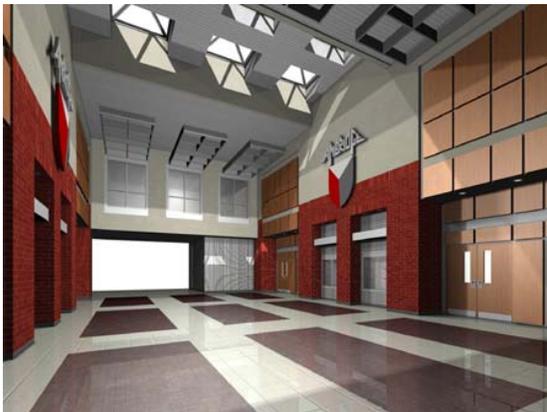


## PROJECT DESIGN OVERVIEW

### Architecture:

The new Ambridge Area High School (AAHS) will replace the existing three story brick structure, built in 1928. Efforts to preserve and renovate the school failed when it was declared ineligible for the National Register of Historic Places. It stands as the most distinctive building in the town, also home to Old Economy Village, home of a nineteenth century Christian communal group, in the historic district which retains its original architecture. The new school will mimic the existing one with a massive red brick structure and a steel bridge entrance which pays homage to the steel fabrication operations which built the town in years prior.



Entrance Lobby Rendering

Accessible from the dual story height entrance lobby on the main level, are a one court gymnasium with retractable seating and the auditorium. The basement level holds facilities including a state of the art computer aided drafting (CAD) suite, a television studio, cafeteria, and a JROTC target shooting range, as well as technology education classrooms and the mechanical rooms for the building. In addition to the traditional classrooms, a Large

Group Instruction (LGI) space provides teachers with a flexible space capable of seating more students in a university lecture hall type setting.

The new design was met with some resistance from the community, but the project goal is to provide the district with a more efficient building, aiming to improve indoor air quality, accessibility, and technology integration.

### Building Codes:

2003 International Building Code

Americans with Disabilities Act

**Zoning:**

Ambridge, PA for Educational, Assembly, and partial Storage use

**Historical Requirements:**

Ambridge, Pennsylvania was incorporated in 1910, named after the American Bridge Company, which started operations there in 1903. Ambridge is situated along the Ohio River, sixteen miles Southwest of Pittsburgh, PA. American Bridge was a consolidation led by J.P. Morgan of the largest steel fabrication and



Existing Ambridge Area High School

construction companies in the U.S. Notable structures manufactured in Ambridge include: the Sears Tower, Empire State Building, and several U.S. Navy warships during WWII. The population of the town peaked during WWII and has seen a consistent decline since American Bridge ceased operations in 1983. The school's mascot is the Bridger, saluting the industrial heritage of the town. The design intent of Forman Architects and Engineers was to create a new school with some similarities of the existing school and salute the industrial heritage of Ambridge, PA.

**Building Envelope:**

The exterior walls of Ambridge Area High School consist primarily of face brick, red and gray, to match the school's colors, with a concrete masonry unit backup. Painted mineral fiber siding is used on some elevations in areas between conventional single-hung aluminum windows. Metal grills and screens above the parapet line are used to screen mechanical equipment from view at ground level. The roof over the majority of the building is constructed of tapered insulation over metal roof deck topped with a 60 mil reinforced black EPDM membrane. Stairwells at the corners of the building, and the main entrance are surrounded by glass and aluminum curtain wall and topped with peaked standing seam metal construction supported by trusses.

**Structural:**

The structural system of Ambridge Area High School is composed of a system of structural steel beams and columns. Structural columns span three floor levels and are supported by pile caps and grade beams both along the building's perimeter and inside the footprint. Grade beams and pile caps are held by 18" auger cast piles to an average depth of 40' to attain sufficient bearing capacity. One unique member supporting the auditorium balcony is a 114' span plate girder weighing 23 tons. Ground level slabs are a 4" slab on grade composed of 3000psi concrete with 6x6 W2.1 x W2.1 welded wire fabric reinforcement. Elevated slabs consist of 4" of 3000psi concrete with 6x6 W1.4x W1.4 welded wire fabric cast over 20 Ga composite steel deck connected to steel members with shear studs.



