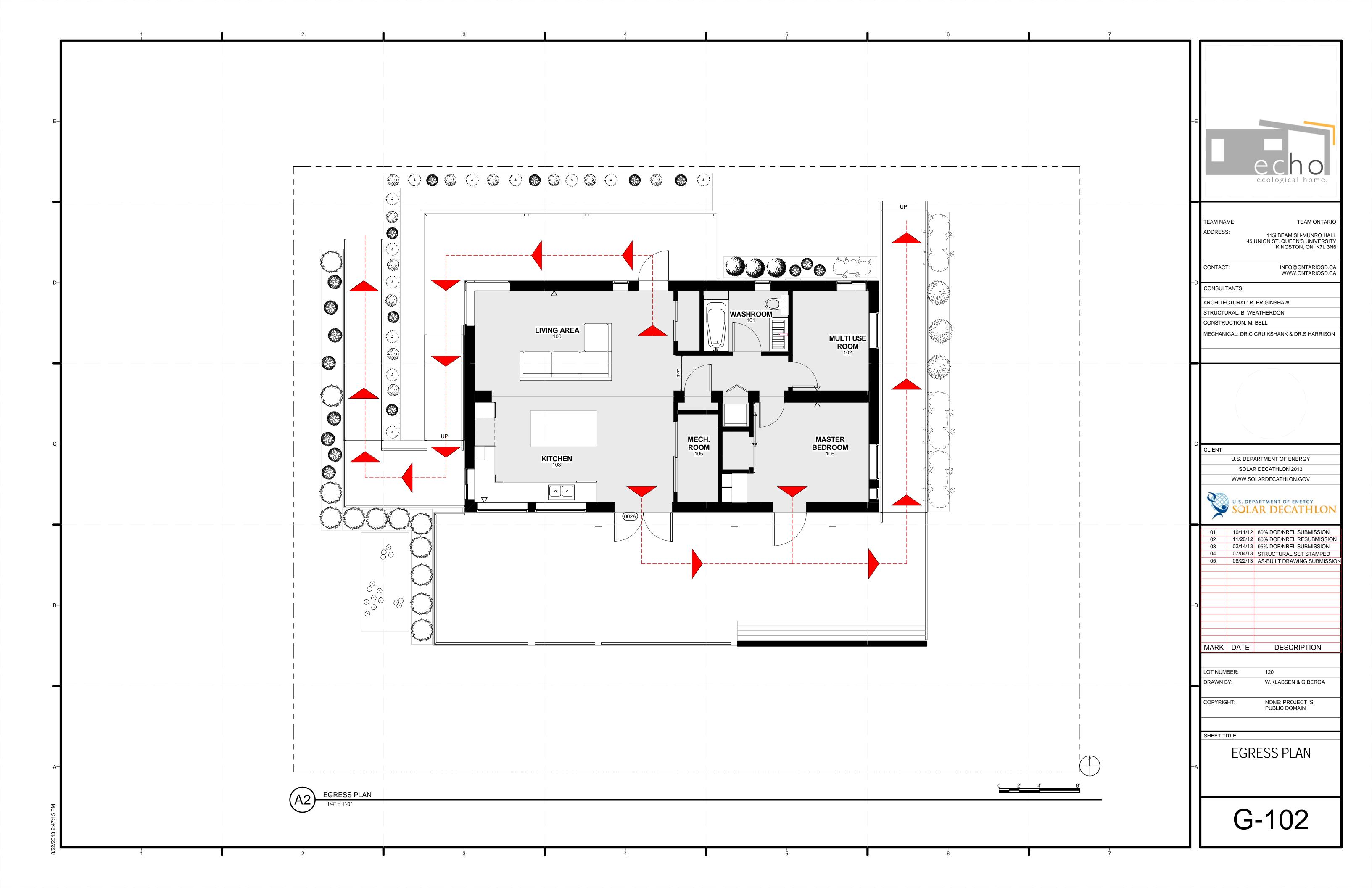
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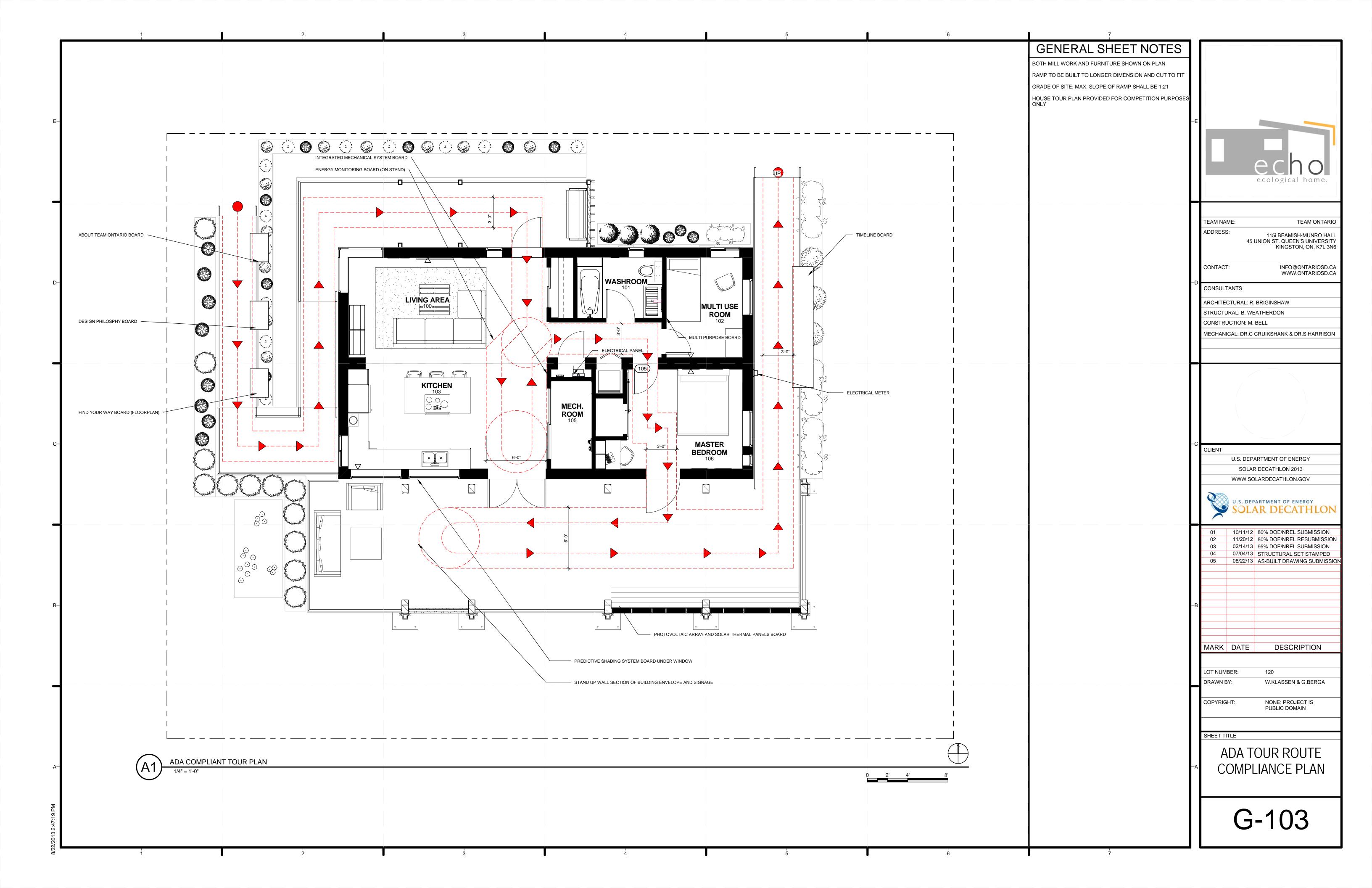
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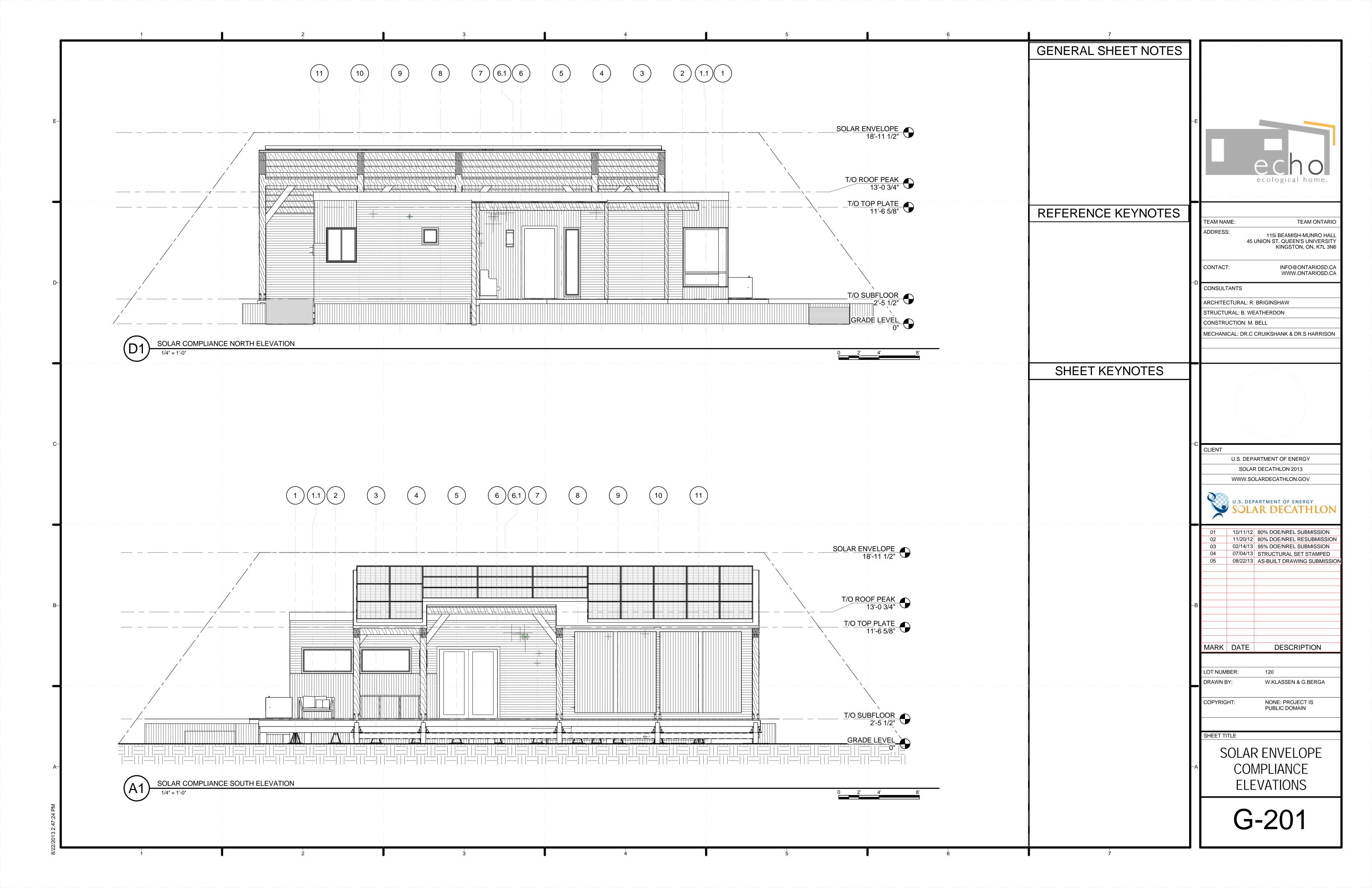
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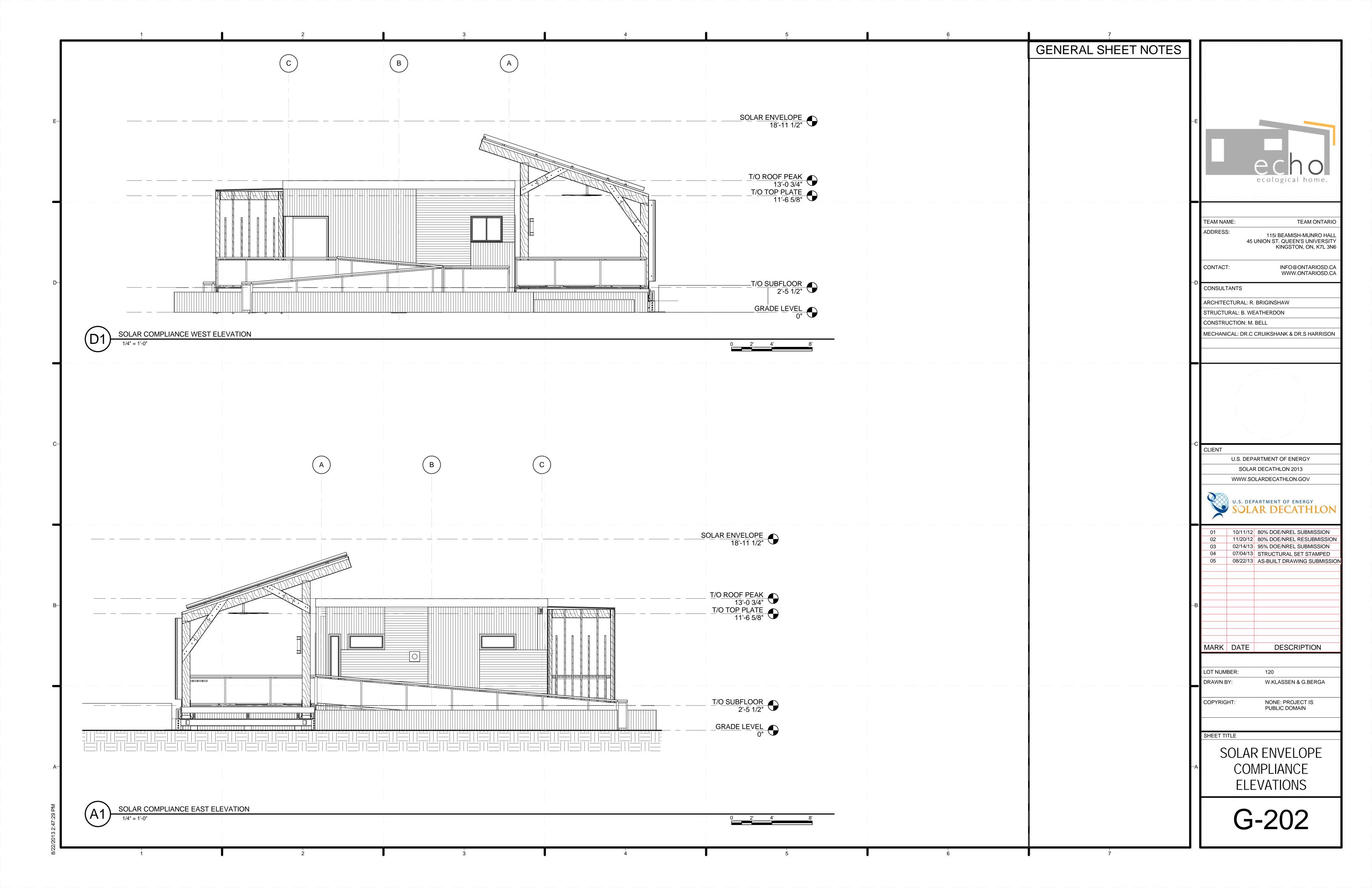


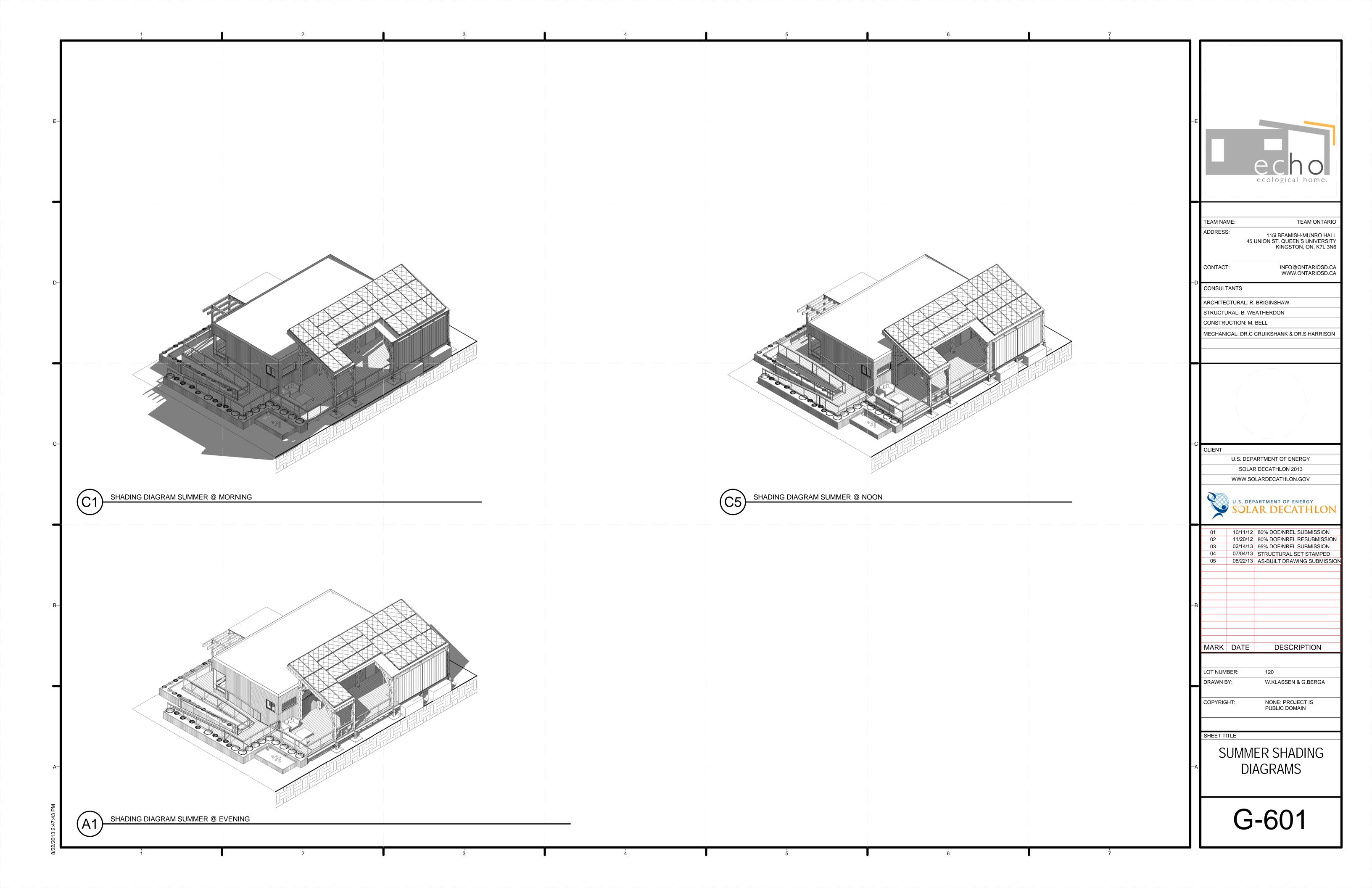


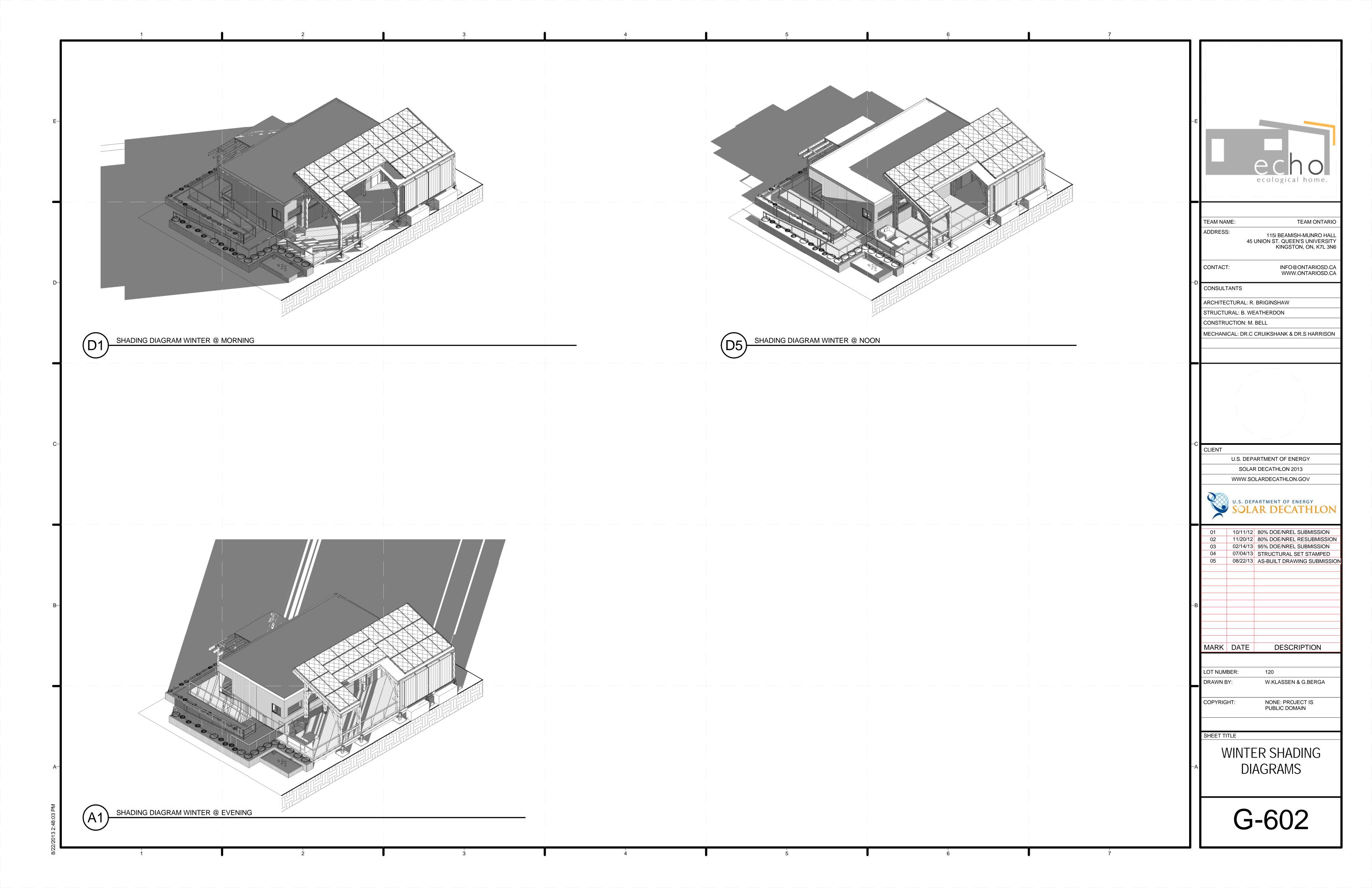


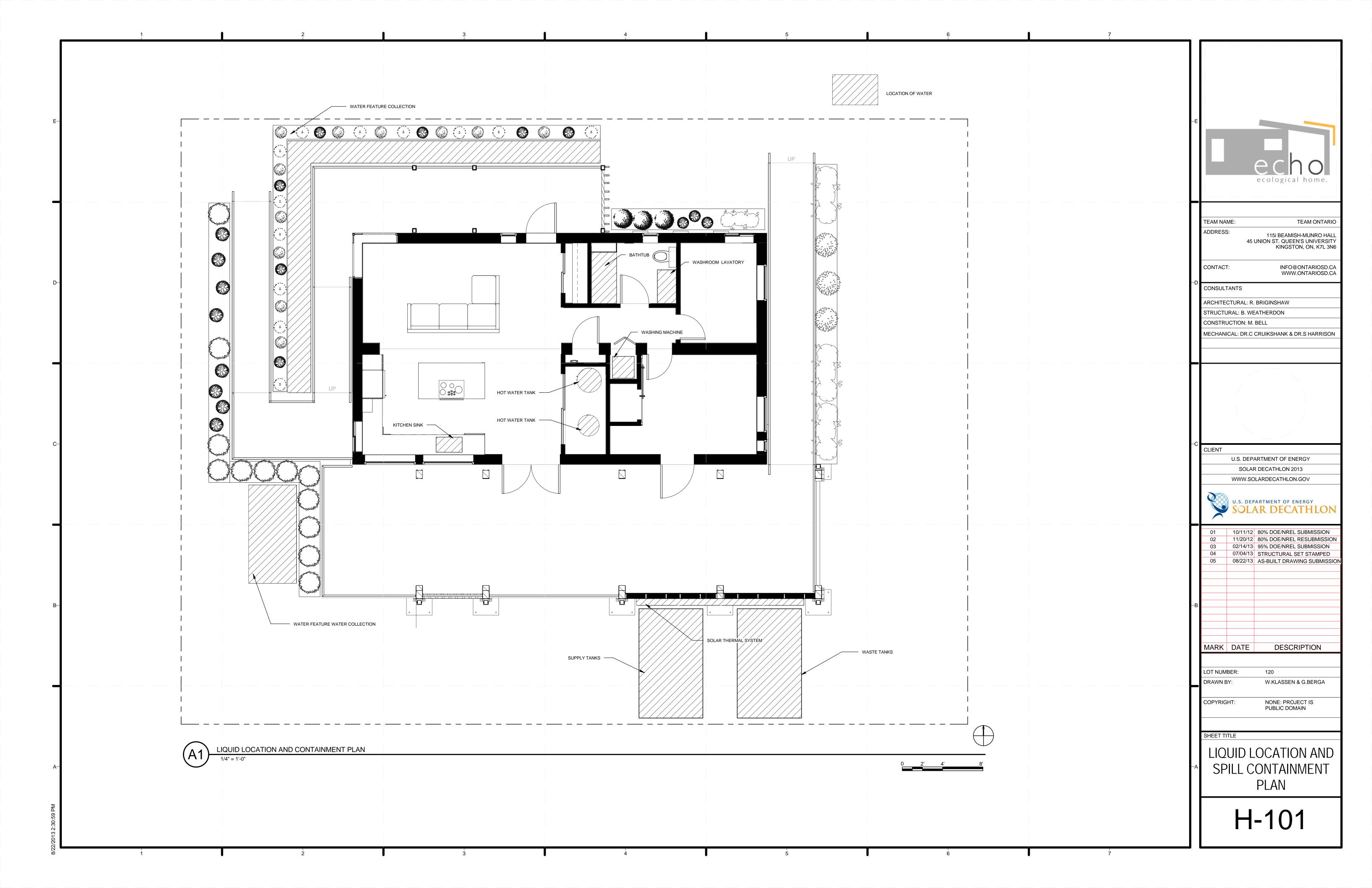


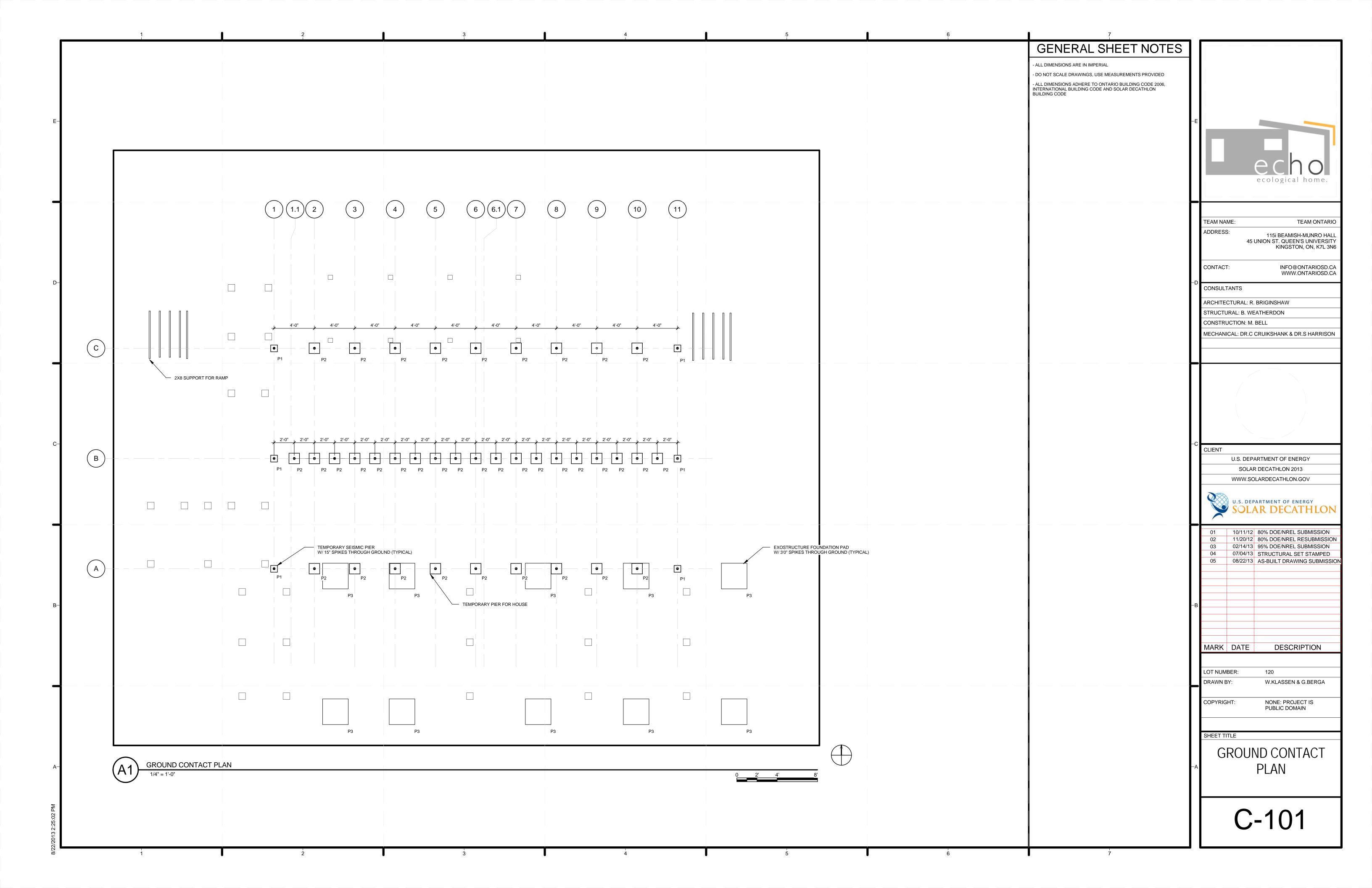


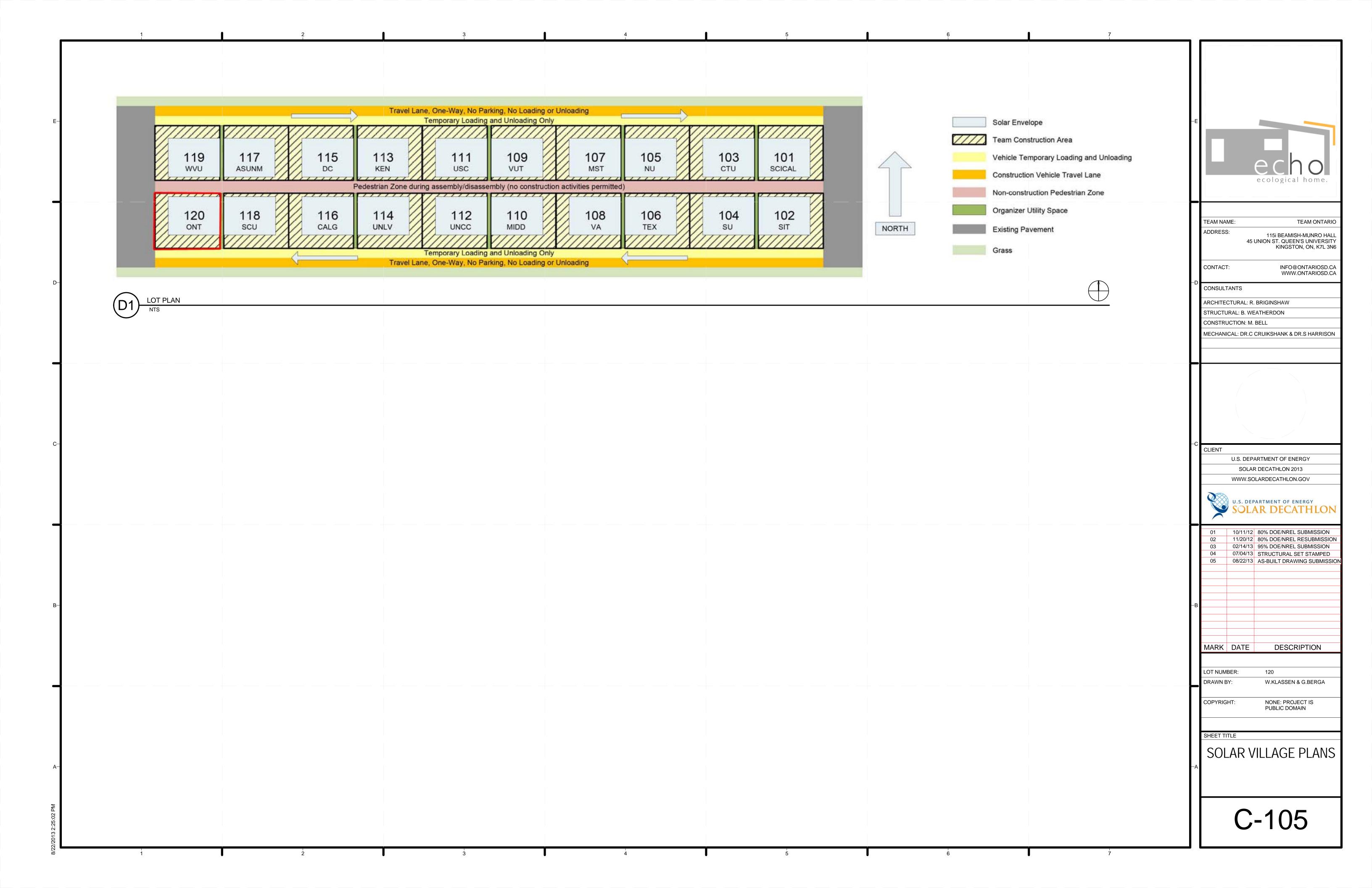


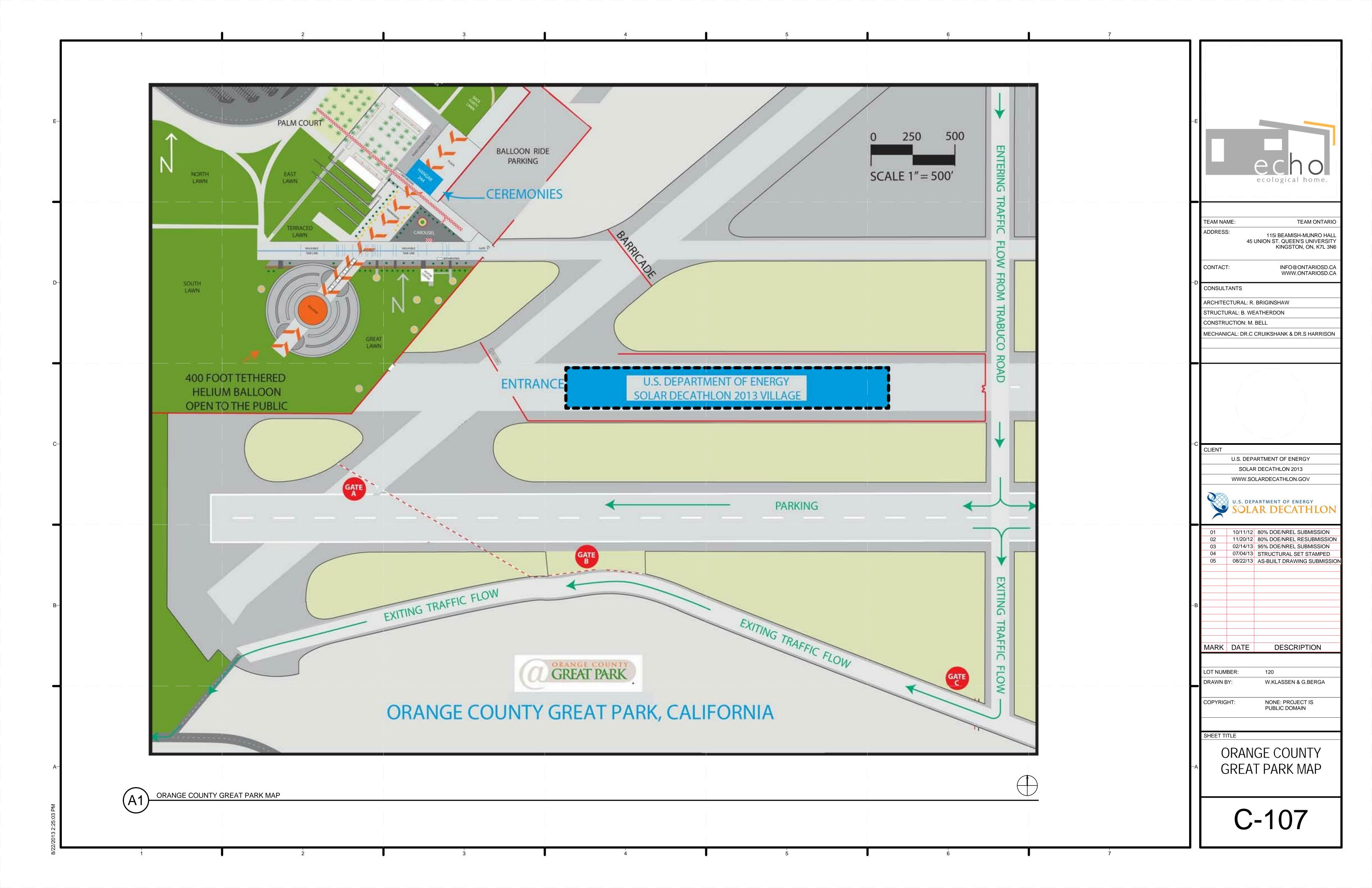












# **DRAWING LEGEND AND ABBREVIATIONS**

CHECK ALL DIMENSIONS ON STRUCTURAL DRAWINGS WITH THE ARCHITECTURAL
DRAWINGS. REPORT ANY INCONSISTENCIES BEFORE PROCEEDING WITH THE WORK.
DO NOT SCALE THESE DRAWINGS. ALL DIMENSIONS ARE IN INCHES.

- STRUCTURAL PLANS SHOW BEARING WALLS AND COLUMNS BELOW THE FLOOR OR ROOFS STRUCTURE WITH DASHED LINES. WALLS AND COLUMNS ABOVE THE FLOOR ARE SHOWN WITH CONTINUOUS LINES
- TYPICAL DETAILS ON DRAWING(S) S-511 AND S-512 SHOW STRUCTURAL INTENT RATHER THAN ACTUAL CONDITIONS FOR THIS PROJECT.
- NOTATIONS ON DRAWINGS RELATING TO FRAMING CLIPS, JOIST HANGER AND OTHER CONNECTING DEVICES REFER TO CATALOG NUMBERS MANUFACTURED BY SIMPSON STRONG TIE COMPANY, SAN LEANDRO CA. ALL SIMPSON HANGERS USED IN EXTERIOR APPLICATIONS SHALL BE PROVIDED WITH "Z-MAX" GALVANIZING, WHEN AVAILABLE, OR SHALL BE "HOT DIPPED GALVANIZED. "STAINLESS STEEL NAILS SHALL BE PROVIDED FOR ALL SIMPSON HANGERS USED IN ALL EXTERIOR APPLICATIONS. THE FOLLOWING STAINLESS STEEL NAILS, AS MANUFACTURED BY SIMPSON, SHALL BE PROVIDED; 8D = SS8D, 10D = SS10D, 16D = SS16D. EQUIVALENT DEVICES BY OTHER MANUFACTURERS MAY BE SUBSTITUTED PROVIDED THEY HAVE ICBO APPROVAL FOR
- ALL DRAWINGS TO CONFORM TO THE ONTARIO BUILDING CODE 2006, INTERNATIONAL BUILDING CODE, SOLAR DECATHLONG BUILDING CODE AND CALIFORNIA BUILDING CODE

#### **SHOP DRAWING REVIEW**

**GENERAL NOTES:** 

- REVIEW OF SHOP DRAWINGS IS ONLY FOR GENERAL CONFORMITY WITH STRUCTURAL CONTRACT DOCUMENTS AND SPECIFICATIONS, COMMENTS MADE ON THE SHOP DRAWINGS DURING THIS REVIEW DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH THE REQUIREMENTS OF THE STRUCUTRAL CONTRACT DOCUMENTS AND SPECIFICATIONS, NOR DO THEY AUTHORIZE ANY CHANGES TO THE CONTRACT, REVIEW OF A SPECIFIC ITEM SHALL NOT INCLUDE REVIEW OF AN ASSEMBLY OF WHICH THE ITEM IS A COMPONENT. THE CONTRACTOR'S RESPONSIBILITIES INCLUDE ALL QUANTITIES, DETAIL DIMENSIONS, FIELD MEASUREMENTS, FABRICATION PROCESS, MEANS, METHODS, SEQUENCES AND PROCEDURES OF CONSTRUCTION COORDINATION OF WORK WITH ALL TRADES AND PERFORMING ALL WORK IN A SAFE AND SATISFACTORY MANNER. THE REVIEW OF SHOP DRAWINGS DOES NOT IMPLY ANY CHANGE IN ANY OTHER CONSULTANTS' OR PREFESSIONALS' RESPONSIBILITES RELATED TO DESIGN OF SPECIFIC ITEMS AS OUTLINED BY THE SPECIFICATIONS (SUCH AS STRUCTURAL STEEL CONNECTIONS, STEEL JOISTS, PRECAST ELEMENTS, ETC.)
- AFTER REVIEW, THE DRAWINS WILL BE STAMPED AND RETURNED TO SHOW ONE OF THE FOLLOWING:

- NOT REVIEWED SHOWS WORK WHICH IS NOT WITHIN THE SCOPE OF STUCTURAL CONSULTING SERVICES. REVIEWED NOTED
  RELEASED FOR FABRICATION
- RELEASED FOR FABRICATION AFTER REVISIONS NOTED ARE MADE. SUBMIT FINAL RECORD PRINT.
- RESUBMIT
  CORRECT AND RESUBMIT FOR REVIEW PRIOR TO FABRICATION

#### **MATERIAL DATA**

- STRUCTURAL DESIGN IN ACCORDANCE TO ONTARIO BUILDING CODE 2006.
- STRUCUTRAL STEEL (EXCEPT HSS): CAN/CSA G40.21M(REVIEW\*\*)
- WIDE FLANGES:
  - ANCHOR BOLTS: A307 (TYP. U.N.O.) BRACE FRAME ANCHOR BOLTS: A193 GR. B7 ALL OTHER STEEL: 300 W

# WOOD FRAMING LUMBER GRADING

MOISTURE CONTENT SHALL BE 19% MAXIMUM. LOAD BEARING AND EXTERIOR STUDS AND PLATES SHALL BE OF GRADE SOUTHERN PINE #2 OR BETTER, UNLESS NOTED OTHERWISE. FLOOR JOISTS AND HEADERS SHALL BE OF LAMINATED VENEER LUMBER. ROOF JOISTS AND HEADERS SHALL BE OF DIMENSIONAL LUMBER UNLESS

#### PLYWOOD SHEATHING

PLYWOOD SHEATHING SHALL BE APA GRADE TRADEMARK PLYWOOD WITH NOMINAL THICKNESS AS SHOWN ON DRAWINGS. FLOOR SHEATHING SHALL BE GLUED AND SCREWED WITH SCREWS AT 6" O/C ALONG EDGES AND AT 10" O/C ALONG INTERMEDIATE FRAMING MEMBERS, UNLESS NOTED OTHERWISE.ROOF SHEATHING SHALL CONFORM TO CSA 0151 AND BE COMPLETE WITH H-CLIPS BOUNDARY. NAILING FOR ROOF SHEATHING TO BE 3 1/2" LONG AND 0.162" DIA COMMON NAILS AT 4" O/C., UNLESS NOTED OTHERWISE. ALL FLOOR, ROOF, AND SHEAR WALLS REQUIRE 4' X 8' PLYWOOD SHEETS INSTALLED WITHE THE SURFACE GRAIN AT RIGHT ANGLES TO THE ROOF FRAMING. AT EDGES OF DIAPHRAGMS WHERE PLYWOOD SHEETS MAY BE LESS THAN 24" WOOD FRAMING DETAILS NOT SHOWN OTHERWISE SHALL BE CONSTRUCTED TO THE MINIMUM STANDARDS OF THE INTERNATIONAL BUILDING CODE ONTARIO BUILDING CODE SOLAR DECATHLON BUILDING CODE, CALIFORNIA BUILDING CODE, AND SHALL CONFORM TO TABLE 2304.9.1

#### FASTENING SCHEDULE OF THE IBC. PRESSURE TREATED WOOD

PRESERVATIVE TREATMENT. ALL LUMBER AND PLYWOOD REQUIRED TO BE PRESERVATIVE TREATED SHALL BE PRESSURE TREATED IN ACCORDANCE WITH IBC SECTION 2303.1.8 TO BEAR THE FDN GRADE MARK. EACH PIECE OF TREATED LUMBER AND PLYWOOD SHALL BEAR AN APPROVED QUALITY MARK OR THAT OF AN APPROVED INSPECTION AGENCY WHICH MAINTAINS CONTINUING SUPERVISION, TESTING AND INSPECTION OVER THE QUALITY OF THE PRODUCT, AS DESCRIBED IN THE IBC STANDARDS, AND SHALL BE IDENTIFIED AS REQUIRED BY THESE STANDARDS. WHERE FDN LUMBER IS CUT OR DRILLED AFTER TREATMENT, THE CUT SURFACE SHALL BE FIELD TREATED WITH APPROVED PRESERVATIVES BY REPEATED BRUSHING, DIPPING OR SOAKING UNTIL THE WOOD ABSORBS NO MORE PRESERVATIVE.

# ENGINEERED WOOD PRODUCTS

ALL MANUFACTURED LUMBER TO BE INSTALLED PER MANUFACTURERS INSTALLATION GUIDELINES.

# COLUMN SCHEDULE

	TYPE	DESCRIPTION
C1	2: 2X6 DIMENSIONAL LUMBER	SPF-2 GRADE OR HIGHER DIMENSIONAL LUMBER
C2	3: 2X6 DIMENSIONAL LUMBER	SPF-2 GRADE OR HIGHER DIMENSIONAL LUMBER

# PIER SCHEDULE

	TYPE	DESCRIPTION
P1	SEISMIC PIER	8" x 8" SEISMIC PIER SYSTEM W/ TIE DOWN
P2	STANDARD PIER	1'-1/2" x 1'-1/2" STANDARD PIER SYSTEM

UNLESS OTHERWISE NOTED, DESIGN LOADS SHOWN ARE SPECIFIED (UNFACTORED) LOADS, TO B	E USED FOR ULS DESIGN. FOR POINT LOADS. IF
ONLY ONE LOAD IS GIVEN, CONSIDER IT LIVE LOAD. FOR WIND AND SNOW LOADS TO BE USED FOR	R SLS DESIGN, REFER TO MATERIAL AND
DESIGN DATA NOTES.	

DESIGN DATA NOT	TES.		
AB Af	ANCHOR BOLT FACTORED AXIAL LOAD IN KN (+ INDICATES TENSION, - INDICATES COMPRESSION)	MAX Mf MIN	MAXIMUM FACTORED MOMENT IN kN.r MINIMUM
ALT ARCH	ALTERNATE ARCHITECTURAL	NBC NTS	NATIONAL BUILDING CODE NOT TO SCALE
B, BOT BM BOF	BOTTOM BEAM BOTTOM OF FOOTING	OBC	ONTARIO BUILDING CODE
CA CANT	COLUMN ABOVE ONLY (NO COLUMN BELOW) CANTILEVER	P Pf	POINT LOAD IN KN FACTORED POINT LOAD IN KN
CB C/C CL	COLUMN BELOW CENTRE TO CENTRE CLEAR	RA SECT	ROOF ANCHOR SECTION
COMP COL CONC	CENTRELINE COMPOSITE COLUMN CONCRETE	SIM SPF STIR STIFF	SIMILIAR SPRUCE PINE FIR STIRRUP STIFFENER
CONT CP	CONTINOUS CAST IN PLACE DEPTH	T T/O TYP	TOP TOP OF TYPICAL
DET DIA DIM DL	DETAIL DIAMETER DIMENSION DEAD LOAD IN kN/M2	ULs U/S U/N	ULTIMATE LIMIT STATE UNDERSIDE UNLESS NOTED
DN DWG	DOWN DRAWING	VB	VAPOUR BARRIER
EA EJ, EXP EL, ELEV EMBED EQ EX, EXIST	EACH EXPANSION JOINT ELEVATION EMBEDMENT EQUAL EXISTING	A101 SIM	SECTION NUMBER SECTION DRAWING REFERENCE
FL FMC FTG fy	FLOOR FULL MOMENT CONNECTION FOOTING YIELD STRENGTH		

	STRUCTURAL INDEX OF DRAWINGS
SHT NO	SHEET NAME
S-001	STRUCTURAL NOTES AND SYMBOLS
S-101	FOUNDATION PLAN
S-102	FIRST FLOOR JOIST FRAMING PLAN
S-103	ROOF FRAMING PLAN
S-104	DECK FOUNDATION PLAN
S-105	DECK FRAMING PLAN
S-106	FIRST FLOOR WALL FRAMING PLAN
S-201	NORTH FRAMING ELEVATIONS
S-202	SOUTH FRAMING ELEVATIONS
S-203	EAST FRAMING ELEVATIONS
S-204	WEST FRAMING ELEVATIONS
S-205	INTERIOR MATING WALL FRAMING ELEVATION
S-301	FRAMING SECTIONS
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S-502	PIER DETAILS
S-503	PIER ISOMETRIC VIEWS
S-511	WALL SECTIONS
S-512	SECTION DETAILS
S-514	SECTION DETAILS
S-521	DECK DETAILS
S-600	FRONT CANOPY
S-702	EXOSTRUCTURE FOUNDATION PLAN
S-703	EXOSTRUCTURE FOUNDATION DETAILS
S-704	EXOSTRUCTURE FOUNDATION PLATE PROFILES
S-707	EXOSTRUCTURE NORTH ELEVATION
S-708	EXOSTRUCTURE BAY SECTIONS
S-801	FRAMING ISOMETRICS
S-802	SOUTH DECK FRAMING ISOMETRIC
S-900	APPENDIX A - EXOSTRUCTURE SHOP DRAWINGS
S-901	APPENDIX A - EXOSTRUCTURE SHOP DRAWINGS
S-902	APPENDIX A - EXOSTRUCTURE SHOP DRAWINGS
S-903	APPENDIX A - EXOSTRUCTURE SHOP DRAWINGS
S-904	APPENDIX A - EXOSTRUCTURE SHOP DRAWINGS
S-905	APPENDIX A - EXOSTRUCTURE SHOP DRAWINGS
S-906	APPENDIX A - EXOSTRUCTURE SHOP DRAWINGS
S-907	APPENDIX A - EXOSTRUCTURE SHOP DRAWINGS
S-908	APPENDIX A - EXOSTRUCTURE SHOP DRAWINGS
S-909	APPENDIX A - EXOSTRUCTURE SHOP DRAWINGS
0.040	A DDENBLY A FYGOTDUOTUDE QUOD DD AVAINGO

**GALVANIZED** 

GRID LINE

HEIGHT

**GRADE BEAM** 

LIVE LOAD IN kN/m2

LAMINATED VENEER LUMBER

#### Structural Design Narrative **Gravity Loads**

#### Echo is an energy efficient single storey structure comprised of repetitive wood framed members spaced at 24" o.c. Special considerations have been made to allow for higher levels of insulation than are required by governing building codes and specifically the use of vacuum insulation panels. The structure incorporates a shallow slope roof, a continuous perimeter header and is constructed in two seperate modules to be shipped via flat bed trailers.

Foundation System A temporary foundation is included in this structural analysis for use during construction and at Orange County Great Park during Solar Decathlon 2013. The foundation system as designed is not intended to be used as a permanent foundation upon completion of the competition. A permanent foundation is to be designed for the permanent resting location according to the local building code utilizing the post saddle

External Structures The external roof structures are purpose built to support Echo's photovoltaic array and provide shading. The external structures have not been considered in the following analysis. The external structure is to be independently supported and not attached to the main framing of the house is any structural manner.

on APPENDIX A - EXOSTRUCTURE SHOP DRAWING S-909.

Structural analysis was conducted assuming all loads are acting on the building in it's as assemblied state. Individual modules are not designed to withstand all loads indepently.

### Structural Design

Design Information

**Snow Factors: Ottawa** 

Ontario Building Code.

Applicable Building The following building codes and design standards were used to conduct the structural Codes and Standards analysis of Echo:

> A. U.S. DOE Solar Decathlon Draft Building Code: UPDATED MAY 14 2013 B. 2009 International Residential Code (IRC) C. 2006 Ontario Building Code (OBC) D. 2005 Canadian Wood Council Wood Design Manual (WDM)

E. ASCE-7-10 Minimum Design Loads for Buildings and Other Structures

F. International Building Code

or plaster board without the risk of cracking.

divided by 180 to avoid noticable movement in the floor.

The largest specified design load taken from the above codes and standards was used as governing the design load for structural calculations. When referring to the International Residential Code, Orange County Great Park was used as the site location. When referring to the Ontario Building Code, Ottawa Ontario was used as the site

Deflection in the roofing structural members is limited to the length of the member

divided by 360. This is done according to the WDM to allow the installation of gyps:

Deflection in the floor structural members is limited to the length of the member

Deflection in the deck members was limited to the length of the member divided by

240 for full serviceability load as per the WDM. The members are also limited to a

deflection of the member length divided by 360 for the live load component only.

