



ALF's House

Project Manager
Avery Sandler
School of Engineering
Alfred, NY 14802
solardecathlon@alfred.edu
917.620.2640



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

Table of Contents

Table of Contents	2
Summary of Changes	4
10.09.2014 Submission	4
11.18.2014 Submission	4
02.12.2015 Submission	4
Rules Compliance Checklist	5
Structural Calculations	8
Flat Roof:	8
Sloped Roof:.....	8
Canopy:.....	9
Dead Load for Roof Covering Material + Solar Panels:.....	9
Truss Spacing:	9
From STAAD Output:.....	9
Bottom Chord Deflection:	9
Truss Reaction Force Long Edge:	9
Wall Loads:.....	9
Dead Load(3lbf for 3/4" plywood + Additional for Finished floor material):.....	10
2" x 10" Floor Joist Spacing:.....	10
Beam Loading:.....	10
Wind Loads:	10
Foundation Load Calculations:	11
Hand Rails	12
Floor Live Loads	13
SeismicModeling for the Foundation Support of Solar House.....	14
Detailed Water Budget	34
Summary of Unlisted Electrical Components	35
Summary of Reconfigurable Feature	36
<i>Resource Furniture</i>	36
Goliath White.....	36
Kali Duo Board.....	38
Flip Chair Orange	39
Penelope.....	40



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Swing Chaise	41
Pocket Chair	41
Pocket Hook	43
Como Basso	44
Tiburon	44
<i>Nanawall</i>	45
Folding Wall.....	Error! Bookmark not defined.
Interconnection Application Form	48
Quantity Takeoff of Competition Prototype House	49
Construction Specifications.....	57
DIVISION 01.....	57
DIVISION 05.....	57
DIVISION 06.....	57
DIVISION 07.....	57
DIVISION 08.....	58
DIVISION 09.....	58
DIVISION 10.....	58
DIVISION 11.....	59
DIVISION 12.....	59
DIVISION 21.....	59
DIVISION 22.....	59
DIVISION 23.....	60
DIVISION 26.....	60
DIVISION 28.....	61
DIVISION 32.....	61



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

Summary of Changes

Time moves on and so do our construction documents. The following Project Manual has been created the first submission, and reflects the development of the house. Below is our submission revision history.

10.09.2014 Submission

The Project Manual has been created and includes:

- Drawing and specifications locations for Rules Compliance Checklist.
- Structural Calculations
- Detailed Water Budget
- Summary of Unlisted Electrical Components
- Summary of Reconfigurable Features
- Interconnection Application Form
- Construction Specifications

11.18.2014 Submission

The Project Manual has been revised with the following changes:

- Drawing and specifications locations for Rules Compliance Checklist.
- Summary of Reconfigurable Features
- Interconnection Application Form
- Quantity Takeoff spreadsheet
- Construction Specifications

02.12.2015 Submission

The Project Manual has been revised with the following changes and updates:

- Drawing and specifications locations for Rules Compliance Checklist.
- Summary of Reconfigurable Features
- Structural Calculations
- Quantity Takeoff spreadsheet
- Construction Specifications



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Rules Compliance Checklist

RULE	RULE DESCRIPTION	LOCATION DESCRIPTION	LOCATION
Rule 4-2	Construction Equipment	Drawing(s) showing the assembly and disassembly sequences and the movement of heavy machinery on the competition site	O-101
Rule 4-2	Construction Equipment	Specifications for heavy machinery	014000
Rule 4-3	Ground Penetration	Drawing(s) showing the locations and depths of all ground penetrations on the competition site	C-101
Rule 4-4	Impact within the Solar Envelope	Drawing(s) showing the location, contact area, and bearing pressure of every component resting directly within the solar envelope	G-201, G-202
Rule 4-5	Generators	Specifications for generators (including sound rating)	None
Rule 4-6	Spill Containment	Drawing(s) showing the locations of all equipment, containers, and pipes that will contain liquids at any point during the event	H-101
Rule 4-6	Spill Containment	Specifications for all equipment, containers, and pipes that will contain fluids at any point during the event	220553
Rule 4-7	Lot Conditions	Calculations showing that the structural design remains compliant even if 18 in. (45.7 cm) of vertical elevation change exists	S-701
Rule 4-7	Lot Conditions	Drawing(s) showing shimming methods and materials to be used if 18 in. (45.7 cm) of vertical elevation change exists on the lot	S-701
Rule 5-2	Solar Envelope Dimensions	Drawing(s) showing the location of all house and site components relative to the solar envelope	G-201, G-202
Rule 5-2	Solar Envelope Dimensions	List of solar envelope exemption requests accompanied by justifications and drawing references	None
Rule 6-1	Structural Design Approval	List of, or marking on, all drawing and project manual sheets that will be stamped by the qualified, licensed design professional in the stamped structural submission; the stamped submission shall consist entirely of sheets that also appear in the drawings and project manual	G-002



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Rule 6-2	Finished Square Footage	Drawing(s) showing all information needed by the rules officials to measure the finished square footage electronically	G-101
Rule 6-2	Finished Square Footage	Drawing(s) showing all movable components that may increase the finished square footage if operated during contest week	G-101
Rule 6-3	Entrance and Exit Routes	Drawing(s) showing the accessible public tour route	G-103
Rule 7-1	Placement	Drawing(s) showing the location of all vegetation and, if applicable, the movement of vegetation designed as part of an integrated mobile system	L-101
Rule 7-2	Watering Restrictions	Drawing(s) showing the layout and operation of greywater irrigation systems	P-103
Rule 8-1	PV Technology Limitations	Specifications for photovoltaic components	263100
Rule 8-3	Batteries	Drawing(s) showing the location(s) and quantity of all primary and secondary batteries and stand-alone, PV-powered devices	E-104
Rule 8-3	Batteries	Specifications for all primary and secondary batteries and stand-alone, PV-powered devices	None
Rule 8-4	Desiccant Systems	Drawing(s) describing the operation of the desiccant system	None
Rule 8-4	Desiccant Systems	Specifications for desiccant system components	None
Rule 8-5	Village Grid	Completed interconnection application form	Page 15
Rule 8-5	Village Grid	Drawing(s) showing the locations of the photovoltaics, inverter(s), terminal box, meter housing, service equipment, and grounding means	E-601
Rule 8-5	Village Grid	Specifications for the photovoltaics, inverter(s), terminal box, meter housing, service equipment, and grounding means	263100, 262713, 260526, 260526
Rule 8-5	Village Grid	One-line electrical diagram	E-601
Rule 8-5	Village Grid	Calculation of service/feeder net computed load per NEC 220	E-603
Rule 8-5	Village Grid	Site plan showing the house, decks, ramps, tour paths, and terminal box	G-101
Rule 8-5	Village Grid	Elevation(s) showing the meter housing, main utility disconnect, and other service equipment	E-401



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Rule 9-1	Container Locations	Drawing(s) showing the location of all liquid containers relative to the finished square footage	H-101
Rule 9-1	Container Locations	Drawing(s) demonstrating that the primary supply water tank(s) is fully shaded from direct solar radiation between 9 a.m. and 5 p.m. PDT or between 8 a.m. and 4 p.m. solar time on October 1	G-601
Rule 9-2	Team-Provided Liquids	Quantity, specifications, and delivery date(s) of all team-provided liquids for irrigation, thermal mass, hydronic system pressure testing, and thermodynamic system operation	223300
Rule 9-3	Greywater Reuse	Drawing(s) showing the layout and operation of greywater reuse systems	P-103
Rule 9-4	Rainwater Collection	Drawing(s) showing the layout and operation of rainwater collection systems	TBD
Rule 9-6	Thermal Mass	Drawing(s) showing the locations of liquid-based thermal mass systems	H-101
Rule 9-6	Thermal Mass	Specifications for components of liquid-based thermal mass systems	223300
Rule 9-7	Greywater Heat Recovery	Drawing(s) showing the layout and operation of greywater heat recovery systems	None
Rule 9-8	Water Delivery	Drawing(s) showing the complete sequence of water delivery and distribution events	P-102
Rule 9-8	Water Delivery	Specifications for the containers to which water will be delivered	O-701,O-702
Rule 9-9	Water Removal	Drawing(s) showing the complete sequence of water consolidation and removal events	O-701,O-702
Rule 9-9	Water Removal	Specifications for the containers from which water will be removed	220553
Rule 11-4	Public Exhibit	Interior and exterior plans showing entire accessible tour route	G-103



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

Structural Calculations

For the ALF house structural calculations had to made to ensure floors, walls and roofs could hold the standard necessary load. Structural calculations were done by the team in order to comply with stipulations of ASCE-7-10, The 2012 International Residence code (IRC), any local or state building codes as well as those stipulated by the Department of Energy for the 2015 Solar Decathlon.

New for the SD2015 competition is the construction of our homes on an unlevelled asphalt surface, rather than the leveled concrete surface as in the SD2013 event and the SD2013 China event. This brought new challenges to the Structural Team along with additional new requirements that were added by the organizers in November of 2014. It was felt that traditional simulation and calculations of wind and seismic would not be accurate for a structure built on unlevelled asphalt. Thus a more detailed analysis was done.

The structural calculations are separated into three groups:

1. Traditional dead load and live load calculations as was done for our October DD.
2. Wind and seismic of the foundation system using only dead loads and no tie-downs. This simulation was done using an FEA analysis using ABACUS software. It was felt that this was the most reliable simulation for frictional forces and lateral movement as well as deformation.
3. Analysis of the upper parts of the house using ROBOT™ structural simulation tool that accompanies Autodesk© Revit.

Flat Roof:

LL Solar panels = 350lb total

LL Solar panels=3.5psf

LL Roof extra safety= 20psf

DL Roof= coverings Shingles 2.5psf

Sloped Roof:

LL Solar Panels=250lb

LL Solar panels=3.5psf

LL Roof extra safety= 20psf



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

DL Roof Shingles = 3psf

Canopy:

LL roof extra safety= 20psf

DL Roof shingles= 2.5psf

Dead Load for Roof Covering Material + Solar Panels:

Total Flat roof=26psf

Total Sloped Roof= 26.5psf

Total Canopy= 22.5psf

Truss Spacing= 24 in

Truss Spacing:

Distributed Load= Total roof * Truss spacing = [lbf/ft]

Flat Roof=13 lb/f

Sloped Roof=13.25lb/f

Canopy=11.25lb/f

From STAAD Output:

Deflection(1)=[(.021mm)²+(0.346mm)²]^{.5}

Deflection(1)= -0.347mm

Bottom Chord Deflection:

Number of trusses= ceil[(11.04m/truss spacing)+1]=20

Truss Reaction Force Long Edge:

Reaction= 1.187kN

Reaction= 266.848 lbf

Total truss load = (number of trusses* Reaction)/(11.04m)

Total Truss load= 147.347 lbf/ft

Wall Loads:

Gravity Design Floor:

LLFloor= 50 psf

[Status]

U.S. D.O.E. Solar Decathlon 20115

Published 2/12/2015

Page -9



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

DLFloor= 5 psf

Dead Load(3lbf for 3/4" plywood + Additional for Finished floor material):

Total Floor= LLFloor + DLFloor

Total Floor= 55 psf

Floor spacing= 16in

2" x 10" Floor Joist Spacing:

16in = 0.406m

Floor Span = 3.18m

Distributed load= Total Floor * Floor Spacing= 73.33 lb/f

Reaction sillpl = [distributed load* floor span]/2

Total Floor area=840ft²

Beam Loading:

Floor=[ceil((span/floor span)+1)*reactionSillPL]/span

Wall= Total Load wall=[lb/ft]

Roof = total load truss= [lb/ft]

Total STBeam= Floor + Wall + Roof = lb/ft

Wind Loads:

North area of building= 237.8 ft²

East area of building= 192.1 ft²

West area of building= 192.1 ft²

South area of building= 332.7 ft²

3 second gusts

C exposure

Basic wind speed retrieved from fig {} fig. {}



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

$V = 85 \text{ mph}$

$P_{sf} = 0.00256 \times \text{wind velocity}^2$

Leeward wall

$P_l = \{psf\}$

Side walls

$P_s = \{psf\}$

Flat Roof

$P_f = P_{sf}$

$[F_{wi}/(lb/ft)] = \#$

$[P_{wi}/(lb/ft)] = \#$

$i = 0,1$

Foundation Load Calculations:

	Loads	Additional	Sum
Canopy	6120	2160	8280
Sloped Roof	21200	1576.75	22776.75
Flat Roof	31590	3120	34710
Floor	47850		47850
Walls	5228.1	5104	10332.1
Truss	6856.75		6856.75
Wind	calculator		
Beams	394.8	768	1162.8
Decking	78000		78000
Total sf	50.25		
(Load/# Support)/sf			4178.476



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

Hand Rails

Hand rails were modeled in ROBOT™ using a concentrated 200 pound load applied between supporting posts. Below are the line moment and deflection drawings. A maximum deflection of 0.38 inches was calculated.



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

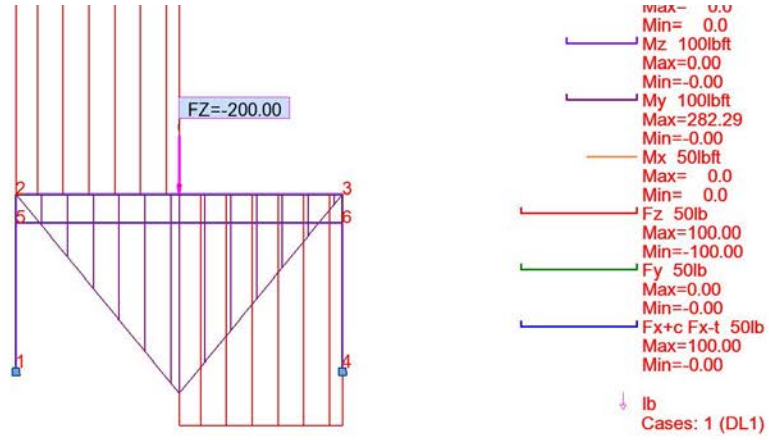


Figure 1 Moment Diagram of Handrail

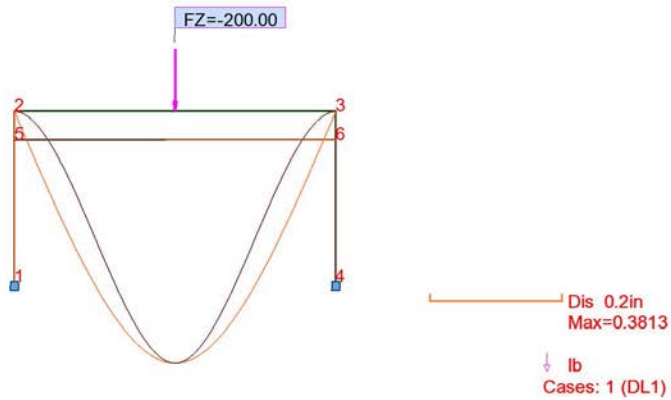


Figure 2 Deflection of Handrail

Floor Live Loads

Figures 3 and 4 are similar diagrams for the floor live loads. There are no ramps in our design.



