



CALTECH STUDENT SOLAR INITIATIVE

# Fall 2008 Project

*Roof Array, Thomas J. Watson, Sr. Laboratories of Applied Physics*

## Installation Plan

November 19-21, 2008



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Morgan Putnam (putnam@caltech.edu) *project leader*

## Contacts

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Nick Grewal Caltech Electrical Engineer Nick.Grewal@caltech.edu	Mike Anchondo Caltech Electrician Mike.Anchondo@caltech.edu

## Timeline

**Wednesday November 19<sup>th</sup>**

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<b>AM Shift, 8AM-12PM</b>
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Group 1: Transportation  
*M. Putnam*

- Move 6 (3 boxes) modules from staging area to roof
- Move Unirac pallet to Watson 2<sup>nd</sup> floor hallway, then all to roof

Equipment: Pallet jack, rope, tape  
Safety: Hard hats (2). Gloves (all).

Group 2: Survey  
*M. Kelzenberg*

- Define 10' grid on roof
- Measure unirac components, finalize panel layout
- Mark locations of panel rows

Equipment: Tape measure, rope, chalk line, spray paint, tape  
Safety: Sunscreen

Both groups

- Install rows 1 and 2 of array (7 modules)

Equipment: 7/16 wrench (several), shims (?), level,  
Safety: Gloves, sunscreen

<b>PM Shift, 1PM-5PM</b>
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Group 1: Most Student Labor  
*M. Putnam*

- Transport 12 (6 boxes) modules from staging area
- Install rows 3 and 4 (12 modules)

Equipment: Pallet jack, rope, tape, wrenches  
Safety: Hard hats (2). Gloves (all).  
Sunscreen

Group 2: Electrical  
*M. Kelzenberg*

- Acquire remaining materials
- Run conduit where possible
- Zip-tie cords between modules

Equipment: Electrician equipment, UV-resistant zip ties  
Safety: Sunscreen

Social events / food & drink		
AM	Lunch	PM
Water + glasses - Morgan	Food/drinks - Morgan	

Wed. afternoon – check conduit plans with electrician

Wed. night – build wooden shuttle for safely pulling bricks up the stairway

**Thursday November 20<sup>th</sup>**

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**AM Shift, 8AM-12PM**

Group 1: Student Labor  
*M. Putnam*

- Move 8 modules (4 boxes) from staging area to roof
  - Load ballast (as much as possible) to roof
  - Assemble row 5 (8 modules)
- Equipment: Pallet jack, rope, tape, hand truck, wrenches  
Safety: Hard hats (2). Gloves (all).

Group 2: Electrical  
*M. Kelzenberg*

- Lay conduit
  - Zip-tie cable runs
  - Machine/install junction boxes
- Equipment: Misc. electrical (MK), Unistrut, hardware and power tools  
Safety: Sunscreen, safety glasses

**PM Shift, 1PM-5PM**

Group 1: Student Labor  
*M. Putnam*

- Transport 16 (8 boxes) modules from staging area, and remaining bricks
  - Assemble rows 6 and 7 (17 modules)
- Equipment: Pallet jack, rope, tape, hand truck, wrenches  
Safety: Hard hats (2). Gloves (all).  
Sunscreen

Group 2: Electrical / Ballast  
*M. Kelzenberg*

- Continue electrical efforts
  - Lay ballast in completed areas
- Equipment: Electrician equipment, UV-resistant zip ties, hand truck, concrete adhesive  
Safety: Sunscreen, gloves, glasses

**Social events**

AM

Lunch

PM

Water/cups - Morgan

Food/drinks – Morgan  
Plates - ?

**Friday November 21<sup>st</sup>**

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**AM Shift, 8AM-12PM**

Group 1: Student Labor  
*M. Putnam*

- Move 16 modules (8 boxes) from staging area to roof
  - Assemble rows 8 and 9 (15 modules)
- Equipment: Pallet jack, rope, tape, wrenches etc.  
Safety: Hard hats (2). Gloves (all).