The design loads below are the governing loads for each of the categories from the

above mentioned codes and standards. The process of applying the governing loads and

subsequently analysing the structure has been performed in accordance with the 2006

# Lateral Loads

<u>Design Loads</u>

1/2" plywood

Type 4 EPS

Type 1 EPS

**Partitions** 

Radiant floor

Interior Finishes

2 lb spray foam 2" thick

Metal cladding (16 Ga)

2 lb spray foam 2" thick

Allowance for M and E

Wind (Structural Components):

Wind (Components and Cladding):

1/2" plywood

Type 4 EPS

Type 1 EPS

Ceiling finish

Grace Ice and water shield

Importance Factor	1
Project City:	Irvine, California
Ss	1.75 g
Fa	1
S1	0.6 g
Fv	1.5
Cs	0.18
R	6.5
V	25233 N [5673 lbf]
Base Shear; Statio	, Governing Conditions
North/South (gove	erning direction)

Wind		
	Exposure Category	
	Basic Wind Speed	
	Method 1: Simplified Design	

Kzt
1
ps30 determined according to figure 6-
pnet determined according to figure 6-3
Wind (Structural Components):
Wind (Components and Cladding):
North (South (comming dispetion)

th/South (go	verning direction)		
ase	41.87	kN	[9413 lb]
base	89.2	kN.m	[65800 ft.lb]



0.06 kPa [1 psf]

0.07 kPa [1 psf]

0.01 kPa [0 psf] 0.03 kPa [1 psf]

0.02 kPa [1 psf]

1 kPa [21 psf]

0.1 kPa [2 psf]

0.8 kPa [17 psf]

2.4 kPa [50 psf]

0.16 kPa [3 psf]

0.01 kPa [0 psf]

0.06 kPa [1 psf]

0.07 kPa [1 psf]

0.01 kPa [0 psf]

0.04 kPa [1 psf]

0.02 kPa [1 psf]

0.25 kPa [5 psf]

0.12 kPa [3 psf]

0.74 kPa [15 psf]

0.90 kPa [19 psf]

2.32 kPa [48 psf]

-0.80 kPa [-17 psf]

-1.90 kPa [-40 psf]

25.2 kN [5665 lbf]

85 mph

0.67 kPa [14 psf] 1 kPa [21 psf]

1.21

94.7 kN [21289 lbf]

2.09 kPa [44 psf]

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CONSTRUCTION: M. BELL
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	U.S. DEPARTMENT OF ENERGY	
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01	10/11/12	80% DOE/NREL SUBMISSION
02	11/20/12	80% DOE/NREL RESUBMISSION
03	02/14/13	95% DOE/NREL SUBMISSION
04	07/04/13	STRUCTURAL SET STAMPED
05	08/22/13	AS-BUILT DRAWING SUBMISSIO
MARK	DATE	DESCRIPTION

LOT NUMBER:	120
DRAWN BY:	W.KLASSEN & G.BERGA
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STRUCTURAL NOTES AND SYMBOLS

PUBLIC DOMAIN

S-001

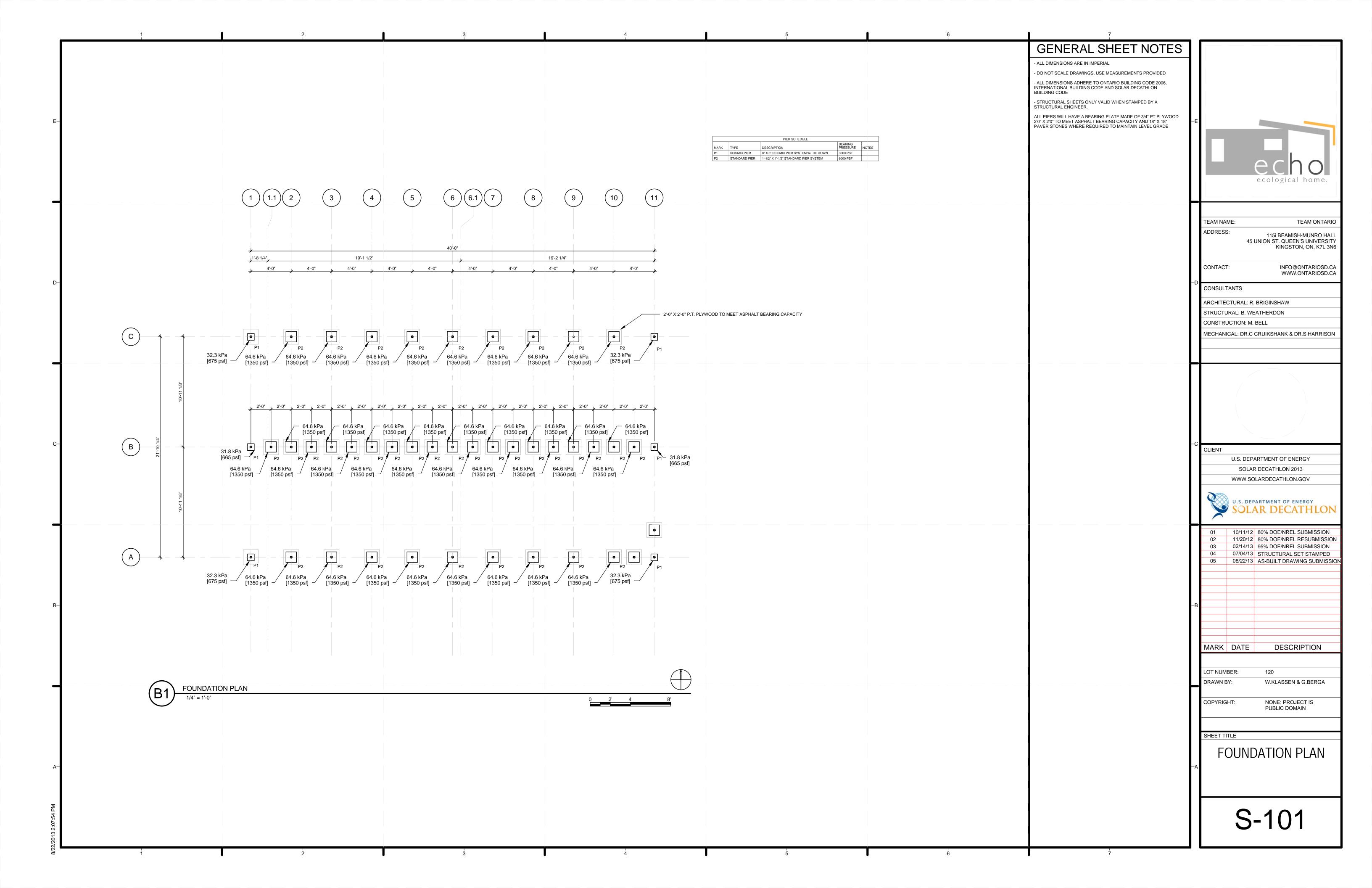
**Deck Deflection Renovation and** This structural analysis does not make consideration for extensive renovations or **Expansion Revision** expansion built in the future. **Design Information** 

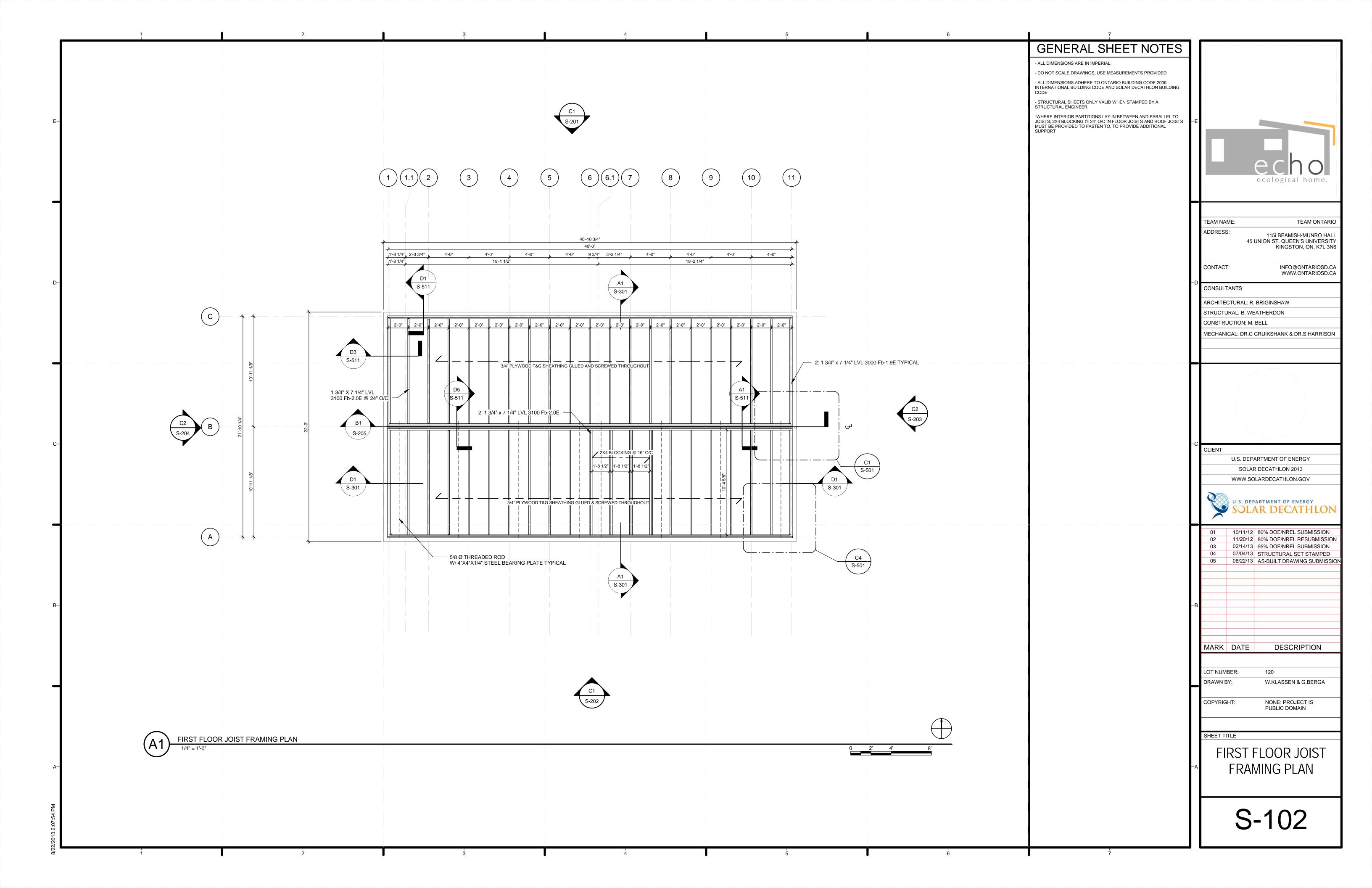
S-910 APPENDIX A - EXOSTRUCTURE SHOP DRAWINGS S-911 APPENDIX A - EXOSTRUCTURE SHOP DRAWINGS S-912 APPENDIX B - ENGINEERED WOOD TRUSS SHOP DRAWING

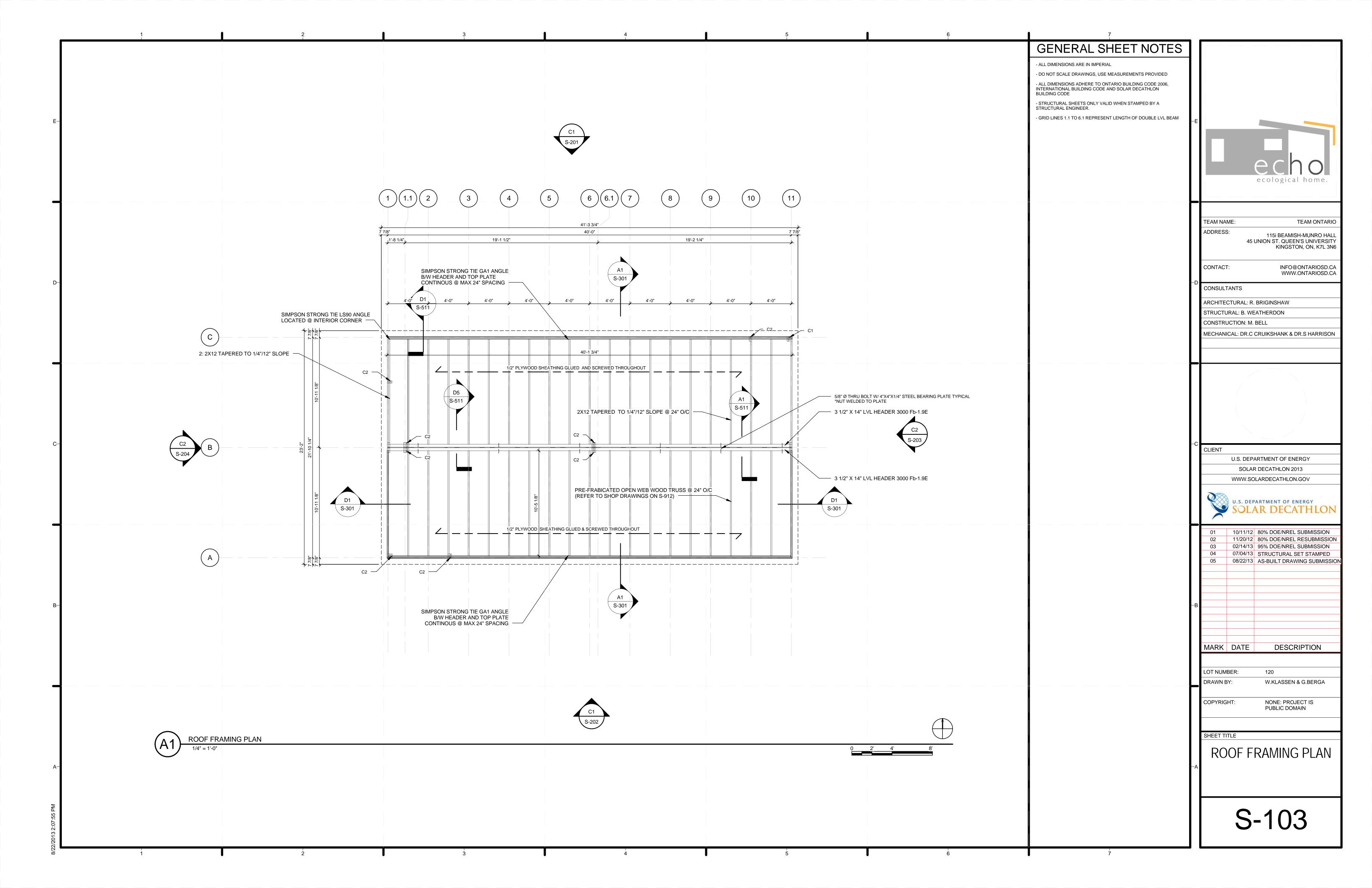
2.4 kPa [50 psf]

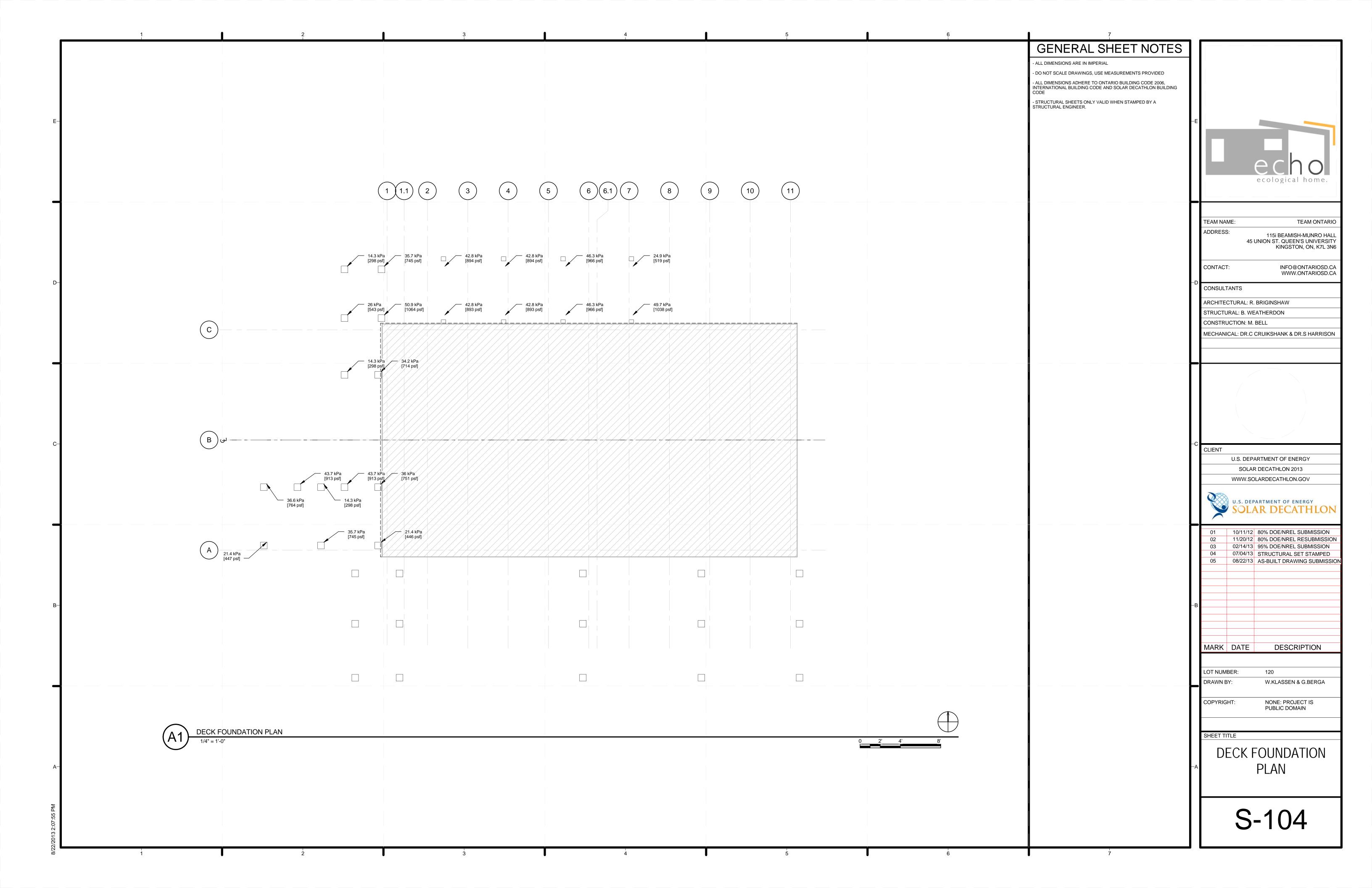
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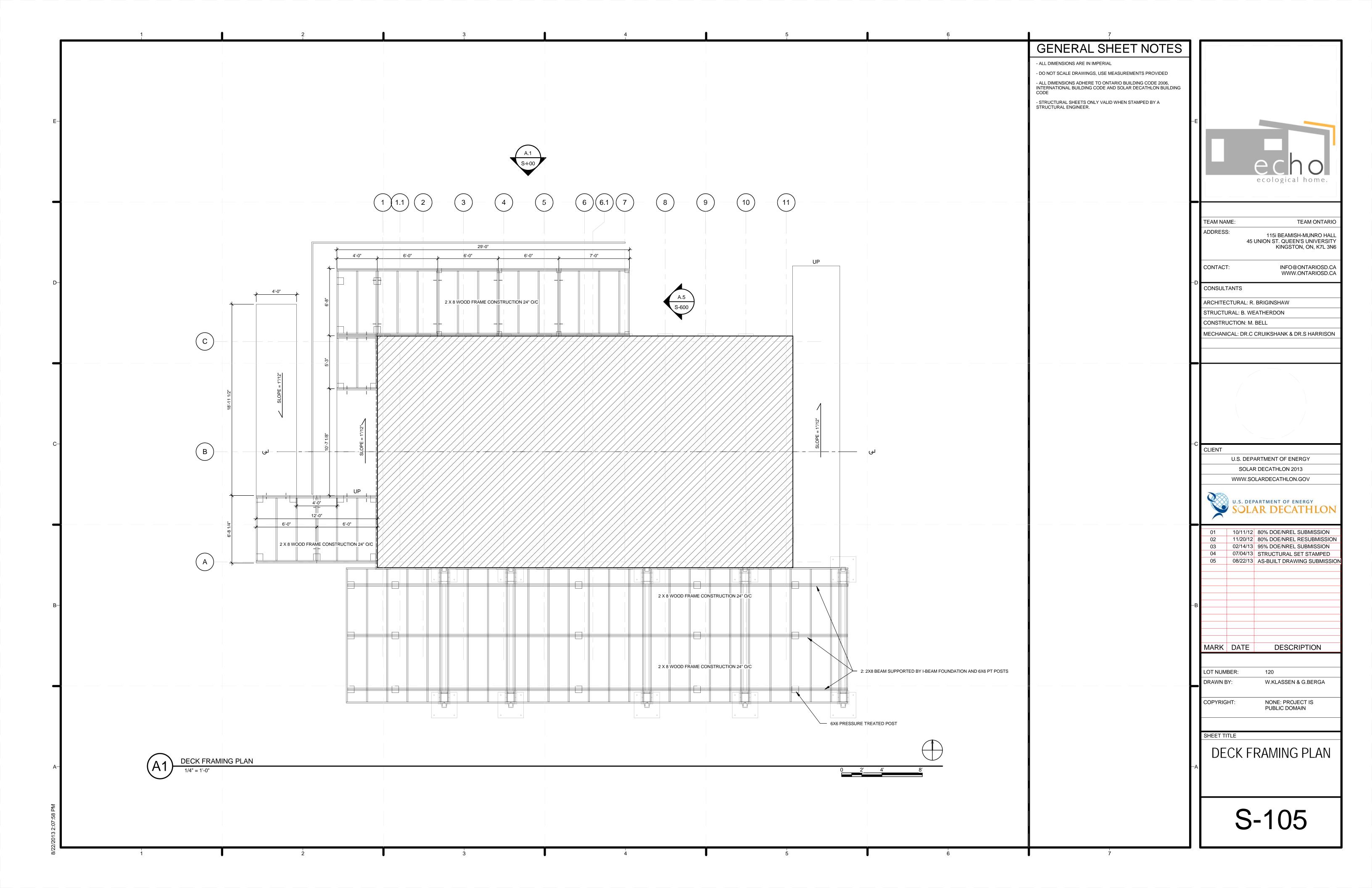
Is [Ss(Cb\*Cw\*Cs\*Ca) + Sr]

