April 2010

A Case Study for the Use of Integrated Project Delivery and Building Information Modeling for the Analysis and Design of The New York Times Building

| Ben Barben | Craig Casey | Nicole Dubowski | Justin Miller |

A Case Study for the Use of Integrated Project Delivery and Building Information Modeling for the Analysis and Design of The New York Times Building

A Thesis in Architectural Engineering submitted to the faculty of

The Pennsylvania State University

Prepared by:

The Project Team of:

Benjamin R. Barben
Structural Option

Craig A. Casey
Lighting / Electrical Option

Nicole L. Dubowski
Mechanical Option

Justin M. Miller
Construction Management Option

Thesis Advisors:

Dr. Andres Lepage

Dr. Kevin Houser

Dr. Jelena Srebric

Dr. Chimay Anumba

April 2010

This thesis was submitted to the following faculty:

Chimay Anumba, Ph. D.
Professor of Architectural Engineering
Head of the Department of Architectural Engineering
Construction Management Thesis Advisor

Robert Holland
Associate Professor of Architectural Engineering
Director of the Senior Thesis Program

M. Kevin Parfitt
Associate Professor of Architectural Engineering
Director of the Senior Thesis Program

Andres Lepage, Ph. D.
Assistant Professor of Architectural Engineering
Structural Thesis Advisor

Theodore H. Dannerth
Associate Professor of Architectural Engineering
Electrical Thesis Advisor

Kevin Houser, Ph. D.
Associate Professor of Architectural Engineering
Lighting Thesis Advisor

Jelena Srebric, Ph. D.
Associate Professor of Architectural Engineering
Mechanical Thesis Advisor

EXECUTIVE SUMMARY

The Pennsylvania State University Architectural Engineering Department, in conjunction with Thornton Tomasetti Foundation and The Leonhard Center for the Enhancement of Engineering Education developed the first multidisciplinary engineering design thesis, incorporating Integrated Project Delivery and Building Information Modeling. Three students from each of the Architectural Engineering disciplines were selected to work collaboratively to investigate The New York Times Building as an academic case study. This report involves the year long work of one student from each of the four options; Construction Management, Lighting/Electrical, Mechanical and Structural.

The lateral system was changed from a braced frame system to concrete shear walls with coupling beams. This was changed in order to eliminate the out riggers, thermal trusses, and x-bracing to increase transparency of the building. The periods of vibrations were determined to be 6.46 seconds and 6.64 seconds in the west-east and north-south directions respectively. It was also determined that the total building drift is H/690 and the acceleration is 14.6 milli-g's. From these results, the system was deemed acceptable.

In order to make room for this added structure, the electrical feeders were switched from conduit to bus duct. This reduced the access space required, but increased the cost by approximately $500,000.00 for aluminum bus duct. Mechanical duct work was also rerouted due to the increased structural space requirements. Due to 3-D modeling of these systems, early detection of possible problems were found. In response to the structural changes, the architectural layouts of the spaces within the core were also changed. Even with the increased structural requirements, transparency through the building was maintained by protecting the circulation space within the core.

Comparing the original steel core to the proposed concrete core resulted in a cost savings of approximately $20,000,000.00 for the immediately affected steel members replaced by the proposed structural core redesign. These savings were achieved by comparing the original and proposed systems within the Building Information Model for material take-offs. When including the schedule and general conditions, the overall cost savings from this analysis resulted in approximately $16,500,000.00.

The existing curtain wall system was changed from a single façade layer with a ceramic rod shading system to a dynamic curtain wall system incorporating motorized louvered shades and operable windows. The new design was modeled in AutoDesk Revit using nested families and parametric parameters to accurately depict the way in which the facade would work. The daylighting study resulted in a 72% reduction in lighting energy use within the first two rows of lighting around the entire floor plan. This proposed redesign created a cost savings of $56,280 per year for the entire building. An exterior lighting redesign incorporated LED fixtures, which saved approximately 10,000 watts per side of the building. These savings resulted in a cost savings of $17,520 per year.

The BIM model was utilized to investigate interoperability with energy analysis software. IES<VE> successfully imported geometries from Revit and was used to analysis the performance of the existing and proposed glazing, proposed shading and reduced lighting power densities within the office. An energy analysis resulted in a reduction of building ambient loads translating to an estimated annual cost savings of $45,136.09.

Hybrid Ventilation was investigated as a possible design solution for the New York Times Building to reduce energy usage and costs, as well as increase the sustainability profile of the building. The analysis concluded the addition of 18 operable window curtain wall panels on office floors above Level 21, excluding floors 28 and 51. Additionally, a control sequence was developed describing the operation of the windows in response to environmental and space conditions. Natural ventilation would reduce energy usage by an estimated 35% resulting in an annual energy savings of $145,419.

Using the data generated from the original and new Revit envelope models, an additional cost of applying louvers was found to be approximately $8,400,000.00. When applied to the cooling load savings generated by the louvers, a payback period of 14 years was achieved. A study into incorporating photovoltaics into the facade was completed simultaneously. The analysis showed that incorporating a photovoltaic system into parts of the west and south facades would add approximately $2,500,000 to the cost of the facade. This addition showed a payback of approximately 25 years. Finally, the incorporation of operable windows cost an additional $2,500,000.00. A payback period of 15 years was found when analyzed for additional cooling load savings on top of the savings due to the louvers.

Using Integrated Project Delivery and Building Information Modeling, the layout of tenant spaces changed. This change is a result of enclosing the exposed steel within the interior of the building to eliminate thermal differentials. This resulted in an increase of rentable area averaging approximately 2,000 square feet per floor. When the increased area was applied to New York City leasing costs for Class A offices, an average revenue increase of approximately $1,275,000.00 per floor per year was achieved for the Forest City Ratner Companies' spaces.

The goal of reducing structural members per bay was not met due to vibrations. It was determined that the redesigned floor system resulted in a total structural depth increase of 3/4" and an increase cost of $1.58 per square foot. The floor framing system was decreased by 7.5 psf and all columns were disengaged from the lateral system. This change decreased column sizes. Built-up columns were required in the cantilever bays in order to keep with the Architect's vision of no columns at the storefront, however they are not as large as the existing columns.

A proposed interior lighting redesign incorporated task lighting into the design. The proposed redesign would use .469 Watts per square foot. If these savings were applied to the entire building, the resulting energy savings would be approximately $462,200.00 per year.

A ducted side-wall displacement ventilation system was selected to replace the existing unducted Underfloor Air Distribution (UFAD) system to improve the indoor environment for the building occupants by minimizing distribution of dust and contaminants that may collect in the open plenum space. The system was sized utilizing load factors determined by ASHRAE, and a 3D model was created in Revit MEP to ensure space requirements were met with the raised floor system.


The New York Times Building
620 Eighth Avenue | New York | New York | 10018
Owners The New York Times Company
Forest City Ratner Companies
CM AMEC Construction Management, Inc. (Core & Shell)
Turner Construction (NYTimes Interiors)
Architects Renzo Piano Building Workshop
FXFOWLE Architects
Gensler (Interiors)
Structural Thornton Tomasetti
MEP Flack & Kurtz
Function Class A office space plus ground floor retail
Size 52 Stories | 1,500,000 ft²
Cost Approximately $1 Billion
Architecture 48 story cruciform plan tower above 4 story pedistal
Exposed structural system
Open air birch and moss garden
TheTimesCenter cultural center and performance space
Structural
Foundation | 6,000 psi spread footings on bedrock
24-inch diameter steel-encased concrete caissons at southeastern corner
Superstructure | Composite beam & girder floor system with 3" metal deck & 2 1/2" normal-weight concrete
Typical bay size is 30' x 40'
Beam and girder sizes range from W18 to W21
Dog-legged beams extend through facade for UFAD system
Box columns anchor the building at corners
Lateral System | Steel core in tower consisting of K-braces and chevron braces
Outriggers on mechanical floors (28 & 51) to engage all columns in lateral system
Exposed pretensioned rods contribute to the transparency of the building
Connections | Built-up knuckle connection for exterior X-braces
Outriggers oriented in weak direction for ease of connection
Mechanical
Air Distribution | UFAD system for NYT floors (2-27)
Overhead ducted system for floors (29-50)
Floor-by-floor VAV air handlers
Cooling | 6000 ton central chilled water plant
(5) 1150 ton centrifugal chillers
(1) 250 ton single stage absorption chiller
Heating | Low pressure steam throughout building
Steam coils in floor-by-floor air handlers
Heating hot water for perimeter heat
Cogeneration | 1.4 MW cogeneration plant on-site
(2) parallel natural gas-fired reciprocating engines
Waste heat for absorption chiller and perimeter heating
Miscellaneous | Building Automation System is Siemens APOGEE
Automatic wet sprinkler and standpipe system
Waterless urinals and low-flow fixtures
Construction Management
Delivery | Design/Bid/Build and CM-at-risk hybrid
Specialty contractor early involvement
Enclosure | Ceramic tube double-skin curtain wall array over ultra-clear glass
Fluid applied asphalt roof with 24"x24" precast roof pavers and stone ballast
Life Safety | Standpipe system with automatic wet sprinkler system and valved outlets on each floor.
Base Class E addressable fire alarm system along with ADA compliance on each floor.
Transportation | Advance dispatch elevator system.
Internal connecting stairs in NYT spaces.
Lighting/Electrical
Daylighting | Automated roller shading
Daylighting sensors
Horizontal exterior ceramic rods spaced at variable center-to-center distances
Lighting | Lutron "Quantum" Controls system for integrated daylighting, dimming, and shading control
18,000 DALI Dimmable Ballasts
Year Average .38 watts/s.f. Lighting Power Density
Electrical | 6 watts/s.f. demand lighting and power
Provisions for tenant generators
2 electrical closets per floor
Telecom. | Main telephone distribution facility
Multiple service providers
Ben Barben | Erika Bonfanti | Andres Perez Structural
Peter Clarke | Nicole Dubowski | Kyle Horst Mechanical
Craig Casey | Dan Cox | Casey Leman Lighting/Electrical
Matt Hedrick | Chris Wiacek | Justin Miller Construction Management
IPD/BIM SENIOR THESIS 09 | 10
Integrated Project Delivery | Building Information Modeling

ACKNOWLEDGEMENTS

Thesis Sponsers:

The New York Times Company

Thornton Tomassetti Foundation

Thornton Tomassetti

Jeff Callow

Kyle Krall

WSP Flack + Kurtz

CMC Steel Products

Stephen Redman

Desimone Consulting Engineers

Chris Cerino

Epic Metal Corporation

Glen Smith

Jason Walsh

Gannett Fleming

John Lydzinski

Mike McGowan

Vulcraft

Mark Cook

Architectural Engineering Department

Friends & Family

Table of Contents

1 INTRODUCTION

The Pennsylvania State University Architectural Engineering Department, in conjunction with Thornton Tomasetti Foundation and The Leonhard Center for the Enhancement of Engineering Education developed the first multidisciplinary engineering design thesis, incorporating Integrated Project Delivery and Building Information Modeling. Three students from each of the Architectural Engineering disciplines were selected to work collaboratively to investigate The New York Times Building as an academic case study. This report involves the year long work of one student from each of the four options; Construction Management, Lighting/Electrical, Mechanical and Structural.

The New York Times Building was selected for this case study by the Penn State Architectural Engineering Department and Thornton Tomasetti, who was the structural engineer.

With industry moving towards a more integrated design approach with use of Building Information Modeling tools, this academic exercise is meant to prepare the design team for practical application expanding through the future of the industry. The application of an Integrated Project Delivery design process and Building Information Modeling platforms are beginning to gain importance through the industry for the benefits associated with improving the life cycle of buildings.

This thesis contains proposed design ideas, detailed engineering analysis, and construction concepts with documentation of the collaborative working process.

1.1 Introduction to IPD/BIM

1.1.1 Objectives

The purpose of this report is to investigate the use of an Integrated Project Delivery process and Building Information Modeling tools on the design and analysis of The New York Times Building.

1.1.2 Methodology

The first part of the process consisted of an in depth analysis of the existing conditions of The New York Times Building. This was completed through the collaborative effort of all members from each discipline. After the design team completed these analyses, a proposal was developed to investigate alternative designs and construction strategies.

1.1.2.1 BIM Ex Plan

1.1.2.1.1 Overview

Building Information Modeling is a growing term in the construction industry. The problem associated with BIM is that owners request it without proper knowledge of what BIM can do or what they would like BIM to do for their project. By developing a Building Information Modeling Execution Plan, owners, designers, engineers and management teams will know exactly what they will get out of BIM on their project as well as be able to plan and track the information flow throughout the project. A breakdown of the BIM Project Execution Planning Procedure provided by Penn State CIC Research can be viewed in Figure 1.

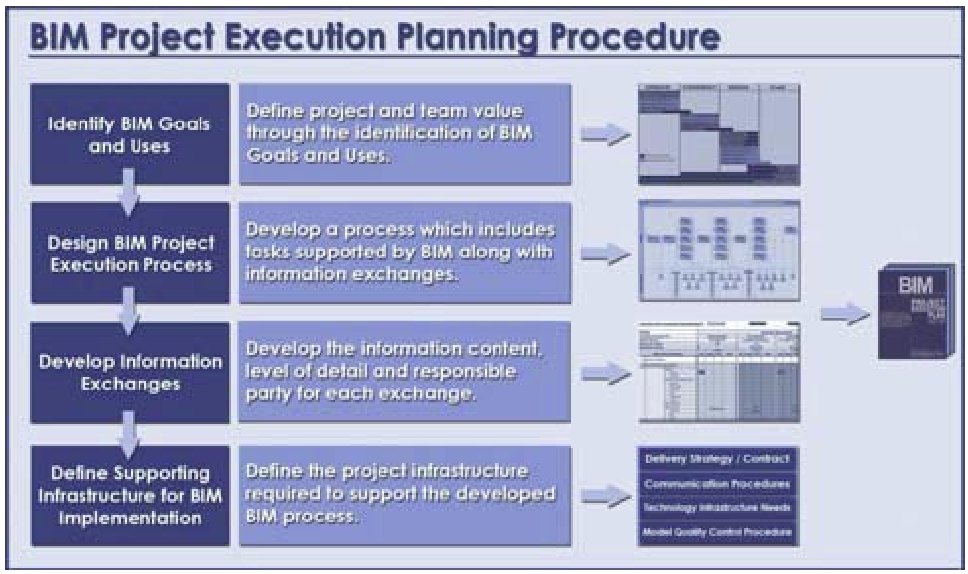


Figure 1: BIM Execution Planning Procedure

With the integrated approach of the IPD/BIM thesis, one major obstacle is the control of information and work of the team. By tracking the flow of information throughout the project, the collaboration between team members will be controlled for the project. Developing goals for the project and the team are a key to success of the project.

As a group, we worked together to develop a Building Information Model Execution Plan during the fall semester as a means of guiding the team through the analysis process. The team also used the plan to control the push and pull of information to and from different members of the team. This created a schedule with deadlines for when certain information is needed by, and which team members are responsible for supplying that information.

1.1.2.1.2 Process

Steps taken included:

- Updated and developed BIM goals and uses throughout spring semester. Shown in Table 1.
- Implemented and updated the BIM use analysis to determine which uses will be included in the research. Shown in Table 2.
- Develop a Overview Process Map to work as a schedule for the Team. Shown inFigure 2.
- Modify and update the Process Map throughout the spring semester.
- Continually enforce the Process Map to ensure team success.
- Continuously updated and enforced the Team 1 semester schedule. Shown in Figure 3.

1.1.2.1.3 Expected Outcome

It is expected that by developing, updating and enforcing the BIM Execution Plan, the project will become more efficient and provide a superior finished product. This Execution Plan will provide strict dates of completion which each team member must abide by to insure the other member's success. Transfer of information and collaboration between the team members will be critical to the success of this undertaking and the final deliverable will be a fully developed process model, an analysis of the BIM Execution process, advantages and disadvantages, and a successful team thesis.

Priority (1-3)	Goal Description	Potential BIM Uses
1- Most Important	Value added objectives	
0	Pull all ideas together (Unification);(Sustainability)	ALL
1	Preserve Architectural Integrity (Desires of Owner)	Design Reviews, Design Authoring, Record Modeling
1	Emphasize Energy Efficiency (Carbon Neutral)	Energy Analysis, LEED Evaluation
1	Maintain/Exceed Occupant Safety/Health/Comfort	Energy Analysis, Daylighting Analysis, Code Validation, Structural Analysis, Disaster Planning
2	Optimize façade to meet goals	Energy Analysis, Lighting Analysis, LEED Evaluation, Site Analysis, Structural Analysis, Cost Estimation, Construction System Design
2	Optimize Electric Lighting to respond to Daylight	Lighting Analysis, Energy Analysis
2	Optimize Structural System for increased space, reduce construction duration, reduce cost	Structural Analysis, 4D Modeling, Cost Estimation, Construction System Design
3	Increase profitability of the building	Cost estimation, 4D Coordination, Digital Fabrication, Virtual Mockup

Table 1: IPD/BIM Team 1 BIM GOALS and Uses

BIM Use*	Value to Project	Responsible Party	Value to Resp Party	Capability Rating			Additional Resources / Competencies Required to Implement	Notes	Proceed with Use
	High / Med / Low		High / Med / Low	Scale 1-3 (1 = Low)					YES / NO / MAYBE
				Resources	Competency	Experience			
Maintenance Scheduling	LOW	NONE							**N**
Building Systems Analysis	HIGH	Ben	H			2			**Y**
		Craig	H			2			
		Nicole	H			2			
Record Modeling	MED	Justin	L			1			**N**
Cost Estimation	HIGH	Justin	H			2			**Y**
4D Modeling	MED	Justin	H			3			**Y**
Site Utilization Planning	LOW	Justin	L			1			**N**
Layout Control & Planning	LOW	Justin	L			1			**N**
3D Coordination (Construction)	LOW	Justin	M			2			**N**
Structural Analysis	HIGH	Ben	H			3			**Y**
Mechanical Analysis	HIGH	Nicole	H			2			**Y**
Lighting Analysis	HIGH	Craig	H			3			**Y**
Energy Analysis	HIGH	Nicole	H			2			**Y**
Site Analysis	HIGH	ALL	H			2			**Y**
Design Reviews	HIGH	ALL	H			2			**Y**
3D Coordination (Design)	HIGH	ALL	H			2			**Y**
Existing Conditions Modeling	HIGH	ALL	M			3			**Y**
Design Authoring	HIGH	ALL	H			3			**Y**
Programming	LOW	BOB	H			1			**N**
LEED Evaluation	LOW	ALL	L			1			**M**
Construction System Design	MED	Justin	H			1			**M**
Virtual Mockup	MED	All	H			3			**Y**

Table 2: IPD/BIM Team 1 BIM Use Analysis

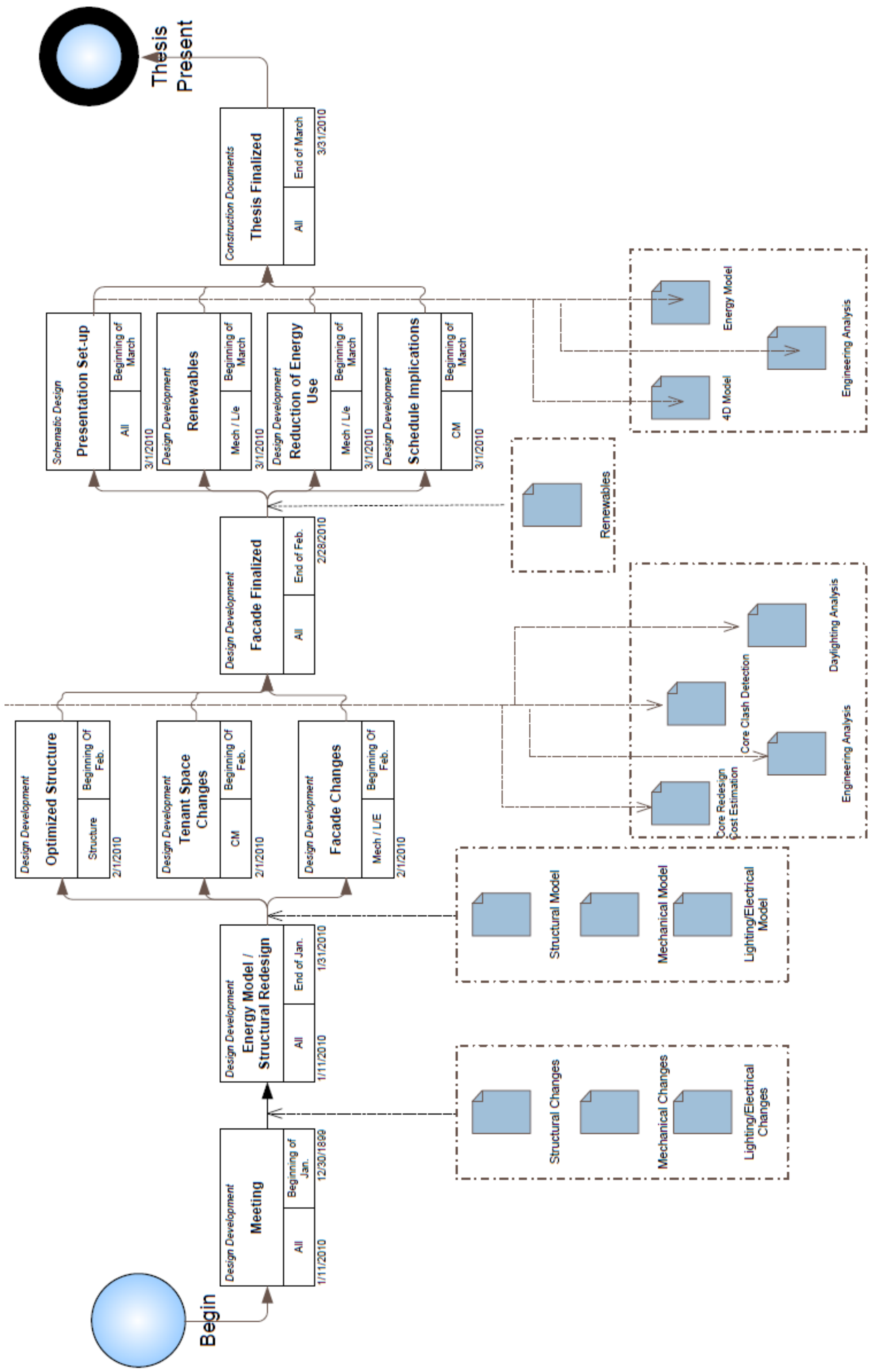


Figure 2: IPD/BIM Team 1 Overview Process Map and Schedule

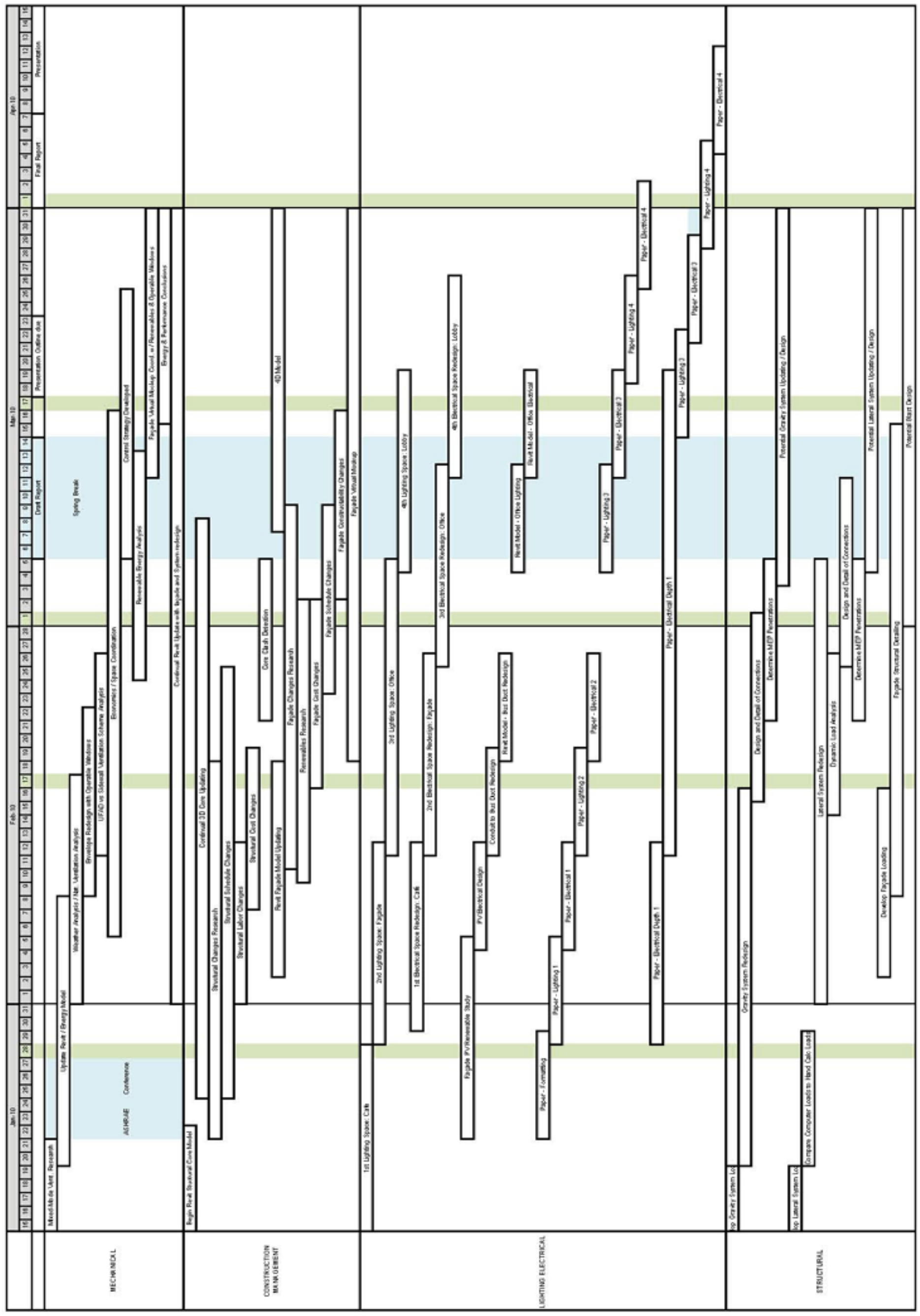


Figure 3: Team Schedule

Milestone 1 – Energy Model / Structural Redesign

Milestone 2 – Go / No-Go

Milestone 3 – Façade Redesign

Milestone 4 – Renewables/Energy Use/Feasibility

Milestone 5 – Finalize Report/Presentation

1.1.2.2 Charettes

Design team meetings were utilized consistently throughout the semester to allow for the exchange of central design information between members of the design team.

1.1.2.3 Interoperability

Each discipline explored various opportunities to utilize software interoperability specific to their respective analyses. The outcomes were documented and are discussed further in this report.

1.2 Building Statistics

1.2.1 **Site and Architecture**

The New York Times building is a 52 story tower located at 620 Eighth Ave., New York City. Jointly owned by The New York Times Company and the developer Forest City Ratner Companies, the first, twenty-eighth, and fifty-first floors are co-owned by both companies, with the first floor including retail, restaurant and performance spaces. The twenty-eighth and fifty-first floors are mechanical spaces serving both companies. The New York Times Company solely owns floors two through twenty-seven, and Forest City Ratner Companies owns floors twenty-nine and above. The building contains the new headquarters for The New York Times as well as several leasing companies in the Forest City Ratner Spaces.

Figure 4: New York Times Building Location, Source: Bing Maps

Architects Renzo Piano Building Workshop in association with FXFOWLE Architects locally, designed the building as a forty-eight story tower on top of a four story pedestal. The pedestal floors are approximately 79,000 sq. ft. and the tower floors average approximately 26,000 sq. ft. of Class A office space. The pedestal contains TheTimesCenter cultural center and performance space along with an open-air paper birch garden. The first floor also contains restaurant and retail spaces within the lobby. At

746 feet tall, The New York Times Building took the architects vision of transparency to a new level by using an exposed steel structure and ultra clear glass from floor to ceiling on the facade. The facade also includes a ceramic rod shading system on the exterior to help control daylighting and heat gain throughout the spaces.

Figure 5: New York City Panorama

1.2.2 **Structural Existing Conditions**

1.2.2.1 Foundations

The New York Times Building was designed with a single basement level to limit excavation at the site. The foundation of the New York Times Headquarters combines typical spread footings with caissons to achieve its capacity. Below the building's 16-foot basement, the majority of the building sits on rock with an allowable bearing capacity of 40 ton per square foot. However in the southern region of the podium sits on rock with an allowable bearing capacity of 20 ton per square foot. After a final investigation was performed, it was discovered that a portion of rock at the southeastern corner of the site, which that tower sits on, had an allowable bearing capacity of 8 ton per square foot. As a result, 7 of the 30 columns are supported by 24-inch diameter 6,000 psi concrete-filled steel caissons of unknown length shown in Figure 6. Each caisson was designed to support a load of 2,400 kips.

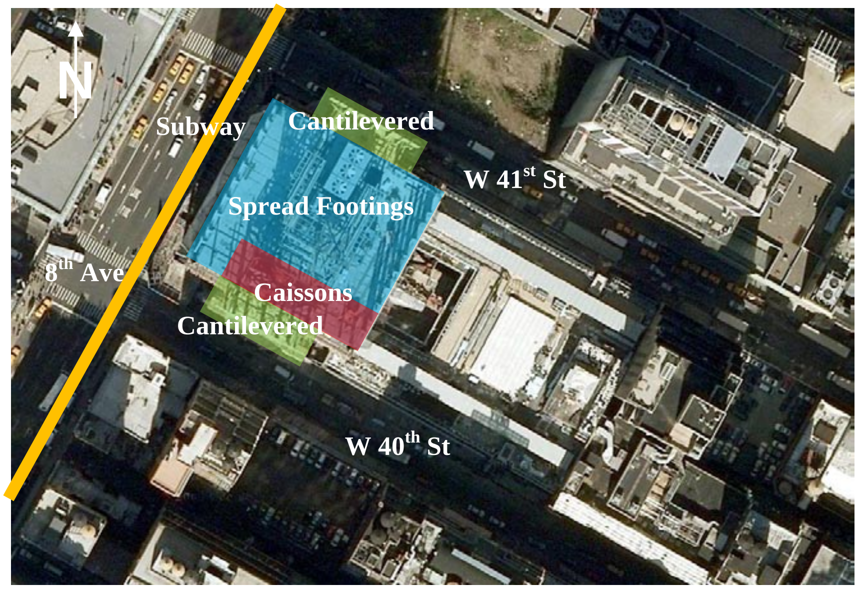


Figure 6: Foundation Location

The other 23 columns, indicated in Figure 6 are supported by spread footings with 6,000 psi concrete. The columns which fall in the cantilevered areas of the tower do not directly transfer load to the ground which removes the need for footings at these locations. The New York City Subway travels below Eighth Avenue which is located on the Northwestern side of the site. Though, the subway does not pass directly under the structure, vibrations may have impacted the design of the foundations and structure.

1.2.2.2 Floor System

The floor system is a composite system with a typical bay size of 30'-0" x 40'-0" surrounding a 90'-0" x 65'-0" core. Refer to Appendix 7.1, Figure 129 on page 212 for a typical floor plan. There are 60'-0" x 20'-0" cantilever bays on the Northeast and Southwest sides of the tower. The floor system is made up of 2 ½" normal weight concrete on 3" metal deck, typically spanning 10'-0" from W12s to W18s infill beams. The beams then span into W18 girders which frame into various 30" x 30" built-up columns. The exterior columns consist of two 30" long flange plates and two web plates inset 3" from the exterior of the column on either side. The flange and web plates vary from 4" thick and 7" thick respectively at the ground floor to 2" thick and 1" thick respectively at the fifty second floor. This is to account for the different steel areas needed for the higher forces at the bottom of the building. The yield strength of the plates also varies with tower height for needed strength. To maintain consistent proportions at all floors, a hierarchy of flange plate thicknesses was developed. The box column hierarchy can be seen in Figure 7.

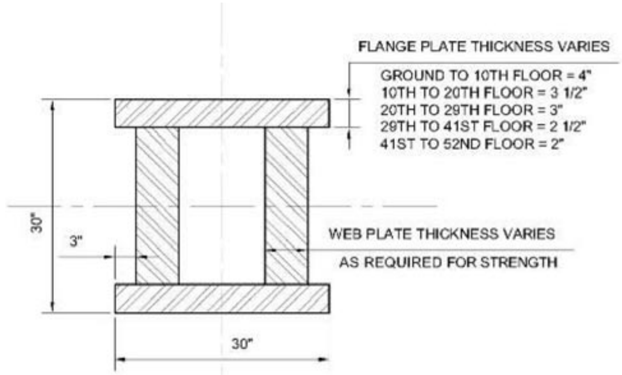


Figure 7: Box Column hierarchy, courtesy of Thornton Tomasetti

Framing of the core consists of W12 and HSS shapes framing into W14 and W16 shapes which frame into W33 girders that frame into the core columns. These columns are a combination of built-up plate sections and rolled shapes. Column locations stay consistent throughout the height of the building, and every perimeter column is engaged in the lateral system which will be described later.

In the New York Times spaces, the structural slab is 16" below the finish floor and the spandrel panel, due to the raised floor system for the under floor mechanical systems. For all the exterior steel of the building to maintain a centerline at the center of the spandrel panel, a crooked connection or 'dog-leg' was used. The 'dog-leg' connection allows for the end of the beam to rise 10" before it leaves the interior of the building and penetrates the building envelope. Figure 8 shows the ‘dog-leg’ prior to metal deck installation and Figure 9 shows the ‘dog-leg’ connection penetrating the building envelope.

Figure 8: 'Dog-leg' beam prior to metal deck installation, courtesy of Thornton Tomasetti

Figure 9: 'Dog-leg' penetrating building envelope

1.2.2.3 Vierendeel Frame

To prevent columns obstructing the glass storefronts at the ground level, a Vierendeel system was used at the 20’-0” cantilever sections of the tower. The middle lines of the cantilevered bays have beams moment connected to the columns engaging every floor except at the outrigger levels. At the outrigger level; floor twenty eight and fifty one, large diagonal braces tie the middle line back to the core through the outrigger trusses. In extreme loading conditions, this provides a redundant load path. See Figure 11 and Figure 12 for Vierendeel frame location. At the exterior beam lines of the cantilever, 2" diameter steel rods were connected from the columns to the ends of the beams to control deflection at every floor. This allowed the beams to be designed only for strength, thus avoiding bulky exterior members.

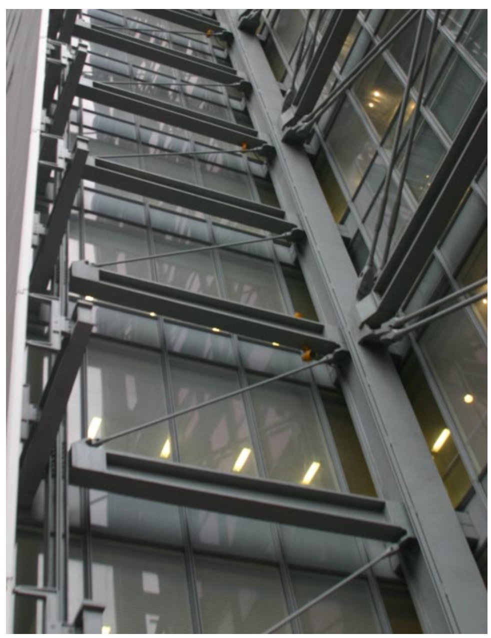


Figure 10: Cantilevered bays from exterior

1.2.2.4 Lateral System

The main lateral load resisting system for the tower of The New York Times Building consists of a centralized, steel braced frame core, with outriggers on the two mechanical floors. The structural core consists of concentric braces behind elevator shafts and eccentric braces at the elevator lobby entrances. The core configuration remains consistent from the ground level to the twenty seventh floor as shown in Appendix

Figure 136 on page 214.

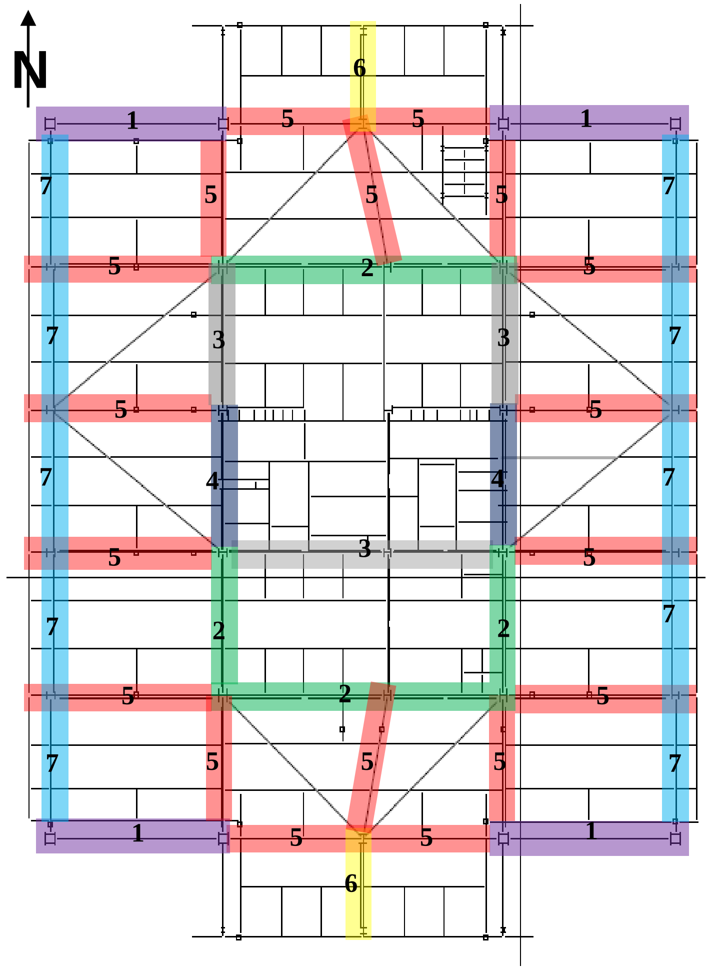


Figure 11: 28th Floor Mechanical Floor Framing Plan

Key:

- Pre-Tensioned Steel Rod X-Bracing (1)
- Concentric Chevron Core Bracing (2)
- Eccentric Chevron Core Bracing (3)
- Single Diagonal Brace (4)
- Outrigger Bracing (5)
- Vierendeel System at Cantilever (6)
- Thermal Trusses (7)

Above the twenty eighth floor, the low rise elevators were no longer required, and the number of bracing lines in the North-South direction was reduced from two to one, shown in Appendix

Figure 136 and Figure 137 on page 214 and 215. The outriggers consist of diagonal braces shown in Figure 11 and Figure 12 on the next page 24, which increases the stiffness of the tower by engaging the exterior and interior columns in the lateral system. For elevations and construction pictures of the outriggers refer to Appendix

Figure 130 through Figure 135 on page 212 through page 213.

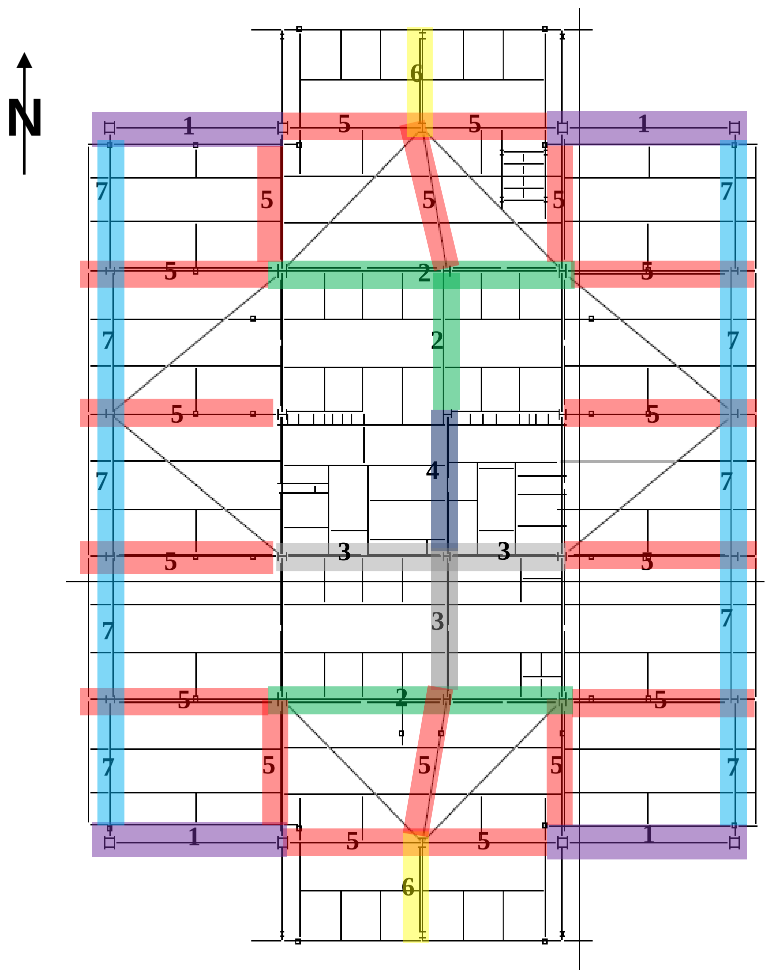


Figure 12: 51st Floor Mechanical Floor Framing Plan

In order to reduce lateral drift and acceleration, the double story steel rod X-braces were utilized instead of increasing the member sizes of the main lateral force resisting system which were sized for strength. The high strength steel rods shown in Figure 12 transition from 2.5" to 4" in diameter and were prestressed to 210 kips. With the addition of the X-braces in the main lateral force resisting system, the calculated deflection of the tower due to wind was L/450 with a 10 year return period and a building acceleration of less than 25 milli-g's for non-hurricane winds.

1.2.2.5 Thermal Differentials

Thermal differentials had to be considered due to interior steel members being maintained at room temperature and exposed steel members undergoing continual temperature changes. Using the National Building Code of Canada and a Rowan Williams Davies and Irwin, Inc report, the structure was designed using a range of -10˚F to 130 ˚F. As a result thirty different thermal load combinations were applied to one side of the building which had more differential temperatures than the other sides. In addition, these combinations also reflect potential differential temperatures in the box columns and steel rods. In the initial analysis, it was determined that outriggers on the fifty first floor in the West-East direction were adequate in limiting the differential deflections between the exposed box columns and the interior columns. However in the North-South direction differential deflections exceeded L/100 due to lack of outriggers. To combat these thermal differentials, a thermal belt trusses was utilized at the twenty eighth and fifty first floors. These trusses shown in Figure 11 and Figure 12 on page 23 and 24 provide bonus redundancy and limited deflection to L/300.

1.2.3 Mechanical Existing Conditions

The New York Times building was designed to meet the plaNYC 2030 initiative, which strives to improve the built environment by reducing green house gas emissions by 30 percent. There were several integrated design approaches taken to meet these goals. Flack and Kurtz worked alongside architects Renzo Piano and FXFOWLE to provide Mechanical, Electrical, Plumbing, Fire protection and Telecommunications design for the core and shell. Flack and Kurtz also partnered with Gensler to design the interior fit-out. Using an integrated approach, a high performance facade was developed which uses low iron clear glass and ceramic rods for passive external shading.

The building cooling load is served by a 6250 ton chilled water system, which consists of five 1,200 ton centrifugal chillers and one 250 ton single stage absorption chiller. The chilled water is pre-cooled by the absorption chiller before it enters the centrifugal chillers. A natural gas-fired cogeneration plant with two parallel reciprocating engines provides the waste heat to run the absorption chiller. Both the chilled and condenser water system utilizes a variable flow primary pumping scheme, and a water-side economizer which provides “free cooling” and increased energy savings. Heating for the building is provided via high-pressure steam purchased from Consolidated Edison. Low-pressure steam is then distributed to each floor-by-floor air handler’s heating coil. At an added cost, the New York Times Company also uses steam to humidify outdoor air.

Air distribution is achieved via variable air volume boxes for interior zones and fan powered boxes with heating coils for exterior zones. The floors occupied by the New York Times utilize an UFAD system. Swirl diffusers were installed to provide occupant control, while in high occupancy spaces perforated floor tiles provide a more visually pleasing layout. A traditional overhead ducted system was implemented on the Forest City Ratner floors. Demand controlled ventilation is achieved via carbon dioxide and VOC sensors located in the return ducts for each floor. Outdoor air is brought in through outdoor air units in the two mechanical penthouses on the 28th and 51st floors, and then is distributed throughout the building.

The cogeneration plant provides 1.4 MW of electricity for the building year-round, and is located on the 5th floor roof of the podium building. With an efficiency of 85%, the plant provides 40% of the power needs of the New York Times Company. The plant waste heat is used in an absorption chiller to pre-cool the chilled water for the electrical chiller plant. Waste heat is also used to produce perimeter heating hot water in the winter months. The cogeneration plant's primary purpose is an uninterrupted power supply for critical spaces such as the New York Time's data center. The cogeneration plant is not connected to the grid for re-metering, but the site is backed up by on-site diesel generators.

1.2.4 **Lighting/ Electrical Existing Conditions**

1.2.4.1 Lighting Design

The design concept for the New York Times Building was to set a new standard for high rise development. The architect, Renzo Piano, was focused on establishing an archetypal beacon in the New York skyline. The ideas that are apparent throughout the design are lightness and transparency. To keep consistency with those concepts, the lighting design needed to highlight the exterior façade and also give spectators a view of the interior spaces. For individuals inside the building, the architecture was aimed at providing unimpeded views to the exterior from any location on any floor. Daylighting was an important factor that guided much of the architecture. The building is able to reduce most of the lighting load during the day due to proper daylighting. This was further confirmed by the day to day data collection by NYT.

Upon entering the building, one is immediately pulled from the crowded urban streets and plunged into the colorful and spacious lobby. The space is filled with rich colors and instantly instills a sense of comfort and relaxation. The lighting is very subtle but provides a bright and warm atmosphere. Daylight also fills the space from the curtain walls surrounding the exterior, as well as the courtyard in the center of the podium.

Continuing through the building to the office spaces, the ideas of lightness and transparency are kept intact. The office floors are lit to promote activity but still have a comfortable feeling similar to the main lobby. Each floor continues to please individuals with warm, vibrant colors. Every floor offers daylight and views to the exterior from any location.

The lighting system is comprised of around 18,000 luminaires. This large quantity is simplified by the use of only 20 different luminaire styles. This manner of product selection helps reduce the complexity of the design and also provides a sense of consistency through each space. The entire building utilizes a digitally addressable lighting interface (DALI) system with dimmable ballasts to harvest the benefits of daylight. The system provides energy savings above 50 percent. There are 15 zones per floor, each with their own photosensor. Every luminaire within a zone takes input from the respective photosensor and dims accordingly. The system also allows for the programming of individual luminaires to accommodate to varying lighting needs.

The overall design is impeccable. The lighting strategy utilizes the most advanced lighting solutions to provide complete control over each space. This report takes an in depth look at the lighting systems and daylight integration controls.

1.2.4.2 Electrical Design

The New York Times building is comprised of two main tenants; The New York Times and the Forest City Ratner Companies (FCRC). These two tenants have two different distribution methods throughout the building. The New York Times tenants use conduit for all feeders throughout their part of the building, whereas the FCRC tenants run bus-duct throughout their part of the building.

A commonality between them is the shared incoming service. Though the system is metered for every tenant, including the per floor fit-out of the FCRC floors, Consolidated Edison provides a main utility entrance to the entire building. The service entrance is located in the cellar and distributed from there to each of the floors above. The New York Times tenants also have a co-generation plant, 1.4 Megawatts, to supplement the utility need. Due to the importance of servers in the New York Times spaces, a UPS system is also located in the cellar and distributed accordingly. The entire building has a main diesel generator for emergency use. The building has the ability to have remote generators connected at street level, should the generator need to be serviced.

While the lighting, appliance, and mechanical panels are on a floor-by-floor design, the emergency panels are located every third floor. In addition, the UPS system has panels spaced out in a similar design. Each floor contains an east and west electrical room. The loads are ran to the nearest electrical room. Each floor also houses a mechanical room and a server room. The mechanical is believed to contain certain mechanical panels, though no information is available.

1.2.5 **Construction Management Existing Conditions**

1.2.5.1 Project Schedule

The detailed schedule represents the important activities that occurred during the construction of the New York Times Building. Below are some key durations and milestones, shown in Table 3, and Table 4 respectively, that were used in the General Conditions Estimate, shown in Table 13. A summary schedule is located below in Figure 13, and a detailed construction schedule is located in Appendix 7.1 on page 216.

ACTIVITY	YEARS	MONTHS	WEEKS	WORK DAYS
Construction Duration	3.5	42	182	910
Tower Crane	1.25	15	65	325
Material Hoists	2	24	104	520
Demolition	0.5	6	26	130
Foundations	1.5	18	78	390
Steel	1.5	18	78	390
Concrete	0.75	9	39	195
Curtainwall	1.25	15	65	325
Mech./Plum.	3	36	156	780
Electrical	2	24	104	520
Interiors	1.75	21	91	455

Table 3: Key Construction Durations

DURATIONS	DATE	DURATIONS	DATE
Start of Construction	12/1/2003	Concrete Fill / Tower Topout	8/23/2006
Start Demolition	12/1/2003	Curtainwall - Poduim Finish	3/13/2006
Finish Demolition	6/30/2004	Curtainwall - Tower	1/3/2007
Start of Excavation Foundations	4/19/2004	MP - Start	5/3/2004
Finish Foundations	9/12/2005	MP - Finish	4/23/2007
Start of Steel Erection (Tower)	5/2/2005	Electrical - Start	8/19/2005
Start of Steel Erection (Podium)	7/26/2005	Electrical - Finish	4/12/2007
Steel Top Out	5/24/2006	Interior Finishes - Start	10/3/2005
Mobilize Podium Concrete	10/24/2005	Interior Finishes - Finish	6/20/2007
Podium Concrete Finished	12/6/2005	Remove Tower Cranes	7/25/2006
Mobilize Tower Concrete	7/18/2005	Remove Hoists	5/31/2007
Pour Concrete 51,52	7/24/2006	Project Closeout	6/20/2007

Table 4: Key Construction Deadlines

ID	Task Name	Duration	Start	Finish
1	Owner Acquisition	657 days	Mon 7/2/01	Tue 1/6/04
2	Documents Available	609 days	Mon 7/2/01	Thu 10/30/03
3	Bid and Award	223 days	Tue 8/19/03	Thu 6/24/04
4	Site Mobilization/Abatement and Demo	140 days	Mon 12/1/03	Fri 6/11/04
5	**Foundations**	**330 days**	**Mon 12/22/03**	**Fri 3/25/05**
9	**Superstructure**	**1058 days**	**Mon 3/3/03**	**Wed 3/21/07**
10	**Steel and Metal Deck**	**699 days**	**Fri 9/19/03**	**Wed 5/24/06**
19	**Concrete**	**590 days**	**Fri 2/6/04**	**Thu 5/11/06**
24	**Intumescent Paint Fireproofing**	**288 days**	**Thu 4/28/05**	**Mon 6/5/06**
29	**Spray Fireproofing**	**291 days**	**Wed 3/23/05**	**Wed 5/3/06**
34	**Curtain Wall**	**1058 days**	**Mon 3/3/03**	**Wed 3/21/07**
45	**Roofing**	**354 days**	**Mon 6/6/05**	**Fri 10/13/06**
51	**Building Systems**	**827 days**	**Wed 2/11/04**	**Thu 4/12/07**
52	Utilities	242 days	Thu 10/14/04	Fri 9/16/05
53	MEP Coordination	214 days	Wed 2/11/04	Mon 12/6/04
54	B.A.T.C	469 days	Mon 6/27/05	Thu 4/12/07
55	HVAC	618 days	Wed 9/1/04	Fri 1/12/07
56	Plumbing	367 days	Wed 9/1/04	Thu 1/26/06
57	Fire Protection	432 days	Tue 5/10/05	Wed 1/3/07
58	Electrical	432 days	Tue 5/10/05	Wed 1/3/07
59	Fire Alarm	404 days	Mon 6/27/05	Thu 1/11/07
60	**Interior Finishes**	**434 days**	**Wed 6/15/05**	**Mon 2/12/07**
61	Core Program	434 days	Wed 6/15/05	Mon 2/12/07
62	Perimeter Program	304 days	Thu 7/21/05	Tue 9/19/06
63	NYT - Interior Program - Floor Handover	128 days	Tue 12/27/05	Thu 6/22/06
64	FCRC - Turnovers	86 days	Mon 10/9/06	Mon 2/5/07
65	**Finish and Closeout**	**446 days**	**Mon 8/22/05**	**Tue 5/8/07**

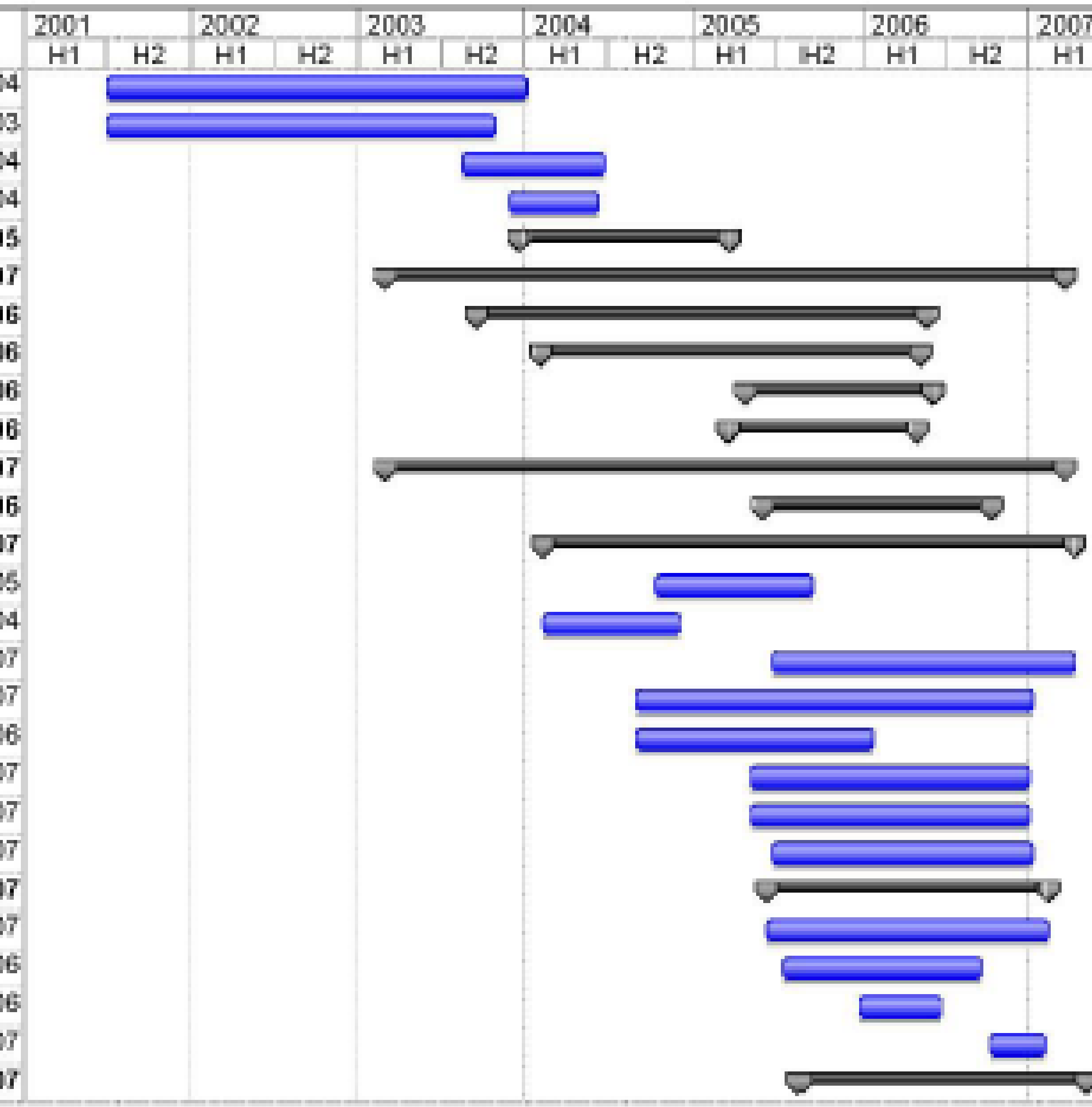


Figure 13: Construction Summary Schedule

1.2.5.2 Project Estimate

Information was fairly difficult to obtain with regards to the New York Times Building Project. Much of the following information has been compiled and calculated using some conservative assumptions. The figures in the following section will include sources or assumptions from which the information has been found or calculated. The Architectural Record Project Portfolio of the New York Times Building states that the cost of the building "exceeds $1 billion." For the purposes of remaining consistent in this report, the construction cost of the project will be assumed to be $1 billion. A brief cost breakdown is shown in Table 5 :

Construction Cost	Construction Cost per Square Foot
$ 1,000,000,000.00	$667 / ft^2

Table 5: Brief Construction Cost Breakdown

There is not a detailed breakdown of actual systems cost for this project. A breakdown of systems cost will be outlined in the parametric cost estimate section below. This will provide a reference for approximately how much the systems of the building cost.

1.2.5.2.1 PARAMETRIC ESTIMATE WITH D4COST

There are very few buildings in the world that are similar to the New York Times Building in size and distinction. Because of its uniqueness, it was difficult to obtain similar buildings within the D4Cost estimation software that compare. The following four projects were selected in order to get a representative parametric estimate for the project. The buildings used for analysis are shown below in Table 6 :

Project Name	Project Location	Building Use	Size	Floors	Cost	Comparison to NYT
Ha-Lo Headquarters	Niles, IL	Office	267,334 ft^2	7	$40,134,138	Building Type, Tower Form
NYS DOT Region One Headquarters	Schenectady, NY	Office	125,000 ft^2	4	$18,914,056	Building Type, LEED Silver
Preston Point Office/Retail/Condo	Louisville, KY	Office	105,768 ft^2	8	$8,505,277	Building Type, Tower Form
SRO Residence	New York, NY	Residential	23,853 ft^2	5	$2,830,057	Location

Table 6: D4 Building Selection

The first three projects were mainly chosen for their building type and relative size. There were not many tower structures in D4Cost and there were no "skyscrapers" in the project database. The NYS DOT project was especially useful in the estimate because it was a LEED Silver certified building. Increases in the systems cost due to the sustainable features of the New York Times Building can be found in the NYS DOT project. A smart averaging function was run with these projects selected, which produced a cost breakdown that would be similar to the New York Times Building. D4Cost came up with a total project cost of **$432,957,936** with a square foot cost of **$288.64/SF**. The estimate also includes costs of each division of the project. A detailed breakdown is available in Appendix 7.1, on page 221. The following is a breakdown of the costs of the major systems in the building, shown in Table 7:

System	Percentage of Project Cost	Cost per ft^2	System Cost for Total D4 Estimated Cost ($432,957,936)	System Cost Projected for $1 Billion Project Cost
Electrical	19.97%	$57.65	$86,467,871	$199,700,000
Mechanical	17.49%	$50.48	$75,721,782	$174,900,000
Site Work	2.03%	$5.87	$8,801,948	$20,300,000
:eel and Concrete	17.93%	$51.77	$77,657,644	$173,300,000

Table 7: Major Systems Cost Breakdown

Due to the change in CSI MasterFormat, multiple divisions had to be combined in order to come up with the systems costs. These systems costs are broken up in order to gain an accurate picture of the estimated costs of each of the systems and the projected cost of the systems actually installed in the New York Times Building.

1.2.5.2.2 RS MEANS SQUARE FOOT ESTIMATE

In order to obtain a more relevant square foot estimate in RS Means, a large amount of assumptions were required to be made. R.S. Means has no estimate for an office building that is more than 20 stories similar to the New York Times Building. The estimate was formed from the 11-20 story office building square foot estimate breakdown. The building system profile that was used was a double glazed heat absorbing tinted plate glass panels with a steel frame construction that had an area of 800,000 SF and a perimeter of 820 LF. This yielded a base cost per SF of $139.50. The following adjustments were made to fit the profile of the New York Times Building, shown in Table 8:

Base Cost per SF	From RS Means	139.5	per SF
Parimeter Adjustment	1,150 - 820 =	330	LF
	330/100 * 1.3 =	**$ 4.29**	**per SF**
Story Height Adjustment	14' - 10' =	4	ft
	4' * 0.95 =	**$ 3.80**	**per SF**
Total Cost per SF	Cost per SF	**$ 147.59**	**per SF**
	Total SF Cost	**$ 221,385,000**	
Basement Adjustment	Basement Area	72,000	SF
	Add per SF	$ 36.40	per SF
	Total	**$ 2,620,800**	

Elevator Adjustment
4000# Capacity

	Quantity	Stops	Base Elevator Cost (Each)	Stops To Add	$ per Add Stop	Add Stop $ (Each)	Total Elevator Cost
Podium	3	4	$ 433,000	-6	$ 13,600	$ (81,600)	$ 1,054,200
Low Rise	6	15	$ 433,000	5	$ 13,600	$ 68,000	$ 3,006,000
Mid-Low Rise	6	28	$ 433,000	18	$ 13,600	$ 244,800	$ 4,066,800
Mid-High Rise	8	39	$ 433,000	29	$ 13,600	$ 394,400	$ 6,619,200
High Rise	6	52	$ 433,000	42	$ 13,600	$ 571,200	$ 6,025,200
Service	2	53	$ 433,000	43	$ 13,600	$ 584,800	$ 2,035,600
						Total	**$ 22,807,000**

Total Square Foot Estimate **$ 246,812,800**

Table 8: R.S. Means Cost Data

1.2.5.3 Existing Site Plan

The New York Times Building is located in downtown Manhattan, directly across 8th Ave. from the Port Authority Bus Terminal and approximately eight blocks Northwest from the Empire State Building. Due to a time lapse with regard to updating satellite imagery some visual data of the site when it was in construction can still be acquired through using Google Maps and Google Maps Street View, and several inferences can be made with regard to site logistics and temporary structures. A summary of the existing site plan is show n below in Table 9. For a more detailed site plan, refer to Appendix 7.1 on page 225.

The site was originally occupied by a variety of different functional areas, ranging from grade-level parking to multi-story mixed-use commercial and residential buildings. The site is bordered by two subway structures on the west and north sides. The 8th Avenue subway runs beneath 8th Avenue to the west, and the Flushing Local subway line runs beneath West 41st street to the north. The subway structure is roughly a box shape in the case of the 8th Avenue subway, while the subway was bored through the bedrock itself for the Flushing Local. Additionally, there is a pedestrian passageway constructed above the subway using cut and cover methods.

The building is surrounded by a variety of different building types, and coupled with the urban environment this creates significant pedestrian and vehicular traffic. Fencing around the perimeter of the site was erected to keep a secure site, as well as temporary Jersey Barriers to provide a temporary sidewalk in the surrounding streets. Pedestrian safety was a major concern during construction, and building codes required temporary structures for pedestrian protection as shown in Appendix 7.1 on page 226.

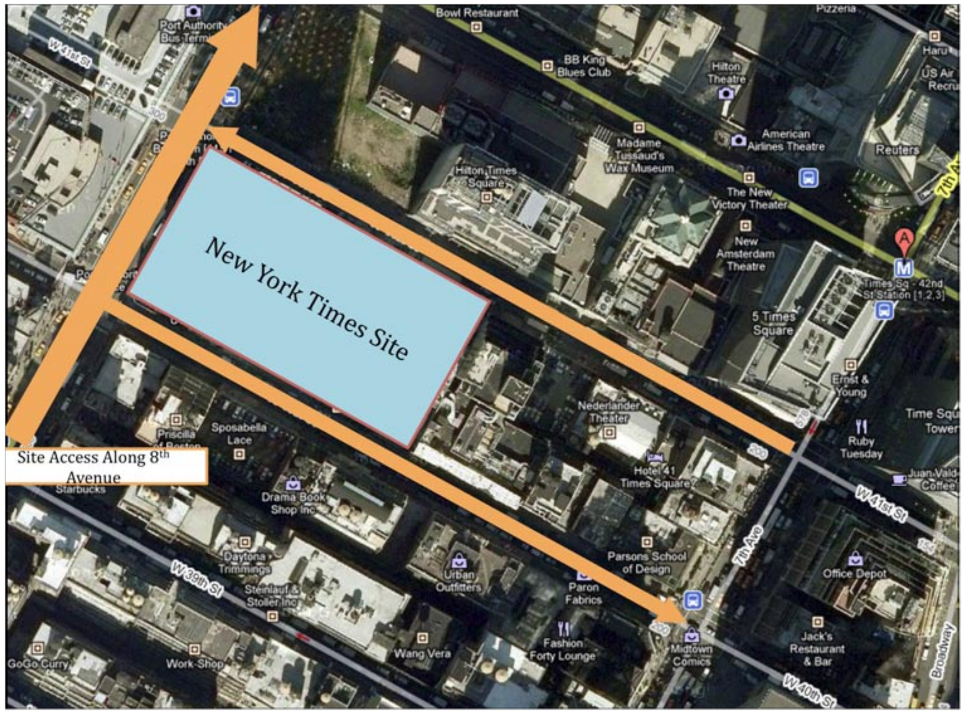


Table 9: Existing Site Plan

1.2.5.4 Project Delivery Method

The New York Times Building utilizes a hybrid system of a Design-Bid-Build with a Construction Manager at-risk delivery. The core and shell delivery is by AMEC construction. Turner Construction Company delivers the interiors for the New York Times spaces. Floors 29 and above are owned by the developer Forest City Ratner Companies, and are to be constructed to the needs of the tenants. In a CM-at-risk delivery method, the owners hold contracts with the design team, architects and engineers, while the CM-at-risk holds contracts with the subcontractors. The construction management firm holds all risk by guaranteeing the cost and schedule to the owners. The hybrid system comes from the involvement of the design and construction teams having collaborative meetings to review and change the building design before construction while the owners were holding contracts with the parties. Architects Renzo Piano Building Workshop, along with architects FXFOWLE held design review meetings with interiors architect Gensler, as well as structural engineer Thornton Tomasetti and MEP engineers WSP Flack & Kurtz to discuss the design. These meetings were held before construction as well as throughout the construction of the building. There is also early involvement from specialty contractors, most notably with the curtain wall system. The early involvement from the interiors architect as well as specialty contractors is crucial to the success of the project.

1.2.5.5 Contract Types

While the owners did not release the exact contract types, three main contract types were most likely utilized. These three types are cost plus fee, guaranteed maximum price and lump sum.

The New York Times Company and Forest City Ratner Company most likely held a GMP contract with AMEC Construction and The New York Times Company may have held a cost plus fee contract with Turner due to the repetitive nature of the interiors construction. While this is not exactly known, these are reasonable assumptions toward the delivery of the project.

With a typical Design-Bid-Build / CM-at-risk delivery method, the construction manager is contractually bound to the subcontractors. While not confirmed, it can be assumed that AMEC Construction holds contracts with the subcontractors, most likely being a lump sum contract. A organizational chart is located below in Figure 14.

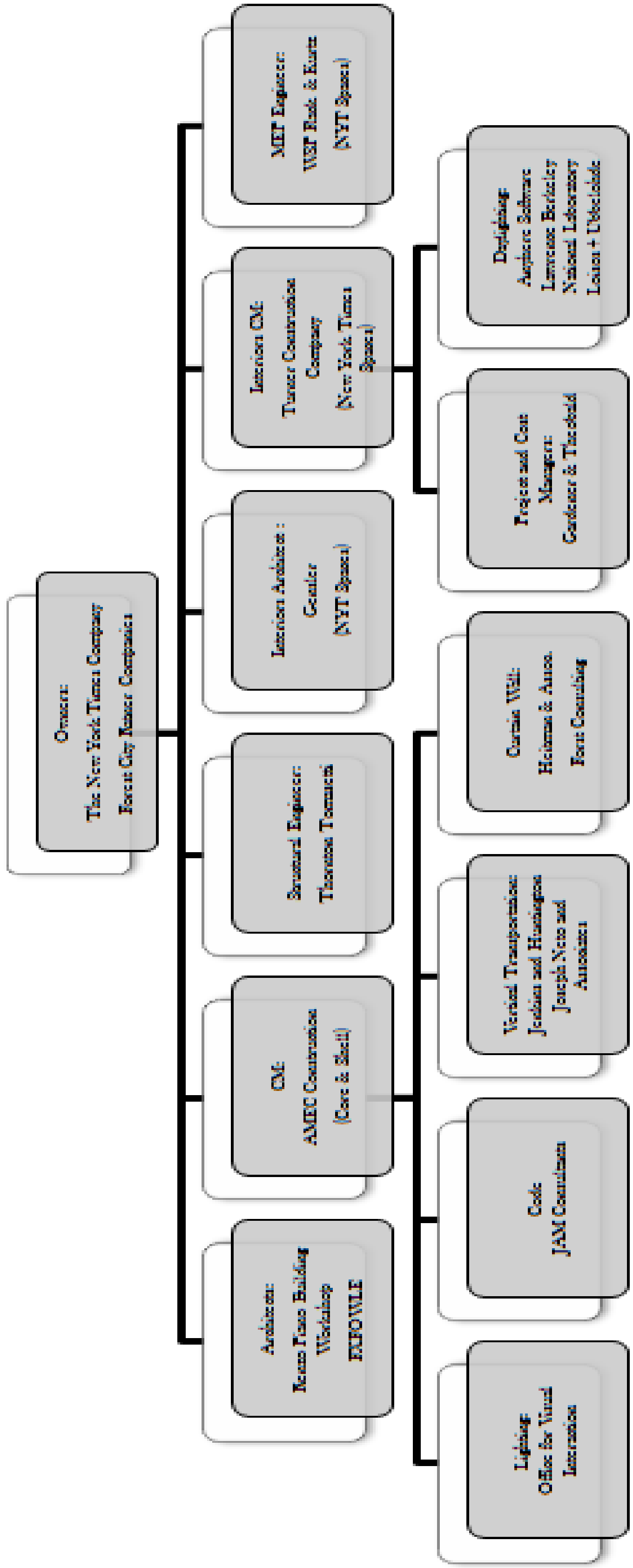


Figure 14: Organizational Chart

1.2.5.6 Site Layout Planning

The New York Times Building is located in the Times Square District of Manhattan, directly across 8th Ave. from the Port Authority Bus Terminal and approximately eight blocks Northwest from the Empire State Building. There were four phases for the construction process- demolition, foundations (two parts), superstructure, and interior turnover. Please refer to Appendix 7.1, page 227, for more detailed information regarding the site layout planning for The New York Times Building site. General descriptions of major site logistics issues with a particular phase are outlined below. Please note that site layout plans were only obtained for the AMEC portion of the construction process as Turner plans were not obtained. It is assumed that the site layout plan remained largely the same following turnover for interior fit out.

1.2.5.6.1 Demolition

This phase consisted of the abatement of the existing structures on the block that the New York Times Building would ultimately occupy. Safety scaffolding was placed above the entirety of the 8th Avenue portion of the site, and partially along both the West 41st Street and West 40th Street site boundaries.

1.2.5.6.2 Foundations – Part I

The eastern portion of the site was demolished first- excavation then followed with the placement of the ramp in the northeast corner. The entire excavated area was surrounded with site fencing, and scaffolding was placed around the western cluster of existing structures that were still undergoing abatement. During this process, the foundation was placed (including deep foundations were placed in the southeast corner of the site).

1.2.5.6.3 Foundations – Part II

The remaining western portion of the site was demolished in the second portion of the foundation placement phase. The western portion of the site was then excavated (Ramp in NW corner) and foundations were placed.

1.2.5.6.4 Superstructure

The entirety of the steel erection took place during this phase. One tower crane was placed in the center of each of the northwestern and southwestern quadrants of the site. Personnel site access was allowed through the northern portion of the site, with staging areas on the northern and southern site boundaries. The subway exit could be closed on a provisional bases based on a permit obtained by the construction team.

1.2.5.6.5 Interior Turnover

For this phase, AMEC turned over the project to Turner Construction to complete the interior fit out of the project. It was assumed by the project team that the site layout plan would remain largely the same, for this portion of the project.

1.2.5.7 Detailed Structural Estimate

Note: Please reference Appendix 7.1, page 232, for a more detailed version of the structural systems estimate.

1.2.5.7.1 Foundations

The foundations of The New York Times Building consist of spread footings over the footprint of most of the site in addition to caissons located on the southeast side of the building. The exact size, locations and quantity for the deep foundation system is unknown, however several assumptions were made from based on the results from D4 cost analysis and RS Means Costworks. The total foundations cost came to approximately $21,344,000.00 based on these assumptions.

1.2.5.7.2 Structural Steel Framing

Structural steel member sizes and lengths were taken from the existing Revit model, which were updated according to the provided structural drawings. Specialty columns are used throughout the structure, primarily consisting of the built-up plate columns within the core of the building in addition to flanged box columns on the exterior of the building. The structural steel framing estimate is summarized in Table 10 below.

QUANTITY	UNIT	DESCRIPTION	PRICE
		STRUCTURAL STEEL MEMBERS	
398.55	L.F.	HSS6x4x3/8	$30,758.10
53.7	L.F.	TT14x99	$13,908.67
673.67	L.F.	W4x13	$35,905.27
41.33	L.F.	W10x26	$3,340.66
887.43	L.F.	W12x19	$58,635.16
18.29	L.F.	W12x26	$1,387.46
951.23	L.F.	W14x22	$71,027.39
37.72	L.F.	W14x30	$3,235.02
57	L.F.	W14x43	$6,812.53
30	L.F.	W14x48	$4,339.23
70.47	L.F.	W14x82	$16,823.16
179.26	L.F.	W14x90	$42,794.38
134.38	L.F.	W14x109	$42,251.62
151.18	L.F.	W14x120	$47,533.86
123.34	L.F.	W14x132	$41,672.76
22.74	L.F.	W14x257	$15,186.41
101.25	L.F.	W14x283	$78,253.80
398.86	L.F.	W16x26	$29,751.77
114.96	L.F.	W16x31	$10,151.54
260	L.F.	W16x36	$29,130.92
2310.15	L.F.	W18x35	$233,606.99
364.18	L.F.	W18x40	$41,313.31
280	L.F.	W18x50	$39,064.76
120	L.F.	W18x60	$21,241.08
120	L.F.	W18x65	$21,241.08
72.49	L.F.	W18x71	$14,827.11
160	L.F.	W18x76	$32,726.40
174.12	L.F.	W18x106	$48,734.10
56.5	L.F.	W18x130	$10,042.54
123	L.F.	W18x143	$21,862.51
260	L.F.	W21x50	$35,763.00
122.12	L.F.	W21x57	$20,506.76
60	L.F.	W21x101	$15,970.08
78	L.F.	W21x132	$24,829.90
225	L.F.	W24x76	$45,424.58
60	L.F.	W33x130	$20,272.14
60	L.F.	W33x141	$21,924.00
120	L.F.	W33x221	$70,898.52
		TOTAL	**$1,323,148.55**

QUANTITY	UNIT	DESCRIPTION	PRICE
		STRUCTURAL COLUMNS	
110	L.F.	C-Channel-Column: C10X33	$30,617.40
27.5	L.F.	W-Wide Flange-Column: W14X257	$13,809.68
110	L.F.	FB-Flanged Box-Column: FB30X1116	$235,974.53
55	L.F.	BU-Built Up-Column: W23X1168	$123,408.30
27.5	L.F.	BU-Built Up-Column: W22X1032	$54,210.38
13.75	L.F.	BU-Built Up-Column: W24X985	$25,989.08
13.75	L.F.	BU-Built Up-Column: W23X729	$19,133.06
55	L.F.	BU-Built Up-Column: W29X2063	$216,841.46
27.5	L.F.	BU-Built Up-Column: W25X1401	$73,981.23
55	L.F.	W-Wide Flange-Column: W14X665	$70,154.59
55	L.F.	W-Wide Flange-Column: W14X730	$76,532.28
		TOTAL	**$940,651.99**

Table 10: Structural Steel Estimate Summary

1.2.5.7.3 Slab System

In the slab estimate, structural concrete with a compressive strength of 4000 psi was used. The structural slab takeoff was generated through the common Revit model after applying a metal decking (18 gauge, 2” depth with 3.5” topping). An additional 5% was added to the concrete takeoff to account for waste in the construction process. Without knowing the exact welded wire fabric that was used in the project, a medium-sized fabric was selected (W2.9xW2.9, 42lb per CSF). The structural slab estimate summary is outlined below in Table 11.

QUANTITY	UNIT	DESCRIPTION	PRICE
		WELDED WIRE FABRIC REINFORCING	
2244	C.S.F.	W2.9 x W2.9 (6 x 6) 42 lb. per C.S.F.	$308,018.17
		TOTAL	**$308,018.17**
		NORMAL WEIGHT CONCRETE, READY MIX	
255	C.Y.	4000 PSI, 3.5" topping	$43,114.89
		TOTAL	**$43,114.89**
		FLOOR DECKING	
22440	C.Y.	2" D, 18 ga	$153,624.24
		TOTAL	**$153,624.24**

Table 11: Structural Slab Estimate Summary

RS Means pricing was used to acquire the pricing for steel, concrete and reinforcing materials. While some steel members are in RS Means, some were required to be increased price due to RS Means lacking data for members of that size. A multiplier was developed from the change in weight per linear foot, as well as the member size to extrapolate a value for the larger-sized members.

The eighth floor was chosen as the typical floor for the analysis. For the purposes of this estimate, the eighth floor structural system was analyzed and the results were then extrapolated over the entire building to develop a more complete structural estimate. The total cost for the 8th floor was found to be $3,163,071.33. This cost was then multiplied by 56 (48 tower floors along with a 4 story podium floors which are about 2 times the square footage of the typical tower floor. The extrapolated cost came to $177,131,994.66 for the entire building. Considering the foundations cost of $21,344,000.00, the final structural system cost comes to $198,475,994.70.

1.2.5.8 General Conditions Estimate

1.2.5.8.1 Overview

The general conditions estimate for the New York Times Building includes costs from field staff and facilities, temporary utilities, temporary site protection, clean up, and rigging and hoisting equipment for the project. The general conditions estimate will be used to assess any cost savings that could be seen if there is an acceleration in the project schedule.

There are a few assumptions made in order to put the general conditions estimate together:

- The total construction cost of the New York Times Building is $1 Billion.
- The square footage of the building is $1.5 million square feet.
- Only on site personnel is included in the general conditions.
- Site offices and crane equipment is rented for the project.
- Site protection has been purchased for the project.
- All lifts and equipment besides the hoists and cranes listed in the general conditions will be provided by the subcontractors.

1.2.5.8.2 Construction Durations

Below, in Table 12, are listed the construction durations that factored into the general conditions estimate. There are 12 months in a year, 52 weeks in a year, and 5 work days in a work week.

ACTIVITY	YEARS	MONTHS	WEEKS	WORK DAYS
Construction Duration	3.5	42	182	910
Tower Crane	1.25	15	65	325
Material Hoists	2	24	104	520
Demolition	0.5	6	26	130
Foundations	1.5	18	78	390
Steel	1.5	18	78	390
Concrete	0.75	9	39	195
Curtainwall	1.25	15	65	325
Mech./Plum.	3	36	156	780
Electrical	2	24	104	520
Interiors	1.75	21	91	455

Table 12: Construction Durations

1.2.5.8.3 Cost Breakdown

The general conditions on the New York Times Building project totaled $ 96,971,123. This accounted for approximately 9.71% of the overall project cost. The field personnel cost contributes $22,865,985 to the general conditions. That adds up to 2.3% of the overall project cost. This is shown in Table 13. A more detailed General Conditions estimate is located in Appendix 7.1 on page 235.

Division	Description	Unit	Total	Quantity	Total Cost
01 31 13.20	**Field Personnel**				
0020	Clerk, 6	Week	$ 380.00	1,092	$ 414,960
0140	Field Engineer, 45	Week	$ 1,350.00	8,190	$ 11,056,500
0220	Project Manager, 20	Week	$ 2,175.00	1,781	$ 3,873,675
0280	Superintendant, 35	Week	$ 2,025.00	3,714	$ 7,520,850
					$ 22,865,985
01 51 13.80	**Temporary Utilities**				
0100	Heat, including fuel and operation, per week, 12 hrs	CSF Flr	$ 30.27	13,846	$ 419,123
0350	Lighting, including service lamps, wiring, and outlets, maximum	CSF Flr	$ 27.70	15,000	$ 415,500
0600	Power for job duration including elevator, etc., min	CSF Flr	$ 47.00	15,000	$ 705,000
0650	Power for job duration including elevator, etc., max	CSF Flr	$ 110.00	15,000	$ 1,650,000
					$ 3,189,623
10 52 13.20	**Office and Storage Space**				
0020	Trailer, furnished, no hookups, 20' x 8', rent per month, 8 Trailers	Each	$ 163.00	576	$ 93,888
0700	AC, rent per month, add	Each	$ 41.00	576	$ 23,616
0800	For delivery, add per mile	Mile	$ 4.50	600	$ 2,700
					$ 120,204
01 52 13.40	**Field Office Expense**				
0100	Office Equipment rental average	Month	$ 155.00	384	$ 59,520
0120	Office supplies, average	Month	$ 85.00	384	$ 32,640
0140	Telephone bill; avg. bill per month	Month	$ 80.00	384	$ 30,720
0160	Lights & HVAC	Month	$ 150.00	384	$ 57,600
					$ 180,480
01 54 19.50	**Truck Crane**				
0600	Truck Mounted, hydrolic, 100 ton capacity	Month	$ 14,100.00	16	$ 225,600
	Crew	Day	$ 104.90	320	$ 33,568
					$ 225,600
01 54 19.60	**Monthly Tower Crane Crew**				
0100	Crane, climbing, 106' jib, 6000 lb. capacity, 410 FPM	Month	$ 13,200.00	60	$ 792,000
	Tower Crane Crew	Day	$ 37.40	2,400	$ 89,760
4550	Hoist and tower, mast type, 6000 lb., 100' high, month	Each	$ 4,136.60	86	$ 357,402
4570	for each added 10' section, add, month	Each	$ 196.20	5,616	$ 1,101,859
					$ 2,341,021
01 56 26.50	**Temporary Fencing**				
0020	Chain Link, 11 ga, 6' high	L.F.	$ 8.51	980	$ 8,340
	Plywood, painted, 4" x 4" frame, 8' high	L.F.	$ 18.20	980	$ 17,836
					$ 26,176
01 56 29.50	**Temporary Protective Walkways**				
2200	Sidewalk, 2" x 12" planks, 2 uses	S.F.	$ 1.60	16,000	$ 25,600
2500	Exterior Plywood, 2 uses, 3/4" thick	S.F.	$ 0.95	16,000	$ 15,200
					$ 40,800
01 58 13.50	**Signs**				
0020	High intensity reflectorized, no posts, buy	S.F.	$ 21.00	1,000	**$ 21,000**
01 74 13.20	**Cleaning Up**				
0040	Maximum	Job	0.8%	$1 Billion	$ 8,000,000
0050	Cleanup of floor area, continuous, per day, during construction	M.S.F.	$ 27.23	1,670	$ 45,485
0100	Final by GC at end of job	M.S.F.	$ 56.44	1,670	$ 94,277
					$ 8,139,762
	Subtotal				**$ 74,313,871**
	Adjusted for Location (New York City, 130.7)				**$ 97,128,230**

Table 13: General Conditions Summary

1.3 Proposal Summary

1.3.1 Core Redesign

The analysis of the structural core was intended to optimize the structural system. This will have an effect on architecture, constructability, and MEP distribution, therefore these affects will be analyzed in a collaborative effort.

1.3.2 Envelope Redesign

The analysis of the building envelope was intended to improve the indoor environmental quality while decreasing building energy consumption. This will have an effect on architecture, daylighting, ambient loads, construction costs, and the building's life-cycle.

1.3.3 Tenant Space Redesign

The analysis of the tenant spaces was intended to decrease the building's life cycle cost. To accomplish this, the building mechanical, lighting and structural systems along with the architectural changes were all analyzed for the benefit to the owner.

2 CORE REDESIGN

2.1 Core Changes

The lateral system was changed from a steel braced frame system to concrete shear walls with coupling beams. These changes resulted in significant cost savings and required coordination with the mechanical and electrical systems as well as architecture and construction. The BIM model was utilized to calculate the changes to cost, schedule and architectural layouts between the original design and the proposed changes. Because the structural system required more space within core for distribution purposes, a switch to aluminum bus duct from conduit was proposed. Additionally, air distribution duct work was rerouted. The BIM model also allowed for clash detection with all of these proposed system changes.

2.2 Lateral System

The following section pertains to the redesign of the lateral system of The New York Times Building tower. Within this section as per the structural designer's MAE requirements a computer model was created in ETABs for a concrete core only option. In addition to the ETABs model, the structural designer utilized basic dynamic principles learned in CE 548: Structural Design for Dynamic Loads to analyze the redesigned lateral system's acceleration.

2.2.1 Objectives

1) Eliminate the outriggers, thermal trusses, and X-bracing to increase transparency of the building

2) Create a model of the lateral system in ETABs to aid in maintaining dynamic properties of the building.

3) Create a model of the lateral system in Revit to aid in structural takeoffs.

2.2.2 Process

Design-

Determine an appropriate concrete lateral system that maintains strength and serviceability requirements

Coordination-

Work with the design team and the architectural advisor to determine an optimal solution for the structural core.

Modeling-

Model potential lateral system designs in ETABs

Utilize PCA Column for flexural reinforcing in irregular shaped shear walls

Takeoffs-

Determine the weight and mass of the building for lateral design by utilizing Revit

Analysis-

Determine appropriate wind loads to be applied to the lateral system

Determine the seismic loads on the building using the take-offs from Revit

Design and analyze the concrete shear walls and coupling beams

Determine if building drift and acceleration requirements are met.

2.2.3 **Codes, References, and criteria**

2.2.3.1 Original Design Codes and Deflection Criteria

National Model Code:

1968 Building Code of the City of New York with latest supplements

Structural Standards:

ASCE 7-98, Minimum Design Loads for Buildings and other Structures

Structural Design Codes:

AISC – LRFD, Steel Construction Manual 2nd edition, American Institute of Steel Construction

National Building Code of Canada, 1995

Uniform Building Code, 1997

Lateral Deflection Criteria:

Total building sway deflection for ten year wind is limited to H/450

The shortening and elongating effects due to thermal fluctuations is designed to L/300

Building peak acceleration for ten year wind should be between 15-27 mg

2.2.3.2 Thesis Design Codes and Deflection Criteria

National Model Code:

2006 International Building Code

Structural Standards:

ASCE 7-05, Minimum Design Loads for Buildings and other Structures

Structural Design Codes:

ACI 318-08 American Concrete Institute Building Code Requirements for Structural Concrete and Commentary

Lateral Deflection Criteria:

Total building sway deflection for ten year wind is limited to H/450

Building peak acceleration for ten year wind should be between 15-27 mg

2.2.4 **Materials**

Concrete:

Shear Walls:

Compressive strength of 10,000, 8,000, and 6,000 psi, Normal Weight

Coupling Beams:

Compressive strength of 10,000, 8,000, and 6,000 psi, Normal Weight

Reinforcing:

ASTM A-615, Grade 60

2.2.5 Building Loads

2.2.5.1 Load Cases

The following LRFD load combinations equations from ASCE 7-05 are the controlling equations for the design of the lateral structural members:

$1.2D+1.6W+L+0.5(L_r \text{ or } S)$	Equation 1
$1.2D+E+L+0.2S$	Equation 2
$0.9D+1.6W$	Equation 3
$0.9D+E$	Equation 4

Since the building drift due to wind is limited to H/450 and checking serviceability using factored wind load is excessively conservative due to winds short term effects, ASCE 7-05 § CC.1.2 allows the use of the following equation for drift due to wind:

$D+0.5L+0.7W$	Equation 5

2.2.5.2 Gravity Loads

The following gravity loads have been determined through IPD and multiply iterations of the gravity system design. The determination of these loads is explained in further detail in section 4.3Gravity System.

2.2.5.2.1 Dead Loads

Typical Tower Floor Dead Loads		
Load Description	**Design Loads**	
Ceiling (ACT, Drywall, and Architectural Ceilings)	5	psf
Mechanical, Electrical, Plumbing in raised floor system	10	psf
Total Superimposed:	**15**	**psf**
Allowance for Steel Framing + Fireproofing	10	psf
3" Composite Deck 20 GA (3VLI20), Unshored clear span 13'-3" with a capacity of 149 psf, unprotected	2	psf
3.25" Light weight Concrete (110 pcf)	44	psf
Total Construction Dead Loads:	**56**	**psf**
Total Floor Dead Loads:	**71**	**psf**

Table 14: Typical Tower Floor Dead Loads

Typical Mechanical Floor Dead Loads		
Load Description	**Design Loads**	
Ceiling (ACT, Drywall, and Architectural Ceilings)	5	psf
Mechanical, Electrical, Plumbing in raised floor system	10	psf
Total Superimposed:	**15**	**psf**
Allowance for Steel Framing + Fireproofing	10	psf
3" Composite Deck 20 GA (3VLI20), Unshored clear span 13'-3" with a capacity of 149 psf, unprotected	2	psf
3.25" Light weight Concrete (110 pcf)	44	psf
Total Construction Dead Loads:	**56**	**psf**
Total Floor Dead Loads:	**71**	**psf**

Table 15: Typical Mechanical Floor Dead Loads

Roof Dead Loads		
Load Description	**Design Loads**	
Ceiling (ACT, Drywall, and Architectural Ceilings)	5	psf
Mechanical, Electrical, Plumbing in raised floor system	8	psf
Total Superimposed:	**13**	**psf**
Allowance for Steel Framing + Fireproofing	20	psf
3" Composite Deck	5	psf
5.0" Normal weight Concrete (145 pcf)	80	psf
Total Construction Dead Loads:	**105**	**psf**
Total Floor Dead Loads:	**118**	**psf**

Table 16: Roof Dead Loads

Exterior Tower Wall System Dead Loads (Elevation)		
Load Description	**Design Loads**	
Double Skin Façade	30	psf
Total Exterior Wall Dead Load:	**30**	**psf**

Table 17: Exterior Tower Wall System Dead Load

2.2.5.2.2 Live Loads

Live Loads		
Load Description	**Design Loads**	
Office	70	psf
Technology Floors	100	psf
Elevator Lobbies	75	psf
Corridors above First Floor	75	psf
All Other Lobbies & Corridors	100	psf
Exit Facilities	100	psf
Retail Areas	100	psf
Kitchen	150	psf
Cafeteria	100	psf
Auditorium (with fixed seats)	100	psf
Light Storage Area	100	psf
Loading Dock	250	psf
Mechanical Floors	150	psf
Mechanical/Fan Rooms	75	psf
Sidewalks	250	psf
Roofs	20	psf

Table 18: Live Loads

2.2.5.2.3 Snow Loads

Snow Load		
Load Description	**Design Loads**	
Ground Snow Load	25	psf
Roof Snow Load	19.3	psf
Drift Snow Load	35.3	psf

Table 19: Snow Loads

2.2.5.3 Lateral Loads

2.2.5.3.1 Wind Loads per 1968 NYBC

The New York Times Building was design under the 1968 Building Code of New York City. In Article 5 of subchapter 904.0 structural frames and exterior components are to be designed to resist wind pressure found in reference standard RS 9-5. Within this section of the code, wind loads can be calculated by design wind pressures given in Table 20 on page 50 or by wind tunnel testing of the building. The resulting base shears due to Table RS 9-5.1 are 4075 kips and 3297 kips in the West-East and North-South direction respectively. After consulting with Jeff Callow at Thornton Tomasetti, the resulting base shears due to the wind tunnel test are 3450 kips and 2850 kips in the West-East and North-South direction respectively. It should be noted that these base shears are service values and therefore unfactored. Also under the 1968 building code, an importance factor of 1.0 was used for wind design.

Table RS 9-5.1 Design Wind Pressures on Vertical surfaces		
Height zone (ft. above curb level)	Design Wind Pressure on Vertical Surfaces (psf of projected solid surface)	
	Structural Frame	Panels Glass
0-50 (signs and similar constructions of shallow depth only)	15	-
0-100	20	30
101-300	25	30
301-600	30	35
601-1000	35	40
Over 1000	40	40

Table 20: RS 9-5.1 Design Wind Pressure, 1968 NYCBC

2.2.5.3.2 Wind Loads per ASCE7-05

In lieu of having the wind tunnel test, ASCE 7-05 was used to determine the wind loads per the 2006 International Building Code and the 2008 New York City Building Code. The following assumptions had to be made in order use Method 2: Analytical Procedure of ASCE 7-05:

1) The tower was analyzed with a rectangular foot print instead of a cruciform shape. Area was added at the corners of the façade to simplify the corner notches.
2) The screens around each face of the roof top allow air flow through them. To consider the wind load transferred to the lateral system, the screens were first treated as if they were a solid face of the building. After the windward pressure was calculated on this “solid face”, a multiplier of 0.5 was implemented to account for the permeability of the screen. The resulting pressure was then transferred to the building.
3) Due to the permeability of the screens, no leeward pressure would develop.

Table 21 on page 51 summarizes the wind parameters of Method 2: Analytical Procedure. The resulting base shears due to Method 2 are 8995 kip and 7001 kips in the West-East and North-South direction respectively. The periods of vibrations were obtained from the final lateral design model using ETABs and will be discussed later. It should be noted that the importance factor changes to 1.15. Please refer to Structural, Table 64 through Table 70 on page 237 through page 243 for in-depth calculations on Method 2: Analytical Procedure.

Method 2 Wind Parameters Summary		
Variable	**Value**	**Unit/Comments**
V	110	mph
K_d	0.85	
Occupancy Category	3	
Importance Factor	1.15	
Surface Roughness Category	B	
Exposure Category	B	
Kzt	1.0	
B	194	feet
L	157	feet
G_f	0.990	West-East Direction
	1.024	North –South Direction
ζ	2%	
Period of Vibration	6.46 s	West-East Direction
	6.64 s	North –South Direction
	4.41 s	Torison

Table 21: Method 2 Wind Load Design Variables Summary

2.2.5.3.3 Wind Loads Utilized

Wind Load Design Summary			
Variable	**Wind Tunnel**	**1968 NYCBC**	**ASCE7-05**
$V_{base,WE}$	3450 kips	4075 kips	8995 kips
$V_{base,NS}$	2850 kips	3297 kips	7001 kips
Importance Factor	1.0	1.0	1.15

Table 22: Wind Load Design Summary

Table 22 above summarizes the base shears due to the wind loads from the wind tunnel test, the 1968 NYCBC, and ASCE 7-05. Since a building of this size and magnitude would be designed using a wind tunnel test the decision was made to use the wind tunnel test base shears with an importance factor of 1.15 to account for updated codes. The resulting base shears are 3968 kips and 3278 kips in the West-East and North-South direction respectively. These base shears were then used to proportion the loads developed by ASCE 7-05 Method 2. The wind force diagrams in the West-East and North-South directions can been seen in Figure 15 on page 52 and Figure 16 on page 53 respectively. Please refer to Structural, Table 71 and Table 72 on pages 244 and 245 for the proportioned wind loads. All four cases of wind loading were considered and their story force values can also be found in Structural, Table 71 and Table 72 on pages 244 and 245.

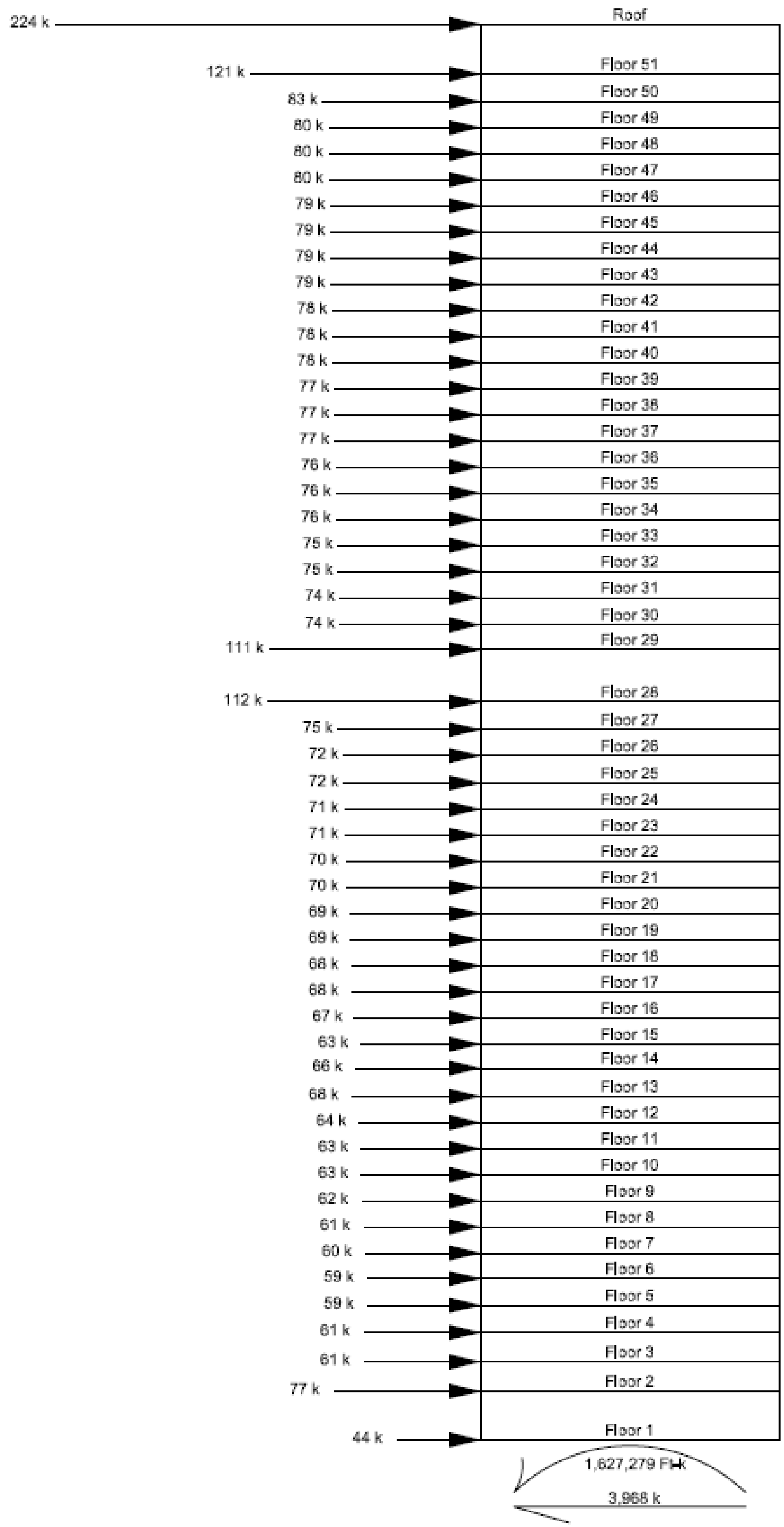


Figure 15: West-East Wind Force Diagram

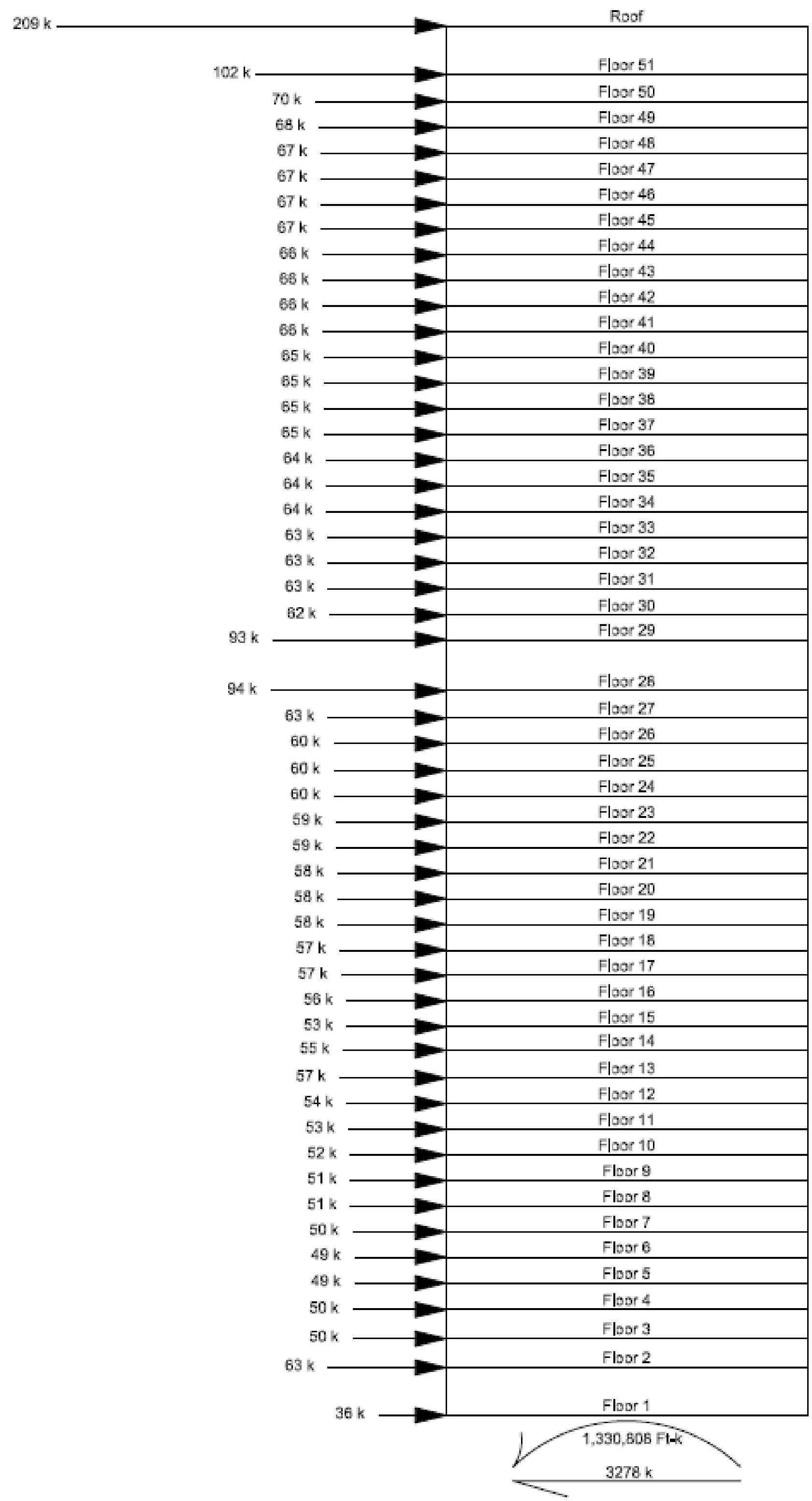


Figure 16: North-South Wind Force Diagram

2.2.5.3.4 Seismic Loads

Since New York City is not a high seismic region the equivalent lateral force method was use to determine the seismic forces acting on the building. Due to the varying bearing capacities of rock on the site, the lower bearing capacity equated to soft rock or Site Class C in ASCE 7-05. Therefore, Site Class C was used in the analysis to be conservative.

The USGS Ground Motion Parameter Tool and ASCE 7-05 was used in calculating the design spectral response acceleration. This yielded S_{DS} and S_{D1} values that corresponded to a seismic design category B using Tables 11.6-1 and 11.6-2. Using the period of vibration calculated in ETABs, 6.46 and 6.64 in West-East and North-South direction respectively, it was found that C_uT_a controlled over the period of vibrations and C_s = 0.01. Revit was used to accurately determine floor weights and subsequently the total building weight which can be found in Structural in Figure 147 and Figure 148 on page 246 and 247. From the total weight, the base shear was determined to be 1806 kips. Please refer to Structural in Table 73 through Table 78 on pages 248 through 250 for in-depth calculations on the seismic loads. Table 23 on page 54 summarizes the seismic parameters and Figure 17 on page 55 shows the seismic forces on the building in both West-East and North-South directions.

Due to the height and location of The New York Times Building, it was expected that the lateral loading due to wind pressure would control over seismic loadings in both strength and serviceability requirement. After comparing the results of the two loading conditions, it was clearly evident that this was the case.

Seismic Parameter Summary	
Site Class	C
Importance Fator	1.25
S_{DS}	0.290
S_{D1}	0.079
Seismic Design Category	B
R	4
$T = C_uT_a$	4.85 s
C_s	0.01
V_{base}	1806 kips

Table 23: Seismic Parameters

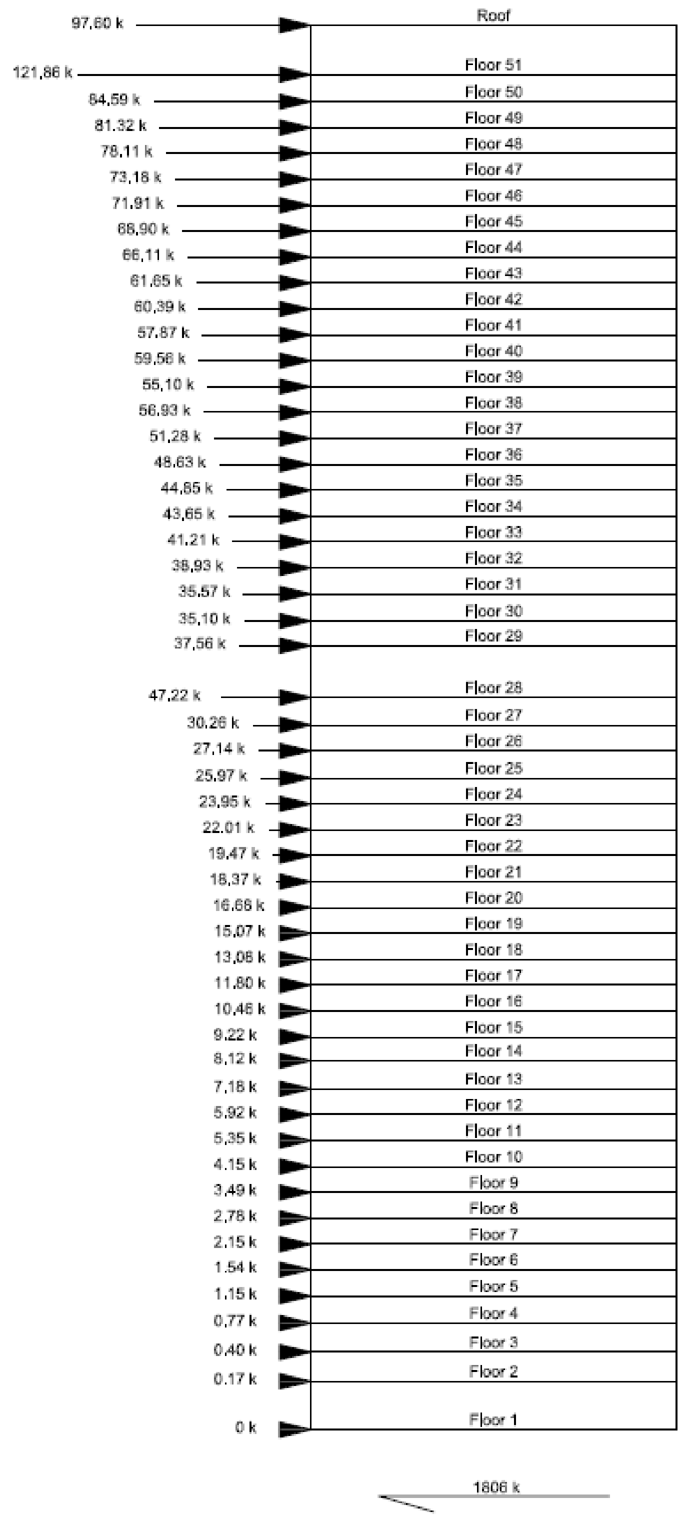


Figure 17: West-East & North-South Seismic Force Diagram

2.2.6 Shear Wall and Coupling Beam Design

As stated before the proposed lateral system redesign investigated changing the existing eccentric and concentric chevron bracing in the core to a concrete core with shear walls and coupling beams. The primary goal of this system is to eliminate the outriggers, thermal trusses, and X-bracing to increase transparency of the building. However the architecture of the core needed to change in order to allow for an efficient lateral design. On numerous occasions the design team met with the architecture advisor and agreed upon architectural changes of the core which is discussed in section 2.3 Core Architecture on page 65. In addition to changes of the core architecture, the architecture of the tenant spaces changed as well bringing all the exterior structural framing inside the building thus eliminating temperature differential on the structure and the need for the thermal trusses. Addition architectural changes are mentioned in section 4.2 Architectural Layouts on page 152. Two computer models of the lateral system were created to analyze the shear walls of the core, one for strength and one for serviceability. For initial sizing, shear walls were sized to resist the factored direct wind loads using

$$t_{wall} = \frac{V_u}{\phi 3 \sqrt{f'_c} \times l_{wall}}$$

and maintaining the target period of vibration of 6.75 seconds. The New York Times Building tower was split into three sections where wall thicknesses, coupling beam sizes, and concrete strength would change going up the building. The following assumptions were made to the lateral model:

1. Each floor was treated as a rigid diaphragm.
2. The gravity system was excluded in the lateral model, but the mass/area of the gravity system was included to correctly analyze the lateral system's period of vibration. These values can be found in Structural Table 73 and Table 78 on page 249 and 250 respectively.
3. Both inherent and accidental torsion effects were taken into account.
4. Seismic forces were applied to the center of mass of each floor and also applied at a 5% offset to model torsion effects.
5. Wind forces were applied at the center of pressure of each floor. Each of the 4 wind load cases listed in ASCE7-05 involving both direct and torsion effects were included.
6. The structure was assigned as a fixed base due to the spread footings and caissons bearing on rock
7. Coupling beams were assigned to be fixed at both ends.
8. P-Delta effects based on mass were considered.
9. Member stiffness were modified for both wind and seismic; 70% and 50% of the gross section properties for the shear walls respectively and 35% of the gross section properties for the coupling beams, based on ACI 318 § 8.8.1.
10. Shear walls were modeled as shell elements and coupling beams were modeled as frame elements. The masses of both elements were not zeroed to allow for potential ease of architectural and structural changes.

After various structural design iterations and consulting with the design team and architecture advisor, a shear wall core design soon emerged. Table 24 and Table 25 on page 57 summarize the iterative initial lateral designs of the shear walls and coupling beams. The table includes wall thicknesses, coupling beam dimensions, concrete strength, and period of vibration due to serviceability requirements.

Initial Iterations of the Lateral Design Summary				
	Option 1	**Option 2**	**Option 3**	**Option 4**
1-18 Wall thickness (in)	30	24	24	30
19-30 Wall thickness (in)	30	24	24	24
30-52 Wall thickness (in)	30	24	24	18
1-18 Beam depth (in)	36	36	36	36
19-29 Beam depth (in)	36	36	36	36
30-52 Beam depth (in)	36	36	36	36
1-18 Beam width (in)	30	24	24	30
19-29 Beam width (in)	30	24	24	24
30-52 Beam width (in)	30	24	24	18
1-18 Concrete Strength (ksi)	10	8	10	10
19-29 Concrete Strength (ksi)	8	8	10	8
30-52 Concrete Strength (ksi)	6	8	8	6
T_x (sec) w/ f_{22}=0.7 & I_g=0.35	4.12	7.95	6.18	5.52
T_y (sec) w/ f_{22}=0.7 & I_g=0.35	3.83	6.43	7.13	6.77
T_z (sec) w/ f_{22}=0.7 & I_g=0.35	2.15	5.04	4.28	4.25

Table 24: Initial Iterations of the Lateral Design Summary, Part A

Initial Iterations of the Lateral Design Summary		
	Option 5	**Option 6**
1-30 Wall thickness (in)	30	30
31-40 Wall thickness (in)	24	24
41-52 Wall thickness (in)	18	18
1-30 Beam depth (in)	36	44
31-40 Beam depth (in)	36	44
41-52 Beam depth (in)	36	44
1-30 Beam width (in)	30	30
31-40 Beam width (in)	24	24
41-52 Beam width (in)	18	18
1-30 Concrete Strength (ksi)	8	10
31-40 Concrete Strength (ksi)	8	8
41-52 Concrete Strength (ksi)	6	6
T_x (sec) w/ f_{22}=0.7 & I_g=0.35	6.82	6.64
T_y (sec) w/ f_{22}=0.7 & I_g=0.35	6.40	6.46
T_z (sec) w/ f_{22}=0.7 & I_g=0.35	4.63	4.41

Table 25: Initial Iterations of the Lateral Design Summary, Part B

2.2.6.1 Center of Rigidity and Center of Mass

The center of rigidity or COR and center of mass or COM was calculated using the ETABs model. Since the tower floor plan and the lateral system are symmetrical in shape the COR and the COM are in the same location on all floors. Because the COR is exactly located at the COM, moments due to torsional shear will not exist.

2.2.6.2 Strength Checks

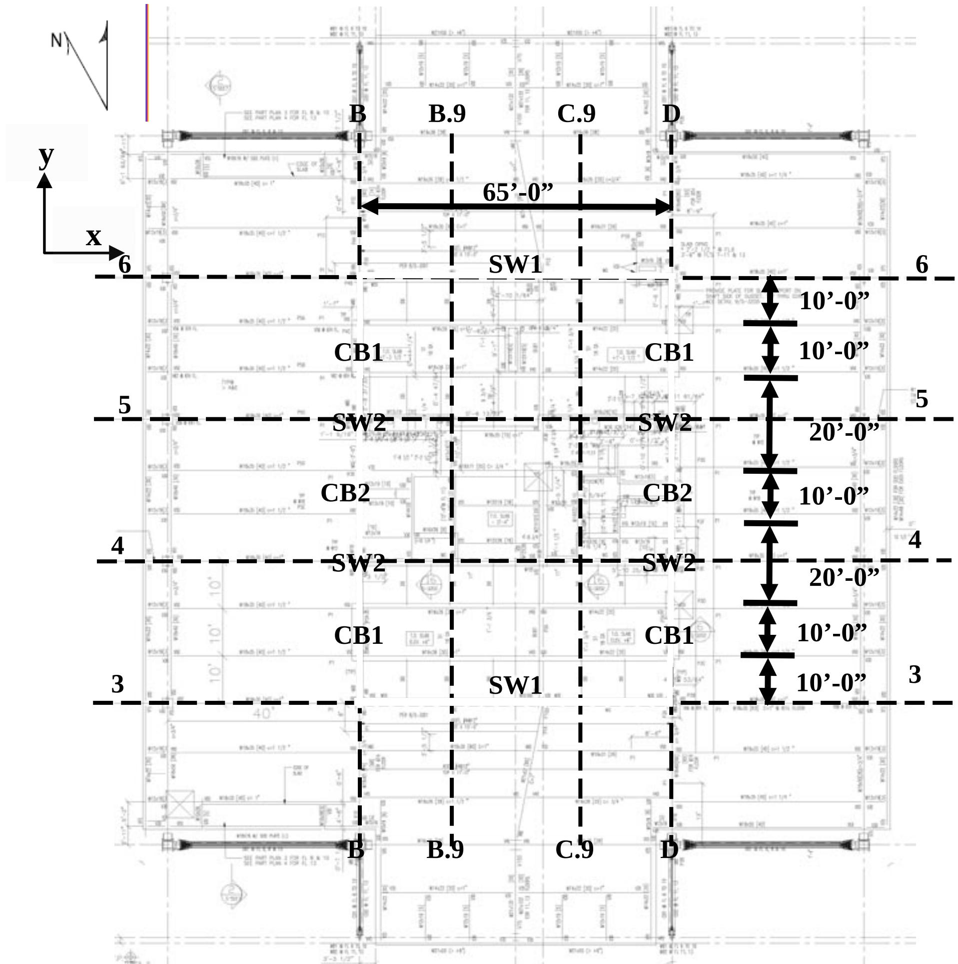


Figure 18: Concrete shear walls in the core

Strength spot checks were performed on shear walls SW1 & SW2 at ground level and all the coupling beams CB1 and CB2 at all floors. Shear forces and moments on each element were determined from the ETABs model. It was determined the coupling controlled the design of the lateral system. Due to large shear stresses in the coupling beams at floor 27 through 30, the depth of the beams were increased from 36 inches to 44 inches and the compressive strength of the concrete was increased to 10,000 psi in order to avoid using diagonal reinforcing in the coupling beams. The coupling beams were designed using force redistribution which was typically applied to groups of three coupling beams to decrease reinforcing in beams with higher forces and increase reinforcing in beams with lower forces. The controlling wind cases for the North/South and West/East direction were found to be from the direct wind. Hand calculations were used to design the shear reinforcing for SW1, SW2, CB1, and CB2, and flexure reinforcing for SW2, CB1, and CB2. Table 26 and Table 27 shows a summary of the shear design of the walls, flexure design of wall SW2 and flexure and shear design of a few of the coupling beams.

Shear Walls	Horiz. Shear Reinf.	Vert. Shear Reinf.	Flexural Reinf.
SW 1 Y	(2) # 9 @ 6 in	(2) # 9 @ 12 in	See PCA output
SW 1 X	(2) # 8 @ 18 in	(2) # 8 @ 18 in	
SW 2 Y	(2) # 7 @ 16 in	(2) # 7 @ 16 in	(2) # 10 @ 6 in

Table 26: Shear Wall Reinforcing Summary

Coupling Beam	Level	f'c (psi)	Dimensions (in)	Top Reinf.	Bottom Reinf.	Shear Reinf.
CB2	52	6000	18X44	(5) # 8	(5) # 8	#4 @ 8in
CB2	35	8000	24X44	(7) # 10	(7) # 10	#4 @ 4in
CB2	1	1000	30X44	(7) # 9	(7) # 9	#4 @ 9in
CB1	30	1000	30X44	(12) #10	(12) #10	#4 @ 2in
CB1	15	1000	30X44	(9) # 9	(9) # 9	#4 @ 6in
CB1	1	1000	30X44	(10) # 8	(10) # 8	#4 @ 8in

Table 27: Coupling Beam Reinforcing Summary

The flexural reinforcing for SW1 was designed using PCA column. Figure 19 through Figure 22 on pages 59 through 61 shows the moments and shears caused by the wind in each direction. These wind values were then combined with the axial load due to gravity on SW1. The controlling load combination for SW1 was Equation 3, 0.9D +1.6W. Please note that wind does not always act on a structure directly which is why SW1 was subjected to biaxial bending with 100 % wind in one direction and 30% wind in the other direction at the same time. For in-depth calculations on the design of the shear walls and coupling beam reinforcing refer to Structural Figure 149 through Figure 177 on page 251 through 274.

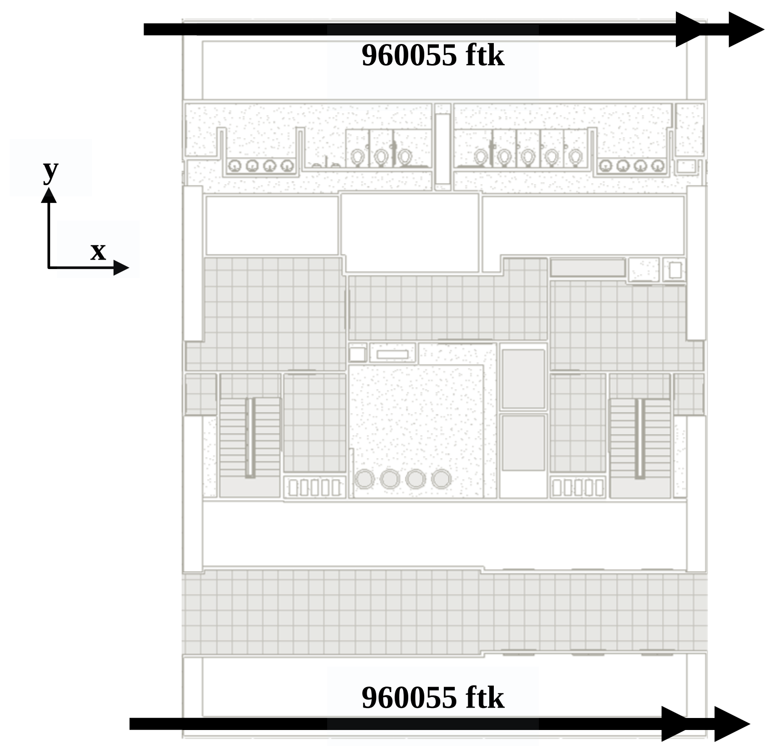


Figure 19: Moments due to wind in X-Direction

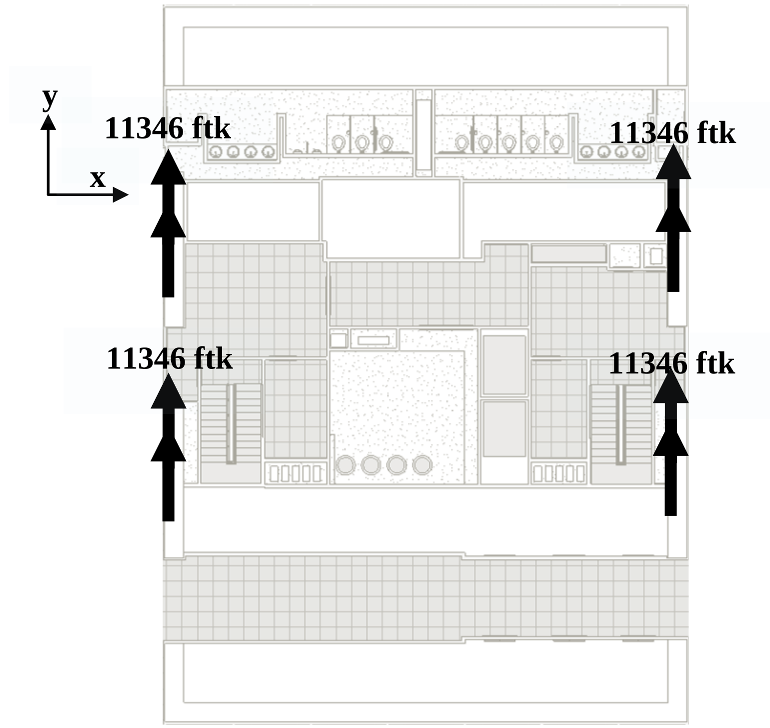


Figure 20: Moments due to wind in Y-Direction

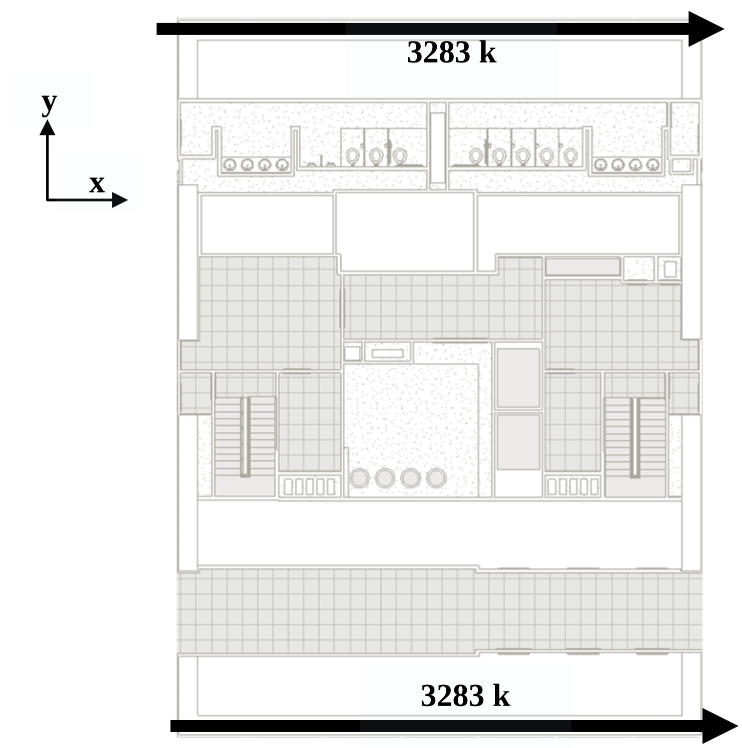


Figure 21: Shears Moments due to wind in X-Direction

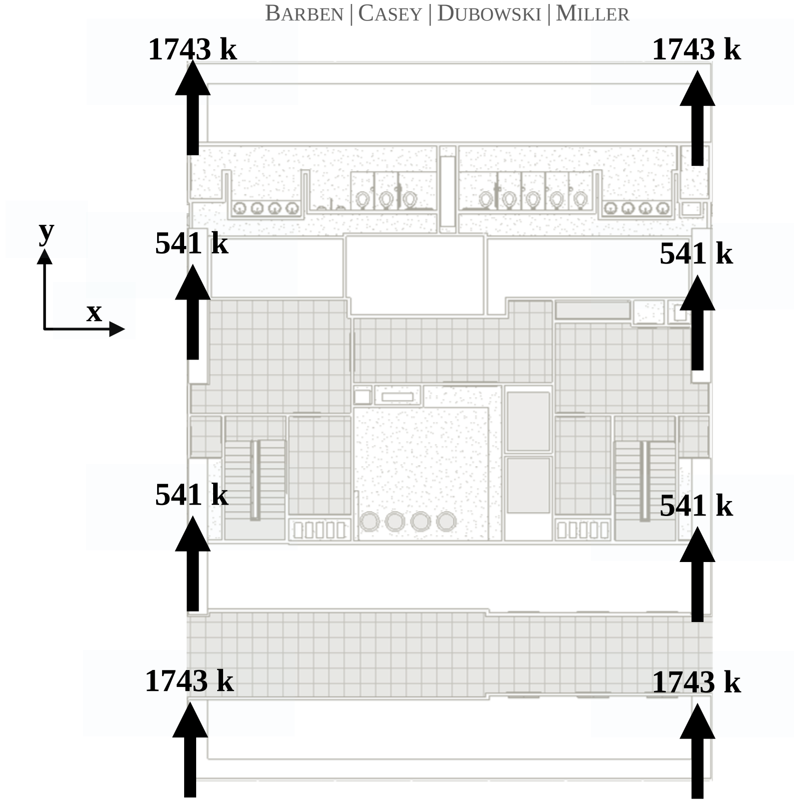


Figure 22: Shears Moments due to wind in Y-Direction

2.2.6.3 Building drift and acceleration

Wind and seismic drifts were computed by ETABs using Equation 5, D + 0.5L + 0.7W for all wind cases and unfactored for seismic. The higher drifts were due to direct wind load which is expected in regions were seismic does not typically drive the design of structures. Wind drift was compared to Δ_{wind} = H/450 for the entire building drift in the North-South and West-East directions. The following chart summarize the building drift due to wind based on ETABs output.

West/East Case1 Wind					
Story	**Story Height Below (ft)**	**Displ. X (in)**	**Allowable Total Displacement (in)**		
			Δ_{wind} = H/450		
STORY52	26.83	12.973	<	19.880	OK
STORY51	14.42	12.257	<	19.164	OK
STORY50	13.75	11.873	<	18.780	OK
STORY49	13.75	11.508	<	18.413	OK
STORY48	13.75	11.143	<	18.047	OK
STORY47	13.75	10.780	<	17.680	OK
STORY46	13.75	10.418	<	17.313	OK
STORY45	13.75	10.058	<	16.947	OK
STORY44	13.75	9.701	<	16.580	OK
STORY43	13.75	9.346	<	16.213	OK
STORY42	13.75	8.996	<	15.847	OK
STORY41	13.75	8.650	<	15.480	OK

STORY40	13.75	8.309	<	15.113	OK
STORY39	13.75	7.973	<	14.747	OK
STORY38	13.75	7.641	<	14.380	OK
STORY37	13.75	7.315	<	14.013	OK
STORY36	13.75	6.994	<	13.647	OK
STORY35	13.75	6.680	<	13.280	OK
STORY34	13.75	6.374	<	12.913	OK
STORY33	13.75	6.075	<	12.547	OK
STORY32	13.75	5.786	<	12.180	OK
STORY31	13.75	5.506	<	11.813	OK
STORY30	13.75	5.235	<	11.447	OK
STORY29	27.50	4.978	<	11.080	OK
STORY28	14.58	4.473	<	10.347	OK
STORY27	13.75	4.213	<	9.958	OK
STORY26	13.75	3.973	<	9.591	OK
STORY25	13.75	3.737	<	9.224	OK
STORY24	13.75	3.505	<	8.858	OK
STORY23	13.75	3.279	<	8.491	OK
STORY22	13.75	3.058	<	8.124	OK
STORY21	13.75	2.841	<	7.758	OK
STORY20	13.75	2.630	<	7.391	OK
STORY19	13.75	2.425	<	7.024	OK
STORY18	13.75	2.225	<	6.658	OK
STORY17	13.75	2.032	<	6.291	OK
STORY16	13.75	1.845	<	5.924	OK
STORY15	12.58	1.664	<	5.558	OK
STORY14	14.92	1.505	<	5.222	OK
STORY13	13.75	1.324	<	4.824	OK
STORY12	13.75	1.165	<	4.458	OK
STORY11	13.75	1.014	<	4.091	OK
STORY10	13.75	0.872	<	3.724	OK
STORY9	13.75	0.739	<	3.358	OK
STORY8	13.75	0.614	<	2.991	OK
STORY7	13.75	0.500	<	2.624	OK
STORY6	13.75	0.396	<	2.258	OK
STORY5	14.32	0.303	<	1.891	OK
STORY4	15.47	0.217	<	1.509	OK
STORY3	15.47	0.140	<	1.097	OK
STORY2	25.66	0.088	<	0.684	OK

Table 28: Case 1 West/East Wind Drifts

North/South Case1 Wind					
Story	**Story Height Below (ft)**	**Displ. X (in)**	**Allowable Total Displacement (in)**		
			Δ_{wind} = H/450		
STORY52	26.83	12.973	<	19.880	OK
STORY51	14.42	12.257	<	19.164	OK
STORY50	13.75	11.873	<	18.780	OK
STORY49	13.75	11.508	<	18.413	OK
STORY48	13.75	11.143	<	18.047	OK
STORY47	13.75	10.780	<	17.680	OK
STORY46	13.75	10.418	<	17.313	OK
STORY45	13.75	10.058	<	16.947	OK

STORY44	13.75	9.701	<	16.580	OK
STORY43	13.75	9.346	<	16.213	OK
STORY42	13.75	8.996	<	15.847	OK
STORY41	13.75	8.650	<	15.480	OK
STORY40	13.75	8.309	<	15.113	OK
STORY39	13.75	7.973	<	14.747	OK
STORY38	13.75	7.641	<	14.380	OK
STORY37	13.75	7.315	<	14.013	OK
STORY36	13.75	6.994	<	13.647	OK
STORY35	13.75	6.680	<	13.280	OK
STORY34	13.75	6.374	<	12.913	OK
STORY33	13.75	6.075	<	12.547	OK
STORY32	13.75	5.786	<	12.180	OK
STORY31	13.75	5.506	<	11.813	OK
STORY30	13.75	5.235	<	11.447	OK
STORY29	27.50	4.978	<	11.080	OK
STORY28	14.58	4.473	<	10.347	OK
STORY27	13.75	4.213	<	9.958	OK
STORY26	13.75	3.973	<	9.591	OK
STORY25	13.75	3.737	<	9.224	OK
STORY24	13.75	3.505	<	8.858	OK
STORY23	13.75	3.279	<	8.491	OK
STORY22	13.75	3.058	<	8.124	OK
STORY21	13.75	2.841	<	7.758	OK
STORY20	13.75	2.630	<	7.391	OK
STORY19	13.75	2.425	<	7.024	OK
STORY18	13.75	2.225	<	6.658	OK
STORY17	13.75	2.032	<	6.291	OK
STORY16	13.75	1.845	<	5.924	OK
STORY15	12.58	1.664	<	5.558	OK
STORY14	14.92	1.505	<	5.222	OK
STORY13	13.75	1.324	<	4.824	OK
STORY12	13.75	1.165	<	4.458	OK
STORY11	13.75	1.014	<	4.091	OK
STORY10	13.75	0.872	<	3.724	OK
STORY9	13.75	0.739	<	3.358	OK
STORY8	13.75	0.614	<	2.991	OK
STORY7	13.75	0.500	<	2.624	OK
STORY6	13.75	0.396	<	2.258	OK
STORY5	14.32	0.303	<	1.891	OK
STORY4	15.47	0.217	<	1.509	OK
STORY3	15.47	0.140	<	1.097	OK
STORY2	25.66	0.088	<	0.684	OK

Table 29: Case 1 North/South Wind Drifts

In addition to building drift, the structural designer utilized basic dynamic principles to analyze and check the acceleration of the building under wind loading. The acceleration of the building was checked according to Lawrence Griffis' paper titled "Serviceability Limit States Under Wind Load". For tall buildings it is necessary to check the acceleration, because even if drift limits are met acceleration issues can cause human discomfort. The hourly mean wind speed at the top of building was determined by back calculating the speed using the base shears due to wind and the excel spreadsheet developed for ASCE 7-05 Method 2 This speed was used in determining the drag, lift, and torsional root mean square acceleration of the building. From these accelerations, it determined that the peak acceleration of the building is 14.6 mili-g's. This acceleration is deemed acceptable due to the recommended range of peak acceleration being between 15 to 27 milli-g's for commercial buildings. Table 30 summarizes calculated acceleration values of the building. For more in-depth calculation refer to Structural Figure 177 on page 274.

Building Acceleration Summary	
Mean hourly roof wind speed	63.3 mph
H/B	4.63
T_L	6.46 sec
T_D	6.64 sec
T_θ	4.41 sec
g_p	3.75
$A_D(Z)$	1.86 milli-g
$A_L(Z)$	2.72 milli-g
BA_θ/SQRT(2)	2.09 milli-g
A_R	3.90 milli-g
A_{peak}	14.6 milli-g

Table 30: Building Acceleration Summary

2.2.7 Foundation Impacts

The overturning moment due to wind controlled the design of the shear wall SW1. This calculation can be seen in the PCA Column output. However, the foundations under the lateral system will have to change. With disengaging all of the columns in the lateral design, their foundations will most likely be smaller due to the removal of moments due to wind acting on the columns. Under the core, a mat foundation will be constructed to help distribute the added weight of the concrete shear walls. Due to the foundation not being part of the design team's scope, in-depth calculations were not performed.

2.2.8 Conclusions

Structurally the concrete core is an alternative feasible lateral design. The final design has 30 inch thick walls with 10,000 psi concrete at the base to the 30th floor, 24 inch thick walls with 8,000 psi concrete from the 31st to the 40th floor, and 18 inch thick walls with 6,000 psi concrete from the 41st to the roof. The coupling beams are all 44 inches deep and the width and concrete strength change with the shear walls. From this analysis, it was determined that the base shears were 3,968 kips and 3,278 kips in the west-east and north-south directions respectively. The periods of vibrations were determined to be 6.46 seconds and 6.64 seconds in the west-east and north-south directions respectively. It was also determined that the total building drift is H/690 and the acceleration is 14.6 milli-g's. From these results, the system was deemed acceptable and the goal of eliminating the out riggers, thermal trusses, and x-bracing to increase transparency of the building is achieved. Additional benefits of the concrete core can be seen in the cost and constructability.

2.3 Core Architecture

2.3.1 Design Review

Due to changing the core to concrete, there was issue between structural needs and the architectural desires to maintain a feeling of openness and transparency for occupants and casual observers of the building. The design team met with the architectural advisor and structural advisor to determine an effective solution in order to maintain the architect's vision. This can be seen in Figure 23.

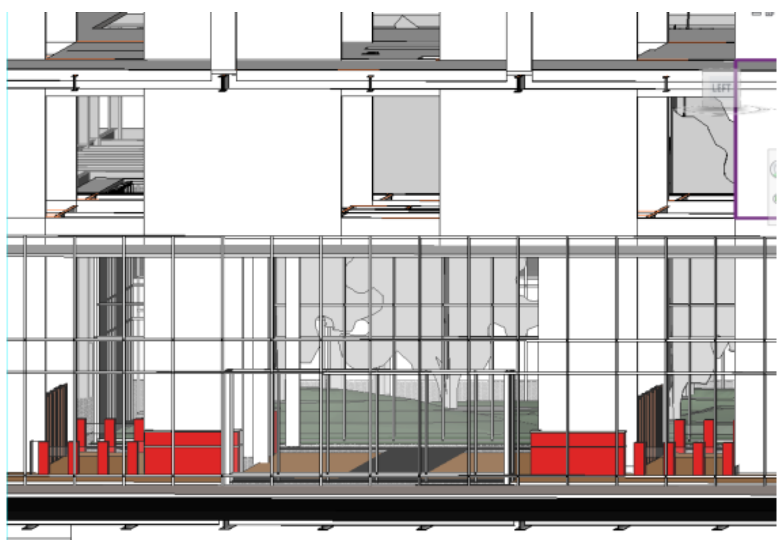


Figure 23: Transparency of Lobby

2.3.2 Codes

With the changes to the core from steel to concrete, architectural layouts within the core were changed to account for the new dimensions of the core. Codes that were taken into account were mainly for the shifting of the emergency stairs toward the core walls as shown between Figure 24 and Figure 25. The code dictated that door to door swings in series must be at least 48'' apart. This needed to be maintained with the new architectural changes. Core architecture is also discussed in section 4.2.

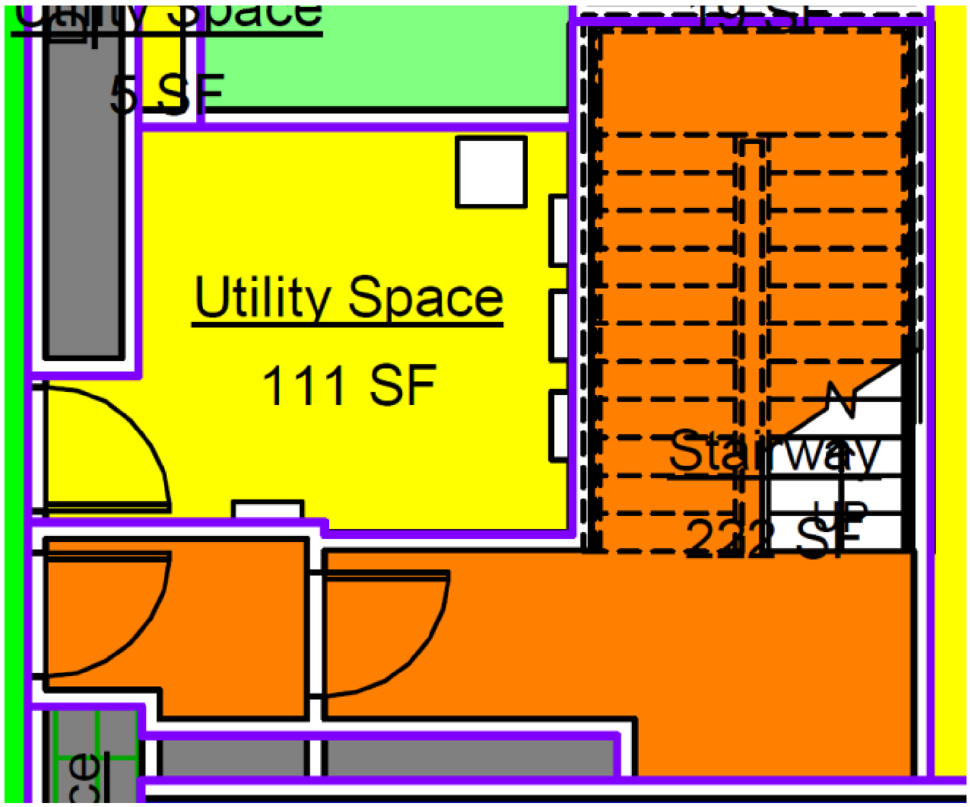


Figure 24 - Existing Emergency Stair

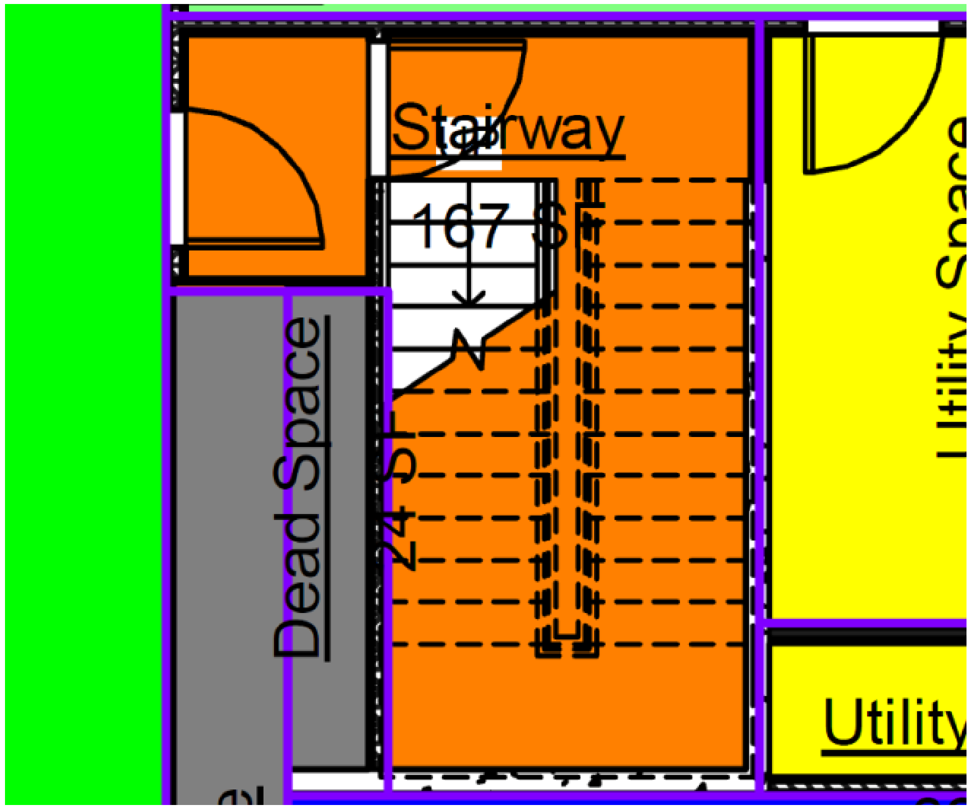


Figure 25 - Proposed New Emergency Stair

Codes were also investigated for fireproofing of the new structural core walls and coupling beams. Code requires a 2-hr fire rating, and by having a 1 ½'' concrete covering for the rebar, a 4-hr fire rating is achieved, which is twice the rating that code requires. This also allowed for framing the exposed areas of the metal stud wall with a single layer of GWB for a total thickness of 2'' and a fire rating of 1-hr instead of a metal stud wall with two layers of double thickness GWB with a total thickness of 5'' and a 2-hr fire rating. These areas would be framed for the purpose of supplying a structure for mounting interior finishes to the interior without drilling into the wall, and to avoid painting directly onto the concrete. This also gave a total fire rating of 5-hrs, which is well above the required rating of 2-hrs. This is shown in Figure 26.

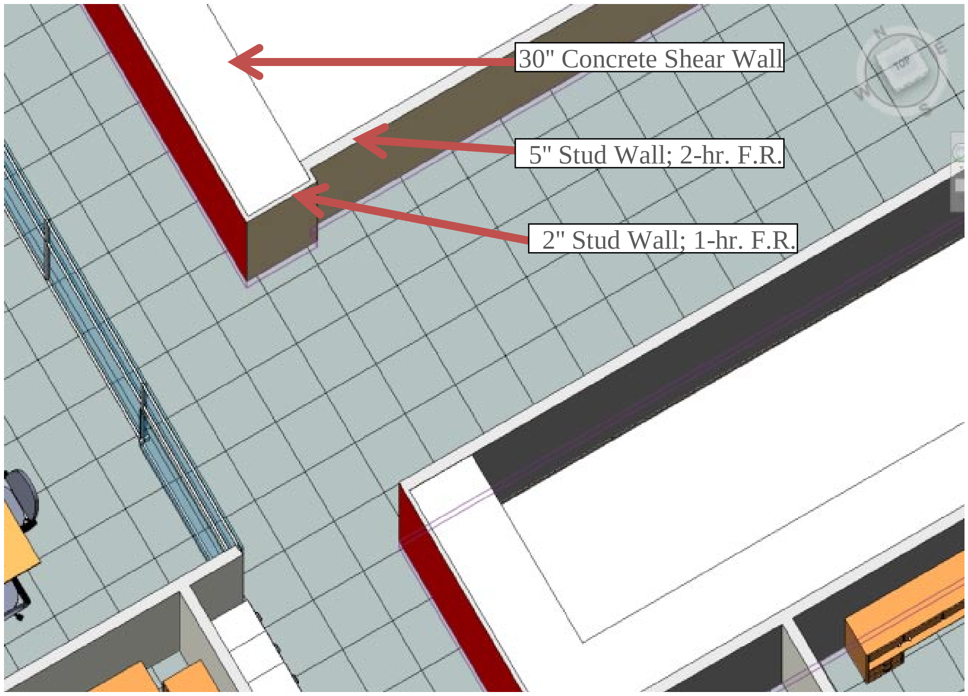


Figure 26 - Differenct in Wall Thicknesses

2.3.3 Conduit to Bus Duct

The following section discusses the change from conduit to bus duct within the New York Times tenant space.

2.3.3.1 Objectives

Goal of this evaluation/analysis/redesign

1) Minimize the space required for the vertical distribution up the building.

2) Lower the cost for the installation of the vertical distribution.

2.3.3.2 Process

Collaboration-

Work with the CM and Structural designer to determine the best location for the new bus duct riser.

Take off-

Quantify the length of conduit used in the existing vertical distribution by using PDF measuring tool.

Cost Analysis-

Create an excel sheet with inputs for cost and quantity to given floors. This will be done for both the existing conduit and the new bus duct distribution.

Modeling-

Model bus duct in the Revit model of the building to minimize clashes with other systems.

2.3.3.3 Assumptions

The cost data is taken from RS Means 2009 Electrical Cost Data.

	Material/Labor
3.5” Steel Conduit	$53.30
500 MCM Conductor	$21.45
1600 Amp Aluminum Bus	
Plug-in	$624.00/ft
Feeder	$598.00/ft
90 L/R	$3380.00/unit
90 U/D	$3380.00/unit
Center Tap	$4192.50/unit
2500 Amp Aluminum Bus	
Plug-in	$923.00/ft
Feeder	$910.00/ft
90 L/R	$4387.50/unit
90 U/D	$4387.50/unit
Center Tap	$5850.00/unit

2.3.3.4 Design Intent

Due to increased structural space requirements within the core, a switch from conduit to bus duct was analyzed. The location on the floor where the current conduit is run is the location where the structure needs more room. Because of this, all of the vertical feeders need to be relocated into the electrical room. Due to the size of the electrical room, bus duct is needed to save room. The analysis took into consideration both space requirements and cost. The New York Times Company installed conduit throughout their part of the building. This was run throughout the entire riser. The Forest City Ratner Company ran bus duct in their riser. Because of this, it was thought that the switch to bus duct would be effective.

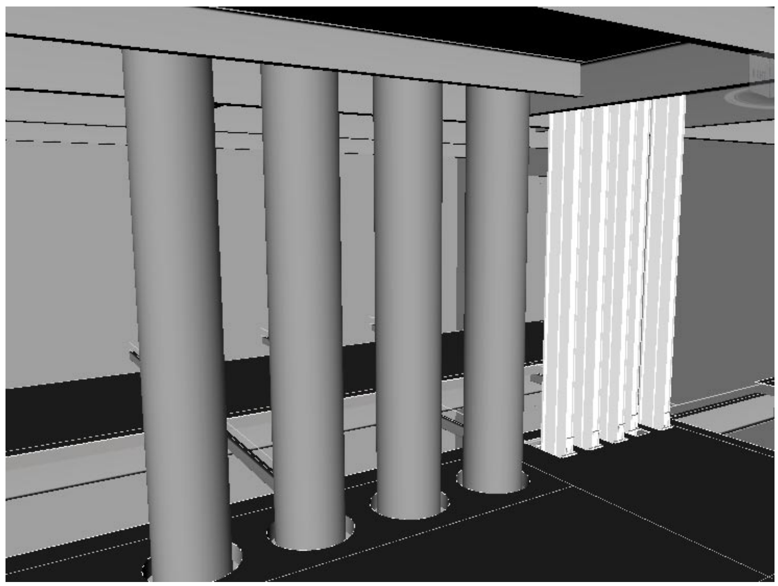


Figure 27: Bus Duct Model

The previous system consisted of 9 sets of 3.5” conduit with (4) 500mcm conductors per conduit. This was run to both the east and west electrical rooms. These were run into the 480Y/277V panel and to a 75kVA transformer for the 208Y/120 panels. There were also 6 sets of 3.5” conduit with (4) 500mcm conductors per conduit. These were run to the mechanical rooms. In total, the riser for the New York Times Company consisted of (24) 3.5” conduits. An estimate was done to get a baseline for the cost comparison. The total cost was estimated at $1,199,876.60. The conduit runs to the electrical rooms totaled $855,584.23 while the mechanical runs totaled $344,292.37. (See Figure 243: Existing Conduit Cost Spread Sheet for Electrical Room Feeders and 342Figure 244: Existing Conduit Cost Spead Sheet for Mechancail Rooms on page 341)

It was assumed that each of the conduits were connected to a 320 amp breaker. To prevent over sizing the bus duct, 75% of the 320 amps was taken per feeder. This brought the ampacity per feeder to 240 amps. The nine electrical feeders per side totaled 2160 amps. The 6 mechanical feeders totaled 1440 amps. The sizing of the bus duct would be 2500 amps to the two electrical rooms and a 1600 amp bus to the mechanical room.

As aluminum is the cheaper of the two types of bus duct, the analysis considered the cost difference between the existing conduit and switching to an aluminum bus. The take off was done from the existing riser diagrams. The cost data was taken from the 2009 RSMeans electrical cost data. All numbers were adjusted for the New York City area. All tap boxes and 90 degree turns were accounted for within the bus duct, but terminations of the conduit for existing costs were not included. Because of this, it is felt that the cost analysis of switching to bus duct is a conservative number.

The 1600 amp bus for the mechanical rooms cost $448,162.00 for labor and materials. The 2500 amp bus for the electrical rooms each cost $653,061.50. Since there would be one 2500 amp per side of the building, the total cost for the electrical rooms would be $1,306,123.00. The final cost for this analysis would come to $1,754,285.00. This proved that there are no cost savings, but actually an increased cost. Copper would save additional space, but because the aluminum bus already increased the cost, it was not analyzed.

	1600 Amps			2500 Amp		
	1 Set			1 Set per side		
	1-28			1-28		
	Length/#	Mat Cost	Lab Cost	Length/#	Mat Cost	Lab Cost
Plugin	388	$624.00		388	$923.00	
Feeder	120	$598.00		120	$910.00	
90 L/R	3	$3,380.00		3	$4,387.50	
90 U/D	2	$3,380.00		2	$4,387.50	
Taps	28	$4,192.50		28	$5,850.00	
	Total	$448,162.00		Total	$653,061.50	

	System Choices		
	(1) 1600 Amp Sets & (1) 2500 Amp		
	Total Cost	$1,754,285.00	

Figure 28: Aluminum Bus Duct Cost Spread Sheet

The space that the feeders take up was the driving force for this analysis. The existing conduits are 3.5" in diameter. For the electrical runs, this means there is a total of 86.59 square inches of conduit per side. For the mechanical room, there is 57.73 square inches of conduit. This totals 230.91 square inches of conduit. This seems small, but when they are spaced out throughout a wall, they take up a significant amount of space because of access room. The 1600 amp bus duct is 9.25" by 4.5 inches or 41.63 square inches. The 2500 amp bus duct is 15.5" by 4.5" or 69.75 square inches. The bus duct area would total 181.13 square inches. This may not seem like much, but the bus ducts have many benefits. There is virtually no turning radius for bus duct. The bus can be installed in 90 degree turns. In addition, the bus duct does not need pull boxes. Because of the amount of other material needed for the conduit, there are added space savings which have not been accounted for here.

A second benefit to switching to bus duct is its flexibility. If there are ever any additional electrical needs on any floor of the building, a panel could be added. As long as there is enough spare capacity, a simple tap onto the bus duct can be made. In order to add other panels with conduit, an additional run may have to be made. This can be a costly addition when a building is already constructed, enclosed, and finishes installed.

In order to complete this redesign, the distribution panels would also need to be redesigned. The existing feeder system runs power to multiple rooms on a given floor from the same distribution panel. This would need to be changed to have a single distribution panel per designated rooms up the building. From an installation point of view, this would be less complicated.

2.3.3.5 Conclusion

The aluminum bus duct design will be more expensive, but the bus duct has many advantages. For this reason, a switch to bus duct within the core of the building for the New York Times Company was completed. (See Figure 33: Resolved Bus Duct vs. Floor Slab Clash Result on page 78)

2.3.4 **Mechanical Coordination**

The following section discusses implications on the ducted air distribution layout resulting from the redesign of the core structure and architecture.

2.3.4.1 Objectives

1) Maintain adequate space for the air highway running through the core

2) Layout a schematic ducted design for the new air distribution system and run clash detection for possible obstructions to determine further rerouting.

2.3.4.2 Process

IPD coordination

Discussion with the Construction Manager and Structural designer to determine the best location to reroute ductwork through the core. Evaluate feasibility of maintaining existing air highway.

BIM coordination

Create 3D model of new ductwork in tenant space and through core to minimize clashes with other systems.

2.3.4.3 Assumptions

Space loads were calculated in IES <VE> and adjusted for the proposed Displacement Ventilation system. Diffusers and ductwork were sized and imported into the Revit MEP model. An in depth description of the air distribution analysis is discussed in Section 4.5. This 3D model was then exported to Navisworks for clash detection.

2.3.4.4 Design Coordination

In the New York Times Building, heating, cooling and ventilation is achieved through an air distribution system. The floors occupied by The New York Times Company utilize an under floor air distribution (UFAD) system. A traditional overhead ducted system was implemented on the floors occupied by Forest City Ratner. Fresh air is brought in through outdoor air units in the two mechanical penthouses on the 28th and 51nd floors, and is then distributed throughout the building to each floor air handler. The existing air highway through the core delivers air from the floor air handling unit to the space.

It was determined that the location of the existing air highway provided the optimal location for the each floor main duct branch. The proposed air distribution system, discussed in detail in Section 4.5 required sufficient space for ductwork. Therefore, this main branch of ductwork was also utilized for the displacement ventilation distribution. Due to the implementation of the concrete core shear walls, this location was obstructed and the ductwork required rerouting, as shown in Figure 29: Ductwork Penetration through Concrete Core Wall. The interior corridors through the core did not provide access to the Air Handling Units located in the utility rooms. Therefore, the ductwork was rerouted, shown in Figure 30 - Rerouting of Ductwork, after discovering duct-through-concrete penetrations visible in the 3D Revit model.

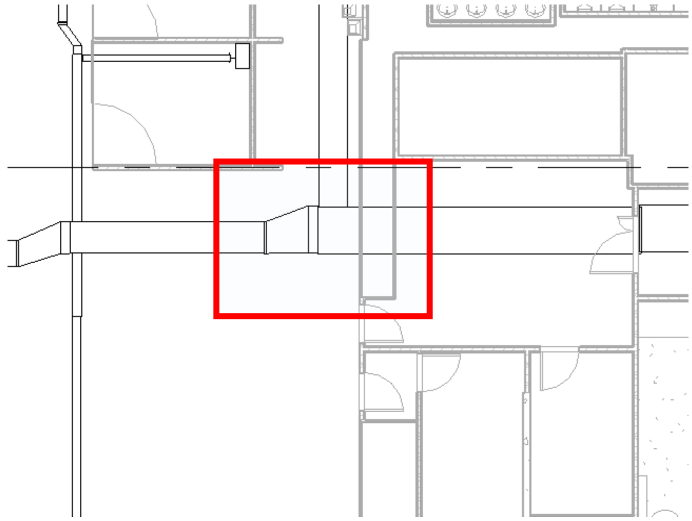


Figure 29: Ductwork Penetration through Concrete Core Wall

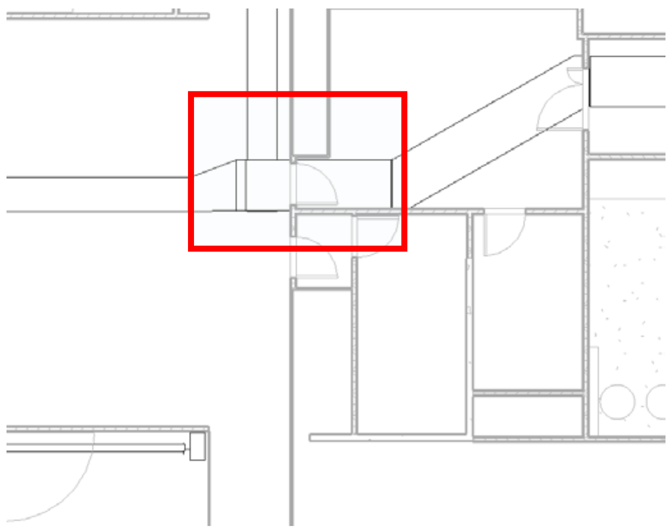


Figure 30 - Rerouting of Ductwork

2.3.4.5 Conclusion

Through the early collaborative coordination and visualization of the BIM software, including the modeling of proper duct sizes and locations, the design team caught potential design problems before they would become costly to redesign.

2.3.5 **Clash Detection**

Clash detection is a very useful tool, and its implementation on a project can be very beneficial to a projects success. By utilizing a Building Information Model and clash detection software, problems can be found before construction of the building starts instead of in the field during construction. The result is a reduction in rework and material expenditure as well as eliminating conflict between trades in the field. While some owners, designers and contractors are still avoiding the implementation of Building Information Modeling due to unfamiliarity, higher upfront costs, and skepticism toward delivering a better finished product.

2.3.5.1 Objective

The goal of this research was to investigate the possibility of utilizing the created Building Information Model to find clashes prior to construction of the building to avoid conflict in the field.

2.3.5.2 Process

IPD Coordination-

Structural, Electrical and Mechanical input to locations of primary building components.

Model Input-

Completed structural model.

Electrical bus duct risers.

Mechanical risers.

Typical 8^{th} floor mechanical duct branches and terminations .

Exportation of individual 3D elements to Navisworks file format.

Analysis-

Compile all files in Navisworks Manage.

Complete clash detection between primary structural, electrical and mechanical components.

Review clashes to determine most critical issues, or if found clashes are not true clashes, i.e. clashes equal to a clash length of 0’-00’’.

Hold meetings between the design team members to determine the possible solutions to found clashes.

Repair the clashes within the model.

Re-run clash detective to confirm solutions to clashes.

2.3.5.3 IPD/BIM Coordination

The first meetings were held to agree that major duct branches from the mechanical rooms would not go through the proposed concrete core walls or concrete coupling beams, but through openings between the core walls. Because of this, the decision was made to keep the raised floor system, but run ductwork between the plenum created between the structural concrete slab and the raised floor. This would eliminate the need for any penetrations through the concrete shear walls, shown in Figure 31.

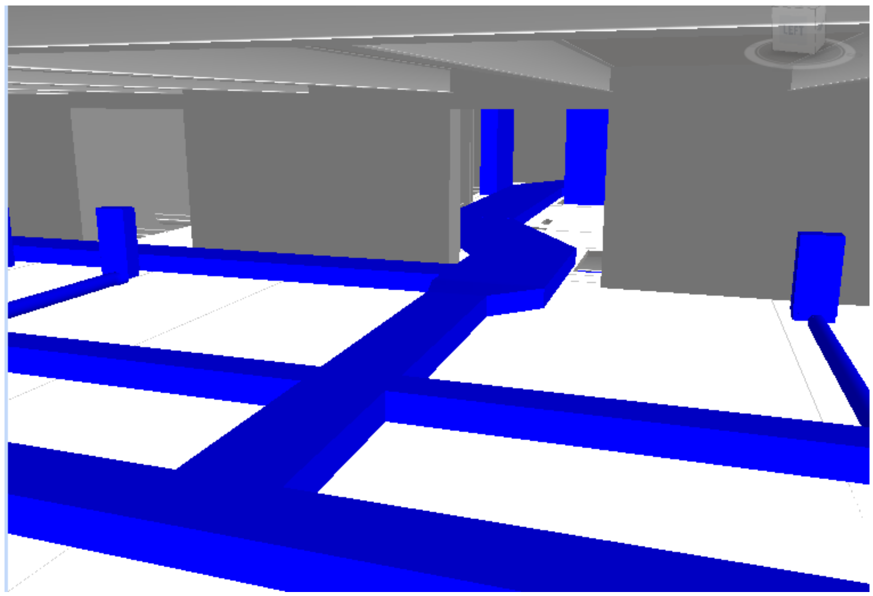


Figure 31: Initial Mechanical Coordination Through Core

2.3.5.4 Clash Results

A clash detection and report test was run between the proposed electrical bus duct risers in the core and the new riser openings of the concrete floor slabs. This was chosen in order to eliminate problems in the field with bus ducts not lining up to travel vertically through the floor openings which extend the height of the entire building. The first result, show in Figure 32, found that the modeled bus duct and connection and support structure conflicted with the concrete floor slab.

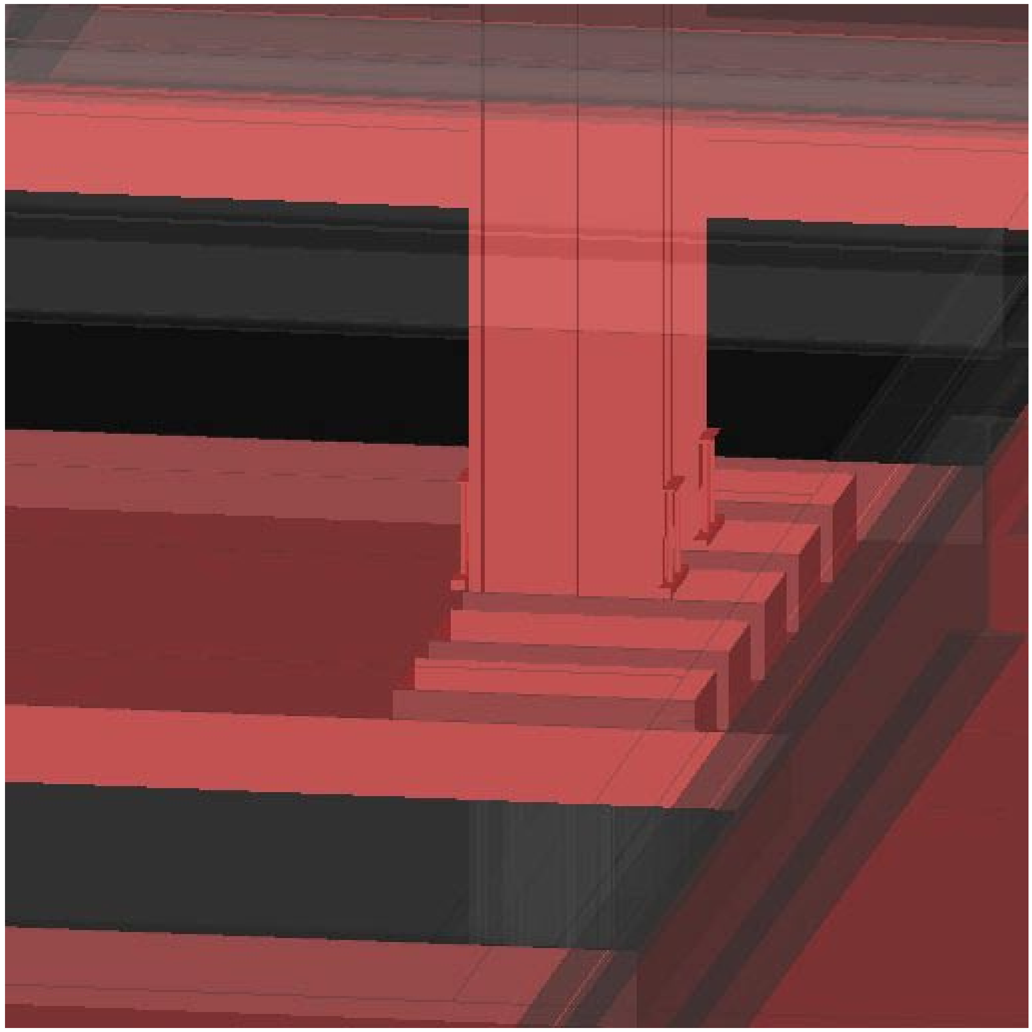


Figure 32: Original Bus Duct vs. Floor Slab Clash Result

By moving the location of the bus ducts ½'' through the entire height of the building, it was possible to resolve the found clashes everywhere. This is shown below in Figure 33. While this may not be as large of a problem in the field, it shows the capability of the technology to properly detect the problems in the model, and to resolve and eliminate potential problems in the field before there are additional costs.

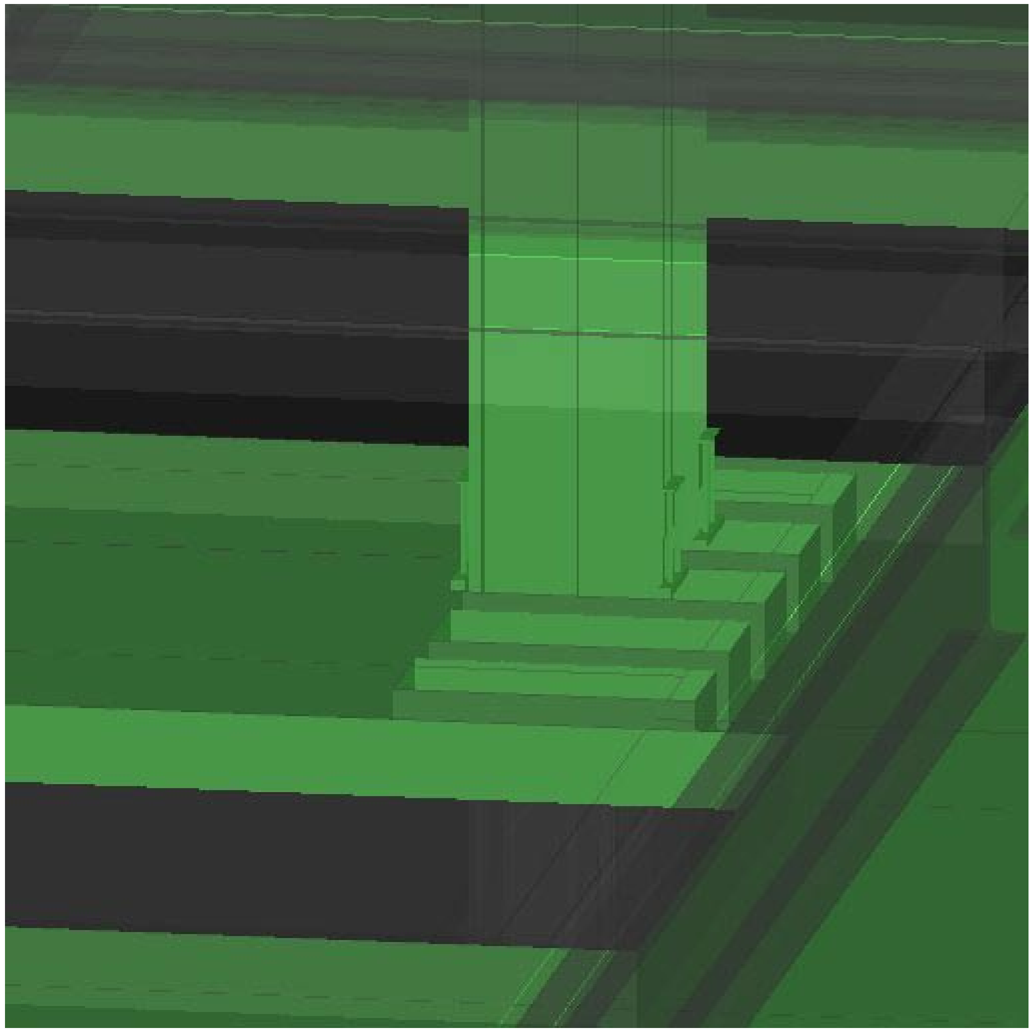


Figure 33: Resolved Bus Duct vs. Floor Slab Clash Result

2.3.5.5 Conclusion

By using an incorporation of the Building Information Model and clash detection software, there would be very beneficial outcomes during construction of The New York Times Building core. Looking at the case of bus ducts, a clash was found in the Building Information Model and a simple fix for the problem was implemented before construction started. This would avoid conflicts on the job site, would eliminate the RFI and change order to correct the problem, and would eliminate the costs associate with changing the installed bus ducts.

2.4 Construction Implications

2.4.1 **Objective**

The objective of this analysis is to perform detailed structural take-offs and apply pricing for labor and material to the original core and changes to the core of the building. The analysis will also include the cost changes as well as schedule implications and general conditions implications due to the lateral system changes.

2.4.2 **Process**

Model-

Develop an accurate structural model with the structural engineer showing the changes to the structure in Revit Structure

Analysis-

Develop electronic material take-offs from the Revit model

Apply R.S. Means cost to existing core and proposed redesign

Schedule implications due to concrete on site before steel

General conditions implications due to proposed concrete core

2.4.3 **Structural Material Take-off**

Some assumptions were made when considering the difference between the original and proposed core changes. They are as follows:

Foundations were not included between the original and proposed changes take-offs, only superstructure.

Connections were considered to remain approximately the same and were thus not included between the original and proposed changes take-offs.

Using the structural model developed by the structural engineer, detailed electronic take-offs were developed in Revit Structure and exported to Microsoft Excel. Electronic R.S. Means cost data was then tied into the electronic tower shear wall material schedules to give accurate cost, which could be updated quickly if specific materials or dimensions were changed due to the structural analysis. The steel framing which was selected for the analysis was only the steel immediately replaced by the concrete shear walls. This included columns, beams and bracing. The proposed concrete structural core is highlighted in Figure 34. The core cost includes the different strengths of concrete, rebar, labor, slip forming, two changes to the slip form for the shear wall thickness changes, and A summary of the costs for the original structural steel core and the proposed concrete core is shown in Table 31, and Table 32 respectively. In depth take-offs are located in Appendix 7.5 on page 401.

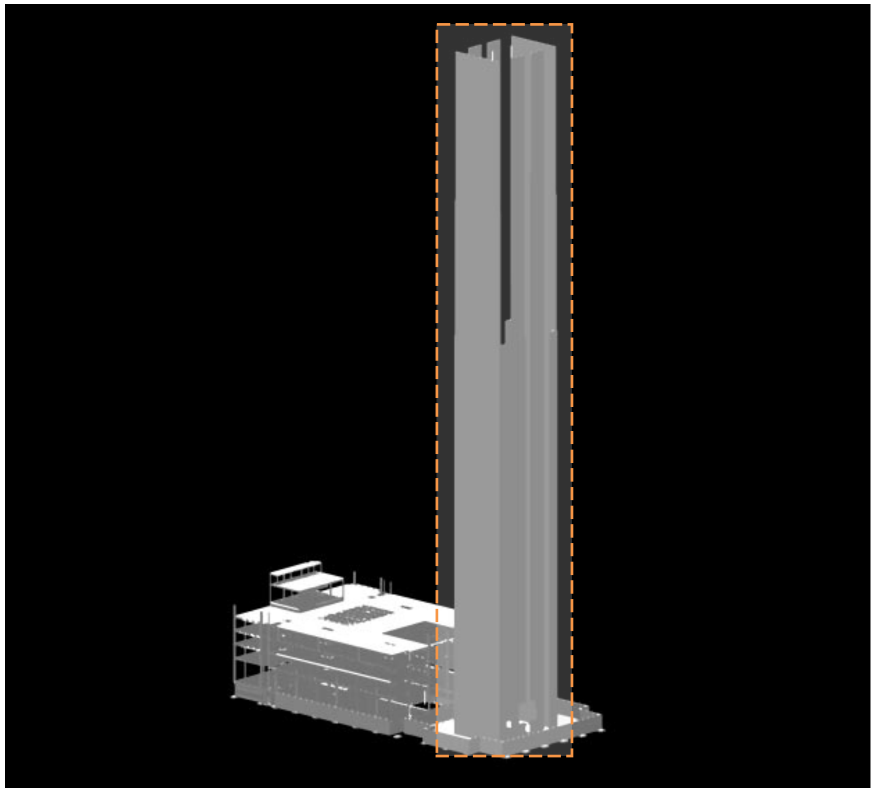


Figure 34: 3D Proposed Structural Core

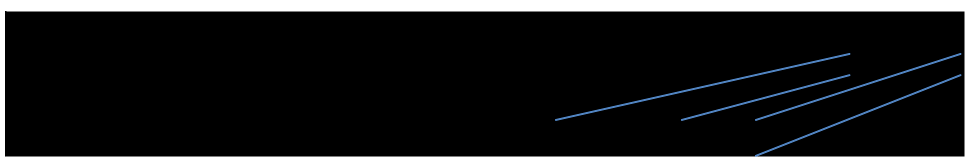


Table 31: Original Steel Core Take-off Summary

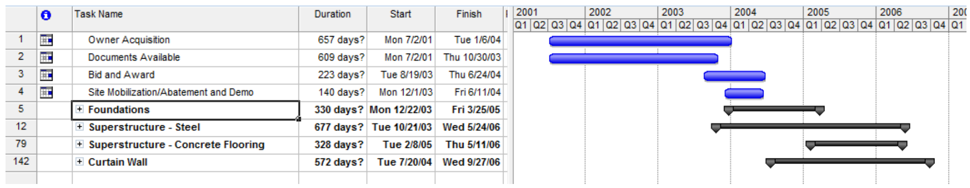
	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
Building Total	$ 8,855,631.75	$ 3,276,027.75	$ 33,794.34	$ 11,955,381.88	$ 9,789,884.20	$ 5,220,710.32	$ 36,270.10	$ 14,816,240.03

$ 14,816,240.03

Table 32: Concrete Core Take-off Summary

2.4.4 Schedule Implications

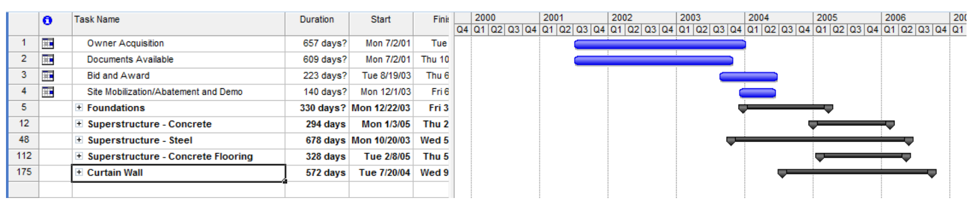
From the analysis of the existing schedule, and discussion with industry members and faculty, keeping to a schedule of forming, reinforcing, placing and curing two stories of the core every two weeks would keep construction on schedule. The original schedule allowed for an average of 9 work days per 2 stories for steel erection. The first floor tower portion is a double height space and was allotted the typical construction time for 2 typical floors. The mechanical floors, 28 and 51, were allotted additional time also, due to being double height spaces as well. Construction for the original all steel core began erection on 2/25/05 and was completed 4/25/06. A summary schedule for the original steel core is shown below in Figure 35.



	Task Name	Duration	Start	Finish
1	Owner Acquisition	657 days?	Mon 7/2/01	Tue 1/6/04
2	Documents Available	609 days?	Mon 7/2/01	Thu 10/30/03
3	Bid and Award	223 days?	Tue 8/19/03	Thu 6/24/04
4	Site Mobilization/Abatement and Demo	140 days?	Mon 12/1/03	Fri 6/11/04
5	**Foundations**	**330 days?**	**Mon 12/22/03**	**Fri 3/25/05**
12	**Superstructure - Steel**	**677 days?**	**Tue 10/21/03**	**Wed 5/24/06**
79	**Superstructure - Concrete Flooring**	**328 days?**	**Tue 2/8/05**	**Thu 5/11/06**
142	**Curtain Wall**	**572 days?**	**Tue 7/20/04**	**Wed 9/27/06**

Figure 35: Original Steel Core Summary Schedule

The changes to the core were also held at the same standard of 2 stories every 2 weeks for forming, reinforcing, placing the shear wall concrete. The ability to mobilize concrete earlier than steel was also taken into account for the schedule changes. Due to the earlier mobilization, the tower cranes needed to be mobilized earlier than the original schedule. By starting the core construction 2 months earlier than the original schedule, the tower cranes also needed to be mobilized and on site 2 months longer. Additional changes to the schedule were the result of the reduction of steel erection, discussed later in section 4.3.10. The schedule was updated according to the earlier on site mobilization for the FRP for the core, along with the earlier mobilization of the tower cranes. The proposed change to the core would begin construction on 1/3/05 and would be completed on 4/25/06. This would include the concrete core along with the steel columns and framing. A summary of the core change schedule is listed below in Figure 36.



	Task Name	Duration	Start	Finish
1	Owner Acquisition	657 days?	Mon 7/2/01	Tue
2	Documents Available	609 days?	Mon 7/2/01	Thu 10
3	Bid and Award	223 days?	Tue 8/19/03	Thu 6
4	Site Mobilization/Abatement and Demo	140 days?	Mon 12/1/03	Fri 6
5	**Foundations**	**330 days?**	**Mon 12/22/03**	**Fri 3**
12	**Superstructure - Concrete**	**294 days**	**Mon 1/3/05**	**Thu 2**
48	**Superstructure - Steel**	**678 days**	**Mon 10/20/03**	**Wed 5**
112	**Superstructure - Concrete Flooring**	**328 days**	**Tue 2/8/05**	**Thu 5**
175	**Curtain Wall**	**572 days**	**Tue 7/20/04**	**Wed 9**

Figure 36: Core Change Summary Schedule

By beginning the concrete core 2 months earlier, the original completion and top-out date for the superstructure would remain exactly the same, finishing 4/25/06.

2.4.5 General Conditions Implications

The general conditions would also be affected by the proposed change to a concrete core. After discussion with faculty and industry professionals, the major changes would occur with the additional time on site for the tower cranes, and the need for temporary heat during the winter months for the proper curing of the concrete core. Information from an interview with an industry professional and faculty advisor who has worked on high rise construction in New York City supplied an added cost between $1.8 million and $2.0

million for temporary heat for concrete core placement for each winter. From the existing general conditions, a tower cost was acquired at $13,200 per tower per month. Crew for each tower was $37.40 per day.

2.4.6 Cost Changes

The total cost of steel which would be replaced by the concrete core was found to total $34,680,590.56 over the height of the building. The total cost of the proposed concrete core was found to total $14,816,240.03. The difference of $19,864,350.53 is a total savings if a concrete core was utilized instead of a steel core.

The proposed concrete placement will begin halfway through the first winter and would completely span a second winter. By using the maximum of $2.0 million as a conservative cost, the total additional cost of approximately $3,000,000.00 would be added to the general conditions for temporary heat.

From the addition of 2 months to the duration of each of the tower cranes, and an additional cost per month for the on-site tower crane duration of $13,200.00 per crane per month, an additional cost of $52,800.00 would be added to the general conditions. The cost for the crane crew at $37.40 per day and an increased duration of 80 days, an additional cost of $2,992.00 would also be added to the general conditions. This is a total of $55,792.00 added cost to the general conditions for the added on-site crane durations.

2.4.7 Conclusions

There are several benefits to utilizing a concrete core within the New York Times Building. When determining the difference in cost between the two systems, a concrete core would save approximately $20 million in material and labor costs compared to the steel columns, framing and bracing that it would replace. By utilizing an early start to the schedule, and the same criteria for FRP for the concrete as with the structural steel framing following the core, construction could remain on schedule. One problem would be the additional costs associated with the increased time on site for the tower cranes and crew along with the requirement for temporary heating during the winter months. These costs are associated with the general conditions and result in an addition of approximately $3,060,000.00. With $20 million being removed from construction already, the addition of these costs would still result in a conservative savings of $16.5 million.

3 ENVELOPE REDESIGN

3.1 Envelope Changes

The existing curtain wall system was changed from a single façade layer with a ceramic rod shading system to a dynamic curtain wall system incorporating motorized louvered shades and operable windows. These changes resulted in significant cost savings and required coordination with the mechanical and electrical systems as well as architecture and construction. The BIM model was utilized to investigate interoperability with energy analysis software. In addition to the energy modeling, families were created within the Revit model to properly portray the proposed system in comparison with the existing. The BIM model allowed the entire team to understand the proposed changes and the influence of BIM tools.

3.2 Daylighting

The following section discusses the façade redesign and the daylighting analysis of the 8th floor. This was the MAE section of the lighting/electrical report.

3.2.1 Objectives

Goal of this evaluation/analysis/redesign

1) Optimize daylight control for occupant comfort

2) Reinforce the architectural appeal of the building by maintaining views to the exterior

3) Determine energy savings from electric lighting controls

4) Pass lighting load profiles to mechanical designer for energy modeling

3.2.2 Process

Literature Review-

Review case studies as well as computer modeling analyses. Apply concepts from literature to the redesign.

Design-

Determine appropriate daylight control system

Modeling-

Apply floor plan changes from the tenant and core changes to the AutoCAD model.

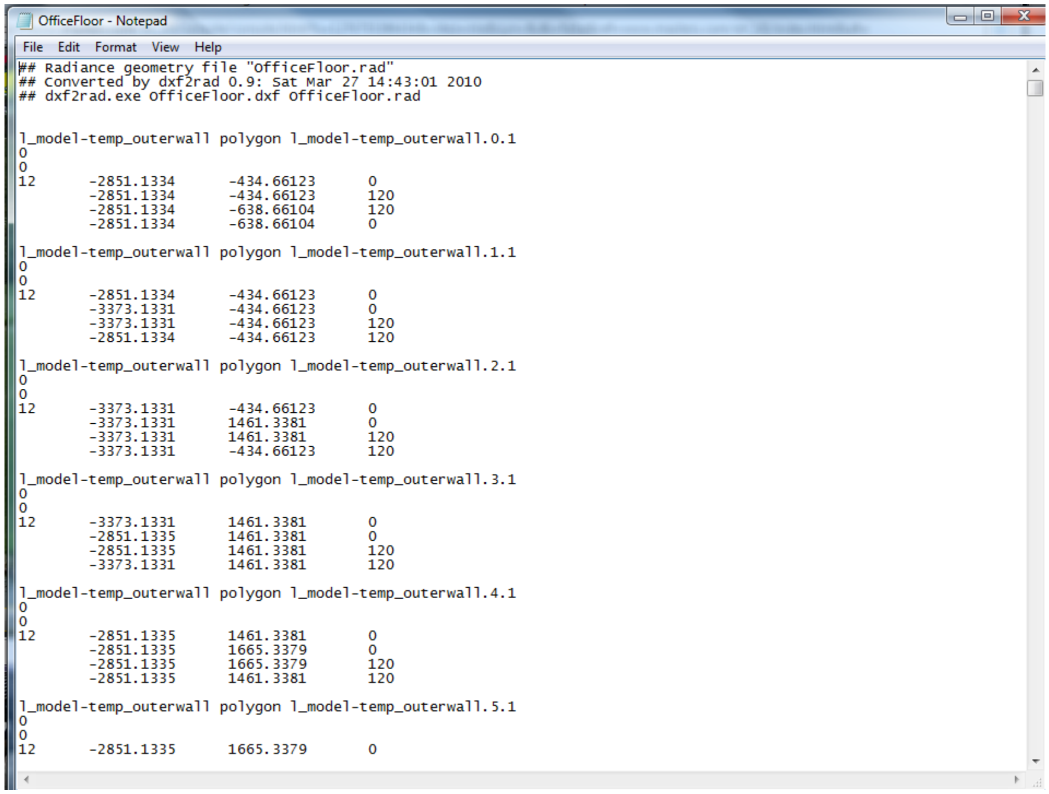
Create geometry files for use in Daysim.

Create material files for use in Daysim

Download/Create all necessary input files for Daysim

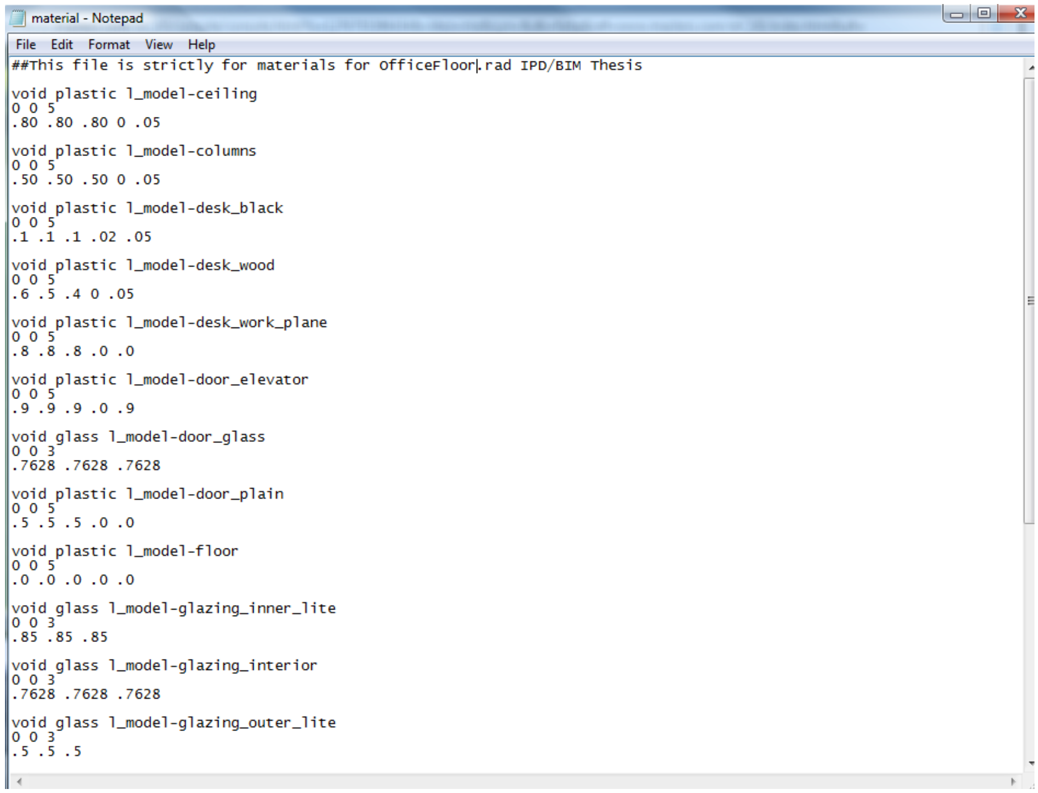
Simulation-

Use the newly updated Daysim software for analysis.




```
## Radiance geometry file "officeFloor.rad"
## Converted by dxf2rad 0.9: Sat Mar 27 14:43:01 2010
## dxf2rad.exe officeFloor.dxf officeFloor.rad


l_model-temp_outerwall polygon l_model-temp_outerwall.0.1
0
0
12      -2851.1334      -434.66123      0
        -2851.1334      -434.66123      120
        -2851.1334      -638.66104      120
        -2851.1334      -638.66104      0

l_model-temp_outerwall polygon l_model-temp_outerwall.1.1
0
0
12      -2851.1334      -434.66123      0
        -3373.1331      -434.66123      0
        -3373.1331      -434.66123      120
        -2851.1334      -434.66123      120

l_model-temp_outerwall polygon l_model-temp_outerwall.2.1
0
0
12      -3373.1331      -434.66123      0
        -3373.1331      1461.3381       0
        -3373.1331      1461.3381       120
        -3373.1331      -434.66123      120

l_model-temp_outerwall polygon l_model-temp_outerwall.3.1
0
0
12      -3373.1331      1461.3381       0
        -2851.1335      1461.3381       0
        -2851.1335      1461.3381       120
        -3373.1331      1461.3381       120

l_model-temp_outerwall polygon l_model-temp_outerwall.4.1
0
0
12      -2851.1335      1461.3381       0
        -2851.1335      1665.3379       0
        -2851.1335      1665.3379       120
        -2851.1335      1461.3381       120

l_model-temp_outerwall polygon l_model-temp_outerwall.5.1
0
0
12      -2851.1335      1665.3379       0
```

Figure 37: Eighth Floor Rad Geometry File




```
##This file is strictly for materials for OfficeFloor.rad IPD/BIM Thesis

void plastic l_model-ceiling
0 0 5
.80 .80 .80 0 .05

void plastic l_model-columns
0 0 5
.50 .50 .50 0 .05

void plastic l_model-desk_black
0 0 5
.1 .1 .1 .02 .05

void plastic l_model-desk_wood
0 0 5
.6 .5 .4 0 .05

void plastic l_model-desk_work_plane
0 0 5
.8 .8 .8 .0 .0

void plastic l_model-door_elevator
0 0 5
.9 .9 .9 .0 .9

void glass l_model-door_glass
0 0 3
.7628 .7628 .7628

void plastic l_model-door_plain
0 0 5
.5 .5 .5 .0 .0

void plastic l_model-floor
0 0 5
.0 .0 .0 .0 .0

void glass l_model-glazing_inner_lite
0 0 3
.85 .85 .85

void glass l_model-glazing_interior
0 0 3
.7628 .7628 .7628

void glass l_model-glazing_outer_lite
0 0 3
.5 .5 .5
```

Figure 38: Eighth Floor Rad Material File

3.2.3 Literature Review

Kacel, S., & Yener, A.K. (2008). The Effect of Facade Design on Lighting Energy Consumption in Offices: A Case Study in Turin, Italy. *Architectural Science Review*, 360-368.

