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1

Site Design Criteria - Flat Roof PV System Basis of Design

Roof Live Load (psf)	20(see footnote 1)
Ground Snow Pg (psf)	50
Flat Roof Snow (psf)	38.5
Snow Importance Factor (Is)	1.0
Wind Design Data	
Basic Wind Speed (mph)	110
Risk Category	II
Wind Exposure	C
Earthquake Design Data	
Risk Category	II
Importance Factor (Ie)	1.00
Component Importance Factor (Ip)	1.0
Mapped Acceleration Parameter (Ss)	0.052
Mapped Acceleration Parameter (S1)	0.034
Seismic Site Class	D
Design Spectral Acceleration Parameter (Sds)	0.055
Design Spectral Acceleration Parameter (Sd1)	0.054
Seismic Design Category (SDC)	A
Basic seismic-force-resisting system(s)	N/A (see footnote 2)
Base Design Shear = Fp x W	N/A (see footnote 2)
Response Modification Factor (Rp)	N/A (see footnote 2)
Analysis Procedure	N/A (see footnote 2)
Design Code (with local amendments)	2020 MN ST BC
-	ASCE 7 - 16
ALTERNATE DESIGN METHOD	
1. Roof Live Load only applicable to areas not covered by PV modules. Reference SEAOC Design Guidelines	
2. Per ASCE 7-16 Section 11.7, nonstructural components in seismic design category (SDC) A are exempt from seismic design requirements. Per Section 13.1.4, mechanical and electrical components in SDC B are exempt from the requirements of Chapter 13 - Seismic Design Requirements for Nonstructural Components.	

1. ALL SITE, PROJECT, AND BUILDING DETAILS ARE PROVIDED BY CUSTOMER OR GENERATED VIA SATELLITE IMAGERY FROM INFORMATION PROVIDED BY CUSTOMER. PANELCLAW IS NOT RESPONSIBLE FOR SITE INACCURACIES THAT COULD LEAD TO CHANGES TO THESE DRAWING DETAILS AND ARRAY LAYOUT CONFIGURATIONS. ALL INFORMATION CONTAINED WITHIN THESE DOCUMENTS ARE TO BE FIELD VERIFIED BY CUSTOMER AND INSTALLER. ANY CHANGES OR MODIFICATIONS TO THESE DOCUMENTS, CONTAINED INFORMATION, OR FINAL ARRAY AND MOUNTING SYSTEM INSTALLATIONS MUST BE SUBMITTED TO PANELCLAW AND OTHER PROJECT AUTHORITIES FOR APPROVAL.

2. REFER TO AND FOLLOW THE APPROPRIATE PANELCLAW INSTALLATION MANUALS AND PROCEDURES DURING THE INSTALLATION PROCESS. NOT FOLLOWING SUCH PROCEDURES AND METHODS COULD RESULT IN DAMAGE TO THE COMPONENTS OR MAY VOID THE PRODUCT WARRANTY.

3. ARRAY SETBACKS: ALL ARRAYS ARE REQUIRED TO BE SETBACK 4-FEET FROM ALL ROOF EDGES UNLESS OTHERWISE SPECIFIED AND CALLED OUT ON THE ARRAY DIAGRAMS ON THIS PAGE OR ON ADDITIONAL ARRAY BALLAST PAGES.

4. REFER TO THE SPECIFIC ARRAY BALLAST SHEETS FOR BALLASTING REQUIREMENTS BASED ON THE PROVIDED SITE INFORMATION.

5. SYSTEM PSF INCLUDES ALL PANELCLAW RACKING COMPONENTS, MECHANICAL ATTACHMENTS (IF APPLICABLE), PV MODULE AND BALLAST BLOCKS. FOR MAXIMUM SYSTEM POINT LOAD SUMMARY (PLS), REFER TO CALCULATIONS.

6. PANELCLAW AND/OR PANELCLAW CONSULTING ENGINEERS ARE NOT RESPONSIBLE FOR DETERMINING THE ADEQUACY OF THE STRUCTURE TO SUPPORT LOADS IMPOSED BY THE ARRAY AND MOUNTING SYSTEM. SUPPORT STRUCTURE TO BE CHECKED BY OTHERS.

7. ALWAYS ALLOW A MINIMUM OF 6" CLEARANCE BETWEEN NEIGHBORING SUBARRAYS, 6" BETWEEN SUBARRAYS AND ALL FIXED ROOF OBJECTS AND 4' BETWEEN SUBARRAYS AND ROOF EDGES. REFER TO LOCAL FIRE CODES AND ELECTRICAL CODES FOR ADDITIONAL REQUIREMENTS WHICH MAY GOVERN DESIGN. SUBARRAYS THAT USE A SEISMIC ANALYSIS METHOD OF DELTA MPV PREDICTED MOVEMENT HAVE THEIR OWN CLEARANCE REQUIREMENTS. REFER TO THE BALLAST LAYOUT SHEETS WITHIN THIS DOCUMENT FOR DETAILS.

8. BALLAST BLOCK DIMENSIONS MUST CONFORM TO THE FOLLOWING SPECIFICATIONS: 3-3/4" THICK MAX., 7-5/8" ± 1/8" WIDTH, 15-5/8" ± 1/8" LENGTH.

9. IF AN ARRAY CLEARANCES TABLE APPEARS BELOW ON THIS PAGE, THE DESIGN UTILIZES THIRD PARTY SEISMIC NON-LINEAR RESPONSE ANALYSIS TO ESTIMATE MAXIMUM ARRAY SEISMIC DISPLACEMENT. THE PREDICTED MOVEMENT IS ONLY AN ESTIMATE. PANELCLAW IS NOT RESPONSIBLE OR LIABLE FOR ANY DAMAGES OR COSTS ASSOCIATED WITH PV ARRAY MOVEMENT INCLUDING MOVEMENT IN EXCESS OF THE CLEARANCES NOTED IN THIS DOCUMENT OR ANY REQUIREMENT TO REPOSITION THE ARRAYS IF MOVEMENT OCCURS.

10. DEFLECTORS MUST BE INSTALLED WHEN WINDS ARE EXPECTED TO EXCEED APPROX. 25% OF WIND SPEED DOCUMENTED IN SITE DESIGN CRITERIA TABLE. DEFLECTORS ARE REQUIRED ON ALL MODULES UNLESS OTHERWISE NOTED ON BALLAST LAYOUT PAGES.

NO.

DESCRIPTION

PC-1	COVER SHEET
PC-2	PROJECT SUMMARY
PC-3	ARRAY SITE MAP
PC-4	TYPICAL ARRAY DIMENSIONS
PC-5	ASSEMBLIES
PC-6	RACKING COMPONENTS
PC-7	BALLAST LEGEND
PC-8 TO PC-12	BALLAST LAYOUT - 1 TO 5
PC-13	MECHANICAL ATTACHMENT DETAIL

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Print Name

Mark A. Tryon

Signature

Mark Tryon

Date

05/21/2025

THIS CONSTRUCTION SET PROVIDES THE RACKING LAYOUT FOR ALL ARRAYS WITH NUMBER OF BALLAST BLOCKS AND/OR MECHANICAL ATTACHMENTS BASED ON THE APPROVED STRUCTURAL CALCULATIONS FOR THE COMPLETED INSTALLED CONDITION OF THE SOLAR ARRAY. THE INSTALLER IS RESPONSIBLE FOR THE SAFETY AND CARE OF THE ARRAY DURING ALL PHASES OF INSTALLATION. THEREFORE, THE INSTALLER MUST MONITOR THE WEATHER FORECAST AND TAKE NECESSARY PRECAUTIONS (SEE GENERAL NOTE #10) TO TEMPORARILY SHORE/BRACE ALL ARRAYS DURING CONSTRUCTION UNTIL INSTALLATION IS COMPLETED IN CONFORMANCE WITH THIS APPROVED CONSTRUCTION SET AND THE PRODUCT INSTALLATION MANUAL (SEE GENERAL NOTE #2). THE INSTALLER HAS SOLE RESPONSIBILITY FOR THE MEANS, METHODS, AND TECHNIQUES OF CONSTRUCTION OF THE SOLAR ARRAY FOR COMPLIANCE WITH LAWS, REGULATIONS, AND CODES, AND FOR THE SAFETY OF CONSTRUCTION APPLICABLE TO THIS WORK.

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51979
STATE OF MINNESOTA

05/21/2025

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				CHECK
RH	AG	DH	RH	PREP
Revised Layout	Revised Layout and Module	Revised DT Layout	Revised Ballast Map Layout	DESCRIPTION
2	3	4	5	REV

SCALE:

0"1/2"1"2"

ORIGINAL SIZE 36"X24"

SHEET SIZE ARCH "D"

PREPARED FOR:

McKinstry

PROJECT:

Blue Earth County Public
Works Building

LOCATION:

19505 Stoltzman Road, Mankato,
Mankato Township, MN 56001,
USA

SHEET TITLE:

COVER SHEET

REVISION:

5

SHEET:

