TOWN OF MANSFIELD
MANSFIELD MIDDLE SCHOOL ROOF BUILDING COMMITTEE
Tuesday, June 23, 2020
Virtual Meeting

This meeting is physically closed to the public but the public may view the meeting on livestream at https://townhallstreams.com/towns/mansfield_ct

8:30AM

Special Meeting Agenda

1. Call to Order
2. Approval of June 16, 2020 Minutes
3. Updates
4. Discussion and Vote: Roof Style Options
5. Adjournment

SPECIAL MEETING DRAFT MINUTES

Members Present: Bill Briggs, John Carrington, John Fratiello, David Litrico, Kelly Lyman, Toni Moran, Paul Shapiro

Staff Present: Sheri Baczanski, Public Works Specialist; Allen Corson, Director of Facilities Management; Derek Dilaj, Acting Director of Public Works; Cherie Trahan, Director of Finance; Bill Trietch, Deputy Director of Facilities Management

Guests: Robert Banning, Principle & Chief Electrical Engineer, Silver Petrucelli; Paul Jorgensen, Associate & Architect, Silver Petrucelli; David Stein, Principle & AIA, Silver Petrucelli; Michael Chambers, Electrical Engineer

1. CALL TO ORDER:
   Meeting called to order at 8:32AM by Paul Shapiro

2. APPROVAL OF APRIL 30, 2020 MINUTES:
   Mr. Briggs **moved** to approve the minutes of the May 27, 2020 meeting. Mr. Fratiello seconded the motion.

   The motion **passed** unanimously.

3. UPDATES: ENVIRONMENTAL (HAZMAT) AND STRUCTURAL ANALYSIS
   Mr. Corson told the Committee that the test field cuts for hazardous materials has been done and lab results should be available within the next few weeks. Mr. Jorgensen shared the results of the structural analysis report and the Committee discussed accommodating photovoltaic panels and load capacities / safety of roof in the event of heavy wet snow.

   Mr. Litrico joined the meeting at 8:36AM

4. ELECTRICAL ENGINEERING REPORT RE: SYSTEM SIZE ON PV SYSTEM
   Mr. Chambers shared a presentation on Solar Photovoltaic Panels and answered questions about ballasted roof systems. The Committee discussed utility costs and energy usage with solar photovoltaic panels.

5. ROOF STYLE OPTIONS AND COSTS
   Discussion covered different roof types which were identified as: membrane, single or double ply, standing seam and metal.

6. DATE FOR NEXT MEETING
   The Committee discussed dates for presenting to the Board of Education and the Town Council. Targeted date for a BOE presentation is July 2, 2020. Targeted date for Town Council presentation is July 13, 202.

   The Committee agreed to hold its next Special meeting on June 23, 2020.

7. ADJORNMENT:
   Mr. Briggs **moved** to adjourn the meeting at 10:09AM. Ms. Moran seconded the motion.

   The motion **passed** unanimously

Respectfully Submitted,

Tasha N. Smith
Executive Assistant, Town Manager's Office

TOWN OF MANSFIELD
Facilities Management Department

Allen N. Corson, Director of Facilities Management

AUDREY P. BECK BUILDING
FOUR SOUTH EAGLEVILLE RD
MANSFIELD, CT 06268-2599
(860) 429-3326
Fax: (860) 429-6863

Dear Mr. Paul Shapiro and MMS Roof Committee Members

As requested by the Committee chair, I am providing you with my opinion concerning roof styles. I can speak from nearly 35 years in the building industry and being responsible for the care of many roofs and problems. Of the four options, EPDM and TPO roofs have shown themselves to be more problematic. They are not as forgiving when someone leaves behind debris i.e. tradesperson drops screws or other items that tends to cause leaks. They also tend to start having problems earlier than the other two options, seams and sealing.

Between metal standing seam and modified bituminous roofing, I would pick metal standing seam as the better long-term value if we knew that the roof needed to last 50 years. However, in our case we do not know enough about what the future holds for the Middle School. Therefore, the better value of roofing for these considerations would be the Modified Bituminous Roofing. The roofing holds up better than EPDM and TPO and will give the Town at least thirty more years at one-half the price of metal standing seam.

Thank You
Director of Facilities
Allen N Corson

June 11, 2020

Mr. Paul Jorgensen, AIA
Silver/Petrucelli + Associates Architects
3190 Whitney Avenue
Hamden, Connecticut 06518-2340

Re: Structural Evaluation of Existing Roof Structure
for Roof Replacement and Solar Panel Installation
Mansfield Middle School
205 Spring Hill Road
Storrs, Connecticut
MHA Project No. 20-55

Dear Mr. Jorgensen:

As requested, Michael Horton Associates, Inc. (MHAI) has reviewed the original structural drawings prepared by Russell Gibson von Dohlen Architects, dated July 15, 1968. Subsequent to our review, MHAI analyzed the existing roof framing of each roof area to determine the available load capacity to support the additional loads that would be imposed by the proposed re-roofing materials and a ballasted solar panel system.

Existing Roof Structure:
The existing roof structure consists of flat and varying pitched roofs, with various types of roofing materials. The typical roof construction consists of wide rib metal roof deck supported on steel beams and girders. In several areas where longer clear spans were required, the structure consists of open web steel joists and trusses. In Areas 3,4, and 11 the roof structure consists of cementitious wood fiber planks, supported on bulb tees over structural steel beams.

