TECHNICAL REPORT 2

C-5 Fuel Cell Facility

167th Airlift Wing

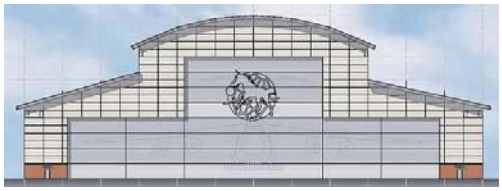
Martinsburg, WV

Kyle Goodyear

Construction Management

October 28, 2009

Dr. Magent



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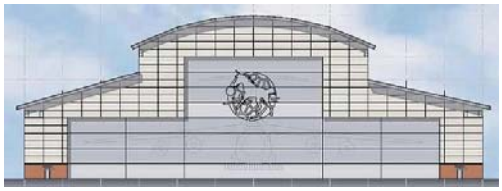


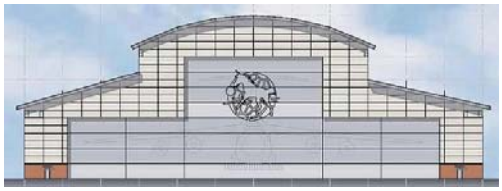
EXECUTIVE SUMMARY

The purpose of this technical assignment is to explore into a level of detail beyond that which was introduced in the first assignment. The first component included in the assignment is a new project schedule with much more detail than was previously created in Technical Assignment #1, consisting of far more specific activities as well as a brief discussion about the project's need for updating of the schedule in order to complete the project on time. Also discussed in this portion is the sequencing of the steel erection and an explanation of how that affects the schedule.

The sequencing of the erection also greatly impacts the site layout planning as all phases of the building follow through in the same general order, meaning that flow of activities through particular locations is a necessity. It is apparent that the site layout plans and the project schedule must go hand-in-hand; the phase of site layout must coincide with the activities going on, and the work being completed must adhere to the schedule to be sure that the current layout plan is most efficient.

Following this portion of the report is a pair of estimates which were created with much more detail than in the first assignment. A detailed structural system estimate, developed from RS Means, examines the cost of the concrete, steel, and some load-bearing masonry present on the project. The second of the two estimates is one for the reimbursable general conditions that Kinsley Construction, Inc. is handling. The estimate was formed through a combination of RS Means data and historical construction data from Kinsley Construction.

This assignment concludes with a discussion about the dynamics of energy on the construction industry, based on the breakout session I attended at the PACE Roundtable Meeting on October 15. Within this specific session, there was a discussion about the theories of why some people decide to build "green" and also about some of the new and improving technologies that are available to the building industry.

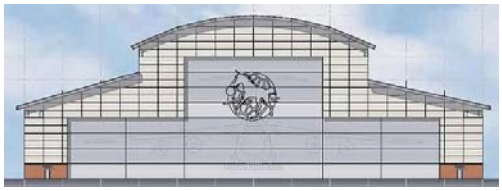


DETAILED PROJECT SCHEDULE

As a design-build project, the early portion of the schedule for the C-5 Fuel Cell Facility is slightly different than a project built using a traditional design-bid-build system. As can be seen on the *Detailed Project Schedule* in Appendix A, the project begins with the bidding and selection period, with the design phase beginning after the awarding of the project and the Notice to Proceed. When the design is nearing completion, work on the structural steel shop drawings commences as the design, fabrication, and erection of the steel are the major driving activities to keep the project on schedule.

It may be noted when comparing the *Project Summary Schedule* from Technical Assignment #1 to the *Detailed Project Schedule* that the duration for the structural shop drawings was increased, thus pushing back the fabrication of the steel. These issues in the steel design forced the entire construction schedule to be modified in order to maintain the original completion date. The schedules have been included in their differing states to illustrate the necessity of compression of activities later in the overall project schedule.

The construction of most exterior portions of the building revolves around the major steel erection sequences that were employed for the project. These sequences, as can be seen in Appendix B, break the building into eight sections with 1A through 2C covering all of the low-roof areas of the building and 3A through 3C covering the high-roof areas. Once the building is completely enclosed, the interior finishing process begins. All interior work, as can be seen on the schedule, has been broken into two separate portions, the hangar area and the administrative area, with many of the activities in the two areas being completed simultaneously. As the installation of the MEP systems is completed, testing and balancing of the systems begins, taking up the majority of the last month of the project schedule. Final inspection takes place immediately following the conclusion of all testing and building occupancy begins the following day.



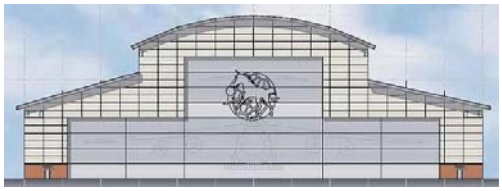
SITE LAYOUT PLANNING

The site for the C-5 Fuel Cell Facility is fairly accommodating as far as space, but this does not make the creation of a site layout plan unimportant. Unfortunately, Kinsley Construction, Inc. was unable to provide any site layout plans for me to analyze. Based on my visits to the site though, it seems that they were successful in locating items on the site effectively. Located in Appendix C, are site layout plans for three major phases of the Fuel Cell Facility project, excavation and foundations, steel erection, and building enclosure.

EXCAVATION/FOUNDATIONS

The excavation phase of this project consisted of blasting a large portion of the site in order to aid in lowering the grade to the design elevation. As can be seen on the Excavation and Foundation Site Layout Plan in Appendix C, the excess spoils of excavation were stockpiled near the center of the site, in an area which has no caissons. In doing this, the entire site did not need to be cleared of the excess spoils prior to foundation work, but instead they could be done simultaneously. The caissons were drilled with a drilling rig, the steel reinforcing cages were set, and then the concrete was placed. In some cases, dewatering pumps were needed to remove water from the bottom of the holes, but this issue was minimal. After the caissons were completed, the pier caps and grade beams were constructed, following the same direction of progression.

As mentioned previously, space on the project was not a major issue, with the entire North side of the project site being available for placement of office and storage trailers, as well as parking for all employees working on site. This area also allowed space for easy loading and unloading of excavation equipment at the times when it was required. It should be noted that this Northern portion of the site is at a higher grade than the portion in which the Fuel Cell Facility is located; this portion did not require mass excavation like the Southern part did. Due to this, a ramp was created during the excavation phase for easy access between the upper staging and office area, and the lower area in which the construction is taking place. The ramp is to be removed at a later date when construction of the new service road begins.



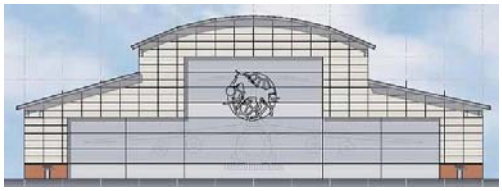
STEEL ERECTION

Steel erection for the Fuel Cell Facility is one of the most important phases of the project. For that reason, as mentioned in *the Detailed Project Schedule* section, there were eight phases created in which the steel would be set; these phases can be seen on the sketches in Appendix B. Erection began with a single, 250 ton crawler crane setting columns in the Southwest corner and moving North along the West side of the proposed building. Meanwhile, two more crawler cranes were being constructed in the upper parking area. Two of the cranes worked simultaneously to set the transverse trusses which run approximately North to South, and the third was then used to hold the truss in place with the aid of temporary shoring towers. This set up was maintained until the apex trusses from the exterior wall to the truss were set.

Once the West side steel was erected, the process repeated itself on the East side. After all of the East side steel was erected, the high roof area steel in the center of the building was set. The most important part of this activity was the setting of the B-line truss which extends from the transverse truss on one side to the other transverse truss, creating the frame for the main hangar door. The setting of this truss required the use of all three crawler cranes, a feat that requires a great deal of communication and teamwork as well as planning. Temporary shoring was used to hold this truss in place until all other steel was set for the building.

BUILDING ENCLOSURE

The enclosure of the Fuel Cell Facility building consists of four major parts: CMU around the bottom of the building, insulated metal wall panels, standing seam metal roofing, and the main hangar door. The first three of these activities take place around the building in the same sequence as the steel erection. Roof deck was first set in the Southwest corner once the steel was erected and followed the erection process. The CMU walls were then constructed and the insulated wall panels followed behind. The main hangar door has yet to be installed, and is scheduled to take place near the beginning of December 2009. The installation of the roof panels, wall panels, and hangar door is being completed with the use of platform and articulated boom lifts. On the upper level, the panels are set simply with manpower and scaffolding which is erected on the lower roof.