PC-1

8

7

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2

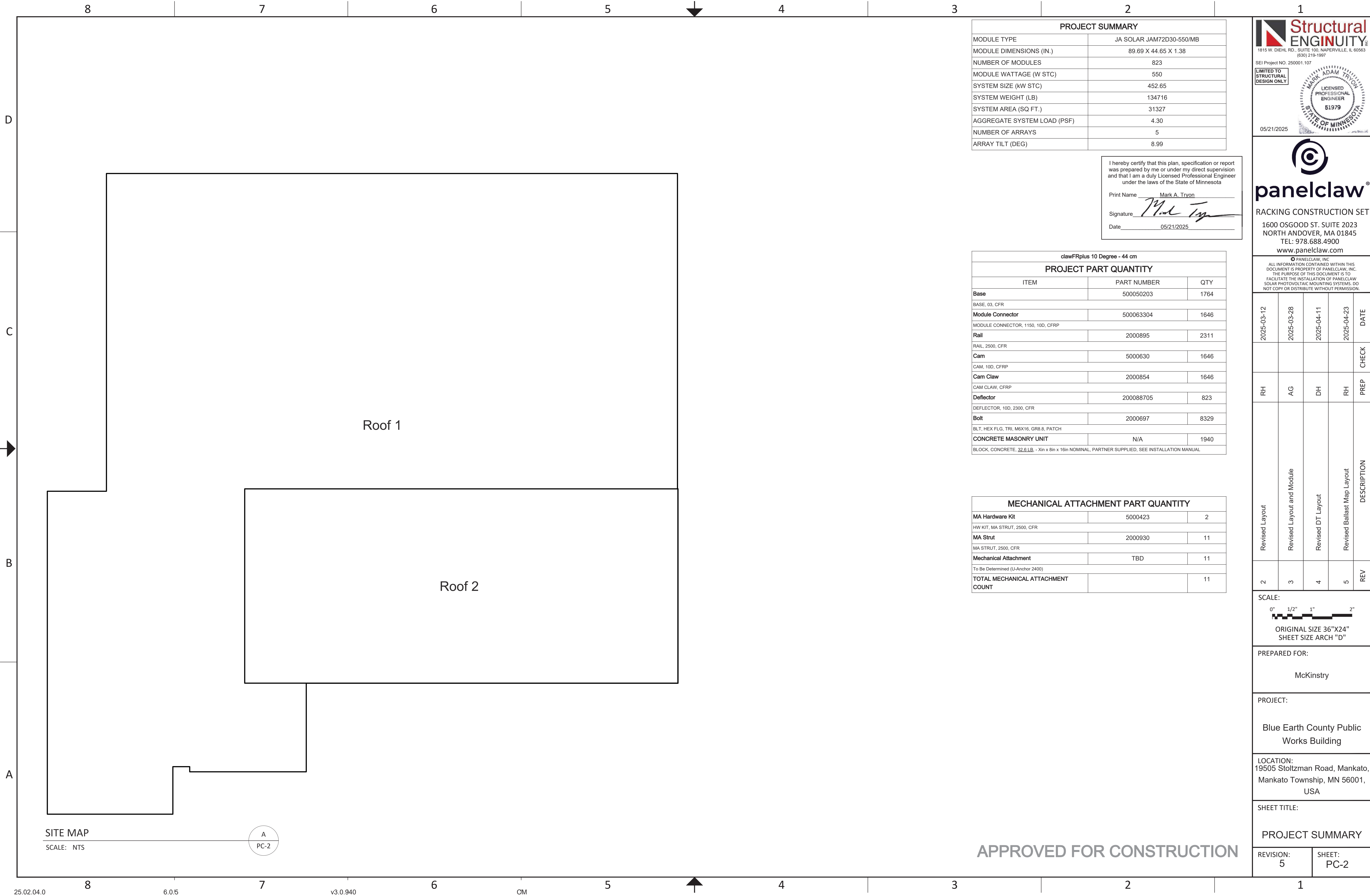
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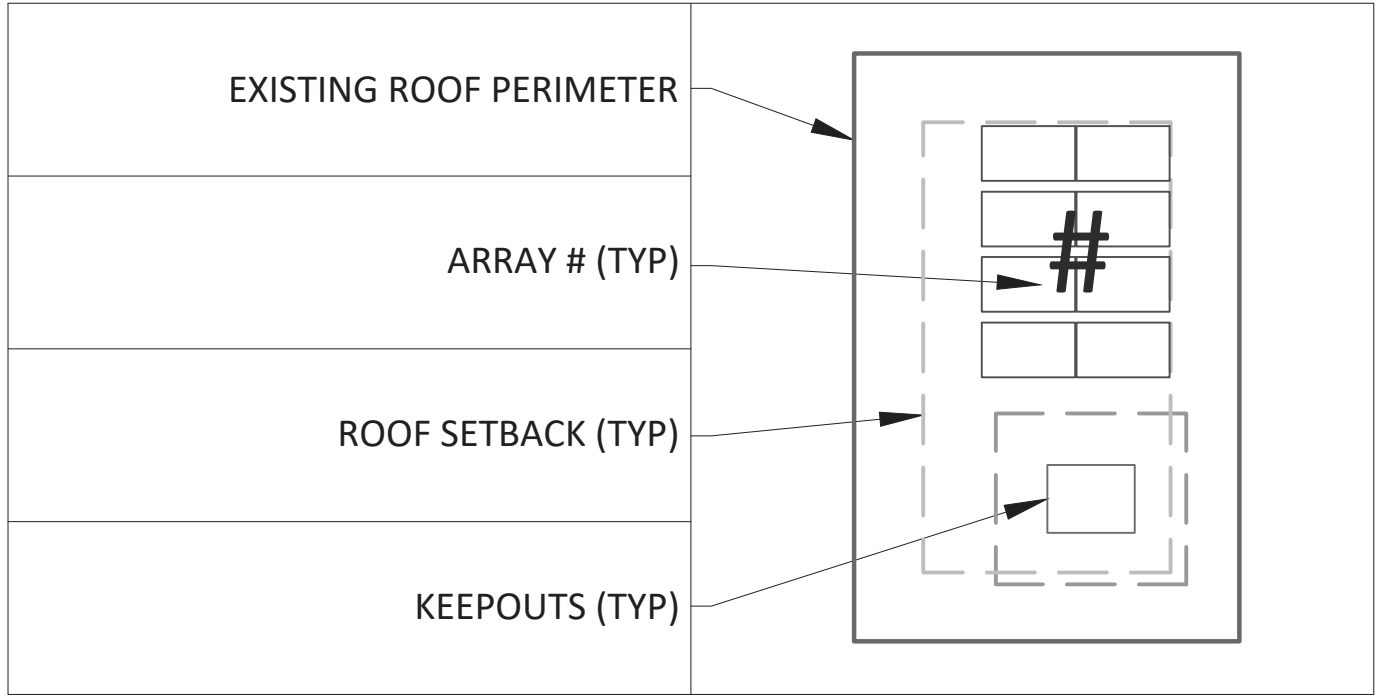
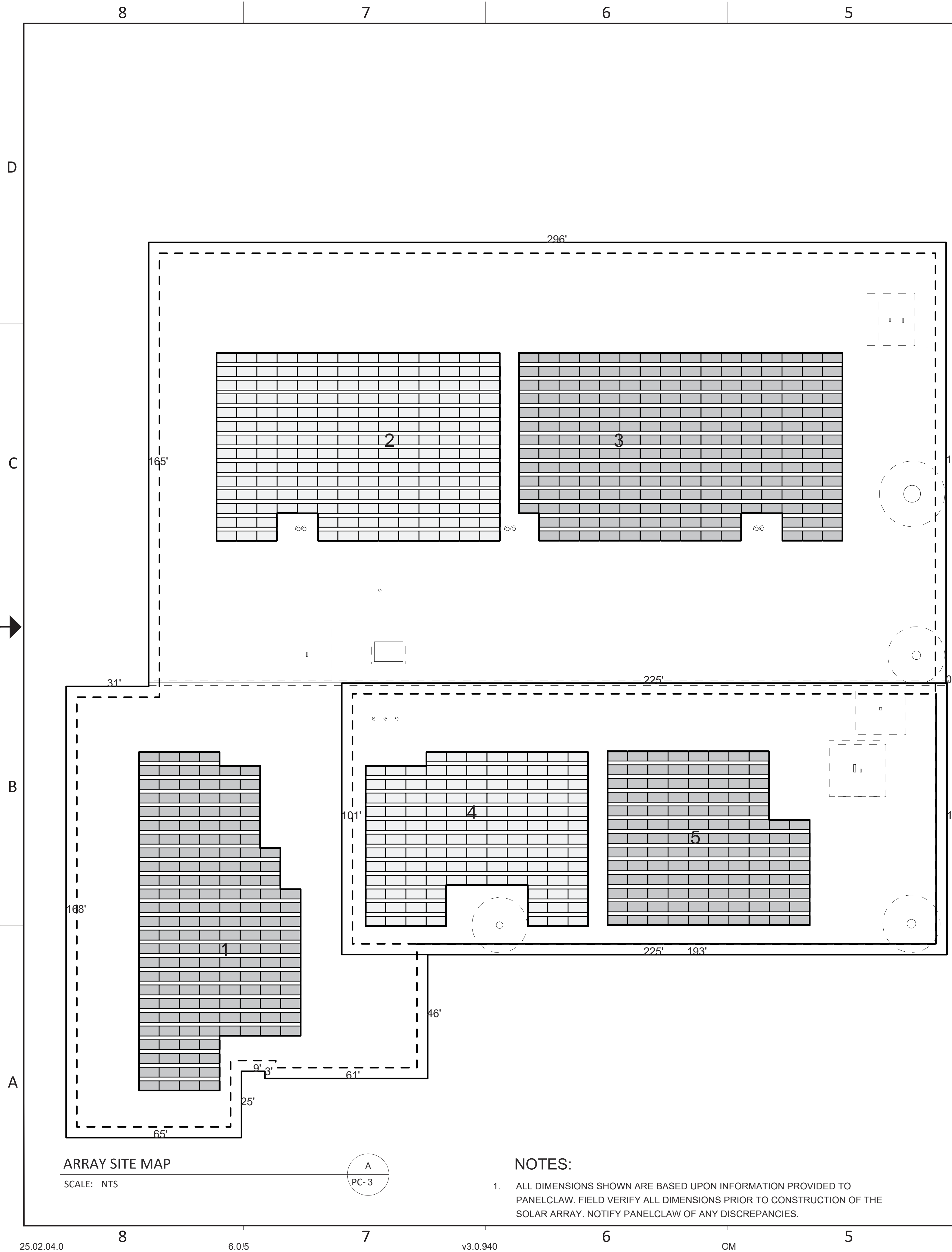
25.02.04.0

6.0.5

v3.0.940

OM





ROOF NAME	ROOF SETBACK (FT.)	ROOF HEIGHT (FT)	PARAPET HEIGHT (FT)	ROOF TILT (DEG)
Roof 1	4.00	28.00	1.0	1
Roof 2	4.00	35.00	1.0	1

