Robinson+Cole

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
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Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts
and New York

June 12, 2023

Via Hand Delivery

Melanie A. Bachman, Esq.
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Docket No. 505 – Application of Haddam Quarter Solar, LLC, a wholly owned subsidiary of Louth Callan Renewables, for a Certificate of Environmental Compatibility and Public Need for the Construction, Maintenance and Operation of a 2.8 MW/AC Solar Photovoltaic Project Off Johnson Lane in Durham, Connecticut**

Development and Management Plan Submission

Dear Attorney Bachman:

Enclosed please find fifteen (15) copies of the following:

1. Haddam Quarter Solar Development and Management ("D&M") Plan Set.

2. Structural Print Package for the Haddam Quarter Solar Facility.

3. Haddam Quarter Solar Electric Design Drawings.

4. Letter from Dean Gustafson and Robert Burns at All-Points Technology Corp. regarding the feasibility of complying with condition 2(d) of the Decision and Order.

5. 2023 Operations and Maintenance Manual prepared by Kearsarge Energy.

6. Haddam Quarter Solar Agricultural Co-Use Plan.

7. Haddam Quarter Solar Health and Safety Plan.

Also enclosed are three (3) full size (24" x 36") sets of the plans and materials in Attachment 1, 2 and 3. Together, this information constitutes the final D&M Plan submission for the approved Haddam Quarter Solar facility in Durham, Connecticut.

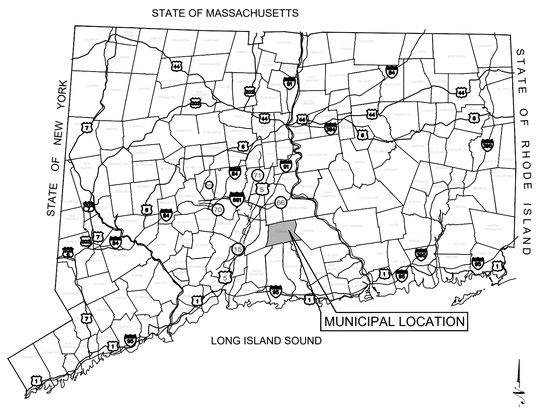
We respectfully request that this information be reviewed and this matter be placed on the next available Siting Council agenda for approval. Please feel free to contact me if you have any questions or require additional information. Thank you.

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
George Eames, First Selectman, Town of Durham
Kyzer Gardiola, Louth Callan Renewables – Without Attachments
Nilchil Johnson, Louth Callan Renewables – Without Attachments
Jennifer Gaudet, All-Points Technology Corporation – Without Attachments

ATTACHMENT 1



LOUTH CALLAN RENEWABLES

"HADDAM QUARTER ROAD SOLAR"
JOHNSON LANE
DURHAM, CT

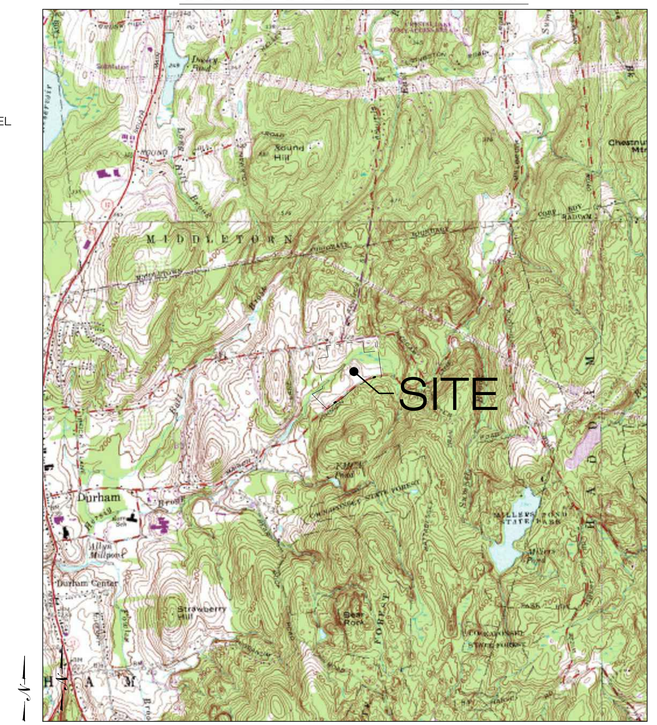
CSC D&M PLAN SET
MAY 26, 2023

LIST OF DRAWINGS

SITE INFORMATION

SITE NAME:	"HADDAM QUARTER ROAD SOLAR"
LOCATION:	JOHNSON LANE DURHAM, CT
SITE TYPE/DESCRIPTION:	ADD (1) GROUND MOUNTED SOLAR PANEL ARRAY W/ ASSOCIATED EQUIPMENT, GRAVEL ACCESS ROAD, AND STORMWATER MANAGEMENT.
PROPERTY OWNER:	NEWTON FAMILY TRUST 1279 ARBUTUS ST DURHAM, CT 06422
APPLICANT:	LOUTH CALLAN RENEWABLES 921 THRALL AVENUE SUFFIELD, CT 06078
ENGINEER CONTACT:	ROBERT C. BURNS, P.E. (860) 552-2036
LATITUDE:	41°29'16.85" N
LONGITUDE:	72°39'0.04" W
ELEVATION:	312'± AMSL
MBLU:	18-22
ZONE:	FR
TOTAL SITE ACREAGE:	49.00± AC.
TOTAL DISTURBED AREA:	11.50± AC.
SOLAR FACILITY AREA:	8.93± AC.
APPROX. VOLUME OF CUT:	688± CY
APPROX. VOLUME OF FILL:	217± CY
APPROX. NET VOLUME:	471± CY OF CUT

USGS TOPOGRAPHIC MAP



SCALE : 1" = 2000'± SOURCE: USGS 7.5 DURHAM QUADRANGLE, CT 2012

Louth Callan Renewables

ALL-POINTS TECHNOLOGY CORPORATION
567 VAUXHALL STREET EXTENSION - SUITE 311
WATERFORD, CT 06385 PHONE: (860)-663-1697
WWW.ALLPOINTSTECH.COM FAX: (860)-663-0935

CSC PERMIT SET

NO	DATE	REVISION
0	04/20/23	FOR PERMIT: RCB
1	04/24/23	FOR PERMIT: RCB
2	05/26/23	D&M: RCB
3	06/02/23	D&M: RCB
4	06/06/23	CLIENT REVISIONS: RCB
5		
6		

DESIGN PROFESSIONAL OF RECORD

PROF: ROBERT C. BURNS, P.E.
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 567 VAUXHALL STREET EXTENSION - SUITE 311 WATERFORD, CT 06385

OWNER: NEWTON FAMILY TRUST

ADDRESS: 1279 ARBUTUS ST DURHAM, CT 06422

HADDAM QUARTER ROAD SOLAR

SITE ADDRESS: JOHNSON LANE DURHAM, CT

APT FILING NUMBER: CT671100

DRAWN BY: CSH

DATE: 04/20/23 CHECKED BY: RCB

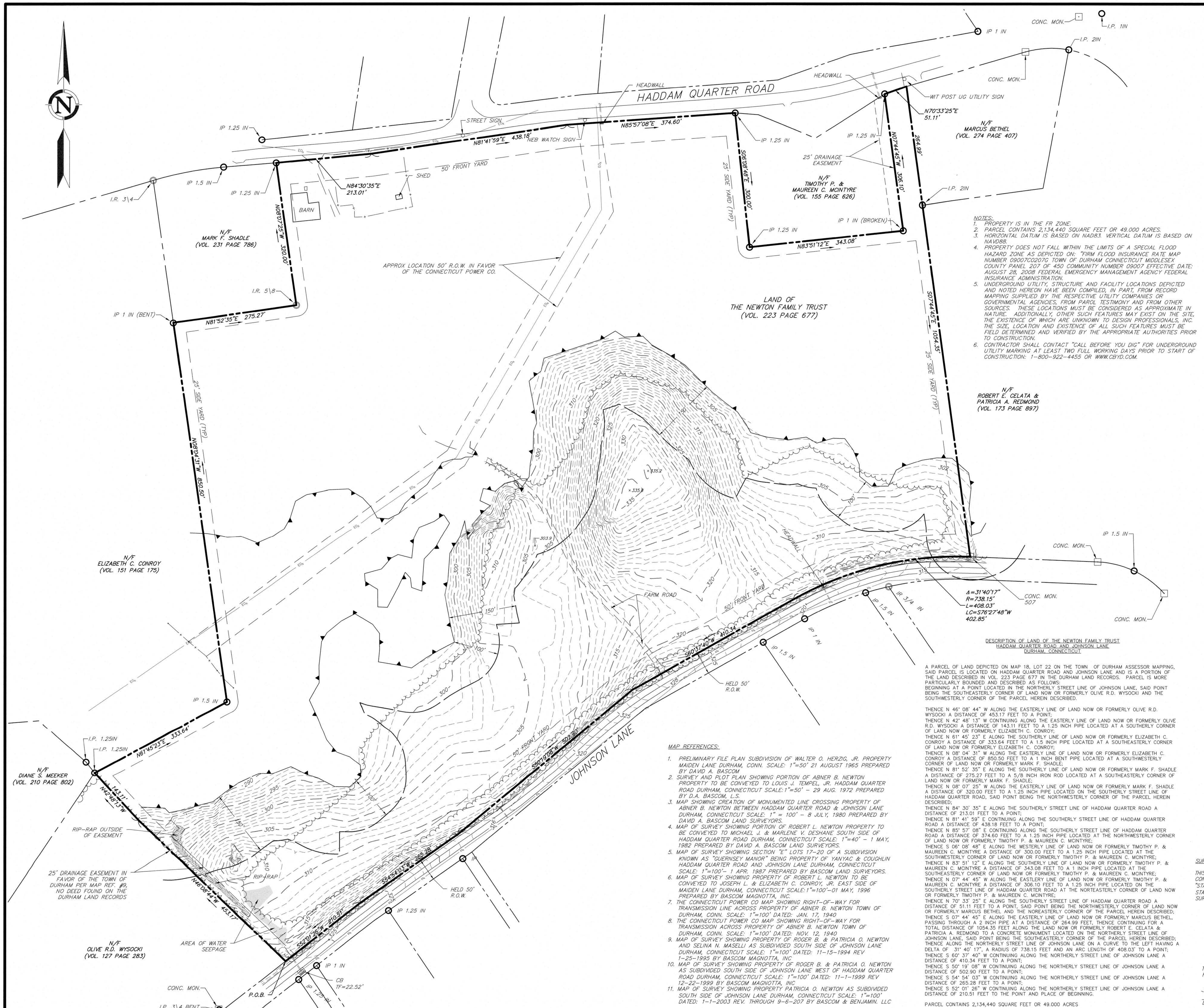
SHEET TITLE:

TITLE SHEET & INDEX

SHEET NUMBER:

T-1

STATE OF CONNECTICUT ROBERT C. BURNS 20071 LICENSED PROFESSIONAL ENGINEER



NOTES:

1. PROPERTY IS IN THE FR ZONE.
2. PARCEL CONTAINS 2,134,440 SQUARE FEET OR 49.000 ACRES.
3. HORIZONTAL DATUM IS BASED ON NAD83. VERTICAL DATUM IS BASED ON NAVD88.
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6. CONTRACTOR SHALL CONTACT "CALL BEFORE YOU DIG" FOR UNDERGROUND UTILITY MARKING AT LEAST TWO FULL WORKING DAYS PRIOR TO START OF CONSTRUCTION: 1-800-922-4455 OR WWW.CBYD.COM.

DESCRIPTION OF LAND OF THE NEWTON FAMILY TRUST
HADDAM QUARTER ROAD AND JOHNSON LANE
DURHAM, CONNECTICUT

A PARCEL OF LAND DEPICTED ON MAP 18, LOT 22 ON THE TOWN OF DURHAM ASSESSOR MAPPING, SAID PARCEL IS LOCATED ON HADDAM QUARTER ROAD AND JOHNSON LANE AND IS A PORTION OF THE LAND DESCRIBED IN VOL. 223 PAGE 677 IN THE DURHAM LAND RECORDS. PARCEL IS MORE PARTICULARLY BOUNDED AND DESCRIBED AS FOLLOWS:
BEGINNING AT A POINT LOCATED IN THE NORTHERLY STREET LINE OF JOHNSON LANE, SAID POINT BEING THE SOUTHEASTERLY CORNER OF LAND NOW OR FORMERLY OLIVE R.D. WYSOCKI AND THE SOUTHWESTERLY CORNER OF THE PARCEL HEREIN DESCRIBED.

THENCE N 46° 08' 44" W ALONG THE EASTERLY LINE OF LAND NOW OR FORMERLY OLIVE R.D. WYSOCKI A DISTANCE OF 453.17 FEET TO A POINT;
THENCE N 42° 48' 13" W CONTINUING ALONG THE EASTERLY LINE OF LAND NOW OR FORMERLY OLIVE R.D. WYSOCKI A DISTANCE OF 143.11 FEET TO A 1.25 INCH PIPE LOCATED AT A SOUTHERLY CORNER OF LAND NOW OR FORMERLY ELIZABETH C. CONROY;
THENCE N 61° 45' 23" E ALONG THE SOUTHERLY LINE OF LAND NOW OR FORMERLY ELIZABETH C. CONROY A DISTANCE OF 333.64 FEET TO A 1.5 INCH PIPE LOCATED AT A SOUTHEASTERLY CORNER OF LAND NOW OR FORMERLY ELIZABETH C. CONROY;
THENCE N 08° 04' 31" W ALONG THE EASTERLY LINE OF LAND NOW OR FORMERLY ELIZABETH C. CONROY A DISTANCE OF 850.50 FEET TO A 1 INCH BENT PIPE LOCATED AT A SOUTHWESTERLY CORNER OF LAND NOW OR FORMERLY MARK F. SHADLE;
THENCE N 81° 52' 35" E ALONG THE SOUTHERLY LINE OF LAND NOW OR FORMERLY MARK F. SHADLE A DISTANCE OF 275.27 FEET TO A 5/8 INCH IRON ROD LOCATED AT A SOUTHEASTERLY CORNER OF LAND NOW OR FORMERLY MARK F. SHADLE;
THENCE N 08° 07' 25" W ALONG THE EASTERLY LINE OF LAND NOW OR FORMERLY MARK F. SHADLE A DISTANCE OF 320.00 FEET TO A 1.25 INCH PIPE LOCATED ON THE SOUTHERLY STREET LINE OF HADDAM QUARTER ROAD, SAID POINT BEING THE NORTHWESTERLY CORNER OF THE PARCEL HEREIN DESCRIBED;
THENCE N 84° 30' 35" E ALONG THE SOUTHERLY STREET LINE OF HADDAM QUARTER ROAD A DISTANCE OF 213.01 FEET TO A POINT;
THENCE N 81° 41' 59" E CONTINUING ALONG THE SOUTHERLY STREET LINE OF HADDAM QUARTER ROAD A DISTANCE OF 438.18 FEET TO A POINT;
THENCE N 85° 57' 08" E CONTINUING ALONG THE SOUTHERLY STREET LINE OF HADDAM QUARTER ROAD A DISTANCE OF 374.60 FEET TO A 1.25 INCH PIPE LOCATED AT THE NORTHWESTERLY CORNER OF LAND NOW OR FORMERLY TIMOTHY P. & MAUREEN C. MCINTYRE;
THENCE S 06° 08' 48" E ALONG THE WESTERLY LINE OF LAND NOW OR FORMERLY TIMOTHY P. & MAUREEN C. MCINTYRE A DISTANCE OF 300.00 FEET TO A 1.25 INCH PIPE LOCATED AT THE SOUTHWESTERLY CORNER OF LAND NOW OR FORMERLY TIMOTHY P. & MAUREEN C. MCINTYRE;
THENCE N 83° 51' 12" E ALONG THE SOUTHERLY LINE OF LAND NOW OR FORMERLY TIMOTHY P. & MAUREEN C. MCINTYRE A DISTANCE OF 343.08 FEET TO A 1 INCH PIPE LOCATED AT THE SOUTHEASTERLY CORNER OF LAND NOW OR FORMERLY TIMOTHY P. & MAUREEN C. MCINTYRE;
THENCE N 07° 44' 45" W ALONG THE EASTLERY LINE OF LAND NOW OR FORMERLY TIMOTHY P. & MAUREEN C. MCINTYRE A DISTANCE OF 306.10 FEET TO A 1.25 INCH PIPE LOCATED ON THE SOUTHERLY STREET LINE OF HADDAM QUARTER ROAD AT THE NORTEASTERLY CORNER OF LAND NOW OR FORMERLY TIMOTHY P. & MAUREEN C. MCINTYRE;
THENCE N 70° 33' 25" E ALONG THE SOUTHERLY STREET LINE OF HADDAM QUARTER ROAD A DISTANCE OF 51.11 FEET TO A POINT, SAID POINT BEING THE NORTHWESTERLY CORNER OF LAND NOW OR FORMERLY MARCUS BETHEL AND THE NOREASTERLY CORNER OF THE PARCEL HEREIN DESCRIBED;
THENCE S 07° 44' 45" E ALONG THE EASTERLY LINE OF LAND NOW OR FORMERLY MARCUS BETHEL, PASSING THROUGH A 2 INCH PIPE AT A DISTANCE OF 264.99 FEET, THENCE CONTINUING FOR A TOTAL DISTANCE OF 1054.35 FEET ALONG THE LAND NOW OR FORMERLY ROBERT E. CELATA & PATRICIA A. REDMOND TO A CONCRETE MONUMENT LOCATED ON THE NORTHERLY STREET LINE OF JOHNSON LANE, SAID POINT BEING THE SOUTHEASTERLY CORNER OF THE PARCEL HEREIN DESCRIBED;
THENCE ALONG THE NORTHERLY STREET LINE OF JOHNSON LANE ON A CURVE TO THE LEFT HAVING A DELTA OF 31° 40' 17", A RADIUS OF 738.15 FEET AND AN ARC LENGTH OF 408.03' TO A POINT;
THENCE S 60° 37' 40" W CONTINUING ALONG THE NORTHERLY STREET LINE OF JOHNSON LANE A DISTANCE OF 410.34 FEET TO A POINT;
THENCE S 50° 19' 08" W CONTINUING ALONG THE NORTHERLY STREET LINE OF JOHNSON LANE A DISTANCE OF 502.90 FEET TO A POINT;
THENCE S 54° 54' 03" W CONTINUING ALONG THE NORTHERLY STREET LINE OF JOHNSON LANE A DISTANCE OF 265.28 FEET TO A POINT;
THENCE S 52° 01' 26" W CONTINUING ALONG THE NORTHERLY STREET LINE OF JOHNSON LANE A DISTANCE OF 210.51 FEET TO THE POINT AND PLACE OF BEGINNING.

PARCEL CONTAINS 2,134,440 SQUARE FEET OR 49.000 ACRES

MAP REFERENCES:

1. PRELIMINARY FILE PLAN SUBDIVISION OF WALTER O. HERZIG, JR. PROPERTY MAIDEN LANE DURHAM, CONN. SCALE: 1"=50' 21 AUGUST 1965 PREPARED BY DAVID A. BASCOM
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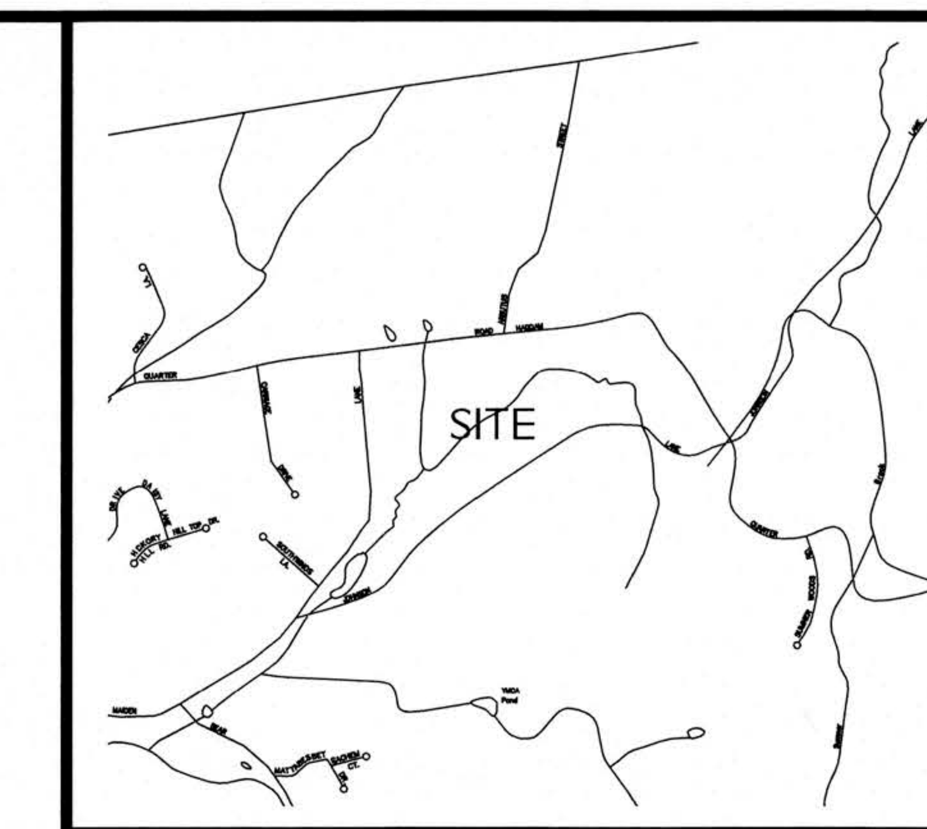


LOCATION PLAN
1"=2,000'

LEGEND

EXISTING	DESCRIPTION
COMMUNICATION	
	OVERHEAD COMM. LINES (CABLE, TEL, ETC.)
	APPROX. UNDERGROUND COMMUNICATION LINES
CONTROL POINTS	
	BENCHMARK
LIGHTING	
	POLE MOUNTED LIGHT
POWER	
	ELECTRICAL LINES, OVERHEAD
	APPROX. ELECTRICAL LINES, UNDERGROUND
	UTILITY POLE
	UTILITY POLE WITH LIGHT
	UTILITY POLE WITH TRANSFORMER
PROPERTY	
	PROPERTY LINE
	EASEMENT LINE
	IRON PIPE
	IRON ROD
	MONUMENT
ROADS	
	GUARD RAIL
OR	SIGN
SITE FEATURES	
	EDGE OF WATER
	BARBED WIRE FENCE
	CHAIN LINK FENCE
	RAIL FENCE
	STOCKADE FENCE
	WIRE FENCE
	STONE WALL
OR	TREE
	TREE LINE
SANITARY SEWER	
	APPROX. SANITARY SEWER MAIN
	APPROX. SANITARY SEWER SERVICE LINE
	SANITARY SEWER MANHOLE
STORM SEWER	
	APPROX. STORM DRAIN PIPE
	STORM DRAIN MANHOLE
	CURB INLET
	CATCH BASIN
TOPOGRAPHY	
95	CONTOUR
X61.95	SPOT ELEVATION
WETLANDS	
	WETLANDS LINE

STATE OF CONNECTICUT
LAWRENCE R. GEISSLER, JR.
No. 12327
LICENSED LAND SURVEYOR

SURVEY NOTES:

THIS SURVEY AND MAP HAS BEEN PREPARED PURSUANT TO THE REGULATIONS OF CONNECTICUT STATE AGENCIES SECTIONS 20-300b-1 THRU 20-300b-20 AND THE "STANDARDS SUGGESTED METHODS AND PROCEDURES FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ADOPTED BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. ON AUGUST 29, 2019.

- TYPE OF SURVEY IS A PROPERTY & PARTIAL TOPOGRAPHIC SURVEY AND IS INTENDED TO DEPICT THE LOCATION OF EXISTING CONDITIONS RELATIVE TO PROPERTY LINES.
- THIS IS A INDEPENDENT RESURVEY BASED ON MAPS REFERENCED HEREON.
- HORIZONTAL ACCURACY MEETS CLASS A-2 STANDARDS. VERTICAL ACCURACY MEETS CLASS V-2 STANDARDS. TOPOGRAPHICAL ACCURACY MEETS CLASS T-2 STANDARDS.

TO MY KNOWLEDGE AND BELIEF, THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON.

Lawrence R Geissler Jr
LAWRENCE R. GEISSLER, JR., L.S. — 12327 LIC. NO.

design professionals INC
CIVIL & TRAFFIC ENGINEERS / PLANNERS / SURVEYORS
GIS ANALYSTS / LANDSCAPE ARCHITECTS
21 JEFFREY DRIVE
P.O. BOX 1167
SOUTH WINDSOR, CT 06074
860-291-8755 - T
860-291-8757 - F
www.designprofessionalsinc.com

PREPARED FOR:
GREENFIELD DEVELOPMENT
LOUTH CALLAN RENEWABLES
921 THRALL AVE.,
SUFFIELD, CONNECTICUT

PROJECT NO.: 4536
DATE: 12-14-20
DESIGN BY: ---
DRAWN BY: BDC
CHECKED BY: LRG

ALTA/NSPS LAND TITLE SURVEY NEWTON FAMILY TRUST

HADDAM QUARTER ROAD & JOHNSON LANE
DURHAM, CONNECTICUT

REVISIONS

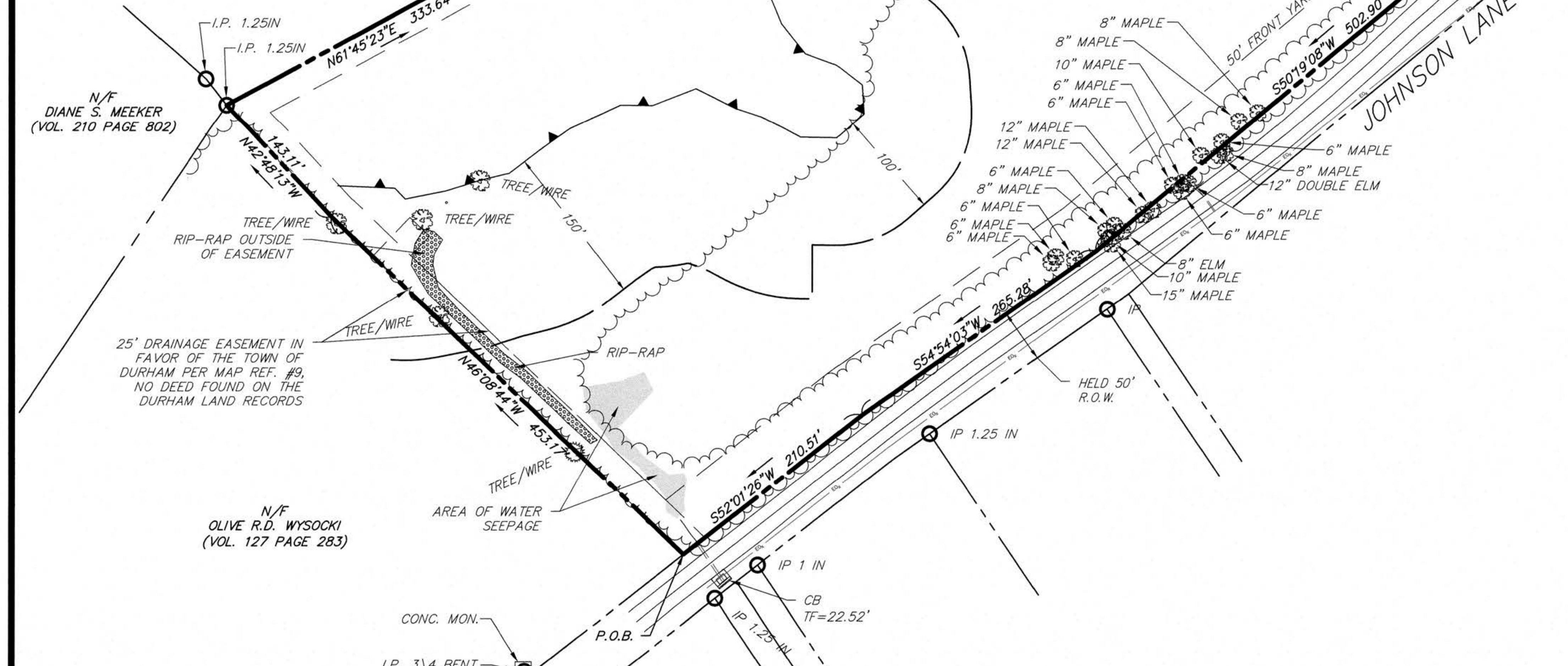
NO.	DATE	REVISIONS	BY

PROPERTY & TOPOGRAPHIC SURVEY

SCALE: 1" = 100' 0 50' 100' 200'

SHEET V-1

File: C:\jobs\4536\Survey\Survey-Base\4536 survey base.dwg Layout: V-1 Plotted: 5/30/2023 7:10 AM Last Saved: 5/30/2023 6:56 AM Last Saved By: MattArsenault



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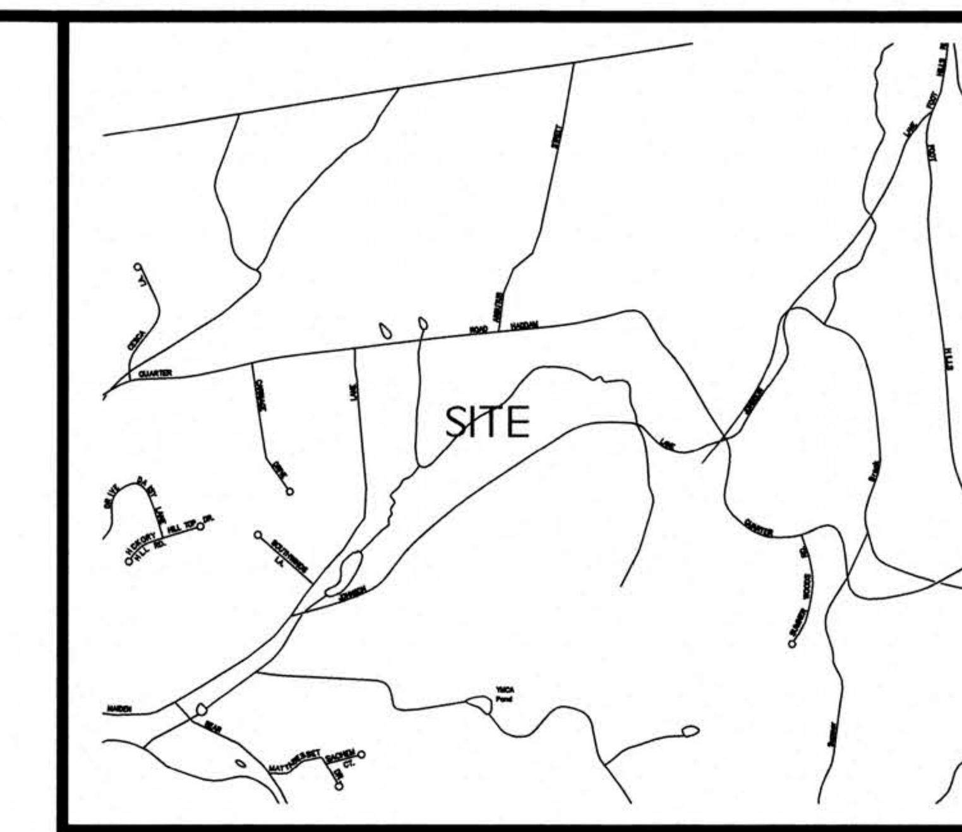

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1"=2,000'

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	UTILITY POLE
	UTILITY POLE WITH LIGHT
	UTILITY POLE WITH TRANSFORMER
PROPERTY	
	PROPERTY LINE
	EASEMENT LINE
	IRON PIPE
	IRON ROD
	MONUMENT
ROADS	
	GUARD RAIL
OR	SIGN
SITE FEATURES	
	EDGE OF WATER
	BARBED WIRE FENCE
	CHAIN LINK FENCE
	RAIL FENCE
	STOCKADE FENCE
	WIRE FENCE
	STONE WALL
OR	TREE
	TREE LINE
SANITARY SEWER	
	APPROX. SANITARY SEWER MAIN
	APPROX. SANITARY SEWER SERVICE LINE
	SANITARY SEWER MANHOLE
STORM SEWER	
	APPROX. STORM DRAIN PIPE
	STORM DRAIN MANHOLE
	CURB INLET
	CATCH BASIN
TOPOGRAPHY	
95	CONTOUR
X61.95	SPOT ELEVATION
WETLANDS	
	WETLANDS LINE

STATE OF CONNECTICUT
LAWRENCE R. GEISSLER, JR.
No. 12327
LICENSED LAND SURVEYOR

SURVEY NOTES:

THIS SURVEY AND MAP HAS BEEN PREPARED PURSUANT TO THE REGULATIONS OF CONNECTICUT STATE AGENCIES SECTIONS 20–300b–1 THRU 20–300b–20 AND THE "STANDARDS SUGGESTED METHODS AND PROCEDURES FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ADOPTED BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. ON AUGUST 29, 2019.

- TYPE OF SURVEY IS A PROPERTY & PARTIAL TOPOGRAPHIC SURVEY AND IS INTENDED TO DEPICT THE LOCATION OF EXISTING CONDITIONS RELATIVE TO PROPERTY LINES.
- THIS IS A INDEPENDENT RESURVEY BASED ON MAPS REFERENCED HEREON.
- HORIZONTAL ACCURACY MEETS CLASS A–2 STANDARDS. VERTICAL ACCURACY MEETS CLASS V–2 STANDARDS. TOPOGRAPHICAL ACCURACY MEETS CLASS T–2 STANDARDS.

TO MY KNOWLEDGE AND BELIEF, THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON.

LAWRENCE R. GEISSLER, JR., L.S. — 12327 LIC. NO.

design professionals
CIVIL & TRAFFIC ENGINEERS / PLANNERS / SURVEYORS
GIS ANALYSTS / LANDSCAPE ARCHITECTS
21 JEFFREY DRIVE
P.O. BOX 1167
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860-291-8755 - T
860-291-8757 - F
www.designprofessionalsinc.com

PREPARED FOR:
GREENFIELD DEVELOPMENT
LOUTH CALLAN RENEWABLES
921 THRALL AVE.
SUFFIELD, CONNECTICUT

PROJECT NO.: 4536
DATE: 5/16/23
DESIGN BY: ---
DRAWN BY: MHA
CHECKED BY: LRG

PARTIAL TREE SURVEY

HADDAM QUARTER ROAD & JOHNSON LANE
DURHAM, CONNECTICUT

NO.	DATE	REVISIONS	BY

PROPERTY SURVEY

SCALE: 1" = 100'

SHEET V-2

GENERAL NOTES

1. ALL CONSTRUCTION SHALL COMPLY WITH PROJECT DEVELOPER STANDARDS, TOWN OF DURHAM STANDARDS & CONNECTICUT DEPARTMENT OF TRANSPORTATION STANDARDS IN THE ABOVE REFERENCED INCREASING HIERARCHY. IF STANDARDS ARE IN CONFLICT, THE MORE STRINGENT SPECIFICATION SHALL APPLY.

2. IF NO PROJECT CONSTRUCTION SPECIFICATION PACKAGE IS PROVIDED BY THE PROJECT DEVELOPER OR THEIR REPRESENTATIVE, THE CONTRACTOR SHALL COMPLY WITH THE MANUFACTURER, TOWN OF DURHAM, OR CONNECTICUT DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS, AND BE IN ACCORDANCE WITH ALL APPLICABLE OSHA, FEDERAL, STATE AND LOCAL REGULATIONS.

3. THE PROJECT DEVELOPER IS RESPONSIBLE FOR OBTAINING ALL NECESSARY ZONING AND STORMWATER PERMITS REQUIRED BY GOVERNMENT AGENCIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL OBTAIN ALL TOWN OF DURHAM CONSTRUCTION PERMITS. THE CONTRACTOR SHALL POST ALL BONDS, PAY ALL FEES, PROVIDE PROOF OF INSURANCE AND PROVIDE TRAFFIC CONTROL NECESSARY FOR THIS WORK.

4. REFER TO PLANS, DETAILS AND REPORTS PREPARED BY ALL-POINTS TECHNOLOGY CORPORATION FOR ADDITIONAL INFORMATION. THE CONTRACTOR SHALL VERIFY ALL SITE CONDITIONS IN THE FIELD AND CONTACT THE PROJECT DEVELOPER IF THERE ARE ANY QUESTIONS OR CONFLICTS REGARDING THE CONSTRUCTION DOCUMENTS AND/OR FIELD CONDITIONS SO THAT APPROPRIATE REVISIONS CAN BE MADE PRIOR TO BIDDING/CONSTRUCTION. ANY CONFLICT BETWEEN THE DRAWINGS AND SPECIFICATIONS SHALL BE CONFIRMED WITH THE PROJECT DEVELOPERS CONSTRUCTION MANAGER PRIOR TO CONSTRUCTION.

5. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF ALL PRODUCTS, MATERIALS PER PLANS, AND SPECIFICATIONS TO THE PROJECT DEVELOPER FOR REVIEW AND APPROVAL PRIOR TO FABRICATION OR DELIVERY TO THE SITE. ALLOW A MINIMUM OF 14 WORKING DAYS FOR REVIEW.

6. SHOULD ANY UNKNOWN OR INCORRECTLY LOCATED EXISTING PIPING OR OTHER UTILITY BE UNCOVERED DURING EXCAVATION, CONSULT THE PROJECT DEVELOPER IMMEDIATELY FOR DIRECTIONS BEFORE PROCEEDING FURTHER WITH WORK IN THIS AREA.

7. DO NOT INTERRUPT EXISTING UTILITIES SERVICING FACILITIES OCCUPIED AND USED BY THE PROJECT DEVELOPER OR OTHERS DURING OCCUPIED HOURS, EXCEPT WHEN SUCH INTERRUPTIONS HAVE BEEN AUTHORIZED IN WRITING BY THE PROJECT DEVELOPER AND THE LOCAL MUNICIPALITY. INTERRUPTIONS SHALL ONLY OCCUR AFTER ACCEPTABLE TEMPORARY SERVICE HAS BEEN PROVIDED.

8. THE CONTRACT LIMIT IS THE LIMIT OF DISTURBANCE UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE CONTRACT DRAWINGS.

9. THE CONTRACTOR SHALL ABIDE BY ALL OSHA, FEDERAL, STATE AND LOCAL REGULATIONS WHEN OPERATING CRANES, BOOMS, HOISTS, ETC. IN CLOSE PROXIMITY TO OVERHEAD ELECTRIC LINES. IF CONTRACTOR MUST OPERATE EQUIPMENT CLOSE TO ELECTRIC LINES, CONTACT POWER COMPANY TO MAKE ARRANGEMENTS FOR PROPER SAFEGUARDS. ANY UTILITY COMPANY FEES SHALL BE PAID FOR BY THE CONTRACTOR.

10. THE CONTRACTOR SHALL COMPLY WITH OSHA CFR 29 PART 1926 FOR EXCAVATION TRENCHING AND TRENCH PROTECTION REQUIREMENTS.

11. THE ENGINEER IS NOT RESPONSIBLE FOR SITE SAFETY MEASURES TO BE EMPLOYED DURING CONSTRUCTION. THE ENGINEER HAS NO CONTRACTUAL DUTY TO CONTROL THE SAFEST METHODS OR MEANS OF THE WORK, JOB SITE RESPONSIBILITIES, SUPERVISION OF PERSONNEL OR TO SUPERVISE SAFETY AND DO NOT VOLUNTARILY ASSUME ANY SUCH DUTY OR RESPONSIBILITY.

12. THE CONTRACTOR SHALL RESTORE ANY DRAINAGE STRUCTURE, PIPE, CONDUIT, PAVEMENT, CURBING, SIDEWALKS, LANDSCAPED AREAS OR SIGNAGE DISTURBED DURING CONSTRUCTION TO THEIR ORIGINAL CONDITION OR BETTER, AS APPROVED BY THE PROJECT DEVELOPER OR TOWN OF DURHAM.

13. THE CONTRACTOR SHALL PROVIDE AS-BUILT RECORDS OF ALL DEVIATIONS TO THE CONSTRUCTION DRAWINGS (INCLUDING UNDERGROUND UTILITIES) TO THE PROJECT DEVELOPER AT THE END OF CONSTRUCTION.

14. ALTERNATIVE METHODS AND PRODUCTS, OTHER THAN THOSE SPECIFIED, MAY BE USED IF REVIEWED AND APPROVED BY THE PROJECT DEVELOPER, ENGINEER, AND APPROPRIATE REGULATORY AGENCY PRIOR TO INSTALLATION DURING THE BIDDING/CONSTRUCTION PROCESS.

16. INFORMATION ON EXISTING UTILITIES AND STORM DRAINAGE HAS BEEN COMPILED FROM AVAILABLE INFORMATION INCLUDING UTILITY PROVIDER AND MUNICIPAL RECORD MAPS AND/OR FIELD SURVEY, AND IS NOT GUARANTEED CORRECT OR COMPLETE. UTILITIES AND STORM DRAINAGE ARE SHOWN TO ALERT THE CONTRACTOR TO THEIR PRESENCE. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR DETERMINING ACTUAL LOCATIONS AND ELEVATIONS OF ALL UTILITIES AND STORM DRAINAGE INCLUDING SERVICES. CONTACT "CALL BEFORE YOU DIG" AT 811 72 HOURS PRIOR TO CONSTRUCTION AND VERIFY ALL UNDERGROUND AND OVERHEAD UTILITY AND STORM DRAINAGE LOCATIONS. THE CONTRACTOR SHALL EMPLOY THE USE OF A UTILITY LOCATING COMPANY TO PROVIDE SUBSURFACE UTILITY ENGINEERING CONSISTING OF DESIGNATING UTILITIES AND STORM PIPING ON PRIVATE PROPERTY WITHIN THE CONTRACT LIMIT AND CONSISTING OF DESIGNATING AND LOCATING WHERE PROP. UTILITIES AND STORM PIPING CROSS EXISTING UTILITIES AND STORM PIPING WITHIN THE CONTRACT LIMITS.

17. NO CONSTRUCTION OR DEMOLITION SHALL BEGIN UNTIL APPROVAL OF THE FINAL PLANS AND PERMITS ARE GRANTED BY ALL GOVERNING AND REGULATORY AGENCIES.

SITE PLAN NOTES

1. THE SURVEY WAS PROVIDED BY DESIGN PROFESSIONALS INC. DATED DECEMBER 14, 2020 AND MAY 16, 2023.

2. THERE ARE BORDERING VEGETATED WETLANDS (BVW/S) LOCATED ON THE SITE AS INDICATED ON THE PLANS. BVW BOUNDARIES WERE FLAGGED AND LOCATED BY JMM WETLAND CONSULTING SERVICES, LLC, IN AUGUST 2020.

3. THERE WILL BE MINIMAL GRADING ON SITE IN THE AREAS OF THE MINOR CLEARING, TO ENSURE THAT PROPER DRAINAGE IS MAINTAINED.

4. THE CONTRACTOR SHALL FOLLOW THE RECOMMENDED SEQUENCE OF CONSTRUCTION NOTES PROVIDED ON THE SEDIMENTATION & EROSION CONTROL PLANS OR SUBMIT AN ALTERNATE PLAN FOR APPROVAL BY THE ENGINEER AND/OR PERMITTING AGENCIES PRIOR TO THE START CONSTRUCTION. ALLOW A MINIMUM OF 14 WORKING DAYS FOR REVIEW.

5. PROPER CONSTRUCTION PROCEDURES SHALL BE FOLLOWED ON ALL IMPROVEMENTS WITHIN THIS PARCEL SO AS TO PREVENT THE SILTING OF ANY WATERCOURSE OR BVWS IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS. IN ADDITION, THE CONTRACTOR SHALL ADHERE TO THE "SEDIMENTATION & EROSION CONTROL PLANS" CONTAINED HEREIN. THE CONTRACTOR SHALL BE RESPONSIBLE TO POST ALL BONDS AS REQUIRED BY GOVERNMENT AGENCIES WHICH WOULD GUARANTEE THE PROPER IMPLEMENTATION OF THE PLAN.

6. ALL SITE WORK, MATERIALS OF CONSTRUCTION, AND CONSTRUCTION METHODS FOR EARTHWORK AND STORM DRAINAGE WORK, SHALL CONFORM TO THE SPECIFICATIONS AND DETAILS. OTHERWISE THIS WORK SHALL CONFORM TO THE STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION AND PROJECT GEOTECHNICAL REPORT IF THERE IS NO PROJECT SPECIFICATIONS MANUAL. ALL FILL MATERIAL UNDER STRUCTURES AND PAVED AREAS SHALL BE PER THE ABOVE STATED APPLICABLE SPECIFICATIONS, AND/OR PROJECT GEOTECHNICAL REPORT, AND SHALL BE PLACED IN ACCORDANCE WITH THE APPLICABLE SPECIFICATIONS UNDER THE SUPERVISION OF A QUALIFIED PROFESSIONAL ENGINEER. MATERIAL SHALL BE COMPACTED IN 8" LIFTS TO 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D 1557 AT 95% PERCENT OF OPTIMUM MOISTURE CONTENT.

7. ALL DISTURBANCE INCURRED TO PUBLIC, MUNICIPAL, COUNTY, STATE PROPERTY DUE TO CONSTRUCTION SHALL BE RESTORED TO ITS PREVIOUS CONDITION OR BETTER, TO THE SATISFACTION OF THE TOWN OF DURHAM AND STATE OF CONNECTICUT.

8. IF CONTAMINATED SOIL IS ENCOUNTERED BY THE CONTRACTOR, THE CONTRACTOR SHALL SUSPEND EXCAVATION WORK OF IMPACTED SOIL AND NOTIFY THE PROJECT DEVELOPER AND/OR PROJECT DEVELOPERS ENVIRONMENTAL CONSULTANT PRIOR TO PROCEEDING WITH FURTHER WORK IN THE IMPACTED SOIL LOCATION UNTIL FURTHER INSTRUCTED BY THE PROJECT DEVELOPER AND/OR PROJECT DEVELOPERS ENVIRONMENTAL CONSULTANT.

UTILITY NOTES

1. CONTRACTOR IS RESPONSIBLE FOR CONTACTING THE TOWN OF DURHAM TO SECURE CONSTRUCTION PERMITS AND FOR PAYMENT OF FEES FOR STREET CUTS AND CONNECTIONS TO EXISTING UTILITIES.

2. REFER TO DRAWINGS BY OTHERS FOR THE ONSITE ELECTRICAL DRAWINGS AND INTERCONNECTION TO EXISTING ELECTRICAL GRID. SITE CONTRACTOR SHALL SUPPLY AND INSTALL PIPE ADAPTERS AS NECESSARY AT BUILDING CONNECTION POINT OR AT EXISTING UTILITY OR PIPE CONNECTION POINT. THESE DETAILS ARE NOT INCLUDED IN THESE PLANS.

3. UTILITY LOCATIONS AND PENETRATIONS ARE SHOWN FOR THE CONTRACTOR'S INFORMATION AND SHALL BE VERIFIED WITH THE ELECTRICAL ENGINEER AND THE PROJECT DEVELOPER'S CONSTRUCTION MANAGER PRIOR TO THE START OF CONSTRUCTION.

4. THE CONTRACTOR SHALL VISIT THE SITE AND VERIFY THE ELEVATION AND LOCATION OF ALL UTILITIES BY VARIOUS MEANS PRIOR TO BEGINNING ANY EXCAVATION. TEST PITS SHALL BE DUG AT ALL LOCATIONS WHERE PROP. SANITARY SEWERS AND WHERE PROP. STORM PIPING WILL CROSS EXISTING UTILITIES, AND THE HORIZONTAL AND VERTICAL LOCATIONS OF THE UTILITIES SHALL BE DETERMINED. THE CONTRACTOR SHALL CONTACT THE PROJECT DEVELOPER IN THE EVENT OF ANY DISCOVERED OR UNFORESEEN CONFLICTS BETWEEN EXISTING AND PROPOSED SANITARY SEWERS, STORM PIPING AND UTILITIES SO THAT AN APPROPRIATE MODIFICATION MAY BE MADE.

5. UTILITY CONNECTION DESIGN AS REFLECTED ON THE PLAN MAY CHANGE SUBJECT TO UTILITY PROVIDER AND GOVERNING AUTHORITY STAFF REVIEW.

6. THE CONTRACTOR SHALL ENSURE THAT ALL UTILITY PROVIDERS AND GOVERNING AUTHORITY STANDARDS FOR MATERIALS AND CONSTRUCTION METHODS ARE MET. THE CONTRACTOR SHALL PERFORM PROPER COORDINATION WITH THE RESPECTIVE UTILITY PROVIDER.

7. THE CONTRACTOR SHALL ARRANGE FOR AND COORDINATE WITH THE RESPECTIVE UTILITY PROVIDERS FOR SERVICE INSTALLATIONS AND CONNECTIONS. THE CONTRACTOR SHALL COORDINATE WORK TO BE PERFORMED BY THE VARIOUS UTILITY PROVIDERS AND SHALL PAY ALL FEES FOR CONNECTIONS, DISCONNECTIONS, RELOCATIONS, INSPECTIONS, AND DEMOLITION UNLESS OTHERWISE STATED IN THE PROJECT SPECIFICATIONS MANUAL AND/OR GENERAL CONDITIONS OF THE CONTRACT.

8. ALL EXISTING PAVEMENT WHERE UTILITY PIPING IS TO BE INSTALLED SHALL BE SAW CUT. AFTER UTILITY INSTALLATION IS COMPLETED, THE CONTRACTOR SHALL INSTALL TEMPORARY AND/OR PERMANENT PAVEMENT REPAIR AS DETAILED ON THE DRAWINGS OR AS REQUIRED BY THE TOWN OF DURHAM.

9. ALL PIPES SHALL BE LAID ON STRAIGHT ALIGNMENTS AND EVEN GRADES USING A PIPE LASER OR OTHER ACCURATE METHOD.

10. RELOCATION OF UTILITY PROVIDER FACILITIES, SUCH AS POLES, SHALL BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF THE UTILITY PROVIDER.

11. THE CONTRACTOR SHALL COMPACT PIPE BACKFILL IN 8" LIFTS ACCORDING TO THE PIPE BEDDING DETAILS. TRENCH BOTTOM SHALL BE STABLE IN HIGH GROUNDWATER AREAS. A PIPE FOUNDATION SHALL BE USED PER THE TRENCH DETAILS AND IN AREAS OF ROCK EXCAVATION.

12. CONTRACTOR TO PROVIDE STEEL SLEEVES AND ANNULAR SPACE SAND FILL FOR UTILITY PIPE AND CONDUIT CONNECTIONS UNDER FOOTINGS.

13. ALL UTILITY CONSTRUCTION IS SUBJECT TO INSPECTION FOR APPROVAL PRIOR TO BACKFILLING, IN ACCORDANCE WITH THE APPROPRIATE UTILITY PROVIDER REQUIREMENTS.

14. A ONE-FOOT MINIMUM VERTICAL CLEARANCE BETWEEN WATER, GAS, ELECTRICAL, AND TELEPHONE LINES AND STORM PIPING SHALL BE PROVIDED. A SIX-INCH MINIMUM CLEARANCE SHALL BE MAINTAINED BETWEEN STORM PIPING AND SANITARY SEWER. A 6-INCH TO 18-INCH VERTICAL CLEARANCE BETWEEN SANITARY SEWER PIPING AND STORM PIPING SHALL REQUIRE CONCRETE ENCASEMENT OF THE SANITARY PIPING.

15. THE CONTRACTOR SHALL RESTORE ANY UTILITY STRUCTURE, PIPE, CONDUIT, PAVEMENT, CURBING, SIDEWALKS, DRAINAGE STRUCTURE, SWALE OR LANDSCAPED AREAS DISTURBED DURING CONSTRUCTION, TO THEIR ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE PROJECT DEVELOPER AND TOWN OF DURHAM.

16. INFORMATION ON EXISTING UTILITIES AND STORM DRAINAGE HAS BEEN COMPILED FROM AVAILABLE INFORMATION INCLUDING UTILITY PROVIDER AND MUNICIPAL RECORD MAPS AND/OR FIELD SURVEY, AND IS NOT GUARANTEED CORRECT OR COMPLETE. UTILITIES AND STORM DRAINAGE ARE SHOWN TO ALERT THE CONTRACTOR TO THEIR PRESENCE. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR DETERMINING ACTUAL LOCATIONS AND ELEVATIONS OF ALL UTILITIES AND STORM DRAINAGE INCLUDING SERVICES. CONTACT "CALL BEFORE YOU DIG" AT 811 72 HOURS PRIOR TO CONSTRUCTION AND VERIFY ALL UNDERGROUND AND OVERHEAD UTILITY AND STORM DRAINAGE LOCATIONS. THE CONTRACTOR SHALL EMPLOY THE USE OF A UTILITY LOCATING COMPANY TO PROVIDE SUBSURFACE UTILITY ENGINEERING CONSISTING OF DESIGNATING UTILITIES AND STORM PIPING ON PRIVATE PROPERTY WITHIN THE CONTRACT LIMIT AND CONSISTING OF DESIGNATING AND LOCATING WHERE PROP. UTILITIES AND STORM PIPING CROSS EXISTING UTILITIES AND STORM PIPING WITHIN THE CONTRACT LIMITS.

17. THE CONTRACTOR SHALL ARRANGE AND COORDINATE WITH UTILITY PROVIDERS FOR WORK TO BE PERFORMED BY UTILITY PROVIDERS. THE CONTRACTOR SHALL PAY ALL UTILITY FEES UNLESS OTHERWISE STATED IN THE PROJECT SPECIFICATION MANUAL AND GENERAL CONDITIONS, AND REPAIR PAVEMENTS AS NECESSARY.

18. ALTERNATIVE METHODS AND PRODUCTS OTHER THAN THOSE SPECIFIED MAY BE USED IF REVIEWED AND APPROVED BY THE PROJECT DEVELOPER, ENGINEER, AND APPROPRIATE REGULATORY AGENCIES PRIOR TO INSTALLATION.

GENERAL LEGEND

	EXISTING	PROPOSED
PROPERTY LINE		
TREE LINE		
WETLAND	V V V	
WETLAND BUFFER		
MAJOR CONTOUR		
MINOR CONTOUR		
UNDERGROUND ELECTRIC		E E
OVERHEAD ELECTRIC		OH OH
BASIN		
SWALE		
FENCE		X X X
LIMIT OF DISTURBANCE		LOD
FILTER SOCK		FS FS
SILT FENCE		SF SF

Louth Callan Renewables

ALL-POINTS TECHNOLOGY CORPORATION

567 VAUXHALL STREET EXTENSION - SUITE 311
WATERFORD, CT 06385 PHONE: (860)-663-1697
WWW.ALLPOINTSTECH.COM FAX: (860)-663-0935

CSC PERMIT SET

NO	DATE	REVISION
0	04/20/23	FOR PERMIT: RCB
1	04/24/23	FOR PERMIT: RCB
2	05/26/23	D&M: RCB
3	06/02/23	D&M: RCB
4	06/06/23	CLIENT REVISIONS: RCB
5		
6		

DESIGN PROFESSIONAL OF RECORD

PROF: ROBERT C. BURNS, P.E.
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 567 VAUXHALL STREET EXTENSION - SUITE 311 WATERFORD, CT 06385

OWNER: NEWTON FAMILY TRUST

ADDRESS: 1279 ARBUTUS ST DURHAM, CT 06422

HADDAM QUARTER ROAD SOLAR

SITE ADDRESS: JOHNSON LANE DURHAM, CT

APT FILING NUMBER: CT671100

DRAWN BY: CSH

DATE: 04/20/23

CHECKED BY: RCB

SHEET TITLE:

GENERAL NOTES

SHEET NUMBER:

GN-1

STATE OF CONNECTICUT ROBERT CHARLES BURNS 20071 LICENSED PROFESSIONAL ENGINEER

ENVIRONMENTAL NOTES

TREE CLEARING ONLY AREA NOTES

AREAS IDENTIFIED ON THE SITE PLANS SHEET EC-3 AS "TREE CLEARING ONLY" ARE LOCATED IN CLOSE PROXIMITY TO WETLAND RESOURCES ON MODERATE SLOPES. AS SUCH, CERTAIN PROTECTION MEASURES AND CLEARING METHODS ARE REQUIRED TO PREVENT POTENTIAL IMPACT TO THESE NEARBY SENSITIVE RESOURCES. THESE METHODS AND PROTECTION MEASURES INCLUDE THE FOLLOWING:

1) PRIOR TO ANY CLEARING WORK, EROSION CONTROLS (I.E., COMPOST FILTER SOCK) WILL BE INSTALLED ALONG THE WESTERN SIDE OF THE TREE CLEARING ONLY AREA, WHICH IS LOCATED CLOSE TO WETLAND RESOURCES.

2) TREES TO BE REMOVED ("NON-COMPATIBLE TREES") SHALL INCLUDE ANY MATURE TREE OVER 30' TALL, AND ANY SPECIES OF TREE EXPECTED TO GROW TO A HEIGHT OF GREATER THAN 30' (I.E., RED OAK, AMERICAN BEECH, BLACK CHERRY, ETC.). EXISTING UNDERSTORY VEGETATION LESS THAN 30' TALL, OR NOT EXPECTED TO GROW TO A HEIGHT EXCEEDING 30' SHALL BE RETAINED WHERE FEASIBLE (I.E., MUSCLEWOOD, SPICEBUSH, NORTHERN ARROWWOOD).

3) NON-COMPATIBLE TREES REMOVED SHALL BE STUMP CUT WITH THE REMAINING STUMP LEFT IN PLACE TO MINIMIZE GROUND DISTURBANCE. TREE TRUNKS AND SLASH SHALL BE REMOVED FROM THE TREE CLEARING ONLY AREAS.

4) AS THE TREE CLEARING ONLY AREAS RANGE FROM MODERATE TO STEEP SLOPES, SURFACE STABILIZATION POST CLEARING IS VITAL TO ENSURE SLOPE INTEGRITY AND PROTECTION OF DOWNSLOPE WETLAND RESOURCES. IMMEDIATELY FOLLOWING COMPLETED CLEARING ACTIVITIES ALL AREAS SHALL BE STABILIZED WITH STRAW MULCH AND UNDERSOWN WITH A CONSERVATION SEED MIX (SPECIFIED IN THE TREE CLEARING ONLY ENHANCEMENT AREA PLANTING SCHEDULE). ANY SLOPES EXCEEDING 3:1 ARE NOT SUITABLE FOR MULCHING, AND SHALL REQUIRE NON-SYNTHETIC NATURALLY WOVEN EROSION BLANKETS AND/OR HYDROSEEDING WITH A BONDED-FIBER MATRIX TACKIFIER.

TREE CLEARING ONLY ENHANCEMENT AREA NOTES

THE TREE CLEARING ONLY ENHANCEMENT AREA ENCOMPASSES TWO DISTINCT AREAS IN THE NORTHWESTERN PORTION OF THE PROJECT IN PROXIMITY TO NEARBY WETLANDS THAT BORDER ON HERSIG BROOK. THESE TWO AREAS WILL BE SUBJECT TO TREE REMOVAL TO ELIMINATE SHADE IMPACTS TO THE SOLAR PROJECT; CLEARING ACTIVITIES WOULD BE RESTRICTED TO TREE SPECIES ONLY AND NO STUMP REMOVAL OR GRUBBING WOULD OCCUR WITHIN THESE SELECT AREAS. THIS ENHANCEMENT PLAN HAS BEEN DESIGNED TO ENHANCE THE TERRESTRIAL HABITAT LOCATED IN CLOSE PROXIMITY TO WETLAND RESOURCE AREAS WITHIN THE PROPOSED TREE CLEARING ONLY AREAS. THE PROPOSED NATIVE PLANTINGS WILL SIGNIFICANTLY ENHANCE THE WETLANDS TERRESTRIAL BUFFER BY PROVIDING NATURE ECOTONE WOODY SHRUB HABITAT POST OVERSTORY REMOVAL. THIS ENHANCEMENT AREA WILL ALSO INCLUDE REMOVAL OF WOODY INVASIVE PLANTS THAT WILL IMPROVE WILDLIFE HABITAT FUNCTION. THE TREE CLEARING ONLY ENHANCEMENT AREA WILL BE CONSTRUCTED PER THE FOLLOWING:

1) ALL-POINTS TECHNOLOGY CORPORATION, P.C. ("APT") WILL SERVE AS THE ENVIRONMENTAL MONITOR FOR THIS PROJECT TO OBSERVE ALL PHASES OF THE TREE CLEARING ONLY ENHANCEMENT AREA PLAN (THE "PLAN"), INCLUDING WOODY INVASIVE PLANT REMOVAL AND NATIVE PLANTINGS, TO ENSURE THAT THE PLAN IS IMPLEMENTED PROPERLY. THE CONTRACTOR SHALL CONTACT DEAN GUSTAFSON, SENIOR WETLAND SCIENTIST AT APT, AT LEAST 5 BUSINESS DAYS PRIOR TO SCHEDULE A PRE-CONSTRUCTION MEETING. MR. GUSTAFSON CAN BE REACHED BY PHONE AT (860) 552-2033 OR VIA EMAIL AT DGUSTAFSON@ALLPOINTSTECH.COM.

2) PRIOR TO ANY EARTHWORK, EROSION CONTROLS (I.E., COMPOST FILTER SOCK) WILL BE INSTALLED ALONG THE WEST SIDE OF THE TREE CLEARING ONLY ENHANCEMENT AREAS, WHICH IS LOCATED CLOSE TO WETLAND RESOURCES.

3) THE TREE CLEARING ONLY ENHANCEMENT AREA PLANTINGS SHALL TAKE PLACE ONCE TREE REMOVAL AND INVASIVE PLANT TREATMENT TASKS HAVE BEEN COMPLETED.

4) REFER TO THE INVASIVE PLANT TREATMENT PLAN NOTES FOR CONTROL OF WOODY INVASIVE PLANTS LOCATED WITHIN THE TREE CLEARING ONLY ENHANCEMENT AREAS.

5) THE TREE CLEARING ONLY ENHANCEMENT AREA WILL BE PLANTED WITH NATIVE SHRUBS AS NOTED IN THE TREE CLEARING ENHANCEMENT AREA PLANTING SCHEDULE AND UNDER SOWN WITH A NATIVE WILDLIFE/CONSERVATION SEED MIX AFTER THE CLEARING IS COMPLETED. SOIL CONDITIONING ACTIVITIES, INCLUDING AMENDING PLANTING HOLES WITH WEED FREE TOPSOIL AND/OR COMPOST, WILL BE COMBINED WITH THE SHRUB PLANTING PROCESS.

6) THE PLANTING STOCK SPECIMENS SHALL BE INSPECTED BY THE ENVIRONMENTAL MONITOR FOR HEALTH, PEST, AND SUITABLE FOR USE WITHIN THE TREE CLEARING ONLY ENHANCEMENT AREAS. UNSUITABLE SPECIMENS THAT ARE REJECTED SHALL BE REPLACED BY THE CONTRACTOR WITH SUITABLE SPECIMENS. ANY PLANTING SUBSTITUTIONS SHALL BE APPROVED BY THE ENVIRONMENTAL MONITOR.

7) ALL WOODY PLANT STOCK SHALL BE CONTAINER-GROWN OR BURLAP BALLED. ONLY PLANT MATERIALS NATIVE TO CONNECTICUT SHALL BE USED. SPECIES NOT SPECIFIED IN THE PLAN SHALL NOT BE USED WITHOUT WRITTEN APPROVAL FROM THE ENVIRONMENTAL MONITOR. INVASIVE PLANT SPECIES SHALL NOT BE USED IN THE PLAN.

8) ALL PLANT MATERIALS INSTALLED SHALL MEET OR EXCEED THE SPECIFICATIONS OF THE "AMERICAN STANDARDS FOR NURSERY STOCK" BY THE AMERICAN ASSOCIATION OF NURSERYMEN. ALL PLANTS SHALL BE GUARANTEED BY THE CONTRACTOR TO REMAIN ALIVE AND HEALTHY FOR TWELVE (12) MONTHS PERIOD FROM THE DATE OF PLANTING.

9) THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CAREFUL INSTALLATION, MAINTENANCE (INCLUDING WATERING, AS NECESSARY), AND ESTABLISHMENT OF THE PLANT MATERIAL IN THE TREE CLEARING ONLY ENHANCEMENT AREA. A MAINTENANCE SCHEDULE FOR IRRIGATION (AS NECESSARY) SHALL BE ESTABLISHED BY THE CONTRACTOR.

10) ALL PLANTINGS TO BE SPACED RANDOMLY IN ACCORDANCE WITH THE TREE CLEARING ONLY ENHANCEMENT AREA PLANTING SCHEDULE TO SIMULATE NATURAL GROWTH PATTERNS. THE ENVIRONMENTAL MONITOR WILL ASSIST THE CONTRACTOR WITH SPACING OF TREES AND SHRUBS.

11) THE EROSION CONTROL BARRIERS SHALL BE DISASSEMBLED AND PROPERLY DISPOSED OF FOLLOWING PLANTING OF THE TREE CLEARING ONLY ENHANCEMENT AREAS AND PERMANENT STABILIZATION OF EXPOSED SOILS WITH VEGETATION. SEDIMENT COLLECTED BY THESE DEVICES WILL BE REMOVED AND DISPOSED OF IN A MANNER THAT PREVENTS EROSION AND TRANSPORT TO NEARBY WETLAND RESOURCES.

INVASIVE PLANT TREATMENT PLAN

INVASIVE WOODY SHRUB AND VINE SPECIES CURRENTLY DOMINATING THE UNDERSTORY OF THE TREE CLEARING ONLY ENHANCEMENT AREAS, INCLUDING JAPANESE BARBERRY (BERBERIS THUNBERGIA), MULTIFLORA ROSE (ROSE MULTIFLORA) AND ASIATIC BITTERSWEET (CELASTRUS ORBICULTATUS) SHALL BE REMOVED BY HAND CUTTING DOWN TO THE STEM BASE. CUT STEMS WILL BE TREATED WITH HERBICIDE AS SPECIFIED IN THE FOLLOWING HERBICIDE USE NOTES.

1) HERBICIDE APPLICATIONS SHALL BE CONDUCTED BY A STATE-LICENSED INDIVIDUAL.

2) THE CONTRACTOR IS RESPONSIBLE FOR SECURING NECESSARY LOCAL, STATE AND/OR FEDERAL PERMITS.

3) THE CONTRACTOR SHALL PRODUCE ALL CERTIFICATIONS, LICENSES AND PERMITS PRIOR TO THE START OF WORK.

4) THE CONTRACTOR SHALL FOLLOW ALL FEDERAL, STATE AND LOCAL REGULATIONS REGARDING HERBICIDE USE, APPLICATOR PERMITS AND POSTING REQUIREMENTS.

5) REFER TO THE CONNECTICUT INVASIVE PLANT WORKING GROUP INVASIVE PLANT MANAGEMENT GUIDE OR MOST RECENT GUIDANCE FOR FURTHER DETAILS AND GUIDANCE ON INVASIVE PLANT CONTROL AND REMOVAL RECOMMENDATIONS.
(HTTP://WWW.HORT.UCONN.EDU/CIPWG/ART_PUBS/GUIDE/INTRODUCTION.HTM).

6) ALL HERBICIDES SHALL BE MIXED WITH A DYE APPROVED BY U.S. EPA FOR USE AS A HERBICIDE ADJUVANTS, SUCH AS TURFMARK@DYE OR EQUIVALENT.

7) ONLY NONIONIC SURFACTANTS SHALL BE ADDED TO THE SPECIFIED HERBICIDES.

WATER QUALITY PROTECTION PLAN

SPILL PREVENTION CONTROL PLAN

CERTAIN PRECAUTIONS ARE NECESSARY TO STORE PETROLEUM MATERIALS, REFUEL AND CONTAIN AND PROPERLY CLEAN UP ANY INADVERTENT FUEL OR PETROLEUM (I.E., OIL, HYDRAULIC FLUID, ETC.) SPILL TO AVOID POSSIBLE IMPACT TO NEARBY HABITATS.

A SPILL CONTAINMENT KIT CONSISTING OF A SUFFICIENT SUPPLY OF ABSORBENT PADS AND ABSORBENT MATERIAL WILL BE MAINTAINED BY THE CONTRACTOR AT THE CONSTRUCTION SITE THROUGHOUT THE DURATION OF THE PROJECT. IN ADDITION, A WASTE DRUM WILL BE KEPT ON SITE TO CONTAIN ANY USED ABSORBENT PADS/MATERIAL FOR PROPER AND TIMELY DISPOSAL OFF SITE IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL LAWS.

THE FOLLOWING PETROLEUM AND HAZARDOUS MATERIALS STORAGE AND REFUELING RESTRICTIONS AND SPILL RESPONSE PROCEDURES WILL BE ADHERED TO BY THE CONTRACTOR.

1. PETROLEUM AND HAZARDOUS MATERIALS STORAGE AND REFUELING
   a. REFUELING OF VEHICLES OR MACHINERY SHALL OCCUR WITHIN THE CONSTRUCTION LAYDOWN AREA ONLY AND SHALL TAKE PLACE ON AN IMPERVIOUS PAD WITH SECONDARY CONTAINMENT DESIGNED TO CONTAIN FUELS. THIS AREA IS GREATER THAN 100' FROM A WETLAND.
   b. ANY FUEL OR HAZARDOUS MATERIALS THAT MUST BE KEPT ON SITE SHALL BE STORED ON AN IMPERVIOUS SURFACE UTILIZING SECONDARY CONTAINMENT A MINIMUM OF 100 FEET FROM WETLANDS OR WATERCOURSES.
2. INITIAL SPILL RESPONSE PROCEDURES
   a. STOP OPERATIONS AND SHUT OFF EQUIPMENT.
   b. REMOVE ANY SOURCES OF SPARK OR FLAME.
   c. CONTAIN THE SOURCE OF THE SPILL.
   d. DETERMINE THE APPROXIMATE VOLUME OF THE SPILL.
   e. IDENTIFY THE LOCATION OF NATURAL FLOW PATHS TO PREVENT THE RELEASE OF THE SPILL TO SENSITIVE NEARBY WATERWAYS OR WETLANDS.
   f. ENSURE THAT FELLOW WORKERS ARE NOTIFIED OF THE SPILL.
3. SPILL CLEAN UP & CONTAINMENT
   a. OBTAIN SPILL RESPONSE MATERIALS FROM THE ON-SITE SPILL RESPONSE KIT. PLACE ABSORBENT MATERIALS DIRECTLY ON THE RELEASE AREA.
   b. LIMIT THE SPREAD OF THE SPILL BY PLACING ABSORBENT MATERIALS AROUND THE PERIMETER OF THE SPILL.
   c. ISOLATE AND ELIMINATE THE SPILL SOURCE.
   d. CONTACT THE APPROPRIATE LOCAL, STATE AND/OR FEDERAL AGENCIES, AS NECESSARY.
   e. CONTACT ACV ENVIRO (860.370.2266, 800.777.4557), A SPILL RESPONSE AND DISPOSAL COMPANY, TO ASSIST WITH THE SPILL RESPONSE AND PROPERLY DISPOSE OF CONTAMINATED MATERIALS IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS.
4. REPORTING
   a. COMPLETE AN INCIDENT REPORT.
   b. NOTIFY REGIONAL WATER AUTHORITY CONTROL ROOM AT 203.401.2629 (STAFFED 24/7)
   c. SUBMIT A COMPLETED INCIDENT REPORT TO THE APPROPRIATE CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION, REGIONAL WATER AUTHORITY, MUNICIPAL OFFICIAL, CONNECTICUT SITING COUNCIL AND OTHER APPLICABLE LOCAL, STATE AND FEDERAL OFFICIALS.

WASTE DISPOSAL

CONSTRUCTION SITE WASTE SHALL BE PROPERLY MANAGED AND DISPOSED OF DURING THE ENTIRE CONSTRUCTION PERIOD. ADDITIONALLY;

- A WASTE COLLECTION AREA WILL BE DESIGNATED. THE SELECTED AREA WILL MINIMIZE TRUCK TRAVEL THROUGH THE SITE AND WILL NOT DRAIN DIRECTLY TO THE ADJACENT WETLANDS.
- WASTE COLLECTION SHALL BE SCHEDULED REGULARLY TO PREVENT THE CONTAINERS FROM OVERFILLING.
- SPILLS SHALL BE CLEANED UP IMMEDIATELY.
- DEFECTIVE CONTAINERS THAT MAY CAUSE LEAKS OR SPILLS WILL BE IDENTIFIED THROUGH REGULAR INSPECTION. ANY FOUND TO BE DEFECTIVE WILL BE REPAIRED OR REPLACED IMMEDIATELY.
- ANY STOCKPILING OF MATERIALS SHOULD BE CONFINED TO THE DESIGNATED AREA AS DEFINED BY THE ENGINEER.

WASHOUT AREAS

WASHOUT OF APPLICATORS, CONTAINERS, VEHICLES AND EQUIPMENT FOR CONCRETE SHALL BE CONDUCTED IN A DESIGNATED WASHOUT AREA. NO SURFACE DISCHARGE OF WASHOUT WASTEWATERS FROM THE AREA WILL BE ALLOWED. ALL CONCRETE WASH WATER WILL BE DIRECTED INTO A CONTAINER OR PIT SUCH THAT NO OVERFLOWS CAN OCCUR. WASHOUT SHALL BE CONDUCTED IN AN ENTIRELY SELF-CONTAINED SYSTEM AND WILL BE CLEARLY DESIGNED AND FLAGGED OR SIGNED WHERE NECESSARY. THE WASHOUT AREA SHALL BE LOCATED OUTSIDE OF ANY BUFFERS AND AT LEAST 50 FEET FROM ANY STREAM, WETLAND OR OTHER SENSITIVE WATER OR NATURAL RESOURCES AS SHOWN ON THE PLANS.

THE DESIGNATED AREA SHALL BE DESIGNED AND MAINTAINED SUCH THAT NO OVERFLOWS CAN OCCUR DURING RAINFALL OR AFTER SNOWMELT. CONTAINERS OR PITS SHALL BE INSPECTED AT LEAST ONCE A WEEK TO ENSURE STRUCTURAL INTEGRITY, ADEQUATE HOLDING CAPACITY AND WILL BE REPAIRED PRIOR TO FUTURE USE IF LEAKS ARE PRESENT. THE CONTRACTOR SHALL REMOVE HARDENED CONCRETE WASTE WHEN IT ACCUMULATES TO A HEIGHT OF ½ OF THE CONTAINER OR PIT OR AS NECESSARY TO AVOID OVERFLOWS. ALL CONCRETE WASTE SHALL BE DISPOSED OF IN A MANNER CONSISTENT WILL ALL APPLICABLE LAWS, REGULATIONS AND GUIDELINES.

Louth Callan Renewables

ALL-POINTS TECHNOLOGY CORPORATION
567 VAUXHALL STREET EXTENSION - SUITE 311
WATERFORD, CT 06385 PHONE: (860)-663-1697
WWW.ALLPOINTSTECH.COM FAX: (860)-663-0935

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NO	DATE	REVISION
0	04/20/23	FOR PERMIT: RCB
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2	05/26/23	D&M: RCB
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4	06/06/23	CLIENT REVISIONS: RCB
5		
6		

DESIGN PROFESSIONAL OF RECORD

PROF: ROBERT C. BURNS, P.E.
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 567 VAUXHALL STREET EXTENSION - SUITE 311 WATERFORD, CT 06385

OWNER: NEWTON FAMILY TRUST

ADDRESS: 1279 ARBUTUS ST DURHAM, CT 06422

HADDAM QUARTER ROAD SOLAR

SITE ADDRESS: JOHNSON LANE DURHAM, CT

APT FILING NUMBER: CT671100

DRAWN BY: CSH

DATE: 04/20/23 CHECKED BY: RCB

SHEET TITLE:

ENVIRONMENTAL NOTES

SHEET NUMBER:

GN-2

STATE OF CONNECTICUT · ROBERT C. BURNS · No. 20071 · LICENSED PROFESSIONAL ENGINEER

1 OP-1 **OVERALL LOCUS MAP**
SCALE : 1" = 150'-0"

150 0 75 150 300
(IN FEET) 1 inch = 150 ft.

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OVERALL LOCUS MAP

SHEET NUMBER:

OP-1

STATE OF CONNECTICUT · ROBERT CHARLES BURNS · 20071 · LICENSED PROFESSIONAL ENGINEER

EROSION CONTROL NOTES

EROSION AND SEDIMENT CONTROL PLAN NOTES

1. THE CONTRACTOR SHALL CONSTRUCT ALL SEDIMENT AND EROSION CONTROLS IN ACCORDANCE WITH THE 2002 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL, LATEST EDITION, IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, AND AS DIRECTED BY THE TOWN OF DURHAM, PERMITTEE, AND/OR SWPCP MONITOR. ALL PERIMETER SEDIMENTATION AND EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE START OF CLEARING AND GRUBBING AND DEMOLITION OPERATIONS.

2. THESE DRAWINGS ARE ONLY INTENDED TO DESCRIBE THE SEDIMENT AND EROSION CONTROL MEASURES FOR THIS SITE. SEE CONSTRUCTION SEQUENCE FOR ADDITIONAL INFORMATION. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHOWN ON THE EROSION & SEDIMENT CONTROL PLAN ARE SHOWN AS REQUIRED BY THE ENGINEER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT ALL EROSION CONTROL MEASURES ARE CONFIGURED AND CONSTRUCTED IN A MANNER THAT WILL MINIMIZE EROSION OF SOILS AND PREVENT THE TRANSPORT OF SEDIMENTS AND OTHER POLLUTANTS TO STORM DRAINAGE SYSTEMS AND/OR WATERCOURSES. ACTUAL SITE CONDITIONS OR SEASONAL AND CLIMATIC CONDITIONS MAY WARRANT ADDITIONAL CONTROLS OR CONFIGURATIONS, AS REQUIRED, AND AS DIRECTED BY THE PERMITTEE AND/OR SWPCP MONITOR. REFER TO SITE PLAN FOR GENERAL INFORMATION AND OTHER CONTRACT PLANS FOR APPROPRIATE INFORMATION.

3. A BOND OR LETTER OF CREDIT MAY BE REQUIRED TO BE POSTED WITH THE GOVERNING AUTHORITY FOR THE EROSION CONTROL INSTALLATION AND MAINTENANCE.

4. THE CONTRACTOR SHALL APPLY THE MINIMUM EROSION & SEDIMENT CONTROL MEASURES SHOWN ON THE PLAN IN CONJUNCTION WITH CONSTRUCTION SEQUENCING, SUCH THAT ALL ACTIVE WORK ZONES ARE PROTECTED. ADDITIONAL AND/OR ALTERNATIVE SEDIMENT AND EROSION CONTROL MEASURES MAY BE INSTALLED DURING THE CONSTRUCTION PERIOD IF FOUND NECESSARY BY THE CONTRACTOR, OWNER, SITE ENGINEER, MUNICIPAL OFFICIALS, OR ANY GOVERNING AGENCY. THE CONTRACTOR SHALL CONTACT THE OWNER AND APPROPRIATE GOVERNING AGENCIES FOR APPROVAL IF ALTERNATIVE CONTROLS OTHER THAN THOSE SHOWN ON THE PLANS ARE PROPOSED BY THE CONTRACTOR.

5. THE CONTRACTOR SHALL TAKE EXTREME CARE DURING CONSTRUCTION SO AS NOT TO DISTURB UNPROTECTED WETLAND AREAS OR INSTALLED SEDIMENTATION AND EROSION CONTROL MEASURES. THE CONTRACTOR SHALL INSPECT ALL SEDIMENT AND EROSION CONTROLS WEEKLY AND WITHIN 24 HOURS OF A STORM WITH A RAINFALL AMOUNT OF 0.25 INCHES OR GREATER TO VERIFY THAT THE CONTROLS ARE OPERATING PROPERLY AND MAKE REPAIRS AS NECESSARY IN A TIMELY MANOR.

6. THE CONTRACTOR SHALL KEEP A SUPPLY OF EROSION CONTROL MATERIAL (SILT FENCE, COMPOST FILTER SOCK, EROSION CONTROL BLANKET, ETC.) ON-SITE FOR PERIODIC MAINTENANCE AND EMERGENCY REPAIRS.

7. ALL FILL MATERIAL PLACED ADJACENT TO ANY WETLAND AREA SHALL BE GOOD QUALITY, WITH LESS THAN 5% FINES PASSING THROUGH A #200 SIEVE (BANK RUN), SHALL BE PLACED IN MAXIMUM ONE FOOT LIFTS, AND SHALL BE COMPACTED TO 95% MAX. DRY DENSITY MODIFIED PROCTOR OR AS SPECIFIED IN THE CONTRACT SPECIFICATIONS.

8. PROTECT EXISTING TREES THAT ARE TO BE SAVED BY FENCING, ORANGE SAFETY FENCE, CONSTRUCTION TAPE, OR EQUIVALENT FENCING/TAPE. ANY LIMB TRIMMING SHOULD BE DONE AFTER CONSULTATION WITH AN ARBORIST AND BEFORE CONSTRUCTION BEGINS IN THAT AREA; FENCING SHALL BE MAINTAINED AND REPAIRED DURING CONSTRUCTION.

9. CONSTRUCTION ENTRANCES (ANTI-TRACKING PADS) SHALL BE INSTALLED PRIOR TO ANY SITE EXCAVATION OR CONSTRUCTION ACTIVITY AND SHALL BE MAINTAINED THROUGHOUT THE DURATION OF ALL CONSTRUCTION IF REQUIRED. THE LOCATION OF THE TRACKING PADS MAY CHANGE AS VARIOUS PHASES OF CONSTRUCTION ARE COMPLETED. CONTRACTOR SHALL ENSURE THAT ALL VEHICLES EXITING THE SITE ARE PASSING OVER THE ANTI-TRACKING PADS PRIOR TO EXITING.

10. ALL CONSTRUCTION SHALL BE CONTAINED WITHIN THE LIMIT OF DISTURBANCE, WHICH SHALL BE MARKED WITH SILT FENCE, SAFETY FENCE, HAY BALES, RIBBONS, OR OTHER MEANS PRIOR TO CLEARING. CONSTRUCTION ACTIVITY SHALL REMAIN ON THE UPHILL SIDE OF THE SEDIMENT BARRIER UNLESS WORK IS SPECIFICALLY CALLED FOR ON THE DOWNHILL SIDE OF THE BARRIER.

11. NO CUT OR FILL SLOPES SHALL EXCEED 2:1 EXCEPT WHERE STABILIZED BY ROCK FACED EMBANKMENTS OR EROSION CONTROL BLANKETS. ALL SLOPES SHALL BE SEEDED AND BANKS WILL BE STABILIZED IMMEDIATELY UPON COMPLETION OF FINAL GRADING UNTIL TURF IS ESTABLISHED.

12. DIRECT ALL DEWATERING PUMP DISCHARGE TO A SEDIMENT CONTROL DEVICE CONFORMING TO THE GUIDELINES WITHIN THE APPROVED LIMIT OF DISTURBANCE IF REQUIRED. DISCHARGE TO STORM DRAINS OR SURFACE WATERS FROM SEDIMENT CONTROLS SHALL BE CLEAR AND APPROVED BY THE PERMITTEE OR MUNICIPALITY.

13. THE CONTRACTOR SHALL MAINTAIN A CLEAN CONSTRUCTION SITE AND SHALL NOT ALLOW THE ACCUMULATION OF RUBBISH OR CONSTRUCTION DEBRIS ON THE SITE. PROPER SANITARY DEVICES SHALL BE MAINTAINED ON-SITE AT ALL TIMES AND SECURED APPROPRIATELY. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID THE SPILLAGE OF FUEL OR OTHER POLLUTANTS ON THE CONSTRUCTION SITE AND SHALL ADHERE TO ALL APPLICABLE POLICIES AND REGULATIONS RELATED TO SPILL PREVENTION AND RESPONSE/CONTAINMENT.

14. MINIMIZE LAND DISTURBANCES. SEED AND MULCH DISTURBED AREAS WITH TEMPORARY MIX AS SOON AS PRACTICABLE (2 WEEK MAXIMUM UNSTABILIZED PERIOD) USING PERENNIAL RYEGRASS AT 40 LBS PER ACRE. MULCH ALL CUT AND FILL SLOPES AND SWALES WITH LOOSE HAY AT A RATE OF 2 TONS PER ACRE. IF NECESSARY, REPLACE LOOSE HAY ON SLOPES WITH EROSION CONTROL BLANKETS OR JUTE CLOTH. MODERATELY GRADED AREAS, ISLANDS, AND TEMPORARY CONSTRUCTION STAGING AREAS MAY BE HYDROSEEDED WITH TACKIFIER.

15. SWEEP AFFECTED PORTIONS OF OFF SITE ROADS ONE OR MORE TIMES A DAY (OR LESS FREQUENTLY IF TRACKING IS NOT A PROBLEM) DURING CONSTRUCTION. FOR DUST CONTROL, PERIODICALLY MOISTEN EXPOSED SOIL SURFACES WITH WATER ON UNPAVED TRAVELWAYS TO KEEP THE TRAVELWAYS DAMP. CALCIUM CHLORIDE MAY ALSO BE APPLIED TO ACCESS ROADS. DUMP TRUCK LOADS EXITING THE SITE SHALL BE COVERED.

16. VEGETATIVE ESTABLISHMENT SHALL OCCUR ON ALL DISTURBED SOIL, UNLESS THE AREA IS UNDER ACTIVE CONSTRUCTION, IT IS COVERED IN STONE OR SCHEDULED FOR PAVING WITHIN 30 DAYS. TEMPORARY SEEDING OR NON-LIVING SOIL PROTECTION OF ALL EXPOSED SOILS AND SLOPES SHALL BE INITIATED WITHIN THE FIRST 7 DAYS OF SUSPENDING WORK IN AREAS TO BE LEFT LONGER THAN 30 DAYS.

17. MAINTAIN ALL PERMANENT AND TEMPORARY SEDIMENT CONTROL DEVICES IN EFFECTIVE CONDITION THROUGHOUT THE CONSTRUCTION PERIOD. UPON COMPLETION OF WORK SWEEP CONCRETE PADS, CLEAN THE STORMWATER MANAGEMENT SYSTEMS AND REMOVE ALL TEMPORARY SEDIMENT CONTROLS ONCE THE SITE IS FULLY STABILIZED AND APPROVAL HAS BEEN RECEIVED FROM PERMITTEE OR THE MUNICIPALITY.

18. SEEDING MIXTURES SHALL BE FUZZ & BUZZ MIX - PREMIUM - ERNMX-147, OR APPROVED EQUAL. SEE SHEET DN-1 FOR SEED MIXTURES.

CONSTRUCTION OPERATION AND MAINTENANCE PLAN - BY CONTRACTOR

E&S MEASURE	INSPECTION SCHEDULE	MAINTENANCE REQUIRED
CONSTRUCTION ENTRANCE	DAILY	PLACE ADDITIONAL STONE, EXTEND THE LENGTH OR REMOVE AND REPLACE THE STONE. CLEAN PAVED SURFACES OF TRACKED SEDIMENT.
COMPOST FILTER SOCK	WEEKLY & WITHIN 24 HOURS OF RAINFALL > 0.25"	REPAIR/REPLACE WHEN FAILURE OR DETERIORATION IS OBSERVED.
SILT FENCE	WEEKLY & WITHIN 24 HOURS OF RAINFALL > 0.25"	REPAIR/REPLACE WHEN FAILURE OR DETERIORATION IS OBSERVED. REMOVE SILT WHEN IT REACHES 1/2 THE HEIGHT OF THE FENCE.
TOPSOIL/BORROW STOCKPILES	DAILY	REPAIR/REPLACE SEDIMENT BARRIERS AS NECESSARY.
TEMPORARY SEDIMENT TRAP	WEEKLY & WITHIN 24 HOURS OF RAINFALL > 0.5"	REMOVE SEDIMENT ONCE IT HAS ACCUMULATED TO ONE HALF OF MINIMUM REQUIRED VOLUME OF THE WET STORAGE, DEWATERING AS NEEDED. RESTORE TRAP TO ORIGINAL DIMENSIONS. REPAIR/REPLACE BAFFLES WHEN FAILURE OR DETERIORATION IS OBSERVED.
TEMPORARY SOIL PROTECTION	WEEKLY & WITHIN 24 HOURS OF RAINFALL > 0.25"	REPAIR ERODED OR BARE AREAS IMMEDIATELY. RESEED AND MULCH.

SEDIMENT & EROSION CONTROL NARRATIVE

1. THE PROJECT INVOLVES THE CONSTRUCTION OF A GROUND MOUNTED SOLAR PANEL FACILITY WITH ASSOCIATED EQUIPMENT, WITH MINIMAL CLEARING, GRUBBING, AND GRADING OF APPROXIMATELY 11.50± ACRES OF THE EXISTING LOT.

THE PROPOSED PROJECT INVOLVES THE FOLLOWING CONSTRUCTION:

A. CLEARING, GRUBBING, AND GRADING OF THE EXISTING LOT.
B. CONSTRUCTION OF 5,496 GROUND MOUNTED SOLAR PANELS AND ASSOCIATED EQUIPMENT.
B. THE STABILIZATION OF DISTURBED AREAS WITH PERMANENT VEGETATIVE TREATMENTS.

2. FOR THIS PROJECT, THERE ARE APPROXIMATELY 11.50± ACRES OF THE SITE BEING DISTURBED WITH NEGLIGIBLE INCREASE IN THE IMPERVIOUS AREA OF THE SITE, AS ALL ACCESS THOUGH THE SITE WILL BE GRAVEL. IMPERVIOUS AREAS ARE LIMITED TO THE CONCRETE PADS FOR ELECTRICAL EQUIPMENT.

3. THE PROJECT SITE, AS MAPPED IN THE SOIL SURVEY OF STATE OF CONNECTICUT (NRCS, VERSION 30, JUN 9, 2020), CONTAINS TYPE 20A, 30B, 77C (HYDROLOGIC SOIL GROUP B), 40B, 69B, AND 69C (HYDROLOGIC SOIL GROUP C). A GEOTECHNICAL ENGINEERING REPORT HAS NOT BEEN COMPLETED.

4. IT IS ANTICIPATED THAT CONSTRUCTION WILL BE COMPLETED IN APPROXIMATELY 3-4 MONTHS.

5. REFER TO THE CONSTRUCTION SEQUENCING AND EROSION AND SEDIMENTATION NOTES FOR INFORMATION REGARDING SEQUENCING OF MAJOR OPERATIONS IN THE ON-SITE CONSTRUCTION PHASES.

6. STORMWATER MANAGEMENT DESIGN CRITERIA UTILIZES THE APPLICABLE SECTIONS OF THE 2004 CONNECTICUT STORMWATER QUALITY MANUAL AND THE TOWN OF DURHAM STANDARDS, TO THE EXTENT POSSIBLE AND PRACTICABLE FOR THIS PROJECT ON THIS SITE. EROSION AND SEDIMENTATION MEASURES ARE BASED UPON ENGINEERING PRACTICE, JUDGEMENT AND THE APPLICABLE SECTIONS OF THE CONNECTICUT EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS, LATEST EDITION.

7. DETAILS FOR THE TYPICAL STORMWATER MANAGEMENT AND EROSION AND SEDIMENTATION MEASURES ARE SHOWN ON THE PLAN SHEETS OR PROVIDED AS SEPARATE SUPPORT DOCUMENTATION FOR REVIEW IN THIS PLAN.

8. CONSERVATION PRACTICES TO BE USED DURING CONSTRUCTION:
   A. STAGED CONSTRUCTION;
   B. MINIMIZE THE DISTURBED AREAS TO THE EXTENT PRACTICABLE DURING CONSTRUCTION;
   C. STABILIZE DISTURBED AREAS WITH TEMPORARY OR PERMANENT MEASURES AS SOON AS POSSIBLE, BUT NO LATER THAN 7-DAYS FOLLOWING DISTURBANCE;
   D. MINIMIZE IMPERVIOUS AREAS;
   E. UTILIZE APPROPRIATE CONSTRUCTION EROSION AND SEDIMENTATION MEASURES.

9. THE FOLLOWING SEPARATE DOCUMENTS ARE TO BE CONSIDERED A PART OF THE EROSION AND SEDIMENTATION PLAN:
   A. STORMWATER MANAGEMENT REPORT DATED APRIL 2021, REVISED APRIL 2023.
   B. SWPCP DATED APRIL 2023.

SUGGESTED CONSTRUCTION SEQUENCE

THE FOLLOWING SUGGESTED SEQUENCE OF CONSTRUCTION ACTIVITIES IS PROJECTED BASED UPON ENGINEERING JUDGEMENT AND BEST MANAGEMENT PRACTICES. THE CONTRACTOR MAY ELECT TO ALTER THE SEQUENCING TO BEST MEET THE CONSTRUCTION SCHEDULE, THE EXISTING SITE ACTIVITIES AND WEATHER CONDITIONS. SHOULD THE CONTRACTOR ALTER THE CONSTRUCTION SEQUENCE OR ANY EROSION AND SEDIMENTATION CONTROL MEASURES THEY SHALL MODIFY THE STORMWATER POLLUTION CONTROL PLAN ("SWPCP") AS REQUIRED BY THE GENERAL PERMIT. MAJOR CHANGES IN SEQUENCING AND/OR METHODS MAY REQUIRE REGULATORY APPROVAL PRIOR TO IMPLEMENTATION.

1. THE CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING. PHYSICALLY FLAG THE LIMITS OF DISTURBANCE IN THE FIELD AS NECESSARY TO FACILITATE THE PRE-CONSTRUCTION MEETING.

2. CONDUCT A PRE-CONSTRUCTION MEETING TO DISCUSS THE PROPOSED WORK AND EROSION AND SEDIMENTATION CONTROL MEASURES. THE MEETING SHOULD BE ATTENDED BY THE OWNER, THE OWNERS REPRESENTATIVE(S), THE GENERAL CONTRACTOR, DESIGNATED SUB-CONTRACTORS AND THE PERSON, OR PERSONS, RESPONSIBLE FOR THE IMPLEMENTATION, OPERATION, MONITORING AND MAINTENANCE OF THE EROSION AND SEDIMENTATION MEASURES. THE CONSTRUCTION PROCEDURES FOR THE ENTIRE PROJECT SHALL BE REVIEWED AT THIS MEETING.

3. NOTIFY CALL BEFORE YOU DIG AT 811, AS REQUIRED, PRIOR TO THE START OF CONSTRUCTION.

PHASE 1

4. REMOVE EXISTING IMPEDIMENTS AS NECESSARY AND PROVIDE MINIMAL CLEARING AND GRUBBING TO INSTALL THE REQUIRED CONSTRUCTION ENTRANCE/S.

5. CLEAR ONLY AS NEEDED TO INSTALL THE PERIMETER EROSION AND SEDIMENTATION CONTROL MEASURES AND, IF APPLICABLE, TREE PROTECTION. ALL WETLAND AREAS SHALL BE PROTECTED BEFORE MAJOR CONSTRUCTION BEGINS.

6. INSTALL PERIMETER EROSION CONTROLS.

7. INSTALL PERMANENT DIVERSION SWALES AND LEVEL SPREADERS FOR THE OFF-SITE CULVERT DRAINAGE ACROSS JOHNSON LANE.

8. INSTALL TEMPORARY COMPOST FILTER SOCK SEDIMENT TRAPS.

PHASE 2

9. UPON COMPLETION OF THE INSTALLATION OF THE PERMANENT DIVERSION SWALES AND LEVEL SPREADERS, THE REMAINING ARRAY AREA CLEARING AND GRUBBING CAN BE COMPLETED AS REQUIRED. REMOVE CUT WOOD AND STOCKPILE FOR FUTURE USE OR REMOVE OFF-SITE. REMOVE AND DISPOSE OF DEMOLITION DEBRIS OFF-SITE IN ACCORDANCE WITH APPLICABLE LAWS. INSTALL EROSION AND SEDIMENT CONTROL MEASURES INTERNAL TO THE SITE AS SHOWN ON EC-4.

10. TEMPORARILY SEED DISTURBED AREAS NOT UNDER CONSTRUCTION FOR THIRTY (30) DAYS OR MORE.

11. INSTALL CONCRETE EQUIPMENT PADS AND CONDUITS.

12. INSTALL REMAINING ELECTRICAL CONDUIT.

13. INSTALL RACKING POSTS FOR GROUND MOUNTED SOLAR PANELS.

14. INSTALL GROUND MOUNTED SOLAR PANELS AND COMPLETE ELECTRICAL INSTALLATION.

15. AFTER SUBSTANTIAL COMPLETION OF THE INSTALLATION OF THE SOLAR PANELS, INSTALL PERMANENT GRASS LINED WATER QUALITY BASIN AND COMPLETE REMAINING SITE WORK, INCLUDING REMOVAL OF CONSTRUCTION ENTRANCES AND INSTALLATION OF GRAVEL DRIVES & PARKING AREAS, ANY REQUIRED LANDSCAPE SCREENING, AND STABILIZE ALL DISTURBED AREAS.

16. FINE GRADE, RAKE, SEED AND MULCH ALL REMAINING DISTURBED AREAS.

17. AFTER THE SITE IS STABILIZED AND WITH THE APPROVAL OF THE PERMITTEE AND TOWN OF DURHAM AGENT, REMOVE PERIMETER EROSION AND SEDIMENTATION CONTROLS.

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COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 567 VAUXHALL STREET EXTENSION - SUITE 311 WATERFORD, CT 06385

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HADDAM QUARTER ROAD SOLAR

SITE ADDRESS: JOHNSON LANE DURHAM, CT

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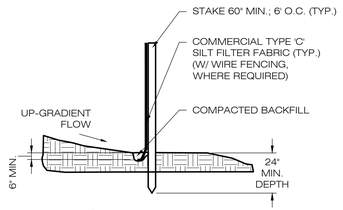
SEDIMENTATION & EROSION CONTROL NOTES

SHEET NUMBER:
EC-1

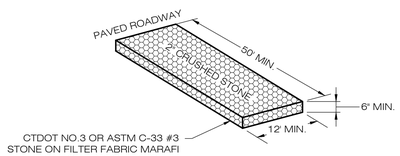
STATE OF CONNECTICUT · ROBERT CHARLES BURNS · 20071 · LICENSED PROFESSIONAL ENGINEER



NOTE:
SILT FENCE SHALL BE LAPPED ONLY WHEN NECESSARY PER THE MANUFACTURER RECOMMENDATIONS.

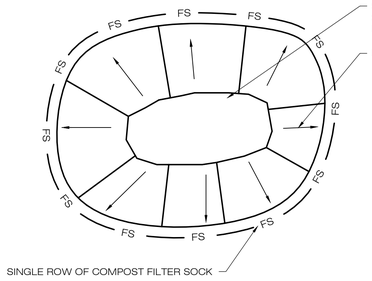
1 EC-2 SILT FENCE DETAIL

SCALE : N.T.S.



2 EC-2 CONSTRUCTION ENTRANCE DETAIL

SCALE : N.T.S.



NOTES:
1. ALL EXISTING EXCAVATED MATERIAL THAT IS NOT TO BE REUSED IN THE WORK IS TO BE IMMEDIATELY REMOVED FROM THE SITE AND PROPERLY DISPOSED OF.

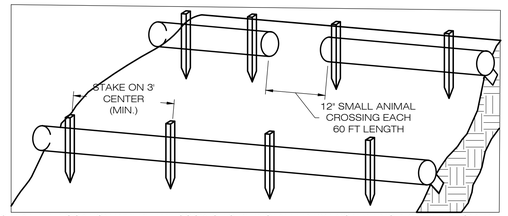
2. SOIL/AGGREGATE STOCKPILE SITES TO BE WHERE SHOWN ON THE DRAWINGS.

3. RESTORE STOCKPILE SITES TO PRE-EXISTING PROJECT CONDITION AND RESEED AS REQUIRED.

4. STOCKPILE HEIGHTS MUST NOT EXCEED 35'. STOCKPILE SLOPES MUST BE 2:1 OR FLATTER.

3 EC-2 MATERIALS STOCKPILE DETAIL

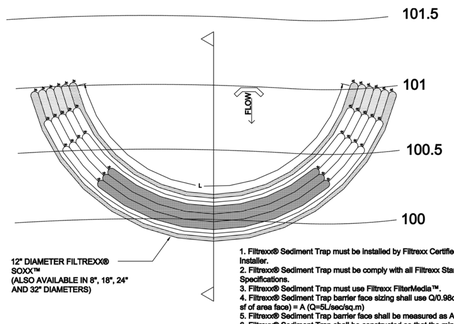
SCALE : N.T.S.



1. BEGIN AT THE LOCATION WHERE THE SOCK IS TO BE INSTALLED BY EXCAVATING A 2-3" (5-7.5 CM) DEEP X 9" (22.9 CM) WIDE TRENCH ALONG THE CONTOUR OF THE SLOPE. EXCAVATED SOIL SHOULD BE PLACED UP SLOPE FROM THE ANCHOR TRENCH.
2. PLACE THE SOCK IN THE TRENCH SO THAT IT CONTOURS TO THE SOIL SURFACE. COMPACT SOIL FROM THE EXCAVATED TRENCH AGAINST THE SOCK ON THE UPHILL SIDE. SOCKS SHALL BE INSTALLED IN 60 FT CONTINUOUS LENGTHS WITH ADJACENT SOCKS TIGHTLY ABUT. EVERY 60 FT THE SOCK ROW SHALL BE SPACED 12 INCHES CLEAR, END TO END, FOR AMPHIBIAN AND REPTILE TRAVEL. THE OPEN SPACES SHALL BE STAGGERED MID LENGTH OF THE NEXT DOWN GRADIENT SOCK.
3. SECURE THE SOCK WITH 18-24" (45.7-61 CM) STAKES EVERY 3-4' (0.9 -1.2 M) AND WITH A STAKE ON EACH END. STAKES SHOULD BE DRIVEN THROUGH THE MIDDLE OF THE SOCK LEAVING AT LEAST 2-3" (5-7.5 CM) OF STAKE EXTENDING ABOVE THE SOCK. STAKES SHOULD BE DRIVEN PERPENDICULAR TO THE SLOPE FACE.

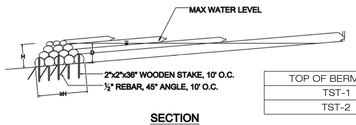
4 EC-2 COMPOST FILTER SOCK SEDIMENTATION CONTROL BARRIER

SCALE : N.T.S.



PLAN

1. Filtrexx® Sediment Trap must be installed by Filtrexx Certified Installer.
2. Filtrexx® Sediment Trap must be comply with all Filtrexx Standard Specifications.
3. Filtrexx® Sediment Trap must use Filtrexx FilterMedia™.
4. Filtrexx® Sediment Trap barrier face sizing shall use Q/0.98cfm(per sf of area face) = A (Q=5L/sec/sq.m)
5. Filtrexx® Sediment Trap barrier face shall be measured as A=L*D.
6. Filtrexx® Sediment Trap shall be constructed so that the minimum base width is equivalent to the height (1H:1V).
7. Sediment accumulation shall not exceed ½ the height of the barrier.
8. Filtrexx® Sediment Trap shall be inspected and maintained after storm events.
9. Soxx™ shall be of larger diameter at the base of the Sediment Tra and decrease in diameter for successive layers.
10. Ends of the Sediment Trap shall be a minimum 1 ft (30 cm) higher in elevation than the mid-section, which shall be at the lowest elevation.
11. Bottom layer of Soxx™ shall be staked with 2x2x36" wooden stakes. Successive layers shall be staked with ½" rebar at a 45 degree angle.



SECTION

TOP OF BERM ELEVATION TABLE	
TST-1	302.5'
TST-2	306.0'

5 EC-2 FILTREXX® SEDIMENT TRAP

SCALE : N.T.S.

Louth Callan Renewables

ALL-POINTS TECHNOLOGY CORPORATION

567 VAUXHALL STREET EXTENSION - SUITE 311
WATERFORD, CT 06385 PHONE: (860)-663-1697
WWW.ALLPOINTSTECH.COM FAX: (860)-663-0935

CSC PERMIT SET

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3	06/02/23	D&M: RCB
4	06/06/23	CLIENT REVISIONS: RCB
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DESIGN PROFESSIONAL OF RECORD

PROF: ROBERT C. BURNS, P.E.
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 567 VAUXHALL STREET EXTENSION - SUITE 311 WATERFORD, CT 06385

OWNER: NEWTON FAMILY TRUST

ADDRESS: 1279 ARBUTUS ST DURHAM, CT 06422

HADDAM QUARTER ROAD SOLAR

SITE ADDRESS: JOHNSON LANE DURHAM, CT

APT FILING NUMBER: CT671100

DRAWN BY: CSH

DATE: 04/20/23 CHECKED BY: RCB

SHEET TITLE:

SEDIMENTATION & EROSION CONTROL DETAILS

SHEET NUMBER:

EC-2

PROP. PHASE 1 CLEARING ONLY (0.53± AC.) CLEARING ACTIVITIES TO INCLUDE THE REMOVAL OF ALL TREES. ALL STUMPS TO REMAIN. CLEARED MATERIAL TO BE CHIPPED & STOCKPILED, TO BE USED FOR TEMPORARY STABILIZATION. SEE SHEET GN-2 FOR TREE CLEARING NOTES & SHEET LP-2 FOR PLANTING SCHEDULE. (TYP.)