Structural Steel Erection Complete  
Composite Deck Placement Beginning

**Electrical:**

Power distribution is provided by five 480V and 17 277/480 V panels, and 13 480 to 120/208 step down transformers. Emergency backup power is provided by a 275 kW diesel generator with 1000 gallon storage tank located in the basement mechanical room. Power distribution to the building typically provides duplex receptacles in classrooms and corridors with allowance for computer equipment in east classroom. Spaces are also wired for data with CAT5 Ethernet from various network rooms inside the building, telephone, and cable television. The closed circuit television system allows viewing on televisions in classrooms from outside sources like cable or direct feed from the television studio on the basement level.

**Lighting:**

Lighting in classrooms is typically pendant fixtures using 277 Volt fluorescent T5HO bulbs. Corridor lighting throughout AAHS is provided by recessed fixtures mounting in the ACT grid using 277 Volt T5 bulbs. The gymnasium is also illuminated using surface mounted fixtures using T5 bulbs with wire guards to protect from abuse. The interior lighting power density for Ambridge Area High School is 0.88 Watts/SF considerably under the allowance of 1.2 Watts/SF.

**Mechanical:**

Conditioning of interior spaces is handled by 19 Trane air handling units both rooftop and interior mounted providing 2900-25,715 CFM, Three gas fired hot water boilers with a 6560MBH output each, and two 283 ton chillers located in the basement level mechanical room. Distribution of conditioned air is provided through steel sheet metal duct. Exhaust



Trane rooftop AHU installed

hoods and ductwork vent spaces including the cafeteria, and lab spaces where required. Hot water for plumbing use is provided by the three hot water boilers one acting as a back up unit. A domestic water booster pump provides up to 125 GPM to maintain water pressure throughout the building

**Fire Protection:**

AAHS uses a wet pipe sprinkler system with vertical standpipes in stairwells and a free standing fire department Siamese connection located at the main building entrance. Pressure is controlled by a fire pump providing 750 GPM. The fire alarm system provides pull stations with bells and strobes throughout the building.

**Conveyance:**

Conveyance in AAHS is provided by three hydraulic lift elevators. One freight elevator with a capacity of 4000 pounds travels two stops between the ground level storage space to the kitchen and food service area of the plan. Two passenger elevators on opposite sites of the building provide stops at all floors and a capacity of 2500 pounds. Passenger elevators provide a method of transport for furnishings upon completion of the project as well as passengers to meet ADA compliance.

## **PROJECT TEAM OVERVIEW**

### **Client:**

#### *History*

With enrollment on the decline, the AASD chose to consolidate from five elementary schools in the district to three, choosing to either renovate or build, to provide a lower cost alternative to operating from five aging buildings. The new Ambridge Area High School (AAHS) is the newest school to be built in the Ambridge Area School District (AASD). State Street Elementary, finished in August 2001, underwent an extensive renovation and expansion. Economy Elementary and Highland Elementary were new construction and opened in August 2002 and 2004 respectively.

#### *Owner Satisfaction*

Since the Ambridge Area High School is the fourth construction project in the Ambridge Area School District in five years, much thought has been placed as to what the expectations of the owner are. In addition to providing a building to serve the community for decades, the project has to also stay within an inflexible budget and schedule. With the design, engineering, project management, and some contractors playing a role in all four district projects, time was saved in adjusting to the acclimation period in dealing with a particular owner. With most parties familiar with the policies and expectations of the Ambridge Area School District, quality could be increased without an increase in input of the team. The construction management agency was a critical step in ensuring the needs of the owner were fulfilled, aiding to minimize change orders and increase overall construction quality. The project schedule was inflexible with substantial completion coming just under four months before occupancy, time allotted for the installation of classroom furnishings and equipment being moved from the existing school set to open doors to students in January 2008.

