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ASSOCIATED SCHOOLS OF CONSTRUCTION

ROCKY MOUNTAIN REGION
REGION VI
AK, AZ, CO, ID, MT, NV, NM, UT, WY

FAR WEST REGION
REGION VII
CA, HI, OR, WA

**National Preconstruction Problem
February 13-16, 2008**

Answer Package

Phase I & II: Request for Proposals

**Downtown Condominium Project
Seattle, WA**

Problem Sponsor:



PCL Construction Services, Inc.
15405 SE 37th Street, Suite 200
Bellevue, WA 98006

**2008 ASC Student Competition
Preconstruction Services National Problem
Request for Proposal, Phase I
Solution Set (Rev: 013008)**

PHASE I DELIVERABLES

Your team is a fictitious construction company who PRIHD Development Partnership has deemed a potential candidate to perform the scope of the work. Please use your creativity to develop the following deliverables. Using all the attachments provided with this RFP, please address the following in your Phase I submittal:

I. Related Experience:

- a. Describe the previous related experience of your firm and the proposed individuals on ***similar*** projects to our proposed project. Please limit your response to a maximum of 3 projects. For each project, please include:
 - i. Name of project, location and description of the facility including type and size.
 - ii. The duration of construction.
 - iii. The role of your firm on the named projects.
 - iv. Please provide the initial contract value and the final contract amount for each of the above named projects. If there are differences in values, please provide an explanation for the differences.
 - v. Describe similarities for each of your reference projects.

Solution (2.5 Points Total):

- a. Related experience to the project description can be found through research and communication with the AEC industry and related company websites.
 - i. Name of project, location and description of the facility including type and size.
(0.5 Pt) – All information described above is provided
 - ii. The duration of construction.
(0.5 Pt) – Duration is provided
 - iii. The role of your firm on the named projects.
(0.5 Pt) – Role on named projects are provided
 - iv. Please provide the initial contract value and the final contract amount for each of the above named projects. If there are differences in values, please provide an explanation for the differences.

(0.5 Pt) – All information is provided

- v. Describe similarities for each of your reference projects.
(0.5 Pt) – Similarities are provided

II. Proposed Team:

Solution (8 Points Total):

- a. Provide a proposed staffing plan for both the pre-construction and construction phases. At a minimum, please provide:

- i. A project organization chart, with roles and responsibilities.

(3 Pts) – All information is provided including the design team and the inter-relationship to the precon team.

- ii. **Using the provided biographies attached to this RFP**, please recommend the four major consultants you would prefer to work with and why. In addition, please select team members who best fit the needs of this project, not limited to the Project Manager or Superintendent.

(4 Pts) – All information is provided. Recommendations should include PM #B, Super #C, Mithun, DCI, MKA, Holaday-Parks and SME.

- iii. For your project team, provide resumes and references (names and phone numbers), which may be contacted in reference to your proposed teams, experiences and qualifications. Provide the qualifications and relevant experience of each team member. At a minimum, please include:

1. Project Manager and Superintendent
- ~~2. Architectural Firm~~
- ~~3. Structural Firm~~
- ~~4. Mechanical and Electrical Subcontractors~~

(1 Pts) – PM and Super resume is provided in Addendum #1. Team needs to provide the other four team members and propose why.

III. Project Management Services:

Solution (2 Points Total):

- a. Describe your philosophy and approach to your safety and accident-prevention program. (Do not provide a project safety plan)

(1 Pt) – Any logical approach and philosophy as long as it has been thought through.

- b. Provide statistics by which the effectiveness of your program is measured.

(1 Pt) – EMR, LTR, TRIR, NM must be specified

IV. Contract:

Solution (4 Points Total):

- a. The Owner is open to any form of contract agreement with reasonable modifications. We are going to give you a variety of contract formats to choose from. Please choose the best contract to pick based on our description of the project and our values.

- i. Explain the advantages of the contract form by completing the Contract Comparison Matrix (attached).

(3 Pts) – Completed Contract Comparison Matrix. (Look for possible bonus points here depending on their logic). The correct choices are:

A201™ – 2007, General Conditions of the Contract for Construction

A102™ – 2007 (formerly A111™ – 1997), Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment is the Cost of the Work Plus a Fee with a Negotiated Guaranteed Maximum Price

This standard form of agreement between owner and contractor is appropriate for use on large projects requiring a negotiated guaranteed maximum price, when the basis of payment to the contractor is the cost of the work plus a fee. A102–2007 is not intended for use in competitive bidding. A102–2007 adopts by reference and is intended for use with A201™ – 2007, General Conditions of the Contract for Construction.

- ii. Please address your willingness to use this contract form and note any significant deviations that you would propose.

(1 Pt) – Address willingness and deviations here (Look for possible bonus points here depending on their logic)

V. Fees:

Solution (3.5 Points Total):

- a. Describe your proposed compensation for preconstruction services.

(2 Pts) – Proposed compensation for preconstruction services.

- b. Please identify what work might be performed by your company's own forces.

(0.25 Pt) – Any answer to concrete, laboring, carpentry, steel erection and operators

c. What is your proposed construction fee on the contract amount?

(0.25 Pt) – Information provided.

d. What is included in the construction fee?

(0.25 Pt) – Information provided.

e. Would the fee differ for subcontracted work versus self-performed work?

(0.25 Pt) – Information provided.

f. Would the fee differ for change orders?

(0.25 Pt) – Information provided.

g. Are there extra fees or additional charges during construction?

(0.25 Pt) – Information provided.



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I. PRECONSTRUCTION PROBLEM TIME TABLE

THURSDAY, FEBRUARY 14 TH

Turn in Phase I RFP6:00 AM
Phase II Pre-Proposal Conf.....6:00 AM
Written Questions (RFI's) Due.....10:00AM
First Progress Meeting11:00 AM
Second Progress Meeting.....2:00 PM
Phase II Proposals Due9:00 PM

FRIDAY, FEBRUARY 15TH

Interview Start Times Posted8:30 AM
Interview Materials Due (All Teams)8:30 AM
Interviews Start9:00 AM
Project Debriefing7:00 PM

SATURDAY, FEBRUARY 16TH

Career Fair8:00 AM – 12:00PM
Awards Banquet / Luncheon12:15 PM

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II. PREFACE

Welcome to the 2008 ASC Student Competition. PCL Construction Services, Inc. is proud to be the sponsor of the new Preconstruction Services National Problem at the 2008 Competition in Sparks, NV.

We believe this problem will enhance each student's experience to the every day occurrence of preconstruction services in today's construction environment. Clients require varying levels of preconstruction services including design coordination, budget development and construction planning.

The problem proposed will be typical to the services provided to a client including the proper selection of your construction team, and in some cases, consultants and subcontractor team. Other services include risk analysis, contracts, design creation, estimating, constructability review, resource requirements, budgeting, scheduling, purchasing, safety and contracting.

This competition is an invaluable tool for your career development. It is designed to enhance and expose each team member in different facets of the construction industry. Each team members' technical knowledge of estimating, scheduling, planning, leadership, and communication skills will be put to the test during the next two days.

PCL hopes every team benefits from this 'real-life' experience. We are here to support the ASC and its members, so please ask questions after the competition is complete or any time throughout the school year.

Understand there are many dynamic elements to every project whether in design or under construction, including this actual project performed by PCL. Please keep an open mind to the challenges that are presented during this event. Learn from our own project experience, as well!

At the end of the day, only three teams are awarded a placement, with the best being recognized at the ASC Awards Ceremony on Saturday. Regardless of your final overall placement, each competitor is truly a winner when you combine the experience of the competition, coupled with the industry exposure you have gained throughout the event.

We look forward to great thinking, fellowship and sportsmanship throughout the week. We are proud to serve our great industry with this problem and advancing construction education to all the member schools, faculty and students of the Associated Schools of Construction! Good luck!

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III. PROBLEM SCENARIO

Congratulations. The development team of PRIHD Development Partnership has short listed your firm from your team from their response to the Phase I RFP. Your team is now invited to continue on to the next stage of the Contractor selection process. You and several other competing teams will now be responding to the Phase 2 Request for Proposal.

Your team will develop the Phase II RFP Response based upon the schematic design drawings and outline specification documents prepared by the Owners' design consultants.

Your team will be asked to establish a project budget, prepare a preconstruction schedule and provide various other deliverables as defined in the succeeding portions of this Problem Statement. You must submit your documentation to the development team by 9:00 PM tonight and be prepared to present your findings to the developer's panel in a meeting with them tomorrow. Interim progress meetings are scheduled for 11:00AM and 2:00 PM today. Any questions should be delivered, in writing on the Request for Information (RFI) form to the management team at the 11:00 AM meeting. Response to these RFI's will be provided at or before the 2:00 PM meeting. The RFI form is provided in Section X - Supplemental Information Tab 0.0.

For the oral presentation on Friday, all teams shall include students representing at a minimum the following firm positions; your project executive, preconstruction manager, project manager, sr. estimator, project superintendent and project engineer. You will be allowed 25 minutes for the team presentation and 10 minutes for questions and answers from upper management.

At a minimum, your presentation should cover the following areas:

- Budget
- Schedule
- Site Utilization
- Team Differentiators

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PROJECT INFORMATION

The developer proposes to construct a 204 unit high rise residential project, with light retail in the Belltown neighborhood of Seattle, to be located at the corner of Second and Broad. The site currently has an existing 4 story concrete and steel framed building with an at grade asphalt parking lot for about 44 cars. The developer owns the property outright. The proposed project will have 3 levels of below grade parking, approximately 3,500sf of retail and 204 mid-high quality level studio, 1, 2 and 3 bedroom condominiums.

The Owner has provided a geotechnical report which did not encounter any subsurface obstacles or contaminants. The excavation of the building will extend from property line to property line. The project will be 13 stories above grade, constructed of a post tension concrete frame, and clad with a mix of materials, including brick, metal panel and window wall. Balconies and decks will be constructed on a hybrid of concrete and steel with glass railing systems.

The developer anticipates breaking ground in late 2008/early 2009 and anticipates a 19-21 month construction schedule.

Mithun, the design firm has progressed the design to the 50 % schematic design stage, and the developer now wishes to engage a contractor to provide preconstruction services including design coordination, constructability review, budget development and construction planning prior to moving into the next design phase. The developer has a history of teaming with contractors and design consultants and does not necessarily award on the initial lowest budget or fee structure proposed.

Your firm has extensive high rise residential experience, and has in fact completed four projects within a ten block radius of the proposed project within the last ten years.

After the response to Phase 1, the developer has decided that the form of contract will be an AIA102-2007 with A201 General Conditions.

Any information concerning the size, scope and time lines provided in previous correspondence has been superseded by the information provided in this written problem statement.

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IV. PROBLEM OUTLINE

Organize and tab your documentation submittal according to the following outline. Include only the information requested in **Section V- Submission Requirements**. Remember to be as brief as necessary to convey your points.

