2010

WESTINGHOUSE BUILDING 4

TECHNICAL ASSIGNMENT 1

Jonathan Fisher, CM
Robert Leicht
10/4/2010

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Executive Summary

Technical Assignment One is intended to bring to light the existing conditions, contractual agreements, cost analysis, and building parameters that led to the building of Westinghouse Building 4 in Cranberry, PA. Westinghouse Electric Company has recently added 121,905 square feet of office space to their brand new headquarters facility in the form of a separate yet nearby building called Westinghouse Building 4. This new building is owned by The Ferchill Group out of Chicago, IL and is currently in its final stages of construction under the supervision of Turner Construction who is serving as the project General Contractor. The project is a 15 month project and is due to be occupied in early November of 2010. The Ferchill Group decided that a traditional design-bid-build delivery method would be most effective way to deliver this project. This was unexpected considering buildings 1, 2, and 3 on the same site were built in the past 2 years and to keep conformity amongst buildings a design-build delivery method might have been easier.

The actual cost of the building was just over the square foot building estimate conducted using RS Means 2010. This was unexpected because Building 4 has a standard office building layout, maximizing open floor space. More information is needed on exact building materials including windows to accurately determine what added to the cost of the building. Exact contractual agreements between Turner Construction and the subcontractors still requires more direct feedback to determine. However, LLI Engineering and IKM Incorporated have formed the backbone of the architectural and engineering design aspects of the building while holding a joint venture agreement between the two companies. Exactly why this joint venture was pursued requires direct feedback from the companies themselves and has not been ascertained at this time.

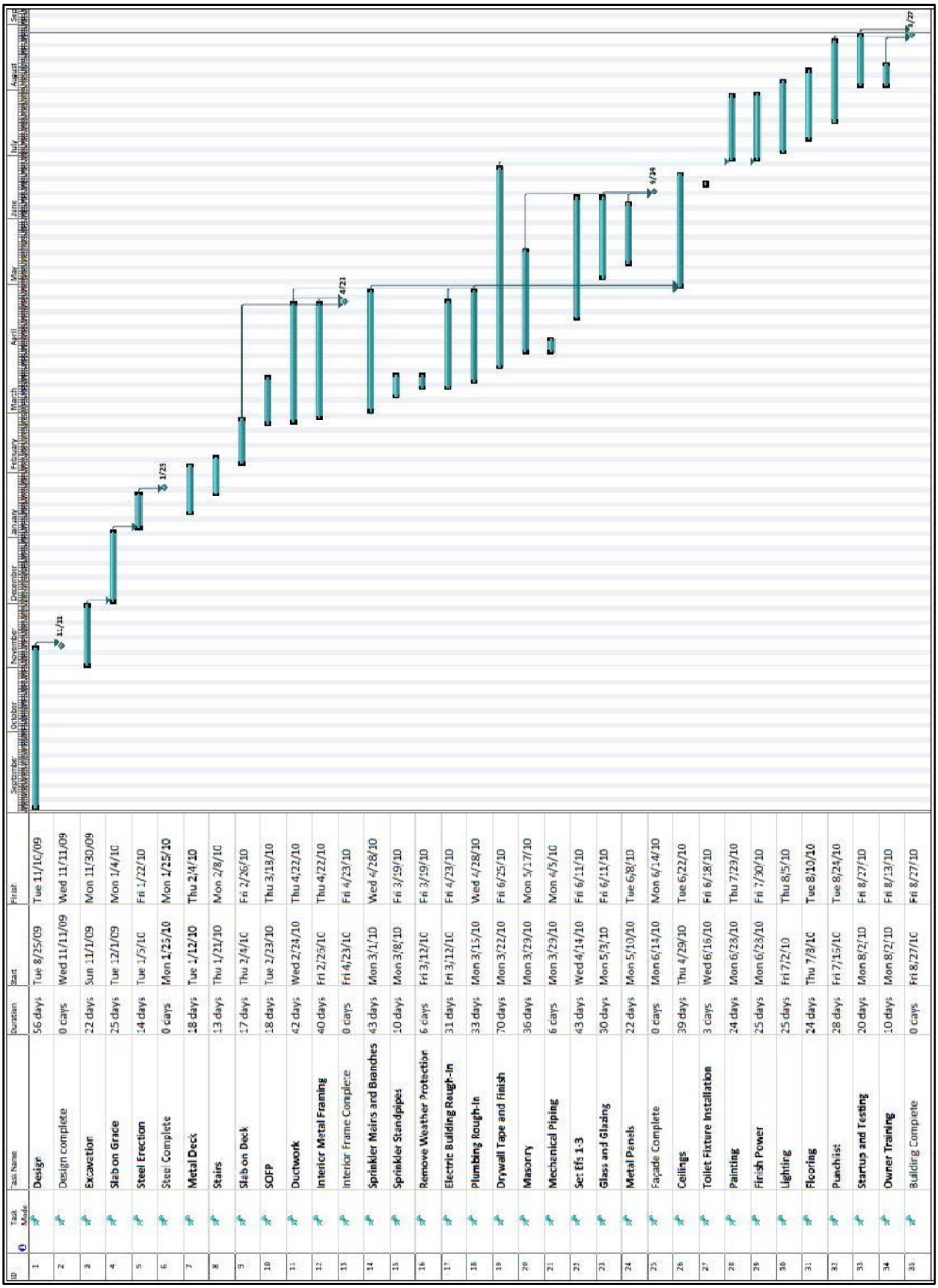
This project had a relatively small on site Turner Construction presence and managed to receive its Certificate of Occupancy three months before the scheduled date. Achieving this feat was a product of hard work by the local subcontractors and excellent building planning and scheduling on Turner Construction's part.