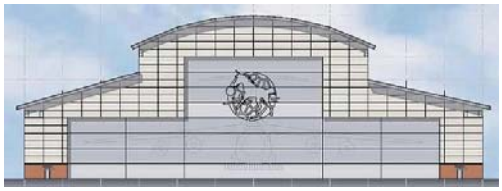
DETAILED STRUCTURAL SYSTEM ESTIMATE

The structural systems estimate for the C-5 Fuel Cell Facility was developed through a hand takeoff of all structural concrete, steel, and load-bearing masonry. The quantities that were found were then entered into the online CostWorks program offered by RS Means, which provides cost estimates for 2009 and also allows a location factor to be entered. The unfortunate part of the RS Means software, as with the books from the same company, is that there is a limited amount of information available. For example, when looking at structural steel members for pricing, the maximum size for a wide flange member is a W18x106. This is most likely not an issue for most common buildings, however the structural steel for the Fuel Cell Facility is anything but common with columns as large as W40x593 and truss members as large as W14x605.

To combat this lack of information, the majority of the steel was estimated based on tonnage. All open-web joists were found within the RS Means charts and were priced accordingly, as well as the metal roof deck, but all hollow structural steel and wide flange members were totaled by tonnage. This limits the ability to break down the different parts of the structure, but as can be seen in Appendix D, there has been some differentiation made between portions of the system. Below is a summary of the structural estimate.

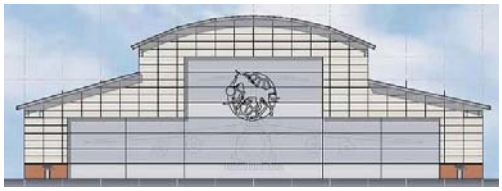
Structural Systems Estimate Summary

CONCRETE		
	Foundations	$236,441.80
	Slab on Grade	$591,272.22
MASONRY		
	CMU Walls	$55,046.70
STEEL		
	Metal Deck	$243,222.40
	Open-Web Joists	$218,099.68
	Wide Flange and Hollow Members	$8,110,373.44
	TOTAL	**$9,454,456.23**



ASSUMPTIONS/METHODS

- Open shop labor used for all parts
- "Concrete in place" category was used to include all formwork, reinforcement, placement, and finishing as one cost
- No overhead or profit is included in this estimate
- CostWorks from RS Means 2009 employed to create the estimate



GENERAL CONDITIONS ESTIMATE

The general conditions estimate for the C-5 Fuel Cell Facility was developed using a combination of RS Means Building Construction Cost Data 2009 and historical estimating data provided by Kinsley Construction, Inc. RS Means contained information concerning a majority of the reimbursable general conditions for the project, but for some items it was much more accurate to use the historical data from Kinsley due to deviations from the typical cost information. For example, it was necessary to use the historical data for estimating the cost of temporary storage trailers since many of these trailers are owned by Kinsley Construction. The costs in RS Means are based on rental of the trailers, but the cost to Kinsley for the trailers is much less since they have already been used on multiple past projects and paid for themselves.

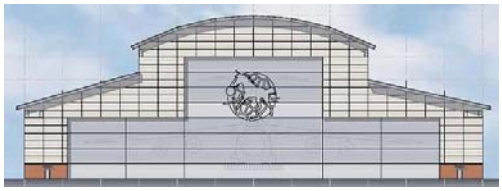
General Conditions Estimate Summary

Description	Total Cost
Project Supervision	$746,700
Field Office and Equipment	$63,163
Mobilization	$78,500
Temporary Utilities	$1,430
Winter Protection	$81,500
Bonding	$240,821
Testing	$106,000
Safety Supervisor and Training	$159,500
Cleanup	$56,000
GRAND TOTAL	**$1,746,717**

Note: Grand Total includes extra costs beyond those listed.

The summary estimate shown above for the general conditions provides some of the major reimbursable costs for the project as well as the Grand Total. As noted, the grand total includes other costs that are not included in the table; it is included for comparison between individual components and the total. For example, it can be calculated from the listed values that *Project Supervision* makes up approximately 43% of the total general conditions cost. Other important costs included above that should be noted are *Bonding*, *Testing*, and *Safety*. Specifically, the cost of safety on this project may seem high but it should be noted that this cost includes a safety supervisor, an expense that could also be included in the project supervision category. However, upon inspection of the *Staffing Plan* in Technical Assignment #1, one would notice that a safety supervisor is not included. This is because Kinsley Construction handles all safety personnel through a separate division of the company.

See Appendix E for entire General Conditions Estimate



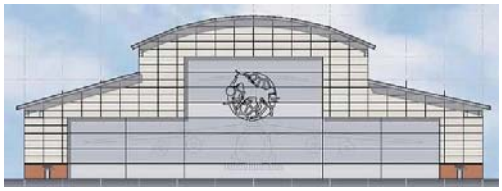
CRITICAL INDUSTRY ISSUES

In the first portion of the breakout session that I attended, we spoke about the dynamics that energy creates within the construction industry. We specifically spoke about how sustainability in buildings is necessary in order to reduce the impact we have on the environment from the perspective of releasing greenhouse gases into the atmosphere, as well as depleting our fuel sources used to keep buildings in operation. From this topic, we expanded to topics such as alternative energy sources and energy independence. We also spent a large portion of time speaking about how designing and constructing a building to meet a LEED certification does not guarantee that the building is functioning in a sustainable manner.

Within this topic we discussed the idea of greenwashing which is the premise that owners employ sustainable concepts in their buildings, at a minimal level, for the sheer purpose of marketability. If the owner's purpose for constructing a sustainable building is only to increase profit, via higher rental rates, then the basic concept of sustainability is being missed, and the chances that the building will have a positive environmental impact are greatly reduced. Also discussed was the idea that some buildings are constructed with sustainable concepts in mind, but are not maintained and operated in a way that allows them to function efficiently. This could be because the owner was never trained on the proper methods or because the designer made assumptions about future occupant behavior that were not accurate.

During the second portion of the breakout session, the attention was focused on individual thesis projects and potential areas of research. While we did not speak about my personal project, I did pick up a few ideas for incorporation of sustainable features. One of the possibilities that I came up with was actually a surprising one as far as the fact that it is already used quite often. I did not realize how popular the use of LED lights in buildings has become; I thought it was a rare item outside of emergency lighting. The Fuel Cell Facility project already has LED's for emergency lighting so exploring more widespread usage in the building is a definite possibility for saving energy. Another specific product that was discussed briefly, and seems like it would be advantageous for my project, was the Solyndra photovoltaic system for rooftop installation.

Within my breakout session group, there were multiple industry members who seemed quite knowledgeable about the above mentioned products as well as many other aspects of sustainable buildings. A few of these members would most likely be able to help me explore my ideas. Included in this group are: Dan Kerr of McClure Company, Mark Kosin of Southland Industries, and Jeremy Sibert of Hensel Phelps.