- 1. Cover Letter**
- 2. Executive Summary**
- 3. Project Budget**
 - a. Conceptual Estimate Summary**
 - b. Preconstruction Services Fee**
 - c. General Conditions**
 - d. Street Use Fees**
 - e. Concrete Estimate**
 - f. Subcontractor Recap**
- 4. Project Schedule**
- 5. Site Logistics**
- 6. Area Summary & Analysis**
- 7. Mechanical Load Analysis**
- 8. Electrical Lighting Analysis**
- 9. LEED Analysis**
- 10. Bonus**

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V. SUBMISSION REQUIREMENTS:

The appearance and organization of proposals is important in our industry, as it is often our first opportunity to interact with a new client and/or impress the upper management in your company. We want them to see the professional image we are trying to portray and be able to find and understand the information we are presenting. Points will be awarded in this section based upon appearance and organization, as well as the clear and concise responses the following requirements. Six copies on your Phase II response are to be submitted.

A disc has been included with some of the forms referenced so that you do not have to recreate them. Use these forms to respond to those portions of the problem for consistency across all teams. ***Always, check formulas to ensure that proper extensions are made.***

1. Cover Letter

Provide a brief cover letter. Be sure to acknowledge all addenda, provide a company logo and sign the letter.

Provide cover letter clearly identifying your team name (school), acknowledgement of all addenda, and signed.

2. Executive Summary

An Executive Summary is an important part of your proposal. It identifies, in a summary fashion, the key benefits and features you want an Owner to know about your Company, and why they should choose your team over others for their project. It is an important sales tool. It let's you be creative and points out your most important differentiators from your competition. It should key in on what you have learned from your research of the Owner's "hot buttons" and should address how you will make sure those "hot buttons" are addressed. Your response to a Request for Proposal should always include an Executive Summary. See the Supplemental Information section for the Executive Summary exercise. Provide your final exercise in this section.

Deliverable:

1. Executive Summary

Provide an Executive Summary similar to the example provided in the Problem Statement, Supplemental Information Tab 2.0. Important components include firm logos, simple theme statement, a key message, differentiators', and a "why us and not them" statement.

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3. Project Budget

A. Conceptual Estimate Summary

You will be finalizing the estimate to determine the budget price that you will submit to the developer. The estimate will be prepared on the 50% Schematic Design Pricing set of documents that have been provided. The Conceptual Estimate Summary form has been filled out with the values for the items that have already been analyzed, priced and summarized, but you will be taking proposals on a few remaining trades, preparing a detailed concrete estimate, estimating your General Conditions, including street use fees, and determining your required fee for the Project. See Supplemental Information section for forms. You will also prepare an estimate of the costs anticipated to be incurred during the preconstruction period of the project. You must plug the values of these items into the Conceptual Estimate Summary Form, apply your required fee for the project, and determine what the overall budget for the project should be.

Deliverable:

1. *Completed Conceptual Estimate Summary*
Please reference the attached Conceptual Estimate Summary in Tab 3.a.1. The budget numbers for the preconstruction estimate, concrete estimate, electrical recap and general expense costs are covered in other sections below. The fee number is quite subjective, with no right or wrong answer within a range. The range most general contractors would bid for this type of work would be in the 3%-6% range, unless market forces dictated otherwise. In tight markets fees may dip below 3%, while busy markets with little competition may dictate fees in excess of 5%.

B. Preconstruction Costs

In an ever increasingly competitive industry and the requirement of many of our clients to operate in a collaborative environment with design professionals, the scope of preconstruction services continues to grow. Preconstruction services can tie up significant amount of personnel resources who are not engaged in our core business of building actual projects. What was once considered as a loss leader and relatively inexpensive cost of project pursuit, preconstruction costs often represent a significant cost that need to be reimbursed by our clients as a professional service, much like that of our design consultants.

As part of your overall budget for the project you will need to prepare an estimate of preconstruction services. A preconstruction personnel billing rate worksheet and estimate form has been included in the Supplemental Information section for your use in developing the estimate. A description of required services for preconstruction services to be included in your estimate has also been included. Preconstruction costs shall be calculated to include personnel directly working on the project, as well as miscellaneous reimbursables. Preconstruction personnel generally work on multiple projects at one time and are generally not charged full time against any given project. Home office overhead is not to be included in preconstruction costs.

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Deliverable:

1. *Preconstruction Services Estimate*

See attached preconstruction estimate in Supplemental Section Tab 3.b.1. Preconstruction costs largely are associated with the personnel required during that time period, including the Preconstruction Manager and Estimating Team, and are generally not full time. Reimbursables are generally a small component of the budget and the Owner's typically provides all of the plan printing and document necessary. Travel, parking and mileage costs are generally the largest reimbursable component during the preconstruction period.

C. General Conditions

General Conditions are defined as the on-site project management and supervision costs incurred throughout the duration of the project to support and supervise subcontracted and self performed work. General condition costs are to be categorized by Project Staff for jobsite personnel costs only, and Project Overhead and Equipment related for equipment rental equipment, and the balance of general conditions costs not included as Project Staff.

Prepare a detailed breakout of General Conditions that your team anticipates for the project. Use the forms provided for each of the two categories of General Conditions costs as included in the Supplemental Information Section. One excel file has both worksheets, tabbed at the bottom of the spreadsheet. Personnel rates and equipment rental are included for your use. You may also use R.S. Means® manuals for any information required to complete your estimate, but not provided on the rate sheets. Home office overhead is not included in the General Conditions for the project. You do not have to include costs for the Owner and subcontractors.

Supervisory staff positions are to be provided as deemed necessary by your team. The staff worksheet lists suggested positions as a starting point, but add or subtract as your team deems necessary. Remember there are 2080 work hours in a year.

Supervision costs for self performed work do not need to be included. Tower crane costs are included in the structure estimate and do not need to be included in the General Conditions. Personnel hoists are included in finishes section of the Estimate Summary and are not to be included in the General Conditions.

Prepare a Staffing Matrix showing the duration and period for each member to be assigned to the project.

Deliverables:

1. *Completed General Conditions Estimate Forms*
2. *Staffing Matrix*

See completed General Expense costs in Supplemental Information Tab 3.c.1.

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D. Street Use Fees

As part of your site utilization plan you may be required to utilize sidewalks, streets, alleys, or enter the Right of Way from time to time, or for the duration of the project. This is typical for projects developed in an urban setting. Depending upon the jurisdiction in which any given project is located, street use permits and fees may be significant and cannot be overlooked in the development of your initial budget. In order to estimate these fees you must first understand your site utilization plan, and then need to calculate area and duration against the jurisdictions fee schedule. Use the estimate form provided in the Supplemental Information section. A use fee schedule has been provided for the jurisdiction of the project. Make sure to read the fee schedule carefully. 2nd Avenue and Broad Street are considered to be arterials.

Use fees are calculated for all areas you intend to use beyond the property line of the site into the Right of Way of the jurisdiction, including public streets, sidewalks and alleys. They do not include any fees for usage of private property adjacent to the developer's property. Any use of private property would have to be negotiated with the actual land owner of that property.

Once you have completed your Street Use Estimate, load the total into the line item in the Project Overhead and Equipment Section of the General Expenses where indicated for "Street and Sidewalk Use".

Deliverable:

1. *Completed Street Use Estimate Form*

See completed Street Use Estimate Form in Supplemental Information Tab 3.d.1. PCL's actual plan included a mix of street and sidewalk uses. Due to the large expense associated with sidewalk and street use, we developed a plan where no rental of Broad St. was necessary. The City of Seattle does not charge for sidewalk covers in the right of way. A lane closure along 2nd Avenue was established each morning and removed at the end of each day to mitigate cost associated with the use of a major arterial. Use of the Alley was included for a large duration of the project. An additional consideration is that when you interfere with the traffic flow through a signal controlled intersection, you have to hire an off duty police officer to control traffic. This was included in our General Expense part of the estimate.

E. Concrete Estimate

Your company prides themselves on being a builder not a broker, and has a long history of self performing many scopes of work, including concrete work. Although the plans and outline specification are at a schematic design stage, there is sufficient information to prepare a detailed concrete estimate for the project. Your estimate for concrete should include:

- Foundations
- Slab-on-grade

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- Foundation walls below grade- 1 sided
- Columns
- Core Walls
- Shear Walls
- Supported slabs/Elevated decks.

For each category above, provide costs for forming, placing, finishing, curing, grinding and patching, as applicable. All excavation, spoils removal, reinforcing steel, post tensioned cables, stud rails, under slab rock and vapor barrier, and site concrete shall be subcontracted and therefore not included in your estimate.

A Concrete Estimate form has been provided for your use in the Supplemental Information Section. Quantities for the foundation system (spread footings, continuous footings, mat footings have been provided since footings are not indicated on the drawings provided. The first couple of line items have been fully completed for your reference. For the balance, you must apply the proper crew rate, productivity and material pricing against the quantities provided. Do not change any quantities, or other lump sum totals provided in the spreadsheet. The balance of the concrete elements described in the first paragraph are to be added to Concrete Estimate form by your team from your own quantity takeoffs. As always, ensure that the formulas are correct and that the totals check.

Utilize the labor crew rates for the selected category of work. These rates are fully burdened, and do not include profit markup. Use the concrete supply quote for pricing the concrete material for each strength required by the documents. Make sure to read the entire quote to derive the proper yardage price for each type of concrete. Also included is a concrete pumping quote for your use.

Use the historic concrete productivity data to apply against your quantities and the wage rates provided to arrive at your total labor for each item. Choose the most appropriate category for each item. The productivity rates have been provided by your company's Chief Estimator and should not be changed.

Review with your team and recommend a fee structure for self performed work to be included in your concrete estimate and include within your concrete estimate. Insert your required self performed fee at location provided at the bottom on the Concrete Pricing sheet. Supervision and Overhead related to the concrete work, including the cranes, have been included at the bottom of the Concrete Estimate. Remember, if this work was subcontracted out, the subcontractor would require profit and overhead.

Deliverable:

1. *Completed Concrete Estimate Form*
See completed Concrete Estimate Form in Supplemental Section Tab 3.e.1. As with the contract fee, the self performed fee is subjective. General contractors must evaluate the risk associated with self performing work and then allocate an appropriate fee. Had the work been subcontracted out it would not be uncommon for a subcontractor to charge 15%- 25% for profit and overhead, depending upon

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market conditions, so the owner actually may benefit financially from a contractors self performance of the work, in addition to better controlling schedule and quality.

F. Subcontractor Bid Recaps

The team has decided that the electrical scope shall be procured under a design-build methodology. You have received proposals from three electrical firms. You are assigned the task of "recapping" the bids to determine the lowest responsible proposal. In order to arrive at the value of work to be loaded into the Conceptual Estimate Summary you must recap the quotes to determine the most advantageous value to use. The Recap sheet has been created and "check questions" written on them to determine if the subcontractors have the correct scope per the plans and outline specifications. You may find that additional check questions are necessary to define the complete scope or differentiate between the proposals. Feel free to add to the check questions as you deem necessary. Choose your subcontractors carefully to ensure that they will perform the correct scope, staff the project adequately, and that they are financially stable. Although the project is design-build, the Owner will contract directly for design services with the selected subcontractor, so design fees are not to be included in the electrical budget for the project. Additionally, utility company charges will be paid directly by the Owner and temporary power is being covered elsewhere in the estimate.

Once you have arrived at a recapped total for each firm, take the lowest responsive and responsible bid and load that number in the electrical line of the Conceptual Estimate Summary. Utilize the lighting exercise in Section 8 to verify garage lighting count is close to your calculation.

