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Construction Research Series

THE BANK OF WESTMINSTER AND HYLAND PARK CONSTRUCTION CONTRACTS AS ENGINEERING STUDENT CLASSROOM PROJECTS; CONSTRUCTION PHASE

By
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Construction Engineering and Management Program

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THE BANK OF WESTMINSTER AND HYLAND PARK CONSTRUCTION CONTRACTS AS ENGINEERING STUDENT CLASSROOM PROJECTS; CONSTRUCTION PHASE

By
Robert J. Bossa

Presented to:
The Department of Civil, Environmental, and Architectural Engineering
The University of Colorado at Boulder
In Partial Fulfillment of the Requirements for a Masters of Science Degree

The University of Colorado at Boulder
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Bossa, Robert J. (M.S., Civil Engineering)  
The Bank of Westminster and Hyland Office Park Construction Contracts as Engineering Student Classroom Projects: Construction Phase.

Employers often find that the recently hired engineering school graduate has difficulty in correlating the methodology and the technology learned in the classroom to actual construction projects. The following report attempts to help in tying together classroom work and an actual construction project.

Information for the report was provided by Walters Construction Management, Inc. The report describes an actual office building presently under construction. Portions of the report are intended to be used as narrative type lessons, other parts are to be used as laboratory problems.

The report focuses on the organizational structure of the construction firm and the contractual requirements of the construction firm. The text then analyzes selected portions of the project in order to explain why certain construction related procedures have been made.

Photographs of the construction phase of the project are presented. The photographs are intended to provide a pictorial history of the construction project.
Past reports on this project will be used along with this report to develop a complete, total construction project for classroom application.

This abstract is approved as to form and content.

Signed

James E. Diekmann
ACKNOWLEDGEMENTS

I would first like to thank the Bill Walters Company, specifically Mr. John Fox and Mr. David Metcalf of Walters Construction Management, Inc., who provided this construction contract to be used as a classroom project. The amount of time and costs expended by them and the firm is truly appreciated.

I would also like to thank Professor James Diekmann for his help and advice throughout this project.
INTRODUCTION

Within the scope of the undergraduate and graduate Civil and Architectural engineering programs is the need to relate information from textbooks and classrooms to the actual construction industry. This report will attempt to bridge the gap between real world situations and the world of academics.

Walters Construction Management has agreed to let their organization and one of their current projects serve as a model for this report. The Bank of Westminster is under construction at the corner of 92nd Avenue and Sheridan Blvd. The bank project along with the organizational structure of Walters Construction Management will be studied and analyzed and results will give a realistic approach to future student assignments.

The objectives of this report are to study the construction phase of the Bank of Westminster and to tie it to specific graduate and undergraduate courses offered in the Construction Management field in the Department of Civil and Architectural Engineering. This report will study the development of the B.L. Walters company from the original corporate entity of Walters Construction Management and why this cooperation came into existence.
The actual organization of Walters Construction Management will be used as a reference for study in the Construction Management (CE 525) class. This will give the class a successful and working organization to compare with the different organizational structures referred to in the classroom. Students will be able to discuss the advantages and disadvantages of this particular organization and compare their thoughts with the thoughts of members in the organization of Walters Construction Management. The class will be given the organizational structure and then discuss the formal and informal links of each department. Afterwards they can again compare their assumptions or results with those of the actual formal and informal links within Walters Construction Management.

By following one of the numerous subcontractors on this job students will experience the actual paper flow and contract related problems encountered during this project. This will be very effective in the Construction Contracts (CE '524) class when discussing effects of backcharging or how backcharging or changes in the plans will affect the subcontractor and his contract.

The use of time lapse photography will be used in the Construction Engineering I & II (CE 528 & CE 529) classes. Time lapse photography will show actual repetitive construction methods used on this project. The class will be able to analyze these methods and decide on
possible alternative solutions to these specific construction practices.

Each classroom application will have packaged slides specifically for that module which will give a visual recording of the project at specific construction phases and will assist students in visualizing the project phase being discussed. The slides will encompass the project from the clearing of the site through the complete building.
PART I - PROJECT REPORT

THE ORGANIZATION STRUCTURE AND THE CREATION OF WALTERS CONSTRUCTION MANAGEMENT

The B.L. Walters Corporation was formed approximately three years ago, in 1981, to the corporate level from the Walters Construction Management organization which was formed in 1974. The primary motivation for forming a full service development company from the traditional construction management firm was the desire of the Chief Executive Officer to have control over what was being developed and how that development was to be accomplished. Because of the objective to have complete control, Walters Construction Management expanded and became the Bill L. Walters Company.

This Corporation is comprised of numerous companies that handle the acquisition of the land, the development of the raw land, the management of the construction, the maintenance and management of the constructed building, the leasing of completed buildings, and a Chief Financial Officer to maintain all the accounting records of the B.L. Walters Company. The overall corporate structure is shown in Figure 1.
This report will deal strictly with the construction management portion of the entire organization and will also touch upon the management/maintenance of a project once a project has been completed. The construction management part of B.L. Walters Company, hereafter referred to as Walters Construction Management, is a wholly owned subsidiary, and is divided into five areas. These areas are Architectural and Design, Shell Construction, Tenant Finish, Roads and Utilities, and Accounting.

Each of these separate areas operate on an arm's-length, semi-formal basis with the B.L. Walters Company. At the head of Walters Construction Management is the Vice President and General Manager who reports directly to the President of B.L. Walters Company. The manager of Shell Projects and the Manager of Tenant Finish, along with the Manager of Road and Utilities, the Senior Architect and the Senior Accountant report directly to the Vice President.

The structure of Walters Construction management makes it very clear that as the general contractor, Walters Construction Management will subcontract a great deal of the work. As an organization they do not maintain the personnel to do the majority of work that a General Contractor can. By maintaining their own Project Managers and Field Supervisors, Walters Construction Management maintains control of these projects. In the architectural area the design drawings may be produced.
either by Walters or by outside designers. In the event that an outside designer is used, Walters Construction Management maintains control over the actual design, the design costs, and the design period.

During the design phase both the Shell Construction Department and the Tenant Finish Department are deeply involved in the design phase. All agreements between the various departments are at arms-length and there are written contracts between the various departments.

Tenant finish is one of the new areas created at Walters Construction Management because of the increased need for specialists to deal with tenants and getting them moved into their building. It is seen as one of the most important areas within the Walters Construction Management organization. At Walters Construction Management they recognized the need for this specialty and reorganized, creating Tenant Finish. The improvement of and a more receptive attitude toward tenant finish was seen as a bona fide plus in the renting of completed buildings and development of good customer relations. The Tenant Finish Department has become one of the biggest departments of Walters Construction Management. The Tenant Finish department is considered the income stream for Walters Construction Management. Working with the tenants and insuring their satisfaction is one of the biggest reasons for the success of Walters Construction
Management. To enhance the organization's credibility and to utilize the "one stop shopping" principal, a good Tenant Finish Department is essential to a successful company.

The goals of Tenant Finish are to give the customer complete satisfaction in their final spaces. Tenant Finish works very closely with the Design area and the Shell Construction area in the very beginning to alleviate problems with the customer's requests. The Tenant Finish Department is structured so that under the Manager of Tenant Finish there is an Interior Design Manager who, with the space planners assigned to him, will do the interior design for the tenant based on proven interior designs. The Interior Design Manager will incorporate into his designed spaces other options or additions that the customer may desire. Walters Construction Management builds typical office buildings thereby creating a quick, concise decisionmaking process of what will work in a specific building and what will not.

When the building is erected and weatherproof, the Project Managers for Tenant Finish, who with their own Field Supervisors, complete the interior portion of the building. The Project Manager for the Tenant Finish will maintain clear, concise records of what is being done to the interior of the building. With the typical building having more than one tenant, he will keep
records of what spaces are for what tenants and keep his field supervisors appraised of any changes in design or schedule. The Tenant Finish Department will also do some work for organizations other than Walters Construction Management. The amount of this work is minimal and only comes to approximately ten percent of the actual tenant finish work accomplished.

The Shell Construction part of the Walters Construction Management organization is very similar to the Tenant Finish Department. Under the Manager of Shell Projects there are various Project Managers and in turn, under the Project Managers are various Field Supervisors.

The Project Manager would be involved with the project from the very first design meeting through the tenant occupation of the building. During the initial design meeting the Project Manager will be there with the Architects and Designers so that when any questions arise about the design in conjunction with the actual construction, it can be answered quickly. The Project Manager also communicates with the various Consulting Engineers hired by the Design Department to help answer any questions that may come up about the Mechanical, Electrical, or Structural systems. The Project Manager would report directly to the Manager of Shell Projects with any problems that he could not solve informally with his counterpart in the Design area, Tenant Finish area, Accounting area, or Road and Utility area. The basic
philosophy of the entire organization is to solve any problem that may arise at the lowest possible level.

If the Project Manager can't solve a problem informally, he would move up his chain of command to the Manager of Shell Projects who will try to solve the problem at his level. If this is not possible then the Vice President and General Manager of Walters Construction Management will make the decision. Because of the informality and the close proximity of these various Managers and Project Managers it is infrequent that a problem can not be solved among the people involved.

In conclusion, the Walters Construction Management organization is a main part of a Design-Build organization that also incorporates the management/maintenance of the structure. The Walters Construction Management organization goes one step further than the Professional Construction Manager organization and not only designs and builds, but also leases, manages, and maintains the structures they erect. This keeps Walters a step ahead of their competition. Walters Construction Management controls the design, the design cost, and the design period but also maintains their credibility and their positive public image by catering to their customers not only in the construction phase, but afterwards in the moving in and leasing phase.
OBJECTIVES OF WALTERS CONSTRUCTION MANAGEMENT
AS COMPARED TO THEORETICAL ORGANIZATIONS

In comparison with normal project delivery systems, Walters Construction Management is a combination of the Owner-Builder organization and the Professional Construction Management organization.

Theoretically, a Professional Construction Management organization combines three parties into a team consisting of the owner, designer, and construction manager in a non-adversary relationship. The construction manager works closely with the owner and the designer from the beginning to the completion of the project. The construction manager does not normally perform construction work with his own forces or guarantee the overall cost of the work. Once the budget is approved the construction manager monitors developments in schedules, quality requirements, and spending in order to maintain the objectives established in the beginning of the project. The construction manager advises and coordinates the procurement of any long lead materials or equipment. He will monitor the payments to subcontractors, the changes in contracts or any claims. In general, the construction manager monitors actual cost, schedules, and quality control.
Walters Construction Management does all of this, but is different in one very important aspect of the typical model. Walters Construction Management does not go out and bid on projects to manage; their projects are established down through the hierarchy of their chain of command. The Chief Executive Officer who is an architect by training, may want to develop land in accordance with members of an organization that he has an interest in, thereby creating the projects.

Walters' desire to maintain absolute control over their project is in line with the aims of the Owner-Builder organization. In theory, the owner is responsible for the design and construction of the project. The owner has the option of using his own work forces or to subcontract part or all of the work.

The Walters Construction Management organization is a Line and Staff Task Force. As shown in Figure 1 there is a distinct hierarchy and a designated chain of command. The hierarchy is designated only for those decisions that can't be resolved at lower levels in the organization. A strength of Walters Construction Management is the project orientation of the entire project team. One of the weaknesses, in theory, in a line and staff organization is that individuals may be troubled by the dual accountability to both a project and a functional boss.
Walters Construction Management is also structured somewhat as a Matrix Organization. The informal lines of the structure opens lines of communication at all levels and gives people the ability to talk with counterparts and maintain a knowledgeable and productive environment. Therefore, Walters construction Management is most definitely a Line and Staff Task Force, but with a little of the Matrix Organization added to help alleviate any communication problems.

In conclusion, the main objective of Walters Construction Management is to maintain absolute control over the project and to produce a product that is a marketable commodity.
DIFFERENCES BETWEEN WALTERS CONSTRUCTION MANAGEMENT AND OTHER CONSTRUCTION MANAGERS

A major difference between Walters Construction Management and other developers is the "one stop shopping" approach. Not only will Walters Construction Management design the building, they will manage the interior finish, and will maintain the upkeep of the building and surrounding grounds. This is a major difference since most developers utilize a fragmented approach to the development of buildings.

A construction manager who utilizes the fragmented approach will have someone come in who owns the land and wants it developed. This manager may or may not help find a designer that can design what the owner wants on the land. Once the design is approved by all interested parties, it is then turned over to the construction manager. The construction manager in turn requests bids based on these designs from various general contractors who in turn receive bids from various subcontractors.

Once the construction manager picks his general contractor he will manage the job as per plans and specifications and keep track of any changes in the project. He will be the owner's representative on the job. The construction manager, in most instances, will carry
professional liability insurance for this specific project and also on any other project he may be managing at the time.

Under Walters Construction management, a major difference is that Walters Construction Management is covered under an umbrella policy from the B.L. Walters Company for professional liability. When Walters Construction Management gets a project to be managed, it usually has been first brainstormed at the Chief Executive Officer's level of the B.L. Walters Company. The land has been acquired under the Land Acquisition Department of B.L. Walters Company, and the developers in Land Development may have specific plans for this tract of land.

Walters Construction Management, like other construction managers, would go out looking for bids for the various parts of construction, but would act as their own general contractor. The differences are quite unique in that Walters Construction Management has control over the design of the project, control of the construction management of the project, control over changes in the design of the project, and once the project is complete, control over the management of the building.

A developer or construction manager who utilizes the fragmented approach can run into many difficulties during the project's construction. There could be quite a bit of money spent in litigation determining who is
responsible and who will pay for corrections to any faulty design or construction applications. If once a tenant has occupied the building and there are maintenance problems, the developer must get in touch with the people who do their maintenance to correct it. In the B.L. Walters company, they would handle their own maintenance problems and there would be no doubt as to what the priority is.

In the fragmented approach, the "finger pointing" and litigation could go on for quite awhile. Finding out who is responsible and then making sure the responsible party adheres to their end of the agreement could be costly not only in dollars, but also in time. While in the full service development company such as Walters Construction Management, a decision could be made and action to fix the problem could be imposed.