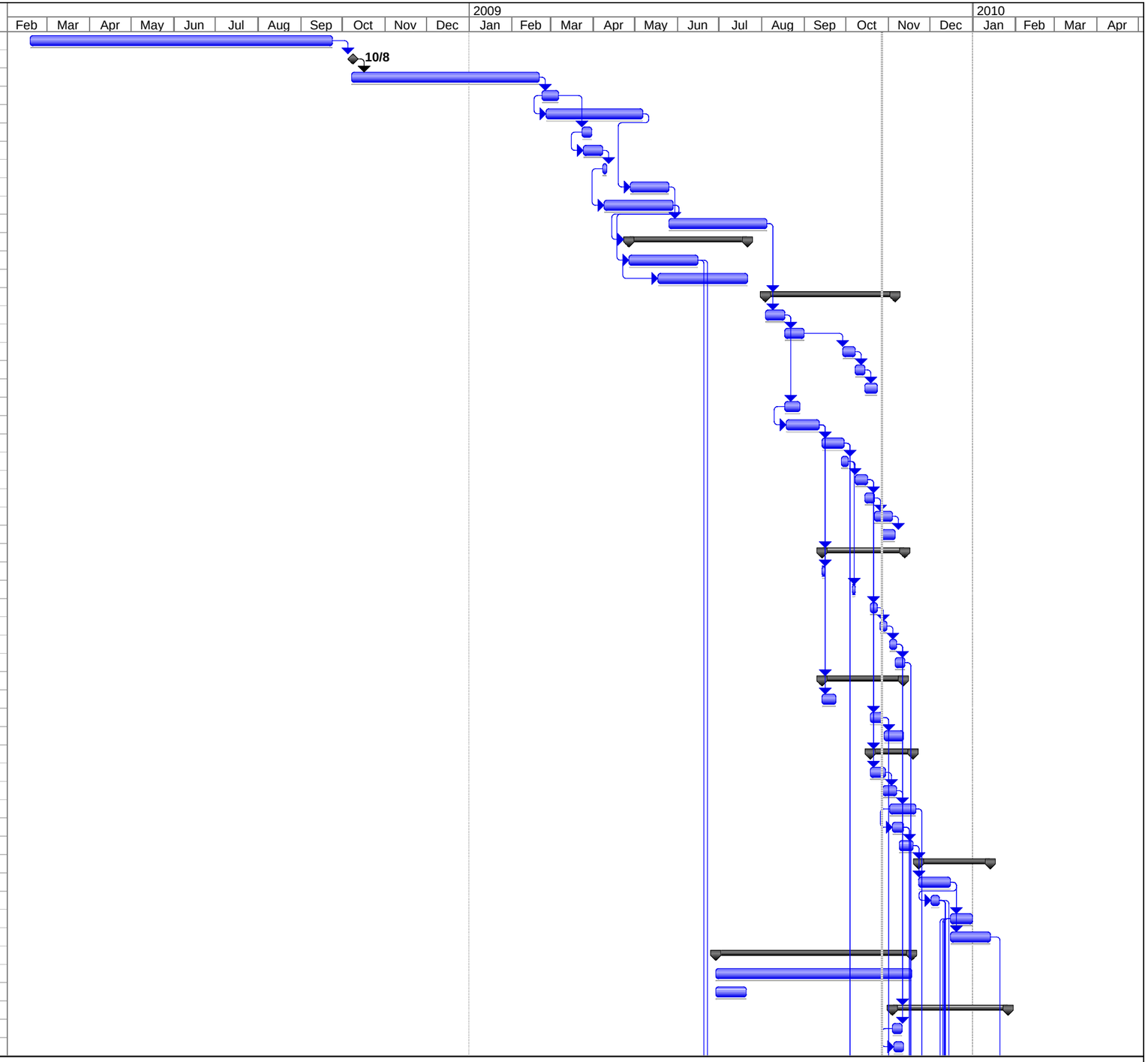


Appendix A

C-5 Fuel Cell Facility

Detailed Project Schedule

ID	Task Name	Duration	Start	Finish	Predecessors
1	Bidding/Selection Period	157 days	Mon 2/18/08	Tue 9/23/08	
2	**Notice to Proceed**	**0 days**	**Wed 10/8/08**	**Wed 10/8/08**	**1FS+11 days**
3	Design Phase	98 days	Wed 10/8/08	Fri 2/20/09	2FS-1 day
4	100% Design Document Review	10 days	Mon 2/23/09	Fri 3/6/09	3
5	Structural Shop Drawings	50 days	Thu 2/26/09	Wed 5/6/09	4SS+3 days
6	Office Mobilization	5 days	Tue 3/24/09	Mon 3/30/09	4FS+11 days
7	Issue Construction Documents	10 days	Wed 3/25/09	Tue 4/7/09	6SS+1 day
8	Initial Layout and Stakeout	3 days	Wed 4/8/09	Fri 4/10/09	7
9	Structural Shop Dwg Approval	20 days	Tue 4/28/09	Mon 5/25/09	5FS-7 days
10	Site- Stormwater and Grading for Bldg	36 days	Thu 4/9/09	Thu 5/28/09	8SS+1 day
11	Structural Steel Fabrication	51 days	Tue 5/26/09	Tue 8/4/09	9
12	**Foundation Construction**	**62 days**	**Mon 4/27/09**	**Tue 7/21/09**	**10FS-24 days**
13	Caisson Construction	36 days	Mon 4/27/09	Mon 6/15/09	10FS-24 days
14	Pier Caps & Grade Beams	47 days	Mon 5/18/09	Tue 7/21/09	13SS+15 days
15	**Steel Erection & Detailing**	**68 days**	**Tue 8/4/09**	**Thu 11/5/09**	**11FS-1 day**
16	Build Trusses on Site- Seq 1A, 1B	10 days	Tue 8/4/09	Mon 8/17/09	11FS-1 day
17	Build Trusses on Site- Seq 2A, 2B	10 days	Tue 8/18/09	Mon 8/31/09	16
18	Build Trusses on Site- Seq 3A	7 days	Tue 9/29/09	Wed 10/7/09	17FS+20 days
19	Build Trusses on Site- Seq 3B	5 days	Thu 10/8/09	Wed 10/14/09	18
20	Build Trusses on Site- Seq 3C	7 days	Thu 10/15/09	Fri 10/23/09	19
21	Erect & Detail- Seq 1A	9 days	Tue 8/18/09	Fri 8/28/09	16
22	Erect & Detail- Seq 1B	18 days	Wed 8/19/09	Fri 9/11/09	21SS+1 day
23	Erect & Detail- Seq 2A	12 days	Mon 9/14/09	Tue 9/29/09	22
24	Erect & Detail- Seq 2B	5 days	Mon 9/28/09	Fri 10/2/09	23FS-2 days
25	Erect & Detail- Seq 3A	7 days	Thu 10/8/09	Fri 10/16/09	24FS+3 days
26	Erect & Detail- Seq 3B	5 days	Thu 10/15/09	Wed 10/21/09	25FS-2 days
27	Erect & Detail- Seq 2C	9 days	Thu 10/22/09	Tue 11/3/09	26
28	Erect & Detail- Seq 3C	8 days	Tue 10/27/09	Thu 11/5/09	27FS-6 days
29	**Roof Deck Installation**	**44 days**	**Mon 9/14/09**	**Thu 11/12/09**	**22**
30	Roof Deck- Seq 1A, 1B	2 days	Mon 9/14/09	Tue 9/15/09	22
31	Roof Deck- Seq 2A, 2B	2 days	Tue 10/6/09	Wed 10/7/09	24FS+1 day
32	Roof Deck- Seq 3A	5 days	Mon 10/19/09	Fri 10/23/09	25
33	Roof Deck- Seq 3B	5 days	Mon 10/26/09	Fri 10/30/09	32
34	Roof Deck- Seq 2C	5 days	Mon 11/2/09	Fri 11/6/09	33
35	Roof Deck- Seq 3C	5 days	Fri 11/6/09	Thu 11/12/09	34FS-1 day
36	**Masonry Wall**	**43 days**	**Mon 9/14/09**	**Wed 11/11/09**	**22**
37	Masonry 1A, 1B	8 days	Mon 9/14/09	Wed 9/23/09	22
38	Masonry 2A, 2B	7 days	Mon 10/19/09	Tue 10/27/09	25
39	Masonry Walls Admin Area	10 days	Thu 10/29/09	Wed 11/11/09	38FS+1 day
40	**Insulated Wall Panels**	**23 days**	**Mon 10/19/09**	**Wed 11/18/09**	**25**
41	Wall Panels 1A, 1B	9 days	Mon 10/19/09	Thu 10/29/09	25
42	Wall Panels 2A, 2B	8 days	Wed 10/28/09	Fri 11/6/09	41FS-2 days
43	Clerestory Siding	15 days	Mon 11/2/09	Fri 11/20/09	42FS-5 days
44	Wall Panels South Elev	6 days	Wed 11/4/09	Wed 11/11/09	43SS+2 days
45	Wall Panels North Elev	8 days	Mon 11/9/09	Wed 11/18/09	44FS-3 days
46	**Metal Roof Panel Installation**	**38 days**	**Mon 11/23/09**	**Wed 1/13/10**	**45FS+2 days**
47	High Roof Panels	17 days	Mon 11/23/09	Tue 12/15/09	45FS+2 days
48	Admin Area Roof Panels	4 days	Wed 12/2/09	Mon 12/7/09	47FS-10 days
49	Low Roof Panels	12 days	Wed 12/16/09	Thu 12/31/09	47
50	Gutters & Downspouts	21 days	Wed 12/16/09	Wed 1/13/10	47
51	**Major Equipment & Systems Fabrication**	**102 days**	**Mon 6/29/09**	**Tue 11/17/09**	
52	Megadoor Fabrication & Delivery	102 days	Mon 6/29/09	Tue 11/17/09	
53	Oil/Water Separator	16 days	Mon 6/29/09	Mon 7/20/09	
54	**Sitework**	**60 days**	**Wed 11/4/09**	**Tue 1/26/10**	**34FS-3 days**
55	Install Fire Hydrants	5 days	Wed 11/4/09	Tue 11/10/09	34FS-3 days
56	Install Sanitary Sewer	5 days	Thu 11/5/09	Wed 11/11/09	55SS+1 day



