Professional Development
Program in
Field Administration

EFFECTIVE CONSTRUCTION CONTRACT AND FIELD ADMINISTRATION

14th annual short course designed for the field administrator to study

(1) LEGAL RESPONSIBILITIES
(2) TECHNICAL RESPONSIBILITIES
(3) PERSONAL RESPONSIBILITIES

involved in field inspection, observation, supervision and coordination of on-site building construction.

Structured to acquire an in-depth knowledge of control techniques, management, contract administration and decision-making.

March 13-17, 1995 **Madison, Wisconsin**

Department of Engineering Professional Development
The College of Engineering, University of Wisconsin-Madison

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Mr. Stephenson is an engineering consultant who has a diversified background in land planning, facilities location, building design and construction.

Mr. Stephenson earned degrees at Lawrence Institute of Technology (Bachelor of Science, Mechanical Engineering) and Michigan State University (Master of Science, Civil Engineering). He has been associated with such firms as Smith, Hinchman & Grylls; Victor Gruen Associates; Benjamin Schulz Associates; and the H.F. Campbell Company. With the latter three organizations, Mr. Stephenson occupied executive positions as vice president. In 1962, he started his own consulting practice, specializing primarily in operational and management direction to owners, designers and contracting firms.

He is a registered professional engineer in Michigan, Wisconsin, Illinois, Indiana, Ohio, Pennsylvania, West Virginia, Virginia, Florida and Minnesota. He is a member of the Engineering Society of Detroit, the Michigan and National Society of Professional Engineers, the American Planning Association, the Detroit Area Economic Forum, and the Mid-America Economic Development Council.

Since 1952, Mr. Stephenson has been involved at middle and upper management levels in the planning, programming, design, construction and operation of several billion dollars worth of construction-related projects. These include work on industrial, commercial and institutional programs throughout North America.

Mr. Stephenson has also chaired numerous partnering charter meetings for both public and private sector projects, and has lectured extensively on the subjects of alternative dispute resolution and partnering.

He has also taught hundreds of technical and management seminars in the United States, Canada and Europe and is the author of several magazine articles and is the co-author of a book on critical path method. His broad experience has given him an understanding of the nature of small, medium and large size companies, and of the need to solve their management problems through creative, systematic, and workable approaches.

EFFECTIVE CONSTRUCTION CONTRACT AND FIELD ADMINISTRATION

March 13-17, 1995
Madison, Wisconsin

Ralph J. Stephenson, P.E., P.C.
Consulting Engineer

Records, documentation, planning & scheduling - notebook index

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Section #1

Introduction to records & documentation

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THINKING PATTERNS

Why plan?.....to evaluate

Why translate?.....to communicate

Why control?.....to achieve

Why correct?.....to maintain

Why learn?.....to improve

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APPROACH PATTERNS

1. Improve capabilities
2. Gain control
3. Expand your conceptual grasp
4. Be creative
5. Experiment - in the low leverage areas
6. Continue to learn
7. Solve problems
8. Define goals & turn them into objectives
9. Teach others to achieve what is important

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LINE OF ACTION

ELEMENTS OF THE LINE OF ACTION

The line of action is a simple statement of the range of tasks necessary to conceive, design, build and operate an environment. The line begins at a point referred to as the recognition of need with these actions following:

- Conceive
- Program
- Articulate
- Approve
- Design
- Construct
- Turnover
- Operate
- Maintain

These all culminate at an end point called discharge of environmental design and construction responsibility. A brief description of each step is appropriate in understanding their importance to the total design and build concept.

Recognition of need is the point at which a requirement for a new environment is first felt. The good design build operation tries to become involved in this creative stage. There is a danger of getting in too early and giving away so much of the early work that the job may be lost through over-exposure at a later date. However, recognition of needs is the starting point and the sales activity starts here. Taking the points in order -

Conceive - During the conceptual period the need which may be for increased facilities, larger dollar volume, more efficient handling systems or a variety of other demands is visualized and put down in some rough form. It may be a pencil sketch or may remain an idea in someone's mind. Here the project sees its origin and it is this early idea that often carries through the entire project. A good conceptual grasp is essential if the project is to be successfully completed.

Program - During the programming phase, the needs of the concept are put into easily understood tabular form so many square feet for storage, so many square feet for office, so much height for shipping facilities, etc. The actual physical demands of the environment are set forth in the project program or project bible.

Articulate - Now the concept and program are combined into preliminary construction language. Floor plans are drawn in accordance with requirements. The functional arrangement is shown in accordance with the project bible. Materials are called out in terms of the demands of the concept.

Approve - This is a critical point in the line of action. By now sufficient work has taken place so the manager can understand the project and say: "I like this or I don't; change this, revise this; let's increase that a bit; let's cut down here." Finally saying: "OK, I'm satisfied with this set of ideas showing the concept and the program - let's move on!" Approval unlocks the design and construction period.

Design - In the design phase, products of the previous four steps are utilized concurrently to prepare a set of working drawings and specifications that translate concept into steel, concrete and space.

Construct - Next, the actual environment is built. Construction is the first point where something major and tangible happens as a result of the concept.

Turnover - When the project has been built, it is turned over with the appropriate operating manuals to the owner or tenant. Turnover is an important step since if done properly it insures that a valuable commodity, the completed environment, is properly given to those who must use it.

Neglect of good turnover procedures is often the cause of serious callback problems. We certainly wouldn't turn a complex piece of machinery over to

Turnover - (Continued)

an amateur operator and expect he would make it perform 100% right from the start. Neither should we assume that an owner can take a new environment that has just been built for him and immediately operate it at full efficiency. Time should be spent during turnover to explain how this environment is to function.

Operate - The environment is now run-in and begins to achieve its full purpose. Operation can be an important responsibility although the design/build contractor should furnish his operational functions in connection with a new environment only on a paid contract arrangement and provided he is competent to operate the facility.

Maintain - Maintenance of the physical environment is the door opener for future projects. It also assures that the environment that has been nursed through the previous eight stages will be maintained correctly so as to work at its best for those who must use it. The maintenance contract is perhaps one of the least explored areas in the more sophisticated approaches to environmental design and construction.

The end of the line of action is when the designer and builder of environments has discharged his responsibilities. In a continuing trustworthy relationship, the line of action will have no end since before it is finished, a competent professional will be re-involved in another program at its beginning.

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PARTICIPANTS IN DESIGNING & BUILDING ENVIRONMENTS

There are five basic participants in the process of designing and building environments. These are the conceiver, the translator, the constructor, the operator and the regulator.

Conceivers - Those who conceive the idea and provide the wherewithal to bring the environmental program to a successful conclusion. The conceiver may be the owner but it also might be a governmental agency, a financial source, an architect, an engineer, a contractor, a vendor or a potential tenant looking for space. We identify the conceiver since he usually is the key person driving the project on to completion.

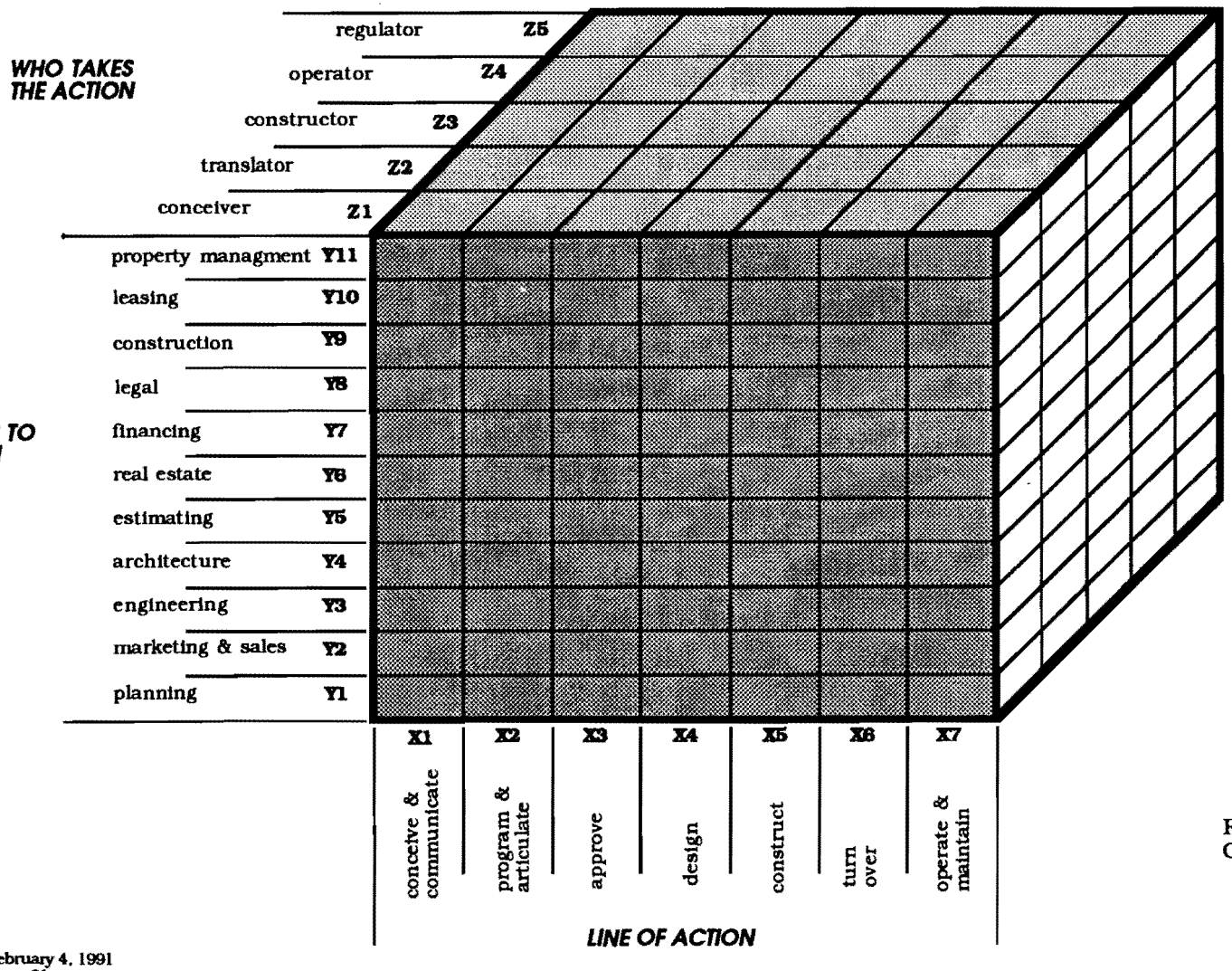
Translators - Those who translate the environmental program into construction language. Traditionally we think of the architect/engineer as the translator. However careful consideration of this matter shows there are many others who translate the conceiver's fundamental ideas into understandable, workable construction language. Subcontractors, suppliers, vendors, manufacturers, contractors and the conceiver may all play a role in translating.

Constructors - Those who interpret the construction language and convert it to a actual physical environment. Occupying this role are general contractors, specialty contractors, vendors, suppliers, manufacturers, artists and others who actually put the materials into place in the field.

Operators - Those who operate and maintain the completed physical environment on a continuing basis. Usually the party responsible for this function is an owner or tenant working through a plant or facilities manager.

Regulators - Those who fill a review & inspection position to help insure protection of the health, safety & welfare of the people. This is usually done by enforcing regulations written and adopted by qualified public or private bodies. Examples of regulators include those who work for building departments, departments of natural resources, public health agencies, fire prevention organizations, technical societies and other such groups.

MACRO MATRIX BOUNDARIES OF DESIGN & CONSTRUCTION



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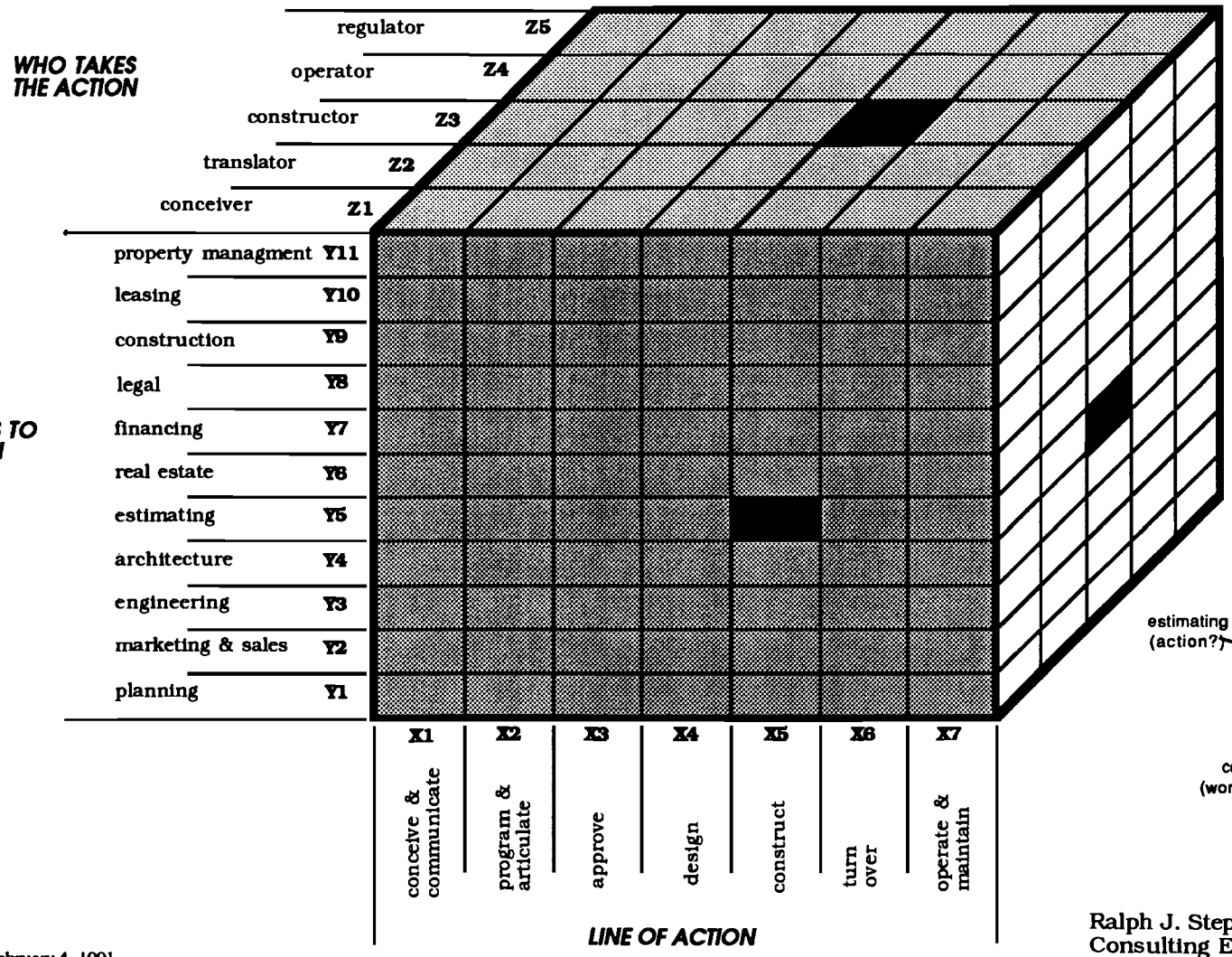
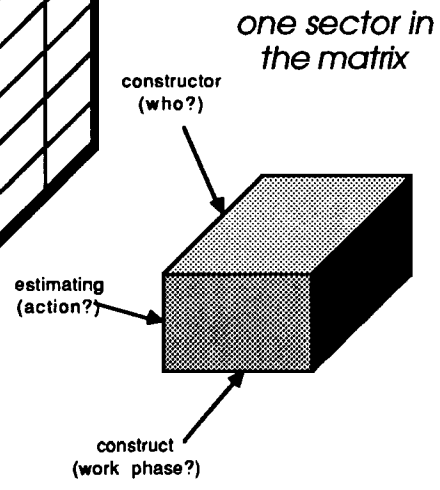
MACRO MATRIX BOUNDARIES OF DESIGN & CONSTRUCTION





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PICTURE OF A PROJECT

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THE NEED FOR PROFIT

A. KINDS OF PROFIT

1. Financial
2. Social
3. Self actualization
4. Value system
5. Technical
6. Enjoyment
7. Educational

B. ELEMENTS OF MULTI VALUE COMPETITION

1. Competence
2. Service
3. Integrity
4. Cost
5. Delivery
6. Understanding

C. HOW DO WE ACHIEVE PROFIT - TRUE PROFIT ?

1. Be smarter
2. Plan better
3. Control closer
4. Achieve more

<u>& profits will be automatic!</u>

1.11

37 Elements of importance to success in design and construction - ho 341

By Ralph J. Stephenson PE PC

- **Summary**

In the design and construction industry there exist many factors which influence the degree of success achieved on a project. They deal with project goals, profit types, project sequencing, the nature of the participants and the kinds of problems most likely to be encountered.

If the parties to a planning, design and construction program recognize the nature and importance of these factors, a major step will have been made toward their proper and effective combination and management.

Below are listed 37 basic influences on project delivery systems. Project management concerns how to combine these into a successful job of which all participants are proud.

- **Six major goals to meet for design & construction project success**

The client, owner & user must be assured upon completion of his job that:

1. The facility program and the facility design have met their needs, desires and wishes.

2. The planning, design and construction work on the project has been accomplished within the time and cost structure required and desired.

3. All relationships on the project have been maintained at a high technical and professional level, and have proven rewarding for those involved and affected.

4. The people involved at all levels of work on the job have realized a financial, professional and technical profit for themselves and their associates by being on the project.

5. The project has been closed out with little or no residual potential for major problems of maintenance or operation.

6. The entire process has been free of unresolved contested claims for additional money, additional time, damage payments, and of the potential for future financial demands after the job has been closed out.

- **Seven types of profit**
  1. **Financial** - an improvement in a money position
  2. **Social** - a gratifying experience contributing to society's well being
  3. **Self actualization** - a gain in personal non financial satisfaction by contributive work
  4. **Value system** - reward gained by application of values in which one believes
  5. **Technical** - acquisition of technical skill or technical data of value
  6. **Enjoyment** - personal enjoyment of a situation gained from involvement in it
  7. **Educational** - learning made possible only by efforts exerted in any given situation
- **Nine major elements in the design & construction sequence & how they are done**
  1. **Conceive the basic project**
     Visualize and state the fundamental nature of the proposed project, what purpose it is to serve, and its base characteristics.

2. **Prepare the program**
   Set down the physical characteristics of the total project in written and graphic form so as to be able to translate these characteristics into approval documents from which the full design can proceed.
3. **Articulate the program for approval**
   Merge the concept, and the written and graphic program into written and graphic construction language which can be reviewed and released by the ultimate decision makers for full design.
4. **Approve the basic project**
   Approve the concept, the program, and the merging of the two. This approval by those in authority initiates the full design and construction process
5. **Design the project**
   Prepare full contract documents for construction use.
6. **Construct the project**
   Build the project and make it ready for turnover to the owner or user.
7. **Turn over the project**
   Release the constructed project to the owner or user with full documentation needed to operated and maintain the completed environment.
8. **Operate the project**
   Take over, run in, and make the new environment fully operational.
9. **Maintain the project**
   Keep the new environment in proper operating condition by a well conceived and effectively managed maintenance effort.

• **Five major participants in the design & construction process**

1. **Conceiver** - The ultimate decision making force behind the entire program
2. **Translators** - The parties that translate the project concept into construction documents
3. **Constructors** - Those who build the project
4. **Operators** - Those who operate the completed project
5. **Regulators** - Those who help assure project adherence to the cause of public good

• **Ten major types of design & construction problems**

1. **Constructive acceleration**
   An action by a party to the contract that forces more work to be done with no time extension, or the same amount of work and a shorter period of time in which to do it.
2. **Constructive change**
   A construction action or inaction by a party to the contract that has the same effect as a written order.
3. **Defective or deficient contract documents**
   Contract documents which do not adequately portray the true contract scope.
4. **Delay**
   A situation, beyond the control and not the fault of a contract party, that causes a delay to the project
5. **Differing site condition**
   A situation in which the actual conditions at the site of a project differs from those represented on the contract documents, or from reasonable expectations of a site in that area.
6. **Directed change**
   A legitimate change within the contract scope for which the owner is obligated to pay.
7. **Impossibility of performance**
   A situation in which it is impossible to carry out the work within the contract requirements.

8. **Maladministration**
   The interference of one contract party with another contract party's rights, that prevents the latter party from enjoying the benefits of least cost performance within the contract provisions.
9. **Superior knowledge**
   The withholding of knowledge by one party to a contract from another party to the contract during the precontract period, and that, subsequent to contract execution, adversely affects the second party's construction operations in matters of importance.
10. **Termination**
    Dismissal of a party to the project contract for convenience or default.

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CONSTRUCTION CONTROL DOCUMENTS

• **WORKING DRAWING** - Graphically define the contract scope of work & show the appearance of the completed project.

• **SPECIFICATIONS** - Verbally describe the contract scope of work and define the qualitative standards to be maintained in the completed project.

• **CONTRACT DOCUMENTS** - Provide a full definition of the scope of project work to be built. Any item included as part of the contract documents becomes a condition of the contract.

• **ESTIMATES** - Verbally describe the quantitative standards to be achieved in the completed project.

• **PLANS & SCHEDULES** - Graphically define the sequences, procedures & amount of resources to be used to construct the project.

• **SHOP DRAWINGS** - Graphically show details of the fabrication, installation and final appearance of building components called for in the contract documents and accepted for use in the work.

2. Professional Service Contract Characteristics

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A. Agreement premises

1. Totally negotiated - broad multivalue competition
2. Partially qualified - moderate multivalue competition
3. Totally qualified - narrow multivalue value competition

B. Authority limits

1. As agent
2. As limited agent
3. As contractor

C. Payment methods

1. Fixed total including payroll + overhead + profit + (expenses)
   a. Expenses included
   b. Expenses separate
2. (Payroll costs) x multiplier + fixed fee + expenses
   a. Limit on
   1.) Payroll hours
   2.) Expenses
   b. No limit on
   1.) Payroll hours
   2.) Expenses
3. (Payroll costs) x multiplier for payroll costs & overhead
   a. Expenses included
   b. Expenses separate
4. % of total construction cost
   a. Expenses included
   b. Expenses separate

D. Scope of services

1. Single responsibility
   a. All in house
   b. In house & outside consultants
2. Split responsibility
   a. In house, client & other prime consultants
   b. In house & other prime consultants
   c. In house & client

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3. Construction Contract Characteristics

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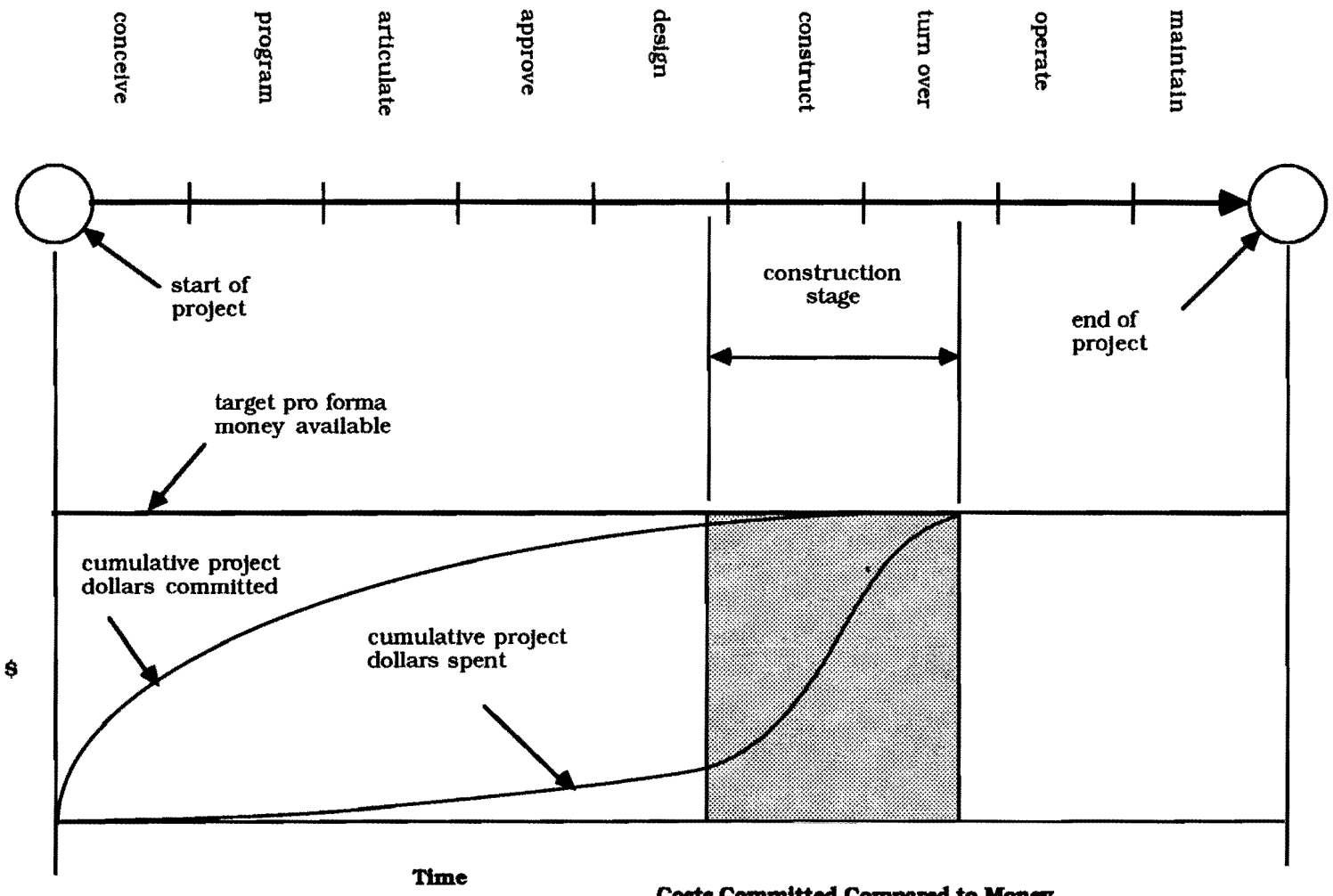
A. Agreement premises
1. Totally negotiated - broad multivalue competition
2. Partially qualified - moderate multivalue competition
3. Totally qualified - narrow multi valuevalue competition

B. Authority limits
1. As full agent
2. As limited agent
3. As contractor

C. Payment methods
1. Fixed cost (hard money)
2. Time & material + fixed fee
   a. Limit on
      1.) Time & material (gmp) with no shared savings
      2.) Time & material (gmp) with shared savings
   b. No limit on time & material
3. Time & material + % fee
   a. Limit on
      1.) Time & material (gmp) with no shared savings
      2.) Time & material (gmp) with shared savings
   b. No limit on time & material
4. Conditional payments or penalties
   a. Incentive/disincentive
   b. Liquidated damages

D. Scope of services
1. Single responsibility - in house & subcontractors
   a. All trades
      1.) Provide management
      2.) Provide design
      3.) Provide construction labor
      4.) Provide construction materials
   b. Limited trades
      1.) Provide management
      2.) Provide design
      3.) Provide construction labor
      4.) Provide construction materials
2. Split responsibility - in house, subcontractors & other primes
   a. All trades in contract
      1.) Provide management
      2.) Provide design
      3.) Provide construction labor
      4.) Provide construction materials
   b. Limited trades in contract
      1.) Provide management
      2.) Provide design
      3.) Provide construction labor
      4.) Provide construction materials



Costs Committed Compared to Money Spent on Construction Projects

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NINE MAJOR STEPS TO EFFECTIVE PROJECT MANAGEMENT

DEFINITIONS

• PROJECT - A set of work actions having identifiable objectives, and a beginning and an end.

• EFFECTIVE - Of a nature that achieves identifiable goals and objectives in accordance with an action plan, and reaches worthwhile peripheral goals through intermediate accomplishments.

• MANAGEMENT - The identification, assembly and direction of resources to achieve desired results.

QUESTION

• What is different about project organization compared to functional organization?

1. Project organization is usually temporary.

2. Project organization is usually based on a different rationale than is functional organization.

3. Project authority positions tend to be vested first and earned later.

STEPS TO GOOD PROJECT MANAGEMENT

• A good project seems to require 9 major steps, done well, to be successful.

1. Goals and objectives for the project are clearly identified, and starting, intermediate and ending measuring points established early in the project life.

2. A suitable project delivery system is selected as the goals & objectives are defined.

3. An action plan showing desired and necessary courses of action from beginning to end of the project is prepared.

4. The action plan is translated into schedules, and the resources needed are determined and balanced for most profitable performance.

5. A project organization is built under (not over) the resources required to provide resource management quality, continuity, and monitorbility.

6. A method of isolating, identifying and correcting deviations from desired performance standards is designed and put into action.

7. The needed resources are assembled and the project team gets to work.

8. Progress and performance of the project team is measured and evaluated using management by exception.

9. The project is closed out promptly, cleanly, and totally as work draws to a close.

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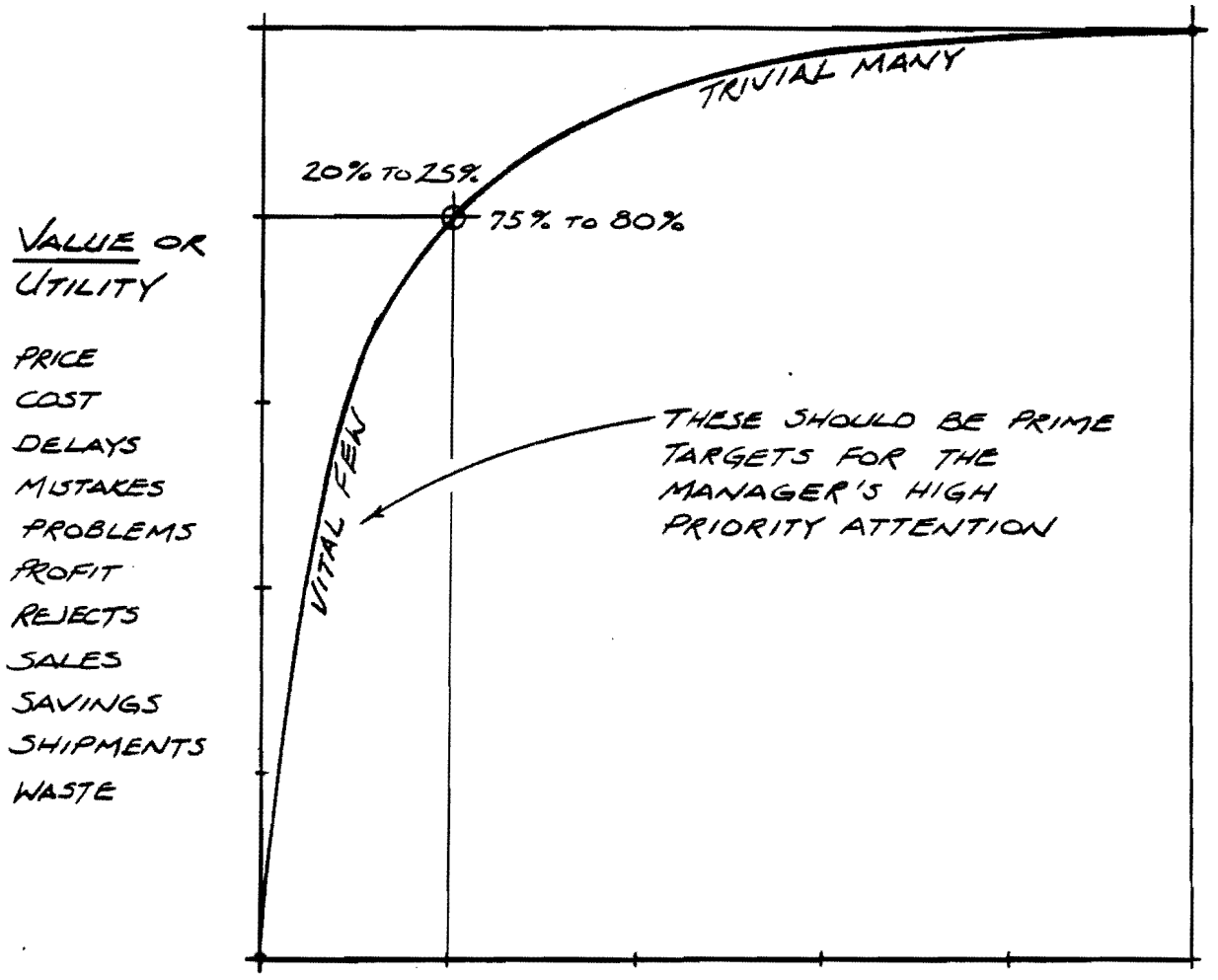
PARETOS LAW - IN AN OBJECT/VALUE SITUATION ONLY A FEW OF THE OBJECTS ACCOUNT FOR THE GREATEST PART OF THE VALUE.



VALUE OR UTILITY

PRICE
COST
DELAYS
MISTAKES
PROBLEMS
PROFIT
REJECTS
SALES
SAVINGS
SHIPMENTS
WASTE

OBJECTS OR RESOURCES

ACTIVITIES
CAUSES
OCCURANCES
PROBLEMS
RESOURCES
PRODUCTS
DECISIONS
FACILITIES
MATERIALS
METHODS
PRODUCTS
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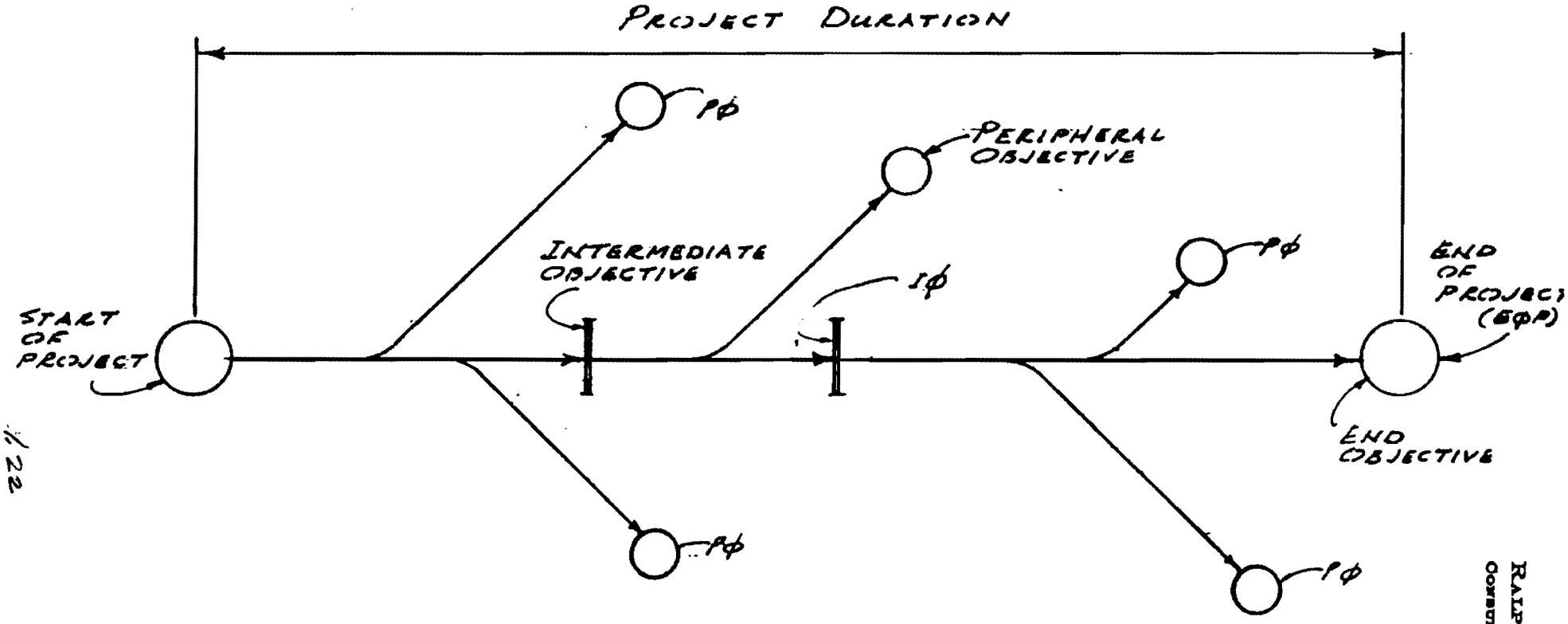

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END, INTERMEDIATE & PERIPHERAL OBJECTIVES

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Section #2

Construction record types & record keeping

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Effective Record Keeping for the Project Manager

Definition - A record is any retained information that can be effectively used in the future.

Reasons that good design and construction record keeping is essential include:

1. The increasing numbers of people and organizations to whom the project manager is responsible.
2. A dramatic an continuing increase in the number of contested design and construction claims.
3. Higher quality and well documented design and construction performance is being demanded in an increasingly competitive business and professional environment.
4. An increased demand for higher levels of cost control than ever before.
5. The documentation demands being made by more complex financing and ownership arrangements in design and construction.
6. Use of multiple firm syndicates and joint ventures in design and construction demands particularly good documentation to protect the combined and individual business entities.

Basic guidelines for preparing record keeping forms.

1. If a standard form works, use it.
2. Display information in a logical, readable sequence.
3. Provide adequate space for proper data entries.
4. Preprint everything possible - remember it costs the organization about $90 per hour for your managers when they are not engaged in a profitable managing/decision activity. Use the manager's time well.
5. Make the form readable.
6. Prepunch the form for loose leaf binders. Use the oversize hole punch. It will save time and money.
7. Be certain the form, when complete, will provide the data you need: the user can always skip non applicable spaces.
8. Provide a specific place on the form for a date and the users signature.
9. Review all forms at least once per year to see if they should be discarded, revised or kept as is.

IF A RECORD IS NOT NEEDED DON'T KEEP IT!

	document	record action	record suptv action	record opin	record chngs	record dec & agrmts	record appvls	record progrs	record resrce flow	record data	record doc procsg	record results
1	Appraisals		x	x					x			x
2	Bulletins				x		x		x		x	
3	Certificates of completion					x	x	x				x
4	Certificates of occupancy					x	x	x				x
5	Change orders				x	x	x		x			x
6	Check lists			x					x	x	x	
7	Claim notification letters	x	x	x	x	x				x		x
8	Clarifications		x	x	x					x		x
9	Color coded network models	x		x			x	x	x	x		x
10	Construction record drawings	x				x	x	x		x	x	x
11	Construction site plan	x	x									
12	Consultant lists		x							x		
13	Contract document sign offs	x				x	x				x	x
14	Contract drawings				x	x	x		x			x
15	Contract specifications				x	x	x		x			x
16	Contractor lists		x							x		
17	Contracts	x	x		x	x	x		x			x
18	Cost estimates		x	x	x		x	x	x	x		x
19	Cost reports		x		x		x	x	x	x	x	x
20	Diaries	x	x	x	x	x	x	x			x	x
21	Document control files									x		x
22	Equipment data tabulations							x		x		
23	Expense reports		x						x	x		
24	Field orders	x			x	x	x					x
25	Field reports	x			x	x	x	x		x		x
26	Guarantees		x									
27	Impact reports	x	x	x	x	x		x	x			x
28	Interoffice memos (IOC)	x		x	x		x					
29	Isoquant line comparisons						x	x	x	x		
30	Letters	x		x							x	
31	Logs	x	x	x	x	x	x	x	x		x	x
32	Maintenance manuals										x	
33	Meeting minutes	x	x	x	x	x	x	x	x		x	x
34	Money flow curves		x					x	x	x		x
35	Monitoring reports	x		x	x	x	x	x	x			x
36	Operation manuals									x		
37	Performance evaluations	x		x		x	x					x
38	Permits		x			x	x	x			x	x
39	Phone records and logs	x	x	x	x		x	x				x
40	Photos	x			x	x		x	x			x

	document	record action	record suptv action	record opin	record chngs	record dec & agrmts	record appvls	record progrs	record resrce flow	record data	record doc procsg	record results
41	Post job critiques	x		x	x		x	x	x		x	x
42	Pro forma financial analyses		x			x			x	x		
43	Project directories									x		
44	Project histories	x			x		x	x	x	x	x	x
45	Project network plans			x	x	x	x	x	x			
46	Project schedules			x	x	x	x	x	x	x		
47	Proposal spread sheets		x							x		x
48	Punch lists	x		x	x	x	x	x		x		x
49	Purchase orders		x			x	x		x			
50	Quantity takeoffs		x						x	x		
51	Requests for change orders	x	x		x	x	x		x			
52	Requests for information		x		x		x					
53	Requests for payment	x	x				x	x	x			x
54	Requests for proposals		x									
55	Resource histograms								x	x		
56	Risk management data		x									
57	Sample logs	x	x		x				x	x	x	x
58	Schedules of values				x				x	x	x	
59	Shop drawing logs				x			x	x	x	x	x
60	Site evlaluation data sheet	x	x	x								x
61	Specifications					x						
62	Testing reports		x	x	x					x		x
63	Time cards	x						x	x	x		x
64	To do lists	x						x				x
65	Transmittals	x			x	x	x	x	x		x	x
66	Waivers	x				x						x
67	Warranties					x						
68	Work orders	x			x	x	x					x

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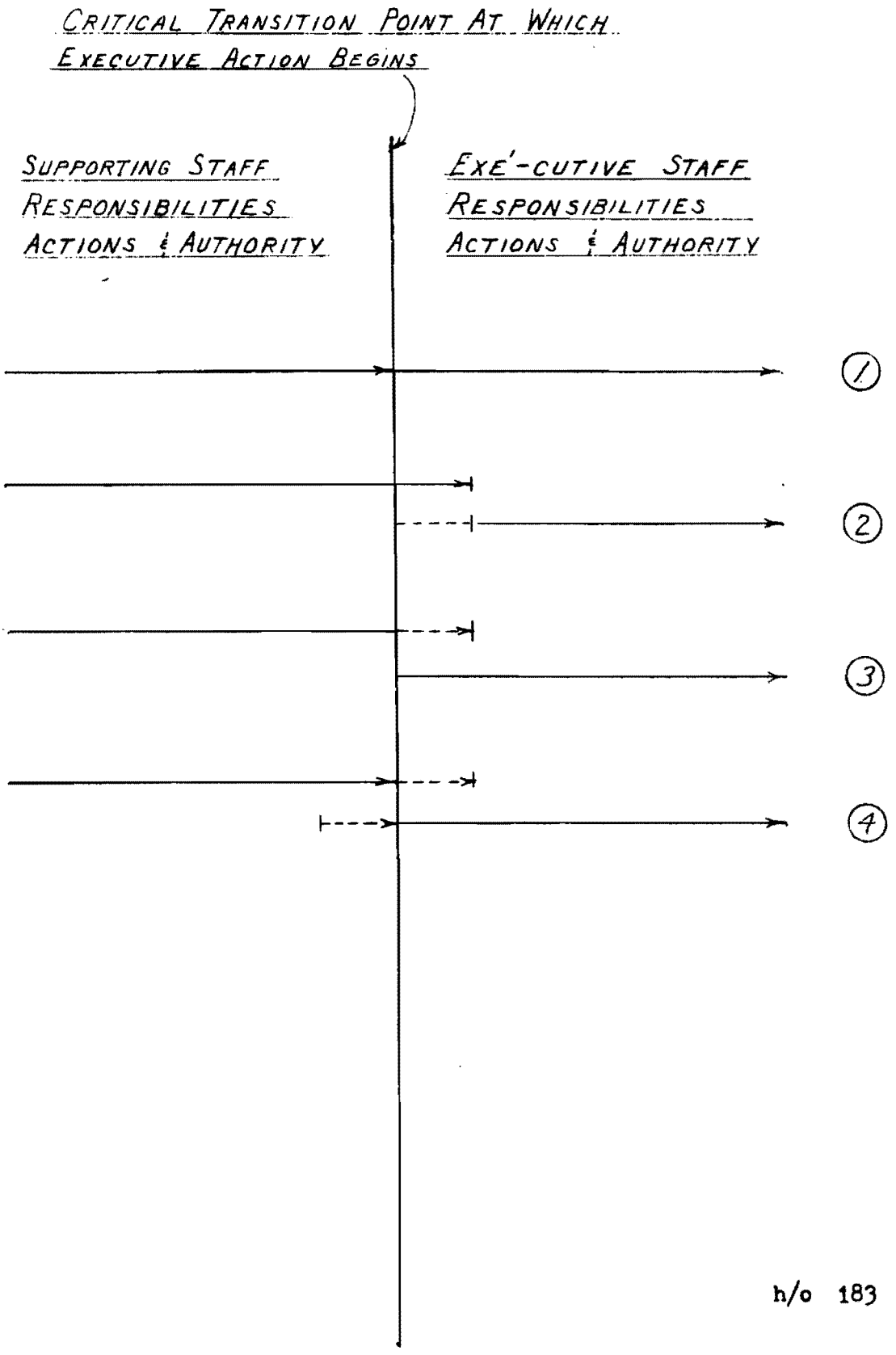

h/o 183

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KINDS OF ESTIMATES

Estimating can be defined as an approximate statement of what would be charged for certain work to be done submitted by one ready to undertake the work. Other definitions have been proposed but they all lead to the conclusion that estimating is fundamentally the art and science of predicting what the total cost actually will be. This estimate classification system takes into account the functional characteristics of the specific estimate to be made. It considers ten elements.