The Walters Construction Management organization allows decisions to be made faster in the pre-construction phase and the construction phase than in the fragmented approach. This is because in the fragmented approach, the construction manager or developer is trying to touch base with numerous people involved in the project at various locations. The start up cycle in decisionmaking at Walters Construction Management is quite short compared to a fragmented approach of construction management. At Walters Construction Management the process of decisionmaking is known and has been
utilized over and over again. The members of the organization know who is in charge and where to go for certain decisions. In a fragmented approach, the construction manager must first establish the lines of communication and the chain of command. This alone is very time consuming.

A significant difference is that the Chief Executive Officer of B.L. Walters Company has absolute control over the Walters Construction Management organization as well as Land Acquisition, Land Development, Maintenance/Management, etc. which ensures a quick decisionmaking process. Because of this control, the Walters Construction Management organization can be more positive and make absolute commitments to cities, municipalities, and/or other public service areas for not only the construction of a project but its overall development. This greatly enhances the credibility of the organization as well as maintaining the flexibility to propose or accept alternatives to the design quickly and effectively.

In conclusion, the significant difference between Walters Construction Management and the fragmented approach is that the decisionmaking process in both the pre-construction and construction phase is quicker and much more efficient in an organization such as Walters Construction Management. Having all the participants for a certain project under one roof makes the life of the
project from conception to completion significantly shorter and improves the quality of the finished project to the tenant or owner.
ADVANTAGES AND DISADVANTAGES OF WALTERS CONSTRUCTION MANAGEMENT

In interviews and conversations with several members of the organizational structure of Walters Construction Management, some distinct advantages and disadvantages of the organization appeared.

A distinct advantage that appeared frequently was that there was a more positive attitude towards the customer and that commitments would be made and adhered to. The majority of people felt that this was a great advantage in enhancing Walters Construction Management's credibility and was in conjunction with the B.L. Walters Company policy of insuring the customer's satisfaction. At times this could be a disadvantage. Because of the organization's feeling of responsibility, they could be abused by trying to make the customer happy at all costs. Having to maintain the warranty can sometimes create the feeling of jumping through hoops.

During good construction periods, the desire to control the project in its entirety could be an advantage because you have a varied selection of customers to choose from. A disadvantage to maintaining complete control is that a number of contractors don't want to give up control to Walters Construction Management, so they don't work for them. This is found more often
during good construction periods. This could put a damper on the marketplace for Walters Construction Management, creating a loss of consultants and a loss of a certain part of the market. During slow times in the construction field, this desire for control is not an advantage, but it is not a big disadvantage.

One disadvantage is that it costs more to do business. The continuity of the organization creates a need for more supervisors to be kept on the payroll when times are slow. In other organizations they would release some supervisors, but at Walters Construction Management they are retained.

Having changes dealt with at a lower level in the organization is a valuable advantage. If there is a policy change affecting a project, because of the informal chain of command within Walters Construction Management, it can be dealt with quickly and at the level the change is having the most effect. The most distinctive advantage observed was that there was more teamwork in the organization at Walters Construction Management. The adversary relationship was minimal and it was observed that any adversities between certain departments could be resolved. The goal of Walters Construction Management is known by everybody and the teamwork needed to achieve that goal is there. It is respected that when it comes down to "passing the buck" or if adverse designs or adverse construction occur, it is all kept within the
B.L. Walters Company organization. This enhances the ability for problems to be solved expeditiously and favorably to all parties involved.

In conclusion, based on my interviews and personal observations, it was found that the advantages of the Walters Construction Management organization outweighed the disadvantages. Various members of the organization felt that the teamwork was favorable for a successful project and that having a self-contained organization where any number of problems from accounting to design could be solved quickly and effectively, was mandatory for a successful project.
PART II - LEGAL AND CONTRACTUAL REQUIREMENTS

Walters Construction Management subcontracts a major portion of their work and with this comes the responsibility to insure that they receive their specified requirements.

This section will address the requirements of a Construction Management firm as regards the bidding process, contracts, job progress management, job cost management, planning and scheduling, modifications, and commercial issues. It will then address the practical application of the aforementioned procedures. These procedures will be documented with actual paperwork used on the Bank of Westminster project.
THEORETICAL APPLICATION

At the beginning of a project plans and specifications must be developed and approved for construction. This requires that the engineering departments and the designer be able to formally agree on a specific set of plans that will fulfill the requirements of the owner. In conjunction with the plans, the various departments will specify any restrictions or constraints that must be included in the specifications.

Once the plans and specifications are approved the Construction Management firm will enter the bidding process. A letter of inquiry is sent out to various subcontractors to determine what contractors are interested in bidding on the project. It will describe when the bids are to be invited, the general nature of the project, what kind of bid is required, and when bids are due. Before the Construction Management firm or owner solicits bids from any contractor he will perform extensive background research on these contractors checking their previous projects, their financial stability, and other general information. Once the background research is complete, the owner will send out invitations to bid. The package will contain the plans and specifications, the type of contract that will be used, the bid form, and
the general conditions of the bid invitation. The subcontractor is then required to assemble his bid.

Once the subcontractor assembles his bid, the owner and architect have 30 to 60 days to award the job. At this time the owner and architect will discuss modifications or changes with the two lowest bidders. In these discussions a clear understanding of the agreements must be reached. Once an agreement is reached the Notice of Award is sent to the subcontractor. This authorizes the subcontractor to start ordering long lead time items and to start shop drawings. In the Notice of Award it is stated that a formal contract will be forthcoming.

In the construction contract received by the subcontractor the description of work, the description of terms, a completion statement insuring the subcontractor is going to provide the labor, material and equipment, and any other general provisions deemed necessary by the owner or his representative. This contract will also stipulate how the subcontractor will be compensated for the work, and have a project title and project number. This form requires signatures, the subcontractor's license number, his Workmen's Compensation Insurance Company, and his Personal Liability Insurance Company with policy numbers and expiration dates.

Once the project is underway it must be insured that the subcontractor does what was specified. Utilizing job progress management is one of the many factors
the owner's representative on the project site must be aware of. In a job progress report the subcontractor will have his job broken into manageable activities and easily understood schedules. A bar chart is easily understood and has activity start and completion dates. This is a widely used tool in understanding a project's progress. The subcontractor, when placing his bid, can set up his progress report based on the time constraints set by the owner. To make this progress report work, meetings must be established on a routine basis so the owner is informed of the subcontractor's schedule. Daily reports filed by the field supervisor will give an account of what the subcontractor accomplished and if he is on schedule. This owner's daily report can be compared with the subcontractor's daily report for any discrepancies. In the daily reports it will show who did what, with how many crew members, and with what equipment and material.

Along with the progress of the job, the project can be managed with the daily, weekly, or monthly costs of the job. The subcontractor and owner have agreed on the subcontractor's costs and monitoring his costs will help insure the owner and subcontractor know what is being spent and for what. The project job cost sheet should break down costs into material, equipment, labor, and any other category the subcontractor or owner deems necessary. This will simplify the subcontractor's requi-

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sition for payment. A change that has increased the scope of the contract or a mistake in labor requirements will eventually show up in the cost management forms.

The subcontractor can be awarded the job under several different kinds of construction contracts. The various contracts can be lump sum, cost-plus-fixed-fee or percentage-fee, and guaranteed-maximum-plus-fixed-fee. Once the job has been awarded the subcontractor must take steps to contact his material suppliers and contract for the purchase of the material needed. A requirement by the owner is a list of the material suppliers utilized by the subcontractor and notification immediately if the list changes.

To keep abreast of the construction costs the owner and the subcontractor maintain a day to day record of material costs and labor. The owner's representative on the job can keep track of labor by daily or weekly time cards submitted for approval. Copies of all material requisitions that have been delivered should also be brought through the owner's field supervisor for submittal to the accounting department. Along with the time cards the field supervisor will fill out daily logs of what occurred on the project, what work was accomplished, crew size, equipment used, and any other valuable information. In the mechanical work it is extremely important for the plumbing subcontractor to keep records of the various pipe sizes that are used, valves and
fittings, and the roughing for fixtures as well as the finished fixtures. This will give the subcontractor an idea of the progress of his job by the amount of material in place and also keep check on any pilfering that can occur.\(^5\)

In the beginning of the project the subcontractor should be advised as to the proper format for requisitioning payment. The owner or architect must clearly state what vouchers, payrolls, bills of lading, or other material he should have; the legal requirements that must be met; when the requisition must be ready; who must approve it; and when to expect his money.\(^6\)

Most contracts will stipulate that monthly requisitions be submitted. This helps the accounting department maintain an active account of the cost for the project. It also gives the owner some leverage if he is not pleased with the progress and insures that inspections will be done at timely intervals, on the project by his field supervisor before payment is authorized. When a requisition is submitted a certain percent is retained as a retainage fee. The sole purpose for this retainage is to make sure the owner does not pay the full value until all work is complete.\(^7\) This will act as an incentive for the subcontractor to complete work that may be in dispute.

During the course of a project change orders occur. There are numerous reasons for change orders and
usually can be no trouble if they are handled expeditiously and properly. Some of the more frequent reasons for change orders are changes due to additional work, changes caused by errors in planning, changes in codes creating extras, and extra compensation because of job conditions.

Changes due to additional work are caused by the owner or architect wanting to change the type of work, upgrade the quality of certain material, or make an addition. Changes due to errors in planning might be errors in dimensions or omitting an essential piece of equipment. The subcontractor is responsible for knowing the codes of his trade and should be aware of any changes in the codes. Change of job conditions can be created by the owner or architect being indecisive, the owner may have financial trouble and slow the job down, or an incompetent subcontractor can not accomplish what he originally agreed on.

Whatever the reason for changes a procedure must be established for processing these changes. Since the changes or modifications will reflect what is happening on the project site, the information must come from the project site itself. A change order can occur at any point of the total construction operation and should include any specific information concerning the exact area where this change originated and who initiated it. Prompt notice should be given to the Contractor, the
Owner, and the Architect of any proposed changes. This will give all the personnel involved the earliest notice of any impending changes.

The authority to authorize changes or modifications will be with the owner or the architect or their designated representatives. Therefore complete and proper procedures for recording proposed changes or modifications by the field supervisor are extremely important. There must be complete information obtained from the field supervisor covering every step from the initial suggestion of the change, to the estimation of material and labor required for the change, the new agreement between the owner and subcontractor, and the cancellation of the change or the incorporation of the change.\(^\text{11}\) Because of the various reasons for changes and modifications a high priority should be to have a member of the contracting organization examine the bidding documents from a contractual standpoint and determine where changes may be adviseable.\(^\text{12}\)

In conclusion, the object of any contracts administrator is to see that problems are addressed before they reach the construction site. Clear, concise procedures for the contractors to follow when bidding for a project and explicit guidelines on how to address any problems once the project is started should be established. Once the guidelines and rules are established and understood by all parties concerned then a well organized and properly run project can be expected.
PRACTICAL APPLICATION

The practical application of legal and contractual requirements will be discussed utilizing one of the subcontractors for the Bank of Westminster project.

Walters C.M. started their preliminary meetings with the various engineering departments, architects, and project manager for the Bank of Westminster as early as March 1984. In these meetings preliminary designs were examined and reviewed to alleviate any future construction or management problems. The past experiences of the engineers and the project manager could help identify problems in the design that will effect the construction of the project.

When the plans and specifications were finalized Walters C.M. sent out invitations for bids. Having dealt with contractors or subcontractors in the past Walters C.M. has a list of acceptable contractors and will notify them of possible projects. During the preliminary design meetings Walters C.M. had already been in touch with various contractors and subcontractors explaining the project and getting responses from interested contractors. Walters C.M. is a private organization and therefore does not have to pick the lowest bidder or accept the lowest bid. Having sent out a letter of inquiry
Walters C.M. will receive a Bid Form from the various contractors stating they have reviewed the plans, specifications, and addenda prepared by the design firm hired by Walters C.M. It will give the name of the project, the bid amount, and what they will accomplish. The bid form will state the contractor will formalize the work with the signing of a written contract within ten days of receiving a written "Notice of Award". See Appendix A, Fig. 1.

Before Walters C.M. sends a "Notice of Award" they will review the contractor's bid form to insure he received all of the addenda and review any exceptions or changes the contractor made to what is specified. The contractor and Walters C.M. will insure there is a clear understanding of the agreements before a "Notice of Award" is sent. These agreements can be made over the phone or in person, but proper documentation must be required. See Appendix A, Figure 2 for copies of phone bids that the plumbing subcontractor made deleting certain items, revised prices and what was not included on the original bid.

The "Notice of Award" is then sent to the contractor, referencing the project by title and location, for him to proceed based upon his proposal of the dated bid form. The "Notice of Award" will give the contractor authorization to start shop drawings and to order long lead time items. Within the "Notice of Award"
is a commitment that a formal contract is forthcoming. See Appendix A, Fig. 3.

Walters C.M. requires that once the contractor receives his "Notice of Award", a list of the material suppliers that the contractor will be utilizing is submitted and if any changes to the list occur they will be notified immediately. See Appendix A, Fig. 4.

Within 30 to 60 days Walters C.M. will send out a standard Subcontract Form for the subcontractor to review. Their form is very similar to the American Institute of Architects Document A101. It will contain the date of agreement, who the agreement is made between, the project name, the architect's name, and the provisions of the contract. This form will stipulate the work to be accomplished and will provide standard provisions on the back. Additional provisions may be added and noted for the subcontractor's verification and approval. As discussed in the Theoretical Application a Workmen's Compensation Insurance Policy and a Personal Liability Insurance Policy with policy numbers and expiration dates appears on the bottom of the Standard Subcontract Form. See Appendix A, Fig. 6 and 7.

One of the additional provisions Walters C.M. added was provision 43 which addresses labor disputes on the project. This provision requires that work be continued on the project without delay. It was discussed with the Project Manager on how access to the project
would be handled in case of a picket or dispute. Two entrances to the project would be authorized, one for the picket lines and one for the subcontractors not in dispute.