100' RESOURCE BUFFER

EXIST. WETLAND LIMITS (TYP.)

50' RESOURCE BUFFER

50' RESOURCE BUFFER

EXIST. WETLAND LIMITS (TYP.)

100' RESOURCE BUFFER

5 EC-2 PROP. FILTREXX® SEDIMENT TRAP (TYP.)

PROP. 12" COMPOST FILTER SOCK WING (5' LENGTH TO BE INSTALLED PERPENDICULAR TO PERIMETER FILTER SOCK)

PROP. 12" COMPOST FILTER SOCK (TYP.) 4 EC-2

5 EC-2 PROP. FILTREXX® SEDIMENT TRAP (TYP.)

TST-1
TOP ELEV. = 302.5'

PROP. PHASE 1 LIMITS OF DISTURBANCE FOR INSTALLATION OF DIVERSION SWALES (±3.18 AC). ALL DISTURBED AREAS TO BE LOAMED & SEEDED. (TYP.)

TST-2
TOP ELEV. = 306.0'

3,5 DN-2 PROP. 2.0' BOTTOM GRASS LINED DIVERSION SWALE W/ STONE BERMED LEVEL SPREADER

PROP. 18" COMPOST FILTER SOCK WING (5' LENGTH TO BE INSTALLED PERPENDICULAR TO PERIMETER FILTER SOCK)

JOHNSON LANE

PROPERTY LINE (TYP.)

PROP. LIMIT OF DISTURBANCE

PROP. CONSTRUCTION ENTRANCE (MINIMUM 50' LONG) 2 EC-2

PROP. CONSTRUCTION ENTRANCE (MINIMUM 50' LONG) 2 EC-2

PROP. 2.0' BOTTOM GRASS LINED DIVERSION SWALE W/ STONE BERMED LEVEL SPREADER 3,5 DN-2

3 EC-2 PROP. STOCK PILE AREA WITH SINGLE ROW FILTER SOCK (TYP.) (IF REQUIRED)

PHASE 1 CLEARING LEGEND	
CLEARING AND GRUBBING	
TREE CLEARING ONLY	

N

1 EC-3 **PHASE 1 - SEDIMENTATION & EROSION CONTROL PLAN**
SCALE : 1" = 50'-0"

50 0 25 50 100
(IN FEET) 1 inch = 50 ft.

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OWNER: NEWTON FAMILY TRUST

ADDRESS: 1279 ARBUTUS ST DURHAM, CT 06422

HADDAM QUARTER ROAD SOLAR

SITE ADDRESS: JOHNSON LANE DURHAM, CT

APT FILING NUMBER: CT671100

DRAWN BY: CSH

DATE: 04/20/23 CHECKED BY: RCB

SHEET TITLE:
PHASE 1 SEDIMENTATION & EROSION CONTROL PLAN

SHEET NUMBER:
EC-3

STATE OF CONNECTICUT · ROBERT C. BURNS · 20071 · LICENSED PROFESSIONAL ENGINEER

PHASE 2 LEGEND

LIMITS OF WORK (NO CLEARING IS REQUIRED)

N

1 EC-4 **PHASE 2 - SEDIMENTATION & EROSION CONTROL PLAN**

SCALE : 1" = 50'-0"

50 0 25 50 100

(IN FEET) 1 inch = 50 ft.

Louth Callan Renewables

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HADDAM QUARTER ROAD SOLAR

SITE ADDRESS: JOHNSON LANE DURHAM, CT

APT FILING NUMBER: CT671100

DRAWN BY: CSH

DATE: 04/20/23 CHECKED BY: RCB

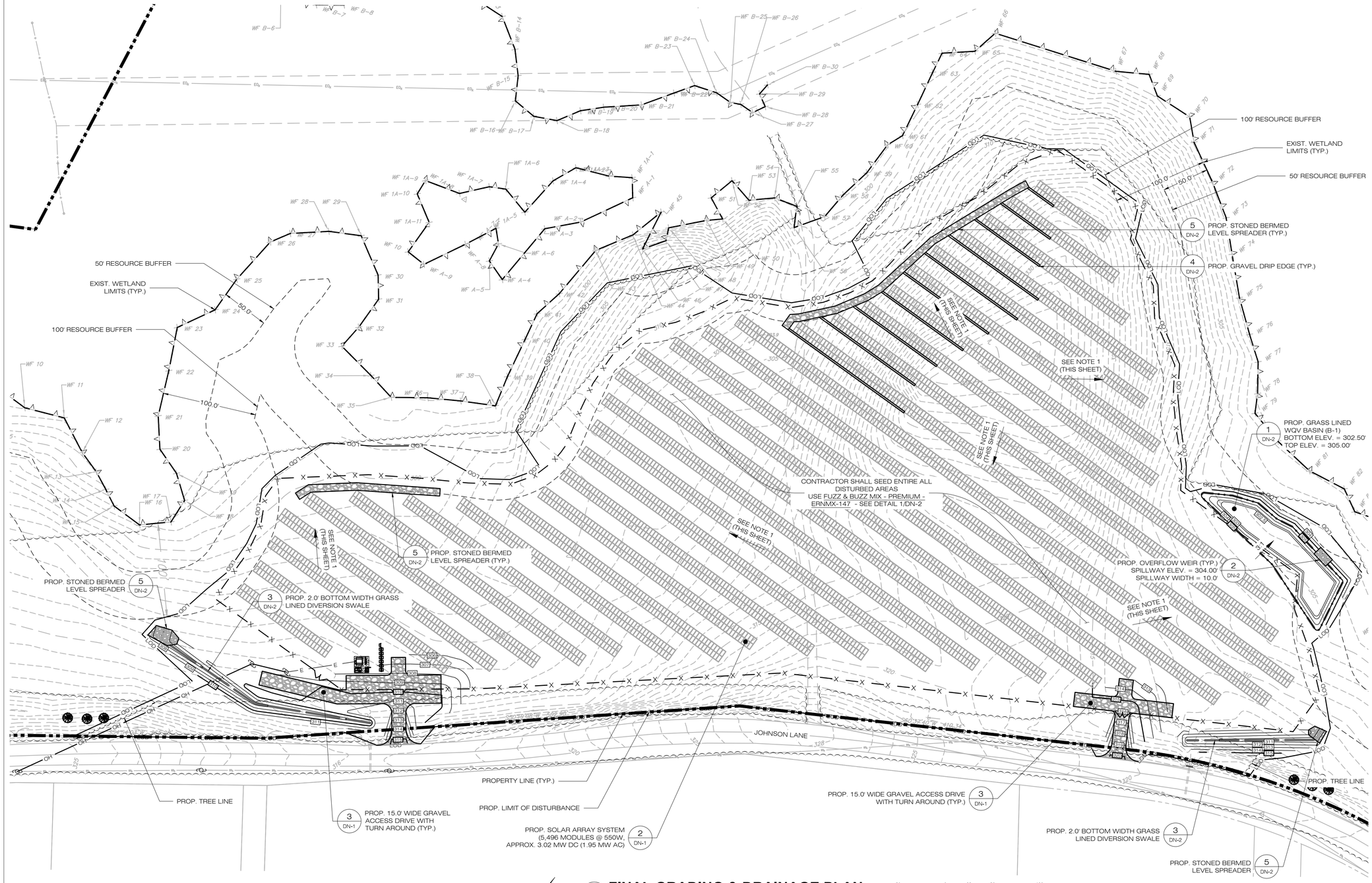
SHEET TITLE:

PHASE 2 SEDIMENTATION & EROSION CONTROL PLAN

SHEET NUMBER:

EC-4

STATE OF CONNECTICUT · ROBERT CHARLES BURNS · 20071 · LICENSED PROFESSIONAL ENGINEER



NOTES:
1. GRADE/SHAPE AREA TO MAINTAIN EXIST. DRAINAGE PATTERNS.

1 GD-1 **FINAL GRADING & DRAINAGE PLAN**
SCALE : 1" = 50'-0"

50 0 25 50 100
(IN FEET) 1 inch = 50 ft.

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HADDAM QUARTER ROAD SOLAR

SITE ADDRESS: JOHNSON LANE DURHAM, CT

APT FILING NUMBER: CT671100

DRAWN BY: CSH
DATE: 04/20/23 CHECKED BY: RCB

SHEET TITLE:
GRADING & DRAINAGE PLAN

SHEET NUMBER:
GD-1

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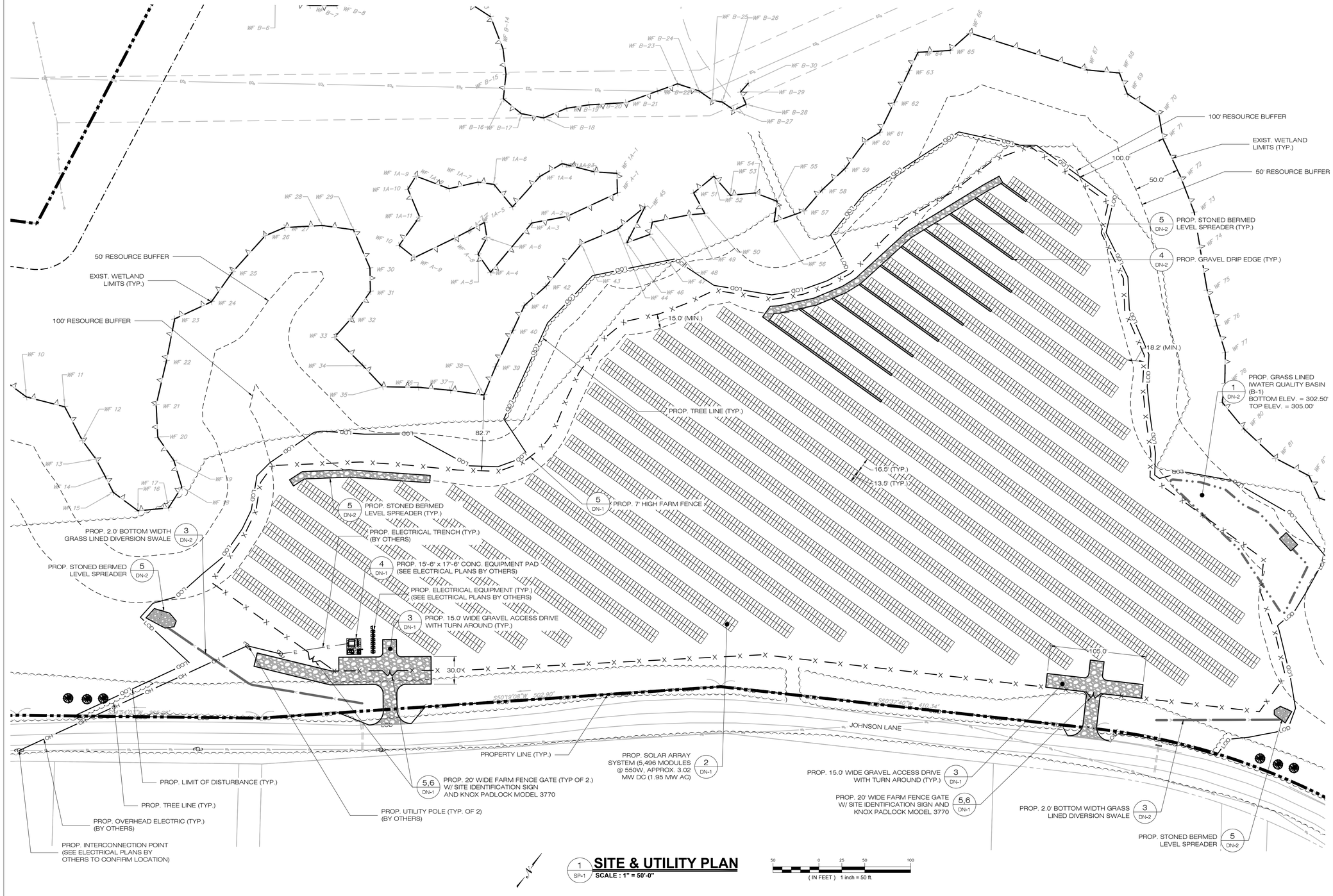

1 SP-1 **SITE & UTILITY PLAN**
SCALE : 1" = 50'-0"

50 0 25 50 100
(IN FEET) 1 inch = 50 ft.

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ADDRESS: 1279 ARBUTUS ST DURHAM, CT 06422

HADDAM QUARTER ROAD SOLAR

SITE ADDRESS: JOHNSON LANE DURHAM, CT

APT FILING NUMBER: CT671100

DRAWN BY: CSH

DATE: 04/20/23 CHECKED BY: RCB

SHEET TITLE:

SITE & UTILITY PLAN

SHEET NUMBER:

SP-1

STATE OF CONNECTICUT ROBERT CHARLES BURNS 20071 LICENSED PROFESSIONAL ENGINEER

TREE REMOVAL CHART

SIZE	TYPE	SIZE	TYPE
10"	MAPLE	12"	MAPLE
12"	DOUBLE ELM	8"	MAPLE
8"	MAPLE	12"	MAPLE
6"	MAPLE	20"	MAPLE
12"	OAK	15"	DEAD CHERRY
12"	SILVER BIRCH	20"	ELM
6"	OAK	10"	MAPLE
6"	MAPLE	10"	ELM
20"	ELM	10"	MAPLE
20"	ELM	6"	MAPLE
20"	SILVER MAPLE	8"	MAPLE
20"	MAPLE	18"	DEAD MAPLE
20"	MAPLE	15"	DEAD MAPLE
10"	MAPLE	10"	MAPLE
12"	HICKORY	15"	DOUBLE MAPLE
6"	MAPLE	24"	MAPLE
15"	MAPLE	10"	BIRCH
12"	MAPLE	12"	MAPLE
8"	ELM	8"	MAPLE
30"	OAK	8"	MAPLE
20"	MAPLE	8"	ELM
8"	MAPLE	18"	ASH
6"	MAPLE	6"	TRIPLE CRAB APPLE
8"	TRIPLE CEDAR	6"	MAPLE
6"	CRAB APPLE	6"	MAPLE
6"	MAPLE	6"	MAPLE
6"	MAPLE	10"	MAPLE
18"	ELM	8"	MAPLE
18"	ELM	6"	MAPLE
18"	ELM	6"	MAPLE
15"	CHERRY	6"	MAPLE
18"	ELM	8"	MAPLE
18"	ELM	8"	MAPLE
6"	MAPLE	12"	MAPLE
12"	CRAB APPLE	15"	MAPLE
24"	DEAD ELM	15"	MAPLE
20"	DEAD ELM	8"	MAPLE
20"	DEAD MAPLE	10"	MAPLE
15"	MAPLE	8"	HICKORY
12"	MAPLE	8"	DOUBLE ASH
6"	MAPLE	10"	ELM
		10"	ASH

PLANTING SCHEDULE

QUANTITY	SYMBOL	BOTANICAL NAME	COMMON NAME	MATURE HEIGHT	MATURE WIDTH	SPACING
4		*BETULA NIGRA*	DWARF RIVER BIRCH	8'-10'	8'-10'	15'-30' ON CENTER
15		*AMELANCHIER SPICATA*	DWARF SERVICEBERRY	3'-5'	3'-5'	10'-15' ON CENTER
15		*ARONIA MELANOCARPA*	BLACK CHOKEBERRY	4'-8'	3'-5'	3'-10' ON CENTER
23		*JUNIPERUS COMMUNIS*	COMMON JUNIPER	3'-4'	8'-13'	5'-7' ON CENTER
6		*RHUS TYPHINA*	STAGHORN SUMAC	15'-20'	15'-20'	8'-12' ON CENTER
6		*VIBURNUM LENTAGO*	NANNYBERRY	8'-10'	8'-10'	10'-15' ON CENTER
17		*THUJA OCCIDENTALIS*	DWARF EMERALD GREEN ARBORVITAE	12'-20'	3'-10'	3'-4' ON CENTER

1 LP-2 PROP. TREE CLEARING ONLY AREA LANDSCAPING (TYP.)

EXIST. TREE TO BE REMOVED (TYP. 83PL.) (SEE TREE REMOVAL CHART)

1-4 LP-3 (3) PROP. DWARF EMERALD GREEN ARBORVITAE, (3) STAGHORN SUMAC & (3) NANNYBERRY, OR APPROVED EQUAL

(11) PROP. DWARF EMERALD GREEN ARBORVITAE, OR APPROVED EQUAL 2,4 LP-3

3,4 LP-3 (3) PROP. DWARF SERVICE BERRY & (3) BLACK CHOKEBERRY, OR APPROVED EQUAL

1-4 LP-3 (3) PROP. DWARF EMERALD GREEN ARBORVITAE, (3) STAGHORN SUMAC & (3) NANNYBERRY, OR APPROVED EQUAL

2 LP-3 (23) PROP. COMMON JUNIPER, OR APPROVED EQUAL (TYP.)

1 LP-3 (4) PROP. DWARF RIVER BIRCH, OR APPROVED EQUAL

1 LP-1 **LANDSCAPE PLAN**
SCALE : 1" = 50'-0"

50 0 25 50 100
(IN FEET) 1 inch = 50 ft.

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ALL-POINTS TECHNOLOGY CORPORATION
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WATERFORD, CT 06385 PHONE: (860)-663-1697
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DESIGN PROFESSIONAL OF RECORD

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COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
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OWNER: NEWTON FAMILY TRUST

ADDRESS: 1279 ARBUTUS ST DURHAM, CT 06422

HADDAM QUARTER ROAD SOLAR

SITE ADDRESS: JOHNSON LANE DURHAM, CT

APT FILING NUMBER: CT671100

DRAWN BY: CSH

DATE: 04/20/23 CHECKED BY: RCB

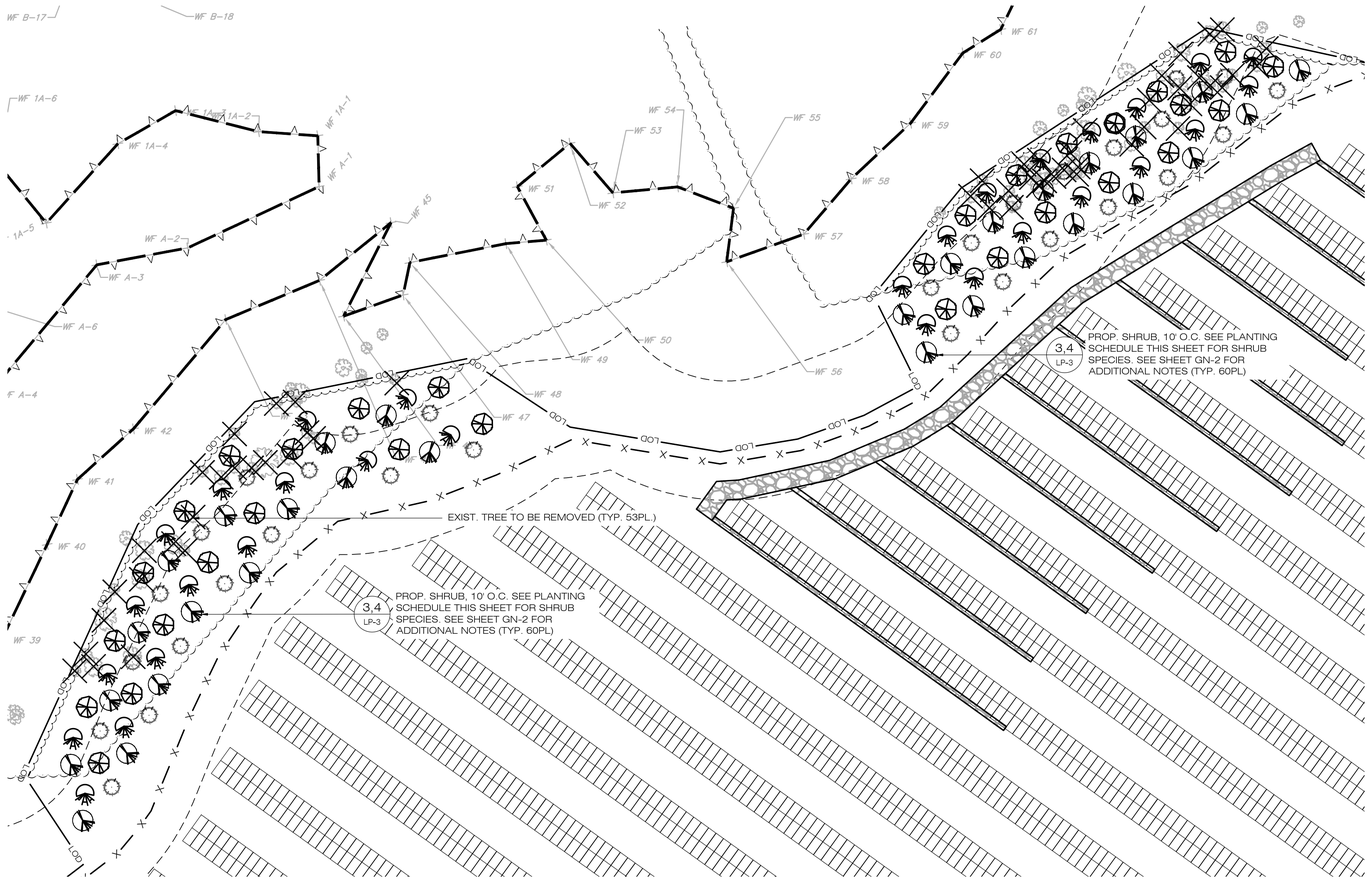
SHEET TITLE:

LANDSCAPE & TREE REMOVAL PLAN

SHEET NUMBER:

LP-1

STATE OF CONNECTICUT ROBERT CHARLES BURNS 20071 LICENSED PROFESSIONAL ENGINEER



1 LP-2 **TREE CLEARING ONLY AREA LANDSCAPE PLAN**

SCALE : 1" = 30'-0"

30 0 15 30 60

(IN FEET) 1 inch = 30 ft.

TREE CLEARING ONLY
ENHANCEMENT AREA PLANTING SCHEDULE

SHRUBS

QUANTITY	SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
30		*CORNUS RACEMOSA*	GRAY DOGWOOD	3'-4'	10' ON CENTER
30		*PHOTINIA MELANOCARPA*	BLACK CHOKEBERRY	3'-4'	10' ON CENTER
30		*MORELLA PENSYLVANICA*	BAYBERRY	3'-4'	10' ON CENTER
30		*RHUS TYPHINA*	STAGHORN SUMAC	3'-4'	10' ON CENTER

NOTES:

1) TREE CLEARING ONLY ENHANCEMENT AREA TO BE UNDERSOWN WITH NEW ENGLAND WETLAND PLANTS CONSERVATION WILDLIFE MIX, OR APPROVED EQUIVALENT. THIS SEED MIX PROVIDES A PERMANENT COVER OF NATIVE GRASSES, FORBS AND WILDFLOWERS TO PROVIDE BOTH GOOD EROSION CONTROL AND WILDLIFE HABITAT VALUE. SEE 5/LP-2 FOR SEED MIXTURE.

2) PLANTINGS TO BE PLACED IN TREE CLEARING ONLY (DOTTED AREA) AS DEPICTED ON SHEET EC-3 OF THE PROJECT SITE PLANS.

3) ACTUAL SHRUB SPACING TO BE PROVIDED IN THE FIELD BY THE SUPERVISING ENVIRONMENTAL MONITOR TO SIMULATE NATURAL GROWTH PATTERNS.

4) SHRUB QUANTITIES ACCOUNT FOR ANTICIPATED REGENERATION OF NATIVE SHRUBS ONCE OVERSTORY CANOPY IS REMOVED.

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DESIGN PROFESSIONAL OF RECORD

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HADDAM QUARTER ROAD SOLAR

SITE ADDRESS: JOHNSON LANE DURHAM, CT

APT FILING NUMBER: CT671100

DRAWN BY: CSH

DATE: 04/20/23 CHECKED BY: RCB

SHEET TITLE:

PARTIAL LANDSCAPE PLAN & DETAILS

SHEET NUMBER:

LP-2

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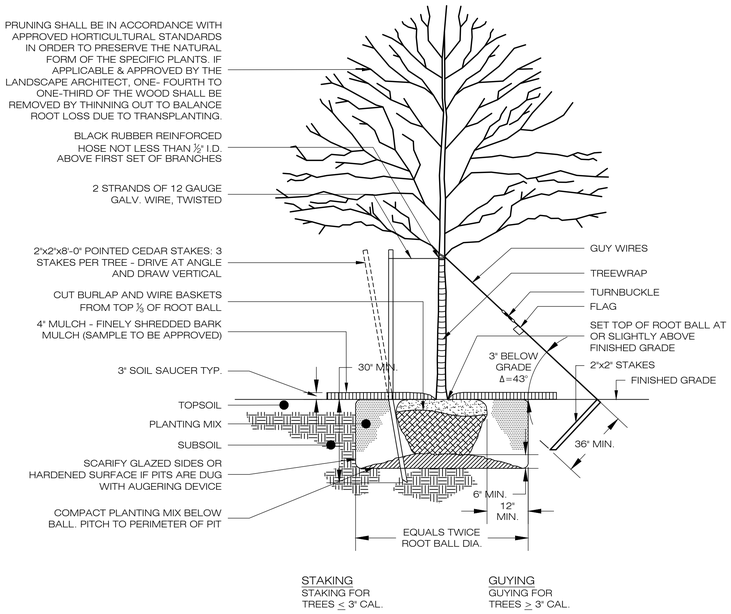
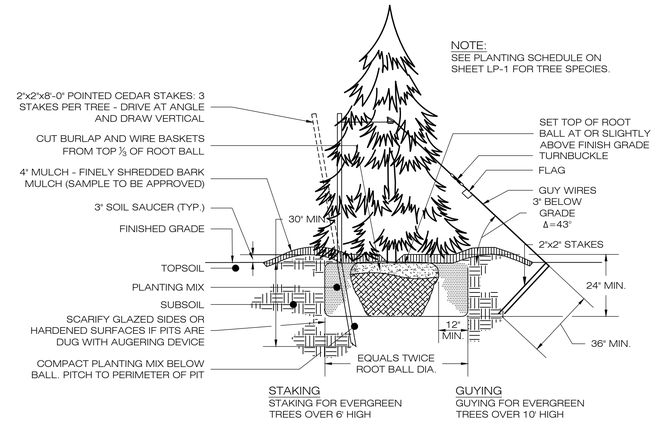
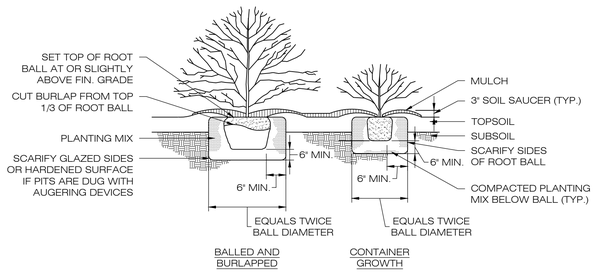


1 LP-3 **DECIDUOUS TREE PLANTING**
SCALE : N.T.S.

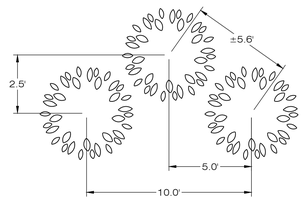


2 LP-3 **EVERGREEN PLANTING DETAIL**
SCALE : N.T.S.



NOTES:
IN AREAS OF MASS PLANTINGS, CONTINUOUSLY EXCAVATE AND MULCH ENTIRE BED..

3 LP-3 **TYPICAL PLANTING DETAIL**
SCALE : N.T.S.



4 LP-3 **PLANTING SPACING**
SCALE : N.T.S.

NEW ENGLAND WETLAND PLANTS, INC
820 WEST STREET, AMHERST, MA 01002
PHONE: 413-548-8000 FAX 413-549-4000
EMAIL: INFO@NEWP.COM WEB ADDRESS: WWW.NEWP.COM

New England Conservation/Wildlife Mix

Botanical Name	Common Name	Indicator
Elymus virginicus	Virginia Wild Rye	FACW-
Schizachyrium scoparium	Little Bluestem	FACU
Andropogon gerardii	Big Bluestem	FAC
Festuca rubra	Red Fescue	FACU
Sorghastrum nutans	Indian Grass	UPL
Panicum virgatum	Switch Grass	FAC
Chamaecrista fasciculata	Partridge Pea	FACU
Desmodium canadense	Showy Tick Trefoil	FAC
Asclepias tuberosa	Butterfly Milkweed	NI
Bidens frondosa	Beggar Ticks	FACW
Eupatorium purpureum (Eutrochium maculatum)	Purple Joe Pye Weed	FAC
Rudbeckia hirta	Black Eyed Susan	FACU-
Aster pilosus (Symphyotrichum pilosum)	Heath (or Hairy) Aster	UPL
Solidago juncea	Early Goldenrod	

PRICE PER LB. $39.50 MIN. QUANITY 2 LBS. **TOTAL:** $79.00 APPLY: 25 LBS/ACRE :1750 sq ft/lb

The New England Conservation/Wildlife Mix provides a permanent cover of grasses, wildflowers, and legumes
For both good erosion control and wildlife habitat value. The mix is designed to be a no maintenance seeding, and is appropriate for cut and fill slopes, detention basin side slopes, and disturbed areas adjacent to commercial and residential projects.

New England Wetland Plants, Inc. may modify seed mixes at any time depending upon seed availability. The design criteria and ecological function of the mix will remain unchanged. Price is $/bulk pound, FOB warehouse, Plus SH and applicable taxes.

TREE CLEARING ONLY
ENHANCEMENT AREA SEED MIX

5 LP-3
SCALE : N.T.S.

Louth Callan Renewables

ALL-POINTS TECHNOLOGY CORPORATION
567 VAUXHALL STREET EXTENSION - SUITE 311
WATERFORD, CT 06385 PHONE: (860)-663-1697
WWW.ALLPOINTSTECH.COM FAX: (860)-663-0935

CSC PERMIT SET

NO	DATE	REVISION
0	04/20/23	FOR PERMIT: RCB
1	04/24/23	FOR PERMIT: RCB
2	05/26/23	D&M: RCB
3	06/02/23	D&M: RCB
4	06/06/23	CLIENT REVISIONS: RCB
5		
6		

DESIGN PROFESSIONAL OF RECORD

PROF: ROBERT C. BURNS, P.E.
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 567 VAUXHALL STREET EXTENSION - SUITE 311 WATERFORD, CT 06385

OWNER: NEWTON FAMILY TRUST

ADDRESS: 1279 ARBUTUS ST DURHAM, CT 06422

HADDAM QUARTER ROAD SOLAR

SITE ADDRESS: JOHNSON LANE DURHAM, CT

APT FILING NUMBER: CT671100

DRAWN BY: CSH
DATE: 04/20/23 **CHECKED BY:** RCB

SHEET TITLE:
LANDSCAPE DETAILS

SHEET NUMBER:
LP-3

STATE OF CONNECTICUT · ROBERT CHARLES BURNS · 20071 · LICENSED PROFESSIONAL ENGINEER

Ernst Conservation Seeds
8884 Mercer Pike
Meadville, PA 16335
(800) 873-3221 Fax (814) 336-5191
www.ernstseed.com

Date: April 14, 2021

Fuzz & Buzz Mix - Premium - ERNMX-147

	Botanical Name	Common Name	Price/lb
24.20 %	*Lolium perenne, 'Crave', Tetraploid*	Perennial Ryegrass, 'Crave', Tetraploid	3.48
17.70 %	*Dactylis glomerata, 'Pennlate'*	Orchardgrass, 'Pennlate'	3.00
17.70 %	*Festuca elatior*	Meadow Fescue	4.80
17.70 %	*Poa pratensis, 'Ginger'*	Kentucky Bluegrass, 'Ginger' (pasture type)	3.36
5.40 %	*Trifolium hybridum*	Alsike Clover	3.90
4.90 %	*Trifolium incarnatum, Variety Not Stated*	Crimson Clover, Variety Not Stated	1.92
4.50 %	*Trifolium pratense, Medium, Variety Not Stated*	Red Clover, Medium, Variety Not Stated	3.00
2.00 %	*Lotus corniculatus, 'Leo'*	Bird's Foot Trefoil, 'Leo'	7.50
1.30 %	*Chrysanthemum leucanthemum*	Oxeye Daisy	33.60
1.30 %	*Cichorium intybus*	Blue Chicory	19.20
0.80 %	*Chamaecrista fasciculata, PA Ecotype*	Partridge Pea, PA Ecotype	7.20
0.40 %	*Aster oblongifolius, PA Ecotype*	Aromatic Aster, PA Ecotype	336.00
0.40 %	*Aster prenanthoides, PA Ecotype*	Zigzag Aster, PA Ecotype	432.00
0.40 %	*Coreopsis lanceolata*	Lanceleaf Coreopsis	28.80
0.40 %	*Tradescantia ohiensis, PA Ecotype*	Ohio Spiderwort, PA Ecotype	192.00
0.40 %	*Zizia aurea*	Golden Alexanders	288.00
0.30 %	*Solidago nemoralis, PA Ecotype*	Gray Goldenrod, PA Ecotype	336.00
0.10 %	*Asclepias syriaca*	Common Milkweed	163.20
0.10 %	*Penstemon hirsutus*	Hairy Beardtongue	480.00
100.00 %		**Mix Price/lb Bulk:**	**$10.91**

Seeding Rate: Expect to apply about 42 lbs per acre with a cover crop of annual ryegrass at 12 lbs/acre.

Forage & Pasture Sites; Solar Sites

NEW ENGLAND WETLAND PLANTS, INC
820 WEST STREET, AMHERST, MA 01002
PHONE: 413-548-8000 FAX 413-549-4000
EMAIL: INFO@NEWP.COM WEB ADDRESS: WWW.NEWP.COM

New England Erosion Control/Restoration Mix For Detention Basins and Moist Sites

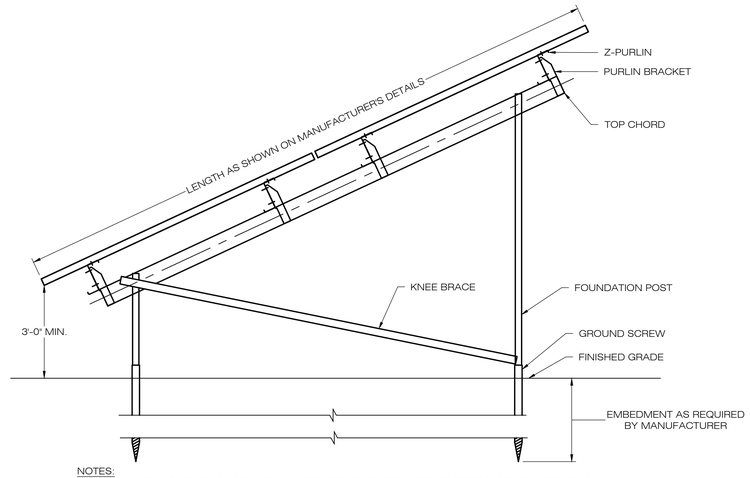
Botanical Name	Common Name	Indicator
Elymus riparius	Riverbank Wild Rye	FACW
Schizachyrium scoparium	Little Bluestem	FACU
Festuca rubra	Red Fescue	FACU
Andropogon gerardii	Big Bluestem	FAC
Panicum virgatum	Switch Grass	FAC
Vernonia noveboracensis	New York Ironweed	FACW+
Agrostis perennans	Upland Bentgrass	FACU
Bidens frondosa	Beggar Ticks	FACW
Eupatorium maculatum (Eutrochium maculatum)	Spotted Joe Pye Weed	OBL
Eupatorium perfoliatum	Boneset	FACW
Aster novae-angliae (Symphyotrichum novae-anglia	New England Aster	FACW-
Scirpus cyperinus	Wool Grass	FACW
Juncus effusus	Soft Rush	FACW+

PRICE PER LB. $37.00 MIN. QUANITY 3 LBS. **TOTAL:** $111.00 APPLY: 35 LBS/ACRE :1250 sq ft/lb

The New England Erosion Control/Restoration Mix for Detention Basins and Moist Sites contains a selection of native grasses and wildflowers designed to colonize generally moist, recently disturbed sites where quick growth of vegetation is desired to stabilize the soil surface. It is an appropriate seed mix for ecologically sensitive restorations that require stabilization as well as long-term establishment of native vegetation. This mix is particularly appropriate for detention basins that do not hold standing water. Many of the plants in this mix can tolerate infrequent inundation, but not constant flooding. The mix may be applied by hand, by mechanical spreader, or by hydro-seeder. After sowing, lightly rake, roll or cultipack to insure good seed-to-soil contact. Best results are obtained with a Spring or late Summer seeding. Late Fall and Winter dormant seeding requires an increase in the application rate. A light mulching of clean, weed-free straw is recommended

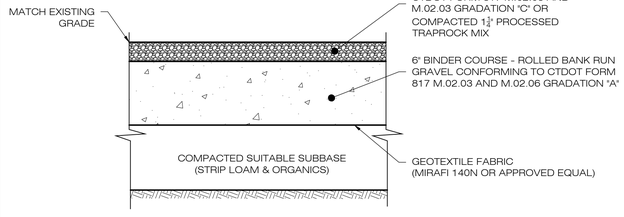
New England Wetland Plants, Inc. may modify seed mixes at any time depending upon seed availability. The design criteria and ecological function of the mix will remain unchanged. Price is $/bulk pound, FOB warehouse, Plus SH and applicable taxes.

1 / DN-1 **SEED MIXES**
SCALE : N.T.S.



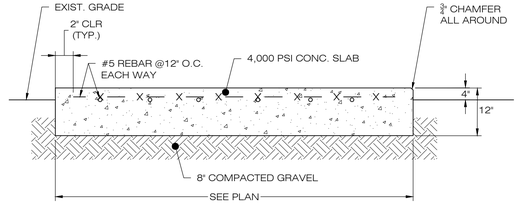
NOTES:
SEE MANUFACTURER'S DETAIL SHEETS FOR ADDITIONAL INFORMATION REGARDING RACKING SYSTEM REQUIREMENTS AND INSTALLATION PROCEDURES. RACKING SYSTEM TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

2 / DN-1 **TYPICAL POST MOUNTED RACKING SYSTEM**
SCALE : N.T.S.

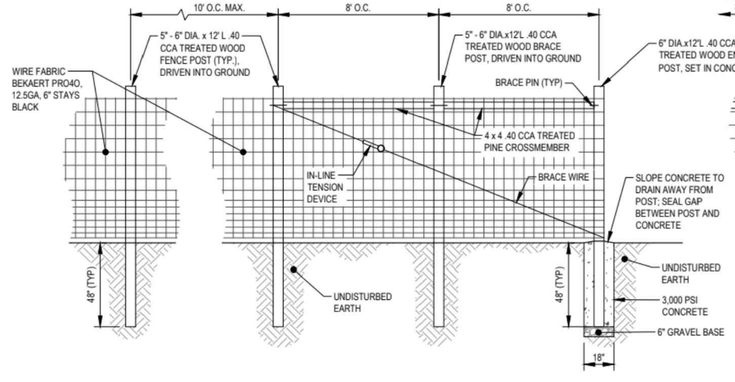


NOTES:
1. SUBBASE MAY CONSIST OF NATIVE MATERIALS IF FOUND ACCEPTABLE BY THE ENGINEER. SUBBASE TO BE COMPACTED TO 95% MAX DRY DENSITY.
2. SUBBASE IS TO BE FREE FROM DEBRIS AND UNSUITABLE MATERIALS.

3 / DN-1 **GRAVEL ACCESS DRIVE SECTION**
SCALE : N.T.S.



4 / DN-1 **CONCRETE EQUIPMENT PAD**
SCALE : N.T.S.



5 / DN-1 **FARM FENCE & GATE DETAIL**
SCALE : N.T.S.

HADDAM QUARTER ROAD SOLAR

IN CASE OF EMERGENCY CALL T.B.D.

NOTES:
EMERGENCY CALL NUMBER TO BE PROVIDED ONCE DETERMINED.

6 / DN-1 **NOTIFICATION SIGN DETAIL**
SCALE : N.T.S.

Louth Callan Renewables

ALL-POINTS TECHNOLOGY CORPORATION
567 VAUXHALL STREET EXTENSION - SUITE 311
WATERFORD, CT 06385 PHONE: (860)-663-1697
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DESIGN PROFESSIONAL OF RECORD
PROF: ROBERT C. BURNS, P.E.
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ADD: 567 VAUXHALL STREET EXTENSION - SUITE 311 WATERFORD, CT 06385

OWNER: NEWTON FAMILY TRUST

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HADDAM QUARTER ROAD SOLAR

SITE ADDRESS: JOHNSON LANE DURHAM, CT

APT FILING NUMBER: CT671100

DRAWN BY: CSH
DATE: 04/20/23 **CHECKED BY:** RCB

SHEET TITLE:
SITE DETAILS

SHEET NUMBER:
DN-1

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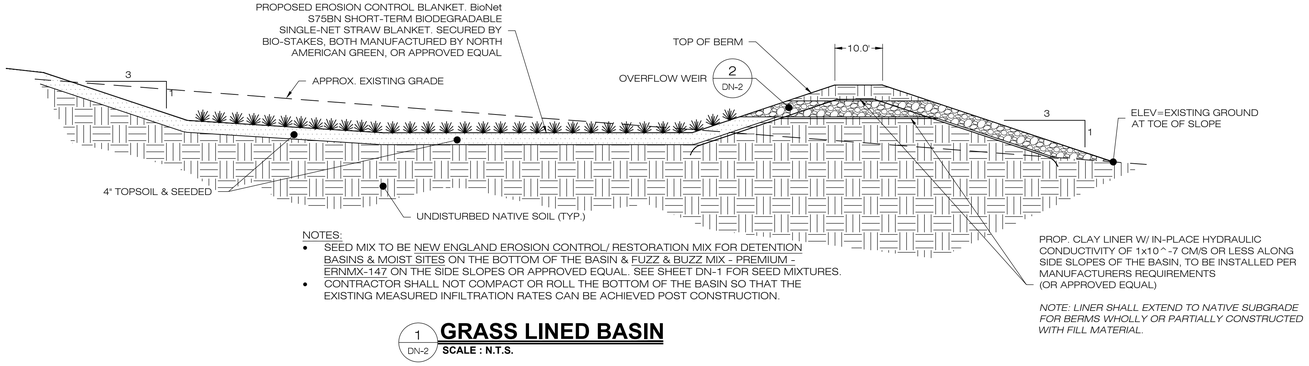
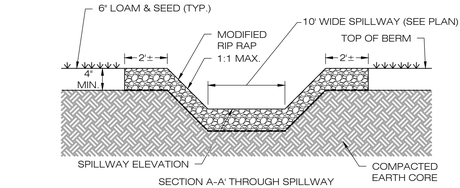
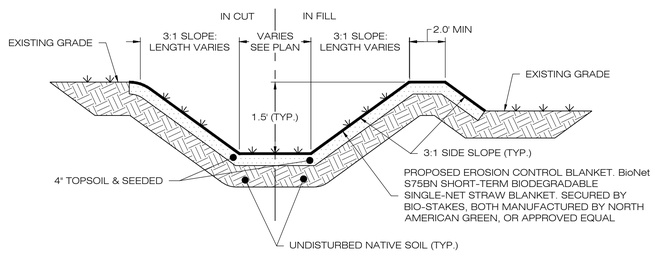


1 DN-2 **GRASS LINED BASIN**
SCALE : N.T.S.

NOTE: LINER SHALL EXTEND TO NATIVE SUBGRADE FOR BERMS WHOLLY OR PARTIALLY CONSTRUCTED WITH FILL MATERIAL.

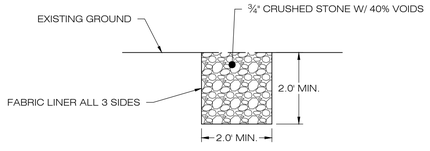


2 DN-2 **OVERFLOW WEIR DETAIL**
SCALE : N.T.S.

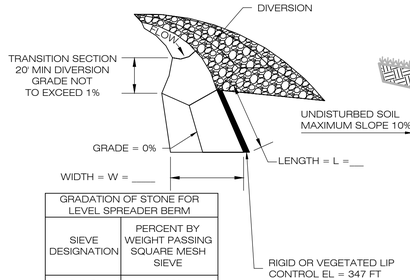


NOTES:
1. IF DEPTH VARIES FROM 1.5', SEE PLAN CALLOUTS.

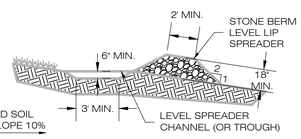
3 DN-2 **GRASS LINED SWALE**
SCALE : N.T.S.



4 DN-2 **GRAVEL DRIP EDGE PROTECTION DETAIL**
SCALE : N.T.S.



GRADATION OF STONE FOR LEVEL SPREADER BERM	
SIEVE DESIGNATION	PERCENT BY WEIGHT PASSING SQUARE MESH SIEVE
12-INCH	100%
6-INCH	84% - 100%
3-INCH	68% - 83%
1-INCH	42% - 55%
NO. 4	8% - 12%



DESIGN CRITERIA	
DESIGN PARAMETER	CRITERIA
SLOPE OF RECEIVING AREA	< 15% (ALONG FLOW PATH)
LEVEL SPREADER GRADE	BOTTOM OF SPREADER CHANNEL, AND BASE AND TOP OF BERM SHOULD BE 0% GRADE
SPREADER CHANNEL CROSS SECTION	6-INCH DEEP TRAPEZOIDAL TROUGH
SPREADER CHANNEL BOTTOM WIDTH	≥ 3 FEET
SIDE SLOPES	2:1 OR FLATTER (LEVEL SPREADER CHANNEL AND BERM)
BERM TOP WIDTH	≥ 2 FEET
BERM HEIGHT	≥ 18 INCHES
LENGTH	≥ 5 FEET

5 DN-2 **STONE BERMED LEVEL SPREADER**
SCALE : N.T.S.

Louth Callan Renewables

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HADDAM QUARTER ROAD SOLAR

SITE ADDRESS: JOHNSON LANE DURHAM, CT

APT FILING NUMBER: CT671100

DRAWN BY: CSH
DATE: 04/20/23
CHECKED BY: RCB

SHEET TITLE:
SITE DETAILS

SHEET NUMBER:
DN-2

STATE OF CONNECTICUT · ROBERT C. BURNS · 20071 · LICENSED PROFESSIONAL ENGINEER

ATTACHMENT 2

STRUCTURAL PRINT PACKAGE - 220028

DURHAM, CT 06422

RACKING PROVIDER

APA SOLAR RACKING

20-345 COUNTY ROAD X
RIDGEVILLE CORNERS, OHIO 43555
(P) 419.267.5280
(F) 419.267.5214
WWW.APASOLAR.COM

STRUC. ENGINEER OF RECORD

the jdi group
architects & engineers

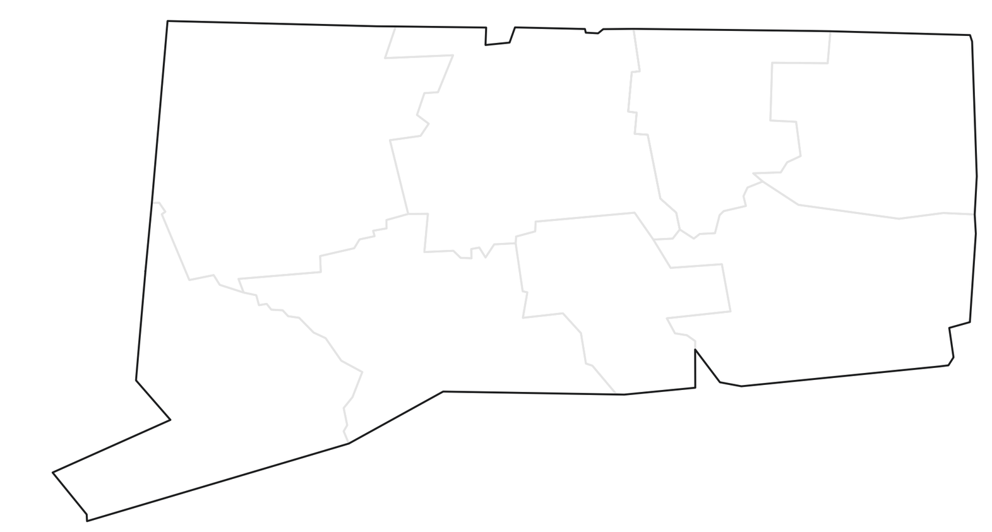
360 W. DUSSEL DR.
MAUMEE, OH 43537
|P| 419.725.7161
|F| 419.725.7160

RACKING PRODUCT LINE

TITAN DUO

USE WITH THE FOLLOWING PRINTS & PACKAGES. INCLUDE WITH SUBMISSION TO PERMIT/INSPECTION AGENCY:

- ☑ CALCULATION PACKAGE: 220028 CALC SET – STAMPED
- ☑ FOUNDATION DESIGN REPORT (SITE SPECIFIC, & ONLY WHERE REQUIRED BY EOR OR AHJ)



SITE ADDRESS: HADDAM QUARTER RD
DURHAM, CT 06422

REVISION: C

PERMIT SET/
STRUCTURAL PACKET

APPROVED

SHEET INDEX		
STRUCTURAL		
S-000	B	STRUCTURAL COVER
S-100	A	RACKING OVERVIEW
S-200	A	GROUND SCREW
S-300	A	STRUCTURAL COMPONENTS
S-400	A	CONNECTIONS
S-500	A	STRUCTURAL PURLINS
S-600	A	CLAMPS & BRACES
S-904	C	COMBINER BOX MOUNTING

SOLAR PHOTOVOLTAIC GROUND MOUNT

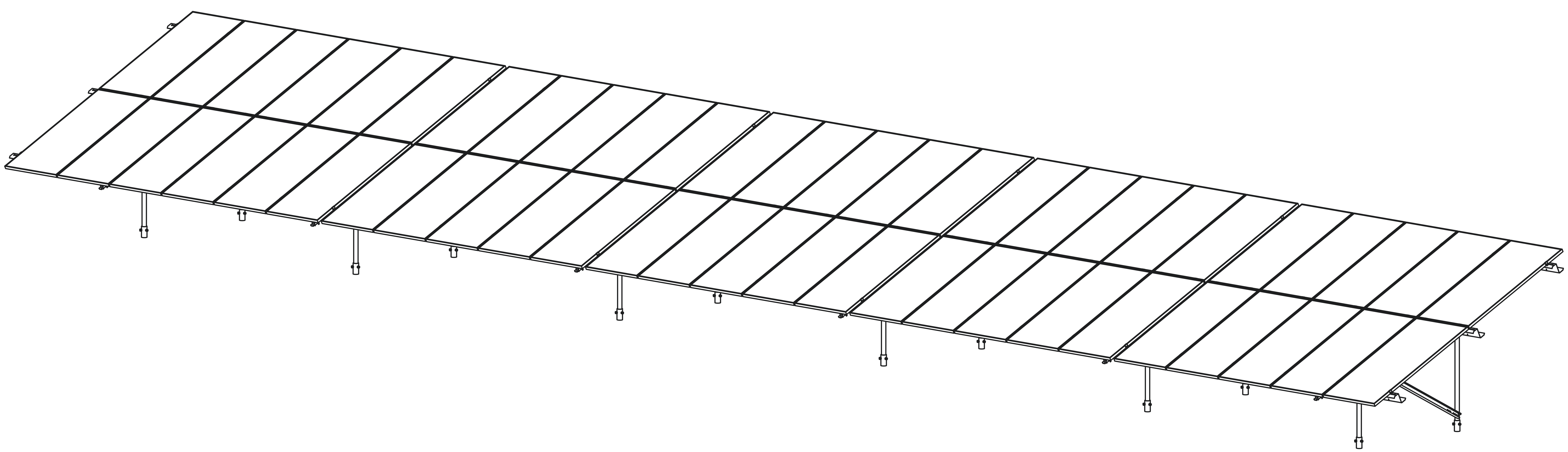


IMAGE FOR REFERENCE ONLY

GOVERNING STRUCTURAL CODE/S

2021 INTERNATIONAL BUILDING CODE

PACKAGE COVERAGE – LOADING AND SETUP RANGES & CONSTANTS

TILT ANGLES:	25°
MAX GROUND SNOW LOAD (PSF):	30
MAX WIND LOADS (MPH):	110
WIND EXPOSURE CATEGORY:	C
MAX SEISMIC Ss:	0.260 g
MAX SEISMIC S1:	0.070 g

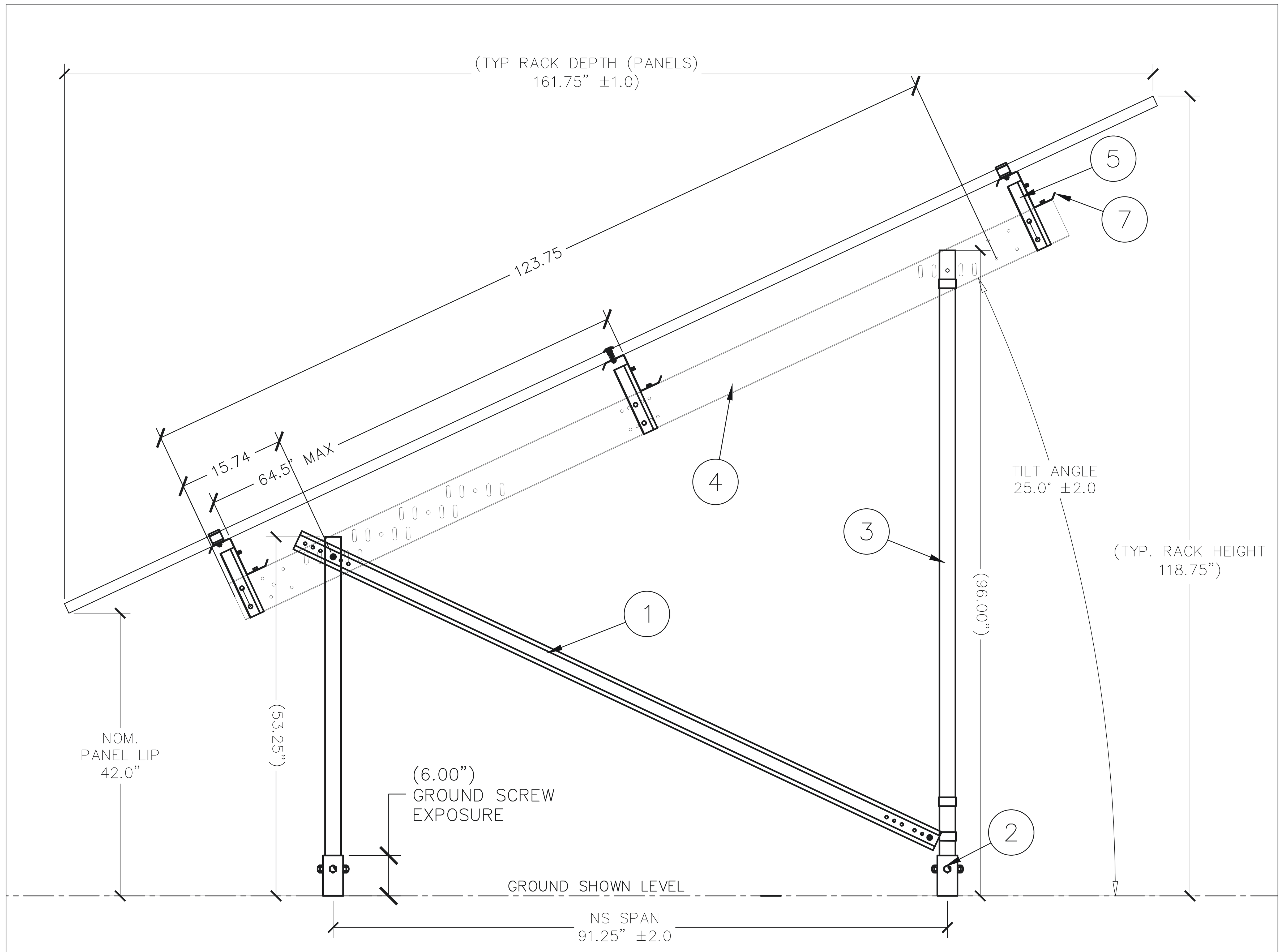
PV MODULE: VSUN/VSUN550-144BMH-DG OR SIMILIAR

MAX. PANEL WIDTH:	44.61"
MAX. PANEL LENGTH:	88.82"
MAX. PANEL HEIGHT:	2.00"
MAX. PANEL WEIGHT:	72.00 LBS
RISK CATEGORY:	I
MAX FRONT LIP CLEARANCE:	48"
MIN FRONT LIP CLEARANCE:	36"

*PER USGS MIN/MAX DESIGN VALUES FOR REGIONS, VALUES BASED ON MAX VALUES IN PROJECT STATE. SEISMIC DOES NOT CONTROL.

SCALE IS REDUCED WHEN SHEET SIZE IS 11" x 17"

4/21/2023 9:11:47 AM JUSTINK 10:50:58 t:\projects_active\220028_durham _ct_haddam quarter_louth callan\engineering\(3) design and structural analysis\apa.str - 220028 - durham, ct - reva - unstamped.dwg



NOTES: PV MODULE & MODULE RELATED DIMENSIONS THIS DETAIL ARE MAX ALLOWABLE, UNLESS SPECIFIED ELSEWHERE IN THIS PACKET.
DIMENSIONS TO GROUND ARE NOMINAL FROM LEVEL GROUND.

C1 PROFILE VIEW: RACK OVERVIEW

PARTS LIST (BALLOONS THIS SHEET)			
ITEM	DESCRIPTION	SHAPE	DETAIL / SHEET
1	KNEE BRACE	CEE	B2 / S.300
2	GROUND SCREW	POST	D2 / S.200
3	FOUNDATION POST	POST	A6 / S.300
4	NS CHORD	CEE	D1 / S.300
5	ROLL BAR	MIXED	A4 / S.300
6	TRANSVERSE BRACE	ZEE	D5 / S.600
7	ZEE PURLIN	HAT	E1 / S.300
8	CABLE BRACE	CABLE	D4/ S.600

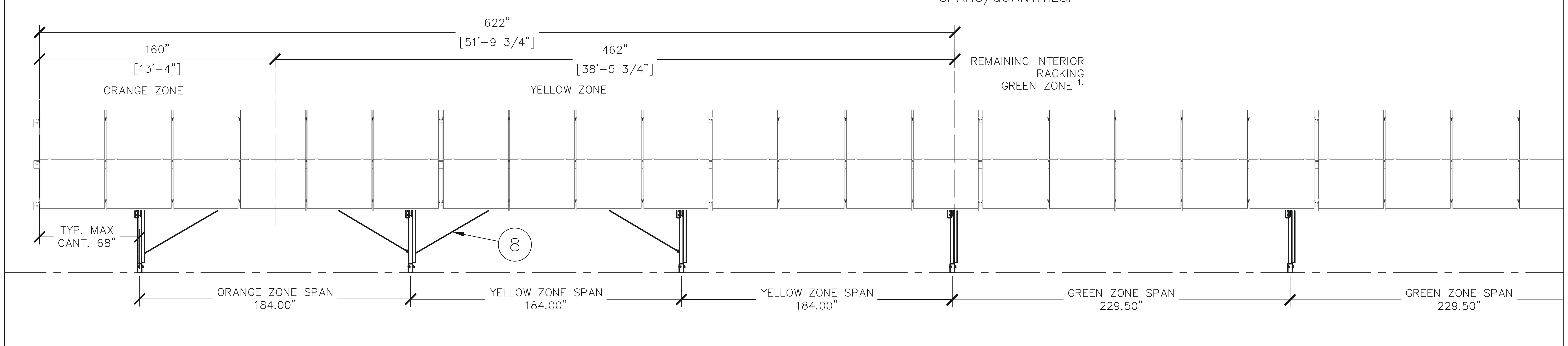
SEE VIEW A1 ON S600 FOR VIEW OF TRANSVERSE BRACE

NOTES:

1. STANDARD FRONT LIP HEIGHT AND TILT ANGLES MEASURED FROM LEVEL GROUND
2. FOUNDATION TESTING, WHERE REQUIRED, SHALL BE DONE ACCORDING TO THE "QUICK TEST METHOD" PER ASTM D1143 & D3689.
3. PRINT DIMENSIONS: DIMENSIONS SHOWN REFLECT POST HEIGHTS ON LEVEL GROUND. ON UNEVEN TERRAIN, REAR FOUNDATION POST HEIGHT WILL BE DICTATED BY FRONT LIP HEIGHT, PANEL TILT, AND NORTH/SOUTH POST SPACING.
4. ADDITIONAL TOLERANCES: POST PLUMBNESS SHOULD BE WITHIN ±2°
5. SPECIAL INSPECTIONS (WHERE REQUIRED):

SPECIAL INSPECTIONS ARE NOT REQUIRED BY APA SOLAR OR THE STRUCTURAL ENGINEER OF RECORD, THE JDI GROUP. WHERE REQUIRED BY OWNER, CUSTOMER, AND/OR AUTHORITY HAVING JURISDICTION, MINIMUM INSPECTION SHALL FOLLOW IBC OR LOCAL AHJ SPECIAL INSPECTIONS GUIDELINES.

*IMAGE REFERENCE ONLY.SHOWS STRUCTURAL MAXIMUMS. NOT INDICATIVE OF REQUIRED QUANTITIES.PLEASE REFER TO SITE SPECIFIC BUILD PLANS FOR SITE SPECIFIC REQUIRED SPANS/QUANTITIES.



NOTES: MAX CANTILEVER MEASURED FROM EDGE OF PANEL TO POST CENTER.
MAX SPAN MEASURED FROM PILE CENTER TO PILE CENTER.
POST QUANTITY AS REQUIRED TO SATISFY CANTILEVERS, SPANS, ROW LENGTH, & PANEL QUANTITY
[1] WHERE ALLOWABLE PER THE CALCULATIONS PACKAGE. EXTERIOR/CORNER AREAS SHALL REMAIN ZONED YELLOW. SEE EXPLAINATION IN CALC PACKAGE.
SITE SPECIFIC BUILD PLANS SHALL DESIGNATE EXTERIOR/CORNER SPANS.

A1 ELEVATION VIEW FROM FRONT (NORTH-FACING)

CUSTOMER

RACKING PROVIDER
APA SOLAR RACKING
20-345 COUNTY ROAD X
RIDGEVILLE CORNERS, OHIO 43555
(P) 419.267.5280
(F) 419.267.5214
WWW.APASOLAR.COM

RACKING TYPE
TITAN DUO

ENGINEER OF RECORD
the jdi group
architects & engineers
360 W. DUSSEL DR.
MAUMEE, OH 43537
|P| 419.725.7161 |F| 419.725.7160

PROFESSIONAL SEAL/STAMP
STATE OF CONNECTICUT
0036452
LICENSED
PROFESSIONAL ENGINEER
5/13/23

DOCUMENT NAME:
STRUCTURAL PRINT PACKAGE
SITE STREET ADDRESS:
HADDAM QUARTER RD
SITE CITY, STATE, ZIP:
DURHAM, CT 06422

SHEET REVISIONS		
REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	3/20/2023

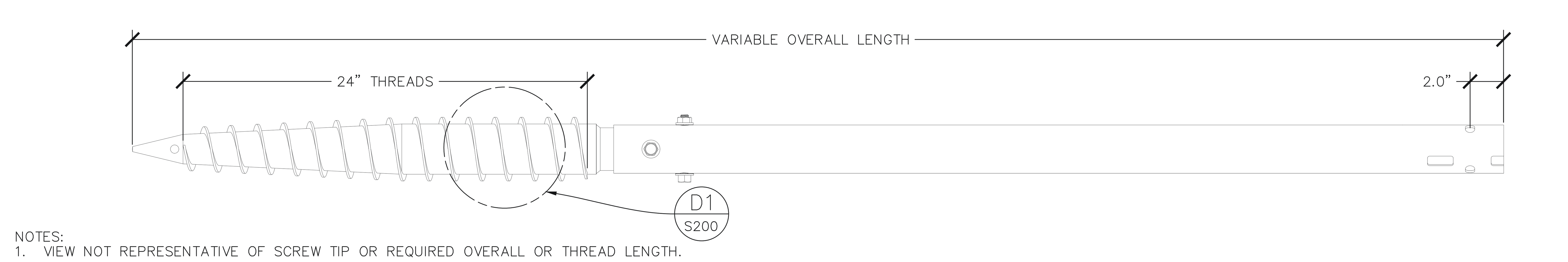
APPROVED

DRAWN	REVIEWED	APPROVED	SIZE
JK	TM	JDI	D

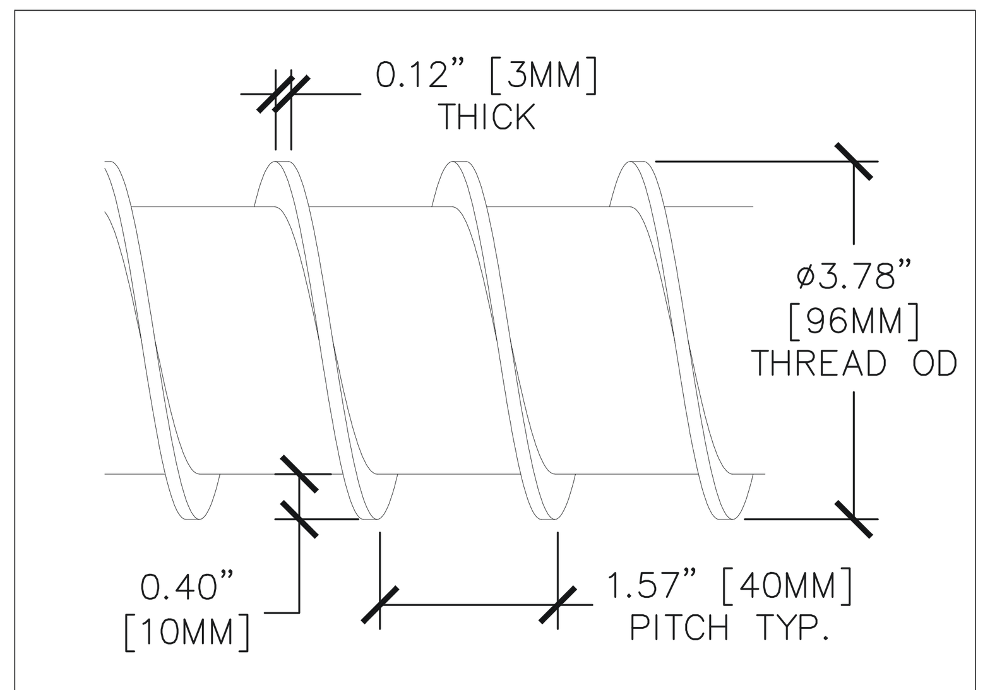
SHEET NAME
RACKING OVERVIEW

PROJECT NUMBER
220028

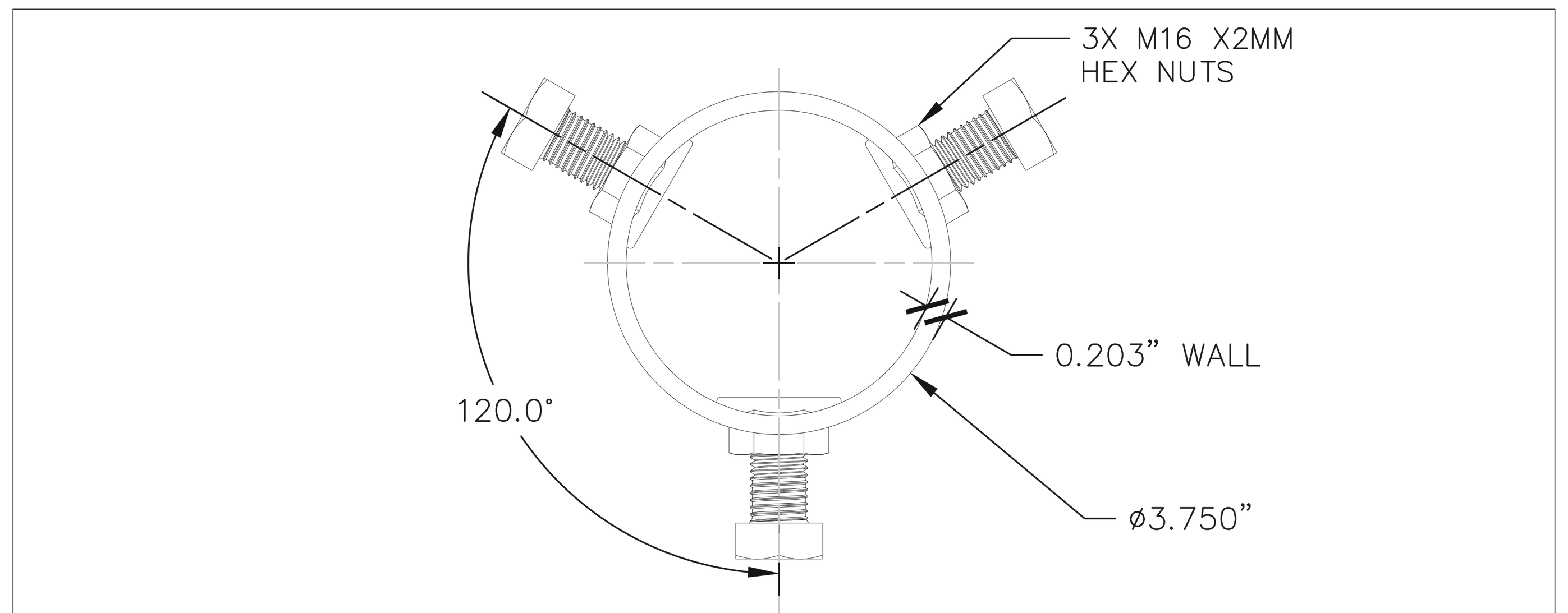
DRAWING NUMBER	REV.
S.100	A



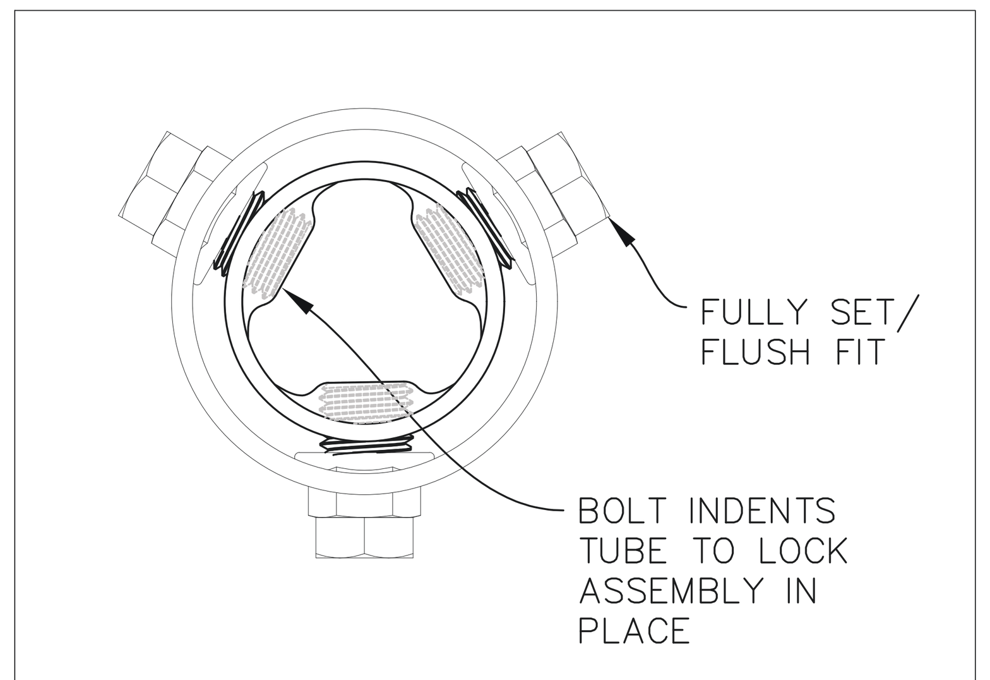
E1 PART: SCREW PILE



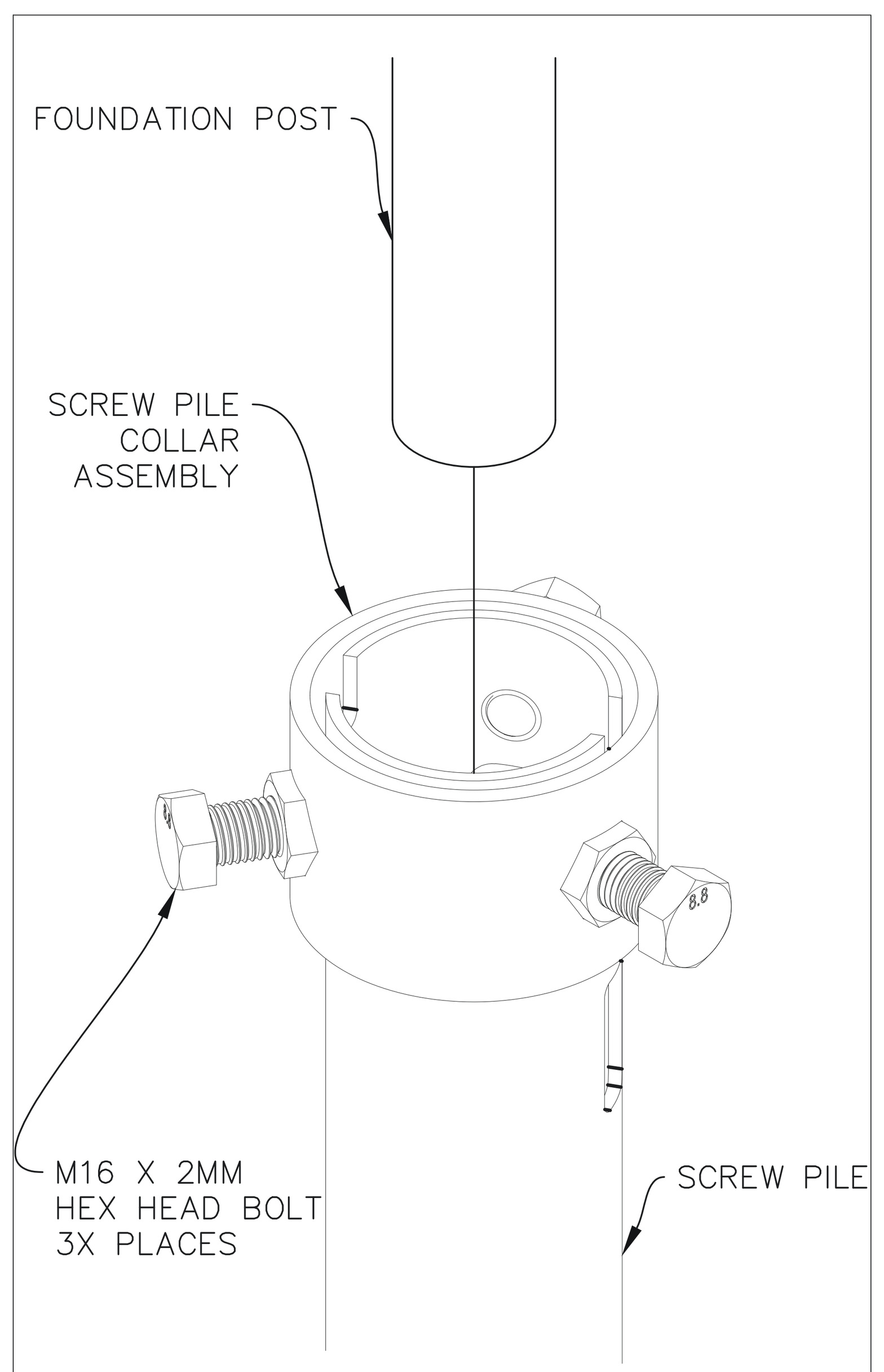
D1 DETAIL: SCREW PILE



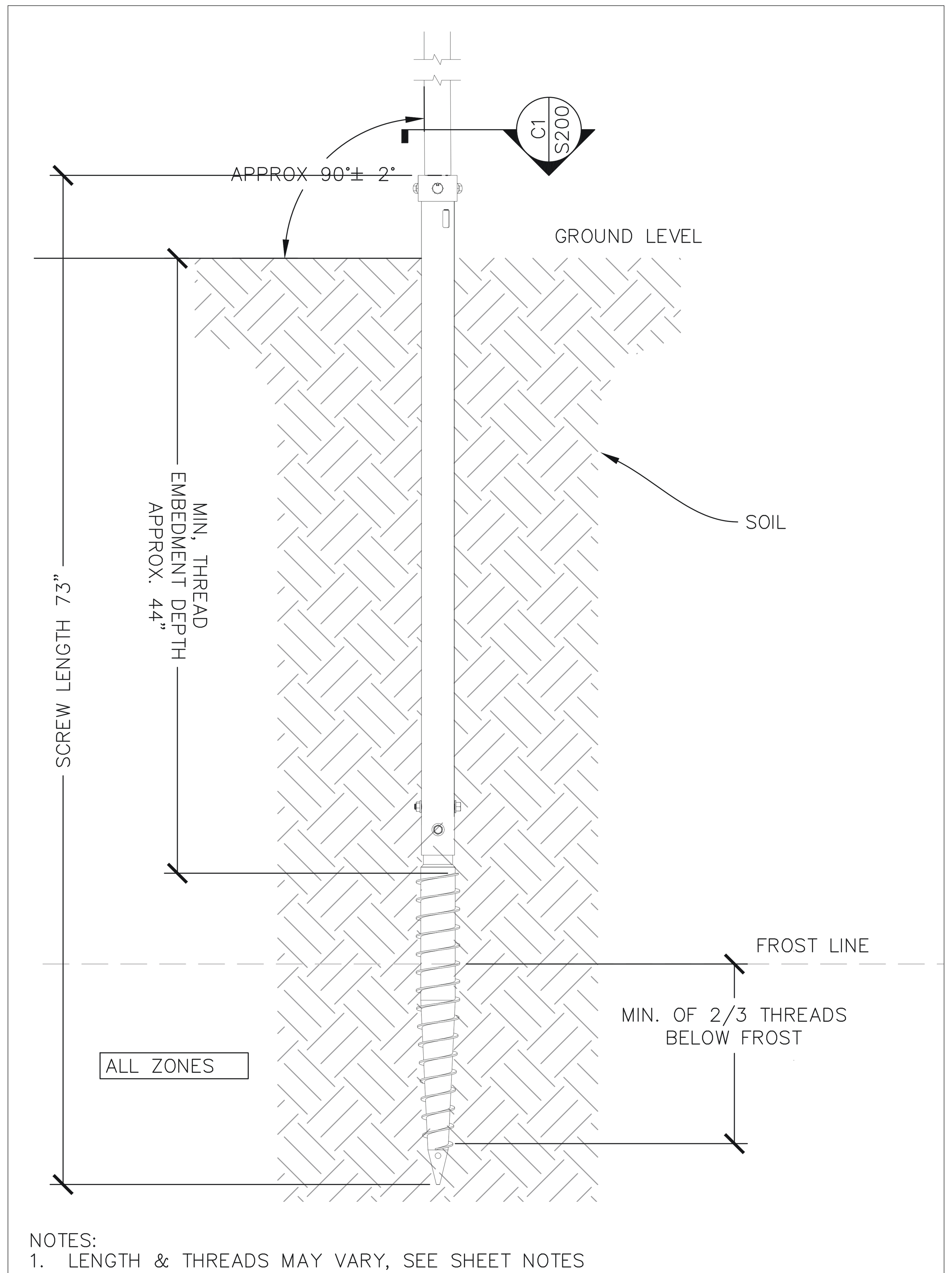
D2 SECTION: SCREW PILE COLLAR ASSEMBLY



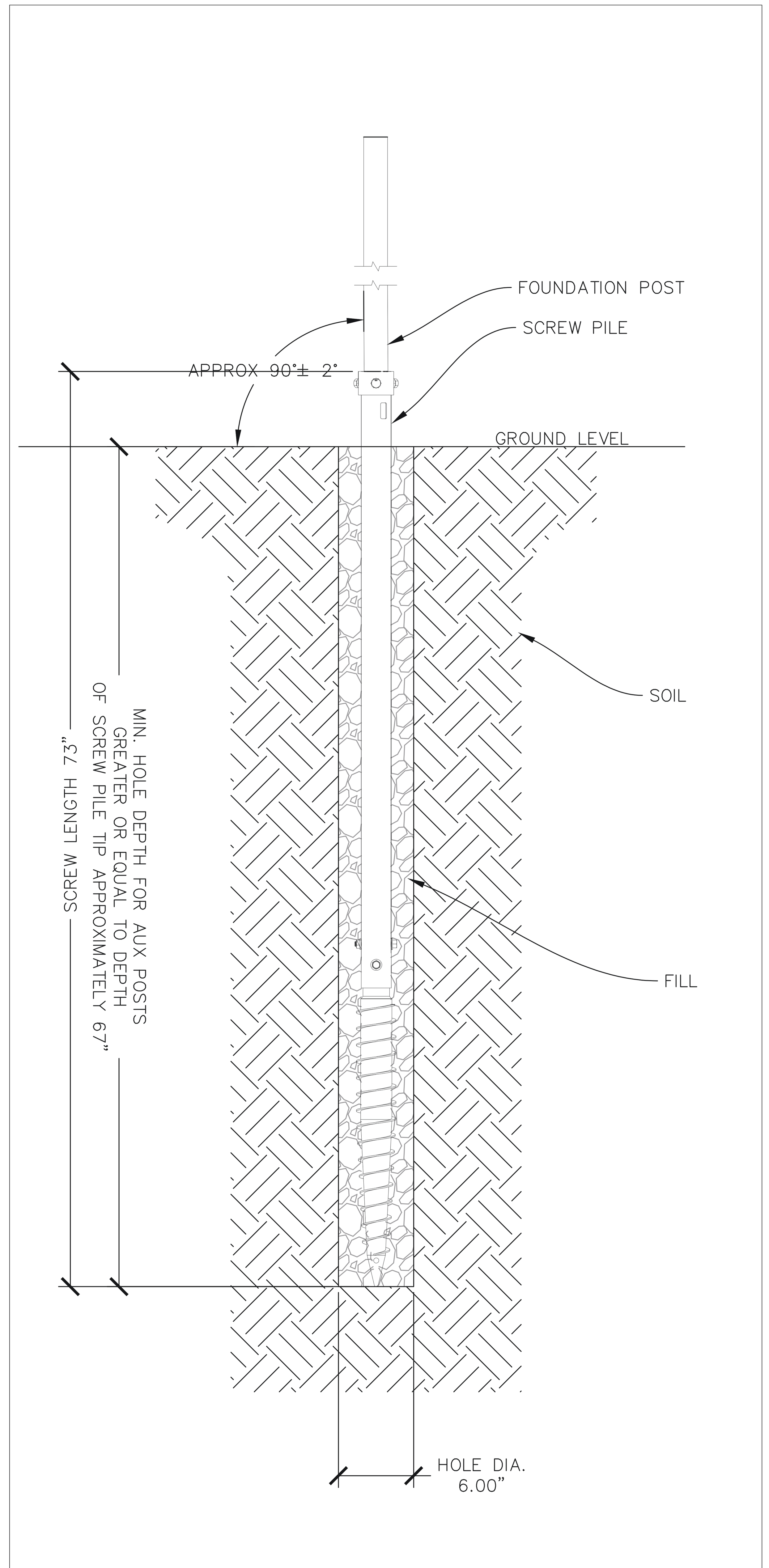
C1 SECTION: PILE ASSEMBLY



A1 CONNECTION: POST–TO–PILE



A2 INSTALLATION OPTION 2



A3 INSTALLATION OPTION 1

NOTES:

1. FOUNDATION POST MATERIAL: 50 KSI MIN YIELD STRENGTH
2. FOUNDATION POST TO BE HOT DIPPED GALVANIZED TO ASTM A123 OR INLINE GALVANIZED TO ASTM A1057.
3. SCREW PILE TUBE MATERIAL: 50 KSI MIN YIELD STRENGTH STEEL.
4. SCREW PILE THREAD MATERIAL: 36 KSI MIN YIELD STRENGTH STEEL.
5. SCREW PILE TO BE HOT DIPPED GALVANIZED TO ASTM A123 OR INLINE GALVANIZED TO ASTM A1057.
6. ALL HARDWARE IS 300 SERIES STAINLESS STEEL, A574 ALLOY STEEL, OR MINIMUM 8.8 CLASS METRIC.
7. GROUND SCREW BOLTS MUST BE FULLY SET INTO NUTS.
8. GROUND SCREW BOLTS SHALL BE 35 MM LONG.
9. SCREW PILE SHALL PENETRATE THE SOIL TO A DEPTH PAST THE FROST LINE, WITH LESS THAN 1/3" OF THE TOTAL LENGTH OF THREADS ARE ABOVE THE FROST LINE, OR TO THE DEPTH INDICATED AS MINIMUM PER THE STAMPED FOUNDATION DESIGN REPORT.
10. FOUNDATION POST SHALL EXTEND ABOVE GROUND LEVEL AT MINIMUM OF INDICATED FRONT LIP CLEARANCE, PLUS THE ADDITIONAL LENGTH REQUIRED TO ACHIEVE THE INDICATED TILT ANGLE.
11. MINIMUM ENGAGEMENT BETWEEN SCREW PILE AND FOUNDATION POST SHALL BE 6".
12. INSTALLERS SHALL REFER TO STRUT AND POST SETUP SHEETS FOR LENGTH AND PLACEMENT DETAILS.

FOUNDATION POST INSTALLATION

13. ACCURATELY LOCATE AND INSTALL SCREW PILES BY SUCH METHODS AND EQUIPMENT SO AS NOT TO IMPAIR THE PILE STRENGTH OR DAMAGE POSTS OR ADJACENT CONSTRUCTION.
14. INSTALLATION CONTRACTOR RESPONSIBLE FOR ALL CONSTRUCTION EQUIPMENT, METHODS, AND SEQUENCES.
15. DISTURBED GALVANIZED SURFACES SHALL BE TOUCHED UP WITH AN APPROVED COLD GALVANIZING COMPOUND.
16. INSTALL SCREW PILES TO MINIMUM DEPTH AS INDICATED THIS SHEET OR AS REQUIRED PER THE STAMPED FOUNDATION DESIGN REPORT, WHICHEVER IS GREATER.

AUXILLIARY FOUNDATION NOTES:

1. EMBEDMENT DEPTH CONTINGENT UPON SITE SPECIFIC DATA, INCLUDING BUT NOT LIMITED TO: FROST DEPTH, SOIL PROPERTIES, AND LOCAL BUILDING CODE REQUIREMENTS.
2. AUGERED HOLE SHOULD EXTEND BELOW THE LOCAL FROST LINE, INTO THE STABLE SOIL ZONE.
3. HOLDING PROPERTIES OF THE SCREW PILE IN AGGREGATE DETERMINED BY TESTING CONDUCTED BY APA, PER ASTM D1143
4. STRUCTURAL PROPERTIES OF SCREW PILE TESTED ONLY. CORROSIVITY, AND OTHER GEOTECHNICAL PROPERTIES NOT TESTED.
5. INSTALLATION PROCEDURE
   - 5.1. AUGER HOLE TO REQUIRED DEPTH. HOLE SHOULD BE APPROXIMATELY PLUMB AND A MINIMUM DIAMETER AS INDICATED IN DRAWING.
   - 5.2. REMOVE THE SPOILS AS BEST AS POSSIBLE. THERE SHOULD BE NO LARGE CLUMPS OR ROCKS AT THE BOTTOM OF THE HOLE.
   - 5.3. POUR IN AGGREGATE.
   - 5.4. AGGREGATE SHOULD BE SIZED BETWEEN 1" – 2 1/2".
   - 5.5. KNOWN ACCEPTABLE AGGREGATES (NAMING PER ASTM C33-03):
     - 5.5.A. #2 (2 1/2" – 1 1/2")
     - 5.5.B. #3 (2" – 1").
     - 5.5.C. A COMBINATION OF BOTH #2 & #3
     - 5.5.D. EQUIVALENT SIZE OF EITHER #2 OR #3.
   - 5.6. DEVIATIONS IN AGGREGATE SIZE, FROM THE ABOVE SPECIFICATIONS, MUST BE APPROVED BY APA SOLAR ENGINEERING BEFORE USING/PURCHASING.
   - 5.7. DRIVE SCREW PILE AS NORMALLY INTO HOLE. ENSURE IT IS PLUMB. ENSURE THE NORTH–SOUTH DIMENSIONS AND EAST–WEST DIMENSIONS ARE CORRECT. ALSO ENSURE BOLT HOLE IN THE POST IS FACING THE CORRECT DIRECTION (FACING EAST–WEST).

   IF NEEDED, RETAMP THE AGGREGATE AT SOIL LEVEL AROUND THE SCREW PILE.
6. QUALITY CONTROL NOTES
   - 1.1. POST HEIGHTS SHOULD BE MEASURED FROM THE GROUND LEVEL, NOT THE TOP OF THE AGGREGATE. IF AGGREGATE IS BELOW GROUND LEVEL, ADDITIONAL GRAVEL SHOULD BE ADDED AND TAMPED TO BRING IT UP TO AT LEAST GROUND LEVEL.
   - 1.2. FOUNDATION POSTS SHOULD NOT BE VERIFIED BY PULLING LATERALLY AT THE TOP OF THE POST (FIGURE 3). THIS CREATES A LARGE AND ARTIFICIAL MOMENT IN THE FOUNDATION. FOUNDATION POSTS SHOULD ALSO NOT BE ROCKED BACK AND FORTH UNTIL IT "FAILS"; THE FOUNDATION POSTS ARE INTENDED TO WORK AS A SYSTEM WITH ALL PARTS INTACT (ADJOINING POSTS, SMALL AND LARGE ZEES, HARD AND CABLE BRACES, AND ALL ADDITIONAL PARTS AND HARDWARE INSTALLED AND TIGHTENED) AND DO NOT REACH FULL CAPACITY UNTIL THAT POINT.

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SHEET REVISIONS

REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	3/20/2023

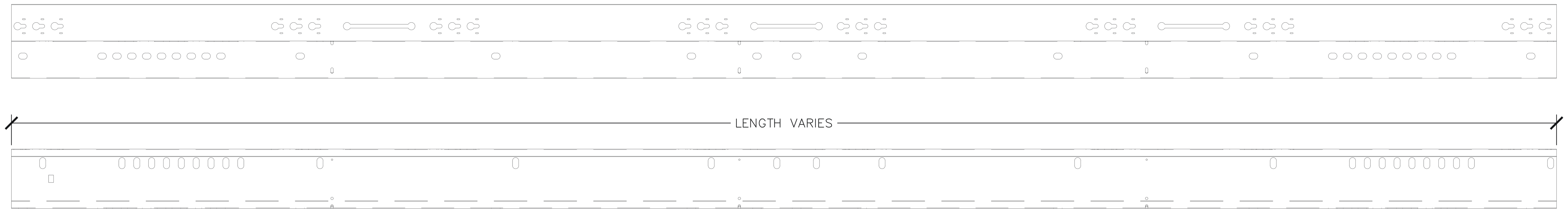
APPROVED

DRAWN	REVIEWED	APPROVED	SIZE
JK	TM	JDI	D

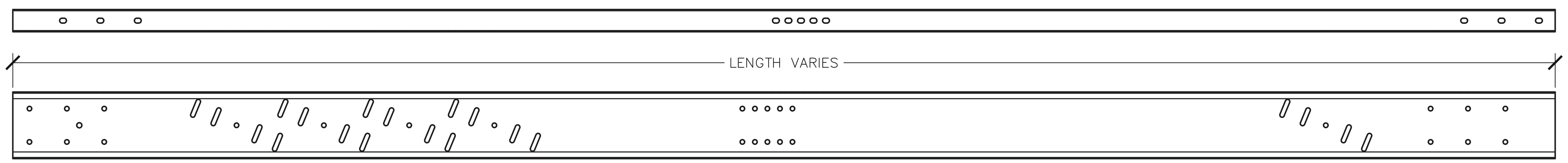
SHEET NAME: GROUND SCREW

PROJECT NUMBER: 220028

DRAWING NUMBER: S.200 REV. A

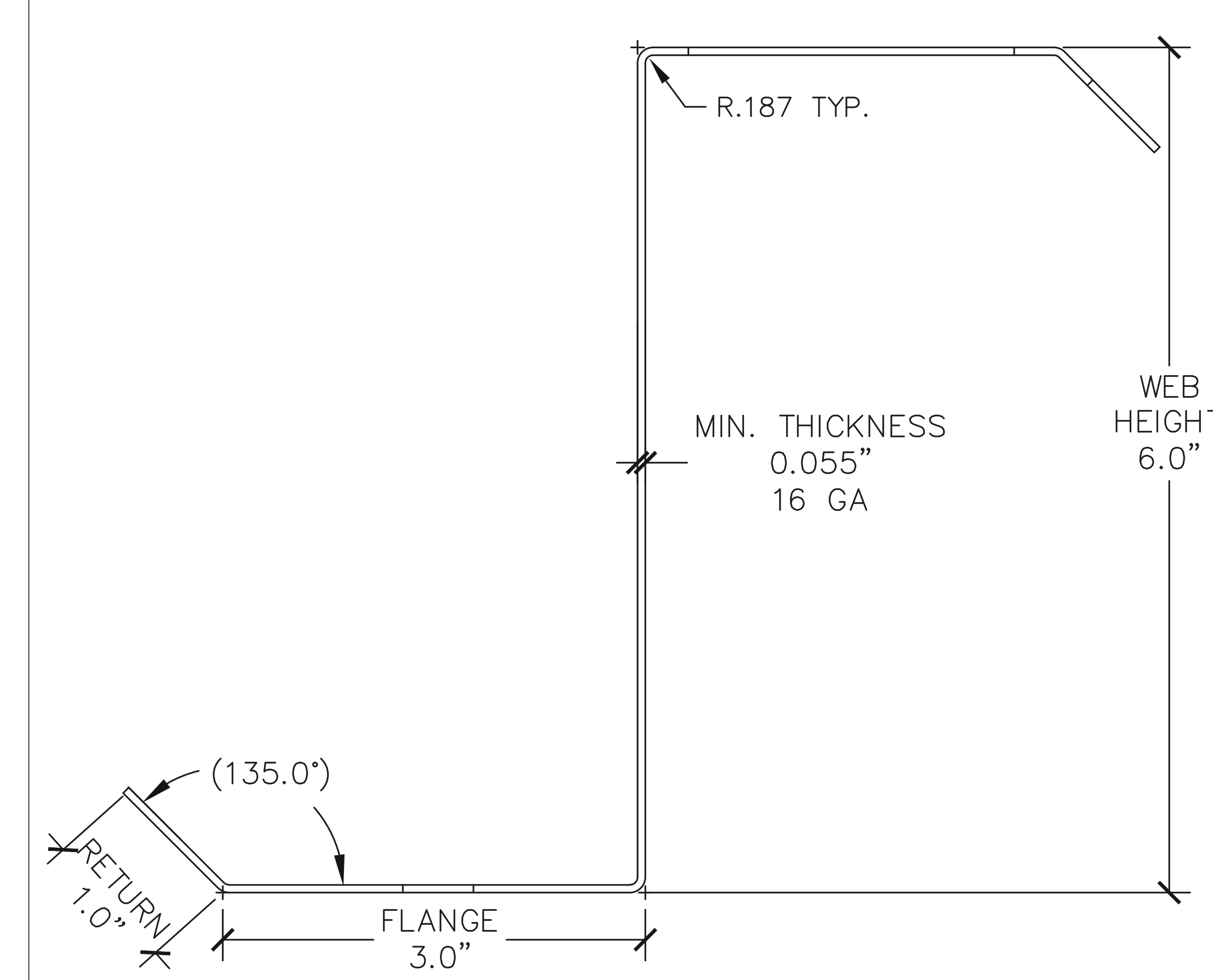


E1 | SIDE/TOP: ZEE PURLIN

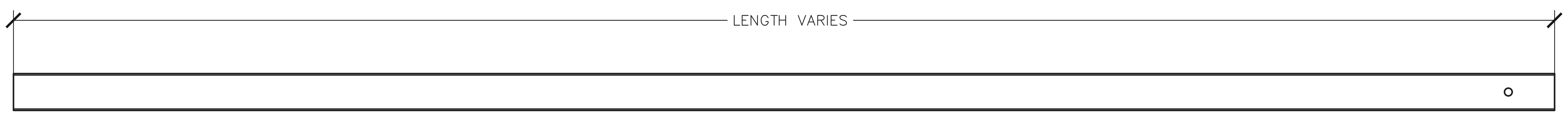


D1 | SIDE/TOP: NS CHORD

MATERIAL: A653 STR. STL.
STRENGTH: MIN. YIELD (Fy): 80 KSI.

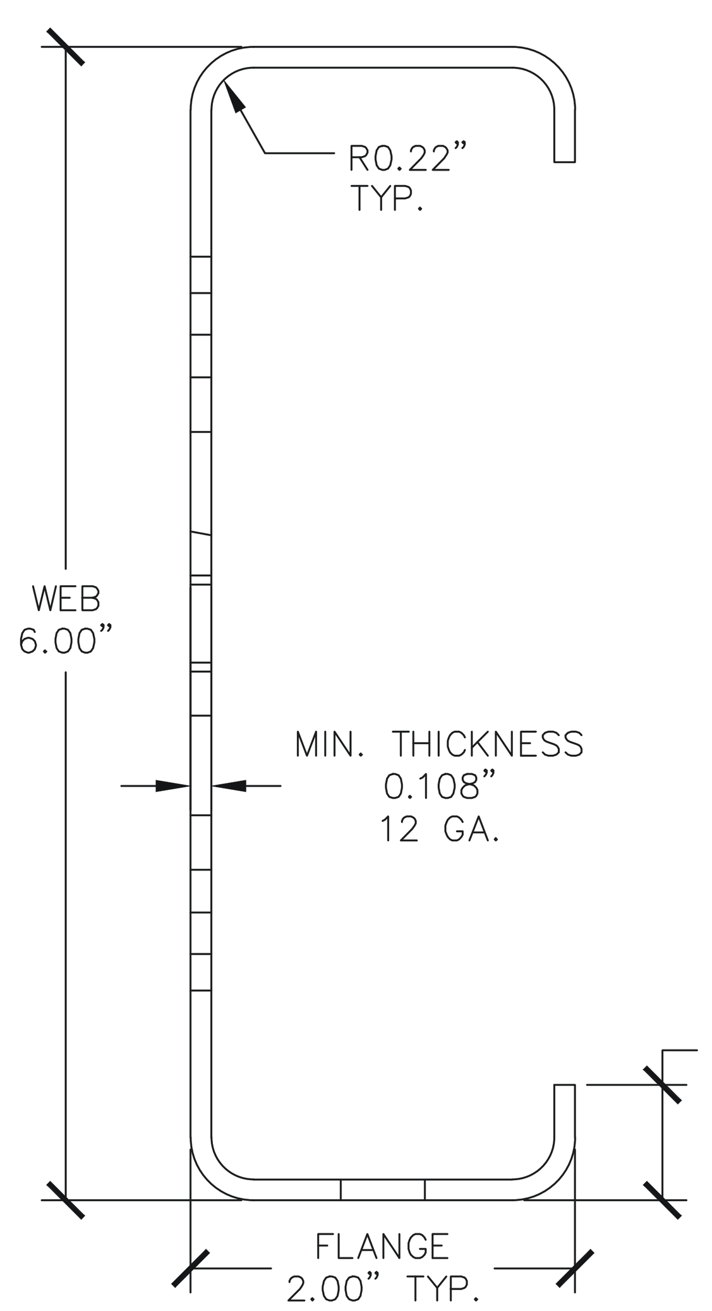


D5 | PART: ZEE PURLIN



C1 | SIDE: FOUNDATION POST

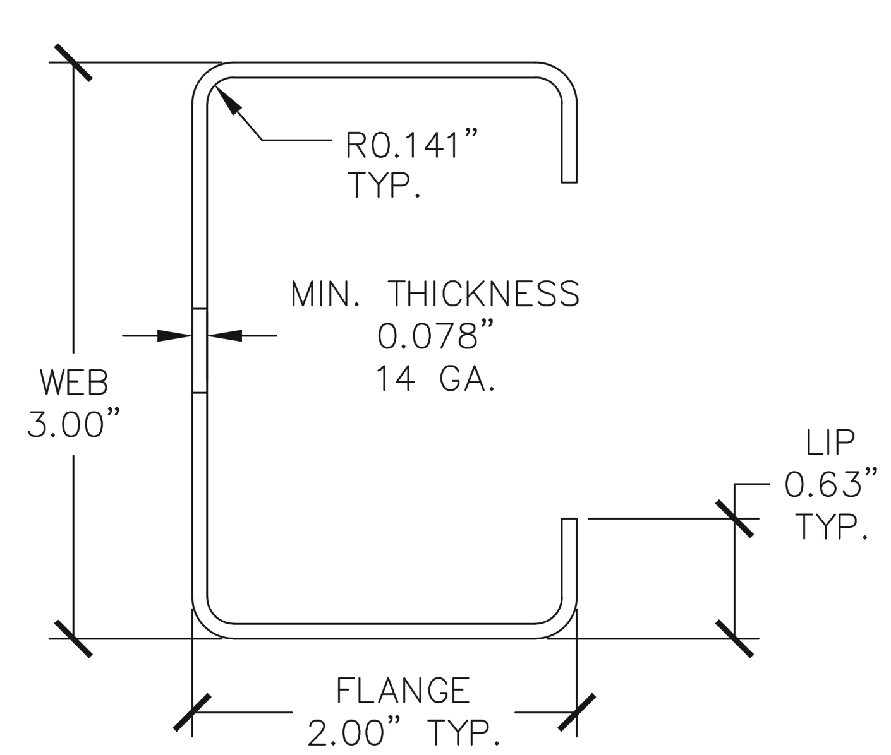
MATERIAL: A653 HSLAS
STRENGTH: MIN. YIELD (Fy): 80 KSI.



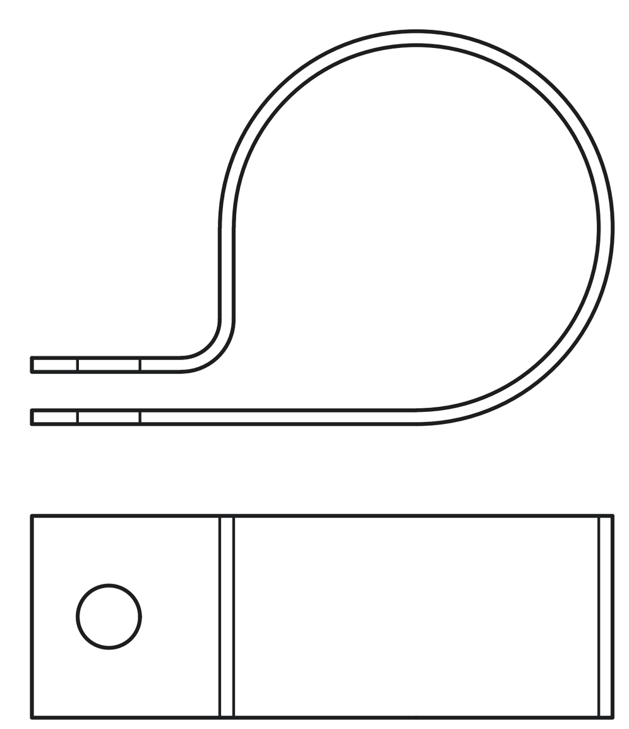
A1 | PROFILE: NS CHORD

B2 | SIDE: KNEE BRACE

MATERIAL: A653 SS GR 80 CL1
STRENGTH: MIN. YIELD (Fy): 80 KSI.