What risks do you see in the electrical quotes? Provide a brief narrative of any concerns.

Deliverables:

1. *Completed Subcontractor Recap Form*
See completed Subcontractor Recap Form in Supplemental Information Section Tab 3.f.1. AC/DC Electrical was the lowest responsive bidder on the project. The fact that they were non-union was not a significant issue in their selection.
2. *Narrative of Risks for Electrical Scope of Work*
Some of the risks observed from the information provided include escalation risks, both on materials and labor. Escalation on construction materials and labor has been in excess of 5% of project cost/per year over the last 5 years. Although the electrical scope is design build, there are risk associated with scope creep if the program is not adequately defined for the contractors to price. Under a design build subcontract, it is our expectation that they have included code minimum requirements in their proposals. In condominium projects it is important to understand the quality level early on so that it can be properly accounted for in the budget. There can be huge swings in things like light fixture costs.

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4. Schedule

As part of your review with management, you will be required to present a complete, workable Critical Path Schedule (CPM) to plan the work within the guidelines prescribed below. As this is a preconstruction services problem, we are equally interested in the activities and your thought processes in the preconstruction phase as in the construction phase. The schedule is to convey your teams plan to fully execute the project from cradle to grave.

The following criteria explain the background information and requirements of the CPM schedule you team will present.

1. General Schedule Criteria:
 - a. Presentation Criteria:
 - i. Format:
 1. At minimum, show Activity ID, Activity Description, Original Duration (OD), Early Start (ES), Early Finish (EF), and Total Float (TF), per activity (see Figure "A" below)
 2. Organize and sort Preconstruction activities grouped together with construction activities following.

Figure A: Schedule Activity Example

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Total Float	FEB 18 25
2008 ASC Student Competition						
Design						
01010	Contractor Selection/Notice to	1	14FEB08	14FEB08	0	Contra
Permitting and Entitlements						
01020	MUP Submittal	1	14FEB08	14FEB08	0	MUP S

- ii. Activity Count: 100- 150 activities
 - iii. Provide an equal amount of preconstruction and construction activities. Include design, permitting and entitlements, easement negotiations, long lead and construction activities
 - iv. Show the logic between activities
 - v. Clearly show the critical path of the schedule
 - vi. Organize activities so they are easy to read, activities are grouped intuitively and the schedule flows well.
- b. Contractual Criteria
 1. Project Start Date for Preconstruction (Notice to Proceed): February 14, 2008
 2. Preconstruction Period: 10 Months
 3. Project Duration: 19-20 Months
 4. Minimum Milestones to be presented on CPM Schedule:

Contract Award	Permit Submittal (s)
Design Complete	GMP Estimate

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Begin Demolition
Finishes Begin
Final Completion

Structure Complete
C of O Inspections

5. Assume the following calendar holidays: May 26, 2008, July 04, 2008, September 01, 2008, November 27-28, December 25, 2008, January 01, 2009, June 01, 2009, July 06, 2009, September 01, 2009, November 26-27, 2009, December 25, 2009, January 01, 2010, May 26, 2010, July 04, 2010, September 01, 2010, November 25-26, 2010, December 25, 2010, January 01, 2011.

2. Preconstruction Phase Criteria:

- a) The Architect and consultants will be 50% complete with the Schematic Design phase on February 14, 2008.
- b) The permitting agency will allow phased permitting for demolition, excavation and shoring, structure and finishes.
- c) Estimates will be required at the completion of each design phase
- d) The project may be contracted under a phased GMP's contract.

3. All other work criteria:

- a) Original durations for the demolition, excavation, shoring and concrete structure shall be derived on a quantitative basis per the worksheet and explanation included in the scheduling section of the Supplemental Information. Use the worksheets to calculate durations based upon quantities that you survey, then divide by a productivity rates that you derive. Examples have been provided. You may use RS Means or other productivity data resources to help.
- b) The remainder of the work will be handled by subcontractors your team will manage.
- c) Scheduling of all work should support the assumption made by the Site Utilization Plans drafted in Section 5 below
- d) Review the plans thoroughly. Ensure that your schedule encompasses as much of the work possible in the limited number of activities your are required to provide.
- e) Your team may begin construction anytime, provided you have your first permit in hand. You may lag activities as you see fit and are reasonable logic assumptions.
- f) The last activity in your schedule should be Contract Completion.

General comments:

1. Do not resource load or cost load your schedule
2. Remember preconstruction period encompasses all project activities prior to the actual commencement of work in the field.
3. When it comes to scheduling, there are no right or wrong answers. Ensure that you team can substantiate and explain all of the assumptions and decisions made in the process of developing your schedule.

Deliverables:

1. *Preconstruction Schedule*

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2. *Completed Scheduling Durations Form*

See attached P3 schedule and scheduling durations form in Tab 4.0

5. Site Logistics

The Downtown Condominium Project is located on a congested urban site, bordered by two major arterials on the South and East sides of the site, and alley to the west with an adjacent 7-story apartment Building and a 4 story apartment building to the North of two separate on-grade parking lots. The site is currently partially occupied by a 4 story office building, with one level below grade. There is an on grade parking lot to the North of the office building dedicated to the office building and within the property line for the project. Just North of the Office Building Parking lot is a privately owned pay parking lot. The mass excavation of the project extends to the property line in all directions. Dry utilities are located in the alley and wet utility mains are in the street to the East.

There is currently on street parking meters on both arterials generating revenue for the City. Access to the alley must be maintained for Fire Department Access, as well as the Apartment Building Parking Garage entrance at the South end of the Alley. No employee parking of any kind will be allowed on the site.

Site Plan

Use the full size drawing to create your site logistics plan (C2.01). Other drawings may be used if you determine them necessary to fully explain your plan. Your plan can add or omit items from the basic list below, as long as a valid reason is present and that your logic does not violate code requirements or jurisdictional limits. Ensure that the locations of all items listed below are coordinated with future work activities, so they do not impede construction progress. In addition, if your site utilization changes/evolves throughout the project, describe any such changes. Include the following without limiting to:

- Project Office location
- Property lines
- Location of subcontractor offices, dryshacks, etc.
- Locations for temporary fences
- Location of access roads and gates
- Project and required signage
- Location of temp services; Water, Power, etc
- Prefab areas
- Location and boom radius of crane
- Personnel/material hoist location
- Concrete Pumping locations
- Delivery locations for staging and unloading
- Stair towers, if used.
- Emergency evacuation location
- Any other items that your team thinks should be on the plan

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In addition to a graphical plan provide written narrative to further explain the site utilization plan prepared by your team. When site work is to take place, briefly explain any conflicts that might occur with locations of trailers, etc. and completing all of the landscaping and site work. Provide a brief explanation of how these conflicts will be coordinated and resolved. If there are no foreseen conflicts, briefly explain how the site utilization plan was coordinated with the final site work.

Deliverable:

1. *Site Logistics Plan*
2. *Site Logistics Narrative*

See attached preliminary Site Logistic Plan in Tab 5.0. As the building structure went from property line to property line, PCL established office facilities and laydown on the North pay parking lot owned by a local parking lot operator. Once the structure was above grade (2) placing booms were used to pump concrete from a central location on 2nd Ave. The extent of Street and Alley use are as defined in the Street Use section. Tower crane and hoist locations are as defined on the plan. Sidewalk covers were placed along Broad Street for pedestrian access. The sidewalk along 2nd Avenue was removed for the duration of construction.

6. Area Summary & Analysis

Prepare an Area Summary by building use per the spreadsheet provided in the Supplemental Information Section Tab 6.0. The spreadsheet is partially completed, and you must provide the remaining information to complete the Area Summary. As you may know, contractors calculate building area based upon gross square footage, not net usable. Building pricing must include all square footage so that it may be taken off and priced. Remember; never trust any summary, notes on drawings, information from proformas etc. provided by the Owner or his consultants. You must do the takeoff to validate any quantities provided by others. Developers and architects often work in net saleable/rentable square foot, efficiency ratios, etc. that leave out actual area such as hallways, stairs, elevators, janitors closets, etc. that must be included in a construction estimate. Definitions of areas have been included in the supplemental information section.

Hint; if you complete this takeoff first you may use it in the solution to some other sections in the problem.

Deliverable:

1. *Completed Area Analysis Form*
See completed Area Analysis form in Tab 6.0

7. Mechanical Load Analysis

For this exercise you will need to calculate the anticipated cooling and heating loads for the building, so you can determine the right amount of money to carry in your proposal estimate for the chiller and the boiler. Information received from subcontractors can be very contradicting when it

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comes to anticipated loads, and because of this pricing may vary widely. It is necessary at times to perform your own calculations for heating and cooling loads so you can determine the right amount of money to include for these components, and to help select the right subcontractor's information to use in the proposal.

Note: Calculations and outcomes from this analysis are not used in any other part of your response to this problem statement.

Deliverable:

1. *Completed Cooling/Heating Form and Sub Selection*
See completed Heating and Cooling form in Tab 7.0

8. Electrical Lighting Analysis

For this exercise you will need to calculate the number of light fixtures required to light the parking garage levels in order to verify the quantity of light fixtures proposed by your electrical bidders. You will need to calculate the fixture counts using two different methods. Like mechanical pricing, information received from subcontractors can be very contradicting when it comes to fixture counts, and thus pricing may vary widely. It is necessary at times to perform your own calculations of the correct number of fixtures so you can determine the right amount of money to include, and to help select the right subcontractor's fixture information to use in the proposal.

Problem 1: SF Method - State of Washington Allowed

Using the information given from the State of Washington, fill out the SF method worksheet to determine the allowable wattage for lighting the garage. Using the information provided on the light fixture cut sheets; calculate the number of fixtures required and the cost of the light fixture package.

Problem 2: Zonal Cavity Method – Maintained Foot-candles

This method is a much more scientific method of calculating lighting levels that will maintained using different fixture types. Using the information given, fill out the zonal cavity worksheet to determine number of fixtures required for lighting the garage.

Deliverable:

1. *Completed Lighting SF and Zone Worksheets*
See completed worksheets in Tab 8.0

9. LEED™ Analysis

The developer has questioned the team about possibly marketing a LEED™ for New Construction project. Based upon information contained within the outline specifications and drawings, make a recommendation as to the possible number of attainable LEED™ points currently available to the project and the associated rating?

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In addition, please recommend what LEED™ points could be cost effective and easily achieved by slightly modifying the specifications to attain the next highest rating? We are looking only for a recommendation; *do not modify the information to achieve additional points*. Utilize the LEED™ scorecard provided in Section X.

Deliverable:

1. Completed LEED™ Scorecard
2. Narrative

See completed LEED™ scorecard in Tab 9.0. Early in the project the architect developed a scorecard for the project. However at the time local market was unwilling absorb the additional sales costs necessary to offset the added construction costs. In preconstruction, we are often asked by our clients to estimate the costs of achieving varying LEED™ designations. We typically use the scorecard as a basis for starting this process.