This article goes through the process for designing buildings in response to daylight. It discusses the need for the daylighting to be taken into account at early stages in the design. Using building information modeling software to complete analysis of the building to inform decisions is also a highlight of the paper. Another important point is the need for an integrated approach during the early design stages. In addition to the process for design, the paper discusses systems and controls. The paper discusses three main ways for control: inactive occupant control, active occupant control, and automatic control.

Parys, W., Saelens, D., & Hens, H. (2009). Impact of Occupant Behaviour on Lighting Energy Use. *Eleventh International IBPSA Conference*, (pp. 1143-1150). Glasgow, Scotland.

An important consideration for a high performance building is controls. It is necessary to understand not only the external factors of the building, but also the way the occupants will interact with the building. In this paper, the topic of occupant behavior is discussed. Multiple situations are simulated through the use of Daysim (old version). The results showed that if an occupant can interact with the lights, such as in a private office, continuous dimming savings are overestimated by ten percent. Another topic was the issue of how to turn on the lights. Significant savings were discussed when forcing the occupant to turn on the lights as opposed to automatically turning on the lights. If the occupant can see a bright sky, they are less likely to turn the lights on, even if the light levels inside the space may require it. Further discussions were in regards to baselines for savings. The paper determines that it is important to compare a continuous dimming system to a room that is switched by active-active occupant. An active-active occupant is one that correlates switching decisions to the ambient daylight conditions and determines what to do with the blinds based on the ambient daylight conditions. This is important when determining savings, because a cost analysis should be based on how a space will function with occupants.

Robinson, L., & Athienitis, A. (2009). Design Methodologoy for Optimization of Electricity Generation and Daylight Utilization for Facade with Semi-transparent Photovoltaics. *Eleventh International IBPSA Conference*, (pp. 811-818). Glasgow, Scotland.

This paper went over a series of simulations and physical mockups to verify the savings found from incorporating semi-transparent photovoltaics into the curtain wall system. The study compared the total energy savings from using either semi-transparent photovoltaics or opaque photovoltaics. The study showed that even at low transparencies, there were still savings from the electric lighting. Even though the efficiency of the panels decreases when moving to semi-transparent photovoltaics, the energy saved from putting them on them into the glazing results in significant lighting savings. The curtain wall should be comprised of three sections for this to be effective.

The bottom third of the window should be an opaque spandrel panel. The middle third should be clear viewing glazing. The top third should incorporate the semi-transparent photovoltaics. The optimal energy savings came from covering the top third 80-90% with the semi-transparent photovoltaics.

3.2.4 Assumptions

The reflectances are assumed as in the interior lighting section of the report

The illuminance level needed to be maintained is 30 fc per IESNA Recommendations

Because the louver system stays perpendicular to the altitude of the sun, all of the direct sun must pass through the louvers before entering the space. Since Daysim does not have the ability to automatically rotate the shades from 0 through 90 degrees, the model has a flat plane of glass covering the opening. This means that indirect light levels entering the space are lower than what would actually happen. This means that the savings achieved will be conservative.

3.2.5 Design Intent

After a literature review on Daylighting of Office Buildings, it was determined that the optimal system from a daylighting perspective would be an automatic shading system. The use of a daylight simulation program would need to be used to understand the lighting impacts. Daysim, the simulation program, has recently been improved by Dr. Rick Mistrick of The Pennsylvania State University. With the information gained in the AE 565 Daylighting class, a daylighting analysis was completed.

The overall design of the façade was an important issue to all members of the design team. For this reason, many meetings were held to develop the proper system. The important parts to be considered were the architectural, thermal, and lighting impacts. Since all of the design members were of the engineering background, a discussion with an architectural consultant was had. With this information, the design team was able to find the most optimal system for energy, comfort, and architectural appeal.

To help lower the overall energy use of the building, a redesign of the facade was completed. The existing shading device is a series of ceramic rods. These rods cover less than 30% of the opening. In addition to the rods, the glazing transmits approximately 94% of the visible light. Due to the obvious issues with direct sun, a motorized shading system was incorporated on the interior of the building. The shade is great for blocking out the direct sun, but the heat will have already made it into the building.

The redesign of the façade system incorporates motorized louvers. (See Figure 283: Double Skin Facade Specification Sheet 1 on pages 380 through 383) These louvers are made from glass and have a ceramic frit applied to it. The frit is comprised of small 1/2" circles covering 50% of the louver. The glass itself has a transmittance of 70%. This exterior system allows for uni-directional tracking of the sun. The tracking nature of this system allows for maximum transparency within the building. When an occupant looks out of the space, there will never be a series of dark bars across their visual field. The louvers will always maintain a uniform view out of the building.

When comparing the existing system with the redesign, the new system already outperforms thermally. With the exterior layer alone, 65% of direct sun is stopped. The distinction between direct sun and light is an important one. Direct sun is what plagues an office environment exposed to glazing on all sides of the building. Even the north side of a building can sometimes receive direct sun. Because this system tracks the sun, the louver will block most of the direct sun while allowing reflected light into the space. By doing this, occupants will be able to leave the blinds open a greater percentage of the time.

When looking at the current system, the blinds close whenever the sun is on that side of the building. This results in less daylight entering the space, which in turn results in higher electric light levels. If the shading system were able to leave the blinds up for a greater portion of the day, the electric light levels would fall drastically. With proper glazing, the sun has a much higher lumen/watt rating than any source available today. This is important when considering the heat load on the building. The fewer the watts used in the lighting system, the lower the heat gain to the space. This is true as long as the glass is able to block out most of the non-visible regions of the spectrum.

The inner layer of the curtain wall must also be designed to block out some light. The transmittance of the inner curtain wall is 80%. When necessary, the inside of the curtain wall also contains motorized shades. If direct sun is an issue, the system needs to have a last line of defense for occupant comfort. With the redesign of the external system, the shades shouldn’t need to be down as often.

The shading system is designed to be on the four major sides of the building. Due to the floor plan of the building, there are four cut-outs that need to be addressed. Since there is no shading device planned for these notches, something needs to be done to keep the direct sun out of the space. To keep a uniform look throughout the space, the frit was applied on the curtain wall of the notches. If the louvers are down, the entire façade will look uniform. If the louvers are up, then the corners will be more diffuse than the rest of the curtain wall. The Revit file was updated with this system and the images on the following pages are as a result of that model input.

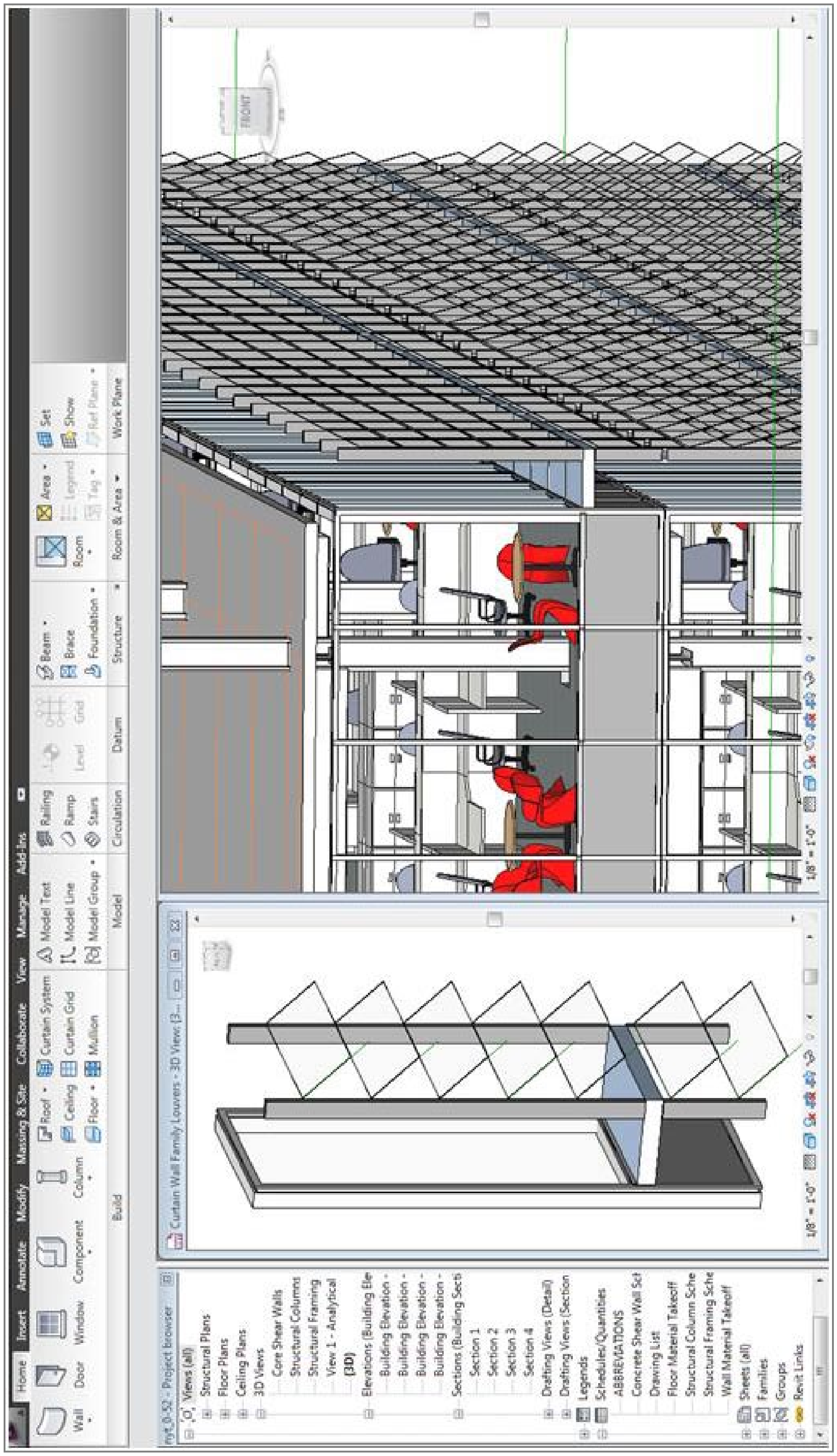


Figure 39: Shading System Family in Revit

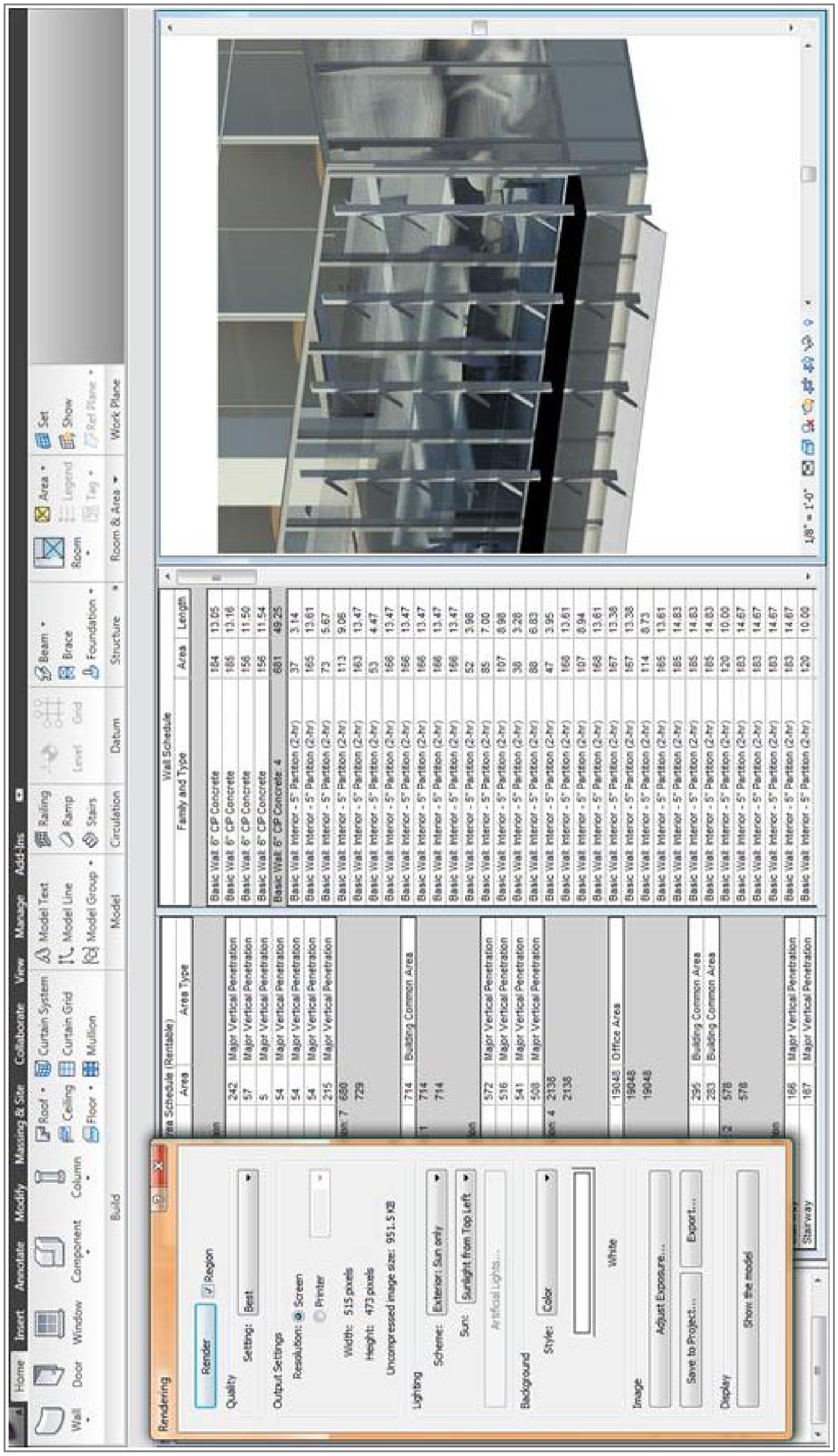


Figure 40: Shading System Render Settings

Figure 41: Shading System Render in Revit

Using a digitally addressable lighting system with continuous dimming is the best way to save energy. The problem with incorporating these systems is the cost. In order for the system to pay itself off, it needs to save a significant amount of energy. This is extremely difficult when designing a system that operates at a low lighting power density. In order to analyze the system for savings, Daysim simulations were run. With information learned in AE 565 a spread sheet was developed to take daylight autonomy (DA) values and turn them into kilowatt hour savings (See Figure 43: Spread Sheet Developed for Continuous Dimming Savings Based on Daylight Autonomy on page 94). This is done by finding the DA, the percentage of time that daylight meets a target illuminance, for five regions of the fluorescent dimming curve. This is done in place of continuous daylight autonomy, due to the nature of fluorescent dimming. The curve for light output versus power is not proportional. At the minimum light output, the ballast consumes a higher percentage power than when at full output. Class lectures gave the necessary information for performing the calculation and the verification that the simplification was valid.

The reason for developing this spread sheet was to run the Daysim simulation once. In a typical simulation, Daysim can have 1 zone being dimmed. With this simulation, Daysim can calculate the energy savings. Because of the large open area of the New York Times office space, a single zone would not be effective. Daysim can output the DA for the entire floor with graphical results. These graphs were used as the input for the spread sheet. The energy savings for the entire floor could then be calculated as opposed to running four full year simulations.

After multiple simulations, the control strategy that had the greatest impact was continuous dimming of the first two rows of fixtures around the entire perimeter. To obtain the cost savings from using continuous dimming, the spread sheet that was developed was used in conjunction to Daysim. By doing this, savings of $1,125.60 per floor per year are expected based on $.15/kWh. Over the 50 typical floors, that is a direct savings of $56,280 per year. In addition to the direct electricity savings, the HVAC system will also have savings. This information was supplied to the mechanical student for energy modeling purposes.

With the redesign of the façade, a look into incorporating PVs was completed. Through the research completed and the Ecotect simulations, it was determined that integrating semi-transparent photovoltaics into the louvers would benefit the energy profile of the building. By incorporating these into the top third of the louvers per floor, the viewing angle would not be disrupted. In addition, peak loads during the summer months could be shaved by use of the system. More information on this redesign can be found in Figure 277: Daylight Autonomy Screen at 0 Lux Target Illuminancethrough Figure 282: Daylight Autonomy Screen at 285 Lux Target Illuminance on pages 374 through 379.

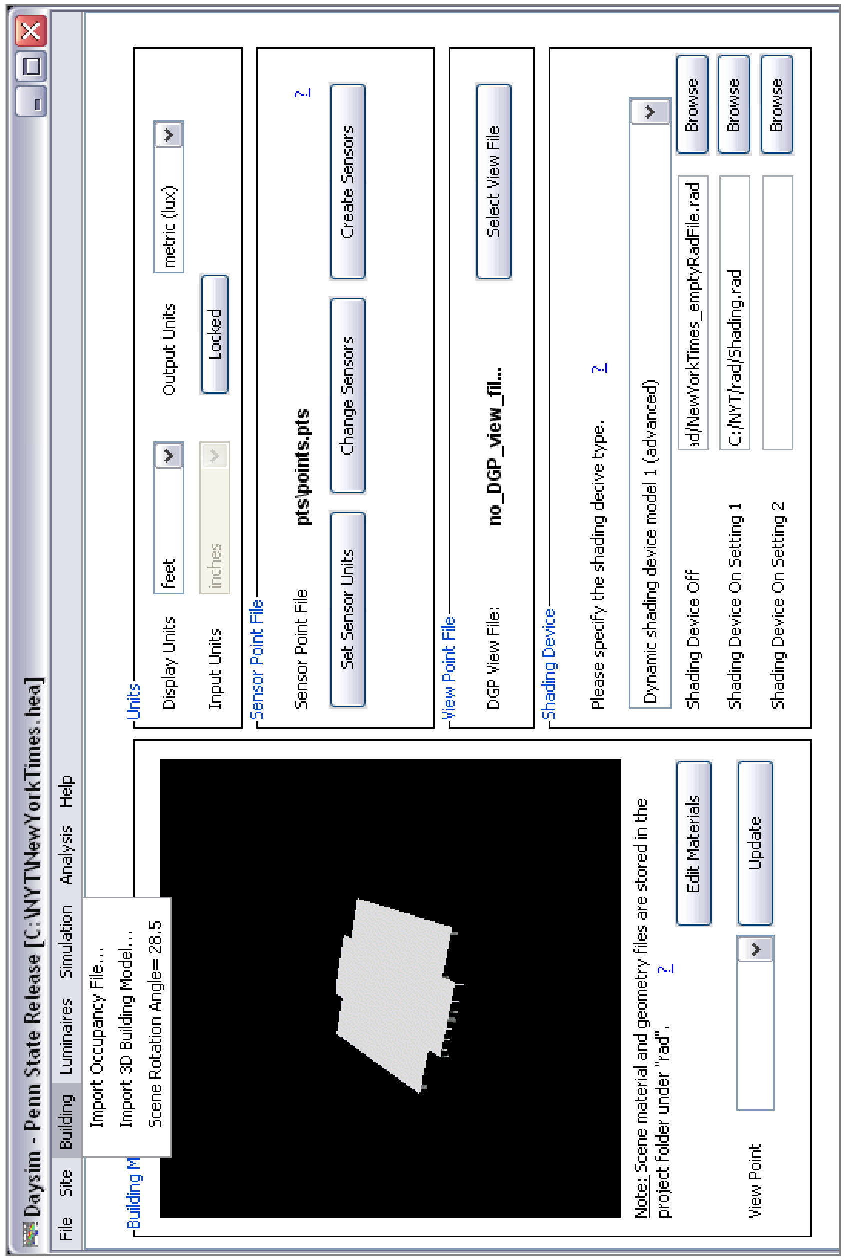


Figure 42: Daysim Building Data Entry Screen

3.2.6 Spread Sheet Development

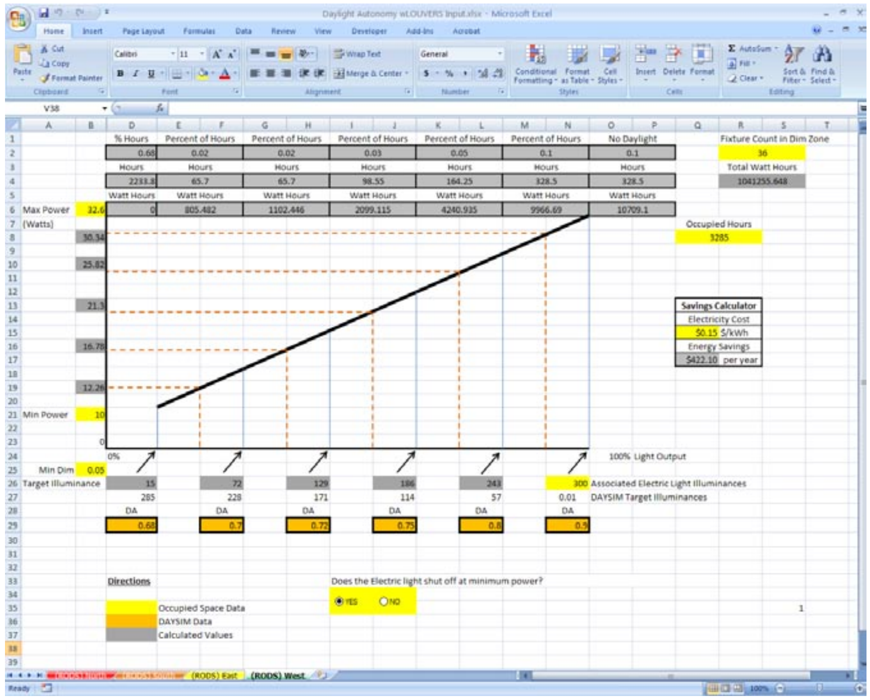


Figure 43: Spread Sheet Developed for Continuous Dimming Savings Based on Daylight Autonomy

3.2.7 Conclusions

Because of the daylight control strategy, these savings are extremely conservative. If the louvers were able to be simulated correctly, more indirect light would be able to enter the space. With this in mind, the combination of the electric lighting design and the daylighting control design will save a significant amount of money. With the already extremely low lighting power density, the daylighting harvesting strategies are adding to the lighting energy savings.

3.3 BIM for Performance Modeling

BIM for performance modeling has become an increasingly significant and powerful tool in industry to make the process of energy analysis more efficient and collaborative. There are, however, many barriers to successful utilization of this tool including software interoperability and best management practices for modeling, both of which were investigated in this thesis.

The Three Dimensional (3D) model of The New York Times Building was created in Autodesk Revit Architecture. Revit, along with other 3D BIM software, supports the Green Building XML (gbXML) Schema. For the purpose of this analysis, the workflow utilizing the gbXML file format to transfer information, including building geometry, wall constructions, and shading devices, into energy analysis tools was investigated.

Specifically the transfer from Revit to Integrated Environmental Solutions (IES) <Virtual Environment> and Autodesk Ecotect Analysis software was investigated. Using IES<VE> simulations were performed to reduce the ambient load profile of the building, resulting in energy reduction and cost savings. The energy efficiency measures analyzed included building envelope improvement, shading performance, and load reduction due to decreased lighting power density in the office spaces.

3.3.1 Objectives

1) Establish workflow criteria for software interoperability
2) Reduce ambient building loads through parametric study

3.3.2 Building Information Modeling Workflow

3.3.2.1 Architectural Model

Figure 44 - Complete 3D BIM Model, provides the original detailed BIM model of The New York Times Building created by the design team with existing constructions and geometries.

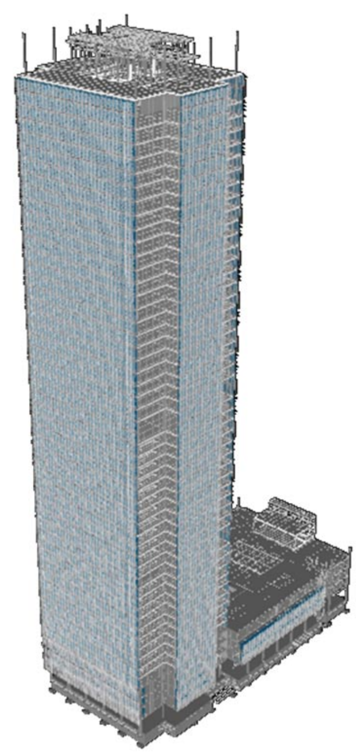


Figure 44 - Complete 3D BIM Model

3.3.2.2 Interoperability

Utilizing the gbXML format to import for import to an energy simulation program produced errors resulting from complex geometries. For example, the shading system would not import correctly as a shading device because it was a custom family created in Revit. Shading would have to be constructed in the energy analysis software. Additionally, wall constructions would not transfer correct performance values and would therefore need to be redesigned as well. This is an obstacle in creating a complete information transfer, however, user-defined constructions can be defined in Revit for reference and assigned manually in <VE>.

The following selection describes the model parameters that needed to be addressed for a successful import.

3.3.2.2.1 Geometry Simplification

Interoperability can be a powerful tool if successful. To ensure this success, the architectural model was recreated by the mechanical designer using simplified geometry. The custom family curtain wall was modified to the default glazing curtain wall system in Revit. Interior construction types were unitized. These simplifications greatly reduced the amount of errors generated in the gbXML file. A recreation of the tower is shown in Figure 45 - Simplified Revit Tower Geometry.

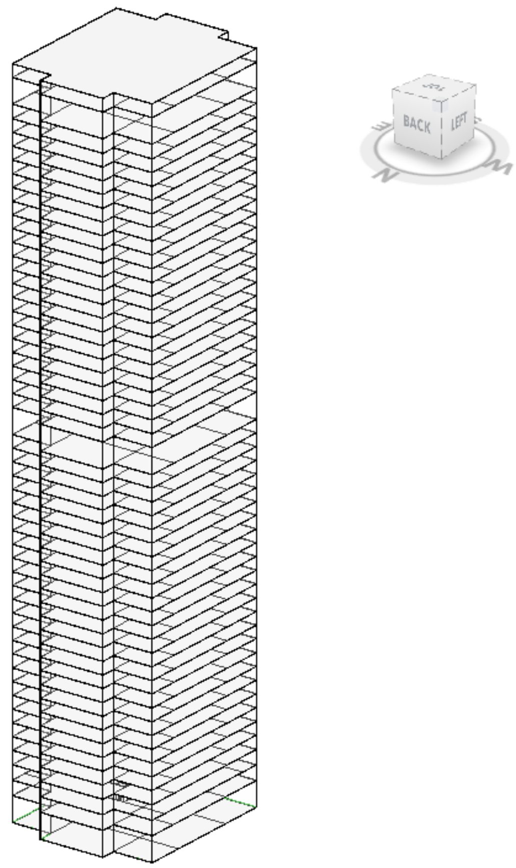
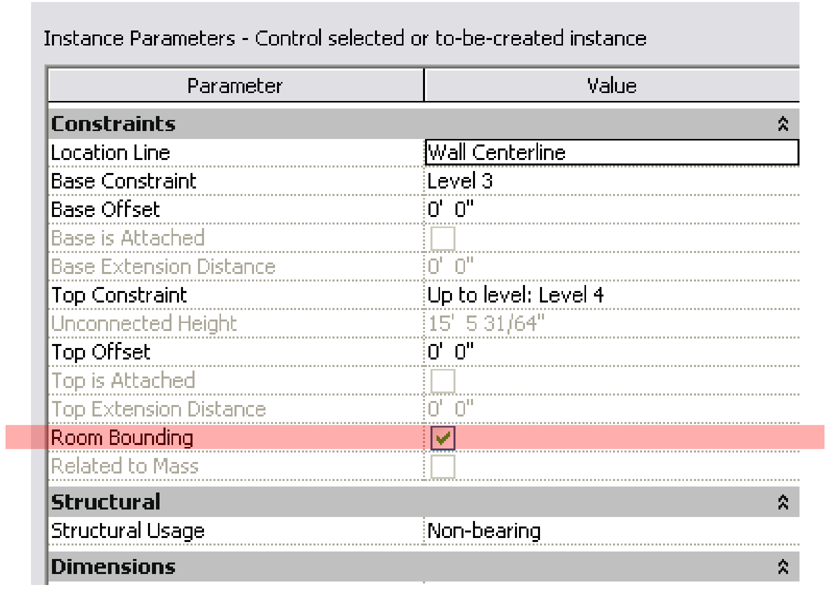


Figure 45 - Simplified Revit Tower Geometry

3.3.2.2.2 Room Based Modeling

The New York Times Building was modeled in Revit using interior Room-based modeling. Proper placement of these were critical for a successful gbXML export. It was necessary to place rooms in every enclosed space, including shafts, as well as floor and ceiling plenums. If an enclosure is not defined as a room, any adjacent wall will be deemed exterior. In addition, it was important to not assign ceilings or raised floor as "Room Bounding," in Revit, as this adjacency issue would occur. This parameter is shown in Figure 46 - Room Bounding Parameter. Room bounding surfaces must have an upper limit set to the next level with a limit offset of zero to ensure that the analytical volumes created are perfectly adjacent and prevent exporting errors. Room separation lines were used to designate separate zones within the open plan space.


Instance Parameters - Control selected or to-be-created instance

Parameter	Value
Constraints	
Location Line	Wall Centerline
Base Constraint	Level 3
Base Offset	0' 0"
Base is Attached	
Base Extension Distance	0' 0"
Top Constraint	Up to level: Level 4
Unconnected Height	15' 5 31/64"
Top Offset	0' 0"
Top is Attached	
Top Extension Distance	0' 0"
Room Bounding	✔
Related to Mass	
Structural	
Structural Usage	Non-bearing
Dimensions	

Figure 46 - Room Bounding Parameter

If utilizing Revit MEP rather than Revit Architecture for export, there is an additional step to this process. In addition to Rooms, Spaces must be placed in each enclosure, however, the file transfer used in this analysis was exported from Revit Architecture, and so only Rooms were needed. The function “Compute Room Volumes,” located in the Room and Area Settings menu must be selected to ensure creation of the analytical volumes in the model. Furniture, structural columns, and other minor details that resulted in exporting errors were also removed to simplify geometry, decrease errors, and increase software interoperability.

3.3.2.2.3 *Successful Export*

The error report generated from the export must be analyzed carefully and requires significant to inspect the entire model to ensure all correct parameters are set. Figure 47 - Revit Analytical Volumes, shows the visualization of the analytical volumes when creating the gbXML file for export. This file was then imported successfully into IES <VE> for analysis shown in Figure 48 – Building Model in IES<VE> with zero errors.

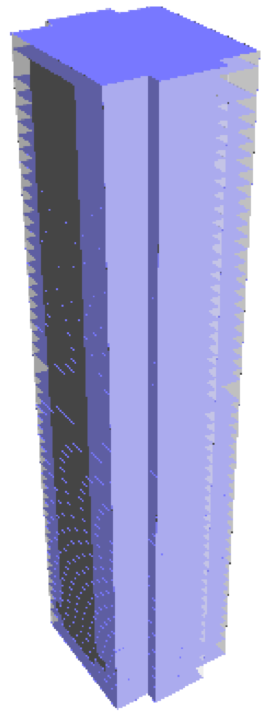


Figure 47 - Revit Analytical Volumes

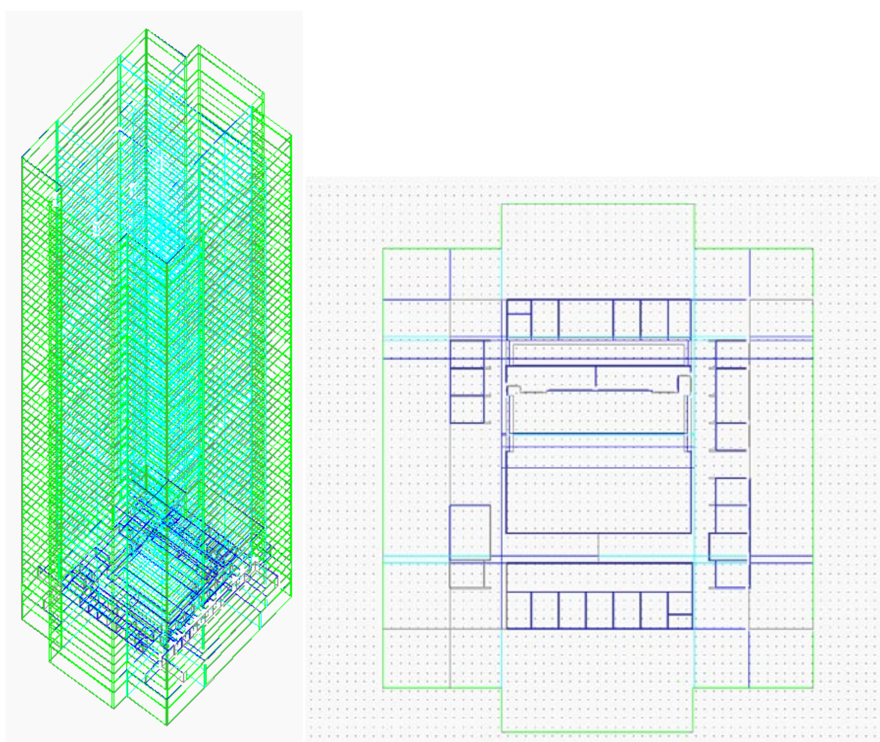


Figure 48 – Building Model in IES<VE>

3.3.2.3 Conclusions

There are several advantages and disadvantages of this workflow. Firstly, visualization is a powerful and persuasive tool. Being able to communicate with all members of the design team, including the architect and owner, could potentially help inform design decisions early on and lead to a higher performing building. Some disadvantages include the need for models to be carefully created and appropriately simplified, as well as the need to have all modeling parameters discussed and simulated correctly for interoperability to be successful. Additionally, any changes made to the model in analysis software, such as IES<VE>, cannot flow backwards into the initial BIM model. This information must be manually recreated. Overall, the interoperability of 3D BIM models to energy analysis software can be a powerful tool if care is taken by the entire design team to appropriately model the building during initial design phases with intention to use the model in this way.

3.3.3 **Ambient Load Optimization**

After successful import of the gbXML file format for the building analytical volumes into IES<VE>, building performance was simulated for both the original design and the buildings systems redesign. Specifically for the reduction of ambient load profiles of the redesign, the envelope constructions were studied and optimized to minimize the envelope load on the building and then results from the lighting analysis were used to determine the load reduction due to decreased lighting power density in the office spaces.

3.3.3.1 Assumptions

The information used in the energy simulation model was derived from relevant design documents, ASHRAE Standards and typical schedules found in the IES <VE> energy simulation program, as well as assumptions made by mechanical designer. The assumptions may have differed from those made by the design engineer of record resulting in differences in analysis results. Office spaces were conditioned according to outdoor and indoor design conditions designated in ASHRAE Fundamentals 2005. Retail spaces are separately metered and paid for by the tenants so for the scope of this thesis and simplification of simulation, these spaces, in addition to the lobbies and cafeteria will not be analyzed. Restrooms and mechanical spaces will not be conditioned, only exhausted with fan energy considered. In addition, the cogeneration plant was considered outside the scope of this thesis and therefore not simulated. The following design conditions were held constant for both the baseline and proposed model.

3.3.3.2 Location & Site

The analyses are based on US climatic data for New York, NY (Table B-1 ASHRAE 90.1-2007). The weather file for ASHRAE weather location New York / Laguardia Airport, New York (NewYorkTMY2.fwt) was used for analysis. Site data is adjusted accordingly:

Terrain type: City

Ground Reflectance: 0.30 (Concrete - average condition)

Site rotation angle: 28.5° from True North

Table 33 - Outdoor and Indoor Design Conditions Source: ASHRAE Fundamentals (2005)

Outdoor Design Conditions					
Season	Dry Bulb (ºF)		Wet Bulb (ºF)		
Winter	15		-		
Summer	87		72		
Indoor Design Conditions					
Space Occupancy	Temperature (ºF)		Humidity	Driftpoints	
	Summer	Winter		Cooling	Heating
Office Spaces	75	70	50 % RH	81	64

Figure 49 – Site location & Rotation Angle

3.3.3.3 Zoning

Perimeter and core zones were defined in the Revit model and simulated in IES<VE> shown in Figure 50 - Typical Office Floor Zoning.

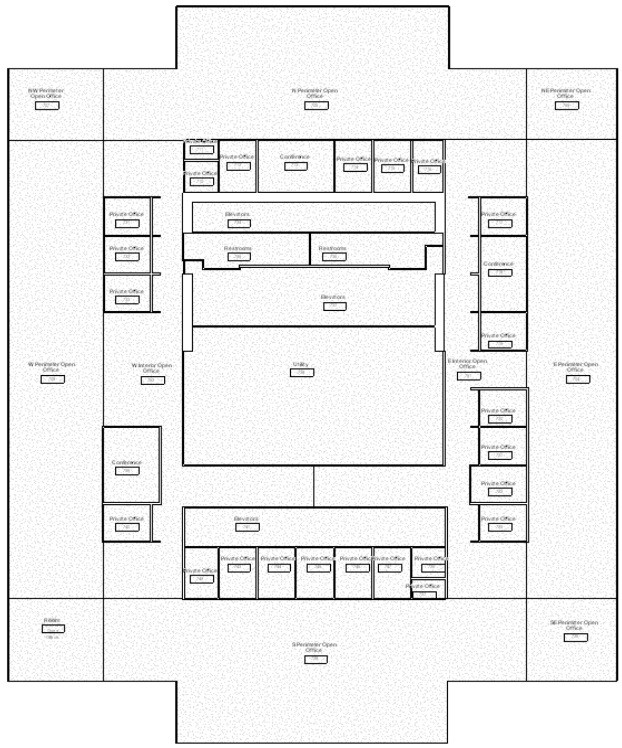


Figure 50 - Typical Office Floor Zoning

3.3.3.4 Model Input Summary

Table 34 - Model Input Summary, describes various modeling assumptions that remained constant for all simulations.

Table 34 - Model Input Summary

Model Input Parameter	Baseline Design Input	Proposed Design Input
Infiltration	0.3 CFM / SF	0.3 CFM / SF
Occupancy Loads	Sensible 250 BTU/hr/person Latent 200 BTU/hr/person	Sensible 250 BTU/hr/person Latent 200 BTU/hr/person
Plug Loads / Equip Loads	Offices - 0.5 W/SF Copier - 400 W Refrigerator - 500 W Microwave - 450 W Telecom Equip - 400W	Offices - 0.5 W/SF Copier - 400 W Refrigerator - 500 W Microwave - 450 W Telecom Equip - 400W
Supply Air Temperature	Cooling Supply: 60-62 F Heating Supply: 83-85 F	Cooling Supply: 60-62 F Heating Supply: 83-85 F
Humidity Control	50 % Relative Humidity	50 % Relative Humidity
OA Ventilation Rates	5 CFM / Person 0.06 CFM / SF	5 CFM / Person 0.06 CFM / SF

3.3.3.4.1 Envelope Constructions

Table 35 - Envelope Constructions describes various modeling assumptions that were changed in the model to determine reductions in ambient load of the building resulting from envelope loads.

Table 35 - Envelope Constructions

Model Input Parameter	Baseline Design Input	Proposed Design Input
Spandrel Panel	Recessed 3/16" Aluminum Spandrel Panel: Uvalue: 0.08 Btu/ft^2-F-hr 2-1/2" Rigid Insulation behind	Recessed 3/16" Aluminum Spandrel Panel: Uvalue: 0.08 Btu/ft^2-F-hr 2-1/2" Rigid Insulation behind
Fenestration Type	1" IGU Vision Lite - Clear w/ Low e Double Pane - Aluminum Frame	1" Coltlite Double glazed panel
Fenestration U-value	U value for glazing: 0.625 Btu/ft^2-F-hr	U value for glazing: 0.405 Btu/ft^2-F-hr
Fenestration Visible Light Transmittance	0.96 (96% transmittance)	0.79 (79% transmittance)
Shading Device	1-5/8" Diameter Ceramic Tubes	Colt Shading Louvres

3.3.3.4.2 Lighting Load Reduction

Table 36 - Lighting Load Reduction provides the lighting power density reduction determined from the lighting analysis performed by the lighting designer. These values were modeled to determine an ambient load reduction due to decreased lighting power density.

Table 36 - Lighting Load Reduction

Model Input Parameter	Baseline Design Input	Proposed Design Input
Interior Lighting Power Density	1.1 W/m^2	.46 W/m^2

3.3.3.5 Simulation Results

A study was conducted and the final reduction in peak cooling and heat loads is summarized in Table 37 - Simulation Results and Figure 51 – Simulation. Baseline Design, Proposed Envelope Design, and Proposed Lighting Design are represented by Case 1, 2, and 3 respectively in the graph.

Table 37 - Simulation Results

Peak Load	Baseline Design	Proposed Design	% Reduction due to Glazing / Shading	Proposed with Reduced Lighting Power Density	% Reduction due to Reduced Lighting
Peak Cooling Load	21,554.50 (kBtu/h)	19,442.50 (kBtu/h)	9.80 %	17,090.20 (kBtu/h)	20.71 %
Peak Heating Load	22,196.00 (kBtu/h)	16,460.20 (kBtu/h)	25.84 %	16,460.20 (kBtu/h)	----

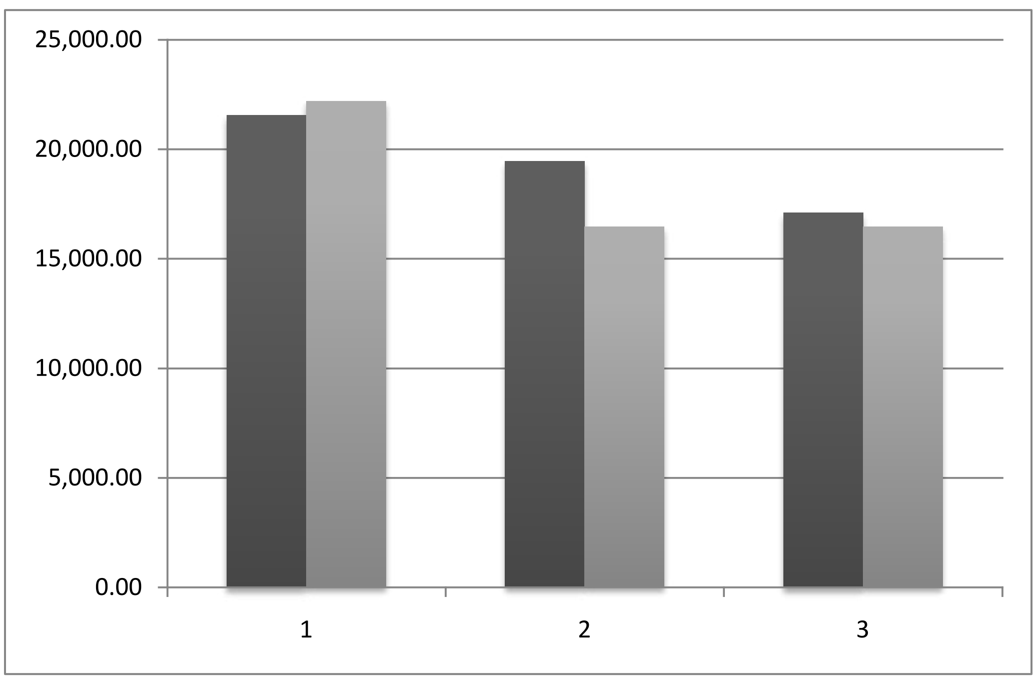


Figure 51 – Simulation Peak Heating and Cooling Load per design in kBtu/h

3.3.4 Energy and Cost Analysis

The utility rates used in this simulation are summarized in Table 38 - Utility Rates Summary. This rate is a simplified rate provided by Consolidated Edison, the electric utility provider to the project site in New York City, and although the building owner has likely negotiated a complex, specific and unique rate structure, a simplified rate structure will be used for all simulations to effectively compare the results of the proposed system redesign to the original system design. Table 39 - Cost Summary - Baseline System summarizes the estimated total building energy usage and costs for the Baseline Case. Table 40 - Cost Summary - Proposed System summarizes the estimated total building energy usage and costs for the Proposed Case, including new glazing system, shading louvers, and reduced lighting power density.

Table 38 - Utility Rates Summary

Utility	Yearly $/Unit	Reference
Natural Gas	$1.392/Ccf	Consolidated Edison
Electric	$0.249/kWh	Consolidated Edison
Steam	$18.36/Mlb	Consolidated Edison
Water	$2.31/748gals	New York City Water Board

Table 39 - Cost Summary - Baseline System

Function	Utility	kBtu	Kwh	Cost ($)
Heating	steam	48,132,500		$ 740,100.28
Cooling	electricity		1,933,833.94	$ 481,537.10
Aux. Fans/Pumps	electricity		463,253	$ 115,350.05
Lighting	electricity		2,782,999	$ 692,966.85
Receptacles	electricity		3,431,936	$ 854,552.02
			Total	**$ 2,884,506.31**

Table 40 - Cost Summary - Proposed System

Function	Utility	kBtu	Kwh	Cost ($)
Heating	steam	29,721,680		$ 457,000.27
Cooling	electricity		1,668,612	$ 415,484.30
Aux. Fans/Pumps	electricity		463,253	$ 115,350.05
Lighting	electricity		2,372,496	$ 590,751.48
Receptacles	electricity		3,431,936	$ 854,552.02
			Total	**$ 2,433,138.12**

Table 41 - Table 40 - Yearly Cost Savings

	Yearly Cost ($)
Baseline Design	$ 2,884,506.31
Proposed Design	$ 2,433,138.22
Savings	**$45,136.09**

3.4 PV Analysis

3.4.1 Objectives

Goal of this evaluation/analysis/redesign

1) Make an environmental statement for the New York Times.
2) Analyze the energy production of a photovoltaic system incorporated into the façade.
3) Determine the payback period for a photovoltaic system.

3.4.2 Process

Design-

Find a system that would incorporate into the architectural statement of the building.

Modeling-

Import Revit model into Ecotect

Model existing buildings surrounding the Site

Simulation-

Run a solar simulation within Ecotect

Analysis-

Create an excel spread sheet to analyze the cost versus savings

3.4.3 Design Intent

Since the New York Times Company has attempted to show that they care about sustainability, an analysis of photovoltaics (PVs) use was completed. The New York Times Company has the ability to shape and mold the impressions of others. By incorporating PVs into their façade, they could make a substantial statement to vast quantities of people. For this reason, the financial incentive may not be the ultimate reason to incorporate PVs into the façade.

This analysis was done in an integrated approach. The BIM model created by the CM was imported into Ecotect by the Mechanical designer. Weather data was collected from the energy.gov website. This information was used as the existing conditions. The team then modeled surrounding buildings for shading patterns. After these steps were completed, a yearly simulation could be run. The desired results were watt hours per square meter of solar radiation incident on the façade. A pseudo color of these results was obtained and used in the calculation of electricity production capability. For an image of the output from Ecotect, see the image on the following page. For more of these images see Figure 274: Incident Solar Radiation from Ecotect (NW Isometric) through Figure 276: Incident Solar Radiation Scale from Ecotect on pages 372 through 373)

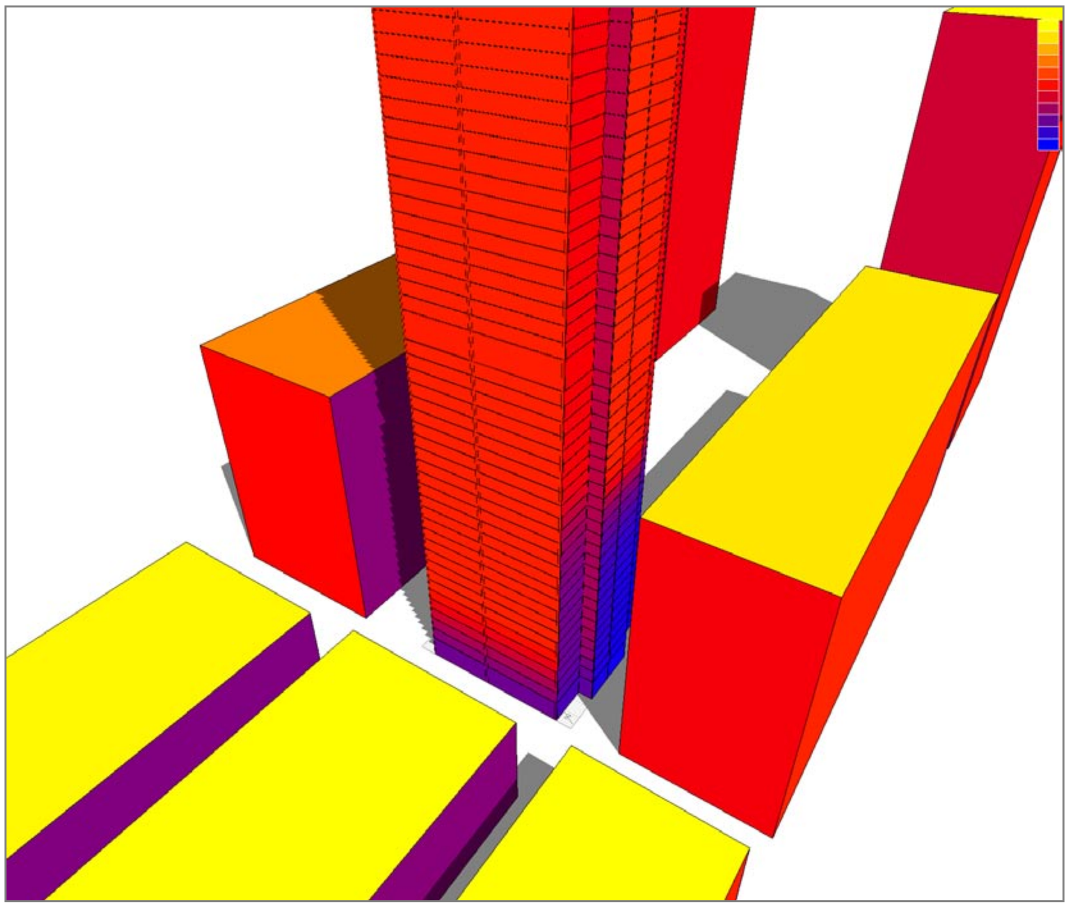


Figure 52: Incident Solar Radiation from Ecotect (SW Isometric)

The use of this program for the analysis was extremely easy. The interoperability between Revit and Ecotect was, for the most part, flawless. In order to make this transition so easy, a month worth of trial and error was done. After learning exactly how the programs worked together, this will become an easier transition. In addition, modeling of the buildings around the site was completed in Ecotect. After a very short time this was an extremely easy task. Considering its graphical interface and its ability to get extremely quick results, this program was integral to this analysis. With the use of weather data, the actual site conditions are taken into account. With most software packages, the number of sunny hours is assumed based on general location in the world. The other programs don't even have the ability to take into account the differential shading from other buildings throughout the year. As far as BIM software goes, this was an easy tool to use.

In order to effectively calculate the benefits of the PV arrays, a spread sheet was developed. This was done due to the repetitive nature of the calculations needing to be done on each side of the building. The spread sheet took into account total square footage of possible install per level of production. This was done for each side of the building. The conversion efficiency from manufacturer data was then applied to determine the DC electricity production. From there a conversion efficiency was applied for the process of inverting the electricity from DC to AC. From these steps, the total kilowatt hours per year could be obtained.

Solar Availability							
			ft^2	m^2	wh/m^2	kwh	Cost
East Façade							
5	-	17	3575	332.25	202300	10216.53	$214,500.00
18	-	54	10175	945.63	1446900	207971.7	$610,500.00
South Façade							
18	-	54	10175	945.63	2652650	381281.5	$610,500.00
West Façade							
8	-	54	12925	1201.21	2652650	484330.5	$775,500.00
			Data				
			PVs	Electricity			
			$/ft2	$/kWh			
			$60.00	$0.15			
			Conversion Efficiency				
			16%				
			Inverting Efficiency				
			95%				

Figure 53: PV Payback Spread Sheet

Using the electricity costs of ConEd in New York City and the cost/sqft of the pv installation, a simple payback period was determined. This payback took into consideration the 20% drop in efficiency over a 40 year period. See the spreadsheets on the following pages for the payback analysis.

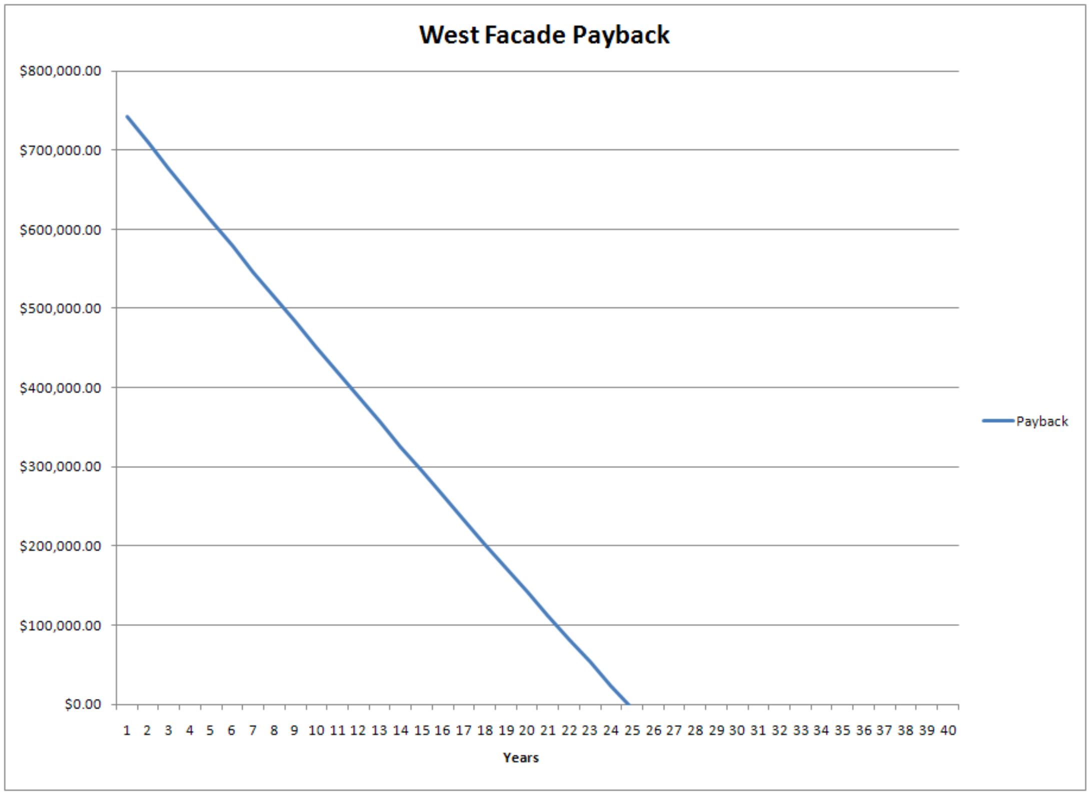


Figure 54: West Facade PV Payback Chart

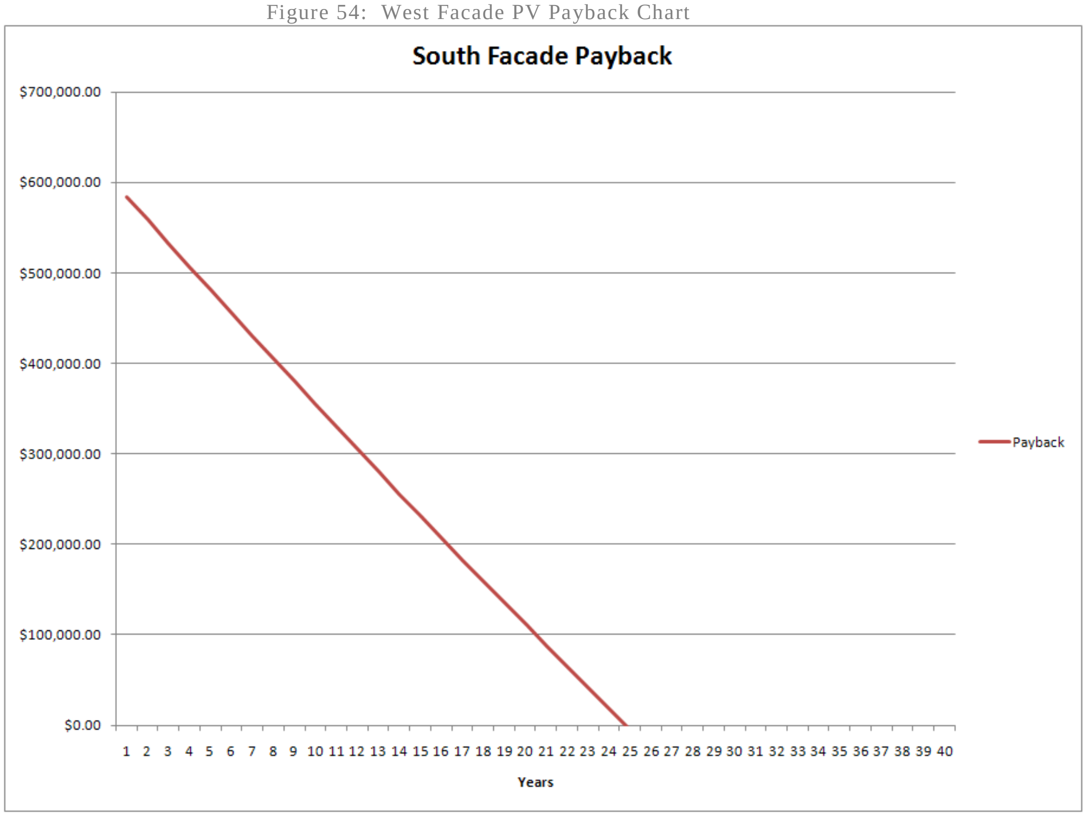


Figure 55: South Facade PV Payback Chart

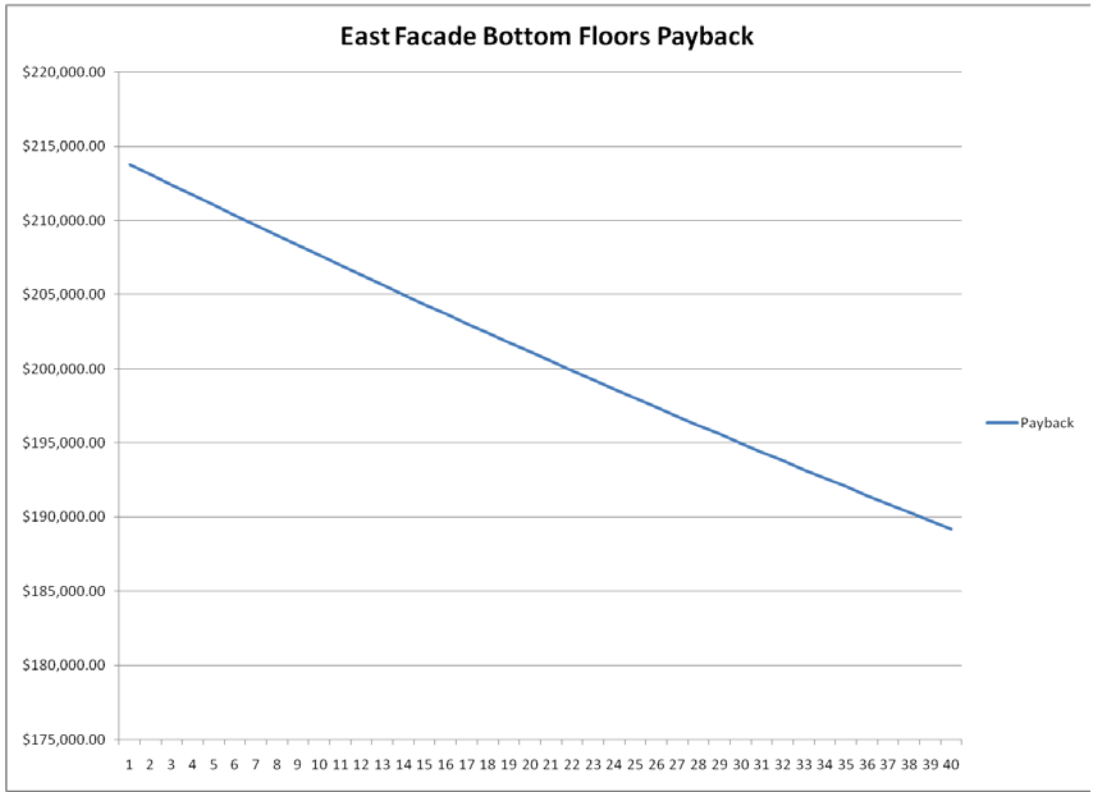


Figure 56: East Facade Bottom Floors Payback Chart

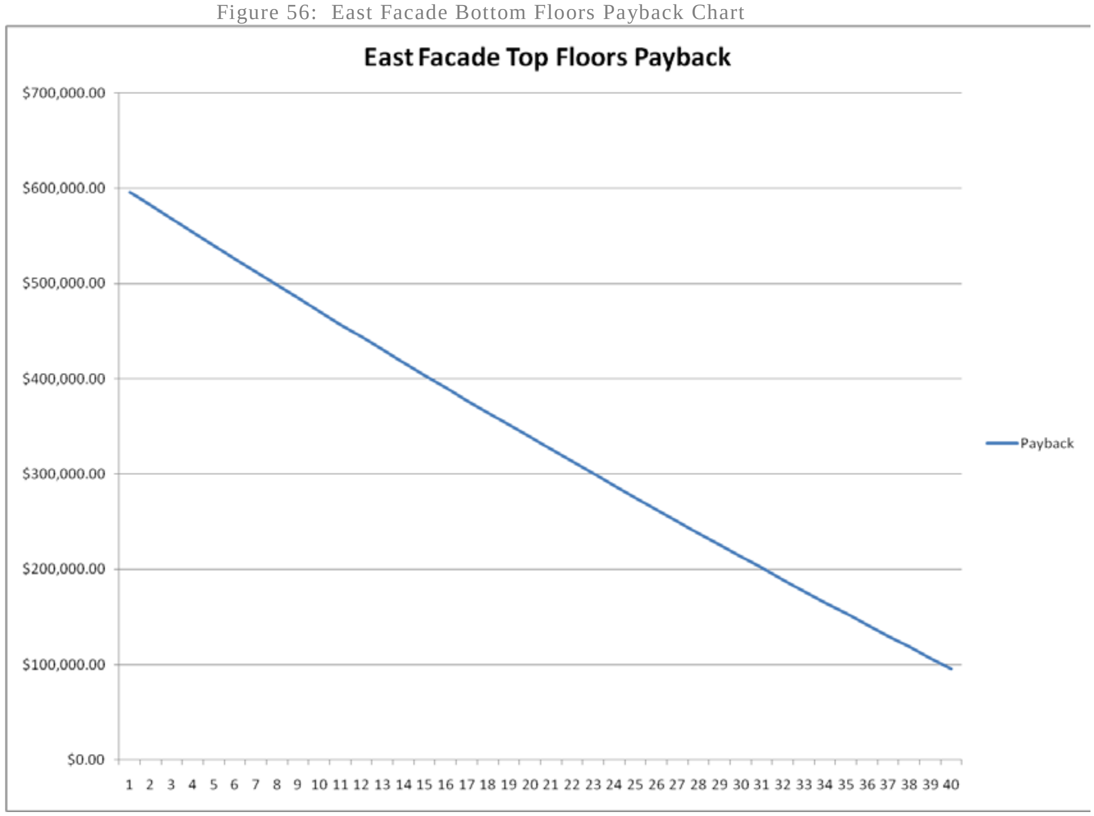


Figure 57: East Facade Top Floors Payback Chart

As discussed in the daylighting section of the paper, these PVs would be installed in the top third of each floor. The PVs would be incorporated into the louver system of the double skin façade. As mentioned before, the PVs would take up 80-90% of the top third of each floor. By doing this, the energy savings from daylighting and energy production from the PVs are maximized.

The cost data obtained for this analysis was from actual bids for smaller installations. Due to the technical aspect of this installation, the number was augmented for the purposes of being conservative. The cost was analyzed at $6/watt of installed PVs. PVs typically produce 1kW/100sqft. The monocrystaline cells are 16% efficient. This resulted in a cost of $60/sqft of installed PVs for the entire installation.

3.4.4 **Conclusion**

3.4.4.1 Simulation Results

The simulation in Ecotect proved that the South and West facades have the highest numbers of incident solar radiation per square meter per year. The lower stories on the south façade will not be considered in the analysis since the simulation proved the significant shading due to surrounding buildings. These results will be put into the spread sheet for determining the payback period for each façade individually.

3.4.4.2 Analysis Results

After importing the simulation results into a payback spread sheet, it was determined that the West façade and the top half of the south façade shall incorporate PVs. Both of these locations were able to have a payback period just over 25 years. The east façade was unable to have a payback within the 40 year scope of this analysis. This façade could be analyzed for a longer payback due to the expected life of the building. The New York Times tenants spent 100 years in their previous building and expect to spend another 100 years in this building. The only problem with extending the payback past forty years is the expected life of the PVs. The life is a hard number to determine. They don't necessary fail, but they slowly degrade their production capabilities. This analysis was completed without any tax credit or incentives applied to the model. Some of the stipulations within the incentives say that 50% of a system load must be met in order to qualify for the incentive. This means that either 50% of the lighting energy or mechanical energy consumption must be met. Due to the size of the building and the lack of installation space, this is not able to be met. In addition, the incentives say that the system must be installed by a certified PV installer. Due to the nature of this system, this may not be able to be met. Since the system is incorporated into the louvers, the installation could be by a curtain wall contractor with assistance from an electrician for the inverters. For these reasons, the incentives could not be guaranteed.

3.5 Hybrid Ventilation

The following section discusses the investigation of hybrid ventilation as a design strategy to increase the sustainability profile of the New York Times Building.

3.5.1 **Introduction**

While natural ventilation has long been used to condition and ventilate buildings, most commercial buildings are now completely sealed from the environment with tight construction and rely solely on mechanical systems for indoor environmental control. However, due to the increasing concern for energy usage in buildings and the indoor environmental effects on health, such as Sick Building Syndrome, many designers are now designing high performance buildings that utilize some sort of natural ventilation.

The hybrid ventilation approach for this redesign investigation of The New York Times Building is “Mixed-Mode” which uses a combination of natural ventilation from automated operable windows and mechanical systems. The building will be naturally ventilated during periods of the year when climate conditions closely match indoor design conditions,and supplemented with mechanical cooling and ventilation when natural ventilation is not sufficient. Renzo Piano, the architect of The New York Times Building, has also employed Natural Ventilation strategies in several of his notable works, which are described in Section 4.2.3.

This design strategy must employ an integrated, multidisciplinary approach, and utilize multiple tools for analysis. Natural ventilation is driven by two forces, buoyancy (or stack effect) and wind. Whole building simulation programs, such as IES<VE> can consider the airflow across building openings to determine pressure differentials due to temperature in the building and wind pressure on an opening. The following analysis utilized a simplified Single-Zone Model approach to determine feasibility and also investigated the use of IES<VE> in conjunction with MacroFlo for mixed-mode design.

3.5.1.1 Objective

1) Investigate the feasibility and design process of implementing hybrid ventilation in the New York Times Building.

2) Determine the impact of using BIM as a modeling tool using analysis software for Mixed-Mode design

3.5.1.2 Process

Review of Literature, Case-studies, and Applicable Building Codes and Standards

Identify Constraints and Design Assumptions

Feasibility Assessment – Single-Zone Model with Spreadsheet Calculations

Curtain Wall Product Selection

Model Outputs - Energy Savings and Payback Analysis

Control Strategy

IES<VE> MacroFlo Investigation

3.5.1.3 Literature Review

Seppanem, O., and Fisk, W., (2001) "Association of Ventilation System Type with SBS symptoms in Office Workers" *Indoor Air 2002*

In their 2001 study, Seppanem and Fisk concluded that properly designed Mixed-Mode buildings have been shown to reduce Indoor Air Quality problems, including Sick Building Syndome (SBS). According to Carnegie Mellon's Guidelines for High Performance Buildings, their Building Investment Decision Support (BIDS) demonstrates the productivity benefits of natural ventilation and mixed-mode systems. It was found that mixed-mode conditioning achieves 0.8-1.3% health cost savings, and 3-18% productivity gain, for an average return-on-investment of at least 120%. According to an extensive study totaling over 467 buildings, relative to naturally ventilated buildings the airconditioned buildings showed 30% to 200% higher incidences of SBS symptoms.

Zhao, Y., (2007) "A Decision-Support Framework For Design of Natural Ventilation In Non-Residential Buildings"

Zhao, in this 2007 publication, provides a framework to assist with the design of natural ventilation for commercial buildings in urban environments. The paper lays a foundation for addressing the constraints of implementation and design through feasibility assessment modules and analysis algorithms. It also describes different strategies and provides various examples through building case-studies.

3.5.1.4 Building Codes and Standards

The building was designed to comply with the following codes and standards: International Building Code, International Mechanical Code, New York City Building Code, ASHRAE Standard 90.1, Standard 55 and Standard 62.1.

3.5.2 **Feasibility Assessment**

3.5.2.1 Constraints and Assumptions

Publications and successful case-studies have recommended a plan depth of no more than 45’ or 2.5 times the height of the space. Redesigning the mechanical system of an existing building provides little flexibility to the geometry of the floor plate, however The New York Times Building provides an open floor plan giving nearly all occupants access to open windows and fresh air. The enclosed offices and conference rooms adjacent to the core of the building are too far from the windows and will be mechanically conditioned all year. Allowable natural ventilation zoning is provided in Figure 58- Natural Ventilation Zoning.

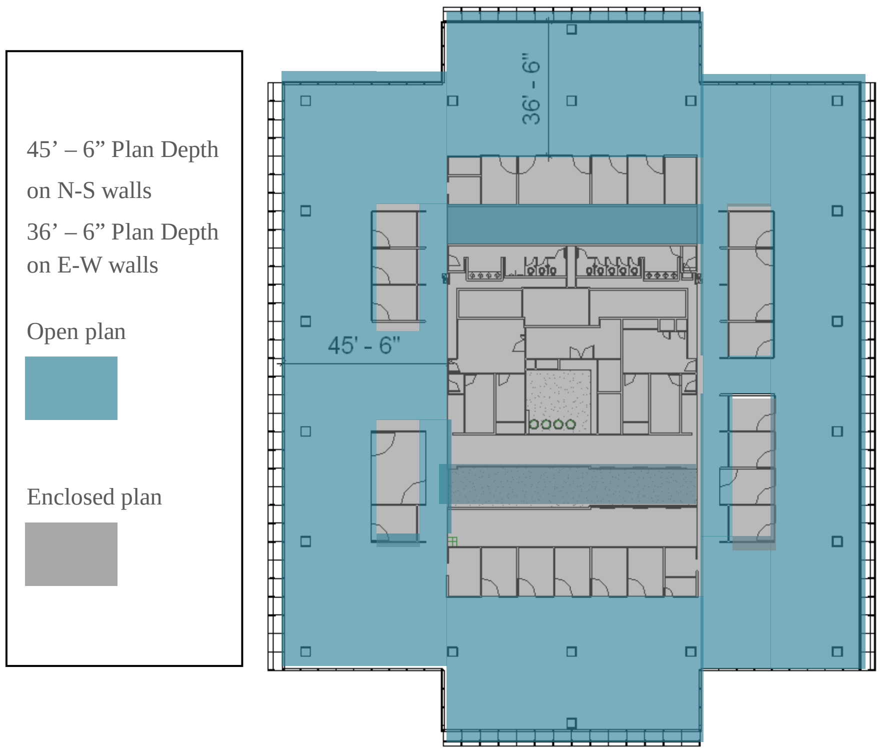


Figure 58- Natural Ventilation Zoning

Local climate conditions significantly determine the feasibility of natural ventilation. Wind direction and speed, temperature, and humidity levels control when operable windows may be utilized. For this analysis TMY-2 weather data was used because on site measurements were not available. This weather data was adjusted for local site conditions with the assumptions listed in Section 3.3.3.2

Local site conditions of an urban environment determine the quality and availability of ventilation air for a Mixed-Mode system. Airflow through urban canyons, pollution and noise determine what parts of the building are suitable for natural ventilation. A more detailed analysis of street level conditions would optimize the specific lower level floor limit where operable windows would be feasible. For the simplification of this analysis, it was assumed that the building would be almost completely unobstructed above Level 21, at a height of 306 feet. This height was determined from the height of the immediate surrounding buildings. In addition, requiring the lower levels to be sealed provides a solution to any potential security considerations.

3.5.2.2 Weather Data

TMY-2 hourly weather data for New York, NY was used for this analysis. Weather trends were investigated using visualization from both IES<VE> and Ecotect. Figure 59 - Annual Diurnal Temperature provides the diurnal temperature swings throughout the year. The green mild trend shows indoor comfort conditions throughout the year, while the blue oscillating values indicate the hourly outdoor temperature conditions at the site. As seen in the Figure, the overlapping conditions between the months of May through September provide comfortable temperature conditions where natural ventilation may be utilized. Therefore, these months were used for this analysis. Figure 60 - Wind Data, shows the predominate wind coming from the southern direction with infrequent gusts coming from the northwest, northeast and southwest directions.

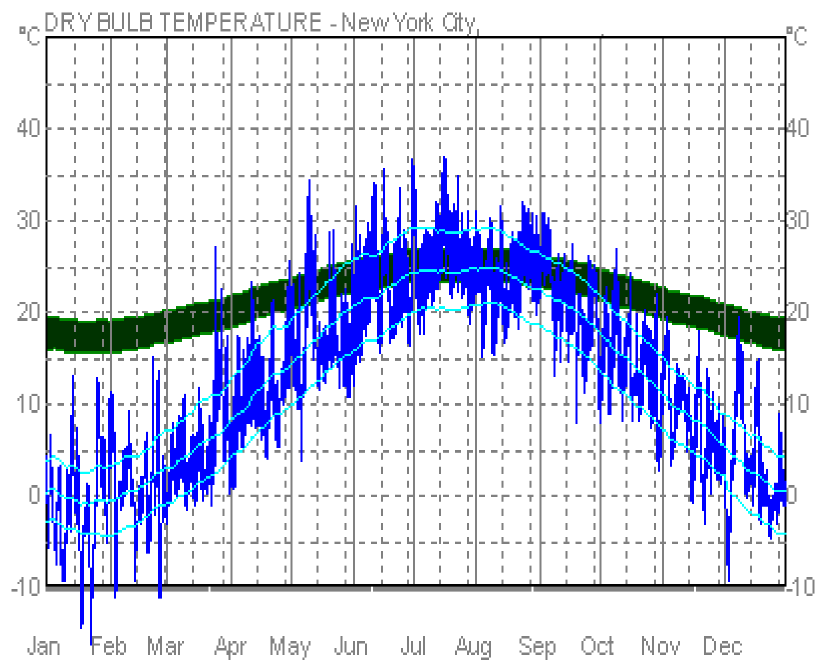


Figure 59 - Annual Diurnal Temperature

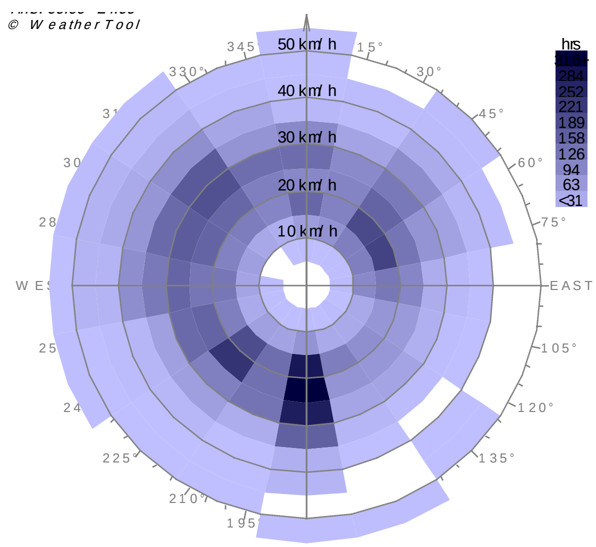


Figure 60 - Wind Data

3.5.2.3 Curtain Wall Selection

There were many design considerations when selecting a curtain wall with operable windows for the façade. It was important to specify a system that worked in conjunction with the shading system. Colt was chosen as the manufacturer for the glazing for more efficient coordination with the entire envelope construction. They also were the manufacturer for the chosen shading system providing a similar manufacturer and point of contact to address any issues during the design and construction process. The load analysis determined the optimal thermal characteristics for the desired architectural requirements of fully transparent glass. The natural ventilation analysis will determine how many glazing panels with operable windows will be needed. The specified operable glazing system can be seen in Figure 61 - Coltlite Operable Glazing System.

Figure 61 - Coltlite Operable Glazing System

Colt Coltlite LWI Ventilator, type LWI

Extruded aluminum outer frame with framed controllable double glazed louvers with thermal breaks to both outer and internal sections.

1” overall glass thickness. Glazing seals contain double weather strips with a nylon lip between, the horizontal glass edges of the louvers are enclosed with aluminum sections which have two overlapping weather seals for air-tightness.

Fixing

Fixing to curtain walling using thermally broken glazing frame adaptor. Fixing to structural opening either through frame of strap fixings.

Control Options

Integrated, hidden electric controls. Frame mounted motor positioned at top or bottom on either side frame, with 24V DCLAH61 motor. Typical operation time is 15 to 30 seconds. Motors fitted with in-built finger trapping sensor.

Performance

Heat transfer coefficient: U-value = 0.405 BTU/h-ft^2-°F

The Product Specifications for the selected curtain wall can be seen in Section 7.4.

Additionally, the specified curtain wall was modeled in the Revit 3D BIM model to architecturally visualize the proposed dynamic façade shading and curtain wall system. This is shown in Figure 62 - Revit Model of Proposed Facade System.

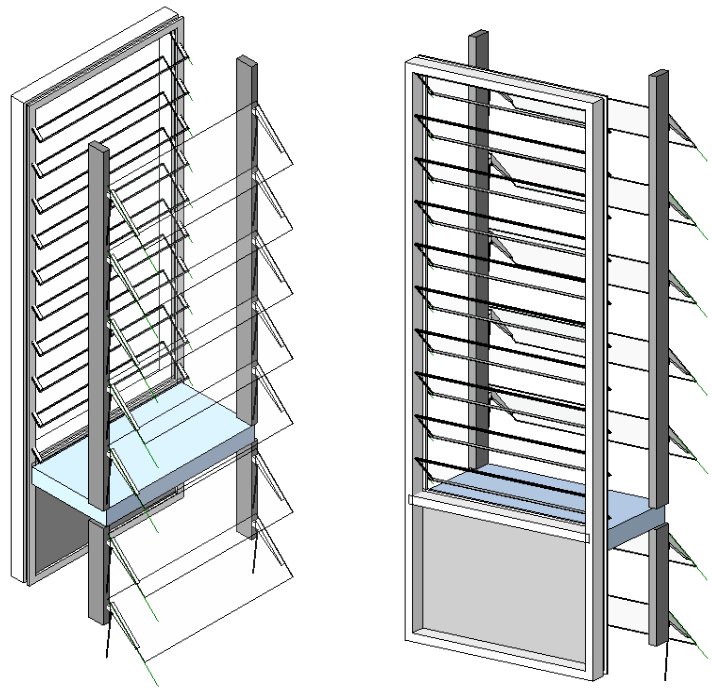


Figure 62 - Revit Model of Proposed Facade System

3.5.2.4 ASHRAE Adaptive Comfort Model

Figure 63 - Acceptable Operative Temperature Ranges for Naturally Conditioned Spaces provides allowable operative temperature limits for use in a naturally conditioned space. This criterion was used to evaluate potential time when windows could be opened and maintain a comfortable temperature for occupants.

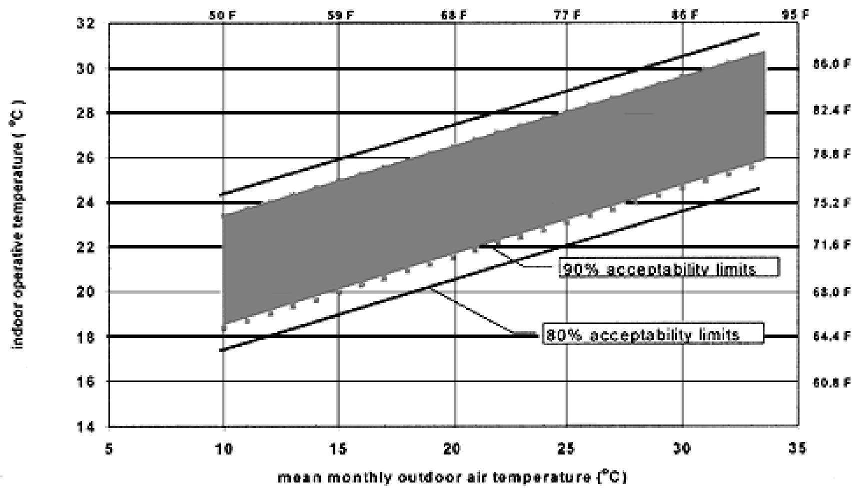


Figure 63 - Acceptable Operative Temperature Ranges for Naturally Conditioned Spaces

3.5.3 **Sizing Openings and Air Flow Estimation**

Several design methods were explored after researching hybrid-ventilation for high-rise commercial buildings. Preliminary analysis was performed utilizing TMY-2 hourly weather data with supplemental spreadsheet calculations. The following section describes the Single Zone Model used for preliminary feasibility and sizing of operable window openings. Section 3.5.4 investigates the effectiveness of using whole building simulation software, such as IES<VE>, to simulation natural ventilation using the original BIM model created in Revit.

3.5.3.1 Single Zone Model

3.5.3.1.1 Assumptions

Natural ventilation will only be utilized during the cooling months of May-September analyzed

Effective opening area, A of 1.6 feet (opening on top and bottom - 3.2 feet total for each operable window glazing panel)

Setpoint Temperature = 75 °F

Six operable glazing panels on East and West Façade

Three operable glazing panels on North and South Façade

Total of 18 operable glazing panels per floor

A single perimeter zone was evaluated with hourly cooling load determined from the IES<VE> energy model.

3.5.3.1.2 Calculations

Note: Data was converted to SI Units for to be analyzed with the following equations to determine flow rates due to buoyancy (stack effect) and wind.

$V_{stack} = 0.6A\sqrt{(gh\Delta T/(Tout+273))}$ (m^3/s)

where $g = 9.8\ m/s^2$ and h is the height of the window opening, and ΔT is the difference between the outside and average inside temperature

$V_{wind} = 0.025AU_{local}$ (m^3/s)

where U_{local} is the local wind speed determined from the equation

$U_{local,z} = KUmetz^a \cos\Theta$,

where the meterological wind speed is adjusted for site conditions of an urban terrain where K=0.35 and a=0.25. The wind direction is adjusted to obtain wind speeds in the perpendicular direction where Θ is the degrees between the wind direction and the angle perpendicular to the façade being analyzed.

Wind and Stack are combined using the equation

$V_{total} = \sqrt{((V_{stack})^2 + (V_{wind})^2)}$

This equation provides the total flow rate provided by the operable windows in the zone.

The required flow rate to meet the cooling load in the space was determine using the hourly cooling data from IES<VE> and the equation

$Q = q_i / (C_p*\rho*(Tin\text{-}Tout))$ with $C_p = 1$ kJ/kgK and $\rho = 1.3\ kg/m^3$

Where the required cooling load was met with the flow rate provided through the window openings, the natural ventilation system was deemed feasible.

3.5.3.1.3 Results

Outdoor air conditions allow for 3067 hours where natural ventilation may be utilized to adequately condition and ventilate the space out of a total of 8760 hours in a year. This is approximately 35% of the total hours in a year, however many of these hours with suitable conditions occur out of the typical work day. The results have been adjusted to reflect utilizable cooling hours during the work day when the system would be able to take advantage of natural ventilation for conditioning the open office space of The New York Times Building. This resulted in an annual energy cost savings of $145,419.

3.5.4 **Whole Building Simulation**

While the Single Zone Model evaluates natural ventilation feasibility within a single zone, IES<VE> also has a simulation tool called MacroFlo which enables multiple zones to be simulated simultaneously, providing more accurate relative pressure and temperature differentials. An investigation was performed to utilize IES<VE> MacrFlo for analyzing Mixed-Mode natural ventilation conditions on The New York Times Building. Due to the complexity of the more detailed inputs required for MacroFlo, this analysis was only successful at obtaining the pressure coefficients as predicted by the Zonal AirFlow Model.

3.5.4.1 BIM Workflow

The existing gbXML file used for load analysis was also used for this MacroFlo simulation. The geometry of the tower was originally built in Autodesk Revit Architecture and the gbXML file was imported to IES <VE> for further analysis.

3.5.4.2 Airflow Network Model

Airflow Network Models calculate the airflow movement through the building. Coupled with thermal dynamic simulation models, IES <VE> uses MacroFlo to investigate performance of the building over a typical year. Within MacroFlo, opening types are selected and adjusted according to their heights on the building. Then the dynamic simulation feature is run in conjunction with MacroFlo to obtain hourly data.

3.5.4.3 Wind Pressure

Wind pressures on the building exterior are calculated utilizing data from the weather file, including wind speed and directional data, combined with opening orientations and wind exposures. The pressure is estimated using wind pressure coefficients, derived from wind tunnel experimentation which are supplied to the user in the IES <VE> software. Wind pressure on the building surface is derived using the relationship

$P_w = C_p \, ½ \, \rho v^2$
Where
P_w is wind pressure
C_p wind pressure coefficient
ρ air density
v^2 reference wind speed

The reference wind speed is estimated from the meteorological wind speed and adjusted for height and terrain type using the expression

$v = uKh^a$
where
u meteorological wind speed
h height above the ground

and a and K are coefficients set when originally setting location data. For this simulation the Terrain Type was set to *City* with an Exponent a of 0.33 and a K value of 0.2097.

For this simulation, 'High-rise' exposure types were used. The elevation is expressed using h/H, where h is the height of the opening and H is the height of the building. Table 42 - Opening Types by Zone, including Wind Pressure Coefficients shows the building's floors zoned by exposure type.

Table 42 - Opening Types by Zone, including Wind Pressure Coefficients

Wind Pressure Coefficients, Cp, as Predicted by Zonal Airflow Model (IES)				
			IES Cp Derivations	Degree of Opening
Building Zone	**Floor**	**Height**	**Exposure Type**	**(Modulating Profile)**
Zone0	1-10	155'	High-rise sheltered wall h/H=0.2	OFF: off continuously
Zone1	11-21	306'	High-rise semi-exposed wall h/H=0.4	OFF: off continuously
Zone2	22-27	443'	High-rise exposed wall h/H=0.6	ON: on continuously
Zone3	28	416'	High-rise exposed wall h/H=.8	OFF: off continuously
Zone4	29-41	594'	High-rise exposed wall h/H=.8	ON: on continuously
Zone5	42-50	719'	High-rise exposed wall h/H=1.0	ON: on continuously
Zone6	51	746'	High-rise exposed wall h/H=1.0	OFF: off continuously

Building Zone	Angle of Attack															
	0.0°	**22.5°**	**45.0°**	**67.5°**	**90.0°**	**112.5°**	**135.0°**	**157.5°**	**180.0°**	**202.5°**	**225.0°**	**247.5°**	**270.0°**	**292.5°**	**315.0°**	**337.5°**
Zone0	0.106	0.084	0.042	-0.043	-0.145	-0.172	-0.148	-0.114	-0.084	-0.114	-0.148	-0.172	-0.145	-0.043	0.042	0.084
Zone1	0.249	0.202	0.1	-0.11	-0.362	-0.348	-0.275	-0.22	-0.175	-0.22	-0.275	-0.348	-0.362	-0.11	0.1	0.202
Zone2	0.55	0.45	0.24	-0.18	-0.615	-0.538	-0.41	-0.333	-0.29	-0.333	-0.41	-0.538	-0.615	-0.18	0.24	0.45
Zone3	0.65	0.558	0.315	-0.155	-0.645	-0.525	-0.39	-0.325	-0.28	-0.325	-0.39	-0.525	-0.645	-0.155	0.315	0.558
Zone4	0.65	0.558	0.315	-0.155	-0.645	-0.525	-0.39	-0.325	-0.28	-0.325	-0.39	-0.525	-0.645	-0.155	0.315	0.558
Zone5	0.4	0.315	0.15	-0.213	-0.65	-0.533	-0.38	-0.303	-0.255	-0.303	-0.38	-0.533	-0.65	-0.213	0.15	0.315
Zone6	0.4	0.315	0.15	-0.213	-0.65	-0.533	-0.38	-0.303	-0.255	-0.303	-0.38	-0.533	-0.65	-0.213	0.15	0.315

3.5.4.4 Buoyancy Pressure

The variation of pressure with height is known as the stack effect. Air pressure in room is a linear function of height:

$P_n(h)=p_n(0)-h\rho_n g$

Where

$P_n(h)$	pressure in room n at height h above ground level
h	height above ground level
ρ_n	air density in room
g	acceleration due to gravity

3.5.4.5 Flow Characteristics

As defined in Table 42 - Opening Types by Zone, including Wind Pressure Coefficients, the Degree of opening for Zone 0 and Zone 1 are set to a modulating profile of OFF CONTINUOUSLY, because they are designated to be below the desirable height to limitnoise, air pollution, and unmeasured airflow through the surrounding urban canyon. Zone 3 and Zone 6 refer to the two mechanical floors and are also set to OFF CONTINUOUSLY. ON CONTINUOUSLY, the area of the opening will be varied by modulating the openable area with the degree of opening percentage profile dictated by the profiles determined in the energy model.

3.5.4.6 Conclusions

This simulation, utilizing MacroFlo, was unable to provide realistic energy comsumption results. This may be due to the significantly detailed and time-consuming inputs required to accurately simulate the Mixed-Mode natural ventilation scheme. Simplified calculations and assumptions, with limited information on system components, such as accuracy of window operational controls, variable modulating profile of the window openable area, detailed internal heat gain sources and locations, more specific geometries of the operable windows, simply provide results with order of magnitude percent errors that are not accurate enough to present in this report. With more detailed information and time, MacroFlo has the potential to provide extremely informative results. It is important, however, to document the workflow and trial of another software design tool utilizing the BIM model. Further investigation of this application could provide accurate and informative results, aiding the application of natural ventilation design for complex high performance buildings.

3.5.5 **Control Strategies**

Mixed-Mode buildings can generally be placed in three categories including CONCURRENT, CHANGE-OVER, and ZONED. A CONCURRENT strategy has mechanical cooling and natural ventilation in the same space at the same time. CHANGE-OVER has the building switch between mechanical cooling and natural ventilation depending on seasonal or daily characteristics. ZONED refers to the mechanical cooling and natural ventilation operating in different areas of the building (Brager, et. al, 2007). Due to the open perimeter plan suitable for natural ventilation and the interior enclosed office and conference spaces, a ZONED strategy was selected for the New York Times Building. This is complimented with CHANGE-OVER occurring in the spaces zoned for natural ventilation responding to interior and exterior conditions.

3.5.5.1 Input Signals

The input signal will consist of temperature and CO_2 sensors that are distributed throughout the zone and generate a ventilation demand when the space deviates from its required set point.

3.5.5.2 Modifiers

The ventilation demand signal will be modified to take into account outside conditions including outside air temperature, wind speed and direction, rain and humidity levels. If the outside air is above the desired set point temperature, the actuators will close the windows and the system will change-over to mechanical cooling and ventilation. A similar function will be performed if any of the outside levels are out of the acceptable range.

3.5.5.3 Controller

The computer Building Management System (BMS) would monitor the input signals and modifiers and direct the control actions.

3.5.5.4 Control Actions

The window fully opened or fully closed and the degree of opening of the window is a control action in response to the input signals or modifiers.

3.5.5.5 Control Functions

The criteria used to drive the control sequence for operable windows include ventilation control, thermal comfort control, and space cooling. Ventilation control refers to the exchange of outside air with stale inside air, diluting indoor air pollutants including CO_2, dust and other particulates. Thermal comfort control is set by the ASHRAE 55 Adaptive Comfort Zone, which allows for a wider range of floating temperatures than a typical mechanically conditioned space. This can encompass space cooling with the adaptive range and allow for the mechanical cooling to switch on to meet peak demands (Brager, et. al, 2007).

3.5.5.6 Control Algorithm

The flowchart shown in Figure 64 - Control Algorithm represents the sequence of the input and modifier signals that would be used to regulate the building in response to the control functions of ventilation, comfort control and cooling.

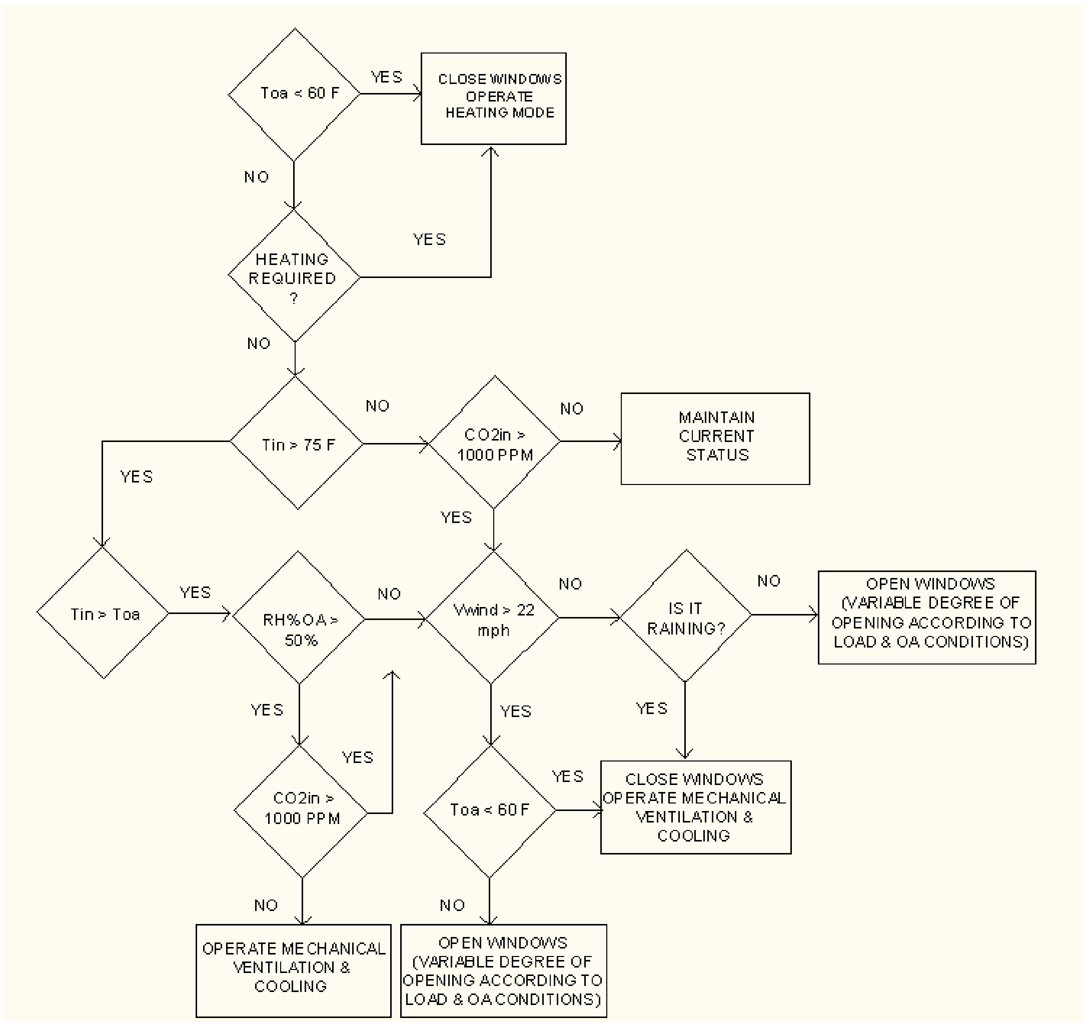


Figure 64 - Control Algorithm

3.6 Façade Lighting

The following section discusses the exterior lighting design for the facade.

3.6.1 **Objective**

Goal of this evaluation/analysis/redesign

1) Design an exterior environment that responds to the two main views of the building. Both the pedestrian scale and distant views were considered.

2) Design the lighting to respond to the goals of the architect.

3) Design an energy efficient lighting design to lower the yearly energy bills.

3.6.2 **Process**

Model inputs-

Building geometry – Use the existing Revit model for geometry

Photometry – Download .ies files from manufacturer websites

Model outputs-

Illuminance levels on the façade

Illuminance levels at the entrance

Lighting Power Densities

Renderings

Architectural impact

3.6.3 **Calculations for Analysis**

AGI was used as the tool for the lighting calculations. Radiance was used to complete the renderings for the façade due to the large number of surfaces. The knowledge of Radiance was gained in the AE 565 Daylighting course. This program has the ability to render more complex scenes than AGI. The reason it is not used often is because of the interface or lack there of. The program must be run from the command prompt, and this concept is unfamiliar to many students of this era.

3.6.4 Assumptions

The reflectances are unknown, so they were assumed.

Facade

Steel	.65
Glazing	.20
Louver	.65

Entrance

Sidewalk	.18
Asphalt	.05

Light Loss Factors

Total	.7

3.6.5 Design Considerations

Psychological Impression

For the pedestrian scale, an impression of visual clarity is needed.

Appearance of Space and Luminaires (Very Important)

The lighting design should highlight the architecture of the building and promote the unique design. The architecture expresses transparency. To assist in the architectural theme, the lighting must express transparency. The luminances at the entrance must be balanced between the interior and exterior. By doing this, pedestrians along the sidewalk will be able to see into the space, and the occupants inside will be able to see outside.

Color Appearance (Important)

Another design concept implemented by the architect was the idea of a constantly changing building appearance. The building should reflect the concept of lightness as the façade reacts to the changing daylight and night conditions. The lighting design should create a glowing structure that seems to disappear into the night sky. The entrance must have high CRI lamps, while the façade can have slightly lower CRI lamps.

Direct Glare (Important)

All luminaires shall have no direct glare to create a safe environment in the streets surrounding the perimeter. Fixture accessories should be used to completely remove glaring effects. This is important when considering the traffic on 8th avenue.

Light Distribution on Surfaces (Very Important)

The lighting design should highlight the entire building to promote the architect's concepts. The facade should be washed horizontally with uniform light gradually fading vertically as the building progresses into the sky. The horizontal louvers will promote a sense of 3-dimensions. If the façade consisted solely of glass, the building would lose all dimension.

Light Pollution/Trespass (Very Important)

Avoid light pollution into the night sky by utilizing cutoff fixtures. This will reduce interference with air traffic and keep the light directly on the building. Spill light should not hit the surfaces surrounding buildings. Fixtures should be kept close to building with medium to narrow distribution.

Point(s) of Interest (Important)

The text across the front of the facade should be emphasized. To emphasize the height of the structure, the entire facade should be illuminated. The spire at the top of the building should also receive illuminance, creating the effect of a structure disappearing into the sky. To promote direction, the main lobby should be clearly visible from the street with luminaires accenting the entry.

Shadows (Important)

Shadows should be present across the building facade to create a visually interesting structure. The building should have dark and light areas to create depth and detail and promote the unique design.

Source/Task/Eye Geometry (Important)

The expansive curtain wall requires that luminaires are not placed too close or aimed directly at the glass. This can prevent irritation to individuals inside the building. Persons walking along the sidewalk or in vehicles should also be taken into consideration. Luminaires should not provide any disturbances to these individuals.

Sparkle/Desirable Reflected Highlights (Somewhat Important)

The interior spaces can provide sparkle and highlight. The different colors of the interior should be visible from the street. The floodlighting across the facade can also cause reflections from parts of the building structure and create a changing visual display.

Surface Characteristics (Important)

The louvers will create a highly reflective surface. The steel structure of the building will reflect less light and create an interesting contrast. The interior spaces should also provide additional detail to the exterior view.

Maintenance

Luminaires should not be easily accessed by individuals in the street or along the sidewalk. The lamp selection is crucial for this. By selecting LED fixtures, the lamp life can be well over 50,000 hours. This would significantly decrease maintenance time.. The fixtures should also be rated to withstand the varying weather conditions in New York, NY. Fixtures should also have easy relamping capabilities.

3.6.6 Design Criteria

Illuminance (IESNA Lighting Handbook Ninth Edition)

Signage	5 fc
Entrance	5 fc
Building	1-5 fc

Lighting Power Density (ASHRAE Standard 90.1-2007)

Façade	.2W/sqft
Building Entrance	30 W/ft of Door
Building Grounds	.2 W/sqft

3.6.7 Design Intent

In one of the interviews of Renzo Piano's, he expressed his interest in having the building disappear into the sky. This was a major consideration for the redesign of the façade lighting. Another consideration was the division between human scale and skyline views. The human scale was from ground level to approximately the eighth floor. This is amount of the building that would be mainly viewed from pedestrian level. Anything above the eighth floor would be visible from across the Hudson. All of these ideas played a role in the redesign of the exterior lighting.

The first consideration was the building entrance. This is where pedestrian scale would play its biggest part. Renzo had mentioned how important the structure was in the building. To bring the building down to size and highlight the structure, uplighting the columns was the first decision. By doing this, there would be a gradient of light traveling up the column for the first floor. This was done to keep the occupants focus on the lower part of the building. Because of the building being located in Times Square, higher light levels were needed. Area lights were used to illuminate the sidewalk in front of the building. The illuminance was targeted to be 6fc. The signage of the building was also illuminated to 6fc. By doing this, equal weight was placed on the building name and the pedestrians.

As for the upper stories, the design was more complicated. Many designs were looked into before ending up with the final one. Due to the height of the building, fixtures either needed to be mounted to the building every few stories or placed far out from the building. The reason for this is the inverse square cosine law, but more specifically the cosine part. As the light traveled further and further up the building, the cosine term would go to 0. To combat part of this problem, the new façade system was used to increase the cosine term.

The new façade system incorporates motorized louvers. At night the sun would not play a role inside the space, so the louvers could be adjusted to any desired position. When the exterior lights come on, the louver position could be re-oriented to horizontal. By doing this, the cosine term would go to 1 towards the top of the building. This allows the building to reach higher illuminance values with less light output.

3.6.8 **Conclusion**

3.6.8.1 Fixture selection

The luminaire schedule can be found on pages Table 79: Luminaire Schedule and Table 80: Luminaire Schedule Continued. The specification sheets for the exterior lighting can be found on pages 321 through 334.

3.6.8.2 Lighting Power Density

The redesign uses 42 fixtures to illuminate the upper part of the building. The approximate square footage of the west façade is 91,920sqft. The allowable wattage would be 18,384Watts. The redesign uses 42 fixtures at 51 watts per fixture for a total of 2142Watts. This results in a lighting power density of .0233w/sqft.

3.6.8.3 Pseudo Colors and Renderings

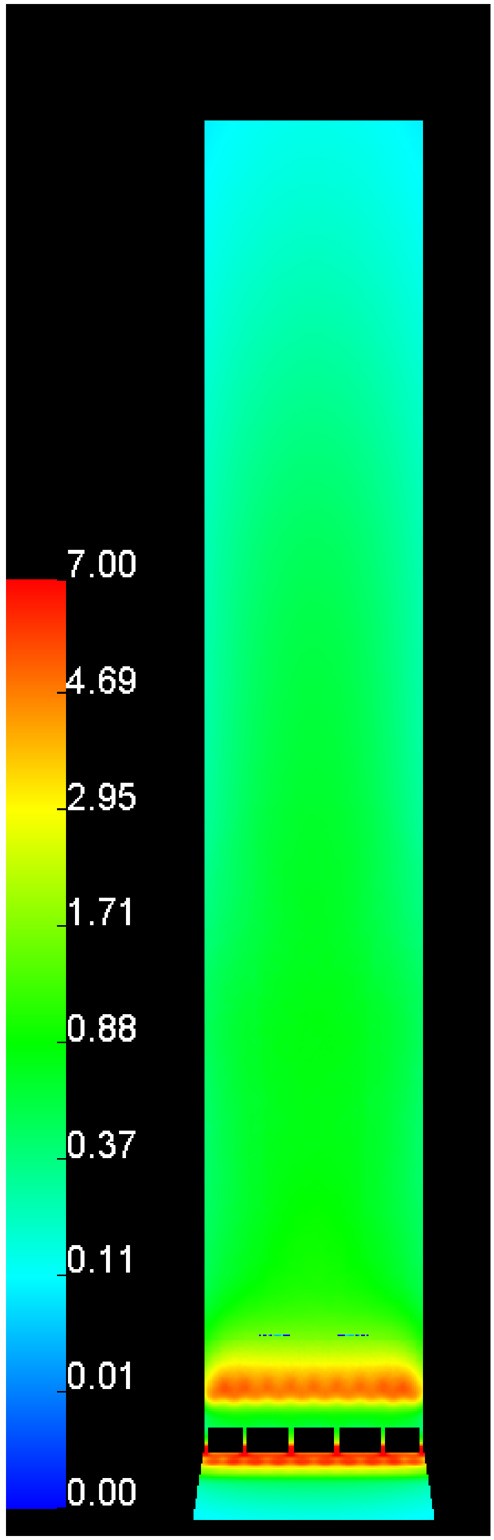


Figure 65: Exterior Facade Illuminance Pseudo Color (fc)

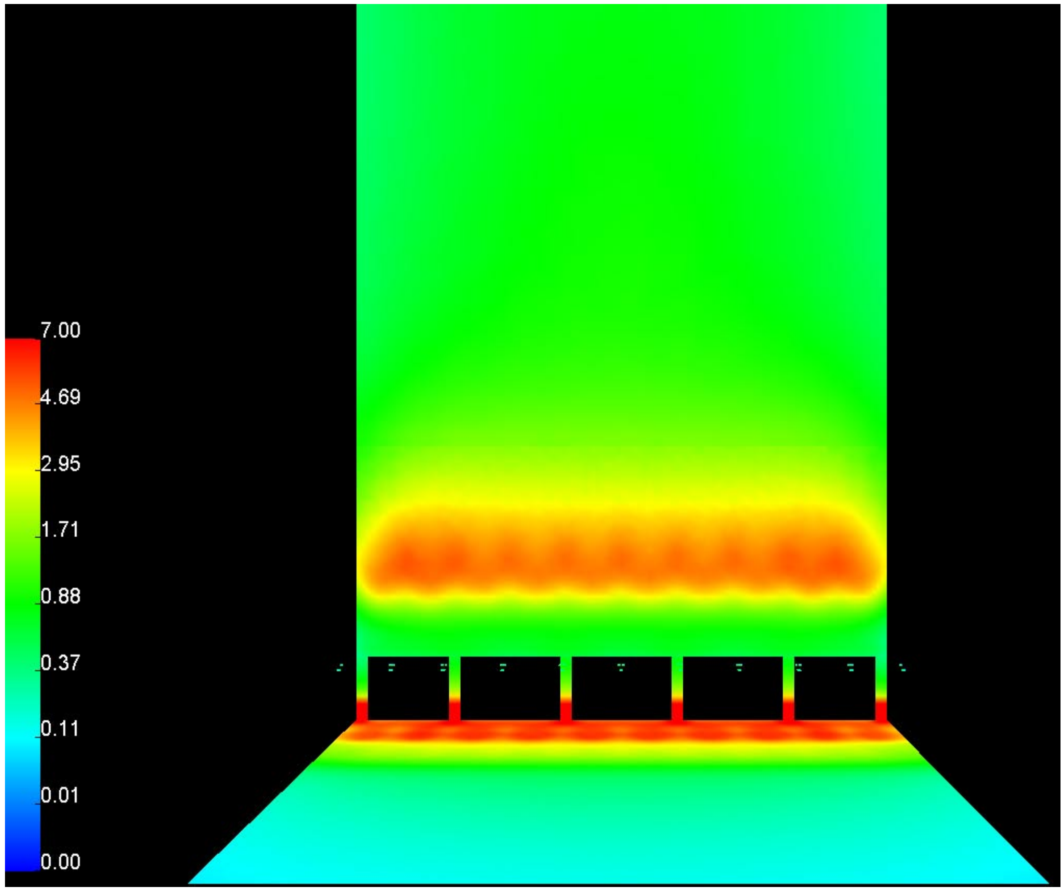


Figure 66: Exterior Entrance Illuminance Pseudo Color (fc)

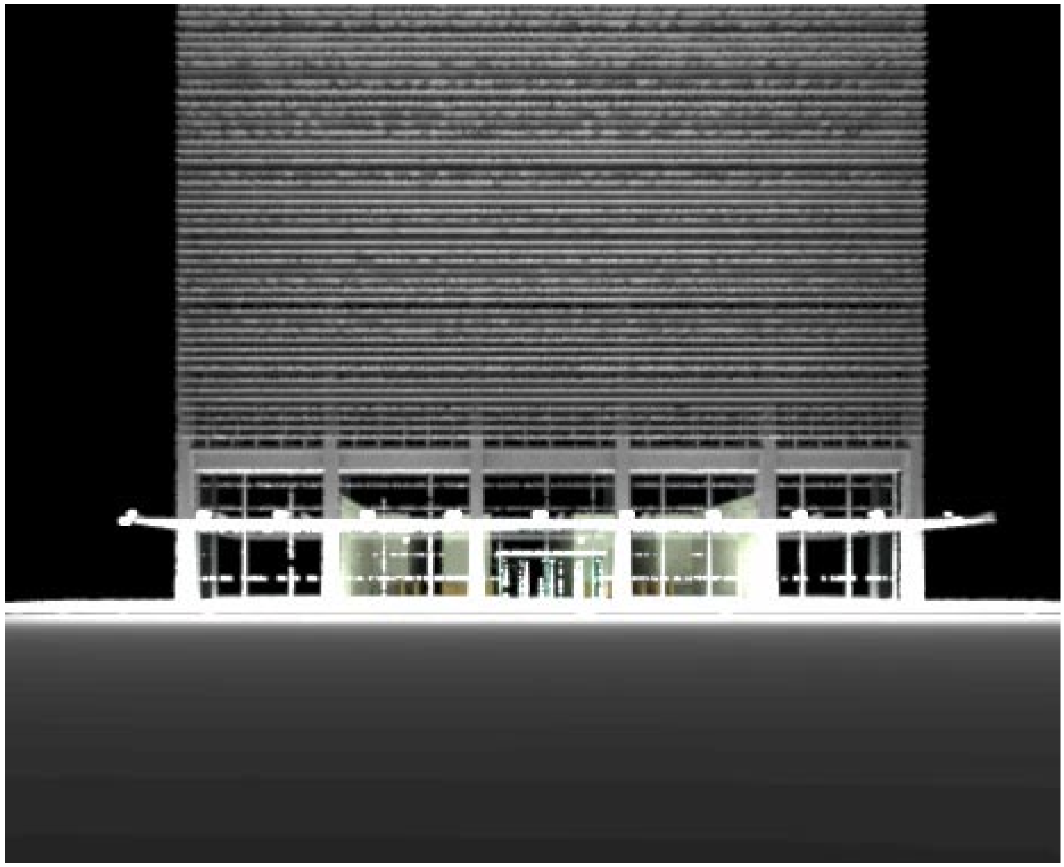


Figure 67: Front Entrance Rendering

Figure 68: Front Entrance Rendering

Figure 69: Front Entrance Rendering

Figure 70: Front Entrance Rendering

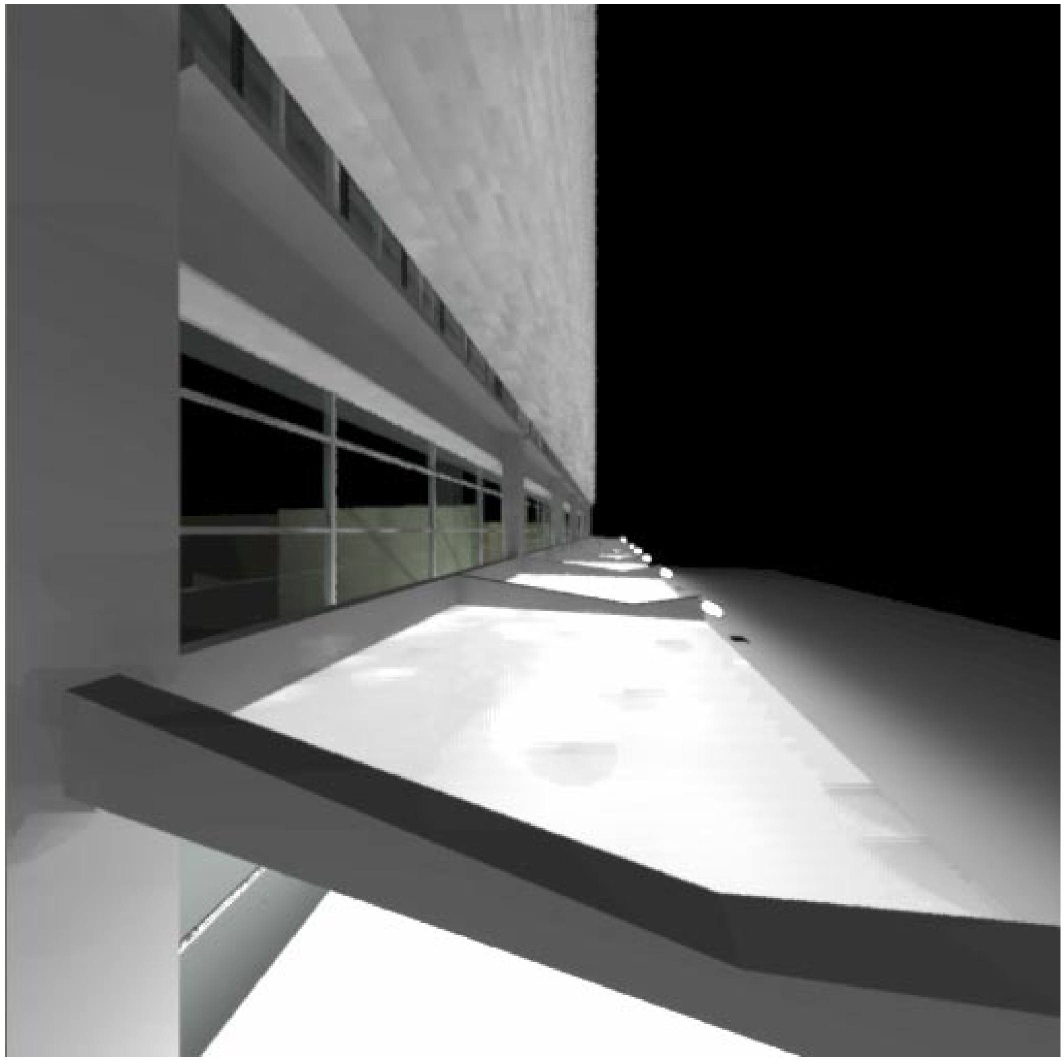


Figure 71: Front Entrance Overhang Rendering

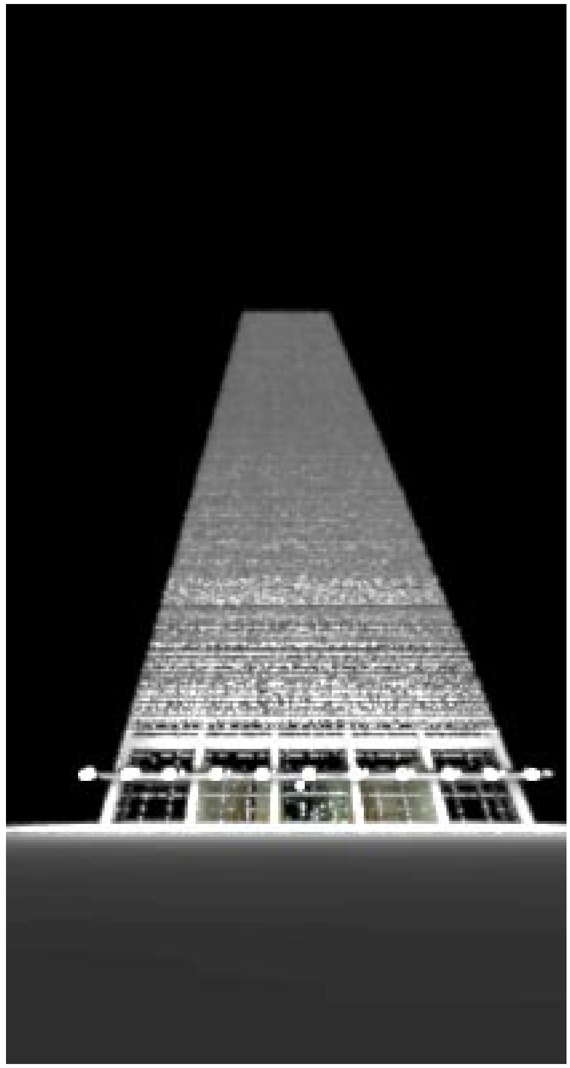


Figure 72: Front Facade Perspective

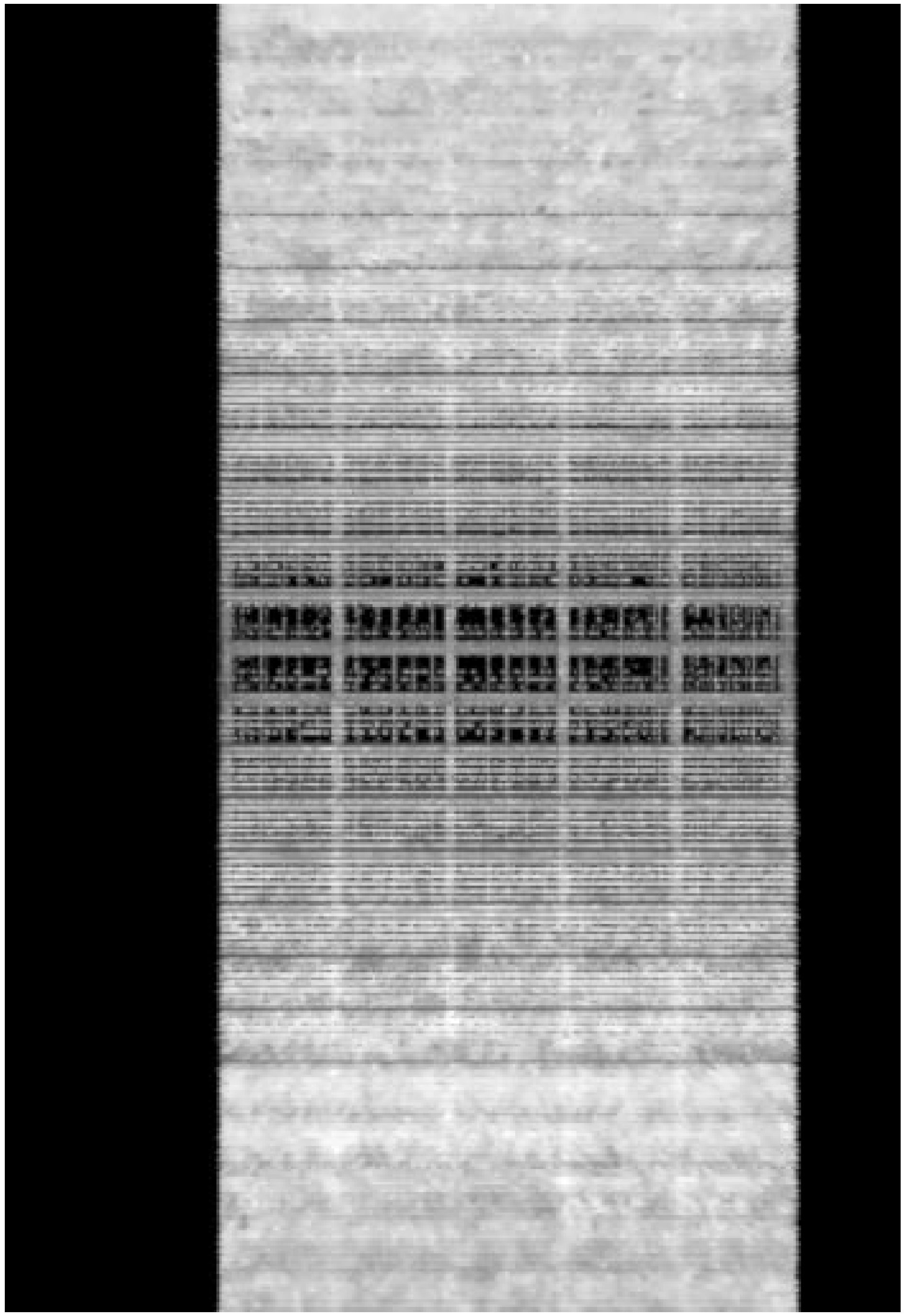


Figure 73: Front Facade Rendering

3.6.8.4 Illuminance Levels (Façade)

Average top	.1 fc
Average bottom	6 fc

3.6.8.5 Illuminance Levels (Entrance)

Average	6 fc

3.6.8.6 Control

The lighting for these two areas will be controlled by a controllable lighting panel. Each of these panels can be set by time clock. There is also capability to include photosensors as input for each of these panels. The fixtures atop the Port Authority building will be connected to their own panel, and the fixtures at the entrance will be connected to their own panel as well. The specification sheet for this panel can be found in Figure 270: Exterior Lighting Contol Panelboard Specification Sheet and Figure 271: Exterior Lighting Control Panelboard Specfication Sheet Continued on pages 368 and 369.

3.6.8.7 Panelboard changes

The existing panelboards that would be effected by this change could not be located. For this reason, new panelboards were created. The effected panelboards can be found in Figure 261: Panelboard P-LE-1 (New) through Figure 264: Panelboard PA-PP-1 (New) on pages 359 through 362. The feeder worksheet can be found in Figure 265: Feeder Sizing Worksheet on page 363.

3.6.8.8 Plans

The lighting plans can be found in Figure 211: Exterior Lighting Plan through Figure 214: Exterior Lighting Elevation E-302 on pages 309 through 312.

3.7 Construction Implications

The changes to the curtain wall will have a large affect on the cost of the system, along with the payback period of the changes to the upfront cost. The first analysis when determining the feasibility of the new curtain wall system was determining the cost of the original system. Then the corner changes to the facade to the more standardized mullion spacing and enclosed structure as discussed in sections 3.1 and 4.2 were modeled and the a cost was developed with the original ceramic rod shading system. The next step included the modeling of the new louver shading system with 50% circular frit on the louvers with fully transparent glass behind the shades, and the same 50% circular frit on the glazing panels where no shading system is present, as discussed in stection 3.2. This analysis also included the addition of photovoltaics to the shading system at strategic locations on the facade, which was determined in section 3.3. The payback period analysis for the photovoltaic addition is also covered in section 3.3 The final analysis was the inclusion of some glazing panels being replaced by an operable glazing system, allowing for hybrid ventilation discussed in section 3.5.

3.7.1 Objective

The goal of this analysis is to provide material take-offs and cost breakdowns for each of the proposed changes to the curtain wall system, which will provide input toward the feasibility of each of the changes.

3.7.2 Process

Model Inputs-

Update existing Revit model families

Worked together to create curtain wall family changes in Revit

Research-

Possible zoning challenges

Cost of original curtain wall system

Cost of curtain wall system changes

Analysis-

Electronic material schedules generated from the BIM

Apply cost to original system and through changes to the curtain wall system

3.7.3 Zoning

When looking at the façade, placing louvers that extend away from the building further than the existing shading system may face building setback problems with the building code. By investigating the New York City building code, the site is found to be classified in both the Market District (M1-6) and the Construction District (C-7, C-6.5) as shown in Figure 74.

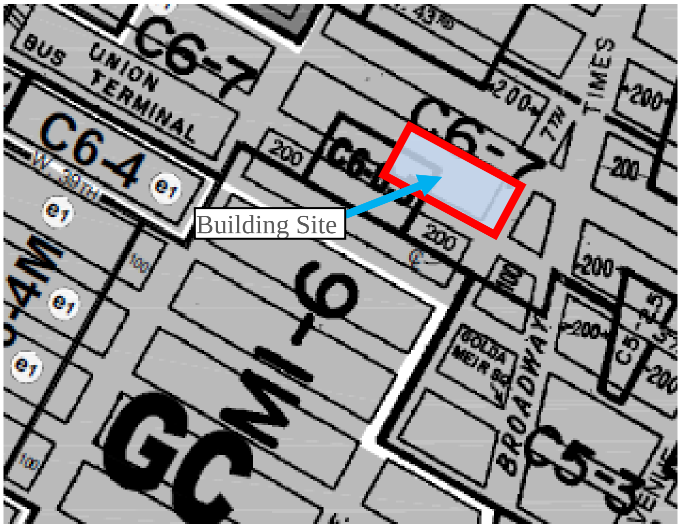


Figure 74 - New York City Zoning Map

The designation of M1-6 and C6-7 gives the setback criteria for buildings, shown in Figure 75 and Figure 76 respectively. The code states that there has to be an initial setback of 15 feet because the front of the building is on a wide street. The setback also states that after the first 85 feet (or 6 stories, whichever is less) a slope of 5.6 to 1.0 (vertical over horizontal) must be applied as setbacks.

MAXIMUM HEIGHT OF FRONT WALL
AND REQUIRED FRONT SETBACKS

#Initial Setback Distance# (in feet)		Maximum Height of a Front Wall, or other Portion of a #Building# within the #Initial Setback Distance#	Height above #Street Line# (in feet)	#Sky Exposure Plane#: Slope over #Zoning Lot# (expressed as a ratio of vertical distance to horizontal distance)			
				On #Narrow Street#		On #Wide Street#	
On #Narrow Street#	On #Wide Street#			Vertical Distance	Horizontal Distance	Vertical Distance	Horizontal Distance
District: M1-1							
20	15	30 feet or 2 #stories#, whichever is less	30	1 to	1	1 to	1
Districts: M1-2 M1-4 M2-1 M2-3 M3							
20	15	60 feet or 4 #stories#, whichever is less	60	2.7 to	1	5.6 to	1
Districts: M1-3 M1-5 M1-6 M2-2 M2-4							
20	15	85 feet or 6 #stories#, whichever is less	85	2.7 to	1	5.6 to	1

Figure 75 - Market District Setback Criteria

#Initial Setback Distance# (in feet)		Maximum Height of a Front Wall or other portion of a #Building# within the #Initial Setback Distance#	Height above the #Street Line# (in feet)	#Sky Exposure Plane#			
				Slope over #Zoning Lot# (Expressed as a Ratio of Vertical Distance to Horizontal Distance)			
				On #Narrow Street#		On #Wide Street#	
On #Narrow Street#	On #Wide Street#			Vertical Distance	Hori-zontal Distance	Vertical Distance	Hori-zontal Distance
Districts: C3 C4-1 C8-1							
20	15	30 feet or two #stories#, whichever is less	30	1	to 1	1	to 1
Districts: C1-6 C2-6 C4-2 C4-3 C4-4 C4-5 C7 C8-2 C8-3							
20	15	60 feet or four #stories#, whichever is less	60	2.7	to 1	5.6	to 1
Districts: C1-7 C1-8 C1-9 C2-7 C2-8 C4-2F C4-6 C4-7 C5 C6 C8-4							
20	15	85 feet or six #stories#, whichever is less	85	2.7	to 1	5.6	to 1

Figure 76 - Commercial District Setback Criteria

When applying the criteria to the current building, it is found that the existing building does not meet these criteria for the setbacks, shown in Figure 77. This is found when applying the initial setback and slope criteria to the south elevation of the building. By not meeting the criteria, there must be unknown information as to why this building was not restricted to these codes, or the city granted certain ordinances for the New York Times Building. This would make it possible for having the shading system extend slightly further than the existing building.

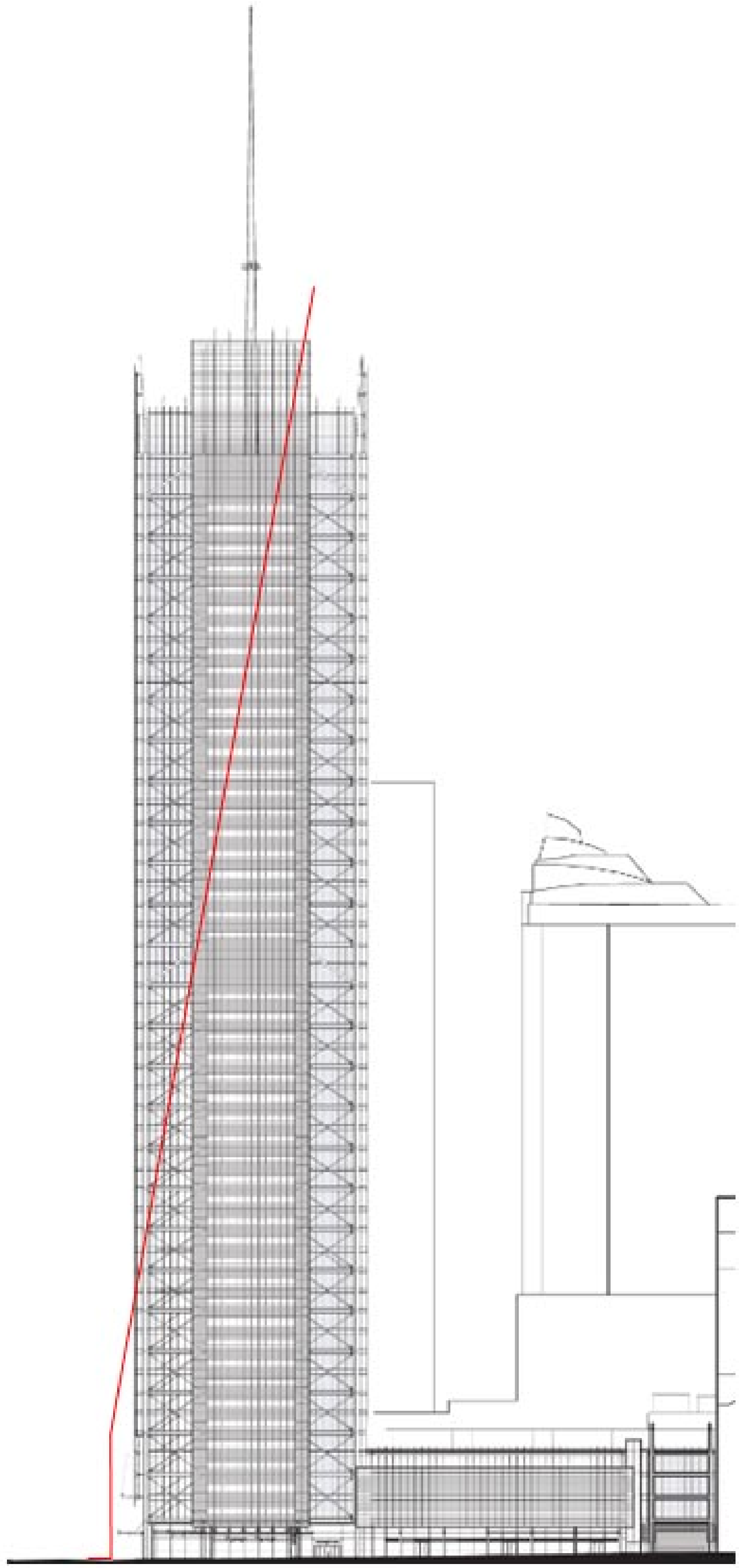


Figure 77 - Existing Building Setback Limits

3.7.4 Curtain Wall Material Take-offs

The original curtain wall was modeled using Autodesk Revit Architecture, showing the glazing and spandrel panels, the mullions, structure for the ceramic tube shading system, and the ceramic rods. By applying the different families to the facade of the building, a curtain wall take-off was developed using the Revit software. The original curtain wall was a unitized system, and when the manufacturer was contacted, an average price of \$145 per ft^2 was supplied. The manufacturer also supplied a cost of \$10 per 5' length of ceramic, plus \$10 per 5' length of structure within each ceramic rod, achieving a total of \$20 per 5' length of ceramic rod with the rod structure. When applying the costs to the curtain wall takeoff, the cost for the original facade totals \$83,532,860.00. The original corner of the building is shown in Figure 78, with the 3 non-standard panels highlighted. The summary of the original curtain wall take-off is shown below in Table 43. Detailed take-offs of all of the following changes are located in Appendix 7.5 on page 403.

TOTALS						
Curtain Wall	555236	Sq. Ft. =			$	80,509,220.00
Ceramic Rods	755910	L.F. =	151182	5' Lengths =	$	3,023,640.00
				Total	$	83,532,860.00

Table 43 - Original Curtain Wall System Take-off

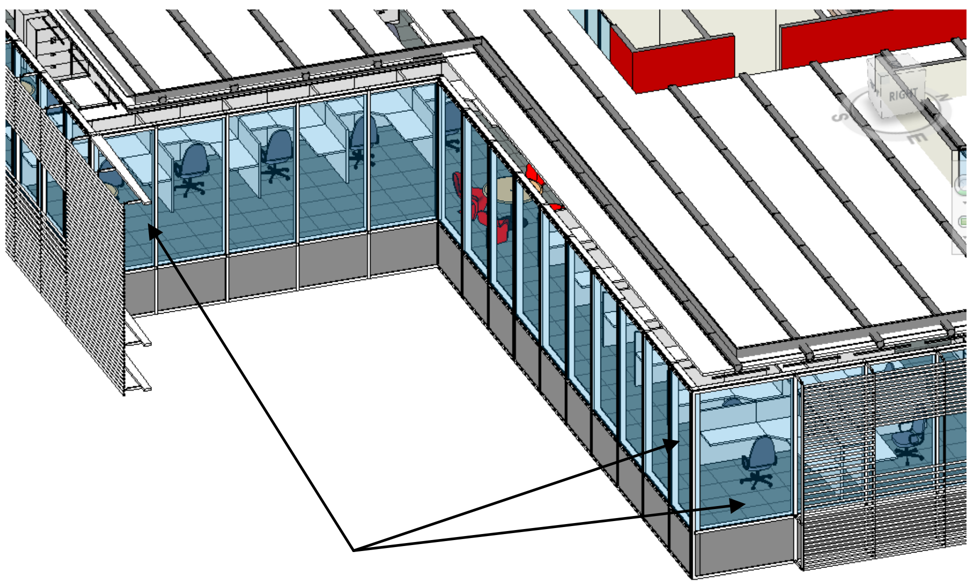


Figure 78: Original Corner of The New York Times Building

When expanding the corners to standardize the curtain wall and enclose the structure of the tower, a material take-off of the facade changes increases with slightly more facade area, and more ceramic rods across the facade. The changes are shown in Figure 79, with the non-standard panel highlighted. The summary of the corner change curtain wall take-off is shown below in Table 44.

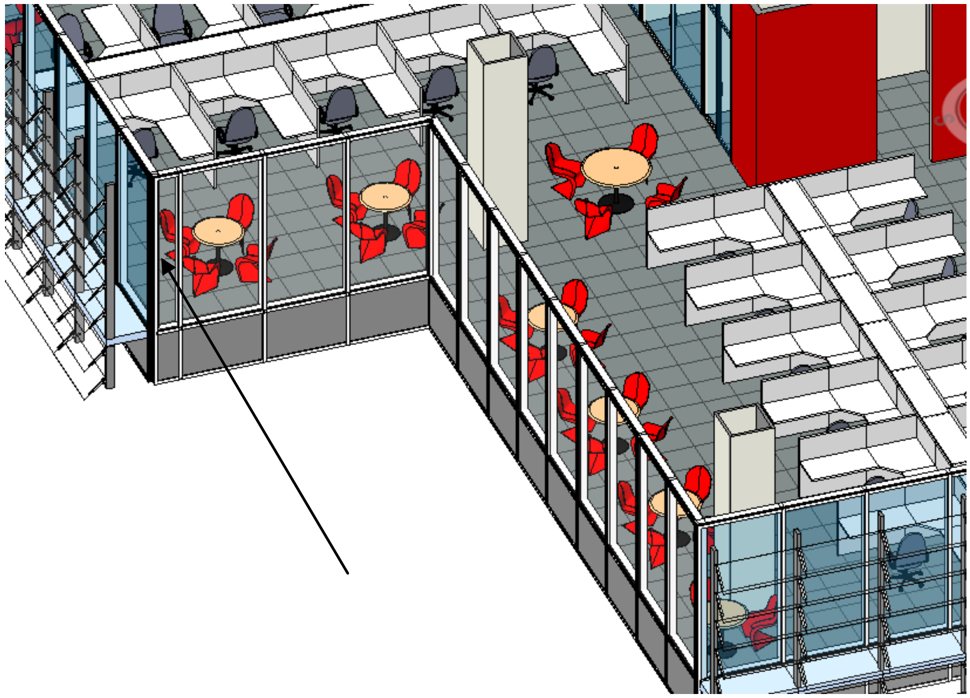


Figure 79: Proposed Corner Change to The New York Times Building

TOTALS							
Curtain Wall	555530	Sq. Ft.	=	[redacted]			$ 80,551,850.00
Ceramic Rods	792200	L.F.	=	158440	5' Lengths	=	$ 3,168,800.00
						Total	$83,720,650.00

Table 44: Corner Change Curtain Wall System Take-off

Take-offs were then completed for the new louvered shading system replacing the existing ceramic rods. Manufacturers data supplied an average cost of $40 per square foot of a louver panel. The sizing of each panel was determined to comply with the specifications of the manufacturer, and placed 7 shading louvers on each facade panel. The pricing breakdown of each louver is shown in Table 45. The summary of the corner change and shading system change to the curtain wall system is shown below in Table 45.

[redacted]

Table 45: Louver Panel Pricing Breakdown

TOTALS							
Curtain Wall	568000	Sq. Ft.	=	[redacted]			$ 82,360,000.00
Louvers	165190	L.F.	=	33038	5' Lengths		$ 11,563,300.00
						Total	$ 93,923,300.00

Table 46: Corner Change Louver Curtain Wall System

This take-off also allowed for the incorporation of photovoltaics on specific louvers of the building. The placement was determined by the analysis of section 3.3, along with the payback period of the photovoltaics. As discussed in section 3.3, to retain the architecture and interior views, only the top 2 louvers on each curtain wall panel would be replaced to have photovoltaics instead of frit. The louvers with photovoltaics would only be contain about 50% coverage from the photovoltaics. As determined in section 3.3, the south facade would have photovoltaics on floors 18 through 51, and the west facade would have photovoltaics on floors 8 through 51. The pricing breakdown for each louver with photovoltaics is shown in Table 47. The summary of the corner change and shading system change with strategic photovoltaics placed on the facade is shown below in Table 48.

P.V. Louver Area	8.75	S.F. per 5' length
P.V. Louver Cost	$612.50	per 5' length; 50% P.V. Coverage

Table 47: Photovoltaic Louver Panel Pricing Breakdown

TOTALS							
Curtain Wall	**568000**	**Sq. Ft.**	**=**			**$**	**82,360,000.00**
Louvers	**145290**	**L.F.**	**=**	**29058**	**5' Lengths**	**$**	**10,170,300.00**
P.V. Louvers	**19900**	**L.F.**	**=**	**3980**	**5' Lengths**	**$**	**2,437,750.00**
					Total	**$**	**94,968,050.00**

Table 48: Corner Change P.V. Louver Curtain Wall System

Finally, an operable glazing system take-off was created to show the implications of added cost due to material and installation of the system. As discussed in section 3.5, due to safety and other restrictions, operable windows were not included on the first 20 stories of the building, along with both the 28th and 51st stories which are double-height mechanical spaces and would not benefit from the operable windows. This gave 29 total stories with operable windows. The entire face of the building would not be replaced with operable windows, but the east and west tower walls would have 6 panels replaced each and the north and south tower walls would have 3 panels replaced each for a total of 18 panels replaced per floor. With a standard panel size of 5'-0" x 13'-9" and 18 panels replaced per floor, a total of 1,237.50 ft^2 replaced per floor. The additional cost was estimated from industry data at \$70/ft^2 added to the initial cost of \$145/ft^2. The cost of the curtain wall panel change was found to add \$3,870.00 per floor. The pricing breakdown for each operable window panel is shown in Table 49. The summary of the corner change and operable window curtain wall system change is shown below in Table 50.

Operable Window Louver	5	S.F. per 5' length
Number of Operable Window Louvers	10	Louvers per glazing panel
Operable Window Louver Cost	$215.00	per S.F. of glazing panel

Table 49: Operable Window Pricing Breakdown

TOTALS					
Curtain Wall	532112.5	Sq. Ft. =	[redacted]		$ 77,156,312.50
Operable Curtian Wall	35887.5	Sq. Ft. =	[redacted]		$ 7,715,812.50
				Total	$ 84,872,125.00

Table 50: Operable Window Curtain Wall System

3.7.5 Cost Implications

Based on the original cost for the curtain wall system priced at a total of $83,532,860.00, expanding the corners of the building to enclose the structure would add an additional cost of $187,790.00, bringing the total to $83,720,650.00. This was due to more ceramic rods. The cost of replacing the existing ceramic rod shading system with a total cost of $3,168,800.00 to a louvered shading system with a total cost of $11,563,300.00 would add a cost of $8,394,500.00 to the curtain wall system, making the entire system total cost equal to $93,923,300.00. This is an increase of approximately 10% to the cost of the system, but is less than 1% of the total building cost. The cost of the addition of photovoltaics on the top two louvers of each panel to the west and south facades of the building on floors 8 through 51 and 18 through 51 respectively, generated an additional cost of $1,044,750.00, bringing the total curtain wall system cost to $94, 968,050.00. Finally, the inclusion of operable curtain wall panels on floors 21 through 27 and floors 29 through 50 generated an additional $2,512,125.00 to the curtain wall. A total for the proposed curtain wall system change is shown below in Table 51 .

TOTALS					
Curtain Wall	532112.5	Sq. Ft. =	[redacted]		$ 77,156,312.50
Operable Curtian Wall	35887.5	Sq. Ft. =	[redacted]		$ 7,715,812.50
Louvers	145290	L.F. =	29058	5' Lengths	$ 10,170,300.00
P.V. Louvers	19900	L.F. =	3980	5' Lengths	$ 2,437,750.00
				Total	$ 97,480,175.00
				Original	$ 83,532,860.00
				Difference	$ 13,947,315.00

Table 51: Total Proposed Curtain Wall System Change Breakdown

This shows a total additional cost of $13,947,315.00 for all changes to the facade, with a total cost of $97,480,175.00. The additional cost would be approximately 16.5% more when compared to the original curtain wall system.

3.7.6 Payback

The data from energy modeling for the original building envelope without the ceramic rod shading system shows energy costs at $1,365,048.80 per year for the cooling loads for the entire building. While the information for the exact ceramic rod cooling load savings, looking at the differences between savings of 1%, 10% and 20%, there would be savings of $13,650.49, $136,504.88, and $273,009.76 respectively. The result is a payback period of over 220 years, 23 years, or 12 years for the ceramic rods when compared to the initial cost for the ceramic rods at $3,023,640.00. Data for the proposed louvered shading system shows a savings of $873,828.43 per year for the entire building.

When applied to the cost of the proposed louver system at $11,563,300.00 the payback period for the cost of the louver system is approximately 13.25 years. With the integration of the photovoltaic panels, the savings are the same for the cooling loads. The payback for the photovoltaic integration is discussed in section 3.4. Finally, the additional cost of $2,512,125.00 for the operable curtain wall panels is offset in approximately 15 years by an additional savings of $171,927.13 in the cooling load.

3.7.7 Conclusions

When all of the systems are put together, a total cooling load savings of $1,045,755.56 per year is obtained. This results in a lower operating cost of the building every year. When the savings are applied to the additional upfront cost of $13,947,315.00, the new system has a payback period of approximately 13.5 years. While the original savings are only a range, it is believed that the savings range would be between 1-5%, or over 50 years. Compared to the payback and energy cost reduction, of the existing system, the proposed system would be a viable option. Even with commissioning and maintenance pricing added to the long term cost of the façade system, the overall payback period would remain under that of the existing system. The environmental significance is also important, as the reduction in cooling load, inclusion of natural ventilation and the improvement of daylighting within the office spaces are all key factors when determining the added social benefit of the system.

4 TENANT SPACES REDESIGN

4.1 Tenant Spaces Changes

The exposed structure was enclosed to eliminate thermal differential between the structural members that penetrated the building envelope. These changes resulted in significant cost savings in the structural system and generated additional revenue for the owner by increasing the rentable area. Due to the increased rentable floor area, the lighting system needed to be redesigned. The proposed change switched the design from an all general lighting system to a lower general lighting level with supplemental task lighting. Additionally, the existing Under Floor Air Distribution (UFAD) system was changed to a ducted sidewall displacement system to improve upon the indoor environmental quality. This required space coordination with the architectural and structural changes. The BIM model was utilized to calculate the changes to rentable floor area, space coordination, and quantity take-off of structural framing members and columns.

4.2 Architectural Layouts

The following section highlights the changes to the layouts of spaces within the core and tenant areas as a result of the structural and facade changes. The architectural layouts for typical floors had to be changed in accordance with the proposed structural and facade changes. The original model was updated to replace the structural steel core with the new concrete core. The facade changes to enclose the exposed steel columns in the corner of the building were also included in the model. Meetings were held between all members of the integrated team and the architectural advisor to discuss the layout changes, and their proper arrangement. The team also worked together to review and change the layouts to make sure the original criteria were met. These spaces were all organized in Autodesk Revit Architecture, along with the color coded layout plans shown below. Area schedules were also developed using Autodesk Revit Architecture.

4.2.1 Objective

The objective of this analysis is to develop architectural changes within a typical floor to meet the criteria of the original architecture, and function properly with the structural and facade changes. The analysis will also focus on the effects to the owners of the New York Times Building due to the changes.

4.2.2 Process

Collaboration-

Meetings to discuss design changes

Review and alter changes as a team

Research

Architectural justification for enclosing the exposed structure

Building codes

Existing criteria

Model Input-

Original model documentation

Model design changes

Analysis-

Develop area schedules to show maintained area of spaces, as well as possibility of gaining rentable space

Apply available rent/lease pricing for NYC high rise to changes

4.2.3 Architectural Justification

Various changes led to architectural impacts on the building envelope and exposed structure. The exposed structure was enclosed to eliminate thermal differential between the structural members that penetrated the building envelope. Additionally a dynamic curtain wall system with louvered shades and operable windows was introduced. The design team researched the architect's previous work to verify that similar designs were utilized in precedent notable work. These building's include the Debis Headquarters Building in Berlin, Germany and Aurora Place in Sydney, Australia shown in Figure 80 and Figure 81.

Figure 80: Debis Headquarters Building in Berlin, Germany

Figure 81: Aurora Place in Sydney, Australia

4.2.4 Layout Changes

The primary change to the architecture of the core was due to the openings between the walls of the concrete core. The openings for each of the elevator shafts were maintained to avoid problems with the elevators. The clear space for access from the elevator lobbies to the office space was also maintained between the shear walls as discussed in section 2.3. Bathroom spaces were also maintained and unchanged in their respective areas of the core. The main problem was encountered when laying out the access to support areas for the core utility spaces along with the access and orientation of the emergency stairs. As a team, we decided to keep the mechanical space and primary duct risers centralized within the core. The emergency stairs were moved away from the center of the core toward the shear walls where the electrical rooms were, and the electrical rooms were moved to each side of the mechanical room. After discussion between the Lighting/Electrical team member and the Construction Management Team member about the use of bus ducts instead of conduit discussed in section 2.3.2, the riser space for bus ducts for the New York Times' floors along with the Forest City Ratner Company's floors was combined and located behind the electrical rooms. All spaces were given proper access from support spaces on each side of the core, and access to the mechanical room was maintained from the service elevator space and the support spaces serving the office floor. These changes are shown between Figure 82 and Figure 83.

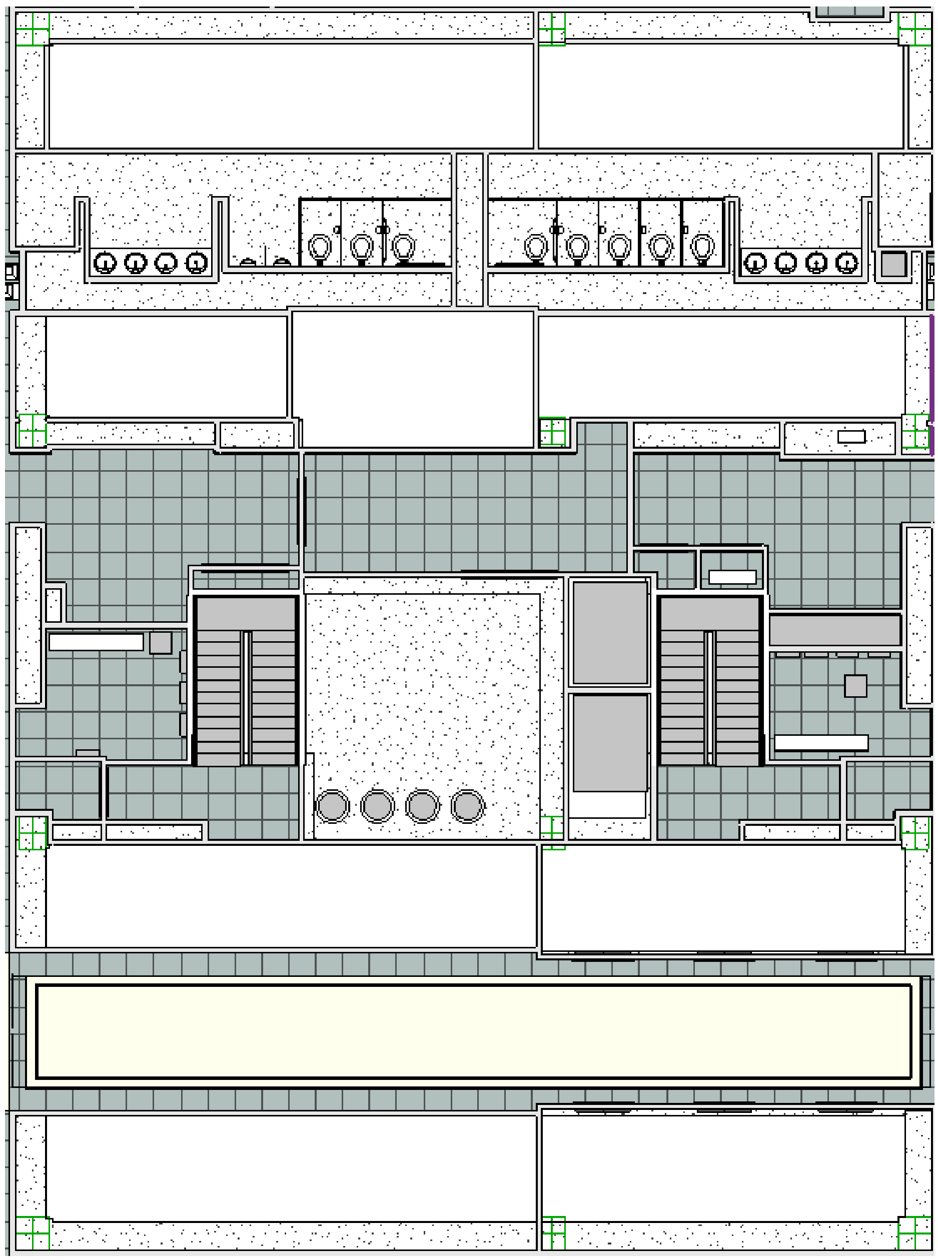


Figure 82: Original Core Layout

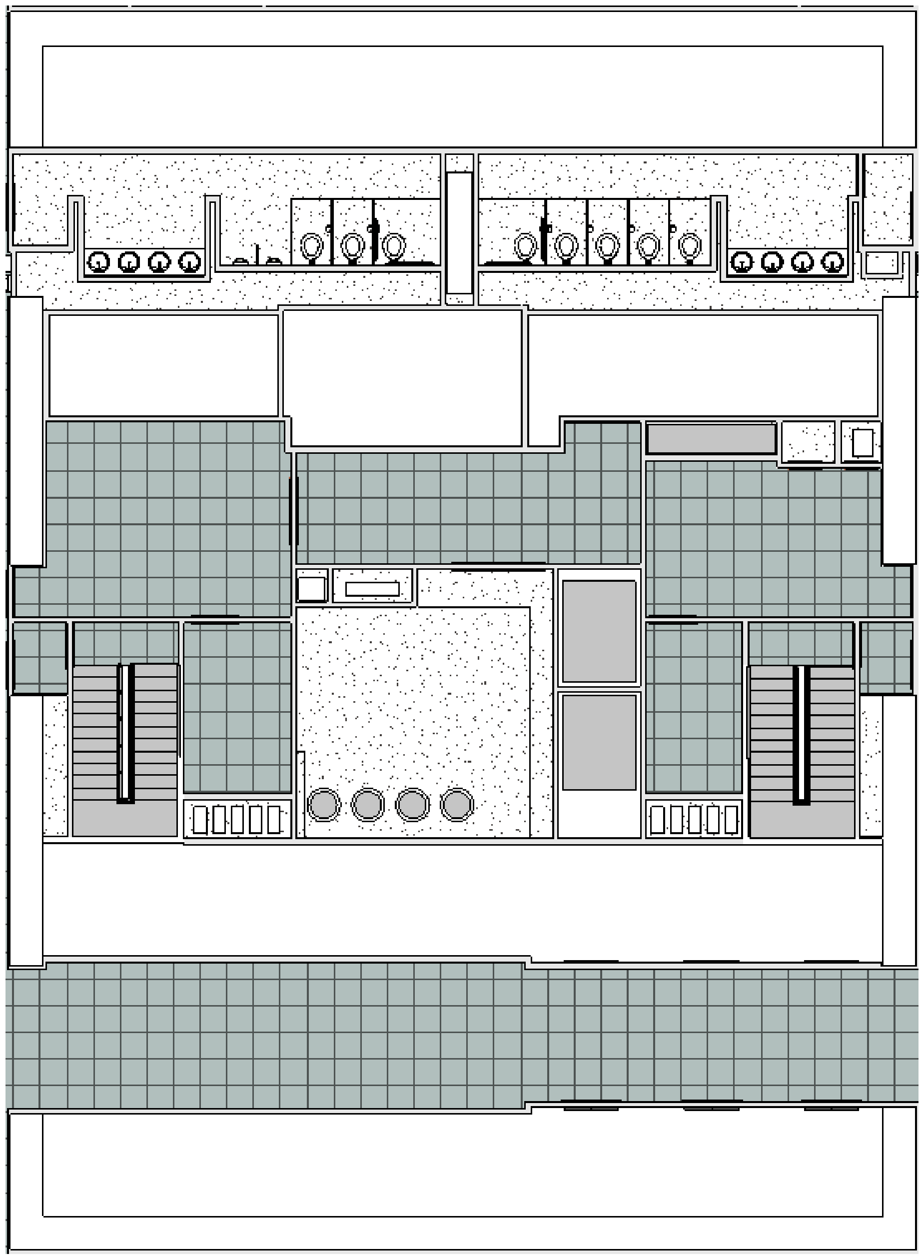


Figure 83: Proposed New Core Layout

4.2.5 Area Changes

Area schedules were developed to show the comparison between the existing layout of spaces and the proposed changes to the layout. This allowed the team to compare the sizes of spaces to the original to maintain at least the same size of each space. These were developed for four levels throughout the tower of the building where elevators drop out and for core shear wall thicknesses changes. The four areas are floors 5 through 17, 18 through 27, 29 through 38, and 39 through 50. Mechanical floors were omitted from this analysis. A summary of each area schedule for the original spaces are shown below in Figure 84, Figure 85, Figure 86, and Figure 87. A summary of each area schedule for the core and corner change spaces are shown below in Figure 88, Figure 89, Figure 90 , and Figure 91. The visual layouts of the spaces along with the detailed area schedules are located Appendix 7.5 on page 421.

Name	Area (S.F.)
Dead Space	629
Elevator Lobby	776
Elevator Shaft	2177
Office	18872
Restroom	581
Stairway	435
Support	413
Utility Space	1366
Total	**25249**
Rentable Area	19285
Not Rentable Area	5964
Total	**25249**

Figure 84: Original Area Schedule; Floors 5-17

Name	Area (S.F.)
Dead Space	679
Elevator Lobby	795
Elevator Shaft	1688
Office	18693
Restroom	475
Stairway	397
Support	985
Utility Space	1397
Total	**25109**
Rentable Area	19678
Not Rentable Area	5431
Total	**25109**

Figure 85: Original Area Schedule; Floors 18-27

Name	Area (S.F.)
Dead Space	350
Elevator Lobby	466
Elevator Shaft	1298
Office	19084
Restroom	552
Stairway	405
Support	1642
Utility Space	1339
Total	**25136**
Rentable Area	20726
Not Rentable Area	4410
Total	**25136**

Figure 86: Original Area Schedule; Floors 29-38

Name	Area (S.F.)
Dead Space	283
Elevator Lobby	449
Elevator Shaft	586
Office	20516
Restroom	526
Stairway	420
Support	1000
Utility Space	1356
Total	**25136**
Rentable Area	21516
Not Rentable Area	3620
Total	**25136**

Figure 87: Original Area Schedule; Floors 39-50

Name	Area (S.F.)
Added Corner Area	1732
Dead Space	730
Elevator Lobby	714
Elevator Shaft	2137
Office	19048
Restroom	578
Stairway	333
Support	509
Utility Space	1334
Total	**27115**
Rentable Area	21289
Not Rentable Area	5826
Total	**27115**

Figure 88: Core/Corner Change Area Schedule Floors 5-17

Name	Area (S.F.)
Added Corner Area	1732
Dead Space	727
Elevator Lobby	774
Elevator Shaft	1645
Office	19046
Restroom	489
Stairway	341
Support	1056
Utility Space	1304
Total	**27115**
Rentable Area	21835
Not Rentable Area	5280
Total	**27115**

Figure 89: Core/Corner Change Area Schedule Floors 18-27

Name	Area (S.F.)
Added Corner Area	1752
Dead Space	458
Elevator Lobby	469
Elevator Shaft	1255
Office	19294
Restroom	482
Stairway	340
Support	1929
Utility Space	1261
Total	**27240**
Rentable Area	22975
Not Rentable Area	4265
Total	**27240**

Figure 90: Core/Corner Change Area Schedule Floors 29-38

Name	Area (S.F.)
Added Corner Area	1752
Dead Space	398
Elevator Lobby	434
Elevator Shaft	642
Office	20648
Restroom	472
Stairway	340
Support	1158
Utility Space	1318
Total	**27162**
Rentable Area	23558
Not Rentable Area	3604
Total	**27162**

Figure 91: Core/Corner Change Area Schedule Floors 39-50

4.2.6 Rent Changes

The amount of rentable area has a significant effect on the profitability of the building to the owner. The amount of rentable space is a major concern to an owner involved in developing leasing the space to other clients. While additional space in the New York Times spaces would be utilized, it is only necessary to analyze the Forest City Ratner Company's floors. By increasing the rentable area of each floor plan, there is an increase in the potential revenue to the owner. The article, Manhattan Office Vacancy Rate Falls for 2nd Consecutive Month by Cushman & Wakefield, dated January 12, 2010 supplies data for class A office space rental prices in Manhattan. The years of 2007, 2008, and 2009 were listed within the article, giving average pricing per square foot of office space per year at $53.24, $72.97, and $55.52 respectively. An average of these prices comes to $60.58. Input from a member of the industry confirmed this by supplying an estimate of currently $50.00. Cost comparison summaries for the two layouts of the original FCRC spaces is shown in Figure 92, and Figure 93, along with the cost comparison summaries for the two layouts of the core and corner changes for the FCRC spaces, shown in Figure 94, and Figure 95 .

Totals		
Name	Area (S.F.)	Area Type
Dead Space	350	Not Rentable
Elevator Lobby	466	Not Rentable
Elevator Shaft	1298	Not Rentable
Office	19084	Rentable
Restroom	552	Not Rentable
Stairway	405	Not Rentable
Support	1642	Rentable
Utility Space	1339	Not Rentable
Total	25136	SF
Rentable Area	20726	SF
Not Rentable Area	4410	SF
Total	25136	SF

Average Rental Price ($ per S.F. per Year)			
2007	2008	2009	AVG.
$ 53.24	$ 72.97	$ 55.52	$ 60.58
$1,103,452.24	$1,512,376.22	$1,150,707.52	$1,255,511.99

Figure 92: Original Rentable Space Pricing
Floors 29-38

Totals		
Name	Area (S.F.)	Area Type
Dead Space	283	Not Rentable
Elevator Lobby	449	Not Rentable
Elevator Shaft	586	Not Rentable
Office	20516	Rentable
Restroom	526	Not Rentable
Stairway	420	Not Rentable
Support	1000	Rentable
Utility Space	1356	Not Rentable
Total	25136	SF
Rentable Area	21516	SF
Not Rentable Area	3620	SF
Total	25136	SF

Average Rental Price ($ per S.F. per Year)			
2007	2008	2009	AVG.
$ 53.24	$ 72.97	$ 55.52	$ 60.58
$1,145,511.84	$1,570,022.52	$1,194,568.32	$1,303,367.56

Figure 93: Original Rentable Space Pricing
Floors 39-50

Totals		
Name	Area (S.F.)	Area Type
Added Corner Area	1752	Rentable
Dead Space	458	Not Rentable
Elevator Lobby	469	Not Rentable
Elevator Shaft	1255	Not Rentable
Office	19294	Rentable
Restroom	482	Not Rentable
Stairway	340	Not Rentable
Support	1929	Rentable
Utility Space	1261	Not Rentable
Total	27240	SF
Rentable Area	22975	SF
Not Rentable Area	4265	SF
Total	27240	SF

Average Rental Price ($ per S.F. per Year)			
2007	2008	2009	AVG.
$ 53.24	$ 72.97	$ 55.52	$ 60.58
$1,223,189.00	$1,676,485.75	$1,275,572.00	$1,391,748.92

Figure 94: Core/Corner Change Rentable Space Pricing
Floors 29-38

Totals		
Name	Area (S.F.)	Area Type
Added Corner Area	1752	Rentable
Dead Space	398	Not Rentable
Elevator Lobby	434	Not Rentable
Elevator Shaft	642	Not Rentable
Office	20648	Rentable
Restroom	472	Not Rentable
Stairway	340	Not Rentable
Support	1158	Rentable
Utility Space	1318	Not Rentable
Total	27162	SF
Rentable Area	23558	SF
Not Rentable Area	3604	SF
Total	27162	SF

Average Rental Price ($ per S.F. per Year)			
2007	2008	2009	AVG.
$ 53.24	$ 72.97	$ 55.52	$ 60.58
$1,254,227.92	$1,719,027.26	$1,307,940.16	$1,427,065.11

Figure 95: Core/Corner Change Rentable Space Pricing
Floors 39-50

4.2.7 Conclusions

Through this analysis, it was found that using an integrative design team, the redesign of the architectural layout of core spaces in response to structural core and facade changes could impact the profitability of the building. The current design was found to have rentable areas each totaling 19,285 ft^2 on the 5th-17th floors, 19,678 ft^2 on the 18th-27th floors, 20,726 ft^2 on the 29th-38th floors and 21,516 ft^2 on the 39th-50th floors. When applied to the floors owned by Forest City Ratner Companies (floors 29-50), this amounts to an average revenue of $1,255,511.99 per floor per year for floors 29-38, and $1,303,367.56 per floor per year for floors 39-50, and a total of $28,195,530.98 per year.

The design of the proposed core and corner changes, along with the proposed architectural layouts of the core and tenant spaces was found to have rentable areas each totaling 21,289 ft^2 on the 5th-17th floors, 21,835 ft^2 on the 18th-27th floors, 22,975 ft^2 on the 19th-38th floors, and 23,558 ft^2 on the 39-50th floors. This is approximately 2,000 ft^2 of additional rentable space per floor. When applied to the floors owned by Forest City Ratner Companies (floors 29-50), this amounts to an average revenue of $1,391,748.92

per floor per year for floors 19-38, and $1,427,065.11 per floor per year for floors 39-50, and a grand total of $31,042,267.52 per year. Compared to the original, the proposed changes would amount to $2,846,736.54 in additional revenue to Forest City Ratner Companies. The result would be shorter payback period to Forest City Ratner Companies.

4.3 Gravity System

The following section pertains to a redesign of the gravity system of The New York Times Building tower. Within this section as per the structural designer's MAE requirements a computer model was created in RAM Structural Systems for the various gravity system analyzed. In addition to the RAM model, the structural designer utilized basic dynamic principles learned in CE 548: Structural Design for Dynamic Loads and AISC Design Guide 11: Floor Vibration Due to Human Activity to analyze the potential solution for walking excitation. With the added design challenge of framing steel beams into the concrete lateral system, connection design techniques learned in AE 534: Analysis and Design of Steel Connections were used to design and analysis adequate connections.

4.3.1 Objective

1) Design an alternative floor system that reduces the number of structural members while providing cost savings and decreasing structural erection time.

2) Design the structural gravity system to respond to the goals of the architect.

3) Design various structural connections for the gravity system.

4) Create a model of the gravity system in Revit to aid in structural takeoffs.

4.3.2 Process

Design-

Determine an appropriate gravity system that maintains strength and serviceability requirements

Coordination-

Work with the design team and the architectural advisor to determine an optimal solution for the gravity system

Modeling-

Import RAM model into Revit

Model potential gravity system designs in RAM

Analysis-

Design and analyze the potential gravity systems for strength and deflection requirements

Analyze the potential gravity system for walking excitation

Design and analyze gravity columns

Design and detail connections

4.3.3 **Codes, References, and Criteria**

4.3.3.1 Original Design Codes and Deflection Criteria

National Model Code:

1968 Building Code of the City of New York with latest supplements

Structural Standards:

ASCE 7-98, Minimum Design Loads for Buildings and other Structures

Structural Design Codes:

AISC – LRFD, Steel Construction Manual 2nd edition, American Institute of Steel Construction

National Building Code of Canada, 1995

Uniform Building Code, 1997

4.3.3.2 Thesis Design Codes and Deflection Criteria

National Model Code:

2006 International Building Code

Structural Standards:

ASCE 7-05, Minimum Design Loads for Buildings and other Structures

Structural Design Codes:

AISC – LRFD, Steel Construction Manual 13th edition, American Institute of Steel Construction

Gravity Deflections Criteria:

Live load deflections for floor members are limited to L/360

Total load deflections for floor members are limited to L/240

4.3.4 Gravity System Material Strength

Structural Steel:

Rolled Shapes and Channels:

ASTM A572 or A992, Minimum yield strength of 50 ksi

Miscellaneous Angles

ASTM A36, Minimum yield strength of 36 ksi

"UAP" Channels

European Code EC3, Grade S-235JRG2, Minimum yield strength of 46 ksi

Tubes

ASTM A500, Grade B, Minimum yield strength of 42 ksi

Pipes

ASTM A500, Grade B, Minimum yield strength of 46 ksi

Plate Material used for Built-Up Members

ASTM A572, Minimum yield strength of 50 ksi

Connections & Base Plate

ASTM A36 (36 ksi), A529 (42 ksi), A572 & A588 (50 ksi)

Metal Decking:

3” Composite Deck

ASTM A653 SQ, Grade 40, Minimum yield strength of 40 ksi

Headed Shear Studs ¾”

ASTM A108, Type B

Connections:

Bolts

ASTM A325 or A490

Nuts

.ASTM A563

Washers

ASTM A-F436

Anchor Bolts/ Rods

ASTM F-1554, Grade 55

Welding Electrodes E70XX

Tensile strength of 70 ksi

4.3.5 Iterative deck and beam design

The proposed floor system redesign investigated two different framing layouts shown in Figure 96 on page 167 and Figure 97 on page 168. For each framing option Wide flange shapes versus SMARTBEAMS (CMC Steel Products castellated beams), normal weight versus lightweight concrete, and long span deck versus typical span deck were investigated as a potential design. The following matrix was constructed to look at all the possible combinations for each framing layout.

LS/WF/NW	TS/WF/NW
LS/SB/NW	TS/SB/NW
LS/WF/LW	TS/WF/LW
LS/SB/LW	TS/SB/LW

Table 52: Framing Matrix

Where:

LS = long span deck & TS = typical span deck

WF = wide flange shape & SB = SMARTBEAM

NW = normal weight concrete & LW = Lightweight concrete

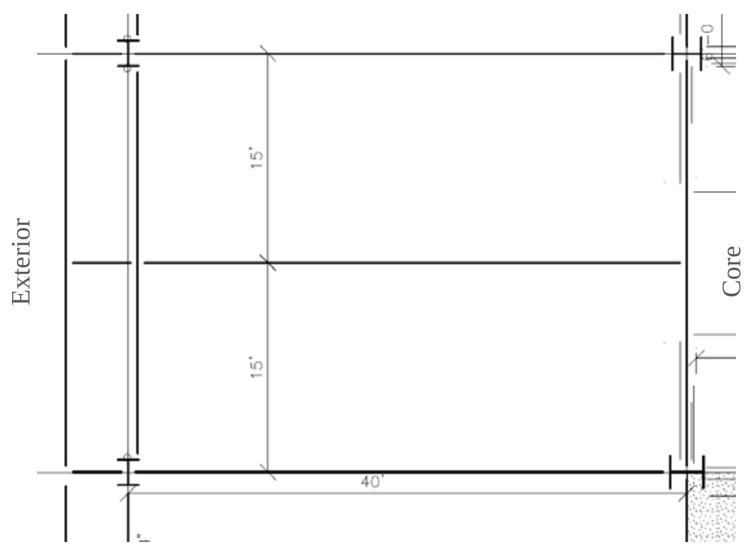


Figure 96: Gravity system framing option 1

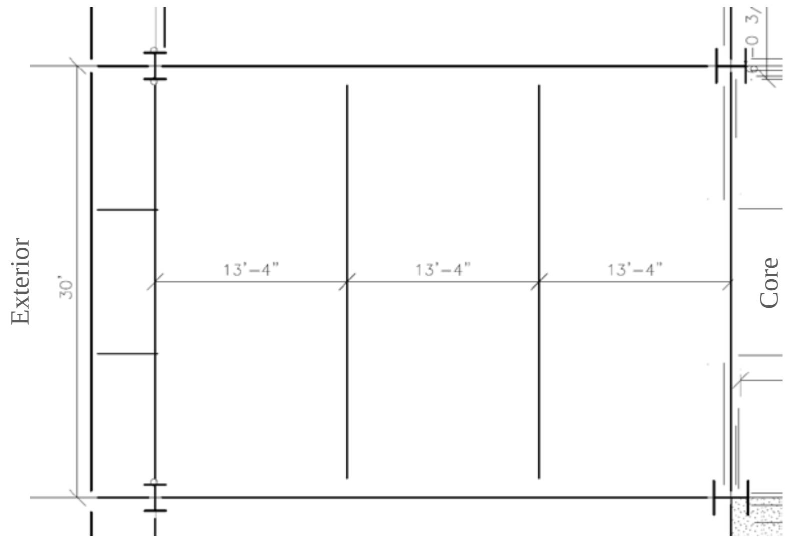


Figure 97: Gravity system framing option 2

4.3.5.1 Initial Gravity Design Calculations

After initially consulting with the construction manager about fireproofing the gravity system, it was decided to investigate an unprotected deck. For which a 2 hour restrained assembly rating, yielded 3 ¼" and 4 ½" thickness of concrete above the flutes of the metal deck for lightweight and normal weight concrete respectively. In addition, the mechanical designer was initially consulted about structural implications due to changing the under floor air distribution or UFAD system. As a result, the 20 psf allotted for the UFAD and MEP in the ceiling was reduced by 10 psf to obtain a total superimposed dead load of 15 psf. It should be noted that the floor live load was not changed. The vendors of the metal decks investigated include Metal Dek Group, Epic Metals, United Steel Deck, and Nucor Vulcraft Group. It was determined that 30 potential metal decks met fireproofing and load capacity requirements in addition to a minimum of double unshored span length. These 30 metal decks were then reduced down to 7 potential metal decks by selecting the least weight and least gage for each metal deck application of each possibility for the two framing options. This can be seen in the attached potential gravity system design matrix in Structural Figure 178 on page 275. Please note that in framing option 1only long span deck with normal weight concrete did not met load requirements. RAM was utilized for the 14 different designs, however it should be noted that the interoperability between RAM and Revit does not exist for 64 bit computers therefore interoperability was not used. Out of the eight possibilities for each framing option the following four possibilities were investigated further:

LS/SB/LW
LS/WF/LW
LS/WF/NW
TS/WF/NW

Table 53: Reduced Framing Matrix

After consulting with Stephen Redman of CMC Steel Products, Glen Smith of Epic Metals Corporation, and Chris Cerino of Desimone Consulting Engineers in New York City the following costs were determined:

EPICORE 450	\$6.10/SF
EPICORE 3.5	\$4.60/SF
SMARTBEAMs	\$100-\$200/ton in addition to steel cost
Lightweight concrete on metal deck	\$11/SF
Normal weight concrete on metal deck	\$10/SF
Structural steel	\$3,500-\$4,500/ton

Table 54: Framing costs

Mr. Redman also advised that for SMARTBEAMs to be cost effective longer spans than 40'-0" are needed. In addition to consulting with Mr. Redman, the mechanical designer was consulted about the location of ductwork relative to structural framing. As a result of this meeting, it was determined that the ductwork would either run out from the core parallel to the framing in option 1 or on top of the structural slab. Due to these meetings, SMARTBEAMs and framing option 2 were eliminated due to cost and minimizing mechanical penetration through the structural framing. Normal weight concrete was eliminated after consulting with the construction manager. It was determined that the added weight of normal concrete needed to obtain the 2 hour fire rating would affect the loads of the framing system increasing beam, columns, and foundation sizes. The added weight would also influence the mass of the building, therefore potentially increasing the period of vibration and potentially increasing the lateral stiffness to counteract the increased mass of the building. This left only the framing option 1 with lightweight concrete on long span composite deck on wide flange shapes. Please refer to Structural Figure 179 on page 275 for the reduced framing matrix with relative costs.

When originally consulting with Mr. Smith at Epic Metals Corporation, the design team only knew of the EPICORE 450 metal deck which is a 4 ½" deck with 4.5" of lightweight concrete topping which resulted with a total slab thickness of 8 ½ inches. Mr. Smith advised the structural designer to consider the EPICORE 3.5 composite floor deck which was \$1.50/SF cheaper and was able to obtain the 2 hour fire rating with a total slab thickness of 5 ½". Please note that this is different from the conventional unprotected deck fire rating due to a no-spray-applied fireproofing that is applied at the factory. For more information see U.L. Design Number D942.

4.3.6 Floor Vibration Analysis

Closing in on the final floor framing solution, only framing option 1 with lightweight concrete on long span metal deck on wide flange beams remained. Both EPICORE 3.5 and EPICORE 450 allow this floor framing option to meet strength and deflection criteria. However to be able to eliminate, aside from cost, and compare one deck over the other a higher level of analysis should be carried out. As stated previously the structural designer utilized basic dynamic principles to analyze these two potential solution for walking excitation or floor vibration.

AISC Design Guide 11: Floor Vibration Due to Human Activity, DG11, was developed due to criteria based on the dynamic response of floor systems to human excitation under walking loads. A floor system is deemed acceptable if the peak acceleration determined from

$$\frac{a_{peak}}{g} = \frac{P_o e^{-0.35 f_n}}{\beta W} \qquad \text{Equation 6}$$

does not exceed the acceleration limit. Design Guide 11 provides the following table for recommended P_o and β value in addition to acceleration limit.

Table 4.1
Recommended Values of Parameters in Equation (4.1) and a_o / g Limits

	Constant Force P_o	Damping Ratio β	Acceleration Limit $a_o / g \times 100\%$
Offices, Residences, Churches	0.29 kN (65 lb)	0.02–0.05*	0.5%
Shopping Malls	0.29 kN (65 lb)	0.02	1.5%
Footbridges—Indoor	0.41 kN (92 lb)	0.01	1.5%
Footbridges—Outdoor	0.41 kN (92 lb)	0.01	5.0%

* 0.02 for floors with few non-structural components (ceilings, ducts, partitions, etc.) as can occur in open work areas and churches,
0.03 for floors with non-structural components and furnishings, but with only small demountable partitions, typical of many modular office areas,
0.05 for full height partitions between floors.

Figure 98: AISC DG11 Recommended Values of Parameters and a_o/g limits

Because long span decks are prone to more vibration issue then typical deck, an additional mode was analyzed and checked for the deck. Since DG11 provide no approach for a slab panel mode, Dr. Hanagan was consulted in the approach of this mode's analysis. The slab panel mode follows the same concepts and ideas utilized in the beam panel mode and girder panel mode. However, the combined mode calculations in DG11 were modified to include the slab panel mode. Please refer to Structural Figure 180 through Figure 185 for in-depth calculations on composite beam design and vibration analysis. After analyzing the two different decks it was determined that in both cases larger structural wide flanges were required in order to meet acceleration limits of 0.5%g for a damping ratio of 0.03 which is for open floor offices. If the open floor office plan was changed to have full-height partition offices smaller member could be used due to the increase of the damping ratio from 0.03 to 0.05. The following table summarizes the vibration calculations for the two types of long span deck. It should be noted that the sizes of the beams are driven by the vibration analysis.

Summary of Vibration Analysis Results		
	EPICORE 3.5	**EPICORE 450**
Slab thickness (in.)	5.5	8.5
Beam Size	W30X108	W21X44
Girder Size	W24X84	W18X40
Framing weight (psf)	62.45	59.43
Slab frequency (Hz)	5.88	12.23
Beam frequency (Hz)	8.70	5.75
Girder frequency (Hz)	7.28	5.31
Combined weight (lbs)	107093	119710
Combined frequency (Hz)	4.05	3.72
a_p/g with $\beta = 0.03$	0.005	0.005
a_p/g with $\beta = 0.05$	0.003	0.003
Avg. relative cost ($/SF)	34.84	28.66

Table 55: Summary of Vibration Analysis Results

Due to the high costs, deep wide flanges, and thicker slab both long span decks were eliminated and the existing design was reevaluated. After a design team consulting session, the decision was made to keep the existing framing system and replace the normal weight concrete in the deck to light weight concrete. Mark Cook at Vulcraft's New York office was contacted for Vulcraft deck costs. It was determined that Vulcraft's deck was the cheapest at 1.80$/SF. Therefore the final gravity system floor framing is summarized in Table 56 on page 171 with the existing floor framing system. Refer to Structural Figure 186 through Figure 191 on page 282 through 287 for in-depth calculation on the final gravity system floor framing and the existing floor framing comparisons. Please note that all the acceleration values include the slab panel mode and therefore the existing and redesigned acceleration values are conservative.

	Existing System	**Redesigned System**
Slab depth (in)	5.5	6.25
Girder depth (in)	17.9	17.9
Beam Depth (in)	17.7	17.7
Total Structural Depth (in)	23.4	24.15
Beam size	W18X35	W18X35
Girder Size	W18X40	W18X40
Deck Span (ft)	10'-0"	10'-0"
Beam Weights (psf)	4.50	4.50
Deck Weight (psf)	53	46
Structural Weight (psf)	57.50	50.50
Avg. relative cost ($/SF)	22.88	24.38
a_p/g with $\beta = 0.03$	0.005	0.005
a_p/g with $\beta = 0.05$	0.003	0.003

Table 56: Comparison Summary of Existing to Redesign

4.3.7 Column Design

Due to the weight of the floor system decreasing and disengaging all of the columns from the lateral system, column sizes were reduced and built-up column sections were minimized to the cantilever bays. Figure 99 shows the columns that are not built-up sections all the way up the building.

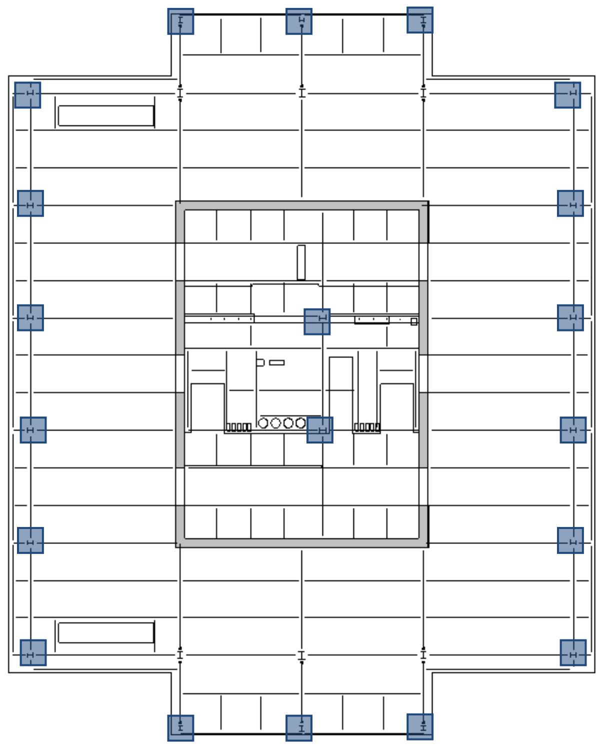


Figure 99: Non-built-up Section Columns

The sizes of the columns of the top floor range from W14X61 to W14X99 and increase in size down to base where the lightest column is a W14X342 and the heavier columns are the built-up sections. The columns were designed using RAM Structural System. Please refer to Structural Figure 192 through Figure 194 on page 288 through 290 for columns loads and RAM output. Due to the 5'-0" cantilevers on West and East sides of the building the columns were oriented to allow for the cantilever beam to be moment connected to the flange of the column. The same is true for the column in the cantilever bays. In order to keep with the architectural vision of the building floating above the storefront and eliminating the single rods in the cantilever bays, two additional Vierendeel frames were added to each cantilever bay and the back span beams were moment connected to reduce the unbalanced moment going into the columns. With the added moments going into the columns no rolled W14 shape could handle the loads thus built up columns were needed. Figure 100 and Figure 101 shows the built-up columns locations for the cantilever bays.

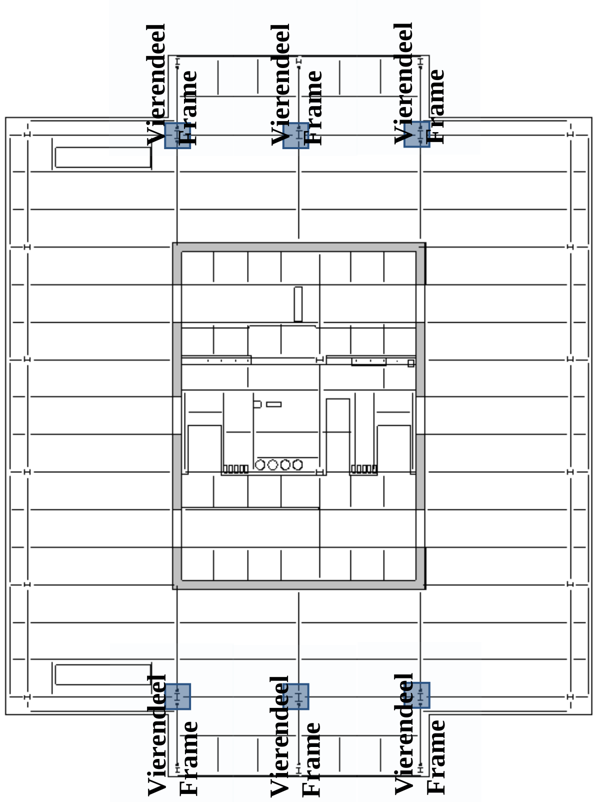


Figure 100: Built-Up column Location and Vierendeel Frames

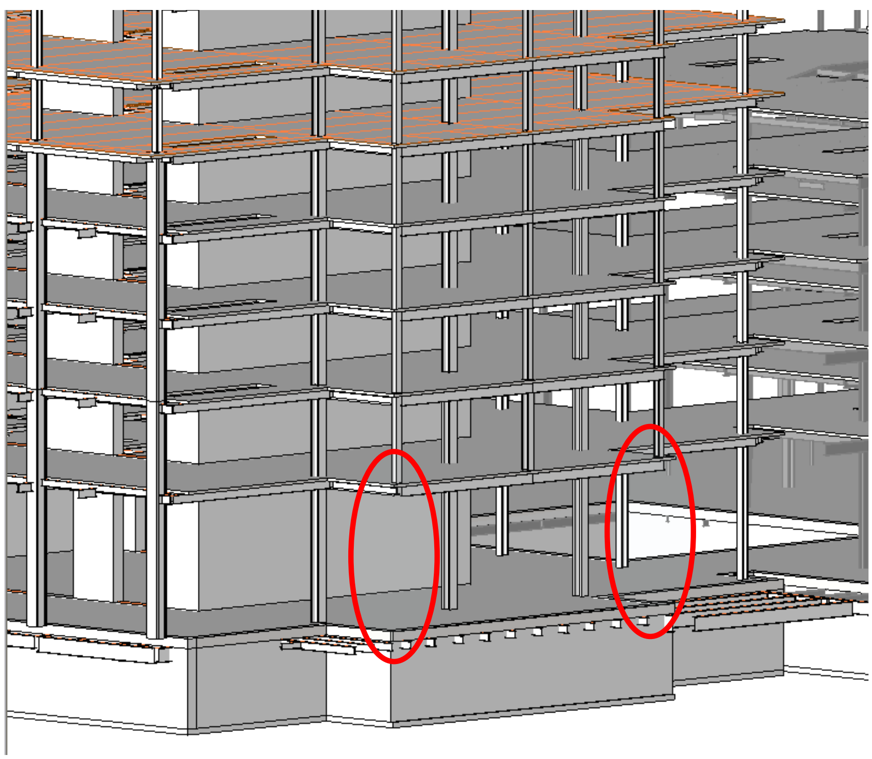


Figure 101: 3D view of Built-Up column Location and Vierendeel Frames

Table 57 shows a summary of the section properties of the two built-up columns that were used. The flanges and webs of the built-up columns were checked for slenderness and were found to be ok. Hand calculations were developed to check the flexural and torsional buckling stresses as well as the flexural yielding of the sections. To verify these results, the RAM column code was changed to include built-up sections and their properties for axial gravity loads and the moments due to the Vierendeel frame. It was determined from the RAM output that the built-up sections met the necessary strength requirements. Refer to Structural Figure 195 through Figure 197 on page 291 through 292 for in-depth built-up column properties, stress checks, and RAM output.