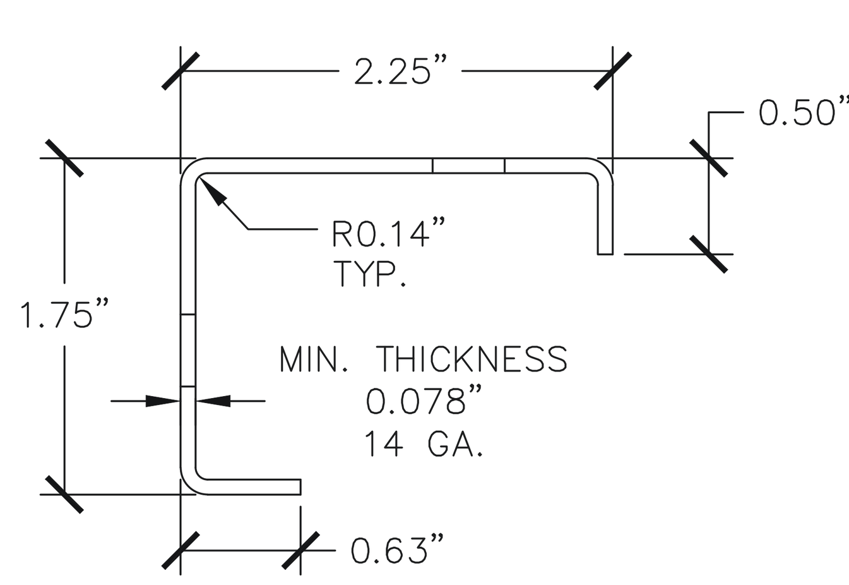


A2 | PROFILE: KNEE BRACE

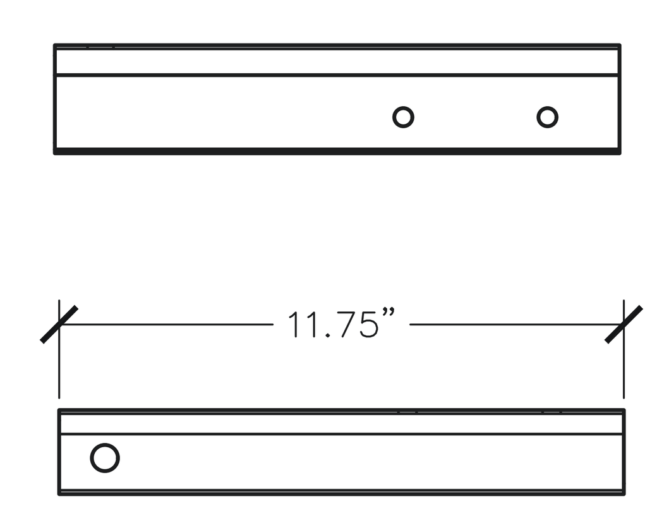


A3 | SIDE: BRACE CLAMP

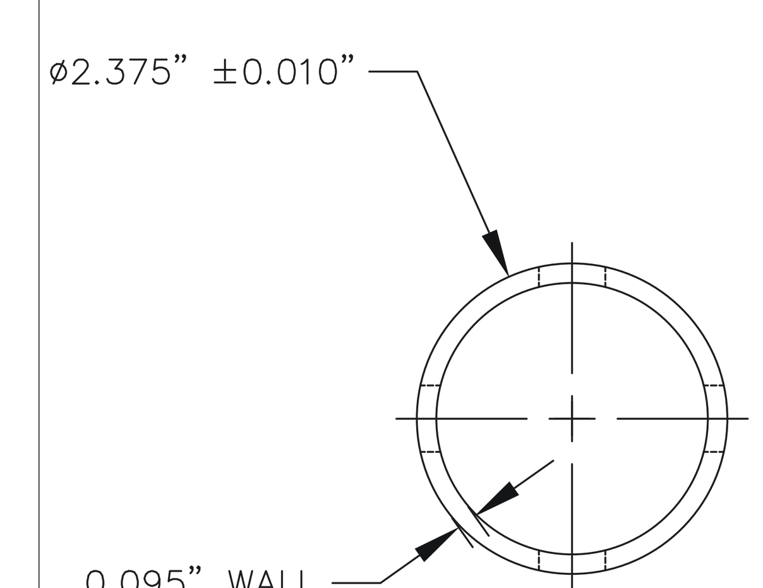
MATERIAL: A572 CF STR. STL.
STRENGTH: MIN. YIELD (Fy): 50 KSI.



A4 | PROFILE: ROLL BAR



A5 | SIDE/TOP: ROLL BAR



A6 | PROFILE: FOUNDATION POST

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5/17/23

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SHEET REVISIONS

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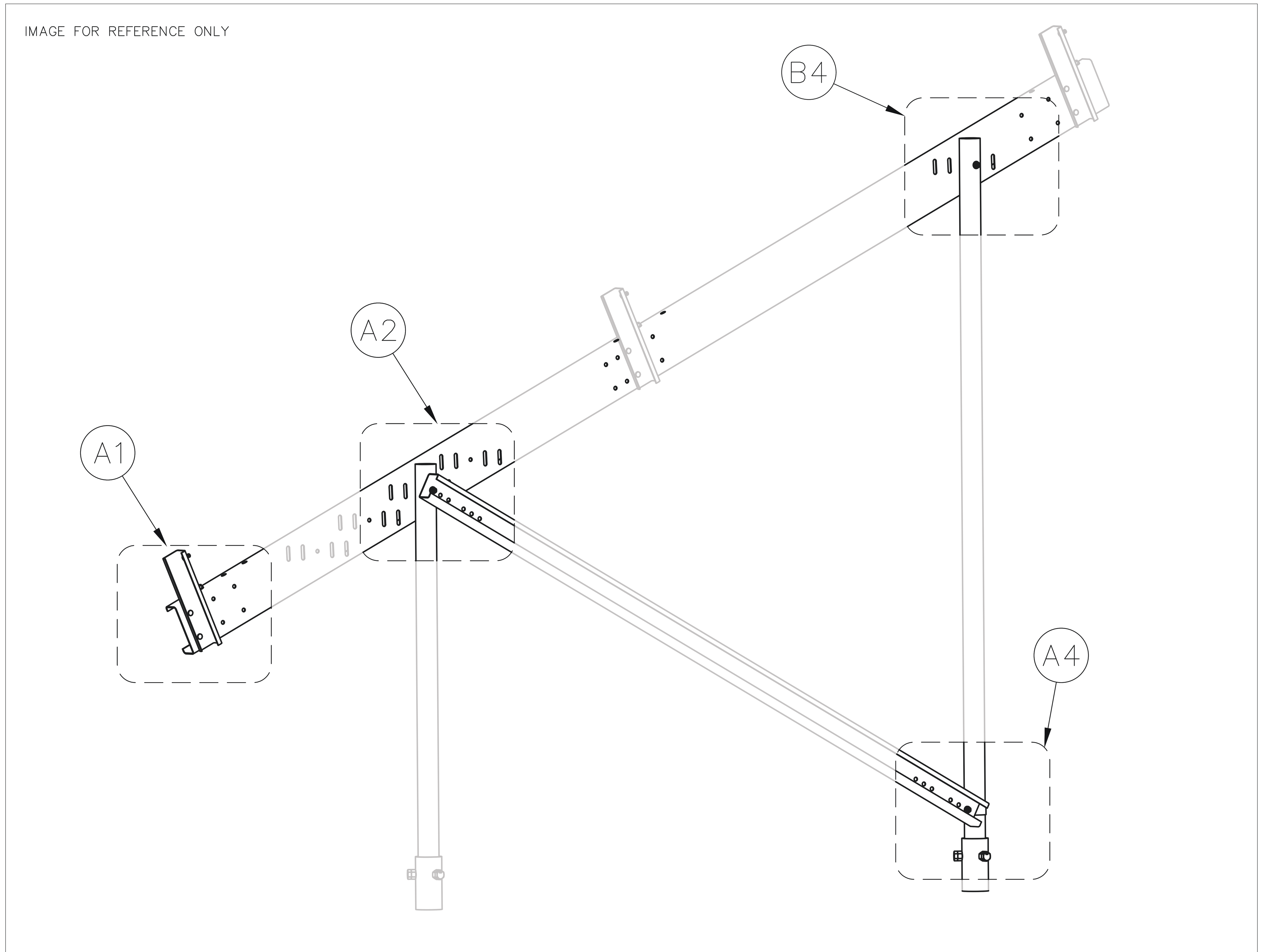
DRAWN	REVIEWED	APPROVED	SIZE
JK	TM	JDI	D

SHEET NAME
STRUCTURAL COMPONENTS

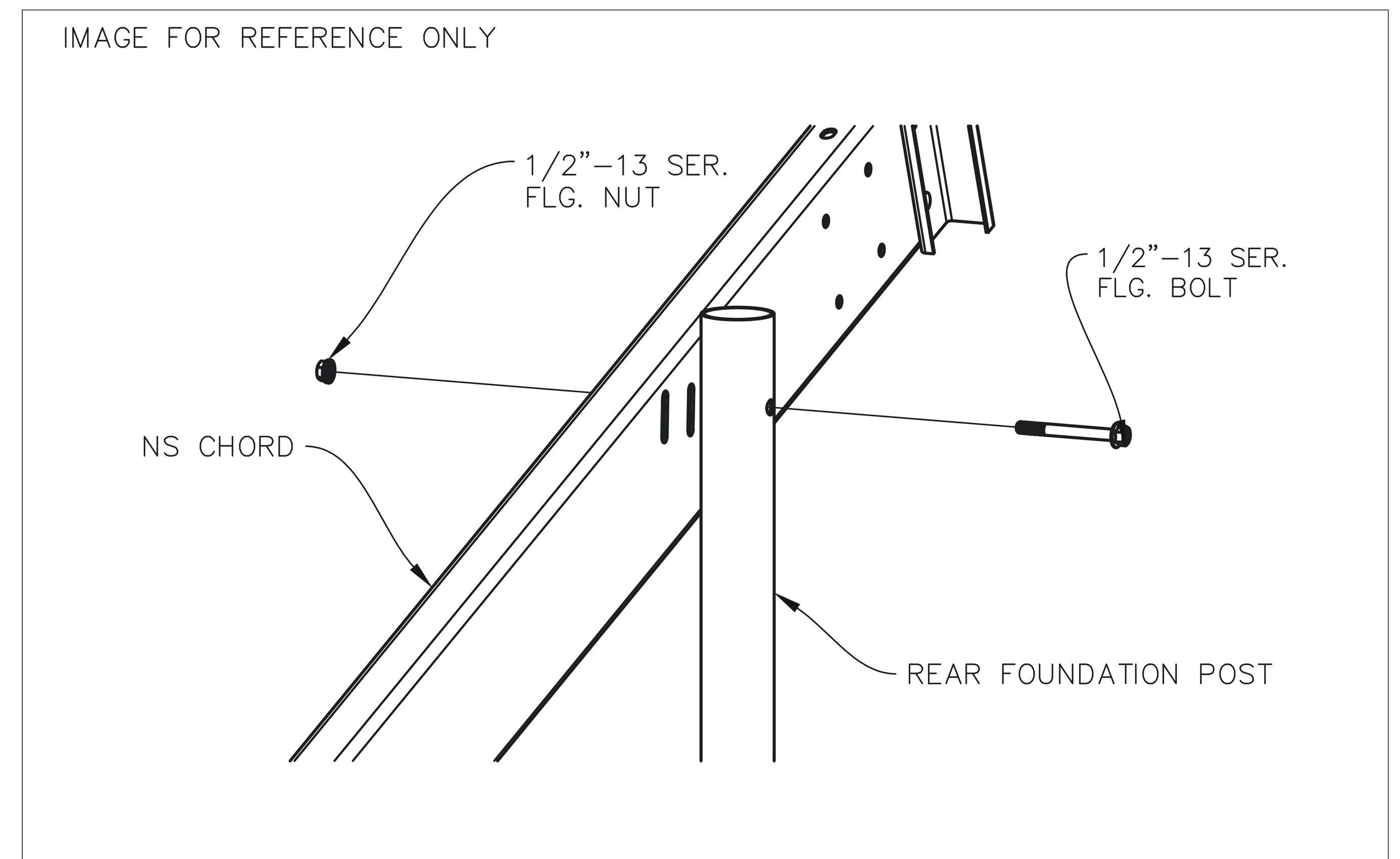
PROJECT NUMBER
220028

DRAWING NUMBER
S.300

REV.
A



B1 FOUNDATION SET CONNECTIONS OVERVIEW



B4 CONNECTION: REAR POST–TO–NS CHORD

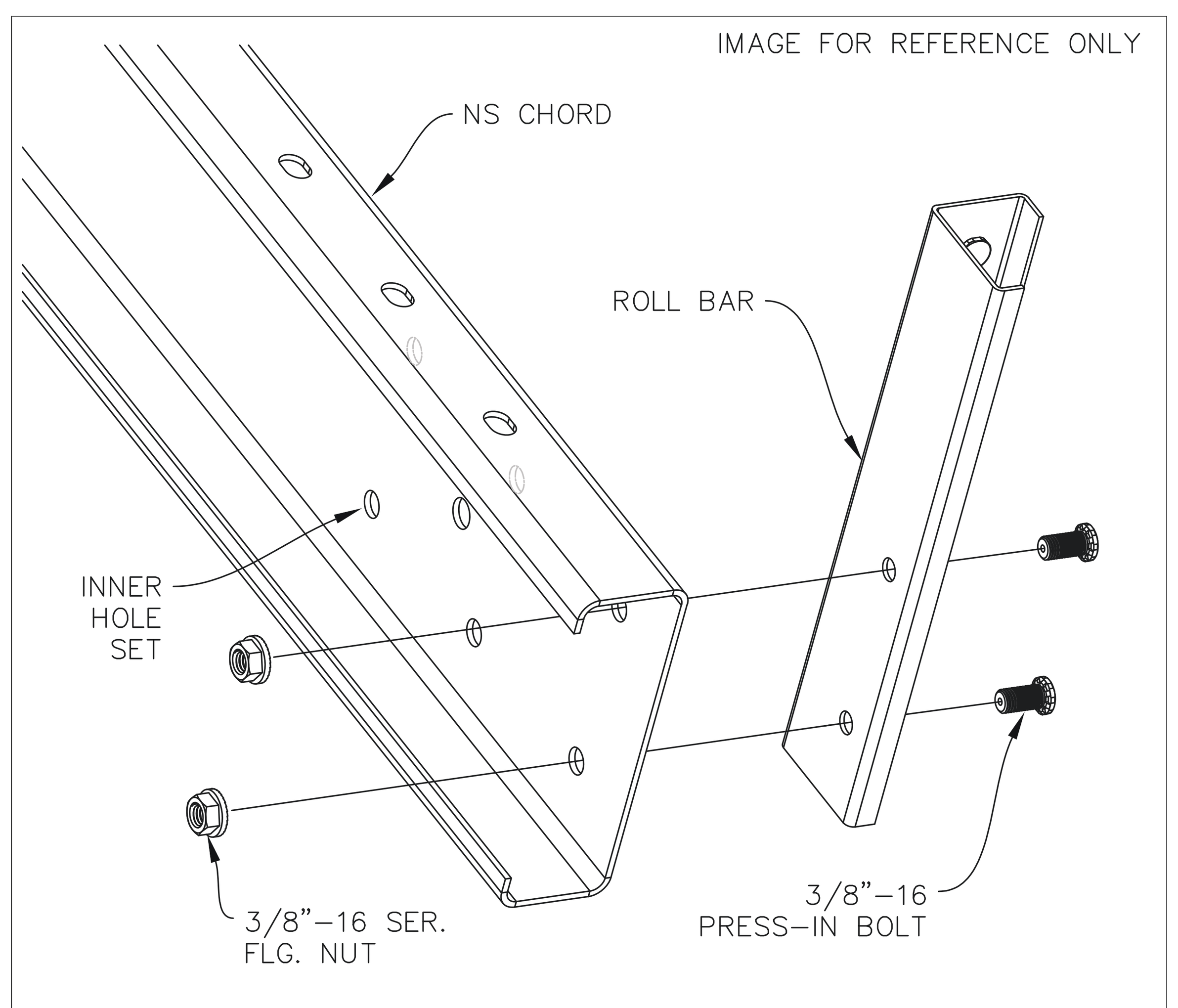
NOTES:

1. HARDWARE TORQUE VALUES:

   3/8"–16 STAINLESS STEEL
   MIN.: 17.5 FT–LBS
   NOM.: 19.6 FT–LBS
   MAX.: 50.0 FT–LBS

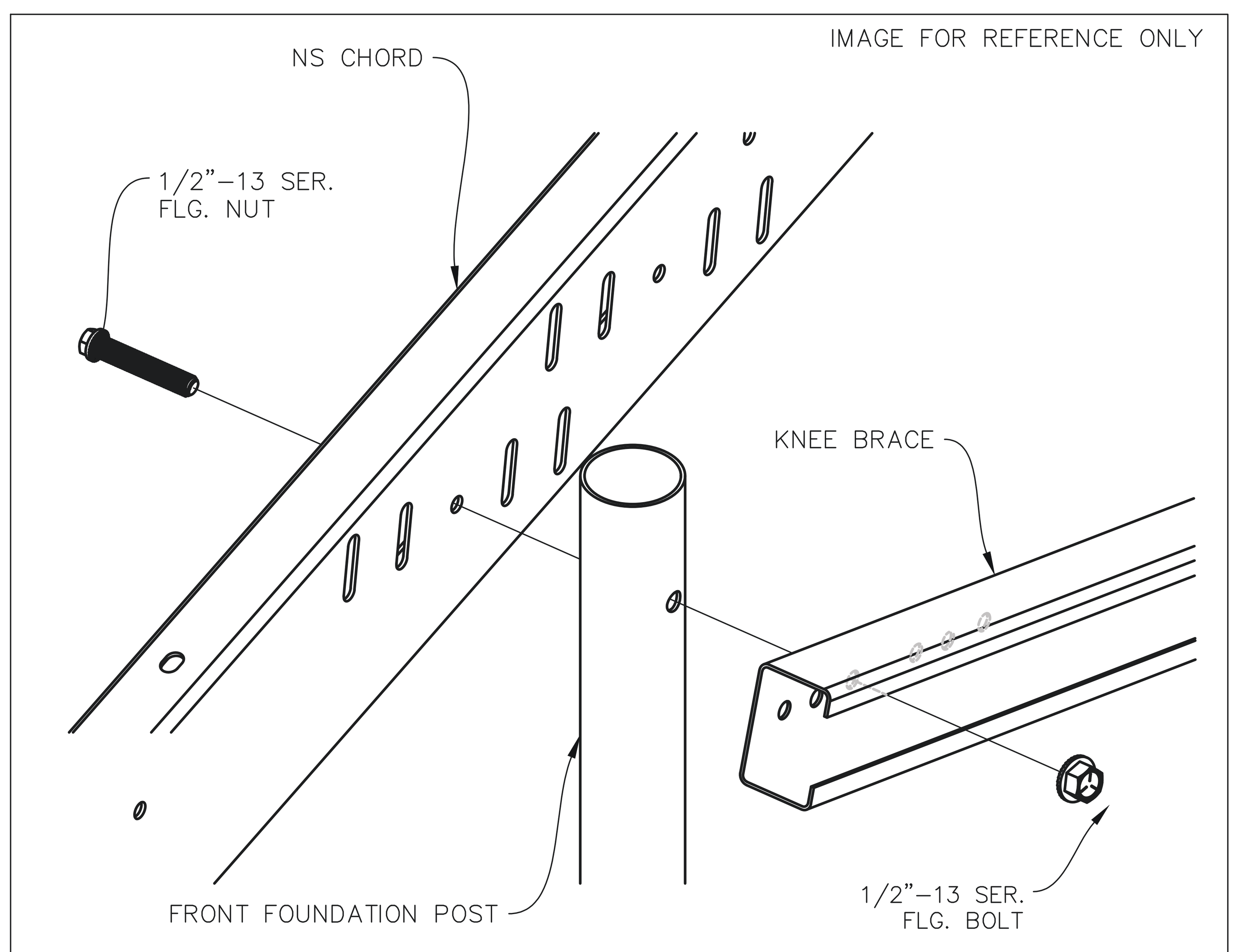
   1/2"–13 STAINLESS STEEL
   MIN: 25 FT–LBS

2. DEPICTED HARDWARE AND PART PLACEMENT NOT INDICATIVE OF PREFERRED OR REQUIRED POSITIONS.
3. HOLE/SLOT PATTERNS IN PARTS ALLOW FOR DEVIATION FROM NOMINAL DIMENSIONS, MULTIPLE PART POSITIONS, AND MULTIPLE TILT ANGLES.
4. SEE INSTALLATION MANUAL FOR SETUP INSTRUCTIONS.
5. SERRATED FLANGED BOLTS MAY BE REPLACED WITH EQUIVALENT PRESS–IN BOLTS. SEE NOTE 10 FOR MORE OPTIONS.
6. PRESS–IN BOLTS, WHERE PRESENT, TO BE INSTALLED TO MANUFACTURERS RECOMMENDED VALUES.
7. OTHER SPECIFIC CONNECTIONS ELSEWHERE IN PRINT SET.
8. ROLL BAR MUST CONNECT TO THE CORRECT HOLES IN CEE CHANNEL (INNER, OR OUTER TYPICALLY), AS DETERMINED BY PV MODULE MANUFACTURERS ALLOWABLE CLAMPING ZONE.
9. USE CORRECT NOMINAL HOLES IN CEE TO CONNECT TO FOUNDATION POST, AS INDICATED. ADJACENT HOLES AND SLOTS FOR FIELD ADJUSTMENTS.
10. SERRATED HARDWARE MAY BE REPLACED WITH EQUIVALENT HARDWARE WITH WASHERS IF NECESSARY.
11. IN ALL DETAILS, THE PRESENCE OF TWO SETS OF HARDWARE INDICATES THE REQUIREMENT OF TWO SETS OF HARDWARE.
12. STAINLESS STEEL HARDWARE MAY BE REPLACED WITH GALVANIZED STEEL HARDWARE OR CORROSION AND STRENGTH COMPARABLE HARDWARE MATERIALS AND FINISHES.
13. UNLESS NOTED OTHERWISE, ALL HARDWARE MAY BE INSTALLED IN EITHER DIRECTION (NUT/BOLT MAY BE ON EITHER SIDE OF CONNECTION).
14. WHEN NECESSARY, ADDITIONAL HOLES MAY BE DRILLED TO COMPLETE CONNECTION. ENGINEERING SHALL BE CONTRACTED PRIOR TO FIELD MODIFICATIONS OF PARTS.

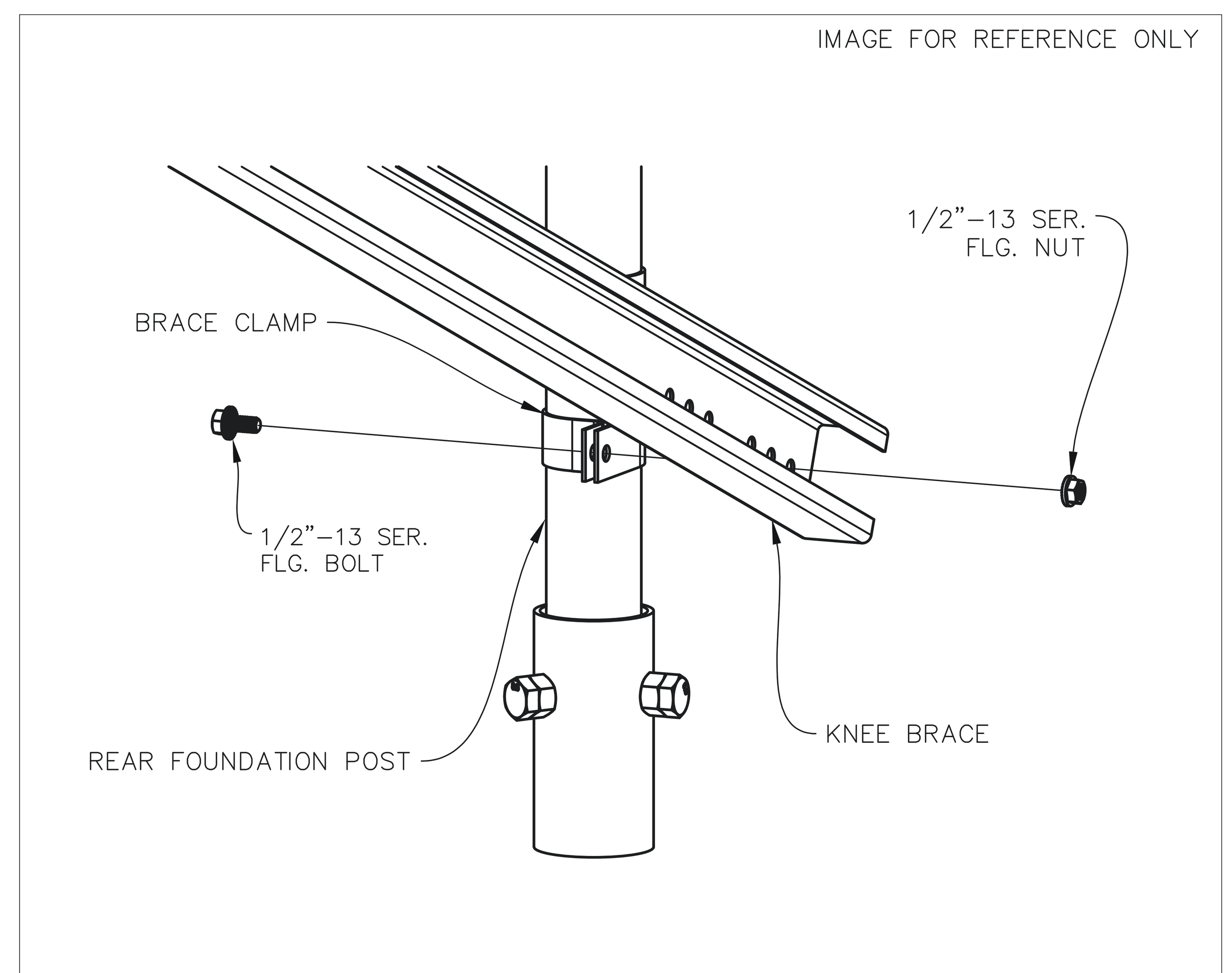


ATTACHED TO OUTER HOLE SET FOR REFERENCE ONLY. SEE NOTES.

A1 CONNECTION: ROLL BAR–TO–NS CHORD



A2 CONNECTION: KNEE BRACE–TO–FRONT POST



A4 KNEE BRACE–TO–REAR POST

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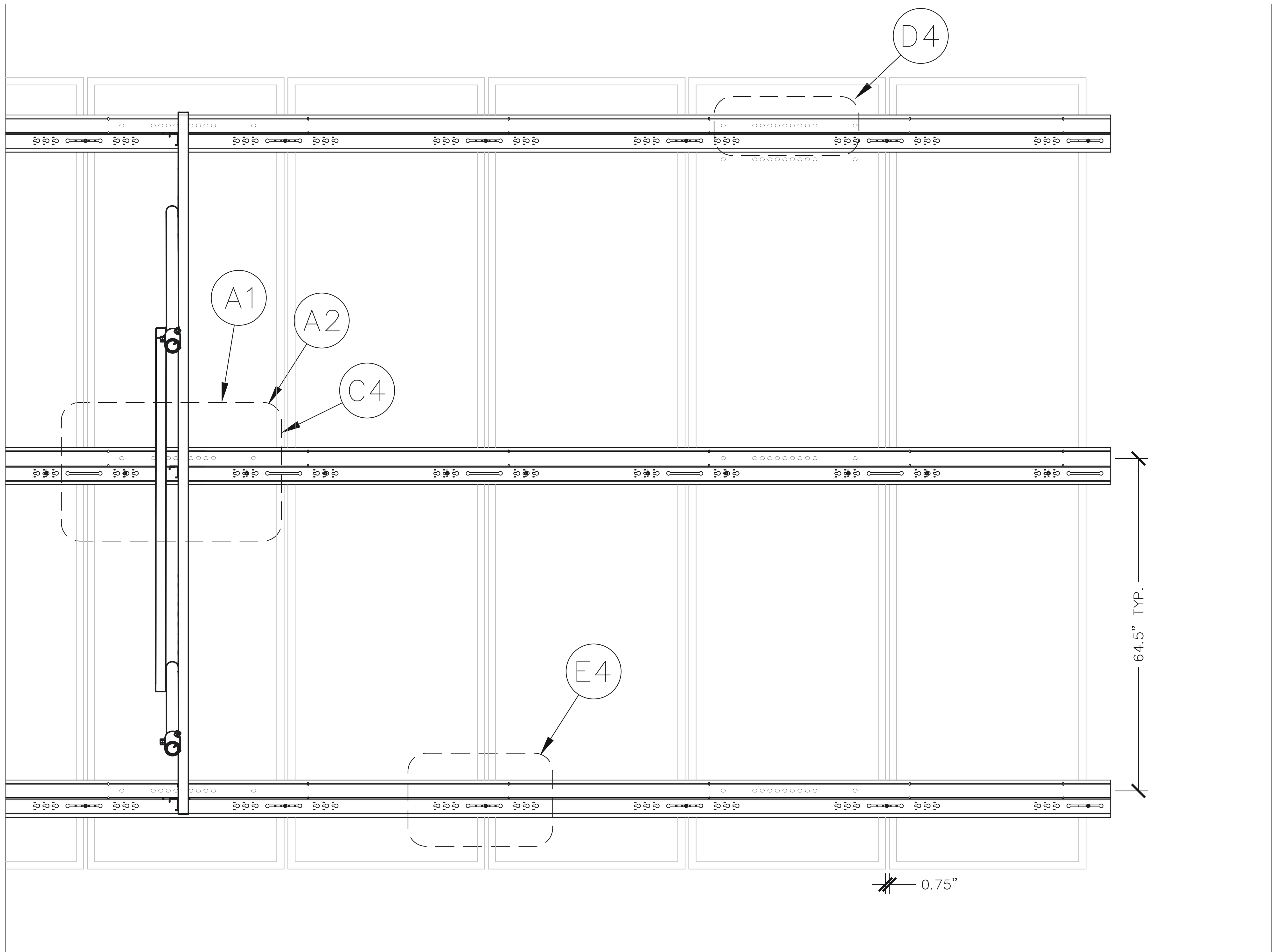
DRAWN	REVIEWED	APPROVED	SIZE
JK	TM	JDI	D

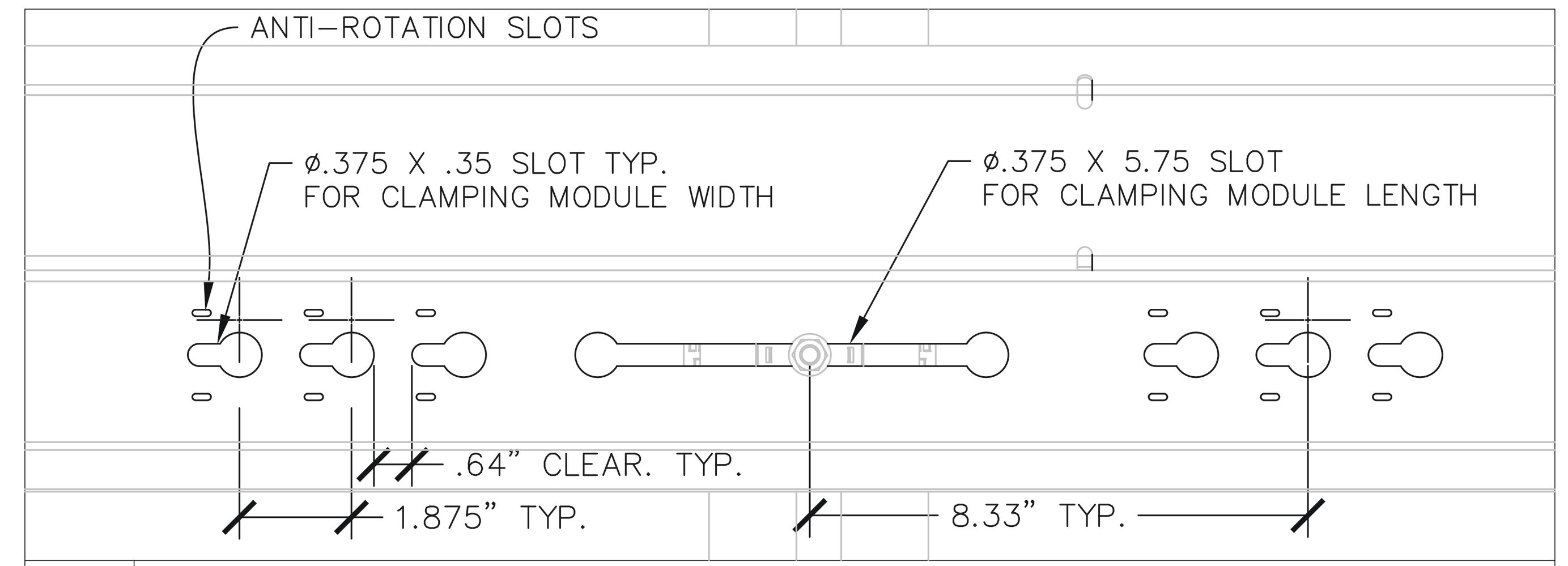
SHEET NAME: CONNECTIONS

PROJECT NUMBER: 220028

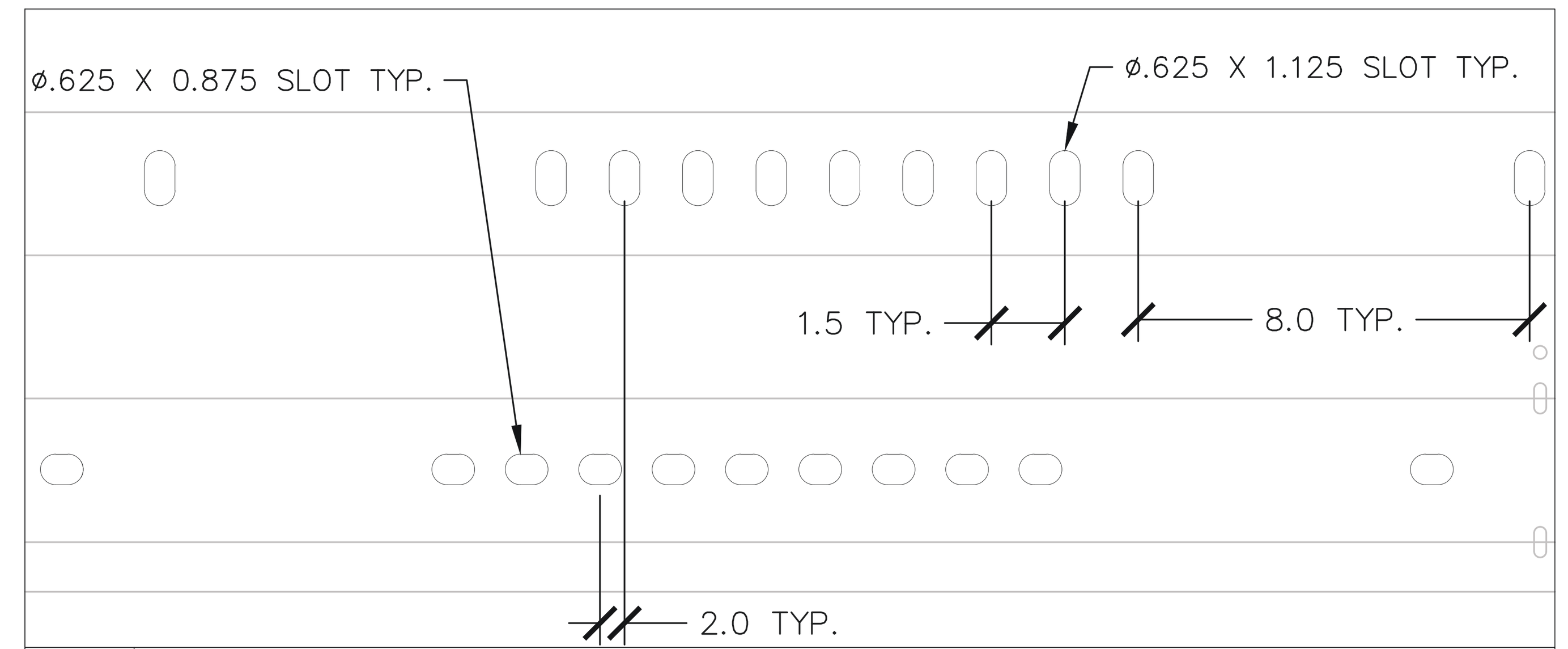
DRAWING NUMBER: S.400 REV. A



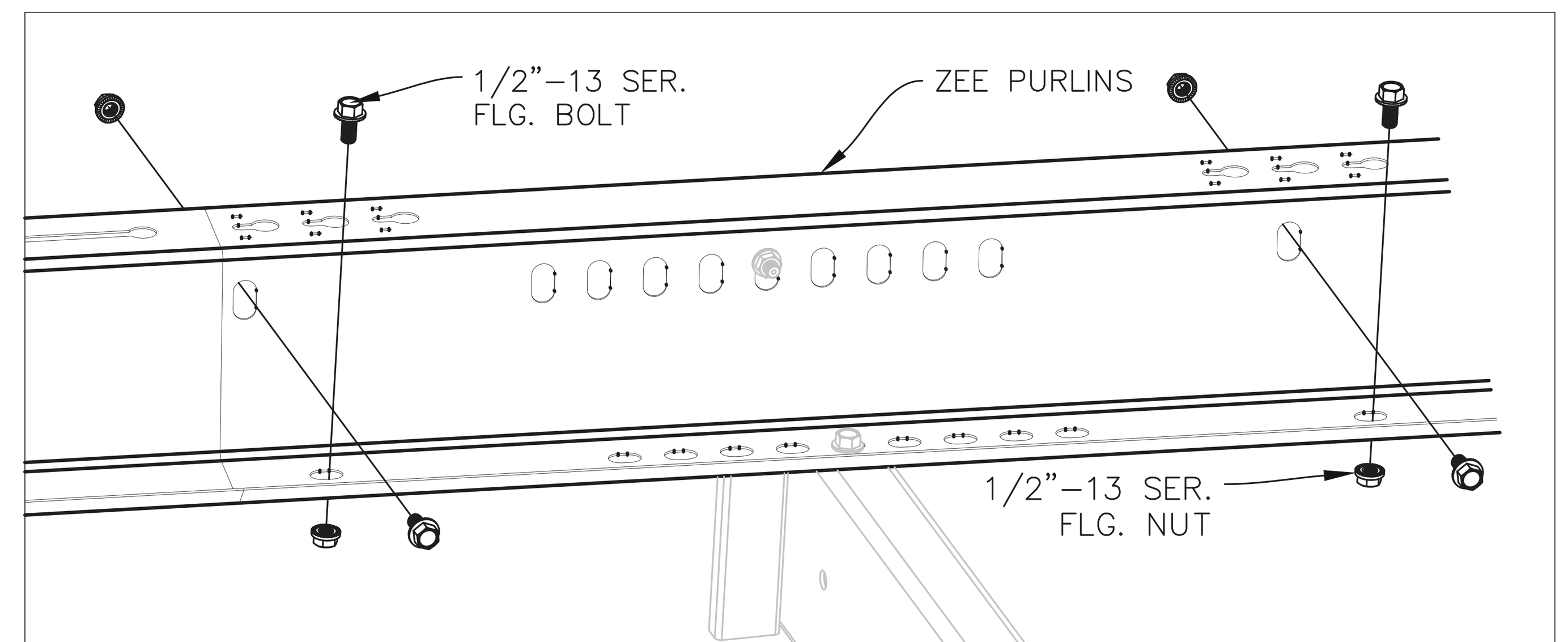
B1 OVERVIEW: ZEE PURLIN CONNECTIONS (RACK UNDERSIDE)



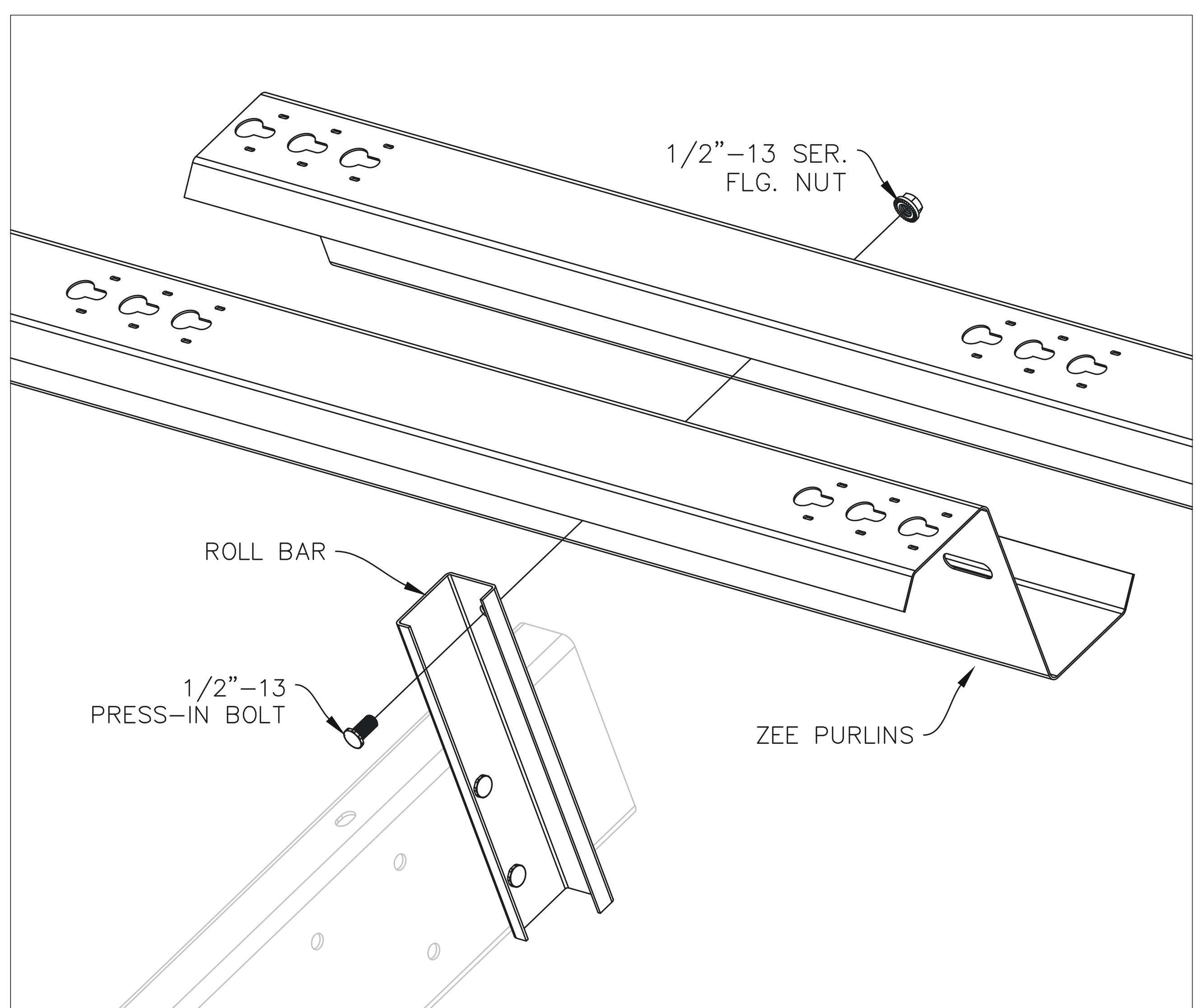
E4 DETAIL: ZEE PURLIN PANEL SLOTS



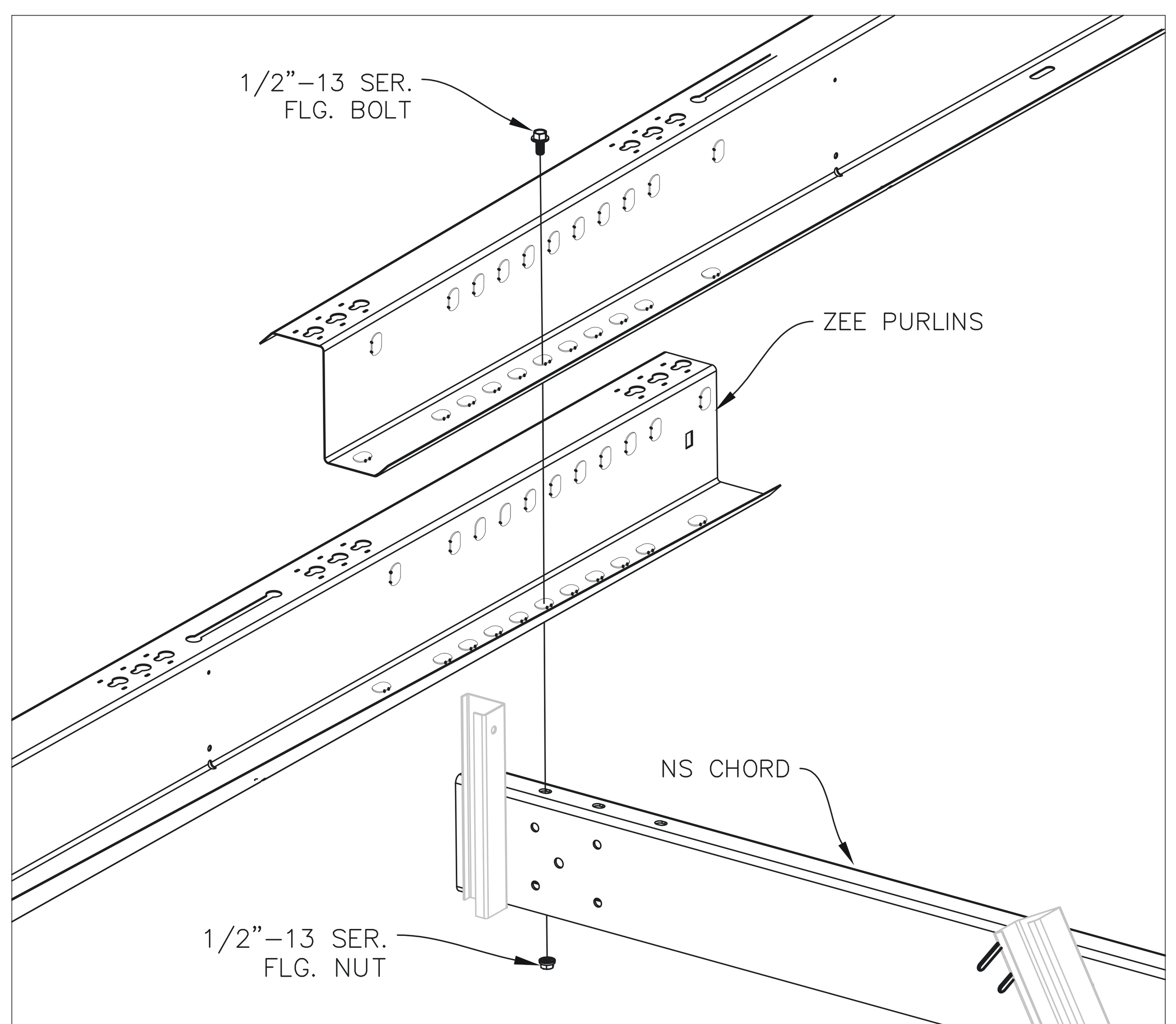
D4 DETAIL: ZEE PURLIN SPLICE SLOTS



C4 CONNECTION: ZEE-TO-ZEE PURLINS SPLICE



A1 CONNECTION: ZEE PURLINS-TO-ROLL BAR



A2 CONNECTION: ZEE PURLINS-TO-NS CHORD

NOTES:

1. HARDWARE TORQUE VALUES:

   3/8"-16 STAINLESS STEEL
   MIN.: 17.5 FT-LBS
   NOM.: 19.6 FT-LBS
   MAX.: 50.0 FT-LBS

2. DEPICTED HARDWARE AND PART PLACEMENT NOT INDICATIVE OF PREFERRED OR REQUIRED POSITIONS.
3. HOLE/SLOT PATTERNS IN PARTS ALLOW FOR DEVIATION FROM NOMINAL DIMENSIONS, MULTIPLE PART POSITIONS, AND MULTIPLE TILT ANGLES.
4. SEE INSTALLATION MANUAL FOR SETUP INSTRUCTIONS.
5. SERRATED FLANGED BOLTS MAY BE REPLACED WITH EQUIVALENT PRESS-IN BOLTS.
6. PRESS-IN BOLTS, WHERE PRESENT, TO BE INSTALLED TO MANUFACTURERS RECOMMENDED VALUES.
7. OTHER SPECIFIC CONNECTIONS ELSEWHERE IN PRINT SET.
8. SERRATED HARDWARE MAY BE REPLACED WITH EQUIVALENT HARDWARE WITH WASHERS IF NECESSARY.
9. IN ALL DETAILS, THE PRESENCE OF TWO SETS OF HARDWARE INDICATES THE REQUIREMENT OF TWO SETS OF HARDWARE.
10. STAINLESS STEEL HARDWARE MAY BE REPLACED WITH GALVANIZED STEEL HARDWARE OR CORROSION AND STRENGTH COMPARABLE HARDWARE MATERIALS AND FINISHES.
11. UNLESS NOTED OTHERWISE, ALL HARDWARE MAY BE INSTALLED IN EITHER DIRECTION (NUT/BOLT MAY BE ON EITHER SIDE OF CONNECTION).
12. WHEN NECESSARY, ADDITIONAL HOLES MAY BE DRILLED TO COMPLETE CONNECTION. ENGINEERING SHALL BE CONTRACTED PRIOR TO FIELD MODIFICATIONS OF PARTS.
13. CONNECTION IN DETAIL A1 & A2 SHOWN IN NOMINAL POSITION. ACTUAL CONNECTION MAY BE ±5°.
14. WHEN CONNECTIONS IN DETAIL A1 & A2 ARE AT THEIR MAX/MIN POSITIONS (±2°) INTERFERING SPLICE HARDWARE MAY BE RELOCATED TO NEXT NEAREST SLOTS.
15. WHERE PRESENT, TRANSVERSE BRACE MAY UTILIZE LOWER SPLICE BOLTS. SEE CONNECTIONS SHEET FOR MORE INFORMATION.
16. ZEE-TO-ZEE SPLICE SHALL ALWAYS OVERLAP MINIMUM 32", AS INDICATED, EXCEPT AT ENDS OF ROW, WHERE NO SPLICE IS REQUIRED.
17. SPLICE MAY OVERLAP IN EITHER DIRECTION.
18. ZEE PURLIN MATERIAL AND FINISH ARE MANUFACTURED TO SPECIFICATIONS THAT MEET OR EXCEED OUR STANDARD PRODUCT WARRANTY.
19. ZEE PURLINS GALVANIZED TO CONFORM TO A MINIMUM THICKNESS DESIGNATION EQUAL TO G90 OR INLINE GALVANIZED TO COMPARABLE THICKNESS AS PER ASTM A1057.
20. TYPICAL ZEE PURLIN RETURN LIP ANGLE SHOWN. ACTUAL ANGLE MAY VARY.
21. SLOT DIMENSIONS FOR REFERENCE ONLY. FINAL SHAPE, FREQUENCY, AND DIMENSIONS MAY VARY.
22. LENGTH OF PURLIN VARIES BY PROJECT AND LOCATION WITHIN ARRAY.

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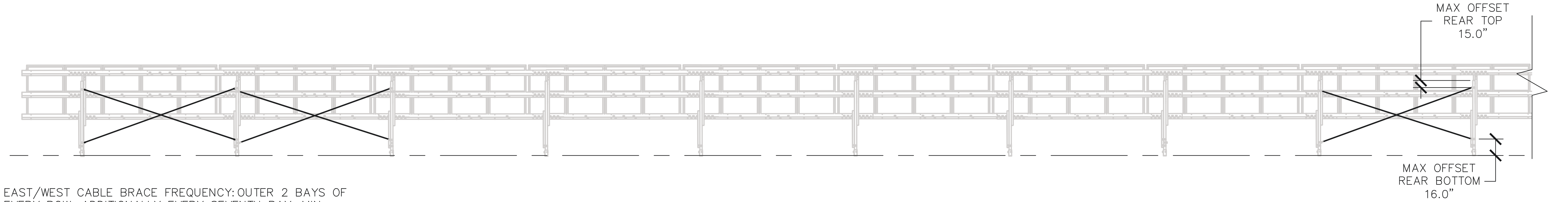
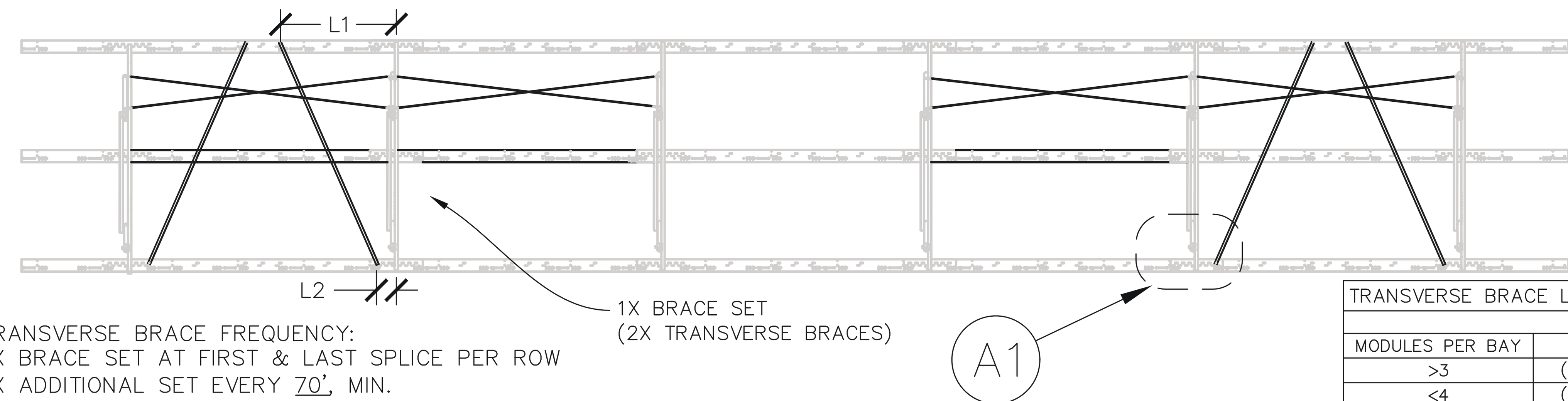
DRAWN	REVIEWED	APPROVED	SIZE
JK	TM	JDI	D

SHEET NAME: STRUCTURAL PURLINS
PROJECT NUMBER: 220028
DRAWING NUMBER: S.500 REV. A



EAST/WEST CABLE BRACE FREQUENCY: OUTER 2 BAYS OF EVERY ROW. ADDITIONALLY EVERY SEVENTH BAY, MIN

E1 REAR VIEW: CABLE BRACE FREQUENCY

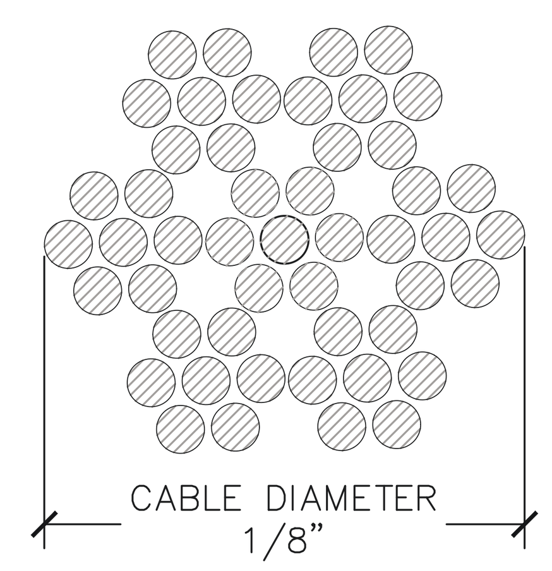


TRANSVERSE BRACE FREQUENCY:
1X BRACE SET AT FIRST & LAST SPLICE PER ROW
1X ADDITIONAL SET EVERY 70', MIN.

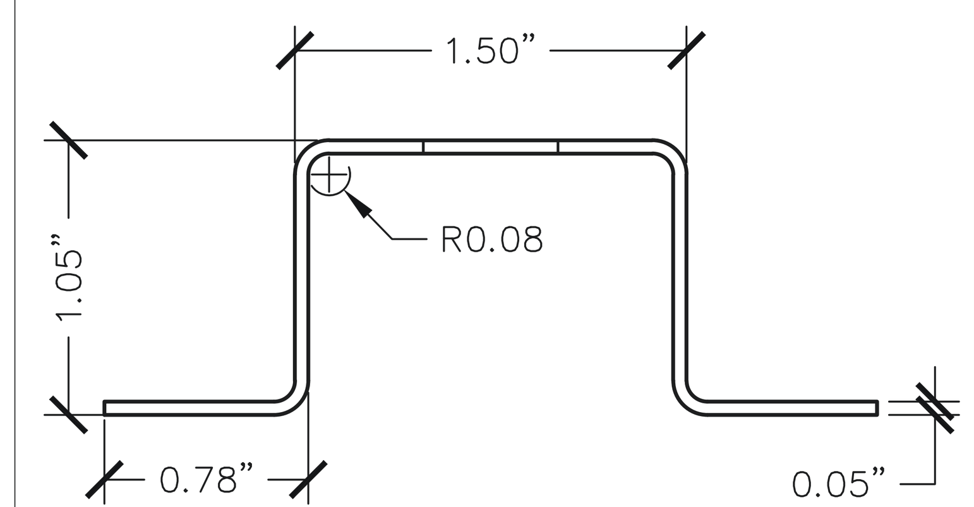
TRANSVERSE BRACE LOCATION FROM CHORD		
MODULES PER BAY	L1	L2
>3	(70.25")	(12.00")
<4	(52.00)"	(14.00")

D1 BOTTOM VIEW: TRANSVERSE BRACE LOCATIONS

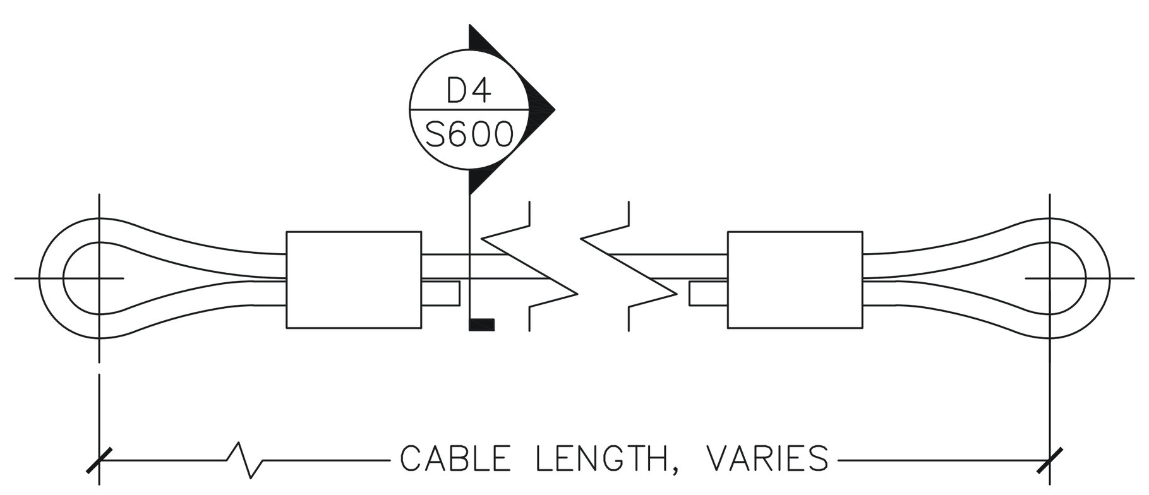
MIN. BREAKING STRENGTH: 1,700 LBS



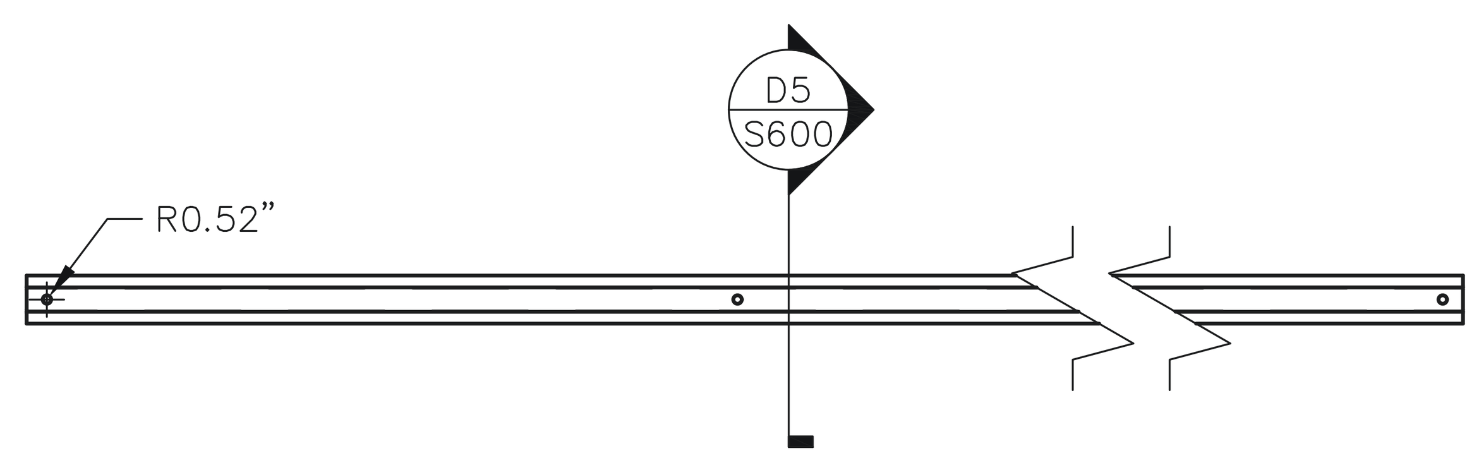
D4 SEC.: CABLE BRACE



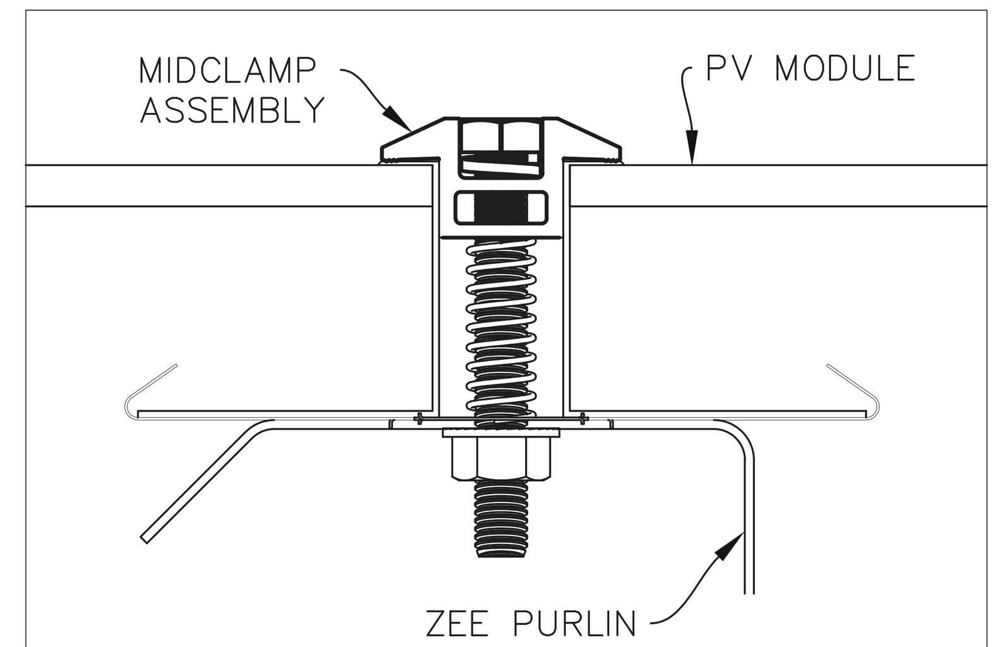
D5 SECTION: TVS BRACE



C1 PART: CABLE BRACE

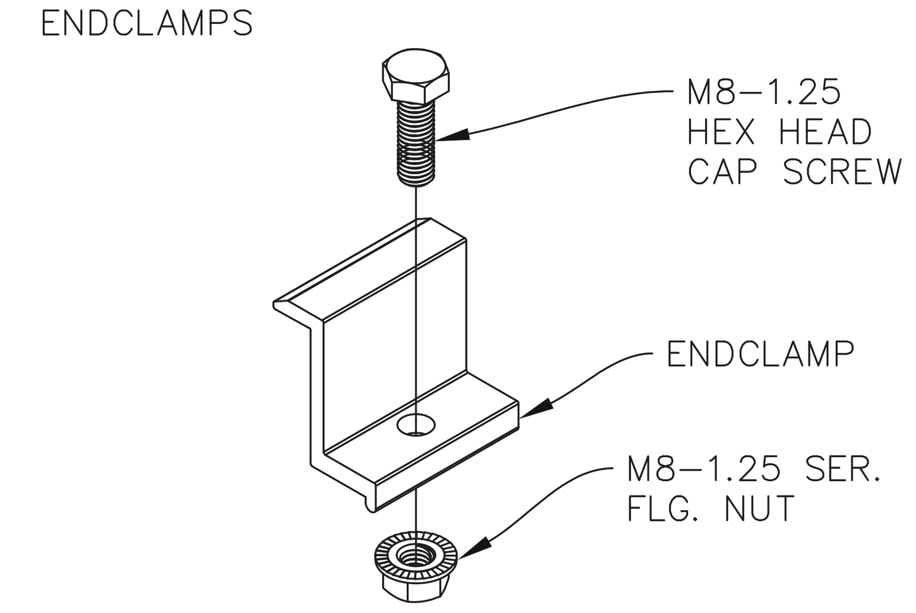


C2 PART: TRANSVERSE BRACE (TVS BRACE)

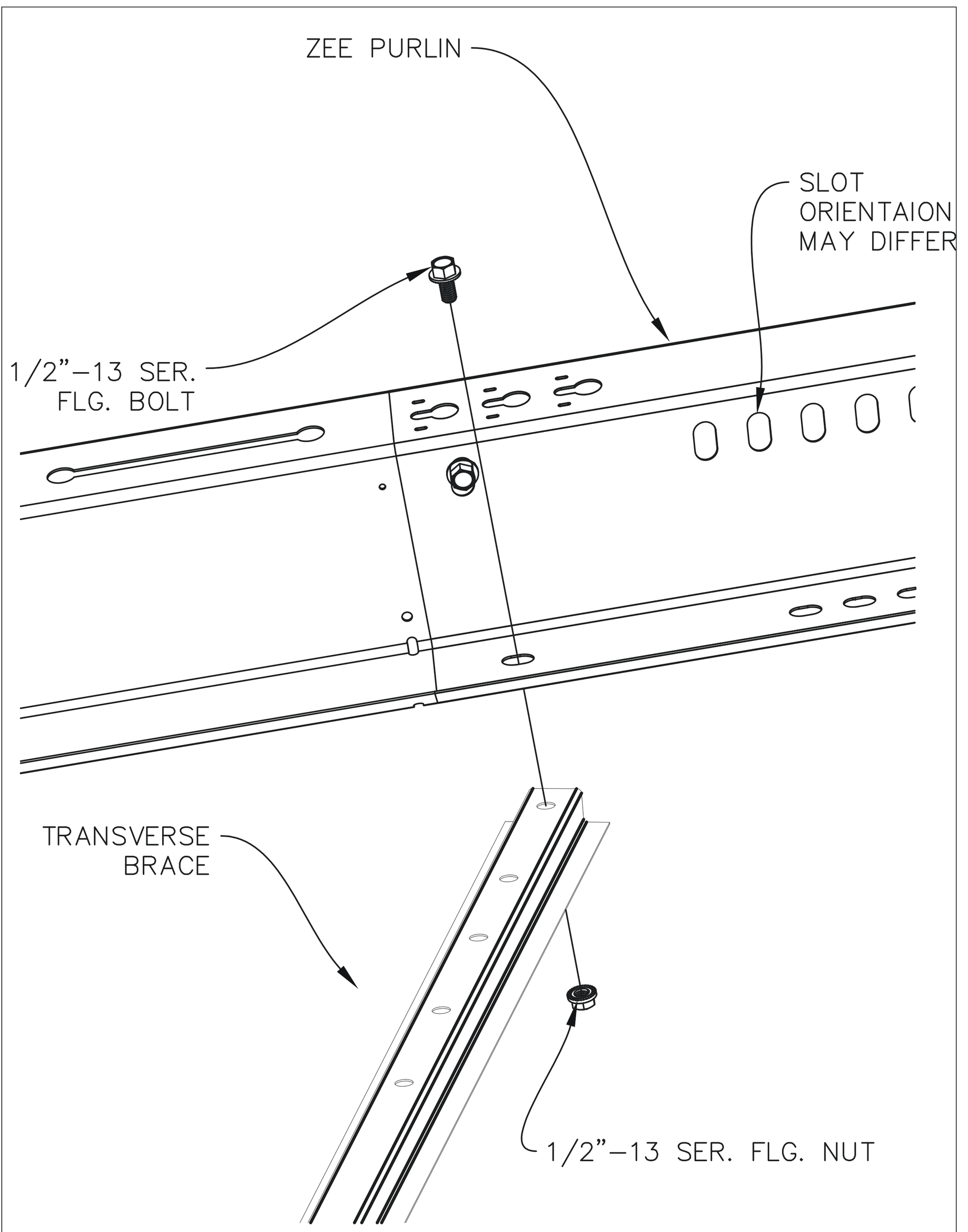


C4 CONNECTION: PV-TO-PURLIN

MAY NOT BE REPRESENTATIVE OF INSTALLED ENDCLAMPS



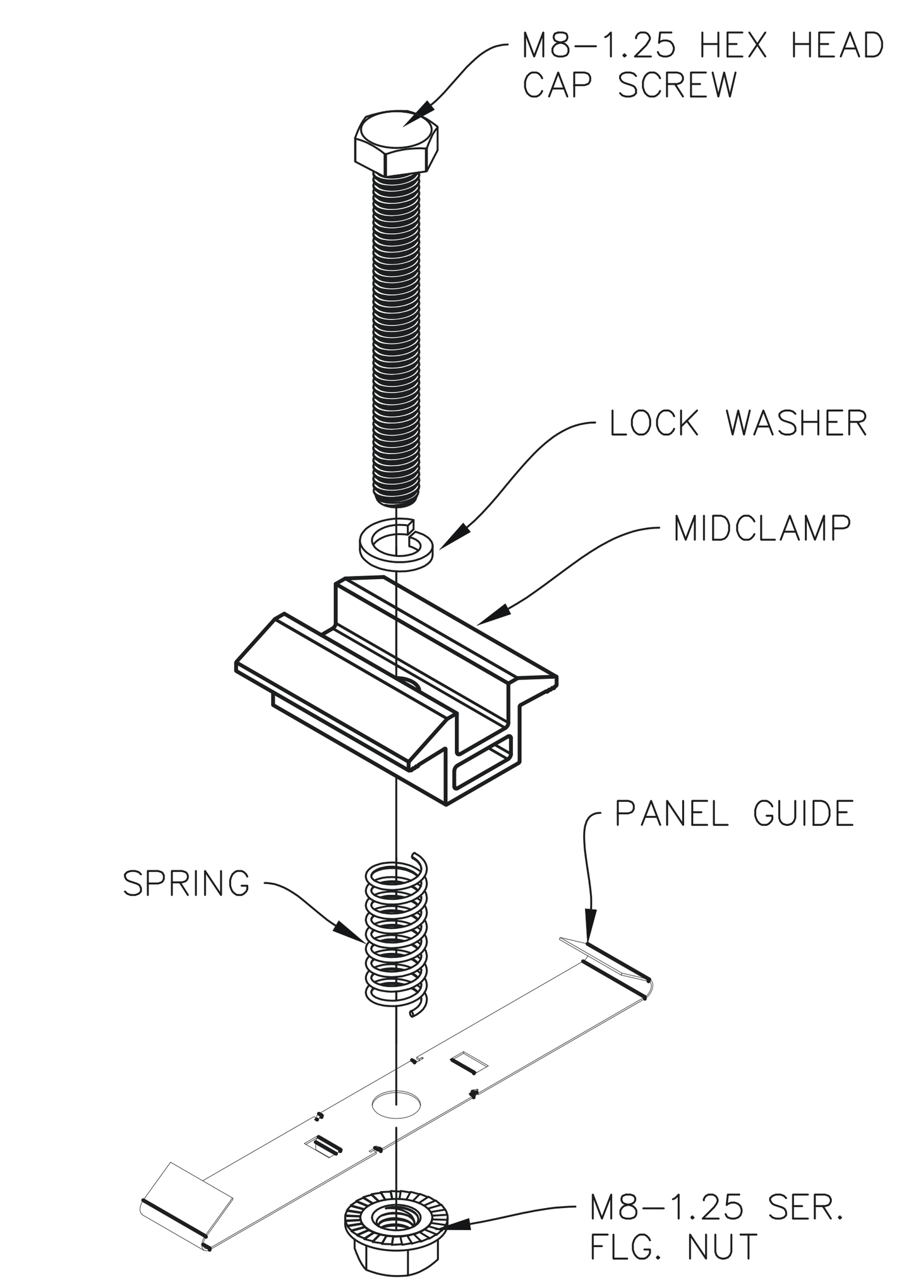
C5 ASSEMBLY: ENDCLAMP



A1 CONNECTION: TVS BRACE-TO-PURLIN

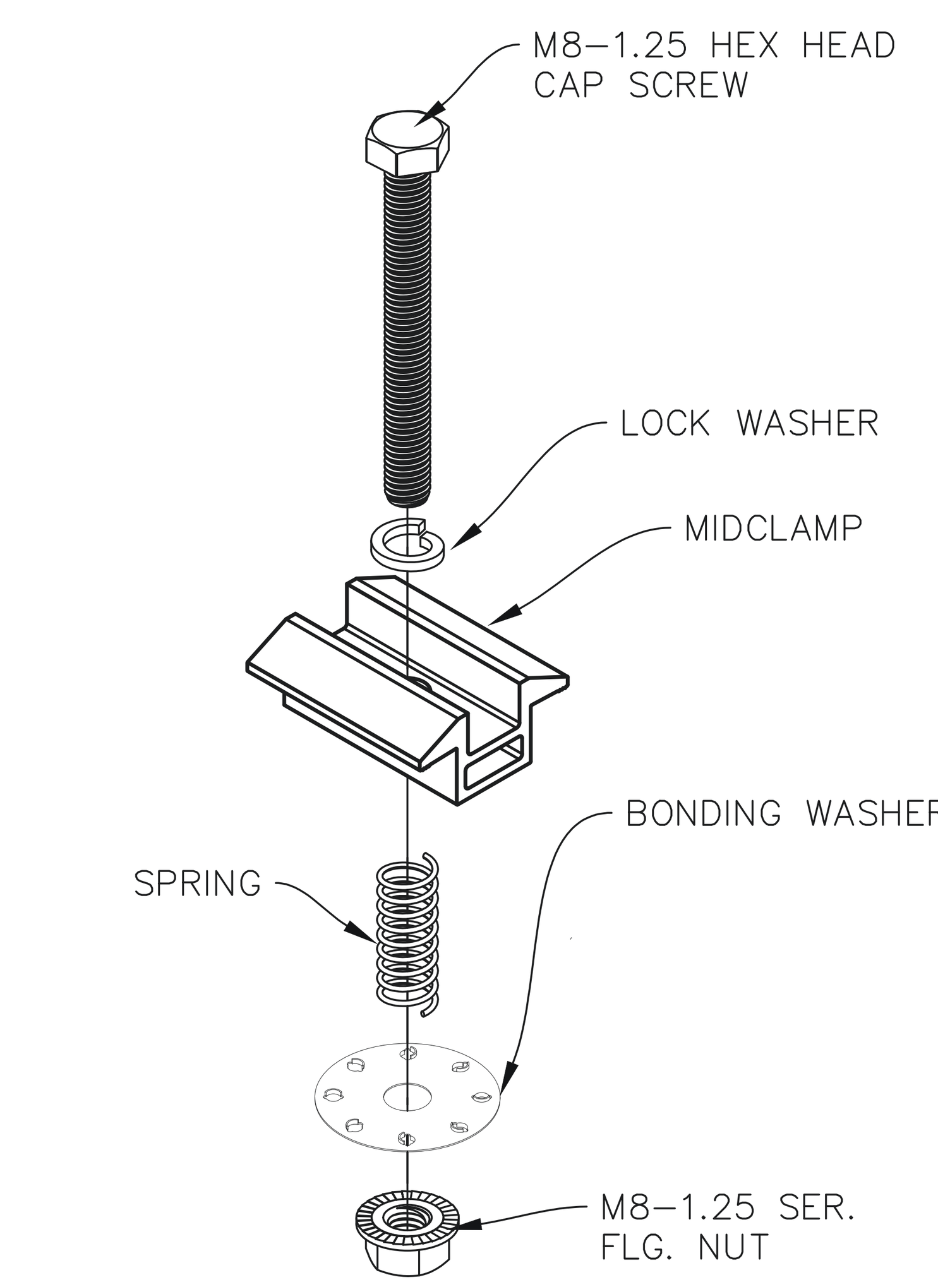
A2 TOP (ISO) VIEW: PV CLAMP LOCATIONS

MAY NOT BE REPRESENTATIVE OF INSTALLED MIDCLAMPS OR IT'S ASSEMBLY COMPONENTS.



A4 ASSEMBLY: MIDCLAMP

MAY NOT BE REPRESENTATIVE OF INSTALLED MIDCLAMPS OR IT'S ASSEMBLY COMPONENTS.



A5 ASSEMBLY: MIDCLAMP

NOTES:

1. HARDWARE TORQUE VALUES:

   1/2"-13 STAINLESS STEEL
   MIN.: 40 FT-LBS

   M8-1.25 STAINLESS STEEL
   MIN.: 14.0 FT-LBS
   NOM.: 15.6 FT-LBS
   MAX.: 25 FT-LBS

2. DEPICTED HARDWARE AND PART PLACEMENT NOT INDICATIVE OF PREFERRED OR REQUIRED POSITIONS.
3. HOLE/SLOT PATTERNS IN PARTS ALLOW FOR DEVIATION FROM NOMINAL DIMENSIONS, MULTIPLE PART POSITIONS, AND MULTIPLE TILT ANGLES.
4. SEE INSTALLATION MANUAL FOR SETUP INSTRUCTIONS.
5. SERRATED FLANGED BOLTS MAY BE REPLACED WITH EQUIVALENT PRESS-IN BOLTS. SEE NOTE 8 FOR MORE INFORMATION.
6. PRESS-IN BOLTS, WHERE PRESENT, TO BE INSTALLED TO MANUFACTURERS RECOMMENDED VALUES.
7. OTHER SPECIFIC CONNECTIONS ELSEWHERE IN PRINT SET.
8. SERRATED HARDWARE MAY BE REPLACED WITH EQUIVALENT HARDWARE WITH WASHERS IF NECESSARY.
9. STAINLESS STEEL HARDWARE MAY BE REPLACED WITH GALVANIZED STEEL HARDWARE OR CORROSION AND STRENGTH COMPARABLE HARDWARE MATERIALS AND FINISHES.
10. UNLESS NOTED OTHERWISE, ALL HARDWARE MAY BE INSTALLED IN EITHER DIRECTION (NUT/BOLT MAY BE ON EITHER SIDE OF CONNECTION).
11. WHEN NECESSARY, ADDITIONAL HOLES MAY BE DRILLED TO COMPLETE CONNECTION. ENGINEERING SHALL BE CONTRACTED PRIOR TO FIELD MODIFICATIONS OF PARTS.
12. EASE/WEST CABLE BRACING (C1) TO BE INSTALLED IN THE SPACE BETWEEN POST SETS (BAY).
13. MINIMUM CABLE BREAKING STRENGTH DETERMINED BY PROJECT SPECIFIC STRUCTURAL CALCULATIONS.
14. CABLE TO BE STAINLESS STEEL AIRCRAFT CABLE.
15. CABLE MAY BE OF ANY CONFIGURATION (IE. 7X7 OR 7X19) AS LONG AS IT MEETS THE REQUIREMENTS LISTED ON THIS SHEET.
16. LENGTH OF BRACES WILL VARY DEPENDENT ON PROJECT SPECIFICS.
17. TRANSVERSE BRACE SETS SHALL BE INSTALLED AT FREQUENCY INDICATED.
18. TRANSVERSE BRACE SHALL BE FASTENED IN THREE PLACES (ONCE TO EACH ZEE).
19. TRANSVERSE BRACES ARE NOT A REQUIREMENT OF THE STRUCTURAL MODELS. APA REQUIRES THEIR PRESENCE AS AN ASSEMBLY AID ONLY.
20. DUE TO IT'S NON-STRUCTURAL NATURE, TRANSVERSE BRACE PROFILE, THICKNESS, MATERIAL, STRENGTH, COATING, FREQUENCY, AND INSTALLATION MAY CHANGE AT ANY TIME AT THE DISCRETION OF APA, BY APPROVAL OF APA ENGINEERING.
21. WHERE TRANSVERSE BRACE CANNOT BE INSTALLED DUE TO NS CHORD (OUT OF NOMINAL LOCATION), BRACE SHALL BE RELOCATED TO NEXT NEAREST REASONABLE SPLICE.
22. TRANSVERSE BRACE MAY UTILIZE LOWER SPLICE BOLTS, WHERE PRESENT. SEE PURLIN SHEET FOR MORE INFORMATION.
23. EACH PV MODULE SHALL BE CLAMPED IN 4 PLACES.
24. A MAJORITY OF THE CLAMP BOLT FLANGES MUST TERMINATE OVER THE SLOT, AND NOT OVER THE KEYHOLE.
25. SPRING, & PANEL GUIDE MAY NOT BE PRESENT AT ALL LOCATIONS, OR ANY LOCATIONS.
26. ALL PANELS MUST BE GROUNDED/BONDED TO ZEE PURLINS. THIS MAY BE ACCOMPLISHED WITH THE PANEL GUIDE, BONDING WASHERS, DYNOBOND EQUIPMENT OR OTHER APPROVED GROUNDING DEVICE.

CUSTOMER

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WWW.APASOLAR.COM

RACKING TYPE
TITAN DUO

ENGINEER OF RECORD
the jdi group
architects & engineers
360 W. DUSSEL DR.
MAUMEE, OH 43537
|P| 419.725.7161 |F| 419.725.7160

PROFESSIONAL SEAL/STAMP
STATE OF CONNECTICUT
0036452
LICENSED PROFESSIONAL ENGINEER
5/17/23

DOCUMENT NAME: STRUCTURAL PRINT PACKAGE
SITE STREET ADDRESS: HADDAM QUARTER RD
SITE CITY, STATE, ZIP: DURHAM, CT 06422

SHEET REVISIONS		
REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	3/20/2023

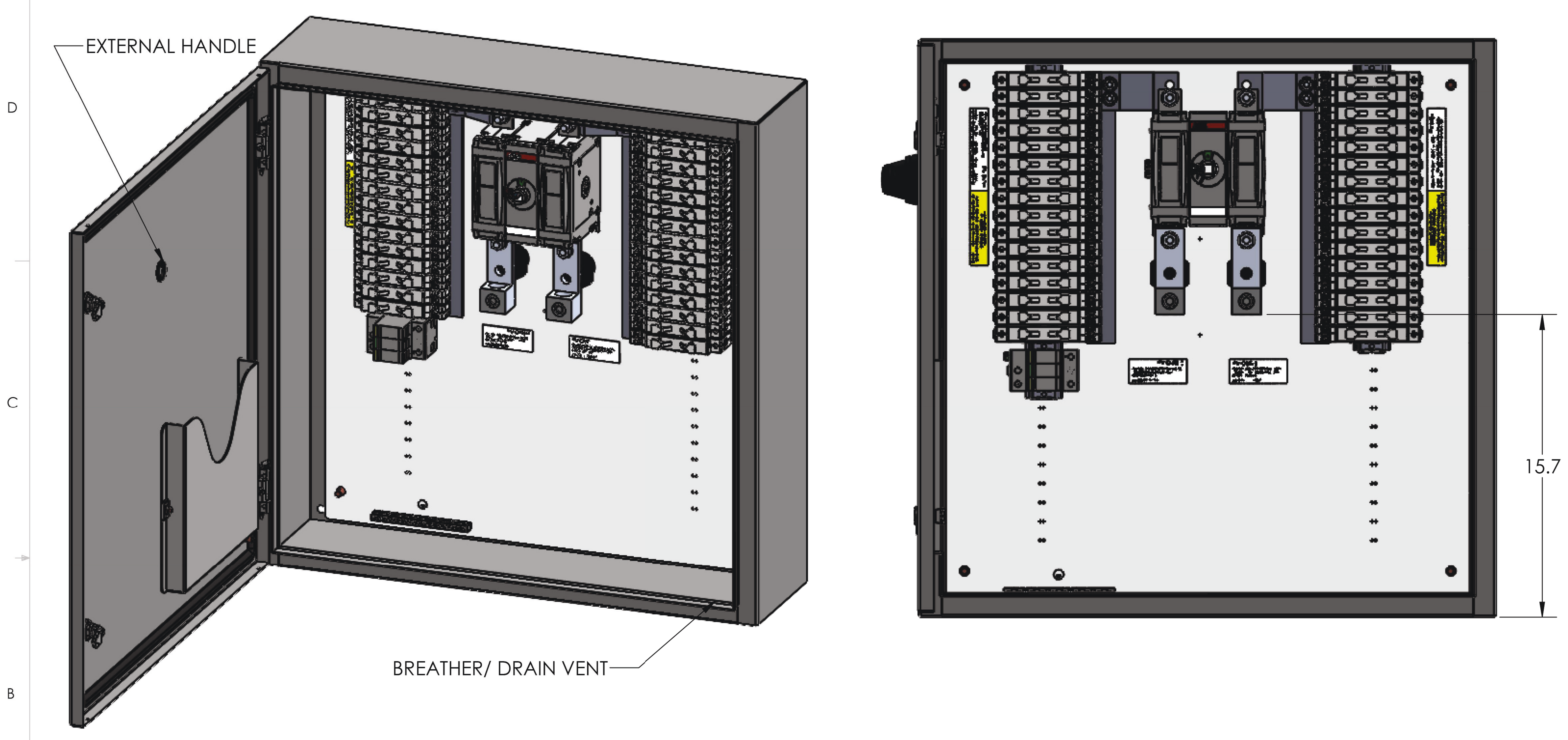
APPROVED

DRAWN	REVIEWED	APPROVED	SIZE
JK	TM	JDI	D

SHEET NAME: CLAMPS & BRACES

PROJECT NUMBER: 220028

DRAWING NUMBER: S.600 REV.: A



terrasmart™

CUSTOMER APPROVAL			
PRINTED NAME	TITLE	SIGNATURE	APPROVAL DATE

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±.050
THREE PLACE DECIMAL ±.010

INTERPRET GEOMETRIC TOLERANCING PER:

	NAME	DATE
MODEL	TYLER	10/28/2022
DRAWN	TYLER	10/28/2022
CHECKED		
MFG APPR.		
Q.A.		

MATERIAL — WEIGHT: 130lbs

FINISH — SCALE:

INTERNAL PART #
Q22-D0829B
Louth Callan Renewables

FILE: FSFT320-16-20-N4-CD — SIZE **B**

DESCRIPTION:
1500 VDC Floating
Disconnect Combiner

MODEL #:
FSFT320-16-20-N4-CD — REV 0

DO NOT SCALE DRAWING — SHEET 1 OF 2

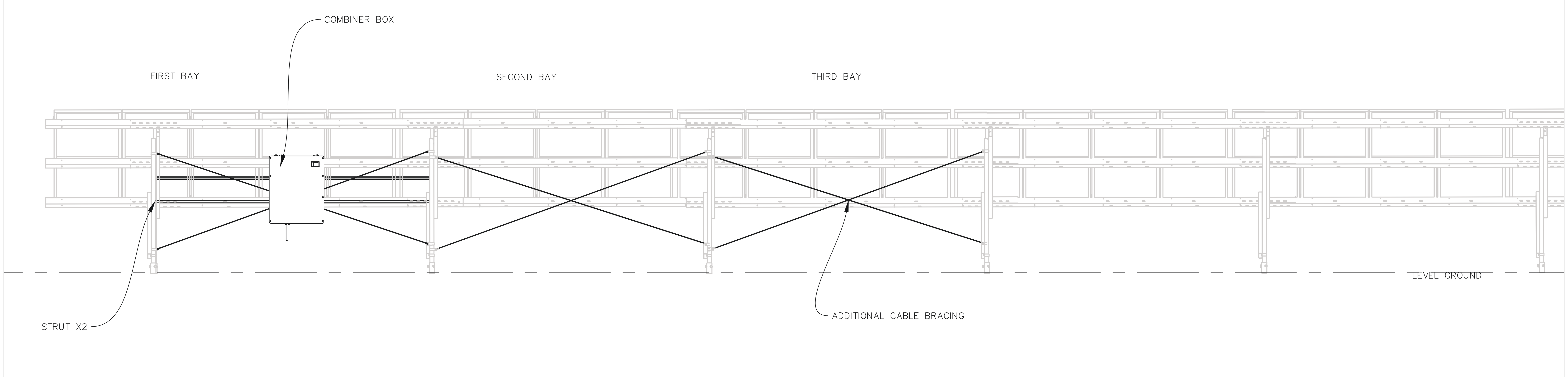
1500 VDC Disconnect Combiner per the following specifications (listed to UL-1741):

- 30x30x8" NEMA-4 powder coated steel enclosure
- 320 Amp dual polarity load break disconnect switch with external handle (disconnects positive and negative conductors)
- 32 x 20 Amp fuses
- 16 x Positive input touch-safe fuse holders, terminals sized to accommodate #14-8 conductors
- 16 x Negative input touch-safe fuse holders, terminals sized to accommodate #14-8 conductors
- 1 x Positive output terminal to accommodate 1 x #2-600 MCM conductors (Mechanical lug)
- 1 x Negative output terminal to accommodate 1 x #2-600 MCM conductors (Mechanical lug)
- PE Ground terminals sized for 7 x #14-6 and 4 x # 14-1/0 conductors (mechanical lug)
- 1500VDC surge suppression device installed by Terrasmart
- Breather/Drain vent installed by Terrasmart

30X30X8" POWDER COATED STEEL ENCLOSURE

NOTES:

1. COMBINER/INVERTER OR ANY OTHER WIRING EQUIPMENT SHALL BE HUNG AT THE REAR OF RACKING. INVERTERS SHALL BE CENTERED, OR EVENLY DISTRIBUTED IN BAY.
   - 1.1. MAX 1 INVERTERS PER BAY ARE ALLOWED, UP TO 1 BAYS CONSECUTIVELY, AS SHOWN IN VIEW A1.
   - 1.2. ONE PANEL BOARD PER BAY IS ALLOWED, UP TO ONE BAY CONSECUTIVELY, AS SHOWN IN VIEW A1.
2. TOTAL WEIGHT OF ELECTRICAL EQUIPMENT SUPPORTED BY THE APA RACKING POSTS SHALL NOT EXCEED:
   - 2.0.1. 1.2 LBS PER LINEAR FOOT (APPROXIMATELY 1 X 216 LB INVERTERS PER 184" POST-TO-POST SPAN), WITHOUT ADDITIONAL SUPPORT
3. IF WEIGHT EXCEEDS 1.2 LBS PER LINEAR FOOT AN ADDITIONAL FOUNDATION SET MUST BE INSTALLED IN THOSE BAYS . APPROXIMATELY AT THE MID POINT OF THE TWO ADJOINING POSTS.
4. INSTALLATION FOR ADDITIONAL FOUNDATION SET SHALL FOLLOW STANDARD APA PROCEDURES, AS DEFINED IN INSTALLATION MANUAL, SHEET S-200, AND ELSEWHERE.
5. REAR CABLE BRACING IN BAYS WITH MOUNTED ELECTRICAL EQUIPMENT MUST BE 1/8" IN DIAMETER TO SUPPORT THE ADDITIONAL WEIGHT CABLE BRACING MUST BE IN BAY WITH INVERTER AND 2 ADJACENT BAYS.
6. APA CANNOT GUARANTEE THE STRUCTURAL INTEGRITY OF ANY PARTS, HARDWARE, AND CONNECTIONS NOT PART OF THE ORIGINAL STRUCTURAL PACKAGE OR PURCHASED FROM APA. THIS INCLUDES, BUT IS NOT LIMITED TO, THE FOLLOWING TYPICAL MOUNTING PARTS:
   - 6.1. INVERTER MOUNTING STRUT
   - 6.2. STRUT TO FOUNDATION POST FASTENERS (U-BOLTS)
7. THE APA RACKING SYSTEM HAS BEEN ANALYZED AND DESIGNED TO ACCOMMODATE ADDITIONAL WEIGHT AND NOT TO EXCEED THE DESIGNATED WEIGHT. THE ADDITIONAL WEIGHT HAS BEEN FOUND NEGLIGIBLE ON BOTH THE LOCAL SYSTEM COMPONENTS (THE TWO SUPPORTING FOUNDATIONS), THE LOCAL FOUNDATION REACTIONS (AFFECTING GROUND SCREW SIZE AND DEPTH), AND THE RACK AND REACTIONS AS A WHOLE.
8. IF ADDITIONAL EQUIPMENT/WEIGHT, BEYOND THAT SHOWN, IS REQUIRED TO BE ADDED, APA SHALL BE CONTACTED IMMEDIATELY TO REEVALUATE THE STRUCTURE. ADDITIONAL FOUNDATION AND/OR OTHER STRUCTURAL COMPONENTS MAY BE REQUIRED TO BE INSTALLED/PURCHASED.
9. APA INSTALLED POSTS/PARTS SHALL NOT BE CUT OR DRILLED TO AN EXTENT THAT COMPROMISES THE STRUCTURAL INTEGRITY OF THE SYSTEM.
   - 9.1. TWO 3/8 HOLES PER POST IF NEEDED FOR STRUT ATTACHMENT.
10. ADDITIONAL PARTS AND FASTENERS REQUIRED TO HANG ELECTRICAL EQUIPMENT (FASTENERS, WIRING, STRUTS, U-BOLTS, ETC.) NOT PROVIDED BY AP ALTERNATIVES OR COVERED BY THE SCOPE OF THIS DOCUMENT.
11. APA ASSUMES NO LIABILITY FOR SAFETY CONCERNS ARISING FROM THE USE OF IT'S RACKING SYSTEM IN ANY OF THE AFOREMENTIONED USES.



A1 VIEW: TYPICAL ROW ELECTRICAL EQUIPMENT MOUNTING

CUSTOMER

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architects & engineers
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MAUMEE, OH 43537
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PROFESSIONAL SEAL/STAMP

DOCUMENT NAME: STRUCTURAL PRINT PACKAGE
SITE STREET ADDRESS: HADDAM QUARTER RD
SITE CITY, STATE, ZIP: DURHAM, CT 06422

SHEET REVISIONS

REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	3/20/2023
B	CHANGE TO COMBINER BOX	4/10/2023
C	UPDATED COMBINER BOX	4/21/2023

APPROVED

DRAWN	REVIEWED	APPROVED	SIZE
JK	TM	JDI	D

SHEET NAME: ELECTRICAL EQUIPMENT MOUNTING

PROJECT NUMBER: 220028

DRAWING NUMBER: S.904 — REV. B

ATTACHMENT 3

3,022.80 kW DC ~ 1,950.00 kW AC

HADDAM QUARTER ROAD SOLAR

ISSUE FOR PERMITTING SET: REV A | PROJECT #: 021019

1 SATELLITE IMAGE
NOT TO SCALE

2 SATELLITE IMAGE W/ PROJECT OVERLAY
NOT TO SCALE

PROJECT DETAILS	
PROJECT OWNER	LOUTH CALLAN RENEWABLES
PROJECT LOCATION:	41.487989, -72.650001
PARCEL #:	18-22
LANDOWNER:	NEWTON FAMILY TRUST
PROJECT AREA:	~ 10.85 ACRES
ROW SPACING:	16.5 FT

SYSTEM INFORMATION	
MODULE TYPE 1 / QTY:	(5,496) VSUN, VSUN550-144BMH-DG (550W)
INVERTERS:	(13) SMA SUNNY HIGHPOWER PEAK3 150-US
SYSTEM SIZE (DC / AC):	3,022.80kW DC / 1,950.00kW AC
MOUNTING SYSTEM:	FIXED TILT, 2 X 12 TABLES
TILT ANGLE:	25°
ARRAY AZIMUTH:	180°
MONITORING SYSTEM:	ALSOENERGY

PROJECT TEAM	
CONTRACTOR:	LOUTH CALLAN RENEWABLES 2 PEARSON WAY, ENFIELD, CT 06082 (860) 814-4379
EPC:	LOUTH CALLAN RENEWABLES 2 PEARSON WAY, ENFIELD, CT 06082 (860) 814-4379
ELECTRICAL ENGINEER:	LOUTH CALLAN RENEWABLES 2 PEARSON WAY, ENFIELD, CT 06082 (860) 814-4379
STRUCTURAL ENGINEER:	APA SOLAR RACKING 20-345 COUNTY ROAD X, RIDGEVILLE CORNERS, OH 43555 (419) 267-5280
CIVIL ENGINEER:	ALL- POINTS TECHNOLOGY CORPORATION SUITE 311, 567 VAUXHALL ST. EXTENSION, WATERFORD, CT 06385 (860) 663-1697
STORMWATER:	ALL- POINTS TECHNOLOGY CORPORATION SUITE 311, 567 VAUXHALL ST. EXTENSION, WATERFORD, CT 06385 (860) 663-1697
ENVIRONMENTAL:	PARTNER ENGINEERING AND SCIENCE, INC 135 CHESTNUT RIDGE RD, GROUND SUITE L101, MONTVALE, NJ 07645 (201) 942-0685

UTILITY INFORMATION	
UTILITY:	EVERSOURCE
UTILITY PROJECT #:	N/A
FEEDER VOLTAGE:	13.2 kV
FEEDER CIRCUIT:	#30K13
POI:	POLE #1148 ON JOHNSON LANE

FOR PERMITTING ONLY

SCOPE OF WORK:
TO INSTALL A SOLAR PHOTOVOLTAIC (PV) SYSTEM LOCATED AT
HADDAM QUARTER ROAD,
DURHAM, CT 06422.

THE PV SYSTEM WILL BE INTERCONNECTED WITH THE UTILITY GRID, WHEREIN THE GENERATED POWER SHALL BE FED IN TO UTILITY POLES.

SHEET INDEX LEGEND	
UPDATED DRAWING ISSUE	●
UNCHANGED DRAWING	○
DRAWING REMOVED FROM SET	⊗

		ONE LINE DIAGRAM (0%) MM/DD/YY	PROGRESS DESIGN (40%) MM/DD/YY	PROGRESS DESIGN (90%) MM/DD/YY	PROGRESS DESIGN (95%) MM/DD/YY	
T-001	TITLE SHEET	●	●	●		
T-002	GENERAL NOTES			●		
T-003	SYMBOLS AND ABBREVIATIONS			●		
A-101	SITE PLAN	●	●	●		
E-201	ELECTRICAL STRINGING PLAN - 1			●		
E-202	ELECTRICAL STRINGING PLAN - 2			●		
E-203	ELECTRICAL STRINGING PLAN - 3			●		
E-301	WIRE MANAGEMENT			●		
E-302	INVERTER DETAILS			●		
E-303	COMBINER BOX DETAILS			●		
E-304	RACKING DETAILS			●		
E-305	TRENCH DETAILS - 1			●		
E-306	TRENCH DETAILS - 2			●		
E-307	EQUIPMENT PAD DETAILS			●		
E-308	PAD STRUCTURAL DETAILS			●		
E-309	PAD GROUNDING DETAILS			●		
E-310	GROUNDING DETAILS - 1			●		
E-311	GROUNDING DETAILS - 2			●		
E-312	MEDIUM VOLTAGE DETAIL			●		
E-313	SWITCHGEAR DETAILS			●		
E-314	DAS SLD DETAILS			●		
E-315	COMMUNICATION DETAILS			●		
L-401	SINGLE LINE DIAGRAM - MV	●	●	●		
L-402	SINGLE LINE DIAGRAM - LV	●	●	●		
L-403	AC CABLE SCHEDULE			●		
L-404	DC CABLE SCHEDULE - 1			●		
L-405	DC CABLE SCHEDULE - 2			●		
S-501	STICKERS	●	●	●		
R-601	RESOURCE DOCUMENTS - 1	●	●	●		
R-602	RESOURCE DOCUMENTS - 2	●	●	●		

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE			
REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO:	N/A
CAD DWG FILE:	HADDAM QUARTER IFC
SHEET SIZE:	ANSI D
DRAWN BY:	
CHECKED BY:	
COPYRIGHT:	

SHEET TITLE

SITE PLAN

T-001

GENERAL NOTES AND SPECIFICATIONS

A. PROVIDE ALL MATERIALS, LABOR, EQUIPMENT, AND SERVICES AND PERFORM ALL OPERATIONS IN CONNECTION WITH THE ELECTRICAL WORK. IT IS THE INTENT THAT THESE DRAWINGS PROVIDE THE WORK REQUIRED FOR AN ELECTRICAL INSTALLATION THAT IS COMPLETE IN EVERY RESPECT, AND READY FOR OPERATION.

B. ALL WORK SHALL COMPLY WITH ALL LOCAL, STATE, AND FEDERAL CODES AND THE REQUIREMENTS OF ANY OF THE AUTHORITIES HAVING JURISDICTION. ALL MATERIAL AND EQUIPMENT SHALL BE UL LISTED AND SHALL BEAR THE UL INSPECTION LABEL WHEREVER STANDARDS HAVE BEEN ESTABLISHED AT THE COMPLETION OF THE WORK, SECURE CERTIFICATES OF APPROVAL FROM THE VARIOUS AUTHORITIES HAVING JURISDICTION, AND DELIVER SAME TO THE DESIGN PROFESSIONAL.

C. ALL WORK SHALL COMPLY WITH NECA STANDARD OF INSTALLATION (PUBLISHED BY THE NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION) AND NFPA 70 - NATIONAL ELECTRICAL CODE (NEC)-2020, MAINE ELECTRIC CODE, AND ALL APPLICABLE SAFETY STANDARDS. COMPLY WITH APPLICABLE STANDARDS THE OWNER HAS DEVELOPED AS THEY PERTAIN TO THIS WORK.

D. "PROVIDE" MEANS TO SUPPLY, ERECT, INSTALL, TEST, AND CONNECT UP IN COMPLETE READINESS FOR REGULAR OPERATION. THE PARTICULAR WORK REFERRED TO "FURNISH" MEANS TO SUPPLY AND DELIVER TO THE JOB. "INSTALL" MEANS TO RECEIVE, INSTALL AND CONNECT UP IN COMPLETE READINESS FOR REGULAR OPERATION, THE PARTICULAR WORK REFERRED TO. "APPROVED EQUAL" MEANS AN EQUIPMENT OR MATERIAL WHICH, IN THE OPINION OF THE DESIGN PROFESSIONAL, IS EQUAL IN QUALITY, DURABILITY, APPEARANCE, STRENGTH, DESIGN, PERFORMANCE, PHYSICAL DIMENSIONS, AND ARRANGEMENT TO THE EQUIPMENT OR MATERIAL SPECIFIED AND WILL FUNCTION ADEQUATELY IN ACCORDANCE WITH THE GENERAL DESIGN.

E. BEFORE SUBMITTING THE BID, VISIT EACH SITE WHERE WORK IS REQUIRED. SURVEY THE EXISTING CONDITIONS AND BECOME FAMILIAR WITH THE DIFFICULTIES WHICH WILL AFFECT THE EXECUTION AND COMPLETION OF THE WORK. INVESTIGATE THE NATURE AND LOCATION OF THE WORK, THE GENERAL AND LOCAL CONDITIONS, PARTICULARLY THOSE BEARING UPON THE WORK REQUIRED, TRANSPORTATION, DISPOSAL, HANDLING AND STORAGE OF MATERIALS, AVAILABILITY OF LABOR, WATER, ELECTRICAL POWER, ROADS, AND PHYSICAL CONDITIONS AT THE SITE NEEDED FOR THE PROSECUTION OF THE WORK AND ALL OTHER MATTERS UPON WHICH INFORMATION REASONABLY OBTAINABLE AND WHICH CAN IN ANY WAY AFFECT THE WORK OR THE COST THEREOF UNDER THE CONTRACT.

F. PROCURE AND PAY FOR ALL CERTIFICATES, FEES, TESTS, INSPECTIONS, BONDS, DEPOSITS, AND ESCROW ACCOUNTS REQUIRED FOR THE COMPLETE INSTALLATION OF THE WORK. GIVE ALL NOTICES REQUIRED BY LAW, ORDINANCES, OR THE RULES AND REGULATIONS OF THE VARIOUS AUTHORITIES. COMPLY WITH ALL ORDERS OF THE LOCAL DEPARTMENT OF BUILDINGS, COUNTY DEPARTMENTS OF HEALTH, FIRE MARSHAL, ETC. DELIVER TO THE OWNER'S REPRESENTATIVE ALL PERMITS AND CERTIFICATES OF APPROVAL ISSUED BY ALL TOWN, COUNTY AND STATE AGENCIES HAVING JURISDICTION IN CONNECTION WITH THIS WORK BEFORE THE CERTIFICATE FOR THE FINAL PAYMENT IS ISSUED.

G. NO WORK SHALL BE COVERED OVER UNTIL TEST HAVE BEEN PERFORMED AND THE AUTHORITIES HAVING JURISDICTION HAVE EXAMINED, INSPECTED AND APPROVED THE TESTS AND THE WORK. PROVIDE ALL CONTROLLED INSPECTIONS CONTROLLED REQUIRED BY THE REGULATIONS OF TOWN, COUNTY AND STATE. THE CONTROLLED INSPECTIONS SHALL BE MADE BY AN INSPECTOR MEETING THE PROFESSIONAL REQUIREMENTS SET FORTH BY STATE AND LOCAL LAWS AND SHALL BE CARRIED OUT IN ACCORDANCE WITH APPLICABLE TOWN, COUNTY AND STATE BUILDING CODES.