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

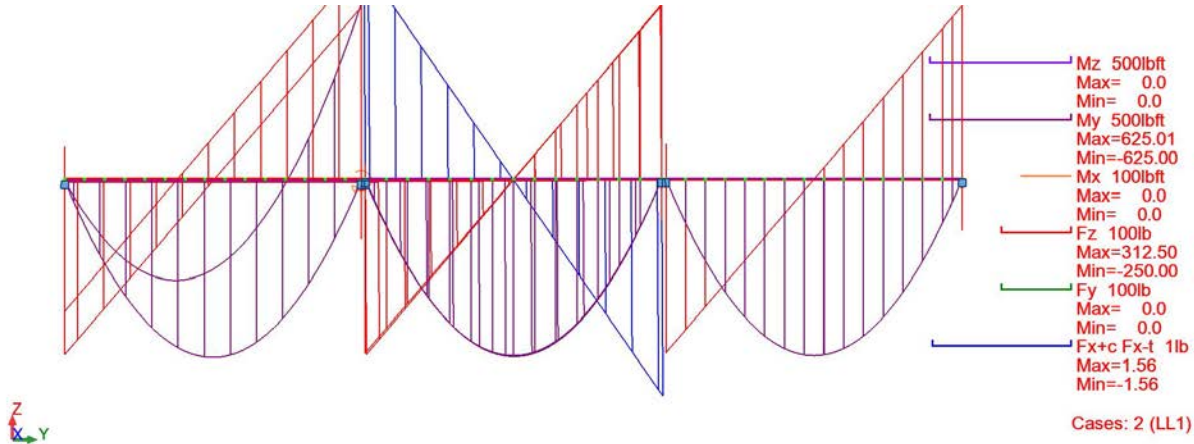


Figure 3 Floor moment analysis

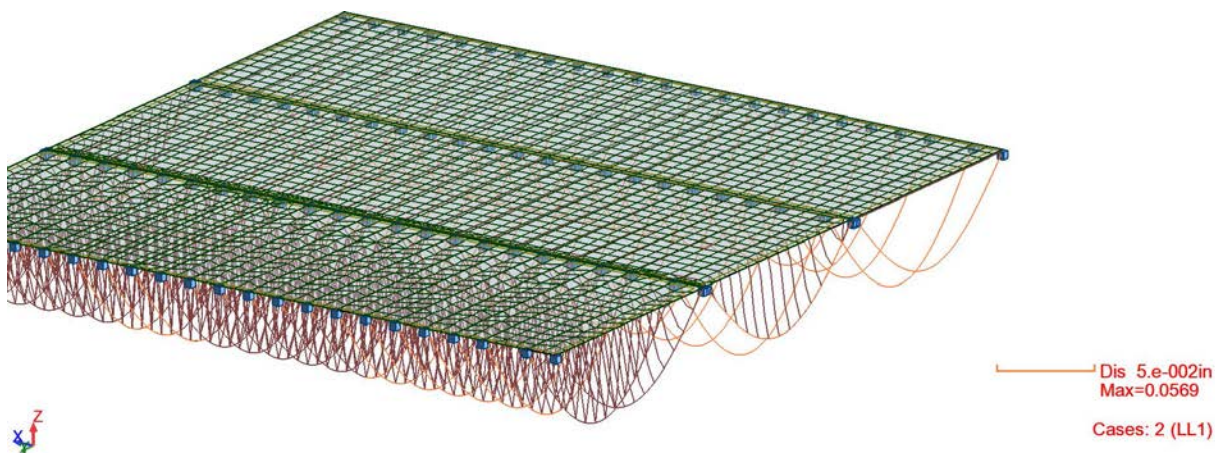


Figure 4 Displacement diagram of floor live loads.

SeismicModeling for the Foundation Support of Solar House

Taolong Xu

2/12/2015

1. Model design

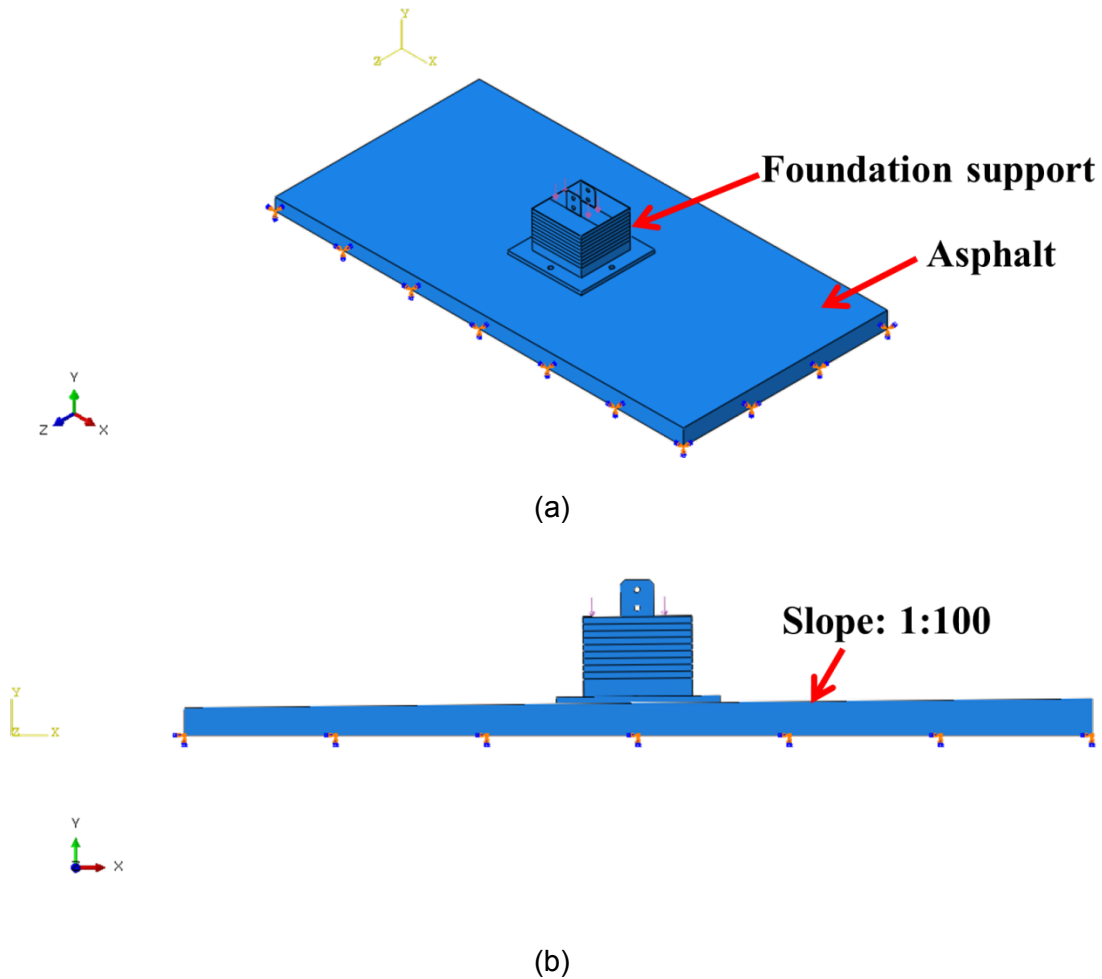


Fig. 1. FE specimen with boundary condition, where the support's contact area to the asphalt ground is 18inch×18inch, and the slope of ground is 1:100.

18inch×18inch support model is selected for the seismic simulation as shown in Fig. 1. Different boundary conditions for specific seismic waves are defined at the bottom of asphalt with slope of 1:100. During the earthquake loading process, the frictional contact is realized by using the surface-to-surface contact between support bottom and asphalt surface, with the friction coefficient of 0.6. Besides the seismic displacement loading, two-scale pressures (184psi and 92psi) of the solar house are applied on the top of the basement in the first simulation step. Then, three-direction (North-South, East-West and Vertical) seismic loadings (Fig. 2) are applied on the bottom of asphalt in the second step. (The constraint is removed when the loading wave is applied on that direction.) The material properties are listed in Tab. 1.

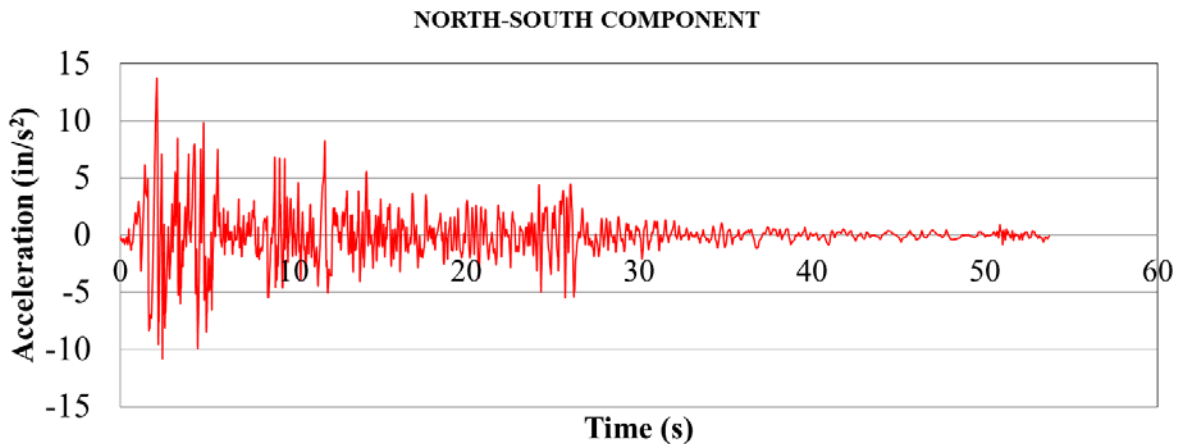


Table. 1. Material properties

Material	Density (lb/in ³)	Young's Modulus (psi)	Poisson's Ratio
Steel	0.281793	3.04579e+07	0.3
Glass fiber (E-Glass)	0.093931	1.04427e+07	0.3
Wood	0.026915	1.27157e+06	0.38
Asphalt	0.085260	1.30534e+06	0.35

2. Loading

Two procedures are adopted in turn for the loading definition. First one is static general step for the pressure from the house weight, which simulation duration is 1 s; the second modeling step is dynamic implicit solution process for the seismic loadings, which contains north-south, east-west and vertical component along three directions. All these dates are derived from the typical vibration data of El Centro earthquake in California, May 18, 1945 that list in Fig. 2.



(a)

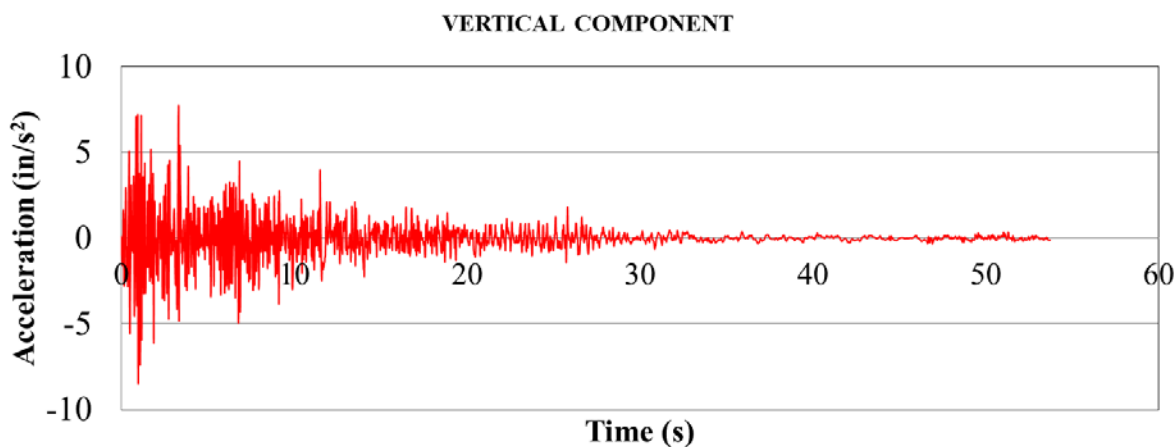
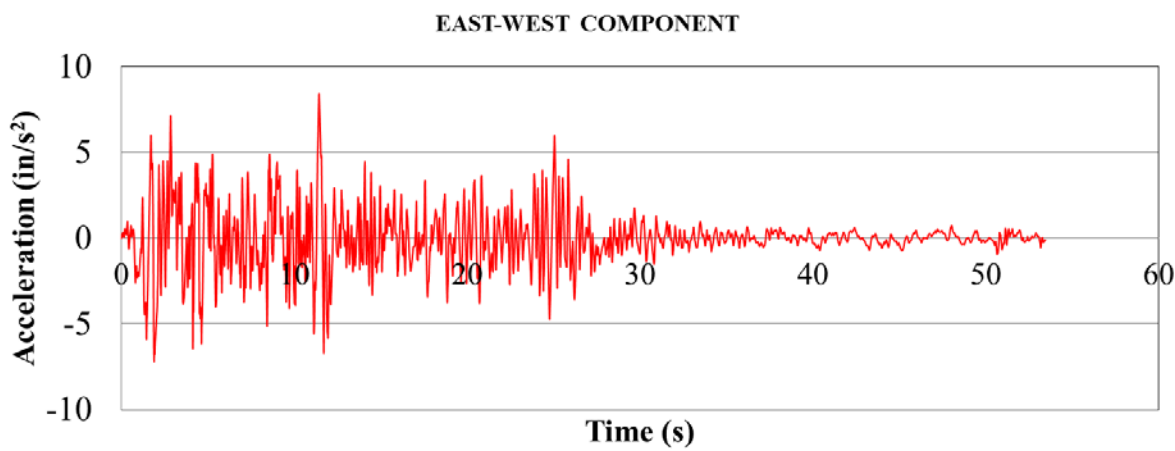


Fig.2 Seismic acceleration data (Vibration data of El Centro earthquake, California, May 18, 1945)

3. Results and Discussion

3.1 System movement under seismic loading

In the simulation, it is assumed that the North-South vibration consistent to the global X-axis, East-West vibration is loaded along to the global Z-axis, and the Vertical vibration is loaded along the global Y-axis. The system (support-asphalt) motions along the waving direction are plotted in Fig. 3, where two pressure



SOLAR DECATHLON

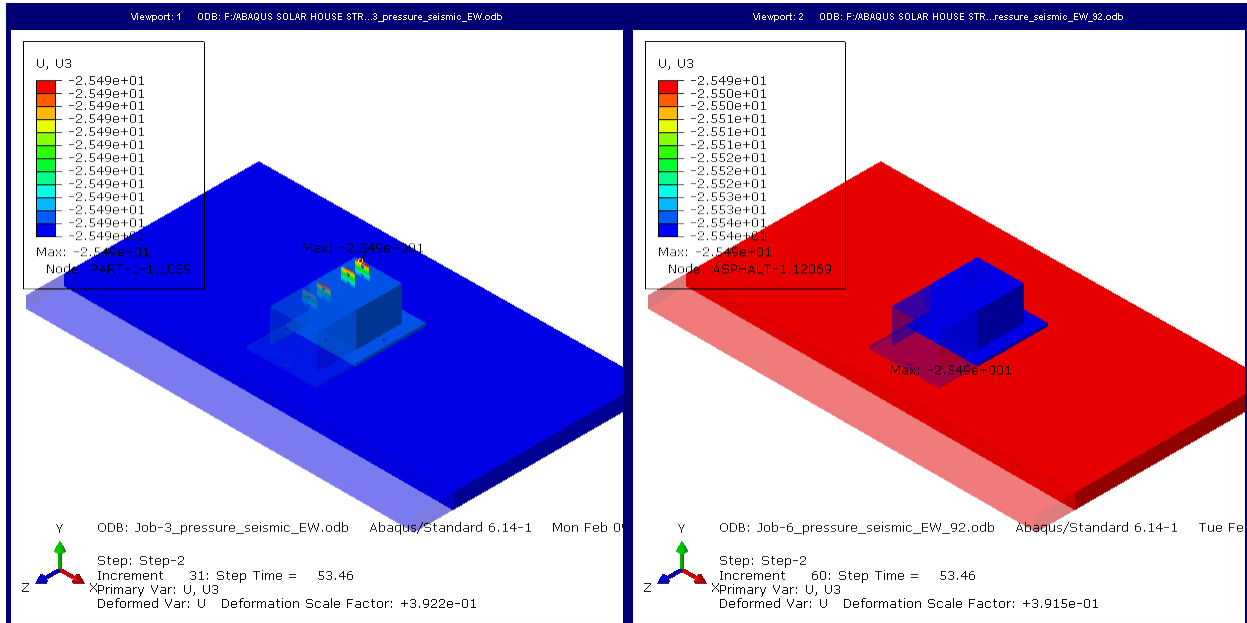
Alfred State College and Alfred University