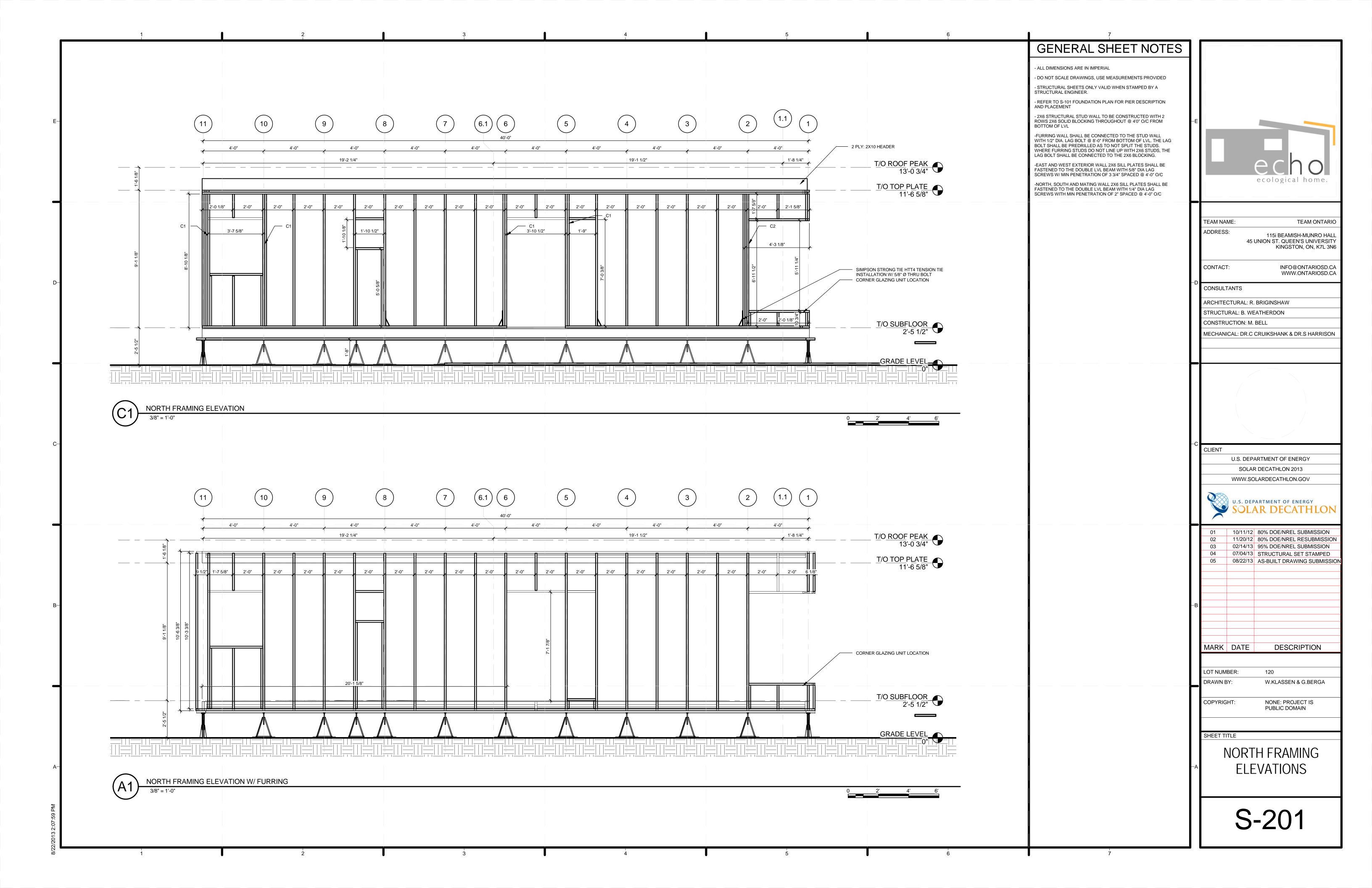


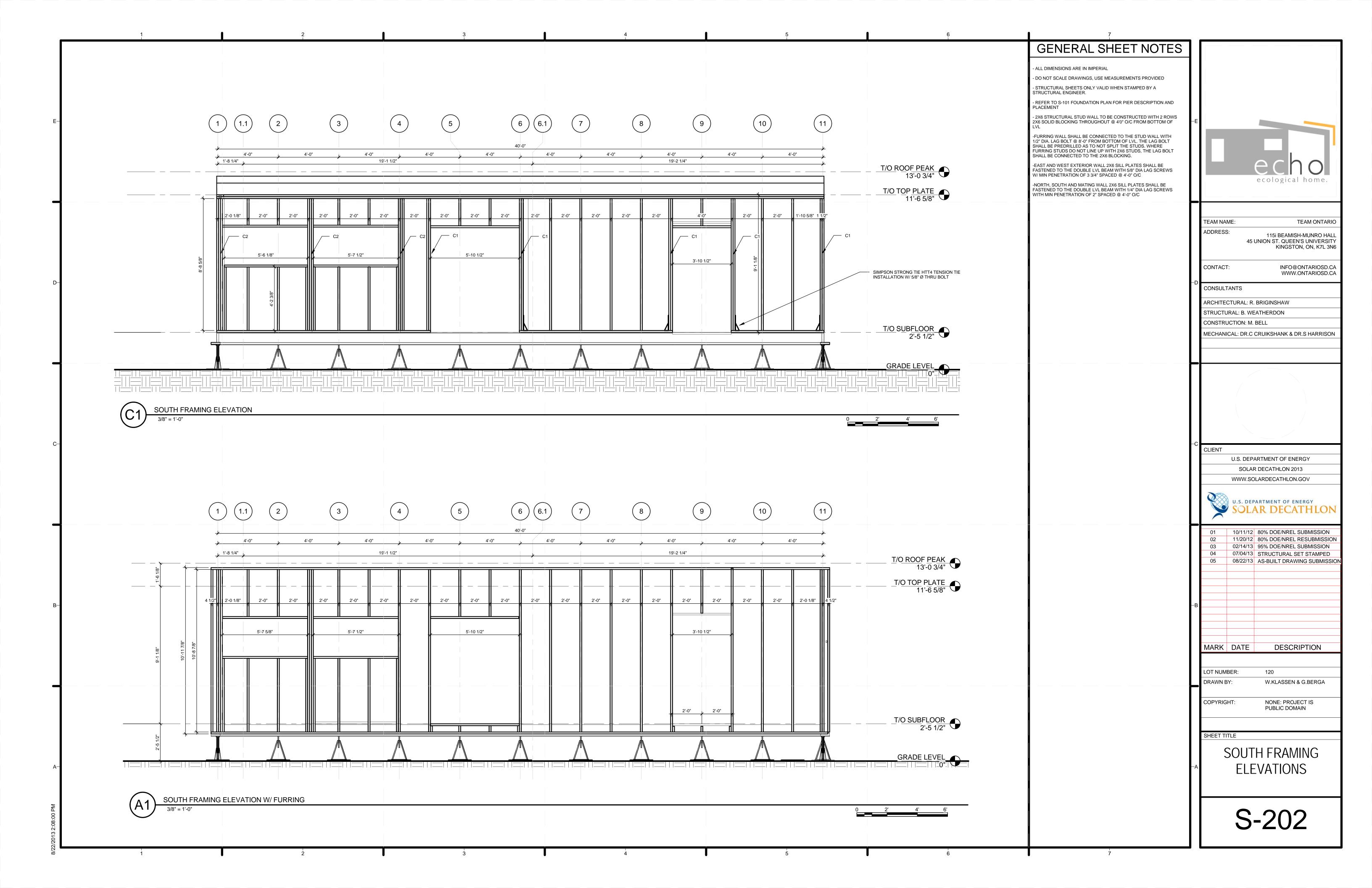


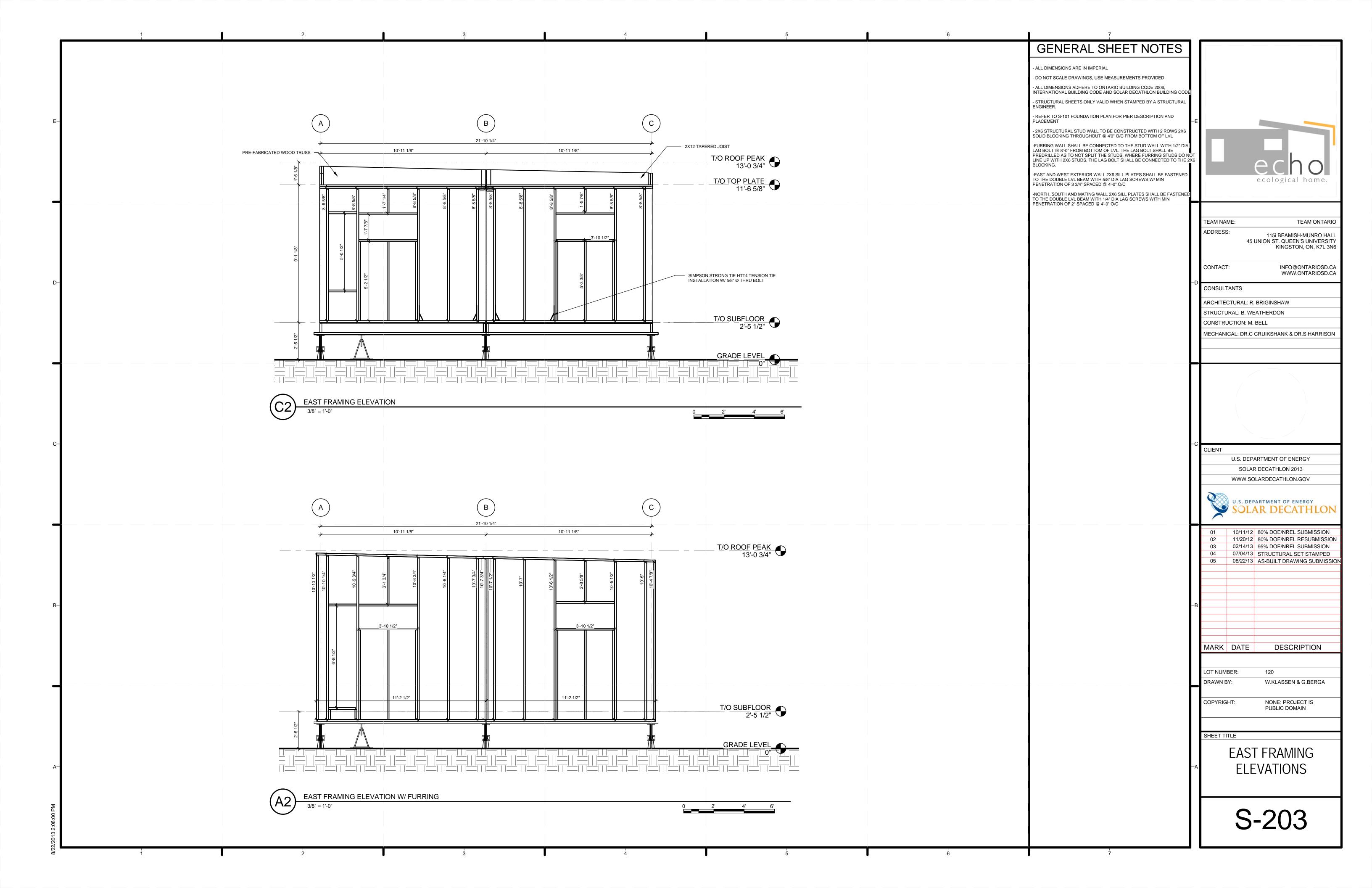


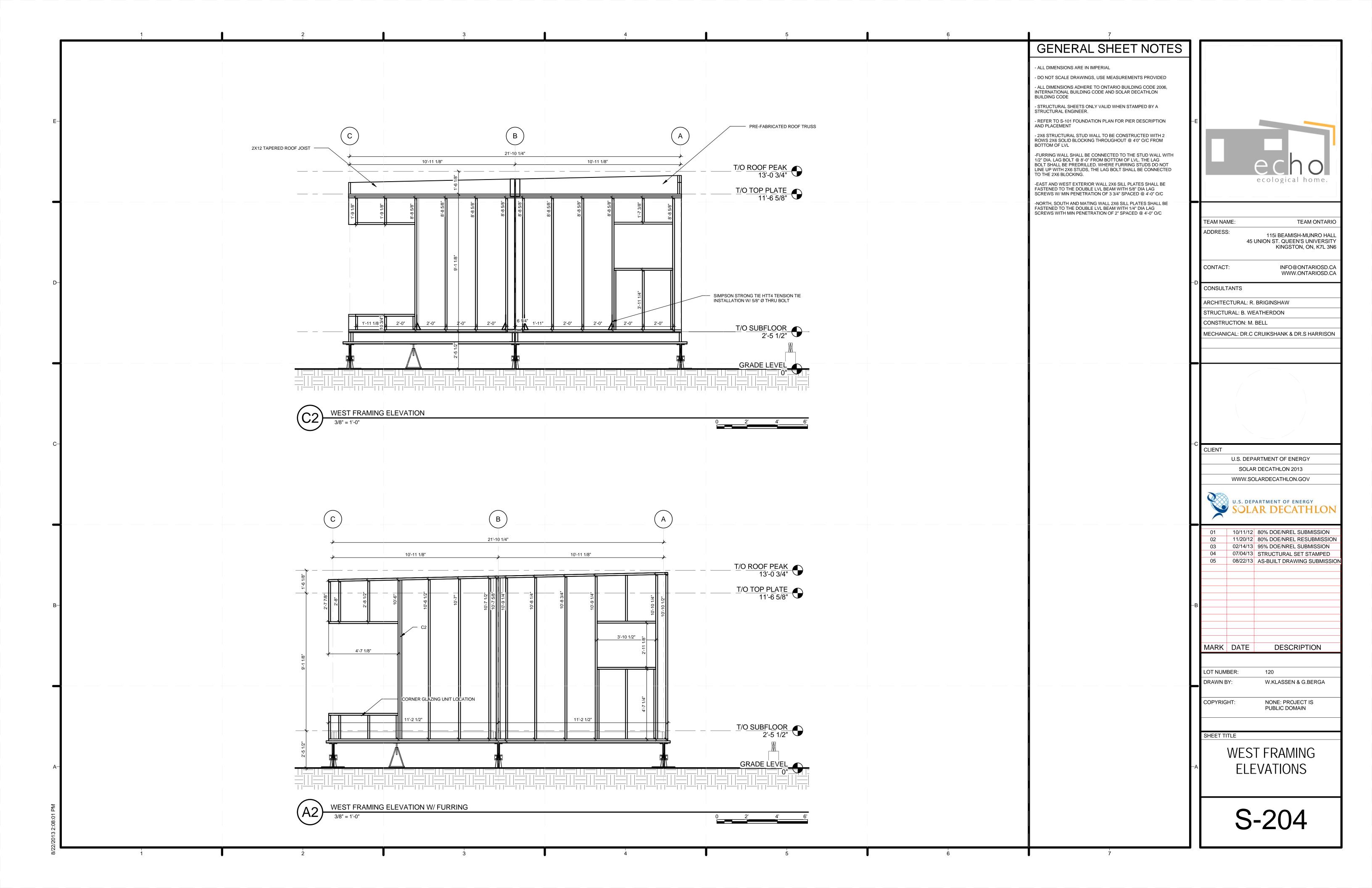


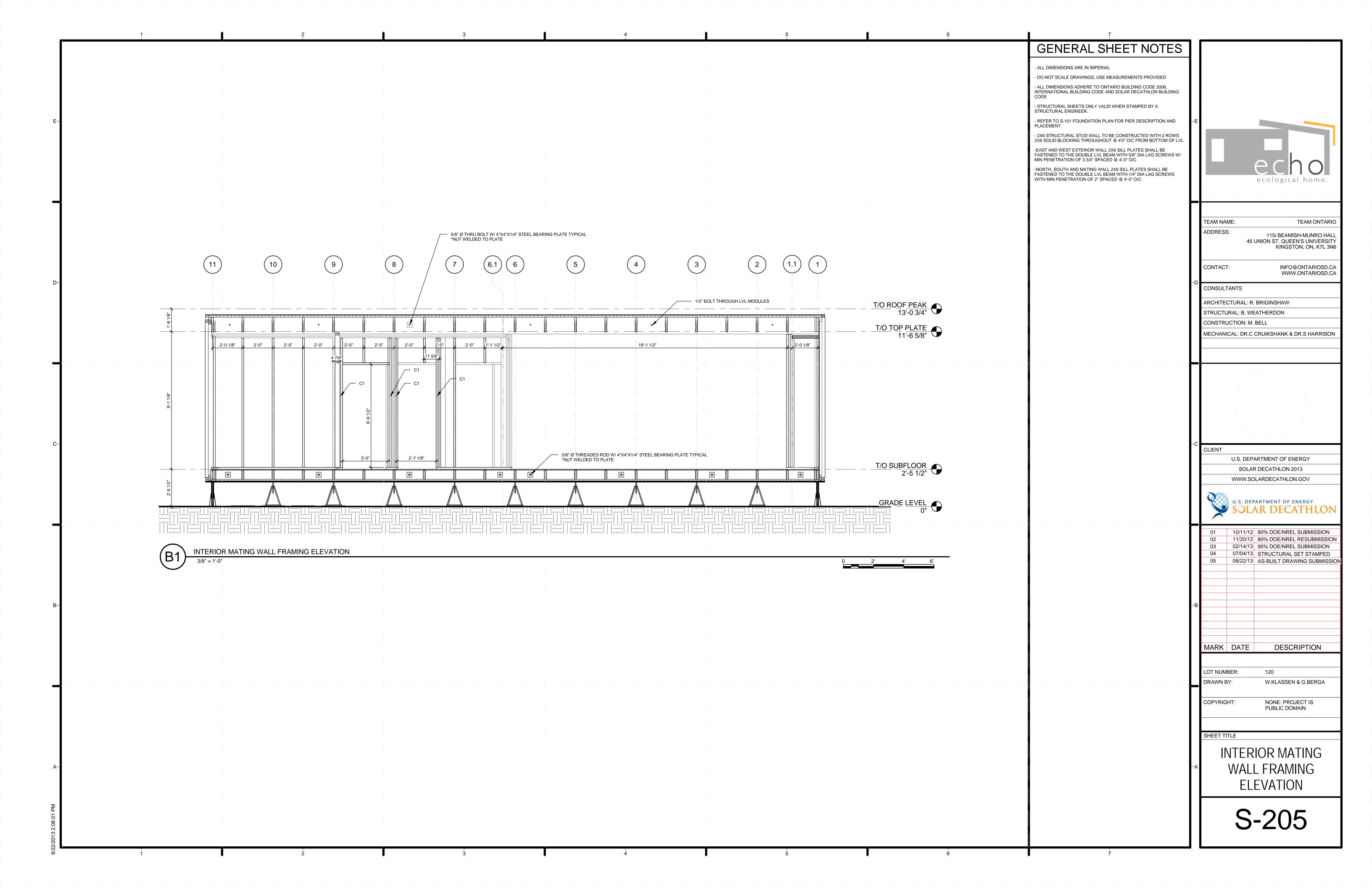


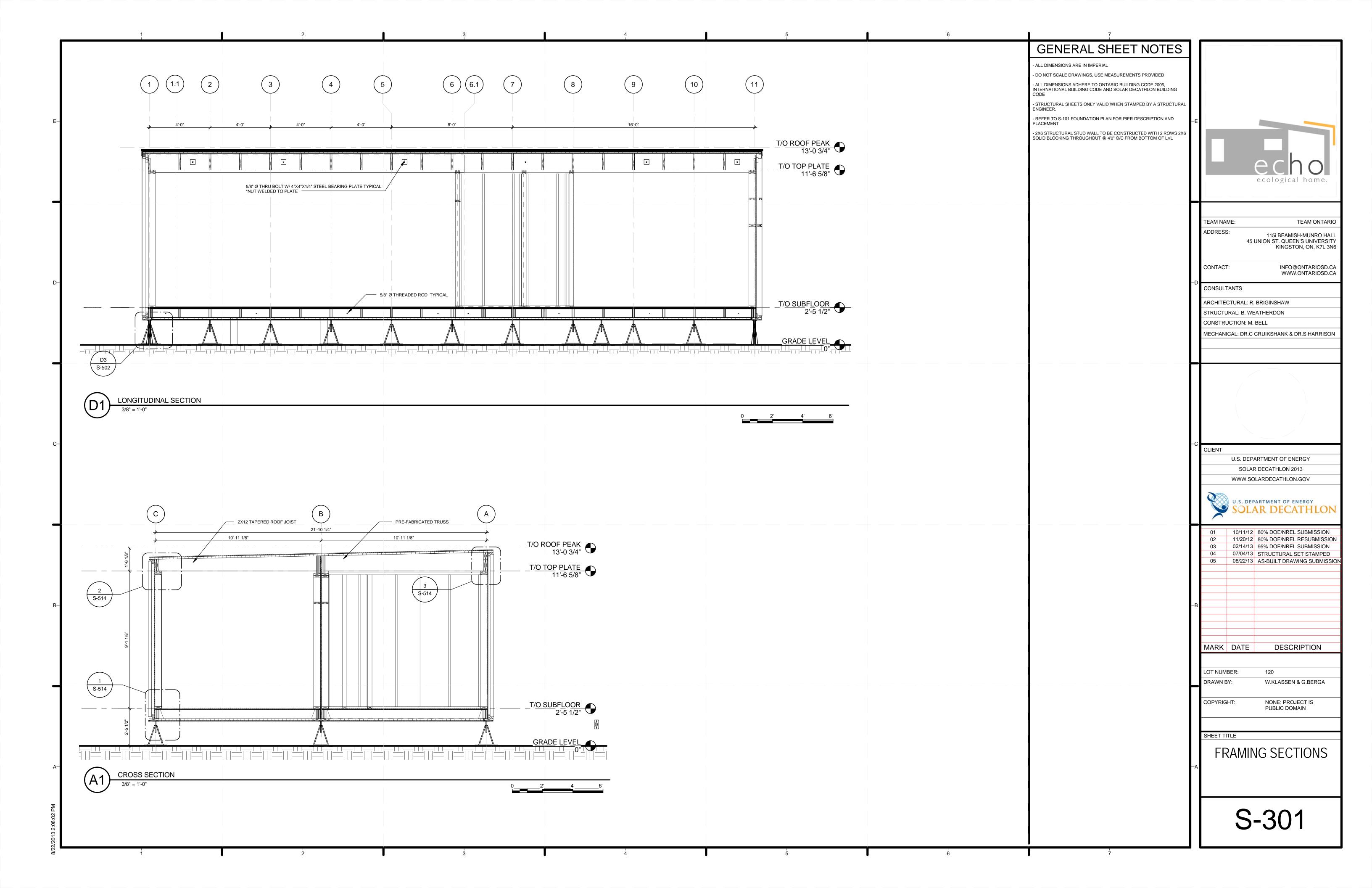


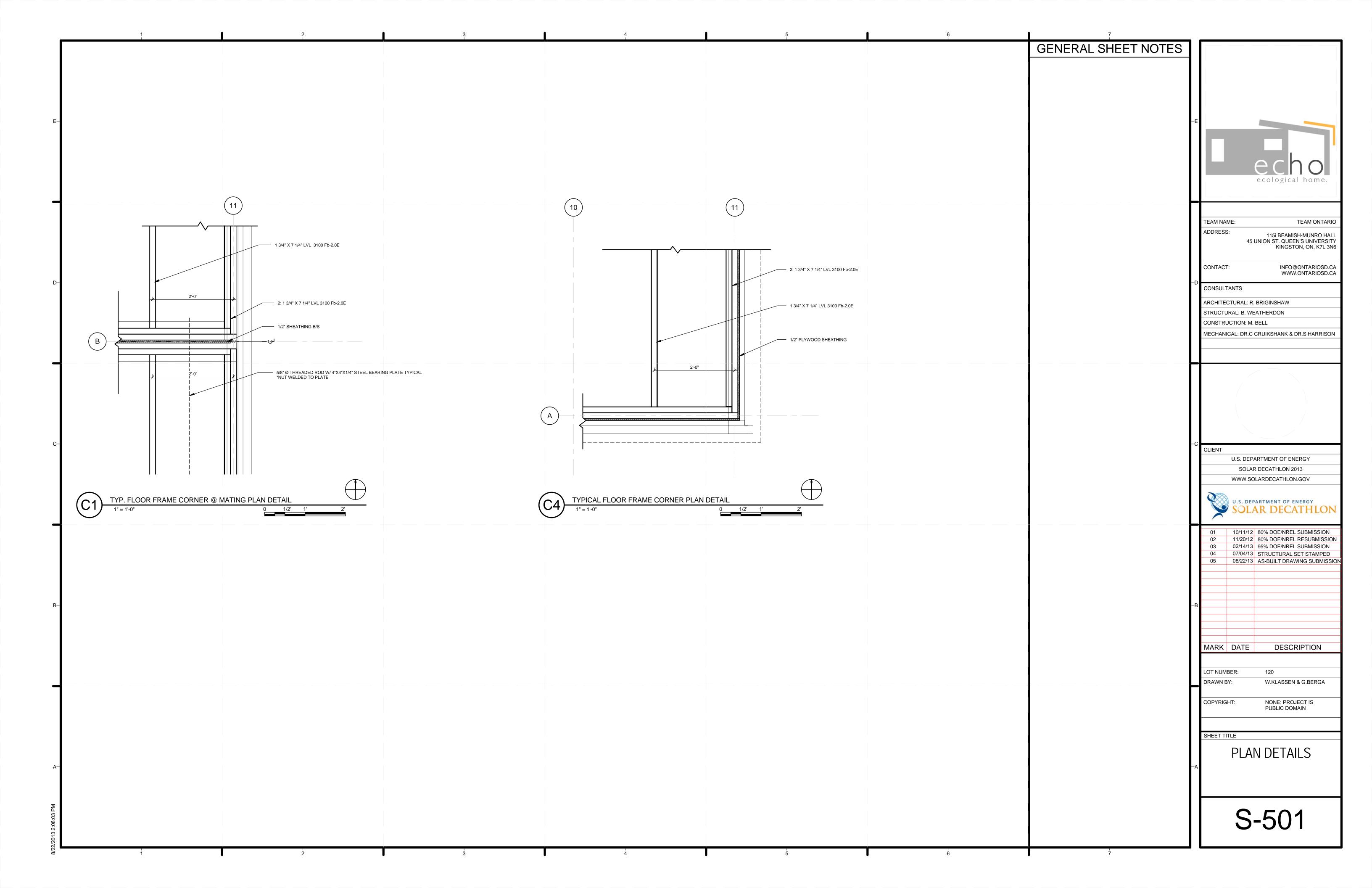


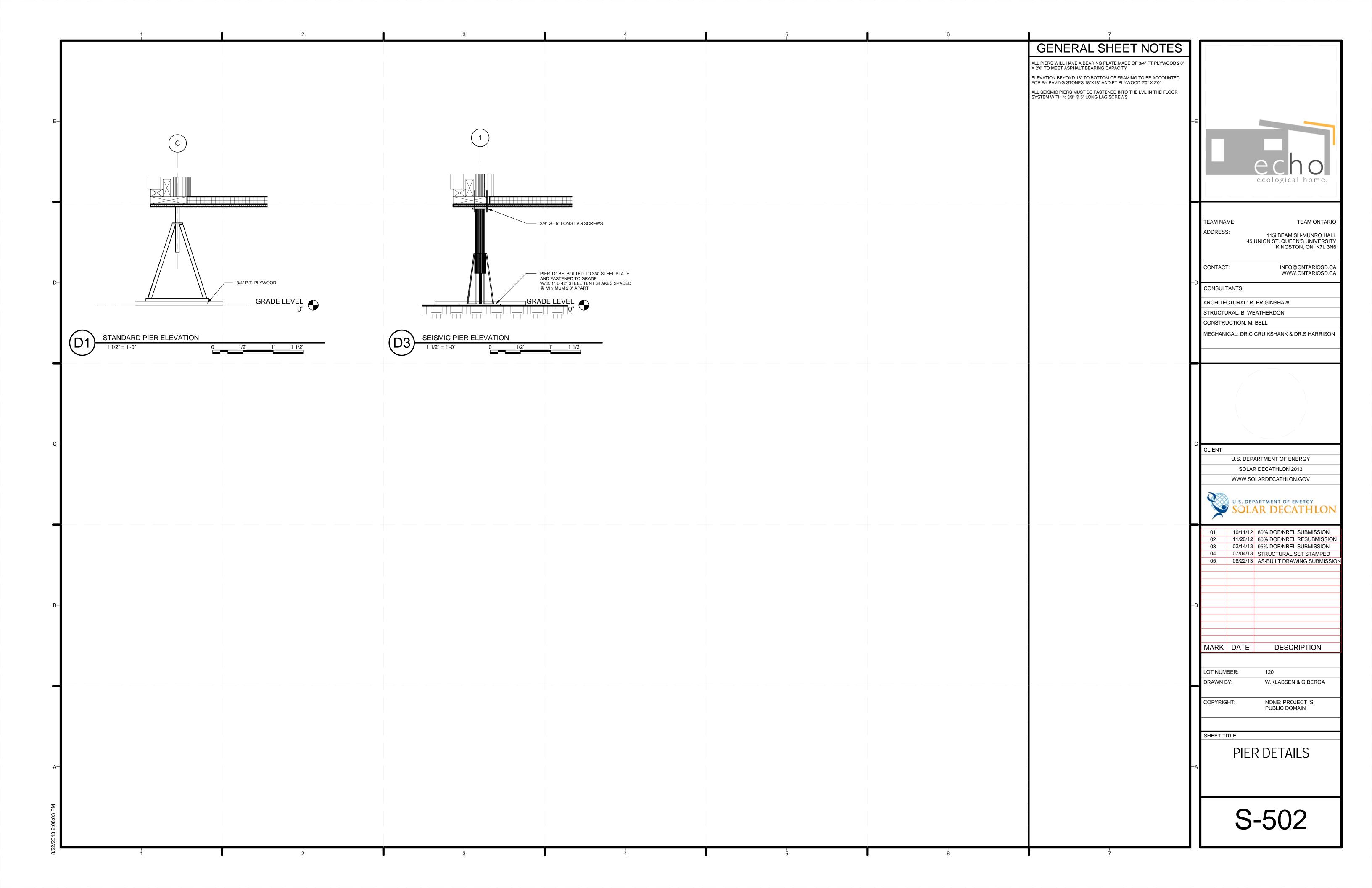


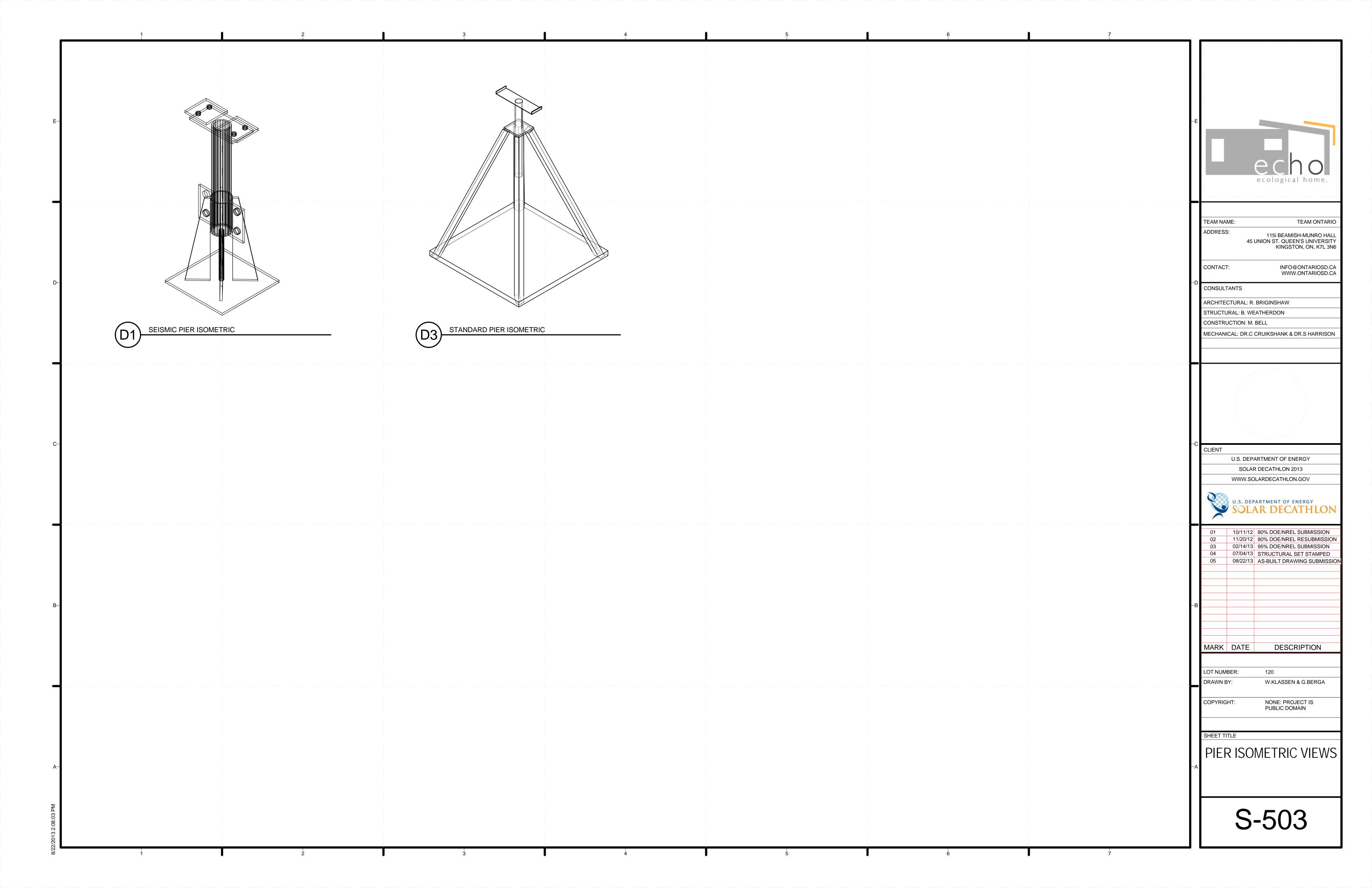


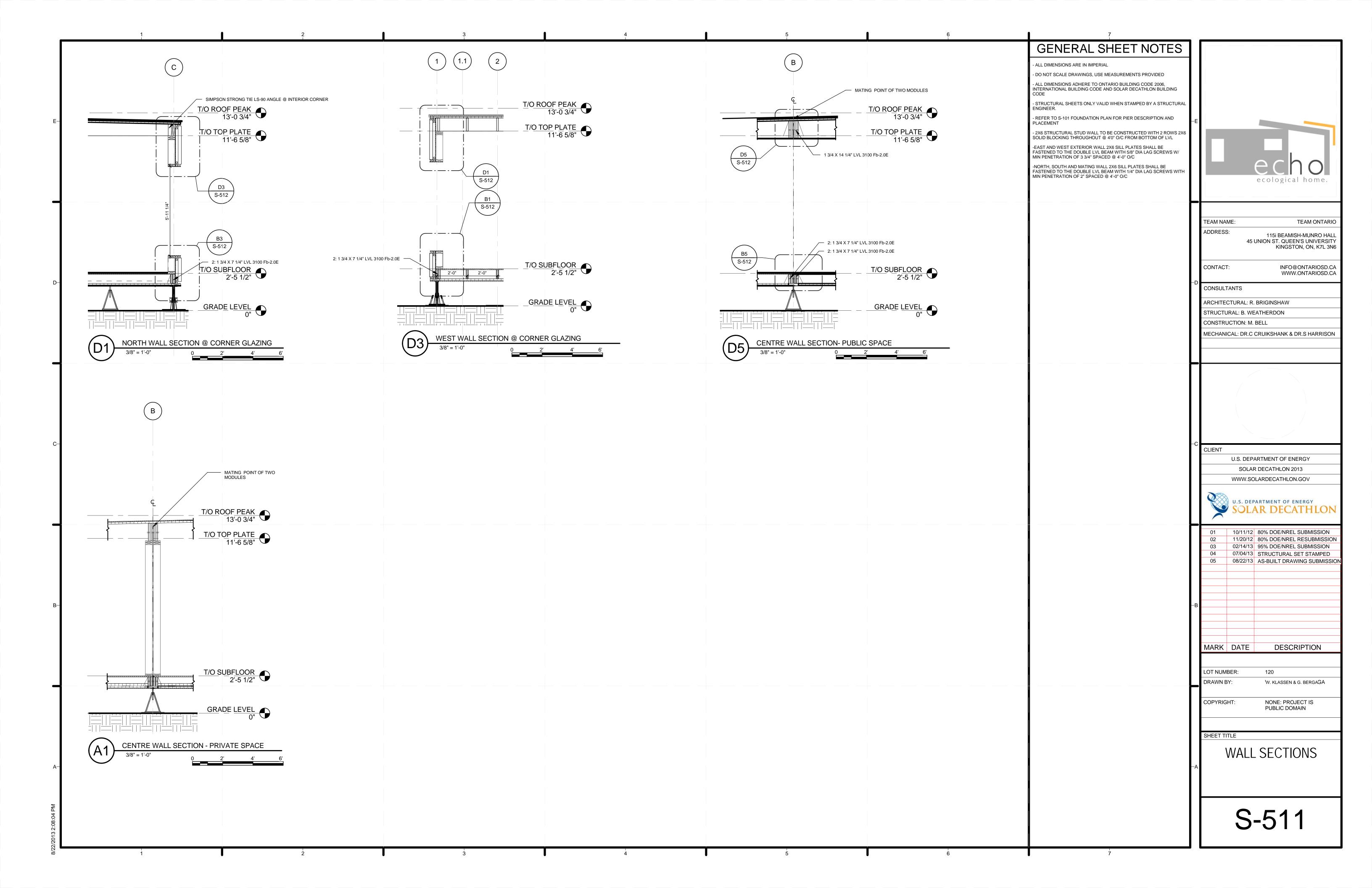


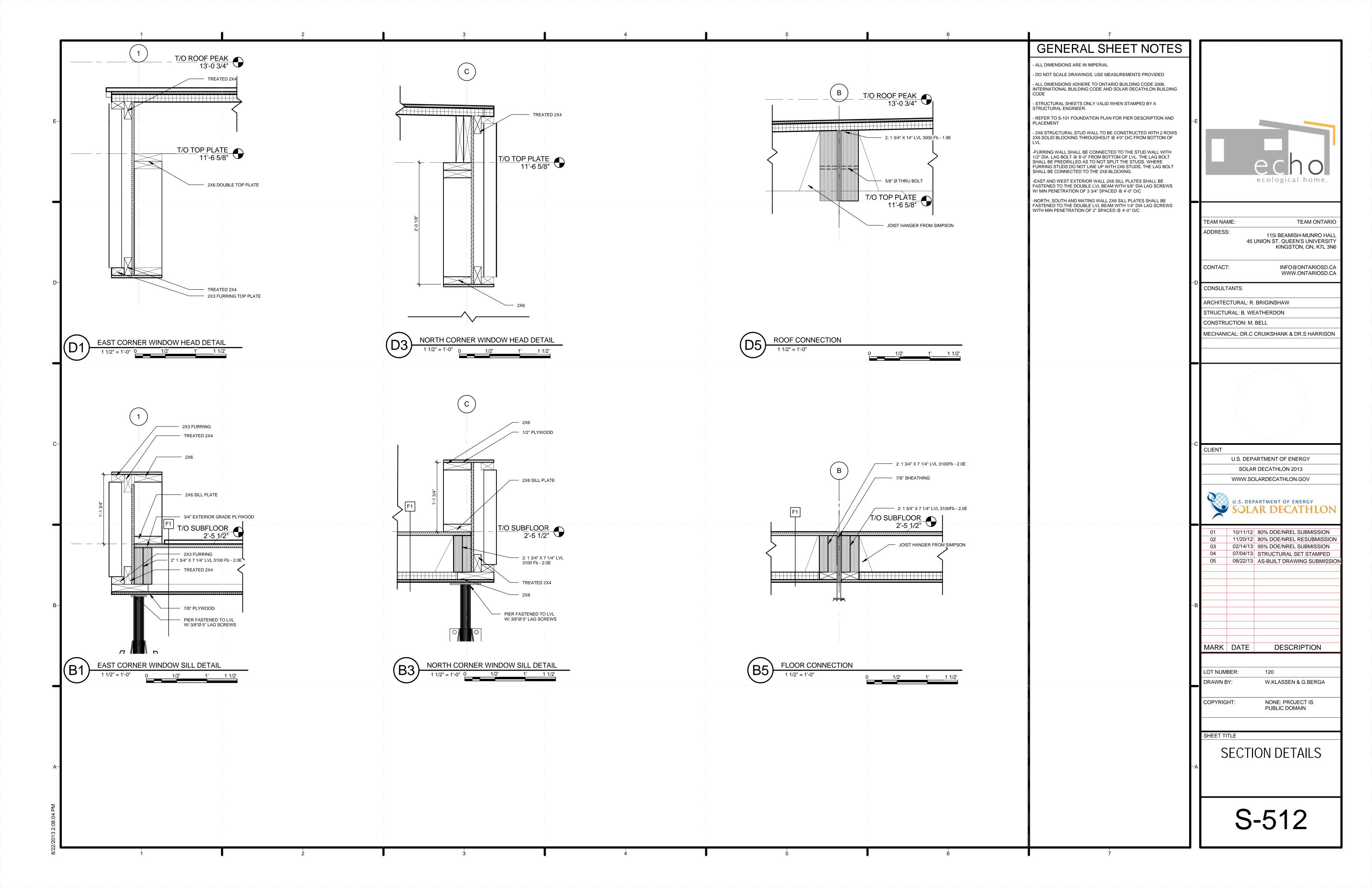


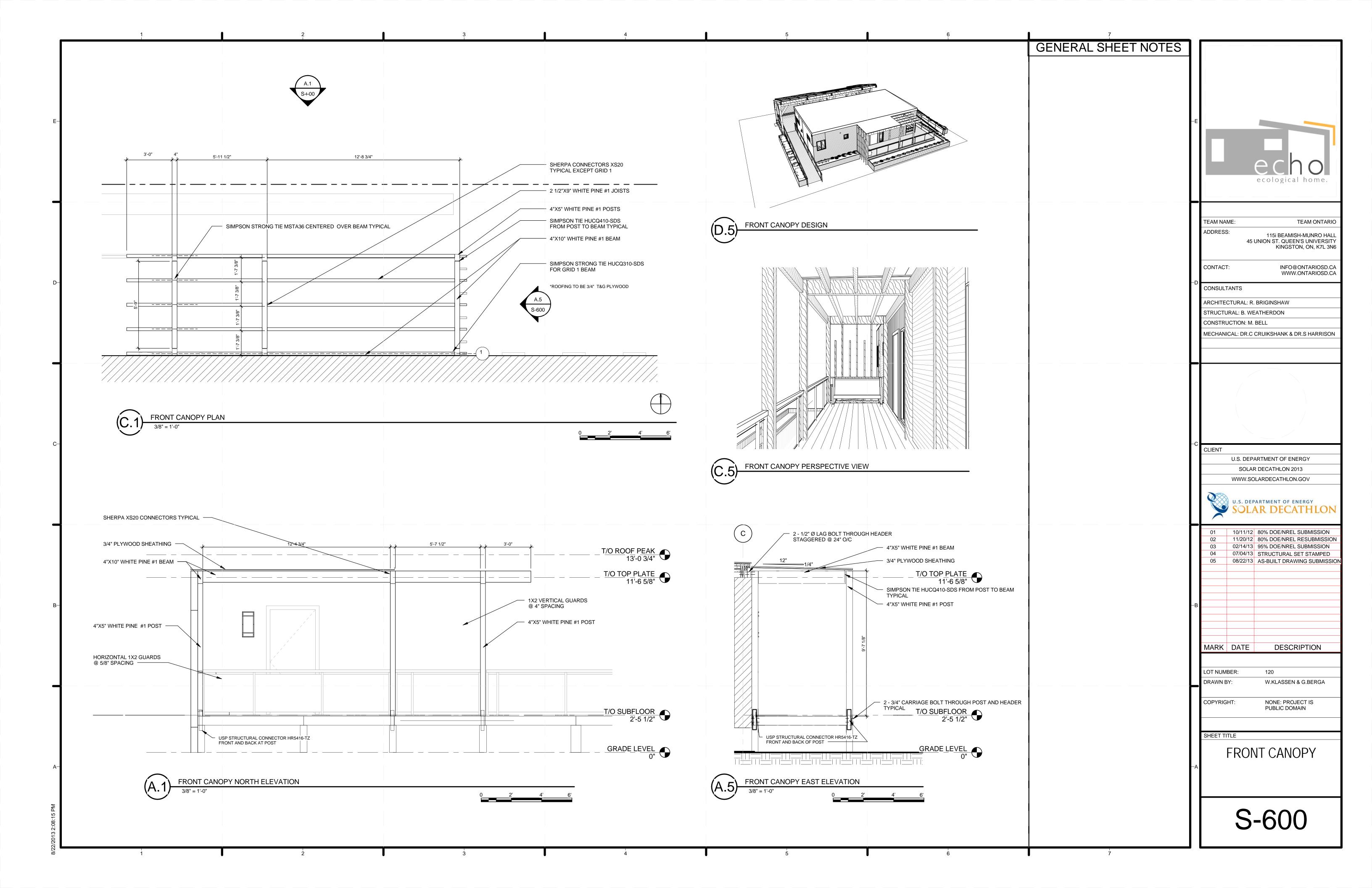


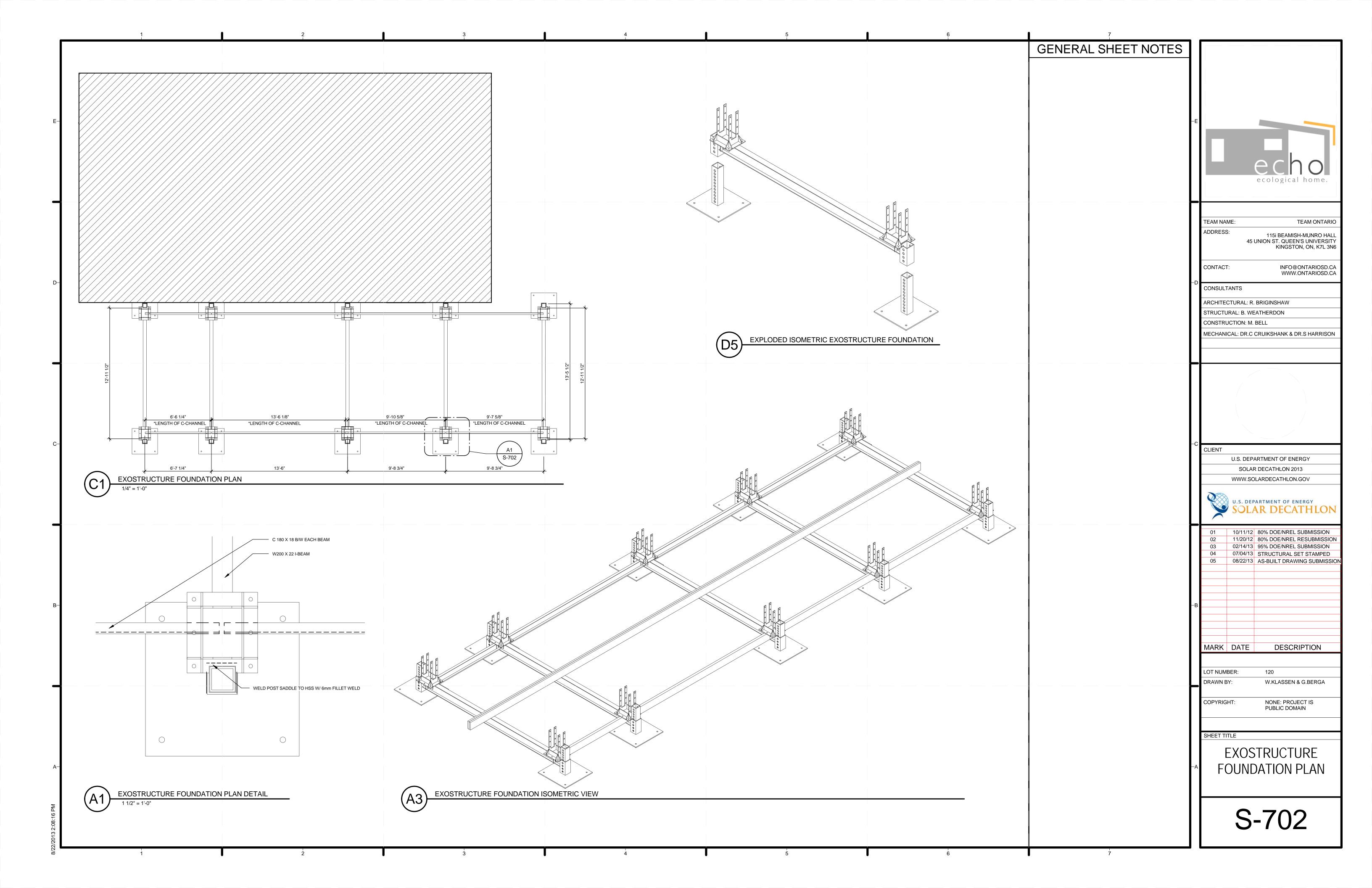


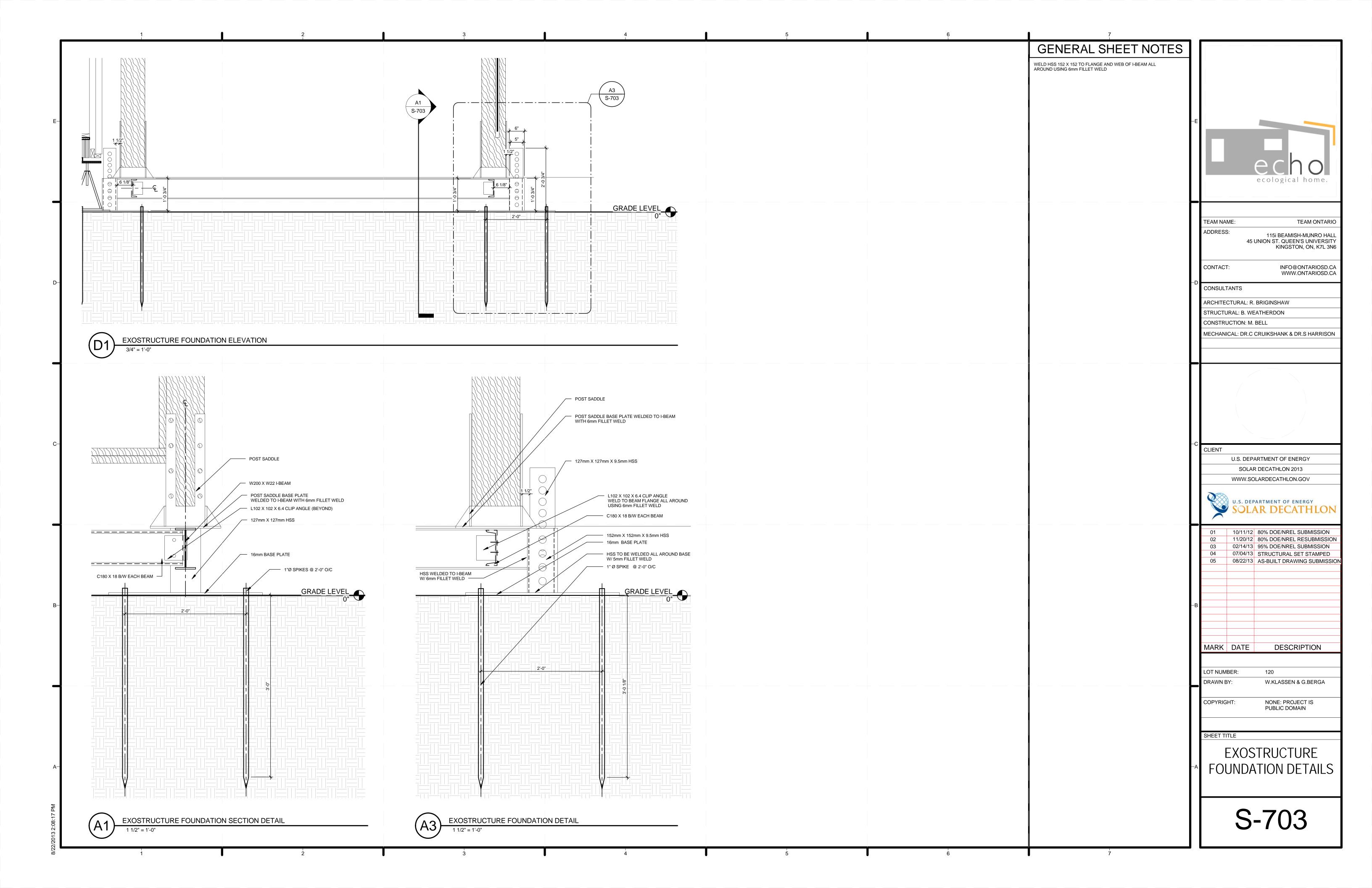


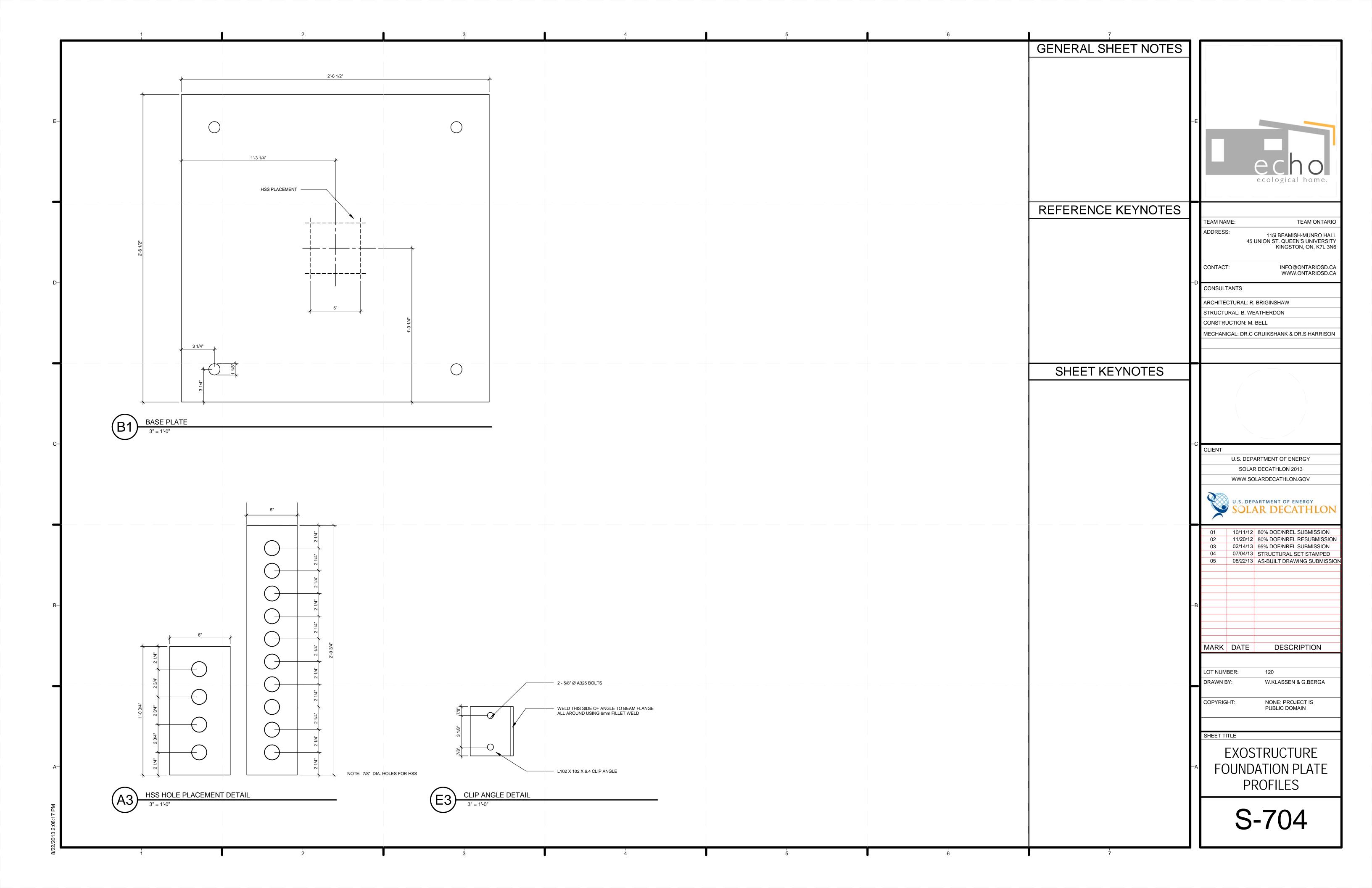


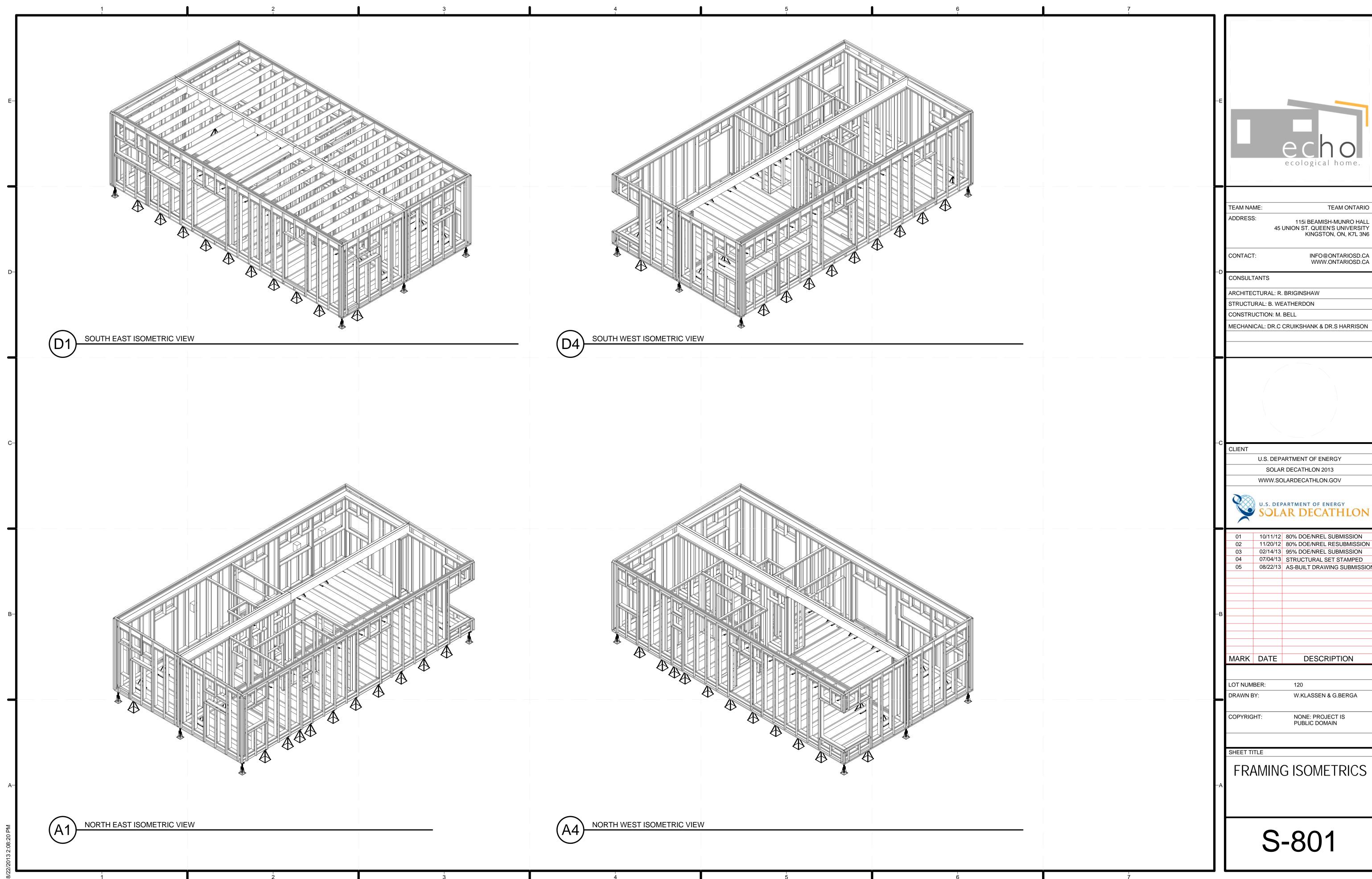












ecological home.

TEAM ONTARIO 115i BEAMISH-MUNRO HALL 45 UNION ST. QUEEN'S UNIVERSITY KINGSTON, ON, K7L 3N6

INFO@ONTARIOSD.CA WWW.ONTARIOSD.CA

ARCHITECTURAL: R. BRIGINSHAW

MECHANICAL: DR.C CRUIKSHANK & DR.S HARRISON

U.S. DEPARTMENT OF ENERGY SOLAR DECATHLON 2013

SOLAR DECATHLON

02/14/13 95% DOE/NREL SUBMISSION
07/04/13 STRUCTURAL SET STAMPED
08/22/13 AS-BUILT DRAWING SUBMISSION

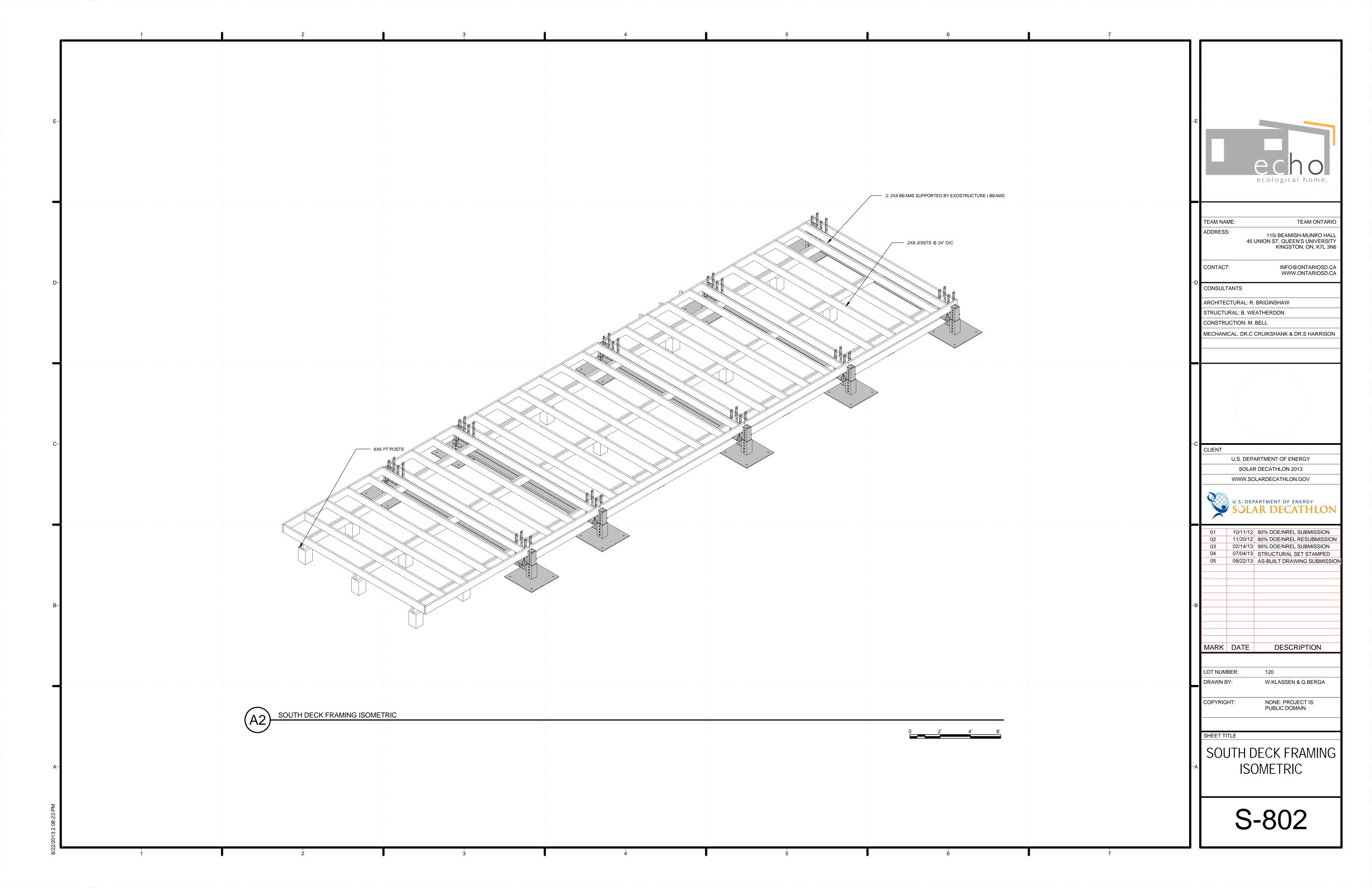
DESCRIPTION

W.KLASSEN & G.BERGA

NONE: PROJECT IS PUBLIC DOMAIN

FRAMING ISOMETRICS

S-801



### **GENERAL NOTES**

- 1. STRUCTURAL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS AND DOCUMENTS INCLUDED IN THIS CONTRACT.
- 2. THE DESIGN, SUPPLY, INSTALLATION AND MAINTENANCE OF ADEQUATE TEMPORARY SHORING, BRACING AND RE-SHORING DURING CONSTRUCTION UNTIL STRUCTURE IS STABLE SHALL BE DONE BY OTHERS.
- 3. STRUCTURAL DESIGN AND CONSTRUCTION SHALL CONFORM TO:
  - .1 ONTARIO BUILDING CODE (OBC-2006)
  - NATIONAL BUILDING CODE OF CANADA, WHERE APPLICABLE.
  - TIMBER
  - .1 CAN/CSA-086-01 (INCLUDING SUPPLEMENT CAN/CSA-086S1-05), ENGINEERING DESIGN IN WOOD
  - .2 ENGINEERING DESIGN IN WOOD CAN3-086-M
  - .3 ALL CODES SHALL BE CURRENT CODES APPLICABLE AT THE TIME OF CONSTRUCTION.
- 4. CONTRACTOR MUST INFORM McINTOSH PERRY CONSULTING ENGINEER LTD. IN WRITING WHEN FABRICATION WORK BEGINS, AND ARRANGE FOR TWO IN SHOP REVIEWS.
- 5. SEE THIS DRAWING FOR DESIGN LOADS. DO NOT EXCEED DURING CONSTRUCTION.

## STRUCTURAL STEEL NOTES

- 1. ALL STEEL TO HAVE A MINIMUM OF 1 COAT OF RED OXIDE PRIMER TO CISC/CPMA 1 -73a. DO NOT PRIME SURFACES THAT WILL BE HIGH STRENGTH BOLTED OR FIREPROOFED.
- 2. ALL BOLTS, NUTS, AND WASHERS SHALL CONFORM TO A307.
- ALL ANCHOR BOLTS SHALL BE DESIGN BY OTHERS.
- WELDING FILLER METAL AND FLUX SHALL CONFORM TO CSA W48 STANDARDS, ANY WELD CONNECTIONS SHALL CONFORM TO CSA W59.
- ELECTRODE CLASSIFICATION IS E49XX.

# WELDING OF PLATES AND HARDWARE

- 1. WELDING PROCEDURES, MATERIALS AND QUALITY STANDARDS SHALL CONFORM TO THE REQUIREMENTS OF CSA W59 "WELDED STEEL CONSTRUCTION".
- 2. FIRMS UNDERTAKING WELDING OF PLATES, ANGLES AND OTHER STRUCTURAL MEMBERS SHALL BE CURRENTLY CERTIFIED BY THE CANADIAN WELDING BUREAU TO CSA W47.1 (DIVISON 1 OR 2.1) "CERTIFICATION OF COMPANIES FOR FUSION WELDING OF STEEL STRUCTURES".

V.E.F. = VERTICAL EACH FACE

VERT. = VERTICAL

## ANCHOR BOLTS / EMBEDDED MATERIALS

1. ALL ANCHOR BOLTS TO BE DESIGNED BY OTHERS FOR THE LOADS SHOWN ON THESE DRAWINGS.

# **ABBREVIATIONS:**

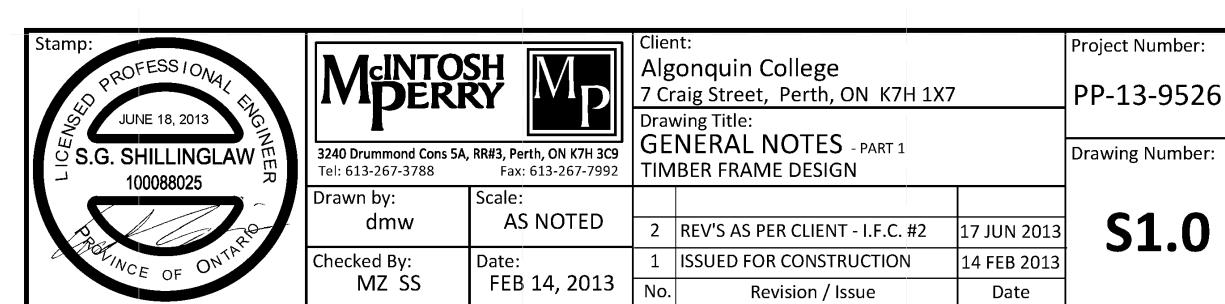
ALT. = ALTERNATE S.C. = SAW CUT = BOTTOM t = THICKNESS CANT. = CANTILEVERED HORZ. = HORIZONTAL HSS = HOLLOW STRUCTURAL SECTION CONSTRUCTION JOINT = ISOLATION JOINT E.F. = EACH FACE EW. = EACH WAY LG. = LONG GALV. = GALVANIZED LLV. = LONG LEG VERTICAL H.E.F. = HORIZONTAL EACH FACE MIN . = MINIMUM MC = MOMENT CONNECTION MAX. = MAXIMUM NON-FACTORED LOAD KN-m T & B. = TOP AND BOTTOM T.J. = TIE JOIST N.T.S. = NOT TO SCALE O.C. = ON CENTER TYP. = TYPICAL OW.S.J.= OPEN WEB STEEL JOIST U.N.O. = UNLESS NOTED OTHERWISE U/S = UNDERSIDE OR = OUTRIGGER

## WOOD NOTES

- 1. ALL MEMBERS SHALL BE SO FRAMED, ANCHORED, FASTENED, TIED AND BRACED TO PROVIDE THE NECESSARY STRENGTH AND RIGIDITY.
- 2. EXCEPT AS PERMITTED, WOOD FRAMING MEMBERS THAT ARE NOT PRESSURE-TREATED WITH A WOOD PRESERVATIVE AND THAT ARE SUPPORTED ON CONCRETE IN CONTACT WITH THE GROUND OR FILL SHALL BE SEPARATED FROM THE CONCRETE OR FILL BY NOT LESS THAN 0.05 MM POLYETHYLENE FILM OR TYPE S ROLL ROOFING.
- 3. LUMBER FOR JOISTS, RAFTERS, TRUSSES, BEAMS, STUD WALL FRAMING, ROOF SHEATHING, SUBFLOORING AND WALL SHEATHING SHALL BE IDENTIFIED BY A GRADE STAMP TO INDICATE ITS GRADE AS DETERMINED BY THE NLGA, "STANDARD GRADING RULES FOR CANADIAN LUMBER (INTERPRETATION INCLUDED)".
- 4. LUMBER FOR JOISTS, RAFTERS, TRUSSES, BEAMS, STUD WALL FRAMING SHALL BE SPF NO.1/NO.2 UNLESS OTHERWISE NOTED.
- 5. WOOD-BASED PANELS FOR ROOF SHEATHING AND SUBFLOORS SHALL CONFORM TO, CSA O121-M, "DOUGLAS FIR PLYWOOD", CSA O151, "CANADIAN SOFTWOOD PLYWOOD", CSA O153-M, "POPLAR PLYWOOD", CAN/CSA-O325.0, "CONSTRUCTION SHEATHING", CSA O437.0, "OSB AND WAFERBOARD".
- 6. EXTERIOR WALL SHEATHING TO BE MINIMUM 7/16" THICK OSB, O-1 GRADE TO CSA O437.0 UNLESS OTHERWISE NOTED. SHEATHING MAY BE SUBSTITUTED WITH PLYWOOD OF THE SAME THICKNESS.
- 7. OSB, WAFERBOARD AND PLYWOOD USED FOR ROOF SHEATHING, WALL SHEATHING AND SUBFLOORING SHALL BE LEGIBLY IDENTIFIED ON THE FACE OF THE MATERIAL INDICATING, THE MANUFACTURER OF THE MATERIAL, THE STANDARD TO WHICH IT IS PRODUCED, AND THAT THE MATERIAL IS OF AN EXTERIOR TYPE.
- 8. MOISTURE CONTENT OF LUMBER SHALL BE NOT MORE THAN 19% AT THE TIME OF INSTALLATION.
- 9. NAILS SHALL BE COMMON STEEL WIRE NAILS OR COMMON SPIRAL NAILS, CONFORMING TO CSA B111, "WIRE NAILS, SPIKES AND STAPLES". ALL NAILS SHALL BE LONG ENOUGH SO THAT NOT LESS THAN HALF THEIR REQUIRED LENGTH PENETRATES INTO THE SECOND MEMBER.
- 10. NAIL SHALL BE ZINC COATED CONFORMING TO CSA B111.
- 11. ALL OTHER WOOD CONSTRUCTION TO MEET PART 9 OF OBC 2006, UNLESS OTHERWISE NOTED ON THE DRAWINGS.
- 12. MAXIMUM DEFLECTION UNDER TOTAL LOAD SHALL NOT EXCEED 1/180 OF THE SPAN. DEFLECTION SHALL NOT EXCEED 1/180 OF THE SPAN UNDER LIVE LOAD.
- 13. STORAGE AND HANDLING REQUIREMENTS:
  - a. STORE MATERIALS IN DRY LOCATION AND IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS IN CLEAN, DRY, WELL-VENTILATED AREA.
- b. STORE AND PROTECT WOOD PRODUCTS FROM NICKS, SCRATCHES, AND BLEMISHES.
- c. REPLACE DEFECTIVE OR DAMAGED MATERIALS WITH NEW.

## FOUNDATION NOTES

1. FOUNDATION TO BE DESIGNED BY OTHERS FOR THE LOADS PROVIDED ON THESE DRAWINGS.





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WWW.ONTARIOSD.CA

CONSULTANTS

ARCHITECTURAL: R. BRIGINSHAW
STRUCTURAL: B. WEATHERDON
CONSTRUCTION: M. BELL

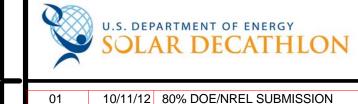
MECHANICAL: DR.C CRUIKSHANK & DR.S HARRISON

C CLIENT

U.S. DEPARTMENT OF ENERGY

SOLAR DECATHLON 2013

WWW.SOLARDECATHLON.GOV



 02
 11/20/12
 80% DOE/NREL RESUBMISSION

 03
 02/14/13
 95% DOE/NREL SUBMISSION

 04
 07/04/13
 STRUCTURAL SET STAMPED

 05
 08/22/13
 AS-BUILT DRAWING SUBMISSION

 MARK
 DATE
 DESCRIPTION

 LOT NUMBER:
 120

 DRAWN BY:
 W.KLASSEN & G.BERGA

NONE: PROJECT IS PUBLIC DOMAIN

APPENDIX A EXOSTRUCTURE SHOP
DRAWINGS

COPYRIGHT:

S-900

## **HEAVY TIMBER NOTES**

- 1. SOFTWOOD LUMBER (HEAVY TIMBER FRAME): SANDED FOUR SIDES, MOISTURE CONTENT 19% OR LESS IN ACCORDANCE WITH FOLLOWING STANDARDS:
- a. CSA 0141.
- b. NLGA STANDARD GRADING RULES FOR CANADIAN LUMBER.
- c. MACHINE STRESS-RATED LUMBER IS ACCEPTABLE.
- d. HARDWOOD LUMBER: MOISTURE CONTENT 19 % OR LESS IN ACCORDANCE TO NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA).
- e. ALL HEAVY TIMBER TO BE EASTERN WHITE PINE No.1 UNLESS NOTED OTHERWISE.
- 2. DOWELS: PEG MATERIAL SHALL BE STRAIGHT GRAINED, ALL HEARTWOOD, KNOT FREE, AND REACTION FREE FROM BIRCH OR
- 3. PROVIDE AND INSTALL ALL NECESSARY HARDWARE AND METAL SHAPES REQUIRED FOR ASSEMBLY AND ERECTION OF THE TIMBER FRAME. THREADED RODS SHALL BE MINIMUM A307 GRADE. STEEL PLATES SHALL BE MINIMUM A36 GRADE. FASTENERS SHALL BE MINIMUM A307 GRADE.
- 4. FASTENING SHALL BE:
  - a. POSITIONED ACCURATELY, LEVEL, PLUMB, TRUE AND FASTENED OR ANCHORED SECURELY.
  - b. DESIGN AND SELECT FASTENERS TO SUIT SIZE AND NATURE OF COMPONENTS BEING JOINED.
  - c. USE OF PROPRIETARY DEVICES AS PER MANUFACTURER RECOMMENDATIONS.
- 5. ENSURE ALL JOINERY AND DOWELS ARE INSTALLED WITH A TIGHT FIT.
- 6. REPLACE ITEMS OF FINISH CARPENTRY WITH DAMAGE TO WOOD SURFACES INCLUDING HAMMER AND OTHER BRUISES.
- 7. INSTALLATION OF TIMBER FRAME SHALL BE IN ACCORDANCE WITH THE DETAILS AND NOTES ON THE DRAWINGS, THE APPROVED SHOP DRAWINGS, CODE REQUIREMENTS, AND THE BEST TRADE PRACTICES.
- 8. JOINERY SHALL BE IN THE BEST OF THE EARLY ENGLISH AND EARLY AMERICAN TRADITIONS. ALL WORKMANSHIP SHALL BE OF THE VERY HIGHEST QUALITY.
- 9. ALL JOINERY SHALL BE ACCURATELY CUT SO AS TO MAKE A NEAT, SNUG FIT.
- 10. TIMBER FRAME COMPONENTS AND ASSEMBLIES MUST BE CHECKED FOR DIMENSIONS AND ANCHORAGE ACCURACY BEFORE ERECTION.
- 11. TEMPORARY BRACING AND GUY LINES SHALL BE PROVIDED TO ADEQUATELY PROTECT ALL PERSONS AND PROPERTY AND TO INSURE PROPER ALIGNMENT.
- 12. PADDING OR NON-MARKING SLINGS SHALL BE USED, AND CORNERS SHALL BE PROTECTED WITH BLOCKING.
- 13. THE ASSEMBLED TIMBER FRAME SHALL BE STRAIGHT, PLUMB, LEVEL AND SQUARE. PORTIONS OF THE STRUCTURE NOT ADEQUATELY BRACED BY DESIGN SHALL HAVE TEMPORARY BRACES UNTIL THE DECKING IS APPLIED
- 14. ALL JOINTS SHALL BE REASONABLY TIGHT.
- 15. TOOLS USED TO DRIVE OR PULL JOINTS TOGETHER SHALL NOT PERMANENTLY MAR THE FINISHED SURFACES OF THE TIMBER
- 16. ALL MORTISE AND TENON CONNECTION AREAS SHALL BE FREE OF STRUCTURAL DEFECTS SUCH AS SPLITS, ROT, SHAKE, LARGE KNOTS, AND EXCESSIVE SLOPE OF GRAIN.
- 17. ALL HOLES FOR DOWELS AND BOLTS SHALL BE PRE-DRILLED.
- 18. RE-TORQUE ALL CONNECTIONS 6-8 MONTHS AFTER INITIAL CONNECTIONS ARE MADE.
- 19. PROVIDE GAPS IN OTHER MATERIALS TO ACCOMMODATE EXPECTED SHRINKING OR SWELLING OF TIMBER FRAME, AS PER MANUFACTURER'S RECOMMENDATIONS.
- 20. APPLY SEALER AS PER MANUFACTURER'S RECOMMENDATIONS.
- 21. CUTTING: AVOID EXTRA CUTTING AFTER FABRICATION. WHERE FIELD FITTING IS UNAVOIDABLE, COMPLY WITH REQUIREMENTS FOR SHOP FABRICATION. ERRORS IN TIMBER CUTTING OR DRILLING SHALL CAUSE TIMBERS TO BE REPLACED WITH NEW. NO PLUGS OR SIMILAR REPAIRS WILL BE ALLOWED.
- 22. REPAIR DAMAGED SURFACES AND FINISHES AFTER COMPLETING ERECTION. REPLACE DAMAGED HEAVY TIMBER CONSTRUCTION IF REPAIRS ARE NOT APPROVED BY ARCHITECT.
- 23. PROTECT INSTALLED PRODUCTS AND COMPONENTS FROM DAMAGE DURING CONSTRUCTION.
- 24. REPAIR DAMAGE TO ADJACENT MATERIALS CAUSED BY FINISH CARPENTRY INSTALLATION.

### **DESIGN DATA**

- FOUNDATION AND ANCHORAGE TO FOUNDATION SHALL BE DESIGNED BY OTHERS FOR THE LOADS SHOWN ON THESE DRAWINGS. ALL LOADS ARE FACTORED LOADS. WHERE SEISMIC LOADS GOVERN, THE LOADS SHOWN ON THESE DRAWINGS HAVE BEEN MAGNIFIED.
- 2. DESIGN LOADS:

GRAVITY LOADS AS SHOWN ON PLANS

DEAD LOAD: PV PANELS: 0.5 kPa

STEEL DECK: 0.15 kPa PURLINS AND BEAMS: 0.2 kPa MISCELLANEOUS: 0.15 kPa 1.0 kPa TOTAL

LIVE LOADS: SNOW LOAD: 2.17 kPa (ls=1; Ss=2.4; Sr=0.4).

WIND LOAD:

WALL DESIGN PRESSURE: 0.97kPa (lw=1; q<sub>1/50</sub>=0.47KPa) BASE SHEARS: 18.3 kN (N-S DIRECTION) 3.7 kN (E-W DIRECTION)

ROOF DESIGN PRESSURE: 0.51kPa (lw=1; q<sub>1/50</sub>=0.47kPa) -1.15kPa (lw=1;  $q_{1/50}$ =0.47kPa)

EARTHQUAKE PARAMETERS:

SITE CLASSIFICATION: D

Fa = 1.136 Fv = 1.370

TYPE OF SEISMIC FORCE RESISTING SYSTEM (SFRS): TIMBER STRUCTURE BRACED OR MOMENT-RESISTING FRAME WITH DUCTILE CONNECTIONS - LIMITED DUCTILITY

Rd = 1.5

Ro = 1.5

Ta = 0.1563 (N-S DIRECTION)

Ta = 0.1563 (E-W DIRECTION)

DESIGN SPECTRAL RESPONSE ACCELERATION (OTTAWA)

Sa(0.2) = 0.66

Sa(0.5) = 0.32

Sa(1.0) = 0.13

Sa(2.0) = 0.044

5% DAMPED DESIGN SPECTRAL RESPONSE ACCELERATION (OTTAWA)

Sa(0.2) = 0.7498

Sa(0.5) = 0.4384

Sa(1.0) = 0.1781Sa(2.0) = 0.0603

 $Sa(4.0^{+}) = 0.0301$ 

S(Ta) = 0.7498 (N-S DIRECTION)

S(Ta) = 0.7498 (E-W DIRECTION)

Mv = 1

TYPES OF IRREGULARITIES:

3 - No 5 - No

1 - No

2 - No

7 - No

 $V = S(Ta) Mv IE W = 0.7498 \times 1 \times 1 \times W = 0.332 \times W$ 1.5 x 1.5

 $V_{MIN} = S(2.0) Mv(2.0) IE W = 0.040 x W$ 

 $V_{MAX} = (2/3) S(2.0) Mv IE W = 0.222 x W$ 

GOVERNING EQUIVALENT STATIC FORCE PROCEDURE FORMULA:

BASE SHEAR:

 $V = (FACTOR) \times W (N-S DIRECTION)$ 

 $= 0.2222 \times 90 \text{ kN}$ 

= 20 kN

 $V = (FACTOR) \times W (E-W DIRECTION)$  $= 0.2222 \times 90 \text{ kN}$ 

= 20 kN

**OVERTURNING MOMENT:** 

M = 91.3 kN-M (N-S DIRECTION)

M = 91.3 kN-M (E-W DIRECTION)

- THE SEISMIC FORCE RESISTING SYSTEM AND DIAPHRAGMS OF FLOORS AND THEIR CONNECTIONS HAVE BEEN DESIGNED IN ACCORDANCE WITH THE 2006 ONTARIO BUILDING CODE, ARTICLE 4.1.8.15 AND ARTICLE 9.5.3 IN CAN/CSA-086-01.
- 5. THE SEISMIC FORCE RESISTING SYSTEM FOUNDATIONS SHALL BEEN DESIGNED IN ACCORDANCE WITH THE 2006 ONTARIO BUILDING CODE, ARTICLE 4.1.8.16 AND ARTICLE 21.11 IN CAN/CSA A23.3.



TEAM ONTARIO 115i BEAMISH-MUNRO HALI 45 UNION ST. QUEEN'S UNIVERSITY

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CONSTRUCTION: M. BELL

MECHANICAL: DR.C CRUIKSHANK & DR.S HARRISON



U.S. DEPARTMENT OF ENERGY

SOLAR DECATHLON 2013

01	10/11/12	80% DOE/NREL SUBMISSION
02	11/20/12	80% DOE/NREL RESUBMISSIO
03	02/14/13	95% DOE/NREL SUBMISSION
04	07/04/13	STRUCTURAL SET STAMPED
05	08/22/13	AS-BUILT DRAWING SUBMISS
MARK	DATE	DESCRIPTION

W.KLASSEN & G.BERGA

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SHEET TITLE

LOT NUMBER:

DRAWN BY:

APPENDIX A -EXOSTRUCTURE SHOP DRAWINGS

S-901

S.G. SHILLINGLAW

McINTOSH DERRY

3240 Drummond Cons 5A, RR#3, Perth, ON K7H 3C9 Tel: 613-267-3788 Fax: 613-267-7992

Drawn by: AS NOTED dmw Checked By: MZ SS

TIMBER FRAME DESIGN FEB 14, 2013 No.