	BU24X987	BU24X817
d (in)	24	24
b_f (in)	22	22
t_f (in)	5	4
t_w (in)	5	4
w (plf)	987	817

Table 57: Built-up Column Section Properties

4.3.8 Connection Design

The typical structural connections of the building consist of simple shear tab connections and flange plate moment connections. However a challenge occurred when the gravity steel beams were framed into lateral concrete shear walls. On numerous occasions the structural designer consulted with the design team's construction manager, Dr. Hanagan, and Mike McGowan of Gannett Fleming. The main concern of the structural designer and the construction manager was the issue of constructability. It was determined early on in the design of the steel to concrete connection that construction flexibility was needed. As a result steel angles were used instead of a shear tab to allow for ease of welding the angle to the embedded plate. In addition, slotted holes were used in the angle for more construction flexibility of the connection. The resulting connection, shown in Figure 102, follows criteria set by AISC and PCI with a connection capacity of 48 kips.

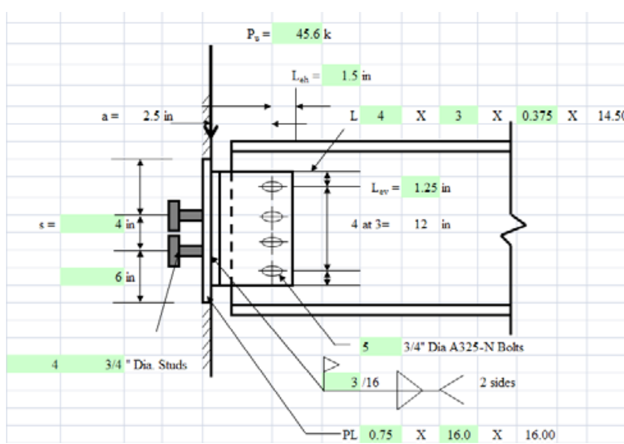


Figure 102: Concrete to Steel Connection

For beam to girder and girder to column flange connections shear tab were used. In the case of girder to column web an extended shear tab was designed. For the moment connections flexibility for construction, was considered. In the case where the W12X19s cantilever 5’-0” every floor the decision was made to use a bolted flange plate moment connection instead of an extended end plate moment connection. The extended end plate connection is ideal for relatively small moments, however due to the construction flexibility the bolted flange plate moment connection was used. See Figure 103 though Figure 107 on page 175 though 176 for the detailed shear tab and moment connections. For in-depth calculations please refer to Structural Figure 198 through Figure 207 on page 293 through 302.

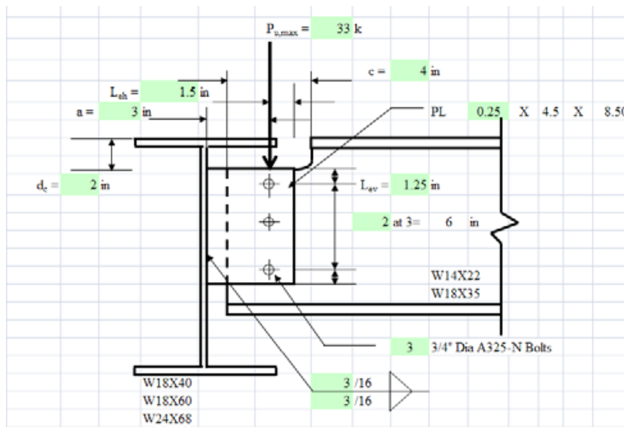


Figure 103: Beam to Girder Shear Tab Connection

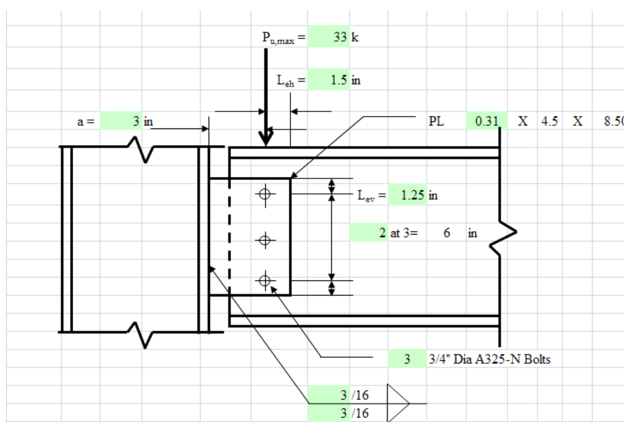


Figure 104: Girder to Column Flange Shear Tab Connection

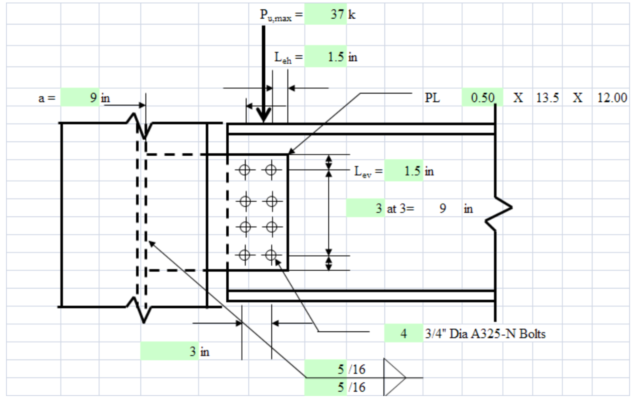


Figure 105: Girder to Column Web Shear Tab Connection

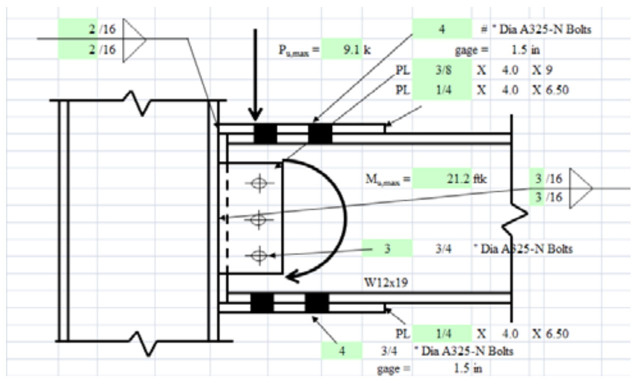


Figure 106: Girder to Column Flange Moment Connection

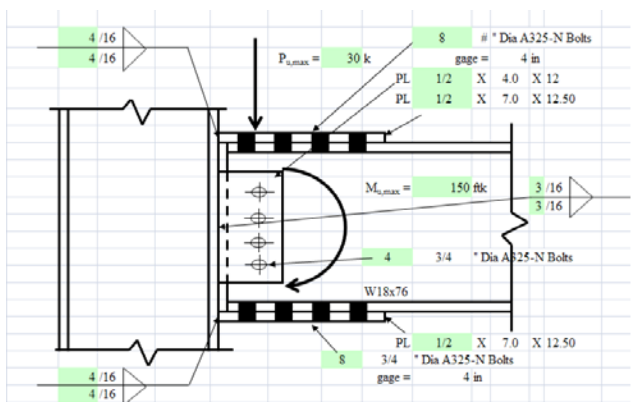


Figure 107: Girder to Column Flange Moment Connection

4.3.9 Foundation Impacts

As stated in section 2.2.7: Foundation Impacts on page 64, with disengaging all of the columns in the lateral design, their foundations will most likely be smaller due to the removal of moments due to wind acting on the columns. The foundations under the

Vierendeel frames will change however not as dramatically as the other column foundations due to the built-up columns and larger cantilevers. Due to the foundation not being part of the design team's scope, in-depth calculations were not performed.

4.3.10 Cost Implications

The Building Information Models were utilized again to obtain accurate schedules for the steel columns and steel framing members of the building. Cost data was applied to the schedules to provide accurate take-offs for comparison. The exterior "knuckle" connections and X-bracing were not included in the original take-off and pricing. A summary of the cost for framing for the original building as well as the proposed core and corner change is shown below in Table 58, Table 59 respectively. Detailed take-offs are available in Appendix 7.5.

Total	52256.4	C.F.
	25605636	Lbs
	12802.818	Tons
	$ 2,205.88	per Ton of Steel
	Total Framing Cost	$ 57,367,161.04

Table 58: Original Framing Cost Summary

Total	30972.96	C.F.
	15176750.4	Lbs
	7588.3752	Tons
	$ 2,658.34	per Ton of Steel
	Total Framing Cost	$ 20,172,478.64

Table 59: Core/Corner Change Framing Cost Summary

Additionally, the cost summary for columns for the original building as well as the core and proposed core and corner change is shown below in Table 60, and Table 61 respectively. Detailed take-offs are available in Appendix 7.5.

Total	28600	L.F.
	26788300	Lbs
	13394.15	Tons
	$ 3,932.80	per Ton of Steel
	Total Column Cost	$ 52,676,511.62

Table 60: Original Column Cost Summary

Total	21724	L.F.
	5547770.2	Lbs
	2773.8851	Tons
	$ 5,206.74	per Ton of Steel
	Total Column Cost	$ 14,442,894.08

Table 61: Core/Corner Change Column Cost Summary

4.3.11 Schedule Implications

The schedule changes for the building evaluated in accordance for the reduction in the number of members, their sizes and integrating their construction along with the concrete core. The original schedule allowed for a total lead time of 7 months from the beginning of fabrication of the steel for the tower to the start of on-site steel erection. The original schedule required 2 weeks for erection of 2 floors of structural steel. This included an average of 9 working days for the erection of 2 floors, and allowed for one day of float every two weeks to still keep on schedule. The original lead time was retained for the new steel, but with the reduction to the number of members and their sizes, the erection of the steel members would eventually overtake the concrete core. To avoid this, the duration of erection was left to the same timeframe of 2 stories per 2 weeks, but allowed for 2 days of float instead of 1. The new framing would begin on 3/18/05 and would be completed on 5/24/06, which are the same dates as the original steel construction. This is shown in the detailed construction schedule available in Appendix 7.5 on page 389.

Using a BIM model in conjunction with a construction schedule into a 4D is very useful to check for possible problems with trade coordination. Prior to construction, the use of a 4D model can help to properly portray the sequencing of trades electronically, helping to eliminate on-site problems before they are created. This was utilized to check that the proposed core, façade and tenant space changes were properly integrated into the construction schedule. By linking the foundations, steel, concrete core, and façade to the schedule in Navisworks, a 4D model was created, accurately showing the construction process. A breakdown of the 4D model is shown in the screen shots below in Figure 108 through Figure 114. The dates associated with each picture depict the date of construction the screen shot was taken at. This analysis showed the durations and sequencing worked together properly, and the coordination between trades could be maintained.

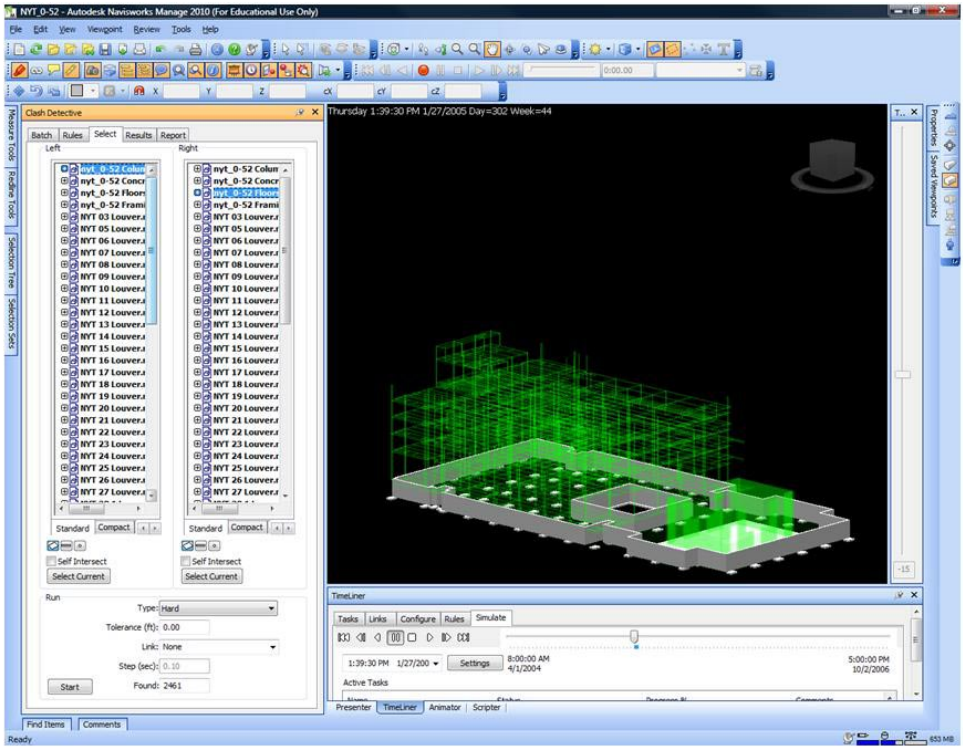


Figure 108: 4D Model; 1/27/05

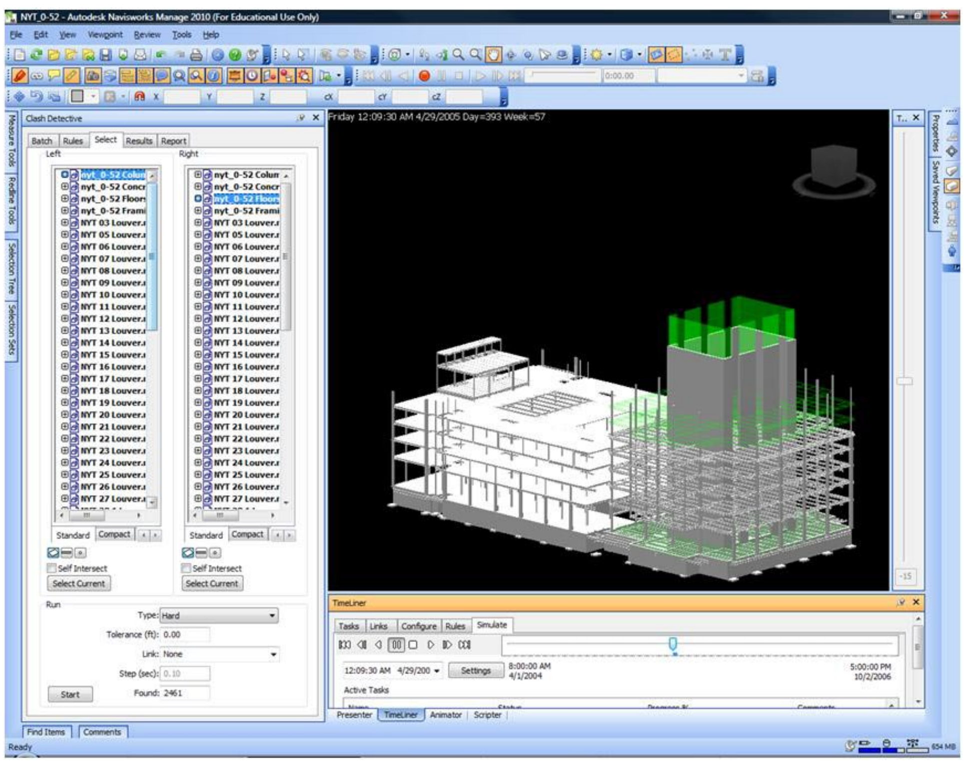


Figure 109: 4D Model; 4/29/05

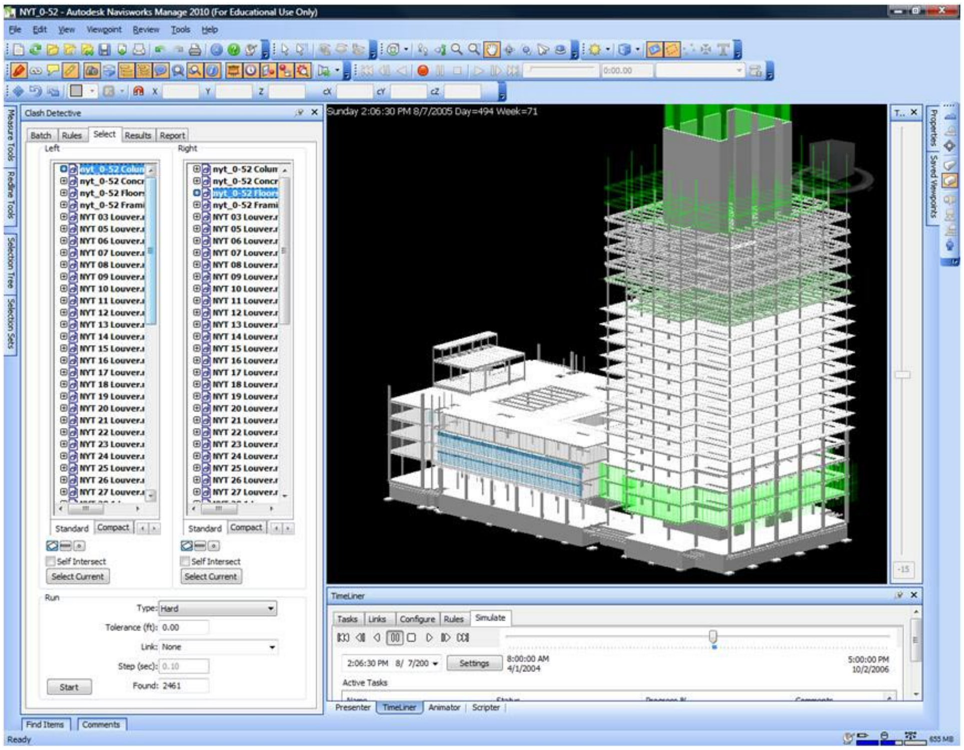


Figure 110: 4D Model; 8/7/05

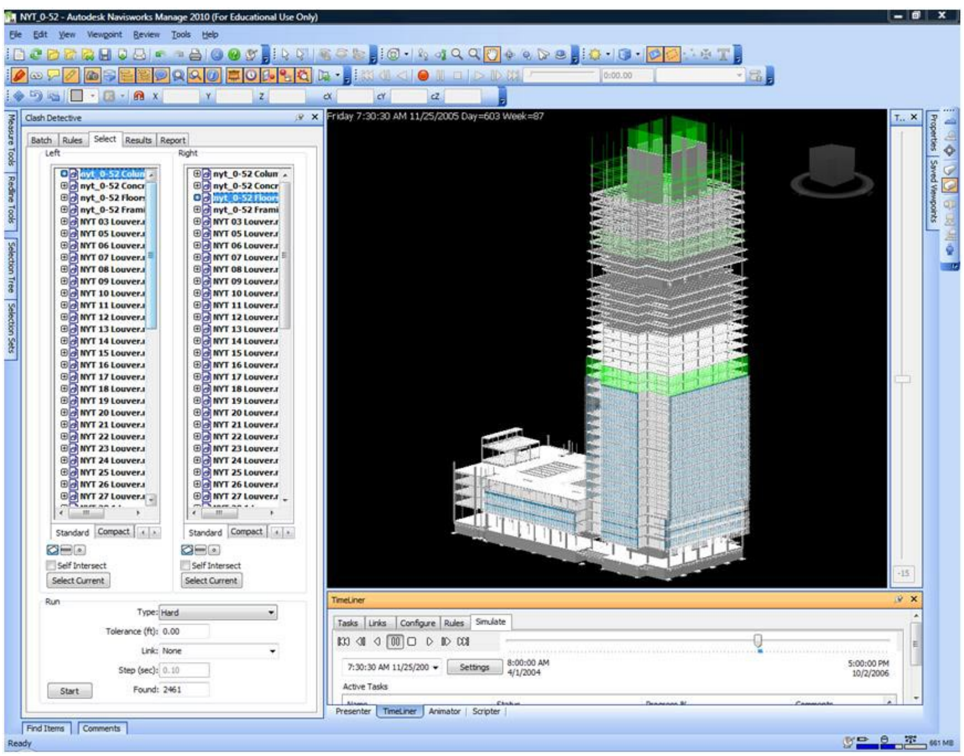


Figure 111: 4D Model; 11/25/05

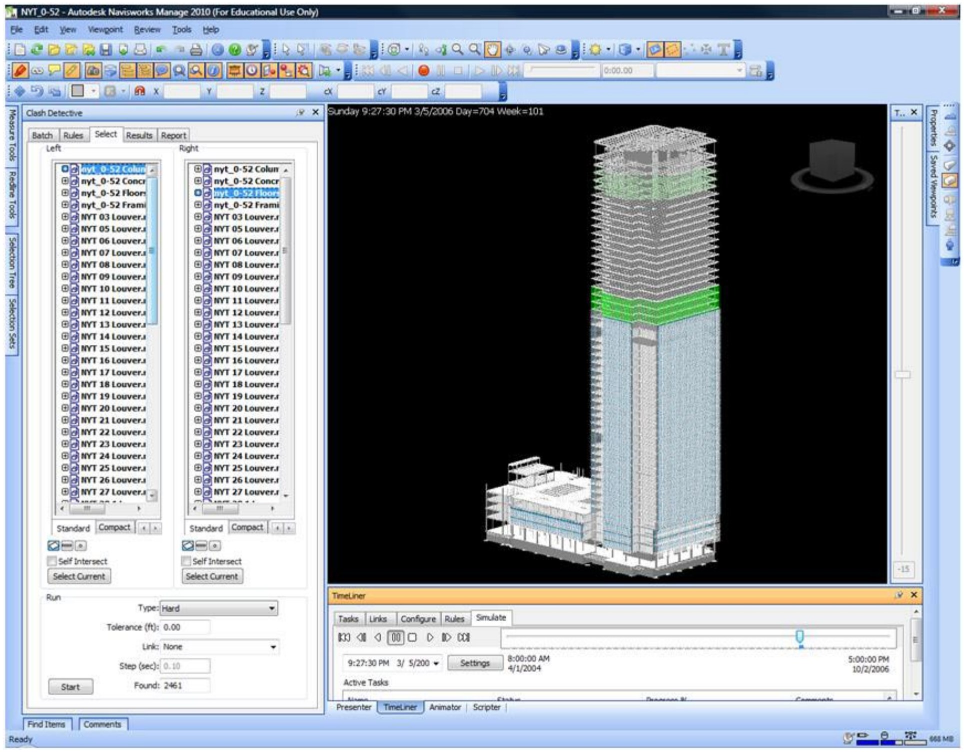


Figure 112: 4D Model; 3/5/06

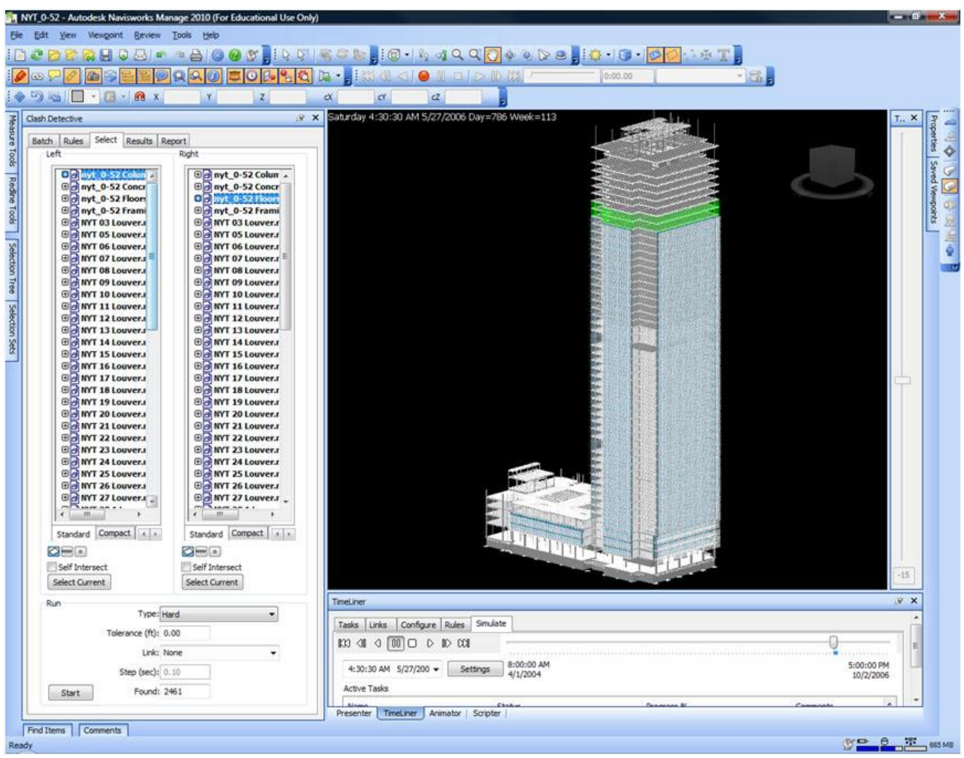


Figure 113: 4D Model; 5/27/2006

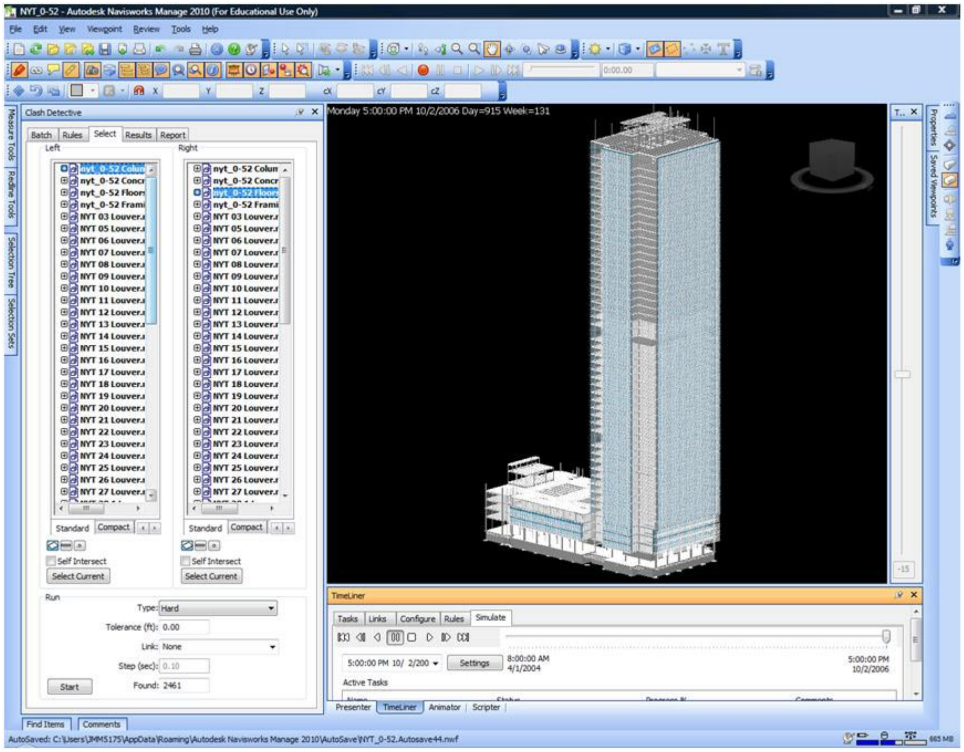


Figure 114: 4D Model; 10/2/06

4.3.12 Conclusions

The goal of reducing structural members per bay was not met due to vibrations. It was determined that the redesigned floor system resulted in a total structural depth increase of ¾" and an increase of cost of $1.58/SF. In addition, the redesigned floor system met acceleration limits when subjected to walking excitation loads. The floor framing system was decreased by 7.5 psf and all columns were disengaged from the lateral system which decreased column sizes. To keep with the architect's vision of no columns at the storefront in the cantilever bays, built-up sections are necessary. However, the redesigned built-up sections are not as large as the existing due to decreased weight and exclusion from the lateral system as listed above. Adequate connections were designed due to being driven by constructability.

There are also several impacts on the cost of the framing and columns of the building. A major impact to the overall weight of steel and the cost of columns and framing occurred with large built up columns being replaced by the concrete core. Additionally, the outrigger system was eliminated from the building, reducing the cost dramatically. The framing throughout the building was also reduced in size and weight due to the use of the concrete core, and some of the more specialty framing members were eliminated or replaced by more common steel members, resulting in a cost reduction. Comparing the columns and framing of the original building and displacing the savings of the members of the core discussed in section 2.4, a reduction in cost to the proposed system is approximately $55 million. This is a fairly conservative savings as well due to the expensive "knuckle" connections and X-bracing on the exterior of the building being eliminated by the structural change.

4.4 Interior Lighting

The following section discusses the interior lighting design for the open office.

4.4.1 Objective

Goal of this evaluation/analysis/redesign

1) Investigate the energy savings resulting from a lower general lighting level with additional task lighting.
2) Pass lighting power densities on to the mechanical designer for energy modeling and possible sizing changes of mechanical systems from previous design.

4.4.2 Process

Model inputs-

Building geometry – Use the existing Revit model for geometry and recreate model in AutoCAD for use in AGI

Photometry – Download .ies files from manufacturer websites

Model outputs-

Illuminance levels within the space

Lighting Power Densities

Renderings

Architectural impact

Psychological perception of the space

4.4.3 Calculations for Analysis

AGI was used as the tool for the lighting calculations. AGI was also used for the raytraced images .

4.4.4 Assumptions

The assumptions for this part of the project include interior finishes, consistent furniture layout, and consistent controls.

Room

Ceiling .80

Walls .50

Floor .20

Desk

Counter .7

Partition .5

Cabinet .3

Light Loss Factors

Ballast Factor	1.0
LDD Category 1	.92
RSDD	.925
Total	.85

4.4.5 Design Considerations

Psychological Impression

The space should have the impression of visual clarity. To obtain this, the space should be uniformly lit across the office area with some peripheral emphasis. Having a luminous glazing surface will help with peripheral emphasis around the exterior. To add peripheral emphasis along the interior, wall washers around the circulation space were used where solid wall is available.

Appearance of Space and Luminaires (Important)

The architecture aids in the appearance of space. The layout is open and all areas have views of the exterior. The luminaires are designed to be flush with the ceiling. This allows a continuous plane across the entire ceiling. Designing the lighting to have peripheral emphasis also adds to the appearance of space.

Color Appearance (Important)

Because of the work completed in the space, the luminaires must use high CRI lamps. The occupants will be working with graphics and type, so it is crucial to have good color rendering. All lamps within the space shall be of 80 CRI or higher. The color temperature of the lamping is 3500K and must be consistent throughout the entire space. To maintain a uniform design throughout the space, all lumianires must be relamped with the same color temperature lamp.

Daylight integration and Control (Important)

Daylight is a major component of the office design. Dimming controls are used to properly harvest the benefits of daylight. Luminaires will individually respond to the changing exterior environment and provide appropriate lighting levels. In addition to controlling the lumianires, the daylight also needs to be controlled. Solar shades are used across each of the facades.

Direct Glare (Very Important)

Direct glare is a crucial part of occupant comfort. To help maintain a glare free environment, both daylight and electric light must be designed accordingly. Electric light fixtures must be chosen that maintain a glare free environment. To control the dynamic nature of daylight, automatic blinds and louvers are incorporated into the façade.

Flicker (Important)

The tasks of computer use and reading or writing require that light sources do not flicker. Any luminaires that caused this occurrence would create an uncomfortable situation and reduce productivity. The combination of lamping and ballasts are designed to minimize this occurrence.

Light Distribution on Surfaces (Important)

All surfaces should receive uniform, area lighting. This will provide appropriate illuminance for individuals working in the space. This uniform design should be present throughout the floor with little to no deviations.

Light Distribution on Task Plane (Important)

The task plane should receive a uniform distribution to create a comfortable work setting. Individuals working at their desks will want to be able to easily focus on tasks without being distracted with varying lighting levels. To help the occupants with this, task lighting is installed at each workstation.

Luminance of Room Surfaces (Very Important)

Room surfaces should appear bright to promote an active atmosphere. The ceiling and walls should have a uniform luminance. This will help in creating a completely uniform environment to work in.

Modeling of Faces or Objects (Important)

Social interaction is important in this workspace. Facial expressions and hand or body motions should be easily seen. The use of area lighting should illuminate the entire space so that these factors will be of no issue. To properly model faces, there must be some contribution of vertical illuminance.

Reflected Glare (Very Important)

Reflected glare should be complete removed from the space. Glare can effect an individual's ability to work and feel comfortable. The reflectance of interior materials is a major consideration for reflected glare. Since the reflectances cannot be changed, it is luminaire placement that must be adapted if reflected glare is a problem.

Shadows (Important)

No shadows should be present in this space. Fluorescent sources should be used to create a diffuse lighting solution. Shadows can create uncomfortable working conditions and reduce productivity. Shadows from daylight were previously an issue. With the redesign of the façade system, shadows are no longer an issue.

Source/Task/Eye Geometry (Very Important)

Furniture should be spaced out so that luminaires are not directly in front of or behind individuals. Veiling reflections can occur on computer screens or glossy papers if luminaires are located in inappropriate spots. With proper selection of flat screen computer monitors, this shouldn’t be a problem.

Maintenance

Luminaires should have lamps with long life to reduce the time between replacement. Proper color temperatures should always be provided to keep the lighting design consistent and uniform. The average height ceiling provides easy access to the fixtures. Luminaires should be able to be relamped or replaced easily to reduce office distractions.

4.4.6 Design Criteria

Illuminance

General Lighting 30fc

Task 50fc

Lighting Power Density

Open Office 1.1W/sqft

Corridor .5W/sqft

4.4.7 Design Intent

The office lighting was redesigned to not only optimize the electrical energy consumption, but to decrease heating loads. The building is 1.6 million square feet in total. With most of the square footage being taken up by open office at 1.1 watts/sqft, there is a significant heat gain from lighting alone. By reducing this interior lighting load, the overall energy consumption of the lighting and mechanical loads should decrease.

To maintain part of the original ideas of the architect, a linear system was used. Strips of glowing lines would be seen from outside of the building as the sun is going down. This look will maintain the rectilinear look of the building. To serve as contrast to the open office, yet compliment the shape of the fixtures, a square downlight was used to mark the circulation space around the core of the building. The combination of downlights and wall washers, where applicable, were used. This look around the core was carried into the elevator lobby. This design allows for a consistent look through all office floors. Due to the nature of the elevator lobby, the lighting needs to be flexible from floor to floor. Each floor has six elevators in the lobby, though not the same six per floor. To highlight the area where the elevators are on each floor, the downlights are placed in front of the doors. Where there are no elevators, wall washers are used to accent the walls.

To save energy, the general lighting within the space was designed to 30fc. This is the IESNA recommendation for reading. For some of the tasks, it would be better if the occupant had 50fc. When an occupant is not at their desk, there is no need for 50fc. At the same time, it would be a negative impact if a downlight were turned off above the empty desk. To aid the occupants, a task light was installed at each desk to bring the light levels up to 50fc. This allows for maximum energy savings for the building.

The original system incorporated digitally addressable ballasts. These ballasts took input from photosensors and occupancy sensors. Since the lighting system was designed to operate at 50fc, the photosensors were set to maintain 50fc. The proposed redesign also incorporates photosensors with the digitally addressable ballasts. Because the general system is only trying to maintain 30fc, the lighting will be able to dim at lower daylight levels. It will be important for the photosensors to be installed in such locations where the sensor cannot see a desk. With the incorporation of task lights, the photosensor could be fooled by higher than actual light levels.

In addition to energy savings, the proposed redesign will also save in maintenance fees. With drastic cuts in the number of fixtures, maintenance workers will spend less time relamping fixtures. This could be a huge financial burden lifted from the New York Times annual expenses. Since the original design incorporated over 18,000 fixtures in the open office, this will also save a large part of construction costs due to the reduced number of fixtures.

4.4.8 **Conclusions**

4.4.8.1 Fixture Selection

The fixtures chosen for this space can be found on pages 314 through 320.

4.4.8.2 Lighting Power Density

The redesign uses 142 R1 fixtures and a combination of 86 R2 and R3 fixtures. The square footage of the floor plan totals 17,558 square feet. The total wattage in the redesigned layout is 8,241.2Watts. This results in an average lighting power density of .469 Watts per Square Foot. Within ASHRAE Standard 90.1, there is a lighting exception for task lights controlled by occupancy. With this exception, the task lighting was not included in the lighting power density. The resulting energy savings would be approximately $462,200.00 per year.

4.4.8.3 Pseudo Colors and Rendered Images

Figure 115: Open Office General Lighting Render

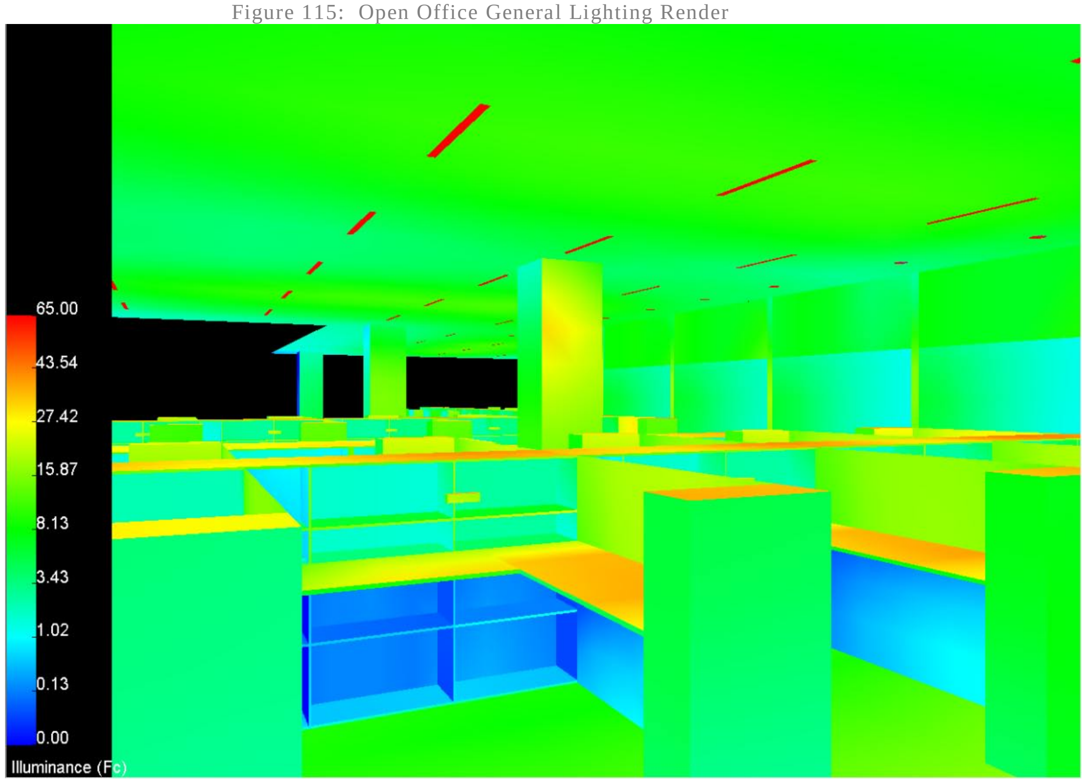


Figure 116: Open Office General Lighting Pseudo Color

Figure 117: Open Office with Task Lighting Render

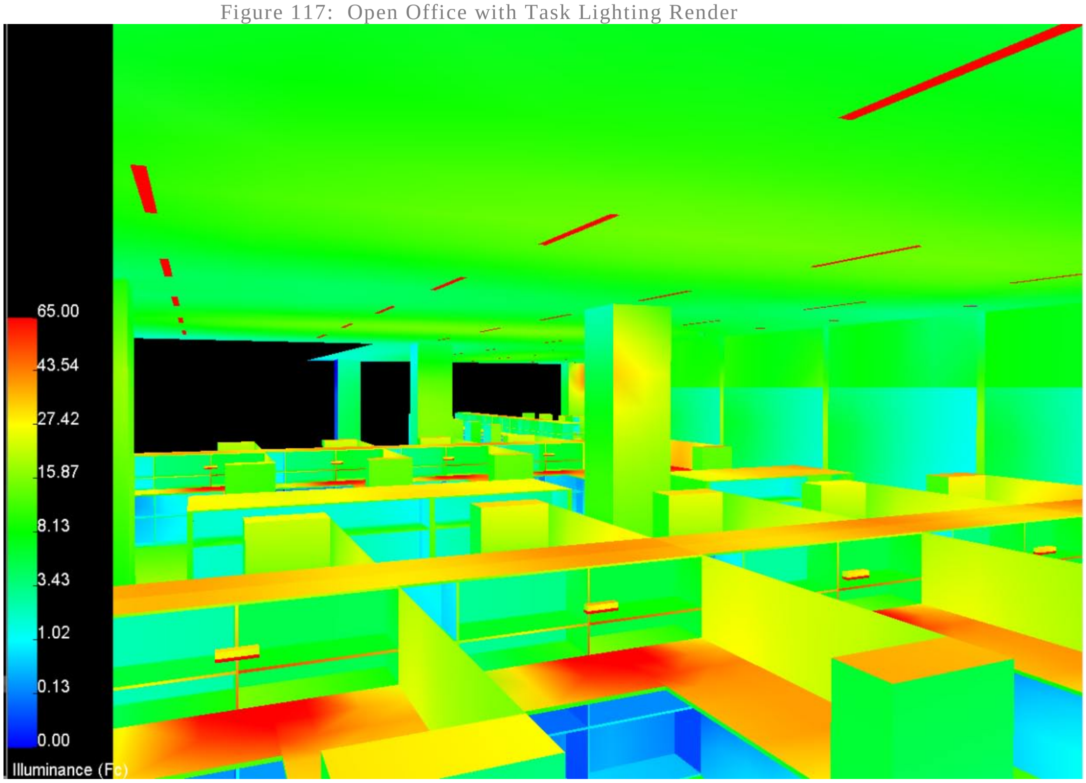


Figure 118: Open Office with Task Lighting Pseudo Color

Figure 119: Elevator Lobby Render

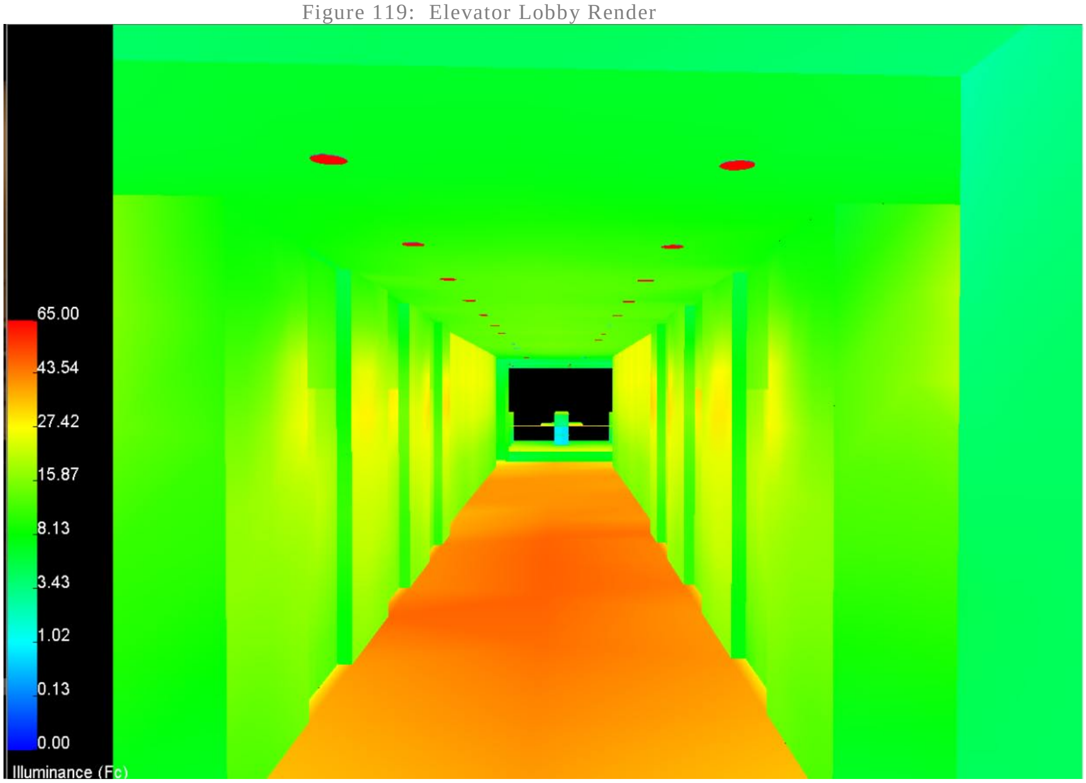


Figure 120: Elevator Lobby Pseudo Color

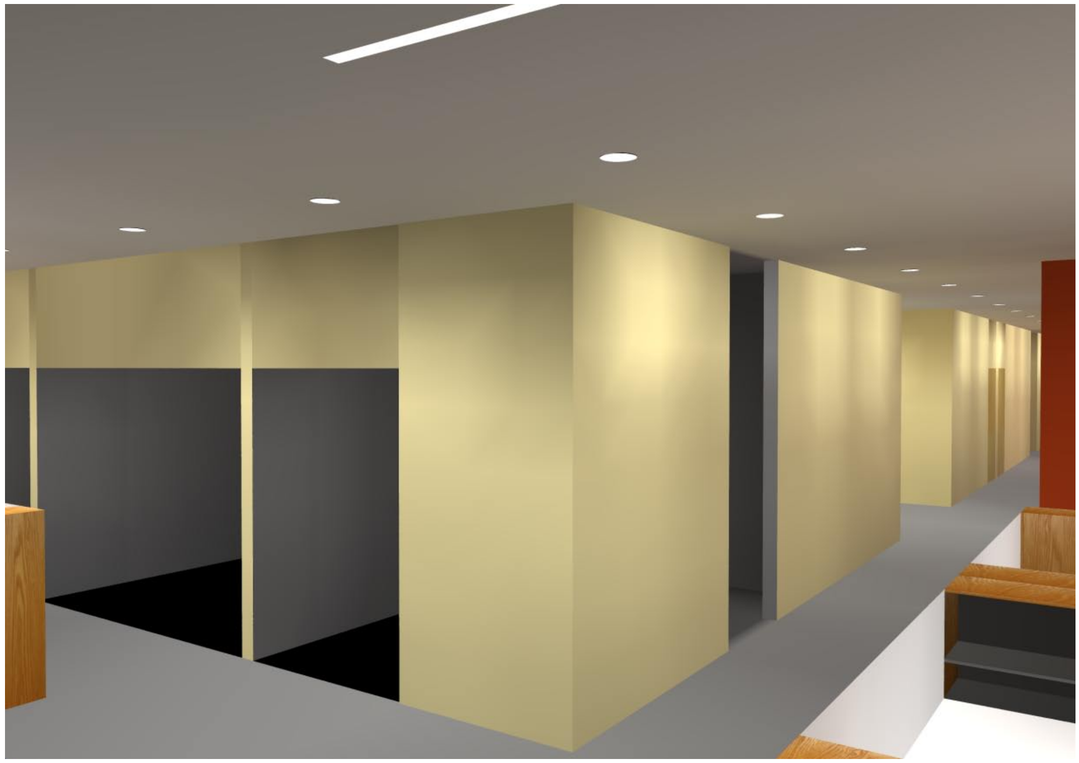


Figure 121: Circulation Space Render

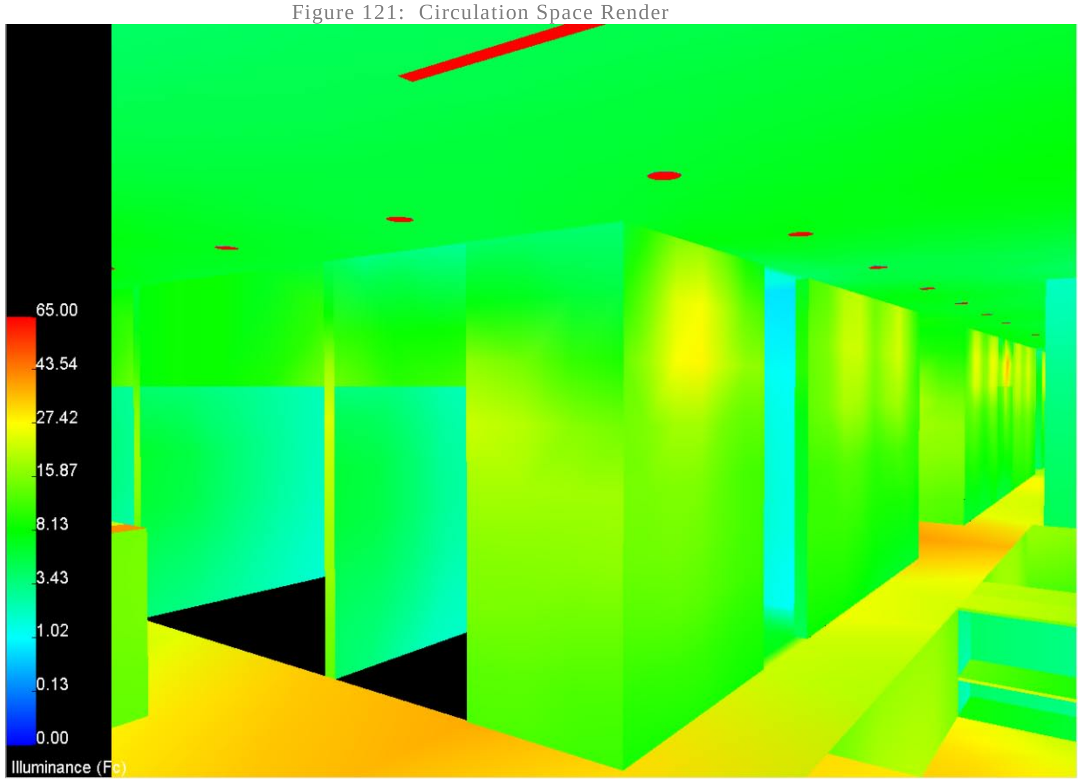


Figure 122: Circulation Space Pseudo Color

4.4.8.4 Illuminance Levels (General Lighting Only)

Average	31 fc
Max/Min	3.39

4.4.8.5 Illuminance Levels (With Task Light)

Average	55 fc

4.4.8.6 Control

The lighting controls for The New York Times Building are extremely complicated. The design was done by Susan Brady Lighting Design, Lutron, and assisted by Lawrence Berkley Laboratory. For this reason, a redesign of the entire control scheme was not completed. The daylighting was analyzed in the Daylighting section of this report starting on page 83. The current system uses all digitally controlled ballasts by Lutron. Each of the ballasts is controlled by a system of photosensors and occupancy sensors. All pieces of the system tie back to the Quantum controls. The system also incorporates the shade control sensors. These are open loop sensors around the exterior of the building. The mast on top of the building also contains a sensor for dealing with the passing of cloud cover. Due to the complexity of these systems, the control system was not redesigned.

4.4.8.7 Panelboard Changes

The panelboard changes for the interior lighting redesign can be found in Figure 245: Panelboard EHV-8 (Existing) through Figure 259: Panelboard P-8-2 (New) on pages 343 through 358. The cut sheets for these panels can be found on pages 364 through 367.

4.4.8.8 Plans

Though a representative section of the entire reflected ceiling plan can be found on page 306 and the task lighting layout on page 307, the full size plans have been folded into the back of this report.

4.5 Air Distribution Redesign

The following section discusses the investigation of the existing air distribution system and its impact on indoor environmental quality. A side-wall displacement ventilation system was selected to replace the existing unducted Underfloor Air Distribution (UFAD) system to improve the indoor environment for the building occupants by minimizing distribution of dust and contaminants that may collect in the open plenum space.

4.5.1 **Process**

Calculate cooling loads and required ventilation rates for the spaces within a typical office floor of The New York Times Building

Select and size Side-Wall Diffusers

Locate diffusers within the space

Size ductwork for within the floor plenum space

4.5.2 **Existing Underfloor Air Distribution (UFAD) System**

In the New York Times Building, heating, cooling and ventilation is achieved through an air distribution system. The floors occupied by The New York Times utilize an under floor air distribution (UFAD) system. A traditional overhead ducted system was implemented on the Forest City Ratner floors. Fresh air is brought in through outdoor air units in the two mechanical penthouses on the 28th and 51st floors, and then distributed throughout the building. Outdoor air is centrally dehumidified so the floor by floor air handlers can operate with dry coils. This minimizes both maintenance costs and long-term microbial growth on the coils.

The underfloor plenum for each floor is served by a base building air handling unit which has multiple zones of control and an overall capacity of 29, 500 CFM. The outdoor ventilation air is supplied through a variable air volume box terminal unit, which is fed from the main outdoor air handling units on the 28th and 51st floors. The typical VAV box terminal unit has a capacity of a 4000 CFM.

Static pressure sensors in the plan East and plan West air highways ensure that the base building air handling unit maintains a constant static pressure of 0.1” WG. In each control zone there are multiple control dampers in the air highway discharging supply air to the under floor plenums. These dampers are controlled in unison to maintain an under floor static pressure of 0.05” WG in each zone. A temperature sensor in each zone will override the pressure control loop to maintain an appropriate temperature in the space.

A temperature sensor located in the fan coil discharge modulates the chilled water cooling coil control valve in order to maintain a constant discharge temperature of 60°F to the space during cooling mode. In heating mode, if the space temperature drops below the occupied set point of 70°F the perimeter fan powered boxes with heating coils will start and supply 84°F air to the space.

A carbon dioxide sensor located in the return air stream monitors CO_2 levels. If the CO_2 level increases to 1000 PPM, the minimum outside air dampers will be opened to 100%. If the CO_2 levels continue to rise, the mixed air control loop will be overridden and the maximum outdoor air damper will be modulated open.

Swirl diffusers were installed to provide occupant control, while in high occupancy spaces air flows through perforated floor tiles.

The under floor air distribution system used in The New York Times Building provides certain advantages and disadvantages. A thorough literature review helped identify some of these and also dictate a potential alternative design. Also, the design intent and objectives of the owner were taken into account during this evaluation.

4.5.3 Design Objectives

In the original design, several objectives and requirements were major driving factors in the selection of a UFAD system for the New York Times Building.

1) High-profile sustainability - The potential for energy savings and improved IAQ with less mixing than an overhead system.
2) Cost-effectiveness - Choosing an un-ducted system provides a lower first cost by eliminating significant amount of ductwork.
3) Raised floor - Desire to accommodate telecommunication cables as well as provide flexibility in the space with the ability to rearrange diffusers as the need of the occupants changes.

These design objectives were given consideration in the evaluation of the existing system and proposed displacement ventilation system.

4.5.4 Literature Review

4.5.4.1 Comparison of UFAD and DV systems

The existing UFAD system leaves room for two significant areas of improvement. Firstly, while utilizing less mixing than a typical overhead system, a displacement ventilation system will supply air at a lower velocity and take advantage of the natural thermal plumes creating by internal heat gains within the space to draw cool supply air upwards and stratify. The open office plan is partitioned causing some mixing. The partitions can block the flow of the floor diffusers from evenly distributing across the floor plate and stratifying. The proposed ducted Displacement Ventilation (DV) system resolves this issue.

The second issue with the original UFAD design using an unducted plenum to supply air. This can instigate several problems. One potential problem is the possibility of air leakage resulting in system efficiency losses and increased utility costs. Additionally, over time, the air quality can degrade due to neglected cleaning and maintenance.

Figure 123 - Side-wall Diffuser Airflow Path Source (Halton shows a typical air flow path for a DV diffuser. Figure 124 - Temperature Profile Comparison shows the improved stratification with DV. This stratification minimizes mixing of fresh supply air with stale room air. This leads to cleaner air supplied to each occupant, and ultimately an improved indoor environment.

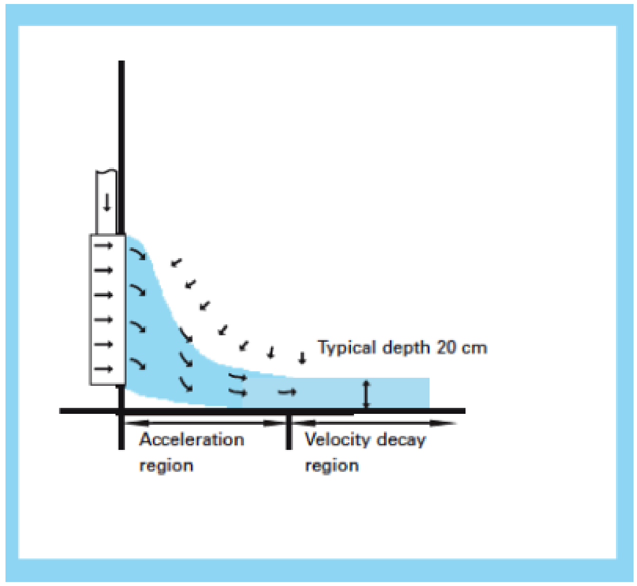
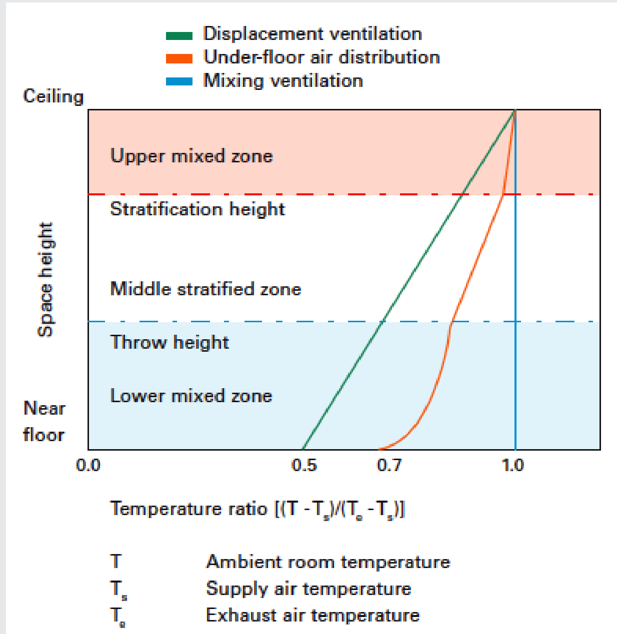


Figure 123 - Side-wall Diffuser Airflow Path Source (Halton)



Temperature profile comparison between under-floor air distribution and displacement & mixing ventilation

Figure 124 - Temperature Profile Comparison Source: Halton.com

4.5.5 **Design of Displacement Ventilation System**

4.5.5.1 Assumptions

Space cooling is coupled with supply ventilation air and therefore, the ducted displacement ventilation system is sized to meet the minimum ventilation requirements and the space cooling loads calculated using the design procedure outlined in Section 4.5.5.3, where supplemental spreadsheet calculations are additionally used to apply load factors associated with the proposed displacement ventilation system. Table 63-Displacement Diffuser Schedule for Typical Office Floor provides specification data for the proposed system.

The space heating system was not drastically modified and is provided by perimeter recirculation fan power boxes. Steam heating coils in the perimeter units as well as floor air handling units are supplied with purchased steam. The mechanical system modifications will not significantly impact the size, layout or operation of the heating system.

4.5.5.2 Diffuser Location

In the proposed design, side-wall displacement ventilation diffusers are located adjacent to the columns in the open floor plan to integrate seamlessly with the interior structure and architecture. An individual diffuser is located in each enclosed office and conference room. Duct sizes and diffuser locations are provided in Figure 126- Duct Sizing and Diffuser Layout.

4.5.5.3 Design Procedure

Results from the IES<VE> simulation provided individual cooling loads for each zone in the typical office plan. The loads, organized by type, and load factors for displacement ventilation, as determined by ASHRAE, are listed in Table 62 - Cooling Load Categories and DV Load Factors. These load factors are applied to their specified load type.

Table 62 - Cooling Load Categories and DV Load Factors

		Load Factors,	Load Type
Q_{oe}	(Btu/h)	0.295	Occupants, desk lamps & equipment
Q_l	(Btu/h)	0.132	overhead lighting
Q_{ex}	(Btu/h)	0.185	heat conduction through the room envelope and transmitted solar radiation
Q_{total}	(Btu/h)		Total Cooling Load

Required air flow rate for cooling is determined by the equation

$V_h = (0.295Q_{oe} + 0.132Q_l + 0.185\ Q_{ex}) / (\Delta T_{hf}*\rho*C_p)$

Required air flow rate for fresh air using ASHRAE defined values for ventilation effectiveness by the equation

$V_{oz} = V_r = V_{bz}/E = (R_pP_z+R_AA_z)/E_z$

The greater of the two ventilation rates are chosen for required airflow

$V= \max\ \{V_f,V_h\}$

The airflow requirements are divided by the number of diffusers in the space

4.5.5.4 Diffuser Selection

A Price-HVAC Floor Mounted Three-Way Diffuser was selected for its performance characteristics to meet the required loads of the space. Table 63- Displacement Diffuser Schedule for Typical Office Floor summarizes the selected diffusers for a typical office floor.

Figure 125 - Three Way Side-Wall Displacement Diffuser - DF-3 Series (Price HVAC)

Table 63- Displacement Diffuser Schedule for Typical Office Floor

Space (add tag)	Unit Type	# of Diffusers per Zone	Unit Size [Face Area, ft²] W x H x	Inlet Size	Face Velocity FPM	Airflow CFM	Total Pressure in.w.g.	Static Pressure in.w.g.	Noise Criteria NC	Adjacent Zone ΔT = 5°F Length ft.	Adjacent Zone ΔT = 5°F Width ft.	Adjacent Zone ΔT = 10°F Length ft.	Adjacent Zone ΔT = 10°F Width ft.
Zone 1 - NW Perimeter Open Office	DF-3 Series	1	24 x 48 x 13	16 x 8	30	475	0.06	0.02	---	10	20	14	28
Zone 2 - W Perimeter Open Office	DF-3 Series	4	24 x 48 x 13	16 x 8	40	633	0.1	0.03	23	11	20	14	28
Zone 3 - N Perimeter Open Office	DF-3 Series	4	24 x 48 x 13	16 x 8	40	633	0.1	0.03	23	11	20	14	28
Zone 4 - E Perimeter Open Office	DF-3 Series	4	24 x 48 x 13	16 x 8	40	633	0.1	0.03	23	11	20	14	28
Zone 5 -S Perimeter Open Office	DF-3 Series	4	24 x 48 x 13	16 x 8	40	633	0.1	0.03	23	11	20	14	28
Zone 5 -SE Perimeter Open Office	DF-3 Series	1	24 x 48 x 13	16 x 8	30	475	0.06	0.02	---	10	20	14	28
Zone 6 -SWPerimeter Open Office	DF-3 Series	1	24 x 48 x 13	16 x 8	30	475	0.06	0.02	---	10	20	14	28
Zone 7 -NE Perimeter Open Office	DF-3 Series	1	24 x 48 x 13	16 x 8	30	475	0.06	0.02	---	10	20	14	28
Zone 8 -Enclosed Offices	DF-3 Series	18	24 x 24 x 13	10	20	155	---	---	---	7	14	10	22
Zone 9 -Conference	DF-3 Series	3	24 x 24 x 13	10	20	155	---	---	---	7	14	10	22

4.5.5.5 Duct Design

The required ductwork was sized and laid out in Revit MEP to check for clash detection. The Equal Friction Method, along with required space supply air, was used to size the ductwork with a pressure of 0.2 inWater. Figure 126- Duct Sizing and Diffuser Layout provides the new layout and ductwork sizes.

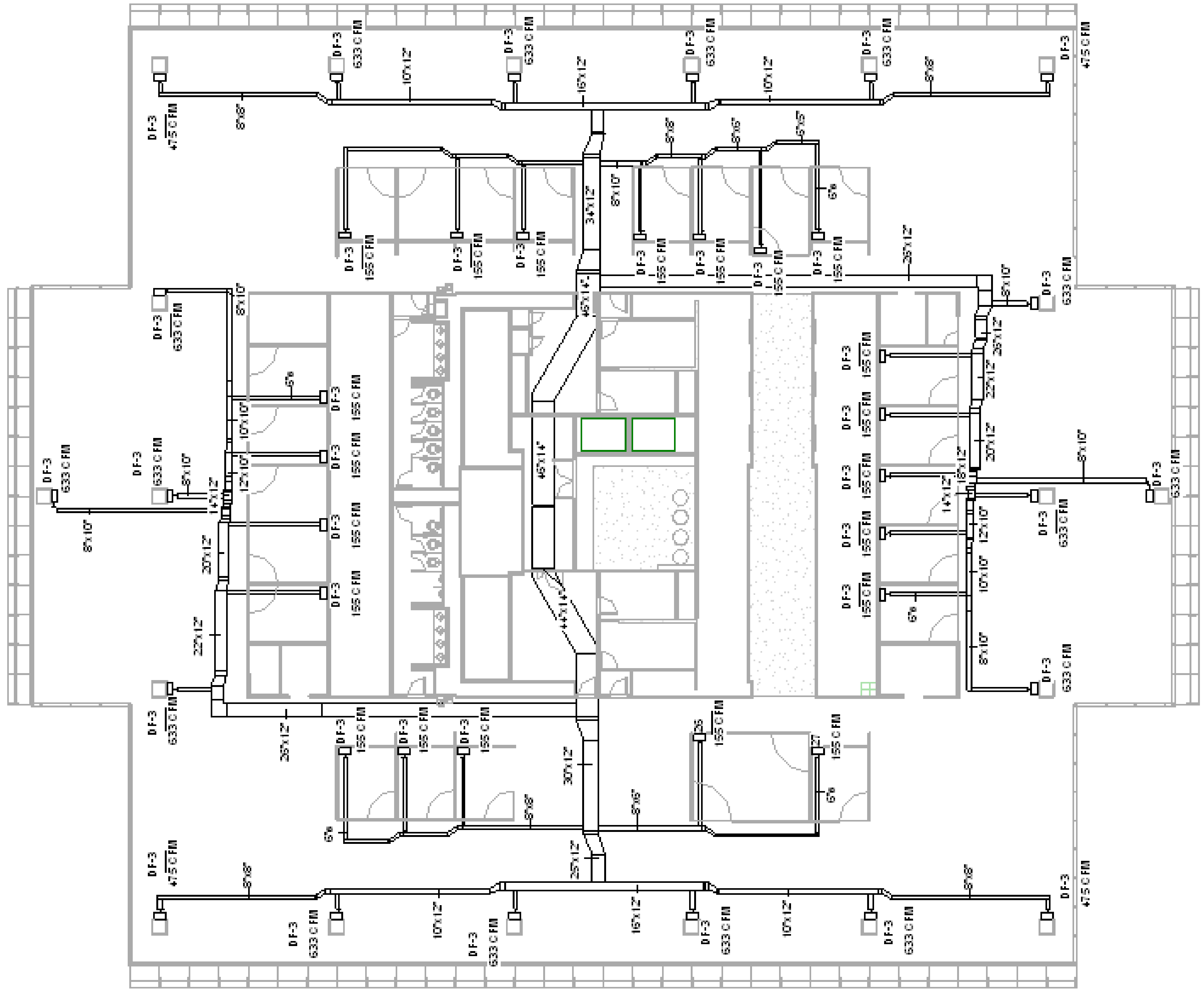


Figure 126- Duct Sizing and Diffuser Layout

5 CONCLUSIONS

5.1 Core

The lateral system was changed from a braced frame system to concrete shear walls with coupling beams. This was changed in order to eliminate the out riggers, thermal trusses, and x-bracing to increase transparency of the building. From this analysis, it was determined that the base shears were 3,968 kips and 3,278 kips in the west-east and north-south directions respectively. The periods of vibrations were determined to be 6.46 seconds and 6.64 seconds in the west-east and north-south directions respectively. It was also determined that the total building drift is H/690 and the acceleration is 14.6 milli-g's. From these results, the system was deemed acceptable.

Due to the necessary structural space within the core, the mechanical and electrical systems were affected. In order to make room for this added structure, the electrical feeders were switched from conduit to bus duct. These feeders were also relocated from a chase along the elevator core into the electrical rooms. This reduced the access space, but increased the cost by approximately $500,000.00 for aluminum bus duct. By switching to bus duct, future capacity is allotted for. Mechanical duct work was also rerouted due to the increased structural space requirements. Due to 3-D modeling of these systems, early detection of possible problems were found. This has the potential to decrease the coordination problems within the field.

In response to the structural changes, the architectural layouts of the spaces within the core also needed to be changed. The main room changes were within the electrical and emergency stairwell areas. In addition to moving The New York Times distribution, the bus duct for the Forest City Ratner Companies was also changed. The analysis of these spaces showed that proper access to the areas could be maintained or improved even with the additional space requirements of the structural system. Even with the increased structural requirements, transparency through the building was maintained by protecting the circulation space within the core.

Comparing the original steel core to the proposed concrete core resulted in a cost savings of approximately $20,000,000.00 for only the immediately affected steel members replaced by the proposed structural core redesign. These savings were achieved by using the original model and proposed systems within the Building Information Model for material take-offs. This information was applied to cost data obtained from R.S. Means Construction Data 2009. The schedule and general conditions implications resulted in the addition of approximately $3,060,000.00. This cost increase was the result of temporary heating requirements as well as requiring the cranes on site two months earlier than the original construction schedule. The overall cost savings from this analysis resulted in approximately $16,500,000.00.

After completing the analysis of the proposed core changes, the redesign would be a valid change because it would maintain structural and architectural integrity while decreasing cost. Overall the use of IPD/BIM strategies was successful in completing this analysis.

5.2 Envelope

The existing curtain wall system was changed from a single façade layer with a ceramic rod shading system to a dynamic curtain wall system incorporating motorized louvered shades and operable windows. The new design was modeled in AutoDesk Revit using nested families and parametric parameters to accurately depict the way in which the facade would work. The proposed redesign allows for improved occupant comfort with respect to daylight and improved upon the architectural desire for transparency. All direct sun will be reflected while allowing maximum indirect light into the space. This allows for increased lighting energy savings, because the shades will not have to close as often as the existing system. The daylighting study resulted in a 72% reduction in lighting energy use within the first two rows of lighting around the entire floor plan. This proposed redesign created a cost savings of $56,280 per year for the entire building. A redesign of the exterior lighting design was also completed. This redesign incorporated LED fixtures, which saved approximately 10,000 watts per side of the building. These savings resulted in a cost savings of $17,520 per year from the original design, assuming 8 hours of use per night.

The BIM model was utilized to investigate interoperability with energy analysis software. IES<VE> successfully imported geometries from Revit and was used to analysis the performance of the existing and proposed glazing, proposed shading and reduced lighting power densities within the office. An energy analysis resulted in a reduction of building ambient loads translating to an estimated annual cost savings of $45,136.09.

Hybrid Ventilation was investigated as a possible design solution for the New York Times Building to reduced energy usage and costs, as well as increase the sustainability profile of the building. Two analysis methods were utilized including a single-zone model to estimate feasibility, and IES<VE> Macroflo. Additionally, a control sequence was developed to allow the operation of the windows to respond to environmental and space conditions. The analysis concluded the addition of 18 operable window curtain wall panels on office floors 22-50, excluding floor 28. Natural ventilation would cut energy usage by 35% resulting in an annual energy savings of $145,419.

Using the data generated from the original and new Revit envelope models, an additional cost of applying louvers was found to be approximately $8,400,000.00. When applied to the cooling load savings generated by the louvers, a payback period of 14 years was achieved. A study into incorporating photovoltaics into the facade was completed simultaneously. The study was completed in Ecotect and analyzed in Excel. The analysis showed that incorporating a photovoltaic system into parts of the west and south facades would add approximately $2,500,000 to the cost of the facade. This addition showed a payback of approximately 25 years. Finally, the incorporation of operable windows cost an additional $2,500,000.00. A payback period of 15 years was found when analyzed for additional cooling load savings on top of the savings due to the louvers.

After completing the analysis of the proposed envelope changes, the redesign would be a valid change because it would maximize energy savings and maintain the architectural integrity but the cost will increase. This increase was deemed to be allowable when the payback periods were analyzed to be shorter than the original design. Overall the use of IPD/BIM strategies was successful in completing this analysis.

5.3 Tenant

Using Integrated Project Delivery and Building Information Modeling, the layout of tenant spaces changed. This change is a result of enclosing the exposed steel within the interior of the building. This resulted in an increase of rentable area averaging approximately 2,000 square feet per floor. When the increased area was applied to New York City leasing costs for Class A offices, an average revenue increase of approximately $1,275,000.00 per floor per year was achieved or a total of $28,200,000.00 per year for the Forest City Ratner Companies' spaces.

It was determined that the redesigned floor system resulted in a total structural depth increase of 3/4" and an increase cost of $1.58 per square foot. In addition, the goal of reduction of structural members per bay was not met due to vibrations. This new system met acceleration limits when subjected to walking excitation loads. The floor framing system was decreased by 7.5 psf and all columns were disengaged from the lateral system. This change decreased column sizes. Built-up columns were required in the cantilever bays in order to keep with the Architect's vision of no columns at the storefront, however they are not as large as the existing columns. Structural connection designs were driven by constructability.

A redesign of the interior lighting was done because of the architectural floor plan change. The proposed design changed incorporated task lighting into the design. The existing system uses 1.1 Watts per square foot. The proposed redesign would use .469 Watts per square foot. If these savings were applied to the entire building at 12 hours of use per day, the resulting energy savings would be approximately $462,200.00 per year.

A ducted side-wall displacement ventilation system was selected to replace the existing unducted Underfloor Air Distribution (UFAD) system to improve the indoor environment for the building occupants by minimizing distribution of dust and contaminants that may collect in the open plenum space. The system was sized utilizing load factors determined by ASHRAE, and a 3D model was created in Revit MEP to ensure space requirements were met with the raised floor system.

After completing the analysis of the proposed tenant changes, the redesign would be a valid change because it would maximize energy savings, maintain the architectural integrity, and decrease cost. Overall the use of IPD/BIM strategies was successful in completing this analysis.

5.4 IPD/BIM Lessons Learned

The Integrated Project Delivery and Building Information Modeling approach allowed for accurate visualization of a 3D model. It allowed the design team to identify any potential system clashes. In addition, the Revit model aided in structural takeoffs for the building weight, seismic loading, and cost data. Interoperability between software allowed for improved information flow. The workflow between the BIM model and the energy analysis software also allowed for optimized system performance.

At times, interoperability between software was time consuming and did not result in improved information flow. The structural analysis software RAM did not have the proper plug-in with Revit on a 64 bit computer and the ETABs model was not deemed complex enough to best utilize the plug-in with Revit. While the gbXML file format for energy performance modeling was successful, it required more time consuming and detailed model creation. In addition BIM requires intensive computing capabilities which can cause multiple software failure due to lack of computing capacity.

6 REFERENCES

ASCE Standard 7-05 Minimum Design Loads for Buildings and Other Structures. Reston, VA: American Society of Civil Engineers/Structural Engineering Institute, 2005.

Building Code Requirements for Structural Concrete (ACI 318-08) and Commentary. Farmington Hills, Mich.: American Concrete Institute, 2008. Print.

Building Construction Cost Data. Kingston, Mass.: R.S. Means, 2009. Print.

Ching, Frank, and Steven R. Winkel. *Building Codes Illustrated: a Guide to Understanding the 2006 International Building Code*. Hoboken, N.J.: John Wiley & Sons, 2007. Print.

"General Conditions Questions." Personal interview. 16 Mar. 2010.

Griffis Lawrence G., "Serviceability Limit States Under Wind Load" Engineering Journal/ American Institute of Steel Construction, 1993

Holland, Robert J. "Architectural Input." Personal interview.

International Code Council, 2006 International Building Code. Illinois: International Code Council Publications, 2006.

Martin, Leslie D., and Christopher J. Perry. *PCI Design Handbook: Precast and Prestressed Concrete*. Chicago: Precast/Prestressed Concrete Institute, 2004. Print.

McNamara, Robert, and Kevin Parfitt. "Structural Core Changes." Personal interview. 27 Jan. 2010.

Murray, Thomas M., Allen, David E., and Ungar, Eric E. “Design Guide 11: Floor Vibrations Due to Human Activity" Steel Design Guide Series Number 11, AISC 1997.

New York (N.Y.). *Building Code of the City of New York*. By Ed Koch. New York: City Pub. Center, Dept. of General Services, 1994. Print.

Online Construction Estimating Software - Costworks from RSMeans. R.S. Means Construction Data. Web. 23 Feb. 2010. <http://www.meanscostworks.com>.

Cushman, Wakefield &., comp. "Manhattan Office Vacancy Rate Falls For 2nd Consecutive Month." *Global Real Estate Solutions*. Cushman & Wakefield, 12 Jan. 2010. Web. <http://www.cushwake.com/cwglobal/jsp/newsDetail.jsp?repId=c28800016p&LanId=EN&LocId=GLOBAL>.

ANSI/ASHRAE. (2007). *ASHRAE Standard 90.1.Energy Standard for Buildings Except Low-Rise Residential Buildings* Atlanta: ASHRAE.

ANSI/ASHRAE. (2004). *ASHRAE Standard 62.1. Ventilation for Acceptable Indoor Air Quality* Atlanta: ASHRAE.

ANSI/ASHRAE Standard 55- 2004: Thermal Environmental Conditions for

Human Occupancy. 2004, Atlanta, GA: American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

ASHRAE. (2005). *ASHRAE Fundamentals.* Atlanta: ASHRAE

Consolodated Edison. (2009, January 1). *Con Edison: Rates and Tariffs - Schedule for Steam Service*.

Retrieved October 1, 2009, from ConEdison: http://www.coned.com/rates/steam-sched.asp

New York City Water Board. (2009). *Rate Schedule*. Retrieved October 1, 2009, from New York City

Water Board: http://www.nyc.gov/html/nycwaterboard/html/rate_schedule/index.shtml

Saint-Gobain Glass. (2008). *SGG Vision-Lite Manufacturer Catalog.* Retrieved September 28, 2009, fromSaint-Gobain Glass: http://uk.saint-gobainglass.com/b2b/default.asp?nav1=pr&nav2=details&nav3=Vision&nav4=8088

"Coltlite for Glass Louvre - Natural Glass Louvred Ventilator." *Colt International Limited - Manufacturer and Supplier of Smoke Control Systems - Climate Control Systems - HVAC Systems - Architectural Solutions.* Web. <http://www.coltinfo.co.uk/products-and-systems/architectural-solutions/glass-constructions/products/coltlite/>.

Seppanem, O., and Fisk, W., (2001) "Association of Ventilation System Type with SBS symptoms in Office Workers" *Indoor Air 2002*

"Natural Ventilation", *The Pennsylvania State University Course: AE 559 Computational Fluid Dynamics, Fall 2010*. Professor: Dr. Jelena Srebric.

Zhao, Ying. "A Decision-Support Framework For Design of Natural Ventilation in Non-Residential Buildings." Diss. Virginia Polytechnic Institute and State University, 2007. *Electronic Theses and Dissertations at Virginia Tech*. Web.

"Design Briefs: Displacement Ventilation Energy Design Resources Design Briefs." *Energy Design Resources*. Nov. 2002. Web. <http://www.energydesignresources.com/Resources/Publications/DesignBriefs/tabid/74/articleType/ArticleView/articleId/112/Design-Briefs-Displacement-Ventilation.aspx>.

McConahey, Erin. "Mixed Mode Ventilation Finding the Right Mix." *ASHRAE Journal* (2008): 36-48. Web.

Brager, Gail, Sam Borgeson, and Yoon S. Lee. *Summary Report: Control Strategies for Mixed-Mode Buildings*. Rep. Berkeley: Center for the Built, University of California Environment, 2007. Print.

"Displacement Ventilation Design Guide." *Price HVAC - Supplier of Preference for Air Distribution.* Web. <http://www.price-hvac.com/>.

McDonell, P.Eng., Geoff. "Underfloor & Displacement Why They're Not the Same." *ASHRAE Journal* (2003): 18-22. Print.

7 APPENDIX

7.1.1 Architectural Existing Conditions

Figure 127:Exterior X-bracing

Figure 128: Exterior view of NY Times HQ

7.1.2 Structural Existing Conditions

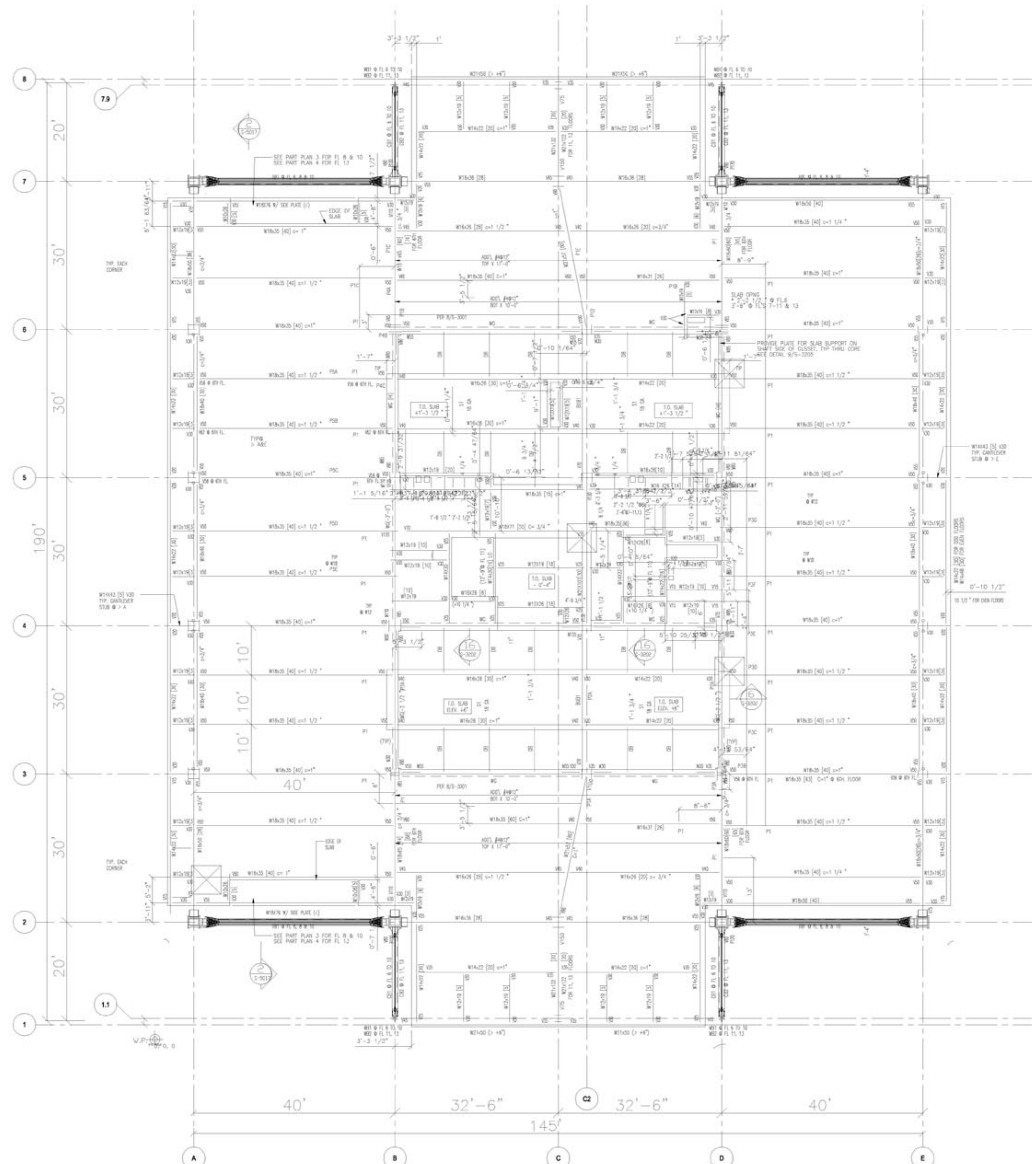


Figure 129: Typical Floor Plan

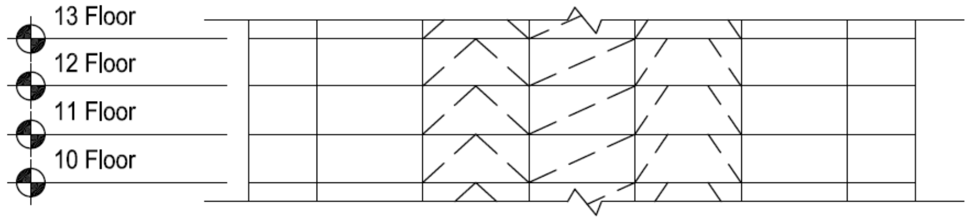


Figure 130: Typical Core N/S Core Bracing Elevation

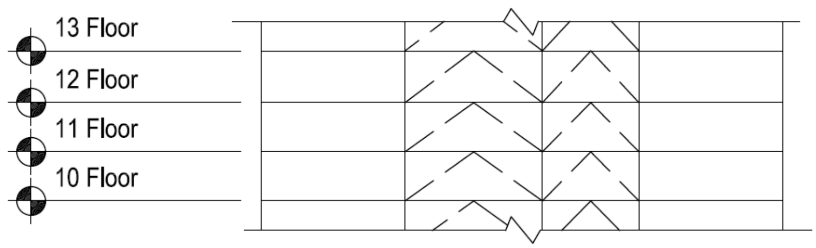


Figure 131: Typical Core E/W Core Bracing Elevation

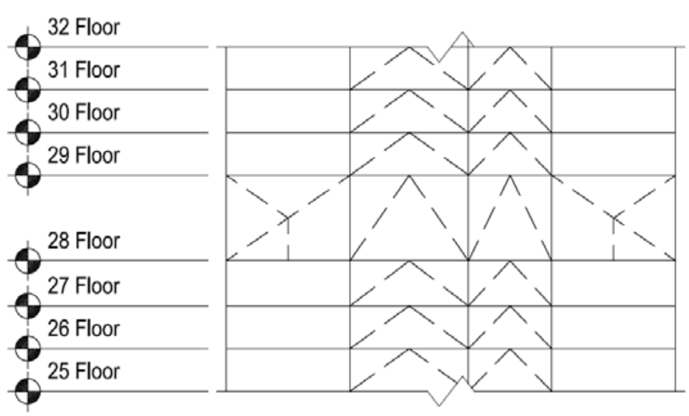


Figure 132: Typical E/W Outrigger Section (28th Floor)

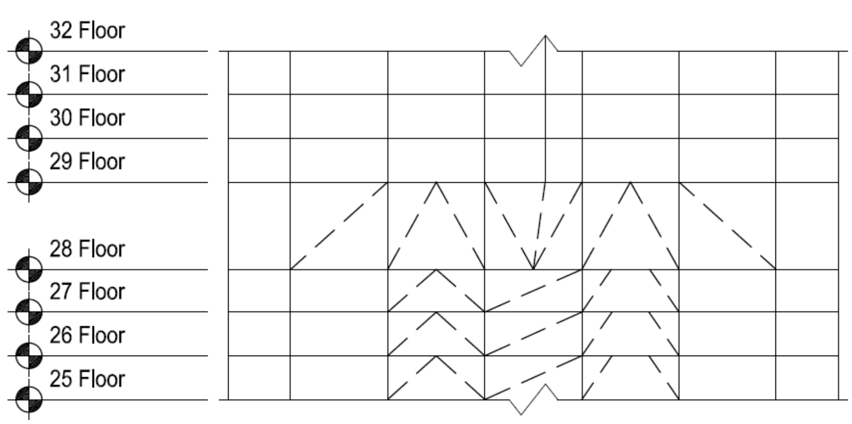


Figure 133: Typical N/S Outrigger Section (28th Floor)

Figure 134: Outrigger bracing on mechanical floor, courtesy of Thornton Tomasetti

Figure 135: Core bracing during construction, courtesy of Thornton Tomasetti

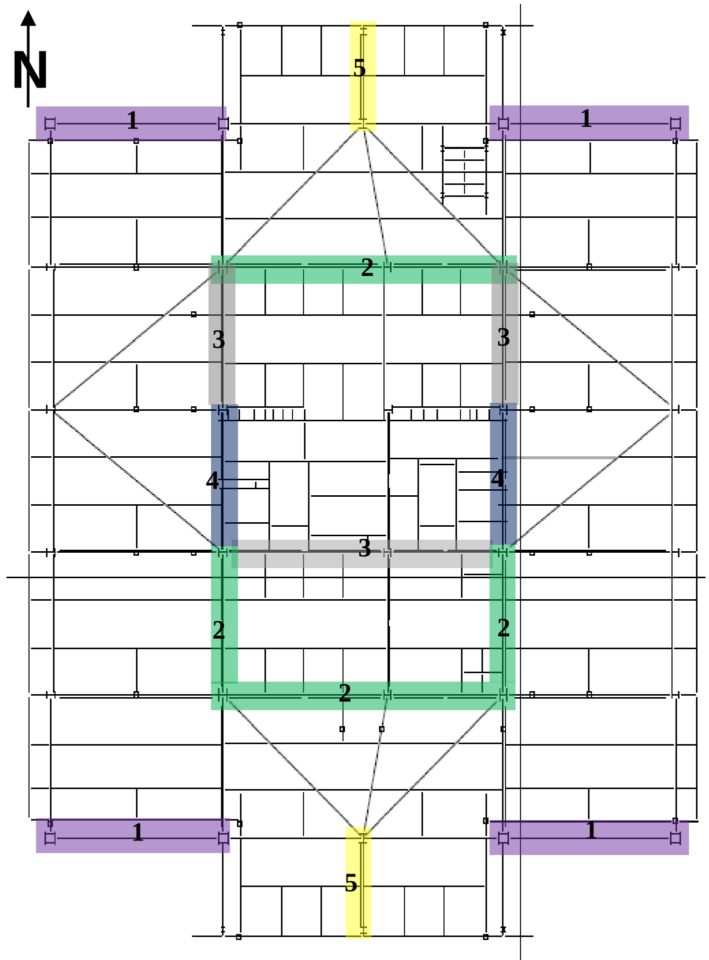


Figure 136: 1st-27th Floor Mechanical Floor Framing Plan

Key:

- Pre-Tensioned Steel Rod X-Bracing (1)
- Concentric Chevron Core Bracing (2)
- Eccentric Chevron Core Bracing (3)
- Single Diagonal Brace (4)
- Vierendeel System at Cantilever (5)

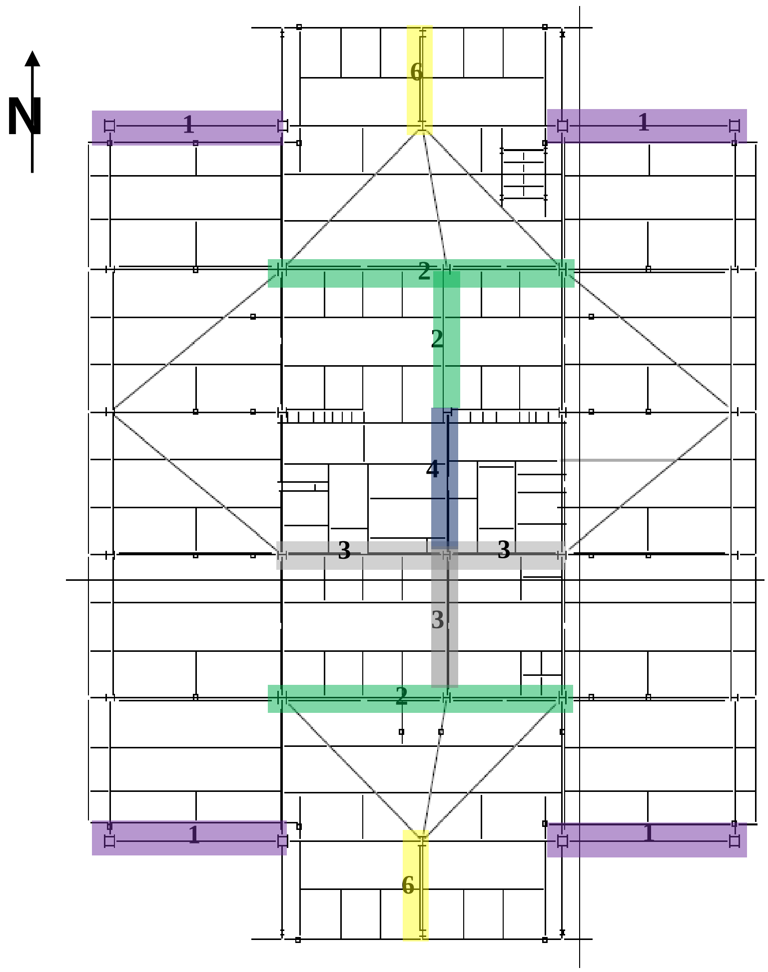


Figure 137:29th-51st Floor Mechanical Floor Framing Plan

Key:

- Pre-Tensioned Steel Rod X-Bracing (1)
- Concentric Chevron Core Bracing (2)
- Eccentric Chevron Core Bracing (3)
- Single Diagonal Brace (4)
- Vierendeel System at Cantilever (5)

7.1.3 Construction Management Existing Conditions

Figure 138: Detailed Project Schedule

The New York Times Building — Detailed Project Schedule

ID	Task Name	Duration	Start	Finish
1	Owner Acquisition	657 days?	Mon 7/2/01	Tue 1/6/04
2	Documents Available	609 days?	Mon 7/2/01	Thu 10/30/03
3	Bid and Award	223 days?	Tue 8/19/03	Thu 6/24/04
4	Site Mobilization/Abatement and Demo	140 days?	Mon 12/1/03	Fri 6/11/04
5	Site Fence	10 days	Mon 12/1/03	Fri 12/12/03
6	Pedestrian Walkway	10 days	Mon 12/15/03	Fri 12/26/03
7	Overhead Protection	20 days	Mon 12/29/03	Fri 1/23/04
8	**Foundations**	**330 days?**	**Mon 12/22/03**	**Fri 3/25/05**
9	Award Excavations/Foundations	6 days?	Mon 12/22/03	Mon 12/29/03
10	Start Construction	0 days	Mon 4/19/04	Mon 4/19/04
11	Excavation/Foundations - East	84 days?	Mon 5/24/04	Thu 9/16/04
12	Excavation/Foundations - West	140 days?	Thu 8/12/04	Wed 2/23/05
13	Slab On Grade	44 days	Tue 1/25/05	Fri 3/25/05
14	**Superstructure**	**1060 days?**	**Mon 3/3/03**	**Wed 3/21/07**
15	**Steel and Metal Deck**	**700 days?**	**Fri 9/19/03**	**Wed 5/24/06**
16	Award Steel Package	22 days?	Fri 9/19/03	Mon 10/20/03
17	Shop Drawings	295 days?	Tue 10/21/03	Mon 12/6/04
18	Mill Orders	159 days?	Thu 11/20/03	Tue 6/29/04
19	Material Deliveries	179 days?	Tue 1/27/04	Fri 10/1/04
20	Fabrication - Podium	90 days?	Mon 6/21/04	Fri 10/22/04
21	Fabrication - Tower	248 days?	Fri 7/16/04	Tue 6/28/05
22	**Erect Steel**	**331 days?**	**Wed 11/17/04**	**Tue 2/21/06**
23	Erect Steel - Podium: 2nd thru 5th Floor	59 days?	Wed 11/17/04	Mon 2/7/05
24	Erect Steel - Floors 1-6	24 days?	Fri 3/18/05	Wed 4/20/05
25	Erect Steel - Floors 7-12	27 days?	Thu 4/21/05	Fri 5/27/05
26	Erect Steel - Floors 13-18	31 days?	Tue 5/31/05	Mon 7/11/05
27	Erect Steel - Floors 19-24	27 days?	Tue 7/12/05	Wed 8/17/05
28	Erect Steel - Floors 25-30	34 days?	Thu 8/18/05	Tue 10/4/05
29	Erect Steel - Floors 31-36	27 days?	Wed 10/5/05	Thu 11/10/05
30	Erect Steel - Floors 37-42	26 days?	Fri 11/11/05	Fri 12/16/05
31	Erect Steel - Floors 43-48	26 days?	Mon 12/19/05	Mon 1/23/06
32	Erect Steel - Floors 49-52	21 days?	Tue 1/24/06	Tue 2/21/06
33	Roof Screen Support/Topout/MEP Equipment	44 days?	Wed 2/22/06	Mon 4/24/06
34	Demobilize	22 days?	Tue 4/25/06	Wed 5/24/06
35	**Concrete**	**591 days?**	**Fri 2/6/04**	**Thu 5/11/06**
36	Award	22 days?	Fri 2/6/04	Mon 3/8/04
37	**Pour Concrete**	**252 days?**	**Tue 4/26/05**	**Tue 4/11/06**
38	Pour Concrete - Floors 1-6	35 days?	Tue 4/26/05	Mon 6/13/05
39	Pour Concrete - Floors 7-12	27 days?	Wed 6/15/05	Wed 7/20/05
40	Pour Concrete - Floors 13-18	30 days?	Thu 7/21/05	Wed 8/31/05
41	Pour Concrete - Floors 19-24	28 days?	Thu 9/1/05	Mon 10/10/05
42	Pour Concrete - Floors 25-30	32 days?	Tue 10/11/05	Wed 11/23/05
43	Pour Concrete - Floors 31-36	30 days?	Thu 11/24/05	Wed 1/4/06
44	Pour Concrete - Floors 37-42	24 days?	Thu 1/5/06	Tue 2/7/06
45	Pour Concrete - Floors 43-48	24 days?	Wed 2/8/06	Mon 3/13/06
46	Pour Concrete - Floors 49-52	21 days?	Tue 3/14/06	Tue 4/11/06
47	Concrete Fills/Topout	22 days?	Wed 4/12/06	Thu 5/11/06
48	**Conc - N/S Cantilever**	**237 days?**	**Fri 5/20/05**	**Fri 4/14/06**
49	Conc - N/S Cantilever - Floors 2-6	20 days?	Fri 5/20/05	Thu 6/16/05
50	Conc - N/S Cantilever - Floors 7-12	23 days?	Fri 6/24/05	Mon 7/25/05
51	Conc - N/S Cantilever - Floors 13-18	24 days?	Thu 8/4/05	Tue 9/6/05
52	Conc - N/S Cantilever - Floors 19-24	21 days?	Thu 9/15/05	Thu 10/13/05
53	Conc - N/S Cantilever - Floors 25-30	27 days?	Mon 10/24/05	Tue 11/29/05
54	Conc - N/S Cantilever - Floors 31-36	23 days?	Thu 12/8/05	Mon 1/9/06
55	Conc - N/S Cantilever - Floors 37-42	19 days?	Tue 1/17/06	Fri 2/10/06
56	Conc - N/S Cantilever - Floors 43-48	19 days?	Mon 2/20/06	Thu 3/16/06

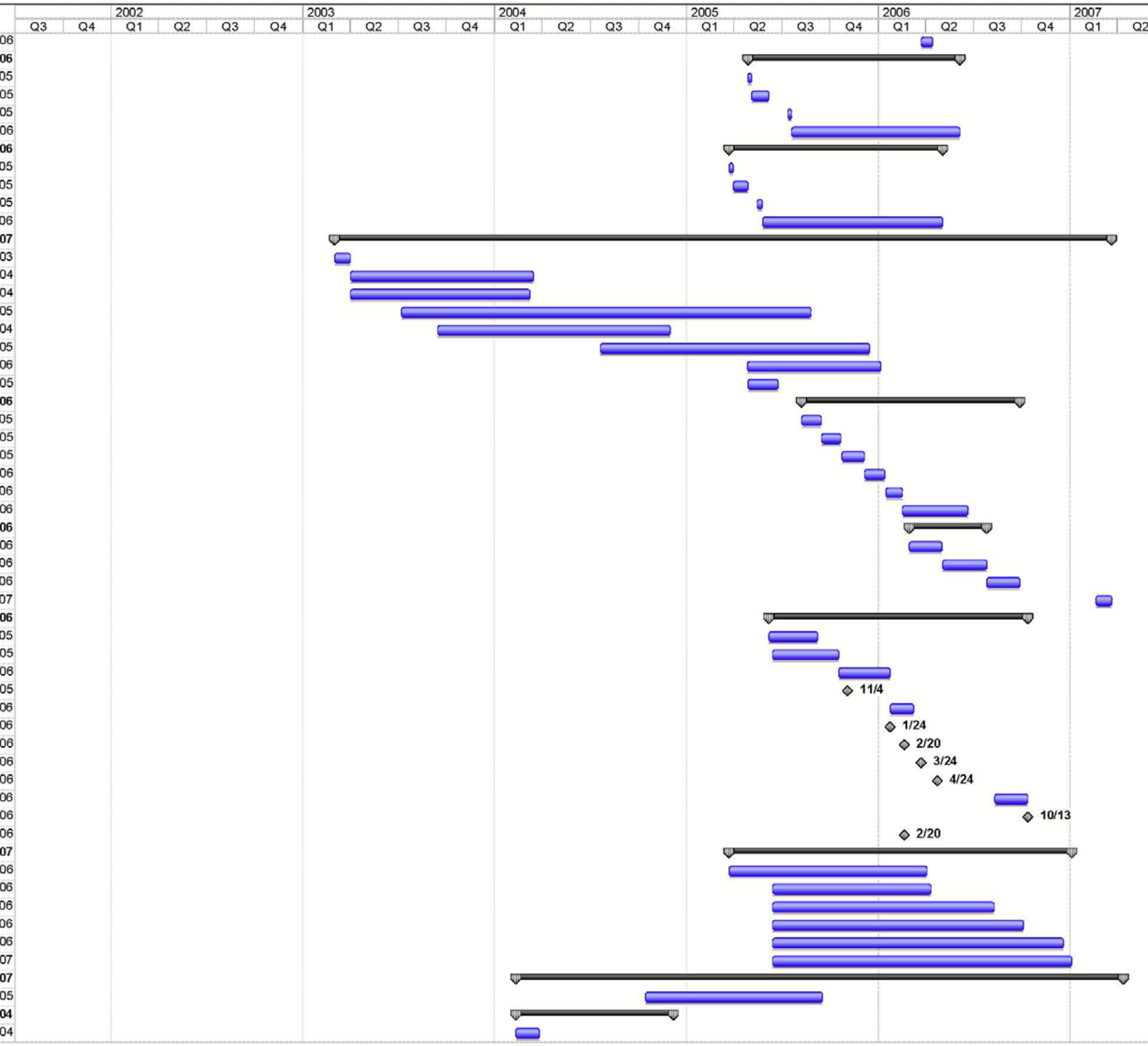
Project: PSU IPD BIM Detailed Schedu
Date: Thu 11/5/09

Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary | Deadline

Technical Assignment 2 — Hedrick | Miller | Wiacek — Page 1

The New York Times Building — Detailed Project Schedule

ID	Task Name	Duration	Start	Finish
57	Conc - N/S Cantilever - Floors 49-52	16 days?	Fri 3/24/06	Fri 4/14/06
58	**Intumescent Paint Fireproofing**	**289 days?**	**Thu 4/28/05**	**Mon 6/5/06**
59	Intumescent FR - Podium Mobilization	5 days?	Thu 4/28/05	Wed 5/4/05
60	Intumescent FR - Podium	23 days?	Thu 5/5/05	Mon 6/6/05
61	Intumescent FR - Tower Mobilization	5 days?	Wed 7/13/05	Tue 7/19/05
62	Intumescent FR - Tower	229 days?	Wed 7/20/05	Mon 6/5/06
63	**Spray Fireproofing**	**292 days?**	**Wed 3/23/05**	**Wed 5/3/06**
64	Mobilize SOFP - Podium	6 days?	Wed 3/23/05	Wed 3/30/05
65	Spray Fireproof - Podium	20 days?	Thu 3/31/05	Wed 4/27/05
66	Spray Fireproof Mobilization - Tower	7 days?	Mon 5/16/05	Tue 5/24/05
67	Spray Fireproof - Tower	246 days?	Thu 5/26/05	Wed 5/3/06
68	**Curtain Wall**	**1060 days?**	**Mon 3/3/03**	**Wed 3/21/07**
69	Award	22 days?	Mon 3/3/03	Tue 4/1/03
70	Shop Drawings	249 days?	Wed 4/2/03	Mon 3/15/04
71	Mock Ups	244 days?	Wed 4/2/03	Mon 3/8/04
72	Material Procurement and Delivery	559 days?	Tue 7/8/03	Thu 8/25/05
73	Fabrication Drawings	317 days?	Mon 9/15/03	Tue 11/30/04
74	Shop Assembly/Shipping - Utilized Frames	368 days?	Wed 7/21/04	Thu 12/15/05
75	Set Inserts/Clips	183 days?	Wed 4/27/05	Thu 1/5/06
76	Curtain Wall Podium	42 days?	Thu 4/28/05	Fri 6/24/05
77	**Curtain Wall Tower**	**299 days?**	**Mon 8/8/05**	**Wed 9/27/06**
78	Curtain Wall Tower - Floors 2-7	28 days?	Mon 8/8/05	Wed 9/14/05
79	Curtain Wall Tower - Floors 8-13	27 days?	Thu 9/15/05	Fri 10/21/05
80	Curtain Wall Tower - Floors 14-19	31 days?	Mon 10/24/05	Mon 12/5/05
81	Curtain Wall Tower - Floors 20-25	29 days?	Tue 12/6/05	Fri 1/13/06
82	Curtain Wall Tower - Floors 26-28	23 days?	Mon 1/16/06	Wed 2/15/06
83	Curtain Wall Tower - Floors 29-50	89 days?	Thu 2/16/06	Tue 6/20/06
84	**Curtain Wall Tower North/South Wings**	**107 days?**	**Wed 3/1/06**	**Wed 7/26/06**
85	Curtain Wall Tower - Floors 31-40	45 days?	Wed 3/1/06	Tue 5/2/06
86	Curtain Wall Tower - Floors 41-51	61 days?	Thu 5/4/06	Wed 7/26/06
87	Roof Top Work - Screen Walls	45 days?	Thu 7/27/06	Wed 9/27/06
88	Curtain Wall Infill	22 days?	Tue 2/20/07	Wed 3/21/07
89	**Roofing**	**355 days?**	**Tue 6/7/05**	**Fri 10/13/06**
90	Port Authority Lighting Assembly	68 days?	Tue 6/7/05	Wed 9/7/05
91	Podium Skylights	91 days?	Tue 6/14/05	Mon 10/17/05
92	Roofing at 5th Floor Podium	70 days?	Tue 10/18/05	Mon 1/23/06
93	Temp. Watertight Roof Above 15th Floor	0 days	Fri 11/4/05	Fri 11/4/05
94	5th Floor Roof Pavers	33 days?	Tue 1/24/06	Thu 3/9/06
95	Weathertight Podium Roof	0 days	Tue 1/24/06	Tue 1/24/06
96	Temp. Watertight Roof Above 28th Floor	0 days	Mon 2/20/06	Mon 2/20/06
97	Temp. Watertight Roof Above 36th Floor	0 days	Fri 3/24/06	Fri 3/24/06
98	Temp. Watertight Roof Above 44th Floor	0 days	Mon 4/24/06	Mon 4/24/06
99	Roofing at Tower	45 days?	Fri 8/11/06	Thu 10/12/06
100	Watertight Tower Roof	0 days	Fri 10/13/06	Fri 10/13/06
101	NY Times Tenant Floors - Weather Tight	0 days	Mon 2/20/06	Mon 2/20/06
102	**Elevators**	**469 days?**	**Wed 3/23/05**	**Thu 1/4/07**
103	Podium Elevators	270 days?	Wed 3/23/05	Mon 4/3/06
104	Low Rise: P1 - P6	217 days?	Tue 6/14/05	Tue 4/11/06
105	Mid-Low Rise: P7 - P12	304 days?	Tue 6/14/05	Wed 8/9/06
106	Mid-High Rise: P13 - P18	344 days?	Tue 6/14/05	Wed 10/4/06
107	High Rise: P19 - P26	398 days?	Tue 6/14/05	Tue 12/19/06
108	Service Elevators: S27 & S28	410 days?	Tue 6/14/05	Thu 1/4/07
109	**Building Systems**	**829 days?**	**Wed 2/11/04**	**Thu 4/12/07**
110	Utilities	242 days?	Fri 10/15/04	Fri 9/16/05
111	**MEP Coordination**	**214 days?**	**Wed 2/11/04**	**Mon 12/6/04**
112	MEP Coordination - Shop Standards	33 days?	Wed 2/11/04	Fri 3/26/04



Project: PSU IPD BIM Detailed Schedu
Date: Thu 11/5/09

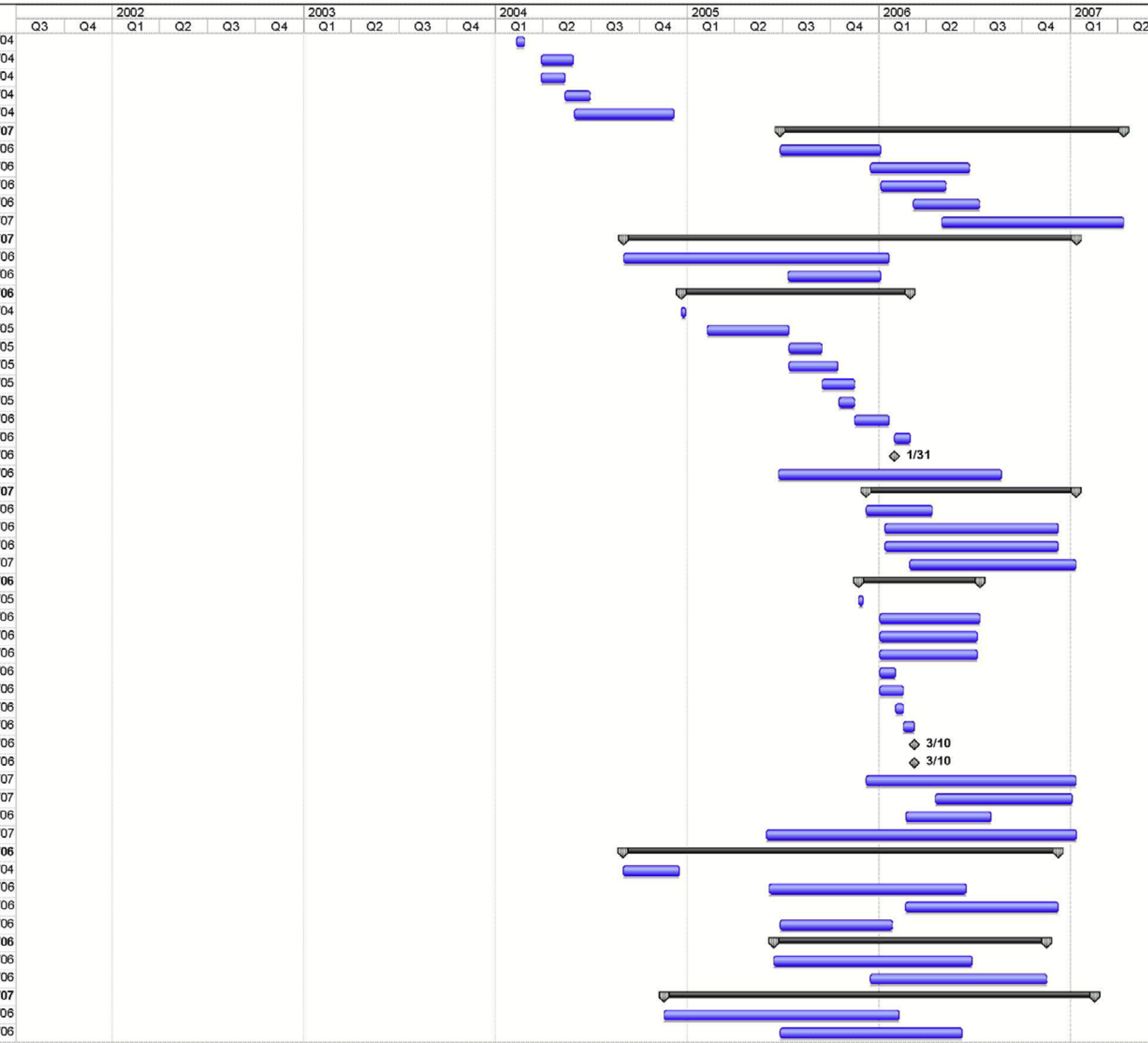
Task	Milestone	Rolled Up Task	Rolled Up Progress	External Tasks	Group By Summary
Progress	Summary	Rolled Up Milestone	Split	Project Summary	Deadline

Technical Assignment 2 — Hedrick \| Miller \| Wiacek — Page 2

The New York Times Building

Detailed Project Schedule

ID	Task Name	Duration	Start	Finish
113	MEP - Underground Coordination	11 days?	Wed 2/11/04	Wed 2/25/04
114	MEP Coordination - Risers	45 days?	Mon 3/29/04	Fri 5/28/04
115	MEP Coordination - Cellar Floor	33 days?	Mon 3/29/04	Wed 5/12/04
116	MEP Coordination - Ground Floor	34 days?	Thu 5/13/04	Tue 6/29/04
117	MEP Coordination - Mechanical RMS & Typical Floors	136 days?	Mon 5/31/04	Mon 12/6/04
118	**B.A.T.C**	**471 days?**	**Mon 6/27/05**	**Thu 4/12/07**
119	BATC - Low Rise Backbone & Panels: C - 27	139 days?	Mon 6/27/05	Wed 1/4/06
120	BATC - High Rise Backbone & Panels: 28 - Roof	135 days?	Fri 12/16/05	Thu 6/22/06
121	BATC - Install Head End Equipment	88 days?	Thu 1/5/06	Mon 5/8/06
122	BATC - Programming	90 days?	Wed 3/8/06	Tue 7/11/06
123	BATC - Commissioning	250 days?	Mon 5/1/06	Thu 4/12/07
124	**HVAC**	**619 days?**	**Thu 9/2/04**	**Fri 1/12/07**
125	Cellar Level - Chiller Plant and Switchgear Room	363 days?	Thu 9/2/04	Fri 1/20/06
126	Ground Floor - 4th Floor	127 days?	Tue 7/12/05	Wed 1/4/06
127	**Co-Gen Plant**	**313 days?**	**Tue 12/21/04**	**Wed 3/1/06**
128	Co-Gen: Rig Equipment	6 days?	Tue 12/21/04	Tue 12/28/04
129	Co-Gen Plant - Structure & Enclosure	113 days?	Tue 2/8/05	Wed 7/13/05
130	Co-Gen: HVAC Piping (Heat Exchangers, Radiators)	45 days?	Thu 7/14/05	Wed 9/14/05
131	Co-Gen: Switchgear, Gererators, Co-Gen Equipment	67 days?	Thu 7/14/05	Fri 10/14/05
132	Co-Gen: HVAC Plenumsm Dampers, etc	44 days?	Thu 9/15/05	Tue 11/15/05
133	Co-Gen: Electrical Wiring/Terminations	22 days?	Mon 10/17/05	Tue 11/15/05
134	Co-Gen Instrumentation And Controls	48 days?	Wed 11/16/05	Fri 1/20/06
135	Co-Gen: Testing	22 days?	Tue 1/31/06	Wed 3/1/06
136	Gas - Blue Card Required	0 days	Tue 1/31/06	Tue 1/31/06
137	5th Floor MER - Podium Roof	305 days?	Fri 6/24/05	Tue 8/22/06
138	**Low Rise**	**287 days?**	**Thu 12/8/05**	**Thu 1/11/07**
139	Rig AHUs: 6th thru 27th Floors	90 days?	Thu 12/8/05	Wed 4/12/06
140	Piping @ AHUs: 29th thru 50th Floor	237 days?	Fri 1/13/06	Fri 12/8/06
141	AHU Ductwork: 29th thru 50th Floor	237 days?	Fri 1/13/06	Fri 12/8/06
142	Pipe/Duct - Floor Run Outs: 29th thru 50th Floor	228 days?	Wed 3/1/06	Thu 1/11/07
143	**28th Floor - Mechanical Room**	**165 days?**	**Thu 11/24/05**	**Wed 7/12/06**
144	Rig All Mech Equipment: 28th Floor	6 days?	Thu 11/24/05	Thu 12/1/05
145	Steam Station - PRV	137 days?	Tue 1/3/06	Wed 7/12/06
146	Piping Equipment	134 days?	Tue 1/3/06	Fri 7/7/06
147	AHU Ductwork	134 days?	Tue 1/3/06	Fri 7/7/06
148	Low Zone Chilled Water Return Loop	22 days?	Tue 1/3/06	Wed 2/1/06
149	LR - Hot Water Return Loop	33 days?	Tue 1/3/06	Thu 2/16/06
150	Testing - Low Zone Chilled Water Loop	11 days?	Thu 2/2/06	Thu 2/16/06
151	LR - Hot Water System - Testing/Comm.	15 days?	Fri 2/17/06	Thu 3/9/06
152	Low Zone Chilled Water Available for NYT	0 days	Fri 3/10/06	Fri 3/10/06
153	LR - Hot Water Sys. - Available for NYT	0 days	Fri 3/10/06	Fri 3/10/06
154	High Rise	287 days?	Thu 12/8/05	Thu 1/11/07
155	51st Floor - Mechanical Room	188 days?	Wed 4/19/06	Thu 1/4/07
156	Roof	117 days?	Wed 2/22/06	Wed 8/2/06
157	Risers	425 days?	Wed 6/1/05	Fri 1/12/07
158	**Plumbing**	**595 days?**	**Wed 9/1/04**	**Fri 12/8/06**
159	Underground	77 days?	Wed 9/1/04	Thu 12/16/04
160	Low Rise	271 days?	Mon 6/6/05	Fri 6/16/06
161	High Rise	210 days?	Tue 2/21/06	Fri 12/8/06
162	Gas Risers	155 days?	Mon 6/27/05	Thu 1/26/06
163	**Fire Protection**	**374 days?**	**Wed 6/15/05**	**Thu 11/16/06**
164	Low Rise	271 days?	Wed 6/15/05	Tue 6/27/06
165	High Rise	241 days?	Fri 12/16/05	Thu 11/16/06
166	**Electrical**	**589 days?**	**Thu 11/18/04**	**Fri 2/16/07**
167	Cellar Level - Chiller Plant and Swithgear Room	321 days?	Thu 11/18/04	Wed 2/8/06
168	Low Rise	250 days?	Mon 6/27/05	Thu 6/8/06



Project: PSU IPD BIM Detailed Schedu
Date: Thu 11/5/09

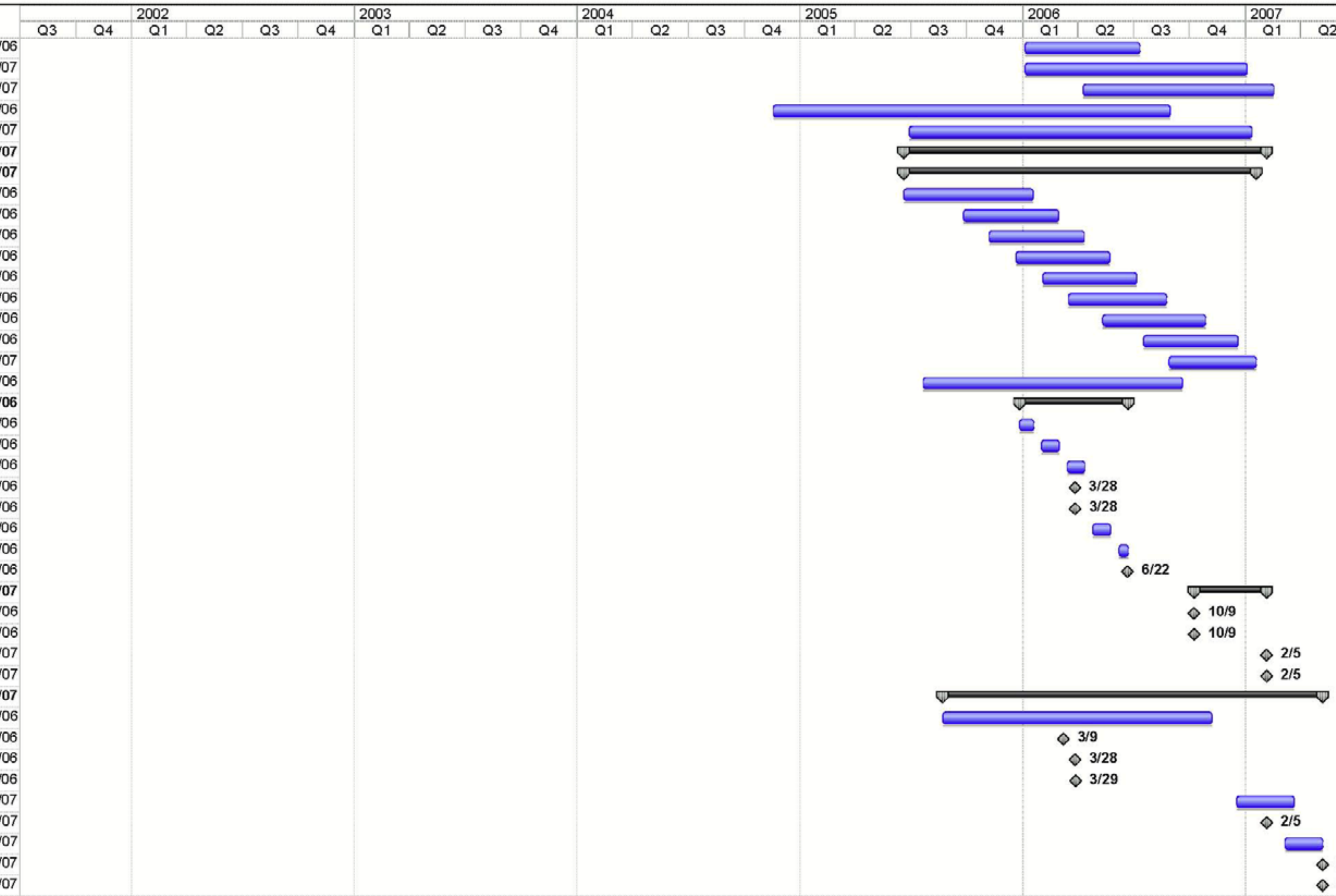
Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary | Deadline

Technical Assignment 2 | Hedrick | Miller | Wiacek | Page 3

The New York Times Building

Detailed Project Schedule

ID	Task Name	Duration	Start	Finish
169	28th Floor - Mechanical Room	134 days?	Thu 1/5/06	Tue 7/11/06
170	High Rise	261 days?	Thu 1/5/06	Wed 1/3/07
171	51st Floor - Mechanical Room	226 days?	Mon 4/10/06	Fri 2/16/07
172	Life Safety	467 days?	Thu 11/18/04	Wed 8/30/06
173	Fire Alarm	404 days?	Wed 6/29/05	Thu 1/11/07
174	**Interior Finishes**	**427 days?**	**Mon 6/20/05**	**Mon 2/5/07**
175	**Core Program**	**416 days?**	**Mon 6/20/05**	**Thu 1/18/07**
176	Core Program - Floors 1-6	153 days?	Mon 6/20/05	Tue 1/17/06
177	Core Program - Floors 7-12	112 days?	Mon 9/26/05	Tue 2/28/06
178	Core Program - Floors 13-18	112 days?	Mon 11/7/05	Tue 4/11/06
179	Core Program - Floors 19-24	110 days?	Wed 12/21/05	Tue 5/23/06
180	Core Program - Floors 25-30	110 days?	Fri 2/3/06	Thu 7/6/06
181	Core Program - Floors 31-36	116 days?	Fri 3/17/06	Thu 8/24/06
182	Core Program - Floors 37-42	122 days?	Fri 5/12/06	Fri 10/27/06
183	Core Program - Floors 43-48	112 days?	Tue 7/18/06	Tue 12/19/06
184	Core Program - Floors 49-52	103 days?	Tue 8/29/06	Thu 1/18/07
185	Perimeter Program	304 days?	Fri 7/22/05	Tue 9/19/06
186	**NYT - Interior Program - Floor Handover**	**128 days?**	**Tue 12/27/05**	**Thu 6/22/06**
187	NYT - Floors 3-6 Handover	17 days	Tue 12/27/05	Wed 1/18/06
188	NYT - Floors 7-12 Handover	21 days	Wed 2/1/06	Wed 3/1/06
189	NYT - Floors 13-18 Handover	21 days	Wed 3/15/06	Wed 4/12/06
190	NYT - Cellar Level Handover	0 days	Tue 3/28/06	Tue 3/28/06
191	NYT - 1st Floor Area - Handover	0 days	Tue 3/28/06	Tue 3/28/06
192	NYT - Floors 19-24 Handover	21 days?	Wed 4/26/06	Wed 5/24/06
193	NYT - Floors 25-28 Handover	11 days?	Thu 6/8/06	Thu 6/22/06
194	NYT - 2nd Floor Handover	0 days	Thu 6/22/06	Thu 6/22/06
195	**FCRC - Turnovers**	**85 days**	**Mon 10/9/06**	**Mon 2/5/07**
196	FCRC Tenant Turnover A (29-34)	0 days	Mon 10/9/06	Mon 10/9/06
197	FCRC Tenant Turnover B (35-40)	0 days	Mon 10/9/06	Mon 10/9/06
198	FCRC Tenant Turnover C (41-46)	0 days	Mon 2/5/07	Mon 2/5/07
199	FCRC Tenant Turnover D (47-50)	0 days	Mon 2/5/07	Mon 2/5/07
200	**Finish and Closeout**	**446 days?**	**Tue 8/23/05**	**Tue 5/8/07**
201	Tower Lobby - Interior and Entrances	316 days?	Tue 8/23/05	Mon 11/6/06
202	NYT - Times Center - 1st Floor Handover	0 days	Thu 3/9/06	Thu 3/9/06
203	NYT - Times Center - Cellar Floor Handover	0 days	Tue 3/28/06	Tue 3/28/06
204	Low Rise TCO	0 days	Wed 3/29/06	Wed 3/29/06
205	Project Punchlist/Closeout/Demobilization	68 days?	Mon 12/18/06	Wed 3/21/07
206	High Rise TCO	0 days	Mon 2/5/07	Mon 2/5/07
207	Internal Garden/Lobby Restoration and Landscaping	44 days?	Wed 3/7/07	Mon 5/7/07
208	Lobby Completion	0 days	Tue 5/8/07	Tue 5/8/07
209	Project Close Out	0 days	Tue 5/8/07	Tue 5/8/07



Project: PSU IPD BIM Detailed Schedu Date: Thu 11/5/09	Task		Milestone	◆	Rolled Up Task		Rolled Up Progress		External Tasks		Group By Summary	
	Progress		Summary		Rolled Up Milestone ◇		Split		Project Summary		Deadline	⇩

Technical Assignment 2 | Hedrick | Miller | Wiacek | Page 4

Figure 139: Cost Estimation

Sunday, October 4, 2009

Statement of Probable Cost

Pa

NYT - Aug 2004 - NY - N.Y.C.

Prepared By:

Fax:

Building Sq. Size: 1500000
Bid Date:
No. of floors: 6
No. of buildings:
Project Height:
1st Floor Height:
1st Floor Size:

Prepared For:

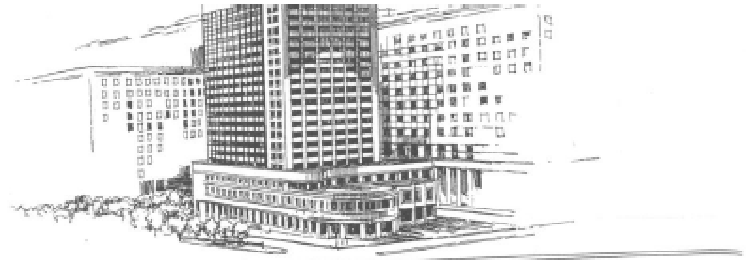
Fax:

Site Sq. Size: 72218
Building use:
Foundation:
Exterior Walls:
Interior Walls:
Roof Type:
Floor Type:
Project Type:

Division		Percent	Sq. Cost	Amount
00	**Bidding Requirements**	**2.65**	**7.64**	**11,464,738**
	Bidding Requirements	2.65	7.64	11,464,738
01	**General Requirements**	**7.58**	**21.88**	**32,820,265**
	General Requirements	7.58	21.88	32,820,265
02	**Site Work**	**0.62**	**1.80**	**2,696,973**
	Site Work	0.62	1.80	2,696,973
03	**Concrete**	**10.13**	**29.25**	**43,874,651**
	Concrete	10.13	29.25	43,874,651
04	**Masonry**	**2.77**	**7.99**	**11,989,406**
	Masonry	2.77	7.99	11,989,406
05	**Metals**	**7.80**	**22.52**	**33,782,993**
	Metals	7.80	22.52	33,782,993
06	**Wood & Plastics**	**0.32**	**0.94**	**1,404,110**
	Wood & Plastics	0.32	0.94	1,404,110
07	**Thermal & Moisture Protection**	**1.25**	**3.61**	**5,421,114**
	Thermal & Moisture Protection	1.25	3.61	5,421,114
08	**Doors & Windows**	**9.96**	**28.75**	**43,127,477**
	Doors & Windows	9.96	28.75	43,127,477
09	**Finishes**	**3.64**	**10.50**	**15,743,545**
	Finishes	3.64	10.50	15,743,545
10	**Specialties**	**2.28**	**6.57**	**9,852,009**
	Specialties	2.28	6.57	9,852,009
11	**Equipment**	**0.59**	**1.70**	**2,554,579**
	Equipment	0.59	1.70	2,554,579
12	**Furnishings**	**1.29**	**3.73**	**5,596,079**
	Furnishings	1.29	3.73	5,596,079
14	**Conveying Systems**	**2.33**	**6.71**	**10,069,183**
	Conveying Systems	2.33	6.71	10,069,183
15	**Mechanical**	**3.15**	**9.11**	**13,658,570**
	Mechanical	3.15	9.11	13,658,570
16	**Electrical**	**1.36**	**3.93**	**5,891,949**
	Electrical	1.36	3.93	5,891,949
21	**Fire Suppression**	**3.31**	**9.55**	**14,319,069**
	Fire Suppression	3.31	9.55	14,319,069
22	**Plumbing**	**1.82**	**5.24**	**7,862,137**
	Plumbing	1.62	5.24	7,862,137

23	**HVAC**	**12.15**	**35.08**	**52,622,158**
	HVAC	12.15	35.08	52,622,158
25	**Integrated Automation**	**0.36**	**1.04**	**1,564,597**
	Integrated Automation	0.36	1.04	1,564,597
26	**Electrical**	**9.55**	**27.56**	**41,335,182**
	Electrical	9.55	27.56	41,335,182
27	**Communications**	**6.16**	**17.79**	**26,681,147**
	Communications	6.16	17.79	26,681,147
28	**Electronic Safety and Security**	**2.90**	**8.37**	**12,559,593**
	Electronic Safety and Security	2.90	8.37	12,559,593
31	**Earthwork**	**1.41**	**4.07**	**6,104,975**
	Earthwork	1.41	4.07	6,104,975
32	**Exterior Improvements**	**3.10**	**8.95**	**13,426,292**
	Exterior Improvements	3.10	8.95	13,426,292
33	**Utilities**	**1.51**	**4.36**	**6,535,147**
	Utilities	1.51	4.36	6,535,147
Total Building Costs		**100.00**	**288.64**	**432,957,936**
Total Non-Building Costs		**100.00**	**0.00**	**0**
Total Project Costs		**--**	**--**	**432,957,936**

Figure 140: R.S. Means Cost Data



Costs per square foot of floor area

Exterior Wall	S.F. Area	120000	145000	170000	200000	230000	260000	400000	600000	800000
	L.F. Perimeter	420	450	470	490	510	530	600	730	820
Double Glazed Heat Absorbing Tinted Plate Glass Panels	Steel Frame	173.85	167.95	163.20	158.85	155.65	153.20	145.95	142.00	139.50
	R/Conc. Frame	161.85	156.15	151.55	147.35	144.25	141.85	134.75	130.95	128.55
Face Brick with Concrete Block Back-up	Steel Frame	168.15	162.95	158.65	154.85	152.05	149.85	143.50	140.05	137.85
	R/Conc. Frame	177.25	172.25	168.15	164.45	161.70	159.60	153.45	150.10	147.95
Precast Concrete Panel With Exposed Aggregate	Steel Frame	169.95	164.55	160.15	156.15	153.20	150.95	144.30	140.65	138.35
	R/Conc. Frame	157.90	152.75	148.45	144.60	141.75	139.55	133.15	129.60	127.40
Perimeter Adj., Add or Deduct	Per 100 L.F.	8.35	6.95	5.85	5.00	4.40	3.85	2.50	1.70	1.30
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	3.30	2.95	2.60	2.30	2.15	1.95	1.40	1.20	0.95
For Basement, add $36.40 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 $93.60 to $228.35 per S.F.

Common additives

Description	Unit	$ Cost
Clock System		
20 room	Each	16,000
50 room	Each	39,100
Directory Boards, Plastic, glass covered		
30" x 20"	Each	595
36" x 48"	Each	1450
Aluminum, 24" x 18"	Each	600
36" x 24"	Each	675
48" x 32"	Each	980
48" x 60"	Each	2025
Elevators, Electric passenger, 10 stops		
3000# capacity	Each	430,500
4000# capacity	Each	433,000
5000# capacity	Each	437,000
Additional stop, add	Each	13,600
Emergency Lighting, 25 watt, battery operated		
Lead battery	Each	282
Nickel cadmium	Each	805

Description	Unit	$ Cost
Escalators, Metal		
32" wide, 10' story height	Each	143,000
20' story height	Each	172,000
48" wide, 10' story height	Each	152,000
20' story height	Each	180,500
Glass		
32" wide, 10' story height	Each	137,000
20' story height	Each	165,000
48" wide, 10' story height	Each	48,300
20' story height	Each	175,000
Smoke Detectors		
Ceiling type	Each	187
Duct type	Each	480
Sound System		
Amplifier, 250 watts	Each	2350
Speaker, ceiling or wall	Each	191
Trumpet	Each	365
TV Antenna, Master system, 12 outlet	Outlet	315
30 outlet	Outlet	203
100 outlet	Outlet	194

180

Important: See the Reference Section for Location Factors

Model costs calculated for a 16 story building with 10' story height and 260,000 square feet of floor area

Office, 11-20 Story

				Unit	Unit Cost	Cost Per S.F.	% Of Sub-Total
A. SUBSTRUCTURE							
1010	Standard Foundations	CIP concrete pile caps		S.F. Ground	9.92	.62	4.5%
1020	Special Foundations	Steel H-piles, concrete grade beams		S.F. Ground	62	3.86	
1030	Slab on Grade	4" reinforced concrete with vapor barrier and granular base		S.F. Slab	4.74	.30	
2010	Basement Excavation	Site preparation for slab, piles and grade beams		S.F. Ground	.26	.02	
2020	Basement Walls	4' foundation wall		L.F. Wall	78	.38	
B. SHELL							
	B10 Superstructure						
1010	Floor Construction	Concrete slab, metal deck, beams		S.F. Floor	29.90	28.03	24.8%
1020	Roof Construction	Metal deck, open web steel joists, beams, columns		S.F. Roof	9.76	.61	
	B20 Exterior Enclosure						
2010	Exterior Walls	N/A		—	—	—	12.2 %
2020	Exterior Windows	Double glazed heat absorbing, tinted plate glass wall panels	100% of wall	Each	41.45	13.52	
2030	Exterior Doors	Double aluminum & glass doors		Each	5571	.60	
	B30 Roofing						
3010	Roof Coverings	Single ply membrane, fully adhered; perlite/EPS composite insulation		S.F. Roof	5.60	.35	0.3%
3020	Roof Openings	N/A		—	—	—	
C. INTERIORS							
1010	Partitions	Gypsum board on metal studs	20 S.F. Floor/L.F. Partition	S.F. Partition	10.20	2.72	17.1%
1020	Interior Doors	Single leaf hollow metal	400 S.F. Floor/Door	Each	875	2.19	
1030	Fittings	Toilet partitions		S.F. Floor	.42	.42	
2010	Stair Construction	Concrete filled metal pan		Flight	18,950	2.55	
3010	Wall Finishes	60% vinyl wall covering, 40% paint		S.F. Surface	1.33	.71	
3020	Floor Finishes	60% carpet tile, 30% vinyl composition tile, 10% ceramic tile		S.F. Floor	4.81	4.81	
3030	Ceiling Finishes	Mineral fiber tile on concealed zee bars		S.F. Ceiling	6.38	6.38	
D. SERVICES							
	D10 Conveying						
1010	Elevators & Lifts	Four geared passenger elevators		Each	479,050	7.37	6.4%
1020	Escalators & Moving Walks	N/A		—	—	—	
	D20 Plumbing						
2010	Plumbing Fixtures	Toilet and service fixtures, supply and drainage	1 Fixture/1345 S.F. Floor	Each	4022	2.99	2.9%
2020	Domestic Water Distribution	Oil fired water heater		S.F. Floor	.25	.25	
2040	Rain Water Drainage	Roof drains		S.F. Roof	2.08	.13	
	D30 HVAC						
3010	Energy Supply	N/A		—	—	—	13.5 %
3020	Heat Generating Systems	Boiler, heat exchanger and fans		Each	388,485	2.04	
3030	Cooling Generating Systems	Chilled water, fan coil units		S.F. Floor	13.59	13.59	
3050	Terminal & Package Units	N/A		—	—	—	
3090	Other HVAC Sys. & Equipment	N/A		—	—	—	
	D40 Fire Protection						
4010	Sprinklers	Sprinkler system, light hazard		S.F. Floor	2.25	2.25	2.4%
4020	Standpipes	Standpipes and hose systems		S.F. Floor	.51	.51	
	D50 Electrical						
5010	Electrical Service/Distribution	2400 ampere service, panel board and feeders		S.F. Floor	1.10	1.10	15.9%
5020	Lighting & Branch Wiring	High efficiency fluorescent fixtures, receptacles, switches, A.C. and misc. power		S.F. Floor	10.99	10.99	
5030	Communications & Security	Addressable alarm systems, internet and phone wiring, emergency lighting		S.F. Floor	5.81	5.81	
5090	Other Electrical Systems	Emergency generator, 200 kW, uninterruptible power supply		S.F. Floor	.51	.51	
E. EQUIPMENT & FURNISHINGS							
1010	Commercial Equipment	N/A		—	—	—	0.0 %
1020	Institutional Equipment	N/A		—	—	—	
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	115.61	100%
	CONTRACTOR FEES (General Requirements: 10%, Overhead: 5%, Profit: 10%)				25%	28.92	
	ARCHITECT FEES				6%	8.67	
					Total Building Cost	153.20	

181

Figure 141: Site Layout

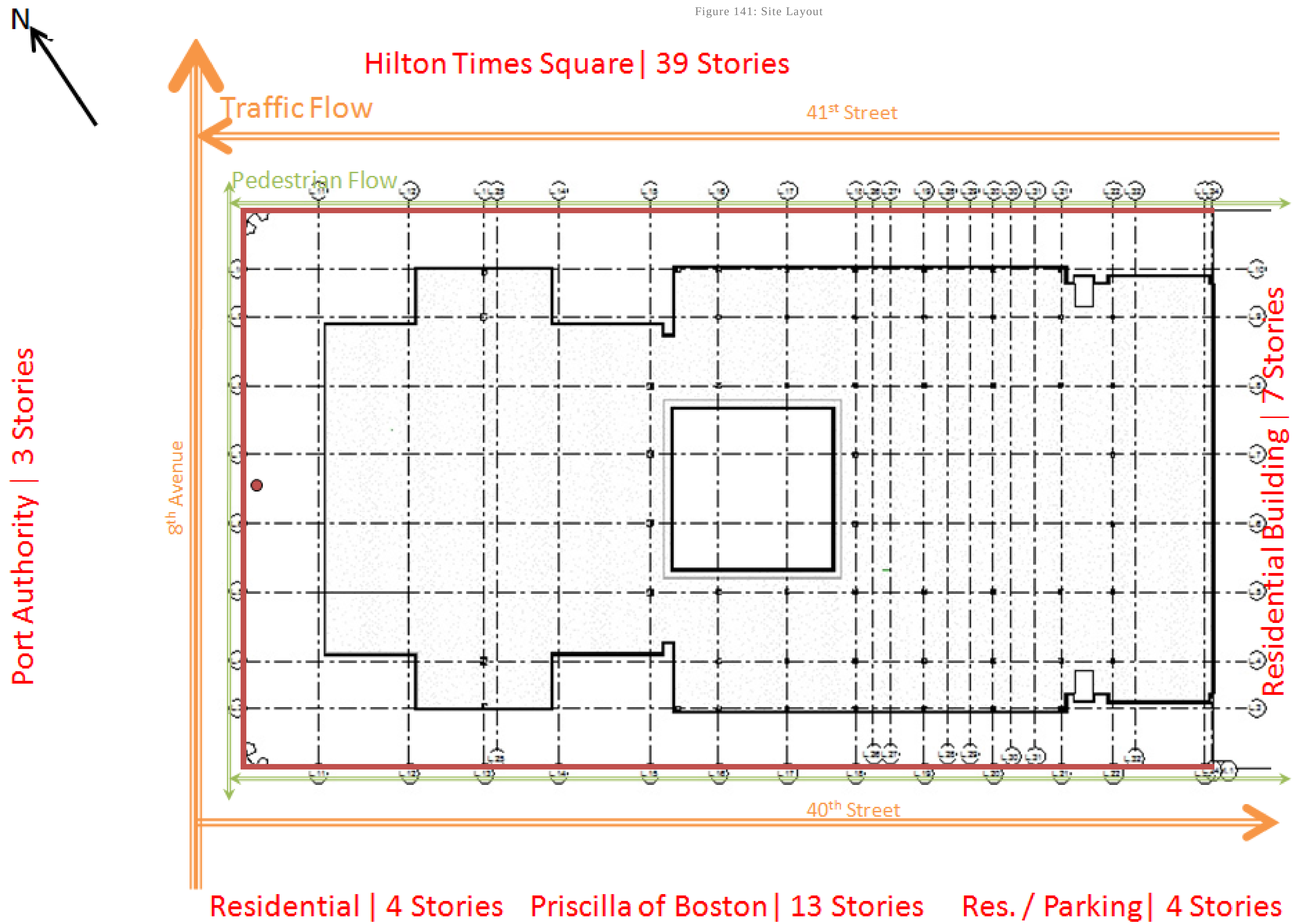
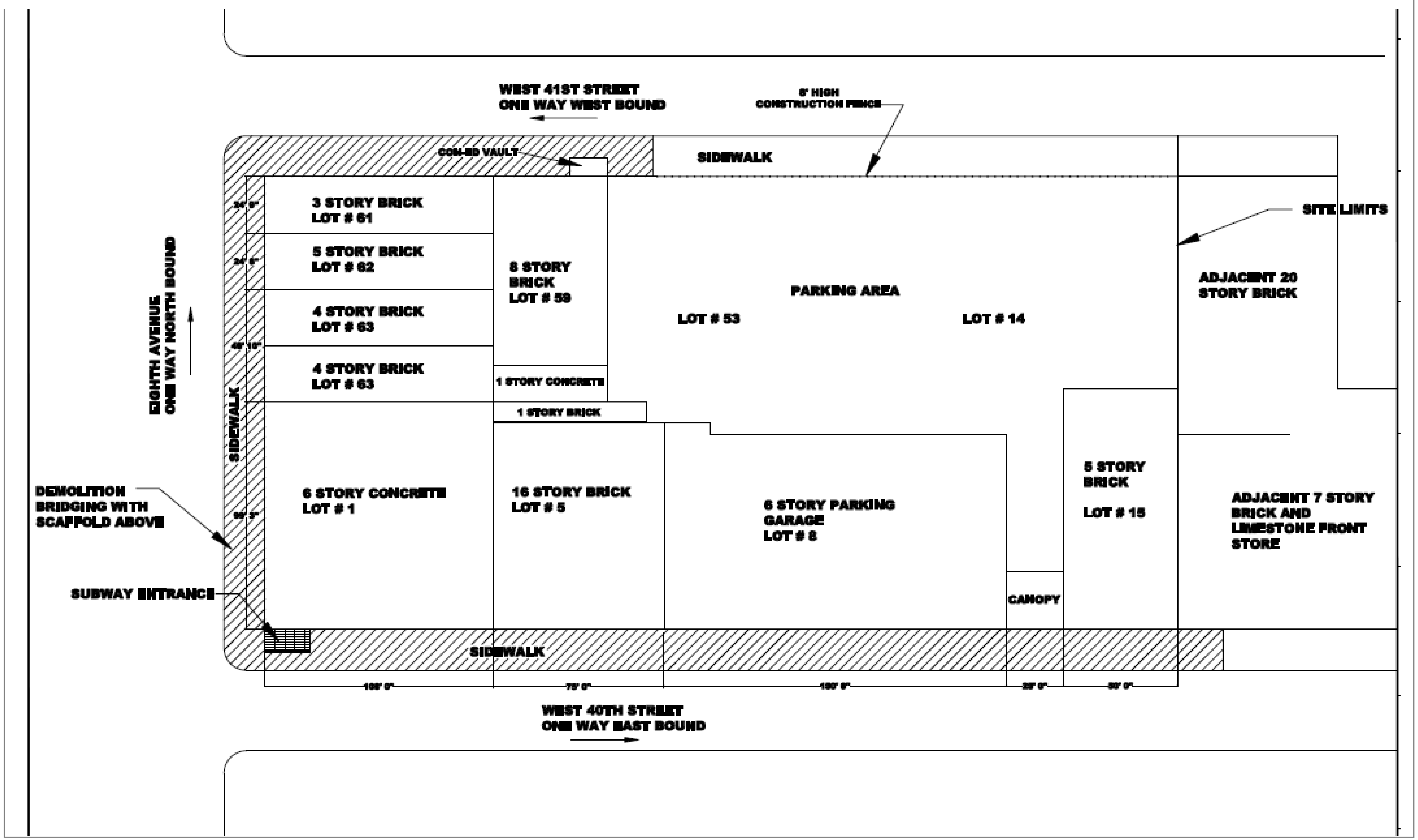
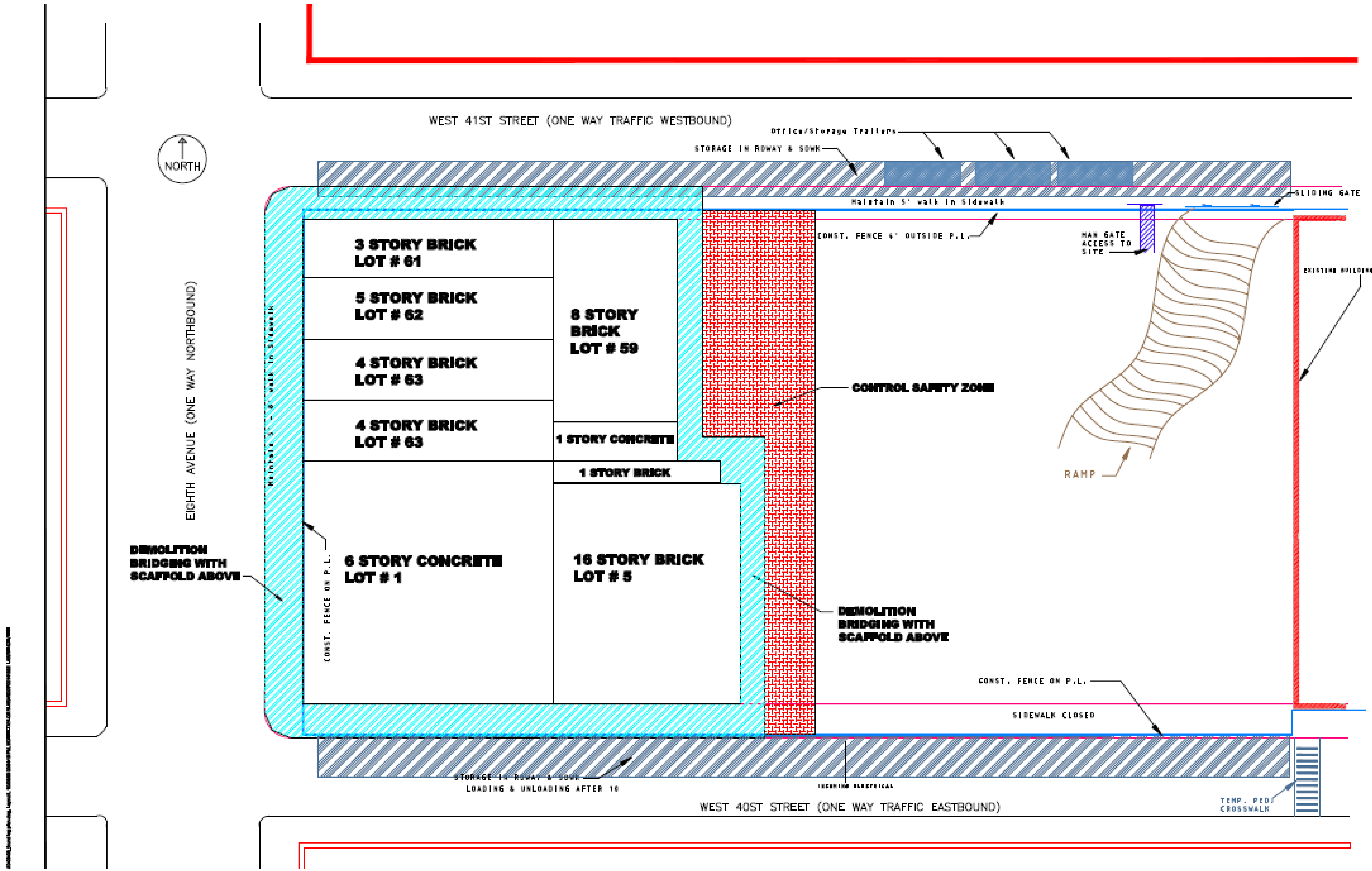


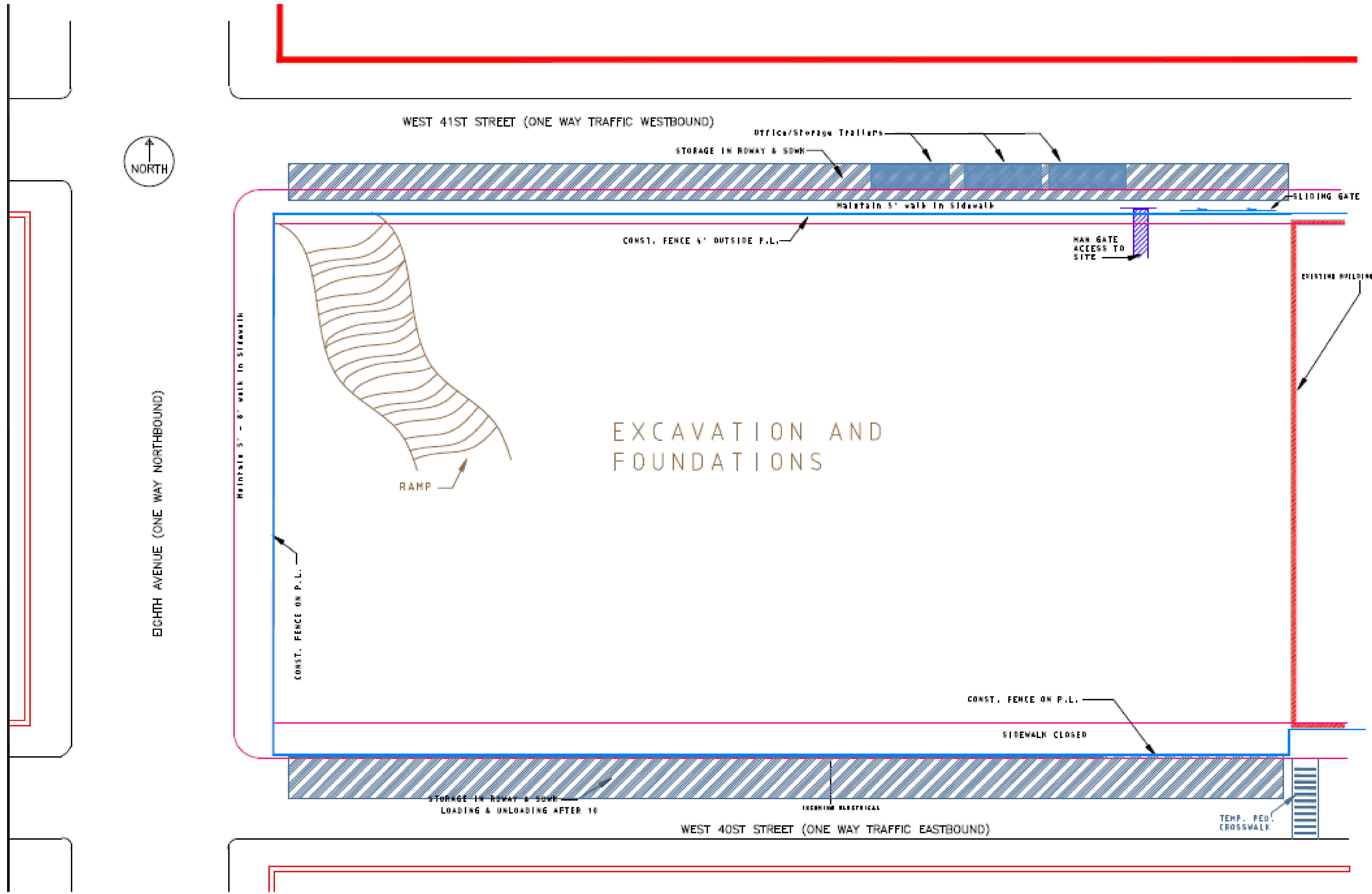
Figure 142: Google Maps Images

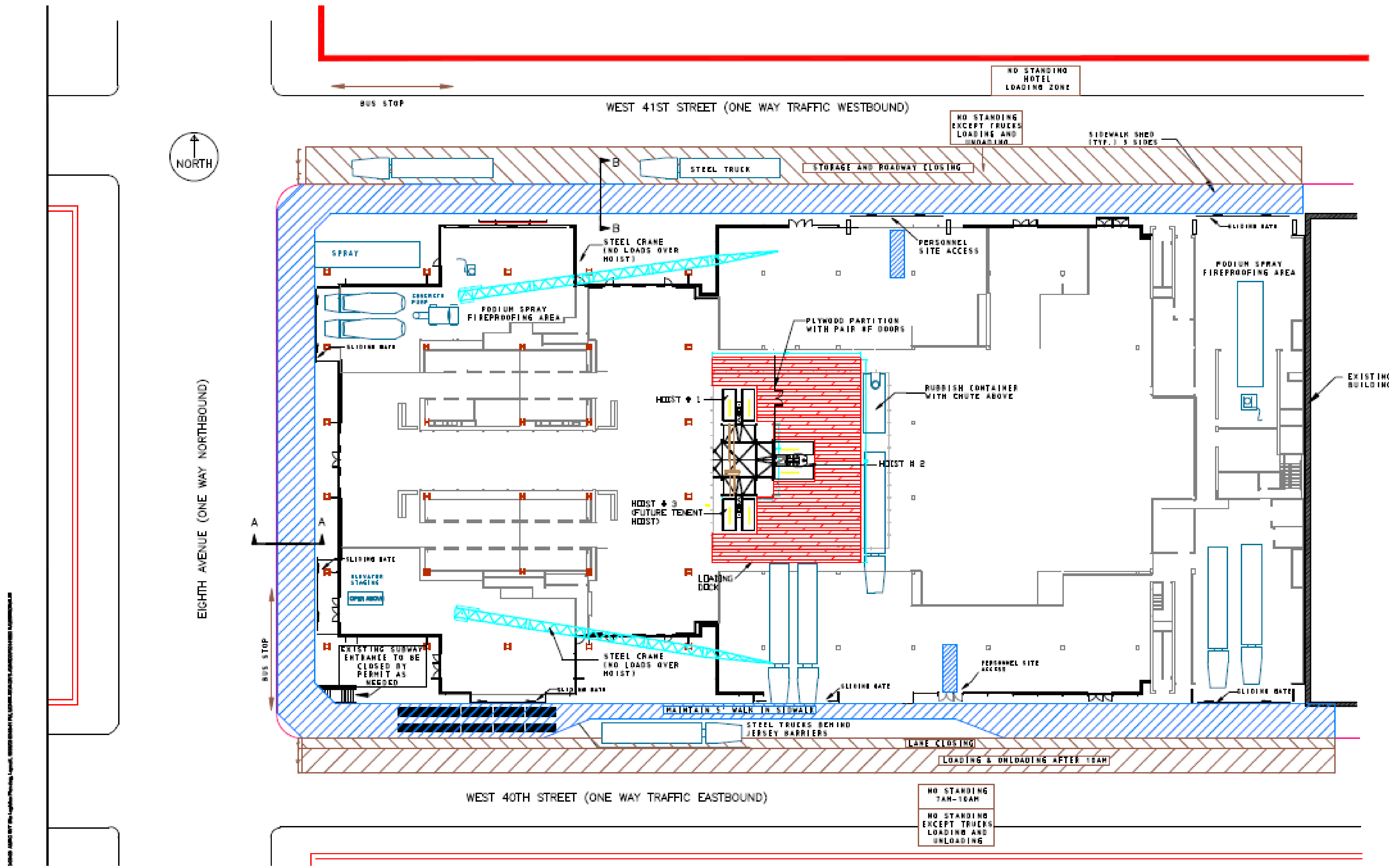
D

Figure 143: Site Utilization Plans




WEST 41ST STREET (ONE WAY TRAFFIC WESTBOUND)
NORTH
EIGHTH AVENUE (ONE WAY NORTHBOUND)
3 STORY BRICK LOT # 61
5 STORY BRICK LOT # 62
4 STORY BRICK LOT # 63
4 STORY BRICK LOT # 63
8 STORY BRICK LOT # 59
1 STORY CONCRETE
1 STORY BRICK
6 STORY CONCRETE LOT # 1
16 STORY BRICK LOT # 5
CONTROL SAFETY ZONE
DEMOLITION BRIDGING WITH SCAFFOLD ABOVE
DEMOLITION BRIDGING WITH SCAFFOLD ABOVE
RAMP
SLIDING GATE
SIDEWALK CLOSED
WEST 40ST STREET (ONE WAY TRAFFIC EASTBOUND)


WEST 41ST STREET (ONE WAY TRAFFIC WESTBOUND)
NORTH
Office/Storage Trailers
STORAGE IN ROWAY & SDWK
SLIDING GATE
Maintain 5' walk in Sidewalk
CONST. FENCE 4' OUTSIDE P.L.
MAN GATE ACCESS TO SITE
EXISTING BUILDING
Maintain 5' - 8' walk in Sidewalk
EIGHTH AVENUE (ONE WAY NORTHBOUND)
RAMP
EXCAVATION AND FOUNDATIONS
CONST. FENCE ON P.L.
CONST. FENCE ON P.L.
SIDEWALK CLOSED
STORAGE IN ROWAY & SDWK
LOADING & UNLOADING AFTER 10
TEMP. PED. CROSSWALK
WEST 40ST STREET (ONE WAY TRAFFIC EASTBOUND)


WEST 41ST STREET (ONE WAY TRAFFIC WESTBOUND)
WEST 40TH STREET (ONE WAY TRAFFIC EASTBOUND)
EIGHTH AVENUE (ONE WAY NORTHBOUND)
NORTH
BUS STOP
STEEL TRUCK
STORAGE AND ROADWAY CLOSING
SIDEWALK SHED (TYP.) 3 SIDES
PERSONNEL SITE ACCESS
STEEL CRANE (NO LOADS OVER HOIST)
PODIUM SPRAY FIREPROOFING AREA
SPRAY
CONCRETE PUMP
SLIDING GATE
PLYWOOD PARTITION WITH PAIR OF DOORS
RUBBISH CONTAINER WITH CHUTE ABOVE
HOIST # 1
HOIST # 2
HOIST # 3 (FUTURE TENENT HOIST)
EXISTING BUILDING
LOADING DOCK
EXISTING SUBWAY ENTRANCE TO BE CLOSED BY PERMIT AS NEEDED
MAINTAIN 5' WALK IN SIDEWALK
STEEL TRUCKS BEHIND JERSEY BARRIERS
LANE CLOSING
LOADING & UNLOADING AFTER 10AM
NO STANDING 7AM-10AM
NO STANDING EXCEPT TRUCKS LOADING AND UNLOADING
NO STANDING HOTEL LOADING ZONE

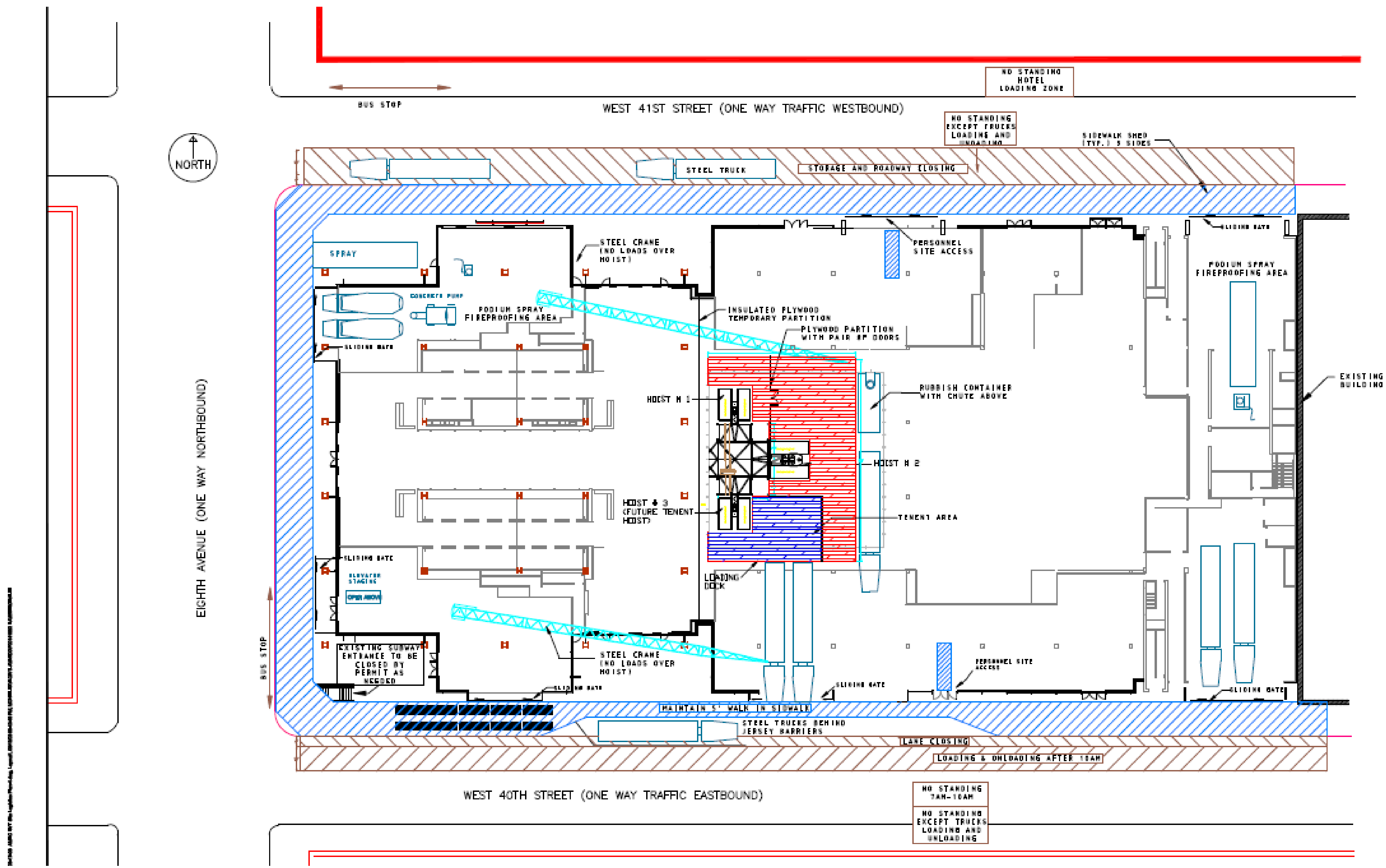

NORTH
BUS STOP
WEST 41ST STREET (ONE WAY TRAFFIC WESTBOUND)
NO STANDING HOTEL LOADING ZONE
NO STANDING EXCEPT TRUCKS LOADING AND UNLOADING
SIDEWALK SHED (TYP.) 3 SIDES
STEEL TRUCK
STORAGE AND ROADWAY CLOSING
SPRAY
STEEL CRANE (NO LOADS OVER HOIST)
PERSONNEL SITE ACCESS
PODIUM SPRAY FIREPROOFING AREA
INSULATED PLYWOOD TEMPORARY PARTITION
PLYWOOD PARTITION WITH PAIR OF DOORS
RUBBISH CONTAINER WITH CHUTE ABOVE
EXISTING BUILDING
HOIST # 1
HOIST # 2
HOIST # 3 (FUTURE TENENT HOIST)
TENENT AREA
LOADING DOCK
SLIDING GATE
EIGHTH AVENUE (ONE WAY NORTHBOUND)
EXISTING SUBWAY ENTRANCE TO BE CLOSED BY PERMIT AS NEEDED
MAINTAIN 5' WALK IN SIDWALK
STEEL TRUCKS BEHIND JERSEY BARRIERS
LANE CLOSING
LOADING & UNLOADING AFTER 10AM
WEST 40TH STREET (ONE WAY TRAFFIC EASTBOUND)
NO STANDING 7AM-10AM
NO STANDING EXCEPT TRUCKS LOADING AND UNLOADING

Figure 144: Detailed Structural Estimate

Quantity	LineNumber	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type
0	**051223750010**	**STRUCTURAL STEEL MEMBERS**					**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**STD**
41.33	051223750720	Structural steel member, 100-ton project, 1 to 2 story building, W10x26, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,839.60	$ 237.65	$ 132.26	$ 2,209.50	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 2,010.70	$ 406.69	$ 145.48	$ 2,562.87	STD
18.29	051223751500	Structural steel member, 100-ton project, 1 to 2 story building, W12x26, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	880	0.064	L.F.	$ 44.51	$ 3.92	$ 2.18	$ 50.61	$ 814.09	$ 71.70	$ 39.87	$ 925.66	$ 48.65	$ 6.71	$ 2.40	$ 57.76	$ 889.81	$ 122.73	$ 43.90	$ 1,056.43	STD
37.72	051223752100	Structural steel member, 100-ton project, 1 to 2 story building, W14x30, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	900	0.062	L.F.	$ 51.23	$ 3.84	$ 2.13	$ 57.20	$ 1,932.40	$ 144.84	$ 80.34	$ 2,157.58	$ 56.41	$ 6.56	$ 2.35	$ 65.32	$ 2,127.79	$ 247.44	$ 88.64	$ 2,463.87	STD
57	051223752320	Structural steel member, 100-ton project, 1 to 2 story building, W14x43, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 4,188.93	$ 242.82	$ 135.09	$ 4,566.84	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 4,601.61	$ 415.53	$ 148.20	$ 5,165.34	STD
179.26	051223752380	Structural steel member, 100-ton project, 1 to 2 story building, W14x90, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 27,645.48	$ 837.14	$ 464.28	$ 28,946.90	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 30,242.95	$ 1,434.08	$ 510.89	$ 32,187.93	STD
151.18	051223752500	Structural steel member, 100-ton project, 1 to 2 story building, W14x120, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 30,981.32	$ 725.66	$ 403.65	$ 32,110.63	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 34,110.74	$ 1,241.19	$ 442.96	$ 35,794.89	STD
398.86	051223752700	Structural steel member, 100-ton project, 1 to 2 story building, W16x26, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 17,753.26	$ 1,380.06	$ 765.81	$ 19,899.13	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 19,404.54	$ 2,353.27	$ 845.58	$ 22,603.40	STD
114.96	051223752900	Structural steel member, 100-ton project, 1 to 2 story building, W16x31, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 6,068.74	$ 441.45	$ 244.86	$ 6,755.05	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 6,722.86	$ 754.14	$ 270.16	$ 7,747.15	STD
2310.15	051223753300	Structural steel member, 100-ton project, 1 to 2 story building, W18x35, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 138,678.30	$ 12,012.78	$ 4,966.82	$ 155,657.91	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 151,823.06	$ 20,768.25	$ 5,475.06	$ 178,066.36	STD
364.18	051223753500	Structural steel member, 100-ton project, 1 to 2 story building, W18x40, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 24,877.14	$ 1,893.74	$ 782.99	$ 27,553.86	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 27,328.07	$ 3,273.98	$ 863.11	$ 31,465.15	STD
280	051223753700	Structural steel member, 100-ton project, 1 to 2 story building, W18x50, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	912	0.088	L.F.	$ 85.39	$ 5.48	$ 2.27	$ 93.14	$ 23,909.20	$ 1,534.40	$ 635.60	$ 26,079.20	$ 94.19	$ 9.49	$ 2.49	$ 106.17	$ 26,373.20	$ 2,657.20	$ 697.20	$ 29,727.60	STD
120	051223753920	Structural steel member, 100-ton project, 1 to 2 story building, W18x65, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	900	0.089	L.F.	$ 110.75	$ 5.55	$ 2.29	$ 118.59	$ 13,290.00	$ 666.00	$ 274.80	$ 14,230.80	$ 122.13	$ 9.63	$ 2.52	$ 134.28	$ 14,655.60	$ 1,155.60	$ 302.40	$ 16,113.60	STD
160	051223753940	Structural steel member, 100-ton project, 1 to 2 story building, W18x76, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 20,700.80	$ 888.00	$ 366.40	$ 21,955.20	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 22,852.80	$ 1,540.80	$ 403.20	$ 24,796.80	STD
174.12	051223753980	Structural steel member, 100-ton project, 1 to 2 story building, W18x106, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	900	0.089	L.F.	$ 181.13	$ 5.55	$ 2.29	$ 188.97	$ 31,538.36	$ 966.37	$ 398.73	$ 32,903.46	$ 198.72	$ 9.63	$ 2.52	$ 210.87	$ 34,601.13	$ 1,676.78	$ 438.78	$ 36,716.68	STD
260	051223754300	Structural steel member, 100-ton project, 1 to 2 story building, W21x50, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 22,201.40	$ 1,222.00	$ 504.40	$ 23,927.80	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 24,489.40	$ 2,116.40	$ 556.40	$ 27,162.20	STD
60	051223754760	Structural steel member, 100-ton project, 1 to 2 story building, W21x101, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	1000	0.08	L.F.	$ 172.85	$ 5.00	$ 2.07	$ 179.92	$ 10,371.00	$ 300.00	$ 124.20	$ 10,795.20	$ 189.41	$ 8.64	$ 2.27	$ 200.32	$ 11,364.60	$ 518.40	$ 136.20	$ 12,019.20	STD
225	051223755500	Structural steel member, 100-ton project, 1 to 2 story building, W24x76, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	1110	0.072	L.F.	$ 129.38	$ 4.50	$ 1.86	$ 135.74	$ 29,110.50	$ 1,012.50	$ 418.50	$ 30,541.50	$ 142.83	$ 7.79	$ 2.05	$ 152.67	$ 32,136.75	$ 1,752.75	$ 461.25	$ 34,350.75	STD
60	051223756900	Structural steel member, 100-ton project, 1 to 2 story building, W33x130, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	1134	0.071	L.F.	$ 222.53	$ 4.40	$ 1.82	$ 228.75	$ 13,351.80	$ 264.00	$ 109.20	$ 13,725.00	$ 244.26	$ 7.65	$ 2.01	$ 253.92	$ 14,655.60	$ 459.00	$ 120.60	$ 15,235.20	STD
60	051223757100	Structural steel member, 100-ton project, 1 to 2 story building, W33x141, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	1134	0.071	L.F.	$ 241.16	$ 4.40	$ 1.82	$ 247.38	$ 14,469.60	$ 264.00	$ 109.20	$ 14,842.80	$ 264.96	$ 7.65	$ 2.01	$ 274.62	$ 15,897.60	$ 459.00	$ 120.60	$ 16,477.20	STD
673.67	051223750120	Structural steel member, 100-ton project, 1 to 2 story building, W4x13, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	600	0.093	L.F.	$ 25.88	$ 5.75	$ 3.20	$ 34.83	$ 17,434.58	$ 3,873.60	$ 2,155.74	$ 23,463.93	$ 27.95	$ 9.84	$ 3.52	$ 41.31	$ 18,829.08	$ 6,628.91	$ 2,371.32	$ 27,829.31	STD
887.43	051223751300	Structural steel member, 100-ton project, 1 to 2 story building, W12x19, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	880	0.064	L.F.	$ 37.78	$ 3.92	$ 2.18	$ 43.88	$ 33,527.11	$ 3,478.73	$ 1,934.60	$ 38,940.43	$ 41.40	$ 6.71	$ 2.40	$ 50.51	$ 36,739.60	$ 5,954.66	$ 2,129.83	$ 44,824.09	STD

951.23	051223751900	Structural steel member, 100-ton project, 1 to 2 story building, W14x22, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 42,339.25	$ 3,310.28	$ 1,845.39	$ 47,494.91	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 46,277.34	$ 5,669.33	$ 2,026.12	$ 53,972.79	STD
30	051223752340	Structural steel member, 100-ton project, 1 to 2 story building, W14x48, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	800	0.07	L.F.	$ 90.56	$ 4.32	$ 2.40	$ 97.28	$ 2,716.80	$ 129.60	$ 72.00	$ 2,918.40	$ 99.36	$ 7.36	$ 2.63	$ 109.35	$ 2,980.80	$ 220.80	$ 78.90	$ 3,280.50	STD
70.47	051223752380	Structural steel member, 100-ton project, 1 to 2 story building, W14x82, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 10,867.88	$ 329.09	$ 182.52	$ 11,379.50	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 11,888.99	$ 563.76	$ 200.84	$ 12,653.59	STD
134.38	051223752500	Structural steel member, 100-ton project, 1 to 2 story building, W14x109, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 27,538.49	$ 645.02	$ 358.79	$ 28,542.31	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 30,320.16	$ 1,103.26	$ 393.73	$ 31,817.15	STD
260	051223753100	Structural steel member, 100-ton project, 1 to 2 story building, W16x36, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	800	0.07	L.F.	$ 68.31	$ 4.32	$ 2.40	$ 75.03	$ 17,760.60	$ 1,123.20	$ 624.00	$ 19,507.80	$ 75.04	$ 7.36	$ 2.63	$ 85.03	$ 19,510.40	$ 1,913.60	$ 683.80	$ 22,107.80	STD
120	051223753920	Structural steel member, 100-ton project, 1 to 2 story building, W18x60, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	900	0.089	L.F.	$ 110.75	$ 5.55	$ 2.29	$ 118.59	$ 13,290.00	$ 666.00	$ 274.80	$ 14,230.80	$ 122.13	$ 9.63	$ 2.52	$ 134.28	$ 14,655.60	$ 1,155.60	$ 302.40	$ 16,113.60	STD
72.49	051223753940	Structural steel member, 100-ton project, 1 to 2 story building, W18x71, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 9,378.76	$ 402.32	$ 166.00	$ 9,947.08	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 10,353.75	$ 698.08	$ 182.67	$ 11,234.50	STD
122.12	051223754500	Structural steel member, 100-ton project, 1 to 2 story building, W21x57, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	1036	0.077	L.F.	$ 105.57	$ 4.83	$ 1.99	$ 112.39	$ 12,892.21	$ 589.84	$ 243.02	$ 13,725.07	$ 116.96	$ 8.35	$ 2.19	$ 127.50	$ 14,283.16	$ 1,019.70	$ 267.44	$ 15,570.30	STD
78	051223754780	Structural steel member, 100-ton project, 1 to 2 story building, W21x132, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 16,227.12	$ 390.00	$ 161.46	$ 16,778.58	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 17,841.72	$ 673.92	$ 177.06	$ 18,692.70	STD
120	051223757900	Structural steel member, 100-ton project, 1 to 2 story building, W33x221, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	1125	0.071	L.F.	$ 393.30	$ 4.45	$ 1.84	$ 399.59	$ 47,196.00	$ 534.00	$ 220.80	$ 47,950.80	$ 434.70	$ 7.72	$ 2.02	$ 444.44	$ 52,164.00	$ 926.40	$ 242.40	$ 53,332.80	STD
53.7	051223756100	Structural steel member, 100-ton project, 1 to 2 story building, TT14x99, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	1200	0.067	L.F.	$ 168.71	$ 4.16	$ 1.72	$ 174.59	$ 9,059.73	$ 223.39	$ 92.36	$ 9,375.48	$ 186.30	$ 7.22	$ 1.90	$ 195.42	$ 10,004.31	$ 387.71	$ 102.03	$ 10,494.05	STD
123.34	051223756900	Structural steel member, 100-ton project, 1 to 2 story building, W14x132, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	1134	0.071	L.F.	$ 222.53	$ 4.40	$ 1.82	$ 228.75	$ 27,446.85	$ 542.70	$ 224.48	$ 28,214.03	$ 244.26	$ 7.65	$ 2.01	$ 253.92	$ 30,127.03	$ 943.55	$ 247.91	$ 31,318.49	STD
22.74	051223757920	Structural steel member, 100-ton project, 1 to 2 story building, W14x257, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	1035	0.077	L.F.	$ 445.05	$ 4.83	$ 1.99	$ 451.87	$ 10,120.44	$ 109.83	$ 45.25	$ 10,275.52	$ 491.63	$ 8.35	$ 2.19	$ 502.17	$ 11,179.67	$ 189.88	$ 49.80	$ 11,419.35	STD
101.25	051223758100	Structural steel member, 100-ton project, 1 to 2 story building, W14x283, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	1035	0.077	L.F.	$ 517.50	$ 4.83	$ 1.99	$ 524.32	$ 52,396.88	$ 489.04	$ 201.49	$ 53,087.40	$ 569.25	$ 8.35	$ 2.19	$ 579.79	$ 57,636.56	$ 845.44	$ 221.74	$ 58,703.74	STD
398.55	051223750360	Structural steel member, 100-ton project, 1 to 2 story building, HSS6x4x3/8, A992 steel, shop fabricated, incl shop primer, bolted connections	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 16,292.72	$ 2,498.91	$ 1,390.94	$ 20,182.57	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 17,942.72	$ 4,288.40	$ 1,526.45	$ 23,757.57	STD
56.5	051223756900	Structural steel member, 100-ton project, 1 to 2 story building, W18x130, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	1134	0.071	L.F.	$ 222.53	$ 4.40	$ 1.82	$ 228.75	$ 12,572.95	$ 248.60	$ 102.83	$ 12,924.38	$ 244.26	$ 7.65	$ 2.01	$ 253.92	$ 13,800.69	$ 432.23	$ 113.57	$ 14,346.48	STD
123	051223757100	Structural steel member, 100-ton project, 1 to 2 story building, W18x143, A992 steel, shop fabricated, incl shop primer, bolted connections	E5	1134	0.071	L.F.	$ 222.53	$ 4.40	$ 1.82	$ 228.75	$ 27,371.19	$ 541.20	$ 223.86	$ 28,136.25	$ 244.26	$ 7.65	$ 2.01	$ 253.92	$ 30,043.98	$ 940.95	$ 247.23	$ 31,232.16	STD
0	**032200000000**	**Welded Wire Fabric Reinforcing**					**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**STD**
2244	032205500300	Welded wire fabric, sheets, 6 x 6 - W2.9 x W2.9 (6 x 6) 42 lb. per C.S.F., A185	2 Rodm	29	0.552	C.S.F.	$ 34.68	$ 46.72	$ -	$ 81.40	$ 77,821.92	$ 104,839.68	$ -	$ 182,661.60	$ 38.41	$ 76.28	$ -	$ 114.69	$ 86,192.04	$ 171,172.32	$ -	$ 257,364.36	STD
0	**033105350010**	**NORMAL WEIGHT CONCRETE, READY MIX**					**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**STD**
255	033105350300	Structural concrete, ready mix, normal weight, 4000 PSI, includes local aggregate, sand, Portland cement and water, delivered, excludes all additives and treatments				C.Y.	$ 115.33	$ -	$ -	$ 115.33	$ 29,409.15	$ -	$ -	$ 29,409.15	$ 126.21	$ -	$ -	$ 126.21	$ 32,183.55	$ -	$ -	$ 32,183.55	STD

0	053113500010	FLOOR DECKING					$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	STD
22440	053113505400	Metal decking, steel, non-cellular, composite, galvanized, 2" D, 18 ga	E4	3380	0.009	C.Y.	$ 3.83	$ 0.60	$ 0.04	$ 4.47	$ 85,945.20	$ 13,464.00	$ 897.60	$ 100,306.80	$ 4.21	$ 1.06	$ 0.04	$ 5.31	$ 94,472.40	$ 23,786.40	$ 897.60	$ 119,156.40	STD
Total											**$1,033,327.75**	**$ 163,534.14**	**$22,374.93**	**$1,219,236.81**					**$1,135,716.36**	**$ 272,868.13**	**$ 24,533.45**	**$1,003,182.53**	
																						$2,222,419.34	

Quantity	LineNumber	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Notes
110	051223400672	C-Channel-Column: C10X33	E3	36	0.667	L.F.	$ 10.71	$ 43.19	$ 4.11	$ 58.01	$ 1,178.10	$ 4,750.90	$ 452.10	$ 6,381.10	$ 11.80	$ 76.46	$ 4.52	$ 92.78	$ 1,298.00	$ 8,410.60	$ 497.20	$ 30,617.40	X3
27.5	051223757920	W-Wide Flange-Column: W14X257	E5	1035	0.077	L.F.	$ 445.05	$ 4.83	$ 1.99	$ 451.87	$ 12,238.88	$ 132.83	$ 54.73	$ 12,426.43	$ 491.63	$ 8.35	$ 2.19	$ 502.17	$ 13,519.83	$ 229.63	$ 60.23	$ 13,809.68	X1
110	051223758100	FB-Flanged Box-Column: FB30X1116	E5	1035	0.077	L.F.	$ 517.50	$ 4.83	$ 1.99	$ 524.32	$ 56,925.00	$ 531.30	$ 218.90	$ 57,675.20	$ 569.25	$ 8.35	$ 2.19	$ 579.79	$ 62,617.50	$ 918.50	$ 240.90	$ 235,974.53	X3.7
55	051223758100	BU-Built Up-Column: W23X1168	E5	1035	0.077	L.F.	$ 517.50	$ 4.83	$ 1.99	$ 524.32	$ 28,462.50	$ 265.65	$ 109.45	$ 28,837.60	$ 569.25	$ 8.35	$ 2.19	$ 579.79	$ 31,308.75	$ 459.25	$ 120.45	$ 123,408.30	X3.87
27.5	051223758100	BU-Built Up-Column: W22X1032	E5	1035	0.077	L.F.	$ 517.50	$ 4.83	$ 1.99	$ 524.32	$ 14,231.25	$ 132.83	$ 54.73	$ 14,418.80	$ 569.25	$ 8.35	$ 2.19	$ 579.79	$ 15,654.38	$ 229.63	$ 60.23	$ 54,210.38	X3.4
13.75	051223758100	BU-Built Up-Column: W24X985	E5	1035	0.077	L.F.	$ 517.50	$ 4.83	$ 1.99	$ 524.32	$ 7,115.63	$ 66.41	$ 27.36	$ 7,209.40	$ 569.25	$ 8.35	$ 2.19	$ 579.79	$ 7,827.19	$ 114.81	$ 30.11	$ 25,989.08	X3.26
13.75	051223758100	BU-Built Up-Column: W23X729	E5	1035	0.077	L.F.	$ 517.50	$ 4.83	$ 1.99	$ 524.32	$ 7,115.63	$ 66.41	$ 27.36	$ 7,209.40	$ 569.25	$ 8.35	$ 2.19	$ 579.79	$ 7,827.19	$ 114.81	$ 30.11	$ 19,133.06	X2.4
55	051223758100	BU-Built Up-Column: W29X2063	E5	1035	0.077	L.F.	$ 517.50	$ 4.83	$ 1.99	$ 524.32	$ 28,462.50	$ 265.65	$ 109.45	$ 28,837.60	$ 569.25	$ 8.35	$ 2.19	$ 579.79	$ 31,308.75	$ 459.25	$ 120.45	$ 216,841.46	X6.8
27.5	051223758100	BU-Built Up-Column: W25X1401	E5	1035	0.077	L.F.	$ 517.50	$ 4.83	$ 1.99	$ 524.32	$ 14,231.25	$ 132.83	$ 54.73	$ 14,418.80	$ 569.25	$ 8.35	$ 2.19	$ 579.79	$ 15,654.38	$ 229.63	$ 60.23	$ 73,981.23	X4.64
55	051223758100	W-Wide Flange-Column: W14X665	E5	1035	0.077	L.F.	$ 517.50	$ 4.83	$ 1.99	$ 524.32	$ 28,462.50	$ 265.65	$ 109.45	$ 28,837.60	$ 569.25	$ 8.35	$ 2.19	$ 579.79	$ 31,308.75	$ 459.25	$ 120.45	$ 70,154.59	X2.2
55	051223758100	W-Wide Flange-Column: W14X730	E5	1035	0.077	L.F.	$ 517.50	$ 4.83	$ 1.99	$ 524.32	$ 28,462.50	$ 265.65	$ 109.45	$ 28,837.60	$ 569.25	$ 8.35	$ 2.19	$ 579.79	$ 31,308.75	$ 459.25	$ 120.45	$ 76,532.28	X2.4
Total											**$ 226,885.74**	**$ 6,876.11**	**$ 1,327.71**	**$ 235,089.53**					**$ 249,633.47**	**$ 12,084.61**	**$ 1,460.81**	**$ 940,651.99**	
																					$3,163,071.33	**TOTAL**	
																					$ 177,131,994.66	BLDG TOTAL	