Analysis:
Per our communications, it is understood that the weight of the proposed roofing materials shall be equal to, or less than, the weight of the existing roofing materials. For the purposes of our analysis, we have assumed the proposed roof shall consist of an EPDM rubber roof over polyisocyanurate insulation installed over the various existing roof deck types. Based on this construction, we estimated the dead loads for the various roof areas, ranging from approximately 12.0 psf to 16.5 psf, depending on the roof construction. Acoustical ceiling tile has been assumed in these weight calculations. If plaster ceilings are encountered, the additional load capacities could vary significantly. Based on these dead loads and live load of 30.0 psf indicated within the original structural drawings, we have established the available capacity for additional loading in each area of the roof. The available capacity has included snow drift and unbalanced snow conditions per IBC 2015.

Attached is Roof Capacity Key Plan - Drawing S1, identifying the various roof areas of the building. Per the Request for Proposals, the metal roofs and portable classrooms were excluded from this scope of work. Also, the original structural drawings were not available for section of the low flat roof located between Area 4 and the hip-shaped metal panel roof has excluded. Per our communications, due to the large RTU and shadowing from the higher roof in this area, no PV panels will be considered.

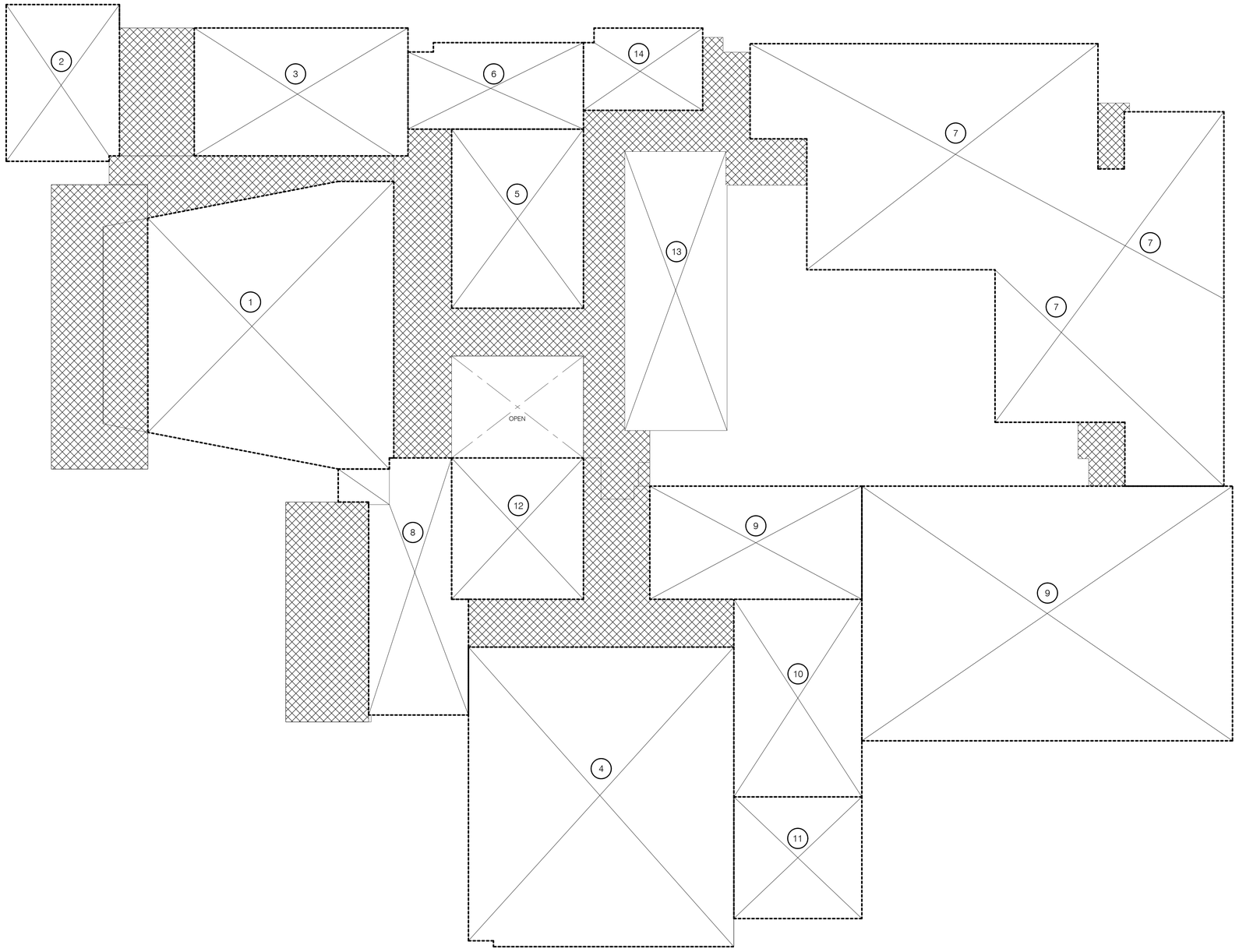
The table below identifies the "Additional Load Capacity" available for each roof area.

Roof Area	**Additional Load Capacity Available** (in psf)
Area 1	20
Area 2	18
Area 3	2.8
Area 4	2.8
Area 5	12
Area 6	20
Area 7	14
Area 8	19
Area 9	11
Area 10	8.5
Area 11	2.8
Area 12	20
Area 13	19
Area 14	12

The inclusion of ballasted PV panels is acceptable on those roof areas where the "Additional Load Capacity" exceeds the weight of the proposed ballasted system. This concludes our report, should you have any questions or require further assistance, please contact our office.

