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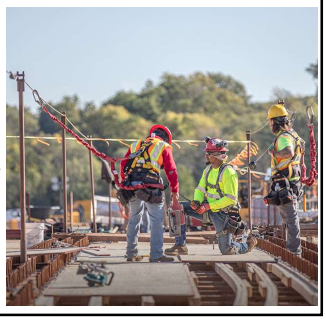
September 25th, 2025

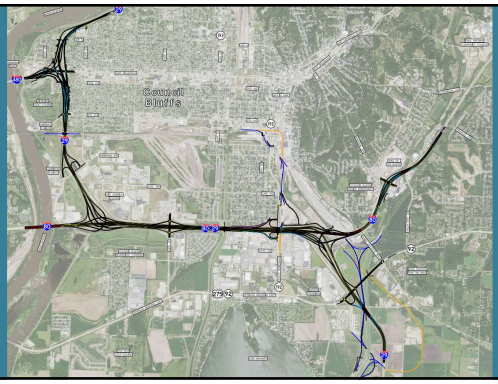
Madison Avenue: The Final Chapter of Council Bluffs Interstate System (CBIS) Program

IOWA DOT
Council Bluffs Interstate System Improvement Program

Topic Overview

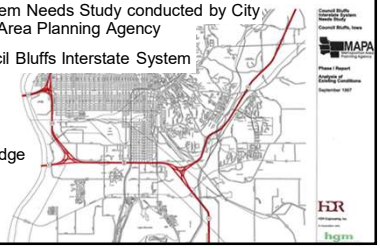
- CBIS Program Overview
- Madison Avenue Design
- Unique Roadway and Bridge Considerations
- CBIS Program Takeaways





CBIS Timeline

- Interstate system originally constructed in the 1960s
- Remained unchanged for 30 years
- 1997 Council Bluffs Interstate System Needs Study conducted by City of Council Bluffs and Metropolitan Area Planning Agency
- 2002 Iowa DOT initiated the Council Bluffs Interstate System Improvement Program
  - Environmental Studies
  - Preliminary Design
- 2008 construction of 24th Street bridge



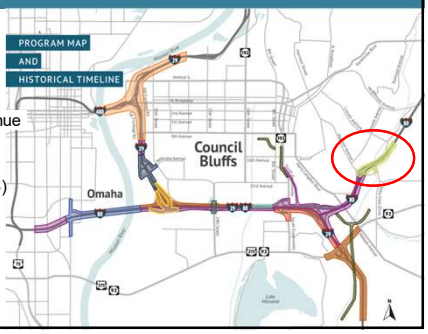
24th Street Bridge

CBIS Timeline (2)

- 2013
  - Iowa Transportation Commission commits to full program funding
  - Formation of PM/GEC team
  - Program acceleration and repackaging – consolidated 70 projects into 13 contract packages
- 2016 railroad relocations completed
- 2017 West System Interchange completed
- 2019 East System Interchange completed
- 2021 completion of dual-divided system, marked substantial completion of program
- 2024 completion of I-480/West Broadway Interchange
- Brings us to…

Madison Avenue Interchange

- East I-80 program limit
- Full Interstate & Madison Avenue interchange reconstruction
- Last Segment of the Council Bluffs Interstate System (CBIS) Program

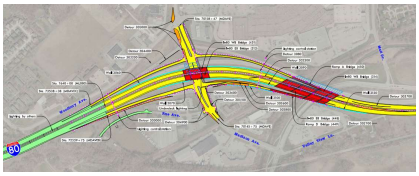


Project Packaging

- Originally programmed as a single package
- Split into two lettings
  - August 2022 for eastbound I-80
  - November 2023 for westbound and Madison Avenue improvements
- Will discuss both packages together
- $115M combined

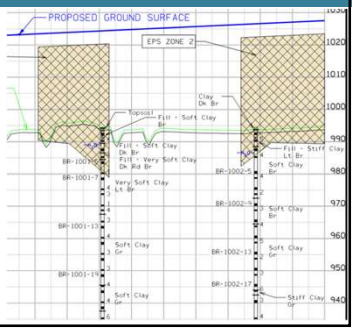
Project Scope

- Increase roadway capacity
- Improve ramp geometry and acceleration lanes
- Reconstruct bridges over Madison Avenue & Valley View Drive/Mosquito Creek
- Madison Avenue sideroad improvements
- Pedestrian facility improvements
- Noise wall construction