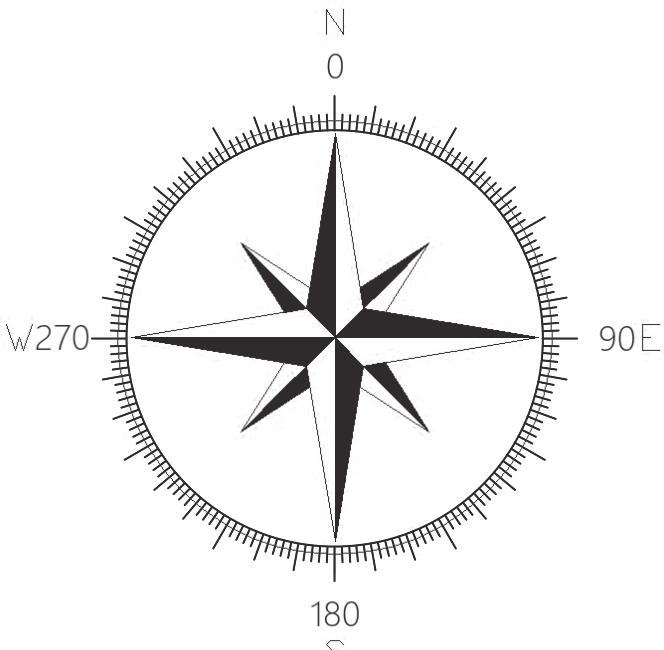
KEEPOUT NAME	KEEPOUT CLEARANCE (FT.)	KEEPOUT HEIGHT (IN.)
Group 1	1	96
Group 2	0.5	6
Group 3	9	12
Group 4	1	48

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Print Name Mark A. Tryon

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Date 05/21/2025



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2	3	4	5	REV

SCALE:

0" 1/2" 1" 2"

ORIGINAL SIZE 36"X24"

SHEET SIZE ARCH "D"

PREPARED FOR:

McKinstry

PROJECT:

Blue Earth County Public Works Building

LOCATION:

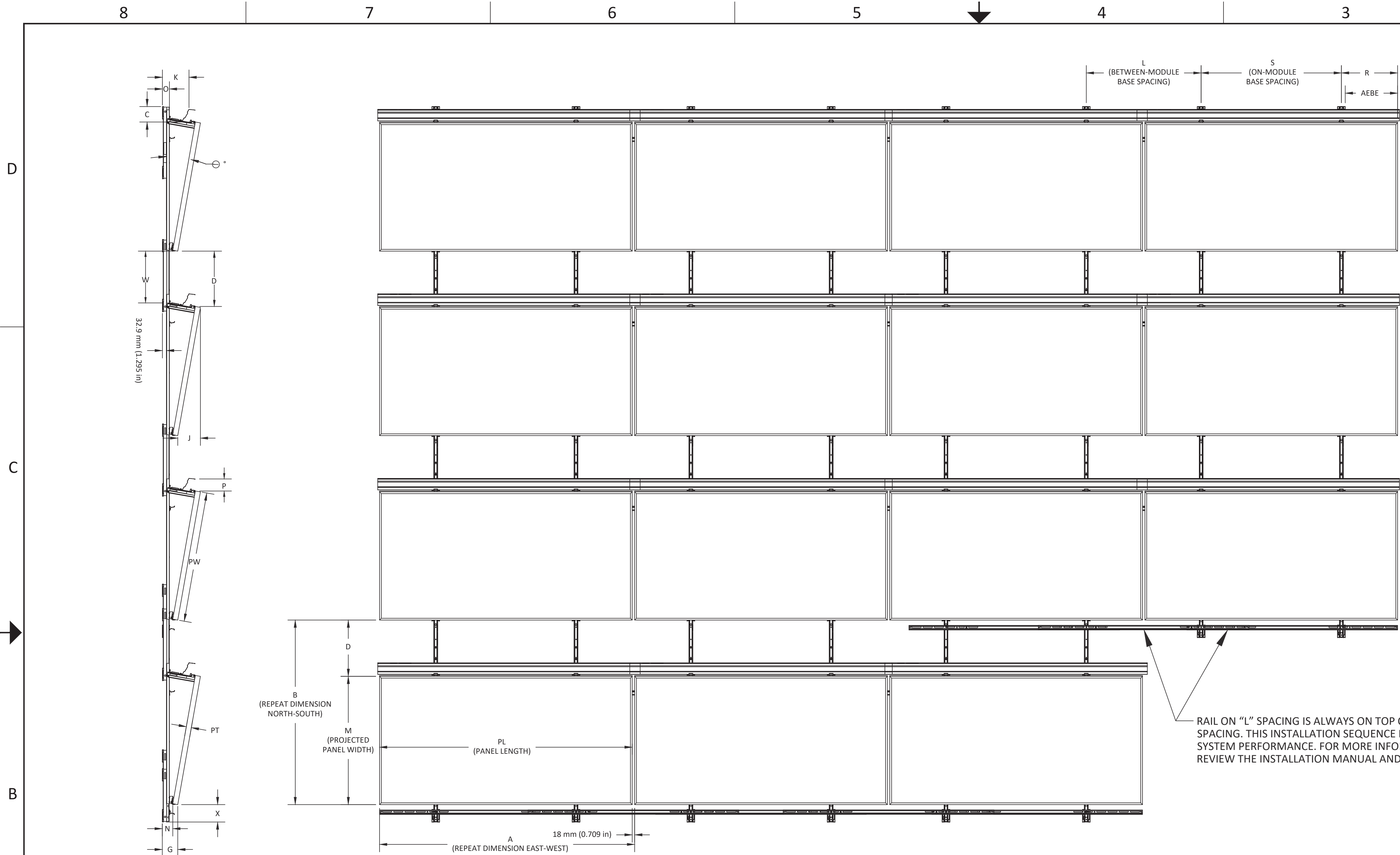
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SHEET TITLE:

ARRAY SITE MAP

REVISION: 5

SHEET: PC-3



ARRAY CROSS SECTION VIEW

SCALE: NTS

ARRAY TOP VIEW

SCALE: NTS

RAIL DETAIL

SCALE: NTS

INSTALLATION MEASUREMENTS				
UNITS	mm	486	1246	1050
	inches	19 1/8	49 1/16	41 5/16
*CAM SPACING SHOWN ON ASSEMBLIES PAGE.				

MODULE DIMENSIONS				
UNITS	mm	2278	1134	35
	inches	89.69	44.65	1.38

INSTALLED ARRAY DIMENSIONS																		
UNITS	mm	2296	1553	121	433	116	177	209	1120	81	59	92	516	407	137	8.99	2.44	0.73
	inches	90.39	61.13	4.75	17.03	4.56	6.97	8.23	44.10	3.20	2.31	3.61	20 5/16	16.03	5.39	8.99	2.44	0.73

* G.C.R = (PW) / B

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Signature *Mark A. Tryon*
Date 05/21/2025

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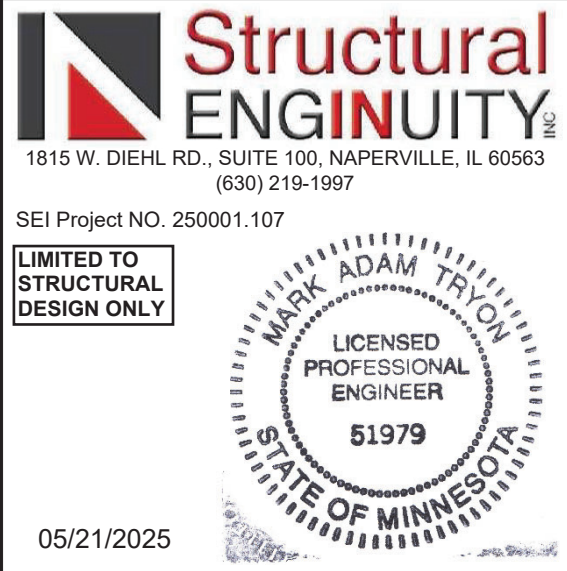
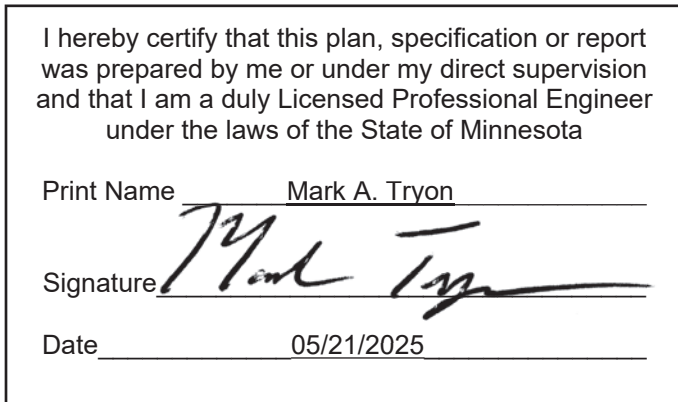
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LOCATION:
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SHEET TITLE:
TYPICAL ARRAY DIMENSIONS

REVISION: 5
SHEET: PC-4

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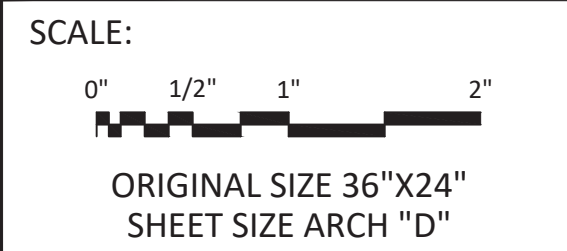


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5	Revised Ballast Map Layout	RH		2025-04-23
REV	DESCRIPTION	PREP	CHECK	DATE