1. Point in time at which estimate is prepared
2. Scale of detail required
3. Estimating methodology
4. Life span covered by costing
5. Data available
6. Ultimate use of estimate
7. Number of elements estimated relative to total
8. Competitive situation
9. Role of estimate in setting final cost
10. Control position occupied

A meaningful classification system results if we assign values or weights to identify the requirements of the specific estimating situation.

1. Point in time at which estimate is prepared

    1) Conceive
    2) Program
    3) Articulate
    4) Approve
    5) Design
    6) Construct
    7) Turnover
    8) Operate
    9) Maintain

2. Scale of detail required

    1) Very rough detail, using general rules of thumb
    2) Generalized combination system in rough detail
    3) Moderate detail by unit or component modified with general historical and current data
    4) Great detail modified with specific historical and detail current data

3. Estimating methodology

    1) Replacement or appraisal technique
    2) Historical unit area or volume figures indexed for current use
    3) Major component costing and assembly indexed for current use
    4) Detailed component costing and assembly indexed for current use

DB
1/28/72

3. Estimating methodology (Cont.)

5) Detailed time and material estimates of elemental units (individually assembled at time of estimating)

The fundamental difference between component costing and costing from elemental units is that in the first the elemental units are pre-assembled and pre-estimated so that they are not evaluated each time the component is encountered in the project.

4. Life span covered by costing

1) Cost of initial installation only
2) Cost of installation, and short operating and maintenance cycle
3) Cost of installation, and long operation and maintenance cycle
4) Cost of installation, and total operation and maintenance over life of investment

5. Data available

1) Very little
2) Moderately adequate with supplementary research
3) Generally adequate
4) As much as required

6. Ultimate use of estimate

1) Conceptualizing - to gain basic idea of scope - usually very rough figures
2) Comparative evaluation - to measure on an equal basis several elements or combinations, all relative to a common datum
3) Budgeting - to provide a basis for allocating capital funds, maintenance or operating costs or other expenditures on a given program prior to its final design but after its conception
4) Competitive - to give the ultimate decision-maker in an environmental design and construction program comparable, firm values by which he can select all elements of the program to optimize its effectiveness

7. Number of elements estimated relative to total

1) Small part of total
2) Moderate part of total
3) Major part of total
4) Most or all of total

8. Competitive situation

1) No competition
2) Moderate multi value competition
3) Heavy single value competition

8. Competitive situation (Cont.)

Multi value competition is a relative evaluation based upon several factors such as size, quality of management, experience, present work load and financial strength.

In single value competition, all of these are reduced to a lone evaluation of the ultimate value expressed in the money bid. Such is the case on public projects where the only requirement to be on the bidding list is that an adequate bond be available.

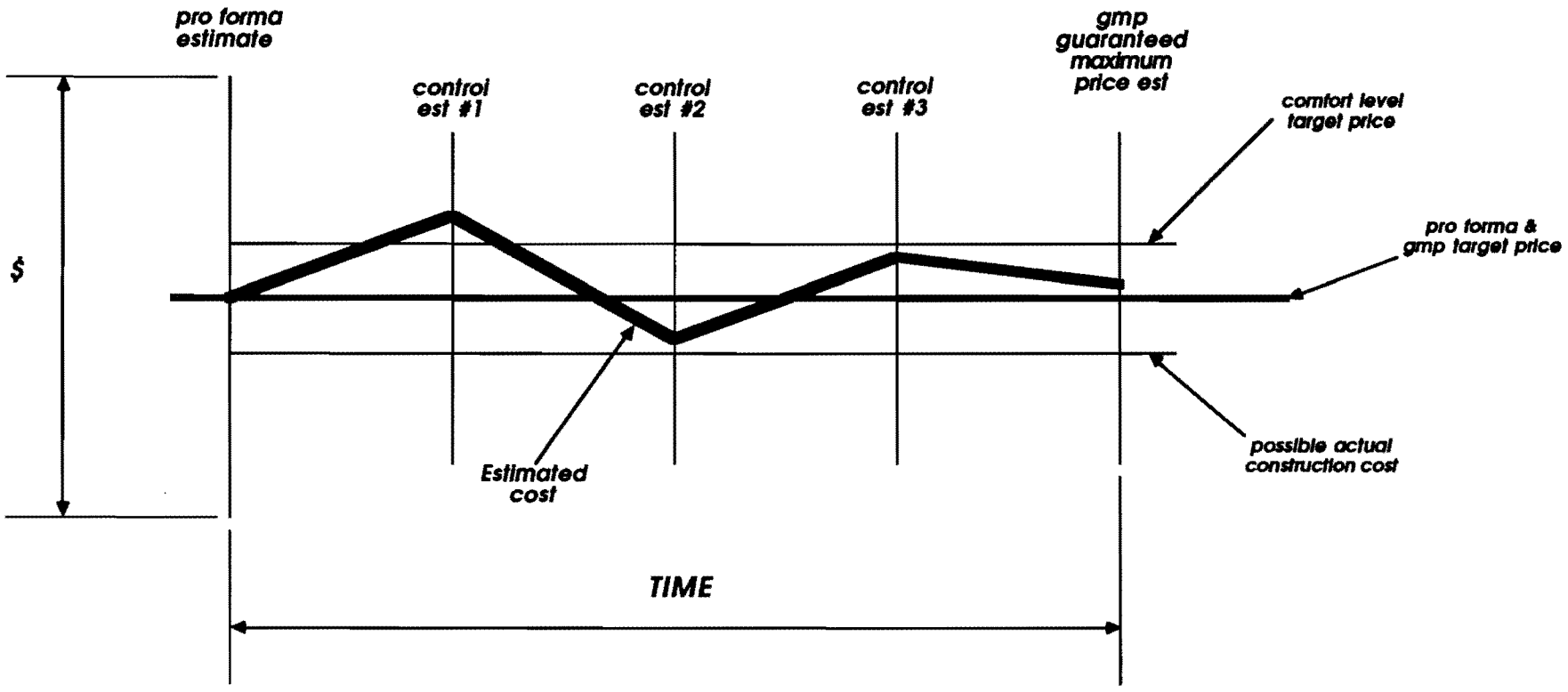
9. Role of estimate in setting final cost

1) To set capital costs only
2) To set financing, operating and maintenance costs only
3) To set all project costs through a specified period of time

10. Control position occupied

1) No control exerted
2) Minor controls possible
3) Major controls possible
4) Total control of program

Much elaboration is possible on control positions. The code suggested is a simplistic approach and in actual use might be modified to reflect to what the control is applied. Control position may extend to labor, material, land, money, design, construction or sub contractors among others.



2.06

THE ITERATIVE COSTING SEQUENCE

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Issue #1 - February 5, 1991
IT1 - ho aspe 1.10

Sheet #IT1

Date May 10

Project: Lake City Community College

Page 1

Item	Code	Contractor or Vendor	Code	Lead Time Reqd.--wkg.dys.					Earliest		Latest		Best		Actual		Remarks
				Detail	Approve	Fabric	Deliver	Total	DTO	DOJ	DTO	DOJ	DTO	DOJ	DO	DOJ	
Struct Steel	5	Frey Erectors	4	10	4	10	2	26	5/23	6/29	5/23	6/29	5/23	6/29			
Alum sash	11	Bell Bros.	9	9	5	12	2	28	6/17	7/28	6/27	8/5	6/17	7/28			
Excavation	3	Mate Bros.	2	—	—	—	—	2	5/12	5/16	5/12	5/16	5/12	5/16			
Roofing	9	Cicotte Roofing	8	—	—	—	—	15	6/24	7/18	7/21	8/11	6/24	7/18			
Brick	10	Richardson Inc.	6	—	—	—	1	1	5/13	5/16	5/16	5/17	5/13	5/16			Sample wall
Plastering	16	Robert Plastering	15	—	—	—	—	10	7/11	7/25	8/4	8/18	7/14	7/28			

Abbreviations

Fabric = Fabricate

Wkg = Working

Dys = Days

Requird = Required

DTO = Date to order (calendar)

DOJ = Date on job (calendar)

DO = Date ordered (calendar)

Purchasing Schedule Example

2.09

H/O 12

Ralph J. Stephenson

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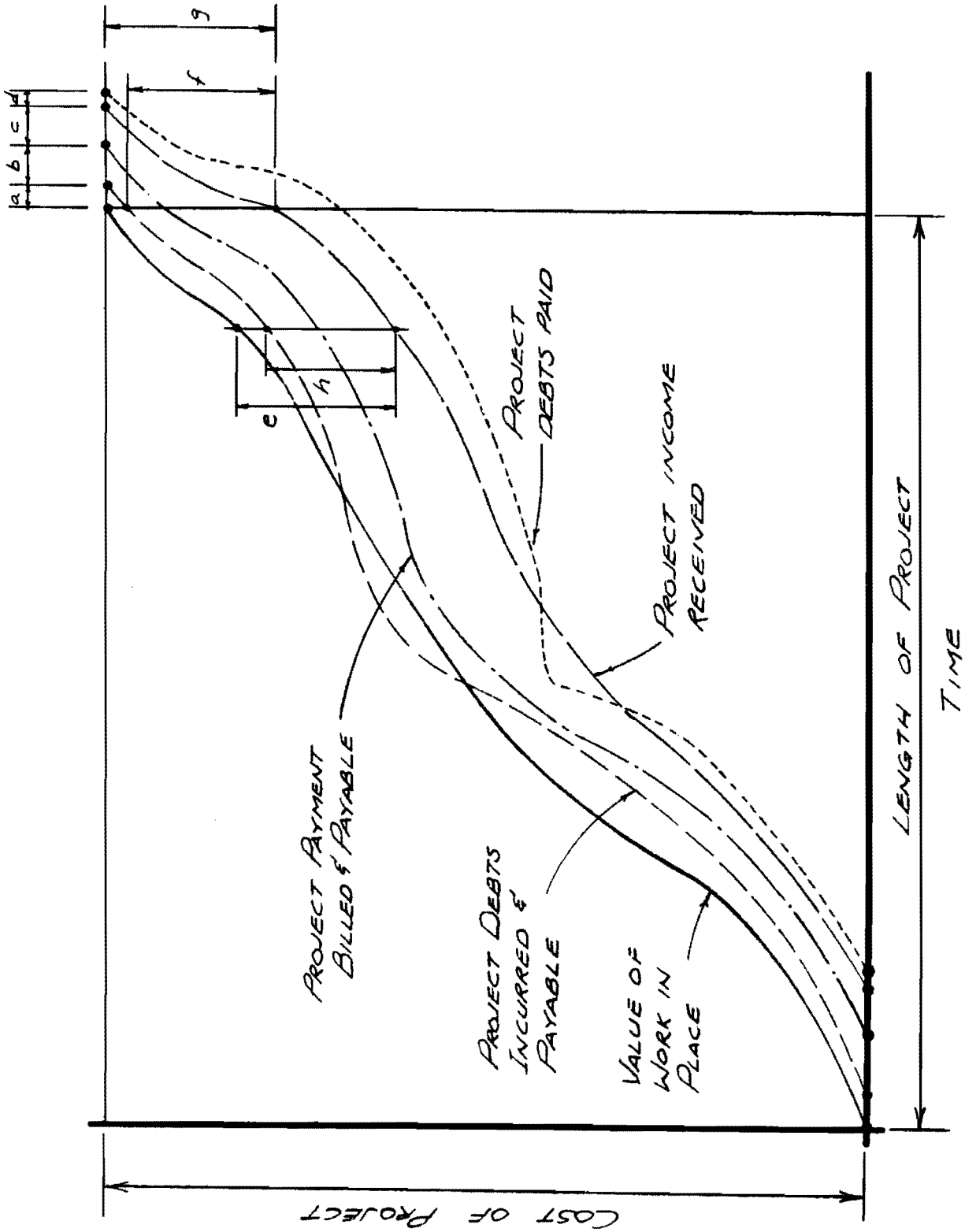
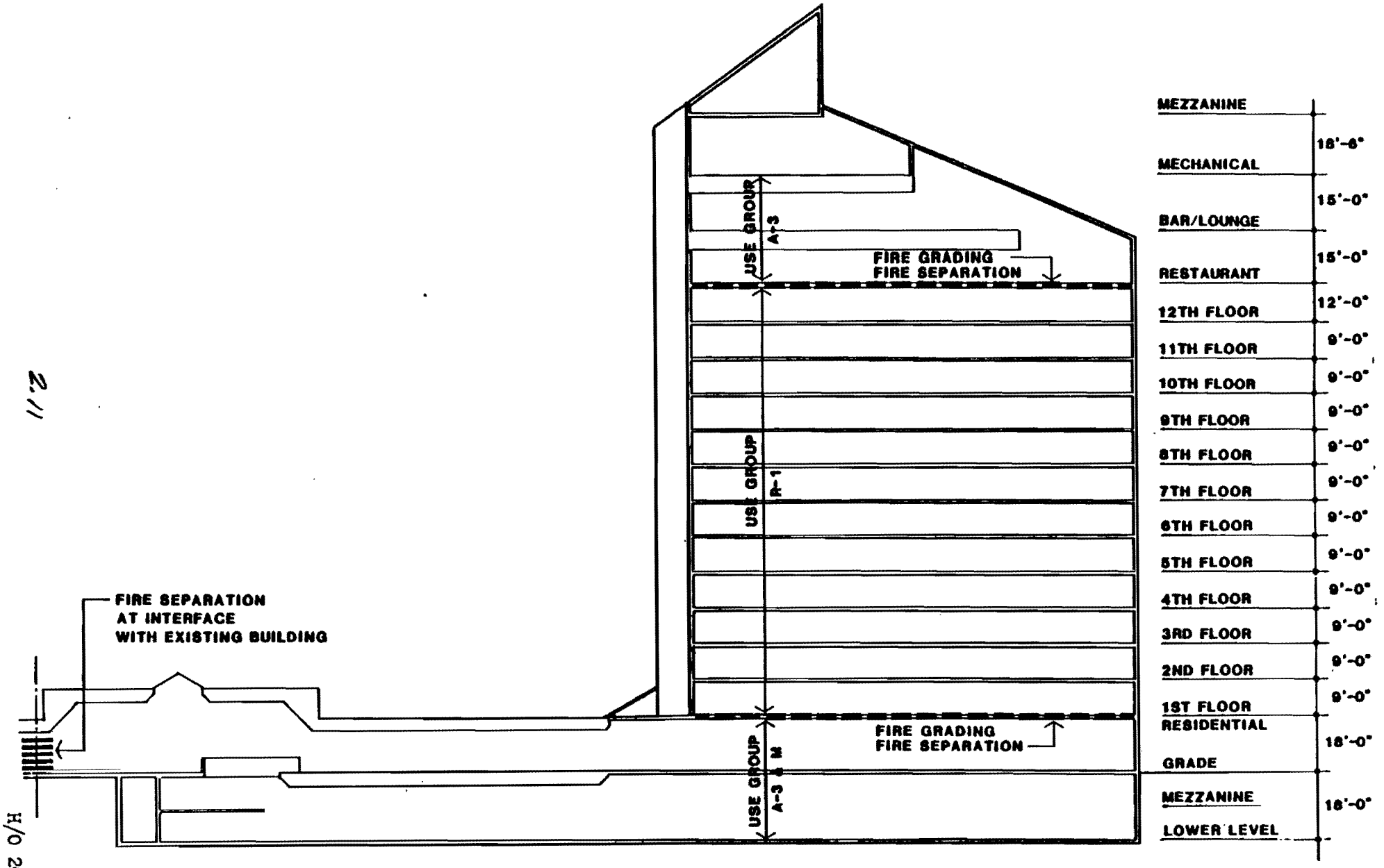


PROJECT MONEY FLOW


MEZZANINE
MECHANICAL
BAR/LOUNGE
RESTAURANT
12TH FLOOR
11TH FLOOR
10TH FLOOR
9TH FLOOR
8TH FLOOR
7TH FLOOR
6TH FLOOR
5TH FLOOR
4TH FLOOR
3RD FLOOR
2ND FLOOR
1ST FLOOR
RESIDENTIAL
GRADE
MEZZANINE
LOWER LEVEL
18'-6"
15'-0"
15'-0"
12'-0"
9'-0"
9'-0"
9'-0"
9'-0"
9'-0"
9'-0"
9'-0"
9'-0"
9'-0"
9'-0"
9'-0"
18'-0"
18'-0"
USE GROUP A-3
USE GROUP R-1
USE GROUP A-3 & M
FIRE GRADING FIRE SEPARATION
FIRE GRADING FIRE SEPARATION
FIRE SEPARATION AT INTERFACE WITH EXISTING BUILDING

2.11

H/O 240

CONTRACT DOCUMENT MATRIX SUMMARY
GRAND TRAVERSE RESORT VILLAGE TOWER & LOW RISE
D106 - RALPH J. STEPHENSON PE PC - DATE PRINTED: JAN 12 1988

I	S	ACTIVITY DESC	AL	LB	LL	LR	TW	SI	EB	REC#
A	-	SET HORIZ & VERT CONTROLS	A	-	-	-	-	A	-	4
A	-	MASS EXCAVATE TO 677'4	A	-	-	-	-	A	-	5
A	-	HAUL EXCAVATION TO BORROW AREA	A	-	-	-	-	A	-	6
A	-	CONSTRUCT HAUL ROAD	-	-	-	-	-	A	-	7
A	-	KEEP EXISTING ROADS CLEAN	-	-	-	-	-	A	-	8
A	-	REMOVE ABANDONED UTIL IN EXCAV AREAS	-	-	-	-	-	A	-	9
A	-	STRIP BLDG SITE & STOCKPILE TOPSOIL	A	-	-	-	-	A	-	10
A	-	DEMOLISH EXISTING ROAD IN EXCAV AREAS	-	-	-	-	-	A	-	11
B	-	OBTAIN FOUNDATION PERMIT	B	-	-	-	-	-	-	28
B	-	EXCAVATE FOOTINGS-NOT FOR SLB ON GRD	B	-	-	B	B	-	-	14
B	-	ERECT NECESSARY CONSTRUCTION FENCING	B	-	-	-	-	-	-	12
B		PART BACKFILL AT EXT FOUND WALLS	B	-	B	B	B	-	B	72
B	-	LAY OUT BUILDING	B	-	-	-	-	-	-	13
B	-	BACKFILL INT FOUND TO EL ?	B	-	-	B	B	-	-	19
B	-	LAY DRAIN TILE AT PITS	-	-	-	-	B	-	-	22
B	X	EFRP PIT SOG	-	-	-	-	B	-	-	20
B	X	FRP EXT LOWER LEVEL WALLS	B	-	B	B	B	-	-	15
B	X	EFRP COL FTGS	B	-	-	B	B	-	B	17
B	X	EFRP WALL FOOTINGS	B	-	-	B	B	-	-	18
B	X	DRIVE SHEETING AT EXISTING BLDG	-	-	-	B	-	-	B	23
B	X	PART APPLY EXT WALL WATERPROOFING	B	-	B	B	B	-	-	25
B	X	PART INSTL EXT WALL DRAIN TILE	B	-	B	B	B	-	B	34
B	X	FRPS COLS TO LOBBY LEVEL	-	-	-	B	-	-	-	24
B	X	FRPS COLS TO LL MEZZ	-	-	-	B	B	-	-	26
C	-	BACKFILL & COMPACT AT PITS	-	-	-	-	C	-	-	21
C	-	COMP INSTL DRAIN TILE AT EXT WALLS	C	-	-	-	-	-	-	36
C	X	APPLY PIT WATERPROOFING	-	-	-	-	C	-	-	16
C	X	FRPS ELEV 5 WALLS TO LB	-	-	-	-	C	-	-	27
C	X	INSTALL TRENCH DRAIN COVERS	-	-	C	C	-	-	-	29
C	X	INSTALL STEEL STAIRS & FILL	C	-	-	-	-	-	-	31
C	-	COMPLETE PHASE 2 ECAVATION	-	-	C	C	-	-	C	33
C	X	FRP PIT WALLS	-	-	-	-	C	-	-	189
C	-	BACKFILL EXT BUILDING WALLS	C	-	-	-	-	-	-	38
C	-	BACKFILL EXT RETAINING WALL	-	-	-	-	-	C	-	35
C	X	EFRP RETAINING WALL FOOTING	-	-	-	-	-	C	-	37
C	X	FRPS RETAINING WALL STEM	-	-	-	-	-	C	-	39
C	-	EXCAVATE FOR ALL SLABS ON GRADE	-	-	C	C	C	-	-	49
C	-	POUR OUT SUPPORTED DECKS	C	-	-	C	C	-	-	53
C	-	DEMOLISH EXISTING CANOPY	-	-	-	-	-	-	C	77
C	X	CURE, PART & TOTAL STRIP SUPTD DECKS	C	-	-	C	C	-	-	51
C	X	INSTL ELECT GROUNDING SYSTEM	C	-	-	-	-	-	-	52
C	X	FRPS COLUMNS ABOVE LOBBY LEVEL	C	-	-	-	C	-	-	54
C	X	FRPS COLS ABOVE LL MEZZ	-	-	C	C	C	-	-	43
C	X	CURE, STRIP & RESHORE SUPTD DECKS	C	-	-	C	C	-	-	50
C	X	ERECT MISC MTLS RELATED TO SS CONC WOR	C	-	-	-	-	-	-	190
C	X	CONSTRUCT LB SLABS ON GRADE	-	C	-	-	-	-	C	46
C	X	INSTL MISC IRON SKIN EMBEDS & SUPPORTS	C	-	-	-	C	-	-	56
C	X	COMP APPLY EXTERIOR WALL WATERPROOFING	C	-	-	-	-	-	-	42
C	X	FORM & SET IN FLOOR WORK FOR SUPTD DKS	C	-	-	C	C	-	-	55
C	X	INSTL EXPANSION JOINTS & RELATED EMBED	C	-	-	-	-	-	-	44
C	X	CONSTRUCT LL SLABS ON GRADE	C	-	C	C	C	-	-	57
C	X	INSTL MATERIAL & PERSONNEL HOIST	C	-	-	-	-	-	-	47
C	X	PROVIDE CONTRACT C HOISTING	C	-	-	-	-	-	-	48
C	X	CONSTRUCT TOWER LL MEZZ DECK	-	-	C	-	C	-	-	41

I	S	ACTIVITY DESC	AL	LB	LL	LR	TW	SI	EB	REC#
D	X	FURNISH ELEVATOR EMBEDMENTS	-	-	-	-	D	-	-	192
D	X	INSTALL ELEVATOR RAILS, EQUIP, CAB	-	-	-	-	D	-	-	58
D	X	INSTALL ELEVATOR HYDRAULIC CYLINDER	-	-	-	-	D	-	-	59
E	X	ERECT LR METAL FLOOR & ROOF DECK	-	-	-	E	-	-	E	108
E	X	ERECT, PLUMB & BOLT LR STRUCT STL & JS	-	-	-	E	-	-	E	107
F	X	INSTL EXT SKIN MISC METALS	F	-	-	-	-	-	-	60
F	X	INSTALL SLIDING DOORS	-	-	-	-	F	-	-	79
F	X	INSTALL CURTAIN WALL GLASS	-	-	-	-	F	-	-	82
F	X	ERECT ALUM SIDING	-	-	-	-	F	-	-	75
F	X	ERECT CURTAIN WALL FRAMING	-	-	-	-	F	-	-	81
F	X	INSTALL BALCONY RAILS	-	-	-	-	F	-	-	78
G	X	INSTL PLUMBING FIXTURES	G	-	-	-	-	-	G	145
G	X	INSTL SPRINKLER HEADS	G	-	-	-	-	-	G	169
G	X	INSTL GRILLS & DIFFUSERS	G	-	-	-	-	-	G	139
G	X	INSTL FAN COIL UNITS	-	-	-	-	G	-	-	142
G	X	PROCURE FAN COIL UNITS	G	-	-	-	-	-	-	99
G	X	PROCURE WATER SOFTENER	G	-	-	-	-	-	-	94
G	X	PROCURE CHILLERS	G	-	-	-	-	-	-	101
G	X	PROCURE DOMESTIC WATER TANKS	G	-	-	-	-	-	-	93
G	X	PROCURE BOILER	G	-	-	-	-	-	-	100
G	X	PROCURE COOLING TOWER (OR COND)	G	-	-	-	-	-	-	98
G	X	PROCURE FIRE PUMPS	G	-	-	-	-	-	-	96
G	X	PROCURE HOT WATER TANK	G	-	-	-	-	-	-	91
G	X	PROCURE DOMESTIC WATER PUMPS	G	-	-	-	-	-	-	
G	X	PROCURE AIR HANDLING UNITS	G	-	-	-	-	-	-	78
G	-	INST AF DOMESTIC MECH PIPING	G	-	-	-	-	-	G	134
G	-	INSTL HARD CEILING SUSP & BLACK IRON	G	-	-	-	-	-	G	167
G	-	INSTL STUDS & IN WALL WORK	G	-	-	-	-	-	G	164
G	X	EIB UG UTIL AT LL SLAB ON GRADE	G	-	G	G	G	-	-	32
G	X	INSTL WATER HEATING SYSTEM	G	-	-	-	-	-	G	159
G	X	INSTL OUTSIDE GREASE TRAP	G	-	-	-	-	-	-	160
G	X	INSTL HOOD DUCTS	G	-	-	G	G	-	-	136
G	X	EIB UG UTIL AT LB LVL SLAB ON GRADE	-	G	-	-	-	-	G	30
G	X	INSTL INSIDE GREASE TRAP	G	-	-	-	-	-	-	161
G	X	INSTL AF SHT MTL DUCTWK	G	-	-	-	-	-	G	133
G	X	INSTL & PIPE FUEL TANK	G	-	-	-	-	G	G	162
G	X	INSTALL ROOF EQUIP CURBS	-	-	-	G	-	-	-	104
G	X	INSTL SIAMESE CONNECTIONS	G	-	-	-	-	-	G	131
G	X	INSTALL ROOF MOUNTED EQUIP	-	-	-	G	-	-	-	105
G	X	INSTL HOSE BIBBS	G	-	-	-	-	-	G	130
G	-	INSTL MECH SLEEVES	G	-	-	-	-	-	G	125
G	X	INSTL ALL MECH EMBEDS IN C CONCRETE	G	-	-	-	-	-	-	45
G	-	TEST & BALANCE MECHANICAL SYSTEMS	G	-	-	-	-	-	G	188
G	X	INSTL SPRINKLER SYSTEM	G	-	-	-	-	-	G	132
G	X	SET & PIPE CHILLER	G	-	-	-	-	-	-	152
G	X	INSTALL WATER HEATING EQUIP	G	-	-	-	-	-	-	106
G	X	SET & HOOK UP JACUZZIS	-	-	-	-	G	-	-	143
G	X	INSTL TOILET ROOM ACCESSORIES	G	-	-	-	-	-	G	149
G	X	INSTL VV BOXES	G	-	-	-	-	-	G	140
H	X	PROCURE MECH CONTROL SYSTEMS	H	-	-	-	-	-	-	88
H	X	INSTL ELECT TRIM ITEMS	H	-	-	-	-	-	H	
H	X	INSTL LIGHT FIXT	H	-	-	-	-	-	H	
H	X	PROCURE EMERGENCY GENERATOR	H	-	-	-	-	-	-	87
H	X	PROCURE TRANSFORMERS	H	-	-	-	-	-	-	102

I	S	ACTIVITY DESC	AL	LB	LL	LR	TW	SI	EB	REC#
H	X	PROCURE MOTOR CONTROL CENTERS	H	-	-	-	-	-	-	97
H	X	PROCURE UNIT SUBSTATIONS	H	-	-	-	-	-	-	86
H	X	PROCURE SWITCH GEAR	H	-	-	-	-	-	-	89
H	-	INSTL ABOVE FLOOR ROUGH ELECT WORK	H	-	-	-	-	-	H	170
H	-	INSTL HARD CEILING SUSP & BLACK IRON	H	-	-	-	-	-	H	168
H	-	INSTL EXPOSED RUFF ELECT COND & FEEDER	H	-	-	-	-	-	H	119
H	X	INSTL POWER PANEL BOXES	H	-	-	-	-	-	-	117
H	X	INSTL LIGHT PANEL BOXES	H	-	-	-	-	-	-	118
H	X	INSTL STUDS & IN WALL WORK	H	-	-	-	-	-	H	165
H	-	INSTL TV CONDUIT	H	-	-	-	-	-	H	127
H	-	INSTL EMBEDDED ELECT CONDUIT	H	-	-	-	-	-	-	115
H	-	INSTL ELECT SLEEVES	H	-	-	-	-	-	H	124
H	-	INSTL EMBEDDED ELECT BOXES	H	-	-	-	-	-	-	116
H	X	INSTL TELEPHONE CONDUIT	H	-	-	-	-	-	H	126
H	X	INSTL ALL ELECT EMBEDS IN C CONCRETE	H	-	-	-	-	-	-	40
H	X	INSTL FIRE SAFETY CONDUIT	H	-	-	-	-	-	H	128
H	-	TEST & BALANCE ELECTRICAL SYSTEMS	H	-	-	-	-	-	H	141
H	X	PROCURE ELECT CONTROL SYSTEMS	H	-	-	-	-	-	H	114
H	X	INSTL & HOOK UP ELECT EQUIP	H	-	-	-	-	-	-	129
H	X	INSTL GROUNDING MAT	H	-	-	-	-	-	-	121
H	X	INSTL LIGHTENING ARRESTER SYSTEM	H	-	-	-	-	-	-	122
J	X	FRP EQUIP BASES	J	-	-	-	-	-	J	1
J	X	PROCURE TRASH COMPACTOR	J	-	-	-	-	-	-	90
J	-	INSTL HARD CEILING SUSP & BLACK IRON	J	-	-	-	-	-	J	166
J	X	INSTL STUDS & IN WALL WORK	J	-	-	-	-	-	J	163
J	X	ERECT INTERIOR MASONRY	J	-	J	J	J	-	J	62
J	X	INSTL LINEN CHUTE	-	-	-	-	J	-	-	148
J	X	INSTL TRASH COMPACTOR	J	-	-	-	-	-	-	171
J	X	INSTL TRASH CHUTE	-	-	-	-	J	-	-	147
J	X	INSTALL INT HOLLOW METAL FRAMES	J	-	-	-	-	-	-	103
J	X	INSTALL DOCK LEVELLERS	-	-	J	J	-	-	-	61
J	X	INSTL SHOWER PANS	J	-	-	-	-	-	J	146
J	O	INSTALL INSULATION AT EXPOSED SOFFITS	-	-	-	J	J	-	J	63
J	X	INSTALL PLASTER SOFFITS	-	-	-	J	J	-	J	80
J	-	HANG BOARD	J	-	-	-	-	-	J	174
J	-	TAPE & SAND BOARD	J	-	-	-	-	-	J	175
J	X	INSTL ACOUST CLG SUSP & GRID	J	-	-	-	-	-	J	181
J	X	INSTL SIGNAGE	J	-	-	-	-	-	J	183
J	X	INSTL VANITIES	J	-	-	-	-	-	J	173
J	X	APPLY FP TO HOOD DUCT	J	-	-	J	J	-	-	137
J	X	INSTL APPLIANCES	-	-	-	-	J	-	-	150
J	X	INSTALL PLASTIC LAM DOORS & HARDWARE	J	-	-	-	-	-	-	109
J	X	INSTL RESILIENT FLOORING	J	-	-	-	-	-	J	180
J	X	INSTALL DUMBWAITER	-	-	-	-	J	-	-	2
J	X	INSTL MILLWORK & TRIM	J	-	-	-	-	-	J	172
J	X	INSTL INTERIOR LANDSCAPING	J	-	-	-	-	-	J	185
J	X	INSTL CERAMIC TILE	J	-	-	-	-	-	-	144
J	X	INSTL ACOUST CLG PANELS	J	-	-	-	-	-	J	182
J	X	INSTL QUARRY TILE	J	-	-	-	-	-	J	179
J	X	INSTALL INT WOOD DOORS & HARDWARE	J	-	-	-	-	-	-	111
J	X	INSTALL INT HARDWARE	J	-	-	-	-	-	-	112
J	X	INSTALL INT HOLLOW METAL DOORS	J	-	-	-	-	-	-	110
J	X	LAY CARPETING IN CORR & PUBL SPACES	J	-	-	-	-	-	J	177
J	X	INSTL VINYL WALL COVERING	J	-	-	-	-	-	J	187

I	S	ACTIVITY DESC	AL	LB	LL	LR	TW	SI	EB	REC#
J	X	PAINT REQUIRED SURFACES	J	-	-	-	-	-	J	176
J	X	INSTL CLOSET DOORS	-	-	-	-	J	-	-	184
J	X	INSTL INT DOORS & HARDWARE	J	-	-	-	-	-	J	157
J	X	INSTL TOILET ROOM PARTITIONS	J	-	-	-	-	-	J	151
K	X	INSTL FOOD SERVICE ROUGH IN	K	-	-	-	-	-	-	154
K	-	FIELD MEASURE FOR FOOD SERVICE EQUIP	K	-	-	-	-	-	-	155
K	X	INSTL HOOD FIRE PROTECTION	K	-	-	M	M	-	-	138
K	-	RUN IN FOOD SERVICE EQUIP & TRAIN STAF	K	-	-	-	-	-	-	186
K	X	INSTALL FOOD SERVICE EQUIP	K	-	-	-	-	-	-	113
K	X	INSTL HOODS	K	-	-	M	M	-	-	135
K	X	FAB & DEL FOOD SERVICE EQUIP	K	-	-	-	-	-	-	156
K	X	INSTL FOOD SERVICE EQUIPMENT	K	-	-	-	-	-	-	153
M	X	ERECT TOWER METAL DK	-	-	-	-	M	-	-	195
M	X	ERECT, PLUMB & BOLT TOWER STRUCT STEEL	-	-	-	-	M	-	-	194
N	X	INSTALL EXT LOUVERS	-	-	-	N	N	-	-	76
N	X	INSTALL ROLLING STEEL DOORS	-	-	N	N	-	-	-	69
N	X	INSTALL EXT HOLLOW METAL DOORS	N	N	N	N	N	-	N	70
N	X	INSTALL EXT ENTRY FRAMING	N	N	-	N	N	-	N	84
N	X	INSTALL EXT HARDWARE	N	N	N	N	N	-	N	85
N	X	APPLY BALCONY TOPPINGS	-	-	-	-	N	-	-	83
N	X	ERECT EXTERIOR MASONRY	N	-	-	N	N	-	N	64
N	X	INSTALL EXT HOLLOW METAL FRAMES	N	N	N	N	N	-	N	71
N	X	ERECT STOREFRONT FRAMING	N	N	-	N	N	-	N	77
N	X	INSTALL STOREFRONT GLASS	N	N	-	N	N	-	N	
N	X	INSTALL LR INSULATION,SHT MTL & RFG	N	-	-	N	-	-	N	73
N	X	INSTALL ENTRY GLASS	N	N	-	N	N	-	N	74
P	X	INSTALL SKYLITE GLASS	-	-	-	P	-	-	-	66
P	X	INSTALL SLOPED GLAZING	-	-	-	-	P	-	-	193
P	X	INSTL BALCONY GLASS	-	-	-	-	P	-	-	191
P	X	INSTALL SKYLITE FRAMING	-	-	-	P	-	-	-	65
P	X	INSTALL WINDOW WASHING EQUIPMENT	-	-	-	-	P	-	-	3
Z	X	LAY CARPET AT GUEST ROOMS	-	-	-	-	Z	-	-	178

Ralph J. Stephenson PE PC
Consulting Engineer

GUIDELINES TO PREPARING CONTRACT DOCUMENT & PROJECT LAUNDRY LIST MATRIXES

DEFINITIONS

Contract document matrix - A two dimensional grid of rows and columns. The rows contain action items required to design, procure, and build the various project components The columns usually designate the geographic location of the item.

At the intersection of a row and a column, the designation of the contract document package in which the information appears is inserted .

Project laundry list matrix - A matrix listing of the actions that must be taken within various project components to execute the plan of action for a project. In the matrix form, the action is shown in the row. Supplementary information regarding the action is shown in in the action row under the appropriate columns.

Supplementary information often given, is listed below under possible fields to be included in matrixes. Frequently the contract document matrix and the project laundry list are combined.

PREPARING THE MATRIX

The first step in building a contract document matrix is to prepare a detailed random laundry list of component actions required to design, procure and construct all project work. Actions are usually classified by the major building component to which they belong. For instance, constructing wall footings is a substructure work component (sbw); forming a supported deck is a superstructure work (ssw) component; preparing and submitting a design development package is a design work (des) component. A suggested range of components is given below in the list of possible fields to be used in the contract document and laundry list matrix.

As the laundry list is prepared, items of work are classified by the contract document package to which they are assigned. Usually assignment to a specific package is made to those items which are interdependent within the package. A typical package assignment is illustrated below:

COD (contract document) package A - Foundation concrete (at random)

- Form, reinforce, pour & strip concrete wall footings

- Form, reinforce, pour basement walls
- Set basement wall miscellaneous iron embeds
- Install basement wall electrical sleeves
- Install basement wall pipe sleeves
- Form, reinforce, pour & strip column footings
- Set anchor bolts
- Form, reinforce, pour & strip column piers
- Form, reinforce, pour & strip truck dock footings
- Form, reinforce, pour & strip truck dock walls

Note that the list may includes action items requiring work on several trades in addition to concrete work. This definition of related activities is one of the main reasons a contract document matrix is valuable - it encourages the owner, designer and constructor team to properly assign actions, and consequently, drawings and specifications that depict the action, to the correct issue package.

The list is constantly refined and items added and relocated when necessary so as to ultimately produce a document packaging plan that allows that allows the most effective procurement and installation processing.

It is important to understand that the contract document package prepared by the design team is not the same as a trade bid package assembled and issued by the contractor.

• A contract document package may contain the drawing and specs needed for several trade contracts.

• Solicitation of proposals within a contract document package may encompass many trades.

It is the responsibility of the manager of construction operations (depending on the delivery system being used) to assemble the issued contract document packages in such manner that individual specialty contractors can propose on their work accurately, and with full confidence that their proposals will contain the full scope of work to be accounted for in the package.