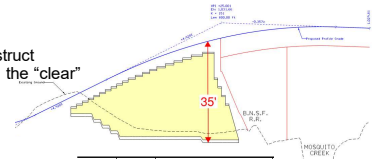
Site Constraints

- Soft soils with high settlement concern
- Constrained corridor – retaining walls in high fill areas
- Traffic restrictions
- Railroad, stream, and pedestrian path crossings
- Staged bridge removals
- Utility relocations and coordination



I-80 Alignment

- South-shifted alignment to construct eastbound lanes and bridges in the "clear"
- Fill areas up to 35'
- Poor soils
- Settlement concerns for both proposed roadway and existing bridges
- Required mitigation



Alignment	Station	Eastbound I-80		
		Fill Thickness (feet)	Estimated Settlement (inches)	Hold Time for 1 Inch Settlement (days)*
I-80	7690+50	28	23	336
I-80	7694+00	30	26	360
I-80	7692+00	32	29	360
I-80	7670+50	34	15	270
I-80	7675+00	26	21	316
I-80	7681+00	11	8	195

N/A – Not applicable
*Assumes 80% Consolidation occurs during fill placement

(for conventional fill)

Previous CBIS Settlement Mitigation Strategies

- Common concern in previous CBIS projects
- Mitigation based on cost and time
  - $ Preconsolidation
  - $$ Wick drains
  - $$$ Rigid inclusions
- Early project embankments used conventional fill materials

Previous CBIS Settlement Mitigation Strategies (2)

- Began using Lightweight Foamed Concrete Fills (LFCF) in 2016
- Approximately 50 PCF
- Higher material cost than conventional fills
- Reduced overall number of required ground improvements
- Good fit with MSE wall construction and staged embankments
- Began using under sloped embankments as well

LFCF Embankment

Vertical LFCF embankment section

Madison Avenue Project Settlement Mitigation

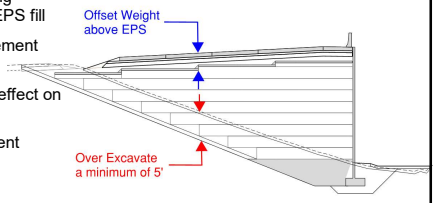
- Effective combination of:
  - Settlement mitigation
  - Schedule impacts
  - Cost
- Extruded Polystyrene (EPS) geofoam block
- Combination of strategies ultimately selected
  - Isolated areas of wick drains and preloading
  - EPS block fills in areas with high settlement risk
  - Areas of LFCF “leveling” course under EPS block
- Revised ramp geometry to reduce wall height and EPS need

Why EPS?

- Next lightest option (LFCF) would still require rigid inclusions
- Generated shortest closures of Madison Avenue ramps
- Allowed vertical staging of embankment, resulting in wider sections of roadway construction per stage
- Growing familiarity with EPS construction in other Iowa DOT projects
- "Net zero" loading with a 5' over excavation

Net Zero Loading

- Pavement section has weight
- Over excavate 5' of existing ground and replace with EPS fill
- Offsets weight of the pavement section
- EPS block has negligible effect on settlement
- Mitigates induced settlement



EPS29

- Lightweight
  - 1.8 PCF (CY ~ 49 lbs)
  - Blocks can be moved by hand
- Very little water absorption
- Surprisingly dense
- A bit pricey…
  - $200/CY (EB Package)
  - $160/CY (WB Package)

Foam-Control Geofoam Properties

Property		ASTM D6817						
		EPS12	EPS15	EPS19	EPS22	EPS29	EPS39	EPS46
Density[1], min.	lb/ft³ (kg/m³)	0.70 (11.2)	0.90 (14.4)	1.15 (18.4)	1.35 (21.6)	1.80 (28.8)	2.40 (38.4)	2.85 (45.7)
Compressive Resistance[2] @ 1% deformation, min.	psi psf (kPa)	2.2 320 (15)	3.6 520 (25)	5.8 840 (40)	7.3 1050 (50)	10.9 1570 (75)	15.0 2160 (103)	18.6 2680 (128)
Elastic Modulus[1], min.	psi (kPa)	220 (1500)	360 (2500)	580 (4000)	730 (5000)	1090 (7500)	1500 (10300)	1860 (12800)
Flexural Strength[1], min.	psi (kPa)	10.0 (69)	25.0 (172)	30.0 (207)	35.0 (240)	50.0 (345)	60.0 (414)	75.0 (517)
Water Absorption[1] by total immersion, max.,	vol. %	4.0	4.0	3.0	3.0	2.0	2.0	2.0
Oxygen Index[1], min.	vol. %	24	24	24	24	24	24	24
Buoyancy Force	lb/ft³ (kg/m³)	61.7 (990)	61.5 (980)	61.3 (980)	61.1 (980)	60.6 (970)	60.0 (960)	59.5 (950)