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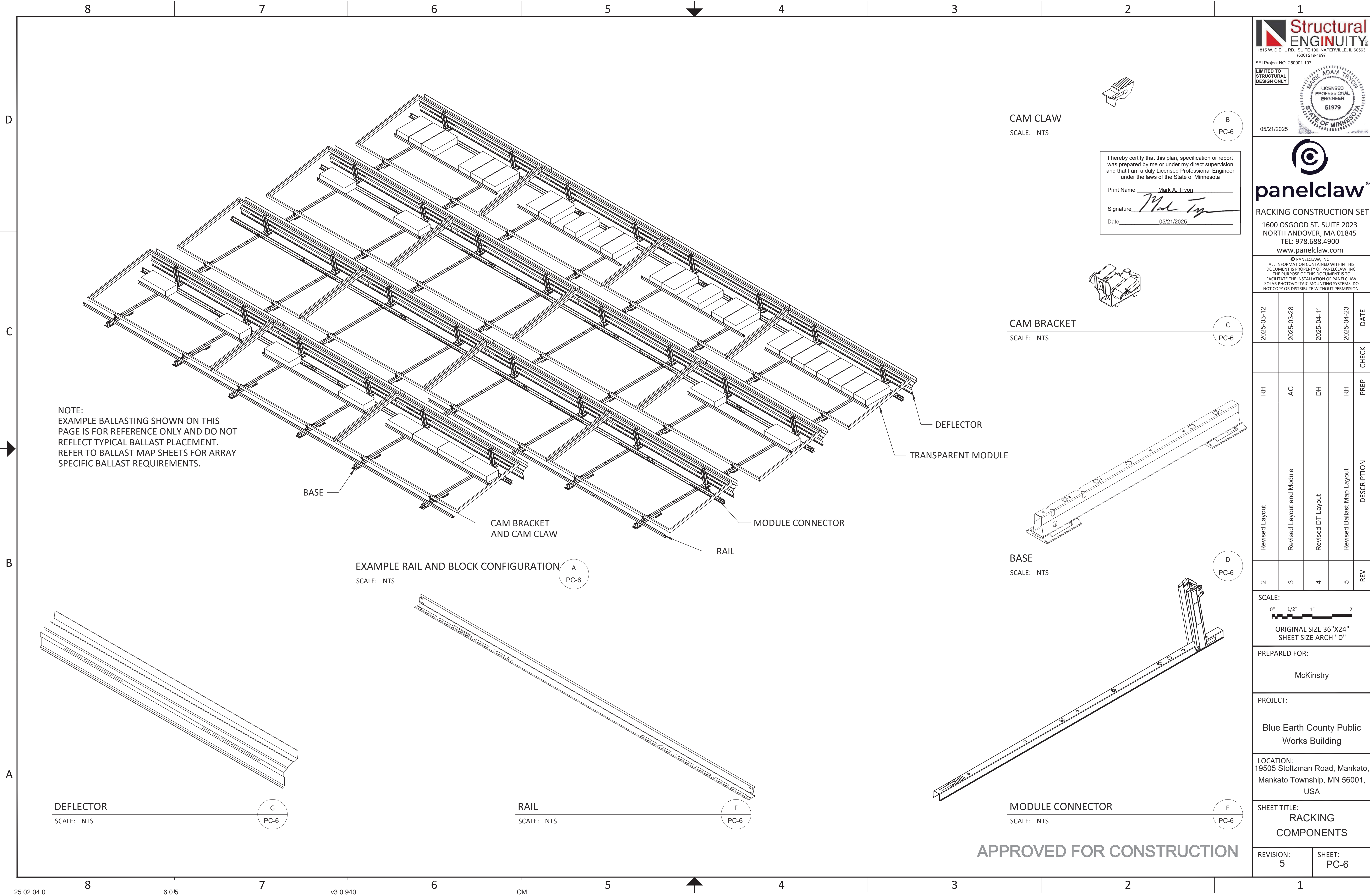
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SHEET TITLE:

ASSEMBLIES

REVISION: 5	SHEET: PC-5
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NOTE:
EXAMPLE BALLASTING SHOWN ON THIS
PAGE IS FOR REFERENCE ONLY AND DO NOT
REFLECT TYPICAL BALLAST PLACEMENT.
REFER TO BALLAST MAP SHEETS FOR ARRAY
SPECIFIC BALLAST REQUIREMENTS.

EXAMPLE RAIL AND BLOCK CONFIGURATION
SCALE: NTS

DEFLECTOR
SCALE: NTS

RAIL
SCALE: NTS

CAM CLAW
SCALE: NTS

CAM BRACKET
SCALE: NTS

BASE
SCALE: NTS

MODULE CONNECTOR
SCALE: NTS

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ORIGINAL SIZE 36"X24"
SHEET SIZE ARCH "D"

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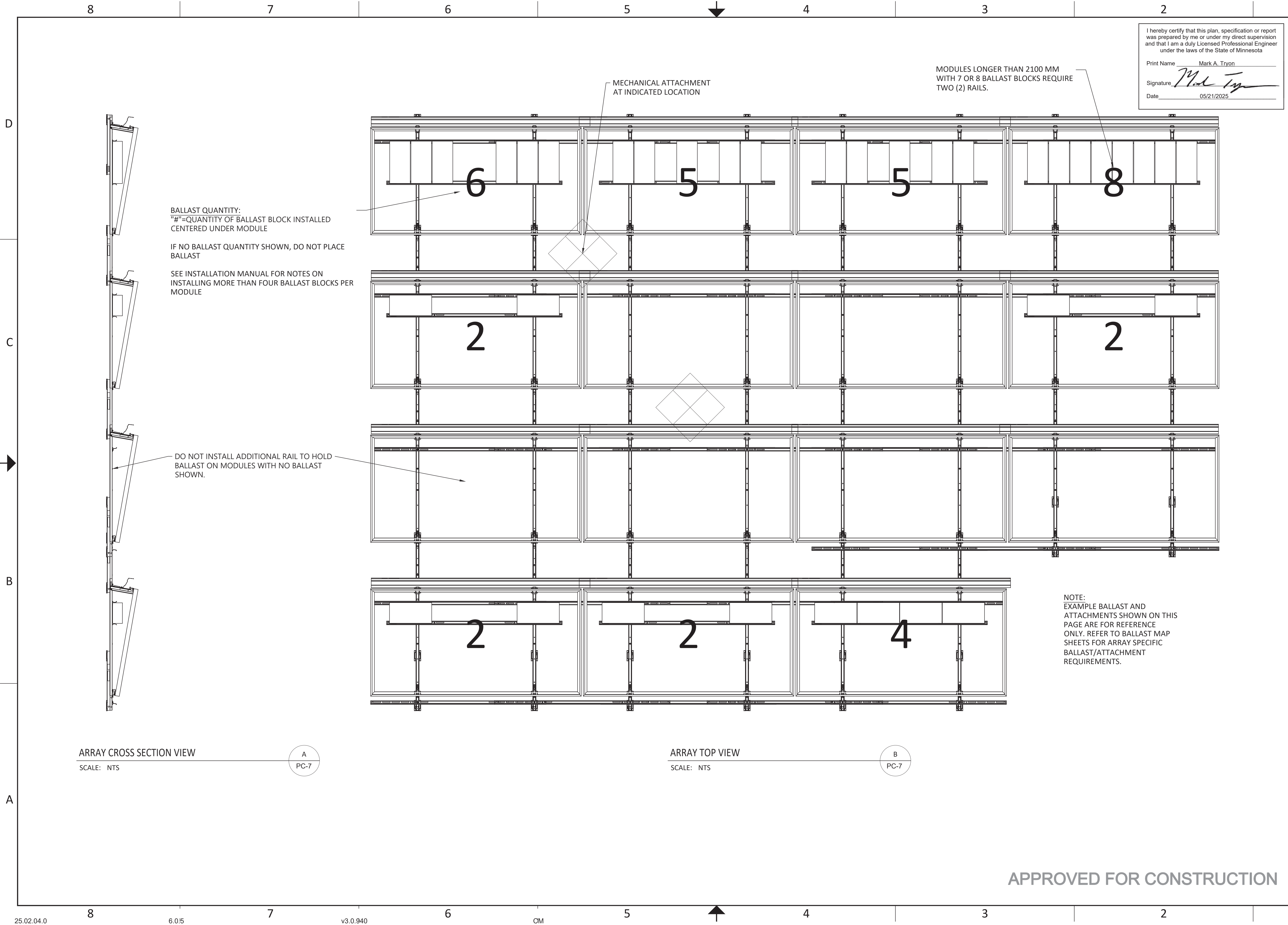
PROJECT:
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LOCATION:
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SHEET TITLE:
RACKING
COMPONENTS

REVISION: 5	SHEET: PC-6
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PROJECT:

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SHEET TITLE:

BALLAST LEGEND

REVISION: 5

SHEET: PC-7



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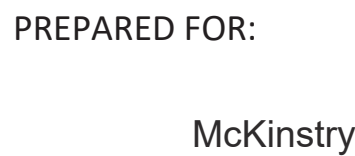
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5	Revised Ballast Map Layout	RH		2025-04-23	
	REV	DESCRIPTION	PREP	CHECK	DATE



PROJECT:

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Works Building

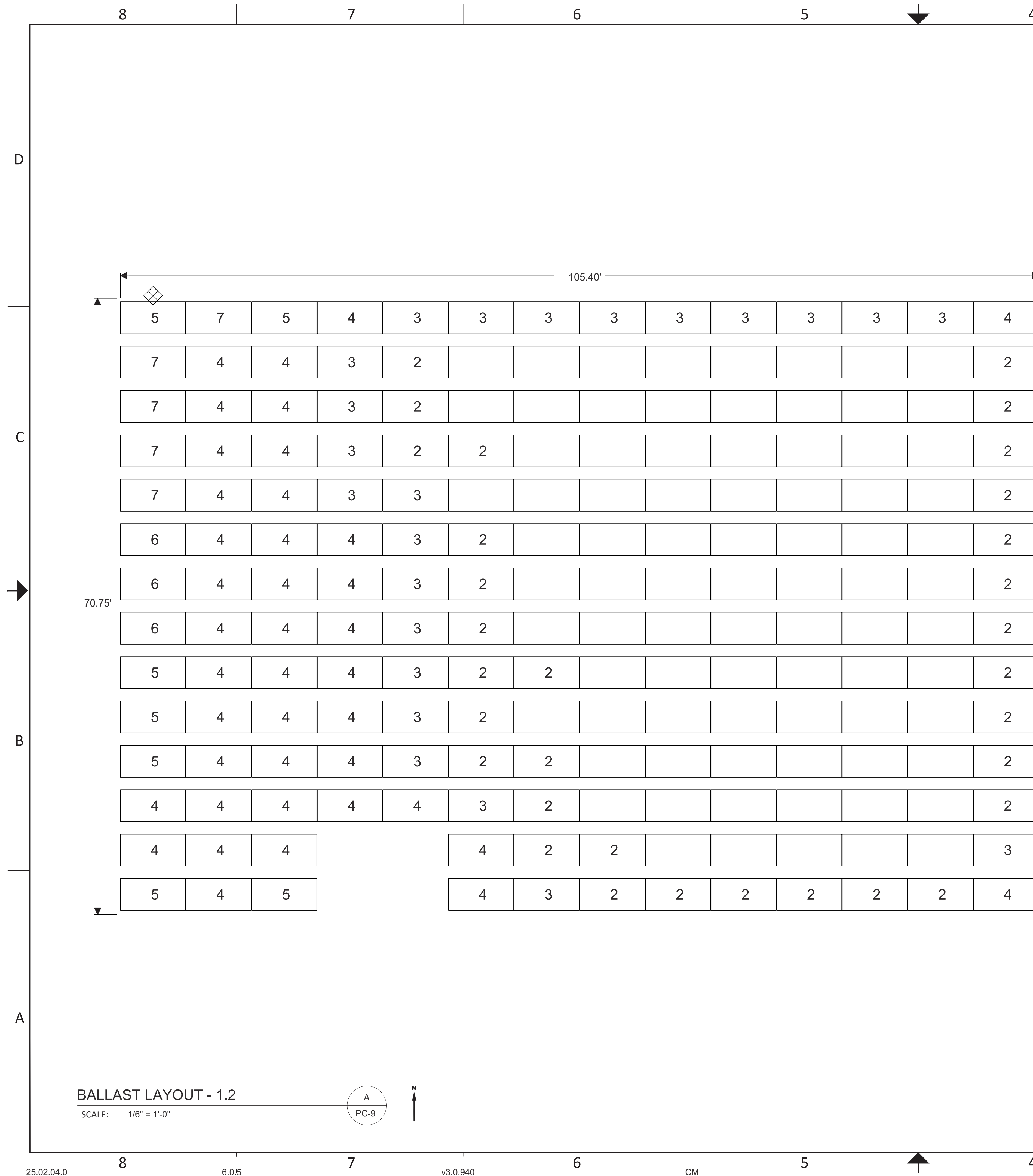
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SHEET TITLE:

BALLAST LAYOUT - 1.1

REVISION: 5	SHEET: PC-8
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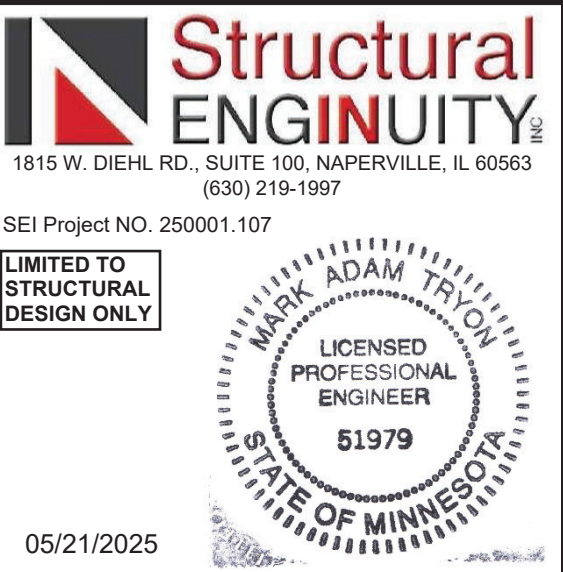
Print Name Mark A. Tryon

Signature 

Date 05/21/2025

ARRAY 1.2	ROOF INFORMATION
ROOF HEIGHT (FT)	28.00
PARAPET HEIGHT (FT)	1.0
ROOF TILT (DEG)	1
ROOF TYPE	EPDM
SPECIFICATIONS	
NUMBER OF MODULES	192
MODULE POWER (W)	550
ARRAY OUTPUT (Kw)	105.6
ARRAY AZIMUTH	180
PART QUANTITIES	
ITEM	QTY
Base	412
Module Connector	384
Rail	512
Cam	384
Cam Claw	384
Deflector	192
Ballast Block	381
Mechanical Attachment	1
LOADING DETAILS	
SINGLE MODULE WT (LB)	70.1
SINGLE CMU WT (LB)	32.6
TOTAL ARRAY WT (LB)	29027
ARRAY AREA (SQ. FT)	7307
ARRAY LOAD (PSF)	3.97

ASSEMBLY QUANTITIES	
ASSEMBLY	QTY
NORTH ASSEMBLY	28
SOUTH ASSEMBLY	28
MIDDLE ASSEMBLY	328
NORTH SOUTH ASSEMBLY	0



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REV	DESCRIPTION	PREP	DATE



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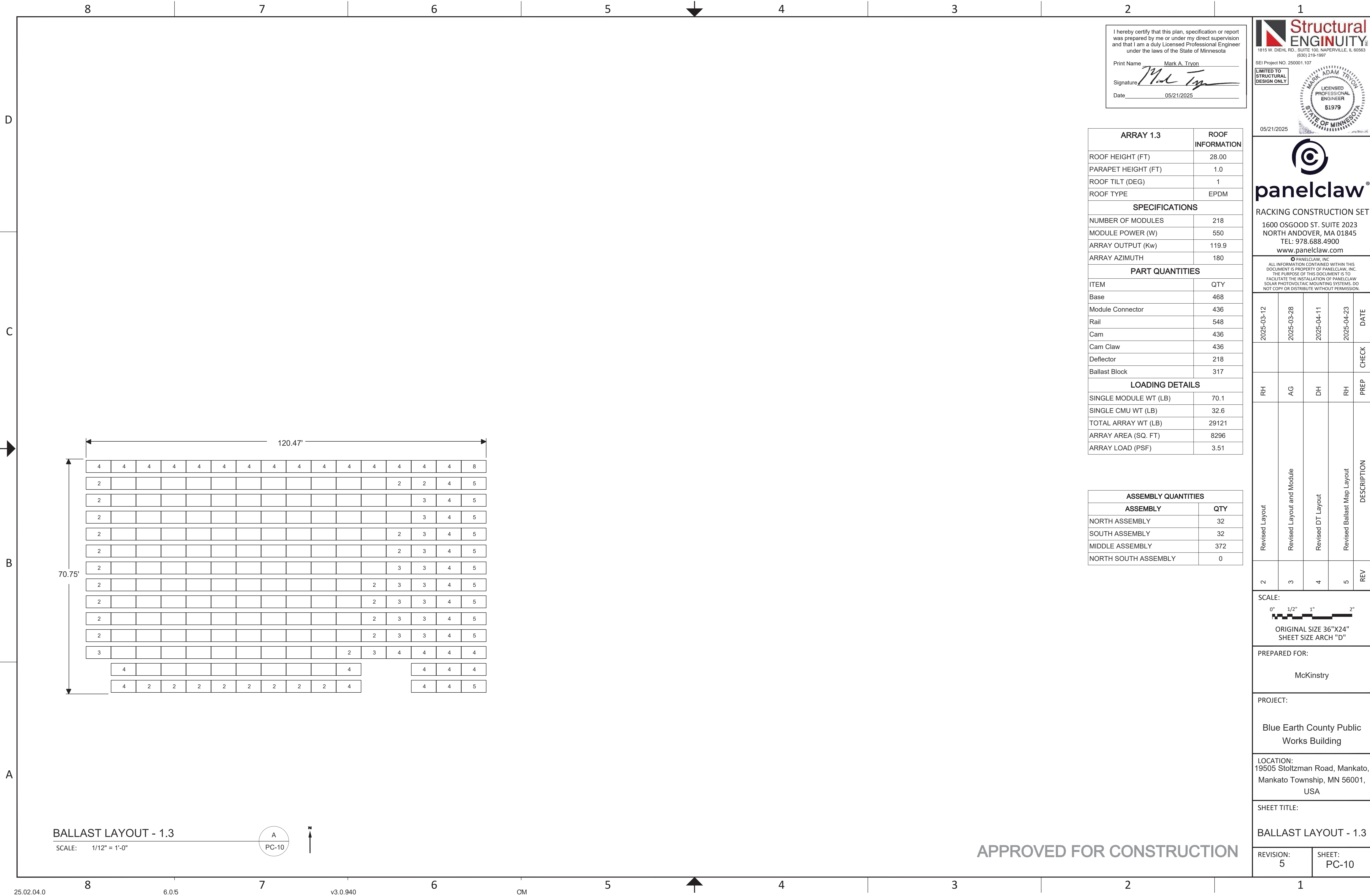
LOCATION:
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SHEET TITLE:

BALLAST LAYOUT - 1.2

REVISION: 5	SHEET: PC-9
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Print Name Mark A. Tryon

Signature *Mark A. Tryon*

Date 05/21/2025

ARRAY 1.3	ROOF INFORMATION
ROOF HEIGHT (FT)	28.00
PARAPET HEIGHT (FT)	1.0
ROOF TILT (DEG)	1
ROOF TYPE	EPDM
SPECIFICATIONS	
NUMBER OF MODULES	218
MODULE POWER (W)	550
ARRAY OUTPUT (Kw)	119.9
ARRAY AZIMUTH	180
PART QUANTITIES	
ITEM	QTY
Base	468
Module Connector	436
Rail	548
Cam	436
Cam Claw	436
Deflector	218
Ballast Block	317
LOADING DETAILS	
SINGLE MODULE WT (LB)	70.1
SINGLE CMU WT (LB)	32.6
TOTAL ARRAY WT (LB)	29121
ARRAY AREA (SQ. FT)	8296
ARRAY LOAD (PSF)	3.51