**Project Delivery System:**

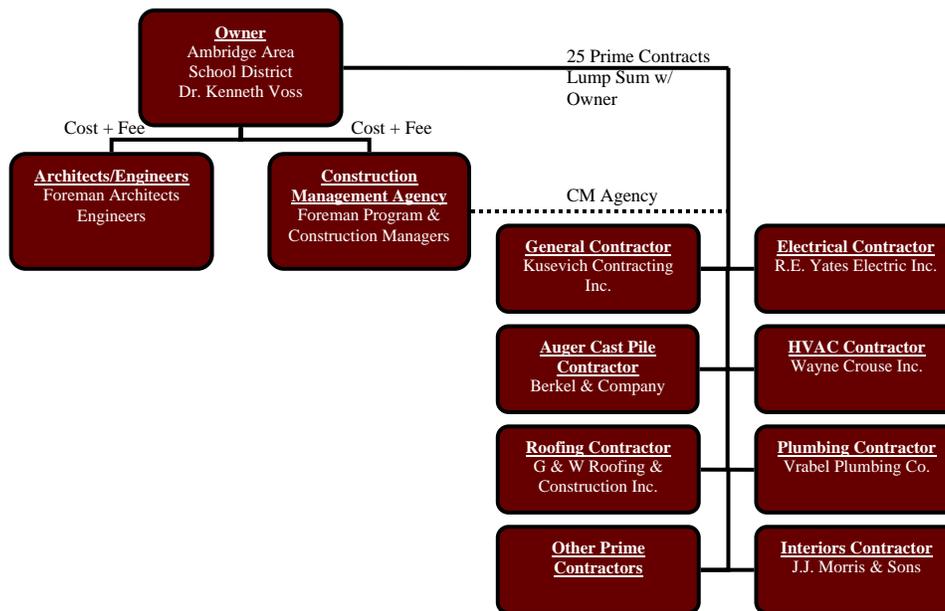
Construction of the new Ambridge Area High School utilized the design-bid-build delivery system with Foreman Architects Engineers (FAE) as the design team, then bid and built using multiple prime contracts to conform to Section 7-751 of the Pennsylvania School Code of 1949, specifying school building projects must have at least four prime contracts: General, Plumbing, HVAC, and Electrical. The Ambridge Area High School used twenty five prime contracts.

1. General Construction	Kusevich Contracting Inc.
2. Cast Piles Construction	Berkel & Company Contractors Inc.
3. Roofing Construction	G & W Roofing & Construction Inc.
4. Aluminum Entrances/Storefronts	Don's Glass & Mirror
5. Aluminum Windows	Specified Systems Inc.
6. Acoustical, Drywall & Plaster	J.J. Morris & Sons
7. Ceramic and Quarry Tile	J.P. Phillips Inc.
8. Hardwood Flooring Construction	Wood Floor Designs
9. Resilient Flooring and Carpeting	Degol Carpet
10. Visual Display Boards	Polyvision Inc.
11. Lockers Construction	Lyon Workspace Products
12. Food Service Equipment	Gateway Kitchen Equipment & Supplies
13. Vocational Shop Equipment	Allegheny Educational Systems Inc.
14. Stage Equipment	Pittsburgh Stage Inc.
15. General Casework Construction	Northeast Interior Systems Inc.
16. Library Casework	T.F. Nichols Company
17. Science Casework Construction	Fisher Hamilton LLC
18. Audience Seating Construction	Naffei Strayer Furnishings Inc.
19. Bleacher Construction	Dave York Sports Inc.
20. Grandstands Construction	Dave York Sports Inc.
21. Fire Protection Construction	Vrabel Plumbing Co. LLC
22. Plumbing Construction	Vrabel Plumbing Co. LLC
23. HVAC Construction	Wayne Crouse Inc.
24. Electrical Construction	R.E. Yates Electric Inc.
25. Communications Construction	Morocco Electric Inc.

The Ambridge Area School District (AASD) chose Foreman Program and Construction Managers (FPCM) as a construction management agency, to provide on site management and a one point contract between the project and the AASD. Foreman has completed several previous projects in the district including the renovation and expansion of an existing elementary school and the new construction of two elementary schools. Subcontractors were contracted with the owner directly.