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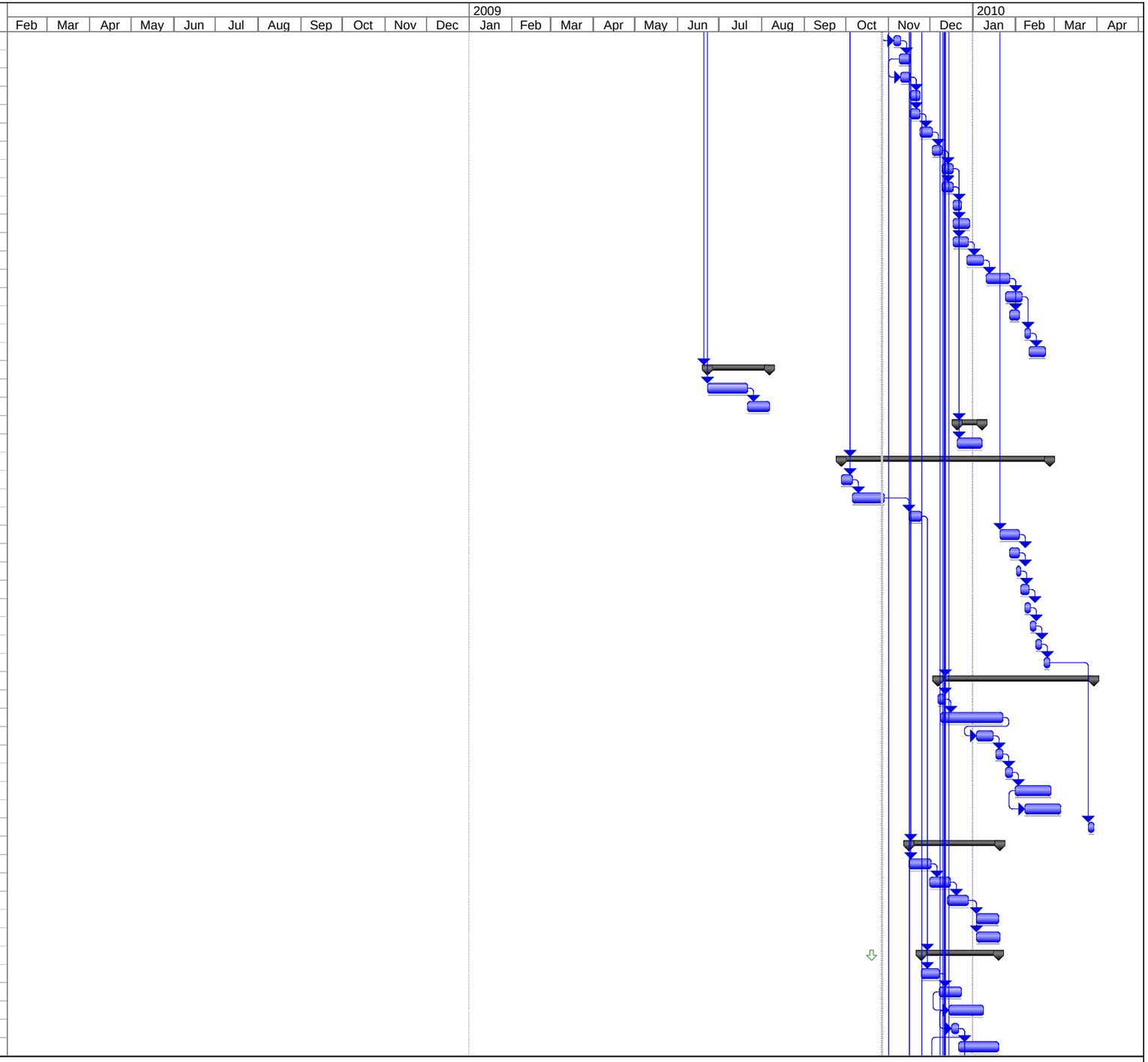
Date: Tue 10/27/09

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

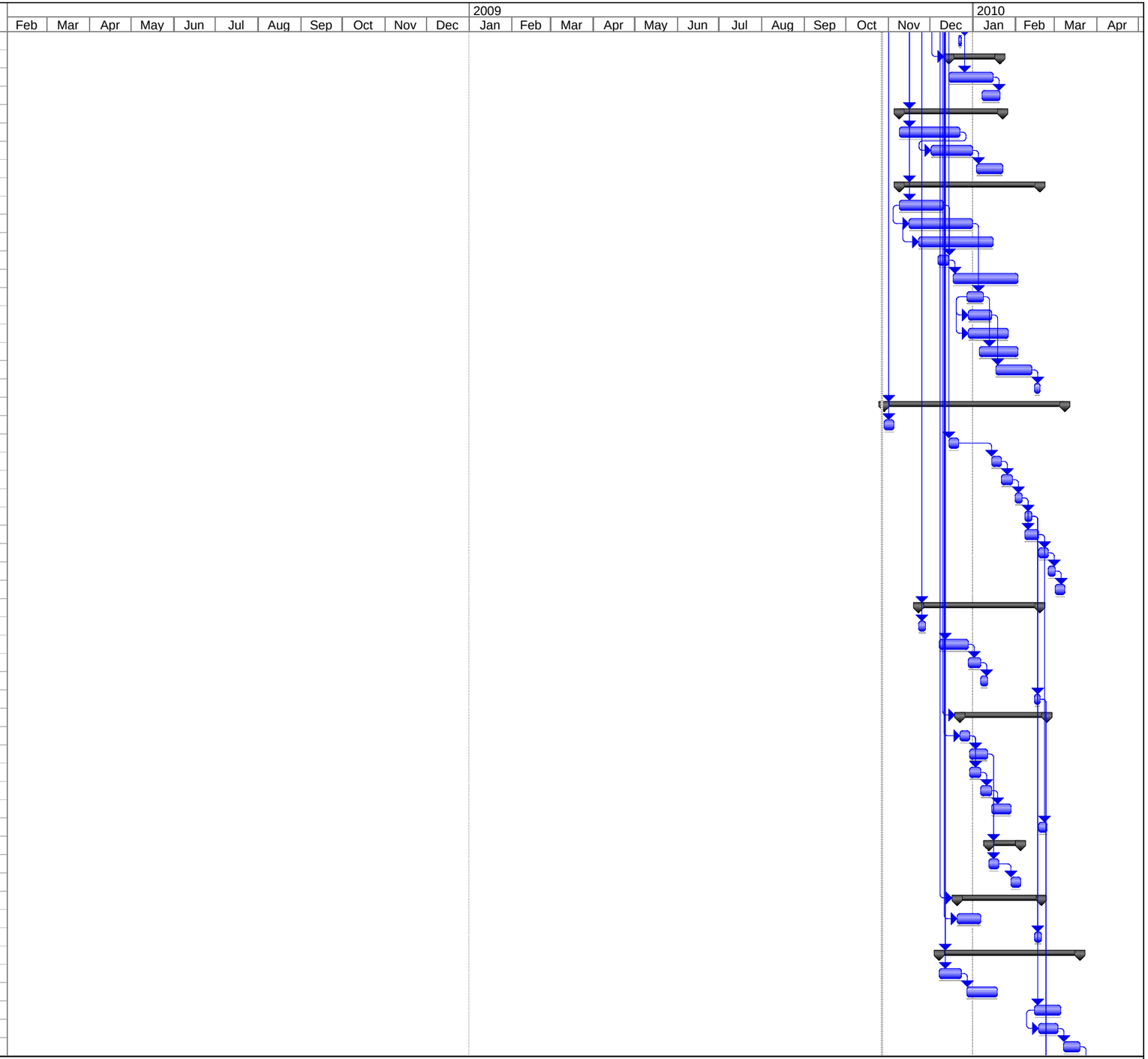
ID	Task Name	Duration	Start	Finish	Predecessors
57	Apron Subdrain	3 days	Thu 11/5/09	Mon 11/9/09	55SS+1 day
58	Oil/Water Separator	6 days	Mon 11/9/09	Mon 11/16/09	57FS-1 day
59	Grade/Stone Base for Apron	5 days	Tue 11/10/09	Mon 11/16/09	58SS+1 day
60	Domestic Water Installation	5 days	Tue 11/17/09	Mon 11/23/09	59
61	Prep/Pour Apron	5 days	Tue 11/17/09	Mon 11/23/09	59
62	Install HEF Line	7 days	Tue 11/24/09	Wed 12/2/09	61
63	Install Gas Line	5 days	Thu 12/3/09	Wed 12/9/09	62
64	Electrical Ductbank & Transformer	6 days	Thu 12/10/09	Thu 12/17/09	63
65	Install Storm Drain	6 days	Thu 12/10/09	Thu 12/17/09	63
66	Communication Ductbank	4 days	Fri 12/18/09	Wed 12/23/09	65
67	Install Roof Leader Pipe	8 days	Fri 12/18/09	Tue 12/29/09	65
68	Drainage Swales	7 days	Fri 12/18/09	Mon 12/28/09	65
69	Site Lighting	10 days	Mon 12/28/09	Fri 1/8/10	68FS-1 day
70	Final Site Grading & Topsoil	13 days	Mon 1/11/10	Wed 1/27/10	69
71	Asphalt Base & Binder	10 days	Mon 1/25/10	Fri 2/5/10	70FS-3 days
72	Install Perimeter Fence	5 days	Thu 1/28/10	Wed 2/3/10	70
73	Asphalt Wearing	4 days	Mon 2/8/10	Thu 2/11/10	71
74	Landscaping	8 days	Thu 2/11/10	Mon 2/22/10	73FS-1 day
75	**Underground Mechanical**	**33 days**	**Tue 6/23/09**	**Thu 8/6/09**	**13FS+5 days**
76	Underground Sanitary Hanger	21 days	Tue 6/23/09	Tue 7/21/09	13FS+5 days
77	Underground Plumbing	12 days	Wed 7/22/09	Thu 8/6/09	76
78	**Underground Electrical**	**14 days**	**Mon 12/21/09**	**Thu 1/7/10**	**64FS+1 day**
79	Electrical Grounding in SOG	14 days	Mon 12/21/09	Thu 1/7/10	64FS+1 day
80	**Slab on Grade**	**109 days**	**Mon 9/28/09**	**Thu 2/25/10**	**23FS-2 days**
81	Stone Base Admin Area SOG	6 days	Mon 9/28/09	Mon 10/5/09	23FS-2 days
82	Prep/Pour Admin Area SOG	17 days	Tue 10/6/09	Wed 10/28/09	81
83	Form/Pour B-Line Trench Drain	7 days	Mon 11/16/09	Tue 11/24/09	82FS+12 days
84	Stone Base Hangar SOG	10 days	Thu 1/21/10	Wed 2/3/10	50FS+5 days
85	Form/Pour H-Line Trench Drain	5 days	Thu 1/28/10	Wed 2/3/10	84FS-5 days
86	Prep/Pour Jacking Points- Part 1	3 days	Tue 2/2/10	Thu 2/4/10	85FS-2 days
87	Prep/Pour SOG#1	4 days	Fri 2/5/10	Wed 2/10/10	86
88	Prep/Pour SOG #2	4 days	Mon 2/8/10	Thu 2/11/10	87FS-3 days
89	Prep/Pour SOG #3 (Jacking Points Part 2)	2 days	Fri 2/12/10	Mon 2/15/10	88
90	Prep/Pour SOG #4	4 days	Tue 2/16/10	Fri 2/19/10	89
91	Prep/Pour SOG #5	4 days	Mon 2/22/10	Thu 2/25/10	90
92	**Building Finishes- Hangar**	**81 days**	**Mon 12/7/09**	**Mon 3/29/10**	**48FS-1 day**
93	Overhead Doors	5 days	Mon 12/7/09	Fri 12/11/09	48FS-1 day
94	MegaDoor Installation	33 days	Wed 12/9/09	Fri 1/22/10	93FS-3 days
95	GWB/Plywood Roof Sheathing	10 days	Mon 1/4/10	Fri 1/15/10	94FS-15 days
96	Paint GWB/CMU	5 days	Mon 1/18/10	Fri 1/22/10	95
97	Misc. Metals	5 days	Mon 1/25/10	Fri 1/29/10	96
98	Paint Structure	20 days	Mon 2/1/10	Fri 2/26/10	97
99	Paint Pipe Systems	20 days	Mon 2/8/10	Fri 3/5/10	98SS+5 days
100	Hangar Floor Striping	2 days	Fri 3/26/10	Mon 3/29/10	91FS+20 days
101	**Mechanical- Hangar**	**48 days**	**Mon 11/16/09**	**Wed 1/20/10**	**35FS+1 day**
102	Spiral Duct	12 days	Mon 11/16/09	Tue 12/1/09	35FS+1 day
103	Louvers	11 days	Tue 12/1/09	Tue 12/15/09	102FS-1 day
104	Exhaust Fans	11 days	Mon 12/14/09	Mon 12/28/09	103FS-2 days
105	Exhaust System	12 days	Mon 1/4/10	Tue 1/19/10	104FS+4 days
106	Ductwork	13 days	Mon 1/4/10	Wed 1/20/10	104FS+4 days
107	**Plumbing- Hangar**	**40 days**	**Wed 11/25/09**	**Tue 1/19/10**	**83**
108	Trench Exhaust	9 days	Wed 11/25/09	Mon 12/7/09	83
109	Compressed Air Lines	12 days	Tue 12/8/09	Wed 12/23/09	108
110	Breathable Air	19 days	Tue 12/15/09	Fri 1/8/10	109SS+5 days
111	Vent Risers	3 days	Thu 12/17/09	Mon 12/21/09	110SS+2 days
112	Domestic Water Piping	21 days	Tue 12/22/09	Tue 1/19/10	111