**Drawing Title:** 

Algonquin College

2 REV'S AS PER CLIENT - I.F.C. #2 1 | ISSUED FOR CONSTRUCTION Revision / Issue

7 Craig Street, Perth, ON K7H 1X7

GENERAL NOTES - PART 2

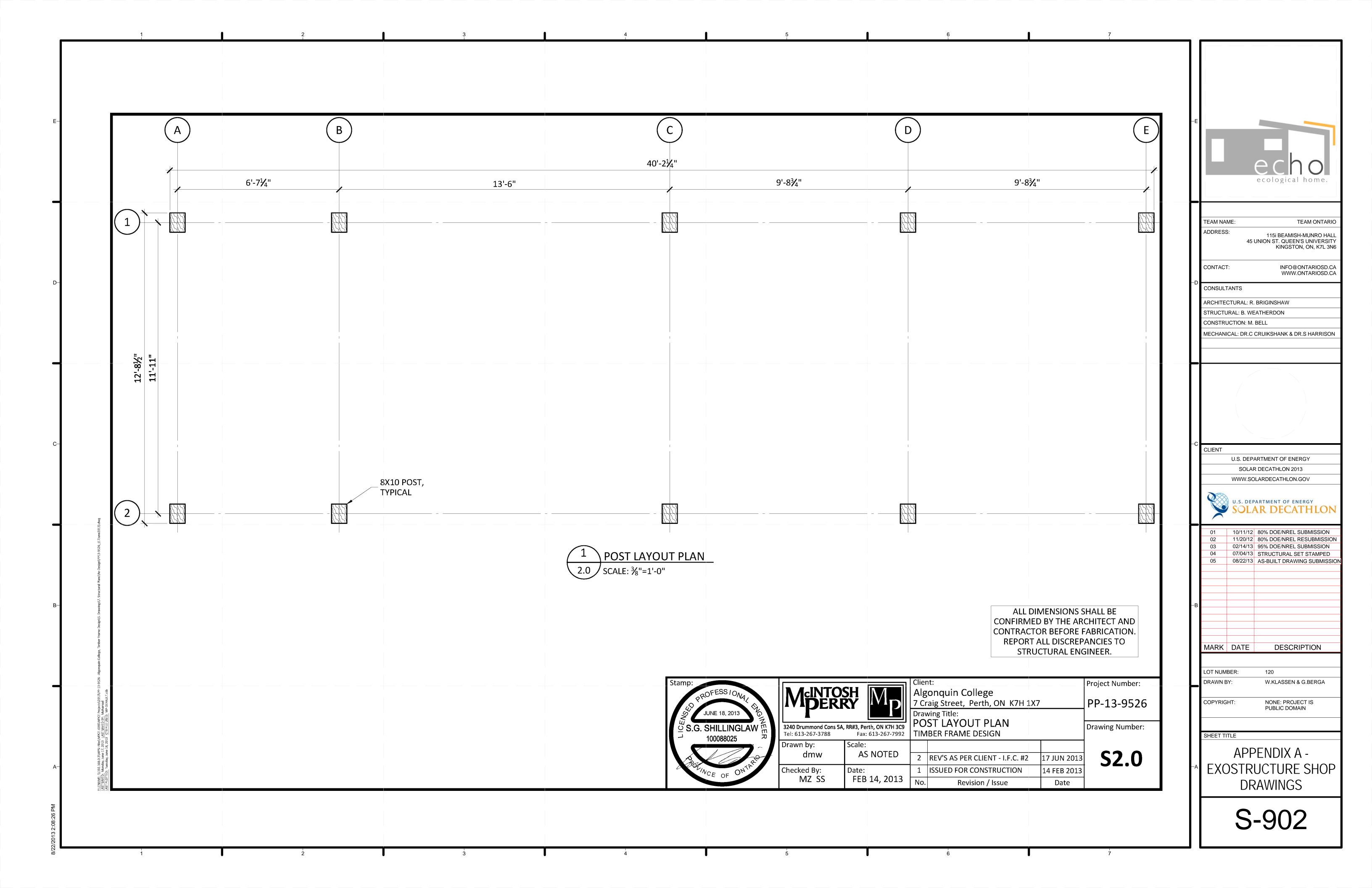
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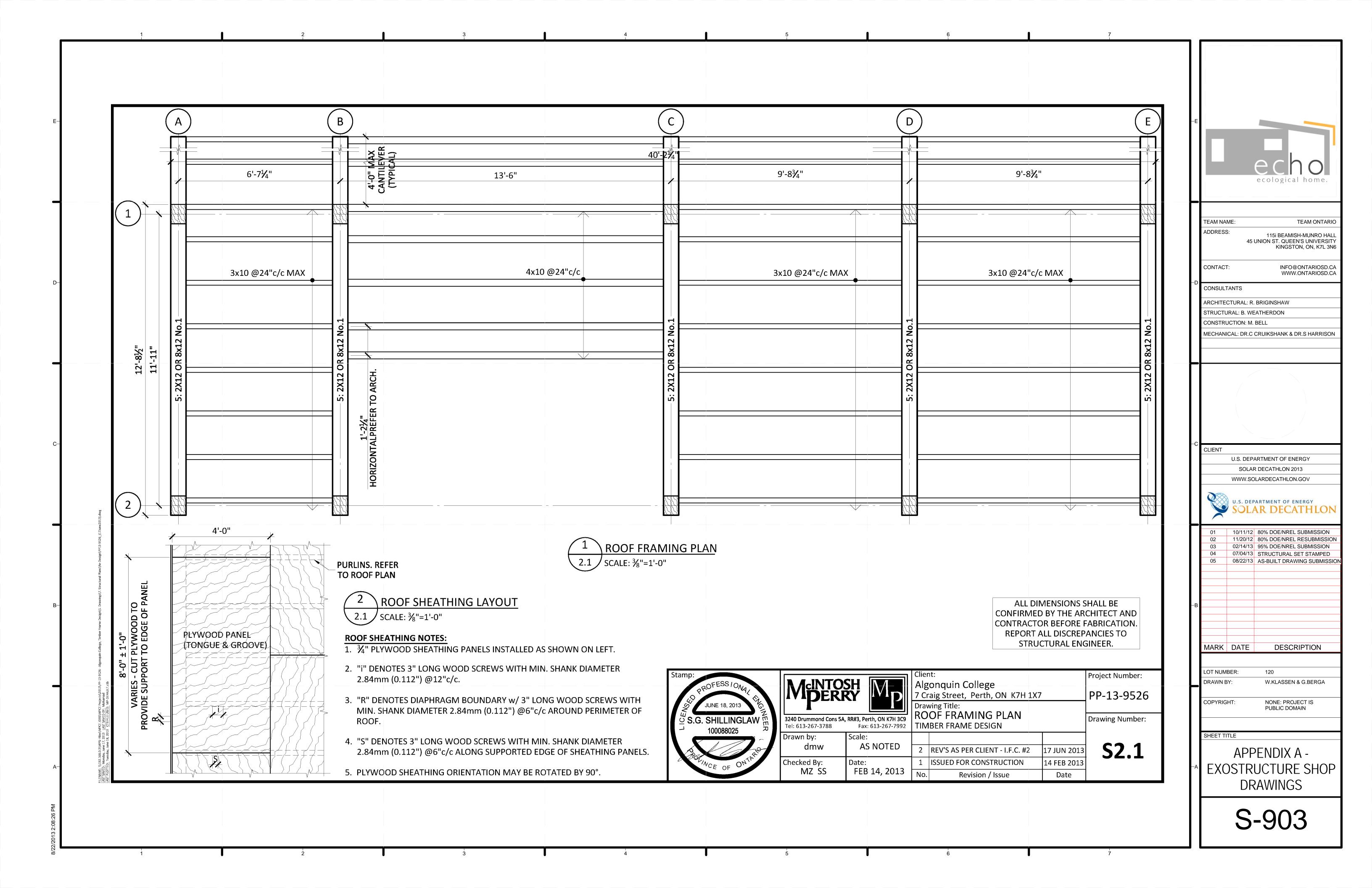
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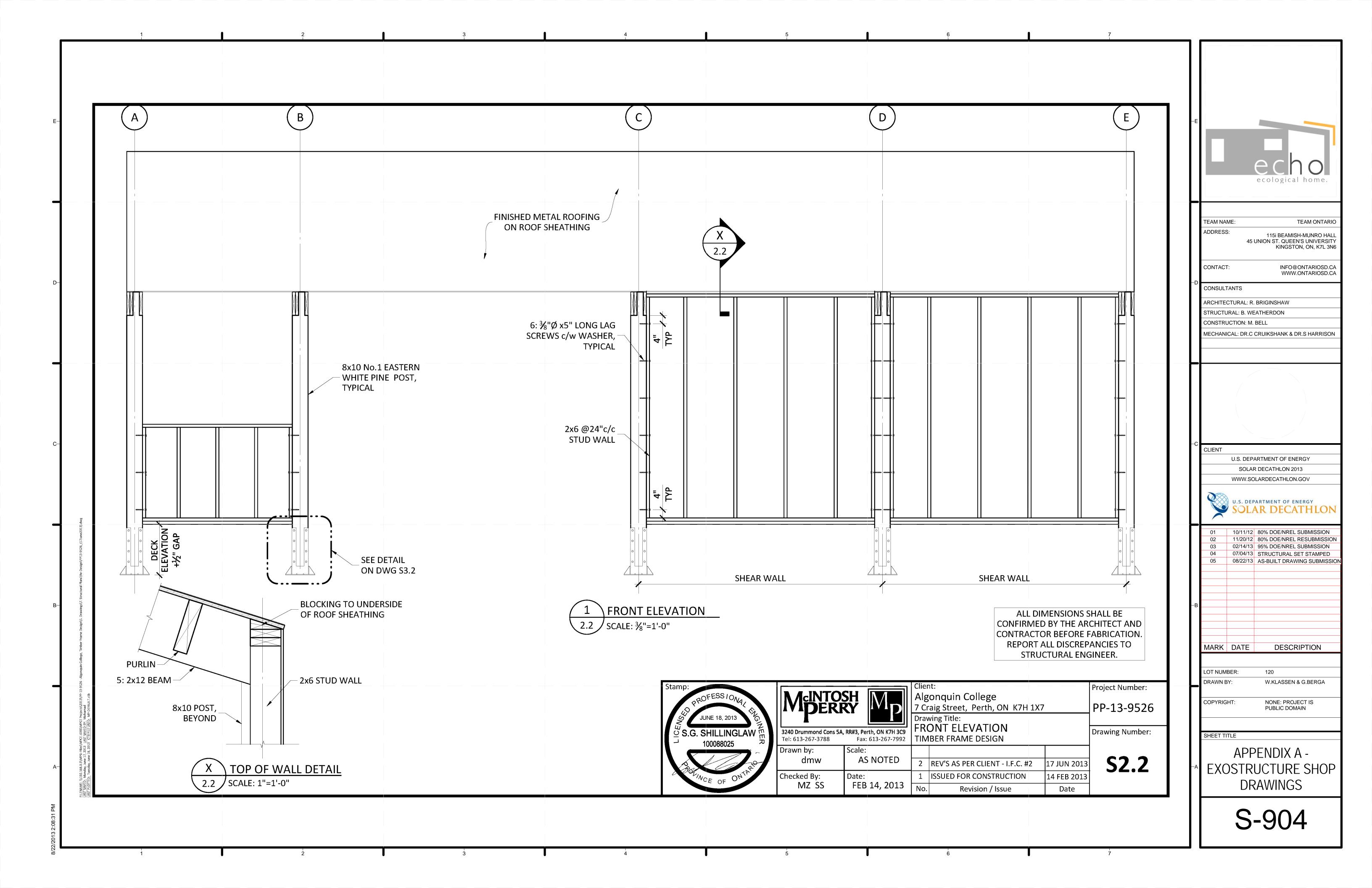
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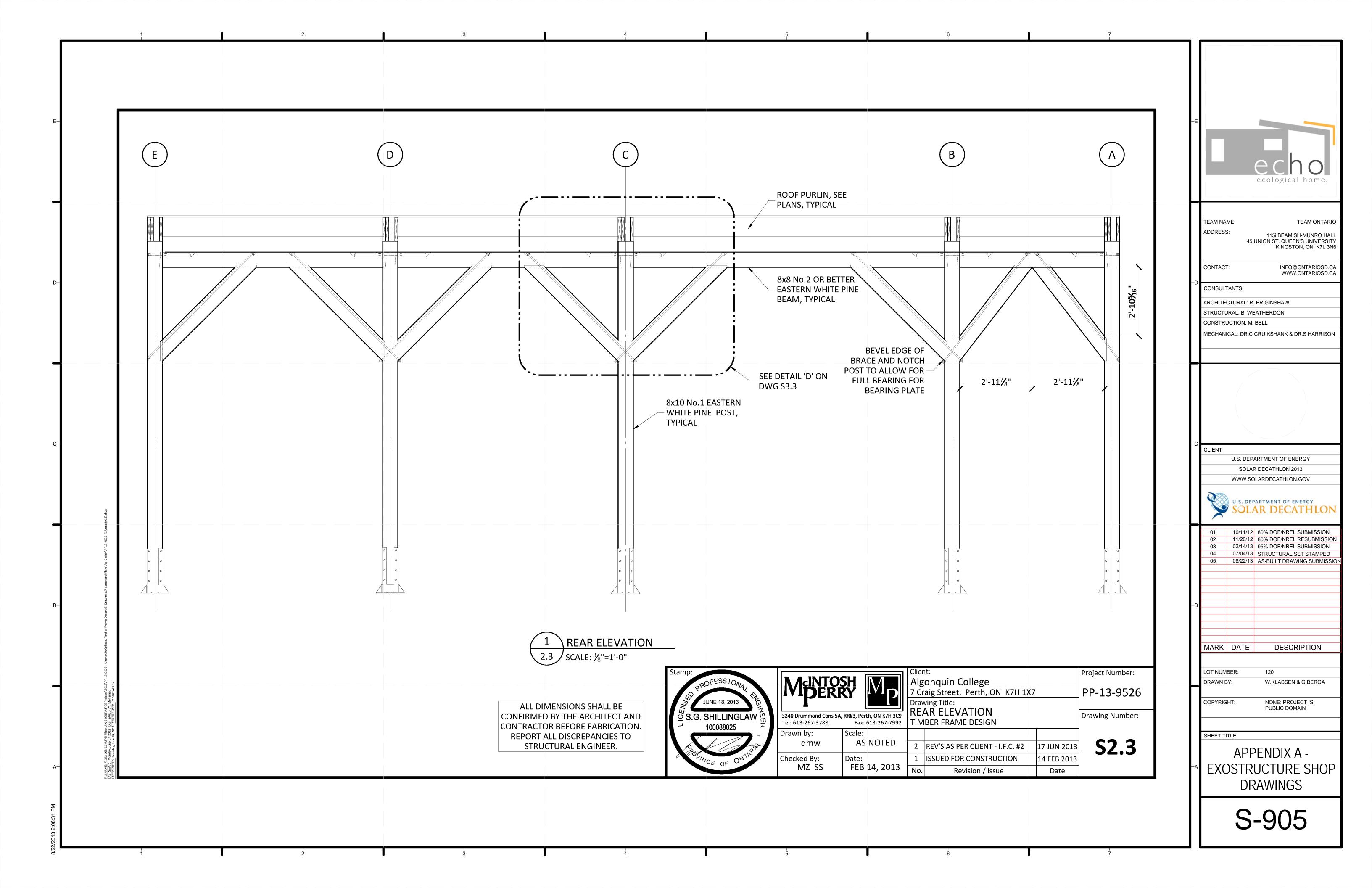
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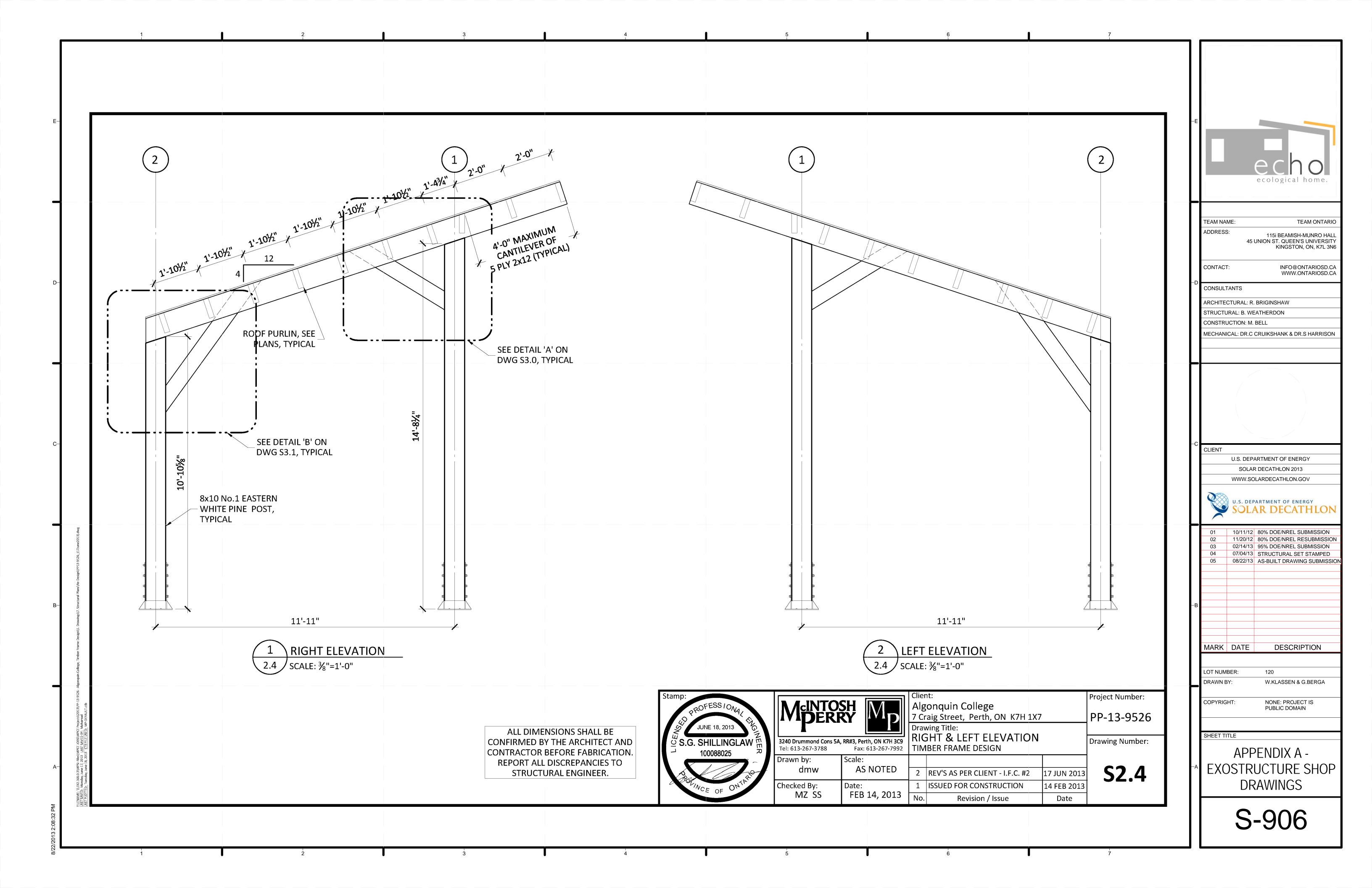
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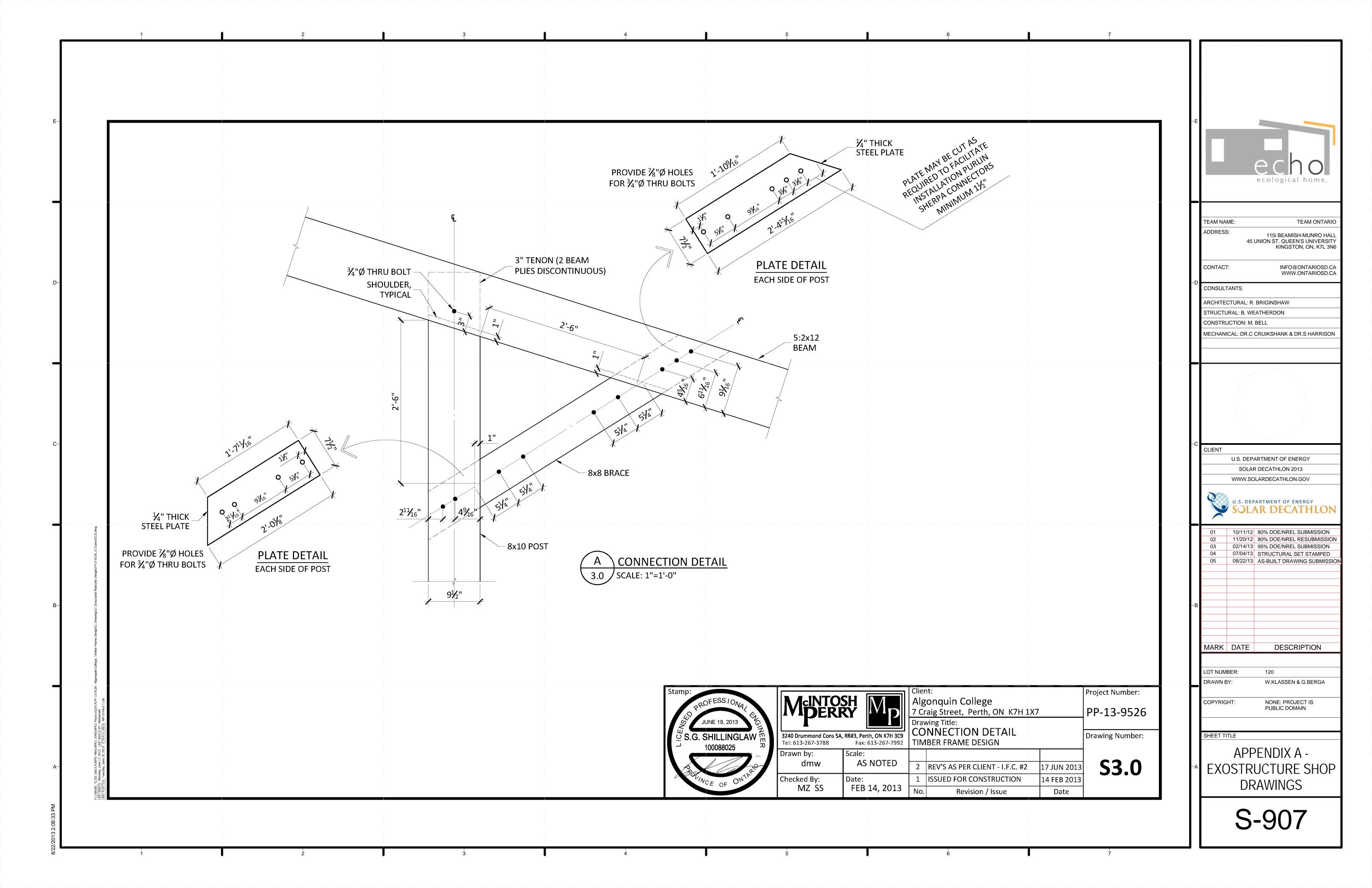