2015

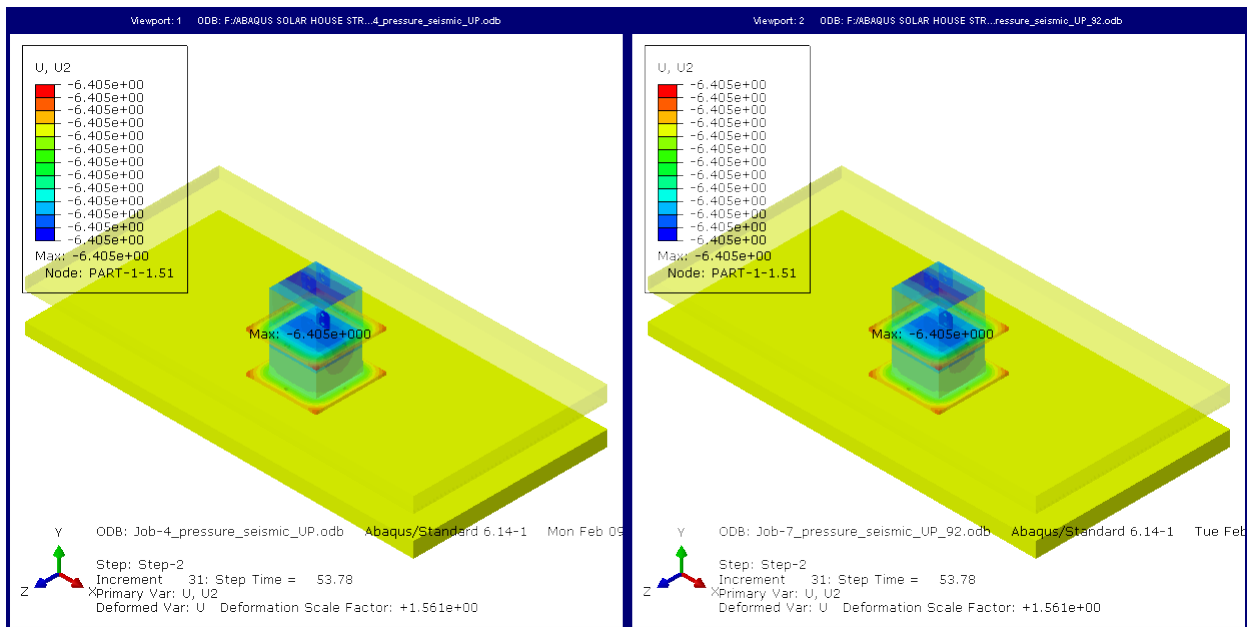
Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org



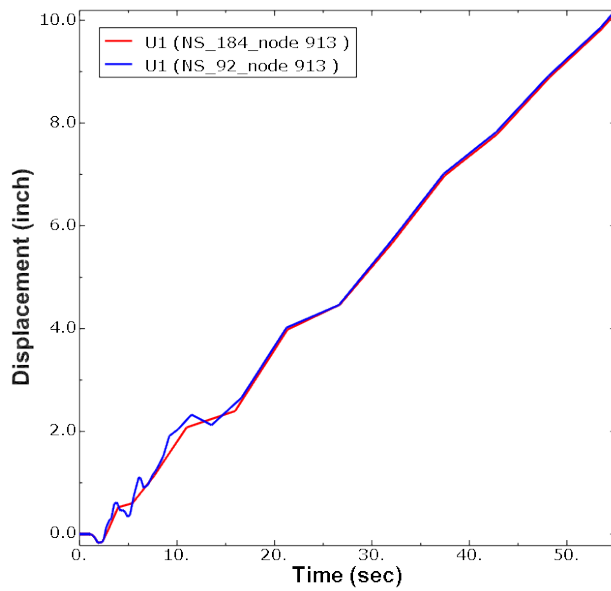
(b) East-West vibration (Max U3=-25.49inch under 184psi; Min U1=-25.54inch under 92psi)



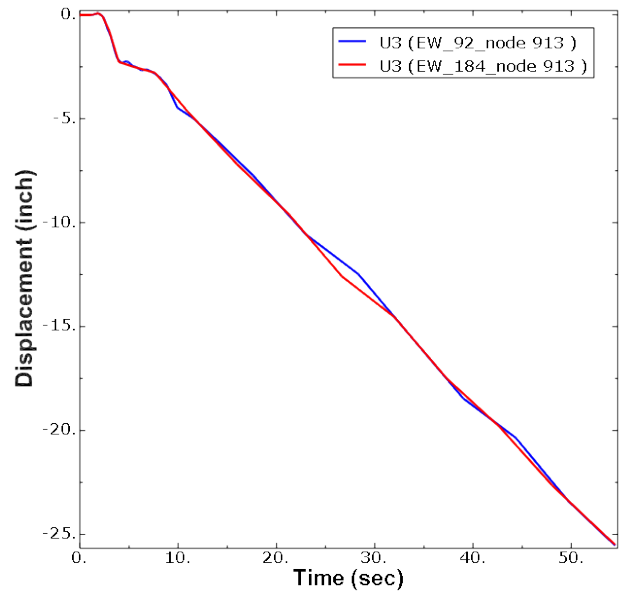
(c) Vertical vibration

Fig.3. System motion along three direction, in which the left plot shows the displacement result under 184psi pressure, and the right one is under 92psi pressure

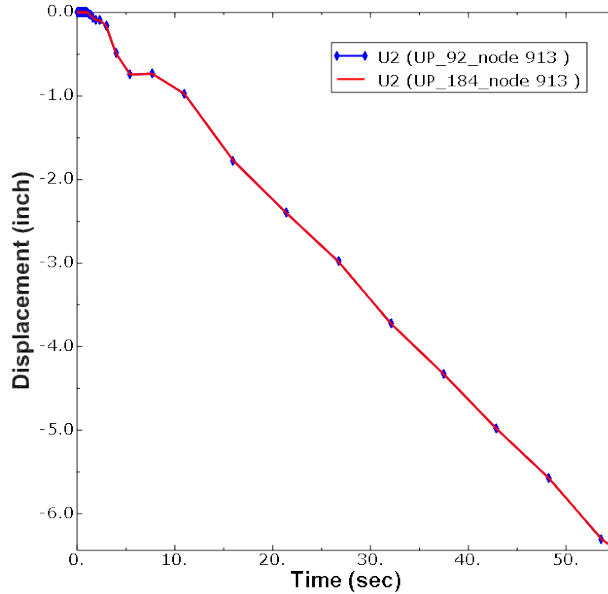
The node 913 on the bottom of support is picked to analysis the specific displacement changing during the earthquake vibration along three directions. The pressure effect in Fig.4 is consistent to the contours results. Nevertheless, the frictional motion under different normal pressure is too small to be detected.



(a) North-South component



(b) East-West component



(c) Vertical component

Fig.4. Time vs. displacement of support's node 193 under two pressure scales, where "NS" denotes the North-South component, "EW" denotes the East-West component, "UP" denotes the Vertical component, "184" and "92" are denote the pressure scale, and the unit is psi.

3.2 Maximum velocity variations

The velocity history responses along three loading directions are addressed in Fig.5, Fig. 6 and Fig. 7, respectively, for North-South vibration, East-West vibration and Vertical vibration. The normal pressure effect shows obviously for the first two components, but not for the third one, say, V2 under Vertical loading.



V1 COMPONENT

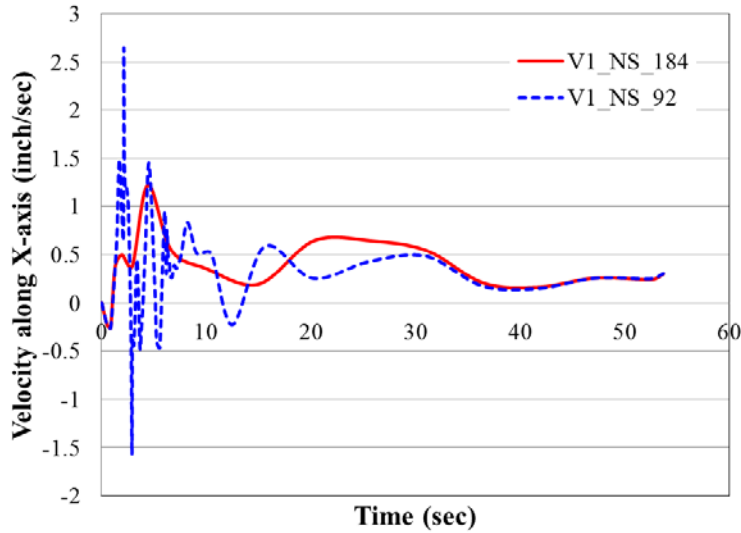


Fig. 5. Velocity component along X-axis under NS seismic loading

V3 COMPONENT

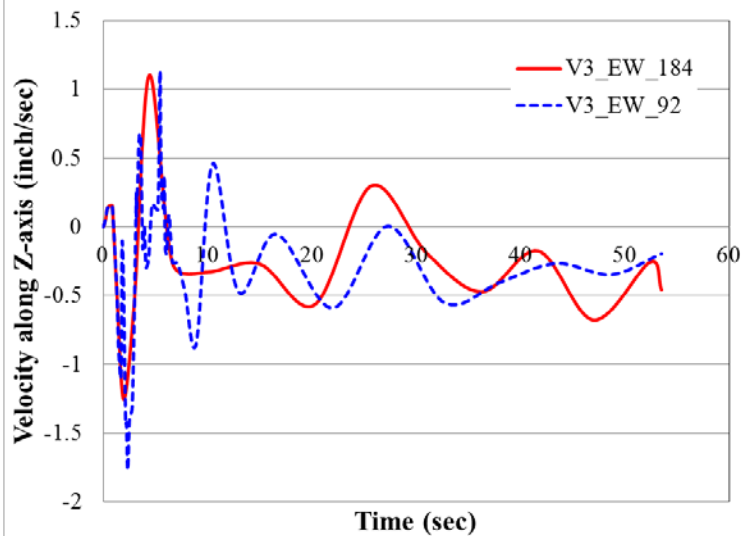


Fig. 6 Velocity component along Z-axis under EW seismic loading

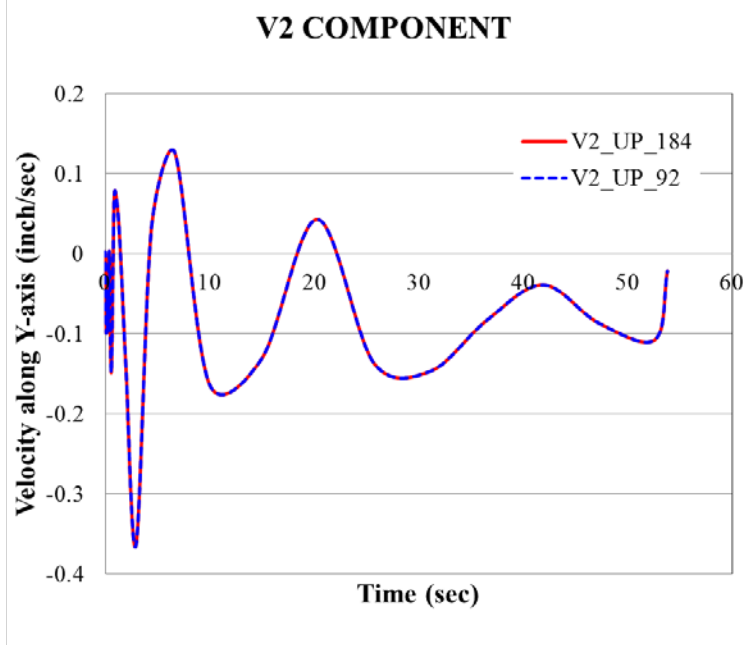


Fig. 7 Velocity component along Y-axis under Vertical seismic loading



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

3.3 Stress and strain distribution and evolution

(1) North-South component

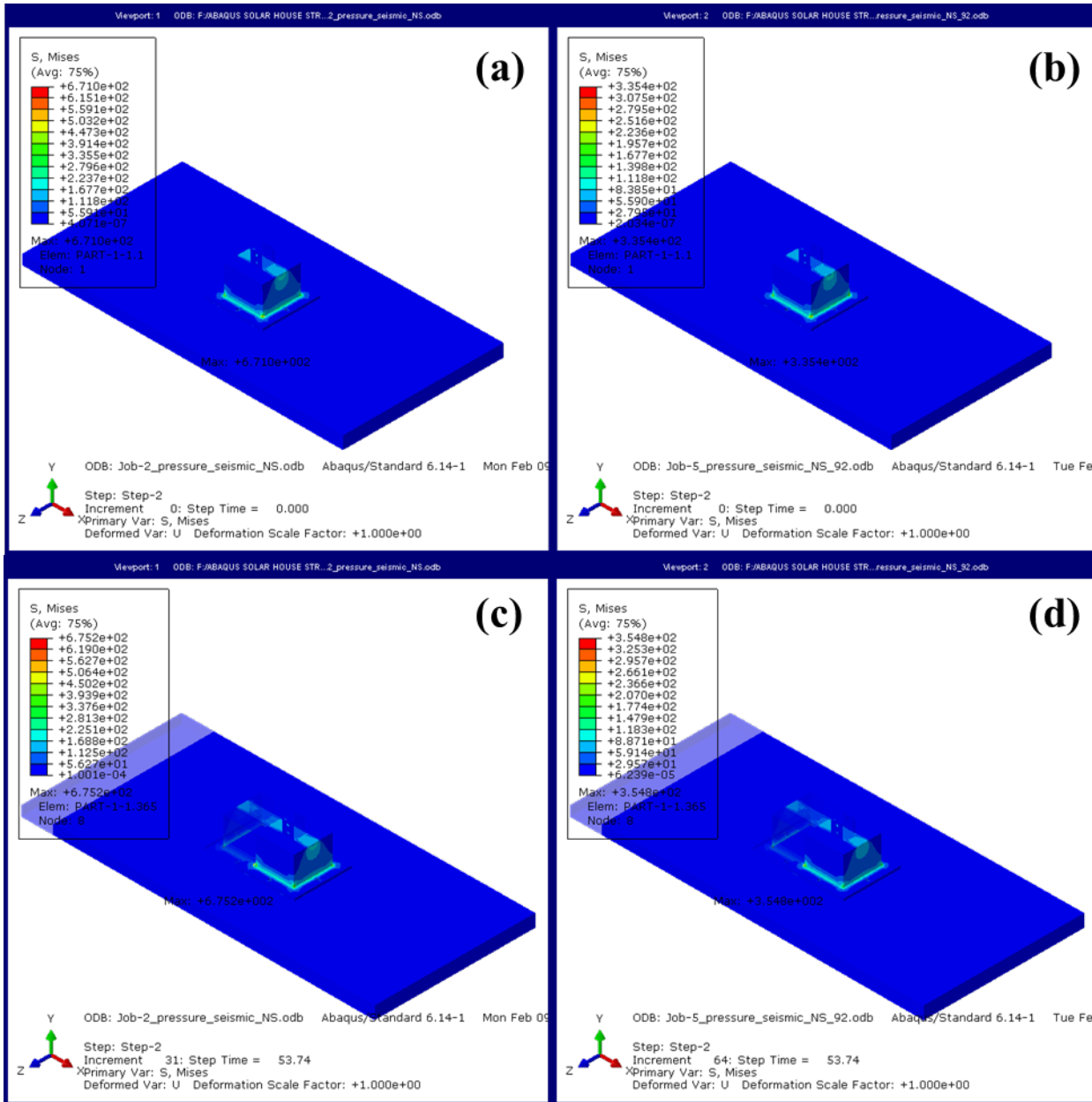


Fig. 8. Stress distribution and evolution, where (a) (c) are the stress contours under 184psi normal pressure, (b) (d) are the stress contours under 92psi normal pressure