H. PROVIDE ALL NECESSARY INSURANCE, FREE OF EXTRA CHARGE AND AGREE TO INDEMNIFY AND SAVE HARMLESS THE PARTY CONTRACTING FOR SERVICES AGAINST LOSS OR EXPENSE.

I. THE DRAWINGS DO NOT UNDERTAKE TO ILLUSTRATE OR SET FORTH EVERY ITEM NECESSARY FOR THE WORK, AS IT IS ASSUMED THAT WITH THIS BID SUBMISSION, THE CONTRACTOR ACKNOWLEDGES THAT HE/SHE IS EXPERT IN THE SEVERAL LINES OF THE WORK AND IS CAPABLE OF INTERPRETING THEM. WHERE NO SPECIFIED MANUFACTURER OR QUALITY OF MATERIAL IS GIVEN, A FIRST-CLASS STANDARD ARTICLE AS APPROVED BY THE DESIGN PROFESSIONAL SHALL BE FURNISHED.

J. THE DRAWINGS ARE GENERALLY DIAGRAMMATIC AND ARE INTENDED TO CONVEY THE SCOPE OF WORK AND INDICATE GENERAL ARRANGEMENT OF EQUIPMENT, CONDUITS, PANELS, FIXTURES, ETC. THE LOCATION OF ALL ITEMS SHOWN THAT ARE NOT DEFINITELY FIXED BY DIMENSIONS ARE APPROXIMATE. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED AT THE PROJECT AND SHALL HAVE THE APPROVAL OF THE DESIGN PROFESSIONAL BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.

K. MAINTAIN AND PROTECT ALL EQUIPMENT, MATERIALS AND TOOLS FROM LOSS OR DAMAGE FROM ALL CAUSES UNTIL FINAL ACCEPTANCE BY THE OWNER.

L. IT IS REQUIRED THAT THE WORK INDICATED BE CARRIED OUT WITH A MINIMUM OF INTERFERENCE TO THE ESTABLISHED ROUTINE OF THE EXISTING BUILDINGS AND THAT ALL WORK BE PERFORMED WITHIN THE REQUIRED CONTRACT TIME.

M. THE OWNER'S REPRESENTATIVE SHALL BE NOTIFIED IN WRITING WHEN INTERRUPTION OF THE PRESENTLY MAINTAINED SERVICES, MECHANICAL, ELECTRICAL OR OTHERWISE IS REQUIRED. WRITTEN PERMISSION SHALL BE OBTAINED FROM THE OWNER'S REPRESENTATIVE PRIOR TO COMMENCING WITH THE SHUT-DOWN.

N. PROVIDE ALL NECESSARY TRAILERS, EXTENSION CORDS AND LAMPS TO PROVIDE TEMPORARY LIGHT AND POWER FOR THE PROPER EXECUTION OF ALL WORK.

O. PROVIDE ALL SCAFFOLDING, RIGGING, HOISTING AND SERVICES NECESSARY FOR ERECTION AND DELIVERY INTO THE PREMISES OF ANY EQUIPMENT AND APPARATUS FURNISHED. REMOVE SAME FROM PREMISES WHEN NO LONGER REQUIRED.

P. ALL WORK SHOWN ON THE DRAWINGS THAT IS NOT SPECIFICALLY INDICATED AS BEING EXISTING SHALL BE ASSUMED TO BE NEW.

Q. THE INSTALLATION OF ALL ELECTRICAL EQUIPMENT, LIGHTING, CONDUIT, AND WIRING SHALL CONFORM TO THE LATEST EDITION IBC CODE EARTHQUAKE CONTROL SECTION 1622.

R. NO PART OF THESE DRAWINGS OR SPECIFICATIONS IS INTENDED TO ALLOW A VIOLATION OF PHYSICAL WORKING SPACE REQUIREMENTS AROUND ELECTRICAL EQUIPMENT.

S. VERIFY ALL UNDERGROUND UTILITIES WITH GROUND PENETRATING RADAR PRIOR TO ANY EXCAVATION.

T. USE "CALL BEFORE YOU DIG" SERVICE PRIOR TO ANY EXCAVATION.

U. CONTRACTOR TO PROVIDE TOILET FACILITIES DURING CONSTRUCTION.

V. THE PV ARRAY IS LOCATED ON A GROUND MOUNT.

W. CONSTRUCTION HOURS ARE AS FOLLOWS: MONDAY - FRIDAY AT 6:30AM - 3:30PM.

1.2 BUILDING PENETRATIONS

A. ALL PENETRATIONS TO BE SEALED WITH FIREPROOF SEALANT WITH FIREHOUR RATING TO MATCH EXISTING WALL.

1.3 TESTS

A. WIRE AND CABLE: PERFORM INSULATION RESISTANCE AND CONTINUITY TESTS FOR ALL CONDUCTORS. THESE SHALL BE COMPLETED PRIOR TO ENERGIZING. INVESTIGATE AND TAKE REMEDIAL ACTION WHEN CONTINUITY VALUES EXCEED 1.0 OHM AND/OR INSULATION RESISTANCE TESTS LESS THAN 500 MEGAOHMS.

B. GROUND RESISTANCE TESTS: RESISTANCE OF THE ELECTRICAL SYSTEM GROUNDING SHALL BE TESTED TO GROUND AT THE MAIN GROUND ELECTRODE CONNECTION TO ENSURE THAT GROUND RESISTIVITY VALUES DO NOT EXCEED 25 OHMS. SUPPLEMENTAL GROUNDING ELECTRODES MAY NOT EXCEED 25 OHMS.

1.4 GROUNDING

A. COMPLY WITH REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION, NEC, UL, AND IEEE STANDARDS. SIZE GROUND CONDUCTORS IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE EXCEPT WHERE LARGER SIZES ARE INDICATED. ALL GROUND CONDUCTORS SHALL BE NOT SMALLER THAN NO.12 AWG. PROVIDE A COMPLETE ASSEMBLY OF MATERIALS REQUIRED FOR GROUNDING AND BONDING. GROUNDING ELECTRODE CONDUCTORS SHALL BE COPPER.

B. GROUNDING BUSHINGS SHALL BE HOT-DIPPED GALVANIZED BODY, MOLDED PHENOLIC INSULATION, RATED AT 150 DEG C. WITH COPPER-TINNED LAY-IN LUG. PROVIDE FOR ALL INCOMING AND OUTGOING CONDUITS TO THE DISTRIBUTION EQUIPMENT. USE STAINLESS STEEL SCREWS.

C. GROUND RODS SHALL BE STEEL CORE, COPPER JACKETED TYPE, HIGH STRENGTH STEEL ALLOY CORE WITH A MOLTEN-WELDED COVERING AND CONICAL POINT WITH CHAMFER EDGE AT TOP. DRIVING HEADS SHALL BE USED TO PROTECT THE TOPS OF RODS DURING DRIVING. THE MINIMUM SIZE ROD SHALL BE 5/8 INCH DIAMETER AND AT LEAST 8 FEET LONG IN CONTACT WITH SOIL AS REQUIRED BY THE CODE.

D. GROUND CONNECTORS FOR CONNECTING CABLE TO PIPE SHALL BE HIGH COPPER ALLOY OR BRONZE FITTINGS. PROVIDE AN OFFSET STEEL TONGUE FOR CONNECTIONS TO STEEL AND A DRILLED TONGUE FOR CONNECTION TO COPPER BUS BAR.

E. EXPOSED NON-CURRENT CARRYING METAL PARTS OF MODULE FRAMES, EQUIPMENT, AND ENCLOSURES SHALL BE GROUNDED IN ACCORDANCE WITH NEC 250.134 AND 250.136(A). PHOTOVOLTAIC MODULES ARE TO BE GROUNDED USING FACTORY GROUND POINT ONLY OR ANY METHOD THAT DOES NOT VIOLATE THE MODULE'S UL LISTING AND MUST BE APPROVED BY THE DESIGN PROFESSIONAL.

F. GROUND CONTINUITY SHALL BE MAINTAINED ACROSS THE CONDUIT/ENCLOSURE INTERFACE USING THE APPROVED JUMPER METHOD.

G. PARTS OF THE ELECTRICAL INSTALLATION TO BE GROUNDED AND BONDED SHALL INCLUDE BUT NOT BE LIMITED TO ELECTRICAL EQUIPMENT, RACEWAYS, CABLE TRAYS, BOXES, CABINETS, AND OTHER NON-CURRENT CARRYING METAL PARTS OF THE WIRING SYSTEM, METAL CONDUIT, SWITCHGEAR, HOUSING, AND NEUTRALS OF TRANSFORMERS, LIGHTING FIXTURES, PANEL DEVICES, FENCES AROUND ELECTRICAL EQUIPMENT AS APPLICABLE TO EQUIPMENT INSTALLED ON THIS PROJECT.

H. USE EXOTHERMIC WELDING FOR PERMANENTLY CONCEALED BURIED AND INACCESSIBLE CONNECTIONS TO FORM SOLID METAL JOINTS. MAKE ACCESSIBLE GROUND CONNECTIONS WITH MECHANICAL PRESSURE-TYPE GROUND CONNECTIONS UNLESS OTHERWISE NOTED.

I. APPLY CORROSION-RESISTANT FINISH TO FILED-CONNECTIONS, BURIED METALLIC GROUNDING AND BONDING PRODUCTS, AND PLACES WHERE FACTORY APPLIED PROTECTIVE COATINGS HAVE BEEN DESTROYED, WHICH ARE SUBJECTED TO CORROSIVE ACTION.

1.5 CONDUITS AND FITTINGS

A. ABOVE GROUND: PVC SCH 80 WITH EXPANSION FITTINGS AND TRANSITION TO PVC SCH 40 AFTER EXPANSION FITTING TO EQUIPMENT AS APPLICABLE.

B. RACEWAYS IN CLOSE PROXIMITY TO OTHER TRADES, SHALL BE ARRANGED TO ALLOW FOR PROPER CLEARANCE FOR SERVICING, MAXIMUM HEADROOM, ETC. AND TO PRESENT A NEAT APPEARANCE. MAINTAIN ADEQUATE CLEARANCE BETWEEN CONDUIT AND PIPING WITH A MINIMUM OF 12 INCHES CLEARANCE BETWEEN CONDUIT AND SURFACES WITH TEMPERATURES EXCEEDING 104 DEGREES F.

C. JOIN RACEWAYS WITH FITTINGS DESIGNED AND APPROVED FOR THE PURPOSE AND MAKE JOINTS TIGHT. WHERE JOINTS CAN NOT BE MADE TIGHT, USE BONDING JUMPERS TO PROVIDE ELECTRICAL CONTINUITY OF THE RACEWAY SYSTEM. MAKE RACEWAY TERMINATIONS TIGHT. WHERE SUBJECT TO VIBRATION OR DAMPNESS, USE INSULATION BUSHINGS TO PROTECT CONDUCTORS. CUT CONDUIT SQUARE USING SAW OR PIPE CUTTER AND DE-BURR CUT ENDS.

D. USE CONDUIT HUBS OR SEALING LOCKNUTS TO FASTEN CONDUIT TO BOXES IN DAMP AND WET LOCATIONS.

E. SUPPORT CONDUIT USING STEEL OR MALLEABLE IRON SINGLE- OR DOUBLE-HOLE CONDUIT STRAPS, LAY-IN ADJUSTABLE HANGERS, CLEVIS HANGERS AND SPLIT HANGERS AS REQUIRED. FASTEN CONDUIT SUPPORTS TO STRUCTURE AND SURFACES. DO NOT ATTACH CONDUIT SUPPORTS TO CEILING SUPPORT WIRES, OR ANY OTHER CONDUIT, PIPE, DUCT, ETC. DO NOT SUPPORT CONDUIT WITH WIRE OR PIPE HANGER STRAPS. ALL SUPPORTS SHALL CONFORM TO NEC 344.30.

F. BELOW GRADE: PVC SCHEDULE 80 OR PVC SCHEDULE 40. VERIFY WITH THE DESIGN ENGINEER PRIOR TO INSTALLATION. CONDUIT NEMA TC2 UL 651, WITH MATCHING FITTINGS BY SAME MANUFACTURER AS THE CONDUIT. COMPLYING WITH NEMA TC 3 AND UL 51413.

G. CONDUIT EXPANSION FITTINGS SHALL BE PROVIDED AS REQUIRED PER NEC 300.7 & 352.44.

H. ALL CONDUITS SHALL BE SEALED AT ALL ENDS.

1.6 WIRE AND CABLE

A. ALL WIRE BETWEEN COMBINER BOXES AND INVERTER TO BE ALUMINUM. ALL ALUMINUM CONDUCTORS TO BE CODE REQUIRED AND INDUSTRY STANDARD AA-8000 ALUMINUM ALLOY CONDUCTORS.

B. PULL CONDUCTORS SIMULTANEOUSLY WITH UL LISTED PULLING COMPOUND OR LUBRICANT FOR BUILDING WIRE #4 AWG AND LARGER. USE PULLING MEANS INCLUDING FISH TAPE, CABLE, ROPE, AND BASKET WEAVE WIRE/CABLE GRIPS WHICH WILL NOT DAMAGE CABLES OR RACEWAYS. TENSION GAGE SHALL BE USED ON ALL MECHANIC PULLING PROCEDURES. PULL TENSION AND SPEED SHALL BE RECORDED DURING ALL PULLS. MAXIMUM TENSION AND SPEED SHALL BE CALCULATED BEFOREHAND.

C. ALL WIRING SHALL BE FACTORY COLOR CODED. FOR MODIFICATIONS TO EXISTING SYSTEMS, MATCH COLOR CODING SCHEME ALREADY IN PLACE. OTHERWISE FEEDER AND BRANCH CIRCUIT CONDUCTORS SHALL BE COLOR CODED AS FOLLOWS:

PHASE	208Y/120V	480Y/277V	600V AND GREATER
A	BLACK	BROWN	BLACK WITH COLOR STRIPE
B	RED	ORANGE	BLACK
C	BLUE	YELLOW	GREEN/BARE
NEUTRAL	WHITE	GRAY	GRAY
GROUND	GREEN	GREEN	GREEN

D. ALL WIRING IN PANELS SHALL BE NEATLY TIE-WRAPPED AND TRAINED WITHIN GUTTER SPACES.

E. POSITIVE AND NEGATIVE PV WIRES SHALL BE VISUALLY DESIGNATED DIFFERENTLY BETWEEN TERMINATION POINTS. ALL BLACK INSULATION FOR POSITIVE AND NEGATIVE WIRES WILL NOT BE ALLOWED. TIE WRAPS SHALL BE WEATHER AND OIL/GAS RESISTANT. TIE WRAPS MUST BE NYLON COATED STEEL OR BE UV STABILIZED GUARANTEED FOR 25 YEARS.

F. COMPRESSION TYPE CONNECTORS ARE TO BE USED AT ALL TIMES UNLESS THE MANUFACTURER'S INSTRUCTION MANUAL REQUIRES A MECHANICAL TYPE CONNECTION.

G. ALL ALUMINUM TERMINATIONS NEED ANTI-OXIDATION COMPOUND.

1.7 BOXES

A. GALVANIZED STEEL PULL BOXES: NEMA OS 1 WITH WELDED SEAMS. WHERE NECESSARY TO PROVIDE A RIGID ASSEMBLY, ALL ALUMINUM TERMINATIONS NEED ANTI-OXIDATION COMPOUND. CONSTRUCT WITH INTERNAL STRUCTURAL STEEL BRACING, HOT-DIP GALVANIZED AFTER FABRICATION. COVER SHALL BE GASKETED, SCREWED OR BOLTED ON OF MATERIAL SAME AS BOX AND SHALL BE OF SIZE AND SHAPE TO SUIT APPLICATION. SIZES SHALL BE ADEQUATE TO MEET NEC VOLUME REQUIREMENTS, BUT IN NO CASE SMALLER THAN SIZES INDICATED. REMOVE SHARP EDGES WHERE THEY MAY COME IN CONTACT WITH WIRING OR PERSONNEL.

B. FOR INTERIOR DRY LOCATIONS USE GALVANIZED SHEET STEEL, NEMA TYPE 1. FOR LOCATIONS EXPOSED TO WEATHER OR DAMPNESS USE NEMA TYPE 3R BOXES, FULLY GASKETED. FOR WET LOCATIONS USE NEMA TYPE 4 BOXES WITH FULLY GASKETED WEATHERPROOF COVERS.

C. ELECTRICALLY GROUND ALL METAL BOXES TO CONDUIT SYSTEM. WHERE WIRING TO ITEMS INCLUDES A GROUNDING CONDUCTOR, ALSO PROVIDE A GROUNDING TERMINAL IN THE INTERIOR OF THE CABINET, BOX OR ENCLOSURE.

1.8 SUPPORTING DEVICES

A. PROVIDE MATERIALS, SIZES AND TYPES OF ANCHORS, FASTENERS AND SUPPORTS TO CARRY THE LOADS OF EQUIPMENT AND CONDUIT. CONSIDER THE WEIGHT OF WIRE IN CONDUIT WHEN SELECTING PRODUCTS. ATTACHMENTS SHALL BE RATED BY AN INDEPENDENT TESTING LABORATORY FOR THE RATED LOADING WITH A SAFETY FACTOR OF FIVE. USE VIBRATION AND SHOCK-RESISTANT FASTENERS FOR ATTACHMENTS TO CONCRETE SLABS. DO NOT USE SPRING STEEL CLIPS AND CLAMPS, POWDER-ACTUATED ANCHORS, TESTING FOR CONCRETE AND STEEL ATTACHMENTS SHALL BE IN ACCORDANCE WITH TEST CRITERIA ESTABLISHED BY UL SUPPORTS, SUPPORT HARDWARE, AND FASTENERS SHALL BE PROTECTED WITH ZINC COATING OR WITH TREATMENT OF EQUIVALENT CORROSION RESISTANCE. PRODUCTS FOR USE OUTDOORS SHALL BE HOT-DIP GALVANIZED. IN CORROSIVE AREAS, PRODUCTS SHALL BE TREATED WITH 15 MIL PVC COATING. ALL PRODUCTS SHALL BE TREATED AFTER CUTTING AND THREADING.

B. PROVIDE ANY SPECIAL WORK, INCLUDING BUT NOT LIMITED TO INTERMEDIATE STEEL CHANNELS, THAT MAY BE REQUIRED TO OVERCOME UNUSUAL CONDITIONS. DO NOT FASTEN TO ANY TRADES OTHER THAN THE STRUCTURAL SYSTEM.

C. PROVIDE SUPPORTS FOR ALL RACEWAYS INCLUDING U-CHANNEL SYSTEMS, RISER CLAMPS, CONDUIT STRAPS, THREADED C-CLAMPS WITH RETAINERS AND WALL BRACKETS.

D. CONCRETE STRUCTURAL ELEMENTS AND MASONRY WALLS: USE CARBON STEEL WEDGE OR SLEEVE TYPE EXPANSION ANCHORS. COORDINATE ALL ANCHOR LOCATIONS IN POST-TENSIONED SLABS. HOLES CUT DEPTH OF MORE THAN 1-1/2 INCHES IN REINFORCED CONCRETE BEAMS OR MORE THAN 3/4 INCH IN REINFORCED CONCRETE SHALL NOT CUT THE MAIN REINFORCING BARS. FILL HOLES THAT ARE NOT USED.

E. HOLLOW MASONRY: USE STEEL SPRINGHEAD TYPE TOGGLE BOLTS AND HOLLOW WALL FASTENERS.

F. STEEL STRUCTURAL ELEMENTS: USE BEAM CLAMPS, STEEL FASTENERS AND CLEVIS HANGERS.

G. STEEL SURFACES: MACHINE SCREWS, WELDED THREADED STUDS, OR SPRING-TENSION CLAMPS.

H. PARTITIONS OF LIGHT STEEL CONSTRUCTION: SHEET METAL SCREWS.

I. WOOD ELEMENTS: USE WOOD SCREWS.

J. U-CHANNEL SYSTEMS: 12 GAUGE CARBON STEEL CHANNELS, WITH 9/16 X 7/8 INCH HOLES IN TOP SURFACE, 2 INCHES ON MANUFACTURER. PROVIDE ANGLES AND OTHER STANDARD STRUCTURAL SHAPES. CONNECT WITH WELDS OR MACHINE BOLTS TO FORM RIGID SUPPORTS.

K. A HANGER OR SUPPORT SHALL BE INSTALLED CLOSE TO THE POINT OF A CHANGE IN DIRECTION OF ALL CONDUIT RUNS, IN EITHER A HORIZONTAL OR VERTICAL PLANE.

L. UNDER NO CONDITIONS SHALL ANY HANGERS, SUPPORTS, BOLTS, OR RIVETS PIERCE DUCTS. THE PUNCHING OF HOLES IN STRUCTURAL SHAPES WILL NOT BE ALLOWED. "C" CLAMPS WILL NOT BE ACCEPTED AS A MEANS OF FASTENING EQUIPMENT OR CONDUITS TO THE BUILDING STRUCTURE, UNLESS HE HANGER SPACING IS REDUCED BY 33-1/3%.

M. SPACING OF CONDUIT SUPPORTS AS PER NEC REQUIREMENTS.

N. CABLE TIES FOR WIRE AND CABLE: PROVIDE CLIPS FROM WILEY ELECTRONICS OR APPROVED EQUAL.

O. TORQUE MARKS SHALL BE APPLIED TO ALL FASTENERS, SCREWS, ETC THAT REQUIRE AND HAVE BEEN PROPERLY TORQUE.

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SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

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DRAWING ISSUE

REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO:	N/A
CAD DWG FILE:	HADDAM QUARTER.IFC
SHEET SIZE:	ANSI D
DRAWN BY:	
CHECKED BY:	

SHEET TITLE

GENERAL NOTES

T-002

1.9 IDENTIFICATION

A. WIRE DESIGNATION MARKERS: PROVIDE FUNGUS RESISTANT, VINYL OR VINYL-CLOTH CONDUCTOR MARKERS IN OUTLET, JUNCTION AND PULL BOXES INDICATING WIRE USAGE (I.E SWITCH LEG, POWER FEED, TRAVELERS, ETC). THIS IS IN ADDITION TO WIRE CIRCUIT IDENTIFICATION REQUIREMENTS AND IS INTENDED TO CLARIFY WIRING WITHIN BOXES.

B. CIRCUIT IDENTIFICATION: PROVIDE WIRE MARKERS ON EACH CONDUCTOR IN PANELBOARD GUTTERS, PULLBOXES, OUTLET AND JUNCTION BOXES, AND AT LOAD CONNECTION. IDENTIFY BRANCH CIRCUIT OR FEEDER NUMBER FOR POWER AND LIGHTING CIRCUITS, AND WIRE DESIGNATION INDICATED ON EQUIPMENT MANUFACTURER'S SHOP DRAWING FOR CONTROL WIRING. MAINTAIN CONSISTENCY WITH SIMILAR PREVIOUSLY ESTABLISHED IDENTIFICATION SCHEMES FOR THE FACILITY'S ELECTRICAL INSTALLATIONS.

1.10 SITE CONDITIONS

A. A TOTAL OF 3,022.80 KW-DC, 1,950.00 KW-AC OF PHOTOVOLTAIC SYSTEM WILL BE INSTALLED AT THE JONES RD SOLAR SITE LOCATED IN DURHAM, CT.

B. PHOTOVOLTAIC ARRAYS WILL BE INSTALLED ON GROUND SCREW MOUNTED FIXED TILT GROUND MOUNT ARRAY AS IDENTIFIED IN THE DRAWINGS.

C. THE ASHRAE EXTREME ANNUAL DRY BULB MINIMUM TEMPERATURE AT THE SITE IS -19°C.

D. THE ASHRAE 2% DRY BULB HIGH AMBIENT TEMPERATURE AT THE SITE IS 32°C.

1.11 PHOTOVOLTAIC CIRCUIT DESIGN

A. THE NUMBER OF MODULES IN A STRING BASED ON MANUFACTURERS SPECIFICATIONS FOR THE TEMPERATURE CO-EFFICIENT FOR VOLTAGE FOR THE VSUN (550W) MODULE IS -0.27%/°C AT AN AMBIENT TEMPERATURE OF 25°C. BASED ON THE RECORD LOW AMBIENT TEMPERATURE OF -19°C, THE TEMPERATURE DIFFERENTIAL IS 44.0°C. CALCULATION: THE MAXIMUM VOLTAGE CALCULATED FROM THE ASHRAE LOW TEMPERATURE WAS FOUND TO BE 1108.70 V.

B. THE PHOTOVOLTAIC ARRAY STRINGS USE 24 MODULES IN SERIES EACH.

C. ALL THE DC CIRCUIT CONNECTIONS HAVE BEEN DESIGNED TO HAVE A VOLTAGE DROP OF LESS THAN 2% FROM THE MODULE TO INVERTER TERMINALS AT STANDARD TEST CONDITIONS. REFER TO WIRING SCHEDULE FOR SAMPLE CALCULATION.

D. ALL MATING STRING WIRING CONNECTORS SHALL BE OF THE SAME BRAND NAME. MC4 COMPATIBLE CONNECTORS SHALL NOT MATE WITH MC4 OR OTHER BRAND NAME MC4 COMPATIBLE CONNECTORS.

E. PHOTOVOLTAIC SOURCE CIRCUITS ARE PROTECTED BY OVERCURRENT PROTECTION IN ACCORDANCE WITH NEC SEC 690.9.

F. PHOTOVOLTAIC INVERTERS ARE PROVIDED WITH GROUND FAULT PROTECTION AND INTERRUPTION ABILITIES.

G. PHOTOVOLTAIC ARRAYS HAVE BEEN PROVIDED WITH DISCONNECTING MEANS IN ACCORDANCE WITH NEC SEC 690.13.

H. PHOTOVOLTAIC ARRAYS HAVE A COMMON DC AND AC GROUNDING ELECTRODE SYSTEM COMPLYING WITH THE REQUIREMENTS OF NEC SEC 690.47.

I. ALL PHOTOVOLTAIC EQUIPMENT INCLUDING PV MODULES, COMBINER BOXES, DISCONNECTS, INVERTERS, AC CIRCUIT BREAKERS WILL BE IDENTIFIED AND INFORMATION ON MAXIMUM SYSTEM VOLTAGE, CURRENT, OPERATING VOLTAGE AND CURRENT WILL BE NOTED WITH A WARNING LABEL ON A CLEARLY VISIBLE LOCATION.

J. ALL PHOTOVOLTAIC DC CONDUCTORS SHALL BE 2000V PV WIRE "SUNLIGHT RESISTANT" MARKED FOR EXPOSED WIRING. 2000V PV WIRE, DIRECT BURIAL FOR DIRECT BURIED WIRED, 2000V XLPE INSULATION EQUIPMENTS.

K. ALL EQUIPMENT SHALL BE RATED FOR A MAXIMUM SYSTEM VOLTAGE OF 2000V AND ALL TERMINALS WILL BE RATED FOR STRANDED WIRES AND HAVE A 90°C TEMPERATURE RATING.

L. CONDUITS HAVE BEEN SIZED TO MEET THE CONDUIT FILL REQUIREMENTS OF NEC. CHAPTER 9 TABLE 1.

1.12 COMBINER BOX, DC DISCONNECT, INVERTER, WARNING LABELS

A. ALL LABELS SHALL BE UV STABILIZED, WEATHERPROOF, AND DURABLE.

B. TEXT ON LABELS SHALL BE OF ARIAL FONT OR SIMILAR; MUST BE LEGIBLE AND CLEAR.

C. THE TONE OF THE BACKGROUND COLOR SHALL BE BRIGHT TO ATTRACT ATTENTION. YELLOW FOR CAUTION LABELS AND RED FOR WARNING LABELS.

D. LABELS SHALL BE SECURELY FASTENED TO SPECIFIED LOCATIONS BY USING A WEATHER PROOF AND DURABLE ADHESIVE SUITABLE FOR THE MATERIAL OF THE LABEL AND THE LOCATION.

E. THE LABELS SHALL BE POSTED AT THE LOCATIONS SPECIFIED. IF FOR REASONS OF REDUCED ACCESS OR SPACE, THE LABELS SHALL BE POSTED AT THE CLOSEST LOCATION THAT BEST SERVES THE INTENT OF THE LABEL. NOTIFY THE ENGINEER/SUPERVISOR IN SUCH A CASE BEFORE ATTACHING.

1.13 ABBREVIATIONS

A	AMPERES (AMP)
AC	ALTERNATING CURRENT
AF	AMP FRAME
AT	AMP TRIP
BIL	BASIC IMPULSE LEVEL
CB	COMBINER BOX
COM	COMMUNICATIONS
CT	CURRENT TRANSFORMER
CPT	CONTROL POWER TRANSFORMER
CU	COPPER
DC	DIRECT CURRENT
EMT	ELECTRIC METALLIC TUBING
EPR	ETHYLENE PROPYLENE RUBBER
GEM	GROUND ENHANCEMENT MATERIAL
G / GND	GROUND
GFCI	GROUND FAULT CIRCUIT INTERRUPTOR
GFP	GROUND FAULT PROTECTION
Inom	NOMINAL CURRENT (AMPS)
KCMIL	THOUSAND CIRCULAR MILS
KV	THOUSAND VOLT
KVA	THOUSAND VOLT-AMPS
KW	THOUSAND WATT
LFMC	LIQUID TIGHT FLEXIBLE METALLIC CONDUIT
MPPT	MAXIMUM POWER POINT
MV	MEDIUM VOLTAGE
NEC	NATIONAL ELECTRIC CODE
NESC	NATIONAL ELECTRIC SAFETY CODE
PCC	POINT OF COMMON COUPLING
PT	POTENTIAL (VOLTAGE) TRANSFORMER
PV	PHOTOVOLTAIC
PVC	POLYVINYL CHLORIDE
RMC	RIGID METALLIC CONDUIT
SA	SURGE ARRESTOR
SCH	SCHEDULE
SPD	SURGE PROTECTION DEVICE
UL	UNDERWRITER'S ;AB
V	VOLTAGE (VOLT)
Z	IMPEDANCE

1.13 ABBREVIATIONS

EXISTING GAS HEADER

ROAD (NEW)

PV MODULE

AC — AC LINE

DC — DC LINE (2000V)

GND — GROUND

OHW — OVERHEAD LINE

UNDERGROUND CABLE ROUTE

GROUND ROD / PLATE

COMBINER BOX / CB

LOAD BREAK DISCONNECT SWITCH

FUSED DISCONNECT SWITCH

AF / AT — POWER CIRCUIT BREAKER (15kV)

CIRCUIT BREAKER (<= 1000V)

POTENTIAL TRANSFORMER

CURRENT TRANSFORMER

GROUND

M — UTILITY METER

DEAD BREAK ELBOW (15kV)

CABLE "LUG" TERMINATION

TRANSFORMER

FUSE

GFD — GROUND FAULT DEVICE

SPD — SURGE PROTECTION DEVICE

OH CABLE TERMINATION "POT HEAD"

SURGE ARRESTOR "SA"

EQUIPMENT PAD

GRAVEL ACCESS ROAD

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PROJECT OWNER:

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A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

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SHEET SIZE:	ANSI D
DRAWN BY:	
CHECKED BY:	
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SHEET TITLE

SYMBOLS AND ABBREVIATIONS

T-003

OVERALL SYSTEM SUMMARY	
DC SYSTEM SIZE	3,022.80 kWdc
AC SYSTEM SIZE	1,950.00 kWdc
DC/AC RATIO	1.55
MODULE	VSUN550-144BMH-DG
MODULE QUANTITY	5,496
STRING SIZE AND VOLTAGE	24 @ 1008V VMP
STRING COUNT	229
INVERTER	SMA SUNNY HIGHPOWER PEAK3 150-US
INVERTER QUANTITY	13
RACKING	APA RACKING
TABLES	229
TILT / AZIMUTH	25° / 180°
UTILITY	EVERSOURCE
LATITUDE	41.487989
LONGITUDE	-72.650001

PROPERTY BOUNDARY
PARCEL ID# 18-22

(5496) VSUN 550W MODULES AT 25° TILT AND 180° ORIENTATION

PROJECT FENCE 16' FROM THE ARRAY

STREAM

DC TRENCH

AC TRENCH

EQUIPMENT PAD (SEE SHEET E-307):
(1) 2500A /600V MCB (SWBD-1)
(1) 2000 kVA 13.2kV-600V XFMR-1
(1) DAS ENCLOSURE (EN-1)
(1) 10kVA MINI LOAD CENTER 1 (MLC-1)
(1) SITE SECURITY CAMERA
(1) SWITCHGEAR WITH INTERUPTING DEVICE (VACUUM BREAKER), CUSTOMER PRODUCTION METER AND GOAB

MV TRENCH

100' SETBACK FROM WETLANDS

50' SETBACK FROM WETLANDS

WETLANDS

ACCESS ROAD

16.5' ROW - ROW SPACING

13.5' RACKING WIDTH

PROPOSED TREE LINE

LIMITS OF DISTURBANCE (LOD)
TOTAL AREA: 10.86 ACRES

EXISTING TREE LINE

JOHNSON LANE

ACCESS ROAD

INVERTER BANK
INVERTERS 1-13

POLE 1: NEW UTILITY OWNED POLE MOUNTED PRIMARY METER FOR PV SERVICE ONLY(POINT OF COMMON COUPLING ON LOAD SIDE OF NEW UTILITY OWNED METER)

POLE 2: NEW POLE MOUNTED UTILITY OWNED RECLOSER

EXISTING UTILITY OWNED POLE# 1148 ON CIRCUIT# 30K13
POINT OF INTERCONNECTION

A-101 SITE PLAN

N

0 80'-0" 160'-0" 320'-0"

SCALE 1" = 80'-0"
ORIGINAL DRAWING SIZE: ARCH D (24"x36")

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DRAWN BY:	
CHECKED BY:	

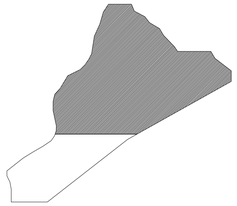
SHEET TITLE

SITE PLAN

A-101

OVERALL SYSTEM SUMMARY	
DC SYSTEM SIZE	3,022.80 kWdc
AC SYSTEM SIZE	1,950.00 kWdc
DC/AC RATIO	1.55
MODULE	VSUN550-144BMH-DG
MODULE QUANTITY	5,496
STRING SIZE AND VOLTAGE	24 @ 1008V VMP
STRING COUNT	229
INVERTER	SMA SUNNY HIGHPOWER PEAK3 150-US
INVERTER QUANTITY	13
RACKING	APA RACKING
TABLES	229
TILT / AZIMUTH	25° / 180°
UTILITY	EVERSOURCE
LATITUDE	41.487989
LONGITUDE	-72.650001

ARRAY KEY



(5496) VSUN 550W MODULES AT 25° TILT AND 180° ORIENTATION

PROJECT FENCE 16' FROM THE ARRAY

DC TRENCH

ROW 1 1-1$_{24}$ 1-2$_{24}$

ROW 2 1-3$_{24}$ 1-4$_{24}$ 1-5$_{24}$

ROW 3 1-6$_{24}$ 1-7$_{24}$ 1-8$_{24}$ 1-9$_{24}$

ROW 4 1-10$_{24}$ 1-11$_{24}$ 1-12$_{24}$ 1-13$_{24}$ 1-14$_{24}$ 1-15$_{24}$

DCB-1$_{18}$

ROW 5 2-1$_{24}$ 2-1$_{24}$ 2-2$_{24}$ 1-16$_{24}$ 2-3$_{24}$ 1-17$_{24}$ 2-4$_{24}$

ROW 6 2-8$_{24}$ 2-5$_{24}$ 2-9$_{24}$ 2-2$_{24}$ 2-10$_{24}$ 2-6$_{24}$ 2-11$_{24}$ 2-7$_{24}$

DCB-2$_{18}$

ROW 7 2-8$_{24}$ 2-15$_{24}$ 3-1$_{24}$ 2-12$_{24}$ 2-13$_{24}$ 2-16$_{24}$ 2-14$_{24}$ 2-17$_{24}$

ROW 8 3-2$_{24}$ 4-1$_{24}$ 3-3$_{24}$ 3-8$_{24}$ 3-4$_{24}$ 3-9$_{24}$ 3-5$_{24}$ 3-10$_{24}$ 3-6$_{24}$ 3-11$_{24}$ 3-7$_{24}$ 3-12$_{24}$

DCB-3$_{18}$

ROW 9 4-2$_{24}$ 4-3$_{24}$ 4-1$_{24}$ 3-13$_{24}$ 4-4$_{24}$ 3-14$_{24}$ 4-5$_{24}$ 3-15$_{24}$ 4-6$_{24}$ 3-16$_{24}$ 4-7$_{24}$ 3-17$_{24}$ 4-8$_{24}$

DCB-4$_{18}$

ROW 10 4-9$_{24}$ 5-1$_{24}$ 4-10$_{24}$ 5-2$_{24}$ 4-11$_{24}$ 5-3$_{24}$ 4-12$_{24}$ 5-4$_{24}$ 4-13$_{24}$ 5-5$_{24}$ 4-14$_{24}$ 4-17$_{24}$ 4-15$_{24}$ 4-16$_{24}$

DCB-5$_{18}$

ROW 11 5-6$_{24}$ 6-1$_{24}$ 5-7$_{24}$ 6-2$_{24}$ 5-8$_{24}$ 6-3$_{24}$ 5-9$_{24}$ 5-17$_{24}$ 5-10$_{24}$ 5-16$_{24}$ 5-11$_{24}$ 5-15$_{24}$ 5-12$_{24}$ 5-14$_{24}$ 5-13$_{24}$

DCB-6$_{18}$

ROW 12 6-4$_{24}$ 6-11$_{24}$ 6-5$_{24}$ 6-12$_{24}$ 6-13$_{24}$ 6-6$_{24}$ 6-14$_{24}$ 6-7$_{24}$ 6-15$_{24}$ 6-8$_{24}$ 6-16$_{24}$ 6-9$_{24}$ 6-17$_{24}$ 6-10$_{24}$ 6-18$_{24}$

ROW 13 7-1$_{24}$ 7-7$_{24}$ 7-2$_{24}$ 7-8$_{24}$ 6-13$_{24}$ 7-9$_{24}$ 7-3$_{24}$ 7-10$_{24}$ 7-4$_{24}$ 7-11$_{24}$ 7-5$_{24}$ 7-12$_{24}$ 7-6$_{24}$ 7-13$_{24}$

DCB-7$_{18}$

ROW 14 8-1$_{24}$ 8-2$_{24}$ 7-14$_{24}$ 8-3$_{24}$ 7-9$_{24}$ 8-4$_{24}$ 7-15$_{24}$ 8-5$_{24}$ 7-16$_{24}$ 8-6$_{24}$ 7-17$_{24}$ 8-7$_{24}$ 7-18$_{24}$ 8-8$_{24}$

DCB-8$_{18}$

ROW 15 8-14$_{24}$ 8-14$_{24}$ 8-9$_{24}$ 8-15$_{24}$ 8-10$_{24}$ 8-16$_{24}$ 8-4$_{24}$ 8-17$_{24}$ 8-11$_{24}$ 8-18$_{24}$ 8-12$_{24}$ 9-1$_{24}$ 8-13$_{24}$ 9-2$_{24}$

ROW 16 9-3$_{24}$ 9-8$_{24}$ 9-4$_{24}$ 9-9$_{24}$ 9-5$_{24}$ 9-10$_{24}$ 8-17$_{24}$ 9-6$_{24}$ 9-11$_{24}$ 9-7$_{24}$ 9-12$_{24}$

DCB-9$_{18}$

ROW 17 9-13$_{24}$ 9-18$_{24}$ 9-14$_{24}$ 10-1$_{24}$ 9-15$_{24}$ 10-2$_{24}$ 9-16$_{24}$ 10-3$_{24}$ 9-17$_{24}$ 10-4$_{24}$

ROW 18 10-5$_{24}$ 10-5$_{24}$ 10-6$_{24}$ 10-9$_{24}$ 10-7$_{24}$ 10-10$_{24}$ 10-2$_{24}$ 10-11$_{24}$ 10-8$_{24}$ 10-12$_{24}$

DCB-10$_{18}$

ACCESS ROAD

16.5' ROW - ROW SPACING

13.5' RACKING WIDTH

STRING LEGEND

INVERTER IDENTIFIER — XX-XX$_{XX}$- — STRING PATH

STRING IDENTIFIER — STRING LENGTH

DC COMBINER BOX LEGEND

DC COMBINER BOX IDENTIFIER — DCB-X$_{XX}$ — NO OF STRINGS ON DC COMBINER

E-201 ELECTRICAL PLAN

N

0 30'-0" 60'-0" 120'-0"

SCALE 1" = 30'-0"

ORIGINAL DRAWING SIZE: ARCH D (24"x36")

Louth Callan Renewables

921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE			
REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO:	N/A
CAD DWG FILE:	HADDAM QUARTER IFC
SHEET SIZE:	ANSI D
DRAWN BY:	
CHECKED BY:	
COPYRIGHT:	LOUTH CALLAN RENEWABLES, LLC. 2022

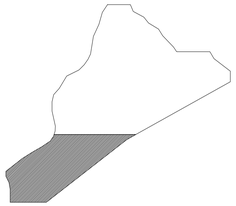
SHEET TITLE

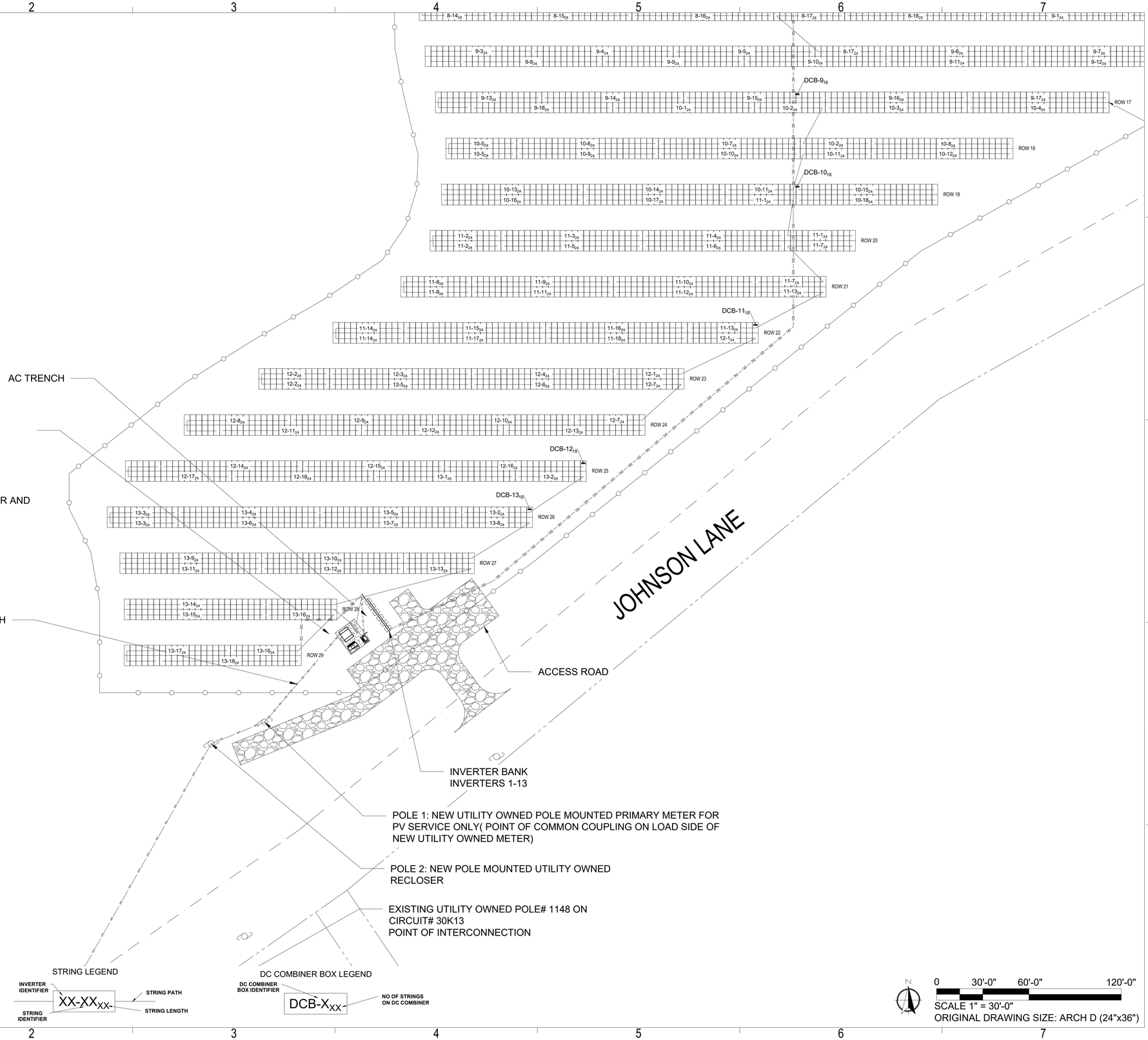
ELECTRICAL STRINGING PLAN - 1

E-201

OVERALL SYSTEM SUMMARY	
DC SYSTEM SIZE	3,022.80 kWdc
AC SYSTEM SIZE	1,950.00 kWdc
DC/AC RATIO	1.55
MODULE	VSUN550-144BMH-DG
MODULE QUANTITY	5,496
STRING SIZE AND VOLTAGE	24 @ 1008V VMP
STRING COUNT	229
INVERTER	SMA SUNNY HIGHPOWER PEAK3 150-US
INVERTER QUANTITY	13
RACKING	APA RACKING
TABLES	229
TILT / AZIMUTH	25° / 180°
UTILITY	EVERSOURCE
LATITUDE	41.487989
LONGITUDE	-72.650001

ARRAY KEY





STRING LEGEND

DC COMBINER BOX LEGEND

E-202 ELECTRICAL STRINGING PLAN

N

0 30'-0" 60'-0" 120'-0"

SCALE 1" = 30'-0"
ORIGINAL DRAWING SIZE: ARCH D (24"x36")

Louth Callan Renewables

921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE

REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO:	N/A
CAD DWG FILE:	HADDAM QUARTER IFC
SHEET SIZE:	ANSI D
DRAWN BY:	
CHECKED BY:	
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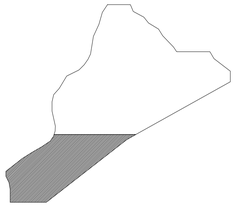
SHEET TITLE

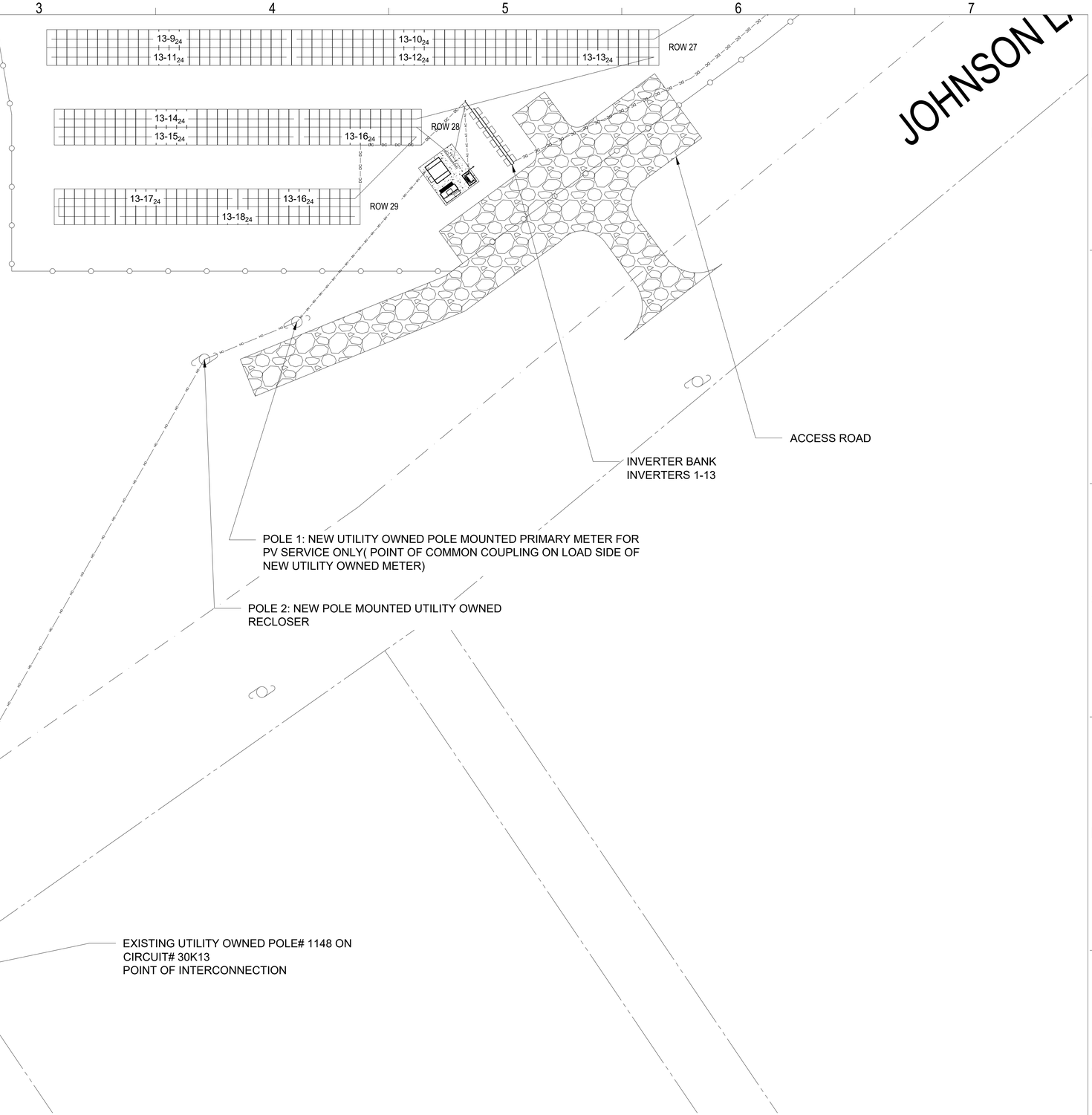
ELECTRICAL STRINGING PLAN - 2

E-202

OVERALL SYSTEM SUMMARY	
DC SYSTEM SIZE	3,022.80 kWdc
AC SYSTEM SIZE	1,950.00 kWdc
DC/AC RATIO	1.55
MODULE	VSUN550-144BMH-DG
MODULE QUANTITY	5,496
STRING SIZE AND VOLTAGE	24 @ 1008V VMP
STRING COUNT	229
INVERTER	SMA SUNNY HIGHPOWER PEAK3 150-US
INVERTER QUANTITY	13
RACKING	APA RACKING
TABLES	229
TILT / AZIMUTH	25° / 180°
UTILITY	EVERSOURCE
LATITUDE	41.487989
LONGITUDE	-72.650001

ARRAY KEY

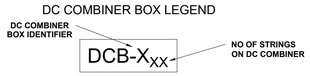




E-202 ELECTRICAL STRINGING PLAN

STRING LEGEND

DC COMBINER BOX LEGEND



N

0 30'-0" 60'-0" 120'-0"

SCALE 1" = 30'-0"

ORIGINAL DRAWING SIZE: ARCH D (24"x36")

Louth Callan Renewables

921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE

REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO:	N/A
CAD DWG FILE:	HADDAM QUARTER IFC
SHEET SIZE:	ANSI D
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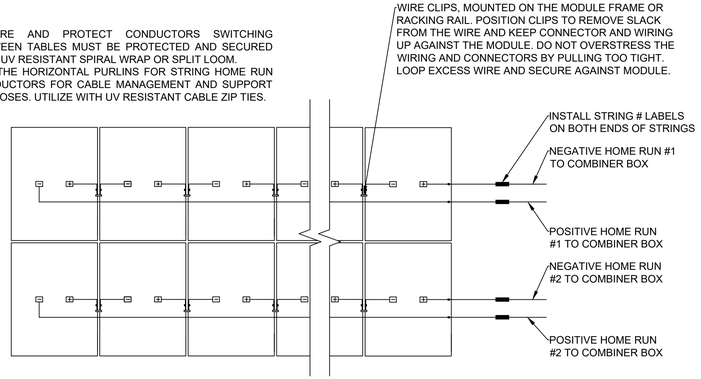
SHEET TITLE

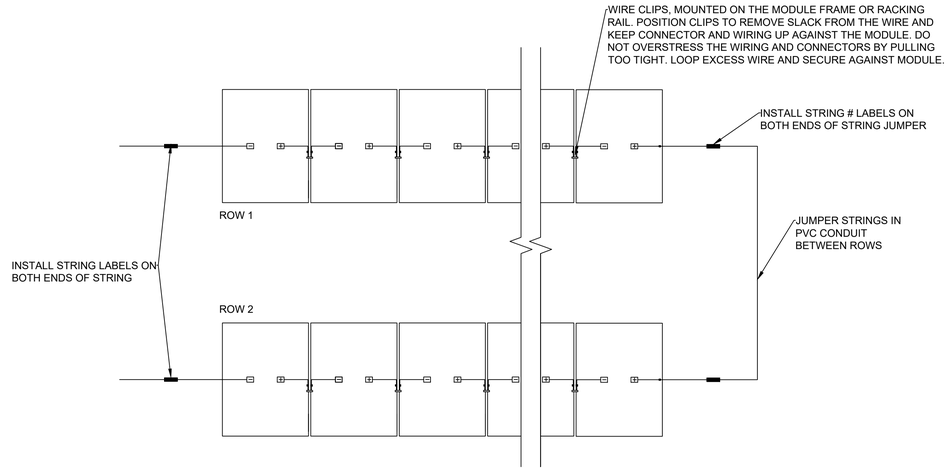
ELECTRICAL STRINGING PLAN - 3

E-203

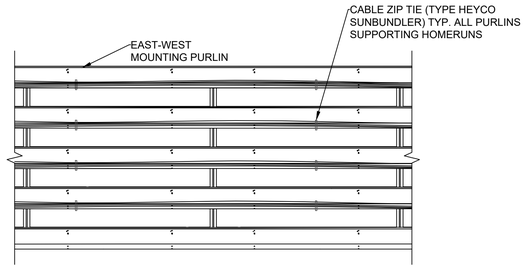
NOTES:
1. SECURE AND PROTECT CONDUCTORS SWITCHING BETWEEN TABLES MUST BE PROTECTED AND SECURED WITH UV RESISTANT SPIRAL WRAP OR SPLIT LOOM.
2. USE THE HORIZONTAL PURLINS FOR STRING HOME RUN CONDUCTORS FOR CABLE MANAGEMENT AND SUPPORT PURPOSES. UTILIZE WITH UV RESISTANT CABLE ZIP TIES.



01 DC SOURCE CIRCUIT DETAIL SINGLE ROW STRING
NOT TO SCALE

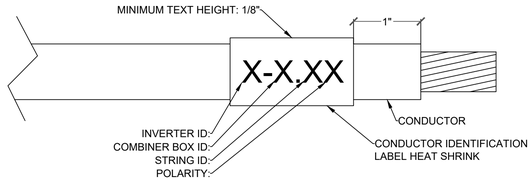


02 DC SOURCE CIRCUIT DETAIL MULTI ROW STRING
NOT TO SCALE



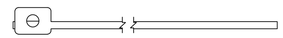
NOTES:
1. PROVIDE UV RESISTANT SPIRAL WRAP OR SPLIT LOOM FOR DC SOURCE CIRCUITS WHERE EXPOSED TO DIRECT SUNLIGHT BETWEEN MODULES.
2. PROVIDE INSULATING SHEATH WITHIN Z-PURLIN FLANGE AT UNEVEN Z-PURLIN GAPS OR EDGE GUARD TO PREVENT ABRASION.
3. WHERE DC SOURCE CIRCUITS ARE RUN IN Z-PURLIN FLANGE, NO MORE THAN 20 #10 PV-WIRE CONDUCTORS SHALL BE BUNDLED TOGETHER.

03 WIRE MANAGEMENT AT BACK OF MODULE
NOT TO SCALE



EXAMPLE:
POSITIVE PV SOURCE CIRCUIT NUMBER 16
ON DC COMBINER BOX 12 AND INVERTER 12
12-12.16 +

04 TYPICAL WIRE LABELING
NOT TO SCALE



NOTES:
1. HEAVY DUTY CABLE TIES TO HEYCO SUNBUNDLERS OR APPROVED EQUAL
2. CABLE TIES TO BE BLACK VINYL COATED 302 STAINLESS STEEL WIRE WITH MINIMUM TENSILE STRENGTH OF 100LBS.

05 CABLE TIE DETAILS
NOT TO SCALE

MODULE LEADS:
1. SECURE MODULE LEADS TO PREVENT STRESS ON MODULE JUNCTION BOX AND MODULE CONNECTORS.
2. LEADS SHALL BE TUCKED NEATLY UNDER THE RACKING SYSTEM AND SHOULD DROP NO LOWER THAN 3" BELOW MODULES.
3. CONTRACTOR TO ENSURE MODULE CONNECTORS ARE NOT INSTALLED AT THE LOW POINT OF THE LOOP TO ENSURE WATER BUILD UP DOES NOT OCCUR ON CONNECTOR.
4. CONNECT EVERY MODULE TOGETHER TO ENABLE THE END OF BOTH THE POSITIVE AND NEGATIVE STRINGS TO BE TO BE IN SAME APPROXIMATE LOCATION.
5. WIRE EACH STRING TO END ON SIDE GOING TO STRING INVERTER TO MINIMIZE VOLTAGE DROP. THE STRING END SIDE WILL VARY WITHIN THE ARRAY.

CONNECTORS:
1. PV SOURCE CIRCUIT CONNECTORS MUST BE IDENTICAL TO MAKE AND MODEL AS THE MODULE CONNECTORS. THE CONNECTION TO SOURCE CIRCUITS MUST BE PER THE MODULE AND CONNECTOR MANUFACTURER INSTRUCTIONS. CONNECTORS LISTED AS "COMPATIBLE" BUT NOT IDENTICAL SHALL NOT BE ACCEPTED. CONTRACTOR TO VERIFY THAT THE SOURCE CIRCUIT CONDUCTOR DIAMETER IS COMPATIBLE WITH THE CONNECTOR USED
2. CONNECT PV CABLE WITH CONNECTOR FOR BOTH POSITIVE AND NEGATIVE AND ROUTE STRING TO INVERTER AS DESIGNATED ON PLANS.
3. DETAIL IS DIAGRAMMATIC IN NATURE. NUMBER OF MODULES PER STRING, AND LOCATION OF JUMPERS TO BE WIRED AS DICTATED BY ELECTRICAL PLAN.

CONDUCTORS:
1. OBSERVE MINIMUM BEND RADIUS OF ALL CONDUCTORS. FOR #10 PV WIRE HOMERUNS AND MODULE LEADS, MINIMUM BEND RADIUS SHALL BE 2-1/8".
2. ALL CONDUCTORS MUST BE SUPPORTED A MINIMUM OF ONCE EVERY 3FT.
3. NO CONDUCTORS SHALL COME IN CONTACT WITH THE EARTH.
4. NO CONDUCTORS SHALL BE EXPOSED TO SHARP OR ROUGH EDGES. PROVIDE UV-RESISTANT SPLIT LOOM OR EDGE GUARD OR APPROVED EQUAL WHERE CONDUCTORS EXIT THE ARRAY OR MAY BE EXPOSED TO SHARP EDGES.

WIRE MANAGEMENT DEVICES:
3. ZIP-TIES MUST BE UV RATED. ONLY ZIP-TIES OF APPROPRIATE RATING AND OWNER APPROVAL SHALL BE PERMITTED FOR WIRE MANAGEMENT.
4. ENSURE ZIP-TIES CRIMP IS NOT WITHIN PROXIMITY OF CONDUCTOR AND AT RISK TO DAMAGE CONDUCTOR.
5. CABLE CLIPS SHALL BE STAINLESS STEEL AND LISTED FOR USE IN SOLAR APPLICATIONS.

GROUNDING:
1. MODULE FRAMES AND RACKING COMPONENTS SHALL BE BONDED. USE MANUFACTURER RECOMMENDED BONDING LOCATIONS AND METHODS.

FIELD MOCK-UP AND ENGINEER REVIEW:
1. TWO WEEKS PRIOR TO BEGINNING INSTALLATION OF DC WIRE MANAGEMENT, CONTRACTOR SHALL ALERT OWNER'S REPRESENTATIVE AND ENGINEER OF TIMING OF WIRE MANAGEMENT INSTALLATION AND SCHEDULE AN ON-SITE MEETING WITH OWNER'S REPRESENTATIVE AND ENGINEER TO REVIEW WIRE MANAGEMENT MOCK-UPS.
2. PROVIDE FIELD-INSTALLED MOCK-UP(S) OF DC WIRE MANAGEMENT INSTALLATION USING ACTUAL MATERIALS AND EQUIPMENT SPECIFIED. MOCK-UPS SHALL ACCURATELY REFLECT WIRE MANAGEMENT INSTALLATION INTENT FOR EACH WIRE MANAGEMENT TYPE AS INDICATED IN THE CONTRACT DOCUMENTS AND AS WILL BE PRESENT IN THE FINAL INSTALLATION.
3. ENGINEER SHALL PREPARE TYPE-WRITTEN REVIEW AND COMMENTS SUMMARIZING REVIEW OF MOCK-UP AND RETURN TO CONTRACTOR. CONTRACTOR SHALL IMPLEMENT RESULTS OF REVIEW INTO FINAL WIRE MANAGEMENT INSTALLATIONS.

06 GENERAL WIRE MANAGEMENT NOTES
NOT TO SCALE

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR
Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE			
REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO:	N/A
CAD DWG FILE:	HADDAM QUARTER.IFC
SHEET SIZE:	ANSI D
DRAWN BY:	
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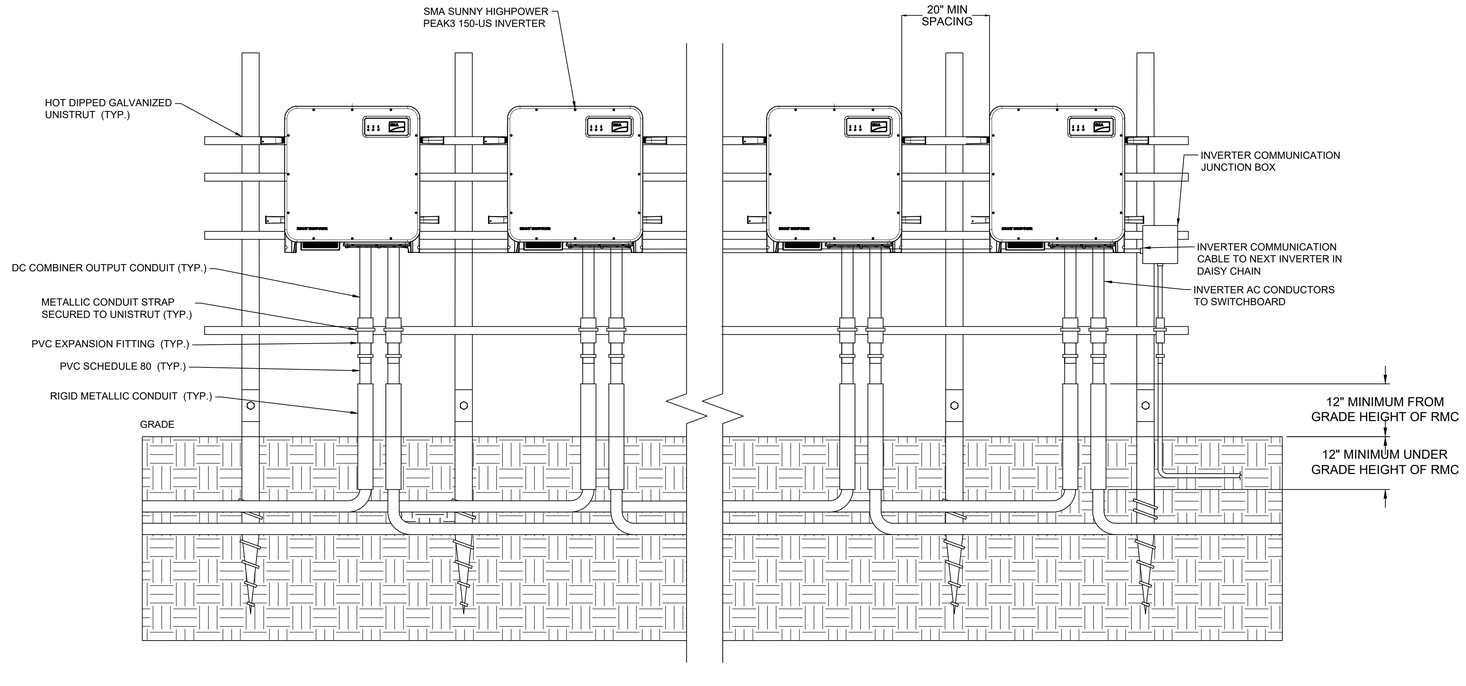
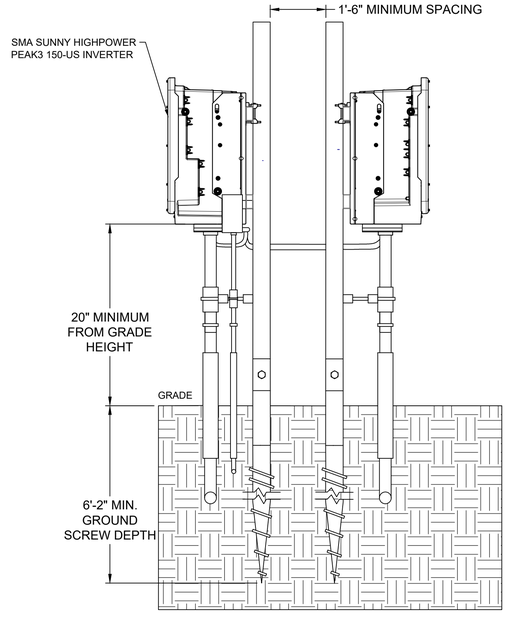
SHEET TITLE
WIRE MANAGEMENT DETAILS

E-301



01 INVERTER RACKING - FRONT
NOT TO SCALE



02 INVERTER RACKING - SIDE VIEW
NOT TO SCALE

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

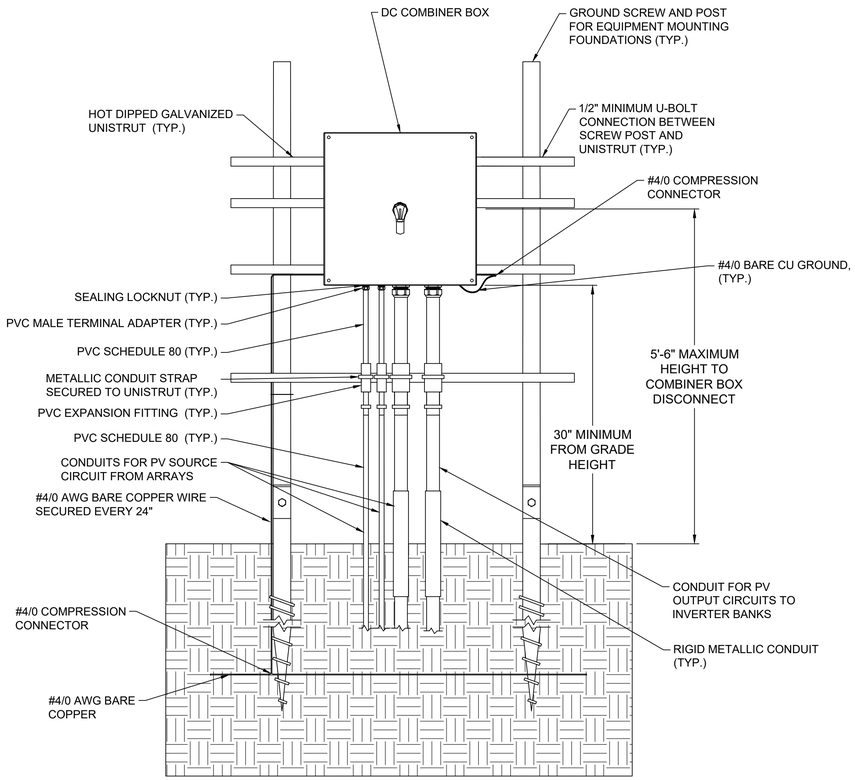
DRAWING ISSUE			
REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO:	N/A
CAD DWG FILE:	HADDAM QUARTER IFC
SHEET SIZE:	ANSI D
DRAWN BY:	
CHECKED BY:	
COPYRIGHT:	LOUTH CALLAN RENEWABLES, LLC. 2022

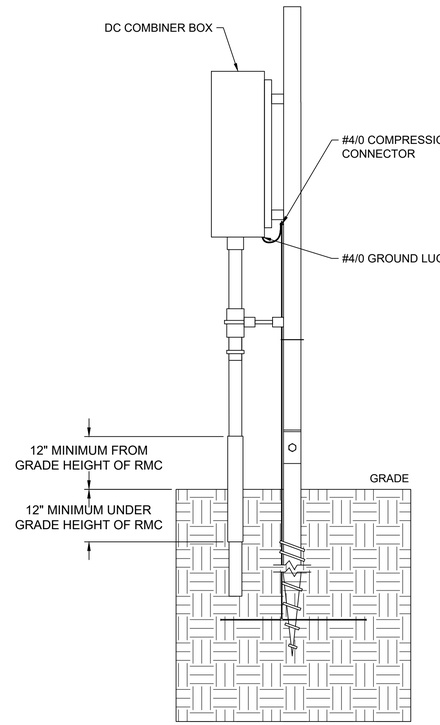
SHEET TITLE

INVERTER DETAILS

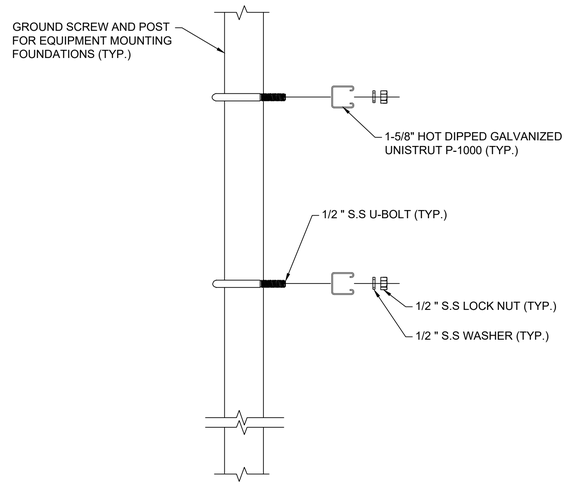
E-302



01 COMBINER BOX RACKING - FRONT
NOT TO SCALE



02 COMBINER BOX RACKING - SIDE VIEW
NOT TO SCALE



03 EQUIPMENT MOUNTING
NOT TO SCALE

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE

REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO:	N/A
CAD DWG FILE:	HADDAM QUARTER.IFC
SHEET SIZE:	ANSI D
DRAWN BY:	
CHECKED BY:	
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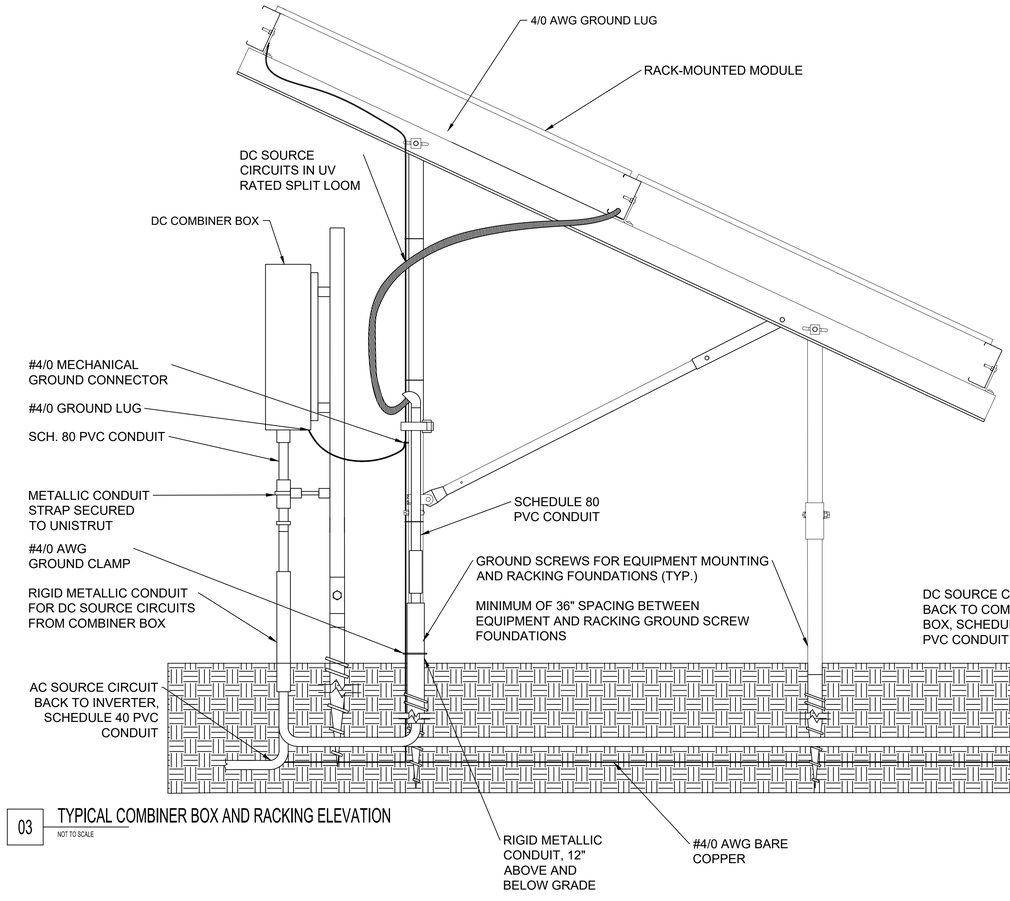
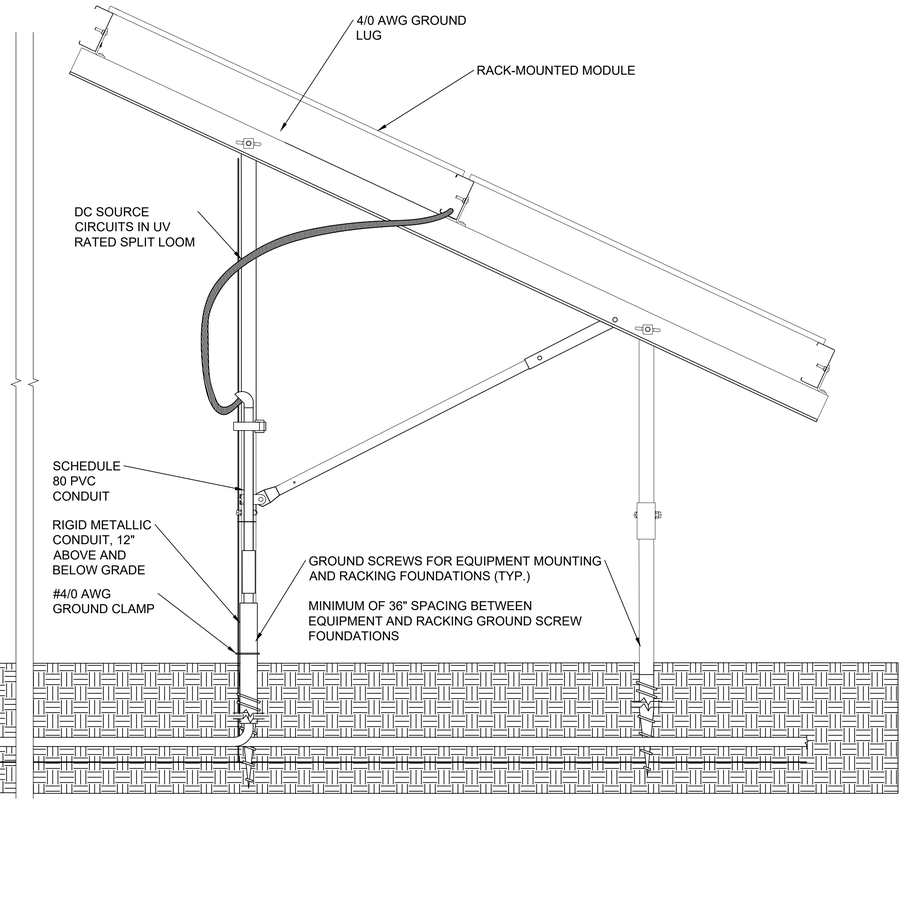
SHEET TITLE

COMBINER BOX DETAILS

E-303



03 TYPICAL COMBINER BOX AND RACKING ELEVATION
NOT TO SCALE



Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE			
REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

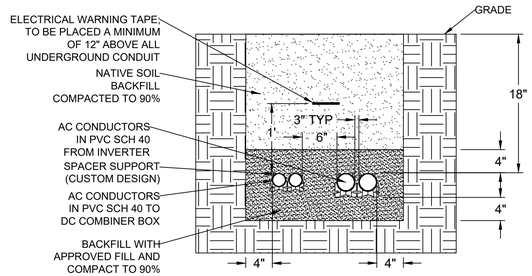
PROJECT NO:	N/A
CAD DWG FILE:	HADDAM QUARTER IFC
SHEET SIZE:	ANSI D
DRAWN BY:	
CHECKED BY:	
COPYRIGHT:	LOUTH CALLAN RENEWABLES, LLC. 2022

SHEET TITLE
RACKING ELEVATION DETAILS

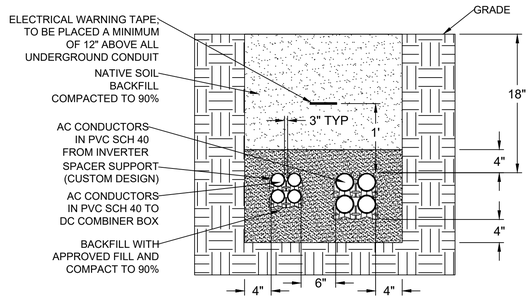
E-304

TRENCH NOTES:

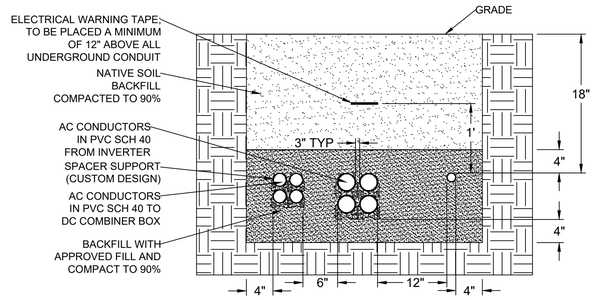
1. CAUTION TO CONTRACTOR: THE CONTRACTOR SHALL BE RESPONSIBLE FOR INVESTIGATING AND VERIFYING THE ACTUAL LOCATION AND DEPTH OF ALL EXISTING UNDERGROUND FACILITIES AT LEAST 48 HOURS IN ADVANCE OF PERFORMING ANY WORK.
2. ASSUMED RHO = 120°C-cm/W.
3. CONDUITS CONTAINING SIMILAR VOLTAGE CLASSES SHOULD HAVE A MINIMUM 3" SPACING BETWEEN ADJACENT RUNS. SPACING BETWEEN CONDUITS OF DIFFERENT VOLTAGE CLASSES SHALL HAVE A MINIMUM 6" SPACING BETWEEN ADJACENT RUNS.
4. ALL TRENCHES SHALL BE COMPACTED TO 90% RELATIVE COMPACTION. TRENCHES WITHIN 5' OF PIERS, FOOTINGS, ROADS, OR OTHER STRUCTURES SHALL BE COMPACTED TO 95% FULL DEPTH.
5. TRENCHES GREATER THAN 18" IN WIDTH SHALL CONTAIN ADDITIONAL ELECTRICAL WARNING TAPE.
6. CABLES IN TRENCHES SHALL NOT BE STACKED WITHOUT ENGINEERING APPROVAL. IF STACKED CONDUITS ARE APPROVED, CONDUIT SPACERS MUST BE INSTALLED.
7. CLEAN FILL MATERIAL SHALL BE SCREENED TO A MAXIMUM 1/4" SIZE, ALL ORGANIC AND MAN-MADE MATERIAL SHALL BE REMOVED.
8. CONDUIT SHALL BE SCHEDULE 40 BELOW GRADE, SCHEDULE 80 BEGINNING AT BOTTOM OF 90° BEND, AND SCHEDULE 80 FROM THE BEND TO THE EXPANSION FITTING.
9. MV TRENCH DEPTH FOR CONDUIT 5-6" IS INCREASED FROM 24" TO 36".



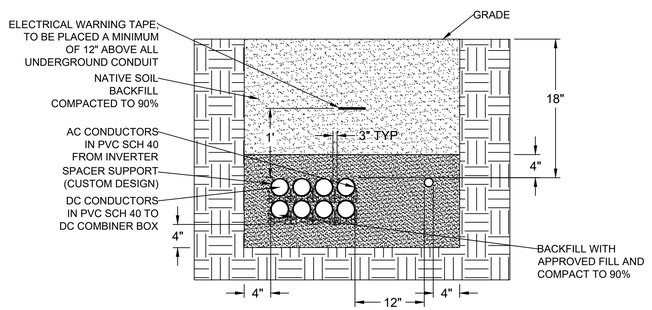
1 SINGLE-LAYER JUMPERS AND DCB OUTPUT CONDUITS
NOT TO SCALE



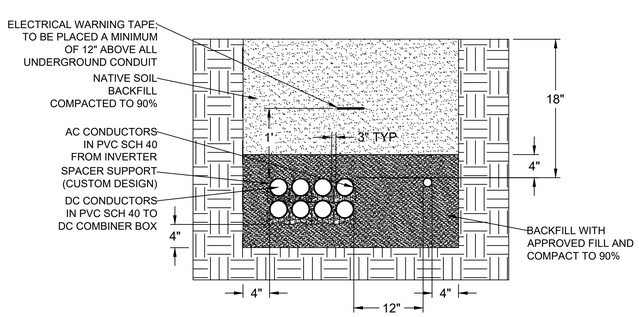
2 DOUBLE-LAYER JUMPERS AND DCB OUTPUT CONDUITS
NOT TO SCALE



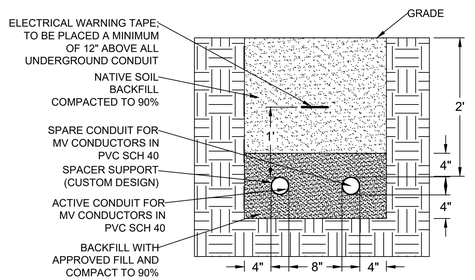
3 DOUBLE-LAYER JUMPERS AND DCB OUTPUT, AND COMM. CONDUITS
NOT TO SCALE



4 DOUBLE-LAYER DC AND COMM. CONDUITS
NOT TO SCALE



5 DOUBLE-LAYER AC AND COMM. CONDUITS
NOT TO SCALE



6 MV CONDUITS
NOT TO SCALE

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE			
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A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO:	N/A
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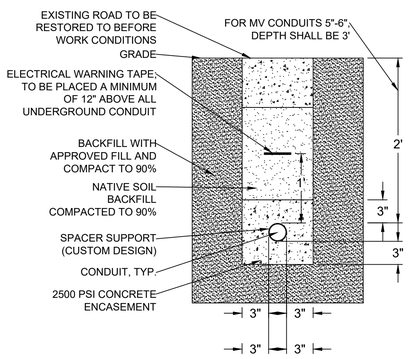
TRENCH DETAILS 1

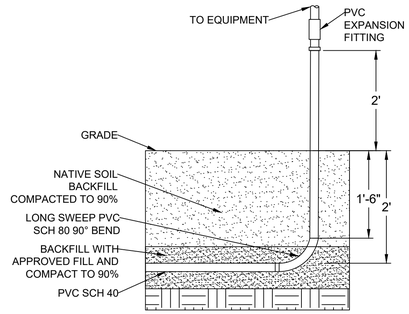
E-305

TRENCH NOTES:

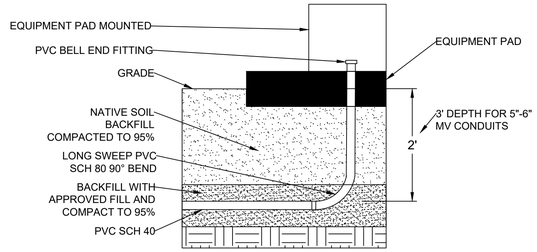
1. CAUTION TO CONTRACTOR: THE CONTRACTOR SHALL BE RESPONSIBLE FOR INVESTIGATING AND VERIFYING THE ACTUAL LOCATION AND DEPTH OF ALL EXISTING UNDERGROUND FACILITIES AT LEAST 48 HOURS IN ADVANCE OF PERFORMING ANY WORK.
2. ASSUMED RHO = 120°C-cm/W.
3. CONDUITS CONTAINING SIMILAR VOLTAGE CLASSES SHOULD HAVE A MINIMUM 3" SPACING BETWEEN ADJACENT RUNS. SPACING BETWEEN CONDUITS OF DIFFERENT VOLTAGE CLASSES SHALL HAVE A MINIMUM 6" SPACING BETWEEN ADJACENT RUNS.
4. ALL TRENCHES SHALL BE COMPACTED TO 90% RELATIVE COMPACTION. TRENCHES WITHIN 5' OF PIERS, FOOTINGS, ROADS, OR OTHER STRUCTURES SHALL BE COMPACTED TO 95% FULL DEPTH.
5. TRENCHES GREATER THAN 18" IN WIDTH SHALL CONTAIN ADDITIONAL ELECTRICAL WARNING TAPE.
6. CABLES IN TRENCHES SHALL NOT BE STACKED WITHOUT ENGINEERING APPROVAL. IF STACKED CONDUITS ARE APPROVED, CONDUIT SPACERS MUST BE INSTALLED.
7. CLEAN FILL MATERIAL SHALL BE SCREENED TO A MAXIMUM 1/4" SIZE, ALL ORGANIC AND MAN-MADE MATERIAL SHALL BE REMOVED.
8. CONDUIT SHALL BE SCHEDULE 40 BELOW GRADE, SCHEDULE 80 BEGINNING AT BOTTOM OF 90° BEND, AND SCHEDULE 80 FROM THE BEND TO THE EXPANSION FITTING.
9. MV TRENCH DEPTH FOR CONDUIT 5-6" IS INCREASED FROM 24" TO 36".



07 CONDUIT ROAD CROSSING DETAIL
NOT TO SCALE



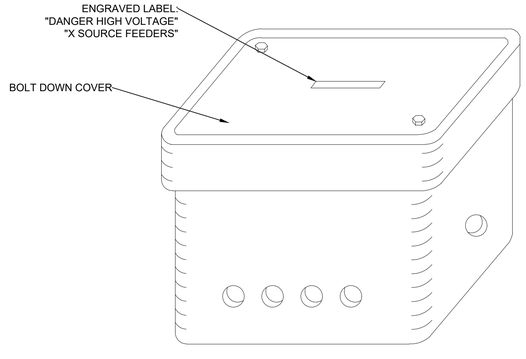
08 CONDUIT EMERGING FROM GRADE DETAIL
NOT TO SCALE



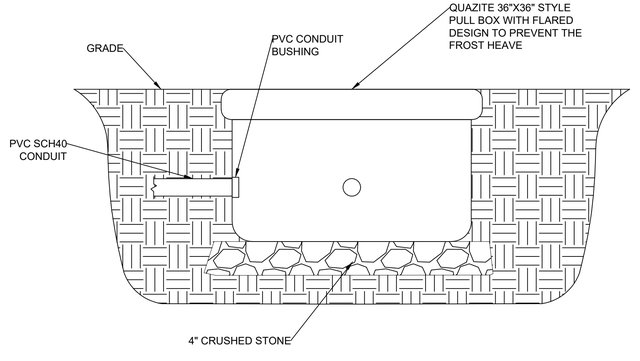
09 EQUIPMENT PAD CONDUIT DETAIL
NOT TO SCALE

NOTE:

1. BOX SHALL BE "QUAZITE" OR APPROVED EQUAL.
2. BOX SHALL BE RATED T8 FOR USE IN GRASSY AREAS NOT SUBJECT TO VEHICULAR TRAFFIC, OR RATED T22 FOR USE IN SIDEWALKS OR PARKING LOTS SUBJECT TO OCCASIONAL NON-DELIBERATE HEAVY VEHICULAR TRAFFIC. BOXES TO BE USED IN ROADWAYS OR AREAS FREQUENTLY SUBJECT TO HEAVY VEHICULAR TRAFFIC SHALL BE SUBMITTED TO EEOR FOR APPROVAL
3. PROVIDE 4" CRUSHED STONE BENEATH BOX.
4. CONDUITS SHALL ENTER ON SIDES. MINIMUM BURIAL DEPTHS OF CONDUITS IS 24" BELOW FINISHED GRADE.
5. CONDUIT KNOCKOUTS SHALL BE DRILLED OR PUNCHED ON SITE, QUANTITIES & SIZES TO MATCH TRENCH PLAN & COMBINER SCHEDULE.



10 PULL BOX DETAIL
NOT TO SCALE



11 PULL BOX UNDERGROUND DETAIL
NOT TO SCALE

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

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TRENCH DETAILS 2

E-306

NOTES:THE FOLLOWING CONDUITS ARE DETAILED IN THE PAD. IF ANY NEED TO BE ADDED, PLEASE CONTACT THE ENGINEER. ALL UNDERGROUND CONDUIT IS PVC SCH 40 UNLESS NOTED OTHERWISE. ALL ABOVE GRADE CONDUIT IS PVC SCH 80. FOR ALL CONDUITS LEAVING THE PAD, THE PATH VARIES FOR EACH PAD, AND IS SHOWN DIAGRAMMATICALLY FOR CLARITY REFER TO SITE PLANS

DC CONDUIT:
DC-1: QTY 13: 2.5" PVC SCH 40 FROM COMBINERS BOXES IN ARRAY TO INVERTERS
DC-2: QTY 1: 1" PVC SCH 40 FROM ALSO ENERGY DAS EN1 TO WEATHER STATION

COMMUNICATION CONDUITS
C1: QTY 1 - 1" PVC SCH 40 CONDUIT FOR INVERTER DAISY CHAIN
C2: QTY 1 - 1" PVC SCH 40 CONDUIT FOR WEATHER STATIONS LOCATED IN THE ARRAY
C3: QTY 1 - 1" PVC SCH 40 CONDUIT FOR TRANSFORMER MONITORING DRY CONTACT
C4: QTY 1 - 1" PVC SCH 40 CONDUIT FOR WEATHER STATION SENSORS IN ARRAY
C5: QTY 1 - 1" PVC SCH 40 CONDUIT BETWEEN WEATHER STATION AND DAS ENCLOSURE EN-1
C6: QTY 1 - 1" PVC SCH 40 CONDUIT FOR ETHERNET BETWEEN DAS ENCLOSURE EN1 AND COSTUMER METERING
C7: QTY 1 - 1" PVC SCH 40 CONDUIT FOR ETHERNET BETWEEN DAS ENCLOSURE EN1 AND RELAY CABINET

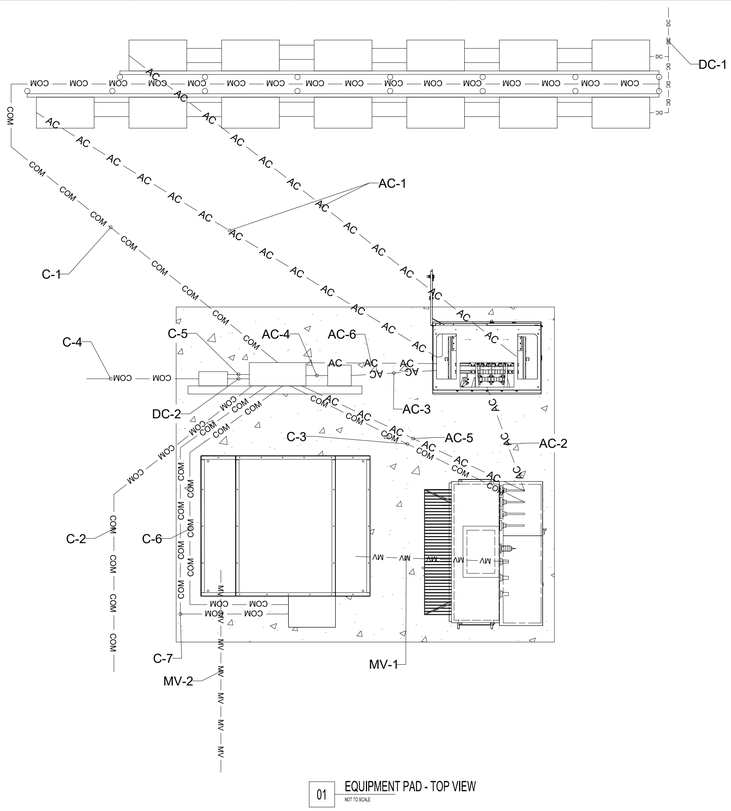
LV AC CONDUITS (REFER TO L-304 FOR SIZING.)
AC-1: QTY 13 - 2" PVC SCH 40 CONDUIT FROM INVERTER BANK TO SWITCHBOARD BREAKER COMPARTMENT
AC-2: QTY 8 - 1" PVC SCH 40 CONDUIT FROM SWITCHBOARD TO TRANSFORMER
AC-3: QTY 1 - 1" PVC SCH 40 CONDUIT FROM SWITCHBOARD TO MINI LOAD CENTER
AC-4: QTY 1 - 1" PVC SCH 40 CONDUIT FROM MINI LOAD CENTER TO DAS ENCLOSURE EN1
AC-5: QTY 1 - 1" PVC SCH 40 CONDUIT FROM TRANSFORMER TO DAS ENCLOSURE EN1 (VOLTAGE REFERENCE)
AC-6: QTY 1 - 1" PVC SCH 40 CONDUIT FROM SWITCBOARD TO DAS ENCLOSURE EN1

MV AC CONDUITS
MV-1: QTY 2 - 5" PVC SCH 40 CONDUIT FROM TRANSFORMER TO GRIDCONNEX SWITCHGEAR (1 ACTIVE, 1 SPARE)
MV-2: QTY 2 - 5" PVC SCH 40 CONDUIT FROM GRIDCONNEX SWITCHGEAR TO RISER POLE

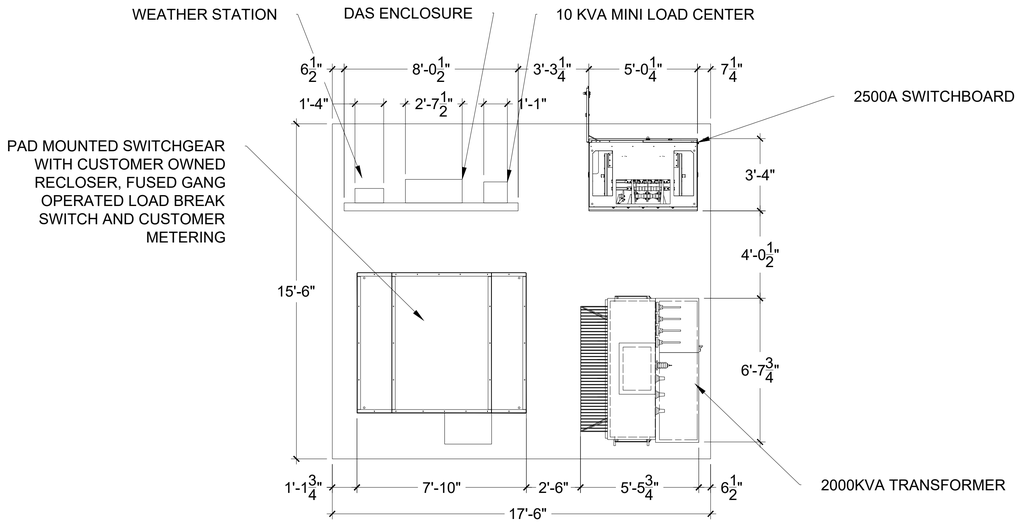
GEC
ALL GEC CONDUCTORS SHALL BE #4/0 BARE COPPER CONDUCTOR AND SHALL SPLICE INTO THE GROUND RING. SEE GROUND RING DETAIL ON SHEET E-310.