Figure 145: General Conditions Estimate

Division	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Quantity	Total Material	Total Labor	Total Equipment	Total Cost
01 51 13.20	**Field Personnel**													
0020	Clerk, 6				Week		$ 380.00		$ 380.00	1,092	$ -	$ 414,960.00	$ -	$ 414,960.00
0140	Field Engineer, 45				Week		$ 1,350.00		$ 1,350.00	8,190	$ -	$ 11,056,500.00	$ -	$ 11,056,500.00
0220	Project Manager, 20				Week		$ 2,175.00		$ 2,175.00	1,781	$ -	$ 3,873,675.00	$ -	$ 3,873,675.00
0280	Superintendant, 35				Week		$ 2,025.00		$ 2,025.00	3,714	$ -	$ 7,520,850.00	$ -	$ 7,520,850.00
														$ 22,865,985.00
01 51 13.80	**Temporary Utilities**													
0100	Heat, including fuel and operation, per week, 12 hrs	1 Skwk	100	0.08	CSF Flr	$ 27.00	$ 3.27		$ 30.27	13,846	$ 373,846.15	$ 45,276.92	$ -	$ 419,123.08
0350	Lighting, including service lamps, wiring, and outlets, maximum	1 Elec	17	0.471	CSF Flr	$ 5.70	$ 22.00		$ 27.70	15,000	$ 85,500.00	$ 330,000.00	$ -	$ 415,500.00
0600	Power for job duration including elevator, etc., min				CSF Flr				$ 47.00	15,000	$ -	$ -	$ -	$ 705,000.00
0650	Power for job duration including elevator, etc., max				CSF Flr				$ 110.00	15,000	$ -	$ -	$ -	$ 1,650,000.00
														$ 3,189,623.08
10 52 13.20	**Office and Storage Space**													
0020	Trailer, furnished, no hookups, 20' x 8', rent per month, 8 Trailers				Each	$ 163.00			$ 163.00	576	$ 93,888.00	$ -	$ -	$ 93,888.00
0700	AC, rent per month, add				Each	$ 41.00			$ 41.00	576	$ 23,616.00	$ -	$ -	$ 23,616.00
0800	For delivery, add per mile				Mile	$ 4.50			$ 4.50	600	$ 2,700.00	$ -	$ -	$ 2,700.00
														$ 120,204.00
01 52 13.40	**Field Office Expense**													
0100	Office Equipment rental average				Month	$ 155.00			$ 155.00	384	$ 59,520.00	$ -	$ -	$ 59,520.00
0120	Office supplies, average				Month	$ 85.00			$ 85.00	384	$ 32,640.00	$ -	$ -	$ 32,640.00
0140	Telephone bill; avg. bill per month				Month	$ 80.00			$ 80.00	384	$ 30,720.00	$ -	$ -	$ 30,720.00
0160	Lights & HVAC				Month	$ 150.00			$ 150.00	384	$ 57,600.00	$ -	$ -	$ 57,600.00
														$ 180,480.00
01 54 19.50	**Truck Crane**													
0600	Truck Mounted, hydrolic, 100 ton capacity				Month			$ 14,100.00	$ 14,100.00	16	$ -	$ -	$ 225,600.00	$ 225,600.00
	Crew				Day		$ 104.90		$ 104.90	320	$ -	$ 33,568.00	$ -	$ 33,568.00
														$ 225,600.00
01 54 19.60	**Monthly Tower Crane Crew**													
0100	Crane, climbing, 106' jib, 6000 lb. capacity, 410 FPM				Month			$ 13,200.00	$ 13,200.00	60	$ -	$ -	$ 792,000.00	$ 792,000.00
	Tower Crane Crew				Day		$ 37.40		$ 37.40	2,400	$ -	$ 89,760.00	$ -	$ 89,760.00
4550	Hoist and tower, mast type, 6000 lb., 100' high, month				Each		$ 1,161.60	$ 2,975.00	$ 4,136.60	86	$ -	$ 100,362.24	$ 257,040.00	$ 357,402.24
4570	for each added 10' section, add, month				Each		$ 19.20	$ 177.00	$ 196.20	5,616	$ -	$ 107,827.20	$ 994,032.00	$ 1,101,859.20
														$ 2,341,021.44
01 56 26.50	**Temporary Fencing**													
0020	Chain Link, 11 ga, 6' high	2 Clab	400	0.04	L.F.	$ 7.25	$ 1.26		$ 8.51	980	$ 7,105.00	$ 1,234.80	$ -	$ 8,339.80
	Plywood, painted, 4' x 4' frame, 8' high	A-4	110	0.218	L.F.	$ 9.85	$ 8.35		$ 18.20	980	$ 9,653.00	$ 8,183.00	$ -	$ 17,836.00
														$ 26,175.80
01 56 29.50	**Temporary Protective Walkways**													
2200	Sidewalk, 2" x 12" planks, 2 uses	1 Carp	350	0.023	S.F.	$ 0.69	$ 0.91		$ 1.60	16,000	$ 11,040.00	$ 14,560.00	$ -	$ 25,600.00
2500	Exterior Plywood, 2 uses, 3/4" thick	1 Carp	600	0.013	S.F.	$ 0.42	$ 0.53		$ 0.95	16,000	$ 6,720.00	$ 8,480.00	$ -	$ 15,200.00
														$ 40,800.00
01 58 13.50	**Signs**													
0020	High intensity reflectorized, no posts, buy				S.F.	$ 21.00			$ 21.00	1,000	$ 21,000.00	$ -	$ -	$ 21,000.00
01 74 13.20	**Cleaning Up**													
0040	Maximum				Job				0.8%	1,000,000,000	$ -	$ -	$ -	$ 8,000,000.00
0050	Cleanup of floor area, continuous, per day, during construction	A-5	24	0.75	M.S.F.	$ 1.70	$ 23.50	$ 2.03	$ 27.23	1,670	$ 2,839.63	$ 39,254.40	$ 3,390.91	$ 45,484.99
0100	Final by GC at end of job	A-5	11.5	1.565	M.S.F.	$ 2.71	$ 49.50	$ 4.23	$ 56.44	1,670	$ 4,526.78	$ 82,684.80	$ 7,065.79	$ 94,277.38
														$ 8,139,762.37
	Subtotal										$ 822,914.62	$ 23,727,176.36	$ 2,279,128.70	$ 74,313,871.37
	Adjusted for Location (New York City, 130.7)										$ 1,075,549.41	$ 31,011,419.51	$ 2,978,821.22	$ 97,128,229.88

7.2 Structural

Method 2 MWFRS Design Variables			
Varibles and Equations	Values		Reference
V =	110	mph	Figure 6-1
K_d =	0.85		Table 6-4
Occupancy	3		Table 1-1
Hurrican Prone?	No		
I =	1.15		Table 6-1
Surface Roughness Cat.	B		§ 6.5.6.2
Exposure Cat.	B		§ 6.5.6.2
K_{zt} =	1		§ 6.5.7
α =	7		Table 6-2
z_g =	1200	ft	Table 6-2

Table 64: Main Wind Force Resisting System Design Variables

East/West Wind Direction for MWFRS			
External Wall Pressure Coefficient (C_p)			
Surface	**L/B**	**C_p**	**Reference**
Windward	N/A	0.80	Figure 6-6
Leeward	0.81	-0.50	
Side	N/A	-0.70	
External Roof Pressure Coefficient (C_p)			
h/L	4.748408	Figure 6-6	
C_p	-1.3		
Area (sf)	25366		
Reduction Factor	0.8		
C_p Corrected	-1.04		
Internal Pressure Coefficient (C_{pi})			
GC_{pi}	0.18	Figure 6-5	
GC_{pi}	-0.18		

Table 65: East/West Wind Pressure Coefficients

North/South Wind Direction for MWFRS			
Wall Pressure Coeff. (C_p)			
Surface	**L/B**	**C_p**	Figure 6-6
Windward	N/A	0.80	
Leeward	1.24	-0.45	
Side	N/A	-0.70	
Roof Pressure Coeff. (C_p)			
h/L	3.842784	Figure 6-6	
C_p	-1.3		
Area (sf)	25366		
Reduction Factor	0.8		
C_p Corrected	-1.04		
Internal Pressure Coefficient (C_{pi})			
GC_{pi}	0.18	Figure 6-5	
GC_{pi}	-0.18		

Table 66: North/South Wind Pressure Coefficients

Gust Factor					
Varibles and Equations	Direction				Reference
	West-East		North-South		
h =	745.5	ft	745.5	ft	
B =	194	ft	157	ft	
L =	157	ft	194	ft	
T =	6.46	s	6.64	s	
$n_1 = 1/T =$	0.1548	Hz	0.1506	Hz	Eq. 12.8-7
	Flexible		Flexible		
$g_Q = g_v =$	3.40		3.40		§ 6.5.8.2
$g_r = \sqrt{2 \ln(3{,}600 n_1)} + 0.577 \sqrt{2 \ln(3{,}600 n_1)} =$	3.72		3.71		§ 6.5.8.2
z bar = max of .6h or z_{min} =	447.30		447.30		§ 6.5.8.1
$I_z = c(33/z\ bar)^{1/6}$	0.194		0.194		§ 6.5.8.1
$L_z = l(z\ bar/33)^{\epsilon} =$	762.98		762.98		§ 6.5.8.1
$Q = \sqrt{(1/(1+0.63(B+h/L_z)^{0.63}))} =$	0.763		0.767		§ 6.5.8.1
$V_z = b(z\ bar/33)^a V(88/60) =$	139.30		139.30		§ 6.5.8.2
$N_1 = n_1 L_z / V_z =$	0.848		0.825		§ 6.5.8.2
$R_n = 7.47 N_1 / (1+10.3 N_1)^{5/3} =$	0.143		0.145		§ 6.5.8.2
$\eta\ (R_h) = 4.6 n_1 \eta / V_z =$	3.811		3.707		§ 6.5.8.2
$R_h = 1/\eta - (1/2\eta^2)(1-e^{-2\eta}) =$	0.228		0.233		§ 6.5.8.2
$\eta\ (R_B) = 4.6 n_1 B / V_z =$	0.992		0.781		§ 6.5.8.2
$R_B = 1/\eta - (1/2\eta^2)(1-e^{-2\eta}) =$	0.570		0.633		§ 6.5.8.2
$\eta\ (R_L) = 15.4 n_1 L / V_z =$	2.687		3.230		§ 6.5.8.2
$R_L = 1/\eta - (1/2\eta^2)(1-e^{-2\eta}) =$	0.303		0.262		§ 6.5.8.2
$\zeta =$	0.0200		0.0200		
$R = \sqrt{((1/b)(R_n R_h R_B (0.53+0.47 R_L))} =$	0.790		0.835		§ 6.5.8.2
$G = 0.925(1+1.7 I_z g_Q Q) / (1+1.7 g_v I_z) =$	N/A		N/A		§ 6.5.8.1
$G_f = 0.925(1+1.7 I_z \sqrt{(g_Q^2 Q^2 + g_R^2 R^2)} / (1+1.7 g_v I_z) =$	1.000		1.019		§ 6.5.8.2

Figure 146: Gust Factor

Calculated Wind Pressures for MWFRS																
Height Above Ground (z) (ft)	West East Direction								North South Direction							
	K_z	q_z & q_h (psf)	GC_pq_z (psf)	GC_pq_h (psf)	$GC_{pi}q_h$ (psf)	p_{ww}	p_{lw}	p_{total} (psf)	K_z	q_z & q_h (psf)	GC_pq_z (psf)	GC_pq_h (psf)	$GC_{pi}q_h$ (psf)	p_{ww}	pl_w	p_{total} (psf)
15.00	0.57	17.40	13.92	-26.55	-9.56	4.35	-36.11	40.46	0.57	17.40	14.18	-24.50	-9.56	4.62	-34.07	38.68
33.39	0.72	21.87	17.49	-26.55	-9.56	7.93	-36.11	44.04	0.72	21.87	17.82	-24.50	-9.56	8.26	-34.07	42.33
48.86	0.81	24.39	19.50	-26.55	-9.56	9.94	-36.11	46.05	0.81	24.39	19.87	-24.50	-9.56	10.31	-34.07	44.38
63.76	0.87	26.31	21.04	-26.55	-9.56	11.48	-36.11	47.59	0.87	26.31	21.44	-24.50	-9.56	11.88	-34.07	45.94
77.79	0.92	27.85	22.27	-26.55	-9.56	12.71	-36.11	48.82	0.92	27.85	22.69	-24.50	-9.56	13.13	-34.07	47.20
91.54	0.96	29.18	23.33	-26.55	-9.56	13.77	-36.11	49.88	0.96	29.18	23.78	-24.50	-9.56	14.21	-34.07	48.28
105.29	1.00	30.37	24.28	-26.55	-9.56	14.72	-36.11	50.83	1.00	30.37	24.75	-24.50	-9.56	15.18	-34.07	49.25
119.04	1.04	31.45	25.15	-26.55	-9.56	15.59	-36.11	51.70	1.04	31.45	25.63	-24.50	-9.56	16.07	-34.07	50.13
132.79	1.07	32.45	25.95	-26.55	-9.56	16.39	-36.11	52.50	1.07	32.45	26.44	-24.50	-9.56	16.88	-34.07	50.95
146.54	1.10	33.37	26.69	-26.55	-9.56	17.13	-36.11	53.24	1.10	33.37	27.20	-24.50	-9.56	17.63	-34.07	51.70
160.29	1.13	34.24	27.38	-26.55	-9.56	17.82	-36.11	53.93	1.13	34.24	27.90	-24.50	-9.56	18.34	-34.07	52.41
174.04	1.16	35.06	28.03	-26.55	-9.56	18.47	-36.11	54.58	1.16	35.06	28.57	-24.50	-9.56	19.00	-34.07	53.07
188.38	1.18	35.86	28.67	-26.55	-9.56	19.11	-36.11	55.22	1.18	35.86	29.22	-24.50	-9.56	19.66	-34.07	53.72
202.13	1.21	36.59	29.26	-26.55	-9.56	19.69	-36.11	55.81	1.21	36.59	29.81	-24.50	-9.56	20.25	-34.07	54.32
215.29	1.23	37.25	29.79	-26.55	-9.56	20.23	-36.11	56.34	1.23	37.25	30.36	-24.50	-9.56	20.79	-34.07	54.86
229.04	1.25	37.92	30.32	-26.55	-9.56	20.76	-36.11	56.87	1.25	37.92	30.90	-24.50	-9.56	21.34	-34.07	55.40
242.79	1.27	38.55	30.83	-26.55	-9.56	21.27	-36.11	57.38	1.27	38.55	31.42	-24.50	-9.56	21.85	-34.07	55.92
256.54	1.29	39.17	31.32	-26.55	-9.56	21.76	-36.11	57.87	1.29	39.17	31.91	-24.50	-9.56	22.35	-34.07	56.42
270.29	1.31	39.75	31.79	-26.55	-9.56	22.23	-36.11	58.34	1.31	39.75	32.39	-24.50	-9.56	22.83	-34.07	56.90
284.04	1.33	40.32	32.24	-26.55	-9.56	22.68	-36.11	58.79	1.33	40.32	32.86	-24.50	-9.56	23.30	-34.07	57.36
297.79	1.35	40.87	32.68	-26.55	-9.56	23.12	-36.11	59.23	1.35	40.87	33.30	-24.50	-9.56	23.74	-34.07	57.81
311.54	1.37	41.40	33.11	-26.55	-9.56	23.54	-36.11	59.66	1.37	41.40	33.74	-24.50	-9.56	24.17	-34.07	58.24
325.29	1.38	41.91	33.52	-26.55	-9.56	23.96	-36.11	60.07	1.38	41.91	34.15	-24.50	-9.56	24.59	-34.07	58.66
339.04	1.40	42.41	33.92	-26.55	-9.56	24.35	-36.11	60.47	1.40	42.41	34.56	-24.50	-9.56	25.00	-34.07	59.07
352.79	1.42	42.90	34.30	-26.55	-9.56	24.74	-36.11	60.85	1.42	42.90	34.96	-24.50	-9.56	25.39	-34.07	59.46
366.54	1.43	43.37	34.68	-26.55	-9.56	25.12	-36.11	61.23	1.43	43.37	35.34	-24.50	-9.56	25.78	-34.07	59.84
380.71	1.45	43.84	35.06	-26.55	-9.56	25.50	-36.11	61.61	1.45	43.84	35.73	-24.50	-9.56	26.16	-34.07	60.23
401.75	1.47	44.52	35.60	-26.55	-9.56	26.04	-36.11	62.15	1.47	44.52	36.28	-24.50	-9.56	26.72	-34.07	60.78
422.38	1.49	45.16	36.11	-26.55	-9.56	26.55	-36.11	62.66	1.49	45.16	36.80	-24.50	-9.56	27.24	-34.07	61.31

Table 67: Calculated Wind Pressures for MWFRS Part A

436.13	1.51	45.58	36.45	-26.55	-9.56	26.88	-36.11	63.00	1.51	45.58	37.14	-24.50	-9.56	27.58	-34.07	61.64
449.88	1.52	45.98	36.77	-26.55	-9.56	27.21	-36.11	63.32	1.52	45.98	37.47	-24.50	-9.56	27.91	-34.07	61.97
463.63	1.53	46.38	37.09	-26.55	-9.56	27.53	-36.11	63.64	1.53	46.38	37.79	-24.50	-9.56	28.23	-34.07	62.30
477.38	1.54	46.77	37.40	-26.55	-9.56	27.84	-36.11	63.95	1.54	46.77	38.11	-24.50	-9.56	28.55	-34.07	62.62
491.13	1.56	47.15	37.70	-26.55	-9.56	28.14	-36.11	64.25	1.56	47.15	38.42	-24.50	-9.56	28.86	-34.07	62.93
504.88	1.57	47.52	38.00	-26.55	-9.56	28.44	-36.11	64.55	1.57	47.52	38.73	-24.50	-9.56	29.16	-34.07	63.23
518.63	1.58	47.89	38.30	-26.55	-9.56	28.73	-36.11	64.84	1.58	47.89	39.02	-24.50	-9.56	29.46	-34.07	63.53
532.38	1.59	48.25	38.58	-26.55	-9.56	29.02	-36.11	65.13	1.59	48.25	39.32	-24.50	-9.56	29.76	-34.07	63.82
546.13	1.61	48.60	38.86	-26.55	-9.56	29.30	-36.11	65.41	1.61	48.60	39.60	-24.50	-9.56	30.04	-34.07	64.11
559.88	1.62	48.95	39.14	-26.55	-9.56	29.58	-36.11	65.69	1.62	48.95	39.89	-24.50	-9.56	30.32	-34.07	64.39
573.63	1.63	49.29	39.41	-26.55	-9.56	29.85	-36.11	65.96	1.63	49.29	40.16	-24.50	-9.56	30.60	-34.07	64.67
587.38	1.64	49.62	39.68	-26.55	-9.56	30.12	-36.11	66.23	1.64	49.62	40.44	-24.50	-9.56	30.88	-34.07	64.94
601.13	1.65	49.95	39.95	-26.55	-9.56	30.38	-36.11	66.49	1.65	49.95	40.71	-24.50	-9.56	31.14	-34.07	65.21
614.88	1.66	50.28	40.20	-26.55	-9.56	30.64	-36.11	66.75	1.66	50.28	40.97	-24.50	-9.56	31.41	-34.07	65.47
628.63	1.67	50.60	40.46	-26.55	-9.56	30.90	-36.11	67.01	1.67	50.60	41.23	-24.50	-9.56	31.67	-34.07	65.73
642.38	1.68	50.91	40.71	-26.55	-9.56	31.15	-36.11	67.26	1.68	50.91	41.48	-24.50	-9.56	31.92	-34.07	65.99
656.13	1.69	51.22	40.96	-26.55	-9.56	31.39	-36.11	67.51	1.69	51.22	41.74	-24.50	-9.56	32.17	-34.07	66.24
669.88	1.70	51.52	41.20	-26.55	-9.56	31.64	-36.11	67.75	1.70	51.52	41.98	-24.50	-9.56	32.42	-34.07	66.49
683.63	1.71	51.82	41.44	-26.55	-9.56	31.88	-36.11	67.99	1.71	51.82	42.23	-24.50	-9.56	32.67	-34.07	66.73
697.38	1.72	52.12	41.68	-26.55	-9.56	32.11	-36.11	68.23	1.72	52.12	42.47	-24.50	-9.56	32.91	-34.07	66.97
711.46	1.73	52.42	41.92	-26.55	-9.56	32.35	-36.11	68.46	1.73	52.42	42.71	-24.50	-9.56	33.15	-34.07	67.22
732.08	1.75	52.85	42.26	-26.55	-9.56	32.70	-36.11	68.81	1.75	52.85	43.06	-24.50	-9.56	33.50	-34.07	67.57
745.50	1.75	53.12	21.24	-26.55	-9.56	11.68	-36.11	47.79	1.75	53.12	43.29	-24.50	-9.56	33.73	-34.07	67.79
802.00	1.79	54.24	21.69	-13.27	-9.56	12.13	-22.84	34.96								
819.00									1.80	54.57	44.47	-12.25	-9.56	34.90	-21.81	56.72

Table 68: Calculated Wind Pressures for MWFRS Part B

Calculated Wind Forces on Tower for MWFRS											
Level	Story Height (ft)	Height Above Ground (z) (ft)	Case 1 Loading (k)		Case 2 Loading (ft-k)		Case 3 Loading (k)		Case 4 Loading (ft-k)	Case 1 Story Shear (k)	
			West/ East	North/South	West/ East	North/South	West/ East	North/South		West/ East	North/South
1	25.66	0	101	78	2198	1376	76	58	2683	**8995**	**7001**
2	15.47	25.66	174	135	3801	2392	131	102	4649	8894	6923
3	15.47	41.13	138	108	3016	1903	104	81	3693	8720	6787
4	14.32	56.59	138	107	3001	1898	103	81	3678	8582	6680
5	13.75	70.92	133	104	2901	1837	100	78	3557	8445	6572
6	13.75	84.67	133	104	2904	1841	100	78	3562	8312	6468
7	13.75	98.42	136	106	2959	1878	102	80	3631	8179	6364
8	13.75	112.17	138	108	3010	1911	103	81	3694	8043	6258
9	13.75	125.92	140	110	3056	1942	105	82	3752	7905	6149
10	13.75	139.67	142	112	3099	1971	107	84	3806	7765	6039
11	13.75	153.42	144	113	3140	1998	108	85	3857	7623	5928
12	13.75	167.17	146	115	3178	2024	109	86	3904	7479	5815
13	14.92	180.92	154	121	3351	2135	115	91	4119	7334	5700
14	12.58	195.83	149	117	3249	2071	112	88	3994	7180	5579
15	13.75	208.42	144	113	3141	2003	108	85	3861	7031	5462
16	13.75	222.17	152	120	3311	2112	114	90	4071	6887	5348
17	13.75	235.92	153	121	3340	2132	115	91	4108	6736	5229
18	13.75	249.67	154	122	3369	2151	116	91	4144	6583	5108
19	13.75	263.42	156	123	3396	2169	117	92	4178	6428	4986
20	13.75	277.17	157	124	3423	2187	118	93	4211	6273	4863
21	13.75	290.92	158	125	3448	2204	118	94	4243	6116	4740
22	13.75	304.67	159	126	3473	2221	119	94	4274	5958	4615
23	13.75	318.42	160	127	3497	2237	120	95	4304	5799	4489
24	13.75	332.17	161	128	3520	2252	121	96	4333	5638	4363
25	13.75	345.92	162	128	3543	2267	122	96	4361	5477	4235
26	13.75	359.67	163	129	3565	2282	122	97	4389	5315	4107
27	14.58	373.42	169	134	3695	2366	127	100	4550	5151	3977
28	27.50	388.00	254	201	5537	3547	190	151	6819	4982	3844
29	13.75	415.50	251	199	5472	3506	188	149	6740	4728	3643
30	13.75	429.25	168	133	3667	2350	126	100	4517	4478	3444

Table 69: Calculated Wind Forces on Tower for MWFRS Part A

31	13.75	443.00	169	134	3686	2363	127	100	4541	4310	3311
32	13.75	456.75	170	134	3705	2375	127	101	4564	4141	3177
33	13.75	470.50	171	135	3723	2387	128	101	4587	3971	3043
34	13.75	484.25	171	136	3741	2399	129	102	4609	3800	2908
35	13.75	498.00	172	136	3758	2411	129	102	4631	3629	2772
36	13.75	511.75	173	137	3775	2422	130	103	4652	3457	2635
37	13.75	525.50	174	138	3792	2433	130	103	4673	3284	2498
38	13.75	539.25	174	138	3808	2444	131	104	4694	3110	2360
39	13.75	553.00	175	139	3824	2455	131	104	4714	2936	2222
40	13.75	566.75	176	140	3840	2466	132	105	4734	2760	2083
41	13.75	580.50	177	140	3856	2476	133	105	4753	2584	1943
42	13.75	594.25	177	141	3871	2486	133	106	4772	2408	1803
43	13.75	608.00	178	141	3886	2496	134	106	4791	2230	1662
44	13.75	621.75	179	142	3901	2506	134	106	4810	2052	1521
45	13.75	635.50	179	142	3916	2516	135	107	4828	1874	1379
46	13.75	649.25	180	143	3930	2526	135	107	4846	1694	1237
47	13.75	663.00	181	144	3944	2535	136	108	4864	1514	1094
48	13.75	676.75	181	144	3958	2544	136	108	4881	1333	950
49	13.75	690.50	182	145	3972	2554	136	108	4899	1152	806
50	14.42	704.25	187	149	4083	2625	140	111	5035	970	662
51	26.83	718.67	275	219	6009	3864	206	164	7412	783	513
Roof		745.50	124	143	2715	2522	93	107	3931	508	294
Screen 1	56.50	802.00	383	0	8364	0	287	0	6278	383	0
Screen 2	73.50	819.00	0	151	0	2674	0	114	2007	0	151

Table 70: Calculated Wind Forces on Tower for MWFRS Part B

Proportioned Wind Forces on Tower for MWFRS											
Level	**Story Height (ft)**	**Height Above Ground (z) (ft)**	**Case 1 Loading (k)**		**Case 2 Loading (ft-k)**		**Case 3 Loading (k)**		**Case 4 Loading (ft-k)**	**Case 1 Story Shear (k)**	
			West/ East	**North/South**	**West/ East**	**North/South**	**West/ East**	**North/South**		**West/ East**	**North/South**
1	25.66	0	44	36	969	644	33	27	1211	**3968**	**3278**
2	15.47	25.66	77	63	1677	1120	58	48	2099	3923	3241
3	15.47	41.13	61	50	1330	891	46	38	1668	3846	3178
4	14.32	56.59	61	50	1324	889	45	38	1661	3785	3127
5	13.75	70.92	59	49	1280	860	44	37	1606	3725	3077
6	13.75	84.67	59	49	1281	862	44	37	1608	3666	3028
7	13.75	98.42	60	50	1305	879	45	37	1640	3607	2979
8	13.75	112.17	61	51	1328	895	46	38	1668	3548	2930
9	13.75	125.92	62	51	1348	909	46	39	1695	3487	2879
10	13.75	139.67	63	52	1367	923	47	39	1719	3425	2827
11	13.75	153.42	63	53	1385	936	48	40	1742	3362	2775
12	13.75	167.17	64	54	1402	947	48	40	1763	3299	2722
13	14.92	180.92	68	57	1478	1000	51	42	1860	3235	2669
14	12.58	195.83	66	55	1433	970	49	41	1804	3167	2612
15	13.75	208.42	63	53	1385	938	48	40	1744	3101	2557
16	13.75	222.17	67	56	1460	989	50	42	1839	3038	2504
17	13.75	235.92	68	57	1473	998	51	42	1855	2971	2448
18	13.75	249.67	68	57	1486	1007	51	43	1871	2903	2391
19	13.75	263.42	69	58	1498	1016	51	43	1887	2835	2334
20	13.75	277.17	69	58	1510	1024	52	43	1902	2767	2277
21	13.75	290.92	70	58	1521	1032	52	44	1916	2697	2219
22	13.75	304.67	70	59	1532	1040	53	44	1930	2628	2161
23	13.75	318.42	71	59	1542	1047	53	44	1944	2558	2102
24	13.75	332.17	71	60	1553	1054	53	45	1957	2487	2042
25	13.75	345.92	72	60	1563	1061	54	45	1970	2416	1983
26	13.75	359.67	72	60	1572	1068	54	45	1982	2344	1923
27	14.58	373.42	75	63	1630	1108	56	47	2055	2272	1862
28	27.50	388.00	112	94	2442	1660	84	71	3080	2197	1799
29	13.75	415.50	111	93	2414	1642	83	70	3044	2086	1705
30	13.75	429.25	74	62	1618	1100	56	47	2040	1975	1612

Table 71: Proportioned Wind Forces Part A

31	13.75	443.00	74	63	1626	1106	56	47	2051	1901	1550
32	13.75	456.75	75	63	1634	1112	56	47	2061	1826	1488
33	13.75	470.50	75	63	1642	1118	56	47	2072	1751	1425
34	13.75	484.25	76	64	1650	1123	57	48	2082	1676	1361
35	13.75	498.00	76	64	1658	1129	57	48	2092	1601	1298
36	13.75	511.75	76	64	1665	1134	57	48	2101	1525	1234
37	13.75	525.50	77	65	1672	1139	57	48	2111	1448	1170
38	13.75	539.25	77	65	1680	1144	58	49	2120	1372	1105
39	13.75	553.00	77	65	1687	1149	58	49	2129	1295	1040
40	13.75	566.75	78	65	1694	1154	58	49	2138	1218	975
41	13.75	580.50	78	66	1701	1159	58	49	2147	1140	910
42	13.75	594.25	78	66	1707	1164	59	49	2156	1062	844
43	13.75	608.00	79	66	1714	1169	59	50	2164	984	778
44	13.75	621.75	79	66	1721	1173	59	50	2172	905	712
45	13.75	635.50	79	67	1727	1178	59	50	2181	826	646
46	13.75	649.25	79	67	1733	1182	60	50	2189	747	579
47	13.75	663.00	80	67	1740	1187	60	50	2197	668	512
48	13.75	676.75	80	67	1746	1191	60	51	2205	588	445
49	13.75	690.50	80	68	1752	1196	60	51	2213	508	377
50	14.42	704.25	83	70	1801	1229	62	52	2274	428	310
51	26.83	718.67	121	102	2650	1809	91	77	3348	345	240
Roof		745.50	55	138	1197	2433	41	103	2725	224	138
Screen 1	56.50	802.00	169	0	3689	0	127	0	2769	169	0
Screen 2	73.50	819.00	0	71	0	1252	0	53	940	0	71

Table 72: Proportioned Wind Forces Part B

The follow structural weights were taking from the Revit model and include only the tower. The total weight per floor is divided by the square footage of the floor which is equal to 25888.55 square feet. The gravity mass/area was calculated to be used in the ETABs model to calculate the period of vibration of the structure.

Story	Slab Weight (k)	Concrete Beam Weight (k)	Steel Beam Weight (k)	Column Weight (k)	Shear Wall Weight (k)	Façade Weight (k)	Partition Weight (k)	Total Weight (k)	Total Weight (psf)	Gravity Weight (psf)	Gravity Mass/ Area (Kip-in)
1	2201	68	394	546	2003	454	518	6182	238.79	158.83	2.85E-06
2	1191	68	211	336	1590	335	518	4248	164.09	100.06	1.80E-06
3	1191	68	226	268	1406	314	518	3991	154.15	97.22	1.75E-06
4	1191	68	278	268	1406	314	518	4043	156.18	99.25	1.78E-06
5	1191	68	208	251	1313	293	518	3840	148.33	95.03	1.71E-06
6	1191	68	188	138	1219	272	518	3594	138.82	89.14	1.60E-06
7	1191	68	189	149	1313	293	518	3720	143.71	90.41	1.62E-06
8	1191	68	172	149	1313	293	518	3703	143.02	89.72	1.61E-06
9	1191	68	172	137	1313	293	518	3691	142.57	89.26	1.60E-06
10	1191	68	172	127	1219	272	518	3566	137.76	88.07	1.58E-06
11	1191	68	172	147	1406	314	518	3815	147.37	90.45	1.63E-06
12	1191	68	172	117	1219	272	518	3556	137.37	87.69	1.58E-06
13	1191	68	174	127	1313	293	518	3682	142.23	88.93	1.60E-06
14	1191	68	168	117	1219	272	518	3553	137.23	87.55	1.57E-06
15	1191	68	164	15	1313	293	518	3561	137.57	84.26	1.51E-06
16	1191	68	160	15	1313	293	518	3557	137.4	84.1	1.51E-06
17	1191	68	160	15	1313	293	518	3557	137.4	84.1	1.51E-06
18	1191	68	160	94	1219	272	518	3522	136.03	86.34	1.55E-06
19	1191	68	160	102	1313	293	518	3644	140.74	87.44	1.57E-06
20	1191	68	160	102	1313	293	518	3644	140.74	87.44	1.57E-06
21	1191	68	160	100	1313	293	518	3642	140.68	87.38	1.57E-06
22	1191	68	160	93	1219	272	518	3520	135.98	86.29	1.55E-06
23	1191	68	160	100	1313	293	518	3642	140.68	87.38	1.57E-06
24	1191	68	160	100	1313	293	518	3642	140.68	87.38	1.57E-06
25	1191	68	160	100	1313	293	518	3642	140.68	87.38	1.57E-06
26	1191	68	160	93	1219	272	518	3520	135.98	86.29	1.55E-06
27	1191	68	160	100	1313	293	518	3642	140.68	87.38	1.57E-06
28	1191	68	197	193	2531	566	518	5263	203.3	102.92	1.85E-06
29	1191	68	168	100	1313	293	518	3651	141.01	87.71	1.58E-06
30	1191	68	167	66	895	293	518	3197	123.48	86.31	1.55E-06

Figure 147: Structural Tower Weight Take-offs, Part A

31	1191	18	151	61	831	272	518	3042	117.49	84.7	1.52E-06
32	1191	18	151	66	895	293	518	3131	120.95	85.69	1.54E-06
33	1191	18	151	58	895	293	518	3124	120.66	85.4	1.53E-06
34	1191	18	151	58	895	293	518	3124	120.66	85.41	1.53E-06
35	1191	18	151	54	831	272	518	3035	117.22	84.44	1.52E-06
36	1191	18	151	50	895	293	518	3116	120.35	85.1	1.53E-06
37	1191	18	151	50	895	293	518	3116	120.36	85.1	1.53E-06
38	1191	18	152	50	1063	293	518	3285	126.89	85.15	1.53E-06
39	1191	18	152	42	831	272	518	3023	116.79	84	1.51E-06
40	1191	18	152	45	895	293	518	3112	120.19	84.94	1.53E-06
41	1191	18	152	45	665	293	518	2882	111.31	84.93	1.53E-06
42	1191	14	151	38	665	293	518	2869	110.84	84.64	1.52E-06
43	1191	14	152	35	617	272	518	2798	108.1	83.73	1.50E-06
44	1191	14	151	38	665	293	518	2870	110.84	84.65	1.52E-06
45	1191	14	151	31	665	293	518	2863	110.58	84.39	1.52E-06
46	1191	14	152	31	665	293	518	2863	110.59	84.39	1.52E-06
47	1191	14	153	29	617	272	518	2794	107.9	83.54	1.50E-06
48	1191	14	153	29	665	293	518	2862	110.55	84.35	1.52E-06
49	1191	14	153	29	665	293	518	2862	110.56	84.36	1.52E-06
50	1191	14	153	29	665	293	518	2862	110.56	84.36	1.52E-06
51	1191	14	298	57	1306	576	518	3959	152.94	101.98	1.83E-06
52	2201	14	215	0	0	0	518	2947	113.84	113.31	2.04E-06
								180568	**6974.83**		

Figure 148: Structural Tower Weight Take-offs, Part B

Site and Soil Classification				
New York City Building Code				
2-65 (medium hard rock)	recommended by geotechnical report			
4-65 (soft rock)	in areas of lower bearing capacity			
ASCE 7-05				
Building Height, h	=	745.5	ft	
Site Class	=	C		
Occupancy Category	=	3	Table 1-1	
Importance Factor, I	=	1.25	Table 11.5-1	
Latitude	=	40.756		
Longitude	=	-73.990		
Zip Code	=	10018		

Table 73: Site and Soil Classification

Spectral Response Acceleration					
	F_a	=	1.20		USGS Ground Motion Parameter Calculator
	F_v	=	1.70		
T = 0.2 s	S_S	=	0.363	g	
	S_{MS}	=	0.436	g	
	S_{DS}	=	0.290	g	
T = 1.0 s	S_1	=	0.070	g	
	S_{M1}	=	0.119	g	
	S_{D1}	=	0.079	g	
Seismic Design Cat.	S_{DS}	=	B	Table 11.6-1	
	S_{D1}	=	B	Table 11.6-2	

Table 74: Spectral Response Acceleration

North-South Base Shear					
	R	=	4	System	Table 12.2-1
	C_d	=	4.5		Table 12.2-1
	C_T	=	0.02		Table 12.8-2
	h_n	=	745.5	ft	
	x	=	0.75		Table 12.8-2
	C_u	=	1.7		Table 12.8-1
	T_a	=	2.853	s	Eq. 12.8-7
T = min of	C_uT_a	=	4.851	s	12.8.2
	T_b	=	6.77	s	Computer Output
	T_L	=	6	s	Figure 22-15
C_s =	$S_{DS}/(R/I)$	=	0.0908		Eq 12.8-2
	$S_{D1}/(TR/I)$	=	0.0051		Eq 12.8-3
	$S_{D1}T_L/(T^2R/I)$	=	0.0063		Eq 12.8-4
		=	0.0100		Eq 12.8-5
	$0.5S_1/(R/I)$	=	0.0109		Eq 12.8-6
	W	=	180568	K	
	$V_b = C_sW$	=	1806	K	Eq 12.8-1

Table 75: North-South Base Shear Calculations

West-East Direction Base Shear					
	R	=	4	System	Table 12.2-1
	C_d	=	4.5		Table 12.2-1
	C_T	=	0.02		Table 12.8-2
	h_n	=	745.5	ft	
	x	=	0.75		Table 12.8-2
	C_u	=	1.7		Table 12.8-1
	T_a	=	2.853	s	Eq. 12.8-7
T = min of	C_uT_a	=	4.851	s	12.8.2
	T_b	=	6.36	s	Model
	T_L	=	6	s	Figure 22-15
C_s =	$S_{DS}/(R/I)$	=	0.0908		Eq 12.8-2
	$S_{D1}/(TR/I)$	=	0.0051	<0.01	Eq 12.8-3
	$S_{D1}T_L/(T^2R/I)$	=	0.0063	<0.01	Eq 12.8-4
		=	0.0100		Eq 12.8-5
	$0.5S_1/(R/I)$	=	0.0109		Eq 12.8-6
	W	=	180568	K	
	$V_b = C_sW$	=	1806	K	Eq 12.8-1

Table 76: West-East Direction Base Shear Calculations

North-South Direction Loading

T = 4.851 s
k = 2.000
V_b = 1806 K

Level, i	h (ft)	h_i (ft)	w (kips)	wh^k	C_{vx}	f_i (kips)	V_i (kips)
Roof		745.50	2947	1.64E+09	0.0541	97.60	97.60
51	26.83	718.67	3959	2.04E+09	0.0675	121.86	219.47
50	14.42	704.25	2862	1.42E+09	0.0468	84.59	304.06
49	13.75	690.50	2862	1.36E+09	0.0450	81.32	385.38
48	13.75	676.75	2862	1.31E+09	0.0433	78.11	463.49
47	13.75	663.00	2794	1.23E+09	0.0405	73.18	536.67
46	13.75	649.25	2863	1.21E+09	0.0398	71.91	608.58
45	13.75	635.50	2863	1.16E+09	0.0382	68.90	677.48
44	13.75	621.75	2870	1.11E+09	0.0366	66.11	743.59
43	13.75	608.00	2798	1.03E+09	0.0341	61.65	805.24
42	13.75	594.25	2869	1.01E+09	0.0334	60.39	865.62
41	13.75	580.50	2882	9.71E+08	0.0320	57.87	923.49
40	13.75	566.75	3112	9.99E+08	0.0330	59.56	983.05
39	13.75	553.00	3023	9.25E+08	0.0305	55.10	1038.14
38	13.75	539.25	3285	9.55E+08	0.0315	56.93	1095.07
37	13.75	525.50	3116	8.6E+08	0.0284	51.28	1146.34
36	13.75	511.75	3116	8.16E+08	0.0269	48.63	1194.97
35	13.75	498.00	3035	7.53E+08	0.0248	44.85	1239.82
34	13.75	484.25	3124	7.33E+08	0.0242	43.65	1283.47
33	13.75	470.50	3124	6.91E+08	0.0228	41.21	1324.68
32	13.75	456.75	3131	6.53E+08	0.0216	38.93	1363.61
31	13.75	443.00	3042	5.97E+08	0.0197	35.57	1399.18
30	13.75	429.25	3197	5.89E+08	0.0194	35.10	1434.28
29	13.75	415.50	3651	6.3E+08	0.0208	37.56	1471.83
28	27.50	388.00	5263	7.92E+08	0.0261	47.22	1519.05
27	14.58	373.42	3642	5.08E+08	0.0168	30.26	1549.32

West-East Direction Loading

T = 4.851 s
k = 2.000
V_b = 1806 K

Level, i	h (ft)	h_i (ft)	w (kips)	wh^k	C_{vx}	f_i (kips)	V_i (kips)
Roof		745.50	2947	1.64E+09	0.0541	97.60	97.60
51	26.83	718.67	3959	2.04E+09	0.0675	121.86	219.47
50	14.42	704.25	2862	1.42E+09	0.0468	84.59	304.06
49	13.75	690.50	2862	1.36E+09	0.0450	81.32	385.38
48	13.75	676.75	2862	1.31E+09	0.0433	78.11	463.49
47	13.75	663.00	2794	1.23E+09	0.0405	73.18	536.67
46	13.75	649.25	2863	1.21E+09	0.0398	71.91	608.58
45	13.75	635.50	2863	1.16E+09	0.0382	68.90	677.48
44	13.75	621.75	2870	1.11E+09	0.0366	66.11	743.59
43	13.75	608.00	2798	1.03E+09	0.0341	61.65	805.24
42	13.75	594.25	2869	1.01E+09	0.0334	60.39	865.62
41	13.75	580.50	2882	9.71E+08	0.0320	57.87	923.49
40	13.75	566.75	3112	9.99E+08	0.0330	59.56	983.05
39	13.75	553.00	3023	9.25E+08	0.0305	55.10	1038.14
38	13.75	539.25	3285	9.55E+08	0.0315	56.93	1095.07
37	13.75	525.50	3116	8.6E+08	0.0284	51.28	1146.34
36	13.75	511.75	3116	8.16E+08	0.0269	48.63	1194.97
35	13.75	498.00	3035	7.53E+08	0.0248	44.85	1239.82
34	13.75	484.25	3124	7.33E+08	0.0242	43.65	1283.47
33	13.75	470.50	3124	6.91E+08	0.0228	41.21	1324.68
32	13.75	456.75	3131	6.53E+08	0.0216	38.93	1363.61
31	13.75	443.00	3042	5.97E+08	0.0197	35.57	1399.18
30	13.75	429.25	3197	5.89E+08	0.0194	35.10	1434.28
29	13.75	415.50	3651	6.3E+08	0.0208	37.56	1471.83
28	27.50	388.00	5263	7.92E+08	0.0261	47.22	1519.05
27	14.58	373.42	3642	5.08E+08	0.0168	30.26	1549.32

Table 77: North-South & West-East Seismic Forces, Part A

26	13.75	359.67	3520	4.55E+08	0.0150	27.14	1576.45
25	13.75	345.92	3642	4.36E+08	0.0144	25.97	1602.42
24	13.75	332.17	3642	4.02E+08	0.0133	23.95	1626.37
23	13.75	318.42	3642	3.69E+08	0.0122	22.01	1648.37
22	13.75	304.67	3520	3.27E+08	0.0108	19.47	1667.85
21	13.75	290.92	3642	3.08E+08	0.0102	18.37	1686.22
20	13.75	277.17	3644	2.8E+08	0.0092	16.68	1702.90
19	13.75	263.42	3644	2.53E+08	0.0083	15.07	1717.96
18	13.75	249.67	3522	2.2E+08	0.0072	13.08	1731.04
17	13.75	235.92	3557	1.98E+08	0.0065	11.80	1742.84
16	13.75	222.17	3557	1.76E+08	0.0058	10.46	1753.30
15	13.75	208.42	3561	1.55E+08	0.0051	9.22	1762.52
14	12.58	195.83	3553	1.36E+08	0.0045	8.12	1770.64
13	14.92	180.92	3682	1.21E+08	0.0040	7.18	1777.82
12	13.75	167.17	3556	99381382	0.0033	5.92	1783.75
11	13.75	153.42	3815	89799834	0.0030	5.35	1789.10
10	13.75	139.67	3566	69567289	0.0023	4.15	1793.24
9	13.75	125.92	3691	58517891	0.0019	3.49	1796.73
8	13.75	112.17	3703	46584979	0.0015	2.78	1799.51
7	13.75	98.42	3720	36035785	0.0012	2.15	1801.65
6	13.75	84.67	3594	25762831	0.0009	1.54	1803.19
5	13.75	70.92	3840	19312407	0.0006	1.15	1804.34
4	14.32	56.59	4043	12950049	0.0004	0.77	1805.11
3	15.47	41.13	3991	6749258	0.0002	0.40	1805.51
2	15.47	25.66	4248	2796195	0.0001	0.17	1805.68
1	25.66	0.00	6182	0	0.0000	0.00	1805.68
		Σ	180568	3.03E+10		1806	

26	13.75	359.67	3520	4.55E+08	0.0150	27.14	1576.45
25	13.75	345.92	3642	4.36E+08	0.0144	25.97	1602.42
24	13.75	332.17	3642	4.02E+08	0.0133	23.95	1626.37
23	13.75	318.42	3642	3.69E+08	0.0122	22.01	1648.37
22	13.75	304.67	3520	3.27E+08	0.0108	19.47	1667.85
21	13.75	290.92	3642	3.08E+08	0.0102	18.37	1686.22
20	13.75	277.17	3644	2.8E+08	0.0092	16.68	1702.90
19	13.75	263.42	3644	2.53E+08	0.0083	15.07	1717.96
18	13.75	249.67	3522	2.2E+08	0.0072	13.08	1731.04
17	13.75	235.92	3557	1.98E+08	0.0065	11.80	1742.84
16	13.75	222.17	3557	1.76E+08	0.0058	10.46	1753.30
15	13.75	208.42	3561	1.55E+08	0.0051	9.22	1762.52
14	12.58	195.83	3553	1.36E+08	0.0045	8.12	1770.64
13	14.92	180.92	3682	1.21E+08	0.0040	7.18	1777.82
12	13.75	167.17	3556	99381382	0.0033	5.92	1783.75
11	13.75	153.42	3815	89799834	0.0030	5.35	1789.10
10	13.75	139.67	3566	69567289	0.0023	4.15	1793.24
9	13.75	125.92	3691	58517891	0.0019	3.49	1796.73
8	13.75	112.17	3703	46584979	0.0015	2.78	1799.51
7	13.75	98.42	3720	36035785	0.0012	2.15	1801.65
6	13.75	84.67	3594	25762831	0.0009	1.54	1803.19
5	13.75	70.92	3840	19312407	0.0006	1.15	1804.34
4	14.32	56.59	4043	12950049	0.0004	0.77	1805.11
3	15.47	41.13	3991	6749258	0.0002	0.40	1805.51
2	15.47	25.66	4248	2796195	0.0001	0.17	1805.68
1	25.66	0.00	6182	0	0.0000	0.00	1805.68
		Σ	180568	3.03E+10		1806	

Table 78: North-South & West-East Seismic Forces, Part B

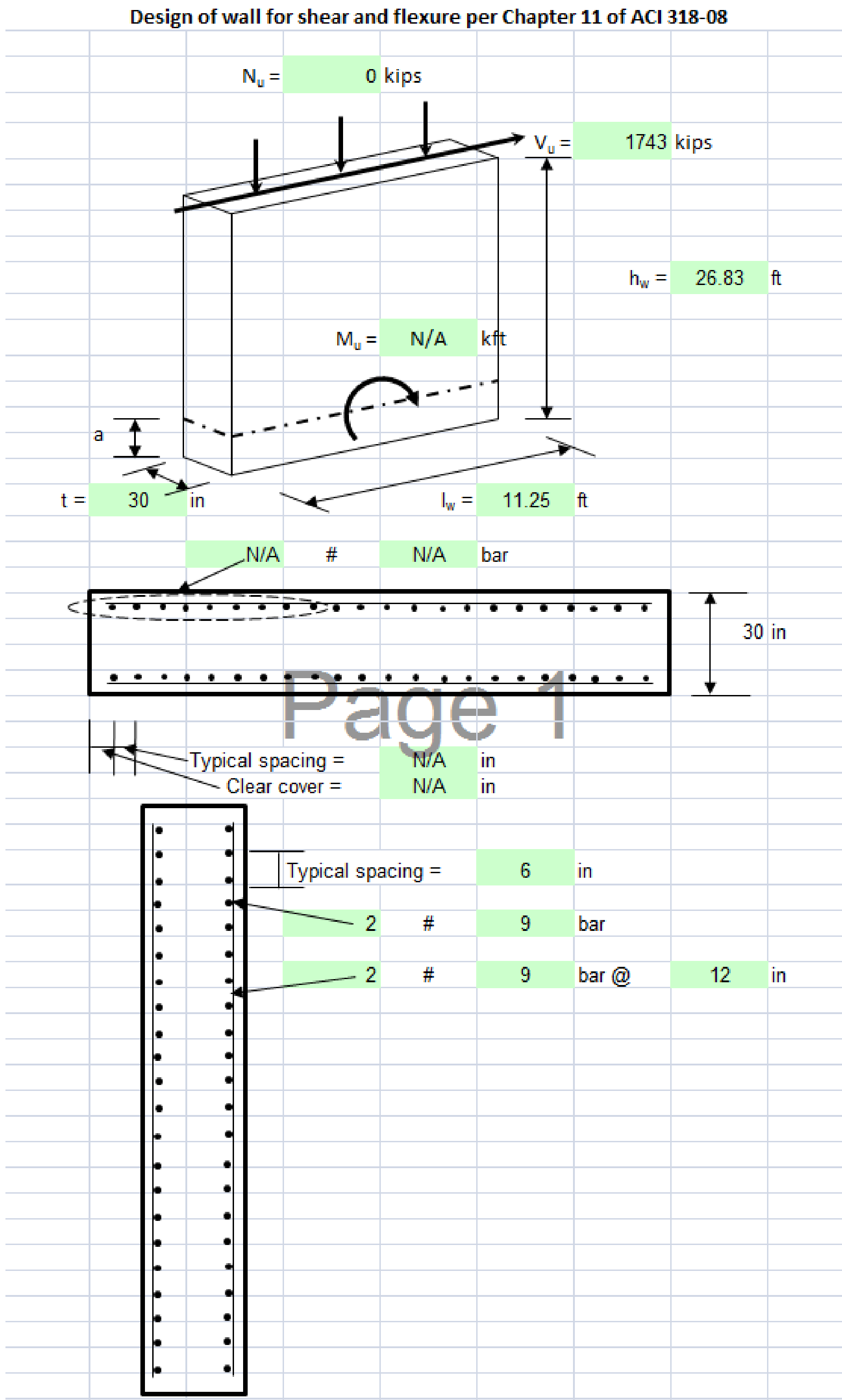


Figure 149: SW1 Y-direction hand calculations

Material Properties:								
f'_c =	10000	psi						
f_y =	60000	psi						
Check V_u < $\phi V_{n,max}$ =ϕ10SQRT(f'_c)hd per §11.9.3:								
$\phi V_{n,max}$ =ϕ10SQRT(f'_c)hd =			2430	kips	>	1743	kips	**OK**
Shear strength of concrete:								
a =min of	= l_w/2 =	5.625	ft					
	= h_w/2 =	13.4	ft					
	∴ a =	5.6	ft					
V_c =2SQRT(f'_c)hd =		648	kips					
V_c =3.3SQRT(f'_c)hd +N_ud/l_w=			1069	kips				
(M_u/V_u-l_w/2)=		187						
V_c =(0.6SQRT(f'_c) +l_w(1.25SQRT(f'_c)+0.2N_u/l_wh)/(M_u/V_u-l_w/2))hd=							487	kips
∴ V_c =	487	kips						
Determine required horizontal shear reinforcement:								
0.5ϕV_c =	183	kips						
$V_{s, req}$ =	1837	kips						
$A_{v,req}$ = V_ss/f_yd =		1.701	in^2					
$A_{v,used}$ =	2	in^2	**OK**					
s =	7.05	in spacing						
s_{used} =	6.00	in O.C.	**OK**					
ρ_t = A_v/sh =		0.0111	>	0.0025	**OK**			
s_{max} = min of	= l_w/5 =	27	in					
	= 3h =	90	in					
	=	18	in					
	∴ s =	18	in	>	6.00	in	**OK**	
Determine required vertical shear reinforcement:								
ρ_l = A_v/sh =		0.0056						
$\rho_{l,min}$ = 0.0025+0.5(2.5-h_w/l_w)(ρ_t-0.0025) =				0.0030	<	ρ_l	**OK**	
			$\rho_{l,min}$ =	0.0025	<	ρ_l	**OK**	
			$\rho_{l,max}$ =	0.0111	>	ρ_l	**OK**	
s_{max} = min of	= l_w/3 =	45	in					
	= 3h =	90	in					
	=	18	in					
	∴ s =	18	in					
$A_{v,used}$ =	2	in^2						
s =	12.00	in spacing						
s_{used} =	12.00	in O.C.	>	12.00	in	**OK**		

Figure 150: SW1 Y-direction hand calculations

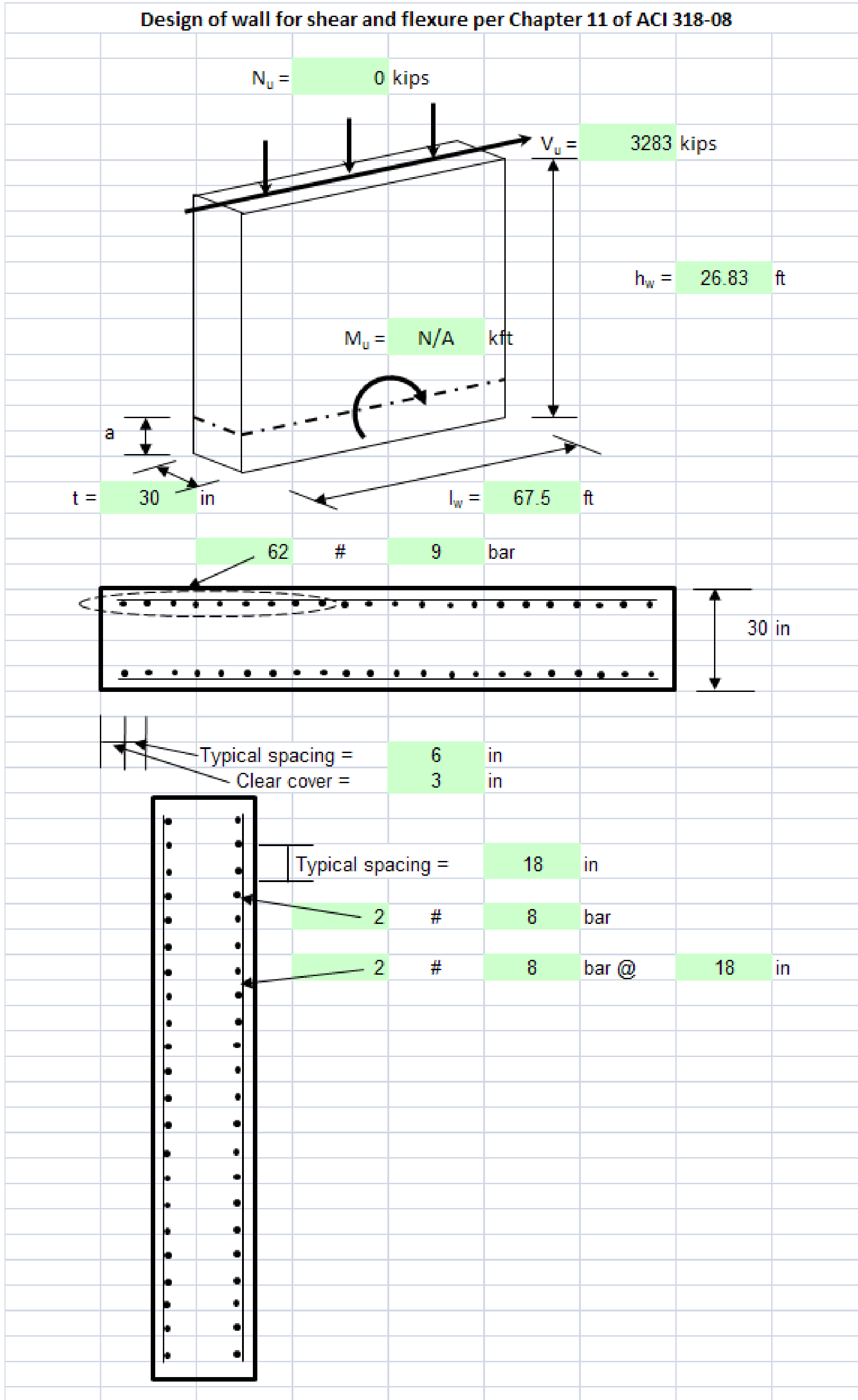


Figure 151: SW1 X-direction hand calculations

Material Properties:								
f'_c =	10000	psi						
f_y =	60000	psi						
Check V_u < $\phi V_{n,max}$ =ϕ10SQRT(f'_c)hd per §11.9.3:								
$\phi V_{n,max}$ =ϕ10SQRT(f'_c)hd =			14580	kips	>	3283	kips	**OK**
Shear strength of concrete:								
a =min of	= l_w/2 =	33.75	ft					
	= h_w/2 =	13.4	ft					
	∴ a =	13.4	ft					
V_c =2SQRT(f'_c)hd =		3888	kips					
V_c =3.3SQRT(f'_c)hd +N_ud/l_w=			6415	kips				
(M_u/V_u-l_w/2)=		-244						
V_c =(0.6SQRT(f'_c) +l_w(1.25SQRT(f'_c)+0.2N_u/l_wh)/(M_u/V_u-l_w/2))hd=							N/A	kips
∴ V_c =	6415	kips						
Determine required horizontal shear reinforcement:								
0.5ϕV_c =	2406	kips						
$V_{s,\ req}$ =	-2038	kips						
$A_{v,req}$ = V_ss/f_yd =		-0.943	in^2					
$A_{v,used}$ =	1.58	in^2	**OK**					
s =	-30.14	in spacing						
s_{used} =	18.00	in O.C.	**NOT GOOD**					
ρ_t = A_v/sh =		0.0029	>	0.0025	**OK**			
s_{max} = min of	= l_w/5 =	162	in					
	= 3h =	90	in					
	=	18	in					
	∴ s =	18	in	>	18.00	in	**OK**	
Determine required vertical shear reinforcement:								
ρ_l = A_v/sh =		0.0029						
$\rho_{l,min}$ = 0.0025+0.5(2.5-h_w/l_w)(ρ_t-0.0025) =				0.0029	>	ρ_l	**OK**	
			$\rho_{l,min}$ =	0.0025	<	ρ_l	**OK**	
			$\rho_{l,max}$ =	0.0029	<	ρ_l	**OK**	
s_{max} = min of	= l_w/3 =	270	in					
	= 3h =	90	in					
	=	18	in					
	∴ s =	18	in					
$A_{v,used}$ =	1.58	in^2						
s =	18.00	in spacing						
s_{used} =	18.00	in O.C.	>	18.00	in	**OK**		

Figure 152: SW1 X-direction hand calculations

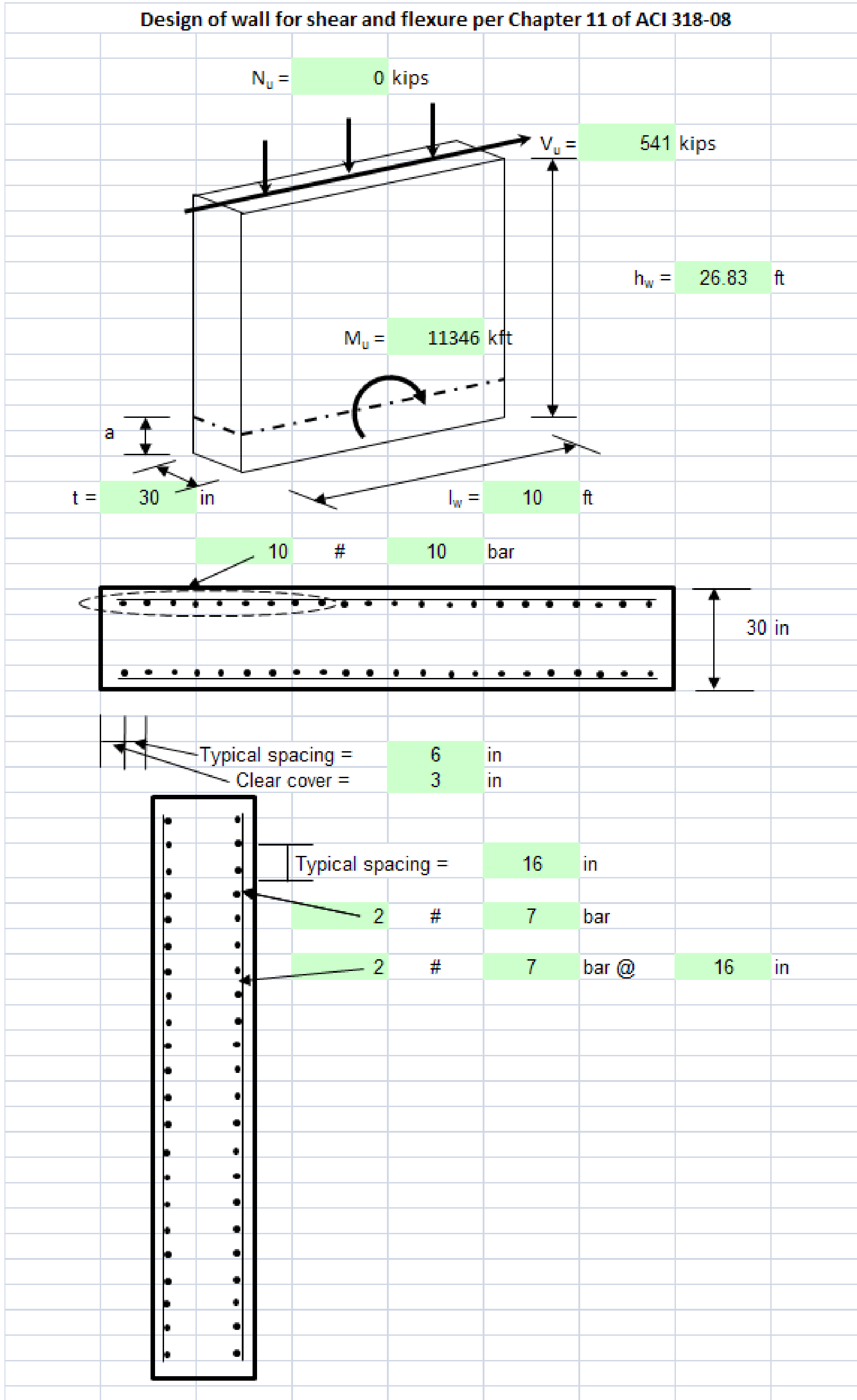


Figure 153: SW2 Y-direction hand calculations

Material Properties:								
f'_c =	10000	psi						
f_y =	60000	psi						
Check V_u < $\phi V_{n,max}$ = ϕ10SQRT(f'_c)hd per §11.9.3:								
$\phi V_{n,max}$ = ϕ10SQRT(f'_c)hd =			2160	kips	>	541.2	kips	**OK**
Shear strength of concrete:								
a = min of	= l_w/2 =	5	ft					
	= h_w/2 =	13.4	ft					
	∴ a =	5.0	ft					
V_c = 2SQRT(f'_c)hd =		576	kips					
V_c = 3.3SQRT(f'_c)hd + N_ud/l_w=			950	kips				
(M_u/V_u-l_w/2)=		202						
V_c = (0.6SQRT(f'_c) + l_w(1.25SQRT(f'_c)+0.2N_u/l_wh)/(M_u/V_u-l_w/2))hd=							387	kips
∴ V_c =	387	kips						
Determine required horizontal shear reinforcement:								
0.5ϕV_c =	145	kips						
$V_{s, req}$ =	335	kips						
$A_{v,req}$ = V_ss/f_yd =		0.930	in^2					
$A_{v,used}$ =	1.2	in^2	**OK**					
s =	20.64	in spacing						
s_{used} =	16.00	in O.C.	**OK**					
ρ_t = A_v/sh =		0.0025	>	0.0025	**OK**			
s_{max} = min of	= l_w/5 =	24	in					
	= 3h =	90	in					
	=	18	in					
	∴ s =	18	in	>	16.00	in	**OK**	
Determine required vertical shear reinforcement:								
ρ_l = A_v/sh =		0.0025						
$\rho_{l,min}$ = 0.0025+0.5(2.5-h_w/l_w)(ρ_t-0.0025) =				0.0025	<	ρ_l	**OK**	
			$\rho_{l,min}$ =	0.0025	<	ρ_l	**OK**	
			$\rho_{l,max}$ =	0.0025	<	ρ_l	**OK**	
s_{max} = min of	= l_w/3 =	40	in					
	= 3h =	90	in					
	=	18	in					
	∴ s =	18	in					
$A_{v,used}$ =	1.2	in^2						
s =	16.00	in spacing						
s_{used} =	16.00	in O.C.	>	16.00	in	**OK**		

Figure 154: SW2 Y-direction hand calculations

Design for flexure:								
$A_{s,used}$ =	25.4	in^2						
d =	108	in						
d_t =	117	in						
a =	5.98	in						
β =	0.65							
c = a/β =	9.19							
ε_t =	0.0352	>	0.005	ϕ =	0.90			
ε_y =	0.0021							
$\phi M_n=\phi A_s f_y(d-a/2)$=	12,003	ftk	>	11,346	ftk	**OK**		

Figure 155: SW2 Y-direction hand calculations

Load	Level	Loc	P
DEAD	Ground	bottom	12595.64
LIVE	Ground	bottom	5720.4
LIVE ROOF	Ground	bottom	63
SNOW	Ground	bottom	61

Figure 156: Unfactored Axial Shear Wall Loads

	Load Combination	Loc	P	MY	MX
1	$0.9D-1.6W_X-.48W_Y$	bottom	11336	-15116	-960055
2	$0.9D+1.6W_X-.48W_Y$	bottom	11336	-15116	960055
3	$0.9D-1.6W_X+.48W_Y$	bottom	11336	15116	-960055
4	$0.9D+1.6W_X+.48W_Y$	bottom	11336	15116	960055
5	$0.9D-1.6W_Y-.48W_X$	bottom	-11698	-50386	-288017
6	$0.9D+1.6W_Y-.48W_X$	bottom	34370	50386	-288017
7	$0.9D-1.6W_Y+.48W_X$	bottom	-11698	-50386	288017
8	$0.9D+1.6W_Y+.48W_X$	bottom	34370	50386	288017

Figure 157: Factored inputted into PCA Column

```
STRUCTUREPOINT - spColumn v4.20 (TM)                                             Page   2
Licensed to: Penn State University . License ID: 55758-1017872-4-22545-25FA0      04/06/10
B:\Team 1 Working Files\Ben\Shear Wall.col                                        03:45 PM


  General Information:
  ====================
     File Name: B:\Team 1 Working Files\Ben\Shear Wall.col
     Project:  NYT
     Column:   SW1                             Engineer: BRB
     Code:     ACI 318-05                      Units: English

     Run Option: Investigation                 Slenderness: Not considered
     Run Axis:   Biaxial                       Column Type: Structural

  Material Properties:
  ====================
     f'c   = 10 ksi                            fy   = 60 ksi
     Ec    = 5700.01 ksi                       Es   = 29000 ksi
     Ultimate strain = 0.003 in/in
     Beta1 = 0.65

  Section:
  ========
     Exterior Points
       No.     X (in)     Y (in)    No.     X (in)     Y (in)    No.     X (in)     Y (in)
     ----- ---------- ----------  ----- ---------- ----------  ----- ---------- ----------
         1        0.0        0.0      2        0.0      135.0      3      810.0      135.0
         4      810.0        0.0      5      780.0        0.0      6      780.0      105.0
         7       30.0      105.0      8       30.0        0.0

     Gross section area, Ag =  30600 in^2
     Ix =  3.04053e+007 in^4                   Iy =  2.2873e+009 in^4
     Xo =  405 in                              Yo =  106.103 in

  Reinforcement:
  ==============
     Bar Set: ASTM A615
     Size Diam (in) Area (in^2)   Size Diam (in) Area (in^2)   Size Diam (in) Area (in^2)
     ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
     #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63        0.31
     #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00        0.79
     #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41        1.56
     # 14      1.69        2.25   # 18      2.26        4.00

     Confinement: Tied; #4 ties with #10 bars,  #4 with larger bars.
     phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

     Pattern: Irregular

     Total steel area, As = 528.68 in^2 at 1.73%

     Area in^2   X (in)   Y (in)  Area in^2   X (in)   Y (in)  Area in^2   X (in)   Y (in)
     --------- -------- --------  --------- -------- --------  --------- -------- --------
          1.56      3.0    132.0       1.56      3.0    126.0       1.56      3.0    120.0
          1.56      3.0    114.0       1.56      3.0    108.0       1.56      9.0    132.0
          1.56     15.0    132.0       1.56     21.0    132.0       1.56     27.0    132.0
          1.56     27.0    108.0       1.56      3.0     27.0       1.56      3.0     21.0
          1.56      3.0     15.0       1.56      3.0      9.0       1.56      3.0      3.0
          1.56      9.0      3.0       1.56     15.0      3.0       1.56     21.0      3.0
          1.56     27.0      3.0       1.56     27.0      9.0       1.56     27.0     15.0
          1.56     27.0     21.0       1.56     27.0     27.0       1.56    783.0    108.0
          1.56    783.0    132.0       1.56    807.0    132.0       1.56    801.0    132.0
          1.56    795.0    132.0       1.56    789.0    132.0       1.56    807.0    126.0
          1.56    807.0    120.0       1.56    807.0    114.0       1.56    807.0    108.0
          1.56    783.0      3.0       1.56    789.0      3.0       1.56    795.0      3.0
          1.56    801.0      3.0       1.56    807.0      3.0       1.56    783.0      9.0
          1.56    783.0     15.0       1.56    783.0     21.0       1.56    783.0     27.0
          1.56    807.0     27.0       1.56    807.0     21.0       1.56    807.0     15.0
```

Figure 158: PCA Column Output for SW1

```
STRUCTUREPOINT - spColumn v4.20 (TM)                                          Page   3
Licensed to: Penn State University . License ID: 55758-1017872-4-22545-25FA0   04/06/10
B:\Team 1 Working Files\Ben\Shear Wall.col                                     03:45 PM
```

1.56	807.0	9.0	1.56	27.0	126.0	1.56	27.0	120.0
1.56	27.0	114.0	1.56	9.0	108.0	1.56	15.0	108.0
1.56	21.0	108.0	1.56	9.0	120.0	1.56	15.0	120.0
1.56	21.0	120.0	1.56	9.0	27.0	1.56	15.0	27.0
1.56	21.0	27.0	1.56	9.0	15.0	1.56	15.0	15.0
1.56	21.0	15.0	1.56	783.0	126.0	1.56	783.0	120.0
1.56	783.0	114.0	1.56	789.0	108.0	1.56	795.0	108.0
1.56	801.0	108.0	1.56	789.0	120.0	1.56	795.0	120.0
1.56	801.0	120.0	1.56	789.0	27.0	1.56	795.0	27.0
1.56	801.0	27.0	1.56	789.0	15.0	1.56	795.0	15.0
1.56	801.0	15.0	1.27	33.1	132.0	1.27	39.2	132.0
1.27	45.3	132.0	1.27	51.4	132.0	1.27	57.5	132.0
1.27	63.6	132.0	1.27	69.7	132.0	1.27	75.8	132.0
1.27	81.9	132.0	1.27	88.0	132.0	1.27	94.1	132.0
1.27	100.2	132.0	1.27	106.3	132.0	1.27	112.4	132.0
1.27	118.5	132.0	1.27	124.5	132.0	1.27	130.6	132.0
1.27	136.7	132.0	1.27	142.8	132.0	1.27	148.9	132.0
1.27	155.0	132.0	1.27	161.1	132.0	1.27	167.2	132.0
1.27	173.3	132.0	1.27	179.4	132.0	1.27	185.5	132.0
1.27	191.6	132.0	1.27	197.7	132.0	1.27	203.8	132.0
1.27	209.9	132.0	1.27	216.0	132.0	1.27	222.1	132.0
1.27	228.2	132.0	1.27	234.3	132.0	1.27	240.4	132.0
1.27	246.5	132.0	1.27	252.6	132.0	1.27	258.7	132.0
1.27	264.8	132.0	1.27	270.9	132.0	1.27	277.0	132.0
1.27	283.1	132.0	1.27	289.2	132.0	1.27	295.3	132.0
1.27	301.4	132.0	1.27	307.5	132.0	1.27	313.5	132.0
1.27	319.6	132.0	1.27	325.7	132.0	1.27	331.8	132.0
1.27	337.9	132.0	1.27	344.0	132.0	1.27	350.1	132.0
1.27	356.2	132.0	1.27	362.3	132.0	1.27	368.4	132.0
1.27	374.5	132.0	1.27	380.6	132.0	1.27	386.7	132.0
1.27	392.8	132.0	1.27	398.9	132.0	1.27	405.0	132.0
1.27	411.1	132.0	1.27	417.2	132.0	1.27	423.3	132.0
1.27	429.4	132.0	1.27	435.5	132.0	1.27	441.6	132.0
1.27	447.7	132.0	1.27	453.8	132.0	1.27	459.9	132.0
1.27	466.0	132.0	1.27	472.1	132.0	1.27	478.2	132.0
1.27	484.3	132.0	1.27	490.4	132.0	1.27	496.5	132.0
1.27	502.5	132.0	1.27	508.6	132.0	1.27	514.7	132.0
1.27	520.8	132.0	1.27	526.9	132.0	1.27	533.0	132.0
1.27	539.1	132.0	1.27	545.2	132.0	1.27	551.3	132.0
1.27	557.4	132.0	1.27	563.5	132.0	1.27	569.6	132.0
1.27	575.7	132.0	1.27	581.8	132.0	1.27	587.9	132.0
1.27	594.0	132.0	1.27	600.1	132.0	1.27	606.2	132.0
1.27	612.3	132.0	1.27	618.4	132.0	1.27	624.5	132.0
1.27	630.6	132.0	1.27	636.7	132.0	1.27	642.8	132.0
1.27	648.9	132.0	1.27	655.0	132.0	1.27	661.1	132.0
1.27	667.2	132.0	1.27	673.3	132.0	1.27	679.4	132.0
1.27	685.5	132.0	1.27	691.5	132.0	1.27	697.6	132.0
1.27	703.7	132.0	1.27	709.8	132.0	1.27	715.9	132.0
1.27	722.0	132.0	1.27	728.1	132.0	1.27	734.2	132.0
1.27	740.3	132.0	1.27	746.4	132.0	1.27	752.5	132.0
1.27	758.6	132.0	1.27	764.7	132.0	1.27	770.8	132.0
1.27	776.9	132.0	1.27	783.0	132.0	1.27	33.1	108.0
1.27	39.2	108.0	1.27	45.3	108.0	1.27	51.4	108.0
1.27	57.5	108.0	1.27	63.6	108.0	1.27	69.7	108.0
1.27	75.8	108.0	1.27	81.9	108.0	1.27	88.0	108.0
1.27	94.1	108.0	1.27	100.2	108.0	1.27	106.3	108.0
1.27	112.4	108.0	1.27	118.5	108.0	1.27	124.5	108.0
1.27	130.6	108.0	1.27	136.7	108.0	1.27	142.8	108.0
1.27	148.9	108.0	1.27	155.0	108.0	1.27	161.1	108.0
1.27	167.2	108.0	1.27	173.3	108.0	1.27	179.4	108.0
1.27	185.5	108.0	1.27	191.6	108.0	1.27	197.7	108.0
1.27	203.8	108.0	1.27	209.9	108.0	1.27	216.0	108.0
1.27	222.1	108.0	1.27	228.2	108.0	1.27	234.3	108.0
1.27	240.4	108.0	1.27	246.5	108.0	1.27	252.6	108.0
1.27	258.7	108.0	1.27	264.8	108.0	1.27	270.9	108.0
1.27	277.0	108.0	1.27	283.1	108.0	1.27	289.2	108.0

Figure 159: PCA Column Output for SW1

STRUCTUREPOINT - spColumn v4.20 (TM) Page 4
Licensed to: Penn State University . License ID: 55758-1017872-4-22545-25FA0 04/06/10
B:\Team 1 Working Files\Ben\Shear Wall.col 03:45 PM

1.27	295.3	108.0	1.27	301.4	108.0	1.27	307.5	108.0
1.27	313.5	108.0	1.27	319.6	108.0	1.27	325.7	108.0
1.27	331.8	108.0	1.27	337.9	108.0	1.27	344.0	108.0
1.27	350.1	108.0	1.27	356.2	108.0	1.27	362.3	108.0
1.27	368.4	108.0	1.27	374.5	108.0	1.27	380.6	108.0
1.27	386.7	108.0	1.27	392.8	108.0	1.27	398.9	108.0
1.27	405.0	108.0	1.27	411.1	108.0	1.27	417.2	108.0
1.27	423.3	108.0	1.27	429.4	108.0	1.27	435.5	108.0
1.27	441.6	108.0	1.27	447.7	108.0	1.27	453.8	108.0
1.27	459.9	108.0	1.27	466.0	108.0	1.27	472.1	108.0
1.27	478.2	108.0	1.27	484.3	108.0	1.27	490.4	108.0
1.27	496.5	108.0	1.27	502.5	108.0	1.27	508.6	108.0
1.27	514.7	108.0	1.27	520.8	108.0	1.27	526.9	108.0
1.27	533.0	108.0	1.27	539.1	108.0	1.27	545.2	108.0
1.27	551.3	108.0	1.27	557.4	108.0	1.27	563.5	108.0
1.27	569.6	108.0	1.27	575.7	108.0	1.27	581.8	108.0
1.27	587.9	108.0	1.27	594.0	108.0	1.27	600.1	108.0
1.27	606.2	108.0	1.27	612.3	108.0	1.27	618.4	108.0
1.27	624.5	108.0	1.27	630.6	108.0	1.27	636.7	108.0
1.27	642.8	108.0	1.27	648.9	108.0	1.27	655.0	108.0
1.27	661.1	108.0	1.27	667.2	108.0	1.27	673.3	108.0
1.27	679.4	108.0	1.27	685.5	108.0	1.27	691.5	108.0
1.27	697.6	108.0	1.27	703.7	108.0	1.27	709.8	108.0
1.27	715.9	108.0	1.27	722.0	108.0	1.27	728.1	108.0
1.27	734.2	108.0	1.27	740.3	108.0	1.27	746.4	108.0
1.27	752.5	108.0	1.27	758.6	108.0	1.27	764.7	108.0
1.27	770.8	108.0	1.27	776.9	108.0	1.27	783.0	108.0
1.56	3.0	27.0	1.56	3.0	101.8	1.56	3.0	95.5
1.56	3.0	89.3	1.56	3.0	83.1	1.56	3.0	76.8
1.56	3.0	70.6	1.56	3.0	64.4	1.56	3.0	58.2
1.56	3.0	51.9	1.56	3.0	45.7	1.56	3.0	39.5
1.56	3.0	33.2	1.56	3.0	27.0	1.56	27.0	101.8
1.56	27.0	95.5	1.56	27.0	89.3	1.56	27.0	83.1
1.56	27.0	76.8	1.56	27.0	70.6	1.56	27.0	64.4
1.56	27.0	58.2	1.56	27.0	51.9	1.56	27.0	45.7
1.56	27.0	39.5	1.56	27.0	33.2	1.56	27.0	27.0
1.56	783.0	101.8	1.56	783.0	95.5	1.56	783.0	89.3
1.56	783.0	83.1	1.56	783.0	76.8	1.56	783.0	70.6
1.56	783.0	64.4	1.56	783.0	58.2	1.56	783.0	51.9
1.56	783.0	45.7	1.56	783.0	39.5	1.56	783.0	33.2
1.56	783.0	27.0	1.56	807.0	101.8	1.56	807.0	95.5
1.56	807.0	89.3	1.56	807.0	83.1	1.56	807.0	76.8
1.56	807.0	70.6	1.56	807.0	64.4	1.56	807.0	58.2
1.56	807.0	51.9	1.56	807.0	45.7	1.56	807.0	39.5
1.56	807.0	33.2	1.56	807.0	27.0	1.56	15.0	126.0
1.56	15.0	114.0	1.56	15.0	21.0	1.56	15.0	9.0
1.56	795.0	126.0	1.56	795.0	114.0	1.56	795.0	21.0
1.56	795.0	9.0						

Factored Loads and Moments with Corresponding Capacities:
==

No.	Pu kip	Mux k-ft	Muy k-ft	fMnx k-ft	fMny k-ft	fMn/Mu	Phi
1	11336.00	-15116.00	-960055.00	-19169.25	-1217517.00	1.268	0.900
2	11336.00	-15116.00	960055.00	-19154.45	1216536.00	1.267	0.900
3	11336.00	15116.00	-960055.00	19881.89	-1262739.25	1.315	0.900
4	11336.00	15116.00	960055.00	19851.94	1260841.88	1.313	0.900
5	-11698.00	-50386.00	-288017.00	-51090.20	-292042.88	1.014	0.900
6	34370.00	50386.00	-288017.00	119184.49	-681282.81	2.365	0.650
7	-11698.00	-50386.00	288017.00	-51079.19	291979.41	1.014	0.900
8	34370.00	50386.00	288017.00	118900.46	679660.44	2.360	0.650

*** End of output ***

Figure 160: PCA Column Output for SW1

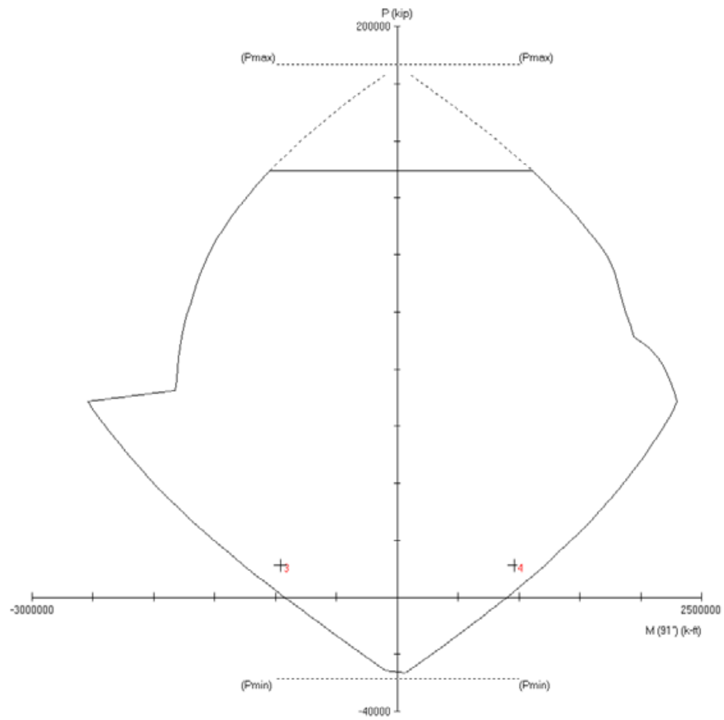


Figure 161: SW1 P-M Diagram

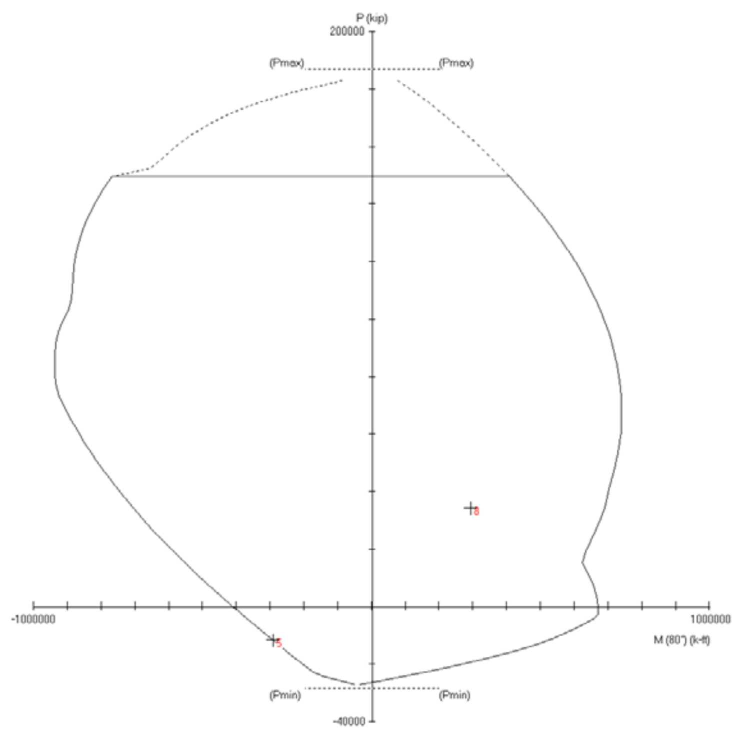


Figure 162: SW1 P-M Diagram

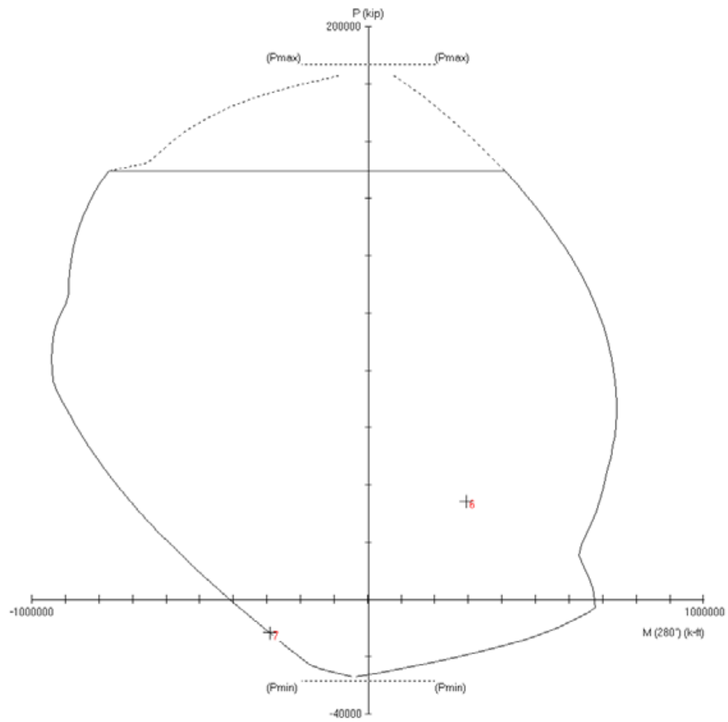


Figure 163: SW1 P-M Diagram

Shear Wall 1 Axial Loads

Story level	Story Height (ft)	Tributary Area (ft^2)	Live Load Influence Area (ft^2)	Live Load Reduction Factor	Dead Load (kips)	Dead Load of Wall (kips)	Roof Live Load (kips)	Snow Load (kips)	Floor Live Load (kips)	Column Load 1.4D (kips)	Column Load 1.2D+1.6L+.5(Lr or S) (kips)	Column Load 1.2D+1.6(Lr or S)+L (kips)	Column Load 1.2D+L+0.5(Lr or S) (kips)	Column Load 1.2D+L+0.2S (kips)	Column Design Load
52 Roof	0	3150	0	1.00	371.70	0.00	63.00	60.80		520	478	547	478	458	547
51 Mech	26.83	6300	8700	1.00	595.35	392.44			472.50	1383	1973	1759	1689	1670	1973
50	14.42	9450	17400	0.40	819.00	210.84			560.70	1442	2164	1897	1828	1809	2164
49	13.75	12600	26100	0.40	1042.65	201.09			648.90	1741	2562	2242	2173	2154	2562
48	13.75	15750	34800	0.40	1266.30	201.09			737.10	2054	2972	2599	2529	2510	2972
47	13.75	18900	43500	0.40	1489.95	201.09			825.30	2367	3381	2955	2886	2867	3381
46	13.75	22050	52200	0.40	1713.60	201.09			913.50	2681	3791	3312	3243	3223	3791
45	13.75	25200	60900	0.40	1937.25	201.09			1001.70	2994	4200	3669	3599	3580	4200
44	13.75	28350	69600	0.40	2160.90	201.09			1089.90	3307	4610	4025	3956	3936	4610
43	13.75	31500	78300	0.40	2384.55	201.09			1178.10	3620	5019	4382	4312	4293	5019
42	13.75	34650	87000	0.40	2608.20	201.09			1266.30	3933	5429	4738	4669	4650	5429
41	13.75	37800	95700	0.40	2831.85	201.09			1354.50	4246	5838	5095	5026	5006	5838
40	13.75	40950	104400	0.40	3055.50	268.13			1442.70	4653	6328	5532	5463	5443	6328
39	13.75	44100	113100	0.40	3279.15	268.13			1530.90	4966	6738	5888	5819	5800	6738
38	13.75	47250	121800	0.40	3502.80	268.13			1619.10	5279	7147	6245	6176	6156	7147
37	13.75	50400	130500	0.40	3726.45	268.13			1707.30	5592	7557	6602	6532	6513	7557
36	13.75	53550	139200	0.40	3950.10	268.13			1795.50	5906	7966	6958	6889	6870	7966
35	13.75	56700	147900	0.40	4173.75	268.13			1883.70	6219	8376	7315	7245	7226	8376
34	13.75	59850	156600	0.40	4397.40	268.13			1971.90	6532	8785	7671	7602	7583	8785
33	13.75	63000	165300	0.40	4621.05	268.13			2060.10	6845	9195	8028	7959	7939	9195
32	13.75	66150	174000	0.40	4844.70	268.13			2148.30	7158	9604	8384	8315	8296	9604
31	13.75	69300	182700	0.40	5068.35	268.13			2236.50	7471	10014	8741	8672	8652	10014
30	13.75	72450	191400	0.40	5292.00	268.13			2324.70	7784	10423	9098	9028	9009	10423
29	13.75	75600	200100	0.40	5515.65	438.28			2412.90	8336	11037	9658	9589	9570	11037
28 Mech	27.50	78750	208800	1.00	5739.30	876.56			2885.40	9262	12587	10925	10856	10837	12587
27	14.58	81900	217500	0.40	5962.95	464.84			2973.60	8999	12503	10788	10718	10699	12503
26	13.75	85050	226200	0.40	6186.60	438.28			3061.80	9275	12880	11112	11043	11024	12880
25	13.75	88200	234900	0.40	6410.25	438.28			3150.00	9588	13290	11469	11400	11380	13290
24	13.75	91350	243600	0.40	6633.90	438.28			3238.20	9901	13699	11826	11756	11737	13699
23	13.75	94500	252300	0.40	6857.55	438.28			3326.40	10214	14109	12182	12113	12094	14109
22	13.75	97650	261000	0.40	7081.20	438.28			3414.60	10527	14518	12539	12469	12450	14518
21	13.75	100800	269700	0.40	7304.85	438.28			3502.80	10840	14928	12895	12826	12807	14928
20	13.75	103950	278400	0.40	7528.50	438.28			3591.00	11153	15337	13252	13183	13163	15337
19	13.75	107100	287100	0.40	7752.15	438.28			3679.20	11467	15747	13609	13539	13520	15747
18	13.75	110250	295800	0.40	7975.80	438.28			3767.40	11780	16156	13965	13896	13876	16156
17	13.75	113400	304500	0.40	8199.45	438.28			3855.60	12093	16566	14322	14252	14233	16566
16	13.75	116550	313200	0.40	8423.10	438.28			3943.80	12406	16975	14678	14609	14590	16975
15	13.75	119700	321900	0.40	8646.75	438.28			4032.00	12719	17385	15035	14966	14946	17385
14 Cafeteria	12.58	122850	330600	1.00	8870.40	401.09			4347.00	12980	18112	15574	15504	15485	18112
13	14.92	126000	339300	0.40	9094.05	475.47			4435.20	13397	18611	16019	15950	15931	18611
12 Data Center	13.75	129150	348000	1.00	9317.70	438.28			4750.20	13658	19339	16558	16489	16470	19339
11	13.75	132300	356700	0.40	9541.35	438.28			4838.40	13971	19748	16915	16845	16826	19748
10	13.75	135450	365400	0.40	9765.00	438.28			4926.60	14285	20158	17271	17202	17183	20158
9	13.75	138600	374100	0.40	9988.65	438.28			5014.80	14598	20567	17628	17559	17539	20567
8	13.75	141750	382800	0.40	10212.30	438.28			5103.00	14911	20977	17984	17915	17896	20977
7	13.75	144900	391500	0.40	10435.95	438.28			5191.20	15224	21386	18341	18272	18252	21386
6	13.75	148050	400200	0.40	10659.60	438.28			5279.40	15537	21796	18698	18628	18609	21796
5	13.75	151200	408900	0.40	10883.25	438.28			5367.60	15850	22205	19054	18985	18966	22205
4	14.32	154350	417600	0.40	11106.90	456.54			5455.80	16189	22637	19433	19363	19344	22637
3	15.47	157500	426300	0.40	11330.55	493.07			5544.00	16553	23090	19833	19764	19744	23090
2	15.47	160650	435000	0.40	11554.20	493.07			5632.20	16866	23500	20190	20120	20101	23500
1	25.66	163800	443700	0.40	11777.85	817.79			5720.40	17634	24299	20936	20867	20847	24299

Figure 164: SW1 Axial Loads due to Gravity

						Redistribution										Shear Reinf.	Flexure Reinf.		
Story	Spandrel	Load	Loc	V2 (k)	M3 (ftk)	V2 (k)	M3 (ftk)	f'c (psi)	fy (psi)	l_n (ft)	b_w (in)	h (in)	Area (in^2)	V check for NO Diagonals		# stirrup	#	Bar	Clear cover (in)
STORY52	B6	C1WY	Left	105	526	125	624	6000	60000	10	18	44	792	2.03	OK	4	5	8	1.50
STORY52	B6	C1WY	Right	105	-526	125	624	6000	60000	10	18	44	792	2.03	OK	4	5	8	1.50
STORY51	B6	C1WY	Left	154	771	125	624	6000	60000	10	18	44	792	2.03	OK	4	5	8	1.50
STORY51	B6	C1WY	Right	154	-771	125	624	6000	60000	10	18	44	792	2.03	OK	4	5	8	1.50
STORY50	B6	C1WY	Left	156	780	125	624	6000	60000	10	18	44	792	2.03	OK	4	5	8	1.50
STORY50	B6	C1WY	Right	156	-780	125	624	6000	60000	10	18	44	792	2.03	OK	4	5	8	1.50
STORY49	B6	C1WY	Left	164	818	152	758	6000	60000	10	18	44	792	2.47	OK	4	6	8	1.50
STORY49	B6	C1WY	Right	164	-818	152	758	6000	60000	10	18	44	792	2.47	OK	4	6	8	1.50
STORY48	B6	C1WY	Left	176	880	152	758	6000	60000	10	18	44	792	2.47	OK	4	6	8	1.50
STORY48	B6	C1WY	Right	176	-880	152	758	6000	60000	10	18	44	792	2.47	OK	4	6	8	1.50
STORY47	B6	C1WY	Left	190	948	152	758	6000	60000	10	18	44	792	2.47	OK	4	6	8	1.50
STORY47	B6	C1WY	Right	190	-948	152	758	6000	60000	10	18	44	792	2.47	OK	4	6	8	1.50
STORY46	B6	C1WY	Left	203	1017	182	912	6000	60000	10	18	44	792	2.97	OK	4	7	8	1.50
STORY46	B6	C1WY	Right	203	-1017	182	912	6000	60000	10	18	44	792	2.97	OK	4	7	8	1.50
STORY45	B6	C1WY	Left	216	1082	182	912	6000	60000	10	18	44	792	2.97	OK	4	7	8	1.50
STORY45	B6	C1WY	Right	216	-1082	182	912	6000	60000	10	18	44	792	2.97	OK	4	7	8	1.50
STORY44	B6	C1WY	Left	228	1140	182	912	6000	60000	10	18	44	792	2.97	OK	4	7	8	1.50
STORY44	B6	C1WY	Right	228	-1140	182	912	6000	60000	10	18	44	792	2.97	OK	4	7	8	1.50
STORY43	B6	C1WY	Left	237	1184	193	967	6000	60000	10	18	44	792	3.15	OK	4	6	9	1.50
STORY43	B6	C1WY	Right	237	-1184	193	967	6000	60000	10	18	44	792	3.15	OK	4	6	9	1.50
STORY42	B6	C1WY	Left	242	1209	193	967	6000	60000	10	18	44	792	3.15	OK	4	6	9	1.50
STORY42	B6	C1WY	Right	242	-1209	193	967	6000	60000	10	18	44	792	3.15	OK	4	6	9	1.50
STORY41	B6	C1WY	Left	339	1694	271	1356	8000	60000	10	24	44	1056	2.87	OK	4	8	9	1.50
STORY41	B6	C1WY	Right	339	-1694	271	1356	8000	60000	10	24	44	1056	2.87	OK	4	8	9	1.50
STORY40	B6	C1WY	Left	371	1854	302	1511	8000	60000	10	24	44	1056	3.20	OK	4	7	10	1.50
STORY40	B6	C1WY	Right	371	-1854	302	1511	8000	60000	10	24	44	1056	3.20	OK	4	7	10	1.50
STORY39	B6	C1WY	Left	374	1870	302	1511	8000	60000	10	24	44	1056	3.20	OK	4	7	10	1.50
STORY39	B6	C1WY	Right	374	-1870	302	1511	8000	60000	10	24	44	1056	3.20	OK	4	7	10	1.50
STORY38	B6	C1WY	Left	378	1889	302	1511	8000	60000	10	24	44	1056	3.20	OK	4	7	10	1.50
STORY38	B6	C1WY	Right	378	-1889	302	1511	8000	60000	10	24	44	1056	3.20	OK	4	7	10	1.50
STORY37	B6	C1WY	Left	380	1902	304	1521	8000	60000	10	24	44	1056	3.22	OK	4	7	10	1.50
STORY37	B6	C1WY	Right	380	-1902	304	1521	8000	60000	10	24	44	1056	3.22	OK	4	7	10	1.50
STORY36	B6	C1WY	Left	380	1899	304	1521	8000	60000	10	24	44	1056	3.22	OK	4	7	10	1.50
STORY36	B6	C1WY	Right	380	-1899	304	1521	8000	60000	10	24	44	1056	3.22	OK	4	7	10	1.50
STORY35	B6	C1WY	Left	374	1871	304	1521	8000	60000	10	24	44	1056	3.22	OK	4	7	10	1.50
STORY35	B6	C1WY	Right	374	-1871	304	1521	8000	60000	10	24	44	1056	3.22	OK	4	7	10	1.50
STORY34	B6	C1WY	Left	361	1804	289	1443	8000	60000	10	24	44	1056	3.06	OK	4	9	9	1.50
STORY34	B6	C1WY	Right	361	-1804	289	1443	8000	60000	10	24	44	1056	3.06	OK	4	9	9	1.50
STORY33	B6	C1WY	Left	336	1682	289	1443	8000	60000	10	24	44	1056	3.06	OK	4	9	9	1.50
STORY33	B6	C1WY	Right	336	-1682	289	1443	8000	60000	10	24	44	1056	3.06	OK	4	9	9	1.50
STORY32	B6	C1WY	Left	297	1483	289	1443	8000	60000	10	24	44	1056	3.06	OK	4	9	9	1.50
STORY32	B6	C1WY	Right	297	-1483	289	1443	8000	60000	10	24	44	1056	3.06	OK	4	9	9	1.50
STORY31	B6	C1WY	Left	234	1172	188	938	8000	60000	10	24	44	1056	1.99	OK	4	7	9	1.50
STORY31	B6	C1WY	Right	234	-1172	188	938	8000	60000	10	24	44	1056	1.99	OK	4	7	9	1.50
STORY30	B6	C1WY	Left	129	646	188	938	10000	60000	10	30	44	1320	1.42	OK	4	7	9	1.50
STORY30	B6	C1WY	Right	129	-646	188	938	10000	60000	10	30	44	1320	1.42	OK	4	7	9	1.50

Figure 165: Coupling Beam Design Hand calculations

STORY29	B6	C1WY	Left	166	831	188	938	10000	60000	10	30	44	1320	1.42	OK	4	7	9	1.50
STORY29	B6	C1WY	Right	166	-831	188	938	10000	60000	10	30	44	1320	1.42	OK	4	7	9	1.50
STORY28	B6	C1WY	Left	110	549	93	466	10000	60000	10	30	44	1320	0.71	OK	4	8	8	1.50
STORY28	B6	C1WY	Right	110	-549	93	466	10000	60000	10	30	44	1320	0.71	OK	4	8	8	1.50
STORY27	B6	C1WY	Left	108	542	93	466	10000	60000	10	30	44	1320	0.71	OK	4	8	8	1.50
STORY27	B6	C1WY	Right	108	-542	93	466	10000	60000	10	30	44	1320	0.71	OK	4	8	8	1.50
STORY26	B6	C1WY	Left	116	582	93	466	10000	60000	10	30	44	1320	0.71	OK	4	8	8	1.50
STORY26	B6	C1WY	Right	116	-582	93	466	10000	60000	10	30	44	1320	0.71	OK	4	8	8	1.50
STORY25	B6	C1WY	Left	131	654	134	669	10000	60000	10	30	44	1320	1.01	OK	4	8	8	1.50
STORY25	B6	C1WY	Right	131	-654	134	669	10000	60000	10	30	44	1320	1.01	OK	4	8	8	1.50
STORY24	B6	C1WY	Left	148	741	134	669	10000	60000	10	30	44	1320	1.01	OK	4	8	8	1.50
STORY24	B6	C1WY	Right	148	-741	134	669	10000	60000	10	30	44	1320	1.01	OK	4	8	8	1.50
STORY23	B6	C1WY	Left	167	836	134	669	10000	60000	10	30	44	1320	1.01	OK	4	8	8	1.50
STORY23	B6	C1WY	Right	167	-836	134	669	10000	60000	10	30	44	1320	1.01	OK	4	8	8	1.50
STORY22	B6	C1WY	Left	187	934	181	905	10000	60000	10	30	44	1320	1.37	OK	4	8	8	1.50
STORY22	B6	C1WY	Right	187	-934	181	905	10000	60000	10	30	44	1320	1.37	OK	4	8	8	1.50
STORY21	B6	C1WY	Left	207	1033	181	905	10000	60000	10	30	44	1320	1.37	OK	4	8	8	1.50
STORY21	B6	C1WY	Right	207	-1033	181	905	10000	60000	10	30	44	1320	1.37	OK	4	8	8	1.50
STORY20	B6	C1WY	Left	226	1131	181	905	10000	60000	10	30	44	1320	1.37	OK	4	8	8	1.50
STORY20	B6	C1WY	Right	226	-1131	181	905	10000	60000	10	30	44	1320	1.37	OK	4	8	8	1.50
STORY19	B6	C1WY	Left	245	1226	225	1124	10000	60000	10	30	44	1320	1.70	OK	4	8	8	1.50
STORY19	B6	C1WY	Right	245	-1226	225	1124	10000	60000	10	30	44	1320	1.70	OK	4	8	8	1.50
STORY18	B6	C1WY	Left	263	1317	225	1124	10000	60000	10	30	44	1320	1.70	OK	4	8	8	1.50
STORY18	B6	C1WY	Right	263	-1317	225	1124	10000	60000	10	30	44	1320	1.70	OK	4	8	8	1.50
STORY17	B6	C1WY	Left	281	1405	225	1124	10000	60000	10	30	44	1320	1.70	OK	4	8	8	1.50
STORY17	B6	C1WY	Right	281	-1405	225	1124	10000	60000	10	30	44	1320	1.70	OK	4	8	8	1.50
STORY16	B6	C1WY	Left	298	1489	263	1315	10000	60000	10	30	44	1320	1.99	OK	4	8	9	1.50
STORY16	B6	C1WY	Right	298	-1489	263	1315	10000	60000	10	30	44	1320	1.99	OK	4	8	9	1.50
STORY15	B6	C1WY	Left	307	1536	263	1315	10000	60000	10	30	44	1320	1.99	OK	4	8	9	1.50
STORY15	B6	C1WY	Right	307	-1536	263	1315	10000	60000	10	30	44	1320	1.99	OK	4	8	9	1.50
STORY14	B6	C1WY	Left	329	1644	263	1315	10000	60000	10	30	44	1320	1.99	OK	4	8	9	1.50
STORY14	B6	C1WY	Right	329	-1644	263	1315	10000	60000	10	30	44	1320	1.99	OK	4	8	9	1.50
STORY13	B6	C1WY	Left	351	1755	296	1480	10000	60000	10	30	44	1320	2.24	OK	4	7	10	1.50
STORY13	B6	C1WY	Right	351	-1755	296	1480	10000	60000	10	30	44	1320	2.24	OK	4	7	10	1.50
STORY12	B6	C1WY	Left	358	1788	296	1480	10000	60000	10	30	44	1320	2.24	OK	4	7	10	1.50
STORY12	B6	C1WY	Right	358	-1788	296	1480	10000	60000	10	30	44	1320	2.24	OK	4	7	10	1.50
STORY11	B6	C1WY	Left	370	1850	296	1480	10000	60000	10	30	44	1320	2.24	OK	4	7	10	1.50
STORY11	B6	C1WY	Right	370	-1850	296	1480	10000	60000	10	30	44	1320	2.24	OK	4	7	10	1.50
STORY10	B6	C1WY	Left	382	1908	321	1603	10000	60000	10	30	44	1320	2.43	OK	4	9	9	1.50
STORY10	B6	C1WY	Right	382	-1908	321	1603	10000	60000	10	30	44	1320	2.43	OK	4	9	9	1.50
STORY9	B6	C1WY	Left	392	1959	321	1603	10000	60000	10	30	44	1320	2.43	OK	4	9	9	1.50
STORY9	B6	C1WY	Right	392	-1959	321	1603	10000	60000	10	30	44	1320	2.43	OK	4	9	9	1.50
STORY8	B6	C1WY	Left	401	2004	321	1603	10000	60000	10	30	44	1320	2.43	OK	4	9	9	1.50
STORY8	B6	C1WY	Right	401	-2004	321	1603	10000	60000	10	30	44	1320	2.43	OK	4	9	9	1.50
STORY7	B6	C1WY	Left	408	2040	335	1677	10000	60000	10	30	44	1320	2.54	OK	4	10	9	1.50
STORY7	B6	C1WY	Right	408	-2040	335	1677	10000	60000	10	30	44	1320	2.54	OK	4	10	9	1.50
STORY6	B6	C1WY	Left	413	2066	335	1677	10000	60000	10	30	44	1320	2.54	OK	4	10	9	1.50
STORY6	B6	C1WY	Right	413	-2066	335	1677	10000	60000	10	30	44	1320	2.54	OK	4	10	9	1.50
STORY5	B6	C1WY	Left	419	2096	335	1677	10000	60000	10	30	44	1320	2.54	OK	4	10	9	1.50
STORY5	B6	C1WY	Right	419	-2096	335	1677	10000	60000	10	30	44	1320	2.54	OK	4	10	9	1.50
STORY4	B6	C1WY	Left	428	2140	342	1712	10000	60000	10	30	44	1320	2.59	OK	4	10	9	1.50
STORY4	B6	C1WY	Right	428	-2140	342	1712	10000	60000	10	30	44	1320	2.59	OK	4	10	9	1.50
STORY3	B6	C1WY	Left	423	2114	342	1712	10000	60000	10	30	44	1320	2.59	OK	4	10	9	1.50
STORY3	B6	C1WY	Right	423	-2114	342	1712	10000	60000	10	30	44	1320	2.59	OK	4	10	9	1.50

Figure 166: Coupling Beam Design Hand calculations

STORY2	B6	C1WY	Left	19	34	35	174	10000	60000	10	30	44	1320	0.26	OK	4	7	9	1.50
STORY2	B6	C1WY	Right	19	-34	35	174	10000	60000	10	30	44	1320	0.26	OK	4	7	9	1.50
STORY1	B6	C1WY	Left	44	218	35	174	10000	60000	10	30	44	1320	0.26	OK	4	7	9	1.50
STORY1	B6	C1WY	Right	44	-218	35	174	10000	60000	10	30	44	1320	0.26	OK	4	7	9	1.50
STORY30	B5	C1WY	Left	591	2786	521	2600	10000	60000	10	30	44	1320	3.95	OK	4	12	10	1.50
STORY30	B5	C1WY	Right	591	-3126	521	2600	10000	60000	10	30	44	1320	3.95	OK	4	12	10	1.50
STORY29	B5	C1WY	Left	652	3251	521	2600	10000	60000	10	30	44	1320	3.95	OK	4	12	10	1.50
STORY29	B5	C1WY	Right	652	-3266	521	2600	10000	60000	10	30	44	1320	3.95	OK	4	12	10	1.50
STORY28	B5	C1WY	Left	549	2737	521	2600	10000	60000	10	30	44	1320	3.95	OK	4	12	10	1.50
STORY28	B5	C1WY	Right	549	-2749	521	2600	10000	60000	10	30	44	1320	3.95	OK	4	12	10	1.50
STORY27	B5	C1WY	Left	482	2405	386	1924	10000	60000	10	30	44	1320	2.92	OK	4	10	10	1.50
STORY27	B5	C1WY	Right	482	-2417	386	1924	10000	60000	10	30	44	1320	2.92	OK	4	10	10	1.50
STORY26	B5	C1WY	Left	441	2198	386	1924	10000	60000	10	30	44	1320	2.92	OK	4	10	10	1.50
STORY26	B5	C1WY	Right	441	-2209	386	1924	10000	60000	10	30	44	1320	2.92	OK	4	10	10	1.50
STORY25	B5	C1WY	Left	415	2070	386	1924	10000	60000	10	30	44	1320	2.92	OK	4	10	10	1.50
STORY25	B5	C1WY	Right	415	-2081	386	1924	10000	60000	10	30	44	1320	2.92	OK	4	10	10	1.50
STORY24	B5	C1WY	Left	396	1977	317	1582	10000	60000	10	30	44	1320	2.40	OK	4	9	9	1.50
STORY24	B5	C1WY	Right	396	-1987	317	1582	10000	60000	10	30	44	1320	2.40	OK	4	9	9	1.50
STORY23	B5	C1WY	Left	383	1910	317	1582	10000	60000	10	30	44	1320	2.40	OK	4	9	9	1.50
STORY23	B5	C1WY	Right	383	-1920	317	1582	10000	60000	10	30	44	1320	2.40	OK	4	9	9	1.50
STORY22	B5	C1WY	Left	373	1862	317	1582	10000	60000	10	30	44	1320	2.40	OK	4	9	9	1.50
STORY22	B5	C1WY	Right	373	-1871	317	1582	10000	60000	10	30	44	1320	2.40	OK	4	9	9	1.50
STORY21	B5	C1WY	Left	367	1829	293	1463	10000	60000	10	30	44	1320	2.22	OK	4	9	9	1.50
STORY21	B5	C1WY	Right	367	-1838	293	1463	10000	60000	10	30	44	1320	2.22	OK	4	9	9	1.50
STORY20	B5	C1WY	Left	362	1807	293	1463	10000	60000	10	30	44	1320	2.22	OK	4	9	9	1.50
STORY20	B5	C1WY	Right	362	-1816	293	1463	10000	60000	10	30	44	1320	2.22	OK	4	9	9	1.50
STORY19	B5	C1WY	Left	360	1794	293	1463	10000	60000	10	30	44	1320	2.22	OK	4	9	9	1.50
STORY19	B5	C1WY	Right	360	-1803	293	1463	10000	60000	10	30	44	1320	2.22	OK	4	9	9	1.50
STORY18	B5	C1WY	Left	358	1788	287	1431	10000	60000	10	30	44	1320	2.17	OK	4	9	9	1.50
STORY18	B5	C1WY	Right	358	-1797	287	1431	10000	60000	10	30	44	1320	2.17	OK	4	9	9	1.50
STORY17	B5	C1WY	Left	358	1787	287	1431	10000	60000	10	30	44	1320	2.17	OK	4	9	9	1.50
STORY17	B5	C1WY	Right	358	-1796	287	1431	10000	60000	10	30	44	1320	2.17	OK	4	9	9	1.50
STORY16	B5	C1WY	Left	359	1789	287	1431	10000	60000	10	30	44	1320	2.17	OK	4	9	9	1.50
STORY16	B5	C1WY	Right	359	-1798	287	1431	10000	60000	10	30	44	1320	2.17	OK	4	9	9	1.50
STORY15	B5	C1WY	Left	353	1759	298	1484	10000	60000	10	30	44	1320	2.25	OK	4	9	9	1.50
STORY15	B5	C1WY	Right	353	-1768	298	1484	10000	60000	10	30	44	1320	2.25	OK	4	9	9	1.50
STORY14	B5	C1WY	Left	363	1809	298	1484	10000	60000	10	30	44	1320	2.25	OK	4	9	9	1.50
STORY14	B5	C1WY	Right	363	-1818	298	1484	10000	60000	10	30	44	1320	2.25	OK	4	9	9	1.50
STORY13	B5	C1WY	Left	372	1856	298	1484	10000	60000	10	30	44	1320	2.25	OK	4	9	9	1.50
STORY13	B5	C1WY	Right	372	-1864	298	1484	10000	60000	10	30	44	1320	2.25	OK	4	9	9	1.50
STORY12	B5	C1WY	Left	367	1828	296	1476	10000	60000	10	30	44	1320	2.24	OK	4	9	9	1.50
STORY12	B5	C1WY	Right	367	-1837	296	1476	10000	60000	10	30	44	1320	2.24	OK	4	9	9	1.50
STORY11	B5	C1WY	Left	368	1837	296	1476	10000	60000	10	30	44	1320	2.24	OK	4	9	9	1.50
STORY11	B5	C1WY	Right	368	-1846	296	1476	10000	60000	10	30	44	1320	2.24	OK	4	9	9	1.50
STORY10	B5	C1WY	Left	370	1845	296	1476	10000	60000	10	30	44	1320	2.24	OK	4	9	9	1.50
STORY10	B5	C1WY	Right	370	-1854	296	1476	10000	60000	10	30	44	1320	2.24	OK	4	9	9	1.50
STORY9	B5	C1WY	Left	371	1850	297	1480	10000	60000	10	30	44	1320	2.25	OK	4	9	9	1.50
STORY9	B5	C1WY	Right	371	-1859	297	1480	10000	60000	10	30	44	1320	2.25	OK	4	9	9	1.50
STORY8	B5	C1WY	Left	371	1850	297	1480	10000	60000	10	30	44	1320	2.25	OK	4	9	9	1.50
STORY8	B5	C1WY	Right	371	-1860	297	1480	10000	60000	10	30	44	1320	2.25	OK	4	9	9	1.50

Figure 167: Coupling Beam Design Hand calculations

STORY7	B5	C1WY	Left	370	1845	297	1480	10000	60000	10	30	44	1320	2.25	OK	4	9	9	1.50
STORY7	B5	C1WY	Right	370	-1854	297	1480	10000	60000	10	30	44	1320	2.25	OK	4	9	9	1.50
STORY6	B5	C1WY	Left	367	1829	293	1464	10000	60000	10	30	44	1320	2.22	OK	4	9	9	1.50
STORY6	B5	C1WY	Right	367	-1838	293	1464	10000	60000	10	30	44	1320	2.22	OK	4	9	9	1.50
STORY5	B5	C1WY	Left	365	1819	293	1464	10000	60000	10	30	44	1320	2.22	OK	4	9	9	1.50
STORY5	B5	C1WY	Right	365	-1827	293	1464	10000	60000	10	30	44	1320	2.22	OK	4	9	9	1.50
STORY4	B5	C1WY	Left	364	1814	293	1464	10000	60000	10	30	44	1320	2.22	OK	4	9	9	1.50
STORY4	B5	C1WY	Right	364	-1822	293	1464	10000	60000	10	30	44	1320	2.22	OK	4	9	9	1.50
STORY3	B5	C1WY	Left	348	1738	279	1390	10000	60000	10	30	44	1320	2.11	OK	4	10	8	1.50
STORY3	B5	C1WY	Right	348	-1745	279	1390	10000	60000	10	30	44	1320	2.11	OK	4	10	8	1.50
STORY2	B5	C1WY	Left	324	1611	279	1390	10000	60000	10	30	44	1320	2.11	OK	4	10	8	1.50
STORY2	B5	C1WY	Right	324	-1627	279	1390	10000	60000	10	30	44	1320	2.11	OK	4	10	8	1.50
STORY1	B5	C1WY	Left	129	661	279	1390	10000	60000	10	30	44	1320	2.11	OK	4	10	8	1.50
STORY1	B5	C1WY	Right	129	-630	279	1390	10000	60000	10	30	44	1320	2.11	OK	4	10	8	1.50

Figure 168: Coupling Beam Design Hand calculations

						As,min Check			As,max Check		Flexure							B_{min} check		Crack control check	
Story	Spandrel	d (in)	dt (in)	β	A_s (in^2)	$3\sqrt{f'_c}bd/f_y$	$200bd/f_y$	$A_{s,min}$	0.025bd	$A_{s,max}$	a	c	$\varepsilon_s=0.003(d-c)/c$	ε_y	φ	ϕM_n (ftk)	$\phi M_n > M_u$	b_{min}	$b > b_{min}$	min	used > min
STORY52	B6	41.50	41.50	0.75	3.95	2.89	2.49	OK	18.68	OK	2.58	3.44	0.0332	0.0021	0.90	715	OK	13.00	OK	3	OK
STORY52	B6	41.50	41.50	0.75	3.95	2.89	2.49	OK	18.68	OK	2.58	3.44	0.0332	0.0021	0.90	715	OK	13.00	OK	3	OK
STORY51	B6	41.50	41.50	0.75	3.95	2.89	2.49	OK	18.68	OK	2.58	3.44	0.0332	0.0021	0.90	715	OK	13.00	OK	3	OK
STORY51	B6	41.50	41.50	0.75	3.95	2.89	2.49	OK	18.68	OK	2.58	3.44	0.0332	0.0021	0.90	715	OK	13.00	OK	3	OK
STORY50	B6	41.50	41.50	0.75	3.95	2.89	2.49	OK	18.68	OK	2.58	3.44	0.0332	0.0021	0.90	715	OK	13.00	OK	3	OK
STORY50	B6	41.50	41.50	0.75	3.95	2.89	2.49	OK	18.68	OK	2.58	3.44	0.0332	0.0021	0.90	715	OK	13.00	OK	3	OK
STORY49	B6	41.50	41.50	0.75	4.74	2.89	2.49	OK	18.68	OK	3.10	4.13	0.0271	0.0021	0.90	852	OK	15.00	OK	3	OK
STORY49	B6	41.50	41.50	0.75	4.74	2.89	2.49	OK	18.68	OK	3.10	4.13	0.0271	0.0021	0.90	852	OK	15.00	OK	3	OK
STORY48	B6	41.50	41.50	0.75	4.74	2.89	2.49	OK	18.68	OK	3.10	4.13	0.0271	0.0021	0.90	852	OK	15.00	OK	3	OK
STORY48	B6	41.50	41.50	0.75	4.74	2.89	2.49	OK	18.68	OK	3.10	4.13	0.0271	0.0021	0.90	852	OK	15.00	OK	3	OK
STORY47	B6	41.50	41.50	0.75	4.74	2.89	2.49	OK	18.68	OK	3.10	4.13	0.0271	0.0021	0.90	852	OK	15.00	OK	3	OK
STORY47	B6	41.50	41.50	0.75	4.74	2.89	2.49	OK	18.68	OK	3.10	4.13	0.0271	0.0021	0.90	852	OK	15.00	OK	3	OK
STORY46	B6	41.50	41.50	0.75	5.53	2.89	2.49	OK	18.68	OK	3.61	4.82	0.0228	0.0021	0.90	988	OK	17.00	OK	3	OK
STORY46	B6	41.50	41.50	0.75	5.53	2.89	2.49	OK	18.68	OK	3.61	4.82	0.0228	0.0021	0.90	988	OK	17.00	OK	3	OK
STORY45	B6	41.50	41.50	0.75	5.53	2.89	2.49	OK	18.68	OK	3.61	4.82	0.0228	0.0021	0.90	988	OK	17.00	OK	3	OK
STORY45	B6	41.50	41.50	0.75	5.53	2.89	2.49	OK	18.68	OK	3.61	4.82	0.0228	0.0021	0.90	988	OK	17.00	OK	3	OK
STORY44	B6	41.50	41.50	0.75	5.53	2.89	2.49	OK	18.68	OK	3.61	4.82	0.0228	0.0021	0.90	988	OK	17.00	OK	3	OK
STORY44	B6	41.50	41.50	0.75	5.53	2.89	2.49	OK	18.68	OK	3.61	4.82	0.0228	0.0021	0.90	988	OK	17.00	OK	3	OK
STORY43	B6	41.44	41.44	0.75	6.00	2.89	2.49	OK	18.65	OK	3.92	5.23	0.0208	0.0021	0.90	1066	OK	16.38	OK	3	OK
STORY43	B6	41.44	41.44	0.75	6.00	2.89	2.49	OK	18.65	OK	3.92	5.23	0.0208	0.0021	0.90	1066	OK	16.38	OK	3	OK
STORY42	B6	41.44	41.44	0.75	6.00	2.89	2.49	OK	18.65	OK	3.92	5.23	0.0208	0.0021	0.90	1066	OK	16.38	OK	3	OK
STORY42	B6	41.44	41.44	0.75	6.00	2.89	2.49	OK	18.65	OK	3.92	5.23	0.0208	0.0021	0.90	1066	OK	16.38	OK	3	OK
STORY41	B6	41.44	41.44	0.65	8.00	4.45	3.32	OK	24.86	OK	2.94	4.52	0.0245	0.0021	0.90	1439	OK	20.88	OK	3	OK
STORY41	B6	41.44	41.44	0.65	8.00	4.45	3.32	OK	24.86	OK	2.94	4.52	0.0245	0.0021	0.90	1439	OK	20.88	OK	3	OK
STORY40	B6	41.38	41.38	0.65	8.89	4.44	3.31	OK	24.83	OK	3.27	5.03	0.0217	0.0021	0.90	1590	OK	20.25	OK	3	OK
STORY40	B6	41.38	41.38	0.65	8.89	4.44	3.31	OK	24.83	OK	3.27	5.03	0.0217	0.0021	0.90	1590	OK	20.25	OK	3	OK
STORY39	B6	41.38	41.38	0.65	8.89	4.44	3.31	OK	24.83	OK	3.27	5.03	0.0217	0.0021	0.90	1590	OK	20.25	OK	3	OK
STORY39	B6	41.38	41.38	0.65	8.89	4.44	3.31	OK	24.83	OK	3.27	5.03	0.0217	0.0021	0.90	1590	OK	20.25	OK	3	OK
STORY38	B6	41.38	41.38	0.65	8.89	4.44	3.31	OK	24.83	OK	3.27	5.03	0.0217	0.0021	0.90	1590	OK	20.25	OK	3	OK
STORY38	B6	41.38	41.38	0.65	8.89	4.44	3.31	OK	24.83	OK	3.27	5.03	0.0217	0.0021	0.90	1590	OK	20.25	OK	3	OK
STORY37	B6	41.38	41.38	0.65	8.89	4.44	3.31	OK	24.83	OK	3.27	5.03	0.0217	0.0021	0.90	1590	OK	20.25	OK	3	OK
STORY37	B6	41.38	41.38	0.65	8.89	4.44	3.31	OK	24.83	OK	3.27	5.03	0.0217	0.0021	0.90	1590	OK	20.25	OK	3	OK
STORY36	B6	41.38	41.38	0.65	8.89	4.44	3.31	OK	24.83	OK	3.27	5.03	0.0217	0.0021	0.90	1590	OK	20.25	OK	3	OK
STORY36	B6	41.38	41.38	0.65	8.89	4.44	3.31	OK	24.83	OK	3.27	5.03	0.0217	0.0021	0.90	1590	OK	20.25	OK	3	OK

Figure 169:Coupling Beam Design Hand calculations

STORY35	B6	41.38	41.38	0.65	8.89	4.44	3.31	OK	24.83	OK	3.27	5.03	0.0217	0.0021	0.90	1590	OK	20.25	OK	3	OK
STORY35	B6	41.38	41.38	0.65	8.89	4.44	3.31	OK	24.83	OK	3.27	5.03	0.0217	0.0021	0.90	1590	OK	20.25	OK	3	OK
STORY34	B6	41.44	41.44	0.65	9.00	4.45	3.32	OK	24.86	OK	3.31	5.09	0.0214	0.0021	0.90	1611	OK	23.13	OK	3	OK
STORY34	B6	41.44	41.44	0.65	9.00	4.45	3.32	OK	24.86	OK	3.31	5.09	0.0214	0.0021	0.90	1611	OK	23.13	OK	3	OK
STORY33	B6	41.44	41.44	0.65	9.00	4.45	3.32	OK	24.86	OK	3.31	5.09	0.0214	0.0021	0.90	1611	OK	23.13	OK	3	OK
STORY33	B6	41.44	41.44	0.65	9.00	4.45	3.32	OK	24.86	OK	3.31	5.09	0.0214	0.0021	0.90	1611	OK	23.13	OK	3	OK
STORY32	B6	41.44	41.44	0.65	9.00	4.45	3.32	OK	24.86	OK	3.31	5.09	0.0214	0.0021	0.90	1611	OK	23.13	OK	3	OK
STORY32	B6	41.44	41.44	0.65	9.00	4.45	3.32	OK	24.86	OK	3.31	5.09	0.0214	0.0021	0.90	1611	OK	23.13	OK	3	OK
STORY31	B6	41.44	41.44	0.65	7.00	4.45	3.32	OK	24.86	OK	2.57	3.96	0.0284	0.0021	0.90	1265	OK	18.63	OK	3	OK
STORY31	B6	41.44	41.44	0.65	7.00	4.45	3.32	OK	24.86	OK	2.57	3.96	0.0284	0.0021	0.90	1265	OK	18.63	OK	3	OK
STORY30	B6	41.44	41.44	0.55	7.00	6.22	4.14	OK	31.08	OK	1.65	2.99	0.0385	0.0021	0.90	1279	OK	18.63	OK	4	OK
STORY30	B6	41.44	41.44	0.55	7.00	6.22	4.14	OK	31.08	OK	1.65	2.99	0.0385	0.0021	0.90	1279	OK	18.63	OK	4	OK
STORY29	B6	41.44	41.44	0.55	7.00	6.22	4.14	OK	31.08	OK	1.65	2.99	0.0385	0.0021	0.90	1279	OK	18.63	OK	4	OK
STORY29	B6	41.44	41.44	0.55	7.00	6.22	4.14	OK	31.08	OK	1.65	2.99	0.0385	0.0021	0.90	1279	OK	18.63	OK	4	OK
STORY28	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY28	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY27	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY27	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY26	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY26	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY25	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY25	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY24	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY24	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY23	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY23	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY22	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY22	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY21	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY21	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY20	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY20	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY19	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY19	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY18	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY18	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY17	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY17	B6	41.50	41.50	0.55	6.32	6.23	4.15	OK	31.13	OK	1.49	2.70	0.0430	0.0021	0.90	1159	OK	19.00	OK	4	OK
STORY16	B6	41.44	41.44	0.55	8.00	6.22	4.14	OK	31.08	OK	1.88	3.42	0.0333	0.0021	0.90	1458	OK	20.88	OK	4	OK
STORY16	B6	41.44	41.44	0.55	8.00	6.22	4.14	OK	31.08	OK	1.88	3.42	0.0333	0.0021	0.90	1458	OK	20.88	OK	4	OK
STORY15	B6	41.44	41.44	0.55	8.00	6.22	4.14	OK	31.08	OK	1.88	3.42	0.0333	0.0021	0.90	1458	OK	20.88	OK	4	OK
STORY15	B6	41.44	41.44	0.55	8.00	6.22	4.14	OK	31.08	OK	1.88	3.42	0.0333	0.0021	0.90	1458	OK	20.88	OK	4	OK
STORY14	B6	41.44	41.44	0.55	8.00	6.22	4.14	OK	31.08	OK	1.88	3.42	0.0333	0.0021	0.90	1458	OK	20.88	OK	4	OK
STORY14	B6	41.44	41.44	0.55	8.00	6.22	4.14	OK	31.08	OK	1.88	3.42	0.0333	0.0021	0.90	1458	OK	20.88	OK	4	OK
STORY13	B6	41.38	41.38	0.55	8.89	6.21	4.14	OK	31.03	OK	2.09	3.80	0.0296	0.0021	0.90	1613	OK	20.25	OK	4	OK
STORY13	B6	41.38	41.38	0.55	8.89	6.21	4.14	OK	31.03	OK	2.09	3.80	0.0296	0.0021	0.90	1613	OK	20.25	OK	4	OK
STORY12	B6	41.38	41.38	0.55	8.89	6.21	4.14	OK	31.03	OK	2.09	3.80	0.0296	0.0021	0.90	1613	OK	20.25	OK	4	OK
STORY12	B6	41.38	41.38	0.55	8.89	6.21	4.14	OK	31.03	OK	2.09	3.80	0.0296	0.0021	0.90	1613	OK	20.25	OK	4	OK
STORY11	B6	41.38	41.38	0.55	8.89	6.21	4.14	OK	31.03	OK	2.09	3.80	0.0296	0.0021	0.90	1613	OK	20.25	OK	4	OK
STORY11	B6	41.38	41.38	0.55	8.89	6.21	4.14	OK	31.03	OK	2.09	3.80	0.0296	0.0021	0.90	1613	OK	20.25	OK	4	OK
STORY10	B6	41.44	41.44	0.55	9.00	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY10	B6	41.44	41.44	0.55	9.00	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK

Figure 170: Coupling Beam Design Hand calculations

STORY9	B6	41.44	41.44	0.55	9.00	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY9	B6	41.44	41.44	0.55	9.00	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY8	B6	41.44	41.44	0.55	9.00	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY8	B6	41.44	41.44	0.55	9.00	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY7	B6	41.44	41.44	0.55	10.00	6.22	4.14	OK	31.08	OK	2.35	4.28	0.0261	0.0021	0.90	1812	OK	25.38	OK	4	OK
STORY7	B6	41.44	41.44	0.55	10.00	6.22	4.14	OK	31.08	OK	2.35	4.28	0.0261	0.0021	0.90	1812	OK	25.38	OK	4	OK
STORY6	B6	41.44	41.44	0.55	10.00	6.22	4.14	OK	31.08	OK	2.35	4.28	0.0261	0.0021	0.90	1812	OK	25.38	OK	4	OK
STORY6	B6	41.44	41.44	0.55	10.00	6.22	4.14	OK	31.08	OK	2.35	4.28	0.0261	0.0021	0.90	1812	OK	25.38	OK	4	OK
STORY5	B6	41.44	41.44	0.55	10.00	6.22	4.14	OK	31.08	OK	2.35	4.28	0.0261	0.0021	0.90	1812	OK	25.38	OK	4	OK
STORY5	B6	41.44	41.44	0.55	10.00	6.22	4.14	OK	31.08	OK	2.35	4.28	0.0261	0.0021	0.90	1812	OK	25.38	OK	4	OK
STORY4	B6	41.44	41.44	0.55	10.00	6.22	4.14	OK	31.08	OK	2.35	4.28	0.0261	0.0021	0.90	1812	OK	25.38	OK	4	OK
STORY4	B6	41.44	41.44	0.55	10.00	6.22	4.14	OK	31.08	OK	2.35	4.28	0.0261	0.0021	0.90	1812	OK	25.38	OK	4	OK
STORY3	B6	41.44	41.44	0.55	10.00	6.22	4.14	OK	31.08	OK	2.35	4.28	0.0261	0.0021	0.90	1812	OK	25.38	OK	4	OK
STORY3	B6	41.44	41.44	0.55	10.00	6.22	4.14	OK	31.08	OK	2.35	4.28	0.0261	0.0021	0.90	1812	OK	25.38	OK	4	OK
STORY2	B6	41.44	41.44	0.55	7.00	6.22	4.14	OK	31.08	OK	1.65	2.99	0.0385	0.0021	0.90	1279	OK	18.63	OK	4	OK
STORY2	B6	41.44	41.44	0.55	7.00	6.22	4.14	OK	31.08	OK	1.65	2.99	0.0385	0.0021	0.90	1279	OK	18.63	OK	4	OK
STORY1	B6	41.44	41.44	0.55	7.00	6.22	4.14	OK	31.08	OK	1.65	2.99	0.0385	0.0021	0.90	1279	OK	18.63	OK	4	OK
STORY1	B6	41.44	41.44	0.55	7.00	6.22	4.14	OK	31.08	OK	1.65	2.99	0.0385	0.0021	0.90	1279	OK	18.63	OK	4	OK
STORY30	B5	40.75	41.38	0.55	15.24	6.11	4.08	OK	30.56	OK	3.59	6.52	0.0160	0.0021	0.90	2672	OK	17.75	OK	4	OK
STORY30	B5	40.75	41.38	0.55	15.24	6.11	4.08	OK	30.56	OK	3.59	6.52	0.0160	0.0021	0.90	2672	OK	17.75	OK	4	OK
STORY29	B5	40.75	41.38	0.55	15.24	6.11	4.08	OK	30.56	OK	3.59	6.52	0.0160	0.0021	0.90	2672	OK	17.75	OK	4	OK
STORY29	B5	40.75	41.38	0.55	15.24	6.11	4.08	OK	30.56	OK	3.59	6.52	0.0160	0.0021	0.90	2672	OK	17.75	OK	4	OK
STORY28	B5	40.75	41.38	0.55	15.24	6.11	4.08	OK	30.56	OK	3.59	6.52	0.0160	0.0021	0.90	2672	OK	17.75	OK	4	OK
STORY28	B5	40.75	41.38	0.55	15.24	6.11	4.08	OK	30.56	OK	3.59	6.52	0.0160	0.0021	0.90	2672	OK	17.75	OK	4	OK
STORY27	B5	40.75	41.38	0.55	12.70	6.11	4.08	OK	30.56	OK	2.99	5.43	0.0198	0.0021	0.90	2243	OK	15.25	OK	4	OK
STORY27	B5	40.75	41.38	0.55	12.70	6.11	4.08	OK	30.56	OK	2.99	5.43	0.0198	0.0021	0.90	2243	OK	15.25	OK	4	OK
STORY26	B5	40.75	41.38	0.55	12.70	6.11	4.08	OK	30.56	OK	2.99	5.43	0.0198	0.0021	0.90	2243	OK	15.25	OK	4	OK
STORY26	B5	40.75	41.38	0.55	12.70	6.11	4.08	OK	30.56	OK	2.99	5.43	0.0198	0.0021	0.90	2243	OK	15.25	OK	4	OK
STORY25	B5	40.75	41.38	0.55	12.70	6.11	4.08	OK	30.56	OK	2.99	5.43	0.0198	0.0021	0.90	2243	OK	15.25	OK	4	OK
STORY25	B5	40.75	41.38	0.55	12.70	6.11	4.08	OK	30.56	OK	2.99	5.43	0.0198	0.0021	0.90	2243	OK	15.25	OK	4	OK
STORY24	B5	41.44	41.44	0.55	9.00	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY24	B5	41.44	41.44	0.55	9.00	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY23	B5	41.44	41.44	0.55	9.00	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY23	B5	41.44	41.44	0.55	9.00	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY22	B5	41.44	41.44	0.55	9.00	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY22	B5	41.44	41.44	0.55	9.00	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY21	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY21	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY20	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY20	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY19	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY19	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY18	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY18	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY17	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY17	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY16	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY16	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY15	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY15	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY14	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY14	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY13	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY13	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK

Figure 171: Coupling Beam Design Hand calculations

STORY12	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY12	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY11	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY11	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY10	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY10	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY9	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY9	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY8	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY8	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY7	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY7	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY6	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY6	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY5	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY5	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY4	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY4	B5	41.44	41.44	0.55	9	6.22	4.14	OK	31.08	OK	2.12	3.85	0.0293	0.0021	0.90	1635	OK	23.13	OK	4	OK
STORY3	B5	41.50	41.50	0.55	7.9	6.23	4.15	OK	31.13	OK	1.86	3.38	0.0338	0.0021	0.90	1442	OK	23.00	OK	4	OK
STORY3	B5	41.50	41.50	0.55	7.9	6.23	4.15	OK	31.13	OK	1.86	3.38	0.0338	0.0021	0.90	1442	OK	23.00	OK	4	OK
STORY2	B5	41.50	41.50	0.55	7.9	6.23	4.15	OK	31.13	OK	1.86	3.38	0.0338	0.0021	0.90	1442	OK	23.00	OK	4	OK
STORY2	B5	41.50	41.50	0.55	7.9	6.23	4.15	OK	31.13	OK	1.86	3.38	0.0338	0.0021	0.90	1442	OK	23.00	OK	4	OK
STORY1	B5	41.50	41.50	0.55	7.9	6.23	4.15	OK	31.13	OK	1.86	3.38	0.0338	0.0021	0.90	1442	OK	23.00	OK	4	OK
STORY1	B5	41.50	41.50	0.55	7.9	6.23	4.15	OK	31.13	OK	1.86	3.38	0.0338	0.0021	0.90	1442	OK	23.00	OK	4	OK

Figure 172: Coupling Beam Design Hand calculations

Story	Spandrel	V_e=M_{pr1}+M_{pr2}/l_n (kip)	$V_c = 2\lambda\sqrt{f'_c} b_w d$	$\phi V_n = 0.5\phi V_c$	V_u @ d	$V_s = V_u/\phi - V_c$	$V_s \le 8\sqrt{f'_c} b_w d$		s_{max}	s_{used}	$V_s = A_v f_y d/s$	
STORY52	B6	125	116	43	125	51	463	OK	8.00	8.00	124.50	OK
STORY52	B6	125	116	43	125	51	463	OK	8.00	8.00	124.50	OK
STORY51	B6	125	116	43	125	51	463	OK	8.00	8.00	124.50	OK
STORY51	B6	125	116	43	125	51	463	OK	8.00	8.00	124.50	OK
STORY50	B6	125	116	43	125	51	463	OK	8.00	8.00	124.50	OK
STORY50	B6	125	116	43	125	51	463	OK	8.00	8.00	124.50	OK
STORY49	B6	152	116	43	152	86	463	OK	8.00	8.00	124.50	OK
STORY49	B6	152	116	43	152	86	463	OK	8.00	8.00	124.50	OK
STORY48	B6	152	116	43	152	86	463	OK	8.00	8.00	124.50	OK
STORY48	B6	152	116	43	152	86	463	OK	8.00	8.00	124.50	OK
STORY47	B6	152	116	43	152	86	463	OK	8.00	8.00	124.50	OK
STORY47	B6	152	116	43	152	86	463	OK	8.00	8.00	124.50	OK
STORY46	B6	182	116	43	182	127	463	OK	8.00	6.00	166.00	OK
STORY46	B6	182	116	43	182	127	463	OK	8.00	6.00	166.00	OK
STORY45	B6	182	116	43	182	127	463	OK	8.00	6.00	166.00	OK
STORY45	B6	182	116	43	182	127	463	OK	8.00	6.00	166.00	OK
STORY44	B6	182	116	43	182	127	463	OK	8.00	6.00	166.00	OK
STORY44	B6	182	116	43	182	127	463	OK	8.00	6.00	166.00	OK
STORY43	B6	193	116	43	193	142	462	OK	9.00	6.00	165.75	OK
STORY43	B6	193	116	43	193	142	462	OK	9.00	6.00	165.75	OK

Figure 173: Coupling Beam Design Hand calculations

STORY42	B6	193	116	43	193	142	462	OK	9.00	6.00	165.75	OK
STORY42	B6	193	116	43	193	142	462	OK	9.00	6.00	165.75	OK
STORY41	B6	271	178	67	271	184	712	OK	9.00	4.00	248.63	OK
STORY41	B6	271	178	67	271	184	712	OK	9.00	4.00	248.63	OK
STORY40	B6	302	178	67	302	225	711	OK	10.00	4.00	248.25	OK
STORY40	B6	302	178	67	302	225	711	OK	10.00	4.00	248.25	OK
STORY39	B6	302	178	67	302	225	711	OK	10.00	4.00	248.25	OK
STORY39	B6	302	178	67	302	225	711	OK	10.00	4.00	248.25	OK
STORY38	B6	302	178	67	302	225	711	OK	10.00	4.00	248.25	OK
STORY38	B6	302	178	67	302	225	711	OK	10.00	4.00	248.25	OK
STORY37	B6	304	178	67	304	228	711	OK	10.00	4.00	248.25	OK
STORY37	B6	304	178	67	304	228	711	OK	10.00	4.00	248.25	OK
STORY36	B6	304	178	67	304	228	711	OK	10.00	4.00	248.25	OK
STORY36	B6	304	178	67	304	228	711	OK	10.00	4.00	248.25	OK
STORY35	B6	304	178	67	304	228	711	OK	10.00	4.00	248.25	OK
STORY35	B6	304	178	67	304	228	711	OK	10.00	4.00	248.25	OK
STORY34	B6	289	178	67	289	207	712	OK	9.00	4.00	248.63	OK
STORY34	B6	289	178	67	289	207	712	OK	9.00	4.00	248.63	OK
STORY33	B6	289	178	67	289	207	712	OK	9.00	4.00	248.63	OK
STORY33	B6	289	178	67	289	207	712	OK	9.00	4.00	248.63	OK
STORY32	B6	289	178	67	289	207	712	OK	9.00	4.00	248.63	OK
STORY32	B6	289	178	67	289	207	712	OK	9.00	4.00	248.63	OK
STORY31	B6	188	178	67	188	72	712	OK	9.00	8.00	124.31	OK
STORY31	B6	188	178	67	188	72	712	OK	9.00	8.00	124.31	OK
STORY30	B6	188	249	93	188	1	995	OK	9.00	8.00	124.31	OK
STORY30	B6	188	249	93	188	1	995	OK	9.00	8.00	124.31	OK
STORY29	B6	188	249	93	188	1	995	OK	9.00	8.00	124.31	OK
STORY29	B6	188	249	93	188	1	995	OK	9.00	8.00	124.31	OK
STORY28	B6	93	249	93	93	-125	996	OK	8.00	8.00	124.50	OK
STORY28	B6	93	249	93	93	-125	996	OK	8.00	8.00	124.50	OK
STORY27	B6	93	249	93	93	-125	996	OK	8.00	8.00	124.50	OK
STORY27	B6	93	249	93	93	-125	996	OK	8.00	8.00	124.50	OK
STORY26	B6	93	249	93	93	-125	996	OK	8.00	8.00	124.50	OK
STORY26	B6	93	249	93	93	-125	996	OK	8.00	8.00	124.50	OK
STORY25	B6	134	249	93	134	-71	996	OK	8.00	8.00	124.50	OK
STORY25	B6	134	249	93	134	-71	996	OK	8.00	8.00	124.50	OK
STORY24	B6	134	249	93	134	-71	996	OK	8.00	8.00	124.50	OK
STORY24	B6	134	249	93	134	-71	996	OK	8.00	8.00	124.50	OK
STORY23	B6	134	249	93	134	-71	996	OK	8.00	8.00	124.50	OK
STORY23	B6	134	249	93	134	-71	996	OK	8.00	8.00	124.50	OK
STORY22	B6	181	249	93	181	-8	996	OK	8.00	8.00	124.50	OK
STORY22	B6	181	249	93	181	-8	996	OK	8.00	8.00	124.50	OK
STORY21	B6	181	249	93	181	-8	996	OK	8.00	8.00	124.50	OK
STORY21	B6	181	249	93	181	-8	996	OK	8.00	8.00	124.50	OK
STORY20	B6	181	249	93	181	-8	996	OK	8.00	8.00	124.50	OK
STORY20	B6	181	249	93	181	-8	996	OK	8.00	8.00	124.50	OK

Figure 174: Coupling Beam Design Hand calculations

STORY19	B6	225	249	93	225	51	996	OK	8.00	8.00	124.50	OK
STORY19	B6	225	249	93	225	51	996	OK	8.00	8.00	124.50	OK
STORY18	B6	225	249	93	225	51	996	OK	8.00	8.00	124.50	OK
STORY18	B6	225	249	93	225	51	996	OK	8.00	8.00	124.50	OK
STORY17	B6	225	249	93	225	51	996	OK	8.00	8.00	124.50	OK
STORY17	B6	225	249	93	225	51	996	OK	8.00	8.00	124.50	OK
STORY16	B6	263	249	93	263	102	995	OK	9.00	8.00	124.31	OK
STORY16	B6	263	249	93	263	102	995	OK	9.00	8.00	124.31	OK
STORY15	B6	263	249	93	263	102	995	OK	9.00	8.00	124.31	OK
STORY15	B6	263	249	93	263	102	995	OK	9.00	8.00	124.31	OK
STORY14	B6	263	249	93	263	102	995	OK	9.00	8.00	124.31	OK
STORY14	B6	263	249	93	263	102	995	OK	9.00	8.00	124.31	OK
STORY13	B6	296	248	93	296	147	993	OK	10.00	6.00	165.50	OK
STORY13	B6	296	248	93	296	147	993	OK	10.00	6.00	165.50	OK
STORY12	B6	296	248	93	296	147	993	OK	10.00	6.00	165.50	OK
STORY12	B6	296	248	93	296	147	993	OK	10.00	6.00	165.50	OK
STORY11	B6	296	248	93	296	147	993	OK	10.00	6.00	165.50	OK
STORY11	B6	296	248	93	296	147	993	OK	10.00	6.00	165.50	OK
STORY10	B6	321	249	93	321	179	995	OK	9.00	4.00	248.63	OK
STORY10	B6	321	249	93	321	179	995	OK	9.00	4.00	248.63	OK
STORY9	B6	321	249	93	321	179	995	OK	9.00	4.00	248.63	OK
STORY9	B6	321	249	93	321	179	995	OK	9.00	4.00	248.63	OK
STORY8	B6	321	249	93	321	179	995	OK	9.00	4.00	248.63	OK
STORY8	B6	321	249	93	321	179	995	OK	9.00	4.00	248.63	OK
STORY7	B6	335	249	93	335	199	995	OK	9.00	4.00	248.63	OK
STORY7	B6	335	249	93	335	199	995	OK	9.00	4.00	248.63	OK
STORY6	B6	335	249	93	335	199	995	OK	9.00	4.00	248.63	OK
STORY6	B6	335	249	93	335	199	995	OK	9.00	4.00	248.63	OK
STORY5	B6	335	249	93	335	199	995	OK	9.00	4.00	248.63	OK
STORY5	B6	335	249	93	335	199	995	OK	9.00	4.00	248.63	OK
STORY4	B6	342	249	93	342	208	995	OK	9.00	4.00	248.63	OK
STORY4	B6	342	249	93	342	208	995	OK	9.00	4.00	248.63	OK
STORY3	B6	342	249	93	342	208	995	OK	9.00	4.00	248.63	OK
STORY3	B6	342	249	93	342	208	995	OK	9.00	4.00	248.63	OK
STORY2	B6	35	249	93	35	-202	995	OK	9.00	9.00	110.50	OK
STORY2	B6	35	249	93	35	-202	995	OK	9.00	9.00	110.50	OK
STORY1	B6	35	249	93	35	-202	995	OK	9.00	9.00	110.50	OK
STORY1	B6	35	249	93	35	-202	995	OK	9.00	9.00	110.50	OK
STORY30	B5	520	245	92	520	449	978	OK	10.00	2.00	489.00	OK
STORY30	B5	520	245	92	520	449	978	OK	10.00	2.00	489.00	OK
STORY29	B5	520	245	92	520	449	978	OK	10.00	2.00	489.00	OK
STORY29	B5	520	245	92	520	449	978	OK	10.00	2.00	489.00	OK
STORY28	B5	520	245	92	520	449	978	OK	10.00	2.00	489.00	OK
STORY28	B5	520	245	92	520	449	978	OK	10.00	2.00	489.00	OK
STORY27	B5	385	245	92	385	268	978	OK	10.00	2.00	489.00	OK
STORY27	B5	385	245	92	385	268	978	OK	10.00	2.00	489.00	OK
STORY26	B5	385	245	92	385	268	978	OK	10.00	2.00	489.00	OK
STORY26	B5	385	245	92	385	268	978	OK	10.00	2.00	489.00	OK

Figure 175: Coupling Beam Design Hand calculations

STORY25	B5	385	245	92	385	268	978	OK	10.00	2.00	489.00	OK
STORY25	B5	385	245	92	385	268	978	OK	10.00	2.00	489.00	OK
STORY24	B5	316	249	93	316	173	995	OK	9.00	4.00	248.63	OK
STORY24	B5	316	249	93	316	173	995	OK	9.00	4.00	248.63	OK
STORY23	B5	316	249	93	316	173	995	OK	9.00	4.00	248.63	OK
STORY23	B5	316	249	93	316	173	995	OK	9.00	4.00	248.63	OK
STORY22	B5	316	249	93	316	173	995	OK	9.00	4.00	248.63	OK
STORY22	B5	316	249	93	316	173	995	OK	9.00	4.00	248.63	OK
STORY21	B5	293	249	93	293	141	995	OK	9.00	6.00	165.75	OK
STORY21	B5	293	249	93	293	141	995	OK	9.00	6.00	165.75	OK
STORY20	B5	293	249	93	293	141	995	OK	9.00	6.00	165.75	OK
STORY20	B5	293	249	93	293	141	995	OK	9.00	6.00	165.75	OK
STORY19	B5	293	249	93	293	141	995	OK	9.00	6.00	165.75	OK
STORY19	B5	293	249	93	293	141	995	OK	9.00	6.00	165.75	OK
STORY18	B5	286	249	93	286	133	995	OK	9.00	6.00	165.75	OK
STORY18	B5	286	249	93	286	133	995	OK	9.00	6.00	165.75	OK
STORY17	B5	286	249	93	286	133	995	OK	9.00	6.00	165.75	OK
STORY17	B5	286	249	93	286	133	995	OK	9.00	6.00	165.75	OK
STORY16	B5	286	249	93	286	133	995	OK	9.00	6.00	165.75	OK
STORY16	B5	286	249	93	286	133	995	OK	9.00	6.00	165.75	OK
STORY15	B5	297	249	93	297	147	995	OK	9.00	6.00	165.75	OK
STORY15	B5	297	249	93	297	147	995	OK	9.00	6.00	165.75	OK
STORY14	B5	297	249	93	297	147	995	OK	9.00	6.00	165.75	OK
STORY14	B5	297	249	93	297	147	995	OK	9.00	6.00	165.75	OK
STORY13	B5	297	249	93	297	147	995	OK	9.00	6.00	165.75	OK
STORY13	B5	297	249	93	297	147	995	OK	9.00	6.00	165.75	OK
STORY12	B5	295	249	93	295	145	995	OK	9.00	6.00	165.75	OK
STORY12	B5	295	249	93	295	145	995	OK	9.00	6.00	165.75	OK
STORY11	B5	295	249	93	295	145	995	OK	9.00	6.00	165.75	OK
STORY11	B5	295	249	93	295	145	995	OK	9.00	6.00	165.75	OK
STORY10	B5	295	249	93	295	145	995	OK	9.00	6.00	165.75	OK
STORY10	B5	295	249	93	295	145	995	OK	9.00	6.00	165.75	OK
STORY9	B5	296	249	93	296	146	995	OK	9.00	6.00	165.75	OK
STORY9	B5	296	249	93	296	146	995	OK	9.00	6.00	165.75	OK
STORY8	B5	296	249	93	296	146	995	OK	9.00	6.00	165.75	OK
STORY8	B5	296	249	93	296	146	995	OK	9.00	6.00	165.75	OK
STORY7	B5	296	249	93	296	146	995	OK	9.00	6.00	165.75	OK
STORY7	B5	296	249	93	296	146	995	OK	9.00	6.00	165.75	OK
STORY6	B5	293	249	93	293	142	995	OK	9.00	6.00	165.75	OK
STORY6	B5	293	249	93	293	142	995	OK	9.00	6.00	165.75	OK
STORY5	B5	293	249	93	293	142	995	OK	9.00	6.00	165.75	OK
STORY5	B5	293	249	93	293	142	995	OK	9.00	6.00	165.75	OK
STORY4	B5	293	249	93	293	142	995	OK	9.00	6.00	165.75	OK
STORY4	B5	293	249	93	293	142	995	OK	9.00	6.00	165.75	OK
STORY3	B5	278	249	93	278	122	996	OK	8.00	8.00	124.50	OK
STORY3	B5	278	249	93	278	122	996	OK	8.00	8.00	124.50	OK
STORY2	B5	278	249	93	278	122	996	OK	8.00	8.00	124.50	OK
STORY2	B5	278	249	93	278	122	996	OK	8.00	8.00	124.50	OK
STORY1	B5	278	249	93	278	122	996	OK	8.00	8.00	124.50	OK
STORY1	B5	278	249	93	278	122	996	OK	8.00	8.00	124.50	OK

Figure 176: Coupling Beam Design Hand calculations

B =	161	ft			
H =	745.5	ft			
H/B =	4.633				
W_T =	180568	kips			
V_R =	96.880	MPH			
T =	50.000	year			
F_c =0.36+0.1ln(12T) =		0.9997			
V_RF_c =	96.85	MPH			
V_{mh} =	63.30	MPH			
V_{fm} =	80.39	MPH			
t_{fm} =	44.78	sec			
U_H =	63.30	MPH			
T_L =	6.46	sec			
T_D =	6.64	sec			
T_θ =	4.41	sec			
ρ =	9.36	pcf			
ζ =	0.02				
g_p =	3.75				
Along-wind:					
M_D =	81,904,331	kg			
$K_D = (2\pi N)^2M$ =		24,471,132	N/m		
$C_D(Z) = 0.0116B^{0.26}Z$ =		7.252			
$A_D(Z) = C_D(Z)U_H^{2.74}/(K_D^{0.37}\zeta^{0.5}M_D^{0.63})$ =			**1.86**	mg	
Across-wind:					
M_L =	81,904,331	kg			
$K_L = (2\pi N)^2M$ =		25,824,979	N/m		
$C_L(Z) = 0.0263B^{-0.54}Z$ =		0.730			
$A_L(Z) = CL(Z)U_H^{3.54}/(K_L^{0.77}\zeta^{0.5}M_L^{0.23})$ =			**2.72**	mg	
Torsional:					
$MMI = M(B^2+W^2)/12$ =		482	M		
M_θ =	81,904,331	kg			
$K_\theta = (2\pi N)^2M$ =		26,773,689,688	N/m		
$N_\theta B/U_H$ =	0.393				
$C_\theta(Z) = 0.00341B^{2.12}Z$ =		N/A			
$C_\theta(Z) = 0.00510B^{1.24}Z$ =		144.657			
$A_\theta(Z) = C_\theta(Z)U_H^{1.88}/(K_\theta^{-0.06}\zeta^{0.5}M_\theta^{1.06})$ =			**N/A**	mg	
$A_\theta(Z) = C_\theta(Z)U_H^{2.76}/(K_\theta^{0.38}\zeta^{0.5}M_\theta^{0.62})$ =			**0.06**	mg	
$BA_\theta/SQRT(2)$ =			**2.09**	mg	
$A_R = (A^2_D+A^2_L+(BA_\theta/SQRT(2))^2)^{0.5}$ =			**3.902**	mg	
$A_{peak} = g_pA_R$ =			**14.631**	mg	

Figure 177: Building Acceleration Hand calculations

Gravity Redesign																
	One 40'-0" Long Infill Beam Spanning West-East								Two 30'-0" Long Infill Beam Spanning North-South							
	Light weight concrete				Normal weight concrete				Light weight concrete				Normal weight concrete			
	Long Span Deck (EC450)		Typical Deck (CF DEK 3)		Long Span Deck (EC450)		Typical Deck		Long Span Deck (WC450)		Typical Deck (3" Lok)		Long Span Deck (EC450)		Typical Deck (3VLI16)	
	SMARTBeam	Normal	SMARTBeam	Normal	SMARTBeam	Normal	SMARTBeam	Normal	SMARTBeam	Normal	SMARTBeam	Normal	SMARTBeam	Normal	SMARTBeam	Normal
Slab depth (in)	8	8	6.25	6.25	8.75	8.75	NA	NA	8	8	6.25	6.25	8.75	8.75	7.5	7.5
Girder depth (in)	17.9	17.9	17.9	17.9	20.8	20.8	NA	NA	34.57	23.7	34.57	23.7	39.09	26.7	39.09	26.7
Beam Depth (in)	30.12	20.7	25.82	17.9	30.12	20.8	NA	NA	15.7	15.7	15.7	15.7	15.9	15.9	15.9	15.9
Total Structural Depth (in)	**38.12**	**28.7**	**32.07**	**24.15**	**38.87**	**29.55**	**NA**	**NA**	**42.57**	**31.7**	**40.82**	**29.95**	**47.84**	**35.45**	**46.59**	**34.2**
Beam size	LB30X44	W21X44	LB27X40	W18X40	LB30X44	W21X50	NA	NA	W16X26	W16X26	W16X26	W16X26	W16X31	W16X31	W16X31	W16X31
Hole Diameter (in)	20.75	NA	17.75	NA	20.75	NA	NA	NA	23.5	NA	23.5	NA	26.5	NA	26.5	NA
Girder Size	W18X40	W18X40	W18X40	W18X40	W21X50	W21X50	NA	NA	LB36X68/76	W24X68	LB36X68/76	W24X68	LB40X84/94	W27X84	LB40X84/94	W27X84
Deck Span (ft)	15'-0"	15'-0"	15'-0"	15'-0"	15'-0"	15'-0"	NA	NA	13'-4"	13'-4"	13'-4"	13'-4"	13'-4"	13'-4"	13'-4"	13'-4"
Deck Span Capacity (ft)	15'-7"	15'-7"	15'-7"	15'-7"	16'-3"	16'-3"	NA	NA	14'-1"	14'-1"	13'-4"	13'-4"	14'-4"	14'-4"	13'-4"	13'-4"
Beam Weights (psf)	3.43	3.43	3.17	3.17	3.56	3.96	NA	NA	4.03	3.89	4.03	3.89	4.90	4.74	4.90	4.74
Deck Weight (psf)	56.2	56.2	47.2	47.2	72.4	72.4	NA	NA	52.3	52.3	48.4	48.4	71.2	71.2	78.58	78.58
Structural Weight (psf)	**59.63**	**59.63**	**50.37**	**50.37**	**75.96**	**76.36**	NA	NA	**56.33**	**56.19**	**52.43**	**52.29**	**76.10**	**75.94**	**83.48**	**83.32**
Relative Cost ($/SF)							NA	NA								

Figure 178: Potential Gravity System Matrix

	One 40'-0" Long Infill Beam Spanning West-East				Two 30'-0" Long Infill Beam Spanning North-South			
	LWC			NWC	LWC		NWC	
	EC3.5		CF DEK 3	EC450	WC450		EC450	3VLI16
	SMARTBeam	Wide Flange	SMARTBeam	Wide Flange	SMARTBeam	Wide Flange	Wide Flange	Wide Flange
Slab depth (in)	5.5	5.5	6.25	8.75	8	8	8.75	7.5
Girder depth (in)	17.9	20.7	17.9	20.8	34.57	23.7	26.7	26.7
Beam Depth (in)	30.12	20.7	25.82	20.8	15.7	15.7	15.9	15.9
Total Structural Depth (in)	**35.62**	**26.2**	**32.07**	**29.55**	**42.57**	**31.7**	**35.45**	**34.2**
Beam size	LB30X44	W21X44	LB27X40	W21X50	W16X26	W16X26	W16X31	W16X31
Hole Diameter (in)	20.75	NA	17.75	NA	23.5	NA	NA	NA
Girder Size	W18X40	W21X44	W18X40	W21X50	LB36X68/76	W24X68	W27X84	W27X84
Deck Span (ft)	15'-0"	15'-0"	15'-0"	15'-0"	13'-4"	13'-4"	13'-4"	13'-4"
Deck Span Capacity (ft)	17'-7"	17'-7"	15'-8"	16'-0"	14'-1"	14'-1"	14'-4"	13'-4"
Beam Weights (psf)	3.43	3.48	3.17	3.96	4.03	3.89	4.74	4.74
Deck Weight (psf)	56	56	47.2	72.4	52.3	52.3	71.2	78.58
Structural Weight (psf)	**59.43**	**59.48**	**50.37**	**76.36**	**56.33**	**56.19**	**75.94**	**83.32**
WF Beam Cost ($/ton)	3500	3500	3500	3500	3500	3500	3500	3500
WF Beam Cost ($/ton)	4500	4500	4500	4500	4500	4500	4500	4500
SMARTBeam Cost ($/ton)	3600	NA	3600	NA	3600	NA	NA	NA
SMARTBeam Cost ($/ton)	4700	NA	4700	NA	4700	NA	NA	NA
Slab/Deck Cost ($/SF)	13.60	13.60	11.00	14.10	15.10	15.10	14.10	10.00
Steel Cost($/SF) Low	6.16	6.10	5.68	6.93	7.16	6.81	8.29	8.29
Steel Cost($/SF) High	8.02	7.84	7.39	8.91	9.30	8.76	10.66	10.66
Relative Cost ($/SF) Low	**19.76**	**19.70**	**16.68**	**21.03**	**22.26**	**21.91**	**22.39**	**18.29**
Relative Cost ($/SF) High	**33.36**	**33.30**	**27.68**	**35.13**	**37.36**	**37.01**	**36.49**	**28.29**

Figure 179: Reduced Potential Gravity System Matrix

Thesis Bay Design For Walking Excitation			
Material Properties:			
Slab & Deck Properties:			
	w_c =	110	pcf
	f'_c =	4	ksi
	t_d=	4.50	in
	t_c=	4.00	in
	t_s=	8.50	in
	L_s =	15.00	ft
	W_s =	54.20	psf
Beam Properties:			
	Size	W21X44	
	F_y =	50	ksi
	F_u =	65	ksi
	A_b =	13.00	in^2
	I_{bx} =	843	in^4
	d_b =	20.70	in
	Camber =	1.5	in
	S_j =	15.00	ft
	B_j =	120	in
	L_j =	40	ft
	w_b=	44	plf
	C_j =	2.00	
Girder Properties:			
	Size	W18X40	
	F_y =	50	ksi
	F_u =	65	ksi
	A_g =	11.80	in^2
	I_{gx} =	612	in^4
	d_g =	17.90	in
	Camber =	0.75	in
	S_g =	30.00	ft
	B_g =	90.0	ft
	L_g =	30	ft
	w_g =	40	plf
	C_g =	1.80	
Additional Information for Vibration Analysis:			
	$width_{floor}$ =	160	ft
	$length_{floor}$ =	145	ft
	w_{LL} =	11	psf
	w_{SDL} =	4	psf
Loads:			
Dead Loads:			
Slab:	0.054	ksf	
Beam Weight:	0.003	ksf	
MEP/Ceiling:	0.015	ksf	
Live Loads:			
Non-Reduced (L_o):	0.070	ksf	
% Reduced (L):	31.700	%	
Reduced:	0.048	ksf	
Total dead load:	1.082	klf	
Total live load:	1.050	klf	
Total reduced live load:	0.717	klf	
Const. dead load (unshored):	0.857	klf	
Const. live load (unshored):	0.300	klf	

Figure 180: EPICORE 4.5 Composite Beam Design and Vibration Analysis

Required Flexural Strength:							
$w_{u,o}$=1.2D+1.6L_o=	3.0	klf					
w_u=1.2D+1.6L=	2.4	klf					
$V_u=w_{u,o}l/2$=	59.6	k					
$V_u=w_u l/2$=	48.9	k					
$M_u=w_{u,o}l^2/8$=	595.7	ftk					
$M_u=w_u l^2/8$=	489.2	ftk					
Determine b_{eff}:							
b_{eff}= min of (span/8 , 1/2 distance to adj. bm, dist. To edge of slab)=	120	in					
Moment Arm for Concrete Force:							
Assume a=	3	in					
$Y_2=t_{slab}-a/2$=	7.000	in	Table 3-19				
Check I_{req}:							
Δ=l/240+camber=	3.500	in					
$I_{req}=5w_{CDL}l^4/(384E\Delta)$=	486.337	in^4	<	843	in^4	OK	Table 3-20
Check member strength as un-shored:							
$w_{u(unshored)}$=1.2D+1.6L=	1.508	klf					
$M_{u(unshored)}=w_u l^2/8$=	301.68	ftk	<	358	ftk	OK	Table 3-19
PNA location=	6						
ΣQ_n=	162	k					Table 3-19
Check member strength:							
ϕM_n=	541	ftk	>	489	ftk	OK	Table 3-19
ϕV_n=	217	k	>	49	k	OK	Table 3-3
Check a:							
$a=\Sigma Qn/0.85f'_c b_{eff}$=	0.397	in	<	3	in	OK	
Check Δ_{LL}:							
Δ_{LL}=l/360=	1.333	in	I_{LB}=	1620	in^4	Table 3-20	
$\Delta_{LL}=5w_{LL}l^4/(384EI_{LB})$=	0.879	in	<	1.333	in	OK	
Check studs:							
Q_n=	17.2	kips/stud		Table 3-21			
# of studs=$\Sigma Q_n/Q_n$=	9.419	use	10	studs/side			
Total studs=	20						
Slab Mode Properties:							
$A_1 = 12t_c$ =	48						
$A_2 = 12t_d/2$ =	27						
A_s =	48	in^2					
$y_s = (A_1t_c/2+A_2(t_c+t_d/2))/(A_1+A_2)$ =	3.530	in					
$I_s = 12t_c^3/12+12(0.5)t_c^3/12 + A_1(y_s-t_c/2)^2+$ $A_2(t_c+t_d/2-y_s)^2$=	408.120	in^4					
$E_c = w_c^{1.5}$*SQRT(f'_c) =	2307	ksi					
$w_{sl} = (W_s+W_{LL}+W_{SDL})/1000$ =	0.0692	ksf					
$\Delta_s=5w_{sl}L_s^4*1728/(384EI_s)$ =	0.084	in					
f_s= 0.18*SQRT(386.4/Δ_s) =	12.230	Hz					
B_s = (2/3)$length_{floor}$ =	96.667	ft					
$W_s = w_{sl}B_sL_s$ =	100.340	k					

Figure 181: EPICORE 4.5 Composite Beam Design and Vibration Analysis

Beam Mode Properties:							
$d_e = t_c+t_d/2 =$	6.25	in					
$n = E_s/1.35E_c =$	9.31						
$y_{bar} = (B_jt_c^2/2n+A_b(d_b/2+t_c+t_d))/(B_jt_c/n+A_b) =$	5.393	in					
$I_j = B_jt_c^3/(12n)+I_{bx}+B_jt_c/n(y_{bar}-t_c/2)^2+A_b(d_b/2+t_c+t_d-y_{bar})^2 =$	3859.484	in^4					
$w_j = (B_j/12)(W_{slab}+W_{LL}+W_{SDL})+w_b =$	736	plf					
$\Delta_j=5w_jL_j^4/(384EI_j) =$	0.379	in					
$f_j = 0.18*SQRT(386.4/\Delta_j) =$	5.749	Hz					
$D_s = d^3_e/n =$	26.224	in^4/ft					
$D_j = I_j/S_j =$	257.299	in^4/ft					
$B_{j1} = C_j(D_s/D_j)^{1/4}L_j =$	45.202	ft					
$B_{j2} = (2/3)width_{floor} =$	106.667	ft					
$B_j = Min\ of(B_{j1} \& B_{j2}) =$	45.202	ft					
W_j modifier (1.5 if continuous) =	1.500						
$W_j=(w_j/S_j)B_jL_j/1000 =$	133.074	k					
Girder Mode Properties:							
$y_{bar} = (B_gd_e^2/2n+A_g(d_g/2+t_c+t_d))/(B_gd_e/n+A_g) =$	5.466	in					
$I_g = B_gd_e^3/(12n)+I_{gx}+(B_gd_e/n)(y_{bar}-d_e/2)^2+A_g(d_g/2+t_c+t_d-y_{bar})^2 =$	2834.466	in^4					
$w_g = (w_j/S_j)L_j+w_g =$	2003	plf					
$\Delta_g=5w_gL_g^4/(384EI_g) =$	0.444	in					
$f_g = 0.18*SQRT(386.4/\Delta_g) =$	5.310	Hz					
$D_g = I_g/L_j =$	70.862	in^4/ft					
$B_{g1} = C_g(D_j/D_g)^{1/4}L_g =$	74.542	ft					
$B_{g2} = (2/3)length_{floor} =$	96.667	ft					
$B_g = Min\ of(B_{j1} \& B_{j2}) =$	74.542	ft					
$W_g =(w_g/L_j)B_gL_g/1000 =$	111.962	k					
Combined Mode Properties:							
$W_c = \Delta_gW_g/(\Delta_g+\Delta_j+\Delta_s)+\Delta_jW_j/(\Delta g+\Delta_j+\Delta_s)+\Delta_sW_s/(\Delta_g+\Delta_j+\Delta_s) =$	119710.04	lbs					
$f_n = 0.18*SQRT(386.4/(\Delta_g+\Delta_j+\Delta_s) =$	3.716	Hz					
$\beta =$	0.03		Table 4.1 AISC DG11				
$P_o =$	65	lbs	Table 4.1 AISC DG11				
$a_p/g=P_oe^{-0.35fn}/\beta W =$	0.005	<	0.005	**OK**		Equation 4.1 AISC DG	
$\beta =$	0.05		Table 4.1 AISC DG11				
$P_o =$	65	lbs	Table 4.1 AISC DG11				
$a_p/g=P_oe^{-0.35fn}/\beta W =$	0.0030	<	0.005	**OK**		Equation 4.1 AISC DG	

Figure 182: EPICORE 4.5 Composite Beam Design and Vibration Analysis

Thesis Bay Design For Walking Excitation			
Material Properties:			
Slab & Deck Properties:			
	w_c =	110	pcf
	f'_c =	4	ksi
	t_d=	3.50	in
	t_c=	2.00	in
	t_s=	5.50	in
	L_s =	15.00	ft
	W_s =	56.00	psf
Beam Properties:			
	Size	W30X108	
	F_y =	50	ksi
	F_u =	65	ksi
	A_b =	31.70	in^2
	I_{bx} =	4470	in^4
	d_b =	29.80	in
	Camber =	0.0	in
	S_j =	15.00	ft
	B_j =	120	in
	L_j =	40	ft
	w_b=	108	plf
	C_j =	2.00	
Girder Properties:			
	Size	W24X84	
	F_y =	50	ksi
	F_u =	65	ksi
	A_g =	24.70	in^2
	I_{gx} =	2370	in^4
	d_g =	24.10	in
	Camber =	0.00	in
	S_g =	30.00	ft
	B_g =	90.0	ft
	L_g =	30	ft
	w_g =	84	plf
	C_g =	1.80	
Additional Information for Vibration Analysis:			
	$width_{floor}$ =	160	ft
	$length_{floor}$ =	145	ft
	w_{LL} =	11	psf
	w_{SDL} =	4	psf
Loads:			
Dead Loads:			
Slab:	0.056	ksf	
Beam Weight:	0.007	ksf	
MEP/Ceiling:	0.015	ksf	
Live Loads:			
Non-Reduced (L_o):	0.070	ksf	
% Reduced (L):	31.700	%	
Reduced:	0.048	ksf	
Total dead load:	1.173	klf	
Total live load:	1.050	klf	
Total reduced live load:	0.717	klf	
Const. dead load (unshored):	0.948	klf	
Const. live load (unshored):	0.300	klf	

Figure 183: EPICORE 3.5 Composite Beam Design and Vibration Analysis

Required Flexural Strength:							
$w_{u,o}$=1.2D+1.6L_o=	3.1	klf					
w_u=1.2D+1.6L=	2.6	klf					
$V_u=w_{u,o}l/2$=	61.8	k					
$V_u=w_u l/2$=	51.1	k					
$M_u=w_{u,o}l^2/8$=	617.5	ftk					
$M_u=w_u l^2/8$=	511.0	ftk					
Determine b_{eff}:							
b_{eff}= min of (span/8 , 1/2 distance to adj. bm, dist. To edge of slab)=	120	in					
Moment Arm for Concrete Force:							
Assume a=	1	in					
$Y_2=t_{slab}-a/2$=	5.00	in	Table 3-19				
Check I_{req}:							
Δ=l/240+camber=	2.000	in					
$I_{req}=5w_{CDL}l^4/(384E\Delta)$=	941.462	in^4	<	4470	in^4	OK	Table 3-20
Check member strength as un-shored:							
$w_{u(unshored)}$=1.2D+1.6L=	1.618	klf					
$M_{u(unshored)}=w_u l^2/8$=	323.52	ftk	<	1300	ftk	OK	Table 3-19
PNA location=	7						
ΣQ_n=	396	k					Table 3-19
Check member strength:							
ϕM_n=	1670	ftk	>	511	ftk	OK	Table 3-19
ϕV_n=	488	k	>	51	k	OK	Table 3-3
Check a:							
$a=\Sigma Qn/0.85f'_c b_{eff}$=	0.971	in	<	1	in	OK	
Check Δ_{LL}:							
Δ_{LL}=l/360=	1.333	in	I_{LB}=	7510	in^4	Table 3-20	
$\Delta_{LL}=5w_{LL}l^4/(384EI_{LB})$=	0.190	in	<	1.333	in	OK	
Check studs:							
Q_n=	17.2	kips/stud		Table 3-21			
# of studs=$\Sigma Q_n/Q_n$=	23.023	use	24	studs/side			
Total studs=	48						
Slab Mode Properties:							
$A_1 = 12t_c$ =	24						
$A_2 = 12t_d/2$ =	21						
A_s =	24	in^2					
$y_s=(A_1t_c/2+A_2(t_c+t_d/2)/(A_1+A_2)$ =	2.283	in					
$I_s=12t_c^3/12+12(0.5)t_c^3/12+A_1(y_s-t_c/2)^2+A_2(t_c+t_d/2-y_s)^2$=	96.700	in^4					
$E_c = w_c^{1.5}$*SQRT(f'_c) =	2307	ksi					
$w_{sl} = (W_s+W_{LL}+W_{SDL})/1000$ =	0.0710	ksf					
$\Delta_s=5w_{sl}L_s^4*1728/(384EI_s)$ =	0.362	in					
f_s= 0.18*SQRT(386.4/Δ_s) =	5.877	Hz					
B_s = (2/3)$length_{floor}$ =	96.667	ft					
$W_s = w_{sl}B_sL_s$ =	102.950	k					

Figure 184: EPICORE 3.5 Composite Beam Design and Vibration Analysis

Beam Mode Properties:						
$d_e = t_c + t_d/2 =$	3.75	in				
$n = E_s/1.35E_c =$	9.31					
$y_{bar} = (B_j t_c^2/2n + A_b(d_b/2 + t_c + t_d))/(B_j t_c/n + A_b) =$	11.699	in				
$I_j = B_j t_c^3/(12n) + I_{bx} + B_j t_c/n(y_{bar} - t_c/2)^2 + A_b(d_b/2 + t_c + t_d - y_{bar})^2 =$	9829.403	in^4				
$w_j = (B_j/12)(W_{slab} + W_{LL} + W_{SDL}) + w_b =$	818	plf				
$\Delta_j = 5w_j L_j^4/(384EI_j) =$	0.165	in				
$f_j = 0.18*SQRT(386.4/\Delta_j) =$	8.703	Hz				
$D_s = d^3_e/n =$	5.664	in^4/ft				
$D_j = I_j/S_j =$	655.294	in^4/ft				
$B_{j1} = C_j(D_s/D_j)^{1/4}L_j =$	24.393	ft				
$B_{j2} = (2/3)width_{floor} =$	106.667	ft				
$B_j =$ Min of$(B_{j1}$& $B_{j2}) =$	24.393	ft				
W_j modifier (1.5 if continuous) =	1.500					
$W_j = (w_j/S_j)B_j L_j/1000 =$	79.814	k				
Girder Mode Properties:						
$y_{bar} = (B_g d_e^2/2n + A_g(d_g/2 + t_c + t_d))/(B_g d_e/n + A_g) =$	8.227	in				
$I_g = B_g d_e^3/(12n) + I_{gx} + (B_g d_e/n)(y_{bar} - d_e/2)^2 + A_g(d_g/2 + t_c + t_d - y_{bar})^2 =$	6022.046	in^4				
$w_g = (w_j/S_j)L_j + w_g =$	2265	plf				
$\Delta_g = 5w_g L_g^4/(384EI_g) =$	0.236	in				
$f_g = 0.18*SQRT(386.4/\Delta_g) =$	7.277	Hz				
$D_g = I_g/L_j =$	150.551	in^4/ft				
$B_{g1} = C_g(D_j/D_g)^{1/4}L_g =$	77.998	ft				
$B_{g2} = (2/3)length_{floor} =$	96.667	ft				
$B_g =$ Min of$(B_{j1}$& $B_{j2}) =$	77.998	ft				
$W_g = (w_g/L_j)B_g L_g/1000 =$	132.518	k				
Combined Mode Properties:						
$W_c = \Delta_g W_g/(\Delta_g + \Delta_j + \Delta_s) + \Delta_j W_j/(\Delta g + \Delta_j + \Delta_s) + \Delta_s W_s/(\Delta_g + \Delta_j + \Delta_s) =$	107093.05	lbs				
$f_n = 0.18*SQRT(386.4/(\Delta_g + \Delta_j + \Delta_s) =$	4.048	Hz				
$\beta =$	0.03		Table 4.1 AISC DG11			
$P_o =$	65	lbs	Table 4.1 AISC DG11			
$a_p/g = P_o e^{-0.35fn}/\beta W =$	0.005	<	0.005	**OK**		Equation 4.1 AISC DG
$\beta =$	0.05		Table 4.1 AISC DG11			
$P_o =$	65	lbs	Table 4.1 AISC DG11			
$a_p/g = P_o e^{-0.35fn}/\beta W =$	0.0029	<	0.005	**OK**		Equation 4.1 AISC DG

Figure 185: EPICORE 3.5 Composite Beam Design and Vibration Analysis

Existing Bay Design For Walking Excitation			
Material Properties:			
Slab & Deck Properties:			
	w_c =	150	pcf
	f'_c =	4	ksi
	t_d=	3.00	in
	t_c=	2.50	in
	t_s=	5.50	in
	L_s =	10.00	ft
	W_s =	53.00	psf
Beam Properties:			
	Size	W18X35	
	F_y =	50	ksi
	F_u =	65	ksi
	A_b =	10.30	in^2
	I_{bx} =	510	in^4
	d_b =	17.70	in
	Camber =	1.5	in
	S_j =	10.00	ft
	B_j =	120	in
	L_j =	40	ft
	w_b=	35	plf
	C_j =	2.00	
Girder Properties:			
	Size	W18X40	
	F_y =	50	ksi
	F_u =	65	ksi
	A_g =	11.80	in^2
	I_{gx} =	612	in^4
	d_g =	17.90	in
	Camber =	1.5	in
	S_g =	30.00	ft
	B_g =	90.0	ft
	L_g =	30	ft
	w_g =	40	plf
	C_g =	1.80	
Additional Information for Vibration Analysis:			
	$width_{floor}$ =	150	ft
	$length_{floor}$ =	145	ft
	w_{LL} =	11	psf
	w_{SDL} =	4	psf
Loads:			
Dead Loads:			
Slab:	0.053	ksf	
Beam Weight:	0.004	ksf	
MEP/Ceiling:	0.025	ksf	
Live Loads:			
Non-Reduced (L_o):	0.070	ksf	
% Reduced (L):	31.700	%	
Reduced:	0.048	ksf	
Total dead load:	0.815	klf	
Total live load:	0.700	klf	
Total reduced live load:	0.478	klf	
Const. dead load (unshored):	0.565	klf	
Const. live load (unshored):	0.200	klf	

Figure 186: Existing Composite Beam Design and Vibration Analysis

Required Flexural Strength:							
$w_{u,o}$=1.2D+1.6L_o=	2.1	klf					
w_u=1.2D+1.6L=	1.7	klf					
$V_u=w_{u,o}l/2$=	42.0	k					
$V_u=w_u l/2$=	34.9	k					
$M_u=w_{u,o}l^2/8$=	419.6	ftk					
$M_u=w_u l^2/8$=	348.6	ftk					
Determine b_{eff}:							
b_{eff}= min of (span/8 , 1/2 distance to adj. bm, dist. To edge of slab)=	120	in					
Moment Arm for Concrete Force:							
Assume a=	1	in					
$Y_2=t_{slab}-a/2$=	5.000	in	Table 3-19				
Check I_{req}:							
Δ=l/240+camber=	3.500	in					
$I_{req}=5w_{CDL}l^4/(384E\Delta)$=	320.631	in^4	<	510	in^4	OK	Table 3-20
Check member strength as un-shored:							
$w_{u(unshored)}$=1.2D+1.6L=	0.998	klf					
$M_{u(unshored)}=w_u l^2/8$=	199.60	ftk	<	249	ftk	OK	Table 3-19
PNA location=	BFL						
ΣQ_n=	260	k					Table 3-19
Check member strength:							
ϕM_n=	435	ftk	>	420	ftk	OK	Table 3-19
ϕV_n=	159	k	>	42	k	OK	Table 3-3
Check a:							
$a=\Sigma Qn/0.85f'_c b_{eff}$=	0.637	in	<	1	in	OK	
Check Δ_{LL}:							
Δ_{LL}=l/360=	1.333	in	I_{LB}=	1170	in^4	Table 3-20	
$\Delta_{LL}=5w_{LL}l^4/(384EI_{LB})$=	1.188	in	<	1.333	in	OK	
Check studs:							
Q_n=	17.2	kips/stud		Table 3-21			
# of studs=$\Sigma Q_n/Q_n$=	15.116	use	16	studs/side			
Total studs=	32						
Slab Mode Properties:							
$A_1 = 12t_c$ =	30						
$A_2 = 12t_d/2$ =	18						
A_s =	30	in^2					
$y_s=(A_1t_c/2+A_2(t_c+t_d/2)/(A_1+A_2)$ =	2.281	in					
$I_s=12t_c^3/12+12(0.5)t_c^3/12+A_1(y_s-t_c/2)^2+A_2(t_c+t_d/2-y_s)^2$=	108.516	in^4					
$E_c = w_c^{1.5}$*SQRT(f'_c) =	3674	ksi					
$w_{sl} = (W_s+W_{LL}+W_{SDL})/1000$ =	0.0680	ksf					
$\Delta_s=5w_{sl}L_s^4*1728/(384EI_s)$ =	0.038	in					
f_s= 0.18*SQRT(386.4/Δ_s) =	18.062	Hz					
B_s = (2/3)$length_{floor}$ =	96.667	ft					
$W_s = w_{sl}B_sL_s$ =	65.733	k					

Figure 187: Existing Composite Beam Design and Vibration Analysis

Beam Mode Properties:							
$d_e = t_c+t_d/2 =$	4.00	in					
$n = E_s/1.35E_c =$	5.85						
$y_{bar} = (B_j t_c^2/2n+A_b(d_b/2+t_c+t_d))/(B_j t_c/n+A_b) =$	3.440	in					
$I_j = B_j t_c^3/(12n)+I_{bx}+B_j t_c/n(y_{bar}-t_c/2)^2+A_b(d_b/2+t_c+t_d-y_{bar})^2 =$	2008.815	in^4					
$w_j = (B_j/12)(W_{slab}+W_{LL}+W_{SDL})+w_b =$	715	plf					
$\Delta_j=5w_jL_j^4/(384EI_j) =$	0.707	in					
$f_j = 0.18*SQRT(386.4/\Delta_j) =$	4.208	Hz					
$D_s = d^3_e/n =$	10.947	in^4/ft					
$D_j = I_j/S_j =$	200.882	in^4/ft					
$B_{j1} = C_j(D_s/D_j)^{1/4}L_j =$	38.652	ft					
$B_{j2} = (2/3)width_{floor} =$	100.000	ft					
$B_j =$ Min of(B_{j1}& B_{j2}) =	38.652	ft					
W_j modifier (1.5 if continuous) =	1.500						
$W_j=(w_j/S_j)B_jL_j/1000 =$	165.818	k					
Girder Mode Properties:							
$y_{bar} = (B_g d_e^2/2n+A_g(d_g/2+t_c+t_d))/(B_g d_e/n+A_g) =$	4.002	in					
$I_g = B_g d_e^3/(12n)+I_{gx}+(B_g d_e/n)(y_{bar}-d_e/2)^2+A_g(d_g/2+t_c+t_d-y_{bar})^2 =$	2228.990	in^4					
$w_g = (w_j/S_j)L_j+w_g =$	2900	plf					
$\Delta_g=5w_gL_g^4/(384EI_g) =$	0.818	in					
$f_g = 0.18*SQRT(386.4/\Delta_g) =$	3.913	Hz					
$D_g = I_g/L_j =$	55.725	in^4/ft					
$B_{g1} = C_g(D_j/D_g)^{1/4}L_g =$	74.408	ft					
$B_{g2} = (2/3)length_{floor} =$	96.667	ft					
$B_g =$ Min of(B_{j1}& B_{j2}) =	74.408	ft					
$W_g =(w_g/L_j)B_gL_g/1000 =$	161.836	k					
Combined Mode Properties:							
$W_c = \Delta_g W_g/(\Delta_g+\Delta_j+\Delta_s)+\Delta_j W_j/(\Delta g+\Delta_j+\Delta_s)+\Delta_s W_s/(\Delta_g+\Delta_j+\Delta_s) =$	161278.01	lbs					
$f_n = 0.18*SQRT(386.4/(\Delta_g+\Delta_j+\Delta_s) =$	2.830	Hz					
$\beta =$	0.03		Table 4.1 AISC DG11				
$P_o =$	65	lbs	Table 4.1 AISC DG11				
$a_p/g=P_oe^{-0.35fn}/\beta W =$	0.0050	<	0.005	**OK**		Equation 4.1 AISC DG	
$\beta =$	0.05		Table 4.1 AISC DG11				
$P_o =$	65	lbs	Table 4.1 AISC DG11				
$a_p/g=P_oe^{-0.35fn}/\beta W =$	0.0030	<	0.005	**OK**		Equation 4.1 AISC DG	