PROJECT SCHEDULE SUMMARY

Activity ID	Activity	Start	Finish	Duration
4689	**Design**	25-Aug-09	10-Nov-09	77
5946	**Excavation**	1-Nov-09	30-Nov-09	29
1000	**Slab on Grade**	14-Dec-09	15-Jan-10	32
1007	**Steel Erection**	6-Jan-10	25-Jan-10	19
1008	**Metal Deck**	12-Jan-10	4-Feb-10	23
1050	**Stairs**	21-Jan-10	8-Feb-10	18
1009	**Slab on Deck**	4-Feb-10	26-Feb-10	22
1060	**SOFP**	23-Feb-10	18-Mar-10	23
2100	**Ductwork**	24-Feb-10	22-Apr-10	57
1450	**Interior Metal Framing**	26-Feb-10	22-Apr-10	55
1180	**Sprinkler Mains and Branches**	1-Mar-10	28-Apr-10	58
1130	**Sprinkler Standpipes**	8-Mar-10	19-Mar-10	11
1021	**Remove Weather Protection**	12-Mar-10	19-Mar-10	7
2300	**Electric Building Rough-In**	12-Mar-10	23-Apr-10	42
1140	**Plumbing Rough-In**	15-Mar-10	28-Apr-10	44
2400	**Drywall Tape and Finish**	22-Mar-10	25-Jun-10	95
1100	**Masonry**	29-Mar-10	17-May-10	49
2117	**Mechanical Piping**	29-Mar-10	5-Apr-10	7
2109	**Set Efs 1-3**	14-Apr-10	11-Jun-10	58
1110	**Glass and Glazing**	3-May-10	11-Jun-10	39
1120	**Metal Panels**	10-May-10	8-Jun-10	29
2600	**Ceilings**	8-Jun-10	30-Jul-10	52
3200	**Toilet Fixture Installation**	16-Jun-10	18-Jun-10	2
2500	**Painting**	28-Jun-10	29-Jul-10	31
2800	**Finish Power**	28-Jun-10	30-Jul-10	32
3100	**Lighting**	2-Jul-10	5-Aug-10	34
3300	**Flooring**	8-Jul-10	10-Aug-10	33
11400	**Punchlist**	16-Jul-10	24-Aug-10	39
4000	**Startup and Testing**	2-Aug-10	27-Aug-10	25
11440	**Owner Training**	2-Aug-10	13-Aug-10	11

The key element of the foundation on this project was the pouring of the slab on grade. The completion of this process meant that all of the foundation piles had been completed and steel erection could then begin. The placing of the last beam of the top floor of the building was a milestone for this project. Being that the building is only three stories high, the constructor waited until all steel erection was complete to move on to the steel decking placement on each floor. The completion of the punch list was a major milestone of the finishes portion of the project. The completion of this process marked

the ability to commence building startup and testing. A ghant chart showing the sequence of tasks is shown below.



ID	Task Mode	Task Name	Duration	Start	Finish
1		Design	56 days	Tue 8/25/09	Tue 11/10/09
2		Design complete	0 days	Wed 11/11/09	Wed 11/11/09
3		Excavation	22 days	Sun 11/1/09	Mon 11/30/09
4		Slab on Grade	25 days	Tue 12/1/09	Mon 1/4/10
5		Steel Erection	14 days	Tue 1/5/10	Fri 1/22/10
6		Steel Complete	0 days	Mon 1/25/10	Mon 1/25/10
7		Metal Deck	18 days	Tue 1/12/10	Thu 2/4/10
8		Stairs	13 days	Thu 1/21/10	Mon 2/8/10
9		Slab on Deck	17 days	Thu 2/4/10	Fri 2/26/10
10		SOFP	18 days	Tue 2/23/10	Thu 3/18/10
11		Ductwork	42 days	Wed 2/24/10	Thu 4/22/10
12		Interior Metal Framing	40 days	Fri 2/25/10	Thu 4/22/10
13		Interior Frame Complete	0 days	Fri 4/23/10	Fri 4/23/10
14		Sprinkler Mains and Branches	43 days	Mon 3/1/10	Wed 4/28/10
15		Sprinkler Standpipes	10 days	Mon 3/8/10	Fri 3/19/10
16		Remove Weather Protection	6 days	Fri 3/12/10	Fri 3/19/10
17		Electric Building Rough-In	31 days	Fri 3/12/10	Fri 4/23/10
18		Plumbing Rough-In	33 days	Mon 3/15/10	Wed 4/28/10
19		Drywall Tape and Finish	70 days	Mon 3/22/10	Fri 6/25/10
20		Masonry	36 days	Mon 3/29/10	Mon 5/17/10
21		Mechanical Piping	6 days	Mon 3/29/10	Mon 4/5/10
22		Set Eifs 1-3	43 days	Wed 4/14/10	Fri 6/11/10
23		Glass and Glazing	30 days	Mon 5/3/10	Fri 6/11/10
24		Metal Panels	22 days	Mon 5/10/10	Tue 6/8/10
25		Façade Complete	0 days	Mon 6/14/10	Mon 6/14/10
26		Ceilings	39 days	Thu 4/29/10	Tue 6/22/10
27		Toilet Fixture Installation	3 days	Wed 6/16/10	Fri 6/18/10
28		Painting	24 days	Mon 6/28/10	Thu 7/29/10
29		Finish Power	25 days	Mon 6/28/10	Fri 7/30/10
30		Lighting	25 days	Fri 7/2/10	Thu 8/5/10
31		Flooring	24 days	Thu 7/8/10	Tue 8/10/10
32		Punchlist	28 days	Fri 7/16/10	Tue 8/24/10
33		Startup and Testing	20 days	Mon 8/2/10	Fri 8/27/10
34		Owner Training	10 days	Mon 8/2/10	Fri 8/13/10
35		Building Complete	0 days	Fri 8/27/10	Fri 8/27/10

BUILDING SYSTEMS SUMMARY

YES	NO	Work Scope
	X	Demolition
X		Structural Steel Frame
X		Cast In Place Concrete
	X	Precast Concrete
X		Mechanical System
X		Electrical System
X		Masonry
	X	Curtain Wall
X		Support of Excavation

Structural Steel Framework: Structural steel frame is braced using L3X3X5/16 in a cross braced formation. The bracing is attached using typical wind moment connections. The 4 1/2" thick concrete that makes up each floor is reinforced using 4" high 3/4" dia. steel shear studs that are welded to the wide flange joists supporting the floor.