Sincerely yours,

Douglas H. McCloskey, P.E.
Michael Horton Associates, Inc.



ROOF AREA	ADDITIONAL LOAD CAPACITY AVAILABLE (IN PSF)
AREA 1	20
AREA 2	18
AREA 3	2.8
AREA 4	2.8
AREA 5	12
AREA 6	20
AREA 7	14
AREA 8	19
AREA 9	11
AREA 10	8.5
AREA 11	2.8
AREA 12	20
AREA 13	19
AREA 14	12

ROOF PLAN

SCALE: NONE

1. NUMBERS ON PLAN INDICATES ZONES CORRESPONDING TO THE ACCOMPANYING STRUCTURAL REPORT. REFER TO REPORT FOR REMAINING CAPACITIES.

CAPACITY FOR RE ROOFING ONLY NO EXCESS CAPACITY FOR PU PANELS

Project Title:
Borough of Mansfield
Mansfield Middle School Roof Replacement & Photovoltaic Project
205 Spring Hill Road
Storrs, Connecticut 06268

SILVER / PETRUCELLI + ASSOCIATES
Architects / Engineers / Interior Designers
3190 Whitney Avenue, Hamden, CT 06518-2340
One Post Hill Place, New London, CT 06320
Tel. 203 230 9007 Fax. 203 230 8247
silverpetrucelli.com

Revision:	*Description:*	*Date:*	*Revised By:*

MHAI
Michael Horton Associates Inc.
Consulting Structural Engineers
151 Meadow Street
Branford, Connecticut 06405
203-481-8600
mha-eng.com

Drawing Title:
Roof Capacity Key Plan

STATE PROJECT # RR/PV

Date: JUNE 16, 2020
Scale: AS NOTED
Drawn By: AC
Project Number: 20.087

Drawing Number: S1

The Town of Mansfield

Roof Replacement Options

Mansfield Middle School
205 Spring Hill Rd. Storrs, Connecticut 06268

June 15, 2020

Prepared by:

Silver Petrucelli & Associates, Inc.
Architects / Engineers / Interior Designers
3190 Whitney Avenue
Hamden, CT 06518
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TABLE OF CONTENTS

I. Executive Summary

This report is the result of a study commissioned by the Town of Mansfield, Connecticut to assess the current condition of the roofs located at the Mansfield Middle School. To pursue professional recommendations for roof repairs and/or replacements including, but not limited to, projected roof replacement schedules, opinions of probable cost for roof replacement & the analysis of roof coverings for the replacement.

Based on committee feedback and selection, the architects will develop schematic design plans and inventory for the entire facility, based upon to State's Office of School Construction Grants (SCG) guidelines for school roof projects. These documents are intended to serve as record documents for the town and state, and to assist the town during future roof replacement projects.

Birdseye view of Mansfield Middle School

This report was prepared by Silver Petrucelli & Associates, Inc. (S/P+A) of Hamden, Connecticut, an architecture and engineering firm specializing in municipal and school programming, planning and design, feasibility analyses and building condition investigations. This report was developed with input from the officials of the School District and the Municipal Government.

Process

The information contained in this report was gathered by S/P+A via interviews and meetings with Allen N. Corson, the district's Facilities Management Director, observations and samples of the existing roof condition and materials, examination of the most recent construction drawings, as prepared by (Russel Gibson Von Dohlen Architects) and historical data of other recently completed school roof replacements. The collected data was organized and appears in sections of this report in the form of written narratives & cost spreadsheet.

II. Roof Replacement Options - membranes

The three most common roofing materials utilized today in the industry are EDPM (ethylene propylene diene monomer), TPO thermoplastic polyolefin and modified bitumen (hot or cold applied).

1 EPDM

a. Fully Adhered – *Fully adhered is the preferred installation of EPDM, due to its proven track record and the inherent problems of the other systems listed below.*
b. Mechanically Fastened – *Mechanically fastened EPDM is second to fully-adhered, but is not our recommended application due to the fact that the plates are fastened through the EPDM membrane and patched over. Each fastener and associated patch is one more potential point for water infiltration.*
c. Loose Laid & Ballasted – *Ballasted EPDM is loose laid over the existing roof and held down by the weight of the ballast. This installation is not recommended, due to the potential movement of a loose laid sheet, the added weight of the ballast, and the difficulty in removing the ballast for future roof replacements.*

2 TPO

a. Fully Adhered – *Fully adhered is the preferred installation for TPO, due to the same rationale used in recommending fully adhered EPDM above.*
b. Mechanically Fastened – *The second preferred TPO option, due to the fact that fasteners must penetrate the membrane, be roofed over and heat welded.*
c. Loose Laid & Ballasted – *This installation is not recommended, due to the same rationale described in the EPDM loose laid roofing above.*

3 2-ply Modified Bitumen

a. Hot Applied – *Refer to previous list of 'Modified Bitumen Advantages' for rationale behind this selection*
b. Cold Applied – *Cold applied modified bitumen, although not a new process, does not have the track and performance record of a hot applied roof. One advantage for cold applied is the absence of hot kettles and associated odors, although the adhesives used in cold applied applications have similar harmful odors and it is recommended that the building not be occupied during installation. One major disadvantage of the cold applied system, is that the*

layers of roofing are fastened together with an adhesive, whereas the layers in a hot applied system are actually melted and combined into one solid, more durable system.