Project: Detailed Project Schedule.mp
Date: Tue 10/27/09

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

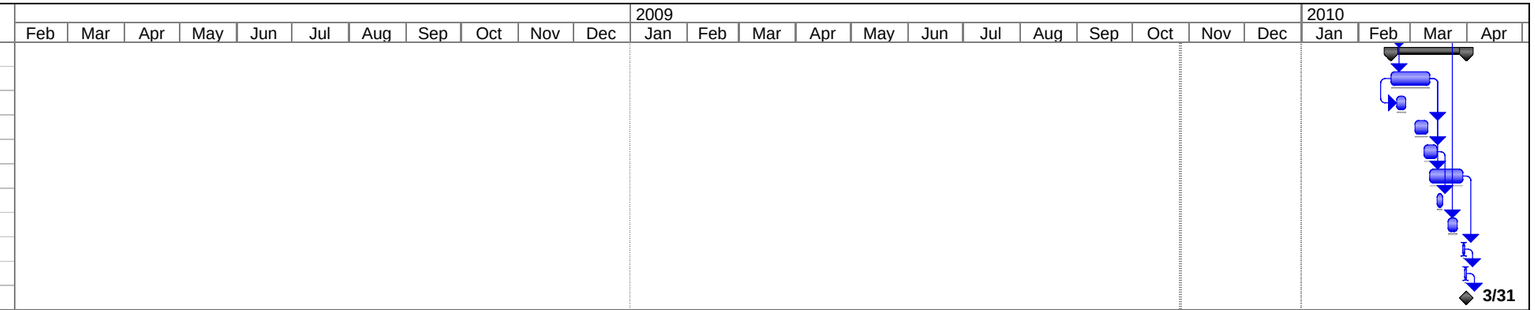
ID	Task Name	Duration	Start	Finish	Predecessors
113	Hose Reels	2 days	Tue 12/22/09	Wed 12/23/09	111
114	**Heating- Hangar**	**27 days**	**Tue 12/15/09**	**Wed 1/20/10**	**111FS-5 days**
115	Infrared Heater Piping	24 days	Tue 12/15/09	Fri 1/15/10	111FS-5 days
116	Infrared Heaters	9 days	Fri 1/8/10	Wed 1/20/10	115FS-6 days
117	**Fire Protection- Hangar**	**55 days**	**Mon 11/9/09**	**Fri 1/22/10**	**44FS-3 days**
118	Wet Sprinkler System	32 days	Mon 11/9/09	Tue 12/22/09	44FS-3 days
119	HEF System Piping	22 days	Wed 12/2/09	Thu 12/31/09	118FS-15 days
120	Install Foam Generators	15 days	Mon 1/4/10	Fri 1/22/10	119FS+1 day
121	**Electrical- Hangar**	**74 days**	**Mon 11/9/09**	**Thu 2/18/10**	**44FS-3 days**
122	Megadoor Power	24 days	Mon 11/9/09	Thu 12/10/09	44FS-3 days
123	HEF and Fire Alarm System	34 days	Mon 11/16/09	Thu 12/31/09	122SS+5 days
124	Lighting & Emergency Lighting	40 days	Mon 11/23/09	Fri 1/15/10	123SS+5 days
125	Wire Overhead Doors	6 days	Mon 12/7/09	Mon 12/14/09	122FS-4 days
126	Electric Cable	33 days	Fri 12/18/09	Tue 2/2/10	125FS+3 days
127	Wire HVAC Hose Reels	10 days	Mon 12/28/09	Fri 1/8/10	123FS-4 days
128	Wire HVAC Purge System	13 days	Tue 12/29/09	Thu 1/14/10	127SS+1 day
129	HVAC Equipment Wiring	21 days	Tue 12/29/09	Tue 1/26/10	127SS+1 day
130	Motorized Hose & Cable Reels	20 days	Wed 1/6/10	Tue 2/2/10	127FS-3 days
131	Cable Trays & Telecomm Wiring	20 days	Mon 1/18/10	Fri 2/12/10	128FS+1 day
132	Switches, Plugs, etc.	4 days	Mon 2/15/10	Thu 2/18/10	131
133	**Building Finishes- Admin Area**	**93 days**	**Thu 10/29/09**	**Mon 3/8/10**	**38FS+1 day**
134	HM Frames	5 days	Thu 10/29/09	Wed 11/4/09	38FS+1 day
135	Aluminum Frames/Glass	5 days	Tue 12/15/09	Mon 12/21/09	48FS+5 days
136	Aluminum Storefront	5 days	Fri 1/15/10	Thu 1/21/10	135FS+18 days
137	GWB Ceilings	6 days	Fri 1/22/10	Fri 1/29/10	136
138	Paint CMU Walls/GWB Ceilings	5 days	Mon 2/1/10	Fri 2/5/10	137
139	Acoustical Grid	5 days	Mon 2/8/10	Fri 2/12/10	138
140	Ceramic Tile	8 days	Mon 2/8/10	Wed 2/17/10	138
141	Lockers	5 days	Thu 2/18/10	Wed 2/24/10	140
142	Toilet Partitions/Specialties	3 days	Thu 2/25/10	Mon 3/1/10	141
143	Doors & Hardware	5 days	Tue 3/2/10	Mon 3/8/10	142
144	**Mechanical- Admin Area**	**64 days**	**Mon 11/23/09**	**Thu 2/18/10**	**43**
145	Louvers	5 days	Mon 11/23/09	Fri 11/27/09	43
146	Ductwork	15 days	Tue 12/8/09	Mon 12/28/09	48
147	Exhaust System	7 days	Tue 12/29/09	Wed 1/6/10	146
148	Exhaust Fans	3 days	Thu 1/7/10	Mon 1/11/10	147
149	Registers/Grilles/Diffusers	4 days	Mon 2/15/10	Thu 2/18/10	139
150	**Plumbing- Admin Area**	**45 days**	**Wed 12/23/09**	**Tue 2/23/10**	**49SS+5 days**
151	Vent Risers	5 days	Wed 12/23/09	Tue 12/29/09	49SS+5 days
152	Domestic Water Piping	9 days	Wed 12/30/09	Mon 1/11/10	151
153	Gas Lines	6 days	Wed 12/30/09	Wed 1/6/10	151
154	Compressed Air Lines	6 days	Thu 1/7/10	Thu 1/14/10	153
155	Pipe Insulation	10 days	Fri 1/15/10	Thu 1/28/10	154
156	Plumbing Fixtures	4 days	Thu 2/18/10	Tue 2/23/10	140
157	**Heating- Admin Area**	**17 days**	**Wed 1/13/10**	**Thu 2/4/10**	**152FS+1 day**
158	Heat Piping	5 days	Wed 1/13/10	Tue 1/19/10	152FS+1 day
159	Pipe Insulation	5 days	Fri 1/29/10	Thu 2/4/10	158FS+7 days
160	**Fire Protection- Admin Area**	**45 days**	**Mon 12/21/09**	**Fri 2/19/10**	**49SS+3 days**
161	Sprinkler Piping	13 days	Mon 12/21/09	Wed 1/6/10	49SS+3 days
162	Sprinkler Heads	5 days	Mon 2/15/10	Fri 2/19/10	139
163	**Electrical- Admin Area**	**74 days**	**Tue 12/8/09**	**Fri 3/19/10**	**48**
164	Conduit Rough-In	12 days	Tue 12/8/09	Wed 12/23/09	48
165	Cable- Conductors	16 days	Mon 12/28/09	Mon 1/18/10	164FS+2 days
166	Lighting & Emergency Lighting	15 days	Mon 2/15/10	Fri 3/5/10	139
167	Lavatory Low Voltage Control	10 days	Thu 2/18/10	Wed 3/3/10	166SS+3 days
168	Switches & Plugs	10 days	Mon 3/8/10	Fri 3/19/10	167FS+2 days