Several advantages are gained by joint preparation of a contract document matrix by the owner, and the design and construction team. These include:

1.) The design team is guided toward preparing a set of documents that best fits the project delivery method selected and the proposal strategy desired by the owner and the construction team.

2.) The matrix provides a detailed reference check list to help insure that all items in the project are placed in the most effective portion of the documents.

3.) The laundry list prepared can be arrayed in approximate construction sequence within components to provide an excellent planning check list (laundry list) from which detailed and summary network models can be prepared.

4.) The matrix helps identify the timing of the package issues and allows most effective use of the design and owner team's attention in making project related decisions.

5.) The matrix will often point the way to the most effective project delivery method for the circumstances surrounding the job.

6.) Submittal requirements can be anticipated in advance and planned for by the design team when identified properly in the matrix. This has the effect of alerting all concerned with procurement that is truly needed to properly bring critical materials and equipment to the site.

* * *

The laundry list matrix is a natural extension of the contract document matrix and is often prepared concurrently. It contains supplementary column data about each task as defined in the list of suggested data fields given below.

POSSIBLE FIELDS TO BE INCLUDED IN MATRIXES

1. Actions required to accomplish the intended construction - act
2. Geographic area in which the action is to be taken - area
3. Responsibility codes of those who are to take the action - rsp
4. CSI specification section number for major trade items used in action - csi

5. Submittals required for action to be taken - sbm

Submittal types include
Design submittal - dsb
Shop drawings - shd
Samples - smp
Cuts & equipment brochures - cut
Mock ups - mup
Color & material boards - cmb
Warranties - war
Operating and maintenance manuals - omm

6. Major planning, design or building component to which an action belongs - cpt

Typical building components include:

• Front end work - fen - All non construction project related work concerning such items as real estate & financing

• Design work - des - Project related work that concerns production and issuing of contract documents.

• Procurement work - pro - Work related to solicitation of proposals, award of contracts, preparation of submittals, and fabrication and delivery of materials and equipment to the job site

• Substructure work - sbw - All foundation work upon which the superstructure bears directly or indirectly. May also include site preparation for start of field work on the building area.

• Superstructure work - ssw - All major structural load carrying components that bear on the substructure directly of indirectly.

• Exterior building skin work - esk - All elements needed to close the building to weather.

• Interior rough work - irw - All interior building components that can be exposed totally or in part to the weather without damage to their prime

function.

• Interior finish work - ifw - All interior building components that must be totally or partially protected from damage by weather

• Unit systems work - usy - All work that can be installed as a unit somewhat isolated from other component work inside or outside the building.

• On site work - ons (sometimes called site work - siw) - All exterior work outside the building line and inside the property or contract boundary lines.

• Off site work - ofs - All exterior work outside the property or contract boundary lines.

7. Responsibility codes - The identification code of those who are to take the action (rsp).

8. Contract document package - The document package in which the action to be taken appears (cdp).

9. Construction sequence - A number showing roughly the installation sequence within a set of related actions (csq).

(1) Line #	(2) Equipment Description & Who Furnishes	(3) Present Location of Equip	(4) Final Location	(5) Action To Be Taken	(6) & By Whom	(7) Other Equip Affected	(8) Remarks
1	2 existing compressed air tanks (Telco)	Existing paint shop	New building paint dept	Relocate	Falstaff	New compressors must be ready to run	
				Set	Young & Falstaff		
				Hook up	Falstaff		
2	3 existing paint spray booths (Telco)	NW corner existing building	New building paint dept	Move & Set	Young	—	
				Hook up	Telco		
3	2 new paint spray booths (Falstaff)	New	New building paint dept	Erect	Young	—	
				Hook up	Telco		
4	6 existing column mounted jib cranes (Telco)	Cols 6C 5D 7D 3F 4C 2F	New bldg Cols 10A 11A 10B 11B 10C 11C	Remove	Telco	—	
				Move & Instl	Young		
5 2.21	2 new prefab shop offices 10'x15'x8' (Young)	New	1 in new bldg lab area 1 in existg bldg QA area	Erect	Young	In existg bldg-after Telco clears space (watch!)	
				Mech/ Elect	Telco		

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

Abbreviations

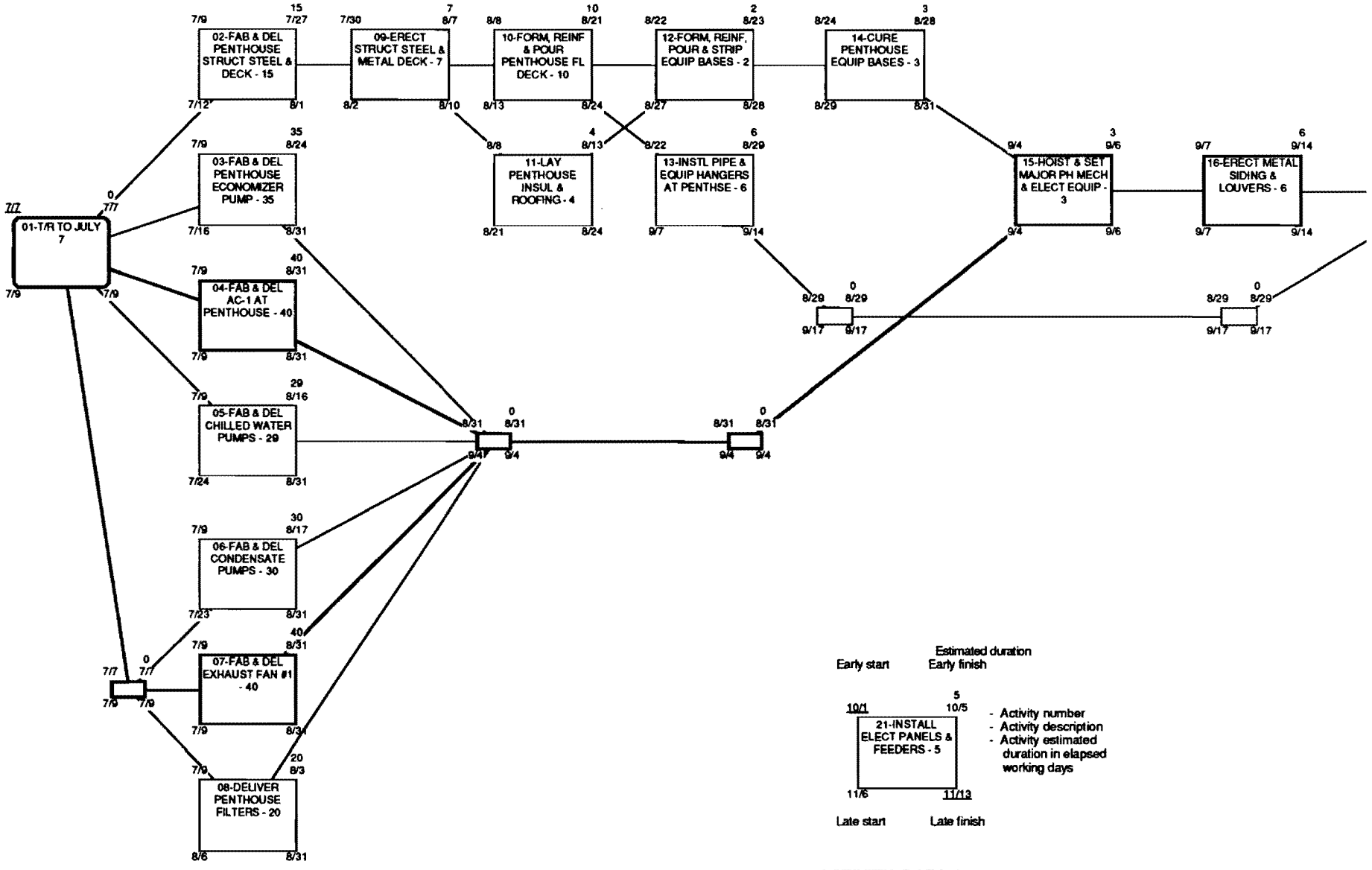
NW Northwest
QA Quality Assurance

EQUIPMENT ACTIVITY TABULATION

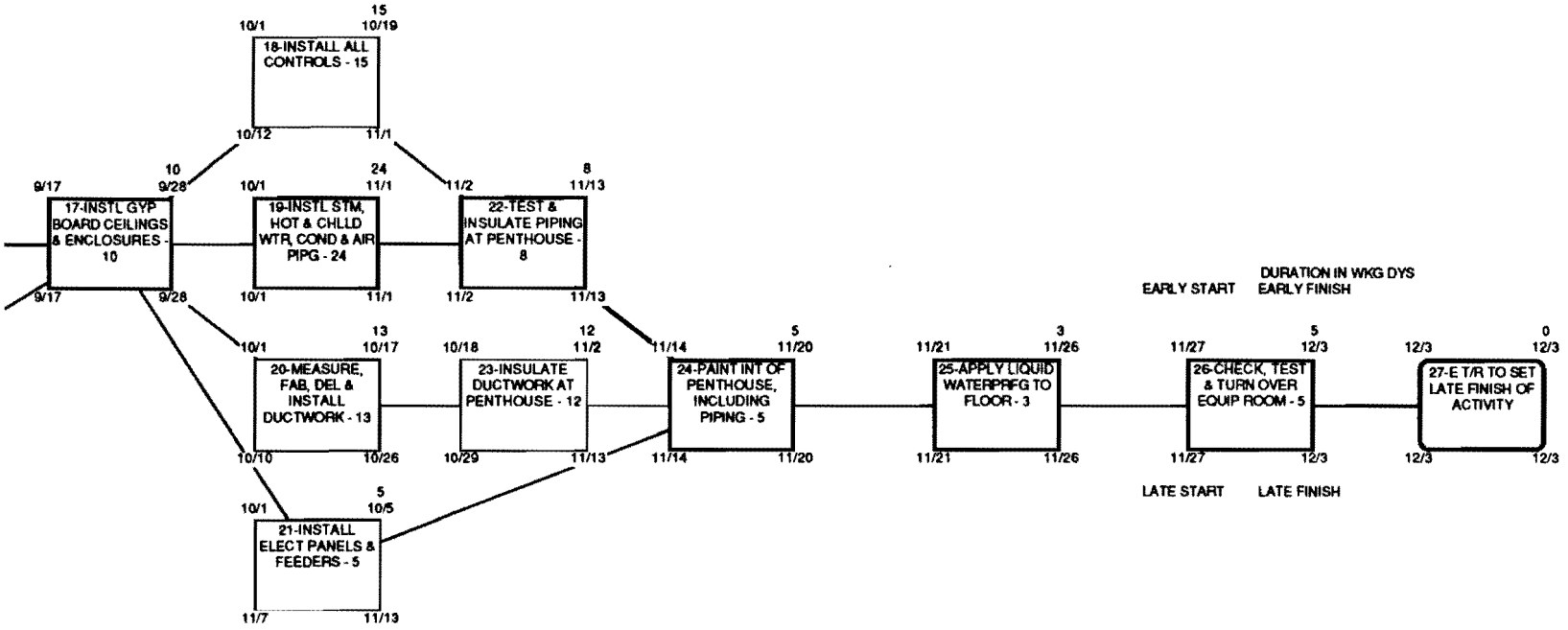
PAVILLION PROJECT DRAWING ISSUE PAGE 1
LISTED BY DATE OF ISSUE - DATE PRINTED: [illegible] 1982
RALPH J. STEPHENSON PE PC

ITEM	ISS DWG	AW CT	SUB SHD	REV APP
PILING	11/22/83			
ANCHOR BOLTS	11/22/83			
PILE CAP RESTL	11/22/83			
ER SPACE FRAME	11/22/83	11/22/83	12/07/83	12/14/83
STEEL JOISTS	12/06/83	12/08/83	12/20/83	12/27/83
STRUCT STEEL	12/06/83	12/08/83	12/20/83	12/27/83
ROOF/FL MTL DK	12/06/83	12/08/83	12/22/83	01/09/84
EXT WALL PANELS	12/06/83	12/08/83	01/09/84	01/16/84
RF TOP MECH EQP	12/06/83	12/08/83	12/22/83	01/09/84
SPRINKLER MATLS	12/06/83	12/08/83	12/30/83	01/23/84
FLAG POLE	12/06/83	12/08/83	12/30/83	01/16/84
EXT WALL FRAMG	12/06/83	12/08/83	01/09/84	01/16/84
TRANSFORMERS	12/06/83	12/08/83	12/30/83	01/09/84
ETB FAB STR STL	12/15/83	12/22/83	01/09/84	01/16/84
MISC IRON	12/30/83	01/09/84	01/30/84	02/06/84
HM FRAMES	12/30/83	01/09/84	01/23/84	01/30/84
LIGHT FIXTURES	12/30/83	01/09/84	01/23/84	01/30/84
ER FABRIC ROOF	12/30/83	01/09/84	01/30/84	02/13/84
HARDWARE	12/30/83	01/09/84	01/23/84	01/30/84
ETB FABRIC ROOF	12/30/83	01/09/84	01/30/84	02/13/84
HM DOORS	12/30/83	01/09/84	01/23/84	01/30/84
SECURITY GATES	01/16/84	01/23/84	02/13/84	02/27/84
LOUVERS	01/16/84	01/23/84	02/13/84	02/27/84

HO 238



ACTIVITY DATA KEY



2.24

Base Plan of Action

NETWORK MODEL FOR CLARION OFFICE BUILDING PENTHOUSE MECHANICAL EQUIPMENT ROOM #1

Luther Mechanical Contractors
Washington D.C.

Issue #1 - July 7
330 clarion base plan
disk 162

Reserved Activity Numbers

041	046
042	047
043	048
044	049
045	050

sheet ph-1

The following codes were developed by the Construction Specifications Institute (CSI) to define types of construction. These codes are an accepted method of determining construction classifications.

Please select the category that best describes the services of your firm, and write in the corresponding five digit number on the CAM survey form. Select a second category that would also apply to your business, and write the five digit number in the "secondary business" section of the survey form.

DIVISION 1—GENERAL REQUIREMENTS

01010 SUMMARY OF WORK
01020 ALLOWANCES
01025 MEASUREMENT AND PAYMENT
01030 ALTERNATES/ALTERNATIVES
01040 COORDINATION
01050 FIELD ENGINEERING
01060 REGULATORY REQUIREMENTS
01070 ABBREVIATIONS AND SYMBOLS
01080 IDENTIFICATION SYSTEMS
01090 REFERENCE STANDARDS
01100 SPECIAL PROJECT PROCEDURES
01200 PROJECT MEETINGS
01300 SUBMITTALS
01400 QUALITY CONTROL
01500 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS
01600 MATERIAL AND EQUIPMENT
01650 STARTING OF SYSTEMS/COMMISSIONING
01700 CONTRACT CLOSEOUT
01800 MAINTENANCE

DIVISION 2—SITEWORK

02010 SUBSURFACE INVESTIGATION
02050 DEMOLITION
02100 SITE PREPARATION
02140 DEWATERING
02150 SHORING AND UNDERPINNING
02160 EXCAVATION SUPPORT SYSTEMS
02170 COFFERDAMS
02200 EARTHWORK
02300 TUNNELING
02350 PILES AND CAISSONS
02450 RAILROAD WORK
02480 MARINE WORK
02500 PAVING AND SURFACING
02600 PIPED UTILITY MATERIALS
02660 WATER DISTRIBUTION
02680 FUEL DISTRIBUTION
02700 SEWERAGE AND DRAINAGE
02760 RESTORATION OF UNDERGROUND PIPELINES
02770 PONDS AND RESERVOIRS
02780 POWER AND COMMUNICATIONS
02800 SITE IMPROVEMENTS
02900 LANDSCAPING

DIVISION 3—CONCRETE

03100 CONCRETE FORMWORK
03200 CONCRETE REINFORCEMENT
03250 CONCRETE ACCESSORIES
03300 CAST-IN-PLACE CONCRETE
03370 CONCRETE CURING
03400 PRECAST CONCRETE
03500 CEMENTITIOUS DECKS
03600 GROUT
03700 CONCRETE RESTORATION AND CLEANING
03800 MASS CONCRETE

DIVISION 4—MASONRY

04100 MORTAR
04150 MASONRY ACCESSORIES
04200 UNIT MASONRY
04400 STONE
04500 MASONRY RESTORATION AND CLEANING
04550 REFRACTORIES
04600 CORROSION RESISTANT MASONRY

DIVISION 5—METALS

05010 METAL MATERIALS
05030 METAL FINISHES
05050 METAL FASTENING
05100 STRUCTURAL METAL FRAMING
05200 METAL JOISTS
05300 METAL DECKING
05400 COLD-FORMED METAL FRAMING
05500 METAL FABRICATIONS
05580 SHEET METAL FABRICATIONS
05700 ORNAMENTAL METAL
05800 EXPANSION CONTROL
05900 HYDRAULIC STRUCTURES

DIVISION 6—WOOD AND PLASTICS

06050 FASTENERS AND ADHESIVES
06100 ROUGH CARPENTRY
06130 HEAVY TIMBER CONSTRUCTION
06150 WOOD-METAL SYSTEMS
06170 PREFABRICATED STRUCTURAL WOOD
06200 FINISH CARPENTRY
06300 WOOD TREATMENT
06400 ARCHITECTURAL WOODWORK
06500 PREFABRICATED STRUCTURAL PLASTICS
06600 PLASTIC FABRICATIONS

DIVISION 7—THERMAL AND MOISTURE PROTECTION

07100 WATERPROOFING
07150 DAMPPROOFING
07190 VAPOR AND AIR RETARDERS
07200 INSULATION
07250 FIREPROOFING
07300 SHINGLES AND ROOFING TILES
07400 PREFORMED ROOFING AND CLADDING/SIDING
07500 MEMBRANE ROOFING
07570 TRAFFIC TOPPING
07600 FLASHING AND SHEET METAL
07700 ROOF SPECIALTIES AND ACCESSORIES
07800 SKYLIGHTS
07900 JOINT SEALERS

DIVISION 8—DOORS AND WINDOWS

08100 METAL DOORS AND FRAMES
08200 WOOD AND PLASTIC DOORS
08250 DOOR OPENING ASSEMBLIES
08300 SPECIAL DOORS
08400 ENTRANCES AND STOREFRONTS
08500 METAL WINDOWS
08600 WOOD AND PLASTIC WINDOWS
08650 SPECIAL WINDOWS
08700 HARDWARE
08800 GLAZING
08900 GLAZED CURTAIN WALLS

DIVISION 9—FINISHES

09100 METAL SUPPORT SYSTEMS
09200 LATH AND PLASTER
09230 AGGREGATE COATINGS
09250 GYPSUM BOARD
09300 TILE
09400 TERRAZZO
09500 ACOUSTICAL TREATMENT
09540 SPECIAL SURFACES
09550 WOOD FLOORING
09600 STONE FLOORING
09630 UNIT MASONRY FLOORING
09650 RESILIENT FLOORING
09680 CARPET
09700 SPECIAL FLOORING
09780 FLOOR TREATMENT
09800 SPECIAL COATINGS
09900 PAINTING
09950 WALL COVERINGS

DIVISION 10—SPECIALTIES

10100 CHALKBOARDS AND TACKBOARDS
10150 COMPARTMENTS AND CUBICLES
10200 LOUVERS AND VENTS
10240 GRILLES AND SCREENS
10250 SERVICE WALL SYSTEMS
10260 WALL AND CORNER GUARDS
10270 ACCESS FLOORING
10280 SPECIALTY MODULES
10290 PEST CONTROL
10300 FIREPLACES AND STOVES
10340 PREFABRICATED EXTERIOR SPECIALTIES
10350 FLAGPOLES
10400 IDENTIFYING DEVICES
10450 PEDESTRIAN CONTROL DEVICES
10500 LOCKERS
10520 FIRE PROTECTION SPECIALTIES
10530 PROTECTIVE COVERS
10550 POSTAL SPECIALTIES
10600 PARTITIONS
10650 OPERABLE PARTITIONS
10670 STORAGE SHELVING
10700 EXTERIOR SUN CONTROL DEVICES
10750 TELEPHONE SPECIALTIES
10800 TOILET AND BATH ACCESSORIES
10880 SCALES
10900 WARDROBE AND CLOSET SPECIALTIES

DIVISION 11—EQUIPMENT

11010 MAINTENANCE EQUIPMENT
11020 SECURITY AND VAULT EQUIPMENT
11030 TELLER AND SERVICE EQUIPMENT
11040 ECCLESIASTICAL EQUIPMENT
11050 LIBRARY EQUIPMENT
11060 THEATER AND STAGE EQUIPMENT
11070 INSTRUMENTAL EQUIPMENT
11080 REGISTRATION EQUIPMENT
11090 CHECKROOM EQUIPMENT
11100 MERCANTILE EQUIPMENT
11110 COMMERCIAL LAUNDRY AND DRY CLEANING EQUIPMENT
11120 VENDING EQUIPMENT
11130 AUDIO-VISUAL EQUIPMENT
11140 SERVICE STATION EQUIPMENT
11150 PARKING CONTROL EQUIPMENT
11160 LOADING DOCK EQUIPMENT
11170 SOLID WASTE HANDLING EQUIPMENT
11190 DETENTION EQUIPMENT
11200 WATER SUPPLY AND TREATMENT EQUIPMENT
11280 HYDRAULIC GATES AND VALVES
11300 FLUID WASTE TREATMENT AND DISPOSAL EQUIPMENT
11400 FOOD SERVICE EQUIPMENT
11450 RESIDENTIAL EQUIPMENT
11460 UNIT KITCHENS
11470 DARKROOM EQUIPMENT
11480 ATHLETIC, RECREATIONAL AND THERAPEUTIC EQUIPMENT
11500 INDUSTRIAL AND PROCESS EQUIPMENT
11600 LABORATORY EQUIPMENT
11650 PLANETARIUM EQUIPMENT
11660 OBSERVATORY EQUIPMENT
11700 MEDICAL EQUIPMENT
11780 MORTUARY EQUIPMENT
11850 NAVIGATION EQUIPMENT

DIVISION 12—FURNISHINGS

12050 FABRICS
12100 ARTWORK
12300 MANUFACTURED CASEWORK
12500 WINDOW TREATMENT
12600 FURNITURE AND ACCESSORIES
12670 RUGS AND MATS
12700 MULTIPLE SEATING
12800 INTERIOR PLANTS AND PLANTERS

DIVISION 13—SPECIAL CONSTRUCTION

13010 AIR SUPPORTED STRUCTURES
13020 INTEGRATED ASSEMBLIES
13030 SPECIAL PURPOSE ROOMS
13080 SOUND, VIBRATION, AND SEISMIC CONTROL
13090 RADIATION PROTECTION
13100 NUCLEAR REACTORS
13120 PRE-ENGINEERED STRUCTURES
13150 POOLS
13160 ICE RINKS
13170 KENNELS AND ANIMAL SHELTERS
13180 SITE CONSTRUCTED INCINERATORS
13200 LIQUID AND GAS STORAGE TANKS
13220 FILTER UNDERDRAINS AND MEDIA
13230 DIGESTION TANK COVERS AND APPURTENANCES
13240 OXYGENATION SYSTEMS
13260 SLUDGE CONDITIONING SYSTEMS
13300 UTILITY CONTROL SYSTEMS
13400 INDUSTRIAL AND PROCESS CONTROL SYSTEMS
13500 RECORDING INSTRUMENTATION
13550 TRANSPORTATION CONTROL INSTRUMENTATION
13600 SOLAR ENERGY SYSTEMS
13700 WIND ENERGY SYSTEMS
13800 BUILDING AUTOMATION SYSTEMS
13900 FIRE SUPPRESSION AND SUPERVISORY SYSTEMS

DIVISION 14—CONVEYING SYSTEMS

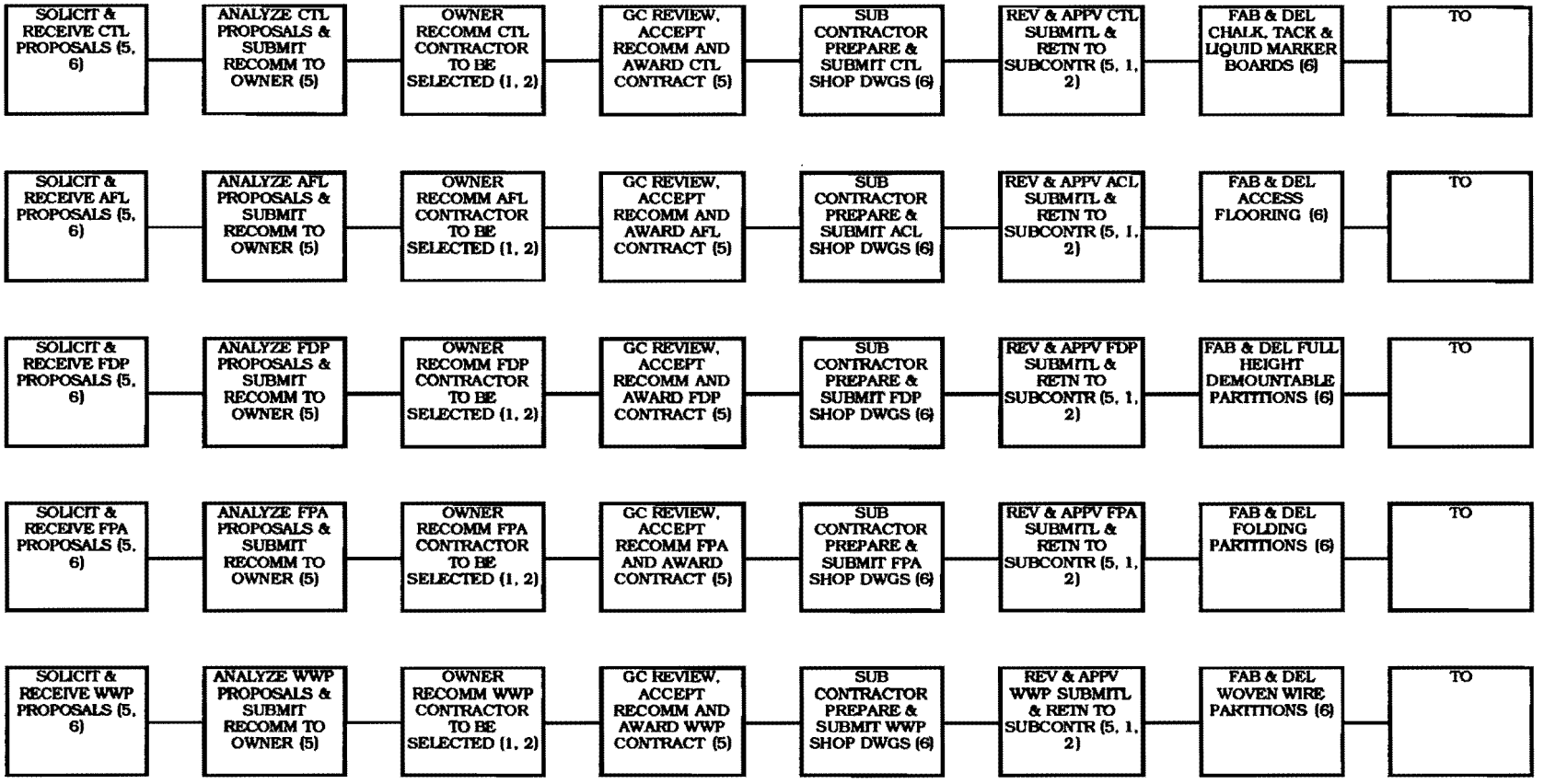
14100 DUMBWAITERS
14200 ELEVATORS
14300 MOVING STAIRS AND WALKS
14400 LIFTS
14500 MATERIAL HANDLING SYSTEMS
14600 HOISTS AND CRANES
14700 TURNTABLES
14800 SCAFFOLDING
14900 TRANSPORTATION SYSTEMS

DIVISION 15—MECHANICAL

15050 BASIC MECHANICAL MATERIALS AND METHODS
15250 MECHANICAL INSULATION
15300 FIRE PROTECTION
15400 PLUMBING
15500 HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)
15550 HEAT GENERATION
15650 REFRIGERATION
15750 HEAT TRANSFER
15850 AIR HANDLING
15880 AIR DISTRIBUTION
15950 CONTROLS
15990 TESTING, ADJUSTING, AND BALANCING

DIVISION 16—ELECTRICAL

16050 BASIC ELECTRICAL MATERIALS AND METHODS
16200 POWER GENERATION
16300 HIGH VOLTAGE DISTRIBUTION (Above 600-Volt)
16400 SERVICE AND DISTRIBUTION (600-Volt and Below)
16500 LIGHTING
16600 SPECIAL SYSTEMS
16700 COMMUNICATIONS
16850 ELECTRIC RESISTANCE HEATING
16900 CONTROLS
16950 TESTING



2.27

Ralph J. Stephenson PE PC
Consulting Engineer
323 Hiawatha Drive
Mt. Pleasant, Michigan 48588
ph 517 772 2537

DIVISION 10

ITEMS INCLUDED

1. Chalk, tack & liquid marker boards (ctl)
2. Access flooring (afl)
3. Full height demountable partitions (fdp)
4. Folding partitions (fop)
5. Woven wire partitions (wwp)

PROCUREMENT NETWORK MODEL FOR TRINITY LAB & OFFICE BUILDING MARTINLY DNR HEADQUARTERS GENERAL SERVICES ADMINISTRATION MARTINLY, OKLAHOMA

Issue #1 - November 15
i1div10sht1procurmt
ho 300 - Dec 90

Project ______________________ Date __________ RALPH J. STEPHENSON

Sht __________ CONSULTING ENGINEER

ITEM PROCESSING SCHEDULE

Item	Date shop dwgs to be submitted			Date of shop dwg approval			Date fabrication complete	Date item on job site
	Subm 1	Subm 2	Subm 3	Subm 1	Subm 2	Subm3		
			2.28					

SUBMITTAL TURN AROUND TIMES

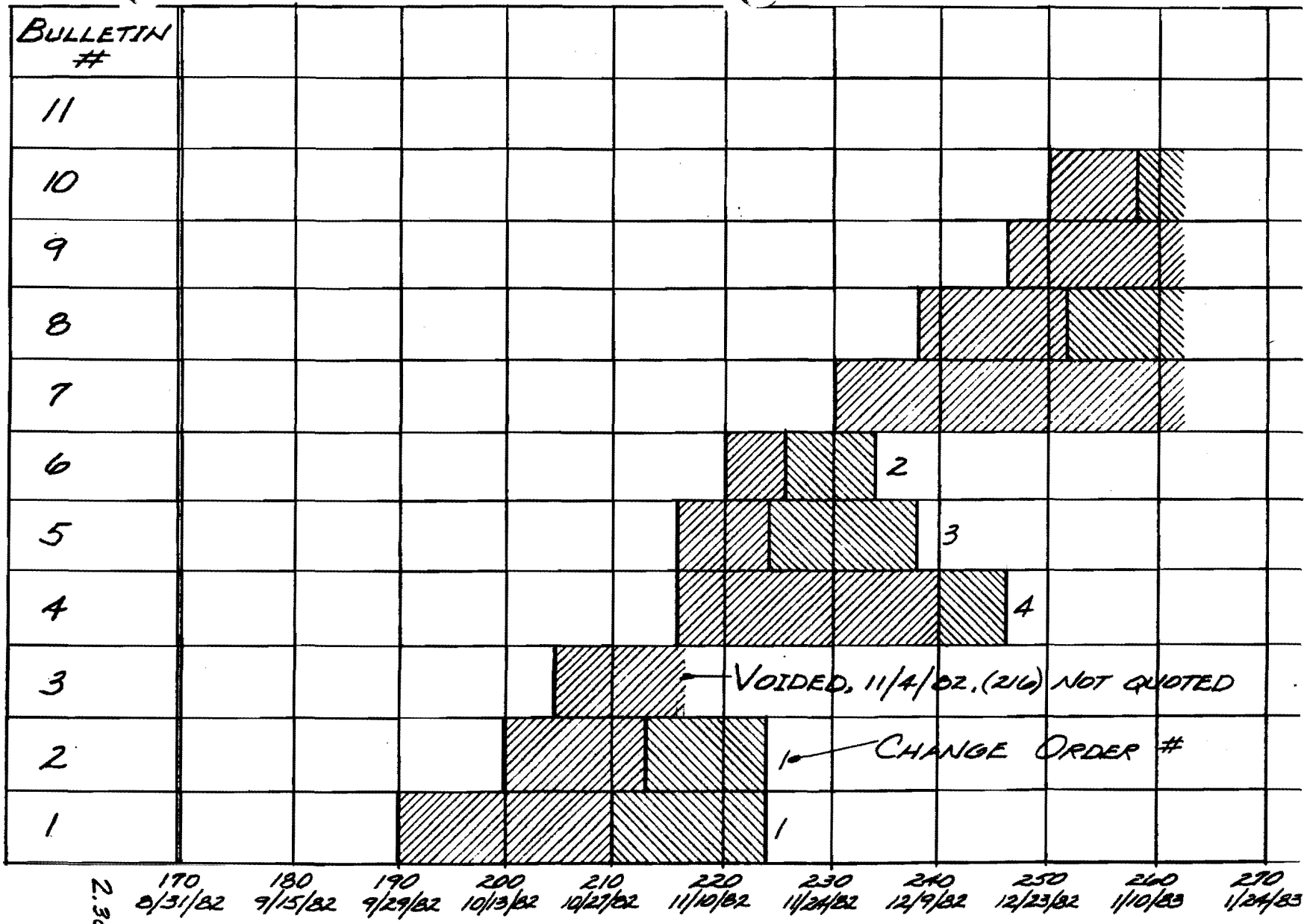
TIME REQUIRED IN WORKING DAYS

	ACTION	NORMAL	EXPEDITED	SUPER EXPEDITED
1	* PRIME CONTRACTOR LOG IN & CHECK	1+2 3	1+1 2	1/2 + 1 1 1/2
2	PRIME CONTRACTOR TRANSMIT TO A/E	3	1	1
3	A/E LOG IN & CHECK	1+15 16	1+10 11	1/2 + 5 5 1/2
4	A/E TRANSMIT TO PRIME CONTRACTOR	3	1	1
5	PRIME CONTRACTOR LOG IN & REVIEW	1+2 3	1+1 2	1/2 + 1/2 1
6	** PRIME CONTRACTOR TRANSMIT TO SUBCONTRACTOR	3	1	1
	TOTALS	31 WKG DAYS	18 WKG DAYS	11 WKG DAYS

* TABULATION TAKEN FROM POINT IN TIME WHERE SUBMITTAL ARRIVES AT PRIME CONTRACTOR'S OFFICE.

** TABULATION ENDS WHEN APPROVED SUBMITTAL ARRIVES AT SUBCONTRACTOR'S OFFICE.

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER



BULLETIN/CHANGE ORDER RECORD

RALPH J. STEPHENSON, P. E.
CONSULTING ENGINEER

ho 198

PR	S	TIME	WHAT TO DO	DATE	REC#
10	0	.70	UPDATE MCAULEY DATA SHEETS	41117	9
10	0	4.00	ASSEMBLE WEX HO & SEND BY 1/15/84 (1/4)	41217	14
10	0	.30	CALL BOB VAN PEEREN FOR MEETING DATE	50103	46
10	0	.40	CHECK RATE TABULATION	50104	58
10	0	.50	UPDATE JOB CIST	50107	66
10	0	.80	COMPLETE REVIEW OF GTRV B	50110	84
10	0	.20	GET SEPIAS OF NORTHVILLE C FOR 1/11/84	50110	76
		6.90			***7
09	0	2.00	SET FLINT WATER FORMAT & RUN 5 ANALYSES	41110	24
09	0	1.00	START TRANSCRIBING CHINA TAPE	41222	10
09	0	1.00	INPUT REDUCED WORK LOAD TO DO ITEMS	41231	12
09	0	.50	UPDATE ICM TO DO LIST	50103	43
09	0	.40	DICTATE U OF M DOW MONITORING REPORT	50103	49
09	0	.40	UPDATE DRAFTING LIST	50103	41
09	0	.40	PREPARE 854 WKG DAY CALENDAR	50107	71
09	0	.20	MAIL OUT GTRV CONTRACT B NETWORK	50110	85
09	0	.30	SET DATE TO MEET WITH DICK DILAURA	50110	75
		6.20			***9
08	0	.70	SET UP FOLDER FOR ESD CLAIM TALK	41231	19
08	0	.20	TALK TO CURT H RE NEW ICM RATE	50103	44
08	0	.20	READ LETTER FROM TEDD CASE	50103	42
08	0	.20	HAVE SHARON PREPARE 854 CALENDAR	50104	61
08	0	.30	CHECK DATING OF VICTORIA	50110	79
08	0	.30	CHECK RESIDENTIAL NETWORK	50110	78
08	0	1.50	START REVIEW OF MERCY CLAIM DOCUMENTS	50110	81
		3.40			***7
07	0	.20	START GAIL YOUNG ON UPDATING PHONE BOOK	41228	35
07	0	1.50	RUN NEW 85-86-87-88 WKG DAY CALENDAR	41231	22
07	0	.40	START BETH ON UPDATING ADDRESS LIST	50107	67
07	0	.20	THANK CARMINE FOR SMALL SECTIONS OF GTRV	50110	77
07	0	1.00	CHECK FLINT DECISION TREE	50110	82
07	0	1.00	GO OVER MC AULEY UPDATE WITH JESSICA	50110	83
		4.30			***6
06	0	.30	CHECK WITH O.P. RE NEXT DESIRED MTG	41217	25
06	0	.30	CALL BOB WILSON RE JOB FOR JAN M	41222	26
06	0	.30	CALL MR. KRAUSE RE MEETING ON MGMT STUDY	41231	29
06	0	.30	SET LUNCH WITH MARIO FERNANDEZ	41231	28
06	0	1.00	START OUTLINING MSPE LIT TALK 1/29/85	50104	57
06	0	.30	SEND TIM GE BOTT THI AWARD DECISION	50110	80
06	0	.30	HAVE GTRV B DRAFTED	50110	86
06	0	.20	SET NEXT DATE WITH DICK SLY ON PKG DK	50110	74
06	0	.20	CALL BOB STRAND FOR MTG 491 6600	50110	73
		3.20			***9
05	0	.10	CALL CURT HACIAS FOR DATE FOR LUNCH	41122	30
05	0	.10	SET LUNCH WITH JOHN WIELAND	41213	31
		.20			***2.

H/O 243

	Pri	Date	Activity	Phone #	Type	w
1	100	2/14/90	Write letter on preparing documentation to lb, at & bf		wrt	m
2	98	2/14/90	Get info on CSI/UCI codes from AGC or AIA and their history for efa class		tac	b
3	98	12/7/90	Write or call Joe K & thank for procurement booklet		phn	m
4	95	4/17/90	Have new business photo taken		tac	m
5	93	11/27/90	Write essay on information services		ho	m
6	91	8/29/90	Write essay about ON A SCALE OF 1 TO 10		wrt	m
7	90	11/27/89	Complete prepare Bornmouthe Company project manager check list		tac	m
8	90	5/9/90	Add legal abbreviations to list of abbreviations		tac	j
9	86	2/18/90	Write procedures for converting MacProject to Micro File		tac	m
10	85	2/14/90	Write Stanton thank you for close out info		wrt	m
11	83	2/18/90	Bring courthouse construction notes up to date - see a:nts0211 epson file		tac	m
12	80	2/28/90	Prepare ho re management principles for const proj mgrs & superintendents		top	m
13	80	11/21/90	Complete adding client abbreviations to master job list		tac	m
14	70	12/6/90	Review management balance profile for management time & cost		edc	m
15	69	2/28/90	Prepare cash flow on resource allocation for handout		ho	m
16	64	12/7/90	Get monitoring networks from Ben J		tac	m
17	63	7/12/90	Set meeting with Bob Franchot to see presentation	612 464 6710	mtg	m
18	62	1/23/90	Respond to Mark's letter re possible law subjects from Curt's friend		rea	m
19	60	6/28/90	Set breakfast with Jack C.	212 514 8272	mtg	m
20	57	11/27/90	Write up planning, scheduling and monitoring procedures for Telequarry	258 2156	wrt	m
21	53	11/1/90	Prepare superstruct network model for Drucker case study - ho258		ho	m
22	51	11/21/90	Have lunch or breakfast with Ollie S.	956 3420	mtg	d
23	50	2/19/90	Assemble & return TL's educational material	614 296 9467	tac	m
24	50	3/14/90	Send for Canadian Building Thesarus - see Phil B's book for reference data		tac	m
25	48	2/14/90	Send Paul T. material on organizational relations		tac	m
26	42	2/22/90	Get book or books by W. Edward Demming - recommended by Carl B.		tac	m
27	35	11/21/90	Print out networks for teams A, C & E		run	d
28	25	12/6/90	Get handout made of systems drawing prepared by Frank Tobias		ho	m

REMARKS 1
REMARKS 2
EL DESCR
LOCATION

REC#	ROL#	P#	DTE	YR	CAM	FLM SPD	JOB #	F TY
SIDEWALK & ROAD INTO HOTEL AT TRAVERSE BAY RESORT								
TRAVERSE RESORT DRIVEWAY TRAVERSE CITY, MICH								
53	0024	00	0904	84	XA	ASA 100	84037	PCO
TRAVERSE BAY RESORT DESIGN CONFERENCE. WAYNE BRYAN, ED SIEGEL, CARMINE & JERRY SHEA DISCUSS A POINT WITH A BEAUTIFUL BACKGROUND WAYNE,ED,CARMINE,JERRY MEET TRAVERSE CITY, MICH								
54	0024	01	0904	84	XA	ASA 100	84037	PCO
CONDOMINIUMS AT TRAVERSE BAY RESORT FROM DEVELOPMENT OFFICE BALCONY TRAVERSE RESORT CONDOMINIUMS TRAVERSE CITY, MICH								
55	0024	02	0904	84	XA	ASA 100	84037	PCO
CONCRETE COLUMN CAPITAL IN KLING OFFICE SEMINAR ROOM. TAKEN AT PROJECT MANAGEMENT SEMINAR ING SEMINAR ROOM COL LADELPHIA, PENN								
56	0024	03	0907	84	XA	ASA 100	84034	PCO
PHIL BENNETT ENJOYING MOMENT OF RELAXATION AT KLING PROJECT MANAGEMENT SEMINAR PHIL BENNET AT KLING SEMINAR PHILADELPHIA, PENN								
57	0024	02	0907	84	XA	ASA 100	84034	PCO
BOB & BETTY INSPECT BASEMENT OF FARM HOUSE BEING TOURED BY BOB & BETH								
BOB & BETTY IN HOUSE BSMT NEAR SALINE, MICH								
58	0024	05	0909	84	XA	ASA 100	P	PCO
DEMOLISHED AND REMOVED ROOF SLABS FROM WATER PLANT FLOCULATION TANK ROOFS WATER PLANT PRECAST DECKS FLINT, MICH								
59	0024	06	0911	84	XA	ASA 100	84026	PCO
CRANE REMOVING ROOF PLANK FROM FLOCULATION TANKS AT WATER PLANT								
REMOVING PC AT WATER PLANT FLINT, MICH								
60	0024	07	0911	84	XA	ASA 100	84026	PCO

Ralph J. Stephenson PE PC
Consulting Engineer

Technography

The practice of preparing displayed and structured meeting notes and related material as discussions proceed

• Overview

Technography material displays may be shown on a single computer screen viewed by one to four people, on multiple screens, controlled by a live computer and viewed at remote terminals, or on a large screen projected from a computer by one of several kinds of devices, and viewed by as many people as can be accommodated by the facilities.