Cast in Place Concrete: Cast in place concrete shall be used in building frame elements, walls, foundations, slab-on-deck, slabs-on-grade, and mechanical equipment pads. The formworks for the CIP concrete shall conform to ACI 301 chapter 4 and ACI 347. All formwork is required to be supported underneath and never supported using the structural steel members of the building.

Mechanical Systems: There are 2 mechanical rooms on each floor of the building. These rooms are directly across the corridor from the stairwell on both sides of the building. The mechanical systems in the building include; 2 roof top air handlers, 2 rooftop evaporative cooling units, and a standpipe sprinkler system among many other systems. On every floor of the building there are several fire extinguisher hubs where personal fire suppression systems can be found.

Electrical System: Westinghouse Building 4 is fed by the utility company by a 1500 KVA transformer outside the building. The main switchgear of the building is a 3200A, 480/277V, 3PH, 4W, 65KAIC symmetrical system. The electrical rooms on each floor are fed 500A a piece through 2 sets of 4-500kcmil and 1 #1/0 GND all in 3” conduit. Once in the electrical room the electricity is distributed to the lighting panel board, general purpose and café panel board, and two electrical equipment panel boards. In the event of a power outage the building can be fed by a diesel generator outside the

building. The generator can only deliver 600A to the building so only emergency and essential systems can be run on backup power.

Masonry: The exterior façade of Westinghouse Building 4 contains three separate layers of 4" polished masonry brick. The total square footage of masonry brick is approximately 19,440 SQFT appearing in 3 separate layers going up the building.

LEED Certification: The main LEED certification attempt with this building is in its large windows on each floor. These large windows are accompanied by light sensors on each floor, which automatically dim the lights during the day and save electricity. All areas of the building are also equipped with motion sensors to the lights are off while the building is unoccupied.

PROJECT COST EVALUATION

RS Means Square Foot Estimate

Sq. ft. Adjustment

Square Footage	65,000	80,000	121,905
Approx. Cost	$162.30	$158.80	$150.14

Total Building Cost

121,905 sq. ft. * $150.14/sq. ft. = $18,302,816.70

Location Adjustment

$18,302,816.70 * .96 = $17,570,704.03

Building Element Cost Breakdown

Building Element		% of Total Building Cost	Element Cost
A. Substructure			
1030	Slab On Grade	4.30%	$755,540.27
B. Shell			
1010	Superstructure	9.60%	$1,686,787.59
2010	Exterior Enclosure	16%	$2,811,312.64
3010	Roofing	1.70%	$298,701.97
C. Interiors			
1010	General	22.90%	$4,023,691.22
D. Services			
1010	Conveying	9.00%	$1,581,363.36
2010	Plumbing	3.20%	$562,262.53
3010	HVAC	12.20%	$2,143,625.89
4010	Fire Protection	3.20%	$56,226,252.90
5010	Electrical	17.80%	$3,127,585.32