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

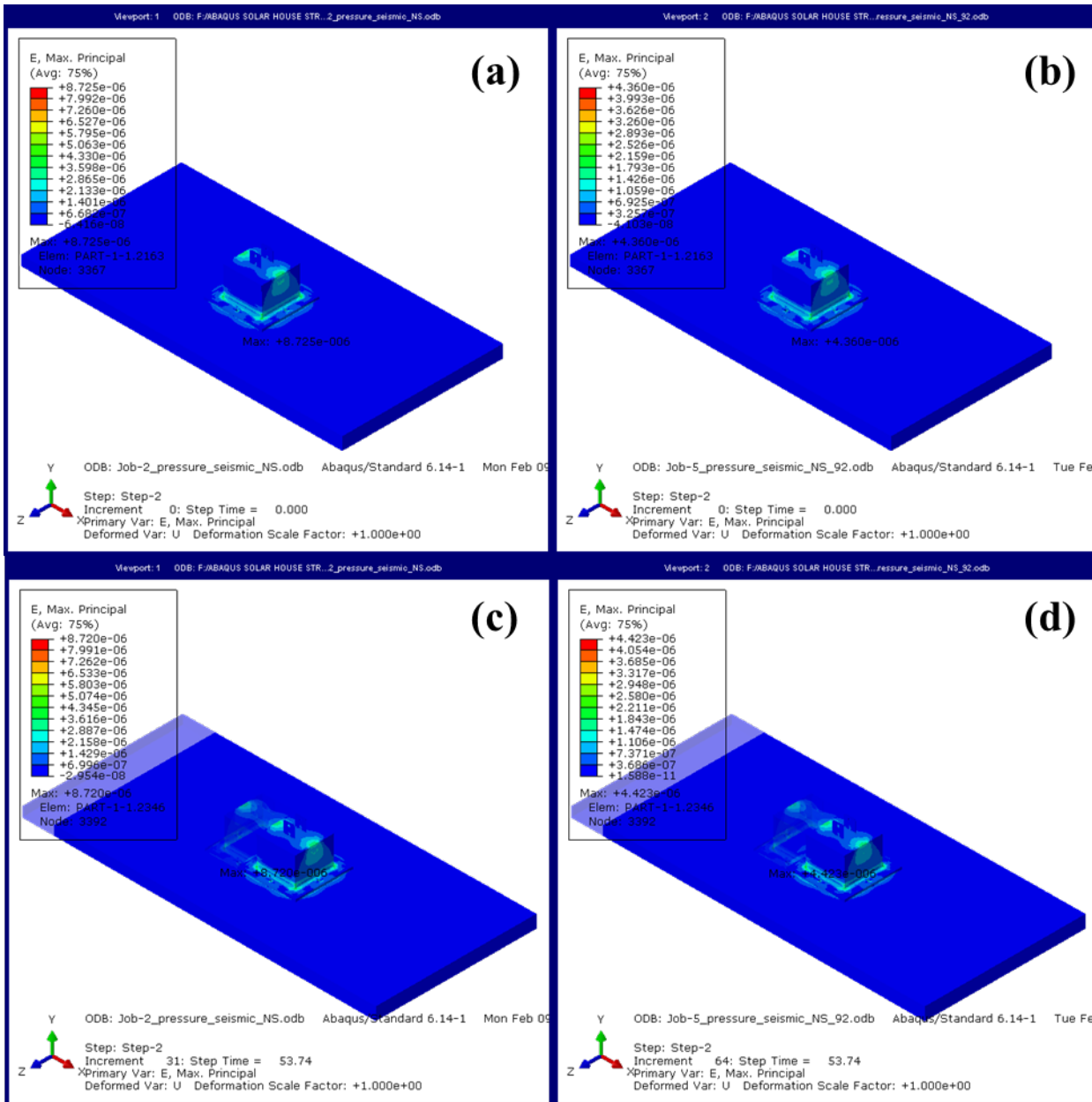


Fig. 9. Strain distribution and evolution, where (a) (c) are the stress contours under 184psi normal pressure, (b) (d) are the stress contours under 92psi normal pressure



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

(2) East-West component

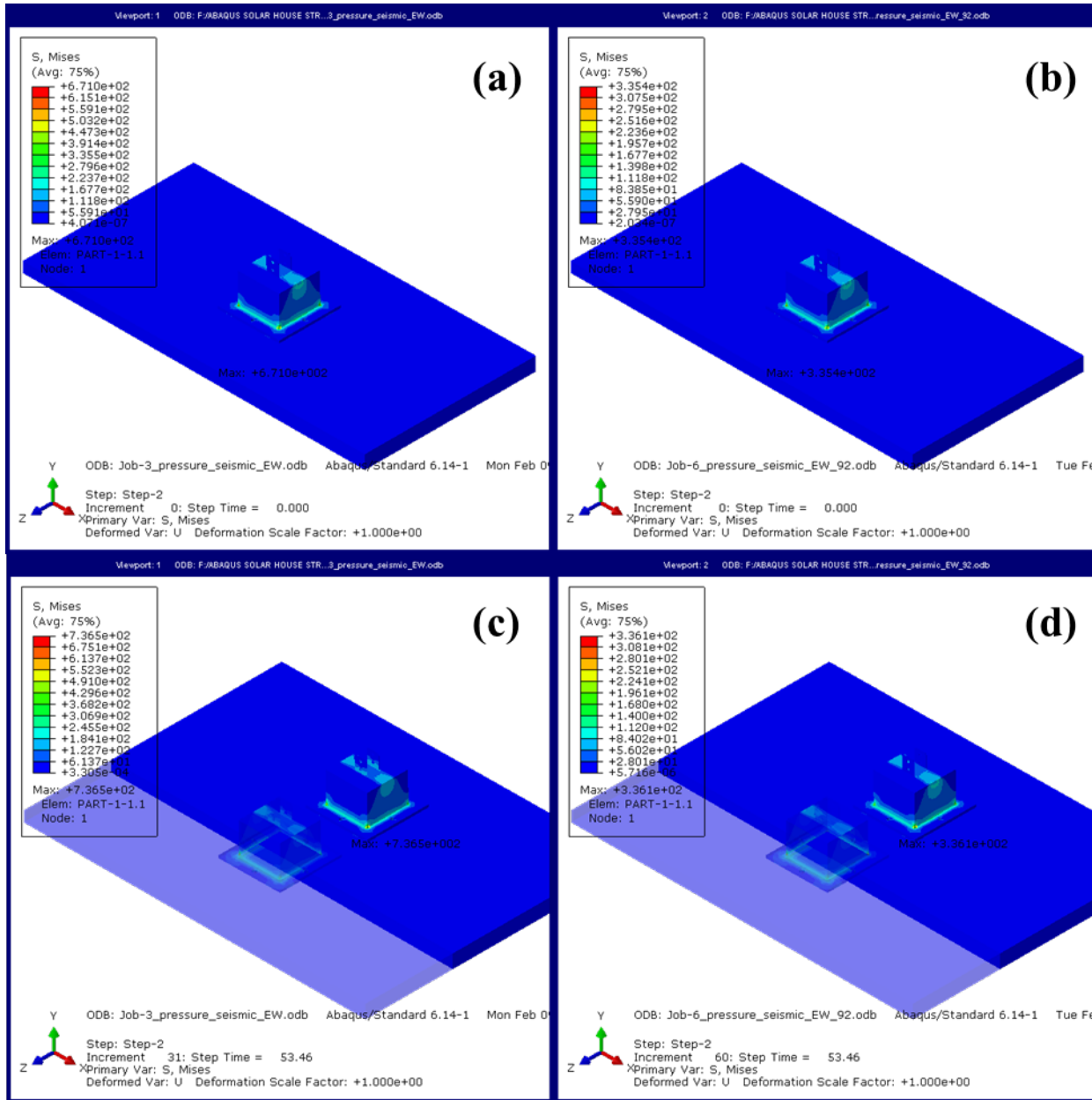


Fig. 10. Stress distribution and evolution, where (a) (c) are the stress contours under 184psi normal pressure, (b) (d) are the stress contours under 92psi normal pressure



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

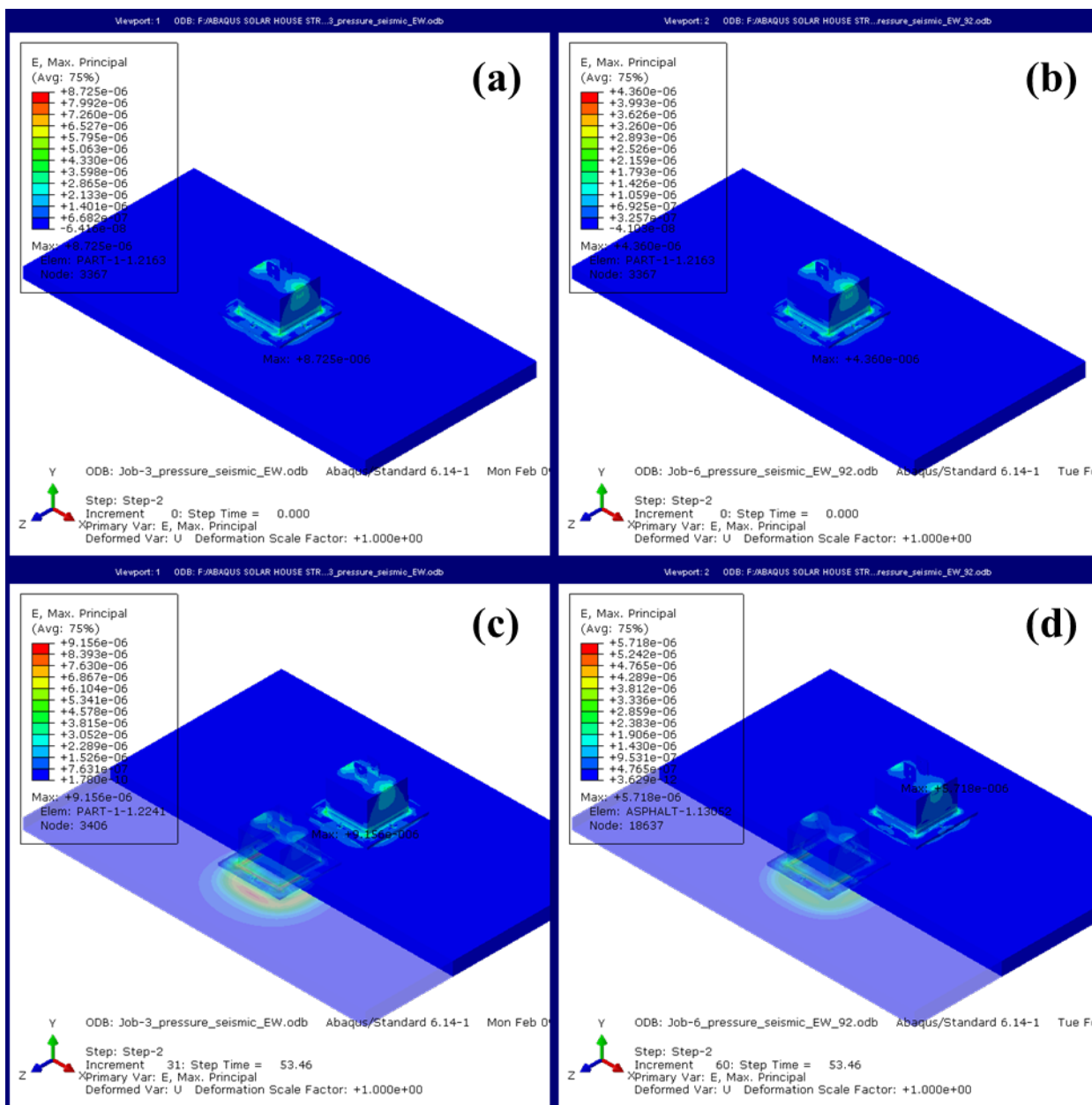


Fig. 11. Strain distribution and evolution, where (a) (c) are the stress contours under 184psi normal pressure, (b) (d) are the stress contours under 92psi normal pressure



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

(3) Vertical component

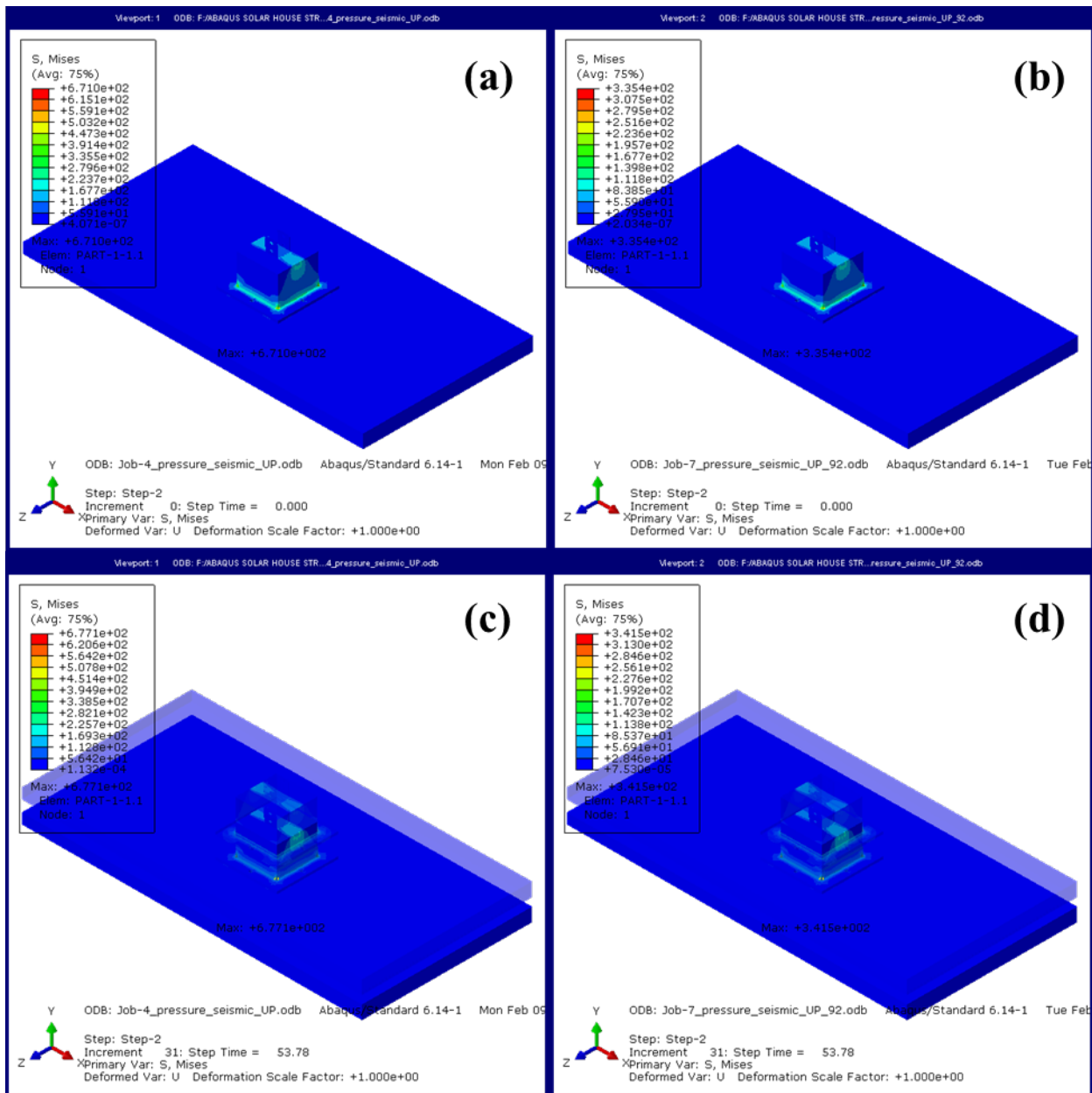


Fig. 12. Stress distribution and evolution, where (a) (c) are the stress contours under 184psi normal pressure, (b) (d) are the stress contours under 92psi normal pressure