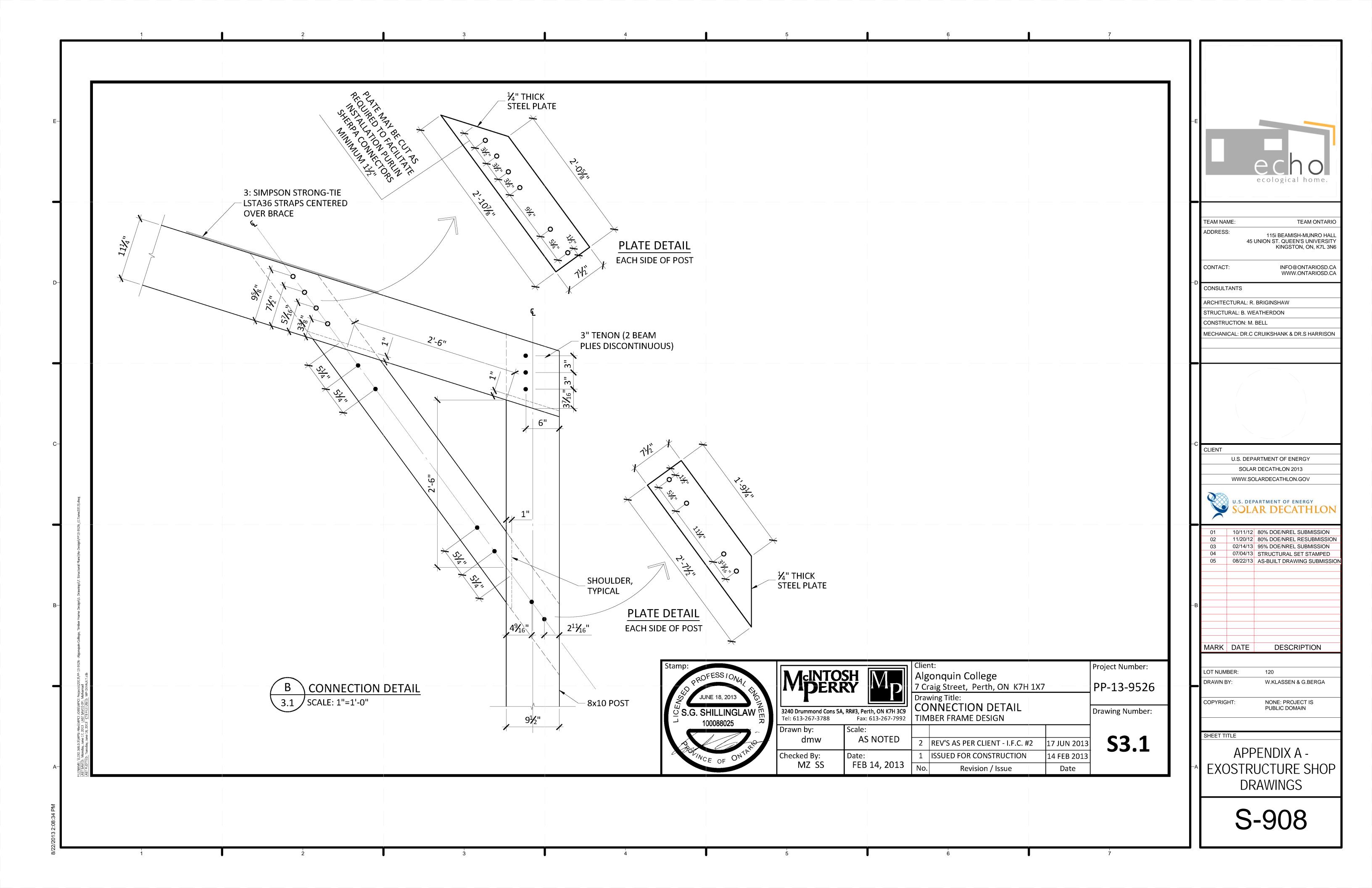


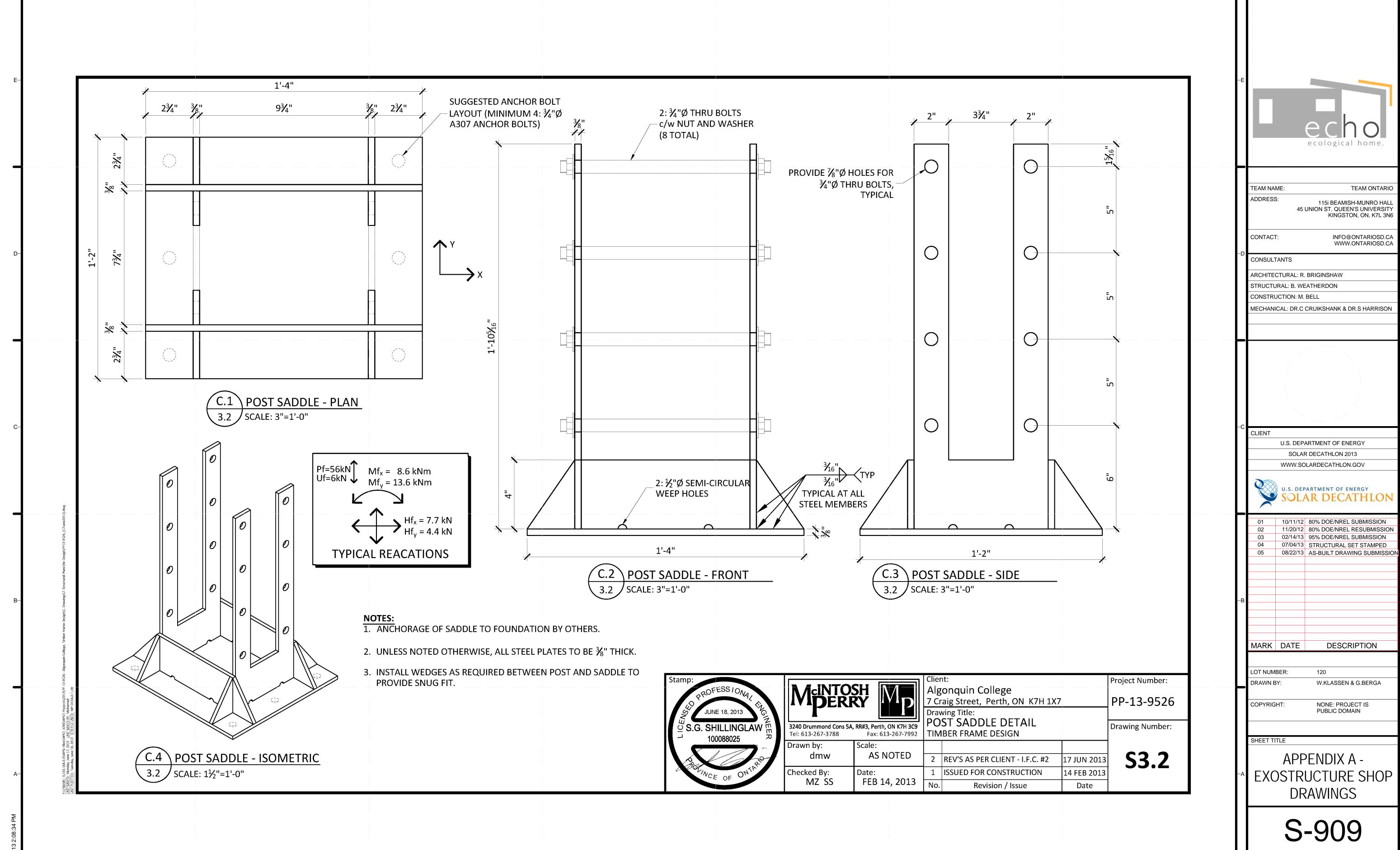


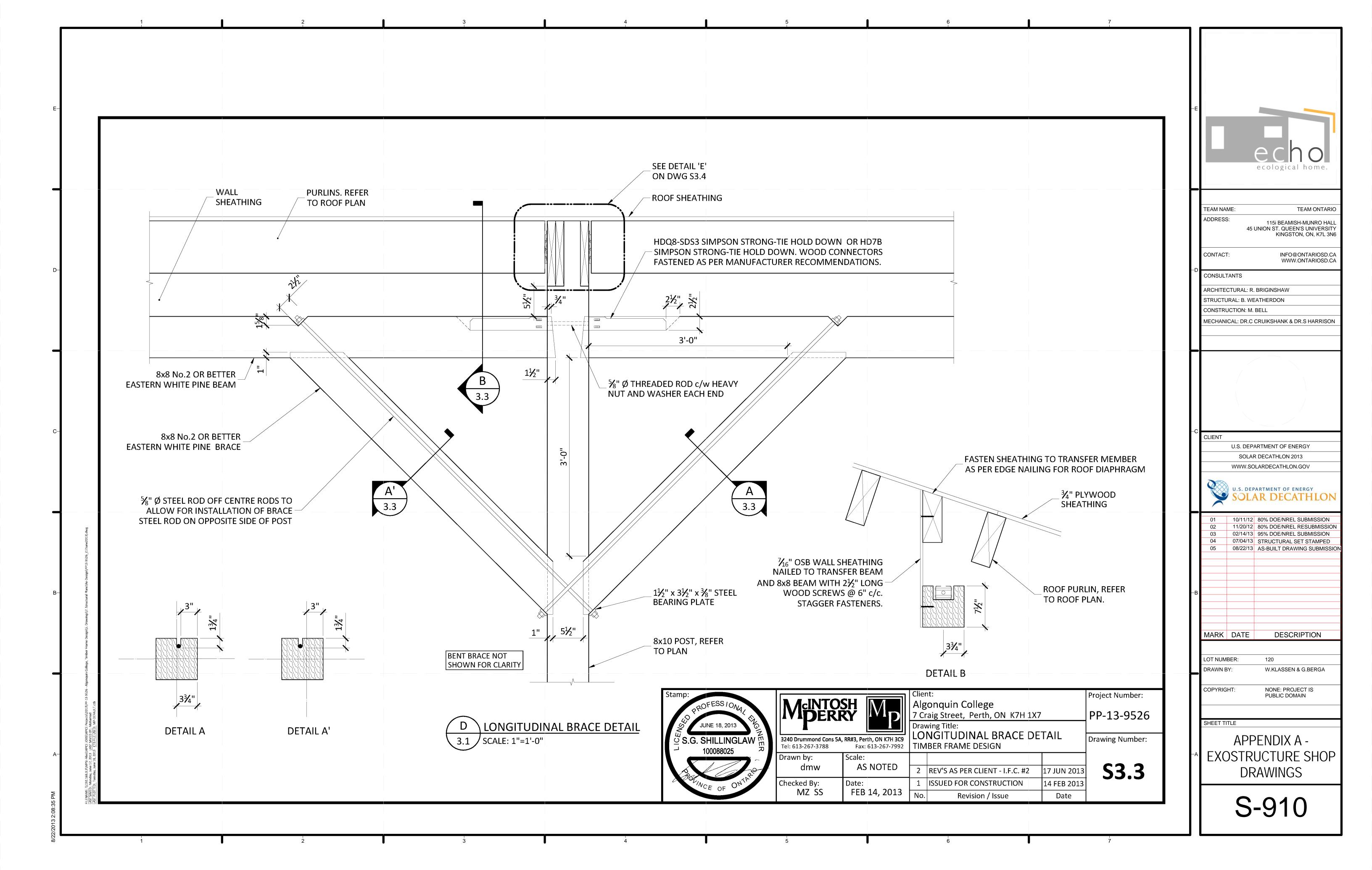


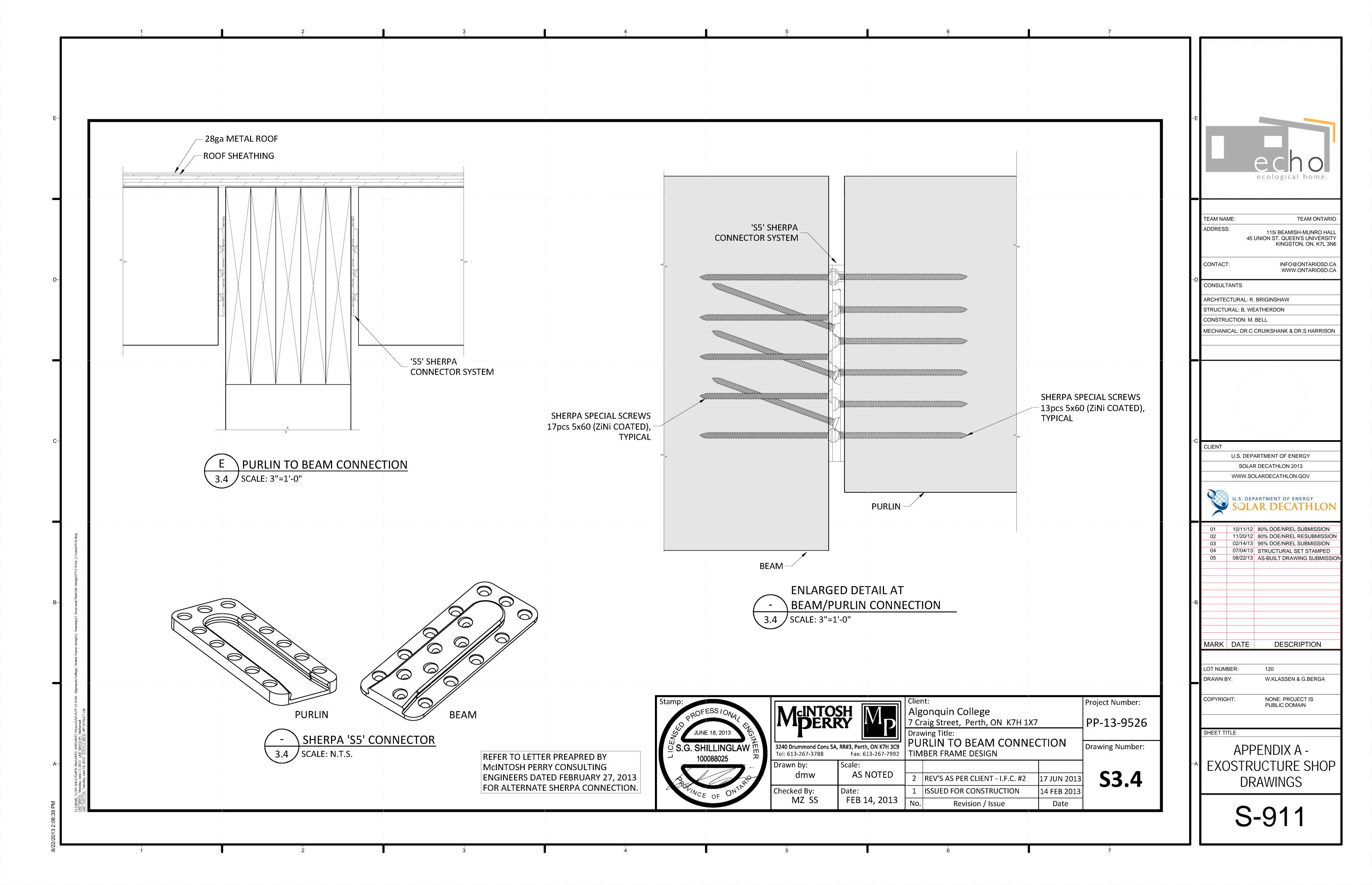


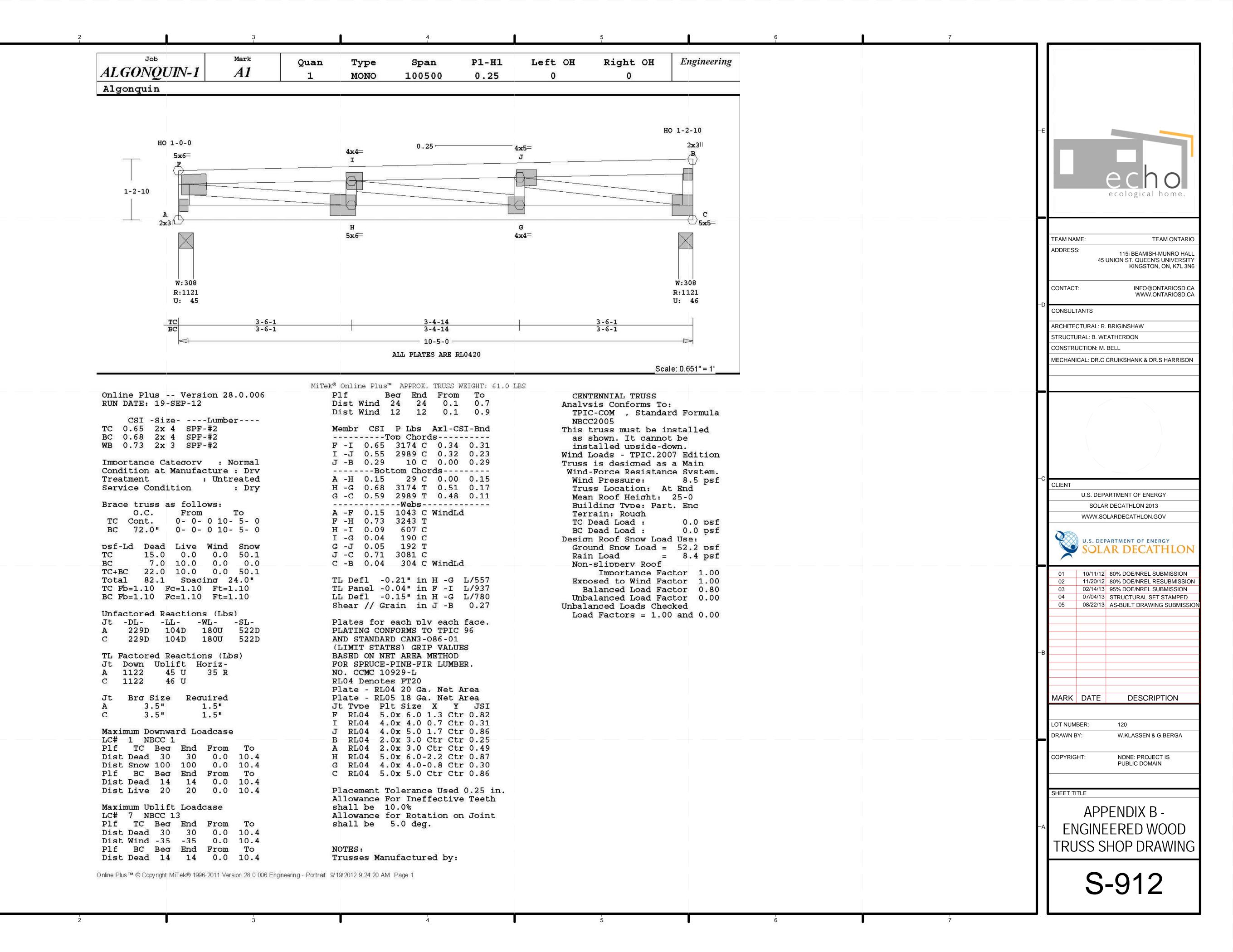


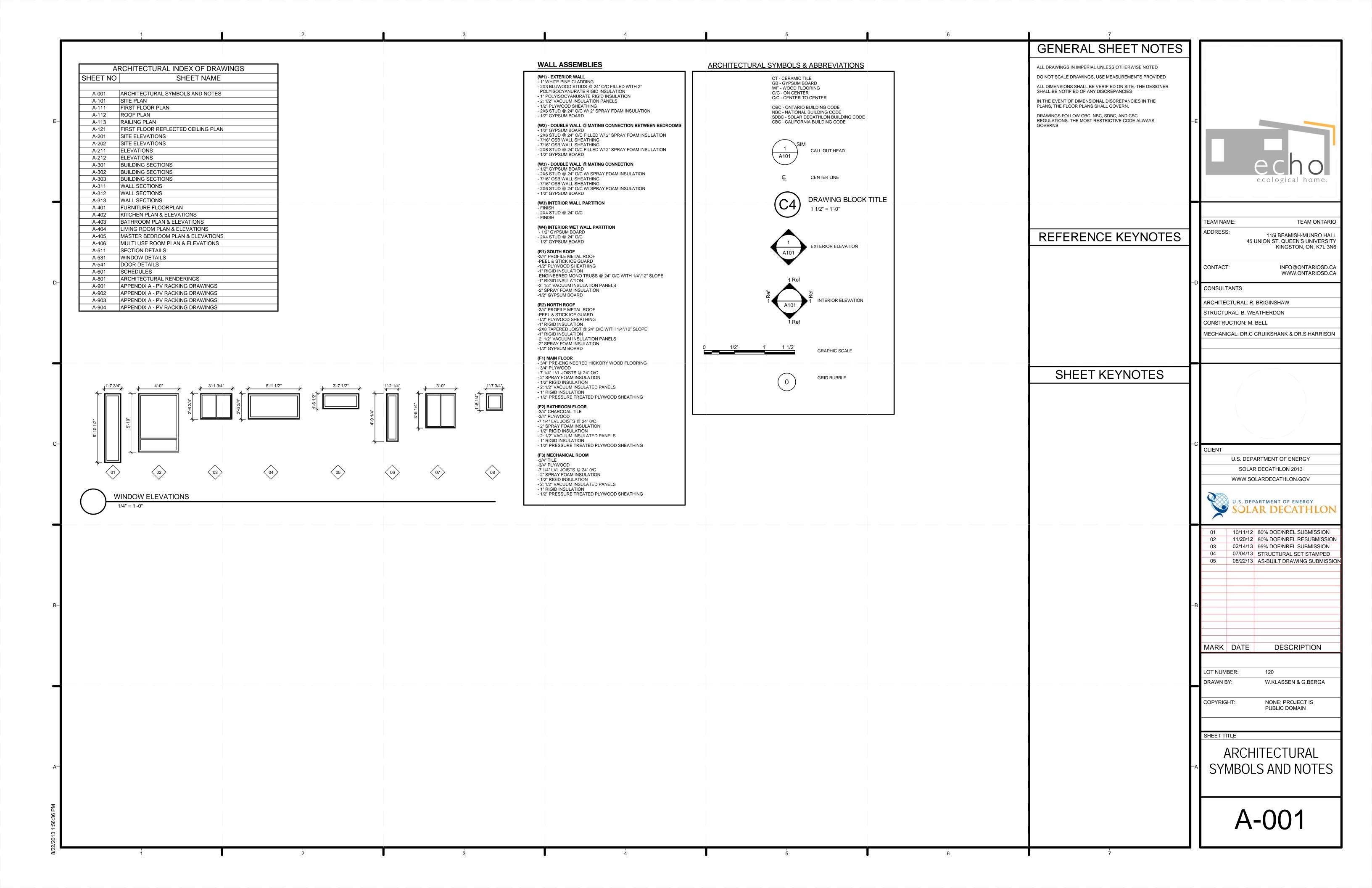


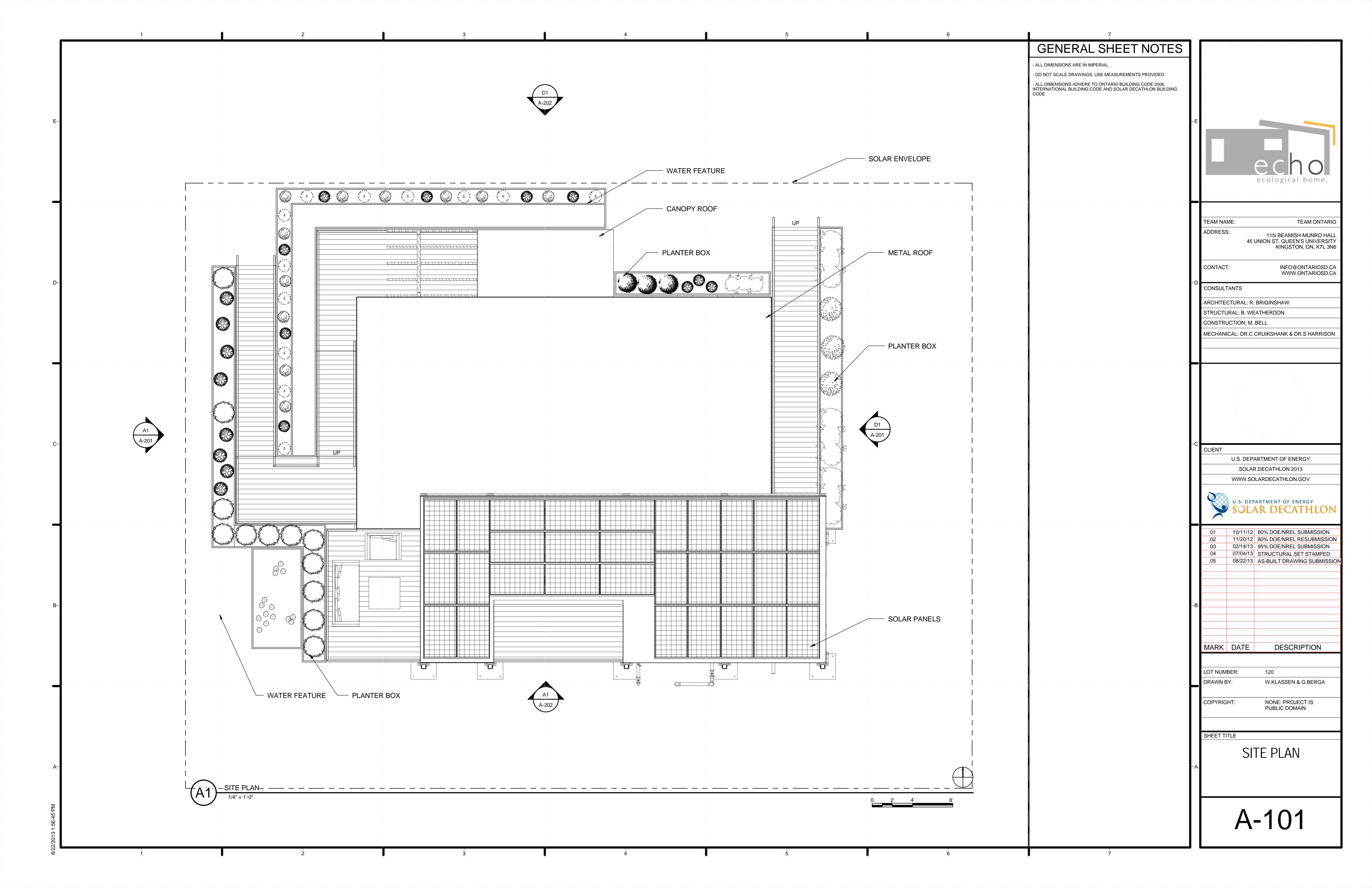


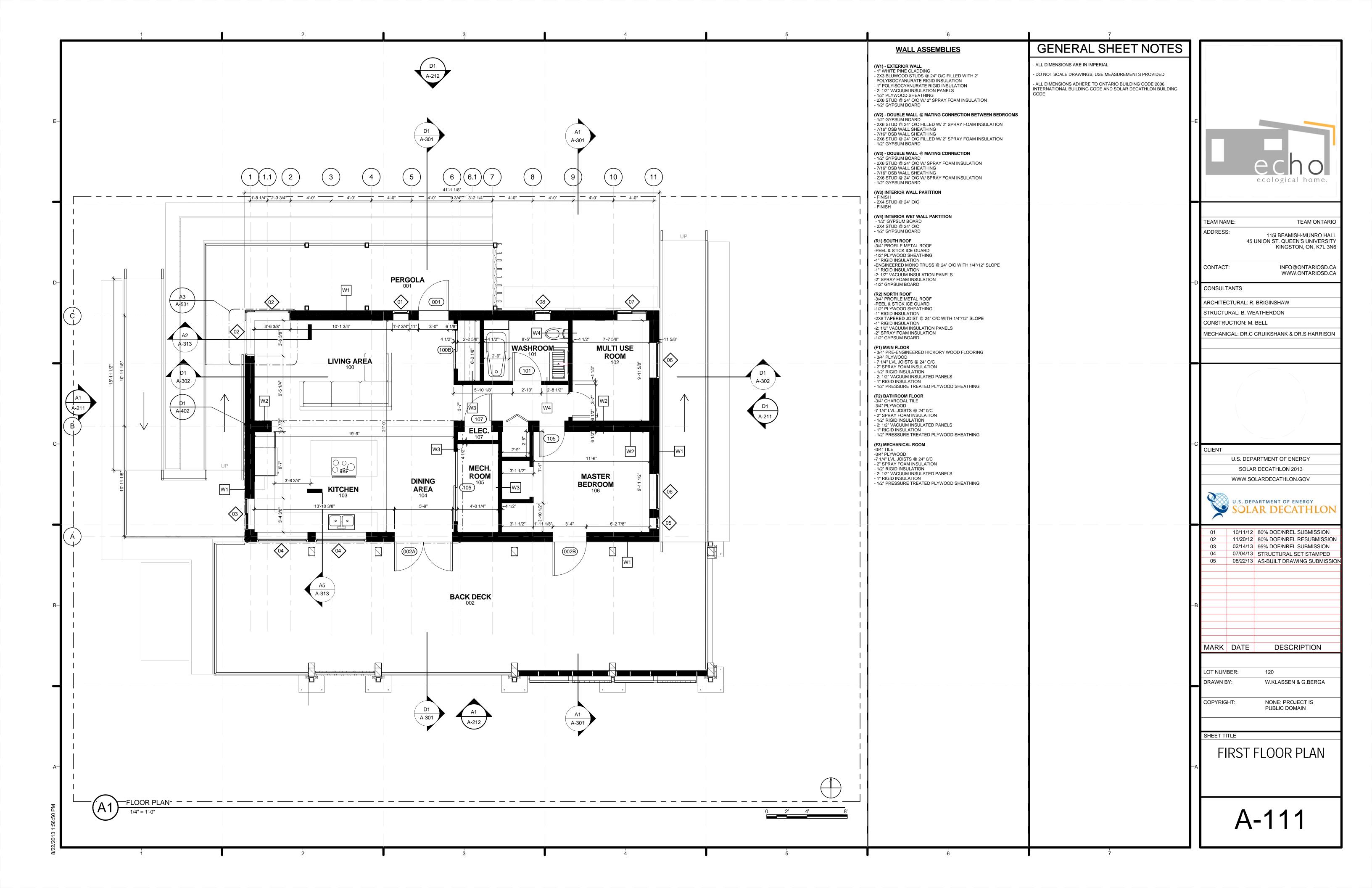


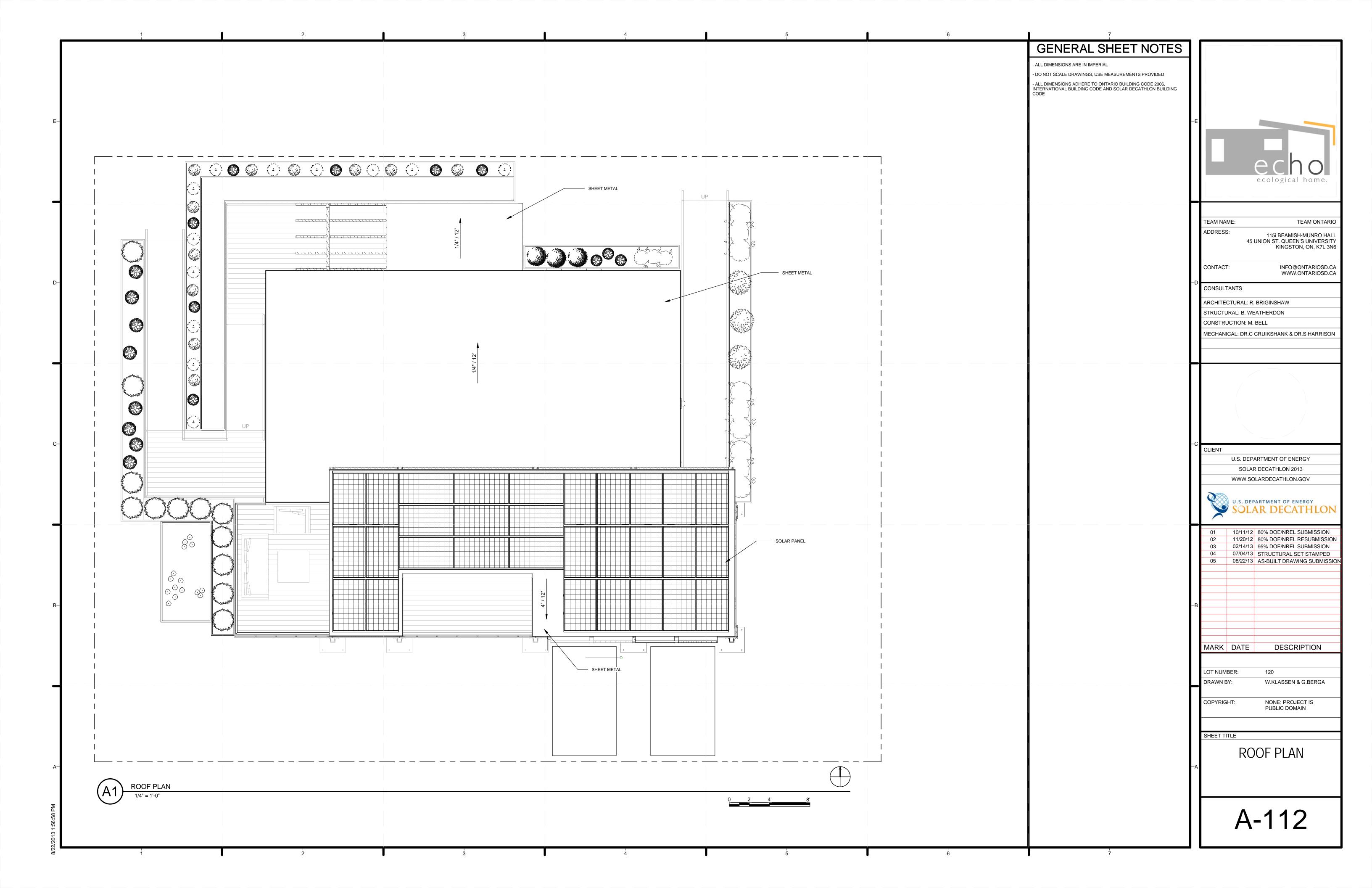


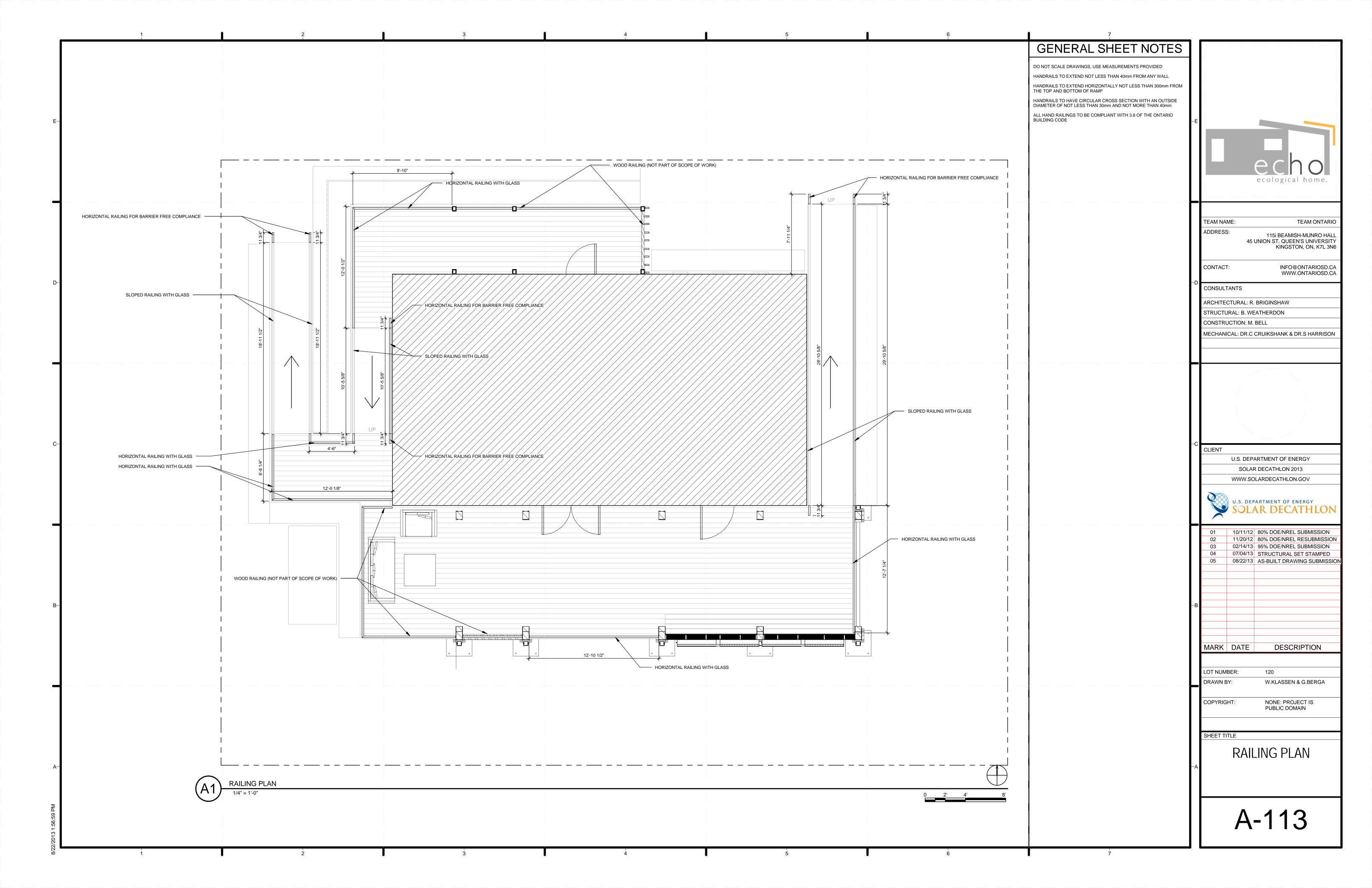


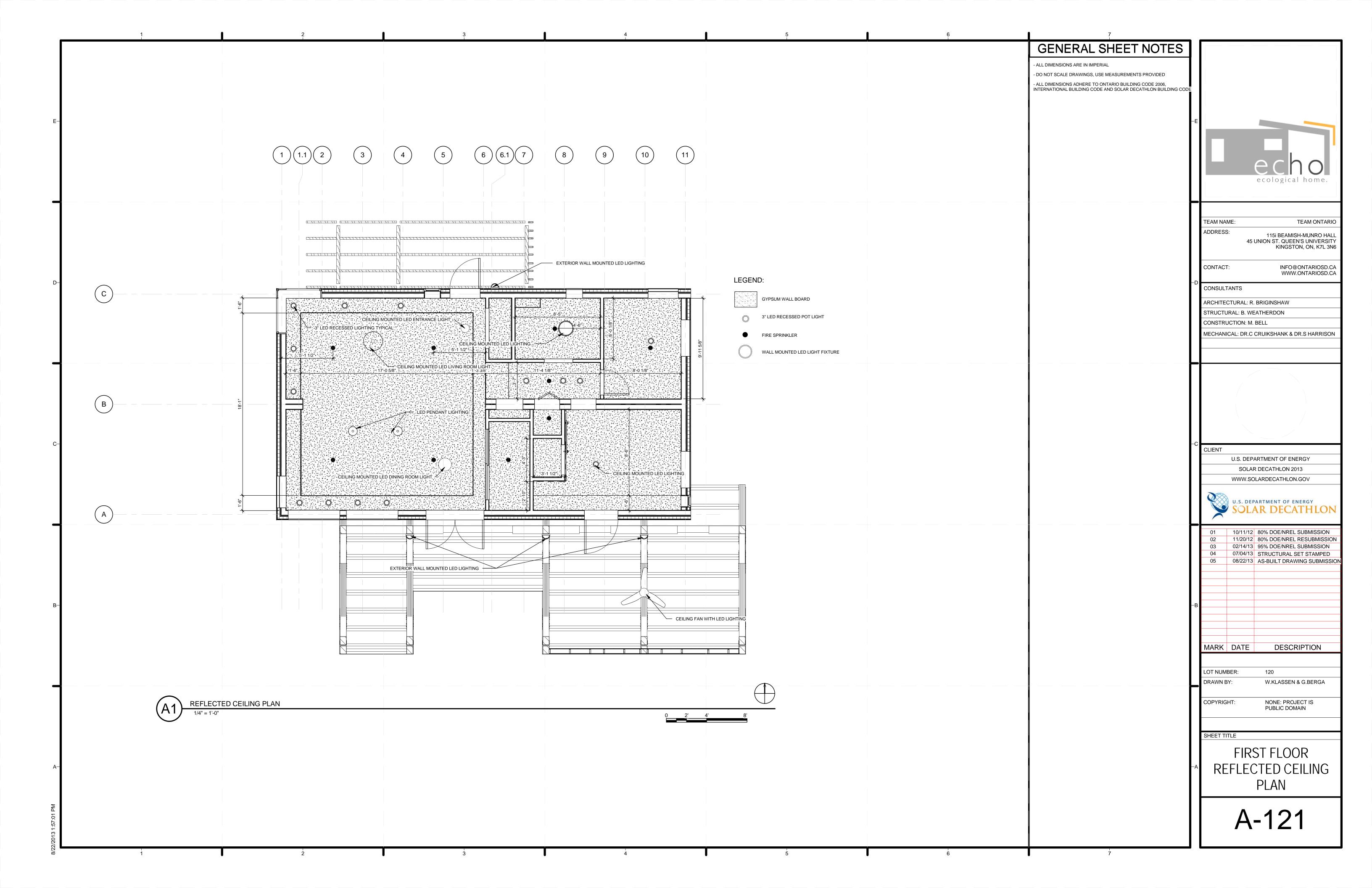


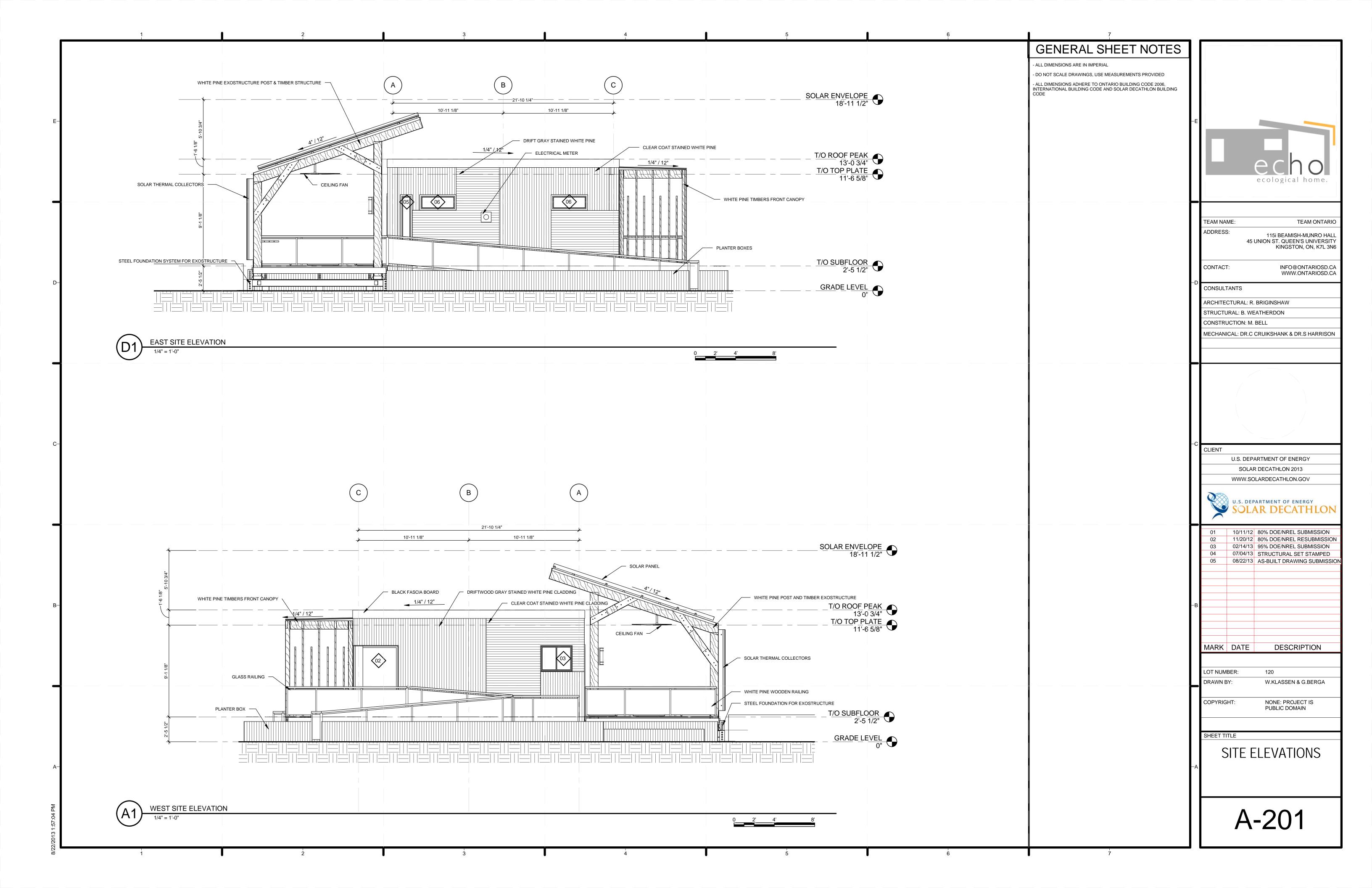


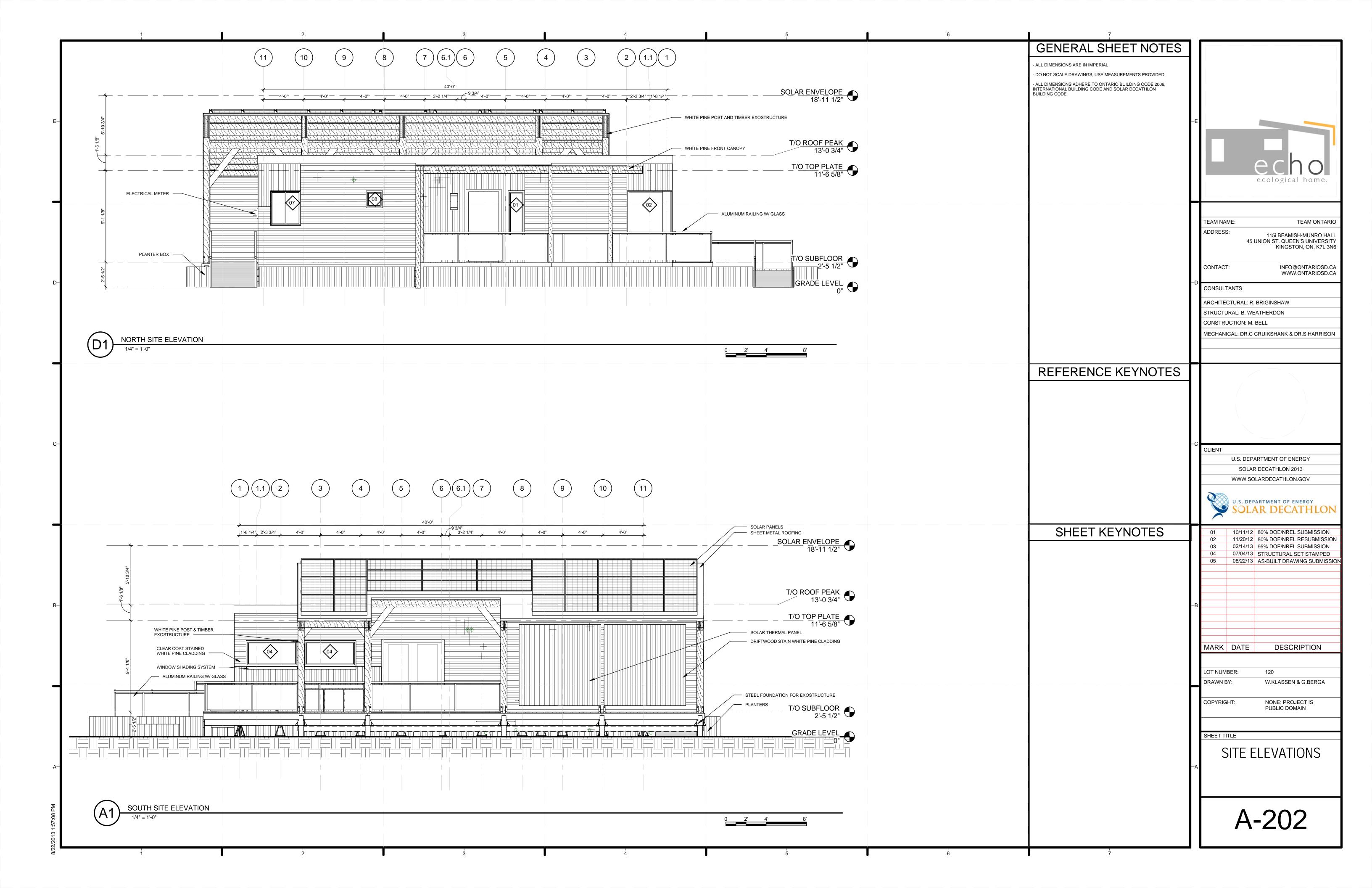


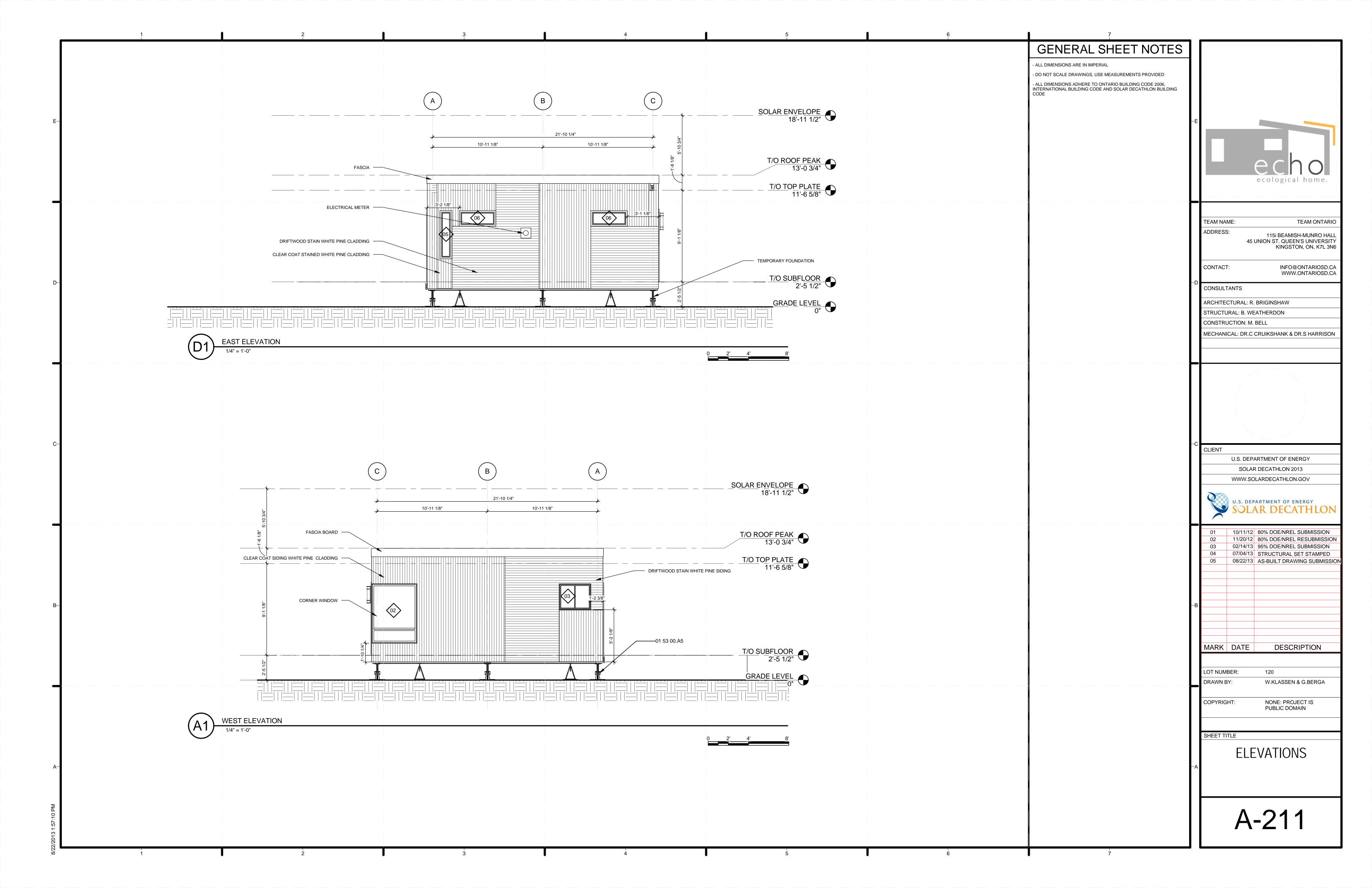


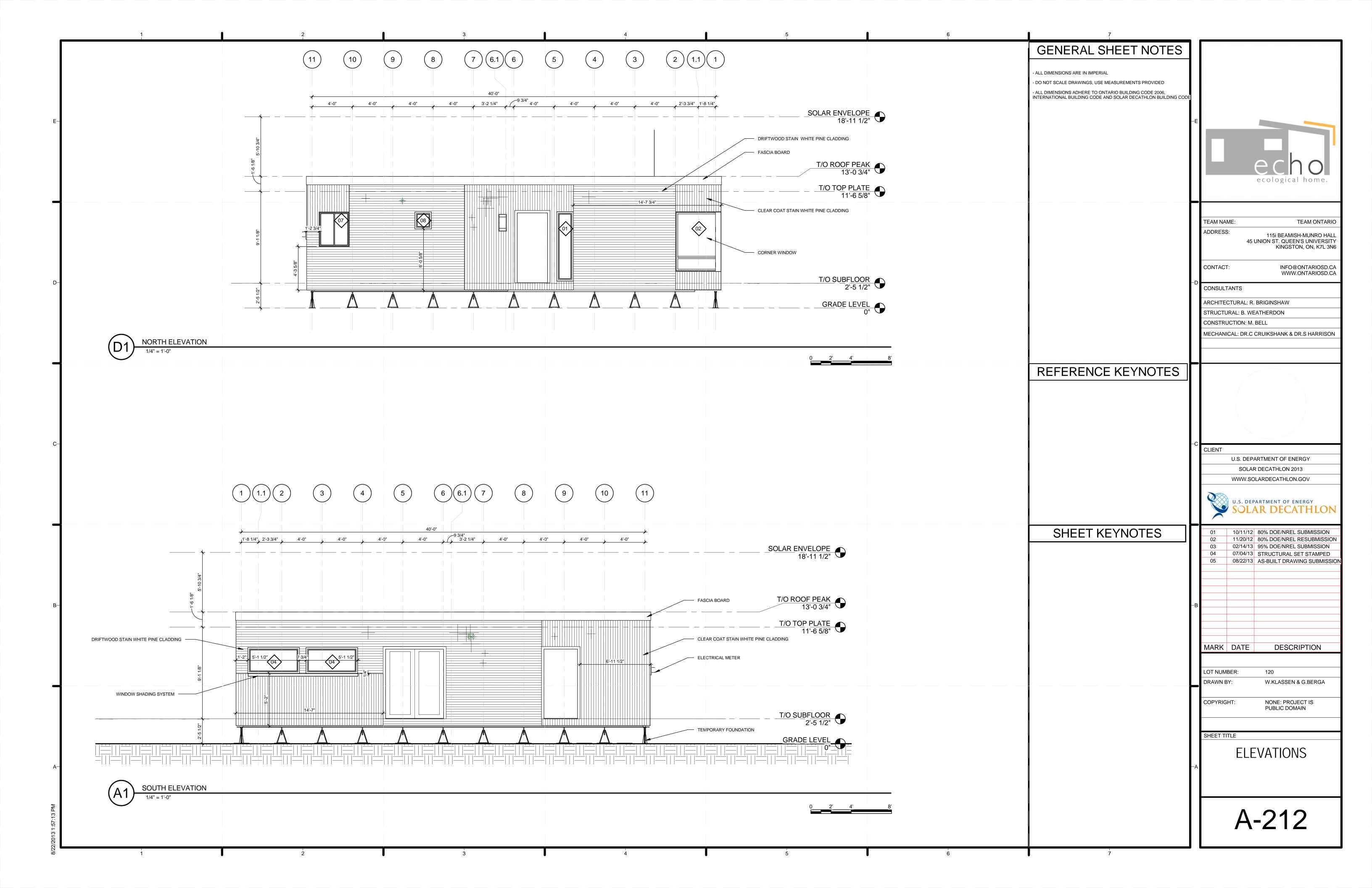


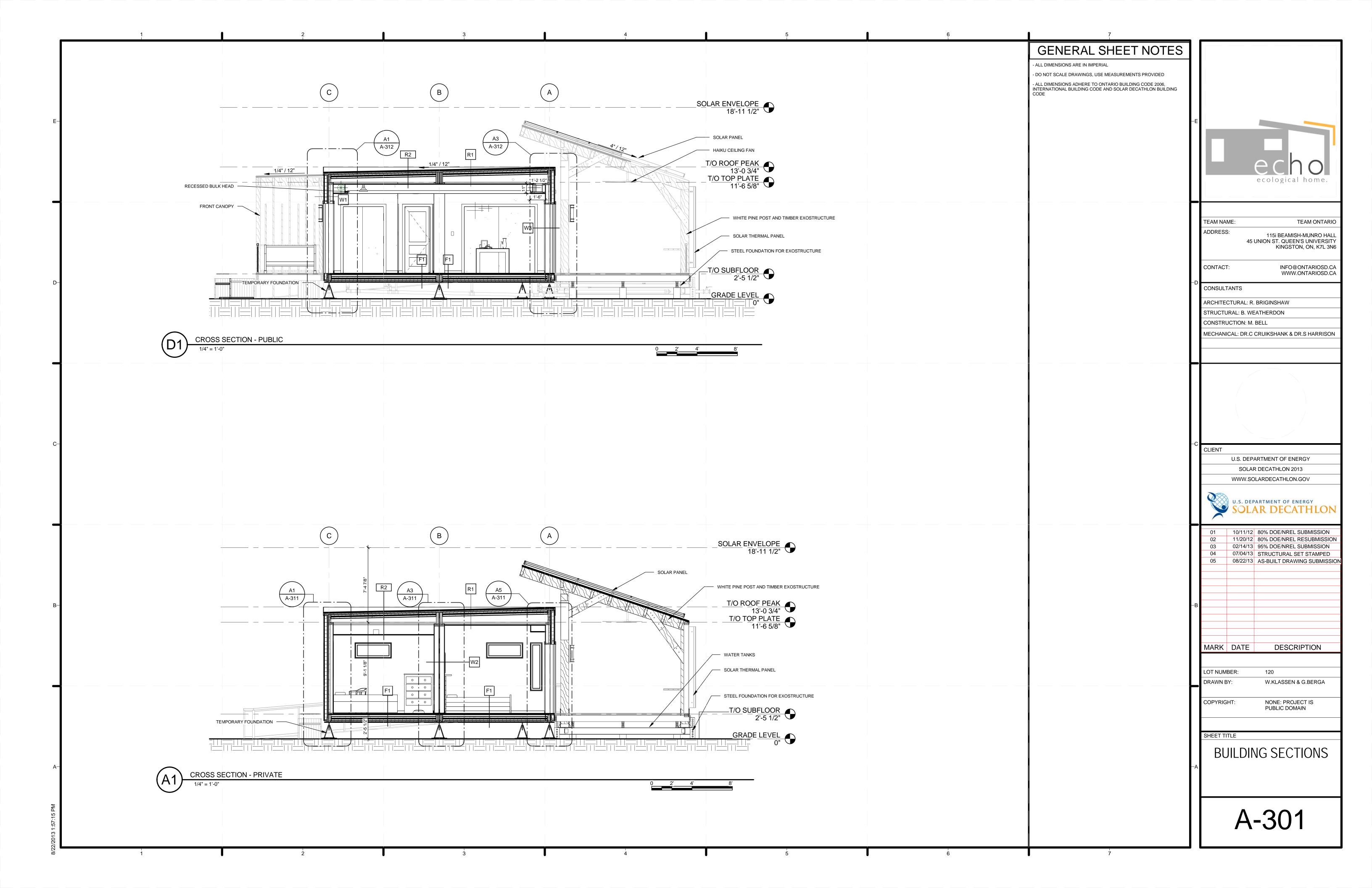


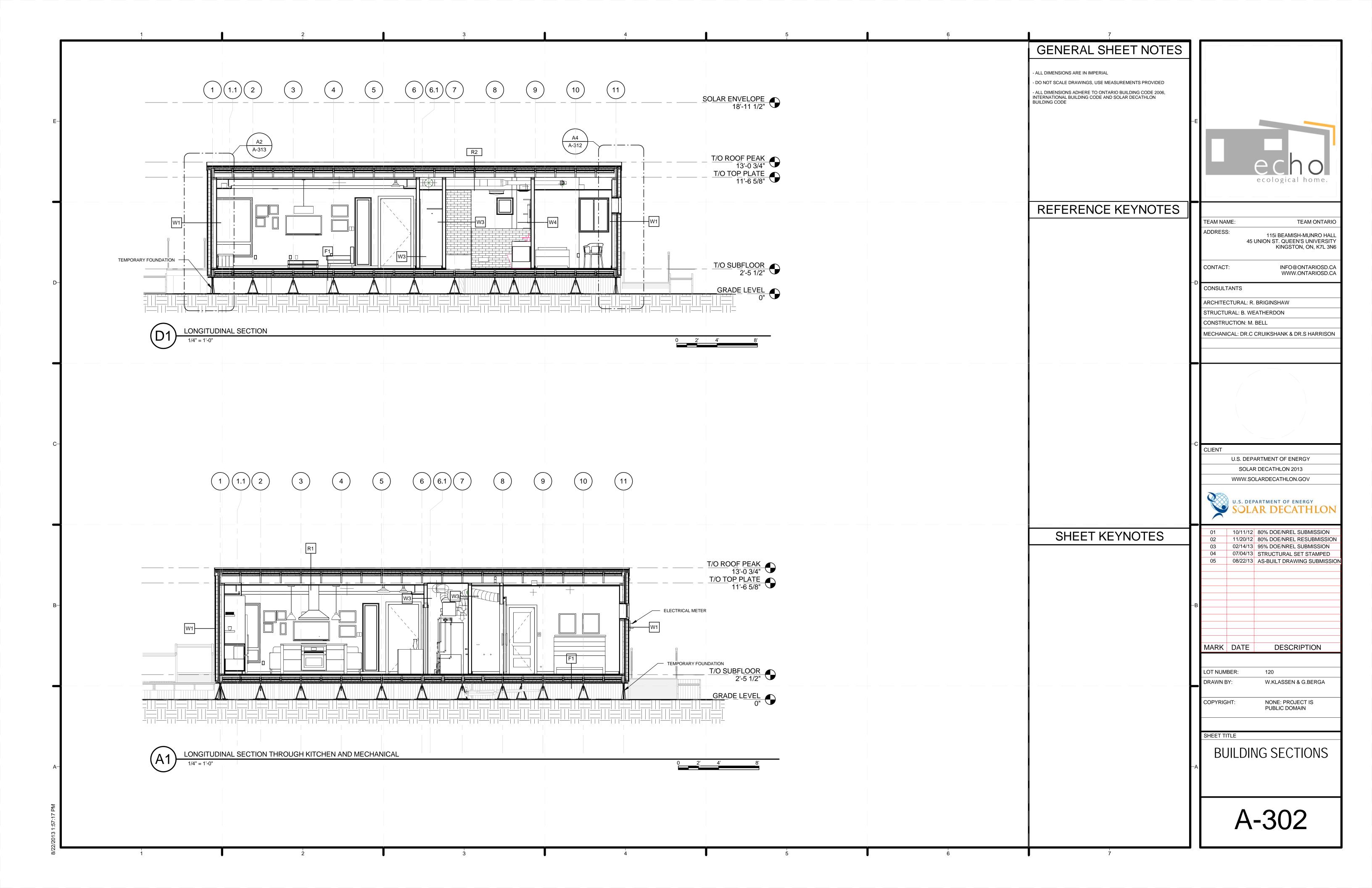


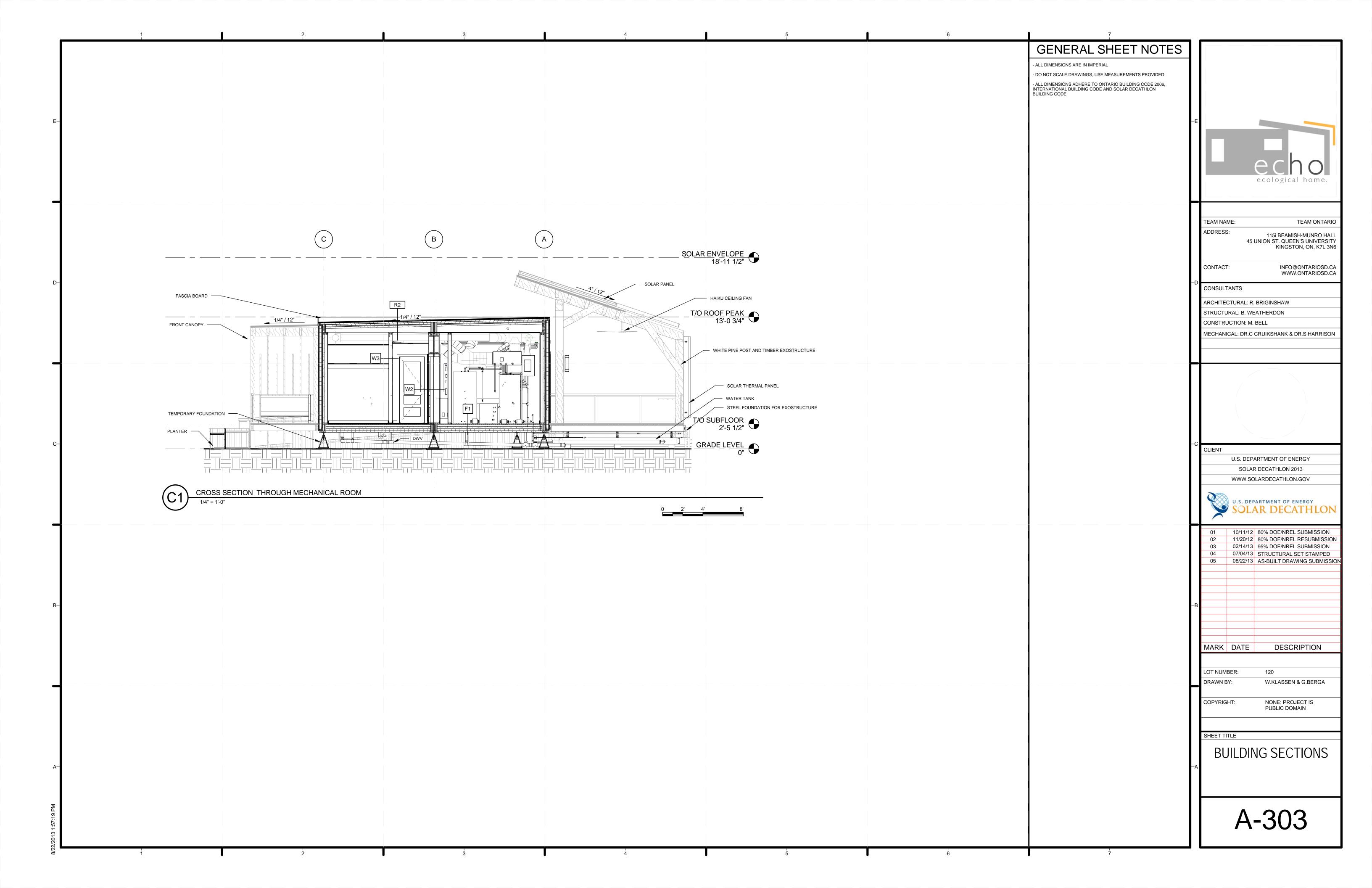


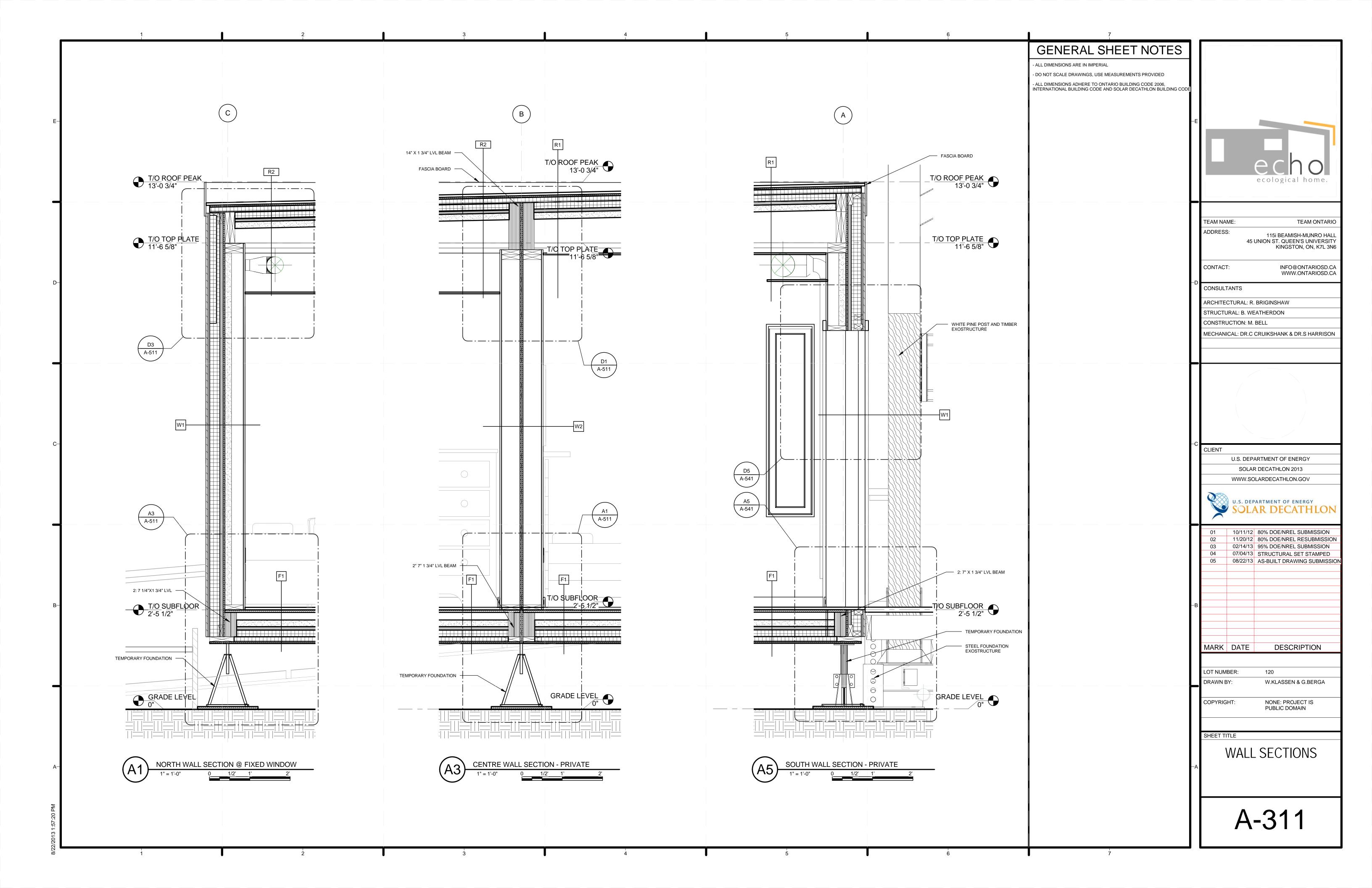


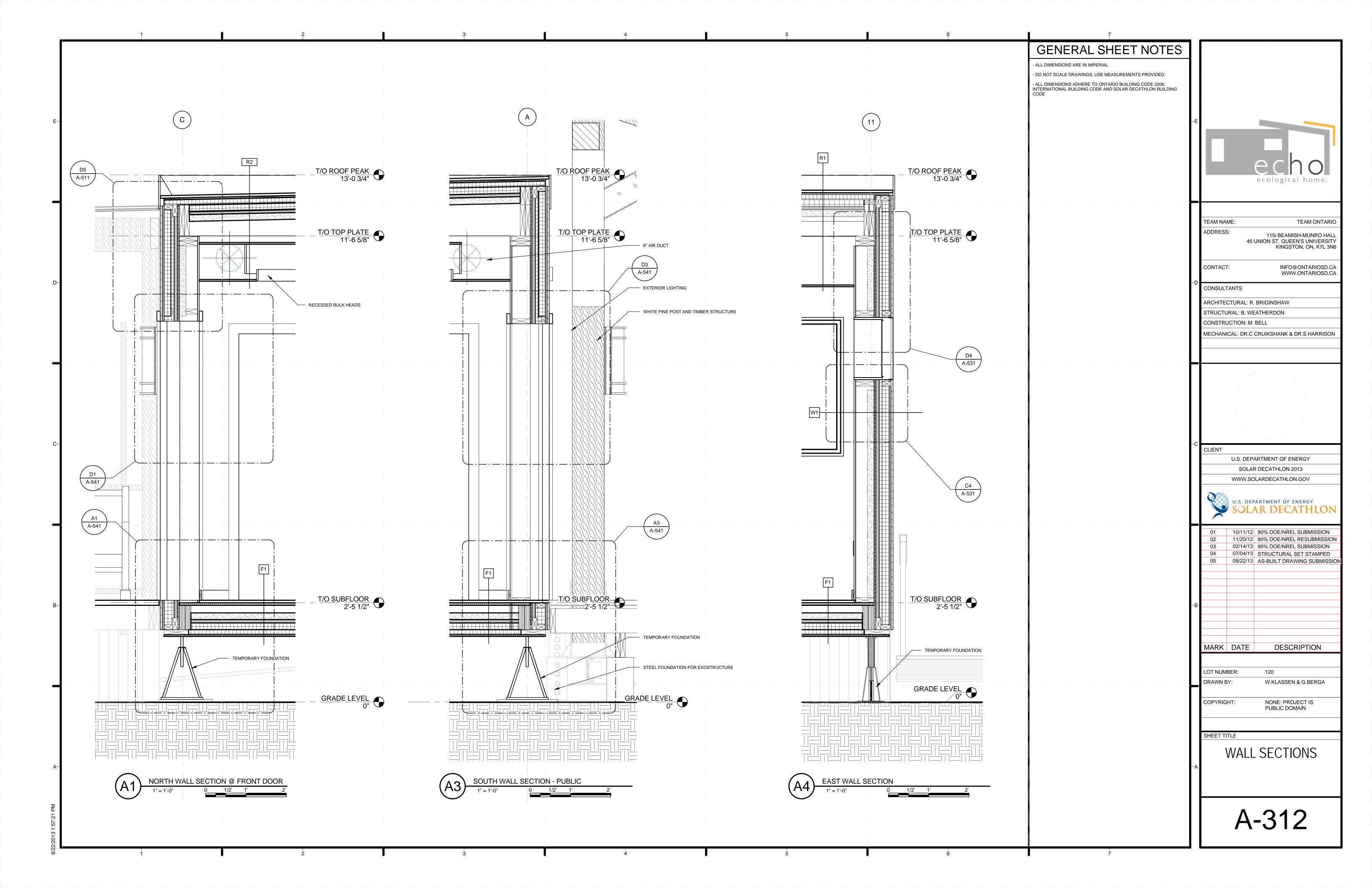


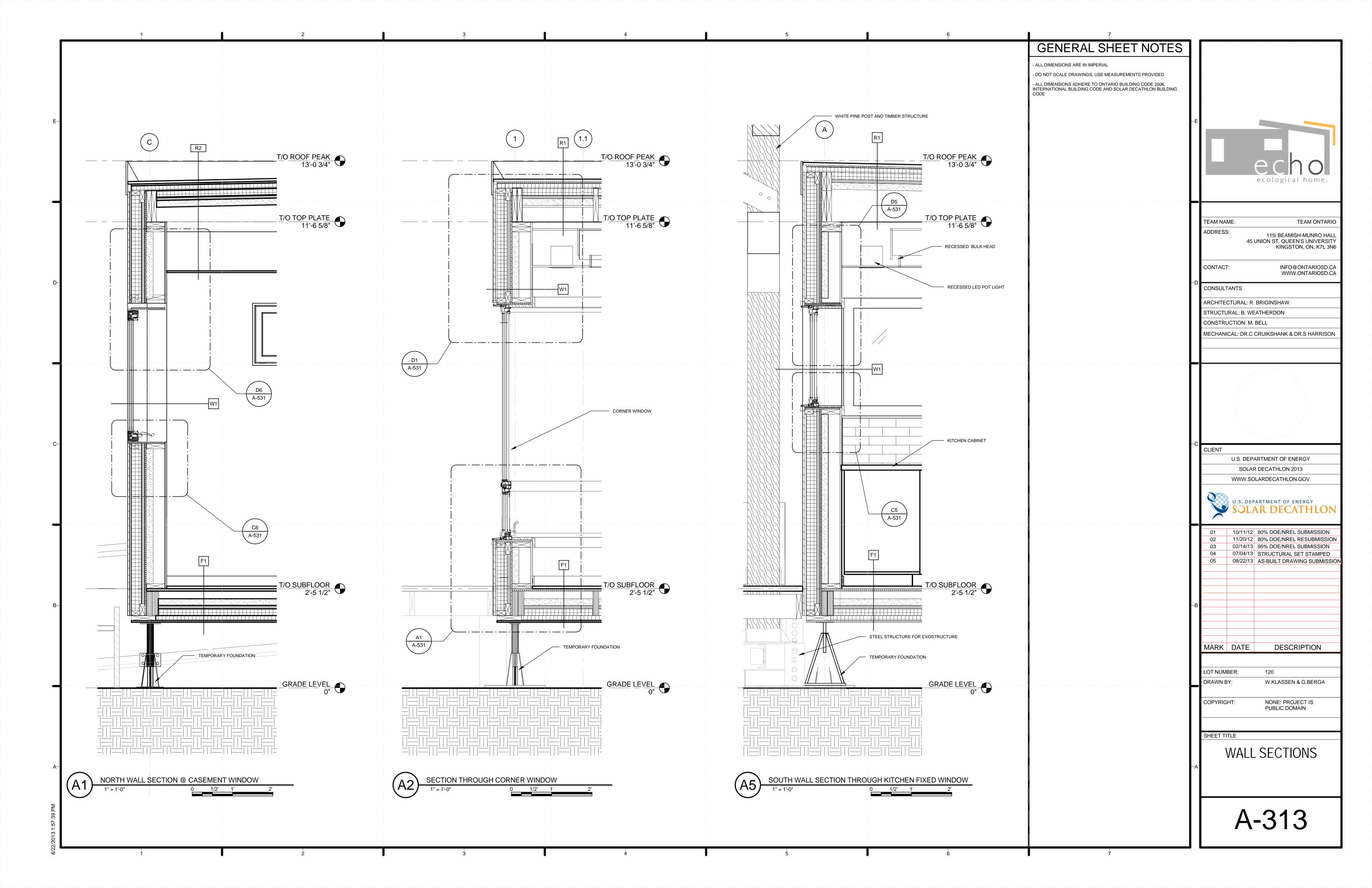


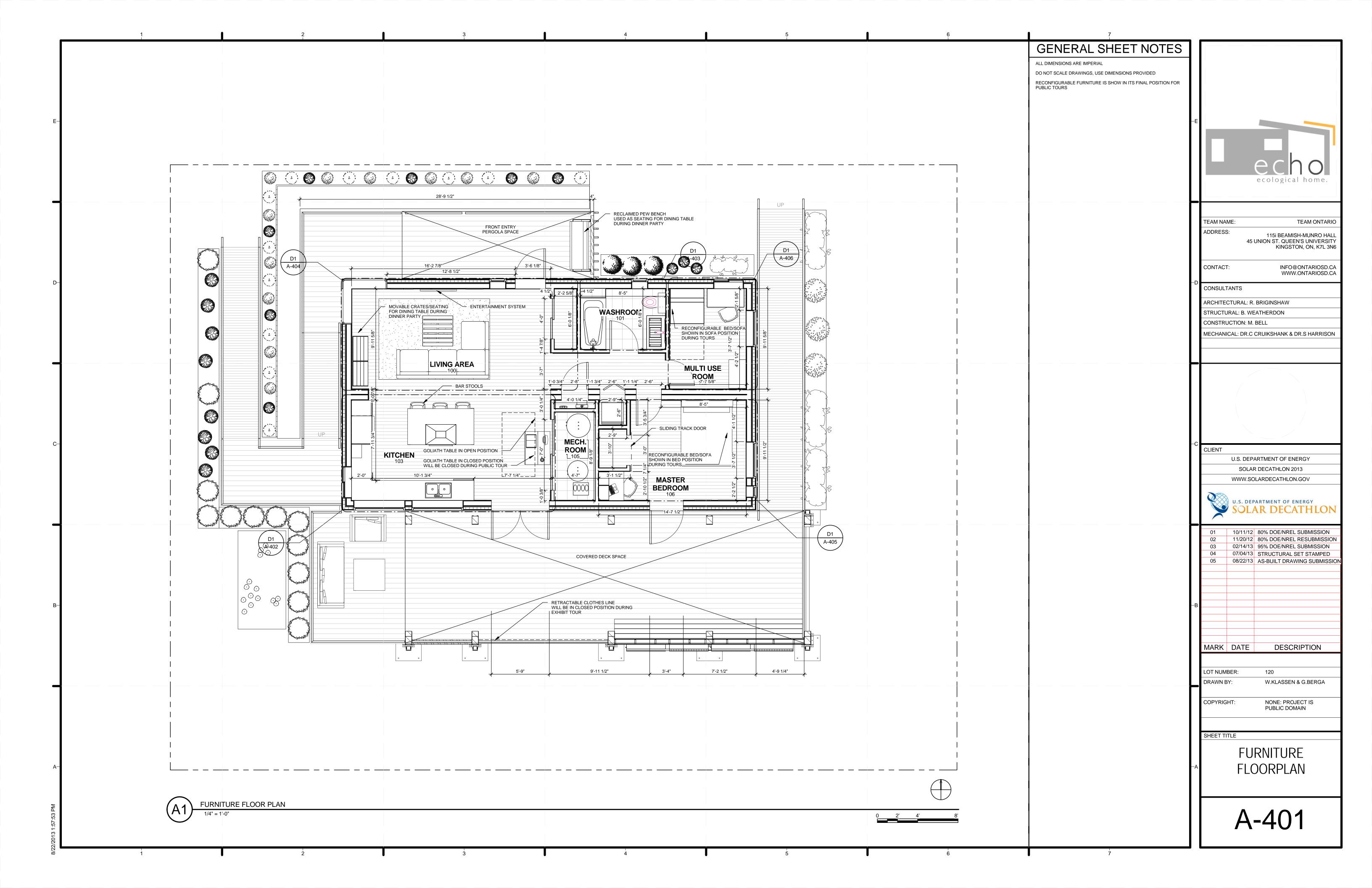


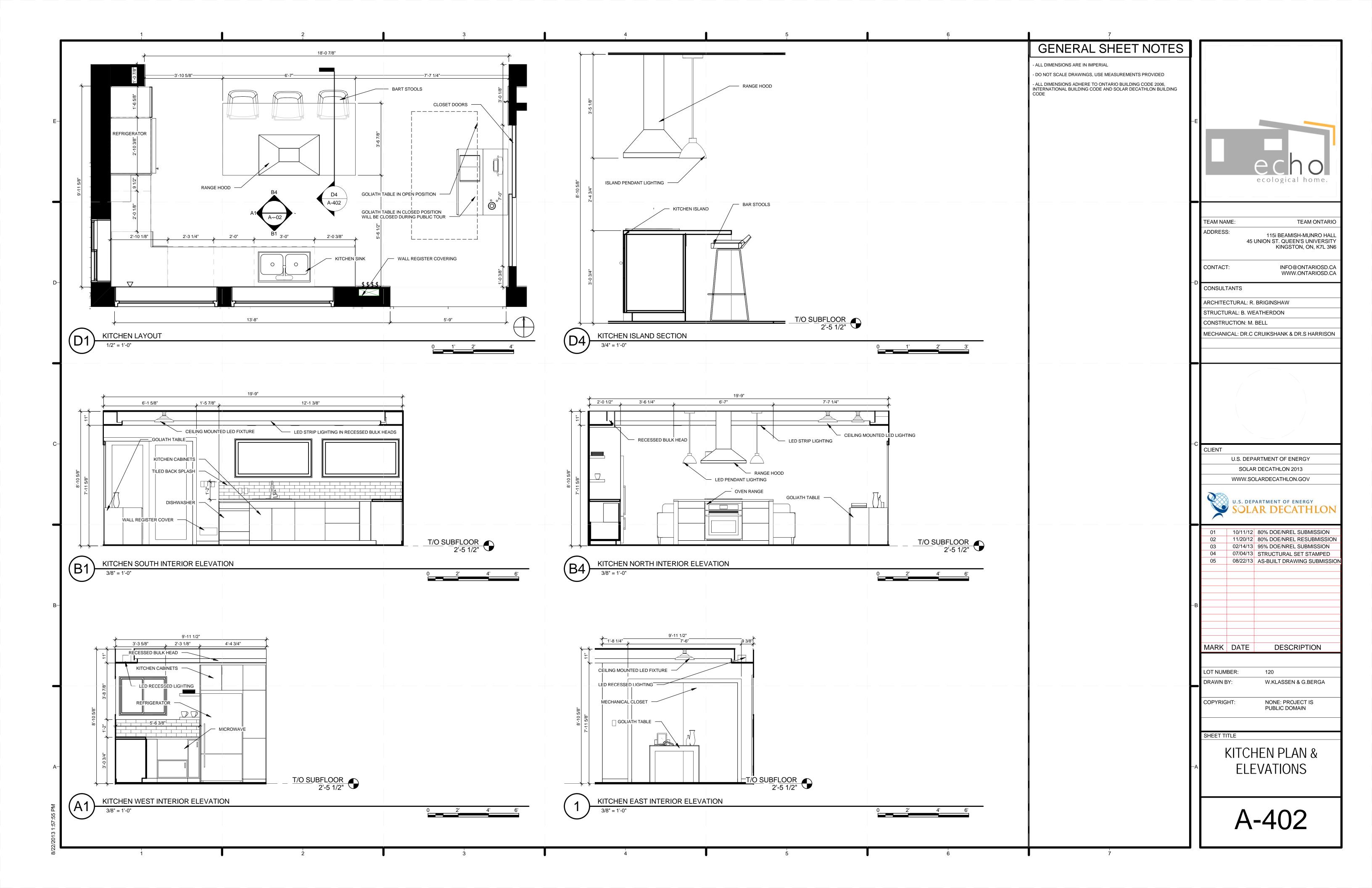


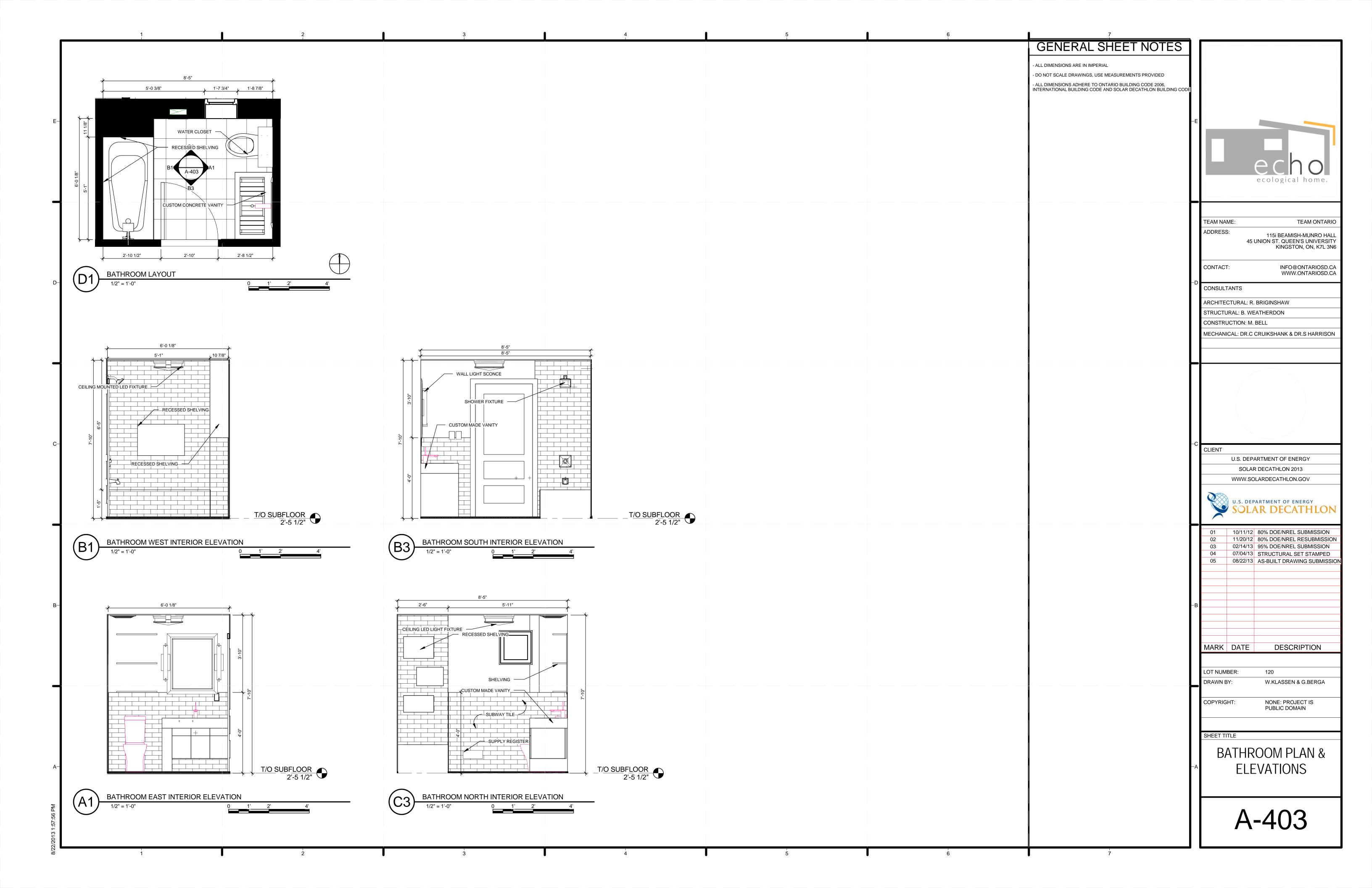


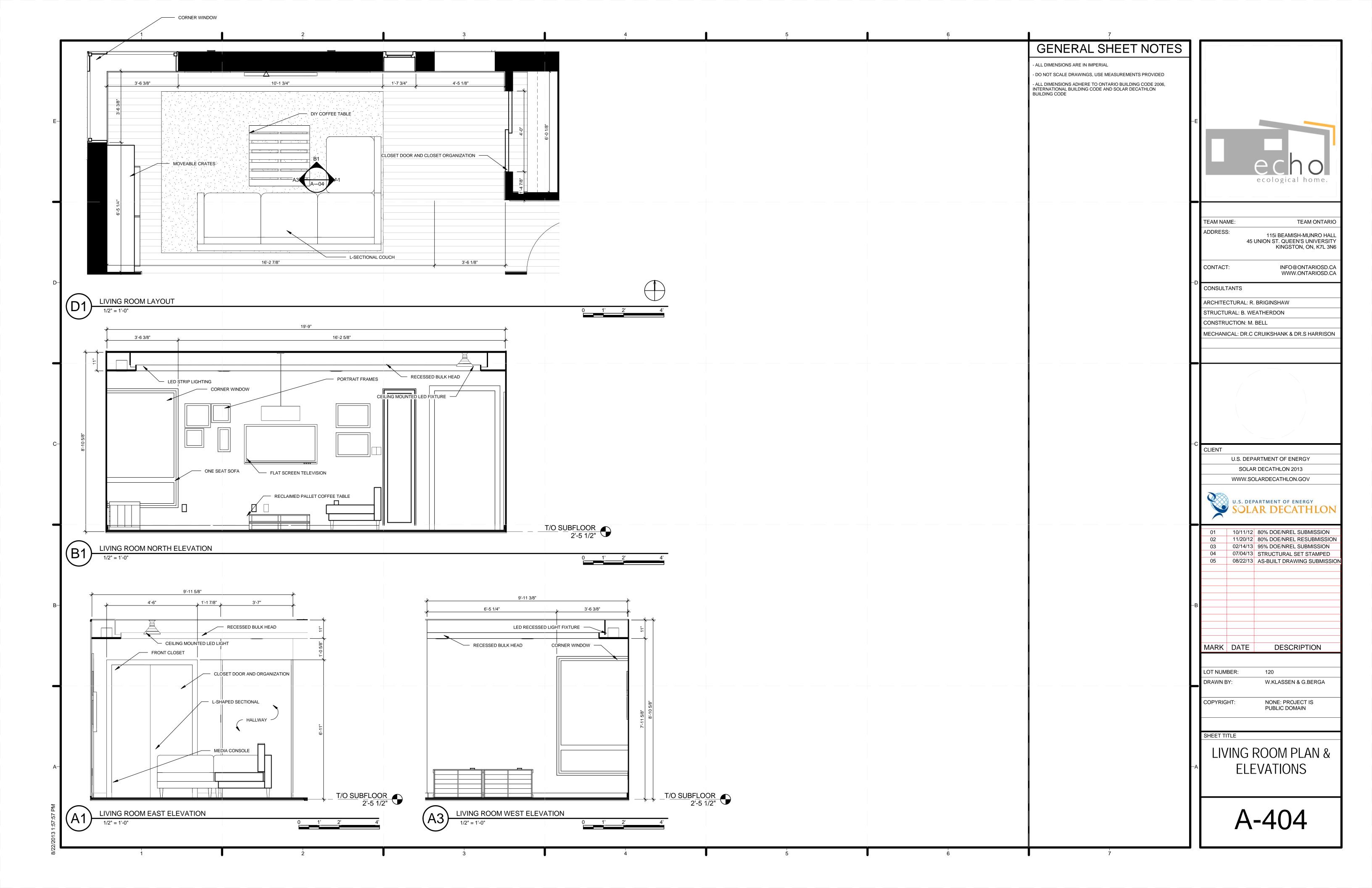


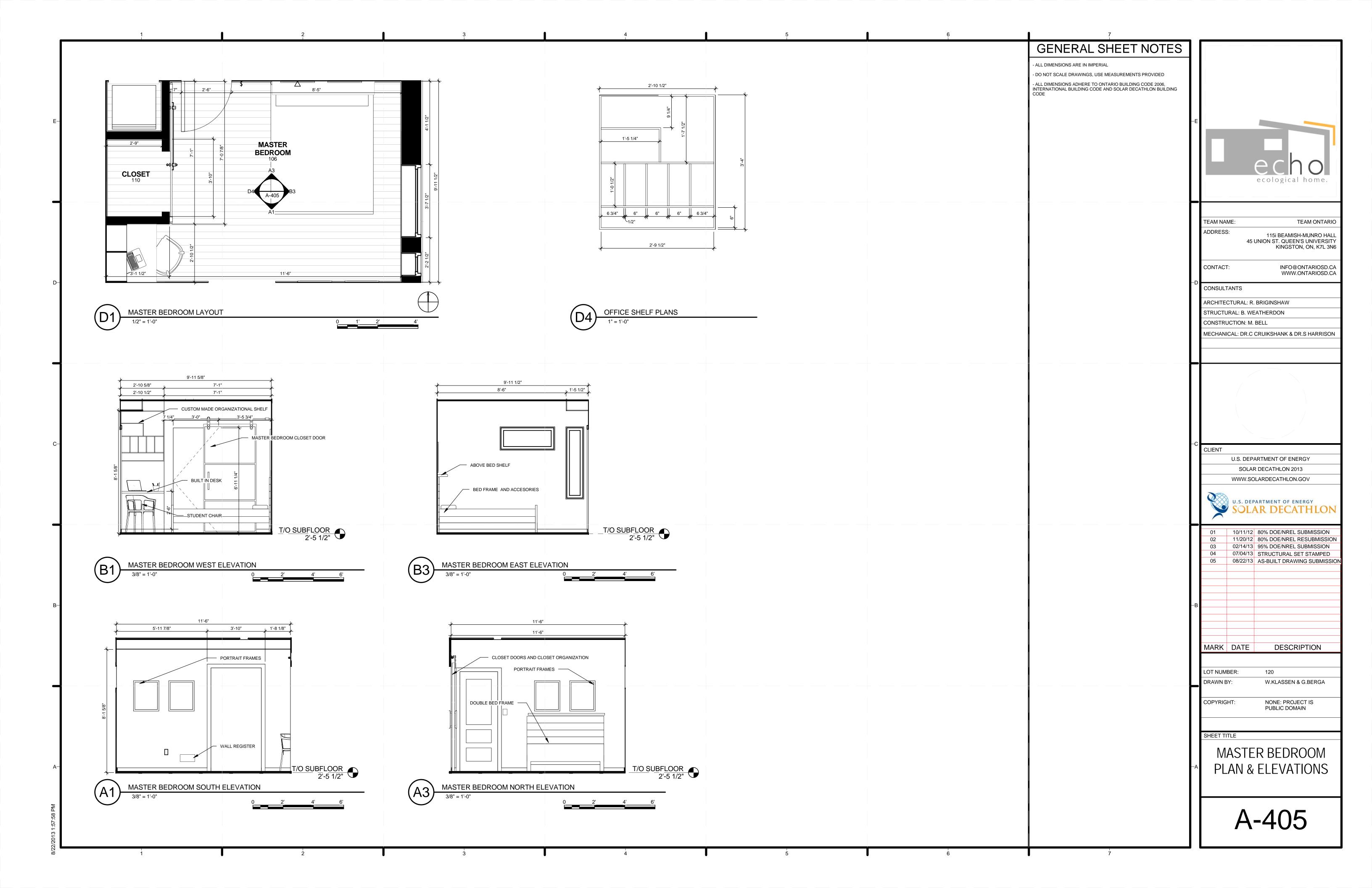


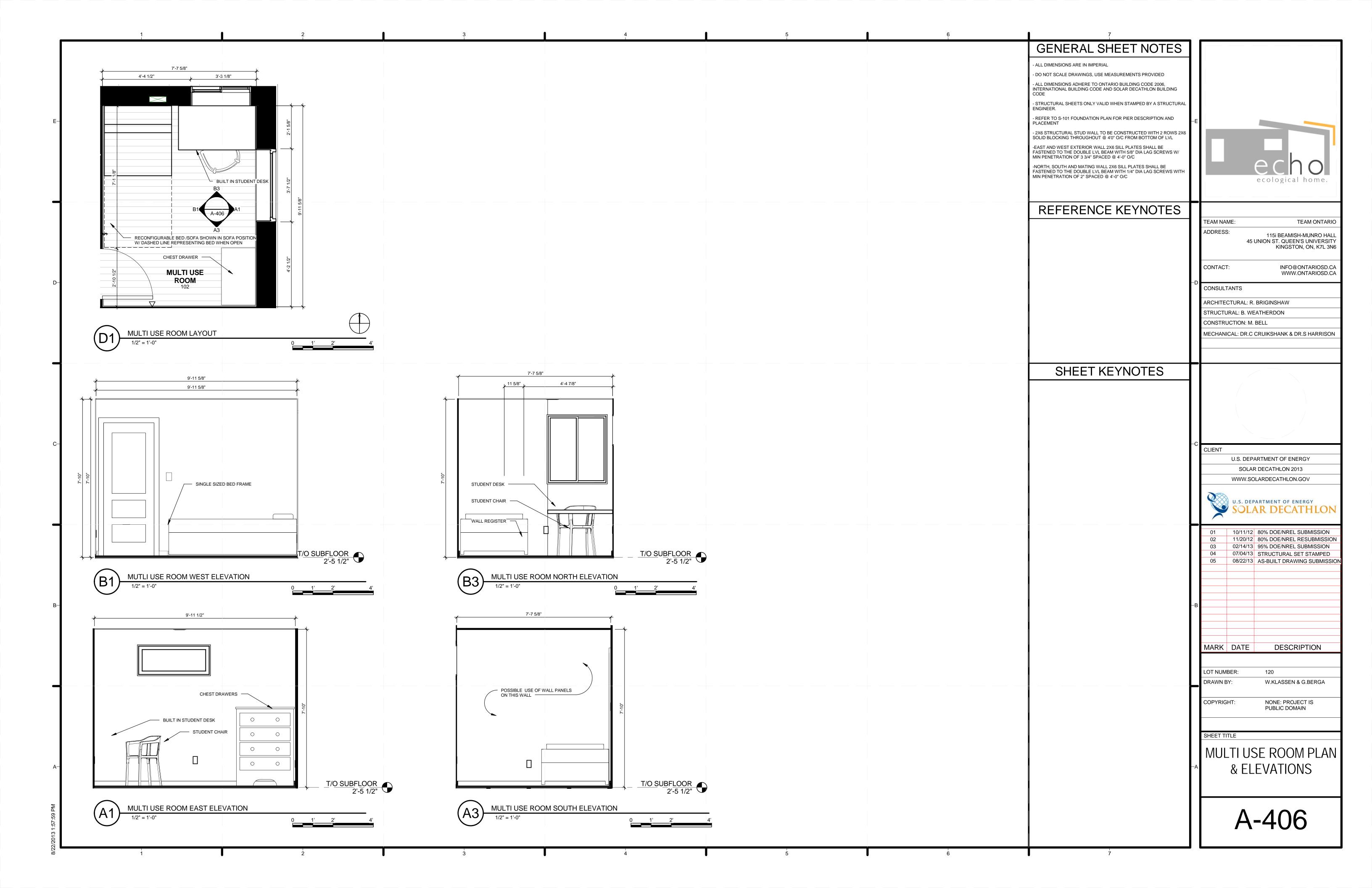


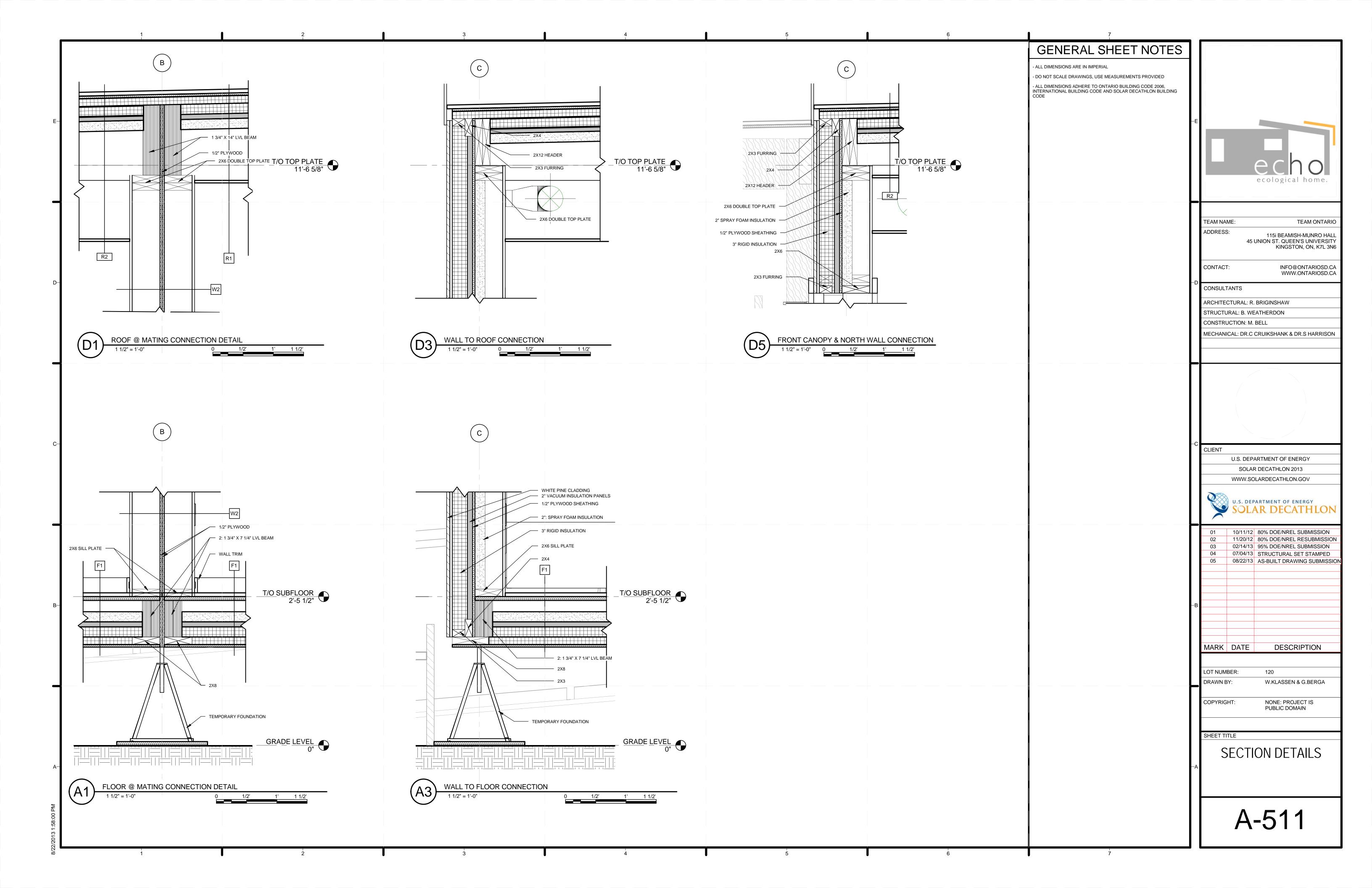


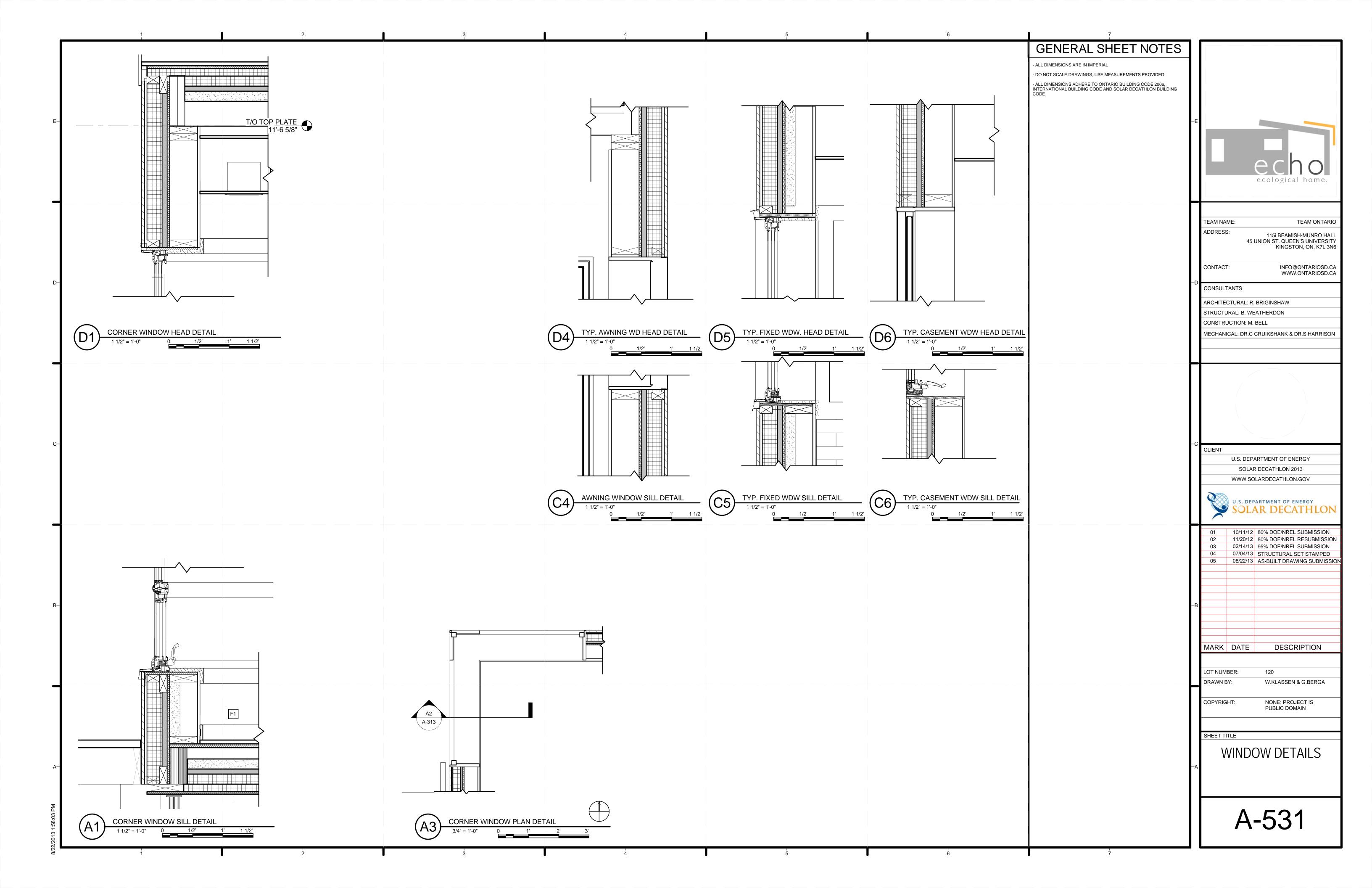


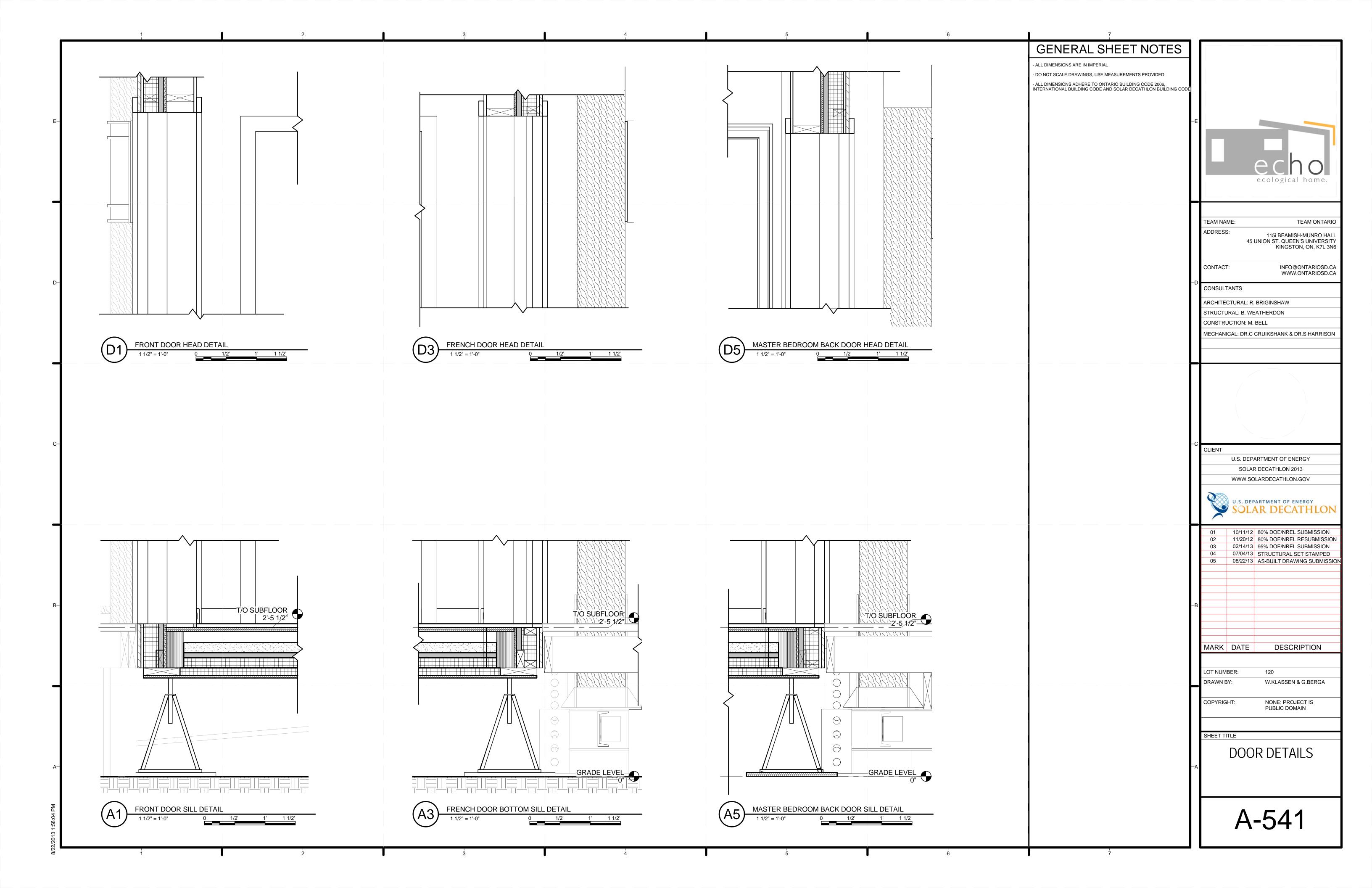