[1] See ASTM D6817 Standard for test methods and complete information.
[2] Combined live and dead load stresses should not exceed the compressive resistance at 1% deformation.

Project EPS Limits

- I-80 Eastbound = 52,500 CY of EPS ($200/SY average bid)
- I-80 Westbound = 10,850 CY of EPS ($160/SY average bid)
- Located behind retaining walls

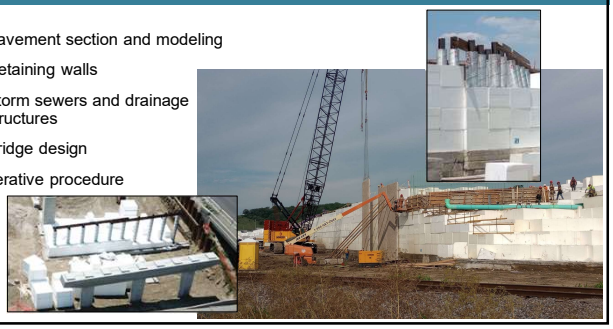
EPS Pros and Cons

+ No change to roadway load rating and operation
+ Very lightweight
+ Rapid embankment construction
+ Vertical staging
+ Blocks are shaped in the field
+ Low placement cost (no large equipment needed)
+ Effective solution for settlement

- Requires load distribution slab construction before receiving full loads
- Buoyant (rain events)
- Large storage/laydown area
- Retain paving subgrade at edges of LDS
- Blocks are shaped in the field
- High material cost
- Unique design considerations

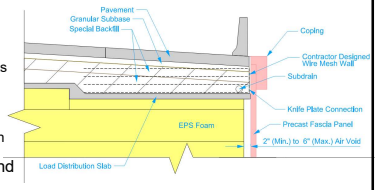
EPS Design Considerations

- Pavement section and modeling
- Retaining walls
- Storm sewers and drainage structures
- Bridge design
- Iterative procedure



Pavement Section Considerations

- Construct Load Distribution Slab (LDS) over EPS blocks
  - Spreads roadway loads across blocks
  - Locks block system together
  - Creates impermeable top barrier
  - 1' steps for profile and superelevation
- Consistent pavement thickness and subgrade treatment
  - Subdrains located on outside edge of LDS
  - Retain subgrade at edge with wire mesh wall

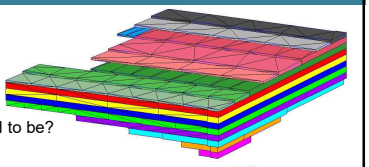


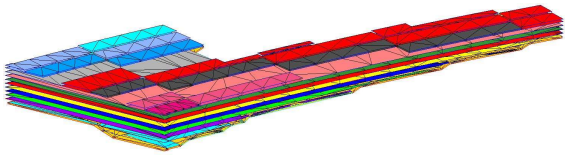
Load Distribution Slab

Wire Mesh Wall for Subgrade

Modeling Considerations

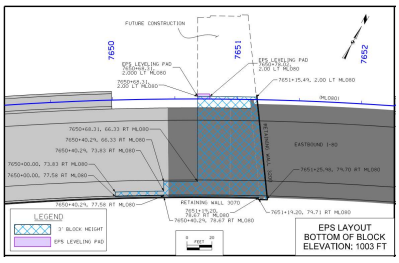
- Where are the EPS layers?
- How is it represented in the plans?
- How prescriptive do the plans need to be?