Up to this point Waltes C.M. practices the theoretical applications previously mentioned, but on this project there is a definite lack in formal job progress management. The Field Supervisor monitors what is accomplished on a daily basis, but the lack of an activity listing and a logic diagram creates difficulties in accurately keeping track of the project's progress. The bar chart is one tool that is being used, but the extensive nature of construction and construction management stipulates that more should be done. This bar chart was created by Walters C.M. and does not have any input from the subcontractor. To tell the subcontractor he is behind or ahead of schedule is strictly Walters C.M.'s interpretation.

Another tool monitoring the job progress of the Bank of Westminster is the daily logs submitted by the Field Supervisor. See Appendix B. These logs give a day by day account of what occurred on the project and what the subcontractors accomplished. It gives updates of any specific problems with weather, concrete received on the job, and other general problems. The logs will tell what equipment was used, for how long, and why. This not only
helps in monitoring the progress of the job, but is
useable documentation for backcharging a subcontractor.

Walters C.M. has the capability to monitor the
project progress and utilizes the computer on other
projects. On the Bank of Westminster it must be assumed
that the smallness of the project plus the release of
certain employees created a void.

Walters C.M. has the capabilities of inputing
activity listings and having a logic diagram created.
They also have the capabilities with this logic diagram
to establish resource leveling, scheduling, and cost
control. They utilize the PMS-II project management
system which is one of the most extensive project manage-
ment systems for a personal computer. See Appendix C.

In the area of job cost control Walters C.M.
again has extensive capabilities in this area. They
utilize the Estimax software which can give them 3 levels
of cost for any project. Each level will have a break-
down of cost code, description, labor cost, material
cost, subcontractors, totals, and dollar per square foot.
As the levels get more explicit a breakdown for quanti-
ties and units is also used. See Appendix A, Fig. 8.
But Walters C.M. doesn't utilize these tools on the Bank
of Westminster project.

During the Bank of Westminster project problems
of a subcontractor not being able to accomplish part of
the work originally contracted for surfaced. This in
turn created a modification to the original agreement. Walters C.M.'s field supervisor was keeping track of the subcontractor's progress and found he was getting behind schedule. The project manager was notified and he in turn got in touch with the subcontractor. The project manager then offered to do a certain part of the work for the subcontractor with Walters C.M. personnel. During the conversation it was agreed what Walters C.M. would do and the maximum amount it would cost the subcontractor. This conversation was referenced by the project manager when he sent a formal letter explaining what Walters C.M. was going to do, how much it would cost the subcontractor, and that a formal Change Order to the contract or a backcharge would be executed. See Appendix A, Fig. 9.

The notification of backcharge was the choice made by Walters C.M. in dealing with this specific subcontractor. In the notification for backcharge is the date, the project name, the subcontractor number which is a key to what subcontractor it is and what kind of work, the cost code, and a description of what exactly Walters C.M. is charging the subcontractor for. See Appendix A, Fig. 10.

After all the work agreed on is done by Walters C.M. a Subcontract Backcharge form is filled out. See Appendix D. The form will have the project name, the subcontract number, the date it was finalized, the cost code, and the notification date. It will describe what
was done by Walters C.M. and the maximum backcharge total agreed on referencing Appendix A, Fig. 9. Attached to the Subcontract Backcharge would be Walters C.M.'s cost distribution summaries, material/equipment invoices, and payroll distribution sheets to substantiate the backcharge. At the bottom is a summary of what money was spent on labor and material. This was then subtracted from the maximum allowable backcharge authorized. As you can see by Appendix D Walters C.M. lost money on this backcharge. An error in the estimate for the maximum cost of this backcharge cost Walters C.M. $3,089.28.

In conclusion, Walters C.M. utilizes a number of the theoretical approaches to construction management and project control. But in the important areas of progress management and cost management they are not utilizing the tools available within their own organization. Again this could be because of the release of certain people and a lack of manpower to use these tools and also because of the small scope of the Bank of Westminster project as compared to other projects.
NOTES


2. Ibid., p. 73.

3. Ibid., p. 40.

4. Ibid., p. 89.

5. Ibid., p. 93.

6. Ibid., p. 94.

7. Ibid., p. 95.

8. Ibid., p. 98.


10. Ibid., p. 148.

11. Ibid.

PART III

CONCLUSIONS

The original projected start date for the Bank of Westminster project was to be in April 1984. However, the start date was slipped to July, 1984 due to design related and owner induced delays.

The impact of the delay in starting did not cause the anticipated negative effect from the weather. It was originally thought that not having the building enclosed by December, harsh weather conditions would be a detrimental factor. But the weather has cooperated to date and the enclosure of the building should be completed by the end of 1984.

The organizational structure was found to be very effective and maintained a well defined hierarchy. This organizational structure encouraged lateral communication among the various departments within the organization. The close proximity of the various departments was very beneficial to the decision making process. This close proximity also favored a positive and effective team atmosphere. Changes in the plans or specifications or errors in the plans and specifications could be worked out expeditiously. The closeness encouraged a relaxed atmosphere when dealing with peers or superiors and
created effective group meetings for the day to day problem solving.

The field management of the project was very good and was the main reason for the project's progress. The lack of practical construction management practices, (i.e. logic diagrams, schedules, cost management) hindered the management of this project. The ability of the field management to keep the daily logs accurately was a substantial reason for the home office not being misinformed or the project being mis-managed. During a problem with a subcontractor not being able to accomplish the agreed work that he was contracted for, the accuracy of the records kept in the field and forwarded to the home office helped alleviate a more substantial loss of money than was incurred.

Time schedules and deadlines that contractors were held to were established from the barchart created by management. The contractor can not be legally held to these time constraints if he did not participate in their creation. Establishing a logic diagram with the computer capabilities available at the home office would have maintained a tighter schedule and created substantial documentation for contractor backcharges or change orders. On the Bank of Westminster project the computer capabilities available were not utilized to their potential and caused managerial difficulties. These difficulties were only overcome by the abilities of the field
management and project management assigned to the project.

During the evaluation of the pre-cast erection timelapse film it was found that the crew size for the project was efficient and appropriate. The amount of idle time during the pre-cast erection was minimal and the supervision of the crew was adequate. The handling of the precast pieces at times was redundant and could have been more efficient, but the overall process was good.

The brick veneer erection timelapse was also evaluated and the crew size was sufficient. During one established cycle the amount of idle time was so minimal it didn't account for any time on the crew balance analysis figure.

The evaluation of the activity listing, logic diagram, scheduling, and resource availability and utilization was hindered. The inability of management to utilize the computer software capabilities available created a gap in this report's analysis. A more concise and clear understanding of how actual "real world" management coincides with classroom management theory would have been very helpful in the grasp of theoretical techniques for students. The ability to study a project step by step in theory and then to compare it with reality would have helped close the gap between academia and the real world of construction management.
The usefulness of this report to students will help differentiate between the theoretical application taught in the classroom and what happens on an actual job site. The students will understand that a project can be planned and scrutinized theoretically but that intangibles such as human factors in management, changes in project priorities, or changes in personnel can not always be accounted for in theory. The ability for management to be flexible and to keep clear, concise records is very important, but also management must be able to deal with those intangibles in a practical and professional manner. This report shows how the theoretical and practical application of construction management coexisted on the Bank of Westminster project and what the deficiencies were.

In general the starting date slippage and the loss of some key personnel within the Walters C.M. organization created a severe time factor in the completion of this report. The inability to follow this construction project to its' finish reduced the information available for classroom study.
PART IV PHOTOGRAPHS

In conjunction with this project, construction photographs have been taken. The exact location from which they were taken is shown on Figure 2 and description of each view is given.

<table>
<thead>
<tr>
<th>POSITION</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>View from far North-West property line.</td>
</tr>
<tr>
<td>2</td>
<td>View from West side of 92nd Avenue service drive cut out.</td>
</tr>
<tr>
<td>3</td>
<td>View from East. Side of 92nd Avenue service drive cut out.</td>
</tr>
<tr>
<td>4</td>
<td>View of proposed North elevation.</td>
</tr>
<tr>
<td>5</td>
<td>View from far North-West property line (intersection of 92nd Avenue and Sheridan Boulevard).</td>
</tr>
<tr>
<td>6</td>
<td>View of proposed East elevation from the far side of Sheridan Boulevard.</td>
</tr>
<tr>
<td>7</td>
<td>View from North side of Sheridan Boulevard cut out.</td>
</tr>
<tr>
<td>8</td>
<td>View of the proposed South elevation of the Bank.</td>
</tr>
<tr>
<td>9</td>
<td>View of existing temporary bank from North side of Sheridan Boulevard cut out.</td>
</tr>
</tbody>
</table>
10 View of existing temporary bank from fence line at Sheridan Boulevard.

11 View of the site from far Southern Corner.

12 View from center of service drive of 5 + 00.

13 View of parking log from South edge.

14 View from center of service drive at 3 + 00.

15 View from center of entry cutout to bank from service drive at 2 + 85.

16 View of the proposed South elevation of the bank.
CONSTRUCTION PHASE PHOTOGRAPH LOCATION

FIG. 2

IV-3
APPENDIX A

BID DOCUMENTS AND CONTRACT
TO: Walters Construction Management, Inc.
7951 East Maplewood Avenue, Suite 200
Englewood, Colorado 80111

Date: June 29, 1984

Having examined the plans and specifications (and addenda) prepared by:
Merrick and Company
10855 East Bethany Drive
Denver, Colorado 80222

and having familiarized ourselves with the site and job conditions, the
Undersigned does hereby submit the following bid for [Furnishing and
Installing] [Furnishing Only] [Installing Only] for the following
classifications of work listed in the Invitation to Bid:

[Signature]

For Private Road Improvements, Hyland Office Park, Westminster, Colorado.

Our firm price bid is in the amount of:
Thirty-four thousand two hundred ninety-eight dollars ($34,298.00)

Upon receipt of "NOTICE OF AWARD" the Undersigned agrees to execute a formal
contract for the work within ten (10) days after receipt of such notice.

The Undersigned acknowledges receipt of Addenda: 1, 2, 3

The Undersigned has carefully checked all the above figures and understands
the responsibility for any errors or omissions in making this proposal.

The Undersigned accepts the conditions that any and all bids may be rejected.
The Undersigned further agrees that this proposal shall not be withdrawn for a period of thirty (30) calendar days after the closing time for receipt of bids.

Respectfully submitted:

Plumber Co.

Name

By

Title

Address

Dated this 39th day of June, 1984.

SEAL (if Bidder is a Corporation)
**PHONE BID**

**PROJECT:** Bank of Westminster

**COMPANY:**

**BY:**

**PHONE:**

Per Plans and Specs. **Yes** **No**
Including Addenda - No.
Including Alternates **Yes** **No**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet Taps - No City Tap Fees Included</td>
<td></td>
</tr>
<tr>
<td>Tap Fees 4&quot; Sewer</td>
<td></td>
</tr>
<tr>
<td>12&quot; x 12&quot; Wet Taps Trench</td>
<td></td>
</tr>
<tr>
<td>Cast of Light Work - O.T.</td>
<td></td>
</tr>
<tr>
<td>Bearing/Exterior - No</td>
<td></td>
</tr>
<tr>
<td>Asphalt Patching - No</td>
<td></td>
</tr>
<tr>
<td>Street E - Form &amp; Excav or Direct</td>
<td></td>
</tr>
<tr>
<td>Concrete</td>
<td></td>
</tr>
<tr>
<td>Backfill</td>
<td></td>
</tr>
<tr>
<td>Pipe Util - Trench OK</td>
<td></td>
</tr>
<tr>
<td>- Special OK</td>
<td></td>
</tr>
<tr>
<td>- Kick Blocks OK</td>
<td></td>
</tr>
<tr>
<td>Size of Gravel - One of Two</td>
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**FIG. 2**

A-3
<table>
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<tr>
<th>DESCRIPTION</th>
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<tr>
<td>Deck 4, 385 ft. x 2 ft. 5&quot;</td>
<td>$12,000</td>
</tr>
<tr>
<td>Deck 4, 2 ft. x 1 ft. 11½&quot; x 1½&quot;</td>
<td></td>
</tr>
<tr>
<td>Remodel Price</td>
<td>$11,702</td>
</tr>
<tr>
<td>Schedules on Sun Feb. Plate Rd</td>
<td></td>
</tr>
</tbody>
</table>

FIG. 2

A-4
**PHONE BID**

**PROJECT**
Bank of Wausau

**COMPANY**
Plumbing

**PHONE**

**Per Plans and Specs.**
Yes No

**Including Addenda**

**Including Alternates**
Yes No

**Taxes Included**
State

**Local**

**Freight Allowed**

**Installed**

---

### DESCRIPTION

<table>
<thead>
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<th></th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>Drill Mfg 06</td>
</tr>
<tr>
<td>2)</td>
<td>O.T. for $1300 Street Cn</td>
</tr>
<tr>
<td>3)</td>
<td>Others</td>
</tr>
</tbody>
</table>

---

**FIG. 2**

A-5
July 17, 1984

Mr. PLUMBING COMPANY

Re: Bank of Westminster
9191 Sheridan Blvd.
WCM Project #3700

Gentlemen:

Please let this letter serve as a Letter of Intent and Notice to Proceed based upon your proposal of June 29, 1984 for Road Utilities in the amount of $97,298 for the above referenced project.

A contract will be mailed to you in the near future for your signature. Please proceed with the ordering of any long lead items, etc. as may be required. Also please proceed with shop drawings as necessary. Please forward Certificates of Insurance to our office when you return your signed contract.

Should you have questions please contact the undersigned.

Very truly yours,

WALTERS CONSTRUCTION MANAGEMENT, INC.