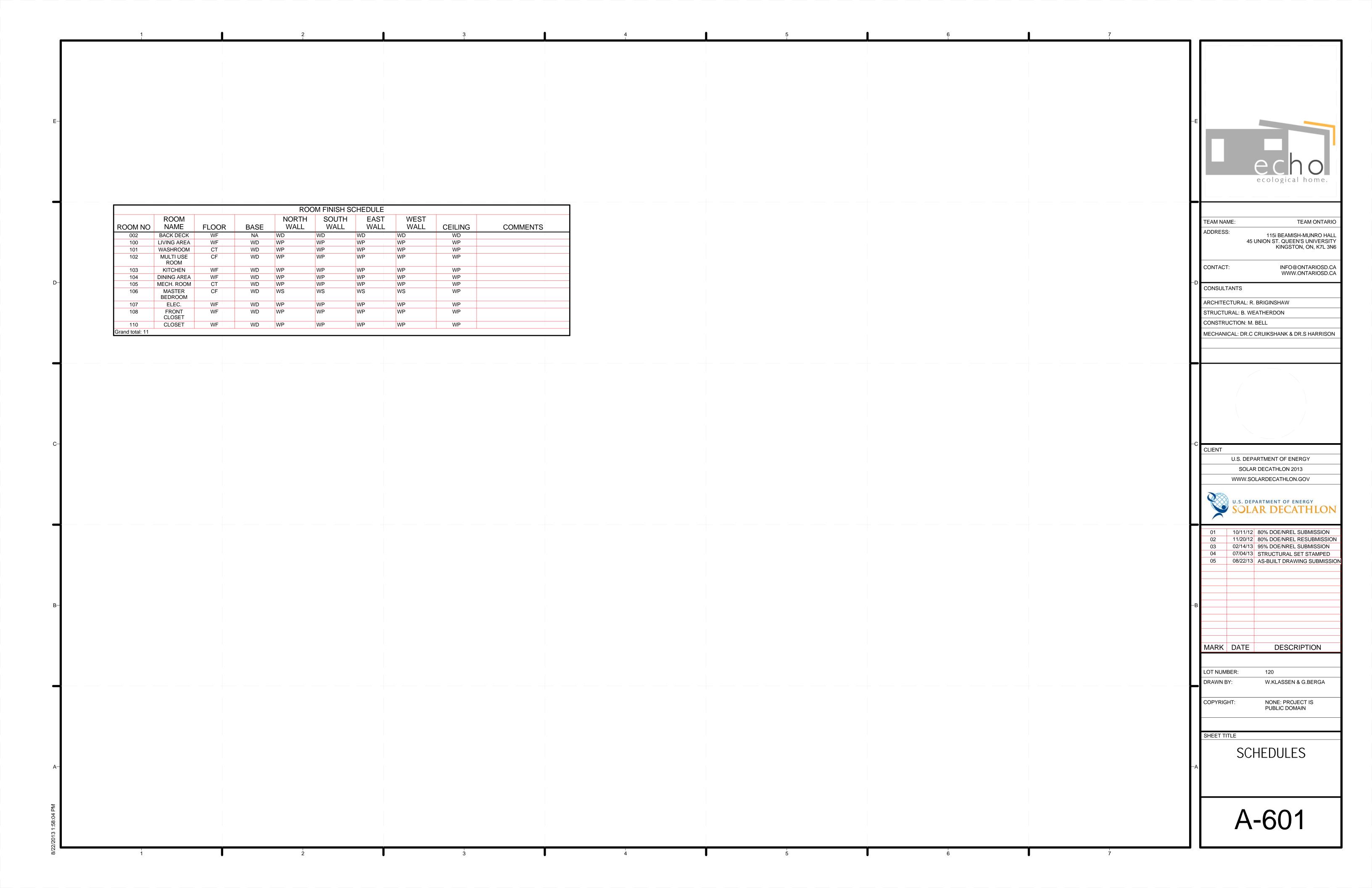














SOUTH WEST VIEW

NTS

ecological home.

TEAM ONTARIO TEAM NAME: ADDRESS: 115i BEAMISH-MUNRO HALL 45 UNION ST. QUEEN'S UNIVERSITY KINGSTON, ON, K7L 3N6

INFO@ONTARIOSD.CA WWW.ONTARIOSD.CA CONTACT:

ARCHITECTURAL: R. BRIGINSHAW STRUCTURAL: B. WEATHERDON

CONSULTANTS

CONSTRUCTION: M. BELL

MECHANICAL: DR.C CRUIKSHANK & DR.S HARRISON

U.S. DEPARTMENT OF ENERGY SOLAR DECATHLON 2013

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SOLAR DECATHLON

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01 10/11/12 80% DOE/NREL SUBMISSION 02 11/20/12 80% DOE/NREL RESUBMISSION 03 02/14/13 95% DOE/NREL SUBMISSION
04 07/04/13 STRUCTURAL SET STAMPED
05 08/22/13 AS-BUILT DRAWING SUBMISSION

DESCRIPTION MARK DATE

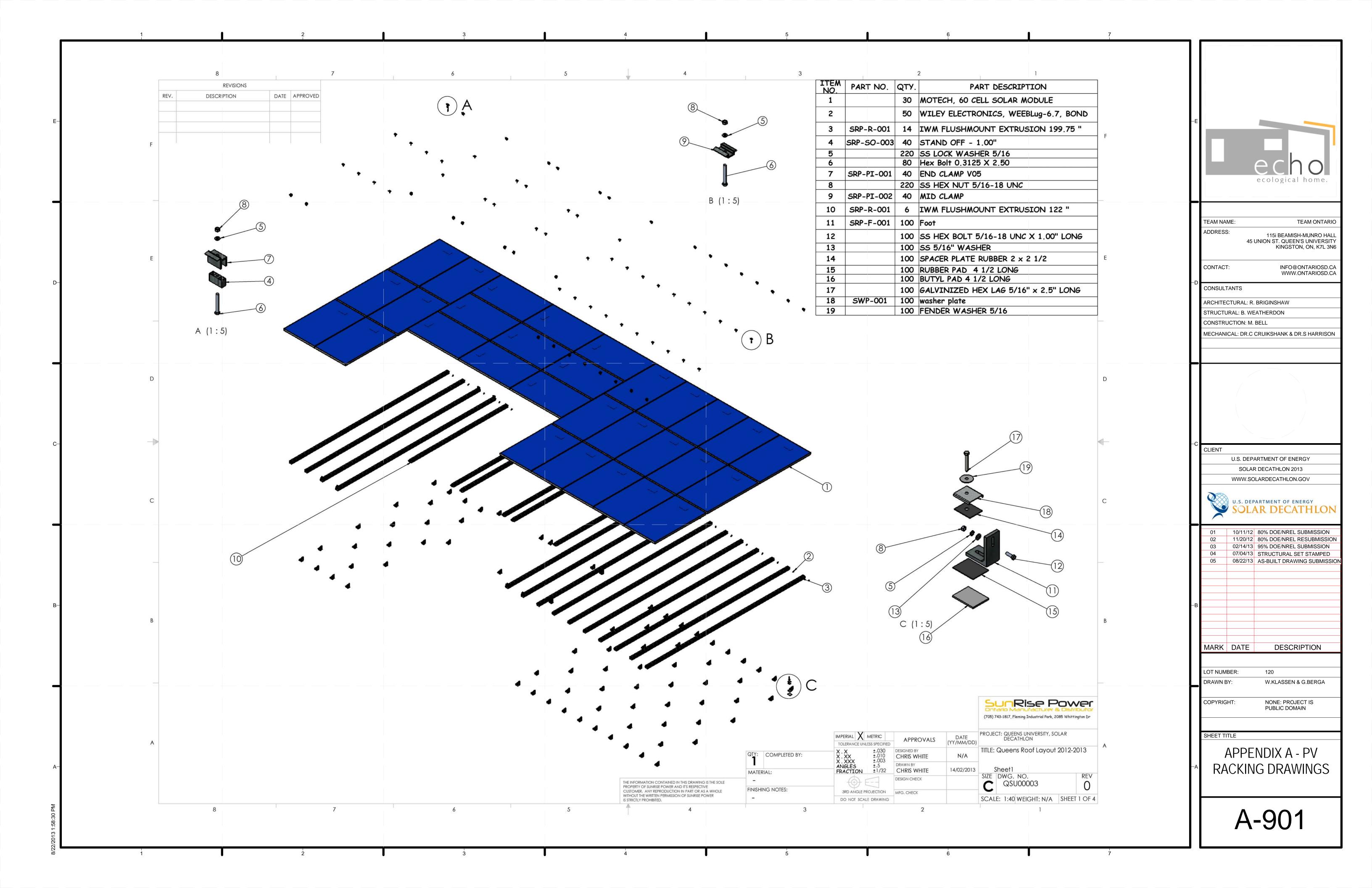
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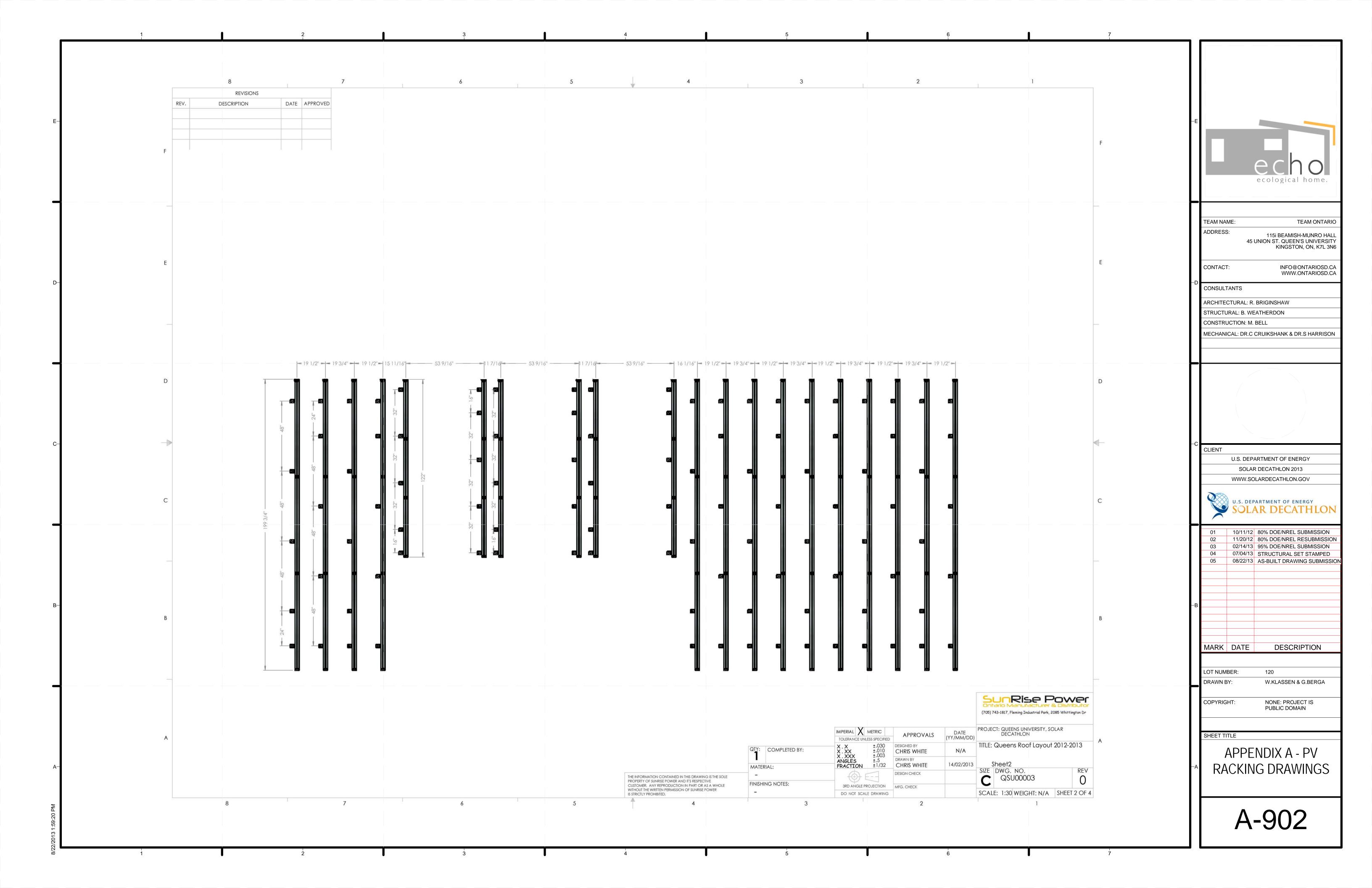
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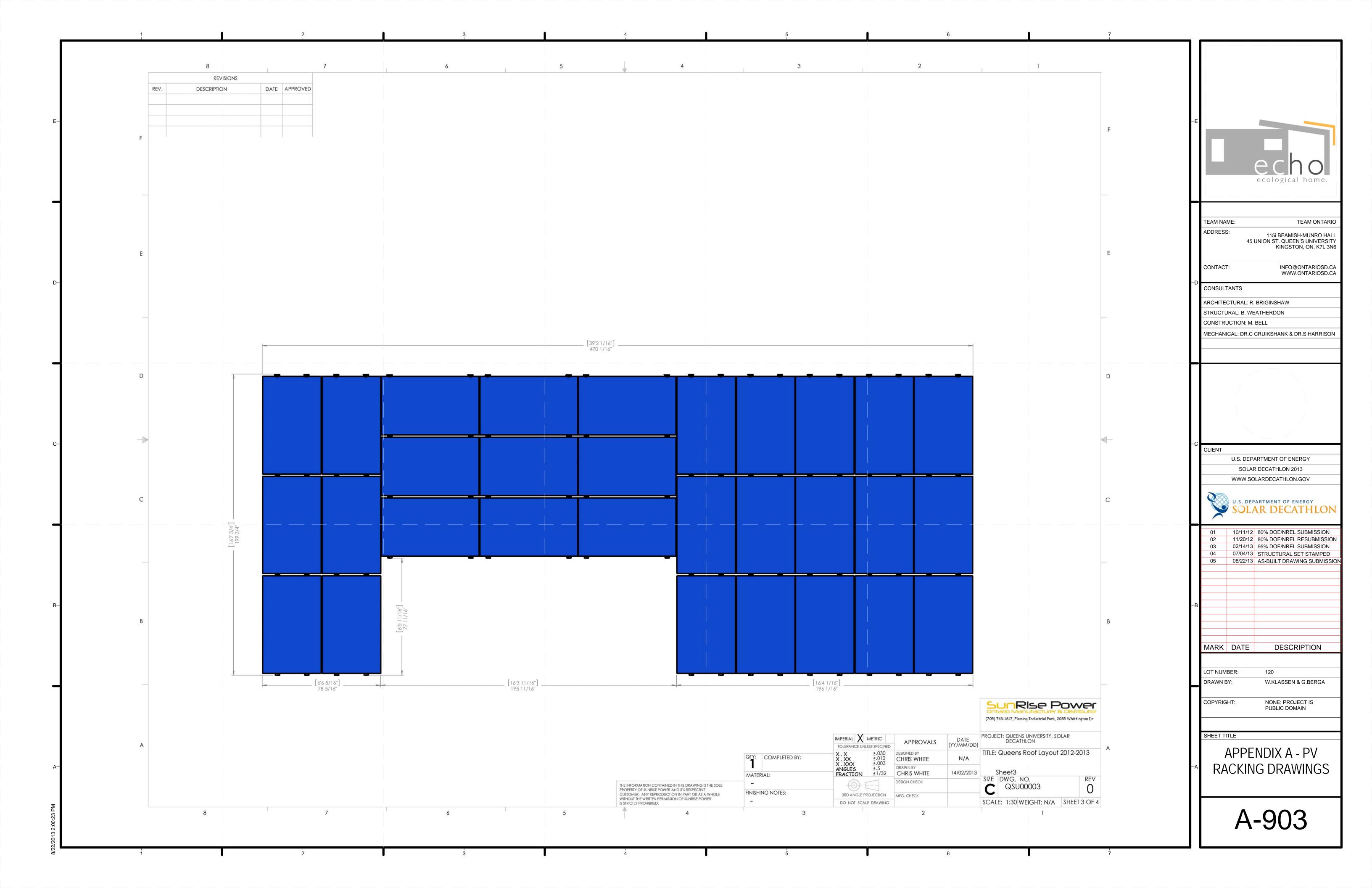
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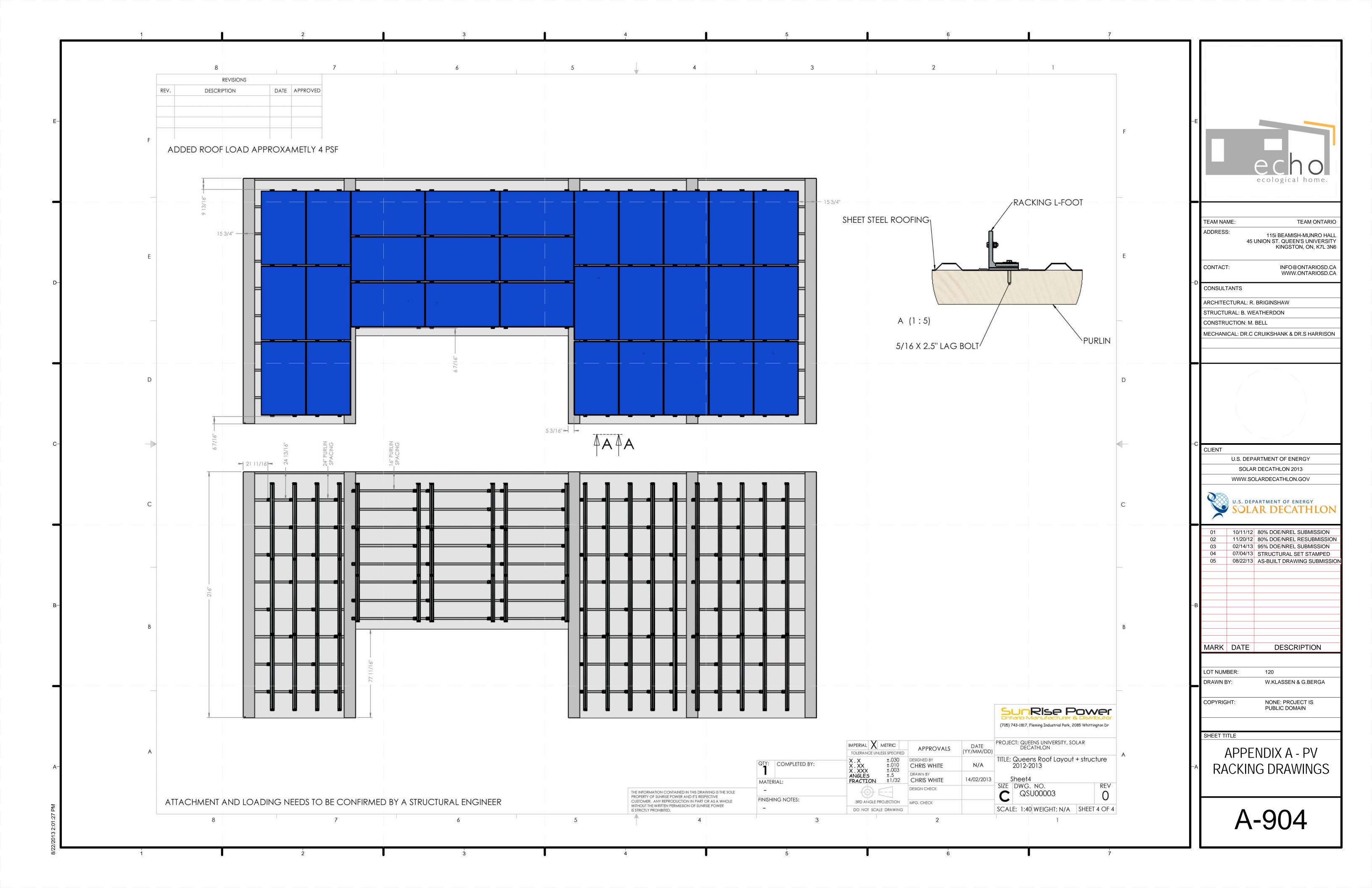
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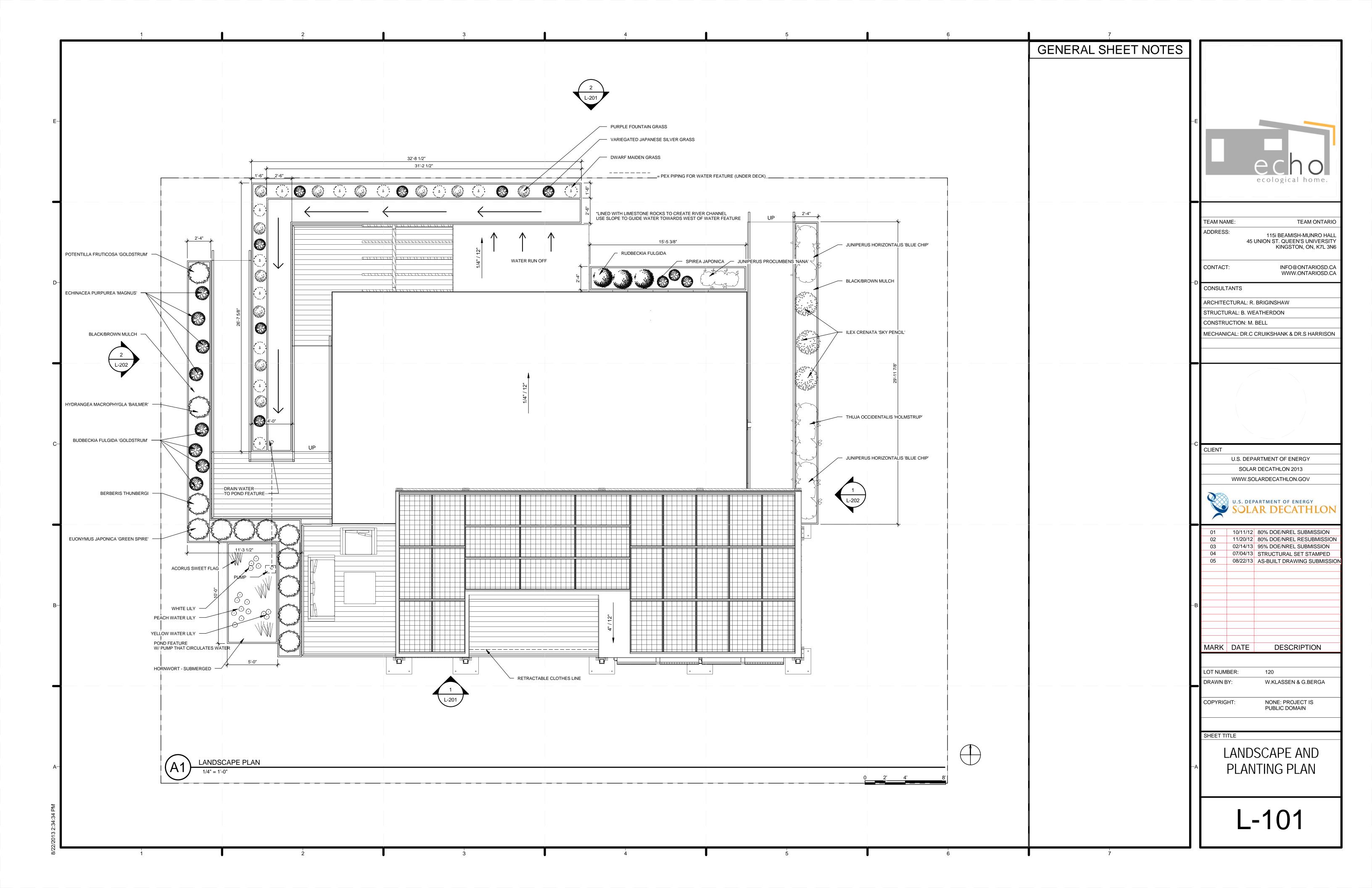
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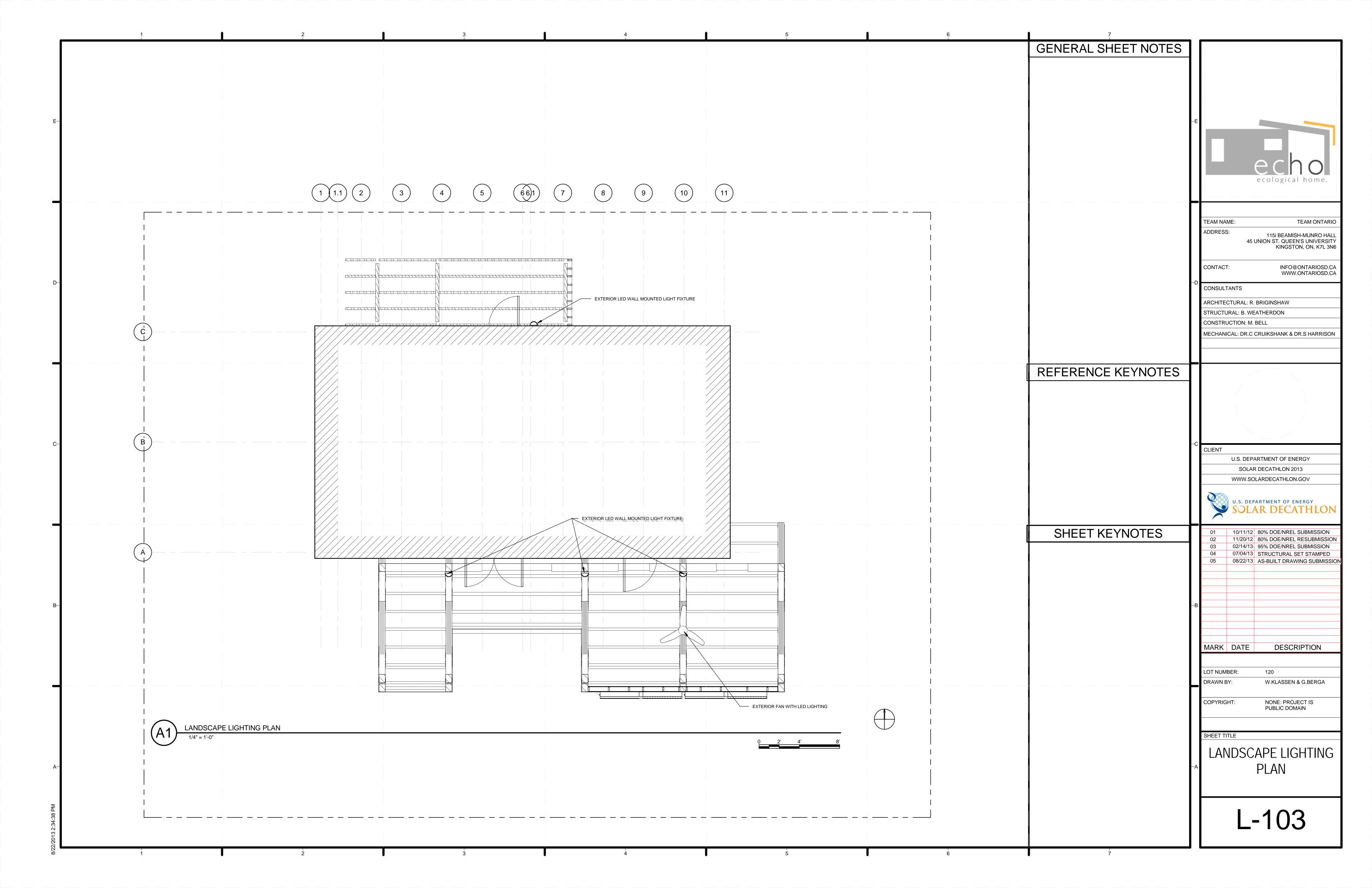