Group 2: Electrical / Ballast  
*M. Kelzenberg*

- Place junction boxes, conduit up through row 7
  - Ballast through row 7
- Equipment: Misc. electrical (MK), Unistrut, hardware and power tools, hand truck  
Safety: Sunscreen, safety glasses

**PM Shift, 1PM-5PM**

Group 1: Student Labor  
*M. Putnam*

- Transport 16 modules (8 boxes) from staging area, and remaining bricks
  - Assemble rows 10-13 (13 modules)
- Equipment: Pallet jack, rope, tape, hand truck  
Safety: Hard hats (2). Gloves (all).  
Sunscreen

Group 2: Electrical / Ballast  
*M. Kelzenberg*

- Continue electrical efforts
  - Lay ballast in completed areas
- Equipment: Electrician equipment, UV-resistant zip ties, hand truck, zip ties, concrete adhesive  
Safety: Sunscreen, gloves, glasses

**Social events**

AM

Lunch

PM

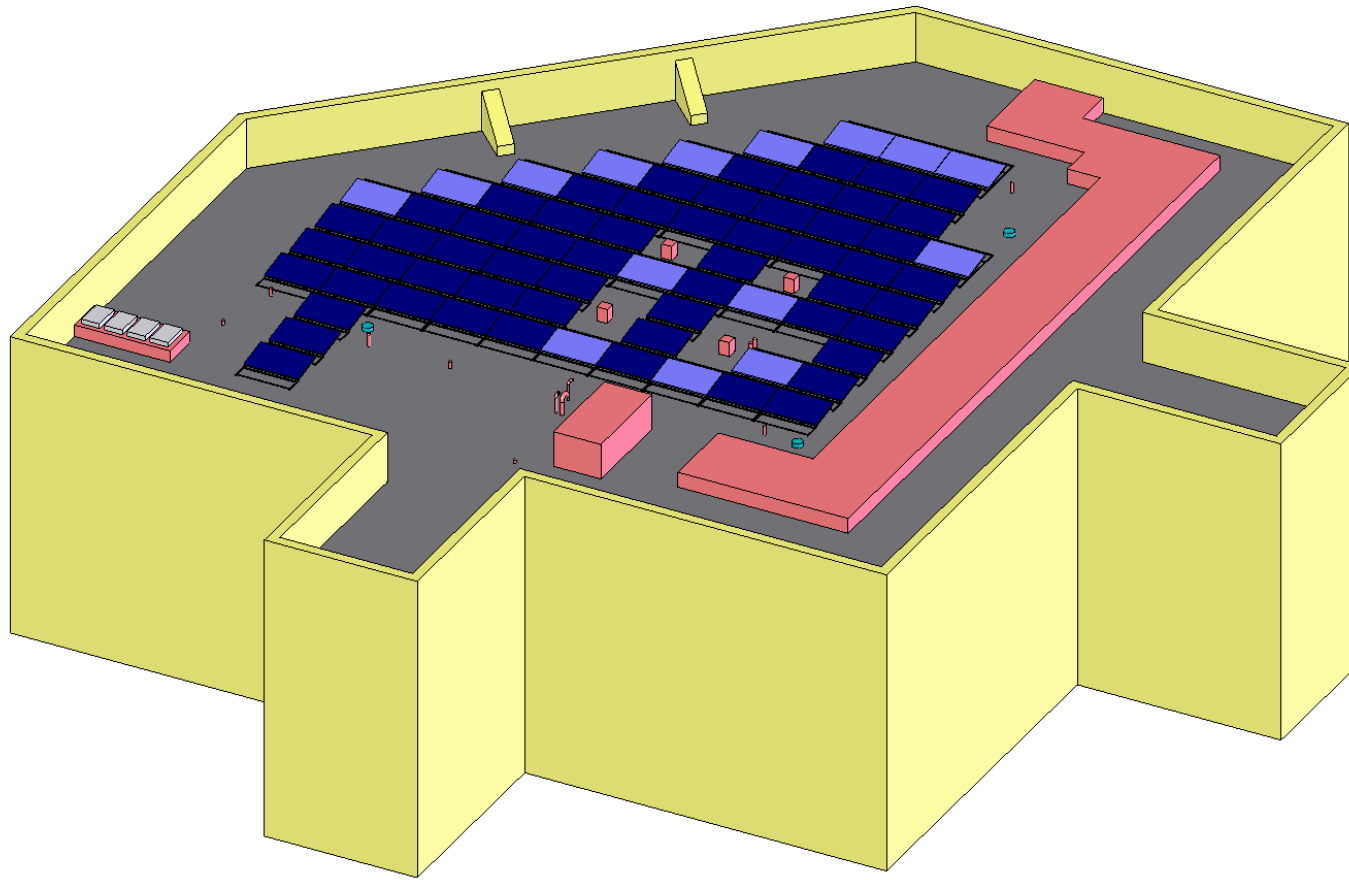
Water/cups – Morgan

Food/drinks – Morgan

Media coverage

Media coverage – late morning?