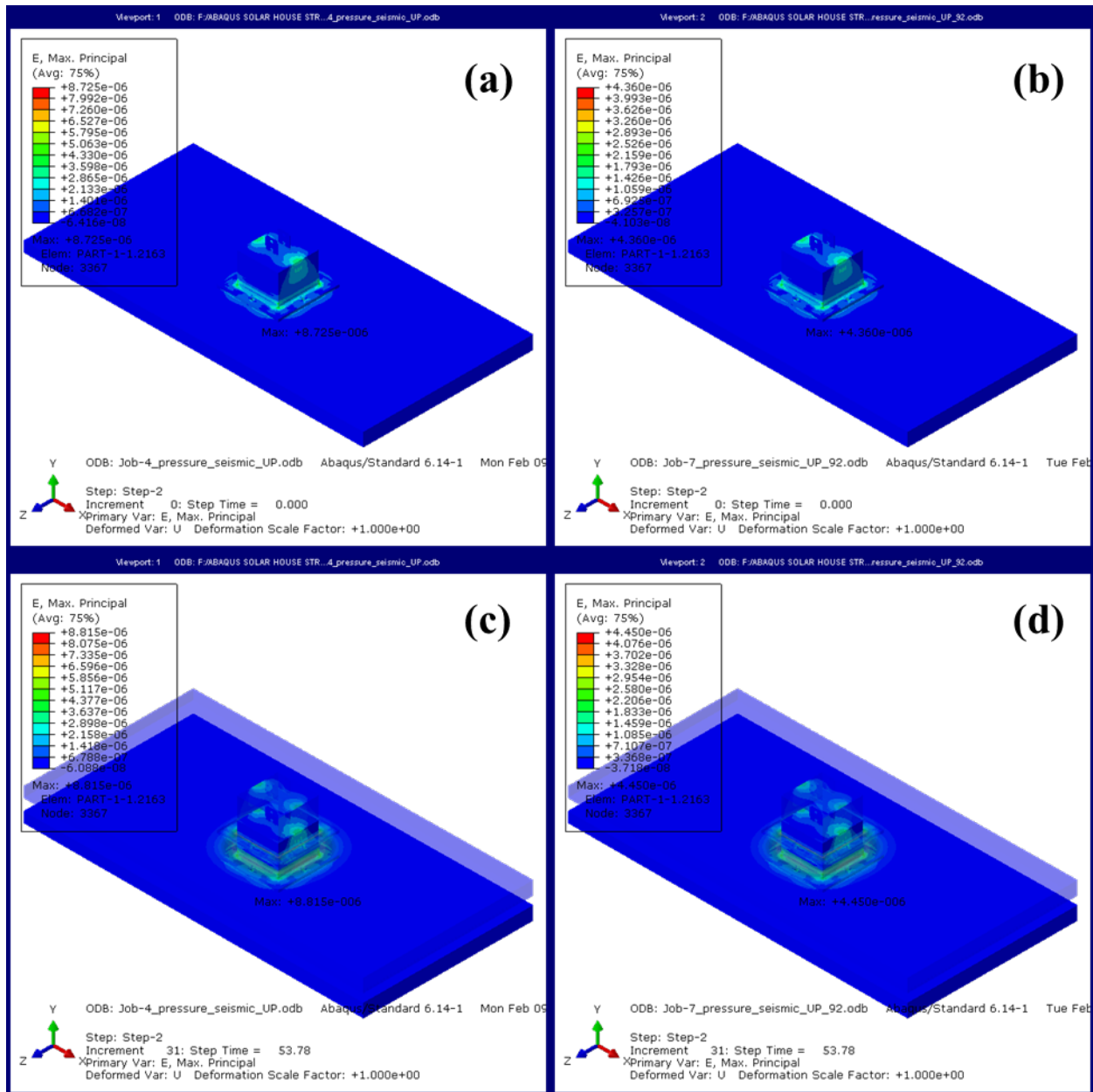
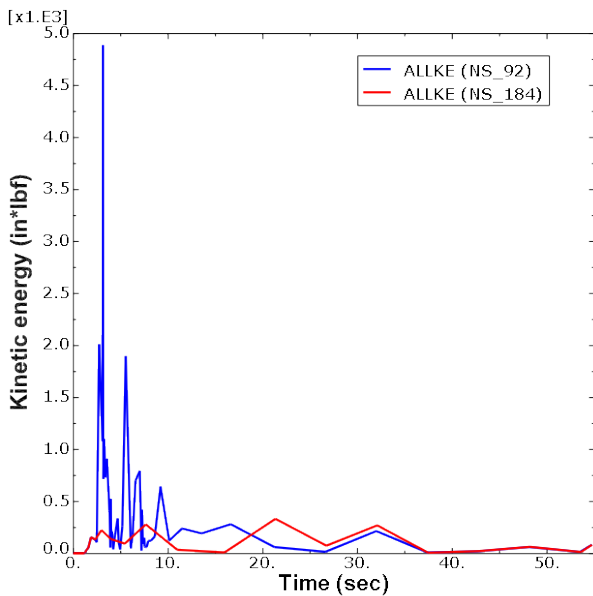


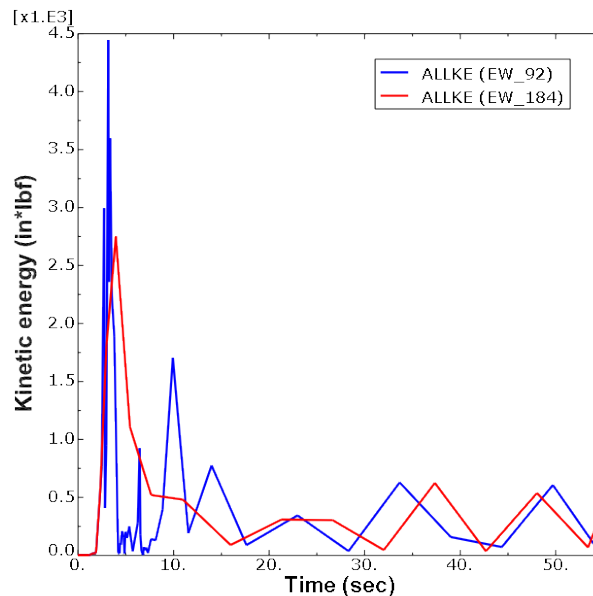
Fig. 13. Strain distribution and evolution, where (a) (c) are the stress contours under 184psi normal pressure, (b) (d) are the stress contours under 92psi normal pressure



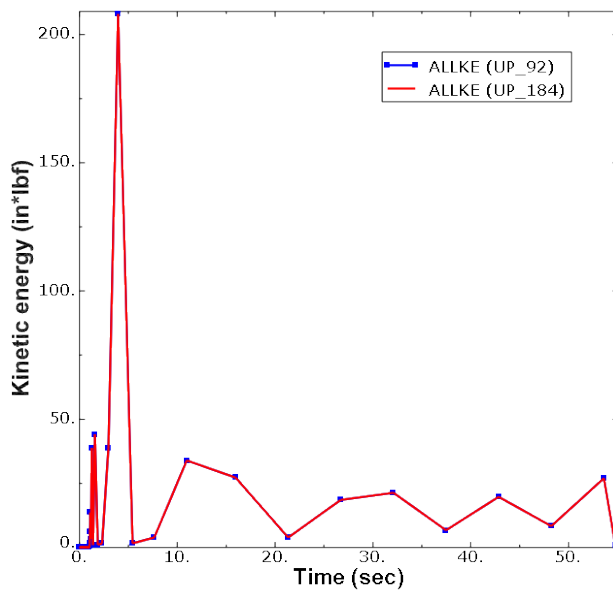
3.4 Energy dissipation



(a)



(b)



(c)

Fig.14. Kinetic energy



SOLAR DECATHLON

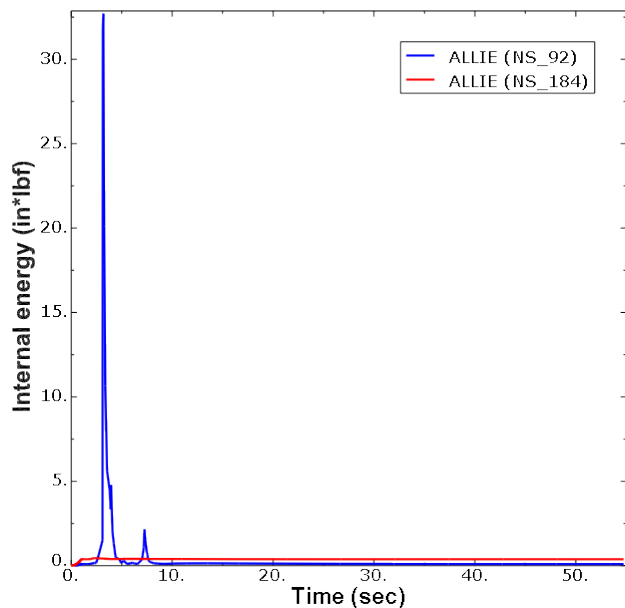
Alfred State College and Alfred University

2015

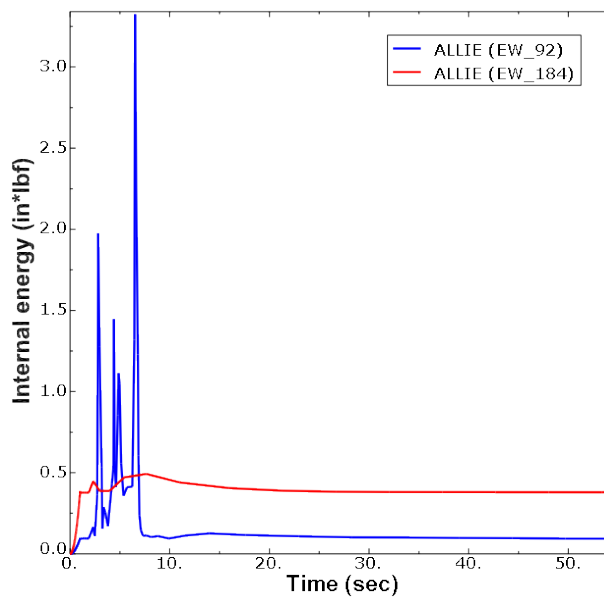
Alfred, NY 14802

solardecathlon@alfred.edu

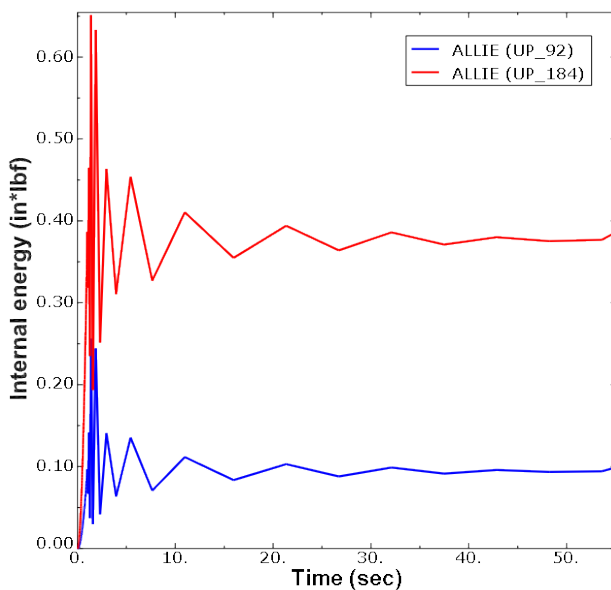
www.solardecathlon-alfred.org



(a)



(b)



(c)

Fig.15. Internal work



SOLAR DECATHLON

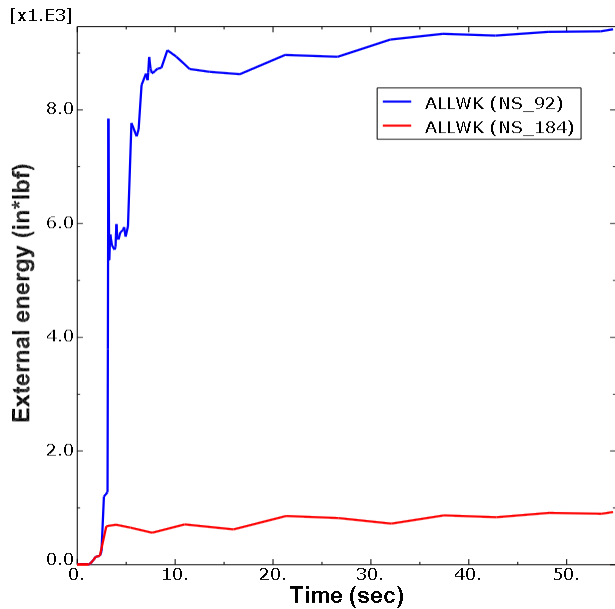
Alfred State College and Alfred University

2015

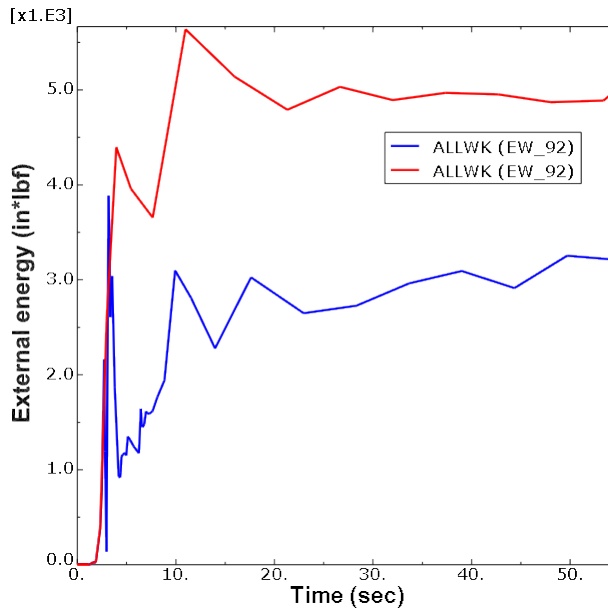
Alfred, NY 14802

solardecathlon@alfred.edu

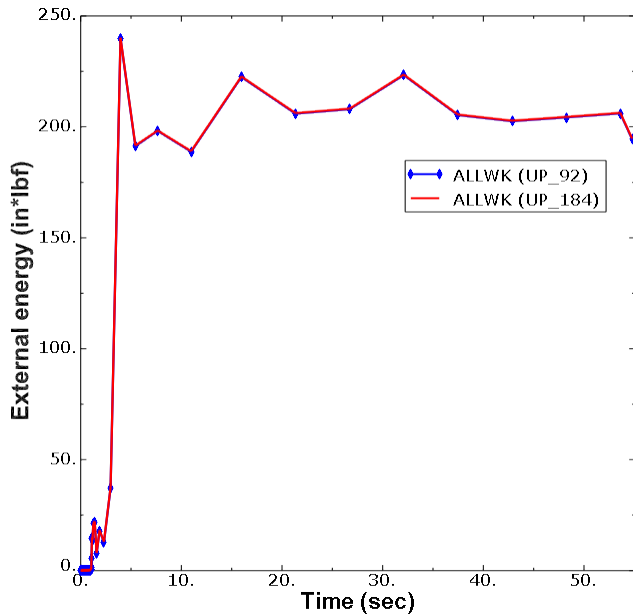
www.solardecathlon-alfred.org



(a)



(b)



(c)

Fig.16. External work

Conclusions

Results of the detailed analysis are allowing the engineering team to continue to make improvements in the support structure. While the ground movement of 10 inches is severe, the actual lateral movement of the support structure as modeled is minimal. This implies that in a similar seismic event the house would not move off the support structure, but move laterally along with it any possible seismic damage would then be limited to the upper stories of the house.