EPDM ROOFING MEMBRANE SYSTEM

1-ply rubber EPDM

This roofing system has been installed on many of the installations that we have completed successfully for numerous towns across the state. This system can be installed while the building is occupied and is less offensive to the nearby neighbors with regards to smell as opposed to a hot applied system. We recommend a roofing system with a 20 year warranty, non-pro rated for labor and materials. The warranty will cover leaks caused by the manufacture's materials and contractor's workmanship failures as long as proper maintenance and good roofing practices are performed. A one or two warranty from the installing contractor will cover any issues created by construction operations.

Advantages:

- Cyclical membrane fatigue resistance
- Proven hail resistance
- High degree of ozone, weathering and abrasion resistance
- Low temperature flexibility
- Superior resistance to extreme heat
- Thermal shock durability
- Ultraviolet radiation resistance
- 20 – 30 year warranties available

Disadvantages:

- Elastomeric membrane has been known to shrink
- Higher puncture rate than other roofing membranes
- Lower roofing membrane life duration
- Elastomeric roofing membrane bubbles after time
- Mil thickness less than other roofing applications
- Glue applications tend to un-adhere over time

EPDM's Physical Properties

- Chemical compounds (ethylene propylene diene monomer)
- Compounded with carbon black, processing oils and various cross-linking and stabilizing agents
- Recaptures its shape after stretching (thermoset membrane)
- Manufactured in large sheets—from up to 50 feet wide and lengths up to 200 feet
- Available in thicknesses of 45, 60, 75 and 90 mils

EPDM's Three Application Methods:

1. The Mechanically-Attached System: Mechanically-attached systems can be installed using large panels and attached through the membrane, or by using narrow panels with the attachment mechanism being installed in the side laps. Non-reinforced or scrim reinforced membranes can be used, depending on the needs of the building owner. The membrane is then attached using either round plates or batten strips to the underlying deck. Mechanically-attached systems are lightweight and are ideal for all building sizes and configurations.

2. The Fully-Adhered System: Fully-adhered systems use panels measuring up to 30 feet by 100 feet. The membrane is bonded to the insulation, which has been physically attached, using mechanical fasteners, stress plates and/or adhesives. Either non-reinforced or scrim reinforced membrane can be used, with the non-reinforced membrane making up most adhered installations. Fully-adhered systems are lightweight and ideal for a wide range of building sizes and geometric configurations, including high-slope applications. Because of recent technological advances in application, the fully-adhered system is becoming the system of choice for roofing removal and replacement applications in many areas of the country.

TPO ROOFING SYSTEM

1-ply TPO Membrane

- **Specifications.**
- **Applications.**

TPO Roofing Membrane

TPO roofing membranes have a heat welded seam system that is one of their signature features along with a high reflective surface and high resistance to puncture and impact. This product can also be installed while the building is occupied and is less offensive to occupants and the nearby neighbors with regards to odors as opposed hot applied system. We recommend a roofing system with a 20 year warranty, non-pro-rated for labor and materials. The warranty will cover leaks caused by the manufacture's materials and contractor's workmanship failures as long as proper maintenance and good roofing practices are performed. A one year warranty from the installing contractor will cover any issues created by construction operations.

Specifications:

TPO- Thermo Plastic Olefin- a thermoplastic membrane utilizing a reinforcement scrim between the two plies. 35/65% thickness for top & bottom ply respectively. Top ply contains Cool Roof Pigments, UV stabilizers, and other components to extend the life of the membrane. Bottom ply contains TPO ingredients to provide consistent weld of top and bottom plies and fillers. Note that the top ply is about half the thickness of the bottom ply. Yet the top ply is the one that make the roof long-lasting. TPO roof system life expectancy is 7 to 20+ years.

Fully Adhered TPO:

The adhered TPO system is ideal for many different types of buildings. It is especially good for roofs not designed for the weight of ballast or that has many roof penetrations and can be installed on almost any roof deck. Sheets of insulation are laid out on the decking and fastened accordingly to the system specifications. TPO sheets are then adhered to the insulation. Adjoining sheets are overlapped and heat-welded using specialized welding equipment.

System Benefits:

- Low maintenance
- Reflective Roof System
- Durable

Mechanically Fastened TPO

Mechanically attached Roofing Systems are ideal for many different types of buildings and can be an economical solution where conditions are suitable. Sheets of insulation are laid out on the decking and fastened accordingly to the system specifications. The insulation is then covered with sheets of TPO and plates and fasteners are installed in the membrane seam. Adjoining panels are overlapped and heat welded using specialized welding equipment. Sheets of insulation are laid out on the roof system and then adhered, with bonding adhesive or mechanically fastened with insulation plates and fasteners to the roof decking

2-ply Modified Bituminous Membrane Roofing:

Modified bitumen membranes -- MBS -- combine the features of a built-up roof with the added tensile strength from its polymer modification. Using a reinforced sheet that is prefabricated in the plant, modified bitumen systems require a less labor-intensive application and can be applied cross-platform in both commercial and certain residential applications.

A modified bitumen roofing system is composed primarily of polymer-modified bitumen reinforced with one or more plies of fabric such as polyester, fiberglass or a combination of both. Factory surfacing, if applied, includes mineral granules, slag, aluminum or copper. The bitumen determines the membrane's physical characteristics and provides primary waterproofing protection, while the reinforcement adds strength, puncture resistance and overall system integrity.

Factory-assembled, modified bitumen membranes undergo strict quality control standards to ensure uniform thickness and consistent physical properties throughout the membrane. The finished roofing system is usually a two- to four-ply system consisting of a modified bitumen membrane and a base sheet, with additional plies for added strength if needed. The substrate often determines which ply system is best specified.