EQUIPMENT LIST ON PAD:
(1) 2000kVA 13.2kV-600V STEP UP TRANSFORMER (XFMR-1)
(1) GRIDCONNEX SWITCHGEAR (VACUUM BREAKER, RECLOSER AND METER)
(1) 2500A 600V SWITCHBOARD (SWBD-1)
(1) DAS ENCLOSURE (EN-1)
(1) DATA ACQUISITION SYSTEM WEATHER STATION
(1) 10kVA MINI LOAD CENTER (MLC-1)

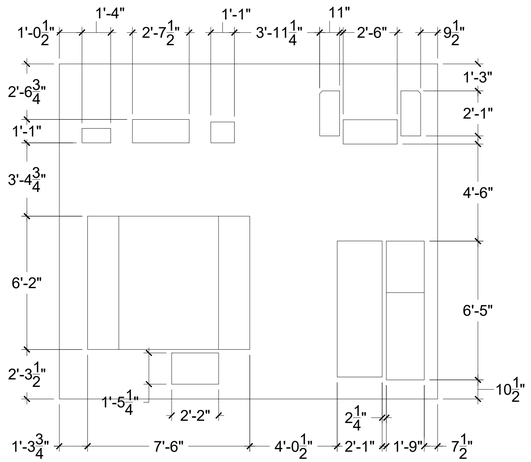
EQUIPMENT LIST ON INVERTER BANK:
(13) SMA SUNNY HIGHPOWER PEAK3 150-US INVERTERS (INVERTERS 1 - INVERTERS 13)



01 EQUIPMENT PAD - TOP VIEW
NOT TO SCALE



02 EQUIPMENT PAD DIMENSIONS - TOP VIEW
NOT TO SCALE



03 EQUIPMENT PAD DIMENSIONS- CONDUIT OPENINGS
NOT TO SCALE

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

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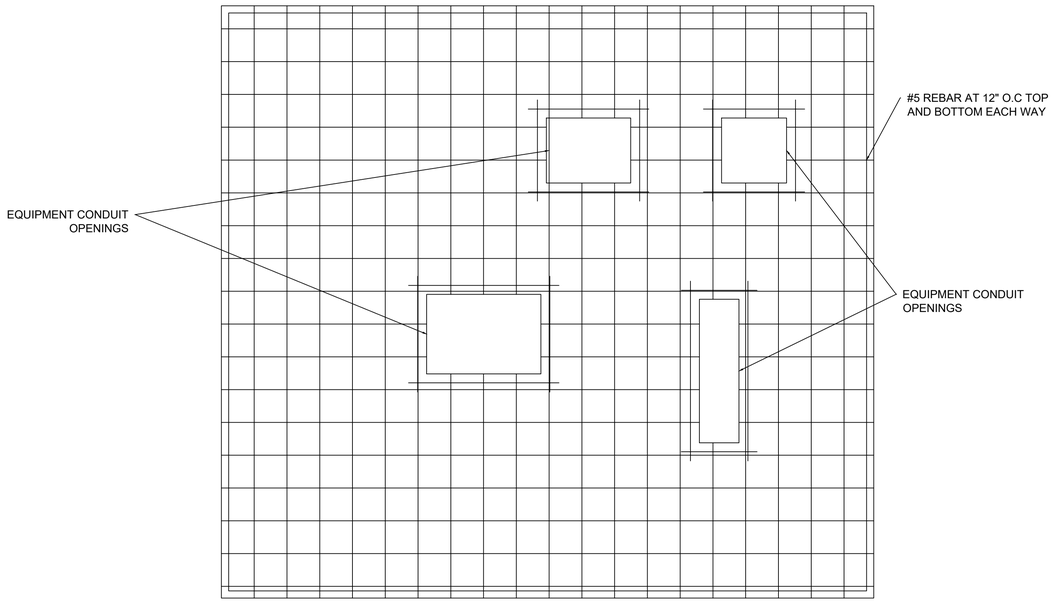
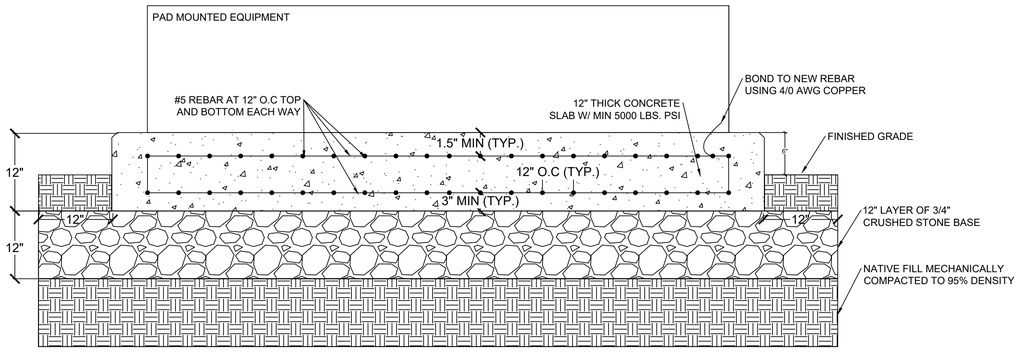
EQUIPMENT PAD 1 DETAILS

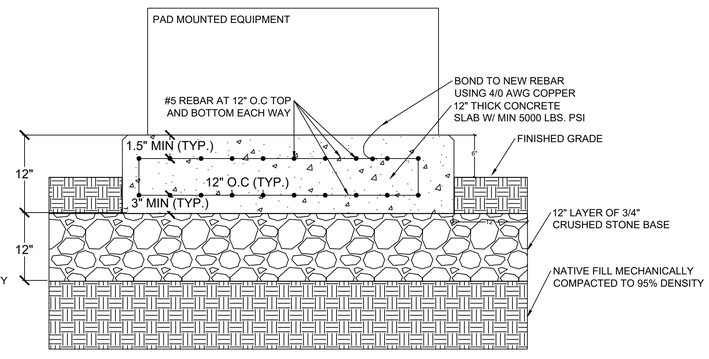
E-307



01 EQUIPMENT PAD STRUCTURAL SUPPORT DETAILS
NOT TO SCALE



02 EQUIPMENT PAD STRUCTURAL DETAILS FRONT VIEW
NOT TO SCALE



03 EQUIPMENT PAD STRUCTURAL DETAILS SIDE VIEW
NOT TO SCALE

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

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HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

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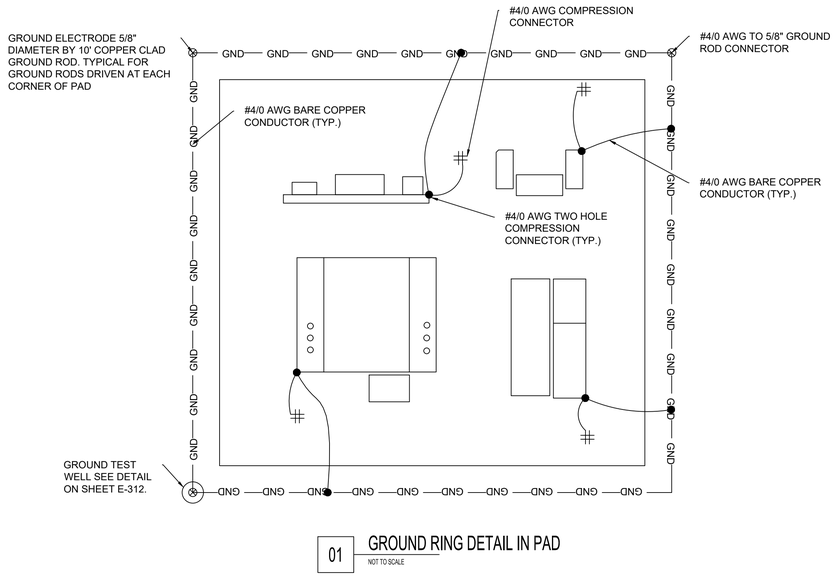
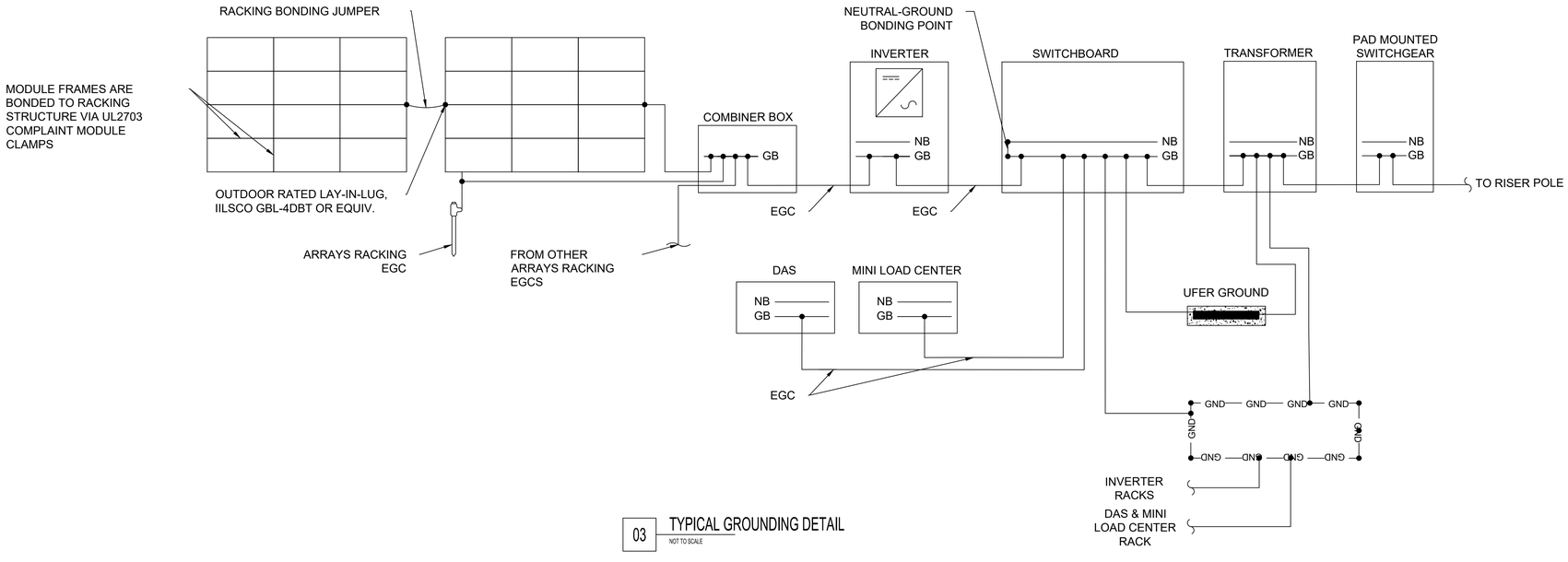
PAD STRUCTURAL DETAILS

E-308



01 GROUND RING DETAIL IN PAD
NOT TO SCALE



03 TYPICAL GROUNDING DETAIL
NOT TO SCALE

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

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PROJECT OWNER:

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Haddam Quarter Road
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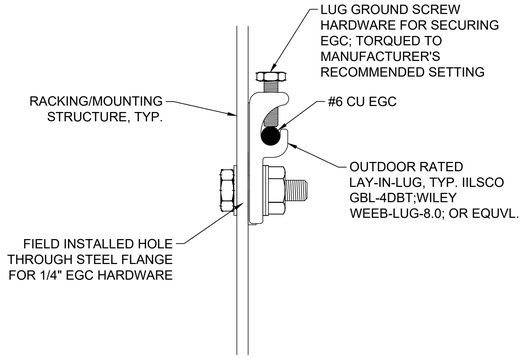
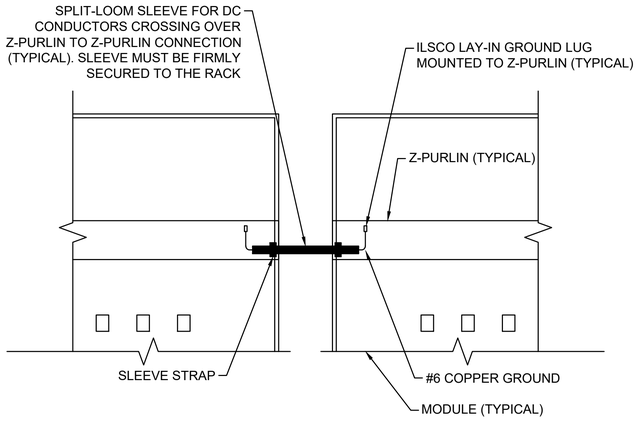
SHEET TITLE

PAD GROUNDING DETAILS

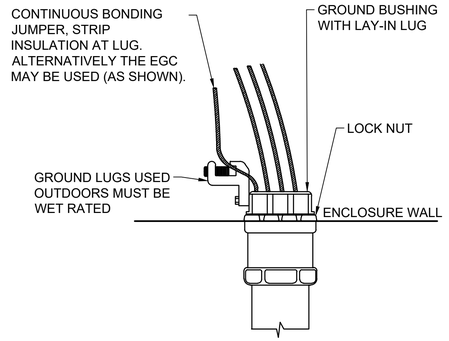
E-309



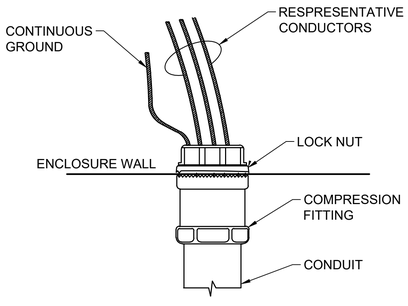
01 GROUND LUG DETAIL
NOT TO SCALE



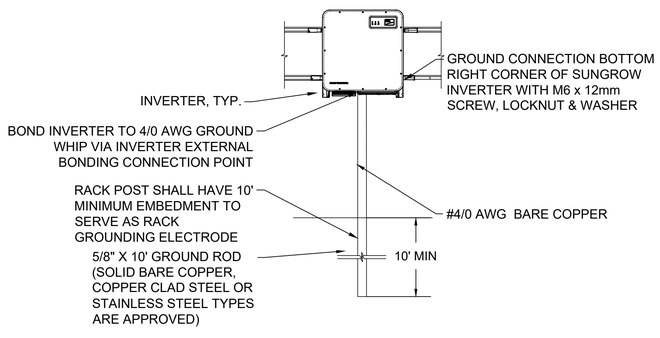
02 RACK TO RACK BONDING JUMPER (6"GAP)
NOT TO SCALE



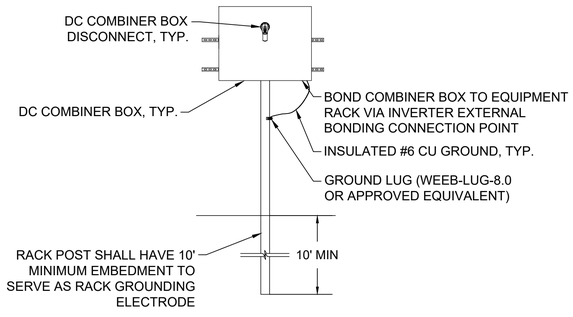
03 BONDING BUSHING GROUNDING DETAIL
NOT TO SCALE



04 MYERS HUB GROUNDING DETAIL
NOT TO SCALE



05 INVERTER/RACK BONDING DETAIL
NOT TO SCALE



06 COMBINER BOX BONDING DETAIL
NOT TO SCALE

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

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HADDAM QUARTER ROAD SOLAR

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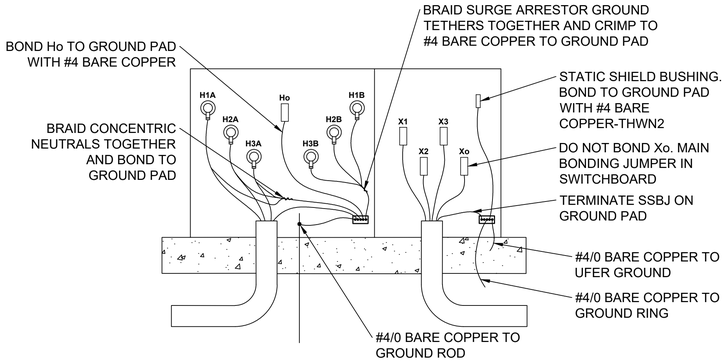
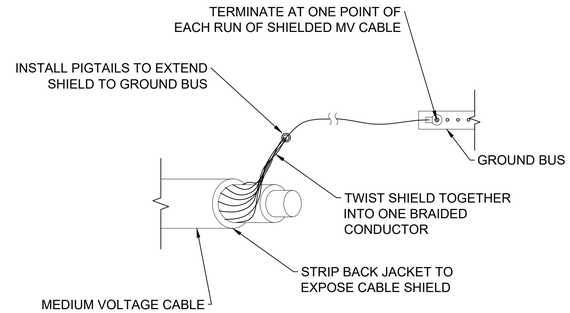
GROUNDING DETAILS

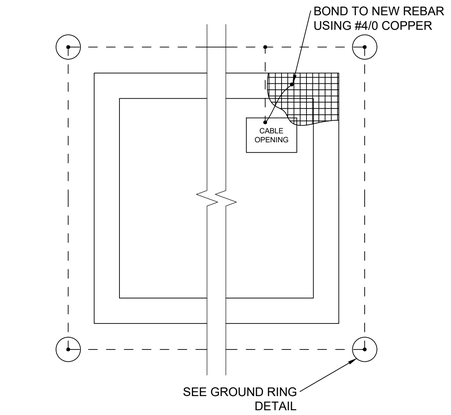
E-310



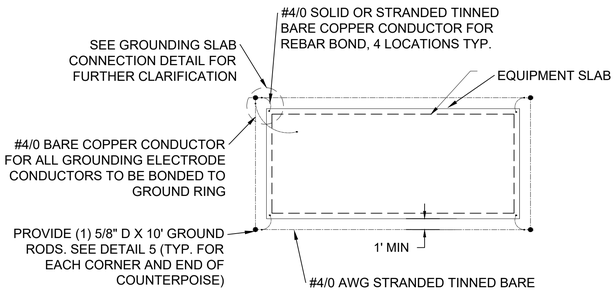
01 TRANSFORMER GROUNDING: WYE-G/WYE-G
NOT TO SCALE



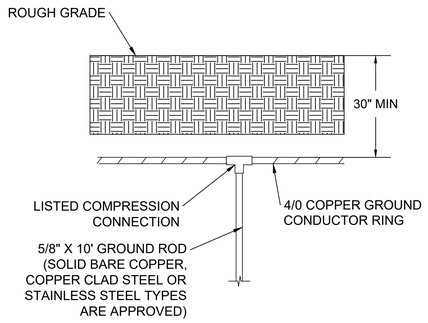
02 MEDIUM VOLTAGE CABLE SHIELD GROUNDING
NOT TO SCALE



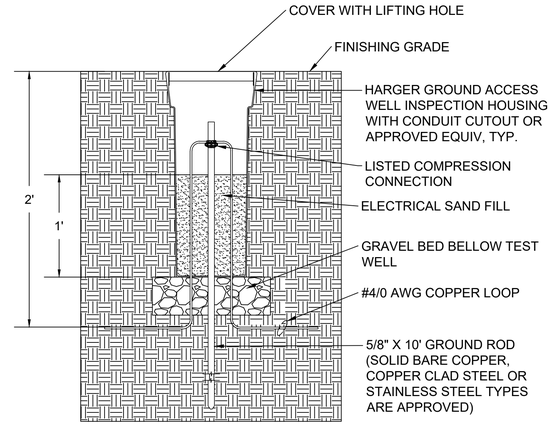
03 TYP. EQUIPMENT PAD GROUNDING DETAIL
NOT TO SCALE



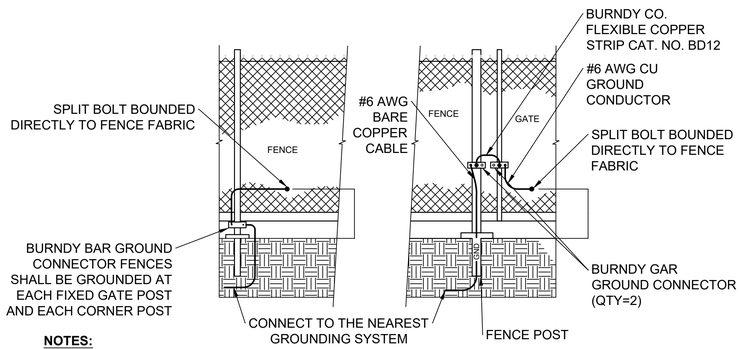
04 EQUIPMENT PAD GROUNDING DETAIL
NOT TO SCALE



05 GROUNDING ROD INSTALLATION DETAIL
NOT TO SCALE



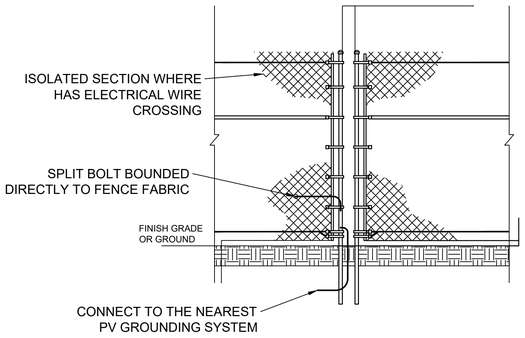
06 GROUNDING TEST WELL DETAIL
NOT TO SCALE



NOTES:

FENCE GROUNDING MUST BE GROUNDED WHEREVER THE FENCE CROSSES UNDERGROUND OR OVERHEAD POWER LINES. FENCE SHALL BE GROUNDED AT A MINIMUM OF 20' ON EITHER SIDE OF THE POWER LINE.

07 FENCE GROUNDING DETAIL
NOT TO SCALE



08 ISOLATED FENCE GROUNDING DETAIL
NOT TO SCALE

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE

REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO.	N/A
CAD DWG FILE:	HADDAM QUARTER P-S
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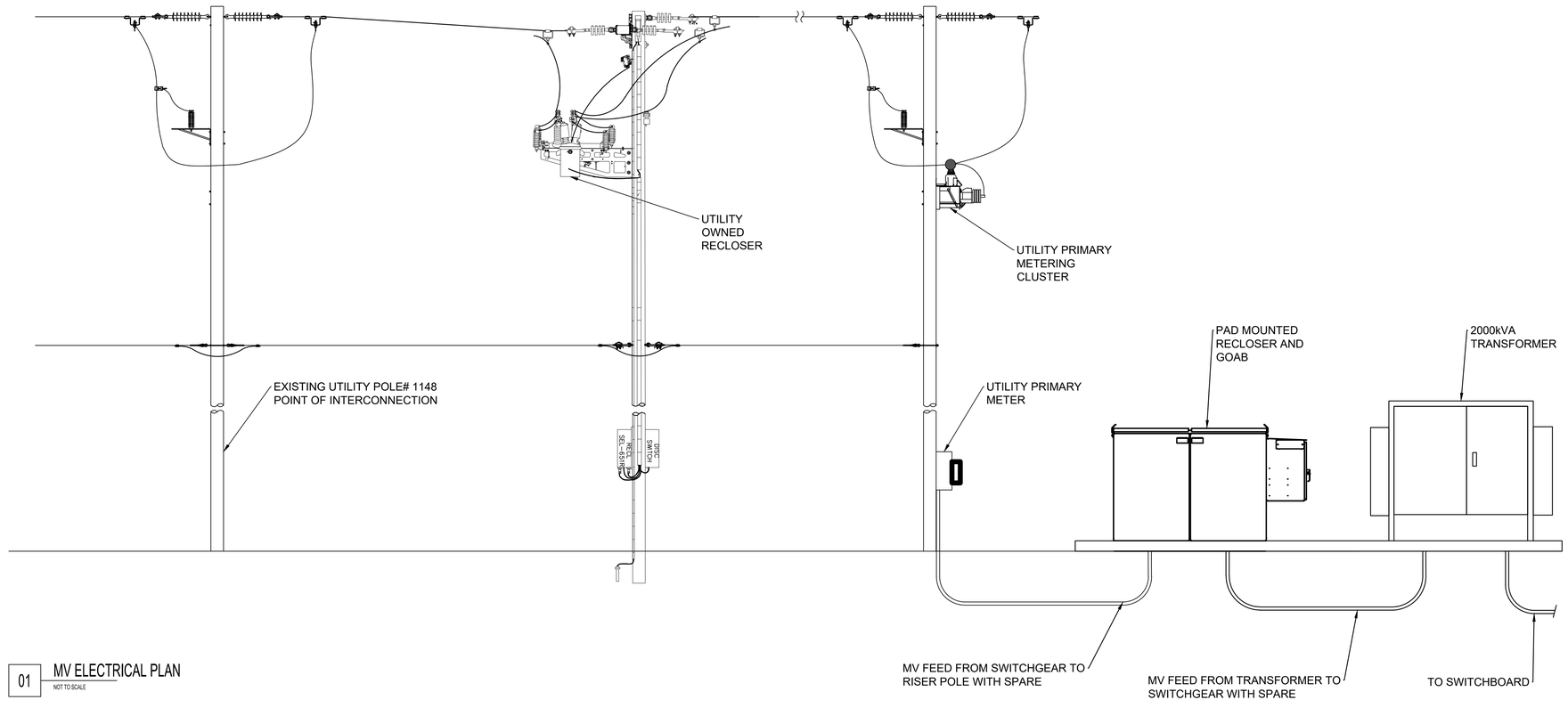
GROUNDING DETAILS

E-311

NOTES:
1. UTILITY POLE DRAWINGS ARE SHOWN FOR REFERENCE ONLY.
2. 2. HOLD FOR FINAL DESIGN ONCE CONFIRMED WITH EVERSOURCE



01 MV ELECTRICAL PLAN
NOT TO SCALE

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

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Haddam Quarter Road
Durham, CT 06422

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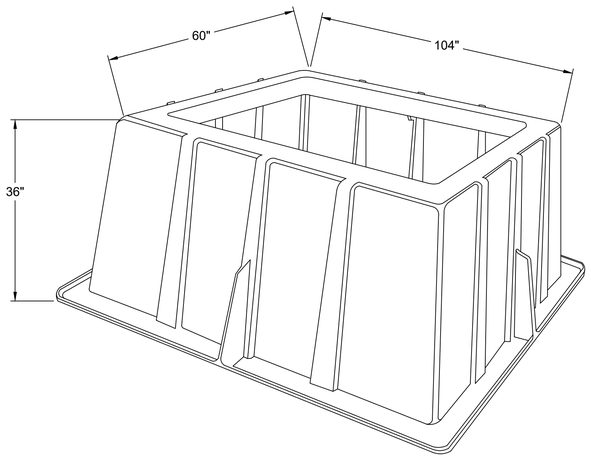
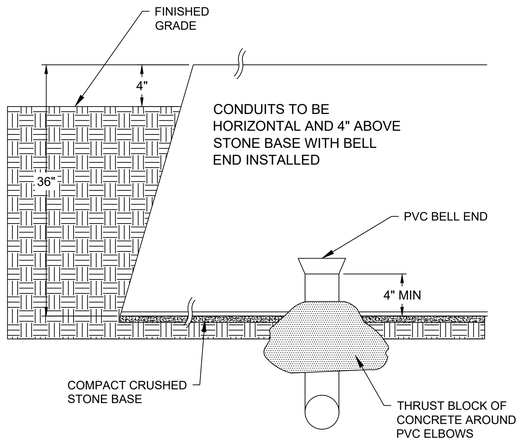
SHEET TITLE
MEDIUM VOLTAGE DETAILS

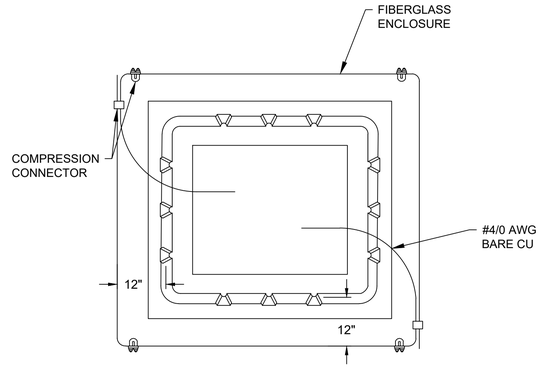
E-312



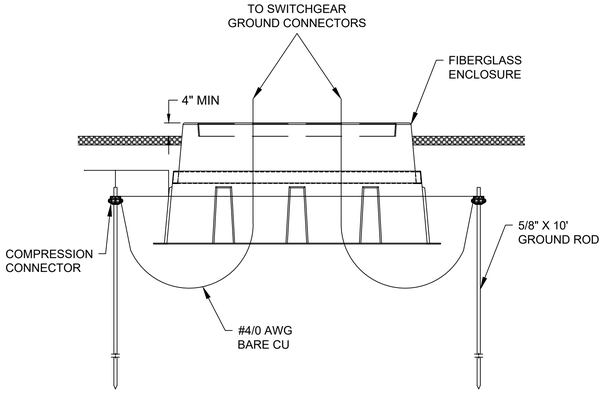
01 ENCLOSURE BASE DIMENSIONS
NOT TO SCALE



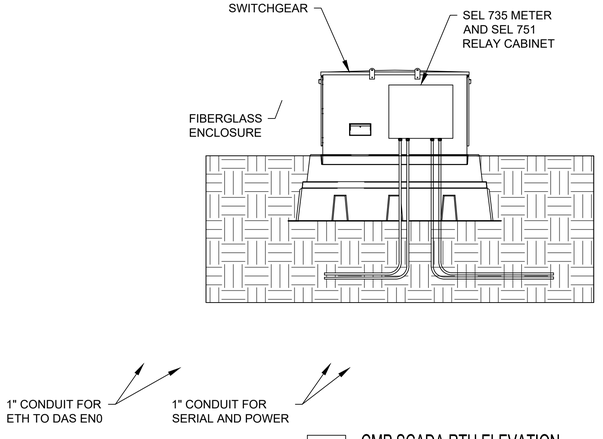
02 ENCLOSURE CONDUIT DETAIL
NOT TO SCALE



03 FIBERGLASS ENCLOSURE GROUNDING DETAIL (TOP)
NOT TO SCALE



04 ENCLOSURE GROUNDING DETAIL (SIDE)
NOT TO SCALE



05 CMP SCADA RTU ELEVATION
NOT TO SCALE

Louth Callan Renewables

921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

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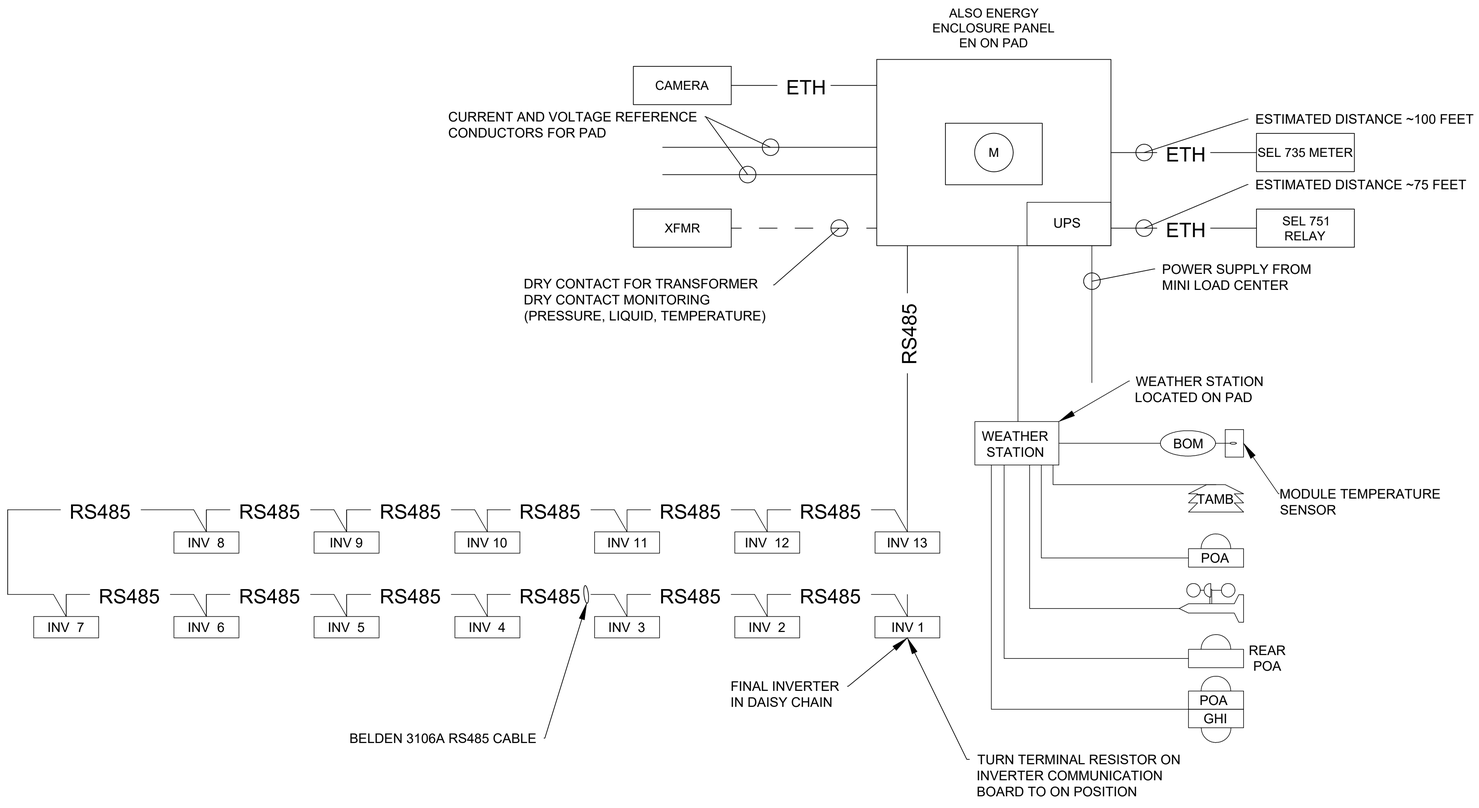
SWITCHGEAR DETAILS

E-313

GENERAL NOTES:

1. ALL WORK SHALL COMPLY WITH APPLICABLE CODE.
2. ALL RS485 WIRING SHALL BE IN DAISY CHAIN CONFIGURATION. STUBS SHALL BE LESS THAN 15m (49').
3. SHIELDED CABLE DRAIN SHALL BE CONNECTED TO EARTH GROUND. GROUND ON ONE END OF CABLE ONLY. GROUND LOOPS MAY RESULT IN FAILED COMMUNICATION AND LOST DATA.
4. RS-485 CABLE SHALL MEET OR EXCEED BELDEN 3106A SPECIFICATIONS. 4000FT (1220M) MAX LENGTH PER BUS.
5. ETHERNET NETWORK CABLE (CAT5E or CAT6) SHALL MEET OR EXCEED BELDEN 7919A SPECIFICATIONS, 100m (328') MAX BETWEEN EACH ACTIVE DEVICE.
6. SINGLE MODE FIBER SHALL BE OS2. REFER TO SINGLE LINE DIAGRAM FOR FIBER TERMINATION TYPE.
7. MULTI-MODE FIBER CABLE SHALL BE 50/125µm OR 62.5/125µm. TERMINATION SHALL BE SC TYPE UNLESS OTHERWISE SPECIFIED
8. ALL FIBER PATCH PANELS PROVIDED BY DAS PROVIDER TO INCLUDE ONE PRE-TERMINATED FIBER JUMPER CABLE OF COMPATIBLE FIBER AND TERMINATION TYPE. FIBER PATCH CABLE SHALL BE SHIPPED IN ORIGINAL PACKAGING INSIDE PANEL HOUSING TO PREVENT DAMAGE. ALL FIBER PATCH TERMINATIONS SHALL BE MADE BY INSTALLER AT COMMISSIONING.
9. MANY ANALOG SENSOR CABLES ARE CALIBRATED. CABLE LENGTH SHALL NOT BE MODIFIED WITHOUT APPROVAL FROM DAS PROVIDER.
10. ALL ENCLOSURE PENETRATIONS SHALL BE MADE ON THE BOTTOM OF THE ENCLOSURE GREATER THAN 1" (25mm) FROM ANY EDGE. WARRANTY OF ALL INTERNAL COMPONENTS AND WORKMANSHIP IS VOID IF THE ENCLOSURE PENETRATIONS DO NOT FOLLOW DAS PROVIDER REQUIREMENTS.

CONTROL CABLE SCHEDULE	
ETH	1" PVC SCH 40 CAT 6
RS-485	1"PVC SCH 40 BELDEN 3106



Louth Callan Renewables

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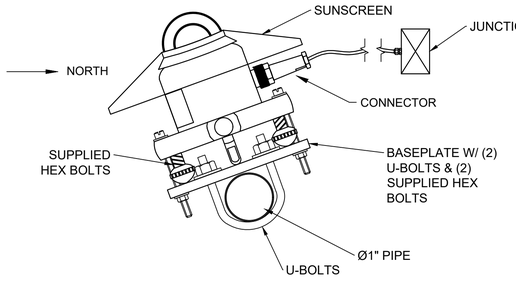
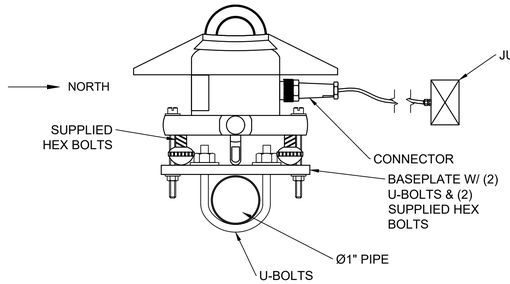
DAS SLD DETAILS

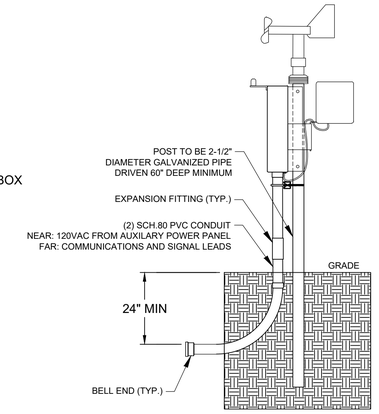
E-314



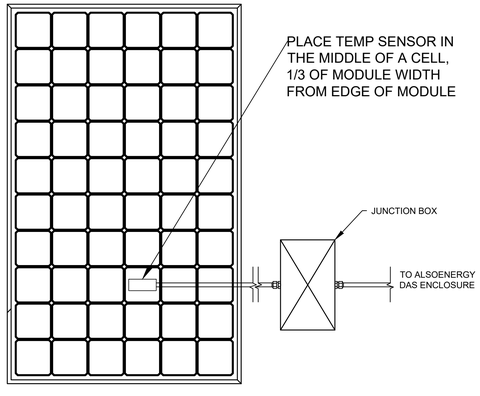
01 PYRANOMETER (POA)
NOT TO SCALE



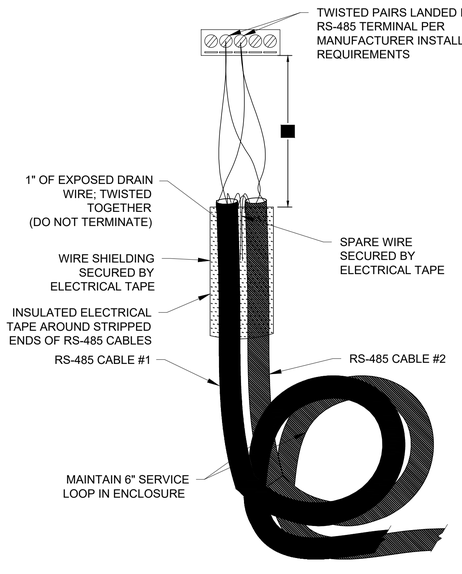
02 PYRANOMETER (GHI)
NOT TO SCALE



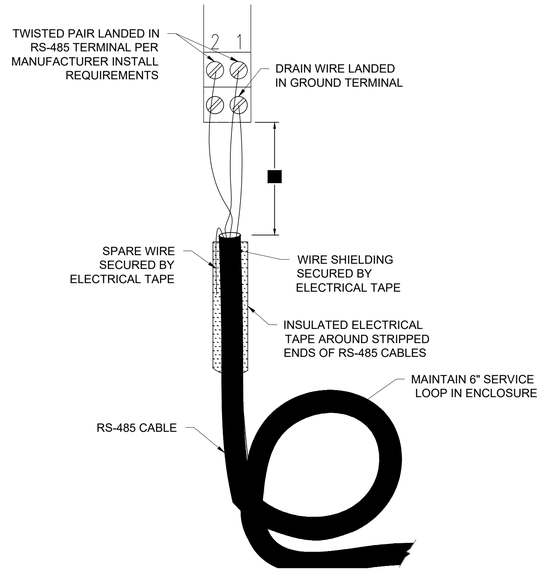
03 ANEMOMETER
NOT TO SCALE



04 MODULE TEMP. SENSOR INSTALL
NOT TO SCALE



06 RS-485 DAISY CHAIN WIRING DETAIL
NOT TO SCALE



07 RS-485 IN DAS ENCLOSURE
NOT TO SCALE

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SUFFIELD, CT 06078

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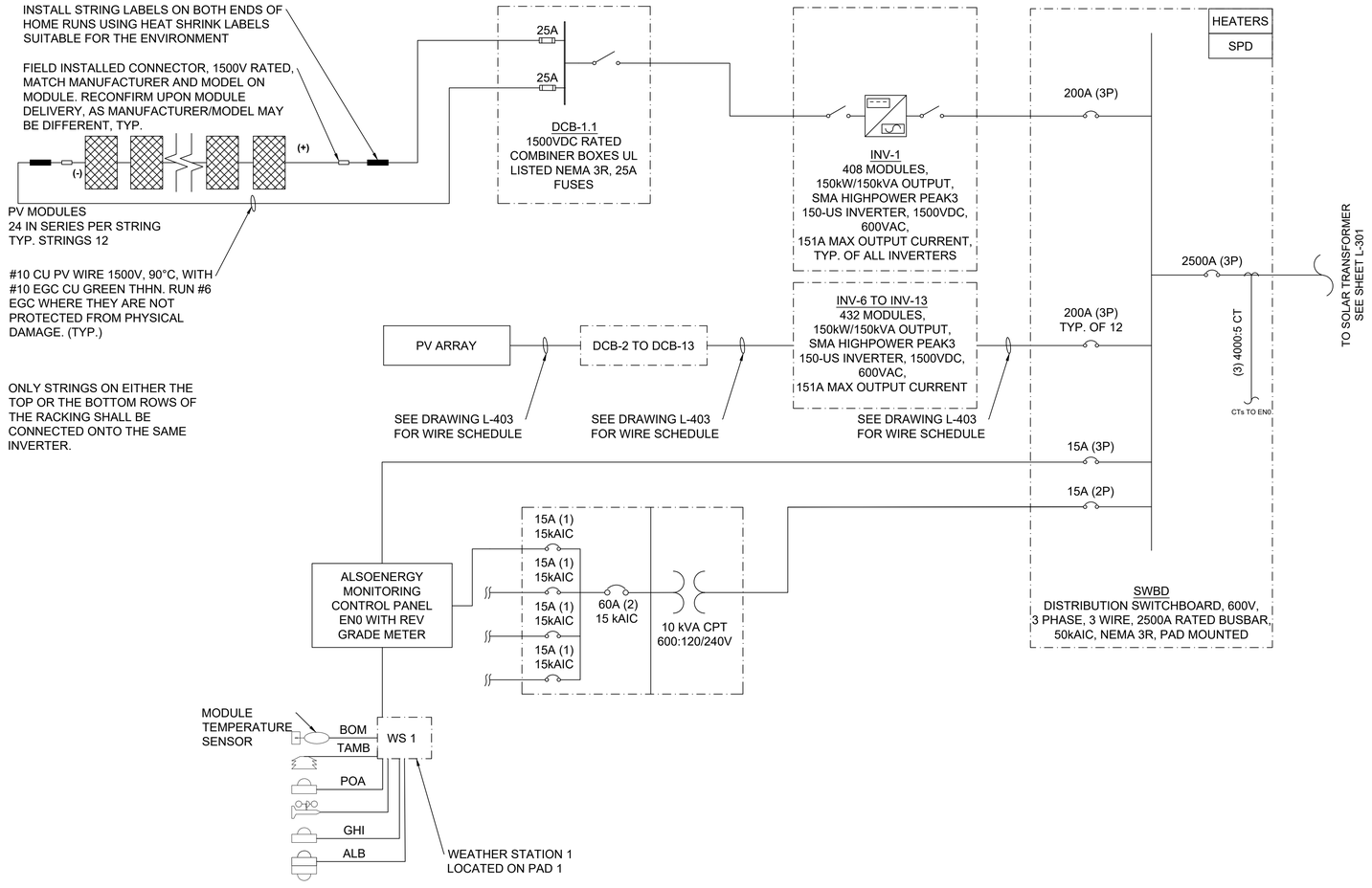
SHEET TITLE

COMMUNICATIONS DETAILS

E-315

NOTES:

1. ALL WORK SHALL BE IN ACCORDANCE WITH STATE AND LOCAL CODES, UTILITY REQUIREMENTS, AND THE NEC, ESPECIALLY ARTICLE 690 & 705.
2. AC AND DC DISCONNECTS SHALL BE LABELED AS SUCH AND READILY ACCESSIBLE IN THEIR APPROPRIATE LOCATIONS.
3. SOLAR PV MODULE FRAMES SHALL BE BONDED TO RACKING RAIL OR COPPER E.G.C PER THE MODULE MANUFACTURER'S LISTED INSTRUCTION SHEETS AND NEC 690 PART V-GROUNDING AND BONDING.
4. ALL JUNCTION BOXES, COMBINER BOXES, AND DISCONNECTS SHALL BE INSTALLED IN AN ACCESSIBLE LOCATION.
5. THESE DRAWINGS REPRESENT ASSUMED FIELD CONDITIONS. INSTALLATION SPECIFICATIONS MAY NEED TO BE ADJUSTED BASED ON ACTUAL FIELD CONDITIONS.
6. INVERTER IS EQUIPPED WITH BOTH DC & AC SURGE PROTECTION TYPE II MOV.
7. OUTDOOR EQUIPMENT AND SWITCHGEAR SHALL BE IN ACCORDANCE WITH APPLICABLE INDUSTRY STANDARDS.
8. METAL ENCLOSED LOW VOLTAGE SWITCHGEAR SHALL BE AS PER ANSI/IEEE C37.20.1.
9. POLE-MOUNTED EQUIPMENT ENCLOSURES SHALL BE AS PER ANSI/IEEE C57.12.31.



OVERALL SYSTEM SUMMARY	
DC SYSTEM SIZE	3022.80kW DC
AC SYSTEM SIZE	1950.00kW DC
MODULE	VSUN 550-144BMH-DG
MODULE QUANTITY	5,496
INVERTER	SMA HIGHPOWER PEAK3 150-US
INVERTER QUANTITY	(13) @ 1950kW OUTPUT
UTILITY	EVERSOURCE

MODULE SPECIFICATIONS	
MANUFACTURER	VSUN
MODEL	VSUN550-144BMH-DG
VOLTAGE CLASS	1500
POWER (W)	550
Isc (A)	13.99
Imp (A)	13.10
Voc (V)	49.92
Vmp (V)	42.00
ß VOC COEFFICENT [%/°C]	-0.27% / °C
SITE CLIMATE CRITERIA	
ASHRAE HIGH (°C)	33
ASHRAE LOW (°C)	-19
STRING SPECIFICATIONS AT STC	
MODULES/STRING	24
POWER (W)	13200
STRING Isc (A)	13.99
STRING Imp (A)	13.10
STRING Vmp (V)	1008
STRING MAX VOLTAGE CALCULATION	
Voc TEMP ADJUSTMENT @ ASHRAE LOW (V)	1.12
Voc @ASHRAE LOW TEMP (V)	55.85
MAX STRING Voc (V)	1340.41

INVERTER PROTECTIVE SETTINGS					
ANSI ID	DESCRIPTION	UNITS*	LEVEL	TRIP	CLEARING TIME [S]
27	SLOW UNDERVOLTAGE	V	88%	304.8 V	2.00
27	FAST UNDERVOLTAGE	V	50%	173.2 V	1.10
59	SLOW OVERVOLTAGE	V	110%	381.1 V	2.00
59	FAST OVERVOLTAGE	V	120%	415.7 V	0.16
81U-1	FAST UNDER FREQUENCY	Hz	56.50	56.5Hz	0.16
81U-2	SLOW UNDER FREQUENCY	Hz	58.50	58.5Hz	300.00
81O-1	FAST OVER FREQUENCY	Hz	62	62Hz	0.16
81O-2	SLOW OVER FREQUENCY	Hz	61.20	61.2Hz	300.00
79	MIN RECLOSING VOLTAGE VALUE	V	95%	329.1 V	300.00
79	MAX RECLOSING VOLTAGE VALUE	V	105%	363.7 V	300.00
79	MIN RECLOSING FREQUENCY VALUE	Hz	99%	59.5Hz	300.00
79	MAX RECLOSING FREQUENCY VALUE	Hz	101%	60.5Hz	300.00

**VOLTAGE TRIP VALUES ARE BASED OF ON A 347V LINE TO NEUTRAL VOLTAGE*

DC STRING WIRING CALCULATION	
MODULE	VSUN 550-144BMH-DG
STRING ISC (A)	13.99
MAX CONTINUOUS FAULT CURRENT FROM PARALLEL SOURCES (A)	13.10
1.25 x MAX CONTINUOUS FAULT CURRENT (A)	16.38
MAX NUMBER OF CURRENT CARRYING CONDUCTORS IN CONDUIT	20
CONDUIT FILL DERATE	0.50
MAX AMBIENT TEMPERATURE	33
TEMPERATURE DERATE	1.00
WIRE GAUGE	CU #10
75°C AMPACITY WITHOUT C.O.U. ADJUSTMENT (A)	35
IS 75°C AMPACITY WITHOUT C.O.U. ADJUSTMENT >= 1.25 x MAX CIRCUIT CURRENT?	YES. COMPLIES WITH 690.8(B)(1)
90°C AMPACITY WITH C.O.U. ADJUSTMENT (A)	20
IS 90°C AMPACITY WITH C.O.U. ADJUSTMENT >= 1.00 x MAX CIRCUIT CURRENT?	YES. COMPLIES WITH 690.8(B)(2)
PV SOURCE CIRCUIT FUSE RATING (A)	30
AVAILABLE FAULT CURRENT FROM ALL PARALLEL SOURCES (A)	17.49
IS FUSE RATING >= 1.25 x MAX CIRCUIT CURRENT?	YES. COMPLIES WITH 690.9(B)

Louth Callan Renewables
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SHEET SIZE:	ANSI D
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SHEET TITLE

SINGLE LINE DIAGRAM - MV

L-401

NOTES:

1. ALL WORK SHALL BE IN ACCORDANCE WITH STATE AND LOCAL CODES, UTILITY REQUIREMENTS, AND THE NEC, ESPECIALLY ARTICLE 690 & 705.
2. AC AND DC DISCONNECTS SHALL BE LABELED AS SUCH AND READILY ACCESSIBLE IN THEIR APPROPRIATE LOCATIONS.
3. SOLAR PV MODULE FRAMES SHALL BE BONDED TO RACKING RAIL OR COPPER E.G.C PER THE MODULE MANUFACTURER'S LISTED INSTRUCTION SHEETS AND NEC 690 PART V-GROUNDING AND BONDING.
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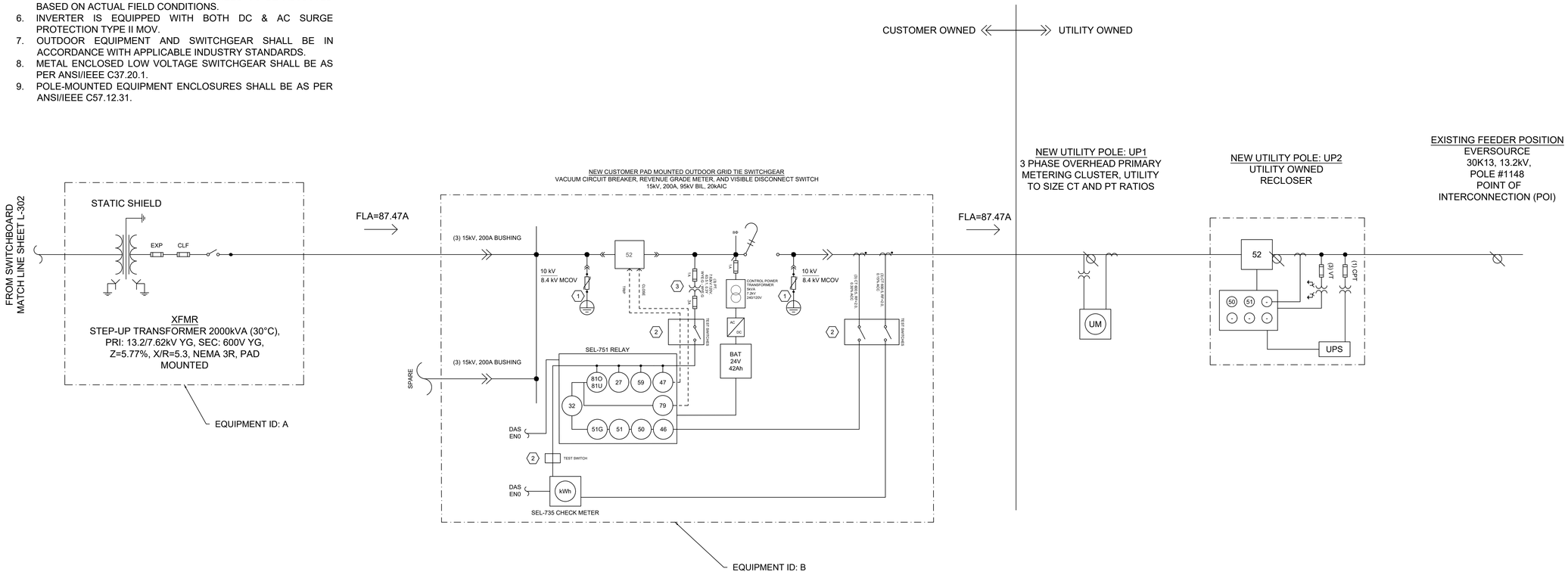

RECLOSER PROTECTIVE SETTINGS

ANSI ID	DESCRIPTION	SETTING (pu)	TRIP	RELAY TIME (SEC)	CLEARING TIME (SEC)
27-1	UNDERVOLTAGE	0.88	6706.5 V	1.95	2.00
27-2	UNDERVOLTAGE	0.5	3810.5 V	1.05	1.10
59-1	OVERVOLTAGE	1.1	8383.1 V	1.95	2.00
59-2	OVERVOLTAGE	1.2	9145.2 V	0.11	0.16
79V	RECLOSE	0.95 < V < 1.05		299.95	300.00
81U-1	UNDER FREQUENCY	58.5	58.5 Hz	299.95	300.00
81U-2	UNDERFREQUENCY	56.5	56.5 Hz	0.11	0.16
81O-1	OVER FREQUENCY	61.2	61.2 Hz	299.95	300.00
81O-2	OVER FREQUENCY	62	62 Hz	0.11	0.16
79F	RECLOSE	59.5 < f < 60.5	RECLOSE	299.95	300.00
ALARM	ALARM	-	TRIP	0.11	0.16
50	INSTANTANEOUS OVERCURRENT	6 PU CURRENT	511.7 A	-	-
51	TIMED OVERCURRENT	1.25 PU CURRENT	106.6 A	CURVE=U1, TD=1	-

NOTES:

1. OVERCURRENT SETTINGS SHALL BE COORDINATED WITH UTILITY PROTECTION SETTINGS AND DOWNSTREAM OVERCURRENT DEVICES. REFER TO COORDINATION STUDY AND PROTECTIVE DEVICE SETTINGS PRIOR TO ENERGIZATION.
2. 79 FUNCTION IS ONLY ENABLED ON VOLTAGE AND FREQUENCY DISTURBANCES. A 5 MINUTE DELAY FOR THE 79 FUNCTION IS ENABLED ON VOLTAGE AND FREQUENCY DISTURBANCES ONLY. A 5 MINUTE DELAY WILL BE SET FOR RECLOSING UPON GOOD QUALITY VOLTAGE. THE FIVE MINUTE TIME INTERVAL WILL RESTART IF THE UTILITY VOLTAGE OR FREQUENCY FALLS OUTSIDE OF THE WINDOW IDENTIFIED IN THE ABOVE CHART. RECLOSER WILL LOCKOUT ON OVERCURRENT OPERATION.
3. RECLOSER WILL ONLY BE ALLOWED TO CLOSE WHEN THE VOLTAGE AND FREQUENCY ARE IN COMPLIANCE WITH IEEE-1547, ANSI C84.1, TABLE 1. VOLTAGE RANGE 95% TO 105% OF NOMINAL. VOLTAGE IS BASED ON LINE TO LINE VOLTAGE. FREQUENCY BETWEEN 59.6HZ TO 60.5HZ.
4. RELAY WILL AUTOMATICALLY TRIP AND BLOCK CLOSE IF THERE IS A HARDWARE FAILURE OR POWER SUPPLY FAILURE.
5. 13279.1V WAS USED FOR THE NOMINAL VOLTAGE CALCULATIONS FOR THE 27/59 VOLTAGE ELEMENTS.

SCHEDULE OF MAJOR ELECTRICAL EQUIPMENT

IDENTIFIER	DESCRIPTION	MANUFACTURER	MODEL NUMBER	QUANTITY
A	STEP-UP TRANSFORMER 2000kVA, 65°C RISE KNAN, FR3. PRIMARY: 13.2/7.62kV YG 95kV BIL, SECONDARY: 600/346V YG 30kV BIL, 5-LEGGED CORE, ELECTROSTATIC SHIELD, Z=5.77%, X/R=6, EXP AND CLF FUSING, DRY CONTACTS FOR MONITORING, TAPS: 2 ABOVE, 2 BELOW @ 2.5%, NEMA 3R, PAD MOUNTED	EATON	CONTACT VENDOR	1
B	OUTDOOR DEAD-FRONT PAD MOUNTED SWITCHGEAR ASSEMBLY, 15kV, 95kV BIL, 20kAIC, 200A	FEDERAL PACIFIC	GRIDCONNEX	1
B	VACUUM CIRCUIT BREAKER, 15kV, 95kV BIL, 40kA, 600A, 300:5 CT ACCURACY +/- 1%, 5kVA SINGLE PHASE CPT 7620:120V (63.5:1), (6) 10kV/8.4kV MCOV SURGE ARRESTORS, FAIL SAFE TRIP CIRCUITRY AND TEST SWITCHES FOR CTs AND PTs, SEL751 P/N 751402B0X0XL0851D00 FEEDER PROTECTION RELAY, 24VDC, 42AH BATTERY.	TAVRIDA	ISM-MD	1
B	ADVANCED RECLOSER CONTROL, CONTROL, FAIL, SAFE AND TRIP AND BLOCK CLOSE IMMEDIATELY IN EVENT OF RELAY HARDWARE OR SOFTWARE ALARM WITHIN 2 SECONDS	SEL	SEL-751	1
B	POWER AND QUALITY REVENUE GRADE METER, (3) 13200:120 POWER TRANSFORMERS, (3) 600:5 CURRENT TRANSFORMERS	SEL	SEL-735	1

KEYED NOTES

#	DESCRIPTION
1	(3) 8.4 kV MAXIMUM CONTINUOUS OPERATING VOLTAGE (MCOV) LIGHTNING ARRESTERS. ONE PER PHASE. ARRESTERS ARE SIZED PER IEEE C62.11 WITH THE ASSUMPTION THAT MAXIMUM VOLTAGE IS 5% OF NOMINAL (10 kV)
2	TEST SWITCHES SHALL BE INCLUDED AS SHOWN FOR O&M PURPOSES
3	(3) EXTERNAL VOLTAGE TRANSFORMER 7620:120V PT's IN GWYE - GWYE CONFIGURATION WITH EXTERNAL TEST SWITCH, FUSED AT 1A ON PRIMARY, 3A ON SECONDARY

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SHEET TITLE
SINGLE LINE DIAGRAM

L-402

MV FEEDER CALCULATIONS																
EQUIPMENT SUPPLIED	FED FROM	CIRCUIT ROUTING	VOLTAGE (V)	APPARENT POWER (KVA)	FEEDER LENGTH (FT)	FULL LOAD AMPERAGE "FLA" (A)	CONDUCTOR MATERIAL	CONDUCTOR TYPE	CONDUCTOR SIZE	NEC TABLE REFERENCE	TEMPERATURE DE-RATE	CURRENT CARRYING CONDUCTOR DE-RATE	ADJUSTED CONDUCTOR AMPACITY (A)	VOLTAGE DROP	CONDUIT SIZE	ADDITIONAL GROUND WIRE SIZE	WIRE SCHEDULE
UTILITY RECLOSER	POI	OVERHEAD SPACED	13,200	1,950	280	85.29	AL	15kV ACSR BARE OVERHEAD	#1/0 AWG	NEC TABLE 310.15(B)(21)	1.00	1.00	215	0.09%	N/A	N/A	(3) #4 AWG ASCR
UTILITY METER	UTILITY RECLOSER	OVERHEAD SPACED	13,200	1,950	50	85.29	AL	15kV ACSR BARE OVERHEAD	#1/0 AWG	NEC TABLE 310.15(B)(21)	1.00	1.00	215	0.01%	N/A	N/A	(3) #4 AWG ASCR
PAD MOUNTED RECLOSER	UTILITY METER	CONDUIT	13,200	1,950	90	85.29	AL	MV 105, 15kV, 100% 1/3 CONCENTRIC NEUTRAL	#1/0 AWG	NEC TABLE 310.60(C)(74)	1.00	1.00	170	0.03%	4" PVC SCH 80	CU #4	(3) #1/0 AWG AL MV105 1/3 CONCENTRIC NEUTRAL 15KV 100% EPR. INCLUDE (1)CU #4 EGC (600V)
TRANSFORMER	PAD MOUNTED RECLOSER	CONDUIT	13,200	1,950	20	85.29	AL	MV 105, 15kV, 100% 1/3 CONCENTRIC NEUTRAL	#1/0 AWG	NEC TABLE 310.60(C)(74)	1.00	1.00	170	0.00%	4" PVC SCH 80	CU #4	(3) #1/0 AWG AL MV105 1/3 CONCENTRIC NEUTRAL 15KV 100% EPR. INCLUDE (1)CU #4 EGC (600V)

01 MV WIRE SCHEDULE

AC FEEDER CALCULATIONS - SWITCHBOARD 1																			
EQUIPMENT SUPPLIED	FED FROM	VOLTAGE (V)	FULL LOAD AMPERAGE "FLA" (A)	OCPD SIZE	GROUND SIZE	CONDUCTORS PER PHASE	PHASE CONDUCTOR SIZE	NEUTRAL CONDUCTOR SIZE	CABLE INSULATION	75°C AMAPACITY	90°C AMAPACITY	90° AMAPACITY WITH C.O.U	C.O.U DERATE AMBIENT TEMP	C.O.U DERATE CONDUIT FILL	RACEWAY	CONDUIT TYPE	CONDUIT SIZE	CONDUIT FILL	FEEDER LENGTH (FEET)	AC VOLTAGE DROP (%)	AC VOLTAGE DROP TO POI (%)
SWITCHBOARD 1	TRANSFORMER 1	600	1963.0	2500	CU 250 MCM	8	AL #500 MCM	AL #500 MCM	XHHW-2	2480	2800	2688.00	0.96	1.00	CONDUIT	PVC SCHED 40	4"	21.79%	10	0.03%	0.07%
INVERTER 1	SWITCHBOARD 1	600	151.0	200	CU #4	1	AL #250 MCM	NONE	XHHW-2	205	230	220.80	0.96	1.00	CONDUIT	PVC SCHED 40	2.5"	22.82%	20	0.07%	0.67%
INVERTER 2	SWITCHBOARD 1	600	151.0	200	CU #4	1	AL #250 MCM	NONE	XHHW-2	205	230	220.80	0.96	1.00	CONDUIT	PVC SCHED 40	2.5"	22.82%	20	0.07%	0.67%
INVERTER 3	SWITCHBOARD 1	600	151.0	200	CU #4	1	AL #250 MCM	NONE	XHHW-2	205	230	220.80	0.96	1.00	CONDUIT	PVC SCHED 40	2.5"	22.82%	20	0.07%	0.67%
INVERTER 4	SWITCHBOARD 1	600	151.0	200	CU #4	1	AL #250 MCM	NONE	XHHW-2	205	230	220.80	0.96	1.00	CONDUIT	PVC SCHED 40	2.5"	22.82%	20	0.07%	0.67%
INVERTER 5	SWITCHBOARD 1	600	151.0	200	CU #4	1	AL #250 MCM	NONE	XHHW-2	205	230	220.80	0.96	1.00	CONDUIT	PVC SCHED 40	2.5"	22.82%	20	0.07%	0.67%
INVERTER 6	SWITCHBOARD 1	600	151.0	200	CU #4	1	AL #250 MCM	NONE	XHHW-2	205	230	220.80	0.96	1.00	CONDUIT	PVC SCHED 40	2.5"	22.82%	20	0.07%	0.67%
INVERTER 7	SWITCHBOARD 1	600	151.0	200	CU #4	1	AL #250 MCM	NONE	XHHW-2	205	230	220.80	0.96	1.00	CONDUIT	PVC SCHED 40	2.5"	22.82%	20	0.07%	0.67%
INVERTER 8	SWITCHBOARD 1	600	151.0	200	CU #4	1	AL #250 MCM	NONE	XHHW-2	205	230	220.80	0.96	1.00	CONDUIT	PVC SCHED 40	2.5"	22.82%	20	0.07%	0.67%
INVERTER 9	SWITCHBOARD 1	600	151.0	200	CU #4	1	AL #250 MCM	NONE	XHHW-2	205	230	220.80	0.96	1.00	CONDUIT	PVC SCHED 40	2.5"	22.82%	20	0.07%	0.67%
INVERTER 10	SWITCHBOARD 1	600	151.0	200	CU #4	1	AL #250 MCM	NONE	XHHW-2	205	230	220.80	0.96	1.00	CONDUIT	PVC SCHED 40	2.5"	22.82%	20	0.07%	0.67%
INVERTER 11	SWITCHBOARD 1	600	151.0	200	CU #4	1	AL #250 MCM	NONE	XHHW-2	205	230	220.80	0.96	1.00	CONDUIT	PVC SCHED 40	2.5"	22.82%	20	0.07%	0.67%
INVERTER 12	SWITCHBOARD 1	600	151.0	200	CU #4	1	AL #250 MCM	NONE	XHHW-2	205	230	220.80	0.96	1.00	CONDUIT	PVC SCHED 40	2.5"	22.82%	20	0.07%	0.67%
INVERTER 13	SWITCHBOARD 1	600	151.0	200	CU #4	1	AL #250 MCM	NONE	XHHW-2	205	230	220.80	0.96	1.00	CONDUIT	PVC SCHED 40	2.5"	22.82%	20	0.07%	0.67%
																			AVERAGE	0.67%	
																			MAX	0.67%	

02 AC FEEDER CALCULATIONS - SWITCHBOARD

AUXILIARY EQUIPMENT WIRING SCHEDULE																			
EQUIPMENT SUPPLIED	FED FROM	VOLTAGE (V)	FULL LOAD AMPERAGE "FLA" (A)	OCPD SIZE	GROUND SIZE	CONDUCTORS PER PHASE	PHASE CONDUCTOR SIZE	NEUTRAL CONDUCTOR SIZE	CABLE INSULATION	75°C AMAPACITY	90°C AMAPACITY	90° AMAPACITY WITH C.O.U	C.O.U DERATE AMBIENT TEMP	C.O.U DERATE CONDUIT FILL	RACEWAY	CONDUIT TYPE	CONDUIT SIZE	CONDUIT FILL	FEEDER LENGTH (FEET)	AC VOLTAGE DROP (%)
MINI LOAD CENTER 1	SWITCHBOARD 1	600	9.6	15	CU #10	1	AL #4	NONE	XHHW-2	65	75	70.50	0.94	1.00	CONDUIT	PVC SCHED 40	1.25"	16.64%	10	0.01%

03 AUX. EQUIPMENT WIRE SCHEDULE

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE

REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO: N/A
CAD DWG FILE: HADDAM QUARTER.IFC
SHEET SIZE: ANSI D
DRAWN BY:
CHECKED BY:
COPYRIGHT:

SHEET TITLE
SCHEDULES AND CALCULATIONS

L-403

PV SOURCE CIRCUITS COMBINER BOX INPUTS DC WIRING SCHEDULE

COMBINER BOX ID	PV SOURCE CIRCUITS PER COMBINER BOX	MODULES PER PV SOURCE CIRCUIT	MODULE SIZE [W]	PEAK DC STC POWER [kW]	PV SOURCE CIRCUIT SHORT CIRCUIT CURRENT Isc [A] (20% BIFACIAL GAIN ZNSHINE MODULES)	MAX CURRENT [A]	MAX CURRENT * 1.25 [A] NEC 690.8(A)	MIN OCPD [A] NEC 690.9 (A)	TEMPERATURE DE-RATE NEC TABLE 690.31(A)	CURRENT-CARRY CONDUCTOR DE-RATE NEC TABLE 310.15 (B)(3)(a)	CONDITIONS OF USE CURRENT [A] NEC 690.31(A)	TOTAL CONDUCTOR 90 °C AMPACITY [A] NEC TABLE 310.15(B)(16)	TOTAL CONDUCTOR 75 °C AMPACITY [A] NEC TABLE 310.15(B)(16)	ADJUSTED CONDUCTOR AMPACITY [A] NEC690.8(B)(2)	CABLE TYPE	CONDUCTOR MATERIAL	CONDUCTOR SIZE	# OF PARRALLEL CONDUCTORS	GROUND CONDUCTOR MATERIAL	GROUND WIRE SIZE	RACEWAY
DCB-1	17	24	550	224.4	16.8	21.0	26.2	30	0.96	0.5	21.0	40	35	19	2000Vdc PV WIRE	CU	#10	1	CU	6 AWG	CONDUIT
DCB-2	17	24	550	224.4	16.8	21.0	26.2	30	0.96	0.5	21.0	40	35	19	2000Vdc PV WIRE	CU	#10	1	CU	6 AWG	CONDUIT
DCB-3	17	24	550	224.4	16.8	21.0	26.2	30	0.96	0.5	21.0	40	35	19	2000Vdc PV WIRE	CU	#10	1	CU	6 AWG	CONDUIT
DCB-4	17	24	550	224.4	16.8	21.0	26.2	30	0.96	0.5	21.0	40	35	19	2000Vdc PV WIRE	CU	#10	1	CU	6 AWG	CONDUIT
DCB-5	17	24	550	224.4	16.8	21.0	26.2	30	0.96	0.5	21.0	40	35	19	2000Vdc PV WIRE	CU	#10	1	CU	6 AWG	CONDUIT
DCB-6	18	24	550	237.6	16.8	21.0	26.2	30	0.96	0.5	21.0	40	35	19	2000Vdc PV WIRE	CU	#10	1	CU	6 AWG	CONDUIT
DCB-7	18	24	550	237.6	16.8	21.0	26.2	30	0.96	0.5	21.0	40	35	19	2000Vdc PV WIRE	CU	#10	1	CU	6 AWG	CONDUIT
DCB-8	18	24	550	237.6	16.8	21.0	26.2	30	0.96	0.5	21.0	40	35	19	2000Vdc PV WIRE	CU	#10	1	CU	6 AWG	CONDUIT
DCB-9	18	24	550	237.6	16.8	21.0	26.2	30	0.96	0.5	21.0	40	35	19	2000Vdc PV WIRE	CU	#10	1	CU	6 AWG	CONDUIT
DCB-10	18	24	550	237.6	16.8	21.0	26.2	30	0.96	0.5	21.0	40	35	19	2000Vdc PV WIRE	CU	#10	1	CU	6 AWG	CONDUIT
DCB-11	18	24	550	237.6	16.8	21.0	26.2	30	0.96	0.5	21.0	40	35	19	2000Vdc PV WIRE	CU	#10	1	CU	6 AWG	CONDUIT
DCB-12	18	24	550	237.6	16.8	21.0	26.2	30	0.96	0.5	21.0	40	35	19	2000Vdc PV WIRE	CU	#10	1	CU	6 AWG	CONDUIT
DCB-13	18	24	550	237.6	16.8	21.0	26.2	30	0.96	0.5	21.0	40	35	19	2000Vdc PV WIRE	CU	#10	1	CU	6 AWG	CONDUIT

01 DC FEEDER CALCULATIONS - PV SOURCE CIRCUITS

PV OUTPUT CIRCUITS COMBINER BOX DC WIRING SCHEDULE

COMBINER BOX ID	PV SOURCE CIRCUITS PER COMBINER BOX	MODULES PER PV SOURCE CIRCUIT	MODULE SIZE [W]	PEAK DC STC POWER [kW]	PV SOURCE CIRCUIT SHORT CIRCUIT CURRENT Isc [A]	MAX CURRENT [A]	MAX CURRENT * 1.25 [A] NEC 690.8(A)	MIN OCPD [A] NEC 690.9 (A) (100% RATED)	TEMPERATURE DE-RATE NEC TABLE 690.31(A)	CURRENT-CARRY CONDUCTOR DE-RATE NEC TABLE 310.15 (B)(3)(a)	CONDITIONS OF USE CURRENT [A] NEC 690.31(A)	TOTAL CONDUCTOR 90 °C AMPACITY [A] NEC TABLE 310.15(B)(16)	TOTAL CONDUCTOR 75 °C AMPACITY [A] NEC TABLE 310.15(B)(16)	ADJUSTED CONDUCTOR AMPACITY [A] NEC690.8(B)(2)	CABLE TYPE	CONDUCTOR MATERIAL	CONDUCTOR SIZE	# OF PARRALLEL CONDUCTORS	GROUND CONDUCTOR MATERIAL	GROUND WIRE SIZE	RACEWAY	CONDUIT SIZE	CONDUIT FILL	CONDUCTOR
DCB-1	17	24	550	224.4	13.10	278.4	348.0	400	0.96	1	290.0	305	270	293	2000Vdc PV WIRE	AL	#400 MCM	1	CU	#1/0 AWG	CONDUIT	2.5"	23.99%	2#400MCM 2000Vdc AL PV-WIRE, 1#1/0 CU EGC IN 2.5" PVC
DCB-2	17	24	550	224.4	13.10	278.4	348.0	400	0.96	1	290.0	305	270	293	2000Vdc PV WIRE	AL	#400 MCM	1	CU	#1/0 AWG	CONDUIT	2.5"	23.99%	2#400MCM 2000Vdc AL PV-WIRE, 1#1/0 CU EGC IN 2.5" PVC
DCB-3	17	24	550	224.4	13.10	278.4	348.0	400	0.96	1	290.0	305	270	293	2000Vdc PV WIRE	AL	#400 MCM	1	CU	#1/0 AWG	CONDUIT	2.5"	23.99%	2#400MCM 2000Vdc AL PV-WIRE, 1#1/0 CU EGC IN 2.5" PVC
DCB-4	17	24	550	224.4	13.10	278.4	348.0	400	0.96	1	290.0	305	270	293	2000Vdc PV WIRE	AL	#400 MCM	1	CU	#1/0 AWG	CONDUIT	2.5"	23.99%	2#400MCM 2000Vdc AL PV-WIRE, 1#1/0 CU EGC IN 2.5" PVC
DCB-5	17	24	550	224.4	13.10	278.4	348.0	400	0.96	1	290.0	305	270	293	2000Vdc PV WIRE	AL	#400 MCM	1	CU	#1/0 AWG	CONDUIT	2.5"	23.99%	2#400MCM 2000Vdc AL PV-WIRE, 1#1/0 CU EGC IN 2.5" PVC
DCB-6	18	24	550	237.6	13.10	294.8	368.4	400	0.96	1	307.0	350	310	336	2000Vdc PV WIRE	AL	#500 MCM	1	CU	#1/0 AWG	CONDUIT	2.5"	23.99%	2#500MCM 2000Vdc AL PV-WIRE, 1#1/0 CU EGC IN 2.5" PVC
DCB-7	18	24	550	237.6	13.10	294.8	368.4	400	0.96	1	307.0	350	310	336	2000Vdc PV WIRE	AL	#500 MCM	1	CU	#1/0 AWG	CONDUIT	2.5"	23.99%	2#500MCM 2000Vdc AL PV-WIRE, 1#1/0 CU EGC IN 2.5" PVC
DCB-8	18	24	550	237.6	13.10	294.8	368.4	400	0.96	1	307.0	350	310	336	2000Vdc PV WIRE	AL	#500 MCM	1	CU	#1/0 AWG	CONDUIT	2.5"	23.99%	2#500MCM 2000Vdc AL PV-WIRE, 1#1/0 CU EGC IN 2.5" PVC
DCB-9	18	24	550	237.6	13.10	294.8	368.4	400	0.96	1	307.0	350	310	336	2000Vdc PV WIRE	AL	#500 MCM	1	CU	#1/0 AWG	CONDUIT	2.5"	23.99%	2#500MCM 2000Vdc AL PV-WIRE, 1#1/0 CU EGC IN 2.5" PVC
DCB-10	18	24	550	237.6	13.10	294.8	368.4	400	0.96	1	307.0	350	310	336	2000Vdc PV WIRE	AL	#500 MCM	1	CU	#1/0 AWG	CONDUIT	2.5"	23.99%	2#500MCM 2000Vdc AL PV-WIRE, 1#1/0 CU EGC IN 2.5" PVC
DCB-11	18	24	550	237.6	13.10	294.8	368.4	400	0.96	1	307.0	350	310	336	2000Vdc PV WIRE	AL	#500 MCM	1	CU	#1/0 AWG	CONDUIT	2.5"	23.99%	2#500MCM 2000Vdc AL PV-WIRE, 1#1/0 CU EGC IN 2.5" PVC
DCB-12	18	24	550	237.6	13.10	294.8	368.4	400	0.96	1	307.0	350	310	336	2000Vdc PV WIRE	AL	#500 MCM	1	CU	#1/0 AWG	CONDUIT	2.5"	23.99%	2#500MCM 2000Vdc AL PV-WIRE, 1#1/0 CU EGC IN 2.5" PVC
DCB-13	18	24	550	237.6	13.10	294.8	368.4	400	0.96	1	307.0	350	310	336	2000Vdc PV WIRE	AL	#500 MCM	1	CU	#1/0 AWG	CONDUIT	2.5"	23.99%	2#500MCM 2000Vdc AL PV-WIRE, 1#1/0 CU EGC IN 2.5" PVC

02 DC FEEDER CALCULATIONS - PV OUTPUT CIRCUITS

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE

REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO: N/A
CAD DWG FILE: HADDAM QUARTER.IFC
SHEET SIZE: ANSI D
DRAWN BY:
CHECKED BY:
COPYRIGHT:
LOUTH CALLAN RENEWABLES, LLC. 2022

SHEET TITLE
DC CABLE SCHEDULE - 1

L-404

DCB1 - DCB4							
STRING NUMBER	WIRE GAUGE	OPERATING VOLTAGE [V]	OPERATING CURRENT [A]	DC IMPEDANCE [OHM/1000 FT]	STRING DISTANCE [FT]	STRING VOLTAGE DROP	TOTAL VOLTAGE DROP TO INV
1-1	CU #10	1008.00	13.10	1.02	330	0.87%	2.48%
1-2	CU #10	1008.00	13.10	1.02	330	0.87%	2.48%
1-3	CU #10	1008.00	13.10	1.02	200	0.53%	2.14%
1-4	CU #10	1008.00	13.10	1.02	190	0.50%	2.11%
1-5	CU #10	1008.00	13.10	1.02	190	0.50%	2.11%
1-6	CU #10	1008.00	13.10	1.02	65	0.17%	1.79%
1-7	CU #10	1008.00	13.10	1.02	280	0.74%	2.35%
1-8	CU #10	1008.00	13.10	1.02	280	0.74%	2.35%
1-9	CU #10	1008.00	13.10	1.02	150	0.40%	2.01%
1-10	CU #10	1008.00	13.10	1.02	145	0.38%	2.00%
1-11	CU #10	1008.00	13.10	1.02	145	0.38%	2.00%
1-12	CU #10	1008.00	13.10	1.02	20	0.05%	1.67%
1-13	CU #10	1008.00	13.10	1.02	330	0.87%	2.48%
1-14	CU #10	1008.00	13.10	1.02	200	0.53%	2.14%
1-15	CU #10	1008.00	13.10	1.02	190	0.50%	2.11%
1-16	CU #10	1008.00	13.10	1.02	190	0.50%	2.11%
1-17	CU #10	1008.00	13.10	1.02	65	0.17%	1.79%
2-1	CU #10	1008.00	13.10	1.02	330	0.87%	2.10%
2-2	CU #10	1008.00	13.10	1.02	330	0.87%	2.10%
2-3	CU #10	1008.00	13.10	1.02	200	0.53%	1.76%
2-4	CU #10	1008.00	13.10	1.02	190	0.50%	1.74%
2-5	CU #10	1008.00	13.10	1.02	190	0.50%	1.74%
2-6	CU #10	1008.00	13.10	1.02	65	0.17%	1.41%
2-7	CU #10	1008.00	13.10	1.02	280	0.74%	1.97%
2-8	CU #10	1008.00	13.10	1.02	280	0.74%	1.97%
2-9	CU #10	1008.00	13.10	1.02	150	0.40%	1.63%
2-10	CU #10	1008.00	13.10	1.02	145	0.38%	1.62%
2-11	CU #10	1008.00	13.10	1.02	145	0.38%	1.62%
2-12	CU #10	1008.00	13.10	1.02	20	0.05%	1.29%
2-13	CU #10	1008.00	13.10	1.02	330	0.87%	2.10%
2-14	CU #10	1008.00	13.10	1.02	330	0.87%	2.10%
2-15	CU #10	1008.00	13.10	1.02	200	0.53%	1.76%
2-16	CU #10	1008.00	13.10	1.02	190	0.50%	1.74%
2-17	CU #10	1008.00	13.10	1.02	190	0.50%	1.74%
3-1	CU #10	1008.00	13.10	1.02	65	0.17%	1.41%
3-2	CU #10	1008.00	13.10	1.02	330	0.87%	1.74%
3-3	CU #10	1008.00	13.10	1.02	330	0.87%	1.74%
3-4	CU #10	1008.00	13.10	1.02	200	0.53%	1.40%
3-5	CU #10	1008.00	13.10	1.02	190	0.50%	1.38%
3-6	CU #10	1008.00	13.10	1.02	190	0.50%	1.38%
3-7	CU #10	1008.00	13.10	1.02	65	0.17%	1.05%
3-8	CU #10	1008.00	13.10	1.02	280	0.74%	1.61%
3-9	CU #10	1008.00	13.10	1.02	280	0.74%	1.61%
3-10	CU #10	1008.00	13.10	1.02	150	0.40%	1.27%
3-11	CU #10	1008.00	13.10	1.02	145	0.38%	1.26%
3-12	CU #10	1008.00	13.10	1.02	145	0.38%	1.26%
3-13	CU #10	1008.00	13.10	1.02	20	0.05%	0.93%
3-14	CU #10	1008.00	13.10	1.02	330	0.87%	1.74%
3-15	CU #10	1008.00	13.10	1.02	330	0.87%	1.74%
3-16	CU #10	1008.00	13.10	1.02	200	0.53%	1.40%
3-17	CU #10	1008.00	13.10	1.02	190	0.50%	1.38%
4-1	CU #10	1008.00	13.10	1.02	190	0.50%	1.38%
4-2	CU #10	1008.00	13.10	1.02	65	0.17%	1.05%
4-3	CU #10	1008.00	13.10	1.02	330	0.87%	1.38%
4-4	CU #10	1008.00	13.10	1.02	330	0.87%	1.38%
4-5	CU #10	1008.00	13.10	1.02	200	0.53%	1.04%
4-6	CU #10	1008.00	13.10	1.02	190	0.50%	1.01%
4-7	CU #10	1008.00	13.10	1.02	190	0.50%	1.01%
4-8	CU #10	1008.00	13.10	1.02	65	0.17%	0.68%
4-9	CU #10	1008.00	13.10	1.02	280	0.74%	1.25%
4-10	CU #10	1008.00	13.10	1.02	280	0.74%	1.25%
4-11	CU #10	1008.00	13.10	1.02	150	0.40%	0.91%
4-12	CU #10	1008.00	13.10	1.02	145	0.38%	0.89%
4-13	CU #10	1008.00	13.10	1.02	145	0.38%	0.89%
4-14	CU #10	1008.00	13.10	1.02	20	0.05%	0.56%
4-15	CU #10	1008.00	13.10	1.02	330	0.87%	1.38%
4-16	CU #10	1008.00	13.10	1.02	330	0.87%	1.38%
4-17	CU #10	1008.00	13.10	1.02	200	0.53%	1.04%
					AVERAGE	0.54%	1.61%
					MAXIMUM	0.87%	2.48%

01 DC FEEDER CALCULATIONS - DCB 1 - 4

DCB5 - DCB8							
STRING NUMBER	WIRE GAUGE	OPERATING VOLTAGE [V]	OPERATING CURRENT [A]	DC IMPEDANCE [OHM/1000 FT]	STRING DISTANCE [FT]	STRING VOLTAGE DROP	TOTAL VOLTAGE DROP TO INV
5-1	CU #10	1008.00	13.10	1.02	330	0.87%	1.29%
5-2	CU #10	1008.00	13.10	1.02	330	0.87%	1.29%
5-3	CU #10	1008.00	13.10	1.02	200	0.53%	0.95%
5-4	CU #10	1008.00	13.10	1.02	190	0.50%	0.92%
5-5	CU #10	1008.00	13.10	1.02	190	0.50%	0.92%
5-6	CU #10	1008.00	13.10	1.02	65	0.17%	0.59%
5-7	CU #10	1008.00	13.10	1.02	280	0.74%	1.16%
5-8	CU #10	1008.00	13.10	1.02	280	0.74%	1.16%
5-9	CU #10	1008.00	13.10	1.02	150	0.40%	0.81%
5-10	CU #10	1008.00	13.10	1.02	145	0.38%	0.80%
5-11	CU #10	1008.00	13.10	1.02	145	0.38%	0.80%
5-12	CU #10	1008.00	13.10	1.02	20	0.05%	0.47%
5-13	CU #10	1008.00	13.10	1.02	330	0.87%	1.29%
5-14	CU #10	1008.00	13.10	1.02	330	0.87%	1.29%
5-15	CU #10	1008.00	13.10	1.02	200	0.53%	0.95%
5-16	CU #10	1008.00	13.10	1.02	190	0.50%	0.92%
5-17	CU #10	1008.00	13.10	1.02	190	0.50%	0.92%
6-1	CU #10	1008.00	13.10	1.02	65	0.17%	0.59%
6-2	CU #10	1008.00	13.10	1.02	330	0.87%	1.70%
6-3	CU #10	1008.00	13.10	1.02	330	0.87%	1.70%
6-4	CU #10	1008.00	13.10	1.02	200	0.53%	1.35%
6-5	CU #10	1008.00	13.10	1.02	190	0.50%	1.33%
6-6	CU #10	1008.00	13.10	1.02	190	0.50%	1.33%
6-7	CU #10	1008.00	13.10	1.02	65	0.17%	1.00%
6-8	CU #10	1008.00	13.10	1.02	280	0.74%	1.56%
6-9	CU #10	1008.00	13.10	1.02	280	0.74%	1.56%
6-10	CU #10	1008.00	13.10	1.02	150	0.40%	1.22%
6-11	CU #10	1008.00	13.10	1.02	145	0.38%	1.21%
6-12	CU #10	1008.00	13.10	1.02	145	0.38%	1.21%
6-13	CU #10	1008.00	13.10	1.02	20	0.05%	0.88%
6-14	CU #10	1008.00	13.10	1.02	330	0.87%	1.70%
6-15	CU #10	1008.00	13.10	1.02	330	0.87%	1.70%
6-16	CU #10	1008.00	13.10	1.02	200	0.53%	1.35%
6-17	CU #10	1008.00	13.10	1.02	190	0.50%	1.33%
6-18	CU #10	1008.00	13.10	1.02	190	0.50%	1.33%
7-1	CU #10	1008.00	13.10	1.02	65	0.17%	1.00%
7-2	CU #10	1008.00	13.10	1.02	330	0.87%	2.06%
7-3	CU #10	1008.00	13.10	1.02	330	0.87%	2.06%
7-4	CU #10	1008.00	13.10	1.02	200	0.53%	1.72%
7-5	CU #10	1008.00	13.10	1.02	190	0.50%	1.70%
7-6	CU #10	1008.00	13.10	1.02	190	0.50%	1.70%
7-7	CU #10	1008.00	13.10	1.02	65	0.17%	1.37%
7-8	CU #10	1008.00	13.10	1.02	280	0.74%	1.93%
7-9	CU #10	1008.00	13.10	1.02	280	0.74%	1.93%
7-10	CU #10	1008.00	13.10	1.02	150	0.40%	1.59%
7-11	CU #10	1008.00	13.10	1.02	145	0.38%	1.58%
7-12	CU #10	1008.00	13.10	1.02	145	0.38%	1.58%
7-13	CU #10	1008.00	13.10	1.02	20	0.05%	1.25%
7-14	CU #10	1008.00	13.10	1.02	330	0.87%	2.06%
7-15	CU #10	1008.00	13.10	1.02	330	0.87%	2.06%
7-16	CU #10	1008.00	13.10	1.02	200	0.53%	1.72%
7-17	CU #10	1008.00	13.10	1.02	190	0.50%	1.70%
7-18	CU #10	1008.00	13.10	1.02	190	0.50%	1.70%
8-1	CU #10	1008.00	13.10	1.02	65	0.17%	1.37%
8-2	CU #10	1008.00	13.10	1.02	330	0.87%	2.44%
8-3	CU #10	1008.00	13.10	1.02	330	0.87%	2.44%
8-4	CU #10	1008.00	13.10	1.02	200	0.53%	2.11%
8-5	CU #10	1008.00	13.10	1.02	190	0.50%	2.08%
8-6	CU #10	1008.00	13.10	1.02	190	0.50%	2.08%
8-7	CU #10	1008.00	13.10	1.02	65	0.17%	1.75%
8-8	CU #10	1008.00	13.10	1.02	280	0.74%	2.31%
8-9	CU #10	1008.00	13.10	1.02	280	0.74%	2.31%
8-10	CU #10	1008.00	13.10	1.02	150	0.40%	1.98%
8-11	CU #10	1008.00	13.10	1.02	145	0.38%	1.96%
8-12	CU #10	1008.00	13.10	1.02	145	0.38%	1.96%
8-13	CU #10	1008.00	13.10	1.02	20	0.05%	1.64%
8-14	CU #10	1008.00	13.10	1.02	330	0.87%	2.44%
8-15	CU #10	1008.00	13.10	1.02	330	0.87%	2.44%
8-16	CU #10	1008.00	13.10	1.02	200	0.53%	2.11%
8-17	CU #10	1008.00	13.10	1.02	190	0.50%	2.08%
8-18	CU #10	1008.00	13.10	1.02	190	0.50%	2.08%
					AVERAGE	0.54%	1.53%
					MAXIMUM	0.87%	2.44%

02 DC FEEDER CALCULATIONS - DCB 5 - 8

DCB9 - DCB12							
STRING NUMBER	WIRE GAUGE	OPERATING VOLTAGE [V]	OPERATING CURRENT [A]	DC IMPEDANCE [OHM/1000 FT]	STRING DISTANCE [FT]	STRING VOLTAGE DROP	TOTAL VOLTAGE DROP TO INV
9-1	CU #10	1008.00	13.10	1.02	330	0.87%	2.83%
9-2	CU #10	1008.00	13.10	1.02	330	0.87%	2.83%
9-3	CU #10	1008.00	13.10	1.02	200	0.53%	2.49%
9-4	CU #10	1008.00	13.10	1.02	190	0.50%	2.46%
9-5	CU #10	1008.00	13.10	1.02	190	0.50%	2.46%
9-6	CU #10	1008.00	13.10	1.02	65	0.17%	2.14%
9-7	CU #10	1008.00	13.10	1.02	280	0.74%	2.70%
9-8	CU #10	1008.00	13.10	1.02	280	0.74%	2.70%
9-9	CU #10	1008.00	13.10	1.02	150	0.40%	2.36%
9-10	CU #10	1008.00	13.10	1.02	145	0.38%	2.35%
9-11	CU #10	1008.00	13.10	1.02	145	0.38%	2.35%
9-12	CU #10	1008.00	13.10	1.02	20	0.05%	2.02%
9-13	CU #10	1008.00	13.10	1.02	330	0.87%	2.83%
9-14	CU #10	1008.00	13.10	1.02	330	0.87%	2.83%
9-15	CU #10	1008.00	13.10	1.02	200	0.53%	2.49%
9-16	CU #10	1008.00	13.10	1.02	190	0.50%	2.46%
9-17	CU #10	1008.00	13.10	1.02	190	0.50%	2.46%
9-18	CU #10	1008.00	13.10	1.02	65	0.17%	2.14%
10-1	CU #10	1008.00	13.10	1.02	150	0.40%	2.25%
10-2	CU #10	1008.00	13.10	1.02	150	0.40%	2.25%
10-3	CU #10	1008.00	13.10	1.02	155	0.41%	2.26%
10-4	CU #10	1008.00	13.10	1.02	285	0.76%	2.60%
10-5	CU #10	1008.00	13.10	1.02	285	0.76%	2.60%
10-6	CU #10	1008.00	13.10	1.02	290	0.77%	2.61%
10-7	CU #10	1008.00	13.10	1.02	240	0.64%	2.48%
10-8	CU #10	1008.00	13.10	1.02	235	0.62%	2.47%
10-9	CU #10	1008.00	13.10	1.02	235	0.62%	2.47%
10-10	CU #10	1008.00	13.10	1.02	150	0.40%	2.25%
10-11	CU #10	1008.00	13.10	1.02	150	0.40%	2.25%
10-12	CU #10	1008.00	13.10	1.02	100	0.27%	2.12%
10-13	CU #10	1008.00	13.10	1.02	150	0.40%	2.25%
10-14	CU #10	1008.00	13.10	1.02	150	0.40%	2.25%
10-15	CU #10	1008.00	13.10	1.02	155	0.41%	2.26%
10-16	CU #10	1008.00	13.10	1.02	285	0.76%	2.60%
10-17	CU #10	1008.00	13.10	1.02	285	0.76%	2.60%
10-18	CU #10	1008.00	13.10	1.02	290	0.77%	2.61%
11-1	CU #10	1008.00	13.10	1.02	150	0.40%	1.86%
11-2	CU #10	1008.00	13.10	1.02	150	0.40%	1.86%
11-3	CU #10	1008.00	13.10	1.02	155	0.41%	1.87%
11-4	CU #10	1008.00	13.10	1.02	285	0.76%	2.21%
11-5	CU #10	1008.00	13.10	1.02	285	0.76%	2.21%
11-6	CU #10	1008.00	13.10	1.02	290	0.77%	2.23%
11-7	CU #10	1008.00	13.10	1.02	240	0.64%	2.10%
11-8	CU #10	1008.00	13.10	1.02	235	0.62%	2.08%
11-9	CU #10	1008.00	13.10	1.02	235	0.62%	2.08%
11-10	CU #10	1008.00	13.10	1.02	150	0.40%	1.86%
11-11	CU #10	1008.00	13.10	1.02	150	0.40%	1.86%
11-12	CU #10	1008.00	13.10	1.02	100	0.27%	1.73%
11-13	CU #10	1008.00	13.10	1.02	150	0.40%	1.86%
11-14	CU #10	1008.00	13.10	1.02	150	0.40%	1.86%
11-15	CU #10	1008.00	13.10	1.02	155	0.41%	1.87%
11-16	CU #10	1008.00	13.10	1.02	285	0.76%	2.21%
11-17	CU #10	1008.00	13.10	1.02	285	0.76%	2.21%
11-18	CU #10	1008.00	13.10	1.02	290	0.77%	2.23%
12-1	CU #10	1008.00	13.10	1.02	150	0.40%	1.48%
12-2	CU #10	1008.00	13.10	1.02	150	0.40%	1.48%
12-3	CU #10	1008.00	13.10	1.02	155	0.41%	1.49%
12-4	CU #10	1008.00	13.10	1.02	285	0.76%	1.83%
12-5	CU #10	1008.00	13.10	1.02	285	0.76%	1.83%
12-6	CU #10	1008.00	13.10	1.02	290	0.77%	1.85%
12-7	CU #10	1008.00	13.10	1.02	240	0.64%	1.71%
12-8	CU #10	1008.00	13.10	1.02	235	0.62%	1.70%
12-9	CU #10	1008.00	13.10	1.02	235	0.62%	1.70%
12-10	CU #10	1008.00	13.10	1.02	150	0.40%	1.48%
12-11	CU #10	1008.00	13.10	1.02	150	0.40%	1.48%
12-12	CU #10	1008.00	13.10	1.02	100	0.27%	1.35%
12-13	CU #10	1008.00	13.10	1.02	150	0.40%	1.48%
12-14	CU #10	1008.00	13.10	1.02	150	0.40%	1.48%
12-15	CU #10	1008.00	13.10	1.02	155	0.41%	1.49%
12-16	CU #10	1008.00	13.10	1.02	285	0.76%	1.83%
12-17	CU #10	1008.00	13.10	1.02	285	0.76%	1.83%
12-18	CU #10	1008.00	13.10	1.02	290	0.77%	1.85%
					AVERAGE	0.55%	2.13%
					MAXIMUM	0.87%	2.83%

03 DC FEEDER CALCULATIONS - DCB 9-12

DCB13							
STRING NUMBER	WIRE GAUGE	OPERATING VOLTAGE [V]	OPERATING CURRENT [A]	DC IMPEDANCE [OHM/1000 FT]	STRING DISTANCE [FT]	STRING VOLTAGE DROP	TOTAL VOLTAGE DROP TO INV
13-1	CU #10	1008.00	13.10	1.02	150	0.40%	1.11%
13-2	CU #10	1008.00	13.10	1.02	150	0.40%	1.11%
13-3	CU #10	1008.00	13.10	1.02	155	0.41%	1.12%
13-4	CU #10	1008.00	13.10	1.02	285	0.76%	1.46%
13-5	CU #10	1008.00	13.10	1.02	285	0.76%	1.46%
13-6	CU #10	1008.00	13.10	1.02	290	0.77%	1.48%
13-7	CU #10	1008.00	13.10	1.02	240	0.64%	1.35%
13-8	CU #10	1008.00	13.10	1.02	235	0.62%	1.33%
13-9	CU #10	1008.00	13.10	1.02	235	0.62%	1.33%
13-10	CU #10	1008.00	13.10	1.02	150	0.40%	1.11%
13-11	CU #10	1008.00	13.10	1.02	150	0.40%	1.11%
13-12	CU #10	1008.00	13.10	1.02	100	0.27%	0.98%
13-13	CU #10	1008.00	13.10	1.02	150	0.40%	1.11%
13-14	CU #10	1008.00	13.10	1.02	150	0.40%	1.11%
13-15	CU #10	1008.00	13.10	1.02	155	0.41%	1.12%
13-16	CU #10	1008.00	13.10	1.02	285	0.76%	1.46%
13-17	CU #10	1008.00	13.10	1.02	285	0.76%	1.46%
13-18	CU #10	1008.00	13.10	1.02	290	0.77%	1.48%
					AVERAGE	0.55%	1.26%
					MAXIMUM	0.77%	1.48%

04 DC FEEDER CALCULATIONS - DCB 13 - 16

DCB1 - DCB13						
DCB IDENTIFIER	WIRE GAUGE	OPERATING VOLTAGE	OPERATING CURRENT	DC IMPEDANCE [OHM/1000 FT]	STRING DISTANCE [FT]	STRING VOLTAGE DROP
DCB-1	AL #350 MCM	1008.00	222.70	0.06	600	1.62%
DCB-2	AL #350 MCM	1008.00	222.70	0.06	460	1.24%
DCB-3	AL #350 MCM	1008.00	222.70	0.06	325	0.88%
DCB-4	AL #350 MCM	1008.00	222.70	0.06	190	0.51%
DCB-5	AL #350 MCM	1008.00	222.70	0.06	155	0.42%
DCB-6	AL #350 MCM	1008.00	235.80	0.06	290	0.83%
DCB-7	AL #350 MCM	1008.00	235.80	0.06	420	1.20%
DCB-8	AL #350 MCM	1008.00	235.80	0.06	555	1.58%
DCB-9	AL #350 MCM	1008.00	235.80	0.06	690	1.97%
DCB-10	AL #350 MCM	1008.00	235.80	0.06	650	1.86%
DCB-11	AL #350 MCM	1008.00	235.80	0.06	515	1.47%
DCB-12	AL #350 MCM	1008.00	235.80	0.06	380	1.08%
DCB-13	AL #350 MCM	1008.00	235.80	0.06	250	0.71%
					AVERAGE	1.18%
					MAXIMUM	1.97%

05 DCB VOLTAGE DROP

	STRING VOLTAGE DROP	TOTAL DC VOLTAGE DROP TO INV	TOTAL VOLTAGE DROP (MODULES TO POI)
AVERAGE	0.54%	1.72%	2.40%
MAXIMUM	0.87%	2.83%	3.51%

06 OVERALL VOLTAGE DROP FROM STRINGS

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE

REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO: N/A
CAD DWG FILE: HADDAM QUARTER R^C
SHEET SIZE: ANSI D
DRAWN BY:
CHECKED BY:
COPYRIGHT:
LOUTH CALLAN RENEWABLES, LLC. 2022

SHEET TITLE
DC CABLE SCHEDULE - 2

L-405

8"
4"

ROW ##

APPLY TO: ROWS; TYP. TO EVERY ROW
QTY: 29

6.25"
2"

SOLAR PV SYSTEM POINT OF INTERCONNECTION
OUTPUT CURRENT: 85.29A
OPERATING VOLTAGE: 13,200V

APPLY TO:
QTY: 1

4"
2"

DANGER
ARC FLASH AND SHOCK HAZARD
FOLLOW ALL REQUIREMENTS IN NFPA 70E FOR SAFE WORK PRACTICES AND FOR PERSONAL PROTECTIVE EQUIPMENT

APPLY TO: ALL EQUIPMENT
QTY: 16

7.25"
1.5"

WARNING: PHOTOVOLTAIC POWER SOURCE

APPLY TO: DC CIRCUIT EVERY 10 FEET
QTY: 500

7.25"
1.5"

PHOTOVOLTAIC DC DISCONNECT (1 OF XX)

APPLY TO: DC SIDE OF INVERTER
QTY: 13

6"
2.75"

WARNING
ELECTRIC SHOCK HAZARD
DO NOT TOUCH THE TERMINALS. TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

APPLY TO: COMBINER BOXES, INVERTERS, MAIN DISCONNECT
QTY: 26

6"
2.5"

SWITCHBOARD - #
OUTPUT CURRENT: 1963A
OPERATING VOLTAGE: 800V

APPLY TO: SWITCHBOARDS, VALUES ON RIGHT TABLE
QTY: 1

12"
8"

DANGER
HIGH VOLTAGE.
KEEP AWAY.
AUTHORIZED PERSONNEL ONLY

APPLY TO: ALL GATES
QTY: 5

7.25"
1.5"

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

APPLY TO: MAIN DISCONNECT
QTY: 1

6"
2.75"

NOTICE
THIS EQUIPMENT IS OWNED AND OPERATED BY SYNCARPHA. IN CASE OF EMERGENCY CALL 911 AND XXX-XXX-XXXX

7.25"
1.5"

PHOTOVOLTAIC AC DISCONNECT (1 OF XX)

APPLY TO: AC SIDE OF INVERTER
QTY: 13

6"
2.75"

WARNING
DO NOT OPEN, REMOVE OR REPLACE FUSES UNDER LOAD

APPLY TO: COMBINER BOXES
QTY: 13

6"
2.75"

WARNING
THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES, EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE SHALL NOT EXCEED AMPACITY OF BUSBAR

APPLY TO: SWITCHBOARDS AND PANELBOARD
QTY: 1

6.25"
1"

SOLAR DATA & MONITORING

APPLY TO: DAS
QTY: 1

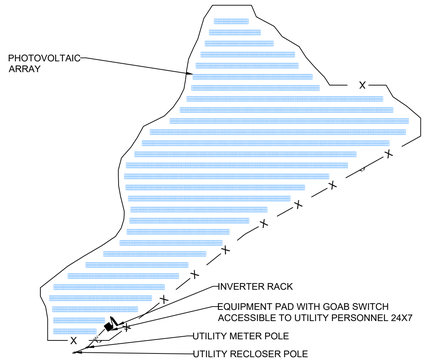
4"
2"

2,000 kVA
MEDIUM VOLTAGE
TRANSFORMER #
OUTPUT CURRENT: 87.47A
PRIMARY VOLTAGE: 13,200V
SECONDARY VOLTAGE: 600V

APPLY TO: TRANSFORMER 1
QTY: 1

8.5"
6.5"

CAUTION



APPLY TO: ALL GATES
QTY: 5

SWITCHBOARD VALUES

SB #	OUTPUT CURRENT	OPERATING VOLTAGE
1	1963.00 A	600 V

MV TRANSFORMER VALUES

XFMR #	SIZE	OUTPUT CURRENT	OPERATING VOLTAGE
1	2000 kVA	85.29 A	13,200 V

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE

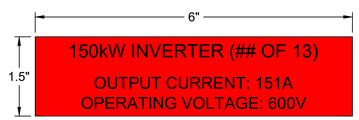
REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO:	N/A
CAD DWG FILE:	HADDAM QUARTER IFC
SHEET SIZE:	ANSI D
DRAWN BY:	
CHECKED BY:	

SHEET TITLE

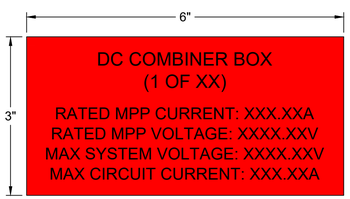
SCHEDULES AND CALCULATIONS

S-501



APPLY TO: INVERTERS
QTY: 13

INVERTER VALUES			
INV #	AC SIZE	OUTPUT CURRENT	OPERATING VOLTAGE
1	150 kW	151 A	600 V
2	150 kW	151 A	600 V
3	150 kW	151 A	600 V
4	150 kW	151 A	600 V
5	150 kW	151 A	600 V
6	150 kW	151 A	600 V
7	150 kW	151 A	600 V
8	150 kW	151 A	600 V
9	150 kW	151 A	600 V
10	150 kW	151 A	600 V
11	150 kW	151 A	600 V
12	150 kW	151 A	600 V
13	150 kW	151 A	600 V



APPLY TO: COMBINER BOXES SEE TABLE TO THE RIGHT
QTY: 13

COMBINER BOX VALUES				
CB #	RATED MPP CURRENT	RATED MPP VOLTAGE	MAX SYSTEM VOLTAGE	MAX CIRCUIT CURRENT
1	235.80	1008.00	1198.08 VDC	251.82
2	235.80	1008.00	1198.08 VDC	251.82
3	235.80	1008.00	1198.08 VDC	251.82
4	235.80	1008.00	1198.08 VDC	251.82
5	235.80	1008.00	1198.08 VDC	251.82
6	235.80	1008.00	1198.08 VDC	251.82
7	235.80	1008.00	1198.08 VDC	251.82
8	235.80	1008.00	1198.08 VDC	251.82
9	235.80	1008.00	1198.08 VDC	251.82
10	235.80	1008.00	1198.08 VDC	251.82
11	235.80	1008.00	1198.08 VDC	251.82
12	235.80	1008.00	1198.08 VDC	251.82
13	235.80	1008.00	1198.08 VDC	251.82

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE

REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

PROJECT NO:	N/A
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SHEET SIZE:	ANSI D
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SHEET TITLE

SCHEDULES AND CALCULATIONS

S-502

SUNNY HIGHPOWER PEAK3 125-US / 150-US

Cost effective
- Modular architecture reduces BOS and maximizes system uptime
- Compact design and high power density maximize transportation and logistical efficiency

Maximum flexibility
- Scalable 1,500 VDC building block with best-in-class performance
- Flexible architecture creates scalability while maximizing land usage

Simple install, commissioning
- Ergonomic handling and simple connections enable quick installation
- Centralized commissioning and control with SMA Data Manager

Highly innovative
- SMA Smart Connected reduces O&M costs and simplifies field-service
- Powered by award winning ennexOS cross sector energy management platform

SUNNY HIGHPOWER PEAK3 125-US / 150-US

A superior modular solution for large-scale power plants

The PEAK3 1,500 VDC inverter offers high power density in a modular architecture that achieves a cost-optimized solution for large-scale PV integrators. With fast, simple installation and commissioning, the Sunny Highpower PEAK3 is accelerating the path to energization. SMA has also brought its field-proven Smart Connected technology to the PEAK3, which simplifies O&M and contributes to lower lifetime service costs. The PEAK3 power plant solution is powered by the ennexOS cross sector energy management platform, 2018 winner of the Intersolar smarter E AWARD.

Technical Data	Sunny Highpower PEAK3 125-US	Sunny Highpower PEAK3 150-US
Input (DC)		
Maximum array power	187500 Wp STC	225000 Wp STC
Maximum system voltage	1500 VDC	
Rated MPP voltage range	705 V ... 1450 V	880 V ... 1450 V
MPPT operating voltage range	684 V ... 1500 V	855 V ... 1500 V
MPP trackers	1	
Maximum operating input current	180 A	
Maximum input short-circuit current	325 A	
Output (AC)		
Nominal AC power	125000 W	150000 W
Maximum apparent power	125000 VA	150000 VA
Output phases / line connections	3 / 3-PE	
Nominal AC voltage	480 V	600 V
Compatible transformer winding configuration	Wye-grounded	
Maximum output current	151 A	
Rated grid frequency	60 Hz	
Grid frequency / range	50 Hz, 60 Hz / -6 Hz ... +6 Hz	
Power factor at rated power / adjustable displacement	1 / 0.0 leading ... 0.0 lagging	
Harmonics (THD)	<3%	
Efficiency		
CEC efficiency	98.5 %	99.0 %
Protection and safety features		
Ground fault monitoring: Riso / Differential current	● / ●	
DC reverse polarity protection	●	
AC short circuit protection	●	
Monitored surge protection (Type 2): DC / AC	● / ●	
Protection class / overvoltage category (as per UL 840)	I / IV	
General data		
Device dimensions (W / H / D)	770 / 830 / 444 mm (30.3 / 32.7 / 17.5 in.)	
Device weight	98 kg (216 lbs)	
Operating temperature range	-25°C ... +60°C (-13°F ... +140°F)	
Storage temperature range	-40°C ... +70°C (-40°F ... +158°F)	
Audible noise emission (full power @ 1m and 25°C)	< 69 dB(A)	
Internal consumption at night	< 5 W	
Topology	Transformerless	
Cooling concept	OptiCool (forced convection, variable speed fans)	
Enclosure protection rating	Type 4X (as per UL 50E)	
Maximum permissible relative humidity (non-condensing)	100%	
Additional information		
Mounting	Rack mount	
DC connection	Terminal lugs - up to 600 kcmil CU/AL	
AC connection	Screw terminals - up to 300 kcmil CU/AL	
LED indicators (Status/Fault/Communication)	●	
SMA Speedwire (Ethernet network interface)	● (2 x RJ45 ports)	
Data protocols: SMA Modbus / SunSpec Modbus	● / ●	
Integrated Plant Control / Q on Demand 24/7	● / ●	
Off-grid capable / SMA Hybrid Controller compatible	– / ●	
SMA Smart Connected (proactive monitoring and service)	●	
Certifications		
Certifications and approvals	UL 62109, UL 1998, CAN/CSA-C22.2 No.62109	
FCC compliance	FCC Part 15, Class A	
Grid interconnection standards	IEEE 1547, UL 1741 SA - CA Rule 21, HECO Rule 14H	
Advanced grid support capabilities	L/HFRT, L/HVRT, Volt-VAr, Volt-Watt, Frequency-Watt, Ramp Rate Control, Fixed Power Factor	
Warranty		
Standard	5 years	
Optional extensions	10 / 15 / 20 years	
Type designation	SHP 125-US-20	SHP 150-US-20
Technical data as of May 2020 ● Standard features ○ Optional features – Not available		

Toll Free +1 888 4 SMA USA
www.SMA-America.com

SMA America, LLC

R-601 INVERTER DATASHEET

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE

REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
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SHEET TITLE
RESOURCE DOCUMENTS - 1

R-601

VSUN
Innovative & Smart

最も信頼出来る再エネパートナー

VSUN550-144BMH

VSUN550-144BMH VSUN545-144BMH
VSUN540-144BMH VSUN535-144BMH

550W Highest power output

12 years Material & Workmanship warranty

21.50% Module efficiency

30 years Linear power output warranty

KEY FEATURES

- MBB technology with Circular Ribbon
- Higher output power
- Half-cell Technology
- Positive tolerance offer
- Micro Gap
- Up to 30% extra power generation yield from the back side
- Certified for salt/ammonia corrosion resistance
- Load certificates: wind to 2400Pa and snow to 5400Pa
- Lower LCOE

ABOUT US

VSUN, a BNEF Tier-1 PV module manufacturer invested by Fuji Solar, has been committed to providing greener, cleaner and more intelligent renewable energy solutions. VSUN is dedicated to bringing reliable, customized and high-efficient products into various markets and customers worldwide.