Current popular equipment such as the Kodak and the Sharp, use a compact flat transparent display which rests on the light bed of an overhead transparency projector, and shows the computer screen image on a conventional projector screen.

Whatever equipment is used, the main elements of the system are

1.) Displayed information.

2.) Hardware and software to permit graphic preparation of the information as it evolves.

3.) A meeting leader who can either accurately type or draw, or have typed or drawn, the main thought flow of the meeting.

4.) Key people who can participate in the session and produce a desired end product.

The process objective is to generate an ongoing set of notes from which all people in the gathering can obtain information and to which they can provide input. The end product of a technography session is a complete, accurate and accepted (accepted does not necessarily mean approved) hard copy report of the proceedings for immediate distribution and use.

The resume of a meeting conducted using technography may be recorded in different modes - text, graphic, tabular, chart or other desired form. The end result, properly identified, dated and referenced provides an accurate record of what went on in the meeting, and what was decided there.

In addition the record if properly prepared, implies acceptance, approval or consensus of those participating without forcing such approval or consensus (a forced technography decision defeats the purpose of the system).

• Advantages

Some of the advantages (listed at random) of centrally displayed meeting notes as used in technography include:

- Encourages heavy concentration of participants on listening and absorbing the ideas and suggestions of involved individuals and groups. Individual note taking is reduced over conventional meeting formats.

- Documentation from the session can be printed at any point in the session, and duplicated and distributed to the group to permit reviewing material covered to that point.

- At the close of the session the documents produced can be printed, duplicated and distributed to the group to encourage immediate action on material covered.

- Opportunity is given to all at the session to input to the group document. This helps minimize individual and organizational hidden agendas.

- Accurate reporting is encouraged since the display permits rapid evaluation of statements and decisions. This ease of review encourages participants to refine ideas throughout the meeting since changes can be made at any time, providing there is agreement on the changes.

- Where there is disagreement about an issue, the entire range of conflict can be recorded for all to see. Thus points of view that may normally be obscured are often encouraged and displayed to the group.

The benefit here is that participants know that through such displayed material there are improved probabilities that the true goals and objectives of the group will be achieved. Everybody works to the same agenda and from the same set of notes.

- Ideas are captured while they are still fresh in the minds of the originator.
- Details can be added to earlier topic discussions as the meeting progresses.

- At the close of the meeting those at the meeting know what they and the others have agreed on and who is to do what.

- The method encourages problem attacks to be made directly on the most likely areas to bring success. The reason? - problem characteristics and the ideas of others tend to encourage synergistic thinking. This happens because the displayed ideas and approaches of each individual participating encourage others to individually think better about the subject at hand.

• Suggestions

The dynamic characteristics of technography are often helpful in overcoming inertia, encouraging initiative and stimulating new insights into a subject at hand. Rapid improvement in results from the note taking system then come about when you actually use the method in your daily work.

Some suggestions to help you to get a good start in using displayed stenography are given below:

1. Learn to listen, think, type and lead simultaneously. This is particularly important if you are to do the note taking.

2. Use good hardware and software that allows all participants to clearly view the screen display.

3. Recommended software for note taking includes one of the standard word processors such as MacWrite or Microsoft Word. Other word processing programs that are easily used in technography include outlining programs such as Think Tank or More. Software for graphic and tabular displays includes standard project planning, data base, free graphics and spread sheet programs such as MacProject, Micro File, MacPaint, MacDraft and Excel.

4. If you cannot do the typing, thinking, leading and operational job yourself select a bright, alert, perceptive member of your staff or of those participating in the meeting to record the main body of material, while you apply your talents to the special leadership and display work required by other than the note

taking process.
5. Have a previously prepared information needed and information desired template from which to conduct the discussion.

For example, if you are conducting an initial design and construction project planning meeting, the various information you might wish to gather could include such topics as:

a. Project identification, date and location

b. Author of notes

c. Proposed distribution of notes

d. Those attending the meeting

e. Those involved in the total effort - this information and other material that is revised and updated continually as the project moves along is usually kept in a general section that is constantly updated to reflect the latest data available.

f. Key dates - in construction this data is always critical to proper job understanding and management - should include contract execution dates, start of design work, start of construction work, key completion targets, and intermediate dates required.

g. Documents used for reference in the sessions and on the project Includes plans and schedules in effect, contract documents currently in effect, special reports and material referred to in the meeting, and other similar items of reference importance.

h. Current status of project work - includes:

- Real estate control
- Financing
- Contract awards
- Acquisition of permits
- Procurement
- Design and planning

- Field construction
- Closing out the project

i. Work to be done in immediate future

j. Actions to be taken and who is to take them

k. Superseded data - A section of the ongoing file where superseded data is stored. Never remove any published information from the record.

l. Responsibility codes

m. Laundry lists defining the scope of work for network modeling

n. Easements and zoning information

0. Abbreviations

p. Mission statements

q. Project characteristics

r. Agenda

s. General notes

I. **Trans America Mall Notes - disk 129 - ho 297**

A. **General information - to be periodically revised & kept current**

General information is to be retained in the notes for the project. If a section of the data is no longer valid it will be noted as such and relocated to the superseded data section of the file, or noted with the change and left in place.

1. Name of project - Trans American Mall
2. Those involved
   a) Carlsbad Holding - Center owner
      (1) Frank Rogell - Officer in charge
      (2) Charles Lugow - Project manager
      (3) Tom Brotherton - On site representative
      (4) Lawrence Jones - Mall manager
   b) Clemency and Harrigan - Architect/Engineer of record
      (1) Charles Clemency - Principal in charge
      (2) Carl Travis - chief designer
      (3) Lorne MacIntosh - project manager
   c) Larkins & Horowitz - Electrical & mechanical engineers
      (1) Art Larkins - Principal
      (2) Fred Karlton - Mechanical engineer
      (3) Ted Horowitz - Electrical engineer
   d) Todd & Jones - General contractor
      (1) Jay Harvey - Project manager
      (2) Charles McElvey - Field superintendent
      (3) Harvey Vennalt - General superintendent
   e) Lincoln Mechanical - Mechanical contractor
      (1) Larro Nadian - Project manager and estimator
      (2) Niles Mechadian - Project superintendent
   f) Sunshine Electrical - Electical contractor
      (1) Stan Sunshine - Principal and project manager
      (2) Lefty Mallett - Superintendent
3. Responsibility codes
   a) 001 - Carlsbad Holding - owner
   b) 002 - Clemency & Harrigan - architect/engineer
   c) 003 - Larkins & Horowitz - electrical/mechanical engineers
   d) 004 - Todd & Jones - General contractor
   e) 005 - Lincoln Mechanical - mechanical contractor
   f) 006 - Sunshine Electrical - electrical contractor
4. Abbreviations (in alphabetical order)
   a) c&h - Clemency & Harrigan
   b) cho - Carlsbad Holding
   c) cod - contract documents
   d) dp1 - design package 1 (other dp abbreviations similar)
   e) dpa - development package
   f) etr - end time restraint
   g) fen - front end work
   h) fiw - finish interior work
   i) gmp - guaranteed maximum price
   j) l&h - Larkins & Horowitz
   k) lme - Lincoln Mechanical
   l) pro - procurement
   m) riw - rough interior work
   n) sbw - shell building work
   o) sel - Sunshine Electrical
   p) sit - site work

q) ski - exterior building skin
r) sub - building substructure work
s) sus - building superstructure work
t) sys - building systems work
u) t&j - Todd & Jones
v) t&m - Time and material
w) t/r - time restraint
x) tim - tenant improvement work

5. Project design package content
   a) Design package dp1
      Complete construction documents for 200' x 400' addition to existing tenant building.
   b) Design package dp2
      Existing building remodeling from col line 01 to col line 22. Complete interior demolition and construction of new base building space with demising studs erected.
   c) Design package dp3
      Extension of north site area including parking and related work for 800 additional cars.
   d) Design package dp4
      Renovation of existing mechanical and electrical rooms and replacement of entire electrical distibution system
   e) Design package dp5 - to be defined
6. Key dates - as of 3/2/88 (43)
   a) Complete prepare & issue design packages (dp)
      (1) 3/25/88 (60) - Comp prepare & issue dp1
      (2) 4/11/88 (71) - Comp prepare & issue dp2
      (3) 4/29/88 (85) - Comp prepare & issue dp3
      (4) 5/31/88 (106)- Comp prepare & issue dp4
      (5) To be determined - Comp prepare & issue dp5
   b) Submit guaranteed maximum prices (gmp)
      (1) 3/25/88 (60) - Submit gmp for dp1
      (2) 4/20/88 (78) - Submit gmp for dp2
      (3) 5/26/88 (104) - Submit gmp for dp3
      (4) 5/31/88 (106) - Submit gmp for dp4
   c) Start construction work
      (1) 4/25/88 (81) - Start construction of dp1 base building
      (2) 6/30/88 (128) - Start renovation under dp4
      (3) 9/11/89 (432) - Start site work under dp3 contract
      (4) 9/11/89 (432) - Start remodeling under dp2
   d) Complete complete work
      (1) 6/1/89 (362) - Complete site work under dp3 contract
      (2) 6/1/89 (362) - Complete const dp1 work to start of tenant improvemnts
      (3) 7/31/89 (403) - Complete base building work under dp1
      (4) 8/15/89 (414) - Grand opening of new addition under dp1
      (5) 3/1/90 (552) - Complete remodeling dp2 base bldg to start of tenant work
      (6) 4/2/90 (574) - Complete remodeling base building under dp2
      (7) 4/27/90 (593) - Grand opening of dp2 contract work
7. General characteristics of project
   a) Location - Delaton, New Hampshire
      (1) Faces on 20th Steet, access to Lohngren on west and Mill Run on east
   b) Philosophy
      (1) To constantly maintain an attractive, safe retail environment during const

c) Existing enclosed mall shopping center
(1) Built about 1971
(2) Gross existing building area = 150,000 sq ft
(3) Parking spaces = 1,000
(4) Anchors
(a) Travelers Merchandise - general department store
i) Strong store
(b) Robertson Company - catalogue outlet
(5) 25 tenant spaces in addition to anchors
(6) Areas presently unoccupied and available for construction use
(a) Col lines 22 to 25/A to D
(b) Col lines 5 to 6/D to D.5
d) Existing fast food building on outlot belongs to Carlsbad Holding
(1) To be maintained in operation at all times
e) Problems to be resolved
(1) Variances needed to remodel electrical and mechanical systems
(2) Must determine safety condition of existing electrical vaults
f) Laundry lists
(1) dp1 - new building close in work
(2) dp4 - mechanical and electrical remodeling work

8. Superseded data
a) Randy East - Carlsbad Holding - project manager - relocated 2/1/88 (21)

B. **8:05:08 - July 27, 1988**

1. Project meeting #1 - in Carlsbad offices - July 27, 1988
2. By Jay Harvey
3. 01.0 - Those attending meeting
a) Frank Rogell - Carlsbad officer in charge
b) Charles Lugow - Carlsbad project manager
c) Charles Clemency - C & H principal in charge
d) Lorne MacIntosh - C & H project manager
e) Art Larkins - L & H principal in charge
f) Jay Harvey - T & J project manager
4. 02.0 - Agenda
a) 2.01 - Review project characteristics
b) 2.02 - Prep smry netwk model for dp1, 2, 3 & 4 to confirm current key dates
c) 2.03 - Prepare laundry lists for early construction work in dp1
d) 2.04 - Prepare laundry lists for all construction work in dp4
e) 2.05 - Prepare network models for close in work for dp1
f) 2.06 - Prep network models for elect and mech remodelling under dp4
5. 03.0 - Current status of project
a) 03.01 - Design
(1) 03.0101 - All intermediate design package production dates being met
(2) 03.0102 - Need cost data on alternate roofing details for dp1
b) 03.02 - Construction
(1) 03.0201 - T & J currently preparing early estimates leading to GMP
c) 03.03 - Owner working with all to define tenant continuity during const
(1) 03.0301 - Having trouble with the Chocolate Poodle
(2) 03.0302 - Records Inc and Fran's Dresses move set and agreed to
6. 04.0 - Old business
7. 05.0 - New business
8. 06.0 - Miscellaneous
a) 06.01 - All parties agreed to current key dates listed above
b) 06.02 - Carlsbad agreed to review T & J sub prices & release appvl promptly
(1) 06.0201 - Within 2 working days of receipt

c) 06.03 - Abbreviations generally three letters
   (1) 6.0301 - For names 1st letter of 1st name and 1st two letters of last name
   (2) 6.0302 - Traditional abbreviation to be maintained
d) 06.04 - All construction contracts will be with T & J
e) 06.05 - T & J contract currently on hourly and t & m basis
   (1) 06.0501 - Will reduce to gmp by iterative estimates
   (2) 06.0602 - gmp to be provided to Carlsbad by package content

C. **ho 297 - Feb 88**

Ralph J. Stephenson PE PC
Consulting Engineer

FORM CONTENT & DESIGN

a. Tips on form content

01. Identify the organization originating the form by showing
- a. Full name
- b. Address & post office box if applicable
- c. Phone number including area code
- d. Telex number if appropriate
- e. Division identification if appropriate
- f. Document identification number if applicable

02. If possible number or letter each item of information to be inputted to the form.

03. Clearly identify at the beginning of the form, who originated the form and to whom it is addressed.

04. Provide a date prepared, date sent and date received space on the form.

05. If possible, always design the form to encourage addressing it to a specific individual

06. Provide enough space to record the information needed. If the form is to be handwritten it will require more space than if to be typed.

Comment: A form is not always transmitted. It may be prepared for individual use to tabulate or record information or to provide a reference source in a working situation. In such cases the form should be designed using the above guidelines as if the originating party is both the sender and the recipient.

b. Steps in designing a form

01. Determine the readership of the form.

02. Briefly describe what the form is to accomplish - what is its mission?

03. Rate your perceived importance of the form on a scale of 1 to 10

04. Review description & rating in steps 1, 2 and 3, and determine if form is truly needed. If not don't prepare it.

05. If form is needed, list, at random, all information items needed to fulfill the mission.

06. Arrange the information items in a logical order.

07. Test the arrangement for input

Can the form be filled out with an easy, accurate flow of input?

08. Test the arrangement for readability

Can the form be read easily, quickly and accurately?

09. Design the form.

Be certain to leave a binding edge at the left or top

10. Prepare a dummy of the form, make copies and test it a few days in actual use if at all possible.

Be certain to explain its purpose and use.

11. Revise the form as needed and have it printed, padded and put into use.

12. Revaluate the form regularly for improving or for discard when no longer needed.

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Consulting Engineer

Computer Disk File & Control System

A disk control system starts with selection of a suitable method of identifying each disk and extends through the process of labeling, naming files, backing up, preparing directories and catalogs, maintaining confidentiality, cross referencing, & physically managing the check out, return, update & storage of each specific disk.

The general elements recommended for such a system are outlined below.

1.) Numbering disks - It is recommended that each disk be assigned a unique number in sequence beginning with disk 001. The 3 digit number should be used as a text field in the disk directory, permitting supplementary alpha information to be added as descriptive qualifiers. Each disk should be numbered as it is added to the disk file. Dependent on size it is usually desirable to reserve a disk for one client, one user, or if the size of a job warrants, for one project.

Where several different makes of computers or disk operating systems or drive sizes are used, identification of disks should be set according to the using hardware. For example if one of the systems in use is a MacIntosh configuration the disk numbering could be prefaced by the letter **M**.

he master disk list, in which all disks should be recorded and described, should contain a field in which the disk type and hardware can be identified, i.e., a single sided, MacIntosh disk #9 in the series might be identified in the disk type field by the code - **SM009**.

If desired the disk size, 3 1/2". 5 1/4" or 8" might also be included in the disk identification field. The numbering system, however, should be kept as simple as possible.

2.) Back up procedures - Each time a disk is used and information is added, a back up copy should be made of the disk. If a selective hardware/software program is available that will back up only new or revised files, these new and revised files should be backed up.

Inexpensive tape backup machines are available, as is hard drive back up hardware. Whatever equipment is used, I suggest the basic backup configuration consist of at least one floppy disk copy containing all files currently on the disk being backed up.

Back up disks should be stored at a different geographical location than the base data disks.

Back up disks should always be made as soon after data is added to a base data disk as possible. It is helpful to write the dates of the latest backup on the label of the disk, crossing out the previous date as a new one is added.

3.) Disk type coding - A label color coding method for quick, accurate identification of disks may be helpful. One color code method consists of attaching a self sticking color dot to the label. Color codes can be as follows:

- Blue dot - A base data disk that has a back up disk in file

- Red dot - A back up of a base data disk - Back ups should be kept disk locked when not in use. The back up disk is given the same number as the base disk but is given an "x" preceding and following the disk number; i.e. if the base disk number is d005 the back up disk number is dx005x.

- Gold dot - Denotes program disk. It is not usually necessary to number program disks, although if desired it can be done.

- Orange dot - Denotes double sided disk. Early hardware configurations used only single sided disks. However double sided disks are now most common. If both types are contained in your disk files a distinction should be made between the two types for both program and data disks.

Dots should be firmly attached to the disk label to minimize the risk of the dot coming off in the disk drive.

4.) Disk cataloging - For disk labeling and listing disk contents, a program such as MacLabeler or other similar software is recommended. Such programs will produce disk labels and disk catalogs to whatever degree of detail and in whatever arrangement is desired. The printed catalog gives an convenient reference list of all folders and individual files stored on the disk.

Whenever data is added to a base disk, an updated disk content list should be prepared for the updated disk A loose leaf disk directory notebook is most convenient for the disk directories, particularly if frequent reference is made to the

disk list.
Suggested contents of a disk directory include:

- Disk number
- Disk type - single sided (ss), double sided (ds), hard drive (hd), etc.
- Disk name - What is contained on the disk in very brief terms
- Project numbers - The project identification numbers for all jobs for which data is stored in the disk

It should be reemphasized that generally a single disk should be devoted to one project or to one client, company or user. In some cases a single disk may be devoted to single uses such as education, training, management analysis, or special record keeping.

Disks are relatively inexpensive. Ease of retrieval and availability of reserve working space should not be sacrificed for a confusing mix of too many unrelated files on a single disk.

5.) Physical control of disks - It is suggested that one person be made responsible for maintaining the disk control system. A central storage facility for all disks should be maintained, and the disks kept in a safe and accessible location. The person responsible should also be charged with the job of tracking disks to insure the file remains intact.

Those using disks should sign out for the base data disk, or copies. The user should also be responsible for informing the disk librarian of any changes or additions they have made to the data disk. The disk librarian is responsible for all disk back up, cataloging, directory updating, storage, and other essential record keeping activities related to disk file upkeep.

It is most important that the librarian make the total office disk records available quickly and at any time to those who must use them and are permitted access to the information Remember the disk files are made to be used.

6.) File names - File names for projects and other data are best kept short, descriptive and reasonably recognizable. The following guidelines might be of use in assigning file names:

As an example let us look at a network model file for construction of a component of the Tell Mall shopping center. The file name should start with the issue number. i1 for instance, followed by the sheet number (sht #1), and ending with an abbreviation of the project name (tel mll). Thus the file described here would be written **i2 sht #1 telmll**. This tells the user that the file contains a network model issue #1, shown on sheet #1 for the Tell Mall project.

For files made from the multitude of other software such as spread sheets, word processors, data base programs cad programs, estimating systems and special use material, names are assigned using similar principles. Whatever system of coding and naming is used, it should be generated from some easily explained and identified rationale for ease of use.

7). Disk storage - The master floppy disk file should be kept in a convenient location, available to those authorized to use them. As noted above a method of insuring their safe return to the master file should be set early.

Back up disks or tapes should be kept in a fire and theft safe location separate from the location of the base file material. Back up disks should not be allowed out of their file unless there is a demonstrated need for the data or during backup.

You probably will not need the back up disks or tapes often, but when you do you will be very glad you stored them safely.

* * * *

In summary the key elements of effective disk control are:

- Number new disks when they are initialized. Don't delay assigning the number.

- Immediately after entering data on a new disk and at the close of the session, make a disk catalog of the disk and enter the disk information and catalog in the disk directory.

- Keep disks in their plastic envelopes. The disk gate is a mechanical apparatus and subject to impact damage. Additional plastic envelopes are usually available from upon request and at a nominal cost.

• Keep disks under the watchful eye of one or two responsible persons. Make certain all disks are accounted for. Losing disks is disruptive.

• Back up disks when you are through using them in a working session. Don't delay making back ups.

• Standardize your abbreviations and publish a list of those commonly used, so the people using the disk files can easily determine the meanings of disk and file names.

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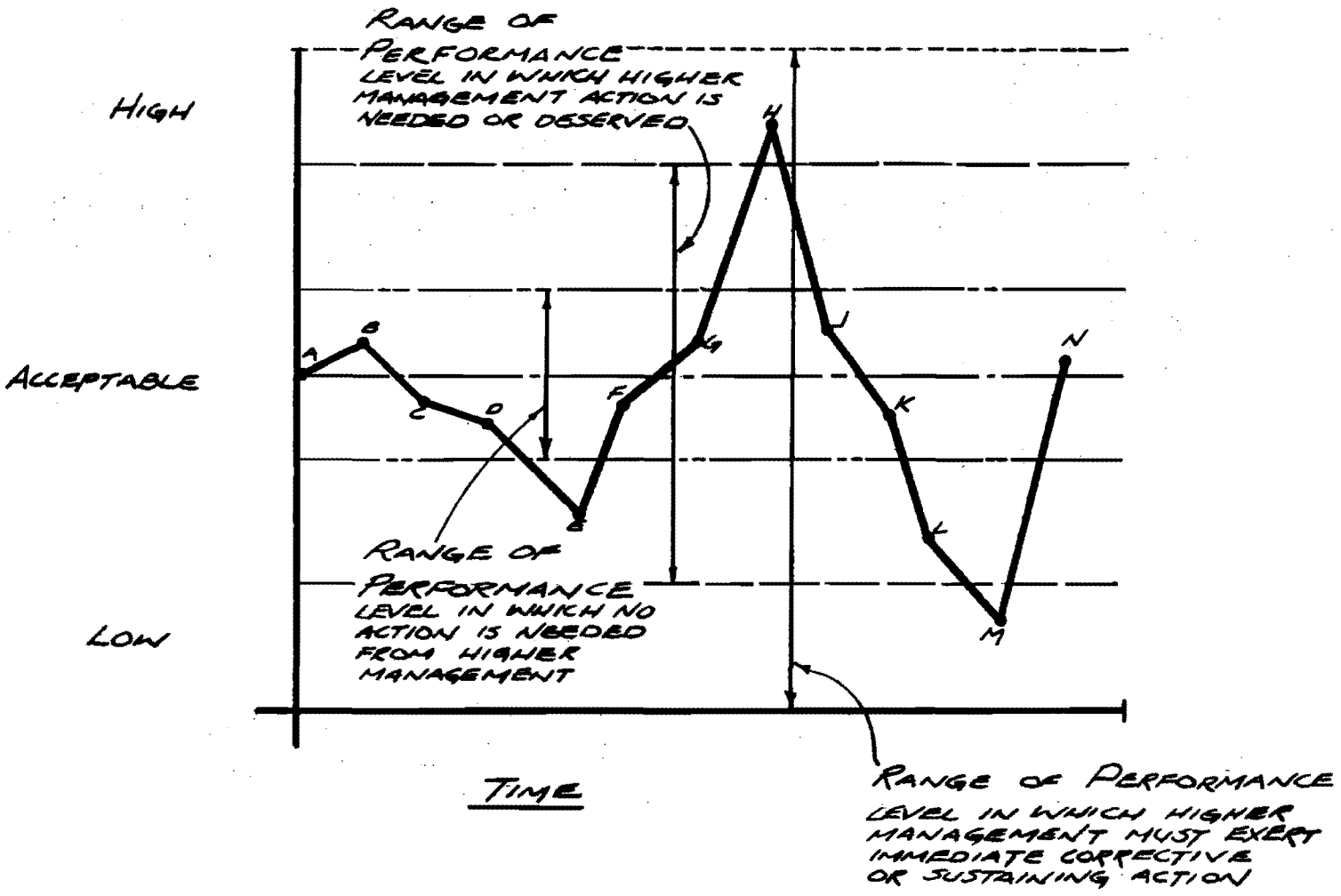
Section #3

Documentation & its nature



MANAGEMENT BY EXCEPTION (MX) AND PERFORMANCE LEVEL ACTIONS

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3.01

H/O 150 3/72

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QUESTIONS TO BE ASKED

1) WHAT?
- What is the scope of the activity?
- What is the standard of performance?
- What are our objectives?
- What are our goals?
- What is needed to start?

2) WHERE?
- Where will the work take place?

3) WHEN?
- When does the work start?
- When is the work supposed to finish?
- When will the work be completed?

4) HOW?
- How do I know when the job is done?
- How do I know if we've done a good job?
- How do I get out of the job when it's done?

5) WHO'S?
- Who's responsible?
- Who's in charge?
- Who's doing the work?
- Who's liable?
- Who's in charge for my client?
- Who's the ultimate decision maker? (UDM)

H/O 186 4/80

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Documentation Degree

The degree of needed documentation on any project is determined by the current or potential level of difficulty perceived.

One method of setting documentation degree (dd) is by use of a scale of one to ten, one being a minimum amount consistent with good practice and ten indicating a maximum amount needed to protect those involved from current or potential problems.

Expressed another way, level 1 documentation signifies an absolute minimum is being used. Level 10 documentation indicates the project is being fully documented.

The approximate ranges shown below are reference guidelines for selecting and preparing documentation systems:

- **Levels 1 & 2**	Informal job structure - no planned documentation
- **Levels 3 & 4**	Normal job - documentation as specified
- **Levels 5 & 6**	Claim prone jobs on which trouble is conjectural
- **Level 7**	Claim prone jobs on which trouble is very likely
- **Levels 8 to 10**	Claim prone jobs on which trouble is a reality

Usually the degree of documentation index indicates an opinion as to how much trouble can be expected on the project.

A brief description of job conditions which may be encountered corresponding to a need for the degrees of documentation indicated is given below.

Documentation degree #1 to 2 (dd 1-2) - no planned documentation

At these levels the project usually is informally organized, with full trust by all parties of all other parties. Most instructions and requests are oral. Revisions and cost commitments are made on a full confidence basis relative to scope, expected payment and resolution. The project team understands and communicates well internally and externally, and all on the team exhibit a high degree of honesty, competence and

integrity. Usually meetings are held on an as needed basis only.

It should be cautioned that a low dd does not mean the project will not encounter difficulties. The number merely indicates a recommended level of documentation being maintained as of a given point in time.

Documentation degree #3 to 4 (dd 3-4) - normal job with formal documentation as needed; minimal documentation level well defined by contract

In a dd 3-4 project the usual procedures for processing work during programming, planning, design and construction are well defined and followed carefully by all parties to the contracts. Usually the project contract documents have been carefully prepared and checked thoroughly. This helps assure that the scope of work is clear and the project is constructible.

Documentation at dd 3-4 during the process of design and construction is maintained at a minimum level consistent with program and contract requirements. An audit trail of approvals, issues, money flow, revisions and quality of construction in place should be able to be followed easily from the system.

An important characteristic of the good level 3 & 4 documentation system is that it must be of a nature that can be increased to a higher level at any time without extensive backtracking and historical research. The fundamental needs of higher level dd's should be able to be easily achieved from the basic work accomplished in a dd 3-4 system. The reason is that the enormous expense and reduced accuracy of later historical research on a troubled construction program should be avoided by setting a good information filing and retrieval system at lower documentation degree level.

Documentation degree #5 & 6 (dd 5-6) - claim prone jobs on which trouble potential is conjectural

Documentation degrees of 5 or 6 should be set early on projects that show potential for claim, but on which no dominant reasons for such problems have yet appeared. For instance a project may be proceeding well despite having a large number of allowance items, several separate prime contractors, and a general trades contractor noted for his sloppy paper work. These are all indicators of potential difficulties but do not necessarily mean trouble.

In a dd 5-6 the level is set high to permit those involved to more quickly react to sudden project difficulties than on a normal project. **To reemphasize, the dd level is set by the nature of the project and is only raised or lowered when sufficient justification for a change is noticed.**

Documentation degree #7 (dd 7) - claim prone jobs on which trouble potential is very likely

On a dd 7 project, comments for dd 5-6 apply, with the qualification that a yet higher dd level requirement than 7 is highly probable. In other words if the job is claim prone and some of the claim prone characteristics are causing actual problems, the documentation level of 7 indicates a movement into higher levels is near at hand.

An example of this might be a claim prone project dd level of 6 as established by a high spread in proposal prices, poor specialty contractor reputations and an architect/engineer who is slow in submittal turnaround , which upon moving into the field, promptly runs into late submittals by the questionable subs and a reactionary slowness by the a/e in processing submittals. This combination might be cause to move the dd to 7, with a good chance it could go even higher within the next month or so. The dd 7 could be looked at as a holding plateau which might be lowered by prompt corrective action or might increase as negative positions harden and remain unresolved.

Documentation degree #8 to 10 (dd 8-10) - claim prone jobs on which trouble is a reality

Projects requiring a dd level of 8 to 10 can be considered to be in trouble and subject to present or future third party action resolution. Usually the project that has moved to a dd 8-10 level has done so over a period of time during which the problem levels have progressively intensified. If such a project is encountered, the files for third party resolution action should be built as the work proceeds.

If dd 8-10 needs are met on a day to day basis as the documentation is sent or received, the cost will be much less than if it is done later. In addition the analysis will be fresher and more accurate. In addition, the knowledge that such a high level file is being built often acts to dampen the conflict and difficulty and may even lead to quick

resolution of the difficulties.

* * *

As a general help in documentation a brief resume of procedures for preparing project documentation is given below. These steps may vary from situation to situation but can be summarized within seven basic documentation actions taken to respond to various dd levels.

Step 1 - Prepare and arrange the document file material - Document copies are arranged, usually chronologically, for future entrance into a single number filing system.

Step 2 - Month number the the documents - Each document is uniquely identified with a number that relates to the month in which the document was prepared.

Step 3 - Day number the documents - When the document has been assigned its month number it is further numbered sequentially by the date within the month. This system is called a single number filing system, since all documents are now uniquely numbered. For instance there would only be one document 04245, a document prepared in the 4th month from the base date, and being the 245th document chronologically entered in that 4th month.

Step 4 - Build the document control file format - With the document uniquely identified, the document copy of the original is coded and a data base retrieval system established. Code fields to be used might include:

Document control number
Document type
Date document prepared
Date document received
Organization from
Organization to
Individual from
Individual to
Subject codes
Others as needed

Step 5 - Enter the document data in the document control file - If justified and required, document data is now entered into the data base file for storage and retrieval in whatever manner required.

Step 6 - Prepare the project history - A project history is prepared in the form of a chronological narrative summarizing the entire project from the document control file. Each major document is reviewed, if appropriate, and entered as a brief unit description of an event, or of events, occurring within a given time period.

Step 7 - Prepare project problem tracking histories - Specific problems causing contested claims, say unexpected artesian water, are identified and the document control files and project history files are searched. The material found is used to build special chronological files for each problem area. These are then analyzed to determine the course of settlement action to be taken.

Rough guidelines for the relation of **dd level** to **documentation steps** as outlined above might be as follows:

- **dd levels 1 & 2 - totally informal - no planned documentation** - No special provisions made for preparing and arranging documents

- **dd levels 3 & 4 - normal job** - Take steps 1 and possibly 2

- **dd levels 5 & 6 - claim prone jobs on which trouble potential is conjectured** - Take steps 1, 2, 3 and possibly 4

- **dd level 7 - Claim prone jobs on which trouble potential is very likely** - Take steps 1, 2, 3, 4 and 5

- **dd levels 8 to 10 - Claim prone jobs on which trouble is a reality** - Take steps 1 through 6 and possibly 7 as required

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Procedures for preparing project documentation

Project documentation is an essential and routine part of every project. However from time to time a project exhibits signs of difficulty which may demand a heavier than normal documentation effort. One way of classifying the level needed is to give it a rating degree from 1 (the lowest level of documentation) to 10 (the highest level of documentation).

A low level of documentation normally utilizes inexpensive and uncomplicated project communication and record keeping. Level 1 encompasses virtually no documentation at all, a situation not usually encountered. Conventional low level routine documentation on a well operating project is normally rated from 2 to 4.

This memo addresses the higher levels of documentation.

Selecting, designing and maintaining a correct documentation level is called document control. Good document control starts with an appropriate method of filing the large number of documents that flow to, from and within the project. Documents include letters, transmittals, bulletins, requests for information, change orders, field orders, shop drawings, change instructions and on & on infinitum. To file these by subject, by document type, by project, by company, or by any other classification system most helpful to those using them. is necessary & desirable in most cases. The project management and the project team must determine how the main filing system classification is to function.

For a document control system the basic classification system is much simpler. A document irrespective of type or classification is filed by a single number assigned to it as it is received. This number is referenced to the date of its production and filed wherever possible in order according to that date. Thus a document dated July 30, 1987 is set earlier in the stack than one dated July 31, 1987 and receives a lower number in the sequence.

This is the fundamental classification system used in the project documentation system described in this discussion. The system is sometimes called a single number filing system.

The basic physical arrangement within the file system recommended here is in ascending order of date of document. Once consecutively numbered however, there

are many other criteria by which the documents might be arranged, the content identified and the document retrieved.

A brief step by step description of the total process is given below:

Step #1- Preparing and arranging the document control material

To start the process a single document control copy is made of all written material received, sent or circulated internally that pertain to the project. These are physically arranged chronologically by their official date (the date of the document).

The documents are next divided into time span packets, punched with an oversized punch and put in loose leaf binders. A packet period of one month has been found to work well in most cases.

Step #2 - Month numbering the documents

Each document is given a number that will identify it uniquely (the only document in the file that has that number). A workable system is to number by the month in which the document was prepared. Using this method a base month is selected and designated as month #1. Month #1 is preferably January of a year in advance of starting major work on the project. Succeeding months are numbered in ascending order. For example if the base date selected is January 1, 1987, then January, 1987 is considered period #1. February, 1987 is period #2, March, 1987 is period #3 and so on.

Thus a document written in June, 1987 and being filed in a document control system using a base date of 01 as January, 1987 will be assigned a document number starting with 06. When there are a large number of documents to be filed it is advisable to use a self advancing numbering stamp.

Step #3 - Day numbering the documents

Once the first two digits of the document identification number is assigned, the last three are then assigned. The remaining three digits reflect the approximate chronological position of the document within the month. If a letter is received dated March 20, 1987, with a control system base month #01 date of January, 1987, and it is the 102nd document entered chronologically in March, 1987, it will be assigned a document number 03102.

Now, every document in the entire file has a unique number and will be identified by that number as to the month and the approximate position in the month it was dated. The name of the system, single number filing, is used since every document filed is identified with a single number irrespective of what type of document it is.

Step #4 - Building the document control file format

With the document identification method set & the documents arranged in ascending document number order, a document retrieval system file is designed and built.

A retrieval data base file should contain the following minimum fields:

1. Document control number (dcn)
2. Document type (dty) - letter (ltr), transmittal (trm), etc.
3. Date document prepared (the basic criteria of the order of the documents in the file) (ddp)
4. Date document received (ddr) - all incoming documents should be date stamped
5. Organization from (ofr)
6. Organization to (oto)
7. Individual from (ifr)
8. Individual to (ito)
9. Subject codes (sco) - Subject codes identify the content nature of the document. For instance a letter concerning mud sills (msi), forming (fmg), supported decks (sde) and building 148 (148) along with a request for information (rfi) would be assigned all the subject codes indicated.

Step #5 - Entering document data in the document control file

The document records (unit entries in a data base program) are next put into the data base file. Methods of entering data vary but the guidelines below should assist in setting the procedure.

a. Item 1 through 8 in step #4 above are entered directly as a routine data entry task, directly from the master document file material.
b. The subject codes, item #9 in step #4 above, are assigned to the chronological file document by someone familiar with the subject codes and capable of abstracting the subjects to be entered by reading the document. As

the documents are read, subject codes should be written directly on the document control copy.
c. Also as the files are read it is helpful to underline and annotate document control file copies to make subject identification as easy and rapid as possible.
d. Once a packet of material has been subject coded (probably one month's file) the subject codes should be entered in the master document control file. Usually the routine entries, items #1 through #8 are entered earlier and in larger batches. Subject codes will generally be assigned at a later date.

Step #6 - Preparing the project history

Let us assume the document file has been prepared for several months of document control records and you wish, or are required, to move to the next level of documentation by conditions encountered on the project.

This level of documentation usually involves preparing a project history from the master document file. The project history is an abstracted chronological narrative of important events on the job.

To prepare a project history, the master document file is read and annotated so each document (depending on relative importance) can be abstracted and put in some type of narrative. Often the annotation is completed in step #5 as subject codes are assigned.

The program selected to process the narrative should be a word processor of some type. For example Think Tank or More can be used by entering the document number number as a heading followed by the document date. Next, the main heading is exploded and a brief summary (under 30 words) of the document is entered in the exploded area. Thus when prepared properly, the information can be sorted by document number or date (whichever is typed first). In addition the abstracts can be searched for key words to build subject files for specialized uses.

The important pivot is the unique document control number which allows the document to be filed in ascending order of document number and to always be found in the file as a numbered file document, no matter how many subject codes it is assigned. For instance document number 09124 can always be found after 09123 and before 09125 in the master chronological file, no matter how many subjects are assigned or what the subject being sought.

An extended use of the project history is to build special reference files for specific uses. For instance one such use is to search the data base subject codes for a set of documents, and then to call each of the project history abstracts of these documents from the file, and to print and assemble them into a subject file to be used for a deposition.

It is important to understand that not all related documents are abstracted in preparing a project history or the special use file. For instance a transmittal may have no impact on the project history and may not have to be made a part of the history. However the transmittal is still available for reference by a search of the data base file. It is simply not stored in the abstract file.

Step #7 - Preparing specific project problem tracking material

When the project history is partially or wholly available, the document control file can be used at a higher level by selecting major classifications of project problem areas. This selection is made on the basis of the strong positions the preparer of the claim feels he has.

Experience indicates it may be best to concentrate early on the strong positions and win them by good logic and sound documentation. However, additional strong points sometimes emerge by a combination of proper actions taken in a variety of smaller and apparently unimportant points and issues. The analyst must be able to discern and select what information is to be used in any given situation.

Problem areas on a job may cover a variety of situations. It is often of help to use a basic list of normal complaints (causes of contested claims) and to derive from these the specific complaints that are related. Let us take an example.

Presume a project has encountered apparent excessive interference of non liable parties acting as agents of the owner. In this hypothetical example, the agent, say a non liable construction manager, decides that the prime contractors under his control, should be working in a sequence that best suits the owner in the opinion of the non liable construction manager agent. Say further that the prime contractors have either individually or in concert given the non liable construction manager an intended plan of action, that in their opinion as liable parties to a contract arrangement with the owner (the ultimate decision maker), will satisfy the project contract they have with the owner,

their client. This plan conflicts with that of the non liable construction manager.

When the owner's agent, the non liable construction manager, pits his desires against those of the prime contractor's, relative to achieving project objectives, the conditions of the contract must be closely analyzed.

In a hard money, fixed time contract, use of time and money are generally the prerogative of the contractor so long as the ends are achieved. Any interference with how the contractor achieves these ends must be viewed as an interference with the contractor's right to enjoy an optimum profit derived from the job plan which he has signified as his intended plan of work.

Such interference is legally known as maladministration. It is a common occurrence and many times is a result of honest misunderstandings about the project. However the dangers of maladministration are felt when the owner and/or his agents, by their actions or inactions affect the potential for a contractor to make an expected profit, within the bounds of agreed upon performance standards. When owner interference occurs the contractor is entitled to reimbursement for the reduction in his ability to earn an intended profit, and to fully cover his costs on the job.