10. Bonus

The developer requests your opinion as the optimum methodology to reduce unit count as follows:

(9ea) 1-Open S-1	(1ea) 1-Open S-12
(1ea) 1-Open S-2	(1ea) 1-Flat S-3
(1ea) 1-Open S-4	(1ea) 1-Flat D-1
(2ea) 1-Open S-5	(1ea) 1-Flat D-2
(1ea) 1-Open S-7	(1ea) 1-Flat D-3
(1ea) 1-Open S-8	(1ea) 2-Flat S-1
(1ea) 1-Open S-9	(1ea) 2-Flat S-5
(1ea) 1-Open S-11	

Provide a written narrative with your proposed solution to this request. There are no budget or schedule components necessary in your response to the bonus question.

Deliverable:

1. Narrative
Using the Unit Matrix included in the Outline Specifications, deleting either the 3rd, 4th or 5th floor in their entirety responds to the developer's request. This is the simplest solution that does not require reshuffling the balance of the units throughout the tower.

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VI. COMPETITION SCORING SYSTEM:

<u>Item</u>	<u>Description</u>	<u>Points</u>
	Phase 1 RFP Phase I	20
	Phase 2 RFP Phase II	50
	Phase 3 Interview	30

Time Adherence Scoring

- Phase I Submittal
 - (on time = 0, up to 1 min late = -1, up to 10 min late = -2, later = -4)
- Phase II Submittal
 - (on time = 0, up to 1 min late = -2, up to 10 min late = -3, later = -6)
- Phase III Presentation
 - (on time = 0, up to 1 min late = -1; up to 2 min = -2; 3 = -3; 4 = -4; later = -5)

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VII. LIST OF JUDGES:

Stewart Grauer, Construction Manager
(425) 454-8020

Seattle District
15405 SE 37th St, Su 200
Bellevue, WA 98006

Jim Pittman, Project Manager
(425) 454-8020

Seattle District
15405 SE 37th St, Su 200
Bellevue, WA 98006

Doug Sprute, Sr. Estimator
(425) 454-8020

Seattle District
15405 SE 37th St, Su 200
Bellevue, WA 98006

Jeff Miller, Construction Manager
(818) 246-3481

LA District
700 N. Central Avenue, Suite 700
Glendale, CA, USA 91203

Wil Painter, Regional Manager, Preconstruction
(818) 246-3481

LA District
700 N. Central Avenue, Suite 700
Glendale, CA, USA 91203

Scott Viola, Project Manager
(808) 541-9101

Hawaii District
1099 Alakea Street, Suite 1560
Honolulu, HI, USA 96813

Alternates:

Kurt Boyd, Manager Business Development
(425) 454-8020

Seattle District
15405 SE 37th St, Su 200
Bellevue, WA 98006

Dale Kain, Director of Corp. Development
(303)365-6500

Denver Head Office
2000 South Colorado Blvd Tower Two
Suite 2-500 Denver, CO 80222

Dave Yount, Operations Manager
(818) 246-3481

LA District
700 N. Central Avenue, Suite 700
Glendale, CA, USA 91203

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VIII. COMPETITION RULES:

The rules for the competition are designed to provide each team with an equal opportunity to apply their knowledge in developing their respective solutions and an equal opportunity to present their problem solutions to the judges. The following rules apply to the National Preconstruction Services Problem and supplement the ASC Competition Rules:

1. While the competition is in progress, only the six students identified as being team members shall be present in the teams' room. Faculty advisors may not interface with their team once the competition has begun.
2. Six (6) copies of the proposal must be turned in at the prescribed time. **Proposals will not be returned to the teams.** If you require some of the material in your proposal for your oral presentation, please make the appropriate copies prior to your submission of the written problem for your use.
3. The number of computers per team and use of the internet is to be as outlined in the ASC Competition Rules.
4. Once the presentations begin, only the teams who have presented their solutions may be present at the presentations of subsequent teams. This will mean that the first team up gets to see them all, while the last team does not get to see any of the others. The purpose of this rule is to prevent those participating in later sessions from gaining an advantage as to the contents of previous sessions.
5. Presentation materials for all teams are to be turned in to the judges prior to the first interview, by 8:30 AM on Friday, February 15th. No other presentation material will be allowed into the presentation that is not turned into the judges by this time. **NO EXCEPTIONS.**
6. All decisions of the judges are final.
7. The problem presented is an actual project under construction. To avoid any conflict of interest or unfair advantage, any student who may have potentially worked on the project in any way shall identify themselves to PCL immediately. This issue will be reviewed, and if appropriate we may request that an alternate be assigned to the project. PCL shall make the final decision as to equity in such a case.
8. Points will be deducted if proposals are submitted later per the Scoring System noted in Section VI. Written proposals will be due as indicated in Section I. The turn in location will be announced at the commencement of the competition. Other deliverables will be as noted elsewhere in the Problem Statement.
9. No phone calls, emails, or communication of any kind shall be made to the Owner, Architect, Engineer or design consultants that may be listed in the documents provided for this competition. They are aware that no team is to contact them and have been notified to contact the judges if any contact occurs. Contact with any of the above shall disqualify team from the competition.
10. Do not submit any extraneous materials with your written proposal, including company profiles, marketing materials etc. Please limit your response to the information requested. Be brief, clear and concise.
11. Any information concerning the size and scope and timelines provided in previous correspondence has been superseded by the information provided in the written problem statement and is not to be used in response to Phase 2.

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12. Last and most important rule: Have fun, learn, and develop new relationships.

Violation of any of these rules will be grounds for disqualification from the competition

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IX. COMPETITION EVALUATION FORM:

Please complete the evaluation form included in the Supplemental Information section Tab IX. Your feedback is important to our team as we strive to continually improve the problem in years to come. Please be honest and forthright with your responses.

Please complete one questionnaire per team and turn it in at the problem debrief. This form will be your admission ticket to the Debrief and Answer Session.

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X. SUPPLEMENTAL INFORMATION

<u>Description</u>	<u>Electronic Form on Disk</u>
0.0 RFI Form	X
2.0 Executive Summary Exercise	
3A.0 Conceptual Estimate Summary Form	X
3b.1 Preconstruction Estimate Form Preconstruction Billing Rates Preconstruction Description of Work	X
3c.1 Staff Estimate Form	X
Project Overhead & Equip Estimate Form	X
Staff Billing Rate Schedule	
Equipment Rental Rates	
3.d.1 Street Use Estimate Form	X
Street Use Fee Schedule	
3.e.1 Concrete Pricing Form	X
Concrete Work Productivities	
Other Pricing Data	
Concrete Material Quote	
3.f.1 Electrical Recap Card	X
Electrical Bids (3ea)	
4.0 Scheduling Durations Form	X
Scheduling Information	
5.0 Site Logistics Plan	
6.0 Area Summary Form	X
Gross Building Area Definitions	
7.0 Mechanical Loads Narrative	
Mechanical Estimating Exercise Forms	X
8.0 Electrical Loads Narrative	
Load Calc Forms- SF Method & Zonal Cavity Method	X
9.0 LEED Scorecard	X
IX. Evaluation Form	

PCL Construction Services, Inc
Seattle Office

Conceptual Estimate Summary

Owner: DCP, LLC
Project: Downtown Condominium Project
Location: Seattle, WA
Designer: Mithun
Area: 303,690 SF

Description	Quantity	UoM	Unit Price	Total Cost	Remarks
DIRECT COSTS					
PRECONSTRUCTION SERVICES	1.0	LS		0	
SITEWORK	1.0	LS		225,005	Provide per Preconstruction Estimate Section
BLDG EXCAVATION	1.0	LS		128,103	
STRUCTURE CONC.	1.0	LS		2,062,099	
STRUCTURE OVERHEAD COST	1.0	LS		7,764,353	Provide per Concrete Estimate Section
METALS	1.0	LS		w/above	
THERMAL/MOIST PROTECT	1.0	LS		1,314,517	
FINISHES	1.0	LS		4,961,526	
Unit Finishes	1.0	LS		6,452,572	
SPECIAL TIES	1.0	LS		6,592,991	
BUILDING EQUIPMENT	1.0	LS		45,094	
CONVEYING SYSTEMS	1.0	LS		30,750	
BLDG MECHANICAL	1.0	LS		636,381	
BLDG ELECTRICAL	1.0	LS		7,934,342	
WARRANTY CONTINGENCY	1.0	LS		3,159,770	Provide from Electrical Recap
DESIGN CONTINGENCY	1.0	LS		510,831	
DIRECT COSTS				255,415	
				42,073,749	
GENERAL EXPENSE COSTS					
PROJECT STAFF	1.0	LS		0	
PROJECT OVERHEAD & EQUIP	1.0	LS		1,415,140	Provide from Project Staff Estimate
INSURANCE/TAXES	1.0	LS		1,193,013	Provide from Project Overhead Estimate
0				1,208,681	
				0	
TOTAL COST				3,816,834	
				45,890,583	
Fee	4%			1,835,623	Provide Fee required by your Firm.
WSST					
WASHINGTON STATE SALES TAX	1	LS		0	NIC
TOTAL BID				0	47,726,207 Calculate Totals

**Downtown Condominium Project
Seattle, WA**

PROJECT OVERHEAD & EQUIPMENT

SPEC/PROD	ITEM	QTY	UNIT	MATERIAL	UNIT	EQUIP/SUB	CREW RATE	PROD	LABOR	TOTAL
						0			0	0
	Office Trailers- 10 x 60	40	MO			0			0	16,000
	Delivery & Set up	1	LS			5000.00			0	5,000
	Office Furniture	1	LS	5000	5,000	0			0	5,000
	Temp Toilets	120	MO	125	15,000	0			0	15,000
	Radios- Hand Held	160	MO		0	100.00			0	16,000
	Radio Chargers- Six Bank	40	MO			65.00			0	2,600
	Base Station Radio	20	MO			245.00			0	4,900
	Computers- Desktop Workstations	140	MO		0	150.00			0	21,000
	Copier/Scanner	20	MO		0	1100.00			0	22,000
	Fax Machine	20	MO			125.00			0	2,500
	Phone System	20	MO		0	800.00			0	16,000
	Monthly Phone Bills	20	MO			1250.00			0	25,000
	Job Photos	20	MO	150	3,000	0			0	3,000
	Office Supplies	20	MO	750	15,000	0			0	15,000
	Drawing Reproduction	1	LS	12000	12,000	0			0	12,000
	Housekeeping	320000	SF	0.05	16,000	0.35			0	128,000
	Trash Removal	20	MO		0	8000.00			0	160,000
	Final Cleanup	320000	SF		0	0.30			0	96,000
	Conex Storage Boxes	40	MO		0	165.00			0	6,600
	Site Fencing	1200	LF		0	2.40			0	2,880
	Fence Maintenance	800	HR		0		50.00	1.00	40,000	40,000
	Parking Expense- Staff Only	140	MO	225	31,500	0			0	31,500
	Misc. Travel Expense	20	MO		0	250.00			0	5,000
	Misc Trucking	1	LS		0	1000.00			0	1,000
	Postage & Shipping	20	MO	250	5,000	0			0	5,000
	Security Services- Nightly Drive By	20	MO		0	500.00			0	10,000
	Pick Up Truck- Project Supt	20	MO		0	1100.00			0	22,000
	Fuel, Oil and Maintenance	20	MO		0	750.00			0	15,000
	Auto Level	14	MO		0	150.00			0	2,100
	Lazer Level	14	MO		0	400.00			0	5,600
	Safety Supplies	20	MO	100	2,000	0			0	2,000
	First Aid Supplies	20	MO	50	1,000	0			0	1,000
	Forklift Rental- 10000# w/1/2 time Operator	15	MO		0	3600.00	4758	1.00	71,363	125,363
	Misc. Equipment Rental	20	MO		0	1500.00			0	30,000
	Generator Rental- 15KW	4	MO		0	900.00			0	3,600
	Barricades/Hoarding	150	LF		0	125.00			0	18,750
	Traffic Cop	250	HR		0	50.00			0	12,500
	Steet Cleaning	20	MO		0	325.00			0	6,500
	Fire Extinguishers	50	EA	50	2,500	0			0	2,500
	Water & Coffee	20	MO	150	3,000	0			0	3,000
	Small Tools	1	LS		0	65,000			0	65,000
	Project Sign	1	EA	800.00	800	0	500.00	1.00	500	1,300
	Celebrations	4	EA		0	1,500			0	6,000
	Steet Use Fees (Insert from Part VI 3 D)	1	LS		0	203,820			0	203,820
					0	0			0	0
					0	0			0	0
					111,800				111,863	1,193,013
	Subtotal			0.0%	0				--	0
					111,800				111,863	1,193,013
	Subtotal				0				--	0
					--				0	0
					--				0	0
					0				0	1,193,013
	Subtotal					969,350			0	1,193,013

