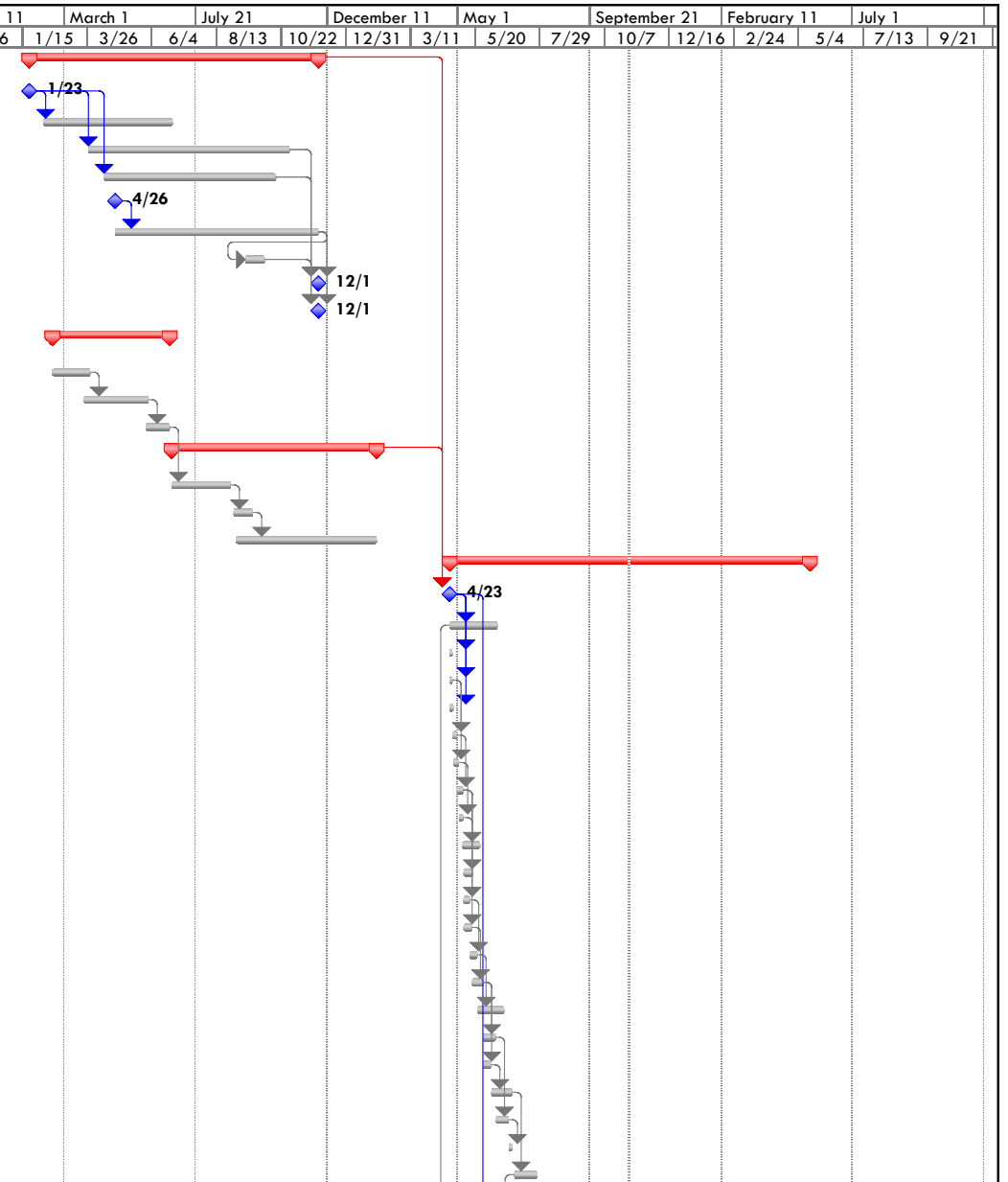


Erica L. Craig  
Construction Management  
April 9<sup>th</sup>, 2008  
Final Report  
Dr. Riley



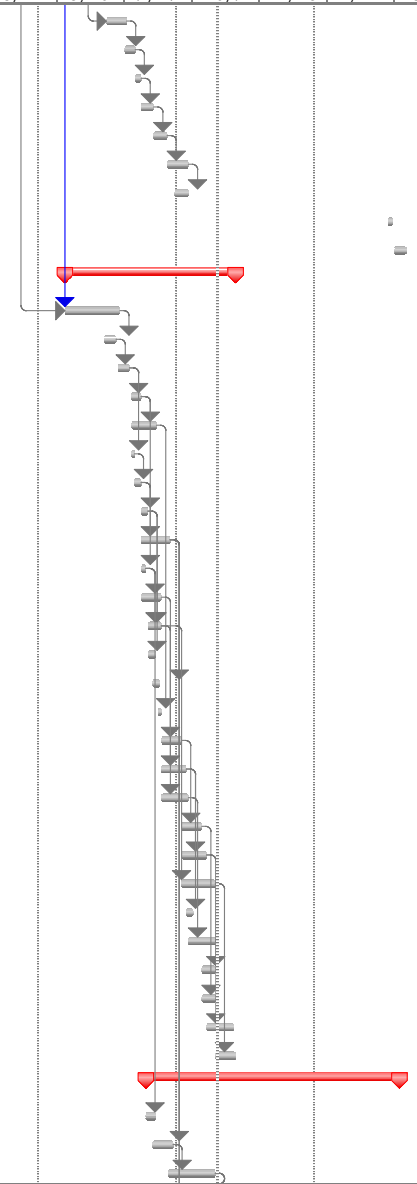
## **APPENDIX A: DETAILED PROJECT SCHEDULE**

ID	Task Name	Duration	Start	Finish	tober 11	March 1	July 21	December 11	May 1	September 21	February 11	July 1			
					11/6	1/15	3/26	6/4	8/13	10/22	12/31	3/11	5/20	7/29	10/7
1	<b>APPROVALS/PERMITS</b>	<b>225 days</b>	<b>Mon 1/23/06</b>	<b>Fri 12/1/06</b>											
2	Site Master Plan Approved	0 days	Mon 1/23/06	Mon 1/23/06											
3	Site Drawings & Easement Approvals	100 days	Tue 2/7/06	Mon 6/26/06											
4	NPDES Plan Revision/Resubmission/Approval	156 days	Tue 3/28/06	Tue 10/31/06											
5	Submit Plans to PennDOT/Approval	132 days	Fri 4/14/06	Mon 10/16/06											
6	Centre Region Council of Gov't Meeting	0 days	Wed 4/26/06	Wed 4/26/06											
7	537 DEP Planning/Approval	158 days	Wed 4/26/06	Fri 12/1/06											
8	Sewer Authority Sewer Main Approval	15 days	Thu 9/14/06	Wed 10/4/06											
9	Obtain Building Permit	0 days	Fri 12/1/06	Fri 12/1/06											
10	Receive Final LDP Approval	0 days	Fri 12/1/06	Fri 12/1/06											
11	<b>DESIGN DEVELOPMENT</b>	<b>91 days</b>	<b>Fri 2/17/06</b>	<b>Fri 6/23/06</b>											
12	Select CM/Schematic Design Estimate	29 days	Fri 2/17/06	Wed 3/29/06											
13	Design Development	50 days	Thu 3/23/06	Wed 5/31/06											
14	D.D. Estimate	20 days	Mon 5/29/06	Fri 6/23/06											
15	<b>CONSTRUCTION DOCUMENTS/GMP/PROCUREMENT</b>	<b>160 days</b>	<b>Mon 6/26/06</b>	<b>Fri 2/2/07</b>											
16	Construction Documents	46 days	Mon 6/26/06	Mon 8/28/06											
17	GMP	15 days	Fri 9/1/06	Thu 9/21/06											
18	Fab. & Deliv. Structural Steel	110 days	Mon 9/4/06	Fri 2/2/07											
19	<b>SITWORK</b>	<b>280 days</b>	<b>Mon 4/23/07</b>	<b>Fri 5/16/08</b>											
20	Mobilize on Site	0 days	Mon 4/23/07	Mon 4/23/07											
21	Building Pad	38 days	Mon 4/23/07	Wed 6/13/07											
22	Layout	3 days	Mon 4/23/07	Wed 4/25/07											
23	E&S (Incl. Pipe)	3 days	Mon 4/23/07	Wed 4/25/07											
24	Tree Protection Fence	4 days	Mon 4/23/07	Thu 4/26/07											
25	Construction Entrance	3 days	Thu 4/26/07	Mon 4/30/07											
26	Haul Road	4 days	Fri 4/27/07	Wed 5/2/07											
27	Impact Basin	5 days	Tue 5/1/07	Mon 5/7/07											
28	Waste Area E&S	3 days	Thu 5/3/07	Mon 5/7/07											
29	Clear & Grubb	15 days	Mon 5/7/07	Fri 5/25/07											
30	Impact Basin Walls	8 days	Tue 5/8/07	Thu 5/17/07											
31	Waste Area Pond	5 days	Tue 5/8/07	Mon 5/14/07											
32	Strip	7 days	Tue 5/8/07	Wed 5/16/07											
33	Waste Area Prep	6 days	Tue 5/15/07	Tue 5/22/07											
34	Cut to Fill	8 days	Thu 5/17/07	Mon 5/28/07											
35	Retaining Wall	21 days	Wed 5/23/07	Wed 6/20/07											
36	Cut to Waste	10 days	Tue 5/29/07	Mon 6/11/07											
37	Sanitary	7 days	Tue 5/29/07	Wed 6/6/07											
38	Waterline	17 days	Thu 6/7/07	Fri 6/29/07											
39	Paving Subgrade - South Parking Lot	10 days	Tue 6/12/07	Mon 6/25/07											
40	Base Paving - South Parking Lot	4 days	Tue 6/26/07	Fri 6/29/07											
41	Storm	19 days	Mon 7/2/07	Thu 7/26/07											



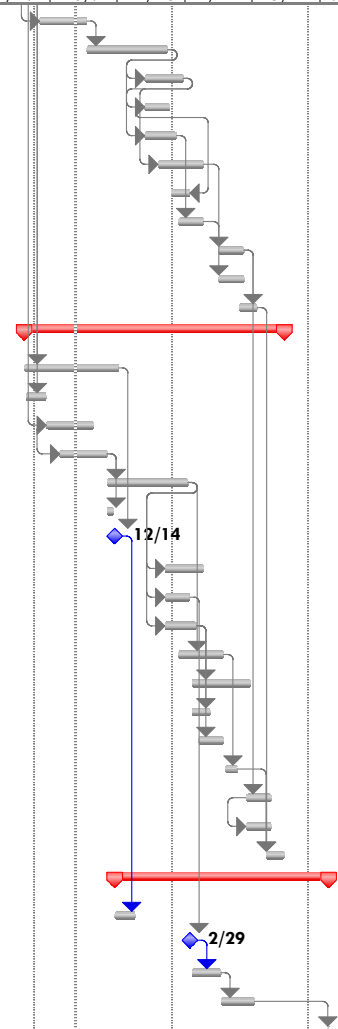
Project: Geisinger Gray's Woods Ambulatory Care Campus Phase 1 Summary Schedule	Task		Rolled Up Task		External Tasks	
	Progress		Rolled Up Milestone		Project Summary	
	Milestone		Rolled Up Progress		Group By Summary	
	Summary		Split		Deadline	

ID	Task Name	Duration	Start	Finish	tober 11	March 1	July 21	December 11	May 1	September 21	February 11	July 1			
					11/6	1/15	3/26	6/4	8/13	10/22	12/31	3/11	5/20	7/29	10/7
42	Underground Detention Facility and Storm	15 days	Wed 7/11/07	Tue 7/31/07											
43	Paving Subgrade - West Parking Lot	9 days	Mon 7/30/07	Thu 8/9/07											
44	Base Paving - West Parking Lot	4 days	Fri 8/10/07	Wed 8/15/07											
45	Concrete Slabs	9 days	Thu 8/16/07	Tue 8/28/07											
46	Curb	10 days	Wed 8/29/07	Tue 9/11/07											
47	Topsoil (Islands & Slopes)	16 days	Wed 9/12/07	Wed 10/3/07											
48	Landscaping & Seeding (Fall)	10 days	Thu 9/20/07	Wed 10/3/07											
49	Wearing Paving	5 days	Mon 4/28/08	Fri 5/2/08											
50	Landscaping & Seeding (Spring)	10 days	Mon 5/5/08	Fri 5/16/08											
51	<b>SHELL &amp; ENCLOSURE</b>	<b>127 days</b>	<b>Tue 5/29/07</b>	<b>Ved 11/21/07</b>											
52	Foundation Concrete	41 days	Tue 5/29/07	Tue 7/24/07											
53	Steel Erection Sequence 1	10 days	Mon 7/9/07	Fri 7/20/07											
54	Steel Erection Sequence 2	10 days	Mon 7/23/07	Fri 8/3/07											
55	Steel Erection Sequence 3	8 days	Mon 8/6/07	Wed 8/15/07											
57	Underground Plumbing	20 days	Mon 8/6/07	Fri 8/31/07											
58	Concrete 2nd Floor Seq. 1 & 2	3 days	Mon 8/6/07	Wed 8/8/07											
59	Concrete Roof Seq. 1 & 2	5 days	Thu 8/9/07	Wed 8/15/07											
56	Boiler Room Steel Erection	5 days	Thu 8/16/07	Wed 8/22/07											
60	TPO Roof	22 days	Thu 8/16/07	Fri 9/14/07											
61	Concrete 2nd Floor Seq. 3/SOG Seq. 1	3 days	Thu 8/16/07	Mon 8/20/07											
66	Exterior Stud Framing/Sheathing North Elevation	15 days	Thu 8/16/07	Wed 9/5/07											
63	Concrete Boiler Room Roof/SOG	10 days	Thu 8/23/07	Wed 9/5/07											
64	East and West Stair Installation	6 days	Thu 8/23/07	Thu 8/30/07											
65	Spray Fireproofing Shaft Bays	5 days	Tue 8/28/07	Mon 9/3/07											
62	Concrete Roof Seq. 3/SOG Seq. 2 & 3	3 days	Mon 9/3/07	Wed 9/5/07											
67	Exterior Stud Framing/Sheathing West Elevation	15 days	Thu 9/6/07	Wed 9/26/07											
69	Brick Masonry North Elevation	18 days	Thu 9/6/07	Mon 10/1/07											
72	Metal Roof	20 days	Thu 9/6/07	Wed 10/3/07											
68	Exterior Stud Framing/Sheathing South Elevation	15 days	Thu 9/27/07	Wed 10/17/07											
70	Brick Masonry West Elevation	18 days	Thu 9/27/07	Mon 10/22/07											
73	Aluminum Curtain Wall East Elevation	25 days	Thu 9/27/07	Wed 10/31/07											
76	Aluminum Windows North Elevation	5 days	Tue 10/2/07	Mon 10/8/07											
75	Aluminum Composite Panels	20 days	Thu 10/4/07	Wed 10/31/07											
71	EIFS	10 days	Thu 10/18/07	Wed 10/31/07											
77	Monumnetal Stair Installation	10 days	Thu 10/18/07	Wed 10/31/07											
78	Aluminum Windows West Elevation	20 days	Tue 10/23/07	Mon 11/19/07											
74	Aluminum Curtain Wall South and West Elevation	15 days	Thu 11/1/07	Wed 11/21/07											
79	<b>LEVEL 2 INTERIORS</b>	<b>189 days</b>	<b>Tue 8/21/07</b>	<b>Fri 5/9/08</b>											
80	East & West Stairs	8 days	Tue 8/21/07	Thu 8/30/07											
81	Hang Ductwork Mains	15 days	Tue 8/28/07	Mon 9/17/07											
82	Interior Metal Studs	35 days	Thu 9/13/07	Wed 10/31/07											