The proof in such situations is however often difficult to provide. But if the document control system is properly prepared, the subject coding accurately done and the project histories well written, it is a relatively simple matter to retrieve all documents relating to the problem and to build a special history for any specific delay or interference.

* * * * * *

Not all the above steps are taken in the preparation of project documentation. If the level of documentation called for is at 2 to 3, it is generally adequate to prepare a subject file of the documents and only take Step #1 above if specific minor problems are encountered in a well defined, limited time period.

If the problems mount on the job and a documentation level of 4 or 5 is indicated, Steps #1, 2, 3 might be advisable to implement. A higher level of project difficulty, say a level of 6 to 8 might call for Steps #4 and 5 to be put into work.

When the level of project difficulty is raised to 9 or 10 which indicates a job upon which very serious problems are being encountered, Steps #6 and 7 should be initiated.

Hopefully a full Step #6 and 7 program will not be needed, but on especially troublesome jobs, may be necessary.

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Section #4

Planning & scheduling the project

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JOB PLANNING - WHAT IS IT ?

1. PLANNING is to formulate a sequence of actions leading to an end goal.

2. NETWORK PLANNING is to graphically depict this sequence of action.

3. CRITICAL PATH PLANNING is a technique of establishing resource limits on each plan component.

PLAN VISIBLY !

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ADVANTAGES OF GOOD PLANNING

1. Provides accurate simulation of the project.
2. Provides early statement of intent.
3. Encourages good communication on the project.
4. Provides management by exception potential.
5. Allows accurate tracking of project progress.
6. Allows accurate performance evaluation.
7. Provides accurate project history.

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Act From A Plan

• If you can't plan it, you can't manage it.
• Good plans shape good decisions.

A. Five essential planning questions for the manager to ask and have answered.

1. What?
2. Where?
3. When?
4. How?
5. Who?

B. Essential planning actions for the manager to take

1. Set goals, objectives, and a project delivery system
2. Prepare, approve and translate an action plan
3. Organize, assemble resources and set project systems
4. Do the job

C. Set goals, objectives and a project delivery system

1. Definitions
   a. Goals - targets, desires, wishes and aims expressed without quantification
   b. Objectives - Expressed goals which have been quantified
2. Be specific when setting objectives - projects are objective oriented
3. Set objectives so that movement toward their achievement can be measured

D. Prepare, have approved and translate an action plan

1. May be mental, verbal, text written or graphic
2. May be strategic or tactical, summary or tactical
3. May be short, medium or long range (the manager must set the time scale)
   a. The shorter the time interval covered by the plan, the greater is the chance the plan will succeed. However, the shorter the time interval covered, the greater is the probability that longer range

needs, which truly measure the manager's effectiveness, will remain unmet

b. The higher you are in the management structure, the larger and longer are the planning scales you must use (the higher you are the further you are expected to see)

4. A good manager plans the work and then works the plan

E. Organize, assemble the resources, set the project systems & do the job

1. Build plans based on optimum integration of management viewpoints
2. Define relationships through functional diagraming of interconnections
   a. Formal
   b. Informal
   c. Reporting
   d. Staff
   e. Temporary
3. Make clear cut assignments
   a. The manager should not assume a person will automatically know his full pattern of responsibilities.
   b. Don't leave definition of authority and responsibility to chance. Be specific.
4. Build a feedback system
   a. Organizational grapevines are often used for informal feedback
   b. Formal feedback systems should be built by specific assignment (must have a standard of project performance defined before a formal feedback system can be put in place)
5. Keep organization goal and objective oriented
   a. Keep organization lean - avoid unnecessary staffing
   b. Provide delegation and training opportunities
   c. Tend to build around objectives and needs rather than people (there are major exceptions to this - distinguish these early)
   d. Provide for proper grading of decision to action time spans

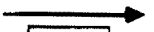
F. Common planning failures

1. Not touching all organizational and management bases - use the

what, where, when, how and who system
2. Committing to too many objectives at one time
3. Underestimating the value and need for good forward planning
4. Failing to challenge plans and actions at the right time
5. Not providing proper escape hatches, mouseholes and safeguards
6. Failure to encourage timely, knowledgeable staff participation
7. Failure to obtain higher level approvals of goals and objectives
8. Inadequate monitoring and control of costs, progress, documentation and resource allocation
9. Poor assignment of duties, authority, responsibilities and actions; and
10. Failure to understand that planning is a major responsibility of the manager

NETWORK PLANNING MINITEXT

Symbols

1. a. Task - for arrow diagramming 

   b. Task - for precedence diagramming 

   Definition - A single definable action (or a single grouping of a number of definable actions) requiring resources.

2. a. Circle or node - for arrow diagramming 

   b. No comparable symbol for precedence diagramming

   Definition - The starting or ending point of a task .... a momentary point in time.

3. a. Dotted or dummy arrow - for arrow diagramming

   b. Solid relation arrow - for precedence diagramming 

   Definition - A symbol representing the existence of a relationship between tasks. Dummies and relational arrows have no resources allocated to them.

KEEP SYMBOLS SIMPLE!

Rules of Job Planning

1. All tasks precededing any single task must be complete before that single task can start.
2. The logic plan represented by a series of tasks, nodes, and dummies or relational arrows must be explicit.

Steps in Network Planning

1. Thoroughly define the scope of work - use random laundry list technique.
2. Draw the logic plan.
3. Approve the logic plan.
4. Assign durations to each task..
5. Compute the early start (ES), early finish (EF), late start (LS) and late finish (LF) for each task.
6. Analyze the network for its validity and revise as required.
7. Issue the network model and the appropriate translations.

Rules for numbering nodes (for arrow diagramming) and tasks (for precedence diagramming)

The i node is the initial node, and the j node is the end node of a task in arrow diagramming. In precedence diagramming the task has only a single identification number.

1. The numbering sequence should move down and to the right.
2. Normally, 20 numbers per 100 per sheet should be reserved for future use.
3. In arrow diagramming a node having two or more arrows entering or leaving is numbered.
4. In arrow diagramming a node having a single arrow entering or leaving does not have to be numbered unless the immediately preceding node has not been numbered.
5. In precedence diagramming all activities are numbered.

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

CPM EXERCISE #1

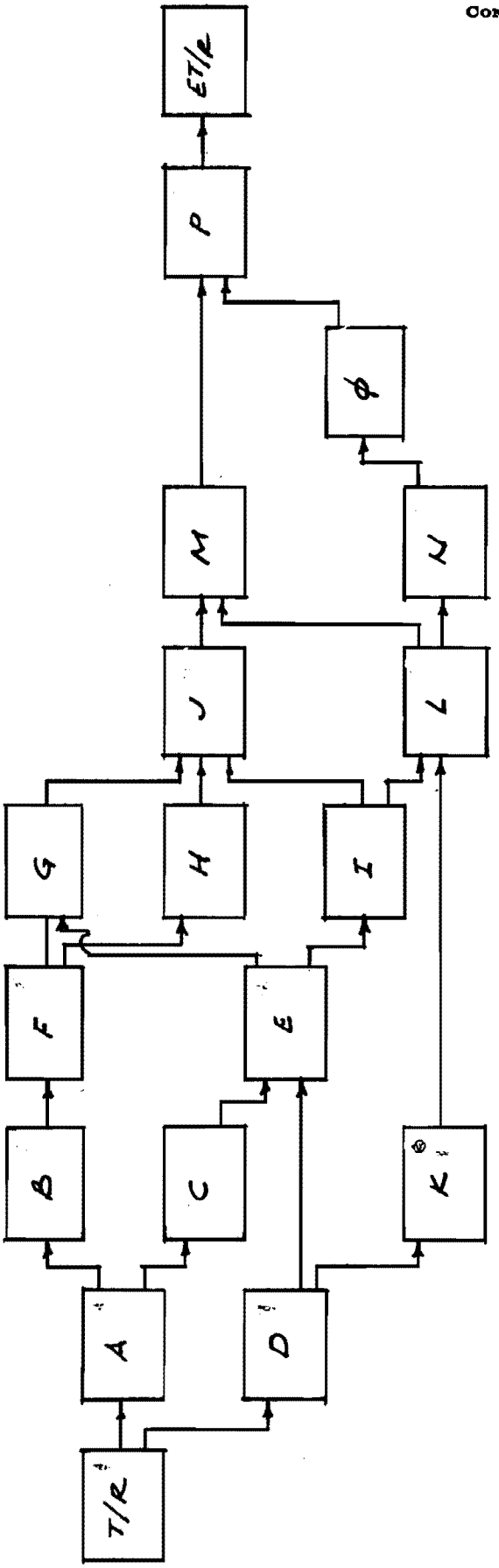
Project starts with task A.
D can be concurrent with A.
B must follow A and precede F.
C follows A.
E cannot begin until both C & D are complete.
F precedes G & H.
G Cannot begin until E is complete.
H, G, & I must precede J.
I follows E and precedes L.
K follows D.
L cannot begin until K is complete.
J & L must be complete before M can start.
N cannot start until L is complete.
O follows N.
P is the last task and can start only when M & O are complete.

RALPH J. STEPHENSON, P. E.
CONSULTING ENGINEER

Reserved Node Nos.
21 24
22 25
23 26

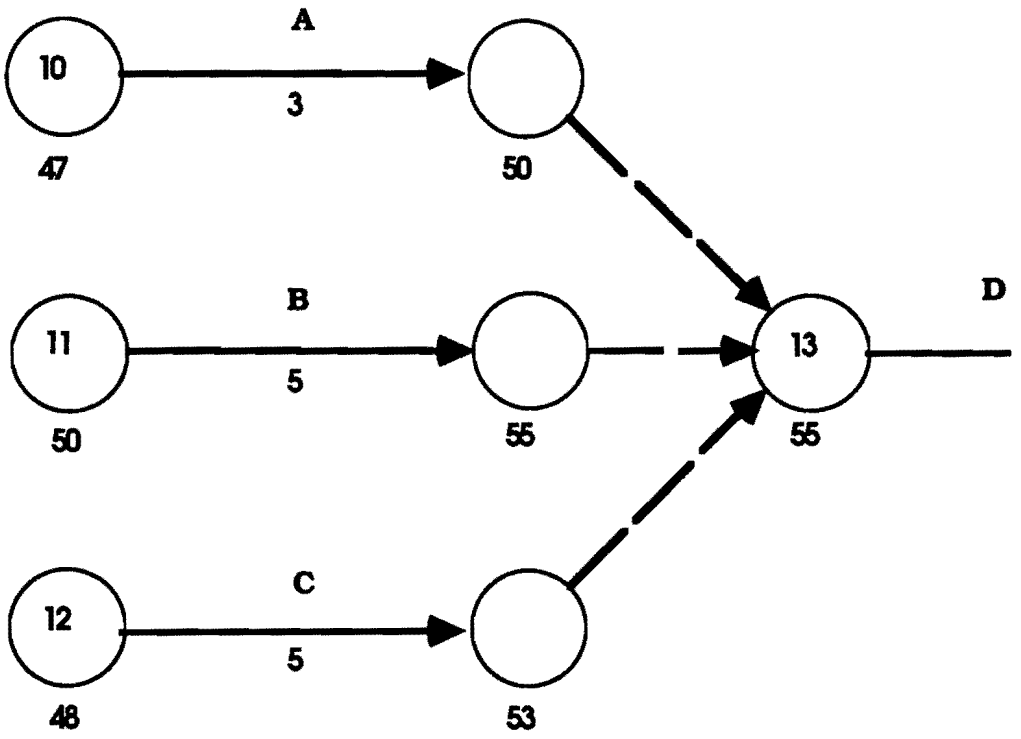
SOLUTION TO EXERCISE #1
ARROW DIAGRAM

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

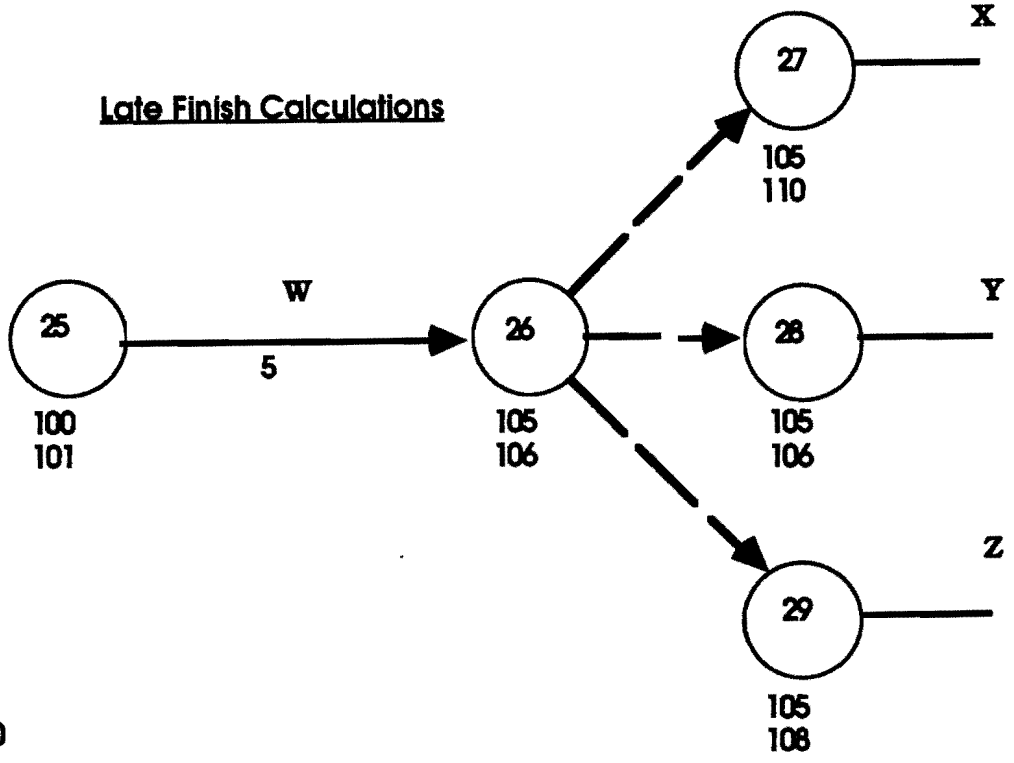


SOLUTION TO EXERCISE #1
PRECEDENCE DIAGRAM

Early Start Calculations



Late Finish Calculations



4 year working day calendar starting on January 4, 1993

Ralph J. Stephenson PE PC - 323 Hiawatha Drive,
Mt. Pleasant, Michigan 48858, ph 517 772 2537

Jan, 1993		15	051	25	102	05	152	19	204
04	001	16	052	26	103	06	153	20	205
05	002	17	053	27	104	09	154	21	206
06	003	18	054	28	105	10	155	22	207
07	004	19	055	**Jun, 93**		11	156	25	208
08	005	22	056	01	106	12	157	26	209
11	006	23	057	02	107	13	158	27	210
12	007	24	058	03	108	16	159	28	211
13	008	25	059	04	109	17	160	29	212
14	009	26	060	07	110	18	161	**Nov, 93**	
15	010	29	061	08	111	19	162	01	213
18	011	30	062	09	112	20	163	02	214
19	012	31	063	10	113	23	164	03	215
20	013	**Apr, 93**		11	114	24	165	04	216
21	014	01	064	14	115	25	166	05	217
22	015	02	065	15	116	26	167	08	218
25	016	05	066	16	117	27	168	09	219
26	017	06	067	17	118	30	169	10	220
27	018	07	068	18	119	31	170	11	221
28	019	08	069	21	120	**Sep, 93**		12	222
29	020	09	070	22	121	01	171	15	223
Feb, 93		12	071	23	122	02	172	16	224
01	021	13	072	24	123	03	173	17	225
02	022	14	073	25	124	07	174	18	226
03	023	15	074	28	125	08	175	19	227
04	024	16	075	29	126	09	176	22	228
05	025	19	076	30	127	10	177	23	229
08	026	20	077	**Jul, 93**		13	178	24	230
09	027	21	078	01	128	14	179	26	231
10	028	22	079	02	129	15	180	29	232
11	029	23	080	06	130	16	181	30	233
12	030	26	081	07	131	17	182	**Dec, 93**	
15	031	27	082	08	132	20	183	01	234
16	032	28	083	09	133	21	184	02	235
17	033	29	084	12	134	22	185	03	236
18	034	30	085	13	135	23	186	06	237
19	035	**May, 93**		14	136	24	187	07	238
22	036	03	086	15	137	27	188	08	239
23	037	04	087	16	138	28	189	09	240
24	038	05	088	19	139	29	190	10	241
25	039	06	089	20	140	30	191	13	242
26	040	07	090	21	141	**Oct, 93**		14	243
Mar, 93		10	091	22	142	01	192	15	244
01	041	11	092	23	143	04	193	16	245
02	042	12	093	26	144	05	194	17	246
03	043	13	094	27	145	06	195	20	247
04	044	14	095	28	146	07	196	21	248
05	045	17	096	29	147	08	197	22	249
08	046	18	097	30	148	11	198	23	250
09	047	19	098	**Aug, 93**		12	199	27	251
10	048	20	099	02	149	13	200	28	252
11	049	21	100	03	150	14	201	29	253
12	050	24	101	04	151	15	202	30	254
						18	203		

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Jan, 1994		15	306	26	358	09	409	21	461
03	255	16	307	27	359	10	410	24	462
04	256	17	308	31	360	11	411	25	463
05	257	18	309	**Jun, 94**		12	412	26	464
06	258	21	310	01	361	15	413	27	465
07	259	22	311	02	362	16	414	28	466
10	260	23	312	03	363	17	415	31	467
11	261	24	313	06	364	18	416	**Nov, 94**	
12	262	25	314	07	365	19	417	01	468
13	263	28	315	08	366	22	418	02	469
14	264	29	316	09	367	23	419	03	470
17	265	30	317	10	368	24	420	04	471
18	266	31	318	13	369	25	421	07	472
19	267	**Apr, 94**		14	370	26	422	08	473
20	268	01	319	15	371	29	423	09	474
21	269	04	320	16	372	30	424	10	475
24	270	05	321	17	373	31	425	11	476
25	271	06	322	20	374	**Sep, 94**		14	477
26	272	07	323	21	375	01	426	15	478
27	273	08	324	22	376	02	427	16	479
28	274	11	325	23	377	06	428	17	480
31	275	12	326	24	378	07	429	18	481
Feb, 94		13	327	27	379	08	430	21	482
01	276	14	328	28	380	09	431	22	483
02	277	15	329	29	381	12	432	23	484
03	278	18	330	30	382	13	433	25	485
04	279	19	331	**Jul, 94**		14	434	28	486
07	280	20	332	01	383	15	435	29	487
08	281	21	333	05	384	16	436	30	488
09	282	22	334	06	385	19	437	**Dec, 94**	
10	283	25	335	07	386	20	438	01	489
11	284	26	336	08	387	21	439	02	490
14	285	27	337	11	388	22	440	05	491
15	286	28	338	12	389	23	441	06	492
16	287	29	339	13	390	26	442	07	493
17	288	**May, 94**		14	391	27	443	08	494
18	289	02	340	15	392	28	444	09	495
21	290	03	341	18	393	29	445	12	496
22	291	04	342	19	394	30	446	13	497
23	292	05	343	20	395	**Oct, 94**		14	498
24	293	06	344	21	396	03	447	15	499
25	294	09	345	22	397	04	448	16	500
28	295	10	346	25	398	05	449	19	501
Mar, 94		11	347	26	399	06	450	20	502
01	296	12	348	27	400	07	451	21	503
02	297	13	349	28	401	10	452	22	504
03	298	16	350	29	402	11	453	23	505
04	299	17	351	**Aug, 94**		12	454	27	506
07	300	18	352	01	403	13	455	28	507
08	301	19	353	02	404	14	456	29	508
09	302	20	354	03	405	17	457	30	509
10	303	23	355	04	406	18	458		
11	304	24	356	05	407	19	459		
14	305	25	357	08	408	20	460		

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Jan, 1995		15	561	25	612	07	662	18	713
03	510	16	562	26	613	08	663	19	714
04	511	17	563	30	614	09	664	20	715
05	512	20	564	31	615	10	665	23	716
06	513	21	565	**Jun, 95**		11	666	24	717
09	514	22	566	01	616	14	667	25	718
10	515	23	567	02	617	15	668	26	719
11	516	24	568	05	618	16	669	27	720
12	517	27	569	06	619	17	670	30	721
13	518	28	570	07	620	18	671	31	722
16	519	29	571	08	621	21	672	**Nov, 95**	
17	520	30	572	09	622	22	673	01	723
18	521	31	573	12	623	23	674	02	724
19	522	**Apr, 95**		13	624	24	675	03	725
20	523	03	574	14	625	25	676	06	726
23	524	04	575	15	626	28	677	07	727
24	525	05	576	16	627	29	678	08	728
25	526	06	577	19	628	30	679	09	729
26	527	07	578	20	629	31	680	10	730
27	528	10	579	21	630	**Sep, 95**		13	731
30	529	11	580	22	631	01	681	14	732
31	530	12	581	23	632	05	682	15	733
Feb, 95		13	582	26	633	06	683	16	734
01	531	14	583	27	634	07	684	17	735
02	532	17	584	28	635	08	685	20	736
03	533	18	585	29	636	11	686	21	737
06	534	19	586	30	637	12	687	22	738
07	535	20	587	**Jul, 95**		13	688	24	739
08	536	21	588	03	638	14	689	27	740
09	537	24	589	05	639	15	690	28	741
10	538	25	590	06	640	18	691	29	742
13	539	26	591	07	641	19	692	30	743
14	540	27	592	10	642	20	693	**Dec, 95**	
15	541	28	593	11	643	21	694	01	744
16	542	**May,95**		12	644	22	695	04	745
17	543	01	594	13	645	25	696	05	746
20	544	02	595	14	646	26	697	06	747
21	545	03	596	17	647	27	698	07	748
22	546	04	597	18	648	28	699	08	749
23	547	05	598	19	649	29	700	11	750
24	548	08	599	20	650	**Oct, 95**		12	751
27	549	09	600	21	651	02	701	13	752
28	550	10	601	24	652	03	702	14	753
Mar, 95		11	602	25	653	04	703	15	754
01	551	12	603	26	654	05	704	18	755
02	552	15	604	27	655	06	705	19	756
03	553	16	605	28	656	09	706	20	757
06	554	17	606	31	657	10	707	21	758
07	555	18	607	**Aug, 95**		11	708	22	759
08	556	19	608	01	658	12	709	26	760
09	557	22	609	02	659	13	710	27	761
10	558	23	610	03	660	16	711	28	762
13	559	24	611	04	661	17	712	29	763
14	560								

4 year working day calendar starting on January 4, 1993

Ralph J. Stephenson PE PC - 323 Hiawatha Drive,
Mt. Pleasant, Michigan 48858, ph 517 772 2537

Jan, 1996		13	815	23	866	05	916	17	968
02	764	14	816	24	867	06	917	18	969
03	765	15	817	28	868	07	918	21	970
04	766	18	818	29	869	08	919	22	971
05	767	19	819	30	870	09	920	23	972
08	768	20	820	31	871	12	921	24	973
09	769	21	821	**Jun, 96**		13	922	25	974
10	770	22	822	03	872	14	923	28	975
11	771	25	823	04	873	15	924	29	976
12	772	26	824	05	874	16	925	30	977
15	773	27	825	06	875	19	926	31	978
16	774	28	826	07	876	20	927	**Nov, 96**	
17	775	29	827	10	877	21	928	01	979
18	776	**Apr, 96**		11	878	22	929	04	980
19	777	01	828	12	879	23	930	05	981
22	778	02	829	13	880	26	931	06	982
23	779	03	830	14	881	27	932	07	983
24	780	04	831	17	882	28	933	08	984
25	781	05	832	18	883	29	934	11	985
26	782	08	833	19	884	30	935	12	986
29	783	09	834	20	885	**Sep, 96**		13	987
30	784	10	835	21	886	03	936	14	988
31	785	11	836	24	887	04	937	15	989
Feb, 96		12	837	25	888	05	938	18	990
01	786	15	838	26	889	06	939	19	991
02	787	16	839	27	890	09	940	20	992
05	788	17	840	28	891	10	941	21	993
06	789	18	841	**Jul, 96**		11	942	22	994
07	790	19	842	01	892	12	943	25	995
08	791	22	843	02	893	13	944	26	996
09	792	23	844	03	894	16	945	27	997
12	793	24	845	05	895	17	946	29	998
13	794	25	846	08	896	18	947	**Dec, 96**	
14	795	26	847	09	897	19	948	02	999
15	796	29	848	10	898	20	949	03	1000
16	797	30	849	11	899	23	950	04	1001
19	798	**May, 96**		12	900	24	951	05	1002
20	799	01	850	15	901	25	952	06	1003
21	800	02	851	16	902	26	953	09	1004
22	801	03	852	17	903	27	954	10	1005
23	802	06	853	18	904	30	955	11	1006
26	803	07	854	19	905	**Oct, 96**		12	1007
27	804	08	855	22	906	01	956	13	1008
28	805	09	856	23	907	02	957	16	1009
29	806	10	857	24	908	03	958	17	1010
Mar, 96		13	858	25	909	04	959	18	1011
01	807	14	859	26	910	07	960	19	1012
04	808	15	860	29	911	08	961	20	1013
05	809	16	861	30	912	09	962	23	1014
06	810	17	862	31	913	10	963	24	1015
07	811	20	863	**Aug, 96**		11	964	26	1016
08	812	21	864	01	914	14	965	27	1017
11	813	22	865	02	915	15	966	30	1018
12	814					16	967	31	1019

FIRST LEVEL NETWORK - Summary Management Diagram

A diagram prepared very early in the project life. The summary network provides an overall look at the entire program, grouping major operations and containing tasks with durations from 10 to 50 working days. This network should normally contain 25 to 70 tasks exclusive of dummies.

SECOND LEVEL NETWORK - Working Diagram

A diagram prepared when most data about major tasks is available and the actual project work is about to begin or is underway. The working network should be sufficiently detailed so as to define key points or milestones at closely spaced intervals. It should contain tasks with durations of one to 10 working days. The second level network is the one most commonly used during project implementation.

THIRD LEVEL NETWORK - Key Operation Sub Diagram

A diagram prepared for the detailed planning of smaller operations within the second level network. Task durations usually range from one to five working days. Most often these networks are prepared by or for sub-contractors, vendors, suppliers, manufacturers and conform to established early start/late finish limits determined from the second level network.

Laundry list for pile test

Pueblo Plant
Nebraska Public Power Distribution District
Oaski, Nebraska

Introduction

You are a facilities engineer for the Nebraska Public Power Distribution District. Your boss has assigned you to be project manager for construction of a new Pueblo Plant in Osaki, Nebraska. He has asked you to plan and execute the installation of test piles to help decide the final design characteristics of the power plant foundation.

You have completed selection of the type of test pile to be used and must now write the test specification, select the number of piles and their location, and lay out the piles in the field. There is a possiblility of saving & using the test pile cluster for the total building foundation group. Therefore you plan to retain a test contractor that could also be awarded the full piling installation contract

Plan the entire test pile installation process.

Laundry list - at random unnumbered

- Select test pile locations
- Record test load results
- Load piling
- Order testing equipment
- Decide whether test piles remain as permanent piles
- Select number of test piles
- Deliver test pile materials
- Retain test pile contractor
- Prepare test procedures
- Approve test pile results
- Remove test loads
- Approve test procedures
- Order test pile materials
- Lay out test piles in field
- Deliver testing equipment
- Drive & fill test piles

Laundry list - at random numbered in rough action sequence

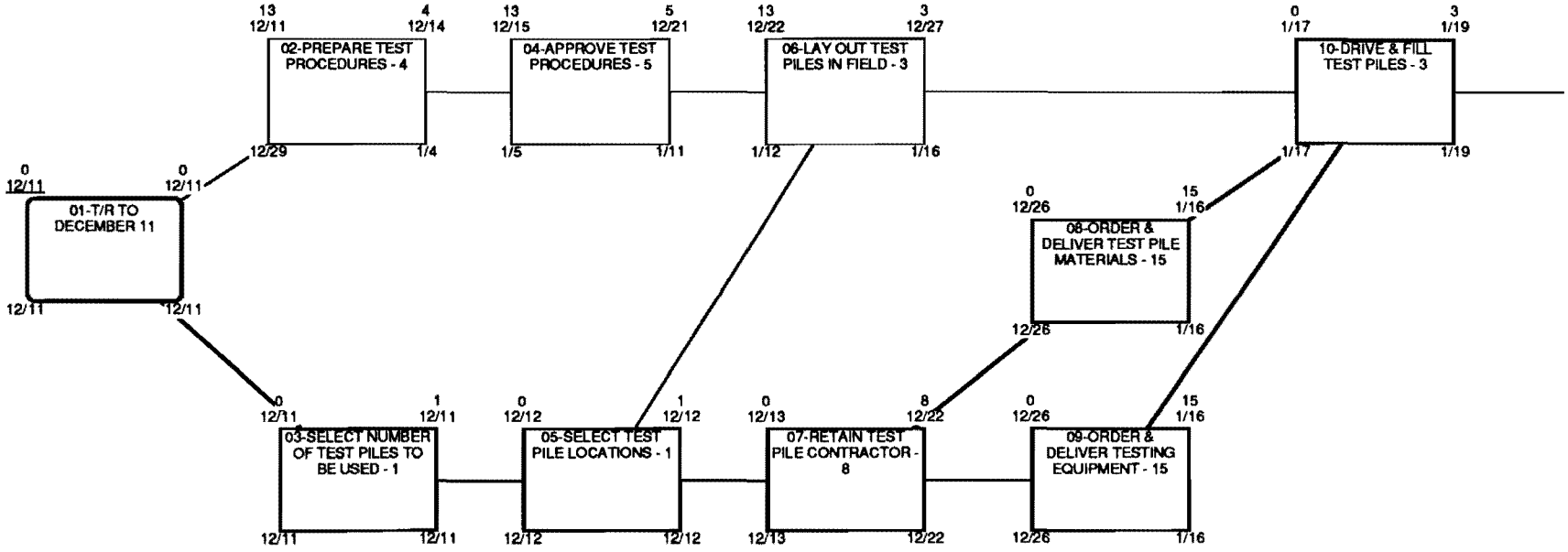
- 002 - Select test pile locations
- 010 - Record test load results
- 008 - Load piling
- 005 - Order testing equipment
- 011 - Decide whether test piles remain as permanent piles
- 001 - Select number of test piles
- 006 - Deliver test pile materials
- 004 - Retain test pile contractor
- 001 - Prepare test procedures
- 011 - Approve test pile results
- 009 - Remove test loads
- 003 - Approve test procedures
- 005 - Order test pile materials
- 004 - Lay out test piles in field
- 006 - Deliver testing equipment

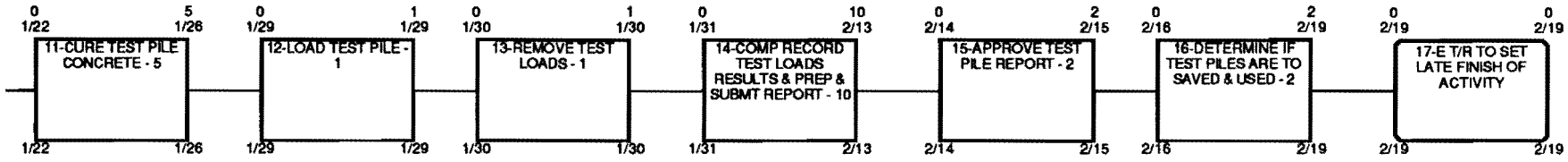
007 - Drive & fill test piles

Laundry list - numbered & ordered

001 - Prepare test procedures
001 - Select number of test piles
002 - Select test pile locations
003 - Approve test procedures
004 - Lay out test piles in field
004 - Retain test pile contractor
005 - Order test pile materials
005 - Order testing equipment
006 - Deliver test pile materials
006 - Deliver testing equipment
007 - Drive & fill test piles
008 - Load piling
009 - Remove test loads
010 - Record test load results
011 - Approve test pile results
011 - Decide whether test piles remain as permanent piles

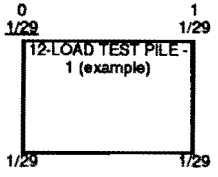
HO 317 Dec 1990


01-T/R TO DECEMBER 11
02-PREPARE TEST PROCEDURES - 4
03-SELECT NUMBER OF TEST PILES TO BE USED - 1
04-APPROVE TEST PROCEDURES - 5
05-SELECT TEST PILE LOCATIONS - 1
06-LAY OUT TEST PILES IN FIELD - 3
07-RETAIN TEST PILE CONTRACTOR - 8
08-ORDER & DELIVER TEST PILE MATERIALS - 15
09-ORDER & DELIVER TESTING EQUIPMENT - 15
10-DRIVE & FILL TEST PILES - 3



4.19

Total float time **Duration**
Early start **Early finish**



- **Activity number**
- **Activity description**
- **Activity estimated duration in elapsed working days**

Late start **Late finish**

ACTIVITY DATA KEY

Issue #1 - November 11, 1989
354 tst pl ntwk 318 - disk 203
ho 354 - Nov 89

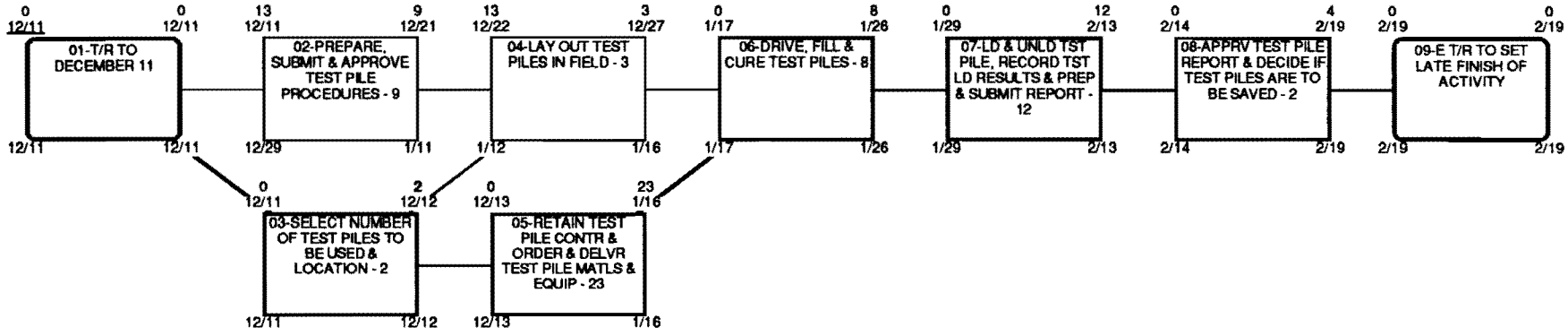
Reserved activity numbers

41 46
42 47
43 48
44 49
45 50

NETWORK MODEL FOR TEST PILE INSTALLATION - NEBRASKA PUBLIC POWER DISTRICT PUEBLO PLANT - OSAKI, NEBRASKA

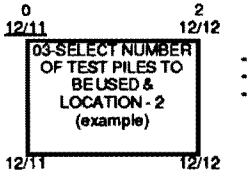
Ralph J. Stephenson PE
Consulting Engineer
323 Hiawatha Drive
Mt. Pleasant, Michigan 48858
ph 518 772 2537

SHEET #1



4.20

Total float time **Duration**
Early start **Early finish**



Late start **Late finish**

- **Activity number**
- **Activity description**
- **Activity estimated duration in elapsed working days**

ACTIVITY KEY

SUMMARY NETWORK MODEL FOR TEST PILE INSTALLATION - NEBRASKA PUBLIC POWER DISTRICT PUEBLO PLANT - OSAKI, NEBRASKA

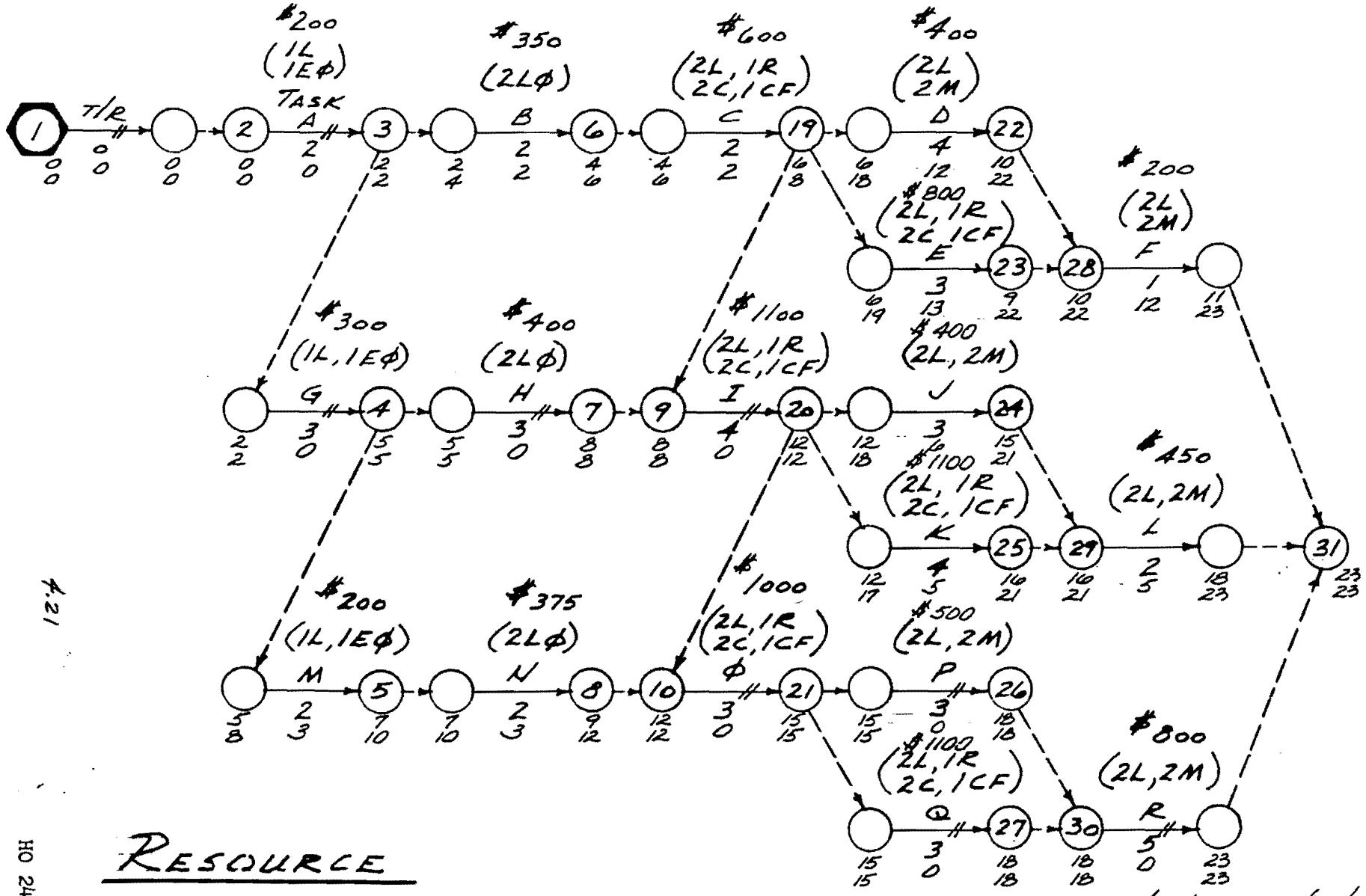
Issue #1 - November 12, 1989
353 tst pl ntwk - disk 203
ho 353 - Nov 89

Reserved activity numbers

41	46
42	47
43	48
44	49
45	50

Ralph J. Stephenson PE
Consulting Engineer
323 Hiawatha Drive
Mt. Pleasant, Michigan 48858
ph 517 772 2537

SHEET SM-1



RESOURCE ALLOCATION

RESERVED NODE NOS.

11	15
12	16
13	17
14	18

RALPH J. STEPHENSON, P.E.