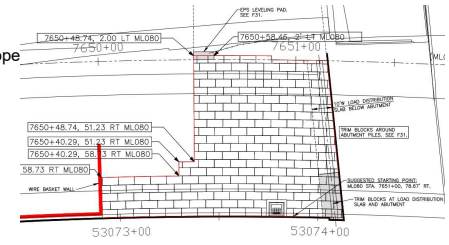
Modeling Considerations (2)

- EPS layers were modeled
- Assumed a 3' layer
- Define limits on designated plan sheets
- Shown on cross sections and wall profiles
- Define the EPS envelope
  - Doesn't dictate means and methods
  - Shop drawings match the envelope, not block by block



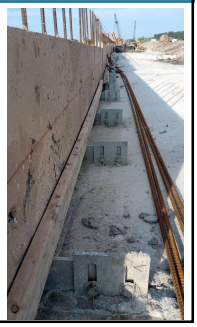
EPS Shop Drawing

- Actual block dimensions varied
- Showed block details
- Matched design envelope

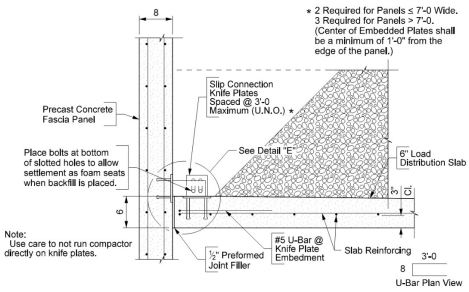


Retaining Wall Considerations

- Precast fascia wall panels
- Wall panel lifted by crane onto on a leveling pad
- Panels braced in place
- Wall panels secured at top to LDS
- Panels can get very tall and heavy
- Requires large equipment to place
- About $100/SF for the panels



Knife Plate Connection



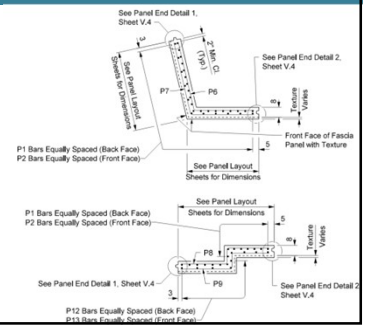
Layers of Approach Construction

Retaining Wall Construction

Placed Retaining Wall Panels

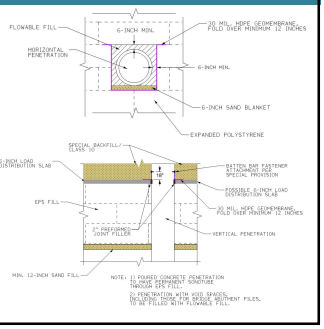
Retaining Wall Details

- A lot of structural details
- Aesthetic form liners
- Integral concrete color
- Specific “corner” and “folded” panel designs
- Knife plate details
- Integration with drainage structures



Storm Sewers and Drainage

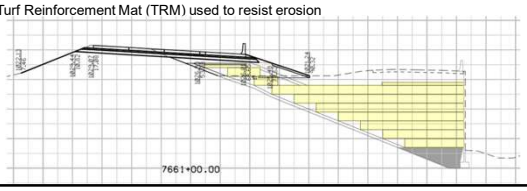
- Interaction with wall system
  - Drainage structures must fall between knife plate connections
  - Knife plates and subgrade wire mesh wall discourages use of longitudinal pipes along walls
  - EPS can support short drainage structures
  - Tall drainage structures required pile supports
- Interaction with EPS
  - Pipes located under LDS
  - Penetrations backfilled with flowable fill



Tall Drainage Structures

Storm Sewers and Drainage (2)

- EPS subdrain system
  - EPS placed on 12” of sand layer with subdrain, outlets to adjacent ditch or storm sewer
  - Replaced first layer of EPS block with LFCF to raise subdrain in shallow ditch areas
- Surface drainage
  - Grass infield areas in interchange, approximately 5’ of earth cover over EPS
  - Turf Reinforcement Mat (TRM) used to resist erosion



Short Drainage Structures and LFCF Layer

Bridges - Comparison "Time Lapse"

August 2022

May 2023

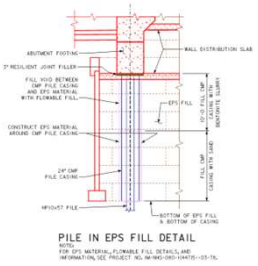
Comparison "Time Lapse"