John K. Fox, Jr.
Project Manager

JKF/jpl

FIG. 3
A-6
MATERIAL SUPPLIERS

PROJECT: Bank of Westminster  
SUBCONTRACTOR: Plumbing Company  
CODE NO: 2710-2505  
DATE: 8-28-84  

(Per Provision No. 35 of Subcontract)
If not applicable, please indicate: ________________

<table>
<thead>
<tr>
<th>NAME OF MATERIAL SUPPLIER</th>
<th>ADDRESS</th>
<th>PHONE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waterworks Sales Co.</td>
<td>600 W. 48th Ave Denver 80216</td>
<td>292-6206</td>
</tr>
<tr>
<td>Carder Concrete Products</td>
<td>8311 W. Carder Ct. Littleton 80125</td>
<td>794-6303</td>
</tr>
<tr>
<td>Mobile Premix Concrete</td>
<td>P.O. Box 5183 TA Denver 80217</td>
<td>534-3165</td>
</tr>
</tbody>
</table>

Immediate notification in writing shall be made to the General Contractor if any of the above suppliers are changed.

Signature

MAY 1
STANDARD SUBCONTRACT FORM

This AGREEMENT made and entered into the 28th day of August, 1984 by and between Plumbing Company, a corporation, (hereinafter called the "Contractor") and Subcontractor, (hereinafter called the "Subcontractor") are the owners of the property to be improved hereunder.

SECTION 1. The Subcontractor agrees to furnish all labor, materials, equipment, and services and supplies for all work hereinafter described in accordance with the general conditions, plans and specifications prepared by the Contractor, hereinafter known as the "Prime Subcontractor," and as described in Section 2 hereof for "Private Road Improvements at Oldland Office Park for Frank Walters Assoc. Contractors." The Subcontractor shall perform all work hereinafter described in accordance with all conditions of the contract between the owner and the Contractor.

SECTION 2. The Prime Subcontractor and the Subcontractor agree that the materials to be furnished and the work to be done by the Subcontractor are set forth in accordance with the Prime Subcontractor's plans, special conditions, specifications, divisions and section numbers dated 1984.

In accordance with Article 16 of the Standard Form of Agreement Between Owner and Contractor dated August 1, 1984 as follows:

1. Provide all necessary labor, materials and equipment required to perform the work which includes but not necessarily limited to the following:
   a. Approximately 1,005 LF of 12" D.I.P. water main including all valves, bends, tees, thrust blocks, rodding, etc. as noted on the documents, including the relocation/adjustment of two (2) existing fire hydrants and the installation of one (1) new fire hydrant all set properly to finish grade and one (1) 12" check valve. Twelve (12") inch wet tap is included.
   b. Approximately 1,492 LF of 8" PVC permanent sanitary sewer and approximately 93 LF of 4" PVC temporary sanitary sewer including all bends, wyes, etc., seven (7) precast manholes with poured concrete bases, one (1) 8" sewer tap.
   c. Approximately 865 LF of 15" RCP storm sewer and approximately 30 LF of 18" storm sewer including four (4) precast manholes with poured bases, three (3) Type R 10 foot inlets, two (2) Type R5 foot inlets, the removal and re-use of existing materials.
   d. All excavation and backfill for the above work shall be by subcontractor and shall be performed to the Soils Engineer's requirements.
   e. All City, State, Federal and RTD taxes are included.
   f. All work shall be performed as approved by the City of Westminster.
   g. The cost of all overtime work for making the 12" water tap in Sheridan Blvd. during a weekend night is included, in the amount of $1,300.00.
   h. The following shall be excluded from the work:
      1. Development fees for sewer or water.
      2. Payment and Performance bonds.

SECTION 3. The Subcontractor agrees to keep himself thoroughly informed as to the progress of the job. To begin work within seven days after notification by the Prime Subcontractor, to proceed with the work promptly and uncompromised with all possible speed. And, to complete the entire work as scheduled and agreed upon by subcontractor and contractor. The Prime Subcontractor, however, shall not be held responsible for any delays caused by the request, delay or default of the general contractor, the owner or any other subcontractor.

IN CONSIDERATION WHEREOF, the Subcontractor agrees to pay the Prime Subcontractor for the full and faithful performance of the work hereunder, the sum of $69,075.00, as hereinbefore agreed upon. The Subcontractor shall pay the Prime Subcontractor in immediately cash seven days after receipt of the above sum.

IN WITNESS WHEREOF, the parties hereto have executed this agreement for themselves, their heirs, executors, successors, administrators, and assigns, on the day and year first above written.

ATTEST:

BILL L. WALTERS CONSTRUCTION MANAGEMENT, INC.

John K. Fox, Jr.

BILLS WALTERS CONSTRUCTION MANAGEMENT, INC.

28th of August 1984

PLUMBING COMPANY.

A-8
The Subcontractor and the Contractor agree that the following provisions shall be a part of their contract:

1. The parties General Contractor (hereinafter referred to as "the Subcontractor") for the work described in the contract shall be deemed to mean the contract between the Subcontractor and the Subcontractor as a whole with the Subcontractor as described in Section 1 of the contract, together with all the provisions, general conditions, general specifications, and other items which are made a part hereof or to be incorporated or to be performed in accordance with the general contract.

2. The subcontractor agrees to furnish and to perform all work required by this subcontract under an order or general contract.

3. In case of the Subcontractor does not perform such work as a whole, for the completion of the work, the Subcontractor shall be liable for all damages or losses incurred by the Subcontractor for the Subcontractor's failure to perform any part of the work.

4. The Subcontractor shall submit to the Subcontractor's office or on the Subcontractor's premises at the Subcontractor's discretion.

5. The Subcontractor shall furnish the Subcontractor with such bills of materials and drawings of the Subcontractor as the Subcontractor may from time to time require, and the Subcontractor shall be deemed to mean the Subcontractor for the Subcontractor's failure to perform any part of the work.

6. The Subcontractor shall furnish all materials and labor and enter into the Subcontractor's premises at the Subcontractor's discretion.

7. The Subcontractor shall furnish all materials and labor and enter into the Subcontractor's premises at the Subcontractor's discretion.

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49. The Subcontractor shall furnish all materials and labor and enter into the Subcontractor's premises at the Subcontractor's discretion.

50. The Subcontractor shall furnish all materials and labor and enter into the Subcontractor's premises at the Subcontractor's discretion.

FIG. 5

A-9
31. The subcontractor shall not place on the site any equipment of which he is not sole owner unless he obtains written permission from the contractor.

32. When material is furnished by the subcontractor, subcontractor agrees to use contractor's material or without notice to the contractor and agrees to pay for any material furnished or damaged or discarded or lost because of subcontractor's failure to properly store or use such material or furnished to contractor same as if furnished to contractor directly by the material supplier. Contractors shall be responsible for any material furnished to subcontractor by the owner, architect or engineer. Contractors shall be responsible for any material furnished to subcontractor by the owner, architect or engineer.

33. The subcontractor agrees to cooperate with the general contractor in the performance of the work and to furnish all labor, materials and equipment required for the work as scheduled.

34. The subcontractor agrees to submit partial payment requests in such form and copy as contractor may require, and to deliver same to contractor's general office by the twenty-fifth (25th) day of the month. Subcontractor agrees that his monthly partial payment request will include only work and materials in place or delivered to the site or stored off-site under conditions satisfactory to the contractor prior to the last day of the month.

35. Monthly partial payments are due not later than thirty (30) days after due date for partial payment requests and shall be made within five (5) days of receipt of payment from the owner. When final payment is due, subcontractor shall submit invoice for final payment, clearly marked "Final Payment".

42. Subcontractor shall be responsible for clean-up of rubbish and debris resulting from his work on a daily basis, all as verbally directed by the general contractor.

43. Subcontractor agrees that, in the event of any picket or other form of labor dispute at the construction site, whether that dispute or picket is in connection with the Contractor, Subcontractor, or any other contractor or subcontractor on this construction site, Subcontractor will continue to perform the work required herein without interruption or delay. In the event Subcontractor fails to continue the performance of the work included herein, without interruption or delay, because of such picket or other form of labor dispute, the rights accorded the Contractor by Provision #19 elsewhere herein shall apply.

FIG. 5
A-10
**Certificate of Insurance**

**Issued To:** The Linden Company
10 Lakeside Lane, #109
Denver, Colorado 80212

**Received:** July 28, 1984

**Companies Affording Coverage:**
- A Transportation Insurance Co.
- B Ranger Insurance Company
- C
- D
- E

**Coverages:**

This is to certify that policies of insurance listed below have been issued to the insured named above for the policy period indicated. The following policy limits apply:

- **General Liability**
  - Policy No.: TBPO20335946
  - Policy Effective Date: 9/1/83
  - Policy Expiration Date: 9/1/84
  - Liability Limits: $500,000
  - Limits per Occurrence: $250,000
  - B. L. P. Combined: $100,000
  - Property Damage: $500,000
  - Personal Injury: $500

- **Automobile Liability**
  - Policy No.: BUAD20335977
  - Policy Effective Date: 9/1/83
  - Policy Expiration Date: 9/1/84
  - Liability Limits: $250,000
  - Limits per Occurrence: $500,000
  - B. L. P. Combined: $500
  - Property Damage: $500
  - Personal Injury: $500

- **Excess Liability**
  - Policy Effective Date: 7/1/84
  - Policy Expiration Date: 7/1/85
  - Limits per Occurrence: $1,000,000
  - B. L. P. Combined: $1,000

**Description of Operations/Location/Vehicles/Special Items:**

Bank of Westminster

**Certificate Holder:** Walters C.M.
7051 East Maplewood Ave., Suite 200
Englewood, Colorado 80111

**Cancellation:**

Should any of the above described policies be cancelled before the expiration date hereof, the issuing company will endeavor to mail a 30-day written notice to the certificate holder named above, but failure to mail such notice shall impose no obligation or liability of any kind upon the company, its agents or representatives.

**Authorized Representative:**

FIG. 6

A-11
CERTIFICATE OF INSURANCE
issued by the
STATE COMPENSATION INSURANCE FUND
95 J BROADWAY
DENVER, COLORADO 80203
DENVER PHONE: (303) 866-2658

TO WHOM IT MAY CONCERN:

This is to certify that this department has issued a Standard Workmen’s Compensation and Employer’s Liability Policy as described below covering the liability imposed upon subject employers by the Workmen’s Compensation Act of Colorado, said policy being in good standing as of this date.

POLICY NUMBER: 055-0

AUGUST 23, 1984

POLICY PERIOD: JULY 1, 1984 to JULY 1, 1985

INSURED: PLUMBING CO

DATE OF ORIGINAL ISSUE: AUGUST 9, 1968

QUARTERLY ADJUSTMENT

** FOR ADDITIONAL COPIES THIS CERTIFICATE MAY BE REPRODUCED. **

All policies are subject to the following provision of the Workmen’s Compensation Act with respect to cancellation:

Section 8-54-114. If any employer shall be in arrears for more than twenty days in any payment required to be made by him to the State Compensation Insurance Fund as provided by this Act, he shall by virtue of such arrangement be in default of such payment and any policy issued to him by said Fund shall thereupon be cancelled without notice as of the effective date or renewal date of said policy.

STATE COMPENSATION INSURANCE FUND

JOYCE MEYERS, ADMINISTRATIVE CLERK

FIG. 7

A-12
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Labor</th>
<th>Material</th>
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<th>$/SF</th>
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Project Total

18229444 18,229,444 72.92

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FIG. 8

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FIG. 8  
A-14
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<th>AC</th>
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<th>Material</th>
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<tr>
<td>101</td>
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<td>Clear &amp; Grub @ Bldg.</td>
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</table>

| 102 | Foundation System            |       |       |          |          |         |
|     | 18" Drilled Piers            | 16.00 EA |       | 700.00   | 11,200   |         |
|     | 30" Drilled Piers            | 158.00 EA |       | 1050.00  | 165,900  |         |
|     | 36" Drilled Piers            | 58.00 EA |       | 300.00   | 17,400   |         |
|     | Pilasters @ Wall             |       |       |          |          |         |
|     | Pier Caps                    |       |       |          |          |         |
|     | Equip. Curbs                 | 3500.00 SF | 5.00  | 17,500   |          |         |
|     | Grade Beams                  | 7200.00 SF | 11.50 | 82,800   |          |         |
|     | Sumo Pits                    | 1.00 EA | 500.00 | 500      |          |         |
|     | Cooling Tower Sump           | 600.00 SF | 11.50 | 6,400    |          |         |
|     | Elevator Pits                | 467.00 SF | 11.50 | 5,371    |          |         |
|     | Waterproofing                | 20200.00 SF | .60  | 12,120   |          |         |
|     | Perim. Insulation            | 1260.00 SF | .80  | 1,008    |          |         |
|     | Winter Protection            | 1.00 LS | 12000.00 | 12,000   |          |         |
|     | Cool Tower Fndn.             | 130.00 SF | 11.50 | 1,475    |          |         |
|     | Generator Pad                | 1200.00 SF | 3.75  | 4,300    |          |         |
|     | Transformer Pad              | 72.00 SF | 3.75  | 270      |          |         |
|     | Concrete Testing             | 1.00 LS | 2000.00 | 2,000    |          |         |
|     | Pier Inspection              | 3.00 WK | 600.00 | 1,800    |          |         |
|     | TOTAL                        |       |       |          |          | 342764  |

| 103 | Structural System            |       |       |          |          |         |
|     | Structural Steel             |       |       |          |          |         |
|     | Structural Steel             | 1000.00 TN | 1050.00 | 1,050.00 |          |         |
August 15, 1984

Mr. Plumbing Company

Re: Private Road Improvements  
Hyland Office Park

Dear Tom:

This is to confirm our telephone conversations regarding Walters CM personnel performing work on the storm inlets (5 each) and the storm drain RCP.

As per our discussion of August 10, 1984 Walters CM shall construct the 10 ft. and 5 ft. inlets. The manhole rings, ladder rungs and grates will be provided by and installed by Walters CM. Excavation and backfill shall be by . The amount charged to for this work shall be cost of the work plus 7% and shall in no case exceed $2,016.00 per each.