EXTENDED BY _____
CHECKED BY _____

PROJECT OVERHEAD

**2nd and Broad
Sidewalk and Street Use Permits**

2nd Avenue Street **\$162,450**
 Alley **\$11,370**
\$173,820
 Unknown **\$30,000**
 Total Estimate **\$203,820**

**2nd Avenue Street (Arterial)
Lane Closure**

**From beginning of excavation to
to substantial completion**

	Date	Length	Width	Cost/sf	Cost/30 dys
Month 1	10/1/2006	250	8	\$0.10	\$600
Month 2	10/31/2006	250	8	\$0.20	\$1,200
Month 3	11/30/2006	250	8	\$0.40	\$2,400
Month 4	12/30/2006	250	8	\$0.80	\$4,800
Month 5	1/29/2007	250	8	\$1.20	\$7,200
Month 6	2/28/2007	250	8	\$1.20	\$7,200
Month 7	3/30/2007	250	8	\$1.20	\$7,200
Month 8	4/29/2007	250	8	\$1.20	\$7,200
Month 9	5/29/2007	250	8	\$1.20	\$7,200
Month 10	6/28/2007	250	8	\$1.20	\$7,200
Month 11	7/28/2007	250	8	\$1.20	\$7,200
Month 12	8/27/2007	250	8	\$1.20	\$7,200
Month 13	9/26/2007	250	8	\$1.20	\$7,200
Month 14	10/26/2007	250	8	\$1.20	\$7,200
Month 15	11/25/2007	250	8	\$1.20	\$7,200
Month 16	12/25/2007	250	8	\$1.20	\$7,200
Month 17	1/24/2008	250	8	\$1.20	\$7,200
Month 18	2/23/2008	250	8	\$1.20	\$7,200
Month 19	3/24/2008	250	8	\$1.20	\$7,200
Month 20	4/23/2008	250	8	\$1.20	\$7,200
Month 21	5/23/2008	250	8	\$1.20	\$7,200
Month 22	6/22/2008	250	8	\$1.20	\$7,200
Month 23	7/22/2008	250	8	\$1.20	\$7,200

2nd Avenue **\$145,800**

2nd Avenue Sidewalk (Arterial)

**From beginning of L4 Slab
to 4 months after topping out**

	Length	Width	Cost/sf	Cost/30 dys
Month 1	100	5	\$0.10	\$150
Month 2	100	5	\$0.20	\$300
Month 3	100	5	\$0.40	\$600
Month 4	100	5	\$0.80	\$1,200
Month 5	100	5	\$1.20	\$1,800
Month 6	100	5	\$1.20	\$1,800
Month 7	100	5	\$1.20	\$1,800
Month 8	100	5	\$1.20	\$1,800
Month 9	100	5	\$1.20	\$1,800
Month 10	100	5	\$1.20	\$1,800
Month 11	100	5	\$1.20	\$1,800

\$14,850

Alley (non Arterial)

**From beginning of Ground Floor Slab
to beginning of L4 (Construct F Line Concrete Wall)**

	Length	Width	Cost/sf	Cost/30 dys
Month 1	175	5	\$0.00	\$0
Month 2	175	5	\$0.10	\$263
Month 3	175	5	\$0.10	\$263
Month 4	175	5	\$0.20	\$525

\$1,050

Alley (non Arterial)

**From beginning of L4
to 4 months after topping out (complete Brick on F line)**

	Length	Width	Cost/sf	Cost/30 dys
Month 5	80	5	\$0.20	\$240
Month 6	80	5	\$0.40	\$480
Month 7	80	5	\$0.40	\$480
Month 8	80	5	\$0.80	\$960
Month 9	80	5	\$0.80	\$960
Month 10	80	5	\$1.20	\$1,440
Month 11	80	5	\$1.20	\$1,440
Month 12	80	5	\$1.20	\$1,440
Month 13	80	5	\$1.20	\$1,440
Month 14	80	5	\$1.20	\$1,440

\$10,320

Downtown Condominium Project
Seattle, WA

CONC. PRICING

SPEC/PROD	ITEM	MT	QTY	UNIT	MATERIAL	UNIT	EQUIP/SUB	CREW RATE	PROD	LABOR	TOTAL
FOUNDATIONS											
	FORM STRIP FOOTINGS	272	1,360	SF	1.50	2,040	0	51.66	0.200	14,052	16,092
	PLACE CONCRETE	56	159	CY	88.50	14,072	0	46.11	0.350	2,566	16,638
	PUMP	0	159	CY		0	15.00	2,385		0	2,385
						0		0		0	0
	FORM PAD FOOTINGS	1,190	5952	SF	1.50	8,928	0	51.66	0.200	61,496	70,424
	PLACE PAD FOOTINGS	162	463	CY	88.50	40,976	0	46.11	0.350	7,472	48,448
	PUMP	0	463	CY		0	15.00	6,945		0	6,945
						0		0		0	0
	FORM SPREAD FOOTINGS	45	224	SF	1.50	336	0	51.66	0.200	2,314	2,650
	PLACE SPREAD FOOTINGS	6	17	CY	88.50	1,505	0	46.11	0.350	274	1,779
	PUMP	0	17	CY		0	15.00	255		0	255
						0		0		0	0
	FORM RAFT SLAB	381	1904	SF	1.50	2,856	0	51.66	0.200	19,672	22,528
	PLACE RAFT SLAB CONC.	247	705	CY	88.50	62,393	0	41.66	0.350	10,280	72,672
	PUMP	0	705	CY		0	15.00	10,575		0	10,575
						0		0		0	0
	SUBTOTAL FOUNDATIONS										271,390
	SLAB - ON - GRADE										
	EDGE FORM/CONSTRUCTION JT 5"	80	400.68	sf	1.50	601	0.00	53.63	0.200	4,298	4,899
	PLACE CONCRETE	162	324.66	cy	89.50	29,057	0.00	49.62	0.500	8,055	37,112
	PUMP CONCRETE	0	324.66	cy		0	15.00	4,870		0	4,870
	SET SCREEDS	42	20871	sf	0.05	1,044	0.55	11,479	53.63	0.002	2,239
	FINISH CONCRETE	0	20871	sf		0	0.55	11,479		0	11,479
	CURE & PROTECT	83	20871	sf	0.10	2,087	0.00	49.62	0.004	4,142	6,230
						0		0		0	0
	SUBTOTAL SLAB - ON - GRADE										79,350
	1 SIDED WALLS										
	FORM 1 SIDED WALLS	2,445	13972	sf	1.50	20,958	0.00	54.48	0.175	133,209	154,167
	PLACE CONCRETE	384	768	cy	86.00	66,048	0.00	46.11	0.500	17,706	83,754
	PUMP CONCRETE	0	768	cy		0	15.00	11,520		0	11,520
	FORM PILASTERS	237	1355	sf	1.50		0.00	54.48	0.175	12,919	
	CURE & PROTECT	61	15327	sf	0.10	1,533	0.00	46.11	0.004	2,827	4,360
						0		0		0	0
	SUBTOTAL 1 SIDED WALLS										253,801
	COLUMNS										
	FORM COLUMNS 18" X 24"	5,462	54621	SF	1.50	81,932	0	54.48	0.100	297,575	379,507
	FORM COLUMNS 24" Round	17	172	SF	1.50	258	0	54.48	0.100	937	1,195
	PLACE CONCRETE	550	917	CY	96.00	88,032	0	46.11	0.600	25,370	113,402
	PUMP	0	917	CY	4.50	4,127	15.00	13,755		0	17,882
	WINTER HEAT CONCRETE	0	275.1	CY	2.75	757	0.00	0		0	757
	WINTER CONCRETE	0	275.1	CY	4.00	1,100	0.00	0		0	1,100
	CURE & PROTECT	218	54621	sf	0.10	5,462	0.00	46.11	0.004	10,074	15,536
						0		0		0	0
	SUBTOTAL COLUMNS										529,378
	CORE WALLS										
	FORM CORE WALLS	3,272	36355	sf	1.50	54,533	0.00	52.87	0.090	172,988	227,520
	PLACE CONCRETE	569	948	cy	96.00	91,008	0.00	46.11	0.600	26,227	117,235
	PUMP CONCRETE	0	948	cy		0	15.00	14,220		0	14,220
	FORM DOOR BUCKS/OPENINGS	83	831	sf	1.50	1,247	0.00	52.87	0.100	4,393	5,640
	WINTER HEAT CONCRETE	0	284.4	cy	2.75	782	0.00	0	0.000	0	782
	WINTER CONCRETE	0	284.4	cy	4.00	1,138	0.00	0	0.000	0	1,138
	CURE & PROTECT	145	36355	sf	0.10	3,636	0.00	46.11	0.004	6,705	10,341
						0		0		0	0