May 2023

March 2025

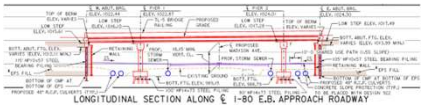
Madison Avenue Bridge Design

- PPCB bridges over Madison Avenue
- 199’ x 72’ EB bridge
- 199’ x 60’ WB bridge
- Variable skew
- EPS fill zones – CMP sleeved piles
- Wrap-around retaining walls – “corner” and “folded” wall details



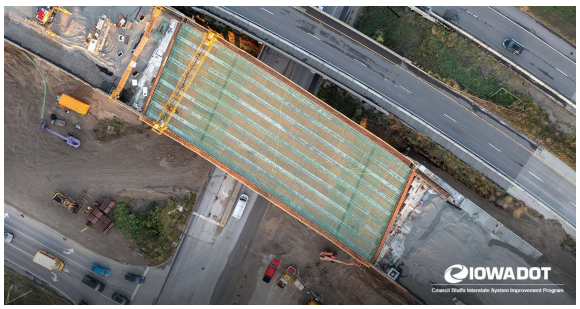
Madison Avenue Bridge Considerations

- Construction adjacent to and over live traffic
  - Maintain traffic on I-80 and Madison Avenue
  - Closures limited to overnights
- High density of utilities
  - Concurrent storm, sanitary, and water line relocations
  - Buried electric lines and communication lines
  - Limits placement of cranes and materials
- Staged bridge removal
  - Existing EB I-80 bridge
  - Between new EB and existing WB bridge



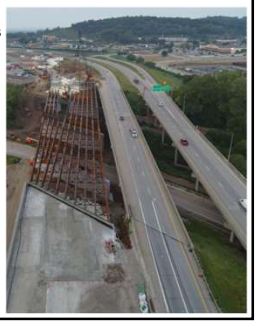
EB Madison Avenue Bridge Construction

EB Madison Avenue Bridge Construction



Valley View Bridge Design

- Two 670' continuously welded steel girder bridges
  - Skewed abutments located in EPS fill
  - Battered abutment pile with CMP sleeves
- 4 separate bridge designs
  - EB I-80
  - Madison Avenue entrance ramp
  - WB I-80
  - Madison Avenue exit ramp
- Very large piers at ramp gore area
  - 142' x 55' wall pier for EB bridge
  - 1,700 CY concrete in the wall and footing



Valley View Bridge Considerations

- Constrained worksites
- Bridges crossing active traffic
  - Valley View Drive
  - Bike Trail
  - BNSF Railroad
- Staged bridge demolition
  - Maintain WB exit ramp
  - Difficult construction access
- Mosquito Creek
  - Multiple stream crossings
  - Used for bridge construction and removals
  - Reduced interaction with railroad tracks

Pier 2 Construction

Comparison “Time Lapse”

August 2022

May 2023

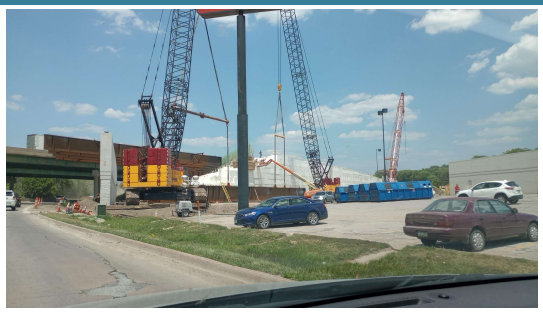
Comparison “Time Lapse”

May 2023

March 2025

Construction Between Tracks and Creek

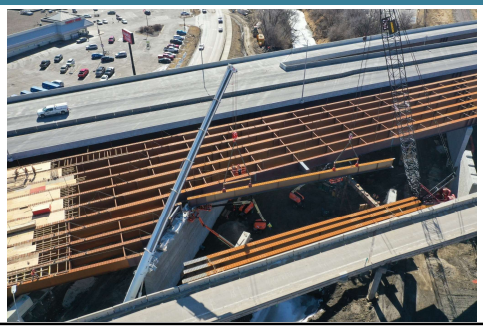
Construction Adjacent to Active Business



South Stream Crossing

North Stream Crossing

Threading the Needle



Exit Ramp Still Open…

CBIS Input and Feedback

- 20 years of ongoing Value Engineering
  - What worked well?
  - What could be improved?
- Input from all
  - Contractors
  - Law enforcement
  - Traffic Incident Management (TIM)
  - Maintenance crews
  - Traveling public
- Cumulative effect applied to program