Advantages:

- Polymer modification to asphalts result in greater elongation and the ability to accommodate building movement
- Ability to manufacture rolls in plants, providing better quality control and quality assurance
- Versatile application options: hot asphalts, cold adhesives
- A variety of modified types and mils are available to better provide resistance against foot traffic and common rooftop abuse when needed
- Thicker mil applications offer more resistance to environmental and weather conditions

Disadvantages:

- Installation requires more labor and is therefore slightly more expensive
- Asphalt applications can be odorous and may affect those occupying the building
- Ply applications cause seams in the roof that could bubble or separate
- Application is not as clean to rubber or TPO applications
- Installation on sloped roofs is more costly due to fastening requirements

Modified Bitumen Application Methods

Modified bitumen systems come in basically two applications - Styrene Butadiene Styrene (SBS) and Atactic Polypropylene (APP). While both systems sheets can be reinforced with glass or polyester, they do differ in how they are installed on the roof. SBS is typically installed with hot asphalts or cold adhesives. APP is almost always installed utilizing the torch method.

Both Modified Bitumen Roof System types can be surfaced with either factory surfacing ceramic granules or with metallic laminates such as copper or stainless steel. If a cap sheet is not utilized, aluminum coatings or white acrylics can be applied to enhance the systems UV and oxidation resistance.

Metal Standing Seam Roof

Pros of Standing Seam Metal Roofing

- **Hidden Fasteners.** Concealed fasteners have a longer lifespan. They are protected from environmental factors and UV exposure.
- **Thermal Movement.** Standing seam metal roofing is designed to deal with expansion and contraction. Hence, it is less prone to leaks than its exposed fastener counterpart.
- **Lifespan.** Metal roofing with hidden fasteners can have significantly longer lifespans. They also require less maintenance.
- **Aesthetics**. A standing seam roof offers a clean, and sleek appearance.
- **Choice.** These roofing systems can be constructed with a variety of metals. Therefore, they are used in simple, as well as complex designs, and offer more architectural freedom.
- **Energy Efficient.** Standing seam systems are made with roof cooling coils, highly reflective colors, and emissive metals. All of that creates a hyper-energy-efficient roofing system.

Cons of Standing Seam Metal Roofing

- **Price.** Standing seam metal roofing is more expensive when compared to other roofing. However, value in the long-run is also important.
- **Labor Intensive**. Installing a standing seam roof is distinctly more complex and labor-intensive. It is imperative to find a contractor with experience installing standing seam roofing systems.
- **Limits.** A standing seam roof cannot be used for flat roofing structures.
- **Replacement and Repairs**. It becomes harder to replace or repair this type of roofing system because of its complex nature, sealing and adhesion.

The installation of a Standing Seam Metal roof over the existing sloped roof areas on the Mansfield Middle School would involve the complete removal of the existing roofing membrane & insulation. As each roof section is removed, the existing structure would then be analyzed for weaknesses, and necessary repairs or reinforcements would be made during this phase. Following the existing roofing systems removal, a new insulation system would be installed followed by a traditional standing seam metal roofing system. This system is comprised of 22-gauge aluminum panels with a Kynar finish fastened to the existing deck over a building paper vapor barrier. The metal panels are held down by metal clips fastened to the purlins. New metal gutters and downspouts shall be installed in their existing locations, we also recommend the town consider the installation of new metal snow guards at all entrance locations. This metal standing seam system has a non-prorated warranty of at least 30 years or better.

III. Costs

State Grant Eligibility & Reimbursement

According to Connecticut General Statutes (C.G.S) Section 10-282, the State of Connecticut requires that in order for a school roof replacement to be fully eligible for reimbursement, the following conditions must be met:

- All roofing materials must be removed down to and/or including the deck prior to installation of the new roof (a.k.a. complete vertical replacement)
- The area of the roof to be replaced must be sizable and contiguous such as a complete wing or the entire facility (as compared to "cut and patch" jobs which will not be deemed roof replacements)
- The roof being replaced must be at least 20 years old at the time of grant application. If the roof is less than 20 years old, you are required to submit (1) the signature of a registered architect or registered engineer to certify improper design or improper construction and (2) the signature of the town or board attorney regarding recovery of damages and recourse at law or in equity. (These signatures are required on Schedule 7 of Form ED049 Grant Application and Executive Summary of Educational Specifications for a School Building Project.)

Furthermore, C.G.S. 10-286 defines the age of a roof as follows:

> *The age of the roof will be determined in whole years to the nearest year. Age shall be defined as the time between the completed installation of the old roof and the date of the grant application for the new roof.*

However, the State Department of Education has amended their interpretation of this definition and for reimbursement purposes, view the age of the roof as:

The time between the beginning date of construction of the old roof and the date of the grant application for the new roof.

Opinions of Probable Construction Cost

The following Opinions of Probable Construction Cost outline the anticipated costs that would be associated with the recommended repairs and full replacement of roofing at the Mansfield Middle School. A cost for the recommended roofing system, including associated soft costs and ineligible costs as determined by the State Department of Education and the Bureau of School Facilities. The final line item, 'Total Cost to Town of Mansfield', is the result of the 'Total Project Cost' reduced by the maximum State Grant Reimbursement of 65.36% for the Town of Mansfield. Ineligible costs such as the replacement of mechanical equipment and maintenance/repair items are not reimbursable, and design fees are reimbursed on a prorated basis, determined by the ratio of ineligible costs to the overall project cost.