The storm drain line RCP shall be installed with our laborers at an hourly rate of $11.70, $12.35, and $13.33 which includes all payroll taxes, etc. All equipment and material for this portion of the work shall be provided by Plumbing.

Upon completion of the work, a Change Order to your contract or a Backcharge will be executed to finalize this agreement.

Should you have questions, please contact the undersigned.

Very truly yours,

WALTERS CONSTRUCTION MANAGEMENT, INC.

John K. Fox, Jr.  
Project Manager

JKF/jpl

cc: 3700-3710

WaltersCM A Bill L. Walters Company

7611 East Magnolia Avenue, Suite 200, Englewood, Colorado 80111, (303) 770-4300

FIG. 9

A-16
NOTIFICATION OF BACKCHARGE

PRIVATE ROAD IMPROVEMENT

SUBCONTRACTOR: Plumbing Company
Date 8-27-84  Project 2 Hyland Office Park
Subcontract Date 8-27-84
Subcontract # 3710-2505
Backcharge Cost Code 19000
Cost Code Description Utilities

Gentlemen:

Under the terms of the above referenced subcontract agreement, Paragraphs 19, 21, & 24, Walters CM is exercising its right and proceeding with the following work:

Per mutual agreement of both parties - Barneko Construction will provide & H trackh
backhoe for the purpose of excavating the water and sewer lines for Plumbing.

The cost of $60 per hour standard rate shall be deducted from the contract for all
tickets signed by Walters CM and Plumbing.

The above work is being completed on a time & material basis. Upon completion, a formal backcharge to your subcontract will be issued. The backcharge will be supported with documented costs.

Bill L. Walters Construction Management, Inc.

John K. Fox, Jr./Project Manager

FIG. 10
A-17
**PROJECT**
Bask Bank of Westminster

**WEATHER CONDITIONS**
- Temperature: High 95, Low 65
- Precipitation: Rain
- Condition: Partly Cloudy

**SAFETY**
- Accidents: Personal
- Equipment
- Public Liability
- Property Damage

**MATERIALS**
- Coat Code
- Code
- Ticket No.

<table>
<thead>
<tr>
<th>Company</th>
<th>No.</th>
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<tbody>
<tr>
<td>WCM</td>
<td>5</td>
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**SUBCONTRACTORS**
- WCM - 7

**EQUIPMENT RENTAL**
- Backhoe Loader Rent

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<th>DATE IN</th>
<th>DATE OUT</th>
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<th>REMARKS</th>
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<tr>
<td>7/23</td>
<td>7/27</td>
<td>Power Rental</td>
<td>Remove Fence</td>
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</table>

**Remarks**
- Removed split rail & stockade fence.
- Removed 5 signs.
- Removed valve boxes, check valves, sprinkler head.
- Called Deane - OK.
- Called R. Pears landscape - didn't show up today.
- Tapped to Murphy excavation, confirm Wednesday start.
- WCM Yard - yard 2 trucks 8 hrs from Harley for fence removal.
- Worked crew 8 hrs.

**Signed:** L. O’Malley

**WCM-015**

**Wrote:** Project Manager
**Canary:** Superintendent
### DAILY LOG

**PROJECT:** WESTMINSTER BANK  
**DATE:** 7-30-84

**WEATHER CONDITIONS**
- **Temperature:** High 95°, Low 62°
- **Precipitation:** Inches - Rain, _Snow_ -
- **Condition:** Clear - Partly Cloudy - Overcast

**SAFETY**
- **Accidents:** Personal - Equipment - Public Liability - Property Damage
- **Explain:**

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<td>2. Sweny - 2</td>
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<td>3. Murphy</td>
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<td>OPER</td>
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<td>5. 9W4</td>
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**EQUIPMENT RENTAL**

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<th>DATE OUT</th>
<th>SUPPLIER</th>
<th>REMARKS</th>
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</table>

1. WASSANAR AE SHOWED UP FOR COMPACT TEST.
2. O'DONNELL SHOWED UP. JUST AROUND PIPE IN. REMOVED 30'-LP OF EXISTING 18'-RCP @ 92'. SHERIDAN BROUGHT OUT LITTLE SSD HOE. THEY ARE BRINGING OUT A TRACK HOE.
3. TALKED TO AL WASSANAR ON USING SERVICE IN A CONFINED TRENCH FOR UTILITY WORK. NO PROBLEM AS LONG AS IT DOESN'T PAVIN INTO THE BUILDING.
4. FRED KAPRIS HAS 8 HRS UNTIL ON 16 BORE FOR BRINGING IN EXISTING FILL IN ROAD DUE TO SURVEY PROBLEMS ON GRADE.
5. EXISTING DETENTION BING ON CORNER NEEDS TO BE MUCKED OUT. USING BERNER TO BACKOFF. CHEAPER THAN MURPHY. MURPHY WANTED 400000 HOURS $200 MOBILIZATION. BERNER ONLY $60/HE.
6. AL WASSANAR APPEARED USING ASPHALT IN FILL @ DETENTION BING.
7. STARTED TO DUMP TRAFFIC ON TEMPORARY ROAD AND TRAP UP BID 3 SITE. ON SCHEDULE FOR BIDDERS ON MONDAY.
8. WE HAVE RECEIVED PAIN EVERY NIGHT FOR PAST WEEK. REAL PROBLEM WITH EXISTING DETENTION BING, BUILDING CORNER RIGHT OVER BING.
### Daily Log

**Project:** Westminster Bank  
**Date:** 8/6/84  
**Signature:**  
**Weather Conditions:**
- Temperature: High 90, Low 60  
- Precipitation: Inches 0.5, Rain  
- Condition: Clear  
**Safety:**
- Accidents: Personal  
- Equipment  
- Public Liability  
- Property Damage  
**Weather Conditions:**
- Clear  
- Rain  

#### Materials

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#### Equipment Rental

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1) **Starter Caissons**

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<td>38 - G</td>
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<td>10 - D</td>
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<td>5.09</td>
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<tr>
<td>30&quot;</td>
<td>10 - C</td>
<td>32'</td>
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**Total:** 188.5 LF  
**Total:** 44.61 CY

2) Routed 44.5 CY, 5% W/D on man.

3) Dismantled 3/4 pipe with caisson casing.

4) Talked to Murphy on getting loader out for problem.

5) O'Donnel on 8" sanitary up to manhole #5.

---

**WCM-015**

**WHITE - Project Manager**  
**CANARY - Superintendent**

---

B-3
DAILY LOG

PROJECT: WESTMINSTER BANK
DATE: 8/3/84

WEATHER CONDITIONS
Temperature: High 95 Low 60°
Precipitation: Inch Rain Snow
Condition: Clear Partly Cloudy Overcast

SAFETY
Accidents: Personal Equipment Public Liability Property Damage
Explain:

MATERIALS
Cost Code Ticket No. SUBCONTRACTORS
1. WCM-6
2. Shovel - 2
3. Dredge - 1-9 MAIN
4. 3-CAB
5. 1-Opel MMM
6. 1-9 MAIN
7. 1-816/Opel
8. 1-Oiler

EQUIPMENT RENTAL
DATE IN DATE OUT SUPPLIER REMARKS

1) Held SAFETY MEETING
2) MERCER ON 5TH DAY OF DRILLING
3) O'NEAL ON 12" WATER, UP TO STATION 24', DISCUSSED STARTING TO "REEL"
4) STORM ON WEDNESDAY, NO HARDWORK
5) WORKING OUT A DEAL WITH OUR
6) ARMS FROM OUR BACK
7) TAKING CONCRETE ON CONCRETE
8) CAMERON, SHAPE 4 AIR CHANCE
9) NEED A CLEAN MICRO DRYER, YIELD
10) TRUCK RUNNING SHORT
11) ORDERED CEMENT FOR TURF FROM
12) CONCRETE DELIVERED 4:30/45.

WCM-015
WHITE: Project Manager CANARY: Superintendent
**WEATHER CONDITIONS**

Temperature: High __ Low __
Precipitation: Inches _______ Rain _______ Snow _______
Condition: Clear ______ Partly Cloudy ______ Overcast ______

**SAFETY**

Accidents: Personal ______ Equipment ______ Public Liability ______ Property Damage ______
Explain: ____________________________

**MATERIALS**

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**SUBCONTRACTORS**

**EQUIPMENT RENTAL**

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<th>Date Out</th>
<th>Supplier</th>
<th>Remarks</th>
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1) DID STARTED CURB & CURB, POURED GROSS
2) STARTED BACKFILL ON THE BEAMS.
3) POURED SECTON ON THE BEAMS 8 & 90 OVER 1 & 2.
4) SCHEDULED SCHED WITH MOBY SAW TO START BUT WILL HAVE TO BE HARD TO NAIL MURPHY TO A SCHEDULE. TRY USING SPEED MOPS.
5) O DARKEN TONIC IN CREEK ROOM 3 AS HIGHWAY TURF CAN
6) SCHEDULED VAULT STEEL FOR DELIVERY ON 2/26 @ 7:00.
7) O DENNIS IS USING OUR CABLES FOR BACKFILL AROUND THE INLETS.
PROJECT: WESTMINSTER BANK

WEATHER CONDITIONS
- Temperature: High 85
- Precipitation: None
- Condition: Clear

SAFETY
- Accidents: None
- Personal Equipment: None
- Public Liability: None
- Property Damage: None

DAILY LOG

DATE: 9/4/04

WEATHER CONDITIONS
- Temperature: High 85
- Precipitation: None
- Condition: Clear

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</table>

1) Started 12" wall @ 7:30am & stop @ 8:30am, Half line until road base, we will pour tomorrow. Found abandoned plane, cars & abandoned electric utility.
2) Murray arrived from 9th Ave., But action performed @ 8:30am. Murray showed up with Charlie & 1-2 men.
3) We met at the day.
4) Normal action, schedule in place.
5) Schedule looks clean again on the wall, started for Thursday @ 12:00.
6) Poured base, showed up to ready wall & 1 1/2 cubic yard concrete. Decision yet to go on to production, talking about foundation.
7) Backfilled grade beams & tie beams.

WCA-015

WHITE - Project Manager
CANARY - Superintendent
WEATHER CONDITIONS
Temperature: High 85 Low 60
Precipitation: Inches — Rain — Snow —
Condition: Clear Yes Partly Cloudy — Overcast —

SAFETY
Accidents: Personal — Equipment — Public Liability — Property Damage —
Explain:

PROJECT WESTMINSTER BANK

WEATHER CONDITIONS
Temperature: High 85 Low 60
Precipitation: Inches — Rain — Snow —
Condition: Clear Yes Partly Cloudy — Overcast —

SAFETY
Accidents: Personal — Equipment — Public Liability — Property Damage —
Explain:

MATERIALS
Cost Code Ticket No.

SUBCONTRACTORS
Company No. Men
1. WCM-B Riviera - 1
2. Donnel 1 - Man
3. 1 - Lab
4. 2 - Forklift
5. Stresscon - 4
6. Murphy - 1 - Loader
7. Form Builders - 4

EQUIPMENT RENTAL
DATE IN DATE OUT SUPPLIER REMARKS

1) Corin Company showed up @ 9:30. John Carlson also finished drilling holes @ the beams for Stresscon.
2) Stresscon started taking 4 cranes ready @ 9:00.
3) Murphy - 2 trucks to haul excess dirt & loader.
4) Shutter traffic on Permanent Road.
6) Scheduled for bank vault floor pour on Tuesday.
7) Passable low concrete breaks @ the road for elevator & stair. 4 & 1, possibly break & tear out. Will know on Tuesday.
8) Stresscon set 8 pieces.
9) BMR for structural plate showed up. WCM unloaded.
10) Board walls for Type R 10' inlay on Sheridan.
11) Talked to Murphy about small backhoe loader for 180. Said one wasn't available.
12) 201 Holdem @ Donnel. Finish' manhole.
13) Donnel on street @ 3:00 being vault steel.