ASSEMBLY QUANTITIES	
ASSEMBLY	QTY
NORTH ASSEMBLY	32
SOUTH ASSEMBLY	32
MIDDLE ASSEMBLY	372
NORTH SOUTH ASSEMBLY	0

1815 W. DIEHL RD., SUITE 100, NAPERVILLE, IL 60563
(630) 219-1997

SEI Project NO. 250001.107

LIMITED TO
STRUCTURAL
DESIGN ONLY

MARK ADAM TRYON
LICENSED
PROFESSIONAL
ENGINEER
51979
STATE OF MINNESOTA

05/21/2025

RACKING CONSTRUCTION SET

1600 OSGOOD ST. SUITE 2023
NORTH ANDOVER, MA 01845
TEL: 978.688.4900
www.panelclaw.com

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2025-03-12	2025-03-28	2025-04-11	2025-04-23	DATE
				CHECK
RH	AG	DH	RH	PREP
Revised Layout	Revised Layout and Module	Revised DT Layout	Revised Ballast Map Layout	DESCRIPTION
2	3	4	5	REV

SCALE:

0" 1/2" 1" 2"

ORIGINAL SIZE 36"X24"

SHEET SIZE ARCH "D"

PREPARED FOR:

McKinstry

PROJECT:

Blue Earth County Public Works Building

LOCATION:

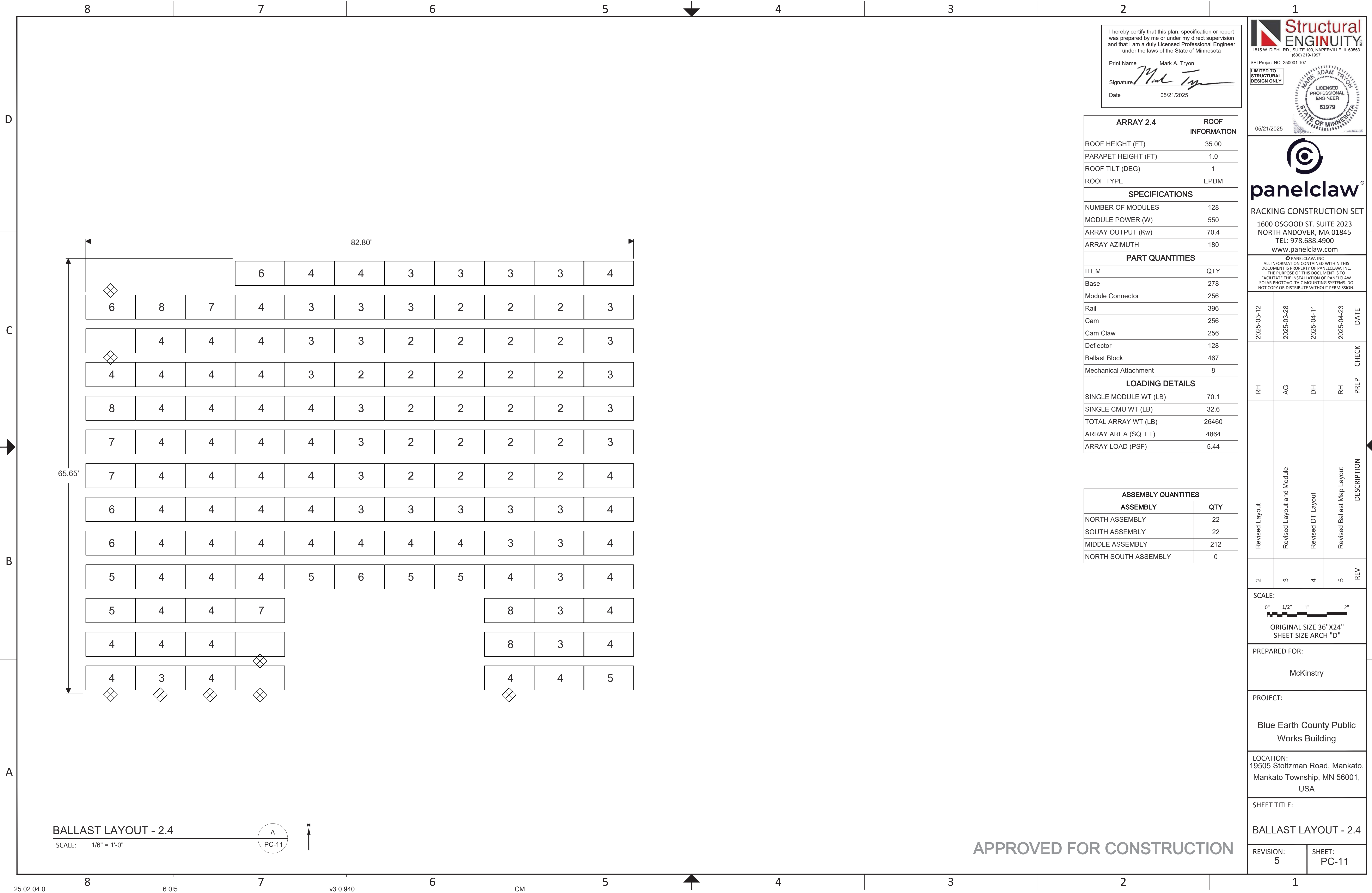
19505 Stoltzman Road, Mankato, Mankato Township, MN 56001, USA

SHEET TITLE:

BALLAST LAYOUT - 1.3

REVISION:	SHEET:
5	PC-10

APPROVED FOR CONSTRUCTION



I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota

Print Name Mark A. Tryon

Signature *Mark A. Tryon*

Date 05/21/2025

ARRAY 2.4	ROOF INFORMATION
ROOF HEIGHT (FT)	35.00
PARAPET HEIGHT (FT)	1.0
ROOF TILT (DEG)	1
ROOF TYPE	EPDM
SPECIFICATIONS	
NUMBER OF MODULES	128
MODULE POWER (W)	550
ARRAY OUTPUT (Kw)	70.4
ARRAY AZIMUTH	180
PART QUANTITIES	
ITEM	QTY
Base	278
Module Connector	256
Rail	396
Cam	256
Cam Claw	256
Deflector	128
Ballast Block	467
Mechanical Attachment	8
LOADING DETAILS	
SINGLE MODULE WT (LB)	70.1
SINGLE CMU WT (LB)	32.6
TOTAL ARRAY WT (LB)	26460
ARRAY AREA (SQ. FT)	4864
ARRAY LOAD (PSF)	5.44

ASSEMBLY QUANTITIES	
ASSEMBLY	QTY
NORTH ASSEMBLY	22
SOUTH ASSEMBLY	22
MIDDLE ASSEMBLY	212
NORTH SOUTH ASSEMBLY	0

1815 W. DIEHL RD., SUITE 100, NAPERVILLE, IL 60563
(630) 219-1997

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				CHECK
RH	AG	DH	RH	PREP
Revised Layout	Revised Layout and Module	Revised DT Layout	Revised Ballast Map Layout	DESCRIPTION
2	3	4	5	REV

SCALE:

0" 1/2" 1" 2"

ORIGINAL SIZE 36"X24"

SHEET SIZE ARCH "D"