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Detailed Water Budget

FUNCTION	USE (GALLON)	CALCULATIONS		NOTES
		GAL	EVENTS	
Hot Water Draws	240	15	16	Using from thermal storage tank
Water Vaporization	3.75	0.625	6	Using from general storage tank
Dishwasher	13.5	2.7	5	Using from general storage tank
Clothes Washer	48	6	8	Using from general storage tank
Vegetation	640	128	5	Using gray water filtering system for irrigation
Fire Protection	300	300	1	May use general storage and waste to supplement
Thermal Storage Tanks	80	80	1	Using from general storage tank
Testing	0	0	0	
Initial Systems Fill	5	5	1	Using from general storage tank
Solar Thermal Collectors	0	3	0	Using 25% glycol mixture
Aesthetic Purpose	0	0	0	
Radiant Flooring	9.5	9.5	1	Using 25% glycol mixture
Safety Factor	133.975			
WATER REQUIRED	1473.725	gallons		



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Summary of Unlisted Electrical Components

There are no unlisted electrical components.



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

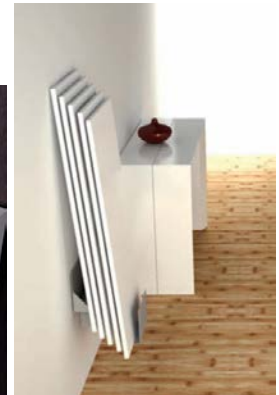
solardecathlon@alfred.edu

www.solardecathlon-alfred.org

Summary of Reconfigurable Feature

Resource Furniture

Goliath White is a transforming table that extends from a console size of 17 inches to a dining size of 115 inches, using a unique aluminum telescoping mechanism. This space saving table comes with five leaves to comfortably seat a dinner party of 10 individuals.





SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org



17"



36.6"



56.25"



76"



95.66"



115.35"



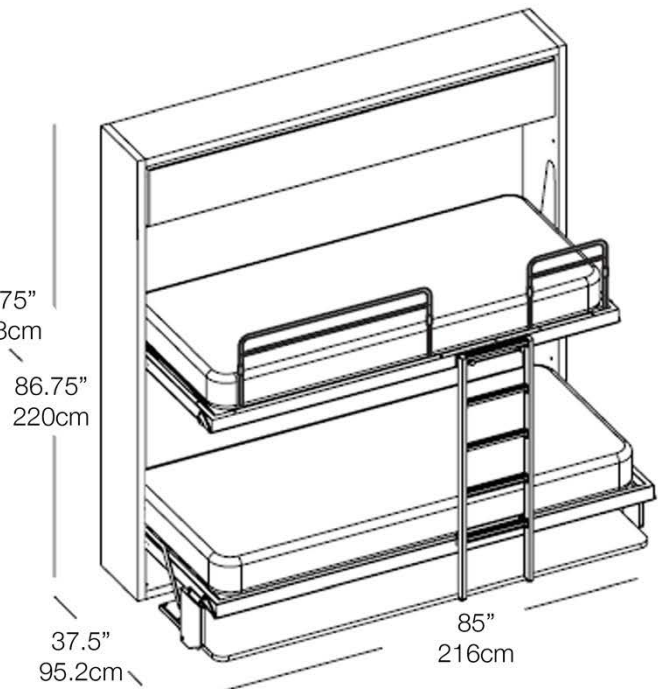
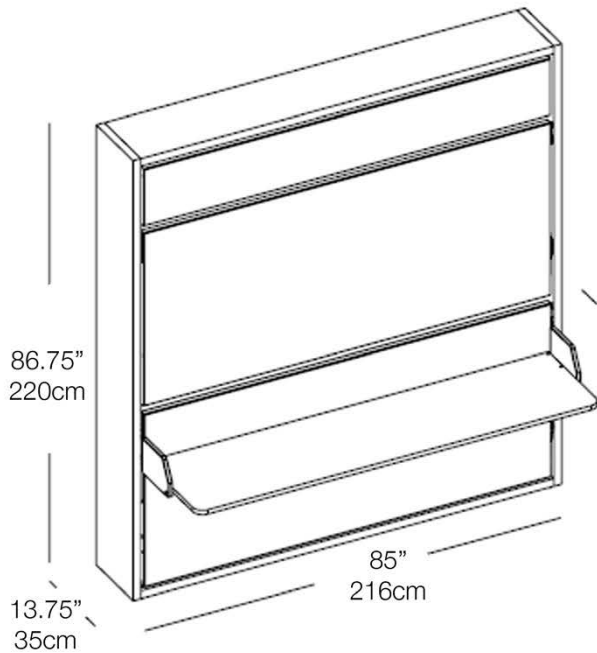
SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Kali Duo Board is the newest addition to the collection of space saving bunk bed systems. This system has a safety rail for the top bunk, separately storing ladder that serves as the main support for the upper bunk, and full-time desk.





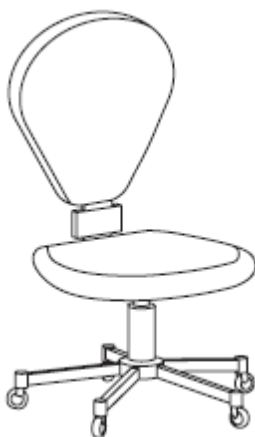
SOLAR DECATHLON

Alfred State College and Alfred University

2015

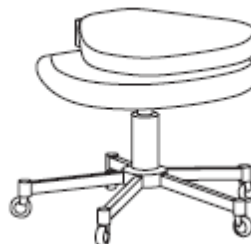
Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Flip Chair Orange is a rolling desk chair that folds down for scooting under a table when not in use.



Height
38.5"- 45.75"
980 cm- 1160cm

width
19.75"
500 cm



Seat Height
20.5"- 28.5"
520 cm- 720 cm

Depth
23.75"
600 cm



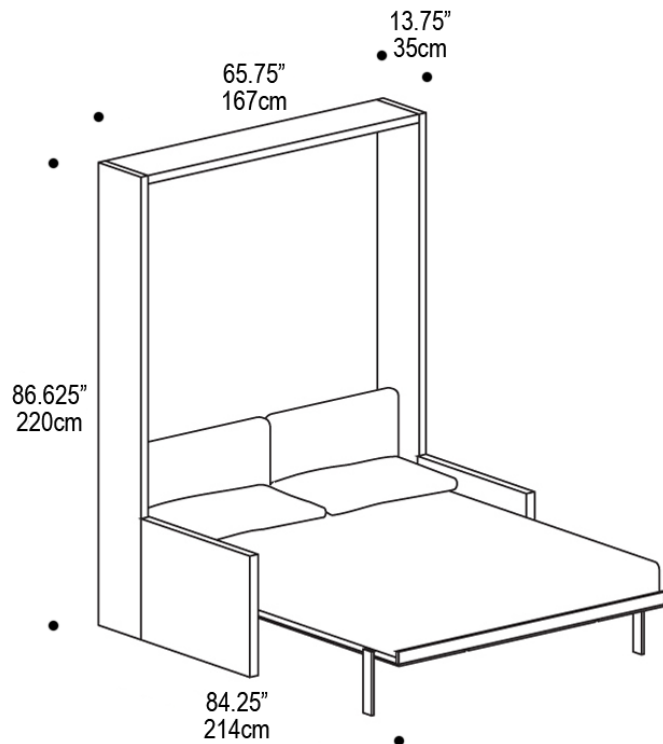
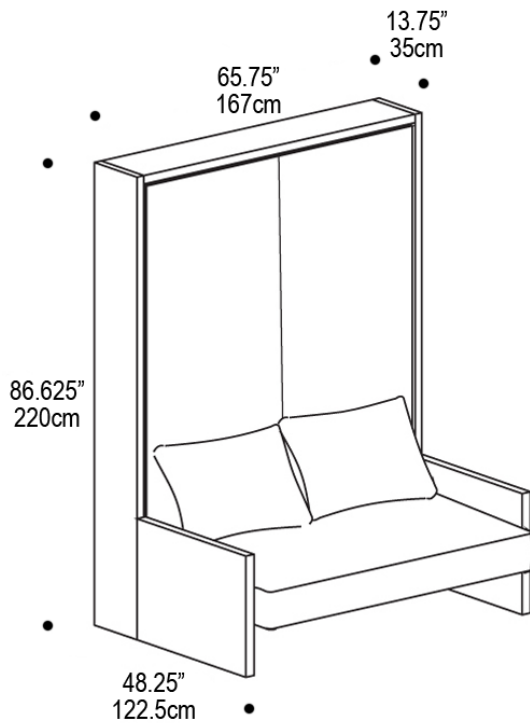
SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Penelope Sofa is a self-standing, queen size wall bed with a three seat sofa.





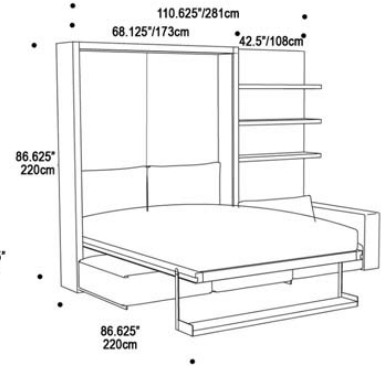
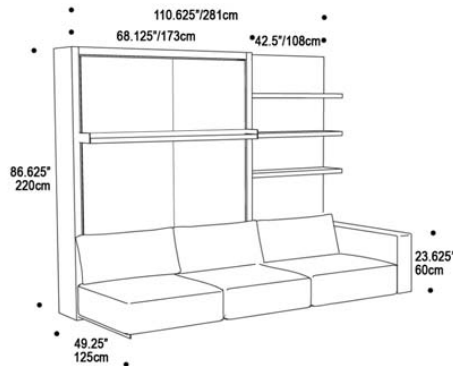
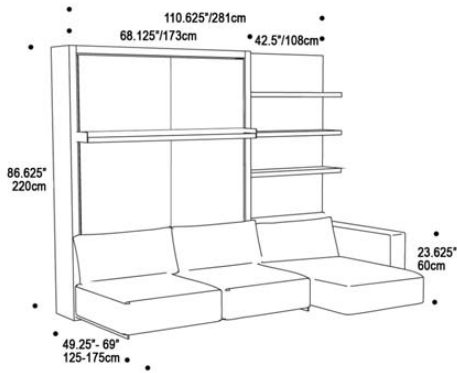
SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Swing Chaise is a self-standing, queen size wall bed with a 9 foot sofa and sliding chaise. Swing also provides additional storage under the sofa and is also available in a three-seat sofa version.





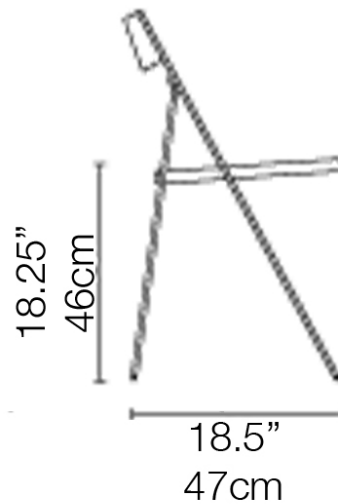
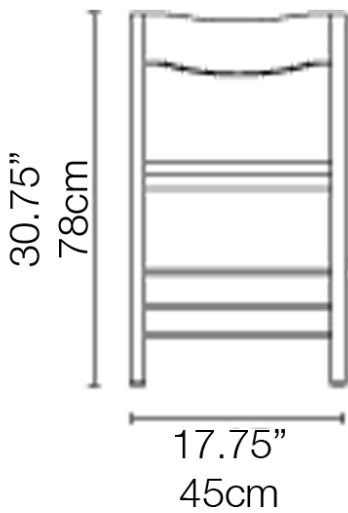
SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Pocket Chair is named for its pocket-sized dimensions. This compact, functional chair is classic in design and crafted with a chromed steel frame and seat in a choice of natural or stained beech or oak plywood.





SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Pocket Hook is a foldable hook made for hanging pocket chairs when not in use.



• 18" •
or 45,5cm

2" or 4,5cm



• 5.5" •
13,5cm



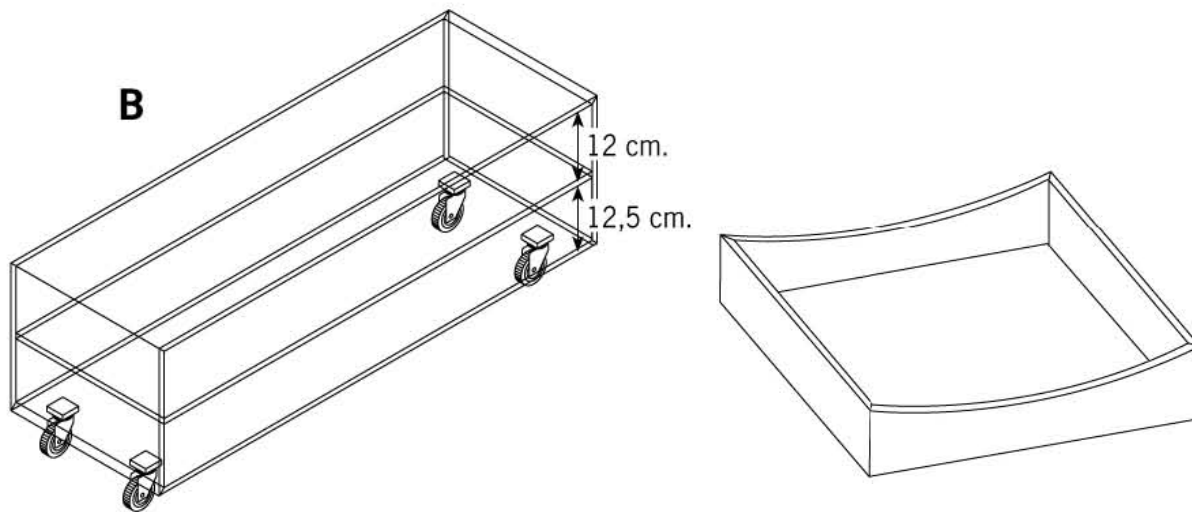
SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Como Basso is a tempered glass coffee table on casters, available in multiple heights. This piece is available with and without drawers.