Project: Geisinger Gray's Woods Ambulatory Care Campus Phase 1 Summary Schedule	Task		Rolled Up Task		External Tasks	
	Progress		Rolled Up Milestone		Project Summary	
	Milestone		Rolled Up Progress		Group By Summary	
	Summary		Split		Deadline	

ID	Task Name	Duration	Start	Finish	tober 11	March 1	July 21	December 11	May 1	September 21	February 11	July 1			
					11/6	1/15	3/26	6/4	8/13	10/22	12/31	3/11	5/20	7/29	10/7
83	MEP in Wall	35 days	Thu 9/27/07	Wed 11/14/07											
84	Drywall	60 days	Thu 11/15/07	Wed 2/6/08											
85	Painting	30 days	Mon 1/14/08	Fri 2/22/08											
86	Epoxy Terrazzo	20 days	Mon 1/14/08	Fri 2/8/08											
88	Ceramic Tile	25 days	Mon 1/14/08	Fri 2/15/08											
87	Ceiling Grid	35 days	Mon 1/28/08	Fri 3/14/08											
89	Milcare Installation	15 days	Mon 2/11/08	Fri 2/29/08											
90	Plumbing Fixtures	20 days	Mon 2/18/08	Fri 3/14/08											
91	Light Fixtures/GRDs	20 days	Mon 3/31/08	Fri 4/25/08											
92	Hang Doors	20 days	Mon 3/31/08	Fri 4/25/08											
93	Floor Finishes	15 days	Mon 4/21/08	Fri 5/9/08											
94	<b>LEVEL 1 INTERIORS</b>	<b>194 days</b>	<b>Tue 9/11/07</b>	<b>Fri 6/6/08</b>											
95	Boiler Room Mechanical	70 days	Tue 9/11/07	Mon 12/17/07											
96	Hang Ductwork Mains	15 days	Thu 9/13/07	Wed 10/3/07											
97	Interior Metal Studs	35 days	Thu 10/4/07	Wed 11/21/07											
98	MEP in Wall	35 days	Thu 10/18/07	Wed 12/5/07											
99	Drywall	60 days	Thu 12/6/07	Wed 2/27/08											
100	MRI RF Enclosure	5 days	Thu 12/6/07	Wed 12/12/07											
102	Permanent System for Temporary Heat	0 days	Fri 12/14/07	Fri 12/14/07											
101	Painting	30 days	Mon 2/4/08	Fri 3/14/08											
103	Epoxy Terrazzo	20 days	Mon 2/4/08	Fri 2/29/08											
104	Ceramic Tile	25 days	Mon 2/4/08	Fri 3/7/08											
105	Ceiling Grid	35 days	Mon 2/18/08	Fri 4/4/08											
106	Install Elevators	45 days	Mon 3/3/08	Fri 5/2/08											
107	Milcare Installation	15 days	Mon 3/3/08	Fri 3/21/08											
108	Plumbing Fixtures	20 days	Mon 3/10/08	Fri 4/4/08											
109	Install Water Feature	10 days	Mon 4/7/08	Fri 4/18/08											
110	Light Fixtures/GRDs	20 days	Mon 4/28/08	Fri 5/23/08											
111	Hang Doors	20 days	Mon 4/28/08	Fri 5/23/08											
112	Floor Finishes	15 days	Mon 5/19/08	Fri 6/6/08											
113	<b>COMPLETION &amp; CLOSEOUT</b>	<b>158 days</b>	<b>Fri 12/14/07</b>	<b>Tue 7/22/08</b>											
114	Testing & Air Balancing	15 days	Fri 12/14/07	Thu 1/3/08											
115	Substantial Completion	0 days	Fri 2/29/08	Fri 2/29/08											
116	Punchlist	22 days	Mon 3/3/08	Tue 4/1/08											
117	Functional Testing - Commissioning	25 days	Wed 4/2/08	Tue 5/6/08											
118	Owner Move-In	1 day	Tue 7/22/08	Tue 7/22/08											

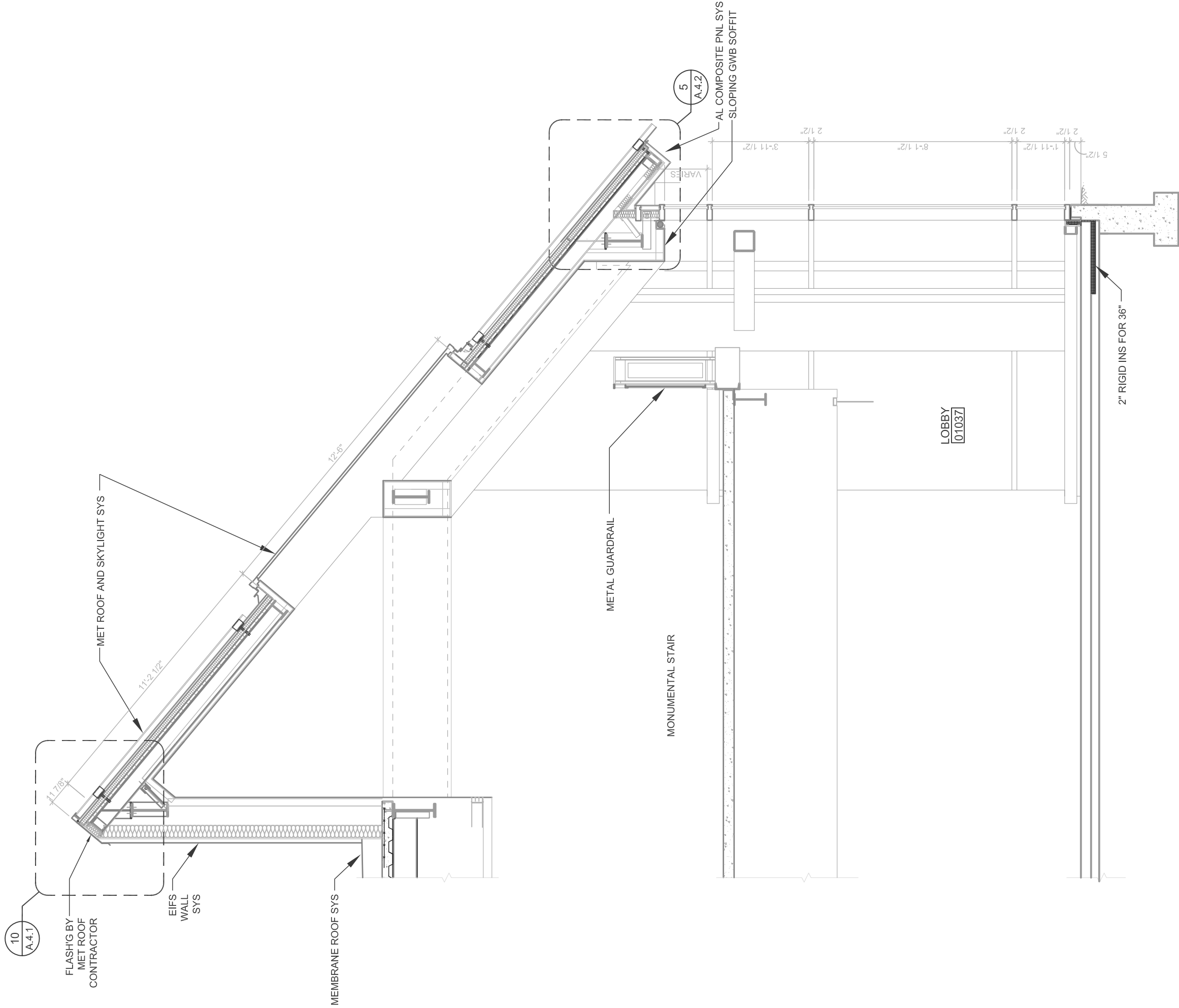


Project: Geisinger Gray's Woods Ambulatory Care Campus Phase 1 Summary Schedule	Task		Rolled Up Task		External Tasks	
	Progress		Rolled Up Milestone		Project Summary	
	Milestone		Rolled Up Progress		Group By Summary	
	Summary		Split		Deadline	

Erica L. Craig  
Construction Management  
April 9<sup>th</sup>, 2008  
Final Report  
Dr. Riley



## **APPENDIX B: ARCHITECTURAL DRAWINGS**

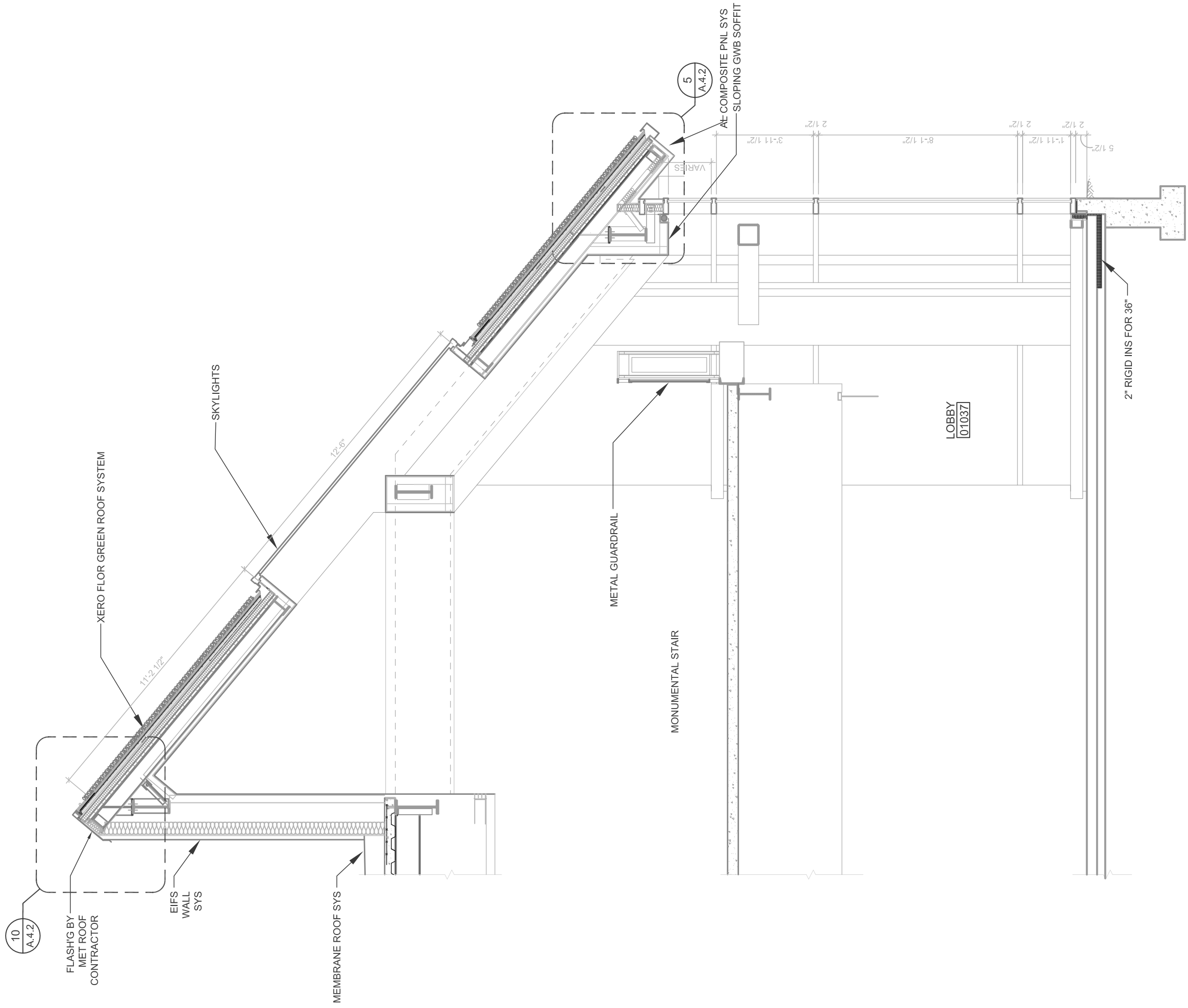


○ WALL SECTION - EAST ELEVATION - METAL ROOF  
3/8"=1'-0"