The Foreman Group, which encompasses both Foreman Architects & Engineers and Foreman Program and Construction Managers, provided a single source entity from conceptual design to finished construction without changing hands. This method helped to ensure constructability issues are considered and handled accordingly in design to reduce potential problems in the field.

**Project Delivery Diagram:**



**Staffing Plan:**

The construction management agency on the Ambridge Area High School organized their operations staff in three levels. At the top level, the Project Executive, spending just four to eight hours per month provided general oversight of the project. The next tier includes the Project Manager, whose part time duties include schedule management, cost tracking, negotiating changes, and correspondence with the owner. Lastly, two full time Site Managers provided on site construction coordination and planning, maintaining and updating the schedule, and safety management. Please refer to the staffing diagram and staff member diagram for more information on the next page.

**Staffing Diagram:**



**Staff Member Distribution**

Member	Design	Preconstruction	Mobilization	Structural	Enclosure	Interior Finishes	Punchlist/ Closeout
<b>Foreman Architects/Engineers (FAE)</b>							
Design Team							
<b>Foreman Program &amp; Construction Managers (FPCM)</b>							
Project Executive							
Project Manager							
Site Manager							
Site Manager							

Involvement during this time period

## **EXISTING CONDITIONS REPORT**

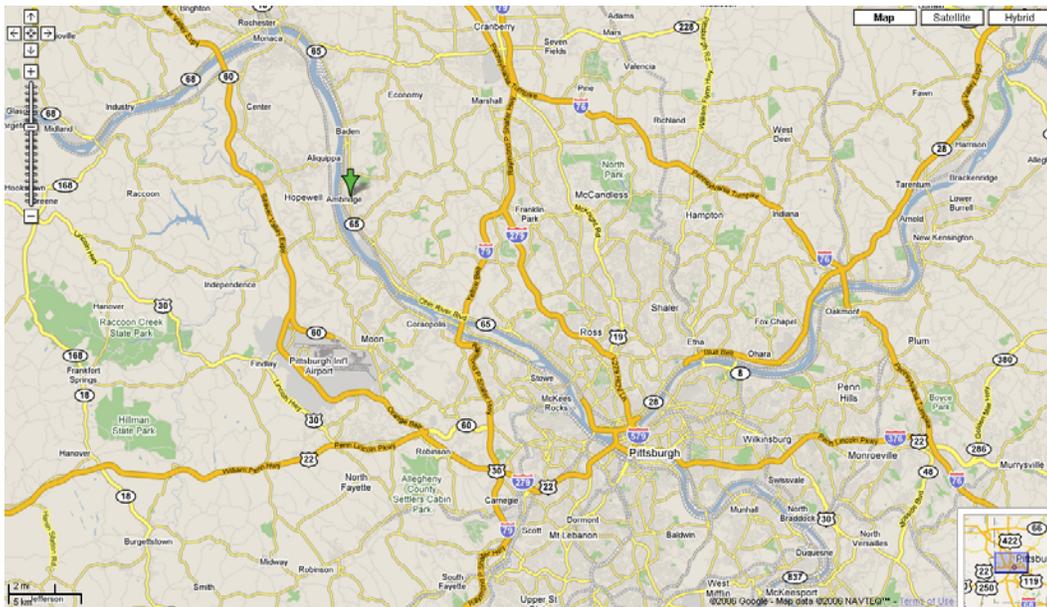
### **Local Conditions:**

Design and construction on Ambridge Area High School were typical of school construction in southwest Pennsylvania. Construction methods in the Pittsburgh area mostly consist of a structural steel frame with slab on deck floors, as does AAHS. The availability of steel and concrete in the area is abundant with several concrete plants in the vicinity. The soil in the project area usually consisted of a level of fill material, usually less than ten feet in depth, followed by layers of siltstone and clay. As Ambridge borders the Ohio River, these soil types are to be expected. Soil was adequate for excavations but forced the use of multiple auger cast piles with pile caps and grade beams to attain proper bearing capacity.