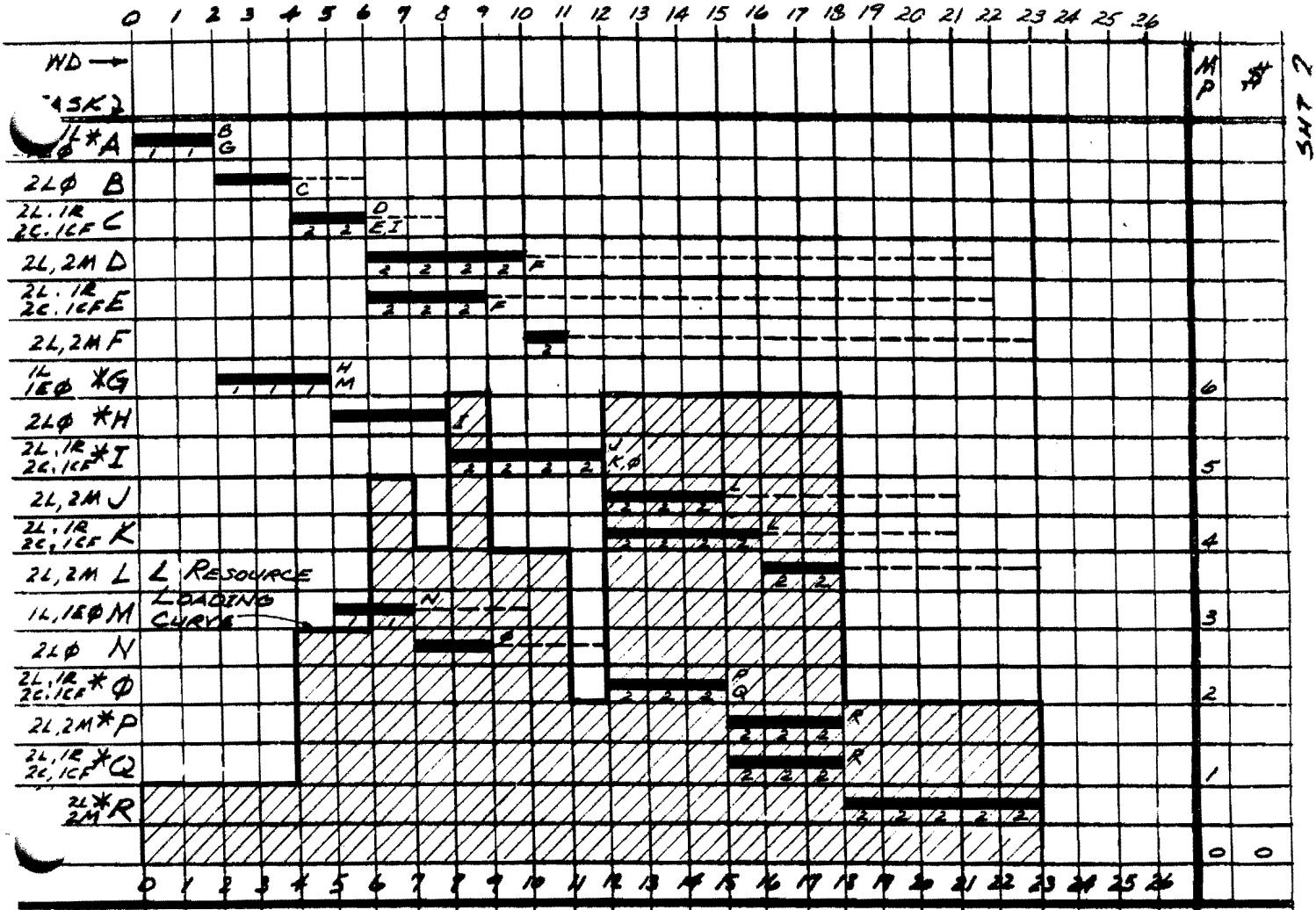
MAY 29, 1968

4.21

HO 244

H/O

EVENT SCHEDULE



	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
L	1	1	1	1	3	3	5	4	6	4	4	2	6	6	6	6	6	6	2	2	2	2	2					81
EØ	1	1	1	1	1	1	1																					7
LØ			2	2		2	2	4	2																			14
R					1	1	1	1	2	1	1	1	2	2	2	2	1	1										19
C					2	2	2	2	4	2	2	2	4	4	4	4	2	2										38
CF					1	1	1	1	2	1	1	1	2	2	2	2	1	1										19
M							2	2	2	2	2		2	2	2	2	4	4	2	2	2	2	2					36
TOTAL	2	2	4	4	8	10	14	14	18	10	10	6	16	16	16	16	14	14	4	4	4	4	4					214

RESOURCE ALLOCATION #1

HO 245

MAY 29, 1968 4.22 RALPH J. STEPHENSON, P.E.

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

Chicago Area Weather

Source: Jack Kolstadt

Week		Working Day	Total Working Days Worked	Loss in Working Days
Dec.	1	234	3½	1½
	2	239	3½	1½
	3	244	4	1
	4	249	3	2
Jan.	1	256	2-1/5	2-4/5
	2	261	2-1/5	2-4/5
	3	266	3½	1½
	4	271	3	2
Feb.	1	277	3	2
	2	282	3	2
	3	287	4	1
	4	292	3½	1½
Mar.	1	297	4½	½
	2	302	4½	½
	3	307	4	1
	4	312	3½	1½
Apr.	1	320	3½	1½
	2	325	4½	½
	3	330	4	1
	4	335		0

H/O 136

RALPH J. STEPHENSON, P.E., P.C.
CONSULTING ENGINEER

Turnover Cycle (t) Example

Definitions:

x = completion date in working days (wd)

i = starting date in working days

d = duration in elapsed working days to complete one unit

t = turnover cycle in working days (the number of working days between the completion of one unit and the completion of the next)

n = number of units

Basic equations:

$$x = i + d + t(n-1)$$

$$i = x - d - t(n-1)$$

$$t = \frac{x - i - d}{(n-1)}$$

Examples:

For x unknown

i = 160

d = 7 wd

t = 4 wd

n = 11 units

For i unknown

x = 325

d = 10 wd

t = 6 wd

n = 21 floors

For t unknown

x = 352

i = 280

d = 9

n = 15 sectors

Ralph J. Stephenson PE PC
Consulting Engineer

Section #5

Monitoring the project

Ralph J. Stephenson PE PC
Consulting Engineer

IDENTIFY VITAL TARGETS

Which inputs and outputs most affect the results, the conditions and the performance the manager wishes to achieve? In considering these questions the following should be kept in mind.

A. Rarely is more than one problem out of four worth other than a manager's fleeting glance.

B. The good manager must quickly identify where his efforts are going to do the most good.

C. The effective manager must understand Pareto's law - the principle of the vital few and the trivial many.

D. In general, fewer than one third of the people a manager supervises require more than two thirds of his time.

E. Managerial missteps resulting from not understanding the vital target concept include:
1. Following prejudices
2. Sticking with pat systems
3. Doing what is easiest
4. Playing hunches

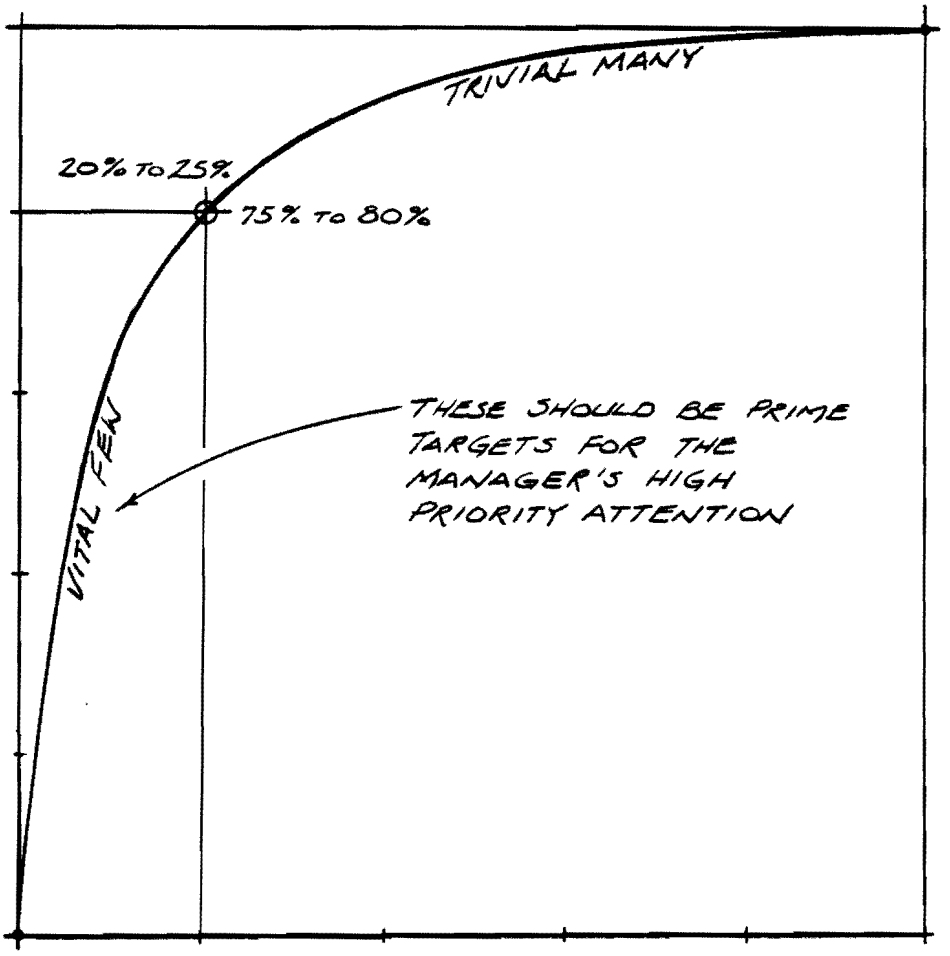
F. How to pick the vital few
1. Prepare and use to do lists
2. Set priorities
3. Use a rating system
4. Identify the critical tasks in a plan of action

G. Moving from a situational view (macro) to the vital few (micro)

H. What to do with the trivial many
1. Delegate
2. Defer (How long?)

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

PARETOS LAW - IN AN OBJECT/VALUE SITUATION ONLY A FEW OF THE OBJECTS ACCOUNT FOR THE GREATEST PART OF THE VALUE.



VALUE OR UTILITY

PRICE
COST
DELAYS
MISTAKES
PROBLEMS
PROFIT
REJECTS
SALES
SAVINGS
SHIPMENTS
WASTE

OBJECTS OR RESOURCES

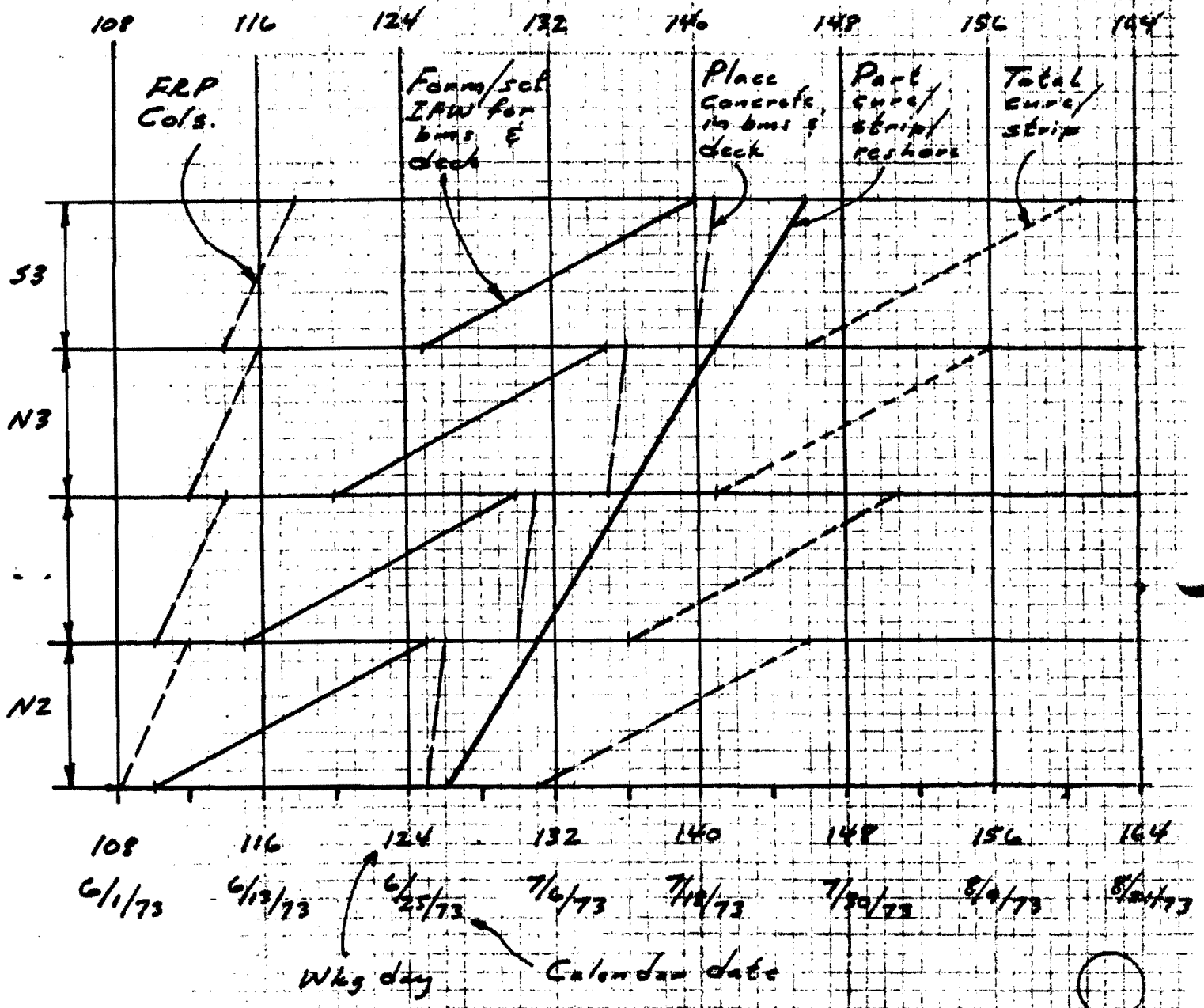
ACTIVITIES
CAUSES
OCCURANCES
PROBLEMS
RESOURCES
PRODUCTS
DECISIONS
FACILITIES
MATERIALS
METHODS
PRODUCTS
SALES CALLS
SERVICES
STAFF

RALPH J. STEPHENSON CONSULTING ENGINEER 15064 WARWICK ROAD DETROIT 23, MICHIGAN PHONE 273-5025

Subject Slant Chart - Floor Pours Date 3/1/73

N2, S2, N3, S3 Page (1)

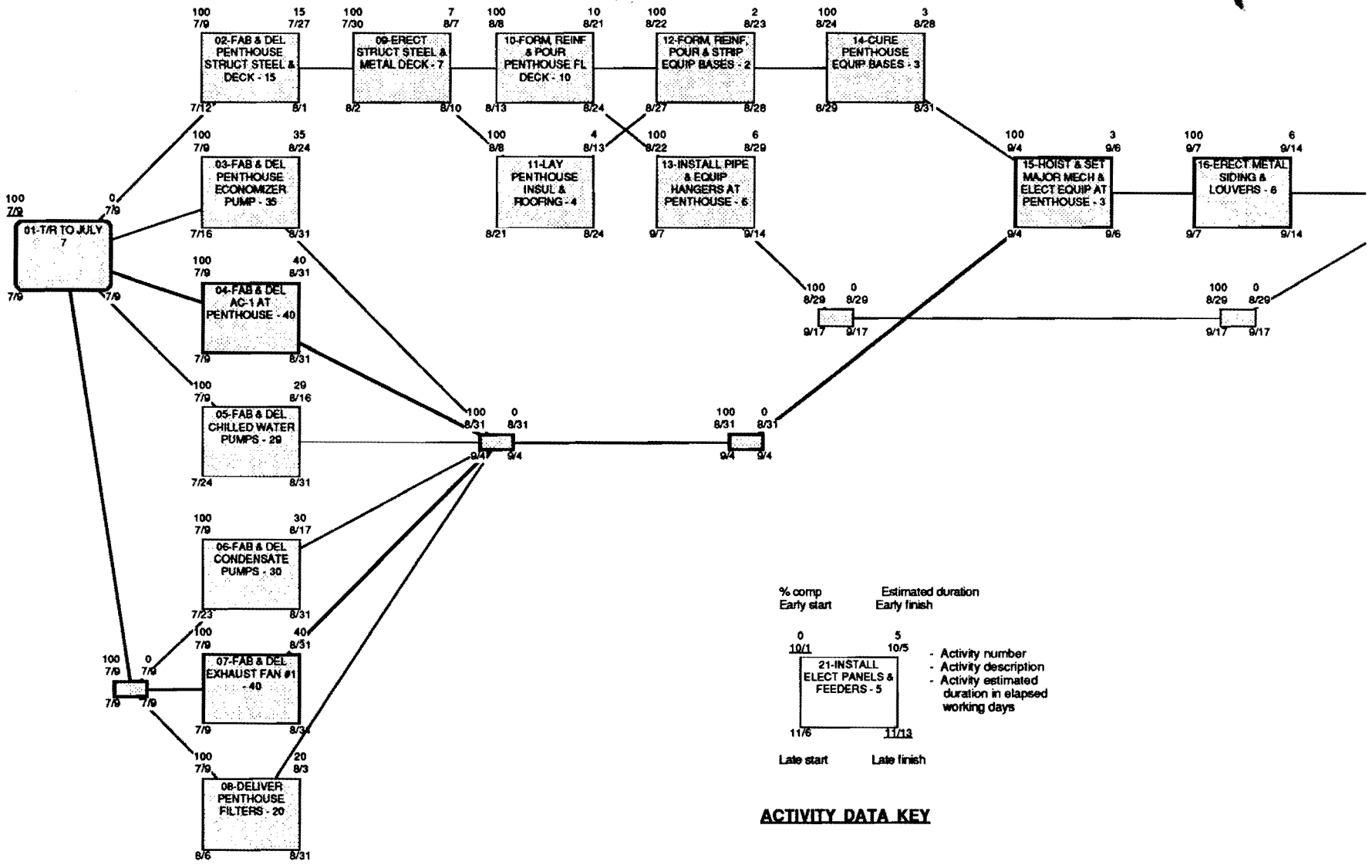
Data from Summary Network - sets 1, 2, 3, 4



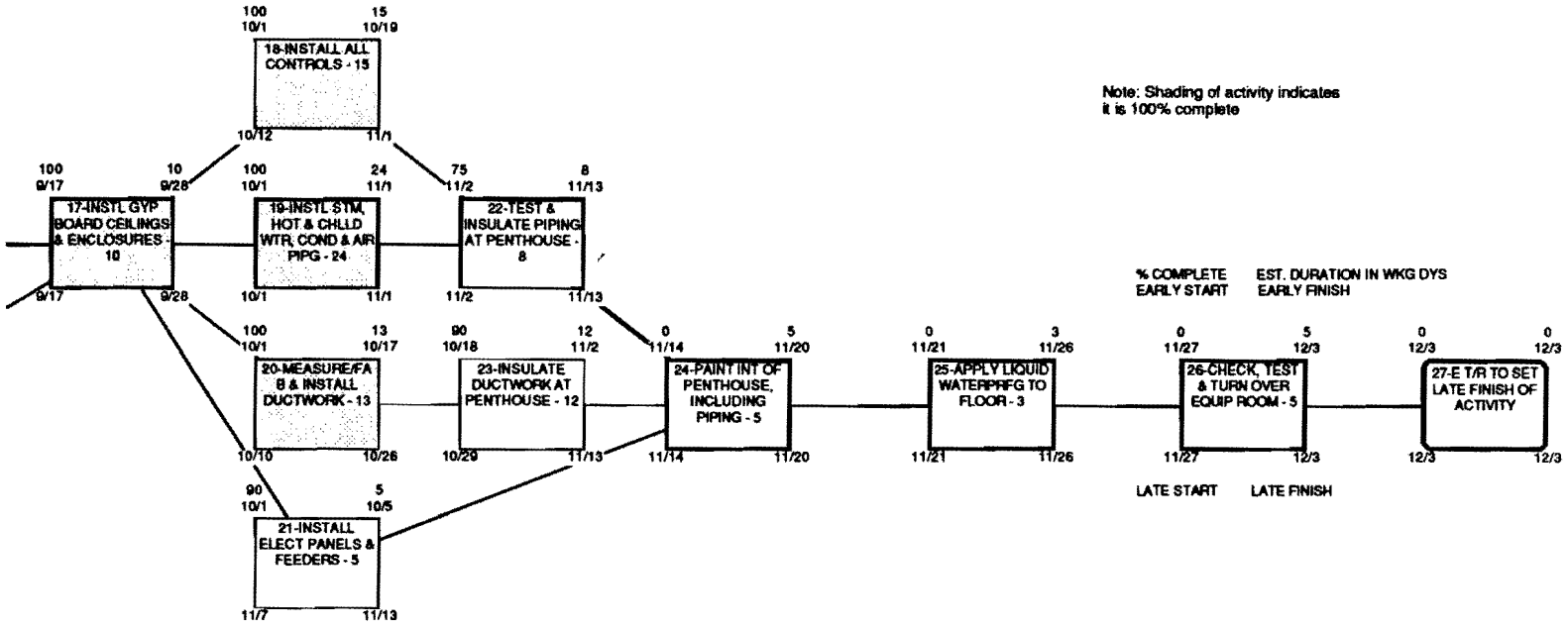
5.03

3/28/73

H/O 7.0


02-FAB & DEL PENTHOUSE STRUCT STEEL & DECK - 15
09-ERECT STRUCT STEEL & METAL DECK - 7
10-FORM, REINF & POUR PENTHOUSE FL DECK - 10
12-FORM, REINF, POUR & STRIP EQUIP BASES - 2
14-CURE PENTHOUSE EQUIP BASES - 3
03-FAB & DEL PENTHOUSE ECONOMIZER PUMP - 35
11-LAY PENTHOUSE INSUL & ROOFING - 4
13-INSTALL PIPE & EQUIP HANGERS AT PENTHOUSE - 5
15-HOIST & SET MAJOR MECH & ELECT EQUIP AT PENTHOUSE - 3
16-ERECT METAL SIDING & LOUVERS - 6
01-T/R TO JULY 7
04-FAB & DEL AC-1 AT PENTHOUSE - 40
05-FAB & DEL CHILLED WATER PUMPS - 29
06-FAB & DEL CONDENSATE PUMPS - 30
07-FAB & DEL EXHAUST FAN #1 - 40
08-DELIVER PENTHOUSE FILTERS - 20
% comp
Early start
Estimated duration
Early finish
21-INSTALL ELECT PANELS & FEEDERS - 5
- Activity number
- Activity description
- Activity estimated duration in elapsed working days
Late start
Late finish
ACTIVITY DATA KEY

5.04



Note: Shading of activity indicates it is 100% complete

5.05

Project Status as of November 5

Issue #1 - July 7
Issue #1 - monitor 11/5
332 11/5 mtr phi i1shtph1
disk 162

NETWORK MODEL FOR CLARION OFFICE BUILDING PENTHOUSE MECHANICAL EQUIPMENT ROOM #1

Luther Mechanical Contractors
Washington, D.C.

Reserved Activity Numbers

041	046
042	047
043	048
044	049
045	050

sheet ph-1

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

CONTROL SYSTEM TECHNIQUES

Color Coding

Color coding is used to qualitatively evaluate project status. The status indicator colors described below are drawn on the solid task arrows, with the end of the color line shown at the approximate percentage of the task complete. The color line end is dated with the current calendar date.

Green

Task on time - currently not past early finish (EF) date.

Orange

Task on time - currently past early finish (EF) date.

Blue

Task behind - currently not past late finish (LF) date.

Yellow

Task behind - currently past late finish (LF) date.

Note that the evaluation is made on the basis of the current date. Changes in color are significant, indicating a deteriorating or improving sequence of work depending upon the progression. Color coding is primarily used to locate undesirable trends in work progress and to show job history.

Description of Various Listings

The computer output is issued in five (5) major listings - by ascending order of node numbers (node sequence), by ascending order of early start dates (ES sequence), by ascending order of late start dates (LS sequence), by ascending order of late finish dates (LF sequence), and by ascending order of available float time (TF sequence).

Node Sequence

The node sequence is arranged in ascending order, first by i node number, then by j node number, where i node numbers are the same. This is the master list from which all revisions are made. It is also the listing used when referring from the arrow diagram into the computer printout for information.

CONTROL SYSTEM TECHNIQUES
(Page 2)

Node Sequence (continued)

All dummy arrows are shown in this listing since subsequent changes to the network (updating) must be shown on the node sequence list to revise the computer input.

Early Start (ES) Sequence

The early start sequence lists all tasks in ascending order of their earliest possible starting dates. The ES listing is used most often by field management as a check list.

Late Start (LS) Sequence

The LS sequence lists tasks in ascending order of their latest allowable starting dates. This is a monitoring document and is used by first drawing a line under the current date in the LS column, and next evaluating tasks that have not started and are above that line. These tasks will be those that have not met their latest allowable starting dates.

As a suggestion, all tasks that are in-work can be indicated as such by circling their late start date. When tasks are complete, a check mark can be placed in front of their late start dates or the task can be crossed off. Thus, a quick inspection will show which tasks above the current date have not yet started or been completed.

Late Finish (LF) Sequence

The LF sequence lists all tasks in ascending order of their latest allowable finish dates. This list is used the same as the late start list but by applying the procedure to the late finish column.

Total Float (TF) Sequence

The TF list shows all tasks arranged in ascending order of the amount of float time available to the task. Those tasks indicated by a CP in the total float column are critical.

This list gives a good picture of (1) the relative criticalness of all tasks, and (2) what tasks become critical as a project begins to lag behind late finish dates. For instance, if a project has lost five (5) working days and it is still essential to maintain current anticipated end dates, then all tasks yet to be done and having float time to and including five, are now critical.

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

COLOR CODING

	1	2	3	4	5	6
IS TASK CURRENTLY PAST EF DATE?	N	N	Y	Y	Y	
IS TASK CURRENTLY PAST LF DATE?	N	N	N	N	Y	
WILL TASK MAKE LF DATE?	Y	N	Y	N	—	
COLOR CODE GREEN	X					
COLOR CODE ORANGE			X			
COLOR CODE BLUE		X		X		
COLOR CODE YELLOW					X	

Color coding is used to qualitatively evaluate project status. The status indicator colors described below are drawn on the solid task arrows, with the end of the color line shown at the approximate percentage of the task complete. The color line end is dated with the current calendar date.

Green

Task on time - currently not past early finish (EF) date.

Orange

Task on time - currently past early finish (EF) date.

Blue

Task behind - currently not past late finish (LF) date.

Yellow

Task behind - currently past late finish (LF) date.

Note that the evaluation is made on the basis of the current date. Changes in color are significant, indicating a deteriorating or improving sequence of work depending upon the progression. Color coding is primarily used to locate undesirable trends in work progress and to show job history.

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

Monitoring #1

Project Status as of morning of Sept. 24 (working day 188)

Task	Color Code	Status	Was completed evening of	Will be completed
101 - 107		Comp.	Sept. 15	----
102 - 108		Comp.	Sept. 23	----
103 - 109		Comp.	Sept. 15	----
104 - 110		Comp.	Sept. 13	----
105 - 111		90% comp.	----	in 6 working days
106 - 112		Comp.	Sept. 22	----
107 - 114		Comp.	Sept. 22	----
108 - 115		50% comp.	----	in 4 working days
109 - 116		50% comp.	----	in 2 working days
110 - 117		80% comp.	----	in 2 working days
112 - 119		10% comp.	----	in 4 working days
133 - 139		50% comp.	----	in 4 working days
134 - 140		Comp.	Sept. 21	----
135 - 151		Comp.	Sept. 17	----
2 - 3		Comp.	Sept. 1	----
2 - 4		Comp.	Sept. 7	----
2 - 5		Comp.	Sept. 9	----
2 - 6		80% comp.	----	in 5 working days

NETWORK MODEL FOR NEW OFFICE FACILITY HIGHLAND AND MORAN
KEITH, IOWA

VICTORIA MECHANICAL COMPANY

PROJECT NO 76-10 ISSUE NO. 1 DATED APRIL 26, 1976

RALPH J STEPHENSON P E - CONSULTANT

DATES ARE SHOWN AS MONTH,DAY,YR '0' IN TFT COL INDICATES CRITICAL ITEM

I	J	DAYS	RSP	LOC CD	AND DESCRIPTION	COST	NODE SEQUENCE E/S	L/S	E/F	L/F	TF
1	2	106	0		T/R TO START OF PROJECT		1026	1026	5316	5316	0
2	3	65	0	1	T/R POUR OUT 1ST FL SOG		6016	6226	8316	9226	15
2	4	69	0	2	T/R TO POUR OUT 2ND DECK		6016	6166	9076	9226	11
2	5	58	0	R	T/R TO C ER RF MTL DECK		6016	7206	8206	10086	34
2	6	70	0	R	T/R TO C LAY INSUL & RFG		6016	7166	9086	10226	32
2	7	102	0		T/R TO C EXT MSNRY&GLZNG		6016	6016	10226	10226	0
3	101	0	0		D		9016	9286	8316	9276	18
3	102	0	0		D		9016	9246	8316	9236	16
3	103	0	0		D		9016	10016	8316	9306	21
3	104	0	0		D		9016	10066	8316	10056	24
3	105	0	0		D		9016	9236	8316	9226	15
3	106	0	0		D		9016	9306	8316	9296	20
4	101	0	0		D		9086	9286	9076	9276	14
4	102	0	0		D		9086	9246	9076	9236	12
4	103	0	0		D		9086	10016	9076	9306	17
4	104	0	0		D		9086	10066	9076	10056	20
4	105	0	0		D		9086	9236	9076	9226	11
4	106	0	0		D		9086	9306	9076	9296	16
5	132	0	0		D		8236	10146	8206	10136	37
5	133	0	0		D		8236	10116	8206	10086	34
5	134	0	0		D		8236	10196	8206	10186	40
5	135	0	0		D		8236	10196	8206	10186	40
5	136	0	0		D		8236	10126	8206	10116	35
5	137	0	0		D		8236	10186	8206	10156	39
6	125	0	0		D		9096	10256	9086	10226	32
7	125	0	0		D		10256	10256	10226	10226	0
101	107	6	6	1	P INS SPRINKLER PIPG	2880	9086	9286	9156	10056	14
102	108	8	2	1	P INS SHT MTL DCT&FTTNGS	4800	9086	9246	9176	10056	12
103	109	3	1	1	P INS DMSTC WTR PPG-CLG	720	9086	10016	9106	10056	17
104	110	4	1	1	P INS HTG&CLNG PPG IN CLG	960	9086	10066	9136	10116	20
105	111	9	1	1	INS TO/R PLUMBG RISERS	2160	9086	9236	9206	10056	11
106	112	4	3	1	P INS RUFF ELEC CNDTSFDRS		9086	9306	9136	10056	16
107	113	0	0		D		9166	10066	9156	10056	14
107	114	5	6	1	C INS SPRINKLER PIPG	2400	9166	10126	9226	10186	18
107	132	0	0		D		9166	10146	9156	10136	20
107	132	0	0		D		9166	10146	9156	10136	20
108	113	0	0		D		9206	10066	9176	10056	12
108	115	8	2	1	C INS SHT MTL DUCT&FTTNGS	4800	9206	10076	9296	10166	13
108	133	0	0		D		9206	10116	9176	10086	15
108	133	0	0		D		9206	10116	9176	10086	15
109	113	0	0		D		9136	10066	9106	10056	17
109	116	3	1	1	C INS DMSTC WTR PPG-CLG	720	9136	10146	9156	10186	23
109	134	0	0		D		9136	10196	9106	10186	26

I	J	DAYS	RSP	LOC CD	AND DESCRIPTION	COST	NODE SEQUENCE E/S	L/S	E/F	L/F	TF
109	134	0	0		D		9136	10196	9106	10186	26
110	117	5	1	1	C INS HTG&CLNG PPG IN CLG	1200	9146	10126	9206	10186	20
110	135	0	0		D		9146	10196	9136	10186	25
110	135	0	0		D		9146	10196	9136	10186	25
111	113	0	0		D		9216	10066	9206	10056	11
111	136	0	0		D		9216	10126	9206	10116	15
111	136	0	0		D		9216	10126	9206	10116	15
112	113	0	0		D		9146	10066	9136	10056	16
112	119	3	3	1	C INS RUFF ELEC CNDT&FDRS		9146	10146	9166	10186	22
112	137	0	0		D		9146	10186	9136	10156	24
112	137	0	0		D		9146	10186	9136	10156	24
113	118	6	4	1	ER INT MSNRY PARTNS		9216	10066	9286	10136	11
114	120	0	0		D		9236	10196	9226	10186	18
115	120	0	0		D		9306	10196	9296	10186	13
116	120	0	0		D		9166	10196	9156	10186	23
117	120	0	0		D		9216	10196	9206	10186	20
118	121	3	5	1	P ER STUDS FOR DRY WALL		9296	10146	10016	10186	11
119	120	0	0		D		9176	10196	9166	10186	22
120	122	0	0		D		9306	10196	9296	10186	13
121	122	0	0		D		10046	10196	10016	10186	11
121	124	3	5	1	C ER STUDS FOR DRY WALL		10046	10226	10066	10266	14
122	123	4	1	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
122	123	4	3	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
123	125	0	0		D		10086	10256	10076	10226	11
123	126	0	0		D		10086	10276	10076	10266	13
124	126	0	0		D		10076	10276	10066	10266	14
124	161	0	0		D		10076	10286	10066	10276	15
124	161	0	0		D		10076	10286	10066	10276	15
125	128	5	5	1	P HANG DRY WALL		10256	10256	10296	10296	0
126	127	3	1	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
126	127	3	3	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
127	128	0	0		D		10136	11016	10126	10296	13
127	163	0	0		D		10136	11026	10126	11016	14
127	163	0	0		D		10136	11026	10126	11016	14
128	129	5	5	1	COMP HANG DRY WALL		11016	11016	11056	11056	0
129	130	0	0		D		11086	11086	11056	11056	0
129	166	0	0		D		11086	11086	11056	11056	0
129	166	0	0		D		11086	11086	11056	11056	0
130	131	4	1	1	INS FIN TUBE PIPING	960	11086	11086	11116	11116	0
131	400	12	0	1	ET/R		11126	11126	11306	11306	0
131	170	0	0		D		11126	11246	11116	11236	8
131	170	0	0		D		11126	11246	11116	11236	8
132	138	6	6	2	P INS SPRINKLER PIPING	2880	9166	10146	9236	10216	20
133	139	8	2	2	P INS SHT MTL DUCT FTTNGS	4800	9206	10116	9296	10206	15
134	140	3	1	2	P INS DMSTC WTR PPG-CLG	720	9136	10196	9156	10216	26
135	151	3	1	2	P INS HTG&CLNG PPG IN CLG	720	9146	10196	9166	10216	25
136	153	8	1	2	INS TO/R PLMG RISERS	1920	9216	10126	9306	10216	15
137	152	4	3	2	P INS RUFF ELEC CNDT&FDRS		9146	10186	9176	10216	24
138	153	0	0		D		9246	10226	9236	10216	20
138	154	5	6	2	C INS SPRINKLER PIPG	2400	9246	10266	9306	11016	22
139	153	0	0		D		9306	10226	9296	10216	16
139	155	8	2	2	C INS SHT MTL DUCT&FTTNGS	4800	9306	10216	10116	11016	15
140	153	0	0		D		9166	10226	9156	10216	26
140	156	3	1	2	C INS DMSTC WTR PPG-CLG	720	9166	10286	9206	11016	30

I	J	DAYS	LOC RSP	CD	AND DESCRIPTION	COST	NODE SEQUENCE E/S	L/S	E/F	L/F	TF
151	153	0	0		D		9176	10226	9166	10216	25
151	157	2	1	2	C INS HTG&CLNG PPG IN CLG	480	9176	10296	9206	11016	30
152	153	0	0		D		9206	10226	9176	10216	24
152	159	3	3	2	C INS RUFF ELEC CNDT&FDRS		9206	10286	9226	11016	26
153	158	4	4	2	ER INT MSNRY PARTNS		10016	10226	10066	10276	15
154	160	0	0		D		10016	11026	9306	11016	22
155	160	0	0		D		10126	11026	10116	11016	15
156	160	0	0		D		9216	11026	9206	11016	30
157	160	0	0		D		9216	11026	9206	11016	30
158	161	0	0		D		10076	10286	10066	10276	15
159	160	0	0		D		9236	11026	9226	11016	26
160	163	0	0		D		10126	11026	10116	11016	15
161	162	3	5	2	P ER STUDS FOR DRY WALL		10076	10286	10116	11016	15
162	163	0	0		D		10126	11026	10116	11016	15
162	165	4	5	2	C ER STUDS FOR DRY WALL		10126	11046	10156	11096	17
163	164	4	1	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
163	164	4	3	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
164	166	0	0		D		10196	11086	10186	11056	14
164	167	0	0		D		10196	11106	10186	11096	16
165	167	0	0		D		10186	11106	10156	11096	17
166	168	6	5	2	P HANG DRY WALL		11086	11086	11156	11156	0
167	168	4	1	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11156	16
167	168	4	3	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11156	16
168	169	6	5	2	C HANG DRY WALL		11166	11166	11236	11236	0
169	170	0	0		D		11246	11246	11236	11236	0
170	171	4	1	2	INS FIN TUBE PIPG	960	11246	11246	11306	11306	0
171	400	0	0		ET/R		12016	12016	11306	11306	0
0	0	0					0	0	0	0	0

NETWORK MODEL FOR NEW OFFICE FACILITY HIGHLAND AND MORAN
KEITH, IOWA

VICTORIA MECHANICAL COMPANY

PROJECT NO 76-10 ISSUE NO. 1 DATED APRIL 26, 1976

RALPH J STEPHENSON P E - CONSULTANT

DATES ARE SHOWN AS MONTH,DAY,YR '0' IN TFT COL INDICATES CRITICAL ITEM

I	J	DAYS	RSP	LOC CD	AND DESCRIPTION	COST	EARLY STRT SEQ E/S	L/S	E/F	L/F	TF
1	2	106	0		T/R TO START OF PROJECT		1026	1076	5316	5316	0
2	3	65	0	1	T/R POUR OUT 1ST FL SOG		6016	6226	8316	9226	15
2	4	69	0	2	T/R TO POUR OUT 2ND DECK		6016	6166	9076	9226	11
2	5	58	0	R	T/R TO C ER RF MTL DECK		6016	7206	8206	10066	34
2	6	70	0	R	T/R TO C LAY INSUL & RFG		6016	7166	9086	10226	32
2	7	102	0		T/R TO C EXT MSNRY&GL ZNG		6016	6016	10226	10226	0
101	107	6	6	1	P INS SPRINKLER PIPG	2880	9086	9286	9156	10056	14
102	108	8	2	1	P INS SHT MTL DCTG&FTTINGS	4800	9086	9246	9176	10056	12
103	109	3	1	1	P INS DMSTC WTR PPG-CLG	720	9086	10016	9106	10056	17
104	110	4	1	1	P INS HTG&CLNG PPG IN CLG	960	9086	10066	9136	10116	20
105	111	9	1	1	INS TO/R PLUMBG RISERS	2160	9086	9236	9206	10056	11
106	112	4	3	1	P INS RUFF ELEC CNDT&FDRS		9086	9306	9136	10056	16
109	116	3	1	1	C INS DMSTC WTR PPG-CLG	720	9136	10146	9156	10186	23
134	140	3	1	2	P INS DMSTC WTR PPG-CLG	720	9136	10196	9156	10216	26
110	117	5	1	1	C INS HTG&CLNG PPG IN CLG	1200	9146	10126	9206	10186	20
112	119	3	3	1	C INS RUFF ELEC CNDT&FDRS		9146	10146	9166	10186	22
135	151	3	1	2	P INS HTG&CLNG PPG IN CLG	720	9146	10196	9166	10216	25
137	152	4	3	2	P INS RUFF ELEC CNDT&FDRS		9146	10186	9176	10216	24
107	114	5	6	1	C INS SPRINKLER PIPG	2400	9166	10126	9226	10186	18
132	138	6	6	2	P INS SPRINKLER PIPING	2880	9166	10146	9236	10216	20
140	156	3	1	2	C INS DMSTC WTR PPG-CLG	720	9166	10286	9206	11016	30
151	157	2	1	2	C INS HTG&CLNG PPG IN CLG	480	9176	10296	9206	11016	30
108	115	8	2	1	C INS SHT MTL DUCT&FTTNGS	4800	9206	10076	9296	10186	13
133	139	8	2	2	P INS SHT MTL DUCT FTTNGS	4800	9206	10116	9296	10206	15
152	159	3	3	2	C INS RUFF ELEC CNDT&FDRS		9206	10286	9226	11016	28
113	118	6	4	1	ER INT MSNRY PARTNS		9216	10066	9286	10136	11
136	153	8	1	2	INS TO/R PLMG RISERS	1920	9216	10126	9306	10216	15
138	154	5	6	2	C INS SPRINKLER PIPG	2400	9246	10266	9306	11016	22
118	121	3	5	1	P ER STUDS FOR DRY WALL		9296	10146	10016	10186	11
139	155	8	2	2	C INS SHT MTL DUCT&FTTNGS	4800	9306	10216	10116	11016	15
153	158	4	4	2	ER INT MSNRY PARTNS		10016	10226	10066	10276	15
121	124	3	5	1	C ER STUDS FOR DRY WALL		10046	10226	10066	10266	14
122	123	4	1	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
122	123	4	3	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
161	162	3	5	2	P ER STUDS FOR DRY WALL		10076	10286	10116	11016	15
126	127	2	1	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
126	127	3	3	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
162	165	4	5	2	C ER STUDS FOR DRY WALL		10126	11046	10156	11096	17
163	164	4	1	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
163	164	4	3	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
167	168	4	1	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11156	16
167	168	4	3	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11156	16
125	126	5	5	1	P HANG DRY WALL		10256	10256	10296	10296	0

I	J	DAYS	LOC RSP	CD	AND DESCRIPTION	COST	EARLY STRT SEQ E/S	L/S	E/F	L/F	TF
128	129	5	5	1	COMP HANG DRY WALL		11016	11016	11056	11056	0
130	131	4	1	1	INS FIN TUBE PIPING	960	11086	11086	11116	11116	0
166	168	6	5	2	P HANG DRY WALL		11086	11086	11156	11156	0
131	400	12	0	1	ET/R		11126	11126	11306	11306	0
168	169	6	5	2	C HANG DRY WALL		11166	11166	11236	11236	0
170	171	4	1	2	INS FIN TUBE PIPG	960	11246	11246	11306	11306	0