PRODUCT CERTIFICATION

WARRANTY

www.vsun-solar.com

Electrical Characteristics at Standard Test Conditions(STC)

Module Type	VSUN550-144BMH	VSUN545-144BMH	VSUN540-144BMH	VSUN535-144BMH
Maximum Power - Pmax (W)	550	545	540	535
Open Circuit Voltage - Voc (V)	49.92	49.81	49.65	49.5
Short Circuit Current - Isc (A)	13.99	13.92	13.85	13.78
Maximum Power Voltage - Vmpp (V)	42	41.8	41.65	41.5
Maximum Power Current - Impp (A)	13.1	13.04	12.97	12.9
Module Efficiency	21.52%	21.32%	21.13%	20.93%

Standard Test Conditions (STC): irradiance 1,000 W/m²; AM 1.5; module temperature 25°C. Pmax Sorting : 0~5W. Measuring Tolerance: ±3%.
Remark: Electrical data do not refer to a single module and they are not part of the offer. They only serve for comparison among different module types.

Electrical Characteristics with different rear side power gain(reference to 545 front)

Pmax (W)	Voc (V)	Isc (A)	Vmpp (V)	Impp (A)	Pmax gain
572	49.71	14.62	41.80	13.69	5%
600	49.71	15.31	41.80	14.34	10%
653	49.81	16.70	41.70	15.65	20%
680	49.81	17.40	41.70	16.30	25%

Material Characteristics

Dimensions	2256×1133×35mm (L×W×H)
Weight	28.6kg
Frame	Silver anodized aluminum profile
Front Glass	White toughened safety glass, 3.2 mm
Cell Encapsulation	EVA (Ethylene-Vinyl-Acetate) or POE
Back Sheet	Transparent mesh backsheet
Cells	12×12 pieces bifacial monocrystalline solar cells series strings
Junction Box	IP68, 3 diodes
Cable&Connector	Potrait: 500 mm (cable length can be customized) , 1×4 mm 2 , compatible with MC4

Temperature Characteristics

NOCT	45°C(±2°C)
Voltage Temperature Coefficient	-0.27%/°C
Current Temperature Coefficient	+0.048%/°C
Power Temperature Coefficient	-0.32%/°C

Maximum Ratings

Maximum System Voltage [V]	1500
Series Fuse Rating [A]	30
Bifaciality	70%±10%

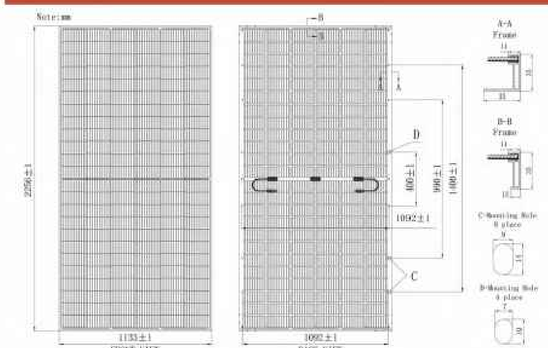
Packaging

Dimensions(L×W×H)	2290×1125×1253mm
Container 20'	155
Container 40'	310
Container 40'HC	620

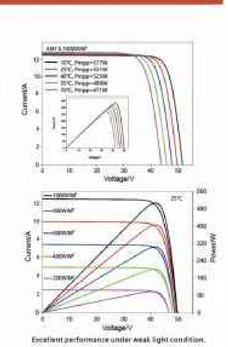
System Design

Temperature Range	-40 °C to + 85 °C
Withstanding Hail	Maximum diameter of 25 mm with impact speed of 23 m/s
Maximum Surface Load	5,400 Pa
Application class	class A

Dimensions



IV-Curves



R-602 MODULE DATASHEET

Louth Callan Renewables
921 THRALL AVENUE
SUFFIELD, CT 06078

PE STAMP AND SIGNATURE:

PROJECT OWNER:

HADDAM QUARTER ROAD SOLAR

Haddam Quarter Road
Durham, CT 06422

DRAWING ISSUE

REVISION	DATE	DESCRIPTION	ENG
A	03/05/2023	SITE PLAN	NJ
A	05/08/2023	ISSUED FOR PERMITTING	HC

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SHEET TITLE
RESOURCE DOCUMENTS - 2

R-602

ATTACHMENT 4

ALL-POINTS
TECHNOLOGY CORPORATION

June 8, 2023

To: Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103-3597

From: Dean Gustafson
Robert Burns

Re: Docket No. 505, Haddam Quarter Road Solar – D&M Plan

Order 2.d. of the Council's Decision and Order, dated December 2, 2021 requires as part of the Development and Management ("D&M") Plan "[M]odification of the limit of disturbance to increase the wetland buffer adjacent to the southeast temporary sediment trap, if feasible...."

All-Points Technology Corp., P.C. ("APT") has reviewed the Project design and has determined it is not feasible to modify the limit of disturbance ("LOD") in that location. The LOD in that portion of the Project Area is a function of the size of the water quality volume basin required for stormwater management, as shown on Sheet GD-1 of the plans. The LOD encompasses the area of grading associated with development of the basin.

The water quality volume basin is situated in an existing cultivated agricultural field and will not disturb nearby mature vegetation that currently buffers the edge of the field and nearby wetland system. Due to the cultivated condition of the field, it currently does not support wetland buffer functions typically associated with naturally vegetated areas such as water quality and wildlife habitat functions. Therefore, even though the LOD associated with the basin encroaches ±35 from wetlands there would be no significant diminishment in buffer functions or indirect impacts to nearby wetlands. In fact, with the principal function of the basin to provide appropriate stormwater quality renovation, and the planting of the basin and solar array with native meadow species, there will be an improvement of buffer functions post construction. The existing agricultural runoff from the cultivated field, which can carry sediment and nutrients from the field and which drains into the nearby wetland, will be eliminated, thereby improving water quality functions of the buffer and eliminating an existing non-point source of pollution to the nearby wetland.

ATTACHMENT 5

KEARSARGE ENERGY

2023 OPERATIONS AND MAINTENANCE MANUAL

HADDAM QUARTER ROAD SOLAR FACILITY

Operations and Maintenance Manual

Contents

INTRODUCTION

This manual describes the operation and maintenance of the Haddam Quarter Road Solar 3.022 MW DC photovoltaic (PV) facility located on Haddam Quarter Road in Durham CT.

The array has been designed as follows. Please note that the site "as built" may vary from the initial design below.

Equipment	Model
Modules (solar panels)	VSUN, VSUN550-144BMH-DG550W panels or equivalent
Transformers	Eaton, Cooper or equivalent
Solar Inverters	SMA Sunny Highpower PEAK3 150-US or equivalent
Racking	APA Solar Racking Systems

The solar PV facility is comprised of PV modules, associated wiring components, and string inverters. In operation, the DC power produced by the solar sub-array is converted to three-phase AC power by the inverters. That power is then supplied into an electrical main utility panelboard, which effectively enables each sub-array to function independently. The sub-arrays are then collectively interconnected to the utility system through a series of step-up transformers.

In the event of a power failure, the facility will automatically shut down when a loss of AC power occurs per UL 1741 and IEEE 1547 to protect utility personnel from injury while repairing the utility system.

This manual provides a description of the facility, procedures for basic operations, maintenance and troubleshooting of the system and important safety information.

RESPONSIBLE PARTIES

Land Owner:

Newton Family Trust
Attn: Charlie Newton
Tel: 860-614-4087
Email: charnew1021@gmail.com

Site Operator (Lessee):

Kearsarge Haddam Quarter LLC
1380 Soldiers Field Road, Suite 3900
Boston, MA 02135
Tel: 617-393-4222
Email: Abernstein@kearsargeenergy.com

A Ground Lease Agreement is being executed between the Landowner (Lessor) and Kearsarge Haddam Quarter LLC (Lessee/Site Operator).

Kearsarge Haddam Quarter LLC is the Operator of the Solar Project at the Site, and is the responsible party for the following Solar operations and maintenance activities on the Site:

- Grounds maintenance and maintenance of vegetation within the limits of the leased area, which shall include all solar generation equipment and a buffer surrounding such equipment, to be determined based on topography and site conditions.
- Drainage swales and stormwater controls (if any) within the limits of the leased area
- Access ways within the leased area

USE OF THIS DOCUMENT

This document packet is provided for informational purposes only. No one but the Operator and its Agents should attempt to operate any equipment on site.

This document is not intended to provide comprehensive site safety instructions, nor detailed operational guidance.

SITE SAFETY INFORMATION

FOR SITE EMERGENCIES

- For any life or property-threatening emergencies, **please dial 911**
- To report site issues, or speak to a Kearsarge representative please dial toll-free **855 277 6257**
- Kearsarge Haddam Quarter LLC welcomes the opportunity to train Town safety officials and operations staff on emergency procedures concerning the installation and operation of the solar system. Shortly after system start up and commissioning and in coordination with Town personnel, Kearsarge Haddam Quarter LLC can provide on-site training to applicable personnel on emergency operations and maintenance of the system and in all aspects concerning safety precautions, considering the high voltages and currents within the array structure and power equipment. Kearsarge Haddam Quarter LLC can also provide a short training course on the web-based Data Acquisition System for data monitoring.

EMERGENCY PV SHUTDOWN PROCEDURE

The following steps are required to shut the system down in an emergency:

1 Turn the AC Disconnect Switch to the "OFF" position.

2 Turn the DC Disconnect Switch to the "OFF" position.

These steps will power off the inverters; however, AC power from the grid and DC power from the array will still be present in the inverter wire termination section.

The next steps will disconnect power from the array and the utility transformer to the inverters:

1 Open DC PV array disconnect switches located on the inverter pad.

2 Open the main overhead disconnect switch. Or disconnect the individual inverter circuit breakers located inside the switchboards within the site.

Please refer to the as-built drawings or prominently displayed signage for switch location.

IMPORTANT NOTES:

WHILE THE ABOVE STEPS ISOLATE THE PV ARRAY CIRCUITS FROM THE INVERTERS, ALL CIRCUITS BETWEEN THE PV MODULES AND THE DISCONNECT SWITCHES WILL BE ENERGIZED DURING DAYLIGHT HOURS. HIGH VOLTAGE WILL BE PRESENT EVEN AT LOW LEVELS OF SUNLIGHT.

IT IS IMPERATIVE TO FOLLOW SAFE WORK PRACTICES AND USE PROPER SAFETY EQUIPMENT DURING ANY EMERGENCY OPERATIONS, WHICH INVOLVE ANY PORTION OF THE PV ARRAY.

GENERAL PV SAFETY PRECAUTIONS

The system has been designed for safe and reliable operation. However, it is critically important that any personnel who operate or maintain the system observe the proper safety precautions. Listed below are some of the most critical safety considerations:

1 ONLY LICENSED, QUALIFIED, EXPERIENCED AND TRAINED PERSONNEL SHOULD PERFORM REPAIR WORK ON ANY ELECTRICAL COMPONENTS OF THE SYSTEMS.

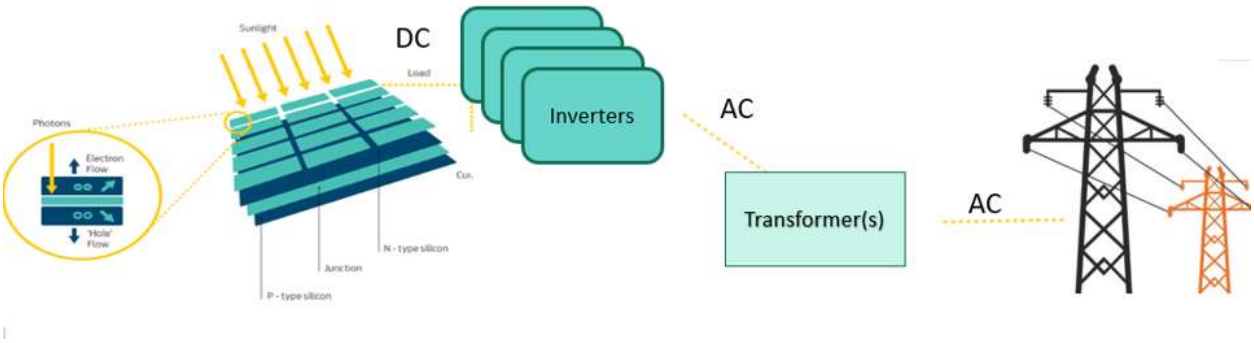
2 DANGEROUS VOLTAGE LEVELS ARE PRESENT IN EACH SYSTEM – VOLTAGES UP TO 1,000 VOLTS DIRECT CURRENT (DC) AND 13,200 VOLTS AC CAN BE FOUND UNDER PARTICULAR OPERATING CONDITIONS. IT SHOULD BE NOTED THAT HIGH VOLTAGE SYSTEMS REQUIRE SPECIAL SAFETY PRECAUTIONS DURING MAINTENANCE OR REPAIR OPERATIONS.

3 PV MODULES PRODUCE VOLTAGE WHENEVER THEY ARE EXPOSED TO SUNLIGHT. AT ANY TIME DURING DAYLIGHT HOURS, (INCLUDING MINIMAL SUNLIGHT CONDITIONS) THERE IS AN ELECTRICAL SHOCK HAZARD IF ANY PERSONNEL SHOULD CONTACT EXPOSED PV ARRAY ELECTRICAL CIRCUIT COMPONENTS.

4 BROKEN OR CRACKED PV MODULE GLASS CAN INCREASE RISK OF SHOCK HAZARD, ESPECIALLY WHEN WET. IMMEDIATELY CONTACT QUALIFIED PERSONNEL FOR REPLACEMENT SERVICES IF ANY BROKEN PV MODULE GLASS IS NOTICED.

SYSTEM DESCRIPTION

Solar sites are remarkably simple, consisting of a handful of major equipment types.



PV ARRAY

The ground-mounted photovoltaic arrays consist of PV modules which convert sunlight directly into electricity for utilization by a load such as a utility interconnected inverter. Each module is a sealed, solid-state device with an expected performance life well in excess of 25 years.

Electrically, the PV modules are wired into groups, which are referred to as strings or source circuits. Each source circuit is comprised of individual PV modules wired in a series configuration. Individual source circuits are then grouped together in combiner boxes forming sub-arrays.

For the PV modules to produce their full electrical output, they must be clean and free of shade. Shadows cast by nearby objects such as antennas, air conditioning equipment, trees, overhead wires, etc. will significantly reduce a module's current and voltage output. Because each module is electrically interconnected with other modules, reducing the output of a single module effectively reduces the energy production for the entire source circuit.

The solar modules are mounted using a rack mounting system, with a steel frame to secure the solar array at a uniform tilt angle to minimize shading, while optimizing use of array area.

INVERTERS

The inverters act as a fully automatic power-conditioning interface between the PV array and the utility system. The inverter will utilize solid-state power and control components to maximize power production from the PV array while meeting power quality and safety standards set forth by utilities under Underwriters Laboratories Safety Standards.

An LED display associated with the Ground Fault Detection and Interrupt Circuit (GFDI) on the face of the inverter will indicate the operating status of the unit along with other pertinent data. Please refer to the Inverter O&M manual for more details on the design and operation of the inverter.

To operate efficiently, the inverter circuit components must be kept free of excessive dust and dirt. In addition, the cooling fans and the blower impellers must be kept clean for efficient air movement. Dirt accumulating on circuit boards and electrical equipment leads to higher component operating temperatures and shorter life.

TRANSFORMERS AND ELECTRICAL SYSTEM

Transformers regulate and condition power prior to injection to the grid, and they are often custom-made to meet the specialized electrical requirements of both the array and the grid.

The system electrical circuitry transfers electrical energy from the PV arrays to the inverters and then from the inverters to the transformer and finally, to the point of utility interconnection. The components utilized in the system design are standard electrical components and can be serviced by any qualified electrical contractor who is thoroughly familiar with photovoltaic power systems.

DATA ACQUISITION SYSTEM

This Photovoltaic power system is equipped with a Data Acquisition System (DAS) manufactured by Also Energy (The global leader in Energy DAS) to monitor the energy production of the system.

The DAS consists of an environmental weather monitoring system, and various energy measurement components, which are both connected to an Internet Broadcast Device. The central DAS components and environmental components are located together within the site.

An environmental instrument package measures solar insolation, wind speed, and ambient temperature while the energy monitoring system measures power and the electrical energy produced by the system.

Information gathered by the DAS is broadcast to a web site for processing and monitoring purposes. This service not only gathers energy production data, but also issues alerts to system administrators when the system's projected performance falls below expected values.

In some cases the DAS can be configured to allow remote site diagnostics and operational control. Please contact the Site Operator for additional information.

SYSTEM COMPONENT SAFETY

PV ARRAYS– REPAIR BY SITE OPERATOR ONLY

PV Array

The solid-state nature of the PV array greatly reduces the amount of maintenance required when compared to traditional mechanical generating systems. Unless a portion of the PV array becomes physically damaged, the system will be safe and reliable for its service life. In the event that repair or maintenance work must be undertaken, please be aware of the following precautions:

- Only qualified personnel should be allowed access to the internal or energized components of the PV array junction boxes, inverters, panelboards, transformers, disconnect switches or field wiring.
- The PV array will always be electrically energized during all daylight conditions; so proper training, experience and precautions are required to ensure personnel safety.
- Before attempting any maintenance or washing operations, carefully inspect the entire PV array for modules with broken glass. A qualified contractor must replace broken PV Modules before any array washing or other maintenance work is attempted.
- In order to disconnect the entire PV array from the inverters, secure the operating handles of all mounted PV Array disconnect switches in the "Off'' position.
- To disconnect a single PV array source circuit from the inverter, secure the operating handle of its associated PV Array disconnect switch in the "Off'' position.
- Verify that all components undergoing maintenance or repair are disconnected from the inverter before servicing.
- Do not remove any fuses, or disconnect any PV module wiring while the array is electrically connected to the inverter.
- Physical damage to components and hazardous conditions will result if any individual PV Array component is opened under load.
- Do not attempt to access the junction boxes on the back of the PV modules. There are no user serviceable components in the module junction boxes.
- Always follow safe work practices and use proper safety equipment during maintenance or repair operations on the PV array.

INVERTERS – REPAIR BY SITE OPERATOR ONLY

When compared to historical rotary inverter technology, the solid-state design utilized in the Inverters greatly reduces maintenance requirements while maximizing system-operating efficiency. Before

undertaking any routine maintenance or repair work, please read the Inverter manual and pay close attention to the following precautions:

- To shut down an inverter, turn the AC and DC Disconnect Switches, on the front of the inverter, to the "OFF" position. These switches can be used to shut down an inverter whenever there is a question regarding personal safety or the operation of either inverter.
- The appropriate AC breaker in the main panelboard for the respective inverter must be secured in the "OFF" position in order to ensure that the inverter is not energized by utility during routine maintenance operations.
- Only qualified, experienced and trained personnel should perform repairs on the electronic and electrically energized components inside the inverters.
- Because the interior of the inverter cabinet contains exposed high voltage components, the cabinet door should remain closed at all times. Qualified, maintenance or repair personnel should only open the cabinet to perform maintenance or service work after the inverter has been completely disconnected from all electrical energy sources and the capacitors have fully discharged.
- To reduce the risk of electric shock, do not perform any maintenance work other than that specified in the Inverter manual.
- Only SMA factory personnel or their designated agents should perform any service work on the inverter's power conditioning or control components.
- Do not open the inverter cabinet doors during wet or inclement weather conditions. Introducing rain or moisture into the cabinet interior could result in hazardous conditions or damage to electrical components. For further information on the inverter, please refer to the appropriate inverter manual.
- Be sure to follow safe work practices and use proper safety equipment during maintenance or repair operations on the inverters.

SYSTEM OPERATION – REPAIR BY SITE OPERATOR ONLY

During normal operation, the inverters will act as fully automatic power-conditioning devices. The inverter will start to process power whenever there is sufficient energy available from the PV array. During the generation process, the inverter will utilize peak power tracking technology to maximize the energy production from the array. This function is achieved by varying the peak voltage and current point on the power curve for the photovoltaic array as operating conditions vary throughout the day.

Under basic operation, the PV array generates direct current (DC) and supplies it to the inverter. The inverter processes and conditions the direct current obtained from the PV array into 600 volt three-phase alternating current (AC), which is then stepped up to 13,200 volts via the transformers to the utility voltage at the site. In addition, the inverter synchronizes the phase characteristics and frequency to match that of the utility system.

In the event that the quality of the utility power momentarily falls outside a set of pre-specified parameters, the inverter will automatically shut down in a fault mode. After stable utility power becomes available again, the inverters will automatically restart and continue to process power. In the total absence of utility power, the inverter will not operate.

Whenever the PV array produces insufficient energy to efficiently operate the inverter, the inverter will automatically go into a low power "sleep" mode. The inverter will then sample the PV array for available power and resume power processing functions when sufficient levels of electrical energy are once again available from the array.

The inverter will also shut down whenever an operating problem is detected with the PV array, utility power quality or an internal operating parameter. Under such conditions, a fault code will be displayed on the front user interface panel. The fault code can then be matched to a detailed list of fault codes found in the Inverter O&M manual.

ACTIVATING OR STARTING THE SYSTEM – BY SITE OPERATOR ONLY

Before attempting to operate the inverters, refer to the Inverter O&M manual for initial turn-on procedures. The O&M manual also contains a detailed list of inverter fault codes, safety procedures, and other pertinent information.

The following describes normal steps taken to turn the inverter on or off. Refer to the as-built drawings for identification of components.

The start-up operations listed below should be followed in the sequence listed (for each inverter):

1 Remove any lockout devices on the disconnect switches after confirming that any repairs or maintenance operations have been completed and that no personnel are still working on the system.

2 Make sure that the inverter cabinet doors and DC disconnect doors are all closed and locked.

3 Turn on the dedicated 3-phase (dedicated) circuit breaker on the electrical panel.

4 Verify the proper clockwise phase sequence at the "line" side terminals (top) of the AC disconnect. Do not turn on until clockwise phase sequence has been verified.

5 Turn on the Inverter's 3-phase AC disconnect.

6 Turn on the Inverter's DC disconnect.

7 Watch the LED indicators for initialization (green and red LEDs on), then slow blinking green LED followed by faster blinking green LED. Watch the LCD display for prompts and system status.

8 Listen for contactor clunk (inverter on-line).

9 Listen for slight 60Hz hum (transformer on-line).

10 Following the blinking green LED and high frequency switching sound you should see a solid green LED (inverter on-line and beginning to feed power into 3-phase circuit). This confirms that the inverter is operating normally. The LCD display will show the AC Power, Energy, current and voltage as well as DC voltage.

11 If the unit fails to power on, use the troubleshooting information provided in the user manual. If those steps do not resolve the problem, contact the Site Operator or Inverter Manufacturer.

MAINTENANCE

STORMWATER AND VEGETATIVE MAINTENANCE

We will comply with all state and local orders and conditions pertaining to stormwater management and site feature inspection. We use generally accepted maintenance standards for solar arrays, typically focused on guaranteeing insolation and the health of any landscaped plantings or features.

MAINTENANCE PRECAUTIONS

The Site Operator and its highly trained Agents are the only parties who should undertake any maintenance or repair to the system. Before doing so, Site Operator staff will follow the shutdown procedure described in the previous sections.

1 Review and understand all safety precautions and maintenance operations described in both this document and the Inverter Manual.

2 Only qualified individuals should perform or supervise any maintenance procedures.

3 Install appropriate lock out devices on all system disconnecting means to protect personnel performing maintenance operations on the system from electrical shock hazards.

4 Do not open the inverter cabinet door for any reason, only SMA personnel are permitted to perform maintenance or inspections.

5 Contact Site Operator if there are any questions regarding operation or maintenance procedure for the PV array.

Note: The PV array circuits, array combiner boxes, the array disconnect switches and all associated wiring will remain energized as long as there is sunlight. Hazardous DC voltage levels will be present in all these components even during very low daylight conditions.

DAILY AND PERIODIC REMOTE OPERATIONS AND MONITORING

The Operator's Asset Management staff have the ability to monitor site equipment remotely, performing a suite of daily operational checks to verify site status and performance. In some cases, real time remote diagnostics allow O&M staff to analyze and correct common equipment issues through the same on-line interface. Comprehensive remote diagnostics and operations are fairly new to solar, and have allowed Operators to perform deeper analysis and understand fairly subtle performance issues without visiting the site.

On site cameras allow Asset Management staff to get a real time and historical view of site conditions, to assess vegetation, soiling, weather, and major equipment housings.

Web based performance monitoring mini sites can be provided to municipalities interested in following solar performance in real time.

PV Array Monitoring Procedures

Description	Action
1. Daily and intraday review of site alerts and equipment notifications	**Daily: Coordinate O&M team site visits as necessary, and insure that issues are corrected expeditiously**
2. Review site video camera as necessary to establish real-time site conditions	**Daily: Review**
3. Verify inverter and meter performance to expected	**Daily: Coordinate investigation of any unexplained variance to expected**
4. Verify total site output to expected	**Daily: Coordinate investigation of any variance to expected**
5. Periodically analyze string, combiner, and inverter performance on a comparative basis, site-wide to identify underperformance related to blown fuses and other subtle performance issues	**Periodically: Coordinate investigation of any variance to expected**

Kearsarge Montague, Winter 2019, from the on-site camera

PROCEDURES FOR ALL SITE VISITS

Remote monitoring and diagnostics do not displace on-site maintenance. From time to time Operations and Maintenance staff will be on site to investigate and correct issues. These visits are irregular but represent an opportunity to conduct a routine inspection and validate site conditions as thoroughly as possible. On average, Operations and Maintenance staff visit sites monthly to attend to on-site maintenance issues. For sites hosting grazing stock visits are at least biweekly.

PV Procedures at all Site Visits

Description	Action
1. Validate integrity of fencing	Coordinate O&M team site visits as necessary, and assure that issues are corrected expeditiously
2. Evaluate general condition of vegetation, shading	Recommend maintenance
3. Verify the integrity of major drainage features/erosion/settling	Recommend maintenance/additional evaluation
4. Verify the integrity and check soil levels of visible panels	Recommend maintenance
5. Note obvious wire maintenance issues, if any	Recommend maintenance
6. Perform equipment-specific or site-specific checks as necessary, on both the PV array and the DSS	As required

ANNUAL MAINTENANCE PROCEDURES FOR THE PV ARRAY

At least once annually (more often if conditions warrant) Operations and Maintenance staff will conduct a thorough walk-through of the site, to perform preventative maintenance and diagnostics on all major equipment. This generally takes place in Spring.

Thermal imaging of major equipment, including a sample of panels, is conducted annually in addition to the below visual inspection. This data is collected and analyzed to uncover issues prior to equipment failure and/or degraded performance. Some array components may require more frequent cleaning depending on age and model; the elements below represent minimum annual activity.

Site inspection and video photography via drone is also performed on an annual or bi-annual basis.

Sheep take cover when the drone comes by, Great Barrington 2019

Annual Maintenance Procedures

Components & Equipment	Description	Action
PV Modules	Check for dust & debris on module surface	Wash or wipe clean with water
	Check for physical damage on all PV modules	Replace damaged PV modules
	Check for loose or disconnected cable terminations between PV module wiring	Retighten or reconnect wiring
	Check cable condition	Replace worn cables if necessary
	Check for shading obstructions on all PV modules	Identify source and remove
	Check for fading/discoloration, burn marks, seal condition, frame damage or rust	Log and report conditions to Site Operator
PVInverters	Check functionality – e.g. auto disconnect upon loss of grid power supply, error & ground fault LED indicators	Consult inverter manufacturer for repair or replacement parts
	Check ventilation condition	Clear dirt, dust or debris from ventilation system
	Check for abnormal operating temperature	Consult inverter manufacturer for repair or replacement parts
	Check for abnormal noises – i.e. irregular humming or rattling	Consult inverter manufacturer for repair
	Inspect inverter structure(s) and enclosure(s) (seals, rust, damage, door condition, switch/handle condition, locks)	Log and report conditions to Site Operator
Cables	Check for cable conditions – i.e. wear and tear	Replace worn cables if necessary
	Check cable terminals for burnt marks, hot spots or loose connections	Tighten connections or replace if necessary
Combiner Boxes	Check cable terminals – e.g. wear and tear, loose connections or burn marks	Tighten or replace if necessary
	Check for placards and signage	Replace if necessary
	Check for physical damage	Replace if necessary
	Check for blown fuses inside the Combiner Box	Replace blown fuses
	Check for water leaks inside the Combiner Box	Replace combiner box or repair to prevent future water leaks
Bonding & Grounding	Check grounding cable and bonding connection conditions	Replace worn cables if necessary
	Check the physical grounding/bonding connection	Retighten connection if necessary
	Check continuity of grounding and bonding conductors	Troubleshoot or replace if necessary
Disconnect Switches	Check functionality	Replace or repair as necessary
PV Module Racking System	Check for corrosion	Treat corroded areas or consult racking manufacturer/installer
	Check for damage to racking system	Replace or repair damaged parts
	Check for settlement	If settlement is detected within the solar array area it will be assessed in conjunction with the Owner, as applicable, and an

Components & Equipment	Description	Action
		appropriate response action will be selected
Pole Mounted Equipment	Check for damage or irregularities – e.g. damage from weather related incidents, blown fuses, lightning marks, etc.	Replace or repair damaged equipment
Transformers	Operator will be responsible for attending the site to check the terminations, etc. for the main transformer Any alarms raised by the public or the DAS should be immediately forwarded directly to Site Operator for action Check fluid levels	Log and report conditions to Site Operator
General/ Vegetation	Check vegetation control to maintain optimal performance of PV system Check fence/gate security Check internal access-ways/signage integrity Check for erosion Check for settlement	Mowing of grassy areas as necessary to maintain solar generation efficiency. Pruning of trees/bushes on property, or overhanging property that cause shading of the PV panels or potential damage to fencing/equipment in compliance with any conditions of the land lease Site Operator to carry out repair/replacement of fence and security systems as appropriate, as well as general erosion control.

SITE ACCESS

Sites are locked via metal chain threaded through the site gate, secured with a combination or key lock. In an emergency, bolt cutters can be used to gain access to the site. The site combination is changed from time to time.

Towns may prefer to have “daisy chain” or Knox Box access, where multi user access is preferred.

In a daisy chain scenario, the entrant need only know one of the combinations in order to gain access. Knox boxes, example pictured below, offer master key access to the site key.

LOCK-INS

Anyone operating in and around the solar site needs to be cognizant of lock-ins, and the danger they pose.

When maintenance staff enter the site they will leave the gate unlocked in the unlikely event that first responders and emergency vehicles need to respond to an accident quickly. For this reason, the site should not be locked if it appears to be unlocked.

Please contact Asset Management at Kearsarge Energy at our toll-free number: **855 277 6257** before locking a gate that appears to have been left open. Kearsarge will verify that O&M staff are not inside before the gate should be secured.

Kearsarge will promptly investigate why the gate was left unlocked.

SITE SIGNAGE

Signage can include markings on particular pieces of equipment, exterior gates, or surrounding fences; NFPA/NEC rules dictate what markings are required on particular pieces of equipment: https://www.nfpa.org/

Kearsarge tailors exterior signage to the preferences and needs of local authorities.

Generally, Kearsarge requires OSHA-compliant exterior signage that:

- Firmly discourages trespassing
- Advises “who to call” to report an emergency or issue
- Lets first responders know where critical site shutoff facilities are
- Provides QR code that links to an application that tracks site entry and exit

Finally, signage, unlike many other site features, is flexible; if preferences change, Kearsarge will work with stakeholders to accommodate reasonable requests.

During construction, the contractor may be listed as primary contact

Typical Exterior Signage

Site disconnect map, telling emergency personnel how to shut down the site

General Trespassing and safety warning

Typical Transformer Signage/ NFPA

Typical Inverter Signage /NFPA

Check in and Check Out Policy

All site visitors are required to check in and check out via an on line application that tracks site entry and exit, and collects basic personal and site condition information.

COMMON MAINTENANCE PROCEDURES

The following section outlines basic maintenance procedures, for the reader's information. No procedure should be attempted by anyone but the Operator or its Agents.

PV MODULE REPLACEMENT PROCEDURE

WARNING: ONLY QUALIFIED PERSONNEL SHOULD WORK ON THIS SYSTEM. PHOTOVOLTAIC MODULES ARE ALWAYS ENERGIZED WHEN EXPOSED TO LIGHT.

Perform module replacement operations in the order described below:

- Refer to the string wiring diagram to locate which inverter and DC disconnect the module is associated with.
- Put in the OFF position and lock out all PV Array Disconnect (inverter DC disconnect and panelboard AC disconnect) switches associated with the inverter prior to starting replacement operation.
- Open all circuit fuses that the module is associated with.
- WARNING: Do not open fuses until the DC disconnects have been turned off. Pulling fuses under load is an unsafe practice and a fire hazard, doing so could cause damage to PV wire, fuse holder, and combiner box.
- Cover the module with a blank out mat with steel spring clamp.
- Use PV disconnect tool to disconnect positive and negative leads of the broken module.
- WARNING: Do not disconnect modules until the fuses have been pulled. Disconnecting modules under load is an unsafe practice and a fire hazard, doing so could cause damage to PV module, connector, and wire.
- Loosen the four 5/16" bolts that attach PV module to racking.
- Replace broken module with new module.
- Replace the four 5/16" bolts and torque to 12 ft-lbs.
- Check module leads for any damage, and then connect positive and negative leads.

- Replace tie wraps for wire management.
- Close all fuses that the module is associated with.

INVERTER IS NOT OPERATING

In the event that the inverter is not running as expected during daylight hours with a clear sky and strong sunlight, please check the following:

1 Contact the Site Operator.

2 Verify that the facility is receiving power from the utility connection and that an electrical outage has not occurred within the last 10 minutes.

3 Make sure that the inverter doors are all closed and locked.

If the inverter does not begin countdown to operation after a 300 second delay once step three is complete, look for lockout devices on the disconnect switches listed below.

Important Note: The switches listed below may also be found unlocked in the "OFF" position for a specific reason. Do not close any switches without first verifying that no personnel or property are at risk if the switch is closed.

1 Utility AC Disconnect.

2 Inverter AC Disconnect.

3 Array Disconnects.

After establishing that it is safe to do so, close the switches in the following sequence:

1 Close the DC Disconnect switches.

2 Close the main disconnect switch and close the individual inverter specific breakers in the panelboard cabinets.

3 Close the DC PV array disconnect switches located on the panelboard pad.

If the inverter still does not operate after completing the sequence described above, then a Fault condition likely exists. Please refer to the following section for recommendations on further actions.

INVERTER IS IN FAULT MODE

The inverters have a set of internally monitored operating conditions that must be met for safe and reliable operation. If any of these conditions is not met, the inverter shuts down and goes into what is known as a "Fault" mode. The inverter will remain in off in the Fault mode until the condition is corrected.

Many operating conditions may change temporarily during normal system operation. Temporary fault conditions such as momentary sags in utility line frequency or voltages are transient, so the inverter will automatically restart after the operating conditions return to normal.

If the fault condition is not temporary the inverter will remain out of operation until the fault condition is corrected. In the event that an inverter has been off for several hours with uninterrupted electric utility service and clear sunny skies, then a more prevalent type of fault condition is likely preventing the inverter from operating.

To identify the fault condition, please refer to the Inverter Installation and Operation manual for a description of how identify fault codes and how to do a soft restart as well as a hard restart of the inverter. The menu will indicate the present fault condition, which should recorded, be reported to facility operations manager for evaluation and correction.

LOW ENERGY PRODUCTION REPORTED BY THE DAS

Some common causes of system underperformance are:

- Heavy dirt, debris, dust accumulation, or shading on the PV array.
- Damaged PV modules.
- Compromised electrical system components such as damaged conduit or wiring.
- Open fuses in the PV array combiner boxes or open disconnect switches.

FAQ's

Common site issues

The Operator should be contacted immediately if abnormalities are discovered on or around the site. The most common issues are weather-related, with storm damage from trees the most common problem.

Contact us toll free at 855 277 6257.

- Trees down
- Fencing compromised
- Broken panels
- Issues with mowing or site maintenance
- Gate appears to be unlocked
- Erosion or animal burrowing on site

How are sites managed?

- Cameras allow remote staff to see the site for security purposes, as well as to confirm snow and other debris.
- Kearsarge monitors individual pieces of equipment to benchmark performance over time; in addition, some site functions are remotely controlled.
- Weather equipment tracks how strong the sun is at minute intervals; other tools track electrical generation down to the inverter and string level.

Concord - WR Grace

How do seasons and weather affect solar production?

Concord - WR Grace

- Snow covered panels don't operate well. Snow typically slides off quickly
- Although snow and ice reduce productivity in the short term, they provide a valuable "scouring" effect that removes grime and dust
- High ambient temperatures reduce solar production; hot August days are less productive than cool May days, even with the same amount of sun
- Solar produces twice as much in June as in January due to the length of the day and the angle of the sun
- When the utility loses power, (counterintuitively), solar arrays stop producing as a safety measure; when the utility is down, so are we.

Meet the Kearsarge Summer Interns

- Lawn-mowing is labor and fossil fuel intensive, and we always worry about damage to the site, noise, and wildlife disturbance
- Solar sites provide safe and comfortable summer living arrangements for grazing sheep
- "Lambscaping" provides natural fertilizer and improved erosion control
- To the right is the flock in Great Barrington, MA

Appendix A – Emergency Response

DRAFT EMERGENCY RESPONSE PLAN

Kearsarge Haddam Quarter Solar Project

Kearsarge Haddam Quarter LLC

Haddam Quarter Road, Durham, CT

In the case of an emergency, responders will access the array from the Johnson Lane entrance where there is a gated access point. One Knox box will be installed at the entrance gate to the solar array during construction to provide the Fire Department with access to the site. Electrical equipment and disconnects are located at the entry point to the solar array. Responders can readily access the electrical equipment. The location of the electrical equipment will be clearly marked on signage at the gates and the disconnect switches will be clearly labeled.

A numbering system will identify individual rows of the PV panels to assist emergency responders with finding a specific location in the event of an emergency. The row labeling will be finalized during the construction phase of the project. As-Built drawings depicting the row labeling will be provided to the Fire Department.

This emergency response plan will be filed with local emergency responders and updated as necessary. Emergency response information may also be posted on the access gates. Contact information is included below.

EMERGENCY CONTACT DETAILS

24-hour Emergency Contact:

Kearsarge Haddam Quarter LLC
Patricia Fennessey
Director of Asset Management
617-393-4222 / 855 277 6257
pfennessey@kearsargeenergy.com
1380 Soldiers Field Road, Suite 3900
Boston, MA 02135

Landowner Contact:

Newton Family Trust
Charlie Newton
Tel: 860-614-4087
Email: charnew1021@gmail.com

Town of Durham Police Department: In an emergency dial 9-1-1

Town of Durham Police Dept.
24 Town House Road
Durham, CT 06422
Tel: 860 399-2100

Town of Durham Fire Department: In an emergency dial 9-1-1

Town of Durham Fire Department
41 Main Street
Durham, CT 06422
Tel: 860 349-9112

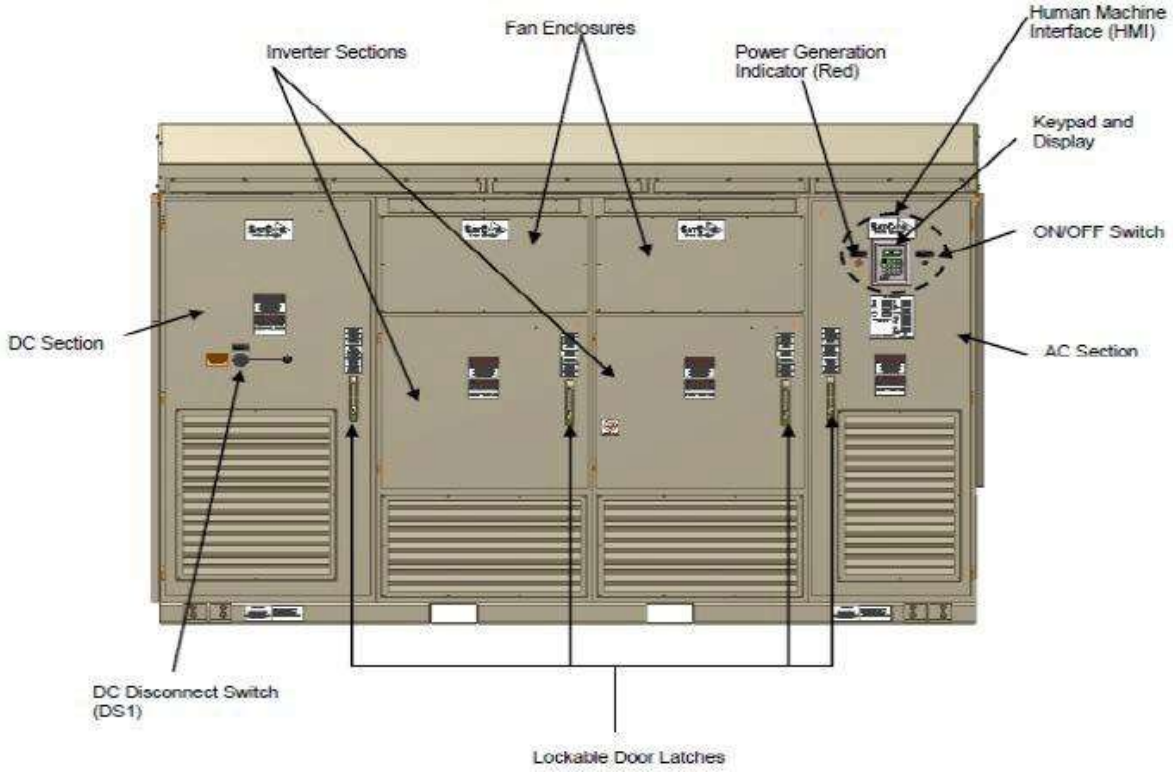
EMERGENCY SHUTDOWN PROCEDURE

In an emergency the ON/OFF switch on each inverter should be manually turned to the OFF position. This will internally shut off both the AC and DC switches inside the inverter. After the system has been turned off the DC Disconnect Switch labeled DS 1 should be turned off and a lock should be placed on it to keep it from being reenergized.

Now that the system is off, follow normal shut down procedures below to turn off remaining closed switches.

Note – Disconnecting the AC and DC switches will stop current flow and isolate the solar system from the utility distribution system, however DC wiring from the panels to the inverters remains potentially energized and hazardous.

A sample figure is provided below.



Simple System Shutdown and Startup Procedures

Any work done on the solar electric system must be approved in writing by Kearsarge Haddam Quarter LLC and performed by an authorized electrician. To work on the DC side of the solar system when the system is running properly or to reset the inverter, use the following steps to shut down and restart the system.

Inverter Shutdown

Use the following procedures for system shutdown.

- Turn off the ON/OFF switch on the inverter/panelboards
- Turn the DC disconnect off
- Turn the AC disconnect off
- Install lockout devices on the disconnects
- Turn off DC-Fused Combiner Box switches

Inverter Start / Restart

Use the following procedures for system start-up and restart:

- Turn on DC-Fused Combiner Box switches after verifying the following:
    - Inverter is off
    - The AC and DC disconnects are off
- Remove any lockout devices on AC and DC disconnects
- Make sure all combiner fuses are closed
- Close the AC disconnect
- Close the DC disconnect

After a short initialization period, the inverter will transition to “waking up” provided that the PV voltage is greater than the PV voltage start set point. After another short period (typically 5 minutes) the system will start up. The inverter cuts itself off when either AC or DC power is removed. It is best to remove both sources of power and you must do this before attempting to service the unit.

SITE SAFETY PROCEDURES

GENERAL WARNINGS!

- The equipment contains lethal AC and DC voltages!
- Site access is intended for authorized personnel only!
- These servicing instructions are for use by qualified personnel only!
- Equipment is supplied from multiple sources!

DO NOT VIOLATE SITE SAFETY AND OPERATION PROCEDURES

The installation, adjustment, repairs or testing of the Photovoltaic System involves possible contact with potentially lethal voltages and currents. No attempt to install or service the system should be made by anyone who is not qualified, trained technician familiar with SMA equipment.

Hazardous Locations

The following are deemed hazardous locations:

- Inverters and Disconnects: For hazardous locations within the inverter, refer to the Inverter Operations and Maintenance Manual.
- Vicinity of the Solar Electric Photovoltaic System.
- Field wiring and all electrical boxes associated with the system.

Precautions While in the Vicinity of the Solar Electric System

- Safety glasses and electrical insulating gloves must be worn when handling or working near the array, modules, electrical boxes, or wiring.
- It is recommended to always have at least two persons present when working on the array or handling modules. Do not attempt to service or adjust unless another person capable of rendering first aid and cardiopulmonary resuscitation (CPR) is also present.
- Any accidents should be immediately reported to a Supervisor, who should then report to Kearsarge Haddam Quarter LLC.
- The Photovoltaic Modules are made of glass and can be broken. Dropping or banging the modules may cause them to break, as may impact with sharp, hard or heavy objects. Along with electrical hazard, sharp edges or broken glass can cause injury. Be careful not to break modules and take care to properly handle and dispose of modules if they are cracked or broken.
- Any crack in the module can expose the person touching it to the full voltage and current of the array. If the module is wet, touching a cracked module anywhere may expose the person to the full voltage and current of the array. Do not touch the modules when they are exposed to the sun without wearing electrical insulating gloves. Do not touch a wet, cracked module without wearing electrical insulating gloves.
- A module may contain an unknown crack or connector failure at any time. Do not touch, handle or carry any wet module without wearing electrical insulating gloves.

ATTACHMENT 6

Agricultural Co-use Plan for Haddam Quarter Road Solar Project

Comprehensive Agricultural Integration with Hay Harvesting

Agricultural co-use at the Haddam Quarter Road project site will include hay harvesting. The co-use plan consists of the following sections:

1. Overview
2. Civil Design Recommendations
3. Risk Management
4. Site Vegetation and seed mix design
5. Seasonal Management Schedule

Overview

Project Objectives: To effectively maintain agricultural production at the site in Durham, CT. Co-location of solar and agriculture could provide the landowner with diversified revenue sources and ecological benefits, while reducing land use competition and siting restrictions. This will be accomplished through the maintenance of a hay harvesting facility next to the solar site. (Refer to Figure 1)

The project will be managed to:

- Prevent panel shading and equipment damage from overgrowth
- Prevent Erosion
- Manage invasive and undesirable species pressure
- Promote long term soil health
- Maintain a mutually beneficial relationship with the landowner, project owner and the community

Civil Design Recommendations

1. Perimeter fencing: Whether chain link or "ag type" woven wire should be installed to the ground, buried slightly below grade, or with a *maximum* gap of 1-2". Gaps cause by uneven ground should be cleaned up with a dozer if possible. If chain link fencing is used, it should be installed with a bottom tensioning wire.
2. Perimeter Gates: Should be installed to meet evenly and have an even spacing to the ground. As above, a *maximum* gap of 1-2". Care should be taken to add some gravel or grade the roadbed to avoid large gaps around the road shoulders in the gateways.
3. Planting & Seeding: As always, the best scenario is building on existing sod or hay-ground and focusing on minimizing damage to these areas. For additional seedings, clover or legume mixes are a good option for vigor and grazing friendliness. For grass species, fescue species should be avoided unless they are *endophyte-free* varieties. Note that species such as Reed Canary grass and some Orchard grass varieties can produce tall growth and fibrous seed. Note that the blends such as Fuzz and Buzz Standard and Fuzz and Buzz Premium can be good here. We expect the seed mix selected for Durham to be customized for the site.
4. Water: A water source would be ideal for hay harvesting at these sites. It is recommended that the spigot be activated for filling and water distribution at the site. This choice on the part of the project owner will drive down costs in the long term.

Site Vegetation and Seed Mix Design

When selecting the appropriate seed mix, it is important to consider factors such as desired hay quality, climate and soil conditions. The two most common hay types in the northeast are timothy mix and alfalfa mix.

1. Timothy mix: A very popular choice for hay production due to its high nutritional value. A typical mix contains other grasses such as bluegrass or orchard grass.
2. Alfalfa mix: A highly productive legume used for hay production. The mix may contain other grasses such as timothy, orchard grass and ryegrass.
3. Native grass mix: We can also use native grass mix. These are composed of grass species that are native to specific region.

Seasonal Management Schedule

The landowner will either manage the hay harvesting operations or contract it out to a harvesting and baling service company. A detailed seasonal management plan will be used to maintain the hay harvesting operations. The appropriate hay type must be selected based on soil conditions, weather conditions and other factors. In the northeast, usually alfalfa, orchard grass or timothy hay is used. Soil testing will be conducted to determine nutrient levels and pH and proper soil amendments will be utilized to get the required nutrient and pH levels. Proper drainage must be maintained and soil compaction or any other issues must be addressed.

High quality hay seed will be selected. The seeds will be sowed using recommended seeding rate and depth after preparing the seedbed. To ensure no weed growth, either manual or mechanical weed control methods will be used. The landowner will monitor the moisture level, height and overall health of the grass plant.

The landowner/contractor will choose an appropriate cutting time, preferably during a dry, sunny period. Allow hay to dry to moisture content of 15%-20%. Dry hay will be baled and stored in a dry, well-ventilated storage facility to avoid fire hazards.

After each harvest, the soil conditions will be assessed and detail record of each harvest will be maintained.

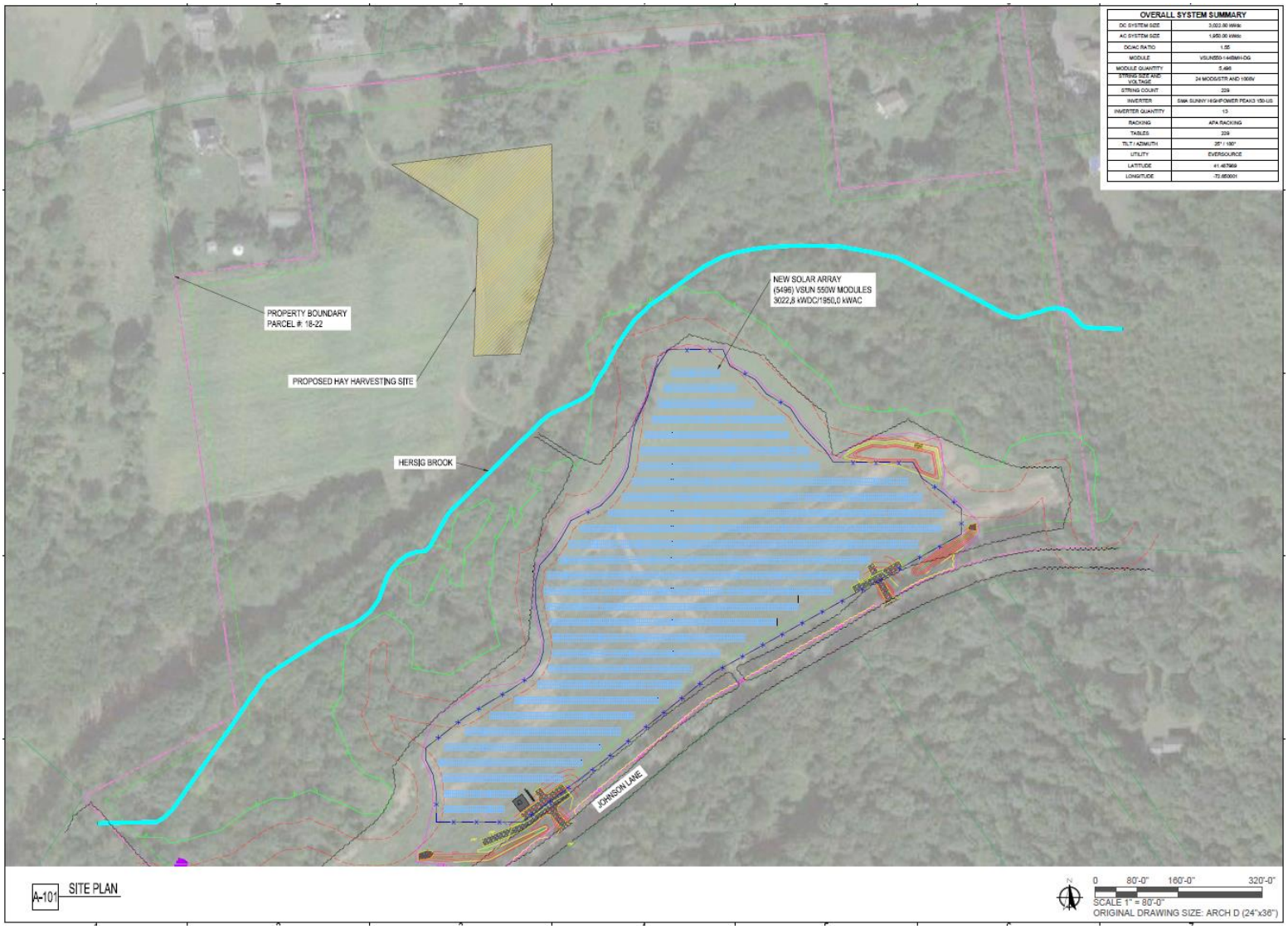


Fig 1: Location of array and hay harvesting facility within the parcel

ATTACHMENT 7

Health and Safety Plan

Prepared for:

Haddam Quarter Road Solar
Haddam Quarter Rd
Durham, CT 06422
3.0MWDC

Prepared by:

Louth Callan Renewables, LLC
921 Thrall Avenue
Suffield, CT 06078

Site Health and Safety Plan

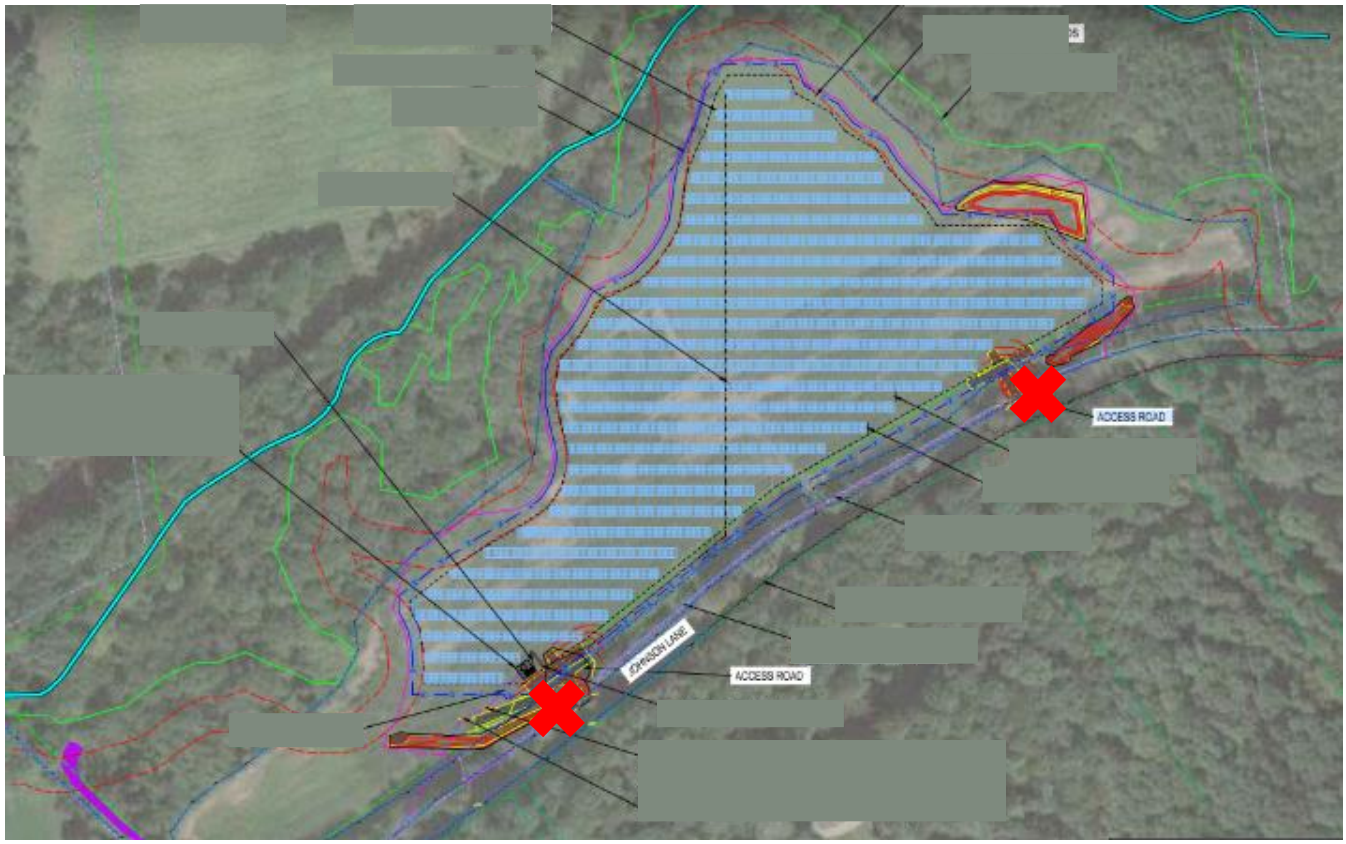
LCR Safety Director: Kristen Michaelian
Email: kristen@louthcallanrenewables.com
Phone: 860-840-3359

Reviewed by: _____ **Title:** _____ **Date:** _____

Reviewed by: _____ **Title:** _____ **Date:** _____

Reviewed by: _____ **Title:** _____ **Date:** _____

EVACUATION ROUTE AND MEETING POINTS



= Muster Point at the beginning of each access road. In case of emergencies or fire, please exit to the nearest access road.

Employee Health and Safety Orientation
Sign Off Form

By signing below, I acknowledge that I have access to review the Site Health and Safety Plan. I have been presented the site-specific health and safety orientation, understand it, and hereby agree to abide by all of the provisions contained within it. I have been offered the opportunity to ask questions. Furthermore, I acknowledge that that any violation of the policy may subject me to removal from the Project without possibility of return to the Project or any other Louth Callan Renewables, LLC projects

Project Name: Haddam Quarter Road Solar		**Project Number:**	
NAME	**SIGNATURE**	**COMPANY**	**DATE**

Louth Callan Renewables

Site Supervisor
Sign Off Form

By signing below, I acknowledge that I have access to review the Site Health and Safety Plan. I have been presented the site-specific health and safety orientation, understand it, and hereby agree to abide by all of the provisions contained within it. I have been offered the opportunity to ask questions. Furthermore, I acknowledge that that any violation of the policy may subject me to removal from the Project without possibility of return to the Project or any other Louth Callan Renewables, LLC projects

Project Name: Haddam Quarter Road Solar

Project Number:

NAME	SIGNATURE	COMPANY	DATE

Escorted Visitor Signoff Form

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Project Name: Haddam Quarter Road Solar		**Project Number:**	
NAME	**SIGNATURE**	**COMPANY**	**DATE**

1.0 INTRODUCTION

Louth Callan Renewables, LLC will be installing a **3.0MW DC** Solar array at **Haddam Quarter Road, Durham CT 06422**. This Health and Safety Plansupports the execution of the project activities in accordance with the Scope of Work (SOW), Specifications of the Contract, and applicable regulations. The project's Definable Features of Work will include but are not limited to

- Surveying and Site Layout
- Clearing and Grubbing
- Receiving Materials
- Dirt Work
- Installing Erosion Controls
- Staging System Equipment
- Placing Concrete Foundations
- Installation of Racking
- Installation of Modules
- Excavation/Trenching for AC/DC Conduit Wiring
- BESS System Installation and Wiring
- Additional Electrical Work
- Utility Installation

1.1 Plan Objective

The objective of this Site Health and Safety Plan (HASP) is to define the requirements and designate protocols to be followed during the activities at the site. Applicability extends to Louth Callan Renewables, LLC personnel, Louth Callan Renewables, LLC's subcontractors, and visitors, and is inclusive of Client personnel and representatives, engineers and subcontractors. Work performed under this contract will comply with applicable Federal,State, and Local Safety and Occupational Health laws and regulations. Through careful planning and implementation of corporate and site-specific safety protocols, Louth Callan Renewables, LLC will strive for zero accidentsand incidents on the project.

1.2 Safety and Health Policy Statement

Louth Callan Renewables, LLC is committed to the safety of each employee. There is no place at Louth Callan Renewables, LLC for an employee who will not work safely or who will endanger the safety of their fellow workers. It is essential that all Managers and Supervisors insist on the maximum safety performance and awareness of all employees under their direction, by enthusiastically and consistently administering all safety rules and regulations. It is Louth Callan Renewables, LLC's policy to take the necessary actions, in engineering, planning, designing,assigning and supervising work operations to create a safe worksite. Louth Callan Renewables, LLC will:

- Maintain safe and healthful working conditions.
- Provide and assure the use of all necessary personal protection equipment to ensure the safetyand health of site employees and the public at large.
- Require that site work be planned to provide a range of protection based on the degree of hazards encountered under actual working conditions.
- Provide site workers with the information and training required to make them fully aware of known and suspected hazards that may be encountered and of the appropriate methods for protecting themselves, their co-workers and the public at large.

1.3 Project Safety and Health Compliance Program

Compliance with the requirements of applicable Federal, State and Local laws will be accomplished through a combination of written programs, employee training, workplace monitoring, and system enforcement. Continued and regular inspections by supervisors and safety personnel as well as the culture of ownership and total involvement in the safety program will produce an atmosphere voluntary compliance. However, disciplinary action for violations of project requirements will be taken, when necessary.

All personnel working on site will be required to attend Site specific Safety and Health Orientation basedon the materials contained in this site Health and Safety Plan (HASP). Each employee will sign the safety plan sign off form indicating that they have received orientation and agree to follow the requirements of this HASP. A copy of the HASP is available by request. Visitors will be expected to comply with all relevant requirements of the HASP. Public safety is of the utmost importance and will be considered during each phase of the project.

The safe and efficient work practices of this company require a spirit of teamwork and cooperation fromall employees. Also required are uniform standards of expected behavior. Employees who refuse or fail to follow the standard set forth by this plan, the Louth Callan Renewables, LLC Safety, Health and Environmental Program and/or Regulatory standards, will subject themselves to disciplinary action up to, and including discharge. In cases not specifically mentioned, employees are expected to use good judgment and refer any questions to their supervisors.

Louth Callan Renewables, LLC makes every reasonable effort to prevent unsafe work practices and to ensure the safety and health of all workers by enforcing the Disciplinary Policy. In the event any policy or procedure or anunsafe habitual pattern is observed, Louth Callan Renewables, LLC will proceed with disciplinary action based on the natureof the violation. Louth Callan Renewables, LLC maintains the right to terminate employees immediately, if in its opinion, theviolation is of such a serious nature to warrant immediate dismissal.

If disciplinary action is taken, a written warning, suspension with or without pay, or termination may result, depending on the severity of the problem. No representations in this place create any right to receive progressive discipline short of termination.

1.4 Substance Abuse Program

Louth Callan Renewables, LLC strives to ensure a workplace that is free of illegal drugs and alcohol use by all employees.Being under the influence of illegal drugs, or alcohol on the job may pose serious Safety and Health risks not only to the user but to all those who work with the user.

Louth Callan Renewables, LLC has **Zero Tolerance for drug and alcohol use in the workplace**. Employees may not possessor have under their control any prohibited drug, alcohol, or drug paraphernalia while acting in the courseand scope of their employment with the Company either on Company premises or on the property of Client companies. Possession or control can include an employee's person or personal property if on Company premises or on the property of Client companies.

Louth Callan Renewables, LLC prohibits employees from reporting for duty or remaining on duty in any capacity while underthe influence of prohibited drugs or alcohol.

All new hire employees shall submit to a pre-employment drug screen before entering the workplace.

1.5.1 Testing / Post-Testing

Testing for Drugs will be by way of urine testing. The following drugs, at a minimum, will be tested for:

- Amphetamines
- Cannabinoids (Marijuana)
- Cocaine (Metabolites)
- Opiates
- Phencyclidine (PCP)
- Heroin
- MDMA - Ecstasy

Testing for Alcohol will be by way of breath-alcohol test.

Immediately upon receipt of test results, Louth Callan Renewables, LLC shall remove from the Site any contractor worker who tests positive or in any way does not comply with the Drug and Alcohol Policy. Louth Callan Renewables, LLC shall notallow a contractor worker who tests positive to return to the Site, unless the Owner's requirements aremet.

1.5.2 Random Testing

Employees will be randomly selected for testing by a third-party provider to ensure there is no bias in selection. Any employee randomly selected will have (2) hours to report to the facility that will be collecting the sample and may be accompanied by a designated escort. Testing may be performed onLouth Callan Renewables, LLC property, in which case testing will be performed immediately.

Employees, who have been selected, once advised, are not permitted to leave the premises. To do soshall subject him/her to disciplinary actions up to and including termination. The employee shall be placed on suspension pending consultation with the Human Resources Department as to the appropriate action to be taken.

Any employee who refuses to submit to any drug or alcohol test is considered to be refusing to cooperate with the Substance Abuse Program and will be subject to disciplinary action up to and including termination.

1.5 References

During development of this HASP consideration was given to current safety and health standards as defined by the Occupational Safety and Health Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH). Specifically, the following reference sources have been utilized in the development of this HASP:

- OSHA Regulations: 29 CFR 1910 and 1926
- USEPA Standard Operating Safety Guides

- NIOSH/OSHA/USEPA "Occupational Safety and Health Guidance Manual for Hazardous WasteSite Activities"
- NIOSH Pocket Guide to Chemical Hazards
- American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Valuesfor Chemical Substances and Chemical Agent
- Supplied Supplemental Specifications and Special Provisions
- NAVFAC Safety & Health Handbook
- MCLB Barstow – Accident Prevention Plan

Louth Callan Renewables, LLC has established a comprehensive and realistic Safety, Health and Environmental Program; based on experience, sound engineering practice, employee training and enforcement of Safety and Health regulations to prevent unreasonable Safety and Health risks. For specific procedures/programs associated with this project, refer to the Louth Callan Renewables, LLC Safety and Health Program and Procedures Manual(copy available on site).

1.6 Site Health and Safety Plan Revisions

The development and preparation of this Site Safety and Health Plan has been based on limited site- specific information provided to Louth Callan Renewables, LLC. Should any unforeseen hazard become evident during the performance of the work, the Site Designated Site Safety Representative (DSSR) shall bring such hazard to the attention of the Client Representative both verbally and in writing for resolution as soon as possible. In the interim, Louth Callan Renewables, LLC will take necessary actions to maintain safe working conditions in order to safeguard on-site personnel, visitors, the public, and the environment. No changes to the HASP will be allowed until the item has been reviewed and an addendum prepared and approved by the Safety and Health Manager and client.

2.0 ORGANIZATION AND RESPONSIBILITIES

While Louth Callan Renewables, LLC's Safety and Health Department directs and supervises the overall Safety, Health and Environmental Program, the responsibility for Safety and Health extends throughout our organization from top management to every employee. For this reason, it is each person's duty to notify the management personnel if a hazardous condition is identified and to make a "stop work" call if the condition represents an immediate danger to life or health, until the DSSR can make a further determination. The following are Louth Callan Renewables, LLC's project personnel positions and responsibilities for this project.

2.1 Project Manager

The Project directs and manages all aspects of the project in compliance with all contract and technicalrequirements. The Project Manager will monitor and control all subcontractors to achieve optimal performance and ensure safe, high quality performance that complies with all contract requirements. His responsibilities include coordinating project activities with the Project Superintendent and serving as the primary liaison with the Client Representative. The Project Manager prepares allcorrespondence, submittals, and other documentation required for the project and coordinates, schedules and administers the contract. The Project Manager prepares reports and documentation, supervises inspection personnel, reviews and approves procurement and subcontract activities.

2.2 Project Superintendent

The Project Superintendent supervises and coordinates all construction crew activities relating to site preparation, excavation, and restoration. The **Project superintendent shall also serve as the Site Designated Site Safety Representative (DSSR) when the DSSR is not present.** The Project Superintendent has the operational responsibility for the implementation of the HASP on this project.

This includes establishing an attitude of concern for safety matters by initiating prompt corrective actionof hazards brought to his attention and ensuring that the project safety and health requirements are initiated and observed by all project personnel.

The Superintendent plans and requires that all work be performed in compliance with this HASP, Louth Callan Renewables, LLC's Safety, Health and Environmental Program and/or the client's safety program including all applicable local, state and federal regulations. He shall impress upon all subcontractors' supervisory personnel a sense of responsibility and accountability of each individual to maintain a safe workplace and to work in a safe manner.

2.3 Safety & Health Manager

Responsible to the Chief Executive Officer, the Safety and Health Manager formulates, administers andcoordinates programs for the company to reduce the risk of loss due to employee injury, regulatory non-compliance, general liability, fire, theft or damage. The Safety and Health Manager will develop writtendetailed policies and procedures covering elements in the Safety, Health and Environmental Program.The Safety and Health Manager will:

- Be responsible for the development, implementation, oversight and enforcement of the HASP.
- Visit the site as needed and at least once per month for the duration of activities, to audit theeffectiveness of the HASP.
- Be available for emergencies.
- Provide onsite consultation as needed to ensure that the HASP is fully implemented.
- Coordinate any modifications to the HASP with the Site Superintendent and the DSSR.
- Provide continued support for upgrading/downgrading of the level of personal protection.
- Be responsible for evaluating air monitoring data and recommending changes to engineeringcontrols, work practices, and PPE.

2.4 Safety and Health Specialist

Under the direction of the Safety and Health Manager, the Safety and Health Specialist shall be responsiblefor the implementation of this HASP and for the daily coordination of safety activities with the Project Superintendent to ensure that the planned work objectives reflect adequate safety and health considerations. The SHS will maintain a complete copy of this plan (and its supplements and addenda) atthe site during all field activities and assure that all workers and visitors are familiar with it. The SHS willperform site-specific training and briefing sessions for employee(s) prior to the start of field activities at thesite. The SHS will ensure the availability, proper use and maintenance of specified personal protective equipment, and other safety and health equipment. The SHS will maintain a high level of safety awarenessamong team members and communicate pertinent matters to them promptly. The Safety and Health Specialist will:

- Plan and require that all work be performed in compliance with this plan, the Louth Callan Renewables, LLC Safetyand Health Program and the client's safety program including all applicable local, state and federalregulations
- Train employees to perform their work in the safe manner and the ability to recognize and correctpotential hazard (using this plan)
- Impress upon all subcontractors' supervisory personnel a sense of responsibility andaccountability of everyone to maintain a safe workplace and to work in a safe manner
- Report and investigate all Accident and Near Misses

2.5 Designated Site Safety Representative (DSSR)

Louth Callan Renewables, LLC's Site Superintendent shall formally serve as DSSR for Louth Callan Renewables, LLC operations on-site. Underthe direction of the Safety and Health Manager, the DSSR shall be responsible for the implementationof this HASP and for the daily coordination of safety activities with the Site Superintendent to ensure that the planned work objectives reflect adequate safety and health considerations. The DSSR will maintain a complete copy of this plan (and its supplements and addenda) at the site during field activities and assure that workers and visitors are familiar with it. The DSSR will perform site-specific orientationand briefing sessions for employee(s) prior to the start of field activities at the site and a briefing sessioneach day before starting work. He/she will ensure the availability, proper use and maintenance of specified personal protective equipment, decontamination, and other safety and health equipment. He/she will maintain a high level of safety awareness among team members and communicate pertinent matters to them promptly. The Designated Site Safety Representative will:

- Assist and represent the Safety and Health Manager in on-site training and the day-to-day on- site implementation and enforcement of the accepted HASP.
- Be assigned to the site on a fulltime basis for the duration of field activities.
- Have the authority to ensure site compliance with specified safety and health requirements, federal, state and OSHA regulations and all aspects of the HASP. This includes, but is not limited to: activity hazard analyses, air monitoring; use of PPE, standard operating procedures used to minimize hazards; safe use of engineering controls; the emergency response plan; confined space entry procedures; spill containment program; and preparation of records. Thiswill be accomplished by performing a daily safety and health inspection and documenting results on the Daily Safety Audit.
- Stop work activities if unacceptable health or safety conditions exist and take necessary actionto re-establish and maintain safe working conditions.
- Consult and coordinate any modifications to the HASP with the Safety and Health Manager andthe Site Superintendent.
- Conduct accident investigations and prepare accident reports.
- Review results of daily inspections and document safety and health findings in the Daily SafetyAudit.
- Coordinate with Site Management and the Safety and Health Manager recommended corrective actions for identified deficiencies and oversee the corrective actions.

2.6 Subcontractors

Subcontractors utilized during this project are covered by this HASP and will be provided a copy of theplan addendums and associated attachments prior to commencing work. The DSSR will verify that subcontractor employee training current and will monitor and enforce compliance with the established plan and standard operating procedures. Required training certificates, and other relevant documents will be maintained at the site for review by OSHA, and the Client Representative. As with all site personnel, subcontractors will be briefed on the provisions of this plan and will attend all daily required Take 5 safety meetings.

The subcontractor shall be required to identify one employee as their safety representative to act as a liaison between Louth Callan Renewables, LLC and the subcontractor's workforce on safety related matters.

Louth Callan Renewables, LLC will continually monitor a subcontractor's safety performance. Louth Callan Renewables, LLC will observe subcontractors for hazards or unsafe practices that are both readily observable and occur in common work areas. The DSSR will note subcontractor work practices on the Daily Safety Audit. If non- compliance or unsafe conditions or practices are observed, the subcontractor safety representative will be notified, and corrective action will be required. The subcontractor will determine and implement necessary controls and corrective actions. If repeat non-compliance/unsafe conditions are observed, the subcontractor will be required to stop affected work until adequate corrective measures are implemented. All provisions of the Subtract agreement shall be enforceable upon execution and mobilization.

As a condition of the Subcontract Agreement, subcontractors shall be required to furnish all required Personal Protective Equipment to its employees and ensure its use.

• HAZARD/RISK ANALYSIS

Sites can pose a multitude of health and safety concerns any of which can result in serious injuries and/or illnesses of workers. Some hazards are a function of the physical, biological or chemical natureof the site itself. Others are a direct result of the construction being done. Based upon the information provided to Louth Callan Renewables, LLC regarding the primary historical uses of the property and the knowledge of the current conditions, the overall Safety and Health hazard assigned to the contemplated activities at the Site is determined to be low to moderate.

• Site Tasks and Operations

The work includes but is not limited to the following list of the work to be completed

- Mobilization/Site Preparation
- Site Inspection and Survey
- Clearing and Grubbing (light)
- Installation of Erosion Controls
- Unload System Components
- Receiving deliverables
- Pile Drive Solar Racking
- Install Solar Rack Frames
- Excavate and Install Electrical Conduit
- Driving Post utilizing GRT
- Install PV Panels to Mounting System/Frame
- Install Electrical Connections and Inverters
- Place Concrete Equipment Pads
- Installing Electrical Equipment
- Pull Test/ Pulling Rack Post w/GRT
- Megger Testing
- High Potential Testing
- Landscaping
- Demobilization/Site Restoration

Louth Callan Renewables, LLC has developed an **Activity Hazard Analysis (AHA)** for each major task associated with the work. A major task is defined as an operation involving any type of activity presenting hazards not experienced in previous operations, or where a new subcontractor or work crew, is to perform the specified operation. The analysis will define the activity being performed and identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard. An AHA shall also be prepared when new tasks are added, job situations change, or when it becomes necessary to alter safety requirements. Work will not proceed on a particular task/work area until the AHA has been reviewed.

- **Hazards**

The following potential hazards could include but are not limited to:

▪ Electrical Hazard	▪ Heavy Equipment/Vehicle Traffic
▪ Material Handling	▪ Hand and Power Tools
▪ Walking/Working Surfaces	▪ Fall from Elevation
▪ Struck-By Tools/Equipment	▪ Underground Utilities
▪ Operational Chemicals	▪ PV Work

3..1 Physical Hazards

Potential safety hazards include but are not limited to those listed in 3.2 above. Safety hazards associated with the project are presented below.

3..1.1 Electrical

Electricity is a serious workplace hazard that must be respected always. It is important to remember that exposure to even a little electrical current can kill! The best protection around electricity is, ampledistance between the worker and the conductive materials. Electrical shock-related injuries include burns, internal injuries, and injuries due to involuntary muscle contractions.

Extension cords: All extension cords shall be of at least a 12 gauge wire. Extension cords or any power tools or equipment must not be used when the cords are frayed, worn out, or if the wires are bare. Defective extension cords shall be removed from service immediately and tagged out of service.

To ensure electrical Safety from shocks on all projects, all temporary 120-volt, single-phase, 15- and 20-amp receptacle outlets must be protected by **ground fault circuit interrupters (GFCIs),** or assured equipment grounding conductor program must be established.

Electrical Equipment: Electrical equipment used on-site may also pose a hazard to workers. Whenever possible, Louth Callan Renewables, LLC will use equipment with ground-fault interrupters and watertight, corrosion-resistant connecting cables to help minimize this hazard.

No employee shall be permitted to work in the proximity of any part of an energized electrical power circuit unless the person is trained to do so and is protected against electric shock by following NFPA 70E electrical protocol. No unauthorized work shall be completed on energized equipment unless deemed necessary.

All electrical wiring and equipment shall be intrinsically safe for use in potentially explosive environmentsand atmospheres.

Overhead Power Lines: Any vehicle or mechanical equipment capable of having part of its structure contact energized overhead lines shall be operated so a maximum safe clearance is maintained at all times and in all directions.

Equipment minimum safe distance to electrical line will vary according to voltage. The greater the voltage, the greater the clearance between any part of the equipment and the power line. Refer to ***Table1 - Minimum Clearance from Energized Overhead Electrical Lines***. When required, a spotter will be utilized to maintain a safety distance between equipment and overhead wires. The basic rule is "Do not locate equipment in a position where it can come in contact with overhead power lines." Maintain the required distance from the lines. Overhead Electrical power lines will be considered energized unless the person owning such line or operating officials of the electrical utility supplying the line assures that it is not energized, and it has been **visibly** grounded. (Ref. OSHA 1926.1408)

Table 1 - Minimum Clearance from Energized Overhead Electrical Lines	
Nominal System Voltage	**Minimum Rated Clearance**
0 to 50 kV	10 Feet (3 m)
51 to 200 kV	15 Feet (4.5 m)
201 to 300 kV	20 Feet (6 m)
301 to 500 kV	25 Feet (7.5 m)
501 to 750 kV	35 Feet (10.5 m)
751 to 1000 kV	45 Feet (13.5m)

3.2.1.1.2 Solar PV Work

Photovoltaic systems are electrical systems. There are hazards associated with the system as with anyother electrical system.

If you are unsure of the hazards or procedures listed herein, please contact a licensed professional orthe manufacturer before any activity is undertaken.

Please make sure that any activities undertaken to maintain or work on or near any installed electrical equipment do not void the manufacturer's warranty or violate the applicable codes and regulations.

PV modules produce power when exposed to the sun and as such may be energized and can contain hazardous voltages even when the system is not operating. Make sure only trained professionals, knowledgeable in photovoltaic systems, are allowed to work on or near the components of the photovoltaic system. Before performing any test and commissioning on system electrical equipment asafety check for hazardous energy must be done. A "Take 5" meeting shall be completed by responsiblecontractors and submitted to Louth Callan Renewables, LLC for review.

See Louth Callan Renewables, LLC's Commissioning Procedure Checklist in Appendix.

3.2.1.1.3 PV Modules

Never disconnect PV Module connectors or home run wires under load. PV Modules are the fundamental building blocks of a solar system. When exposed to light, they begin generating a voltageand consequently a current. They convert the energy from sunlight to usable electricity. It should be noted clearly that PV modules produce Direct Current (DC) for electricity. DC power has more significantarc flash and other hazards associated with work than AC. Careful attention should be paid to work around the photovoltaic system. Level D PPE will be worn by workers installing PV modules.

3.2.1.1.4 PV Combiners/Recombiners

Even when the disconnect switches and/or fuses are open and active power is not flowing, keep in mindthat there are hazardous voltages present at the DC terminals and wires from the PV arrays.

Adequate precautions must be taken even if trained professionals have to work on all electricalequipment.

3.2.1.1.5 PV Inverters

Even when the disconnect switches are open and active power is not flowing, keep in mind that there are hazardous voltages present at the DC terminals and wires from the PV arrays and at the AC terminals and wires from the utility grid. Adequate precautions must be taken even if trained professionals have to work on all electrical equipment.

DANGER

Risk of Electrical Shock. Part(s) of the inverter(s) may remain charged even after power to the unit has been cut off. Allow discharge of inverter(s) at least five minutes before servicing. Only qualified service personnel should attempt to service the interior of the inverter(s).

The DC and AC bus bars may still beenergized even if the disconnects are open!

DANGER

Risk of Electrical Shock. When performing inspections on the interior of inverter(s), do not open the inverter door(s) until all disconnects and circuit breakers related to the photovoltaic system are in the OFF position unless you are fully qualified and wearing the appropriate PPE.

3.2.1.1.6 Ground Faults

When troubleshooting a ground-fault alert, in addition to the shock hazard, a fire hazard may also be present due to arcing or heating of metallic elements that may now be carrying current. Components that are arcing, scorched, burnt, or on fire, indicate a severe ground fault and additional protective gearand safety measures may be required. Do not try to fight an electrical fire without proper equipment ortraining—call the fire department.

3.2.1.1.7 Electrical Work

No electrical work shall be performed on electric distribution circuits or equipment, except by a qualified person or by a person trained to perform electrical work and to maintain electrical equipment under the direct supervision of a qualified person. Disconnecting devices shall be locked out and suitably taggedby the persons who perform such work, except that in cases where locking out is not possible, such devices shall be opened and suitably tagged by such persons. Locks or tags shall be removed only bythe persons who installed them or, if such persons are unavailable, by persons authorized by the operator or his agent.

NOTE

A qualified person is one who has the skills and knowledge related to the construction and operation of the electrical equipment and installation and has received safety training on the hazards involved.

Only qualified and trained personnel may perform electrical work.

All electrical work will be done according to the latest adopted National Electrical Code as well as established local codes.

Only **qualified persons** may work on electric circuit parts or equipment that have not been deenergized.These persons must be made familiar with the use of special precautionary techniques, PPE, insulating& shielding materials, and insulated tools.

NOTE

When dealing with safety related work practices to prevent electric shock or other injuries resultingfrom either direct or indirect electrical contacts, a Qualified Person is defined as one who: "is permittedto work on or near exposed energized parts" and who, at a minimum, has been trained in and is familiarwith:

- the skills and techniques necessary to distinguish exposed live parts from other parts of electricequipment, and
- the skills and techniques necessary to determine the nominal voltage of exposed live parts, and
- the clearance distances specified in §1910.333(c) and the corresponding voltages to which thequalified person will be exposed. **(Ref. OSHA 1910.269)**

Table 2 - Minimum Approach Distance for Non-Qualified Employees

Nominal Voltage Phase-to-Phase (V)	Minimum Approach Distance in Feet
0 to 50 kV	10 Feet
69 kV	11 Feet
115 to 138 kV	13 Feet
345 kV	20 Feet

Table 3 - Minimum Approach Distance for Qualified Employees (OSHA)

Nominal Voltage Phase-to-Phase (V)	Phase to Ground Exposure Minimum Approach Distance in Ft/In	Phase-to-Phase Exposure Minimum Approach Distance in Ft/In
50 to 300	Avoid Contact	Avoid Contact
301 to 750	13.1”	13.1”
751 to 5,000	2’1”	2’1”
5,001 to 15,000	2’2”	2’3”
15,001 to 36,000	2’7”	2’11”
36,001 to 46,000	2’10”	3’3”
46,001 to 72,500	3’4”	4’
72,600 to 121,000	3’4”	4’3”
121,001 to 145,000	3’10”	4’10”
145,100 to 169,000	4’4”	5’5”
230,000	5’3”	7’6”
345,000	8’6”	12’6”

Note: When an unqualified person is working in an elevated position near overhead lines, the location shall be such that the person and the longest conductive object he or she may contact, cannot come closer to any unguarded energized overhead line, than the following distances:

- For voltages to ground 50kV or below 10 feet
- For voltages to ground over 50kV 10 feet plus 4 inches for every 10kV over 50kV.

NOTE
When an unqualified person is working on the ground in the vicinity of overhead lines, the personmay not bring any conductive object closer to unguarded, energized overhead lines than the distancesgiven above.

3.2.1.1.8 Electrical Safety Measures

- Prior to use, all electrical equipment -- including extension cords -- will be inspected. Defectiveitems will be tagged out of service and not used.
- With the exception of double insulated tools (with UL approval), all electrical tools and equipmentwill be grounded.
- Tools will not be hoisted by their flexible electrical cords.
- Except in an emergency, load rated switches and circuit breakers will be used for the openingand closing of circuits under load conditions as opposed to fuses and splice connections.
- While working on electrical equipment, unauthorized persons will be kept clear by barriers orother means of guarding.
- Temporary wiring and extension cords will be kept off of walking working surfaces and vehicletraffic areas or covered to prevent tripping and vehicle damage.
    - Electrical cords will not be suspended with staples, hung from nails, or suspended bywire.
    - Worn or frayed electric cords or cables will not be used.
- Hands will be dry when working on electrical equipment including plugging in extension cords.
- Areas in which electrical work is to be done must be adequately illuminated and temporarylighting must:
    - Have guards in place.
    - Not be suspended by its cords unless specifically designed for such installation. A competent person, before work commences, will inform all employees in the work area of both exposed and concealed electrical hazards. If appropriate, warning tags will be used to prevent accidental contact with electrical energy.
- When working around any electrical power circuit, employees will:
    - Protect themselves by deenergizing the circuit and grounding it or by establishing insulation between themselves and the current.
    - Ensure that any conductive materials and equipment that are in contact with any part oftheir body will be handled in a manner that will preclude contact with exposed energizedconductors or circuit parts.
    - Use portable ladders that have non-conductive side rails.
    - Remove or insulate conductive articles of jewelry and clothing that might contact exposed energized parts.
- All 15, 20, or 30-amp receptacle outlets that are not part of the permanent wiring of the buildingor structure and that are used by personnel shall have ground-fault circuit interrupter protectionfor personnel. GFCI pigtails may be used to meet this requirement if properly sized.
    - Remember, extension cords are considered temporary wiring.

- Ground fault circuit interrupters will be tested before use.

- Only qualified persons may perform testing work on electric circuits or equipment.
- Only qualified electricians may perform testing work on electric circuits such as performing OpenCircuit Voltage testing and short circuit current testing from each fuse holder terminal to the grounded conductor terminal.
- Only qualified personnel may perform operational testing work at the fuse holders and terminations blocks wearing the appropriate PPE such as Rubber Insulating Gloves as well as Insulated and Insulating Hand Tools.
- Equipment used for performing electrical testing on site shall be calibrated yearly and such calibration shall be kept on file in the project offices. Such calibrations certification shall includefor voltage meters, insulation testers, irradiance sensors, clamp meters, Seaward or similar openCircuit voltage checking equipment.
- When performing Megger Testing, ensure to use properly calibrated Megger test equipment thatis safe and fit for use. Ensure personnel on adjacent end of the cables and or if the cable is exposed ensure adjacent personnel are aware of the testing operations and flag the end of thecable as necessary before performing the megger test. Ensure there is two-way communications if one end of cable is not in line of sight of the other.
- Only qualified and trained technicians shall perform Hi Potential Testing with certified and calibrated Hi Pot Testing Equipment. This will be performed during the Testing & Commissioningphase of the onsite activities.
- Sufficient access and working space must be maintained about all electric equipment to permitready and safe operation and maintenance. This space must be kept clear, i.e., it cannot be used for storage.
- When working or proposing to work around live components, personnel must always be accompanied by another person throughout the duration of the work. Personnel must be sufficiently briefed on the current operation and what precautionary measures are going to be taken throughout the activity.
- Personnel shall go through Electrical Contractor's site-specific safety briefing on energized workon site and shall be briefed and work activity prior to engaging in such energized activities.
- If any work is to take place under overhead lines, the lines must be de-energized and groundedor other protective measures taken such as physically preventing approach such as using a barrier.
- Portable ladders must have non-conductive side rails.
- Conductive items such as jewelry, watches, or clothing must not be worn while working on or around electrical parts.
- The dimension of the working space in the direction of access to live parts likely to requiredexamination, adjustment, service, or maintenance must not be less that noted below:

Table 4 – Working Clearances, Minimum Clearance Conditions			
Nominal Voltage toGround	**(a) Feet[2]**	**(b) Feet[2]**	**(c) Feet[2]**
0-150	3	3	3
151-600	3	3.5	4

NOTE

Note: Conditions (a), (b), and (c) are as follows: {a} Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by insulating material. Insulated wire or insulated bus bars operating at not over 300 volts arenot considered live parts. {b} Exposed live parts on one side and grounded parts on the other side. {c}Exposed live parts on both sides of the workplace [not guarded as provided in Condition (a) with the operator between. (Ref. NEC Article 240 Table 110.26 for both tables)

Table 5 – Minimum Depth of Clear Working Space in Front of Electric Equipment			
Nominal Voltage toGround	(a) Feet[2]	(b) Feet[2]	(c) Feet[2]
601-2,500	3	4	5
2,501 to 9,000	4	5	6
9,001 to 25,000	5	6	9
25,001 to 75kV	6	8	10
Above 75kV	8	10	12

NOTE

Conditions (a), (b), and (c) are as follows:
{a} Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by insulating materials. Insulated wire or insulated bus bars operating at not over 300 volts arenot considered live parts.
{b} Exposed live parts on one side and grounded parts on the other side. Walls constructed of concrete, brick, or tile is considered to be grounded surfaces.
{c} Exposed live parts on both sides of the workspace [not guarded as provided in Condition (a)] with the operator between.
1. The importance of working clearances cannot be overstated. At any time, when working with live electrical systems, there is the possibility of an arcing fault causing an arc flash where the current explosively flows through ionized air at 35,000°F causing incurable burns, hearing loss, collapsed lungs, or even death from the electricity of flying metal shrapnel.
2. As an electrical contractorworking in a facility where the possibility of arc flash exists, check to see if an arc flash assessment hasbeen performed on electrical equipment on which you will be working. If it has, follow that specific guidance. If it has not, perform (or have a qualified vendor perform) the arc flash assessment. Refer toNFPA 70E for specific guidance appropriate to the facility's specific electrical equipment.

NOTE
NFPA 70E is a National Consensus Standard which is incorporated by reference within the OSHAstandards; specifically, Appendix A to Subpart S, 29 CFR 1910. Failure to comply with NFPA 70E is citable under the general duty clause.

3.2.1.1.9 Electrical Shock/Electrocution

When working near or on deenergized parts, they will be considered energized unless they are lockedout or tagged out in accordance with our control of hazardous energy program found in Section III of this safety program.

Electrical equipment and lines must be assumed to be energized until proved to be deenergized. Operating voltages of equipment and lines must be determined before working on or near energized parts. One can avoid the hazards of electricity by determining, prior to starting work, the voltages one will be working with and the condition of equipment; deenergizing the line or equipment; wearing the appropriate PPE; maintaining the prescribed distance; and using the appropriate tools.

No employee is permitted to approach or take any conductive object without an approved insulating handle closer to exposed energized parts than shown below unless: a. the employee is insulated or guarded from the energized part (gloves or gloves with sleeves rated for the voltage involved shall be considered insulation of the employee from the energized part), or b. the energized part is insulated orguarded from the employee and any other conductive object at a different potential, or c. the employeeis isolated, insulated, or guarded from any other conductive object(s), as during live-line bare-hand work. (Ref. Appendix B of OSHA 1920.269)

Table 6 – Alternating Current Minimum Distances	
Voltage Range (phase to phase kV)	**Minimum Working and Clear Hot Stick Distance**
2.1 to 15	2ft. 1in.
15.1 to 36	2ft. 4in.
36.1 to 46	2ft. 7in.
46.1 to 72.5	3ft. 0in.
72.6 to 121	3ft. 2in.
138 to 145	3ft. 7in.
161 to 169	4ft. 0in.
230 to 242	5ft. 0in.
345 to 362	7ft. 0in.
500 to 552	11ft. 0in.
700 to 765	15ft. 0in.

NOTE

The minimum clear hot stick distance is that for the use of live-line tools held by linemen when performing live-line work.

NOTE

For 345-362 kV., 500-552 kV., and 700-765 kV., minimum clear hot stick distance may be reducedprovided that such distances are not less than the shortest distance between the energized part and the grounded surface.

When deenergizing lines and equipment operated in excess of 600 volts, and the means of disconnecting from electric energy is not visibly open or visibly locked out, essentially the provisions ofour control of hazardous energy program will be implemented which includes:

- clearly identifying and isolating all sources of voltage (hazardous energy).
- notification and assurance from the designated employee will be obtained assuring that:
    - all switches and disconnectors through which electric energy may be supplied to the particular section of line or equipment to be worked have been deenergized.
    - all switches and disconnectors are plainly tagged indicating that men are at work and, ifdesign allows, they are rendered inoperable.
    - after all designated switches and disconnectors have been opened, rendered inoperable, and tagged, visual inspection or tests shall be conducted to ensure that equipment or lines have been deenergized.
    - protective grounds shall be applied on the disconnected lines or equipment to be workedon.
    - guards or barriers will be erected as necessary to adjacent energized lines.
    - when more than one independent crew requires the same line or equipment to be deenergized, a prominent tag for each such independent crew shall be placed on the line or equipment by the designated employee in charge.
    - upon completion of work on deenergized lines or equipment, each designated employeein charge shall determine that all employees in his crew are clear, that protective groundsinstalled by his crew have been removed, and he shall report to the designated authoritythat all tags protecting his crew may be removed.

When a crew working on a line or equipment can clearly see that the means of disconnecting from electric energy are visibly open or visibly locked-out, then:

- Guards or barriers will be erected as necessary to adjacent energized lines.
- Upon completion of work on deenergized lines or equipment, each designated employee in charge of a crew will determine that all employees in the crew are clear, the protective groundsinstalled by the crew have been removed, and he/she will report to the designated authority that all tags protecting his crew may be removed.

All live-line tools shall be visually inspected before use each day. Prior to use, tools must be wiped clean. Tools with apparent hazardous defects must be tagged and removed from service until tested with portable or laboratory testing equipment.

All rubber insulating equipment will be visually inspected prior to use and an “air test” will be performedon rubber gloves prior to use.

Hard hats for those who have possible exposure to electrical shock or burns must be manufactured in accordance with the provisions of ANSI Z89.2-1971 Industrial Protective Helmets for Electrical Workers,Class B.

Tools, tape, straps, lifelines, belts, hoses, and ladders must be non-conductive.

Only live-line tool poles having a manufacturer's certification to withstand the following minimum testsshall be used:

- 100,000 volts per foot of length for 5 minutes when the tool is made of fiberglass.
- 75,000 volts per foot of length for 3 minutes when the tool is made of wood.

When working on energized lines with live-line tools, insulating high voltage gloves must be worn (andother insulating protective equipment, as required) during the operating of switching, fusing, or disconnecting devices and energizing or deenergizing oil filled electrical equipment that is being worked on. Proper cross-arm extensions or ropes will be used to hold an energized conductor clear.

When ropes or blocks and ropes are used under strain, they must be securely tied off. When tied offto a vehicle, the vehicle must be chocked with the brakes set.

Portable electric hand tools will be:

- equipped with a three-wire cord having the ground wire permanently connected to the toolframe and means for grounding the other end; or
- of the double insulated type and permanently labeled as "Double Insulated"; or
- connected to the power supply by means of an isolating transformer, or other isolated powersupply.

Pneumatic tools which are used on or around energized lines or equipment will have an accumulatoron the compressor to collect moisture.

Provided the “on-off” switch may be activated by a single motion of the finger that turned it on,hydraulic tools may, as drills and similar equipment, have a switch that has a lock-on control.

Chain saws and circular saws and similar equipment will have switches that turn off when released.Aerial lift trucks, when working near energized lines or equipment, must be grounded or barricadedand considered as energized equipment, or the aerial lift truck shall be insulated for the work beingperformed.

Equipment or material shall not be passed between a pole or structure and an aerial lift while an employee working from the basket is within reaching distance of energized conductors or equipmentthat are not covered with insulating protective equipment.

Mechanical equipment including derrick trucks, cranes and other lifting equipment, unless certified forwork on the proper voltage, must not operate any closer to energized line or equipment as stated in “Alternating Current - Minimum Distances” on the previous pages unless:

- an insulated barrier is installed between the energized part and the mechanical equipment, or
- the mechanical equipment is grounded, or
- the mechanical equipment is insulated, or the mechanical equipment is considered energized.

In all cases, conductors and equipment shall be treated as energized until tested or otherwise determined to be deenergized or until grounded. Ensure there is no possibility of inducing voltages orcontact with energized lines.

When attaching grounds, the ground end shall be attached first, and the other end shall be attached and removed by means of insulated tools or other suitable devices. When removing grounds, the grounding device shall first be removed from the line or equipment using insulating tools or other suitable devices. Grounds shall be placed between the work location and all sources of energy and asclose as practicable to the work location. Grounds may be temporarily removed only when necessary for test purposes and extreme caution shall be exercised during the test procedures.

When grounding electrodes are utilized, such electrodes shall have a resistance to ground low enough to remove the danger of harm to personnel or permit prompt operation of protective devices.

Grounding to tower shall be made with a tower clamp capable of conducting the anticipated faultcurrent.

A ground lead, to be attached to either a tower ground or driven ground, shall be capable of conducting the anticipated fault current and shall have a minimum conductance of No. 2 AWG copper.

Ground is required when using portable generators.

Safe Work Practices for portable generators.

- Maintain and operate portable generators in accordance with the manufacturer’s use andsafety instructions.
- Never attach a portable generator directly to the electrical system of a structure (home, office or trailer) unless the generator has a properly installed open-transition transfer switch.
- Always plug electrical appliances and tools directly into the generator, using the appliancemanufacturer’s supplied cords. Use heavy-duty extension cords that contain a grounding conductor (3-wire flexible cord and 3-pronged cord connectors).

- Proper grounding and bonding are a means to prevent shocks and electrocutions.
- Use ground-fault circuit interrupters (GFCIs) as per the manufacturer's instructions.
- Do not connect a generator to a structure unless the generator has a properly installed transferswitch.
- Visually inspect the equipment before use; remove defective equipment from service; mark ortag it as unsafe for use.

Grounding Requirements for Portable and Vehicle-mounted Generators
Under the following conditions, OSHA directs (29 CFR 1926.404(f)(3)(i)) that the frame of a portable generator need not be grounded (connected to earth) and that the frame may serve as the ground (inplace of the earth):

The generator supplies only equipment mounted on the generator and/or cord and plug-connected equipment through receptacles mounted on the generator, § 1926.404(f)(3)(i)(A). The noncurrent-carrying metal parts of equipment (such as the fuel tank, the internal combustionengine, and the generator's housing) are bonded to the generator frame, and the equipment grounding conductor terminals (of the power receptacles that are a part of [mounted on] the generator) are bonded to the generator frame, § 1926.404(f)(3)(i)(B).

Thus, rather than connect to a grounding electrode system, such as a driven ground rod, thegenerator's frame replaces the grounding electrode.

If these conditions do not exist, then a grounding electrode, such as a ground rod, is required.

If the portable generator is providing electric power to a structure by connection via a transfer switchto a structure (home, office, shop, trailer, or similar) it must be connected to a grounding electrode system, such as a driven ground rod. The transfer switch must be approved for the use and installedin accordance with the manufacturer's installation instructions by a qualified electrician.

Arc Flash

An Arc Flash is the light and heat produced from an electric arc supplied with sufficient electrical energy to cause substantial damage, fire, injury or even death. Electrical arcs experience a negative incremental resistance, which causes the electrical resistance to decrease as the arc temperature increases. As the arc develops and gets hotter, the resistance drops drawing more and more current until some part of the system melts, trips, or evaporates, providing enough distance to break the circuit and extinguish the arc.
An Arc Flash, essentially an electrical short circuit through the air, from phase to ground or phase to phase, occurs in an instant. In the worst-case scenario, an arc flash can vaporize equipment causing an arc-plasma fireball. Solid copper conductors can expand to 67,000 times their original volume and temperatures may exceed 35,000°F.

Additional types of serious injuries that can result from an arc blast may include:

- Memory loss due to a concussion
- Shock hazard from touching an energized conductor
- Hearing loss due to the loud sound that is created with the pressure wave
- Shrapnel wounds resulting from flying debris
- Inhalation of toxic gases from vaporized metals
- Trauma from the blast pressure

Several other hazards, in addition to spikes, can contribute to an arc flash such as:

- Exposed energized electrical conductors or circuit parts
- Broken conductor insulation
- Static electricity
- Blocked disconnect panels
- Resistance heating due to corrosion and dust
- Worn connections
- Equipment not properly installed or maintained such as circuit breakers
- Faulty or damaged electrical equipment
- High voltage cables.

Carelessness and lack of compliance with safety guidelines, and poor safety work practices result in arc flashes and blasts. While an employee may be well trained, there is always the chance that their inability to perform safety procedures or maintain focus on their tasks can create hazards in the workplace.

Per NFPA 70E, an Arc Flash Hazard Analysis will be done before a person approaches any exposed electrical conductor or circuit part that has not been placed in an electrical safe work condition. This Arc Flash Hazard Analysis will be used to determine the level of PPE (Personal Protection Equipment) required and the Arc Flash Boundary in inches along with the incident energy found at each location.

Limits of Approach Boundaries

The OSHA electrical standards also identify required minimum approach distances (MAD) that must be maintained, based on the voltage involved, by unprotected qualified employees when exposed to energized parts. While these distances are based on shock protection and not arc flash protection, they are incorporated within the arc flash boundaries, as depicted at the bottom of the above diagram.

Included in the various requirements are proper work techniques, equipment, and PPE for each distance, with additional standard tables providing guidance for adjusting MADs for alternative conditions and situations. An employer is advised to review the MAD values and incorporate them into their workplace procedures should they be applicable to their workplace.

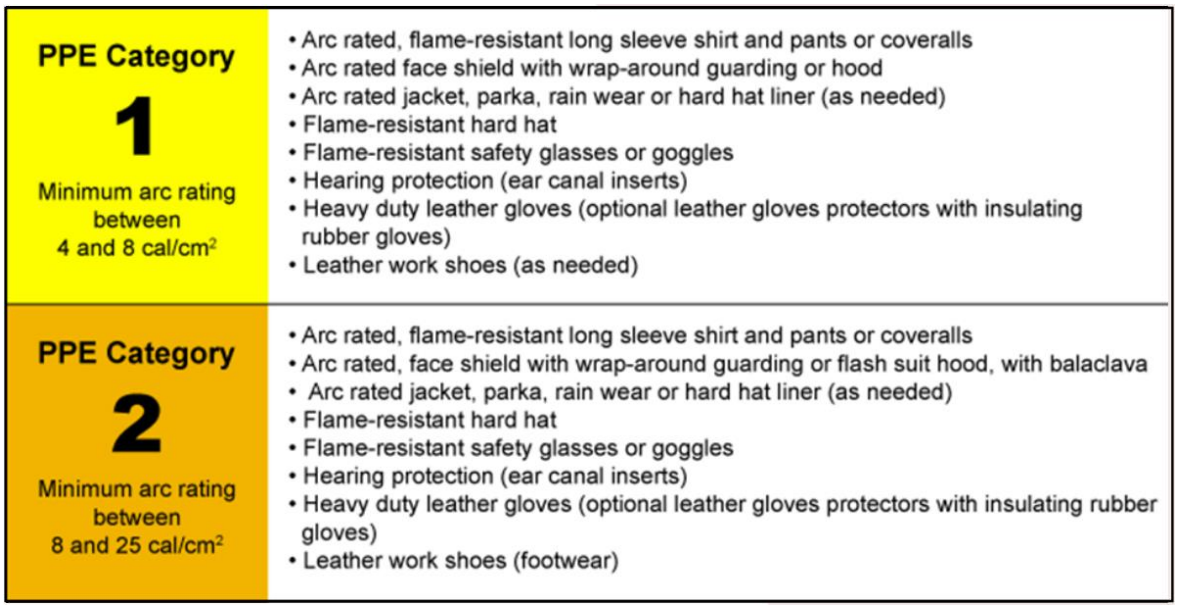
Alternative Minimum Approach Distances for Voltages of 72.5kV and Less[1]

Nominal Voltage (kV) Phase to Phase	Distance			
	Phase to Ground		Phase to Phase	
	m	ft	m	ft
0.050 to 0.300[2]	Avoid Contact		Avoid Contact	
0.301 to 0.750[2]	0.33	1.09	0.33	1.09
0.751 to 5.0	0.63	2.07	0.63	2.07
5.1 to 15.0	0.65	2.14	0.68	2.24
15.1 to 36.0	0.77	2.53	0.89	2.92
36.1 to 46.0	0.84	2.76	0.98	3.22
46.1 to 72.5	1.00	3.29	1.20	3.94

[1] Employers may use the minimum approach distances in this table provided the worksite is at an elevation of 900 meters (3,000ft) or less. If employees will be working at elevations greater than 900 meters (3,000ft) above mean sea level.
[2] For single-phase systems, use voltage-to-ground.

Arc Flash PPE

It's important to understand that just because there is an electrical shock hazard present, it doesn't mean there won't be an arc flash hazard present as well. That is the reason it is very important to complete an arc flash hazard assessment in the workplace. An Arc Flash Suit is considered a complete arc-rated clothing and equipment system that covers the entire body, except for the hands and feet. Rated arc flash shields are designed to protect the face from very high thermal heat produced during an arc flash event. Voltage-rated rubber insulated gloves must be worn with leather covers to provide the appropriate arc flash and shock protection. For more information on the different levels of PPE, please refer to the detailed table on the next page.