Plates - ?



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		FINISH		MFG APPR.		<b>Anirac Layout</b>	
NEXT ASSY	USED ON			Q.A.		REV	
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						SHEET 1 OF 7	

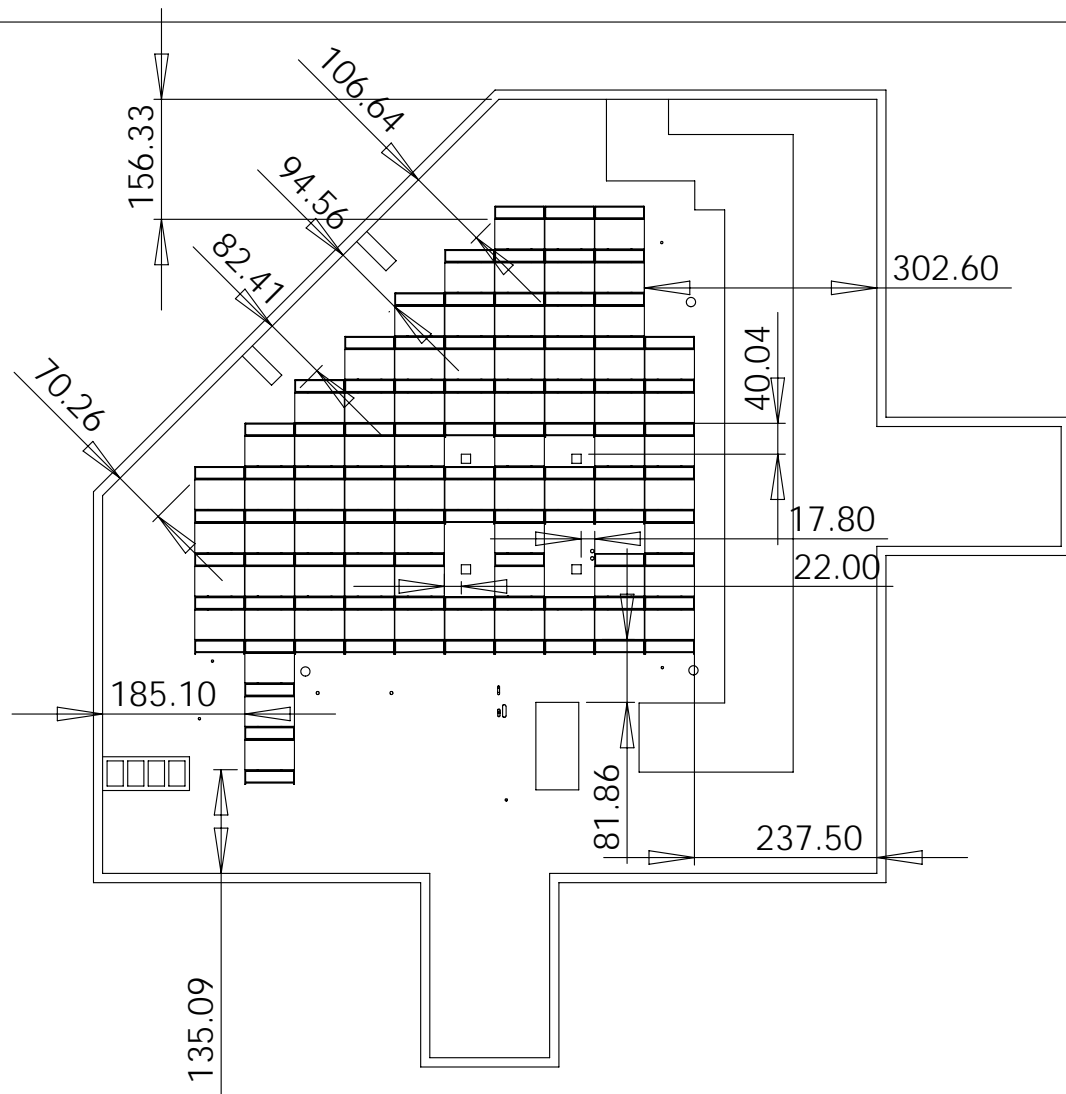
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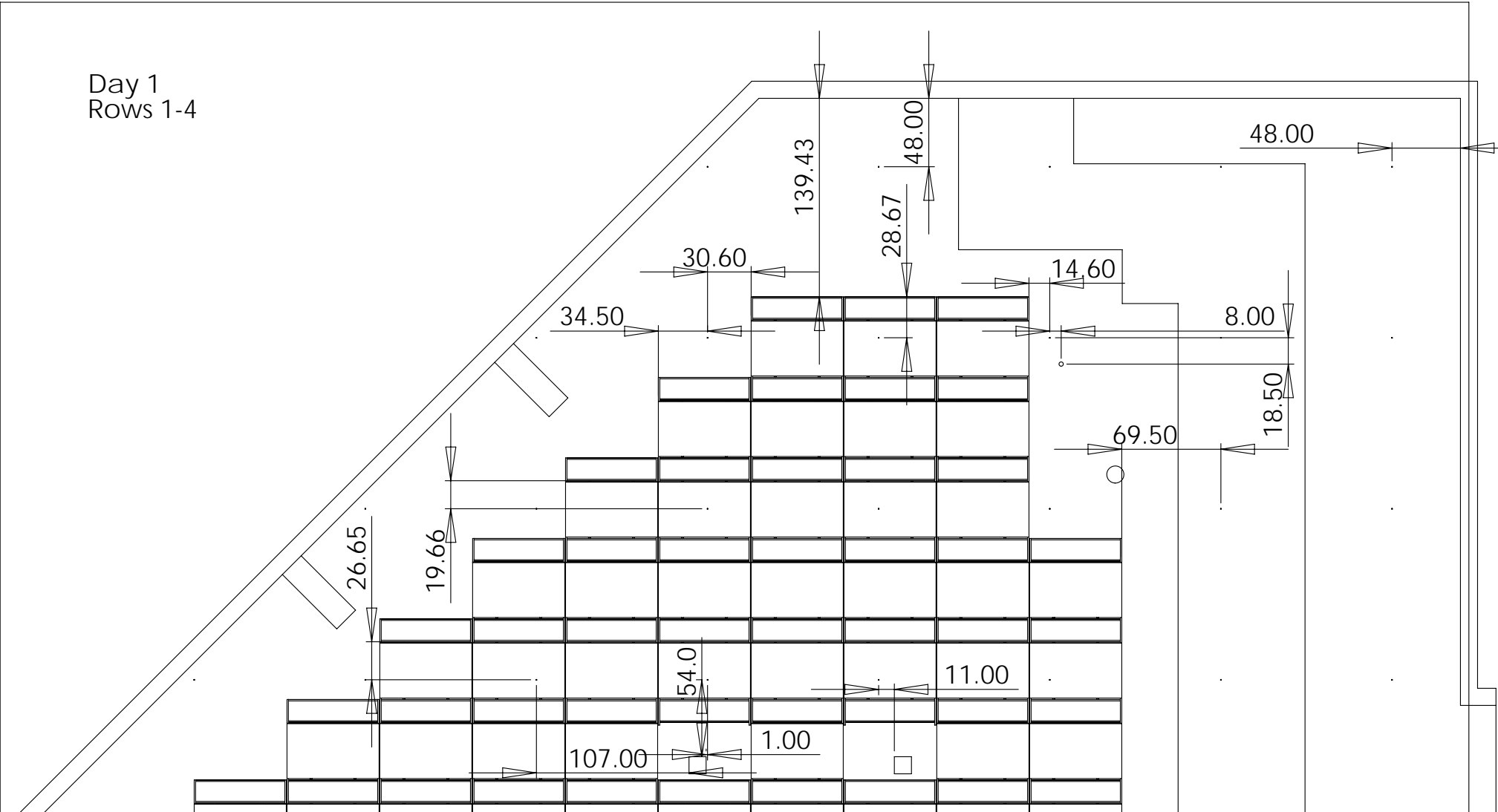