Figure 188:Existing Composite Beam Design and Vibration Analysis

Redesigned Bay Design For Walking Excitation			
Material Properties:			
Slab & Deck Properties:			
	w_c =	110	pcf
	f'_c =	4	ksi
	t_d=	3.00	in
	t_c=	3.25	in
	t_s=	6.25	in
	L_s =	10.00	ft
	W_s =	44.00	psf
Beam Properties:			
	Size	W18X35	
	F_y =	50	ksi
	F_u =	65	ksi
	A_b =	10.30	in^2
	I_{bx} =	510	in^4
	d_b =	17.70	in
	Camber =	1.5	in
	S_j =	10.00	ft
	B_j =	120	in
	L_j =	40	ft
	w_b=	35	plf
	C_j =	2.00	
Girder Properties:			
	Size	W18X40	
	F_y =	50	ksi
	F_u =	65	ksi
	A_g =	11.80	in^2
	I_{gx} =	612	in^4
	d_g =	17.90	in
	Camber =	1.5	in
	S_g =	30.00	ft
	B_g =	90.0	ft
	L_g =	30	ft
	w_g =	40	plf
	C_g =	1.80	
Additional Information for Vibration Analysis:			
	$width_{floor}$ =	150	ft
	$length_{floor}$ =	145	ft
	w_{LL} =	11	psf
	w_{SDL} =	4	psf
Loads:			
Dead Loads:			
Slab:	0.044	ksf	
Beam Weight:	0.004	ksf	
MEP/Ceiling:	0.025	ksf	
Live Loads:			
Non-Reduced (L_o):	0.070	ksf	
% Reduced (L):	31.700	%	
Reduced:	0.048	ksf	
Total dead load:	0.725	klf	
Total live load:	0.700	klf	
Total reduced live load:	0.478	klf	
Const. dead load (unshored):	0.475	klf	
Const. live load (unshored):	0.200	klf	

Figure 189: Final Composite Beam Design and Vibration Analysis

Required Flexural Strength:							
$w_{u,o}$=1.2D+1.6L_o=	2.0	klf					
w_u=1.2D+1.6L=	1.6	klf					
$V_u=w_{u,o}l/2$=	39.8	k					
$V_u=w_u l/2$=	32.7	k					
$M_u=w_{u,o}l^2/8$=	398.0	ftk					
$M_u=w_u l^2/8$=	327.0	ftk					
Determine b_{eff}:							
b_{eff}= min of (span/8 , 1/2 distance to adj. bm, dist. To edge of slab)=	120	in					
Moment Arm for Concrete Force:							
Assume a=	1	in					
$Y_2=t_{slab}-a/2$=	5.750	in	Table 3-19				
Check I_{req}:							
Δ=l/240+camber=	3.500	in					
$I_{req}=5w_{CDL}l^4/(384E\Delta)$=	269.557	in^4	<	510	in^4	OK	Table 3-20
Check member strength as un-shored:							
$w_{u(unshored)}$=1.2D+1.6L=	0.890	klf					
$M_{u(unshored)}=w_u l^2/8$=	178.00	ftk	<	249	ftk	OK	Table 3-19
PNA location=	BFL						
ΣQ_n=	260	k					Table 3-19
Check member strength:							
ϕM_n=	435	ftk	>	398	ftk	OK	Table 3-19
ϕV_n=	159	k	>	40	k	OK	Table 3-3
Check a:							
$a=\Sigma Qn/0.85f'_c b_{eff}$=	0.637	in	<	1	in	OK	
Check Δ_{LL}:							
Δ_{LL}=l/360=	1.333	in	I_{LB}=	1170	in^4	Table 3-20	
$\Delta_{LL}=5w_{LL}l^4/(384EI_{LB})$=	1.188	in	<	1.333	in	OK	
Check studs:							
Q_n=	17.2	kips/stud		Table 3-21			
# of studs=$\Sigma Q_n/Q_n$=	15.116	use	16	studs/side			
Total studs=	32						
Slab Mode Properties:							
$A_1 = 12t_c$ =	39						
$A_2 = 12t_d/2$ =	18						
A_s =	39	in^2					
$y_s = (A_1t_c/2+A_2(t_c+t_d/2)/(A_1+A_2)$ =	2.612	in					
$I_s = 12t_c^3/12+12(0.5)t_c^3/12 + A_1(y_s-t_c/2)^2+ A_2(t_c+t_d/2-y_s)^2$=	171.764	in^4					
$E_c = w_c^{1.5}$*SQRT(f'_c) =	2307	ksi					
$w_{sl} = (W_s+W_{LL}+W_{SDL})/1000$ =	0.0590	ksf					
$\Delta_s=5w_{sl}L_s^4$*1728/(384EI_s) =	0.033	in					
f_s= 0.18*SQRT(386.4/Δ_s) =	19.333	Hz					
B_s = (2/3)$length_{floor}$ =	96.667	ft					
$W_s = w_{sl}B_sL_s$ =	57.033	k					

Figure 190: Final Composite Beam Design and Vibration Analysis

Beam Mode Properties:					
$d_e = t_c+t_d/2 =$	4.75	in			
$n = E_s/1.35E_c =$	9.31				
$y_{bar} = (B_jt_c^2/2n+A_b(d_b/2+t_c+t_d))/(B_jt_c/n+A_b) =$	4.284	in			
$I_j = B_jt_c^3/(12n)+I_{bx}+B_jt_c/n(y_{bar}-t_c/2)^2+A_b(d_b/2+t_c+t_d-y_{bar})^2 =$	2048.007	in^4			
$w_j = (B_j/12)(W_{slab}+W_{LL}+W_{SDL})+w_b =$	625	plf			
$\Delta_j=5w_jL_j^4/(384EI_j) =$	0.606	in			
$f_j = 0.18*SQRT(386.4/\Delta_j) =$	4.545	Hz			
$D_s = d^3_e/n =$	11.512	in^4/ft			
$D_j = I_j/S_j =$	204.801	in^4/ft			
$B_{j1} = C_j(D_s/D_j)^{1/4}L_j =$	38.953	ft			
$B_{j2} = (2/3)width_{floor} =$	100.000	ft			
$B_j = Min\ of(B_{j1}\ \&\ B_{j2}) =$	38.953	ft			
W_j modifier (1.5 if continuous) =	1.500				
$W_j=(w_j/S_j)B_jL_j/1000 =$	146.074	k			
Girder Mode Properties:					
$y_{bar} = (B_gd_e^2/2n+A_g(d_g/2+t_c+t_d))/(B_gd_e/n+A_g) =$	4.997	in			
$I_g = B_gd_e^3/(12n)+I_{gx}+(B_gd_e/n)(y_{bar}-d_e/2)^2+A_g(d_g/2+t_c+t_d-y_{bar})^2 =$	2242.418	in^4			
$w_g = (w_j/S_j)L_j+w_g =$	2540	plf			
$\Delta_g=5w_gL_g^4/(384EI_g) =$	0.712	in			
$f_g = 0.18*SQRT(386.4/\Delta_g) =$	4.194	Hz			
$D_g = I_g/L_j =$	56.060	in^4/ft			
$B_{g1} = C_g(D_j/D_g)^{1/4}L_g =$	74.656	ft			
$B_{g2} = (2/3)length_{floor} =$	96.667	ft			
$B_g = Min\ of(B_{j1}\ \&\ B_{j2}) =$	74.656	ft			
$W_g =(w_g/L_j)B_gL_g/1000 =$	142.219	k			
Combined Mode Properties:					
$W_c = \Delta_gW_g/(\Delta_g+\Delta_j+\Delta_s)+\Delta_jW_j/(\Delta g+\Delta_j+\Delta_s)+\Delta_sW_s/(\Delta_g+\Delta_j+\Delta_s) =$	141836.59	lbs			
$f_n = 0.18*SQRT(386.4/(\Delta_g+\Delta_j+\Delta_s)) =$	3.044	Hz			
$\beta =$	0.03		Table 4.1 AISC DG11		
$P_o =$	65	lbs	Table 4.1 AISC DG11		
$a_p/g=P_oe^{-0.35fn}/\beta W =$	0.005	<	0.005	**OK**	Equation 4.1 AISC DG
$\beta =$	0.05		Table 4.1 AISC DG11		
$P_o =$	65	lbs	Table 4.1 AISC DG11		
$a_p/g=P_oe^{-0.35fn}/\beta W =$	0.003	<	0.005	**OK**	Equation 4.1 AISC DG

Figure 191: Final Composite Beam Design and Vibration Analysis

Column C2-5

Story level	Story Height (ft)	Tributary Area (ft^2)	Live Load Influence Area (ft^2)	Live Load Reduction Factor	Dead Load (kips)	Roof Live Load (kips)	Snow Load (kips)	Floor Live Load (kips)	Column Load 1.4D (kips)	Column Load 1.2D+1.6L+.5(Lr or S) (kips)	Column Load 1.2D+1.6(Lr or S)+L (kips)	Column Load 1.2D+L+0.5(Lr or S) (kips)	Column Load 1.2D+L+0.2S (kips)	Column Design Load
52 Roof	0	975	0	1.00	115.05	19.50	18.82		161	148	169	148	142	**169**
51 Mech	26.83	1950	3900	1.00	184.28			146.25	258	465	399	377	371	**465**
50	14.42	2925	7800	0.42	253.50			174.90	355	594	510	489	483	**594**
49	13.75	3900	11700	0.40	322.73			202.20	452	721	621	599	593	**721**
48	13.75	4875	15600	0.40	391.95			229.50	549	847	731	710	704	**847**
47	13.75	5850	19500	0.40	461.18			256.80	646	974	841	820	814	**974**
46	13.75	6825	23400	0.40	530.40			284.10	743	1101	952	930	924	**1101**
45	13.75	7800	27300	0.40	599.63			311.40	839	1228	1062	1041	1035	**1228**
44	13.75	8775	31200	0.40	668.85			338.70	936	1354	1173	1151	1145	**1354**
43	13.75	9750	35100	0.40	738.08			366.00	1033	1481	1283	1261	1255	**1481**
42	13.75	10725	39000	0.40	807.30			393.30	1130	1608	1393	1372	1366	**1608**
41	13.75	11700	42900	0.40	876.53			420.60	1227	1735	1504	1482	1476	**1735**
40	13.75	12675	46800	0.40	945.75			447.90	1324	1861	1614	1593	1587	**1861**
39	13.75	13650	50700	0.40	1014.98			475.20	1421	1988	1724	1703	1697	**1988**
38	13.75	14625	54600	0.40	1084.20			502.50	1518	2115	1835	1813	1807	**2115**
37	13.75	15600	58500	0.40	1153.43			529.80	1615	2242	1945	1924	1918	**2242**
36	13.75	16575	62400	0.40	1222.65			557.10	1712	2368	2055	2034	2028	**2368**
35	13.75	17550	66300	0.40	1291.88			584.40	1809	2495	2166	2144	2138	**2495**
34	13.75	18525	70200	0.40	1361.10			611.70	1906	2622	2276	2255	2249	**2622**
33	13.75	19500	74100	0.40	1430.33			639.00	2002	2749	2387	2365	2359	**2749**
32	13.75	20475	78000	0.40	1499.55			666.30	2099	2875	2497	2476	2470	**2875**
31	13.75	21450	81900	0.40	1568.78			693.60	2196	3002	2607	2586	2580	**3002**
30	13.75	22425	85800	0.40	1638.00			720.90	2293	3129	2718	2696	2690	**3129**
29	13.75	23400	89700	0.40	1707.23			748.20	2390	3256	2828	2807	2801	**3256**
28 Mech	27.50	24375	93600	1.00	1776.45			894.45	2487	3573	3057	3036	3030	**3573**
27	14.58	25350	97500	0.40	1845.68			921.75	2584	3699	3168	3146	3140	**3699**
26	13.75	26325	101400	0.40	1914.90			949.05	2681	3826	3278	3257	3251	**3826**
25	13.75	27300	105300	0.40	1984.13			976.35	2778	3953	3389	3367	3361	**3953**
24	13.75	28275	109200	0.40	2053.35			1003.65	2875	4080	3499	3477	3471	**4080**
23	13.75	29250	113100	0.40	2122.58			1030.95	2972	4206	3609	3588	3582	**4206**
22	13.75	30225	117000	0.40	2191.80			1058.25	3069	4333	3720	3698	3692	**4333**
21	13.75	31200	120900	0.40	2261.03			1085.55	3165	4460	3830	3809	3803	**4460**
20	13.75	32175	124800	0.40	2330.25			1112.85	3262	4587	3940	3919	3913	**4587**
19	13.75	33150	128700	0.40	2399.48			1140.15	3359	4713	4051	4029	4023	**4713**
18	13.75	34125	132600	0.40	2468.70			1167.45	3456	4840	4161	4140	4134	**4840**
17	13.75	35100	136500	0.40	2537.93			1194.75	3553	4967	4271	4250	4244	**4967**
16	13.75	36075	140400	0.40	2607.15			1222.05	3650	5094	4382	4360	4354	**5094**
15	13.75	37050	144300	0.40	2676.38			1249.35	3747	5220	4492	4471	4465	**5220**
14 Cafeteria	12.58	38025	148200	1.00	2745.60			1346.85	3844	5459	4673	4651	4645	**5459**
13	14.92	39000	152100	0.40	2814.83			1374.15	3941	5586	4783	4762	4756	**5586**
12 Data Center	13.75	39975	156000	1.00	2884.05			1471.65	4038	5825	4964	4942	4936	**5825**
11	13.75	40950	159900	0.40	2953.28			1498.95	4135	5952	5074	5053	5047	**5952**
10	13.75	41925	163800	0.40	3022.50			1526.25	4232	6079	5184	5163	5157	**6079**
9	13.75	42900	167700	0.40	3091.73			1553.55	4328	6206	5295	5273	5267	**6206**
8	13.75	43875	171600	0.40	3160.95			1580.85	4425	6332	5405	5384	5378	**6332**
7	13.75	44850	175500	0.40	3230.18			1608.15	4522	6459	5516	5494	5488	**6459**
6	13.75	45825	179400	0.40	3299.40			1635.45	4619	6586	5626	5604	5598	**6586**
5	13.75	46800	183300	0.40	3368.63			1662.75	4716	6713	5736	5715	5709	**6713**
4	14.32	47775	187200	0.40	3437.85			1690.05	4813	6839	5847	5825	5819	**6839**
3	15.47	48750	191100	0.40	3507.08			1717.35	4910	6966	5957	5936	5930	**6966**
2	15.47	49725	195000	0.40	3576.30			1744.65	5007	7093	6067	6046	6040	**7093**
1	25.66	50700	198900	0.40	3645.53			1771.95	5104	7220	6178	6156	6150	**7220**

Figure 192: Gravity Column Loads

Gravity Column Design

RAM Steel v14.00.04.01
b
DataBase: NYT — 04/07/10 04:27:47
Building Code: IBC — Steel Code: AISC360-05 LRFD

Story level Level 52, Column Line C.2-5

Fy (ksi)	= 50.00	Column Size	= W14X90
Orientation (deg.)	= 0.0		

INPUT DESIGN PARAMETERS:

		X-Axis	Y-Axis
Lu (ft)		26.83	26.83
K		1	1
Braced Against Joint Translation		Yes	Yes
Column Eccentricity (in)	Top	9.50	9.75
	Bottom	9.50	9.75

CONTROLLING COLUMN LOADS - Load Case 10:

			Dead	Live	Roof
Axial (kip)			105.72	74.83	9.63
Moments	Top	Mx (kip-ft)	0.00	0.00	0.00
		My (kip-ft)	-1.65	-60.80	-7.82
	Bot	Mx (kip-ft)	0.00	0.00	0.00
		My (kip-ft)	-0.36	10.12	0.00

Single curvature about X-Axis
Single curvature about Y-Axis

CALCULATED PARAMETERS: (1.2DL + 1.6LL + 0.5RF)

Pu (kip)	=	251.41	0.90*Pn (kip)	=	684.60
Mux (kip-ft)	=	0.00	0.90*Mnx (kip-ft)	=	489.05
Muy (kip-ft)	=	103.18	0.90*Mny (kip-ft)	=	272.68
Rm	=	1.00			
Cbx	=	1.00			
Cmx	=	1.00	Cmy	=	0.66
Pex (kip)	=	2757.73	Pey (kip)	=	999.30
B1x	=	1.10	B1y	=	1.00

INTERACTION EQUATION

Pu/0.90*Pn = 0.367
Eq H1-1a: 0.367 + 0.000 + 0.336 = 0.704

Figure 193: RAM output for Column C2.5 @ 51-52

Gravity Column Design

RAM Steel v14.00.04.01
b
DataBase: NYT 04/07/10 04:30:55
Building Code: IBC Steel Code: AISC360-05 LRFD

Story level Level 2, Column Line C.2-5

Fy (ksi)	= 50.00	Column Size	= W14X730
Orientation (deg.)	= 0.0		

INPUT DESIGN PARAMETERS:

	X-Axis	Y-Axis
Lu (ft)	41.66	25.66
K	1	1
Braced Against Joint Translation	Yes	Yes
Column Eccentricity (in) Top	13.70	11.45
Bottom	0.00	11.45

CONTROLLING COLUMN LOADS - Load Case 1:

	Dead	Live	Roof
Axial (kip)	3589.67	1607.25	18.80
Moments Top Mx (kip-ft)	0.00	0.00	0.00
My (kip-ft)	-0.72	-0.26	0.00
Bot Mx (kip-ft)	0.00	0.00	0.00
My (kip-ft)	0.01	0.00	0.00

Single curvature about X-Axis
Single curvature about Y-Axis

CALCULATED PARAMETERS: (1.2DL + 1.6LL + 0.5RF)

Pu (kip)	=	6888.60	0.90*Pn (kip)	=	7055.81
Mux (kip-ft)	=	0.00	0.90*Mnx (kip-ft)	=	6124.24
Muy (kip-ft)	=	1.50	0.90*Mny (kip-ft)	=	3060.00
Rm	=	1.00			
Cbx	=	1.00			
Cmx	=	1.00	Cmy	=	0.61
Pex (kip)	=	16379.85	Pey (kip)	=	14252.44
B1x	=	1.73	B1y	=	1.17

INTERACTION EQUATION

Pu/0.90*Pn = 0.976
Eq H1-1a: 0.976 + 0.000 + 0.000 = 0.977

Figure 194:RAM output for Column C2.5 @ 1-2

																			Flange slender check			Web slender check	
d (in)	b_f (in)	t_f (in)	t_w (in)	A (in^2)	I_x (in^4)	S_x (in^3)	Z_x (in^3)	r_x (in)	I_y (in^4)	S_y (in^3)	Z_y (in^3)	r_y (in)	r_{ts} (in)	h_o (in)	J (in^4)	C_w (in^6)	plf	k_c	k_c	b/t		h/t	
24	22	5	5	290	21457	1557	2335	8.60	9019	865	1298	5.58	7.42	19.00	2416.67	813980	987	7.8	0.76	4.40	13.4	2.80	35.9
24	22	4	4	240	19200	1344	2016	8.94	7184	688	1032	5.47	7.31	20.00	1280.00	718400	817	8.9	0.76	5.50	13.4	4.00	35.9

Figure 195: Built-Up Section Properties

Elastic flexural buckling stress		
K_y =	1	
L_y =	25.66	ft
KL_y/r_y =	55.2	
K_x =	1	
L_x =	25.66	ft
KL_x/r_x =	35.8	
$F_e = \pi^2 E/(KL/r)^2$ =	93.88	ksi
Elastic critical torsional buckling stress		
$F_e = (\pi^2 EC_w/(K_zL)^2 + GJ)/(I_x+I_y)$ =	968.76	
4.71SQRT(E/Fy) =	113.4318	
$F_{cr} = 0.658$^$(F_y/F_e)F_y$ =	49.988	ksi
$F_{cr} = 0.877F_e$ =	NA	ksi
$\phi P_n = F_{cr}A_g$ =	13047	kip
Flexural Yielding		
$\phi M_{nx} = \phi M_{px} = \phi F_y Z_x$ =	8756	kft
$\phi M_{ny} = \phi M_{py} = \phi F_y Z_y$ =	4866	kft
$L_p = 1.76 r_y$SQRT(E/F_y) =	19.70	ft
$L_r = 1.95 r_{st}(E/0.7F_y)$SQRT$(Jc/S_xh_o)$SQRT$(1+$SQRT$(1+6.76(0.7F_yS_xh_o/EJc)^2))$ =	403.9	ft

Figure 196: BU24x987 Stress Checks at Ground Floor

Member Code Check

RAM Frame v14.00.04.01
b
DataBase: NYT 04/06/10 15:53:02
Building Code: IBC Steel Code: AISC360-05 LRFD

COLUMN INFORMATION:

Story Level = Level 2 Frame Number = 0 Column Number = 17
Fy (ksi) = 50.00
Column Size = BU24X987

INPUT DESIGN PARAMETERS:

	X-Axis	Y-Axis
Lu (ft)	25.66	25.66
K	1.00	1.00

CONTROLLING COLUMN FORCES - SHEAR

Load Combination: 1.200 D + 1.600 Lp + 0.500 Sp

Shear	Top	Vux (kip)	-32.30
		Vuy (kip)	0.03
Shear	Bot.	Vux (kip)	-32.30
		Vuy (kip)	0.03

SHEAR CHECK:

Vux (kip) = -32.30 0.90Vnx (kip) = 3240.00 Vux/0.90Vnx = 0.010
Vuy (kip) = 0.03 0.90Vny (kip) = 5940.00 Vuy/0.90Vny = 0.000

CONTROLLING COLUMN FORCES - FLEXURE

Load Combination: 1.200 D + 1.600 Lp + 0.500 Sp

Axial		Load (kip)	8523.27
Moment	Top	Mux (kip-ft)	584.14
		Muy (kip-ft)	0.43
Moment	Bot.	Mux (kip-ft)	-193.70
		Muy (kip-ft)	1.15

CALCULATED PARAMETERS:

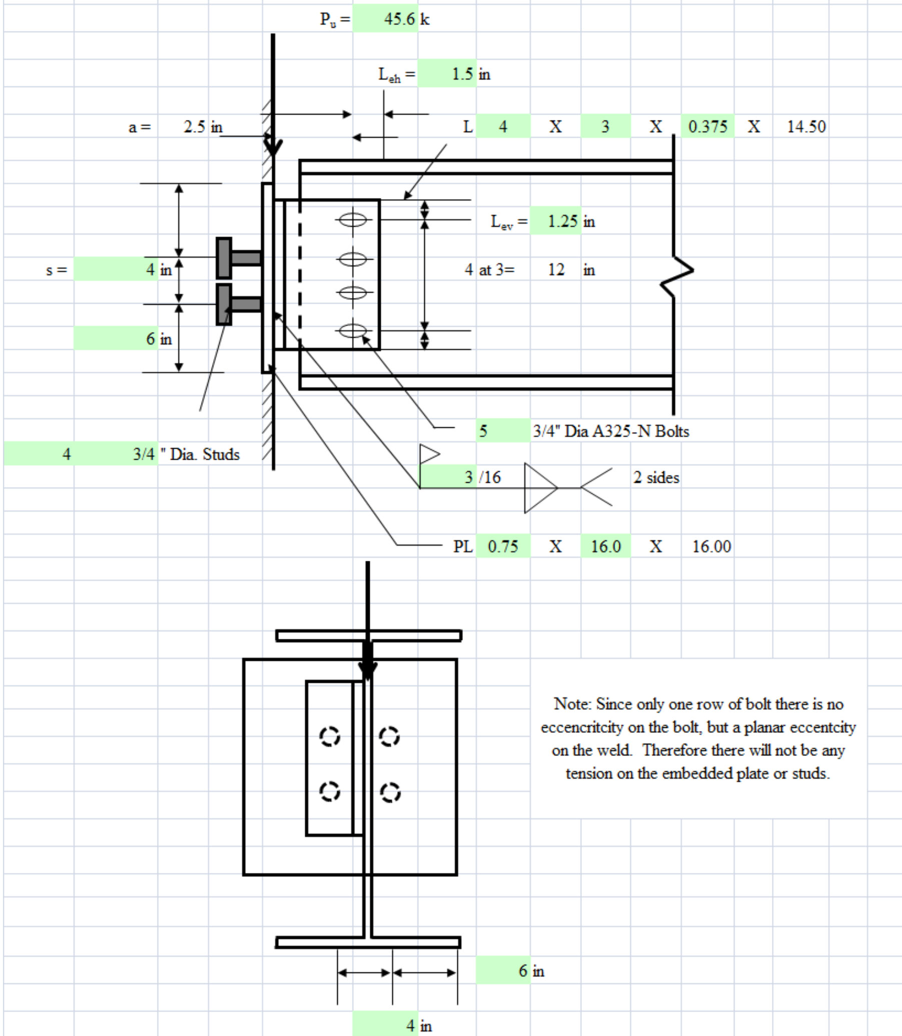
Pu (kip) = 8523.27 0.90Pn (kip) = 10443.08
Mux (kip-ft) = 584.14 0.90Mnx (kip-ft) = 8756.25
Muy(kip-ft) = 0.43 0.90Mny (kip-ft) = 4867.50
Cbx = 2.11

INTERACTION EQUATION:

Pu/φPn = 0.816
Eq H1-1a: 0.816 + 8/9(0.067 + 0.000) = 0.876

Figure 197: RAM output of BU24X987 @ Ground Floor

Concrete to Steel Shear Connection
Bolted/Weld Single Angle with Embedded Plate



Material Properties:

Beam	F_y =	50 ksi	F_u =	65 ksi
Shear Tab Plate	F_y =	36 ksi	F_u =	58 ksi
Angle	F_y =	36 ksi	F_u =	58 ksi
Embedded Plate	F_y =	36 ksi	F_u =	58 ksi
Studs	F_y =	51 ksi	F_u =	65 ksi
Concrete	f'_c =	8000 psi	d_{e1} =	6 in

Geometric Properties:

W18X35	t_w =	0.300 in	d =	17.7 in	t_f =	0.425 in		
Studs	A_{se} =	0.44 in^2	A_{brg} =	0.79 in^2	t_{hs} =	0.375 in	L =	6.00 in
	h_{ef} =	6.25 in						

Determine the shear strength of one bolt:

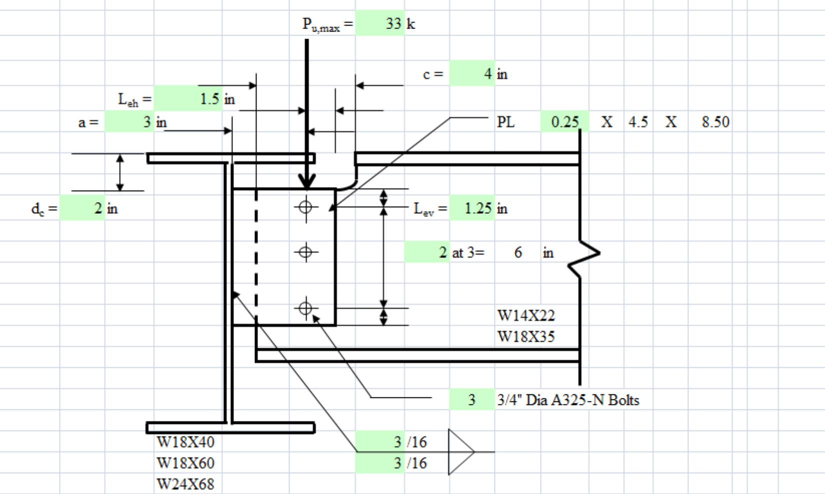
ϕr_n = 15.9 k

Figure 198: Concrete to Steel Connection Design

Determine the strength of the bolt group:											
C =		4.15		Table 10-10							
e =		2.5	in	Table 10-10 is		Conservative					
$\phi R_n = C\phi r_n =$		66.0	k	>	$P_u =$	45.6	k	**OK**			
Shear yielding of angle:											
$\phi R_n = \phi 0.6F_yA_g =$		117.5	k	>	$P_u =$	45.6	k	**OK**			
Shear rupture of angle:											
$\phi R_n = \phi 0.6F_uA_n =$		99.1	k	>	$P_u =$	45.6	k	**OK**			
Block shear of angle:											
$\phi F_uA_{nt} =$		46.2	k/in	x	$t_{angle} =$	17.3	k		Table 9-3a		
$\phi 0.6F_yA_{gv} =$		219	k/in	x	$t_{angle} =$	82.1	k		Table 9-3b		
$\phi 0.6F_uA_{nv} =$		250	k/in	x	$t_{angle} =$	93.8	k		Table 9-3c		
$\phi R_n = \phi F_uA_{nt} + \min(\phi 0.6F_yA_{gv}, \phi F_uA_{nv}) =$					99.5	k	>	$P_u =$	45.6	k	**OK**
Flexural yielding:											
$\phi R_n = \phi F_yZ_g/e_a =$		241	k	>	$P_u =$	45.6	k	**OK**			
Flexural rupture:											
$Z_{eff} =$	15.1	in^3	Table 15-2								
$\phi R_n = \phi F_uZ_{eff}/e_a =$		247.9	k	>	$P_u =$	45.6	k	**OK**			
Bearing & Tearout:											
$L_ct =$	0.727	in^2	Table 9-1								
$\phi R_n = \phi 1.0L_ctF_u =$		31.62	k	>	$\phi r_n =$	15.9	k	**OK**			
$\phi R_n = \phi 2.0dtF_u =$		24.47	k	>	$\phi r_n =$	15.9	k	**OK**			
Weld Rupture:											
$\phi R_n =$	119.0	k	>	$P_u =$	45.6	k	**OK**		Table 10-11		
$t_{support} =$	0.75	in	>	$t_{support,min} =$	0.476	in	**OK**		Table 10-11		
Embedment Plate Limit States:											
$t_{p,min} =$	$.5*d_o =$	0.375	in	<	$t_p =$	0.750	in	**OK**	PCI Handbook EQ. 6.5.1.1		
Stud strength Capacity:											
$\phi V_s = \phi nA_{se}f_{ut} =$		74.66	k	>	$P_u =$	45.6	k	**OK**	PCI Handbook EQ. 6.5.2.1		
Concrete Capacity in side edge failure:											
$V_{co1} = 87xSQRT(f'_c)d_{e1}^{1.33}d_o^{0.75} =$				68.0	k						
$C_{x1} = n_xX/2.5d_{e1}+2-n_{sides} =$			1.533						PCI Handbook EQ. 6.5.5.14		
$C_{y1} = (n_yY)^{0.25}/0.6d_{e1}+1.5 =$			0.617						PCI Handbook EQ. 6.5.5.16		
$C_{ev1} =$	1										
$C_{vr} =$	1										
$\phi V_{c3} = \phi V_{co1}(C_{x1})(C_{y1})(C_{ev1})(C_{vr}) =$				48	k	>	$P_u =$	45.6	k	**OK**	
										PCI Handbook EQ. 6.5.5.12	

Figure 199: Concrete to Steel Connection Design

Beam to Girder Shear Connection
Shear Tab



Material Properties:

Beam	F_y =	50 ksi	F_u =	65 ksi	
Shear Tab Plate	F_y =	36 ksi	F_u =	58 ksi	

Geometric Properties:

W14X22	t_w =	0.230 in	d =	13.7 in	S_{net} =	7.97 in	Table 9-2
W18X35	t_w =	0.300 in	d =	17.7 in	S_{net} =	18.2 in	Table 9-2

Bolt & Plate Limit States:

Both	ϕR_n =	52.2 k	>	P_u =	33 k	OK	Per Table 10-9 in AISC Manual
Both	$t_{weld,min}$ =	0.13 in	<	t_{weld} =	0.19 in	OK	Section J2.2b

Beam Limit States:

W14X22	ϕR_n =	250.0	x t_w =	57.5 k	>	P_u = 33 k	OK	Per Table 10-1 in AISC Manual
W18X35	ϕR_n =	250.0	x t_w =	75 k	>	P_u = 33 k	OK	Per Table 10-1 in AISC Manual

Check flexural rupture on the coped section:

W14X22	$\phi R_n = 0.75F_uS_{net}/e$ =	86.3417 k	>	P_u = 33 k	OK
W18X35	$\phi R_n = 0.75F_uS_{net}/e$ =	197.167 k	>	P_u = 33 k	OK

Check local web buckling at the coped section:

W14X22:

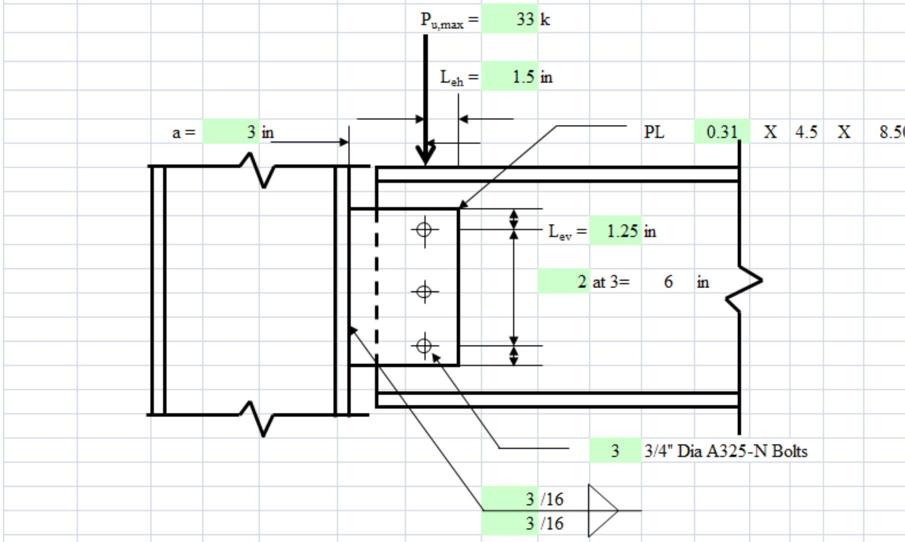
c =	4 in	<	2d =	27.4	in	OK
d_c =	2 in	<	d/2 =	6.85	in	OK
c/d =	0.292		f =2(c/d) =	0.584		
c/h_o =	0.342		$k = 2.2(h_o/c)^{1.65}$ =	12.928		
$F_{cr} = 26{,}210(t_w/h_o)^2fk$ =	76.46 k					
$\phi R_n = 0.90F_{cr}S_{net}/e$ =	182.00 k	>	P_u =	33 k		OK

W18X35

c =	4 in	<	2d =	35.4	in	OK
d_c =	2 in	<	d/2 =	8.85	in	OK
c/d =	0.226		f =2(c/d) =	0.452		
c/h_o =	0.255		$k = 2.2(h_o/c)^{1.65}$ =	21.00		
$F_{cr} = 26{,}210(t_w/h_o)^2fk$ =	90.84 k					
$\phi R_n = 0.90F_{cr}S_{net}/e$ =	182.00 k	>	P_u =	33 k		OK

Figure 200:Beam to Girder Shear Connection

Girder to Column Flange Shear Connection
Shear Tab

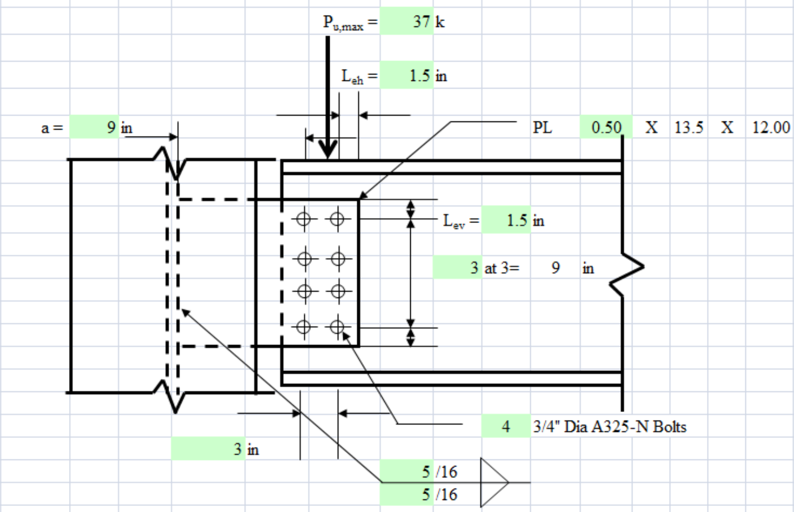


Material Properties:										
Beam	F_y =	50	ksi	F_u =	65	ksi				
Shear Tab Plate	F_y =	36	ksi	F_u =	58	ksi				
Geometric Properties:										
W14X22	t_w =	0.230	in							
W18X35	t_w =	0.300	in							
Bolt & Plate Limit States:										
Per Table 10-9 in AISC Manual	ϕR_n =	63.6	k	>	P_u =	33	k	**OK**		
Section J2.2b	$t_{weld,min}$ =	0.19	in	<	t_{weld} =	0.25	in	**OK**		
Beam Limit States:										
Per Table 10-1 in AISC Manual	ϕR_n =	351.0	x t_w =	80.73	k	>	P_u =	33	k	**OK**
Per Table 10-1 in AISC Manual	ϕR_n =	351.0	x t_w =	105.3	k	>	P_u =	33	k	**OK**

Figure 201: Girder to Column Flange Shear Connection

Girder to Column Web Shear Connection

Extended Shear Tab



Material Properties:

Column	F_y =	49 ksi	F_u =	64 ksi
Beam	F_y =	50 ksi	F_u =	65 ksi
Shear Tab Plate	F_y =	36 ksi	F_u =	58 ksi

Geometric Properties:

	t_w =	in	b_f =	in
W18X40	t_w =	0.300 in	d =	17.9 in

Determine the bearing strength of one bolt on the beam web:

$\phi r_n = 2.4F_u t_w d_b$ = 26.33 k

Determine the shear strength of one bolt:

ϕr_n = 15.9 k

Determine the strength of the bolt group:

e =	10.5 in				
C =	2.33	Table 7-8			
$\phi R_n = C\phi r_n$ =	37.05 k	>	P_u =	37 k	**OK**

Determine the maximum plate thickness such that the plate will yield before the bolts shear:

$1.25F_{nv}$ =	60 ksi				
A_b =	0.442 in^2				
C' =	26	Table 7-8			
$M_{max} = 1.25F_{nv}A_bC'$ =	689.5 k-in				
$t_{max} = 6M_{max}/F_yd^2$ =	0.798 in	>	t_{plate} =	0.50 in	**OK**

Check flexural strength of the plate:

$M_u = P_ue$ = 388.5 k-in

Check shear yielding of the plate:

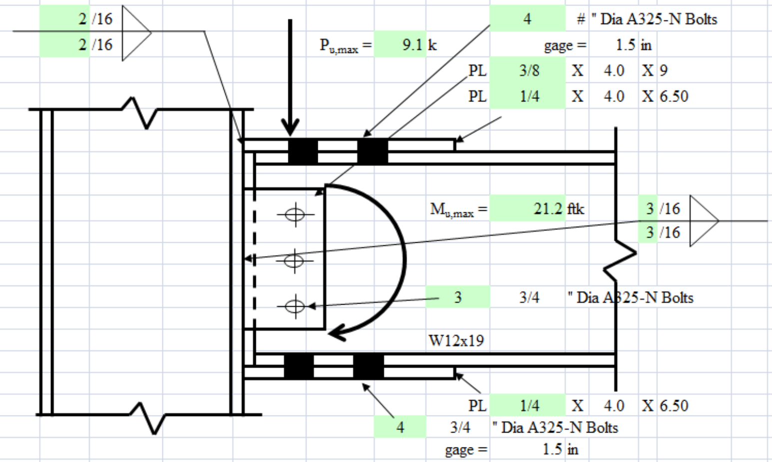
$\phi R_n = \phi 0.6F_yA_g$ = 129.6 k > P_u = 37 k **OK**

Figure 202: Girder to Column Web Shear Connection

Determine critical flexural stress in presence of shear stress, fv:											
f_v =	6.00	ksi									
$\phi F_{cr} = SQRT((\phi F_y)^2 - 3f_v^2) =$				30.69	ksi						
$\phi M_n = \phi F_{cr} Z =$		552.4	k-in	>	$M_u =$	388.5	k	**OK**			
Check flexural rupture:											
$Z_{net} = t_p d^2/4(1-(d_b+.125)/3)) =$				12.75	in						
$\phi M_n = \phi F_u Z_{net} =$		554.6	k-in	>	$M_u =$	388.5	k	**OK**			
Check shear rupture of the plate:											
$A_n = t_p(d-n(d_b+.125) =$			4.25	in							
$\phi R_n = \phi 0.6 F_u A_n =$		110.9	k	>	$P_u =$	37	k	**OK**			
Check block shear rupture of the plate:											
$\phi F_u A_{nt} =$		46.2	k/in	x	$t_p =$	23.1	k		Table 9-3a		
$\phi 0.6 F_y A_{gv} =$		170	k/in	x	$t_p =$	85.0	k		Table 9-3b		
$\phi 0.6 F_u A_{nv} =$		194	k/in	x	$t_p =$	97.0	k		Table 9-3c		
$\phi R_n = \phi F_u A_{nt} + \min(\phi 0.6 F_y A_{gv}, \phi F_u A_{nv}) =$					108.1	k	>	$P_u =$	37	k	**OK**
Check local buckling of the plate:											
$F_{cr} = F_y Q$											
$\lambda = h_o SQRT(F_y)/(10 t_w SQRT(475+280(h_o/c)^2) =$						0.462	<	0.7	∴	Q =	1
$F_{cr} = F_y$		∴	buckling does not control								

Figure 203: Girder to Column Web Shear Connection

Girder to Column Flange Moment Connection
Bolted Flange-Plate FR Moment Connection



Material Properties:

Beam	F_y =	50 ksi	F_u =	65 ksi
Column	F_y =	50 ksi	F_u =	65 ksi
Plate	F_y =	36 ksi	F_u =	58 ksi

Geometric Properties:

W12X19	d =	12.2 in	b_f =	4.01 in	t_f =	0.35 in
	t_w =	0.235 in	S_x =	21.3 in		
W14X90	d =	14 in	b_f =	14.5 in	t_f =	0.71 in
	k_{design} =	1.31 in	t_w =	0.44 in	T =	10 in

Beam flexural strength:

$A_{fg} = b_f t_f$ =	1.404 in^2				
$A_{fn} = A_{fg}$-n(d_b+1/8) =	0.48475 in^2				
Fy/Fu =	0.76923	<	0.8	Y_t =	1
F_uA_{fn} =	31.5088 k				
$Y_tF_yA_{fg}$ =	70.175 k				
$\phi M_n = \phi F_uA_{fn}S_x/A_{fg}$	35.86 ftk	>	21.2 ftk	OK	

Design of single plate web connection:
Shear strength of bolts:

ϕr_n =	15.9 k/bolt				Per Table 7-1 in AISC Manual
ϕR_n =	47.7 k	>	9.1 k	OK	

Bearing strength of bolts:

ϕr_n =	78.3 k/in/bolt				Per Table 7-5 in AISC Manual
ϕR_n =	29.36 k	>	9.1 k	OK	

Plate shear yielding:

$\phi R_n = 0.6\phi F_yA_g$ =	72.90	k	>	9.1 k	OK

Plate shear rupture:

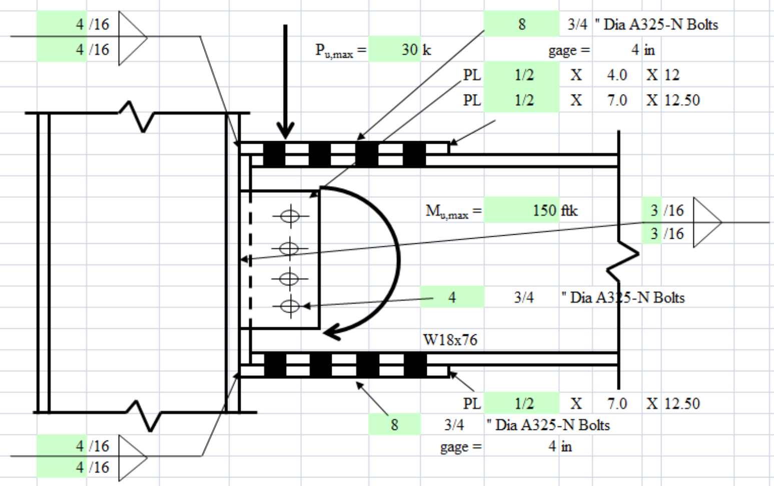
$\phi R_n = 0.6\phi F_uA_{nv}$ =	62.40	k	>	9.1 k	OK

Figure 204: Girder to Column Flange Moment Connection

Block shear rupture strength of the plate:											
$\phi F_u A_{nt}$ =		46.2	k/in	x	t_{plate} =	17.33	k		Table 9-3a		
$\phi 0.6F_y A_{gv}$ =		121	k/in	x	t_{plate} =	45.38	k		Table 9-3b		
$\phi 0.6F_u A_{nv}$ =		131	k/in	x	t_{plate} =	49.13	k		Table 9-3c		
$\phi R_n = \phi F_u A_{nt} + \min(\phi 0.6F_y A_{gv}, \phi F_u A_{nv})$ =					62.7	k	>	P_u =	9.1	k	**OK**
Weld strength:											
ϕR_n = 1.392Dlx2=		75.17	k	>	P_u =	9.1	k	**OK**			
Shear rupture of the base metal:											
$\phi R_n = \phi 0.6F_{u,plate} t_{fcol} l_{weld}$x2=			33.3558	k	>	P_u =	9.1	k	**OK**		
Design of tension flange plate and connection:											
Design of bolts											
$P_{uf} = M_u/d$ =		20.85	kips								
Shear strength of bolts:											
ϕr_n =	15.9	k/bolt					Per Table 7-1 in AISC Manual				
ϕR_n =	63.6	k	>	20.85	k	**OK**					
For bearing on flange:											
ϕr_n =	49.4	k/bolt	x t_f =	17.29	kip/bolt		Per Table 7-6 in AISC Manual				
ϕR_n =	69.16	k	>	20.85	k	**OK**					
For bearing on plate:											
ϕr_n =	44	k/bolt	x t_f =	15.4	kip/bolt		Per Table 7-6 in AISC Manual				
ϕR_n =	61.6	k	>	20.85	k	**OK**					
Flange plate tension yielding:											
$\phi P_n = \phi F_y A_g$ =		32.40	kips	>	20.43	k	**OK**				
$P_{uf} = M_u/d + t_{plate}$ =		20.43	kips								
Flange plate tension rupture:											
$0.85A_g$ =	0.85	in^2									
A_n =	0.56	in^2									
$\phi P_n = \phi F_u A_e$ =		24.47	k	>	20.43	k	**OK**				
Flange plate block shear rupture:											
$\phi F_u A_{nt}$ =		35.3	k/in	x	t_{plate} =	17.65	k		Table 9-3a		
$\phi 0.6F_y A_{gv}$ =		72.9	k/in	x	t_{plate} =	36.45	k		Table 9-3b		
$\phi 0.6F_u A_{nv}$ =		83.2	k/in	x	t_{plate} =	41.60	k		Table 9-3c		
$\phi R_n = \phi F_u A_{nt} + \min(\phi 0.6F_y A_{gv}, \phi F_u A_{nv})$ =					54.1	k	>	P_{uf} =	20.43	k	**OK**
Determine required size of fillet weld:											
$D_{min} = P_{uf}/(4.176l)$ =		1.223	/16	<	2	/16	**OK**				
Tension rupture of the base metal:											
$t_{min} = 1.86D/F_u$ =		0.057	in	<	0.71	in	**OK**				
$t_{min} = 3.71D/F_u$ =		0.128	in	<	0.25	in	**OK**				
Design of compression flange plate and connection:											
K =	0.65										
l =	2	in									
Kl/r =	18.01	<	25								
$F_{cr} = F_y$											
$\phi P_n = \phi F_y A_g$ =		32.40	k	>	P_{uf} =	20.43	k	**OK**			
Flange bending of column:											
$\phi R_n = \phi 6.25 t_f^2 F_y$ =		141.8	k	>	P_{uf} =	20.43	k	**OK**			
Web yielding of column:											
$\phi R_n = \phi F_y(5k_{design}+N)t_w$ =			166.1	k	>	P_{uf} =	20.43	k	**OK**		
Web crippling of column:											
$\phi R_n = \phi 0.8t_w^2(1+3(N/d)(t_w/t_f)^{1.5})SQRT(EF_y t_f/t_w)$ =					196.26	k	>	P_{uf} =	20.43	k	**OK**
Web buckling of column:											
$\phi R_n = \phi 24t_w^3 SQRT(Efy)/T$ =			221.56	k	>	P_{uf} =	20.43	k	**OK**		
				NO STIFFENERS REQUIRED							

Figure 205: Girder to Column Flange Moment Connection

Girder to Column Flange Moment Connection
Bolted Flange-Plate FR Moment Connection



Material Properties:

Beam	F_y =	50 ksi	F_u =	65 ksi
Column	F_y =	50 ksi	F_u =	65 ksi
Plate	F_y =	36 ksi	F_u =	58 ksi

Geometric Properties:

W18X76	d =	18.2 in	b_f =	11 in	t_f =	0.68 in
	t_w =	0.48 in	S_x =	146 in		
W14X99	d =	14.2 in	b_f =	14.6 in	t_f =	0.78 in
	k_{design} =	1.38 in	t_w =	0.485 in	T =	10 in

Beam flexural strength:

$A_{fg} = b_f t_f$ =	7.48 in^2				
$A_{fn} = A_{fg}$-n(d_b+1/8) =	5.1 in^2				
Fy/Fu =	0.76923	<	0.8	Y_t =	1
$F_u A_{fn}$ =	331.5 k				
$Y_t F_y A_{fg}$ =	374 k				
$\phi M_n = \phi F_u A_{fn} S_x / A_{fg}$	485.3 ftk	>	21.2 ftk	**OK**	

Design of single plate web connection:
Shear strength of bolts:

ϕr_n =	15.9 k/bolt			Per Table 7-1 in AISC Manual
ϕR_n =	63.6 k	>	30 k	**OK**

Bearing strength of bolts:

ϕr_n =	78.3 k/in/bolt			Per Table 7-5 in AISC Manual
ϕR_n =	39.15 k	>	30 k	**OK**

Plate shear yielding:

$\phi R_n = 0.6\phi F_y A_g$ =	129.6 k	>	30 k	**OK**

Plate shear rupture:

$\phi R_n = 0.6\phi F_u A_{nv}$ =	110.9 k	>	30 k	**OK**

Figure 206: Girder to Column Flange Moment Connection

Block shear rupture strength of the plate:								
ϕF_uA_{nt} =	46.2	k/in	x	t_{plate} =	23.10	k	Table 9-3a	
$\phi 0.6F_yA_{gv}$ =	170	k/in	x	t_{plate} =	85.00	k	Table 9-3b	
$\phi 0.6F_uA_{nv}$ =	194	k/in	x	t_{plate} =	97.00	k	Table 9-3c	
$\phi R_n = \phi F_uA_{nt} + \min(\phi 0.6F_yA_{gv}, \phi F_uA_{nv})$ =	108.1	k	>	P_u =	30	k	**OK**	
Weld strength:								
ϕR_n = 1.392Dlx2=	100.2	k	>	P_u =	30	k	**OK**	
Shear rupture of the base metal:								
$\phi R_n = \phi 0.6F_{u,plate}t_{fcol}l_{weld}$x2=	48.9	k	>	P_u =	30	k	**OK**	
Design of tension flange plate and connection:								
Design of bolts								
$P_{uf} = M_u/d$ =	98.9	kips						
Shear strength of bolts:								
ϕr_n =	15.9	k/bolt					Per Table 7-1 in AISC Manual	
ϕR_n =	127.2	k	>	98.90	k	**OK**		
For bearing on flange:								
ϕr_n =	49.4	k/bolt	x t_f =	33.592	kip/bolt		Per Table 7-6 in AISC Manual	
ϕR_n =	268.736	k	>	98.90	k	**OK**		
For bearing on plate:								
ϕr_n =	44	k/bolt	x t_f =	29.92	kip/bolt		Per Table 7-6 in AISC Manual	
ϕR_n =	239.36	k	>	98.90	k	**OK**		
Flange plate tension yielding:								
$\phi P_n = \phi F_yA_g$ =	113.4	kips	>	96.26	k	**OK**		
$P_{uf} = M_u/d+t_{plate}$ =	96.26	kips						
Flange plate tension rupture:								
$0.85A_g$ =	2.98	in^2						
A_n =	2.63	in^2						
$\phi P_n = \phi F_uA_e$ =	114.2	k	>	96.26	k	**OK**		
Flange plate block shear rupture:								
ϕF_uA_{nt} =	46.2	k/in	x	t_{plate} =	46.20	k	Table 9-3a	
$\phi 0.6F_yA_{gv}$ =	170	k/in	x	t_{plate} =	170.00	k	Table 9-3b	
$\phi 0.6F_uA_{nv}$ =	194	k/in	x	t_{plate} =	194.00	k	Table 9-3c	
$\phi R_n = \phi F_uA_{nt} + \min(\phi 0.6F_yA_{gv}, \phi F_uA_{nv})$ =	216.2	k	>	P_{uf} =	96.26	k	**OK**	
Determine required size of fillet weld:								
$D_{min} = P_{uf}/(4.176l)$ =	3.29	/16	<	4	/16	**OK**		
Tension rupture of the base metal:								
$t_{min} = 1.86D/F_u$ =	0.114	in	<	0.78	in	**OK**		
$t_{min} = 3.71D/F_u$ =	0.256	in	<	0.50	in	**OK**		
Design of compression flange plate and connection:								
K =	0.65							
l =	2	in						
Kl/r =	9.01	<	25					
$F_{cr} = F_y$								
$\phi P_n = \phi F_yA_g$ =	113.4	k	>	P_{uf} =	96.26	k	**OK**	
Flange bending of column:								
$\phi R_n = \phi 6.25t_f^2F_y$ =	171.1	k	>	P_{uf} =	96.26	k	**OK**	
Web yielding of column:								
$\phi R_n = \phi F_y(5k_{design}+N)t_w$ =	191.575	k	>	P_{uf} =	96.26	k	**OK**	
Web crippling of column:								
$\phi R_n = \phi 0.8t_w^2(1+3(N/d)(t_w/t_f)^{1.5})$SQRT($EF_yt_f/t_w$) =	237.85	k	>	P_{uf} =	96.26	k	**OK**	
Web buckling of column:								
$\phi R_n = \phi 24t_w^3$SQRT(Efy)/T =	296.73	k	>	P_{uf} =	96.26	k	**OK**	
NO STIFFENERS REQUIRED								

Figure 207: Girder to Column Flange Moment Connection

7.3 Lighting/Electrical

LUMINAIRE SCHEDULE													
FIXTURE TAG	**DESCRIPTION**	**HOUSING/TRIM/ COLOR/HOUSING**	**VOLTAGE**	**TOTAL FIXTURE WATTAGE**	**MANUFACTURE SEE NOTE 1**	**CATALOG**	**LAMPS**		**BALLAST/ XMFR/TYPE**	**MOUNTING TYPE**	**MAXIMUM FIXTURE DEPTH**	**GENERAL LOCATION**	**REMARKS**
							NO.	**TYPE**					
R1	FOUR FOOT 28 WATT T5 LUMINAIRE WITH DALI BALLAST, CONTINUOUSLY EXTRUDED METAL HOUSING WITH SATINE LENS.	WHITE	277V	32.6W	SELUX	M1B0-1T5-SD-SG-004-WH-277-TB-DMA	1	F28T5	ECOSYSTEM	RECESSED	6"	OPEN OFFICE	-
R2	8" SQUARE WALL WASHER, WITH METAL HALIDE LAMPING AND POWDER COATED STEEL HOUSING	SILVER	277V	48W	ZUMTOBEL	2LS1W-1H39T45G85-U-FF-SRM	1	39WT4	DALI	RECESSED	7"	CIRCULATION SPACE	-
R2E	8" SQUARE WALL WASHER, WITH METAL HALIDE LAMPING, QUARTZ RESTRIKE AND POWDER COATED STEEL HOUSING	SILVER	277V	48W	ZUMTOBEL	2LS1W-1H39T45G85-U-FF-SRM-Q	1	39WT4	DALI	RECESSED	7"	CIRCULATION SPACE	-
R3	8" SQUARE DOWNLIGHT, WITH METAL HALIDE LAMPING AND POWDER COATED STEEL HOUSING	SILVER	277V	48W	ZUMTOBEL	2LS1D-1H39T45G85-U-FF-SRM	1	39WT4	DALI	RECESSED	7"	CIRCULATION SPACE	-
R3E	8" SQUARE DOWNLIGHT, WITH METAL HALIDE LAMPING, QUARTZ RESTRIKE AND POWDER COATED STEEL HOUSING	SILVER	277V	48W	ZUMTOBEL	2LS1D-1H39T45G85-U-FF-SRM-Q	1	39WT4	DALI	RECESSED	7"	CIRCULATION SPACE	-
T1	6 WATT LED TASK LIGHT, LOW PROFILE ALUMINUM FIXTURE WITH DESK MOUNTING AND LINE SWITCH ACCESSORIES	SILVER	120V	21W/3UNITS 60W/10UNITS	FINELITE	DL-6W-S	LED 3500K		PS-21W	UNDER CABINET	.8"	TASK LIGHT	-
B1	EXTERIOR IN GROUND LED UPLIGHT WITH CORROSION-RESISTANT CAST ALUMINUM, DOUBLE POWDER-COATED, REPLACEABLE LED MODULE	SILVER	277V	32W	ERCO	33665000	LED 5500K		INTEGRAL DRIVER	-	-	BUILDING MOUNTED	-

Table 79: Luminaire Schedule

LUMINAIRE SCHEDULE CONTINUED												
FIXTURE TAG	DESCRIPTION	HOUSING/TRIM/ COLOR/HOUSING	VOLTAGE	TOTAL FIXTURE WATTAGE	MANUFACTURE SEE NOTE 1	CATALOG	LAMPS		BALLAST/ XMFR/TYPE	MOUNTING TYPE	MAXIMUM FIXTURE DEPTH	GENERAL LOCATION
							NO.	TYPE				
B2	EXTERIOR SPOT CORROSION-RESISTANT CAST ALUMINUM, DOUBLE POWDER-COATED, LED LUMINAIRE WITH STEEL MOUNTING BRACKET FOR +-90 DEGREE TILT, REPLACEABLE LED MODULE	SILVER	277V	51W	ERCO	34249000	LED 5500K		INTEGRAL DRIVER	-	-	BUILDING MOUNTED
B3	EXTERIOR WIDE FLOOD CORROSION-RESISTANT CAST ALUMINUM, DOUBLE POWDER-COATED, LED LUMINAIRE WITH STEEL MOUNTING BRACKET FOR +-90 DEGREE TILT, REPLACEABLE LED MODULE	SILVER	277V	51W	ERCO	34253000	LED 5500K		INTEGRAL DRIVER	-	-	BUILDING MOUNTED
B4	EXTERIOR FLOOD CORROSION-RESISTANT CAST ALUMINUM, DOUBLE POWDER-COATED, LED LUMINAIRE WITH STEEL MOUNTING BRACKET FOR +-90 DEGREE TILT, REPLACEABLE LED MODULE	SILVER	277V	51W	ERCO	34251000	LED 5500K		INTEGRAL DRIVER	-	-	BUILDING MOUNTED
B5	EXTERIOR AREA CAST ALUMINUM LED LUMINAIRE WITH POWDER COAT FINISH RESISTANT TO CORROSION, CUSTOM MOUNTING	SILVER	277V	50W	BETALED	ARE-EDG-2SB-DA-02-C-UL-SV-60K	LED 4300K		INTEGRAL DRIVER	-	-	BUILDING MOUNTED

Table 80: Luminaire Schedule Continued

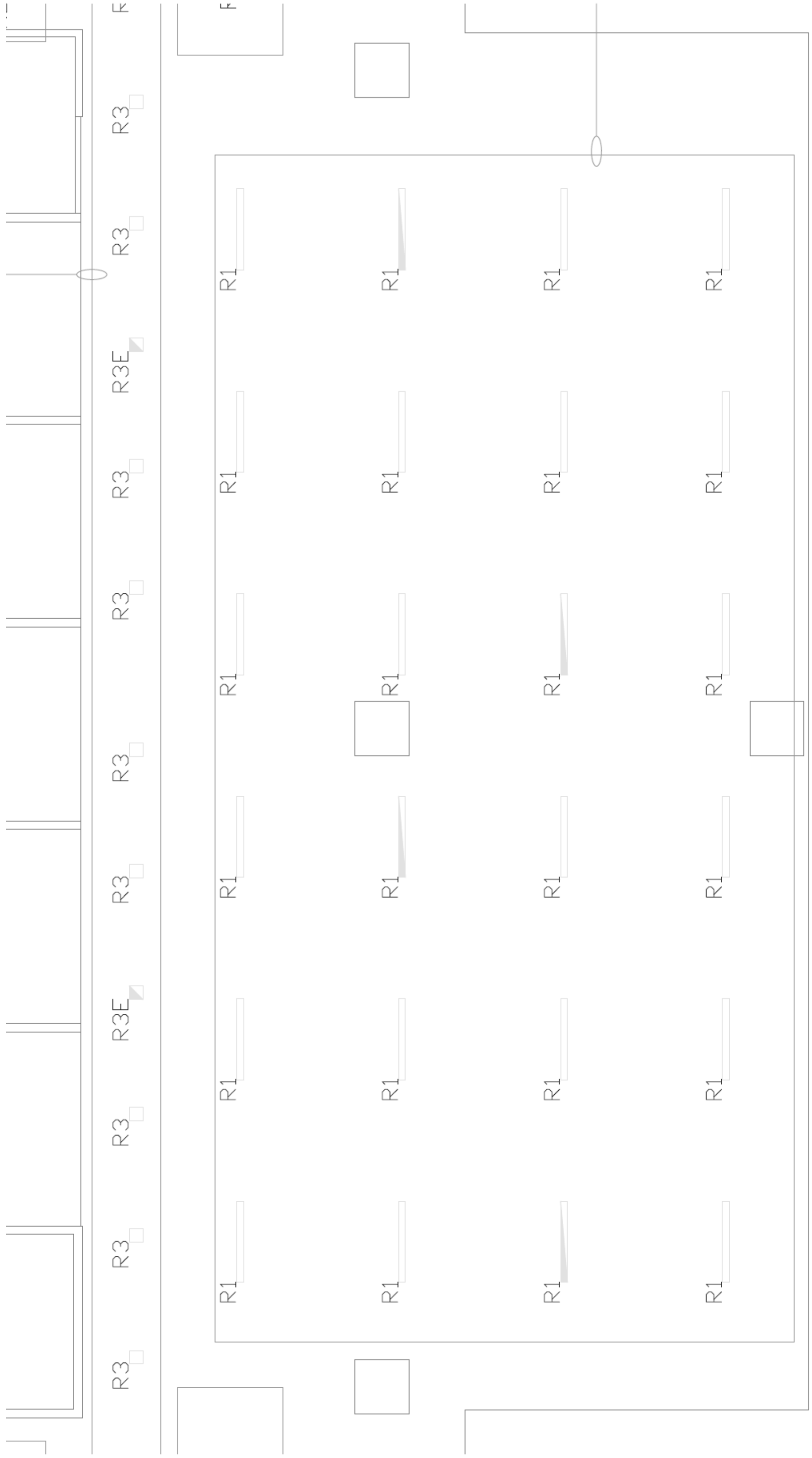


Figure 208: South Open Office Reflected Ceiling Plan

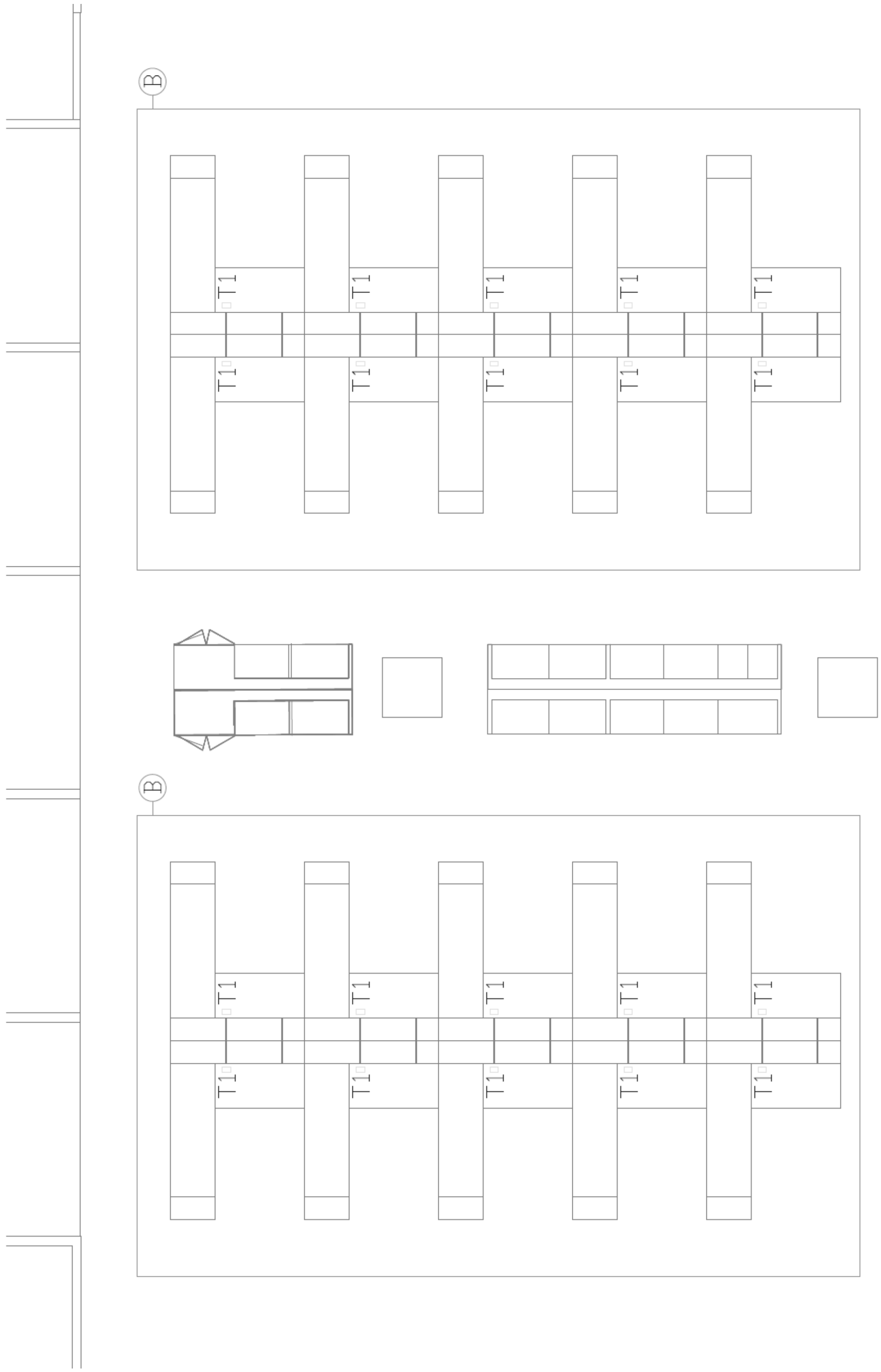


Figure 209: South Open Office Task Lighting

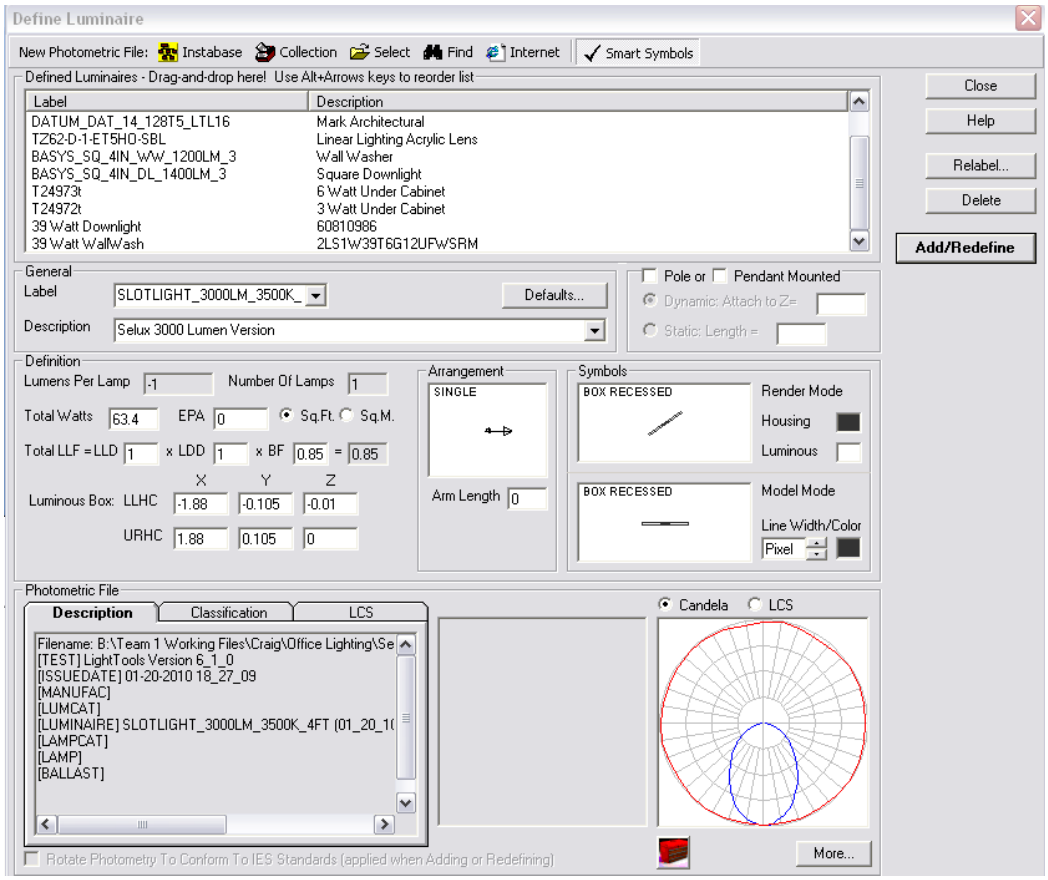


Figure 210: Example Luminaire Detail for Interior Calculation

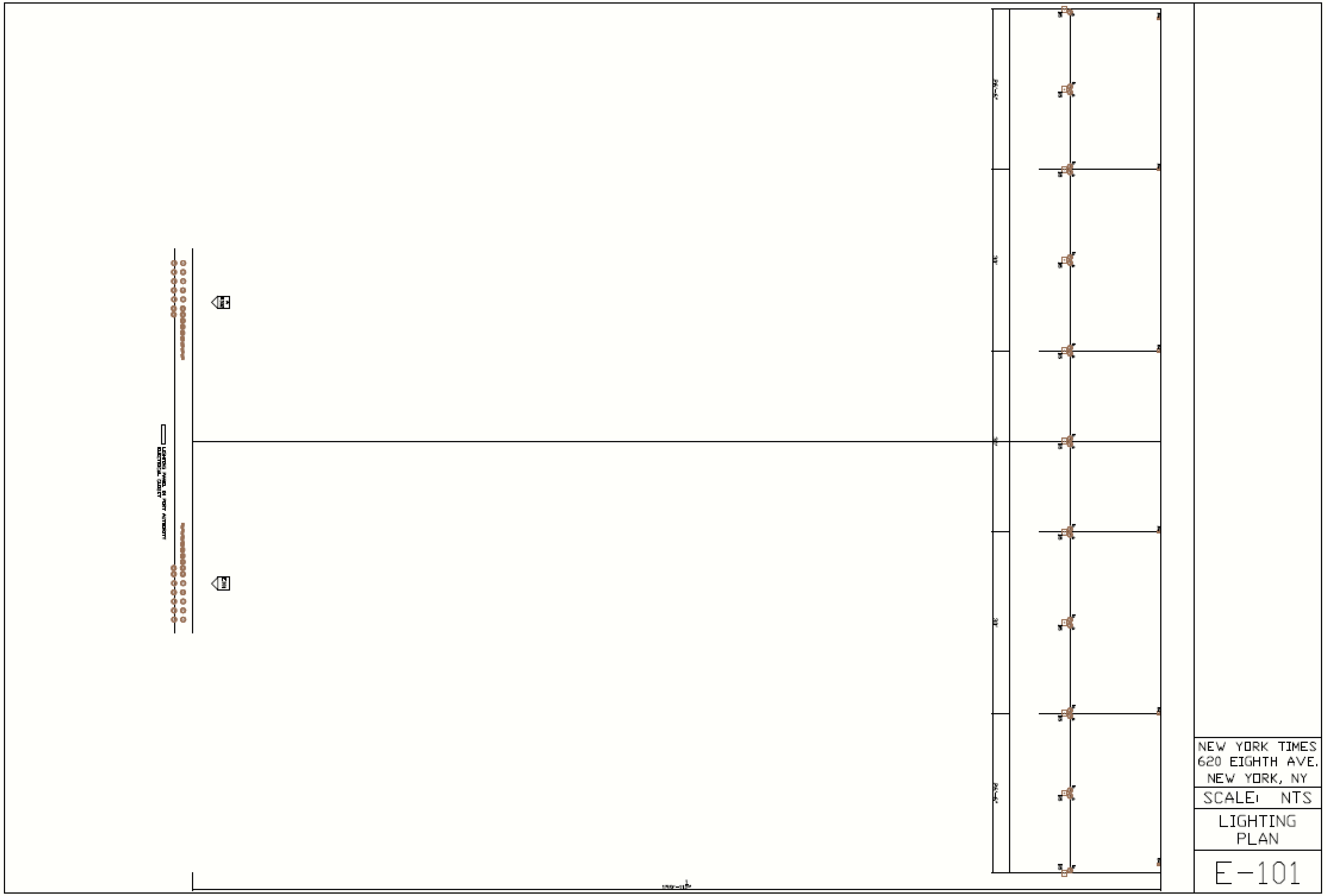
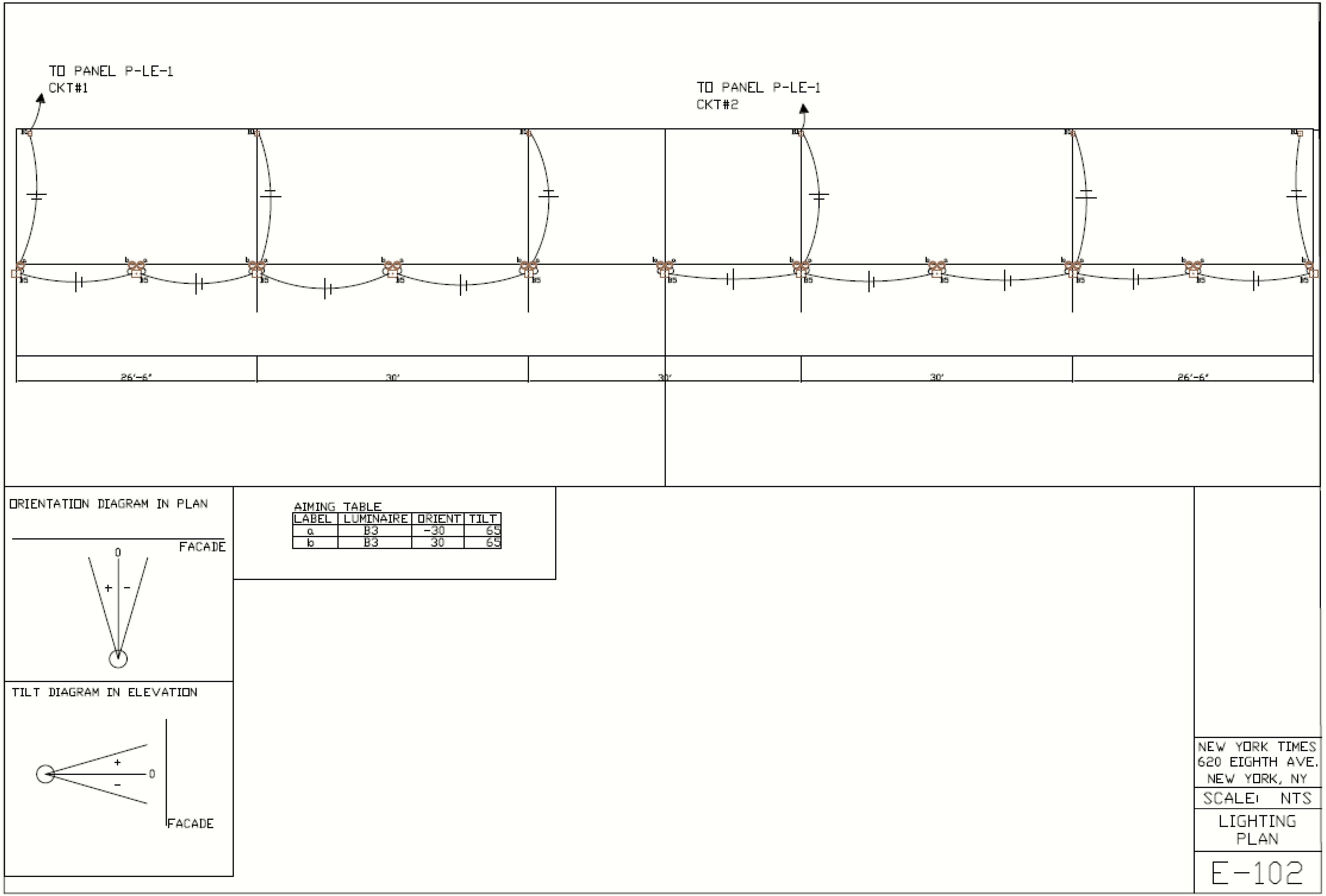
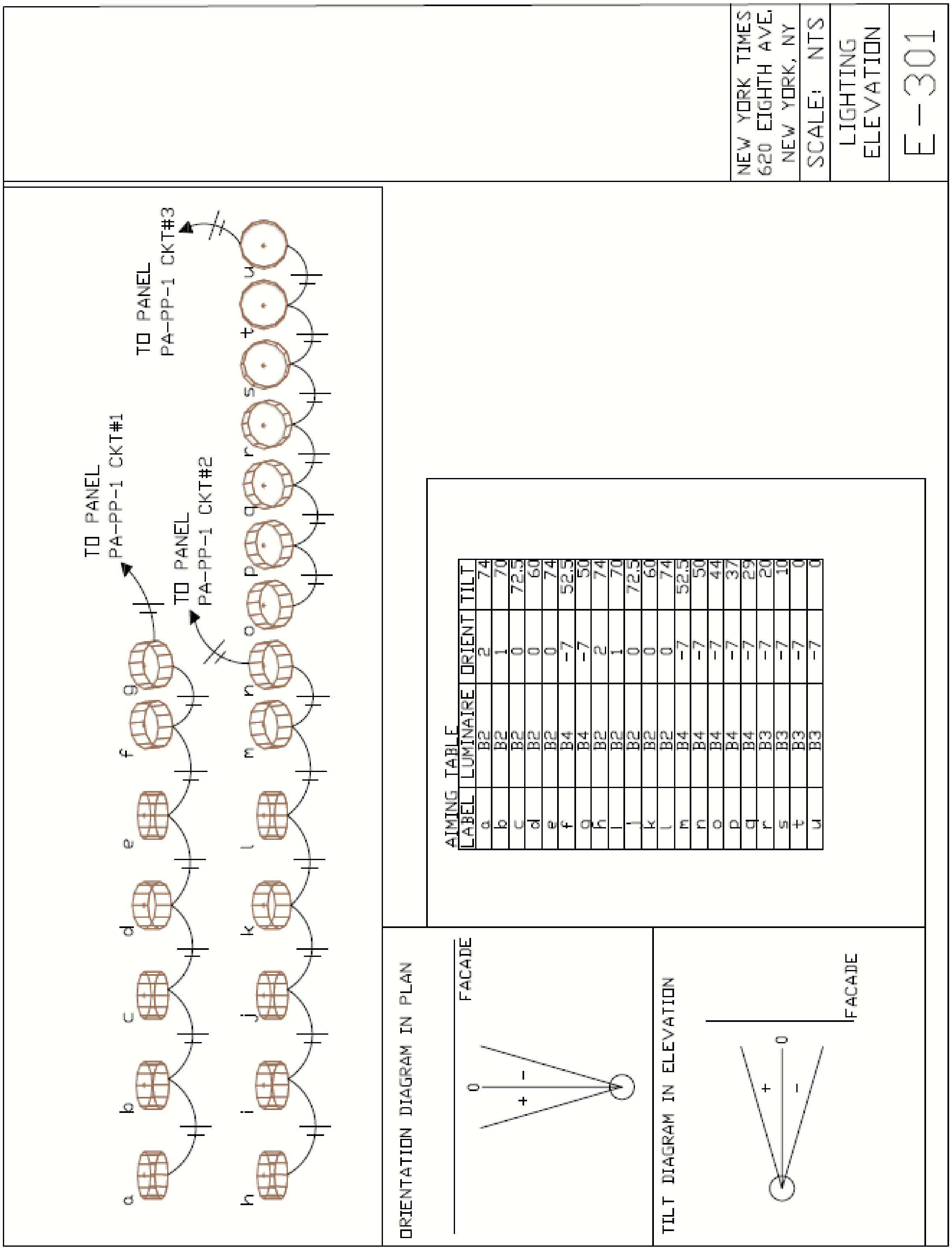


Figure 211: Exterior Lighting Plan



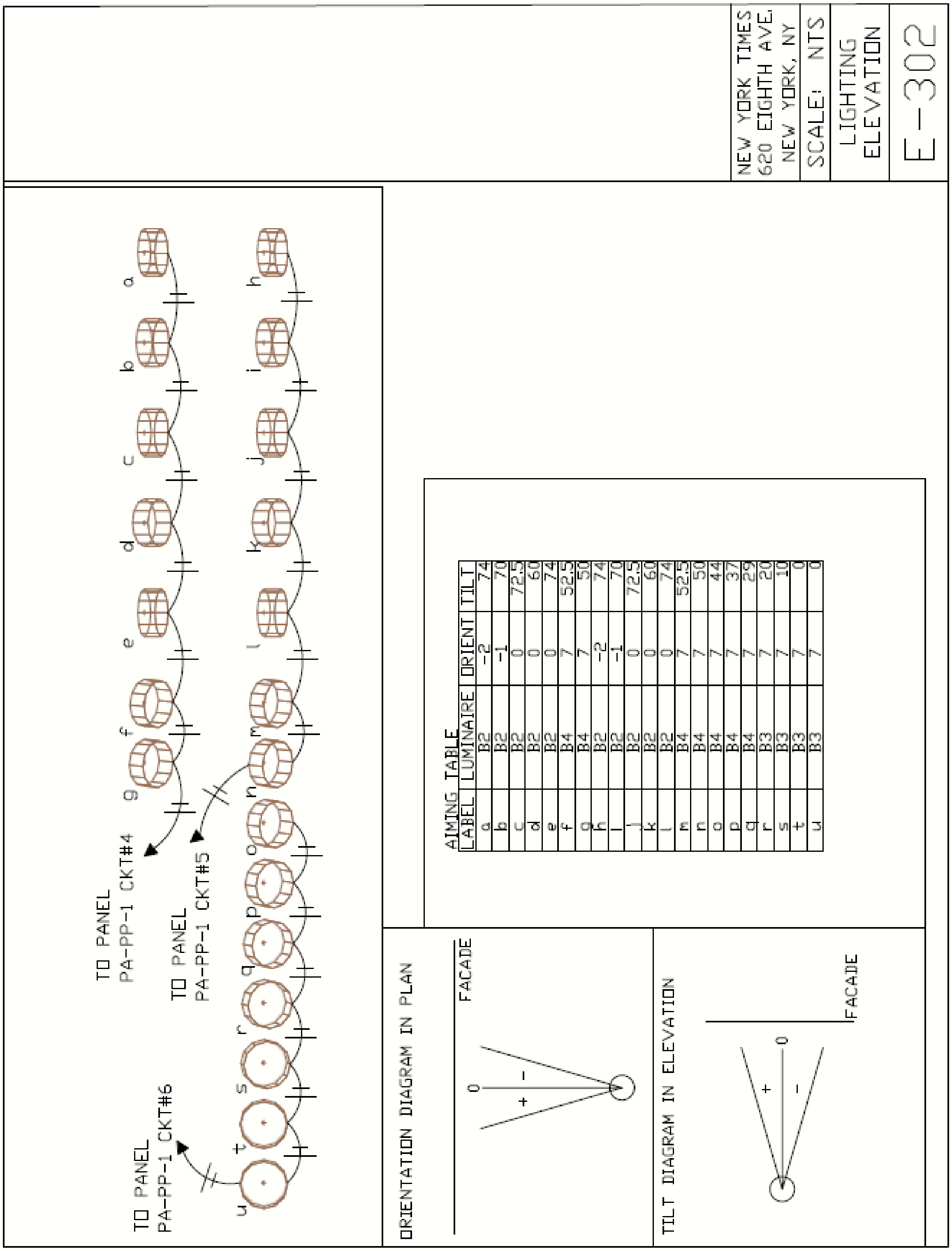
LABEL	LUMINAIRE	ORIENT	TILT
a	B3	-30	65
b	B3	30	65

Figure 212: Entrance Lighting Plan



LABEL	LUMINAIRE	ORIENT	TILT
a	B2	2	74
b	B2	1	70
c	B2	0	72.5
d	B2	0	60
e	B2	0	74
f	B4	-7	52.5
g	B4	-7	50
h	B2	2	74
i	B2	1	70
j	B2	0	72.5
k	B2	0	60
l	B2	0	74
m	B4	-7	52.5
n	B4	-7	50
o	B4	-7	44
p	B4	-7	37
q	B4	-7	29
r	B3	-7	20
s	B3	-7	10
t	B3	-7	0
u	B3	-7	0

Figure 213: Exterior Lighting Elevation E-301



AIMING TABLE

LABEL	LUMINAIRE	ORIENT	TILT
a	B2	-2	74
b	B2	-1	70
c	B2	0	72.5
d	B2	0	60
e	B2	0	74
f	B4	7	52.5
g	B4	7	50
h	B2	-2	74
i	B2	-1	70
j	B2	0	72.5
k	B2	0	60
l	B2	0	74
m	B4	7	52.5
n	B4	7	50
o	B4	7	44
p	B4	7	37
q	B4	7	29
r	B3	7	20
s	B3	7	10
t	B3	7	0
u	B3	7	0

Figure 214: Exterior Lighting Elevation E-302

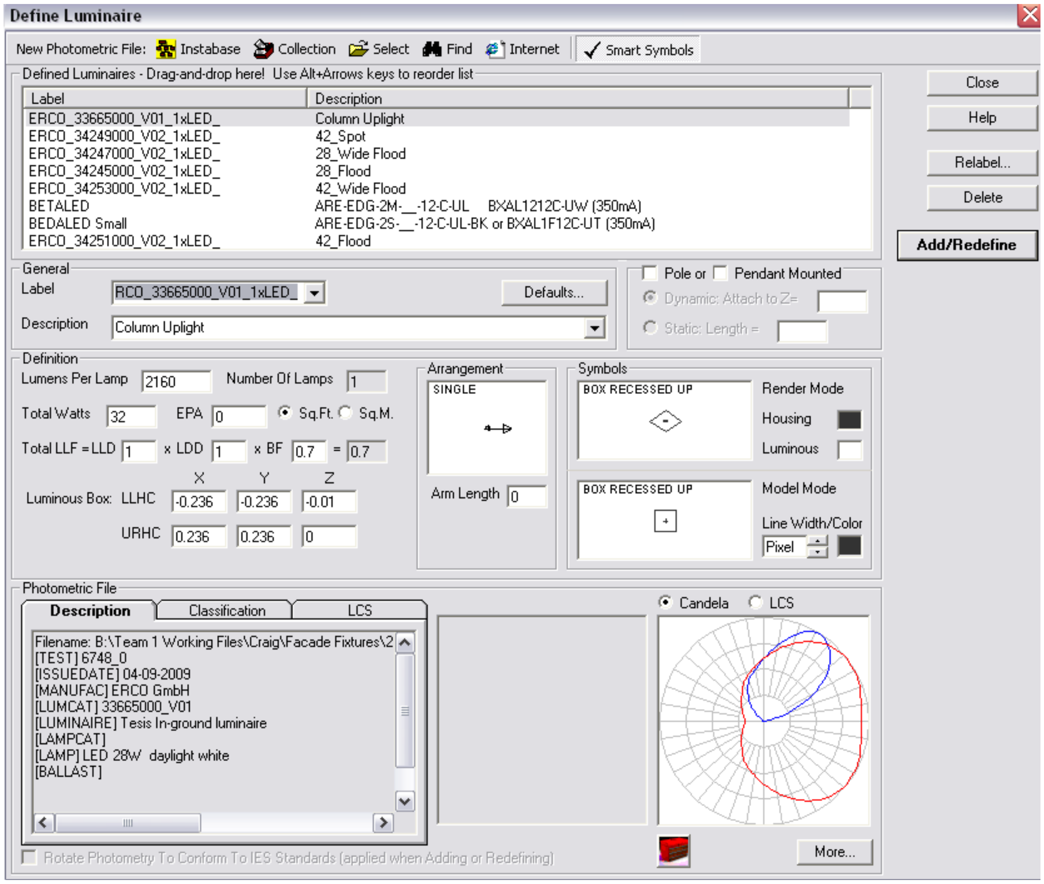
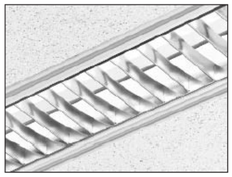


Figure 215: Example Luminaire Details in AGI for Exterior Calculation

M100 Super Recessed Linear Fluorescent Slot Grid / Thick Ceiling Panel

se'lux®



Project: New York Times Thesis **Type:** R1 **Qty:**

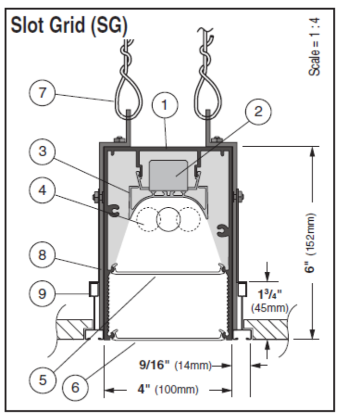
M1B0	– 1T5	– SD	–	– SG	– 004	– WH	– 277
Fixture Series	Lamp Type	Upper Shielding	Lower Shielding	Mounting	Nominal Length	Finish	Voltage

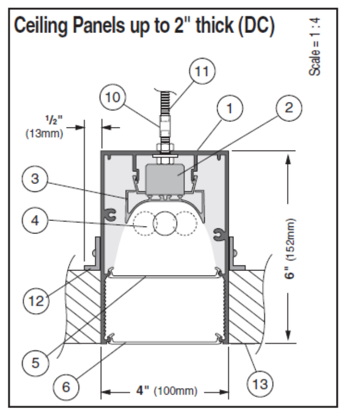
DMA _ _ _ _ _ _ _

Options (refer to separate data sheets for ordering codes and details)

Fixture Series	Lamp Type	Shielding	Mounting	Nominal Length	Finish	Voltage	Options
M1B0 M100 Super Recessed Multi-Mount Form	**1T5** F28T5 **2T5** (2x)F28/T5 **1T5HO** F54T5HO **1T8** F032/T8	**SA** Specular Parabolic **MA** Matte Parabolic **MP** Silky Specular Parabolic **PL** Matte Perforated Parabolic **SD** Satine Lens **OD** Extra Diffuse Lens **X** None	**SG** Slot Grid[1] **DC** Ceiling Panels up to 2" thick (lengths per submittal drawings)	**004** 4 foot **008** 8 foot **012** 12 foot For actual lengths see following page. For other lengths, configurations indicate nominal length rounded to the next highest foot. Factory will supply layout drawings. Individual fixtures cannot be field joined.	**WH** White **BK** Black **SV** Silver **SP** Specify RAL#	**120** **277** **347**	**(qty.)EM** Stand-by Battery Pack[2] (prefix quantity, i.e. - **5EM**) **FS** Single Fusing **DM** Dimming[2] (specify system) **DMA** Digital Addressable Dimming[2] **SI** Satine Acrylic Inlay[4] **FW** Flex Whip (standard) **FW1** Flex Whip (dimming) **Track** Eutrac Standard[3] **DL** Suitable for Damp Locations **CCEA** Chicago Plenum **Downlights** (See MR16 spec sheets, pp.98-99)

[1]T5 & T5HO lamps only, consult factory for other lamps. [2]Must be low profile ballasts (1½" W x 1⁵⁄₁₆" H); consult factory for details. [3]Consult factory for details. [4]SA, MA, MP & PL shieldings only.





1. Housing - Continuous, 6063-T5 extruded aluminum profile up to 16 feet long. Joined with Connector Plus Joining System for ease of installation and to assure a uniform appearance.

2. Ballast - Electronic, high power factor, class "P", type "A" sound rating. Specify 120v, 277v, or 347v. Ballast is factory pre-wired with leads to one end of fixture. Consult factory for ballast options.

3. Gear Tray - Extruded aluminum,with white painted finish. Gear tray installed as a complete electrical unit and is held in place with knurled dress nuts. It is fully accessible from below ceiling.

4. Lamps - As noted (by others). Other lamp lengths or wattages available, consult factory.

5. Upper Shielding - Louvers offer excellent glare control in longitudinal, lateral, and all diagonal planes. High quality aluminum louvers and acrylic shielding allow true freedom of layout for today's modern spaces.

6. Lower Shielding - Same options as Upper Shielding #5.

7. Support Wire to Structure - Supplied and installed by others.

8. Support bracket - Supplied nominally every four feet.

9. Slot Grid Beam and Cross Tees - Supplied and installed by others.

10. Pre-installed 1" 1/4-20 Stud - Attached to fixture every nominal 4 feet.

11. Coupling and Threaded Rod to Structure - Supplied and installed by others.

12. Aluminum Angle Brackets - Run entire length of fixture to block view into plenum area from below fixture.

13. Ceiling Panels up to 2" Thick - Supplied and installed by others. Suitable for Decoustic® ceiling panel installations. Other ceiling systems possible, please consult factory. Decoustic® is a registered trademark of Decoustics Ltd. Corporation.

Interior Luminaire Finish - Standard interior colors are White (WH), Black (BK) and Silver (SV). RAL colors (SP) are available, please specify RAL#.

SELUX Corp. © 2006
TEL: (845) 691-7723
FAX: (845) 691-6749
www.selux.com/usa
M1B0_SG-01 (v5.0)

c UL us LISTED
Union Made Affiliated with IBEW Local 363

In a continuing effort to offer the best product possible, we reserve the right to change, without notice, specifications or materials that in our opinion will not alter the function of the product. Specification sheets found at www.selux.com/usa are the most recent versions and supercede all other printed or electronic versions.

62

Figure 216: Luminaire R1 Specification Sheet

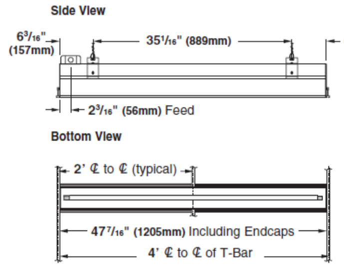
M100 Super Recessed Linear Fluorescent Slot Grid

se'lux

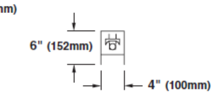
M1B0 Slot Grid Layout Dimensions

For T5 lamps only, for other lamping consult factory.

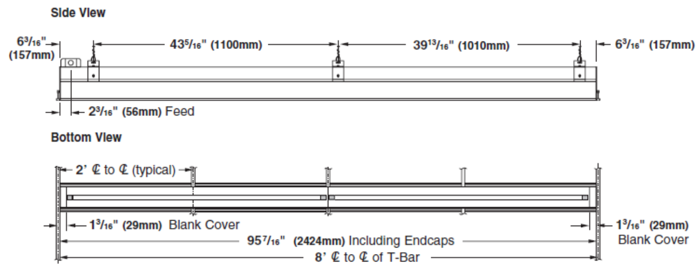
Nominal 4 foot Individual



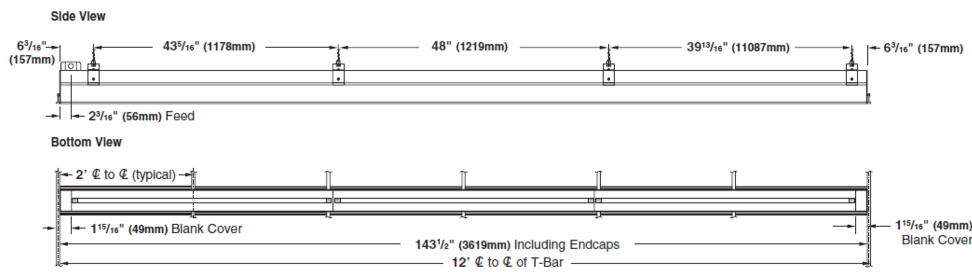
Typical End View (all lengths)



Nominal 8 foot Individual



Nominal 12 foot Individual



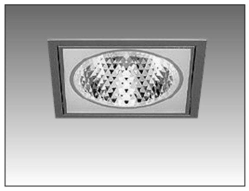
Fixture supplied with 7/8 knockout located 2 3/16" from end in top of fixture.

For other lengths, lamping, continuous runs or configurations please specify overall length (in feet), accessories desired and sketch/drawing of configuration. SELUX will detail project drawings upon order and supply submittal drawings for approval. Individual fixtures cannot be field joined. If you have any questions please contact SELUX customer service or applications engineering for assistance (1-800-SELUX-CS).

SELUX Corp. © 2006
PO Box 1060, 5 Lumen Lane / Highland, NY 12528
TEL: (845) 691-7723 / FAX: (845) 691-6749
E-mail: seluxus@selux.com / Web Site: www.selux.com/usa
M1B0_SG-02 (02/06)

63

Figure 217: Luminaire R1 Specification Sheet Continued



2LIGHT	Recessed	Square	Non-IC	8"
Downlight	Horizontal	39W	G8.5	

Type: R2 R2E Wall Washers, R3 R3E Downlight

Project: New York Times Thesis

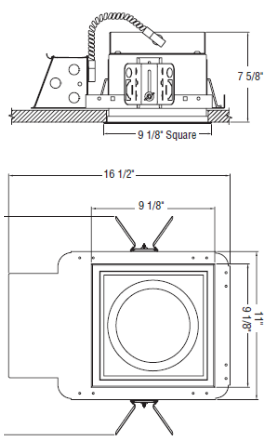
Ceramic Metal Halide

online Find it Fast 420

2LS1D	1H39T45G85	U	FF	SRM	Q (For E fixtures)

FIXTURE	BALLAST/VOLTAGE	REFLECTOR	FINISH	OPTIONS
2LIGHT Recessed Square 8" Aperture Non-IC Standard Wet Location Downlight Horizontal, 39W G8.5 Base	**U** Universal 120V/277V **S3** 347V Electronic ballast	**FF** Faceted	**SRM** Titan Frame **WHM** White Frame	**MDLSBL** Mellow Downlight Filter - Blue **MDLSYL** Mellow Downlight Filter - Yellow **MDLSGR** Mellow Downlight Filter - Green **Q** Quartz Restrike **CP** Chicago Plenum **F** Fusing **9930** Set of two 27" C-Channel mounting bars. **9952** Set of two 52" C-Channel mounting bars. **9956** Set of two 28" 10 ga. one-piece universal mounting bars.

VIEWS



Ceiling cutout 8 7/16" x 8 7/16"

MECHANICAL

Mounting Frame
16-gauge galvanized steel plate suitable for accessible or inaccessible ceiling types. Rigid mounting brackets provide 4" vertical adjustment from side of mounting frame. Brackets accommodate 1½" C-Channel, ½" EMT, ¾" lathing channel, Caddy 517A, B, and C-Channels for flexibility in mounting. (mounting bars ordered as an optional accessory).

Optical Housing
Square steel housing, welded corners, post-painted white powder coat paint is light-tight, completely enclosed, exceeding IP44 requirements. Optical housing is installed from below with swing-out mounting arms for vertical adjustment in ceilings up to 1 3/8" thick.

Door Frame/Trim
Toolless "Push and Release" die-cast aluminum door frame inclusive of lower reflector and diffuser swings down for easy relamping and cleaning. Die-cast aluminum trim provides 5/16" overlap for ceiling opening. Door frame and trim in titan or white color finish.

ELECTRICAL

Junction Box
Integral 16-guage galvanized steel junction box provided on mounting frame. UL Listed for thru wiring (4 in 4 out at 90° C). Flexible electrical whip with quick connect is provided for field connection to the junction box of the optical assembly. Ground wire is supplied.

Ballast
Electronic multi-voltage (120v/277v), 39W-ANSI M-130, thermally protected metal halide safety ballast integral to junction box.

Socket
(1) Ceramic metal halide lamp, 2-pin: G8.5 Base. Lamp supplied by others.

Code Compliance / Listing
c UL us LISTED UL Listed for Wet Location. Covered Ceiling Mount Only. Approved for thru wiring. Above ceiling access not required.

OPTICAL SYSTEM

Upper Reflector
Stippled, highly specular, non-iridescent, upper reflector with innovative swing-out lampholder and built-in scattering disc provides convenient relamping.

Lower Reflector
Round lower reflector is injection-molded of high-grade recyclable polycarbonate with diamond-shaped mirror-like facets in high specular silver; free of iridescence due to a surface of high purity aluminum applied by sputtering, and coated with a transparent hard silicone finish for durability and easy cleaning. A standard opal lens on outside of reflector provides diffuse lighting.

Optional colored filters can be used in place of opal diffuser for a subtle introduction of color without affecting the quality of light.

Weight – 10.0 lbs.

COMPANION DOWNLIGHTS USING SAME SOCKET/WATTAGE

TYPE	CATALOG NUMBER	FIF #	SPEC SHEET PAGE
Wallwasher	2LS1W1H39T45G85	426	2LS- 14
Cardanic	2LS1C1A39T45G85	430	2LS- 20

PHOTOMETRICS

FINISH/REFLECTOR	REPORT #	%EFF	NOTES
Faceted	Proration	60.0%	LTL #12882, Sheet 2LS-6

Zumtobel Lighting Inc. ©2010
3300 Route 9W
Highland, NY 12528-2630

1/25/10

TEL (845) 691-6262
(800) 932-0633
FAX (845) 691-6289

www.zumtobel.us

2LS-5

In a continuing effort to offer the best product possible we reserve the right to change, without notice, specifications or materials. Technical specification sheets that appear on www.zumtobel.us are the most recent version and supersede all other versions that exist in any other printed or electronic form.

ZUMTOBEL

Figure 218: Luminaires R2, R2E, R3, and R3E Specification Sheet

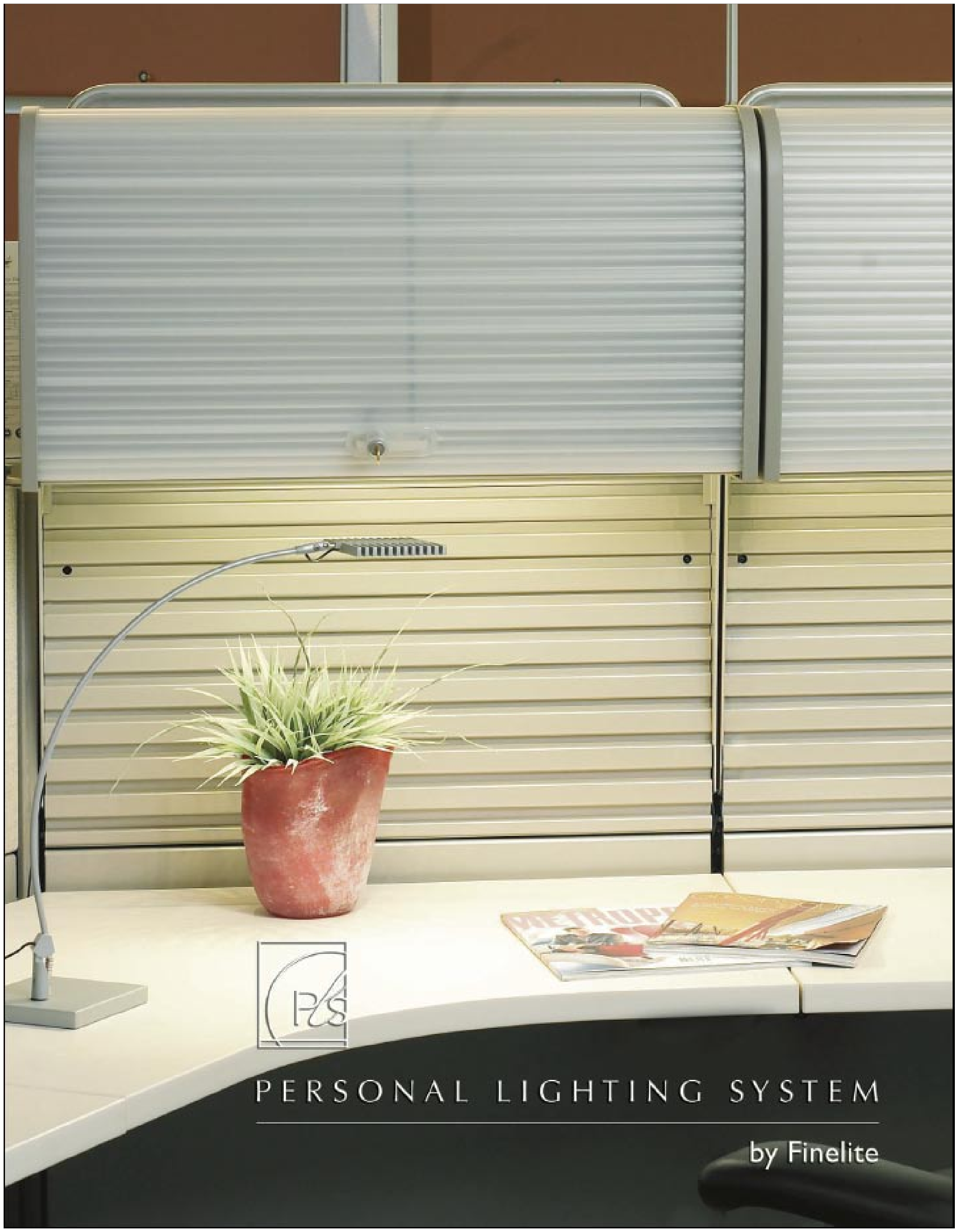
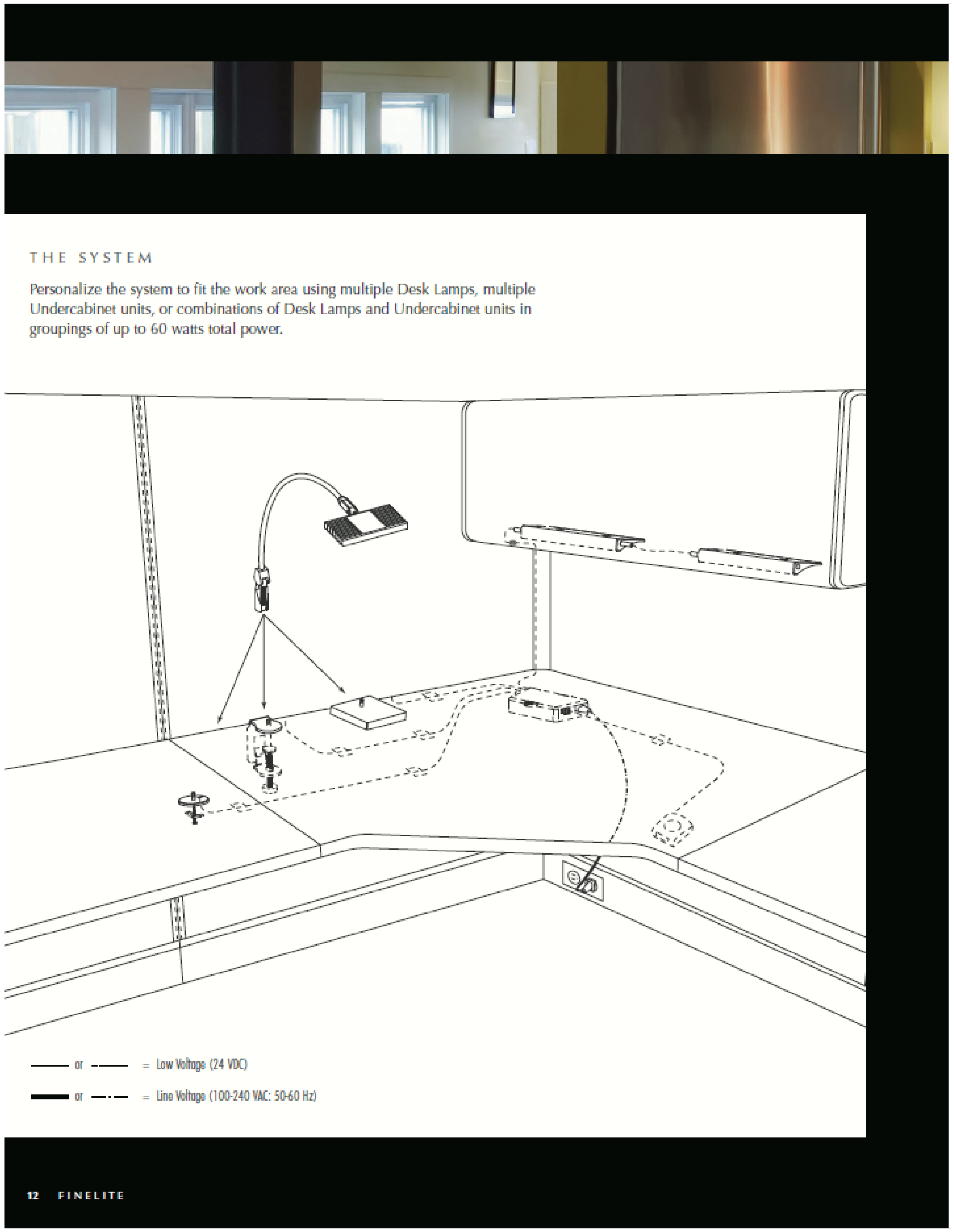


Figure 219: Luminaire T1 Specification Sheet



THE SYSTEM

Personalize the system to fit the work area using multiple Desk Lamps, multiple Undercabinet units, or combinations of Desk Lamps and Undercabinet units in groupings of up to 60 watts total power.

Figure 220: Luminaire T1 Specification Sheet Continued

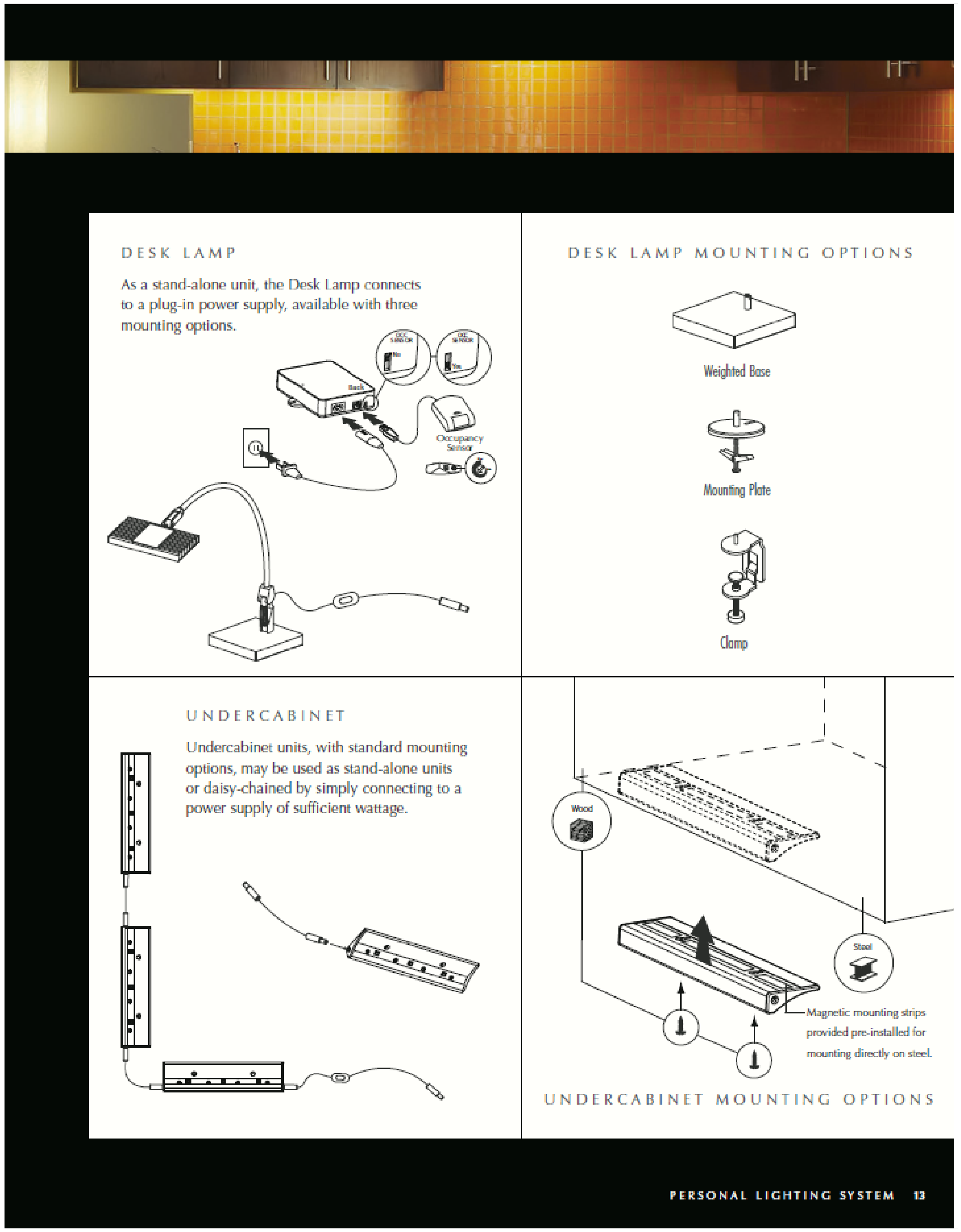
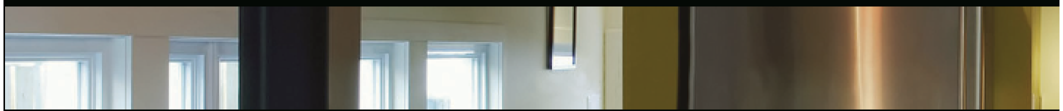
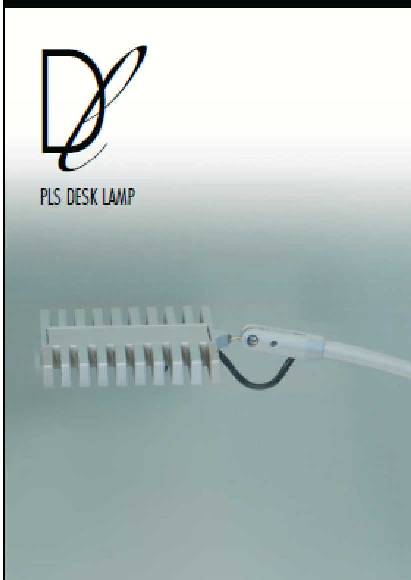


Figure 221: Luminaire T1 Specification Sheet Continued





ORDERING INFO

Series		Color
3W Desk Lamp	DL-3W-B	Black
	DL-3W-S	Silver
6W Desk Lamp	DL-6W-B	
	DL-6W-S	
9W Desk Lamp	DL-9W-B	
	DL-9W-S	

Mounting Options

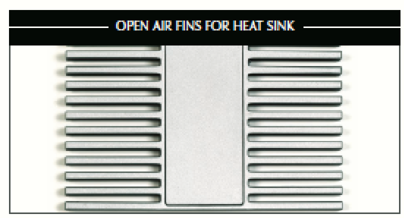
Weighted Base
Mounting Plate
Clamp

SPECIFICATIONS

Three, Six, or Nine 1-Watt Warm White LEDs

Light Source Life	• > 50,000 hours
Color Temperature	• 3500K 4000K (3W DL)
Input to Fixture	• 24 VDC
Cabling	• 12′ low voltage power cable with in-line switch

FEATURES



Fixture Head Size

- 3W DL 3.75″ l x 2.05″ w x 0.38″ t
- 6W DL 4.46″ l x 2.76″ w x 0.38″ t
- 9W DL 5.5″ l x 3.46″ w x 0.38″ t

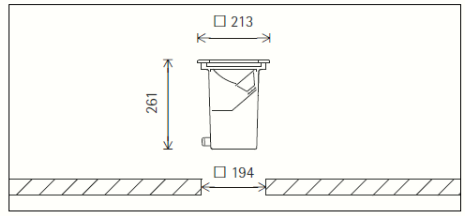
14 FINELITE

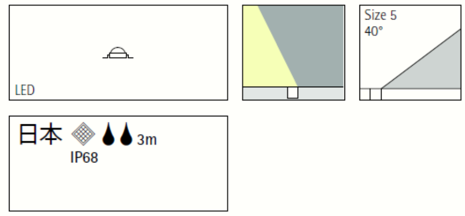
Figure 222: Luminaire T1 Specification Sheet Continued

ERCO

Tesis In-ground luminaire

Lens wallwasher with LED





33665.000 Reflector silver
LED daylight white
LED 28W 2160lm 5500K
Version 1

Product description
Housing: corrosion-resistant cast aluminium, No-Rinse surface treatment. Double powder-coated black. Mounting by means of swing bolts. Clamp range 11-46mm.
Electronic control gear. Cable 3x1.5mm^2, L 1m.
Replaceable LED module: high-power LEDs on metal-core PCB. Reflector for mixing light: aluminium, silver, mirror-finish anodised. Wallwasher lens.
Darklight reflector: aluminium, silver, bright anodised. Cut-off angle 40°.
Screw-fastened cover frame with flush safety glass: corrosion resistant stainless steel. Safety glass: 15mm, clear.
Can be driven over by vehicles with pneumatic tyres. Load: 45kN.
Installation with separate junction box.
Protection mode IP68 3m: protection against dust ingress, and continuous immersion up to 3m deep.
On site protection must be provided using a residual current circuit breaker, FI≦30mA.
Available from 3rd quarter 2010
Weight 5.20kg
Temperature on the light aperture 38°C

ERCO GmbH
Brockhauser Weg 80-82
58507 Lüdenscheid
Germany
Tel.: +49 2351 551 0
Fax: +49 2351 551 300
info@erco.com

Technical Region: 230V/50Hz
We reserve the right to make technical and design changes.
Edition: 03.11.2009
Current version under
www.erco.com/33665.000

1/3

Figure 223: Luminaire B1 Specification Sheet

ERCO

Tesis In-ground luminaire

Planning data

Illuminance E_h (lx)
Specifications:
Number of luminaires n > 5
Wall height (m) 4
LED 28W 2160lm 5500K

Offset from wall (m)	1.00		1.00		1.25		1.25	
Luminaire spacing (m)	1.25		1.50		1.25		1.75	
	below the luminaire	between the luminaires	below the luminaire	between the luminaires	below the luminaire	between the luminaires	below the luminaire	between the luminaires
3.750	32	31	29	28	40	39	32	32
3.500	38	37	34	33	47	46	38	37
3.250	46	44	40	40	56	55	44	44
3.000	55	54	48	48	67	65	51	51
2.750	67	65	58	58	80	78	60	61
2.500	81	81	70	70	95	94	71	72
2.250	100	100	85	86	114	114	84	87
2.000	123	124	104	107	136	137	99	103
1.750	152	156	127	133	161	163	115	122
1.500	187	194	156	164	187	191	133	140
1.250	226	237	187	198	209	218	148	157
1.000	259	275	217	227	217	230	156	161
0.750	268	283	231	226	190	203	142	136
0.500	198	196	178	147	108	115	86	71
0.250	56	47	52	32	23	24	20	13

Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.96	0.94	0.90	0.86	0.93	0.91	0.86	0.81	0.92	0.90	0.84	0.79
RSMF	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81

Hours of operation (h)	1000	30000	10000	50000
LLMF	1.00	0.80	0.90	0.70
LSF	1	1	1	1

MF	LMFxRSMFxLLMFxLSF
MF	Maintainance Factor
LMF	Lumiaire Maintenance Factor
RSMF	Room Surface Maintenance Factor
LLMF	Lamp Lumens Maintenance Factor
LSF	Lamp Survival Factor
P	Room pure
C	Room clean
N	Room normal
D	Room dirty

Tesis In-ground luminaire
33665.000

2/3

Figure 224: Luminaire B1 Specification Sheet Continued

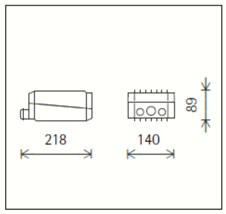
ERCO

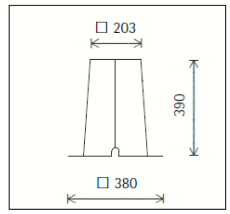
Tesis In-ground luminaire

Accessories

33699.000
Junction box
Cast aluminium, powder-coated black.
2 screwed cable glands for cable diameters of 5-14mm.
Protection mode IP68 3m: protection against dust ingress, and continuous immersion up to 3m deep.
Weight 1.20kg
3m
IP68

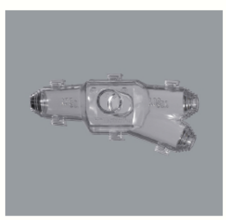
33696.000
Housing for recessed mounting
Corrosion-resistant aluminium, No-Rinse surface treatment. Black double powder-coated. 2 cable entries.
Weight 4.80kg





34974.000
Distribution box, IP68
With four cable entries, 7-25mm.
Plastic.
ø 95mm, L 240mm.
Weight 0.47kg
3m
IP68

33958.000
Coupling sleeve
for max. 16mm cable diameter.
Plastic conduit, two-part PUR-cast resin.
ø 26mm, L 180mm.



33959.000
Branching sleeve
for 8-23mm cable diameter.
Plastic shell, two-part PUR cast resin.
L 150mm, B 70mm, H 46mm.

Tesis In-ground luminaire
33665.000

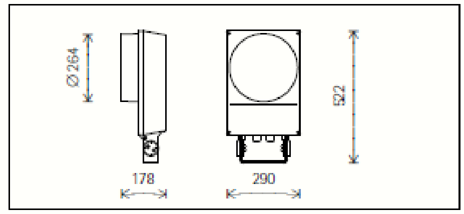
3/3

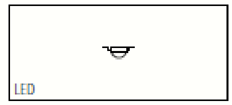
Figure 225: Luminiare B1 Specification Sheet Continued

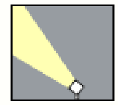
ERCO

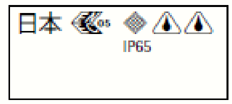
Powercast Projector

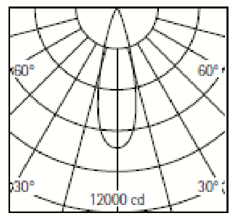
with LED











34251.000 Graphit m
LED daylight white
LED 42W 3240lm 5500K
Version 2

Product description
Housing: corrosion-resistant cast aluminium, No-Rinse surface treatment. Double powder-coated. Optimised surface for reduced accumulation of dirt.
Mounting bracket: steel, hot galvanized, ±90° tilt.
3 electronic control gear units. 2 cable entries and M25 cable glands. Through-wiring possible. 5-pole terminal block.
Screw-mounted cover with safety glass: corrosion-resistant cast aluminium, double powder-coated. Hinge open for lamp replacement.
Replaceable LED module: high-power LEDs on metal-core PCB.
Lens system, flood: collimating lens, clear plastic. Spherolit lens, flood.
Fitting the cable glands and mounting bracket to the housing must be carried out on site.
Protection mode IP65: dust-proof and water jet-proof.
Weight 8.00kg
Maximum wind load area 0.119m²

LED 42W 3240lm 5500K

h(m)	E(lx)	D(m)
		29°
1	8193	0.52
2	2048	1.03
3	910	1.55
4	512	2.07
5	328	2.59

ERCO GmbH
Brockhauser Weg 80-82
58507 Lüdenscheid
Germany
Tel.: +49 2351 551 0
Fax: +49 2351 551 300
info@erco.com

Technical Region: 230V/50Hz
We reserve the right to make technical and design changes.
Edition: 03.11.2009
Current version under
www.erco.com/34251.000

1/3

Figure 226: Luminaire B4 Specification Sheet

ERCO

Powercast Projector

Planning data

Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.96	0.94	0.90	0.86	0.93	0.91	0.86	0.81	0.92	0.90	0.84	0.79
RSMF	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81

Hours of operation (h)	1000	30000	10000	50000
LLMF	1.00	0.80	0.90	0.70
LSF	1	1	1	1

MF	LMFxRSMFxLLMFxLSF
MF	Maintainance Factor
LMF	Lumiaire Maintenance Factor
RSMF	Room Surface Maintenance Factor
LLMF	Lamp Lumens Maintenance Factor
LSF	Lamp Survival Factor
P	Room pure
C	Room clean
N	Room normal
D	Room dirty

Powercast Projector
34251.000

2/3

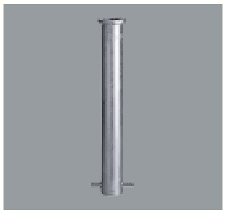
Figure 227: Luminaire B4 Specification Sheet Continued

ERCO

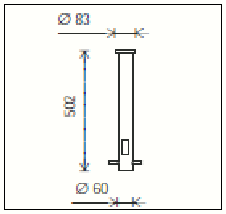
Powercast Projector

Accessories

34974.000
Distribution box, IP68
With four cable entries, 7-25mm.
Plastic.
ø 95mm, L 240mm.
Weight 0.47kg
3m
IP68



33975.000
Ground socket
Metal, hot-dip galvanised.
Cable entry.
Weight 1.75kg



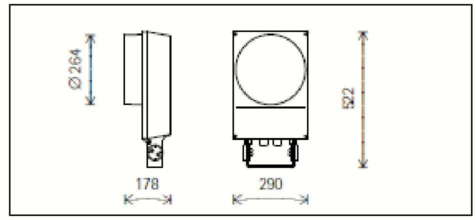
Powercast Projector
34251.000
3/3

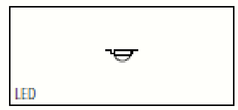
Figure 228: Luminaire B4 Specification Sheet Continued

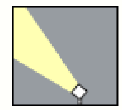
ERCO

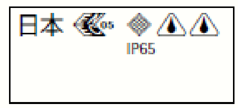
Powercast Projector

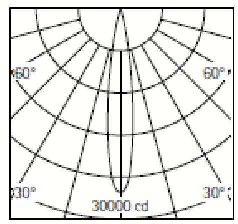
with LED











LED 42W 3240lm 5500K

h(m)	E(lx)	D(m) 16°
1	26113	0.28
2	6528	0.56
3	2901	0.84
4	1632	1.12
5	1045	1.41

34249.000 Graphit m
LED daylight white
LED 42W 3240lm 5500K
Version 2

Product description
Housing: corrosion-resistant cast aluminium, No-Rinse surface treatment. Double powder-coated. Optimised surface for reduced accumulation of dirt.
Mounting bracket: steel, hot galvanized, ±90° tilt.
3 electronic control gear units. 2 cable entries and M25 cable glands. Through-wiring possible. 5-pole terminal block.
Screw-mounted cover with safety glass: corrosion-resistant cast aluminium, double powder-coated. Hinge open for lamp replacement.
Replaceable LED module: high-power LEDs on metal-core PCB.
Lens system, spot: collimating lens, plastic, clear. Spherolit lens, spot.
Fitting the cable glands and mounting bracket to the housing must be carried out on site.
Protection mode IP65: dust-proof and water jet-proof.
Weight 8.00kg
Maximum wind load area 0.119m²

ERCO GmbH
Brockhauser Weg 80-82
58507 Lüdenscheid
Germany
Tel.: +49 2351 551 0
Fax: +49 2351 551 300
info@erco.com

Technical Region: 230V/50Hz
We reserve the right to make technical and design changes.
Edition: 03.11.2009
Current version under
www.erco.com/34249.000

1/3

Figure 229: Luminaire B2 Specification Sheet

ERCO

Powercast Projector

Planning data

Cleaning [a]	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.96	0.94	0.90	0.86	0.93	0.91	0.86	0.81	0.92	0.90	0.84	0.79
RSMF	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81

Hours of operation (h)	1000	30000	10000	50000
LLMF	1.00	0.80	0.90	0.70
LSF	1	1	1	1

MF LMFxRSMFxLLMFxLSF
MF Maintainance Factor
LMF Lumiaire Maintenance Factor
RSMF Room Surface Maintenance Factor
LLMF Lamp Lumens Maintenance Factor
LSF Lamp Survival Factor
P Room pure
C Room clean
N Room normal
D Room dirty

Powercast Projector
34249.000

2/3

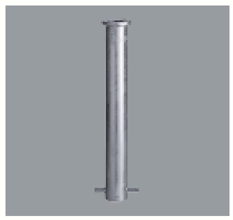
Figure 230: Luminaire B2 Specification Sheet Continued

ERCO

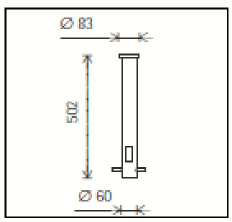
Powercast Projector

Accessories

34974.000
Distribution box, IP68
With four cable entries, 7-25mm.
Plastic.
ø 95mm, L 240mm.
Weight 0.47kg
◈ ♦♦3m
IP68



33975.000
Ground socket
Metal, hot-dip galvanised.
Cable entry.
Weight 1.75kg



Powercast Projector
34249.000

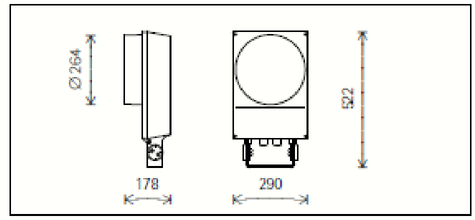
3/3

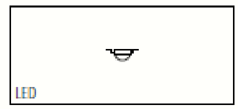
Figure 231: Luminaire B2 Specification Sheet Continued

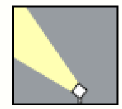
ERCO

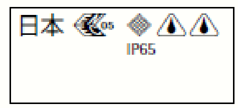
Powercast Projector

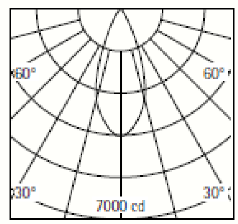
with LED











34253.000 Graphit m
LED daylight white
LED 42W 3240lm 5500K
Version 2

Product description
Housing: corrosion-resistant cast aluminium, No-Rinse surface treatment. Double powder-coated. Optimised surface for reduced accumulation of dirt.
Mounting bracket: steel, hot galvanized, ±90° tilt.
3 electronic control gear units. 2 cable entries and M25 cable glands. Through-wiring possible. 5-pole terminal block.
Screw-mounted cover with safety glass: corrosion-resistant cast aluminium, double powder-coated. Hinge open for lamp replacement.
Replaceable LED module: high-power LEDs on metal-core PCB.
Lens system, wide flood: collimating lens, plastic, clear. Spherolit lens, wide flood.
Fitting the cable glands and mounting bracket to the housing must be carried out on site.
Protection mode IP65: dust-proof and water jet-proof.
Weight 8.00kg
Maximum wind load area 0.119m^2

LED 42W 3240lm 5500K

h(m)	E(lx)	D(m) 42°
1	4219	0.77
2	1055	1.54
3	469	2.30
4	264	3.07
5	169	3.84

ERCO GmbH
Brockhauser Weg 80-82
58507 Lüdenscheid
Germany
Tel.: +49 2351 551 0
Fax: +49 2351 551 300
info@erco.com

Technical Region: 230V/50Hz
We reserve the right to make technical and design changes.
Edition: 03.11.2009
Current version under
www.erco.com/34253.000

1/3

Figure 232: Luminaire B3 Specification Sheet

ERCO

Powercast Projector

Planning data

Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.96	0.94	0.90	0.86	0.93	0.91	0.86	0.81	0.92	0.90	0.84	0.79
RSMF	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81

Hours of operation (h)	1000	30000	10000	50000
LLMF	1.00	0.80	0.90	0.70
LSF	1	1	1	1

MF	LMFxRSMFxLLMFxLSF
MF	Maintainance Factor
LMF	Lumiaire Maintenance Factor
RSMF	Room Surface Maintenance Factor
LLMF	Lamp Lumens Maintenance Factor
LSF	Lamp Survival Factor
P	Room pure
C	Room clean
N	Room normal
D	Room dirty

Powercast Projector
34253.000

2/3

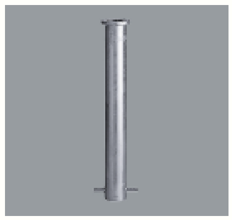
Figure 233: Luminaire B3 Specification Sheet Continued

ERCO

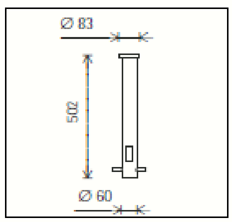
Powercast Projector

Accessories

34974.000
Distribution box, IP68
With four cable entries, 7-25mm.
Plastic.
ø 95mm, L 240mm.
Weight 0.47kg
3m
IP68



33975.000
Ground socket
Metal, hot-dip galvanised.
Cable entry.
Weight 1.75kg



Powercast Projector
34253.000

3/3

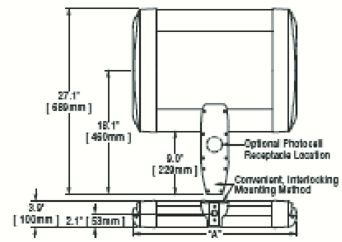
Figure 234: Luminaire B3 Specification Sheet Continued

ARE-EDG-2S-DA THE EDGE™ LED Area Light – Type II Short

Rev. Date: 12/11/09

BetaLED Catalog #: ARE - EDG - 2SB - DA - 02 - C - UL - SV - -

Reset



# of LEDs	Dim. "A"
20	11.75"
40	11.75"
60	13.75"
80	15.75"
100	17.75"
120	19.75"
140	21.75"
160	23.75"
180	25.75"
200	27.75"
220	29.75"
240	31.75"

Notes:

Product	Family	Optic	Mounting	# of LEDs (x 10)	LED Series	Voltage	Color Options
ARE	EDG	☐ 2S[1] ☒ 2SB[2]	DA[3]	☒ 02 ☐ 04 ☐ 06 ☐ 08 ☐ 10 ☐ 12 ☐ 14 ☐ 16 ☐ 18 ☐ 20 ☐ 22 ☐ 24	C	☒ UL Universal 120–277V ☐ UH Universal 347–480V ☐ 12 120V ☐ 24 240V ☐ 27 277V ☐ 34 347V	☒ SV Silver ☐ BK Black ☐ BZ Bronze ☐ PB Platinum Bronze ☐ WH White

Factory-Installed Options

Please type additional options in manually on the lines provided above.

- ☐ 43K 4300K Color Temperature[4]
- ☐ 525 525mA Drive Current[5,6]
- ☐ DIM 0–10V Dimming[7,8]
- ☐ F Fuse[9]
- ☐ HL Hi/Low (175/350/525, dual circuit input)[10-12]
- ☐ P Photocell[13-16]
- ☐ R NEMA Photocell Receptacle[15-18]
- ☐ TL Two-Level (175/525 w/ integrated sensor control)[10,12]
- ☐ TL2 Two-Level (0/350 w/ integrated sensor control)[12]
- ☐ TL3 Two-Level (0/525 w/ integrated sensor control)[10,12]

Footnotes

1. IESNA Type II Short distribution
2. IESNA Type II Short distribution with backlight control
3. Direct mounting arm for use with 3–6" square or round pole
4. Color temperature per fixture; minimum 70 CRI
5. Driver operates at 525mA instead of the standard 350mA providing a higher lumen output and a shorter life
6. Available on fixtures with 20–120 LEDs
7. Control by others
8. Please consult factory for availability
9. Not available with TL, TL2, or TL3 options when UH voltage is selected
10. Available on 120–277V fixtures with 20–120 LEDs and 347–480V fixtures with 40–120 LEDs
11. Sensor not included
12. Refer to multi-level spec sheet for more information
13. Not available with HL option when UH voltage is selected
14. Must specify voltage other than UL or UH
15. Not available with TL2 or TL3 options
16. Not available with TL option when UH voltage is selected
17. 100 LED maximum when used with TL option
18. Not available with HL option

LED PERFORMANCE SPECS

# of LEDs	Initial Delivered Lumens – Type II Short @ 6000K	B	U	G	Initial Delivered Lumens – Type II Short w/ Backlight Control @ 6000K	B	U	G	Initial Delivered Lumens – Type II Short @ 4300K	B	U	G	Initial Delivered Lumens – Type II Short w/ Backlight Control @ 4300K	B	U	G	System Watts 120–277V	Total Current @ 120V	Total Current @ 230V	Total Current @ 277V	System Watts 347–480V[1]	Total Current @ 347V	Total Current @ 480V	L_{70} Hours[2] @ 25° C (77° F)
		Rating[3]				Rating[3]				Rating[3]				Rating[3]										
350mA (Standard) Fixture Operating at 25° C (77° F)																								
20	1,752 (02)	1	1	1	1,360 (02)	0	1	0	1,537 (02)	1	1	1	1,193 (02)	0	1	0	29	0.25	0.14	0.13	31	0.09	0.08	104,935
40	3,504 (04)	1	1	1	2,720 (04)	1	1	1	3,073 (04)	1	1	1	2,386 (04)	1	1	1	50	0.43	0.24	0.21	54	0.16	0.12	104,935
60	5,255 (06)	2	1	2	4,081 (06)	1	1	1	4,610 (06)	1	1	1	3,579 (06)	1	1	1	78	0.65	0.37	0.35	81	0.23	0.18	104,935
80	7,007 (08)	2	1	2	5,441 (08)	1	1	1	6,146 (08)	2	1	2	4,772 (08)	1	1	1	100	0.84	0.47	0.41	102	0.29	0.22	104,935
100	8,759 (10)	2	1	2	6,801 (10)	1	1	1	7,683 (10)	2	1	2	5,965 (10)	1	1	1	115	0.98	0.52	0.44	121	0.35	0.26	104,935
120	10,511 (12)	3	1	3	8,161 (12)	1	1	1	9,219 (12)	2	1	2	7,158 (12)	1	1	1	138	1.18	0.62	0.52	145	0.42	0.31	104,935
140	12,263 (14)	3	1	3	9,522 (14)	2	1	2	10,756 (14)	3	1	3	8,352 (14)	1	1	1	164	1.64	0.74	0.63	172	0.50	0.37	104,935
160	14,014 (16)	3	1	3	10,882 (16)	2	1	2	12,292 (16)	3	1	3	9,545 (16)	2	1	2	187	1.57	0.84	0.71	195	0.59	0.41	104,935
180	15,766 (18)	3	1	3	12,242 (18)	2	1	2	13,829 (18)	3	1	3	10,738 (18)	2	1	2	208	2.10	0.94	0.80	218	0.64	0.46	104,935
200	17,518 (20)	3	1	3	13,602 (20)	2	1	2	15,365 (20)	3	1	3	11,931 (20)	2	1	2	230	1.95	1.03	0.88	241	0.71	0.51	104,935
220	19,270 (22)	3	1	3	14,962 (22)	2	1	2	16,902 (22)	3	1	3	13,124 (22)	2	1	2	254	2.13	1.13	0.96	264	0.77	0.56	104,935
240	21,022 (24)	3	1	3	16,323 (24)	2	1	2	18,438 (24)	3	1	3	14,317 (24)	2	1	2	277	2.34	1.23	1.03	287	0.86	0.60	104,935
525mA Fixture Operating at 25° C (77° F)																								
20	2,277 (02)	1	1	1	1,768 (02)	0	1	0	1,997 (02)	1	1	1	1,551 (02)	0	1	0	38	0.32	0.18	0.16	44	0.12	0.11	60,685
40	4,555 (04)	1	1	1	3,537 (04)	1	1	1	3,995 (04)	1	1	1	3,102 (04)	1	1	1	70	0.59	0.32	0.27	77	0.23	0.18	60,685
60	6,832 (06)	2	1	2	5,305 (06)	1	1	1	5,992 (06)	2	1	2	4,653 (06)	1	1	1	106	0.89	0.49	0.44	115	0.33	0.25	60,685
80	9,109 (08)	2	1	2	7,073 (08)	1	1	1	7,990 (08)	2	1	2	6,204 (08)	1	1	1	139	1.16	0.63	0.55	148	0.43	0.32	60,685
100	11,387 (10)	3	1	3	8,841 (10)	2	1	2	9,987 (10)	3	1	3	7,755 (10)	1	1	1	180	1.54	0.82	0.72	192	0.56	0.41	60,685
120	13,664 (12)	3	1	3	10,610 (12)	2	1	2	11,985 (12)	3	1	3	9,306 (12)	2	1	2	217	1.82	0.99	0.84	226	0.66	0.49	60,685

1. Utilizes magnetic step-down transformer
2. For recommended lumen depreciation data see TD-13
3. For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit www.iesna.org/PDF/Erratas/TM-15-07BugRatingsAddendum.pdf

Figure 235: Luminaire B5 Specification Sheet

ARE-EDG-2S-DA THE EDGE™ LED Area Light – Type II Short

Rev. Date: 12/11/09

General Description

Slim, low profile design minimizes wind load requirements. Fixture sides are rugged cast aluminum with integral, weather-tight LED driver compartments and high performance aluminum heatsinks. Convenient, interlocking mounting method. Mounting housing is rugged die cast aluminum and mounts to 3 – 6" square or round pole. Fixture is secured by two (2) 5/16-18 UNC bolts spaced on 2" centers. Includes leaf/debris guard. Five year limited warranty on fixture.

Electrical

Modular design accommodates varied lighting output from high power, white, 6000K (+/- 500K per full fixture), minimum 70 CRI, long life LED sources. 120–277V 50/60 Hz, Class 1 LED drivers are standard. 347–480V 50/60 Hz driver is optional. LED drivers have power factor >90% and THD <20% of full load. Units provided with integral 9kV surge suppression protection standard. Integral weather-tight electrical box with terminal strip for easy power hook-up. Surge protection tested in accordance with IEEE C62.41.2 and ANSI standard 62.41.2.

Testing & Compliance

UL listed in the U.S. and Canada for wet locations. Consult factory for CE Certified products. RoHS compliant. International Dark-Sky Association approved.

Finish

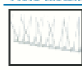
Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultra-durable silver powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Bronze, black, white and platinum bronze powder topcoats are also available. The finish is covered by our 10 year limited warranty.

Fixture and finish are endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117.

Patents

U.S. and international patents granted and pending. BetaLED is a division of Ruud Lighting, Inc. For a listing of Ruud Lighting, Inc. patents, visit www.uspto.gov.

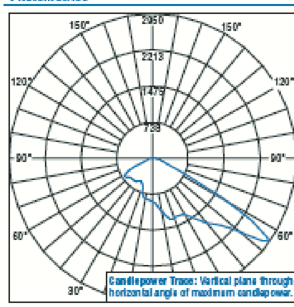
Field-Installed Accessories



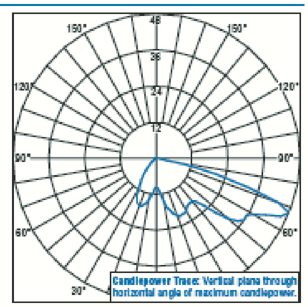
Bird Spikes

☐ XA-BRDSPK

Photometrics

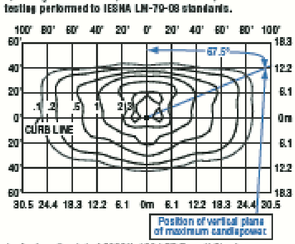


Independent Testing Laboratories certified test. Report No. ITL63656. Candlepower trace of 6000K, 40 LED Type II Short streetlight luminaire with 5,225 initial delivered lumens operating at 525mA. All published luminaire photometric testing performed to IESNA LM-79-08 standards.

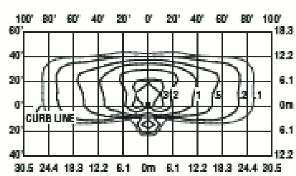


PRELIMINARY

Candlepower trace of Type II Short LED luminaire with backlight control.



Isofootcandle plot of 6000K, 120 LED Type II Short area luminaire at 25' A.F.G. Luminaire with 10,511 initial delivered lumens operating at 350mA. Initial FC at grade.



Isofootcandle plot of 6000K, 120 LED Type II Short area luminaire with backlight control at 25' A.F.G. Luminaire with 8,161 initial delivered lumens operating at 350mA. Initial FC at grade.

THE EDGE™ EPA & Weight Calculations

# of LEDs	Approximate Weight 120-277V[1]	Single	2@ 180°	2@ 90°	3@ 90	4@ 90°
Fixed Arm Mount						
20	21.0 lbs.	0.60	1.20	0.87	1.47	1.75
40	23.7 lbs.	0.60	1.20	0.87	1.47	1.75
60	27.0 lbs.	0.60	1.20	0.92	1.51	1.83
80	28.1 lbs.	0.60	1.20	0.96	1.55	1.91
100	32.3 lbs.	0.60	1.20	1.00	1.60	2.00
120	33.5 lbs.	0.60	1.20	1.04	1.64	2.08
140	36.9 lbs.	0.60	1.20	1.08	1.68	2.16
160	41.4 lbs.	0.60	1.20	1.12	1.72	2.24
180	42.1 lbs.	0.60	1.20	n/a[2]	n/a[2]	n/a[2]
200	43.3 lbs.	0.61	1.21	n/a[2]	n/a[2]	n/a[2]
220	46.6 lbs.	0.65	1.29	n/a[2]	n/a[2]	n/a[2]
240	47.8 lbs.	0.69	1.38	n/a[2]	n/a[2]	n/a[2]

1. Add 5 lbs. for transformer in 347-480V fixtures
2. For applications requiring 180 or more LEDs at 90 degrees refer to the DL mount version of our spec sheet.

Figure 236: Luminaire B5 Specification Sheet Continued

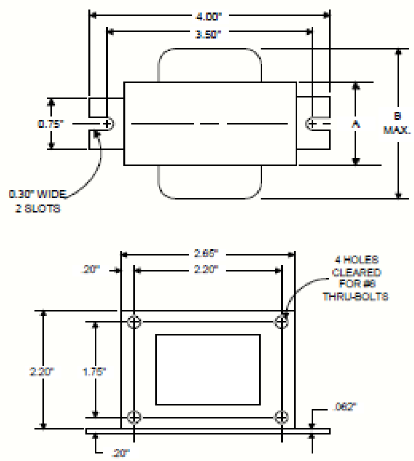
PHILIPS ADVANCE

Metal Halide Lamp Ballast

Catalog Number 71A5037BP
For 35/39W M130
60 Hz R-HPF
Status: Active

DIMENSIONS AND DATA

2 5/8 X 2 3/16 CORE

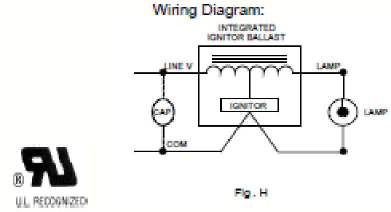


		277				
INPUT VOLTS		277				
CIRCUIT TYPE	R-HPF					
POWER FACTOR (min)	90%					
REGULATION						
Line Volts	±5%					
Lamp Watts	±10%					
LINE CURRENT (Amps)						
Operating		0.19				
Open Circuit		0.52				
Starting		0.30				
UL TEMPERATURE RATINGS						
Insulation Class	H(180°C)					
Coil Temperature Code	1029	A				
MIN. AMBIENT STARTING TEMP.	-20°F or -30°C					
NOM. OPEN CIRCUIT VOLTAGE	277					
INPUT VOLTAGE AT LAMP DROPOUT		190				
INPUT WATTS	48					
RECOMMENDED FUSE (Amps)		2				
CORE and COIL						
Dimension (A)	0.95					
Dimension (B)	2.70					
Weight (lbs.)	1.9					
Lead Lengths	12"					
CAPACITOR REQUIREMENT						
Microfarads	5.0					
Volts (min.)	280					
Fault Current Withstand (amps)						
60 Hz TEST PROCEDURES (Refer to Philips Lighting Electronics N.A. TEST Procedure for HID Ballasts - Form 127						
High Potential Test (Volts)						
1 minute	2000					
2 seconds	2500					
Open Circuit Voltage Test (Volts)	260-290					
Short-Circuit Current Test (Amps)						
Secondary Current	0.50-0.80					
Input Current		0.10-0.16	-	-	-	-

Capacitor: 7C050L30RA

Capacitance: 5
Dia/Oval Dim: 1.18
Height: 2.2
Temp Rating: 105°C

Wiring Diagram:



Ignitor: INTEGRAL

An ignitor integral to the core and coil assembly is used to start the lamp.

Ballast to Lamp Distance (BTL) = 2 feet
Temp Rating: 125°C

Typical Ordering Information

(please call Philips Lighting Electronics N.A. for suffix availability)

Order Suffix	Description

Data is based upon tests performed by Philips Lighting Electronics N.A. in a controlled environment and is representitive of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice.

PHILIPS LIGHTING ELECTRONICS N.A.
10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Tel: 800-322-2086 · Fax: 888-423-1882 · www.philips.com/advance
Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

Revised: 07/31/09

Figure 237: Metal Halide Ballast for Luminaires R2, R2E, R3, and R3E

EcoSystem® | Five Control Input | Digital Dimming Ballasts

EcoSystem Ballasts 1 11.03.08

EcoSystem Multiple Control Input Ballasts

Digital electronic dimming ballasts maximize the benefits of a lighting management system. *EcoSystem* Ballasts offer 100% to 10% dimming; ideal for use where saving energy, increasing flexibility, and maximizing productivity are the goals of the lighting design.

***EcoSystem* case type G**

***EcoSystem* case type J**

Features

- Continuous, flicker-free dimming from 100% to 10%
- Provides power for and responds to one occupancy sensor, one photo sensor, and one personal control input (infrared receiver or wallstation)
- Communicates status and sensor inputs over the *EcoSystem* Bus
- Programmed rapid start design ensures full rated lamp life while dimming and cycling
- Lamps turn on to any dimmed level without flashing to full brightness
- Low harmonic distortion throughout the entire dimming range
- Frequency of operation ensures that ballast does not interfere with infrared devices
- End-of-lamp-life protection circuitry ensures safe operation throughout entire lamp life
- Ultra-quiet operation
- Nonvolatile memory restores all ballast settings after power failure
- Ballasts maintain consistent light output for linear lamp lengths (i.e. 4 ft., 3 ft., 2 ft. have same relative output)
- 100% performance tested at factory

LUTRON® SPECIFICATION SUBMITTAL Page 1

Job Name:	Model Numbers:	
Job Number:		

Figure 238: Ballast Specification Sheet for Luminaire R1

EcoSystem® | Five Control Input | Digital Dimming Ballasts

EcoSystem Ballasts 2 11.03.08

Specifications

Standards

- California Energy Commission Listed
- UL Listed (evaluated to the requirements of UL935)
- CSA certified (evaluated to the requirements of C22.2 No. 74)
- NOM Listed for 32 W T8 Ballasts
- S Mark Certified
- Class P thermally protected
- Meets ANSI C82.11 High Frequency Ballast Standard
- Meets FCC Part 18 Non-Consumer requirements for EMI/RFI emissions
- Meets ANSI C62.41 Category A surge protection standards up to and including 4 kV
- Manufacturing facilities employ ESD reduction practices that comply with the requirements of ANSI/ESD S20.20
- Lutron Quality Systems registered to ISO 9001.2000

Performance

- Operating Voltage: 120, 220/240, 277 V~ at 50 or 60 Hz
- Grounding: ballast and fixture must be grounded for proper dimming
- Dimming Range: 100% to 10% measured relative light output
- Lamp Starting: programmed rapid start
- Lamp Current Crest Factor: less than 1.7
- Light Output Variation: Constant ±2% light output for line voltage variations of ±10%
- Lamp Life: Average lamp life meets or exceeds specified lamp ratings
- Power Factor: 0.95 minimum
- Total Harmonic Distortion (THD): Less than 20%
- Inaudible in a 27 dBA ambient
- Maximum Inrush Current: 3 A per ballast at 277 V~, 7A per ballast at 120 V~
- Class 2 Output: +20 V⎓, 50mA maximum (one daylight sensor, one keypad and one occupancy sensor can be connected)

Environment

- Minimum lamp starting temperature: 50 °F (10 °C)
- Relative humidity: less than 90% non-condensing
- Sound Rating: inaudible in a 27 dB ambient
- Maximum ballast case temperature: 75 °C (167 °F)

Ballast Wiring & Mounting

- Ballast is grounded by a mounting screw to the fixture
- Terminal blocks on the ballast accept the following wire gauges:
  Power Wiring, Lamp Wiring, and *EcoSystem* Bus:
  only one #18 AWG solid per terminal
  Class 2 Sensors:
  only one #22 AWG solid per terminal
- Only one wire per terminal
- Class 2 sensor wiring must be separated from all power and Class 1 wiring, consult all applicable local and national codes
- Ballast mounts using two screws (or sheet metal feature and one screw) within a fluorescent fixture
- Wiring from the ballast to lamp sockets shall not exceed 7 ft. for T8, T5, and T5HO lamps
- Wiring from the ballast to lamps sockets shall not exceed 3 ft. for T5 Twin Tube lamps

Lamp Seasoning

Refer to lamp manufacturer for lamp seasoning requirements prior to dimming

LUTRON. SPECIFICATION SUBMITTAL Page 2

Job Name:	Model Numbers:	
Job Number:		

Figure 239: Ballast Specification Sheet for Luminaire R1 Continued

EcoSystem® Five Control Input Digital Dimming Ballasts

EcoSystem Ballasts 4 11.03.08

EcoSystem Ballasts for linear T5 Lamps

Lamp	No. of	Model	Case Size	Input Voltage (VAC)	Input Current (A)	Input Power (W)	Ballast Factor (BF)	System Lumens (lm)	System Efficacy (lm/W)	Ballast Efficacy Factor	Relative Efficacy (RSE)
F35T5 (57.1 in.)	1	EC5 T535 J UNV 1	J	277	0.15	42.0	1.0	3650	87	2.38	0.83
				240	0.18	42.3	1.0	3650	87	2.38	0.83
				120	0.35	42.2	1.0	3650	87	2.38	0.83
F28T5 (45.2 in.)	2	EC5 T528 J UNV 2	J	277	0.23	64.5	1.0	5800	90	1.55	0.87
				240	0.27	65.0	1.0	5800	89	1.54	0.86
				120	0.54	65.2	1.0	5800	89	1.53	0.86
	1	EC5 T528 J UNV 1	J	277	0.12	32.6	1.0	2900	89	3.07	0.86
				240	0.14	32.9	1.0	2900	88	3.04	0.85
				120	0.27	32.9	1.0	2900	88	3.04	0.85
F21T5 (33.4 in.)	2	EC5 T521 J UNV 2	J	277	0.17	46.0	1.0	4200	91	2.17	0.91
				240	0.20	47.2	1.0	4200	89	2.12	0.89
				120	0.39	47.2	1.0	4200	89	2.12	0.89
	1	EC5 T521 J UNV 1	J	277	0.09	25.8	1.0	2100	81	3.88	0.81
				240	0.11	25.8	1.0	2100	81	3.88	0.81
				120	0.22	25.8	1.0	2100	81	3.88	0.81
F14T5 (21.6 in.)	2	EC5 T514 J UNV 2	J	277	0.12	32.8	1.0	2700	82	3.05	0.85
				240	0.14	33.3	1.0	2700	81	3.00	0.85
				120	0.28	33.3	1.0	2700	81	3.00	0.85
	1	EC5 T514 J UNV 1	J	277	0.07	19.0	1.0	1350	71	5.26	0.74
				240	0.08	19.2	1.0	1350	70	5.21	0.74
				120	0.16	19.2	1.0	1350	70	5.21	0.74

LUTRON® SPECIFICATION SUBMITTAL Page 4

Job Name:

Job Number:

Model Numbers:

Figure 240: Ballast Specification Sheet for Luminaire R1 Continued

FLUORESCENT LAMPS

SILHOUETTE™ T5, Colored Linear Fluorescent Lamps

SILHOUETTE™ LONG LIFE T5 LAMPS—(2FT–5 FT)

T5 Miniature Bipin; Programmed Start

Watts	Product Number	Symbols, Footnotes	Ordering Code	Pkg. Qty.‡	Description	Nom. Length (In.)	Rated Average Life 3 Hr. Start (202)	Rated Average Life 12 Hr. Start (241)	Approx. Initial Lumens (203,204)	Design Lumens (208)	CRI
14	23077-1	$ •	F14T5/830/ALTO	40	TL 830, 3000K	22	25,000	35,000	1350	1275	85
	23079-7	$ •	F14T5/835/ALTO	40	TL 835, 3500K	22	25,000	35,000	1350	1275	85
	23080-5	$ •	F14T5/841/ALTO	40	TL 841, 4100K	22	25,000	35,000	1350	1275	85
21	23081-3	$ •	F21T5/830/ALTO	40	TL 830, 3000K	34	25,000	35,000	2100	2000	85
	23082-1	$ •	F21T5/835/ALTO	40	TL 835, 3500K	34	25,000	35,000	2100	2000	85
	23083-9	$ •	F21T5/841/ALTO	40	TL 841, 4100K	34	25,000	35,000	2100	2000	85
28	23084-7	$ • [illegible]	F28T5/830/ALTO	40	TL 830, 3000K	46	25,000	35,000	2900	2750	85
	23085-4	$ • [illegible]	F28T5/835/ALTO	40	TL 835, 3500K	46	25,000	35,000	2900	2750	85
	23086-2	$ • [illegible]	F28T5/841/ALTO	40	TL 841, 4100K	46	25,000	35,000	2900	2750	85
35	23088-8	$ •	F35T5/830/ALTO	40	TL 830, 3000K	58	25,000	35,000	3650	3450	85
	23091-2	$ •	F35T5/835/ALTO	40	TL 835, 3500K	58	25,000	35,000	3650	3450	85
	23095-3	$ •	F35T5/841/ALTO	40	TL 841, 4100K	58	25,000	35,000	3650	3450	85

COLORED—LINEAR FLUORESCENT LAMPS—T5 HIGH OUTPUT

Watts	Product Number	Symbols, Footnotes	Ordering Code	Pkg. Qty.‡	Description	Nom. Length (In.)	Rated Avg. Life (Hrs.) (202)	Approx. Initial Lumens (203,204)	Design Lumens (208)	CRI
24	14637-3	$	F24T5/RED/HO	15	TL5HO Colored Pro 24W/150 Red	22	12,000	1400	1330	N/A
	14638-1	$	F24T5/GREEN/HO	15	TL5HO Colored Pro 24W/170 Green	22	12,000	2750	2475	N/A
	14639-9	$	F24T5/BLUE/HO	15	TL5HO Colored Pro 24W/180 Blue	22	12,000	550	440	N/A
54	14640-7	$	F54T5/RED/HO	15	TL5HO Colored Pro 54W/150 Red	46	12,000	3450	3280	N/A
	14641-5	$	F54T5/GREEN/HO	15	TL5HO Colored Pro 54W/170 Green	46	12,000	6900	6210	N/A
	14642-3	$	F54T5/BLUE/HO	15	TL5HO Colored Pro 54W/180 Blue	46	12,000	1500	1200	N/A

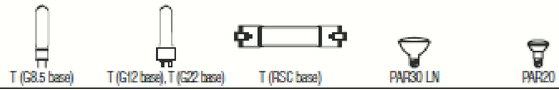
For the most current product information, go to the e-catalog on www.philips.com
Fluorescent symbols and footnotes located on page 120

T5 LUMENS AT 35°C AND 25°C


T5 Miniature Bipin

Lamp Type	Approx. Initial Lumens at 35°C (203, 204)	Approx. Initial Lumens at 25°C (203, 204)
F14T5	1350	1200
F21T5	2100	1900
F28T5	2900	2600
F35T5	3650	3300
F24T5/HO	2000	1800
F39T5/HO	3500	3150
F54T5/HO	5000	4500
F80T5/HO	7000	6300

Figure 241: Lamp Specification Sheet for Luminaire R1



HID

POWERBALL® CERAMIC METALARC® TUBULAR SINGLE-ENDED
High CRI, Pulse Start, UV Stop – Enclosed Fixtures Only

Watts	Bulb	Base	Product Number	Ordering Abbreviation	ANSI Code	Pkg Qty	Lamp Finish	Operating Position	Fix Req	Avg Rated Life (hrs)	Approx Lumens (Initial)	Approx Lumens (mean)	CRI	CCT (K)	Symbols & Footnotes
20	T4.5	G8.5	64882	**MC20TC/U/G8.5/830PB**	M156/E	12	Clear	Universal	E	12000	1700	1275	83	3000	1,4,18, 24,25,30,48
39	T4.5	G8.5	64791	**MC39TC/U/G8.5/830PB**	M130/E	12	Clear	Universal	E	12000	3400	2720	82	3000	1,4,18,24, 25,30,48
	T6	G12	64363	**MC39T6/U/G12/830PB**	M130/E	12	Clear	Universal	E	12000	3400	2720	82	3000	1,4,18,24, 25,30,48
			64325	**MC39T6/U/G12/940PB**	M130/E	12	Clear	Universal	E	12000	3300	2640	90	4200	1,4,18, 24,25,26,30,48
70	T4.5	G8.5	64825	**MC70TC/U/G8.5/930PB**	M139/E, M98/E	12	Clear	Universal	E	12000	6300	5040	95	3000	1,4,18, 24,25,26,30,48
	T6	G12	64361	**MC70T6/U/G12/830PB**	M139/E, M98/E	12	Clear	Universal	E	12000	7000	5600	87	3000	1,4,18,24, 25,26,30,48
			64200	**MC70T6/U/G12/930PB**	M139/E, M98/E	12	Clear	Universal	E	12000	6400	5120	95	3000	1,4,18, 24,25,26,30,48
			64338	**MC70T6/U/G12/940PB**	M139/E, M98/E	12	Clear	Universal	E	12000	6700	5360	93	4200	1,4,18,24, 25,26,30,48
150	T7.5	G12	64359	**MC150T7.5/U/G12/830**	M102/E, M142/E	12	Clear	Universal	E	12000	15500	12400	89	3000	1,4,18,24, 30,31,48
			64337	**MC150T7.5/U/G12/940PB**	M102/E, M142/E	12	Clear	Universal	E	12000	14500	11600	95	4200	1,4,18,24, 30,31,48
250	T9	G22	64167	**MC250T9/U/G22/830PB**	M80/E	10	Clear	Universal	E	12000	24500	19600	86	3000	1,4 ,18,24,30,31,48

POWERBALL® CERAMIC METALARC® TUBULAR DOUBLE-ENDED

Watts	Bulb	Base	Product Number	Ordering Abbreviation	ANSI Code	Pkg Qty	Lamp Finish	Operating Position	Fix Req	Avg Rated Life (hrs)	Approx Lumens (Initial)	Approx Lumens (mean)	CRI	CCT (K)	Symbols & Footnotes
70	T6	RX7s RSC	64793	**MC70T6/DE/830PB**	M139/E, M85/E, M98/E	12	Clear	HOR ± 45°	E	12000	6900	5520	88	3000	1,4,18,25, 26,30,35,48
150	T7.5	RX7s RSC	64794	**MC150T7.5/DE/830PB**	M102/E, M142/E, M81/E	12	Clear	HOR ± 45°	E	12000	14800	11840	91	3000	1,4,18,30, 37,48

POWERBALL® CERAMIC METALARC® PAR
High CRI, Pulse Start, UV Stop – Open or Enclosed Fixtures

Watts	Bulb	Base	Product Number	Ordering Abbreviation	ANSI Code	Pkg Qty	Beam Type	Beam Angle	Operating Position	Fix Req	Avg Rated Life (hrs)	MBCP	Approx Lumens (Initial)	CRI	CCT (K)	Symbols & Footnotes
20	PAR30LN	E26 Med	64879	**MCP20PAR30LN/U/830/SP/ECOPB**	M156/O	6	SP	10°	Universal	O	12000	24000	1200	82	3100	1,4,7,17,24,30,48
			64878	**MCP20PAR30LN/U/830/FL/ECOPB**	M156/O	6	FL	30°	Universal	O	12000	4000	1200	82	3100	1,4,7,17,24,30,48
39	PAR20	E26 Med	64824	**MCP39PAR20/U/830/SPPB**	M130/O	12	SP	10°	Universal	O	12000	20000	2000	87	3000	1,4,17, 24,25,30,48
			64826	**MCP39PAR20/U/830/FLPB**	M130/O	12	FL	30°	Universal	O	12000	5000	2000	87	3000	1,4,17, 24,25,30,48
	PAR30LN	E26 Med	64880	**MCP39PAR30LN/U/830/SP/ECOPB**	M130/O	6	SP	10°	Universal	O	12000	39600	2300	85	3000	1,4, 7,17,24,25,30,48
			64881	**MCP39PAR30LN/U/830/FL/ECOPB**	M130/O	6	FL	30°	Universal	O	12000	8000	2300	85	3000	1,4, 7,17,24,25,30,48

For more complete product information visit www.sylvania.com

Symbols/Footnotes on page 101-102

91

Figure 242: Lamp Specification Sheet for Luminaires R2, R2E, R3, and R3E

13.85714286	2	-	4	5	-	7	8	-	10	11	-	13	14	-	16
	Length/#	**Mat Cost and Labor**		**Length/#**	**Mat Cost and Labor**		**Length/#**	**Mat Cost and Labor**		**Length/#**	**Mat Cost and Labor**		**Length/#**	**Mat Cost and Labor**	
Conduit	350.8571429	$53.30		434	$53.30		517.1429	$53.30		600.2857	$53.30		683.4286	$53.30	
Conductor	1403.428571	$21.45		1736	$21.45		2068.571	$21.45		2401.143	$21.45		2733.714	$21.45	
	Total	$48,804.23	$0.00	Total	$60,369.40	$0.00	Total	$71,934.57	$0.00	Total	$83,499.74	$0.00	Total	$95,064.91	$0.00
	G Total	$48,804.23		G Total	$60,369.40		G Total	$71,934.57		G Total	$83,499.74		G Total	$95,064.91	
	Total Cost	$855,584.23													
				17	-	19	20	-	22	23	-	25	26	-	28
				Length/#	**Cost and Labor**		**Length/#**	**t Cost and Labor**		**Length/#**	**t Cost and Labor**		**Length/#**	**Mat Cost and Labor**	
				766.5714	$53.30		849.7143	$53.30		932.8571	$53.30		1016	$53.30	
				3066.286	$21.45		3398.857	$21.45		3731.429	$21.45		4064	$21.45	
	Lighting	Mechanical		Total	#########	$0.00	Total	$118,195.26	$0.00	Total	$129,760.43	$0.00	Total	$141,325.60	$0.00
	$855,584.23	$344,292.37		G Total	#########		G Total	$118,195.26		G Total	$129,760.43		G Total	$141,325.60	
Total Cost	$1,199,876.60														

Figure 243: Existing Conduit Cost Spread Sheet for Electrical Room Feeders

13.85714286	2	-	5	6	-	9	10	-	13	14	-	17
	Length/#	**Mat Cost and Labor**		**Length/#**	**Mat Cost and Labor**		**Length/#**	**Mat Cost and Labor**		**Length/#**	**Mat Cost and Labor**	
Conduit	189.2857143	$53.30		244.7143	$53.30		300.1429	$53.30		355.5714	$53.30	
Conductor	757.1428571	$21.45		978.8571	$21.45		1200.571	$21.45		1422.286	$21.45	
	Total	$26,329.64	$0.00	Total	$34,039.76	$0.00	Total	$41,749.87	$0.00	Total	$49,459.99	$0.00
	G Total	$26,329.64		G Total	$34,039.76		G Total	$41,749.87		G Total	$49,459.99	
	Total Cost	$344,292.37										
				18	-	21	22	-	25	26	-	28
				Length/#	**Mat Cost and Labor**		**Length/#**	**Mat Cost and Labor**		**Length/#**	**Mat Cost and Labor**	
				411	$53.30		466.4286	$53.30		508	$53.30	
				1644	$21.45		1865.714	$21.45		2032	$21.45	
				Total	$57,170.10	$0.00	Total	$64,880.21	$0.00	Total	$70,662.80	$0.00
				G Total	$57,170.10		G Total	$64,880.21		G Total	$70,662.80	

Figure 244: Existing Conduit Cost Spead Sheet for Mechancail Rooms

PANELBOARD SCHEDULE

VOLTAGE:	480Y/277V,3PH,4W	PANEL TAG: EHV-8 (OLD)	MIN. C/B AIC:	10K
SIZE/TYPE BUS:	100A	PANEL LOCATION: EAST ELECTRICAL ROOM	OPTIONS:	
SIZE/TYPE MAIN:	100A/3P C/B	PANEL MOUNTING: SURFACE		

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
		0	20A/1P	1	*			2	20A/1P	0		
		0	20A/1P	3		*		4	20A/1P	0		
		0	20A/1P	5			*	6	20A/1P	0		
		0	20A/1P	7	*			8	20A/1P	0		
		0	20A/1P	9		*		10	20A/1P	0		
		0	20A/1P	11			*	12	20A/1P	0		
		0	20A/1P	13	*			14	20A/1P	0		
		0	20A/1P	15		*		16	20A/1P	0		
		0	20A/1P	17			*	18	20A/1P	0		
		0	20A/1P	19	*			20	20A/1P	0		
		0	20A/1P	21		*		22	20A/1P	0		
		0	20A/1P	23			*	24	20A/1P	0		
		0	20A/1P	25	*			26	20A/1P	1300	9TH FLOOR	Emerg. LTG. 9th floor
0	0	0	20A/1P	27		*		28	20A/1P	1200	9TH FLOOR	Emerg. LTG. 9th floor
0	0	0	20A/1P	29			*	30	20A/1P	1300	8TH FLOOR	Emerg. LTG. 8th floor
0	0	0	20A/1P	31	*			32	20A/1P	1200	8TH FLOOR	Emerg. LTG. 8th floor
		0	20A/1P	33		*		34	20A/1P	1100	7TH FLOOR	Emerg. LTG. 7th floor
		0	20A/1P	35			*	36	20A/1P	1400	7TH FLOOR	Emerg. LTG. 7th floor
		0	20A/1P	37	*			38	20A/1P	0		
		0	20A/1P	39		*		40	20A/1P	0		
		0	20A/1P	41			*	42	20A/1P	0		

CONNECTED LOAD (KW) - A Ph.	2.50	TOTAL DESIGN LOAD (KW)	9.00
CONNECTED LOAD (KW) - B Ph.	2.30	POWER FACTOR	0.80
CONNECTED LOAD (KW) - C Ph.	2.70	TOTAL DESIGN LOAD (AMPS)	14

Figure 245: Panelboard EHV-8 (Existing)

PANELBOARD SIZING WORKSHEET

Panel Tag------------------------->					HV-8 (OLD	Panel Location:			EAST ELECTRICAL ROOM		
Nominal Phase to Neutral Voltage------->					277	Phase:			3		
Nominal Phase to Phase Voltage-------->					480	Wires:			4		
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks	
1	A				0	w		0	0		
2	A				0	w		0	0		
3	B				0	w		0	0		
4	B				0	w		0	0		
5	C				0	w		0	0		
6	C				0	w		0	0		
7	A				0	w		0	0		
8	A				0	w		0	0		
9	B				0	w		0	0		
10	B				0	w		0	0		
11	C				0	w		0	0		
12	C				0	w		0	0		
13	A				0	w		0	0		
14	A				0	w		0	0		
15	B				0	w		0	0		
16	B				0	w		0	0		
17	C				0	w		0	0		
18	C				0	w		0	0		
19	A				0	w		0	0		
20	A				0	w		0	0		
21	B				0	w		0	0		
22	B				0	w		0	0		
23	C				0	w		0	0		
24	C				0	w		0	0		
25	A				0	w		0	0		
26	A	merg. LTG. 9th floo	3	9TH FLOOR	1.3	kw		1300	1625		
27	B					kw		0	0		
28	B	merg. LTG. 9th floo	3	9TH FLOOR	1.2	kw		1200	1500		
29	C					kw		0	0		
30	C	merg. LTG. 8th floo	3	8TH FLOOR	1.3	kw		1300	1625		
31	A					kw		0	0		
32	A	merg. LTG. 8th floo	3	8TH FLOOR	1.2	kw		1200	1500		
33	B				0	kw		0	0		
34	B	merg. LTG. 7th floo	3	7TH FLOOR	1.1	kw		1100	1375		
35	C				0	kw		0	0		
36	C	merg. LTG. 7th floo	3	7TH FLOOR	1.4	kw		1400	1750		
37	A				0	w		0	0		
38	A				0	w		0	0		
39	B				0	w		0	0		
40	B				0	w		0	0		
41	C				0	w		0	0		
42	C				0	w		0	0		
PANEL TOTAL								7.5	9.4	Amps=	11.3
PHASE LOADING								kW	kVA	%	Amps
PHASE TOTAL			A					2.5	3.1	33%	11.3
PHASE TOTAL			B					2.3	2.9	31%	10.4
PHASE TOTAL			C					2.7	3.4	36%	12.2
LOAD CATAGORIES				Connected			Demand				Ver. 1.04
				kW	kVA	DF	kW	kVA	PF		
1		receptacles		0.0	0.0		0.0	0.0			
2		computers		0.0	0.0		0.0	0.0			
3		fluorescent lighting		7.5	9.4		7.5	9.4	0.80		
4		HID lighting		0.0	0.0		0.0	0.0			
5		incandescent lighting		0.0	0.0		0.0	0.0			
6		HVAC fans		0.0	0.0		0.0	0.0			
7		heating		0.0	0.0		0.0	0.0			
8		kitchen equipment		0.0	0.0		0.0	0.0			
9		unassigned		0.0	0.0		0.0	0.0			
Total Demand Loads							7.5	9.4			
Spare Capacity				20%			1.5	1.9			
Total Design Loads							9.0	11.3	0.80	Amps=	13.5

Default Power Factor =	0.80	
Default Demand Factor =	100	%

Figure 246: Panelboard Worksheet EHV-8 (Existing)

PANELBOARD SCHEDULE

VOLTAGE:	208Y/120V,3PH,4W	PANEL TAG:	EHV-8 (NEW)	MIN. C/B AIC:	10K
SIZE/TYPE BUS:	100A	PANEL LOCATION:	EAST ELECTRICAL ROOM	OPTIONS:	
SIZE/TYPE MAIN:	100A/3P C/B	PANEL MOUNTING:	SURFACE		

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
		0	20A/1P	1	*			2	20A/1P	0		
		0	20A/1P	3		*		4	20A/1P	0		
		0	20A/1P	5			*	6	20A/1P	0		
		0	20A/1P	7	*			8	20A/1P	0		
		0	20A/1P	9		*		10	20A/1P	0		
		0	20A/1P	11			*	12	20A/1P	0		
		0	20A/1P	13	*			14	20A/1P	0		
		0	20A/1P	15		*		16	20A/1P	0		
		0	20A/1P	17			*	18	20A/1P	0		
		0	20A/1P	19	*			20	20A/1P	0		
		0	20A/1P	21		*		22	20A/1P	0		
		0	20A/1P	23			*	24	20A/1P	0		
		0	20A/1P	25	*			26	20A/1P	1300	9TH FLOOR	Emerg. LTG. 9th floor
0	0	0	20A/1P	27		*		28	20A/1P	1200	9TH FLOOR	Emerg. LTG. 9th floor
0	0	0	20A/1P	29			*	30	20A/1P	816	8TH FLOOR	Emerg. LTG. 8th floor
0	0	0	20A/1P	31	*			32	20A/1P	978	8TH FLOOR	Emerg. LTG. 8th floor
		0	20A/1P	33		*		34	20A/1P	1100	7TH FLOOR	Emerg. LTG. 7th floor
		0	20A/1P	35			*	36	20A/1P	1400	7TH FLOOR	Emerg. LTG. 7th floor
		0	20A/1P	37	*			38	20A/1P	0		
		0	20A/1P	39		*		40	20A/1P	0		
		0	20A/1P	41			*	42	20A/1P	0		

CONNECTED LOAD (KW) - A Ph.	2.28	TOTAL DESIGN LOAD (KW)	8.15
CONNECTED LOAD (KW) - B Ph.	2.30	POWER FACTOR	0.80
CONNECTED LOAD (KW) - C Ph.	2.22	TOTAL DESIGN LOAD (AMPS)	12

Figure 247: Panelboard EHV-8 (New)

PANELBOARD SIZING WORKSHEET											
Panel Tag------------------------->					HV-8 (NEW	Panel Location:			EAST ELECTRICAL ROOM		
Nominal Phase to Neutral Voltage------->					277	Phase:			3		
Nominal Phase to Phase Voltage-------->					480	Wires:			4		
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks	
1	A				0	w		0	0		
2	A				0	w		0	0		
3	B				0	w		0	0		
4	B				0	w		0	0		
5	C				0	w		0	0		
6	C				0	w		0	0		
7	A				0	w		0	0		
8	A				0	w		0	0		
9	B				0	w		0	0		
10	B				0	w		0	0		
11	C				0	w		0	0		
12	C				0	w		0	0		
13	A				0	w		0	0		
14	A				0	w		0	0		
15	B				0	w		0	0		
16	B				0	w		0	0		
17	C				0	w		0	0		
18	C				0	w		0	0		
19	A				0	w		0	0		
20	A				0	w		0	0		
21	B				0	w		0	0		
22	B				0	w		0	0		
23	C				0	w		0	0		
24	C				0	w		0	0		
25	A				0	w		0	0		
26	A	Emerg. LTG. 9th floo	3	9TH FLOOR	1.3	kw		1300	1625		
27	B					kw		0	0		
28	B	Emerg. LTG. 9th floo	3	9TH FLOOR	1.2	kw		1200	1500		
29	C					kw		0	0		
30	C	Emerg. LTG. 8th floo	3	8TH FLOOR	0.816	kw		816	1020	17 SQUARES	
31	A					kw		0	0		
32	A	Emerg. LTG. 8th floo	3	8TH FLOOR	0.978	kw		978	1223	30 R1 FIXTURES	
33	B				0	kw		0	0		
34	B	Emerg. LTG. 7th floo	3	7TH FLOOR	1.1	kw		1100	1375		
35	C				0	kw		0	0		
36	C	Emerg. LTG. 7th floo	3	7TH FLOOR	1.4	kw		1400	1750		
37	A				0	w		0	0		
38	A				0	w		0	0		
39	B				0	w		0	0		
40	B				0	w		0	0		
41	C				0	w		0	0		
42	C				0	w		0	0		
PANEL TOTAL								6.8	8.5	Amps=	10.2
PHASE LOADING								kW	kVA	%	Amps
PHASE TOTAL			A					2.3	2.8	34%	10.3
PHASE TOTAL			B					2.3	2.9	34%	10.4
PHASE TOTAL			C					2.2	2.8	33%	10.0
LOAD CATAGORIES				Connected			Demand				Ver. 1.04
				kW	kVA	DF	kW	kVA	PF		
1	receptacles			0.0	0.0		0.0	0.0			
2	computers			0.0	0.0		0.0	0.0			
3	fluorescent lighting			6.8	8.5		6.8	8.5	0.80		
4	HID lighting			0.0	0.0		0.0	0.0			
5	incandescent lighting			0.0	0.0		0.0	0.0			
6	HVAC fans			0.0	0.0		0.0	0.0			
7	heating			0.0	0.0		0.0	0.0			
8	kitchen equipment			0.0	0.0		0.0	0.0			
9	unassigned			0.0	0.0		0.0	0.0			
Total Demand Loads							6.8	8.5			
Spare Capacity				20%			1.4	1.7			
Total Design Loads							8.2	10.2	0.80	Amps=	12.3

Default Power Factor =	0.80	
Default Demand Factor =	100	%

Figure 248: Panelboard Worksheet EHV-8 (New)

PANELBOARD SCHEDULE

VOLTAGE: 208Y/120V,3PH,4W	PANEL TAG: L-PP-8-1-(C) (OLD)	MIN. C/B AIC: 10K
SIZE/TYPE BUS: 125A	PANEL LOCATION: WEST ELECTRICAL ROOM	OPTIONS:
SIZE/TYPE MAIN: 125A/3P C/B	PANEL MOUNTING: SURFACE	

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
COPIER RECEP		1500	20A/1P	1	*			2	20A/1P	1500		LED TV (5)
SPARE		0	20A/1P	3		*		4	20A/1P	1500		LED TV (5)
SPARE		0	20A/1P	5			*	6	20A/1P	500		NDERCOUNTER REF
DED. RECEPT		1000	20A/1P	7	*			8	20A/1P	1500		ERCOUNTER ICEMA
COFFEE MAKER		1200	20A/1P	9		*		10	20A/1P	1500		MICROWAVE
PC RECEPT		300	20A/1P	11			*	12	20A/1P	720		CONV. RECEPT
SPARE		0	20A/1P	13	*			14	20A/1P	0		SPARE
MOTORIZED SHADE		1350	20A/1P	15		*		16	20A/1P	1500		COPIER RECEP
MOTORIZED SHADE		1350	20A/1P	17			*	18	20A/1P	1000		DED. RECEPT
MOTORIZED SHADE		1350	20A/1P	19	*			20	20A/1P	1080		CONV. RECEPT
PC RECEPT		1200	20A/1P	21		*		22	20A/1P	1090		CONV. RECEPT
PC RECEPT.		1200	20A/1P	23			*	24	20A/1P	1300		PRINTER RECEPT
SPARE		0	20A/1P	25	*			26	20A/1P	1300		PRINTER RECEPT
		0	20A/1P	27		*		28	20A/1P	0		
		0	20A/1P	29			*	30	20A/1P	0		
		0	20A/1P	31	*			32	20A/1P	0		
		0	20A/1P	33		*		34	20A/1P	0		
		0	20A/1P	35			*	36	20A/1P	0		
		0	20A/1P	37	*			38	20A/1P	0		
		0	20A/1P	39		*		40	20A/1P	0		
		0	20A/1P	41			*	42	20A/1P	0		

CONNECTED LOAD (KW) - A Ph.	9.23	TOTAL DESIGN LOAD (KW)	29.93
CONNECTED LOAD (KW) - B Ph.	9.34	POWER FACTOR	0.80
CONNECTED LOAD (KW) - C Ph.	6.37	TOTAL DESIGN LOAD (AMPS)	104

Figure 249: Panelboard L-PP-8-1-(C) (Existing)

PANELBOARD SIZING WORKSHEET										
Panel Tag------------------------->				-8-1-(C) (	Panel Location:			WEST ELECTRICAL ROOM		
Nominal Phase to Neutral Voltage------->				120	Phase:			3		
Nominal Phase to Phase Voltage-------->				208	Wires:			4		
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks
1	A	COPIER RECEP			1.5	KW		1500	1875	
2	A	LED TV (5)			1.5	KW		1500	1875	
3	B	SPARE			0	KW		0	0	
4	B	LED TV (5)			1.5	KW		1500	1875	
5	C	SPARE			0	KW		0	0	
6	C	IDERCOUNTER RI			0.5	KW		500	625	
7	A	DED. RECEPT			1	KW		1000	1250	
8	A	RCOUNTER ICEM			1.5	KW		1500	1875	
9	B	COFFEE MAKER			1.2	KW		1200	1500	
10	B	MICROWAVE			1.5	KW		1500	1875	
11	C	PC RECEPT			0.3	KW		300	375	
12	C	CONV. RECEPT			0.72	KW		720	900	
13	A	SPARE			0	KW		0	0	
14	A	SPARE			0	KW		0	0	
15	B	IOTORIZED SHADI			1.35	KW		1350	1688	
16	B	COPIER RECEP			1.5	KW		1500	1875	
17	C	IOTORIZED SHADI			1.35	KW		1350	1688	
18	C	DED. RECEPT			1	KW		1000	1250	
19	A	IOTORIZED SHADI			1.35	KW		1350	1688	
20	A	CONV. RECEPT			1.08	KW		1080	1350	
21	B	PC RECEPT			1.2	KW		1200	1500	
22	B	CONV. RECEPT			1.09	KW		1090	1363	
23	C	PC RECEPT.			1.2	KW		1200	1500	
24	C	PRINTER RECEPT			1.3	KW		1300	1625	
25	A	SPARE			0	KW		0	0	
26	A	PRINTER RECEPT			1.3	KW		1300	1625	
27	B				0	w		0	0	
28	B				0	w		0	0	
29	C				0	w		0	0	
30	C				0	w		0	0	
31	A				0	w		0	0	
32	A				0	w		0	0	
33	B				0	w		0	0	
34	B				0	w		0	0	
35	C				0	w		0	0	
36	C				0	w		0	0	
37	A				0	w		0	0	
38	A				0	w		0	0	
39	B				0	w		0	0	
40	B				0	w		0	0	
41	C				0	w		0	0	
42	C				0	w		0	0	
PANEL TOTAL								24.9	31.2	Amps= 86.6

PHASE LOADING							kW	kVA	%	Amps
PHASE TOTAL	A						9.2	11.5	37%	96.1
PHASE TOTAL	B						9.3	11.7	37%	97.3
PHASE TOTAL	C						6.4	8.0	26%	66.4

LOAD CATAGORIES			Connected			Demand				Ver. 1.04
			kW	kVA	DF	kW	kVA	PF		
1	receptacles		0.0	0.0		0.0	0.0			
2	computers		0.0	0.0		0.0	0.0			
3	fluorescent lighting		0.0	0.0		0.0	0.0			
4	HID lighting		0.0	0.0		0.0	0.0			
5	incandescent lighting		0.0	0.0		0.0	0.0			
6	HVAC fans		0.0	0.0		0.0	0.0			
7	heating		0.0	0.0		0.0	0.0			
8	kitchen equipment		0.0	0.0		0.0	0.0			
9	unassigned		24.9	31.2		24.9	31.2	0.80		
Total Demand Loads						24.9	31.2			
Spare Capacity			20%			5.0	6.2			
Total Design Loads						29.9	37.4	0.80	Amps=	103.9

Default Power Factor =	0.80	
Default Demand Factor =	100	%

Figure 250: Panelboard Worksheet L-PP-8-1-(C) (Existing)

PANELBOARD SCHEDULE

VOLTAGE:	208Y/120V,3PH,4W	PANEL TAG:	L-PP-8-1-(C) (NEW)	MIN. C/B AIC:	10K
SIZE/TYPE BUS:	125A	PANEL LOCATION:	WEST ELECTRICAL ROOM	OPTIONS:	
SIZE/TYPE MAIN:	125A/3P C/B	PANEL MOUNTING:	SURFACE		