PPE Category **3** Minimum arc rating between 25 and 40 cal/cm²	• Arc rated, flame-resistant long sleeve shirt and pants and coveralls (selected so that the system arc rating meets the required minimum) • Arc rated arc flash suit including jacket, pants, hood (rating level as required) • Arc rated gloves (rating level as required) • Arc rated jacket, parka, rain wear or hard hat liner (as needed) • Flame-resistant hard hat • Flame-resistant safety glasses or goggles • Hearing protection (ear canal inserts) • Heavy duty leather gloves (optional leather gloves protectors with insulating rubber gloves) • Leather work shoes (footwear)
PPE Category **4** Minimum arc rating 40 cal/cm²	• Arc rated, flame-resistant long sleeve shirt and pants and coveralls (selected so that the system arc rating meets the required minimum) • Arc rated multi-layered flash suit jacket (selected so that the system arc rating meets the required minimum) • Arc rated flash suit pants (rating level as required) • Arc rated flash suit hood (rating level as required) • Arc rated gloves (rating level as required) (optional leather gloves protectors with insulating rubber gloves) • Arc rated jacket, parka, rain wear or hard hat liner (as needed) • Flame-resistant hard hat • Flame-resistant safety glasses or goggles • Hearing protection (ear canal inserts) • Leather work shoes (footwear)

3.2.1.1.10 Training

All employees who face electrical hazards that are not reduced to a safe level by the applicable electricalinstallation requirements will be trained in safety-related work practices and procedural requirements as necessary to provide protection from the electrical hazards associated with the job assignments. Employees will be trained to identify and understand the relationship between electrical hazards and possible injury.

Training will be in a classroom and/or on-the-job and the degree of training will be determined by the risk to the employee. Employees will receive training in emergency procedures including methods of release from contact with exposed energized electrical conductors or circuit parts; methods of first aid;and CPR if the duties warrant such training. The Safety and Health Manager will certify that employeeshave been trained in approved methods of resuscitation annually.

Training for Qualified Persons:

A qualified person has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved.

- Qualified persons must be trained and knowledgeable of the construction and operation of equipment or a specific work method and to recognize and avoid the electrical hazards with respect to the equipment or work methods.
    - Qualified persons will be familiar with the proper use of special precautionary techniques,PPE, including arc-flash, insulating and shielding materials, and insulated tools and testequipment. **Note:** A person can be qualified with respect to certain equipment and methods but still be unqualified for others.
    - Qualified persons will be permitted to work with the Limited Approach Boundary of exposed energized electrical conductors and circuit parts operating at 50 volts or more and will be trained in the following:

        - The skills and techniques necessary to distinguish exposed energized electricalconductors and circuits parts from other parts of electrical equipment
        - The skills and techniques necessary to determine the nominal voltage of exposedenergized electrical conductors and circuit parts.
        - The approach distances specified in Table 130.2(c) and the corresponding voltages to which the qualified person will be exposed.
        - The decision-making process necessary to determine the degree and extent ofthe hazard and the PPE and job planning necessary to perform the task safely.
    - If undergoing OJT and, in the course of the OJT has demonstrated an ability to performduties safely under the direct supervision of a qualified person, this person will be considered qualified for the performance of these duties.
    - Tasks performed less often that once per year will require retraining before performanceof the work practices involved.
    - Qualified persons will be trained to select an appropriate voltage detector and demonstrate how to use a device to verify the absence of voltage, including interpretingindications provided by the device. Will be trained to understand all limitations of each specific voltage detector that may be used.

Training for Unqualified Persons: Unqualified persons will be trained in and be familiar with any of the electrical safety related practices that are necessary for their safety. **Note**: Unqualified persons willnot be permitted to enter spaces that are required to be accessible to qualified employees only unlessthe electric conductors and equipment involved are in an electrically safe work condition.

Retraining: Retraining will be given when:

- Supervisors or annual inspections indicate that the employee is not complying with the safetyrelated work practices.
- New technology, new types of equipment, of changes in procedures necessitate the use ofsafety related work practices that are different than those the employee would normally use.
- If the employee must employ safety-related work practices that are not normally used duringregular job duties.

3..1.2 Heavy Equipment/Vehicle Traffic

Considerations for controlling the movement of personnel and equipment in a construction area are vitallyimportant to any project, as injuries may occur while working with or adjacent to such equipment. This category includes all operations that utilize moving heavy equipment such as but not limited to: excavators, loaders, graders, dozers, and trucks. Louth Callan Renewables, LLC will take every precaution necessary to ensure the safety of the public and the on-site personnel during operations.

Mobile equipment and vehicle shall have spill kits, absorbent pads / diapers, or similar materials on or inside the equipment at all times. Also, mobile equipment shall have drip protection (e.g., drip pan, absorbent pad / diaper, poly sheeting, etc.) provided beneath the equipment at all times when the equipment is parked.

All workers will adhere to all applicable standards and regulations while operating heavy equipment/vehicles at the site. Operators and drivers will be trained and experienced in the

use and maintenance of the equipment they are operating. The initial equipment/vehicle inspection will be performed by Louth Callan Renewables, LLC and the Equipment Supplier (if a rental unit).

Photos will be taken at initial inspection to document general conditions of equipment upon delivery andto document any specific concerns.

Rental suppliers will be notified of any deficiencies with equipment/vehicles. Equipment/vehicles will notbe placed into service until all deficiencies have been corrected and re-inspected. Equipment/vehicleswill be inspected on a daily basis to identify any worn parts, and/or unsafe conditions. Inspections will be documented using the Equipment Checklist. Any unsafe equipment/vehicles will be removed from service until safety defects can be corrected. Louth Callan Renewables, LLC will perform final inspection of the equipment/vehiclesbefore they leave the site. Equipment operators/drivers will not leave their equipment/vehicles unattended while it is running. Each piece of equipment will be equipped with a minimum 5 lb. ABC fire extinguisher.No vehicles or equipment will be operated in a careless or unsafe manner.

Personnel will wear high visibility reflective vests when working around equipment/vehicles. Pedestriansshall maintain an adequate distance (i.e., separation) from mobile equipment (e.g., forklifts telescoping handlers, pickup trucks, light-duty vehicles, and skid steer loaders), no closer than 4 feet to the left andright as well as 25 feet directly in front of or behind the equipment's travel path.

Powered Industrial Trucks

The following are general safety procedures as Powered Industrial Trucks are further addressed in SOP-18 "Powered Industrial Truck (Forklift) Safety Program."

- Only those properly trained, certified and authorized to operate a specific Forklift shall be permitted to operate it. This training shall consist of both classroom and practical applicationsfor the safe operation of the forklifts provided by an approved Third Party Vendor Training shallnot take place in-house.
- Training shall be conducted by an authorized instructor who is familiar with the fork lift and qualified to instruct. Training shall cover at a minimum: load capacity, instructions, distances,refueling, ramps, visibility, balance and counterbalances.
- Operators shall be re-evaluated at no more than 3 years from initial instruction. Re-training shalloccur immediately if unsafe operations are observed, after an accident or if operations or lift typechange.
- When operating any forklift, substantial overhead protective equipment will be provided.
- Each forklift must have a warning horn, whistle or other device which can be clearly heard abovethe normal noise in the area where operated.
- Before using a forklift, the lift shall be inspected daily or more often if necessary, checking thebrakes, controls, lights, alarms, etc.
- The parking brake will be engaged prior to dismounting the equipment at all times.
- Operators are required to utilize the seatbelt at all times when operating the lift. Pedestrians always have the right of way. The forklift operator must stop and permit pedestrians to cross to a safe distance prior to commencing activities.

- Forks on the lifts shall be lowered 2-4” off the ground when traveling to prevent impalementhazards. Each forklift operator must ensure that the dock plates are fully engaged, the capacity of thetrailer floor and that the trailer has been chocked prior to entering the trailer.

Spotters
Spotters are a proven method of protecting employees on foot behind vehicles with an obstructed view,but spotters themselves can be at risk for injury or even death.

Spotters shall maintain an adequate distance (i.e. separation) from mobile equipment (e.g., forklifts telescoping handlers, pickup trucks, light-duty vehicles, and skid steer loaders), which are smaller in size.At a minimum, the following distances shall be observed:

- At least of 25 feet shall be maintained when in front or behind construction vehicles and mobileequipment
- At least two (2) vehicle lengths shall be maintained from earth moving equipment (e.g., scrapers,graders, loaders, bulldozers, drum compactors, dump trucks, etc.), which is larger in size with bigger blind spots.

Site shall implement the following actions to help keep spotters safe:

- Ensure that spotters and drivers agree on hand signals before backing up.
- Instruct spotters to always maintain visual contact with the driver while the vehicle is backing.
- Instruct drivers to stop backing immediately if they lose sight of the spotter.
- Not give spotters additional duties while they are acting as spotters.

In areas where earth moving equipment is being operated, Exclusion Zones shall be utilized to eliminateor minimize the need for Spotters and keep foot traffic (i.e., pedestrians) out of the area.

- Instruct spotters not to use personal mobile phones, personal headphones, or other items whichcould
- pose a distraction during spotting activities.
- Provide spotters with high-visibility clothing, especially during night operations.

Non-essential personnel shall stop and get permission each time they enter an Exclusion Zone. Prior togranting access, the person in charge of the Exclusion Zone shall alert the earth moving equipment operators in the area.

Mobile equipment operators shall stop if an unauthorized vehicle or person enters the Exclusion Zone without permission or communication is broken with the Spotter.

During some activities, it is often necessary to have a worker direct the operator/driver. In these cases,close communication between the operator/driver and the ground person is of critical importance. Onedesignated person will give signals to the operator/driver of both

equipment and vehicles in the work area.Workers should not take any action unless they have made eye contact with the operator and clearly communicated their intentions. In addition, equipment/vehicles shall be equipped with back-up alarms,which are checked daily and repaired immediately. If back-up alarm is not working, the equipment/vehicleshall be removed from service until it is repaired.

Maintenance and inspection of vehicles and heavy equipment is a vital part of the overall safety program.Louth Callan Renewables, LLC has a fully staffed equipment maintenance shop that handles all preventative and overhaulwork for our entire vehicle and equipment fleet. As part of the preventative maintenance, all equipment is checked for properly functioning safety devices (e.g., backup alarms, brakes, lights, fire extinguishers,leaks, spills etc.) Before each piece of equipment leaves the shop it must pass a safety checklist. All rentalequipment is subjected to a similar inspection when delivered to the job site. Any piece of rental equipment that fails the inspection must be repaired by the vendor before it is accepted for use. In addition, all equipment is inspected in the field prior to the start of each day's activities. If a superintendent, operator,or DSSR detects a defect, a properly qualified mechanic is dispatched from the shop to make the repairs on-site.

Climbing heavy equipment can be hazardous and workers can fall or be injured getting in and outof equipment. When climbing construction equipment employees shall use 3-points of contact.This means using two hands and one foot or two feet and one hand at all times while climbing.Only break 3-points of contact when you reach the ground, you reach the machines cab, or a stable platform.

Employees operating vehicles or equipment equipped with seat belts shall wear the seat belts providedat all time.

The Speed Limit on site shall be abided by at all times and in all areas. Signs will be posted.

3.2.1.2.2 All-Terrain Vehicles / "Buggies"

Where All-Terrain Vehicles or "buggies" are utilized on site the following requirements shall be met:

At a minimum, the following the safety equipment / devices shall be installed on all onsite vehicles [including all side-by-side / utility task vehicles (UTV's) and pick-up trucks (purchased or rented)] used on the Owner's premises:

- Seatbelts
- Headlights (i.e., required for nighttime and/or low light conditions)
- Roll-Over Protection System (ROPS) / cab protection
- Back-Up Alarm
- Fire Extinguisher
- Flashing / Strobe Lights
- Roof-mounted flashing / strobe lights and/or "buggy whips / flags" are recommended on UTV'sfor improved detection / visibility, especially by drivers of larger vehicles.

All personnel who will operate the “buggies” must be given familiarization training that shall include, at aminimum:

- How to inspect and maintain the equipment
- How to fuel the equipment and what type of fuel to use
- How to start and stop the equipment
- How to engage and disengage the parking brake
- How to change gears
- How to engage and disengage the 4-Wheel Drive function (if equipped)
- How to operate the dump bed (if equipped)
- How to operate, engage or disengage any other components not otherwise describedabove

- Seat belts shall be worn by all passengers and drivers at all times while the “buggies” engine(s)are running
- Parking brakes shall be set anytime the “buggies” are stopped
- All passengers and drivers shall be equipped with the minimum Personal Protective Equipmentfor the site as described in this Safety Plan

- All “buggies” shall be equipped with an Orange Flag at least 5’ (five feet) higher than the top of theroof so as to make the “buggies” visible to other vehicles and equipment on site.

Employees operating vehicles or equipment equipped with seat belts shall wear the seat belts provided at all time.

The Speed Limit on site shall be abided by at all times and in all areas. Signs will be posted.

3..1.3 Material Handling

Various materials and equipment may be handled manually during project operations. Care should be taken when lifting and handling heavy or bulky items to avoid back injuries. The following fundamentalsaddress the proper lifting techniques that are essential in preventing back injuries:

- The size, shape, and weight of the object to be lifted must first be considered. Multiple employees or the use of mechanical lifting devices are required for objects weighing >50lbs or with an awkward configuration that results in poorly distributed weight or would obstruct the view of the employee lifting it.
- The anticipated path to be taken by the lifter should be considered for the presence of slip, trip,and fall hazards.
- The feet shall be placed far enough apart for good balance and stability (typically shoulder width).
- The worker shall get as close to the load as possible. The legs shall be bent at the knees.
- The back shall be kept as straight as possible and abdominal muscles should be tightened. Ifnecessary, back/lifting belts will be provided.
- Twisting motions should be avoided when performing manual lifts.
- To lift the object, the legs are straightened from their bending position.
- A worker shall never carry a load that cannot be seen over or around.
- Workers must wear PPE including but not limited to safety-toed boots, hard hat, safety glasses,cut sleeves, and cut gloves

When placing an object down, the stance and position are identical to that for lifting. The legs are bentat the knees and the object lowered. When two or more workers are required to handle the same object,workers shall coordinate the effort so that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each worker, if possible, shall face the direction in which the object is being carried. In handling bulky or heavy items, the following guidelines shall be followed to avoid injury to the hands and fingers:

- A firm grip on the object is essential; leather gloves shall be used if necessary.
- The hands and object shall be free of oil, grease, and water which might prevent a firm grip andthe fingers shall be kept away from any points that could cause them to be pinched or crushed,especially when setting the object down. Level 2 cut resistant gloves shall be worn.
- The item shall be inspected for metal slivers, jagged edges, burrs, and rough or slippery surfaces prior to being lifted.

3..1.4 Hand and Power Tools

Hand and power tools are used for various site activities. Procedures for using hand and power toolsare as follows:

- Persons using power tools shall be trained in their use.
- Ground prongs must be present on all electrical tools, except double insulated tools.
- Only tools in good condition shall be used.
- Tools shall be kept clean.
- Guards and shields shall be kept on all tools at all times and shall not be removed for anyreason
- Air couplings shall be secured, and whip checks shall be installed
- Non-sparking tools shall be used in hazardous/flammable atmospheres
- Proper eye protection is critical when using power tools. At a minimum, safety glasses will be required during site operations. Where there is a risk of flying materials/debris, full-face shieldswill be utilized in addition to safety glasses.

The use of folding razor knives, folding pocketknives, and spring-assisted / quick opening pocketknives are prohibited on site. Scissoring-action tools (e.g., side cutters / snips, industrial scissors, pliers, or similar tools) shall be used to cut tie wraps / zip ties, non-metallic hoses / tubing, and etc. Utility knivesshall not be used for "skinning" wire or cable. The use of electrician plier-type / scissor-action tools (e.g.,wire / cable strippers, cutters, and crimpers) is recommended.

Wire / cable skinning knife (i.e., lineman knife with fixed curved blade) may be used to remove insulationjackets on electrical wire / cable. These knives shall be sheathed when not in use. Long blade knives commonly used by insulators are acceptable for cutting insulation only. Insulation knives (i.e., fixed / straight blade) shall be sheathed when not in use by Insulators. Use only box cutters with self-retractingor enclosed blades for opening boxes.

Portable grinders shall be equipped with a non-locking (i.e., dead man) trigger mechanism and shall beequipped with anti-kickback braking mechanism unless otherwise accepted by the Owner.

3..1.5 Fall Protection

During construction activities personnel will be required to gain access to equipment at various elevations. To prevent falls and injuries when employees work in areas where fall hazards cannot be eliminated by reasonable means, personnel will be required to use a full body harness and double-leg shock-absorbing lanyard when working at heights of 6ft or greater. Personnel will make maximum useof primary fall protection systems. These systems will be equipped with standard guardrails and safe means of access/egress.

Employers must set up the work place to prevent employees from falling off of overhead platforms, elevated work stations or into holes in the floor and walls. OSHA requires that fall protection be provided at elevations of four feet in general industry workplaces, five feet in shipyards, six feet in the construction industry and eight feet in longshoring operations. In addition, OSHA requires that fall protection be provided when working over dangerous equipment and machinery, regardless of the fall distance.

To prevent employees from being injured from falls, employers must:

- Guard every floor hole into which a worker can accidentally walk (using a railing and toe-board or a floor hole cover).
- Provide a guard rail and toe-board around every elevated open sided platform, floor or runway.
- Regardless of height, if a worker can fall into or onto dangerous machines or equipment (such as a vat of acid or a conveyor belt) employers must provide guardrails and toe-boards to prevent workers from falling and getting injured.
- Other means of fall protection that may be required on certain jobs include safety harness and line, safety nets, stair railings and hand rails.

It is Louth Callan Renewables, LLC's policy to take all practical measures possible to prevent employees from being injuredby falls from heights.

NOTE
Louth Callan Renewables, LLC has adopted a "Zero Tolerance Policy" in regards to compliance with '100% Fall Protection 100% of the time when working at unprotected height greater than 6ft.' Shall any employee be found to be in violation of any of the policies or procedures outlined in this Fall Protection Program and/or the Site Specific Health and Safety Plan, said employee shall be subject to immediate termination "with cause." Should an employee be terminated for a fall protection violation, said employee shall be ineligible for rehire and shall not be permitted on any Louth Callan Renewables, LLC project in any capacity.

Before any employee attempts to work in an area where a risk of falls exists, they must equip themselveswith suitable fall arresting equipment and be trained in its use. Personnel riding on or working from Aerial work platforms (boom lifts, scissor lifts, etc.) must secure their safety lanyards to the anchorage point in the basket at all times.

The fall protection equipment will be properly fitted and will not restrict the movements of the worker. Full safety harnesses and double-leg lanyards are required for any work performed over 6 ft. (1.8 meters) in elevation.

PPE for fall protection may include, but is not limited to the following:

- Full body harness
- Energy absorbing lanyard
- Self-retracting Layard
- Connectors
- Ladder climbing devices
- Vertical lifeline
- Horizontal lifeline

All PPE must meet the ANSI (American National Standards Institute) requirements.

Lanyards of the shortest workable length must be attached to a secure point in the vicinity of the work area. The line will be long enough not to restrict the worker's movements, but short enough to prevent tripping over the line and falls beyond the worker's extended reach for self-rescue; in any case, not over6 ft. (1.8 meters).

Each employee working at the edge of a vertical excavation six (6) feet or more in depth shall be protected from falling. Fall protection is not required for excavations, which are sloped or benched, where the horizontal to vertical ratio is less than or equal to ¾:1 (≤ 53o angle). Only rigid barricading will be used at areas where a fall hazard is present, unless otherwise approved by the Owner.

Only **one employee is permitted to one anchor at a time.** Employees are not to share an anchor point with any other employees for any reason.

Administrative Controls

Louth Callan Renewables LLC will make every effort in providing administrative controls on any project site that has a slip trip and fall hazard. Administrative controls can include but are not limited to:

- Reducing the hazard exposure time by rotating employees in and out of hazardous height conditions
- Installations of warning signs and placards reminding employees of proper safety procedures.
- Practice, and encourage employees to practice good housekeeping. Keeping the site free of debris, trash and other objects that could cause an employee to slip trip or fall.

Fall Protection Inspection

To ensure proper condition, all employees must complete a visual inspection of their fall protection equipment before each use. The inspection shall include:

- **Hardware** (inspect hardware, including snap hooks, D-rings, and buckles for damage, andcheck for sharp edges, corrosion, burrs, cracks, and worn parts),
- **Webbing** (check for tears, abrasions, mold, burns, heavy soiling, or discoloration, andchemical or heat damage,
- **Cable** (inspect for cuts, kinks, broken wires and fibers, corrosion, chemical contact, andseverely abraded areas), and
- **Labels** (affixed and fully legible).

Fall protection equipment that is found to be defective must be taken out of service and discarded. An out-of-service tag should be affixed to the equipment indicating it is defective until discarded.

Elevated Lift Platforms

Elevated & Rotating Work Platforms / SPE
Aerial Lifts Aerial lifts acquired for use which were manufactured on or after January 22, 1973, will have a placard or label affixed which indicates that the lift is designed and constructed in accordance with ANSI standard A92.2-1969. Aerial lifts acquired for use prior to January 22, 1973, may not be used unless modified to meet this standard.

Aerial lifts may be modified to perform other than originally designed tasks provided the modifications are certified by the manufacturer or a nationally recognized testing laboratory that the aerial lift conforms with ANSI standard A92.2-1969 and is as safe as before modifications. Before the truck is moved for highway travel, aerial ladders will be secured in the lower traveling position by the locking device above the truck cab, and the manually operated device at the base of the ladder, or by other equally effective means.

Only **trained/authorized persons will operate an aerial lift.**

Aerial lifts include the following types of vehicle-mounted aerial devices to elevate personnel to jobsites above the ground:
a. Extensible boom platforms
b. Aerial ladders
c. Articulating boom platforms
d. Vertical towers
e. A combination of any of the above

Only authorized persons may operate an aerial lift.

- Lift controls and equipment must be inspected and tested each day, prior to use, to determine that they are in a safe working condition.
- When working from an aerial lift, you must stand firmly on the floor of the basket or cage, and use (wear) an approved fall restraint system.
- The fall restraint system must be attached to the boom or basket – it may not be attached to any adjacent pole, structure, or other equipment.
- You may not sit or climb on the edge of the basket; also, do not use planks, ladders, or other devices for a work position.
- Load limits set by the manufacturer must never be exceeded.
- The brakes must be set.
- When outriggers are used, they will be positioned on pads or a solid surface.
- Before moving an aerial lift, the booms will be inspected to see that it is properly cradled, and outriggers are in stowed position.
- Aerial lifts must not be moved with personnel in the basket unless it is designed for this type of operation.
- Aerial lifts designed as personnel movers must have controls that are clearly marked as to their use and the lower controls must be able to override the upper controls.
- Except in an emergency, the lower controls will not be used unless permission has

been granted by the persons in the lift.

- All electrical tests will conform to the requirements of ANSI A92.2-1969 section 5. However, equivalent DC voltage tests which are approved by the equipment manufacturer or equivalent entity may be used in lieu of the AC voltage specified in A92.2-1969.

It is required that the vehicle have a “reverse signal alarm” audible above the surrounding noise level or a ground-guide (spotter), using standard hand signals, when backing up.

The vehicle will be backed up only when the spotter signals that it is safe to do so. Using a ground-guide provides a substantially higher level of safety than a “reverse signal alarm” because the vehicle can be guided to an exact location with assurance that there is sufficient clearance from objects, and, most importantly, no person is in harm’s way.

Heavy Equipment and Electrical Power Lines Special attention will be given to electrical lines. **Extreme care must be exercised to avoid contact with electrical energy.** Except where electrical distribution and transmissions lines have been deenergized and visibly grounded at point of work or where insulating barriers (not attached to the vehicle) have been erected to prevent physical contact with the lines, the following clearance -- between any part of the equipment, load line, or load and the power line -- will be observed:

Table A—Minimum Clearance Distances Per 29 CFR 1926. 1408 & 1409	
Voltage (nominal, kV, alternating current)	Minimum clearance distance(feet)
up to 50	10
over 50 to 200	15
over 200 to 350	20
over 350 to 500	25
over 500 to 750	35
over 750 to 1,000	45
over 1,000	(As established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).

The value that follows “to” is up to and includes that value. For example, over 50 to 200 means up to and including 200 kV.

A ground guide will be designated to observe clearance of the equipment and give warning to the equipment operator in situations where it is difficult for the equipment operator to maintain the desired clearances by visual means. An overhead wire will be considered energized unless the owner of the line or the electrical utility authorities indicate that it is not energized, and it has been visibly grounded

3.2.1.5.1 Stairways and Ladders

Stairways and ladders are a major source of injuries and fatalities among workers. Because of the potential hazards involved in using stairways and ladders, the following safety practices and procedures need to be implemented and enforced at the project. Ladders must be secured to prevent accidental displacement or be protected by barricades. Ladders shall be securely placed, held, or tied / lashed to prevent slipping, falling, or displacement while in use. While climbing ladders always maintain at least **3-points of contact (you should always have at last two hands and one foot or two feet and one hand holding on to the ladder for stability).** Workers should always face the ladder and use both hands whengoing up and down ladders. Only break 3-points of contact when you reach the ground or you're on a stable platform. Materials and tools should be lowered or raised by a rope or other mechanical means.Hold on to the railing on stairways. The areas around the top and base of ladders must be free of tripping hazards such as loose materials, trash, and electrical cords. The same holds true for the bottom of stairways and on stairway platforms.

Ladders

Ladders must be capable of supporting four times the maximum intended load. Ladder rungs,cleats, and steps must be parallel, level, and uniformly spaced **(not less than 10 in or more than 14 in)**.Do not tie or fasten ladders together to provide longer sections unless they are specifically designed for such use. All stepladders must be equipped with a metal spreader or locking device and shall only be used in the fully open and locked position. Do not paint ladders, except to stencil for identification. Maintain ladders free from oil, grease, and other slipping hazards. Ladders must extend at least 3 ft above the upper landing surface and be secured. The horizontal distance for the base of the ladder should extend 1 ft for every 4 ft in vertical distance. Wood job-made ladders must be used at an angle so that the horizontal distance is one-eighth the working length of the ladder. Do not use ladders on slippery surfaces unless they have been properly secured or provided with slip-resistant feet. Do not move, shift, or extend ladder while occupied. Never stand above the top two steps of a stepladder.

Always check a ladder before using it. Check all ladders to see that steps or rungs are tight and secure.Be sure that all hardware and fittings are properly and securely attached. Test movable parts to see that they operate without binding or without too much free play. Inspect fiberglass ladders for bends and breaks. Inspect wood ladders for cracks and splits in the wood. Never use a damaged ladder. Tagit "Defective" and report it to the supervisor so that it may be removed from the job.

All Fiberglass ladders shall have a duty rating of at least 1A or 1AA.

***Metal ladders are not allowed on site at any time.**

A competent person on a periodic basis and after any occurrence that could affect their performance, must inspect ladders. Ladders with structural defects must be tagged with "Do Not Use" or similar language and withdrawn from service until repaired.

Any employee who uses a ladder or stairway must receive training by a competent person in the following areas:

- Types of hazards.
- Correct procedures for erecting, securing, maintaining, and disassembling ladders andstairways Proper construction use, placement, and handling.
- Maximum intended load-carrying capacities.
- Requirements contained within 29 CFR 1926 Subpart X.

Stairways
Stairways that are not permanent parts of the structure must have landings of not less than **30 inches** (0.76 meters) in the direction of travel. A platform must be provided where doors or gates open directly on a stairway. Metal pan landings and metal pan treads must be filled in with wood or other materials if they are to be used prior to being finished. Maintain all parts of stairways free from hazardous projections, such as protruding nails. Eliminate slippery conditions on stairways before thestairways are used to reach other levels.

To reduce the possibility of falling, before setting up a ladder and/or accessing an area where there is a potential to fall to a lower level, perform a site hazard evaluation. If setting up a ladder, evaluate thearea in which you will be positioning your ladder. Check to ensure that the ground is solid and level. Donot position a ladder on unstable, uneven or undulating ground. If you must use a ladder on uneven terrain, use a partner to help stabilize the ladder. If work tasks need to be performed near an unprotected edge greater than 6'ft a fall protection plan will need to be submitted to Louth Callan Renewables, LLC's safety departmentand approved by the owner before work can start.

3.2.1.5.2 Slip/Trip/Fall
Slip/trip/hit/fall injuries are the most frequent of all injuries to workers. They occur for a wide variety ofreasons, but all injuries can be prevented by the following prudent practices:

- Spot-check the work area to identify hazards.
- Establish and utilize a pathway, which is free of slip and trip hazards.
- Beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain.
- Carry only loads that you can see over.
- Keep work areas clean and free of clutter, especially in storage rooms and walkways.
- Communicate hazards to on-site personnel.
- Secure all loose clothing, ties, and remove jewelry while around machinery.
- Report and/or remove hazards.
- Keep a safe buffer zone between workers using equipment and tools.
- Workers must take particular care when walking on the geotextile-working mat.
- All packaging material including boxes, pallets, crates, banding (e.g., metal and plastic), etc.shall be removed from the work area immediately.
- Leads, hoses, and extension cords shall be suspended (minimum of 7 feet) with a nonconductive material off all floors, stairways, and walkways. Nails, bent welding rods, andother metal items are not acceptable materials for suspending leads, hoses, and electrical cords.
- Mats, cord trays, cable protectors, or bridge covers shall be utilized to eliminate trippinghazards where it is not possible to suspend leads, hoses, and extension cords.
- Where items, such as protruding rebar and anchor bolts, create an impalement or trippinghazard, they shall be properly protected with OSHA-

approved rebar caps for impalement protection and conspicuously marked.

3..1.6 Noise

Noise is found during site activities in such operations as transportation of materials and operation of heavy construction equipment. Noise has been defined as unwanted sounds. The human ear can tolerate a certain amount of sound without any harmful effects. The **OSHA standard allows 90 dB (A) for a full 8 hours and for a lesser time when the levels exceed 90 db** (A). It is usually safe to assume that if you need to shout to be heard at arms-length, the noise level is at 90 dB (A) or above. Personneloperating or working around construction equipment or power tools will utilize hearing protection. Based on the nature of activities to be performed on site, the use of heavy equipment, power tools, and othernoise producing devices, Louth Callan Renewables, LLC personnel are enrolled in a Hearing Conservation Program that meets the requirements of OSHA regulation 29 CFR 1910.95 as part of our Medical Surveillance Program. OSHA requires employees to be part of a Hearing Conservation Program when their exposureis 85 dB (A) or above.

Based upon Louth Callan Renewables, LLC's past experience, it is known that the noise levels emanating from the operationof the heavy equipment may exceed what is allowable for worker exposure. Consequently, equipmentoperators and personnel working near the equipment are required to wear hearing protection. Louth Callan Renewables, LLC will provide hearing protection to all site personnel.

3..1.7 Excavation/Trenching

The primary hazard to which employees may be exposed during excavation work is a cave-in, which occurs when the soil forming the side of the excavation can no longer resist the forces applied to it. Thisresults from a reduction in the frictional and cohesive capacities of the soil to resist forces. Changing environmental conditions, such as freezing and thawing, or the addition or removal of water from the pores of the soil can reduce the ability of a soil to resist forces. The addition of superimposed loads from spoil piles, or the placement of equipment or materials near the edge of the excavation also create forces that can exceed the ability of the soil to resist.

Trenches 5 feet (1.5 meters) deep or greater require a protective system unless the excavation is madeentirely in stable rock. If an excavation measures less than 5 feet deep, a competent person may determine that a protective system is not required. Trenches 20 feet (6.1 meters) deep or greater requirethat the protective system be designed by a registered professional engineer or be based on tabulateddata prepared and/or approved by a registered professional engineer in accordance with 1926.652(b) and (c).

Prior to commencing digging an excavation permit shall be completed by the competent person. This permit shall identify dig authorization and the hazards involved with the excavation and controls in place.It shall also identify, soil classifications, protection methods, utility locations in the area, communication, and inspection methods used during the excavation activities.

General Excavation Rules

- Keep heavy equipment away from trench edges.
- Identify other sources that might affect trench stability.
- Keep excavated soil (spoils) and other materials at least 2 feet (0.6 meters) from trench edges.
- Know where underground utilities are located before digging.
- Test for atmospheric hazards such as low oxygen, hazardous fumes and toxic gases when > 4feet deep
- Inspect trenches at the start of each shift.
- Inspect trenches following a rainstorm or other water intrusion.
- Do not work under suspended or raised loads and materials.
- Inspect trenches after any occurrence that could have changed conditions in the trench.
- Ensure that personnel wear high visibility or other suitable clothing when exposed to vehiculartraffic

Competent Person

The competent person will be designated for each project where any form of trenching or excavating is planned. The competent person must be knowledgeable of the OSHA standards, including sloping andbenching design and shoring/bracing specifications. The competent person will be familiar with excavation processes and general construction techniques. The competent person is authorized to stopwork and correct any problems. Specific Responsibilities of the Competent Person:

- Conducts tests for soil classification
    - **Type A** – The most stable soil, including clay, silty clay, sandy clay, and clay loam.
    - **Type B** – Medium unconfined compressive strength. Angular gravel, silt, silt loam, and soils that are fissured or near sources of vibration are all examples of type B soil.
    - **Type C** – Least stable soil. This type includes granular soils in which particles don't stick together. Examples include gravel and sand.
- Understand standards and any data provided
- Determine proper protective system
- Recognize and reclassify soil after changes in conditions
- Determine whether damage to excavation safety equipment renders it unusable
- Conducts tests for hazardous atmospheres
- Design of structural ramps
- Location of underground installations/utilities
- Monitor water removal equipment and operation
- Perform daily inspections
- Determine the necessity for a protective system if less than 5 feet deep

Access and Egress

Means of access and egress from excavations **(less than 20 ft deep)** A stairway, ladder, ramp or othersafe means of egress will be located in trench excavations that are 18'' (inches) or more in depth so asto require no more than 25 feet (7.62 m) of lateral travel for employees. In the event a ramp or walkway is greater than 6' and exposes employees or passing people to a fall hazard, means of protecting fromthe fall in the way of guardrails or handrails shall be utilized.

Vehicular Traffic
Employees exposed to public vehicular traffic will be provided with, and will wear, warning vests or other suitable garments marked with or made of reflective or high-visibility material. Vehicular and equipmenttraffic shall maintain a safe distance away from open trenches.

Hazardous Atmospheres
Where oxygen deficiency (atmospheres containing less than **19.5% oxygen**) or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in contaminated soils or excavations in areas where hazardous substances are stored nearby, the atmospheres in the excavation will be tested before employees enter excavations greater than 4 feet in depth. Adequate precaution will be taken such as providing ventilation, to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 10 percent of the lower flammable limit of the gas. When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing will be conducted as often as necessary to ensure that the atmosphere remains safe.

Stability of Adjacent Structures
Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning will be provided to ensure the stability of such structures for the protection of employees. Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees will not be permitted except when, a support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure, or the excavation is in stable rock, or a registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity, or will not pose a hazardto employees. Sidewalks, pavements and appurtenant structures will not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

Protection from Falling Rock, Soil, or Overhead Materials
Employees will be protected from excavated or other materials, or equipment that could pose a hazardby falling or rolling into excavations. Protection will be provided by placing and keeping such materialsor equipment at least 2 feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combinationof both if necessary. Additionally, employees will not be permitted to work under loads being placed into the excavation.

Inspections
The Competent Person is responsible for inspecting an excavation each day or more often if necessary.The condition of the excavation must be noted in the daily job notes. Shoring systems should be inspected daily by the company representative having direct supervision responsibilities over the project. Inspections are especially important after a rainstorm or whenever a change in conditions thatincreases the likelihood of a cave-in or slide occurs. If any dangerous ground movements are detectedor appear likely, work in the trench should be stopped immediately until the problem is corrected. In cases where trenches are greater than 4 feet deep and the possibility for the presence of combustible gases such as methane or for the presence of oxygen deficient atmospheres exists, appropriate tests shall be made by a properly trained individual prior to initial entries and

periodically throughout the job as needed.

Requirements for Protective Systems
Employee in an excavation shall be protected from cave-ins by an adequate protective system designedin accordance with the OSHA Standards, except when
(A) Excavations are made entirely in stable rock; or (B) Excavations are less than 5 feet in depth and examination of the ground by a competent personprovides no indication of a potential cave-in. Protective systems shall have the capacity to resist withoutfailure all loads that are intended or could reasonably be expected to be applied or transmitted to the system. There are different types of protective systems.

Benching means a method of protecting workers from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near vertical surfaces between levels. **Benching is not permitted in type C soil.**

Sloping involves cutting back the trench wall at an angle inclined away from the excavation.

Shoring requires installing aluminum hydraulic or other types of supports to prevent soil movement andcave-ins.

Shielding protects workers by using trench boxes or other types of supports to prevent soil cave-ins. Designing a protective system can be complex because you must consider many factors: soil classification, depth of cut, water content of soil, changes caused by weather or climate, surcharge loads (e.g., spoil, other materials to be used in the trench), and other operations in the vicinity.

3.2.1.7.1 Excavation/Trenching Competent Person

Supervisory and other essential personnel engaged in excavation activities are required to complete Competent Person Training. This training provides knowledge about soil analysis and classification, use of protective systems and the requirements of the OSHA Excavation Standard 29 CFR 1926.650 –652, Subpart P.

3..1.8 Underground Utilities

Prior to commencement of construction, Louth Callan Renewables, LLC shall self-perform or have a third party perform a “pre-construction” underground survey. The survey shall be conducted by utilizing a combination of ground penetrating radar (GPR) technology, electromagnetic (EM) testing equipment that induces anelectrical current into the earth, conductive testing of trace wires, site walk down, and research of historical information, drawings, and/or aerial photographs. The methods (e.g., geophysical prospecting equipment) used to conduct the pre-construction underground survey will be determined by onsite conditions with the final decision made by the Owner. The underground survey shall be conducted for the Contractor’s construction “limits of disturbance” with the completed survey / drawings / mapping provided to the Owner.

On "green field" sites that have not been previously developed (e.g., industrial, commercial, or residential), GPR and EM testing shall be conducted around the entire perimeter of the Project site. Anyunderground utilities identified by GPR, EM testing, or locate services (e.g., One-Call or Call Before You Dig) shall be fully traced, physically marked, and documented (e.g., GPS location and depth). In addition, GPR and EM testing shall perform over all utility corridors, surface depressions, or other suspect areas or anomalies identified in aerial

photographs, historical research, and/or site walk downs.

Due to the uses and limitations with varying types of locating equipment, unpredictable conditions, andnumerous considerations on Project sites, a joint collaboration between the Owner and Louth Callan Renewables, LLC willbe made regarding the “pre-construction” underground survey plan with the final decision made by theOwner.

Louth Callan Renewables, LLC shall take precautions to ensure existing structures and utilities are not damaged. The detection of previously unidentified utilities, and any damage to utilities, pre-existing or otherwise, shall bereported immediately to the Client.

The "pre-dig" test shall be performed specifically within the excavation corridor or area where the groundwill be penetrated just prior (i.e., greater than 3 working days) to performing the work. The "pre-dig" test is not the same as the "pre-construction" underground survey mentioned above that covers the project site. This"pre-dig test" is in addition to the "pre-construction" underground survey and is used to validate / confirmthe results of the initial survey. The pre-dig test may be conducted by a contractor employee, who is trained, or a third party. The "pre-dig” underground utility locate test utilizing an underground locating device, such as an electromagnetic testing device or ground penetrating radar (GPR), just prior to breaking ground to either verify the absence of any utility / structure or confirm the location of previouslyidentified utilities in the pre-construction survey. Any variance to this requirement will be made by the Owner on a case-by-case basis. Utility location devices to be used shall be capable of detecting utilities and underground structures both conductively and inductively (i.e., metallic and non-conductive materials). Survey information shall include both the vertical (depth) and horizontal plane / location of the underground utilities and subsurface structures.

Determination of utilities can be made in a number of ways. Always CALL BEFORE YOU DIG. In mostlocations 8-1-1 is the number to call to locate underground utilities and you must allow at least 3 business days for the utility owners to respond. Check the Emergency Contacts Section of the plan to confirm the One-Call phone number for this project.

Louth Callan Renewables, LLC shall provide and maintain above ground identification (e.g., color coded post markers for the applicable utility) for high hazard utilities (e.g., gas, electricity, fiber optic,
pressurized lines) as agreed upon with the Owner.

Prior to breaking ground, the competent person shall mark and establish the excavation boundaries and mark / identify hold points at least 10 feet from any underground utility. Hold points shall be clearlymarked on the ground (e.g., paint) indicating the presence of a utility. No mechanical excavation activityshall take place within the established hold points until the area has been surveyed with an undergroundlocating device and the utility has been visually located using "soft digging" methods.

Where utilities are identified, Contractor shall “soft dig” (e.g., hydro excavate, vacuum excavate, pneumatic / air blast excavate, or systematically hand dig) to "pot hole" and visually locate (daylight) the utility or underground structure, unless otherwise approved by the Owner. Again, mechanical digging shall not take place within 10 feet of an identified utility, unless otherwise accepted by the Owner.

Once soft digging methods expose the buried utility, soft digging methods shall be used to clear / remove earthen material from the utility in order to create a buffer zone of at least 3 feet from the underground line before mechanical digging may resume in the area.

3..1.9 Heat and Cold Stress

- Working in hot conditions puts stress on our body's cooling system. When the heat is combinedwith other stresses such as physical labor, loss of fluids, fatigue or preexisting medicalconditions, it may lead to heat-related illness, disability and even death.
- Hot work environments can be managed with an effective program including but not limited tothis policy as well as the Louth Callan Renewables, LLC Heat and Cold Stress Management SOP.

- High-heat procedures shall include, but are not limited to:
    - Effective communication by voice, observation or electronic means
    - Observation of employees for alertness and signs/symptoms of heat illness
    - Designating one or more employees on each worksite as authorized to call for emergency medical services
    - Reminding employees to drink water throughout the shift for worker hydration (Electrolyte Replacement)
    - Pre-shift meetings before beginning work to review the high heat procedures, encourage drinking water, and remind employees of their right to take a cool-downrest when necessary.
    - Work / rest regiments
    - Heat Stress Monitoring program
    - Ventilation / Fans
    - Employees trained in the signs and symptoms of heat stress
    - Provide access to shade when workers are exposed to temperatures at or above80 degrees Fahrenheit.
- The Project Management Team (e.g., Project Manager, Superintendent, and/or Designated SiteSafety Representative) will monitor the weather throughout the day in regard to temperature, humidity, and heat index. This information will be obtained by online websites or mobile phone applications (e.g., National Weather Service or OSHA-NIOSH Heat Safety Tool App). The weather information obtained for the day will be communicated at the Take 5 meeting to help coordinate the activities scheduled for the day. The weather shall be monitored throughout the workday and days in advance to better prepare for and prevent heat-related illnesses.

Based on the NOAA Heat Index Chart (below), there are four risk levels of heat illness.

1. **Caution**: Heat index between 80ºF and 90ºF
2. **Extreme Caution**: Heat index between 91ºF and 103ºF
3. **Danger**: Heat index between 103ºF and 115ºF
4. **Extreme Danger**: Heat index greater than 115ºF

NOAA's National Weather Service

Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

NOTE
The heat index values were devised for shady, light wind conditions, exposure to full sunshine can increase heat index values by up to 15°F. Also, strong winds, particularly with very hot, dry air, canbe extremely hazardous. For example, a Heat Index of 80° Fahrenheit (F) can be 90° F in the sun.

Heat Stress Guide				
Danger Category	Heat Index		Heat Syndrome	Control Measures
	°C	°F		
Caution	27°C to 32°C	80°F to 90°F	Fatigue possible with prolonged exposure and physical activity. Continuing activity could result inHeat Cramps.	Basic heat safety and planning
Extreme Caution	33°C to 39.5°C	91°F to 103°F	Fatigue, Heat Rash, and Heat Cramps likely with prolonged exposure and physical activity. Continuing activity could result inHeat Exhaustion.	Implement precautions andheighten awareness
Danger	39.5°C to 46°C	103°F to 115°F	Fatigue, Heat Rash, Heat Cramps, and Heat Exhaustion are likely. HeatStroke possible with prolonged exposure and physical activity.	Additional precautions to protectworkers
Extreme Danger	> 46°C	> 115°F	Heat Stroke likely without following rest and water intake requirements along with aggressive protective measures.	Aggressive Protective MeasuresRequired

The table below gives general guidance on length of time between water breaks and a corresponding hydration target for each hour of work.			
Temperature	Work Level	Maximum Minutes Worked Between Hydration Breaks	Hydration Target
< 80	Normal		8 – 12 oz / hour
80 – 85	Normal		8 – 16 oz / hour
86 – 90	Normal	50	12 – 20 oz / hour
91 – 95	Normal	45	16 – 24 oz / hour
≥ 96	Normal	40	24 – 32 oz / hour

- *If you are performing heavy or excessive work you will need to increase your hydration level and take more frequent water breaks.*
- *People with a history of renal insufficiency or congestive heart failure need to be cautious of over hydrating.*

Heat Index	Work Level	Work / Recovery (minutes)	Hydration
< 90°F	Light	55 / 5	1 - pint / hr.
	Moderate	50 / 10	2 - pint / hr.
	Heavy	45 / 15	3 - pint / hr.
90°F – 103°F	Light	50 / 10	1 - pint / hr.
	Moderate	45 / 15	2 - pint / hr.
	Heavy	40 / 20	3 - pint / hr.
104°F – 111°F	Light	50 / 10	2 - pint / hr.
	Moderate	40 / 20	3 - pint / hr.
	Heavy	35 / 25	3 - pint / hr.
112°F – 121°F	Light	40 / 20	2 - pint / hr.
	Moderate	30 / 30	3 - pint / hr.
	Heavy	20 / 40	3 - pint / hr.
122°F – 129°F	Light	30 / 30	2 - pint / hr.
	Moderate	20 / 40	3 - pint / hr.
	Heavy	15 / 45	4 - pint / hr.
> 129°F	No Work	No work	Ensure hydration

CAUTION

Water Intoxication - Drinking too much water
Never consume more than 5 pints in an hour or 24 pints in a day (1½ quarts in an houror 12 quarts in a day).

NOTE

Rest times depend on the physical level of the work activity (e.g., light, moderate, or heavy).The higher the physical activity level, the more time is needed for the body to recover before resuming work.

- **Light** – Sitting with light work and/or driving. Standing with some light arm work and occasional walking.
- **Moderate** – Sustained moderate hand/arm work. Moderate arm/leg work. Light pushing / pulling. Normal walking.
- **Heavy** – Intense arm and trunk work, carrying, shoveling, manual sawing (e.g., hand saw),or pushing and pulling heavy loads. Walking or working at a fast pace.

The means of communication for alerting site personnel of Heat Index and risk level updates following the Take 5 meeting will be via 2-way radio. All updates will be routed to the foreman who will route themessage to the craft.

Administrative Work practice controls depend on either limiting the duration of heat stress or on providing air-conditioned rest areas for rapid body cooling, or both. Successful application of this kind of control depends on an intimate knowledge of the heat stress exerted by the environment or on the resulting heat strain as a function of environmental variables.

- Schedule hot jobs to cooler times of the day.
- Work / rest regiment.
- Make available cool drinking water or other fluids for workers and remind them todrink a cup every 20 minutes.
- Assign additional workers or slow down work pace.
- Make sure everyone is properly acclimatized.
- Set up areas where workers can rest out of the heat
- Train workers to recognize the signs and symptoms of heat stress.

In addition, the work / rest schedules and hydration targets in the above table will be used as a guideto limit the amount of time worked in a hot environment according to the type of work performed.

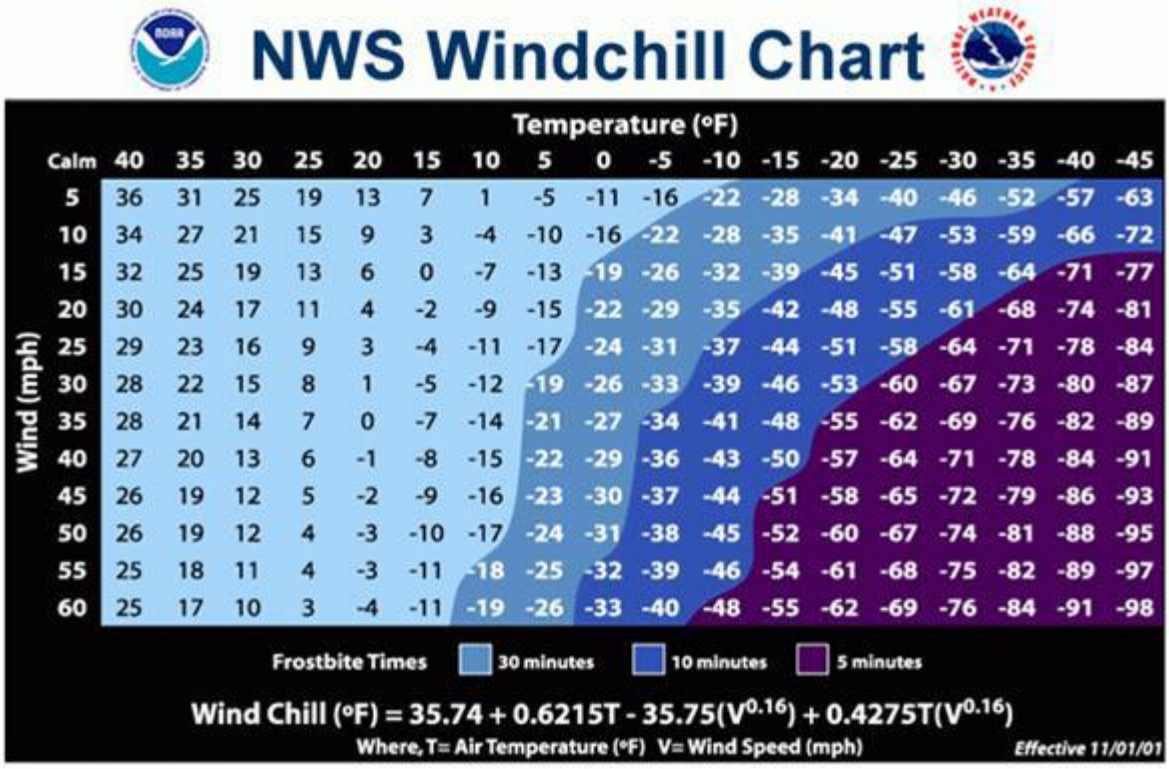
Keep in mind that poor physical condition and/or medication will also impair the ability to work in a hot environment. Older, over-weight individuals or those in poor health may not be able to follow average work / rest regimens. Supervisors shall permit employees to take additional rest breaks as needed in potential heat stress conditions.

3.2.1.9.1 Cold Stress

Cold injury (frostbite and hypothermia) and impaired ability to work are hazards to persons working outdoors in low temperatures at or below freezing. Extreme cold for a short time may cause severe injury to exposed body surfaces (frost nip or frostbite) or result in profound generalized cooling (hypothermia). Areas of the body which have high surface area-to-volume ratio such as fingers, toes, and ears, are the most susceptible to frost nip or frostbite.

Two factors influence the development of a cold weather injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph, for example. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when protective equipment is removed if the clothing underneath is perspiration soaked.

To guard against cold injuries, workers should wear appropriate clothing and use warm shelters for removing personal protective equipment. The office trailer will be used as a warm shelter when required. The DSSR may periodically monitor workers' physical conditions, specifically checking for symptoms offrostbite.



National Weather Service

3..1.10 Fires, Explosions, and Hot Work

If required, the DSSR will establish areas approved for welding, cutting, and other hot work. Hot work (welding, burning, cutting, etc.) conducted on-site must comply with the following Hot Work Procedures.A Hot Work Permit shall be obtained from the DSSR. All personnel shall be protected from welding radiation, flashes, sparks, molten metal, and slag. All welding, burning, and cutting equipment shall beinspected daily by the operator. Defective equipment shall be tagged and removed from service, replaced or repaired, and re-inspected before again being placed in service. All welders shall be properly trained in the safe operation of their equipment, safe welding/cutting practices, and welding/cutting respiratory and fire protection. PPE, such as leather arm coverings eye and face protection and gloves shall be used.

Cutting or welding shall NOT be permitted in the presence of explosive atmospheres (mixtures of flammable/combustible gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside un-cleaned or improperly prepared drums, tanks, or other containers, and equipment which has previously contained such materials.

Welding screens shall be used if hot work is to be performed in close proximity to other jobs, walkways,or high traffic areas.

Where practical, all combustible material shall be relocated at least 35 feet away from the hot work site.Where relocation is impractical, combustibles shall be protected with flame proofed covers or otherwiseshielded. At a minimum, two fully charged and operable fire extinguishers, appropriate for the type of possible fire (20- ABC), shall be available within 25ft of the work area. A fire watch shall be required whenever hot work is performed and for a minimum of 30 minutes after hot work is complete.

A hot work permit will be completed by the DSSR, reviewed with personnel who will perform the hot work, and posted near the work area. The hot work permit is good only for the date issued and is validonly for the eight-hour shift for which it is issued. If at any time during the hot work operation a changein conditions at the work site is suspected, such as a release of flammable gases or vapors in the workarea, work shall be stopped immediately and the DSSR shall be notified. Such work stoppage invalidates the hot work permit, and a new permit shall be completed after inspections and tests have been performed by the DSSR.

3..1.11 Oxygen Deficiency

Oxygen deficiency may occur on-site during excavation operations or storage tank entry, due to displacement of oxygen by other gases in these areas. The oxygen content of ambient air is 20.9 percent. Physiological effects of oxygen deficiency are readily apparent when the oxygen concentrationdecreases below 16 percent. Oxygen-deficient conditions may be controlled by air monitoring areas foroxygen concentrations using a multi-gas meter that is capable of monitoring for 0_2/LEL/CO/H_2S simultaneously. Air monitoring will reduce risks by indicating when action levels have been exceeded. Supplied-air type respiratory protection shall be utilized in areas known to have oxygen concentrations below **19.5 percent.** All operations shall cease and desist if oxygen concentrations exceed 21.5 percent.

3..1.12 Confined Spaces

Louth Callan Renewables, LLC does not anticipate confined spaces on this project, however, if any are discovered,Louth Callan Renewables, LLC employees are not permitted to enter any confined space. Confined Space is definedas: 1) being large enough for an employee to enter and perform work; 2) has limited or restricted **means**for entry or exit; and 3) is not designed for continuous occupancy.

3.2.2 Chemical Hazards

Potential sources of contamination consist of the wastes that were disposed at the site. The site areas may contain mixed household waste and construction/demolition debris. Construction excavation or earthmoving activities that encounter suspect contaminated soils shall be stopped and the Owner notified immediately.

3.2.2.1 Nature and Extent of Contamination

Louth Callan Renewables, LLC is responsible for the cleanup and proper handling, collection, containerizing, and removal ofregulated wastes, as defined by the EPA and state or local regulations. Louth Callan Renewables, LLC shall handle, store,and manage all regulated wastes in accordance with federal, state, and local laws and regulations andthe Owner's requirements, which may vary depending on the state, county, local municipality, and Owner's facility.

Regulated waste, including to but not limited to, hazardous waste, used oil, oily debris, universal waste, and non-hazardous waste shall be disposed by the responsible party as stated in the terms and conditionsof the contract.

Louth Callan Renewables, LLC shall use only Owner-approved vendors and landfills for the disposal of regulated wastes, including to but not limited to, used oil, oily debris, universal waste, and non-hazardous waste.

3.2.2.2 Exposure Routes

A primary exposure route of concern at the site is inhalation of dusts and vapors during excavation. Airmonitoring, using direct reading instruments, for volatile organic compounds and particulate shall be performed when handling materials that may produce a potential for exposure.

Direct contact of the skin and eyes with contaminated material/leachate is another important route of exposure. To protect workers against dermal contact, they will wear protective gloves, safety glasses and appropriate clothing for operations involving potential exposure to leachate or other hazardous materials. Proper personal decontamination procedures will be emphasized during site activities.

Although ingestion should be the least significant route of exposure, employees will be made aware ofways in which this type of exposure can occur and methods to avoid such exposure. Deliberate ingestion of chemicals is unlikely. Personal hygiene habits that provide a route of entry for chemicals will be restricted. Proper decontamination procedures will reduce/eliminate potential of ingesting hazardous materials. Site personnel will wash their hands, face and other exposed parts of their skin before eating or smoking.

3.2.2.3 Operational Chemicals/ Cleaning Chemicals/ Hazard Communication Program

Operational chemicals and cleaning chemicals may be brought to the project-site for use in activitiessupporting the site activities. These chemicals are used for fuels in operating heavy equipment, gluesfor welding pipes, painting, etc. The use of operational chemicals is regulated by OSHA under theHazard Communication Standard (29 CFR 1910.1200). Safety Data Sheets (SDS's) for operationalchemicals are kept on file in the project office trailer. An inventory list of the anticipated operationalchemicals (Hazardous Chemical Inventory List) for use at project will be maintained at the site and updated as new material is received. The use of Sulfur Hexafluoride (SF6) Arc Quenching/Suppressionon load Break Equipment is not anticipated to be utilized. Sulfur Hexafluoride will not be used duringthe course of the project.

Louth Callan Renewables, LLC and Subcontractors shall notify the Owner of all chemicals and hazardous materials at leastfive (5) working days in advance of bringing them onto the site. Contractors may be prohibited from bringing some chemicals on site if the chemical or material has been disapproved by the site EHS Professional or by the Owner's Chemical Commodity Management Program.

Contractors shall provide to the Owner a current Safety Data Sheet (SDS), estimated amount or quantity of material brought on site, proposed days on site, storage location, and any special handling / storage requirements for each chemical or hazardous material. Contractors shall submit to the Owner for approval a completed Contractor Chemical Control Form or similar Owner-approved form with requiredinformation for all hazardous materials / chemicals brought on site.

An index listing of chemicals used on site (i.e., Hazardous Chemical List) shall be created, maintained,and updated when a new Safety Data Sheet (SDS) is added.

Louth Callan Renewables, LLC shall provide a current hazardous material inventory / chemical list to the Owner on a monthly basis. Louth Callan Renewables, LLC shall submit the inventory or list by the seventh business day of each month.Louth Callan Renewables,

LLC shall maintain SDSs on site for all chemicals brought on site by them and their Subcontractors. Further, the Louth Callan Renewables, LLC shall provide SDS access available to all of their employees, Subcontractors, and Owner's personnel. Contractors must remove all chemical commodities from thesite that are not consumed during the job.

3.2.3 Biological Hazards

There is a potential for encountering biological hazards such as bites from ticks, rodents, snakes and exposure to poison ivy and others. Biological hazards and controls are presented below.

3.2.3.1 Ticks

Working in tall grass, especially in or at the edge of wooded areas, increases the potential for ticks to affect workers. Ticks are vectors of many different diseases including: Rocky Mountain spotted fever, Q fever, tularemia, Colorado tick fever, and Lyme disease. They attach to their host's skin and intravenously feed on its blood creating an opportunity for disease transmission. Covering exposed areas of the body and the use of commercially prepared tick repellent, such as N, N-Diethyl-m-toluamide(DEET), help prevent tick bites. DEET should be used in concentrations of at least 25% to be effective.Please note that there are some concerns with the use of DEET on skin and associated potential adverse health effects and it should be washed of after exposure to ticks has subsided. Periodically during the workday, employees working in tall grass will inspect themselves for the presence of ticks. Notify the DSSR of any tick bites as soon as possible.

How to remove a tick

1. Use fine-tipped tweezers to grasp the tick as close to the skin's surface as possible.
2. Pull upward with steady, even pressure. Do not twist or jerk the tick. This can cause the mouthparts to break off and remain in the skin. If this happens, remove the mouthparts with tweezers. If you are unable to remove the mouth easily with clean tweezers, leave it alone and let the skin heal.
3. After removing the tick, thoroughly clean the bite area and your hands with rubbing alcohol or soap and water.
4. Never crush a tick with your fingers. Dispose of a live tick by putting it in alcohol, placing it in a sealed bag/container, wrapping it tightly in tape, or flushing it down the toilet.

(Ref. per cdc.gov)

3.2.3.2 Rodents and Wildlife

If wildlife is encountered on site call Louth Callan Renewables, LLC's health and safety department to discuss our responsibilities for protecting regional species. During site operations, animals such as snakes, rabbits, deer, mice, and other rodents may be encountered. Workers will use discretion and avoid all contact with animals. If these animals are interfering with site operations, or if dead animals are observed, the DSSR should be contacted immediately for assistance and advice.

Hanta virus Pulmonary Syndrome (HPS) is a disease that may be contracted when a person comes into contact with Hanta virus-infected rodents, their nesting materials, droppings, urine, or saliva. HPS may develop when virus particles are inhaled, absorbed

through broken skin or the eyes, or when bittenby an infected animal. The majority of HPS cases have been reported in the Southwest; however, there is the potential for Hanta virus transmission in most regions with rodent populations. Risk to workers at the site is considered to be low; however, the severity of disease is high. Therefore, field personnel should be aware of the potential for exposure and should avoid coming into contact with rodents or theirburrows or dens.

Rabies is an acute, infectious, often fatal viral disease transmitted to humans by the bite of warm- blooded infected animals. This disease affects the central nervous system of humans. A rabid animal may be recognized by signs of raging, uncontrollable movement and possible foaming near or at the mouth. The best control method is avoidance of animals that could be rabid. If bitten by a potentially rabid animal, contact the DSSR immediately. The animal in question must be capture or trap the animalso that it can be tested for rabies. The bitten individual shall seek medical attention immediately.

3.2.3.3 Poisonous Plants

Poison ivy, poison oak, and poison sumac are identified by three or five leaves radiating from a stem. Poison ivy is in the form of a vine while oak and sumac are bush-like. All of these plants can produce adelayed allergic reaction. The plant tissues have an oleoresin, which is active in live, dead, and dried parts. The oleoresin may be carried through smoke, dust, contaminated articles, and the hair of animals.Symptoms usually occur 24 to 48 hours after exposure resulting in rashes that itch and blister. Should exposure to any of these plants occur, wash the affected area with a mild soap and water within one- half hour, but do not scrub the area. The best preventative measure for poisonous plants is recognition and avoidance.

3.2.3.4 Snakes

The degree of toxicity resulting from snakebites depends on the potency of the venom, the amount of venom injected, and the size of the person bitten. Poisoning may occur from injection or absorption of venom through cuts or scratches. The most effective way to prevent snakebites is to avoid snakes in the first place. Personnel should avoid walking at night or in high grass and underbrush. Visual inspection of work areas should be performed prior to activities taking place. The use of leather boots and long pants will be required, since more than half of all bites are on the lower part of the leg. No attempts at killing snakes should be made; many people are bitten in such an attempt. Personnel shallnot put their hands in areas where they cannot be seen. Should an employee need to work in high grass or swamp areas on site in areas where snakes are known or suspected to be, employees shall wear snake chaps.

When working in areas where snakes could be present, take the following precautions:

- Wear above the ankle boots or protective snake proof chaps/ gaiters.
- Be alert when walking through underbrush or areas obscured by foliage. Walk slowlyand give snakes time to get out of your way.
- Be careful when placing your feet and hands. Do not put hands under objects ormaterials which obscure your ability to see snakes that may be underneath.
- Be cautious when moving rocks or moving around or over rocky terrain.
- Probe areas before stepping over logs or piles of brush or debris.
- If bitten by a snake, get immediate medical attention.

3.2.3.5 Flying Insects

Flying insects such as mosquitoes, wasps, hornets, and bees may be encountered while project activities occur. Mosquito bites can be effectively prevented by the use of insect repellants containing DEET (at least 25%). Please note that there are some concerns with the use of DEET on skin and associated potential adverse health effects and it should be washed off when exposure has subsided. Treatment for insect bites and bee stings can be affected by the use of commercially prepared ointments. Personnel who are allergic to bee stings shall notify the DSSR prior to working on the project.

Be on the lookout for bees, wasps, and hornets. Do not reach into areas where they may be nesting.Dress appropriately; wear pants and wear long-sleeved shirts.

3.2.3.6 Spiders

Personnel shall be alert to the potential for spider bites. Spiders sometimes establish residence in stored clothing and PPE. It is advisable for personnel to inspect clothing and PPE for spiders prior to donning.Immediate reporting and medical evaluation are necessary if personnel suspect being bitten by a spider.If a spider bite is sustained, personnel shall report it to the DSSR.

3.2.3.7 2019 Coronavirus (Covid-19) Pandemic

Coronavirus (COVID-19) is an illness caused by a virus that can spread from person to person. The virus that causes COVID-19 is a new coronavirus that has spread throughout the world. COVID-19 symptoms can range from mild (or no symptoms) to severe illness. In order to maintain the health andsafety of our workers please review the referenced material below.

This COVID-19 related information and educational tools are to make employees aware of the currentthreat and steps Louth Callan Renewables, LLC is taking to prepare, control, and protect our employees and contractors.

- Provide information on the current threat.
- Communicate recommended practices to control the spread, such as effective hygiene, socialdistancing, personal protective equipment PPE and other preventative measures.
- Provide information on the signs and symptoms of the current threat.
- Provide instructions on how to respond if you or a coworker becomes sick at work
- Provide on-going employee training techniques for infection control.
- Provide instruction on appropriate personal protective equipment (PPE) for infection controlpurposes.
- Provide instructions on how to prevent cross contamination.

See attachment #6 for Louth Callan Renewables, LLC's SOP-71 Coronavirus 2019 (COVID-19) ProgramSee attachment #7 for Louth Callan Renewables, LLC's COVID-19 Field Protocols Ver. 1.0

3.3 Engineering Controls

The use of engineering controls for the protection of personnel is the first means of mitigation. This involves the elimination of hazards and the isolation of the workers from the hazards. Implementation of engineering controls can reduce the need for personal

protective equipment by separating the worker from the hazard through the use of equipment or materials.

3.3.1 Dust Hazards

Control measures will be implemented for all operations where dust is likely to be generated. Potentialdust concentrations will be reduced primarily by careful planning and implementation of controls. Thereare a number of specific construction practices, which will reduce levels of airborne particulates. These include:

- Providing for a misting spray during excavation activities
- Applying water on and sweeping haul roads.
- Hauling materials in properly covered containers.
- Reducing the active work area surface and limiting the number of concurrent operations.
- Regular washing of equipment.

4.0 SAFETY AND HEALTH TRAINING

All personnel working at the Site will review this HASP with the DSSR. Personnel will sign the Safety and Health Plan Sign-Off form to document their review and agreement to comply with the provisions of the HASP. All visitors must sign the visitor's log and wait in the Louth Callan Renewables, LLC field office for a briefingbefore entering the Site.

The DSSR will be responsible for training Site visitors in the hazard associated with the Site, to explainemergency procedures and instruct on the use of protective gear required during the visit.

Louth Callan Renewables, LLC shall maintain a training matrix outlining required training for Louth Callan Renewables, LLC and Subcontractor personnel on site. This training matrix shall list each person's name and completion of pertinent training. Louth Callan Renewables, LLC's database, spreadsheet, or form shall be submitted and approved by Owner. An example training matrix can be provided by the Owner, if necessary.

Training matrix shall include the completion dates of all OSHA required training (e.g., PPE, Hazard Communication, Control of Hazardous Energy / Lockout Tagout, Confined Space Entry, Fall Protection, Scaffold User, Crane Operator, Signal Person, Rigger, Hearing Conservation, Respiratory Protection, Powered Industrial Truck, and etc.).

Additional onsite training (e.g., orientation, fire watch, spotter, and dropped object prevention) shall also be provided to personnel depending on their job duties and assigned tasks. This additional training shallbe included in the training matrix with documentation provided to the Owner upon request for review.

Training dates and certifications shall be provided for mobile equipment operators (e.g., earthmoving equipment, aerial lift, skid steer loader, and powered industrial truck operators).

Louth Callan Renewables, LLC shall submit to Owner a list of competent persons (e.g., scaffolding, trench and excavation,confined space entry, electrical safety, fall protection, cranes and rigging, etc.) accompanied with a relevant work history / experience and training that qualifies them to perform the duties of a competentperson and/or a certificate of completion from a recognized training provider or employer audited program, as agreed upon with the Owner.

4.1 Initial Site Safety Training and New Hire Identification

Prior to commencement of onsite field activities, all site employees will attend a site-specific safety andhealth training session. This session will be conducted by the Site Designated Site Safety Representative (DSSR) to ensure that personnel are familiar with the requirements of this Site-SpecificSafety and Health Plan. The initial session will consist of the contents of this HASP and specific procedures developed for the project. The DSSR shall also provide initial site-specific training for replacement employees. **All employees must go through orientation and sign off on the HASP prior to commencement of work. Copies of these sign in sheets will be maintained with the HASP.**

As a minimum the site-specific training will include:

- Explanation of the Overall Site HASP
- Health and Safety Personnel and Organization
- Special attention to signs and symptoms of overexposure to known and suspected sitecontaminants
- Air monitoring description (if applicable)
- Physical hazards associated with the project
- Selection, use, and limitations of available safety equipment and proper procedures for its use.
- Personal hygiene and decontamination
- Site rules and regulations
- Site communication and the “Buddy System”
- Emergency preparedness procedures
- Review applicable Louth Callan Renewables, LLC Standard Operating Procedures
- Site Specific Hazard Communication
- Lockout / Tagout Affected Employee Training

New hires will be given a safety trained sticker (worn on their hard hat) that identifies that they haveparticipated in the site-specific safety training. New hires will also be given a green sticker (also to be worn on the hard hat that will identify them as new to the site.) New hire green stickers are to be worn for the **first month** of acclimation to the project.

4.1.1 OSHA 10- and 30-Hour Construction Safety Training

- All Foreman level and up employees shall have a minimum of 30 Hours of OSHA ConstructionIndustry Outreach Training.
- All other employees shall have a minimum of 10 hours of OSHA Construction Industry OutreachTraining.
- This training must be documented and provided to the DSSR before any employee will bepermitted to work on site.

4.1.2 Continuous Employee Training

Continuous on the job training will be provided at least weekly and prior to each change of operation. The training shall address safety and health procedures, work practices, any changes to HASP, reviewactivity hazard analysis, work task or schedule, results of previous week's air monitoring, review of safety discrepancies and accidents.

4.2 Safety Meetings

A well-ordered flow of information is essential to a good safety program. Louth Callan Renewables, LLC, through a program of safety meetings at all levels, intends to accomplish the goals of safety awareness, education, and participation.

The DSSR shall ensure weekly safety meetings are conducted with ALL on-site personnel every Tuesday prior to the start of each shift. An opportunity shall be provided for employees to voice safety-related concerns.

Take 5 Checklists are to be conducted daily before the start of work, at lunch break, and before the workers sign out for the day. This is to help communicate basic safety knowledge to all crews onsite and to make sure all procedures, equipment, and safety measures are known and in place for a safe and productive work day. The Take 5 checklist is to be additionally reviewed whenever there is a change in personnel, equipment, materials, environment or processes.

4.3 Hazard Communication Training

OSHA's standard for hazard communication requires that all workers be informed of potentially hazardous materials used in their work area, including cleaning chemicals. Louth Callan Renewables, LLC provides employees with information and training on hazardous chemicals at their work site at the time of their initial assignment, annually, and whenever a new chemical is introduced into their work site that could present a potential hazard. Personnel are briefed on the general requirements of the OSHA hazard communication standard and duty-specific hazards by their immediate supervisor before they begin anyduties on the work site. Personnel transferred from another site are also briefed on the duty-specific hazards by their immediate supervisor before they begin any duties on the work site.

4.5 Housekeeping, Sanitation, Toilets, and Washing Facilities

Personnel will be briefed on requirements to keep neat and tidy working area at all times. Materials required for that workday are to be staged on site as needed. All easily transportable materials and tools will be staged in a Conex box for the duration of the work and small tools and materials shall be stored in such Conex box's and or predesignated storage locations. When tools and equipment are idle the tools and equipment shall be staged in a designated location. Racking materials and electricalmaterial such as conduits and conduit supports being incorporated into the permanent works shall be staged and incorporated into the permanent works as work progresses. Pallets of PV panels will be staged as they are received and placed in the allocated location where they will be final mounted onto the structures. Contractors, project personnel, shall ensure to keep debris and trash picked up and placed into designated dumpsters on a daily basis.

Sanitation

Project shall establish and maintain hygienic sanitation provisions for all employees in all places ofemployment as specified in the following paragraphs.

Places of employment shall be kept as clean as possible, taking into consideration the nature of the work. Regular cleaning shall be conducted in order to maintain safe and sanitary conditions in the workplace.

- Periodic sanitation inspections of facilities shall be conducted at least weekly and documented.
- In workplaces where toxic dusts, fumes, or mists are generated, all surfaces in the work areaand adjacent common use areas shall be cleaned periodically.

Drinking Water

An adequate supply of potable water shall be provided in all places of employment, for both drinking and personal cleansing.

Drinking water shall be provided, whenever possible, from a local municipal water supply that is in compliance with federal, state, and local drinking water standards. Cool drinking water shall be providedduring hot weather. Drinking water shall be dispensed by means that prevent contamination between the consumer and the source.

Portable drinking water dispensers shall be designed, constructed, and serviced to ensure sanitary conditions, shall be capable of being closed and shall have a tap. Any container used to distribute drinking water shall be clearly marked “DRINKING WATER” and may not be used for other purposes.

Open containers (i.e., barrels, pails, or tanks) or any container (with or without a fit ted cover) from whichthe water is dipped or poured are prohibited for drinking water. Lid shall remain on a container exceptwhen being sanitized, washed or filled.

Use of a common cup (a cup shared by more than one worker) and other common utensils is prohibited. Employees shall use cups when drinking from portable water coolers/containers. Unused disposable cups shall be kept in sanitary containers and a waste receptacle shall be provided for used cups.

Potable drinking water dispensers shall only contain drinking water and shall not be used to store or cool drinks or food or other items.

Toilets.

General. Toilets shall be present in all places of employment and shall contain the following:

Exception: The requirements below do not apply to mobile crews or to normally unattended work locations if employees working at these locations have transportation readily available to nearby toilet and/or washing facilities.

Toilets shall remine within the proper ratio:
20 or less employees on site = 1 facility
20 or more employees on site = 1 toilet seat and 1 urinal per 40 workers
200 or more employees on site = 1 toilet seat and 1 urinal per 50 workers

Separate toilet facilities, in toilet rooms provided for each sex shall be provided in all places of employment. Separate toilet rooms for each sex need not be provided if toilet rooms can only be occupied by one person at a time, can be locked from the inside and contain at least one toilet seat. The following shall be provided in toilet facilities:

- Hand soap or similar cleansing agents shall be provided;
- Individual disposable paper towels or warm air blowers designed for hand-drying, convenientto the lavatories;
- An adequate supply of toilet paper and a holder for each seat;

Washing Facilities

Washing facilities shall be provided at toilet facilities and as needed to maintain healthful and sanitary conditions. Each washing facility shall be maintained in a sanitary condition and provided with water from an approved potable water supply. Water shall be either hot and cold or tepid running water. Soap and either individual disposable paper towels or warm air blowers designed for hand-drying shall be provided. If impractical to provide running water, hand sanitizer and individual disposable paper towelsmay be used.

Washing facilities shall be in close proximity to the worksite.

5.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

This section provides an outline of the PPE and guidelines that will be implemented to minimize chemical, physical, and biological exposures and accidents during site activities.

NOTE: Any employee who refuses to wear their PPE will be sent home immediately for the remainder of the day and without pay.

Minimum PPE required at all times by all personnel in all areas (Level D):

- Hard Hats
  - **Level E** shall be worn when working around electrical components
- Safety Glasses: ANSI Z87 Rated
- Class II Hi-Visibility Retro-Reflective Vest
- ANSI Cut 2 Resistant Gloves
- Safety-Toe Work Foot Boots
- Long Pants/Shirt with 6” or longer Sleeves

- ANSI cut 2 arm sleeves for material handling
- Flying Debris: Face shield and goggles required in addition to safety glasses
- Chain Saw Use: must have Chaps and Face shield
- Cutting/ Burning/ Welding: appropriate eye and face protection; appropriate gloves and armcoverings

All PPE shall meet the following requirements:

- It will be appropriate for the particular hazard.
- It will be maintained in good condition and inspected daily when in use.
- It will be properly stored when not in use, to prevent damage or loss.
- It will be kept clean, fully functional and sanitary.
- Must meet all applicable ANSI standards.

ADDITIONAL PPE MAY BE REQUIRED FOR CERTAIN ACTIVITIES - CONSULT WITH THE DSSR.

5.1 PPE Hazard Assessment

Selection of the appropriate PPE is a complex process, which should take into consideration a variety of factors. Key factors involved in this process are identification of the hazards, or suspected hazards, routes of potential exposure to employees (inhalation, skin absorption, ingestion, and eye or skin contact); and the performance of the PPE materials (and clothing seams) in providing a barrier to these hazards. The amount of protection provided by PPE is material-hazard specific.

Personal Protective Equipment alone should not be relied on to provide protection against hazards, butshould be used in conjunction with guards, engineering controls, and sound work practices.

5.1.1 Head Protection

All personnel shall wear at all times a hard hat that meets the requirements and specifications in ANSI Safety Requirements for Industrial Head Protection Z89.1. Exceptions to this requirement are personnel in the site office and designated rest and eating areas. Personnel working around electrical components should have an ANSI Class E hard had.

5.1.2 Hand Protection (Mandatory Glove Use)

Potential hand injuries include, but are not limited to laceration, puncture, abrasion, contusion, de-gloving (complete removal of skin), fractures, breaks and amputation.

The purpose of this section is to reduce and/or eliminate injuries to the hands and/or fingers.While engineering and administrative controls must be the first priority, it is recognized that not all hazards to the hands and fingers can be controlled to the extent necessary with thesemethods.

Wearing rings provides an outlet for personal expression. In some work environments, however, ringscreate a danger and has accounted for thousands of claims per year throughout the industry.
Employees often work around hazardous equipment or moving parts that could catch on rings. Requiring employees to wear gloves may not be enough to protect them from injury. Although someemployees may have concerns with removing rings, such as wedding bands, it is important to remember that the removal of rings is for their safety

and the safety of others. Risks include, but are not limited to:

1. Being pulled into moving parts resulting in severe injury or death.
2. Starting machinery or equipment unintentionally putting the employee and other employees atrisk.
3. Electrical Shock and Electrocution (death by electrical shock) due to conductivity.
4. Burns due to heat transfer.
5. Chemical burns due to chemicals becoming trapped between the rings and the skin. Somechemicals may also damage rings.
6. Other hand and finger injuries ranging from simple contusion to de-gloving (complete removalof skin from hand/finger), fractures and/or amputation.

As such, rings are required to be removed prior to working in the following situationsor situations that may pose similar hazards:

1. When working in, on or around moving parts, including the use of hand and power tools,especially those with rotating parts such as saws and drills.
2. When operating heavy equipment.
3. When operating vehicles that require employees to engage levers, etc., such as dumptrucks.
4. When climbing is required, such as when utilizing ladders or formwork.
5. When repairing vehicles or equipment, including office equipment such as printers.
6. When cutting, burning or welding.
7. When utilizing rigging equipment.
8. When handling hazardous chemicals or materials.
9. When working with electrical components, whether energized or not.

Failure to remove rings when working in the above listed and similar situations may result indisciplinary action up to and including termination.

- **Mandatory Glove Use**

Louth Callan Renewables, LLC has adopted a Mandatory Glove Policy, whereas **all tasks and activities, especially those that pose laceration, puncture and abrasion hazards shall require the use of a minimumLevel 2 Cut-Resistant Glove. This requirement extends to and includes all site visitors, supervisors and workers (including subcontractors) whether actively working or simply walking on site.**

Furthermore, Louth Callan Renewables, LLC recognizes that there are many different glove materials with a variety or performance characteristics that can be utilized in many different applications. Each site needs to evaluate the specific need for gloves of varying materials and other performance characteristics (described below) that may be required for different tasks, such as welding or handling hazardous chemicals. The only requirement in the selection and use of gloves is that **the gloves which are selected shall meet a minimum of Level 2 Cut-Resistance.** A member of the Safety Department canassist in glove selection and the teams are encouraged to receive feedback from them.

Gloves may be removed while actively operating heavy equipment and vehicles but must be placed back on the hands prior to exiting the cab of the machine. Gloves shall be kept on persons at all times.

Failure to adhere to the policies described above may result in disciplinary action up to and includingtermination.

5.1.2.1 Electrical Rated Personnel Protective Equipment

Tasks being performed on energized equipment, whether being performed for pre-start up, commissioning, and/or start up commissioning, shall be undertaken with the appropriate PPE. Such PPE shall consist of but, not limited to, the appropriate rated Rubber Insulating Gloves and use of Insulated and Insulating Hand Tools and body protective coverings. When working with Medium Voltage equipment in an energized state, a Take 5 safety analysis is to be performed for that operationoutlining the appropriate use of Arc-Rated Face Shields, Arc Rated Flash Hood, Arc Rated Gloves or Rubber Insulating Gloves, and the use of Arc Rated Flash Suit Jacket and Pants. Flame Resistant (FR)protective clothing shall be used in accordance with NFPA 70E 2015.

There are four categories of FR clothing which range from PPE category 1, which allows single-layer FR arc-rated shirts, pants or coveralls, up to Category 4, that requires a FR arc-rated shirt and pants, plus a double layer stitching coat and pants. (NOTE: As of the 2015 edition of NFPA 70E, all garmentsfor PPE 1 through 4 MUST be Arc-Rated. Older editions of the standard allowed for "layering" solutionsusing 100% cotton, non-FR T-shirts worn under rated FRC.)

FR PPE shall be chosen based on the certified electrical companies Health & Safety Plan and own hazard analysis, which determines the right clothes for the potential incident energy exposures in a given work environment.

5.1.3 Eye/Face Protection

Eye/Face protection shall be worn by all personnel at all times. Double eye protection will be required when there is a risk of flying debris or materials. All eye/face protection provided shall be ANSI Z87- 2010 approved.

Goggles or sealable fitting eyewear (e.g., spoggles) shall be worn, in conjunction with a face shield or welding hood, by all employees performing grinding, welding, and/or cutting operations on any material(e.g., metal, wood, plastic, concrete, etc.) with a powered tool.
Anyone within 10 feet of grinding, welding, and cutting operations shall wear goggles or sealable eyewear (e.g., spoggles).
Goggles or sealable eyewear and face shield are required within 10 feet of concrete discharge (e.g., concrete chutes, shotcrete operations, etc.).

Goggles or sealable fitting eyewear (e.g., spoggles) shall be worn by employees who are involved in scaffold erection / dismantling, vacuuming, insulating activities, or other dusty operations where airborne particles / debris are generated.

Louth Callan Renewables, LLC and Subcontractors shall provide various styles of eye protection and ensure eyewear is correctly fitted (i.e., proper size for face with negligible gaps /voids between frame and skin). Sealable eyewear (e.g., spoggles) shall be form fitted and seal against the face so flying debris and airborne particles cannot enter.

5.1.4 Footwear

Footwear will be safety-toe boots and shall be worn by all personnel at all times. All safety-toe boots shall meet ASTM requirements. Metatarsal protection shall also be worn when there is a danger of impact of objects fall onto or rolling up the upper foot (such tasks as using a jumping compactor).

5.1.5 High Visibility Retro-Reflective Safety Vests

All personnel shall wear ANSI 107 Class 2 High Visibility Retro-Reflective Safety Vests at all times.

5.1.6 Respiratory Protection

This program will ensure that respiratory hazards on our projects are evaluated and that information concerning these hazards is transmitted to all employees and address the issues of evaluating the potential respiratory hazards, communicating information concerning these hazards, and establishing appropriate engineering controls/work practices, or respiratory protective measures for employees.

The use of respiratory protection is not anticipated on this project. Except where voluntarily used for nuisance dust, the selection and use of respirators shall be based on actual air sampling data or a calculated estimate of exposure levels above the regulatory exposure limits in 29 CFR Subpart Z. Respiratory protection level and cartridge type (where used) shall be appropriate for the chemical hazard encountered and for the anticipated or known exposure level.

5.2 Levels of Protection

The level of protection must correspond to the level of hazards known or suspected for the specific workactivity, environment or situation.

Once the need for PPE is established, a careful evaluation of the hazards is necessary so that a selection can be made that minimizes the risk to the user. For chemical situations, knowing the hazardincludes being aware of: the type of chemical, the physical state (liquid, solid or gas), and the physiological effect (toxic, corrosive, etc.). Knowing the level of exposure is also important when selecting protective clothing and equipment.

Air monitoring using direct-reading instruments and personal air sampling (as required) may be performed (as required) to determine if an upgrade or downgrade from initial PPE levels is warranted. All decisions on the level of protection will be based upon a conservative interpretation by the DSSR of the information provided by air monitoring results, environmental results and other appropriate information. **No changes to the level of protection will be allowed until the item has been reviewedand approved by Safety and Health Manager.** Changes to Site Specific Safety and Health Plan willbe documented and approved by using the ***"Safety and Health Plan Revision Request Form"***

5.2.2 Level D

Level D equipment is defined in the sections above and is the same as the minimum required PPE listed for the site. **Refer to section 5.0 PPE**

5.3 Initial Levels of Protection

Based upon the nature of the activities to be performed at the Site, the initial levels of protection to be used are outlined in ***Table 7, "Initial Levels of Protection"***. This table lists each work task and the initial level of protection. The initial level of protection is defined as that level in which work commences.

Table 7 - Initial Level of Protection		
Task	**CPC**	**Level of PPE**
Mobilization	None	Level D
Survey	None	Level D
Erosion and Sediment control	None	Level D
Clearing and Grubbing	None	Level D
Install SWPPP Controls	None	Level D
Install cover soils/grading	None	Level D
Site Restoration, seeding, planting	None	Level D
Demobilization	None	Level D

Once the need for PPE is established, a careful evaluation of the hazards is necessary so that a selection can be made that minimizes the risk to the user. For chemical situations, knowing the hazardincludes being aware of the type of chemical, the physical state (liquid, solid, or gas), and the physiological effect (toxic, corrosive, etc.). Knowing the level of exposure is also important when selecting protective clothing and equipment.

Air monitoring using direct-reading instruments and personal air sampling (as required) may be performed (as required) to determine if an upgrade or downgrade from initial PPE levels is warranted.

All decisions on the level of protection will be based upon a conservative interpretation by the DSSR ofthe information provided by air monitoring results, environmental results and other appropriate information. **No changes to the level of protection will be allowed until the item has been reviewedand approved by Safety and Health Manager.** Changes to Site Specific Health and Safety Plan willbe documented and approved by using the ***"Health and Safety Plan Revision Request Form"***

6.0 AIR MONITORING

The air-monitoring plan will serve to outline procedures to identify and quantify airborne chemical contaminants during activities at the site. Engineering controls will be utilized to the maximum extent possible to control the production of dust/particulates during the project. Engineering controls may include the use of tarps or coverings, water misting or dust control additives. Data will be reviewed bythe Safety and Health Manager.

6.1.1 Organic Vapor Monitoring

During excavating, stockpiling, or other handling of site materials, organic vapor levels will be monitored with a multi-gas monitor/PID equipped with a 10.2 eV probe or equivalent device (a copy of the PID Operator's Manual will be kept on-site). This monitoring shall be conducted during initial excavation to determine exposure potentials and continuously throughout intrusive activities to determine changes in potential exposures. Real-time air monitoring equipment calibration will be performed in accordance with the manufacturer's recommendation prior to field use. Calibration information will be recorded on the Daily Air Monitoring Report. Maintenance and

calibration procedures for all air monitoring devices will be maintained on site.

6.1.2 Particulate Monitoring

During excavating, stockpiling, or other handling of site materials or dusty conditions are found duringthis project, real-time air monitoring will be performed to address airborne particulate generated duringmaterial handling activities, as necessary. If necessary, air monitoring will be performed at the work area using an approved Particulate Monitor. Real-time air monitoring equipment calibration will be performed in accordance with the manufacturer's recommendation prior to field use. Calibration information will be recorded on the Daily Air Monitoring Report. Maintenance and calibration procedures for all air monitoring devices will be maintained on site.

6.1.3 Crystalline Silica

Louth Callan Renewables, LLC's Crystalline Exposure Program describes the hazards associated with projects involving potential exposure to airborne concentrations of crystalline silica and the issues to be addressed duringproject operations.

At a minimum, control methods (e.g., engineering controls, work practices, and respiratory protection) for activities addressed in 29 CFR 1926.1153, Table 1 shall be followed.

***SEE APPENDIX FOR CRYSTALLINE SILICA EXPOSURE PROGRAM**

6.1.4 Hydrogen Sulfide Monitoring (See table 8 for Action Levels)

Hydrogen Sulfide also known as H2S (Hydro sulfuric acid, Sewer gas, Sulfuretted hydrogen) is a colorless gas that carries a distinct odor of rotten eggs at lower concentrations (Higher concentrations can deaden the sense of smell). It is a flammable gas and is extremely dangerous to life and health if exposed to hazardous concentrations (see operational action level chart). Hydrogen Sulfide occurs naturally in crude petroleum and natural gas and can be produced by the breakdown of organic matterand human/ animal wastes (ex. landfills). It is slightly heavier than air and can collect in low-lying, enclosed, and poorly ventilated areas such as basements, manholes, sewer lines and underground telephone/electrical vaults. The landfill may still produce hazardous levels of Hydrogen Sulfide gas which is collected in the landfill gas collection system. If Hydrogen Sulfide is detected the area shall beimmediately evacuated and work shall cease until the hazard is assessed by safety.

6.1.5 Methane Monitoring (Landfill)

Methane is an extremely flammable gas produced by the landfill. Methane is produced naturally through the landfills waste decomposition processes. It is highly reactive with oxidizers, halogen and some halogen-containing compounds. Methane is a potential fire hazard that can easily ignite, even by static discharge. **No SMOKING shall be permitted on site. All hot work activity shall be prohibited on the landfill and shall be located off site.** Adequate fire protection shall be located throughout site. In high concentrations Methane is an asphyxiant posing a significant health hazard by displace oxygen in the air. This can lead to suffocation, especially in low laying areas and enclosedspaces. Oxygen levels should always be maintained above 19.5%.

Operating Heavy Equipment within a 10ft radius of the gas wells is prohibited. Gas wells shall beprotected at all times by means of a physical hard barricade.

Atmospheric monitoring for Methane and other combustible gases will be conducted during site operations. Multi-Gas Monitors will be used to monitor gas levels in the atmosphere. In an eventwhere gases released, evacuated the area immediately.

6.2 Operational Action Levels

A decision-making protocol for an upgrade in levels of protection and/or withdrawal of personnel from an area based on atmospheric hazards is outlined in ***Table 8 – "Operational Action Levels".***

Table 8 - Operational Action Levels

Contaminants	Action Level	Action to Take
Volatile Organic Compounds	• < 1 PPM Above Background at the Breathing Zone and Sustained For 1 Minute • 1 To 10 PPM Above Background at the Breathing Zone and Sustained For 1 Minute • Greater than 10 PPM Above Background at the Breathing Zone and Sustained For 1 Minute	• Level D, Periodic Air Monitoring • Level D, Continuous Air Monitoring, andQuantify with Colorimetric Tubes as appropriate. • Stop Work and evaluate source. If levelsdo not subside, contact Safety Manager.
Respirable Particulate in Air (working area)	• Visible dust sustained from site activities. • Less Than 3.0 mg/m^3 at the Breathing Zone and Sustained For 1 Minute • Greater Than 3.0 mg/m^3 at the Breathing Zone 15 minute average	▪ Evaluate Activities, Implement Dust Control, Conduct particulate monitoring ▪ Continue work Level D ▪ Implement/Increase Dust Control, Continuous Air Monitoring for Particulate.If levels do not subside contact Safety Manager.

Combustible Gas	• Less Than 10% LEL • Greater Than 10% LEL	▪ Continue work/ventilate as appropriate. ▪ Stop Work, Withdrawal Personnel, and investigate. If levels do not subside contact Safety Manager
Carbon Monoxide	▪ Less Than 20 PPM ▪ 20 PPM to 25 PPM ▪ Greater Than 25 PPM	▪ Continue Work ▪ Stop Work, Withdrawal Personnel, Evaluate/ventilate work area ▪ If levels do not subside contact SafetyManager
Hydrogen Sulfide	▪ Less Than 10 PPM ▪ Greater Than 10 PPM	▪ Level D Modified, Continue Work with AirMonitoring ▪ Stop Work and evacuate immediate area.Contact Safety Manager
Oxygen in Air	▪ Less Than 19.5% ▪ 19.5 To 23.5% ▪ Greater Than 23.5%	▪ Stop Work &Ventilate or Contact SafetyManager Continue Work ▪ Stop Work, Immediate Withdrawal of Personnel and Evaluate. Contact SafetyManager
Crystalline Silica	▪ Less Than 50 micrograms per cubic meter of air ▪ Greater than 50 micrograms ▪ per cubic meter of air	▪ Select appropriate control measure to reduce silica dust ▪ Stop Work Immediately and consultSafety Manager

6.3 Personal Air Sampling (Laboratory Analysis)

Although not anticipated on this project, a personal air-monitoring program may be implemented basedon direct-reading air monitoring instrumentation readings to provide for the determination of worker's airborne exposure levels. The implementation of personnel exposure monitoring shall be determined by the DSSR based on the presence of contaminant levels as measured by direct reading instruments.Exposure evaluation will be based on laboratory analysis of air samples collected from workers duringan 8- hour work shift. The selection of the worker to be monitored for daily exposure will be done by the DSSR based on his professional judgment of the characteristics of the job and locations in each work area. Personal sampling will be conducted in a manner representative of exposure of workers at thoselocations or jobs where the potential for maximum exposure is predicted. Personal air monitoring results will be used to verify personnel exposure during the remedial project. Samples will be collected from representative workers during material handling activities.

Where industrial hygiene (IH) monitoring is performed by Louth Callan Renewables, LLC, Subcontractor, or third party, a copy of the IH monitoring results shall be provided to the Owner. Names may be removed to preserveprivacy concerns.

Industrial hygiene air samples shall be submitted to a laboratory accredited by the American IndustrialHygiene Association for the analytical method used.

7.0 SAFETY PROCEDURES AND WORK PRACTICES

7.1 Safety Bulletin Board Emergency Phone Numbers, OSHA Posters,

Emergency telephone numbers and Route to the Area Hospital will be clearly posted and easily visibleat all times and shall be made available in all work areas. There should be OSHA posters prominently displayed and warning signs posted for any known or potential hazard(s) present. Safety Data Sheets(SDS) must be available on the job site at all times. All postings must be in a conspicuous location.

The project team shall erect and maintain a safety bulletin board in a commonly accessed area in clearview of the on-site workers. The bulletin board shall be continually maintained and updated and placed in a location that is protected against the elements and unauthorized removal. It shall contain, at minimum, the following safety information:

- A map denoting the route to the nearest emergency care facility;
- Emergency phone numbers;
- A copy of the most current Health and Safety Plan mounted on/adjacent to the bulletin board,or a notice on the bulletin board stating the location of the Plan. The location of the Plan shall be accessible on the site by all workers;
- The Occupational Safety and Health Administration (OSHA) Form 300A, Summary of Work Related Injuries and Illnesses, posted in accordance with OSHA requirements (from February 1to April 30 of the year following the issuance of this form). It shall be mounted on/adjacent to the bulletin board, accessible on the site by all workers;
- Safety and Health promotional posters;
- OSHA Safety and Health Poster;

7.1.2 Accident Prevention Signs, and Traffic Control

Signs, tags, and labels shall be provided to give adequate warning and caution of hazards. They are provided to instruct and direct workers and the public. All warning systems such as signs, tags, and labels shall be visible at all times when the hazard or problem exists and shall be removed or covered when the hazard or problem no longer exists. All employees shall be informed as to the meaning of thevarious signs, tags, and labels used throughout the workplace and any special precautions that may berequired.

Traffic Control

Traffic control at public roadways shall be accomplished in accordance with DOT Federal HighwayAdministration's MUTCD.

Project management team shall conduct its operations in such a manner as to offer the least possible obstruction to the safe and satisfactory movement of traffic over the existing roads during the course ofthe work. Contractors shall be responsible for providing, erecting, maintaining, and removing all traffic signs, barricades, and other traffic control devices necessary for maintenance of traffic. All barricades, warning signs, lights, temporary signals, other devices, flagmen, and signaling devices shall meet or exceed the minimum requirements of the local DOT requirements.

Parking
Employee parking area shall be identified in the preparation phase of the project. Consideration of workforce size, and site space and conditions will be important when choosing a parking area.

When feasible perform pull-through parking (pulling through a space, so the vehicle is facing outwardsin the next space) when available. Backing into a parking space is preferred over directly pulling in. Thisprovides the operator an easier exit from the parking area.

7.2 First Aid Kits

First-aid kits/stations and required contents are maintained in a serviceable condition. Unit-type kits have all items in the first-aid kit individually wrapped, sealed, and packaged in comparable sized packages. First-aid stations shall be located as close as practicable to each work area. First-aid stationsshall be well-marked and available to personnel during all working hours. First-aid stations shall be equipped with a first-aid kit, the size of which shall be dependent upon the number of personnel normally employed at the work site. The minimum size kit is a 10-Person First Aid Kit. Each foreman's vehicle shall also be equipped with a minimum 10-Person First Aid Kit and Flashlight. All project site should have a minimum of a **Level B** first aid kit.

An adequately supplied medical jump bag (i.e., EMT / trauma bag) and AED shall be provided and available to First Aid / CPR / AED trained personnel.

7.3 Personal Protective Equipment and Clothing

Where there is a danger of flying particles or corrosive materials, employees must wear protective goggles and/or face shields. Employees are required to wear safety glasses at all times in all non-officeareas. Employees who need corrective lenses are required to wear only approved safety glasses, protective goggles, or other medically approved precautionary procedures when working in areas with harmful exposures, or risk of eye injury. Employees are required to wear protective gloves, aprons, shields, and other means provided in areas where they may be subject to cuts, corrosive liquids, and/or harmful chemicals.

Hard hats must be worn at all times while at sites, with the exception of the office/break areas. Appropriate footwear including safety-toed shoes must be worn at all times.

Class 2 High Visibility Retro-Reflective Safety vests shall be worn at all times.

When necessary, employees must use the approved respirators, which are provided for regular and emergency use. Allsafety equipment must be maintained in sanitary condition and ready for use. Report any defective equipment immediately. Food may not be eaten in work areas, or in places where there is any danger of exposure to toxic materials or other

health hazards. In cases of cleaning toxic or hazardous materials, protective clothing provided must be worn.

7.4 Combustible Materials

All combustible scrap, debris and waste materials (oily rags, etc.) must be stored in covered metal receptacles and removed from the work site promptly. Proper storage to minimize the risk of fire, including spontaneous combustion must be practiced. **Only approved UL Listed Metal Safety containers with spring loaded self-closing lids and flash arrestors are to be used for the storageand handling of flammable and combustible liquids. Gasoline cans must be RED; Diesel cans must be YELLOW; Kerosene cans must be BLUE.** All connections on drums and combustible liquidpiping, vapor and liquid must be kept tight. All flammable liquids should be kept in closed containers when not in use (e.g., parts-cleaning tanks, pans, etc.). Liquefied petroleum gas must be stored, handled, and used in accordance with safe practices and standards. No smoking signs must be posted. All solvent wastes and flammable liquids should be kept in covered containers until they are removed from the work site. Fuel gas cylinders and oxygen cylinders must be separated by distance, fire resistant barriers, etc., while in storage**. Fire extinguishers will be 20 lb. ABC and placed in areas where they are to be used.** Fire extinguishers must be located within 75 ft. of outside areas containing flammable liquids, and within 10 ft. of any inside storage area for such materials. "NO SMOKING" rules will be enforced in areas involving storage and use of hazardous materials. "NO SMOKING" signs shall be posted where appropriate in areas where flammable or combustible materials are used and/or stored. All spills of flammable or combustible liquids must be reported and cleaned up promptly. Follow appropriate bonding procedures when transferring flammable/combustible liquids from one container toanother.

Dry chemical fire extinguishers will not be used in locations with electrical equipment and componentsincluding*;* Battery storage equipment and components; Electrical Panels and Relaying Panels; Power Panels; Electrical Switchgear, Motor Control Centers; DCS Cabinets / Control System; Isolated PhaseBus; and High Voltage Breakers. Water, foam, and powders can damage wiring, circuits, and internal parts that can ruin or affect critical systems and circuits. Carbon Dioxide (CO_2) or Halon fire extinguishers, which do not leave a residue and/or contain moisture, must be located / mounted in areascontaining sensitive equipment and components.

7.5 Hazardous Substances

When hazardous substances are used in the workplace, the employees will be trained in the hazard communication program dealing with Safety Data Sheets (SDS), substance hazards, labeling, etc. SDSmaterials will be readily available for each hazardous substance used. A training program dealing withhazardous materials will be given to keep employees informed. The program will include an explanationof what an SDS is and how to use and obtain one; SDS contents for each hazardous substance or classof substances; explanation of the "Right to Know"; identification of where employees can see the employer's written hazard communication program and where hazardous substances are present in their work area, the health hazards of substances in the work area, how to detect their presence, and specific protective measures to be used, as well as informing them of hazards of non-routine tasks andunlabeled pipes. Copies may be provided at request.

7.6 Work Areas

Work sites must be clean and orderly. Spills must be reported and cleaned up immediately.

All combustible scrap, debris and waste must be stored safely and removed promptly. Waste containers must be covered. Oily and paint-soaked rags are combustible and should be discarded in sealable metal containers only. Make sure all pits and floor openings are either covered or otherwise guarded. Fire extinguishers must remain accessible at all times. Work sites shall be kept free of debris, floor storage and electrical cords.

7.7 General Fire Safety

No smoking shall be permitted anywhere on site at any time except in designated smoking areas.
Any employee caught smoking outside of a designated area will be promptly removed from the site.

If required, the SHS will establish areas approved for welding, cutting, and other hot work. Hot work (welding, burning, cutting, etc.) conducted on-site must comply with the following Hot Work Procedures.A Hot Work Permit shall be obtained from the SHS, if required. All personnel shall be protected from welding radiation, flashes, sparks, molten metal, and slag. All welding, burning, and cutting equipmentshall be inspected daily by the operator. Defective equipment shall be tagged and removed from service,replaced or repaired, and re-inspected before again being placed in service. All welders shall be properly trained in the safe operation of their equipment, safe welding/cutting practices, and welding/cutting respiratory and fire protection, such as leather arm coverings and gloves.

Cutting or welding shall NOT be permitted in the presence of explosive atmospheres (mixtures of flammable/combustible gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside un-cleaned or improperly prepared drums, tanks, or other containers, and equipment which has previously contained such materials.

Where practical, all combustible material shall be relocated at least 35 feet away from the hot work site.Where relocation is impractical, combustibles shall be protected with flame proofed covers or otherwiseshielded. At a minimum, two fully charged and operable fire extinguishers, appropriate for the type of possible fire (10- ABC), shall be available at the work area. A fire watch shall be required whenever hotwork is performed and a minimum of 30 minutes after hot work is complete.

A hot work permit will be completed by the SHS, reviewed with personnel who will perform the hot work,and posted near the work area. The hot work permit is good only for the date issued and is valid only for the eight-hour shift for which it is issued. If at any time during the hot work operation a change in conditions at the work site is suspected, such as a release of flammable gases or vapors in the work area, work shall be stopped immediately and the SHS, shall be notified. Such work stoppage invalidatesthe hot work permit, and a new permit shall be completed after inspections and tests have been performed by the SHS.

Portable fire extinguishers are provided in adequate number and type (10 lb. ABC) and are located throughout the site. Fire extinguishers are located in readily accessible locations. Fire extinguishers are recharged regularly, and the date of last inspection noted on their tags. Extinguishers should be placedfree from obstructions or blockage. All extinguishers must be fully charged and in their designated places unless in use. All employees are periodically instructed in the use of extinguishers and fire protection procedures

7.8 Fueling

Where flammable liquids are used, employees will be trained to deal with spillage during fueling operations, clean-up methods, the types and designs of fueling hoses and the specific types of fuel it can handle, whether fueling is being done with a nozzle that is a gravity flow system or self-closing, howto avoid spills and recognition that if a spill does occur, the safety of restarting an engine. Employees must be aware that an open flame or light near any fuel is prohibited when fueling or the transfer of fuelis occurring. **"NO SMOKING" signs will be posted conspicuously. Vehicles/Equipment shall be turned off during fueling.**

Refueling shall be conducted greater than 125 feet from surface water and storm drains and requires 100% attendance by the fueling attendant. Spill drip pans shall be installed at every re-fueling station and used to capture potential leaks while re-fueling. The fueling device / truck shall have appropriatelyrated fire extinguishers in adequate quantity for the fuel being dispensed and a suitable spill kit to immediately remediate any release.