WALL SECTION - EAST ELEVATION  
METAL ROOF  
GEISINGER GRAY'S WOODS AMBULATORY CARE CAMPUS  
PATTON TOWNSHIP, CENTRE COUNTY, PA

Date	4/2/2008
Scale	1 1/2" = 1'
Sheet No.	A.3.1
File No.	2007.9.29

Drawn By	ELC
Client	Geisinger
No.	
DATE	
REVISION	
BY	



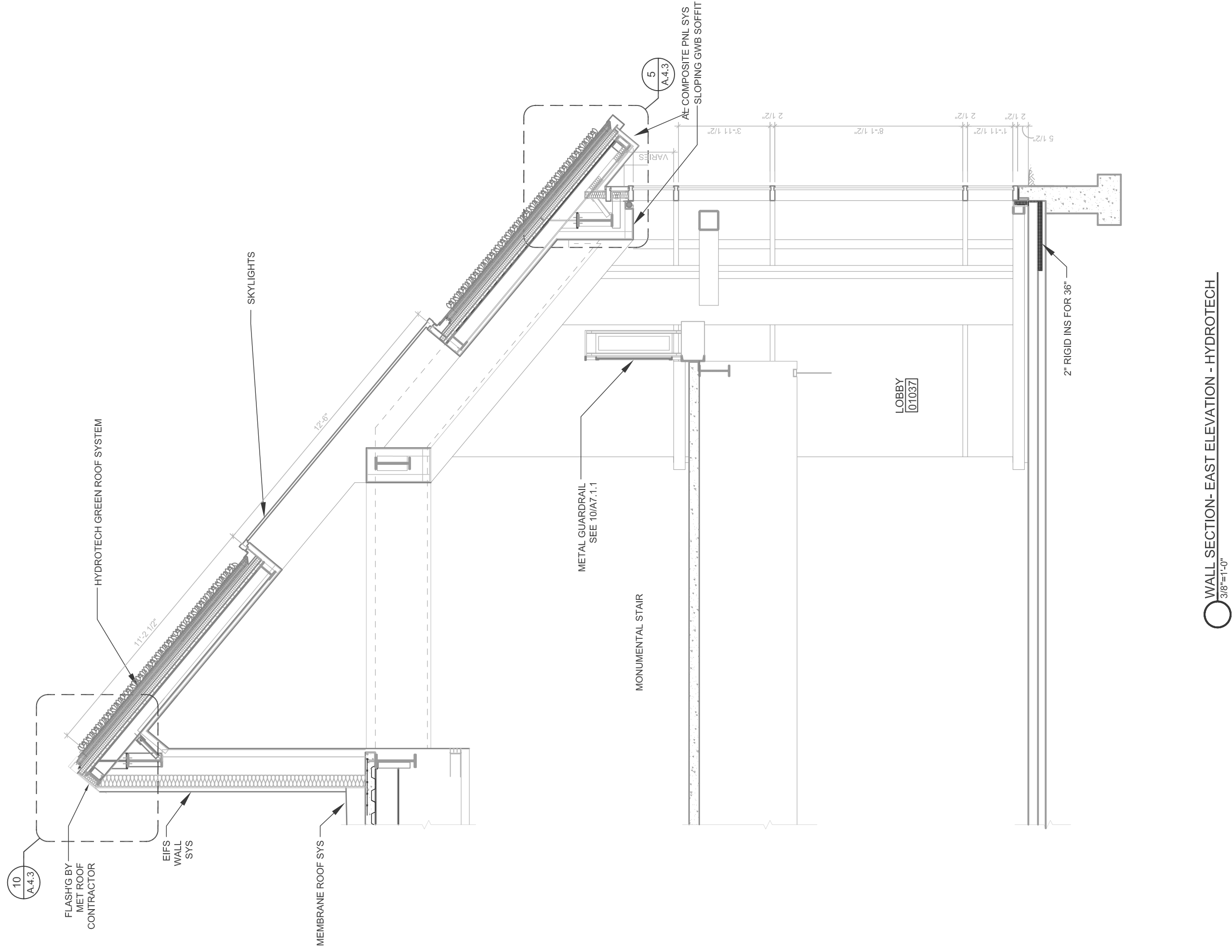
○ WALL SECTION- EAST ELEVATION - XERO FLOR  
3/8"=1'-0"

WALL SECTION - EAST ELEVATION  
XERO FLOR GREEN ROOF  
GEISINGER GRAY'S WOODS AMBULATORY CARE CAMPUS  
PATTON TOWNSHIP, CENTRE COUNTY, PA

Date	4/2/2008
Scale	1 1/2" = 1'
Sheet No.	A.3.2
File No.	2007.9.29

Drawn By  
ELC  
Client  
Geisinger

No.	DATE	REVISION	BY



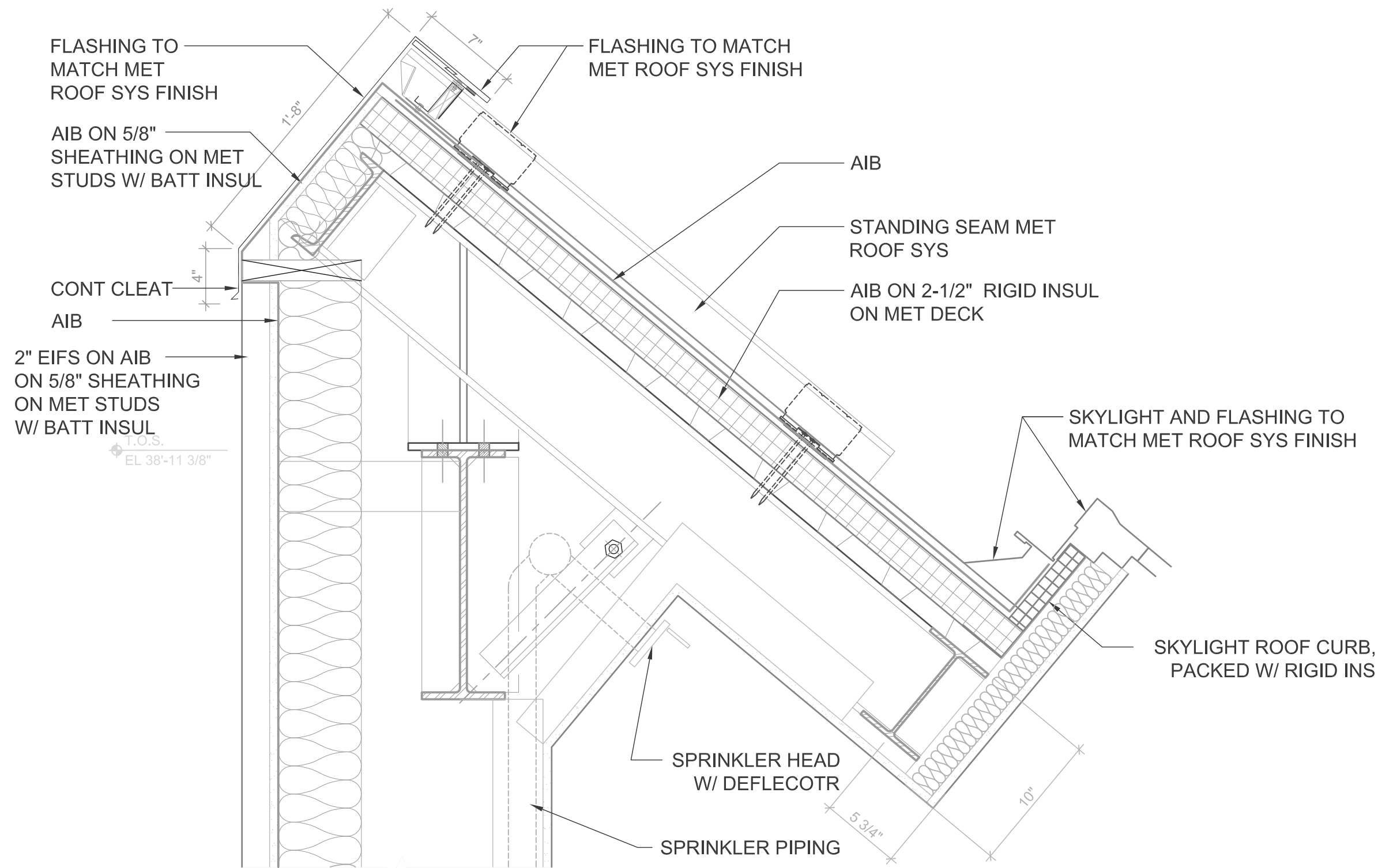
○ WALL SECTION - EAST ELEVATION - HYDROTECH  
 3/8"=1'-0"

WALL SECTION - EAST ELEVATION  
 HYDROTECH GREEN ROOF  
 GEISINGER GRAY'S WOODS AMBULATORY CARE CAMPUS  
 PATTON TOWNSHIP, CENTRE COUNTY, PA

Date	4/2/2008
Scale	1 1/2" = 1'
Sheet No.	A.3.3
File No.	2007.9.29

Drawn By	ELC
Client	Geisinger
No.	
DATE	
REVISION	
BY	





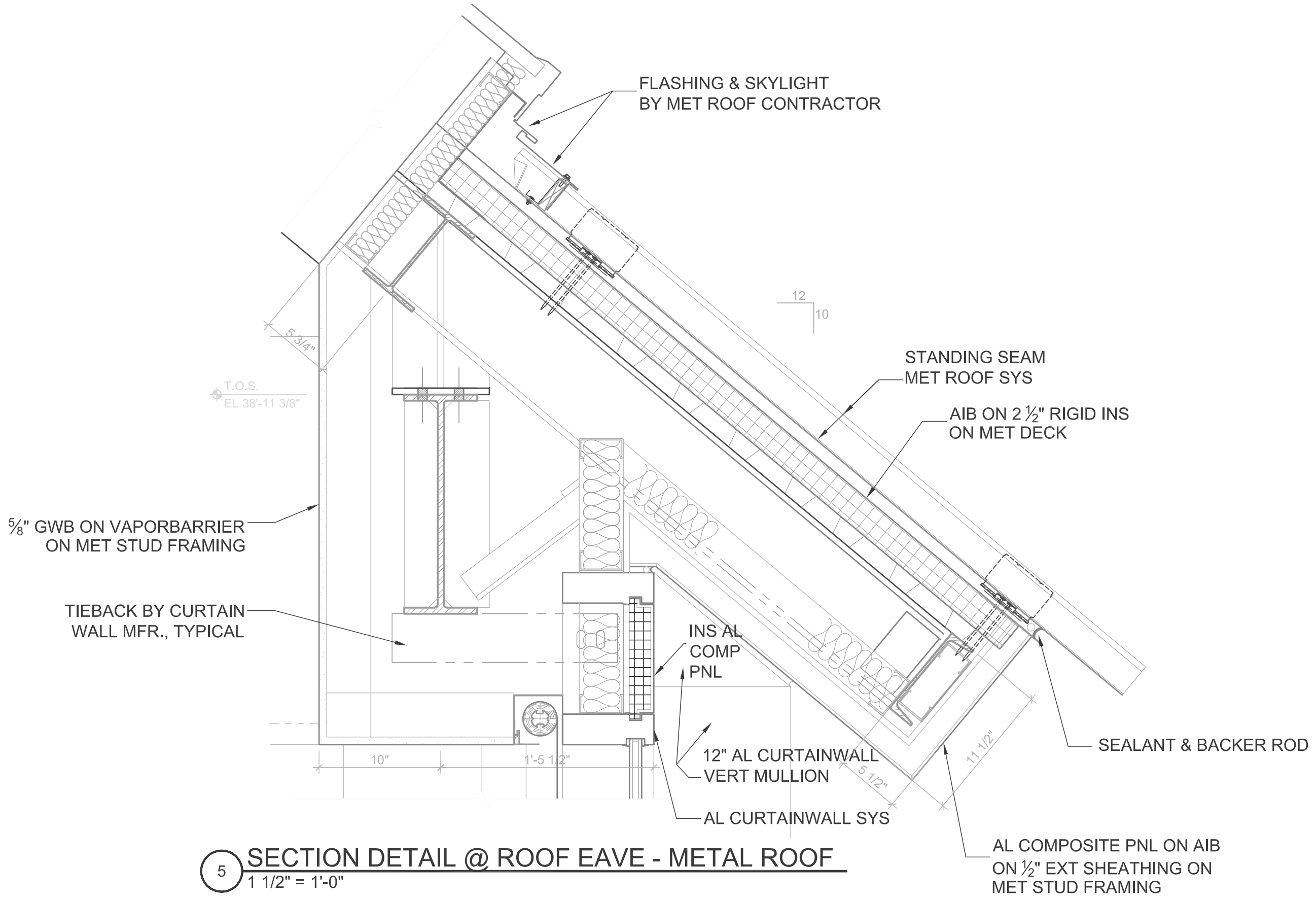
10 SECTION DETAIL @ ROOF SLOPE - METAL ROOF  
1 1/2" = 1'-0"

Drawn By	ELC
Client	Geisinger
No.	
DATE	
REVISION	
BY	

SECTION DETAIL AT ROOF SLOPE  
METAL ROOF  
GEISINGER GRAY'S WOODS AMBULATORY CARE CAMPUS  
PATTON TOWNSHIP, CENTRE COUNTY, PA