Parking during construction was provided for management personnel in a gravel lot adjacent to the contractor trailers, and accessed from the lower entrance on 11<sup>th</sup> street (See site plan). Overflow parking was provided on neighboring streets and a park and ride lot within walking distance of the site. Dumpster tipping fees averaged between \$400 and \$500 with steel waste from construction being recycled, and other waste sent to a landfill.

**Vicinity Maps:**

Below you will find two maps depicting the project area. The top map shows Ambridge Area High School in the Pittsburgh, Pennsylvania area, while the bottom one shows the location within the community of Ambridge, PA as well as the location with respect to the existing Ambridge Area High School.



City of Pittsburgh Vicinity Map



Town of Ambridge Vicinity Map

## ***SITE LAYOUT PLANNING***

The detailed site plans included in Appendix A detail the site layout during various phases of the project including foundations, superstructure erection, slab on grade, elevated slabs and building enclosure. Access to the site is provided by several gates on both Duss Avenue and 11<sup>th</sup> Street, with the main delivery entrance for steel via the lower entrance on 11<sup>th</sup> street. Steel fabrication was done by Sippel Steel in Ambridge, PA, less than 2 miles from the project site. The proximity of the shop location reduced the amount of steel staging areas needed within the site fence, allowing for as many just-in-time deliveries as possible.

### ***Excavation and Foundations:***

Auger cast piles were drilled using a pile rig to an average depth of 40' to attain proper bearing capacity. Excavation for grade beams and pile caps were achieved with hydraulic excavators. A top soil stockpile was used to maintain suitable soil for placement when construction was complete.

### ***Steel Erection:***

Erection of structural steel members used a 165 Ton crawler crane in multiple locations, shown in figure 1 erecting the first structural column. Steel erection began adjacent to the retaining wall separating the 1<sup>st</sup> floor slab on grade and elevated slab area. Using two crane locations, phase one of steel is erected. The installation of the 114' long, 23 Ton plate girder had to be well planned as the transportation from Sippel required permits and traffic control as the over size truck navigated the streets of Ambridge. The placement of the girder was accomplished with a 200 Ton DEMAG mobile crane. Structural steel topped out on April 4, 2006.

### ***Concrete:***

Installation of metal deck followed structural steel erection and was followed with pouring of slabs using a concrete pump in several locations. Several concrete batch plants in close proximity to the project site ensured no shortages of concrete for large pours.

***Building Enclosure:***

Building enclosure came after completion of structural steel and concrete work with the erection of masons scaffolding around the entire perimeter of the building. Work began on the South elevation adjacent to the main building entrance and proceeded counterclockwise around the footprint ending at the building entrance.

## **PROJECT LOGISTICS SUMMARY**

### **Detailed Project Schedule:**

The Ambridge Area High School schedule is composed of 157 activities. In addition to being broken up into phases of the project, all floor specific work is broken up between the three floors for additional ease. Please refer to the summary schedule on the next page detailing project milestones. A detailed project schedule can be found in Appendix B.