WCIM-015
Whites - Project Manager
Canary - Superintendent

B-7
PROJECT: WESTMINSTER BANK

DATE: 9/14/94

WEATHER CONDITIONS
- Temperature: High: __ Low: __
- Precipitation: Inches: __ Rain: __ Snow: __
- Condition: Clear: __ Partly Cloudy: __ Overcast: __

SAFETY

Explain: __________

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</table>

1) Beam reel started timing vault wall steel. Pour vault on 9/18.
2) Form & pour topping slab @ corners on 1st floor. To be able to start brick work.
3) 04/27-948 Con. Manager (Westminster Office). Police stopped by and said arrested 2 people on picking up WCM cones and barricades.
4) Zig zag did 4-9in. cores @ Tim Hend. 9:30 - 12:00. Wissmar will pick them up. Wissmar picked up cylinders @ 12:30.
5) Mel graffiti沿着大楼 a holes in the beam for stresscon.
6) Northwestern Drive, rear end for O'Donnell on 3rd & east 3rd.
8) Topped to base plank on west elev. on going 1st floor for 9-17.
9) Scheduled to pour light bull base on 9-21.
10) Rivera set temporary power to bids. 220 3 phase.
11) Weather - cold, like winter.
12) Pour 2-4x4x3 glaciers @ structural plaza.
DAILY LOG

PROJECT WESTMINSTER BANK

DATE SEPTEMBER 20, 1989

WEATHER CONDITIONS

Temperature: High _______ Low _______
Precipitation: Inches _______ Rain _______ Snow _______
Condition: Clear _______ Partly Cloudy _______ Overcast _______

SAFETY

Accidents: Personal _______ Equipment _______ Public Liability _______ Property Damage _______
Explain: _______

MATERIALS

| Cost Code | Ticket No. | Company
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SUBCONTRACTORS

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1) D&D Doing Curb & Gutter & Crosspas From Station 6:00 to 9:00. 
AHW Has A Bust Problem In The Curb & Gutter. Had A 
Bust To Be Cut Out. Did Start At 8:00 Worked Quit To 6:00.
2) Buried Nailed 7 Light Pole Bases. Nailed From 8:00 To 10:30.
Concrete Came At 11:00. S.C.Y. Electricians Set Conduit & Bolt Pattern.
And AHM Swings (Greg) Situated Bases So Lights Face The Right Way.
3) Murray Still Behind On Moving Dirt. Blade Scheduled To Come In 
4) Brick Masony Setting Up Scaffold On 10 Line. Having Problem With 
Their Delivery On Their Mortar Color. 1 Day Behind.
5) Stresson Was Supose To Be To 2 Line On North Side. Today Wasn't 
Be Until Tomorrow. They Are 1 Bay Behind. 2 Days.
6) Driver Pile Is Tearing Up Vault Roof Still. Then They Will 
Move Over To Structural Plaza.
7) Talked To How (Bill Martin) On Schedule. Mech. Crew In 10-1 Will Be 
8) Met With AHM Surveying On 9-28 Backcharge. Everything 
Worked Out On Handling Backcharges. No Backcharge.
**DAILY LOG**

**WEATHER CONDITIONS**
- Temperature: High 75° Low 30°
- Precipitation: Inches Rain Snow
- Condition: Clear Partly Cloudy Overcast

**SAFETY**
- Accidents: Personal Equipment Public Liability Property Damage

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1) PUT IN SQUIPS FROM RAP ON 10 LINE. 2 BRICKS HIGH 2 BRICKS LONG 9 OFF OF TWIN TE. IN CENTER OF WALL.
2) KENNY BERRY WAS WORKING IN PARKING LOT.
3) PART OF CREW GETTING 1ST FLOOR READY FOR A POUR.
4) 2 FELT FROM CHAIR MANHATTAN BANK VISIT THE JOB SITE. SHOWED THEM A PHOTO OF HOW CLEAN JOB SHOULD.
5) DID SNEAK HAVE CURB & CURTAIN IN PHASE 1 PARKING DONE.
6) HEIST POUR HAS 6 GUYS SCHEDULED FOR THURSDAY.
7) TALKED TO ART ABOUT SUBURBAN ON CONCRETE DESIGN FOR FLOOR TOPPING WE ARE GOING TO A 5/2 SACK MIX WITH A PAVEMENT ACCELERATOR.
8) RAIN WENT OUT THIS MORNING SAYING CHANGES TO BE MADE. NO LINGER WITH WALTERS DAVID MCFADDEN PROJECT MANAGER.
9) TALKED TO BRANNON ON PAIRES START TODAY & WORK SATURDAY ALSO.
10) MAY HAVE TO WORK LARGER GATE 7 GET READY FOR 1ST FLOOR POUR.

**NOTES**

- 3:30 STARTED TO RAIN. CHECK MAY HAVE TO CANCEL PAVING.

**DARKING LOT & 1ST FLOOR POUR.**

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<td>CANARY - Superintendent</td>
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**B-10**
**PROJECT**  WESTMINSTER BANK  
**DATE**  OCTOBER 8, 1984  

**WEATHER CONDITIONS**  
- Temperature: High 65° Low 35°  
- Precipitation: Inches __ Rain __ Snow __  
- Condition: Clear __ Partly Cloudy __ Overcast __  

**SAFETY**  
- Accidents: Personal __ Equipment __ Public Liability __ Property Damage __  
- Explain:  

**MATERIALS**  
- Cost Code  
- Ticket No.  

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**EQUIPMENT RENTAL**  
- DATE IN  
- DATE OUT  
- SUPPLIER  
- REMARKS  

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1) Set up for 1st floor pour. Pumper here @ 6:00. Ready to pour. Suburban had problems with the batch plant. Concrete didn’t show up until 8:15. Slump was bad 4 concrete. Temperature was 65°. Backcharge Suburban 4 talked to Mike.  
2) Finished pumping @ 11:30. Poured 1st floor & stair tower 2 landings, 132 cy.  
3) Pushed branchback until Wednesday. Subgrade still to wet.  
4) Public service showed up to hook up permanent power through parking lot.  
5) Rebar finished up – on the building. They should be completely done on Wednesday.  
6) Did pour out all curb & gutter for Phase 1 Parking Bey  

WCM-015  

**WHITE - Project Manager CANARY - Superintendent**  

B-11
**DAILY LOG**

**PROJECT** Westminster Bridge  
**DATE** October 23, 1984  
**WEATHER CONDITIONS**  
- Temperature: High 40°F, Low 25°F  
- Precipitation: Inches, Rain, Snow  
- Condition: Clear, Partly Cloudy, Yes, Overcast  

**SAFETY**  
- Accidents: Personal, Equipment, Public Liability, Property Damage  
- Explain:  

**MATERIALS**  
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</table>

1. Weather would take five walk days.
2. Carpenters continue weather enclosures.
3. Berkh workin half a day moving scaffold. The ground is still wet yet.
4. Still hadn't done any site work.
5. Keep grade the pole posts.

---

WCM-015  
WHITE - Project Manager  
CANARY - Superintendent

B-12
## Daily Log

### Project
Westminster Bank

### Date
29/10/94

### Weather Conditions
- **Temperature:** High: 60, Low: 35
- **Precipitation:** Inches: Rain, Snow
- **Condition:** Clear, Partly Cloudy

### Signature
Page 1

### Safety
- **Accidents:**
  - Personal
  - Equipment
  - Public Liability
  - Property Damage
- **Explain:**

### Materials

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<th>Cost Code</th>
<th>Ticket No</th>
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<td></td>
</tr>
</tbody>
</table>

### Subcontractors
- **Company**
- **No.**
- **Men**

<table>
<thead>
<tr>
<th>Company</th>
<th>No.</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCM - 7</td>
<td>D &amp; D - 20</td>
<td></td>
</tr>
<tr>
<td>O’Donnell - 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rivera - 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HM - 4</td>
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<tr>
<td>Berch - 7</td>
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<tr>
<td>CBC - 6</td>
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### Equipment Rental

<table>
<thead>
<tr>
<th>SUPPLIER</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

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1. O’Donnell Tapped Rom. drain into stream on east side of bldg.
2. helm finished drain support on north.
3. framing drain support on frame.
4. Material up on 3rd floor & 1st floor on third.
5. Bricks on east side of building, north on the south side.
6. 6 1/2 panels off 2nd floor, last section of 3rd floor.
7. Stairway doors, stair treads, 4th floor.
8. Elevator guillotine & 2000, remote & 1 1/2 & 1 1/4 total.
10. AHW finished picking up & the wall.
11. CBC finished 1/3 of roof.
12. Called to Dennis Heeter on picking up rental items.

---

WCM-015

WHITE - Project Manager
CANNAY - Superintendent

B-13
APPENDIX C

PROJECT MANAGEMENT SOFTWARE UTILIZED
THE PROBLEM:
What do you do when . . .?

The president of your company just assigned you the responsibility of managing
the development of a new product that requires:
- Market verification
- Design feasibility
- Reliability certification
- Production facility design
- Pilot production run
- Conceptual design
- Prototype development
- Test marketing
- Facility construction

And you are expected to present a plan from beginning to end at the Board of
Directors meeting in two weeks. Your plan must identify what resources will be needed
and when, how much the project will cost, and when each of the major accomplishments
will be ready for review. You are to use the available resources that are controlled by
ten different department managers, and this project is to be scheduled around the current
workload of the various departments. And, by the way, your bonus and next year's salary
are dependent upon how quickly and inexpensively you can accomplish this assignment.

How are you going to approach this seemingly impossible task?

THE SOLUTION:

You need a systematic method for assembling your project into a dynamic network
of interrelated activities. This network should be able to handle the complexities of your
project, yet be simple to change. It should be able to present you with the current status
of each activity in your project, and it should be able to tell you how each is doing against
budget.

This systematic method should enable you to prepare the reports that the president
wants, and it should allow you to identify what activities will be affected by a slip
or a gain in another activity. Your project needs to be under the control of a Project
Management System.
PMS-II is a complete critical path network analyzer that will calculate the early start/finish and late start/finish dates, float time, and critical paths for project networks with up to 2700 activities.

You'll find PMS-II as easy to operate as it is profitable to use. The 100+ page user manual comes complete with a tutorial section to guide the first time user through the operation of the system. In just a few minutes you can have PMS-II solving your project problems.

FEATURES:
- U.S. and international date formats supported.
- Schedule based on a 3, 4, 5, 6, or 7 day work week.
- Scheduling around up to 100 holiday or non-work periods of up to 99 days in length.
- Three project management disciplines: 1) actual start/finish, 2) days remaining, and 3) percent complete. Since PMS-II maintains the data required for all three methods, you can switch from one mode to the other on the same project as conditions dictate.
- Optional desired finish date causes PMS-II also to process your project from desired finish to earliest start calculating "True Float" for all activities.
- All mandatory and optional government contract reporting requirements as defined in the Corps of Engineers Project Management specifications ER-1- I-I and DOD 7000-2. A real plus for those engaged in government contract work!
- Designed by experts in the field of user oriented software, PMS-II is extremely easy to operate. It is a "menu-driven" system with extensive editing and error checking features. PMS-II's calculation program even checks your network for logic errors and identifies broken activity chains.
- Speed — performing all calculations on a project network of 1000 activities in under 10 minutes. This rapid turn-around time affords you the luxury of playing out various "what if" scenarios until all dates and durations are fully optimized.
- Easily interfaced to your job cost system or dBASE II (tm) and other programming languages.

SUPPORT:
North America Mics provides each user with one year of free software and manual updates (PMS-II is now in its eighth enhanced release) as well as free phone-in consulting service on any PMS-II related question.

CAPACITY:
PMS-II determines the maximum number of activities per network by looking at the amount of free memory available. With 64K under the CP/M operating system, PMS-II will handle over 1250 activities. Under MP/M in a 48K user partition, PMS-II will allow about 700 activities, and under CP/M-86 or PC/MS DOS up to 2700 activities can be processed in 128K, with a hard disk or XT system.

PMS-II will manage 'n' number of projects or sub-projects depending on disk capacity. Sub-projects can be automatically linked to provide for an unlimited project size.

HARDWARE REQUIREMENTS:
- Any microcomputer system with at least 64K of memory, and
- 80 character by 24 line video display with addressable cursor, and erase to end-of-line, and
- A 132 column printer; character or dot-matrix (10 CPI on 14" paper, 16.7 CPI with 8" paper), and
- 600K of disk storage in 2 drives or a hard disk.

SOFTWARE REQUIREMENTS:
- CP/M (tm) (Ver. 2.2 or later), MP/M (tm), CP/M-86 (tm), MSDOS (tm), or PCDOS (tm) operating systems.

*BASE II IS A TRADEMARK OF ASHTON-TATE. CP/M & MP/M ARE TRADEMARKS OF DIGITAL RESEARCH.
With The Most Complete Set of Project

ACTIVITY-ON-ARC DIAGRAM —
- A graphic presentation of the logic of the activity network.
- Displays node numbers, description, and duration of each activity.
- Optionally prints the early start/finish or late start/finish dates.
- Highlights the Critical Path(s), In-Process, and completed activities.

ACTIVITY REPORT — keystone of the system’s reporting capabilities:
- Allows you to select primary, secondary, and/or tertiary start from early start, early finish, late start, late finish, responsibility, aux1, aux2, float, job cost fields, or end node.
- You can select a range of values or a single value on any or all of the data fields to extract any subset of activities from your project.
- The report provides page breaks and cost assignment on the major sort field at your option.
- You can optionally suppress the printing of the budgeted and actual dollar amounts.
- The activity status as of the report date (Can Start, Must Start, Late, Critical, Active, Completed, or Planned) is displayed for each activity.
- All of your printing parameters (i.e., burden rate, workdays per week, etc.), holidays, and sort/selection choices are recapitulated at the end of the report.
- A "Schedule Only" report can be displayed on the screen.
GANTT OR BAR CHART

- Shows in graphical form the start and stop dates, float time, and percent complete status for each activity.
- Shows the critical path(s).
- Gives you the same data sorting and selection options as the Activity Report.
- Allows you to define the symbols you want for Critical Path, Activity Time, Float Time, Late, and Percent Complete.
- Prints a vertical Gantt chart under the report date which shows you what should be complete and what is still ahead.
- The holidays, non-work periods, and weekends are highlighted.
- You can select either a daily or weekly print format (weekly shown).
Earned Value Analysis

- For defense contractors working in DoD reg 7000.2
- Shows value of work budgeted vs accomplished vs actual cost for each activity.
- Calculates earned value based upon percent complete or days remaining.
- An outstanding management tool that is applicable to any project control situation.
- Report generated in three sections:

1. Value of work accomplished by activity as a function of budgeted amounts, percent complete, and actual.

2. Budgeted, earned, and actual amount by month for all activities.

3. A graphic presentation of the earned value, the budget, and the actual amounts.
**Funding Schedule**

- Shows in tabular and graphic form the total costs by month in 4 ways: 1) early finish basis, 2) late finish basis, 3) average of 1 and 2 (per Corps of Engineers specification ER 1-1-11 reporting requirements), and 4) actual cost at actual start/finish.

For activities that span more than one month, PME II can put all the activity's dollars in the ending month or spread them over the duration of the activity.

<table>
<thead>
<tr>
<th>MONTH</th>
<th>EARLY FINISH</th>
<th>LATE FINISH</th>
<th>AVERAGE</th>
<th>ACTUAL</th>
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<td>06/04</td>
<td>16149</td>
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<td>16149</td>
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</tr>
</tbody>
</table>

**Now, Do You Have the Resources to Accomplish the Schedule . . . ?**
THE PROBLEM:

Your company has successfully used PMS-II to schedule and control many concurrent projects, but your project managers are experiencing unexpected delays and confusion because more than one of them has planned to utilize the same resource at the same time. Often, critical activities within your project are discussed in detail with the department managers that will be providing the resource(s) required. They may assure you that your project will be “taken care of” only to find out when it is too late that they don’t have enough resources to meet the schedule because the resource plans that were submitted for budget approval were in error! They’re very sorry, but your project will now be delayed. All remaining activities will need to be renegotiated with all of the other departments and you can expect more of the unexpected.