Date	4/2/2008
Scale	1 1/2" = 1'
Sheet No.	A.4.1.1
File No.	2007.9.29

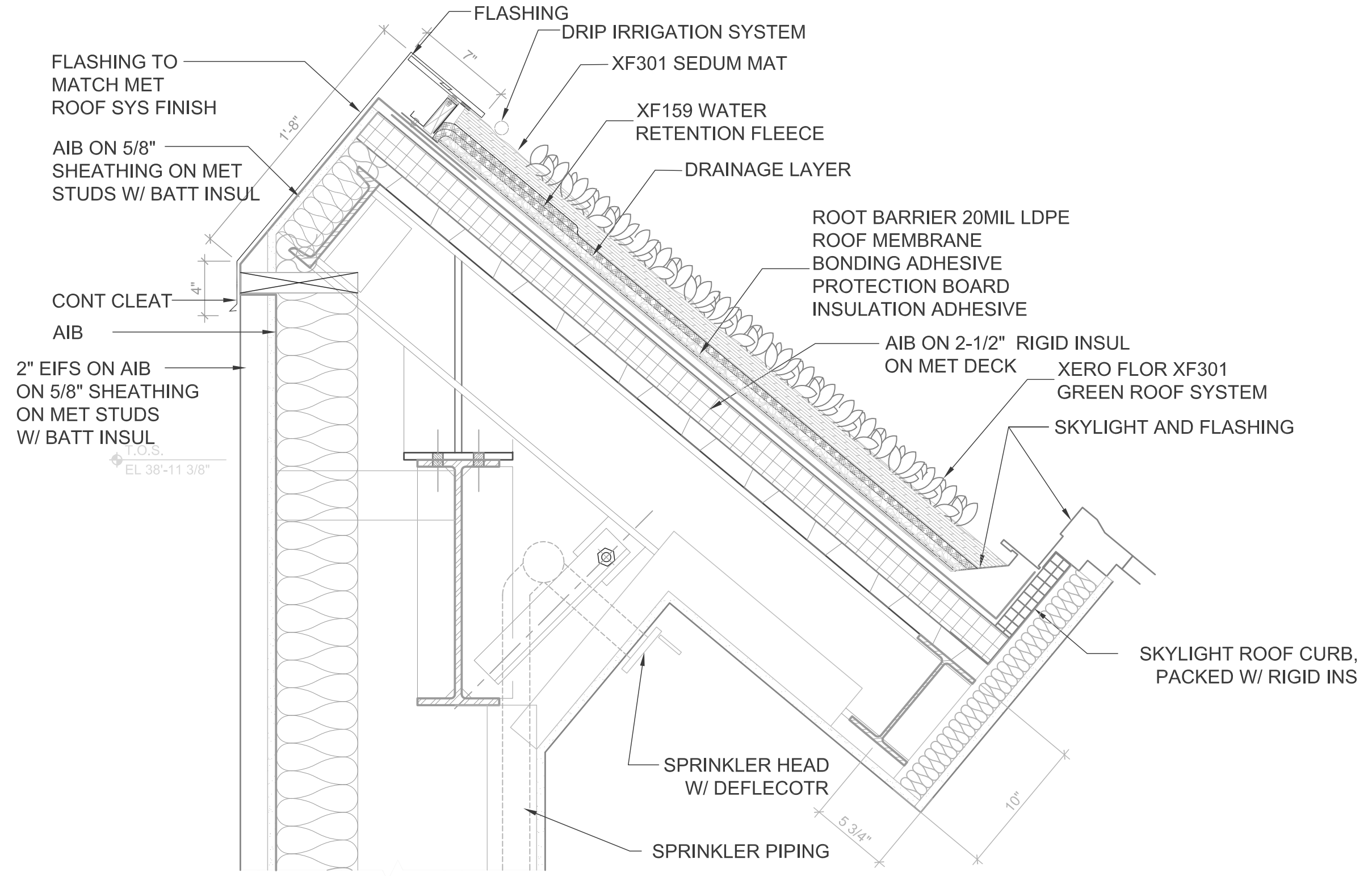
Drawn By	ELC
Client	Geisinger
No.	
DATE	
REVISION	
BY	



**5 SECTION DETAIL @ ROOF EAVE - METAL ROOF**  
 1 1/2" = 1'-0"

SECTION DETAIL AT ROOF EAVE  
 METAL ROOF  
 GEISINGER GRAY'S WOODS AMBULATORY CARE CAMPUS  
 PATTON TOWNSHIP, CENTRE COUNTY, PA

Date	4/2/2008
Scale	1 1/2" = 1'
Sheet No.	A.4.1.2
File No.	2007.9.29



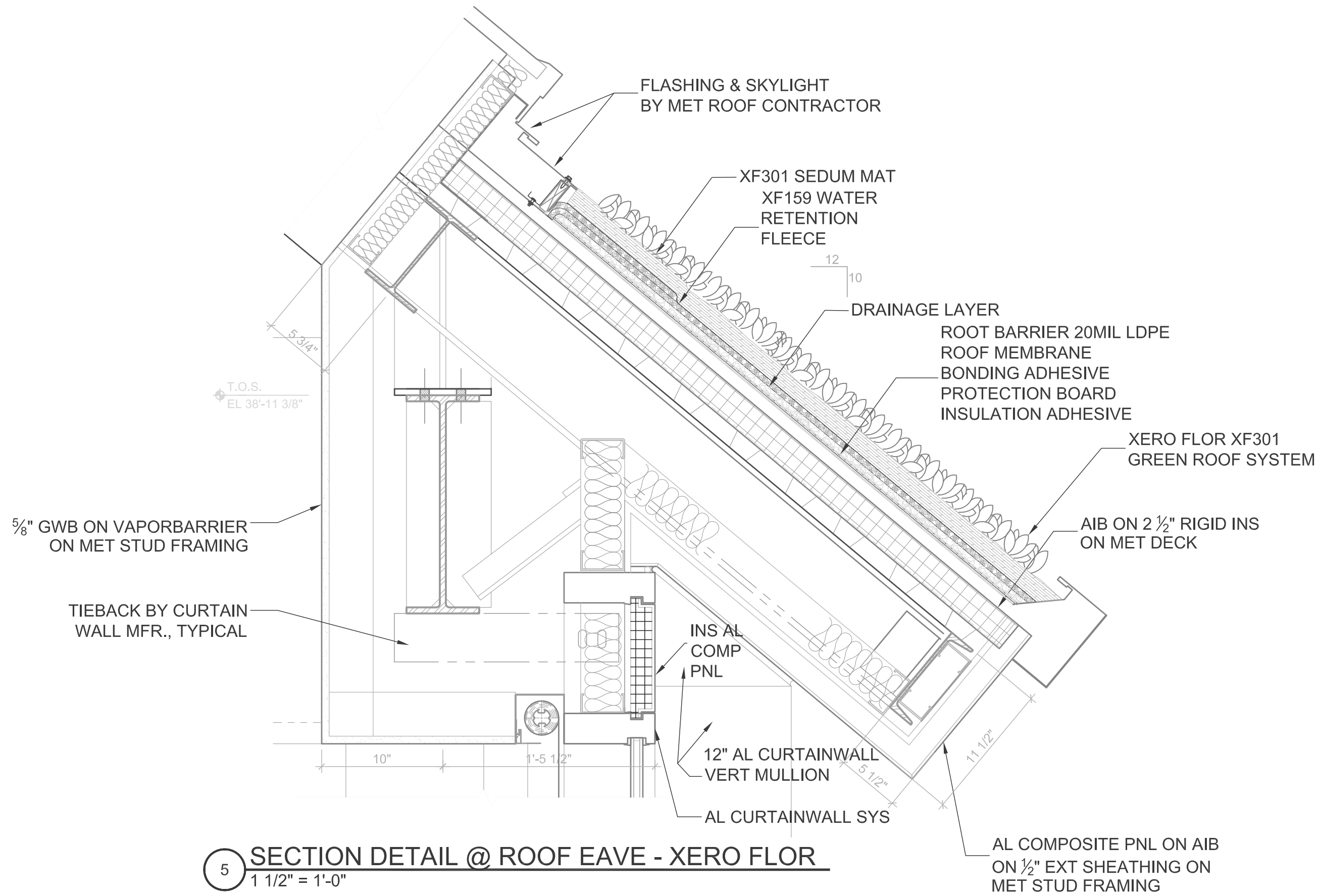
10 SECTION DETAIL @ ROOF SLOPE - XERO FLOR  
 1 1/2" = 1'-0"

Drawn By	ELC
Client	Geisinger
No.	
DATE	
REVISION	
BY	

SECTION DETAIL AT ROOF SLOPE  
 XERO FLOR GREEN ROOF  
 GEISINGER GRAY'S WOODS AMBULATORY CARE CAMPUS  
 PATTON TOWNSHIP, CENTRE COUNTY, PA

Date	4/2/2008
Scale	1 1/2" = 1'
Sheet No.	A.4.2.1
File No.	2007.9.29

Drawn By	ELC
Client	Geisinger
No.	
DATE	
REVISION	
BY	



5 SECTION DETAIL @ ROOF EAVE - XERO FLOR  
 1 1/2" = 1'-0"

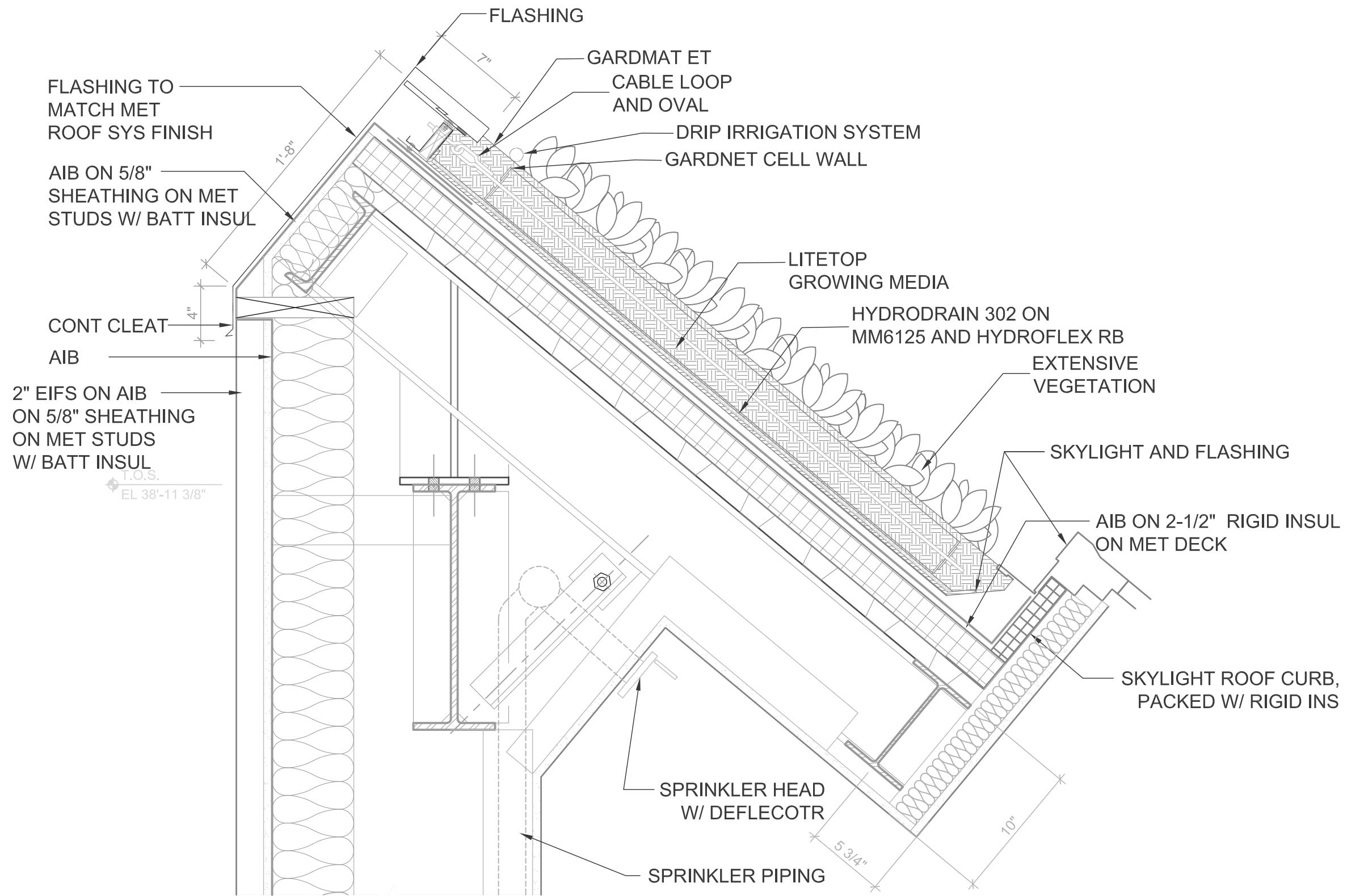
SECTION DETAIL AT ROOF EAVE  
 XERO FLOR GREEN ROOF  
 GEISINGER GRAY'S WOODS AMBULATORY CARE CAMPUS  
 PATTON TOWNSHIP, CENTRE COUNTY, PA