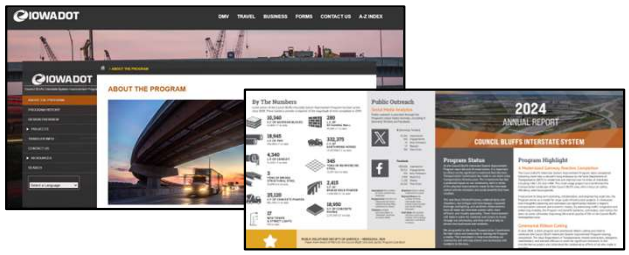
Final CBIS Segment – Lasting Benefit

- Madison Avenue project started 30 years ago
- Result of true partnerships decades in the making
  - Team CBIS
  - No give and take: just give
  - Common goal of improved safety and efficiency for all users
- Combination of time-tested and innovative solutions
- Closes out the program ahead of schedule, under budget
- The whole is greater than the sum of its parts

Meaningful Outreach

- Residents and travelers were partners every step of the way
- Years outreach and materials throughout the program evolution
  - Public events
  - Mailers
  - Media releases
  - Highway message signs
  - Water cooler
  - Website

CBIS Website



https://councilbluffsinterstate.iowadot.gov

Questions?

Bridge Cost Comparisons

Letting: 8/2022

Bridge Items	Unit	Unit Prices I-80EB Low Bid	I-80EB Avg Bid	Ramp D Low Bid	Ramp D Avg Bid
STRUCTURAL STEEL	LB	$ 2.48	$ 2.73	$ 2.33	$ 2.62
STRUCT CONC (BRIDGE)	CY	$ 427.39	$ 734.48	$ 420.16	$ 743.03
HIGH PERFORMANCE STRUC CONC	CY	$ 576.75	$ 838.35	$ 562.65	$ 915.53
REINFORC STEEL	LB	$ 1.38	$ 1.66	$ 1.39	$ 1.66
REINFORC STEEL, EPOXY COATED	LB	$ 1.48	$ 1.91	$ 1.40	$ 1.58
REINF STEEL, STAINLESS STEEL	LB	$ 4.10	$ 4.54	$ 4.00	$ 4.52
PILE, STEEL, HP 12X53	LF	$ 58.82	$ 81.56	$ 55.49	$ 62.10
PILE, STEEL, HP 14X89	LF	$ 79.50	$ 89.30	$ 79.50	$ 89.90

Roadway Items	Unit	Low Bid	Avg Bid
EXPANDED POLYSTYRENE (EPS) BLOCK GEOFOAM, EPS29	CY	$ 165.00	$ 191.27
PRECAST FASCIA WALL FOOTING	LF	$ 195.00	$ 332.16
PRECAST FASCIA WALL PANELS	SF	$ 59.00	$ 71.72

Letting: 11/2023

Bridge Items	Unit	Unit Prices I-80WB Low Bid	I-80WB Avg Bid	Ramp A Low Bid	Ramp A Avg Bid
STRUCTURAL STEEL	LB	$ 2.38	$ 2.81	$ 2.46	$ 2.80
STRUCT CONC (BRIDGE)	CY	$ 604.39	$ 776.10	$ 570.67	$ 791.42
HIGH PERFORMANCE STRUC CONC	CY	$ 745.70	$ 1,024.93	$ 750.97	$ 1,173.24
REINFORC STEEL	LB	$ 1.21	$ 1.54	$ 1.21	$ 1.50
REINFORC STEEL, EPOXY COATED	LB	$ 1.29	$ 1.52	$ 1.31	$ 1.50
REINF STEEL, STAINLESS STEEL	LB	$ 3.96	$ 4.35	$ 3.96	$ 4.35
PILE, STEEL, HP 12X53	LF	$ 53.17	$ 57.29	$ 53.20	$ 59.05
PILE, STEEL, HP 14X89	LF	$ 79.48	$ 85.87	$ 80.89	$ 87.72

Roadway Items	Unit	Low Bid	Avg Bid
EXPANDED POLYSTYRENE (EPS) BLOCK GEOFOAM, EPS29	CY	$ 158.33	$ 158.75
PRECAST FASCIA WALL FOOTING	LF	$ 310.00	$ 330.96
PRECAST FASCIA WALL PANELS	SF	$ 99.30	$ 100.31