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
COPIER RECEP		1500	20A/1P	1	*			2	20A/1P	1500		LED TV (5)
SPARE		0	20A/1P	3		*		4	20A/1P	1500		LED TV (5)
SPARE		0	20A/1P	5			*	6	20A/1P	500		NDERCOUNTER REF
DED. RECEPT		1000	20A/1P	7	*			8	20A/1P	1500		ERCOUNTER ICEMA
COFFEE MAKER		1200	20A/1P	9		*		10	20A/1P	1500		MICROWAVE
PC RECEPT		300	20A/1P	11			*	12	20A/1P	720		CONV. RECEPT
SPARE		0	20A/1P	13	*			14	20A/1P	0		SPARE
MOTORIZED SHADE		1350	20A/1P	15		*		16	20A/1P	1500		COPIER RECEP
MOTORIZED SHADE		1350	20A/1P	17			*	18	20A/1P	1000		DED. RECEPT
MOTORIZED SHADE		1350	20A/1P	19	*			20	20A/1P	1080		CONV. RECEPT
PC RECEPT		1200	20A/1P	21		*		22	20A/1P	1090		CONV. RECEPT
PC RECEPT.		1200	20A/1P	23			*	24	20A/1P	1300		PRINTER RECEPT
TASK LIGHTS	N/W	408	20A/1P	25	*			26	20A/1P	1300		PRINTER RECEPT
TASK LIGHTS	S/E	408	20A/1P	27		*		28	20A/1P	0		
		0	20A/1P	29			*	30	20A/1P	0		
		0	20A/1P	31	*			32	20A/1P	0		
		0	20A/1P	33		*		34	20A/1P	0		
		0	20A/1P	35			*	36	20A/1P	0		
		0	20A/1P	37	*			38	20A/1P	0		
		0	20A/1P	39		*		40	20A/1P	0		
		0	20A/1P	41			*	42	20A/1P	0		

CONNECTED LOAD (KW) - A Ph.	9.64	TOTAL DESIGN LOAD (KW)	30.91
CONNECTED LOAD (KW) - B Ph.	9.75	POWER FACTOR	0.80
CONNECTED LOAD (KW) - C Ph.	6.37	TOTAL DESIGN LOAD (AMPS)	107

Figure 251: Panelboard L-PP-8-1-(C) (New)

PANELBOARD SIZING WORKSHEET

Panel Tag------------------------>					8-1-(C) (N	Panel Location:			WEST ELECTRICAL ROOM		
Nominal Phase to Neutral Voltage------->					120	Phase:			3		
Nominal Phase to Phase Voltage-------->					208	Wires:			4		
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks	
1	A	COPIER RECEP			1.5	KW		1500	1875		
2	A	LED TV (5)			1.5	KW		1500	1875		
3	B	SPARE			0	KW		0	0		
4	B	LED TV (5)			1.5	KW		1500	1875		
5	C	SPARE			0	KW		0	0		
6	C	DERCOUNTER RE			0.5	KW		500	625		
7	A	DED. RECEPT			1	KW		1000	1250		
8	A	RCOUNTER ICEM			1.5	KW		1500	1875		
9	B	COFFEE MAKER			1.2	KW		1200	1500		
10	B	MICROWAVE			1.5	KW		1500	1875		
11	C	PC RECEPT			0.3	KW		300	375		
12	C	CONV. RECEPT			0.72	KW		720	900		
13	A	SPARE			0	KW		0	0		
14	A	SPARE			0	KW		0	0		
15	B	IOTORIZED SHAD			1.35	KW		1350	1688		
16	B	COPIER RECEP			1.5	KW		1500	1875		
17	C	IOTORIZED SHAD			1.35	KW		1350	1688		
18	C	DED. RECEPT			1	KW		1000	1250		
19	A	IOTORIZED SHAD			1.35	KW		1350	1688		
20	A	CONV. RECEPT			1.08	KW		1080	1350		
21	B	PC RECEPT			1.2	KW		1200	1500		
22	B	CONV. RECEPT			1.09	KW		1090	1363		
23	C	PC RECEPT.			1.2	KW		1200	1500		
24	C	PRINTER RECEPT			1.3	KW		1300	1625		
25	A	TASK LIGHTS	9	N/W	0.408	KW		408	510	(4) 60W, (8) 21W	
26	A	PRINTER RECEPT			1.3	KW		1300	1625		
27	B	TASK LIGHTS	9	S/E	0.408	KW		408	510	(4) 60W, (8) 21W	
28	B				0	w		0	0		
29	C				0	w		0	0		
30	C				0	w		0	0		
31	A				0	w		0	0		
32	A				0	w		0	0		
33	B				0	w		0	0		
34	B				0	w		0	0		
35	C				0	w		0	0		
36	C				0	w		0	0		
37	A				0	w		0	0		
38	A				0	w		0	0		
39	B				0	w		0	0		
40	B				0	w		0	0		
41	C				0	w		0	0		
42	C				0	w		0	0		
PANEL TOTAL								25.8	32.2	Amps=	89.4
PHASE LOADING								kW	kVA	%	Amps
		PHASE TOTAL	A					9.6	12.0	37%	100.4
		PHASE TOTAL	B					9.7	12.2	38%	101.5
		PHASE TOTAL	C					6.4	8.0	25%	66.4
LOAD CATAGORIES				Connected			Demand				Ver. 1.04
				kW	kVA	DF	kW	kVA	PF		
1		receptacles		0.0	0.0		0.0	0.0			
2		computers		0.0	0.0		0.0	0.0			
3		fluorescent lighting		0.0	0.0		0.0	0.0			
4		HID lighting		0.0	0.0		0.0	0.0			
5		incandescent lighting		0.0	0.0		0.0	0.0			
6		HVAC fans		0.0	0.0		0.0	0.0			
7		heating		0.0	0.0		0.0	0.0			
8		kitchen equipment		0.0	0.0		0.0	0.0			
9		unassigned		25.8	32.2		25.8	32.2	0.80		
		Total Demand Loads					25.8	32.2			
		Spare Capacity		20%			5.2	6.4			
		Total Design Loads					30.9	38.6	0.80	Amps=	107.3

Default Power Factor =	0.80	
Default Demand Factor =	100	%

Figure 252: Panelboard Worksheet L-PP-8-1-(C) (New)

PANELBOARD SCHEDULE

VOLTAGE:	480Y/277V,3PH,4W	PANEL TAG:	P-8-1 (OLD)	MIN. C/B AIC:	10K
SIZE/TYPE BUS:	100A	PANEL LOCATION:	WEST ELECTRICAL ROOM	OPTIONS:	
SIZE/TYPE MAIN:	100A/3P C/B	PANEL MOUNTING:	SURFACE		

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
DL-08-01	N1, N2	1520	20A/1P	1	*			2	20A/1P	1120	N2	DL-08-02
DL-08-03	W1	1200	20A/1P	3		*		4	20A/1P	1840	W2	DL-08-04
DL-08-05	W3	1760	20A/1P	5			*	6	20A/1P	1840	W4	DL-08-06
DL-08-07	W5	1160	20A/1P	7	*			8	20A/1P	1080	N1	DL-08-08
PERIMETER COVE	NORTH	480	20A/1P	9		*		10	20A/1P	560	WEST	PERIMETER COVE
PERIMETER COVE	WEST	560	20A/1P	11			*	12	20A/1P	2100	CORE	
STAIR COVE	W1	250	20A/1P	13	*			14	20A/1P	250	W5	STAIR COVE
		0	20A/1P	15		*		16	20A/1P	0		
		0	20A/1P	17			*	18	20A/1P	0		
		0	20A/1P	19	*			20	20A/1P	0		
		0	20A/1P	21		*		22	20A/1P	0		
		0	20A/1P	23			*	24	20A/1P	0		
		0	20A/1P	25	*			26	20A/1P	0		
		0	20A/1P	27		*		28	20A/1P	0		
		0	20A/1P	29			*	30	20A/1P	0		
		0	20A/1P	31	*			32	20A/1P	0		
		0	20A/1P	33		*		34	20A/1P	0		
		0	20A/1P	35			*	36	20A/1P	0		
		0	20A/1P	37	*			38	20A/1P	0		
		0	20A/1P	39		*		40	20A/1P	0		
		0	20A/1P	41			*	42	20A/1P	0		

CONNECTED LOAD (KW) - A Ph.	5.38	TOTAL DESIGN LOAD (KW)	18.86
CONNECTED LOAD (KW) - B Ph.	4.08	POWER FACTOR	0.80
CONNECTED LOAD (KW) - C Ph.	6.26	TOTAL DESIGN LOAD (AMPS)	28

Figure 253: Panelboard P-8-1 (Existing)

PANELBOARD SIZING WORKSHEET

Panel Tag------------------------->					P-8-1 (OLD	Panel Location:			WEST ELECTRICAL ROOM		
Nominal Phase to Neutral Voltage------->					277	Phase:			3		
Nominal Phase to Phase Voltage-------->					480	Wires:			4		
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks	
1	A	DL-08-01	3	N1, N2	1.52	KW		1520	1900		
2	A	DL-08-02	3	N2	1.12	KW		1120	1400		
3	B	DL-08-03	3	W1	1.2	KW		1200	1500		
4	B	DL-08-04	3	W2	1.84	KW		1840	2300		
5	C	DL-08-05	3	W3	1.76	KW		1760	2200		
6	C	DL-08-06	3	W4	1.84	KW		1840	2300		
7	A	DL-08-07	3	W5	1.16	KW		1160	1450		
8	A	DL-08-08	3	N1	1.08	KW		1080	1350		
9	B	PERIMETER COVE	3	NORTH	0.48	KW		480	600		
10	B	PERIMETER COVE	3	WEST	0.56	KW		560	700		
11	C	PERIMETER COVE	3	WEST	0.56	KW		560	700		
12	C		3	CORE	2.1	KW		2100	2625		
13	A	STAIR COVE	3	W1	0.25	KW		250	313		
14	A	STAIR COVE	3	W5	0.25	KW		250	313		
15	B				0	w		0	0		
16	B				0	w		0	0		
17	C				0	w		0	0		
18	C				0	w		0	0		
19	A				0	w		0	0		
20	A				0	w		0	0		
21	B				0	w		0	0		
22	B				0	w		0	0		
23	C				0	w		0	0		
24	C				0	w		0	0		
25	A				0	w		0	0		
26	A				0	w		0	0		
27	B				0	w		0	0		
28	B				0	w		0	0		
29	C				0	w		0	0		
30	C				0	w		0	0		
31	A				0	w		0	0		
32	A				0	w		0	0		
33	B				0	w		0	0		
34	B				0	w		0	0		
35	C				0	w		0	0		
36	C				0	w		0	0		
37	A				0	w		0	0		
38	A				0	w		0	0		
39	B				0	w		0	0		
40	B				0	w		0	0		
41	C				0	w		0	0		
42	C				0	w		0	0		
PANEL TOTAL								15.7	19.7	Amps=	23.6
PHASE LOADING								kW	kVA	%	Amps
PHASE TOTAL			A					5.4	6.7	34%	24.3
PHASE TOTAL			B					4.1	5.1	26%	18.4
PHASE TOTAL			C					6.3	7.8	40%	28.2
LOAD CATAGORIES				Connected			Demand				Ver. 1.04
				kW	kVA	DF	kW	kVA	PF		
1	receptacles			0.0	0.0		0.0	0.0			
2	computers			0.0	0.0		0.0	0.0			
3	fluorescent lighting			15.7	19.7		15.7	19.7	0.80		
4	HID lighting			0.0	0.0		0.0	0.0			
5	incandescent lighting			0.0	0.0		0.0	0.0			
6	HVAC fans			0.0	0.0		0.0	0.0			
7	heating			0.0	0.0		0.0	0.0			
8	kitchen equipment			0.0	0.0		0.0	0.0			
9	unassigned			0.0	0.0		0.0	0.0			
Total Demand Loads							15.7	19.7			
Spare Capacity				20%			3.1	3.9			
Total Design Loads							18.9	23.6	0.80	Amps=	28.4

Default Power Factor =	0.80
Default Demand Factor =	100 %

Figure 254: Panelboard Worksheet P-8-1 (Existing)

PANELBOARD SCHEDULE

VOLTAGE:	480Y/277V,3PH,4W	PANEL TAG:	P-8-1 (NEW)	MIN. C/B AIC:	10K
SIZE/TYPE BUS:	100A	PANEL LOCATION:	WEST ELECTRICAL ROOM	OPTIONS:	
SIZE/TYPE MAIN:	100A/3P C/B	PANEL MOUNTING:	SURFACE		

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
DL-08-01	N1, N2	652	20A/1P	1	*			2	20A/1P	480	NORTH	NORTH CORRIDOR
DL-08-03	W1	228	20A/1P	3		*		4	20A/1P	196	W2	DL-08-04
DL-08-05	W3	293	20A/1P	5			*	6	20A/1P	196	W4	DL-08-06
DL-08-07	W5	261	20A/1P	7	*			8	20A/1P	768	WEST	WEST CORRIDOR
PERIMETER COVE	NORTH	480	20A/1P	9		*		10	20A/1P	560	WEST	PERIMETER COVE
PERIMETER COVE	WEST	560	20A/1P	11			*	12	20A/1P	2100	CORE	
STAIR COVE	W1	250	20A/1P	13	*			14	20A/1P	250	W5	STAIR COVE
ELEVATOR LOBBY	CORE	864	20A/1P	15		*		16	20A/1P	0		
		0	20A/1P	17			*	18	20A/1P	0		
		0	20A/1P	19	*			20	20A/1P	0		
		0	20A/1P	21		*		22	20A/1P	0		
		0	20A/1P	23			*	24	20A/1P	0		
		0	20A/1P	25	*			26	20A/1P	0		
		0	20A/1P	27		*		28	20A/1P	0		
		0	20A/1P	29			*	30	20A/1P	0		
		0	20A/1P	31	*			32	20A/1P	0		
		0	20A/1P	33		*		34	20A/1P	0		
		0	20A/1P	35			*	36	20A/1P	0		
		0	20A/1P	37	*			38	20A/1P	0		
		0	20A/1P	39		*		40	20A/1P	0		
		0	20A/1P	41			*	42	20A/1P	0		

CONNECTED LOAD (KW) - A Ph.	2.66	TOTAL DESIGN LOAD (KW)	9.77
CONNECTED LOAD (KW) - B Ph.	2.33	POWER FACTOR	0.80
CONNECTED LOAD (KW) - C Ph.	3.15	TOTAL DESIGN LOAD (AMPS)	15

Figure 255: Panelboard P-8-1 (New)

PANELBOARD SIZING WORKSHEET

Panel Tag------------------------->	P-8-1 (NEW	Panel Location:	WEST ELECTRICAL ROOM
Nominal Phase to Neutral Voltage------->	277	Phase:	3
Nominal Phase to Phase Voltage-------->	480	Wires:	4

Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks	
1	A	DL-08-01	3	N1, N2	0.652	KW		652	815	(20) R1 FIXTURES	
2	A	NORTH CORRIDOR	4	NORTH	0.48	KW		480	600	(10) SQUARES	
3	B	DL-08-03	3	W1	0.2282	KW		228	285	(7) R1 FIXTURES	
4	B	DL-08-04	3	W2	0.1956	KW		196	245	(6) R1 FIXTURES	
5	C	DL-08-05	3	W3	0.2934	KW		293	367	(9) R1 FIXTURES	
6	C	DL-08-06	3	W4	0.1956	KW		196	245	(6) R1 FIXTURES	
7	A	DL-08-07	3	W5	0.2608	KW		261	326	(8) R1 FIXTURES	
8	A	WEST CORRIDOR	4	WEST	0.768	KW		768	960	(16) SQUARES	
9	B	PERIMETER COVE	3	NORTH	0.48	KW		480	600		
10	B	PERIMETER COVE	3	WEST	0.56	KW		560	700		
11	C	PERIMETER COVE	3	WEST	0.56	KW		560	700		
12	C		3	CORE	2.1	KW		2100	2625		
13	A	STAIR COVE	3	W1	0.25	KW		250	313		
14	A	STAIR COVE	3	W5	0.25	KW		250	313		
15	B	ELEVATOR LOBBY	4	CORE	0.864	KW		864	1080	(18) SQUARES	
16	B				0	w		0	0		
17	C				0	w		0	0		
18	C				0	w		0	0		
19	A				0	w		0	0		
20	A				0	w		0	0		
21	B				0	w		0	0		
22	B				0	w		0	0		
23	C				0	w		0	0		
24	C				0	w		0	0		
25	A				0	w		0	0		
26	A				0	w		0	0		
27	B				0	w		0	0		
28	B				0	w		0	0		
29	C				0	w		0	0		
30	C				0	w		0	0		
31	A				0	w		0	0		
32	A				0	w		0	0		
33	B				0	w		0	0		
34	B				0	w		0	0		
35	C				0	w		0	0		
36	C				0	w		0	0		
37	A				0	w		0	0		
38	A				0	w		0	0		
39	B				0	w		0	0		
40	B				0	w		0	0		
41	C				0	w		0	0		
42	C				0	w		0	0		
PANEL TOTAL								8.1	10.2	Amps=	12.2

PHASE LOADING		kW	kVA	%	Amps
PHASE TOTAL	A	2.7	3.3	33%	12.0
PHASE TOTAL	B	2.3	2.9	29%	10.5
PHASE TOTAL	C	3.1	3.9	39%	14.2

	LOAD CATAGORIES	Connected			Demand				Ver. 1.04
		kW	kVA	DF	kW	kVA	PF		
1	receptacles	0.0	0.0		0.0	0.0			
2	computers	0.0	0.0		0.0	0.0			
3	fluorescent lighting	6.0	7.5		6.0	7.5	0.80		
4	HID lighting	2.1	2.6		2.1	2.6	0.80		
5	incandescent lighting	0.0	0.0		0.0	0.0			
6	HVAC fans	0.0	0.0		0.0	0.0			
7	heating	0.0	0.0		0.0	0.0			
8	kitchen equipment	0.0	0.0		0.0	0.0			
9	unassigned	0.0	0.0		0.0	0.0			
	Total Demand Loads				8.1	10.2			
	Spare Capacity	20%			1.6	2.0			
	Total Design Loads				9.8	12.2	0.80	Amps=	14.7

Default Power Factor =	0.80	
Default Demand Factor =	100	%

Figure 256: Panelboard Worksheet P-8-1 (New)

PANELBOARD SCHEDULE												
VOLTAGE:	480Y/277V,3PH,4W			PANEL TAG:	P-8-2 (OLD)				MIN. C/B AIC:	10K		
SIZE/TYPE BUS:	100A			PANEL LOCATION:	EAST ELECTRICAL ROOM				OPTIONS:			
SIZE/TYPE MAIN:	100A/3P C/B			PANEL MOUNTING:	SURFACE							
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
DL-08-09	S1,S2	1520	20A/1P	1	*			2	20A/1P	1080	S2	DL-08-10
DL-08-11	E1	1480	20A/1P	3		*		4	20A/1P	1840	E2	DL-08-12
DL-08-13	E3	1800	20A/1P	5			*	6	20A/1P	1800	E4	DL-08-14
DL-08-15	E5	1520	20A/1P	7	*			8	20A/1P	1120	S1	DL-08-16
PERIMETER COVE	SOUTH	480	20A/1P	9		*		10	20A/1P	560	EAST	PERIMETER COVE
PERIMETER COVE	EAST	560	20A/1P	11			*	12	20A/1P	400	CORE	
	0	0	20A/1P	13	*			14	20A/1P	0	0	
		0	20A/1P	15		*		16	20A/1P	0		
		0	20A/1P	17			*	18	20A/1P	0		
		0	20A/1P	19	*			20	20A/1P	0		
		0	20A/1P	21		*		22	20A/1P	0		
		0	20A/1P	23			*	24	20A/1P	0		
		0	20A/1P	25	*			26	20A/1P	0		
		0	20A/1P	27		*		28	20A/1P	0		
		0	20A/1P	29			*	30	20A/1P	0		
		0	20A/1P	31	*			32	20A/1P	0		
		0	20A/1P	33		*		34	20A/1P	0		
		0	20A/1P	35			*	36	20A/1P	0		
		0	20A/1P	37	*			38	20A/1P	0		
		0	20A/1P	39		*		40	20A/1P	0		
		0	20A/1P	41			*	42	20A/1P	0		
CONNECTED LOAD (KW) - A Ph.		5.24								TOTAL DESIGN LOAD (KW)		16.99
CONNECTED LOAD (KW) - B Ph.		4.36								POWER FACTOR		0.80
CONNECTED LOAD (KW) - C Ph.		4.56								TOTAL DESIGN LOAD (AMPS)		26

Figure 257: Panelboard P-8-2 (Existing)

PANELBOARD SIZING WORKSHEET											
Panel Tag------------------------->					P-8-2 (OLD	Panel Location:			EAST ELECTRICAL ROOM		
Nominal Phase to Neutral Voltage------->					277	Phase:			3		
Nominal Phase to Phase Voltage-------->					480	Wires:			4		
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks	
1	A	DL-08-09	3	S1,S2	1.52	KW		1520	1900		
2	A	DL-08-10	3	S2	1.08	KW		1080	1350		
3	B	DL-08-11	3	E1	1.48	KW		1480	1850		
4	B	DL-08-12	3	E2	1.84	KW		1840	2300		
5	C	DL-08-13	3	E3	1.8	KW		1800	2250		
6	C	DL-08-14	3	E4	1.8	KW		1800	2250		
7	A	DL-08-15	3	E5	1.52	KW		1520	1900		
8	A	DL-08-16	3	S1	1.12	KW		1120	1400		
9	B	PERIMETER COVE	3	SOUTH	0.48	KW		480	600		
10	B	PERIMETER COVE	3	EAST	0.56	KW		560	700		
11	C	PERIMETER COVE	3	EAST	0.56	KW		560	700		
12	C		3	CORE	0.4	KW		400	500		
13	A				0	w		0	0		
14	A				0	w		0	0		
15	B				0	w		0	0		
16	B				0	w		0	0		
17	C				0	w		0	0		
18	C				0	w		0	0		
19	A				0	w		0	0		
20	A				0	w		0	0		
21	B				0	w		0	0		
22	B				0	w		0	0		
23	C				0	w		0	0		
24	C				0	w		0	0		
25	A				0	w		0	0		
26	A				0	w		0	0		
27	B				0	w		0	0		
28	B				0	w		0	0		
29	C				0	w		0	0		
30	C				0	w		0	0		
31	A				0	w		0	0		
32	A				0	w		0	0		
33	B				0	w		0	0		
34	B				0	w		0	0		
35	C				0	w		0	0		
36	C				0	w		0	0		
37	A				0	w		0	0		
38	A				0	w		0	0		
39	B				0	w		0	0		
40	B				0	w		0	0		
41	C				0	w		0	0		
42	C				0	w		0	0		
PANEL TOTAL								14.2	17.7	Amps=	21.3
PHASE LOADING								kW	kVA	%	Amps
PHASE TOTAL			A					5.2	6.6	37%	23.6
PHASE TOTAL			B					4.4	5.5	31%	19.7
PHASE TOTAL			C					4.6	5.7	32%	20.6
LOAD CATAGORIES				Connected			Demand				Ver. 1.04
				kW	kVA	DF	kW	kVA	PF		
1	receptacles			0.0	0.0		0.0	0.0			
2	computers			0.0	0.0		0.0	0.0			
3	fluorescent lighting			14.2	17.7		14.2	17.7	0.80		
4	HID lighting			0.0	0.0		0.0	0.0			
5	incandescent lighting			0.0	0.0		0.0	0.0			
6	HVAC fans			0.0	0.0		0.0	0.0			
7	heating			0.0	0.0		0.0	0.0			
8	kitchen equipment			0.0	0.0		0.0	0.0			
9	unassigned			0.0	0.0		0.0	0.0			
Total Demand Loads							14.2	17.7			
Spare Capacity				20%			2.8	3.5			
Total Design Loads							17.0	21.2	0.80	Amps=	25.6
Default Power Factor =			0.80								
Default Demand Factor =			100 %								

Figure 258: Panelboard Worksheet P-8-2 (Existing)

PANELBOARD SCHEDULE												
VOLTAGE:	480Y/277V,3PH,4W			PANEL TAG:	P-8-2 (NEW)				MIN. C/B AIC:	10K		
SIZE/TYPE BUS:	100A			PANEL LOCATION:	EAST ELECTRICAL ROOM				OPTIONS:			
SIZE/TYPE MAIN:	100A/3P C/B			PANEL MOUNTING:	SURFACE							
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
DL-08-09	S1,S2	652	20A/1P	1	*			2	20A/1P	528	SOUTH	SOUTH CORRIDOR
DL-08-11	E1	261	20A/1P	3		*		4	20A/1P	196	E2	DL-08-12
DL-08-13	E3	228	20A/1P	5			*	6	20A/1P	196	E4	DL-08-14
DL-08-15	E5	261	20A/1P	7	*			8	20A/1P	768	EAST	EAST CORRIDOR
PERIMETER COVE	SOUTH	480	20A/1P	9		*		10	20A/1P	560	EAST	PERIMETER COVE
PERIMETER COVE	EAST	560	20A/1P	11			*	12	20A/1P	400	CORE	
	0	0	20A/1P	13	*			14	20A/1P	0	0	
		0	20A/1P	15		*		16	20A/1P	0		
		0	20A/1P	17			*	18	20A/1P	0		
		0	20A/1P	19	*			20	20A/1P	0		
		0	20A/1P	21		*		22	20A/1P	0		
		0	20A/1P	23			*	24	20A/1P	0		
		0	20A/1P	25	*			26	20A/1P	0		
		0	20A/1P	27		*		28	20A/1P	0		
		0	20A/1P	29			*	30	20A/1P	0		
		0	20A/1P	31	*			32	20A/1P	0		
		0	20A/1P	33		*		34	20A/1P	0		
		0	20A/1P	35			*	36	20A/1P	0		
		0	20A/1P	37	*			38	20A/1P	0		
		0	20A/1P	39		*		40	20A/1P	0		
		0	20A/1P	41			*	42	20A/1P	0		
CONNECTED LOAD (KW) - A Ph.		2.21								TOTAL DESIGN LOAD (KW)		6.11
CONNECTED LOAD (KW) - B Ph.		1.50								POWER FACTOR		0.80
CONNECTED LOAD (KW) - C Ph.		1.38								TOTAL DESIGN LOAD (AMPS)		9

Figure 259: Panelboard P-8-2 (New)

PANELBOARD SIZING WORKSHEET

Panel Tag------------------------->				P-8-2 (NEW	Panel Location:		EAST ELECTRICAL ROOM		
Nominal Phase to Neutral Voltage------->				277	Phase:		3		
Nominal Phase to Phase Voltage-------->				480	Wires:		4		

Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks
1	A	DL-08-09	3	S1,S2	0.652	KW		652	815	(20) R1 FIXTURES
2	A	SOUTH CORRIDOR	4	SOUTH	0.528	KW		528	660	(11) SQUARES
3	B	DL-08-11	3	E1	0.2608	KW		261	326	(8) R1 FIXTURES
4	B	DL-08-12	3	E2	0.1956	KW		196	245	(6) R1 FIXTURES
5	C	DL-08-13	3	E3	0.2282	KW		228	285	(7) R1 FIXTURES
6	C	DL-08-14	3	E4	0.1956	KW		196	245	(6) R1 FIXTURES
7	A	DL-08-15	3	E5	0.2608	KW		261	326	(8) R1 FIXTURES
8	A	EAST CORRIDOR	4	EAST	0.768	KW		768	960	(16) SQUARES
9	B	PERIMETER COVE	3	SOUTH	0.48	KW		480	600	
10	B	PERIMETER COVE	3	EAST	0.56	KW		560	700	
11	C	PERIMETER COVE	3	EAST	0.56	KW		560	700	
12	C		3	CORE	0.4	KW		400	500	
13	A				0	w		0	0	
14	A				0	w		0	0	
15	B				0	w		0	0	
16	B				0	w		0	0	
17	C				0	w		0	0	
18	C				0	w		0	0	
19	A				0	w		0	0	
20	A				0	w		0	0	
21	B				0	w		0	0	
22	B				0	w		0	0	
23	C				0	w		0	0	
24	C				0	w		0	0	
25	A				0	w		0	0	
26	A				0	w		0	0	
27	B				0	w		0	0	
28	B				0	w		0	0	
29	C				0	w		0	0	
30	C				0	w		0	0	
31	A				0	w		0	0	
32	A				0	w		0	0	
33	B				0	w		0	0	
34	B				0	w		0	0	
35	C				0	w		0	0	
36	C				0	w		0	0	
37	A				0	w		0	0	
38	A				0	w		0	0	
39	B				0	w		0	0	
40	B				0	w		0	0	
41	C				0	w		0	0	
42	C				0	w		0	0	
PANEL TOTAL								5.1	6.4	Amps= 7.7

PHASE LOADING							kW	kVA	%	Amps
PHASE TOTAL	A						2.2	2.8	43%	10.0
PHASE TOTAL	B						1.5	1.9	29%	6.8
PHASE TOTAL	C						1.4	1.7	27%	6.2

LOAD CATAGORIES		Connected			Demand				Ver. 1.04
		kW	kVA	DF	kW	kVA	PF		
1	receptacles	0.0	0.0		0.0	0.0			
2	computers	0.0	0.0		0.0	0.0			
3	fluorescent lighting	3.8	4.7		3.8	4.7	0.80		
4	HID lighting	1.3	1.6		1.3	1.6	0.80		
5	incandescent lighting	0.0	0.0		0.0	0.0			
6	HVAC fans	0.0	0.0		0.0	0.0			
7	heating	0.0	0.0		0.0	0.0			
8	kitchen equipment	0.0	0.0		0.0	0.0			
9	unassigned	0.0	0.0		0.0	0.0			
Total Demand Loads					5.1	6.4			
Spare Capacity		20%			1.0	1.3			
Total Design Loads					6.1	7.6	0.80	Amps=	9.2

Default Power Factor =	0.80	
Default Demand Factor =	100	%

Figure 260: Panelboard Worksheet P-8-2 (New)

PANELBOARD SCHEDULE

VOLTAGE:	480Y/277V,3PH,4W	PANEL TAG:	P-LE-1 (NEW)	MIN. C/B AIC:	10K
SIZE/TYPE BUS:	100A	PANEL LOCATION:	LOBBY ELECTRIC ROOM	OPTIONS:	
SIZE/TYPE MAIN:	100A/3P C/B	PANEL MOUNTING:	SURFACE		

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
EXTERIOR FIXT.	ENTRANCE	802	20A/1P	1	*			2	20A/1P	954	ENTRANCE	EXTERIOR FIXT.
		0	20A/1P	3		*		4	20A/1P	0		
		0	20A/1P	5			*	6	20A/1P	0		
		0	20A/1P	7	*			8	20A/1P	0		
		0	20A/1P	9		*		10	20A/1P	0		
		0	20A/1P	11			*	12	20A/1P	0		
		0	20A/1P	13	*			14	20A/1P	0		
		0	20A/1P	15		*		16	20A/1P	0		
		0	20A/1P	17			*	18	20A/1P	0		
		0	20A/1P	19	*			20	20A/1P	0		
		0	20A/1P	21		*		22	20A/1P	0		
		0	20A/1P	23			*	24	20A/1P	0		
		0	20A/1P	25	*			26	20A/1P	0		
		0	20A/1P	27		*		28	20A/1P	0		
		0	20A/1P	29			*	30	20A/1P	0		
		0	20A/1P	31	*			32	20A/1P	0		
		0	20A/1P	33		*		34	20A/1P	0		
		0	20A/1P	35			*	36	20A/1P	0		
		0	20A/1P	37	*			38	20A/1P	0		
		0	20A/1P	39		*		40	20A/1P	0		
		0	20A/1P	41			*	42	20A/1P	0		

CONNECTED LOAD (KW) - A Ph.	1.76	TOTAL DESIGN LOAD (KW)	2.11
CONNECTED LOAD (KW) - B Ph.	0.00	POWER FACTOR	0.80
CONNECTED LOAD (KW) - C Ph.	0.00	TOTAL DESIGN LOAD (AMPS)	3

Figure 261: Panelboard P-LE-1 (New)

PANELBOARD SIZING WORKSHEET											
Panel Tag------------------------->					LE-1 (NEV	Panel Location:			LOBBY ELECTRIC ROOM		
Nominal Phase to Neutral Voltage------->					277	Phase:			3		
Nominal Phase to Phase Voltage-------->					480	Wires:			4		
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks	
1	A	EXTERIOR FIXT.	9	ENTRANCE	802	w		802	1003	(3) B1, (9) B3, (5) B5	
2	A	EXTERIOR FIXT.	9	ENTRANCE	954	w		954	1193	3) B1, (11) B3, (6) B5	
3	B				0	w		0	0		
4	B				0	w		0	0		
5	C				0	w		0	0		
6	C				0	w		0	0		
7	A				0	w		0	0		
8	A				0	w		0	0		
9	B				0	w		0	0		
10	B				0	w		0	0		
11	C				0	w		0	0		
12	C				0	w		0	0		
13	A				0	w		0	0		
14	A				0	w		0	0		
15	B				0	w		0	0		
16	B				0	w		0	0		
17	C				0	w		0	0		
18	C				0	w		0	0		
19	A				0	w		0	0		
20	A				0	w		0	0		
21	B				0	w		0	0		
22	B				0	w		0	0		
23	C				0	w		0	0		
24	C				0	w		0	0		
25	A				0	w		0	0		
26	A				0	w		0	0		
27	B				0	w		0	0		
28	B				0	w		0	0		
29	C				0	w		0	0		
30	C				0	w		0	0		
31	A				0	w		0	0		
32	A				0	w		0	0		
33	B				0	w		0	0		
34	B				0	w		0	0		
35	C				0	w		0	0		
36	C				0	w		0	0		
37	A				0	w		0	0		
38	A				0	w		0	0		
39	B				0	w		0	0		
40	B				0	w		0	0		
41	C				0	w		0	0		
42	C				0	w		0	0		
PANEL TOTAL								1.8	2.2	Amps=	2.6
PHASE LOADING								kW	kVA	%	Amps
PHASE TOTAL			A					1.8	2.2	100%	7.9
PHASE TOTAL			B					0.0	0.0		0.0
PHASE TOTAL			C					0.0	0.0		0.0
LOAD CATAGORIES				Connected			Demand				Ver. 1.04
				kW	kVA	DF	kW	kVA	PF		
1	receptacles			0.0	0.0		0.0	0.0			
2	computers			0.0	0.0		0.0	0.0			
3	fluorescent lighting			0.0	0.0		0.0	0.0			
4	HID lighting			0.0	0.0		0.0	0.0			
5	incandescent lighting			0.0	0.0		0.0	0.0			
6	HVAC fans			0.0	0.0		0.0	0.0			
7	heating			0.0	0.0		0.0	0.0			
8	kitchen equipment			0.0	0.0		0.0	0.0			
9	unassigned			1.8	2.2		1.8	2.2	0.80		
Total Demand Loads							1.8	2.2			
Spare Capacity				20%			0.4	0.4			
Total Design Loads							2.1	2.6	0.80	Amps=	3.2

Default Power Factor =	0.80	
Default Demand Factor =	100	%

Figure 262: Panelboard Worksheet P-LE-1 (New)

PANELBOARD SCHEDULE												
VOLTAGE:	480Y/277V,3PH,4W				PANEL TAG:	PA-PP-1 (NEW)				MIN. C/B AIC:	10K	
SIZE/TYPE BUS:	100A				PANEL LOCATION:	PORT AUTHORITY				OPTIONS:		
SIZE/TYPE MAIN:	100A/3P C/B				PANEL MOUNTING:	SURFACE						
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
EXTERIOR FIXT.	SOUTH	357	20A/1P	1	*			2	20A/1P	357	SOUTH	EXTERIOR FIXT.
EXTERIOR FIXT.	SOUTH	357	20A/1P	3		*		4	20A/1P	357	NORTH	EXTERIOR FIXT.
EXTERIOR FIXT.	NORTH	357	20A/1P	5			*	6	20A/1P	357	NORTH	EXTERIOR FIXT.
		0	20A/1P	7	*			8	20A/1P	0		
		0	20A/1P	9		*		10	20A/1P	0		
		0	20A/1P	11			*	12	20A/1P	0		
		0	20A/1P	13	*			14	20A/1P	0		
		0	20A/1P	15		*		16	20A/1P	0		
		0	20A/1P	17			*	18	20A/1P	0		
		0	20A/1P	19	*			20	20A/1P	0		
		0	20A/1P	21		*		22	20A/1P	0		
		0	20A/1P	23			*	24	20A/1P	0		
		0	20A/1P	25	*			26	20A/1P	0		
		0	20A/1P	27		*		28	20A/1P	0		
		0	20A/1P	29			*	30	20A/1P	0		
		0	20A/1P	31	*			32	20A/1P	0		
		0	20A/1P	33		*		34	20A/1P	0		
		0	20A/1P	35			*	36	20A/1P	0		
		0	20A/1P	37	*			38	20A/1P	0		
		0	20A/1P	39		*		40	20A/1P	0		
		0	20A/1P	41			*	42	20A/1P	0		
CONNECTED LOAD (KW) - A Ph.		0.71								TOTAL DESIGN LOAD (KW)		2.57
CONNECTED LOAD (KW) - B Ph.		0.71								POWER FACTOR		0.80
CONNECTED LOAD (KW) - C Ph.		0.71								TOTAL DESIGN LOAD (AMPS)		4

Figure 263: Panelboard PA-PP-1 (New)

PANELBOARD SIZING WORKSHEET

Panel Tag------------------------->	-PP-1 (NE	Panel Location:	PORT AUTHORITY
Nominal Phase to Neutral Voltage------->	277	Phase:	3
Nominal Phase to Phase Voltage-------->	480	Wires:	4

Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks	
1	A	EXTERIOR FIXT.	9	SOUTH	357	w		357	446	5 B2, 2 B4	
2	A	EXTERIOR FIXT.	9	SOUTH	357	w		357	446	5 B2, 2 B4	
3	B	EXTERIOR FIXT.	9	SOUTH	357	w		357	446	3 B4, 4 B3	
4	B	EXTERIOR FIXT.	9	NORTH	357	w		357	446	5 B2, 2 B4	
5	C	EXTERIOR FIXT.	9	NORTH	357	w		357	446	5 B2, 2 B4	
6	C	EXTERIOR FIXT.	9	NORTH	357	w		357	446	3 B4, 4 B3	
7	A				0	w		0	0		
8	A				0	w		0	0		
9	B				0	w		0	0		
10	B				0	w		0	0		
11	C				0	w		0	0		
12	C				0	w		0	0		
13	A				0	w		0	0		
14	A				0	w		0	0		
15	B				0	w		0	0		
16	B				0	w		0	0		
17	C				0	w		0	0		
18	C				0	w		0	0		
19	A				0	w		0	0		
20	A				0	w		0	0		
21	B				0	w		0	0		
22	B				0	w		0	0		
23	C				0	w		0	0		
24	C				0	w		0	0		
25	A				0	w		0	0		
26	A				0	w		0	0		
27	B				0	w		0	0		
28	B				0	w		0	0		
29	C				0	w		0	0		
30	C				0	w		0	0		
31	A				0	w		0	0		
32	A				0	w		0	0		
33	B				0	w		0	0		
34	B				0	w		0	0		
35	C				0	w		0	0		
36	C				0	w		0	0		
37	A				0	w		0	0		
38	A				0	w		0	0		
39	B				0	w		0	0		
40	B				0	w		0	0		
41	C				0	w		0	0		
42	C				0	w		0	0		
PANEL TOTAL								2.1	2.7	Amps=	3.2
PHASE LOADING								kW	kVA	%	Amps
	PHASE TOTAL		A					0.7	0.9	33%	3.2
	PHASE TOTAL		B					0.7	0.9	33%	3.2
	PHASE TOTAL		C					0.7	0.9	33%	3.2
LOAD CATAGORIES				Connected			Demand				Ver. 1.04
				kW	kVA	DF	kW	kVA	PF		
1	receptacles			0.0	0.0		0.0	0.0			
2	computers			0.0	0.0		0.0	0.0			
3	fluorescent lighting			0.0	0.0		0.0	0.0			
4	HID lighting			0.0	0.0		0.0	0.0			
5	incandescent lighting			0.0	0.0		0.0	0.0			
6	HVAC fans			0.0	0.0		0.0	0.0			
7	heating			0.0	0.0		0.0	0.0			
8	kitchen equipment			0.0	0.0		0.0	0.0			
9	unassigned			2.1	2.7		2.1	2.7	0.80		
	Total Demand Loads						2.1	2.7			
	Spare Capacity			20%			0.4	0.5			
	Total Design Loads						2.6	3.2	0.80	Amps=	3.9

Default Power Factor =	0.80	
Default Demand Factor =	100	%

Figure 264: Panelboard PA-PP-1 (New)

Feeder Sizing Worksheet

Panelboard Tag	EHV-8	L-PP-8-1-(C)	P-8-2	P-8-1	PA-PP-1	P-LE-1
Panelboard Voltage	480Y/277	208Y/120	480Y/277	480Y/277	480Y/277	480Y/277
Calculated Design Load (kw)	8.15	30.91	6.11	9.77	2.57	2.11
Resultant Power Factor	0.8	0.8	0.8	0.8	0.8	0.8
Calculated Design Load (kva)	10.2	38.6	7.6	12.2	3.2	2.6
Calculated Design Load (amps)	12.3	107	9	15	4	3.2
Feeder Sizing - Method	1 - primary	1 - secondary	1 - primary	1 - primary	1 - primary	1 - primary
Sets	1	1	1	1	1	1
Wire Size						
Phase	#6	#2	#6	#6	#6	#6
Neutral	#6	#2	#6	#6	#6	#6
Ground	#10	#6	#10	#10	#10	#10
Wire Area (table 5)						
Each Phase	0.0507	0.1158	0.0507	0.0507	0.0507	0.0507
Total -Phase Conductors	0.1521	0.3474	0.1521	0.1521	0.1521	0.1521
Neutral	0.0507	0.1158	0.0507	0.0507	0.0507	0.0507
Ground	0.0211	0.0507	0.0211	0.0211	0.0211	0.0211
Total Area	0.2239	0.5139	0.2239	0.2239	0.2239	0.2239
Min. Conduit Area (above *2.5)	0.55975	1.28475	0.55975	0.55975	0.55975	0.55975
Conduit Size (Sizing Worksheet)	1.0"	1.25"	1.0"	1.0"	1.0"	1.0"
Remarks						

Based feeder sizing on:
Copper Wire, 75 degree C, THWN, maximum size 500kcmil
IMC Conduit, minimum zie 3/4"
Dry type transformers with primary and seconday feeders exceeding 25 feet, 100% neutral

Figure 265: Feeder Sizing Worksheet

EATON

July 2007

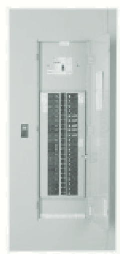
Panelboards
Pow-R-Line C Panelboards

14-23

PRL2a

Product Description

- 480Y/277 Vac maximum (125 Vdc).
- 3-phase 4-wire, 3-phase 3-wire, 1-phase 3-wire, 1-phase 2-wire.
- 400 ampere maximum mains.
- 100 ampere maximum branch breakers.
- Bolt-on branch breakers.
- Factory assembled.
- Refer to **Page 14-5** for additional Information.



Type PRL2a

Application Description

- Lighting and appliance branch panelboard.
- Fully rated or series rated.
- Interrupting ratings up to 200 kA symmetrical.
- Suitable for use as Service Entrance Equipment, when specified on the order.
- See **Pages 14-5** through **14-18** for additional information.

Standards and Certifications

- UL 67, UL 50.
- Federal Specification W-P-115c.
- Refer to **Page 14-5** for additional information.

Options and Accessories

- Refer to **Page 14-46**.

Layout and Sizing

- Refer to **Page 14-24**.

Product Selection

Formula Pricing: Base Price + Branch Circuits + Modifications = Total Price U.S. $

Table 14-22. Base Prices — PRL2a

Ampere Rating	Interrupting Rating (kA Symmetrical)			Breaker Type	Price U.S. $		
	240 Vac	480Y/277 Vac	125/250 Vdc		3-Phase 4-Wire	1-Phase 3-Wire [1], 1-Phase 2-Wire	3-Phase 3-Wire [1]
Main Lug Only							
100	—	—	—	—			
225	—	—	—	—			
400	—	—	—	—			
Main Breaker							
100	65	14	14	GHB			
100	18	14	10	EHD			
100	65	35	10	FD			
100	100	65	22	HFD			
100	200	100	22	FDC			
225	65	—	—	ED			
225	65	35	10	FD			
225	100	65	22	HFD			
225	200	100	22	FDC			
250	65	35	10	JD			
250	100	65	22	HJD			
250	200	100	22	JDC			
400	65	35	10	KD			
400	100	65	22	HKD			
400	200	100	22	KDC			

[1] These system voltages apply only to 240 volts.

Table 14-23. Branch Circuit Breakers — PRL2a

Ampere Rating	Interrupting Rating (kA Symmetrical)			Breaker Type	Price U.S. $		
	240 Vac [2]	480Y/277 Vac	125/250 Vdc		1-Pole	2-Pole	3-Pole
15 – 20	65	14	—	GHQ [3]			
15 – 20	65	14	14	GHB [3]			
25 – 60	65	14	14	GHB [3]			
70 – 100	65	14	14	GHB [3]			
15 – 30	65	25	—	HGHB [3]			
15 – 20	65	14	—	GHQRSP [4]			
15 – 30	65	14	—	GHBS [3][4]			
15 – 60	—	14	—	GHBGFEP [3][5]			
15 – 20	—	14	—	GHBHID [3][6]			
Provision	—	—	—	—			

[2] Interrupting ratings in this column are applicable to 120 Vac for 1-pole breakers.
[3] At 480 volts, must be used on 480Y/277 volts grounded wye systems only.
[4] Solenoid operated breaker.
[5] GFP for 30 mA equipment protection. Requires 2-pole spaces. 277 Vac only.
[6] HID (High Intensity Discharge) rated breaker.

14

Discount Symbol **CE9**

CA08101001E

For more information visit: **www.eaton.com**

Figure 266: 100 Amp Panelboard Specification Sheet

Box Sizing and Selection

Assembled Circuit Breaker Panelboards

Box size and box and trim catalog numbers for all standard panelboard types are found in **Table 14-24**.

Instructions

1. Using description of the required panelboard, select the rating and type of main required.
2. Count the total number of branch circuit poles, including provisions, required in the panelboard. Do not count main breaker poles. Convert 2- or 3-pole branch breaker to single-poles, i.e., 3-pole breaker, count as 3 poles.

   Determine sub-feed breaker or through-feed lug requirements.
3. Select the main ampere rating section from **Table 14-24**.
4. Select panelboard type from first column, main breaker frame, if applicable, from second column, and sub-feed breaker frame, if applicable, from the third column.
5. From Step #2, determine the number of branch circuits in Column 4.
6. Read box size, box and trim catalog numbers across columns to the right. Specify surface or flush mounting on the order.

Cabinets

Fronts are code-gauge steel, ANSI-61 light gray painted finish.

Boxes are code-gauge galvanized steel without knockouts. Standard depth is 5-3/4 inches (146.1 mm). Standard width is 20 inches (508.0 mm). An optional 28-inch (711.2 mm) wide box is available.

Top and Bottom Gutters

5-1/2 inches (139.7 mm) minimum.

Table 14-24. PRL2a Panelboard Sizing

Panelboard Types	Main Breaker Types & Mounting Position (H) = Horiz. (V) = Vert.	Sub-Feed Breaker Types & Mounting Position (H) = Horiz. (V) = Vert.	Maximum No. of Branch Circuits Including Provisions	Box Dimensions Inches ①② H	W	D	YS Box Catalog Number	LT Trim Catalog Number	EZ Box Catalog Number	EZ Trim Catalog Number
100 Ampere Maximum										
Main Breaker	BAB, QBHW (H)	—	15	36.00	20.00	5.75	**YS2036**	**LT2036S or F**	**EZB2036R**	**EZT2036S or F**
		—	27	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
		—	39	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
		—	42	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
Main Lugs or Main Breaker	EHD FD, HFD (V)	—	18	36.00	20.00	5.75	**YS2036**	**LT2036S or F**	**EZB2036R**	**EZT2036S or F**
		—	30	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
		—	42	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
Main Lugs or Main Breaker with 100 A Thru-Feed Lugs or Sub- Feed Breaker	EHD FD HFD (V)	EHD FD HFD (V)	18	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
			30	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
			42	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
225 Ampere Maximum										
Main Lugs or Main Breaker	EDB, EDS, ED, EDH, FD, HFD (V)	—	18	36.00	20.00	5.75	**YS2036**	**LT2036S or F**	**EZB2036R**	**EZT2036S or F**
		—	30	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
		—	42	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
	JD, HJD JDC (V)	—	18	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
		—	30	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
		—	42	72.00	20.00	5.75	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
Main Lugs or Main Breaker with 225 A Thru-Feed Lugs or Sub-Feed Breaker	EHD, FD, HFD, EDB, EDS, ED, EDH (V)	EHD, FD, HFD, EDB, EDS, ED, EDH (V)	18	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
			30	48.00	20.00	5.75	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
			42	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
	JD, HJD JDC (V)	EHD, FD, HFD, EDB, EDS, ED, EDH (V)	18	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
			30	72.00	20.00	5.75	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
			42	72.00	20.00	5.75	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
400 Ampere Maximum										
Main Lugs or Main Breaker	DK, KD, HKD, KDC (V)	—	18	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
		—	30	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
		—	42	72.00	20.00	5.75	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
Main Lugs or Main Breaker with 225 A Thru-Feed Lugs or Sub- Feed Breaker	DK, KD, HKD, KDC (V)	EHD, FD, HFD, EDB, EDS, ED, EDH (V)	18	60.00	20.00	5.75	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
			30	72.00	20.00	5.75	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
			42	72.00	20.00	5.75	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
Main Lugs or Main Breaker with 400 A Thru-Feed Lugs or Sub- Feed Breaker	DK, KD, HKD, KDC (V)	JD, HJD, JDC, DK, KD, HKD, KDC (V)	18	72.00	20.00	5.75	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
			30	90.00	20.00	5.75	**YS2090**	**LT2090S or F**	**EZB2090R**	**EZT2090S or F**
			42	90.00	20.00	5.75	**YS2090**	**LT2090S or F**	**EZB2090R**	**EZT2090S or F**

① Metric box dimensions:

Catalog Number		Dimensions in mm		
YS Box	**EZ Box**	**Height**	**Width**	**Depth**
YS2036	**EZB2036R**	914.4	508.0	146.1
YS2048	**EZB2048R**	1219.2	508.0	146.1
YS2060	**EZB2060R**	1524.0	508.0	146.1
YS2072	**EZB2072R**	1828.8	508.0	146.1
YS2090	**EZB2090R**	2286.0	508.0	146.1

② Smaller panelboard box sizes are available if required. Contact Eaton for application information.

Figure 267: 100 Amp Panelboard Specification Sheet Continued

EATON

July 2007

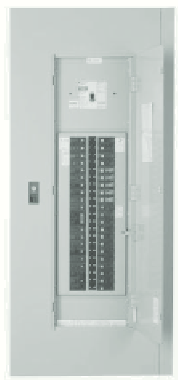
Panelboards
Pow-R-Line C Panelboards

14-21

PRL1a

Product Description

- 240 Vac maximum.
- 3-phase 4-wire, 3-phase 3-wire, 1-phase 3-wire, 1-phase 2-wire.
- 400 ampere maximum mains.
- 100 ampere maximum branch breakers.
- Bolt-on or plug-on branch breakers.
- Factory assembled.
- Refer to **Page 14-5** for additional information.



Type PRL1a

Application Description

- Lighting and appliance branch panelboard.
- Fully rated or series rated.
- Interrupting ratings up to 200 kA symmetrical.
- Suitable for use as Service Entrance Equipment, when specified on the order.
- See **Pages 14-5** through **14-18** for additional information.

Standards and Certifications

- UL 67, UL 50.
- Federal Specification W-P-115c.
- Refer to **Page 14-5** for additional information.

Options and Accessories

- Refer to **Page 14-46.**

Layout and Sizing

- Refer to **Page 14-22.**

Product Selection

Formula Pricing: Base Price + Branch Circuits + Modifications = Total Price U.S. $

Table 14-19. Base Prices — PRL1a

Ampere Rating	Interrupting Rating (kA Sym.) 240 Vac	Breaker Type	Price U.S. $		
			3-Phase 4-Wire	1-Phase 3-Wire, 1-Phase 2-Wire	3-Phase 3-Wire
Main Lug Only					
100	—	—			
225	—	—			
400	—	—			
Main Breaker					
100	10	BAB			
100	18	EHD			
100	22	QBHW			
100	22	EDB			
100	42	EDS			
100	65	ED			
100	65	FD			
100	100	EDH			
100	100	HFD			
225	22	EDB			
225	42	EDS			
225	65	ED			
225	100	EDH			
250	65	JD			
250	100	HJD			
250	200	JDC			
400	65	DK			
400	65	KD			
400	100	HKD			
400	200	KDC			

Table 14-20. Branch Circuit Breakers — PRL1a

Bolt-on = BAB, QBHW, QBGF, QBHGF, QBGFEP, QBHGFEP, QBAF, QBAG, QBHAF, QBHAG
Plug-on = HQP, QPHW, QPGF, QPHGF, QPGFEP, QPHGFEP

Ampere Rating	Interrupting Rating (kA Sym.) 240 Vac ①	Breaker Type	Price U.S. $			
			1-Pole 120 V	2-Pole 120/240 V	2-Pole 240 V ②	3-Pole 240 V
15 – 60	10	BAB, HQP				
70	10	BAB, HQP				
80 – 100	10	BAB, HQP				
15 – 50 ③	10	QBGF, QPGF ④				
15 – 50 ③	10	QBGFEP, QPGFEP ⑤				
15 – 20	10	QBAF ⑥				
15 – 20	10	QBAG ⑦				
15 – 60	10	BAB-D, HQP-D ⑧				
15 – 30	10	BAB-C, HQP-B ⑧				
15 – 30	10	BABRP ⑩				
15 – 30	10	BABRSP ⑩				
15 – 60	22	QBHW, QPHW				
70	22	QBHW, QPHW				
80 – 100	22	QBHW, QPHW				
15 – 30	22	QBHGF, QPHGF ④				
15 – 30	22	QBHGFEP, QPHGFEP ⑤				
15 – 20	22	QBHAF ⑥				
15 – 20	22	QBHAG ⑦				
Provision	—	—				

① 1-pole breakers are rated 120 Vac maximum.
② 240 volt breakers must be used on 3-phase, 3-wire, 240 volt delta systems or on the high leg of a midpoint delta grounded system.
③ 50 ampere devices are available as 2-pole only.
④ GFCI for 5 mA personnel protection.
⑤ GFP for 30 mA equipment protection.
⑥ Arc fault circuit breaker.
⑦ Arc fault circuit breaker with GFCI.
⑧ HID (High Intensity Discharge) rated breaker.
⑨ Switching Neutral Breaker. 1-pole device requires 2-pole space, 2-pole device requires 3-pole space.
⑩ Solenoid operated breaker.

Discount Symbol **CE9**

CA08101001E

For more information visit: **www.eaton.com**

14

Figure 268: 225 Amp Panelboard Specification Sheet

14-22 **Panelboards**
Pow-R-Line C Panelboards

PRL1a

EATON

July 2007

Box Sizing and Selection

Assembled Circuit Breaker Panelboards

Box size and box and trim catalog numbers for all standard panelboard types are found in **Table 14-21.**

Instructions

1. Using description of the required panelboard, select the rating and type of main required.
2. Count the total number of branch circuit poles, including provisions, required in the panelboard. Do not count main breaker poles. Convert 2- or 3-pole branch breaker to single-poles, i.e., 3-pole breaker, count as 3 poles.
   Determine sub-feed breaker or through-feed lug requirements.
3. Select the main ampere rating section from **Table 14-21.**
4. Select panelboard type from first column, main breaker frame, if applicable, from second column, and sub-feed breaker frame, if applicable, from the third column.
5. From Step #2, determine the number of branch circuits in Column 4.
6. Read box size, box and trim catalog numbers across columns to the right. Specify surface or flush mounting on the order.

Cabinets

Fronts are code-gauge steel, ANSI-61 light gray painted finish.

Boxes are code-gauge galvanized steel without knockouts. Standard depth is 5-3/4 inches (146.1 mm). Standard width is 20 inches (508.0 mm). An optional 28-inch (711.2 mm) wide box is available.

Top and Bottom Gutters

5-1/2 inches (139.7 mm) minimum.

14

Table 14-21. PRL1a Panelboard Sizing

Panelboard Types	Main Breaker Types & Mounting Position (H) = Horiz. (V) = Vert.	Sub-Feed Breaker Types & Mounting Position (H) = Horiz. (V) = Vert.	Maximum No. of Branch Circuits Including Provisions	Box Dimensions Inches ①②			YS Box Catalog Number	LT Trim Catalog Number	EZ Box Catalog Number	EZ Trim Catalog Number
				H	W	D				
100 Ampere Maximum										
Main Breaker	BAB, QBHW (H)	— — — —	15 27 39 42	36.00 48.00 48.00 60.00	20.00 20.00 20.00 20.00	5.75 5.75 5.75 5.75	YS2036 YS2048 YS2048 YS2060	LT2036S or F LT2048S or F LT2048S or F LT2060S or F	EZB2036R EZB2048R EZB2048R EZB2060R	EZT2036S or F EZT2048S or F EZT2048S or F EZT2060S or F
Main Lugs or Main Breaker	EHD FD, HFD (V)	— — —	18 30 42	36.00 48.00 48.00	20.00 20.00 20.00	5.75 5.75 5.75	YS2036 YS2048 YS2048	LT2036S or F LT2048S or F LT2048S or F	EZB2036R EZB2048R EZB2048R	EZT2036S or F EZT2048S or F EZT2048S or F
Main Lugs or Main Breaker with 100 A Thru-Feed Lugs or Sub- Feed Breaker	EHD FD HFD (V)	EHD FD HFD (V)	18 30 42	48.00 48.00 60.00	20.00 20.00 20.00	5.75 5.75 5.75	YS2048 YS2048 YS2060	LT2048S or F LT2048S or F LT2060S or F	EZB2048R EZB2048R EZB2060R	EZT2048S or F EZT2048S or F EZT2060S or F
225 Ampere Maximum										
Main Lugs or Main Breaker	EDB, EDS, ED, EDH, FD, HFD (V)	— — —	18 30 42	36.00 48.00 48.00	20.00 20.00 20.00	5.75 5.75 5.75	YS2036 YS2048 YS2048	LT2036S or F LT2048S or F LT2048S or F	EZB2036R EZB2048R EZB2048R	EZT2036S or F EZT2048S or F EZT2048S or F
	JD, HJD JDC (V)	— — —	18 30 42	60.00 60.00 72.00	20.00 20.00 20.00	5.75 5.75 5.75	YS2060 YS2060 YS2072	LT2060S or F LT2060S or F LT2072S or F	EZB2060R EZB2060R EZB2072R	EZT2060S or F EZT2060S or F EZT2072S or F
Main Lugs or Main Breaker with 225 A Thru-Feed Lugs or Sub-Feed Breaker	EHD, FD, HFD, EDB, EDS, ED, EDH (V)	EHD, FD, HFD, EDB, EDS, ED, EDH (V)	18 30 42	48.00 48.00 60.00	20.00 20.00 20.00	5.75 5.75 5.75	YS2048 YS2048 YS2060	LT2048S or F LT2048S or F LT2060S or F	EZB2048R EZB2048R EZB2060R	EZT2048S or F EZT2048S or F EZT2060S or F
	JD, HJD JDC (V)	EHD, FD, HFD, EDB, EDS, ED, EDH (V)	18 30 42	60.00 72.00 72.00	20.00 20.00 20.00	5.75 5.75 5.75	YS2060 YS2072 YS2072	LT2060S or F LT2072S or F LT2072S or F	EZB2060R EZB2072R EZB2072R	EZT2060S or F EZT2072S or F EZT2072S or F
400 Ampere Maximum										
Main Lugs or Main Breaker	DK, KD, HKD, KDC (V)	— — —	18 30 42	60.00 60.00 72.00	20.00 20.00 20.00	5.75 5.75 5.75	YS2060 YS2060 YS2072	LT2060S or F LT2060S or F LT2072S or F	EZB2060R EZB2060R EZB2072R	EZT2060S or F EZT2060S or F EZT2072S or F
Main Lugs or Main Breaker with 225 A Thru-Feed Lugs or Sub- Feed Breaker	DK, KD, HKD, KDC (V)	EHD, FD, HFD, EDB, EDS, ED, EDH (V)	18 30 42	60.00 72.00 72.00	20.00 20.00 20.00	5.75 5.75 5.75	YS2060 YS2072 YS2072	LT2060S or F LT2072S or F LT2072S or F	EZB2060R EZB2072R EZB2072R	EZT2060S or F EZT2072S or F EZT2072S or F
Main Lugs or Main Breaker with 400 A Thru-Feed Lugs or Sub- Feed Breaker	DK, KD, HKD, KDC (V)	JD, HJD, JDC, DK, KD, HKD, KDC (V)	18 30 42	72.00 90.00 90.00	20.00 20.00 20.00	5.75 5.75 5.75	YS2072 YS2090 YS2090	LT2072S or F LT2090S or F LT2090S or F	EZB2072R EZB2090R EZB2090R	EZT2072S or F EZT2090S or F EZT2090S or F

① Metric box dimensions:

Catalog Number		Dimensions in mm		
YS Box	EZ Box	Height	Width	Depth
YS2036	EZB2036R	914.4	508.0	146.1
YS2048	EZB2048R	1219.2	508.0	146.1
YS2060	EZB2060R	1524.0	508.0	146.1
YS2072	EZB2072R	1828.8	508.0	146.1
YS2090	EZB2090R	2286.0	508.0	146.1

② Smaller panelboard box sizes are available if required. Contact Eaton for application information.

For more information visit: **www.eaton.com** CA08101001E

Figure 269: 225 Amp Panelboard Specification Sheet Continued

LIGHTING CONTROL PANEL SYSTEMS | LP8 Peanut Panel

LP8 Peanut Lighting Control Panels

Simple and effective interior and exterior lighting control

Controls up to eight single-pole lighting circuits

Easy user interface with on-screen help

Compatible with AS-100 Automatic Control Switches for local override control

System clock provides time scheduled or astronomic control

PROJECT

LOCATION/TYPE

Product Overview

Description

WattStopper's LP8 Peanut Lighting Control Panels provide simple, effective zone-based control of exterior and interior lighting in small applications. Panels control up to eight channels or zones of lighting. Zones respond to control signals from the system clock (or other signalling device) to turn lighting on and off. LP8 Panels ship pre-assembled in easy-to-install compact packages available for surface and flush mounting. They consist of relays, a system clock, panel intelligence, power supply, tub and cover. The standard enclosure is NEMA 1-rated.

Operation

For exterior applications, the system clock provides astronomic control (based on sunrise and sunset), or an optional EM Photocell can be added for light-level control. For interior applications, AS-100 Automatic Control Switches or low voltage switches can automate after-hours lighting shutoff while providing manual override control.

System Clock

The LP8 system clock provides automation and features a seven-day format with holiday scheduling. Set-up and programming is simple with an easy-to-navigate keypad, backlit LCD and user-friendly help menus. Preprogrammed control scenarios include: scheduled-on/off and manual-on/scheduled-off. Manual-on/sweep-off is available with an AS-100 switch. Astronomic or photocell on/off, and astronomic or photocell with schedule on/off available by adding an EM Photocell.

Applications

LP8 Panels save energy by turning lights off when not needed, while providing a secure illuminated space when occupants are present. They are ideal for areas with less than eight loads and a small amount of zones in both interior (i.e., small offices or retail facilities and elevator lobbies) and exterior (i.e., small parking lots, courtyards and driveways) applications. LP8 Panels integrate with a wide range of control devices, such as switches and occupancy sensors to create a flexible lighting shutoff strategy.

Features

- Preprogrammed control scenarios; seven-day format with holiday scheduling, astronomic control and automatic daylight savings
- Time retained during power outage; nonvolatile program memory
- Eight universal switch inputs for low voltage switches, occupancy sensors, photocells or other devices to directly control each relay
- Pushbuttons for manual override of each relay
- Uses individually replaceable HDR5P Mechanically Latching Relay with integral manual override
- Optional group of eight switch inputs for pushbutton grouping of relays (Smartwiring™)
- LED for visual indication of relay status
- Accepts most types of switch inputs
- Separate high voltage and low voltage sections for user protection

WattStopper
www.wattstopper.com
800.879.8585

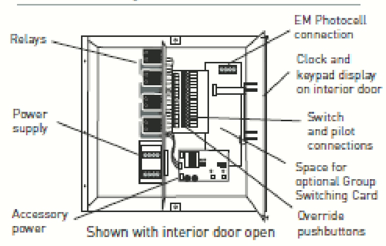
Figure 270: Exterior Lighting Contol Panelboard Specification Sheet

Specifications

- Multiple power supplies available: 115/277 VAC, 220-240 VAC, 115/347 VAC; 50/60 Hz
- Relay: Mechanically latching
  - Integral manual override
  - Individually replaceable
  - Ratings: 20 Amp tungsten @ 120 VAC
    - 30 Amp ballast @ 277 VAC
    - 20 Amp ballast @ 347 VAC
    - 30 Amp resistive @ 347 VAC
    - 1.5 hp @ 120 VAC
- Accessory power 800 mA at 24 VDC/VAC/VACR
- Eight universal switch inputs; compatible with 3-wire momentary or maintained, 2-wire momentary or maintained, or 24 VDC input
- Eight universal group switch inputs that allow pushbutton grouping of relays (optional)
- Ambient temperature 32-139°F (0-60°C); 5-95% RH noncondensing
- Dimensions: 15.08" x 16.5" x 4.62" (383.0mm x 419.1mm x 117.3mm) L x W x D
- UL and CUL listed; one-year warranty

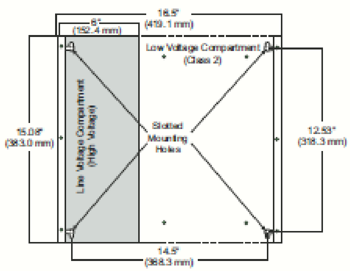
Wiring & Installation

LP8 Panel Layout



Shown with interior door open

LP8 Dimensions



Ordering Information

Catalog No.	Description	Door Mounting	# Relays	Group Switching Card	Voltage
☐ LP8S-8-115	LP8 Peanut Lighting Control Panel	Surface	8 Relays	none	115/277 VAC
☐ LP8S-8-G-115	LP8 Peanut Lighting Control Panel	Surface	8 Relays	included	115/277 VAC
☐ LP8F-8-115	LP8 Peanut Lighting Control Panel	Flush	8 Relays	none	115/277 VAC
☐ LP8F-8-G-115	LP8 Peanut Lighting Control Panel	Flush	8 Relays	included	115/277 VAC
☐ LP8S-4-115	LP8 Peanut Lighting Control Panel	Surface	4 Relays	none	115/277 VAC
☐ LP8F-4-115	LP8 Peanut Lighting Control Panel	Flush	4 Relays	none	115/277 VAC
☐ LP8S-8-347	LP8 Peanut Lighting Control Panel	Surface	8 Relays	none	115/347 VAC
☐ LP8S-8-G-347	LP8 Peanut Lighting Control Panel	Surface	8 Relays	included	115/347 VAC
☐ LP8F-8-347	LP8 Peanut Lighting Control Panel	Flush	8 Relays	none	115/347 VAC
☐ LP8F-8-G-347	LP8 Peanut Lighting Control Panel	Flush	8 Relays	included	115/347 VAC
☐ LP8S-8-240	LP8 Peanut Lighting Control Panel	Surface	8 Relays	none	240 VAC
☐ LP8S-8-G-240	LP8 Peanut Lighting Control Panel	Surface	8 Relays	included	240 VAC
☐ LP8F-8-240	LP8 Peanut Lighting Control Panel	Flush	8 Relays	none	240 VAC
☐ LP8F-8-G-240	LP8 Peanut Lighting Control Panel	Flush	8 Relays	included	240 VAC
Optional system enhancements:					
☐ EM-24A2	Exterior Photocell, low voltage				24VAC
☐ AS-100-W	Automatic Control Switch, White				120/277 VAC, 50/60 Hz
☐ AS-100-A	Automatic Control Switch, Light Almond				120/277 VAC, 50/60 Hz
☐ AS-100-I	Automatic Control Switch, Ivory				120/277 VAC, 50/60 Hz

Pub. No. 15106 rev 11/2009

www.wattstopper.com | 800.879.8585

LIGHTING CONTROL PANELSSYSTEMS | LP Peanut Panel

Figure 271: Exterior Lighting Control Panelboard Specfication Sheet Continued

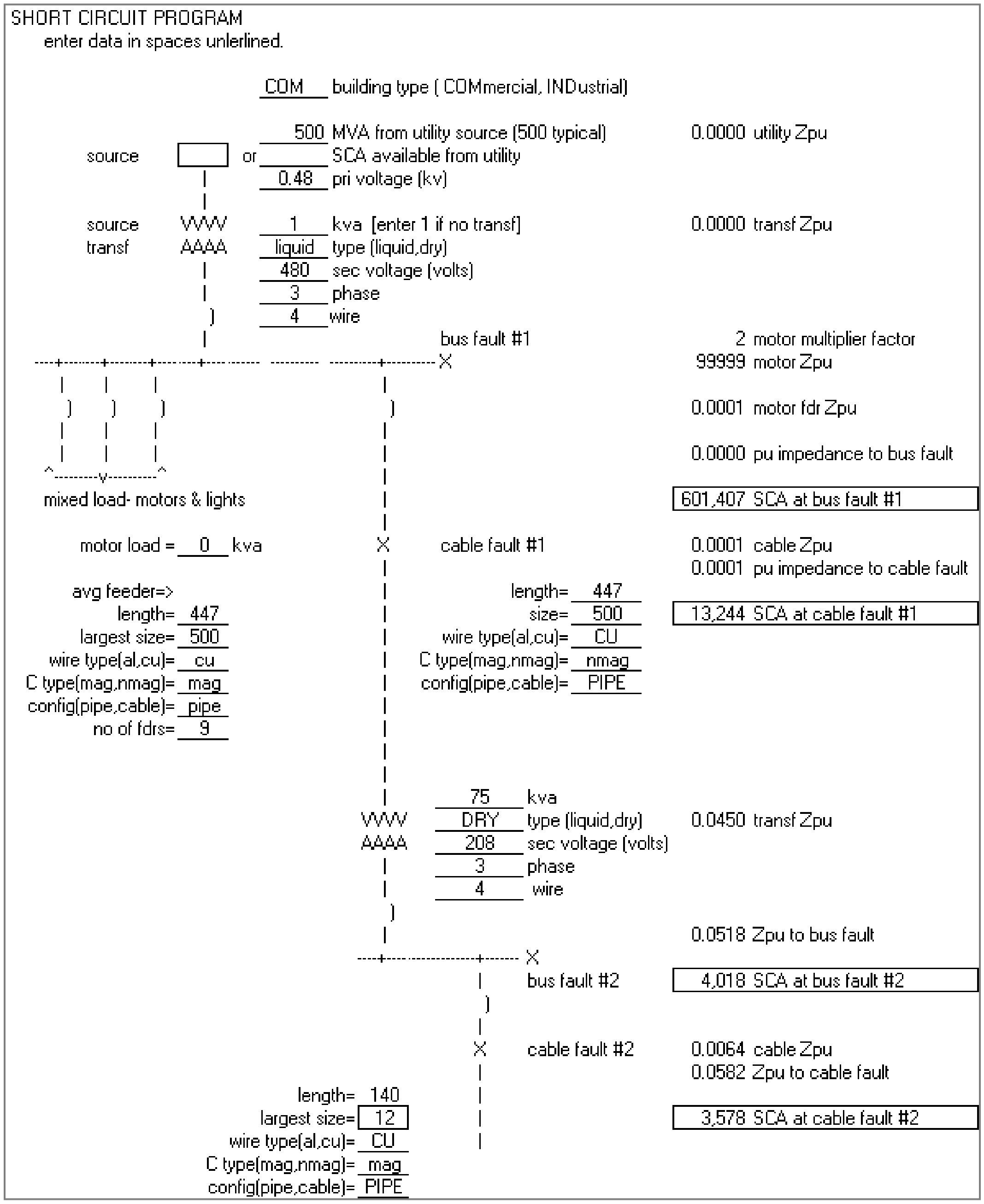


Figure 272: Short Circuit Analysis

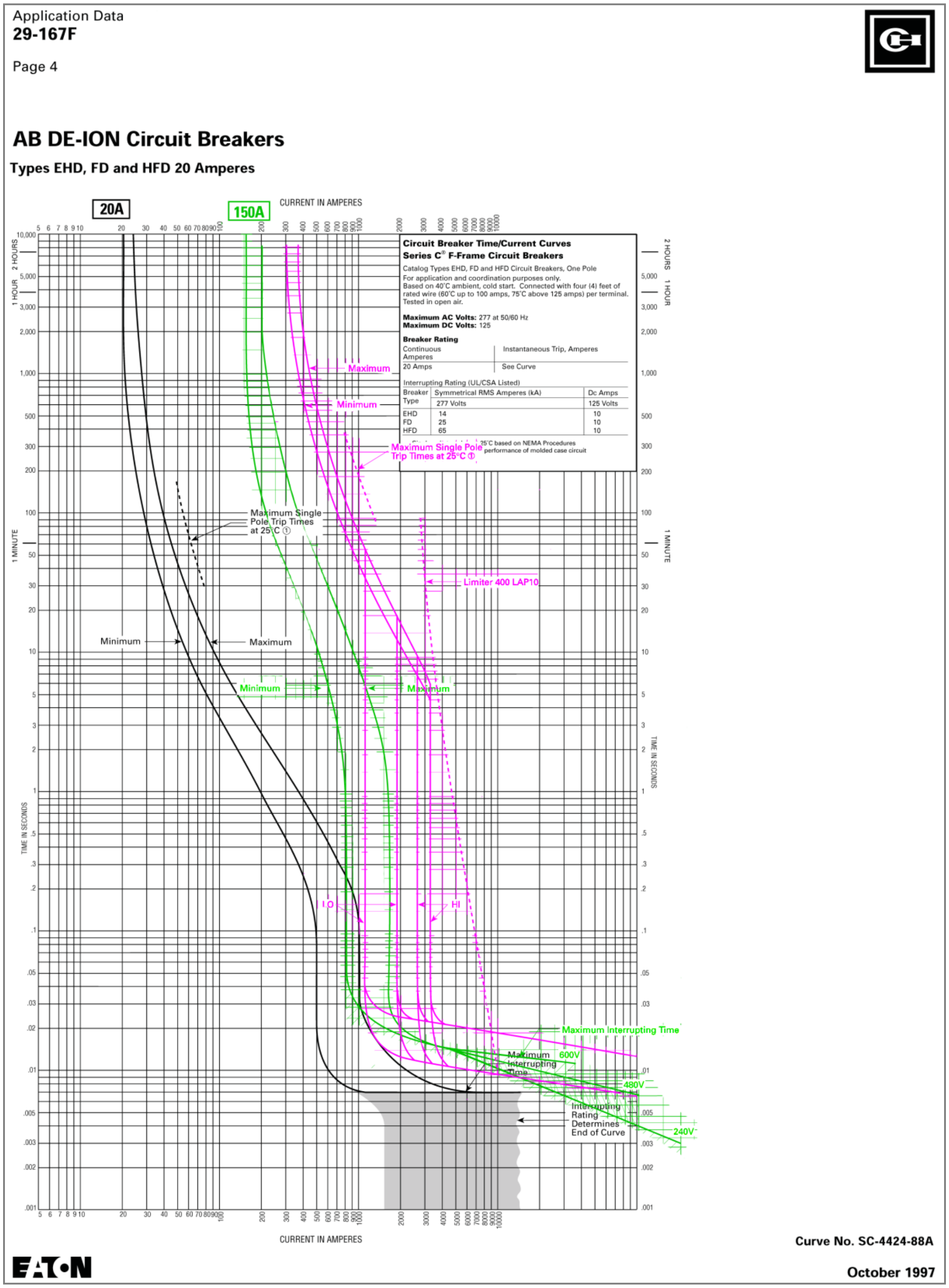


Figure 273: Selective Coordination of a 20 amp, a 150 amp, and a 300 amp breaker

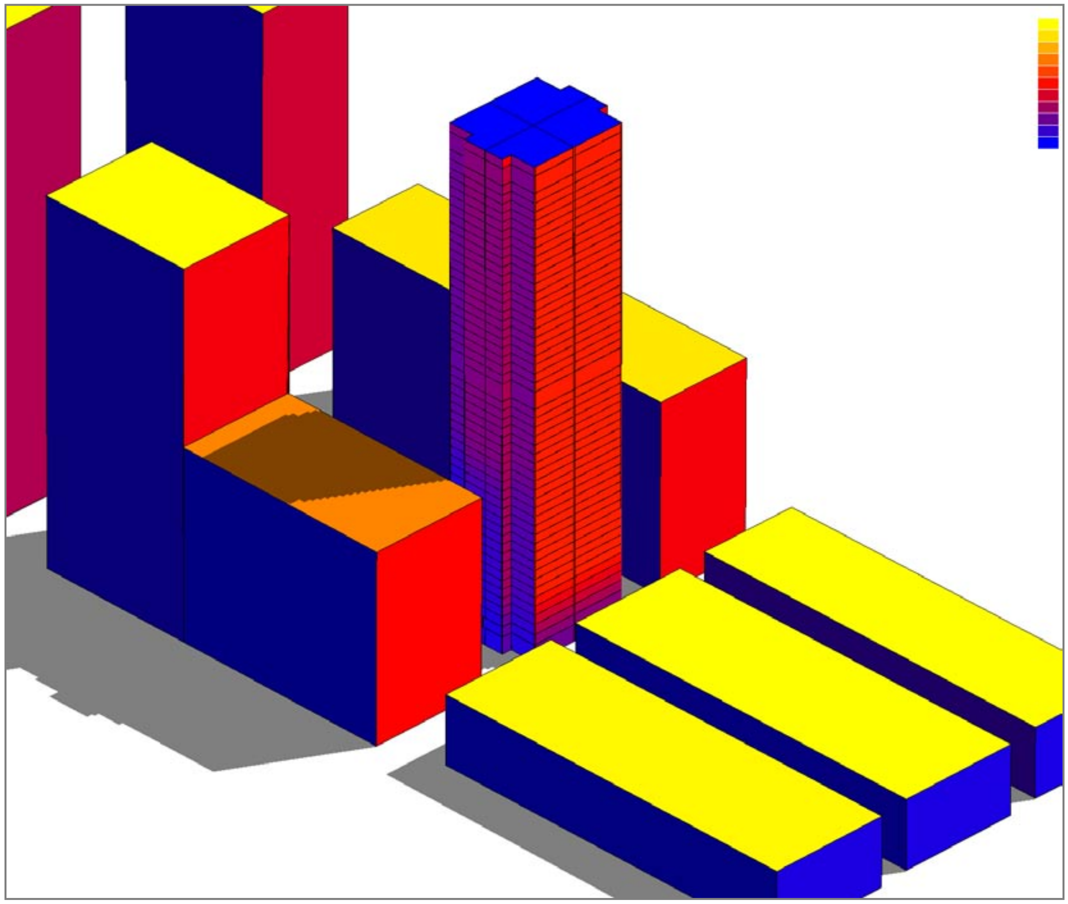


Figure 274: Incident Solar Radiation from Ecotect (NW Isometric)

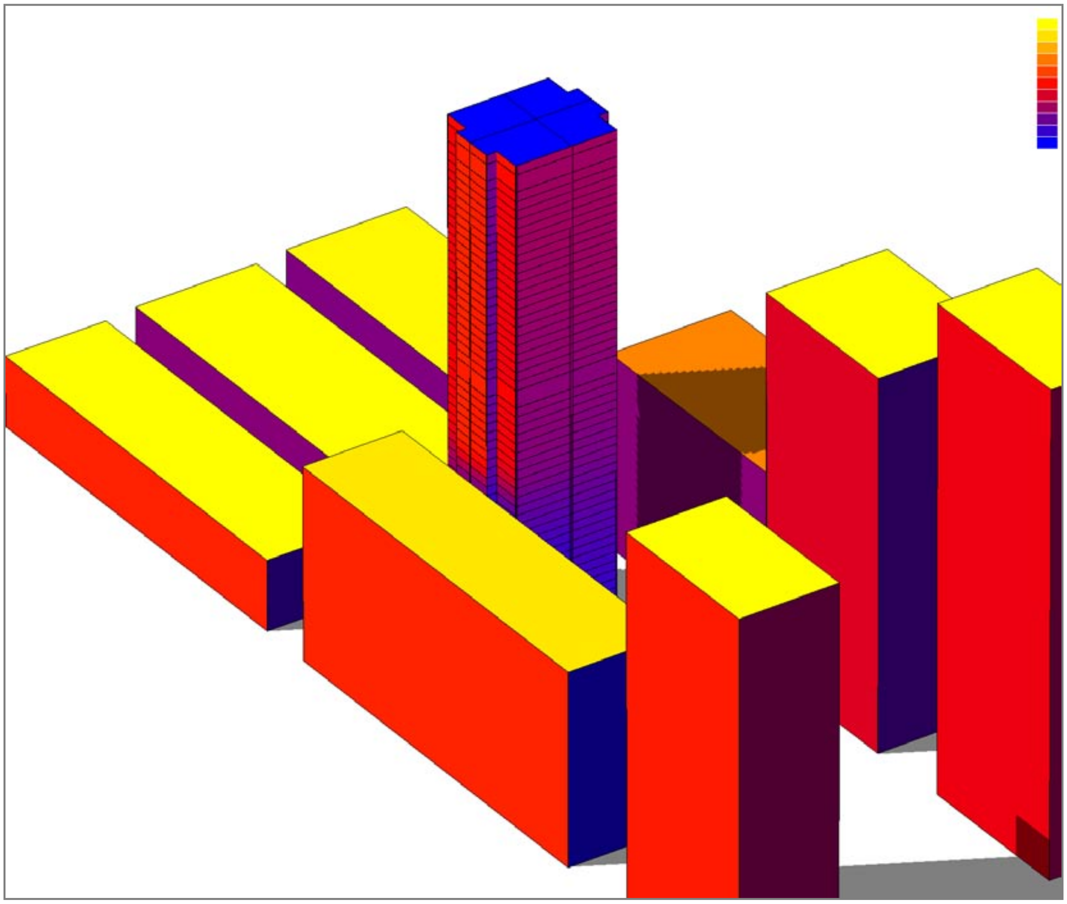


Figure 275: Incident Solar Radiation from Ecotect (SE Isometric)

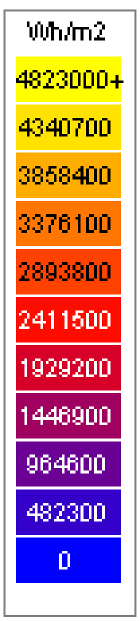


Figure 276: Incident Solar Radiation Scale from Ecotect

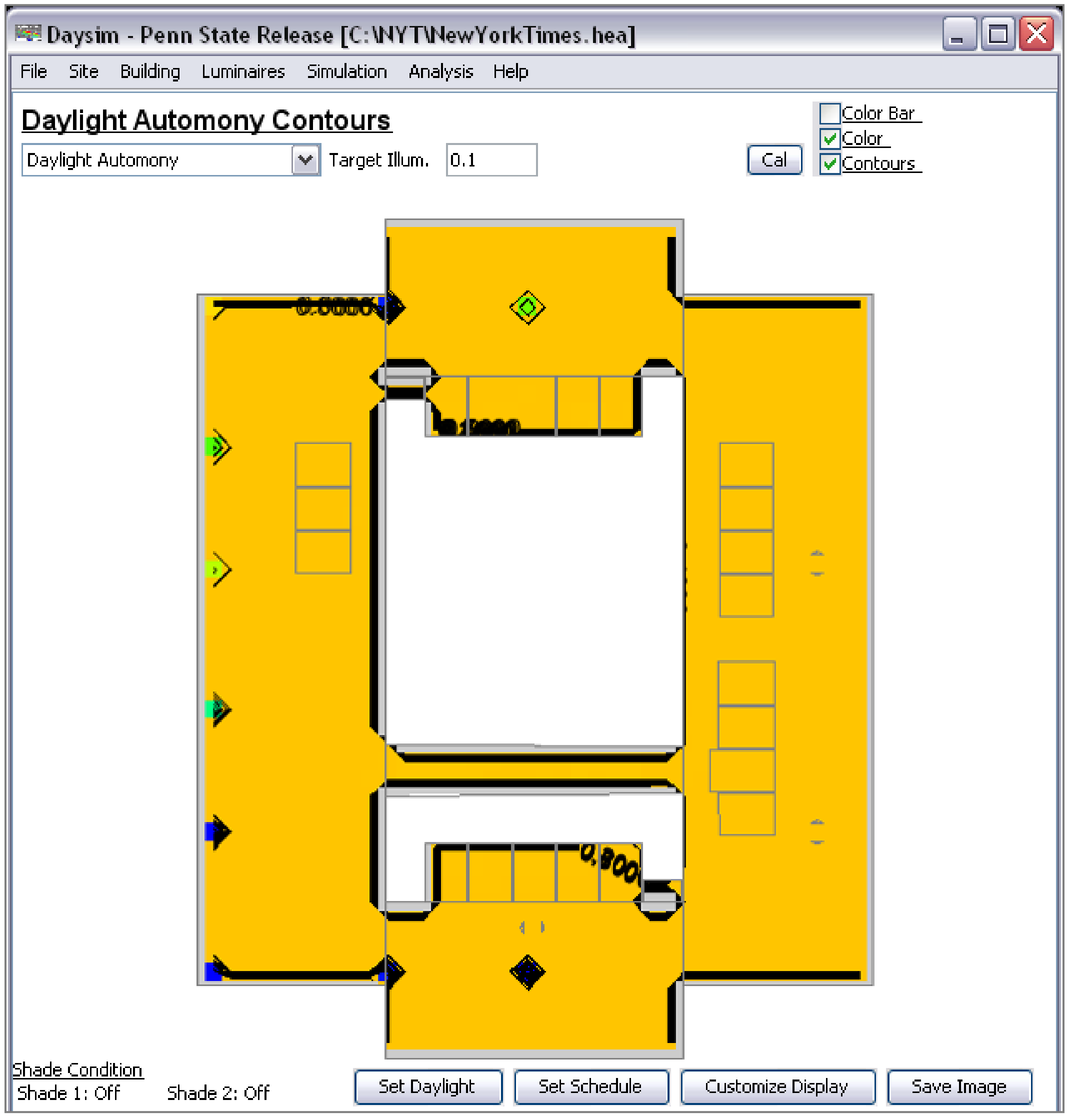


Figure 277: Daylight Autonomy Screen at 0 Lux Target Illuminance

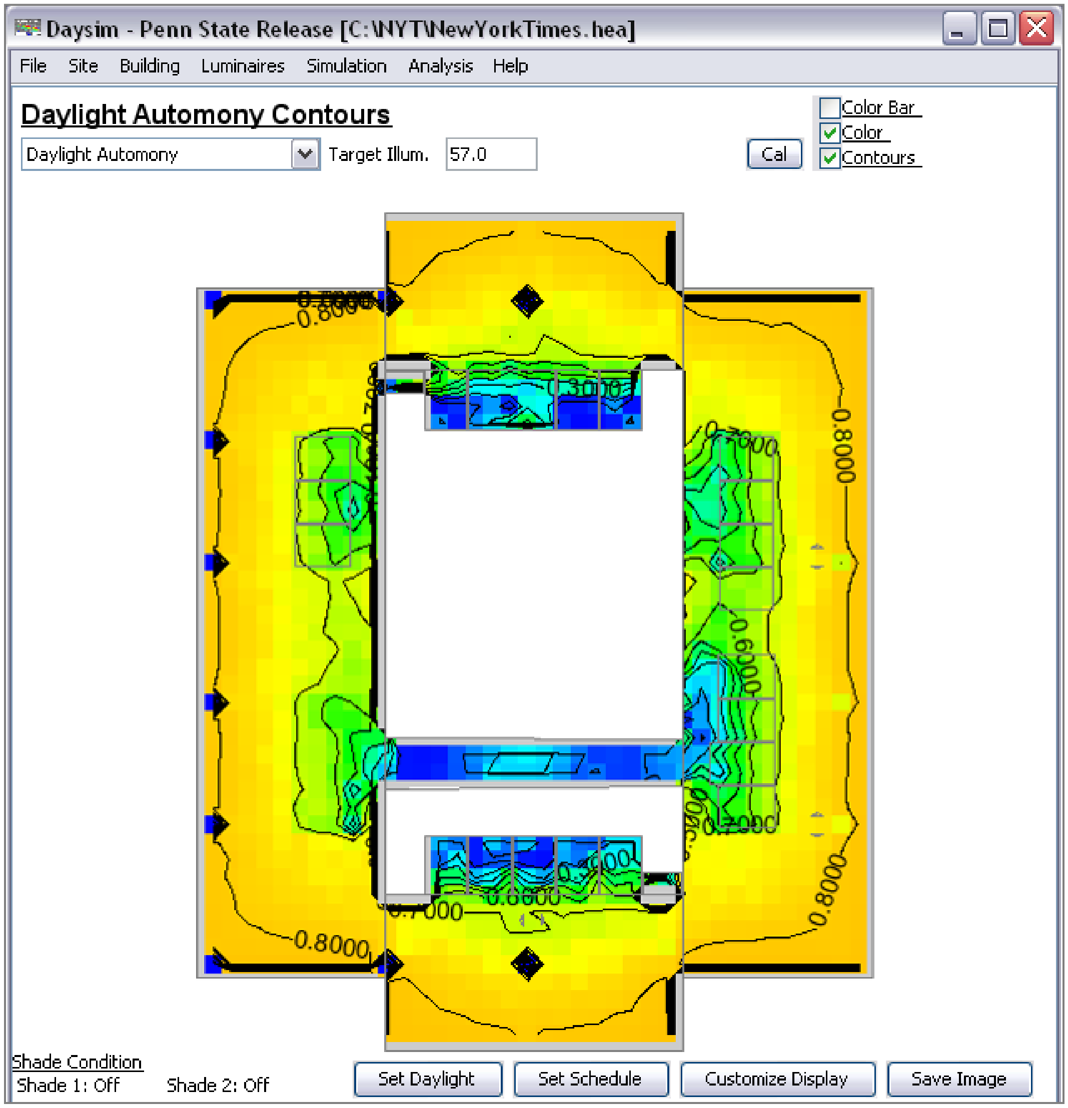


Figure 278: Daylight Autonomy Screen at 57 Lux Target Illuminance

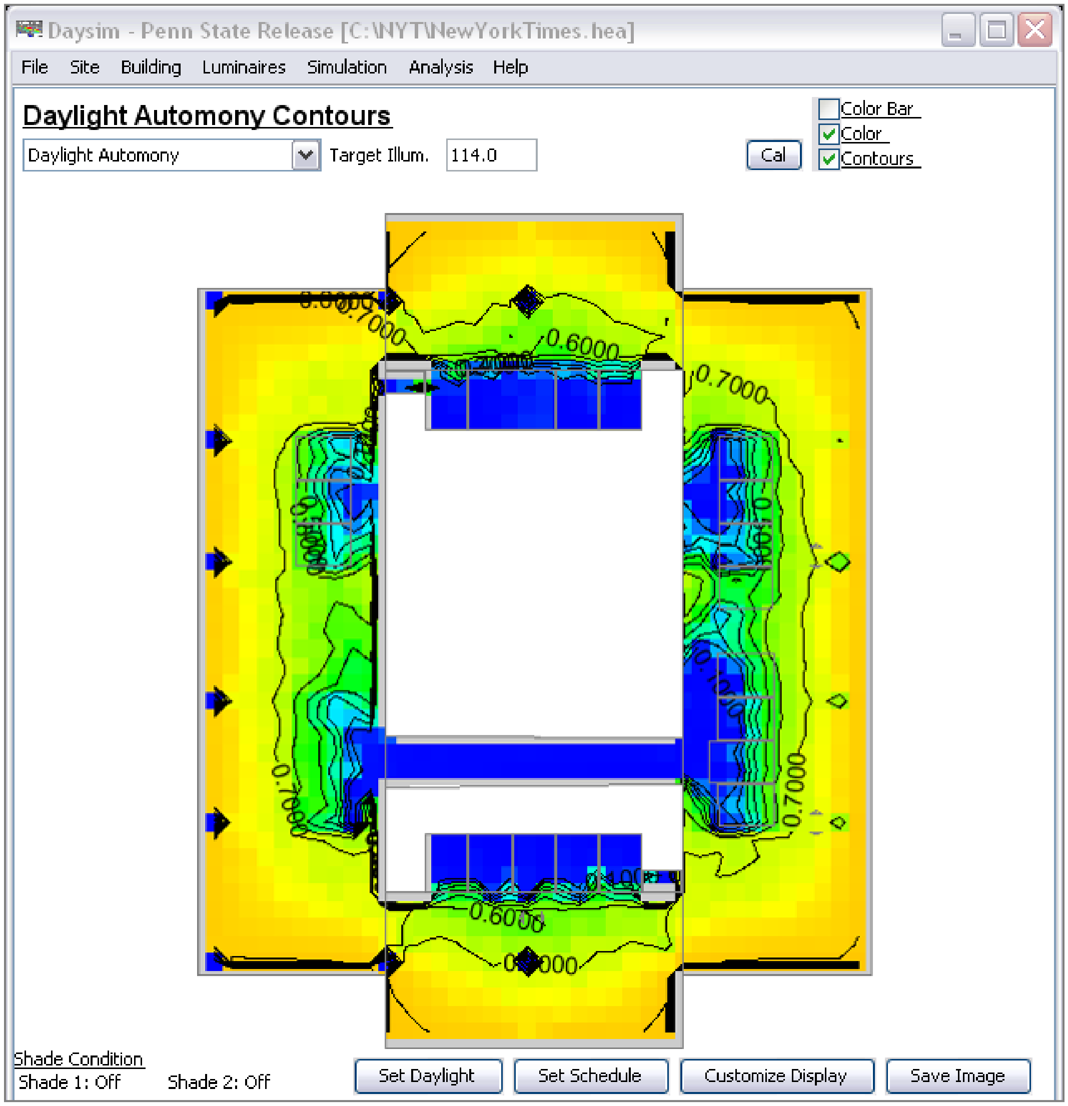


Figure 279: Daylight Autonomy Screen at 114 Lux Target Illuminance

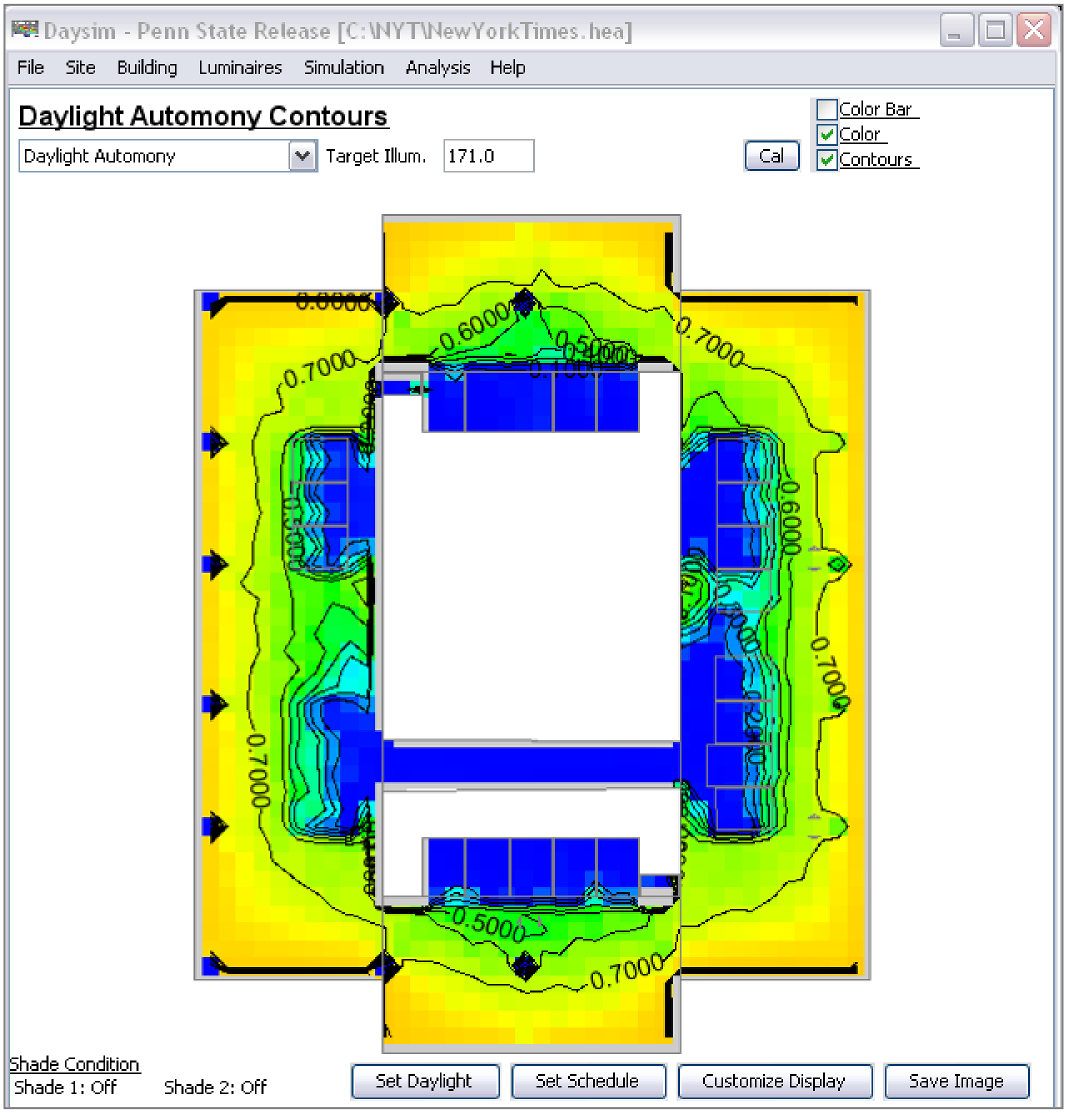


Figure 280: Daylight Autonomy Screen at 171 Lux Target Illuminance

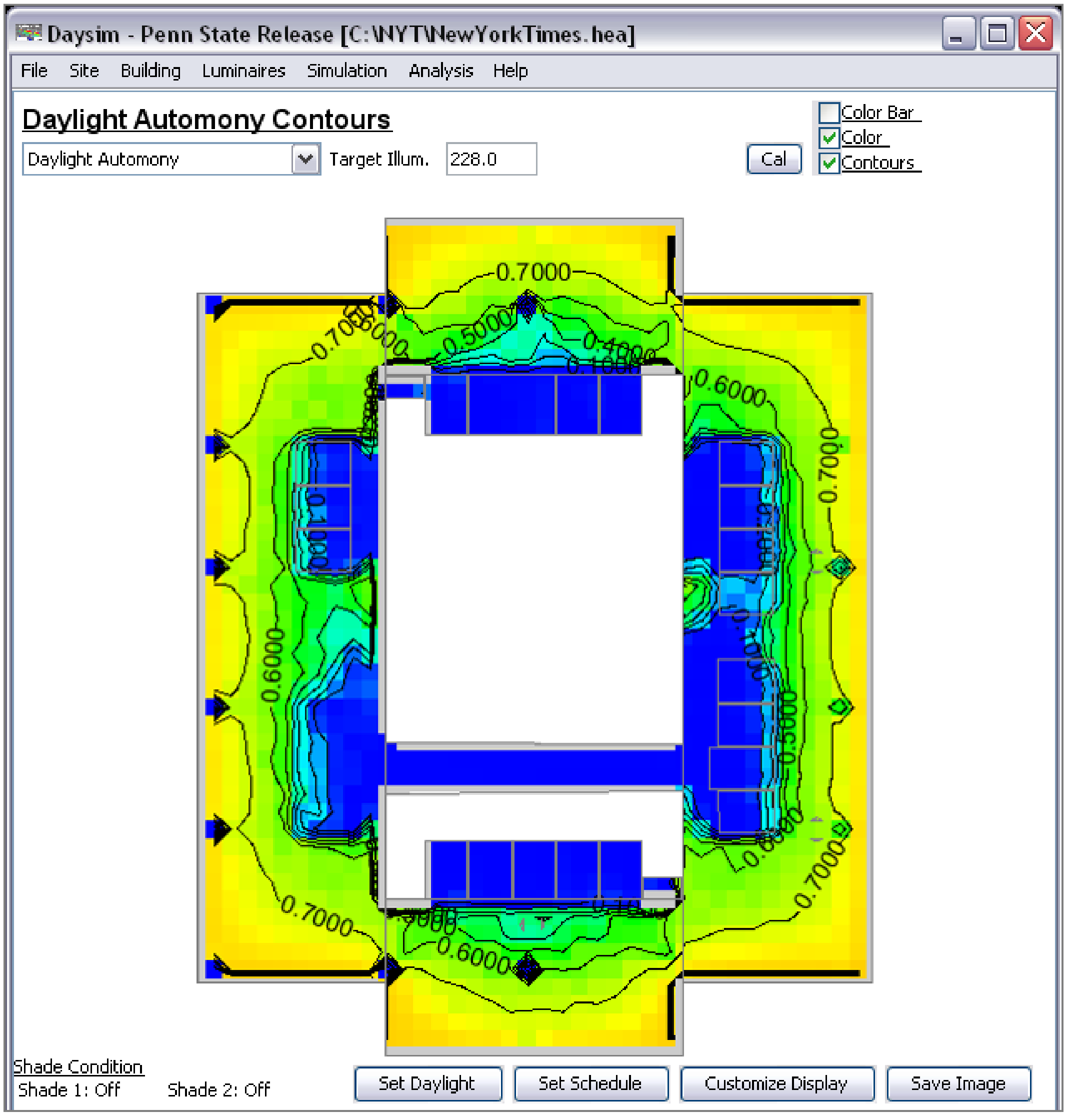


Figure 281: Daylight Autonomy Screen at 228 Lux Target Illuminance

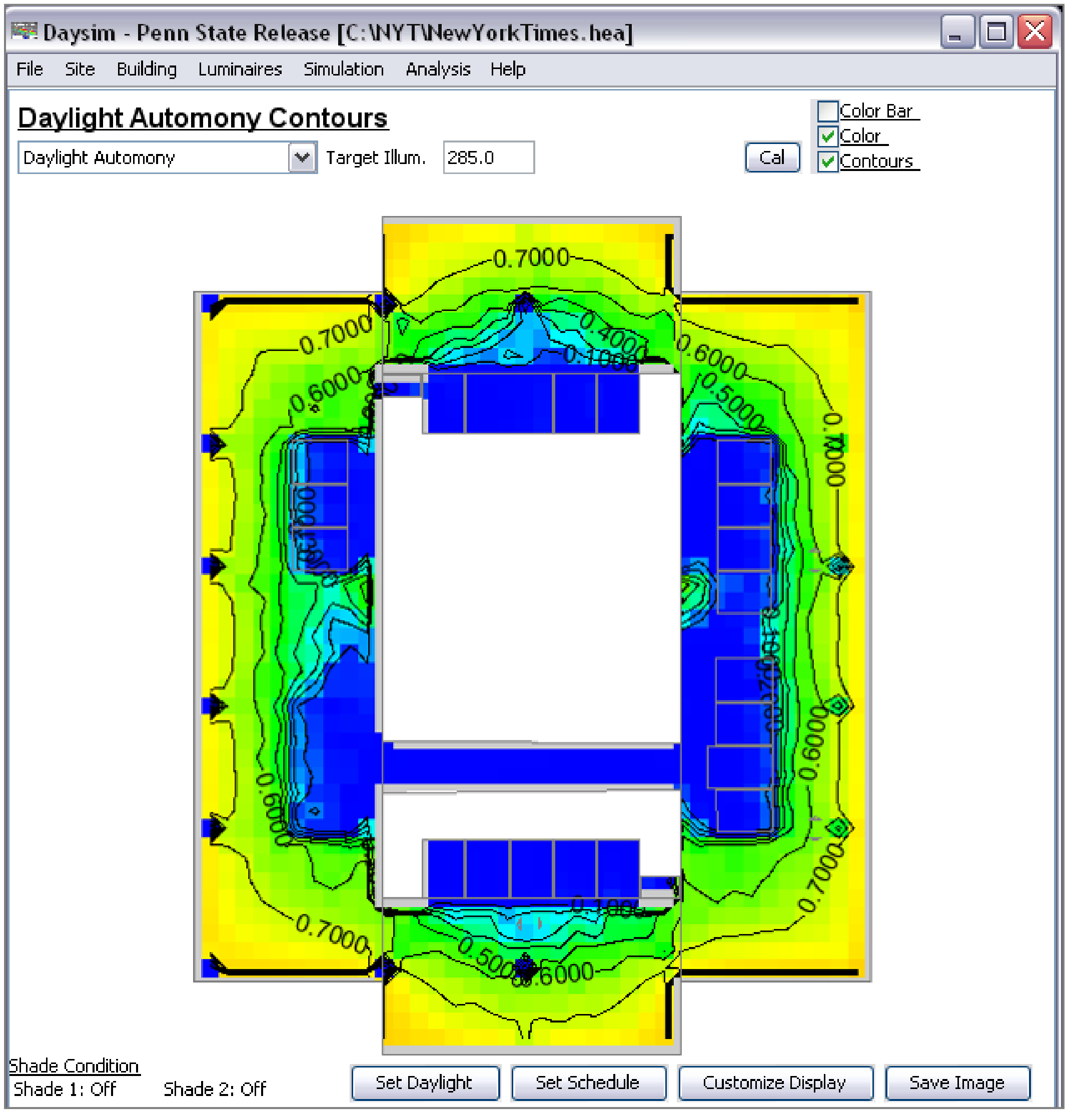


Figure 282: Daylight Autonomy Screen at 285 Lux Target Illuminance

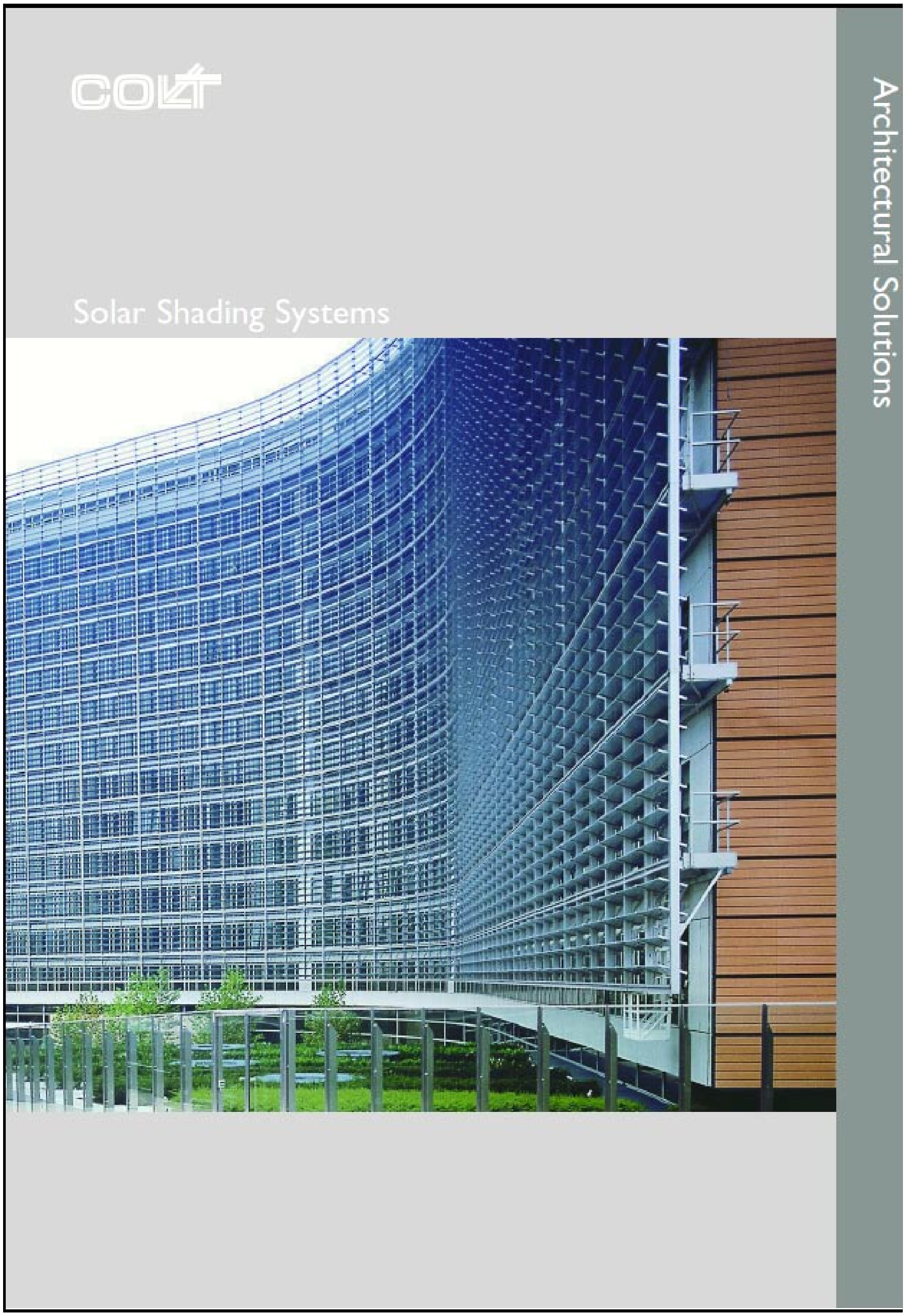


Figure 283: Double Skin Facade Specification Sheet 1

Introduction

Front Page: Berlaymont, Brussels

Over 22,000m^2 of controllable Colt Shadoglass louvres were installed onto the European Commission Headquarters. These act as a high performance secondary facade. The control system was supplied by Colt and adjusts the position of the louvres in response to changing climatic conditions and available daylight.

INTRODUCTION

Excessive solar heat gain and solar glare can be a costly and unwanted hindrance for building owners. In addition, Building Regulations Approved Document L2 now requires designers to reduce heat gain, with solar shading recommended as a preventative measure unless glass areas are minimised.

Colt solar shading systems offer designers the opportunity for distinctive architectural impact, whilst reducing solar heat gains.

SOLAR RADIATION & LOUVRES

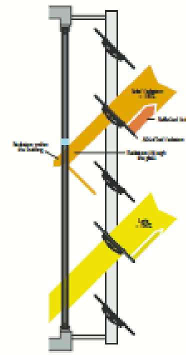
External solar shading is one of the most effective ways to control the internal conditions of a building.

Radiation from the sun is transmitted, absorbed and reflected by the louvres. As a result solar heat gain is prevented from passing into the building, minimising ventilation requirements and reducing cooling loads. If a controllable system is installed, adjustable louvres track the position of the sun, thereby reducing the numbers of days when the building overheats. Equally, in winter the louvres may be adjusted in such a way that the building benefits from the heat from the sun, and they can be closed at night reducing heat loss.

At the same time, daylight levels are enhanced, and at the same time levels of glare are reduced.

COLT'S OFFER

- Calculation of sun angles and heat loads.
- Selection of the most appropriate system from a wide range of options.
- Louvre panels are available in various configurations, materials, finishes and coatings to meet the requirements of almost any project.
- Three advanced control options are available, ICS 4-Link for large or medium sized projects, Soltronic for smaller projects, and the innovative Girasol thermohydraulic system, which requires no external energy source.
- All systems are durable and reliable with low maintenance needs.



COLT'S TRACK RECORD

Colt has more than 40 years experience in designing solar shading solutions.

With operating companies located worldwide, Colt has a broad product portfolio to meet your needs.

Colt was the first to incorporate electricity generating photovoltaic cells into solar shading louvres.

Colt understands that a low energy building fails on its weakest link, so it can provide integrated solutions that cover many aspects of design including daylighting and natural ventilation solutions.

Colt is dedicated to innovation and has a comprehensive design capability, including prototyping and testing facilities. We would welcome the opportunity to develop solutions to match your unique requirements.

SOLAR SHADING SYSTEMS LEAFLET

This leaflet shows the different systems Colt can offer. Firstly, the five standard carrier systems are outlined. Then the different louvre types are shown.

2

Figure 284: Double Skin Facade Specification Sheet 2

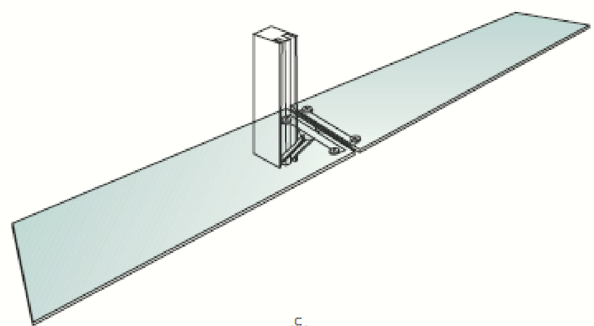
Carrier System 4

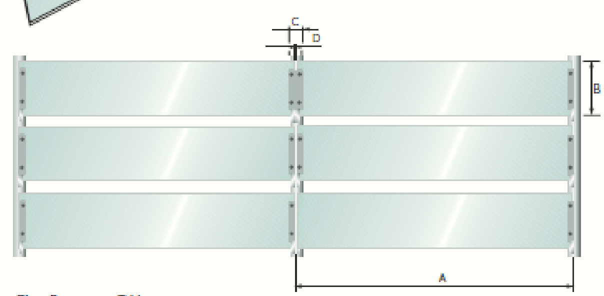
CARRIER SYSTEM 4

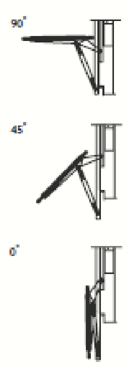
Carrier systems 1, 2 ,3 and 5 are pivoted systems which require the supports to be connected to each side of the louvre. System 4 provides a back hung design solution with hidden control mechanisms integrated within the main vertical supports. This allows for seamless continuous louvres with unobtrusive supports when viewed from the outside, due to the louvres being installed in front of the supports.

For glass, carrier system 4 is suitable for smaller spans of up to 1800mm in length. It can utilise cross sectional louvre widths of up to 600mm, incorporating photovoltaic cells if required.

This carrier system is also suited for use with metal, fabric, wood, terracotta clay and translucent acrylic louvres.







Glass Parameters Table

Dimensions	LS4
A mm (max)	1800
B mm	600
C mm	65
D mm	10
Angle of rotation °	0 - 90

Note: Table to be used as a guide only. Allowable dimensions depend upon the specific requirements of the project.

10

Figure 285: Double Skin Facade Specification Sheet 3

Shadovoltaic

Shadovoltaic describes a fixed or controllable external solar shading system that incorporates glass louvres with photovoltaic cells integrated into the glass so as to generate electricity at the same time as providing shading. The louvres are available in various colours, surface finishes, patterns and coatings to meet specific design requirements.

Both monocrystalline and polycrystalline cells may be used. The photovoltaic cells may be integrated into the glass, either by attaching them onto the reverse side of the glass panels or by laminating them between two sheets of glass.

Features & benefits

- Combines the functions of solar shading with the generation of electrical power.
- Available in widths of up to 600mm.
- Available in supported spans of up to 4m (depending on windloads and other criteria).
- Wide range of colours, surface finishes, cell patterns and coatings.
- All principal support components manufactured from corrosion-resistant extruded aluminium alloy with stainless steel fixings.
- Fixed or controllable.

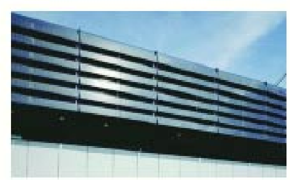


Figure 286: Double Skin Facade Specification Sheet 4

7.4 Mechanical

Product Information

Price **DF3** series displacement diffusers are designed to produce a low turbulence horizontal air supply in three directions. Typically installed against a wall pillar or free standing, the DF3 discharges air evenly across its perforated face with minimal turbulence or induction of room air. The coil supply air flows down to the floor level and gradually fills the occupied space. The superior air quality and low noise levels realized with the DF3 make it suitable for office space, restaurants, supermarkets, theatres, hotels, convention centers, schools or any application where air quality demands are high.

Features

- Optional inlet locations, bottom, top or rear.

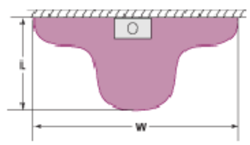
Construction / Finish

- Diffuser frame and equalization baffle – aluminum
- Side, top and bottom panels – coated steel
- Perforated front panel – coated steel
- Finish – B12 White
  For optional and special finishes see color matrix.

Options

- Base
- Duct Covers
- AFSD

Air Pattern



✓ Product Selection Checklist

1. Select diffuser Size based on desired performance characteristics.
2. Select mounting method.
3. Select Options and Accessories if required.
4. Select Finish.

Example: DF3 / 24 x 24 / Top / 10

Figure 287: DV Diffuser Product Selection

Displacement Accessories

Duct Covers
Price Duct Covers for Displacement Diffusers provide a consistent look from floor to ceiling. These products continue the appearance of the diffuser while concealing the duct work for an architecturally appealing installation. To ensure that the duct is completely hidden, the cover is supplied in solid sheets, but continues the other features of the unit such as extrusions and color. The duct cover is available in varying lengths and can be split into multiple sections to create a symmetric look with the diffuser. These units are perfect for top ducted diffusers where exposed duct work is not desired, such as hotel lobbies, office boardrooms, and restaurants. This product is not available for the DF1R or DF1W.

Features

- Seamless construction
- Matches corresponding product design.
- Variable height to match look of diffuser and fit into any room height

Construction / Finish

- Face – 21 Gauge steel
- Support Extrusion (where required) - Aluminum
- Finish – B12 White
  For optional and special finishes see color matrix.

Sizes

- Width, Radius/Diameter, Depth are all based on diffuser ordered
- Support Extrusion (where required) - Aluminum
- Finish – B12 White
  For optional and special finishes see color matrix.

DFIC-DC – Duct Cover for DFIC

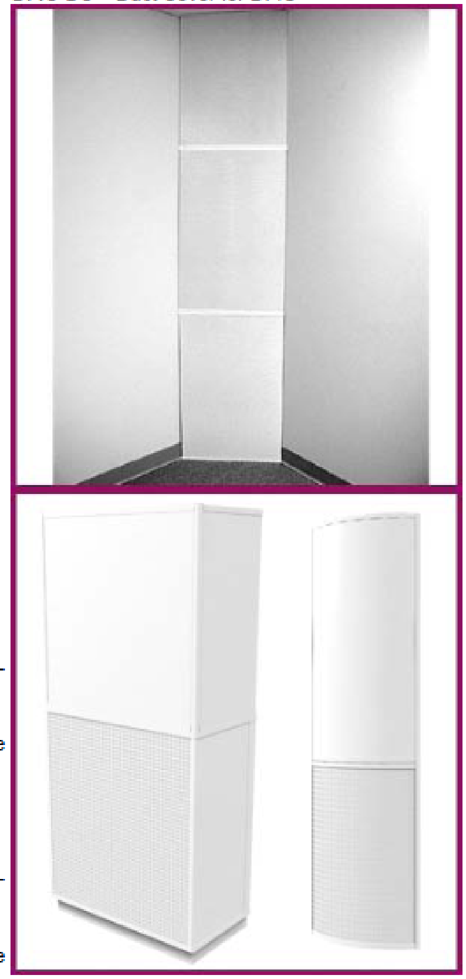


Figure 288: DV Diffuser Accessories

LWS 45 CHAMFERED	LWS OVERLAPPING	LWST FLUSH FRAMED	LWI HIDDEN CONTROLS
Thermally broken outer frame, frameless chamfered louvres	Non thermally broken outer frame, frameless overlapping louvres	Double glazed panel, 30mm overall glass panel thickness	Double glazed panel, 28mm overall glass panel
250 - 1600mm	250 - 1600mm	250 - 1600mm	250 - 1800mm
200mm, up to any height	200mm, up to any height	200mm, up to any height	520mm, up to any height
150mm x 110mm	150mm x 110mm	150mm x 110mm	150mm x 110mm
1500mm x 300mm	1500mm x 350mm	1500mm x 350mm	1700mm x 350mm
46mm	46mm	48mm	46mm
0.55	0.55	tbc	0.56
10.59 $m^3/h/m^2$ 2.03 $m^3/h/m$ (Class 2)	10.46 $m^3/h/m^2$ 1.76 $m^3/h/m$ (Class 2)	7.5 $m^3/h/m^2$ 1.5 $m^3/h/m$ (Class 3)	3.23 $m^3/h/m^2$ 0.53 $m^3/h/m$ (Class 3)
Watertight up to 0 Pa (Class 1a)	Watertight up to 100 Pa (Class 3a)	Watertight up to 100 Pa (Class 3a)	Watertight up to 100 Pa (Class 3a)
5.8 $W/m^2/K$	5.8 $W/m^2/K$	2.3 $W/m^2/K$	2.3 $W/m^2/K$
variable	variable	non variable	variable
84° / 75°	84° / 75°	84° / 75°	84° / 75°

(1) Outside frame dimensions. For throat dimensions substract 100mm.
(2) Aspect ratio of louvre height to louvre length must be less than 1:10.
(3) For all systems the standard is 50/50 (one half of the louvre blade is inside and the other half is outside). A range from 1/3 inside or outside to 2/3 inside or outside can be provided.
(4) Louvre opening angle (with motor/handle).

This data is indicative only. Colt can guarantee the structural stability for a bank of windows with an area up to $5m^2$ assuming a design wind load of 1500 Pa. Above this, a structural engineering calculation will be required. Units up to 15m high may be supplied to a special order subject to technical approval by Colt.

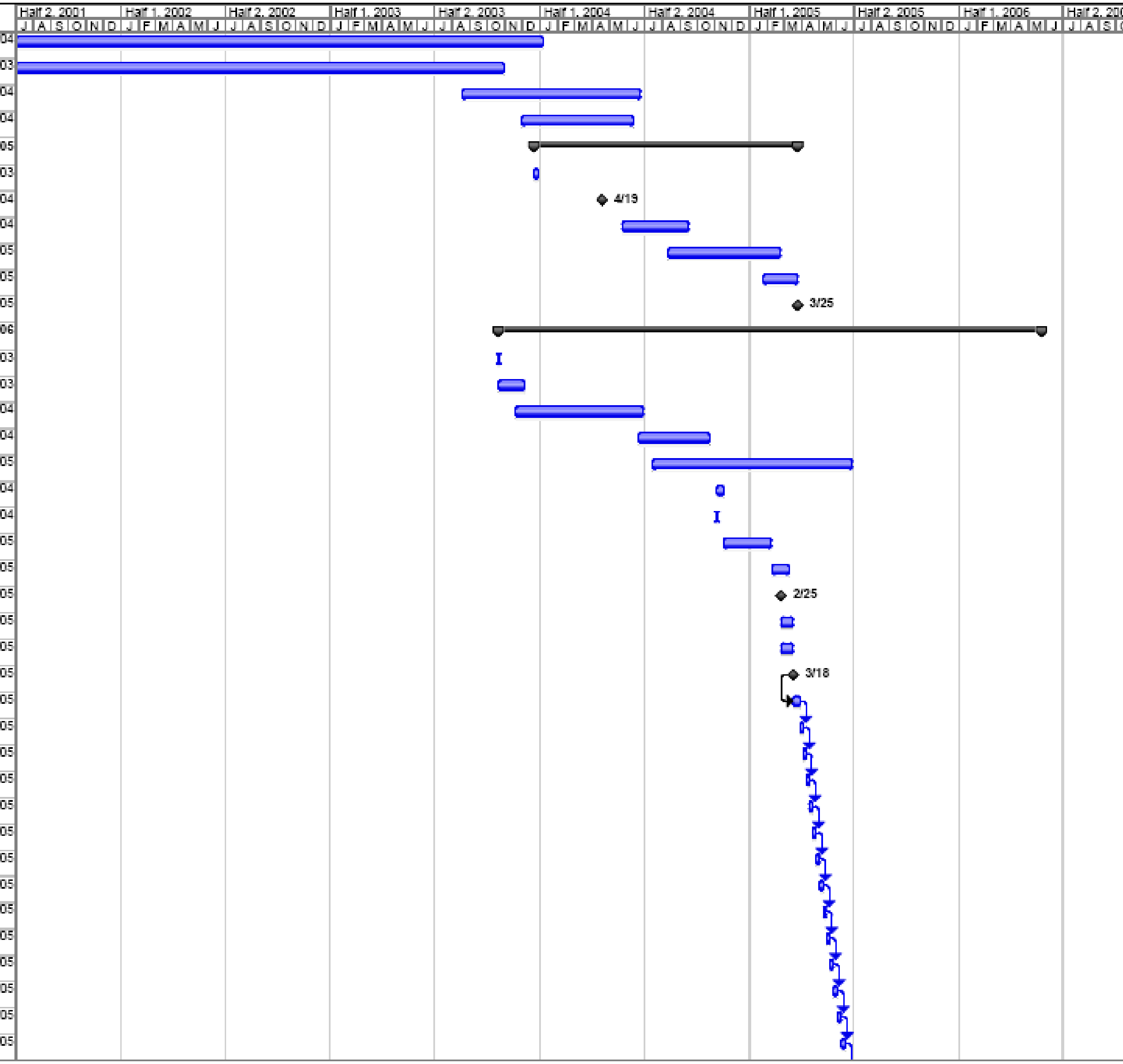
7

Figure 289 : Coltlite Operable Window Specifications

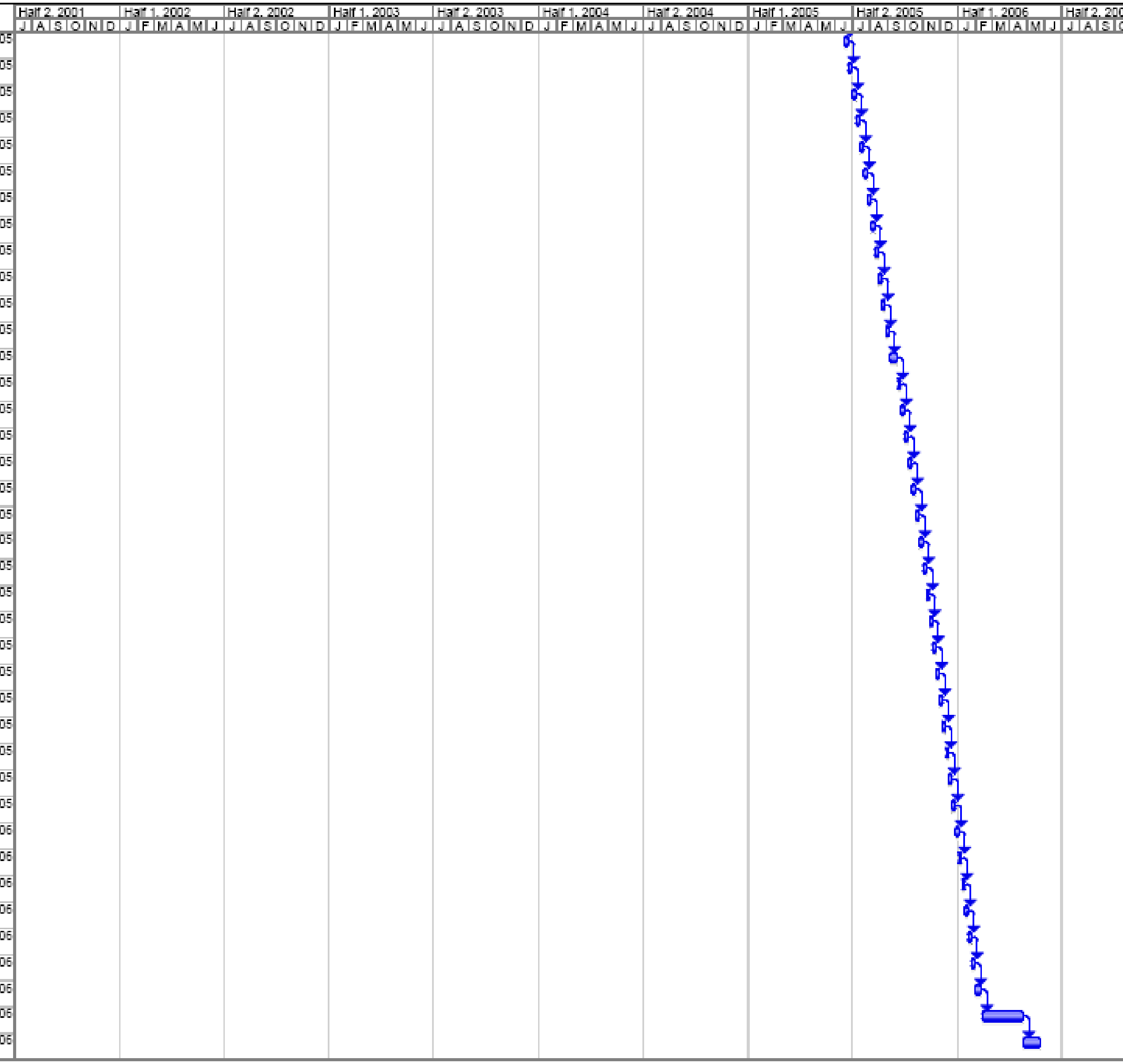
7.5 Construction Management

Figure 290: Detailed Schedule - Original

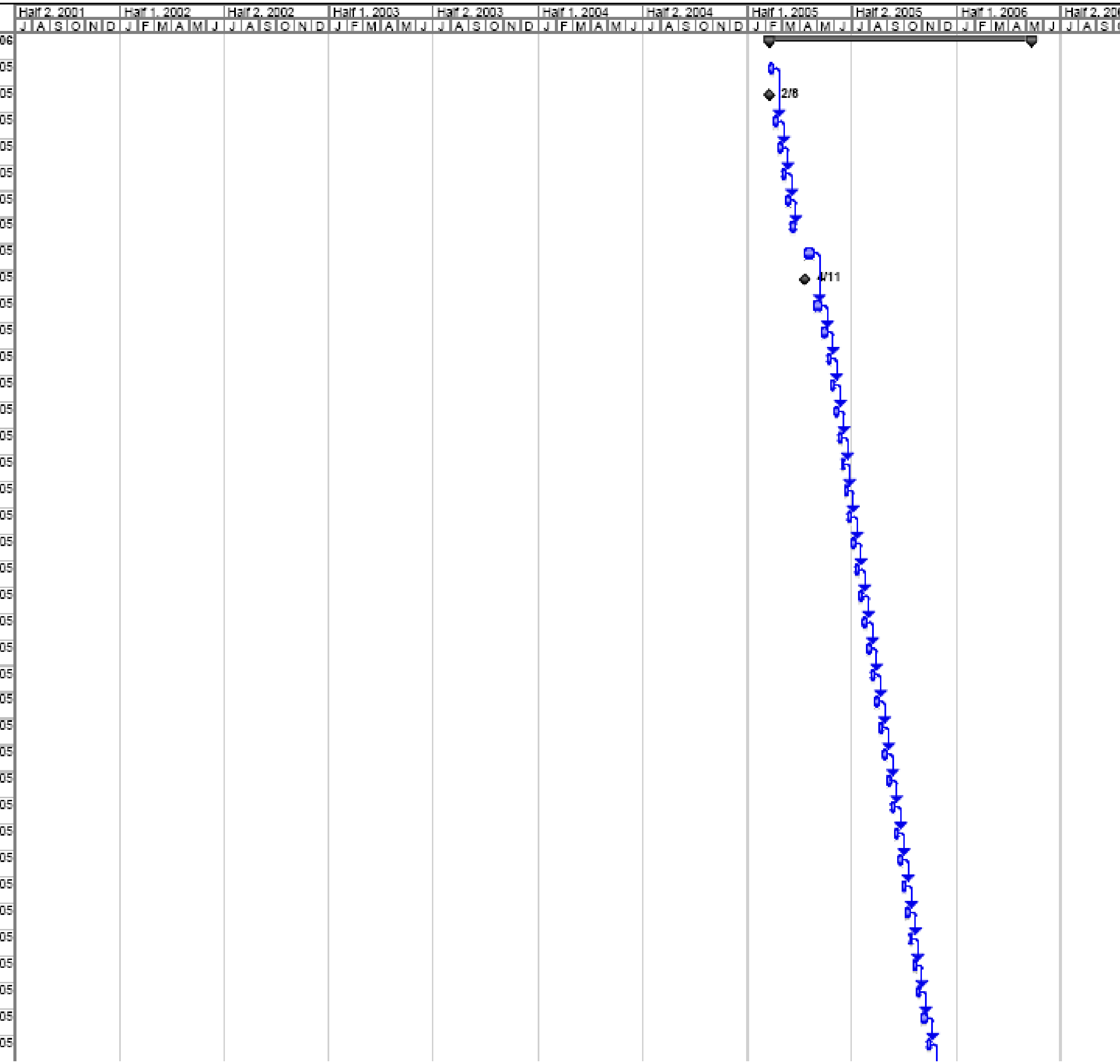
ID	Task Name	Duration	Start	Finish
1	Owner Acquisition	657 days?	Mon 7/2/01	Tue 1/6/04
2	Documents Available	609 days?	Mon 7/2/01	Thu 10/30/03
3	Bid and Award	223 days?	Tue 8/19/03	Thu 6/24/04
4	Site Mobilization/Abatement and Demo	140 days?	Mon 12/1/03	Fri 6/11/04
5	**Foundations**	**330 days?**	**Mon 12/22/03**	**Fri 3/25/05**
6	Award Excavations/Foundations	6 days?	Mon 12/22/03	Mon 12/29/03
7	Start Construction	0 days	Mon 4/19/04	Mon 4/19/04
8	Excavation Foundations - East	84 days?	Mon 5/24/04	Thu 9/16/04
9	Excavation Foundations - West	140 days?	Thu 8/12/04	Wed 2/23/05
10	Slab On Grade	44 days?	Tue 1/25/05	Fri 3/25/05
11	Slab On Grade Complete	0 days	Fri 3/25/05	Fri 3/25/05
12	**Superstructure - Steel**	**677 days?**	**Tue 10/21/03**	**Wed 5/24/06**
13	Shop Drawings	1 day?	Tue 10/21/03	Tue 10/21/03
14	Mill Orders	34 days?	Tue 10/21/03	Fri 12/5/03
15	Material Deliveries	159 days?	Thu 11/20/03	Tue 6/29/04
16	Fabrication - Podium	90 days?	Mon 6/21/04	Fri 10/22/04
17	Fabrication - Tower	248 days?	Fri 7/16/04	Tue 6/28/05
18	Mobilize Podium Steel	8 days?	Fri 11/5/04	Tue 11/16/04
19	Mobilize Tower Steel	1 day?	Fri 11/5/04	Fri 11/5/04
20	Erect Podium Steel	59 days?	Wed 11/17/04	Mon 2/7/05
21	Mobilize	22 days?	Wed 2/9/05	Thu 3/10/05
22	Set Up / Mobilize Tower Cranes	0 days	Fri 2/25/05	Fri 2/25/05
23	Tower Crane 1	15 days?	Fri 2/25/05	Thu 3/17/05
24	Tower Crane 2	15 days?	Fri 2/25/05	Thu 3/17/05
25	Erect Steel - Ground Floor Framing	0 days	Fri 3/18/05	Fri 3/18/05
26	Erect Steel - 2nd Floor	8 days?	Fri 3/18/05	Tue 3/29/05
27	Erect Steel - 3rd Floor	4 days	Wed 3/30/05	Mon 4/4/05
28	Erect Steel - 4th Floor	4 days	Tue 4/5/05	Fri 4/8/05
29	Erect Steel - 5th Floor	4 days	Mon 4/11/05	Thu 4/14/05
30	Erect Steel - 6th Floor	4 days	Fri 4/15/05	Wed 4/20/05
31	Erect Steel - 7th Floor	4 days	Thu 4/21/05	Tue 4/26/05
32	Erect Steel - 8th Floor	4 days	Wed 4/27/05	Mon 5/2/05
33	Erect Steel - 9th Floor	4.5 days	Tue 5/3/05	Mon 5/9/05
34	Erect Steel - 10th Floor	4.5 days	Mon 5/9/05	Fri 5/13/05
35	Erect Steel - 11th Floor	4.5 days	Mon 5/16/05	Fri 5/20/05
36	Erect Steel - 12th Floor	4.5 days	Fri 5/20/05	Thu 5/26/05
37	Erect Steel - 13th Floor	5 days	Fri 5/27/05	Thu 6/2/05
38	Erect Steel - 14th Floor	5 days	Fri 6/3/05	Thu 6/9/05
39	Erect Steel - 15th Floor	5 days	Fri 6/10/05	Thu 6/16/05



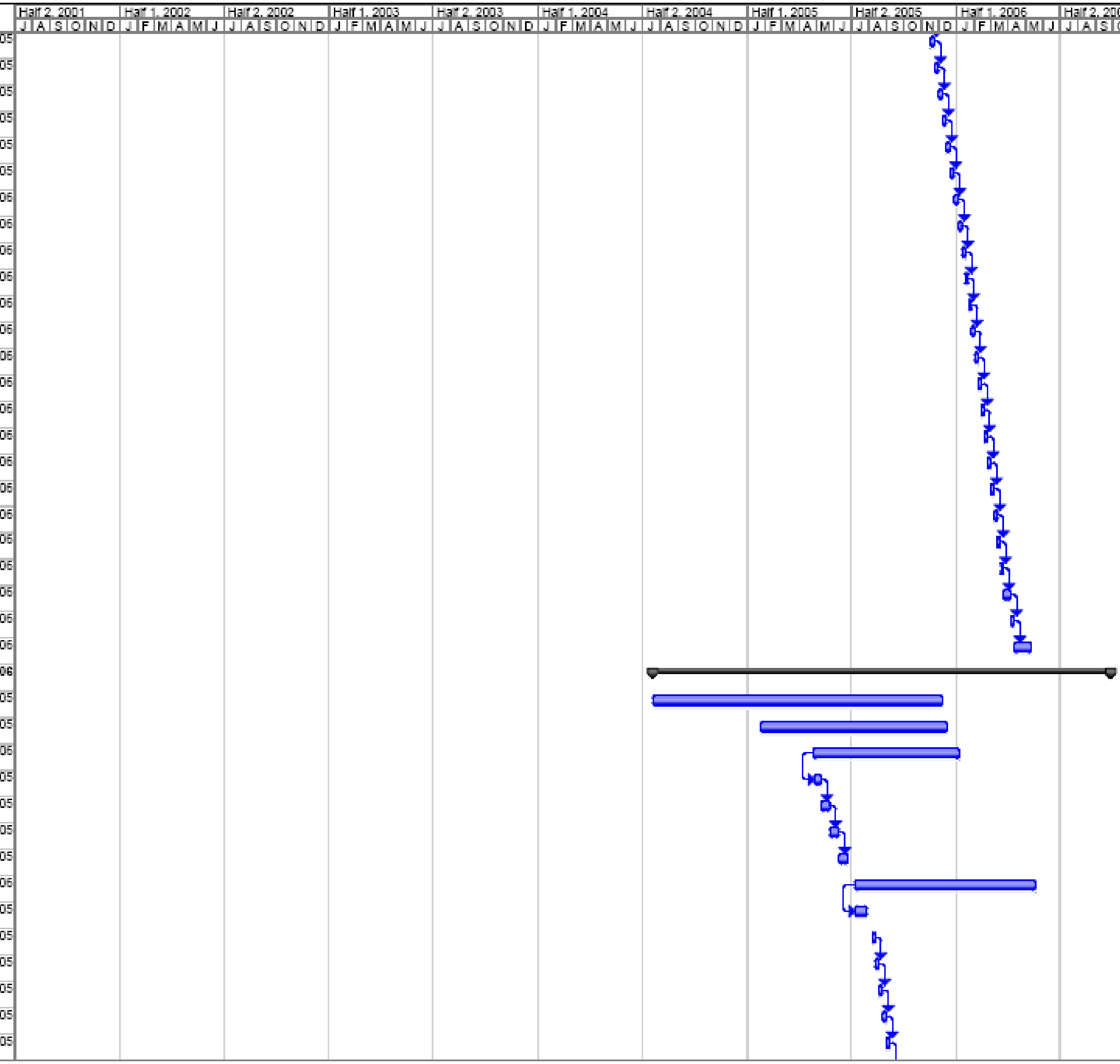
ID	Task Name	Duration	Start	Finish
40	Erect Steel - 16th Floor	5 days	Fri 6/17/05	Thu 6/23/05
41	Erect Steel - 17th Floor	5 days	Fri 6/24/05	Thu 6/30/05
42	Erect Steel - 18th Floor	5 days	Fri 7/1/05	Thu 7/7/05
43	Erect Steel - 19th Floor	4.5 days	Fri 7/8/05	Thu 7/14/05
44	Erect Steel - 20th Floor	4.5 days	Thu 7/14/05	Wed 7/20/05
45	Erect Steel - 21st Floor	4.5 days	Thu 7/21/05	Wed 7/27/05
46	Erect Steel - 22nd Floor	4.5 days	Wed 7/27/05	Tue 8/2/05
47	Erect Steel - 23rd Floor	4.5 days	Wed 8/3/05	Tue 8/9/05
48	Erect Steel - 24th Floor	4.5 days	Tue 8/9/05	Mon 8/15/05
49	Erect Steel - 25th Floor	4.5 days	Tue 8/16/05	Mon 8/22/05
50	Erect Steel - 26th Floor	4.5 days	Mon 8/22/05	Fri 8/26/05
51	Erect Steel - 27th Floor	5 days	Mon 8/29/05	Fri 9/2/05
52	Erect Steel - 28th Floor	10 days	Mon 9/5/05	Fri 9/16/05
53	Erect Steel - 29th Floor	4.5 days	Mon 9/19/05	Fri 9/23/05
54	Erect Steel - 30th Floor	4.5 days	Fri 9/23/05	Thu 9/29/05
55	Erect Steel - 31st Floor	4.5 days	Fri 9/30/05	Thu 10/6/05
56	Erect Steel - 32nd Floor	4.5 days	Thu 10/6/05	Wed 10/12/05
57	Erect Steel - 33rd Floor	4.5 days	Thu 10/13/05	Wed 10/19/05
58	Erect Steel - 34th Floor	4.5 days	Wed 10/19/05	Tue 10/25/05
59	Erect Steel - 35th Floor	4.5 days	Wed 10/26/05	Tue 11/1/05
60	Erect Steel - 36th Floor	4.5 days	Tue 11/1/05	Mon 11/7/05
61	Erect Steel - 37th Floor	4 days	Tue 11/8/05	Fri 11/11/05
62	Erect Steel - 38th Floor	4 days	Mon 11/14/05	Thu 11/17/05
63	Erect Steel - 39th Floor	4 days	Fri 11/18/05	Wed 11/23/05
64	Erect Steel - 40th Floor	4 days	Thu 11/24/05	Tue 11/29/05
65	Erect Steel - 41st Floor	4 days	Wed 11/30/05	Mon 12/5/05
66	Erect Steel - 42nd Floor	4 days	Tue 12/6/05	Fri 12/9/05
67	Erect Steel - 43rd Floor	4 days	Mon 12/12/05	Thu 12/15/05
68	Erect Steel - 44th Floor	4 days	Fri 12/16/05	Wed 12/21/05
69	Erect Steel - 45th Floor	4 days	Thu 12/22/05	Tue 12/27/05
70	Erect Steel - 46th Floor	4 days	Wed 12/28/05	Mon 1/2/06
71	Erect Steel - 47th Floor	4 days	Tue 1/3/06	Fri 1/6/06
72	Erect Steel - 48th Floor	4 days	Mon 1/9/06	Thu 1/12/06
73	Erect Steel - 49th Floor	4 days	Fri 1/13/06	Wed 1/18/06
74	Erect Steel - 50th Floor	4 days	Thu 1/19/06	Tue 1/24/06
75	Erect Steel - 51st Floor	4 days	Wed 1/25/06	Mon 1/30/06
76	Erect Steel - 52nd Floor	9 days	Tue 1/31/06	Fri 2/10/06
77	Erect Steel - Tower Roof/Top out	51 days	Mon 2/13/06	Mon 4/24/06
78	Demobilize	22 days	Tue 4/25/06	Wed 5/24/06



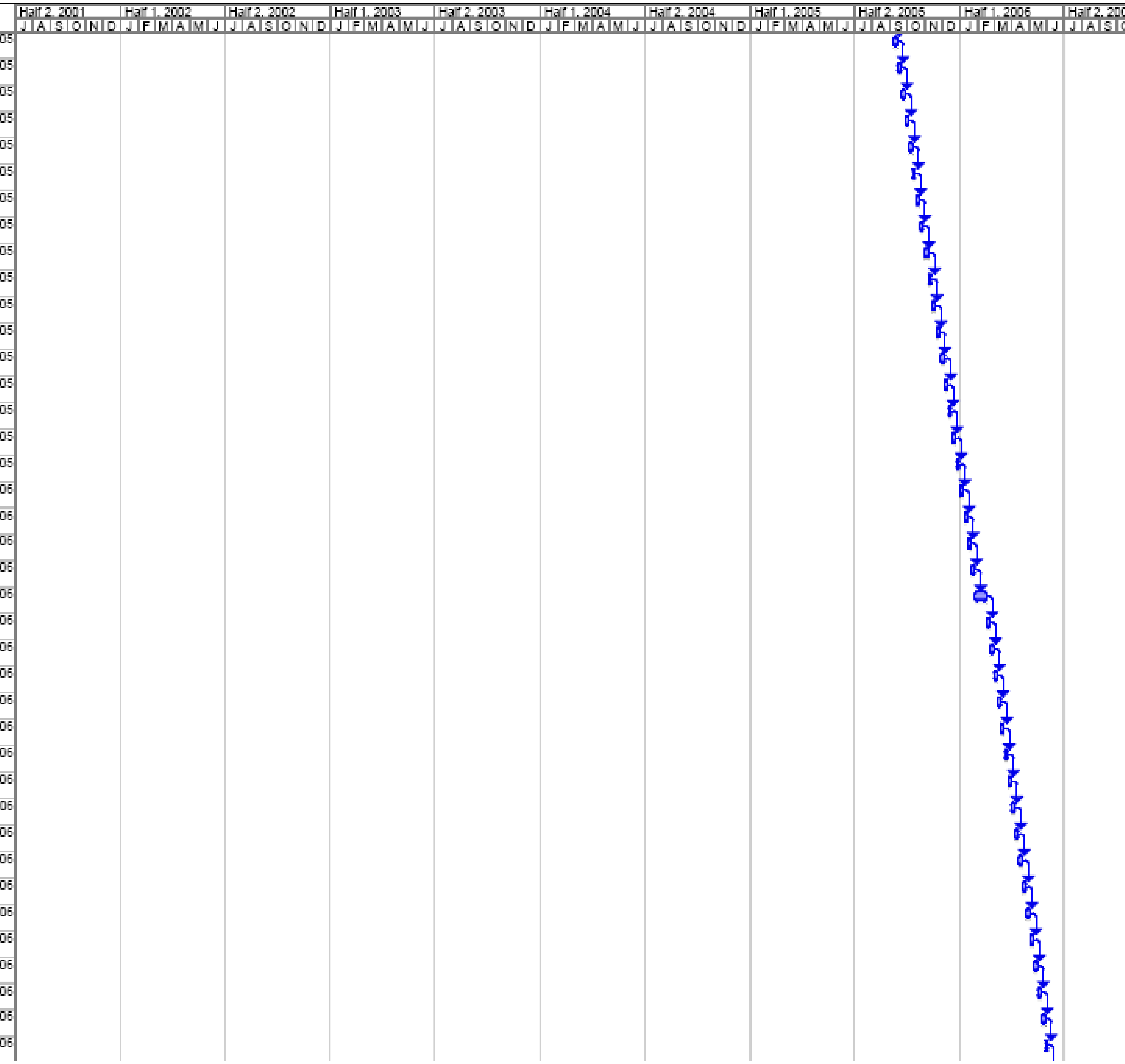
ID	Task Name	Duration	Start	Finish
79	**Superstructure - Concrete Flooring**	**328 days?**	**Tue 2/8/05**	**Thu 5/11/06**
80	Mobilize Podium	5 days?	Tue 2/8/05	Mon 2/14/05
81	Mobilize Podium Concrete	0 days	Tue 2/8/05	Tue 2/8/05
82	Pour Concrete - Podium Ground Floor	6 days	Tue 2/15/05	Tue 2/22/05
83	Pour Concrete - Podium 2nd Floor	5 days	Wed 2/23/05	Tue 3/1/05
84	Pour Concrete - Podium 3rd Floor	5 days	Wed 3/2/05	Tue 3/8/05
85	Pour Concrete - Podium 4th Floor	5 days	Wed 3/9/05	Tue 3/15/05
86	Pour Concrete - Podium 5th Floor	8 days	Wed 3/16/05	Fri 3/25/05
87	Mobilization - Tower	11 days?	Mon 4/11/05	Mon 4/25/05
88	Mobilize Tower Concrete	0 days	Mon 4/11/05	Mon 4/11/05
89	Pour Concrete - Ground Floor	10 days	Tue 4/26/05	Mon 5/9/05
90	Pour Concrete - 2nd Floor	8 days	Tue 5/10/05	Thu 5/19/05
91	Pour Concrete - 3rd Floor	4 days	Fri 5/20/05	Wed 5/25/05
92	Pour Concrete - 4th Floor	5 days	Thu 5/26/05	Wed 6/1/05
93	Pour Concrete - 5th Floor	4 days	Thu 6/2/05	Tue 6/7/05
94	Pour Concrete - 6th Floor	4 days	Wed 6/8/05	Mon 6/13/05
95	Pour Concrete - 7th Floor	4 days	Tue 6/14/05	Fri 6/17/05
96	Pour Concrete - 8th Floor	4 days	Mon 6/20/05	Thu 6/23/05
97	Pour Concrete - 9th Floor	5 days	Fri 6/24/05	Thu 6/30/05
98	Pour Concrete - 10th Floor	5 days	Fri 7/1/05	Thu 7/7/05
99	Pour Concrete - 11th Floor	4 days	Fri 7/8/05	Wed 7/13/05
100	Pour Concrete - 12th Floor	5 days	Thu 7/14/05	Wed 7/20/05
101	Pour Concrete - 13th Floor	5 days	Thu 7/21/05	Wed 7/27/05
102	Pour Concrete - 14th Floor	5 days	Thu 7/28/05	Wed 8/3/05
103	Pour Concrete - 15th Floor	5 days	Thu 8/4/05	Wed 8/10/05
104	Pour Concrete - 16th Floor	5 days	Thu 8/11/05	Wed 8/17/05
105	Pour Concrete - 17th Floor	5 days	Thu 8/18/05	Wed 8/24/05
106	Pour Concrete - 18th Floor	5 days	Thu 8/25/05	Wed 8/31/05
107	Pour Concrete - 19th Floor	5 days	Thu 9/1/05	Wed 9/7/05
108	Pour Concrete - 20th Floor	5 days	Thu 9/8/05	Wed 9/14/05
109	Pour Concrete - 21st Floor	4 days	Thu 9/15/05	Tue 9/20/05
110	Pour Concrete - 22nd Floor	5 days	Wed 9/21/05	Tue 9/27/05
111	Pour Concrete - 23rd Floor	4 days	Wed 9/28/05	Mon 10/3/05
112	Pour Concrete - 24th Floor	5 days	Tue 10/4/05	Mon 10/10/05
113	Pour Concrete - 25th Floor	4 days	Tue 10/11/05	Fri 10/14/05
114	Pour Concrete - 26th Floor	5 days	Mon 10/17/05	Fri 10/21/05
115	Pour Concrete - 27th Floor	5 days	Mon 10/24/05	Fri 10/28/05
116	Pour Concrete - 28th Floor	8 days	Mon 10/31/05	Wed 11/9/05
117	Pour Concrete - 29th Floor	5 days	Thu 11/10/05	Wed 11/16/05



ID		Task Name	Duration	Start	Finish
118		Pour Concrete - 30th Floor	5 days	Thu 11/17/05	Wed 11/23/05
119		Pour Concrete - 31st Floor	5 days	Thu 11/24/05	Wed 11/30/05
120		Pour Concrete - 32nd Floor	5 days	Thu 12/1/05	Wed 12/7/05
121		Pour Concrete - 33rd Floor	4 days	Thu 12/8/05	Tue 12/13/05
122		Pour Concrete - 34th Floor	5 days	Wed 12/14/05	Tue 12/20/05
123		Pour Concrete - 35th Floor	5 days	Wed 12/21/05	Tue 12/27/05
124		Pour Concrete - 36th Floor	6 days	Wed 12/28/05	Wed 1/4/06
125		Pour Concrete - 37th Floor	4 days	Thu 1/5/06	Tue 1/10/06
126		Pour Concrete - 38th Floor	4 days	Wed 1/11/06	Mon 1/16/06
127		Pour Concrete - 39th Floor	4 days	Tue 1/17/06	Fri 1/20/06
128		Pour Concrete - 40th Floor	4 days	Mon 1/23/06	Thu 1/26/06
129		Pour Concrete - 41st Floor	4 days	Fri 1/27/06	Wed 2/1/06
130		Pour Concrete - 42nd Floor	4 days	Thu 2/2/06	Tue 2/7/06
131		Pour Concrete - 43rd Floor	4 days	Wed 2/8/06	Mon 2/13/06
132		Pour Concrete - 44th Floor	4 days	Tue 2/14/06	Fri 2/17/06
133		Pour Concrete - 45th Floor	4 days	Mon 2/20/06	Thu 2/23/06
134		Pour Concrete - 46th Floor	4 days	Fri 2/24/06	Wed 3/1/06
135		Pour Concrete - 47th Floor	4 days	Thu 3/2/06	Tue 3/7/06
136		Pour Concrete - 48th Floor	4 days	Wed 3/8/06	Mon 3/13/06
137		Pour Concrete - 49th Floor	4 days	Tue 3/14/06	Fri 3/17/06
138		Pour Concrete - 50th Floor	4 days	Mon 3/20/06	Thu 3/23/06
139		Pour Concrete - 51st Floor	9 days	Fri 3/24/06	Wed 4/5/06
140		Pour Concrete - 52nd Floor	4 days	Thu 4/6/06	Tue 4/11/06
141		Pour Concrete - Concrete Fills / Top out	22 days	Wed 4/12/06	Thu 5/11/06
142		**Curtain Wall**	**572 days?**	**Tue 7/20/04**	**Wed 9/27/06**
143		Shop Assembly	362 days?	Tue 7/20/04	Wed 12/7/05
144		Shipping	234 days?	Mon 1/24/05	Thu 12/15/05
145		Set Insert / Clips	183 days?	Tue 4/26/05	Thu 1/5/06
146		Mobilize - Load Podium Units	8 days	Thu 4/28/05	Mon 5/9/05
147		Curtain Wall - Floor 2 Podium	11 days	Tue 5/10/05	Tue 5/24/05
148		Curtain Wall - Floor 3 Podium	12 days	Wed 5/25/05	Thu 6/9/05
149		Curtain Wall - Floor 4 Podium	11 days	Fri 6/10/05	Fri 6/24/05
150		Mobilization - Loading	225 days	Fri 7/8/05	Thu 5/18/06
151		Curtain Wall Tower - Overhead Protection	15 days	Fri 7/8/05	Thu 7/28/05
152		Curtain Wall Tower - Floor 2	4 days	Mon 8/8/05	Thu 8/11/05
153		Curtain Wall Tower - Floor 3	5 days	Fri 8/12/05	Thu 8/18/05
154		Curtain Wall Tower - Floor 4	4 days	Fri 8/19/05	Wed 8/24/05
155		Curtain Wall Tower - Floor 5	5 days	Thu 8/25/05	Wed 8/31/05
156		Curtain Wall Tower - Floor 6	4 days	Thu 9/1/05	Tue 9/6/05



ID	Task Name	Duration	Start	Finish
157	Curtain Wall Tower - Floor 7	5 days	Wed 9/7/05	Tue 9/13/05
158	Curtain Wall Tower - Floor 8	5 days	Wed 9/14/05	Tue 9/20/05
159	Curtain Wall Tower - Floor 9	5 days	Wed 9/21/05	Tue 9/27/05
160	Curtain Wall Tower - Floor 10	4 days	Wed 9/28/05	Mon 10/3/05
161	Curtain Wall Tower - Floor 11	5 days	Tue 10/4/05	Mon 10/10/05
162	Curtain Wall Tower - Floor 12	4 days	Tue 10/11/05	Fri 10/14/05
163	Curtain Wall Tower - Floor 13	5 days	Mon 10/17/05	Fri 10/21/05
164	Curtain Wall Tower - Floor 14	5 days	Mon 10/24/05	Fri 10/28/05
165	Curtain Wall Tower - Floor 15	6 days	Mon 10/31/05	Mon 11/7/05
166	Curtain Wall Tower - Floor 16	4 days	Tue 11/8/05	Fri 11/11/05
167	Curtain Wall Tower - Floor 17	5 days	Mon 11/14/05	Fri 11/18/05
168	Curtain Wall Tower - Floor 18	5 days	Mon 11/21/05	Fri 11/25/05
169	Curtain Wall Tower - Floor 19	6 days	Mon 11/28/05	Mon 12/5/05
170	Curtain Wall Tower - Floor 20	4 days	Tue 12/6/05	Fri 12/9/05
171	Curtain Wall Tower - Floor 21	5 days	Mon 12/12/05	Fri 12/16/05
172	Curtain Wall Tower - Floor 22	5 days	Mon 12/19/05	Fri 12/23/05
173	Curtain Wall Tower - Floor 23	5 days	Mon 12/26/05	Fri 12/30/05
174	Curtain Wall Tower - Floor 24	5 days	Mon 1/2/06	Fri 1/6/06
175	Curtain Wall Tower - Floor 25	5 days	Mon 1/9/06	Fri 1/13/06
176	Curtain Wall Tower - Floor 26	4 days	Mon 1/16/06	Thu 1/19/06
177	Curtain Wall Tower - Floor 27	5 days	Fri 1/20/06	Thu 1/26/06
178	Curtain Wall Tower - Floor 28	14 days	Fri 1/27/06	Wed 2/15/06
179	Curtain Wall Tower - Floor 29	4 days	Thu 2/16/06	Tue 2/21/06
180	Curtain Wall Tower - Floor 30	5 days	Wed 2/22/06	Tue 2/28/06
181	Curtain Wall Tower - Floor 31	4 days	Wed 3/1/06	Mon 3/6/06
182	Curtain Wall Tower - Floor 32	5 days	Tue 3/7/06	Mon 3/13/06
183	Curtain Wall Tower - Floor 33	4 days	Tue 3/14/06	Fri 3/17/06
184	Curtain Wall Tower - Floor 34	5 days	Mon 3/20/06	Fri 3/24/06
185	Curtain Wall Tower - Floor 35	4 days	Mon 3/27/06	Thu 3/30/06
186	Curtain Wall Tower - Floor 36	5 days	Fri 3/31/06	Thu 4/6/06
187	Curtain Wall Tower - Floor 37	4 days	Fri 4/7/06	Wed 4/12/06
188	Curtain Wall Tower - Floor 38	5 days	Thu 4/13/06	Wed 4/19/06
189	Curtain Wall Tower - Floor 39	4 days	Thu 4/20/06	Tue 4/25/06
190	Curtain Wall Tower - Floor 40	5 days	Wed 4/26/06	Tue 5/2/06
191	Curtain Wall Tower - Floor 41	4 days	Wed 5/3/06	Mon 5/8/06
192	Curtain Wall Tower - Floor 42	5 days	Tue 5/9/06	Mon 5/15/06
193	Curtain Wall Tower - Floor 43	5 days	Tue 5/16/06	Mon 5/22/06
194	Curtain Wall Tower - Floor 44	5 days	Tue 5/23/06	Mon 5/29/06
195	Curtain Wall Tower - Floor 45	4 days	Tue 5/30/06	Fri 6/2/06



ID		Task Name	Duration	Start	Finish
196		Curtain Wall Tower - Floor 46	5 days	Mon 6/5/06	Fri 6/9/06
197		Curtain Wall Tower - Floor 47	4 days	Mon 6/12/06	Thu 6/15/06
198		Curtain Wall Tower - Floor 48	5 days	Fri 6/16/06	Thu 6/22/06
199		Curtain Wall Tower - Floor 49	5 days	Fri 6/23/06	Thu 6/29/06
200		Curtain Wall Tower - Floor 50	5 days	Fri 6/30/06	Thu 7/6/06
201		Curtain Wall Tower - Floor 51	14 days	Fri 7/7/06	Wed 7/26/06
202		Curtain Wall Tower - Screen Work	45 days	Thu 7/27/06	Wed 9/27/06

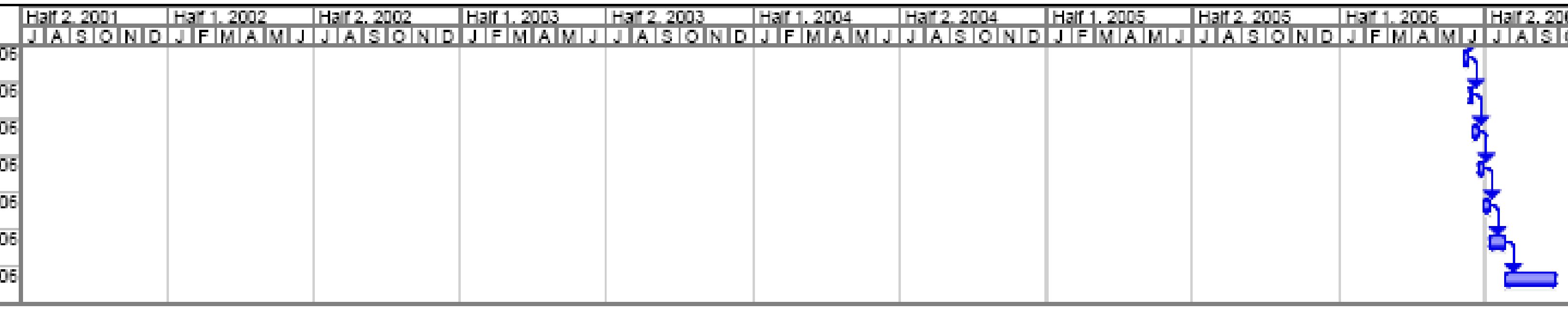
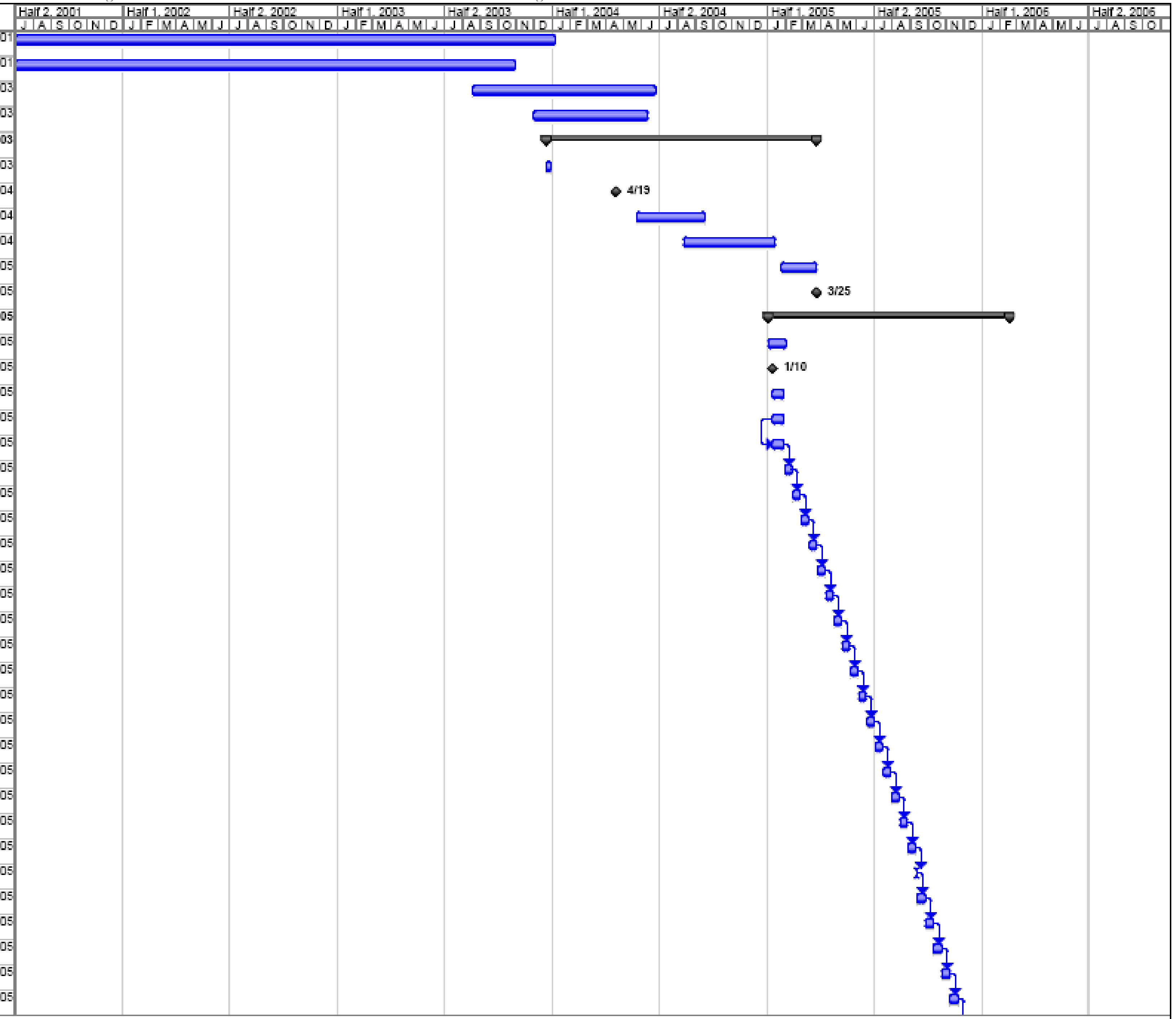
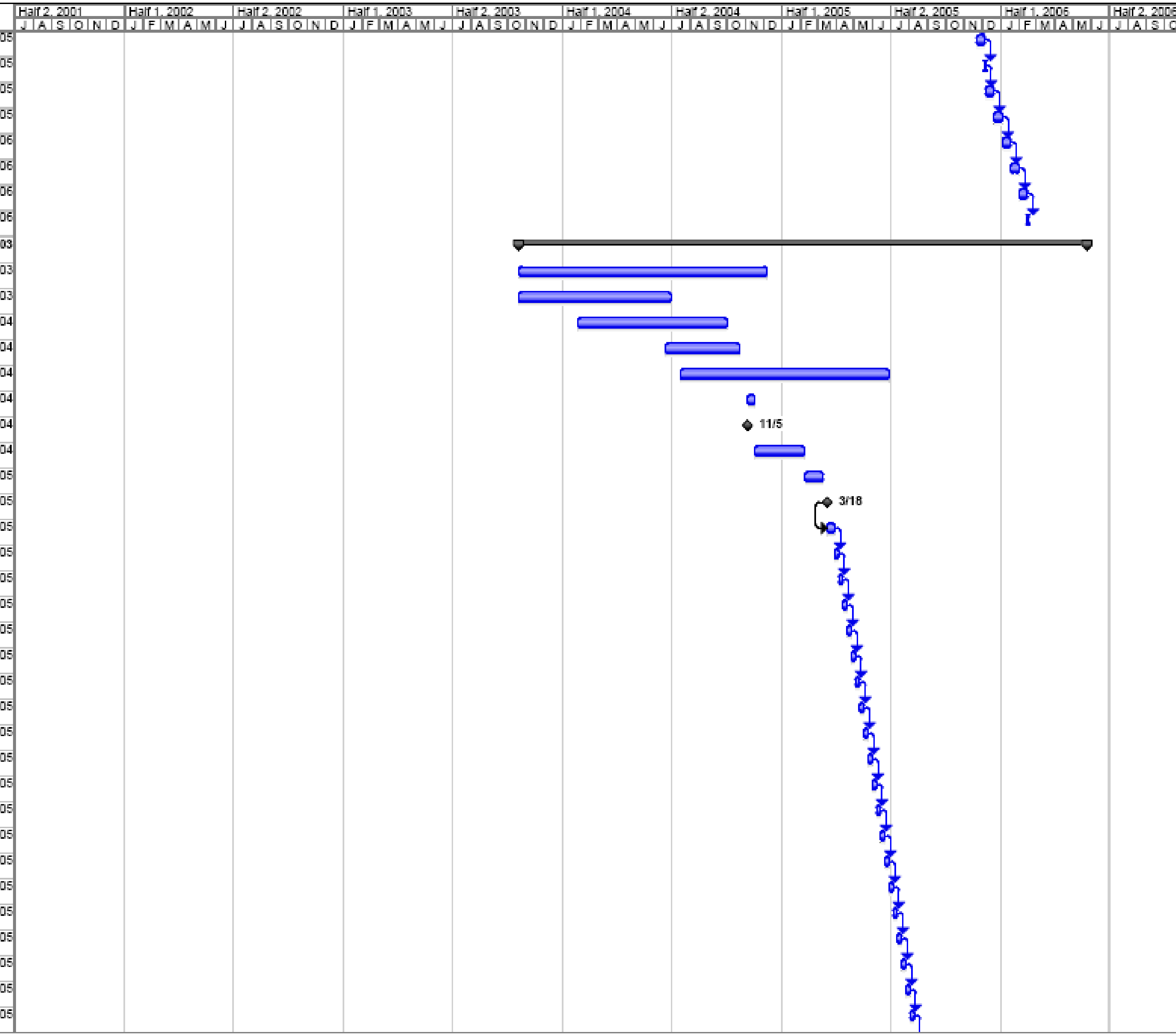


Figure 291: Detailed Schedule - Core/Corner and Facade Change

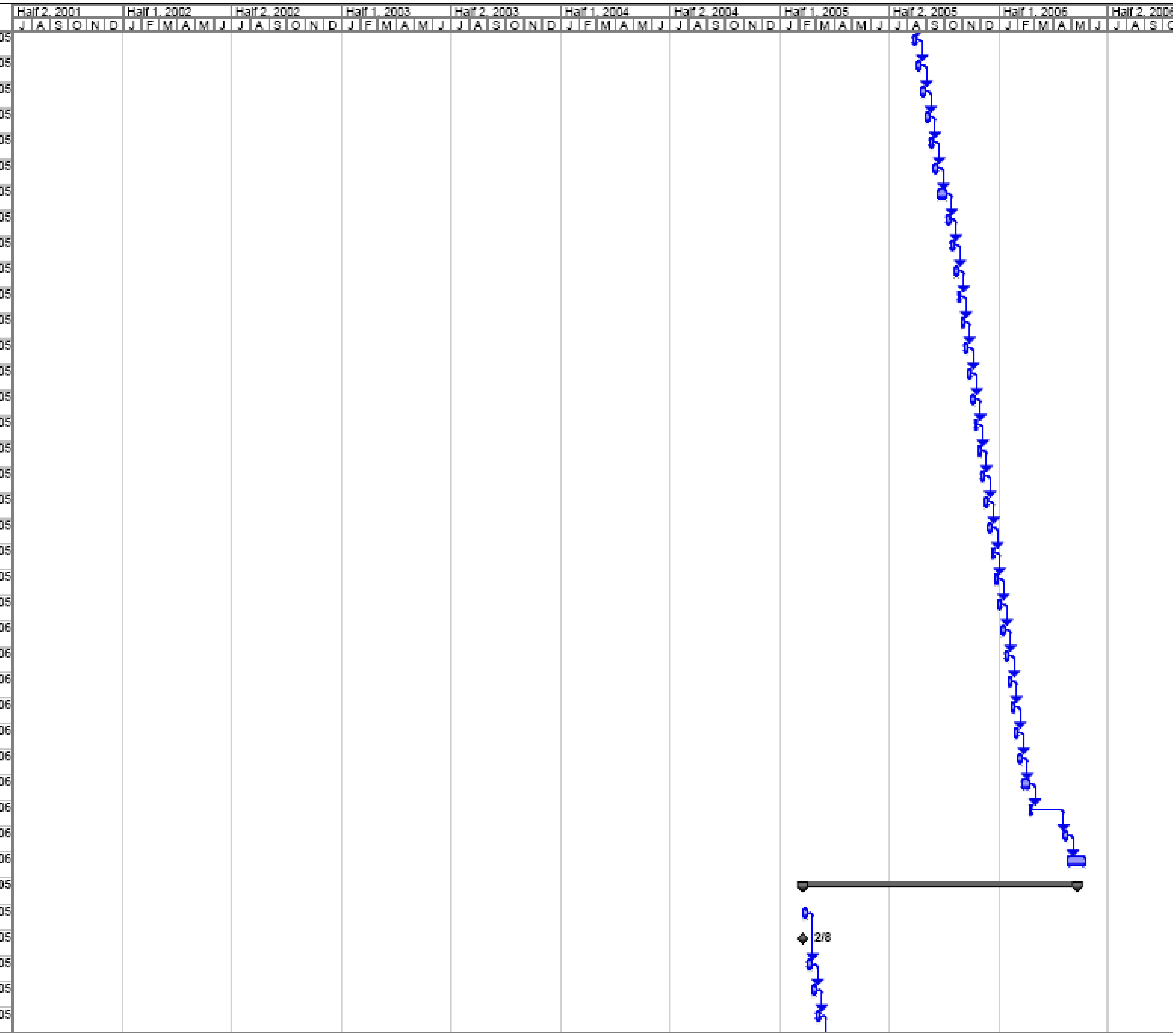
ID	Task Name	Duration	Start
1	Owner Acquisition	657 days?	Mon 7/2/01
2	Documents Available	609 days?	Mon 7/2/01
3	Bid and Award	223 days?	Tue 8/19/03
4	Site Mobilization/Abatement and Demo	140 days?	Mon 12/1/03
5	**Foundations**	**330 days?**	**Mon 12/22/03**
6	Award Excavations/Foundations	6 days?	Mon 12/22/03
7	Start Construction	0 days	Mon 4/19/04
8	Excavation Foundations - East	84 days?	Mon 5/24/04
9	Excavation Foundations - West	112 days?	Thu 8/12/04
10	Slab On Grade	44 days?	Tue 1/25/05
11	Slab On Grade Complete	0 days	Fri 3/25/05
12	**Superstructure - Concrete**	**294 days**	**Mon 1/3/05**
13	Mobilize	22 days	Mon 1/3/05
14	Set Up / Mobilize Tower Cranes	0 days	Mon 1/10/05
15	Tower Crane 1	15 days	Mon 1/10/05
16	Tower Crane 2	15 days	Mon 1/10/05
17	Concrete Core - Assemble Slip Form/Place Cella	15 days	Mon 1/10/05
18	Concrete Core - Ground Floor	10 days	Mon 1/31/05
19	Concrete Core - Floors 2,3	10 days	Mon 2/14/05
20	Concrete Core - Floors 4,5	10 days	Mon 2/28/05
21	Concrete Core - Floors 6,7	10 days	Mon 3/14/05
22	Concrete Core - Floors 8,9	10 days	Mon 3/28/05
23	Concrete Core - Floors 10,11	10 days	Mon 4/11/05
24	Concrete Core - Floors 12,13	10 days	Mon 4/25/05
25	Concrete Core - Floors 14,15	10 days	Mon 5/9/05
26	Concrete Core - Floors 16,17	10 days	Mon 5/23/05
27	Concrete Core - Floors 18,19	10 days	Mon 6/6/05
28	Concrete Core - Floors 20,21	10 days	Mon 6/20/05
29	Concrete Core - Floors 22,23	10 days	Mon 7/4/05
30	Concrete Core - Floors 24,25	10 days	Mon 7/18/05
31	Concrete Core - Floors 26,27	10 days	Mon 8/1/05
32	Concrete Core - Floor 28	10 days	Mon 8/15/05
33	Concrete Core - Floors 29,30	10 days	Mon 8/29/05
34	Slip Form Change-over 1	1 day	Mon 9/12/05
35	Concrete Core - Floors 31,32	10 days	Tue 9/13/05
36	Concrete Core - Floors 33,34	10 days	Tue 9/27/05
37	Concrete Core - Floors 35,36	10 days	Tue 10/11/05
38	Concrete Core - Floors 37,38	10 days	Tue 10/25/05
39	Concrete Core - Floors 39,40	10 days	Tue 11/8/05



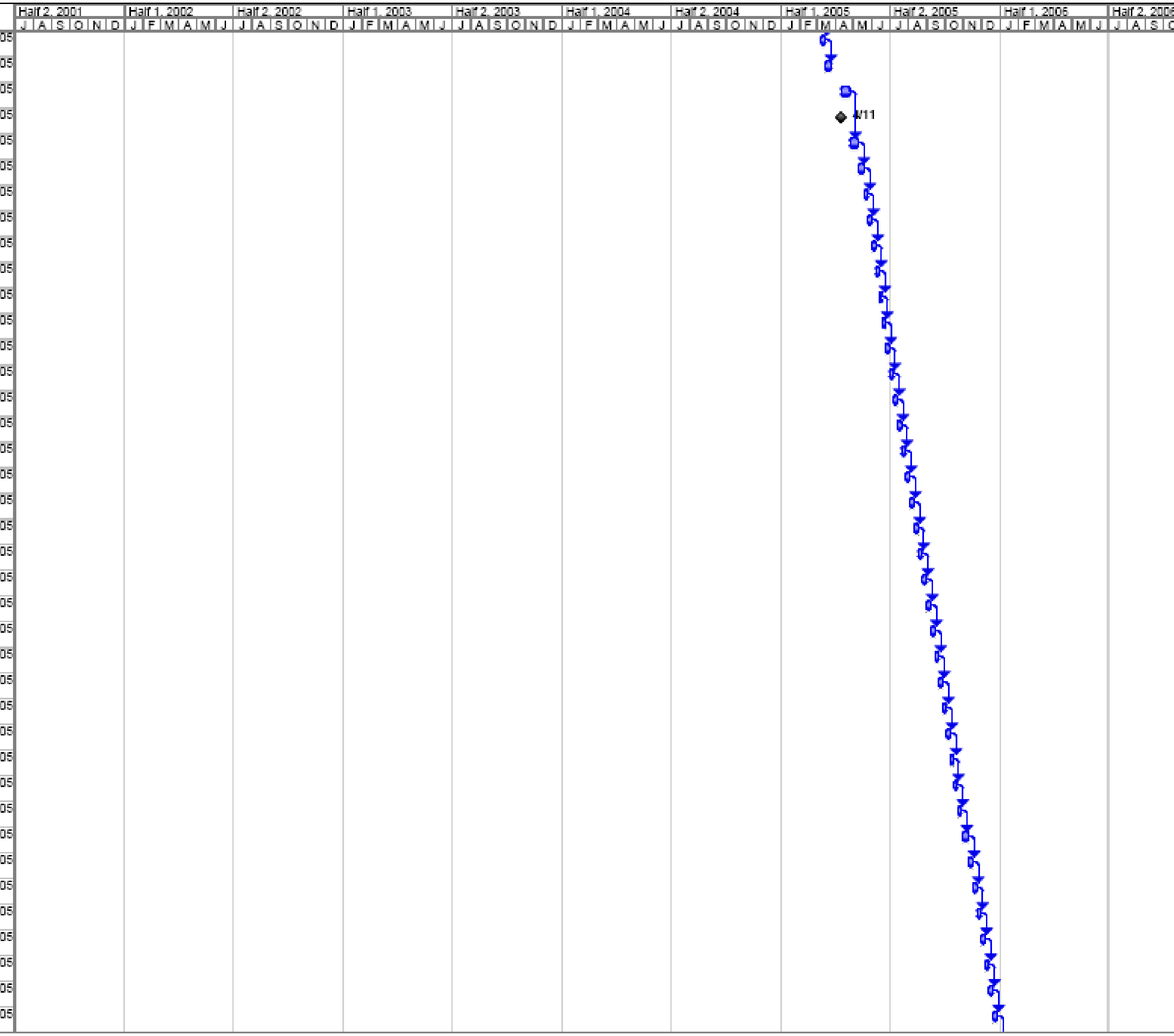
ID		Task Name	Duration	Start
40		Concrete Core - Floors 41,42	10 days	Tue 11/22/05
41		Slip Form Change-over 2	1 day	Tue 12/6/05
42		Concrete Core - Floors 43,44	10 days	Wed 12/7/05
43		Concrete Core - Floors 45,46	10 days	Wed 12/21/05
44		Concrete Core - Floors 47,48	10 days	Wed 1/4/06
45		Concrete Core - Floors 49,50	10 days	Wed 1/18/06
46		Concrete Core - Floor 51	10 days	Wed 2/1/06
47		Demobilize/Disassemble Slip Form	2 days	Wed 2/15/06
48		**Superstructure - Steel**	**678 days**	**Mon 10/20/03**
49		Shop Drawings	295 days	Tue 10/21/03
50		Mill Orders	182 days	Mon 10/20/03
51		Material Deliveries	179 days	Tue 1/27/04
52		Fabrication - Podium	90 days	Mon 6/21/04
53		Fabrication - Tower	248 days	Fri 7/16/04
54		Mobilize Podium Steel	8 days	Fri 11/5/04
55		Mobilize Podium Steel	0 days	Fri 11/5/04
56		Erect Podium Steel	59 days	Wed 11/17/04
57		Mobilize	22 days	Wed 2/9/05
58		Erect Steel - Ground Floor Framing	0 days	Fri 3/18/05
59		Erect Steel - 2nd Floor	8 days	Fri 3/18/05
60		Erect Steel - 3rd Floor	5 days	Wed 3/30/05
61		Erect Steel - 4th Floor	5 days	Wed 4/6/05
62		Erect Steel - 5th Floor	5 days	Wed 4/13/05
63		Erect Steel - 6th Floor	5 days	Wed 4/20/05
64		Erect Steel - 7th Floor	5 days	Wed 4/27/05
65		Erect Steel - 8th Floor	5 days	Wed 5/4/05
66		Erect Steel - 9th Floor	5 days	Wed 5/11/05
67		Erect Steel - 10th Floor	5 days	Wed 5/18/05
68		Erect Steel - 11th Floor	5 days	Wed 5/25/05
69		Erect Steel - 12th Floor	5 days	Wed 6/1/05
70		Erect Steel - 13th Floor	5 days	Wed 6/8/05
71		Erect Steel - 14th Floor	5 days	Wed 6/15/05
72		Erect Steel - 15th Floor	5 days	Wed 6/22/05
73		Erect Steel - 16th Floor	5 days	Wed 6/29/05
74		Erect Steel - 17th Floor	5 days	Wed 7/6/05
75		Erect Steel - 18th Floor	5 days	Wed 7/13/05
76		Erect Steel - 19th Floor	5 days	Wed 7/20/05
77		Erect Steel - 20th Floor	5 days	Wed 7/27/05
78		Erect Steel - 21st Floor	5 days	Wed 8/3/05



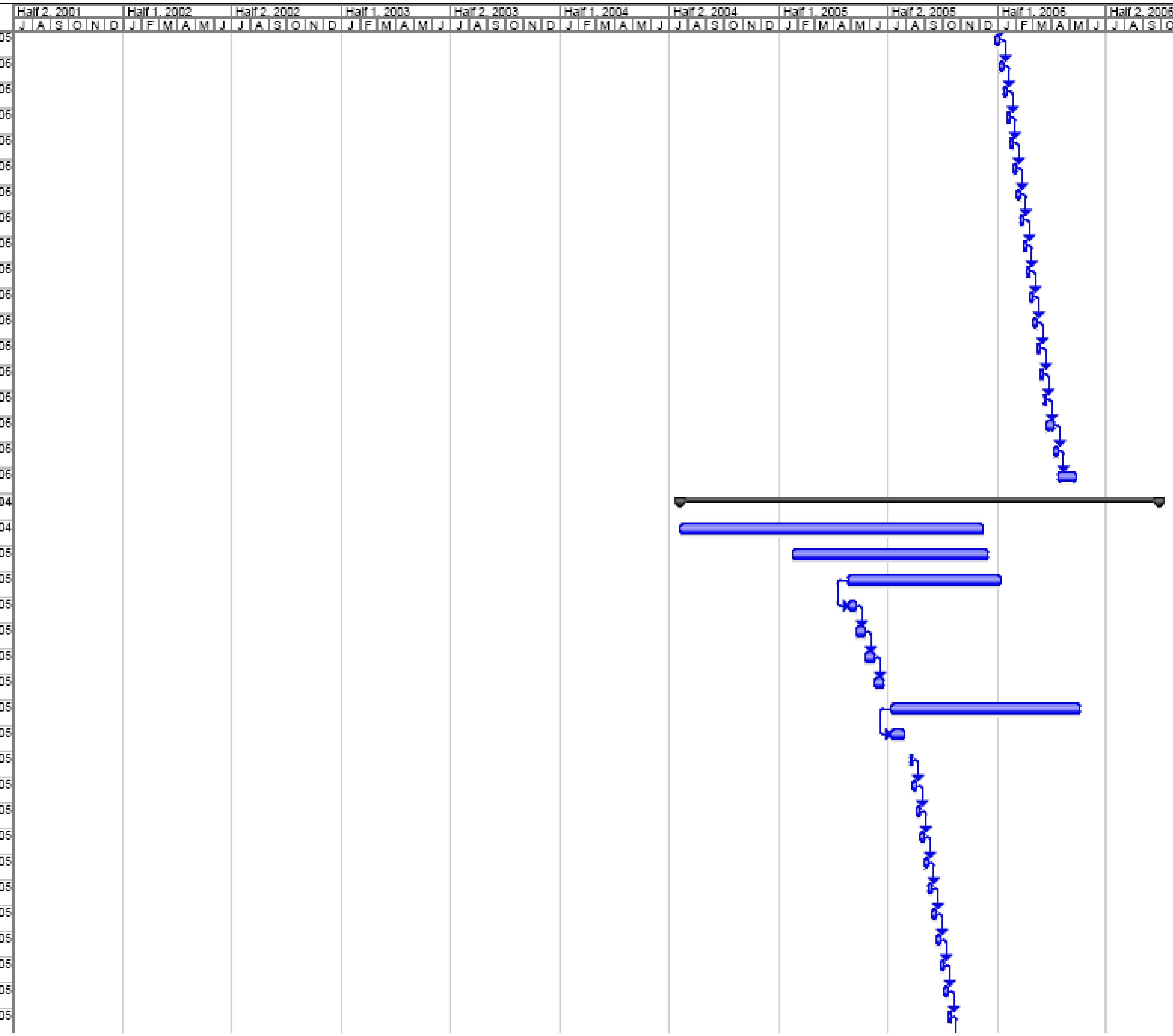
ID	Task Name	Duration	Start
79	Erect Steel - 22nd Floor	5 days	Wed 8/10/05
80	Erect Steel - 23rd Floor	5 days	Wed 8/17/05
81	Erect Steel - 24th Floor	5 days	Wed 8/24/05
82	Erect Steel - 25th Floor	5 days	Wed 8/31/05
83	Erect Steel - 26th Floor	5 days	Wed 9/7/05
84	Erect Steel - 27th Floor	5 days	Wed 9/14/05
85	Erect Steel - 28th Floor	10 days	Wed 9/21/05
86	Erect Steel - 29th Floor	5 days	Wed 10/5/05
87	Erect Steel - 30th Floor	5 days	Wed 10/12/05
88	Erect Steel - 31st Floor	4 days	Wed 10/19/05
89	Erect Steel - 32nd Floor	4 days	Tue 10/25/05
90	Erect Steel - 33rd Floor	4 days	Mon 10/31/05
91	Erect Steel - 34th Floor	4 days	Fri 11/4/05
92	Erect Steel - 35th Floor	4 days	Thu 11/10/05
93	Erect Steel - 36th Floor	4 days	Wed 11/16/05
94	Erect Steel - 37th Floor	4 days	Tue 11/22/05
95	Erect Steel - 38th Floor	4 days	Mon 11/28/05
96	Erect Steel - 39th Floor	4 days	Fri 12/2/05
97	Erect Steel - 40th Floor	4 days	Thu 12/8/05
98	Erect Steel - 41st Floor	4 days	Wed 12/14/05
99	Erect Steel - 42nd Floor	4 days	Tue 12/20/05
100	Erect Steel - 43rd Floor	4 days	Mon 12/26/05
101	Erect Steel - 44th Floor	4 days	Fri 12/30/05
102	Erect Steel - 45th Floor	4 days	Thu 1/5/06
103	Erect Steel - 46th Floor	4 days	Wed 1/11/06
104	Erect Steel - 47th Floor	4 days	Tue 1/17/06
105	Erect Steel - 48th Floor	4 days	Mon 1/23/06
106	Erect Steel - 49th Floor	4 days	Fri 1/27/06
107	Erect Steel - 50th Floor	4 days	Thu 2/2/06
108	Erect Steel - 51st Floor	9 days	Wed 2/8/06
109	Erect Steel - 52nd Floor	4 days	Tue 2/21/06
110	Erect Steel - Tower Roof/Top out	4 days	Wed 4/19/06
111	Demobilize	22 days	Tue 4/25/06
112	**Superstructure - Concrete Flooring**	**328 days**	**Tue 2/8/05**
113	Mobilize Podium	5 days	Tue 2/8/05
114	Mobilize Podium Concrete	0 days	Tue 2/8/05
115	Pour Concrete - Podium Ground Floor	6 days	Tue 2/15/05
116	Pour Concrete - Podium 2nd Floor	5 days	Wed 2/23/05
117	Pour Concrete - Podium 3rd Floor	5 days	Wed 3/2/05