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				Q.A.	
				COMMENTS:	
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

Quantity: 1		
TITLE: Michael Kelzenberg mk@caltech.edu x3983		
SIZE	DWG. NO.	REV
<b>Anirac Layout</b>		
SCALE: 1:1	WEIGHT:	SHEET 2 OF 7

Day 1  
Rows 1-4



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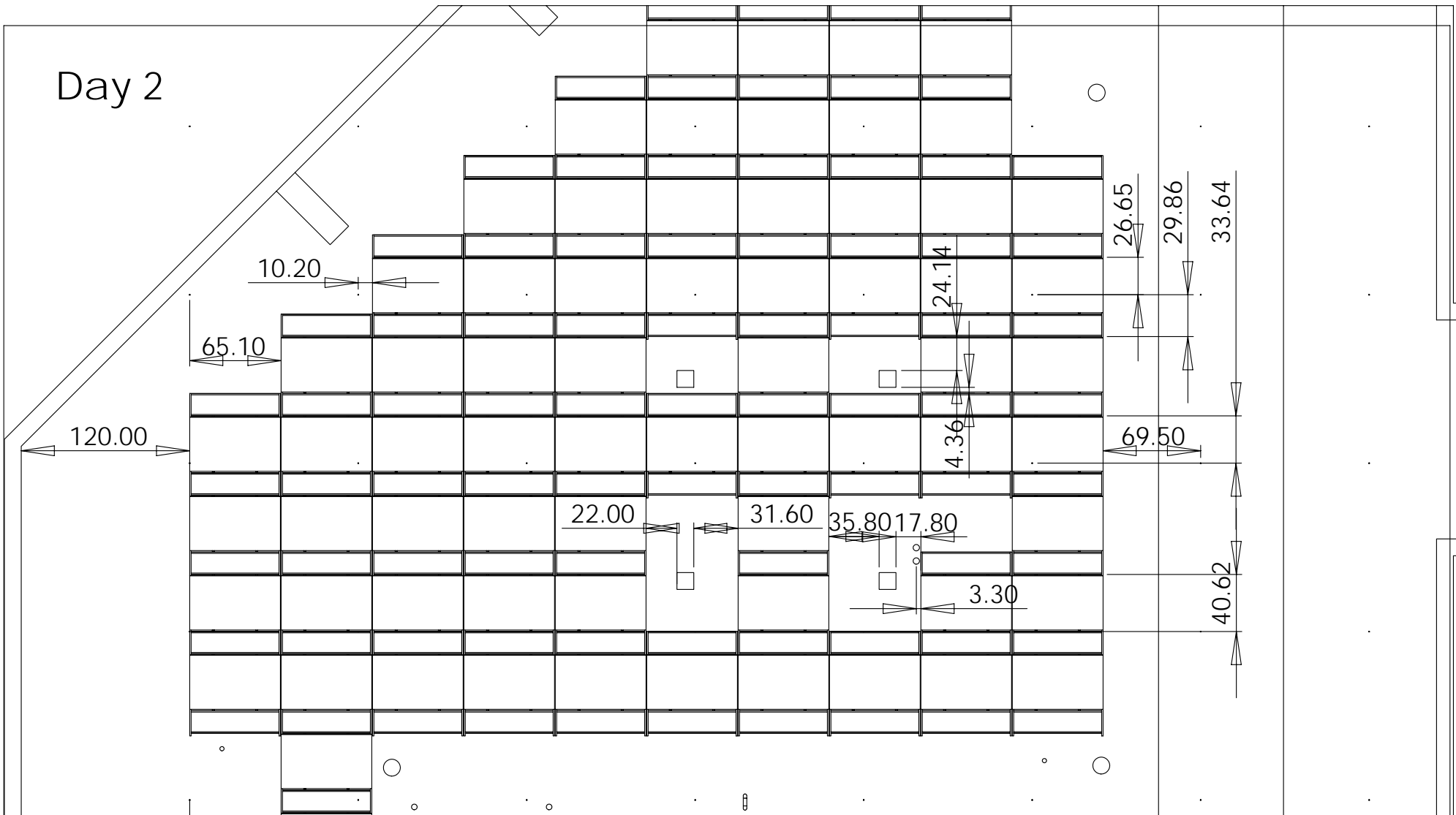
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FINISH		MFG APPR.	
DO NOT SCALE DRAWING		Q.A.	
		COMMENTS:	

<b>Watson Roof</b>		
TITLE:		
Michael Kelzenberg mk@caltech.edu x3983		
SIZE	DWG. NO.	REV
<b>A</b>		
SCALE: 1:100	WEIGHT:	SHEET 3 OF 7



Day 2



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DO NOT SCALE DRAWING	Q.A.	
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**Watson Roof**