Assumptions

1. Building has a Glass and Metal Curtain Wall

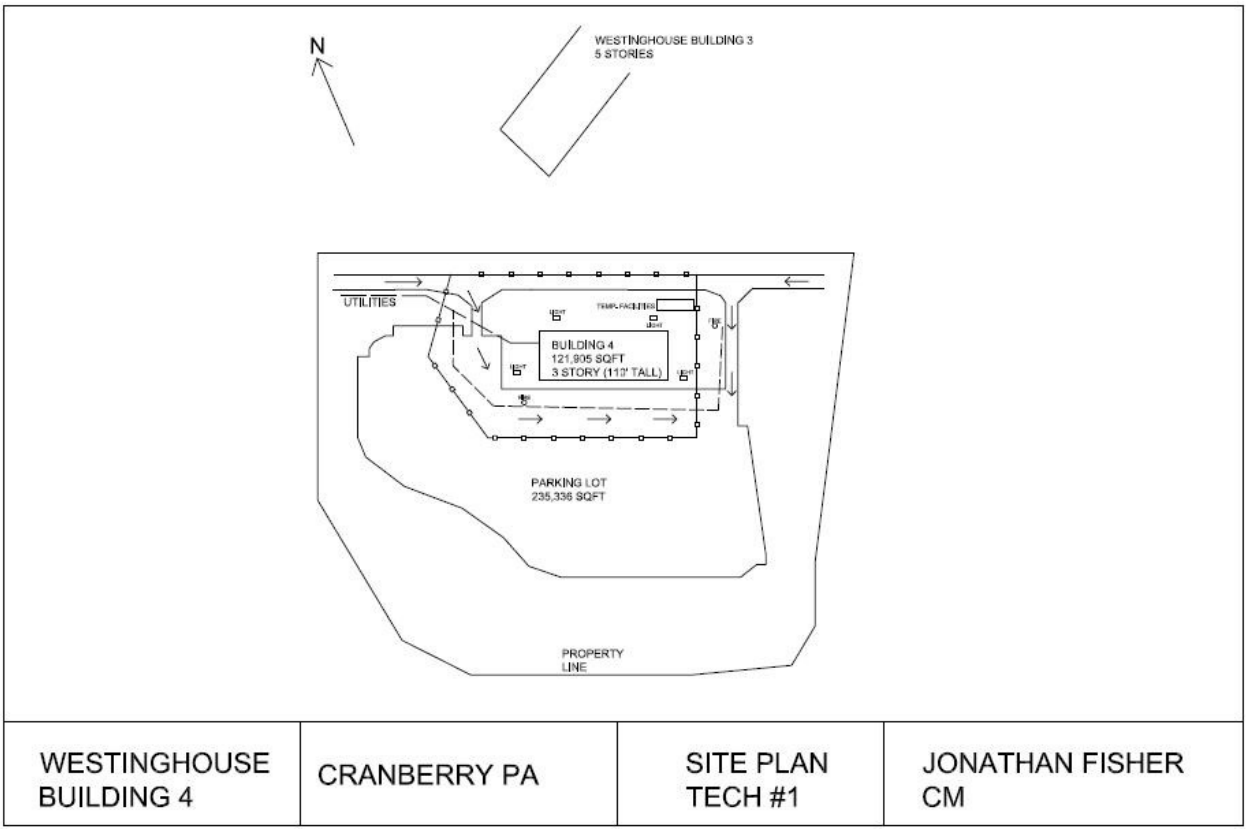
2. Building has a Steel Frame

3. Extrapolation yields a square footage cost of $150.14 per sq. ft.

4. Building Location is Butler, PA and has a location adjustment of .94

To evaluate the cost of the Westinghouse Building 4 project a D4 Cost analysis and an RS Means square foot cost estimate were conducted to compare to the actual cost of the project. The RS Means estimate was conducted using the square footage numbers for a 3 story office building. A rough extrapolation was done to estimate a building of such large square footage. The RS Means overall building cost estimate was close to the actual cost because this building is a standard office building with minimal efficiency and system upgrades. The 4D Cost analysis was very low even though the building's overall square footage is almost identical and number of floors is the same. I believe this difference is because the D4 Cost building has an overall height of 40 feet. This differs from Westinghouse's 110 foot tall building. It is likely that the building used in the D4 Cost analysis has a basement that only spans half the building and is not usable office space.

SITE PLAN of EXTISTING CONDITIONS



WESTINGHOUSE BUILDING 4	CRANBERRY PA	SITE PLAN TECH #1	JONATHAN FISHER CM

(See site plan in appendix for clearer image)

LOCAL CONDITIONS

Westinghouse Building 4 is being built in Cranberry Pennsylvania in the Cranberry Woods office building complex. The building site can be accessed through the back entrance to the Westinghouse property. Being that Building 4 is in an office complex, rush hour times were avoided for truck deliveries. The township of Cranberry had major congestion problems involving route 79 and the PA turnpike exits that both emptied into the already busy streets of route 19. To fix this problem, the township of Cranberry added an extra lane of traffic on route 228 from route 79 that leads directly to the driveway of the Westinghouse Complex. This addition keeps all Westinghouse traffic from having to enter the streets of downtown Cranberry.

New construction in Cranberry Township is on the rise so construction companies and crews are abundant in the area. Westinghouse just completely its new main headquarters building just a few hundred yards from Building 4 so many of the subcontractors were able to continue work on this building after the main buildings were completed. Contractor parking on the site is no problem because the parking lots for the Westinghouse buildings were completed when the main headquarters was constructed.

A subsurface investigation was done at the site of Building 4 involving twenty four test borings. These tests revealed that the residual soil on the site will likely be able to be used as backfill, however pending laboratory tests the soil may require drying first. The geotechnical report also revealed that groundwater would likely be encountered during the excavation process. Subsurface drains and possibly pumps will be required on site during the excavation.

CLIENT INFORMATION

Westinghouse Building 4 is owned by The Ferchill Group, but is being built for the Westinghouse Electric Company. In recent years Westinghouse has expanded tremendously and required more office space for the employees. Westinghouse was forced to relocate from their previous building in Monroeville Pennsylvania due to zoning complications involving building additions. In the summer of 2009 Westinghouse employees began moving into their new home in the Westinghouse headquarters building 1, 2, and 3. During this move Westinghouse was still expanding faster than the pace of construction so additional office space was leased inside the Cranberry Woods complex. Out of necessity, due to this expansion, Westinghouse began immediate construction on Building 4 even before Building 2 and 3 were 100% complete. It is very important to Westinghouse that Building 4 is completed on time so they can begin moving out of their leased space and into their new building. In addition, having their employees in different buildings creates problems when scheduling meetings and other company events.

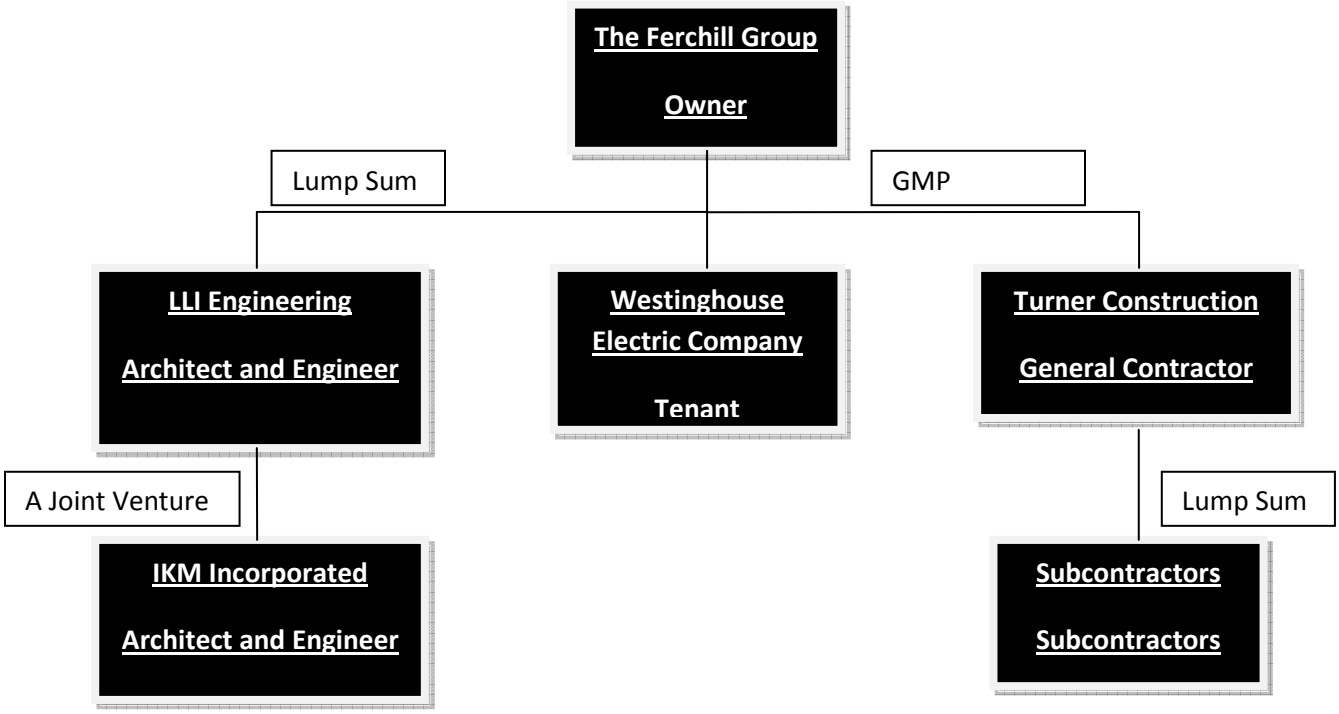
Schedule was the biggest factor for the Building 4 project in the eyes of Westinghouse. It was very important to the leaders of the company that their employees be able to move into the new building. All parties involved in the project held safety to the highest standards on the site as well. An Owner Controlled Insurance Program or OCIP was used for this project, which meant a city safety employee could be brought in as a third party safety manager on the site. Westinghouse is expanding very quickly right now largely due to their new safety systems that they are incorporating into their new power plant designs and the last thing they would want is negative publicity about safety on the headquarters buildings.