Dimensions: 21.5" x 17.5" x 4.75"



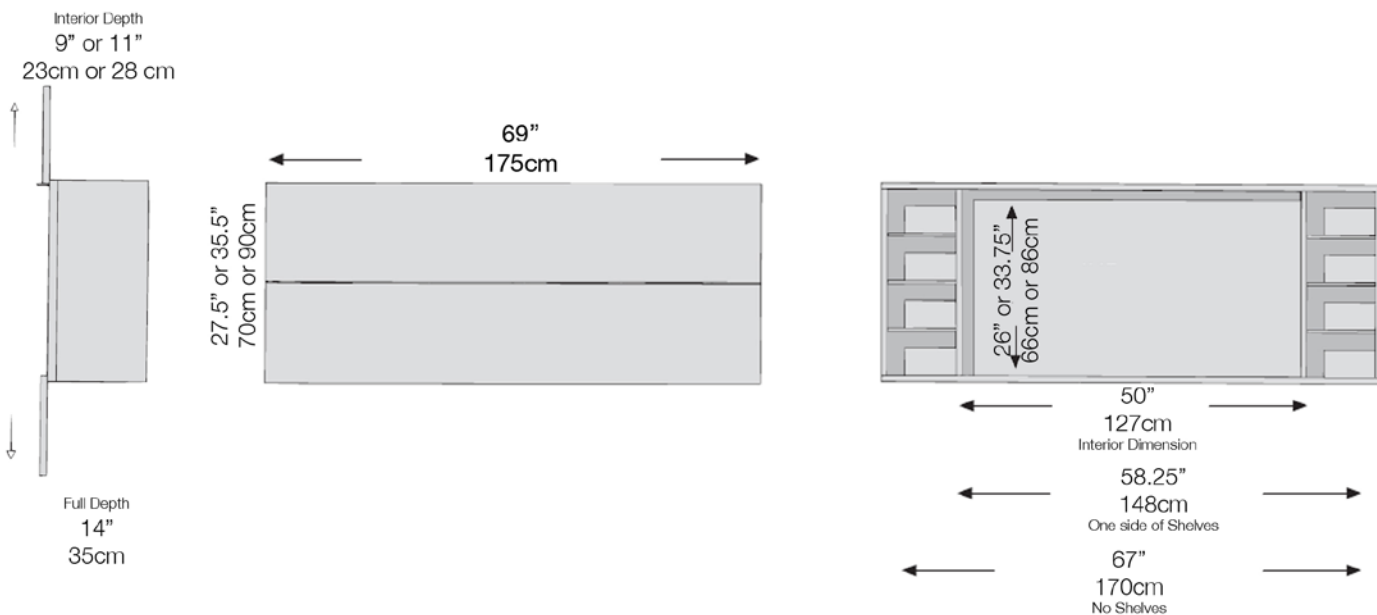
SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Tiburon is a sleek, wall-mounted TV module that lets you hide the screen when not in use. The cover closes with a smooth guillotine mechanism.





SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

Nanawall

Design

Minimal Sightlines - The NanaWall SL60 maintains the European styling of narrow and equal sightlines around each door panel creating an attractive display of glass and light.

Designed for energy efficiency and strong weather performance - The NanaWall SL60 delivers superior weather performance, beautiful aesthetic design, and offers an optional floor supported movement when installation conditions require it.

Insulating Aluminum Core - The NanaWall SL60 features an All-Aluminum design that incorporates an insulation barrier built-in. With an overall depth of 60mm, this provides exceptional protection from exterior elements and delivers a comfortable indoor experience when closed.

Energy Efficiency

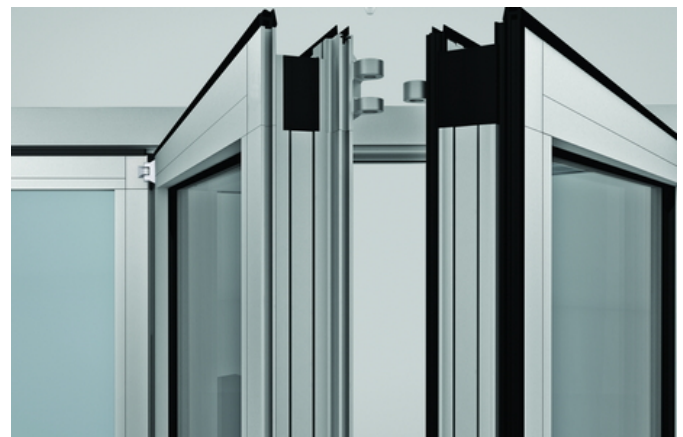
Triple-Paned Glass Optional - can accommodate triple-paned glass for additional thermal performance in more extreme conditions.

Hardware

Easy Cleaning for Balconies with Top-Hung Option

- The NanaWall SL60 has a removable hinge pin option that makes for safe and easy access to clean the outside when needed.

Operation



[Status]

U.S. D.O.E. Solar Decathlon 20115

Published 2/12/2015

Page -46



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Swing Doors for Everyday Use Are Possible - Choose from various configuration options that include a daily access door without needing to open the entire system.

Life Cycle Performance Tested - The NanaWall SL60 meets the German "DIN EN 1191/12400 Classification" where a unit is tested after 20,000 opening and closing cycles and is still functional.

Concealed Locking & Force Entry Protected - The NanaWall SL60 features a concealed locking rod and locks into both the head track and sill. The locking hardware has passed forced entry testing.



Quiet and Comfortable - The NanaWall SL60 has been tested for sound control and has a remarkable resistance to wind driven rain.



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Interconnection Application Form

PV Systems

Module Manufacturer	Short Description of Array	DC Rating of Array (sum of the DC ratings)
Solar World	46 250W panels at 10 degrees monoslope	11.5 kW

Total DC power of all arrays is 11.5 kW (in tenths)

INVERTERS

Inverter Manufacturer	Model Number	Voltage	Rating (kVA or KW)	Quantity
Solar World	Enphase M250	48V	250W	46

Total AC power of all inverters is 10.7 kW (in whole numbers)

	Location
One-Line Electrical Schematic	See Construction Documents Sheet E-601
Calculations of service/feeder net computed load and neutral load (NEC 220)	See Construction Document Sheet E-603
Plan view of the lot showing the house, decks, ramps, tour paths, the service point, and the distribution panel or load center	See Construction Document Sheet A-101

Provide the Team's "Electrical Engineer" contact in the "Team Officer Contact Info" database on the Yahoo Group as required per Rule 3-2.



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Quantity Takeoff of Competition Prototype House

Specification Number	Brief Description	Detailed Description	Qty	Unit
Division 01	General Requirements			
01 XX XX	Typical House Crane	80-ton truck-mounted crane, plus crew.	1	Day
Division 02	Existing Conditions			
022113	Site Survey, locate project on site	Boundary & survey markers	0.5	Acre
Division 05	Metals			
050000	Steel Plates	3/4"x18"x18" - Cross Holed with 5/8" diameter holes Steel Plates	18	Each
050000	Steel Plates	3/4"x12"x12" - Cross Holed with 5/8" diameter holes Steel Plates	19	Each
050000	Steel Anchor Double LVL Brackets	12 Gauge 12"x12" ASTM 36 Steel Anchor Brackets	6	Each
050000	Steel Anchor Cross Double LVL Brackets	12 Gauge 12"x12" ASTM 36 Steel Anchor Brackets	12	Each
050000	Steel Anchor Decking Double LVL Brackets	12 Gauge 8"x8" ASTM 36 Steel Anchor Brackets	13	Each
050000	Steel Anchor Decking Corner Single LVL Brackets	12 Gauge 8"x8" ASTM 36 Steel Anchor Brackets	4	Each
050000	Steel Anchor Post Brackets	12 Gauge 12"x12" ASTM 36 Steel Anchor Brackets	2	Each
Division 06	Wood, Plastics and Composites			
064313	Wood Stairs/Ramps	Temporary, ramps, decking, 1" decking on 2" x 10" joists, 16" O.C.	198	S.F.
061000	2 X 6 Stud Walls	Wood framing, partitions, standard & better lumber, 2" x 6" studs, 16" O.C., 10' high, includes single bottom plate and double top plate, excludes waste	22	L.F.
061000	2 X 4 Stud Walls	Wood framing, partitions, standard & better lumber, 2" x 4" studs, 16" O.C., 10' high, includes single bottom plate and double top plate, excludes waste	31	L.F.
061200	6-1/2" X 4' X 10' SIPS Panel	Structural insulated panels, 7/16" OSB both faces, EPS insulation, 5-5/8" thick	1704	S.F.
061533	2X10 Deck Framing	Porch or deck framing, treated lumber, joists, 2" x 10"	764	L.F.



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

064316	1" X 6" Decking	Decking, 1" x 6" pressure treated decking.	1204	L.F.
061200	10-1/4" X 4' X 8' SIPS Panel	Structural insulated panels, 7/16" OSB both faces, EPS insulation, 9-3/8" thick	1184	S.F.
061600	3/4" sturdi-floor	3/4" X 4' X 8' subflooring.	1152	S.F.
	1-3/4" X 9-1/2" LVL	1-3/4" X 9-1/2" LVL for structural floor framing	928	L.F.
	Engineered I-Joists	2-1/2" X 9-1/2" Engineered I-Joists for structural floor support and flat roof support	798	L.F.
061800	Glue Laminated Beam	3" X 11" Glue Laminated Beam	15	L.F.
061800	Glue Laminated Beam	6-3/4" X 11" Glue Laminated Beam	20	L.F.
061800	Glue Laminated Column	6-3/4" X 6-7/8" Glue Laminated Column	20	L.F.
061800	Glue Laminated Column	3" X 5-1/2" Glue Laminated Column	20	L.F.
061753	Shop Fabricated Wood Trusses	2" X 4" Vertical Oriented Wood Truss	85	L.F.
	4" X 4" Deck Posts	4" X 4" Pine deck posts	60	L.F.
	6" X 6" Carport Posts	6" X 6" Pine carport posts	20	L.F.
Division 07	Thermal and Moisture Protection			
076200	SHEET METAL FLASHING AND TRIM	Sheet metal flashing, aluminum, flexible, mill finish, .013" thick, including up to 4 bends	34	S.F.
076100	Metal Roofing	Steel roofing panels, on steel frame, flat profile, standard finish, 1-3/4" standing seams, 12" wide, 24 gauge	800	S.F.
072719	Metal Roofing Underlayment	Vapor retarders, building paper, asphalt felt roof deck vapor barrier, class 1 metal decks	800	Sq.
077123	MANUFACTURED GUTTERS AND DOWNSPOUTS	Aluminum downspouts, embossed, 2" x 3", .020" thick	60	L.F.
075329	EPDM Rubber Membrane, butyl, 1/16" thick, Elastomeric Sheet Membrane Conventional Roofing System	EPDM Rubber Roofing, 60 mils, heat welded seams, fully adhered	704	S.F.
07XXXX	Siding	1/2" Vinyl Siding	1704	S.F.
Division 08	Openings			
081423	ENTRY/ KITCHEN, 72"W x 96"H, INTUS 5/32" THK. ARGON FILLED DBL. GLAZED CLEAR LITE W/ WOOD INT. FINISH, FD2 1520 LAR	Premier 78, Single, with glass lites	1	Each
081423	ENTRY/WEST, 90"W x 96"H, INTUS 5/32" THK. ARGON FILLED DBL. GLAZED CLEAR LITE W/ WOOD INT. FINISH,	Premier 78, Single, with glass lites	1	Each



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

FD2 1520 LAR				
081416	BEDROOM DOOR, 60"W x 82"H, INTUS, 5/32" THK. ARGON FILLED DBL. GLAZED CLEAR LIT, FD2 1520 LARE, Metal Clad	French exterior door, fir, Single, 1-3/4", 3'-0" x 6'-8", with glass lites	1	Each
083219	MECHANICAL ROOM, 66"W x 92"H, DBL. WOODED SLIDING PANELS W/OVERHEAD MOUNT ALUM. DBL. TRACK, Allegeny Wood Works	Rule of Thumb - Typical Exterior Door, prehung, exterior, wood	1	Each
083219	BATHROOM, 66"W x 92"H, DBL. WOODED SLIDING PANELS W/OVERHEAD MOUNT ALUM. DBL. TRACK, Allegeny Wood Works	Rule of Thumb - Typical Interior Door, prehung, interior, flush, solid core	1	Each
085200	Hinged 4' x 3', Intus Wood low-E	Rule of Thumb - Typical hinged Window	3	Each
085200	Fixed 1' x 3', Wood low-E	Rule of Thumb - Typical Fixed Window	7	Each
083213	Awning 10' X 5', Intus Wood low-E	Rule of Thumb - Glazed Lift/Slide Door	7200	Sq. In.
088000	Fixed Glazing 10' X 10', Intus Wood low-E	Rule of Thumb - Fixed Glazing	14400	Sq. In.
Division 09 Finishes				
09XXXX	Sheetrock	Sheetrock wallboard, on walls, standard, w/compound skim coat (level 5 finish), 1/2" thick	3200	S.F.
09XXXX	Wall tile	4 x 24 ceramic tile	72	S.F.
09XXXX	Typical Interior Paint	Paints & Coatings, walls & ceilings, interior, concrete, drywall or plaster, zero voc latex, 3 coats, smooth finish, roller	3200	S.F.
099113	Floor Tile	Ceramic tile	24	S.F.
099300	Typical Interior Trim Paint	Paints & coatings, miscellaneous interior, trim, wood, paint 3 coats, latex, brushwork, under 6" wide	170	L.F.
096400	Bathroom Floor	Flooring, wood, bamboo strips, 3/8" x 4" x 4', finished	63	S.F.
09XXXX	Bathroom ceiling	Painted MDF	63	S.F.
096400	Finished Floor	Flooring, wood, bamboo strips, 3/8" x 4" x 4', finished	687	S.F.
09XXXX	Bedroom Ceiling	Suspended ceiling	120	S.F.
Division 10 Specialties				



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

102800	Residential Bath Accessories	Kohler Forté Collection Toilet Tissue Dispenser	1	Each
102800	Residential Bath Accessories	Kohler Forté Collection Glass Shelf	1	Each
102800	Residential Bath Accessories	Kohler Forté Collection Traditional 30" towel bar	1	Each
102800	Residential Bath Accessories	Kohler Forté Collection Transitional triple wall sconce lighting	1	Each
Division 11 Equipment				
113100	Typical Range	GE Profile PS950EFES	1	Each
113100	Microwave	GE Microwave - MMDV305		
113100	Exhaust Hood	GE Ducted Wall-Mounted Range Hood 30" - PV970NSS	1	Each
113100	Refrigerator/Freezer	GE French Door Refrigerator with Single Ice Maker 26.7 cu.ft - GFE27GMDES	1	Each
113100	Dishwasher	GE Built-in Dishwasher with Hard Food Disposer 24" - GDF520PGDBB	1	Each
113100	Clothes Washer	GE High-Efficiency Top-Load Washer 5 cu.ft - GTWS8650DWS	1	Each
113100	Clothes Dryer	GE Electric Dryer 7.8 cu.ft - GTDP740EDWW	1	Each
Division 12 Furnishings				
123530	Base Cabinet-Built In: SD_2015_cabinet built in_30"	Custom Cabinets, rule of thumb: kitchen cabinets, excl. counters & appliances, maximum	2.5	L.F.
123530	Base Cabinet-Double Door Sink Unit: SD_2015_sink cabinet_36"	Custom Cabinets, rule of thumb: kitchen cabinets, excl. counters & appliances, maximum	3	L.F.
123530	Upper Cabinet-Single Door-Wall: SD_2015_upper cabinet single_15"	Custom Cabinets, rule of thumb: kitchen cabinets, excl. counters & appliances, maximum	1.25	L.F.
123530	Upper Cabinet-Double Door-Wall: SD_2015_cabinet high 24 5/16"	Custom Cabinets, rule of thumb: kitchen cabinets, excl. counters & appliances, maximum	4	L.F.
123530	Upper Cabinet-Double Door-Wall: SD_2015_cabinet high 36"	Custom Cabinets, rule of thumb: kitchen cabinets, excl. counters & appliances, maximum	6	L.F.
123530	Base Cabinet-Single Door & Drawer: SD_2015_cabinet_15"	Custom Cabinets, rule of thumb: kitchen cabinets, excl. counters & appliances, maximum	1.25	L.F.
123530	Base Cabinet-Single Door & Drawer: SD_2015_cabinet_18"	Custom Cabinets, rule of thumb: kitchen cabinets, excl. counters & appliances, maximum	1.5	L.F.