THE SOLUTION:

Your company needs to use a systematic method for controlling the allocation of finite resources against the requirements of many competing projects. Your company needs RMS-II, the Resource Management System for PMS-II.

RMS-II is a completely integrated resource management system that allows a project manager to define up to 96 separate resource centers — people, departments, machine tools, test centers, etc. — each with a unique capacity in hours, an hourly cost, and a burden rate. These resources can then be allocated to the activities in your PMS-II projects. Reports can be generated showing these allocations on either a project or a resource center basis.

RMS-II is ideal for contractors who have their own crews, for engineering or manufacturing firms using a matrix type of organization, or in any project situation where conflicts over scarce resources can arise. It makes capacity planning and load leveling easy by providing the resource managers with quick visibility of the demands on the resource centers under their control. RMS-II provides:

- Optional selection of either the resource center’s burden rate or the burden rate associated with the project (fixed burden contracts).
- Video display of all allocations against a resource center that potentially conflict with the activity that is being allocated.
- Allocations automatically update the activity’s budget for labor and burden.
- Allocations are made in hours per day and can be budgeted in either total hours or total dollars.

...And Unproductive Excess Resource Capacity
**Allocation Report For A Project**

### Allocation Report

- Shows all allocations to a given activity within a project from any resource center.
- Indicates whether each allocation to an activity is within that activity's current scheduled time period.
- Offers all the Sort and Select features from PMS-II Activity Report.

**Example Table:**

<table>
<thead>
<tr>
<th>Task ID</th>
<th>Start Date</th>
<th>End Date</th>
<th>Resource</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>01/01/2023</td>
<td>01/15/2023</td>
<td>Resource A</td>
<td>10 units</td>
</tr>
<tr>
<td>T2</td>
<td>01/16/2023</td>
<td>01/30/2023</td>
<td>Resource B</td>
<td>5 units</td>
</tr>
<tr>
<td>T3</td>
<td>02/01/2023</td>
<td>02/28/2023</td>
<td>Resource C</td>
<td>15 units</td>
</tr>
</tbody>
</table>

**Legend:**

- Resource A: Project Manager
- Resource B: Technical Lead
- Resource C: Software Developer
Resource Allocation Report/Graph

- Shows sum of all allocations of a given resource center as a percent of capacity over time.
- Graph shows allocations by date and highlights allocations in excess of 100% of capacity.
- Data selectable and single project selectable for partial print.
<table>
<thead>
<tr>
<th>Row 1</th>
<th>Row 2</th>
<th>Row 3</th>
<th>Row 4</th>
<th>Row 5</th>
<th>Row 6</th>
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</tr>
</tbody>
</table>

END
Consolidated Allocation Report/Graph

- Provides allocation to capacity data over time for any combination of 2 to 96 resource centers.
- Allows resource manager to define individuals as resource centers and still extract summary allocation data for the entire group or department.

And you can manage your project's material commitments as well...
THE PROBLEM:

MEMO

To: PROJECT MANAGER

- Will the materials arrive in time for each activity?
- Can money be saved by bulk purchases across projects?
- The project schedule has changed — what orders need attention?
- What are the details of the large material expenditures for the main steel structure?
- Will material orders allow concrete pouring to be moved back two weeks?
- The vendor is asking for payment — did we receive line 12 of P.O. 142.3434A?
- What materials have been allocated for the major electrical work?
- I'd like to see details of how you are minimizing construction loan cash draw.

Call me tomorrow morning.

From: A.J.T., Vice President

P.S.: "Genius is not 'knowing' the answer to every question. It is knowing 'where to find' the answer." (Albert Einstein)

THE SOLUTION:

MMS-II is a materials management system that gives a project manager control of all major bid items. As many as 1,000 purchase orders can be entered into MMS-II's purchase order data base for as many as 100 different vendors. Up to 32,000 line items of material can be allocated to activities in PMS-II projects.

MMS-II works hand-in-hand with PMS-II. Entries to MMS-II automatically update material budget and actual values in PMS-II and are shown on the ACTIVITY REPORT, FUNDING SCHEDULE, and EARNED VALUE ANALYSIS. Schedule changes in PMS-II are matched with scheduled delivery dates of material orders, and late or excessively early scheduled deliveries are highlighted.

MMS-II has the same easy-to-use techniques for entering and updating information as PMS-II. Only necessary information is requested, and clear editing and error checking messages help you get your data entered correctly the first time.

ACTIVITY REPORT WITH MATERIAL ALLOCATIONS

- Provides the details of all material allocations for each activity, showing delivery schedule and status.
- Highlights situations where materials are due to arrive outside of currently scheduled activity time periods.
- Keeps track of thousands of line items of material orders as the project moves from activity to activity, making timely delivery of critical materials practical even with frequent schedule changes.
- Highlights areas where delaying or expediting deliveries could improve project profitability and programs.
- Includes the same sort and select capabilities as PMS-II and RMS-II.
## A Materials Management System for use with PMS-II

### MATERIAL ORDERS

<table>
<thead>
<tr>
<th>DATE</th>
<th>LINE NUMBER</th>
<th>ITEM DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td>3/6/80</td>
<td>1</td>
<td>10 x 1200 1x250g Paper</td>
<td>100</td>
<td>EA</td>
<td>5.00</td>
<td>500</td>
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<td>3/6/80</td>
<td>2</td>
<td>20 x 4x12 1x250g Paper</td>
<td>200</td>
<td>EA</td>
<td>4.00</td>
<td>800</td>
</tr>
</tbody>
</table>

### MATERIAL ORDERS DETAIL REPORT

- Shows the detail of each purchase order in the database, including quantities received against orders.
- P.O.s can be selectively reported based on a range of P.O. numbers, status of purchase order, order data, and vendor.

### MATERIALS RECEIVED — AUDIT AND CONTROL

- Provides a continuous audit trail of the quantities and costs of materials received as well as a convenient means of controlling the authorizations of material expenditures.

### VENDOR REFERENCE AND ANALYSIS LISTING

- Acts as a control list of acceptable vendors and as an aid to tracking each vendor's performance.
And when you get tired of running PMS-II yourself . . .

**BPS-II**

**THE PROBLEM:**
When you first get your PMS-II, and are running three or four projects, sitting at the computer and generating each of the reports you needed is not much of a chore — in fact, it is actually a lot of fun. But after you have several projects on your system, and the novelty of watching the programs go through their paces has worn off, tending the machine while it generates the many weekly reports you require can become an expensive and tiresome task.

**THE SOLUTION:**
BPS-II is a batch processing system, which allows you to:
1) define the projects you are currently managing,
2) calculate and generate activity reports, GANTT charts, and edit listings, and
3) select options for these calculations and reports.

Then, with a single command from you, BPS-II will calculate and report against any number of projects with as many different options as your current PMS-II system, all from your pre-defined files, completely unattended by you.

If you will find yourself running the same reports against the same projects day after day or week after week, BPS-II can result in a considerable savings in time, money, boredom, and aggravation.

BPS-II has been designed to provide you with the greatest flexibility possible by allowing you to set up multiple independent files for:
1) projects to be processed,
2) reports to be generated, and
3) the sort, select, and format options to be used with the reports.

Then, any set of projects can be run against any set of reports using any set of options!

. . . let BPS-II do it for you.
Maximum Project Control on a Micro Budget

Pricing:

<table>
<thead>
<tr>
<th></th>
<th>Full System</th>
<th>Demo</th>
<th>Upgraded Demo</th>
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<tbody>
<tr>
<td>1) PMS-II</td>
<td>$1295.00</td>
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<td>2) RMS-II</td>
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<tr>
<td>3) MMS-II</td>
<td>$995.00</td>
<td>$50.00</td>
<td>$945.00</td>
</tr>
<tr>
<td>4) BPS-II</td>
<td>$495.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discount Policy:
30% educational discount for recognized institutions. Demo system price applied toward full system price.

Payment Terms:
Prepay or C.O.D. Next day air available via UPS Red Label (add $20.00 per PMS-II system).

Delivery:
All systems shipped within 24 hours ARO. UPS Blue Label (second day air).

Freight:
N/C in U.S.A.

About the Demo Systems

The demo systems come with full user documentation including tutorial and ALL the features of the full system except those which allow you to create or add to a project network. With the DEMO network that is included on your disk, you can explore every feature of PMS-II, RMS-II, or MMS-II, on your own machine, at your leisure. When you decide to purchase a full system, just return your demo disk(s) for an upgrade(s), and you will receive $50 credit for each upgraded demo.

ORDER FORM

☐ Please send one PMS-II demonstration system and user manual ($50.00 — applicable towards the price of the full system)
☐ Please send one RMS-II demonstration system and user manual ($50.00 — applicable towards the price of the full system) (requires PMS-II)
☐ Please send one MMS-II demonstration system and user manual ($50.00 — applicable towards the price of the full system) (requires PMS-II)
☐ Please send full PMS-II system ($1295.00)
☐ Please send full RMS-II system ($995.00) (requires PMS-II)
☐ Please send full MMS-II system ($995.00) (requires PMS-II)
☐ Please send full BPS-II system ($495.00) (requires PMS-II)

Ordered by (print): __________________________ Date: ________________

Title: __________________________ Company: __________________________

Address: __________________________

Phone: ( ) __________________________ Ext. ( ) ________

Disk Format: ☐ CP/M ☐ CP/M 86 ☐ PCDOS ☐ MSDOS

Disk Size: ☐ 8" ☐ 5 1/4"

Computer: __________________________ Make: __________________________

SHIPPING INSTRUCTIONS/DEALER STAMP

DEMAND CONSTRUCTION SERVICES, INC.

7430 E. Caley Ave. Building 1, Suite 350
ENGLEWOOD, COLORADO 80111
(303) 760-6967

11772 Sorrento Valley Rd., Suite 100
San Diego, California 92121

(619) 481-6998
Telex #701257 NAMICA UD

15
Keeping you on
The Critical Path . . .
APPENDIX D

SUBCONTRACT BACKCHARGE
SUBCONTRACT BACKCHARGE

SUBCONTRACTOR: 
Company

Date 11-1-84 Project Hyland Office Park
Subcontract # 3710-2505 
Backcharge Cost Code 3710-2510
Notification Date 8-15-84

Under the terms of the subcontract agreement, referenced above, Walter CM has exercised its right and completed the following work:

Construction of three (3) 10-ft. Type R inlets and two (2) 5-ft. Type R inlets in the Private Road, excluding manhole rings, ladder runs and grates supplied by Subcontractor, by mutual agreement. Per WCM letter dated 8-15-84, maximum backcharge total of 9 x $2,016.00 x $10,080.00 is applicable, as actual costs exceeded that maximum. (WCM Cost Distribution summaries, material/equipment invoices, and Payroll Distribution sheets are attached hereto.)

Per Paragraphs 19, 21, & 24 of the agreement, your next subcontract payment will be credited the following amount for reimbursement of our costs.

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Invoice No./WCM Labor</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCM labor (see attached)</td>
<td>8/19, 8/25, 9/2, 9/9, 9/16</td>
<td>$10,446.69</td>
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<tr>
<td>Misc. vendors (see attached)</td>
<td>Materials &amp; equipment</td>
<td>2,722.59</td>
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</tbody>
</table>

**ACTUAL COSTS**

**SUBTOTAL** $13,169.28

Minimum Allowed minus Actual Costs = $10,080.00 - $13,169.28

(3,089.28)

Subtotal $10,080.00

Overhead (0 %) 0

**TOTAL** $10,080.00

By: David M. Metcalf/Project Manager

Walter CM

White - Subcontractor  Yellow - Project Manager  Pink - Accounting

D-1
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Lab.</th>
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**TOTAL FOR PROJECT 3710:** 912400.90
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**CONRESCO INC.**

**INVOICE #**

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<table>
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<td>BANK OF WESTMINSTER</td>
</tr>
<tr>
<td></td>
<td>3391 SHERIDAN BLVD</td>
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<td>DENVER, CO</td>
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<th>INVOICE DATE</th>
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<th>UNIT</th>
<th>ITEM NO / DESCRIPTION</th>
<th>SHIPPED</th>
<th>BACK ORDERED</th>
<th>PRICE</th>
<th>UNIT</th>
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**YOU MAY DEDUCT $6.75 IF PAID BY 9/10/94**

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<th>WEIGHT</th>
<th>DELIVERY</th>
<th>SALES TAX</th>
<th>MISC</th>
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**RECEIVED**

**AUG 2, 1994**

**THANK YOU**
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<tr>
<th>Service Charge:</th>
<th>For loads ordered less than 4 cu yds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Waiting Time will be charged for at the rate of $35.00 per hour ($5.00 per min.) or any part thereof for unloading time over free time written at left.</td>
</tr>
<tr>
<td></td>
<td>Free Time to Unload this load: 32 mins</td>
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<tr>
<td>Air Entrainment</td>
<td>Yes</td>
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<td>Pozzolith</td>
<td>322, 344</td>
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<tr>
<td>Calcium Chloride</td>
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</tr>
<tr>
<td>Use Curb Gutter Paving</td>
<td>No</td>
</tr>
<tr>
<td>Platform Floor</td>
<td>Compound 1</td>
</tr>
<tr>
<td>Max slump</td>
<td>3</td>
</tr>
<tr>
<td>Pump mix</td>
<td>2</td>
</tr>
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<td></td>
<td>Service Charge: 236.25</td>
</tr>
<tr>
<td></td>
<td>State Tax: 236.25</td>
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<td></td>
<td>City Tax: 7.24</td>
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<tr>
<td></td>
<td>County Tax: 1.42</td>
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<tr>
<td></td>
<td>Suburban Ready Mix Co. assumes no responsibility for damages to person or property if you designate driver to go beyond curb or property line. You will be responsible for any damage that may occur.</td>
</tr>
<tr>
<td></td>
<td>Finance charge at the rate of 2% per month (APR 24%) will be on balance 30 days from date of purchase.</td>
</tr>
<tr>
<td></td>
<td>6564 Customer Signature:</td>
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### Suburban Reddi Mix Co.