<i>SUBTOTAL CORE WALLS</i>											376,876
SHEAR WALLS											
		13972	sf								
FORM SHEAR WALLS	1,397	13972	sf	1.50	20,958	0.00	0	54.48	0.100	76,119	97,077
PLACE CONCRETE	192	383	cy	96.00	36,768	0.00	0	46.11	0.500	8,830	45,598
PUMP CONCRETE	0	383	cy		0	15.00	5,745			0	5,745
WINTER CONCRETE	0	114.9	cy	4.00	460	0.00	0		0.000	0	460
CURE & PROTECT	56	13972	sf	0.10	1,397	0.00	0	46.11	0.004	2,577	3,974
<i>SUBTOTAL SHEAR WALLS</i>											152,854
2 SIDED WALLS											
FORM 2 SIDED WALLS	465	4653	sf	1.50	6,980	0.00	0	54.48	0.100	25,350	32,329
PLACE CONCRETE	35	69	cy	86.00	5,934	0.00	0	46.11	0.500	1,591	7,525
PUMP CONCRETE	0	69	cy		0	15.00	1,035			0	1,035
CURE & PROTECT	19	4653	sf	0.10	465	0.00	0	46.11	0.004	858	1,323
<i>SUBTOTAL 2 SIDED WALLS</i>											42,212
ELEVATED SLABS											
FORM ELEVATED SLABS	26,813	315449	sf	1.50	473,174	0.00	0	52.28	0.085	1,401,792	1,874,966
EDGE FORM	1,698	6790	sf	1.50	10,185	0.00	0	52.28	0.250	88,745	98,930
PLACE CONCRETE	2,521	7203	cy	96.00	691,488	0.00	0	49.62	0.350	125,095	816,583
PUMP CONCRETE	0	7203	cy		0	15.00	108,045			0	108,045
SET SCREEDS	622	311189	sf	0.05	15,559			52.28	0.002	32,538	48,097
FINISH	0	311189	sf			0.55	171,154				171,154
CURE & PROTECT	0	311189	sf	0.10	31,119	0.00	0	49.62	0.004	61,765	92,884
WINTER HEAT CONCRETE 30%	0	2037	cy	2.75	5,602	0.00	0		0.000	0	5,602
WINTER CONCRETE 30%	0	2160.9	cy	4.00	8,644	0.00	0		0.000	0	8,644
GRIND SOFFITS 50%		155594.5	sf	0.15	23,339	0.00	0	49.62	0.020	154,412	177,751
<i>SUBTOTAL ELEVATED SLABS</i>											3,402,655
	49,988	inh									
Misc. Rebar		1	LS		0		0			0	
Stud Rails		1	LS		0		0			0	0
Temporary Rails @ Perimeter		1	LS		0	115,505	115,505			0	115,505
Tower Crane Estimate		1	LS		0	958,668	958,668			0	958,668
Mobile Cranes		1	LS		0	50,000	50,000			0	50,000
Structure Overhead		1	LS		0	1,277,190	1,277,190			0	1,277,190
					1,920,512		2,774,825			2,827,463	7,509,881
Subtotal				0.00	0		--			--	0
					1,920,512		2,774,825			2,827,463	7,509,881
Subtotal					0		--			--	0
					--		--			0	0
FEE on Self Performed Work 9% of DL					--		--			254,472	254,472
Subtotal	0				0		2,774,825			0	0
											7,764,353

CONCRETE

EXTENDED BY _____
 CHECKED BY _____

16A - ELECTRICAL

Bid Recap:

Downtown Condominium Project

Sec	Description	PB ELECTRIC	AC/DC ELECT.	BULLSEYE
	Total Cost	PETER BILLINGS 3,175,000	DOM SPARKY 3,143,510	ED GOTTENBERG 6,123,321
	By Owner	NO-OK- ✓	<60,000> ✓	NO-OK- ✓
	Design Fee	✓	✓	✓
	Residential Units	✓	✓	✓
	Commons Areas	✓	✓	✓
	Service	✓	✓	✓
	Equipment Connections	✓	✓	✓
	Fire Alarm	✓	✓	✓
	Generator	✓	✓	✓
	Telecom/CATV Systems	✓	✓	✓
	Security Systems	✓	✓	✓
	CCTV Camera System	✓	15 120	✓
	Video Surveillance System	✓	31 140	✓
	Temp Power	NO-OK-	NO OK	<63,159>
	Utility Company Charges	NO-OK	NO OK	NO-OK-
	Electrical Permit	45,000	✓	✓
	Warranty Costs	50,000	✓	50,000
	Parking- Onsite	NO-OK.	30,000	NO-OK-
	BONDABLE	YES	YES	YES
	PER PLANS AND SPECS	✓	✓	✓
	Sales Tax	NO-OK	NO-OK	NO-OK-
	ADDENDUM 1 & 2	✓	✓	✓ ONLY
	UNION/NON UNION	UNION	NO UNION	UNION
	ELECTRICAL	3,270,000	3,159,770	6,110,162

The Downtown Condo Project Scheduling Areas



		Misc. Work							
		Rate/Day	Qty	UM	Duration (Days)				
	Demolition	2,000	60,000	CF	30				
	Mass Excavation	750	22100	CY	29				
	Shoring- Soil Nailing	500	13940	SF	28				
	Footings	50	1345	CY	27				
Floors	Level	Concrete Work- Deck Cycle							
		Rate/Wk	SF	Duration(WKS)					
	P4	4,500	8824	2					
1	P3	10,000	25,105	3					
2	P2 Elevated Deck	10,000	25,131	3					
3	P1 "	10,000	20,166	2					
4	Ground Lvl	8,000	22,163	3					
5	L2	10,000	21,024	2					
6	L3	10,000	21,914	2					
7	L4	10,000	21,695	2					
8	L5	10,000	21,641	2					
9	L6	10,000	21,772	2					
10	L7	10,000	20,145	2					
11	L8	10,000	18,742	2					
12	L9	10,000	18,742	2					
13	L10	10,000	18,742	2					
14	L11	10,000	18,742	2					
15	L12	8,000	17,720	2					
16	Penthouse Floor Slab	7,500	15,145	2					
Totals			337,413		36.3			-	-
					8.4	Months		-	Months

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Total Float	2009												2010																				
						F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O
ASenatorial P/egion Services Problem																																						
Milestones																																						
Project Milestones																																						
Preconstruction																																						
MS-000100	Contract Award	0	14FEB08*		0																																	
Design																																						
MS-000110	Design Complete	0		10NOV08	483																																	
Permits Phase 2																																						
MS-000120	Permit Submittals Commence	0	09MAR09		403																																	
Construction																																						
MS-000130	Begin Demolition	0	21OCT08		66																																	
MS-000140	Structure Complete	0		05FEB10	170																																	
MS-000150	Finishes Begin	0	08FEB10		170																																	
MS-000160	C of O Inspection	0		01OCT10*	0																																	
Design																																						
Preconstruction																																						
DS-000090	Design	190*	14FEB08	10NOV08	36																																	
DS-000100	Schematic Design	25	14FEB08	19MAR08	0																																	
DS-000110	VE and SD Redesign	24	20MAR08	22APR08	0																																	
DS-000120	Design Development	30	20MAR08	30APR08	0																																	
DS-000130	Estimate and Review	14	01MAY08	20MAY08	0																																	
DS-000140	CD's Phase 1	40	01MAY08	26JUN08	0																																	
DS-000150	Estimate Reriew 2	14	27JUN08	17JUL08	0																																	
DS-000160	CD's Phase 2 (90% CD)	55	27JUN08	15SEP08	0																																	
DS-000180	Construction Set (100% CD)	40	16SEP08	10NOV08	36																																	
Entitlements																																						
Master Use Permit/Design Review Board																																						
MD-000090	MUP/DBR Entitlements	155*	14FEB08	22SEP08	43																																	
MD-000100	EDG Meeting	0	14FEB08		43																																	
MD-000110	MUP Intake	0	28FEB08		43																																	
MD-000130	Planner Review	30	28FEB08	09APR08	43																																	
MD-000120	Interim DRB #1	0	10APR08		43																																	
MD-000140	Planner Comments/response	25	10APR08	14MAY08	58																																	
MD-000150	Interim DRB #2	0	06JUN08		43																																	
MD-000170	Second Review	30	06JUN08	18JUL08	43																																	
MD-000180	Comments/Response 2	15	21JUL08	08AUG08	43																																	
MD-000160	Final DRB Meeting	0	04AUG08		48																																	
MD-000190	MUP Determination/ Issuance	30	11AUG08	22SEP08	43																																	
MD-000200	MUP Issued	0	23SEP08		43																																	

Sheet 1 of 4

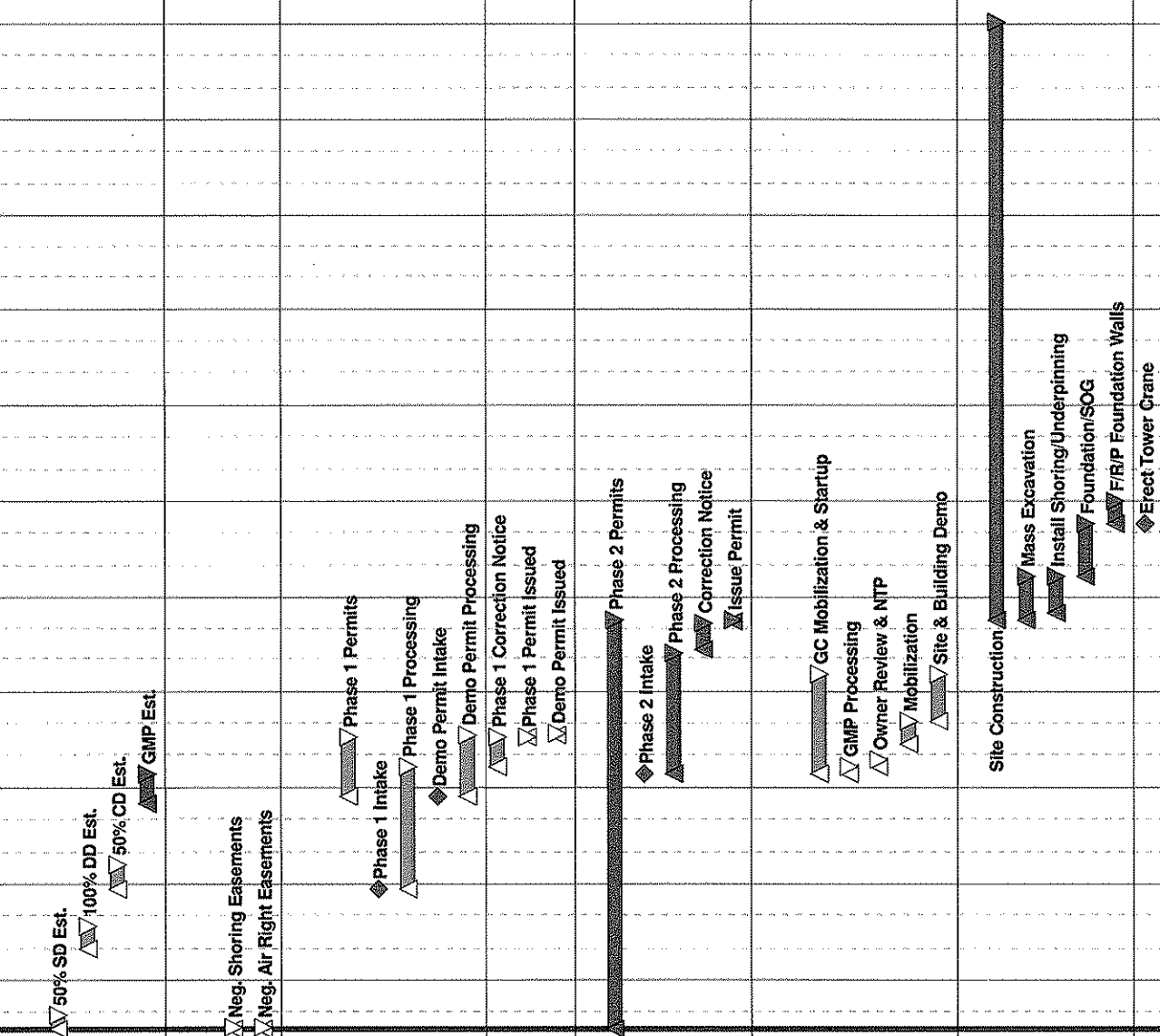
PCL
Downtown Condo Project

Start Date: 04APR05
 Finish Date: 01OCT10
 Data Date: 14FEB08
 Run Date: 12FEB08 11:20