Ambridge Area High School  
Summary Schedule

ID	Task Name	Duration	Start	Finish	2006			2007			2008								
					Jul	Sep	Nov	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul	Sep	
1	Contracts Awarded	0 days	Wed 8/17/05	Wed 8/17/05	◆ Contracts Awarded														
2	Mobilization	19 days	Thu 8/18/05	Tue 9/13/05	■ Mobilization														
3	Sitework	75 days	Wed 9/14/05	Tue 12/27/05	■ Sitework														
4	Auger Cast Piles	54 days	Wed 9/21/05	Mon 12/5/05	■ Auger Cast Piles														
5	Pile Caps and Footings	27 days	Mon 11/21/05	Tue 12/27/05	■ Pile Caps and Footings														
6	Waterproofing	15 days	Wed 12/28/05	Tue 1/17/06	■ Waterproofing														
7	Erect/Detail Structural Steel	55 days	Wed 1/18/06	Tue 4/4/06	■ Erect/Detail Structural Steel														
8	Topping Out	1 day	Tue 4/4/06	Tue 4/4/06	◆ Topping Out														
9	Exterior CMU	70 days	Wed 3/1/06	Tue 6/6/06	■ Exterior CMU														
10	Brick Veneer	70 days	Wed 3/22/06	Tue 6/27/06	■ Brick Veneer														
11	Windows & Glazing	65 days	Wed 4/12/06	Tue 7/11/06	■ Windows & Glazing														
12	Ground Floor Slab on Grade	30 days	Wed 4/19/06	Tue 5/30/06	■ Ground Floor Slab on Grade														
13	1st Floor Slab on Deck	10 days	Wed 5/17/06	Tue 5/30/06	■ 1st Floor Slab on Deck														
14	1st Floor Slab on Grade	20 days	Wed 5/31/06	Tue 6/27/06	■ 1st Floor Slab on Grade														
15	2nd Floor Slab on Deck	9 days	Wed 6/14/06	Mon 6/26/06	■ 2nd Floor Slab on Deck														
16	Exterior Façade Complete	0 days	Wed 7/12/06	Wed 7/12/06	◆ Exterior Façade Complete														
17	EPDM Roofing System	40 days	Wed 4/5/06	Tue 5/30/06	■ EPDM Roofing System														
18	Rooftop Mechanical Equipment	41 days	Wed 6/14/06	Wed 8/9/06	■ Rooftop Mechanical Equipment														
19	Building Enclosure	0 days	Tue 10/17/06	Tue 10/17/06	◆ Building Enclosure														
20	Ground Floor Interior	344 days	Fri 3/3/06	Wed 6/27/07	■ Ground Floor Interior														
21	Ground Floor Complete	0 days	Wed 6/27/07	Wed 6/27/07	◆ Ground Floor Complete														
22	1st Floor Interior	268 days	Fri 6/16/06	Tue 6/26/07	■ 1st Floor Interior														
23	1st Floor Complete	0 days	Thu 7/26/07	Thu 7/26/07	◆ 1st Floor Complete														
24	2nd Floor Interior	302 days	Wed 6/28/06	Thu 8/23/07	■ 2nd Floor Interior														
25	2nd Floor Complete	0 days	Thu 8/23/07	Thu 8/23/07	◆ 2nd Floor Complete														
26	Elevator Installation	86 days	Wed 5/31/06	Wed 9/27/06	■ Elevator Installation														
27	Paving and Landscaping	101 days	Mon 4/2/07	Mon 8/20/07	■ Paving and Landscaping														
28	Substantial Completion	0 days	Thu 8/23/07	Thu 8/23/07	◆ Substantial Completion														
29	Owner Moves F, F & E	96 days	Fri 8/24/07	Fri 1/4/08	■ Owner Moves F, F & E														
30	Students Return for Class	0 days	Mon 1/7/08	Mon 1/7/08	◆ Students Return for Class														

Project: Summary Schedule.mpp  
Date: Mon 4/9/07

Task		Progress		Summary		External Tasks		Deadline	
Split		Milestone		Project Summary		External Milestone			

**Project Estimate Summary:**

The table below summarizes the project estimate including general conditions, foundations, structure, and façade items. All data was obtained using R.S. Means 2005 with necessary location factors included.

<b>Estimate Summary</b>		
<b>Division Name</b>	<b>% of Total</b>	<b>Cost</b>
<b>General Conditions</b>	1.56%	\$604,436
<b>Concrete</b>		
Piles	2.16%	\$840,704
Grade Beams/Pile Caps	1.33%	\$517,821
Slab on Grade	0.46%	\$179,057
Elevated Slabs	0.63%	\$243,013
<b>Masonry</b>		
Brick & CMU	5.50%	\$2,137,162
<b>Metals</b>		
Structural Members	6.42%	\$2,495,695
Metal Deck	0.97%	\$375,598
<b>Doors and Windows</b>		
Windows	0.34%	\$130,289
Curtainwall	0.46%	\$180,243
<b>Total Project Cost</b>	<b>100.00%</b>	<b>\$38,846,057</b>

AAHS used twenty six prime contracts, the table below details the amounts of these contracts which add to the total construction cost of \$38,846,057. The design and construction management fees were estimated as industry standard for a school project and bring total project cost to approximately \$42,730,663. Please note items including superstructure and building façade are included in the general contractor’s prime contract.