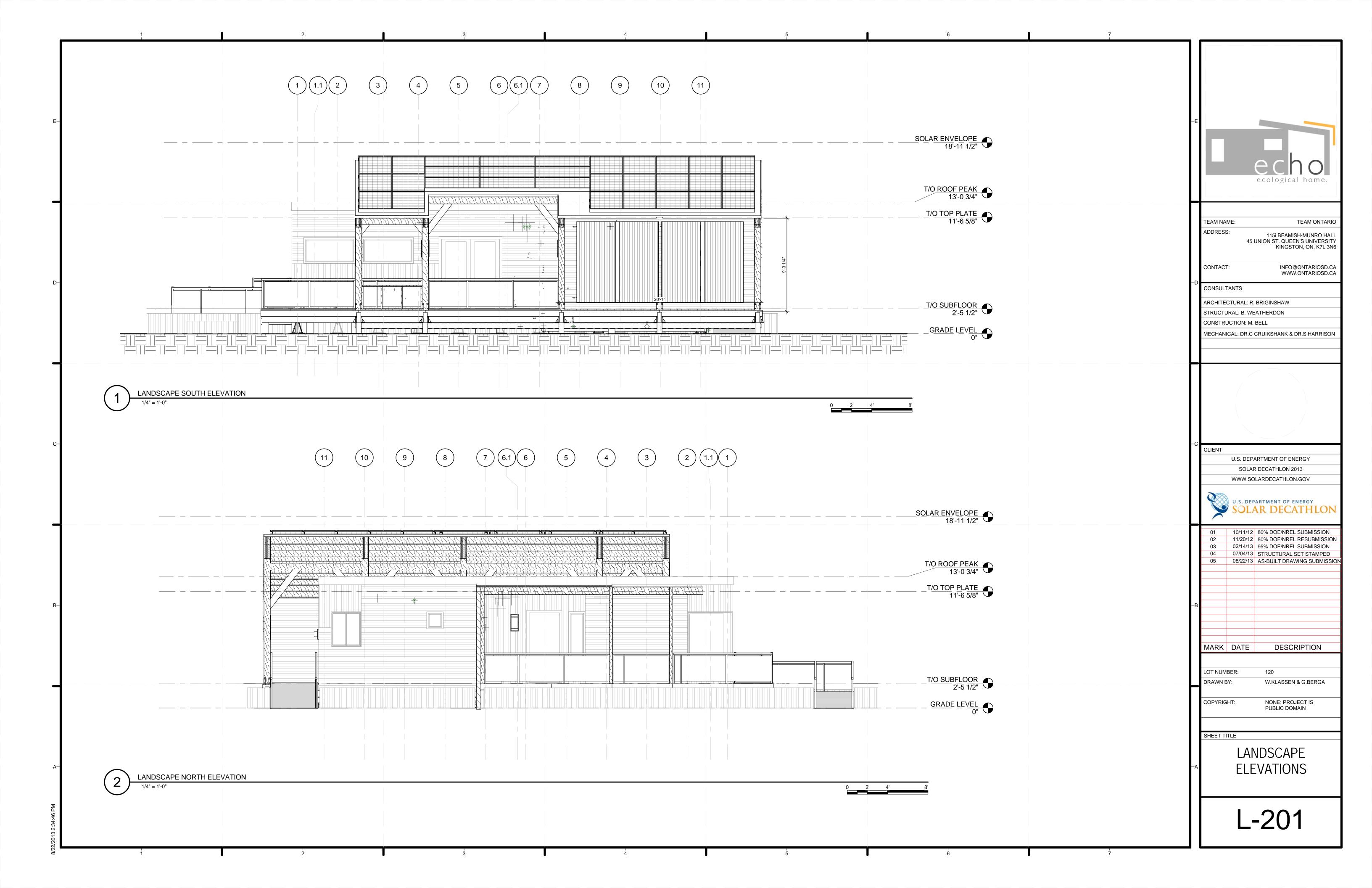


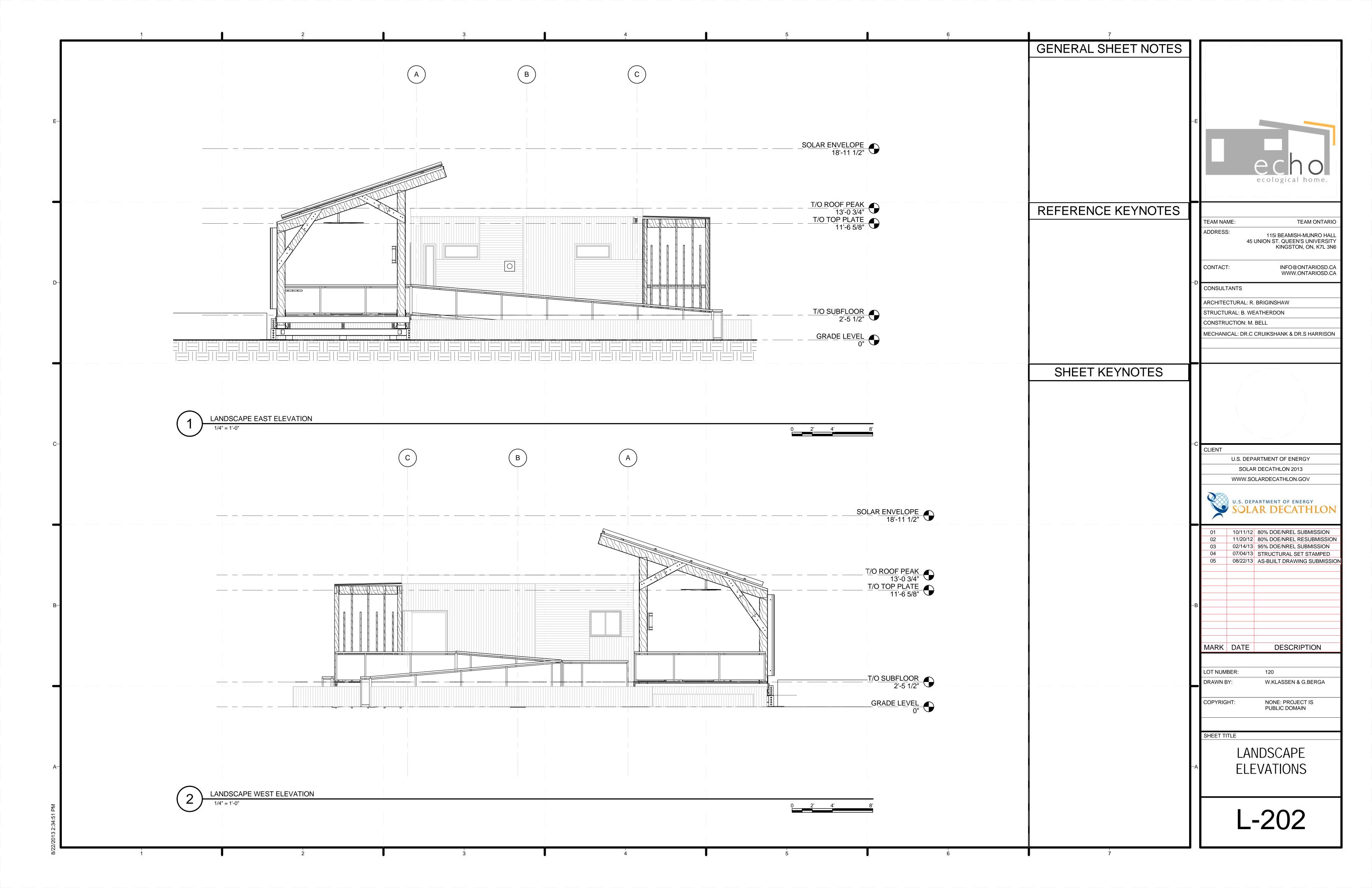


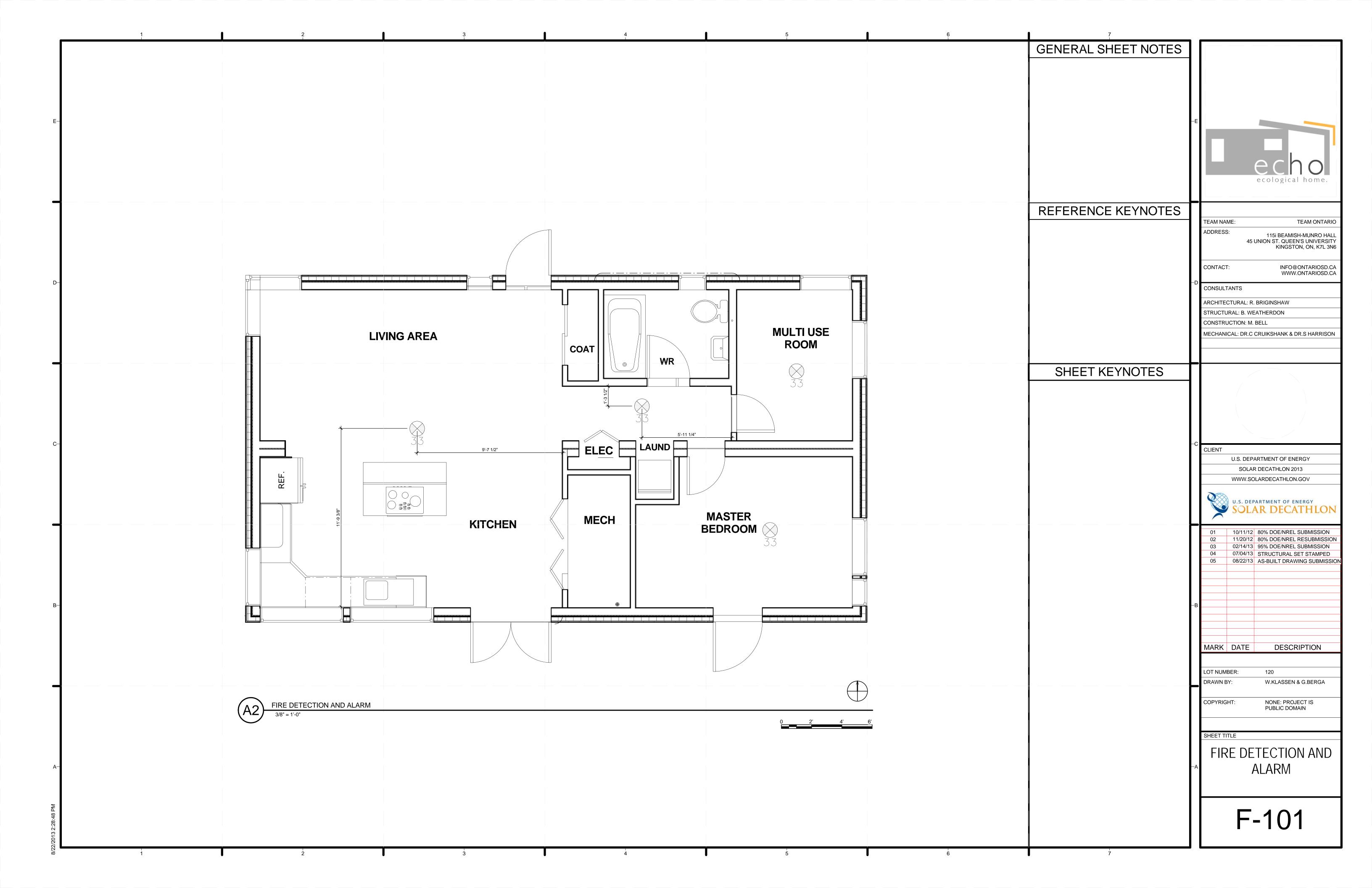


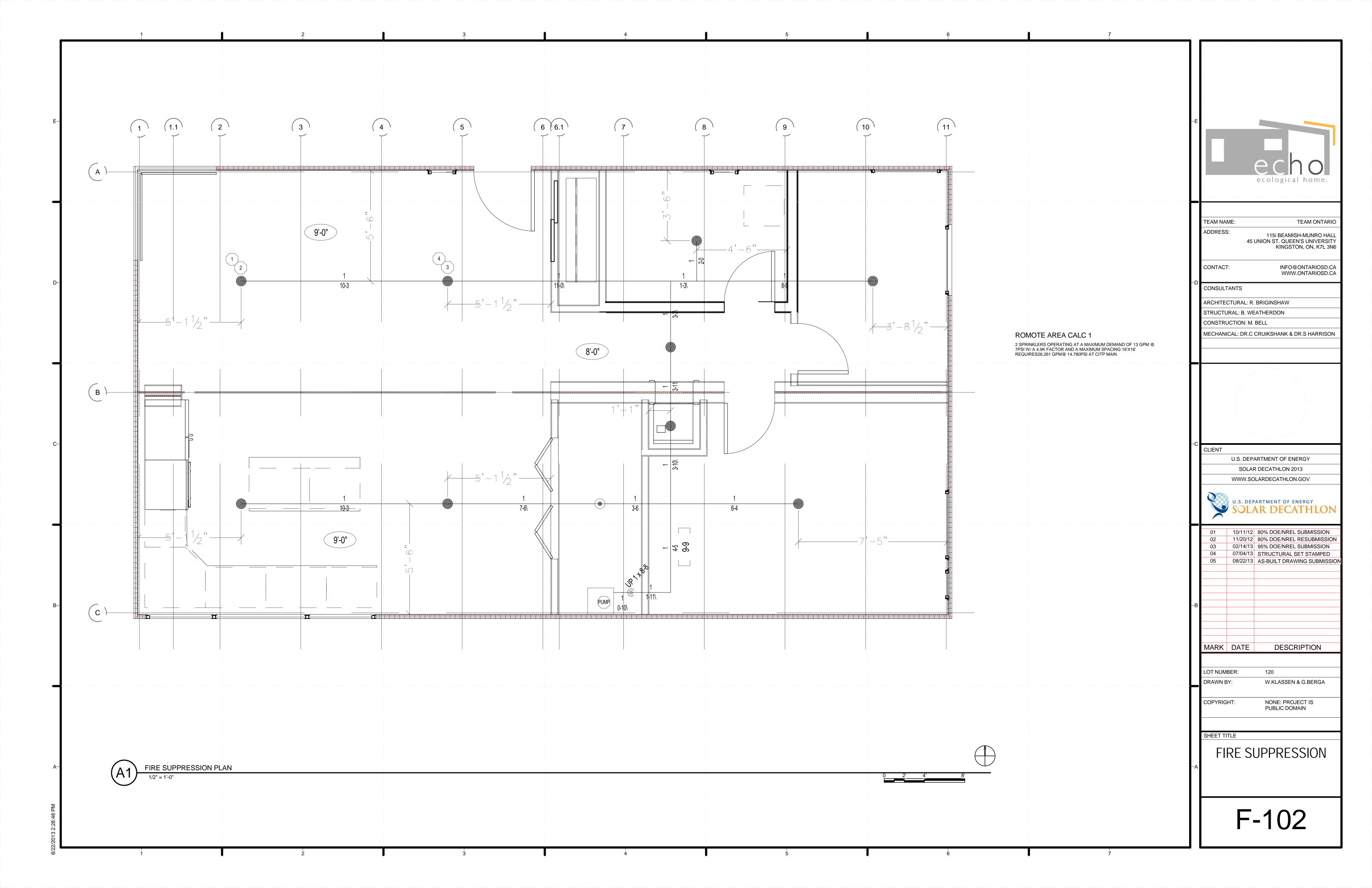


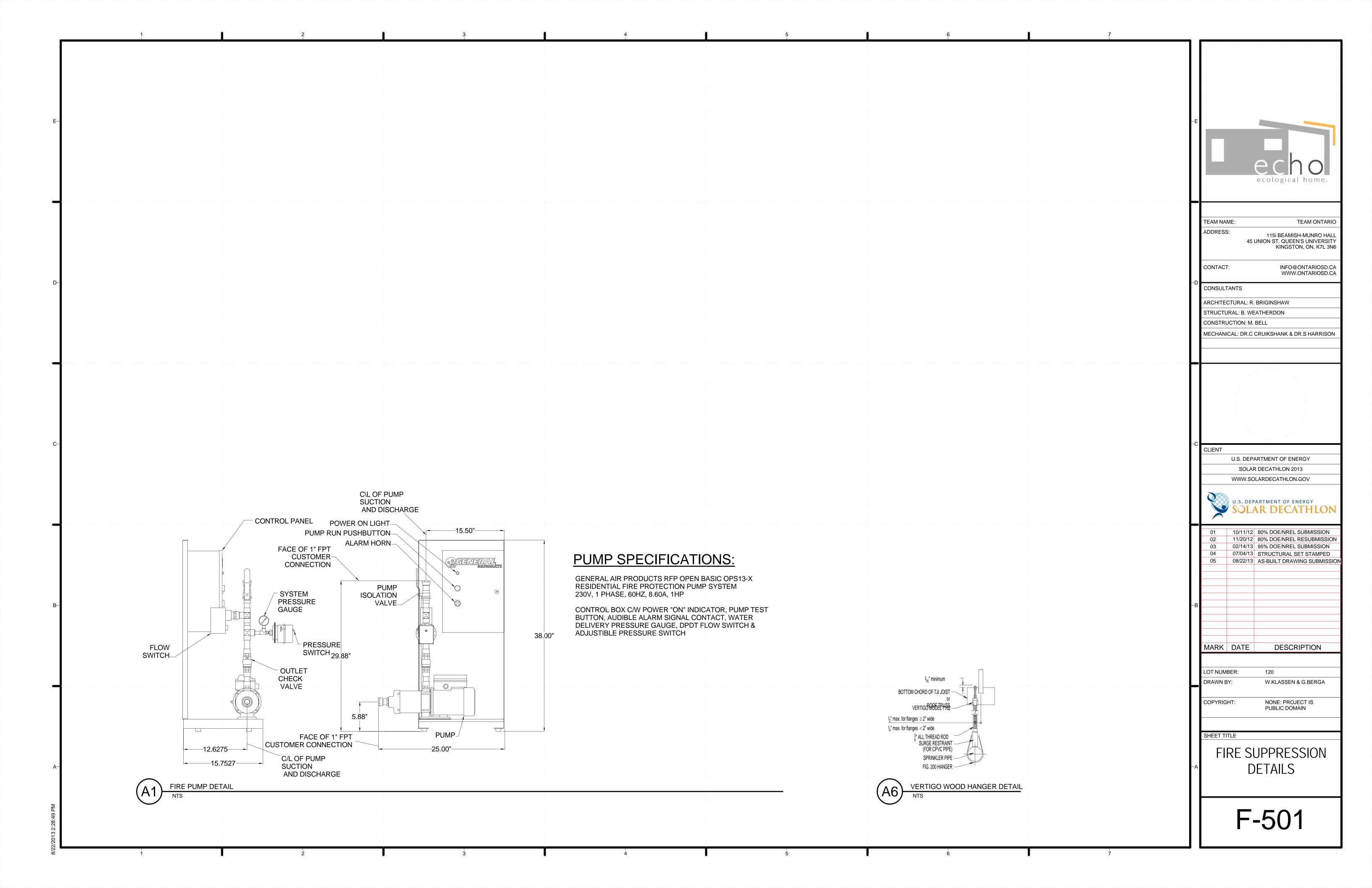




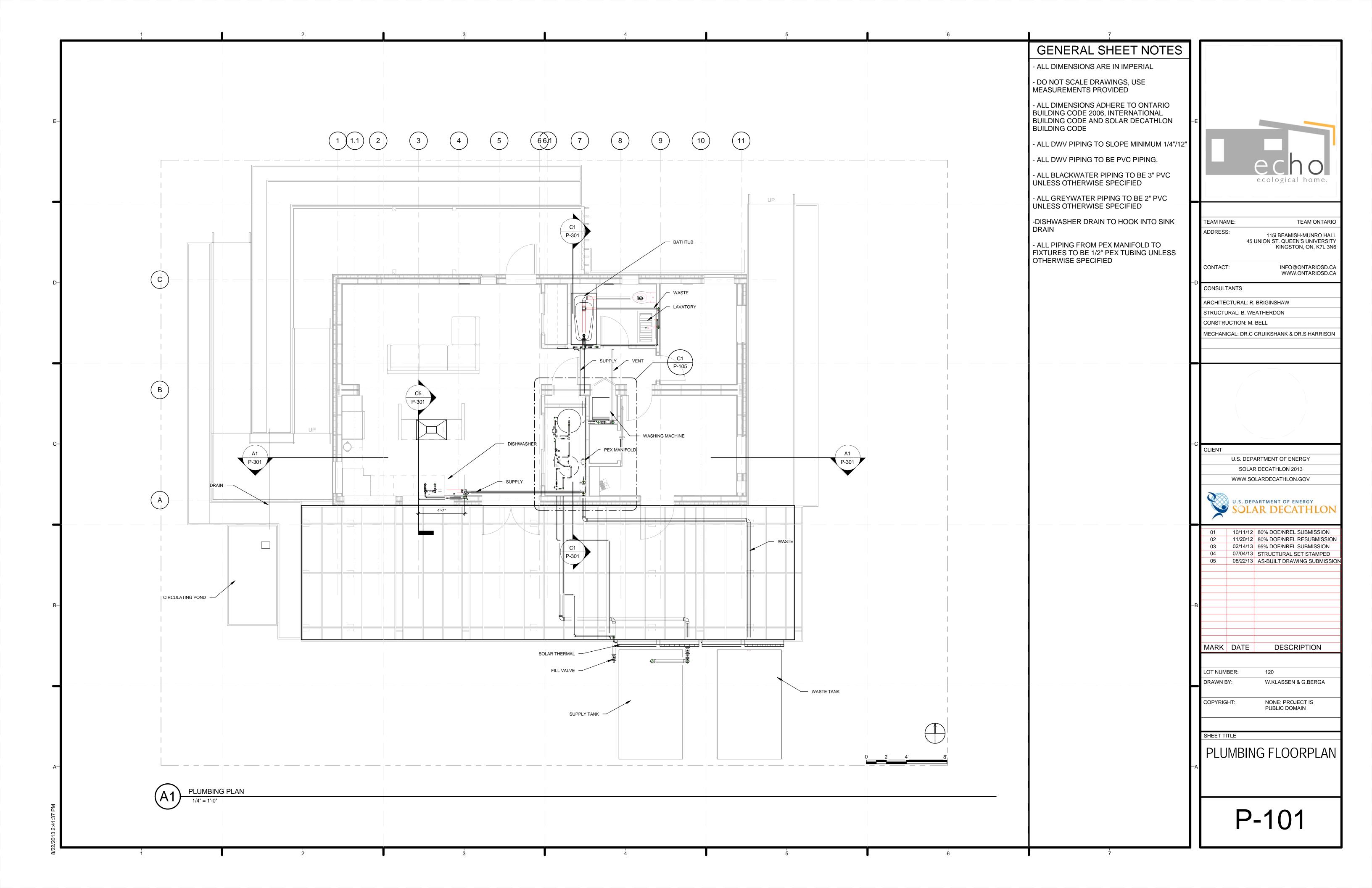


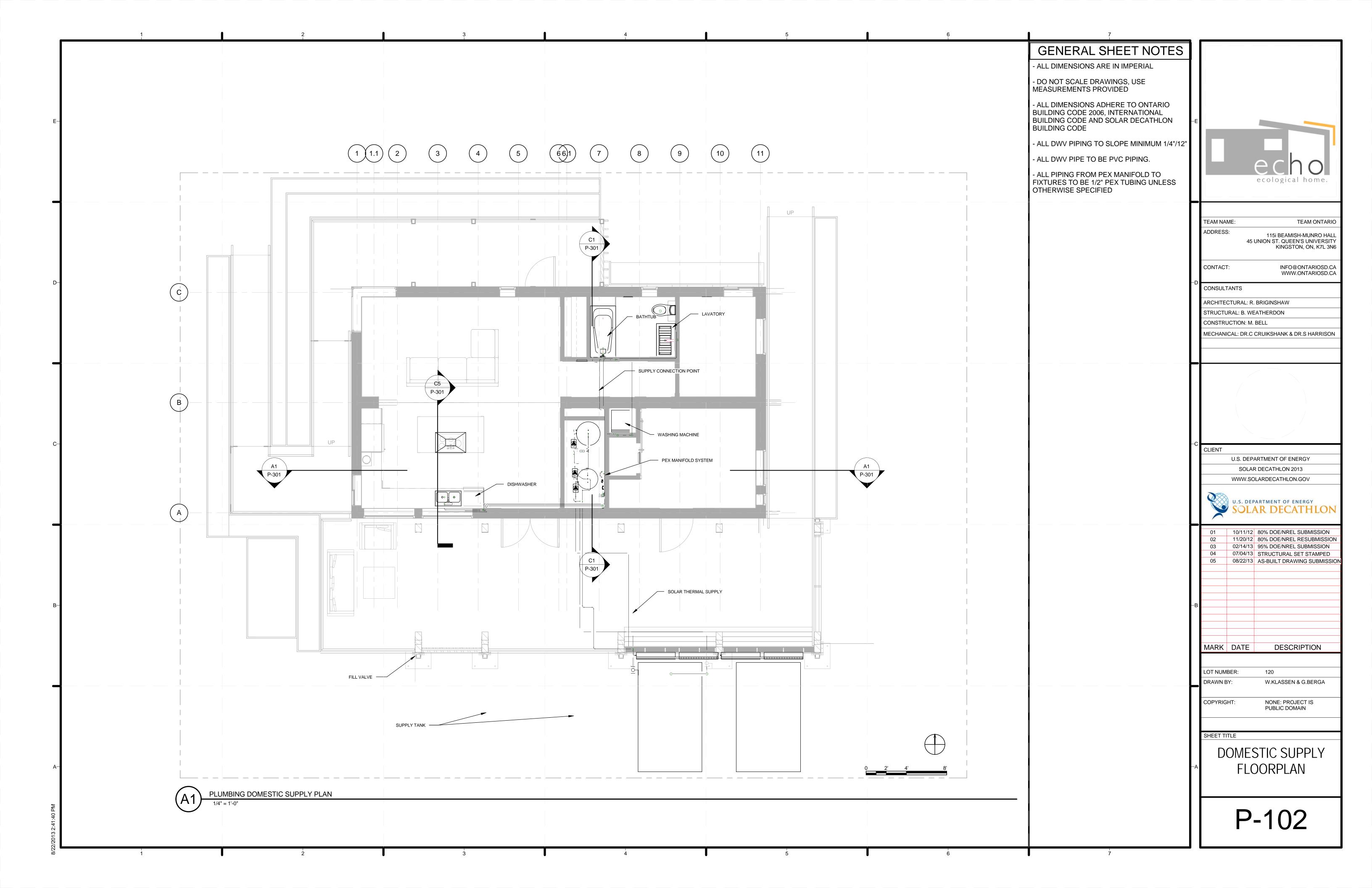


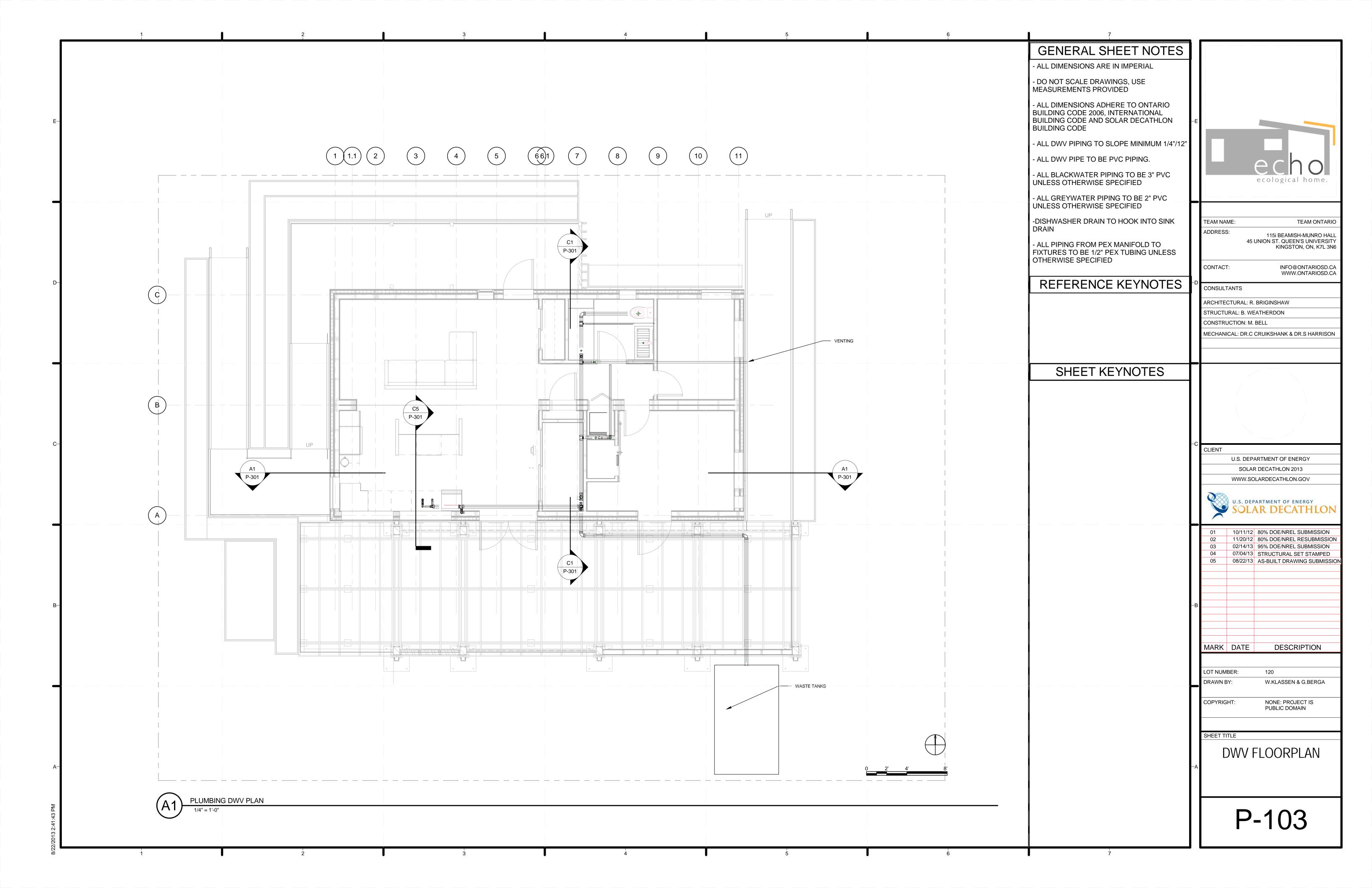


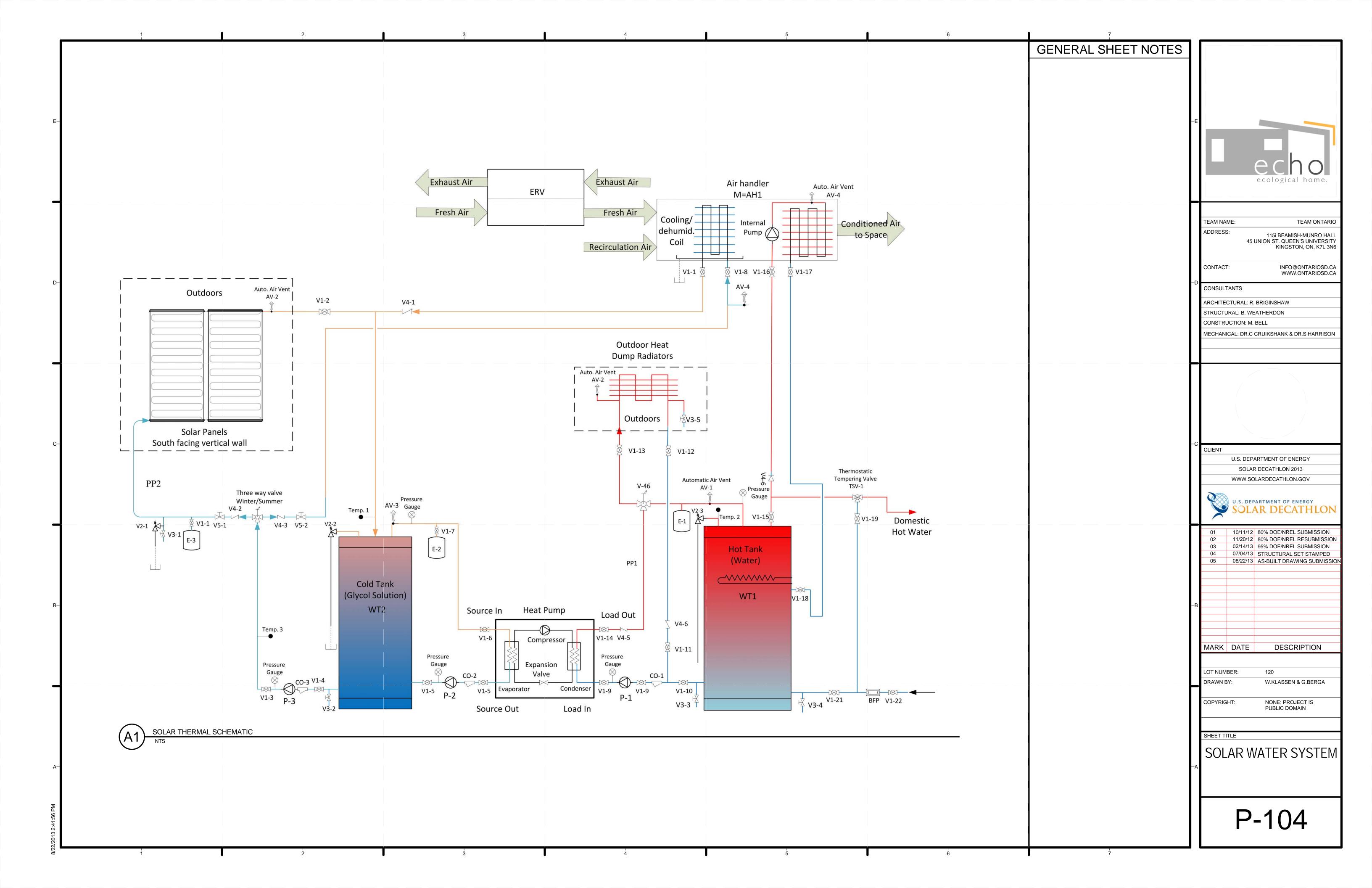


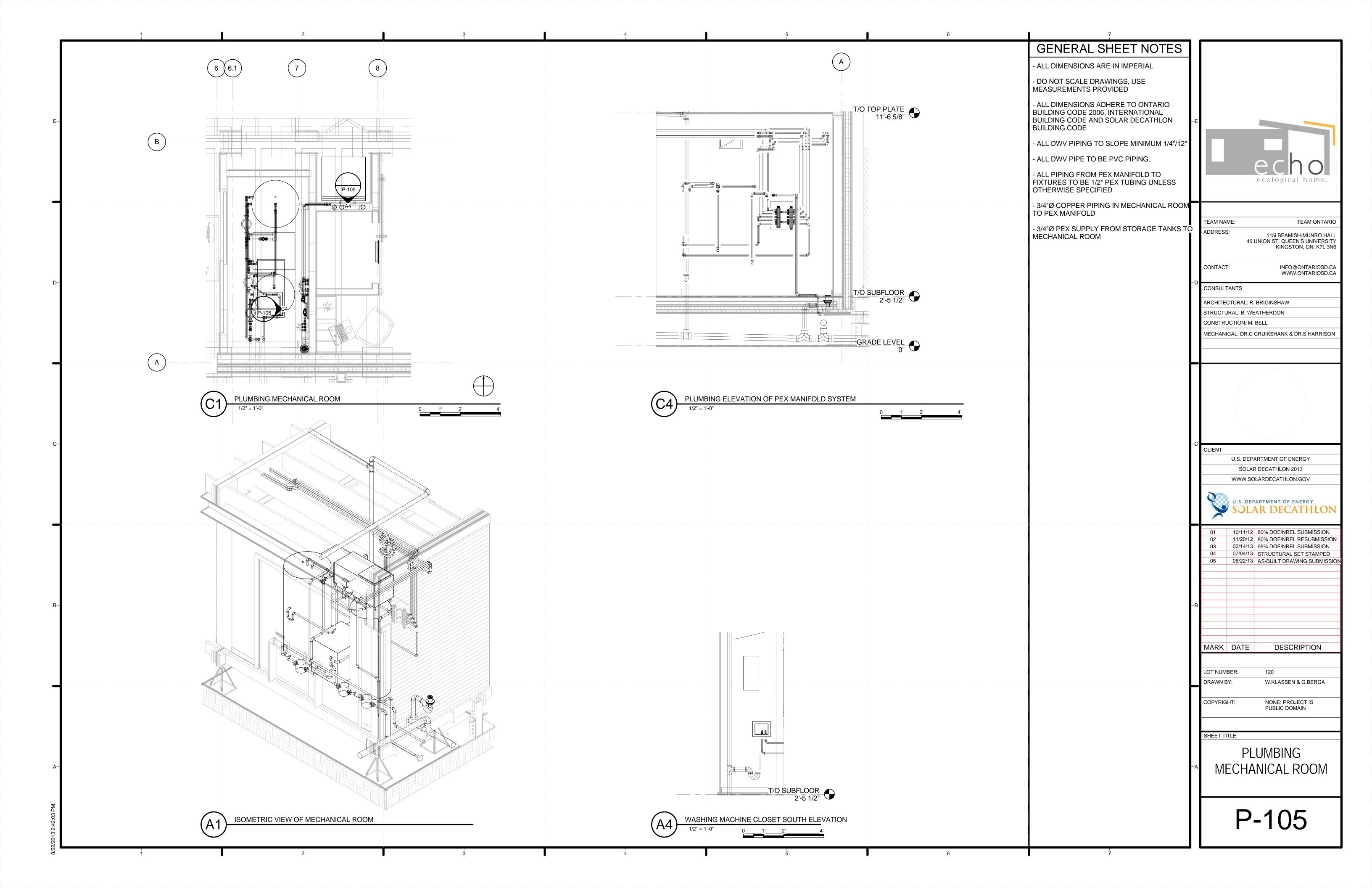
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PLUMBING INDEX OF DRAWIN SHEET NO SHEET NAME  P-001 PLUMBING SYMBOLS AND NOTES P-101 PLUMBING FLOORPLAN P-102 DOMESTIC SUPPLY FLOORPLAN P-103 DWV FLOORPLAN P-104 SOLAR WATER SYSTEM P-105 PLUMBING MECHANICAL ROOM P-301 PLUMBING SECTIONS P-601 SCHEDULES P-901 SUPPLY ISOMETRICS P-902 DWV ISOMETRICS							Echo
D—							TEAM NAME:  TEAM ONTARIO  ADDRESS:  115i BEAMISH-MUNRO HALL 45 UNION ST. QUEEN'S UNIVERSITY KINGSTON, ON, K7L 3N6  CONTACT:  INFO@ONTARIOSD.CA WWW.ONTARIOSD.CA WWW.ONTARIOSD.CA STRUCTURAL: R. BRIGINSHAW STRUCTURAL: B. WEATHERDON
C-							C CLIENT
							U.S. DEPARTMENT OF ENERGY  SOLAR DECATHLON 2013  WWW.SOLARDECATHLON.GOV  U.S. DEPARTMENT OF ENERGY SOLAR DECATHLON  01 10/11/12 80% DOE/NREL SUBMISSION 02 11/20/12 80% DOE/NREL RESUBMISSION 03 02/14/13 95% DOE/NREL SUBMISSION 04 07/04/13 STRUCTURAL SET STAMPED 05 08/22/13 AS-BUILT DRAWING SUBMISSION
B-							MARK DATE DESCRIPTION  LOT NUMBER: 120  DRAWN BY: W.KLASSEN & G.BERGA  COPYRIGHT: NONE: PROJECT IS PUBLIC DOMAIN
/2013 2:41:34 PM P							PLUMBING SYMBOLS AND NOTES  P-001

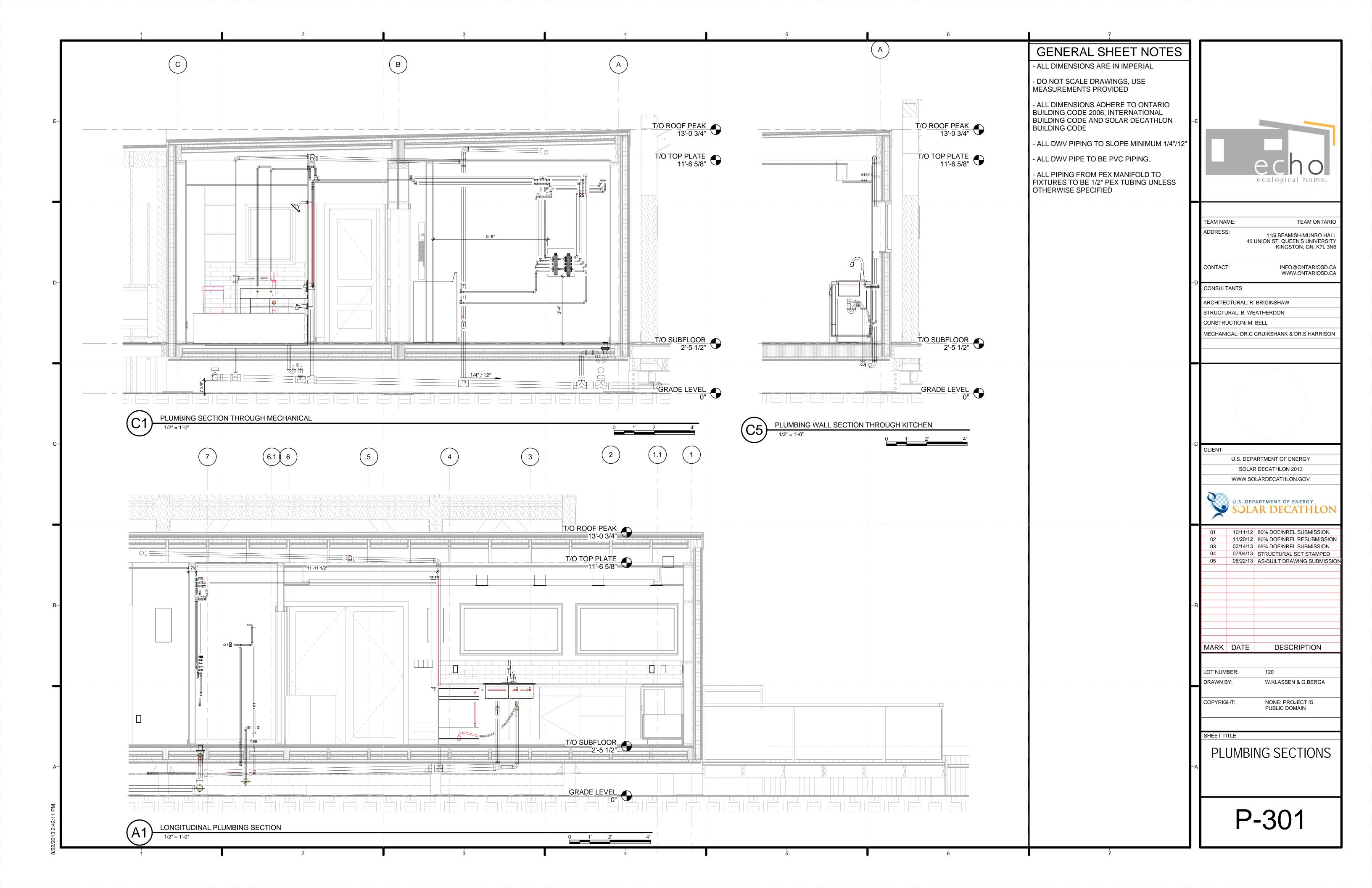




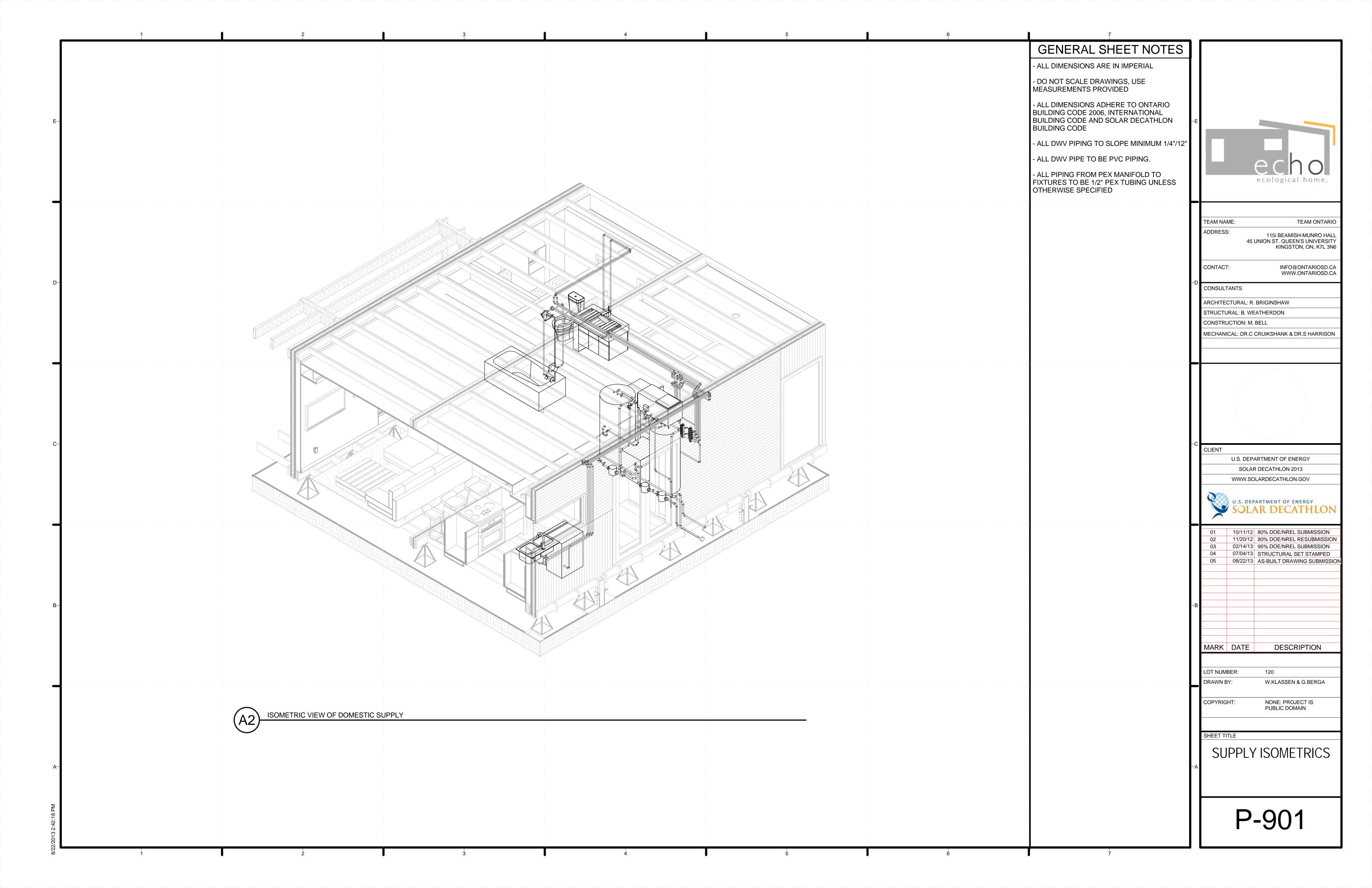


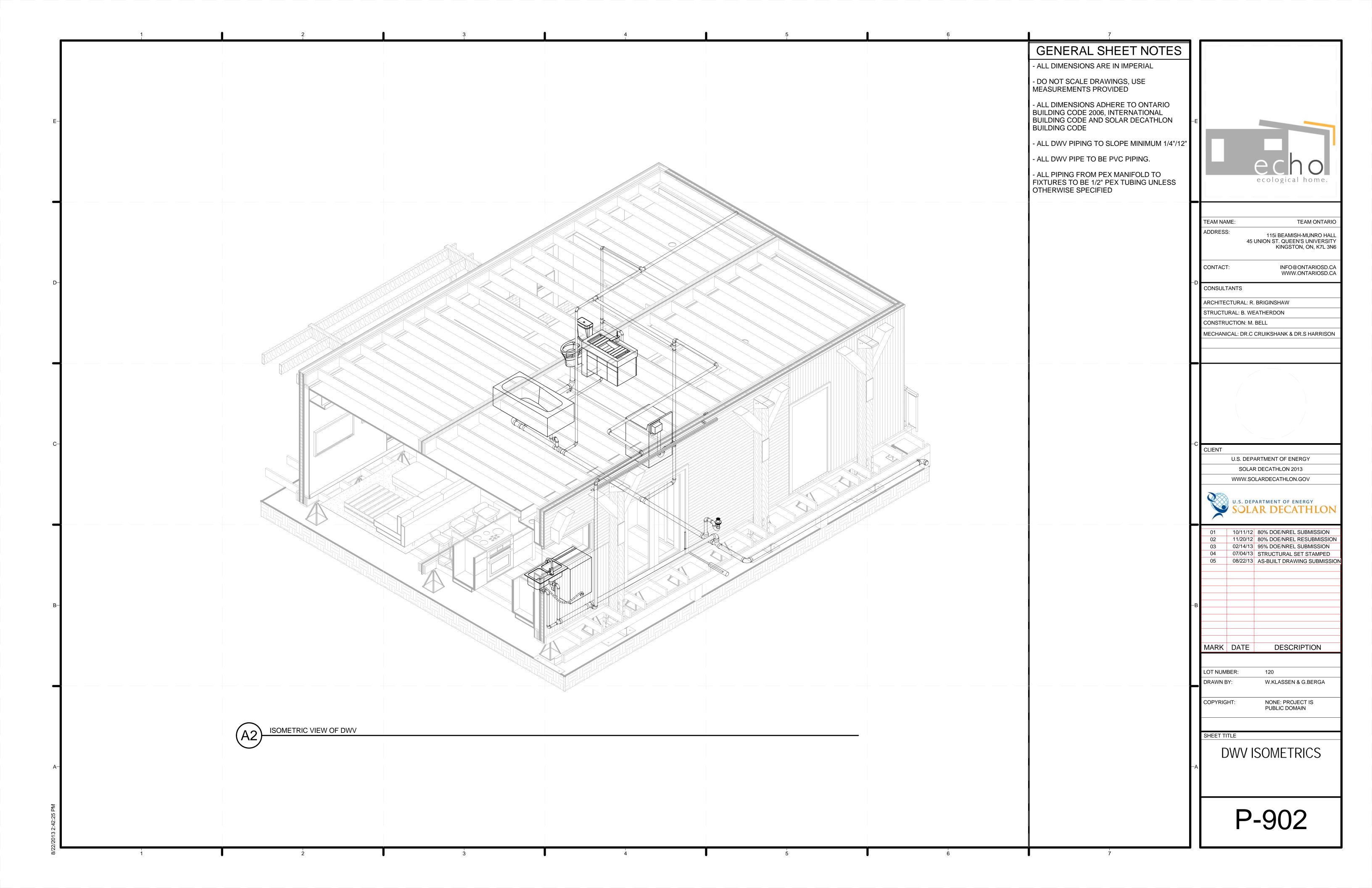




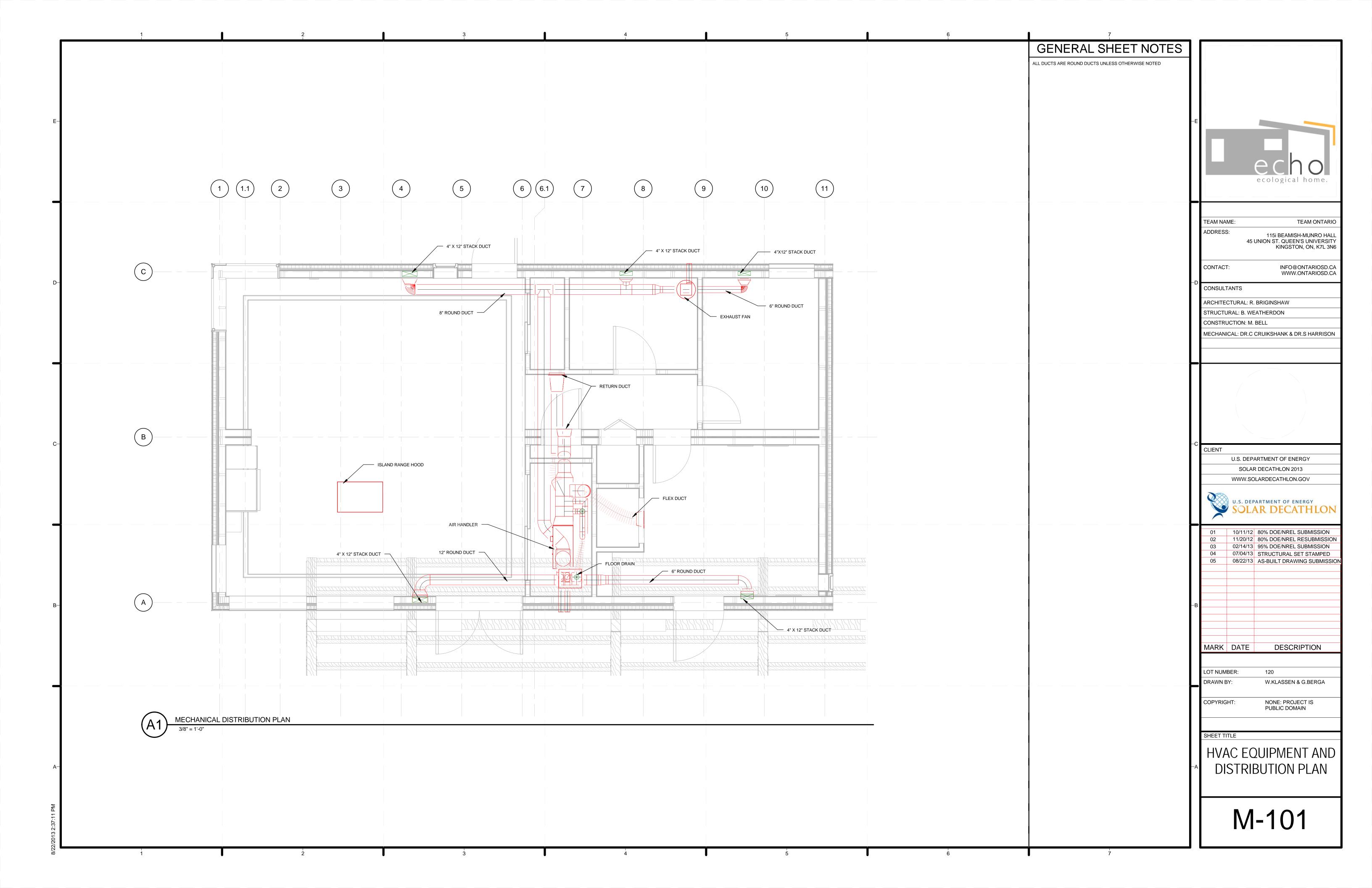


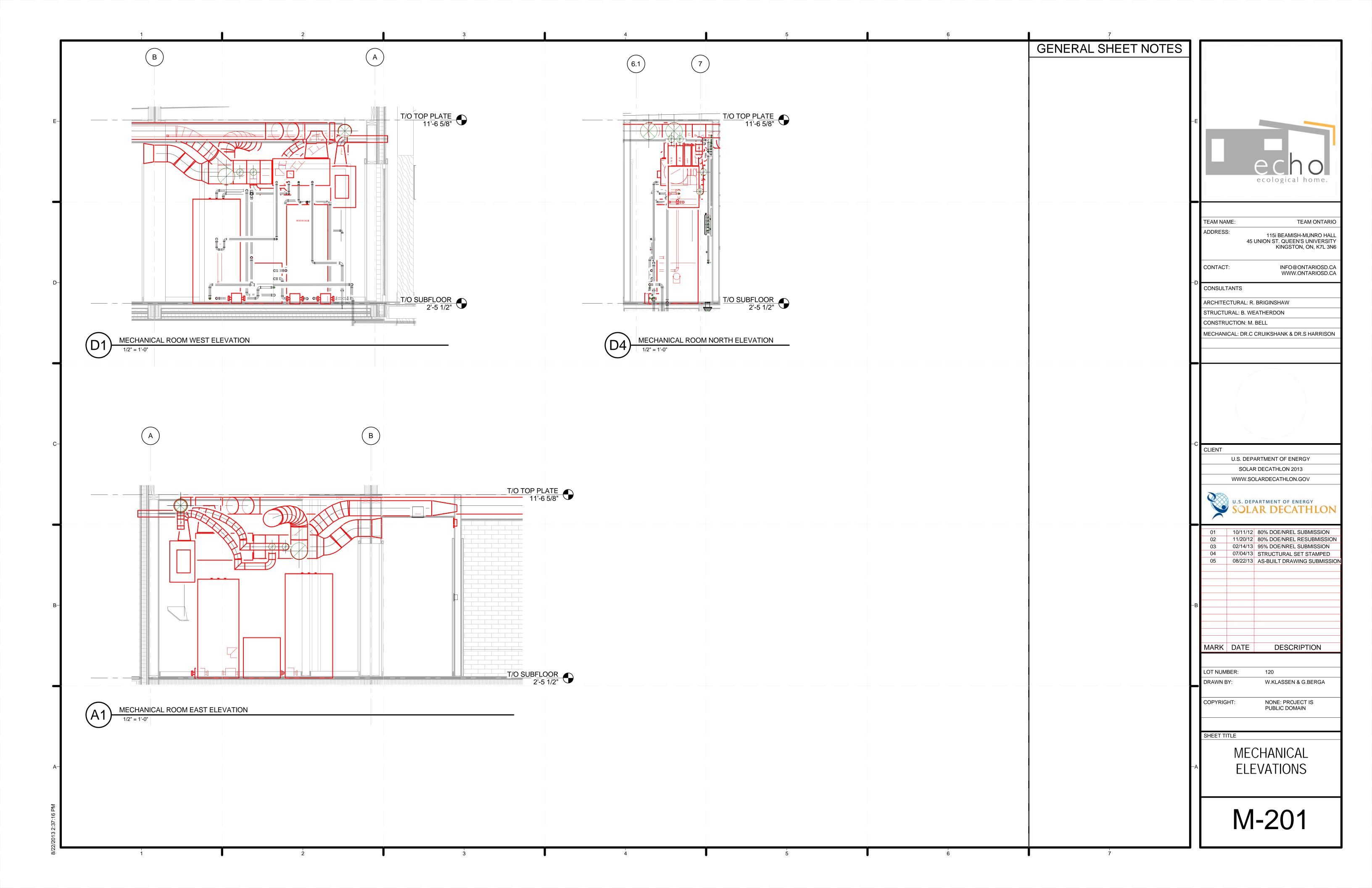
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MARK SPECIFICATION DESCIRPTION  NUMBER  RHEEM SOL  (120 US. GAL	TYPE MANUFACTURER MODEL  ARAIDE HOT WATER HEATER  RHEEM 81VR-120-1 1	QUANTITY UNIT					
WT2 22 33 00 2.3D COLD WATER TANK COLD TANK PROPYLENE	- (FOOD - GRADE (NON-TOXIC)         RHEEM         RHEEM SOLARAIDE (80 US GaI)         1           LD EXPANSION TANK         FLEXCON Ind.         IXX165 SERIES B6000 BALL         3	EACH EACH EACH 2 EACH					
V3         23 05 23 2.2H         DRAIN VALVE         3/4" SOLDER           V4         23 05 23 2.2F         CHECK VALVE         CHECK VALVE	DW ADJUSTMENT VALVE         WATTS         100XL         3           ED PURGE VALVE         WATTS         RPVM1         5           YE 3/4"         WATTS         SERIES 7         7           SLOBE VALVE         WATTS         GLV         2	EACH EACH EACH EACH				-E	
V6 23 05 23 2.2K AUTOMATIC DIVERTING VALVE WITH FEMAL TSV 23 05 23 2.2J THERMOSTATIC TEMPERING VALVE UISTED, CSA	WAY DIVERTING VALVE NPT         BELIMO         ZONE320N-35         2           117, ASSE 1069 & ASSE 1070         WATTS         MMV-UT_M1         2	EACH EACH EACH					
P 23 21 23 PUMP INLINE CENT  HP 23 81 46 HEAT PUMP PUMP	ASS WYE STRAINER WATTS 745 3  GRUNDFOS PUMPS CORPORATION UP 15-42 F/VS 3  VATER SOLAR ASSISTED HEAT WATERFURNACE NSW018 1	EACH EACH					echo
ERV 23 34 23 2.3 ENERGY RECOVERY VENTILATOR CORE  AH1 23 73 13 AIR HANDLING UNIT HEAT PUMP  COPPER WA	CHECK VALVE         WATTS         0.9 BACKFLOW PREVENTER         1           WITH INTERCHANGABLE HRV         VENMAR         EKO 1.5         1           AIR HANDLING UNIT         ECOLOGIX         HPAH30         1           TER TUBE, TYPE M (LIGHT TEMPER ASTM - B88         CERRO         TYPE M         10	EACH EACH					ecological home.
PP2 23 21 13 1.1B 1/2" SOFT COPPER PIPE 1/2 OD AC/R ANNEALED S	REFRIGERATION GRADE 1/2" REFRIGERATION SOFT OPPER CERRO COPPER 20	0 FT 0 FT					TEAM NAME: TEAM ONTARIO
							ADDRESS: 115i BEAMISH-MUNRO HALL 45 UNION ST. QUEEN'S UNIVERSITY KINGSTON, ON, K7L 3N6
D-							CONTACT: INFO@ONTARIOSD.CA WWW.ONTARIOSD.CA CONSULTANTS
							ARCHITECTURAL: R. BRIGINSHAW STRUCTURAL: B. WEATHERDON
							CONSTRUCTION: M. BELL  MECHANICAL: DR.C CRUIKSHANK & DR.S HARRISON
с-						-c	CLIENT
							U.S. DEPARTMENT OF ENERGY SOLAR DECATHLON 2013
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							01 10/11/12 80% DOE/NREL SUBMISSION 02 11/20/12 80% DOE/NREL RESUBMISSION 03 02/14/13 95% DOE/NREL SUBMISSION
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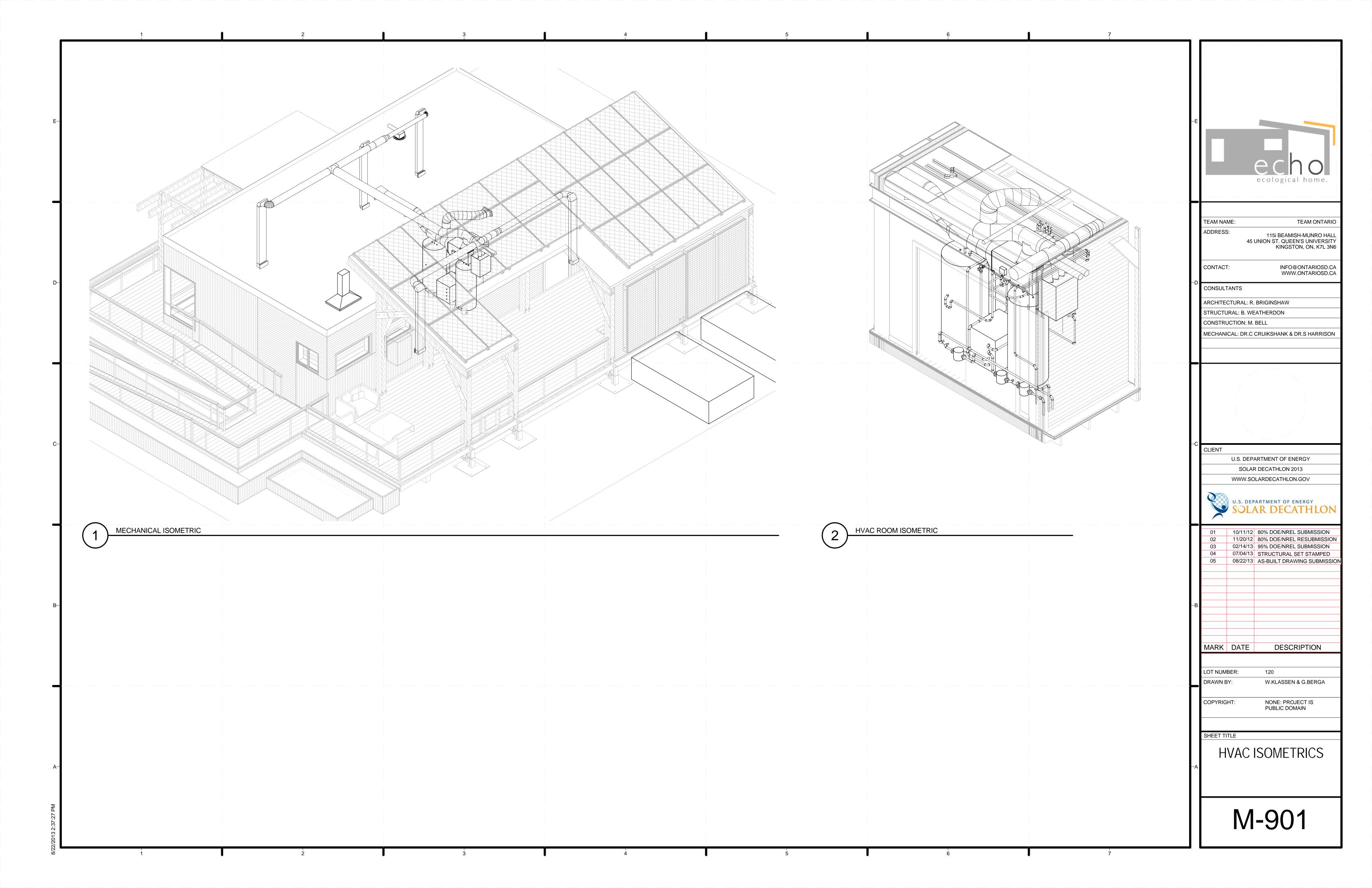