NETWORK MODEL FOR NEW OFFICE FACILITY HIGHLAND AND MORAN
KEITH, IOWA

VICTORIA MECHANICAL COMPANY

PROJECT NO 76-10 ISSUE NO. 1 DATED APRIL 26, 1976

RALPH J STEPHENSON P E - CONSULTANT

DATES ARE SHOWN AS MONTH,DAY,YR '0' IN 1ST COL INDICATES CRITICAL ITEM

I	J	DAYS	LOC RSP	CD	AND DESCRIPTION	COST	LATE E/S	STRT SEQ L/S	E/F	L/F	TF
1	2	106	0		T/R TO START OF PROJECT		1026	1026	5316	5316	0
2	7	102	0		T/R TO C EXT MSNRY&GLZNG		6016	6016	10226	10226	0
2	4	69	0	2	T/R TO POUR OUT 2ND DECK		6016	6166	9076	9226	11
2	3	65	0	1	T/R POUR OUT 1ST FL SOG		6016	6226	8316	9226	15
2	6	70	0	R	T/R TO C LAY INSUL & RFG		6016	7166	9086	10226	32
2	5	58	0	R	T/R TO C ER RF MTL DECK		6016	7206	8206	10086	34
105	111	9	1	1	INS TO/R PLUMBG RISERS	2160	9086	9236	9206	10056	11
102	108	8	2	1	P INS SHT MTL DCT&FTTNGS	4800	9086	9246	9176	10056	12
101	107	6	6	1	P INS SPRINKLER PIPG	2880	9086	9286	9156	10056	14
106	112	4	3	1	P INS RUFF ELEC CNDT&FDRS		9086	9306	9136	10056	16
103	109	3	1	1	P INS DMSTC WTR PPG-CLG	720	9086	10016	9106	10056	17
104	110	4	1	1	P INS HTG&CLNG PPG IN CLG	960	9086	10066	9136	10116	20
115	118	6	4	1	ER INT MSNRY PARTNS		9216	10066	9266	10136	11
108	115	8	2	1	C INS SHT MTL DUCT&FTTNGS	4800	9206	10076	9296	10186	13
135	139	8	2	2	P INS SHT MTL DUCT FTTNGS	4800	9206	10116	9296	10206	15
107	114	5	6	1	C INS SPRINKLER PIPG	2400	9166	10126	9226	10186	18
110	117	5	1	1	C INS HTG&CLNG PPG IN CLG	1200	9146	10126	9206	10186	20
136	153	8	1	2	INS TO/R PLMG RISERS	1920	9216	10126	9306	10216	15
109	116	3	1	1	C INS DMSTC WTR PPG-CLG	720	9136	10146	9156	10186	23
112	119	3	3	1	C INS RUFF ELEC CNDT&FDRS		9146	10146	9166	10186	22
118	121	3	5	1	P ER STUDS FOR DRY WALL		9296	10146	10016	10186	11
132	138	6	6	2	P INS SPRINKLER PIPING	2880	9166	10146	9236	10216	20
137	152	4	3	2	P INS RUFF ELEC CNDT&FDRS		9146	10186	9176	10216	24
122	123	4	1	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
122	123	4	3	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
134	140	3	1	2	P INS DMSTC WTR PPG-CLG	720	9136	10196	9156	10216	26
135	151	3	1	2	P INS HTG&CLNG PPG IN CLG	720	9146	10196	9166	10216	25
139	155	8	2	2	C INS SHT MTL DUCT&FTTNGS	4800	9306	10216	10116	11016	15
121	124	3	5	1	C ER STUDS FOR DRY WALL		10046	10226	10066	10266	14
153	150	4	4	2	ER INT MSNRY PARTNS		10016	10226	10066	10276	15
125	128	5	5	1	P HANG DRY WALL		10256	10256	10296	10296	0
138	154	5	6	2	C INS SPRINKLER PIPG	2400	9246	10266	9306	11016	22
126	127	3	1	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
126	127	3	3	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
140	156	3	1	2	C INS DMSTC WTR PPG-CLG	720	9166	10286	9206	11016	30
152	159	3	3	2	C INS RUFF ELEC CNDT&FDRS		9206	10286	9226	11016	28
161	162	3	5	2	P ER STUDS FOR DRY WALL		10076	10286	10116	11016	15
151	157	2	1	2	C INS HTG&CLNG PPG IN CLG	480	9176	10296	9206	11016	30
128	129	5	5	1	COMP HANG DRY WALL		11016	11016	11056	11056	0
163	164	4	1	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
163	164	4	3	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
162	165	4	5	2	C ER STUDS FOR DRY WALL		10126	11046	10156	11096	17
130	131	4	1	1	INS FIN TUBE PIPING	960	11086	11086	11116	11116	0

I	J	DAYS	LOC RSP	CD	AND DESCRIPTION	COST	LATE STRT SEQ E/S	L/S	E/F	L/F	TF
166	168	6	5	2	P HANG DRY WALL		11086	11086	11156	11156	0
167	168	4	1	2	C INS IN WLL MECH/ELEC WK 1920		10196	11106	10226	11156	16
167	168	4	3	2	C INS IN WLL MECH/ELEC WK 1920		10196	11106	10226	11156	16
131	400	12	0	1	ET/R		11126	11126	11306	11306	0
168	169	6	5	2	C HANG DRY WALL		11166	11166	11236	11236	0
170	171	4	1	2	INS FIN TUBE PIPG	960	11246	11246	11306	11306	0

NETWORK MODEL FOR NEW OFFICE FACILITY HIGHLAND AND MORAN
KEITH, IOWA

VICTORIA MECHANICAL COMPANY

PROJECT NO 76-10 ISSUE NO. 1 DATED APRIL 26, 1976

RALPH J STEPHENSON P E - CONSULTANT

DATES ARE SHOWN AS MONTH,DAY,YR '0' IN TFT COL INDICATES CRITICAL ITEM

I	J	DAYS	RSP	LOC CD	AND DESCRIPTION	COST	LATE FINISH SEQ E/S	L/S	E/F	L/F	TF
1	2	106	0		T/R TO START OF PROJECT		1026	1026	5316	5316	0
2	3	65	0	1	T/R POUR OUT 1ST FL SOG		6016	6226	8316	9226	15
2	4	69	0	2	T/R TO POUR OUT 2ND DECK		6016	6166	9076	9226	11
101	107	6	6	1	P INS SPRINKLER PIPG	2880	9086	9286	9156	10056	14
102	108	8	2	1	P INS SHT MTL DCT&FTTNGS	4800	9086	9246	9176	10056	12
103	109	3	1	1	P INS DMSTC WTR PPG-CLG	720	9086	10016	9106	10056	17
105	111	9	1	1	INS TO/R PLUMBG RISERS	2160	9086	9236	9206	10056	11
106	112	4	3	1	P INS RUFF ELEC CNDT&FDRS		9086	9306	9136	10056	16
2	5	58	0	R	T/R TO C ER RF MTL DECK		6016	7206	8206	10086	34
104	110	4	1	1	P INS HTG&CLNG PPG IN CLG	960	9086	10066	9136	10116	20
113	118	6	4	1	ER INT MSNRY PARTNS		9216	10066	9286	10136	11
107	114	5	6	1	C INS SPRINKLER PIPG	2400	9166	10126	9226	10186	18
108	115	8	2	1	C INS SHT MTL DUCT&FTTNGS	4800	9206	10076	9296	10186	13
109	116	3	1	1	C INS DMSTC WTR PPG-CLG	720	9136	10146	9156	10186	23
110	117	5	1	1	C INS HTG&CLNG PPG IN CLG	1200	9146	10126	9206	10186	20
112	119	3	3	1	C INS RUFF ELEC CNDT&FDRS		9146	10146	9166	10186	22
118	121	3	5	1	P ER STUDS FOR DRY WALL		9296	10146	10016	10186	11
133	139	8	2	2	P INS SHT MTL DUCT FTTNGS	4800	9206	10116	9296	10206	15
132	138	6	6	2	P INS SPRINKLER PIPING	2880	9166	10146	9236	10216	20
134	140	3	1	2	P INS DMSTC WTR PPG-CLG	720	9136	10196	9156	10216	26
135	151	3	1	2	P INS HTG&CLNG PPG IN CLG	720	9146	10196	9166	10216	25
136	153	6	1	2	INS TO/R PLMG RISERS	1920	9216	10126	9306	10216	15
137	152	4	3	2	P INS RUFF ELEC CNDT&FDRS		9146	10186	9176	10216	24
2	6	70	0	R	T/R TO C LAY INSUL & RFG		6016	7166	9086	10226	32
2	7	102	0		T/R TO C EXT MSNRY&GLZNG		6016	6016	10226	10226	0
122	123	4	1	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
122	123	4	3	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
121	124	3	5	1	C ER STUDS FOR DRY WALL		10046	10226	10066	10286	14
153	158	4	4	2	ER INT MSNRY PARTNS		10016	10226	10066	10276	15
125	128	5	5	1	P HANG DRY WALL		10256	10256	10296	10296	0
126	127	3	1	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
126	127	3	3	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
138	154	5	6	2	C INS SPRINKLER PIPG	2400	9246	10266	9306	11016	22
139	155	8	2	2	C INS SHT MTL DUCT&FTTNGS	4800	9306	10216	10116	11016	15
140	156	3	1	2	C INS DMSTC WTR PPG-CLG	720	9166	10286	9206	11016	30
151	157	2	1	2	C INS HTG&CLNG PPG IN CLG	480	9176	10296	9206	11016	30
152	159	3	3	2	C INS RUFF ELEC CNDT&FDRS		9206	10286	9226	11016	28
161	162	3	5	2	P ER STUDS FOR DRY WALL		10076	10286	10116	11016	15
128	129	5	5	1	COMP HANG DRY WALL		11016	11016	11056	11056	0
163	164	4	1	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
163	164	4	3	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
162	165	4	5	2	C ER STUDS FOR DRY WALL		10126	11046	10156	11076	17
130	131	4	1	1	INS FIN TUBE PIPING	960	11086	11086	11116	11116	0

I	J	DAYS	LOC RSP	CD	AND DESCRIPTION	COST	LATE FINISH SEQ E/S	L/S	E/F	L/F	TF
166	168	6	5	2	P HANG DRY WALL		11086	11086	11156	11156	0
167	168	4	1	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11156	16
167	168	4	3	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11156	16
168	169	6	5	2	C HANG DRY WALL		11166	11166	11236	11236	0
131	400	12	0	1	ET/R		11126	11126	11306	11306	0
170	171	4	1	2	INS FIN TUBE PIPG	960	11246	11246	11306	11306	0

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NETWORK MODEL FOR NEW OFFICE FACILITY HIGHLAND AND MORAN
KEITH, IOWA

VICTORIA MECHANICAL COMPANY

PROJECT NO 76-10 ISSUE NO. 1 DATED APRIL 26, 1976

RALPH J STEPHENSON P E - CONSULTANT

DATES ARE SHOWN AS MONTH,DAY,YR '0' IN TFT COL INDICATES CRITICAL ITEM

I	J	DAYS	LOC RSP	LOC CD	AND DESCRIPTION	COST	TOTAL FLT SEQ E/S	L/S	E/F	L/F	TF
1	2	106	0		T/R TO START OF PROJECT		1026	1026	5316	5316	0
2	7	102	0		T/R TO C EXT MSNRY&GLZNG		6016	6016	10226	10226	0
125	128	5	5	1	P HANG DRY WALL		10256	10256	10296	10296	0
128	129	5	5	1	COMP HANG DRY WALL		11016	11016	11056	11056	0
130	131	4	1	1	INS FIN TUBE PIPING	960	11086	11086	11116	11116	0
131	400	12	0	1	ET/R		11126	11126	11306	11306	0
166	168	6	5	2	P HANG DRY WALL		11086	11086	11156	11156	0
168	169	6	5	2	C HANG DRY WALL		11166	11166	11236	11236	0
170	171	4	1	2	INS FIN TUBE PIPG	960	11246	11246	11306	11306	0
2	4	69	0	2	T/R TO POUR OUT 2ND DECK		6016	6166	9076	9226	11
105	111	9	1	1	INS TO/R PLUMBG RISERS	2160	9086	9236	9206	10056	11
113	118	6	4	1	ER INT MSNRY PARTNS		9216	10066	9286	10136	11
118	121	3	5	1	P ER STUDS FOR DRY WALL		9296	10146	10016	10186	11
122	123	4	1	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
122	123	4	3	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
102	108	8	2	1	P INS SHT MTL DCT&FTTNGS	4800	9086	9246	9176	10056	12
108	115	8	2	1	C INS SHT MTL DUCT&FTTNGS	4800	9206	10076	9296	10186	13
126	127	3	1	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
126	127	3	3	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
101	107	6	6	1	P INS SPRINKLER PIPG	2880	9086	9286	9156	10056	14
121	124	3	5	1	C ER STUDS FOR DRY WALL		10046	10226	10066	10266	14
163	164	4	1	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
163	164	4	3	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
2	3	65	0	1	T/R POUR OUT 1ST FL SOG		6016	6226	8316	9226	15
133	139	8	2	2	P INS SHT MTL DUCT FTINGS	4800	9206	10116	9296	10206	15
136	153	8	1	2	INS TO/R PLMG RISERS	1920	9216	10126	9306	10216	15
139	155	8	2	2	C INS SHT MTL DUCT&FTTNGS	4800	9306	10216	10116	11016	15
153	158	4	4	2	ER INT MSNRY PARTNS		10016	10226	10066	10276	15
161	162	3	5	2	P ER STUDS FOR DRY WALL		10076	10286	10116	11016	15
106	112	4	3	1	P INS RUFF ELEC CNDT&FDRS		9086	9306	9136	10056	16
167	168	4	1	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11136	16
167	168	4	3	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11136	16
103	109	3	1	1	P INS DMSTC WTR PPG-CLG	720	9086	10016	9106	10056	17
162	165	4	5	2	C ER STUDS FOR DRY WALL		10126	11046	10156	11096	17
107	114	5	6	1	C INS SPRINKLER PIPG	2400	9166	10126	9226	10186	18
104	110	4	1	1	P INS HTG&CLNG PPG IN CLG	960	9086	10066	9136	10116	20
110	117	5	1	1	C INS HTG&CLNG PPG IN CLG	1200	9146	10126	9206	10186	20
132	138	6	6	2	P INS SPRINKLER PIPING	2880	9166	10146	9236	10216	20
112	119	3	3	1	C INS RUFF ELEC CNDT&FDRS		9146	10146	9166	10186	22
138	154	5	6	2	C INS SPRINKLER PIPG	2400	9246	10266	9306	11016	22
109	116	3	1	1	C INS DMSTC WTR PPG-CLG	720	9136	10146	9156	10186	23
137	152	4	3	2	P INS RUFF ELEC CNDT&FDRS		9146	10186	9176	10216	24
135	151	3	1	2	P INS HTG&CLNG PPG IN CLG	720	9146	10196	9166	10216	25

5.19

I	J	DAYS	LOC RSP	CD	AND DESCRIPTION	COST	TOTAL FLT SEQ E/S	L/S	E/F	L/F	TF
134	140	3	1	2	P INS DMSTC WTR PPG-CLG	720	9136	10196	9156	10216	26
152	159	3	3	2	C INS RUFF ELEC CNDT&FDRS		9206	10286	9226	11016	28
140	156	3	1	2	C INS DMSTC WTR PPG-CLG	720	9166	10286	9206	11016	30
151	157	2	1	2	C INS HTG&CLNG PPG IN CLG	480	9176	10296	9206	11016	30
2	6	70	0	R	T/R TO C LAY INSUL & RFG		6016	7166	9086	10226	32
2	5	58	0	R	T/R TO C ER RF MTL DECK		6016	7206	8206	10086	34

PROJECT STATUS REPORT FOR NEW OFFICE FACILITY HIGHLAND AND MORAN KEITH, IOWA

PROJECT NO 76-10 ISSUE NO. 1 DATED APRIL 26, 1976
VICTORIA MECHANICAL COMPANY

RALPH J STEPHENSON P E - CONSULTANT

LISTING IS IN LATE START SEQUENCE

ACTIVITIES FROM 9-24-76 TO 10-26-76

RETURN BY 10-19/76

I TASK	J	DESCRIPTION	-DEADLINE- START	FINISH	TOTAL DAYS	RESPONSIBILITY	COMMENT	DAYS LATE
2	7	T/R TO C EXT MSNRY&GLZNG	6 1 76	10 22 76	102	NOT ASSIGNED	SHOULD FINISH	
2	6	T/R TO C LAY INSUL & RFG	7 16 76	10 22 76	70	NOT ASSIGNED	SHOULD FINISH	
105 111 1		INS TO/R PLUMBG RISERS	9 23 76	10 5 76	9 2160	VICTORIA MECHNL	SHOULD FINISH	
113 118 1		ER INT MSNRY PARTNS	10 6 76	10 13 76	6	MASONRY CONTRCT	SHOULD START AND FINISH	
108 115 1		C INS SHT MTL DUCT&FTTNGS	10 7 76	10 18 76	8 4800	HVAC CONTRCTR	SHOULD FINISH	
133 139 2		P INS SHT MTL DUCT FTTNGS	10 11 76	10 20 76	8 4800	HVAC CONTRCTR	SHOULD FINISH	
110 117 1		C INS HTG&CLNG PPG IN CLG	10 12 76	10 18 76	5 1200	VICTORIA MECHNL	SHOULD FINISH	
136 153 2		INS TO/R PLMG RISERS	10 12 76	10 21 76	8 1920	VICTORIA MECHNL	SHOULD START AND FINISH	
109 116 1		C INS DMSTC WTR PPG-CLG	10 14 76	10 18 76	3 720	VICTORIA MECHNL	SHOULD FINISH	
112 119 1		C INS RUFF ELEC CNDT&FDRS	10 14 76	10 18 76	3	ELEC CONTRCTR	SHOULD FINISH	
118 121 1		P ER STUDS FOR DRY WALL	10 14 76	10 18 76	3	DRY WALL CONTRC	SHOULD START AND FINISH	
132 138 2		P INS SPRINKLER PIPING	10 14 76	10 21 76	6 2880	SPRNKLR CONTRCT	SHOULD START AND FINISH	
137 152 2		P INS RUFF ELEC CNDT&FDRS	10 18 76	10 21 76	4	ELEC CONTRCTR	SHOULD START AND FINISH	
122 123 1		P INS IN WLL MECH/ELEC WK	10 19 76	10 22 76	4 1920	VICTORIA MECHNL	SHOULD START AND FINISH	

5.21

PROJECT STATUS REPORT FOR NEW OFFICE FACILITY HIGHLAND AND MORAN
ACTIVITIES FROM 9-24-76 TO 10-26-76

RETURN BY 10-19/76

I TASK	J	DESCRIPTION	-DEADLINE- START	FINISH	TOTAL DAYS	RESPONSIBILITY	COMMENT	DAYS LATE
122	123		10 19 76	10 22 76	4	ELEC CONTRCTR	SHOULD START AND FINISH	
1	P	INS IN WLL MECH/ELEC WK			1920			
139	155		10 21 76	11 1 76	8	HVAC CONTRCTR	SHOULD START AND CONTINUE	
2	C	INS SHT MTL DUCT&FTTNGS			4800			
121	124		10 22 76	10 26 76	3	DRY WALL CONTRC	SHOULD START AND FINISH	
1	C	ER STUDS FOR DRY WALL						
153	158		10 22 76	10 27 76	4	MASONRY CONTRCT	SHOULD START AND CONTINUE	
2		ER INT MSNRY PARTNS						
125	128		10 25 76	10 29 76	5	DRY WALL CONTRC	SHOULD START AND CONTINUE	
1	P	HANG DRY WALL						
138	154		10 26 76	11 1 76	5	SPRNKLR CONTRCT	SHOULD START AND CONTINUE	
2	C	INS SPRINKLER PIPG			2400			

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

November 1,

Subject: Monitoring Report #1

New Office Facility

Highland and Moran, Keith, Iowa

Victoria Mechanical Company

Project: 76:10

Monitored from Issue #1 dated April 26,

Date of Monitoring: September 24, (working day 188)

Target Completion Date: November 30, evening (working day 234) for fin tube piping

Actions taken:

- Inspected project
- Reviewed job progress with superintendent
- Evaluated job progress
- Color coded networks

General Summary

As of September 24, (working day 188) the project is basically in healthy condition. An evaluation of the job against late starts and late finishes shows that all major tasks are currently meeting or bettering late starts and late finishes.

Accurate information on exterior masonry and glazing status was not available from the general contractor. This work should be watched carefully since it affects hanging board upon which installation of our fin tube piping depends.

Projecting directly from late start/late finish sequences, it appears activities over the next two weeks should include:

- continuing installation of all major riser and overhead mechanical and electrical work
- installation of interior masonry partitions
- installation of insulation and roofing
- erection of exterior masonry and glazing

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

It is anticipated that on September 29, according to the current early start schedule, studs for drywall are due to start at the first floor. However, looking at installation progress of toilet room plumbing risers, it appears these are lagging early start/early finish targets. Therefore, interior masonry which restrains installation of studs will probably be late and may delay installation of in-wall work past the current desired early target of October 4, (working day 194).

In a conference with the drywall contractor on September 24 (working day 188) he said he would prefer to erect studs and install one side of the board. We told him that this was not a desirable procedure and asked him if he would leave both sides exposed. He agreed, providing we would be liable for any damage to his studs by our work. We agreed.

In summary, the project is moving fairly well. The superintendent is on top of the job and our projections for work over the next week indicate the job should stay healthy.

Ralph J. Stephenson, P.E.

RJS
m

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

Monitoring #2

Project Status as of morning of Oct. 8 (working day 198)

Task	Color Code	Status	Was completed evening of	Will be completed
108 - 115		Comp.	Sept. 30	----
109 - 116		Comp.	Sept. 28	----
110 - 117		Comp.	Sept. 30	----
105 - 111		Comp.	Oct. 5	----
112 - 119		Comp.	Sept. 28	----
132 - 138		Comp.	Oct. 6	----
133 - 139		Comp.	Oct. 1	----
136 - 153		10% comp.	----	in 6 working days
137 - 152		Comp.	Sept. 30	----
138 - 154		10% comp.	----	in 20 working days (material problems)
139 - 155		50% comp.	----	in 3 working days
140 - 156		Comp.	Sept. 27	----
151 - 157		Comp.	Oct. 5	----
152 - 159		Comp.	Oct. 7	----
2 - 6		Comp.	Oct. 4	----
2 - 7		70% comp.	----	in 15 working days

Ralph J. Stephenson PE PC
Consulting Engineer

Section #6

The problem job & its documentation

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

Claim Prone Job Characteristics

During the profiling, proposing and negotiating period, it is often possible to gain a good insight into the expected nature of a job if one is fortunate (or unfortunate) enough to be the successful proposer. The problem job is becoming increasingly serious in our business and professional lives and it should be identified early. The problem job generally results in increased costs during the construction period and quite often requires arbitration or litigation to achieve resolution of costs and damages.

Thus, it is good policy for the perceptive owner, architect/engineer and contractor to become familiar with those characteristics that early identify a job as having potential for being a trouble project.

This list of characteristics is by no means complete, nor is it meant to imply that a job having these features will necessarily be claim prone. It is, on the other hand, an honest effort to state certain unique job features that have been identified in projects that have ended up in litigation or arbitration. The list is at random with no attempt to classify or characterize the features.

Claim prone job characteristics may include:

a. A wide spread in proposal prices.

b. Issuance of a large number of pre-bid addenda and instructions.

c. For subcontractors, a poor general contractor reputation if the project is being built by one prime.

d. For projects with separate primes, poor other prime contractor reputations.

e. More than four to six prime contractors involved(applicable on normal building work only).

f. Poor reputation of architect/engineer preparing contract documents.

g. Excessive how-to-do-it emphasis in contract drawings and specifications.

Claim Prone Job Characteristics
(continued)

h. Non-liable party involvement in responsible positions, i.e. non-liable construction manager.

i. Large numbers of allowance items.

j. Zero (or excessively small) tolerance specifications.

k. Poorly defined authority and responsibility patterns in the offices of the architect/engineer, the owner, the general contractor or other prime contractors.

l. Inexperienced specialty contractors.

m. Excessive number of pre-selected suppliers for key material and equipment.

n. Large dollar amount or numbers of owner purchased equipment.

o. Location in strike prone areas.

p. Location in jurisdictionally sensitive areas.

q. Heavy use specified for untried products and equipment.

r. Non-liable party involvement in establishing delivery commitments, i.e. construction manager, architect/engineer, owner representative.

s. Involvement of politically accountable owners, architect/engineers or other contractors.

t. Multi responsibility payment structures.

u. Excessively long time periods to award contracts after a proposal.

(Note: This often occurs in public work where many non-project approvals and agencies are involved.)

v. Poor owner reputation.

Ralph J. Stephenson PE PC
Consulting Engineer

COMMON CAUSES OF CONTESTED CLAIMS

Contested construction claims have increased over the past few years and now must be recognized as a serious road block to proper and profitable construction procedures.

The reasons for the increase in contested claims are many and must be understood in the sense that our society has become somewhat legalistic. That is to say, the recourse to legal resolution, as opposed to interpersonal, technical, or administrative resolution of problems has become a common fortunately shows some signs of diminishing as costs and time involvement in legal matters have increased astronomically.

However, there are claims, there always have been claims, and there will probably always will be contested claims. Those in construction should however, thoroughly understand the structure of the contested claim.

Specifically, contested claims lead to resolution by an administrative settlement, litigation, arbitration, or mediation. There are some common causes of conflict and it is these that stimulate the parties to go to a formal settlement by outsiders. It is important for those in construction to understand how to avoid the mistakes that cause wasteful contested claims.

Several years ago a firm specializing in construction claims and their settlements studied some of the most common causes of disputes. Of two hundred occurrence of contested claims the following percentages were found.

1. Directed Change - 48%

A legitimate change within the contract scope for which the owner must pay.

Examples
- Owner changes the door color after the door is painted.
- Owner revises size of electrical room door opening

Advice
- Required extensions of time should be stated in writing.
- Costs for extended general conditions should be agreed upon early.
- The client or owner is obligated to pay for the change, if there is a charge.
- Payment for the work should be explicitly agreed upon before starting.

2. Constructive change - 42%

An owner's action or inaction that has the same effect as a written order.

Examples
- Shop drawing corrections, showing additional work not covered in contract documents.
- Owner's representative tells a superintendent to relocate a wall with no payment intended.

Advice
- Don't assume changes will be free. Find out if there is a cost.
- Don't enrich contract documents.
- Don't enrich shop drawings.
- Make certain the scope and costs of additional work is clearly understood.

3. Defective or deficient contract documents - 41%

Contract documents which do not adequately portray the true contract scope.

Examples
- A retaining wall shown dotted on the contract documents and expected by the architect/engineer and the owner to be built as part of the contract.
- Dimensional errors that cannot be resolved by verbal clarification.
- Contract documents that expect performance by default. For instance, specifying a miscellaneous iron ladder but not showing it on the drawings.

Advice
- Expect to pay your architect and engineer for good quality assurance in the production of contract documents.
- Select your design team on the basis of performance not cost.
- Clearly define design and construction delivery methods to be used.
- Don't expect your contractor to design the job unless it is a design/build project.
- Don't make unrecorded corrections to contract documents.

4. Delays - 41%

A delay situation beyond the control and not the fault of the contractor.

Examples
- Rock encountered that delays the job but was not shown on the contract documents.

Advice
- Be as thorough as possible in defining physical conditions of the site upon which the facility is to be constructed.
- Specify weather standards when it is necessary to clarify time extensions that might be caused by inclement weather.
- Determine delay costs quickly and eliminate them as soon as possible.
- Don't stop field work without proper authority and a very good reason.

5. Constructive acceleration - 35%

More work with no time extensions, or the same work and a shorter time period in which to do it.

Examples
- Owner refuses to grant time extension for work that will take longer to perform.
- Owner makes unauthorized use of critical path time without extension.
- Owner makes use of float time with the expectation that the contractor will not request or require a time extension.

Advice
- Never assume the contractor will do extra work within the contract time.
- Work out an early agreement on the use of float time in the network model.
- Never assume a field order is a no cost, no time extension change.

6. Maladministration - 35%

Owner interference with the contractor's right to enjoy least cost performance.

Examples
- Owner directs contractor to provide a certain space in a facility early without such early turn over having been specified in contract documents.
- Owner directs contractor to start work on an encumbered site.
- Architect/engineer unresponsive to legitimate requests for information.

Advice

- Always allow the contractor to select construction methods and means.
- Make certain the site is fully available to the contractor before the job begins.
- Process submittals promptly.
- Clearly define the time frame and the sequence by which submittals are to be processed, and do it early in the job.

7. Differing site conditions - 31%

The actual site differs from that represented on the contract documents, or deviates from ordinary or normal expectations of such a site in that area.

Examples
- Artesian water encountered in sand seam outside of where soil borings were taken.
- Existing basements encountered but not indicated on contract documents.
- Restrictive easements or assessments on the property not made known to the contractor before contract execution.

Advice
- Expect to pay for and get a good site survey
- Make certain soil borings are adequate to show any unusual conditions.
- Locate and define all easements.
- Check the site history for unusual or restricted conditions.
- Take photos of any unusual conditions encountered.

8. Impossibility of performance - 18%

A situation where it is impossible to carry out the contract work.

Examples
- Expecting a contractor to work on an encumbered site.
- Owner refuses to move interfering utilities he is supposed to relocate by contract.
- Specifying installation of above ceiling work that won't fit in the space provided.

Advice
- Expect the design team to check their work thoroughly for interferences.
- Accept your legitimate design and administrative duties and responsibilities and take care of them.
- Resolve dimensional difference early.
- Do your homework to presolve expected problems and interferences.

9. Superior knowledge - 18%

Withholding data or information during the pre contract period, that affects construction on matters of importance.

Examples
- On a steel erection contract not telling the bidders that the steel had been refabricated from a previous job.
- Failing to tell bidders that there is a cost cap on the first two months costs
- Not telling bidders that there is a high pressure gas line through the site that must be accommodated during construction.

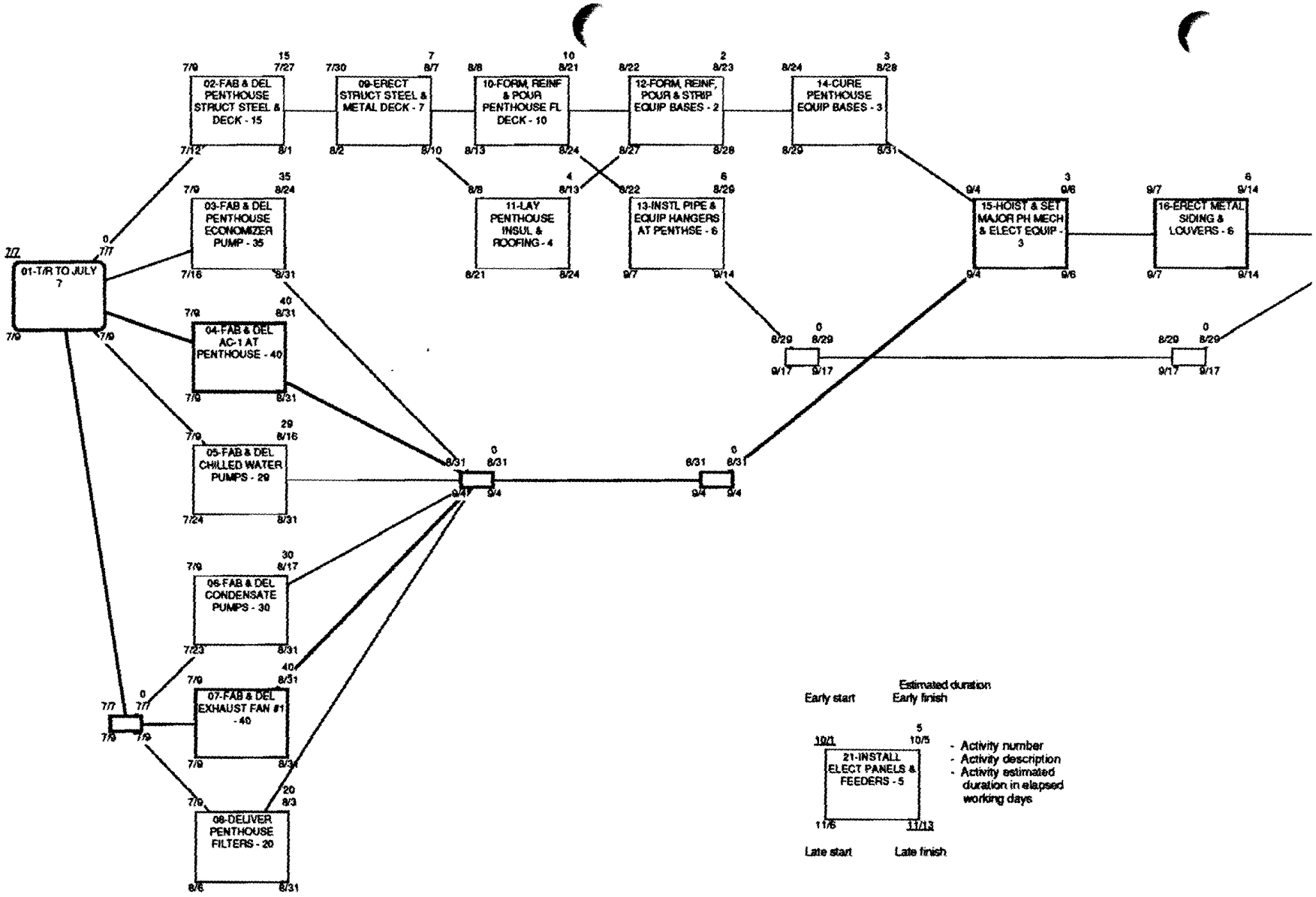
Advice
- Be certain all bidders know as much as they must know to propose properly.
- Be certain demolition contract documents specify all work to be done.
- Locate, to the best of your ability, all site obstructions before bidding.
- Don't expect the contractor or the architect and engineer to read your mind.

10. Termination - 7%

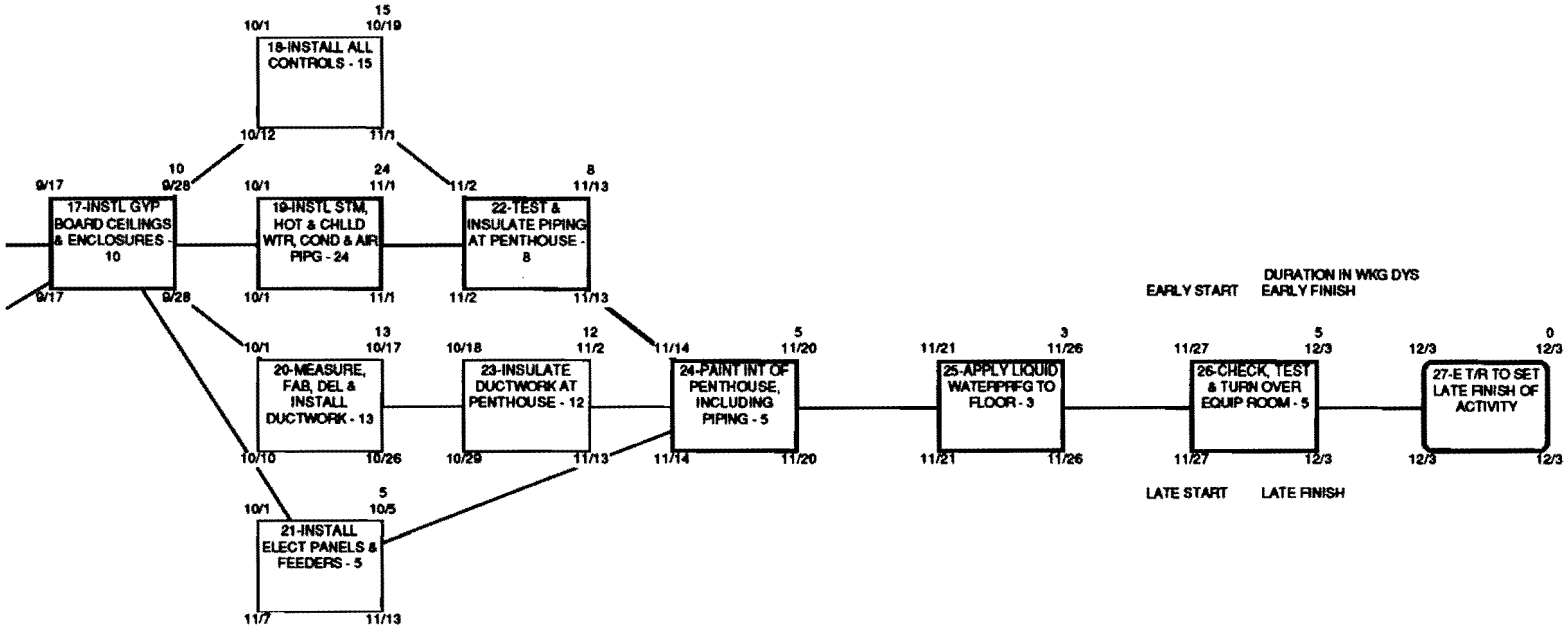
Dismissal from the project for convenience or default.

Examples
- The section of the project is no longer needed and is removed from the contract.
- The contractor is behind schedule.
- The contractor's performance is unsatisfactory.
- The owner doesn't like the way the superintendent talks back to him.
- The contractor doesn't manage submittals promptly and accurately.

Advice
- Be certain the cause for dismissal is legitimate and well defined.
- Don't dismiss for minor reasons. Dismissal is serious business.
- If dismissing, be certain proper notice is given.
- Insure the contract documents give you the right to dismiss.



ACTIVITY DATA KEY



C.09

Base Plan of Action

NETWORK MODEL FOR CLARION OFFICE BUILDING PENTHOUSE MECHANICAL EQUIPMENT ROOM #1

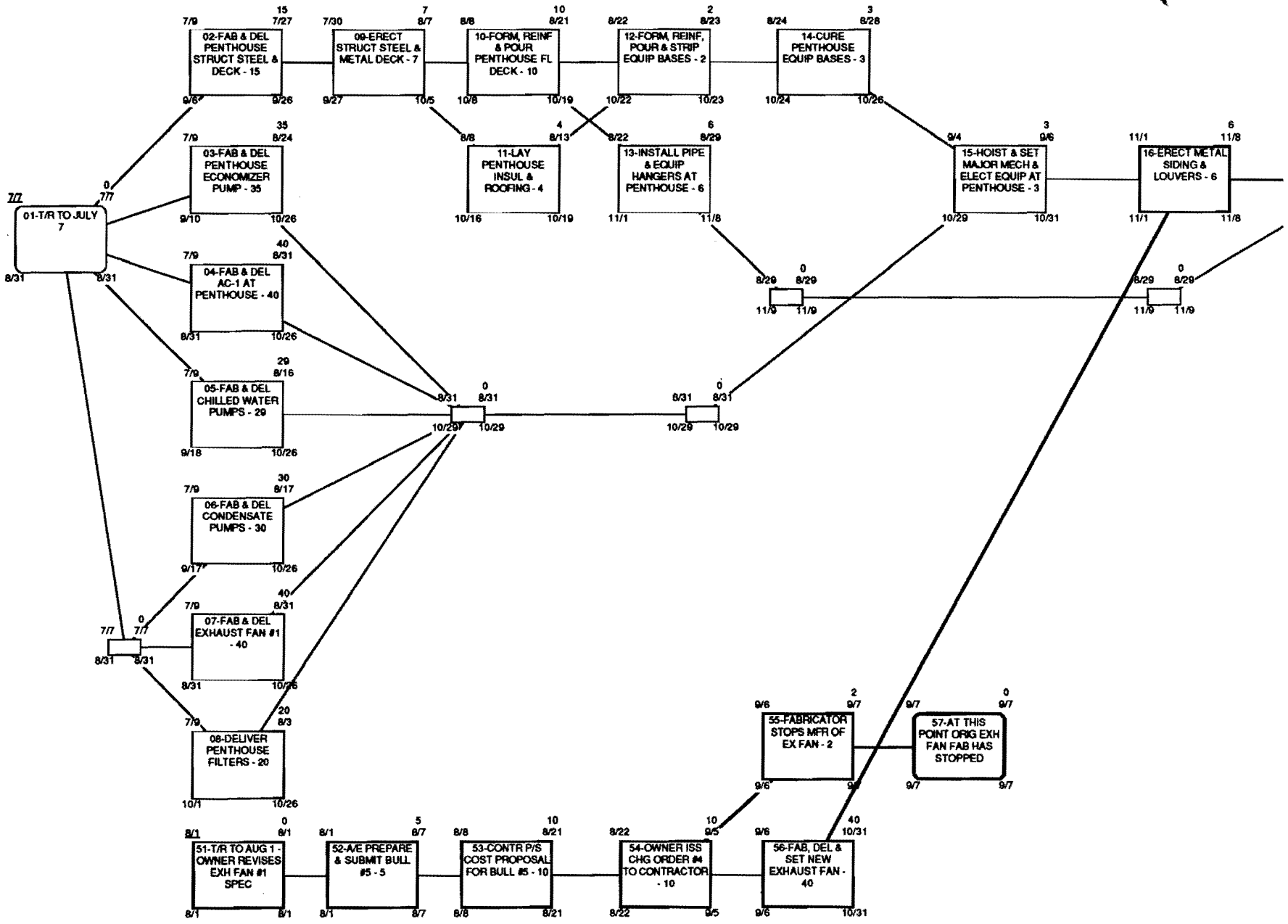
Luther Mechanical Contractors
Washington D.C.