Date	4/2/2008
Scale	1 1/2" = 1'
Sheet No.	A.4.2.2
File No.	2007.9.29

Drawn By	ELC
Client	Geisinger
No.	
DATE	
REVISION	
BY	

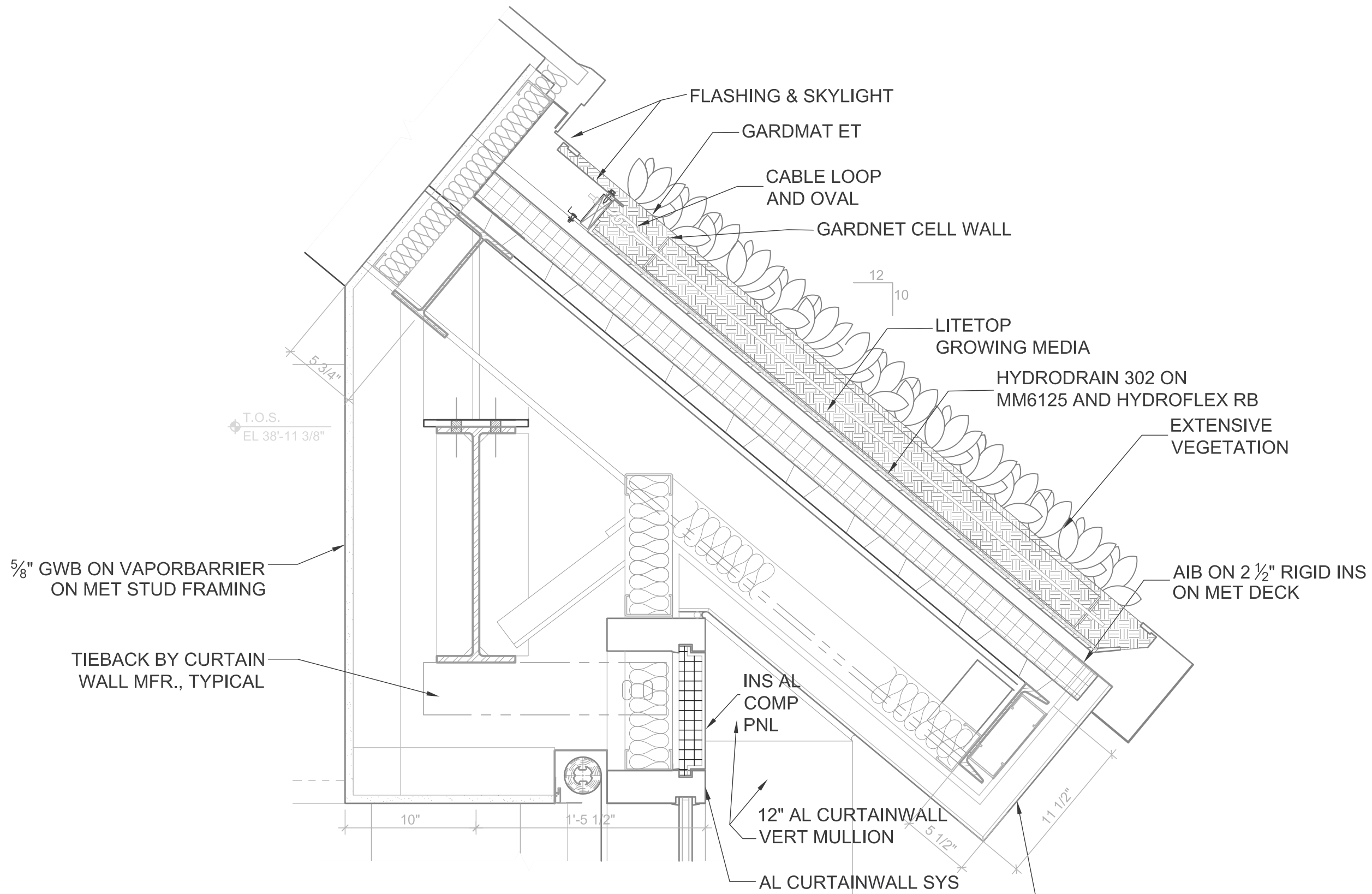
SECTION DETAIL AT ROOF SLOPE  
 HYDROTECH GREEN ROOF  
 GEISINGER GRAY'S WOODS AMBULATORY CARE CAMPUS  
 PATTON TOWNSHIP, CENTRE COUNTY, PA

Date	4/2/2008
Scale	1 1/2" = 1'
Sheet No.	A.4.3.1
File No.	2007.9.29



10 SECTION DETAIL @ ROOF SLOPE - HYDROTECH  
 1 1/2" = 1'-0"

Drawn By	ELC
Client	Geisinger
No.	
DATE	
REVISION	
BY	



**5 SECTION DETAIL @ ROOF EAVE - HYDROTECH**  
 1 1/2" = 1'-0"

AL COMPOSITE PNL ON AIB ON 1/2" EXT SHEATHING ON MET STUD FRAMING

SECTION DETAIL AT ROOF EAVE  
 HYDROTECH GREEN ROOF  
 GEISINGER GRAY'S WOODS AMBULATORY CARE CAMPUS  
 PATTON TOWNSHIP, CENTRE COUNTY, PA

Date	4/2/2008
Scale	1 1/2" = 1'
Sheet No.	A.4.3.2
File No.	2007.9.29

Erica L. Craig  
Construction Management  
April 9<sup>th</sup>, 2008  
Final Report  
Dr. Riley



**APPENDIX C:  
GREEN ROOF MATERIALS &  
MECHANICAL CALCULATIONS**



## Xero Flor® Green Roof Systems

Xero Flor green roof technologies provide a variety of roof vegetation solutions, from our lightweight XF301 extensive green roof system to our semi-intensive and intensive systems. Xero Flor systems are backed by 35 years of research and installation experience on green roof projects ranging in size from single-family residences to multiple acre commercial properties.



Xero Flor green roof mats contain a special blend of Sedums and other succulents, which are especially tolerant to the extreme conditions of the rooftop environment. These plants are naturally drought resistant and low profile, requiring very minimal maintenance. The Xero Flor green roof mat plant mix provides dramatic leaf and floral coloration in response to seasonal climate fluctuations. The Sedum and succulent plant community changes from light and dark greens in spring to greens, reds and yellows in autumn. The mats display a dynamic mosaic of yellow, white, and pink flower colors over the extended growing season.

Xero Flor systems are continually improved by field and greenhouse testing resulting in numerous patented and certified features for long lasting, proven products. Xero Flor components are made from recycled and fully recyclable materials earning additional LEED® credits for green building designs.

Xero Flor's patented, pre-cultivated vegetation blankets provide "instant green" coverage. The textile-based carrier design allows easier assembly with less waste than injected-plastic trays or dimple-sheet systems. Pre-vegetated blankets prevent substrate erosion and reduce labor costs and installation times relative to grown-on systems. The Xero Flor pre-vegetated mat design accommodates dynamic roof features, such as variable slope angles, curved edges, and roof penetrations.







**Why Install A Green Roof ?**

The primary appeal of green roofs is replacement of unattractive roof surfaces with a landscaped covering. Cityscapes typically contain an abundance of conventional roofing sightlines, which create an “urban desert” appearance.

Green roofs provide both aesthetic quality and restore a portion of the natural habitat displaced by the building footprint. This ecosystem attracts birds and beneficial insects, including pollinators and predators of insect pests.

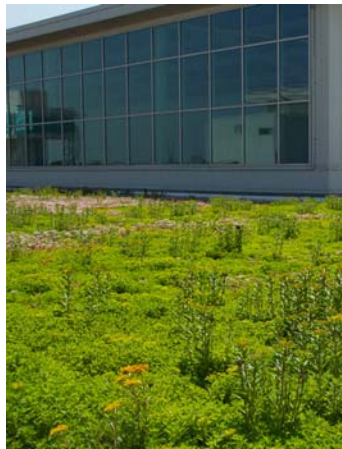
Green roofs reduce and purify storm water runoff. Incoming rainfall is retained and slowly released and evaporated, with as much as 80% decrease in annual stormwater runoff.

Green roofs filter numerous hazardous substances from rainfall runoff, including heavy metals, acid rain, and airborne pathogens. Green roofs also clean the air of green house gases and particulate debris, which cause urban smog and respiratory distress.



Green roofs protect roof membranes from harmful UV rays and extreme temperature fluctuations. The result is a 2- to 3-fold lifetime extension of roofing materials, saving building owners from roof replacement costs.

Local environments also benefit from overall cooler building temperatures by reducing the Urban Heat Island Effect, which have been shown to increase ambient air temperatures in city centers as much as 10°C (~20°F).



As well as saving money through roof lifetime extension, green roofs reduce cooling costs and energy consumption. Less heat is conducted through vegetated layers compared to typical roofing materials. In addition to diminished thermal loading, cooler air temperatures are drawn into intake vents resulting in further reduction in air conditioning energy costs. Due to the multiple environmental and economic benefits, green roofs are becoming an essential design tool for urban planning, sustainable architecture and construction, and land use policymaking.

- | BENEFITS  |   |
|---|---|
| <input type="checkbox"/> INCREASED AESTHETIC VALUE  | <input type="checkbox"/> STORMWATER MANAGEMENT                |
| <input type="checkbox"/> REDUCTION OF AIR POLLUTION | <input type="checkbox"/> REDUCED COOLING COSTS                |
| <input type="checkbox"/> OXYGEN PRODUCTION          | <input type="checkbox"/> INCREASED LIFESPAN OF ROOF MEMBRANES |
|   | <input type="checkbox"/> SOUND INSULATION                     |





Xero Flor XF301 green roof system:

- saturated weight (as shown) 12 lbs/sqft
- XF301-2FL (extra fleece) 15 lbs/sqft
- XF301+ (extra medium) 15 – 18 lbs/sqft
- may be ballasted to 24 lbs/sqft

- } XF301 Sedum Mat (1 1/2")
- } XF159 Water Retention Fleece (1/2")
- } XF108H Drainage Layer (1/2")

(not shown: XF112 Root Barrier 20mil LDPE)



# GARDEN ROOF

GREEN

ROOFS

FOR THE

LIFE OF THE

STRUCTURE



# "We shape our dwellings and afterwards our dwellings shape our lives."

WINSTON CHURCHILL, 1960

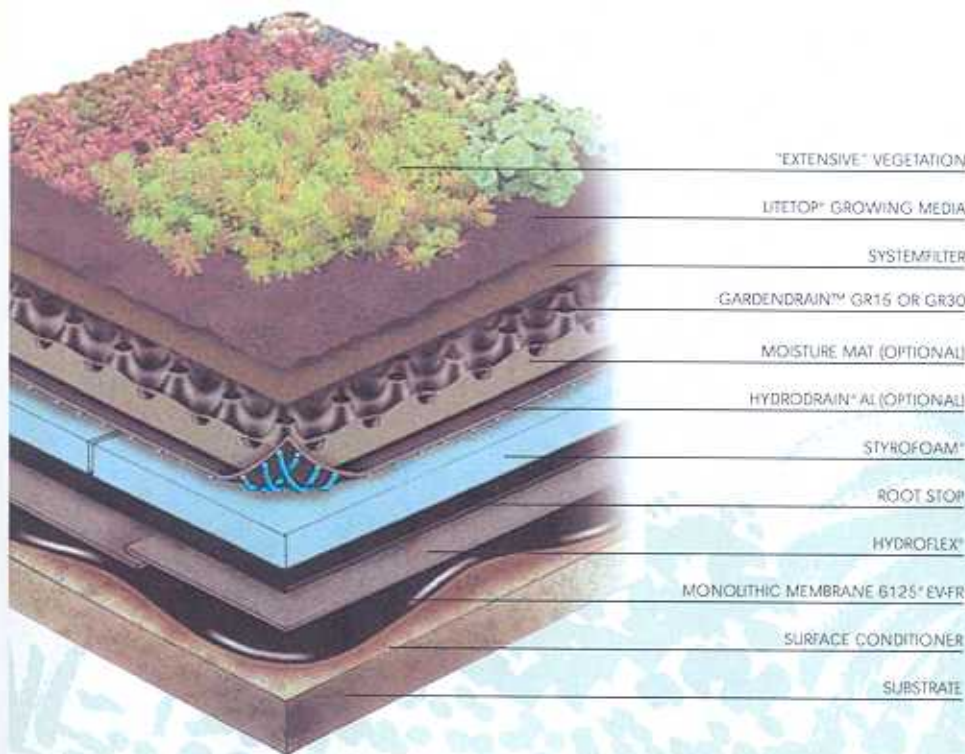
Hydrotech, a global leader in the development of waterproofing and roofing technology, is once again reshaping the future of roofing with the **Garden Roof® Assembly**. Our roofing/waterproofing membrane, MM6125, has been in the field for over 40 years and is rated by the British Board of Agrément as "... an effective barrier to the transmission of water ... for the design life of the roof of which it is incorporated." This is a critical element when considering "life cycle" costs. Now, Hydrotech has combined state-of-the-art European technology with our decades of field experience to bring the building owner the most advanced "green" roof system in the marketplace today.

Hydrotech's **Garden Roof®** adds beauty to the once forgotten area of a building, reclaiming this neglected "fifth elevation" to nature by integrating the building and surrounding landscape. The naked roof level can now be revitalized with a wide variety of plantings from sedums, herbs, grasses, wild flowers, sod lawns, shrubs and small ornamental trees. Hardscape elements, such as pavers, and water features can also be integrated into your design.



Existing flat and sloping roofs offer an ideal opportunity for creating new "green" areas for either ecological, economic or recreational benefits to the Building Owner, such as:

- storm water management
- improving energy efficiency of building
- increasing useable space for tenants
- increasing property value
- creating therapeutic and peaceful environments for hospitals
- absorbing external noise pollution
- improving quality of life
- increasing aesthetic appeal
- recycling of nutrients
- processing of airborne toxins
- reoxygenating the air
- provision of wildlife corridors





The Garden Roof® Assembly combines Hydrotech's superior waterproofing technology with an engineered system of drainage/water retention components. Hydrotech can offer detailed solutions to the architect and owner to bring the structure back to "life".

A brief description of some of the Garden Roof® components:

**Roofing Membrane**—Monolithic Membrane 6125-EV, a high endurance waterproofing membrane, no VOC's, 25% post-consumer recycled content.