**Plant:** Brighton
**Address:** 11755 Brighton Rd.
**Phone:** 421-0720

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<tbody>
<tr>
<td>1.24</td>
<td>MAX TYPE 2</td>
<td>50.50</td>
<td>114.35</td>
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</table>

**Service Charge:** For loads ordered less than 1 cu. yd.

- **Waiting Time:** Will be charged for at the rate of $39.00 per hour, 15c per min. or any part thereof for unloading time in excess of time printed at left.
- **Water:** Added to the mix at the job site will be the purchaser's responsibility.
- **Waiting Charge:** At the rate of 3% per month (APR 24%) will be on accounts not paid within 30 days from date of purchase.

**Signature:**

---

**Note:** Properly mixed cement, mortar, or grout mix can cause severe injury. Avoid contact with skin and wash exposed skin immediately with water and soap. If any compound enters eyes, rinse immediately with water and get prompt medical attention. Keep out of reach of children.

**Service Charge:**

- **Waiting Time:** Will be charged for at the rate of $39.00 per hour, 15c per min. or any part thereof for unloading time in excess of time printed at left.
- **Total:**
  - **Sub Total:** 149.58
  - **Total:** 149.58

---

**Customer's Signature:**

---

**Date:** 8-14-87

**Order No:** 3710

**Customer's Name:** Walter C. M

---

**Plant:** Brighton
**Address:** 11755 Brighton Rd.
**Phone:** 421-0720

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<th>PLANT</th>
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<td>114.35</td>
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**Service Charge:** For loads ordered less than 1 cu. yd.

- **Waiting Time:** Will be charged for at the rate of $39.00 per hour, 15c per min. or any part thereof for unloading time in excess of time printed at left.
- **Water:** Added to the mix at the job site will be the purchaser's responsibility.
- **Waiting Charge:** At the rate of 3% per month (APR 24%) will be on accounts not paid within 30 days from date of purchase.

**Signature:**

---

**Note:** Properly mixed cement, mortar, or grout mix can cause severe injury. Avoid contact with skin and wash exposed skin immediately with water and soap. If any compound enters eyes, rinse immediately with water and get prompt medical attention. Keep out of reach of children.

**Service Charge:**

- **Waiting Time:** Will be charged for at the rate of $39.00 per hour, 15c per min. or any part thereof for unloading time in excess of time printed at left.
- **Total:**
  - **Sub Total:** 149.58
  - **Total:** 149.58

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**Customer's Signature:**

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**TOTAL**: 603.68

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**Service Charge:**

Waiting time will be charged for at the rate of $10.00 per hour, $1.00 per min. or any part thereof for unloading or over free time written at left.

- State Tax: 3.07%
- City Tax: 0%
- County Tax: 0%

Total: 135.78

**FINANCE CHARGE AT THE RATE OF 3% PER MONTH (APR 0%):**

All accounts not paid within 30 days of date of purchase.

Customer Signature: JED 28

Journal Entry To:

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STATE 1.18
CITY 1.18
RFD .28

TOTAL 49.04

No merchandise returned without our written permission - Make no deductions from this invoice - If incorrect return at once.
Suburban Ready Mix Co.

Plant: Brighton

Arado: 3701 - 2570

Shovel: 18 cu yd

Concrete: 2 cu yd

Date: 9/12/84

Received:

2 cu yd

2 @ $44.00 = $88.00

3.6% = 3.13

WALL: 2 @ $37.00 = $74.00

Total: $119.96

SERVICE CHARGE:

For loads ordered

Less than 4 cu yds

Waiting time will be charged at the rate of $30.00 per hour ($6.00 per min) on any part thereof for unloading time over free time written at left.

COUNTY TAX

SUBURBAN READY MIX CO DISCLAIMS ANY RESPONSIBILITY FOR DAMAGES BEYOND THE CURB OR PROPERTY LINE IF YOU DESIGNATE DRIVER TO GO BEYOND CURB OR PROPERTY LINE YOU WILL BE RESPONSIBLE FOR ANY DAMAGE THAT MAY OCCUR.

Suburban Ready Mix Co.

Customer Signatures:

Z 8832

CAUTION: Freely mixed, concrete, mortar, or grout may cause burns. Avoid contact with skin, eyes, or mucous membranes. Wash exposed skin area promptly with water. If any cement mixture gets into eyes, rinse thoroughly.
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<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.34</td>
<td>2.50</td>
<td>12.10</td>
</tr>
</tbody>
</table>

**Details:**
- 3.710 cubic yards
- Concrete

**Logistics:**
- **Date:** 8-30
- **Receives:** Walter Cox

**Service Charge:**
- 101.63
- **Walter Cox**

**Signatures:**
- Customer: 7242
- Signature: [Signature]
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY ORDERED</th>
<th>QTY SHIPPED</th>
<th>UNIT PRICE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot; N/Cs Die Car Rapid Prep</td>
<td>1</td>
<td>1</td>
<td>34.95</td>
<td>41.70</td>
</tr>
<tr>
<td>Cutting Fluid</td>
<td></td>
<td></td>
<td>6.75</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>48.45</td>
</tr>
</tbody>
</table>

A finance charge of 21% per month, equal to 21% APR, will be charged on all past due amounts.

Please pay directly from this invoice. No statement will be sent unless requested.

Thank You

State Tax 126
City Tax
FSTD Tax
Shipping Charges 48.45
TOTAL 43.41
## Invoice Details

**Company:** CCS Supply, Inc.

**Address:**
5150 Fox Street
Denver, Colorado 80216

**Contact:** Bill Walters

**Phone:** (303) 296-5160

**Date:** SEP 10 1984

**Invoice #:** 30990

**Ship Via:**

**Customer:**
Walters C.M. Construction

**Address:**
9191 N. Sheridan

### Rental Equipment

<table>
<thead>
<tr>
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<th>DESCRIPTION</th>
<th>PRICE</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rental Equipment per attached</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 each</td>
<td>.30</td>
<td>.06</td>
</tr>
<tr>
<td></td>
<td>RTD</td>
<td></td>
<td>10.36</td>
</tr>
</tbody>
</table>

**Terms:** NET 30

---

**Notes:**
- No merchandise returned without our written permission.
- Make no deductions from this invoice.
- If incorrect, return at once.

---

**D-21**
# RENTAL INVOICE

**CCS SUPPLY CO.**
DISTRIBUTORS OF CONSTRUCTION MATERIALS
3150 FOX
DENVER, COLORADO 80216
TELEPHONE 303-294-9120

![RE NTAL INVOICE]

**INVOICE DATE:** 8-22-74

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Steel Wedges</td>
<td>$10.00</td>
</tr>
</tbody>
</table>

All equipment shall be returned in same condition as received. Any damage or claims will be at lessee's expense. Please check equipment before accepting.

**RENTAL PERIOD**

<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME IN TO</th>
<th>TOTAL</th>
</tr>
</thead>
</table>

**PURCHASE OPTION**

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
<th>PRICE $</th>
<th>TOTAL</th>
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</thead>
</table>

**SALES TAX**

TRANSPORTATION OUT

TRANSPORTATION IN

**ALL INSURANCE TO BE PROVIDED AT LESSEE EXPENSE**

---

D-22
PURCHASE ORDER

Job & Cost Code: 3100-250  
Bldg. Permit No.:  
Date: 3/20/81 1984

To: C.C.S. Supply  
For: INSERT FORMS

Address: 510 E. 25th St.  
Date Required: 3/20/84

Ship To: WHITE'S BLDG  
How Ship: VICKA PICKUP

Address: 9191 SHEFFIELD RD., HIGHLANDS C.P.

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>RECEIVED</th>
<th>PLEASE SUPPLY ITEMS LISTED BELOW</th>
<th>UNIT</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>WEDGES</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IMPORTANT
Our order number must appear on all invoices, packages, etc. Please notify us immediately if you are unable to ship complete order by date specified.

Purchasing Agent

White—Supplier  Green—File  Canary—Accounting  Pink—Field  Gold—Numeric Copy

WCM-008
<table>
<thead>
<tr>
<th>QUANTITY</th>
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<tbody>
<tr>
<td>12.50</td>
<td>RTO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.96</td>
<td>Socket</td>
<td></td>
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</tr>
</tbody>
</table>

**Total Amount:**

- **State:** $12.50
- **RTO:** $12.96

- **Total:** $25.46

**Date:** 8/20/84

**Walter C.**

**Bill Watters Construction & Management, Inc.**
# RENTAL INVOICE

**Company:** CCS Supply Co.
**Address:** 3150 POX, Denver, Colorado 80216
**Telephone:** 303-639-120

---

**Sold To:** Walters CM
**Job = 3710**
**Job Location:** 9191 Sweden Blvd

<table>
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<tr>
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<th>TERMS</th>
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<tr>
<td></td>
<td>17108</td>
<td>1010 DAYS NET 30 DAYS</td>
<td>E-26-51</td>
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<table>
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<tbody>
<tr>
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<td>Steel Wedges</td>
<td>1.00</td>
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---

All equipment shall be returned in same condition as received. Any Damage or Cleaning will be at lessee expense. Please check equipment before accepting.

Signature

---

**Rental Period:**
- **From:**
- **To:**
- **Time:**
- **Rent Rate:**
- **Price:**
- **Purchase Option:**
- **Subject to the terms and Conditions on the reverse hereof, which are made a part hereof as if fully set forth herein above.**
- **I have read the terms and Conditions of this lease agreement and agree thereto.**

**Transportation Out:**

**Transportation In:**

**Sales Tax:**

**Transportation Out:**

**Transportation In:**

---

**All Insurance to be provided at Lessee Expense**

---

D-25
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<tr>
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<td>-----------------</td>
<td>----------</td>
<td>-------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2x4 12' Stair Bt.</td>
<td>238</td>
<td>14.25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RECEIVED**

OCT 2 1984

---

NOTICE: ALL MATERIALS RETURNED SUBJECT TO 20% HANDLING CHARGE.

MATERIALS AND/OR LABOR RECEIVED PER INVOICE TERMS.

*DELIVERY REQUESTED ON*

**WILL CALL**

BY

Thank You

RECEIVED BY

---

D-27
**RECEIVED**

**DATE 9/30/84**

**ORDER NO.** 1306

<table>
<thead>
<tr>
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<th>DESCRIPTION</th>
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<tbody>
<tr>
<td></td>
<td>RENTAL EQUIPMENT PER ATTACHED</td>
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</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10.36</td>
</tr>
</tbody>
</table>

**NO MERCHANDISE RETURNED WITHOUT OUR WRITTEN PERMISSION - MAKE NO DEDUCTIONS FROM THIS INVOICE - IF INCORRECT RETURN AT ONCE.**

**D-28**
**Rental Contract**

**Leasee**

**Rent** 3450

**Sign Here**

Customer is responsible for all damages to tires.

1. 2" Franklin Ram 30° 24h

2. 2" Decker 42° 1/2h

---

**Rental Rates Quoted Cover 48 Hour Week, or 8 Hour Day.**

D-30
# Power RENTAL

**RENTAL INVOICE**

**LESSEE**
WALTERS CONSTRUCTION MGMT
7891 EAST MAPLEWOOD AVENUE
SUITE 200
ENGLEWOOD
CO 80111

**FOR USE AT SITE**
92ND & SHERIDAN BLVD.

**INVOICE DATE**
9/25/84

<table>
<thead>
<tr>
<th>ITEM NUMBER</th>
<th>CATALOG DESCRIPTION</th>
<th>USAGE UNIT PRICE</th>
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<td>BAR TAMPER 10000#</td>
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<td>8/27 07</td>
<td>39.00 F</td>
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<tr>
<td></td>
<td>PICKUP/DEL. ZONE B</td>
<td>1.0</td>
<td>8/24 15</td>
<td>7.29</td>
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<td>BUMPER PINTLE ADAPTE</td>
<td>1.0</td>
<td>8/24 15</td>
<td>15.00</td>
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</table>

**ADDITIONAL COST**

**RENTAL AMEND TO BE ISSUED 9/23/84 PER**

**KEY @ POWER PROVIDER**

**TOTAL**

176.27
APPENDIX E

PROBLEMS AND SOLUTIONS
ASSIGNMENT 1

Analyze and suggest ways to improve the erection process of the precast structure of the Bank of Westminster from the given timelapse film. Set up a crew balance chart for analysis and comparison as shown in Methods Improvement for Construction Managers by Henry W. Parker and Clarkson H. Oglesby, McGraw Hill Book Co., 1972.

Given: 1) Welder 1 is dressed in dark pants and dark shirt.
2) Welder 2 is dressed in dark pants and white shirt.
3) Foreman is dressed in dark pants, white shirt, and red hard hat.
4) Equipment Operator is dressed in dark pants, dark shirt, and dark ball cap. (NOTE: Operator does not leave cab of crane.)
5) Each frame was taken every 60 seconds, therefore 1 frame is equal to 1 minute.
6) The 60 second interval starts at the start of film.
7) The second half of the film was taken at 15 second intervals, therefore 4 frames equals 1 minute.
ASSIGNMENT 2

Analyze and suggest ways to improve the erection process of the brick veneer of the Bank of Westminster from the given timelapse as shown in Methods Improvement for Construction Managers by Henry W. Parker and Clarkson H. Ogelsby, McGraw Hill Book Co., 1972.

Given:
1) Foreman is heavy set with white hard hat dressed in tank jacket and dark pants.
2) Two bricklayers both dressed in maroon shirts and dark pants with white hard hats.
3) Laborer dressed in gray jacket, dark pants, and red hard hat.
4) Laborer dressed in gray jacket with blue shoulders, dark pants, and white hard hat.
5) Film was at 1 second intervals, therefore 60 frames equals 1 minute.
APPENDIX F

BIBLIOGRAPHY
BIBLIOGRAPHY