Cost and quality were also taken into consideration in the planning of this building. The cost was to be kept down while the quality was to be maximized and mimic that of the main buildings. The interior finishes and the general exterior facades of the building were also meant to be similar to those of the main 3 buildings. The keys to completion of the project in the owner's eyes are that it is finished and occupied on time. Furnishing the interior of the building on time and correctly running all low voltage technology wire are also key completion criteria.

The Ferchill Group
Saving Cities
since 1978

PROJECT DELIVERY SYSTEM

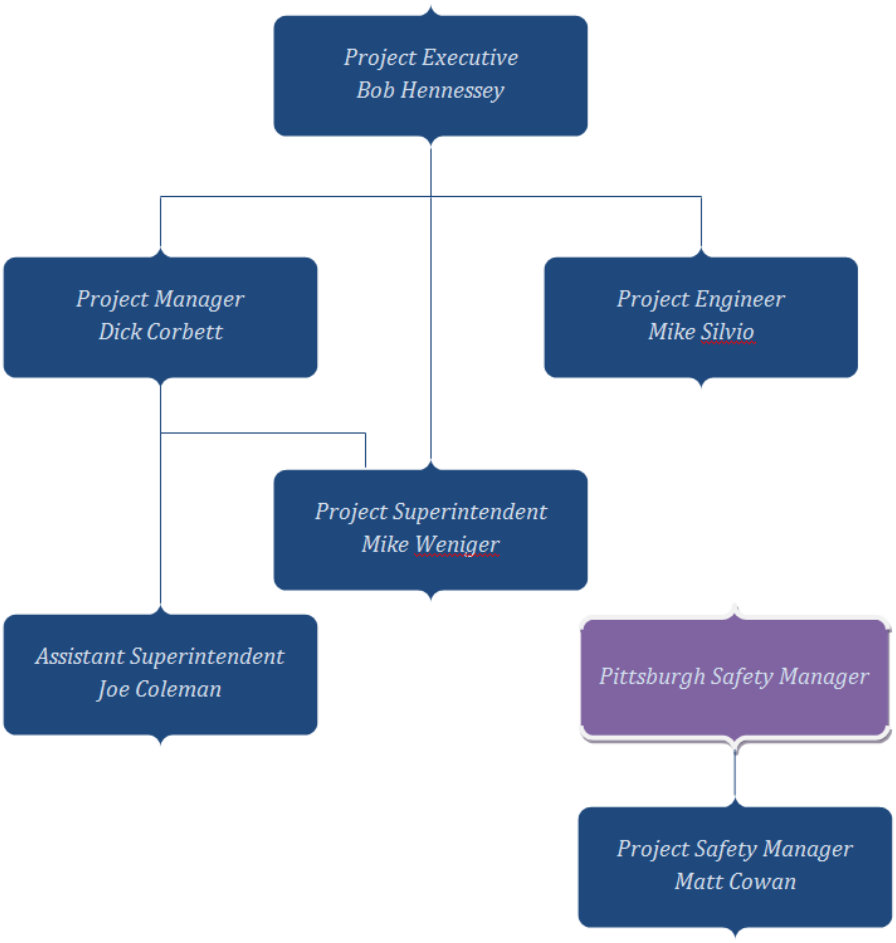
The Westinghouse Building 4 project is being delivered using a Design-Bid-Build delivery method. Turner Construction won the bid for this building and is carrying it out using lump sum contracts for the design team and guaranteed max price for all of their subcontractors. LLI/IKM is a joint venture architecture and engineering company and designed Westinghouse Building 4.



The traditional design-bid-build delivery method allows The Ferchill Group to have limited involvement in the project. This is important to them because they are based out of Chicago, IL. Subcontractors are local and were chosen on a lowest bid basis. Many of the subcontractors used for Building 4 also worked on Westinghouse Buildings 1, 2 and 3. The Ferchill Group owns all insurance policies for the project. The project guaranteed max price is based on a subcontractor breakdown of all of the system costs. Turner retains the ability to withhold 10% of all subcontractor contracts until 50% of the total project price has been completed. Subcontractors that complete their work early con apply for an early release of their retention should they so desire.

STAFFING PLAN

Below is an organizational chart that shows the CM/GC staff and how they are assigned to the project. Turner Construction is the CM on the project and has a project executive that oversees the entire project and reports important information back to Turner headquarters. Directly reporting to the project executive are the project engineer and the project manager. The project manager spends most of his time behind the scenes ensuring that orders and materials arrive on time to the site. Reporting to the PM and reporting directly to the project executive is the project superintendent. This person is responsible for enlightening upper management of what is going on out on the jobsite. On this project there is also an assistant project manager that also reports to the project PM.