Legend:
 Early Bar: [Arrow]
 Progress Bar: [Bar]
 Critical Activity: [Bar]

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CONSTRUCTION LEADERS



Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Total Float
Estimating					
Preconstruction					
DS-000190	50% SD Est.	10	14FEB08	27FEB08	663
DS-000200	100% DD Est.	15	01MAY08	21MAY08	603
DS-000210	50% CD Est.	15	27JUN08	18JUL08	563
DS-000170	GMP Est.	20	16SEP08	13OCT08	0
Easements					
Preconstruction					
DS-000220	Neg. Shoring Easements	1	14FEB08	14FEB08	270
DS-000230	Neg. Air Right Easements	1	14FEB08	14FEB08	380
Permits					
Permits Phase 1					
PM-000090	Phase 1 Permits	41*	23SEP08	18NOV08	44
PM-000120	Phase 1 Intake	0	27JUN08		44
PM-000130	Phase 1 Processing	80	27JUN08	20OCT08	44
PM-000100	Demo Permit Intake	0	23SEP08		43
PM-000110	Demo Permit Processing	42	23SEP08	19NOV08	43
PM-000140	Phase 1 Correction Notice	20	21OCT08	17NOV08	44
PM-000150	Phase 1 Permit Issued	1	18NOV08	18NOV08	44
PM-000200	Demo Permit Issued	1	20NOV08	20NOV08	43
Permits Phase 2					
PM-000091	Phase 2 Permits	271*	14FEB08	09MAR09	0
PM-000160	Phase 2 Intake	0	14OCT08		0
PM-000170	Phase 2 Processing	80	14OCT08	06FEB09	0
PM-000180	Correction Notice	20	09FEB09	06MAR09	0
PM-000190	Issue Permit	1	09MAR09	09MAR09	0
General Contractor					
GC Mobilization					
GC-000090	GC Mobilization & Startup	65*	14OCT08	16JAN09	36
GC-000100	GMP Processing	5	14OCT08	20OCT08	46
GC-000110	Owner Review & NTP	5	21OCT08	27OCT08	46
GC-000120	Mobilization	15	11NOV08	03DEC08	36
GC-000130	Site & Building Demo	30	04DEC08	16JAN09	36
Construction					
C0-000090	Site Construction	402*	10MAR09	01OCT10	0
C1-000100	Mass Excavation	30	10MAR09	20APR09	0
C1-000110	Install Shoring/Underpinning	25	17MAR09	20APR09	0
C2-000120	Foundation/SOG	35	21APR09	09JUN09	0
C2-000130	F/R/P Foundation Walls	15	10JUN09	30JUN09	0
C2-000160	Erect Tower Crane	0	10JUN09		15

Sheet 2 of 4

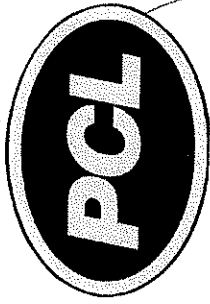
PCL
Downtown Condo Project

Start Date: 04APR05
 Finish Date: 01OCT10
 Data Date: 14FEB08
 Run Date: 12FEB08 11:20

Legend:
 Early Bar
 Progress Bar
 Critical Activity

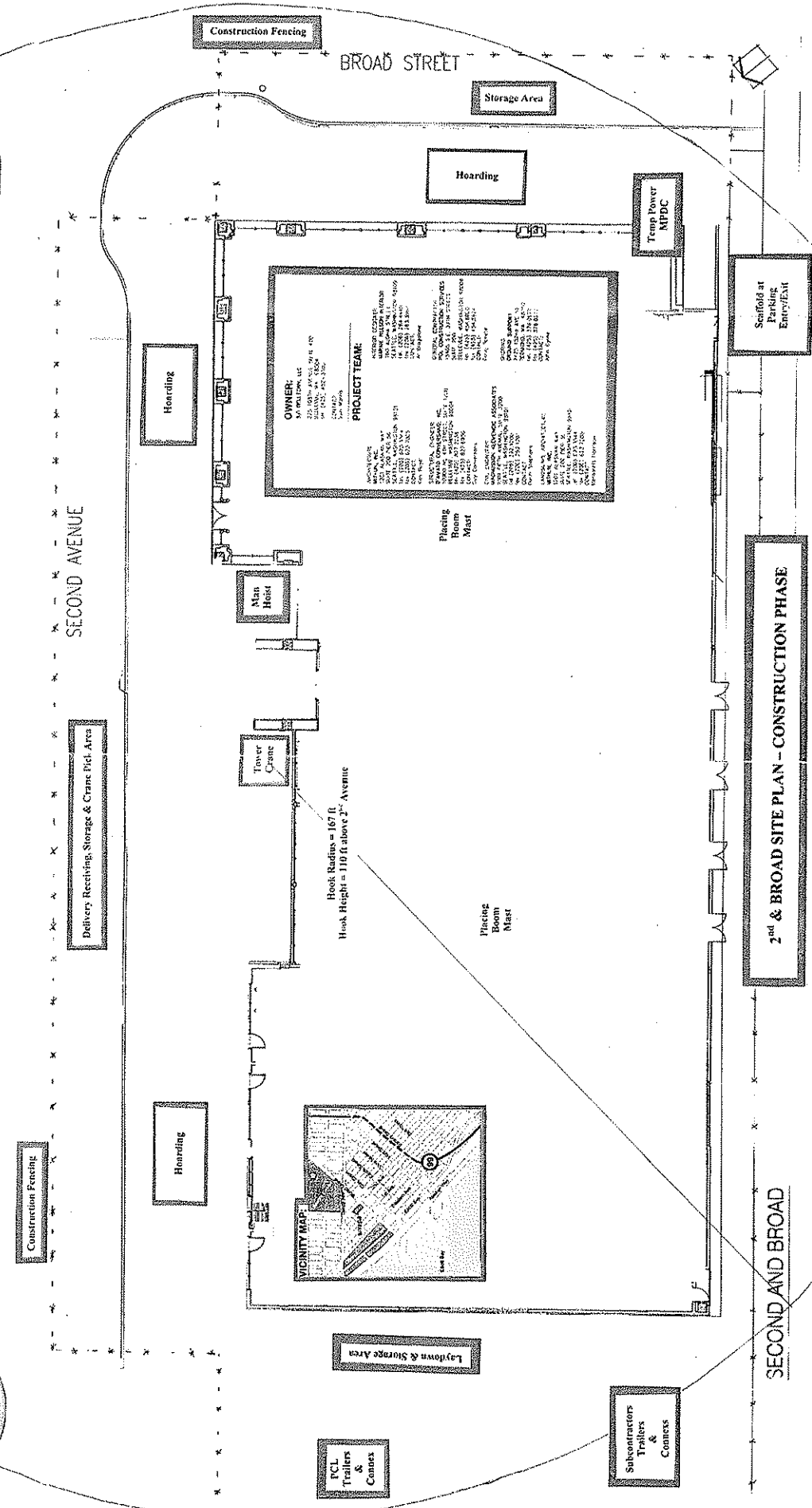
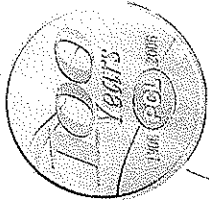
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PCL
CONSTRUCTION LEADERS



GALLERY

THE NEW LOOK OF BELLTOWN LIVING



OWNER:
 50 BELTOWN, LLC
 100 BELTOWN AVENUE
 SUITE 200
 PHILADELPHIA, PA 19106
 TEL: 215-592-1300
 FAX: 215-592-1300

PROJECT TEAM:

ARCHITECT:
 HOK INC.
 400 MARKET STREET, SUITE 2000
 PHILADELPHIA, PA 19106
 TEL: 215-592-1300
 FAX: 215-592-1300

GENERAL CONTRACTOR:
 MCGRAW-HILL CONSTRUCTION SERVICES
 1200 MARKET STREET, SUITE 1000
 PHILADELPHIA, PA 19106
 TEL: 215-592-1300
 FAX: 215-592-1300

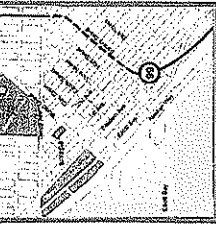
STRUCTURAL ENGINEER:
 TAYLOR ENGINEERING INC.
 1000 MARKET STREET, SUITE 1000
 PHILADELPHIA, PA 19106
 TEL: 215-592-1300
 FAX: 215-592-1300

MECHANICAL/ELECTRICAL/PLUMBING ENGINEER:
 HOK INC.
 400 MARKET STREET, SUITE 2000
 PHILADELPHIA, PA 19106
 TEL: 215-592-1300
 FAX: 215-592-1300

GENERAL CONTRACTOR:
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 TEL: 215-592-1300
 FAX: 215-592-1300



2nd & BROAD SITE PLAN - CONSTRUCTION PHASE

SECOND AND BROAD

Area Summary

Project: Downtown Condominium Project
Owner: PRIDH Development
A/E: Mithun

Area	Total GSF	SF Breakout:			Retail	Condo's	Condo Units (EA)	Parking Stalls (EA)	Comments
		Parking	Circ./Service	Condo's					
Parking L4	8824	7125	1699	0	0	0			
Parking L3	25105	22364	2741	0	0	0	72		
Parking L2	25131	21975	3156	0	0	0	72		
Parking L1	20166	16895	3271	0	0	0	57	Ramp Opening Deduct	
Grnd Lvl	22163	5991	9363	3954	2855	4	2		
Level 2	21024	9562	3295	0	2340	0	18	Ramp Opening Deduct/Open to Below	
Level 3	21914	0	5212	0	15465	21	0	2 guest suites w/Circ/Service	
Level 4	21695	0	3332	0	18023	25	0		
Level 5	21641	0	3355	17945	0	25	0		
Level 6	21772	0	3326	0	17982	25	0		
Level 7	20145	0	3074	0	15211	14	0	Amenity Space w/Circ/Service	
Level 8	18742	0	1938	0	16120	20	0		
Level 9	18742	0	1983	0	16120	20	0		
Level 10	18742	0	1983	0	16120	20	0		
Level 11	18742	0	1983	0	16120	20	0		
Level 12	17720	0	1881	0	14305	18	0		
Penthouse	15145	0	1718	0	12099	7	0		
Totals	337413	83912	53310	21899	162760	0	221	380 Stalls/Unit	

1.01

Calculation of Heating and Cooling Loads & Cost

Cooling Load Analysis

	<u>Area (1)</u>		<u>Rate (2)</u>		<u>Load (4)</u>
Condos	162,760 sf		350-450 sf/ton		407 tons
Offices & Public Spaces	53,310 sf		190-360 sf/ton		194 tons
Retail	21,899 sf		150-400 sf/ton		80 tons
Total Basic Tonnage	237,969 sf		349.44 sf/ton (average)		681 tons