Project: Detailed Project Schedule.mp
Date: Tue 10/27/09

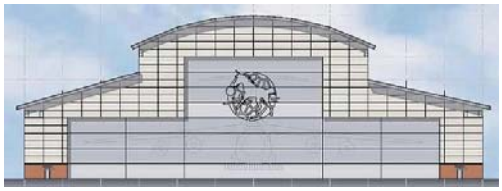
Task Progress Summary External Tasks Deadline
Split Milestone Project Summary External Milestone

ID	Task Name	Duration	Start	Finish	Predecessors
169	**Testing & Close-out**	**29 days**	**Fri 2/19/10**	**Wed 3/31/10**	**149**
170	Test, Adjust, & Balance	15 days	Fri 2/19/10	Thu 3/11/10	149
171	Sprinkler System Testing	5 days	Mon 2/22/10	Fri 2/26/10	170SS+1 day
172	Plumbing Testing	5 days	Thu 3/4/10	Wed 3/10/10	170FS-6 days
173	HEF System Testing	5 days	Tue 3/9/10	Mon 3/15/10	170FS-3 days
174	PVT- HVAC	12 days	Fri 3/12/10	Mon 3/29/10	170
175	Fire Alarm Testing	3 days	Tue 3/16/10	Thu 3/18/10	173
176	Electrical Systems Testing	5 days	Mon 3/22/10	Fri 3/26/10	168
177	Final Inspection	1 day	Tue 3/30/10	Tue 3/30/10	174
178	Building Acceptance/Occupancy	1 day	Wed 3/31/10	Wed 3/31/10	177
179	**Project Complete**	**0 days**	**Wed 3/31/10**	**Wed 3/31/10**	**178**



Project: Detailed Project Schedule.mp
Date: Tue 10/27/09

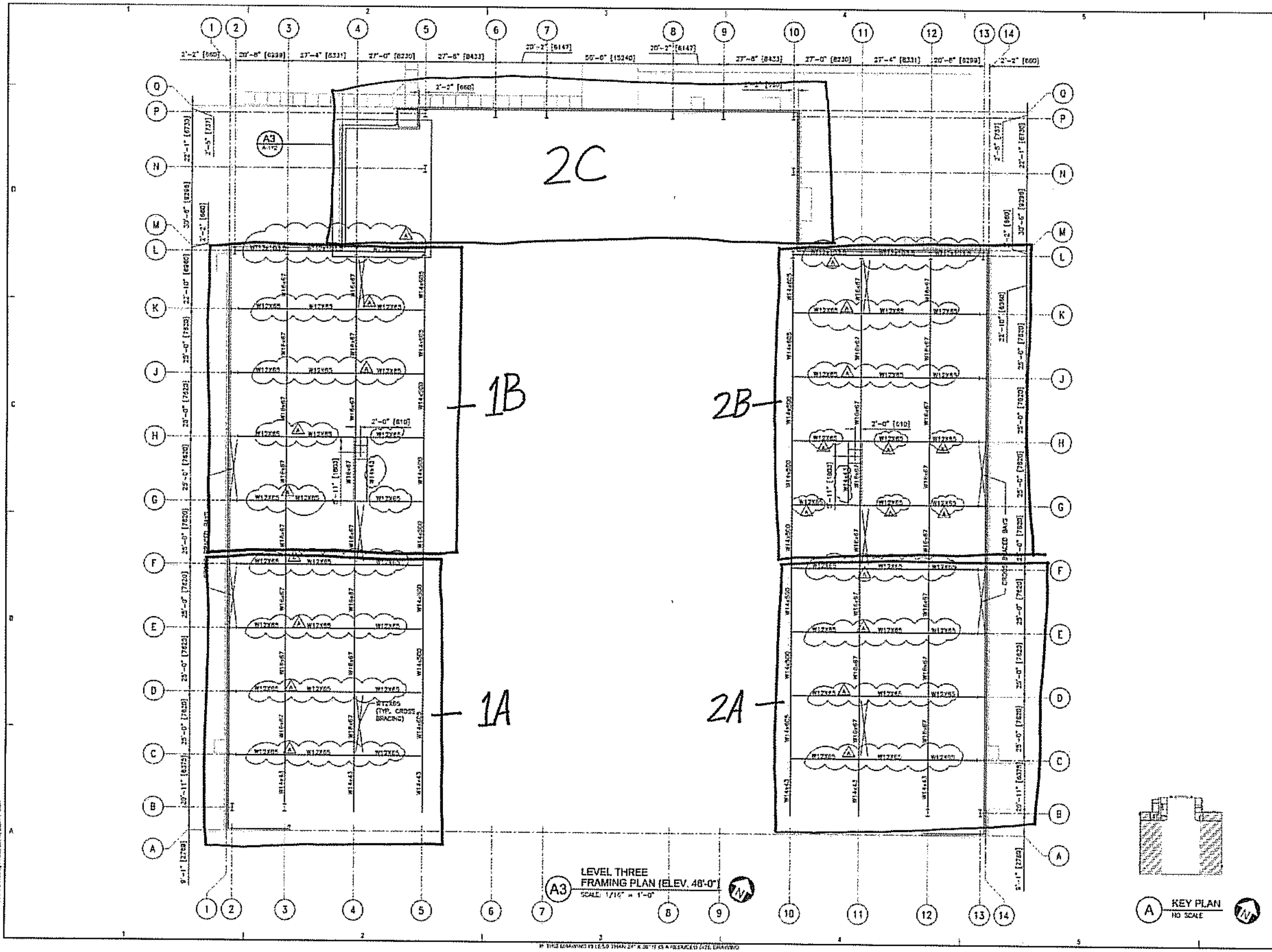
Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone



Appendix B

C-5 Fuel Cell Facility

Steel Erection Sequencing



TranSystems
220 ST. CHARLES WAY
SUITE 150
YORK, PA 17402

PRELIMINARY SUBMITTAL
NOT FOR CONSTRUCTION OR PERMIT

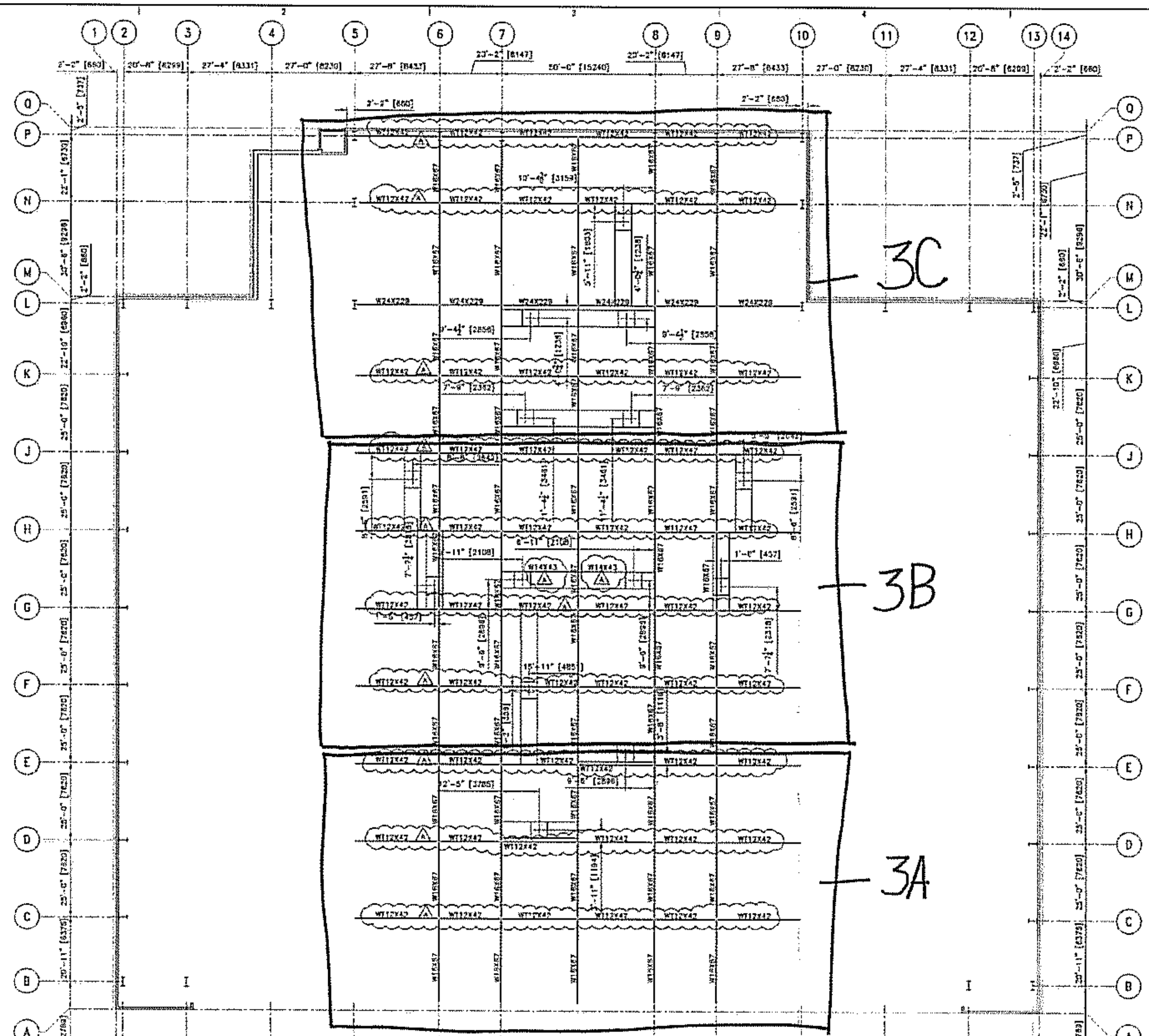
lscdesign
architects engineers
1110 EAST PRINCESS STREET
YORK, PA 17403

KINSLEY CONSTRUCTION
2700 WATER STREET
YORK, PA 17403

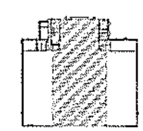
C-5 FUEL CELL FACILITY
167th AIRLIFT WING
MARTINSBURG, WEST VIRGINIA
BERKELEY COUNTY
WEST VIRGINIA

SHEET TITLE:
LEVEL THREE FRAMING PLAN

SHEET NO
S113



A3 LEVEL FIVE FRAMING PLAN (ELEV. = 80'-0")
SCALE: 1/16" = 1'-0"



A KEY PLAN
NO SCALE

REVISIONS:

MARK	DATE	DESCRIPTION
A		CHANGED STEEL SIZES AND ADDED STEEL SIZES

C-5 FUEL CELL FACILITY
167th AIRLIFT WING
Project No. PJVY009074
Contract No. W912L8-08-C-0016
MARTINSBURG, WEST VIRGINIA
BERKELEY COUNTY
WEST VIRGINIA

KINSLEY CONSTRUCTION
2700 WATER STREET
YORK, PA 17405

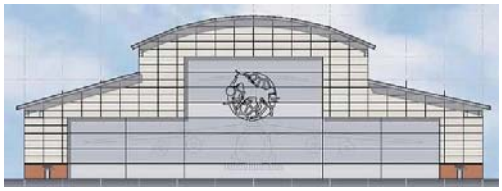
lscdesign architects engineers
1113 EAST PRINCESS STREET
YORK, PA 17403

PRELIMINARY SUBMITTAL
NOT FOR CONSTRUCTION OR PERMIT

TranSystems
220 ST. CHARLES WAY
SUITE 100
YORK, PA 17402

SHEET TITLE:
LEVEL FIVE FRAMING PLAN

SHEET NO.
S115



Appendix C

C-5 Fuel Cell Facility

Site Layout Plans

Site Entry/Exit

Base Road

N

Excavation Equipment Storage Area

GC and Sub Office Trailers

Storage Trailers

Site Fence

Limit of Construction

Excavated Ramp

Existing Fire Dept.

Caisson Construction

Excess Spoils Pile to be Hauled Off

Existing Taxiway

C-5 Fuel Cell Facility Martinsburg, WV Kyle Goodyear Construction Management	Excavation and Foundation Site Layout Plan 1"=60' October 25, 2009