Appendix A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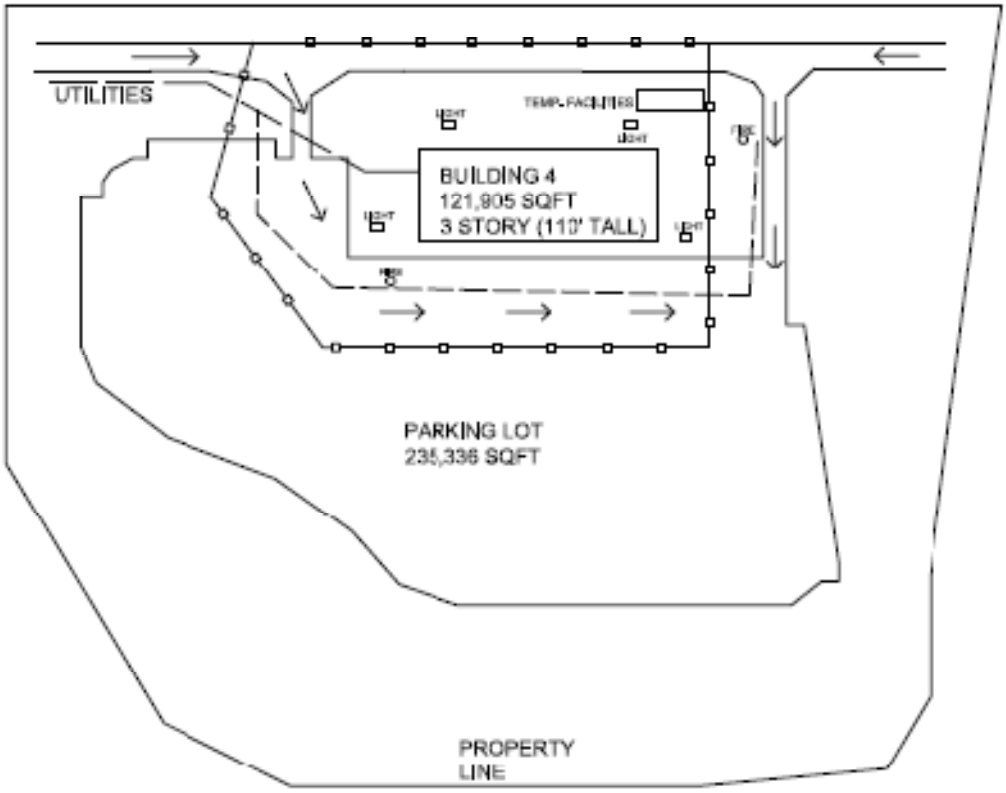
WESTINGHOUSE BUILDING 3
5 STORIES


UTILITIES
BUILDING 4
121,905 SQFT
3 STORY (113' TALL)
PARKING LOT
235,336 SQFT
PROPERTY
LINE

Appendix B

Cost Evaluation Sources

Tuesday, September 28, 2010

Statement of Probable Cost

Page 1

Conectiv Services Call Center - Jul 1998 - NJ - Other

Prepared By:		Prepared For:	
	EDiS Company 110 S. Poplar Street, #400 Wilmington, DE 19801 Fax:		Fax:
Building Sq. Size:	120000	Site Sq. Size:	447609
Bid Date:	7/1/1998	Building use:	Office
No. of floors:	3	Foundation:	CON
No. of buildings:	1	Exterior Walls:	PRE
Project Height:	40	Interior Walls:	DRY
1st Floor Height:	13	Roof Type:	EPD
1st Floor Size:	40000	Floor Type:	CAR
		Project Type:	NEW

Division		Percent	Sq. Cost	Amount
01	**General Requirements**	**4.71**	**4.32**	**518,500**
	General Requirements	4.71	4.32	518,500
03	**Concrete**	**14.11**	**12.93**	**1,551,800**
	Concrete	14.11	12.93	1,551,800
05	**Metals**	**8.95**	**8.21**	**985,000**
	Metals	8.95	8.21	985,000
06	**Wood & Plastics**	**7.36**	**6.75**	**809,700**
	Wood & Plastics	7.36	6.75	809,700
07	**Thermal & Moisture Protection**	**1.86**	**1.70**	**204,400**
	Thermal & Moisture Protection	1.86	1.70	204,400
08	**Doors & Windows**	**7.50**	**6.88**	**825,000**
	Doors & Windows	7.50	6.88	825,000
09	**Finishes**	**11.17**	**10.24**	**1,229,100**
	Finishes	11.17	10.24	1,229,100
11	**Equipment**	**3.78**	**3.46**	**415,700**
	Food Service	3.78	3.46	415,700
14	**Conveying Systems**	**1.35**	**1.24**	**148,700**
	Elevators	1.35	1.24	148,700
15	**Mechanical**	**22.92**	**21.01**	**2,521,700**
	Mechanical	22.92	21.01	2,521,700
16	**Electrical**	**16.28**	**14.93**	**1,791,300**
	Electrical	16.28	14.93	1,791,300
Total Building Costs		**100.00**	**91.67**	**11,000,900**
02	**Site Work**	**100.00**	**2.85**	**1,273,500**
	Site Work	100.00	2.85	1,273,500
Total Non-Building Costs		**100.00**	**2.85**	**1,273,500**
Total Project Costs		--	--	**12,274,400**

RS Means Cost Estimate

Model costs calculated for a 3 story building with 12' story height and 20,000 square feet of floor area