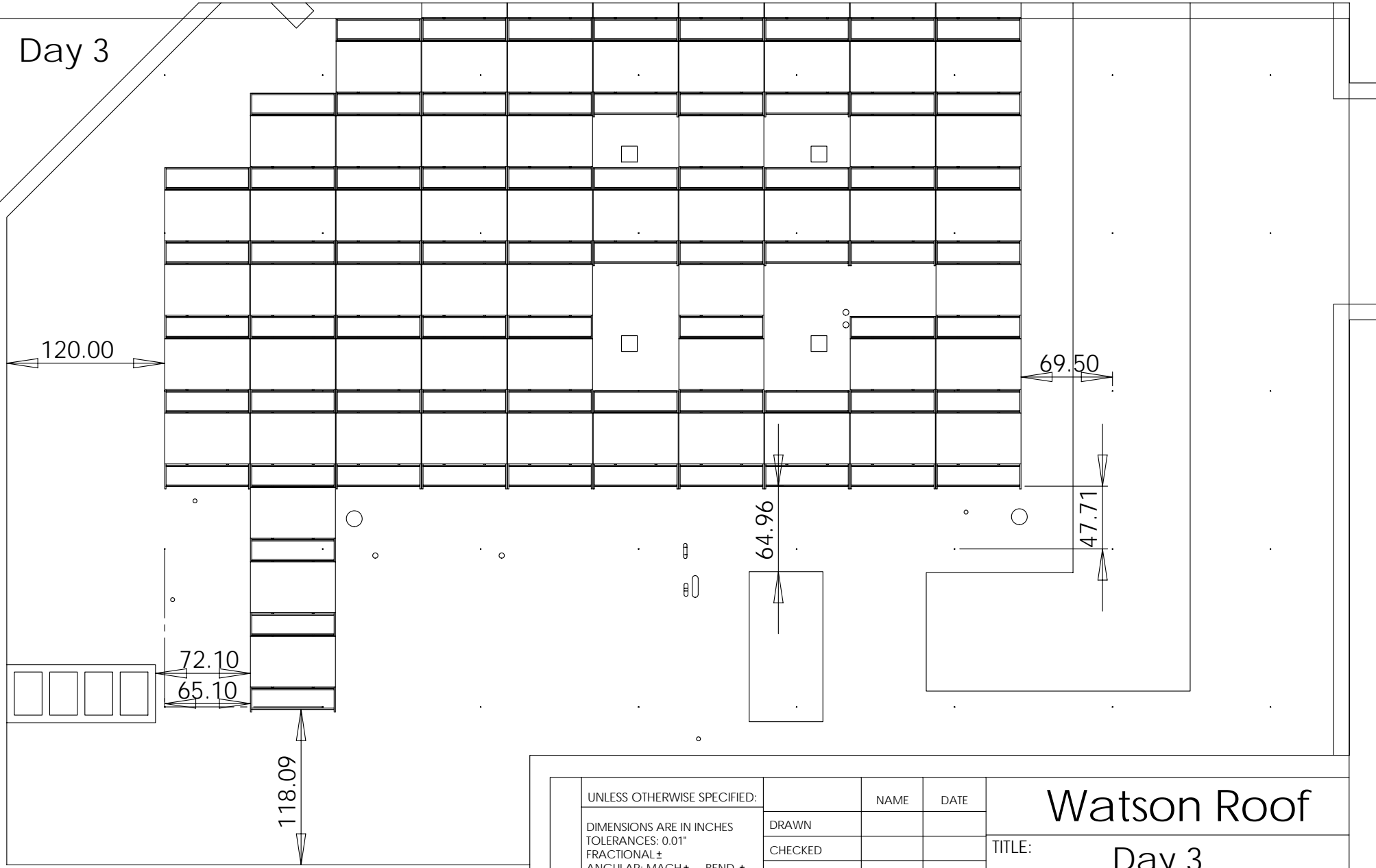
TITLE: **Day 2**

Michael Kelzenberg  
 mk@caltech.edu x3983

SIZE	DWG. NO.	REV
<b>A</b>		

SCALE: 1:100    WEIGHT:    SHEET 4 OF 7

Day 3



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NEXT ASSY                      USED ON

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	COMMENTS:	