Site Entry/Exit

Base Road

N

On-Site Truss Fabrication Area

GC and Sub Office Trailers

Storage Trailers

Site Fence

Limit of Construction

Excavated Ramp

Temp. shoring towers to be used

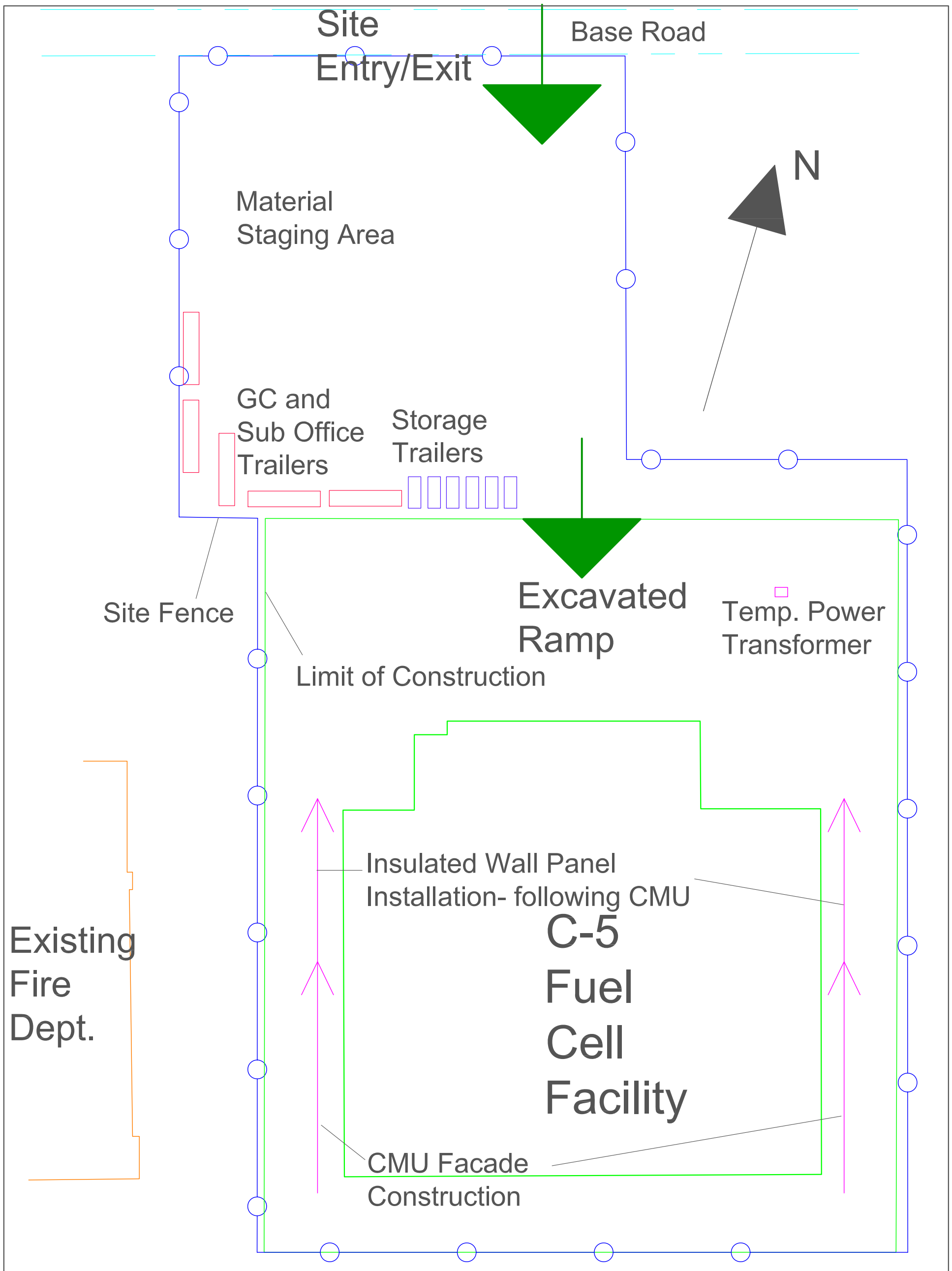
2 Crawler Cranes- a 3rd to be added later

C-5 Fuel Cell Facility

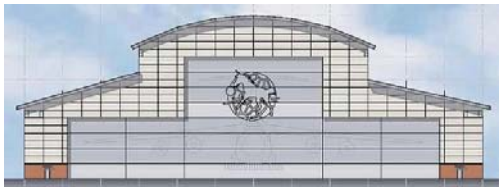
Existing Fire Dept.

Existing Taxiway

C-5 Fuel Cell Facility Martinsburg, WV Kyle Goodyear Construction Management	Steel Erection Site Layout Plan 1"=60' October 25, 2009



C-5 Fuel Cell Facility Martinsburg, WV Kyle Goodyear Construction Management	Building Enclosure Layout Plan 1"=60' October 25, 2009



Appendix D

C-5 Fuel Cell Facility

Structural Systems Estimate

STRUCTURAL SYSTEM ESTIMATE

C-5 Fuel Cell Facility

CONCRETE

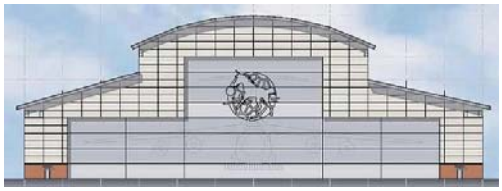
		Quantity	Unit	Unit Cost	Total Cost
	3' dia. Caisson	340	VLF	$ 75.23	$ 25,578.20
	6' dia. Caisson	386	VLF	$ 210.31	$ 81,179.66
	Pier Caps	426	CY	$ 237.43	$ 101,145.18
	Grade Beams	104	CY	$ 250.34	$ 26,035.36
	Strip Footing	10	CY	$ 250.34	$ 2,503.40
	6" Slab on Grade	197	CY	$ 217.14	$ 42,776.58
	8" Slab on Grade	1109	CY	$ 217.14	$ 240,808.26
	14" Slab on Grade	875	CY	$ 217.14	$ 189,997.50
	Jacking Points Slab	53	CY	$ 217.14	$ 11,508.42
	Trench Drain Slab	489	CY	$ 217.14	$ 106,181.46
			Concrete Total		**$ 827,714.02**

MASONRY

		Quantity	Unit	Unit Cost	Total Cost
	8" CMU bearing wall	2998	SF	$ 7.65	$ 22,934.70
	12" CMU bearing wall	2880	SF	$ 11.15	$ 32,112.00
			Masonry Total		**$ 55,046.70**

STEEL

		Quantity	Unit	Unit Cost	Total Cost
	Columns	334.48	Ton	$ 4,330.66	$ 1,448,519.16
	Support Areas	62.15	Ton	$ 4,330.66	$ 269,150.52
	Wind Girts	127.96	Ton	$ 4,330.66	$ 554,151.25
	Truss Structure	1348.19	Ton	$ 4,330.66	$ 5,838,552.51
	24LH Joists	1792	LF	$ 31.65	$ 56,716.80
	14K Joists	1260	LF	$ 10.60	$ 13,356.00
	16K Joists	12,888	LF	$ 10.20	$ 131,457.60
	18K Joists	1456	LF	$ 11.38	$ 16,569.28
	18 Ga. Metal Roof Deck	37,320	SF	$ 3.42	$ 127,634.40
	20 Ga. Metal Roof Deck	42,032	SF	$ 2.75	$ 115,588.00
			Steel Total		**$ 8,571,695.51**
			Structural Total		**$ 9,454,456.23**



Appendix E

C-5 Fuel Cell Facility

General Conditions Estimate

Description	Quantity	Units	Unit Cost	Total Cost
Project Supervision				
Superintendent	60	WKS	$2,975	$178,500
Asst. Superintendent	60	WKS	$2,750	$165,000
Job Engineer	60	WKS	$1,800	$108,000
Quality Control Supervisor	60	WKS	$1,800	$108,000
Mechanical QC Manager	52	WKS	$1,800	$93,600
Electrical QC Manager	52	WKS	$1,800	$93,600
				$746,700
Office Trailer-Double Wide	5	EA	$5,915	$29,575
Office Phones (5 trailers)	13	MOS	$440	$5,720
Office Equipment (5 trailers)	13	MOS	$1,323	$17,193
Job Photos	7	DAY	$1,525	$10,675
				$63,163
Mobilization				
Initial	30	CD	$610	$18,300
Equipment	20	WKS	$810	$16,200
Concrete Equipment	16	WKS	$2,100	$33,600
Material	52	WKS	$200	$10,400
				$78,500
Equipment Maintenance				
Equipment Maintenance	52	WKS	$140	$7,280
Concrete Equipment	16	WKS	$380	$6,080
				$13,360
Misc. Job Support Allowance	1	LS	$5,500	**$5,500**
Scheduling	1	LS	$10,704	**$10,704**
Layout				
Building Layout	70	MSF	$120	$8,400
Field Survey	87	MSF	$250	$21,750
Layout Sub	1	LS	$6,000	$6,000
				$36,150
Temp Toilets	13	MOS	$550	**$7,150**
Temp Utilities				
Temp Electric	13	MOS	$100	$1,300
Temp Water	13	MOS	$10	$130
				$1,430

Winter Protection/Heat				
Temp Heat	4	MOS	$8,700	$34,800
Snow & Ice Removal	3	MOS	$5,500	$16,500
Concrete Protection	4	MOS	$4,700	$18,800
Masonry Heating	3	MOS	$3,800	$11,400
				$81,500
Temp Floor Protection	864	CSF	$25	**$21,600**
Temp Storage Trailers- Owned	6	EA	$130	**$780**
Temp Roads	500	SY	$15	**$7,500**
Temp Fencing	2,000	LF	$6	**$12,000**
Dewatering/Pumping	5	MOS	$1,500	**$7,500**
Permits	1	LS	$6,690	**$6,690**
Bonds				
Payment Bond	1	LS	$80,274	$80,274
Performance Bond	1	LS	$160,547	$160,547
				$240,821
Builder's Risk Insurance	1	LS	$64,219	**$64,219**
Testing	1	LS	$106,000	**$106,000**
Cleanup				
Weekly Cleanup	80	MSF	$600	$48,000
Final Cleanup	80	MSF	$100	$8,000
				$56,000
Dumpster/Trash Removal	13	MOS	$650	**$8,450**
Safety				
General Building Safety	58	WKS	$275	$15,950
Safety Supervisor	58	WKS	$2,475	$143,550
				$159,500
As-Built Drawings	1	LS	$6,000	**$6,000**
Punch-out	1	LS	$5,500	**$5,500**
		GRAND TOTAL		**$1,746,717**