**Protection Course/Root Barrier**—Hydroflex 30 and Root Stop or Hydroflex RB. Light weight or heavy-duty root barrier sheets.

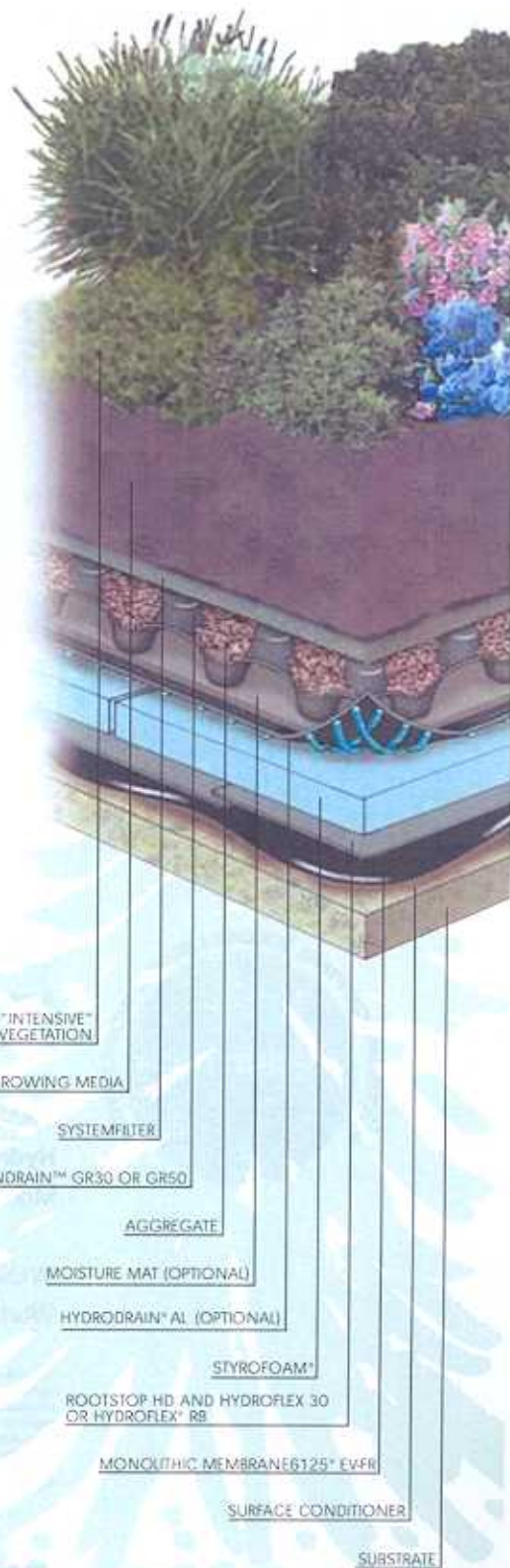
**Insulation**—Dow STYROFOAM® moisture resistant, thermally stable, reusable, CFC free. (optional component)



**Drainage/Water Retention Elements**—GR15, GR30 or GR50: 100% recycled polyethylene three-dimensional panels provide water storage, drainage, and aeration for substrate soil. Moisture Mat, a specially designed polypropylene mat can be added for extra water retention.

In addition to providing the Garden Roof® components, Hydrotech can work in tandem with the landscape architect to provide technical guidance on the selection of an appropriate blend of our LiteTop® lightweight soils with the selected vegetation.

The Garden Roof® Assembly by Hydrotech is a sustainable system design; backed by over 40 years of combined experience in premium waterproofing and green roof components. For more detailed information regarding the planning of your next "Garden Roof", contact a Hydrotech representative to request a Planning Guide.



## WEIGHT SAVINGS COMPARISON

System	Approximate Wet Weight/SF
Traditional Green Roof	125 - 180 lbs.
Hydrotech Garden Roof - Intensive	45 lbs.+
Hydrotech Garden Roof - Extensive	18 - 31 lbs.



### UNITED STATES

**American Hydrotech Inc.** 303 East Ohio Street, Chicago, Illinois 60611-3387

Chicago

800.877.6125

312.337.4998

FAX 312.661.0731

### CANADA

**Hydrotech Membrane Corporation** 10,951 Parkway, Ville D'Anjou, Quebec H1J 1S1

Montreal

800.361.8924

514.353.6000

FAX 514.354.6649

### WORLDWIDE

**World Wide Web:** [www.hydrotechusa.com](http://www.hydrotechusa.com)

The contents and methods described herein are the intellectual property of American Hydrotech, Inc. Copying, reproduction or any use thereof without permission is strictly prohibited. We hope the information given here will be helpful. It is based on data and knowledge considered to be true and correct and is offered for the user's consideration, investigation and verification. The information is subject to change without notice. The determination of suitability and fitness of the products and the application described herein for a particular purpose is the sole responsibility of the user. Please read all statements, recommendations and suggestions in conjunction with the conditions of sale which apply to all goods sold by American Hydrotech, Inc. for the United States and abroad, or Hydrotech Membrane Corporation for Canada, including the express disclaimers by each company of the implied warranties of merchantability or fitness for a particular purpose.

© 2007 AMERICAN HYDROTECH INC.



Table 7-3 Solar Intensity and Solar Heat Gain Factors for 40°N Latitude<sup>a</sup>
(Table 8, Chapter 27, 1989 ASHRAE Handbook — Fundamentals)

Table with columns: Date, Solar Time, Direct Normal Btu/h·ft², Solar Heat Gain Factors (N, NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW, NW, NNW), HOR, Solar Time. Rows include monthly data for Jan 21, Feb 21, Mar 21, Apr 21, May 21, Jun 21, Jul 21, Aug 21, Sep 21, Oct 21, Nov 21, Dec 21.

CLTD Chart for Roofs with Suspended Ceilings

Roof No.	Description of construction	Weight, lb/ft <sup>2</sup>	U value, Btu/hr-ft <sup>2</sup> -°F	Solar time																								Hr of max. CLTD	Min. CLTD	Max. CLTD	Diff. CLTD	
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1	Steel sheet with 1" (or 2") insulation	9 (10)	0.134 (0.092)	2	0	-2	-3	-4	-4	-1	9	23	37	50	62	71	77	78	74	67	56	42	28	18	12	8	5	15	-4	78	82	
2	1" wood with 1" insulation	10	0.115	20	15	11	8	5	3	2	3	7	13	21	30	40	48	55	60	62	61	58	51	44	37	30	25	17	2	62	60	
3	4" lightweight concrete	20	0.134	19	14	10	7	4	2	0	0	4	10	19	29	39	48	56	62	65	64	61	54	46	38	30	24	17	0	65	65	
4	heavyweight concrete with 1" (or 2") insulation	30	0.131	28	25	23	20	17	15	13	13	14	16	20	25	30	35	39	43	46	47	46	44	41	38	35	32	18	13	47	34	
5	1" wood with 2" insulation	10	0.083	25	20	16	13	10	7	5	5	7	12	18	25	33	41	48	53	57	57	56	52	46	40	34	29	18	5	57	52	
6	6" lightweight concrete	26	0.109	32	28	23	19	16	13	10	8	7	8	11	16	22	29	36	42	48	52	54	54	51	47	42	37	20	7	54	47	
7	2.5" wood with 1" insulation	15	0.096	34	31	29	26	23	21	18	16	15	15	16	18	21	25	30	34	38	41	43	44	44	42	40	37	21	15	44	29	
8	8" lightweight concrete	33	0.093	39	36	33	29	26	23	20	18	15	14	14	15	17	20	25	29	34	38	42	45	46	45	44	42	21	14	46	32	
9	heavyweight concrete with 1" (or 2") insulation	53 (54)	0.128 (0.090)	30	29	27	26	24	22	21	20	20	21	22	24	27	29	32	34	36	38	38	38	37	36	34	33	19	20	38	18	
10	2.5" wood with 2" insulation	15	0.072	35	33	30	28	26	24	22	20	18	18	18	20	22	25	28	32	35	38	40	41	41	40	39	37	21	18	41	23	
11	Roof terrace system	77	0.082	30	29	28	27	26	25	24	23	22	22	22	23	23	25	26	28	29	31	32	33	33	33	33	33	32	22	22	33	11
12	heavyweight concrete with 1" (or 2") insulation	77 (77)	0.125 (0.088)	29	28	27	26	25	24	23	22	21	21	22	23	25	26	28	30	32	33	34	34	34	33	32	31	20	21	34	13	
13	4" wood with 1" (or 2") insulation	19 (20)	0.082 (0.064)	35	34	33	32	31	29	27	26	24	23	22	21	22	22	24	25	27	30	32	34	35	36	37	36	23	21	37	16	



Erica L. Craig  
 Construction Management  
 April 9<sup>th</sup>, 2008  
 Final Report  
 Dr. Riley



<b>Current Roofing Systems</b>			
	Amount	Cost	Total
Green Roof - Boiler Room	3290 SF	25 \$/SF	82,250
+ Plants for Green Roof	3290 SF	5 \$/SF	16,450
Cool Roof - Flat Main Roof	24200 SF	10 \$/SF	242,000
Metal System	5105 SF	16 \$/SF	81,680
PRICE			<b>\$422,380</b>

<b>Relocation of Green Roof - Hydrotech</b>			
	Amount	Cost	Total
Cool Roof - Boiler Room	3290 SF	10 \$/SF	32,900
Cool Roof - Flat Main Roof	24200 SF	10 \$/SF	242,000
Green Roof - Sloped	5105 SF	32 \$/SF	163,360
+ Irrigation			2,500
+ Plants for Green Roof	5105 SF	5 \$/SF	25,525
PRICE			<b>\$466,285</b>

<b>Relocation of Green Roof - XeroFlor</b>			
	Amount	Cost	Total
Cool Roof - Boiler Room	3290 SF	10 \$/SF	32,900
Cool Roof - Flat Main Roof	24200 SF	10 \$/SF	242,000
Green Roof - Sloped	5105 SF	13 \$/SF	66,365
+ Shipping Costs	5105 SF	0.25 \$/SF	1,500
+ Roofing Membrane & Insulation	5105 SF	8 \$/SF	40,840
+ Tacking and Accessories	5105 SF	2 \$/SF	10,210
+ Irrigation			2,500
PRICE			<b>\$396,315</b>

	<b>Current Roofing System</b>	<b>Relocation with Hydrotech</b>	<b>Relocation with XeroFlor</b>
<b>Initial Cost</b>	\$422,400	\$466,300	\$396,300
<b>Difference</b>		\$43,900	<b>-\$26,100</b>

Erica L. Craig  
 Construction Management  
 April 9<sup>th</sup>, 2008  
 Final Report  
 Dr. Riley



**Metal Roof Thermal Calculations**

Design Temp Change	20 °			
Area of Roof	5015 SF			
Material	Thickness	Thermal Conductance	Thermal Resistance	Temperature Change
	Inches	But/hr*ft <sup>2</sup> *F	hr*ft <sup>2</sup> *F/Btu	Δ
Inside Air Film	-	1.64	0.61	0.56
Gypsum Wallboard	0.50	2.22	0.45	0.41
Air Space	6.00	-	1.00	0.92
Metal Decking	1.00	-	0.00	0.00
Rigid Insulation	2.50	0.07	15.30	14.02
AIB	1.00	0.23	4.30	3.94
Metal Roof	0.04	-	0.00	0.00
Outside Air Film	-	5.88	0.17	0.16
<b>Total</b>		<b>0.05</b>	<b>21.83</b>	<b>20.00</b>
Heat Flow Rate	4,594.59 Btu/hr			
Degree Days	4926			
	543,191,351.35 Btu/year			
	162,957.41 kWh/year			
	\$0.09 /kWh			
Cost for Entire Year	\$14,666.17 /Year			

**Hydrotech Green Roof**

Design Temp Change	20 °			
Area of Roof	5015 SF			
Material	Thickness	Thermal Conductance	Thermal Resistance	Temperature Change
	Inches	But/hr*ft <sup>2</sup> *F	hr*ft <sup>2</sup> *F/Btu	Δ
Inside Air Film	-	1.64	0.61	0.52
Gypsum Wallboard	0.50	2.22	0.45	0.39
Air Space	6.00	-	1.00	0.86
Metal Decking	1.00	-	0.00	0.00
Rigid Insulation	2.50	0.07	15.30	13.11
Acoustical Board	1.00	0.23	4.30	3.68
HydroFlex 30	0.09	16.67	0.06	0.05
HydroDrain 300	0.22	2.22	0.45	0.39
LiteTop Soil	3.00	1.00	1.00	0.86
Outside Air Film	-	5.88	0.17	0.15
<b>Total</b>		<b>0.04</b>	<b>23.34</b>	<b>20.00</b>
Heat Flow Rate	4297.343616 Btu/hr			
Degree Days	4926			
	508049151.7 Btu/year			
	152,414.75 kWh/year			
	\$0.09 /kWh			
Cost for Entire Year	\$13,717.33 /Year			

Erica L. Craig  
 Construction Management  
 April 9<sup>th</sup>, 2008  
 Final Report  
 Dr. Riley



**Xero Flor Green Roof**

Design Temp Change 20 °  
 Area of Roof 5015 SF

Material	Thickness	Thermal Conductance	Thermal Resistance	Temperature Change
	Inches	But/hr*ft <sup>2</sup> *F	hr*ft <sup>2</sup> *F/Btu	Δ
Inside Air Film	-	1.64	0.61	0.52
Gypsum Wallboard	0.50	2.22	0.45	0.38
Air Space	6.00	1.00	1.00	0.85
Metal Decking	1.00	-	0.00	0.00
Rigid Insulation	2.50	0.07	15.30	13.03
Acoustical Board	1.00	0.23	4.30	3.66
Drainage Layer	0.50	2.22	0.45	0.38
Water Retention Fleece	0.50	5.00	0.20	0.17
Sedum Mat	1.50	1.00	1.00	0.85
Outside Air Film	-	5.88	0.17	0.14
<b>Total</b>		<b>0.04</b>	<b>23.48</b>	<b>20.00</b>