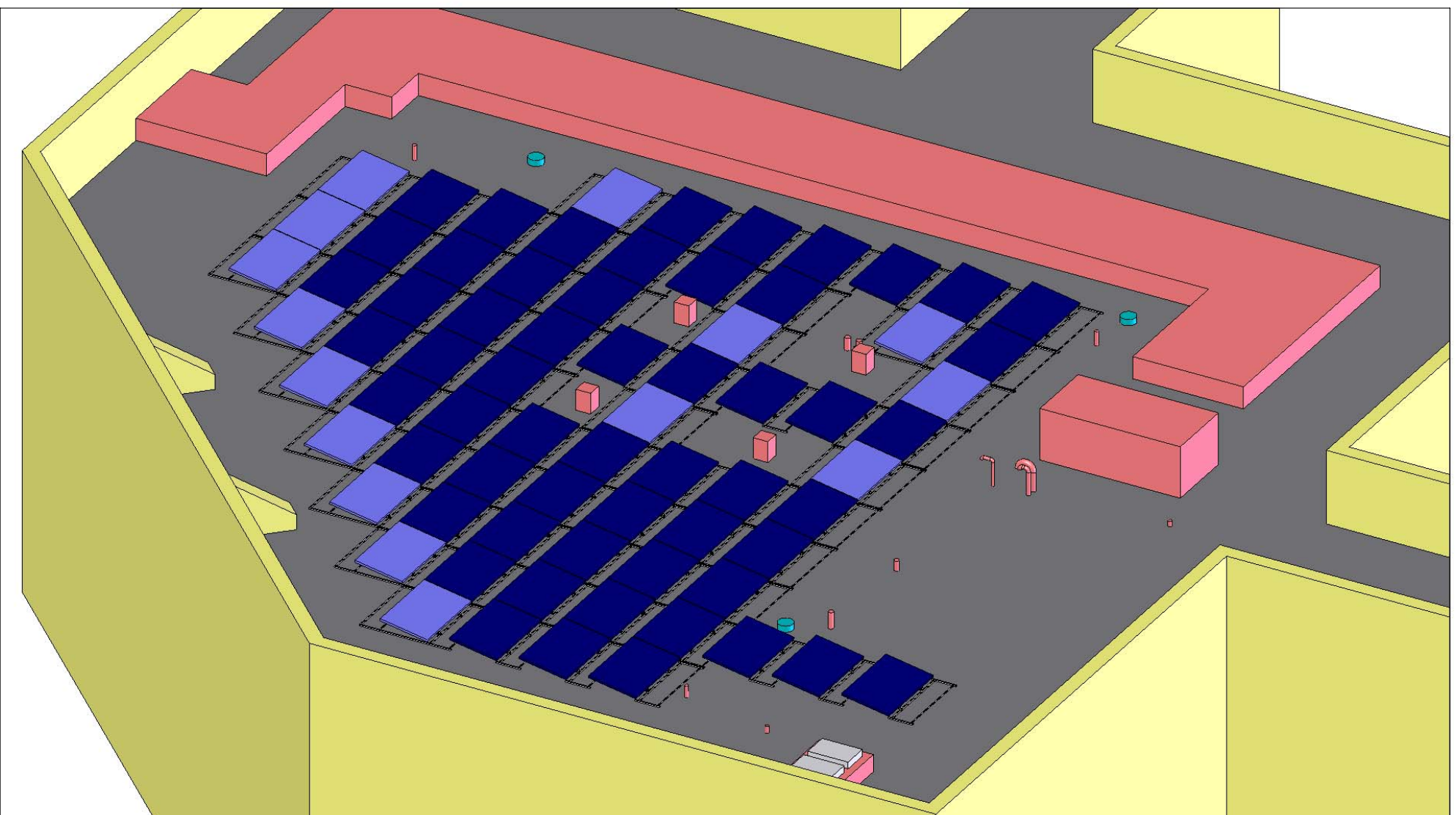
**Watson Roof**

TITLE: **Day 3**

Michael Kelzenberg  
 mk@caltech.edu x3983

SIZE	DWG. NO.	REV
<b>A</b>		

SCALE: 1:100    WEIGHT:    SHEET 5 OF 7



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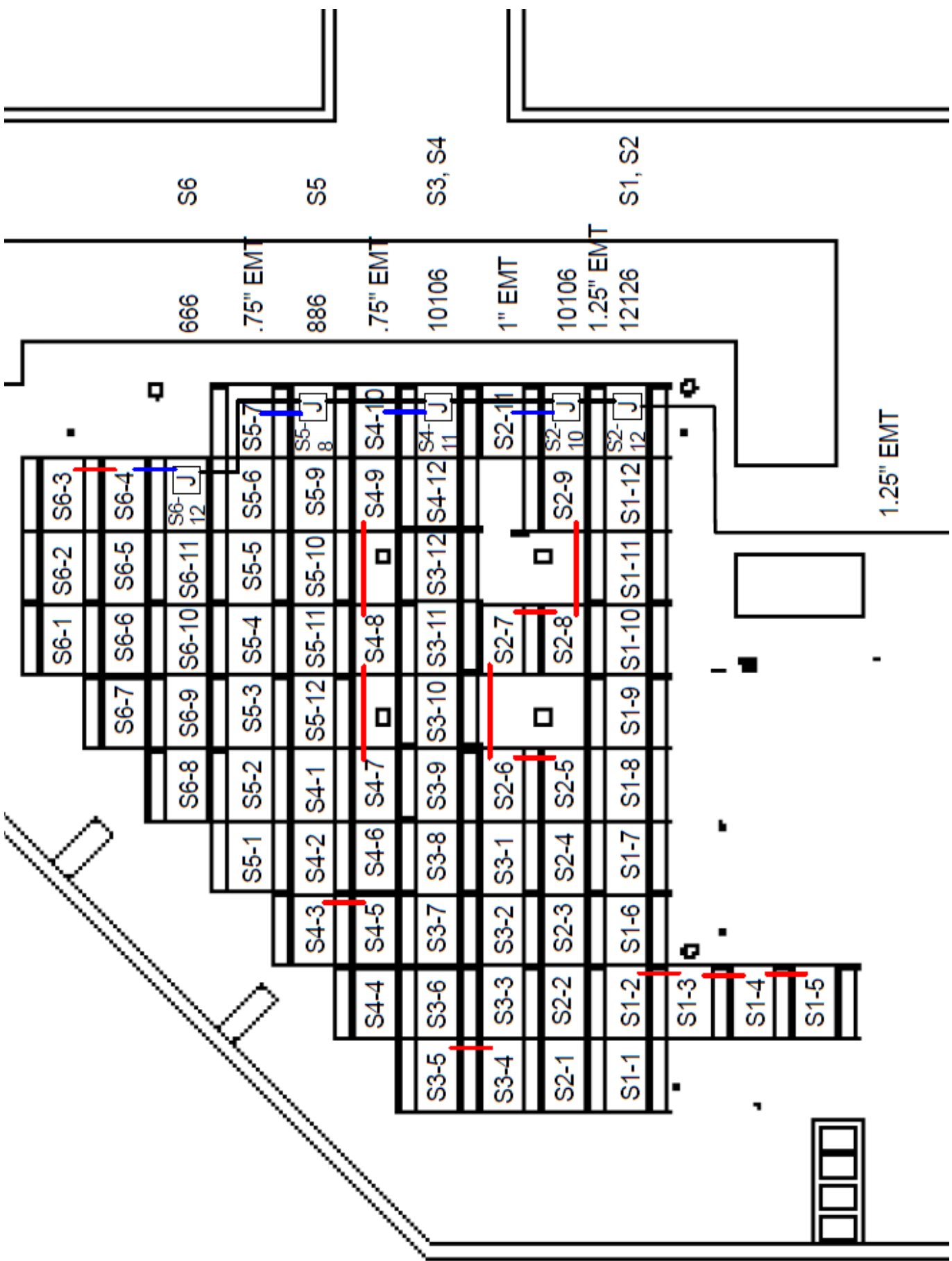
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DO NOT SCALE DRAWING

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ENG APPR.		
MFG APPR.		
Q.A.		
COMMENTS:		

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Michael Kelzenberg mk@caltech.edu x3983		
SIZE	DWG. NO.	REV
<b>A</b>		
SCALE: 1:100	WEIGHT:	SHEET 6 OF 7

5                      4                      3                      2                      1



S6

S5

S3, S4

S1, S2

666

.75" EMT

886

.75" EMT

10106

1" EMT

10106

1.25" EMT

12126

1.25" EMT

S6-1	S6-2	S6-3	S6-4	S6-5	S6-6	S6-7	S6-8	S6-9	S6-10	S6-11	S6-12
S5-1	S5-2	S5-3	S5-4	S5-5	S5-6	S5-7	S5-8	S5-9	S5-10	S5-11	S5-12
S4-1	S4-2	S4-3	S4-4	S4-5	S4-6	S4-7	S4-8	S4-9	S4-10	S4-11	S4-12
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