Office, 2-4 Story

				Unit	Unit Cost	Cost Per S.F.	% Of Sub-Total
A. SUBSTRUCTURE							
1010	Standard Foundations	Poured concrete; strip and spread footings		S.F. Ground	6.84	2.28	
1020	Special Foundations	N/A		–	–	–	
1030	Slab on Grade	4" reinforced concrete with vapor barrier and granular base		S.F. Slab	4.77	1.59	4.3%
2010	Basement Excavation	Site preparation for slab and trench for foundation wall and footing		S.F. Ground	.18	.06	
2020	Basement Walls	4' foundation wall		L.F. Wall	71	1.60	
B. SHELL							
	B10 Superstructure						
1010	Floor Construction	Open web steel joists, slab form, concrete, columns		S.F. Floor	15.72	10.48	9.6%
1020	Roof Construction	Metal deck, open web steel joists, columns		S.F. Roof	5.67	1.89	
	B20 Exterior Enclosure						
2010	Exterior Walls	Face brick with concrete block backup	80% of wall	S.F. Wall	30.30	15.71	
2020	Exterior Windows	Aluminum outward projecting	20% of wall	Each	703	3.97	16.0%
2030	Exterior Doors	Aluminum and glass, hollow metal		Each	3196	.96	
	B30 Roofing						
3010	Roof Coverings	Built-up tar and gravel with flashing; perlite/EPS composite		S.F. Roof	6.66	2.22	1.7%
3020	Roof Openings	N/A		–	–	–	
C. INTERIORS							
1010	Partitions	Gypsum board on metal studs	20 S.F. Floor/L.F. Partition	S.F. Partition	9.30	3.72	
1020	Interior Doors	Single leaf hollow metal	200 S.F. Floor/Door	Each	1001	5.01	
1030	Fittings	Toilet partitions		S.F. Floor	1.05	1.05	
2010	Stair Construction	Concrete filled metal pan		Flight	12,275	4.30	22.9%
3010	Wall Finishes	60% vinyl wall covering, 40% paint		S.F. Surface	1.38	1.10	
3020	Floor Finishes	60% carpet, 30% vinyl composition tile, 10% ceramic tile		S.F. Floor	7.75	7.75	
3030	Ceiling Finishes	Mineral fiber tile on concealed zee bars		S.F. Ceiling	6.51	6.51	
D. SERVICES							
	D10 Conveying						
1010	Elevators & Lifts	Two hydraulic passenger elevators		Each	116,400	11.64	9.0%
1020	Escalators & Moving Walks	N/A		–	–	–	
	D20 Plumbing						
2010	Plumbing Fixtures	Toilet and service fixtures, supply and drainage	1 Fixture/1320 S.F. Floor	Each	4171	3.16	
2020	Domestic Water Distribution	Gas fired water heater		S.F. Floor	.41	.41	3.2%
2040	Rain Water Drainage	Roof drains		S.F. Roof	1.68	.56	
	D30 HVAC						
3010	Energy Supply	N/A		–	–	–	
3020	Heat Generating Systems	Included in D3050		–	–	–	
3030	Cooling Generating Systems	N/A		–	–	–	12.2 %
3050	Terminal & Package Units	Multizone unit gas heating, electric cooling		S.F. Floor	15.70	15.70	
3090	Other HVAC Sys. & Equipment	N/A		–	–	–	
	D40 Fire Protection						
4010	Sprinklers	Wet pipe sprinkler system		S.F. Floor	3.33	3.33	3.2%
4020	Standpipes	Standpipes and hose systems		S.F. Floor	.81	.81	
	D50 Electrical						
5010	Electrical Service/Distribution	1000 ampere service, panel board and feeders		S.F. Floor	4.49	4.49	
5020	Lighting & Branch Wiring	High efficiency fluorescent fixtures, receptacles, switches, A.C. and misc. power		S.F. Floor	11.48	11.48	17.8%
5030	Communications & Security	Addressable alarm systems, internet and phone wiring, and emergency lighting		S.F. Floor	6.67	6.67	
5090	Other Electrical Systems	Emergency generator, 7.5 kW, uninterruptible power supply		S.F. Floor	.23	.23	
E. EQUIPMENT & FURNISHINGS							
1010	Commercial Equipment	N/A		–	–	–	
1020	Institutional Equipment	N/A		–	–	–	0.0 %
1030	Vehicular Equipment	N/A		–	–	–	
1090	Other Equipment	N/A		–	–	–	
F. SPECIAL CONSTRUCTION							
1020	Integrated Construction	N/A		–	–	–	0.0 %
1040	Special Facilities	N/A		–	–	–	
G. BUILDING SITEWORK		N/A					
					Sub-Total	128.68	100%
	CONTRACTOR FEES (General Requirements: 10%, Overhead: 5%, Profit: 10%)				25%	32.16	
	ARCHITECT FEES				7%	11.26	
					Total Building Cost	172.10	

COMMERCIAL/INDUSTRIAL/ INSTITUTIONAL — M.460 — Office, 2-4 Story

Costs per square foot of floor area

Exterior Wall	S.F. Area	5000	8000	12000	16000	20000	35000	50000	65000	80000
	L.F. Perimeter	220	260	310	330	360	440	490	548	580
Face Brick with Concrete Block Back-up	Wood Joists	236.75	206.30	188.85	176.75	170.40	157.75	151.60	148.60	146.05
	Steel Joists	238.45	208.00	190.55	178.45	172.10	159.45	153.30	150.25	147.75
Glass and Metal Curtain Wall	Steel Frame	280.45	240.35	217.30	200.80	192.20	175.00	166.55	162.30	158.80
	R/Conc. Frame	277.70	238.05	215.25	198.95	190.45	173.40	165.00	160.80	157.35
Wood Siding	Wood Frame	190.40	168.40	155.80	147.55	143.15	134.50	130.35	128.35	126.70
Brick Veneer	Wood Frame	210.80	183.45	167.80	157.10	151.50	140.30	134.95	132.25	130.05
Perimeter Adj., Add or Deduct	Per 100 L.F.	36.35	22.70	15.20	11.35	9.05	5.20	3.70	2.75	2.30
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	5.90	4.40	3.50	2.80	2.45	1.70	1.35	1.10	0.95

For Basement add $33.80 per square foot of basement area

The above costs were calculated using the basic specifications shown on the facing page. These costs should be adjusted where necessary for design alternatives and owner's requirements. Reported completed project costs, for this type of structure, range from $66.55 to $257.85 per S.F.