Heat Flow Rate 4,271.72 Btu/hr  
 Degree Days 4926  
 505,019,897.79 Btu/year  
 151,505.97 kWh/year  
 \$0.09 /kWh  
 Cost for Entire Year \$13,635.54 /Year

**Comparisons**

	Metal Roof Current Design	Xero Flor Roof	Hydrotech Roof
Btu/Year	581,300,101	535,549,898	538,579,152
Difference from Current Design		45,750,204	42,720,950
	Metal Roof Current Design	Xero Flor Roof	Hydrotech Roof
R-Value	21.83	23.48	23.34
Difference from Current Design		-1.65	-1.51

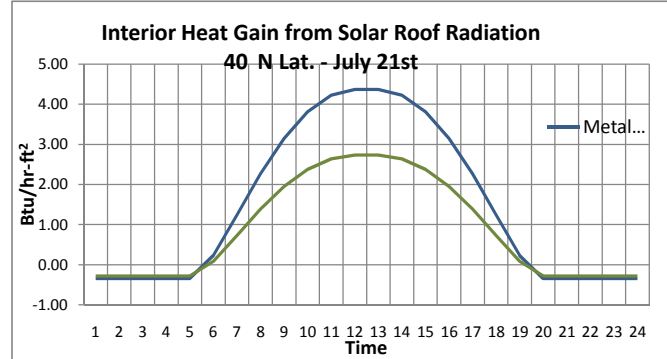
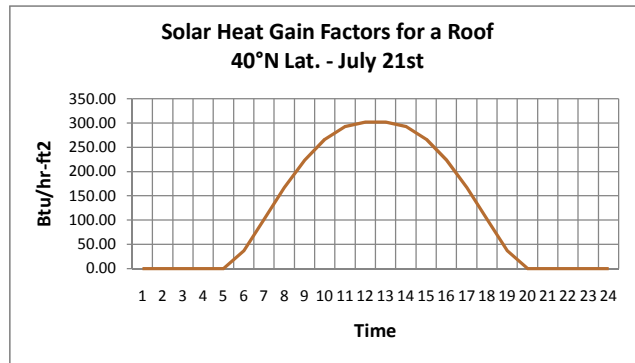
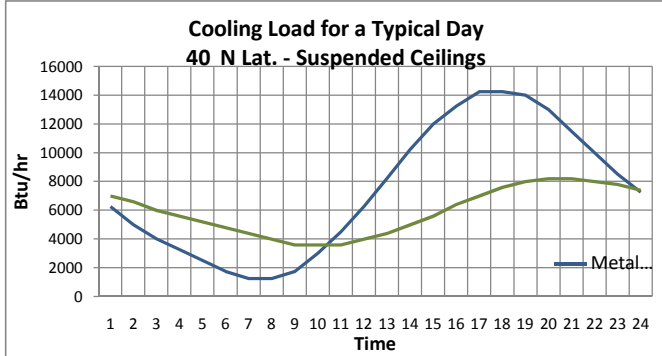
Erica L. Craig  
 Construction Management  
 April 9<sup>th</sup>, 2008  
 Final Report  
 Dr. Riley



**Solar Radiation Calculations for Geisinger Gray's Woods - 40°N Latitude - July 21st - Roofs with Suspended Ceilings**

Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
HOR	0	0	0	0	0	32	88	145	194	231	254	262	262	254	231	194	145	88	32	0	0	0	0	0	
x 1.15	0.00	0.00	0.00	0.00	0.00	36.80	101.20	166.75	223.10	265.65	292.10	301.30	301.30	292.10	265.65	223.10	166.75	101.20	36.80	0.00	0.00	0.00	0.00	0.00	
Hour	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00	
Metal Roof	-0.35	-0.35	-0.35	-0.35	-0.35	0.23	1.24	2.26	3.15	3.81	4.23	4.37	4.37	4.23	3.81	3.15	2.26	1.24	0.23	-0.35	-0.35	-0.35	-0.35	-0.35	
Green Roof	-0.28	-0.28	-0.28	-0.28	-0.28	0.09	0.73	1.39	1.95	2.38	2.64	2.73	2.73	2.64	2.38	1.95	1.39	0.73	0.09	-0.28	-0.28	-0.28	-0.28	-0.28	
CLTD																									
Metal Roof	25	20	16	13	10	7	5	5	7	12	18	25	33	41	48	53	57	57	56	52	46	40	34	29	
Green Roof	35	33	30	28	26	24	22	20	18	18	18	20	22	25	28	32	35	38	40	41	41	40	39	37	
Cooling Load																									

Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total Btu/Day	Number of Sunny Days Per Year	Total Btu/Year		
Metal Roof	6250	5000	4000	3250	2500	1750	1250	1250	1750	3000	4500	6250	8250	10250	12000	13250	14250	14250	14000	13000	11500	10000	8500	7250	177,250	215	38,108,750		
Green Roof	7000	6600	6000	5600	5200	4800	4400	4000	3600	3600	3600	4000	4400	5000	5600	6400	7000	7600	8000	8200	8200	8000	7800	7400	142,000	215	30,530,000		
																										Total kWh/Year	Cost /Year		
																											Metal	11,432.63	\$1,028.94
																											Green	9,159.00	\$824.31



	Total Btu/Day	# of Sunny Days Per Year	Total Btu/Year
Metal Roof	177,250	215	38,108,750
Green Roof	142,000	215	30,530,000

Erica L. Craig  
 Construction Management  
 April 9<sup>th</sup>, 2008  
 Final Report  
 Dr. Riley



## OPERATING COST SUMMARIES

	Current Roofing System	Relocation with Hydrotech	Relocation with XeroFlor
Initial Cost	\$422,400	\$466,300	\$396,300
Difference		\$43,900	-\$26,100

### CONDUCTION

	Current Roofing System	Relocation with Xero Flor	Relocation with Hydrotech
Yearly Operating Costs	\$14,650.00	\$13,700	\$13,650
Difference		-\$950	-\$1,000

### RADIATION

	Current Roofing System	Relocation with Hydrotech	Relocation with XeroFlor
Yearly Operating Costs	\$1,030.00	\$830	\$830
Difference		-\$200	-\$200

### XERO FLOR

Item	Savings
Initial Building Cost	26,100
Yearly Energy Costs	1,150
<b>Total:</b>	\$27,250

### HYDROTECH

Item	Savings
Initial Building Cost	-43,900
Yearly Energy Costs	1,200
<b>Total:</b>	-\$34,600

Erica L. Craig  
Construction Management  
April 9<sup>th</sup>, 2008  
Final Report  
Dr. Riley



## **APPENDIX D: STRUCTURAL TABLES**

Erica L. Craig  
 Construction Management  
 April 9<sup>th</sup>, 2008  
 Final Report  
 Dr. Riley



2" Decking with LW Concrete				
	Size	Amount	Cost	Total
LW Concrete	3.5"	12.5 CY	142 /CY	1,775
Concrete Placing	< 6" thick	12.5 CY	29 /CY	363
Steel Decking	2" LOK	0.09 100 Sq	16,000 /100 Sq	1,440
Steel Beams	W 16x26 3	30 Ft	40.5 /Ft	3,645
Steel Girders	W24x55 1	30 Ft	88 /Ft	2,640
Steel Columns	W10x68 2	15 Ft	103.23 /Ft	3,097
Fireproofing		900 SF	0.47 /SF	423
PRICE				<b>\$13,382</b>

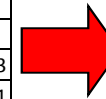
Conclusions: \$685,000 cost, 51 days on schedule.

2" Decking with Normal Weight Concrete				
	Size	Amount	Cost	Total
NW Concrete	4.5"	15.3 CY	97 /CY	1,484
Concrete Placing	< 6" thick	15.3 CY	29 /CY	444
Steel Decking	2" LOK	0.09 100 Sq	16,000 /100 Sq	1,440
Steel Beams	W14x22 4	30 Ft	35 /Ft	4,200
Steel Girders	W24x68 1	30 Ft	97 /Ft	2,910
Steel Columns	W10x88 2	15 Ft	127 /Ft	3,810
Fireproofing		900 SF	0.47 /SF	423
PRICE				<b>\$14,711</b>

Conclusions: \$75,000 over original design, approx. two days longer on schedule.

CURRENT DESIGN	Size
LW Concrete	3.5"
Concrete Placing	< 6" thick
Steel Decking	2" LOK
Steel Beams	W 16x26 3
Steel Girders	W24x55 1
Steel Columns	W10x68 2
Fireproofing	

NW CONCRETE	Size
NW Concrete	4.5"
Concrete Placing	< 6" thick
Steel Decking	2" LOK
Steel Beams	W14x22 4
Steel Girders	W24x68 1
Steel Columns	W10x88 2
Fireproofing	

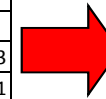


9/16" Formdecking w/ NW Concrete				
	Size	Amount	Cost	Total
NW Concrete	3"	8.3 CY	97 /CY	805
Concrete Placing	< 6" thick	8.3 CY	29 /CY	241
Steel Decking	9/6" FD	0.090 100 Sq	9500 /100 Sq	855
Steel Joists	18K9 10	30 Ft	229 /Ea	2,290
Steel Girders	W24x76 1	30 Ft	108 /Ft	3,240
Steel Columns	W10x88 2	15 Ft	127 /Ft	3,810
Steel Dunnage		900 SF	1.2 /SF	1,080
Fireproofing		900 SF	0.47 /SF	423
PRICE				<b>\$12,744</b>

Conclusions: \$40,000 under original design, same schedule.

CURRENT DESIGN	Size
LW Concrete	3.5"
Concrete Placing	< 6" thick
Steel Decking	2" LOK
Steel Beams	W 16x26 3
Steel Girders	W24x55 1
Steel Columns	W10x68 2
Fireproofing	

FORMDECK	Size
NW Concrete	3"
Concrete Placing	< 6" thick
Steel Decking	9/6" FD
Steel Joists	18K9 10
Steel Girders	W24x76 1
Steel Columns	W10x88 2
Steel Dunnage	
Fireproofing	



System	Cost	Difference
2"Decking with LW Concrete - Current Design	\$347,942	-
2" Decking with NW Concrete	\$382,481	\$34,538
9/16" Form Decking with NW Concrete	\$331,339	-\$16,604

Erica L. Craig  
Construction Management  
April 9<sup>th</sup>, 2008  
Final Report  
Dr. Riley



## **APPENDIX E: SURVEY MATERIAL**



---

Industry Survey

---

Permitting and Approvals for New Commercial Construction

Name:

Position:

Are you responsible for approving any or all building permits for new commercial construction projects, and which ones?

If so, what is the most time and money consuming component of the process for your department?

Are there some permits that are easier (faster, cheaper) to approve than others?

What, do you feel, is the best way for developers, construction managers to improve permitting packages so not to cause resubmissions or delays?

Has your department ever considered changing the permitting process? If it has been changed recently, why did the change occur?

---

Industry Survey

---

Permitting and Approvals for New Commercial Construction

Name: Ned Liggett

Position: Commercial Plan Examiner

Are you responsible for approving any or all building permits for new commercial construction projects, and which ones?

I am responsible for reviewing and approving approximately 200 plan reviews annually; they range from minor interior alterations to multi-story buildings of various occupancy type.

If so, what is the most time and money consuming component of the process for your department?

Review of poorly prepared plans where design professionals are either unaware of, or are uninterested in minimum code requirements and how they apply to their project.

Are there some permits that are easier (faster, cheaper) to approve than others?

Yes, usually minor alterations (if you want me to elaborate you need to ask a specific follow-up question).

What, do you feel, is the best way for developers, construction managers to improve permitting packages so not to cause resubmissions or delays?

Where developers or construction managers are directing the "permit package" they should make sure that they have a clear understanding of what the permit package is to include; this can vary in jurisdictions due to a number of variables. Communication is critical; whoever is handling procurement of a permit should know what each department in the jurisdiction needs: number of copies of plans, geotechnical reports, energy compliance path info, site plans, copies of other approvals (zoning, water, sewer, etc.).

Has your department ever considered changing the permitting process? If it has been changed recently, why did the change occur?

Yes; we are in the process of changing the fee structure to reflect and recapture costs associated with poorly prepared plans that cause time delays for other more responsible design professionals.

Additionally, we have increased the time allotment for turn-around time on plan review due to new requirements/details based on the energy and accessibility code. We also provide site meetings with owners, design professionals and contractors to discuss proposed alterations to existing buildings so as to facilitate a smoother review and permitting process.

Erica Craig

February 5, 2008

PSU AE Senior Thesis  
Industry Survey  
Permitting and Approvals for New Commercial Construction

Name: **Michael R. Rupert**  
Position: **Senior Building Inspector**  
**Centre Region Code Administration**

Q: Are you responsible for approving any or all building permits for new commercial construction projects and which ones?

A: **Yes, I am one of two Plans Examiners who review commercial project drawings and correspond with architects and contractors in order to maintain code compliance.**

Q: If so, what is the most time and money consuming component of the process for your department?

A: **Our policy is to review the drawings and produce comments within 15 business days of the date of receipt. The actual plan review takes anywhere from 2 to 12 hours depending on the size and complexity of the project. My day is filled with email and telephone questions which can be time consuming and essentially offered as a free service.**

Q: Are there some permits that are easier (faster, cheaper) to approve than others?

A: **The smaller the project, the easier they are to review because the code has built-in exceptions for low occupancy spaces and buildings. If a building is being renovated but the use group does not change (Business Office to Business Office) then a lot of the existing components may remain. For instance, restaurants have more requirements and require more review time than an insurance office.**

Q: What, do you feel, is the best way for developers, construction managers to improve permitting packages so not to cause resubmissions or delays?