C.G.S. 10-291(b)(2) *If the plans incorporate new roof construction or total replacement of an existing roof, they shall provide for the following:*

(A) A minimum roof pitch of one-quarter inch per foot, for a total replacement of an existing roof.

(B) a minimum twenty-year unlimited manufacturer's guarantee for water tightness covering material and workmanship on the entire roofing system,

(C) the inclusion of vapor retarders, insulation, bitumen, felts, membranes, flashings, metals, decks and any other feature required by the roof design, and

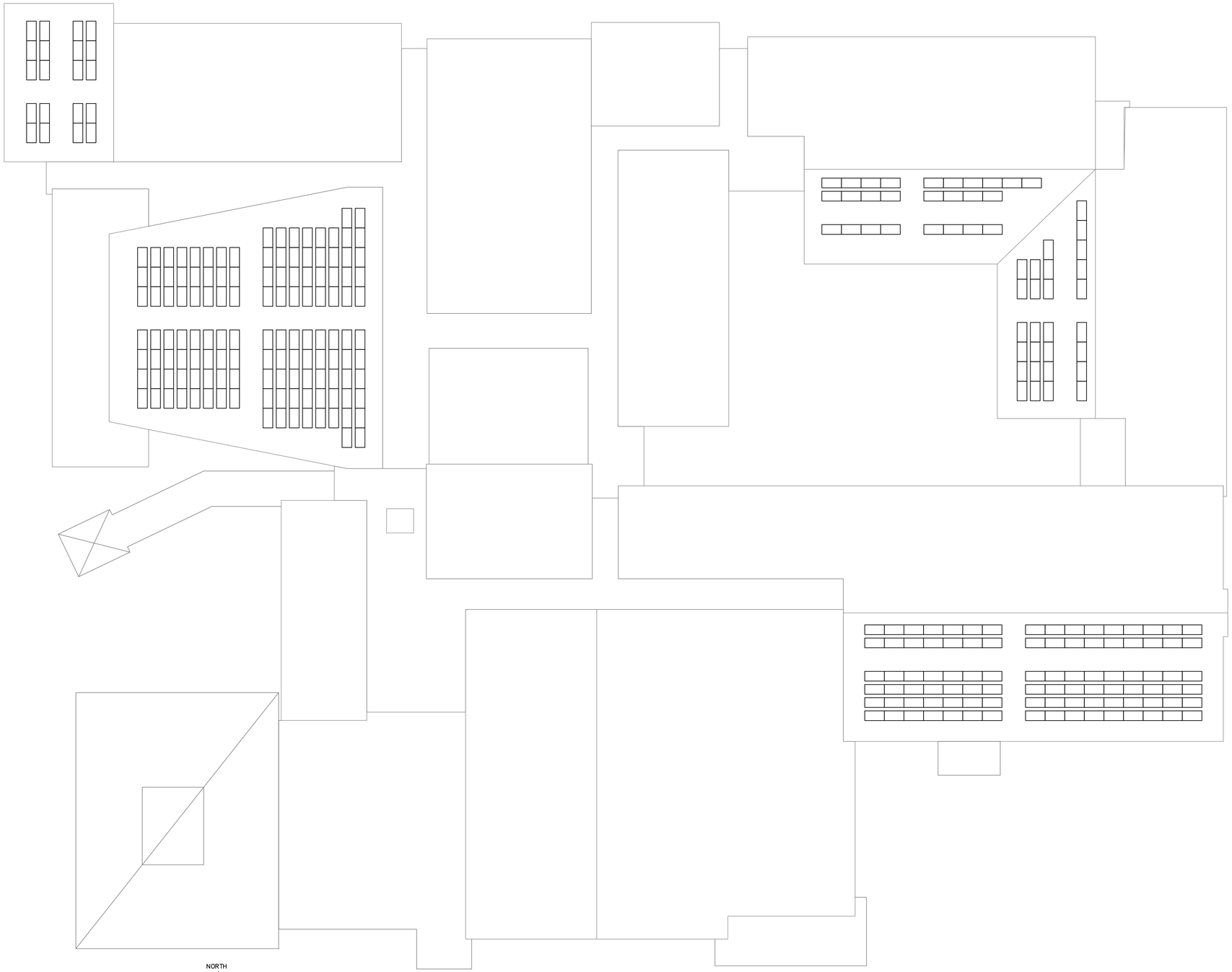
(D) that all manufacturer's materials to be used in the roofing system are specified to meet the latest standards for individual components of the roofing systems of the American Society for Testing and Materials

Mansfield Middle School Roof Replacement
Roof Replacement Cost Spreadsheet
Mansfield, Connecticut

Opinion of Probable Construction Cost

Total Roof Replacement (SF) 91,516

Roof Replacement Options	AREA SF	Detail	COST/SF	SUBTOTAL
EPDM Roofing Membrane	91,516	30 Year Warranty	$ 22.50	$2,059,110.00
EPDM Roofing Membrane	91,516	20 Year Warranty	$ 20.50	$1,876,078.00
TPO Roofing Membrane	91,516	30 Year Warranty	$ 21.50	$1,967,594.00
TPO Roofing Membrane	91,516	20 Year Warranty	$ 19.50	$1,784,562.00
Modified Bitumen Membrane	91,516	30 Year Warranty	$ 25.40	$2,324,506.40
Modified Bitumen Membrane	91,516	20 Year Warranty	$ 22.10	$2,022,503.60
Standing Seam Metal Roof	91,516	50 Year Warranty	$ 45.00	$4,118,220.00