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

123530	Custom Cabinets, rule of thumb: Bath cabinets, excl. counters & fixtures, maximum		3	L.F.
123530	Upper Cabinets 18" x 60"		1.5	L.F.
123530	Resource furniture	Kali Duo Board 2200	1	Each
123530	Resource furniture	Smart Comfort Twin U1	2	Each
123530	Resource furniture	A89601	2	Each
123530	Resource furniture	A85601	2	Each
123530	Resource furniture	A89301	2	Each
123530	Resource furniture	Flip Chair Orange	1	Each
123530	Resource furniture	Boiserie	2	Each
123530	Resource furniture	A89601	2	Each
123530	Resource furniture	Penelope	1	Each
123530	Resource furniture	Smart Comfort Queen	1	Each
123530	Resource furniture	Swing Chaise	1	Each
123530	Resource furniture	Smart Green Queen	1	Each
123530	Resource furniture	Boiserie	1	Each
123530	Resource furniture	Goliath L061	1	Each
123530	Resource furniture	Pocket Supra S1 W11	8	Each
123530	Resource furniture	Pocket Hook	1	Each
123530	Resource furniture	Como Basso	1	Each
123530	Resource furniture	Como Basso Drawer U	2	Each
123530	Resource furniture	Tiburon	1	Each
Division 21	Fire Suppression			
211000	Typical Wet Fire Sprinkler System	Sprinkler System Components, 6" fire cycle system, controls, includes panel, batteries, solenoid valves & pressure switches	922	SF/living
Division 22	Plumbing			
22XXXX	Custom Grey Water Filtration System	Aqua2Use Greywater Recycling System - GWDD	1	Each
221123	Pumps	Pump, circulating, bronze, heated or chilled water application, in line, solder joints, 1/40 H.P., 3/4" size	3	Each
221116	Typical Plastic Rough Plumbing Waste Water System, Piping, Fittings, 1 kitchen & 1 bath	PVC schedule 40 drain piping	960	SF/living



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

225613.19	HEATING SOLAR VACUUM-TUBE COLLECTORS	AP-30 Solar Evacuated tube collector with copper bulb, closed loop glycol system, Stainless Steel Framing.	2	Each
223300	DOMESTIC HOT WATER HEATER TANK	80 gallon thermal storage tank w/4500W heating element	1	Each
223300	DOMESTIC HOT WATER EXPANSION TANK	Apricus 20 gal. capacity, factory pre-charge 40 PSI, max P 150 PSI, max temp 200 °F	1	Each
223300	HXEST EXPANSION TANK	Apricus 2 gal. capacity, factory pre-charge 12 PSI, max P 100 PSI, max temp 240 °F	2	Each
223300	80 GALLON HOT WATER HEATER	Apricus Thermal Storage Tank w/ 4500W element	1	Each
224000	WALL MOUNTED CERAMIC TOILET	Toto Wall Hung, mounted to in-wall tank system, elongated front bowl and wall-mounted push-button	1	Each
224000	WALL MOUNTED VANITY SINK	Kohler Wading Pool® above-counter/wall-mount bathroom sink with 8" widespread faucet holes	1	Each
224000	KITCHEN SINK	33" x 22" x 8-5/16" top-mount large/medium double-bowl kitchen sink with single faucet hole - Staccato	1	Each
224000	KITCHEN FAUCET	Single-hole or 3-hole kitchen sink faucet with 10-1/8" pullout spray spout	1	Each
224000	Shower Pan	Tile rediRedi-Free	1	Each
224000	Shower Faucet and Head	Kohler Forté Collection Traditional Rite-Temp® pressure-balancing bath/shower trim set, valve not included	1	Each
224000	Lavatory Faucet	Kohler Forté Collection Widespread bathroom sink faucet with sculpted lever handles	1	Each
Division 23	Heating, Ventilating, and Air-Conditioning			
233100	Ductwork Rule of Thumb, cost per square foot of living area, Maximum	1/2 average	461	SF/living
238219	Air Handler	Carrier - 2 ton FE4 infinity series AHU	2	Each
236313	Central Air Conditioner	Carrier - Infinity 21 Air Conditioner - 24ANB1	1	Each
233423	Air to Air Energy Recovery Ventilator	Carrier - Performance™ Energy Recovery Ventilator - ERVXXLHB1200	1	Each
233423	Exhaust Fan	EcoVent™ with Veri-Boost™	2	Each
230593	Fire Damper	Round Fire Damper, 165 Deg F, 13-5/8 In. D	1	Each
230523	Damper Actuator	Fire&Smoke Actuator, 120 VAC, 18inlb, 1m Cable	1	Each
238316	Radiant Floor Heating	NuHeat Radiant Floor Pad	1	Each
233400	Ceiling Fan	Big Ass Fans - Haiku	3	Each
Division 25	Integrated Automation			



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802

solardecathlon@alfred.edu

www.solardecathlon-alfred.org

25XXXX	Generic Sensors, Router, Software for monitoring electrical circuits, heat and humidity	Siemens	1	Project
25XXXX		Siemens	2	Each
25XXXX	Central Controller	Siemens	1	Each
25XXXX	Lighting Controller	Siemens	2	Each
25XXXX	Dimmer Panels	Siemens	1	Each
Division 26	Electrical			
	Rule of thumb, Installation, Distribution, Includes all rough electrical work, outlets and switches, no fixtures		922	SF/living
262416	Typical Load Panel	Load centers, 1 phase, 3 wire, main lugs, indoor, 120/240 V, 200 amp, 20 circuits, incl 20 A 1 pole plug-in breakers	1	Each
260529	Pitched PV Mounting Rack, per solar panel	Unirac RM Ballast Bay 10 Degrees	16	Each
260529	Roof Attachment	UniRac-PV Kit (metal roofing)		Each
263100	PV Panels	Solar World 250W Monocrystalline Panels	42	Each
26XXXX	Inverters	Enphase M250	42	Each
262713	Energy Management Unit	Enphase Envoy Energy Management Unit (EMU)	1	Each
262713	Enphase Installation Kit; Ac Branch Circuit		3	Each
265000	Flood Light		4	Each
265000	Exterior Door Light		2	Each
265000	Shower/Hall Light		2	Each
265000	Vanity		3	Each
265000	Mech Room		2	Each
265000	Bedroom Light		1	Each
265000	Living Room Light		4	Each
265000	Kitchen Light		1	Each
Division 27	Communications			
27XXXX	To Be Determined			
Division 28	Electronic Safety and Security			



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

283111	Fire Alarm System	Fire Detection Systems, remote annunciator, 8 zone lamp, excluding wires & conduits	1	Each
Division 32	Exterior Improvements			
321216	Ground Cover for Asphalt Paving	Geo-Textile	2800	S.F.



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

Construction Specifications

Division	Section Title	Revision Date	Page
SPECIFICATIONS GROUP			
<i>General Requirements Subgroup</i>			
DIVISION 01	GENERAL REQUIREMENTS		
014000	QUALITY REQUIREMENTS		1
017000	EXECUTION AND CLOSEOUT REQUIREMENTS		4
017419	CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL		11
018113.26	SUSTAINABLE DESIGN REQUIREMENTS - LEED FOR HOMES		15
18113.36	SUSTAINABLE DESIGN REQUIREMENTS - NATIONAL GREEN BUILDING STANDARD		19
DIVISION 05	METALS		
055000	METAL FABRICATIONS		23
DIVISION 06	WOOD, PLASTICS, AND COMPOSITES		
061000	ROUGH CARPENTRY		28
061053	MISCELLANEOUS ROUGH CARPENTRY		32
061200	STRUCTURAL INSULATED PANELS (SIPS)		35
061533	WOOD PATIO DECKING		42
061600	SHEATHING		47
061753	SHOP-FABRICATED WOOD TRUSSES		51
061800	GLUED-LAMINATED CONSTRUCTION		54
062000	FINISH CARPENTRY		56
064113	WOOD-VENEER-FACED ARCHITECTURAL CABINETS		61
064600	WOOD TRIM		64
066113	CULTURED MARBLE FABRICATIONS		67
DIVISION 07	THERMAL AND MOISTURE PROTECTION		
071326	SELF-ADHERING SHEET WATERPROOFING		69
072100	THERMAL INSULATION		71



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

072500	WEATHER BARRIERS	74
076100	SHEET METAL ROOFING	76
076200	SHEET METAL FLASHING AND TRIM	80
077100	ROOF SPECIALTIES	83
077200	ROOF ACCESSORIES	87
079200	JOINT SEALANTS	89
DIVISION 08		
	OPENINGS	
081416	FLUSH WOOD DOORS	92
081433	STILE AND RAIL WOOD DOORS	96
081436	HINGED WOOD-FRAMED GLASS DOORS	99
083219	SLIDING WOOD-FRAMED GLASS DOORS	102
083513	FOLDING DOORS	105
085200	WOOD WINDOWS	107
087100	DOOR HARDWARE	109
088000	GLAZING	113
088300	MIRRORS	119
089119	FIXED LOUVERS	121
089516	WALL VENTS	125
DIVISION 09		
	FINISHES	
092900	GYPSUM BOARD	127
093013	CERAMIC TILING	130
096400	WOOD FLOORING	135
096816	SHEET CARPETING	140
099113	EXTERIOR PAINTING	143
099123	INTERIOR PAINTING	147
099300	STAINING AND TRANSPARENT FINISHING	151
DIVISION 10		
	SPECIALTIES	
102600	WALL AND DOOR PROTECTION	154
102800	TOILET, BATH, AND LAUNDRY ACCESSORIES	156
102819	TUB AND SHOWER DOORS	160
105723	CLOSET AND UTILITY SHELVING	162



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

DIVISION 11		
EQUIPMENT		
113100	RESIDENTIAL APPLIANCES	164
DIVISION 12		
FURNISHINGS		
122116	VERTICAL LOUVER BLINDS	167
122413	ROLLER WINDOW SHADES	169
122416	PLEATED WINDOW SHADES	171
123530	RESIDENTIAL CASEWORK	173
123623.13	PLASTIC-LAMINATE-CLAD COUNTERTOPS	175
DIVISION 21		
FIRE SUPPRESSION		
210548	VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT	177
211000	WATER-BASED FIRE-SUPPRESSION SYSTEMS	181
DIVISION 22		
PLUMBING		
220523	GENERAL-DUTY VALVES FOR PLUMBING PIPING	188
220529	HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT	193
220548	VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT	196
220553	IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT	201
220700	PLUMBING INSULATION	204
221113	FACILITY WATER DISTRIBUTION PIPING	210
221116	DOMESTIC WATER PIPING	219
221119	DOMESTIC WATER PIPING SPECIALTIES	224
221123	DOMESTIC WATER PUMPS	231
221413	FACILITY STORM DRAINAGE PIPING	234
221423	STORM DRAINAGE PIPING SPECIALTIES	237
223300	ELECTRIC, DOMESTIC-WATER HEATERS	242
224000	PLUMBING FIXTURES	244



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

DIVISION 23	HEATING VENTILATING AND AIR CONDITIONING	
230517	SLEEVES AND SLEEVE SEALS FOR HVAC PIPING	259
230523	GENERAL-DUTY VALVES FOR HVAC PIPING	261
230529	HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT	265
230548	VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT	268
230593	TESTING, ADJUSTING, AND BALANCING FOR HVAC	274
230700	HVAC INSULATION	277
232113	HYDRONIC PIPING	282
232300	REFRIGERANT PIPING	289
233100	HVAC DUCTS AND CASINGS	293
233423	HVAC POWER VENTILATORS	297
233600	AIR TERMINAL UNITS	301
233713	DIFFUSERS, REGISTERS, AND GRILLES	307
235213	ELECTRIC BOILERS	310
235413	ELECTRIC-RESISTANCE FURNACES	314
235613.1	HEATING, SOLAR, VACUUM-TUBE COLLECTORS	318
236200	PACKAGED COMPRESSOR AND CONDENSER UNITS	323
236313	AIR-COOLED REFRIGERANT CONDENSERS	326
238113	PACKAGED TERMINAL AIR-CONDITIONERS	329
238216.13	REFRIGERANT AIR COILS	333
238219	FAN COIL UNITS	335
238316	RADIANT-HEATING HYDRONIC PIPING	342
DIVISION 26	ELECTRICAL	
260519	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES	345
260526	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS	348
260529	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS	351
260533	RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS	354
260544	SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING	359
260548.16	SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS	361



SOLAR DECATHLON

Alfred State College and Alfred University

2015

Alfred, NY 14802 solardecathlon@alfred.edu www.solardecathlon-alfred.org

260923	LIGHTING CONTROL DEVICES	364
260926	LIGHTING CONTROL PANELBOARDS	367
260936.19	STANDALONE MULTIPRESET MODULAR DIMMING CONTROLS	371
262200	LOW-VOLTAGE TRANSFORMERS	373
262413	SWITCHBOARDS	375
262416	PANELBOARDS	380
262713	ELECTRICITY METERING	383
262726	WIRING DEVICES	385
262816	ENCLOSED SWITCHES AND CIRCUIT BREAKERS	389
262913	ENCLOSED CONTROLLERS	392
263100	PHOTOVOLTAIC COLLECTORS	395
264313	TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS	400
265000	LIGHTING	402
DIVISION 28		
	ELECTRONIC SAFETY AND SECURITY	
283111	DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM	408
DIVISION 32		
	EXTERIOR IMPROVEMENTS	
323126	WOOD FENCES AND GATES	413
329300	PLANTING	416