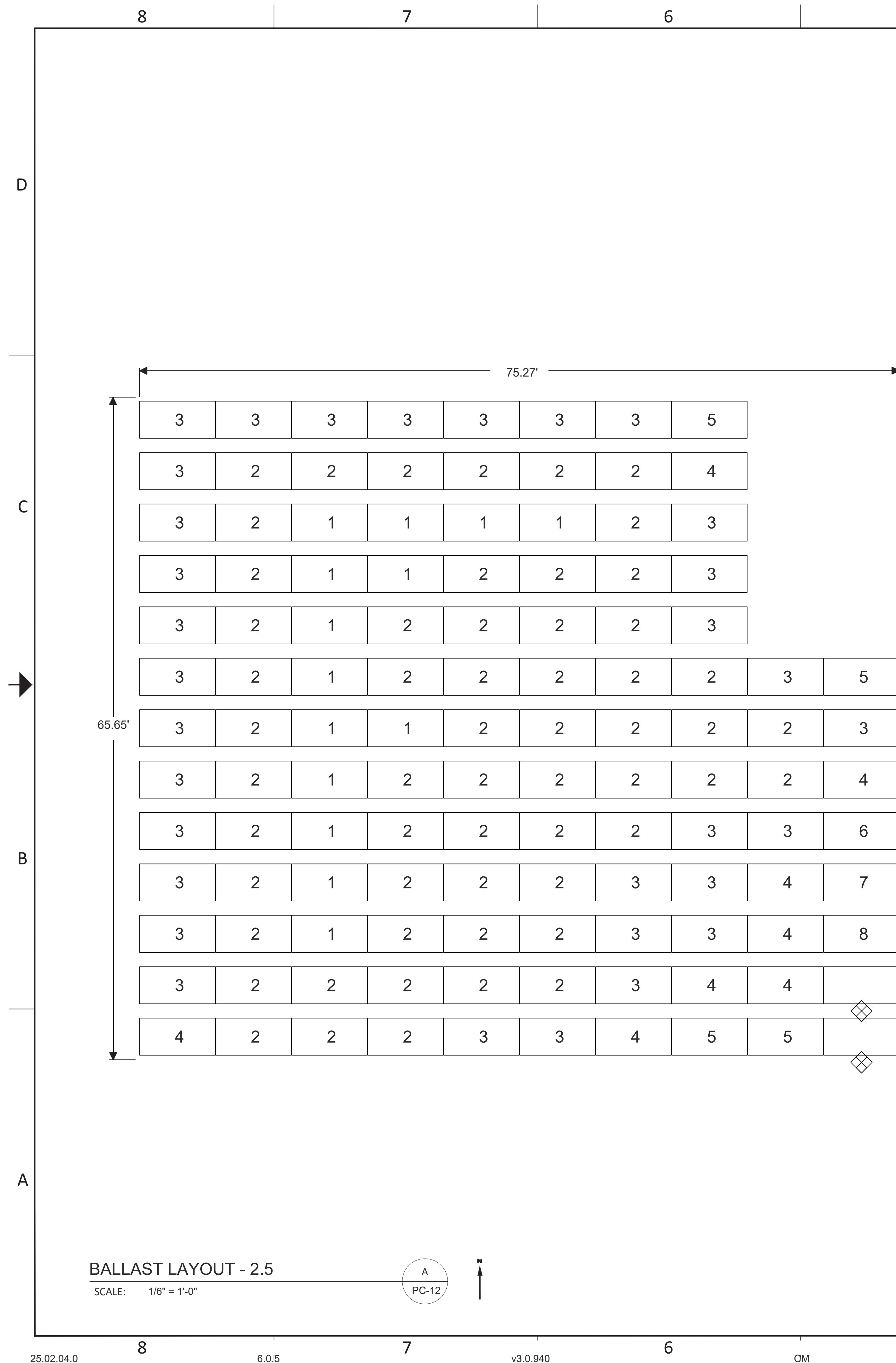
PREPARED FOR:
McKinstry

PROJECT:
Blue Earth County Public Works Building

LOCATION:
19505 Stoltzman Road, Mankato, Mankato Township, MN 56001, USA

SHEET TITLE:
BALLAST LAYOUT - 2.4

REVISION: 5	SHEET: PC-11
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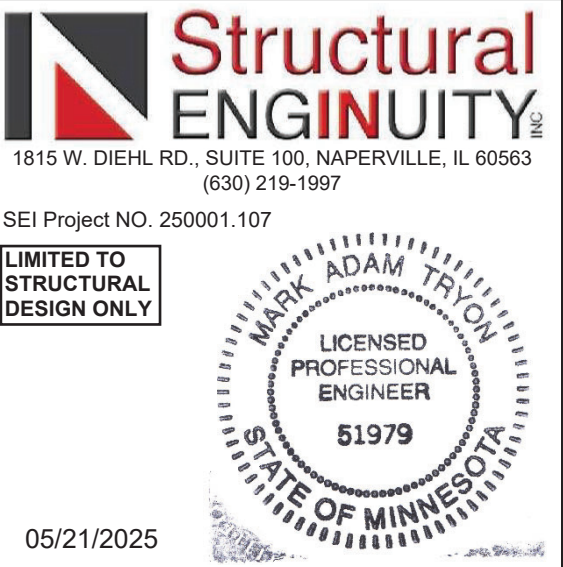
Print Name Mark A. Tryon

Signature 

Date 05/21/2025

ARRAY 2.5		ROOF INFORMATION
ROOF HEIGHT (FT)		35.00
PARAPET HEIGHT (FT)		1.0
ROOF TILT (DEG)		1
ROOF TYPE		EPDM
SPECIFICATIONS		
NUMBER OF MODULES		120
MODULE POWER (W)		550
ARRAY OUTPUT (Kw)		66
ARRAY AZIMUTH		180
PART QUANTITIES		
ITEM		QTY
Base		260
Module Connector		240
Rail		366
Cam		240
Cam Claw		240
Deflector		120
Ballast Block		297
Mechanical Attachment		2
LOADING DETAILS		
SINGLE MODULE WT (LB)		70.1
SINGLE CMU WT (LB)		32.6
TOTAL ARRAY WT (LB)		20173
ARRAY AREA (SQ. FT)		4562
ARRAY LOAD (PSF)		4.42

ASSEMBLY QUANTITIES	
ASSEMBLY	QTY
NORTH ASSEMBLY	20
SOUTH ASSEMBLY	20
MIDDLE ASSEMBLY	200
NORTH SOUTH ASSEMBLY	0

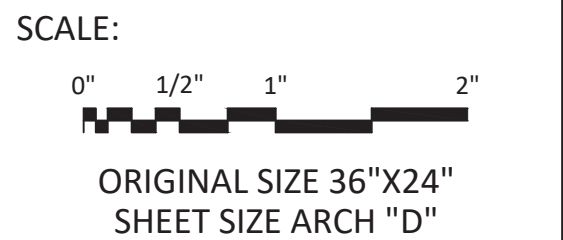


RACKING CONSTRUCTION SET

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NORTH ANDOVER, MA 01845
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2	Revised Layout	RH	2025-03-12
3	Revised Layout and Module	AG	2025-03-28
4	Revised DT Layout	DH	2025-04-11
5	Revised Ballast Map Layout	RH	2025-04-23
REV	DESCRIPTION	PREP	DATE



PREPARED FOR:

McKinstry

PROJECT:

Blue Earth County Public
Works Building

LOCATION:
19505 Stoltzman Road, Mankato,
Mankato Township, MN 56001,
USA

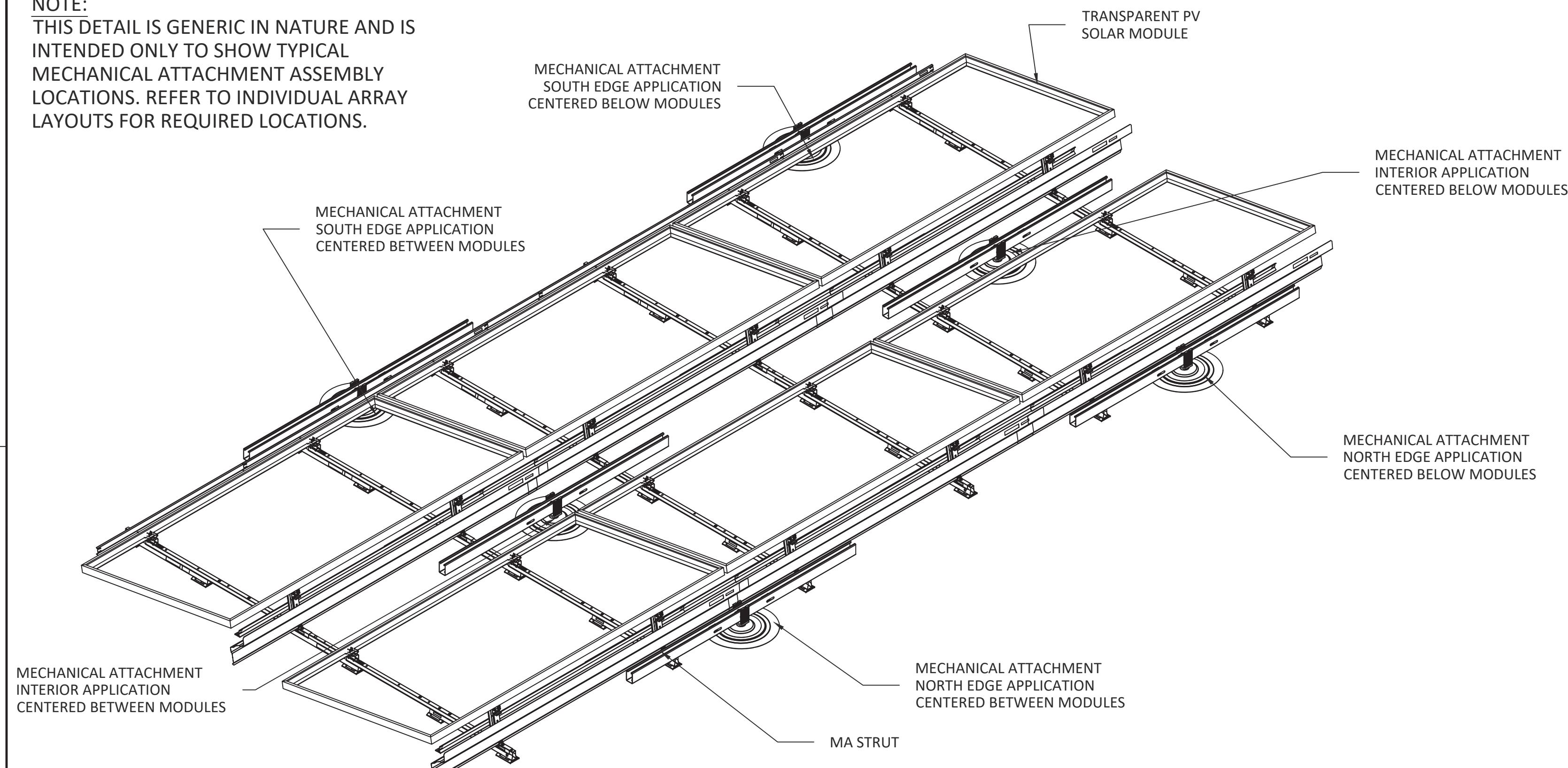
SHEET TITLE:

BALLAST LAYOUT - 2.5

REVISION: 5	SHEET: PC-12
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APPROVED FOR CONSTRUCTION

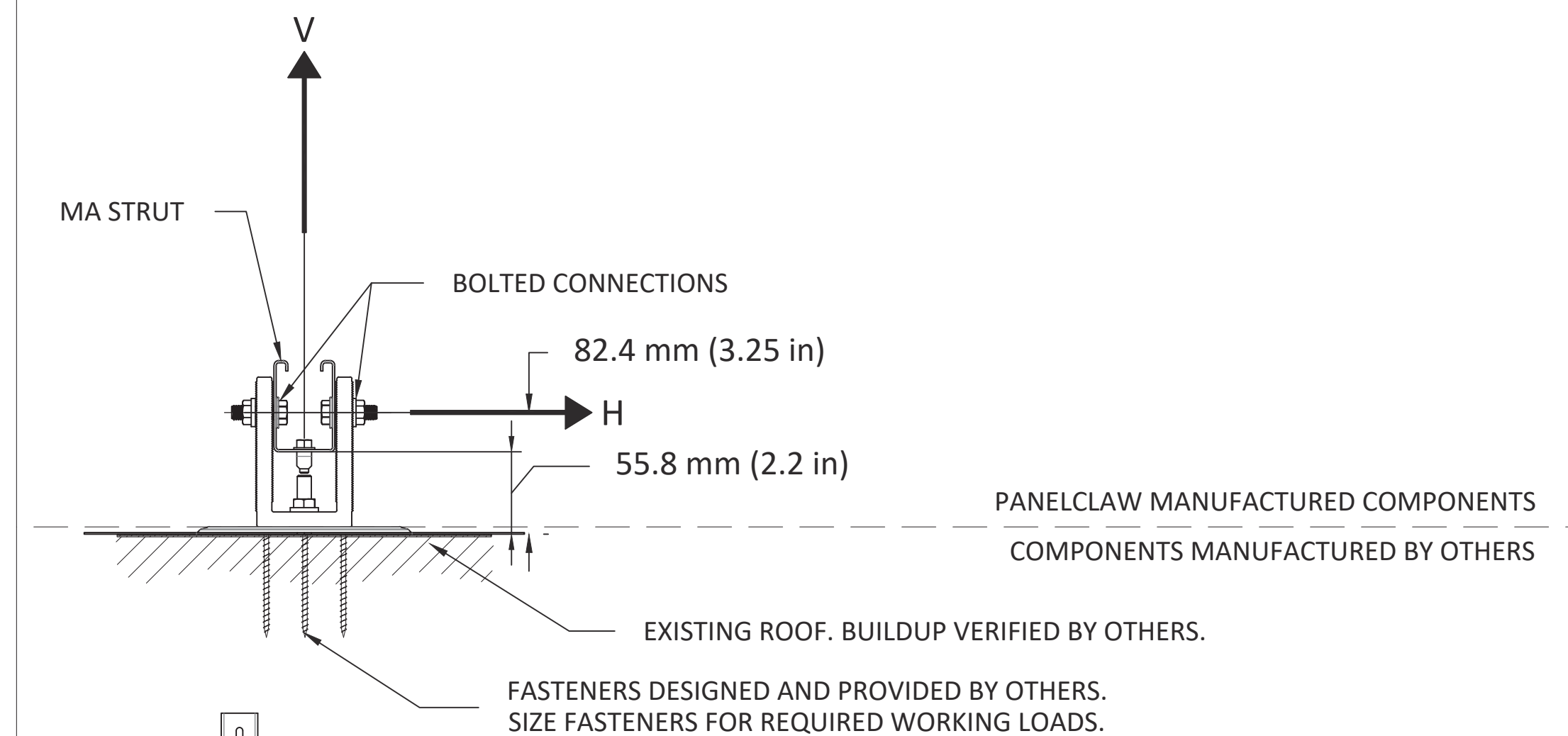
NOTE:
THIS DETAIL IS GENERIC IN NATURE AND IS INTENDED ONLY TO SHOW TYPICAL MECHANICAL ATTACHMENT ASSEMBLY LOCATIONS. REFER TO INDIVIDUAL ARRAY LAYOUTS FOR REQUIRED LOCATIONS.



MECHANICAL ATTACHMENT LOCATION DETAIL

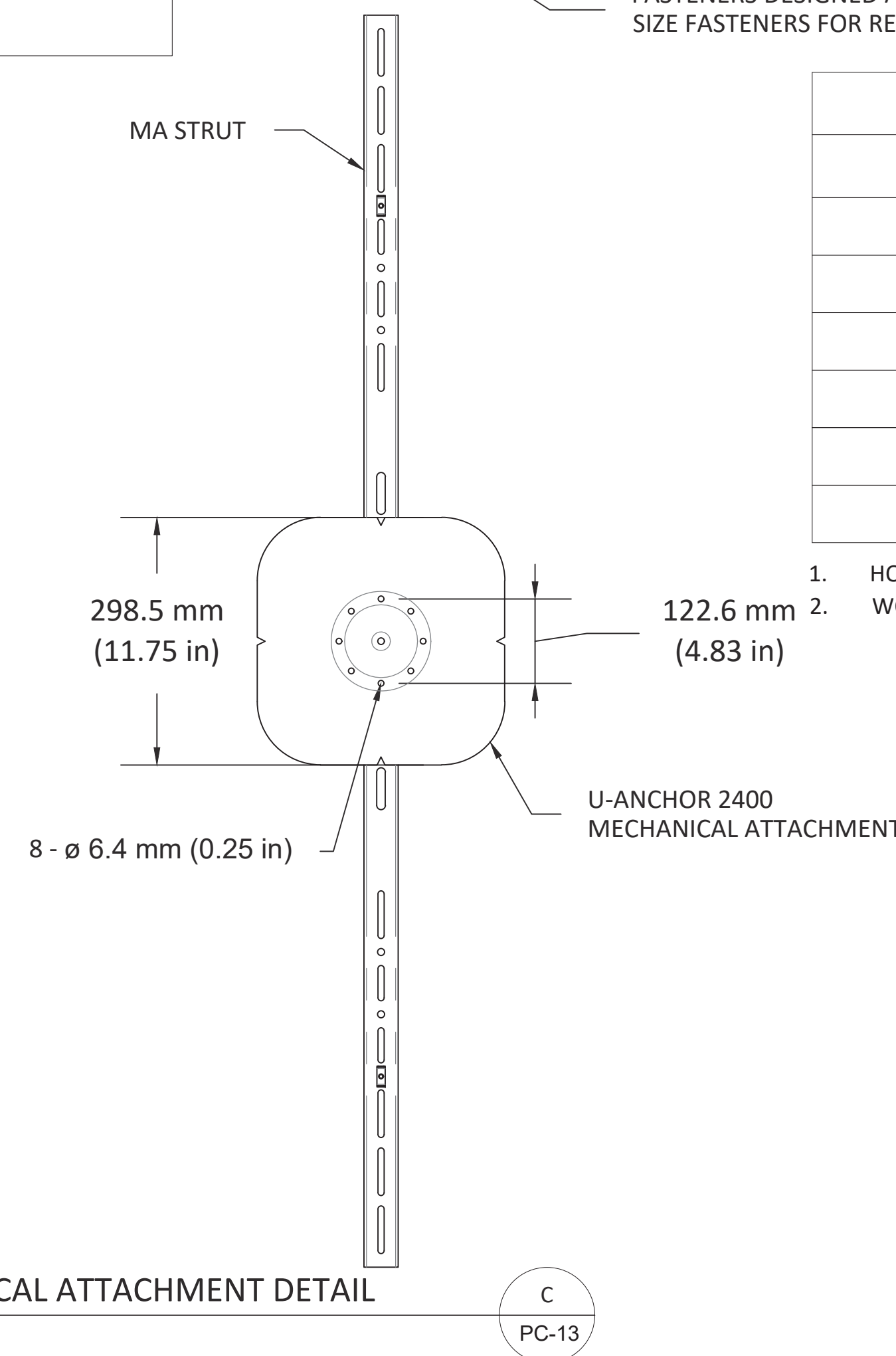
SCALE: N.T.S.

U-ANCHOR 2400 MECHANICAL
ATTACHMENT: MANUFACTURED BY
OTHERS



MECHANICAL ATTACHMENT		
WORST-CASE SERVICE LOAD (LB)		
HORIZONTAL (H)		VERTICAL (V)
WIND	SEISMIC	WIND
0	0	525
MAXIMUM ALLOWABLE LOAD (LB)		
HORIZONTAL (H)		VERTICAL (V)
650		525

1. HORIZONTAL LOAD H MAY ACT IN ANY DIRECTION
2. WORKING LOADS = ALLOWABLE LOADS (i.e. NON-FACTORED)



MECHANICAL ATTACHMENT DETAIL

SCALE: N.T.S.

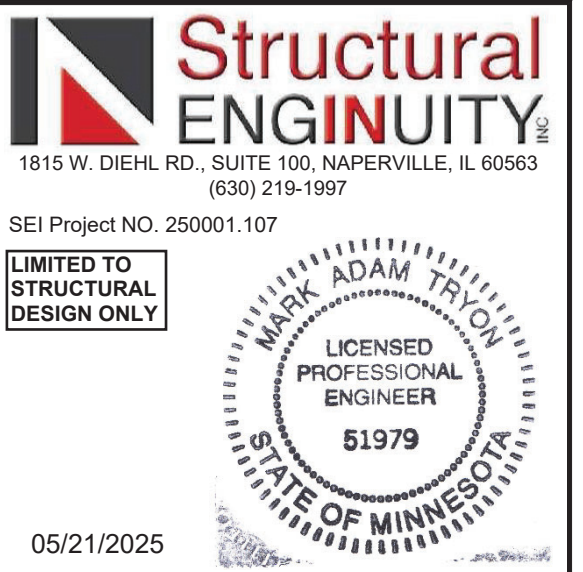
NOTE: MECHANICAL ATTACHMENT COMPONENT DIMENSIONS ARE PROVIDED FOR REFERENCE ONLY AND SHOULD BE VERIFIED WITH ATTACHMENT MANUFACTURER PRIOR TO FASTENER DESIGN.

APPROVED FOR CONSTRUCTION

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota

Print Name Mark A. Tryon

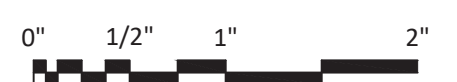
Signature 1/10/12

Date 05/21/2025

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5	Revised Ballast Map Layout	RH	2025-04-23
REV	DESCRIPTION	PREP	CHECK DATE

SCALE:



ORIGINAL SIZE 36"X24"
SHEET SIZE ARCH "D"

PREPARED FOR:

McKinstry

PROJECT:

Blue Earth County Public
Works Building

LOCATION:
19505 Stoltzman Road, Mankato,
Mankato Township, MN 56001,
USA

SHEET TITLE:
MECHANICAL
ATTACHMENT DETAIL

REVISION:
5

SHEET:
PC-13