All fueling stations / trucks shall have appropriate signage and labeling required by OSHA, NFPA, DOT,and/or other government agencies as well as “No Smoking Within 25 Feet “ signs shall be posted in alllocations where flammable liquids are dispensed, used, or stored. At least a 20lb portable fire extinguisher shall be located no more than 50ft from fueling area.

7.10 Machine Guarding

All equipment and machinery should be securely placed and anchored when necessary, to prevent tipping or other movement that could result in personal injury. Electrical power to each machine shall be capable of being locked out for maintenance, repair or security. All manually operated valves and switches controlling the operation of equipment and machines must be clearly identified and readily accessible. All moving chains and gears must be properly guarded. The supervisor will instruct every employee in the work area on the methods provided to protect the operator and other employees in themachine area from hazards created by the operation of a machine, such as nip points, rotating parts, flying chips, and sparks. The machinery guards must be secured and arranged so they do not presenta hazard. All radial arm saws must be arranged so that the cutting head will gently return to the back ofthe table when released.

7.11 Lockout/Tagout Procedures

All machinery or equipment capable of movement must be de-energized or disengaged and blocked orlocked out during cleaning, servicing, adjusting or setting up operations. The lockout procedure requires that stored energy (i.e. mechanical, hydraulic, air) be released or blocked before equipment is locked out for repairs. Appropriate employees are provided with individually keyed personal safety locks. Employees are required to keep personal control of their key(s) while they have safety locks in use. Employees must check the safety of the lockout by attempting a start up after making sure no one is exposed. Where the power-disconnect does not also disconnect the electrical control circuit, the appropriate electrical enclosures must be identified. The control circuit can also be disconnected and locked out.

For electrical isolations where employees may contact conductors that were previously energized, a qualified person shall use a voltage detector to test the circuit elements and electrical parts to verify they are de-energized. Voltage detectors shall be checked for

proper operation as described in its operations manual immediately before and immediately after use (i.e., live-dead-live test).

Temporary Electrical service installation will be performed by a qualified electrician, and work may onlybe performed on de-energized equipment. Lockout/Tagout procedures will be implemented to assure the safety of personnel during electrical work activities.
Louth Callan Renewables, LLC shall be responsible for legibly labeling all breaker panels, switch boxes, disconnects, and etc. used by the Louth Callan Renewables, LLC and Subcontractors with the respective voltage and phase rating and whatthe box / panel / service controls.

Louth Callan Renewables, LLC shall be responsible for legibly labeling / tagging all temporary systems and equipment installed by Louth Callan Renewables, LLC and Subcontractors with the appropriate equipment and system information along with contact information of the installer and end user.

Louth Callan Renewables, LLC and Subcontractors shall utilize tags and labeling that are weather resistant and suitable forthe environment in which they will be used so that information remains legible. When zip ties / cable ties are used to attach various LOTO tags (e.g., lockout tags, test tags, custody tags, and etc.), the zipties shall have a tensile strength of at least 50 pounds and have ultra-violet (UV) protection.

For Multiple-Point Lockout and Tagout Equipment-specific, written procedures must be developed andimplemented for equipment with multiple isolation points or that otherwise does not meet the conditionsfor single-point lockout or tagout. The written procedure must identify all the hazardous energy sources for the equipment item or process, and the technique(s) required to isolate each source. An authorized employee or their supervisor must develop the procedure. If developed by an authorized employee, their supervisor must approve the procedure.

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- An authorized employee, designated by the supervisor, shall inform affected employees that service or maintenance is required on the equipment and that it must be shutdown, locked out,and tagged.
- The designated authorized employee will shut down the equipment using the normal shutdownprocedures (i.e., activate the stop button, open the switch, close the valves, etc.). Specific shut-down operations should be described in the written procedure.
- The designated authorized employee will isolate all sources of energy (i.e., turn off the breaker, apply blind flanges on a pipe, etc.). Specific energy sources and isolation operations should bedescribed in the written procedure.
- The designated authorized employee will attach a group lock and tag on each isolation point.
- The designated authorized employee will place a copy of the procedure and the key(s) into thelock box
- The group locks into a lockbox under the supervision of at least one other authorized employeeor supervisor. The designated authorized employee will then place a hasp and tag on the lockbox and place their employee lock on the hasp.

- The designated authorized employee will test the equipment to verify the effectiveness of the lockout device, if applicable. Specific test procedures should be described in the equipment specific lockout/tag out procedure.
- Each authorized employee should visually inspect the isolation of the equipment and when satisfied that it is correctly and safely isolated, place their lock on the hasp prior to beginning work. When an authorized employee completes their work, they are responsible for removing their lock from the lockbox.
- When the equipment is ready to be returned to service the designated authorized employee should check the equipment and the immediate area to ensure that nonessential items have been removed, that all components are operationally intact, and that all guards or other protective features are restored.
- The designated authorized employee will check the work area to ensure that all personnel are safely positioned away from the equipment.
- The designated authorized employee will verify that the controls are in the neutral, off, or safe position.
- All authorized employees will remove their locks from the lockbox.
- The designated authorized employee will notify affected employees that work is complete and the equipment is ready to be returned to service.
- The designated authorized employee will remove their lock, the group locks, and associated tags, and then re-energize the equipment.

Lockout/Tag out Subcontractors
Sub-contractors or vendors performing service, maintenance, and/or construction work at Louth Callan Renewables, LLC Projects are required to have in place and follow their Lockout/Tag out Program equal to or more stringent the Louth Callan Renewables, LLC program. Louth Callan Renewables, LLC will issue all Lockout/Tag out Permits. When outside service personnel (i.e., independent contractors or service vendors) are to be engaged in a group lockout with Louth Callan Renewables, LLC the authorize employee employees will follow the group lockouts procedure andcontractors will apply their locks to the lockbox hasp. Communication between/among groups must take place to ensure all affected and authorized employees are protected.

Shift or Personnel Changes

To maintain continuity in the protection provided for those involved in the lockout/tag out procedures, and for the orderly transfer of the lockout/tag out devices, the steps below are necessary during personnel or shifts changes.

- Personnel Changes. The arriving authorized employee's lock and tag should be applied beforethe departing authorized employee's lock and tag are removed. The departing personnel will inform the arriving personnel of the status of the equipment and the work in progress.
- Group Lockout Shift Changes. The lock and tag of at least one authorized employee on the arriving shift should be applied before the last crewmember of the departing crew removes theirlock. The departing crew will inform the arriving crew of the status of the equipment and the workin progress.

Removal of Another Employee’s Lock

When the authorized employee who applied the lockout devices and associated tags is not available to remove them, the devices may be removed by the authorized employee's supervisor in accordance with the process described below:

- The authorized employee's supervisor must verify that the authorized employee who applied thelockout device(s) and associated tag(s) is not on duty and that their work is no longer in progressby taking all reasonable efforts to contact the authorized employee to inform him/her that the devices need to be removed.
- An authorized employee/supervisor returns the equipment to service and notifies the affectedemployees that service maintenance is complete and the equipment is ready for use.
- When the employee returns to work, the supervisor notifies him/her that their lock(s) and tag(s)were removed.
- This process and reason for removal, as well as who was contacted, shall be documented on the daily log for that particular task and work area.

Lockout/Tag out Training

The OSHA standard requires employers to conduct lockout/tag out procedural training and retraining sessions for all of its authorized and affected employees. Also, the employer is required to perform periodic site inspections to ensure that the lockout/tag out procedure is fully understood and followed by each employee. Louth Callan Renewables, LLC's site specific safety orientation shall include Lockout / Tagout (LOTO) "Affected Employee" training for all employees, Subcontractors, vendors, and visitors who work in an area where LOTO activities may occur.

The Project Management Team shall ensure that all personnel involved in lockout/tag out procedures are trained. The training shall include the following elements:

- Recognition of applicable hazardous energy sources,
- Methods and procedures for energy isolation and control,
- Lockout/tag out equipment and supplies,
- Limitations of tag out.

7.12 Electrical

Equipment such as electrical tools or appliance must be grounded or of the double insulated type. Extension cords being used must have a grounding conductor. If ground-fault circuit interrupters are installed on each temporary AC circuit at locations where construction or excavations are being performed, temporary circuits must be protected by suitable disconnecting switches or plug connectorswith permanent wiring at the junction. Personnel must be aware of the following: Exposed wiring and cords with frayed or deteriorated insulation must be repaired or replaced. Flexible cords and cables must be free of splices or taps. Clamps or other securing means must be provided on flexible cords orcables at plugs, receptacles, tools, and equipment. The cord jacket must be held securely in place. Allcord, cable, and raceway connections must be intact and secure. In wet or damp locations, electrical tools and equipment must be appropriate for the use or location, or otherwise protected.

A significant hazard on construction jobsites is the accidental contact of moving equipment with live overhead power distribution and service lines. Where work must be done near live lines, the movementof all equipment such as cranes, excavators and other equipment must be guided by an observer whocan observe the clearance of the equipment from energized

lines and give timely warning to equipmentoperators. The minimum clearance between live lines and any jobsite equipment is 10 ft. (3.0 m), and the clearance increases with increasing line voltages.

Underground electric lines shall be located and clearly marked. These utilities will be protected, removed or relocated as needed to do the work safely. The excavation work shall not be allowed to endanger the underground utility or the people doing the work. Barricades, shoring, or other supports as needed shall protect utilities left in place that are exposed by the excavation

7.13 Material Handling

In the handling of materials, employees must know the following: There must be safe clearance for equipment through aisles and doorways. Vehicles must be shut off and brakes must be set prior toloading or unloading. Containers of combustibles or flammable, when stacked while being moved, mustbe separated by dunnage sufficient to provide stability. Trucks and trailers will be secured from movement during loading and unloading operations. Hand trucks must be maintained in safe operatingcondition. Chutes must be equipped with sideboards of sufficient height to prevent the handled materials from falling off. At the delivery end of rollers or chutes, provisions must be made to stop the movement of the handled materials. Hooks with safety latches or other arrangements will be used when hoisting materials, so that slings or load attachments won't accidentally slip off the hoist hooks. Securing chains, ropes, chokers or slings must be adequate for the job to be performed. When hoisting materialor equipment, provisions must be made to assure no one will be passing under the suspended loads. When hoisting loads and control of the load is required, tag lines shall be used on an as needed basisto ensure the load is maneuvered in a controlled fashion.

Rigging below the tines of a forklift / powered industrial truck / telescoping handler is prohibited unlessperformed with a manufacturer's approved lifting attachment. The direct attachment or placement of rigging equipment (e.g., slings, shackles, rings, etc.) onto the tines of a powered industrial truck is prohibited. If a load is unstable, unbalanced, awkwardly shaped, or prone to roll, slide or shift, the loadshall be secured at all times. Manual handling of materials shall not exceed 50 pounds per person.

When loading and unloading trucks with motorized mobile equipment (e.g., forklifts, telehandlers, and cranes), Exclusion Zones shall be established by the use of barricades or traffic cones. Exclusion Zones shall extend 25 feet on each side of the truck trailer (and 25 feet on rear if loaded or unloaded from trailer's rear end) and shall include the total length of the trailer being loaded or unloaded. If a distanceof 25 feet cannot be established due to interferences or the presence of permanent structures, equipment, or other physical barriers, these structures maybe used as a hard or physical barricade. However, control measures shall be in place to ensure pedestrians do not inadvertently enter the pinch/crush hazard area between the truck and stationary object.

Only material handling equipment operators are permitted inside the Exclusion Zone while trucks are being unloaded with mobile equipment. No movement of material handling equipment is to occur withinthe Exclusion Area if pedestrians are inside the restricted area.

If any pedestrian needs to enter the Exclusion Zone for any reason the steps below must be followed:

• All material handling equipment shall stop and loading / unloading operations shall cease.
• Personnel shall not enter the Exclusion Zone until the material handling equipment operator grantspermission.
• Operation of material handling equipment (e.g., forklift, telescoping handler, crane, etc.) shall not toresume until all pedestrians have exited the Exclusion Zone and returned to the Safe Zone.

Workers shall not remove chains, straps, or banding from a load until the truck has reached its final unloading location (i.e., offload destination on site). Prior to removing straps, chains, and/or banding, the load shall be thoroughly examined to determine / assess if the load has shifted, binders have beenbroken, stability of the load has been altered, or it is otherwise hazardous to personnel.

Ergonomics

If work tasks, equipment, and general working conditions do not incorporate ergonomic principles in their design, employees may have exposure to undue physical stress on their bodies. Employees who must repeat the same motion throughout their workday, are most likely to develop serious injuries.

Ergonomic injuries are those that are caused by hazardous activities which affect the human body's movement relative to the musculoskeletal system and are referred to as musculoskeletal disorders (MSDs) or biochemical injuries.

Changes to the workplace using engineering controls can include but are not limited to:

- Using height-adjustable workbenches and seating options to adequately support the back, legs and feet
- Provide for full range of motion with adequate leg room, as well as a variety of working positions to avoid static postures
- Provide floor surfaces designed to prevent slipping and provide adequate transaction and comfort
- Locate tools and materials within a short reaching distance
- Allow for adequate space for convenient access to all necessary tools and equipment
- Utilize powered equipment such as forklifts, lulls and cranes as assist devices to relieve heavy load lifting and carrying tasks
- Utilize alternatives to manual handling such as conveyor, slides, airball tables or chutes
- Considering utilizing handles or slotted hand holes in packages that require material handling
- Consider the use of non-powered equipment such as a drum drolly, hand cart, platform cart, or portable scissor lift.

7.14 Portable Power Tools

Portable power tools pose a special danger to employees because they are deceptively small and light,yet they can do great bodily harm if used improperly or poorly maintained. These rules apply to all power tools, but are especially important when handling portable saws, drills, and power screwdrivers.Check your equipment before you use it. All grinders,

saws, and similar equipment shall be equipped with appropriate safety guards. Power tools shall not be used without the correct shield, guard, or attachment, recommended by the manufacturer. Portable circular saws must be equipped with guards above and below the base shoe. Circular saw guards should be checked periodically and before each use to assure they are not wedged up, thus leaving the lower portion of the blade unguarded. All rotatingor moving parts of equipment should be guarded to prevent physical contact. All cord-connected, electrically operated tools, and equipment should be effectively grounded or of the approved double insulated type. Effective guards must be in place over belts, pulleys, chains, sprockets, on equipment such as concrete mixers, air compressors, etc. If portable fans are provided, they must be equipped with full guards or screens having openings 1/2 inch or less. Do not attempt to lift heavy objects without proper equipment. Hoisting equipment will be made available for lifting heavy objects, with hoist ratings and characteristics appropriate for the task. Power tools are either battery operated or wired. If battery operated, don't under-estimate their power. A small electric drill or power screwdriver can cause a severe injury if it lands in the wrong place. Typically used with extension cords, the more powerful hard- wired equipment presents a double safety problem: the actual equipment plus its electrical power source. Ground-fault circuit interrupters must be provided on all temporary electrical 15 and 20-amperecircuits used during periods of construction. Pneumatic and hydraulic hoses on power-operated tools should be checked regularly for deterioration or damage.

7.15 Compressed Gas & Cylinders

Cylinders must be legibly marked to identify clearly the gas contained. Compressed gas cylinders should be stored only in areas which are protected from external heat sources such as flame impingement, intense radiant heat, electric arcs or high temperature lines. Cylinders must be stored ortransported in a manner to prevent them from creating a hazard by tipping, falling or rolling. Valve protectors must always be placed on cylinders when the cylinders are not in use or connected for use.All valves must be closed off before a cylinder is moved, when the cylinder is empty, and at the completion of each job.

Flashback arrestors shall be used on all torch sets. Flashback protection shall be provided to prevent aflame from passing into the fuel-gas system. Compressed gas cylinders shall not be taken into confinedspaces. When in storage (i.e., not in use), oxygen cylinders shall be separated from fuel gas cylinders or combustible materials by a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least 30 minutes. Protective caps shall be installed on cylinders.

Oxygen and acetylene cylinders may be stored on dollies / carts with regulators attached if the cart hasan adequate fire-rated barrier separating the cylinders. Without an adequate fire-rated barrier, storageof gas cylinders on dollies / carts with regulators attached is only permitted if the gas cylinders will be used within 24 hours.

7.16 Welding and Cutting (Hot Work)

Compressed gas cylinders should be regularly examined for obvious signs of defects, deep rusting, orleakage. Use care in handling and storing cylinders, safety valves, relief valves and the like, to preventdamage. Precautions must be taken to prevent mixture of air or oxygen with flammable gases, except at a burner or in a standard torch. Only approved apparatus (torches, regulators, pressure-reducing valves, acetylene generators, manifolds) may be used. Cylinders must be kept away from sources of heat. It is prohibited to use cylinders as rollers or supports. Cylinders, cylinder valves, couplings, regulators, hoses

and apparatus must be kept free of oily or greasy substances. Care must be taken not to drop or strike cylinders. Unless secured on special trucks, all regulators must be removed, and valve-protection caps put in place before moving cylinders. Before a regulator is removed, the valve must be closed, and gas released from the regulator.

The (No Load) voltage of arc welding and cutting machines must be as low as possible and not in excess of the recommended limits. Under wet conditions, automatic controls for reducing no-load voltage must be used. Grounding of the machine frame and safety ground connections of portable

machines must be checked periodically. Electrodes must be removed from the holders when not in use. All electric power to the welder must be shut off when no one is in attendance. Suitable fire extinguishing equipment must be available for immediate use before starting to ignite the welding torch.All connecting cable lengths must have adequate insulation. When the object to be welded cannot bemoved and fire hazards cannot be removed, shields must be used to confine heat, sparks and slag.

The Hot Work Permit Procedures will be followed, as required. Fire watchers will be assigned when welding or cutting is performed in locations where a serious fire might develop. All combustible floors must be kept wet or protected by fire-resistant shields. When floors are wet down, personnel should beprotected from possible electrical shock. When welding is done on metal walls, precautions must be taken to protect combustibles on the other side. Before hot work is begun, used drums, barrels, tanks,and other containers must be so thoroughly cleaned that no substances remain that could explode, ignite, or produce toxic vapors. Employees exposed to the hazards created by welding, cutting, or brazing operations must be protected with personal protective equipment and clothing such as respiratory protection, leather arm coverings, and gloves. Check for adequate ventilation where weldingor cutting is performed. When working in confined spaces, environmental monitoring tests should be taken and means provided for quick removal of welders in case of emergency.

7.17 Battery Energy Storage Systems (BESS)

In order to ensure the installation quality and a safe construction operation all Battery Energy Storage Systems shall be placed and installed by means of manufacture's installation specifications. Only qualified personnel shall install battery storage systems and shall ensure the following:

- Only authorized qualified electricians shall work with electrical connections
- Before commissioning and closing of any isolation circuit breaker, installation personnel mustunderstand all installation instructions, for assembly and operation of the battery unit
- Understand and use manufacture's specified installation components
- Before any live operation, shall measure the device properly and ensure that the device is powered off completely.
- Must use appropriate measuring device and follow appropriate standards and directives when testing equipment. Must understand the operating manual of the measuring device before any measurement.
- Do not open the device during operation

7.18 Daily Stretch and Flex

Stretch and Flex is a program implemented on all project sites as part of our Injury-Free Environment culture. This daily activity involves stretching exercises to warm up muscles and help prevent soft-tissue injuries. Ultimately, Stretch and Flex is a daily reminder to put safety first.

Stretching Principles:

- Only stretch to your level of comfort
- Stand with feet spread shoulder-width apart and knees slightly bent

- Move in and out of stretches slowly (2-3 second each)
- Hold each stretch for 8-10 seconds at a gentle level and breath normallythroughout
- Protect your back by keeping your head up and eyes forward

- Relax fully after each stretch

7.19 Daily Engagement Observations (*Behavior Based Safety*)

Engagement with employees and contractors on a daily basis is required to ensure the foundation forbehavior-based safety. The Safety and Health team will provide the site management team with a daily engagement tool/checklist of observed behaviors. This tool shall document any coaching provided or action items to be executed as result of any observed opportunities, deficiencies or violations throughout any given day.

The Site Safety Manager will review the results of this engagement tool to look for trends in behavior,which may exist. Those trends may be used to adjust site processes, training and any safety communications, such as toolbox talks and daily Take 5s.

7.20 Concrete Work

Employee shall be permitted to work under concrete buckets, bundled material loads, orother suspended loads.

Elevated concrete buckets and loads shall be routed, to the extent practical, to minimize theexposure of workers to hazards associated with falling loads or materials from the loads.
Vibrator crews shall be kept out from under concrete buckets suspended from cranes ofcableways.

Riding on concrete buckets or other suspended loads shall be prohibited

Bulk storage bins, containers, or silos shall have conical or tapered bottoms with mechanical orpneumatic means of starting the flow of material.

Concrete mixers equipped with 1 yd3 (0.8 m3) or larger loading skip shall be equipped with a mechanical device to clear the skip of material and shall have guardrails installed on each side of the skip.

Handles on bull floats used where they may contact energized electrical conductors shall be constructedof nonconductive material or insulated with a nonconductive sheath whose electrical and mechanical characteristics provide equivalent protection.

Powered and rotating concrete troweling machines that are manually guided shall be equipped with a control switch that will automatically shut off the power whenever the operator removes his/her hands from the equipment handles.

Based on hazard evaluations conducted by supervisors, employee shall use, personal protective equipment (PPE) and safety equipment that will provide appropriate protection for the work being performed. All PPE (i.e., for eyes, face, head and extremities, protective clothing, respiratory devices and protective shields and barriers) shall be provided, used, and maintained in a sanitary and reliable condition whenever the hazard dictates.

Exposure to wet concrete can result in skin irritation or even first-, second- or third-degree chemicalburns. Compounds such as hexavalent chromium may also be harmful.

All concrete workers are required to wear alkali-resistant gloves, coveralls with long sleeves and full- length pants, waterproof boots and eye protection (googles) and or face shield. If exposed to wet

concrete, wash contaminated skin areas with cold, running water as soon as possible. Rinse eyes splashed with wet concrete with water for at least 15 minutes and then go to the hospital for further treatment.

Formwork, shoring, and bracing shall be designed, fabricated, erected, supported, braced, and maintained so that it will safely support all vertical and lateral loads that might be applied until such loads can be supported by the structure.

Concrete washout and wastewater shall be managed carefully. After equipment cleaning operators shallretain all waste wash in approved containers with a leak proof design so that wash out does not leak into environment. Concrete wash out containers shall be on site and used to capture all washout and contents shall be recycled.

Making sure all of the concrete equipment is cleaned out properly prevents the concrete washout fromleaking into nearby environments. This prevents wash water from entering the waterways which can cause pollution.

8.0 EMERGENCY CONTINGENCY PLAN

This section describes the emergency response plan that shall be implemented by Louth Callan Renewables, LLC employees to handle emergencies. The nature of the project, the contaminants present and the activities planned for the site are such that there is little potential for an emergency, which would result in a significant release of hazardous substances, and in any way threaten the adjoining community. However, there is always the potential at any construction site for emergency situations to occur whichthreaten the on-site workers. Possible examples of emergency situations during site activities include equipment fires or contact of equipment with overhead power lines. In all of these cases, procedures will be implemented to minimize the possibility of an emergency situation. The procedures outlined below are designed to ensure that the workforce reacts quickly and appropriately to emergency situations, thereby protecting the health and well-being of the individual workers. It is expected that modifications may be necessary upon actual site set-up and conditions. Furthermore, Louth Callan Renewables, LLC's Corporate Safety, Health and Environmental Program and Procedures Manual include Louth Callan Renewables, LLC's Corporate Emergency Action Plan Policy and Guideline for Handling Emergencies.

8.1 Pre-Emergency Planning

During the site safety briefings held daily, all employees will be informed of the location of this plan, the procedures outlined in this plan, and the communication systems and evacuation routes to be used during an emergency.

Individual personnel should be constantly alert for indicators of potentially hazardous situations and forsigns and symptoms in themselves and others that warn of hazardous conditions and exposures.

8.2 Personnel Responsibilities

All on-site employees have a role in mitigating an emergency incident. The Site Superintendent has primary responsibility for responding to and directing emergency response operations to correct emergency situations. This includes taking appropriate measures to ensure the safety of site personnel and the public. He is additionally responsible for ensuring that corrective measures have been implemented, appropriate

authorities notified, and follow-up reports completed. The DSSR shall assistand advise the Site Superintendent and will direct any emergency medical responses.

The following is an outline of job titles and corresponding responsibilities during an emergency.

- The Site Superintendent directs emergency response activities, serves as liaison with appropriate Client and Client representatives' personnel and subcontractors. In the event of an emergency the Site Superintendent will be the Incident Commander.
- The Designated Site Safety Representative recommends that work be stopped if any operation threatens worker or public health or safety. Advises Site Superintendent of emergency procedures if necessary. Provides emergency medical care on site. Notifies emergency services. The DSSR will assume the responsibility of Incident Commander if the Site Superintendent is off-site.

8.3 Evacuation Routes and Procedures

In the event of an emergency that necessitates an evacuation of the site; on-site personnel shall be notified by hand-held or mobile two-way radios to leave the area by immediate emergency exit. An alternate method of communication will be the use of a portable air horn sounded in regularly spaced, repeated blasts.

During an evacuation, all non-emergency radio transmissions shall cease. The DSSR, in conjunction with the Site Superintendent, shall control the scene until the appropriate municipal and state agenciesarrive and a site-specific Incident Command System (ICS) should be implemented. Since site conditions, i.e., wind direction, precipitation, and work location, change often, the DSSR will determinethe appropriate evacuation procedures. (Ref. Louth Callan Renewables, LLC SOP #02)

All personnel shall assemble/muster at the designated muster area (office trailer). Access to the site willbe restricted. All non-emergency radio transmissions shall cease.

8.4 Job Site Security

The project site shall be secured at the end of each shift by way of locked security fencing. All accessroad and paths into the job site shall be closed off and warning signage (example KEEP OUT, or NO TRESSPASSING) shall be posted to keep the public off the property. The site shall also be monitoredby perimeter security camera posted at locations around the project.

8.5 Medical Treatment/First Aid

At least two personnel on site shall be trained in CPR and First Aid and have first aid kits for use in a medical emergency. First Aid Kits will be located in the main support area and at the work activity locations (typically in vehicles). Eyewash stations will be available in the support area. Emergency contacts shall be notified immediately if their resources are needed on site.

At least two personnel on site shall be trained in CPR and First Aid and have first aid kits for use in a medical emergency. First Aid Kits will be located in the main support area and at the work activity locations (typically in vehicles). Eyewash stations will be available in the support area. On-siteemployees have a basic knowledge of first aid and will assist the Site Superintendent and DSSR. Emergency contacts shall be notified immediately if their resources are needed on site.

Louth Callan Renewables, LLC shall ensure an adequately supplied medical jump bag (i.e., EMT / trauma bag) and AED are provided and available to First Aid / CPR / AED trained personnel.

Louth Callan Renewables, LLC shall ensure First Aid/CPR/AED trained personnel are capable of responding promptly (i.e.,3-4 minutes) in areas where serious, life-threatening injuries or illnesses (e.g., suffocation, severe bleeding, falls, electrocution, or amputation) are possible and/or reasonably anticipated to avoid permanent medical impairment or death.

All deaths must be reported to OSHA within 8 hours of the incident.

All serious hospitalizations or loss of limb(s) or an eye must be reported to OSHA within 24 hours of the incident.

If the event of an emergency the injured or sick party shall be taken to:

Middlesex Hospital
28 Crescent Street
Middletown, CT 06467
860-258-6000

Please refer to ***Figure 1 – "Route to Hospital Map"*** for directions to the facility.
The 'Route toHospital map will be posted and visible on site.

[Insert Name and Address of Occupational Therapy Clinic]

Please refer to ***Figure 2 – "Route to Occupational Clinic"*** for directions to the facility.
The 'Route toHospital' map will be posted and visible on site.

A copy of Louth Callan Renewables, LLC's INJURY MANAGEMENT PROCEDURES shall be posted on site and followed anytime there is an injury.

8.6 Emergency Alarms/Notifications and Procedures

When any emergency occurs on-site, the on-site DSSR and Site Superintendent shall be notified immediately. The Site Superintendent or the DSSR shall notify the client and his representatives. Pleaserefer to the ***Table 9 – "Emergency Telephone Numbers"*** for emergency telephones. Emergency Telephones will be posted and easily visible at all times.

To notify any site workers of an emergency, workers can be signaled by way of handheld, mobile two-way radios, or as a backup, the use of an emergency alarm (portable air horn). Any audible pattern of blasts from a portable air horn becomes difficult to interpret due to distance and the inhibitory effects ofa respirator.

The "All Clear" will be used to indicate a return to normal (non-emergency) conditions following emergency response activities. The alarm signals will be prominently posted at the site. The audible alarm system will be discussed with each resident within hearing range of the alarm system.

Figure 1 – Route to Hospital

Middlesex Hospital
28 Crescent Street
Middletown, CT 06467
860-258-6000

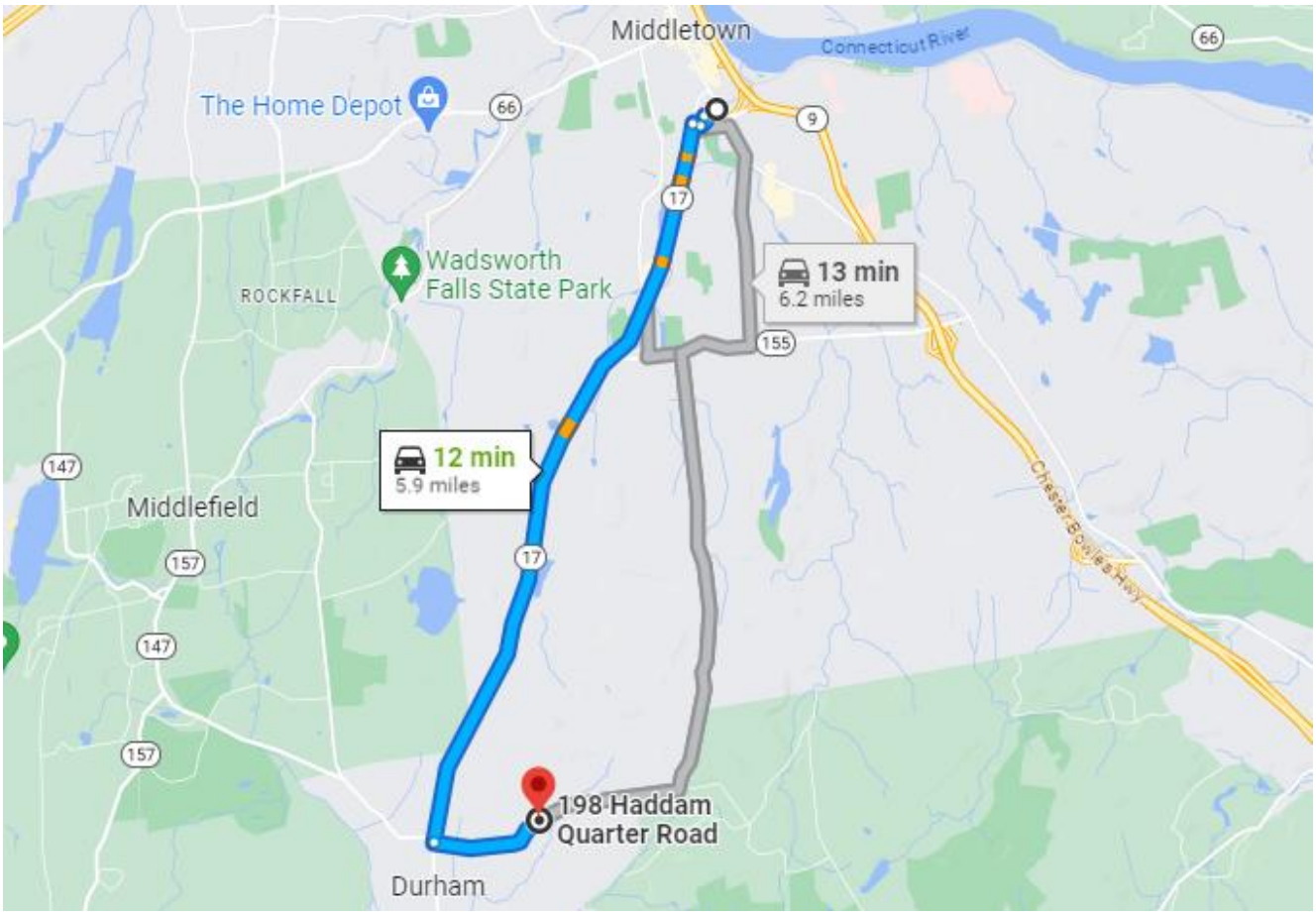

Figure 2 – Route to Occupational Clinic

Danielle Dell'oso
600 Highland Avenue
Middletown, CT 06457
860-347-3315

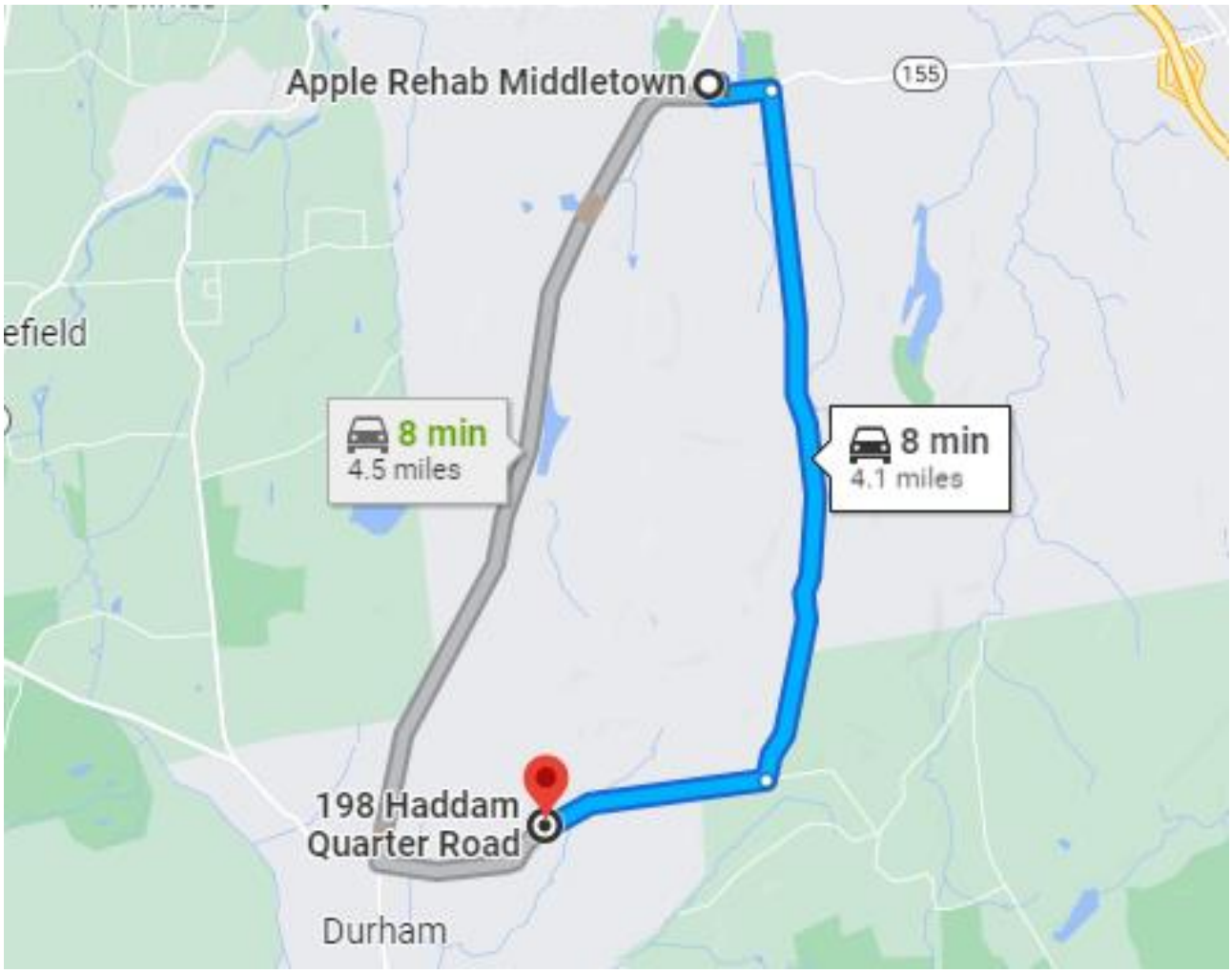

Table 9 – Emergency Telephone Numbers	
Police: **Middletown Police Department** **222 Main Street** **Middletown, CT 06457**	**9-1-1 (EMERGENCY)** **860-638-4000**
Fire & Ambulance: **Middletown South Fire District** **445 Randolph Rd** **Middletown, CT 06457**	**9-1-1 (EMERGENCY)** **860-347-6661**
Walk-in Medical Center: **Concentra Urgent Care** **900 Northrop Road** **Wallingford, CT 06492**	**9-1-1 (EMERGENCY)** **203-949-1534**
DIG Safe http://www.digsafe.com/	**Call 811**

8.7 Implementation of the Plan

In the event of a fire, explosion, accidental material release, or any other emergency, response activities will be initiated following the evaluation of the event. An assessment of the situation will be performed by the DSSR immediately upon notification. The Site Superintendent/DSSR is authorized to commit resources to the extent detailed in this plan. If it is determined that an emergency exists, he will then implement the appropriate emergency response activities.

8.7.1 Conditions for Implementation

The contingency plan will be activated by the Site Superintendent/DSSR immediately, in the event of afire or explosion, or emissions of toxic chemicals in excess of limits set forth by Federal, State, and local agencies. In the event of a spill or material release, it will be up to the Site Superintendent/DSSR to make a determination as to when emergency conditions exist, as opposed to routine maintenance of the site. His determination will depend upon the location of the spill, the size of the spill, weather conditions and the proximity of the release to workers, the community and environmental receptors.

8.7.1.1 Fire or Explosion

Although the potential for fire or explosion is minimal, sources of risk do exist. These sources include site gases, gasoline for portable equipment, diesel fuel for the heavy equipment, and combustible debris. In the event of an explosion, possible emergency conditions would exist. Unless extinguishedimmediately, a fire or explosion will trigger implementation of these procedures.

8.7.1.2 Material Spills

Material Spills could occur during truck loading and from vehicle accidents. Additionally, equipment fueling operations could produce spills. Ultimately, a spill could contaminate receiving surface water orcause a release of vapors to the air. A spill of fuel could also ignite. A small spill should be cleaned up immediately but should not trigger activation of these procedures. Should an onsite spill occur, the immediate response will include closing off the source of the spill, if possible, application of the sorbentmaterial or sand bagging, and street sweeping, as appropriate. Any spill that results in a discharge to off-site surface water will be contained with sorbent booms as needed. All spills will be investigated, and a written report will be provided to the regulatory agencies in accordance with applicable regulations.

Notification of spills or releases, which are reportable to a regulatory agency, shall be made by the Owner. In other words, the Owner shall contact the regulatory agency and provide notification to the appropriate governing bodies of the reportable spill or release. Therefore, it is essential all spills and releases, regardless of size and location, be immediately reported to the Owner.

8.7.1.3 Severe Weather

In the event of severe weather, the Site Superintendent and/or the DSSR have the authority to stop operations and direct evacuation procedures, if conditions warrant. After the storm, a visual inspectionwill be performed by the Superintendent and/or the DSSR to check for damage and hazards. This inspection will be performed before any work is resumed. If damage or hazards are noted, Site Superintendent and/or the DSSR will evaluate the conditions and implement corrective actions to repairthe damage or eliminate the hazard. These actions will begin as soon as possible and will take precedence over other site

activities.

In addition, lightning is a hazard during outdoor operations, particularly for workers handling metal containers or equipment. In the event of an electrical storm within 10 miles of project location, all operations will cease for the duration of the storm. The warning procedure for lightning shall be 3 threesecond blast of the foghorn which will notify the field.

Workers shall seek shelter in the nearest shanty, office trailer, or vehicle. The safest place for an equipment operator (enclosed cabs only) is in the seat of his/her machine with both feet on the floor, his/her hands on his/her lap with the doors and windows shut, the equipment shut down and the batteries switched off. Lightning shutdowns will remain in effect for 30 minutes following the last observed lightning strike. Each time a lightning strike is observed, the clock will be reset at 30 minutes.Work may resume once a full 30-minute period has passed with no observed lightning strikes.

Lightning Detection
There are several methods the site supervision can use to detect lightning in the area. In one form or another, these methods can be applied by the project team at all levels to know when a lightning hazardis expected or imminent. A major disadvantage of most detection systems is that they cannot predict the first strike of lightning. They can only tell what has already happened. At the front of a fast-movingstorm, risk of first strike may be significant. Tracking and early warning is a good feature available from many lightning detection systems. To keep up to date with inclement weather reports the project team can use but or not limited to:

Local weather reports are available through various media, radio, television and internet. These reports, especially forecasts, are useful to know when to expect lightning hazards and consequently plan accordingly.

Phone applications such as WEATHER BUG, and Weather Channel have lightning alert features thatcan give alerts of the closet lightning strike in the area.

NOAA radio, available throughout the continental U.S. in the 162.4 – 162.55 MHz band, also broadcasts storm alerts affecting the nearby area. These radios provide some degree of early warningbut are not specific to lightning.

NLDN is a system of lightning sensors covering most of CONUS. Lightning warning services from NLDN are available through Global Atmospherics Inc. These services are available by subscription and are relatively inexpensive. (See www.lightningstorm.com for details.) Warnings can be issued bythis service via pager.

8.7.1.4 Bomb Threat

If a bomb threat is received, the following procedures will be carried out. All employees will be instructedto notify Site supervision immediately.

Site personnel will:

- Notify the Client / Owner, Police and Fire Department
- The emergency evacuation procedure will be initiated, unless the threat includes instructions not to do so (proper law/emergency enforcement agencies should determine proper course of action in this situation).

- The individual who received the threat should be instructed to document every word of the conversation immediately, if applicable.
- A search of the property will be performed by the appropriate law enforcement personnel only.
- Access to the building/job site will not be permitted until clearance is given by the appropriate personnel (i.e. police, fire department).

8.7.2 Initial Action

Once the extent of the emergency is known, the Superintendent and/or the DSSR will make an immediate decision as to what initial steps should be taken to remedy the emergency situation. This first action, in the case of large-scale emergencies, usually consists of notifying responsible authorities and/or calling for the necessary assistance in order of priority.

8.7.3 Corrective Action

When help arrives, the Site Superintendent/DSSR should immediately inform those called of the pertinent details of the situation. Corrective action should be continued until the situation is either under control or completely rectified. If corrective actions will take considerable time, a long-term effort to complete the task should be developed.

8.7.4 Follow-Through

After the situation is corrected, the cause of the emergency event is to be determined and review of thecorrective actions taken, etc. In the case of equipment failure, if negligence was not a factor, then revising maintenance procedures would be the most likely first preventive step. For natural disasters that cannot be prevented from recurring, the procedures followed in dealing with them can be reviewedto develop more effective action plans. The entire event, along with all of the responses, will be thoroughly documented for review by management and project supervisory personnel.

8.8 Spill Response and Control Plan

The purpose of this section is to define practices and procedures for the prevention, containment and cleanup of accidental discharges of hazardous substances during the project. These substances include both the contaminated material managed as a result of the remedial project, such as contaminated soils and decontamination liquids, and construction materials typically found on any construction site, such as lubricating fluids, diesel fuel, gasoline, etc.

Spill prevention applies to all types of spills and can be described as the first and simplest approach tospill control. Human error is a major contributing factor to spills and releases. An awareness of spill consequences, preventive measures, and countermeasures will greatly reduce spill occurrences. A sound prevention program includes careful work practices, constant inspection, and immediate notification and correction of deficiencies. In the event that a spill does occur, proper containment and cleanup procedures must then be followed in order to reduce the effect of the spill.

8.8.1 Prevention

Prevention of unnecessary spills is of first priority. Prevention measures include:

- Operators and drivers will exercise extreme caution when transporting material around the

site.

- When removing hoses from machines an appropriate and adequate supply of absorbents will be on hand. A supply of the following absorbents will be kept on-site: oil sorbent booms, rolls and pillows, universal towels and sheets and vermiculite.
- Hoses will be capped when not connected to their appropriate fitting.
- All containers will be inspected daily for decay. No open container shall be exposed to rainfall, snowfall, etc. without being emptied and cleaned of residue.
- All equipment will be inspected for leaks before and after service.
- Storage of material such as fuels, oils, and solvents on-site will be limited to the minimum required. All fluids will be stored in individual fluid containers appropriate and approved for thematerial. Most of the individual fluids containers will be further secured by storage in large, locked tool and equipment storage containers. Drums or other containers too large to be storedin containers will be stored raised off the ground on a liner and covered by plastic.

Mobile equipment shall have drip protection (e.g., drip pan, absorbent pad / diaper, poly sheeting, etc.)provided beneath the equipment at all times when the equipment is parked. Mobile equipment shall have spill kits, absorbent pads / diapers, or similar materials on or inside the equipment at all times.

Louth Callan Renewables, LLC shall train personnel assigned to the Project on spill prevention requirements, location anduse of spill kits and containment measures, reporting expectations for leaks, spills, and chemical releases, and maintenance of additional environmental protection measures (e.g., silt fencing, berms, catch basins, and storm drain protection).

Portable equipment (e.g., lights plants, generators, welding machines, and air compressors) shall havedrip protection and containment provided at all times beneath the equipment. Stored equipment, tanks,and containers with hazardous chemicals or petroleum products shall have a spill containment systemin place to prevent any spilled or leaked fluid from reaching storm drainage, runoff, or water bodies.

All containments shall be evaluated for evidence of product (i.e., sheen) prior to being drained or emptied of rain water. Louth Callan Renewables, LLC shall notify the Owner's environmental specialist or designated personprior to emptying or draining containments.

8.8.2 Reporting

All spills will be reported immediately to appropriate field and office management personnel. The sequence of all spills will be reported immediately to appropriate field and office management personnel. The sequence of reporting will be as follows:

- Notification by workers to the Project Superintendent or Site Designated Site Safety Representative.
- The Project Superintendent or Designated Site Safety Representative will immediately notify theClient Representative regardless of the size of the spill.
- Louth Callan Renewables, LLC, and the Client Representative will jointly determine the nature of the spill, its size, direction of travel, if anyone has been injured as a result of the spill and whether it requires immediate notification to regulatory agencies.
- The Client Representative will have primary responsibility for notifying the

regulatory agencies. Louth Callan Renewables, LLC will have follow-up responsibility to verify that the notification is made in a timely manner.
- If a reportable spill occurs and the COR cannot be immediately reached, Louth Callan Renewables, LLC will have primary responsibility to report the spill to the regulators within two hours of the incident and a spill number obtained).
- A full list of emergency contacts and telephone numbers is included this plan. This list includesLouth Callan Renewables, LLC personnel as well as federal, state and local authorities. This list will be posted in alltrailers on-site.

Upon notification of a spill, all project activity will be immediately suspended and all necessary equipment and personnel will be diverted to spill control and containment. In the event of a spill, and regardless of the size, a Spill Incident Report will be submitted to the Client Representative within 24 hours of the incident.

8.8.3 Spill Response Equipment

Given the nature of this project, all the necessary equipment and personnel necessary to deal with a release of hazardous substances will be available on site. In addition to the heavy equipment and personal protective equipment, which is critical to spill control, Louth Callan Renewables, LLC will have on hand an ample amount of sorbent materials, UN1A2 open top drums, and overpacks.

8.8.4 Confinement and Containment

Prior to entering a spill area, all workers must be protected from any adverse effects of the spilled material. No one will enter any spill area alone. The Designated Site Safety Representative will determine the level of protection required for response activities. To the extent practicable, the area will immediately be cordoned off and, if appropriate, exclusion, contamination reduction, and support zones will be established.

The decision to use confinement techniques such as diversion, diking, and retention, are generally based on time, personnel, equipment, and supplies. As mentioned above, all necessary resources willbe available on-site at all times. To the extent the nature of the material is known, the decision should be made based upon a review of the harmful effects of the material. In the event of a large migrating spill, an unlikely circumstance, diversion techniques, such as placing a soil wall or absorbent boom ahead of the spill, shall be implemented first. Subsequently, diking techniques, such as using material such as sand covered with liner material (PVC, Hypalon) should be implemented.

8.8.5 Cleanup

Once a spill has been contained and the source of the spill corrected and controlled, cleanup can begin. Spill cleanup can proceed at the same time as containment if feasible. Supervisory personnel will determine the appropriate cleanup methods. The Site Designated Site Safety Representative will determine the appropriate level of protection depending upon the nature of the material.

- The first action will be to absorb free liquids with absorbent pads, booms, pillows, or clay. The absorbent material will be placed in drums and moved to an appropriate storage location. Subsequent to the removal of free liquids, soil believed to be contaminated will be excavated and containerized in drums or stockpiled on poly sheeting and covered for further testing.
- Dry spills, while posing less of a risk of migration, will still require appropriate and immediate action. The nature of the spilled material will be ascertained. The spilled

material will be recovered for reuse if appropriate. Material which cannot be recovered and residual contaminated soil will be shoveled into 55-gallon drums, placed in the drum storage area and sampled and analyzed for waste characterization and disposal.

- Once containerized, Louth Callan Renewables, LLC will provide for the appropriate sampling and analysis for wastecharacterization and disposal facility acceptance. Results of waste characterization analysis, waste profiles and manifests will be provided to the Construction Representative for review. The generator shall review and sign off on disposal documentation for both hazardous and non- hazardous materials.
- All spilled material and visually contaminated soil will be excavated and containerized in the initial spill response. If there appears to be a possibility that contaminants have migrated into the surrounding soil, post-remedial sampling will be initiated. Soil samples will be taken from theareas of suspected contamination and analyzed for the compounds, which were released.

Personnel Decontamination - In general, all spill response operations will be performed in accordancewith the provisions of the approved Site Safety and Health Plan.

Louth Callan Renewables, LLC is responsible for the cleanup and proper handling, collection, containerizing, and removal of regulated wastes, as defined by the EPA and state or local regulations.

Louth Callan Renewables, LLC shall handle, store, and manage all regulated wastes in accordance with federal, state, and local laws and regulations and the Owner's requirements, which may vary depending on the state, county, local municipality, and Owner's facility. Regulated waste, including to but not limited to, hazardous waste, used oil, oily debris, universal waste, and non-hazardous waste shall be disposed by the responsible party as stated in the terms and conditions of the contract. Louth Callan Renewables, LLC shall use only Owner-approved vendors and landfills for the disposal of regulated wastes, including to but not limitedto, used oil, oily debris, universal waste, and non-hazardous waste.

8.9 Incident Investigation

A written incident investigation shall be made within 24 hours of incident resolution. The Client Representative will be provided with a copy. In addition, all key personnel will have a meeting within 48hours of the incident to discuss and critique all of the aspects of the Emergency Contingency Plan according to new site conditions and lessons learned.

9.0 INSPECTION AND REPORTING

9.1 Safety and Health Inspections

Safety and Health inspections will be conducted to discover, through specific, methodical auditing, checking, or inspection procedures, conditions, and work practices that lead to job accidents and illnesses.

The Safety and Health Manager shall be responsible for ensuring that inspections are conducted at thefrequency stated, reviewing the Daily Safety Audits for completeness, thoroughness, and trends, performing bi-monthly project inspections, and training site personnel on proper inspection techniques.

The DSSR shall be responsible for ensuring that inspections are conducted, reviewing the inspectionsfindings and corrective actions for applicability and thoroughness.

9.2 Daily Safety and Inspections Log

The DSSR shall insure that all aspects of the HASP are complied with on a daily basis. The DSSR hasthe authority to shut the work down and ban any individual from the Site. If deficiencies are noted, they will be recorded on the Daily Safety and Inspection Report and will be corrected immediately. The DailySafety and Inspection Report will include the date, work area, employees present at the work area, PPEand work equipment in each area, specific safety and health issues and notes and the signature of thepreparer. Daily Safety and Inspections Report will be stored on site until completion of the project. It is not anticipated excavation operations will be required for the duration of the project. Where excavation operations are required, such operations shall be briefed in the Take 5 checklist, AHAs andJobsite Briefings; and shall be recorded on the Daily Safety and Inspections Log should they apply. Louth Callan Renewables, LLC shall document inspections of the worksite and make available to the Owner upon request.

A single, comprehensive Action Item list or register shall be maintained for the Project by the Louth Callan Renewables, LLC to document findings or deficiencies not immediately corrected during inspections to ensure open itemsare monitored and tracked through to completion. This list or register shall be available to the Owner upon request for effectiveness review to ensure hazards are being corrected and items are completed.

9.3 Incident/Accident Reports

All incidents (e.g., injuries, illnesses, and near miss incidents) and environmental events (e.g., chemical petroleum release, leak, or spill) occurring from work performed shall be reported, investigated, and analyzed by competent and qualified personnel. All injuries, illnesses, and near misses shall receive a casual analysis with contributing factors identified.

- All injuries and illnesses shall be reported regardless of severity. Even if no onsite first aid treatment or offsite medical care is provided. Contractor shall report to LOUTH CALLAN RENEWABLES, LLC any injuryor illness.
- The timeliness of this reporting is extremely important. All incidents shall be reported to LOUTH CALLAN RENEWABLES, LLC immediately, or as soon as practical.
- LOUTH CALLAN RENEWABLES, LLC shall immediately notify the Owner within 24 hours of any incident, injury, or environmental event. Notification to the Owner’s designated representative will be by cell phone, email, or direct contact (i.e., face-to-face).
- **Fatalities will be reported to OSHA within 8 hours. Serious injuries resulting in hospitalization, loss of limb(s) or eye will be reported to OSHA within 24 hours.**

Recordable injuries, lost time accidents, life-altering injuries (LAI), serious injuries and fatalities (SIFs),and environmental events reported to a government agency shall receive a Root Cause Analysis. In some cases, LOUTH CALLAN RENEWABLES, LLC may require the Contractor to perform a Root Cause Analysis depending onthe significance of the near miss or first aid case (i.e., Potential SIF). Contractor shall develop corrective actions to prevent reoccurrence of environmental events, first aid injuries, near misses, recordable injuries, and lost time accidents and monitor the effectiveness of corrective actions.

- LOUTH CALLAN RENEWABLES, LLC shall implement a formal Root Cause (fault tree), Casual Analysis, andCorrective Action process that is submitted to the Owner for acceptance.
- Near misses, first aids, recordable injuries, and lost time accidents are to be subject totrending and common cause analysis.

In the event of a serious incident, the incident scene shall not be disturbed until released by LOUTH CALLAN RENEWABLES, LLC and the Owner, except for circumstances where “imminent danger” exists to those performing any emergency services.

Contractor will immediately notify LOUTH CALLAN RENEWABLES, LLC Site Management (e.g., Project Manager or Superintendent), and/or onsite Designated Site Safety Representative by cell phone, email, or direct contact (e.g., face-to-face). In the event of an incident, Contractor shall take care of injured person first (if applicable), make scene safe, and notify LOUTH CALLAN RENEWABLES, LLC. LOUTH CALLAN RENEWABLES, LLC shall notify Owner within 1 hourany incident, injury, or environmental event.

- Before shift’s end, Contractor shall provide a written one-page summary of the incident including the date and time of the event, name of affected worker(s), event description, andavailable details. This summary must be emailed to kristen@louthcallanrenewables.com
- A detailed written report including photographs, identified causes, and recommended corrective actions shall be submitted to LOUTH CALLAN RENEWABLES, LLC within 72 hours unless otherwiseagreed to by LOUTH CALLAN RENEWABLES, LLC and the Owner.
- LOUTH CALLAN RENEWABLES, LLC shall provide a copy of the incident reports and notifications to the Ownerwithin the same timeframe listed above.

LOUTH CALLAN RENEWABLES, LLC shall ensure all Subcontractors are informed and comply with LOUTH CALLAN RENEWABLES, LLC’s and the Owner’s incident reporting and post-incident case management requirements.

LOUTH CALLAN RENEWABLES, LLC and the Owner reserve the right to observe or participate in any environmental, health, and safety accident investigation conducted by the Contractor or anyone performing work for, on behalfof LOUTH CALLAN RENEWABLES, LLC.

LOUTH CALLAN RENEWABLES, LLC and the Owner reserve the right in its sole discretion, to initiate its own accident investigation.

Contractor shall immediately begin correcting any unsafe or environmentally hazardous conditions identified by LOUTH CALLAN RENEWABLES, LLC or the Owner. In the event Contractor fails to immediately correct such unsafe or environmentally hazardous conditions, LOUTH CALLAN RENEWABLES, LLC may have the unsafe or environmentally hazardous conditions corrected by others at Contractor's expense, or direct the work to be stopped in the area of the unsafe condition. This right to stop the work shall not give rise to any duty to Contractor or to any third party on the part of LOUTH CALLAN RENEWABLES, LLC to exercise this right. Any work stoppage for unsafe conditions is at no cost to LOUTH CALLAN RENEWABLES, LLC.

Except for medical emergencies where an ambulance is required, Louth Callan Renewables, LLC or Subcontractors shall transport work-related injured or ill employees to and from medical facilities initially and remain with theinjured or ill person throughout this period. If offsite medical treatment is required, Louth Callan Renewables, LLC shall appoint appropriate personnel to accompany the injured or ill employee to the offsite medical provider.Individuals, who transport injured or ill workers off site for treatment, shall have First Aid / CPR training and general knowledge of the OSHA Recordkeeping standard regarding work restrictions and the option employees have to ask attending medical professionals if over-the-counter medication maybe taken inlieu of perception medication. Subcontractors shall notify Louth Callan Renewables, LLC before taking any worker off site for medical care or evaluation. Louth Callan Renewables, LLC shall notify the Owner prior to sending anyone off site for medical treatment or examination.

9.4 Weekly Safety Meeting/Toolbox Talks

As part of Louth Callan Renewables, LLC's Corporate Safety and Health Program, a Weekly Safety Meeting is conducted.The weekly safety meeting outlines current industry safety issues and allows for discussion of job- specific issues. In addition, a daily site briefing will be held to discuss current work activities and hazards for the day along with the air monitoring results from the previous day. The DSSR/Superintendent will conduct Daily Take 5 safety checks and Weekly Safety Toolbox Meetings with ALL on-site personnel. All personnel will be required to sign in on a weekly safety toolbox talk sign in sheet which acknowledges they have been present at such safety discussion, understand what has been discussed, and have brought up any safety concerns, questions that arise as a result of such safety meetings/discussions. All weekly safety talks/toolbox talks with sign in will be kept on file in the project offices for the durationof the project. Prior to the start of each day, a Take 5 will be conducted by the lead on each crew identifying the tasks to be performed that day, what the associated hazards are, what the controls are the crew will put in place to minimize such hazards, and what PPE should be worn including other environmental issues such as heat/cold stress, ticks, snakes. Project Management Personnel shall attend Take 5 meetings daily and provide coaching and feedback as appropriate.

In addition to the toolbox talks and the weekly safety meeting, Louth Callan Renewables, LLC will conduct monthly project management safety meetings. All site management, including sub-contractor personnel, are required to attend. Topics of discussion will include hazards identified and abated during the previous month, any outstanding action, new tasks to be performed, site concerns etc. The DSSR will submit a synopsis of each meeting including topics covered, safety-related concerns, action items to be addressed,

status of previous items and a signed attendance list.

9.5 Quarterly Tool and Equipment Inspections

- The following equipment and materials shall be uniquely identified and inspectedquarterly, at a minimum, by a competent person and marked to show the current color code per the Contractor's color coding system. These inspections shall be documented.Items found defective shall be removed from site or destroyed. Items included in the inspection program includes, but is not limited to:
  - Electrical cords, GFCI's, electric tools
  - Ladders
  - Fall protection equipment
  - Rigging
- Contractor shall utilize the following color code system for equipment and materialinspections is as follows:

1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Jan, Feb, Mar	Apr, May, Jun	Jul, Aug, Sep	Oct, Nov, Dec
White	**Blue**	**Red**	**Green**

No tape – means not inspected, inspection out of date, or defective;

9.6 Handgun Policy

Firearms, alcohol, and illegal drugs are prohibited on the Owner's site. This includes storage in personalvehicles. Subject to any applicable state or local laws, any vehicle, personal toolboxes, and lunchboxes entering the Owner's site are subject to search.

10.0 CRANES AND RIGGING AND HOISTING

Hoisting and Rigging refers to the lifting and moving of loads using mechanical devices, such as a crane. The objective this program is to protect personnel from injury, the environment from harm, and equipment and property from damage; specifically, to protect load operators and others in the work area, other property, and the crane and rigging equipment itself. Cranes covered by this procedure include:

- A **crawler crane** consists of a rotating superstructure with power plant, operating machinery, and boom, mounted on a base, equipped with crawler treads for travel. Its function is to hoist and swing loads at various radii.
- A **locomotive crane** consists of a rotating superstructure with power- plant, operating machinery and boom, mounted on a base or car equipped for travel on railroad track. It may beself- propelled or propelled by an outside source. Its function is to hoist and swing loads at various radii.
- A **truck crane** consists of a rotating superstructure with powerplant, operating machinery and boom, mounted on an automotive truck equipped with a powerplant for travel. Its function is to hoist and swing loads at various radii.
- A **wheel mounted crane** (wagon crane) consists of a rotating superstructure with powerplant, operating machinery and boom, mounted on a base or platform equipped with axles and rubber-tired wheels for travel. The base is usually propelled by the engine in the superstructure, but it may be equipped with a separate engine controlled from the superstructure. Its function is to hoist and swing loads at various

radii.

Only U.S. and Canadian manufactured rigging will be used. Specialized Rigging, including non- domestic, on vendor supplied equipment must be inspected prior to use and verified that it is properly designed, engineered, sized and documented to be capable of safely handling the load and approved by the EHS Manager.

Only trained, qualified, and authorized personnel shall be allowed to rig loads or operate cranes. Training for the type of equipment used must be completed to the required level. All pre-use inspectionsfor cranes and rigging hardware and accessories must be performed prior to the lift.

10.1 Procedures

Rigging equipment shall not be loaded in excess of its recommended safe working load as prescribed in attached tables, equipment, when not in use, shall be removed from the immediate work area so asto prevent damage to the equipment or present a hazard to the employees. Special custom design grabs, hooks, clamps, or other lifting accessories, for such units as modular panels, prefabricated structures and similar materials, shall be marked to indicate the safe working loads and shall be proof-tested prior to use to 125% of their rated load.

Never swing loads over the heads of workers in the area. Must keep all personnel clear of all suspendedloads and loads ready to be lifted. Only trained flagmen and signalmen are to direct rigging operations,using established hand signals that are standard for the industry.

Do not overload any part of your rigging. Check loads just off the ground for balance and stability beforehoisting. Tag lines must be used to control rigged loads and never leave a suspended load unattended.

A fire extinguisher shall be located in the cab or vicinity of the crane no more than 25ft from the operator.A carbon dioxide, dry chemical, or equivalent fire extinguisher shall be kept in the cab or in close vicinity of the crane. These fire extinguishers need to be readily available to employees.

Operating and maintenance personnel are familiar with the use and care of provided fire extinguishers.Operating and maintenance personnel must be familiar with how to operate and care for the fire extinguishers they may need to use in the course of their work.

Never allow loads, booms or rigging to approach within 10 feet of energized electrical lines rated 50KVor lower unless the lines are de-energized. For lines rated greater than 50 KV, follow OSHA regulations.

Always operate cranes on firm, level ground or use mats, particularly for near-capacity lifts. Rope off orbarricade a space equivalent to the swing radius of the rear of the rotating structure 360 degrees around all cranes operating on your jobsite.

All hoist chains, slings and hooks are visually inspected before each use, monthly and every three months all hoist chains, slings and hooks will be inspected and documented by a certified outside contractor. Any rigging that does not pass inspection will be removed from service immediately.

All safety latches will be in place on all hooks, eliminating the hook throat opening. Latches shall not bedeactivated or made inoperable. Hooks on overhaul ball assemblies, lower load blocks, or other attachment assemblies shall be of a type that can be closed and locked, eliminating the hook throat opening. Alternatively, an alloy anchor type shackle with a bolt, nut and retaining pin may be used.

A locomotive crane will not be swung into a position where railway cars on an adjacent track might strikeit, until it has been ascertained that the cars are not being moved on the adjacent track and proper flagprotection has been established.

10.1 Responsibilities

Safety, Health and Environmental
The SH&E shall be responsible for:

- Ensuring that the personnel involved have received proper and current training andQualification.
- Ensure that the equipment and accessories specified in the procedure are available.
- Survey the lift site for hazardous or unsafe conditions.
- Ensure that equipment is properly set up and positioned.
- Ensure that a signaler is assigned, if required, and is identified to the operator.
- Direct the lifting operation to ensure that the job is done safely and efficiently.
- Stop the job when any potentially unsafe condition is recognized.

Project Management Team
The Project Management Team will designate the Person-in-Charge (PIC). The PIC will be responsiblefor:

- Personnel assignments and responsibilities (Qualified Operator, Rigger, Flagger etc.) and verifythe qualifications of participating personnel
- Ensure that lift planning is completed and reviews the lift with all participating personnel beforethe lift begins
- Verify load description and condition
- Selection of proper equipment/tools (Rigging or Material Handling).
- Be present during the entire lift operation
- Recognition and control of hazardous or unsafe conditions.
- Oversee critical lifts and documentation.

Crane Operator
Crane operators with valid certifications from the National Commission for the Certification of Crane Operators (NCCCO) or equivalent certifying body are authorized to operate the class of equipment as noted on the certification. Operators without the certification from NCCCO or equivalent may be considered. However, the certification standards must first be submitted for review to the EHS Department for approval.

Only crane operators with valid certifications as noted in this program or approved by EHS Departmentare authorized to operate cranes on a Louth Callan Renewables, LLC job site. The crane operator is responsible for:

- Complying with all applicable jurisdictional codes, standards & regulations (e.g. USA by ANSI/OSHA) including customer restrictions and job site-specific

requirements.

- Operating assigned cranes and heavy lift equipment within the specifications provided by the manufacturer's operator manuals, load charts, and operator notes. This includes pre-start and poststart inspection, maneuvering skills, shutdown, and securing procedures.
- Utilizing crane information and monitoring systems (onboard computers) when they are installedon the crane. Crane operators will not disable or tamper with these systems.
- Producing upon request and maintaining valid certifications for the class of equipment to be operated.

Qualified Riggers

Riggers assemble, rig, hook and unhook, guide, and disassemble crane equipment and materials. Riggers must meet the requirements of a qualified person. A qualified rigger is a person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, successfully demonstrates the ability to resolve problems relatingto the subject matter, the work, or the project.

Riggers must be trained in all the requirements of the regulations that apply to their respective roles. For example, riggers must be trained and qualified to perform assembly and disassembly operations when their job tasks require them to perform such operations. The Qualified rigger will be:

- Be present at the work site and authorized by the subcontractor to take prompt corrective actionto ensure that substandard or unsafe equipment or methods are immediately eliminated or corrected.
- Comply with applicable OSHA standards and federal, state, county, and local regulations, including customer restrictions and job site specific requirements, as necessary.
- Ensure that rigging hardware and materials are inspected before use, configured correctly, andproperly attached to the lifting equipment.
- Ensure the availability of information, procedures, and equipment necessary to move loadswithout injury to personnel and without damage either to the site or the equipment
- Ensure that substandard or unsafe equipment or methods are not used to move loads.
- Ensure that all loads are dogged-off (positive hoist latching device engaged) until unsafeequipment is repaired or methods are revised so that the lift can be completed in a safe manner.

Qualified Signal Person

All signal persons must be qualified to give signals. In order to be qualified, the signal person must:

- Know and understand the type of signals used; if hand signals are used, the signal person mustknow and understand the Standard Method for hand signals.
- Be competent in the application of the type of signals used.
- Have a basic understanding of equipment operation and limitations, including the cranedynamics involved in swinging and stopping loads and boom deflection from hoisting loads.
- Know and understand the regulatory requirements for signals (29 CFR 1926.1419

to 1926.1422)and the signal person qualifications (29 CFR 1926.1428).
- Demonstrate that he or she meets the qualification requirements for signalers through an oralor written test and through a practical test.

Assembly/Disassembly Director
The Assembly/Disassembly Director will be responsible for:

- Direct the Assembly and Disassembly of all crane onsite
- Review Assembly and Disassembly Procedures with each member of the crew performing thework
- Verify all capacities of any equipment used, including rigging, lifting lugs, etc.
- Address hazards associated with the operation

10.2 Crane Inspections

Louth Callan Renewables, LLC will comply with the manufacturer's specifications and limitations applicable to the operation of any and all cranes. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determination of a qualified engineer competent in this field andsuch determinations will be appropriately documented and recorded. Attachments used with cranes shall not exceed the capacity, rating or scope recommended by the manufacturer.

Initial Inspection
- Initial inspection and test shall be performed by a qualified third party.
- Prior to initial use all new and altered cranes shall be inspected and tested.
- Only after determining, by this inspection, testing and proper documentation, that the crane is insafe operating condition, shall it be put into service.
- Temporary cranes are subject to the appropriate inspections. After each rig-up or relocation, they shall also be load tested.
- Before installation of temporary cranes, a new crane, or a refurbished replacement crane, the structure and deck of the fixed platform should be evaluated to insure that it can accommodatethe proposed crane installation and operation. The crane may be derated in accordance with the platform's limitation and appropriate load rating charts shall be installed on the crane, readilyvisible to the crane operator.
- Operational procedures, including the manufacturer's manual(s) will be readily available in the cab at all times so that the operator has full access to them.

Pre-Use Inspection (Daily)

A visual inspection of the equipment will be conducted by a competent person prior to each shift. A competent person must conduct a visual inspection of equipment prior to each shift. The inspection must consist of observation for apparent deficiencies. Some inspection items shall include control mechanisms, pressurized lines, hooks and latches, wire rope, electrical apparatus, tires (when used), and ground conditions. The manufacturer's guidelines shall be followed. The following will be tested at the beginning of each shift by the competent operator:

- All control mechanisms for maladjustment interfering with proper operation
- All control mechanisms for excessive wear of components and contamination by lubricants orother foreign matter
- All safety devices for malfunction
- Deterioration or leakage in air or hydraulic systems

- Crane hooks with deformations or cracks. For hooks with cracks or having more than 15 percentin excess of normal throat opening or more than 10 deg. twist from the plane of the unbent hook
- Rope reeving for noncompliance with manufacturer's recommendations
- Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moistureaccumulation
- Deformed, cracked, or corroded members in the crane structure and boom
- Loose bolts or rivets.
- Cracked or worn sheaves and drums.
- Excessive wear on brake and clutch system parts, linings, pawls, and ratchets.
- Load, boom angle, and other indicators over their full range, for any significant inaccuracies.
- Gasoline, diesel, electric, or other power plants for improper performance or noncompliance withsafety requirements.
- Excessive wear of chain-drive sprockets and excessive chain stretch.
- Travel steering, braking, and locking devices, for malfunction.
- Excessively worn or damaged tires.

Any defects found during inspection or use of a crane or hoist must be recorded in the inspection and maintenance record system and be reported immediately to the supervisor, who must determine the course of action to be taken. If a defect affects the safe operation of the crane or hoist, the equipment must not be used until the defect has been remedied.

Monthly Inspection
Monthly inspections on critical items such as brakes, hooks and ropes are performed and kept. Documented certification records which include the date of inspection, the signature of the person whoperformed the inspection and the serial number, or other identifier, of the crane which was inspected shall be made monthly on critical items in use such as brakes, crane hooks, and ropes. This certificationrecord shall be kept readily available.

Monthly inspections on running ropes are performed, signed and dated by an authorized person. A thorough inspection of all ropes in use shall be made at least once a month and a certification record which includes the date of inspection, the signature of the person who performed the inspection and anidentifier for the ropes shall be prepared and kept on file where readily available. All inspections shall be performed by an appointed or authorized person.

Louth Callan Renewables, LLC will ensure monthly inspections of equipment by a competent person are documented. Equipment must be inspected monthly by a competent person. The manufacturer’s guidelines shall be followed. The inspection must be documented. Documentation must include the following:

- Items checked,
- Results of inspection,
- Name and signature of the inspector.

Documentation must be retained for 3 months. (Documented monthly inspection is not required if the daily inspection is documented and records are retained for 3 months). Any defects must be correctedbefore the crane is used. The report must be dated and signed by the person performing the inspection.

A crane which has been idle for a period of one month or more, but less than 6 months, shall be givenan inspection before placing in service. A crane which has been idle for a period of six months shall begiven a complete inspection before placing in service.

Annual Inspection

- The annual inspection shall be performed once every twelve months. A qualified inspector shallperform this inspection and it applies to all cranes, regardless of usage category.
- A crane that is taken out of service for more than 12 months should have an OUT OF SERVICEsign placed over the primary controls. Before the crane can be placed into service, it shall be given an annual inspection.

Overloaded

- Cranes that have been overloaded shall be inspected prior to being returned to service. Theinspection and testing requirements are included.

10.3 Ground Conditions

The equipment shall not be assembled or used unless ground conditions are firm, drained, and gradedto a sufficient extent so that, in conjunction (if necessary) with the use of supporting materials, the equipment manufacturer's specifications for adequate support and degree of level of the equipment aremet. The requirement for the ground to be drained does not apply to marshes/wetlands. Louth Callan Renewables, LLC will:

- Ensure that ground preparations necessary to meet the requirements in paragraph (b) of this section are provided.
- Inform the user of the equipment and the operator of the location of hazards beneath the equipment set-up area (such as voids, tanks, utilities) if those hazards are identified in documents (such as site drawings, as-built drawings, and soil analyses) that are in thepossession of the controlling entity (whether at the site or off-site) or the hazards are otherwiseknown to that controlling entity.

If there is no controlling entity for the project, the above requirement shall be met by the employer thathas authority at the site to make or arrange for ground preparations needed to meet ground condition requirements.

If the assembly/disassembly (A/D) director or the operator determines that ground conditions do not meet the requirements, that person's employer shall have a discussion with the controlling entity regarding the ground preparations that are needed so that, with the use of suitable supporting materials/devices (if necessary), the ground conditions requirements can be met.

10.4 Assembly/Disassembly

When assembling or disassembling equipment (or attachments), the Louth Callan Renewables, LLC shall comply with all applicable manufacturer procedures applicable to assembly and disassembly. Assembly and Disassembly requires a qualified/competent director who is responsible to direct both the assembly and/or disassembly of equipment (cranes). Upon completion of assembly, the equipment shall be inspected by a qualified person to assure that it is configured in accordance with manufacturer equipment criteria.

- Where manufacturer equipment criteria are unavailable, a qualified person shall ensure that thecriteria are developed by the qualified person.
- Equipment shall not be used until an inspection demonstrates that the equipment is configuredin accordance with the applicable criteria.
- Equipment must not be modified from the manufacturer's standard configurations and designs without written approval from the manufacturer or approval from a registered professional engineer.

10.5 Proper Load Rating for Cranes

The load ratings of cranes, with booms of specific lengths at specific working radii for the various typesof crane mountings (truck, crawler, locomotive) is established by taking a percentage of the loads whichcould involve tipping or balance with the boom in the least stable direction, relative to the type of mounting.

The load ratings shall not exceed the following percentages for cranes, with the indicated types of mounting under conditions

Type of Crane Mounting	Maximum Load Ratings (% of tipping load)
Locomotive without outriggers	
Booms 60 feet or less	85%*
Booms over 60 feet	85%*
Locomotive, using outriggers fully extended	80%
Crawler, without outriggers	75%
Crawler, using outriggers fully extended	85%
Truck and Wheel mounted without outriggers or using outriggers fully extended	85%

*Unless this results in less than 30,000 pound-feet net stabilizing moment about the rail, which shall beminimum with such booms.

The rating chart must be clearly legible and location easily visible to the operator while seated at the control station. A substantial and durable rating chart with clearly legible letters and figures shall be provided with each crane and securely fixed to the crane cab in a location easily visible to the operatorwhile seated at their control station.

Rail clamps shall not be used as a means of restraining tipping of a locomotive crane.

10.6 Handling a Load

The rated capacity of a crane or hoist must not be exceeded, except for rated load test. The working load shall not be exceeded and shall be determined by the original manufacturer of the equipment, a registered professional engineer, or other persons whose qualifications are acceptable to local regulatory requirements.

Before lifting loads with locomotive cranes without using outriggers, means must be applied to preventthe load from being carried by the truck springs.

No loads will be lifted over the front area of a truck-mounted crane. On truck-mounted cranes, no loads shall be lifted over the front area except as approved by the crane manufacturer. This prevents the load from potentially falling on the cab or motor section of the truck.

Attaching the Load

- The load shall be attached to the hook by means of slings or other suitable and effective meanswhich shall be properly rigged to ensure the safe handling of the load.
- Chain and rope slings shall be free of kinks or twists before use.
- Baskets, tubs, skips or similar containers used for hoisting bulk materials shall be loaded so asnot to exceed their safe carrying capacity.

Safe Lifting

- If the operator of a lifting device has any doubts as to the safety of employees in the vicinity of the lift, the operator must not move any equipment or load until the operator is assured that theworking conditions are safe. He or she shall report the circumstances to his or her supervisor who then shall be responsible for determining the action to be taken.
- Loads will be carried as close to the grade as possible and tag lines shall be rigged as necessaryto control swinging of the load.
- Prior to moving a load ensure that the travel path of the load is free and clear of any undesirableobstructions.
- A suspended load shall not be left unattended by an employee.
- Ensure all employees who may be affected by the lift are aware of the hazards and are adequately protected.
- Louth Callan Renewables, LLC will ensure that work is arranged, if it is reasonably practicable, so that a load does not pass over employees. An operator of a lifting device must not pass the load on the device over employees unless no other practical alternative exists in the circumstances and the employees are effectively warned of the danger by an audible alarm or other effective means. The operator of a lifting device that is travelling with a load must ensure that the load is positionedas close to the ground or grade as possible.
- A person working at a workplace must not stand or pass beneath a suspended load unless theemployee has been effectively warned of the danger and the operator of the lifting device knowsthe employee is under the suspended load.
- Release the load only after the stability of the load has been verified and loads shall be safely landed and supported before unhooking.

Traveling a Crane Load

A qualified person shall be responsible for determining and controlling safety prior to traveling a crane load. Before traveling a crane load, a designated person shall be responsible for determining and controlling safety. Decisions such as position of the load, boom location, ground support, travel route and speed of movement shall be in accord with the designated person's determinations

Cranes must not be used unless ground conditions are able to support the equipment and any supporting materials per the manufacturer's specifications. Equipment must not be assembled or usedunless ground conditions are firm, drained, and graded to a sufficient extent so that, in conjunction (if necessary) with the use of supporting materials, the

equipment manufacturer's specifications for adequate support and degree of level of the equipment are met.

10.7 Pre-Lift Planning

Prior to starting any major rigging activity, a detailed plan must be developed that identifies any potentialhazards and the preventative measures appropriate to eliminate the hazard. All written activity plans must include a complete listing of rigging needed to hoist materials and equipment. The competent person/lift director must be identified by the superintendent/site supervisor at the work location and shallbe identified by name in the activity plan. The competent person/lift director must provide input into rigging/hoisting activities and approve activity plans involving rigging. Refer to the Lift Operations Flow Diagram. Listed below are some items to consider when developing the activity plan.

- Classify the lift (Ordinary/Critical Lift)
- Proper rigging and inspection.
- Identify Designated Leader/Qualified rigger.
- Weight evaluation.
    - Crane capacity - load/list charts.
    - Combined weight of object and rigging.
- Proper crane setup (level, solid ground, etc.).
- How will rigging equipment be installed on the load
- What other work is ongoing below or near the lift (consider barricades, team member alarmsystem, etc.)?
- Refer to Appendix A - Pre-lift checklists for planning loads to be hoisted available
- Are work locations near public or other areas where special precautions must be planned?

10.8 Lift Classification

Rigging is essential for moving construction materials and equipment and, at the same time, keeping them under control. Rigging equipment for material handling shall be inspected prior to use on each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment shall be removed from service immediately and repaired or disposed of in accordance with manufacturer's specifications.

Ordinary Lifts

Operations for ordinary lifts require a designated leader who shall be present at the lift site during the entire lifting operation. If the lift is being made by only one person, that person assumes all responsibilities of the designated leader. The designated leader's responsibility shall include the following:

- Ensure that personnel involved understand how the lift is to be made.
- Ensure that the weight of the load is determined, that proper equipment and accessories areselected, and that rated capacity is not exceeded.
- Survey the lift site for hazardous/unsafe conditions.
- Ensure that equipment is properly set up and positioned.
- Ensure that a signaler is assigned, if required, and is identified to the operator.
- Direct the lifting operation to ensure that the lift is completed safely and efficiently.
- Stop the operation when any potentially unsafe condition is recognized.
- Direct operations if an accident or injury occur.

- Inspect all cranes to ensure that they are still within the inspection interval.
- Inspect all lifting devices to ensure that the rated capacity of these items of equipment will notbe exceeded.

Critical Lifts

A lift shall be designated critical if load, if damaged or upset would result in a personal injury or release into the environment of radioactive or hazardous material exceeding the established permissible environmental limits. The load item is unique and, if damaged, would be irreplaceable or not repairableand is vital to a system, facility or project operation. The cost to replace or repair the load item, or the delay in operations. A lift should also be designated as critical if the load requires exceptional care and handling because ofsize, weight (>75% of capacity), close-tolerance installation, high susceptibility to damage, multiple crane use or other unusual factors. Prior to performing a critical lift the Person – in-Charge will ensure that a pre-job plan is prepared that defines the operation and shall include the following:

- Identification of the items to be moved, the weight, dimensions, center of gravity, and thepresence of hazardous or toxic materials.
- Identification of cranes to be used by type and rated capacity.
- Rigging sketches that include (as applicable):
    - Identification and rated capacity of slings, lifting bars, rigging accessories, and below-the-hook lifting devices
    - Load-indicating devices
    - Load vectors
    - Lifting points
    - Sling angles
    - Boom and swing angles
    - Methods of attachment
    - Crane orientations
    - Other factors affecting equipment capacity
- Operating procedures and special instructions to operators including rigging
- Precautions and safety measures to be followed as applicable.
- Experienced operators who have been trained and qualified to operate the specific equipment to be used shall be assigned to make the lift.
- Only designated, qualified signalers shall give signals to the operator. However, obey a STOP signal at all times no matter who gives the signal.
- The responsible manager or designee shall review and approve the procedure and rigging sketches before the lift is made.
- A pre-lift meeting involving participating personnel shall be conducted prior to making a critical lift. The critical lift plan/procedure shall be reviewed and questions shall be resolved.
- If required by the critical lift procedure, a practice lift shall be done before the critical lift. Conditions for a practice lift should closely simulate actual conditions involving: weight, rigging selection and configuration, load movement path, and other relevant factors. Practice lifts shouldbe done by the same crew, using the same lifting equipment.

10.9 Rigging Equipment Requirements

Before each used, the sling and all fastenings and attachments shall be inspected for damage or defectsby a competent person designated by the employer. Additional inspections shall be performed during sling use, where service conditions warrant. *Damaged or defective slings shall be immediately removedfrom service and repaired or disposed of in accordance with manufacturer's specifications.*

Alloy Steel Chains

The Alloy Steel Chain sling shall be visually inspected each day before they are used as follows:

- Welded alloy steel chain slings shall have permanently affixed, durable identification stating size,grade, rated capacity, and sling manufacturer.
- Hooks, rings, oblong links, pear shaped links, welded or mechanical coupling links, or other attachments, when used with alloy steel chains, shall have a rated capacity at least equal to thatof the chain.
- Job or shop hooks and links, or makeshift fasteners, formed from bolts, rods, etc., or other suchattachments, shall not be used.
- Rated capacity (working load limit) for alloy steel chain slings shall the manufactures specifications or available tabulated data.
- Whenever wear at any point of any chain link exceeds the manufactures specifications, the assembly shall be removed from service.
- Conduct a link-by-link inspection for the following defects: bent or stretched links, cracks in anysection of link, scores, or abrasions tending to weaken the rings or hooks. Remove from serviceif discovered.
- Check rings and hooks for distortion, cracks in weld areas, corrosion, scores, or abrasions tending to weaken the ring or hooks. Remove from service if discovered.
- Perform inspection on an individual-link basis. If any link does not hinge freely with the adjoining link, remove the assembly from service. Remove from service assemblies with deformed masterlinks or coupling links.
- Remove from service assemblies if hooks have been opened more than 15 percent of the normalthroat opening measured at the narrowest point or twisted more than 10 degrees from the planeof the unbent hook.
- Do not straighten deformed hooks or other attachments on the job. Assemblies with such defectsshall be reconditioned by the manufacturer. Remove from service assemblies with cracked hooks or other end attachments; assemblies with repairable defects shall be reconditioned or repaired prior to being returned to service.
- In addition to the inspection required by other areas of this section, a thorough periodic inspection of alloy steel chain slings in use shall be made regularly based on:
    - Frequency of sling use
    - Severity of service conditions
    - Nature of lifts being made
    - Experience gained on the service life of slings used in similar circumstances
- Such inspection shall in no event be at intervals greater than once every 12 months.
- The employer shall make and maintain a record of the most recent month in which each alloy steel chain sling was thoroughly inspected, and shall make such record available for examination.

THE USE OF STEEL CHAINS IS PROHIBITED UNLESS PRIOR APPROVAL IS REQUESTED ANDGRANTED FROM THE EHS DEPARTMENT

Wire Rope

The wire rope sling shall be visually inspected each day prior to use, carefully noting any deteriorationthat could result in an appreciable loss of original strength and determining whether further use of the sling would constitute a safety hazard.

- All Rigging equipment for material handling including Wire Rope Slings shall be inspected priorto use on each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment shall be removed from service by applying an “Out Of Service Tag” or “Do Not Operate” (Red Tag) to prevent usage.

- All Wire Rope Slings shall have permanently affixed and legible identification markings as prescribed by the manufacturer that indicate the recommended safe working load.

- ***When Wire Rope Slings are purchased by Louth Callan Renewables, LLC Projects, a request shall be made to the vendor at the time of purchase to affix Duplicate Tags on the Wire Rope Slings to help preserve the proper identification markings.***
- Wire Rope Slings shall not be used without affixed, legible identification markings. Any Wire Rope Slings without affixed, legible identification markings shall be removed from service by applying an “Out Of Service Tag” or “Do Not Operate” (Red Tag) to prevent usage.

- Wire Rope Slings that cannot be Re-Tagged by the manufacturer or repaired shall be destroyedand disposed of so that they cannot be used on any Louth Callan Renewables, LLC Site.

- Wire Rope Slings shall not be loaded in excess of the recommended safe working load as prescribed on the identification markings by the manufacturer.

- Rigging equipment, when not in use, shall be stored properly and removed from the immediatework area so as not to create a hazard to employees.

The manufactures specifications shall be used to determine the safe working loads of various sizes andclassifications of improved plow steel wire rope and wire rope slings with various types of terminals. Forsizes, classifications, and grades not included in these tables, the safe working load recommended bythe manufacturer for specific, identifiable products shall be followed, provided that a safety factor of notless than 5 is maintained.

Protruding ends of strands in splices on slings and bridles shall be covered or blunted. Wire rope shallnot be secured by knots, except on haul back lines on scrapers. The following limitations shall apply tothe use of wire rope:

- An eye splice made in any wire rope shall have not less than three full tucks. However, this requirement shall not preclude the use of another form of splice or connection which can be shown to be as efficient and which is not otherwise prohibited.
- Except for eye splices in the ends of wires and for endless rope slings, each wire

rope used in hoisting or lowering, or in pulling loads, shall consist of one continuous piece without knot or splice.

- Eyes in wire rope bridles, slings, or bull wires shall not be formed by wire rope clips or knots.
- Wire rope shall not be used if, in any length of eight diameters, the total number of visible brokenwires excess 10% of the total number of wires, or if the rope shows other signs of excessive wear, corrosion, or defect.

When U-bolt wire rope clips are used to form eyes, the manufactures specifications shall be used to determine the number and spacing of clips. When used for eye splices, the U bolt shall be applied so that the "U" section is in contact with the dead end of the rope.

Slings shall not be shortened with knots or bolts or other makeshift devices. Kinking, crushing, bird- caging, or any other damage resulting in distortion of the rope structure. Slings used in a basket hitch shall have the loads balanced to prevent slippage.

Slings shall be padded or protected from the sharp edges of their loads. Hands or fingers shall not be placed between the sling and its load while the sling is being tightened around the load. Shock loadingis prohibited. A sling shall not be pulled from under a load when the load is resting on the sling. Slings will be taken out of service for any of the following:

- Ten randomly distributed broken wires in one rope lay, or five broken wires in one strand in onerope lay.
- Wear or scraping of one-third the original diameter of outside individual wires.
- Evidence of heat damage from any cause.
- End attachments that are cracked, deformed, or worn.
- Hooks that have been opened more than 15 percent of the normal throat opening measured atthe narrowest point or twisted more than 10 degrees from the plane of the unbent hook.

Cable laid and 6 X 19 and 6 X 37 slings shall have a minimum clear length of wire rope, 10 times the component rope diameter between splices, sleeves or end fittings. Braided slings shall have a minimum clear length of wire rope 40 times the component rope diameter between the loops or end fittings. Cablelaid grommets, strand laid grommets and endless slings shall have a minimum circumferential length of96 times their body diameter.

Fiber core wire rope slings of all grades shall be permanently removed from service if they are exposedto temperatures in excess of 200 degrees F (93.33 degrees C). When non-fiber core wire rope slings of any grade are used at temperatures above 400 degrees For below minus 60 degrees F recommendations of the sling manufacturer regarding use at that temperature shall be followed.

Welding of end attachments, except covers to thimbles, shall be performed prior to the assembly of thesling. All welded end attachments shall not be used unless proof tested by the manufacturer or equivalent entity at twice their rated capacity prior to initial use. The employer shall retain a certificate of the proof test, and make it available for examination.

Synthetic Web Slings

Synthetic Web Slings (nylon, polyester, and polypropylene) shall be visually inspected each Day prior to use, carefully noting any deterioration that could result in an appreciable loss of original strength anddetermining whether further use of the sling would constitute a safety

hazard. The synthetic web sling shall be marked or coded to show:

- Name or trademark of manufacturer.
- Rated capacities for the type of hitch.
- Type of material.
- Rated capacity shall not be exceeded.

Webbing: Synthetic webbing shall be of uniform thickness and width and salvage edges shall not be split from the webbing's width.

Fittings*:* Fittings shall be of a minimum breaking strength equal to that of the sling and free of all sharpedges that could in any way damage the webbing.

Nylon web slings shall not be used where fumes, vapors, sprays, mists or liquids of acids or phenolicsare present. Polyester and polypropylene web slings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present. Web slings with aluminum fittings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.

Synthetic web slings of polyester and nylon shall not be used at temperatures in excess of 180 degrees
F. Polypropylene web slings shall not be used at temperatures in excess of 200 degree F.

Synthetic web slings shall be immediately removed from service if any of the following conditions are present;

- Acid or caustic burns.
- Melting or charring of any part of the sling surface.
- Snags, punctures, tears or cuts.
- Broken or worn stitches
- Distortion of fittings.
- Wear or elongation exceeding the amount recommended by manufacturers.
- Knots in any part.
- Missing or illegible sling identification.
- Sling’s warning threads are exposed and visible.

For other apparent defects that cause doubt as to the strength of the sling, refer to the manufacturer fordetermination of whether continued use would constitute a safety hazard.

Shackles and Hooks
The manufactures specifications shall be used to determine the safe working loads of various sizes of shackles, except that higher safe working loads are permissible when recommended by the manufacturer for specific, identifiable products, provided that a safety factor of not less than five (5) is maintained.

The manufacturer's recommendations shall be followed in determining the safe working loads of the various sizes and types of specific and identifiable hooks. All hooks for which no applicable manufacturer's recommendations are available shall be tested to twice the intended safe working loadbefore they are initially put into use.

Inspections, Testing and Maintenance Inspections

- Only select rigging equipment that is in good condition.
- All rigging equipment shall be inspected annually; defective equipment is to be removed from service and destroyed to prevent inadvertent reuse.
- The load capacity limits shall be stamped or affixed to all rigging components.
- All devices shall be visually inspected prior to use and removed from service for any of the following conditions:
  - Nylon slings with:
    - Abnormal wear.
    - Torn stitching.
    - Broken or cut fibers.
    - Discoloration or deterioration.
  - Wire rope slings with:
    - Kinking, crushing, bird caging, or other distortions.
    - Evidence of heat damage.
    - Cracks, deformation, or worn end attachments.
    - Six randomly broken wires in a single rope lay.
    - Three broken wires in one strand of rope.
    - Hooks opened more than 15% at the throat.
    - Hooks twisted sideways more than 10 degrees from the plane of the unbent hook.
  - Alloy steel chain slings with:
    - Cracked, bent, or elongated links or components.
    - Cracked hooks.
    - Shackles, eye bolts, turnbuckles, or other components that are damaged or deformed.

The various rope conditions noted upon inspection should be used to determine continued use or retirement of the rope in question.

Inspection records should be maintained to determine the time interval for retirement of the rope. Records should be readily available until the specific wire rope is retired. All observed rope deterioration should be recorded on these inspection records.

Wire rope unfit for use on cranes, slings or other load carrying devices should be removed from service and identified as unfit for use.

Replacement Criteria

The following criteria are based on using the wire rope under maximum load conditions. While the wire rope should be retired if any of the conditions are found limited usage may continue until the replacement rope is available. This determination shall be made by a qualified operator or a qualified inspector.

When broken wires appear, the inspections should be at more frequent intervals as additional broken wires can be anticipated in a short period of time. Valley breaks are more detrimental than surface broken wires. Running ropes used in the boom hoist:

- Six randomly distributed broken wires within one lay length.
- Three broken wires in one strand within one lay length.

Running ropes of rotation-resistant construction used in the main or auxiliary hoist:

- Four randomly distributed broken wires within one lay length.
- Two broken wires in one strand within one lay length.

Standing ropes such as boom pendants:

- Three broken wires within one lay length.
- Two broken wires at the end connection.

One valley break may indicate internal rope damage requiring close inspection of this section of the rope. When two or more valley breaks are found in one lay length the rope should be retired.

More than one-third of the original diameter of the outside wires of the strand are worn.

The rope construction has been distorted by kinking, crushing, birdcaging or other distortional damage.

There is evidence of heat damage from any source. Heat can be generated by passing a rope over a frozen or nonturning sheave, contact with structural members of the crane, improperly grounded welding leads or lightning strikes.

Reductions for the rope diameter in a nonworking area (an area away from the sheaves) compared to the lowest diameter of rope measured in three working areas (areas where the rope regularly goes overa sheave) of more than the following is observed:

- 3/64 (.047) inch for diameters up to and including ¾ inch.
- 1/16 (.062) inch for diameters of 7/8 through 11/8 inch.
- 3/32 (.093) inch for diameter of 11/4 through 11/2 inch.

Increase in the length of an individual rope lay is observed. This increase in lay length and accompanying reduction in diameter can be caused by failure of the core. This may occur more readilyin ropes or rotation-resistant construction.

Extensive external and/or internal permanent corrosion is cause for rope replacement. Wire ropereplacement should be selected by using the following criteria:

- Boom hoist rope replaced with rope of the same diameter, length, construction, grade, (either galvanized or bright with the same minimum break load) as originally furnished or as recommended by the crane manufacturer or other qualified sources. Rotation resistant rope should not be used to replace boom hoist ropes.
- Pendants or standing ropes replaced with rope of the same diameter, length, construction, grade, (either galvanized or bright with the same minimum break load) as originally furnished oras recommended by the crane or rope manufacturer. End connections should be the same as originally furnished or as recommended by the crane manufacturer or other qualified sources.
- Load hoist ropes replaced with rope of the same diameter, length, construction, grade (either galvanized or bright with the same minimum break load) as originally furnished or as recommended by the crane manufacturer or other qualified sources.

- When the replacement rope is other than the type and grade that was originally furnished, all load rating charts should be reviewed by the original crane manufacturer, an API Specification 2C licensed crane manufacturer, authorized surveyor, or an engineer experienced in crane wirerope applications.

Testing

- Load test records will be furnished showing procedures outlined in Appendix E of API2D, 4.2.
- All records of annual and load testing shall be retained at the facility where each crane, hoist orother equipment covered by this program is located. All maintenance and repair records shall be retained for the life of the equipment.

Maintenance

- Rope should be stored and handled to prevent damage and deterioration.
- Unreeling or uncoiling of rope should be done as recommended by the rope manufacturer. Whenunreeling or uncoiling rope attention should be given to avoid the introduction of kinks or twistsinto the rope. Rotation-resistant rope may be more susceptible to this type of damage than other rope types.
- Wire rope in the boom hoist and load hoist systems should be installed as recommended by thecrane and/or wire rope manufacturer.
- Before cutting a rope, seize the rope at either side of the cut location to prevent unlaying of thestrands.
- Care should be taken during installation to avoid contaminating, scraping or nicking the wire rope. Do not bend the rope about small pipe or crane components that might induce kinks or curling.
- Wedge socketing or terminating of the wire rope should be performed or supervised by a qualified operator or qualified inspector. Wire rope clips shall be drop-forged steel and shall be single saddle (U-bolt) or double saddle type clips. Malleable cast iron clips shall not be used. For spacing, number of clips, and torque values, refer to the clip manufacturer's recommendations. Wire rope clips attached with u-bolts shall have the u-bolt over the dead endof the rope and the live rope resting in the clip saddle. Clips shall be tightened evenly to the recommended torque. After the initial load is applied to the rope, the clip nuts shall be retightened to the recommended torque to compensate for any decrease in rope diameter caused by the load. Rope clip nuts should be retightened periodically to compensate for any further decrease in rope diameter during usage.
- Wedge type sockets should be properly installed.
- Rope should be maintained in a well-lubricated condition to minimize internal and external corrosion or friction. The best penetration of lubricant is obtained when the lubricant is applied as the rope passes over a sheave. Lubricants applied in the field should be compatible with thelubricant applied by the rope manufacturer following the recommendations of the rope and/or acrane manufacturer. Do not apply used oil because of contamination.

10.10 Operational Procedures

Only qualified personnel shall operate cranes and equipment covered by this program. Operators shallcomply with the following safety rules while operating cranes and hoists:

- Employees shall not be exposed to unsafe concentrations of toxic gases or oxygen deficient atmospheres when internal combustion engine powered equipment is used. Tests shall be conducted and documented.
- Do not engage in any practice that will divert your attention while operating the crane.
- Respond to signals only from the person who is directing the lift or any appointed signal person.
- Obey a stop signal at all times, no matter who gives it.
- Do not move a load over people.
- People shall not be placed in jeopardy by being under a suspended load.
- Do not work under a suspended load unless the load is supported by blocks, jacks, or a solidfooting that will safely support the entire weight.
- Have a crane or hoist operator remain at the controls or lock open and tag the main electricaldisconnect switch.
- Ensure that the rated load capacity of a crane's bridge, individual hoist, or any sling or fitting isnot exceeded.
- Know the weight of the object being lifted.
- Check that all controls are in the OFF position before closing the main line disconnect switch.
- If spring-loaded reels are provided to lift pendants clear off the work area, ease the pendant upinto the stop to prevent damaging the wire.
- Avoid side pulls. These can cause the hoist rope to slip out of the drum groove, damaging the rope or destabilizing the crane or hoist.
- To prevent shock loading, avoid sudden stops or starts. Shock loading can occur when a suspended load is accelerated or decelerated, and can overload the crane or hoist. When completing an upward or downward motion, ease the load slowly to a stop.

At the start of each work shift, the designated competent person operator shall do the following stepsbefore making lifts with any crane or hoist:

- Test the upper-limit switch and slowly raise the unloaded hook block until the limit switch trips.
- Visually inspect the hook, load lines, trolley, and bridge as much as possible from the operator'sstation; in most instances, this will be the floor of the building.
- If provided, test the lower-limit switch.
- Test all direction and speed controls for both bridge and trolley travel.
- Test all bridge and trolley limit switches, where provided, if operation will bring the equipment inclose proximity to the limit switches
- Test the pendant emergency stop.
- Test the hoist brake to verify there is no drift without a load.
- If provided, test the bridge movement alarm.
- Lock out and tag for repair any crane or hoist that fails any of the above tests.
- Any deficiencies shall be repaired, or defective parts replaced, before continued use.

Moving a Load

- Center the hook over the load to keep the cables from slipping out of the drum grooves and overlapping, and to prevent the load from swinging when it is lifted.
- Inspect the drum to verify that the cable is in the grooves.
- Use a tag line when loads must traverse long distances or must otherwise be controlled.
- Manila rope may be used for tag lines.
- Plan and check the travel path to avoid personnel and obstructions.
- Lift the load only high enough to clear the tallest obstruction in the travel path.
- Start and stop slowly.
- Land the load when the move is finished.
- Choose a safe landing area.
- Never leave suspended loads unattended
- In an emergency where the crane or hoist has become inoperative, if a load must be left suspended, barricade and post signs in the surrounding area, under the load, and on all four sides.
- Lock open and tag the crane or hoist's main electrical disconnect switch.

Parking a Crane

- Remove all slings and accessories from the hook.
- Return the rigging device to the designated storage racks.
- Place the emergency stop switch (or push button) in the OFF position.
- Follow all site specific environmental requirements for spill control and prevention

Rigging a Load

- Determine the weight of the load - do not guess.
- Determine the proper size for slings and components. Do not use manila rope for rigging.
- Ensure that shackle pins and shouldered eyebolts are installed in accordance with themanufacturer's recommendations.
- Ensure that ordinary (shoulder less) eyebolts are threaded in at least 1.5 times the bolt diameter.
- Use safety hoist rings (swivel eyes) as a preferred substitute for eye bolts wherever possible.
- Pad sharp edges to protect slings.
- Remember that machinery foundations or angle-iron edges may not feel sharp to the touch butcould cut into rigging when under several tons of load.
- Wood, tire rubber, or other pliable materials may be suitable for padding.
- Do not use slings, eyebolts, shackles, or hooks that have been cut, welded, or brazed.
- Install wire-rope clips with the base only on the live end and the U-bolt only on the dead end.
- Follow the manufacturer's recommendations for the spacing for each specific wire size.
- Determine the center of gravity and balance the load before moving it.
- Initially lift the load only a few inches to test the rigging and balance.

Signaling
A signal person must be provided if the operator's view is obstructed, if site specific safety concerns require it, or if the operator determines that it is necessary. A signal person must be provided for the following situations:

- The point of operation is not in full view of the operator,
- The view is obstructed when the equipment is traveling, or
- The operator or the person handling the load determines it is necessary due to site specificconcerns.

Signals to the operator shall be in accordance with the standard hand.
Specific requirements include:

- Each movement of equipment will be proceeded by distinctive signals clearly discernible to all employees endangered by the movement and clearly distinguishable by the operator of the equipment controlled, and a signal which is not understood clearly by the operator of equipmentshall be acted upon by him or her as though it were a stop signal.
- An employee will not cause a signal to be given for the movement of equipment unless he or she has ensured that he or she and all employees within the area for which he or she is responsible are not endangered by the movement.
- Only a designated employee will cause a signal to be given for the movement of equipment, butemployees may cause a stop signal to be given and this signal will be obeyed promptly and without question.
- An employee designated to direct the movement of equipment will not be otherwise occupied while the equipment is in motion and he or she shall be prepared to signal to stop during the motion.
- The ability to transmit signals between the operator and signal person must be maintained. If the ability to transmit signals is interrupted at any time, the operator must safely stop operationsrequiring signals until communication is reestablished and a proper signal is given and understood.
- The signaling device used to transmit signals must be tested on site before beginning operationsto ensure that the signal transmission is effective, clear and reliable
- A signaling device that functions unreliably or in a way that might constitute a hazard to an employee shall be removed from service immediately.
- Signals shall be discernible or audible at all times.
- Some special operations may require addition to or modification of the basic signals.
- For all such cases, these special signals shall be agreed upon and thoroughly understood by both the person giving the signals and the operator and shall not be in conflict with the standardsignals.

11.0 Lighting
Proper illumination of work spaces on the project site, roadways and other work areas is imperative to a safe working environment. It is of significant importance in safe vehicular operation and the prevention of slips and falls.

A review of the lighting requirements for specific tasks or operations shall be evaluated as part of the activity hazard analysis (AHA).

While work is in progress, offices, facilities, accessways, working areas, construction roads, etc., shall be lit to ensure worker can perform their work safely. Office lighting shall be a minimum of 50 foot- candles (lm/ft2) or 540 luminance (lx) at the working surface. Means of egress shall be illuminated, with emergency and non-emergency lighting, to provide a minimum of 5 lm/ft2, (55 lx), measured at the floor.
> Reference IESNA Handbook.

The illumination shall be arranged so that the failure of any single lighting unit, including the burning outof an electric bulb, will not leave any area darkened to the point of impeding the means of egress.

If work is to be performed at night, a night operation lighting plan shall be developed to ensure that allactivities, areas and operations are adequately illuminated to perform work safely. On-task lighting shallbe in conformance with Table 7-1. Lighting near roadways and other public transportation areas shall be positioned as to avoid creating a glare hazard.