PV ROOF PLAN – BALLASTED (1/E1)

SCALE: 1"=15'-0"

Project Title:
Borough of Mansfield
Mansfield Middle School Roof Replacement & Photovoltaic Project
205 Spring Hill Road
Storrs, Connecticut 06268

SILVER / PETRUCELLI + ASSOCIATES
Architects / Engineers / Interior Designers
3190 Whitney Avenue, Hamden, CT 06518-2340
One Post Hill Place, New London, CT 06320
Tel. 203 230 9007 Fax. 203 230 8247
silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: PV Roof Plan - Ballasted

state project # RR/PV

Date: JUNE 16, 2020
Scale: AS NOTED
Drawn By: M. CHAMBERS
Project Number: 20.087

Drawing Number: E1

MANSFIELD MIDDLE SCHOOL ROOF REPLACEMENT & PHOTOVOLTAIC PROJECT — 16-Jun-20

205 SPRING HILL ROAD, STORRS CT. 06268

OWNER: BOROUGH OF MANSFIELD

OPINION OF PROBABLE CONSTRUCTION COST — **122KW BALLASTED PV SYSTEM**

90,000 (SQUARE FEET) — **CT STATE PROJECT #**

SECTION NUMBER	WORK CATEGORIES	QTY.	UNIT	MATERIAL COST UNIT $	MATERIAL COST TOTAL	LABOR COST UNIT $	LABOR COST TOTAL	ALLOWANCE	TOTAL $	CT INELIGIBLE	
	OTHER COSTS										
	BONDS, INSURANCE	1	LS					$18,000.00	$18,000		$0
	STATE PERMIT FEE (.26 PER 1,000)	1	LS					$106.00	$106		$106
				OTHER SUB-TOTAL				$18,106		TOTAL:	$106
	DIVISION SEVEN										
	SLIP SHEETS & PITCH POCKETS FOR PV SYSTEM	1	LS					$50,000	$50,000		$0
				DIVISION SEVEN SUB-TOTAL				$50,000		TOTAL:	$0
	DIVISION TWENTY SIX										
	PV PANELS	1	LS	$70,000.00	$70,000	$0.00	$0		$70,000		$0
	INVERTERS	1	LS	$25,000.00	$25,000	$0.00	$0		$25,000		$0
	RACKING	1	LS	$25,000.00	$25,000	$0.00	$0		$25,000		$0
	ELECTRICAL COMPONENTS	1	LS	$45,000.00	$45,000	$0.00	$0		$45,000		$0
	DIRECT INSTALL LABOR	1	LS	$0.00	$0	$90,000.00	$90,000		$90,000		$0
				DIVISION TWENTY SIX SUB-TOTAL				$255,000		TOTAL:	$0

CONSTRUCTION COST PER SQUARE FOOT = $4.49

SUBTOTAL =		$323,106	TOTAL:	$106
GEN. CONDITIONS	10.00%	$32,311		$8
OVERHEAD & PROFIT	15.00%	$48,466		$13
SUBTOTAL		$403,883		
CONSTRUCTION TOTAL =		**$403,883**	TOTAL:	$127
A/E FEES INCLUDING CA =		$31,900		$8
ENVIRONMENTAL FEE		$0		$0
CONTINGENCY (+/- 7%)		$28,272		$28,272
GRAND TOTAL		**$464,054**	TOTAL:	$28,407

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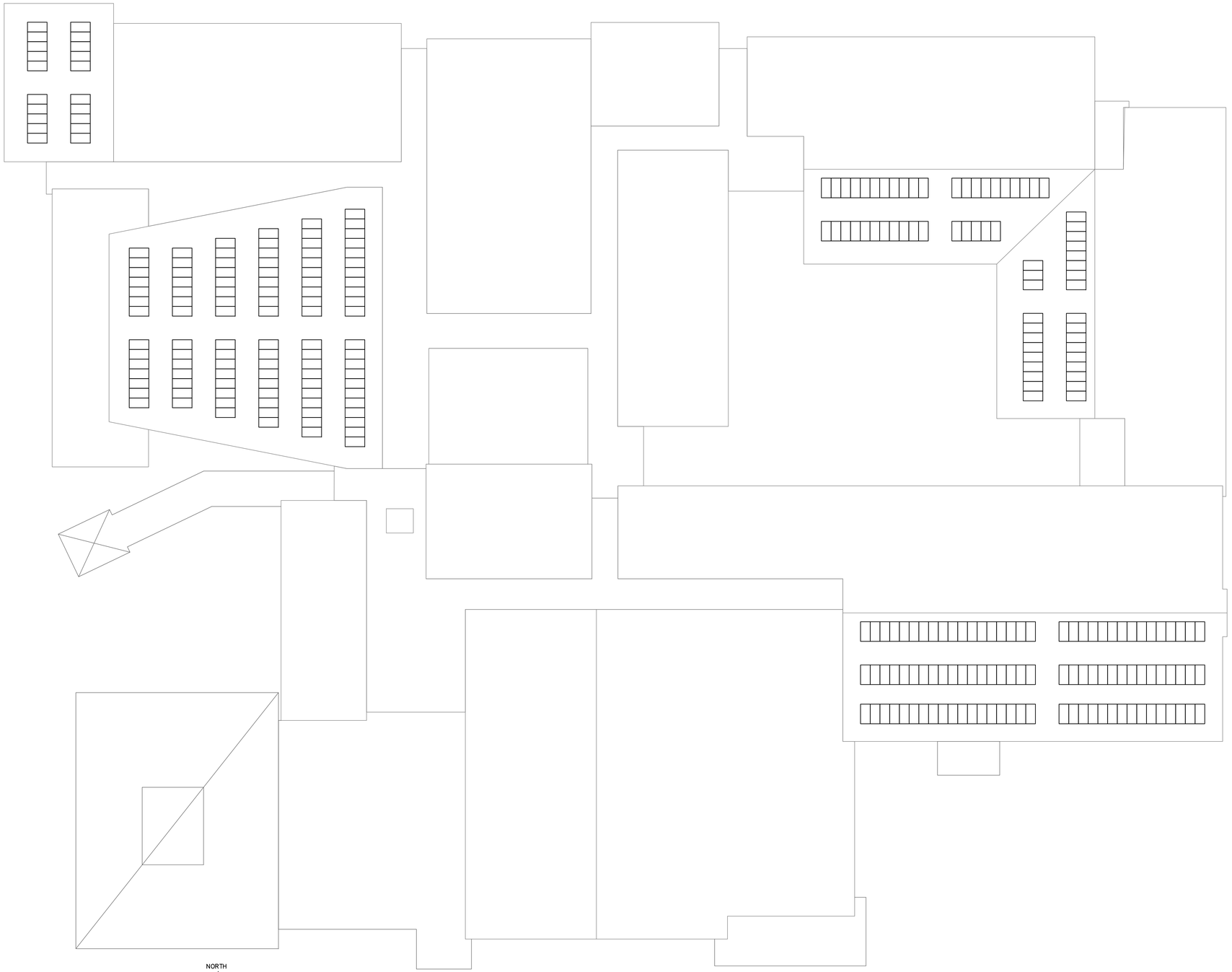