A: **A practice that I used while in the architectural field and recommend to anyone who asks is to schedule a preliminary meeting with the code office to briefly review the project and identify any obvious issues that may be associated with the project.**

Q: Has your department ever considered changing the permitting process? If there have been changes recently, why did the changes occur?

A: **We often visit the issue of making the permitting process easier and more profitable for everyone. Our agency offers next day inspections and site meetings which greatly decreases the "down time" some contractors experience waiting for an inspection. Most of the code officers here come from the design/construction industry and recognize the problems that can be caused by a failed permit process. Recently, our attention has been on addressing the issue of reviews being performed that are never permitted and therefore not paid for. Our salaries are paid by permit fees alone and offering free site meetings, etc. can have a detrimental affect on our budget.**

Erica Craig

February 5, 2008

PSU AE Senior Thesis  
Industry Survey  
Permitting and Approvals for New Commercial Construction

Name: **Dan Slatt**

Position: **Lower Paxton Building Inspector**

Q: Are you responsible for approving any or all building permits for new commercial construction projects and which ones?

A: **Certified for approving commercial construction plans**

Q: If so, what is the most time and money consuming component of the process for your department?

A: **Bigger jobs – hotel, – ship out to a third party approval, we pay, to have them review. Smaller jobs they review. Time consuming the mechanical aspects cause the most time to the code. Pennoni Engineers, and others.**

Q: Are there some permits that are easier (faster, cheaper) to approve than others?

A: **same rate regardless, for all developers. Depends on size of projects. Tenant fitout – faster. By law 30 business days to get reviewed, and if comments, delivered to applicate, so 30 days start over again.**

Q: What, do you feel, is the best way for developers, construction managers to improve permitting packages so not to cause resubmissions or delays?

A: **When looking at plans, looking architects and engineers to make sure they do their job to the best of their ability and be updated on all aspects of the codes. Continuing education for everyone.**

Q: Has your department ever considered changing the permitting process? If there have been changes recently, why did the changes occur?

A: **Uniform Construction Code – 1999 – 2004 enacted by PA. Labor and Industry out of the process now, after that, started to contract out to third parties for larger buildings.**

**Lower Paxton – 2 examiners.**

---

Industry Survey

---

Permitting and Approvals for New Commercial Construction

Name: Rod Smay

Position: manager

Are you responsible for approving any or all building permits for new commercial construction projects, and which ones?

I don't do all the commercial plan review right now. But I issue all  
The permits when they are ready.

If so, what is the most time and money consuming component of the process for your department?

The time spent between the architect and the plan reviewer when things don't meet code.

Are there some permits that are easier (faster, cheaper) to approve than others?

Yes, Residential permits. (one book)

What, do you feel, is the best way for developers, construction managers to improve permitting packages so not to cause resubmissions or delays

Guardian give out permit kits and if they follow the kits then there isn't to many problems

Has your department ever considered changing the permitting process? If it has been changed recently, why did the change occur?

We did change our kits this year, but we just up dated and made things easier

---

**Industry Survey**

---

**Permitting and Approvals for New Commercial Construction**

Name: Albert Wrightstone

Position: Building Inspections

Are you responsible for approving any or all building permits for new commercial construction projects, and which ones?

This office subcontracted out the review and inspection of commercial permits to a third party agency. I still review some minor ones. But it is my signature that goes on the permit when it is issued. This was done in May of 2006 because of the backlog of permits. With the third party being hired, all reviews including accessibility came under the purview of the third party. Prior to this, accessibility reviews were handled by the PA. Department of Labor and Industry since I am not certified for accessibility reviews and inspections. The Third party agency also provides reviews and inspections for residential permits when I am out of the office for vacations.

If so, what is the most time and money consuming component of the process for your department?

The most time consuming component is the review process because of the time involved in looking over plans, researching code issues, getting review comments to the applicant then performing second review after revisions are provided.

Are there some permits that are easier (faster, cheaper) to approve than others?

I would say there are some simple tenant space fitouts that are among the easier permits to review. Most likely where the size is smaller and the plan itself is simple.

New residential permits (single family detached, townhouses) where the builder has been working in the municipality for some time and knows what the inspector wants and has the complete information makes the review process much easier as well.

What, do you feel, is the best way for developers, construction managers to improve permitting packages so not to cause resubmissions or delays?

I would say have plans code compliant at the very beginning. A second point to make is that the package as submitted should be complete. When just parts of a package are submitted, that draws out the review process tremendously.

Has your department ever considered changing the permitting process? If it has been changed recently, why did the change occur?

See above for the change that Susquehanna Township made in the commercial permit process.

# Contact Information

## Seattle Design Commission

700 5th Ave., Suite 2000  
 P.O. Box 34019  
 Seattle, WA 98124-4019  
 (206) 615-1349  
[www.seattle.gov/designcommission](http://www.seattle.gov/designcommission)

## Design Review Boards

700 5th Ave., Suite 2000  
 P.O. Box 34019  
 Seattle, WA 98124-4019  
 (206) 684-4686  
[www.seattle.gov/designreview](http://www.seattle.gov/designreview)

## Seattle Planning Commission

700 5th Ave., Suite 2000  
 P.O. Box 34019  
 Seattle, WA 98124-4019  
 (206) 684-3486  
[www.seattle.gov/planningcommission](http://www.seattle.gov/planningcommission)

## Historic Landmarks Boards/ Landmarks Preservation Board

Department of Neighborhoods  
 700 5th Ave., Suite 1700  
 P.O. Box 94649  
 Seattle, WA 98124-4649  
 (206) 684-0228  
[www.seattle.gov/neighborhoods](http://www.seattle.gov/neighborhoods)



Photo credit: Johnston Architects

# Project Design Review *in Seattle*

encouraging & incorporating...



*communication & participation*



*better design*

creating & enhancing...

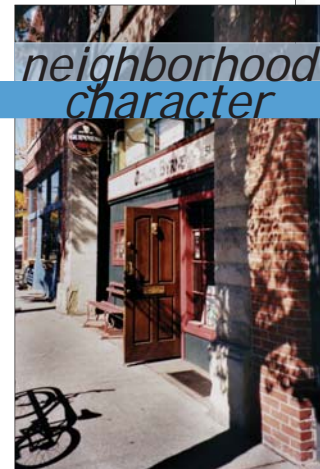


*sensitive development*



*consistency in neighborhoods*

preserving & protecting...



*neighborhood character*



*historical value*



*architectural significance*

## Navigating Seattle's Process

Just how Seattle handles design review is rather confusing to many. To demystify the process, we have composed this document to explain who does what in carrying out the important function of project design review.

Seattle is unique in having an intricate network of review bodies—staffed by citizen volunteers—that work in close coordination to ensure thorough review of major projects, whether public or private, under development within the city.

This network includes the Seattle Design Commission and the Seattle Planning Commission, both of which are advisory to the City at large; seven neighborhood-based design review boards that advise DPD in carrying out regulatory review of private multifamily and commercial projects; and a centralized Landmarks Board, along with several additional area-specific boards, charged with regulatory review of Seattle's historic districts.

# Project Design Review Throughout Seattle...

	Design Commission	Design Review Boards	Planning Commission	Historic District Boards			Landmarks Preservation Board	
								
<b>established</b>	1968	1994	1911	1970	1971	1973	1976	1973
<b>when</b>	City officials wanted oversight of the City's capital projects, starting with those created by the voter-approved Forward Thrust Bond.	Citizens, designers and developers decried the incompatible design of many buildings built in the 1980s, the result of the City's prescriptive land use code.	Voters, after two decades of fast growth, passed an amendment to create a commission to draw up plans for the city's future expansion.	Visionaries and activists were concerned that a ring road proposed by the City's urban renewal plans would raze most of the area's historic buildings.	Voters, worried that Pike Place Market would be demolished under an urban renewal plan, passed an initiative to preserve the Market's character.	Community members were concerned that their neighborhood—and its Asian character—would be damaged by the development of the Kingdome.	Property owners wanted to preserve the qualities of its "small town main street" that reflected early 20th century America.	To provide protection for historic properties throughout the city, a citywide landmarks ordinance was enacted.
<b>why</b>	To ensure that public facilities and projects within the City's right-of-way incorporate "design excellence." To ensure wise allocation of the City's resources. To ensure City projects fit the City's design goals.	To encourage better design and responsiveness to a site's context. To provide flexibility in the application of the City's development standards. To engage citizens and developers early in the design process to resolve issues.	To advise the Mayor, City Council and City departments on broad planning goals, policies and plans for the physical development of Seattle. To engage citizens in the work of planning for the city's future.	To preserve the district's unique historic and architectural character. To assure the sensitive rehabilitation of buildings. To promote development of residential uses for all income levels. To enhance the district's economic climate.	To preserve the character of Pike Place Market. To perpetuate the district's architectural, cultural, economic and historical qualities.	To protect the district's character and architectural significance, emphasizing the neighborhood's Asian character.	To protect the district's significance and its historical and architectural values. To create and maintain continuity of architectural characteristics, arrangement, and design of the district's buildings.	To identify, preserve, protect, and ensure appropriate alterations to landmarks. To preserve, protect and ensure compatible alterations to the significant characteristics of the Harvard-Belmont, Columbia City and Ft. Lawton Districts.
<b>goal(s)</b>								
<b>projects</b>								
<b>project type</b>	City facilities (parks, libraries, etc.) and projects on City land or in right-of-way, including large transportation projects, street vacations, skybridges and special street uses	Private development (commercial and large-scale residential) above a certain threshold	Comp Plan, neighborhood plans, subarea plans, citywide or region-wide public infrastructure projects, major public projects and plans (e.g., Civic Center, major institution master plans)	Businesses, buildings, parks, open space, rights-of-way	Businesses, buildings, parks, open space, rights-of-way	Businesses, buildings, parks, open space, rights-of-way	Businesses, buildings, parks, open space, rights-of-way	Public or private building, site or object over 25 years old that meets designation criteria
<b>what is reviewed</b>	Exterior, public interiors, urban design, projects that affect the public right-of-way and streets	As detailed in the City's design guidelines—site plan; building's height, bulk and scale; architectural elements and materials; pedestrian environment; and landscaping	Policies, goals and plans that affect the City's future physical development	All alterations to public and private building exteriors, rights-of-way, open spaces, demolition, new construction, changes of use	Use in building/business; interior and exterior of all businesses/buildings; street use and design; use and design of park	All alterations to building exteriors, rights-of-way, public and private exterior, open spaces, demolition, new construction, changes of use	Changes to the exteriors of buildings visible from public right-of-way, park, street design	Exterior, interior and site may be designated for individual landmarks
<b>project proponents</b>	City agencies, private developers	Private developers	City agencies	Private developers, property owners, business owners, residents, public agencies	Private developers, property owners, business owners, residents, public agencies	Private developers, property owners, business owners, residents, public agencies	Private developers, property owners, business owners, residents, public agencies	Private developers, property owners, business owners, residents, public agencies
<b>reviews per project</b>	2-4	2-4	as needed on case by case basis	2	2	1	1	2
<b>avg. reviews per year</b>	100+	200+	as needed on case by case basis	120	250	75	20	100+
<b>board</b>								
<b># of boards</b>	1	7	1	1	1	1	1	1
<b>purview</b>	Citywide	Neighborhood-based	City-wide	Pioneer Square Preservation Dist.	Pike Place Market Historical Dist.	International Special Review Dist.	Ballard Avenue Landmark Dist.	City-wide
<b># of board members</b>	10	5 per board (35 total)	16	10	12	7	7	11
<b>member terms</b>	2 years + reappointment	2 years + reappointment	3-year terms, renewable	3 years + reappointment	3 years + reappointment	2 years + re-election/reppt.	2 years + re-election/reppt.	3 years + reappointment
<b>appointed</b>	by Mayor	by Mayor/Council	by Mayor/Council	by Mayor	by Mayor	2 by Mayor; 5 elected within Dist.	2 by Mayor; 5 elected within Dist.	by Mayor
<b>roles represented</b>	architect (2), landscape architect (2), fine artist, engineer, urban planner, urban designer, member at large, Get Engaged	design professional, community representative, developer, business representative, resident, Get Engaged	an engineer or architect, an urban planner, ethnic minority members, and citizens active in neighborhood or community affairs, Get Engaged	architect (2), resident, retail business owner, property owner (2), historian/arch. historian, attorney, human services rep., Get Engaged	2 each: Allied Arts, Friends of the Market, AIA Seattle, district merchants, residents and property owners	Appointed: 2 members. Elected: business/property owners (2); resident, tenant or person interested in community (2); at-large member	Appointed: architect, community historian. Elected: property owners (2); property-business owners (2); tenant or resident	architects (2), historians (2), structural engineer, planning commissioner, real estate manager, finance, at-large (3), Get Engaged
<b>meetings</b>	Twice a month (1st & 3rd Thurs.)	Each board meets twice a month (days vary per board)	Twice a month (2nd & 4th Thurs.)	Twice a month (1st & 3rd Wed.)	Twice a month (2nd & 4th Wed.)	Twice a month (2nd & 4th Tues.)	Once a month (1st Thurs.)	Twice a month (1st & 3rd Wed.)
<b>authority</b>								
<b>advises who?</b>	Mayor, City Council, City departments	Department of Planning and Development Director	Mayor, City Council, City departments	Mayor, City Council, Department of Neighborhoods Director	Mayor, City Council	Mayor, City Council, Department of Neighborhoods Director	Mayor, City Council, Department of Neighborhoods Director	Mayor, City Council
<b>decisions</b>	advisory	advisory/regulatory	advisory	regulatory	regulatory	regulatory	regulatory	regulatory

(Individual landmarks plus Columbia City, Ft. Lawton, Harvard-Belmont Historic Districts)