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	MECHANICAL INDEX OF DRAW										
	M-001 MECHANICAL SYMBOLS AND NOTES M-101 HVAC EQUIPMENT AND DISTRIBUTION P										
E-	M-201 MECHANICAL ELEVATIONS M-601 SCHEDULES M-901 HVAC ISOMETRICS									—E	
											ecological home.
4											
											TEAM NAME: TEAM ONTARIO  ADDRESS: 115i BEAMISH-MUNRO HALL
											45 UNION ST. QUEEN'S UNIVERSITY KINGSTON, ON, K7L 3N6  CONTACT: INFO@ONTARIOSD.CA
D-										<b>–</b> c	CONTACT: INFO@ONTARIOSD.CA WWW.ONTARIOSD.CA CONSULTANTS
											ARCHITECTURAL: R. BRIGINSHAW STRUCTURAL: B. WEATHERDON CONSTRUCTION: M. BELL
											MECHANICAL: DR.C CRUIKSHANK & DR.S HARRISON
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			/ENMAR         EKO 1.5         1           COLOGIX         HPAH30         1	UNIT EACH EACH										
	4 233100 2.2A1 GALVANIZED STEEL SPIRAL ROUND DUCT 5 233100 2.2A1 GALVANIZED STEEL SPIRAL ROUND DUCT	IMPERIAL 7" ROUND DUCT IN IMPERIAL 8" ROUND DUCT IN	MPERIAL         GV1994         9           MPERIAL         GV0401         8           MPERIAL         GV0412         48           MPERIAL         GV0427         18	FT FT FT										
E-	7         233100 2.2A1         GALVANIZED STEEL SPIRAL ROUND DUCT           8         233100 2.2A10         GALVANIZED STEEL BOOT FITTING           9         233100 2.2A2         GALVANIZED STEEL STACK DUCT           10         233100 2.2A2         GALVANIZED STEEL STACK DUCT	IMPERIAL 12" ROUND DUCT	MPERIAL         GV0436         3           MPERIAL         GV0710         2           MPERIAL         GV0221         22           MPERIAL         GV0221         22	EACH FT										E
	12         233100 2.2A3         GALVANIZED STEEL ROUND TEE           13         233100 2.2A3         GALVANIZED STEEL ROUND TEE	IMPERIAL 8"X8"X7" TEE (FULL FLOW)  IMPERIAL 10"X10"X10" TEE (FULL FLOW)	MPERIAL         GV0893         1           MPERIAL         GV0900         2           MPERIAL         GV0905         1           MPERIAL         GV1255         1	EACH EACH EACH EACH										
	16 233100 2.2A5 GALVANIZED STEEL ROUND DUCT INCREASER 17 233100 2.2A5 GALVANIZED STEEL ROUND DUCT INCREASER	IMPERIAL 7" to 8" SHORT INCREASER         IMPERIAL 10" to 12" SHORT INCREASER         IMPERIAL 6" ROUND 90° ELBOW	MPERIAL         GV1352         1           MPERIAL         GV0774         2           MPERIAL         GV0775         2           MPERIAL         GV0326         1	EACH EACH EACH EACH										echol
	20         233100 2.2A6         GALVANIZED STEEL ROUND ELBOW           21         233100 2.2A6         GALVANIZED STEEL ROUND ELBOW           22         233100 2.2A7         GALVANIZED STEEL RECTANGULAR ELBOW	IMPERIAL 8" 90° ROUND DUCT         IMPERIAL 8"ADJUSTABLE ELBOW 45°           IMPERIAL 4" X 10" 90° ELBOW         IMPERIAL 4" X 10" 90° ELBOW	WPERIAL         GV0328         1           WPERIAL         GV0329         2           WPERIAL         GV0269         1           MPERIAL         GV1149         3	EACH EACH EACH										ecological home.
	24     233100 2.2A8     GALVANIZED STEEL BOOT FITTING       25     233100 2.2A8     GALVANIZED STEEL BOOT FITTING       26     233100 2.2A8     GALVANIZED STEEL BOOT FITTING	IMPERIAL 4"X10"X 7" ANGLE BOOT IMPERIAL 4"X10"X 6" ANGLE BOOT IMPerial 4"X 12"X 8" ANGLE BOOT IM	MPERIAL GV0633 1	EACH EACH EACH EACH EACH EACH										TEAM NAME. TEAM ONTARIO
	28         233100 2.3A         VOLUME CONTROL DAMPER           29         233100 2.3A         VOLUME CONTROL DAMPER           30         233100 2.3A         VOLUME CONTROL DAMPER           31         233100 2.3C         GALVANIZED STEEL ROUND FLEXIBLE DUCT	8" ROUND MOTORIZED DUCT DAMPER H 6" ROUND MOTORIZED DUCT DAMPER H 4" ROUND MOTORIZED DUCT DAMPER H	ARD6   2   ARD6   2   ARD6   1   ARD6   1   ARD6   1   ARD6   1   ARD6   1   ARD6   ARD6	EACH EACH										TEAM NAME: TEAM ONTARIO  ADDRESS: 115i BEAMISH-MUNRO HALL 45 UNION ST. QUEEN'S UNIVERSITY KINGSTON, ON, K7L 3N6
	32 233100 2.3D INTAKE CAP  33 233100 2.3E EXHAUST VENT CAP  34 233100 2.3E EXHAUST VENT CAP	IMPERIAL BOWFLEX INTAKE CAP 6" IN IMPERIAL BOWFLEX VENT CAP 6" IN IMERIAL BOWFLEX VENT CAP 4" IN	MPERIAL         PA-6W         1           MPERIAL         G-6W         1           MPERIAL         G-4W         1	EACH EACH EACH										
D	36 233713 2.1A AUTOMATIC ZONE SUPPLY REGISTER 37 233713 2.1B AUTOMATIC ZONE SUPPLY REGISTER	4" X 12" AUTOMATIC SUPPLY REGISTER J.	ACKSON SYSTEMS AZR-1204-T 2 ACKSON SYSTEMS AZR-1004-T 3 ACKSON SYSTEMS AZR-1206-T 2	EACH EACH EACH										CONTACT: INFO@ONTARIOSD.CA WWW.ONTARIOSD.CA  CONSULTANTS
														ARCHITECTURAL: R. BRIGINSHAW
														STRUCTURAL: B. WEATHERDON  CONSTRUCTION: M. BELL  MECHANICAL: DR.C CRUIKSHANK & DR.S HARRISON
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ELE	ECTRICAL LEGEND
SYMBOL	DESCRIPTION
X	SURFACE MOUNTED LUMINAIRE
$\boxtimes$	RECESSED INDIRECT LUMINAIRE
Q	WALL MOUNTED LUMINAIRE
Ф	DUPLEX RECEPTACLE
	GFCI RECEPTACLE
AFC!	AFCI RECEPTACLE
	WEATHERPROOF RECEPTACLE
\$	SWITCH
\$	DIMMER SWITCH
\$ <sub>3D</sub>	3-WAY DIMMER SWITCH
Ø	MOTOR
⊠h	FUSE DISCONNECT
$\otimes$	JUNCTION BOX
$\otimes$	SMOKE ALARM
▼	TELEPHONE OUTLET
$\nabla$	TELEVISION OUTLET
	FLUSH MOUNTED ELECTRICAL PANEL

	ELECTRICAL	INDEX OF DRAWINGS
SHEET NO		SHEET NAME
E-001 E	ELECTRICAL SYM	IBOLS AND NOTES
E-101 E	ELECTRICAL DIST	TRIBUTION PLAN
E-103 L	IGHTING PLAN	
E-104 L	OW TENSION PL	AN
E-601 P	PV ONE-LINE DIA	GRAM
E-603 S	SCHEDULES	



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MECHANICAL: DR.C CRUIKSHANK & DR.S HARRISON

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10/11/12 80% DOE/NREL SUBMISSION

02 11/20/12 80% DOE/NREL RESUBMISSION 
 03
 02/14/13
 95% DOE/NREL SUBMISSION

 04
 07/04/13
 STRUCTURAL SET STAMPED

 05
 08/22/13
 AS-BUILT DRAWING SUBMISSION

MARK DATE DESCRIPTION

LOT NUMBER: 120 DRAWN BY: W.KLASSEN & G.BERGA

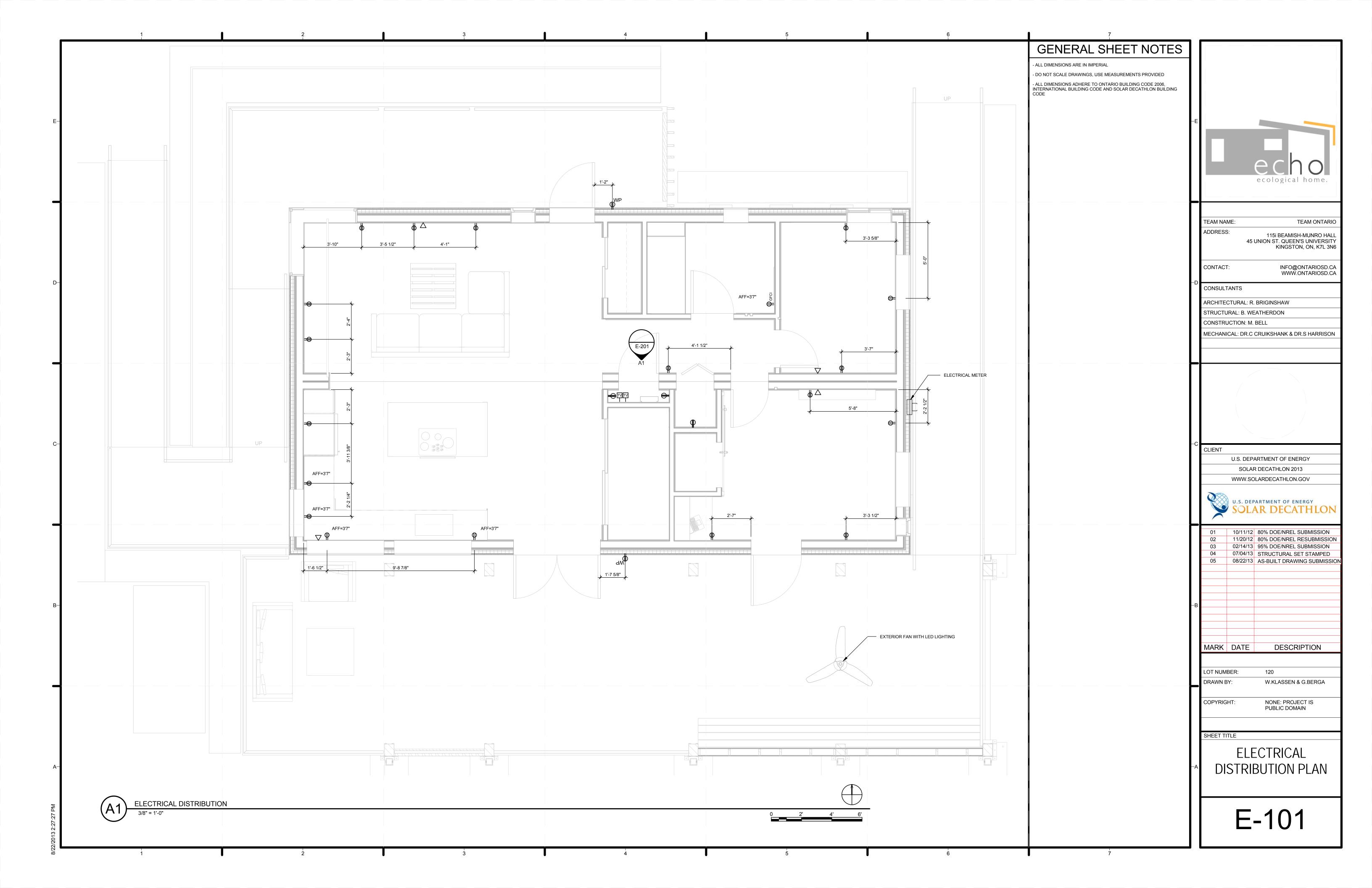
COPYRIGHT:

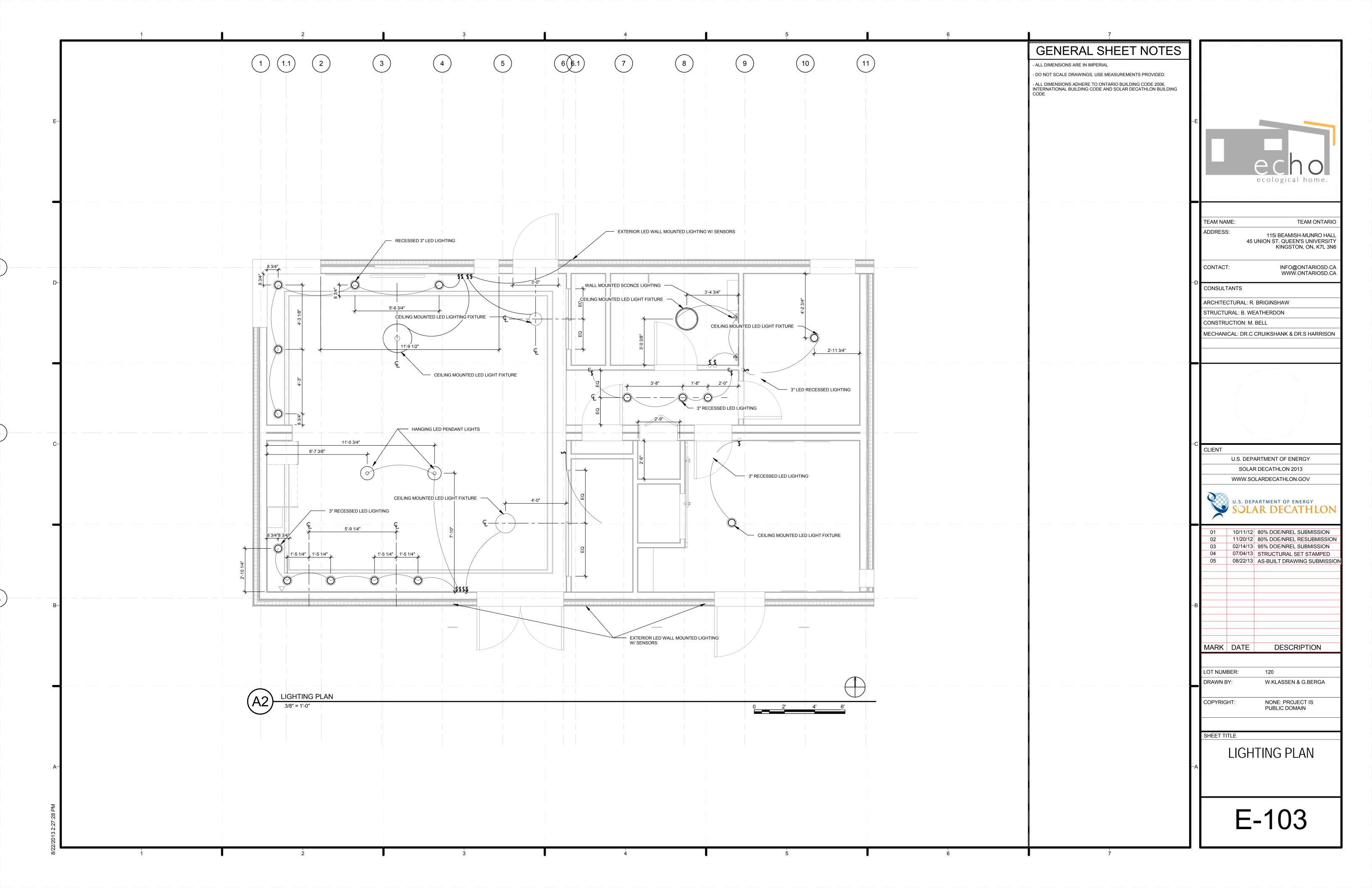
NONE: PROJECT IS PUBLIC DOMAIN

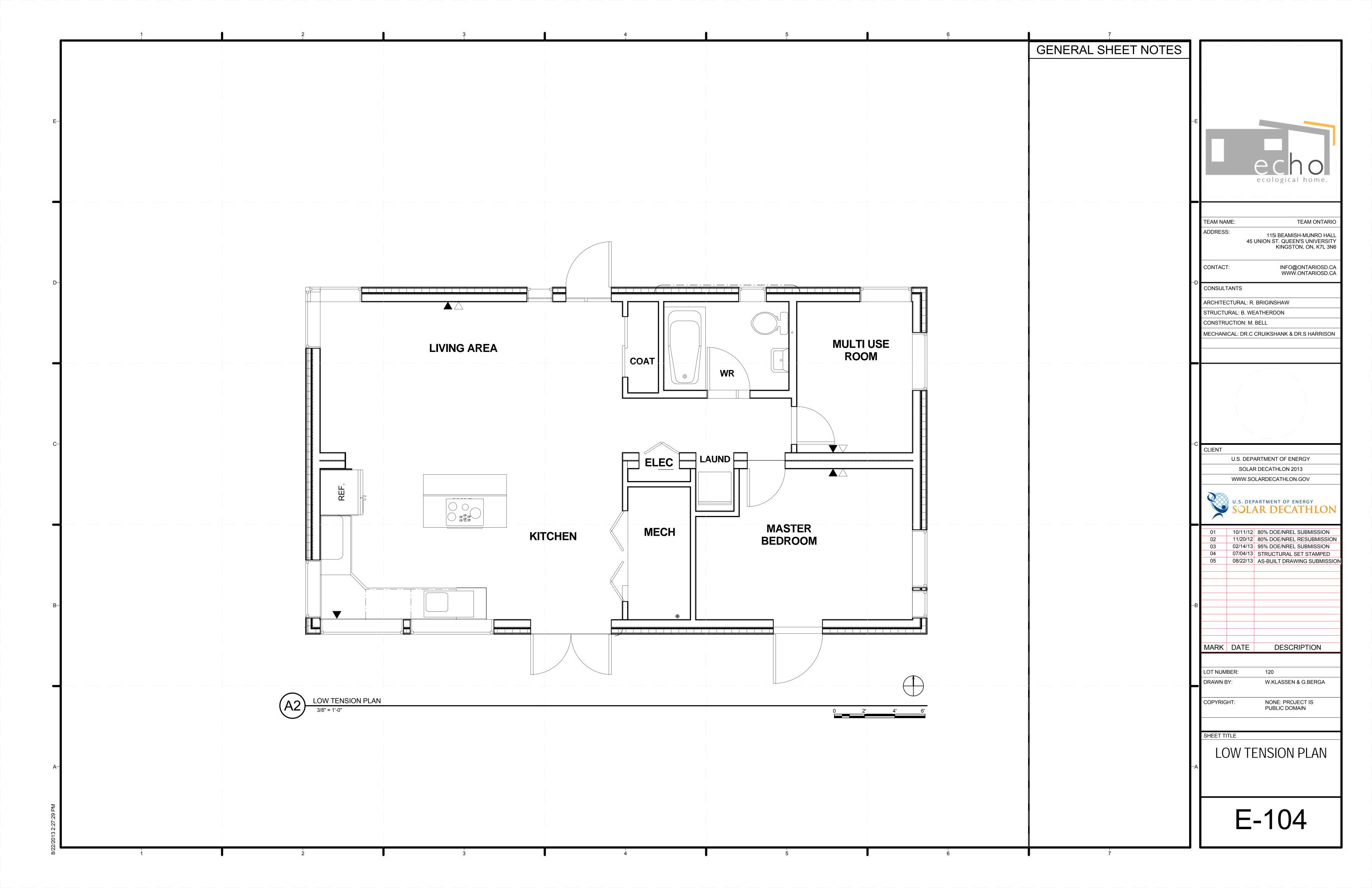
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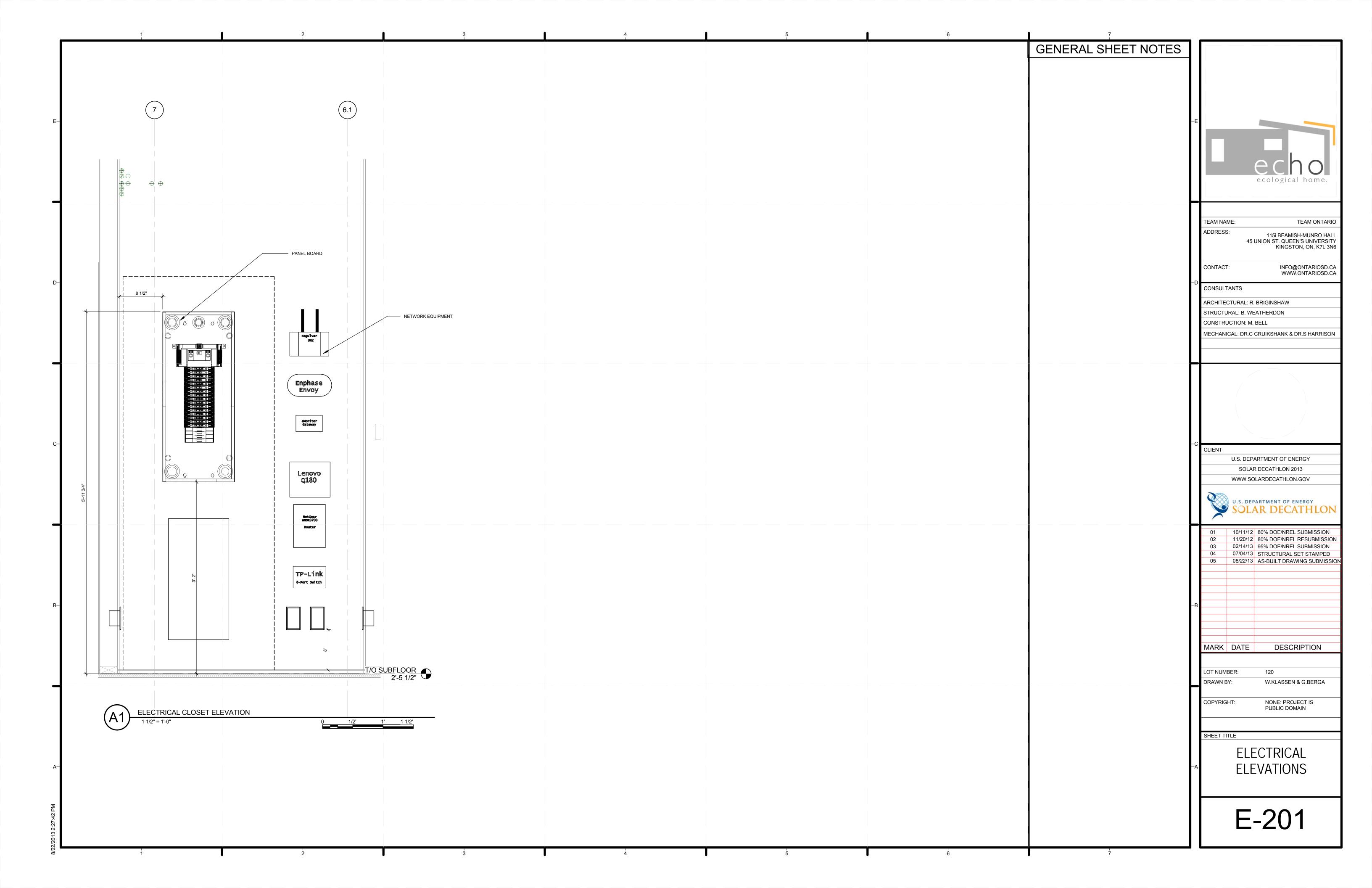
ELECTRICAL SYMBOLS AND NOTES

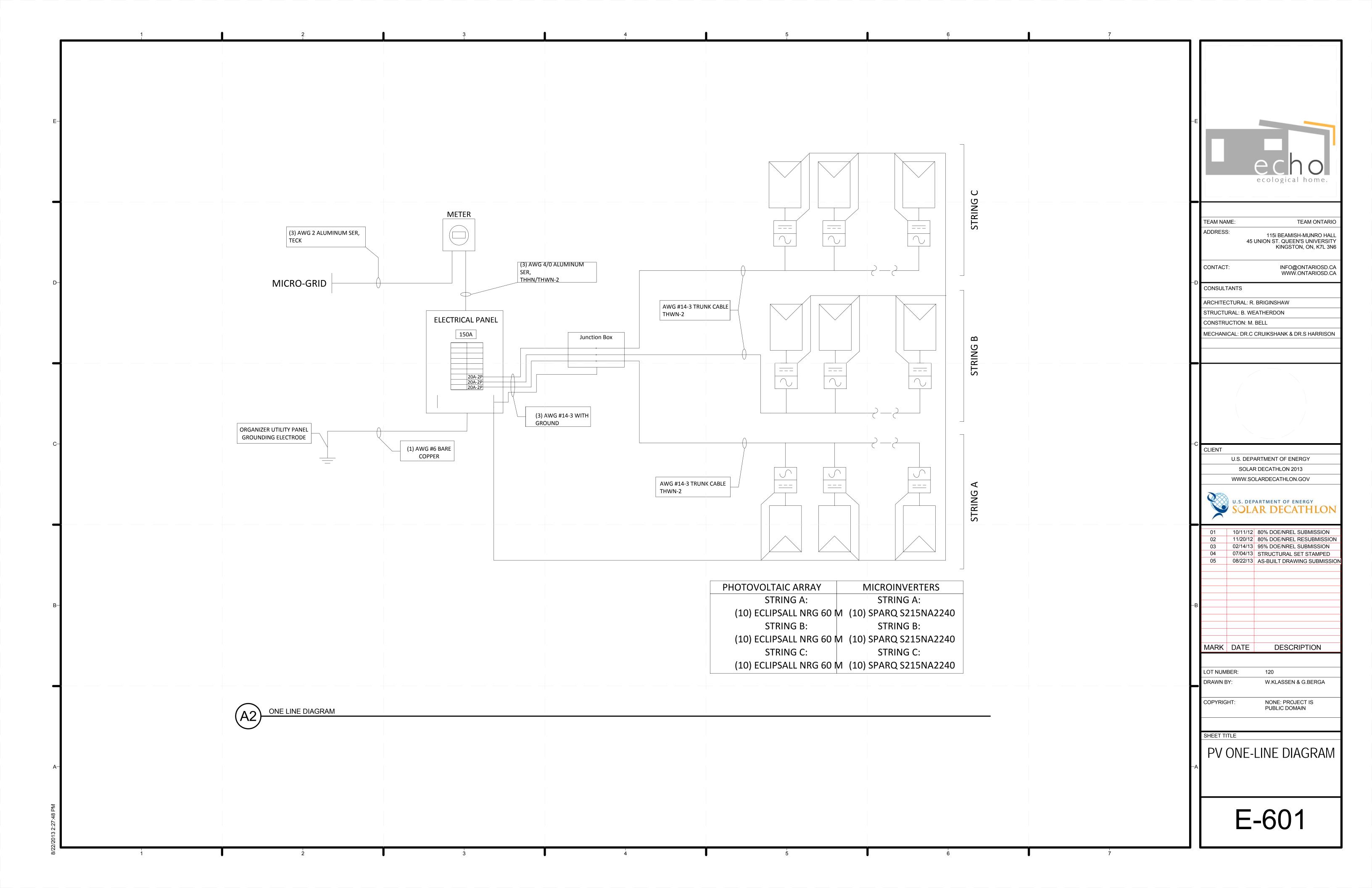
E-001

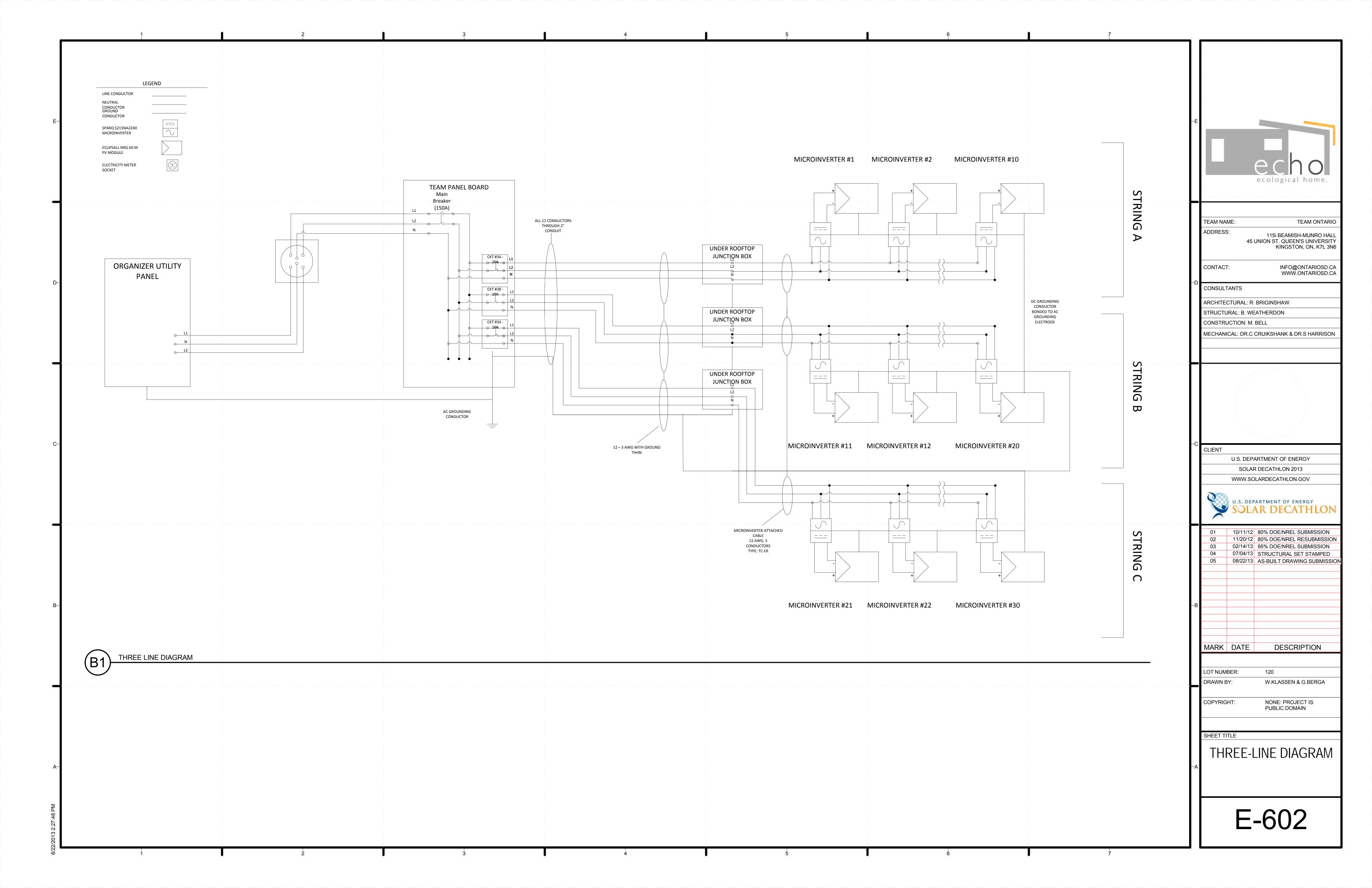












	Voltage &	Phase: 120/240 - 1Ø	Panel Amperage: 200	)A				
	Mo	ounting: Flush	Panel A.I.C Rating: 10k	Panel A.I.C Rating: 10kAIC				
	Other: I	MCB / Bottom Fed	Main Circuit Breaker: 150A					
CIRCUIT	BREAKER	DESCRIPTION	DESCRIPTION	BREAKER	CIR			
1.00000	2P40	COOKTOR	LIEAT DUMP	2P30	2.0			
3.00000	2P40	COOKTOP	HEAT PUMP	2P30	4.0			
5.00000	2P30	OVEN	WATER / FIRE DUMARS	2015	6.0			
7.00000		OVEN	WATER / FIRE PUMPS	2P15	8.0			
9.00000	2P30	CLOTHES DRYER	LAUNDRY ROOM	1P20*	10.0			
11.00000	2P30	CLOTHES DRYER	ELEC + MECH RECEPTACLES	1P15	12.0			
13.00000	1P20*	WATER HEATER	MICROWAVE	1P15	14.0			
15.00000	1720	WATER HEATER	LAUNDRY ROOM	1P20*	16.0			
17.00000	1P15*	KITCHEN RECEPTACLES (WEST)	ERV	1P15	18.0			
19.00000	1P20*	KITCHEN RECEPTACLES (SOUTH)	AIR HANDLER	1P15	20.0			
21.00000	1P15*	KITCHEN RECEPTACLES (ISLAND)	CIRCULATOR PUMPS	1P15	22.0			
23.00000	1P15	REFRIGERATOR	MECH ROOM LIGHTS + LAUNDRY	1P15	24.0			
25.00000	1P15	DISHWASHER	OUTSIDE FRONT RECEPTACLE	1P15***	26.0			
27.00000	1P15	KITCHEN LIGHTS	OUTSIDE BACK RECEPTACLE	1P15***	28.0			
29.00000	1P15	LIVING ROOM LIGHTS	EV CHARCED	2040	30.0			
31.00000	1P15	LIVING ROOM RECEPTACLES	EV CHARGER	2P40	32.0			
33.00000	1P15	HALL + BEDROOM LIGHTS			34.0			
35.00000	1P15**	HALLWAY + MULTI-USE ROOM RECEPTACLES	PV ARRAY 1	2P20	36.0			
37.00000	1P15	MASTER BEDROOM LIGHTS	PV ARRAY 2	2P20	38.0			
39.00000	1P15**	MASTER BEDROOM RECEPTACLES	PV ARRAY 2	2720	40.0			
41.00000	1P15*	BATHROOM RECEPTACLE	RANGE HOOD	1P15	42.0			
43.00000	1P15	BATHROOM LIGHTS + FAN	SPARE	1P15	44.0			
45.00000	1P15	SPARE	SPARE	1P15	46.0			
47.00000	1P15	SPARE	SPARE	1P15	48.0			

	PHOTO'	VOLTAIC E	QUIPMENT					PHOTOVOLTAIC SYSTEM CALC	JLATIONS			
П									T			
	PV ARRAY SUMMARY					MAXIMU	M PHO	TOVOLTAIC SYSTEM VOLTAGE		NEC 690.7(A	A)	
	ENERGY HARVESTING											
_	ARCHITECTURE		MICROINVE 2	RIER				NUMBER OF MODULES CONNECTED IN SERIES		24	°C	
	NUMBER OF BRANCHES		15				-	LOWEST EXPECTED AMBIENT TEMPERATURE (OTTAWA, ONTARIO, CANADA)		-24	°C	
$\overline{}$	PV MODULES PER BRANCH						_				1404 70	
	MAX. POWER PER BRANCH		3750	WATTS				OPEN CIRCUIT VOLTAGE		37.68	VOLTS	
-	MAX. CURRENT PER BRANCH		16	AMPS				STC TEMPERATURE		25	°C	
$\dashv$								V_OC TEMPERATURE COEFFICIENT (BETA)		-49	°C	
$\dashv$	MOTECH POLYCRYSTALLINE							V_OC TEMPERATURE COEFFICIENT (BETA)		-0.34	%/°C	
	MODULE							OPEN CIRCUIT VOLTAGE CORRECTION				
T								FACTOR		1.167		
	MODEL NUMBER		IM-60 BLACK									
	RATED POWER (P_MAX)		250	WATTS			CORR	ECTED OPEN CIRCUIT SYSTEM VOLTAGE		43.97	VOLTS	
	MAX. POWER VOLTAGE (V_MPP)		30.93	VOLTS								
	MAX. POWER CURRENT (I_MPP)		8.08	AMPS								
	OPEN CIRCUIT VOLTAGE (V_OC)		37.68	VOLTS		CALCULA	TION C	F MAXIMUM CIRCUIT CURRENT		NEC 690.8(A	A)	_
_	SHORT CIRCUIT CURRENT (I_SC)		8.63	AMPS								
T	MAXIMUM SYSTEM VOLTAGE		600	VOLTS		(1)	PHOT	OVOLTAIC SOURCE CIRCUIT CURRENTS				
	MAXIMUM SERIES FUSE		15	AMPS								
$\overline{}$	LIMITING REVERSE CURRENT		8.9	AMPS				SHORT CIRCUIT CURRENT (I_SC)		8.63	AMPS	
7								SUM OF PARALLEL MODULES		1		
T	LSC TEMPERATURE COEFFICIENT											
	(ALPHA)		0.07	%/°C				CORRECTION FACTOR		125	%	_
- [	V_OC TEMPERATURE COEFFICIENT (BETA)		.0.34	94.190						1		
_	P_MAX TEMPERATURE		-0.34	%/°C			_	L	_			$\vdash$
Į.	COEFFICIENT (GAMMA)		-0.46	%/°C			MAXIN	MUM CURRENT PER MODULE		10.79	AMPS	
_	STANDARD TEST CONDITION		25	°C				-				
	CERTIFICATIONS		UL1703, IEC612		730	(3)	INVER	TER OUTPUT CIRCUIT CURRENTS				
T												
T							CONT	IN JOUS OUTPUT CURRENT RATING		0.896	AMPS	
	ENPHASE MICROINVERTER											
	MODEL NUMBER		M215			AMPACIT	YAND	OVERCURRENT DEVICE RATINGS		NEC 690.8(E	3)	•
	INPUT DATA (DC)						STRIN	IG A				
	RECOMMENDED INPUT POWER											
	(STC)		190 - 270	WATTS			NUMB	ER OF MICROINVERTERS		15		
	MAXIMUM INPUT DC VOLTAGE		45	VOLTS			MAXIN	NUM CURRENT		13.44	AMPS	
	PEAK POWER TRACKING VOLTAGE		22 - 36	VOLTS				OF MAXIMUM CURRENT		16.8	AMPS	
	OPERATING RANGE		16 - 36	VOLTS			DISTA	NCE FROM JUNCTION BOX TO PANEL BOARD		60	FEET	
	MIN/MAX. START VOLTAGE		22 / 45	VOLTS								
	MAX. DC SHORT CIRCUIT CURRENT		15	AMPS			STRIN	IG B				
	MAX. INPUT CURRENT		10.5	AMPS			NUMB	ER OF MICROINVERTERS		15		
$\perp$							MAXIN	NUM CURRENT		13.44	AMPS	
_	OUTPUT DATA (AC) @ 240V_AC						125%	OF MAXIMUM CURRENT		16.8	AMPS	
	MAXIMUM OUTPUT POWER		215	WATTS			DISTA	NCE FROM JUNCTION BOX TO PANEL BOARD		25	FEET	
$\perp$	NOMINAL OUTPUT CURRENT		0.9	AMPS								
	NOMINAL VOLTAGE/RANGE		240/211-264		VOLTS	(1)	OVER	CURRENT DEVICES				
	EXTENDED VOLTAGE/RANGE		240/206-269		VOLTS							
$\rightarrow$	NOMINAL FREQUENCY/RANGE		60.0/59.3-60.5		HZ			L BOARD OVERCURRENT DEVICE - STRING A		20	AMPS	
$\Box$	EXTENDED FREQUENCY/RANGE		60.0/59.2-60.6		HZ		PANE	BOARD OVERCURRENT DEVICE - STRING B		20	AMPS	
	POWER FACTOR		>0.95					L,	1			
T	MAXIMUM UNITS PER 20A BRANCH CIRCUIT		17			(2)	CONIC	LICTOR AMPACITY				
_				0/		(2)	COND	UCTOR AMPACITY				
	CEC WEIGHTED EFFICIENCY		96.0	%		<del>                                     </del>		CARLE AMPACITY RECUIRED	<del>                                     </del>	16.8	AMPS	
	CURRENT	105 A PM	IS, OVER 3 CYCL			_		CABLE AMPACITY REQUIRED CONDITIONS	IN CONDU	16.8 IT, BELOW R		
+			AK, 1.74MS DUR			_	_	AMBIENT TEMPERATURE	CONDO	25	°C	
		3.27.0.0	,			<u> </u>		AMPACITY OF 12 AWG THHN (90°C) WIRE IN	<del>                                     </del>		-	_
$\dashv$				RT 15 CLA	SS B	<u></u>	L_	CONDUIT	<u></u>	30	AMPS	L
	COMPLIANCE	UL1741/IEI	EE1547, FCC PAR					(NEC TABLE 310.15(B))				
	COMPLIANCE		EE1547, FCC PAR C22.2 NO. 0-M91,		ND 107.1-01							
	COMPLIANCE				ND 107.1-01			CORRECTION FACTOR FOR 4 CURRENT		00	0/	
	COMPLIANCE				ND 107.1-01			CARRYING		80	%	
	COMPLIANCE				ND 107.1-01			CORRECTION FACTOR FOR 4 CURRENT CARRYING CONDUCTORS IN CONDUIT (NEC TABLE 310.15(B)(3)(A)		80	%	
	COMPLIANCE  SOLADECK JUNCTION BOX				ND 107.1-01			CARRYING CONDUCTORS IN CONDUIT (NEC TABLE		24	% AMPS	
					ND 107.1-01			CARRYING  CONDUCTORS IN CONDUIT (NEC TABLE 310.15(B)(3)(A)				
4	SOLADECK JUNCTION BOX		C22.2 NO. 0-M91	0.4-04, A	ND 107.1-01			CARRYING CONDUCTORS IN CONDUIT (NEC TABLE 310.15(B)(3)(A) ADJUSTED AMPACITY UCTOR SIZE CHOSEN FOR STRING A AND B		24	AMPS	
	SOLADECK JUNCTION BOX  MODEL		C22.2 NO. 0-M91	0.4-04, A	ND 107.1-01		COND	CARRYING CONDUCTORS IN CONDUIT (NEC TABLE 310.15(B)(3)(A) ADJUSTED AMPACITY UCTOR SIZE CHOSEN FOR STRING A AND B				
	SOLADECK JUNCTION BOX  MODEL MAXIMUM SYSTEM VOLTAGE		0786-3F	0.4-04, A	ND 107.1-01			CARRYING CONDUCTORS IN CONDUIT (NEC TABLE 310.15(B)(3)(A) ADJUSTED AMPACITY UCTOR SIZE CHOSEN FOR STRING A AND B		24	AMPS	
	SOLADECK JUNCTION BOX  MODEL  MAXIMUM SYSTEM VOLTAGE  MAXIMUM CURRENT		C22.2 NO. 0-M91	0.4-04, A	ND 107.1-01			CARRYING CONDUCTORS IN CONDUIT (NEC TABLE 310.15(B)(3)(A) ADJUSTED AMPACITY UCTOR SIZE CHOSEN FOR STRING A AND B		24	AMPS	
	SOLADECK JUNCTION BOX  MODEL MAXIMUM SYSTEM VOLTAGE MAXIMUM CURRENT MAXIMUM FURS SHORT CIRCUIT		0786-3F	0.4-04, A	ND 107.1-01			CARRYING CONDUCTORS IN CONDUIT (NEC TABLE 310.15(B)(3)(A) ADJUSTED AMPACITY UCTOR SIZE CHOSEN FOR STRING A AND B		24	AMPS	
	SOLADECK JUNCTION BOX  MODEL  MAXIMUM SYSTEM VOLTAGE  MAXIMUM CURRENT  MAXIMUM FUSE SHORT CIRCUIT  CURRENT		0786-3F 600 120	0.4-04, A	ND 107.1-01			CARRYING CONDUCTORS IN CONDUIT (NEC TABLE 310.15(B)(3)(A) ADJUSTED AMPACITY UCTOR SIZE CHOSEN FOR STRING A AND B		24	AMPS	
	SOLADECK JUNCTION BOX  MODEL MAXIMUM SYSTEM VOLTAGE MAXIMUM CURRENT MAXIMUM FURS SHORT CIRCUIT		0786-3F	0.4-04, A  VOLTS  KA  AWG				CARRYING CONDUCTORS IN CONDUIT (NEC TABLE 310.15(B)(3)(A) ADJUSTED AMPACITY UCTOR SIZE CHOSEN FOR STRING A AND B		24	AMPS	

NEC 2011 220.82	NEC 220.61								
EEDER AND SERVICE LOAD CALCULATIONS	FEEDER NEUTRAL LOAD								
MAIN SERVICE	MA	MAIN SERVICE							
GENERAL LOADS					+	HOUSE AREA	957 SQFT x 3VA/SQFT	2871	VA
OLINEIVAE EOADO						SMALL APPLIANCE 20A 2-WIRE	937 301 1 X 3 V A 301 1	2071	VA
HOUSE AREA	957 SQFT x 3VA/SQFT	2871	VA			CIRCUITS	2 x 1500VA/CIRCUIT	3000	VA
SMALL APPLIANCE 20A 2-WIRE CIRCUITS	2 x 1500VA/CIRCUIT	3000	VA			LAUNDRY CIRCUIT	1 x 1500VA/CIRCUIT	1500	VA
LAUNDRY CIRCUIT	1 x 1500VA/CIRCUIT	1500	VA				SUBTOTAL	7371	VA
CLOTHES DRYER	5600VA AT 100%	5600	VA						
COOKING APPLIANCES							3000 VA at 100%	3000	VA
ELECTRIC RANGE	7.7 KW COOKTOP + 4.8 KW OVEN = 12.5KW (NEC TABLE						7371 VA - 3000 VA = 4341 VA at 35%	1530	VA
·	220.55, NOTE 4,1))	8400	VA		·		SUBTOTAL	4530	VA
	TOTAL	21371	VA						
						ELECTRIC RANGE	8400VA AT 70%	5880	VA
WATER HEATER		6000	VA			CLOTHES DRYER	5600VA AT 70%	3920	VA
DISHWASHER		1200	VA			DISHWASHER		1200	VA
REFRIGERATOR		900	VA			REFRIGERATOR		900	VA
RANGE HOOD		200	VA			RANGE HOOD		200	VA
GREY WATER PUMP		373	VA			GREY WATER PUMP		373	VA
WATER SUPPLY PUMP	1/2 HP	373	VA			CIRCULATING PUMP	4 x 85VA	340	VA
FIRE SUPPRESION PUMP		240	VA				TOTAL	17343	VA
CIRCULATING PUMP	4 x 85VA	340	VA						
	TOTAL	9626	VA			CALCULATED LOAD FOR NEUTRAL	17903 VA x 240 V	72	Α
							,		
	SUBTOTAL GENERAL LOAD	30997	VA						
FIRST 10KVA AT 100%		10000	VA						
REMAINDER AT 40%		8399	VA						
	NET GENERAL LOAD	18399	VA						
			1						
IEATING AND AIR CONDITIONING LOADS	1							1	
ENERGY RECOVER VENTILATOR	156VA AT 100%	156	VA						
HEAT PUMP COMPRESSOR	4200VA AT 100%	4200	VA		_				+
LARGEST MOTOR	4200VA AT 25%	1050	VA						+
AIR HANDLER	732VA AT 100%	732	VA						
7	NET HEATING AND AIR CONDITIONING	6138	VA						
OTALS	1	-	'						
NET GENERAL LOAD		18399	VA						
NET HEATING AND AIR CONDITIONING		6138	VA						
TOTAL		24537	VA						
TOTAL CURRENT	-	102	Α						
MAIN SERVICE PANEL BREAKER		200	A						



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SHEET TITLE

SCHEDULES

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