Heating Load Analysis

	<u>Area (1)</u>		<u>Rate (3)</u>		<u>Load (4)</u>
Condos	162,760 sf		85.5 BTU/sf		13,915,980 BTU's
Offices & Public Spaces	53,310 sf		85.5 BTU/sf		4,558,005 BTU's
Retail	21,899 sf		85.5 BTU/sf		1,872,365 BTU's
Total Basic BTUs	237,969 sf		85.5 BTU/sf		20,346,350 BTU's

Cost Analysis

	<u>Amt (5)</u>		<u>Cost (6)</u>		<u>Amount (7)</u>
Cooling (Chiller only)					
Basic tonnage	681 tons				
Diversity	90 %				
Redundancy	- %				
Estimated Cooling \$	613 tons		459 \$/ton		\$ 281,321
Heating (Boiler only)					
Basic BTU's	20,346,350 BTU				
Diversity	- %				
Redundancy	50 %				
Estimated Heating \$	30,519,524 BTU				
	30,520 MBH		26.5 \$/MBH		\$ 808,767

Notes:

- (1) Calculate areas from plans
- (2) Chose cooling rate from table of alternatives given in handouts
- (3) Calculate heat loss rate from information given in handouts (one rate for entire building)
- (4) Multiply the area by the rate to calculate cooling tons or heating BTU's
- (5) Use calculated tons and BTU's and from written PRIHD requirements provided, determine the diversity and redundancy percentages
- (6) From bids, determine the right Subcontractor cost to use for your estimate. Same sub for both chiller and boiler
- (7) Multiply the quantity by the selected rate to determine the estimated costs for heating and cooling
- (8) For heating, 1000 BTUs = 1 MBH
- (9) Identify which subcontractor you used for pricing and why on the following sheet

Team _____

Mechanical Estimating Exercise

SUBCONTRACTOR SELECTED: Seahawk HVAC

REASON FOR SELECTED SUBCONTRACTOR:

	Calculated \$ / Unit
Seahawk HVAC	
Chiller Load Bid = 664 Tons; Chiller \$ Bid = \$304,776	Chiller \$/Ton = \$459
Boiler Load Bid = 31,086 MBH; Boiler \$ Bid = \$823,779	Boiler \$/MBH = \$26.5
Supersonic Mechanical	
Chiller Load Bid = 601 Tons; Chiller \$ Bid = \$315,525	Chiller \$/Ton = \$525
Boiler Load Bid = 31,321 MBH; Boiler \$ Bid = \$814,346	Boiler \$/MBH = \$26
Mariners Plumbing and Heating	
Chiller Load Bid = 615 Tons; Chiller \$ Bid = \$320,415	Chiller \$/Ton = \$521
Boiler Load Bid = 26,446; Boiler \$ Bid = \$819,826	Boiler \$/MBH = \$31

Cooling Discussion:

Even though Seahawk HVAC had the middle total \$ bid for the chillers, they had best \$/Ton rate.

When you applied this rate to the calculated total tonnage, it resulted in the best cost estimate. Both other subcontractors had \$/Ton rates that are over the recommended \$/Ton given in the exercise.

Heating Discussion:

Seahawk and Supersonic had a \$/MBH that were within the cost range given in the exercise. Mariner was above the recommended \$/MBH. Since Supersonic had a cooling rate above the recommended cooling range, Seahawk has the best combined bid package for both cooling and heating.

"SF Method"
Lighting Load Analysis

Team _____

Parking Lighting - Washington		<u>Fixture A</u>	<u>Fixture B</u>
		<u>Action</u>	
Calculate Watts Allowed By State to Light Parking Garage			
1 Parking Ramp Area (sf)	(Take-off Sheets A2.01-A2.04)	75,624	75,624
2 Lighting Power Allowance (Watts/sf)	(Find from info given to you)	0.20	0.20
3 Total Wattage Allowed by State	#1 * #2	15,125	15,125
Calculate # of Fixtures Allowed to Meet State Allowance using Wattage			
4 Watts/fixture	(Find from info given to you)	180	118
5 Quantity of Fixtures allowed to be used to stay below lighting power allowance	#3 / #4	84	129
Calculate # of Fixtures Required Using Lighting Specs			
6 Area (sf)/Fixture (Area each fixture will light)	This is given "Rule of Thumb" to use for this calculation	800	500
7 Number of fixtures required using square foot per fixture "Rule of Thumb"	#1 / #6	95	152
8 Total watts used if (sf) quantity is used	#7 * #4	17,100	17,936
9 Req'd watts/sf based on Lighting Specs	#8 / #1	0.23	0.24
Calculate Fixture Package Cost			
10 Cost per Fixture	From bids given below.	\$ 700	\$ 395
11 Cost of Parking Lighting System	#7 * #10	\$ 66,500	\$ 60,040
12 Fixture Package Cost per sf	#11 / #1	\$ 0.88	\$ 0.79
If line #9 exceeds #2, use the more accurate way of determining quantity of fixtures needed (Problem 2)	Does req'd fixture wattage/sf exceed State allowable wattage? If no, stop here. If yes, move to Problem 2	Ⓚ / N	Ⓚ / N
Notes:			

"Zonal Cavity Method" of determining the quantity of light maintained on the floor of a parking ramp

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Fixture Type	IES FC req'd	Area (SF)	Length + Width	Ceiling Height	Rm Cavity Ratio	Coefficient of Utilization	Maint. Factor	Lumens per Lamp	Total Lumens Required	# of Lamps Required	Lamps per Fixture	# Fixtures Required	# Fixtures Installed	Watts per Fixture	Installed Watts	Installed Watts per SF	State Allowed Watts per SF
A	5	83,912	1190	10	0.71	0.460	0.86	3200	1060566.2	331.4	4	82.9	83.0	180.0	14940.0	0.18	0.20
B	5	83,912	1190	10	0.71	0.425	0.77	8500	1282077.9	150.8	1	150.8	151.0	118.0	17818.0	0.21	0.20

INFORMATION NEEDED:

- IES requires 5 foot-candles (FC) of light in a parking ramp
- IES = Illuminating Engineering Society of North America
- Room Cavity Ratio (RCR) Formula = $(IES\ FC) \times (Height) \times (Length + Width) / Area$

$$[(1) \times (4)] \times [(3) / (2)]$$

(Note: Length + width is for two sides of the garage footprint only, not all 4 sides. This is provided for you.)

- Coefficient of Utilization (COU): This is a multiplier that accounts for light reflectivity based on design and garage materials
(From COU Chart)

- Maintenance Factor (MF): This is a multiplier that accounts for light loss due to lamps aging and getting dirty and ballast factors
(From MF Worksheet)

- Total Lumens required = $(IES\ FC) \times (SF) / (COU) \times (MF)$

$$[(1) \times (2)] / [(6) \times (7)]$$

- Number of lamps required = Total Lumens required / lumens per lamp

- Number of fixtures required = number of lamps required / lamps per fixture

- Number of fixtures installed = number of fixtures required rounded up to nearest whole #

- Watts per fixture = from information given

- Installed watts = (number of fixtures installed) * (watts per fixture)

- Installed watts per SF = Installed watts / Area

- State Allowed watts/SF = from State Table 15-1 information in Problem 1

- Cost per fixture from information given

- Total fixture package cost = (# of fixtures installed) * (cost per fixture)

- Cost per sf = (cost per fixture) / Area

CONCLUSION: Using this Zone Cavity Method:

- Is either fixture under the State allowed watts per SF? If so, which fixture? (Type A is under the State wattage/sf allowance)
- Which fixture would you include in your proposal and why? (Include Type A, it meets wattage allowance and is the best price)

Fixture Package Cost

Fixture Type	18		19		20	
	Cost per fixture	Package Total \$	Cost per sf	Package Total \$	Cost per sf	Package Total \$
A	\$ 700	\$ 58,100	\$ 0.69	\$ 58,100	\$ 0.69	\$ 58,100
B	\$ 395	\$ 59,645	\$ 0.71	\$ 59,645	\$ 0.71	\$ 59,645

COEFFICIENT OF UTILIZATION

Fixture Type A

Coefficient of Utilization (This is the percentage of light that actually reaches the area being illuminated)

RCR Value	Ceiling Reflectance =		70%		50%	
	Wall Reflectance =	COU Value =	50%	30%	50%	30%
0		0.42	0.41	0.35	0.42	0.30
1		0.48	0.45	0.42	0.42	0.38

Type A COU value selected: 0.46

Fixture Type B

Coefficient of Utilization (This is the percentage of light that actually reaches the area being illuminated)

RCR Value	Ceiling Reflectance =		70%		50%	
	Wall Reflectance =	COU Value =	50%	30%	50%	30%
0		0.41	0.40	0.33	0.33	0.30
1		0.43	0.42	0.35	0.35	0.36

Type B COU value selected: 0.425

Note: For this calculation, assume the ceiling of the parking structure will be painted (70% reflectance) and the walls will be rubbed exposed concrete (50% reflectance). The COU value you will need will be an extrapolated value based on the RCR value calculated from the worksheet.

MAINTENANCE FACTOR

The Maintenance Factor (MF) is the factor obtained by multiplying the following:
Maintenance Factor equals DDF x LF

Dirt Depreciation Factor (DDF)	
Areas that are kept very clean, with minimal dirt and dust in area	DDF 0.95
Areas that are kept clean, with dirt and dust in area	0.90

Lamp Factor (LF)	
Fluorescent Lamps	LF 0.95
Metal-Halide Lamps	0.85

$$\text{DDF} \times \text{LF} = \text{MF} \quad (\text{for Zone Cavity Method Calculation})$$

Type A	$\frac{0.90}{0.95}$	$\frac{0.86}{0.86}$	(fluorescent lamps)
Type B	$\frac{0.90}{0.85}$	$\frac{0.77}{0.77}$	(metal-halide lamp)

Notes: Assume in discussion with Owner, the parking area will be swept every other month, but dirt and dust will be prevalent in the area

LEED™ Scorecard**Instructions**

The scorecard below should be used throughout the design and development of your building project to track your anticipated LEED™ score. The spreadsheet automatically dates each printout to give you a snapshot of your LEED™ score as your project progresses. The active spreadsheet sums the credit points for each category and provides a total score for the project. Do not input values in the category subtotal or in the project total fields as this will be done automatically.

The prerequisites are required and must be achieved. Thus, a "Y" appears adjacent in the first box and the other two are shaded. Beside each credit are three boxes to indicate the likelihood of achieving each credit. To score the project appropriately, input the number of points for that credit into the first column labeled "Y" if this credit will be pursued. Input the number of points in the second column labeled "?" if it is unsure if this credit will be pursued. Finally, input the number of points in the third column labeled "N" if this credit will not be pursued or is not applicable to the project. The possible points available for each credit are shown in the far right column in each category. Remember that Energy & Atmosphere Credit 1.1 through 1.5 are each worth **two** points.

The total number of points listed in the first box of the Total Project Score indicates the current anticipated score of the project. The ranges for each LEED certification category are listed below this row. A minimum of 26 points and achievement of all prerequisites is required to certify a project.

In the Innovation & Design Process category you are encouraged to propose up to four innovations for your project. You should rename the credit titles for Credits 1.1 to 1.4 to reflect the strategies your project will propose.