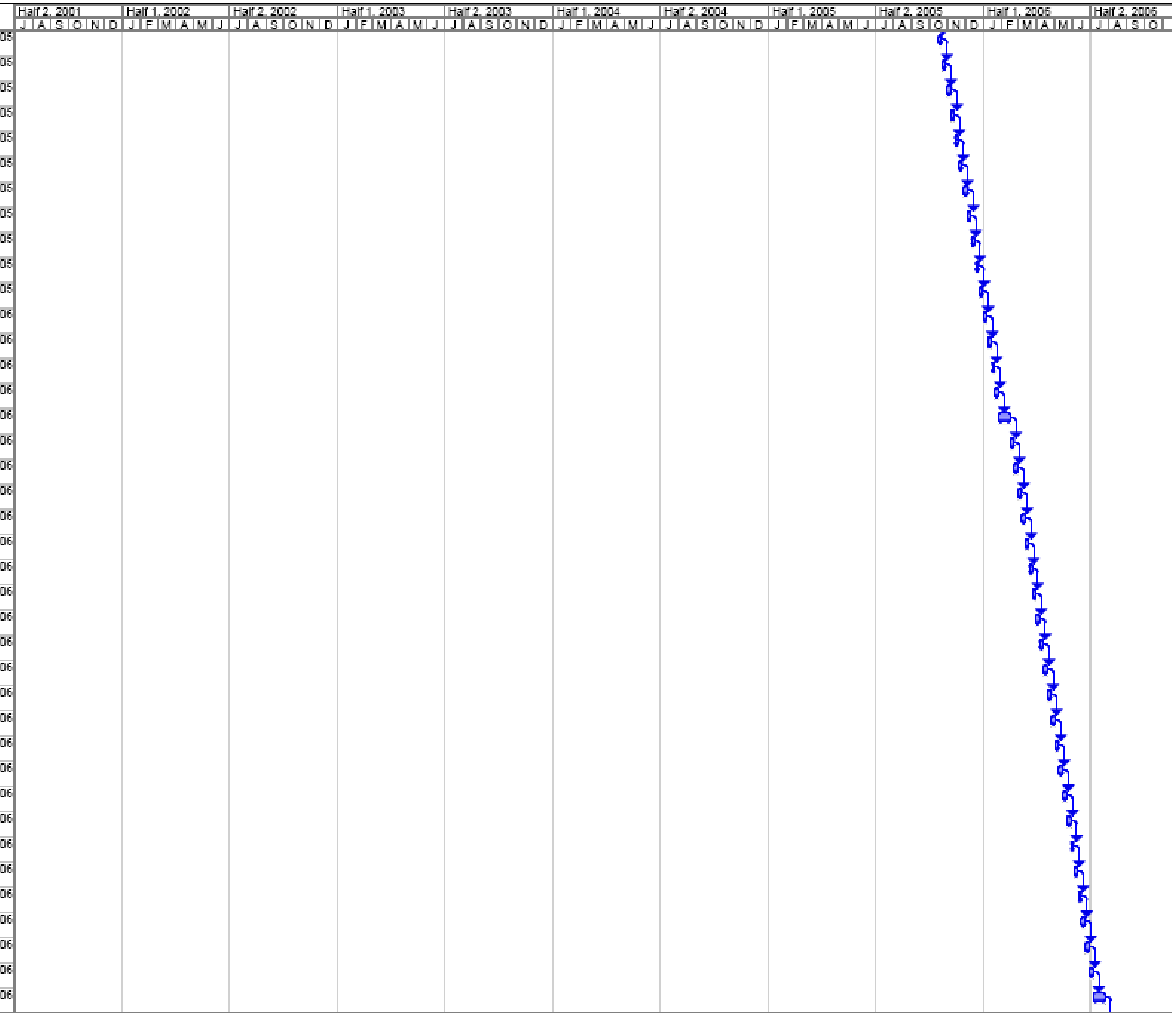
ID		Task Name	Duration	Start
118		Pour Concrete - Podium 4th Floor	5 days	Wed 3/9/05
119		Pour Concrete - Podium 5th Floor	8 days	Wed 3/16/05
120		Mobilization - Tower	11 days	Mon 4/11/05
121		Mobilize Tower Concrete	0 days	Mon 4/11/05
122		Pour Concrete - Ground Floor	10 days	Tue 4/26/05
123		Pour Concrete - 2nd Floor	8 days	Tue 5/10/05
124		Pour Concrete - 3rd Floor	4 days	Fri 5/20/05
125		Pour Concrete - 4th Floor	5 days	Thu 5/26/05
126		Pour Concrete - 5th Floor	4 days	Thu 6/2/05
127		Pour Concrete - 6th Floor	4 days	Wed 6/8/05
128		Pour Concrete - 7th Floor	4 days	Tue 6/14/05
129		Pour Concrete - 8th Floor	4 days	Mon 6/20/05
130		Pour Concrete - 9th Floor	5 days	Fri 6/24/05
131		Pour Concrete - 10th Floor	5 days	Fri 7/1/05
132		Pour Concrete - 11th Floor	4 days	Fri 7/8/05
133		Pour Concrete - 12th Floor	5 days	Thu 7/14/05
134		Pour Concrete - 13th Floor	5 days	Thu 7/21/05
135		Pour Concrete - 14th Floor	5 days	Thu 7/28/05
136		Pour Concrete - 15th Floor	5 days	Thu 8/4/05
137		Pour Concrete - 16th Floor	5 days	Thu 8/11/05
138		Pour Concrete - 17th Floor	5 days	Thu 8/18/05
139		Pour Concrete - 18th Floor	5 days	Thu 8/25/05
140		Pour Concrete - 19th Floor	5 days	Thu 9/1/05
141		Pour Concrete - 20th Floor	5 days	Thu 9/8/05
142		Pour Concrete - 21st Floor	4 days	Thu 9/15/05
143		Pour Concrete - 22nd Floor	5 days	Wed 9/21/05
144		Pour Concrete - 23rd Floor	4 days	Wed 9/28/05
145		Pour Concrete - 24th Floor	5 days	Tue 10/4/05
146		Pour Concrete - 25th Floor	4 days	Tue 10/11/05
147		Pour Concrete - 26th Floor	5 days	Mon 10/17/05
148		Pour Concrete - 27th Floor	5 days	Mon 10/24/05
149		Pour Concrete - 28th Floor	8 days	Mon 10/31/05
150		Pour Concrete - 29th Floor	5 days	Thu 11/10/05
151		Pour Concrete - 30th Floor	5 days	Thu 11/17/05
152		Pour Concrete - 31st Floor	5 days	Thu 11/24/05
153		Pour Concrete - 32nd Floor	5 days	Thu 12/1/05
154		Pour Concrete - 33rd Floor	4 days	Thu 12/8/05
155		Pour Concrete - 34th Floor	5 days	Wed 12/14/05
156		Pour Concrete - 35th Floor	5 days	Wed 12/21/05



ID	Task Name	Duration	Start
157	Pour Concrete - 36th Floor	6 days	Wed 12/28/05
158	Pour Concrete - 37th Floor	4 days	Thu 1/5/06
159	Pour Concrete - 38th Floor	4 days	Wed 1/11/06
160	Pour Concrete - 39th Floor	4 days	Tue 1/17/06
161	Pour Concrete - 40th Floor	4 days	Mon 1/23/06
162	Pour Concrete - 41st Floor	4 days	Fri 1/27/06
163	Pour Concrete - 42nd Floor	4 days	Thu 2/2/06
164	Pour Concrete - 43rd Floor	4 days	Wed 2/8/06
165	Pour Concrete - 44th Floor	4 days	Tue 2/14/06
166	Pour Concrete - 45th Floor	4 days	Mon 2/20/06
167	Pour Concrete - 46th Floor	4 days	Fri 2/24/06
168	Pour Concrete - 47th Floor	4 days	Thu 3/2/06
169	Pour Concrete - 48th Floor	4 days	Wed 3/8/06
170	Pour Concrete - 49th Floor	4 days	Tue 3/14/06
171	Pour Concrete - 50th Floor	4 days	Mon 3/20/06
172	Pour Concrete - 51st Floor	9 days	Fri 3/24/06
173	Pour Concrete - 52nd Floor	4 days	Thu 4/6/06
174	Pour Concrete - Concrete Fills / Top out	22 days	Wed 4/12/06
175	**Curtain Wall**	**572 days**	**Tue 7/20/04**
176	Shop Assembly	362 days	Tue 7/20/04
177	Shipping	234 days	Mon 1/24/05
178	Set Insert / Clips	183 days	Tue 4/26/05
179	Mobilize - Load Podium Units	8 days	Thu 4/28/05
180	Curtain Wall - Floor 2 Podium	11 days	Tue 5/10/05
181	Curtain Wall - Floor 3 Podium	12 days	Wed 5/25/05
182	Curtain Wall - Floor 4 Podium	11 days	Fri 6/10/05
183	Mobilization - Loading	225 days	Fri 7/8/05
184	Curtain Wall Tower - Overhead Protection	15 days	Fri 7/8/05
185	Curtain Wall Tower - Floor 2	4 days	Mon 8/8/05
186	Curtain Wall Tower - Floor 3	5 days	Fri 8/12/05
187	Curtain Wall Tower - Floor 4	4 days	Fri 8/19/05
188	Curtain Wall Tower - Floor 5	5 days	Thu 8/25/05
189	Curtain Wall Tower - Floor 6	4 days	Thu 9/1/05
190	Curtain Wall Tower - Floor 7	5 days	Wed 9/7/05
191	Curtain Wall Tower - Floor 8	5 days	Wed 9/14/05
192	Curtain Wall Tower - Floor 9	5 days	Wed 9/21/05
193	Curtain Wall Tower - Floor 10	4 days	Wed 9/28/05
194	Curtain Wall Tower - Floor 11	5 days	Tue 10/4/05
195	Curtain Wall Tower - Floor 12	4 days	Tue 10/11/05



ID	Task Name	Duration	Start
196	Curtain Wall Tower - Floor 13	5 days	Mon 10/17/05
197	Curtain Wall Tower - Floor 14	5 days	Mon 10/24/05
198	Curtain Wall Tower - Floor 15	6 days	Mon 10/31/05
199	Curtain Wall Tower - Floor 16	4 days	Tue 11/8/05
200	Curtain Wall Tower - Floor 17	5 days	Mon 11/14/05
201	Curtain Wall Tower - Floor 18	5 days	Mon 11/21/05
202	Curtain Wall Tower - Floor 19	6 days	Mon 11/28/05
203	Curtain Wall Tower - Floor 20	4 days	Tue 12/6/05
204	Curtain Wall Tower - Floor 21	5 days	Mon 12/12/05
205	Curtain Wall Tower - Floor 22	5 days	Mon 12/19/05
206	Curtain Wall Tower - Floor 23	5 days	Mon 12/26/05
207	Curtain Wall Tower - Floor 24	5 days	Mon 1/2/06
208	Curtain Wall Tower - Floor 25	5 days	Mon 1/9/06
209	Curtain Wall Tower - Floor 26	4 days	Mon 1/16/06
210	Curtain Wall Tower - Floor 27	5 days	Fri 1/20/06
211	Curtain Wall Tower - Floor 28	14 days	Fri 1/27/06
212	Curtain Wall Tower - Floor 29	4 days	Thu 2/16/06
213	Curtain Wall Tower - Floor 30	5 days	Wed 2/22/06
214	Curtain Wall Tower - Floor 31	4 days	Wed 3/1/06
215	Curtain Wall Tower - Floor 32	5 days	Tue 3/7/06
216	Curtain Wall Tower - Floor 33	4 days	Tue 3/14/06
217	Curtain Wall Tower - Floor 34	5 days	Mon 3/20/06
218	Curtain Wall Tower - Floor 35	4 days	Mon 3/27/06
219	Curtain Wall Tower - Floor 36	5 days	Fri 3/31/06
220	Curtain Wall Tower - Floor 37	4 days	Fri 4/7/06
221	Curtain Wall Tower - Floor 38	5 days	Thu 4/13/06
222	Curtain Wall Tower - Floor 39	4 days	Thu 4/20/06
223	Curtain Wall Tower - Floor 40	5 days	Wed 4/26/06
224	Curtain Wall Tower - Floor 41	4 days	Wed 5/3/06
225	Curtain Wall Tower - Floor 42	5 days	Tue 5/9/06
226	Curtain Wall Tower - Floor 43	5 days	Tue 5/16/06
227	Curtain Wall Tower - Floor 44	5 days	Tue 5/23/06
228	Curtain Wall Tower - Floor 45	4 days	Tue 5/30/06
229	Curtain Wall Tower - Floor 46	5 days	Mon 6/5/06
230	Curtain Wall Tower - Floor 47	4 days	Mon 6/12/06
231	Curtain Wall Tower - Floor 48	5 days	Fri 6/16/06
232	Curtain Wall Tower - Floor 49	5 days	Fri 6/23/06
233	Curtain Wall Tower - Floor 50	5 days	Fri 6/30/06
234	Curtain Wall Tower - Floor 51	14 days	Fri 7/7/06



ID	Task Name	Duration	Start
235	Curtain Wall Tower - Screen Work	45 days	Thu 7/27/06

Figure 292: Detailed Original Core Take-off

Structural Framing Schedule

Family and Type	Mark	Length	Volume	Quantity	LineNumber	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type
						STRUCTURAL STEEL MEMBERS																					
TT-W-Wide Flange: W14X99	Replaced by Core	26.8	5.25	26.8	051223756100	TT14x99,	E5	1200	0.067	L.F.	$ 168.71	$ 4.16	$ 1.72	$ 174.59	$ 4,521.43	$ 111.49	$ 46.10	$ 4,679.01	$ 186.30	$ 7.22	$ 1.90	$ 195.42	$ 4,992.84	$ 193.50	$ 50.92	$ 5,237.26	STD
W-Wide Flange: W14X82	Replaced by Core	16.3	2.69	16.3	051223752380	W14x82	E2	740	0.076	L.F.	$ 140.51	$ 4.67	$ 2.59	$ 147.77	$ 2,290.34	$ 76.12	$ 42.22	$ 2,408.68	$ 153.71	$ 8.00	$ 2.85	$ 164.56	$ 2,505.53	$ 130.40	$ 46.46	$ 2,682.39	STD
W-Wide Flange: W14X82	Replaced by Core	16.3	2.69	16.3	051223752380	W14x82	E2	740	0.076	L.F.	$ 140.51	$ 4.67	$ 2.59	$ 147.77	$ 2,290.34	$ 76.12	$ 42.22	$ 2,408.68	$ 153.71	$ 8.00	$ 2.85	$ 164.56	$ 2,505.53	$ 130.40	$ 46.46	$ 2,682.39	STD
W-Wide Flange: W14X82	Replaced by Core	16.8	2.97	16.8	051223752380	W14x82	E2	740	0.076	L.F.	$ 140.51	$ 4.67	$ 2.59	$ 147.77	$ 2,360.59	$ 78.46	$ 43.51	$ 2,482.56	$ 153.71	$ 8.00	$ 2.85	$ 164.56	$ 2,582.39	$ 134.40	$ 47.88	$ 2,764.67	STD
W-Wide Flange: W14X90	Replaced by Core	16.3	2.96	16.3	051223752380	W14x90	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 2,513.79	$ 76.12	$ 42.22	$ 2,632.12	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 2,749.97	$ 130.40	$ 46.46	$ 2,926.83	STD
W-Wide Flange: W14X90	Replaced by Core	16.3	2.96	16.3	051223752380	W14x90	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 2,513.79	$ 76.12	$ 42.22	$ 2,632.12	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 2,749.97	$ 130.40	$ 46.46	$ 2,926.83	STD
W-Wide Flange: W14X90	Replaced by Core	22	3.87	22	051223752380	W14x90	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 3,392.84	$ 102.74	$ 56.98	$ 3,552.56	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 3,711.62	$ 176.00	$ 62.70	$ 3,950.32	STD
W-Wide Flange: W14X90	Replaced by Core	19.2	3.49	19.2	051223752380	W14x90	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 2,961.02	$ 89.66	$ 49.73	$ 3,100.42	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 3,239.23	$ 153.60	$ 54.72	$ 3,447.55	STD
W-Wide Flange: W14X90	Replaced by Core	19.2	3.49	19.2	051223752380	W14x90	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 2,961.02	$ 89.66	$ 49.73	$ 3,100.42	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 3,239.23	$ 153.60	$ 54.72	$ 3,447.55	STD
W-Wide Flange: W14X90	Replaced by Core	26.8	4.76	26.8	051223752380	W14x90	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,133.10	$ 125.16	$ 69.41	$ 4,327.66	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,521.43	$ 214.40	$ 76.38	$ 4,812.21	STD
W-Wide Flange: W14X109	Replaced by Core	19.2	4.37	19.2	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 3,934.66	$ 92.16	$ 51.26	$ 4,078.08	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 4,332.10	$ 157.63	$ 56.26	$ 4,545.98	STD
W-Wide Flange: W14X109	Replaced by Core	19.2	4.23	19.2	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 3,934.66	$ 92.16	$ 51.26	$ 4,078.08	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 4,332.10	$ 157.63	$ 56.26	$ 4,545.98	STD
W-Wide Flange: W14X109	Replaced by Core	19.6	4.49	19.6	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 4,016.63	$ 94.08	$ 52.33	$ 4,163.04	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 4,422.35	$ 160.92	$ 57.43	$ 4,640.69	STD
W-Wide Flange: W14X120	Replaced by Core	27.8	6.4	27.8	051223752500	W14x120	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 5,697.05	$ 133.44	$ 74.23	$ 5,904.72	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 6,272.51	$ 228.24	$ 81.45	$ 6,582.21	STD
W-Wide Flange: W14X120	Replaced by Core	23.5	5.74	23.5	051223752500	W14x120	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 4,815.86	$ 112.80	$ 62.75	$ 4,991.40	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 5,302.31	$ 192.94	$ 68.86	$ 5,564.10	STD
W-Wide Flange: W14X120	Replaced by Core	23.5	5.74	23.5	051223752500	W14x120	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 4,815.86	$ 112.80	$ 62.75	$ 4,991.40	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 5,302.31	$ 192.94	$ 68.86	$ 5,564.10	STD
W-Wide Flange: W14X120	Replaced by Core	38.2	9.11	38.2	051223752500	W14x120	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,828.33	$ 183.36	$ 101.99	$ 8,113.68	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,619.07	$ 313.62	$ 111.93	$ 9,044.61	STD
W-Wide Flange: W14X132	Replaced by Core	38.2	10.21	38.2	051223752500	W14x132	E2	720	0.078	L.F.	$ 225.42	$ 4.80	$ 2.67	$ 232.89	$ 8,611.16	$ 183.36	$ 101.99	$ 8,896.51	$ 248.19	$ 8.21	$ 2.93	$ 259.33	$ 9,480.97	$ 313.62	$ 111.93	$ 9,906.52	STD
W-Wide Flange: W14X145	Replaced by Core	23.5	6.92	23.5	051223752500	W14x145	E2	720	0.078	L.F.	$ 247.62	$ 4.80	$ 2.67	$ 255.09	$ 5,819.16	$ 112.80	$ 62.75	$ 5,994.70	$ 272.64	$ 8.21	$ 2.93	$ 283.78	$ 6,406.95	$ 192.94	$ 68.86	$ 6,668.74	STD
W-Wide Flange: W14X145	Replaced by Core	23.5	6.7	23.5	051223752500	W14x145	E2	720	0.078	L.F.	$ 247.62	$ 4.80	$ 2.67	$ 255.09	$ 5,819.16	$ 112.80	$ 62.75	$ 5,994.70	$ 272.64	$ 8.21	$ 2.93	$ 283.78	$ 6,406.95	$ 192.94	$ 68.86	$ 6,668.74	STD
W-Wide Flange: W14X257	Replaced by Core	22.5	11.75	22.5	051223752500	W14x257	E2	720	0.078	L.F.	$ 438.89	$ 4.80	$ 2.67	$ 446.36	$ 9,875.06	$ 108.00	$ 60.08	$ 10,043.14	$ 483.22	$ 8.21	$ 2.93	$ 494.36	$ 10,872.55	$ 184.73	$ 65.93	$ 11,123.20	STD
W-Wide Flange: W14X283	Replaced by Core	23.1	13.26	23.1	051223752500	W14x283	E2	720	0.078	L.F.	$ 483.29	$ 4.80	$ 2.67	$ 490.76	$ 11,164.07	$ 110.88	$ 61.68	$ 11,336.63	$ 532.11	$ 8.21	$ 2.93	$ 543.25	$ 12,291.76	$ 189.65	$ 67.68	$ 12,549.09	STD
W-Wide Flange: W14X283	Replaced by Core	17.3	9.96	17.3	051223752500	W14x283	E2	720	0.078	L.F.	$ 483.29	$ 4.80	$ 2.67	$ 490.76	$ 8,360.97	$ 83.04	$ 46.19	$ 8,490.20	$ 532.11	$ 8.21	$ 2.93	$ 543.25	$ 9,205.52	$ 142.03	$ 50.69	$ 9,398.24	STD
W-Wide Flange: W14X283	Replaced by Core	21.7	12.47	21.7	051223752500	W14x283	E2	720	0.078	L.F.	$ 483.29	$ 4.80	$ 2.67	$ 490.76	$ 10,487.46	$ 104.16	$ 57.94	$ 10,649.56	$ 532.11	$ 8.21	$ 2.93	$ 543.25	$ 11,546.80	$ 178.16	$ 63.58	$ 11,788.54	STD
W-Wide Flange: W14X283	Replaced by Core	17.3	9.96	17.3	051223752500	W14x283	E2	720	0.078	L.F.	$ 483.29	$ 4.80	$ 2.67	$ 490.76	$ 8,360.97	$ 83.04	$ 46.19	$ 8,490.20	$ 532.11	$ 8.21	$ 2.93	$ 543.25	$ 9,205.52	$ 142.03	$ 50.69	$ 9,398.24	STD
W-Wide Flange: W14X283	Replaced by Core	21.7	12.46	21.7	051223752500	W14x283	E2	720	0.078	L.F.	$ 483.29	$ 4.80	$ 2.67	$ 490.76	$ 10,487.46	$ 104.16	$ 57.94	$ 10,649.56	$ 532.11	$ 8.21	$ 2.93	$ 543.25	$ 11,546.80	$ 178.16	$ 63.58	$ 11,788.54	STD
W-Wide Flange: W33X141	Replaced by Core	30	8.54	30	051223757100	W33x141	E5	1134	0.071	L.F.	$ 241.16	$ 4.40	$ 1.82	$ 247.38	$ 7,234.80	$ 132.00	$ 54.60	$ 7,421.40	$ 264.96	$ 7.65	$ 2.01	$ 274.62	$ 7,948.80	$ 229.50	$ 60.30	$ 8,238.60	STD
W-Wide Flange: W33X141	Replaced by Core	30	8.54	30	051223757100	W33x141	E5	1134	0.071	L.F.	$ 241.16	$ 4.40	$ 1.82	$ 247.38	$ 7,234.80	$ 132.00	$ 54.60	$ 7,421.40	$ 264.96	$ 7.65	$ 2.01	$ 274.62	$ 7,948.80	$ 229.50	$ 60.30	$ 8,238.60	STD
W-Wide Flange: W33X141	Replaced by Core	30	8.11	30	051223757100	W33x141	E5	1134	0.071	L.F.	$ 241.16	$ 4.40	$ 1.82	$ 247.38	$ 7,234.80	$ 132.00	$ 54.60	$ 7,421.40	$ 264.96	$ 7.65	$ 2.01	$ 274.62	$ 7,948.80	$ 229.50	$ 60.30	$ 8,238.60	STD
W-Wide Flange: W33X141	Replaced by Core	30	8.11	30	051223757100	W33x141	E5	1134	0.071	L.F.	$ 241.16	$ 4.40	$ 1.82	$ 247.38	$ 7,234.80	$ 132.00	$ 54.60	$ 7,421.40	$ 264.96	$ 7.65	$ 2.01	$ 274.62	$ 7,948.80	$ 229.50	$ 60.30	$ 8,238.60	STD
W-Wide Flange: W33X201	Replaced by Core	30	11.53	30	051223757100	W33x201	E5	1134	0.071	L.F.	$ 343.78	$ 4.40	$ 1.82	$ 350.00	$ 10,313.44	$ 132.00	$ 54.60	$ 10,500.04	$ 377.71	$ 7.65	$ 2.01	$ 387.37	$ 11,331.27	$ 229.50	$ 60.30	$ 11,621.07	STD
W-Wide Flange: W33X201	Replaced by Core	30	11.53	30	051223757100	W33x201	E5	1134	0.071	L.F.	$ 343.78	$ 4.40	$ 1.82	$ 350.00	$ 10,313.44	$ 132.00	$ 54.60	$ 10,500.04	$ 377.71	$ 7.65	$ 2.01	$ 387.37	$ 11,331.27	$ 229.50	$ 60.30	$ 11,621.07	STD
Grand total: 32		**755.8**	**225.25**	**Total**											**$ 193,532.86**	**$ 3,516.69**	**$ 1,826.02**	**$ 198,875.51**					**$ 212,802.05**	**$ 6,042.28**	**$ 2,007.81**	**$ 220,852.06**	

Structural Column Schedule

Family and Type	Mark	Length	Volume	Quantity	LineNumber	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	
W-Wide Flange-Column: W23X1168	Replaced by Core	13.75	20.5	13.75	051223758100	BU-Built Up-Column: W23X1168	E5	1035	0.077	L.F.	$ 2,002.73	$ 4.83	$ 1.99	$ 2,009.55	$ 27,537.47	$ 66.41	$ 27.36	$ 27,631.24	$ 2,203.00	$ 8.35	$ 2.19	$ 2,213.54	$ 30,291.22	$ 114.81	$ 30.11	$ 30,436.14	STD
W-Wide Flange-Column: W23X1168	Replaced by Core	13.75	20.5	13.75	051223758100	BU-Built Up-Column: W23X1168	E5	1035	0.077	L.F.	$ 2,002.73	$ 4.83	$ 1.99	$ 2,009.55	$ 27,537.47	$ 66.41	$ 27.36	$ 27,631.24	$ 2,203.00	$ 8.35	$ 2.19	$ 2,213.54	$ 30,291.22	$ 114.81	$ 30.11	$ 30,436.14	STD
W-Wide Flange-Column: W23X1168	Replaced by Core	13.75	20.5	13.75	051223758100	BU-Built Up-Column: W23X1168	E5	1035	0.077	L.F.	$ 2,002.73	$ 4.83	$ 1.99	$ 2,009.55	$ 27,537.47	$ 66.41	$ 27.36	$ 27,631.24	$ 2,203.00	$ 8.35	$ 2.19	$ 2,213.54	$ 30,291.22	$ 114.81	$ 30.11	$ 30,436.14	STD
W-Wide Flange-Column: W23X1168	Replaced by Core	13.75	20.5	13.75	051223758100	BU-Built Up-Column: W23X1168	E5	1035	0.077	L.F.	$ 2,002.73	$ 4.83	$ 1.99	$ 2,009.55	$ 27,537.47	$ 66.41	$ 27.36	$ 27,631.24	$ 2,203.00	$ 8.35	$ 2.19	$ 2,213.54	$ 30,291.22	$ 114.81	$ 30.11	$ 30,436.14	STD
W-Wide Flange-Column: W29X2063	Replaced by Core	13.75	20.5	13.75	051223758100	BU-Built Up-Column: W29X2063	E5	1035	0.077	L.F.	$ 3,519.00	$ 4.83	$ 1.99	$ 3,525.82	$ 48,386.25	$ 66.41	$ 27.36	$ 48,480.03	$ 3,870.90	$ 8.35	$ 2.19	$ 3,881.44	$ 53,224.88	$ 114.81	$ 30.11	$ 53,369.80	STD
W-Wide Flange-Column: W29X2063	Replaced by Core	13.75	20.5	13.75	051223758100	BU-Built Up-Column: W29X2063	E5	1035	0.077	L.F.	$ 3,519.00	$ 4.83	$ 1.99	$ 3,525.82	$ 48,386.25	$ 66.41	$ 27.36	$ 48,480.03	$ 3,870.90	$ 8.35	$ 2.19	$ 3,881.44	$ 53,224.88	$ 114.81	$ 30.11	$ 53,369.80	STD
W-Wide Flange-Column: W29X2063	Replaced by Core	13.75	20.5	13.75	051223758100	BU-Built Up-Column: W29X2063	E5	1035	0.077	L.F.	$ 3,519.00	$ 4.83	$ 1.99	$ 3,525.82	$ 48,386.25	$ 66.41	$ 27.36	$ 48,480.03	$ 3,870.90	$ 8.35	$ 2.19	$ 3,881.44	$ 53,224.88	$ 114.81	$ 30.11	$ 53,369.80	STD
W-Wide Flange-Column: W29X2063	Replaced by Core	13.75	20.5	13.75	051223758100	BU-Built Up-Column: W29X2063	E5	1035	0.077	L.F.	$ 3,519.00	$ 4.83	$ 1.99	$ 3,525.82	$ 48,386.25	$ 66.41	$ 27.36	$ 48,480.03	$ 3,870.90	$ 8.35	$ 2.19	$ 3,881.44	$ 53,224.88	$ 114.81	$ 30.11	$ 53,369.80	STD
W-Wide Flange-Column: W22X1032	Replaced by Core	13.75	20.5	13.75	051223758100	BU-Built Up-Column: W22X1032	E5	1035	0.077	L.F.	$ 1,759.50	$ 4.83	$ 1.99	$ 1,766.32	$ 24,193.13	$ 66.41	$ 27.36	$ 24,286.90	$ 1,935.45	$ 8.35	$ 2.19	$ 1,945.99	$ 26,612.44	$ 114.81	$ 30.11	$ 26,757.36	STD
W-Wide Flange-Column: W25X1401	Replaced by Core	13.75	20.5	13.75	051223758100	BU-Built Up-Column: W25X1401	E5	1035	0.077	L.F.	$ 2,401.20	$ 4.83	$ 1.99	$ 2,408.02	$ 33,016.50	$ 66.41	$ 27.36	$ 33,110.28	$ 2,641.32	$ 8.35	$ 2.19	$ 2,651.86	$ 36,318.15	$ 114.81	$ 30.11	$ 36,463.08	STD
Grand total: 10		**137.5**	**204.7**	**Total**											**$ 360,904.51**	**$ 664.10**	**$ 273.60**	**$ 361,842.26**					**$ 396,994.99**	**$ 1,148.10**	**$ 301.10**	**$ 398,444.20**	
				Total											**$ 554,437.37**	**$ 4,180.79**	**$ 2,099.62**	**$ 560,717.77**					**$ 609,797.04**	**$ 7,190.38**	**$ 2,308.91**	**$ 619,296.26**	
																									Building Total	**$ 34,680,590.56**	

Figure 293: Detailed Concrete Core Take-off

Wall Material Takeoff

Family and Type	Material: Name	Material: Area	Material: Volume	Length	Area	Volume	Function	Structural Usage
Shear								
Basic Wall: Wall 18"								
Core-shaft								
Core-shaft: 66			52887.52					
Basic Wall: Wall 18": 66			52887.52					
Basic Wall: Wall 24"								
Core-shaft								
Core-shaft: 68			65454.23					
Basic Wall: Wall 24": 68			65454.23					
Basic Wall: Wall 30"								
Core-shaft								
Core-shaft: 300			275824.99					
Basic Wall: Wall 30": 300			275824.99					
Shear: 434			393666.64					
	Concrete - Normal Weight - 6 ksi							
	Concrete - Normal Weight - 8 ksi							
	Concrete - Normal Weight - 10 ksi							
Formwork								
Basic Wall: Wall 18"								
Core-shaft								
Core-shaft: 66								
Basic Wall: Wall 18": 66								
Basic Wall: Wall 24"								
Core-shaft								
Core-shaft: 68								
Basic Wall: Wall 24": 68								
Basic Wall: Wall 30"								
Core-shaft								
Core-shaft: 300								
Basic Wall: Wall 30": 300								
Formwork								
Reinforcing								
Basic Wall: Wall 18"								
Core-shaft								
Core-shaft: 66								
Basic Wall: Wall 18": 66								
Basic Wall: Wall 24"								
Core-shaft								
Core-shaft: 68								
Basic Wall: Wall 24": 68								
Basic Wall: Wall 30"								
Core-shaft								
Core-shaft: 300								
Basic Wall: Wall 30": 300								
Reinforcing								
Concrete Structural Shear Wall Total								

Quantity	LineNumber	So	Su	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	Data Release	Zip Code	Notes
Total													$ 268,108.22	$ 3,317.82	$ 873.12	$ 272,299.20					$ 293,428.82	$ 5,180.44	$ 873.12	$ 299,482.42				
Total													$ 543,342.34	$ 4,145.52	$ 1,090.82	$ 548,578.62					$ 598,706.12	$ 6,472.74	$ 1,090.82	$ 606,299.74				
14580.24444																												
Total													$ 3,389,989.30	$ 17,469.00	$ 4,597.04	$ 3,412,055.16					$ 3,779,004.82	$ 27,275.82	$ 4,597.04	$ 3,810,877.40				
Total 6ksi Concrete													$ 281,513.63	$ 3,317.82	$ 873.12	$ 272,299.20					$ 305,165.97	$ 5,180.44	$ 873.12	$ 299,482.42				
Total 8ksi Concrete													$ 570,509.46	$ 4,145.52	$ 1,090.82	$ 548,578.62					$ 628,672.93	$ 6,472.74	$ 1,090.82	$ 606,299.74				
Total 10ksi Concrete													$ 3,559,488.77	$ 17,469.00	$ 4,597.04	$ 3,412,055.16					$ 3,967,954.75	$ 27,275.82	$ 4,597.04	$ 3,810,877.40				
Total													$ 338,064.32	$ 486,840.56	$ 7,683.28	$ 832,588.16					$ 370,194.40	$ 755,056.88	$ 8,381.76	$ 1,133,633.04				
Total													$ 316,787.68	$ 456,200.44	$ 7,199.72	$ 780,187.84					$ 346,895.60	$ 707,536.12	$ 7,864.24	$ 1,062,285.96				
Total													$ 1,067,684.64	$ 1,537,554.12	$ 24,265.56	$ 2,629,504.32					$ 1,169,158.80	$ 2,384,642.76	$ 26,471.52	$ 3,580,273.08				
Total Formwork													$ 1,198,267.84	$ 1,725,604.72	$ 27,233.36	$ 2,951,105.92					$ 1,312,152.80	$ 2,676,296.56	$ 29,709.12	$ 4,018,158.48				
1829.26944																												
Total Reinforcing													$ 3,245,852.06	$ 1,525,490.69	$ -	$ 4,771,342.98					$ 3,575,937.76	$ 2,505,484.76	$ -	$ 6,081,421.99				
Total													$ 8,855,631.75	$ 3,276,027.75	$ 33,794.34	$ 11,955,381.88					$ 9,789,884.20	$ 5,220,710.32	$ 36,270.10	$ 14,816,240.03				

Figure 294: Detailed Original Curtain Wall Take-off

	Original Curtain Wall Take-off					
	Floor 1					
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: Glazing No Tubes	1648	59.93	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	4742	172.44	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	1648	59.93	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	4742	172.44	Exterior	N/A	$145.00/SF
Total	**Exterior: 4**	**12780**	**464.74**			
	Curtain Wall: Glazing No Tubes 2	1098	39.93	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1098	39.93	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	3575	130	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1249	45.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	655	23.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	94	3.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	136	4.94	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	111	4.04	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	825	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	213	7.75	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	67	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	137	5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	103	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1238	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	92	3.36	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	94	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	259	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	94	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	655	23.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1249	45.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	655	23.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	94	3.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	136	4.94	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	111	4.04	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	825	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	213	7.75	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	67	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	137	5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	103	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1238	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	92	3.36	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	94	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	259	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	94	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	655	23.83	Exterior	N/A	$145.00/SF
Total	**Exterior: 35**	**17819**	**647.97**			
	Curtain Wall: Glazing No Tubes 2	1925	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1925	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1925	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1925	70	Garden	N/A	$145.00/SF
Total	**Garden: 4**	**7700**	**280**			
	Curtain Wall: Glazing No Tubes 3	204	7.4	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 3	204	7.4	Exterior	N/A	$145.00/SF
Total	**Curtain Wall: Glazing No Tubes 3: 2**	**407**	**14.81**			
Totals	**Curtain Wall**	**38706**	**1407.52**			**$145.00/SF**
	Ceramic Tubes	**N/A**	**N/A**			

	Floor 2					
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: East Wall 3	2011	130	Exterior	36 @ 5' Each	$145.00/SF
Total	**Exterior: 1**	**2011**	**130**			
	Curtain Wall: Glazing Ceramic Tubes	917	59.29	Exterior	38 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	2667	172.44	Exterior	38 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	917	59.29	Exterior	38 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	2667	172.44	Exterior	38 @ 5' Each	$145.00/SF
Total	**Exterior: 4**	**7169**	**463.46**			
	Curtain Wall: Glazing No Tubes 2	618	39.93	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	618	39.93	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	369	23.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	369	23.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	703	45.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	369	23.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	369	23.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	76	4.94	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	63	4.04	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	464	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	120	7.75	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	38	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	77	5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	696	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	52	3.69	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	703	45.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	76	4.94	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	38	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	75	4.82	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	696	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	51	3.63	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	146	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	146	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	63	4.04	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	464	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	120	7.74	Exterior	N/A	$145.00/SF
Total	**Exterior: 34**	**8009**	**518.39**			
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
Total	**Garden: 4**	**4331**	**280**			
	Curtain Wall: Glazing No Tubes 3	115	7.4	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 3	115	7.4	Exterior	N/A	$145.00/SF
Total	**Exterior: 2**	**229**	**14.81**			
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
Total	**Curtain Wall: Shade Extension: 8**	**237**	**80**			
Totals	**Curtain Wall**	**21749**	**1406.66**			**$145.00/SF**
	Ceramic Tubes		**Total #**	**5328**	**5' Lengths**	**$20 Each**

	Floor 3					
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: East Wall 3	2011	130	Exterior	36 @ 5' Each	$145.00/SF
Total	**Exterior: 1**	**2011**	**130**			
	Curtain Wall: Glazing Ceramic Tubes	917	59.29	Exterior	38 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	2667	172.44	Exterior	38 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	917	59.29	Exterior	38 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	2667	172.44	Exterior	38 @ 5' Each	$145.00/SF
Total	**Exterior: 4**	**7169**	**463.46**			
	Curtain Wall: Glazing No Tubes 2	618	39.93	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	618	39.93	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	369	23.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	369	23.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	703	45.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	369	23.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	369	23.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	76	4.94	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	63	4.04	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	464	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	120	7.75	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	38	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	77	5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	696	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	52	3.69	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	703	45.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	76	4.94	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	38	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	75	4.82	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	696	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	51	3.63	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	146	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	146	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	63	4.04	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	464	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	120	7.74	Exterior	N/A	$145.00/SF
Total	**Exterior: 34**	**8009**	**518.39**			
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
Total	**Garden: 4**	**4331**	**280**			
	Curtain Wall: Glazing No Tubes 3	115	7.4	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 3	115	7.4	Exterior	N/A	$145.00/SF
Total	**Exterior: 2**	**229**	**14.81**			
	Curtain Wall: Shade Extension	30	1.91	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	1.91	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	1.94	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	1.91	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	1.91	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	1.91	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	1.94	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	1.94	Exterior	56 @ 10' Each	
Total	**Curtain Wall: Shade Extension: 8**	**237**	**15.35**			
Totals	**Curtain Wall**	**21749**	**1406.66**			**$145.00/SF**
	Ceramic Tubes		**Total #**	**5328**	**5' Lengths**	**$20 Each**

	Floor 4					
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: East Wall 4	1862	130	Exterior	21 @ 5' Each	$145.00/SF
Total	**Exterior: 1**	**1862**	**130**			
	Curtain Wall: Glazing Ceramic Tubes	858	59.93	Exterior	38 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	858	59.93	Exterior	38 @ 5' Each	$145.00/SF
Total	**Exterior: 2**	**1717**	**119.86**			
	Curtain Wall: Glazing No Tubes 2	572	39.93	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	572	39.93	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	352	24.57	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	352	24.57	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	650	45.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	352	24.57	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	352	24.57	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	49	3.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	71	4.94	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	4.04	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	373	26.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.72	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	35	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	54	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	645	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	48	3.36	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	650	45.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	49	3.42	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	71	4.94	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	4.04	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	373	26.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.72	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	35	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	54	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	645	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	47	3.3	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	43	2.97	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	127	8.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	43	2.97	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	43	2.97	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	127	8.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	43	2.97	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	2470	172.44	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	2470	172.44	Exterior	N/A	$145.00/SF
Total	**Exterior: 34**	**11986**	**836.84**			
	Curtain Wall: Glazing No Tubes 2	1182	82.55	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1182	82.55	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1247	87.06	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1247	87.06	Garden	N/A	$145.00/SF
Total	**Garden: 4**	**4859**	**339.22**			
	Curtain Wall: Glazing No Tubes 3	106	7.4	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 3	106	7.4	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 3	81	5.67	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 3	81	5.67	Exterior	N/A	$145.00/SF
Total	**Exterior: 4**	**374**	**26.14**			
	Curtain Wall: Shade Extension	32	2.25	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	32	2.25	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	32	2.25	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	32	2.25	Exterior	56 @ 10' Each	
Total	**Exterior: 4**	**129**	**9**			
Totals	**Curtain Wall**	**20798**				**$145.00/SF**
	Ceramic Tubes		**Total #**	**1946**	**5' Lengths**	**$20 Each**

	Floors 5-27 / 29-50					
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: Glazing Ceramic Tubes	815	59.29		33 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	1650	120		33 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	1650	120		33 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	815	59.29		33 @ 5' Each	$145.00/SF
Total	**Curtain Wall: Glazing Ceramic Tubes: 4**	**4931**	**358.58**	**72**		
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
Total	**Curtain Wall: Glazing Ceramic Tubes Full: 4**	**275**	**20**			
	Curtain Wall: Glazing No Tubes	613	44.56		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	275	20		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	275	20		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	613	44.56		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	613	44.56		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	275	20		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	275	20		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	613	44.56		N/A	$145.00/SF
Total	**Curtain Wall: Glazing No Tubes: 8**	**3551**	**258.25**			
	Curtain Wall: Glazing No Tubes 2	62	4.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	62	4.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	54	3.94		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	98	7.15		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	4.23		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	98	7.15		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	62	4.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	62	4.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	54	3.94		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	98	7.15		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	4.23		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	98	7.15		N/A	$145.00/SF
Total	**Curtain Wall: Glazing No Tubes 2: 12**	**865**	**62.92**			
	Curtain Wall: Shade Extension	26	1.91		48 @ 10' Each	
	Curtain Wall: Shade Extension	26	1.91		48 @ 10' Each	
	Curtain Wall: Shade Extension	26	1.91		48 @ 10' Each	
	Curtain Wall: Shade Extension	26	1.91		48 @ 10' Each	
Total	**Curtain Wall: Shade Extension: 4**	**106**	**7.65**			
Totals	**Curtain Wall**	**9622**	**699.75**			**$145.00/SF**
	Ceramic Tubes		**Total #**	**2924**	**5' Lengths**	**$20 Each**
Tower Totals						
	Curtain Wall	**432990**	**31488.75**			**$145.00/SF**
	Ceramic Tubes	**Typical Floors Total**		**131580**	**5' Lengths**	**$20 Each**

	Floors 28/51	=	Twice Height of Other Tower Floors			
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: Glazing Ceramic Tubes Full	815	59.29		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	1650	120		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	1650	120		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	815	59.29		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
Total	**Curtain Wall: Glazing Ceramic Tubes Full: 8**	**5206**	**378.58**	**10412**		
	Curtain Wall: Glazing No Tubes	613	44.56		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	275	20		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	275	20		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	613	44.56		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	613	44.56		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	275	20		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	275	20		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	613	44.56		N/A	$145.00/SF
Total	**Curtain Wall: Glazing No Tubes: 8**	**3551**	**258.25**	**7102**		
	Curtain Wall: Glazing No Tubes 2	62	4.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	62	4.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	54	3.94		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	98	7.15		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	4.23		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	98	7.15		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	62	4.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	62	4.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	54	3.94		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	98	7.15		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	4.23		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	98	7.15		N/A	$145.00/SF
Total	**Curtain Wall: Glazing No Tubes 2: 12**	**865**	**62.92**	**1730**		
	Curtain Wall: Shade Extension	26	1.91		48 @ 10' Each	
	Curtain Wall: Shade Extension	26	1.91		48 @ 10' Each	
	Curtain Wall: Shade Extension	26	1.91		48 @ 10' Each	
	Curtain Wall: Shade Extension	26	1.91		48 @ 10' Each	
Total	**Curtain Wall: Shade Extension: 4**	**106**	**7.65**			
Totals	**Curtain Wall**	**9622**	**699.75**			**$145.00/SF**
	Ceramic Tubes		**Total #**	**3500**	**5' Lengths**	**$20 Each**
Mechanical Floor Totals						
	Curtain Wall	**19244**		**38488**		**$145.00/SF**
	Ceramic Tubes	**Both Floors Total**		**7000**	**5' Lengths**	**$20 Each**
	TOTALS					
	Curtain Wall	**555236**	**Sq. Ft. =**	[redacted]		**$ 80,509,220.00**
	Ceramic Rods	**755910**	**L.F. =**	**151182**	**5' Lengths =**	**$ 3,023,640.00**
					Total	**$ 83,532,860.00**

Figure 295: Detailed Corner Change Curtain Wall Take-off

Corner Change Curtain Wall Take-off						
	Floor 1					
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: Glazing No Tubes	4742	172.44	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	4742	172.44	Exterior	N/A	$145.00/SF
Total	**Exterior: 2**	**9484**	**344.88**			
	Curtain Wall: Glazing No Tubes 2	4400	160	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	112	4.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	825	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	213	7.75	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	67	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	137	5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	103	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1238	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	92	3.36	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	94	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	259	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	94	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1939	70.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	112	4.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	825	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	213	7.75	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	67	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	137	5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	103	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1238	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	92	3.36	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	94	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	259	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	94	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1925	70	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	413	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1196	43.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	347	12.63	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	413	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	942	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	413	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1196	43.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	347	12.63	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	413	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	942	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	45	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	45	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	44	1.6	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	41	1.5	Exterior	N/A	$145.00/SF
Total	**Exterior: 39**	**21529**	**782.96**			
	Curtain Wall: Glazing No Tubes 2	1925	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1925	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1925	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1925	70	Garden	N/A	$145.00/SF
Total	**Garden: 4**	**7700**	**280**			
	Curtain Wall: Glazing No Tubes 3	204	7.4	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 3	204	7.4	Exterior	N/A	$145.00/SF
Total	**Curtain Wall: Glazing No Tubes 3: 2**	**407**	**14.81**			
Totals	**Curtain Wall**	**39120**	**1422.65**			**$145.00/SF**
	Ceramic Tubes	**N/A**	**N/A**			

	Floor 2					
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: East Wall 2	2166	140	Exterior	36 @ 5' Each	$145.00/SF
Total	**Exterior: 1**	**2166**	**140**			
	Curtain Wall: Glazing Ceramic Tubes	2667	172.44	Exterior	38 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	2667	172.44	Exterior	38 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	963	70	Exterior	38 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	963	70	Exterior	38 @ 5' Each	$145.00/SF
Total	**Exterior: 4**	**7260**	**484.88**			
	Curtain Wall: Glazing No Tubes 2	155	10	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	155	10	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	63	4.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	464	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	120	7.75	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	38	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	77	5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	696	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	52	3.69	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	38	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	75	4.82	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	696	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	51	3.63	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	146	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	146	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	63	4.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	464	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	120	7.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	673	43.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	195	12.63	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	530	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	673	43.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	196	12.64	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	530	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	25	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	25	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	23	1.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	23	1.5	Exterior	N/A	$145.00/SF
Total	**Exterior: 38**	**7768**	**502.78**			
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
Total	**Garden: 4**	**4331**	**280**			
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
Total	**Curtain Wall: Shade Extension: 8**	**237**	**80**			
Totals	**Curtain Wall**	**21525**	**1407.66**			**$145.00/SF**
	Ceramic Tubes		**Total #**	**5552**	**5' Lengths**	**$20 Each**

	Floor 3					
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: East Wall 3	2166	140	Exterior	36 @ 5' Each	$145.00/SF
Total	**Exterior: 1**	**2166**	**140**			
	Curtain Wall: Glazing Ceramic Tubes	2667	172.44	Exterior	38 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	2667	172.44	Exterior	38 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	963	70	Exterior	38 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	963	70	Exterior	38 @ 5' Each	$145.00/SF
Total	**Exterior: 4**	**7260**	**484.88**			
	Curtain Wall: Glazing No Tubes 2	155	10	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	155	10	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	63	4.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	464	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	120	7.75	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	38	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	77	5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	696	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	52	3.69	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	38	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	75	4.82	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	696	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	51	3.63	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	146	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	146	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	63	4.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	464	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	120	7.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	673	43.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	195	12.63	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	530	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	673	43.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	196	12.64	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	530	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	25	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	25	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	23	1.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	23	1.5	Exterior	N/A	$145.00/SF
Total	**Exterior: 38**	**7768**	**502.78**			
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1083	70	Garden	N/A	$145.00/SF
Total	**Garden: 4**	**4331**	**280**			
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	30	10	Exterior	56 @ 10' Each	
Total	**Curtain Wall: Shade Extension: 8**	**237**	**80**			
Totals	**Curtain Wall**	**21525**	**1407.66**			**$145.00/SF**
	Ceramic Tubes		**Total #**	**5552**	**5' Lengths**	**$20 Each**

	Floor 4					
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: East Wall 4	2005	140	Exterior	21 @ 5' Each	$145.00/SF
Total	**Exterior: 1**	**2005**	**140**			
	Curtain Wall: Glazing Ceramic Tubes	1003	70	Exterior	38 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	1003	70	Exterior	38 @ 5' Each	$145.00/SF
Total	**Exterior: 2**	**2006**	**140**			
	Curtain Wall: Glazing No Tubes 2	180	12.53	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	4.04	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	373	26.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.72	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	35	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	54	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	645	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	48	3.36	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	180	12.53	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	58	4.04	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	373	26.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	53	3.72	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	35	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	54	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	645	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	47	3.3	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	43	2.97	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	127	8.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	43	2.97	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	43	2.97	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	127	8.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	43	2.97	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	2470	172.44	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	2470	172.44	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	143	10	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	143	10	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	215	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	622	43.46	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	215	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	491	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	215	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	622	43.46	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	215	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	491	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	24	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	24	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	21	1.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	21	1.5	Exterior	N/A	$145.00/SF
Total	**Exterior: 38**	**11719**	**817.92**			
	Curtain Wall: Glazing No Tubes 2	1182	82.55	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1182	82.55	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1247	87.06	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	1247	87.06	Garden	N/A	$145.00/SF
Total	**Garden: 4**	**4858**	**339.22**			
	Curtain Wall: Glazing No Tubes 3	81	5.67	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 3	81	5.67	Exterior	N/A	$145.00/SF
Total	**Exterior: 2**	**162**	**11.34**			
	Curtain Wall: Shade Extension	32	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	32	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	32	10	Exterior	56 @ 10' Each	
	Curtain Wall: Shade Extension	32	10	Exterior	56 @ 10' Each	
Total	**Exterior: 4**	**128**	**40**			
Totals	**Curtain Wall**	**20750**				**$145.00/SF**
	Ceramic Tubes		**Total #**	**2100**	**5' Lengths**	**$20 Each**

	Floors 5-27 / 29-50					
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: Glazing Ceramic Tubes	1788	130		33 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	963	70		33 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	963	70		33 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes	1788	130		33 @ 5' Each	$145.00/SF
Total	**Curtain Wall: Glazing Ceramic Tubes: 4**	**5502**	**400**	**72**		
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
Total	**Curtain Wall: Glazing Ceramic Tubes Full: 4**	**276**	**20**			
	Curtain Wall: Glazing No Tubes	206	15		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	598	43.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	138	10		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	206	15		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	598	43.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	138	10		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	138	10		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	206	15		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	598	43.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	138	10		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	206	15		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	598	43.5		N/A	$145.00/SF
Total	**Curtain Wall: Glazing No Tubes: 12**	**3768**	**274**			
	Curtain Wall: Glazing No Tubes 2	21	1.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	21	1.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	21	1.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	21	1.5		N/A	$145.00/SF
Total	**Curtain Wall: Glazing No Tubes 2: 4**	**84**	**6**			
	Curtain Wall: Shade Extension	26	10		48 @ 10' Each	
	Curtain Wall: Shade Extension	26	10		48 @ 10' Each	
	Curtain Wall: Shade Extension	26	10		48 @ 10' Each	
	Curtain Wall: Shade Extension	26	10		48 @ 10' Each	
Total	**Curtain Wall: Shade Extension: 4**	**104**	**40**			
Totals	**Curtain Wall**	**9630**	**700**			**$145.00/SF**
	Ceramic Tubes		**Total #**	**3188**	**5' Lengths**	**$20 Each**
Tower Totals						
	Curtain Wall	**433350**	**31500**			**$145.00/SF**
	Ceramic Tubes	**Typical Floors Total**		**143460**	**5' Lengths**	**$20 Each**

	Floors 28/51		= Twice Height of Other Tower Floors			
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: Glazing Ceramic Tubes Full	1788	130		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	963	70		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	963	70		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	1788	130		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Ceramic Tubes Full	69	5		41 @ 5' Each	$145.00/SF
Total	**Curtain Wall: Glazing Ceramic Tubes Full: 8**	**5778**	**420**	**11556**		
	Curtain Wall: Glazing No Tubes	206	15		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	598	43.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	138	10		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	206	15		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	598	43.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	138	10		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	138	10		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	206	15		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes	598	43.5			
	Curtain Wall: Glazing No Tubes	138	10			
	Curtain Wall: Glazing No Tubes	206	15			
	Curtain Wall: Glazing No Tubes	598	43.5			
Total	**Curtain Wall: Glazing No Tubes: 12**	**3768**	**274**	**7536**		
	Curtain Wall: Glazing No Tubes 2	21	1.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	21	1.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	21	1.5		N/A	$145.00/SF
	Curtain Wall: Glazing No Tubes 2	21	1.5		N/A	$145.00/SF
Total	**Curtain Wall: Glazing No Tubes 2: 4**	**84**	**6**	**168**		
	Curtain Wall: Shade Extension	26	10		48 @ 10' Each	
	Curtain Wall: Shade Extension	26	10		48 @ 10' Each	
	Curtain Wall: Shade Extension	26	10		48 @ 10' Each	
	Curtain Wall: Shade Extension	26	10		48 @ 10' Each	
Total	**Curtain Wall: Shade Extension: 4**	**104**	**40**			
Totals	**Curtain Wall**	**9630**	**700**			**$145.00/SF**
	Ceramic Tubes		**Total #**	**3664**	**5' Lengths**	**$20 Each**
Mechanical Floor Totals						
	Curtain Wall	**19260**		**38520**		**$145.00/SF**
	Ceramic Tubes	**Both Floors Total**		**7328**	**5' Lengths**	**$20 Each**
	TOTALS					
	Curtain Wall	**555530**	**Sq. Ft. =**	[redacted]		**$ 80,551,850.00**
	Ceramic Rods	**792200**	**L.F. =**	**158440**	**5' Lengths =**	**$ 3,168,800.00**
					Total	**$83,720,650.00**

Figure 296: Detailed Core and Corner Change Curtain Wall with Louvers Take-offs

Corner Change Louver Curtain Wall Take-off						
	Floor 1					
	Type	**Area**	**Length**	**Comment**	**Louvers Per**	**Price**
	Curtain Wall: Glazing No Frit	4742	172.44	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit	4742	172.44	Exterior	N/A	$145.00/SF
Total	**Exterior: 2**	**9484**	**344.88**			
	Curtain Wall: Glazing No Frit 2	4400	160	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	112	4.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	825	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	213	7.75	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	67	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	137	5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	103	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	1238	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	92	3.36	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	94	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	259	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	94	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	1939	70.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	112	4.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	825	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	213	7.75	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	67	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	137	5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	103	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	1238	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	92	3.36	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	94	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	259	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	94	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	1925	70	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	413	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	1196	43.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	347	12.63	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	413	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	942	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	413	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	1196	43.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	347	12.63	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	413	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	942	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	45	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	45	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	44	1.6	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 2	41	1.5	Exterior	N/A	$145.00/SF
Total	**Exterior: 39**	**21529**	**782.96**			
	Curtain Wall: Glazing Garden No Frit	1925	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing Garden No Frit	1925	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing Garden No Frit	1925	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing Garden No Frit	1925	70	Garden	N/A	$145.00/SF
Total	**Garden: 4**	**7700**	**280**			
	Curtain Wall: Glazing No Frit 3	204	7.4	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing No Frit 3	204	7.4	Exterior	N/A	$145.00/SF
Total	**Curtain Wall: Glazing No Tubes 3: 2**	**407**	**14.81**			
Totals	**Curtain Wall**	**39120**	**1422.65**			**$145.00/SF**
	Louvers	**N/A**	**N/A**			

	Floor 2					
	Type	**Area**	**Length**	**Comment**	**Louvers Per**	**Price**
	Curtain Wall: East Wall 2	2480	160	Exterior	8 @ 5' Each	$145.00/SF
Total	**Exterior: 1**	**2480**	**160**			
	Curtain Wall: Louvers	2667	172.44	Exterior	8 @ 5' Each	$145.00/SF
	Curtain Wall: Louvers	2667	172.44	Exterior	8 @ 5' Each	$145.00/SF
	Curtain Wall: Louvers	963	70	Exterior	8 @ 5' Each	$145.00/SF
	Curtain Wall: Louvers	963	70	Exterior	8 @ 5' Each	$145.00/SF
Total	**Exterior: 4**	**7260**	**484.88**			
	Curtain Wall: Glazing Frit Only	63	4.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	464	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	120	7.75	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	38	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	77	5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	58	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	696	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	52	3.69	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	38	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	75	4.82	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	58	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	696	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	51	3.63	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	146	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	146	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	63	4.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	464	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	120	7.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	673	43.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	195	12.63	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	530	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	673	43.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	196	12.64	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	530	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	25	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	25	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	23	1.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	23	1.5	Exterior	N/A	$145.00/SF
Total	**Exterior: 38**	**7458**	**482.78**			
	Curtain Wall: Glazing Garden Frit Only	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing Garden Frit Only	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing Garden Frit Only	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing Garden Frit Only	1083	70	Garden	N/A	$145.00/SF
Total	**Garden: 4**	**4331**	**280**			
Totals	**Curtain Wall**	**21529**	**1407.66**			**$145.00/SF**
	Louvers		**Total #**	**1032**	**5' Lengths**	**$350 Each**

	Floor 3					
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: East Wall 3	2480	160	Exterior	8 @ 5' Each	$145.00/SF
Total	**Exterior: 1**	**2480**	**160**			
	Curtain Wall: Glazing Louvers	2667	172.44	Exterior	8 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers	2667	172.44	Exterior	8 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers	963	70	Exterior	8 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers	963	70	Exterior	8 @ 5' Each	$145.00/SF
Total	**Exterior: 4**	**7260**	**484.88**			
	Curtain Wall: Glazing Frit Only	63	4.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	464	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	120	7.75	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	38	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	77	5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	58	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	696	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	52	3.69	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	38	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	75	4.82	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	58	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	696	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	51	3.63	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	146	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	146	9.41	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	53	3.43	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	63	4.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	464	30	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	120	7.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	673	43.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	195	12.63	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	530	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	673	43.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	196	12.64	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	232	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	530	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	25	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	25	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	23	1.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	23	1.5	Exterior	N/A	$145.00/SF
Total	**Exterior: 38**	**7458**	**482.78**			
	Curtain Wall: Glazing Garden Frit Only	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing Garden Frit Only	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing Garden Frit Only	1083	70	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing Garden Frit Only	1083	70	Garden	N/A	$145.00/SF
Total	**Garden: 4**	**4331**	**280**			
Totals	**Curtain Wall**	**21529**	**1407.66**			**$145.00/SF**
	Louvers		**Total #**	**1032**	**5' Lengths**	**$350 Each**

	Floor 4					
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: East Wall 4	2293	160	Exterior	7.5 @ 5' Each	$145.00/SF
Total	**Exterior: 1**	**2293**	**160**			
	Curtain Wall: Glazing Louvers	1003	70	Exterior	7.5 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers	1003	70	Exterior	7.5 @ 5' Each	$145.00/SF
Total	**Exterior: 2**	**2006**	**140**			
	Curtain Wall: Glazing Frit Only 2	180	12.53	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	58	4.04	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	373	26.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	53	3.72	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	35	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	54	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	645	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	48	3.36	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	180	12.53	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	58	4.04	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	373	26.08	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	53	3.72	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	35	2.45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	54	3.74	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	645	45	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	47	3.3	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	43	2.97	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	127	8.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	43	2.97	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	43	2.97	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	127	8.83	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	43	2.97	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	2470	172.44	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	2470	172.44	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	215	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	622	43.46	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	215	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	491	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	215	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	622	43.46	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	215	15	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	491	34.25	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	24	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	24	1.65	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	21	1.5	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	21	1.5	Exterior	N/A	$145.00/SF
Total	**Exterior: 38**	**11433**	**797.92**			
	Curtain Wall: Glazing Garden Frit Only	1182	82.55	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing Garden Frit Only	1182	82.55	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing Garden Frit Only	1247	87.06	Garden	N/A	$145.00/SF
	Curtain Wall: Glazing Garden Frit Only	1247	87.06	Garden	N/A	$145.00/SF
Total	**Garden: 4**	**4858**	**339.22**			
	Curtain Wall: Glazing Frit Only	81	5.67	Exterior	N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	81	5.67	Exterior	N/A	$145.00/SF
Total	**Exterior: 2**	**162**	**11.34**			
Totals	**Curtain Wall**	**20752**				**$145.00/SF**
	Louvers		**Total #**	**450**	**5' Lengths**	**$350 Each**

	Floors 28/51	=	Twice Height of Other Tower Floors			
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: Glazing Louvers 2	4125	150		7 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers 2	1925	70		7 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers 2	1925	70		7 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers 2	4125	150		7 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers 2	137.5	5		7 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers 2	137.5	5		7 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers 2	137.5	5		7 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers 2	137.5	5		7 @ 5' Each	$145.00/SF
Total	**Curtain Wall: Glazing Louvers 2: 8**	**12650**	**460**	**25300**		
	Curtain Wall: Glazing Frit Only	206	15		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	598	43.5		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	206	15		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	598	43.5		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	206	15		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	598	43.5			
	Curtain Wall: Glazing Frit Only	206	15			
	Curtain Wall: Glazing Frit Only	598	43.5			
Total	**Curtain Wall: Glazing Frit Only: 12**	**3216**	**234**	**6432**		
	Curtain Wall: Glazing Frit Only 2	21	1.5		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	21	1.5		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	21	1.5		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	21	1.5		N/A	$145.00/SF
Total	**Curtain Wall: Glazing Frit Only 2: 4**	**84**	**6**	**168**		
Totals	**Curtain Wall**	**15950**	**700**			**$145.00/SF**
	Louvers		**Total #**	**1288**	**5' Lengths**	**$350 Each**
Mechanical Floor Totals						
	Curtain Wall	**31900**		**2576**		**$145.00/SF**
	Louvers		**Both Floors Total**	**2576**	**5' Lengths**	**$350/$612.50 Each**

	Floors 5-27 / 29-50					
	Type	**Area**	**Length**	**Comment**	**Rods Per**	**Price**
	Curtain Wall: Glazing Louvers	2062.5	150		7 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers	962.5	70		7 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers	962.5	70		7 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers	2062.5	150		7 @ 5' Each	$145.00/SF
Total	**Curtain Wall: Glazing Louvers: 4**	**6050**	**440**	**72**		
	Curtain Wall: Glazing Louvers 2	69	5		7 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers 2	69	5		7 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers 2	69	5		7 @ 5' Each	$145.00/SF
	Curtain Wall: Glazing Louvers 2	69	5		7 @ 5' Each	$145.00/SF
Total	**Curtain Wall: Glazing Louvers 2: 4**	**276**	**20**			
	Curtain Wall: Glazing Frit Only	206	15		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	598	43.5		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	206	15		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	598	43.5		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	206	15		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	598	43.5		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	206	15		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only	598	43.5		N/A	$145.00/SF
Total	**Curtain Wall: Glazing Frit Only: 12**	**3216**	**234**			
	Curtain Wall: Glazing Frit Only 2	21	1.5		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	21	1.5		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	21	1.5		N/A	$145.00/SF
	Curtain Wall: Glazing Frit Only 2	21	1.5		N/A	$145.00/SF
Total	**Curtain Wall: Glazing Frit Only 2: 4**	**84**	**6**			
Totals	**Curtain Wall**	**9626**	**700**			**$145.00/SF**
	Louvers		**Total #**	**644**	**5' Lengths**	**$350 Each**
Tower Totals						
	Curtain Wall	**433170**	**31500**			**$145.00/SF**
	Louvers		**Typical Floors Total**	**28980**	**5' Lengths**	**$350/$612.50 Each**

Louver Area	8.75	S.F. per 5' length
Louver Cost	$350.00	per 5' length

TOTALS						
Curtain Wall	568000	Sq. Ft. =	[redacted]		$	82,360,000.00
Louvers	165190	L.F. =	33038	5' Lengths	$	11,563,300.00
				Total	$	93,923,300.00

P.V. Louver Area	8.75	S.F. per 5' length
P.V. Louver Cost	$612.50	per 5' length; 50% P.V. Coverage

TOTALS						
Curtain Wall	568000	Sq. Ft. =	[redacted]		$	82,360,000.00
Louvers	145290	L.F. =	29058	5' Lengths	$	10,170,300.00
P.V. Louvers	19900	L.F. =	3980	5' Lengths	$	2,437,750.00
				Total	$	94,968,050.00

Operable Window Louver	5	S.F. per 5' length
Number of Operable Window Louvers	10	Louvers per glazing panel
Operable Window Louver Cost	$215.00	per S.F. of glazing panel

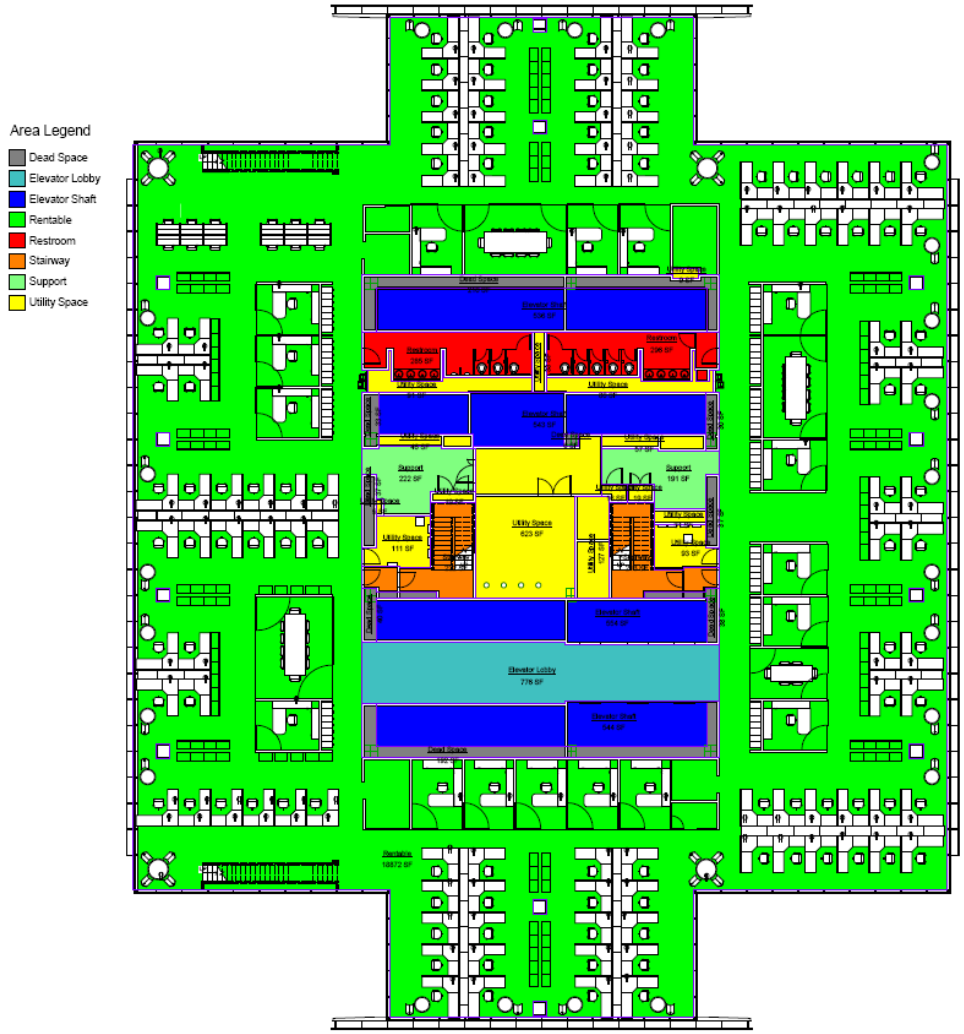
TOTALS						
Curtain Wall	532112.5	Sq. Ft. =	[redacted]		$	77,156,312.50
Operable Curtian Wall	35887.5	Sq. Ft. =	[redacted]		$	7,715,812.50
				Total	$	84,872,125.00

[redacted]

TOTALS						
Curtain Wall	532112.5	Sq. Ft. =	[redacted]		$	77,156,312.50
Operable Curtian Wall	35887.5	Sq. Ft. =	[redacted]		$	7,715,812.50
Louvers	145290	L.F. =	29058	5' Lengths	$	10,170,300.00
P.V. Louvers	19900	L.F. =	3980	5' Lengths	$	2,437,750.00
				Total	$	97,480,175.00
				Original	$	83,532,860.00
				Difference	$	13,947,315.00

Tenant Layout Areas and Detailed Area Schedules

Figure 297: Original Floors: 5-17

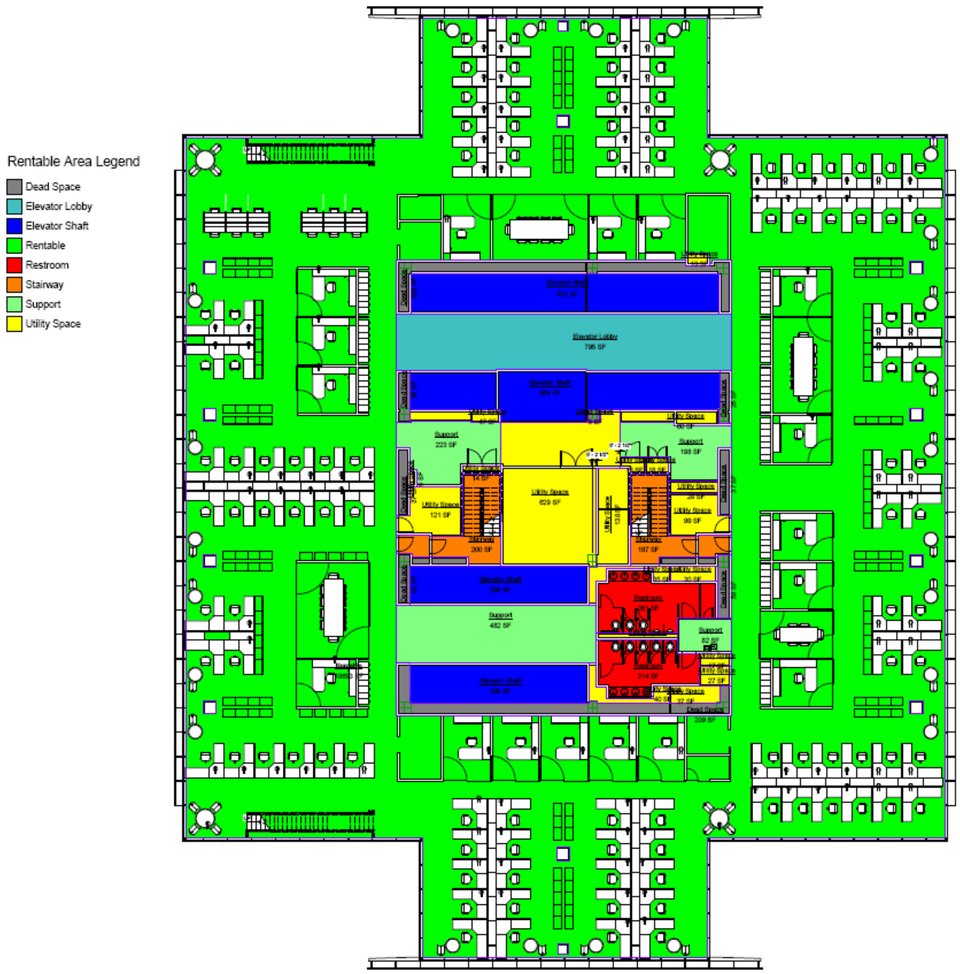


NYT 05-17 Original Area Schedule		
Name	**Area**	**Area Type**
Dead Space		
Structure		
Steel Framing	37	Structure
Steel Framing	40	Structure
Steel Framing	38	Structure
Steel Framing	37	Structure
Steel Framing	30	Structure
Steel Framing	216	Structure
Steel Framing	33	Structure
Steel Framing	6	Structure
Steel Framing	192	Structure
Structure: 9	**629**	
Dead Space: 9	**629**	
Elevator Lobby		
Building Common Area		
Elevator Lobby	776	Building Common Area
Building Common Area: 1	**776**	
Elevator Lobby: 1	**776**	
Elevator Shaft		
Major Vertical Penetration		
Elevator Shaft	536	Major Vertical Penetration
Elevator Shaft	543	Major Vertical Penetration
Elevator Shaft	554	Major Vertical Penetration
Elevator Shaft	544	Major Vertical Penetration
Major Vertical Penetration: 4	**2177**	
Elevator Shaft: 4	**2177**	
Rentable		
Office Area		
Office	18872	Office Area
Office Area: 1	**18872**	
Rentable: 1	**18872**	
Restroom		
Building Common Area		
Men's Restroom	285	Building Common Area
Women's Restroom	296	Building Common Area
Building Common Area: 2	**581**	
Restroom: 2	**581**	
Stairway		
Major Vertical Penetration		
Emergency Stair	222	Major Vertical Penetration
Emergency Stair	213	Major Vertical Penetration
Major Vertical Penetration: 2	**435**	
Stairway: 2	**435**	
Support		
Building Common Area		
Support Space	222	Building Common Area
Support Space	191	Building Common Area
Building Common Area: 2	**413**	
Support: 2	**413**	
Utility Space		
Building Common Area		
Mechanical Room	623	Building Common Area
Electrical Room 1	93	Building Common Area
A.V. Closet	16	Building Common Area
F.B.S. Closet	19	Building Common Area
Electrical Room 2	111	Building Common Area
Women's Room Pipe Chase	86	Building Common Area
Men's Room Pipe Chase	91	Building Common Area
Building Common Area: 7	**1039**	
Major Vertical Penetration		
Duct Riser Space	127	Major Vertical Penetration
Duct Riser Space	31	Major Vertical Penetration
Riser Closet	19	Major Vertical Penetration
Mechanical Room Exhaust	5	Major Vertical Penetration
Bathroom Duct Riser Space	33	Major Vertical Penetration
FCRC Electrical Riser Space	46	Major Vertical Penetration
FCRC Electrical Riser Space	57	Major Vertical Penetration
Duct Riser Space	9	Major Vertical Penetration
Major Vertical Penetration: 8	**327**	
Utility Space: 15	**1366**	
Grand total	**25249**	

Totals		
Name	**Area (S.F.)**	**Area Type**
Dead Space	629	Not Rentable
Elevator Lobby	776	Not Rentable
Elevator Shaft	2177	Not Rentable
Office	18872	Rentable
Restroom	581	Not Rentable
Stairway	435	Not Rentable
Support	413	Rentable
Utility Space	1366	Not Rentable
Total	**25249**	**SF**
Rentable Area	19285	SF
Not Rentable Area	5964	SF
Total	**25249**	**SF**

Average Rental Price ($ per S.F. per Month)			
2007	**2008**	**2009**	**AVG.**
$ 53.24	**$ 72.97**	**$ 55.52**	**$ 60.58**
$ 1,026,733.40	**$ 1,407,226.45**	**$ 1,070,703.20**	**$ 1,168,221.02**

Figure 298: Original Floors: 18-27

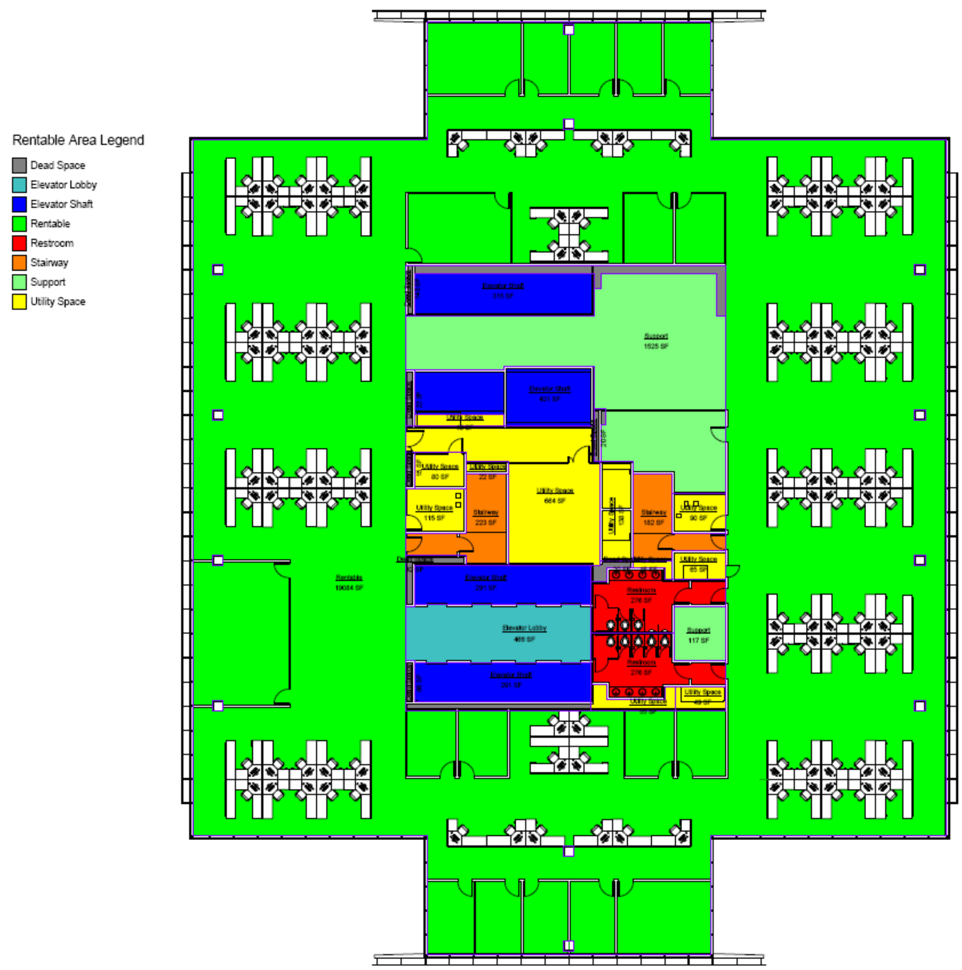


NYT 18-27 Core & Corner Change Area Schedule		
Name	**Area**	**Area Type**
Dead Space		
Structure		
Steel Framing	58	Structure
Steel Framing	209	Structure
Steel Framing	52	Structure
Steel Framing	37	Structure
Steel Framing	25	Structure
Steel Framing	37	Structure
Steel Framing	28	Structure
Steel Framing	228	Structure
Steel Framing	5	Structure
Structure: 9	**679**	
Dead Space: 9	**679**	
Elevator Lobby		
Building Common Area		
Elevator Lobby	795	Building Common Area
Building Common Area: 1	**795**	
Elevator Lobby: 1	**795**	
Elevator Shaft		
Major Vertical Penetration		
Elevator Shaft	306	Major Vertical Penetration
Elevator Shaft	296	Major Vertical Penetration
Elevator Shaft	564	Major Vertical Penetration
Elevator Shaft	522	Major Vertical Penetration
Major Vertical Penetration: 4	**1688**	
Elevator Shaft: 4	**1688**	
Rentable		
Office Area		
Office	18693	Office Area
Office Area: 1	**18693**	
Rentable: 1	**18693**	
Restroom		
Building Common Area		
Women's Restroom	261	Building Common Area
Men's Restroom	214	Building Common Area
Building Common Area: 2	**475**	
Restroom: 2	**475**	
Stairway		
Major Vertical Penetration		
Emergency Stair	200	Major Vertical Penetration
Emergency Stair	197	Major Vertical Penetration
Major Vertical Penetration: 2	**397**	
Stairway: 2	**397**	
Support		
Building Common Area		
Support Space	82	Building Common Area
Support Space	198	Building Common Area
Support Space	223	Building Common Area
Support Space	482	Building Common Area
Building Common Area: 4	**985**	
Support: 4	**985**	
Utility Space		
Building Common Area		
Shared Restroom Pipe Chase	23	Building Common Area
Shared Restroom Pipe Chase	17	Building Common Area
Women's Room Pipe Chase	40	Building Common Area
Electrical Room 1	99	Building Common Area
Men's Room Pipe Chase	35	Building Common Area
Mechanical Room	629	Building Common Area
A.V. Closet	16	Building Common Area
Electrical Room 2	121	Building Common Area
F.B.S. Closet	14	Building Common Area
Building Common Area: 9	**994**	
Major Vertical Penetration		
Duct Riser Space	27	Major Vertical Penetration
Duct Riser Space	37	Major Vertical Penetration
Duct Riser Space	30	Major Vertical Penetration
Duct Riser Space	28	Major Vertical Penetration
Duct Riser Space	138	Major Vertical Penetration
FCRC Electrical Riser Space	60	Major Vertical Penetration
Riser Closet	18	Major Vertical Penetration
Mechanical Room Exhaust	5	Major Vertical Penetration
FCRC Electrical Riser Space	47	Major Vertical Penetration
Duct Riser Space	13	Major Vertical Penetration
Major Vertical Penetration: 10	**403**	
Utility Space: 19	**1397**	
Grand total: 42	**25109**	

Totals		
Name	**Area (S.F.)**	**Area Type**
Dead Space	679	Not Rentable
Elevator Lobby	795	Not Rentable
Elevator Shaft	1688	Not Rentable
Office	18693	Rentable
Restroom	475	Not Rentable
Stairway	397	Not Rentable
Support	985	Rentable
Utility Space	1397	Not Rentable
Total	**25109**	SF
Rentable Area	19678	SF
Not Rentable Area	5431	SF
Total	**25109**	SF

Average Rental Price ($ per S.F. per Month)			
2007	**2008**	**2009**	**AVG.**
$ 53.24	$ 72.97	$ 55.52	$ 60.58
$ 1,047,656.72	**$ 1,435,903.66**	**$ 1,092,522.56**	**$ 1,192,027.65**

Figure 299: Original Floors: 29-38



FCRC 29-38 Original Area Schedule

Name	Area	Area Type
Dead Space		
Structure		
Steel Framing	145	Structure
Steel Framing	20	Structure
Steel Framing	22	Structure
Steel Framing	15	Structure
Steel Framing	42	Structure
Steel Framing	86	Structure
Steel Framing	20	Structure
Structure: 7	**350**	
Dead Space: 7	**350**	
Elevator Lobby		
Building Common Area		
Elevator Lobby	466	Building Common Area
Building Common Area: 1	**466**	
Elevator Lobby: 1	**466**	
Elevator Shaft		
Major Vertical Penetration		
Elevator Shaft	315	Major Vertical Penetration
Elevator Shaft	401	Major Vertical Penetration
Elevator Shaft	291	Major Vertical Penetration
Elevator Shaft	291	Major Vertical Penetration
Major Vertical Penetration: 4	**1298**	
Elevator Shaft: 4	**1298**	
Rentable		
Office Area		
Office	19084	Office Area
Office Area: 1	**19084**	
Rentable: 1	**19084**	
Restroom		
Building Common Area		
Men's Restroom	276	Building Common Area
Women's Restroom	276	Building Common Area
Building Common Area: 2	**552**	
Restroom: 2	**552**	
Stairway		
Major Vertical Penetration		
Emergency Stair	182	Major Vertical Penetration
Emergency Stair	223	Major Vertical Penetration
Major Vertical Penetration: 2	**405**	
Stairway: 2	**405**	
Support		
Building Common Area		
Support Space	1525	Building Common Area
Support Space	117	Building Common Area
Building Common Area: 2	**1642**	
Support: 2	**1642**	
Utility Space		
Building Common Area		
Mechanical Room	664	Building Common Area
Electrical Room 1	90	Building Common Area
Telephone Room	80	Building Common Area
Electrical Room 2	115	Building Common Area
Men's Room Pipe Chase	15	Building Common Area
Women's Room Pipe Chase	55	Building Common Area
Building Common Area: 6	**1019**	
Major Vertical Penetration		
Duct Riser Space	138	Major Vertical Penetration
F.B.S. Closet	22	Major Vertical Penetration
Duct Riser Space	65	Major Vertical Penetration
Duct Riser Space	49	Major Vertical Penetration
FCRC Electrialc Riser Space	46	Major Vertical Penetration
Major Vertical Penetration: 5	**320**	
Utility Space: 11	**1339**	
Grand total	**25136**	

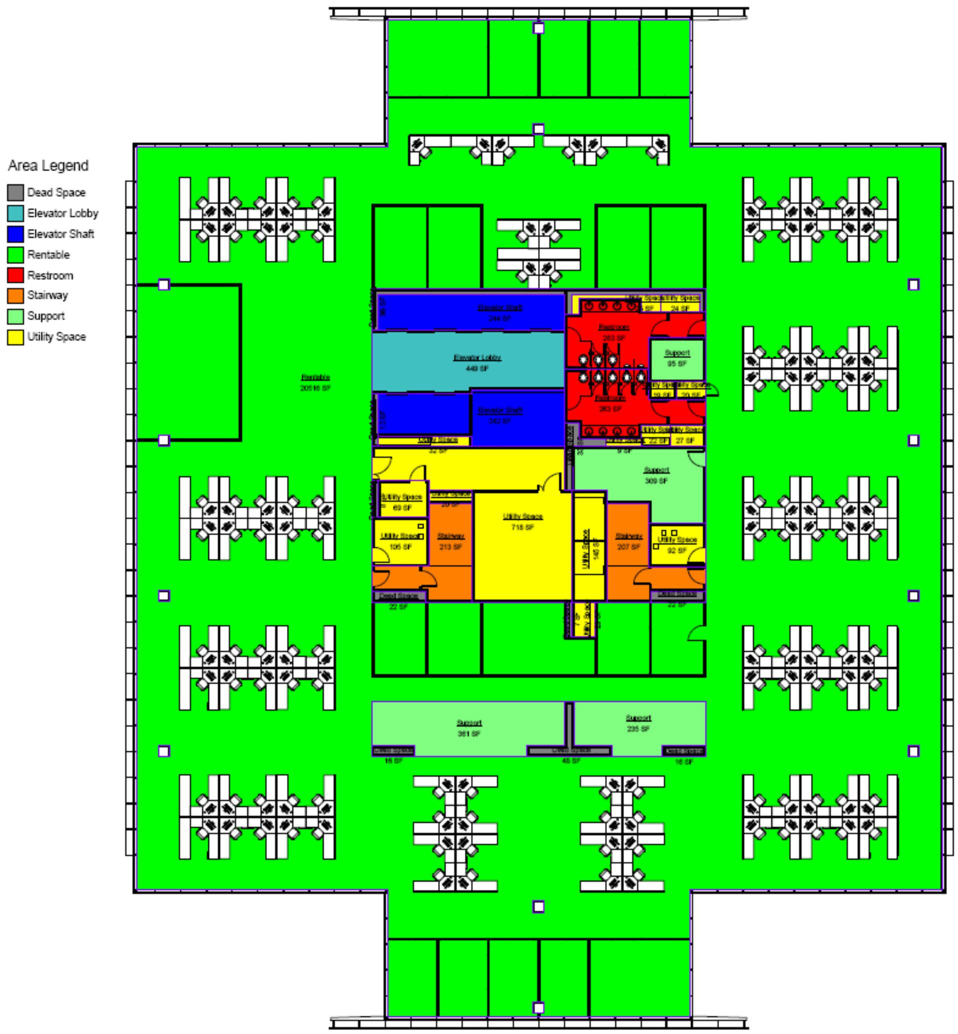
Totals

Name	Area (S.F.)	Area Type
Dead Space	350	Not Rentable
Elevator Lobby	466	Not Rentable
Elevator Shaft	1298	Not Rentable
Office	19084	Rentable
Restroom	552	Not Rentable
Stairway	405	Not Rentable
Support	1642	Rentable
Utility Space	1339	Not Rentable
Total	**25136**	**SF**
Rentable Area	20726	SF
Not Rentable Area	4410	SF
Total	**25136**	**SF**

Average Rental Price ($ per S.F. per Month)

2007	2008	2009	AVG.
$ 53.24	$ 72.97	$ 55.52	$ 60.58
$ 1,103,452.24	**$ 1,512,376.22**	**$ 1,150,707.52**	**$ 1,255,511.99**

Figure 300: Original Floors: 39-50

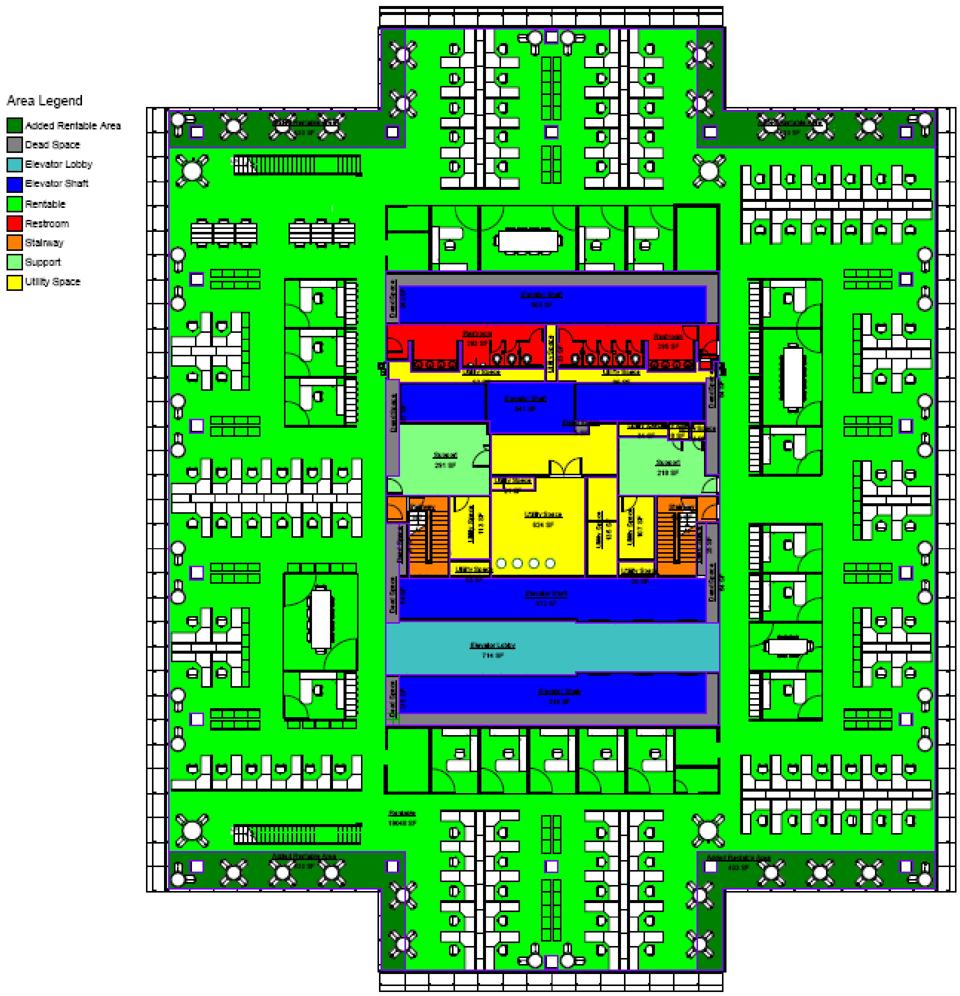


FCRC 39-50 Original Area Schedule		
Name	**Area**	**Area Type**
Dead Space		
Structure		
Steel Framing	99	Structure
Steel Framing	12	Structure
Steel Framing	33	Structure
Steel Framing	22	Structure
Steel Framing	8	Structure
Steel Framing	22	Structure
Steel Framing	7	Structure
Steel Framing	48	Structure
Steel Framing	16	Structure
Steel Framing	16	Structure
Structure: 10	**283**	
Dead Space: 10	**283**	
Elevator Lobby		
Building Common Area		
Elevator Lobby	449	Building Common Area
Building Common Area: 1	**449**	
Elevator Lobby: 1	**449**	
Elevator Shaft		
Major Vertical Penetration		
Elevator Shaft	342	Major Vertical Penetration
Elevator Shaft	244	Major Vertical Penetration
Major Vertical Penetration: 2	**586**	
Elevator Shaft: 2	**586**	
Rentable		
Office Area		
Office	20516	Office Area
Office Area: 1	**20516**	
Rentable: 1	**20516**	
Restroom		
Building Common Area		
Women's Restroom	263	Building Common Area
Men's Restroom	263	Building Common Area
Building Common Area: 2	**526**	
Restroom: 2	**526**	
Stairway		
Major Vertical Penetration		
Emergency Stair	213	Major Vertical Penetration
Emergency Stair	207	Major Vertical Penetration
Major Vertical Penetration: 2	**420**	
Stairway: 2	**420**	
Support		
Building Common Area		
Support	95	Building Common Area
Support	309	Building Common Area
Support	361	Building Common Area
Support	235	Building Common Area
Building Common Area: 4	**1000**	
Support: 4	**1000**	
Utility Space		
Building Common Area		
Men's Room Pipe Chase	25	Building Common Area
A.V. Closet	20	Building Common Area
Utility Closet	27	Building Common Area
Women's Room Pipe Chase	9	Building Common Area
Mechanical Room	718	Building Common Area
Electrical Room 1	92	Building Common Area
Telephone Room	69	Building Common Area
Electrical Room 2	105	Building Common Area
Building Common Area: 8	**1065**	
Major Vertical Penetration		
FCRC Electrical Riser Space	32	Major Vertical Penetration
Duct Riser Space	19	Major Vertical Penetration
Duct Riser Space	22	Major Vertical Penetration
Duct Riser Space	145	Major Vertical Penetration
F.B.S. Closet	20	Major Vertical Penetration
Duct Riser Space	29	Major Vertical Penetration
Duct Riser Space	24	Major Vertical Penetration
Major Vertical Penetration: 7	**291**	
Utility Space: 15	**1356**	
Grand total: 37	**25136**	

Totals		
Name	**Area (S.F.)**	**Area Type**
Dead Space	283	Not Rentable
Elevator Lobby	449	Not Rentable
Elevator Shaft	586	Not Rentable
Office	20516	Rentable
Restroom	526	Not Rentable
Stairway	420	Not Rentable
Support	1000	Rentable
Utility Space	1356	Not Rentable
Total	**25136**	SF
Rentable Area	21516	SF
Not Rentable Area	3620	SF
Total	**25136**	SF

Average Rental Price ($ per S.F. per Month)			
2007	**2008**	**2009**	**AVG.**
$ 53.24	$ 72.97	$ 55.52	$ 60.58
$ 1,145,511.84	**$ 1,570,022.52**	**$ 1,194,568.32**	**$ 1,303,367.56**

Figure 301: Core and Corner Change Floors: 5-17

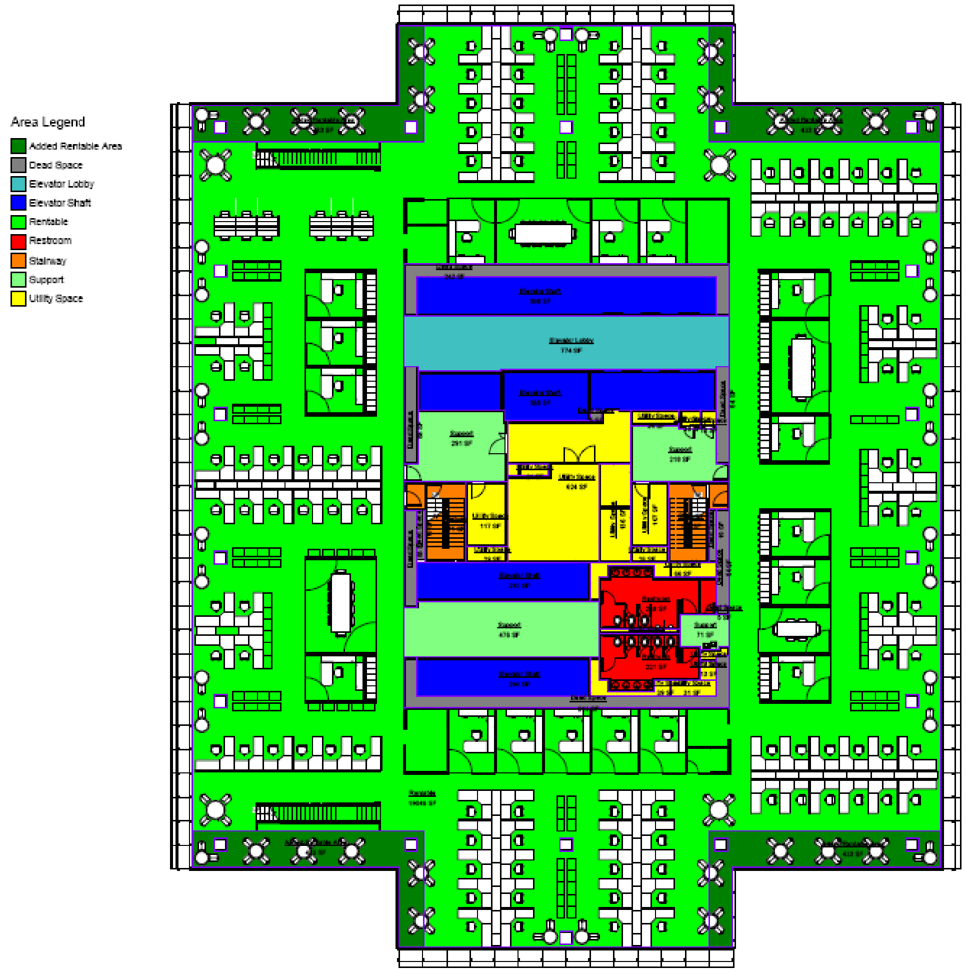


NYT 05-17 Core & Corner Change Area Schedule		
Name	**Area**	**Area Type**
Added Rentable Area		
Building Common Area		
Office	433	Office Area
Office	433	Office Area
Office	433	Office Area
Office	433	Office Area
Building Common Area: 4	**1732**	
Added Rentable Area: 4	**1732**	
Dead Space		
Building Common Area		
Dead Space	24	Building Common Area
Dead Space	25	Building Common Area
Building Common Area: 2	**49**	
Structure		
30" Concrete Shear Wall	242	Structure
30" Concrete Shear Wall	57	Structure
Steel Column	5	Structure
30" Concrete Shear Wall	54	Structure
30" Concrete Shear Wall	54	Structure
30" Concrete Shear Wall	54	Structure
30" Concrete Shear Wall	215	Structure
Structure: 7	**681**	
Dead Space: 9	**730**	
Elevator Lobby		
Building Common Area		
Elevator Lobby	714	Building Common Area
Building Common Area: 1	**714**	
Elevator Lobby: 1	**714**	
Elevator Shaft		
Major Vertical Penetration		
Elevator Shaft	572	Major Vertical Penetration
Elevator Shaft	516	Major Vertical Penetration
Elevator Shaft	541	Major Vertical Penetration
Elevator Shaft	508	Major Vertical Penetration
Major Vertical Penetration: 4	**2137**	
Elevator Shaft: 4	**2137**	
Rentable		
Office Area		
Office	19048	Office Area
Office Area: 1	**19048**	
Rentable: 1	**19048**	
Restroom		
Building Common Area		
Women's Restroom	295	Building Common Area
Men's Restroom	283	Building Common Area
Building Common Area: 2	**578**	
Restroom: 2	**578**	
Stairway		
Major Vertical Penetration		
Emergency Stair	166	Major Vertical Penetration
Emergency Stair	167	Major Vertical Penetration
Major Vertical Penetration: 2	**333**	
Stairway: 2	**333**	
Support		
Building Common Area		
Support Space	291	Building Common Area
Support Space	218	Building Common Area
Building Common Area: 2	**509**	
Support: 2	**509**	
Utility Space		
Building Common Area		
Mechanical Room	624	Building Common Area
Electrical Room 1	107	Building Common Area
Electrical Room 2	113	Building Common Area
A.V. Closet	18	Building Common Area
Women's Room Pipe Chase	86	Building Common Area
Men's Room Pipe Chase	92	Building Common Area
Building Common Area: 6	**1040**	
Major Vertical Penetration		
Duct Riser Space	135	Major Vertical Penetration
Duct Riser Space	34	Major Vertical Penetration
Riser Closet	13	Major Vertical Penetration
FCRC Electrical Riser Space	32	Major Vertical Penetration
FCRC Electrical Riser Space	26	Major Vertical Penetration
Bathroom Duct Riser Space	33	Major Vertical Penetration
F.B.S. Closet / Mechanical Room Exhaust	21	Major Vertical Penetration
Major Vertical Penetration: 7	**294**	
Utility Space: 13	**1334**	
Grand total	**27115**	

Totals		
Name	**Area (S.F.)**	**Area Type**
Added Corner Area	1732	Rentable
Dead Space	730	Not Rentable
Elevator Lobby	714	Not Rentable
Elevator Shaft	2137	Not Rentable
Office	19048	Rentable
Restroom	578	Not Rentable
Stairway	333	Not Rentable
Support	509	Rentable
Utility Space	1334	Not Rentable
Total	**27115**	SF
Rentable Area	21289	SF
Not Rentable Area	5826	SF
Total	**27115**	SF

Average Rental Price ($ per S.F. per Month)			
2007	**2008**	**2009**	**AVG.**
$ 53.24	$ 72.97	$ 55.52	$ 60.58
$ 1,133,426.36	$ 1,553,458.33	$ 1,181,965.28	$ 1,289,616.66

Figure 302: Core and Corner Change Floors: 18-27



NYT 18-27 Core & Corner Change Area Schedule

Name	Area	Area Type
Added Rentable Area		
Building Common Area		
Office	433	Office Area
Office	433	Office Area
Office	433	Office Area
Office	433	Office Area
Building Common Area: 4	**1732**	
Added Rentable Area: 4	**1732**	
Dead Space		
Building Common Area		
Dead Space	19	Building Common Area
Dead Space	19	Building Common Area
Dead Space	5	Building Common Area
Building Common Area: 3	**43**	
Structure		
Steel Column	5	Structure
30" Concrete Shear Wall	56	Structure
30" Concrete Shear Wall	242	Structure
30" Concrete Shear Wall	214	Structure
30" Concrete Shear Wall	54	Structure
30" Concrete Shear Wall	58	Structure
30" Concrete Shear Wall	55	Structure
Structure: 7	**684**	
Dead Space: 10	**727**	
Elevator Lobby		
Building Common Area		
Elevator Lobby	774	Building Common Area
Building Common Area: 1	**774**	
Elevator Lobby: 1	**774**	
Elevator Shaft		
Major Vertical Penetration		
Elevator Shaft	290	Major Vertical Penetration
Elevator Shaft	292	Major Vertical Penetration
Elevator Shaft	555	Major Vertical Penetration
Elevator Shaft	508	Major Vertical Penetration
Major Vertical Penetration: 4	**1645**	
Elevator Shaft: 4	**1645**	
Rentable		
Building Common Area		
Office	19046	Office Area
Building Common Area: 1	**19046**	
Rentable: 1	**19046**	
Restroom		
Building Common Area		
Women's Restroom	268	Building Common Area
Men's Restroom	221	Building Common Area
Building Common Area: 2	**489**	
Restroom: 2	**489**	
Stairway		
Building Common Area		
Emergency Stair	171	Building Common Area
Emergency Stair	170	Building Common Area
Building Common Area: 2	**341**	
Stairway: 2	**341**	
Support		
Building Common Area		
Support Space	476	Building Common Area
Support Space	291	Building Common Area
Support Space	218	Building Common Area
Support Space	71	Building Common Area
Building Common Area: 4	**1056**	
Support: 4	**1056**	
Utility Space		
Building Common Area		
Mechanical Room	624	Building Common Area
Electrical Room 1	107	Building Common Area
Electrical Room 2	117	Building Common Area
A.V. Closet	18	Building Common Area
Women's Room Pipe Chase	39	Building Common Area
Men's Room Pipe Chase	66	Building Common Area
Shared Restroom Pipe Chase	13	Building Common Area
Shared Restroom Pipe Chase	17	Building Common Area
Building Common Area: 8	**1001**	
Major Vertical Penetration		
Duct Riser Space	34	Major Vertical Penetration
Duct Riser Space	136	Major Vertical Penetration
Riser Closet	13	Major Vertical Penetration
FCRC Electrical Riser Space	29	Major Vertical Penetration
FCRC Electrical Riser Space	26	Major Vertical Penetration
Bathroom Duct Riser Space	13	Major Vertical Penetration
Bathroom Duct Riser Space	31	Major Vertical Penetration
F.B.S. Closet / Mechanical Room Exhaust	21	Major Vertical Penetration
Major Vertical Penetration: 8	**303**	
Utility Space: 16	**1304**	
Grand total: 45	**27115**	

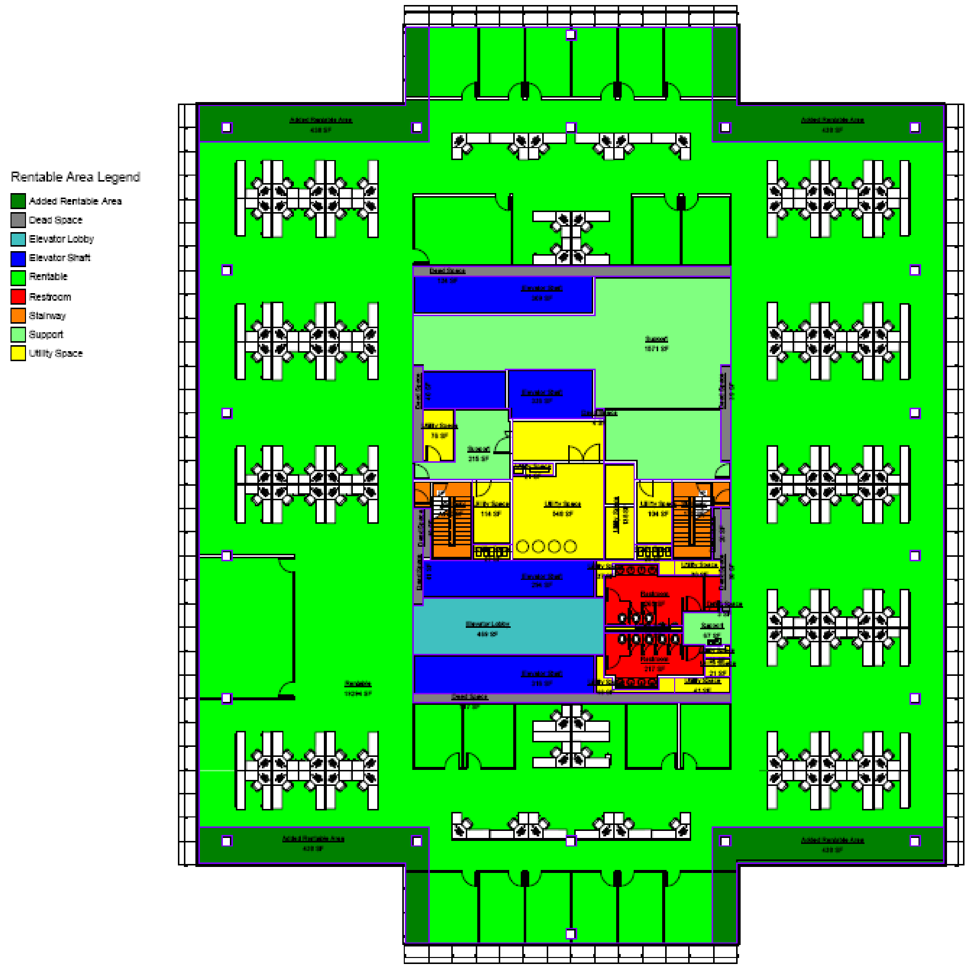
Totals

Name	Area (S.F.)	Area Type
Added Corner Area	1732	Rentable
Dead Space	727	Not Rentable
Elevator Lobby	774	Not Rentable
Elevator Shaft	1645	Not Rentable
Office	19046	Rentable
Restroom	489	Not Rentable
Stairway	341	Not Rentable
Support	1056	Rentable
Utility Space	1304	Not Rentable
Total	**27115**	SF
Rentable Area	21835	SF
Not Rentable Area	5280	SF
Total	**27115**	SF

Average Rental Price ($ per S.F. per Month)

2007	2008	2009	AVG.
$ 53.24	$ 72.97	$ 55.52	$ 60.58
$ 1,162,495.40	$ 1,593,299.95	$ 1,212,279.20	$ 1,322,691.52

Figure 303: Core and Corner Change Floors: 29-38



FCRC 29-38 Core & Corner Change Area Schedule

Name	Area	Area Type
Added Rentable Area		
Building Common Area		
Office	438	Office Area
Office	438	Office Area
Office	438	Office Area
Office	438	Office Area
Building Common Area: 4	**1752**	
Added Rentable Area: 4	**1752**	
Dead Space		
Building Common Area		
Dead Space	19	Building Common Area
Dead Space	20	Building Common Area
Dead Space	3	Building Common Area
Building Common Area: 3	**42**	
Structure		
Dead Space	4	Structure
24" Concrete Shear Wall	41	Structure
24" Concrete Shear Wall	40	Structure
24" Concrete Shear Wall	134	Structure
24" Concrete Shear Wall	39	Structure
24" Concrete Shear Wall	39	Structure
24" Concrete Shear Wall	117	Structure
Structure: 7	**414**	
Dead Space: 10	**458**	
Elevator Lobby		
Building Common Area		
Elevator Lobby	469	Building Common Area
Building Common Area: 1	**469**	
Elevator Lobby: 1	**469**	
Elevator Shaft		
Major Vertical Penetration		
Elevator Shaft	336	Major Vertical Penetration
Elevator Shaft	309	Major Vertical Penetration
Elevator Shaft	294	Major Vertical Penetration
Elevator Shaft	316	Major Vertical Penetration
Major Vertical Penetration: 4	**1255**	
Elevator Shaft: 4	**1255**	
Rentable		
Building Common Area		
Office	19294	Office Area
Building Common Area: 1	**19294**	
Rentable: 1	**19294**	
Restroom		
Building Common Area		
Women's Restroom	265	Building Common Area
Men's Restroom	217	Building Common Area
Building Common Area: 2	**482**	
Restroom: 2	**482**	
Stairway		
Building Common Area		
Emergency Stair	170	Major Vertical Penetration
Emergency Stair	170	Major Vertical Penetration
Building Common Area: 2	**340**	
Stairway: 2	**340**	
Support		
Building Common Area		
Support Space	291	Building Common Area
Support Space	1571	Building Common Area
Support Space	67	Building Common Area
Building Common Area: 3	**1929**	
Support Space: 3	**1929**	
Utility Space		
Building Common Area		
Mechanical Room	548	Building Common Area
Electrical Room 1	114	Building Common Area
Electrical Room 2	104	Building Common Area
Men's Room Pipe Chase	37	Building Common Area
Shared Restroom Pipe Chase	14	Building Common Area
Shared Restroom Pipe Chase	25	Building Common Area
Women's Room Pipe Chase	43	Building Common Area
Telephone Room	76	Building Common Area
Building Common Area: 8	**961**	
Major Vertical Penetration		
Duct Riser Space	135	Major Vertical Penetration
FCRC Electrical Riser Space	25	Major Vertical Penetration
FCRC Electrical Riser Space	27	Major Vertical Penetration
Bathroom Duct Riser Space	30	Major Vertical Penetration
Bathroom Duct Riser Space	21	Major Vertical Penetration
Bathroom Duct Riser Space	41	Major Vertical Penetration
F.B.S. Closet / Mechanical Room Exhaust	21	Major Vertical Penetration
Major Vertical Penetration: 7	**300**	
Utility Space: 15	**1261**	
Grand total:	**27240**	

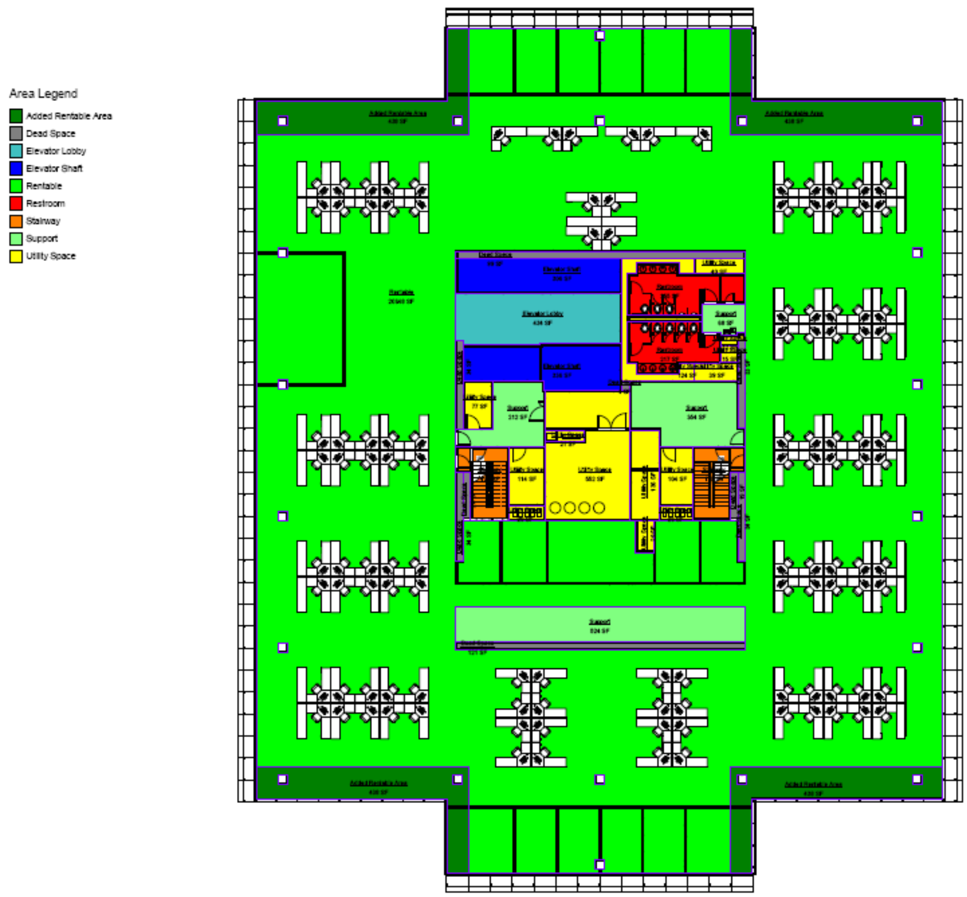
Totals

Name	Area (S.F.)	Area Type
Added Corner Area	1752	Rentable
Dead Space	458	Not Rentable
Elevator Lobby	469	Not Rentable
Elevator Shaft	1255	Not Rentable
Office	19294	Rentable
Restroom	482	Not Rentable
Stairway	340	Not Rentable
Support	1929	Rentable
Utility Space	1261	Not Rentable
Total	**27240**	SF
Rentable Area	22975	SF
Not Rentable Area	4265	SF
Total	**27240**	SF

Average Rental Price ($ per S.F. per Month)

2007	2008	2009	AVG.
$ 53.24	$ 72.97	$ 55.52	$ 60.58
$ 1,223,189.00	$ 1,676,485.75	$ 1,275,572.00	$ 1,391,748.92

Figure 304: Core and Corner Change Floors: 39-50



FCRC 39-50 Core & Corner Change Area Schedule

Name	Area	Area Type
Added Rentable Area		
Building Common Area		
Office	438	Office Area
Office	438	Office Area
Office	438	Office Area
Office	438	Office Area
Building Common Area: 4	**1752**	
Added Rentable Area: 4	**1752**	
Dead Space		
Building Common Area		
Dead Space	19	Building Common Area
Dead Space	20	Building Common Area
Building Common Area: 2	**39**	
Structure		
18" Concrete Shear Wall	99	Structure
18" Concrete Shear Wall	34	Structure
18" Concrete Shear Wall	34	Structure
18" Concrete Shear Wall	34	Structure
18" Concrete Shear Wall	33	Structure
18" Concrete Shear Wall	121	Structure
Steel Column	4	Structure
Structure: 7	**359**	
Dead Space: 9	**398**	
Elevator Lobby		
Building Common Area		
Elevator Lobby	434	Building Common Area
Building Common Area: 1	**434**	
Elevator Lobby: 1	**434**	
Elevator Shaft		
Major Vertical Penetration		
Elevator Shaft	336	Major Vertical Penetration
Elevator Shaft	306	Major Vertical Penetration
Major Vertical Penetration: 2	**642**	
Elevator Shaft: 2	**642**	
Rentable		
Building Common Area		
Office	20648	Office Area
Building Common Area: 1	**20648**	
Rentable: 1	**20648**	
Restroom		
Building Common Area		
Men's Restroom	217	Building Common Area
Women's Restroom	255	Building Common Area
Building Common Area: 2	**472**	
Restroom: 2	**472**	
Stairway		
Major Vertical Penetration		
Emergency Stair	170	Major Vertical Penetration
Emergency Stair	170	Major Vertical Penetration
Major Vertical Penetration: 2	**340**	
Stairway: 2	**340**	
Support		
Building Common Area		
Support Space	212	Building Common Area
Support Space	354	Building Common Area
Support Space	524	Building Common Area
Support Space	68	Building Common Area
Building Common Area: 4	**1158**	
Support Space: 4	**1158**	
Utility Space		
Building Common Area		
Mechanical Room	552	Building Common Area
Electrical Room 1	114	Building Common Area
Electrical Room 2	104	Building Common Area
Telephone	77	Building Common Area
Shared Restroom Pipe Chase	12	Building Common Area
Shared Restroom Pipe Chase	124	Building Common Area
Building Common Area: 6	**983**	
Major Vertical Penetration		
Duct Riser Space	136	Major Vertical Penetration
Duct Riser Space	29	Major Vertical Penetration
F.B.S. Closet / Mechanical Room Exhaust	21	Major Vertical Penetration
FCRC Electrical Riser Space	26	Major Vertical Penetration
FCRC Electrical Riser Space	29	Major Vertical Penetration
Bathroom Duct Riser Space	15	Major Vertical Penetration
Bathroom Duct Riser Space	39	Major Vertical Penetration
Bathroom Duct Riser Space	40	Major Vertical Penetration
Major Vertical Penetration: 8	**335**	
Utility Space: 14	**1318**	
Grand total	**27162**	

Totals

Name	Area (S.F.)	Area Type
Added Corner Area	1752	Rentable
Dead Space	398	Not Rentable
Elevator Lobby	434	Not Rentable
Elevator Shaft	642	Not Rentable
Office	20648	Rentable
Restroom	472	Not Rentable
Stairway	340	Not Rentable
Support	1158	Rentable
Utility Space	1318	Not Rentable
Total	**27162**	SF
Rentable Area	23558	SF
Not Rentable Area	3604	SF
Total	**27162**	SF

Average Rental Price ($ per S.F. per Month)

2007	2008	2009	AVG.
$ 53.24	$ 72.97	$ 55.52	$ 60.58
$ 1,254,227.92	$ 1,719,027.26	$ 1,307,940.16	$ 1,427,065.11

Figure 305: Structural Column Schedule

Structural Column Schedule

Family and Type	Base Level	Length	Volume	[redacted]	Quantity	LineNumber	Source	Sub	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total
1 Ground																	
Box Col: 30x30xtw2																	
Box Col: 30x30xtw2: 4		168	382.67		168	051223758100			FB-Flanged Box-Column: FB	E5	255	0.077	L.F.	$ 930.53	$ 4.83	$ 1.99	$ 937.35
Box Col: 30x30xtw7																	
Box Col: 30x30xtw7: 2		84	319.67		84	051223758100			FB-Flanged Box-Column: FB	E5	255	0.077	L.F.	$ 1,914.75	$ 4.83	$ 1.99	$ 1,921.57
BUS Col: BU24X987																	
BUS Col: BU24X987: 6		252	507.5		252	051223758100			BU-Built Up-Column: W24X	E5	255	0.077	L.F.	$ 1,796.34	$ 4.83	$ 1.99	$ 1,803.16
HSS-Hollow Structural Section-Column: HSS6X6X1/2																	
HSS-Hollow Structural Section-Column: HSS6X6X1/2: 1		2	0.14		2	051223750360			HSS6x6x1/2	E2	550	0.102	L.F.	$ 81.72	$ 6.27	$ 3.49	$ 91.48
W-Wide Flange-Column: W14X342																	
W-Wide Flange-Column: W14X342: 2		84	58.51		84	051223177350			W14x342	E2	984	0.057	L.F.	$ 584.82	$ 3.51	$ 1.95	$ 590.28
W-Wide Flange-Column: W14X550																	
W-Wide Flange-Column: W14X550: 4		168	188.17		168	051223177350			W14x550	E2	984	0.057	L.F.	$ 940.50	$ 3.51	$ 1.95	$ 945.96
W-Wide Flange-Column: W14X730																	
W-Wide Flange-Column: W14X730: 2		84	125.06		84	051223177350			W14x730	E2	984	0.057	L.F.	$ 1,248.30	$ 3.51	$ 1.95	$ 1,253.76
1 Ground: 21		842	1581.71		Total												
2																	
W-Wide Flange-Column: W14X176																	
W-Wide Flange-Column: W14X176: 4		64	22.89		64	051223177450			W14x176	E2	912	0.061	L.F.	$ 300.15	$ 3.78	$ 2.10	$ 306.03
W-Wide Flange-Column: W14X311																	
W-Wide Flange-Column: W14X311: 2		32	20.23		32	051223177350			W14x311	E2	984	0.057	L.F.	$ 531.81	$ 3.51	$ 1.95	$ 537.27
2:06		96	43.12		Total												
3																	
Box Col: 30x30xtw2																	
Box Col: 30x30xtw2: 4		176	400.89		176	051223758100			FB-Flanged Box-Column: FB	E5	255	0.077	L.F.	$ 930.53	$ 4.83	$ 1.99	$ 937.35
Box Col: 30x30xtw7																	
Box Col: 30x30xtw7: 2		88	334.89		88	051223758100			FB-Flanged Box-Column: FB	E5	255	0.077	L.F.	$ 1,914.75	$ 4.83	$ 1.99	$ 1,921.57
BUS Col: BU24x817																	
BUS Col: BU24x817: 6		264	440		264	051223758100			BU-Built Up-Column: W24X	E5	255	0.077	L.F.	$ 1,486.94	$ 4.83	$ 1.99	$ 1,493.76
W-Wide Flange-Column: W14X176																	
W-Wide Flange-Column: W14X176: 4		176	62.95		176	051223177450			W14x176	E2	912	0.061	L.F.	$ 300.15	$ 3.78	$ 2.10	$ 306.03
W-Wide Flange-Column: W14X257																	
W-Wide Flange-Column: W14X257: 2		88	46.07		88	051223177350			W14x257	E2	984	0.057	L.F.	$ 439.47	$ 3.51	$ 1.95	$ 444.93
W-Wide Flange-Column: W14X283																	
W-Wide Flange-Column: W14X283: 2		88	50.64		88	051223177350			W14x283	E2	984	0.057	L.F.	$ 483.93	$ 3.51	$ 1.95	$ 489.39
W-Wide Flange-Column: W14X455																	
W-Wide Flange-Column: W14X455: 4		176	162.92		176	051223177350			W14x455	E2	984	0.057	L.F.	$ 778.05	$ 3.51	$ 1.95	$ 783.51
W-Wide Flange-Column: W14X605																	
W-Wide Flange-Column: W14X605: 2		88	108.46		88	051223177350			W14x605	E2	984	0.057	L.F.	$ 1,034.55	$ 3.51	$ 1.95	$ 1,040.01
3:26		1144	1606.81		Total												
6																	
BUS Col: BU24x817																	
BUS Col: BU24x817: 2		82	136.67		82	051223758100			BU-Built Up-Column: W24X	E5	255	0.077	L.F.	$ 1,486.94	$ 4.83	$ 1.99	$ 1,493.76
W-Wide Flange-Column: W14X159																	
W-Wide Flange-Column: W14X159: 4		164	52.99		164	051223177350			W14x159	E2	984	0.057	L.F.	$ 271.89	$ 3.51	$ 1.95	$ 277.35
W-Wide Flange-Column: W14X233																	
W-Wide Flange-Column: W14X233: 4		164	77.55		164	051223177350			W14x233	E2	984	0.057	L.F.	$ 398.43	$ 3.51	$ 1.95	$ 403.89
W-Wide Flange-Column: W14X257																	
W-Wide Flange-Column: W14X257: 2		82	42.93		82	051223177350			W14x257	E2	984	0.057	L.F.	$ 439.47	$ 3.51	$ 1.95	$ 444.93
W-Wide Flange-Column: W14X398																	
W-Wide Flange-Column: W14X398: 8		328	266.44		328	051223177350			W14x398	E2	984	0.057	L.F.	$ 680.58	$ 3.51	$ 1.95	$ 686.04
W-Wide Flange-Column: W14X550																	
W-Wide Flange-Column: W14X550: 2		82	91.84		82	051223177350			W14x550	E2	984	0.057	L.F.	$ 940.50	$ 3.51	$ 1.95	$ 945.96
W-Wide Flange-Column: W14X665																	
W-Wide Flange-Column: W14X665: 4		164	222.71		164	051223177350			W14x665	E2	984	0.057	L.F.	$ 1,137.15	$ 3.51	$ 1.95	$ 1,142.61
6:26		1066	891.14		Total												
9																	
W-Wide Flange-Column: W14X145																	
W-Wide Flange-Column: W14X145: 4		168	49.42		168	051223177350			W14x145	E2	984	0.057	L.F.	$ 247.95	$ 3.51	$ 1.95	$ 253.41
W-Wide Flange-Column: W14X233																	
W-Wide Flange-Column: W14X233: 6		252	119.17		252	051223177350			W14x233	E2	984	0.057	L.F.	$ 398.43	$ 3.51	$ 1.95	$ 403.89
W-Wide Flange-Column: W14X398																	
W-Wide Flange-Column: W14X398: 8		336	272.94		336	051223177350			W14x398	E2	984	0.057	L.F.	$ 680.58	$ 3.51	$ 1.95	$ 686.04
W-Wide Flange-Column: W14X500																	
W-Wide Flange-Column: W14X500: 2		84	85.53		84	051223177350			W14x500	E2	984	0.057	L.F.	$ 855.00	$ 3.51	$ 1.95	$ 860.46
W-Wide Flange-Column: W14X550																	
W-Wide Flange-Column: W14X550: 4		168	188.17		168	051223177350			W14x550	E2	984	0.057	L.F.	$ 940.50	$ 3.51	$ 1.95	$ 945.96
W-Wide Flange-Column: W14X730																	
W-Wide Flange-Column: W14X730: 2		84	125.06		84	051223177350			W14x730	E2	984	0.057	L.F.	$ 1,248.30	$ 3.51	$ 1.95	$ 1,253.76
9:26		1092	840.28		Total												
12																	
W-Wide Flange-Column: W14X145																	
W-Wide Flange-Column: W14X145: 4		160	47.07		160	051223177350			W14x145	E2	984	0.057	L.F.	$ 247.95	$ 3.51	$ 1.95	$ 253.41
W-Wide Flange-Column: W14X211																	
W-Wide Flange-Column: W14X211: 4		160	68.43		160	051223177350			W14x211	E2	984	0.057	L.F.	$ 360.81	$ 3.51	$ 1.95	$ 366.27
W-Wide Flange-Column: W14X233																	
W-Wide Flange-Column: W14X233: 2		80	37.83		80	051223177350			W14x233	E2	984	0.057	L.F.	$ 398.43	$ 3.51	$ 1.95	$ 403.89
W-Wide Flange-Column: W14X370																	
W-Wide Flange-Column: W14X370: 8		320	241.48		320	051223177350			W14x370	E2	984	0.057	L.F.	$ 632.70	$ 3.51	$ 1.95	$ 638.16
W-Wide Flange-Column: W14X500																	
W-Wide Flange-Column: W14X500: 6		240	244.36		240	051223177350			W14x500	E2	984	0.057	L.F.	$ 855.00	$ 3.51	$ 1.95	$ 860.46
W-Wide Flange-Column: W14X605																	
W-Wide Flange-Column: W14X605: 2		80	98.6		80	051223177350			W14x605	E2	984	0.057	L.F.	$ 1,034.55	$ 3.51	$ 1.95	$ 1,040.01
12:26		1040	737.78		Total												

Family and Type	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor	Data R	Zip Co	Notes
1 Ground																
Box Col: 30x30xtw2: 4	$ 156,329.04	$ 811.44	$ 334.32	$ 157,474.80	$ 1,032.41	$ 8.35	$ 2.19	$ 1,042.95	$ 173,444.88	$ 1,402.80	$ 367.92	$ 648,297.72	STD	Year 2009	100-102	
Box Col: 30x30xtw7: 2	$ 160,839.00	$ 405.72	$ 167.16	$ 161,411.88	$ 2,124.38	$ 8.35	$ 2.19	$ 2,134.92	$ 178,447.92	$ 701.40	$ 183.96	$ 663,533.14	STD	Year 2010	100-103	
BUS Col: BU24X987: 6	$ 452,677.68	$ 1,217.16	$ 501.48	$ 454,396.32	$ 1,926.29	$ 8.35	$ 2.19	$ 1,936.83	$ 485,425.08	$ 2,104.20	$ 551.88	$ 1,591,144.58	STD	Year 2010	100-103	
HSS-Hollow Structural Section-Column: HSS6X6X1/2: 1	$ 163.44	$ 12.54	$ 6.98	$ 182.96	$ 90.00	$ 10.76	$ 3.83	$ 104.59	$ 180.00	$ 21.52	$ 7.66	$ 209.18	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X342: 2	$ 49,124.88	$ 294.84	$ 163.80	$ 49,583.52	$ 639.54	$ 6.00	$ 2.15	$ 647.69	$ 53,721.36	$ 504.00	$ 180.60	$ 54,405.96	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X550: 4	$ 158,004.00	$ 589.68	$ 327.60	$ 158,921.28	$ 1,028.50	$ 6.00	$ 2.15	$ 1,036.65	$ 172,788.00	$ 1,008.00	$ 361.20	$ 174,157.20	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X730: 2	$ 104,857.20	$ 294.84	$ 163.80	$ 105,315.84	$ 1,365.10	$ 6.00	$ 2.15	$ 1,373.25	$ 114,668.40	$ 504.00	$ 180.60	$ 115,353.00	STD	Year 2009	100-102	
1 Ground: 21	$ 1,081,995.24	$ 3,626.22	$ 1,665.14	$ 1,087,286.60					$ 1,178,675.64	$ 6,245.92	$ 1,833.82	$ 3,247,100.78				
2																
W-Wide Flange-Column: W14X176: 4	$ 19,209.60	$ 241.92	$ 134.40	$ 19,585.92	$ 331.20	$ 6.47	$ 2.31	$ 339.98	$ 21,196.80	$ 414.08	$ 147.84	$ 21,758.72	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X311: 2	$ 17,017.92	$ 112.32	$ 62.40	$ 17,192.64	$ 581.57	$ 6.00	$ 2.15	$ 589.72	$ 18,610.24	$ 192.00	$ 68.80	$ 18,871.04	STD	Year 2009	100-102	
2:06	$ 36,227.52	$ 354.24	$ 196.80	$ 36,778.56					$ 39,807.04	$ 606.08	$ 216.64	$ 40,629.76				
3																
Box Col: 30x30xtw2: 4	$ 163,773.28	$ 850.08	$ 350.24	$ 164,973.60	$ 1,032.41	$ 8.35	$ 2.19	$ 1,042.95	$ 181,704.16	$ 1,469.60	$ 385.44	$ 679,169.04	STD	Year 2009	100-102	
Box Col: 30x30xtw7: 2	$ 168,498.00	$ 425.04	$ 175.12	$ 169,098.16	$ 2,124.38	$ 8.35	$ 2.19	$ 2,134.92	$ 186,945.44	$ 734.80	$ 192.72	$ 695,129.95	STD	Year 2010	100-103	
BUS Col: BU24x817: 6	$ 392,552.16	$ 1,275.12	$ 525.36	$ 394,352.64	$ 1,594.51	$ 8.35	$ 2.19	$ 1,605.05	$ 420,950.64	$ 2,204.40	$ 578.16	$ 1,381,370.23	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X176: 4	$ 52,826.40	$ 665.28	$ 369.60	$ 53,861.28	$ 331.20	$ 6.47	$ 2.31	$ 339.98	$ 58,291.20	$ 1,138.72	$ 406.56	$ 59,836.48	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X257: 2	$ 38,673.36	$ 308.88	$ 171.60	$ 39,153.84	$ 480.59	$ 6.00	$ 2.15	$ 488.74	$ 42,291.92	$ 528.00	$ 189.20	$ 43,009.12	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X283: 2	$ 42,585.84	$ 308.88	$ 171.60	$ 43,066.32	$ 529.21	$ 6.00	$ 2.15	$ 537.36	$ 46,570.48	$ 528.00	$ 189.20	$ 47,287.68	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X455: 4	$ 136,936.80	$ 617.76	$ 343.20	$ 137,897.76	$ 850.85	$ 6.00	$ 2.15	$ 859.00	$ 149,749.60	$ 1,056.00	$ 378.40	$ 151,184.00	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X605: 2	$ 91,040.40	$ 308.88	$ 171.60	$ 91,520.88	$ 1,131.35	$ 6.00	$ 2.15	$ 1,139.50	$ 99,558.80	$ 528.00	$ 189.20	$ 100,276.00	STD	Year 2009	100-102	
3:26	$ 1,086,886.24	$ 4,759.92	$ 2,278.32	$ 1,093,924.48					$ 1,186,062.24	$ 8,187.52	$ 2,508.88	$ 3,157,262.50				
6																
BUS Col: BU24x817: 2	$ 121,929.08	$ 396.06	$ 163.18	$ 122,488.32	$ 1,594.51	$ 8.35	$ 2.19	$ 1,605.05	$ 130,749.82	$ 684.70	$ 179.58	$ 429,061.97	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X159: 4	$ 44,589.96	$ 575.64	$ 319.80	$ 45,485.40	$ 297.33	$ 6.00	$ 2.15	$ 305.48	$ 48,762.12	$ 984.00	$ 352.60	$ 50,098.72	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X233: 4	$ 65,342.52	$ 575.64	$ 319.80	$ 66,237.96	$ 435.71	$ 6.00	$ 2.15	$ 443.86	$ 71,456.44	$ 984.00	$ 352.60	$ 72,793.04	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X257: 2	$ 36,036.54	$ 287.82	$ 159.90	$ 36,484.26	$ 480.59	$ 6.00	$ 2.15	$ 488.74	$ 39,408.38	$ 492.00	$ 176.30	$ 40,076.68	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X398: 8	$ 223,230.24	$ 1,151.28	$ 639.60	$ 225,021.12	$ 744.26	$ 6.00	$ 2.15	$ 752.41	$ 244,117.28	$ 1,968.00	$ 705.20	$ 246,790.48	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X550: 2	$ 77,121.00	$ 287.82	$ 159.90	$ 77,568.72	$ 1,028.50	$ 6.00	$ 2.15	$ 1,036.65	$ 84,337.00	$ 492.00	$ 176.30	$ 85,005.30	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X665: 4	$ 186,492.60	$ 575.64	$ 319.80	$ 187,388.04	$ 1,243.55	$ 6.00	$ 2.15	$ 1,251.70	$ 203,942.20	$ 984.00	$ 352.60	$ 205,278.80	STD	Year 2009	100-102	
6:26	$ 754,741.94	$ 3,849.90	$ 2,081.98	$ 760,673.82					$ 822,773.24	$ 6,588.70	$ 2,295.18	$ 1,129,104.99				
9																
W-Wide Flange-Column: W14X145: 4	$ 41,655.60	$ 589.68	$ 327.60	$ 42,572.88	$ 271.15	$ 6.00	$ 2.15	$ 279.30	$ 45,553.20	$ 1,008.00	$ 361.20	$ 46,922.40	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X233: 6	$ 100,404.36	$ 884.52	$ 491.40	$ 101,780.28	$ 435.71	$ 6.00	$ 2.15	$ 443.86	$ 109,798.92	$ 1,512.00	$ 541.80	$ 111,852.72	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X398: 8	$ 228,674.88	$ 1,179.36	$ 655.20	$ 230,509.44	$ 744.26	$ 6.00	$ 2.15	$ 752.41	$ 250,071.36	$ 2,016.00	$ 722.40	$ 252,809.76	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X500: 2	$ 71,820.00	$ 294.84	$ 163.80	$ 72,278.64	$ 935.00	$ 6.00	$ 2.15	$ 943.15	$ 78,540.00	$ 504.00	$ 180.60	$ 79,224.60	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X550: 4	$ 158,004.00	$ 589.68	$ 327.60	$ 158,921.28	$ 1,028.50	$ 6.00	$ 2.15	$ 1,036.65	$ 172,788.00	$ 1,008.00	$ 361.20	$ 174,157.20	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X730: 2	$ 104,857.20	$ 294.84	$ 163.80	$ 105,315.84	$ 1,365.10	$ 6.00	$ 2.15	$ 1,373.25	$ 114,668.40	$ 504.00	$ 180.60	$ 115,353.00	STD	Year 2009	100-102	
9:26	$ 705,416.04	$ 3,832.92	$ 2,129.40	$ 711,378.36					$ 771,419.88	$ 6,552.00	$ 2,347.80	$ 780,319.68				
12																
W-Wide Flange-Column: W14X145: 4	$ 39,672.00	$ 561.60	$ 312.00	$ 40,545.60	$ 271.15	$ 6.00	$ 2.15	$ 279.30	$ 43,384.00	$ 960.00	$ 344.00	$ 44,688.00	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X211: 4	$ 57,729.60	$ 561.60	$ 312.00	$ 58,603.20	$ 394.57	$ 6.00	$ 2.15	$ 402.72	$ 63,131.20	$ 960.00	$ 344.00	$ 64,435.20	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X233: 2	$ 31,874.40	$ 280.80	$ 156.00	$ 32,311.20	$ 435.71	$ 6.00	$ 2.15	$ 443.86	$ 34,856.80	$ 480.00	$ 172.00	$ 35,508.80	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X370: 8	$ 202,464.00	$ 1,123.20	$ 624.00	$ 204,211.20	$ 691.90	$ 6.00	$ 2.15	$ 700.05	$ 221,408.00	$ 1,920.00	$ 688.00	$ 224,016.00	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X500: 6	$ 205,200.00	$ 842.40	$ 468.00	$ 206,510.40	$ 935.00	$ 6.00	$ 2.15	$ 943.15	$ 224,400.00	$ 1,440.00	$ 516.00	$ 226,356.00	STD	Year 2009	100-102	
W-Wide Flange-Column: W14X605: 2	$ 82,764.00	$ 280.80	$ 156.00	$ 83,200.80	$ 1,131.35	$ 6.00	$ 2.15	$ 1,139.50	$ 90,508.00	$ 480.00	$ 172.00	$ 91,160.00	STD	Year 2009	100-102	
12:26	$ 619,704.00	$ 3,650.40	$ 2,028.00	$ 625,382.40					$ 677,688.00	$ 6,240.00	$ 2,236.00	$ 686,164.00				

15																																
W-Wide Flange-Column: W14X132																																
W-Wide Flange-Column: W14X132: 4		168	44.87	[redacted]	168	051223177350			W14x132	E2	984	0.057	L.F.	$ 225.72	$ 3.51	$ 1.95	$ 231.18	$ 37,920.96	$ 589.68	$ 327.60	$ 38,838.24	$ 246.84	$ 6.00	$ 2.15	$ 254.99	$ 41,469.12	$ 1,008.00	$ 361.20	$ 42,838.32	STD	Year 2009	100-102
W-Wide Flange-Column: W14X193																																
W-Wide Flange-Column: W14X193: 6		252	98.87	[redacted]	252	051223177350			W14x193	E2	984	0.057	L.F.	$ 330.03	$ 3.51	$ 1.95	$ 335.49	$ 83,167.56	$ 884.52	$ 491.40	$ 84,543.48	$ 360.91	$ 6.00	$ 2.15	$ 369.06	$ 90,949.32	$ 1,512.00	$ 541.80	$ 93,003.12	STD	Year 2009	100-102
W-Wide Flange-Column: W14X311																																
W-Wide Flange-Column: W14X311: 8		336	212.36	[redacted]	336	051223177350			W14x311	E2	984	0.057	L.F.	$ 531.81	$ 3.51	$ 1.95	$ 537.27	$ 178,688.16	$ 1,179.36	$ 655.20	$ 180,522.72	$ 581.57	$ 6.00	$ 2.15	$ 589.72	$ 195,407.52	$ 2,016.00	$ 722.40	$ 198,145.92	STD	Year 2009	100-102
W-Wide Flange-Column: W14X426																																
W-Wide Flange-Column: W14X426: 6		252	219.12	[redacted]	252	051223177350			W14x426	E2	984	0.057	L.F.	$ 728.46	$ 3.51	$ 1.95	$ 733.92	$ 183,571.92	$ 884.52	$ 491.40	$ 184,947.84	$ 796.62	$ 6.00	$ 2.15	$ 804.77	$ 200,748.24	$ 1,512.00	$ 541.80	$ 202,802.04	STD	Year 2009	100-102
W-Wide Flange-Column: W14X550																																
W-Wide Flange-Column: W14X550: 2		84	94.08	[redacted]	84	051223177350			W14x550	E2	984	0.057	L.F.	$ 940.50	$ 3.51	$ 1.95	$ 945.96	$ 79,002.00	$ 294.84	$ 163.80	$ 79,460.64	$ 1,028.50	$ 6.00	$ 2.15	$ 1,036.65	$ 86,394.00	$ 504.00	$ 180.60	$ 87,078.60	STD	Year 2009	100-102
15:26		1092	669.31	[redacted]	Total													$ 562,350.60	$ 3,832.92	$ 2,129.40	$ 568,312.92					$ 614,968.20	$ 6,552.00	$ 2,347.80	$ 623,868.00			
18																																
W-Wide Flange-Column: W14X132																																
W-Wide Flange-Column: W14X132: 4		164	43.8	[redacted]	164	051223177350			W14x132	E2	984	0.057	L.F.	$ 225.72	$ 3.51	$ 1.95	$ 231.18	$ 37,018.08	$ 575.64	$ 319.80	$ 37,913.52	$ 246.84	$ 6.00	$ 2.15	$ 254.99	$ 40,481.76	$ 984.00	$ 352.60	$ 41,818.36	STD	Year 2009	100-102
W-Wide Flange-Column: W14X176																																
W-Wide Flange-Column: W14X176: 4		164	58.66	[redacted]	164	051223177450			W14x176	E2	912	0.061	L.F.	$ 300.15	$ 3.78	$ 2.10	$ 306.03	$ 49,224.60	$ 619.92	$ 344.40	$ 50,188.92	$ 331.20	$ 6.47	$ 2.31	$ 339.98	$ 54,316.80	$ 1,061.08	$ 378.84	$ 55,756.72	STD	Year 2009	100-102
W-Wide Flange-Column: W14X193																																
W-Wide Flange-Column: W14X193: 2		82	32.17	[redacted]	82	051223177350			W14x193	E2	984	0.057	L.F.	$ 330.03	$ 3.51	$ 1.95	$ 335.49	$ 27,062.46	$ 287.82	$ 159.90	$ 27,510.18	$ 360.91	$ 6.00	$ 2.15	$ 369.06	$ 29,594.62	$ 492.00	$ 176.30	$ 30,262.92	STD	Year 2009	100-102
W-Wide Flange-Column: W14X311																																
W-Wide Flange-Column: W14X311: 8		328	207.31	[redacted]	328	051223177350			W14x311	E2	984	0.057	L.F.	$ 531.81	$ 3.51	$ 1.95	$ 537.27	$ 174,433.68	$ 1,151.28	$ 639.60	$ 176,224.56	$ 581.57	$ 6.00	$ 2.15	$ 589.72	$ 190,754.96	$ 1,968.00	$ 705.20	$ 193,428.16	STD	Year 2009	100-102
W-Wide Flange-Column: W14X370																																
W-Wide Flange-Column: W14X370: 4		164	123.76	[redacted]	164	051223177350			W14x370	E2	984	0.057	L.F.	$ 632.70	$ 3.51	$ 1.95	$ 638.16	$ 103,762.80	$ 575.64	$ 319.80	$ 104,658.24	$ 691.90	$ 6.00	$ 2.15	$ 700.05	$ 113,471.60	$ 984.00	$ 352.60	$ 114,808.20	STD	Year 2009	100-102
W-Wide Flange-Column: W14X398																																
W-Wide Flange-Column: W14X398: 2		82	66.61	[redacted]	82	051223177350			W14x398	E2	984	0.057	L.F.	$ 680.58	$ 3.51	$ 1.95	$ 686.04	$ 55,807.56	$ 287.82	$ 159.90	$ 56,255.28	$ 744.26	$ 6.00	$ 2.15	$ 752.41	$ 61,029.32	$ 492.00	$ 176.30	$ 61,697.62	STD	Year 2009	100-102
W-Wide Flange-Column: W14X455																																
W-Wide Flange-Column: W14X455: 2		82	75.9	[redacted]	82	051223177350			W14x455	E2	984	0.057	L.F.	$ 778.05	$ 3.51	$ 1.95	$ 783.51	$ 63,800.10	$ 287.82	$ 159.90	$ 64,247.82	$ 850.85	$ 6.00	$ 2.15	$ 859.00	$ 69,769.70	$ 492.00	$ 176.30	$ 70,438.00	STD	Year 2009	100-102
18:26		1066	608.22	[redacted]	Total													$ 511,109.28	$ 3,785.94	$ 2,103.30	$ 516,998.52					$ 559,418.76	$ 6,473.08	$ 2,318.14	$ 568,209.98			
21																																
W-Wide Flange-Column: W14X132																																
W-Wide Flange-Column: W14X132: 4		164	43.8	[redacted]	164	051223177350			W14x132	E2	984	0.057	L.F.	$ 225.72	$ 3.51	$ 1.95	$ 231.18	$ 37,018.08	$ 575.64	$ 319.80	$ 37,913.52	$ 246.84	$ 6.00	$ 2.15	$ 254.99	$ 40,481.76	$ 984.00	$ 352.60	$ 41,818.36	STD	Year 2009	100-102
W-Wide Flange-Column: W14X176																																
W-Wide Flange-Column: W14X176: 4		164	58.66	[redacted]	164	051223177450			W14x176	E2	912	0.061	L.F.	$ 300.15	$ 3.78	$ 2.10	$ 306.03	$ 49,224.60	$ 619.92	$ 344.40	$ 50,188.92	$ 331.20	$ 6.47	$ 2.31	$ 339.98	$ 54,316.80	$ 1,061.08	$ 378.84	$ 55,756.72	STD	Year 2009	100-102
W-Wide Flange-Column: W14X193																																
W-Wide Flange-Column: W14X193: 2		82	32.17	[redacted]	82	051223177350			W14x193	E2	984	0.057	L.F.	$ 330.03	$ 3.51	$ 1.95	$ 335.49	$ 27,062.46	$ 287.82	$ 159.90	$ 27,510.18	$ 360.91	$ 6.00	$ 2.15	$ 369.06	$ 29,594.62	$ 492.00	$ 176.30	$ 30,262.92	STD	Year 2009	100-102
W-Wide Flange-Column: W14X311																																
W-Wide Flange-Column: W14X311: 8		328	207.31	[redacted]	328	051223177350			W14x311	E2	984	0.057	L.F.	$ 531.81	$ 3.51	$ 1.95	$ 537.27	$ 174,433.68	$ 1,151.28	$ 639.60	$ 176,224.56	$ 581.57	$ 6.00	$ 2.15	$ 589.72	$ 190,754.96	$ 1,968.00	$ 705.20	$ 193,428.16	STD	Year 2009	100-102
W-Wide Flange-Column: W14X370																																
W-Wide Flange-Column: W14X370: 4		164	123.76	[redacted]	164	051223177350			W14x370	E2	984	0.057	L.F.	$ 632.70	$ 3.51	$ 1.95	$ 638.16	$ 103,762.80	$ 575.64	$ 319.80	$ 104,658.24	$ 691.90	$ 6.00	$ 2.15	$ 700.05	$ 113,471.60	$ 984.00	$ 352.60	$ 114,808.20	STD	Year 2009	100-102
W-Wide Flange-Column: W14X398																																
W-Wide Flange-Column: W14X398: 4		164	133.22	[redacted]	164	051223177350			W14x398	E2	984	0.057	L.F.	$ 680.58	$ 3.51	$ 1.95	$ 686.04	$ 111,615.12	$ 575.64	$ 319.80	$ 112,510.56	$ 744.26	$ 6.00	$ 2.15	$ 752.41	$ 122,058.64	$ 984.00	$ 352.60	$ 123,395.24	STD	Year 2009	100-102
21:26		1066	598.92	[redacted]	Total													$ 503,116.74	$ 3,785.94	$ 2,103.30	$ 509,005.98					$ 550,678.38	$ 6,473.08	$ 2,318.14	$ 559,469.60			
24																																
W-Wide Flange-Column: W14X132																																
W-Wide Flange-Column: W14X132: 4		164	43.8	[redacted]	164	051223177350			W14x132	E2	984	0.057	L.F.	$ 225.72	$ 3.51	$ 1.95	$ 231.18	$ 37,018.08	$ 575.64	$ 319.80	$ 37,913.52	$ 246.84	$ 6.00	$ 2.15	$ 254.99	$ 40,481.76	$ 984.00	$ 352.60	$ 41,818.36	STD	Year 2009	100-102
W-Wide Flange-Column: W14X176																																
W-Wide Flange-Column: W14X176: 4		164	58.66	[redacted]	164	051223177450			W14x176	E2	912	0.061	L.F.	$ 300.15	$ 3.78	$ 2.10	$ 306.03	$ 49,224.60	$ 619.92	$ 344.40	$ 50,188.92	$ 331.20	$ 6.47	$ 2.31	$ 339.98	$ 54,316.80	$ 1,061.08	$ 378.84	$ 55,756.72	STD	Year 2009	100-102
W-Wide Flange-Column: W14X193																																
W-Wide Flange-Column: W14X193: 2		82	32.17	[redacted]	82	051223177350			W14x193	E2	984	0.057	L.F.	$ 330.03	$ 3.51	$ 1.95	$ 335.49	$ 27,062.46	$ 287.82	$ 159.90	$ 27,510.18	$ 360.91	$ 6.00	$ 2.15	$ 369.06	$ 29,594.62	$ 492.00	$ 176.30	$ 30,262.92	STD	Year 2009	100-102
W-Wide Flange-Column: W14X311																																
W-Wide Flange-Column: W14X311: 8		328	207.31	[redacted]	328	051223177350			W14x311	E2	984	0.057	L.F.	$ 531.81	$ 3.51	$ 1.95	$ 537.27	$ 174,433.68	$ 1,151.28	$ 639.60	$ 176,224.56	$ 581.57	$ 6.00	$ 2.15	$ 589.72	$ 190,754.96	$ 1,968.00	$ 705.20	$ 193,428.16	STD	Year 2009	100-102
W-Wide Flange-Column: W14X370																																
W-Wide Flange-Column: W14X370: 4		164	123.76	[redacted]	164	051223177350			W14x370	E2	984	0.057	L.F.	$ 632.70	$ 3.51	$ 1.95	$ 638.16	$ 103,762.80	$ 575.64	$ 319.80	$ 104,658.24	$ 691.90	$ 6.00	$ 2.15	$ 700.05	$ 113,471.60	$ 984.00	$ 352.60	$ 114,808.20	STD	Year 2009	100-102
W-Wide Flange-Column: W14X398																																
W-Wide Flange-Column: W14X398: 4		164	133.22	[redacted]	164	051223177350			W14x398	E2	984	0.057	L.F.	$ 680.58	$ 3.51	$ 1.95	$ 686.04	$ 111,615.12	$ 575.64	$ 319.80	$ 112,510.56	$ 744.26	$ 6.00	$ 2.15	$ 752.41	$ 122,058.64	$ 984.00	$ 352.60	$ 123,395.24	STD	Year 2009	100-102
24:26:00		1066	598.92	[redacted]	Total													$ 503,116.74	$ 3,785.94	$ 2,103.30	$ 509,005.98					$ 550,678.38	$ 6,473.08	$ 2,318.14	$ 559,469.60			
27																																
W-Wide Flange-Column: W14X132																																
W-Wide Flange-Column: W14X132: 4		220	58.76	[redacted]	220	051223177350			W14x132	E2	984	0.057	L.F.	$ 225.72	$ 3.51	$ 1.95	$ 231.18	$ 49,658.40	$ 772.20	$ 429.00	$ 50,859.60	$ 246.84	$ 6.00	$ 2.15	$ 254.99	$ 54,304.80	$ 1,320.00	$ 473.00	$ 56,097.80	STD	Year 2009	100-102
W-Wide Flange-Column: W14X176																																
W-Wide Flange-Column: W14X176: 4		220	78.69	[redacted]	220	051223177450			W14x176	E2	912	0.061	L.F.	$ 300.15	$ 3.78	$ 2.10	$ 306.03	$ 66,033.00	$ 831.60	$ 462.00	$ 67,326.60	$ 331.20	$ 6.47	$ 2.31	$ 339.98	$ 72,864.00	$ 1,423.40	$ 508.20	$ 74,796.60	STD	Year 2009	100-102
W-Wide Flange-Column: W14X193																																
W-Wide Flange-Column: W14X193: 2		110	43.16	[redacted]	110	051223177350			W14x193	E2	984	0.057	L.F.	$ 330.03	$ 3.51	$ 1.95	$ 335.49	$ 36,303.30	$ 386.10	$ 214.50	$ 36,903.90	$ 360.91	$ 6.00	$ 2.15	$ 369.06	$ 39,700.10	$ 660.00	$ 236.50	$ 40,596.60	STD	Year 2009	100-102
W-Wide Flange-Column: W14X311																																
W-Wide Flange-Column: W14X311: 8		440	278.1	[redacted]	440	051223177350			W14x311	E2	984	0.057	L.F.	$ 531.81	$ 3.51	$ 1.95	$ 537.27	$ 233,996.40	$ 1,544.40	$ 858.00	$ 236,398.80	$ 581.57	$ 6.00	$ 2.15	$ 589.72	$ 255,890.80	$ 2,640.00	$ 946.00	$ 259,476.80	STD	Year 2009	100-102
W-Wide Flange-Column: W14X370																																
W-Wide Flange-Column: W14X370: 4		220	166.02	[redacted]	220	051223177350			W14x370	E2	984	0.057	L.F.	$ 632.70	$ 3.51	$ 1.95	$ 638.16	$ 139,194.00	$ 772.20	$ 429.00	$ 140,395.20	$ 691.90	$ 6.00	$ 2.15	$ 700.05	$ 152,218.00	$ 1,320.00	$ 473.00	$ 154,011.00	STD	Year 2009	100-102
W-Wide Flange-Column: W14X398																																
W-Wide Flange-Column: W14X398: 4		220	178.71	[redacted]	220	051223177350			W14x398	E2	984	0.057	L.F.	$ 680.58	$ 3.51	$ 1.95	$ 686.04	$ 149,727.60	$ 772.20	$ 429.00	$ 150,928.80	$ 744.26	$ 6.00	$ 2.15	$ 752.41	$ 163,737.20	$ 1,320.00	$ 473.00	$ 165,530.20	STD	Year 2009	100-102
27:26:00		1430	803.43	[redacted]	Total													$ 674,912.70	$ 5,078.70	$ 2,821.50	$ 682,812.90					$ 738,714.90	$ 8,683.40	$ 3,109.70	$ 750,508.00			
30																																
W-Wide Flange-Column: W14X99																																
W-Wide Flange-Column: W14X99: 4		164	32.92	[redacted]	164	051223177350			W14x99	E2	984	0.057	L.F.	$ 169.29	$ 3.51	$ 1.95	$ 174.75	$ 27,763.56	$ 575.64	$ 319.80	$ 28,659.00	$ 185.13	$ 6.00	$ 2.15	$ 193.28	$ 30,361.32	$ 984.00	$ 352.60	$ 31,697.92	STD	Year 2009	100-102
W-Wide Flange-Column: W14X120																																
W-Wide Flange-Column: W14X120: 6		246	59.93	[redacted]	246	051223177400			W14x120	E2	960	0.058	L.F.	$ 204.93	$ 3.60	$ 1.99	$ 210.52	$ 50,412.78	$ 885.60	$ 489.54	$ 51,787.92	$ 225.63	$ 6.15	$ 2.19	$ 233.97	$ 55,504.98	$ 1,512.90	$ 538.74	$ 57,556.62	STD	Year 2009	100-102
W-Wide Flange-Column: W14X193																																
W-Wide Flange-Column: W14X193: 8		328	128.68	[redacted]	328	051223177350			W14x193	E2	984	0.057	L.F.	$ 330.03	$ 3.51	$ 1.95	$ 335.49	$ 108,249.84	$ 1,151.28	$ 639.60	$ 110,040.72	$ 360.91	$ 6.00	$ 2.15	$ 369.06	$ 118,378.48	$ 1,968.00	$ 705.20	$ 121,051.68	STD	Year 2009	100-102
W-Wide Flange-Column: W14X233																																
W-Wide Flange-Column: W14X233: 4		164	77.55	[redacted]	164	051223177350			W14x233	E2	984	0.057	L.F.	$ 398.43	$ 3.51	$ 1.95	$ 403.89	$ 65,342.52	$ 575.64	$ 319.80	$ 66,237.96	$ 435.71	$ 6.00	$ 2.15	$ 443.86	$ 71,456.44	$ 984.00	$ 352.60	$ 72,793.04	STD	Year 2009	100-102
W-Wide Flange-Column: W14X283																																
W-Wide Flange-Column: W14X283: 4		164	94.37	[redacted]	164	051223177350			W14x283	E2	984	0.057	L.F.	$ 483.93	$ 3.51	$ 1.95	$ 489.39	$ 79,364.52	$ 575.64	$ 319.80	$ 80,259.96	$ 529.21	$ 6.00	$ 2.15	$ 537.36	$ 86,790.44	$ 984.00	$ 352.60	$ 88,127.04	STD	Year 2009	100-102
30:26:00		1066	393.46	[redacted]	Total													$ 331,133.22	$ 3,763.80	$ 2,088.54	$ 336,985.56					$ 362,491.66	$ 6,432.90	$ 2,301.74	$ 371,226.30			
33																																
W-Wide Flange-Column: W14X90																																
W-Wide Flange-Column: W14X90: 4		164	29.8	[redacted]	164	051223177350			W14x90	E2	984	0.057	L.F.	$ 153.90	$ 3.51	$ 1.95	$ 159.36	$ 25,239.60	$ 575.64	$ 319.80	$ 26,135.04	$ 168.30	$ 6.00	$ 2.15	$ 176.45	$ 27,601.20	$ 984.00	$ 352.60	$ 28,937.80	STD	Year 2009	100-102
W-Wide Flange-Column: W14X109																																
W-Wide Flange-Column: W14X109: 6		246	54.12	[redacted]	246	051223177350			W14x109	E2	984	0.057	L.F.	$ 186.39	$ 3.51	$ 1.95	$ 191.85	$ 45,851.94	$ 863.46	$ 479.70	$ 47,195.10	$ 203.83	$ 6.00	$ 2.15	$ 211.98	$ 50,142.18	$ 1,476.00	$ 528.90	$ 52,147.08	STD	Year 2009	100-102
W-Wide Flange-Column: W14X176																																
W-Wide Flange-Column: W14X176: 8		328	117.32	[redacted]	328	051223177450			W14x176	E2	912	0.061	L.F.	$ 300.15	$ 3.78	$ 2.10	$ 306.03	$ 98,449.20	$ 1,239.84	$ 688.80	$ 100,377.84	$ 331.20	$ 6.47	$ 2.31	$ 339.98	$ 108,633.60	$ 2,122.16	$ 757.68	$ 111,513.44	STD	Year 2009	100-102
W-Wide Flange-Column: W14X211																																
W-Wide Flange-Column: W14X211: 4		164	70.14	[redacted]	164	051223177350			W14x211	E2	984	0.057	L.F.	$ 360.81	$ 3.51	$ 1.95	$ 366.27	$ 59,172.84	$ 575.64	$ 319.80	$ 60,068.28	$ 394.57	$ 6.00	$ 2.15	$ 402.72	$ 64,709.48	$ 984.00	$ 352.60	$ 66,046.08	STD	Year 2009	100-102
W-Wide Flange-Column: W14X233																																
W-Wide Flange-Column: W14X233: 4		164	77.55	[redacted]	164	051223177350			W14x233	E2	984	0.057	L.F.	$ 398.43	$ 3.51	$ 1.95	$ 403.89	$ 65,342.52	$ 575.64	$ 319.80	$ 66,237.96	$ 435.71	$ 6.00	$ 2.15	$ 443.86	$ 71,456.44	$ 984.00	$ 352.60	$ 72,793.04	STD	Year 2009	100-102
33:26:00		1066	348.95	[redacted]	Total													$ 294,056.10	$ 3,830.22	$ 2,127.90	$ 300,014.22					$ 322,542.90	$ 6,550.16	$ 2,344.38	$ 331,437.44			

36																													
W-Wide Flange-Column: W14X90																													
W-Wide Flange-Column: W14X90: 8	336	61.06	[redacted]	336	051223177350	W14x90	E2	984	0.057	L.F.	$ 153.90	$ 3.51	$ 1.95	$ 159.36	$ 51,710.40	$ 1,179.36	$ 655.20	$ 53,544.96	$ 168.30	$ 6.00	$ 2.15	$ 176.45	$ 56,548.80	$ 2,016.00	$ 722.40	$ 59,287.20	STD	Year 2009	100-102
W-Wide Flange-Column: W14X99																													
W-Wide Flange-Column: W14X99: 2	84	16.86	[redacted]	84	051223177350	W14x99	E2	984	0.057	L.F.	$ 169.29	$ 3.51	$ 1.95	$ 174.75	$ 14,220.36	$ 294.84	$ 163.80	$ 14,679.00	$ 185.13	$ 6.00	$ 2.15	$ 193.28	$ 15,550.92	$ 504.00	$ 180.60	$ 16,235.52	STD	Year 2009	100-102
W-Wide Flange-Column: W14X145																													
W-Wide Flange-Column: W14X145: 8	336	98.85	[redacted]	336	051223177350	W14x145	E2	984	0.057	L.F.	$ 247.95	$ 3.51	$ 1.95	$ 253.41	$ 83,311.20	$ 1,179.36	$ 655.20	$ 85,145.76	$ 271.15	$ 6.00	$ 2.15	$ 279.30	$ 91,106.40	$ 2,016.00	$ 722.40	$ 93,844.80	STD	Year 2009	100-102
W-Wide Flange-Column: W14X176																													
W-Wide Flange-Column: W14X176: 4	168	60.09	[redacted]	168	051223177450	W14x176	E2	912	0.061	L.F.	$ 300.15	$ 3.78	$ 2.10	$ 306.03	$ 50,425.20	$ 635.04	$ 352.80	$ 51,413.04	$ 331.20	$ 6.47	$ 2.31	$ 339.98	$ 55,641.60	$ 1,086.96	$ 388.08	$ 57,116.64	STD	Year 2009	100-102
W-Wide Flange-Column: W14X211																													
W-Wide Flange-Column: W14X211: 4	168	71.86	[redacted]	168	051223177350	W14x211	E2	984	0.057	L.F.	$ 360.81	$ 3.51	$ 1.95	$ 366.27	$ 60,616.08	$ 589.68	$ 327.60	$ 61,533.36	$ 394.57	$ 6.00	$ 2.15	$ 402.72	$ 66,287.76	$ 1,008.00	$ 361.20	$ 67,656.96	STD	Year 2009	100-102
36:26:00	1092	308.72	[redacted]	Total											$ 260,283.24	$ 3,878.28	$ 2,154.60	$ 266,316.12					$ 285,135.48	$ 6,630.96	$ 2,374.68	$ 294,141.12			
39																													
W-Wide Flange-Column: W14X74																													
W-Wide Flange-Column: W14X74: 4	164	24.53	[redacted]	164	051223177350	W14x74	E2	984	0.057	L.F.	$ 126.27	$ 3.51	$ 1.95	$ 131.73	$ 20,708.28	$ 575.64	$ 319.80	$ 21,603.72	$ 138.69	$ 6.00	$ 2.15	$ 146.84	$ 22,745.16	$ 984.00	$ 352.60	$ 24,081.76	STD	Year 2009	100-102
W-Wide Flange-Column: W14X90																													
W-Wide Flange-Column: W14X90: 6	246	44.71	[redacted]	246	051223177350	W14x90	E2	984	0.057	L.F.	$ 153.90	$ 3.51	$ 1.95	$ 159.36	$ 37,859.40	$ 863.46	$ 479.70	$ 39,202.56	$ 168.30	$ 6.00	$ 2.15	$ 176.45	$ 41,401.80	$ 1,476.00	$ 528.90	$ 43,406.70	STD	Year 2009	100-102
W-Wide Flange-Column: W14X132																													
W-Wide Flange-Column: W14X132: 8	328	87.61	[redacted]	328	051223177350	W14x132	E2	984	0.057	L.F.	$ 225.72	$ 3.51	$ 1.95	$ 231.18	$ 74,036.16	$ 1,151.28	$ 639.60	$ 75,827.04	$ 246.84	$ 6.00	$ 2.15	$ 254.99	$ 80,963.52	$ 1,968.00	$ 705.20	$ 83,636.72	STD	Year 2009	100-102
W-Wide Flange-Column: W14X159																													
W-Wide Flange-Column: W14X159: 4	164	52.99	[redacted]	164	051223177350	W14x159	E2	984	0.057	L.F.	$ 271.89	$ 3.51	$ 1.95	$ 277.35	$ 44,589.96	$ 575.64	$ 319.80	$ 45,485.40	$ 297.33	$ 6.00	$ 2.15	$ 305.48	$ 48,762.12	$ 984.00	$ 352.60	$ 50,098.72	STD	Year 2009	100-102
W-Wide Flange-Column: W14X176																													
W-Wide Flange-Column: W14X176: 4	164	58.66	[redacted]	164	051223177450	W14x176	E2	912	0.061	L.F.	$ 300.15	$ 3.78	$ 2.10	$ 306.03	$ 49,224.60	$ 619.92	$ 344.40	$ 50,188.92	$ 331.20	$ 6.47	$ 2.31	$ 339.98	$ 54,316.80	$ 1,061.08	$ 378.84	$ 55,756.72	STD	Year 2009	100-102
39:26:00	1066	268.5	[redacted]	Total											$ 226,418.40	$ 3,785.94	$ 2,103.30	$ 232,307.64					$ 248,189.40	$ 6,473.08	$ 2,318.14	$ 256,980.62			
42																													
W-Wide Flange-Column: W14X74																													
W-Wide Flange-Column: W14X74: 8	328	49.06	[redacted]	328	051223177350	W14x74	E2	984	0.057	L.F.	$ 126.27	$ 3.51	$ 1.95	$ 131.73	$ 41,416.56	$ 1,151.28	$ 639.60	$ 43,207.44	$ 138.69	$ 6.00	$ 2.15	$ 146.84	$ 45,490.32	$ 1,968.00	$ 705.20	$ 48,163.52	STD	Year 2009	100-102
W-Wide Flange-Column: W14X82																													
W-Wide Flange-Column: W14X82: 2	82	13.51	[redacted]	82	051223177350	W14x82	E2	984	0.057	L.F.	$ 140.22	$ 3.51	$ 1.95	$ 145.68	$ 11,498.04	$ 287.82	$ 159.90	$ 11,945.76	$ 153.34	$ 6.00	$ 2.15	$ 161.49	$ 12,573.88	$ 492.00	$ 176.30	$ 13,242.18	STD	Year 2009	100-102
W-Wide Flange-Column: W14X109																													
W-Wide Flange-Column: W14X109: 8	328	72.17	[redacted]	328	051223177350	W14x109	E2	984	0.057	L.F.	$ 186.39	$ 3.51	$ 1.95	$ 191.85	$ 61,135.92	$ 1,151.28	$ 639.60	$ 62,926.80	$ 203.83	$ 6.00	$ 2.15	$ 211.98	$ 66,856.24	$ 1,968.00	$ 705.20	$ 69,529.44	STD	Year 2009	100-102
W-Wide Flange-Column: W14X132																													
W-Wide Flange-Column: W14X132: 4	164	43.8	[redacted]	164	051223177350	W14x132	E2	984	0.057	L.F.	$ 225.72	$ 3.51	$ 1.95	$ 231.18	$ 37,018.08	$ 575.64	$ 319.80	$ 37,913.52	$ 246.84	$ 6.00	$ 2.15	$ 254.99	$ 40,481.76	$ 984.00	$ 352.60	$ 41,818.36	STD	Year 2009	100-102
W-Wide Flange-Column: W14X145																													
W-Wide Flange-Column: W14X145: 4	164	48.25	[redacted]	164	051223177350	W14x145	E2	984	0.057	L.F.	$ 247.95	$ 3.51	$ 1.95	$ 253.41	$ 40,663.80	$ 575.64	$ 319.80	$ 41,559.24	$ 271.15	$ 6.00	$ 2.15	$ 279.30	$ 44,468.60	$ 984.00	$ 352.60	$ 45,805.20	STD	Year 2009	100-102
42:26:00	1066	226.79	[redacted]	Total											$ 191,732.40	$ 3,741.66	$ 2,078.70	$ 197,552.76					$ 209,870.80	$ 6,396.00	$ 2,291.90	$ 218,558.70			
45																													
W-Wide Flange-Column: W14X68																													
W-Wide Flange-Column: W14X68: 6	246	33.44	[redacted]	246	051223177350	W14x68	E2	984	0.057	L.F.	$ 116.28	$ 3.51	$ 1.95	$ 121.74	$ 28,604.88	$ 863.46	$ 479.70	$ 29,948.04	$ 127.16	$ 6.00	$ 2.15	$ 135.31	$ 31,281.36	$ 1,476.00	$ 528.90	$ 33,286.26	STD	Year 2009	100-102
W-Wide Flange-Column: W14X74																													
W-Wide Flange-Column: W14X74: 4	164	24.53	[redacted]	164	051223177350	W14x74	E2	984	0.057	L.F.	$ 126.27	$ 3.51	$ 1.95	$ 131.73	$ 20,708.28	$ 575.64	$ 319.80	$ 21,603.72	$ 138.69	$ 6.00	$ 2.15	$ 146.84	$ 22,745.16	$ 984.00	$ 352.60	$ 24,081.76	STD	Year 2009	100-102
W-Wide Flange-Column: W14X90																													
W-Wide Flange-Column: W14X90: 8	328	59.61	[redacted]	328	051223177350	W14x90	E2	984	0.057	L.F.	$ 153.90	$ 3.51	$ 1.95	$ 159.36	$ 50,479.20	$ 1,151.28	$ 639.60	$ 52,270.08	$ 168.30	$ 6.00	$ 2.15	$ 176.45	$ 55,202.40	$ 1,968.00	$ 705.20	$ 57,875.60	STD	Year 2009	100-102
W-Wide Flange-Column: W14X99																													
W-Wide Flange-Column: W14X99: 4	164	32.92	[redacted]	164	051223177350	W14x99	E2	984	0.057	L.F.	$ 169.29	$ 3.51	$ 1.95	$ 174.75	$ 27,763.56	$ 575.64	$ 319.80	$ 28,659.00	$ 185.13	$ 6.00	$ 2.15	$ 193.28	$ 30,361.32	$ 984.00	$ 352.60	$ 31,697.92	STD	Year 2009	100-102
W-Wide Flange-Column: W14X109																													
W-Wide Flange-Column: W14X109: 4	164	36.08	[redacted]	164	051223177350	W14x109	E2	984	0.057	L.F.	$ 186.39	$ 3.51	$ 1.95	$ 191.85	$ 30,567.96	$ 575.64	$ 319.80	$ 31,463.40	$ 203.83	$ 6.00	$ 2.15	$ 211.98	$ 33,428.12	$ 984.00	$ 352.60	$ 34,764.72	STD	Year 2009	100-102
45:26:00	1066	186.59	[redacted]	Total											$ 158,123.88	$ 3,741.66	$ 2,078.70	$ 163,944.24					$ 173,018.36	$ 6,396.00	$ 2,291.90	$ 181,706.26			
48																													
W-Wide Flange-Column: W14X61																													
W-Wide Flange-Column: W14X61: 2	84	10.28	[redacted]	84	051223177350	W14x61	E2	984	0.057	L.F.	$ 104.31	$ 3.51	$ 1.95	$ 109.77	$ 8,762.04	$ 294.84	$ 163.80	$ 9,220.68	$ 114.07	$ 6.00	$ 2.15	$ 122.22	$ 9,581.88	$ 504.00	$ 180.60	$ 10,266.48	STD	Year 2009	100-102
W-Wide Flange-Column: W14X68																													
W-Wide Flange-Column: W14X68: 4	168	22.84	[redacted]	168	051223177350	W14x68	E2	984	0.057	L.F.	$ 116.28	$ 3.51	$ 1.95	$ 121.74	$ 19,535.04	$ 589.68	$ 327.60	$ 20,452.32	$ 127.16	$ 6.00	$ 2.15	$ 135.31	$ 21,362.88	$ 1,008.00	$ 361.20	$ 22,732.08	STD	Year 2009	100-102
W-Wide Flange-Column: W14X74																													
W-Wide Flange-Column: W14X74: 4	168	25.13	[redacted]	168	051223177350	W14x74	E2	984	0.057	L.F.	$ 126.27	$ 3.51	$ 1.95	$ 131.73	$ 21,213.36	$ 589.68	$ 327.60	$ 22,130.64	$ 138.69	$ 6.00	$ 2.15	$ 146.84	$ 23,299.92	$ 1,008.00	$ 361.20	$ 24,669.12	STD	Year 2009	100-102
W-Wide Flange-Column: W14X82																													
W-Wide Flange-Column: W14X82: 8	336	55.36	[redacted]	336	051223177350	W14x82	E2	984	0.057	L.F.	$ 140.22	$ 3.51	$ 1.95	$ 145.68	$ 47,113.92	$ 1,179.36	$ 655.20	$ 48,948.48	$ 153.34	$ 6.00	$ 2.15	$ 161.49	$ 51,522.24	$ 2,016.00	$ 722.40	$ 54,260.64	STD	Year 2009	100-102
W-Wide Flange-Column: W14X90																													
W-Wide Flange-Column: W14X90: 4	168	30.53	[redacted]	168	051223177350	W14x90	E2	984	0.057	L.F.	$ 153.90	$ 3.51	$ 1.95	$ 159.36	$ 25,855.20	$ 589.68	$ 327.60	$ 26,772.48	$ 168.30	$ 6.00	$ 2.15	$ 176.45	$ 28,274.40	$ 1,008.00	$ 361.20	$ 29,643.60	STD	Year 2009	100-102
W-Wide Flange-Column: W14X99																													
W-Wide Flange-Column: W14X99: 4	168	33.72	[redacted]	168	051223177350	W14x99	E2	984	0.057	L.F.	$ 169.29	$ 3.51	$ 1.95	$ 174.75	$ 28,440.72	$ 589.68	$ 327.60	$ 29,358.00	$ 185.13	$ 6.00	$ 2.15	$ 193.28	$ 31,101.84	$ 1,008.00	$ 361.20	$ 32,471.04	STD	Year 2009	100-102
48:26:00	1092	177.86	[redacted]	Total											$ 150,920.28	$ 3,832.92	$ 2,129.40	$ 156,882.60					$ 165,143.16	$ 6,552.00	$ 2,347.80	$ 174,042.96			
51																													
W-Wide Flange-Column: W14X61																													
W-Wide Flange-Column: W14X61: 2	55	6.73	[redacted]	55	051223177350	W14x61	E2	984	0.057	L.F.	$ 104.31	$ 3.51	$ 1.95	$ 109.77	$ 5,737.05	$ 193.05	$ 107.25	$ 6,037.35	$ 114.07	$ 6.00	$ 2.15	$ 122.22	$ 6,273.85	$ 330.00	$ 118.25	$ 6,722.10	STD	Year 2009	100-102
W-Wide Flange-Column: W14X68																													
W-Wide Flange-Column: W14X68: 4	110	14.95	[redacted]	110	051223177350	W14x68	E2	984	0.057	L.F.	$ 116.28	$ 3.51	$ 1.95	$ 121.74	$ 12,790.80	$ 386.10	$ 214.50	$ 13,391.40	$ 127.16	$ 6.00	$ 2.15	$ 135.31	$ 13,987.60	$ 660.00	$ 236.50	$ 14,884.10	STD	Year 2009	100-102
W-Wide Flange-Column: W14X74																													
W-Wide Flange-Column: W14X74: 4	110	16.45	[redacted]	110	051223177350	W14x74	E2	984	0.057	L.F.	$ 126.27	$ 3.51	$ 1.95	$ 131.73	$ 13,889.70	$ 386.10	$ 214.50	$ 14,490.30	$ 138.69	$ 6.00	$ 2.15	$ 146.84	$ 15,255.90	$ 660.00	$ 236.50	$ 16,152.40	STD	Year 2009	100-102
W-Wide Flange-Column: W14X82																													
W-Wide Flange-Column: W14X82: 8	220	36.25	[redacted]	220	051223177350	W14x82	E2	984	0.057	L.F.	$ 140.22	$ 3.51	$ 1.95	$ 145.68	$ 30,848.40	$ 772.20	$ 429.00	$ 32,049.60	$ 153.34	$ 6.00	$ 2.15	$ 161.49	$ 33,734.80	$ 1,320.00	$ 473.00	$ 35,527.80	STD	Year 2009	100-102
W-Wide Flange-Column: W14X90																													
W-Wide Flange-Column: W14X90: 4	110	19.99	[redacted]	110	051223177350	W14x90	E2	984	0.057	L.F.	$ 153.90	$ 3.51	$ 1.95	$ 159.36	$ 16,929.00	$ 386.10	$ 214.50	$ 17,529.60	$ 168.30	$ 6.00	$ 2.15	$ 176.45	$ 18,513.00	$ 660.00	$ 236.50	$ 19,409.50	STD	Year 2009	100-102
W-Wide Flange-Column: W14X99																													
W-Wide Flange-Column: W14X99: 4	110	22.08	[redacted]	110	051223177350	W14x99	E2	984	0.057	L.F.	$ 169.29	$ 3.51	$ 1.95	$ 174.75	$ 18,621.90	$ 386.10	$ 214.50	$ 19,222.50	$ 185.13	$ 6.00	$ 2.15	$ 193.28	$ 20,364.30	$ 660.00	$ 236.50	$ 21,260.80	STD	Year 2009	100-102
51:26:00	715	116.46	[redacted]	Total											$ 98,816.85	$ 2,509.65	$ 1,394.25	$ 102,720.75					$ 108,129.45	$ 4,290.00	$ 1,537.25	$ 113,956.70			
52																													
HSS-Hollow Structural Section-Column: HSS12X4X5/16																													
HSS-Hollow Structural Section-Column: HSS12X4X5/16: 5	128	7.89	[redacted]	128	051223750360	HSS12x4x5/16	E2	550	0.102	L.F.	$ 68.13	$ 6.27	$ 3.49	$ 77.89	$ 8,720.64	$ 802.56	$ 446.72	$ 9,969.92	$ 75.03	$ 10.76	$ 3.83	$ 89.62	$ 9,603.84	$ 1,377.28	$ 490.24	$ 11,471.36	STD	Year 2009	100-102
W-Wide Flange-Column5: W12X53																													
W-Wide Flange-Column5: W12X53: 24	612	64.81	[redacted]	612	051223177150	W12x53	E2	1032	0.054	L.F.	$ 85.39	$ 3.34	$ 1.86	$ 90.59	$ 52,258.68	$ 2,044.08	$ 1,138.32	$ 55,441.08	$ 94.19	$ 5.72	$ 2.05	$ 101.96	$ 57,644.28	$ 3,500.64	$ 1,254.60	$ 62,399.52	STD	Year 2009	100-102
W-Wide Flange-Column5: W14X68																													
W-Wide Flange-Column5: W14X68: 2	51	6.93	[redacted]	51	051223177350	W14x68	E2	984	0.057	L.F.	$ 116.28	$ 3.51	$ 1.95	$ 121.74	$ 5,930.28	$ 179.01	$ 99.45	$ 6,208.74	$ 127.16	$ 6.00	$ 2.15	$ 135.31	$ 6,485.16	$ 306.00	$ 109.65	$ 6,900.81	STD	Year 2009	100-102
W-Wide Flange-Column5: W14X132																													
W-Wide Flange-Column5: W14X132: 17	434	115.79	[redacted]	434	051223177350	W14x132	E2	984	0.057	L.F.	$ 225.72	$ 3.51	$ 1.95	$ 231.18	$ 97,962.48	$ 1,523.34	$ 846.30	$ 100,332.12	$ 246.84	$ 6.00	$ 2.15	$ 254.99	$ 107,128.56	$ 2,604.00	$ 933.10	$ 110,665.66	STD	Year 2009	100-102
W-Wide Flange-Column5: W21X68																													
W-Wide Flange-Column5: W21X68: 2	51	7.01	[redacted]	51	051223754700	W21x68	E5	1036	0.077	L.F.	$ 115.92	$ 4.83	$ 1.99	$ 122.74	$ 5,911.92	$ 246.33	$ 101.49	$ 6,259.74	$ 127.31	$ 8.35	$ 2.19	$ 137.85	$ 6,492.81	$ 425.85	$ 111.69	$ 7,030.35	STD	Year 2009	100-102
W-Wide Flange-Column: W14X68																													
W-Wide Flange-Column: W14X68: 4	162	22	[redacted]	162	051223177350	W14x68	E2	984	0.057	L.F.	$ 116.28	$ 3.51	$ 1.95	$ 121.74	$ 18,837.36	$ 568.62	$ 315.90	$ 19,721.88	$ 127.16	$ 6.00	$ 2.15	$ 135.31	$ 20,599.92	$ 972.00	$ 348.30	$ 21,920.22	STD	Year 2009	100-102
W-Wide Flange-Column: W14X90																													
W-Wide Flange-Column: W14X90: 4	162	29.41	[redacted]	162	051223177350	W14x90	E2	984	0.057	L.F.	$ 153.90	$ 3.51	$ 1.95	$ 159.36	$ 24,931.80	$ 568.62	$ 315.90	$ 25,816.32	$ 168.30	$ 6.00	$ 2.15	$ 176.45	$ 27,264.60	$ 972.00	$ 348.30	$ 28,584.90	STD	Year 2009	100-102
52:58:00	1599	253.84	[redacted]	Total											$ 214,553.16	$ 5,932.56	$ 3,264.08	$ 223,749.80					$ 235,219.17	$ 10,157.77	$ 3,595.88	$ 248,972.82			
53																													
HSS-Hollow Structural Section-Column: HSS12X12X1/4																													
HSS-Hollow Structural Section-Column: HSS12X12X1/4: 57	713	54.26	[redacted]	713	051223750360	HSS12x12x1/4	E2	550	0.102	L.F.	$ 163.52	$ 6.27	$ 3.49	$ 173.28	$ 116,589.76	$ 4,470.51	$ 2,488.37	$ 123,548.64	$ 180.08	$ 10.76	$ 3.83	$ 194.67	$ 128,397.04	$ 7,671.88	$ 2,730.79	$ 138,799.71	STD	Year 2009	100-102
53:57:00	713	54.26	[redacted]	Total											$ 116,589.76	$ 4,470.51	$ 2,488.37	$ 123,548.64					$ 128,397.04	$ 7,671.88	$ 2,730.79	$ 138,799.71			
54																													
HSS-Hollow Structural Section-Column: HSS6X6X1/4																													
HSS-Hollow Structural Section-Column: HSS6X6X1/4: 69	184	6.91	[redacted]	184	051223750360	HSS6x6x1/4	E2	550	0.102	L.F.	$ 40.86	$ 6.27	$ 3.49	$ 50.62	$ 7,518.24	$ 1,153.68	$ 642.16	$ 9,314.08	$ 45.00	$ 10.76	$ 3.83	$ 59.59	$ 8,280.00	$ 1,979.84	$ 704.72	$ 10,964.56	STD	Year 2009	100-102
54: 69	184	6.91	[redacted]	Total											$ 7,518.24	$ 1,153.68	$ 642.16	$ 9,314.08					$ 8,280.00	$ 1,979.84	$ 704.72	$ 10,964.56			
Grand total: 653	**21724**	**11322**	[redacted]	**Total**											**$ 9,089,722.57**	**$ 80,983.92**	**$ 44,190.44**	**###########**					**$ 9,937,302.08**	**$ 138,605.45**	**$ 48,689.42**	**$ 14,442,894.08**			