Common additives

Description	Unit	$ Cost
Clock System		
20 room	Each	16,000
50 room	Each	39,100
Closed Circuit Surveillance, One station		
Camera and monitor	Each	1875
For additional camera stations, add	Each	1025
Directory Boards, Plastic, glass covered		
30" x 20"	Each	605
36" x 48"	Each	1325
Aluminum, 24" x 18"	Each	585
36" x 24"	Each	685
48" x 32"	Each	975
48" x 60"	Each	2025
Elevators, Hydraulic passenger, 2 stops		
1500# capacity	Each	60,900
2500# capacity	Each	64,300
3500# capacity	Each	67,600
Additional stop, add	Each	8250
Emergency lighting, 25 watt, battery operated		
Lead battery	Each	287
Nickel cadmium	Each	845

Description	Unit	$ Cost
Smoke Detectors		
Ceiling type	Each	233
Duct type	Each	525
Sound System		
Amplifier, 250 watts	Each	2400
Speaker, ceiling or wall	Each	196
Trumpet	Each	375
TV Antenna, Master system, 12 outlet	Outlet	320
30 outlet	Outlet	207
100 outlet	Outlet	199

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Important: See the Reference Section for Location Factors

Location Factors

STATE/ZIP	CITY	Residential	Commercial
NORTH DAKOTA (CONT'D)			
586	Dickinson	.74	.82
587	Minot	.79	.85
588	Williston	.74	.81
OHIO			
430-432	Columbus	.94	.94
433	Marion	.88	.88
434-436	Toledo	.99	.97
437-438	Zanesville	.87	.88
439	Steubenville	.93	.93
440	Lorain	.96	.96
441	Cleveland	1.00	.99
442-443	Akron	.96	.96
444-445	Youngstown	.94	.94
446-447	Canton	.92	.92
448-449	Mansfield	.92	.92
450	Hamilton	.91	.90
451-452	Cincinnati	.91	.91
453-454	Dayton	.90	.90
455	Springfield	.92	.90
456	Chillicothe	.94	.91
457	Athens	.88	.88
458	Lima	.89	.90
OKLAHOMA			
730-731	Oklahoma City	.78	.82
734	Ardmore	.77	.80
735	Lawton	.80	.82
736	Clinton	.76	.80
737	Enid	.76	.81
738	Woodward	.75	.80
739	Guymon	.69	.67
740-741	Tulsa	.76	.79
743	Miami	.80	.80
744	Muskogee	.70	.72
745	Mcalester	.73	.75
746	Ponca City	.76	.79
747	Durant	.76	.79
748	Shawnee	.75	.79
749	Poteau	.77	.79
OREGON			
970-972	Portland	.98	.99
973	Salem	.96	.98
974	Eugene	.97	.98
975	Medford	.96	.98
976	Klamath Falls	.96	.98
977	Bend	.98	.98
978	Pendleton	.95	.95
979	Vale	.94	.90
PENNSYLVANIA			
150-152	Pittsburgh	.98	1.00
153	Washington	.95	.98
154	Uniontown	.92	.97
156	Bedford	.88	.94
156	Greensburg	.95	.98
157	Indiana	.92	.97
158	Dubois	.90	.96
159	Johnstown	.90	.95
160	Butler	.94	.96
161	New Castle	.93	.95
162	Kittanning	.95	.97
163	Oil City	.90	.94
164-165	Erie	.93	.94
166	Altoona	.88	.93
167	Bradford	.90	.95
168	State College	.91	.93
169	Wellsboro	.92	.95
170-171	Harrisburg	.96	.97
172	Chambersburg	.89	.93
173-174	York	.93	.96
175-176	Lancaster	.92	.92
177	Williamsport	.85	.88
178	Sunbury	.93	.95
179	Pottsville	.93	.96
180	Lehigh Valley	1.04	1.04
181	Allentown	1.05	1.04
182	Hazleton	.93	.96
183	Stroudsburg	.93	1.00
184-185	Scranton	.98	1.00
186-187	Wilkes-Barre	.95	.96
188	Montrose	.92	.96
189	Doylestown	1.08	1.07

STATE/ZIP	CITY	Residential	Commercial
PENNSYLVANIA (CONT'D)			
190-191	Philadelphia	1.11	1.15
193	Westchester	1.13	1.10
194	Norristown	1.12	1.12
195-196	Reading	.98	1.00
PUERTO RICO			
009	San Juan	.73	.79
RHODE ISLAND			
028	Newport	1.08	1.05
029	Providence	1.08	1.06
SOUTH CAROLINA			
290-292	Columbia	.82	.78
293	Spartanburg	.82	.76
294	Charleston	.85	.81
295	Florence	.78	.76
296	Greenville	.81	.76
297	Rock Hill	.80	.75
298	Aiken	.95	.86
299	Beaufort	.80	.74
SOUTH DAKOTA			
570-571	Sioux Falls	.77	.81
572	Watertown	.74	.78
573	Mitchell	.75	.77
574	Aberdeen	.76	.80
575	Pierre	.75	.79
576	Mobridge	.74	.78
577	Rapid City	.76	.80
TENNESSEE			
370-372	Nashville	.84	.87
373-374	Chattanooga	.81	.85
375,380-381	Memphis	.81	.86
376	Johnson City	.70	.79
377-379	Knoxville	.74	.80
382	Mckenzie	.71	.78
383	Jackson	.73	.80
384	Columbia	.72	.81
385	Cookeville	.70	.81
TEXAS			
750	Mckinney	.74	.78
751	Waxahackie	.76	.80
752-753	Dallas	.83	.85
754	Greenville	.70	.73
755	Texarkana	.74	.78
756	Longview	.69	.73
757	Tyler	.75	.80
758	Palestine	.68	.71
759	Lufkin	.72	.74
760-761	Fort Worth	.82	.83
762	Denton	.75	.76
763	Wichita Falls	.78	.80
764	Eastland	.72	.72
765	Temple	.75	.76
766-767	Waco	.78	.80
768	Brownwood	.68	.72
769	San Angelo	.72	.76
770-772	Houston	.85	.87
773	Huntsville	.68	.72
774	Wharton	.70	.75
775	Galveston	.83	.85
776-777	Beaumont	.82	.82
778	Bryan	.74	.81
779	Victoria	.73	.76
780	Laredo	.72	.75
781-782	San Antonio	.78	.81
783-784	Corpus Christi	.77	.78
785	Mc Allen	.75	.76
786-787	Austin	.78	.80
788	Del Rio	.66	.69
789	Giddings	.69	.71
790-791	Amarillo	.79	.82
792	Childress	.77	.78
793-794	Lubbock	.78	.80
795-796	Abilene	.75	.78
797	Midland	.78	.78
798-799,885	El Paso	.79	.78
UTAH			
840-841	Salt Lake City	.79	.87
842,844	Ogden	.77	.84
843	Logan	.77	.85

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