<b>AAHS Actual Prime Contract Cost Schedule</b>			
<b>Package</b>	<b>Contract #</b>	<b>Total Cost (\$)</b>	<b>SF Cost (\$)</b>
General Construction	401	\$14,933,500.00	-
Cast Piles Construction	402	\$1,025,600.00	-
Roofing Construction	403	\$1,194,500.00	-
Aluminum Entrances and Storefronts	404	\$528,189.00	-
Aluminum Windows	405	\$159,200.00	-
Acoustical, Drywall & Plaster	406	\$3,869,686.00	-
Ceramic and Quarry Tile	407	\$734,029.00	-
Hardwood Flooring Construction	408	\$149,274.00	-
Resilient Flooring and Carpeting	409	\$509,700.00	-
Visual Display Boards	410	\$91,858.00	-
Lockers Construction	411	\$156,600.00	-
Food Service Equipment	412	\$509,159.00	-
Vocational Shop Equipment	413	\$235,000.00	-
Stage Equipment	414	\$193,377.00	-
General Casework Construction	415	\$553,800.00	-
Library Casework	416	\$102,800.00	-
Science Casework Construction	417	\$247,700.00	-
Audience Seating Construction	418	\$127,000.00	-
Bleacher Construction	419	\$96,520.00	-
Grandstands Construction	420	\$755,000.00	-
Fire Protection Construction	422	\$453,400.00	-
Plumbing Construction	423	\$1,895,000.00	-
HVAC Construction	424	\$5,376,500.00	-
Electrical Construction	425	\$3,837,000.00	-
Communications Construction	426	\$1,111,665.00	-
<b>Contract Total:</b>		<b>\$38,846,057.00</b>	<b>\$158.35 / SF</b>
AE FEE (Industry Range - 5-8%)	6.50%	\$2,524,994.00	10.29/SF
CM FEE (Industry Range - 2-5%)	3.50%	\$1,359,612.00	5.54/SF
<b>Project Total (Approximate):</b>		<b>\$42,730,663.00</b>	<b>174.18/SF</b>

**General Conditions Estimate:**

With the contract arrangement being multiple prime with a CM, the general conditions costs are shared by more than one contractor. Gathering actual general conditions costs was difficult. Please find the estimate using items listed in the temporary facilities portion of the specification for use by the Construction Manager, in the table below. R.S. Means was utilized to gather the unit costs used in this estimate.

Category	Quantity	Unit	Duration (Months)	Unit Price	Cost / Month (\$)	Total Cost (\$)
<b>Staffing</b>						
Project Management	1	EA	24	-	\$6,700	\$160,800
Site Supervisors	2	EA	24	-	\$6,200	\$297,600
<b>Site Items</b>						
Office Trailers	1	EA	24	-	\$554	\$13,296
Mobilize Trailers	1	EA	-	\$5,000	-	\$5,000
Schedule	1	EA	-	\$3,000	-	\$3,000
Project Sign	2	EA	-	\$300	-	\$600
Temporary Fence	2,200	LF	24	\$20	-	\$44,000
Gravel Parking Area	2,500	SY	-	\$9	-	\$22,500
Temporary Toilets	6	EA	24	-	\$185	\$26,640
Site Survey	1	EA	-	\$4,000	-	\$4,000
Silt Fence	2,200	LF	-	\$3	\$275	\$6,600
<b>Temp. Utilities</b>						
Electric	1	EA	24	-	\$300	\$7,200
Water	1	EA	24	-	\$250	\$6,000
Telephone	1	EA	24	-	\$300	\$7,200

<b>Totals</b>	<b>\$25,185</b>	<b>\$604,436</b>
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