Figure 306: Structural Framing Schedule

Structural Framing Schedule

Family and Type	Reference Level	Length	Cut Length	Volume	Number of Studs	Quantity	LineNumber	Source	Sub	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total
1 Ground																		
C-Channel: C6X8.2																		
C-Channel: C6X8.2: 7		16.27	11.9	0.24		16.27	051223400668			C6x8.2	E3	55	0.436	L.F.	$ 7.40	$ 28.04	$ 2.69	$ 38.13
Concrete-Rectangular Beam: 36x30																		
Concrete-Rectangular Beam: 36x30: 6		60	60	450		60	033105350412			Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26
HSS-Hollow Structural Section: HSS6X4X3/8																		
HSS-Hollow Structural Section: HSS6X4X3/8: 20		205.58	181.08	8.14		205.58	051223750360			HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64
W-Wide Flange: W10X15																		
W-Wide Flange: W10X15: 1		3.73	2.79	0.08	4	3.73	051223750620			W10x15	E2	600	0.093	L.F.	$ 25.88	$ 5.75	$ 3.20	$ 34.83
W-Wide Flange: W10X26					-													
W-Wide Flange: W10X26: 1		26.57	26.1	1.37	27	26.57	051223750720			W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46
W-Wide Flange: W12X19					-													
W-Wide Flange: W12X19: 40		301.86	271.75	10.41	302	301.86	051223751100			W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67
W-Wide Flange: W12X22					-													
W-Wide Flange: W12X22: 1		10	9.58	0.43	10	10	051223751300			W12x22	E2	880	0.064	L.F.	$ 37.78	$ 3.92	$ 2.18	$ 43.88
W-Wide Flange: W14X22					-													
W-Wide Flange: W14X22: 1		18.18	17.49	0.77	18	18.18	051223751900			W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93
W-Wide Flange: W14X43					-													
W-Wide Flange: W14X43: 1		26.39	25.58	2.19	26	26.39	051223752320			W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12
W-Wide Flange: W14X132					-													
W-Wide Flange: W14X132: 1		28.08	26.79	7.16	28	28.08	051223752500			W14x132	E2	720	0.078	L.F.	$ 225.42	$ 4.80	$ 2.67	$ 232.89
W-Wide Flange: W14X145					-													
W-Wide Flange: W14X145: 1		37	35.67	10.49	37	37	051223752500			W14x145	E2	720	0.078	L.F.	$ 247.62	$ 4.80	$ 2.67	$ 255.09
W-Wide Flange: W16X31					-													
W-Wide Flange: W16X31: 2		20	16.63	1.04	20	20	051223752900			W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76
W-Wide Flange: W16X36					-													
W-Wide Flange: W16X36: 7		160.31	156.52	11.38	160	160.31	051223753100			W16x36	E2	800	0.07	L.F.	$ 68.31	$ 4.32	$ 2.40	$ 75.03
W-Wide Flange: W16X50					-													
W-Wide Flange: W16X50: 2		45.8	44.47	4.51	46	45.8	051223753120			W16x50	E2	800	0.07	L.F.	$ 85.39	$ 4.32	$ 2.40	$ 92.11
W-Wide Flange: W16X67					-													
W-Wide Flange: W16X67: 3		68.72	66.84	9.03	69	68.72	051223753140			W16x67	E2	760	0.074	L.F.	$ 114.89	$ 4.55	$ 2.52	$ 121.96
W-Wide Flange: W16X89					-													
W-Wide Flange: W16X89: 1		22.81	22.26	4.03	23	22.81	051223753140			W16x89	E2	760	0.074	L.F.	$ 152.62	$ 4.55	$ 2.52	$ 159.69
W-Wide Flange: W18X35					-													
W-Wide Flange: W18X35: 5		116.94	110.81	7.83	117	116.94	051223753300			W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38
W-Wide Flange: W18X46					-													
W-Wide Flange: W18X46: 2		34	33.25	3.1	34	34	051223753520			W18x46	E5	960	0.083	L.F.	$ 78.66	$ 5.20	$ 2.15	$ 86.01
W-Wide Flange: W21X44					-													
W-Wide Flange: W21X44: 5		128.56	122.69	10.91	129	128.56	051223754100			W21x44	E5	1064	0.075	L.F.	$ 75.04	$ 4.70	$ 1.94	$ 81.68
W-Wide Flange: W21X57					-													
W-Wide Flange: W21X57: 3		69.88	66.95	7.69	70	69.88	051223754300			W21x57	E5	1064	0.075	L.F.	$ 97.34	$ 4.70	$ 1.94	$ 103.98
W-Wide Flange: W21X62					-													
W-Wide Flange: W21X62: 3		83.89	81.88	10.23	84	83.89	051223754500			W21x62	E5	1036	0.077	L.F.	$ 105.57	$ 4.83	$ 1.99	$ 112.39
W-Wide Flange: W21X68					-													
W-Wide Flange: W21X68: 4		130	125.49	17.24	130	130	051223754700			W21x68	E5	1036	0.077	L.F.	$ 115.92	$ 4.83	$ 1.99	$ 122.74
W-Wide Flange: W21X83					-													
W-Wide Flange: W21X83: 1		32.5	31.33	5.25	33	32.5	051223754720			W21x83	E5	1000	0.08	L.F.	$ 141.80	$ 5.00	$ 2.07	$ 148.87
W-Wide Flange: W21X93					-													
W-Wide Flange: W21X93: 2		65	62.74	11.8	65	65	051223754740			W21x93	E5	1000	0.08	L.F.	$ 158.36	$ 5.00	$ 2.07	$ 165.43
W-Wide Flange: W21X111					-													
W-Wide Flange: W21X111: 1		32.5	31.4	7.06	33	32.5	051223754760			W21x111	E5	1000	0.08	L.F.	$ 172.85	$ 5.00	$ 2.07	$ 179.92
W-Wide Flange: W21X122					-													
W-Wide Flange: W21X122: 2		60.01	59.13	14.67	60	60.01	051223754780			W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11
W-Wide Flange: W21X132					-													
W-Wide Flange: W21X132: 1		30	29.17	7.81	30	30	051223754780			W21x132	E5	1000	0.08	L.F.	$ 225.09	$ 5.00	$ 2.07	$ 232.16
W-Wide Flange: W24X55					-													
W-Wide Flange: W24X55: 4		148.09	144	15.98	148	148.09	051223754900			W24x55	E5	1110	0.072	L.F.	$ 94.19	$ 4.50	$ 1.86	$ 100.55
W-Wide Flange: W24X68					-													
W-Wide Flange: W24X68: 4		133.75	129.16	17.79	134	133.75	051223755300			W24x68	E5	1110	0.072	L.F.	$ 115.92	$ 4.50	$ 1.86	$ 122.28
W-Wide Flange: W24X76					-													
W-Wide Flange: W24X76: 13		519.3	501.29	77.17	519	519.3	051223755500			W24x76	E5	1110	0.072	L.F.	$ 129.38	$ 4.50	$ 1.86	$ 135.74
W-Wide Flange: W24X94					-													
W-Wide Flange: W24X94: 2		80	77.78	14.85	80	80	051223755720			W24x94	E5	1080	0.074	L.F.	$ 160.43	$ 4.63	$ 1.92	$ 166.98
W-Wide Flange: W24X104					-													
W-Wide Flange: W24X104: 1		23	22.61	4.79	23	23	051223755740			W24x104	E5	1050	0.076	L.F.	$ 178.02	$ 4.76	$ 1.97	$ 184.75
W-Wide Flange: W24X192					-													
W-Wide Flange: W24X192: 2		60	56.4	22.03	60	60	051223755740			W24x192	E5	1050	0.076	L.F.	$ 328.65	$ 4.76	$ 1.97	$ 335.38
W-Wide Flange: W24X207					-													
W-Wide Flange: W24X207: 2		60	56.49	23.72	60	60	051223755740			W24x207	E5	1050	0.076	L.F.	$ 354.33	$ 4.76	$ 1.97	$ 361.06
W-Wide Flange: W27X84					-													
W-Wide Flange: W27X84: 2		52.37	51.25	8.73	52	52.37	051223755800			W27x84	E5	1190	0.067	L.F.	$ 143.87	$ 4.19	$ 1.74	$ 149.80
W-Wide Flange: W27X102					-													
W-Wide Flange: W27X102: 3		90	86.85	17.9	90	90	051223755900			W27x102	E5	1190	0.067	L.F.	$ 160.43	$ 4.19	$ 1.74	$ 166.36
W-Wide Flange: W27X114					-													
W-Wide Flange: W27X114: 1		30	28.98	6.7	30	30	051223755920			W27x114	E5	1150	0.07	L.F.	$ 194.58	$ 4.35	$ 1.80	$ 200.73
W-Wide Flange: W30X108					-													
W-Wide Flange: W30X108: 1		30.45	29.49	6.44	30	30.45	051223756300			W30x108	E5	1200	0.067	L.F.	$ 184.23	$ 4.16	$ 1.72	$ 190.11
W-Wide Flange: W30X132					-													
W-Wide Flange: W30X132: 10		398.02	388.56	103.5	398	398.02	051223756520			W30x132	E5	1160	0.069	L.F.	$ 225.63	$ 4.30	$ 1.79	$ 231.72
W-Wide Flange: W30X173					-													
W-Wide Flange: W30X173: 3		90.75	89.6	31.52	91	90.75	051223756560			W30x173	E5	1120	0.071	L.F.	$ 294.98	$ 4.46	$ 1.84	$ 301.28
W-Wide Flange: W33X118					-													
W-Wide Flange: W33X118: 12		454.9	438.97	104.52	455	454.9	051223756700			W33x118	E5	1176	0.068	L.F.	$ 201.83	$ 4.25	$ 1.75	$ 207.83
W-Wide Flange: W33X130					-													
W-Wide Flange: W33X130: 1		30	28.04	7.37	30	30	051223756900			W33x130	E5	1134	0.071	L.F.	$ 222.53	$ 4.40	$ 1.82	$ 228.75
W-Wide Flange: W33X141					-													
W-Wide Flange: W33X141: 2		46	45.04	12.86	46	46	051223757100			W33x141	E5	1134	0.071	L.F.	$ 241.16	$ 4.40	$ 1.82	$ 247.38
W-Wide Flange: W36X135					-													
W-Wide Flange: W36X135: 10		374.98	363.05	99.35	375	374.98	051223757300			W36x135	E5	1170	0.068	L.F.	$ 230.81	$ 4.28	$ 1.76	$ 236.85
W-Wide Flange: W36X150					-													
W-Wide Flange: W36X150: 2		52.83	51.32	15.63	53	52.83	051223757500			W36x150	E5	1170	0.068	L.F.	$ 256.68	$ 4.28	$ 1.76	$ 262.72
W-Wide Flange: W40X167					-													
W-Wide Flange: W40X167: 1		23.01	22.46	7.49	23	23.01	051223757600			W40x167	E5	1150	0.07	L.F.	$ 285.71	$ 4.35	$ 1.80	$ 291.86
1 Ground: 200		4532.03	4341.64	1223.19		**Total**												

Family and Type	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P
C-Channel: C6X8.2: 7	$ 120.40	$ 456.21	$ 43.77	$ 620.38	$ 8.12	$ 50.27	$ 2.95	$ 61.34
Concrete-Rectangular Beam: 36x30: 6	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61
HSS-Hollow Structural Section: HSS6X4X3/8: 20	$ 8,404.11	$ 1,288.99	$ 717.47	$ 10,410.57	$ 45.02	$ 10.76	$ 3.83	$ 59.61
W-Wide Flange: W10X15: 1	$ 96.53	$ 21.45	$ 11.94	$ 129.92	$ 27.95	$ 9.84	$ 3.52	$ 41.31
W-Wide Flange: W10X26: 1	$ 1,182.63	$ 152.78	$ 85.02	$ 1,420.43	$ 48.65	$ 9.84	$ 3.52	$ 62.01
W-Wide Flange: W12X19: 40	$ 9,831.58	$ 1,183.29	$ 658.05	$ 11,672.93	$ 35.65	$ 6.71	$ 2.40	$ 44.76
W-Wide Flange: W12X22: 1	$ 377.80	$ 39.20	$ 21.80	$ 438.80	$ 41.40	$ 6.71	$ 2.40	$ 50.51
W-Wide Flange: W14X22: 1	$ 809.19	$ 63.27	$ 35.27	$ 907.73	$ 48.65	$ 5.96	$ 2.13	$ 56.74
W-Wide Flange: W14X43: 1	$ 1,939.40	$ 112.42	$ 62.54	$ 2,114.37	$ 80.73	$ 7.29	$ 2.60	$ 90.62
W-Wide Flange: W14X132: 1	$ 6,329.79	$ 134.78	$ 74.97	$ 6,539.55	$ 273.24	$ 8.21	$ 2.93	$ 284.38
W-Wide Flange: W14X145: 1	$ 9,161.94	$ 177.60	$ 98.79	$ 9,438.33	$ 300.15	$ 8.21	$ 2.93	$ 311.29
W-Wide Flange: W16X31: 2	$ 1,055.80	$ 76.80	$ 42.60	$ 1,175.20	$ 58.48	$ 6.56	$ 2.35	$ 67.39
W-Wide Flange: W16X36: 7	$ 10,950.78	$ 692.54	$ 384.74	$ 12,028.06	$ 75.04	$ 7.36	$ 2.63	$ 85.03
W-Wide Flange: W16X50: 2	$ 3,910.86	$ 197.86	$ 109.92	$ 4,218.64	$ 94.19	$ 7.36	$ 2.63	$ 104.18
W-Wide Flange: W16X67: 3	$ 7,896.24	$ 312.68	$ 173.17	$ 8,381.09	$ 126.27	$ 7.79	$ 2.78	$ 136.84
W-Wide Flange: W16X89: 1	$ 3,481.26	$ 103.79	$ 57.48	$ 3,642.53	$ 167.73	$ 7.79	$ 2.78	$ 178.30
W-Wide Flange: W18X35: 5	$ 7,019.91	$ 608.09	$ 251.42	$ 7,879.42	$ 65.72	$ 8.99	$ 2.37	$ 77.08
W-Wide Flange: W18X46: 2	$ 2,674.44	$ 176.80	$ 73.10	$ 2,924.34	$ 86.42	$ 8.99	$ 2.37	$ 97.78
W-Wide Flange: W21X44: 5	$ 9,647.14	$ 604.23	$ 249.41	$ 10,500.78	$ 82.80	$ 8.14	$ 2.14	$ 93.08
W-Wide Flange: W21X57: 3	$ 6,802.12	$ 328.44	$ 135.57	$ 7,266.12	$ 107.38	$ 8.14	$ 2.14	$ 117.66
W-Wide Flange: W21X62: 3	$ 8,856.27	$ 405.19	$ 166.94	$ 9,428.40	$ 116.96	$ 8.35	$ 2.19	$ 127.50
W-Wide Flange: W21X68: 4	$ 15,069.60	$ 627.90	$ 258.70	$ 15,956.20	$ 127.31	$ 8.35	$ 2.19	$ 137.85
W-Wide Flange: W21X83: 1	$ 4,608.50	$ 162.50	$ 67.28	$ 4,838.28	$ 156.29	$ 8.64	$ 2.27	$ 167.20
W-Wide Flange: W21X93: 2	$ 10,293.40	$ 325.00	$ 134.55	$ 10,752.95	$ 174.92	$ 8.64	$ 2.27	$ 185.83
W-Wide Flange: W21X111: 1	$ 5,617.63	$ 162.50	$ 67.28	$ 5,847.40	$ 189.41	$ 8.64	$ 2.27	$ 200.32
W-Wide Flange: W21X122: 2	$ 12,484.48	$ 300.05	$ 124.22	$ 12,908.75	$ 228.74	$ 8.64	$ 2.27	$ 239.65
W-Wide Flange: W21X132: 1	$ 6,752.70	$ 150.00	$ 62.10	$ 6,964.80	$ 247.49	$ 8.64	$ 2.27	$ 258.40
W-Wide Flange: W24X55: 4	$ 13,948.60	$ 666.41	$ 275.45	$ 14,890.45	$ 103.50	$ 7.79	$ 2.05	$ 113.34
W-Wide Flange: W24X68: 4	$ 15,504.30	$ 601.88	$ 248.78	$ 16,354.95	$ 127.31	$ 7.79	$ 2.05	$ 137.15
W-Wide Flange: W24X76: 13	$ 67,187.03	$ 2,336.85	$ 965.90	$ 70,489.78	$ 142.83	$ 7.79	$ 2.05	$ 152.67
W-Wide Flange: W24X94: 2	$ 12,834.40	$ 370.40	$ 153.60	$ 13,358.40	$ 176.99	$ 8.00	$ 2.10	$ 187.09
W-Wide Flange: W24X104: 1	$ 4,094.46	$ 109.48	$ 45.31	$ 4,249.25	$ 195.62	$ 8.21	$ 2.16	$ 205.99
W-Wide Flange: W24X192: 2	$ 19,719.00	$ 285.60	$ 118.20	$ 20,122.80	$ 361.14	$ 8.21	$ 2.16	$ 371.51
W-Wide Flange: W24X207: 2	$ 21,259.80	$ 285.60	$ 118.20	$ 21,663.60	$ 389.36	$ 8.21	$ 2.16	$ 399.73
W-Wide Flange: W27X84: 2	$ 7,534.47	$ 219.43	$ 91.12	$ 7,845.03	$ 157.32	$ 7.29	$ 1.91	$ 166.52
W-Wide Flange: W27X102: 3	$ 14,438.70	$ 377.10	$ 156.60	$ 14,972.40	$ 176.99	$ 7.29	$ 1.91	$ 186.19
W-Wide Flange: W27X114: 1	$ 5,837.40	$ 130.50	$ 54.00	$ 6,021.90	$ 214.25	$ 7.50	$ 1.97	$ 223.72
W-Wide Flange: W30X108: 1	$ 5,609.80	$ 126.67	$ 52.37	$ 5,788.85	$ 202.86	$ 7.22	$ 1.90	$ 211.98
W-Wide Flange: W30X132: 10	$ 89,805.25	$ 1,711.49	$ 712.46	$ 92,229.19	$ 248.40	$ 7.43	$ 1.96	$ 257.79
W-Wide Flange: W30X173: 3	$ 26,769.44	$ 404.75	$ 166.98	$ 27,341.16	$ 326.03	$ 7.72	$ 2.03	$ 335.78
W-Wide Flange: W33X118: 12	$ 91,812.47	$ 1,933.33	$ 796.08	$ 94,541.87	$ 221.49	$ 7.36	$ 1.93	$ 230.78
W-Wide Flange: W33X130: 1	$ 6,675.90	$ 132.00	$ 54.60	$ 6,862.50	$ 244.26	$ 7.65	$ 2.01	$ 253.92
W-Wide Flange: W33X141: 2	$ 11,093.36	$ 202.40	$ 83.72	$ 11,379.48	$ 264.96	$ 7.65	$ 2.01	$ 274.62
W-Wide Flange: W36X135: 10	$ 86,549.13	$ 1,604.91	$ 659.96	$ 88,814.01	$ 253.58	$ 7.36	$ 1.94	$ 262.88
W-Wide Flange: W36X150: 2	$ 13,560.40	$ 226.11	$ 92.98	$ 13,879.50	$ 281.52	$ 7.36	$ 1.94	$ 290.82
W-Wide Flange: W40X167: 1	$ 6,574.19	$ 100.09	$ 41.42	$ 6,715.70	$ 315.19	$ 7.50	$ 1.97	$ 324.66
1 Ground: 200	**$ 679,917.20**	**$ 20,689.36**	**$ 9,055.83**	**$ 709,662.39**				

Family and Type	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	Data Release	Zip Code	Notes
C-Channel: C6X8.2: 7	$ 132.11	$ 817.89	$ 48.00	$ 998.00	STD	Year 2009	100-102	
Concrete-Rectangular Beam: 36x30: 6	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401	
HSS-Hollow Structural Section: HSS6X4X3/8: 20	$ 9,255.21	$ 2,212.04	$ 787.37	$ 12,254.62	STD	Year 2009	100-102	
W-Wide Flange: W10X15: 1	$ 104.25	$ 36.70	$ 13.13	$ 154.09	STD	Year 2009	100-102	
W-Wide Flange: W10X26: 1	$ 1,292.63	$ 261.45	$ 93.53	$ 1,647.61	STD	Year 2009	100-102	
W-Wide Flange: W12X19: 40	$ 10,761.31	$ 2,025.48	$ 724.46	$ 13,511.25	STD	Year 2009	100-102	
W-Wide Flange: W12X22: 1	$ 414.00	$ 67.10	$ 24.00	$ 505.10	STD	Year 2009	100-102	
W-Wide Flange: W14X22: 1	$ 884.46	$ 108.35	$ 38.72	$ 1,031.53	STD	Year 2009	100-102	
W-Wide Flange: W14X43: 1	$ 2,130.46	$ 192.38	$ 68.61	$ 2,391.46	STD	Year 2009	100-102	
W-Wide Flange: W14X132: 1	$ 7,672.58	$ 230.54	$ 82.27	$ 7,985.39	STD	Year 2009	100-102	
W-Wide Flange: W14X145: 1	$ 11,105.55	$ 303.77	$ 108.41	$ 11,517.73	STD	Year 2009	100-102	
W-Wide Flange: W16X31: 2	$ 1,169.60	$ 131.20	$ 47.00	$ 1,347.80	STD	Year 2009	100-102	
W-Wide Flange: W16X36: 7	$ 12,029.66	$ 1,179.88	$ 421.62	$ 13,631.16	STD	Year 2009	100-102	
W-Wide Flange: W16X50: 2	$ 4,313.90	$ 337.09	$ 120.45	$ 4,771.44	STD	Year 2009	100-102	
W-Wide Flange: W16X67: 3	$ 8,677.27	$ 535.33	$ 191.04	$ 9,403.64	STD	Year 2009	100-102	
W-Wide Flange: W16X89: 1	$ 3,825.92	$ 177.69	$ 63.41	$ 4,067.02	STD	Year 2009	100-102	
W-Wide Flange: W18X35: 5	$ 7,685.30	$ 1,051.29	$ 277.15	$ 9,013.74	STD	Year 2009	100-102	
W-Wide Flange: W18X46: 2	$ 2,938.28	$ 305.66	$ 80.58	$ 3,324.52	STD	Year 2009	100-102	
W-Wide Flange: W21X44: 5	$ 10,644.77	$ 1,046.48	$ 275.12	$ 11,966.36	STD	Year 2009	100-102	
W-Wide Flange: W21X57: 3	$ 7,503.71	$ 568.82	$ 149.54	$ 8,222.08	STD	Year 2009	100-102	
W-Wide Flange: W21X62: 3	$ 9,811.77	$ 700.48	$ 183.72	$ 10,695.98	STD	Year 2009	100-102	
W-Wide Flange: W21X68: 4	$ 16,550.30	$ 1,085.50	$ 284.70	$ 17,920.50	STD	Year 2009	100-102	
W-Wide Flange: W21X83: 1	$ 5,079.43	$ 280.80	$ 73.78	$ 5,434.00	STD	Year 2009	100-102	
W-Wide Flange: W21X93: 2	$ 11,369.80	$ 561.60	$ 147.55	$ 12,078.95	STD	Year 2009	100-102	
W-Wide Flange: W21X111: 1	$ 6,155.83	$ 280.80	$ 73.78	$ 6,510.40	STD	Year 2009	100-102	
W-Wide Flange: W21X122: 2	$ 13,726.69	$ 518.49	$ 136.22	$ 14,381.40	STD	Year 2009	100-102	
W-Wide Flange: W21X132: 1	$ 7,424.70	$ 259.20	$ 68.10	$ 7,752.00	STD	Year 2009	100-102	
W-Wide Flange: W24X55: 4	$ 15,327.32	$ 1,153.62	$ 303.58	$ 16,784.52	STD	Year 2009	100-102	
W-Wide Flange: W24X68: 4	$ 17,027.71	$ 1,041.91	$ 274.19	$ 18,343.81	STD	Year 2009	100-102	
W-Wide Flange: W24X76: 13	$ 74,171.62	$ 4,045.35	$ 1,064.57	$ 79,281.53	STD	Year 2009	100-102	
W-Wide Flange: W24X94: 2	$ 14,159.20	$ 640.00	$ 168.00	$ 14,967.20	STD	Year 2009	100-102	
W-Wide Flange: W24X104: 1	$ 4,499.26	$ 188.83	$ 49.68	$ 4,737.77	STD	Year 2009	100-102	
W-Wide Flange: W24X192: 2	$ 21,668.40	$ 492.60	$ 129.60	$ 22,290.60	STD	Year 2009	100-102	
W-Wide Flange: W24X207: 2	$ 23,361.60	$ 492.60	$ 129.60	$ 23,983.80	STD	Year 2009	100-102	
W-Wide Flange: W27X84: 2	$ 8,238.85	$ 381.78	$ 100.03	$ 8,720.65	STD	Year 2009	100-102	
W-Wide Flange: W27X102: 3	$ 15,929.10	$ 656.10	$ 171.90	$ 16,757.10	STD	Year 2009	100-102	
W-Wide Flange: W27X114: 1	$ 6,427.50	$ 225.00	$ 59.10	$ 6,711.60	STD	Year 2009	100-102	
W-Wide Flange: W30X108: 1	$ 6,177.09	$ 219.85	$ 57.86	$ 6,454.79	STD	Year 2009	100-102	
W-Wide Flange: W30X132: 10	$ 98,868.17	$ 2,957.29	$ 780.12	$ 102,605.58	STD	Year 2009	100-102	
W-Wide Flange: W30X173: 3	$ 29,587.22	$ 700.59	$ 184.22	$ 30,472.04	STD	Year 2009	100-102	
W-Wide Flange: W33X118: 12	$ 100,755.80	$ 3,348.06	$ 877.96	$ 104,981.82	STD	Year 2009	100-102	
W-Wide Flange: W33X130: 1	$ 7,327.80	$ 229.50	$ 60.30	$ 7,617.60	STD	Year 2009	100-102	
W-Wide Flange: W33X141: 2	$ 12,188.16	$ 351.90	$ 92.46	$ 12,632.52	STD	Year 2009	100-102	
W-Wide Flange: W36X135: 10	$ 95,087.43	$ 2,759.85	$ 727.46	$ 98,574.74	STD	Year 2009	100-102	
W-Wide Flange: W36X150: 2	$ 14,872.70	$ 388.83	$ 102.49	$ 15,364.02	STD	Year 2009	100-102	
W-Wide Flange: W40X167: 1	$ 7,252.52	$ 172.58	$ 45.33	$ 7,470.43	STD	Year 2009	100-102	
1 Ground: 200	**$ 749,703.54**	**$ 35,722.25**	**$ 9,960.71**	**$ 795,386.49**				

2																																		
Concrete-Rectangular Beam: 36x30						[redacted]																												
Concrete-Rectangular Beam: 36x30: 6		60	60	450		[redacted]	60	033105360412			Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8						[redacted]																												
HSS-Hollow Structural Section1: HSS4X2X1/8: 8		15.42	11.76	0.11		[redacted]	15.42	051223750360			HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8						[redacted]																												
HSS-Hollow Structural Section1: HSS6X4X3/8: 20		191.98	173.42	7.79		[redacted]	191.98	051223750360			HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12					-	[redacted]																												
W-Wide Flange1: W10X12: 2		52.69	48.82	1.17	53	[redacted]	52.69	051223750600			W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16					-	[redacted]																												
W-Wide Flange1: W12X16: 3		65.63	63.26	2.04	66	[redacted]	65.63	051223751100			W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19					-	[redacted]																												
W-Wide Flange1: W12X19: 16		172.09	163.04	6.24	172	[redacted]	172.09	051223751100			W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 5,604.97	$ 674.59	$ 375.16	$ 6,654.72	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 6,135.01	$ 1,154.72	$ 413.02	$ 7,702.75	STD	Year 2009	100-102
W-Wide Flange1: W14X22					-	[redacted]																												
W-Wide Flange1: W14X22: 28		878.62	833.39	36.82	879	[redacted]	878.62	051223751900			W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 39,107.38	$ 3,057.60	$ 1,704.52	$ 43,869.50	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 42,744.86	$ 5,236.58	$ 1,871.46	$ 49,852.90	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2					-	[redacted]																												
W-Wide Flange1: W14X82 2: 1		26.33	24.07	3.97	26	[redacted]	26.33	051223752380			W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2					-	[redacted]																												
W-Wide Flange1: W14X109 2: 1		37.67	36.06	7.93	38	[redacted]	37.67	051223752500			W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26					-	[redacted]																												
W-Wide Flange1: W16X26: 3		65.63	63.03	3.3	66	[redacted]	65.63	051223752700			W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31					-	[redacted]																												
W-Wide Flange1: W16X31: 4		151.19	146.06	9.12	151	[redacted]	151.19	051223752900			W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35					-	[redacted]																												
W-Wide Flange1: W18X35: 30		1158	1045.79	73.91	1,158	[redacted]	1158	051223753300			W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 69,514.74	$ 6,021.60	$ 2,489.70	$ 78,026.04	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 76,103.76	$ 10,410.42	$ 2,744.46	$ 89,258.64	STD	Year 2009	100-102
W-Wide Flange1: W18X40					-	[redacted]																												
W-Wide Flange1: W18X40: 1		37.68	35.41	2.86	38	[redacted]	37.68	051223753500			W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 2,573.92	$ 195.94	$ 81.01	$ 2,850.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 2,827.51	$ 338.74	$ 89.30	$ 3,255.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50					-	[redacted]																												
W-Wide Flange1: W21X50: 7		219	213.18	21.42	219	[redacted]	219	051223754300			W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W12X19					-	[redacted]																												
W-Wide Flange: W12X19: 8		46.23	42.68	1.63	46	[redacted]	46.23	051223751100			W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 1,505.71	$ 181.22	$ 100.78	$ 1,787.71	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 1,648.10	$ 310.20	$ 110.95	$ 2,069.25	STD	Year 2009	100-102
W-Wide Flange: W14X43					-	[redacted]																												
W-Wide Flange: W14X43: 2		7.33	6.38	0.55	7	[redacted]	7.33	051223752320			W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 538.68	$ 31.23	$ 17.37	$ 587.28	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 591.75	$ 53.44	$ 19.06	$ 664.24	STD	Year 2009	100-102
W-Wide Flange: W14X500					-	[redacted]																												
W-Wide Flange: W14X500: 4		78	73.83	75.16	78	[redacted]	78	051223752500			W14x500	E2	720	0.078	L.F.	$ 853.88	$ 4.80	$ 2.67	$ 861.35	$ 66,602.64	$ 374.40	$ 208.26	$ 67,185.30	$ 940.13	$ 8.21	$ 2.93	$ 951.27	$ 73,330.14	$ 640.38	$ 228.54	$ 74,199.06	STD	Year 2009	100-102
W-Wide Flange: W14X550					-	[redacted]																												
W-Wide Flange: W14X550: 2		39	36.92	41.35	39	[redacted]	39	051223752500			W14x550	E2	720	0.078	L.F.	$ 939.26	$ 4.80	$ 2.67	$ 946.73	$ 36,631.14	$ 187.20	$ 104.13	$ 36,922.47	$ 1,034.14	$ 8.21	$ 2.93	$ 1,045.28	$ 40,331.46	$ 320.19	$ 114.27	$ 40,765.92	STD	Year 2009	100-102
W-Wide Flange: W16X31					-	[redacted]																												
W-Wide Flange: W16X31: 2		49.99	48.7	3.04	50	[redacted]	49.99	051223752900			W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,638.97	$ 191.96	$ 106.48	$ 2,937.41	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,923.42	$ 327.93	$ 117.48	$ 3,368.83	STD	Year 2009	100-102
W-Wide Flange: W18X35					-	[redacted]																												
W-Wide Flange: W18X35: 20		539.72	481.98	34.06	540	[redacted]	539.72	051223753300			W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 32,399.39	$ 2,806.54	$ 1,160.40	$ 36,366.33	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 35,470.40	$ 4,852.08	$ 1,279.14	$ 41,601.62	STD	Year 2009	100-102
W-Wide Flange: W18X40					-	[redacted]																												
W-Wide Flange: W18X40: 4		120	117.54	9.5	120	[redacted]	120	051223753500			W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 8,197.20	$ 624.00	$ 258.00	$ 9,079.20	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 9,004.80	$ 1,078.80	$ 284.40	$ 10,368.00	STD	Year 2009	100-102
W-Wide Flange: W18X46					-	[redacted]																												
W-Wide Flange: W18X46: 2		60	58.83	5.48	60	[redacted]	60	051223753520			W18x46	E5	960	0.083	L.F.	$ 78.66	$ 5.20	$ 2.15	$ 86.01	$ 4,719.60	$ 312.00	$ 129.00	$ 5,160.60	$ 86.42	$ 8.99	$ 2.37	$ 97.78	$ 5,185.20	$ 539.40	$ 142.20	$ 5,866.80	STD	Year 2009	100-102
W-Wide Flange: W18X55					-	[redacted]																												
W-Wide Flange: W18X55: 2		10.01	8.74	0.97	10	[redacted]	10.01	051223753920			W18x55	E5	900	0.089	L.F.	$ 93.71	$ 5.55	$ 2.29	$ 101.55	$ 938.04	$ 55.56	$ 22.92	$ 1,016.52	$ 103.34	$ 9.63	$ 2.52	$ 115.49	$ 1,034.43	$ 96.40	$ 25.23	$ 1,156.05	STD	Year 2009	100-102
W-Wide Flange: W18X65					-	[redacted]																												
W-Wide Flange: W18X65: 10		45.86	34.31	4.52	46	[redacted]	45.86	051223753920			W18x65	E5	900	0.089	L.F.	$ 110.75	$ 5.55	$ 2.29	$ 118.59	$ 5,079.00	$ 254.52	$ 105.02	$ 5,438.54	$ 122.13	$ 9.63	$ 2.52	$ 134.28	$ 5,600.88	$ 441.63	$ 115.57	$ 6,158.08	STD	Year 2009	100-102
W-Wide Flange: W18X76					-	[redacted]																												
W-Wide Flange: W18X76: 6		183	169	25.96	183	[redacted]	183	051223753940			W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W18X106					-	[redacted]																												
W-Wide Flange: W18X106: 4		67.33	61.74	13.29	67	[redacted]	67.33	051223753980			W18x106	E5	900	0.089	L.F.	$ 181.13	$ 5.55	$ 2.29	$ 188.97	$ 12,195.48	$ 373.68	$ 154.19	$ 12,723.35	$ 198.72	$ 9.63	$ 2.52	$ 210.87	$ 13,379.82	$ 648.39	$ 169.67	$ 14,197.88	STD	Year 2009	100-102
W-Wide Flange: W21X44					-	[redacted]																												
W-Wide Flange: W21X44: 3		90	85.45	7.6	90	[redacted]	90	051223754100			W21x44	E5	1064	0.075	L.F.	$ 75.04	$ 4.70	$ 1.94	$ 81.68	$ 6,753.60	$ 423.00	$ 174.60	$ 7,351.20	$ 82.80	$ 8.14	$ 2.14	$ 93.08	$ 7,452.00	$ 732.60	$ 192.60	$ 8,377.20	STD	Year 2009	100-102
	0.221527778	4468.4	4143.39	849.8		[redacted]	Total													$ 374,593.84	$ 20,782.05	$ 9,687.79	$ 405,063.69					$ 411,511.74	$ 35,816.26	$ 10,664.34	$ 457,992.32			
3																																		
Concrete-Rectangular Beam: 36x30						[redacted]																												
Concrete-Rectangular Beam: 36x30: 6		60	60	450		[redacted]	60	033105360412			Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8						[redacted]																												
HSS-Hollow Structural Section1: HSS4X2X1/8: 8		15.42	11.76	0.11		[redacted]	15.42	051223750360			HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8						[redacted]																												
HSS-Hollow Structural Section1: HSS6X4X3/8: 20		191.98	170.83	7.68		[redacted]	191.98	051223750360			HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12					-	[redacted]																												
W-Wide Flange1: W10X12: 2		52.69	48.82	1.17	53	[redacted]	52.69	051223750600			W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16					-	[redacted]																												
W-Wide Flange1: W12X16: 3		65.63	63.26	2.04	66	[redacted]	65.63	051223751100			W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19					-	[redacted]																												
W-Wide Flange1: W12X19: 16		172.09	163.04	6.24	172	[redacted]	172.09	051223751100			W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 5,604.97	$ 674.59	$ 375.16	$ 6,654.72	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 6,135.01	$ 1,154.72	$ 413.02	$ 7,702.75	STD	Year 2009	100-102
W-Wide Flange1: W14X22					-	[redacted]																												
W-Wide Flange1: W14X22: 28		878.62	833.36	36.82	879	[redacted]	878.62	051223751900			W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 39,107.38	$ 3,057.60	$ 1,704.52	$ 43,869.50	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 42,744.86	$ 5,236.58	$ 1,871.46	$ 49,852.90	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2					-	[redacted]																												
W-Wide Flange1: W14X82 2: 1		26.33	24.07	3.97	26	[redacted]	26.33	051223752380			W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2					-	[redacted]																												
W-Wide Flange1: W14X109 2: 1		37.67	36.06	7.93	38	[redacted]	37.67	051223752500			W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26					-	[redacted]																												
W-Wide Flange1: W16X26: 3		65.63	63.03	3.3	66	[redacted]	65.63	051223752700			W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31					-	[redacted]																												
W-Wide Flange1: W16X31: 4		151.19	146.06	9.12	151	[redacted]	151.19	051223752900			W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35					-	[redacted]																												
W-Wide Flange1: W18X35: 30		1158	1045.81	73.91	1,158	[redacted]	1158	051223753300			W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 69,514.74	$ 6,021.60	$ 2,489.70	$ 78,026.04	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 76,103.76	$ 10,410.42	$ 2,744.46	$ 89,258.64	STD	Year 2009	100-102
W-Wide Flange1: W18X40					-	[redacted]																												
W-Wide Flange1: W18X40: 1		37.68	35.41	2.86	38	[redacted]	37.68	051223753500			W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 2,573.92	$ 195.94	$ 81.01	$ 2,850.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 2,827.51	$ 338.74	$ 89.30	$ 3,255.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50					-	[redacted]																												
W-Wide Flange1: W21X50: 7		219	213.18	21.42	219	[redacted]	219	051223754300			W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26					-	[redacted]																												
W-Wide Flange: W10X26: 4		40.17	37.83	1.99	40	[redacted]	40.17	051223750720			W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W12X19					-	[redacted]																												
W-Wide Flange: W12X19: 8		46.23	42.05	1.61	46	[redacted]	46.23	051223751100			W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 1,505.71	$ 181.22	$ 100.78	$ 1,787.71	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 1,648.10	$ 310.20	$ 110.95	$ 2,069.25	STD	Year 2009	100-102
W-Wide Flange: W14X22					-	[redacted]																												
W-Wide Flange: W14X22: 2		50	48.75	2.15	50	[redacted]	50	051223751900			W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 2,225.50	$ 174.00	$ 97.00	$ 2,496.50	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 2,432.50	$ 298.00	$ 106.50	$ 2,837.00	STD	Year 2009	100-102
W-Wide Flange: W14X43					-	[redacted]																												
W-Wide Flange: W14X43: 2		7.33	6.38	0.55	7	[redacted]	7.33	051223752320			W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 538.68	$ 31.23	$ 17.37	$ 587.28	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 591.75	$ 53.44	$ 19.06	$ 664.24	STD	Year 2009	100-102
W-Wide Flange: W14X500					-	[redacted]																												
W-Wide Flange: W14X500: 2		39	35.45	36.08	39	[redacted]	39	051223752500			W14x500	E2	720	0.078	L.F.	$ 853.88	$ 4.80	$ 2.67	$ 861.35	$ 33,301.32	$ 187.20	$ 104.13	$ 33,592.65	$ 940.13	$ 8.21	$ 2.93	$ 951.27	$ 36,665.07	$ 320.19	$ 114.27	$ 37,099.53	STD	Year 2009	100-102
W-Wide Flange: W14X605					-	[redacted]																												
W-Wide Flange: W14X605: 4		78	71.13	87.67	78	[redacted]	78	051223752500			W14x605	E2	720	0.078	L.F.	$ 1,033.19	$ 4.80	$ 2.67	$1,040.66	$ 80,588.82	$ 374.40	$ 208.26	$ 81,171.48	$ 1,137.55	$ 8.21	$ 2.93	$ 1,148.69	$ 88,728.90	$ 640.38	$ 228.54	$ 89,597.82	STD	Year 2009	100-102
W-Wide Flange: W16X26					-	[redacted]																												
W-Wide Flange: W16X26: 1		30	29.29	1.53	30	[redacted]	30	051223752700			W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,335.30	$ 103.80	$ 57.60	$ 1,496.70	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,459.50	$ 177.00	$ 63.60	$ 1,700.10	STD	Year 2009	100-102
W-Wide Flange: W18X35					-	[redacted]																												
W-Wide Flange: W18X35: 21		579.73	520.82	36.81	580	[redacted]	579.73	051223753300			W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 34,801.19	$ 3,014.60	$ 1,246.42	$ 39,062.21	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 38,099.86	$ 5,211.77	$ 1,373.96	$ 44,685.59	STD	Year 2009	100-102
W-Wide Flange: W18X40					-	[redacted]																												
W-Wide Flange: W18X40: 3		90	88.25	7.13	90	[redacted]	90	051223753500			W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 6,147.90	$ 468.00	$ 193.50	$ 6,809.40	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 6,753.60	$ 809.10	$ 213.30	$ 7,776.00	STD	Year 2009	100-102
W-Wide Flange: W18X46					-	[redacted]																												
W-Wide Flange: W18X46: 2		60	58.83	5.48	60	[redacted]	60	051223753520			W18x46	E5	960	0.083	L.F.	$ 78.66	$ 5.20	$ 2.15	$ 86.01	$ 4,719.60	$ 312.00	$ 129.00	$ 5,160.60	$ 86.42	$ 8.99	$ 2.37	$ 97.78	$ 5,185.20	$ 539.40	$ 142.20	$ 5,866.80	STD	Year 2009	100-102
W-Wide Flange: W18X55					-	[redacted]																												
W-Wide Flange: W18X55: 2		9.75	8.44	0.94	10	[redacted]	9.75	051223753920			W18x55	E5	900	0.089	L.F.	$ 93.71	$ 5.55	$ 2.29	$ 101.55	$ 913.67	$ 54.11	$ 22.33	$ 990.11	$ 103.34	$ 9.63	$ 2.52	$ 115.49	$ 1,007.57	$ 93.89	$ 24.57	$ 1,126.03	STD	Year 2009	100-102
W-Wide Flange: W18X65					-	[redacted]																												
W-Wide Flange: W18X65: 10		45.86	34.31	4.52	46	[redacted]	45.86	051223753920			W18x65	E5	900	0.089	L.F.	$ 110.75	$ 5.55	$ 2.29	$ 118.59	$ 5,079.00	$ 254.52	$ 105.02	$ 5,438.54	$ 122.13	$ 9.63	$ 2.52	$ 134.28	$ 5,600.88	$ 441.63	$ 115.57	$ 6,158.08	STD	Year 2009	100-102
W-Wide Flange: W18X76					-	[redacted]																												
W-Wide Flange: W18X76: 6		183	169	25.96	183	[redacted]	183	051223753940			W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W18X106					-	[redacted]																												
W-Wide Flange: W18X106: 6		127.33	119.32	25.69	127	[redacted]	127.33	051223753980			W18x106	E5	900	0.089	L.F.	$ 181.13	$ 5.55	$ 2.29	$ 188.97	$ 23,063.28	$ 706.68	$ 291.59	$ 24,061.55	$ 198.72	$ 9.63	$ 2.52	$ 210.87	$ 25,303.02	$ 1,226.19	$ 320.87	$ 26,850.08	STD	Year 2009	100-102
W-Wide Flange: W21X44					-	[redacted]																												
W-Wide Flange: W21X44: 6		180	170.9	15.19	180	[redacted]	180	051223754100			W21x44	E5	1064	0.075	L.F.	$ 75.04	$ 4.70	$ 1.94	$ 81.68	$ 13,507.20	$ 846.00	$ 349.20	$ 14,702.40	$ 82.80	$ 8.14	$ 2.14	$ 93.08	$ 14,904.00	$ 1,465.20	$ 385.20	$ 16,754.40	STD	Year 2009	100-102
	0.270138889	4698.31	4355.45	879.87		[redacted]	Total													$ 405,909.53	$ 21,905.48	$ 10,197.38	$ 438,012.40					$ 445,893.56	$ 37,756.48	$ 11,225.22	$ 494,875.25			

4																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	450			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	62.26	-	-	62.26	3,735.60	-	-	3,735.60	68.61	-	-	68.61	4,116.60	-	-	4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	4.54	6.27	3.49	14.30	70.01	96.68	53.82	220.51	5.00	10.76	3.83	19.59	77.10	165.92	59.06	302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	40.88	6.27	3.49	50.64	7,848.14	1,203.71	670.01	9,721.87	45.02	10.76	3.83	59.61	8,642.94	2,065.70	735.28	11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.88	1.17	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	20.49	5.75	3.20	29.44	1,079.62	302.97	168.61	1,551.19	22.77	9.84	3.52	36.13	1,199.75	518.47	185.47	1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	27.43	3.92	2.18	33.53	1,800.23	257.27	143.07	2,200.57	30.02	6.71	2.40	39.13	1,970.21	440.38	157.51	2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 16	172.09	163.04	6.24	172		172.09	051223751100	W12x19	E2	880	0.064	L.F.	32.57	3.92	2.18	38.67	5,604.97	674.59	375.16	6,654.72	35.65	6.71	2.40	44.76	6,135.01	1,154.72	413.02	7,702.75	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 28	878.21	834.44	36.86	878		878.21	051223751900	W14x22	E2	990	0.057	L.F.	44.51	3.48	1.94	49.93	39,089.13	3,056.17	1,703.73	43,849.03	48.65	5.96	2.13	56.74	42,724.92	5,234.13	1,870.59	49,829.64	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.13	3.98	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	154.22	4.67	2.59	161.48	4,060.61	122.96	68.19	4,251.77	168.71	8.00	2.85	179.56	4,442.13	210.64	75.04	4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	204.93	4.80	2.67	212.40	7,719.71	180.82	100.58	8,001.11	225.63	8.21	2.93	236.77	8,499.48	309.27	110.37	8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	44.51	3.46	1.92	49.89	2,921.19	227.08	126.01	3,274.28	48.65	5.90	2.12	56.67	3,192.90	387.22	139.14	3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	52.79	3.84	2.13	58.76	7,981.32	580.57	322.03	8,883.92	58.48	6.56	2.35	67.39	8,841.59	991.81	355.30	10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 30	1158	1046.79	73.98	1,158		1158	051223753300	W18x35	E5	960	0.083	L.F.	60.03	5.20	2.15	67.38	69,514.74	6,021.60	2,489.70	78,026.04	65.72	8.99	2.37	77.08	76,103.76	10,410.42	2,744.46	89,258.64	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 1	37.68	35.48	2.87	38		37.68	051223753500	W18x40	E5	960	0.083	L.F.	68.31	5.20	2.15	75.66	2,573.92	195.94	81.01	2,850.87	75.04	8.99	2.37	86.40	2,827.51	338.74	89.30	3,255.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.26	21.42	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	85.39	4.70	1.94	92.03	18,700.41	1,029.30	424.86	20,154.57	94.19	8.14	2.14	104.47	20,627.61	1,782.66	468.66	22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.83	1.99	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	44.51	5.75	3.20	53.46	1,787.97	230.98	128.54	2,147.49	48.65	9.84	3.52	62.01	1,954.27	395.27	141.40	2,490.94	STD	Year 2009	100-102
W-Wide Flange: W12X19				-																											
W-Wide Flange: W12X19: 8	46.11	41.23	1.58	46		46.11	051223751100	W12x19	E2	880	0.064	L.F.	32.57	3.92	2.18	38.67	1,501.80	180.75	100.52	1,783.07	35.65	6.71	2.40	44.76	1,643.82	309.40	110.66	2,063.88	STD	Year 2009	100-102
W-Wide Flange: W14X22				-																											
W-Wide Flange: W14X22: 3	90	87.64	3.87	90		90	051223751900	W14x22	E2	990	0.057	L.F.	44.51	3.48	1.94	49.93	4,005.90	313.20	174.60	4,493.70	48.65	5.96	2.13	56.74	4,378.50	536.40	191.70	5,106.60	STD	Year 2009	100-102
W-Wide Flange: W14X43				-																											
W-Wide Flange: W14X43: 2	7.33	6.42	0.55	7		7.33	051223752320	W14x43	E2	810	0.069	L.F.	73.49	4.26	2.37	80.12	538.68	31.23	17.37	587.28	80.73	7.29	2.60	90.62	591.75	53.44	19.06	664.24	STD	Year 2009	100-102
W-Wide Flange: W14X398				-																											
W-Wide Flange: W14X398: 2	39	35.47	28.8	39		39	051223752500	W14x398	E2	720	0.078	L.F.	679.69	4.80	2.67	687.16	26,507.91	187.20	104.13	26,799.24	748.34	8.21	2.93	759.48	29,185.26	320.19	114.27	29,619.72	STD	Year 2009	100-102
W-Wide Flange: W14X500				-																											
W-Wide Flange: W14X500: 4	78	71.13	72.41	78		78	051223752500	W14x500	E2	720	0.078	L.F.	853.88	4.80	2.67	861.35	66,602.64	374.40	208.26	67,185.30	940.13	8.21	2.93	951.27	73,330.14	640.38	228.54	74,199.06	STD	Year 2009	100-102
W-Wide Flange: W18X35				-																											
W-Wide Flange: W18X35: 21	579.73	521	36.82	580		579.73	051223753300	W18x35	E5	960	0.083	L.F.	60.03	5.20	2.15	67.38	34,801.19	3,014.60	1,246.42	39,062.21	65.72	8.99	2.37	77.08	38,099.86	5,211.77	1,373.96	44,685.59	STD	Year 2009	100-102
W-Wide Flange: W18X40				-																											
W-Wide Flange: W18X40: 3	90	88.25	7.13	90		90	051223753500	W18x40	E5	960	0.083	L.F.	68.31	5.20	2.15	75.66	6,147.90	468.00	193.50	6,809.40	75.04	8.99	2.37	86.40	6,753.60	809.10	213.30	7,776.00	STD	Year 2009	100-102
W-Wide Flange: W18X46				-																											
W-Wide Flange: W18X46: 2	60	58.83	5.48	60		60	051223753520	W18x46	E5	960	0.083	L.F.	78.66	5.20	2.15	86.01	4,719.60	312.00	129.00	5,160.60	86.42	8.99	2.37	97.78	5,185.20	539.40	142.20	5,866.80	STD	Year 2009	100-102
W-Wide Flange: W18X55				-																											
W-Wide Flange: W18X55: 2	9.47	8.2	0.91	9		9.47	051223753920	W18x55	E5	900	0.089	L.F.	93.71	5.55	2.29	101.55	887.43	52.56	21.69	961.68	103.34	9.63	2.52	115.49	978.63	91.20	23.86	1,093.69	STD	Year 2009	100-102
W-Wide Flange: W18X65				-																											
W-Wide Flange: W18X65: 10	45.87	34.42	4.54	46		45.87	051223753920	W18x65	E5	900	0.089	L.F.	110.75	5.55	2.29	118.59	5,080.10	254.58	105.04	5,439.72	122.13	9.63	2.52	134.28	5,602.10	441.73	115.59	6,159.42	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	169	25.96	183		183	051223753940	W18x76	E5	900	0.089	L.F.	129.38	5.55	2.29	137.22	23,676.54	1,015.65	419.07	25,111.26	142.83	9.63	2.52	154.98	26,137.89	1,762.29	461.16	28,361.34	STD	Year 2009	100-102
W-Wide Flange: W18X106				-																											
W-Wide Flange: W18X106: 6	127.33	119.45	25.72	127		127.33	051223753980	W18x106	E5	900	0.089	L.F.	181.13	5.55	2.29	188.97	23,063.28	706.68	291.59	24,061.55	198.72	9.63	2.52	210.87	25,303.02	1,226.19	320.87	26,850.08	STD	Year 2009	100-102
W-Wide Flange: W21X44				-																											
W-Wide Flange: W21X44: 6	180	171.1	15.21	180		180	051223754100	W21x44	E5	1064	0.075	L.F.	75.04	4.70	1.94	81.68	13,507.20	846.00	349.20	14,702.40	82.80	8.14	2.14	93.08	14,904.00	1,465.20	385.20	16,754.40	STD	Year 2009	100-102
0.311805556	4707.51	4366.98	857.67			Total											385,527.74	21,937.49	10,215.71	417,680.95					423,449.55	37,812.04	11,244.97	472,506.55			
5																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	450			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	62.26	-	-	62.26	3,735.60	-	-	3,735.60	68.61	-	-	68.61	4,116.60	-	-	4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	4.54	6.27	3.49	14.30	70.01	96.68	53.82	220.51	5.00	10.76	3.83	19.59	77.10	165.92	59.06	302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	40.88	6.27	3.49	50.64	7,848.14	1,203.71	670.01	9,721.87	45.02	10.76	3.83	59.61	8,642.94	2,065.70	735.28	11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.88	1.17	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	20.49	5.75	3.20	29.44	1,079.62	302.97	168.61	1,551.19	22.77	9.84	3.52	36.13	1,199.75	518.47	185.47	1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	27.43	3.92	2.18	33.53	1,800.23	257.27	143.07	2,200.57	30.02	6.71	2.40	39.13	1,970.21	440.38	157.51	2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 16	172.09	163.04	6.24	172		172.09	051223751100	W12x19	E2	880	0.064	L.F.	32.57	3.92	2.18	38.67	5,604.97	674.59	375.16	6,654.72	35.65	6.71	2.40	44.76	6,135.01	1,154.72	413.02	7,702.75	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 28	878.21	835.76	36.92	878		878.21	051223751900	W14x22	E2	990	0.057	L.F.	44.51	3.48	1.94	49.93	39,089.13	3,056.17	1,703.73	43,849.03	48.65	5.96	2.13	56.74	42,724.92	5,234.13	1,870.59	49,829.64	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.13	3.98	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	154.22	4.67	2.59	161.48	4,060.61	122.96	68.19	4,251.77	168.71	8.00	2.85	179.56	4,442.13	210.64	75.04	4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	204.93	4.80	2.67	212.40	7,719.71	180.82	100.58	8,001.11	225.63	8.21	2.93	236.77	8,499.48	309.27	110.37	8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	44.51	3.46	1.92	49.89	2,921.19	227.08	126.01	3,274.28	48.65	5.90	2.12	56.67	3,192.90	387.22	139.14	3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	52.79	3.84	2.13	58.76	7,981.32	580.57	322.03	8,883.92	58.48	6.56	2.35	67.39	8,841.59	991.81	355.30	10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 31	1196.75	1046.25	73.94	1,197		1196.75	051223753300	W18x35	E5	960	0.083	L.F.	60.03	5.20	2.15	67.38	71,840.90	6,223.10	2,573.01	80,637.02	65.72	8.99	2.37	77.08	78,650.41	10,758.78	2,836.30	92,245.49	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 1	37.68	35.48	2.87	38		37.68	051223753500	W18x40	E5	960	0.083	L.F.	68.31	5.20	2.15	75.66	2,573.92	195.94	81.01	2,850.87	75.04	8.99	2.37	86.40	2,827.51	338.74	89.30	3,255.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.26	21.42	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	85.39	4.70	1.94	92.03	18,700.41	1,029.30	424.86	20,154.57	94.19	8.14	2.14	104.47	20,627.61	1,782.66	468.66	22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.33	37.83	1.99	40		40.33	051223750720	W10x26	E2	600	0.093	L.F.	44.51	5.75	3.20	53.46	1,796.09	231.90	129.06	2,156.04	48.65	9.84	3.52	62.01	1,962.05	396.85	141.96	2,500.86	STD	Year 2009	100-102
W-Wide Flange: W12X19				-																											
W-Wide Flange: W12X19: 8	46.11	41.34	1.58	46		46.11	051223751100	W12x19	E2	880	0.064	L.F.	32.57	3.92	2.18	38.67	1,501.80	180.75	100.52	1,783.07	35.65	6.71	2.40	44.76	1,643.82	309.40	110.66	2,063.88	STD	Year 2009	100-102
W-Wide Flange: W14X22				-																											
W-Wide Flange: W14X22: 3	90	87.64	3.87	90		90	051223751900	W14x22	E2	990	0.057	L.F.	44.51	3.48	1.94	49.93	4,005.90	313.20	174.60	4,493.70	48.65	5.96	2.13	56.74	4,378.50	536.40	191.70	5,106.60	STD	Year 2009	100-102
W-Wide Flange: W14X43				-																											
W-Wide Flange: W14X43: 2	7.33	6.42	0.55	7		7.33	051223752320	W14x43	E2	810	0.069	L.F.	73.49	4.26	2.37	80.12	538.68	31.23	17.37	587.28	80.73	7.29	2.60	90.62	591.75	53.44	19.06	664.24	STD	Year 2009	100-102
W-Wide Flange: W14X398				-																											
W-Wide Flange: W14X398: 6	117	106.6	86.55	117		117	051223752500	W14x398	E2	720	0.078	L.F.	679.69	4.80	2.67	687.16	79,523.73	561.60	312.39	80,397.72	748.34	8.21	2.93	759.48	87,555.78	960.57	342.81	88,859.16	STD	Year 2009	100-102
W-Wide Flange: W18X35				-																											
W-Wide Flange: W18X35: 21	579.73	522.78	36.95	580		579.73	051223753300	W18x35	E5	960	0.083	L.F.	60.03	5.20	2.15	67.38	34,801.19	3,014.60	1,246.42	39,062.21	65.72	8.99	2.37	77.08	38,099.86	5,211.77	1,373.96	44,685.59	STD	Year 2009	100-102
W-Wide Flange: W18X40				-																											
W-Wide Flange: W18X40: 3	90	88.25	7.13	90		90	051223753500	W18x40	E5	960	0.083	L.F.	68.31	5.20	2.15	75.66	6,147.90	468.00	193.50	6,809.40	75.04	8.99	2.37	86.40	6,753.60	809.10	213.30	7,776.00	STD	Year 2009	100-102
W-Wide Flange: W18X46				-																											
W-Wide Flange: W18X46: 2	60	58.83	5.48	60		60	051223753520	W18x46	E5	960	0.083	L.F.	78.66	5.20	2.15	86.01	4,719.60	312.00	129.00	5,160.60	86.42	8.99	2.37	97.78	5,185.20	539.40	142.20	5,866.80	STD	Year 2009	100-102
W-Wide Flange: W18X55				-																											
W-Wide Flange: W18X55: 2	9.47	8.2	0.91	9		9.47	051223753920	W18x55	E5	900	0.089	L.F.	93.71	5.55	2.29	101.55	887.43	52.56	21.69	961.68	103.34	9.63	2.52	115.49	978.63	91.20	23.86	1,093.69	STD	Year 2009	100-102
W-Wide Flange: W18X65				-																											
W-Wide Flange: W18X65: 10	45.87	34.42	4.54	46		45.87	051223753920	W18x65	E5	900	0.089	L.F.	110.75	5.55	2.29	118.59	5,080.10	254.58	105.04	5,439.72	122.13	9.63	2.52	134.28	5,602.10	441.73	115.59	6,159.42	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	169	25.96	183		183	051223753940	W18x76	E5	900	0.089	L.F.	129.38	5.55	2.29	137.22	23,676.54	1,015.65	419.07	25,111.26	142.83	9.63	2.52	154.98	26,137.89	1,762.29	461.16	28,361.34	STD	Year 2009	100-102
W-Wide Flange: W18X106				-																											
W-Wide Flange: W18X106: 6	127.33	119.45	25.72	127		127.33	051223753980	W18x106	E5	900	0.089	L.F.	181.13	5.55	2.29	188.97	23,063.28	706.68	291.59	24,061.55	198.72	9.63	2.52	210.87	25,303.02	1,226.19	320.87	26,850.08	STD	Year 2009	100-102
W-Wide Flange: W21X44				-																											
W-Wide Flange: W21X44: 6	180	171.1	15.21	180		180	051223754100	W21x44	E5	1064	0.075	L.F.	75.04	4.70	1.94	81.68	13,507.20	846.00	349.20	14,702.40	82.80	8.14	2.14	93.08	14,904.00	1,465.20	385.20	16,754.40	STD	Year 2009	100-102
0.354166667	4746.43	4369.67	843.16			Total											374,274.20	22,139.91	10,299.54	406,713.66					411,044.36	38,161.98	11,337.37	460,543.70			

6																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.88	1.17	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1028.21	989.93	43.73	1,028		1028.21	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,765.63	$ 3,578.17	$ 1,994.73	$ 51,338.53	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 50,022.42	$ 6,128.13	$ 2,190.09	$ 58,340.64	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	55.97	4.8	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.13	3.98	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.25	1399.69	98.92	1,444		1444.25	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,698.33	$ 7,510.10	$ 3,105.14	$ 97,313.57	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,916.11	$ 12,983.81	$ 3,422.87	$ 111,322.79	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	315.21	25.47	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.26	21.42	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W14X398				-																											
W-Wide Flange: W14X398: 6	117	106.6	86.55	117		117	051223752500	W14x398	E2	720	0.078	L.F.	$ 679.69	$ 4.80	$ 2.67	$ 687.16	$ 79,523.73	$ 561.60	$ 312.39	$ 80,397.72	$ 748.34	$ 8.21	$ 2.93	$ 759.48	$ 87,555.78	$ 960.57	$ 342.81	$ 88,859.16	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	169	25.96	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
0.390972222	4373.3	4157.5	725.46			Total											$ 330,341.27	$ 20,000.89	$ 9,512.28	$ 359,854.45					$ 362,777.24	$ 34,443.60	$ 10,468.63	$ 407,689.48			
7																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	397.92			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	13.55	9.89	0.09			13.55	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 61.52	$ 84.96	$ 47.29	$ 193.77	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 67.75	$ 145.80	$ 51.90	$ 265.44	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	193.49	172.33	7.74			193.49	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,909.87	$ 1,213.18	$ 675.28	$ 9,798.33	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,710.92	$ 2,081.95	$ 741.07	$ 11,533.94	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.91	1.17	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	991.4	43.8	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.42	5.18	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.16	3.98	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	149.89	9.36	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.25	1410.88	99.71	1,444		1444.25	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,698.33	$ 7,510.10	$ 3,105.14	$ 97,313.57	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,916.11	$ 12,983.81	$ 3,422.87	$ 111,322.79	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	320.95	25.93	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.3	21.43	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W14X398				-																											
W-Wide Flange: W14X398: 6	117	107.05	86.92	117		117	051223752500	W14x398	E2	720	0.078	L.F.	$ 679.69	$ 4.80	$ 2.67	$ 687.16	$ 79,523.73	$ 561.60	$ 312.39	$ 80,397.72	$ 748.34	$ 8.21	$ 2.93	$ 759.48	$ 87,555.78	$ 960.57	$ 342.81	$ 88,859.16	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	169.4	26.03	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
0.432638889	4372.4	4184.76	753.93			Total											$ 330,369.58	$ 19,996.69	$ 9,509.93	$ 359,876.20					$ 362,808.62	$ 34,436.39	$ 10,466.06	$ 407,711.07			
8																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.91	1.17	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	992.12	43.83	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.42	5.18	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.16	3.98	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1406.13	99.37	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	320.95	25.93	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.3	21.43	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W14X342				-																											
W-Wide Flange: W14X342: 2	39	35.48	24.73	39		39	051223752500	W14x342	E2	720	0.078	L.F.	$ 584.05	$ 4.80	$ 2.67	$ 591.52	$ 22,777.95	$ 187.20	$ 104.13	$ 23,069.28	$ 643.05	$ 8.21	$ 2.93	$ 654.19	$ 25,078.95	$ 320.19	$ 114.27	$ 25,513.41	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	169.4	26.03	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X182				-																											
W-Wide Flange: W21X182: 4	78	71.57	26.53	78		78	051223754780	W21x182	E5	1000	0.08	L.F.	$ 310.35	$ 5.00	$ 2.07	$ 317.42	$ 24,207.30	$ 390.00	$ 161.46	$ 24,758.76	$ 341.24	$ 8.64	$ 2.27	$ 352.15	$ 26,616.72	$ 673.92	$ 177.06	$ 27,467.70	STD	Year 2009	100-102
0.474305556	4373.22	4177.27	691.64			Total											$ 297,807.27	$ 20,017.09	$ 9,465.44	$ 327,289.81					$ 326,922.08	$ 34,478.20	$ 10,417.11	$ 371,817.42			

9																																
Concrete-Rectangular Beam: 36x30						[redacted]																										
Concrete-Rectangular Beam: 36x30: 6		60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																																
HSS-Hollow Structural Section1: HSS4X2X1/8: 8		15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																																
HSS-Hollow Structural Section1: HSS6X4X3/8: 20		191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12					-																											
W-Wide Flange1: W10X12: 2		52.69	48.91	1.17	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16					-																											
W-Wide Flange1: W12X16: 3		65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19					-																											
W-Wide Flange1: W12X19: 36		266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22					-																											
W-Wide Flange1: W14X22: 33		1027.65	990.83	43.77	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43					-																											
W-Wide Flange1: W14X43: 16		71.21	60.42	5.18	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2					-																											
W-Wide Flange1: W14X82 2: 1		26.33	24.16	3.98	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2					-																											
W-Wide Flange1: W14X109 2: 1		37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26					-																											
W-Wide Flange1: W16X26: 3		65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31					-																											
W-Wide Flange1: W16X31: 4		151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35					-																											
W-Wide Flange1: W18X35: 36		1444.74	1406.13	99.37	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40					-																											
W-Wide Flange1: W18X40: 11		337.68	320.95	25.93	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50					-																											
W-Wide Flange1: W21X50: 7		219	213.1	21.43	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26					-																											
W-Wide Flange: W10X26: 4		40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W14X342					-																											
W-Wide Flange: W14X342: 2		39	35.48	24.73	39		39	051223752500	W14x342	E2	720	0.078	L.F.	$ 584.05	$ 4.80	$ 2.67	$ 591.52	$ 22,777.95	$ 187.20	$ 104.13	$ 23,069.28	$ 643.05	$ 8.21	$ 2.93	$ 654.19	$ 25,078.95	$ 320.19	$ 114.27	$ 25,513.41	STD	Year 2009	100-102
W-Wide Flange: W18X76					-																											
W-Wide Flange: W18X76: 6		183	169.4	26.03	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X182					-																											
W-Wide Flange: W21X182: 4		78	71.57	26.53	78		78	051223754780	W21x182	E5	1000	0.08	L.F.	$ 310.35	$ 5.00	$ 2.07	$ 317.42	$ 24,207.30	$ 390.00	$ 161.46	$ 24,758.76	$ 341.24	$ 8.64	$ 2.27	$ 352.15	$ 26,616.72	$ 673.92	$ 177.06	$ 27,467.70	STD	Year 2009	100-102
	0.515972222	4373.22	4175.98	691.58			Total											$ 297,807.27	$ 20,017.09	$ 9,465.44	$ 327,289.81					$ 326,922.08	$ 34,478.20	$ 10,417.11	$ 371,817.42			
10																																
Concrete-Rectangular Beam: 36x30						[redacted]																										
Concrete-Rectangular Beam: 36x30: 6		60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																																
HSS-Hollow Structural Section1: HSS4X2X1/8: 8		15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																																
HSS-Hollow Structural Section1: HSS6X4X3/8: 20		191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12					-																											
W-Wide Flange1: W10X12: 2		52.69	48.93	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16					-																											
W-Wide Flange1: W12X16: 3		65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19					-																											
W-Wide Flange1: W12X19: 36		266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22					-																											
W-Wide Flange1: W14X22: 33		1028.14	992.12	43.83	1,028		1028.14	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,762.51	$ 3,577.93	$ 1,994.59	$ 51,335.03	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 50,019.01	$ 6,127.71	$ 2,189.94	$ 58,336.66	STD	Year 2009	100-102
W-Wide Flange1: W14X43					-																											
W-Wide Flange1: W14X43: 16		71.21	60.42	5.18	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2					-																											
W-Wide Flange1: W14X82 2: 1		26.33	24.18	3.98	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2					-																											
W-Wide Flange1: W14X109 2: 1		37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26					-																											
W-Wide Flange1: W16X26: 3		65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31					-																											
W-Wide Flange1: W16X31: 4		151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35					-																											
W-Wide Flange1: W18X35: 36		1444.74	1406.21	99.38	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40					-																											
W-Wide Flange1: W18X40: 11		337.68	320.98	25.93	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50					-																											
W-Wide Flange1: W21X50: 7		219	213.33	21.43	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26					-																											
W-Wide Flange: W10X26: 4		40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W14X342					-																											
W-Wide Flange: W14X342: 2		39	35.64	24.84	39		39	051223752500	W14x342	E2	720	0.078	L.F.	$ 584.05	$ 4.80	$ 2.67	$ 591.52	$ 22,777.95	$ 187.20	$ 104.13	$ 23,069.28	$ 643.05	$ 8.21	$ 2.93	$ 654.19	$ 25,078.95	$ 320.19	$ 114.27	$ 25,513.41	STD	Year 2009	100-102
W-Wide Flange: W18X76					-																											
W-Wide Flange: W18X76: 6		183	169.77	26.08	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X182					-																											
W-Wide Flange: W21X182: 4		78	71.83	26.63	78		78	051223754780	W21x182	E5	1000	0.08	L.F.	$ 310.35	$ 5.00	$ 2.07	$ 317.42	$ 24,207.30	$ 390.00	$ 161.46	$ 24,758.76	$ 341.24	$ 8.64	$ 2.27	$ 352.15	$ 26,616.72	$ 673.92	$ 177.06	$ 27,467.70	STD	Year 2009	100-102
	0.557638889	4373.72	4178.25	691.91			Total											$ 297,829.08	$ 20,018.80	$ 9,466.39	$ 327,314.28					$ 326,945.92	$ 34,481.12	$ 10,418.16	$ 371,845.22			
11																																
Concrete-Rectangular Beam: 36x30						[redacted]																										
Concrete-Rectangular Beam: 36x30: 6		60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																																
HSS-Hollow Structural Section1: HSS4X2X1/8: 8		15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																																
HSS-Hollow Structural Section1: HSS6X4X3/8: 20		191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12					-																											
W-Wide Flange1: W10X12: 2		52.69	48.93	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16					-																											
W-Wide Flange1: W12X16: 3		65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19					-																											
W-Wide Flange1: W12X19: 36		266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22					-																											
W-Wide Flange1: W14X22: 33		1027.65	992.93	43.87	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43					-																											
W-Wide Flange1: W14X43: 16		71.21	60.42	5.18	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2					-																											
W-Wide Flange1: W14X82 2: 1		26.33	24.18	3.98	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2					-																											
W-Wide Flange1: W14X109 2: 1		37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26					-																											
W-Wide Flange1: W16X26: 3		65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31					-																											
W-Wide Flange1: W16X31: 4		151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35					-																											
W-Wide Flange1: W18X35: 36		1444.74	1406.23	99.38	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40					-																											
W-Wide Flange1: W18X40: 11		337.68	320.98	25.93	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50					-																											
W-Wide Flange1: W21X50: 7		219	213.33	21.43	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26					-																											
W-Wide Flange: W10X26: 4		40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W14X342					-																											
W-Wide Flange: W14X342: 2		39	35.64	24.84	39		39	051223752500	W14x342	E2	720	0.078	L.F.	$ 584.05	$ 4.80	$ 2.67	$ 591.52	$ 22,777.95	$ 187.20	$ 104.13	$ 23,069.28	$ 643.05	$ 8.21	$ 2.93	$ 654.19	$ 25,078.95	$ 320.19	$ 114.27	$ 25,513.41	STD	Year 2009	100-102
W-Wide Flange: W18X76					-																											
W-Wide Flange: W18X76: 6		183	169.77	26.08	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122					-																											
W-Wide Flange: W21X122: 4		78	71.83	17.82	78		78	051223754780	W21x182	E5	1000	0.08	L.F.	$ 310.35	$ 5.00	$ 2.07	$ 317.42	$ 24,207.30	$ 390.00	$ 161.46	$ 24,758.76	$ 341.24	$ 8.64	$ 2.27	$ 352.15	$ 26,616.72	$ 673.92	$ 177.06	$ 27,467.70	STD	Year 2009	100-102
	0.599305556	4373.22	4179.08	683.14			Total											$ 297,807.27	$ 20,017.09	$ 9,465.44	$ 327,289.81					$ 326,922.08	$ 34,478.20	$ 10,417.11	$ 371,817.42			

12																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.93	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	992.93	43.87	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.42	5.18	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.18	3.98	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1406.23	99.38	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	320.98	25.93	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.33	21.43	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W14X342				-																											
W-Wide Flange: W14X342: 2	39	35.64	24.84	39		39	051223752500	W14x342	E2	720	0.078	L.F.	$ 584.05	$ 4.80	$ 2.67	$ 591.52	$ 22,777.95	$ 187.20	$ 104.13	$ 23,069.28	$ 643.05	$ 8.21	$ 2.93	$ 654.19	$ 25,078.95	$ 320.19	$ 114.27	$ 25,513.41	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	169.77	26.08	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 4	78	71.83	17.82	78		78	051223754780	W21x182	E5	1000	0.08	L.F.	$ 310.35	$ 5.00	$ 2.07	$ 317.42	$ 24,207.30	$ 390.00	$ 161.46	$ 24,758.76	$ 341.24	$ 8.64	$ 2.27	$ 352.15	$ 26,616.72	$ 673.92	$ 177.06	$ 27,467.70	STD	Year 2009	100-102
0.640972222	4373.22	4179.08	683.14			Total											$ 297,807.27	$ 20,017.09	$ 9,465.44	$ 327,289.81					$ 326,922.08	$ 34,478.20	$ 10,417.11	$ 371,817.42			
13																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	13.56	9.89	0.09			13.56	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 61.56	$ 85.02	$ 47.32	$ 193.91	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 67.80	$ 145.91	$ 51.93	$ 265.64	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	193.49	172.33	7.74			193.49	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,909.87	$ 1,213.18	$ 675.28	$ 9,798.33	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,710.92	$ 2,081.95	$ 741.07	$ 11,533.94	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.93	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	992.91	43.87	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.62	5.2	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.18	3.98	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1406.32	99.39	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	321.06	25.94	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.33	21.43	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W14X342				-																											
W-Wide Flange: W14X342: 2	39	35.76	24.92	39		39	051223752500	W14x342	E2	720	0.078	L.F.	$ 584.05	$ 4.80	$ 2.67	$ 591.52	$ 22,777.95	$ 187.20	$ 104.13	$ 23,069.28	$ 643.05	$ 8.21	$ 2.93	$ 654.19	$ 25,078.95	$ 320.19	$ 114.27	$ 25,513.41	STD	Year 2009	100-102
W-Wide Flange: W18X97				-																											
W-Wide Flange: W18X97: 2	61	56.59	11.15	61		61	051223753940	W18x97	E5	900	0.089	L.F.	$ 165.13	$ 5.55	$ 2.29	$ 172.97	$ 10,072.93	$ 338.55	$ 139.69	$ 10,551.17	$ 182.29	$ 9.63	$ 2.52	$ 194.44	$ 11,119.69	$ 587.43	$ 153.72	$ 11,860.84	STD	Year 2009	100-102
W-Wide Flange: W18X119				-																											
W-Wide Flange: W18X119: 4	122	113.4	27.57	122		122	051223753980	W18x119	E5	900	0.089	L.F.	$ 203.34	$ 5.55	$ 2.29	$ 211.18	$ 24,807.48	$ 677.10	$ 279.38	$ 25,763.96	$ 223.09	$ 9.63	$ 2.52	$ 235.24	$ 27,216.98	$ 1,174.86	$ 307.44	$ 28,699.28	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 4	78	71.93	17.85	78		78	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 16,227.12	$ 390.00	$ 161.46	$ 16,778.58	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 17,841.72	$ 673.92	$ 177.06	$ 18,692.70	STD	Year 2009	100-102
0.682638889	4372.88	4179.51	695.97			Total											$ 301,084.24	$ 20,014.90	$ 9,464.21	$ 330,563.36					$ 330,404.54	$ 34,474.44	$ 10,415.77	$ 375,294.77			
14																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.93	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	993.56	43.89	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.62	5.2	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.18	3.98	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1406.32	99.39	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	321.06	25.94	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.33	21.43	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W18X97				-																											
W-Wide Flange: W18X97: 2	61	56.59	11.15	61		61	051223753940	W18x97	E5	900	0.089	L.F.	$ 165.13	$ 5.55	$ 2.29	$ 172.97	$ 10,072.93	$ 338.55	$ 139.69	$ 10,551.17	$ 182.29	$ 9.63	$ 2.52	$ 194.44	$ 11,119.69	$ 587.43	$ 153.72	$ 11,860.84	STD	Year 2009	100-102
W-Wide Flange: W18X119				-																											
W-Wide Flange: W18X119: 4	122	113.4	27.57	122		122	051223753980	W18x119	E5	900	0.089	L.F.	$ 203.34	$ 5.55	$ 2.29	$ 211.18	$ 24,807.48	$ 677.10	$ 279.38	$ 25,763.96	$ 223.09	$ 9.63	$ 2.52	$ 235.24	$ 27,216.98	$ 1,174.86	$ 307.44	$ 28,699.28	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 4	78	71.93	17.85	78		78	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 16,227.12	$ 390.00	$ 161.46	$ 16,778.58	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 17,841.72	$ 673.92	$ 177.06	$ 18,692.70	STD	Year 2009	100-102
W-Wide Flange: W21X182				-																											
W-Wide Flange: W21X182: 2	39	35.76	13.26	39		39	051223754780	W21x182	E5	1000	0.08	L.F.	$ 310.35	$ 5.00	$ 2.07	$ 317.42	$ 12,103.65	$ 195.00	$ 80.73	$ 12,379.38	$ 341.24	$ 8.64	$ 2.27	$ 352.15	$ 13,308.36	$ 336.96	$ 88.53	$ 13,733.85	STD	Year 2009	100-102
0.724305556	4373.22	4180.54	684.28			Total											$ 290,356.66	$ 20,024.89	$ 9,442.04	$ 319,823.60					$ 318,575.27	$ 34,494.97	$ 10,391.37	$ 363,461.64			

15

Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
HSS-Hollow Structural Section: HSS5X5X3/8																															
HSS-Hollow Structural Section: HSS5X5X3/8: 28	247.29	225.3	10.12			247.29	051223750360	HSS5x5x3/8	E2	550	0.102	L.F.	$ 42.58	$ 6.27	$ 3.49	$ 52.34	$ 10,529.61	$ 1,550.51	$ 863.04	$ 12,943.16	$ 46.89	$ 10.76	$ 3.83	$ 61.48	$ 11,595.43	$ 2,660.84	$ 947.12	$ 15,203.39	STD	Year 2009	100-102
HSS-Hollow Structural Section: HSS12X12X5/8																															
HSS-Hollow Structural Section: HSS12X12X5/8: 16	241.95	228.7	42.22			241.95	051223750360	HSS12x12x5/8	E2	550	0.102	L.F.	$ 408.80	$ 6.27	$ 3.49	$ 418.56	$ 98,909.16	$ 1,517.03	$ 844.41	$ 101,270.59	$ 450.20	$ 10.76	$ 3.83	$ 464.79	$ 108,925.89	$ 2,603.38	$ 926.67	$ 112,455.94	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.93	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 16	172.09	162.7	6.23	172		172.09	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 5,604.97	$ 674.59	$ 375.16	$ 6,654.72	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 6,135.01	$ 1,154.72	$ 413.02	$ 7,702.75	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 15	468.62	452.63	20	469		468.62	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 20,858.28	$ 1,630.80	$ 909.12	$ 23,398.20	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 22,798.36	$ 2,792.98	$ 998.16	$ 26,589.50	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 3	13.08	11.12	0.95	13		13.08	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 961.25	$ 55.72	$ 31.00	$ 1,047.97	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 1,055.95	$ 95.35	$ 34.01	$ 1,185.31	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.18	3.98	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 10	340	327.58	23.15	340		340	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 20,410.20	$ 1,768.00	$ 731.00	$ 22,909.20	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 22,344.80	$ 3,056.60	$ 805.80	$ 26,207.20	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 1	37.68	35.53	2.87	38		37.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 2,573.92	$ 195.94	$ 81.01	$ 2,850.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 2,827.51	$ 338.74	$ 89.30	$ 3,255.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	116.17	11.67	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W12X19				-																											
W-Wide Flange: W12X19: 10	47.08	40.7	1.56	47		47.08	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 1,533.40	$ 184.55	$ 102.63	$ 1,820.58	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 1,678.40	$ 315.91	$ 112.99	$ 2,107.30	STD	Year 2009	100-102
W-Wide Flange: W14X22				-																											
W-Wide Flange: W14X22: 5	150	146.25	6.46	150		150	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 6,676.50	$ 522.00	$ 291.00	$ 7,489.50	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 7,297.50	$ 894.00	$ 319.50	$ 8,511.00	STD	Year 2009	100-102
W-Wide Flange: W14X43				-																											
W-Wide Flange: W14X43: 5	22.5	19.19	1.65	23		22.5	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 1,653.53	$ 95.85	$ 53.33	$ 1,802.70	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 1,816.43	$ 164.03	$ 58.50	$ 2,038.95	STD	Year 2009	100-102
W-Wide Flange: W18X46				-																											
W-Wide Flange: W18X46: 16	642.77	622.6	57.97	643		642.77	051223753520	W18x46	E5	960	0.083	L.F.	$ 78.66	$ 5.20	$ 2.15	$ 86.01	$ 50,560.29	$ 3,342.40	$ 1,381.96	$ 55,284.65	$ 86.42	$ 8.99	$ 2.37	$ 97.78	$ 55,548.18	$ 5,778.50	$ 1,523.36	$ 62,850.05	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 8	241	225.13	34.59	241		241	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 31,180.58	$ 1,337.55	$ 551.89	$ 33,070.02	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 34,422.03	$ 2,320.83	$ 607.32	$ 37,350.18	STD	Year 2009	100-102
W-Wide Flange: W21X50				-																											
W-Wide Flange: W21X50: 7	220	182.96	18.38	220		220	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,785.80	$ 1,034.00	$ 426.80	$ 20,246.60	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,721.80	$ 1,790.80	$ 470.80	$ 22,983.40	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 4	78	71.93	17.85	78		78	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 16,227.12	$ 390.00	$ 161.46	$ 16,778.58	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 17,841.72	$ 673.92	$ 177.06	$ 18,692.70	STD	Year 2009	100-102
W-Wide Flange: W21X182				-																											
W-Wide Flange: W21X182: 2	39	35.76	13.26	39		39	051223754780	W21x182	E5	1000	0.08	L.F.	$ 310.35	$ 5.00	$ 2.07	$ 317.42	$ 12,103.65	$ 195.00	$ 80.73	$ 12,379.38	$ 341.24	$ 8.64	$ 2.27	$ 352.15	$ 13,308.36	$ 336.96	$ 88.53	$ 13,733.85	STD	Year 2009	100-102
0.764583333	3846.6	3528.37	676.12			Total											$ 354,485.10	$ 18,495.30	$ 8,961.72	$ 381,942.11					$ 389,927.68	$ 31,849.63	$ 9,857.97	$ 431,635.28			

16

Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.97	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1028.14	994.33	43.93	1,028		1028.14	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,762.51	$ 3,577.93	$ 1,994.69	$ 51,335.03	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 50,019.01	$ 6,127.71	$ 2,189.94	$ 58,336.66	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.93	5.23	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.22	3.99	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1406.8	99.42	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	321.32	25.96	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.38	21.44	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	170.2	26.15	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	107.96	26.78	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
0.807638889	4373.72	4182.95	667.52			Total											$ 275,184.51	$ 20,026.60	$ 9,442.99	$ 304,654.11					$ 302,012.83	$ 34,497.89	$ 10,392.42	$ 346,903.16			

17

Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.97	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	993.83	43.91	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.93	5.23	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.22	3.99	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1406.8	99.42	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	321.32	25.96	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.38	21.44	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	170.2	26.15	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	107.96	26.78	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
0.849305556	4373.22	4182.45	667.5			Total											$ 275,162.70	$ 20,024.89	$ 9,442.04	$ 304,629.64					$ 301,988.99	$ 34,494.97	$ 10,391.37	$ 346,875.36			

18																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.97	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	993.83	43.91	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.93	5.23	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.22	3.99	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1406.8	99.42	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	321.32	25.96	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.38	21.44	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	170.2	26.15	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	107.96	26.78	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
0.890972222	4373.22	4182.45	667.5			Total											$ 275,162.70	$ 20,024.89	$ 9,442.04	$ 304,629.64					$ 301,988.99	$ 34,494.97	$ 10,391.37	$ 346,875.36			
19																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	13.56	9.89	0.09			13.56	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 61.56	$ 85.02	$ 47.32	$ 193.91	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 67.80	$ 145.91	$ 51.93	$ 265.64	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	193.49	172.33	7.74			193.49	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,909.87	$ 1,213.18	$ 675.28	$ 9,798.33	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,710.92	$ 2,081.95	$ 741.07	$ 11,533.94	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.99	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	993.95	43.91	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.98	5.23	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.24	3.99	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1406.88	99.43	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	321.33	25.96	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.4	21.44	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	170.43	26.18	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	108.19	26.84	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
0.932638889	4372.88	4182.86	667.66			Total											$ 275,215.98	$ 20,022.70	$ 9,440.81	$ 304,679.50					$ 302,047.67	$ 34,491.21	$ 10,390.03	$ 346,928.93			
20																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.99	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	993.95	43.91	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.98	5.23	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.24	3.99	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1408.17	99.52	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	321.33	25.96	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.4	21.44	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	170.43	26.18	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	108.19	26.84	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
0.974305556	4373.22	4184.53	667.7			Total											$ 275,162.70	$ 20,024.89	$ 9,442.04	$ 304,629.64					$ 301,988.99	$ 34,494.97	$ 10,391.37	$ 346,875.36			

21																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	48.99	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	993.95	43.91	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.98	5.23	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.24	3.99	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1408.17	99.52	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	321.33	25.96	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.4	21.44	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	170.43	26.18	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	108.19	26.84	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
1.015972222	4373.22	4184.53	667.7			Total											$ 275,162.70	$ 20,024.89	$ 9,442.04	$ 304,629.64					$ 301,988.99	$ 34,494.97	$ 10,391.37	$ 346,875.36			
22																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	13.56	9.89	0.09			13.56	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 61.56	$ 85.02	$ 47.32	$ 193.91	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 67.80	$ 145.91	$ 51.93	$ 265.64	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	193.49	172.33	7.74			193.49	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,909.87	$ 1,213.18	$ 675.28	$ 9,798.33	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,710.92	$ 2,081.95	$ 741.07	$ 11,533.94	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.71	49	1.18	53		52.71	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,080.03	$ 303.08	$ 168.67	$ 1,551.78	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,200.21	$ 518.67	$ 185.54	$ 1,904.41	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.64	993.97	43.91	1,028		1027.64	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.26	$ 3,576.19	$ 1,993.62	$ 51,310.07	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,994.69	$ 6,124.73	$ 2,188.87	$ 58,308.29	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.98	5.23	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.25	4	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1408.17	99.52	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	321.32	25.96	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.4	21.44	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	170.46	26.19	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	108.28	26.86	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
1.057638889	4372.88	4184.3	667.78			Total											$ 275,215.95	$ 20,022.78	$ 9,440.85	$ 304,679.60					$ 302,047.65	$ 34,491.35	$ 10,390.08	$ 346,929.08			
23																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	49	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	993.97	43.91	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.98	5.23	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.25	4	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1408.17	99.52	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	321.32	25.96	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.4	21.44	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	170.46	26.19	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	108.28	26.86	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
1.099305556	4373.22	4184.68	667.73			Total											$ 275,162.70	$ 20,024.89	$ 9,442.04	$ 304,629.64					$ 301,988.99	$ 34,494.97	$ 10,391.37	$ 346,875.36			

24																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	49	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	993.97	43.91	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.98	5.23	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.25	4	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1408.17	99.52	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	321.32	25.96	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.4	21.44	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40.17	37.49	1.97	40		40.17	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,787.97	$ 230.98	$ 128.54	$ 2,147.49	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,954.27	$ 395.27	$ 141.40	$ 2,490.94	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	170.46	26.19	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	108.28	26.86	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
24: 203	4373.22	4184.68	667.73			Total											$ 275,162.70	$ 20,024.89	$ 9,442.04	$ 304,629.64					$ 301,988.99	$ 34,494.97	$ 10,391.37	$ 346,875.36			
25																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	13.56	9.89	0.09			13.56	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 61.56	$ 85.02	$ 47.32	$ 193.91	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 67.80	$ 145.91	$ 51.93	$ 265.64	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	193.49	172.33	7.74			193.49	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,909.87	$ 1,213.18	$ 675.28	$ 9,798.33	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,710.92	$ 2,081.95	$ 741.07	$ 11,533.94	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.71	49	1.18	53		52.71	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,080.03	$ 303.08	$ 168.67	$ 1,551.78	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,200.21	$ 518.67	$ 185.54	$ 1,904.41	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.64	993.97	43.91	1,028		1027.64	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.26	$ 3,576.19	$ 1,993.62	$ 51,310.07	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,994.69	$ 6,124.73	$ 2,188.87	$ 58,308.29	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.98	5.23	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.25	4	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1408.17	99.52	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	321.32	25.96	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.4	21.44	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40	37.67	1.98	40		40	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,780.40	$ 230.00	$ 128.00	$ 2,138.40	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,946.00	$ 393.60	$ 140.80	$ 2,480.40	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	170.46	26.19	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	108.28	26.86	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
25: 203	4372.72	4184.48	667.79			Total											$ 275,208.38	$ 20,021.80	$ 9,440.31	$ 304,670.51					$ 302,039.38	$ 34,489.68	$ 10,389.48	$ 346,918.54			
26																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	49	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	993.97	43.91	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.98	5.23	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.25	4	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1408.17	99.52	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	321.32	25.96	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.4	21.44	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-																											
W-Wide Flange: W10X26: 4	40	37.67	1.98	40		40	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,780.40	$ 230.00	$ 128.00	$ 2,138.40	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,946.00	$ 393.60	$ 140.80	$ 2,480.40	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	170.46	26.19	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	108.28	26.86	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
26: 203	4373.06	4184.85	667.74			Total											$ 275,155.13	$ 20,023.91	$ 9,441.50	$ 304,620.55					$ 301,980.72	$ 34,493.30	$ 10,390.77	$ 346,864.82			

27																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88		[redacted]	60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8					[redacted]																										
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11		[redacted]	15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8					[redacted]																										
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68		[redacted]	191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-	[redacted]																										
W-Wide Flange1: W10X12: 2	52.69	49	1.18	53	[redacted]	52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-	[redacted]																										
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66	[redacted]	65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-	[redacted]																										
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266	[redacted]	266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-	[redacted]																										
W-Wide Flange1: W14X22: 33	1027.65	993.97	43.91	1,028	[redacted]	1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-	[redacted]																										
W-Wide Flange1: W14X43: 16	71.21	60.98	5.23	71	[redacted]	71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-	[redacted]																										
W-Wide Flange1: W14X82 2: 1	26.33	24.25	4	26	[redacted]	26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-	[redacted]																										
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38	[redacted]	37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-	[redacted]																										
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66	[redacted]	65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-	[redacted]																										
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151	[redacted]	151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-	[redacted]																										
W-Wide Flange1: W18X35: 36	1444.74	1408.17	99.52	1,445	[redacted]	1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-	[redacted]																										
W-Wide Flange1: W18X40: 11	337.68	321.32	25.96	338	[redacted]	337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-	[redacted]																										
W-Wide Flange1: W21X50: 7	219	213.4	21.44	219	[redacted]	219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W10X26				-	[redacted]																										
W-Wide Flange: W10X26: 4	40.08	37.49	1.97	40	[redacted]	40.08	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 1,783.96	$ 230.46	$ 128.26	$ 2,142.68	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 1,949.89	$ 394.39	$ 141.08	$ 2,485.36	STD	Year 2009	100-102
W-Wide Flange: W18X76				-	[redacted]																										
W-Wide Flange: W18X76: 6	183	170.46	26.19	183	[redacted]	183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-	[redacted]																										
W-Wide Flange: W21X122: 6	117	108.28	26.86	117	[redacted]	117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
27: 203	4373.14	4184.68	667.73		[redacted]	Total											$ 275,158.69	$ 20,024.37	$ 9,441.76	$ 304,624.83					$ 301,984.61	$ 34,494.09	$ 10,391.05	$ 346,869.78			
28																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88		[redacted]	60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8					[redacted]																										
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11		[redacted]	15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8					[redacted]																										
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68		[redacted]	191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-	[redacted]																										
W-Wide Flange1: W10X12: 2	52.69	49	1.18	53	[redacted]	52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-	[redacted]																										
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66	[redacted]	65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-	[redacted]																										
W-Wide Flange1: W12X19: 36	266.26	244.43	9.36	266	[redacted]	266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-	[redacted]																										
W-Wide Flange1: W14X22: 21	638.14	616.93	27.26	638	[redacted]	638.14	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 28,403.61	$ 2,220.73	$ 1,237.99	$ 31,862.33	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 31,045.51	$ 3,803.31	$ 1,359.24	$ 36,208.06	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-	[redacted]																										
W-Wide Flange1: W14X43: 16	71.21	60.98	5.23	71	[redacted]	71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-	[redacted]																										
W-Wide Flange1: W14X82 2: 1	26.33	24.25	4	26	[redacted]	26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-	[redacted]																										
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38	[redacted]	37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-	[redacted]																										
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66	[redacted]	65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-	[redacted]																										
W-Wide Flange1: W16X31: 16	541.18	523.32	32.67	541	[redacted]	541.18	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 28,568.89	$ 2,078.13	$ 1,152.71	$ 31,799.74	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 31,648.21	$ 3,550.14	$ 1,271.77	$ 36,470.12	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-	[redacted]																										
W-Wide Flange1: W18X35: 8	320	310.65	21.95	320	[redacted]	320	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 19,209.60	$ 1,664.00	$ 688.00	$ 21,561.60	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 21,030.40	$ 2,876.80	$ 758.40	$ 24,665.60	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-	[redacted]																										
W-Wide Flange1: W18X40: 1	37.68	35.57	2.87	38	[redacted]	37.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 2,573.92	$ 195.94	$ 81.01	$ 2,850.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 2,827.51	$ 338.74	$ 89.30	$ 3,255.55	STD	Year 2009	100-102
W-Wide Flange1: W21X44				-	[redacted]																										
W-Wide Flange1: W21X44: 28	1124.74	1096.89	97.51	1,125	[redacted]	1124.74	051223754100	W21x44	E5	1064	0.075	L.F.	$ 75.04	$ 4.70	$ 1.94	$ 81.68	$ 84,400.49	$ 5,286.28	$ 2,182.00	$ 91,868.76	$ 82.80	$ 8.14	$ 2.14	$ 93.08	$ 93,128.47	$ 9,155.38	$ 2,406.94	$ 104,690.80	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-	[redacted]																										
W-Wide Flange1: W21X50: 13	389	369.23	37.09	389	[redacted]	389	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 33,216.71	$ 1,828.30	$ 754.66	$ 35,799.67	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 36,639.91	$ 3,166.46	$ 832.46	$ 40,638.83	STD	Year 2009	100-102
W-Wide Flange1: W30X99				-	[redacted]																										
W-Wide Flange1: W30X99: 4	130	129.91	26.02	130	[redacted]	130	051223756100	W30x99	E5	1200	0.067	L.F.	$ 168.71	$ 4.16	$ 1.72	$ 174.59	$ 21,932.30	$ 540.80	$ 223.60	$ 22,696.70	$ 186.30	$ 7.22	$ 1.90	$ 195.42	$ 24,219.00	$ 938.60	$ 247.00	$ 25,404.60	STD	Year 2009	100-102
W-Wide Flange: W18X119				-	[redacted]																										
W-Wide Flange: W18X119: 2	61	56.79	13.81	61	[redacted]	61	051223753980	W18x119	E5	900	0.089	L.F.	$ 203.34	$ 5.55	$ 2.29	$ 211.18	$ 12,403.74	$ 338.55	$ 139.69	$ 12,881.98	$ 223.09	$ 9.63	$ 2.52	$ 235.24	$ 13,608.49	$ 587.43	$ 153.72	$ 14,349.64	STD	Year 2009	100-102
W-Wide Flange: W18x192				-	[redacted]																										
W-Wide Flange: W18x192: 4	122	113.68	44.58	122	[redacted]	122	051223753980	W18x192	E5	900	0.089	L.F.	$ 328.08	$ 5.55	$ 2.29	$ 335.92	$ 40,025.76	$ 677.10	$ 279.38	$ 40,982.24	$ 359.94	$ 9.63	$ 2.52	$ 372.09	$ 43,912.68	$ 1,174.86	$ 307.44	$ 45,394.98	STD	Year 2009	100-102
W-Wide Flange: W21X122				-	[redacted]																										
W-Wide Flange: W21X122: 6	117	108.27	26.86	117	[redacted]	117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
28: 199	4333.56	4144.86	743.32		[redacted]	Total											$ 338,216.12	$ 19,153.41	$ 9,060.74	$ 366,430.28					$ 372,204.82	$ 33,005.92	$ 9,977.90	$ 415,188.67			
29																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88		[redacted]	60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8					[redacted]																										
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11		[redacted]	15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8					[redacted]																										
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68		[redacted]	191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-	[redacted]																										
W-Wide Flange1: W10X12: 2	52.69	49	1.18	53	[redacted]	52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-	[redacted]																										
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66	[redacted]	65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-	[redacted]																										
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266	[redacted]	266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-	[redacted]																										
W-Wide Flange1: W14X22: 33	1027.65	993.63	43.9	1,028	[redacted]	1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-	[redacted]																										
W-Wide Flange1: W14X43: 16	71.21	60.98	5.23	71	[redacted]	71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-	[redacted]																										
W-Wide Flange1: W14X82 2: 1	26.33	24.25	4	26	[redacted]	26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-	[redacted]																										
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38	[redacted]	37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-	[redacted]																										
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66	[redacted]	65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-	[redacted]																										
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151	[redacted]	151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-	[redacted]																										
W-Wide Flange1: W18X35: 36	1444.74	1407.76	99.49	1,445	[redacted]	1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-	[redacted]																										
W-Wide Flange1: W18X40: 11	337.68	321.32	25.96	338	[redacted]	337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-	[redacted]																										
W-Wide Flange1: W21X50: 7	219	213.4	21.44	219	[redacted]	219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W18X76				-	[redacted]																										
W-Wide Flange: W18X76: 2	61	56.79	8.73	61	[redacted]	61	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 7,892.18	$ 338.55	$ 139.69	$ 8,370.42	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 8,712.63	$ 587.43	$ 153.72	$ 9,453.78	STD	Year 2009	100-102
W-Wide Flange: W21X122				-	[redacted]																										
W-Wide Flange: W21X122: 6	117	108.27	26.86	117	[redacted]	117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
W-Wide Flange: W36X160				-	[redacted]																										
W-Wide Flange: W36X160: 4	122	113.68	36.75	122	[redacted]	122	051223757600	W36x160	E5	1150	0.07	L.F.	$ 273.73	$ 4.35	$ 1.80	$ 279.88	$ 33,395.06	$ 530.70	$ 219.60	$ 34,145.36	$ 301.98	$ 7.50	$ 1.97	$ 311.45	$ 36,841.56	$ 915.00	$ 240.34	$ 37,996.90	STD	Year 2009	100-102
29: 199	4333.06	4146.44	685.01		[redacted]	Total											$ 290,985.43	$ 19,647.51	$ 9,253.72	$ 319,886.67					$ 319,451.02	$ 33,839.84	$ 10,182.87	$ 363,473.76			

30																															
Concrete-Rectangular Beam: 36x30					[redacted]																										
Concrete-Rectangular Beam: 36x30: 6	60	60	371.88			60	033105350412	Concrete Rectangular Beam: 36"x30"				L.F.	$ 62.26	$ -	$ -	$ 62.26	$ 3,735.60	$ -	$ -	$ 3,735.60	$ 68.61	$ -	$ -	$ 68.61	$ 4,116.60	$ -	$ -	$ 4,116.60	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	170.83	7.68			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	49	1.18	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	993.9	43.91	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	60.98	5.23	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.25	4	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.06	7.93	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	146.06	9.12	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1408.09	99.51	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	321.32	25.96	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.4	21.44	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 2	61	56.79	8.73	61		61	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 7,892.18	$ 338.55	$ 139.69	$ 8,370.42	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 8,712.63	$ 587.43	$ 153.72	$ 9,453.78	STD	Year 2009	100-102
W-Wide Flange: W18X143				-																											
W-Wide Flange: W18X143: 4	122	113.68	33.06	122		122	051223753980	W18x143	E5	900	0.089	L.F.	$ 244.35	$ 5.55	$ 2.29	$ 252.19	$ 29,810.70	$ 677.10	$ 279.38	$ 30,767.18	$ 268.08	$ 9.63	$ 2.52	$ 280.23	$ 32,705.76	$ 1,174.86	$ 307.44	$ 34,188.06	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	108.27	26.86	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
30: 199	4333.06	4147.04	681.35			Total											$ 287,401.07	$ 19,793.91	$ 9,313.50	$ 316,508.49					$ 315,315.22	$ 34,099.70	$ 10,249.97	$ 359,664.92			
31																															
Concrete-Rectangular Beam: 36x24					[redacted]																										
Concrete-Rectangular Beam: 36x24: 2	20	20	99.17			20	033105350412	Concrete Rectangular Beam: 36"x24"				L.F.	$ 49.81	$ -	$ -	$ 49.81	$ 996.20	$ -	$ -	$ 996.20	$ 54.89	$ -	$ -	$ 54.89	$ 1,097.80	$ -	$ -	$ 1,097.80	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	173.33	7.79			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.94	49.8	1.2	53		52.94	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,084.74	$ 304.41	$ 169.41	$ 1,558.55	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,205.44	$ 520.93	$ 186.35	$ 1,912.72	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.64	994.69	43.94	1,028		1027.64	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.26	$ 3,576.19	$ 1,993.62	$ 51,310.07	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,994.69	$ 6,124.73	$ 2,188.87	$ 58,308.29	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	61.8	5.3	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.55	4.05	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.31	7.99	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.35	9.26	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1410.92	99.71	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	322.15	26.03	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.98	21.5	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.37	1.9	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.35	2.27	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	172.44	26.49	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	108.87	27.01	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
31: 199	4371.31	4194.33	398.48			Total											$ 274,434.71	$ 20,080.02	$ 9,472.23	$ 303,986.97					$ 301,199.20	$ 34,588.04	$ 10,425.16	$ 346,212.42			
32																															
Concrete-Rectangular Beam: 36x24					[redacted]																										
Concrete-Rectangular Beam: 36x24: 2	20	20	99.17			20	033105350412	Concrete Rectangular Beam: 36"x24"				L.F.	$ 49.81	$ -	$ -	$ 49.81	$ 996.20	$ -	$ -	$ 996.20	$ 54.89	$ -	$ -	$ 54.89	$ 1,097.80	$ -	$ -	$ 1,097.80	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	173.33	7.79			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	49.55	1.19	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	994.69	43.94	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	61.8	5.3	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.55	4.05	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.31	7.99	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.35	9.26	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1410.92	99.71	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	322.15	26.03	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.98	21.5	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.37	1.9	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.35	2.27	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	172.44	26.49	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	108.87	27.01	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
32: 199	4371.05	4194.08	398.47			Total											$ 274,430.03	$ 20,078.61	$ 9,471.45	$ 303,980.10					$ 301,193.99	$ 34,585.64	$ 10,424.30	$ 346,203.96			

33																															
Concrete-Rectangular Beam: 36x24					[redacted]																										
Concrete-Rectangular Beam: 36x24: 2	20	20	99.17			20	033105350412	Concrete Rectangular Beam: 36"x24"				L.F.	$ 49.81	$ -	$ -	$ 49.81	$ 996.20	$ -	$ -	$ 996.20	$ 54.89	$ -	$ -	$ 54.89	$ 1,097.80	$ -	$ -	$ 1,097.80	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	173.33	7.79			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	49.55	1.19	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	994.69	43.94	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	61.8	5.3	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.55	4.05	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.31	7.99	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.35	9.26	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1410.92	99.71	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	322.15	26.03	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	213.98	21.5	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.37	1.9	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.35	2.27	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	172.44	26.49	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	108.87	27.01	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
33: 199	4371.05	4194.08	398.47			Total											$ 274,430.03	$ 20,078.61	$ 9,471.45	$ 303,980.10					$ 301,193.99	$ 34,585.64	$ 10,424.30	$ 346,203.96			
34																															
Concrete-Rectangular Beam: 36x24					[redacted]																										
Concrete-Rectangular Beam: 36x24: 2	20	20	99.17			20	033105350412	Concrete Rectangular Beam: 36"x24"				L.F.	$ 49.81	$ -	$ -	$ 49.81	$ 996.20	$ -	$ -	$ 996.20	$ 54.89	$ -	$ -	$ 54.89	$ 1,097.80	$ -	$ -	$ 1,097.80	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	13.56	9.89	0.09			13.56	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 61.56	$ 85.02	$ 47.32	$ 193.91	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 67.80	$ 145.91	$ 51.93	$ 265.64	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	193.49	174.83	7.85			193.49	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,909.87	$ 1,213.18	$ 675.28	$ 9,798.33	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,710.92	$ 2,081.95	$ 741.07	$ 11,533.94	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	49.58	1.19	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.66	994.77	43.95	1,028		1027.66	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,741.15	$ 3,576.26	$ 1,993.66	$ 51,311.06	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.66	$ 6,124.85	$ 2,188.92	$ 58,309.43	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	61.95	5.31	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.58	4.05	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.31	7.99	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.35	9.26	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1411.07	99.72	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	322.2	26.03	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	214.01	21.5	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.37	1.9	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.35	2.27	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	172.55	26.51	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	109.03	27.05	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
34: 199	4370.72	4194.49	398.62			Total											$ 274,483.76	$ 20,076.46	$ 9,470.24	$ 304,030.46					$ 301,253.16	$ 34,581.94	$ 10,422.99	$ 346,258.10			
35																															
Concrete-Rectangular Beam: 36x24					[redacted]																										
Concrete-Rectangular Beam: 36x24: 2	20	20	99.17			20	033105350412	Concrete Rectangular Beam: 36"x24"				L.F.	$ 49.81	$ -	$ -	$ 49.81	$ 996.20	$ -	$ -	$ 996.20	$ 54.89	$ -	$ -	$ 54.89	$ 1,097.80	$ -	$ -	$ 1,097.80	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	173.33	7.79			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	49.58	1.19	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	994.77	43.95	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	61.95	5.31	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.58	4.05	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.31	7.99	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.35	9.26	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1411.07	99.72	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	322.2	26.03	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	214.01	21.5	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.37	1.9	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.35	2.27	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	172.55	26.51	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	109.03	27.05	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
35: 199	4371.05	4194.86	398.57			Total											$ 274,430.03	$ 20,078.61	$ 9,471.45	$ 303,980.10					$ 301,193.99	$ 34,585.64	$ 10,424.30	$ 346,203.96			

36																															
Concrete-Rectangular Beam: 36x24					[redacted]																										
Concrete-Rectangular Beam: 36x24: 2	20	20	99.17			20	033105350412	Concrete Rectangular Beam: 36"x24"				L.F.	$ 49.81	$ -	$ -	$ 49.81	$ 996.20	$ -	$ -	$ 996.20	$ 54.89	$ -	$ -	$ 54.89	$ 1,097.80	$ -	$ -	$ 1,097.80	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	173.33	7.79			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	49.58	1.19	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	994.77	43.95	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	61.95	5.31	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.58	4.05	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.31	7.99	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.35	9.26	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1411.07	99.72	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	322.2	26.03	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	214.01	21.5	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.37	1.9	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.35	2.27	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	172.55	26.51	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	109.03	27.05	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
36: 199	4371.05	4194.86	398.57			Total											$ 274,430.03	$ 20,078.61	$ 9,471.45	$ 303,980.10					$ 301,193.99	$ 34,585.64	$ 10,424.30	$ 346,203.96			
37																															
Concrete-Rectangular Beam: 36x24					[redacted]																										
Concrete-Rectangular Beam: 36x24: 2	20	20	99.17			20	033105350412	Concrete Rectangular Beam: 36"x24"				L.F.	$ 49.81	$ -	$ -	$ 49.81	$ 996.20	$ -	$ -	$ 996.20	$ 54.89	$ -	$ -	$ 54.89	$ 1,097.80	$ -	$ -	$ 1,097.80	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	13.56	9.89	0.09			13.56	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 61.56	$ 85.02	$ 47.32	$ 193.91	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 67.80	$ 145.91	$ 51.93	$ 265.64	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	193.49	174.83	7.85			193.49	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,909.87	$ 1,213.18	$ 675.28	$ 9,798.33	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,710.92	$ 2,081.95	$ 741.07	$ 11,533.94	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	49.6	1.19	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	994.82	43.95	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	62.15	5.33	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.6	4.05	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.31	7.99	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.35	9.26	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1411.27	99.74	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	322.36	26.04	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	214.03	21.5	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.37	1.9	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.35	2.27	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 6	183	172.66	26.53	183		183	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 23,676.54	$ 1,015.65	$ 419.07	$ 25,111.26	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 26,137.89	$ 1,762.29	$ 461.16	$ 28,361.34	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	109.14	27.08	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
37: 199	4370.72	4195.36	398.72			Total											$ 274,483.31	$ 20,076.42	$ 9,470.22	$ 304,029.96					$ 301,252.67	$ 34,581.88	$ 10,422.96	$ 346,257.53			
38																															
Concrete-Rectangular Beam: 36x24					[redacted]																										
Concrete-Rectangular Beam: 36x24: 2	20	20	99.17			20	033105350412	Concrete Rectangular Beam: 36"x24"				L.F.	$ 49.81	$ -	$ -	$ 49.81	$ 996.20	$ -	$ -	$ 996.20	$ 54.89	$ -	$ -	$ 54.89	$ 1,097.80	$ -	$ -	$ 1,097.80	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	173.33	7.79			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	49.59	1.19	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	994.78	43.95	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	62.15	5.33	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.6	4.05	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.31	7.99	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.35	9.26	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1411.23	99.74	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	322.36	26.04	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	214.03	21.5	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.37	1.9	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.35	2.27	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 2	61	57.53	8.84	61		61	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 7,892.18	$ 338.55	$ 139.69	$ 8,370.42	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 8,712.63	$ 587.43	$ 153.72	$ 9,453.78	STD	Year 2009	100-102
W-Wide Flange: W18X86				-																											
W-Wide Flange: W18X86: 4	122	115.13	20.14	122		122	051223753940	W18x86	E5	900	0.089	L.F.	$ 153.35	$ 5.55	$ 2.29	$ 161.19	$ 18,708.70	$ 677.10	$ 279.38	$ 19,665.18	$ 161.62	$ 9.63	$ 2.52	$ 173.77	$ 19,717.64	$ 1,174.86	$ 307.44	$ 21,199.94	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	109.14	27.08	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
38: 199	4371.05	4195.66	401.11			Total											$ 277,354.37	$ 20,078.61	$ 9,471.45	$ 306,904.44					$ 303,486.37	$ 34,585.64	$ 10,424.30	$ 348,496.34			

39																															
Concrete-Rectangular Beam: 36x24					[redacted]																										
Concrete-Rectangular Beam: 36x24: 2	20	20	99.17			20	033105350412	Concrete Rectangular Beam: 36"x24"				L.F.	$ 49.81	$ -	$ -	$ 49.81	$ 996.20	$ -	$ -	$ 996.20	$ 54.89	$ -	$ -	$ 54.89	$ 1,097.80	$ -	$ -	$ 1,097.80	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	173.33	7.79			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	49.59	1.19	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	994.78	43.95	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	62.15	5.33	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.6	4.05	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.31	7.99	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.35	9.26	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1411.23	99.74	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	322.36	26.04	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	214.03	21.5	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.37	1.9	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.35	2.27	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 2	61	57.53	8.84	61		61	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 7,892.18	$ 338.55	$ 139.69	$ 8,370.42	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 8,712.63	$ 587.43	$ 153.72	$ 9,453.78	STD	Year 2009	100-102
W-Wide Flange: W18X86				-																											
W-Wide Flange: W18X86: 4	122	115.13	20.14	122		122	051223753940	W18x86	E5	900	0.089	L.F.	$ 153.35	$ 5.55	$ 2.29	$ 161.19	$ 18,708.70	$ 677.10	$ 279.38	$ 19,665.18	$ 161.62	$ 9.63	$ 2.52	$ 173.77	$ 19,717.64	$ 1,174.86	$ 307.44	$ 21,199.94	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	109.14	27.08	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
39: 199	4371.05	4195.66	401.11			Total											$ 277,354.37	$ 20,078.61	$ 9,471.45	$ 306,904.44					$ 303,486.37	$ 34,585.64	$ 10,424.30	$ 348,496.34			
40																															
Concrete-Rectangular Beam: 36x24					[redacted]																										
Concrete-Rectangular Beam: 36x24: 2	20	20	99.17			20	033105350412	Concrete Rectangular Beam: 36"x24"				L.F.	$ 49.81	$ -	$ -	$ 49.81	$ 996.20	$ -	$ -	$ 996.20	$ 54.89	$ -	$ -	$ 54.89	$ 1,097.80	$ -	$ -	$ 1,097.80	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	13.56	9.89	0.09			13.56	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 61.56	$ 85.02	$ 47.32	$ 193.91	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 67.80	$ 145.91	$ 51.93	$ 265.64	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	193.49	174.83	7.85			193.49	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,909.87	$ 1,213.18	$ 675.28	$ 9,798.33	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,710.92	$ 2,081.95	$ 741.07	$ 11,533.94	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	49.62	1.19	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	994.84	43.95	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	62.18	5.33	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.62	4.06	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.31	7.99	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.35	9.26	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1411.28	99.74	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	322.91	26.09	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	214.05	21.5	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.37	1.9	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.35	2.27	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 2	61	57.57	8.84	61		61	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 7,892.18	$ 338.55	$ 139.69	$ 8,370.42	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 8,712.63	$ 587.43	$ 153.72	$ 9,453.78	STD	Year 2009	100-102
W-Wide Flange: W18X86				-																											
W-Wide Flange: W18X86: 4	122	115.17	20.14	122		122	051223753940	W18x86	E5	900	0.089	L.F.	$ 153.35	$ 5.55	$ 2.29	$ 161.19	$ 18,708.70	$ 677.10	$ 279.38	$ 19,665.18	$ 161.62	$ 9.63	$ 2.52	$ 173.77	$ 19,717.64	$ 1,174.86	$ 307.44	$ 21,199.94	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	109.2	27.09	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
40: 199	4370.72	4196.17	401.25			Total											$ 277,407.65	$ 20,076.42	$ 9,470.22	$ 306,954.30					$ 303,545.05	$ 34,581.88	$ 10,422.96	$ 348,549.91			
41																															
Concrete-Rectangular Beam: 36x24					[redacted]																										
Concrete-Rectangular Beam: 36x24: 2	20	20	99.17			20	033105350412	Concrete Rectangular Beam: 36"x24"				L.F.	$ 49.81	$ -	$ -	$ 49.81	$ 996.20	$ -	$ -	$ 996.20	$ 54.89	$ -	$ -	$ 54.89	$ 1,097.80	$ -	$ -	$ 1,097.80	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	173.33	7.79			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	49.62	1.19	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	994.84	43.95	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	62.18	5.33	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.62	4.06	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.31	7.99	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.35	9.26	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1411.28	99.74	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	322.91	26.09	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	214.05	21.5	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.37	1.9	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.35	2.27	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 2	61	57.57	8.84	61		61	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 7,892.18	$ 338.55	$ 139.69	$ 8,370.42	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 8,712.63	$ 587.43	$ 153.72	$ 9,453.78	STD	Year 2009	100-102
W-Wide Flange: W18X86				-																											
W-Wide Flange: W18X86: 4	122	115.17	20.14	122		122	051223753940	W18x86	E5	900	0.089	L.F.	$ 153.35	$ 5.55	$ 2.29	$ 161.19	$ 18,708.70	$ 677.10	$ 279.38	$ 19,665.18	$ 161.62	$ 9.63	$ 2.52	$ 173.77	$ 19,717.64	$ 1,174.86	$ 307.44	$ 21,199.94	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	109.2	27.09	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
41: 199	4371.05	4196.54	401.2			Total											$ 277,354.37	$ 20,078.61	$ 9,471.45	$ 306,904.44					$ 303,486.37	$ 34,585.64	$ 10,424.30	$ 348,496.34			

42																															
Concrete-Rectangular Beam: 36x18					[redacted]																										
Concrete-Rectangular Beam: 36x18: 2	20	20	74.38			20	033105350412	Concrete Rectangular Beam: 36"x18"				L.F.	37.36	-	-	37.36	747.20	-	-	747.20	41.17	-	-	41.17	823.40	-	-	823.40	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	4.54	6.27	3.49	14.30	70.01	96.68	53.82	220.51	5.00	10.76	3.83	19.59	77.10	165.92	59.06	302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	175.83	7.9			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	40.88	6.27	3.49	50.64	7,848.14	1,203.71	670.01	9,721.87	45.02	10.76	3.83	59.61	8,642.94	2,065.70	735.28	11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	50.12	1.2	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	20.49	5.75	3.20	29.44	1,079.62	302.97	168.61	1,551.19	22.77	9.84	3.52	36.13	1,199.75	518.47	185.47	1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	27.43	3.92	2.18	33.53	1,800.23	257.27	143.07	2,200.57	30.02	6.71	2.40	39.13	1,970.21	440.38	157.51	2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	32.57	3.92	2.18	38.67	8,672.09	1,043.74	580.45	10,296.27	35.65	6.71	2.40	44.76	9,492.17	1,786.60	639.02	11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	995.84	43.99	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	44.51	3.48	1.94	49.93	45,740.70	3,576.22	1,993.64	51,310.56	48.65	5.96	2.13	56.74	49,995.17	6,124.79	2,188.89	58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	62.18	5.33	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	73.49	4.26	2.37	80.12	5,233.22	303.35	168.77	5,705.35	80.73	7.29	2.60	90.62	5,748.78	519.12	185.15	6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.87	4.1	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	154.22	4.67	2.59	161.48	4,060.61	122.96	68.19	4,251.77	168.71	8.00	2.85	179.56	4,442.13	210.64	75.04	4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.56	8.04	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	204.93	4.80	2.67	212.40	7,719.71	180.82	100.58	8,001.11	225.63	8.21	2.93	236.77	8,499.48	309.27	110.37	8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	44.51	3.46	1.92	49.89	2,921.19	227.08	126.01	3,274.28	48.65	5.90	2.12	56.67	3,192.90	387.22	139.14	3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.6	9.28	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	52.79	3.84	2.13	58.76	7,981.32	580.57	322.03	8,883.92	58.48	6.56	2.35	67.39	8,841.59	991.81	355.30	10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1413.28	99.88	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	60.03	5.20	2.15	67.38	86,727.74	7,512.65	3,106.19	97,346.58	65.72	8.99	2.37	77.08	94,948.31	12,988.21	3,424.03	111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	323.16	26.11	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	68.31	5.20	2.15	75.66	23,066.92	1,755.94	726.01	25,548.87	75.04	8.99	2.37	86.40	25,339.51	3,035.74	800.30	29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	214.55	21.55	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	85.39	4.70	1.94	92.03	18,700.41	1,029.30	424.86	20,154.57	94.19	8.14	2.14	104.47	20,627.61	1,782.66	468.66	22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.87	1.93	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	44.51	3.46	1.92	49.89	1,735.89	134.94	74.88	1,945.71	48.65	5.90	2.12	56.67	1,897.35	230.10	82.68	2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.85	2.3	39		39	051223752900	W16x31	E2	900	0.062	L.F.	52.79	3.84	2.13	58.76	2,058.81	149.76	83.07	2,291.64	58.48	6.56	2.35	67.39	2,280.72	255.84	91.65	2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 2	61	58.07	8.92	61		61	051223753940	W18x76	E5	900	0.089	L.F.	129.38	5.55	2.29	137.22	7,892.18	338.55	139.69	8,370.42	142.83	9.63	2.52	154.98	8,712.63	587.43	153.72	9,453.78	STD	Year 2009	100-102
W-Wide Flange: W18X86				-																											
W-Wide Flange: W18X86: 4	122	116.17	20.32	122		122	051223753940	W18x86	E5	900	0.089	L.F.	153.35	5.55	2.29	161.19	18,708.70	677.10	279.38	19,665.18	161.62	9.63	2.52	173.77	19,717.64	1,174.86	307.44	21,199.94	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	109.2	27.09	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	208.04	5.00	2.07	215.11	24,340.68	585.00	242.19	25,167.87	228.74	8.64	2.27	239.65	26,762.58	1,010.88	265.59	28,039.05	STD	Year 2009	100-102
42: 199	4371.05	4206.54	377.21			**Total**											**277,105.37**	**20,078.61**	**9,471.45**	**306,655.44**					**303,211.97**	**34,585.64**	**10,424.30**	**348,221.94**			
43																															
Concrete-Rectangular Beam: 36x18					[redacted]																										
Concrete-Rectangular Beam: 36x18: 2	20	20	74.38			20	033105350412	Concrete Rectangular Beam: 36"x18"				L.F.	37.36	-	-	37.36	747.20	-	-	747.20	41.17	-	-	41.17	823.40	-	-	823.40	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	13.56	9.89	0.09			13.56	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	4.54	6.27	3.49	14.30	61.56	85.02	47.32	193.91	5.00	10.76	3.83	19.59	67.80	145.91	51.93	265.64	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	193.49	177.33	7.97			193.49	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	40.88	6.27	3.49	50.64	7,909.87	1,213.18	675.28	9,798.33	45.02	10.76	3.83	59.61	8,710.92	2,081.95	741.07	11,533.94	STD	Year 2009	100-102
W-Wide Flange1: W10X12																															
W-Wide Flange1: W10X12: 2	52.7	50.14	1.2	53		52.7	051223750600	W10x12	E2	600	0.093	L.F.	20.49	5.75	3.20	29.44	1,079.82	303.03	168.64	1,551.49	22.77	9.84	3.52	36.13	1,199.98	518.57	185.50	1,904.05	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	27.43	3.92	2.18	33.53	1,800.23	257.27	143.07	2,200.57	30.02	6.71	2.40	39.13	1,970.21	440.38	157.51	2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	32.57	3.92	2.18	38.67	8,672.09	1,043.74	580.45	10,296.27	35.65	6.71	2.40	44.76	9,492.17	1,786.60	639.02	11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	996.03	44	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	44.51	3.48	1.94	49.93	45,740.70	3,576.22	1,993.64	51,310.56	48.65	5.96	2.13	56.74	49,995.17	6,124.79	2,188.89	58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	63.02	5.4	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	73.49	4.26	2.37	80.12	5,233.22	303.35	168.77	5,705.35	80.73	7.29	2.60	90.62	5,748.78	519.12	185.15	6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.88	4.1	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	154.22	4.67	2.59	161.48	4,060.61	122.96	68.19	4,251.77	168.71	8.00	2.85	179.56	4,442.13	210.64	75.04	4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.56	8.04	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	204.93	4.80	2.67	212.40	7,719.71	180.82	100.58	8,001.11	225.63	8.21	2.93	236.77	8,499.48	309.27	110.37	8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	44.51	3.46	1.92	49.89	2,921.19	227.08	126.01	3,274.28	48.65	5.90	2.12	56.67	3,192.90	387.22	139.14	3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.6	9.28	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	52.79	3.84	2.13	58.76	7,981.32	580.57	322.03	8,883.92	58.48	6.56	2.35	67.39	8,841.59	991.81	355.30	10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1413.53	99.9	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	60.03	5.20	2.15	67.38	86,727.74	7,512.65	3,106.19	97,346.58	65.72	8.99	2.37	77.08	94,948.31	12,988.21	3,424.03	111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	323.98	26.17	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	68.31	5.20	2.15	75.66	23,066.92	1,755.94	726.01	25,548.87	75.04	8.99	2.37	86.40	25,339.51	3,035.74	800.30	29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	214.58	21.56	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	85.39	4.70	1.94	92.03	18,700.41	1,029.30	424.86	20,154.57	94.19	8.14	2.14	104.47	20,627.61	1,782.66	468.66	22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.87	1.93	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	44.51	3.46	1.92	49.89	1,735.89	134.94	74.88	1,945.71	48.65	5.90	2.12	56.67	1,897.35	230.10	82.68	2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.85	2.3	39		39	051223752900	W16x31	E2	900	0.062	L.F.	52.79	3.84	2.13	58.76	2,058.81	149.76	83.07	2,291.64	58.48	6.56	2.35	67.39	2,280.72	255.84	91.65	2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 2	61	58.1	8.93	61		61	051223753940	W18x76	E5	900	0.089	L.F.	129.38	5.55	2.29	137.22	7,892.18	338.55	139.69	8,370.42	142.83	9.63	2.52	154.98	8,712.63	587.43	153.72	9,453.78	STD	Year 2009	100-102
W-Wide Flange: W18X86				-																											
W-Wide Flange: W18X86: 4	122	116.22	20.33	122		122	051223753940	W18x86	E5	900	0.089	L.F.	153.35	5.55	2.29	161.19	18,708.70	677.10	279.38	19,665.18	161.62	9.63	2.52	173.77	19,717.64	1,174.86	307.44	21,199.94	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	109.26	27.11	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	208.04	5.00	2.07	215.11	24,340.68	585.00	242.19	25,167.87	228.74	8.64	2.27	239.65	26,762.58	1,010.88	265.59	28,039.05	STD	Year 2009	100-102
43: 199	4370.72	4208.48	377.45			**Total**											**277,158.85**	**20,076.48**	**9,470.25**	**306,705.60**					**303,270.88**	**34,581.98**	**10,422.99**	**348,275.87**			
44																															
Concrete-Rectangular Beam: 36x18					[redacted]																										
Concrete-Rectangular Beam: 36x18: 2	20	20	74.38			20	033105350412	Concrete Rectangular Beam: 36"x18"				L.F.	37.36	-	-	37.36	747.20	-	-	747.20	41.17	-	-	41.17	823.40	-	-	823.40	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	4.54	6.27	3.49	14.30	70.01	96.68	53.82	220.51	5.00	10.76	3.83	19.59	77.10	165.92	59.06	302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	175.83	7.9			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	40.88	6.27	3.49	50.64	7,848.14	1,203.71	670.01	9,721.87	45.02	10.76	3.83	59.61	8,642.94	2,065.70	735.28	11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	50.14	1.2	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	20.49	5.75	3.20	29.44	1,079.62	302.97	168.61	1,551.19	22.77	9.84	3.52	36.13	1,199.75	518.47	185.47	1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	27.43	3.92	2.18	33.53	1,800.23	257.27	143.07	2,200.57	30.02	6.71	2.40	39.13	1,970.21	440.38	157.51	2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	32.57	3.92	2.18	38.67	8,672.09	1,043.74	580.45	10,296.27	35.65	6.71	2.40	44.76	9,492.17	1,786.60	639.02	11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	996.03	44	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	44.51	3.48	1.94	49.93	45,740.70	3,576.22	1,993.64	51,310.56	48.65	5.96	2.13	56.74	49,995.17	6,124.79	2,188.89	58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	63.02	5.4	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	73.49	4.26	2.37	80.12	5,233.22	303.35	168.77	5,705.35	80.73	7.29	2.60	90.62	5,748.78	519.12	185.15	6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.88	4.1	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	154.22	4.67	2.59	161.48	4,060.61	122.96	68.19	4,251.77	168.71	8.00	2.85	179.56	4,442.13	210.64	75.04	4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.56	8.04	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	204.93	4.80	2.67	212.40	7,719.71	180.82	100.58	8,001.11	225.63	8.21	2.93	236.77	8,499.48	309.27	110.37	8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	44.51	3.46	1.92	49.89	2,921.19	227.08	126.01	3,274.28	48.65	5.90	2.12	56.67	3,192.90	387.22	139.14	3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.6	9.28	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	52.79	3.84	2.13	58.76	7,981.32	580.57	322.03	8,883.92	58.48	6.56	2.35	67.39	8,841.59	991.81	355.30	10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1413.53	99.9	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	60.03	5.20	2.15	67.38	86,727.74	7,512.65	3,106.19	97,346.58	65.72	8.99	2.37	77.08	94,948.31	12,988.21	3,424.03	111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	323.98	26.17	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	68.31	5.20	2.15	75.66	23,066.92	1,755.94	726.01	25,548.87	75.04	8.99	2.37	86.40	25,339.51	3,035.74	800.30	29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	214.58	21.56	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	85.39	4.70	1.94	92.03	18,700.41	1,029.30	424.86	20,154.57	94.19	8.14	2.14	104.47	20,627.61	1,782.66	468.66	22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.87	1.93	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	44.51	3.46	1.92	49.89	1,735.89	134.94	74.88	1,945.71	48.65	5.90	2.12	56.67	1,897.35	230.10	82.68	2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.85	2.3	39		39	051223752900	W16x31	E2	900	0.062	L.F.	52.79	3.84	2.13	58.76	2,058.81	149.76	83.07	2,291.64	58.48	6.56	2.35	67.39	2,280.72	255.84	91.65	2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 2	61	58.1	8.93	61		61	051223753940	W18x76	E5	900	0.089	L.F.	129.38	5.55	2.29	137.22	7,892.18	338.55	139.69	8,370.42	142.83	9.63	2.52	154.98	8,712.63	587.43	153.72	9,453.78	STD	Year 2009	100-102
W-Wide Flange: W18X86				-																											
W-Wide Flange: W18X86: 4	122	116.22	20.33	122		122	051223753940	W18x86	E5	900	0.089	L.F.	153.35	5.55	2.29	161.19	18,708.70	677.10	279.38	19,665.18	161.62	9.63	2.52	173.77	19,717.64	1,174.86	307.44	21,199.94	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	109.26	27.11	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	208.04	5.00	2.07	215.11	24,340.68	585.00	242.19	25,167.87	228.74	8.64	2.27	239.65	26,762.58	1,010.88	265.59	28,039.05	STD	Year 2009	100-102
44: 199	4371.05	4208.85	377.4			**Total**											**277,105.37**	**20,078.61**	**9,471.45**	**306,655.44**					**303,211.97**	**34,585.64**	**10,424.30**	**348,221.94**			

45																															
Concrete-Rectangular Beam: 36x18					[redacted]																										
Concrete-Rectangular Beam: 36x18: 2	20	20	74.38		[redacted]	20	033105350412	Concrete Rectangular Beam: 36"x18"				L.F.	$ 37.36	$ -	$ -	$ 37.36	$ 747.20	$ -	$ -	$ 747.20	$ 41.17	$ -	$ -	$ 41.17	$ 823.40	$ -	$ -	$ 823.40	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8					[redacted]																										
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11		[redacted]	15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8					[redacted]																										
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	175.83	7.9		[redacted]	191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-	[redacted]																										
W-Wide Flange1: W10X12: 2	52.69	50.14	1.2	53	[redacted]	52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-	[redacted]																										
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66	[redacted]	65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-	[redacted]																										
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266	[redacted]	266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-	[redacted]																										
W-Wide Flange1: W14X22: 33	1027.65	996.03	44	1,028	[redacted]	1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-	[redacted]																										
W-Wide Flange1: W14X43: 16	71.21	63.02	5.4	71	[redacted]	71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-	[redacted]																										
W-Wide Flange1: W14X82 2: 1	26.33	24.88	4.1	26	[redacted]	26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-	[redacted]																										
W-Wide Flange1: W14X109 2: 1	37.67	36.56	8.04	38	[redacted]	37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-	[redacted]																										
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66	[redacted]	65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-	[redacted]																										
W-Wide Flange1: W16X31: 4	151.19	148.6	9.28	151	[redacted]	151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-	[redacted]																										
W-Wide Flange1: W18X35: 36	1444.74	1413.53	99.9	1,445	[redacted]	1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-	[redacted]																										
W-Wide Flange1: W18X40: 11	337.68	323.98	26.17	338	[redacted]	337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-	[redacted]																										
W-Wide Flange1: W21X50: 7	219	214.58	21.56	219	[redacted]	219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-	[redacted]																										
W-Wide Flange: W16X26: 2	39	36.87	1.93	39	[redacted]	39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-	[redacted]																										
W-Wide Flange: W16X31: 2	39	36.85	2.3	39	[redacted]	39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-	[redacted]																										
W-Wide Flange: W18X76: 2	61	58.1	8.93	61	[redacted]	61	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 7,892.18	$ 338.55	$ 139.69	$ 8,370.42	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 8,712.63	$ 587.43	$ 153.72	$ 9,453.78	STD	Year 2009	100-102
W-Wide Flange: W18X86				-	[redacted]																										
W-Wide Flange: W18X86: 4	122	116.22	20.33	122	[redacted]	122	051223753940	W18x86	E5	900	0.089	L.F.	$ 153.35	$ 5.55	$ 2.29	$ 161.19	$ 18,708.70	$ 677.10	$ 279.38	$ 19,665.18	$ 161.62	$ 9.63	$ 2.52	$ 173.77	$ 19,717.64	$ 1,174.86	$ 307.44	$ 21,199.94	STD	Year 2009	100-102
W-Wide Flange: W21X122				-	[redacted]																										
W-Wide Flange: W21X122: 6	117	109.26	27.11	117	[redacted]	117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
45: 199	**4371.05**	**4208.85**	**377.4**		[redacted]	**Total**											**$ 277,105.37**	**$ 20,078.61**	**$ 9,471.45**	**$ 306,655.44**					**$ 303,211.97**	**$ 34,585.64**	**$ 10,424.30**	**$ 348,221.94**			
46																															
Concrete-Rectangular Beam: 36x18					[redacted]																										
Concrete-Rectangular Beam: 36x18: 2	20	20	74.38		[redacted]	20	033105350412	Concrete Rectangular Beam: 36"x18"				L.F.	$ 37.36	$ -	$ -	$ 37.36	$ 747.20	$ -	$ -	$ 747.20	$ 41.17	$ -	$ -	$ 41.17	$ 823.40	$ -	$ -	$ 823.40	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8					[redacted]																										
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	13.56	9.89	0.09		[redacted]	13.56	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 61.56	$ 85.02	$ 47.32	$ 193.91	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 67.80	$ 145.91	$ 51.93	$ 265.64	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8					[redacted]																										
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	193.49	177.33	7.97		[redacted]	193.49	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,909.87	$ 1,213.18	$ 675.28	$ 9,798.33	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,710.92	$ 2,081.95	$ 741.07	$ 11,533.94	STD	Year 2009	100-102
W-Wide Flange1: W10X12					[redacted]																										
W-Wide Flange1: W10X12: 2	52.7	50.16	1.2	53	[redacted]	52.7	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.82	$ 303.03	$ 168.64	$ 1,551.49	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.98	$ 518.57	$ 185.50	$ 1,904.05	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-	[redacted]																										
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66	[redacted]	65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-	[redacted]																										
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266	[redacted]	266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-	[redacted]																										
W-Wide Flange1: W14X22: 33	1027.65	996.22	44.01	1,028	[redacted]	1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-	[redacted]																										
W-Wide Flange1: W14X43: 16	71.21	63.17	5.42	71	[redacted]	71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-	[redacted]																										
W-Wide Flange1: W14X82 2: 1	26.33	24.9	4.1	26	[redacted]	26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-	[redacted]																										
W-Wide Flange1: W14X109 2: 1	37.67	36.56	8.04	38	[redacted]	37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-	[redacted]																										
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66	[redacted]	65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-	[redacted]																										
W-Wide Flange1: W16X31: 4	151.19	148.6	9.28	151	[redacted]	151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-	[redacted]																										
W-Wide Flange1: W18X35: 36	1444.74	1413.68	99.91	1,445	[redacted]	1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-	[redacted]																										
W-Wide Flange1: W18X40: 11	337.68	324.08	26.18	338	[redacted]	337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-	[redacted]																										
W-Wide Flange1: W21X50: 7	219	214.73	21.57	219	[redacted]	219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-	[redacted]																										
W-Wide Flange: W16X26: 2	39	36.87	1.93	39	[redacted]	39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-	[redacted]																										
W-Wide Flange: W16X31: 2	39	36.85	2.3	39	[redacted]	39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-	[redacted]																										
W-Wide Flange: W18X76: 2	61	58.14	8.93	61	[redacted]	61	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 7,892.18	$ 338.55	$ 139.69	$ 8,370.42	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 8,712.63	$ 587.43	$ 153.72	$ 9,453.78	STD	Year 2009	100-102
W-Wide Flange: W18X86				-	[redacted]																										
W-Wide Flange: W18X86: 4	122	116.3	20.34	122	[redacted]	122	051223753940	W18x86	E5	900	0.089	L.F.	$ 153.35	$ 5.55	$ 2.29	$ 161.19	$ 18,708.70	$ 677.10	$ 279.38	$ 19,665.18	$ 161.62	$ 9.63	$ 2.52	$ 173.77	$ 19,717.64	$ 1,174.86	$ 307.44	$ 21,199.94	STD	Year 2009	100-102
W-Wide Flange: W21X122				-	[redacted]																										
W-Wide Flange: W21X122: 6	117	109.41	27.14	117	[redacted]	117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
46: 199	**4370.72**	**4209.54**	**377.57**		[redacted]	**Total**											**$ 277,158.85**	**$ 20,076.48**	**$ 9,470.25**	**$ 306,705.60**					**$ 303,270.88**	**$ 34,581.98**	**$ 10,422.99**	**$ 348,275.87**			
47																															
Concrete-Rectangular Beam: 36x18					[redacted]																										
Concrete-Rectangular Beam: 36x18: 2	20	20	74.38		[redacted]	20	033105350412	Concrete Rectangular Beam: 36"x18"				L.F.	$ 37.36	$ -	$ -	$ 37.36	$ 747.20	$ -	$ -	$ 747.20	$ 41.17	$ -	$ -	$ 41.17	$ 823.40	$ -	$ -	$ 823.40	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8					[redacted]																										
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11		[redacted]	15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8					[redacted]																										
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	175.83	7.9		[redacted]	191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-	[redacted]																										
W-Wide Flange1: W10X12: 2	52.69	50.16	1.2	53	[redacted]	52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-	[redacted]																										
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66	[redacted]	65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-	[redacted]																										
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266	[redacted]	266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-	[redacted]																										
W-Wide Flange1: W14X22: 33	1027.65	996.22	44.01	1,028	[redacted]	1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-	[redacted]																										
W-Wide Flange1: W14X43: 16	71.21	63.17	5.42	71	[redacted]	71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-	[redacted]																										
W-Wide Flange1: W14X82 2: 1	26.33	24.9	4.1	26	[redacted]	26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-	[redacted]																										
W-Wide Flange1: W14X109 2: 1	37.67	36.56	8.04	38	[redacted]	37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-	[redacted]																										
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66	[redacted]	65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-	[redacted]																										
W-Wide Flange1: W16X31: 4	151.19	148.6	9.28	151	[redacted]	151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-	[redacted]																										
W-Wide Flange1: W18X35: 36	1444.74	1413.68	99.91	1,445	[redacted]	1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-	[redacted]																										
W-Wide Flange1: W18X40: 11	337.68	324.08	26.18	338	[redacted]	337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-	[redacted]																										
W-Wide Flange1: W21X50: 7	219	214.73	21.57	219	[redacted]	219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-	[redacted]																										
W-Wide Flange: W16X26: 2	39	36.87	1.93	39	[redacted]	39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-	[redacted]																										
W-Wide Flange: W16X31: 2	39	36.85	2.3	39	[redacted]	39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-	[redacted]																										
W-Wide Flange: W18X76: 2	61	58.14	8.93	61	[redacted]	61	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 7,892.18	$ 338.55	$ 139.69	$ 8,370.42	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 8,712.63	$ 587.43	$ 153.72	$ 9,453.78	STD	Year 2009	100-102
W-Wide Flange: W18X97				-	[redacted]																										
W-Wide Flange: W18X97: 4	122	116.3	22.91	122	[redacted]	122	051223753940	W18x86	E5	900	0.089	L.F.	$ 153.35	$ 5.55	$ 2.29	$ 161.19	$ 18,708.70	$ 677.10	$ 279.38	$ 19,665.18	$ 161.62	$ 9.63	$ 2.52	$ 173.77	$ 19,717.64	$ 1,174.86	$ 307.44	$ 21,199.94	STD	Year 2009	100-102
W-Wide Flange: W21X122				-	[redacted]																										
W-Wide Flange: W21X122: 6	117	109.41	27.14	117	[redacted]	117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
47: 199	**4371.05**	**4209.91**	**380.09**		[redacted]	**Total**											**$ 277,105.37**	**$ 20,078.61**	**$ 9,471.45**	**$ 306,655.44**					**$ 303,211.97**	**$ 34,585.64**	**$ 10,424.30**	**$ 348,221.94**			

48																															
Concrete-Rectangular Beam: 36x18																															
Concrete-Rectangular Beam: 36x18: 2	20	20	74.38		[redacted]	20	033105350412	Concrete Rectangular Beam: 36"x18"				L.F.	$ 37.36	$ -	$ -	$ 37.36	$ 747.20	$ -	$ -	$ 747.20	$ 41.17	$ -	$ -	$ 41.17	$ 823.40	$ -	$ -	$ 823.40	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	175.83	7.9			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	50.16	1.2	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	996.22	44.01	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	63.17	5.42	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.9	4.1	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.56	8.04	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.6	9.28	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1413.68	99.91	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	324.08	26.18	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	214.73	21.57	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.87	1.93	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.85	2.3	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 2	61	58.14	8.93	61		61	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 7,892.18	$ 338.55	$ 139.69	$ 8,370.42	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 8,712.63	$ 587.43	$ 153.72	$ 9,453.78	STD	Year 2009	100-102
W-Wide Flange: W18X97				-																											
W-Wide Flange: W18X97: 4	122	116.3	22.91	122		122	051223753940	W18x86	E5	900	0.089	L.F.	$ 153.35	$ 5.55	$ 2.29	$ 161.19	$ 18,708.70	$ 677.10	$ 279.38	$ 19,665.18	$ 161.62	$ 9.63	$ 2.52	$ 173.77	$ 19,717.64	$ 1,174.86	$ 307.44	$ 21,199.94	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	109.41	27.14	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
48: 199	4371.05	4209.91	380.09			Total											$ 277,105.37	$ 20,078.61	$ 9,471.45	$ 306,655.44					$ 303,211.97	$ 34,585.64	$ 10,424.30	$ 348,221.94			
49																															
Concrete-Rectangular Beam: 36x18																															
Concrete-Rectangular Beam: 36x18: 2	20	20	74.38		[redacted]	20	033105350412	Concrete Rectangular Beam: 36"x18"				L.F.	$ 37.36	$ -	$ -	$ 37.36	$ 747.20	$ -	$ -	$ 747.20	$ 41.17	$ -	$ -	$ 41.17	$ 823.40	$ -	$ -	$ 823.40	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	175.83	7.9			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	50.17	1.21	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	996.24	44.01	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	63.07	5.41	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.92	4.11	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.56	8.04	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.17	148.6	9.28	151		151.17	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,980.26	$ 580.49	$ 321.99	$ 8,882.75	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,840.42	$ 991.68	$ 355.25	$ 10,187.35	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1413.58	99.9	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	327.03	26.42	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	214.75	21.57	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.87	1.93	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	37.1	2.32	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 2	61	58.17	8.94	61		61	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 7,892.18	$ 338.55	$ 139.69	$ 8,370.42	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 8,712.63	$ 587.43	$ 153.72	$ 9,453.78	STD	Year 2009	100-102
W-Wide Flange: W18X97				-																											
W-Wide Flange: W18X97: 4	122	116.3	22.91	122		122	051223753940	W18x86	E5	900	0.089	L.F.	$ 153.35	$ 5.55	$ 2.29	$ 161.19	$ 18,708.70	$ 677.10	$ 279.38	$ 19,665.18	$ 161.62	$ 9.63	$ 2.52	$ 173.77	$ 19,717.64	$ 1,174.86	$ 307.44	$ 21,199.94	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	109.44	27.15	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
49: 199	4371.04	4213.03	380.34			Total											$ 277,104.31	$ 20,078.53	$ 9,471.41	$ 306,654.27					$ 303,210.80	$ 34,585.51	$ 10,424.25	$ 348,220.60			
50																															
Concrete-Rectangular Beam: 36x18																															
Concrete-Rectangular Beam: 36x18: 2	20	20	74.38		[redacted]	20	033105350412	Concrete Rectangular Beam: 36"x18"				L.F.	$ 37.36	$ -	$ -	$ 37.36	$ 747.20	$ -	$ -	$ 747.20	$ 41.17	$ -	$ -	$ 41.17	$ 823.40	$ -	$ -	$ 823.40	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	175.83	7.9			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	50.17	1.21	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	246.35	9.44	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 33	1027.65	996.24	44.01	1,028		1027.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 45,740.70	$ 3,576.22	$ 1,993.64	$ 51,310.56	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 49,995.17	$ 6,124.79	$ 2,188.89	$ 58,308.86	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 16	71.21	63.07	5.41	71		71.21	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 5,233.22	$ 303.35	$ 168.77	$ 5,705.35	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 5,748.78	$ 519.12	$ 185.15	$ 6,453.05	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.92	4.11	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.56	8.04	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.6	9.28	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 36	1444.74	1413.58	99.9	1,445		1444.74	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 86,727.74	$ 7,512.65	$ 3,106.19	$ 97,346.58	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 94,948.31	$ 12,988.21	$ 3,424.03	$ 111,360.56	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 11	337.68	327.03	26.42	338		337.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 23,066.92	$ 1,755.94	$ 726.01	$ 25,548.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 25,339.51	$ 3,035.74	$ 800.30	$ 29,175.55	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 7	219	214.75	21.57	219		219	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 18,700.41	$ 1,029.30	$ 424.86	$ 20,154.57	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 20,627.61	$ 1,782.66	$ 468.66	$ 22,878.93	STD	Year 2009	100-102
W-Wide Flange: W16X26				-																											
W-Wide Flange: W16X26: 2	39	36.87	1.93	39		39	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 1,735.89	$ 134.94	$ 74.88	$ 1,945.71	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 1,897.35	$ 230.10	$ 82.68	$ 2,210.13	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.85	2.3	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X76				-																											
W-Wide Flange: W18X76: 2	61	58.17	8.94	61		61	051223753940	W18x76	E5	900	0.089	L.F.	$ 129.38	$ 5.55	$ 2.29	$ 137.22	$ 7,892.18	$ 338.55	$ 139.69	$ 8,370.42	$ 142.83	$ 9.63	$ 2.52	$ 154.98	$ 8,712.63	$ 587.43	$ 153.72	$ 9,453.78	STD	Year 2009	100-102
W-Wide Flange: W18X97				-																											
W-Wide Flange: W18X97: 4	122	116.3	22.91	122		122	051223753940	W18x86	E5	900	0.089	L.F.	$ 153.35	$ 5.55	$ 2.29	$ 161.19	$ 18,708.70	$ 677.10	$ 279.38	$ 19,665.18	$ 161.62	$ 9.63	$ 2.52	$ 173.77	$ 19,717.64	$ 1,174.86	$ 307.44	$ 21,199.94	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	117	109.44	27.15	117		117	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,340.68	$ 585.00	$ 242.19	$ 25,167.87	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,762.58	$ 1,010.88	$ 265.59	$ 28,039.05	STD	Year 2009	100-102
50: 199	4371.05	4212.78	380.33			Total											$ 277,105.37	$ 20,078.61	$ 9,471.45	$ 306,655.44					$ 303,211.97	$ 34,585.64	$ 10,424.30	$ 348,221.94			

51																															
Concrete-Rectangular Beam: 36x18					[redacted]																										
Concrete-Rectangular Beam: 36x18: 2	20	20	74.38			20	033105350412	Concrete Rectangular Beam: 36"x18"				L.F.	$ 37.36	$ -	$ -	$ 37.36	$ 747.20	$ -	$ -	$ 747.20	$ 41.17	$ -	$ -	$ 41.17	$ 823.40	$ -	$ -	$ 823.40	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	15.42	11.76	0.11			15.42	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 70.01	$ 96.68	$ 53.82	$ 220.51	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 77.10	$ 165.92	$ 59.06	$ 302.08	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	191.98	175.83	7.9			191.98	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,848.14	$ 1,203.71	$ 670.01	$ 9,721.87	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,642.94	$ 2,065.70	$ 735.28	$ 11,443.93	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X6X1/4																															
HSS-Hollow Structural Section1: HSS6X6X1/4: 14	183.99	173.02	6.49			183.99	051223750360	HSS6x6x1/4	E2	550	0.102	L.F.	$ 40.86	$ 6.27	$ 3.49	$ 50.62	$ 7,517.83	$ 1,153.62	$ 642.13	$ 9,313.57	$ 45.00	$ 10.76	$ 3.83	$ 59.59	$ 8,279.55	$ 1,979.73	$ 704.68	$ 10,963.96	STD	Year 2009	100-102
W-Wide Flange1: W10X12				-																											
W-Wide Flange1: W10X12: 2	52.69	50.17	1.21	53		52.69	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.62	$ 302.97	$ 168.61	$ 1,551.19	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.75	$ 518.47	$ 185.47	$ 1,903.69	STD	Year 2009	100-102
W-Wide Flange1: W10X22 2				-																											
W-Wide Flange1: W10X22 2: 32	239.32	209.16	9.28	239		239.32	051223750720	W10x22	E2	600	0.093	L.F.	$ 37.66	$ 5.75	$ 3.20	$ 46.61	$ 9,012.79	$ 1,376.09	$ 765.82	$ 11,154.71	$ 41.17	$ 9.84	$ 3.52	$ 54.53	$ 9,852.80	$ 2,354.91	$ 842.41	$ 13,050.12	STD	Year 2009	100-102
W-Wide Flange1: W10X26 2				-																											
W-Wide Flange1: W10X26 2: 6	88.74	83.33	4.37	89		88.74	051223750720	W10x26	E2	600	0.093	L.F.	$ 44.51	$ 5.75	$ 3.20	$ 53.46	$ 3,949.82	$ 510.26	$ 283.97	$ 4,744.04	$ 48.65	$ 9.84	$ 3.52	$ 62.01	$ 4,317.20	$ 873.20	$ 312.36	$ 5,502.77	STD	Year 2009	100-102
W-Wide Flange1: W10X39				-																											
W-Wide Flange1: W10X39: 16	71.37	54.58	4.28	71		71.37	051223750720	W10x39	E2	600	0.093	L.F.	$ 66.77	$ 5.75	$ 3.20	$ 75.72	$ 4,765.37	$ 410.38	$ 228.38	$ 5,404.14	$ 72.98	$ 9.84	$ 3.52	$ 86.34	$ 5,208.58	$ 702.28	$ 251.22	$ 6,162.09	STD	Year 2009	100-102
W-Wide Flange1: W10X60				-																											
W-Wide Flange1: W10X60: 3	39	35.55	4.31	39		39	051223750720	W10x60	E2	600	0.093	L.F.	$ 102.72	$ 5.75	$ 3.20	$ 111.67	$ 4,006.08	$ 224.25	$ 124.80	$ 4,355.13	$ 112.28	$ 9.84	$ 3.52	$ 125.64	$ 4,378.92	$ 383.76	$ 137.28	$ 4,899.96	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	244.03	9.35	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W12X53				-																											
W-Wide Flange1: W12X53: 8	233	228.64	24.21	233		233	051223751300	W12x53	E2	880	0.064	L.F.	$ 91.02	$ 3.92	$ 2.18	$ 97.12	$ 21,207.66	$ 913.36	$ 507.94	$ 22,628.96	$ 99.74	$ 6.71	$ 2.40	$ 108.85	$ 23,239.42	$ 1,563.43	$ 559.20	$ 25,362.05	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 21	637.64	618.74	27.34	638		637.64	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 28,381.36	$ 2,218.99	$ 1,237.02	$ 31,837.37	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 31,021.19	$ 3,800.33	$ 1,358.17	$ 36,179.69	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 12	56.54	49.57	4.25	57		56.54	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 4,155.12	$ 240.86	$ 134.00	$ 4,529.98	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 4,564.47	$ 412.18	$ 147.00	$ 5,123.65	STD	Year 2009	100-102
W-Wide Flange1: W14X68				-																											
W-Wide Flange1: W14X68: 5	350.97	350.97	47.71	351		350.97	051223752320	W14x68	E2	810	0.069	L.F.	$ 112.22	$ 4.26	$ 2.37	$ 118.85	$ 39,385.85	$ 1,495.13	$ 831.80	$ 41,712.78	$ 127.67	$ 7.29	$ 2.60	$ 137.56	$ 44,808.34	$ 2,558.57	$ 912.52	$ 48,279.43	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.92	4.11	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.56	8.04	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 3	65.63	63.03	3.3	66		65.63	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 2,921.19	$ 227.08	$ 126.01	$ 3,274.28	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 3,192.90	$ 387.22	$ 139.14	$ 3,719.25	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 16	541.19	525.79	32.82	541		541.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 28,569.42	$ 2,078.17	$ 1,152.73	$ 31,800.32	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 31,648.79	$ 3,550.21	$ 1,271.80	$ 36,470.79	STD	Year 2009	100-102
W-Wide Flange1: W16X36				-																											
W-Wide Flange1: W16X36: 9	127.55	119.12	8.66	128		127.55	051223753100	W16x36	E2	800	0.07	L.F.	$ 68.31	$ 4.32	$ 2.40	$ 75.03	$ 8,712.94	$ 551.02	$ 306.12	$ 9,570.08	$ 75.04	$ 7.36	$ 2.63	$ 85.03	$ 9,571.35	$ 938.77	$ 335.46	$ 10,845.58	STD	Year 2009	100-102
W-Wide Flange1: W16X50 2				-																											
W-Wide Flange1: W16X50 2: 18	140.54	127.1	12.88	141		140.54	051223753120	W16x50	E2	800	0.07	L.F.	$ 85.39	$ 4.32	$ 2.40	$ 92.11	$ 12,000.71	$ 607.13	$ 337.30	$ 12,945.14	$ 94.19	$ 7.36	$ 2.63	$ 104.18	$ 13,237.46	$ 1,034.37	$ 369.62	$ 14,641.46	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 8	320	312.67	22.1	320		320	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 19,209.60	$ 1,664.00	$ 688.00	$ 21,561.60	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 21,030.40	$ 2,876.80	$ 758.40	$ 24,665.60	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 1	37.68	36.26	2.93	38		37.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 2,573.92	$ 195.94	$ 81.01	$ 2,850.87	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 2,827.51	$ 338.74	$ 89.30	$ 3,255.55	STD	Year 2009	100-102
W-Wide Flange1: W21X44				-																											
W-Wide Flange1: W21X44: 28	1124.74	1101.34	97.9	1,125		1124.74	051223754100	W21x44	E5	1064	0.075	L.F.	$ 75.04	$ 4.70	$ 1.94	$ 81.68	$ 84,400.49	$ 5,286.28	$ 2,182.00	$ 91,868.76	$ 82.80	$ 8.14	$ 2.14	$ 93.08	$ 93,128.47	$ 9,155.38	$ 2,406.94	$ 104,690.80	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 3	89	84.83	8.52	89		89	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 7,599.71	$ 418.30	$ 172.66	$ 8,190.67	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 8,382.91	$ 724.46	$ 190.46	$ 9,297.83	STD	Year 2009	100-102
W-Wide Flange1: W24X55				-																											
W-Wide Flange1: W24X55: 10	300	290.77	32.27	300		300	051223754900	W24x55	E5	1110	0.072	L.F.	$ 94.19	$ 4.50	$ 1.86	$ 100.55	$ 28,257.00	$ 1,350.00	$ 558.00	$ 30,165.00	$ 103.50	$ 7.79	$ 2.05	$ 113.34	$ 31,050.00	$ 2,337.00	$ 615.00	$ 34,002.00	STD	Year 2009	100-102
W-Wide Flange1: W24X104 2				-																											
W-Wide Flange1: W24X104 2: 10	288	277.1	58.7	288		288	051223755740	W24x104	E5	1050	0.076	L.F.	$ 178.02	$ 4.76	$ 1.97	$ 184.75	$ 51,269.76	$ 1,370.88	$ 567.36	$ 53,208.00	$ 195.62	$ 8.21	$ 2.16	$ 205.99	$ 56,338.56	$ 2,364.48	$ 622.08	$ 59,325.12	STD	Year 2009	100-102
W-Wide Flange1: W24X117 2				-																											
W-Wide Flange1: W24X117 2: 2	60	57.83	13.75	60		60	051223755740	W24x117	E5	1050	0.076	L.F.	$ 200.27	$ 4.76	$ 1.97	$ 207.00	$ 12,016.20	$ 285.60	$ 118.20	$ 12,420.00	$ 220.07	$ 8.21	$ 2.16	$ 230.44	$ 13,204.20	$ 492.60	$ 129.60	$ 13,826.40	STD	Year 2009	100-102
W-Wide Flange1: W24X162 2				-																											
W-Wide Flange1: W24X162 2: 1	39	37.88	12.51	39		39	051223755740	W24x162	E5	1050	0.076	L.F.	$ 227.30	$ 4.76	$ 1.97	$ 234.03	$ 8,864.70	$ 185.64	$ 76.83	$ 9,127.17	$ 304.71	$ 8.21	$ 2.16	$ 315.08	$ 11,883.69	$ 320.19	$ 84.24	$ 12,288.12	STD	Year 2009	100-102
W-Wide Flange1: W30X99				-																											
W-Wide Flange1: W30X99: 4	130	129.91	26.02	130		130	051223756100	W30x99	E5	1200	0.067	L.F.	$ 168.71	$ 4.16	$ 1.72	$ 174.59	$ 21,932.30	$ 540.80	$ 223.60	$ 22,696.70	$ 186.30	$ 7.22	$ 1.90	$ 195.42	$ 24,219.00	$ 938.60	$ 247.00	$ 25,404.60	STD	Year 2009	100-102
W-Wide Flange: W14X48				-																											
W-Wide Flange: W14X48: 18	9.45	9.45	0.91	9		9.45	051223752320	W14x48	E2	810	0.069	L.F.	$ 82.84	$ 4.26	$ 2.37	$ 89.47	$ 782.84	$ 40.26	$ 22.40	$ 845.49	$ 90.12	$ 7.29	$ 2.60	$ 100.01	$ 851.63	$ 68.89	$ 24.57	$ 945.09	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.85	2.3	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X35				-																											
W-Wide Flange: W18X35: 2	39	36.83	2.6	39		39	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 2,341.17	$ 202.80	$ 83.85	$ 2,627.82	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 2,563.08	$ 350.61	$ 92.43	$ 3,006.12	STD	Year 2009	100-102
W-Wide Flange: W18X143				-																											
W-Wide Flange: W18X143: 2	61	58.17	16.92	61		61	051223753980	W18x143	E5	900	0.089	L.F.	$ 244.35	$ 5.55	$ 2.29	$ 252.19	$ 14,905.35	$ 338.55	$ 139.69	$ 15,383.59	$ 268.08	$ 9.63	$ 2.52	$ 280.23	$ 16,352.88	$ 587.43	$ 153.72	$ 17,094.03	STD	Year 2009	100-102
W-Wide Flange: W18x234				-																											
W-Wide Flange: W18x234: 4	122	116.3	55.69	122		122	051223753980	W18x234	E5	900	0.089	L.F.	$ 399.85	$ 5.55	$ 2.29	$ 407.69	$ 48,781.70	$ 677.10	$ 279.38	$ 49,738.18	$ 438.68	$ 9.63	$ 2.52	$ 450.83	$ 53,518.96	$ 1,174.86	$ 307.44	$ 55,001.26	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	116.47	109.44	27.15	116		116.47	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,230.42	$ 582.35	$ 241.09	$ 25,053.86	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,641.35	$ 1,006.30	$ 264.39	$ 27,912.04	STD	Year 2009	100-102
51: 337	6226.8	5960.77	677.31			Total											$ 535,807.72	$ 28,502.75	$ 13,979.89	$ 578,290.34					$ 592,741.51	$ 49,028.12	$ 15,379.83	$ 657,149.51			
52																															
Concrete-Rectangular Beam: 36x18					[redacted]																										
Concrete-Rectangular Beam: 36x18: 2	20	20	70			20	033105350412	Concrete Rectangular Beam: 36"x18"				L.F.	$ 37.36	$ -	$ -	$ 37.36	$ 747.20	$ -	$ -	$ 747.20	$ 41.17	$ -	$ -	$ 41.17	$ 823.40	$ -	$ -	$ 823.40	STD	Year 2009	100-401
HSS-Hollow Structural Section1: HSS4X2X1/8																															
HSS-Hollow Structural Section1: HSS4X2X1/8: 8	13.56	9.89	0.09			13.56	051223750360	HSS4x2x1/8	E2	550	0.102	L.F.	$ 4.54	$ 6.27	$ 3.49	$ 14.30	$ 61.56	$ 85.02	$ 47.32	$ 193.91	$ 5.00	$ 10.76	$ 3.83	$ 19.59	$ 67.80	$ 145.91	$ 51.93	$ 265.64	STD	Year 2009	100-102
HSS-Hollow Structural Section1: HSS6X4X3/8																															
HSS-Hollow Structural Section1: HSS6X4X3/8: 20	193.49	177.33	7.97			193.49	051223750360	HSS6x4x3/8	E2	550	0.102	L.F.	$ 40.88	$ 6.27	$ 3.49	$ 50.64	$ 7,909.87	$ 1,213.18	$ 675.28	$ 9,798.33	$ 45.02	$ 10.76	$ 3.83	$ 59.61	$ 8,710.92	$ 2,081.95	$ 741.07	$ 11,533.94	STD	Year 2009	100-102
W-Wide Flange1: W10X12																															
W-Wide Flange1: W10X12: 2	52.7	50.17	1.21	53		52.7	051223750600	W10x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,079.82	$ 303.03	$ 168.64	$ 1,551.49	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,199.98	$ 518.57	$ 185.50	$ 1,904.05	STD	Year 2009	100-102
W-Wide Flange1: W12X16				-																											
W-Wide Flange1: W12X16: 3	65.63	63.26	2.04	66		65.63	051223751100	W12x16	E2	880	0.064	L.F.	$ 27.43	$ 3.92	$ 2.18	$ 33.53	$ 1,800.23	$ 257.27	$ 143.07	$ 2,200.57	$ 30.02	$ 6.71	$ 2.40	$ 39.13	$ 1,970.21	$ 440.38	$ 157.51	$ 2,568.10	STD	Year 2009	100-102
W-Wide Flange1: W12X19				-																											
W-Wide Flange1: W12X19: 36	266.26	248.37	9.51	266		266.26	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 8,672.09	$ 1,043.74	$ 580.45	$ 10,296.27	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 9,492.17	$ 1,786.60	$ 639.02	$ 11,917.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22				-																											
W-Wide Flange1: W14X22: 21	637.65	623.76	27.56	638		637.65	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 28,381.80	$ 2,219.02	$ 1,237.04	$ 31,837.86	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 31,021.67	$ 3,800.39	$ 1,358.19	$ 36,180.26	STD	Year 2009	100-102
W-Wide Flange1: W14X43				-																											
W-Wide Flange1: W14X43: 12	56.54	50.48	4.33	57		56.54	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 4,155.12	$ 240.86	$ 134.00	$ 4,529.98	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 4,564.47	$ 412.18	$ 147.00	$ 5,123.65	STD	Year 2009	100-102
W-Wide Flange1: W14X82 2				-																											
W-Wide Flange1: W14X82 2: 1	26.33	24.92	4.11	26		26.33	051223752380	W14x82	E2	740	0.076	L.F.	$ 154.22	$ 4.67	$ 2.59	$ 161.48	$ 4,060.61	$ 122.96	$ 68.19	$ 4,251.77	$ 168.71	$ 8.00	$ 2.85	$ 179.56	$ 4,442.13	$ 210.64	$ 75.04	$ 4,727.81	STD	Year 2009	100-102
W-Wide Flange1: W14X109 2				-																											
W-Wide Flange1: W14X109 2: 1	37.67	36.56	8.04	38		37.67	051223752500	W14x109	E2	720	0.078	L.F.	$ 204.93	$ 4.80	$ 2.67	$ 212.40	$ 7,719.71	$ 180.82	$ 100.58	$ 8,001.11	$ 225.63	$ 8.21	$ 2.93	$ 236.77	$ 8,499.48	$ 309.27	$ 110.37	$ 8,919.13	STD	Year 2009	100-102
W-Wide Flange1: W16X26				-																											
W-Wide Flange1: W16X26: 17	196.98	187.43	9.81	197		196.98	051223752700	W16x26	E2	1000	0.056	L.F.	$ 44.51	$ 3.46	$ 1.92	$ 49.89	$ 8,767.58	$ 681.55	$ 378.20	$ 9,827.33	$ 48.65	$ 5.90	$ 2.12	$ 56.67	$ 9,583.08	$ 1,162.18	$ 417.60	$ 11,162.86	STD	Year 2009	100-102
W-Wide Flange1: W16X31				-																											
W-Wide Flange1: W16X31: 4	151.19	148.56	9.27	151		151.19	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 7,981.32	$ 580.57	$ 322.03	$ 8,883.92	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 8,841.59	$ 991.81	$ 355.30	$ 10,188.69	STD	Year 2009	100-102
W-Wide Flange1: W16X45 2				-																											
W-Wide Flange1: W16X45 2: 4	130	124.82	11.37	130		130	051223753120	W16x45	E2	800	0.07	L.F.	$ 76.85	$ 4.32	$ 2.40	$ 83.57	$ 9,990.50	$ 561.60	$ 312.00	$ 10,864.10	$ 85.42	$ 7.36	$ 2.63	$ 95.41	$ 11,104.60	$ 956.80	$ 341.90	$ 12,403.30	STD	Year 2009	100-102
W-Wide Flange1: W18X35				-																											
W-Wide Flange1: W18X35: 4	160	157.77	11.15	160		160	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 9,604.80	$ 832.00	$ 344.00	$ 10,780.80	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 10,515.20	$ 1,438.40	$ 379.20	$ 12,332.80	STD	Year 2009	100-102
W-Wide Flange1: W18X40				-																											
W-Wide Flange1: W18X40: 7	217.68	210.71	17.02	218		217.68	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 14,869.72	$ 1,131.94	$ 468.01	$ 16,469.67	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 16,334.71	$ 1,956.94	$ 515.90	$ 18,807.55	STD	Year 2009	100-102
W-Wide Flange1: W18X50				-																											
W-Wide Flange1: W18X50: 16	454.67	441.22	44.57	455		454.67	051223753920	W18x50	E5	900	0.089	L.F.	$ 85.19	$ 5.55	$ 2.29	$ 93.03	$ 38,733.34	$ 2,523.42	$ 1,041.19	$ 42,297.95	$ 93.95	$ 9.63	$ 2.52	$ 106.10	$ 42,716.25	$ 4,378.47	$ 1,145.77	$ 48,240.49	STD	Year 2009	100-102
W-Wide Flange1: W21X44				-																											
W-Wide Flange1: W21X44: 28	1124.88	1101.64	97.93	1,125		1124.88	051223754100	W21x44	E5	1064	0.075	L.F.	$ 75.04	$ 4.70	$ 1.94	$ 81.68	$ 84,411.00	$ 5,286.94	$ 2,182.27	$ 91,880.20	$ 82.80	$ 8.14	$ 2.14	$ 93.08	$ 93,140.06	$ 9,156.52	$ 2,407.24	$ 104,703.83	STD	Year 2009	100-102
W-Wide Flange1: W21X50				-																											
W-Wide Flange1: W21X50: 3	89	84.83	8.52	89		89	051223754300	W21x50	E5	1064	0.075	L.F.	$ 85.39	$ 4.70	$ 1.94	$ 92.03	$ 7,599.71	$ 418.30	$ 172.66	$ 8,190.67	$ 94.19	$ 8.14	$ 2.14	$ 104.47	$ 8,382.91	$ 724.46	$ 190.46	$ 9,297.83	STD	Year 2009	100-102
W-Wide Flange1: W30X99				-																											
W-Wide Flange1: W30X99: 4	130	129.92	26.02	130		130	051223756100	W30x99	E5	1200	0.067	L.F.	$ 168.71	$ 4.16	$ 1.72	$ 174.59	$ 21,932.30	$ 540.80	$ 223.60	$ 22,696.70	$ 186.30	$ 7.22	$ 1.90	$ 195.42	$ 24,219.00	$ 938.60	$ 247.00	$ 25,404.60	STD	Year 2009	100-102
W-Wide Flange: W16X31				-																											
W-Wide Flange: W16X31: 2	39	36.85	2.3	39		39	051223752900	W16x31	E2	900	0.062	L.F.	$ 52.79	$ 3.84	$ 2.13	$ 58.76	$ 2,058.81	$ 149.76	$ 83.07	$ 2,291.64	$ 58.48	$ 6.56	$ 2.35	$ 67.39	$ 2,280.72	$ 255.84	$ 91.65	$ 2,628.21	STD	Year 2009	100-102
W-Wide Flange: W18X35				-																											
W-Wide Flange: W18X35: 2	39	36.83	2.6	39		39	051223753300	W18x35	E5	960	0.083	L.F.	$ 60.03	$ 5.20	$ 2.15	$ 67.38	$ 2,341.17	$ 202.80	$ 83.85	$ 2,627.82	$ 65.72	$ 8.99	$ 2.37	$ 77.08	$ 2,563.08	$ 350.61	$ 92.43	$ 3,006.12	STD	Year 2009	100-102
W-Wide Flange: W18X40				-																											
W-Wide Flange: W18X40: 4	122	117.49	9.49	122		122	051223753500	W18x40	E5	960	0.083	L.F.	$ 68.31	$ 5.20	$ 2.15	$ 75.66	$ 8,333.82	$ 634.40	$ 262.30	$ 9,230.52	$ 75.04	$ 8.99	$ 2.37	$ 86.40	$ 9,154.88	$ 1,096.78	$ 289.14	$ 10,540.80	STD	Year 2009	100-102
W-Wide Flange: W21X122				-																											
W-Wide Flange: W21X122: 6	116.47	109.44	27.15	116		116.47	051223754780	W21x122	E5	1000	0.08	L.F.	$ 208.04	$ 5.00	$ 2.07	$ 215.11	$ 24,230.42	$ 582.35	$ 241.09	$ 25,053.86	$ 228.74	$ 8.64	$ 2.27	$ 239.65	$ 26,641.35	$ 1,006.30	$ 264.39	$ 27,912.04	STD	Year 2009	100-102
W-Wide Flange: W24X62				-																											
W-Wide Flange: W24X62: 8	244	234.99	29.34	244		244	051223755300	W24x62	E5	1110	0.072	L.F.	$ 105.69	$ 4.50	$ 1.86	$ 112.05	$ 25,788.36	$ 1,098.00	$ 453.84	$ 27,340.20	$ 116.08	$ 7.79	$ 2.05	$ 125.92	$ 28,323.52	$ 1,900.76	$ 500.20	$ 30,724.48	STD	Year 2009	100-102
W-Wide Flange: W36X160				-																											
W-Wide Flange: W36X160: 2	61	58.17	18.8	61		61	051223757600	W36x160	E5	1150	0.07	L.F.	$ 273.73	$ 4.35	$ 1.80	$ 279.88	$ 16,697.53	$ 265.35	$ 109.80	$ 17,072.68	$ 301.98	$ 7.50	$ 1.97	$ 311.45	$ 18,420.78	$ 457.50	$ 120.17	$ 18,998.45	STD	Year 2009	100-102
W-Wide Flange: W36X182				-																											
W-Wide Flange: W36X182: 4	122	116.3	42.94	122		122	051223757600	W36x182	E5	1150	0.07	L.F.	$ 311.37	$ 4.35	$ 1.80	$ 317.52	$ 37,987.14	$ 530.70	$ 219.60	$ 38,737.44	$ 343.50	$ 7.50	$ 1.97	$ 352.97	$ 41,907.00	$ 915.00	$ 240.34	$ 43,062.34	STD	Year 2009	100-102
52: 221	4767.69	4601.71	503.15			Total											$ 385,915.53	$ 21,686.38	$ 10,052.08	$ 417,653.99					$ 424,920.96	$ 37,392.86	$ 11,064.32	$ 473,378.17			

53																															
W-Wide Flange1: W6X12					-																										
W-Wide Flange1: W6X12: 16		52	43	1.05	52	52	051223750600	W6x12	E2	600	0.093	L.F.	$ 20.49	$ 5.75	$ 3.20	$ 29.44	$ 1,065.48	$ 299.00	$ 166.40	$ 1,530.88	$ 22.77	$ 9.84	$ 3.52	$ 36.13	$ 1,184.04	$ 511.68	$ 183.04	$ 1,878.76	STD	Year 2009	100-102
W-Wide Flange1: W12X19					-																										
W-Wide Flange1: W12X19: 6		84.58	79.42	3.04	85	84.58	051223751100	W12x19	E2	880	0.064	L.F.	$ 32.57	$ 3.92	$ 2.18	$ 38.67	$ 2,754.77	$ 331.55	$ 184.38	$ 3,270.71	$ 35.65	$ 6.71	$ 2.40	$ 44.76	$ 3,015.28	$ 567.53	$ 202.99	$ 3,785.80	STD	Year 2009	100-102
W-Wide Flange1: W14X22					-																										
W-Wide Flange1: W14X22: 3		16.5	13.53	0.6	17	16.5	051223751900	W14x22	E2	990	0.057	L.F.	$ 44.51	$ 3.48	$ 1.94	$ 49.93	$ 734.42	$ 57.42	$ 32.01	$ 823.85	$ 48.65	$ 5.96	$ 2.13	$ 56.74	$ 802.73	$ 98.34	$ 35.15	$ 936.21	STD	Year 2009	100-102
W-Wide Flange1: W14X43					-																										
W-Wide Flange1: W14X43: 34		636.67	613	52.57	637	636.67	051223752320	W14x43	E2	810	0.069	L.F.	$ 73.49	$ 4.26	$ 2.37	$ 80.12	$ 46,788.88	$ 2,712.21	$ 1,508.91	$ 51,010.00	$ 80.73	$ 7.29	$ 2.60	$ 90.62	$ 51,398.37	$ 4,641.32	$ 1,655.34	$ 57,695.04	STD	Year 2009	100-102
W-Wide Flange1: W14X68					-																										
W-Wide Flange1: W14X68: 14		362.71	353.76	48.09	363	362.71	051223752320	W14x68	E2	810	0.069	L.F.	$ 112.22	$ 4.26	$ 2.37	$ 118.85	$ 40,703.32	$ 1,545.14	$ 859.62	$ 43,108.08	$ 127.67	$ 7.29	$ 2.60	$ 137.56	$ 46,307.19	$ 2,644.16	$ 943.05	$ 49,894.39	STD	Year 2009	100-102
W-Wide Flange1: W14X74					-																										
W-Wide Flange1: W14X74: 9		117	104.8	15.67	117	117	051223752380	W14x74	E2	740	0.076	L.F.	$ 131.17	$ 4.67	$ 2.59	$ 138.43	$ 15,346.89	$ 546.39	$ 303.03	$ 16,196.31	$ 152.25	$ 8.00	$ 2.85	$ 163.10	$ 17,813.25	$ 936.00	$ 333.45	$ 19,082.70	STD	Year 2009	100-102
W-Wide Flange1: W24X55 2					-																										
W-Wide Flange1: W24X55 2: 1		11.31	10.25	1.14	11	11.31	051223754300	W22x55	E5	1064	0.075	L.F.	$ 97.34	$ 4.70	$ 1.94	$ 103.98	$ 1,100.92	$ 53.16	$ 21.94	$ 1,176.01	$ 107.38	$ 8.14	$ 2.14	$ 117.66	$ 1,214.47	$ 92.06	$ 24.20	$ 1,330.73	STD	Year 2009	100-102
W-Wide Flange1: W24X68					-																										
W-Wide Flange1: W24X68: 2		53.33	51.5	7.1	53	53.33	051223755300	W24x68	E5	1110	0.072	L.F.	$ 115.92	$ 4.50	$ 1.86	$ 122.28	$ 6,182.01	$ 239.99	$ 99.19	$ 6,521.19	$ 127.31	$ 7.79	$ 2.05	$ 137.15	$ 6,789.44	$ 415.44	$ 109.33	$ 7,314.21	STD	Year 2009	100-102
W-Wide Flange1: W30X99					-																										
W-Wide Flange1: W30X99: 6		82.62	75.89	15.2	83	82.62	051223756100	W30x99	E5	1200	0.067	L.F.	$ 168.71	$ 4.16	$ 1.72	$ 174.59	$ 13,938.82	$ 343.70	$ 142.11	$ 14,424.63	$ 186.30	$ 7.22	$ 1.90	$ 196.42	$ 15,392.11	$ 596.52	$ 156.98	$ 16,145.60	STD	Year 2009	100-102
W-Wide Flange1: W30X108					-																										
W-Wide Flange1: W30X108: 3		45.67	42.67	9.32	46	45.67	051223756300	W30x108	E5	1200	0.067	L.F.	$ 184.23	$ 4.16	$ 1.72	$ 190.11	$ 8,413.78	$ 189.99	$ 78.55	$ 8,682.32	$ 202.86	$ 7.22	$ 1.90	$ 211.98	$ 9,264.62	$ 329.74	$ 86.77	$ 9,681.13	STD	Year 2009	100-102
W-Wide Flange1: W33X118 2					-																										
W-Wide Flange1: W33X118 2: 2		53.33	51.5	12.26	53	53.33	051223756700	W33x118	E5	1176	0.068	L.F.	$ 201.83	$ 4.25	$ 1.75	$ 207.83	$ 10,763.59	$ 226.65	$ 93.33	$ 11,083.57	$ 221.49	$ 7.36	$ 1.93	$ 230.78	$ 11,812.06	$ 392.51	$ 102.93	$ 12,307.50	STD	Year 2009	100-102
53: 96		1515.73	1439.32	166.05		Total											$ 147,792.88	$ 6,545.20	$ 3,489.47	$ 157,827.55					$ 164,993.56	$ 11,225.30	$ 3,833.23	$ 180,052.07			
54																															
HSS-Hollow Structural Section1: HSS6X6X1/4																															
HSS-Hollow Structural Section1: HSS6X6X1/4: 6		119.01	108.49	4.07		119.01	051223750360	HSS6x6x1/4	E2	550	0.102	L.F.	$ 40.86	$ 6.27	$ 3.49	$ 50.62	$ 4,862.75	$ 746.19	$ 415.34	$ 6,024.29	$ 45.00	$ 10.76	$ 3.83	$ 59.59	$ 5,355.45	$ 1,280.55	$ 455.81	$ 7,091.81	STD	Year 2009	100-102
W-Wide Flange1: W10X22 2					-																										
W-Wide Flange1: W10X22 2: 23		180.03	155.26	6.89	180	180.03	051223750720	W10x22	E2	600	0.093	L.F.	$ 37.66	$ 5.75	$ 3.20	$ 46.61	$ 6,779.93	$ 1,035.17	$ 576.10	$ 8,391.20	$ 41.17	$ 9.84	$ 3.52	$ 54.53	$ 7,411.84	$ 1,771.50	$ 633.71	$ 9,817.04	STD	Year 2009	100-102
W-Wide Flange1: W10X39					-																										
W-Wide Flange1: W10X39: 7		38.77	30.16	2.36	39	38.77	051223750720	W10x39	E2	600	0.093	L.F.	$ 66.77	$ 5.75	$ 3.20	$ 75.72	$ 2,588.67	$ 222.93	$ 124.06	$ 2,935.66	$ 72.98	$ 9.84	$ 3.52	$ 86.34	$ 2,829.43	$ 381.50	$ 136.47	$ 3,347.40	STD	Year 2009	100-102
W-Wide Flange1: W10X60					-																										
W-Wide Flange1: W10X60: 2		26	23.7	2.87	26	26	051223750720	W10x60	E2	600	0.093	L.F.	$ 102.72	$ 5.75	$ 3.20	$ 111.67	$ 2,670.72	$ 149.50	$ 83.20	$ 2,903.42	$ 112.28	$ 9.84	$ 3.52	$ 125.64	$ 2,919.28	$ 255.84	$ 91.52	$ 3,266.64	STD	Year 2009	100-102
W-Wide Flange1: W12X53					-																										
W-Wide Flange1: W12X53: 2		34.99	35.15	3.72	35	34.99	051223751300	W12x53	E2	880	0.064	L.F.	$ 91.02	$ 3.92	$ 2.18	$ 97.12	$ 3,184.79	$ 137.16	$ 76.28	$ 3,398.23	$ 99.74	$ 6.71	$ 2.40	$ 108.85	$ 3,489.90	$ 234.78	$ 83.98	$ 3,808.66	STD	Year 2009	100-102
W-Wide Flange1: W16X50 2					-																										
W-Wide Flange1: W16X50 2: 14		122.51	109.47	11.09	123	122.51	051223753120	W16x50	E2	800	0.07	L.F.	$ 85.39	$ 4.32	$ 2.40	$ 92.11	$ 10,461.13	$ 529.24	$ 294.02	$ 11,284.40	$ 94.19	$ 7.36	$ 2.63	$ 104.18	$ 11,539.22	$ 901.67	$ 322.20	$ 12,763.09	STD	Year 2009	100-102
W-Wide Flange1: W24X104 2					-																										
W-Wide Flange1: W24X104 2: 3		90	86.75	18.38	90	90	051223755740	W24x104	E5	1050	0.076	L.F.	$ 178.02	$ 4.76	$ 1.97	$ 184.75	$ 16,021.80	$ 428.40	$ 177.30	$ 16,627.50	$ 195.62	$ 8.21	$ 2.16	$ 205.99	$ 17,605.80	$ 738.90	$ 194.40	$ 18,539.10	STD	Year 2009	100-102
	54:57:00	611.32	548.99	49.39		Total											$ 46,569.79	$ 3,248.59	$ 1,746.30	$ 51,564.70					$ 51,150.92	$ 5,564.74	$ 1,918.09	$ 58,633.74			
55																															
W-Wide Flange1: W10X30 2					-																										
W-Wide Flange1: W10X30 2: 4		33.93	31.85	1.95	34	33.93	051223750720	W10x30	E2	600	0.093	L.F.	$ 51.36	$ 5.75	$ 3.20	$ 60.31	$ 1,742.64	$ 195.10	$ 108.58	$ 2,046.32	$ 56.13	$ 9.84	$ 3.52	$ 69.49	$ 1,904.49	$ 333.87	$ 119.43	$ 2,357.80	STD	Year 2009	100-102
W-Wide Flange1: W14X68					-																										
W-Wide Flange1: W14X68: 1		90.99	90.99	12.37	91	90.99	051223752320	W14x68	E2	810	0.069	L.F.	$ 112.22	$ 4.26	$ 2.37	$ 118.85	$ 10,210.90	$ 387.62	$ 215.65	$ 10,814.16	$ 127.67	$ 7.29	$ 2.60	$ 137.56	$ 11,616.69	$ 663.32	$ 236.57	$ 12,516.58	STD	Year 2009	100-102
W-Wide Flange1: W16X36					-																										
W-Wide Flange1: W16X36: 6		111.71	105.54	7.67	112	111.71	051223753100	W16x36	E2	800	0.07	L.F.	$ 68.31	$ 4.32	$ 2.40	$ 75.03	$ 7,630.91	$ 482.59	$ 268.10	$ 8,381.60	$ 75.04	$ 7.36	$ 2.63	$ 85.03	$ 8,382.72	$ 822.19	$ 293.80	$ 9,498.70	STD	Year 2009	100-102
	55:11:00	236.63	228.38	21.99		Total											$ 19,584.45	$ 1,065.31	$ 592.33	$ 21,242.08					$ 21,903.90	$ 1,819.38	$ 649.80	$ 24,373.08			
Total Framing						Total											$ 16,194,952.24	$ 1,067,571.42	$ 503,886.74	$ 17,766,410.89					$ 17,778,968.58	$ 1,838,961.69	$ 554,547.27	$ 20,172,478.64			

Figure 307: Structural Concrete Composite Slab Take-off

Floor Material Takeoff

Family and Type	Level	Material: Name	Material: Area	Material: Volume	Perimeter	Area	Volume	Quantity	LineNumber	So	Su	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O	Labor (	Equip.	Total O	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
Concrete - Light Weight - 4 ksi																																
Concrete - Light Weight - 4 ksi: 50			1371716	714436				Total													$ 4,174,393.91	$ -	$ -	$ 4,174,393.91					$ 4,606,227.68	$ -	$ -	$ 4,606,227.68
Concrete - Normal Weight - 4 ksi																																
Concrete - Normal Weight - 4 ksi: 7			164483	205564				Total													$ 878,062.81	$ -	$ -	$ 878,062.81					$ 960,897.50	$ -	$ -	$ 960,897.50
Metal - Deck																																
Metal - Deck: 56			1470011	0				Total													$ 4,880,436.52	$ 779,105.83	$ 58,800.44	$ 5,718,342.79					$ 5,350,840.04	$ 1,396,510.45	$ 58,800.44	$ 6,806,150.93
Welded Wire Fabric																																
Welded Wire Fabric: 56			1470011	0	92872	1470011	853802	Total													$ 415,719.07	$ 644,746.92	$ -	$ 1,060,465.87					$ 454,821.51	$ 1,051,204.86	$ -	$ 1,506,026.39
Slab Formwork																																
Slab Formwork: 56			1470011	0	92872	1470011	853802	Total													$ 16,716.96	$ 415,137.84	$ -	$ 431,854.80					$ 18,574.40	$ 645,460.40	$ -	$ 664,034.80
Grand total: 113			3006202	919999				Total													$ 10,365,329.27	$1,838,990.59	$ 58,800.44	$ 12,263,120.18					$ 11,391,361.13	$3,093,175.71	$ 58,800.44	$ 14,543,337.30