NORTH

PV ROOF PLAN – ATTACHED TO STRUCTURE (1 / E2)

SCALE: 1"=15'-0"

Project Title:
Borough of Mansfield
Mansfield Middle School Roof Replacement & Photovoltaic Project
205 Spring Hill Road
Storrs, Connecticut 06268

SILVER / PETRUCELLI + ASSOCIATES
Architects / Engineers / Interior Designers
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Revision:	Description:	Date:	Revised By:

Drawing Title:
PV Roof Plan - Attached to Structure

state project # RR/PV

Date: JUNE 16, 2020
Scale: AS NOTED
Drawn By: M. CHAMBERS
Project Number: 20.087

Drawing Number: E2

MANSFIELD MIDDLE SCHOOL ROOF REPALCEMENT & PHOTOVOLTAIC PROJECT — 16-Jun-20

205 SPRING HILL ROAD, STORRS CT. 06268

OWNER: BOROUGH OF MANSFIELD

OPINION OF PROBABLE CONSTRUCTION COST — **117KW ATTACHED TO STRUCTURE PV SYSTEM**

90,000 (SQUARE FEET) — **CT STATE PROJECT #**

SECTION NUMBER	WORK CATEGORIES	QTY.	UNIT	MATERIAL COST UNIT $	MATERIAL COST TOTAL	LABOR COST UNIT $	LABOR COST TOTAL	ALLOWANCE	TOTAL $	CT INELIGIBLE	
	OTHER COSTS										
	BONDS, INSURANCE	1	LS					$18,000.00	$18,000		$0
	STATE PERMIT FEE (.26 PER 1,000)	1	LS					$120.00	$120		$120
				OTHER SUB-TOTAL				$18,120		TOTAL:	$120
	DIVISION FIVE										
	STEEL CONNECTIONS & REINFORCING FOR PV SYST	1	LS	$10,000	$10,000	$40,000	$40,000		$50,000		$0
				DIVISION FIVE SUB-TOTAL				$50,000		TOTAL:	$0
	DIVISION SEVEN										
	SLIP SHEETS & PITCH POCKETS FOR PV SYSTEM	1	LS					$150,000	$150,000		$0
				DIVISION SEVEN SUB-TOTAL				$150,000		TOTAL:	$0
	DIVISION TWENTY SIX										
	PV PANELS	1	LS	$65,000.00	$65,000	$0.00	$0		$65,000		$0
	INVERTERS	1	LS	$25,000.00	$25,000	$0.00	$0		$25,000		$0
	RACKING	1	LS	$25,000.00	$25,000	$0.00	$0		$25,000		$0
	ELECTRICAL COMPONENTS	1	LS	$40,000.00	$40,000	$0.00	$0		$40,000		$0
	DIRECT INSTALL LABOR	1	LS	$0.00	$0	$85,000.00	$85,000		$85,000		$0
				DIVISION TWENTY SIX SUB-TOTAL				$240,000		TOTAL:	$0

CONSTRUCTION COST PER SQUARE FOOT = $6.36

SUBTOTAL =		$458,120	TOTAL:	$120
GEN. CONDITIONS	10.00%	$45,812		$10
OVERHEAD & PROFIT	15.00%	$68,718		$14
SUBTOTAL		$572,650		
CONSTRUCTION TOTAL =		**$572,650**	TOTAL:	$144
A/E FEES INCLUDING CA =		$31,900		$7
ENVIRONMENTAL FEE		$0		$0
CONTINGENCY (+/- 7%)		$40,086		$40,086
GRAND TOTAL		**$644,636**	TOTAL:	$40,236

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