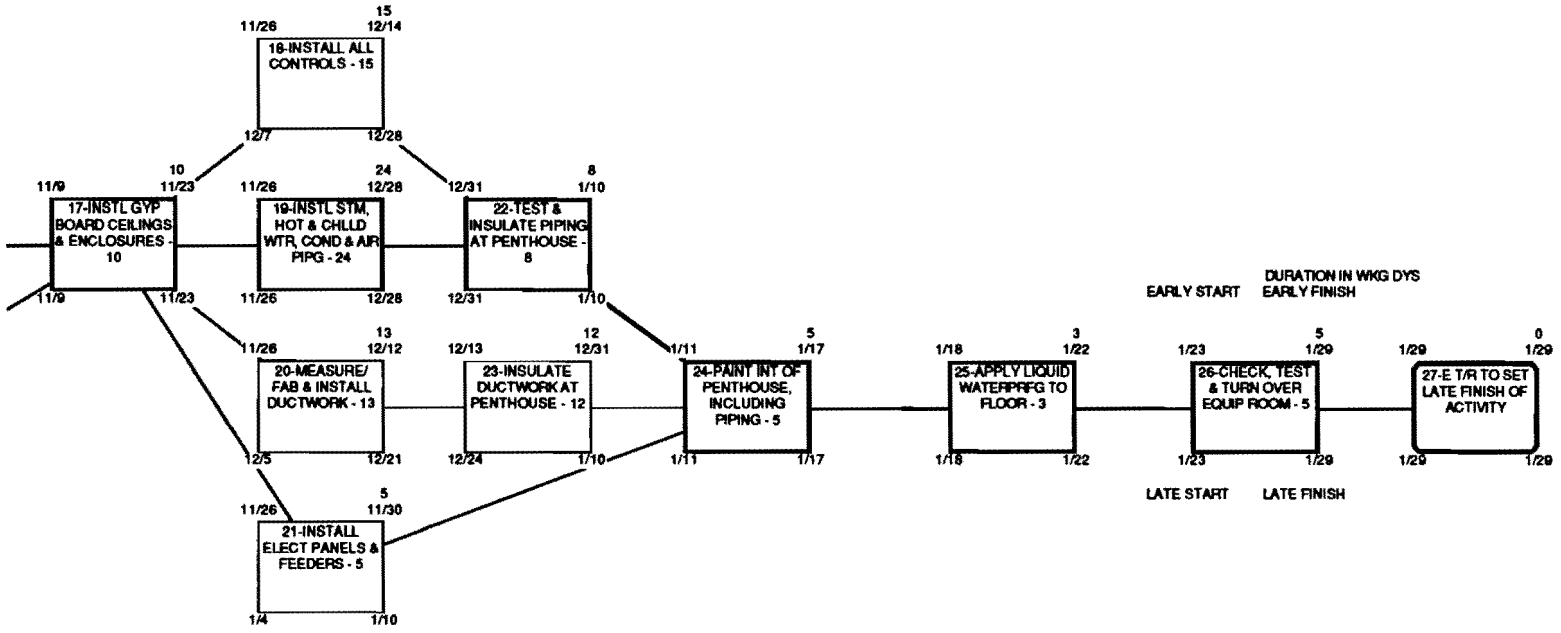
Issue #1 - July 7
330 clarion base plan
disk 162

Reserved Activity Numbers

041	046
042	047
043	048
044	049
045	050

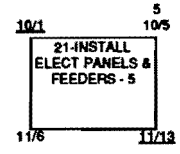
sheet ph-1


01-T/R TO JULY 7
02-FAB & DEL PENTHOUSE STRUCT STEEL & DECK - 15
03-FAB & DEL PENTHOUSE ECONOMIZER PUMP - 35
04-FAB & DEL AC-1 AT PENTHOUSE - 40
05-FAB & DEL CHILLED WATER PUMPS - 29
06-FAB & DEL CONDENSATE PUMPS - 30
07-FAB & DEL EXHAUST FAN #1 - 40
08-DELIVER PENTHOUSE FILTERS - 20
09-ERECT STRUCT STEEL & METAL DECK - 7
10-FORM, REINF & POUR PENTHOUSE FL DECK - 10
11-LAY PENTHOUSE INSUL & ROOFING - 4
12-FORM, REINF, POUR & STRIP EQUIP BASES - 2
13-INSTALL PIPE & EQUIP HANGERS AT PENTHOUSE - 6
14-CURE PENTHOUSE EQUIP BASES - 3
15-HOIST & SET MAJOR MECH & ELECT EQUIP AT PENTHOUSE - 3
16-ERECT METAL SIDING & LOUVERS - 6
51-T/R TO AUG 1 - OWNER REVISES EXH FAN #1 SPEC
52-A/E PREPARE & SUBMIT BULL #5 - 5
53-CONTR P/S COST PROPOSAL FOR BULL #5 - 10
54-OWNER ISS CHG ORDER #4 TO CONTRACTOR - 10
55-FABRICATOR STOPS MFR OF EX FAN - 2
56-FAB, DEL & SET NEW EXHAUST FAN - 40
57-AT THIS POINT ORIG EXH FAN FAB HAS STOPPED



Change order impact on base plan of action

Estimated duration
Early start
Early finish



- Activity number
- Activity description
- Activity estimated duration in elapsed working days

Late start
Late finish

ACTIVITY DATA KEY

Issue #1 - July 9
Issue #2 - August 1
333 clarion chg order
disk 162

Reserved Activity Numbers

041	046
042	047
043	046
044	049
045	050

NETWORK MODEL FOR CLARION OFFICE BUILDING PENTHOUSE MECHANICAL EQUIPMENT ROOM #1

Luther Mechanical Contractors
Washington, D.C.

sheet ph-1

Ralph J. Stephenson PE PC
Consulting Engineer

General Steps Taken in Processing A Construction Claim

Review and study draft only

The starting point of most construction related claims is when one of the parties involved feels they have been harmed in some manner by the actions of another involved party. Of course there are many variations on this basic theme. Due to the number, complexity and combinations of circumstances under which a contested claim may arise, let us first take a specific set of project delivery criteria and examine the steps that might be followed in resolving a typical dispute.

Assumptions - The project is a hard money, fixed time job in which the construction firm doing the work is considered a prime contractor, with a conventional construction contract with the owner. The owner has had his design team prepare a relatively complete set of contract documents from which contractor selection was made by competitive bidding from a short list.

Further assume that at some point in the construction process the owner takes an action that seems to interfere with the right of the contractor to enjoy a maximum profit from his construction efforts (sometimes called maladministration), while, in the contractor's opinion, he is still performing in accordance with his contract obligations.

To describe an instance where this could actually happen, suppose the contract calls for completion of the total facility by September 1st with no specified intermediate dates for owner occupancy of the facility. Part way through the job the owner makes it known to the contractor that he wants the upper floors delivered by July 1st, but will still take the lower floors on September 1st. The owner says this should be at no additional cost to him since the contractor was planning to be done about that time anyway. The contractor proceeds to try and accommodate the owner.

Usually in a good contractor/owner relation a matter of this nature can be worked out amiably and to the mutual operational and financial satisfaction of both parties, the owner and the contractor.

However in this case, assume the revisions apparently cause considerable disruption of sequencing, delivery commitments and manpower assignment to the project over what had been planned by the contractor. An effort to resolve the matter equitably for both parties has been made and was unsuccessful. Clearly, where the financial and other losses of the contractor, real or imagined, is sizable, another method of approaching a

settlement must be found.

Now, the first step in a formal resolution takes place - making a decision on the preferred or specified method to use to settle. Usual methods are:

- Administrative settlement
- Mediation
- Arbitration
- Modifications or combinations of the above

Usually the preferred solution by most parties to a dispute is by some type of administrative settlement through discussion among the operational and executive staffs of the owner and the contractor. Where this proves difficult or impossible, succeeding steps are usually taken.

For our example let us start by considering litigation.

Litigation is the settlement of a dispute through the efforts of a third party operating under legal rules governing the presentation, consideration and judgments rendered in the case. It is to be emphasized that the steps outlined below are not to be considered the formal legal steps to be taken, but within the writer's experience are steps most contested claims in which he has been involved with follow to their resolution.

There may be considerable variation in the sequence in which the steps are taken. However at some time in the process each of the following actions must be considered, and if appropriate, taken. The steps are lettered for convenience of reference, but are not necessarily listed in the sequence in which they may be taken.

- **Step A** - The need for a claim emerges and the parties involved discuss the matter. There is either a resolution, a decision to pursue the matter further administratively, or a decision to file for formal action resulting from the discussions.

- **Step B** - If a resolution is not achieved, the contractor will probably prepare additional submittal material identifying the circumstances, the effects, the impacts and the approximate reimbursement felt due him as a result of imposition of other than contract conditions on his work.

- **Step C** - This submittal material is then presented by the contractor to the owner and further discussions are held. These hopefully will lead to an administrative settlement.

If not, the contractor may file through his legal advisors, a request for one of several kinds of formal third party decision actions, such as mediation, arbitration or litigation. The discussion in this paper deals primarily with the technical steps usually followed in litigation.

• **Step D** - The contractor through his legal advisors, then actually files for litigation. This is a complex and formal process, a description of which is beyond the scope of this essay.

• **Step E** - As the petition for litigation is being filed, the contractor selects the issues to be addressed that have contributed to the claim, and the level of documentation he and his technical and legal counsel feel appropriate.

• **Step F** - If a relatively low level of documentation has been deemed adequate, since the causes and proof of the contested claim issues seem apparent, the contractor's staff will usually assemble the claim file and estimate the cost of the damages caused by the owner's apparent interference.

If the nature of the claim is such that many complex and obscure factors have contributed to the claimed loss, or the proof of loss appears excessively complex, the contractor may call in an outside qualified and objective expert to help assemble the documents, the facts and the amounts to be claimed.

• **Step G** - The backup documentation concerning correspondence, transmittals, estimates, change processing, directives, and other pertinent historical records is assembled into a data system which allows the location, printing, abstracting and relative rapid analysis of groups of documents or records relating to any subject, chronology, organization or other classification system desired.

• **Step H** - Concurrent with preparation of detailed document files, the discovery of evidence by both parties is pursued. This discovery period is often characterized by demands for what are called interrogatories and depositions. It is to be emphasized that the discovery period in litigation is primarily to uncover evidence, its source, its existence and its nature.

Because of the often difficult nature of activities during discovery in the litigation process it is usually an advantage for the contractor to have his outside experts work directly for the legal advisor. This may provide some protection to the consultant work product and thus shield it from those not friendly to the contractor.

• **Step I** - As discovery proceeds, the parties to the dispute should be, and usually are, trying to agree on an administrative settlement as the various claims and counter claims statements emerge.

Also, during the discovery period face to face attempts to uncover evidence are accomplished most commonly by deposition. The deposition consists of testimony and questioning, again aimed at evidence location. The deposition period will usually continue over a period specified loosely by the governing judicial body in the matter.

From depositions, additional documentation is found, and if wanted by a party to the dispute, subject to acquisition by the subpoena process. This process usually does not allow material prepared by a consultant for an attorney to be acquired through subpoena. This is the main reason for having the legal consultant work directly for the legal consultant and prepare confidential data and analyses for the attorneys. This material is sometimes known as a protected work product.

An important feature of the discovery/subpoena process is that few if any documents prepared during the course of the job can be totally shielded from acquisition by the opposition. Therefore there is a strong need for good, intelligently written documentation of the job during its construction.

• **Step J** - At some point, usually determined by the governing legal body, the discovery period is declared closed and formal legal hearings now begin. By this time a selection and settlement on the type of litigation decision making process has been made. The two most common methods are the bench trial and the jury trial.

A bench trial is conducted by a judge only, and he makes the decision in the matter after the hearings have been completed. The jury trial uses a jury of lay individuals to hear the testimony and to judge the merits of the case.

In technical matters, such as construction, it is most often found that a bench trial is preferable to the jury trial due to the difficulty in presenting understandable evidence to a group of lay people, who often are not acquainted either with the legal process or the design and construction industry.

• **Step K** - During the formal trial process the parties to the contested claim present their respective views in arguments, displays of evidence, direct questioning and cross examination of witnesses. The judge, in a bench trial, or the jury, in a jury trial, listens

to the presentation of evidence until the arguments are exhausted, and both sides or the judge calls it quits.

During the hearing process many people may be called to the witness stand to answer questions. Those who have given depositions may be closely questioned on statements made by them during the deposition, particularly in relation to additional information that has come out during subsequent depositions, interrogatories or in court.

• **Step L** - Once the governing legal body declares the trial completed, the case is closed and either the judge, in a bench trial, or the jury, in a jury trial, retire to review the evidence, think about the testimony and the evidence, and to make a decision from the choices presented during the trial.

• **Step M** - When a decision as to the relative merits of each party's case is reached by the judge or the jury, the decision is announced and the settlement of claim is decided on by the governing legal body. This then closes out the case as originally heard and judged upon. From this point on there are several legal actions possible that could reopen the matter of the contested claim and its merits. A discussion of these is beyond the scope of this paper.

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Section #7

Case studies

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Pointers for Reading, Analyzing and Solving Case Studies

We will be using miniature case studies occasionally to point up various features of project planning and control systems. The suggestions below are to help you gain the most from the case study work.

Pointer 1

Read the case study carefully and try to get an overall managerial feeling for the situation and problems. The first scanning should be rapid with brief returns to specific problems. Underline and highlight key points as you go through the case study the first time.

Pointer 2

Where problems seem to exist in the description, isolate these even though they appear minor, and give them a mental priority ranking as you read through the study the first or second time. Identify problems to be solved and actions to be taken by asterisks or some other identifying mark.

Pointer 3

Clearly identify your position in the case study. What is it you are supposed to be, and how are you supposed to act? This activity is called internal role playing and is a good simulation technique for solving problems from your standpoint.

Pointer 4

Always ask yourself the basic questions about any situation - who?, what?, why?, when?, where? Without the answers to these five fundamental one word questions, an analysis may be incomplete and faulty.

Pointer 5

Be certain to answer the problem questions as fully as time permits. Normally the minutes allocated to a case study will be few and it is important to focus quickly upon the essential elements of the problems presented.

Pointer 6

When the case study is discussed, don't hesitate to bring out points you feel are important. Also learn from other's solutions. Remember there are usually many ways to solve problems and resolve difficulties.

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Case Study for Preparing Forms

Define a situation in which it may be necessary for you to prepare a form for transmitting, receiving or tabulating information on a regular and somewhat standardized basis. The need can be taken from your own work experience, or you may choose to select one of the situations listed below to use as a basis for the form design.

Situation #1 - Owner - Review and approval of submittals (turnaround) is being delayed by an inadequate understanding of the paper flow which is from the general contractor, to the owner, to the architect/engineer of record, to the owner and back to the general contractor. You are the owner. Design a form that may help alleviate the situation.

Situation #2 - Architect/engineer - It is time for you as the architect/engineer to begin punching out the back-of-house ballroom, meeting room, restaurant, lobby and food service areas of a new hotel. The owner is expecting clear cut sign off points so he can begin installing his fixtures, furnishings and equipment (FFE) with no residual complaints from the general contractor,and clear cut acceptance of the space from the FFE contractor. Design a punching out system and form that will satisfy yours, the contractor's & the owner's needs.

Situation #3 - General contractor - As the project manager for the general contractor on a new 5 story office building you are responsible for keeping the official construction meeting minutes at job meetings with the owner, the architect/engineer and the major sub contractors. You feel it might be well to devise a standard form to use for each meeting so you are certain to include all the agenda items necessary to cover at each meeting. Design an outline form on which you could hand write the minutes directly and efficiently for later typing by the field office receptionist.

Situation #4 - Construction manager - Procurement of critical materials and equipment has become very critical on a large research and development project for which you are the liable construction manager. It is felt important by all that a comprehensive check list be provided to all major contractors on the job for them to indicate procurement status twice per month on all critical items. One of the items of importance is to provide an index of procurement criticality. Design a form that will provide you the information you need.

Situation #5 - General contractor - You are a general contractor on an addition to a new city hall in a middle size mid west town. For several reasons the owner is not communicating well with you, particularly so far as payment procedures, supplemental instructions to you and your subcontractors, and items that concern checking of shop drawings and the flow of submittals from and to you through the architect and engineer. It is early in the job and you want to channel communications so you can operate effectively. Design a form that will indicate the proper flow of information between you and the other parties where owner input is essential.

Situation #6 - Design build - You are the vice president of operations of a moderate size design build firm. The company is being asked with increasing frequency to evaluate potential sites that might be available to your clients and prospects for building, or to you to add to your own property portfolio. Design a site survey and information form that will give you the information needed to quickly and thoroughly locate a site with given characteristics and allow you to quantitatively evaluate its value for a given use.

Situation #7 - Owner - As an owner of a chain of franchised fast food restaurants you are beginning to lose valuable data on proposal tabulations of major contract work on your facilities. You have built 12 restaurants and have available in your files, contractor proposal data on each, along with a detailed description of each site facility developed to date. Design a form that will allow you to tabulate the essential information so as to help in selecting contractors on your future jobs. You will soon be building 15 more restaurants in locations within a radius of 50 miles of your office.

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The Case of the Changing Library

A study in the analysis of construction documentation

You work for Joe Gather, the Director of Physical Plant at West Fork University, a state college in Maine. Currently you are acting as the owner's project manager on a $4 million library addition for the school. It is late March, and the project is to be completed by early July, next year. Construction is proceeding under a traditional project delivery system.

The first three months of the job have gone well. Mobilization and site layout proceeded as scheduled, mass excavation is substantially complete, and all spread footings are installed. Basement wall construction is now moving into full production.

Over the past 3 weeks there have been some concerns on the part of the architect, the engineer and the general contractor about possible changes to the project. A new director of library services, Larry Insotel, recently joined the staff and is mildly criticizing the design, privately to you, and by inference in the weekly construction meetings. It is your intent to have these meetings weekly until the substructure is complete and then to conduct them every 2 weeks up to the point when the building is closed to weather.

Mr. Insotel has a moderate knowledge of building design and construction but has never participated in a major facility expansion. He is conscientious about his responsibilities, and seems to respond well to predictable demands made on his time. He reports directly to the Vice President of Administrative Services, the same vice president to whom Joe Gather reports.

You realize that you will soon have to do something about the matter of change implications and rumors, since field work is showing signs of slowing. Nobody on the project apparently wants to go through the trouble and potential expense of unneeded revisions, cost fishing expeditions, bulletins, change orders and long arguments about how to collect for the extra money and time that might be involved.

As the owner's project manager and design and construction representative on the job answer the following questions

1. Specifically, what are the potential problems in this situation?

2. What steps would you take now to help resolve any current or potential problems you have identified in question 1 above?

3. What indications are there that any of the problems might be cleared by the use of appropriate documentation.

4. What documentation would you design to permanently (for the full length of the project), or temporarily (tailored specifically to a temporary problem) help restore full and confident job implementation in the field?

5. Write a mission statement for the documentation system you are considering.

6. Prepare a layout and description of one of the documents you would tailor to the current project situation.

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The case of the resource sensitive school project

A project management case study in the allocation of resources

You and your partner own a small flat work firm, Regal Construction, Inc. located in northern Missouri. You are Alan Dobson, president ,and your partner is Fred Mikello, vice president. Both of you came from a large general contractor, the Rasmussen Company, where you were a senior project manager, and Fred was a senior field superintendent. The general superintendent for Rasmussen was George Bushnell, a good friend to both of you.

You each left Rasmussen about eight months ago to start Regal, and have done reasonably well constructing a small volume of sidewalks, drives and masonry work along with some earthwork and carpentry. You've been able to purchase a front loader and are now actively involved in finding ways to keep your equipment and tradesmen, mostly laborers and cement finishers, busy.

This morning George Bushnell called and said Rasmussen had just been awarded the general contract on a large educational park. The first of the projects is three moderate size masonry wall bearing buildings. They must start in the field immediately, but George says he cannot man the job for another 2 weeks. He asked if Regal could start within two days on layout, clearing the site and constructing the concrete and masonry foundations for the first three buildings, A, B & C. Footprint sizes of the buildings are for A - 150' x 200', B - 200' x 250' and C - 200' x 200'.

You reply that you could move on site immediately. George says to give him a rough budget estimate along with a plan of work, a schedule and an idea of how Regal would man the job all by tomorrow noon. If the cost and the schedule are in the ball park you have a job.

The business and management objectives you are thinking about as you consider how to plan the job include:

1. Maintain the plan of work finally agreed on. Plan the work and then work the plan!

2. Maintain crew integrity. Don't split a composite work crew.

3. Don't interrupt an activity once it has started.

4. Keep the total time of the job to no more than four and a half weeks.

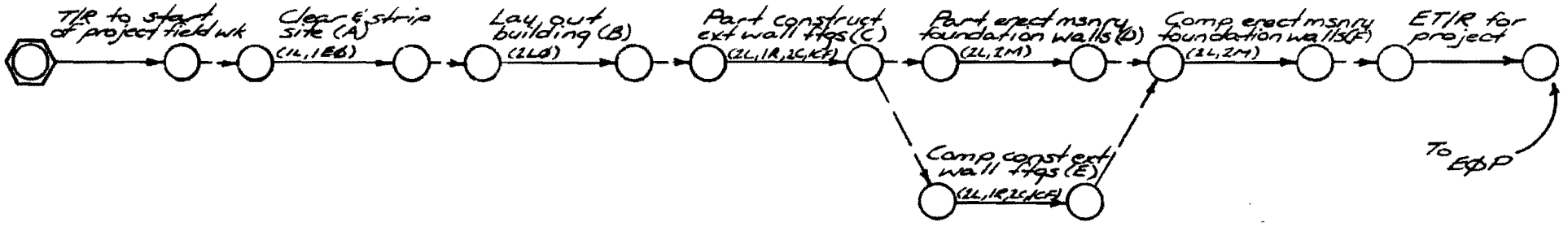
5. Balance tradesmen use on the job, particularly laborers, to maintain as constant level as possible.

6. Use equipment you own. Don't rent anything you don't absolutely have to.

7. Minimize the risk of lost profit potential.

8. Do a first rate job for school and for Rasmussen.

You have just put down the phone. How do you proceed from here?



7 of

RESOURCE CODE

L Labors
EØ Equipment operators
LØ Layout engineers
R Reinforcing stl workers
C Carpenters
CF Cement finishers
M Masons

RESOURCE ALLOCATION

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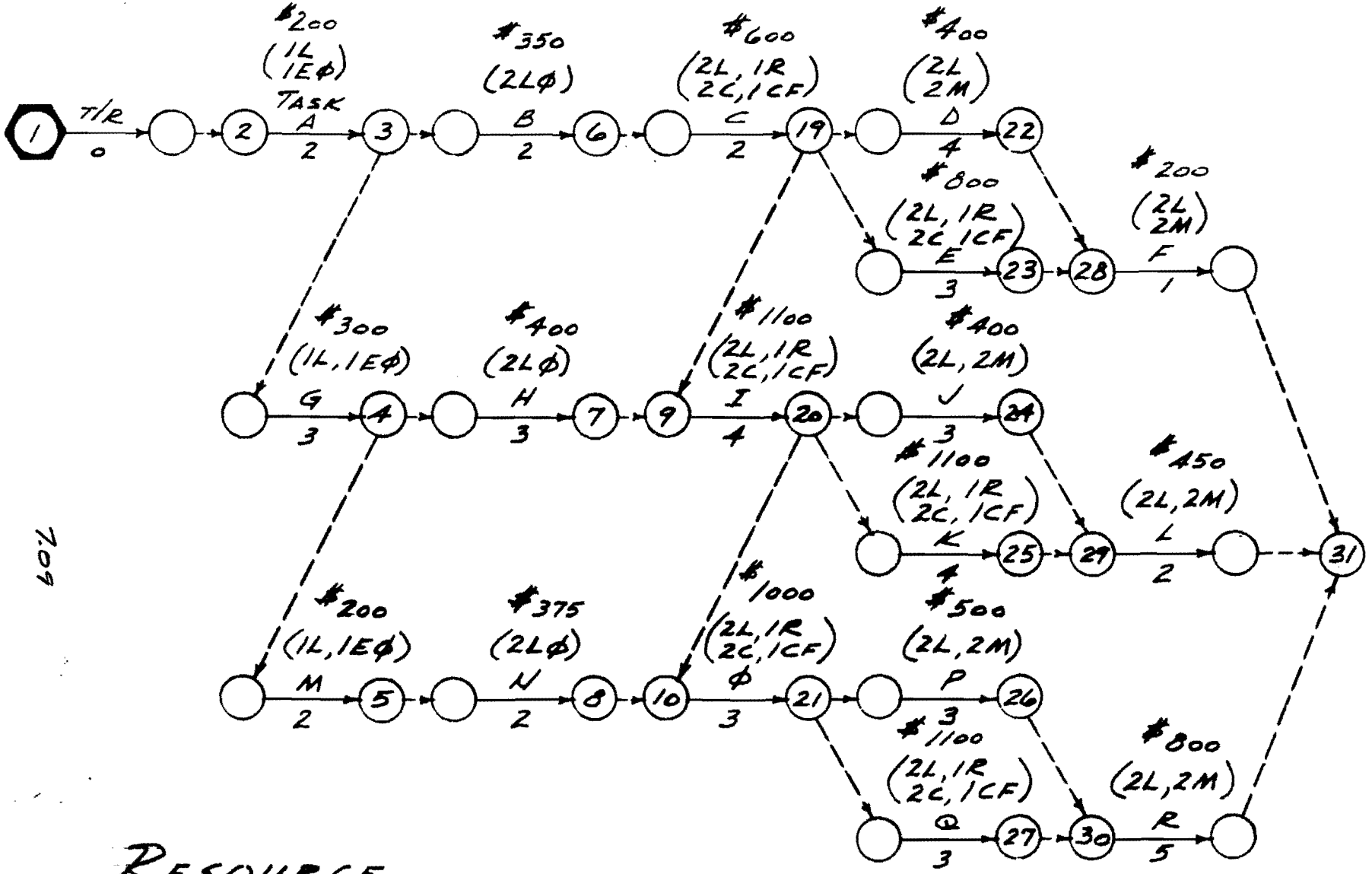
H/O 154



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RESOURCE ALLOCATION

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MAY 29, 1968

H/O 25

RESERVED NODE NOS.

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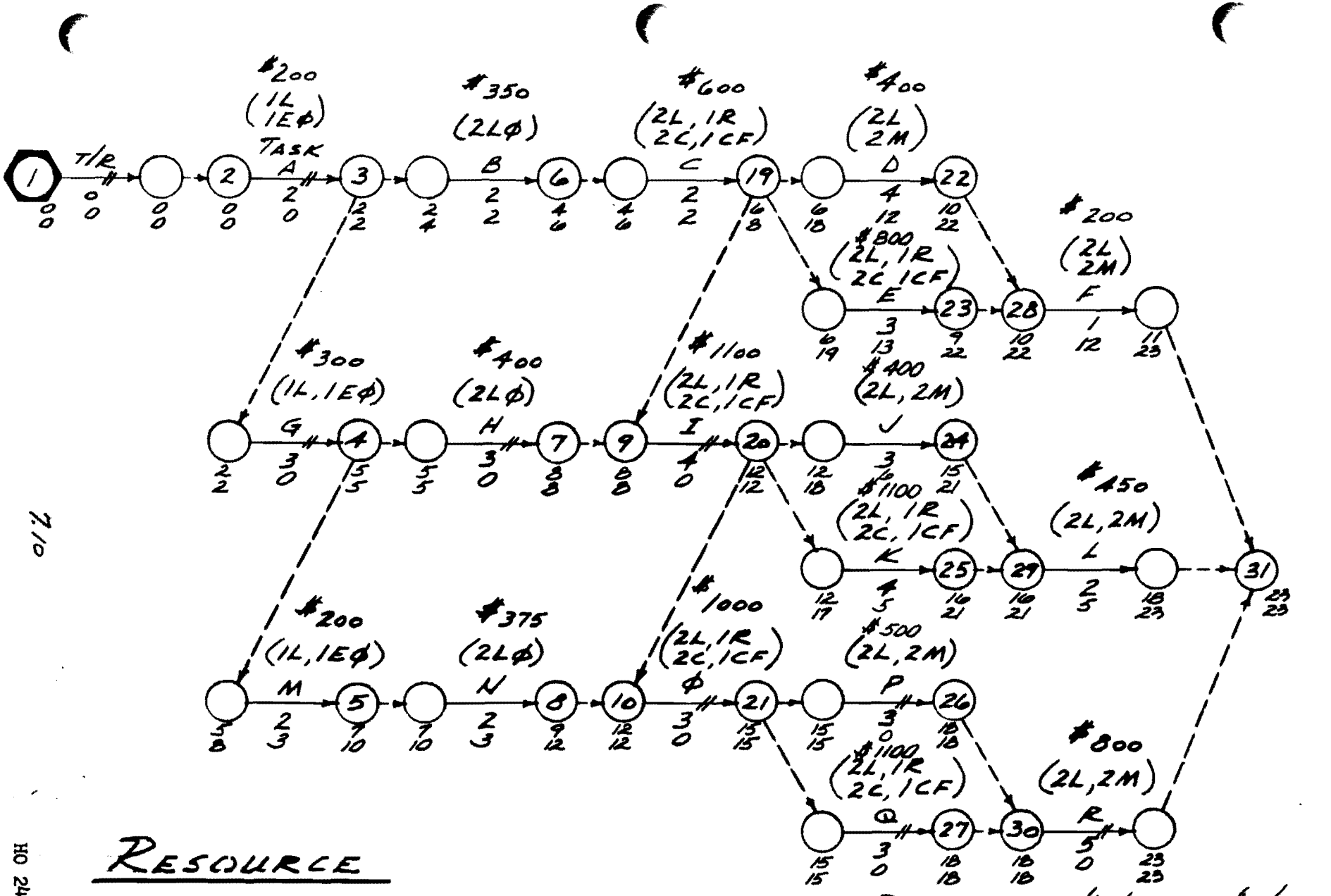

RESOURCE ALLOCATION

RESERVED NODE NOS.

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MAY 29, 1968

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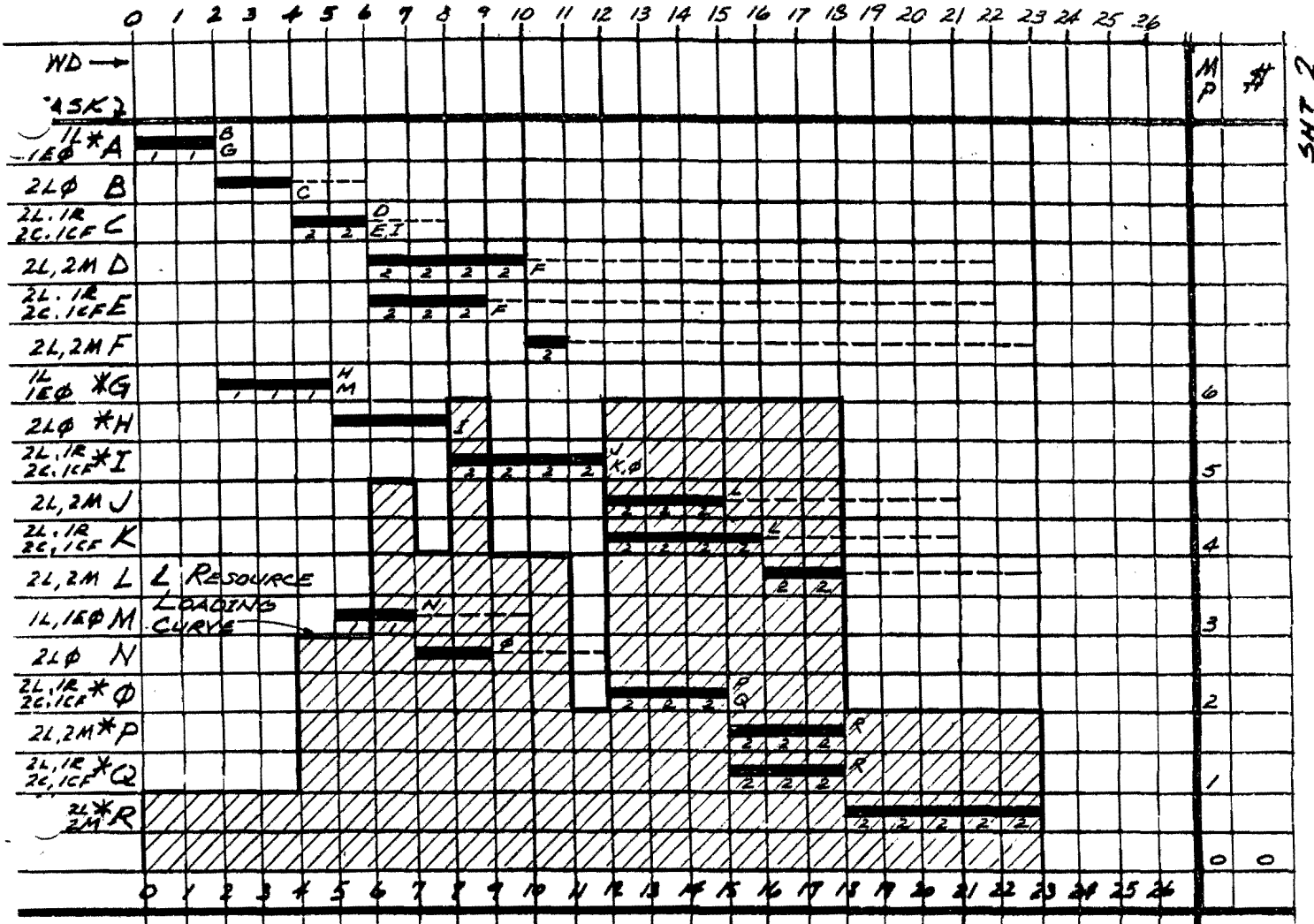
H/O

ES/EF SCHEDULE



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EΦ	1	1	1	1	1	1	1																			7
LΦ			2	2		2	2	4	2																	14
R					1	1	1	1	2	1	1	1	2	2	2	2	1	1								19
C					2	2	2	2	4	2	2	2	4	4	4	4	2	2								38
CF					1	1	1	1	2	1	1	1	2	2	2	2	1	1								19
M							2	2	2	2	2		2	2	2	2	4	4	2	2	2	2	2			36
TOTAL	2	2	4	4	8	10	14	14	18	10	10	6	16	16	16	16	14	14	4	4	4	4	4			214

RESOURCE ALLOCATION #1

HO 245

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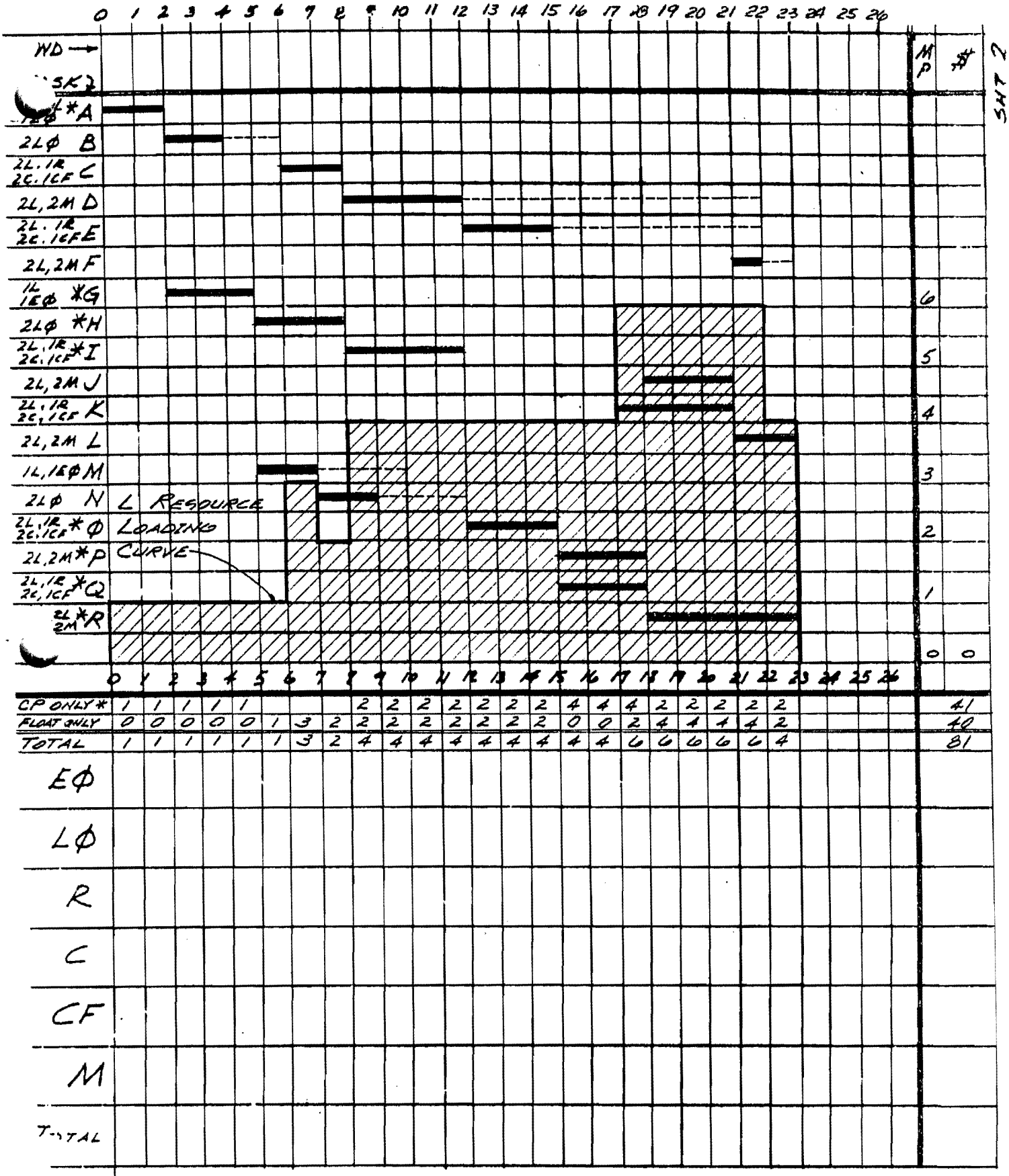
LEVELED SCHEDULE



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CP ONLY*	1	1	1	1	1				2	2	2	2	2	2	2	4	4	4	2	2	2	2	2					41
FLOAT ONLY	0	0	0	0	0	1	3	2	2	2	2	2	2	2	2	0	0	2	4	4	4	4	2					40
TOTAL	1	1	1	1	1	1	3	2	4	4	4	4	4	4	4	4	4	6	6	6	6	6	4					81

EΦ

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R

C

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M

TOTAL

RESOURCE ALLOCATION #2

HO 246

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Case Study #8

The Case of the Color Schedule Argument

As project manager on a new 16 million dollar classroom building at the local state university, you have prepared over the past 4 months (from the beginning of the job) a detailed network diagram for the entire building. It is a good diagram and you and your superintendent are very pleased with it as a job tool. The subcontractors have participated in its preparation and they, too, are happy to have a document to guide them in their work. This is particularly the case since the university and the architect both have reputations for being hard on their contractors.

Copies of the network have been provided to the director of the physical plant for the university and the architect with a covering letter indicating this is your plan of work and soliciting comments.

They respond that they, too, like what they have seen and it is satisfactory. This response is in writing.

Six months into the job the owner and the architect have a severe disagreement with each other on the interior color and finish schedule. You remind them constantly that you need this schedule now. Your network model shows an early receipt of the schedule two weeks from the current date, with a late receipt three months from now. However, you have scheduled purchasing so if you are delayed in receiving it past the early date, it could cause serious delivery problems due to firm commitments with your vendors.

This poses an interesting situation. Some questions of importance might be:

1) What should you do, if anything, to help resolve the dispute between the owner and the architect?
2) What do you do to protect yours and your firm's interest?
3) What obligation do you have in this matter to your subcontractors, many of whom are affected?
4) What is your immediate course of action?
5) Suppose the dispute is not resolved in timely fashion, would you have cause for a claim? How would you present such a claim?

H/O 171 9/77

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Case Study #5

The Sneaky Boiler Contractor

You have just completed and activated a sizable boiler house addition. The contract for boiler installation was a separate agreement with the owner, Carlton State College, with all other contracts direct with your firm, the Shoenite Construction Company, general contractors. As the job is being closed out, Jerry Biel, the physical plant director for the college comes to you confidentially and says the boiler contractor, Laguna, is claiming extra costs because Shoenite Construction interferred with his erection procedure by not providing a slab on grade from which to erect the tube systems and the boiler walls.

Actually Laguna, because of their separate contract with the owner, paid little or no attention to your requests as project manager to keep the area clear and early filled the slab on grade sector with material and equipment before you could possibly have built the slab.

Early in the job you prepared a detailed critical path diagram of all elements of the project including the boiler work. The boiler diagram was prepared in consultation with Laguna, and approved by their superintendent. The network clearly showed the slab on grade being built prior to loading the area with boiler equipment.

Consider these questions:

1) What potential problems exist here for you and Shoenite Construction Company?

2) What steps should you take immediately?

3) What is your own position in this matter? Why?

4) Describe the problem the owner has and how Shoenite Construction and you might help him resolve it.

H/O 168 9/77

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Case Study #4

The Wasted Treatment Plant

The project is a 25 million dollar waste treatment plant. You are the project manager and superintendent. Your involvement has been especially heavy for the past three weeks right after the job was obtained. It is apparent to you that the contract documents are poor, the owner is painfully indifferent to all influence except political pressures and the job is definitely claim prone.

What steps do you take now (within the first two months of this 2½ year job) to protect your company's interest?

Consider these questions:

1) How would a summary network diagram be of use?

2) What special activities should you be certain to include in the early summary diagram?

3) Who should be invited to the initial network planning session?

4) With whom should you discuss the problems that you see on the horizon?

H/O 167 9/77

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Case Study #9

The Case of the Dependent Tasks Additions

A small glass firm, Crystal Glass, is constructing a new plant to produce plate glass with a relatively untried water float process. Your company, Douglas Design and Build, has been awarded the superstructure work built upon a substructure by others. You have designed and are building the superstructure exclusive of equipment installation.

There are some minor delay problems attributable to the earlier let foundation work but not serious enough to bother you financially. However, as the job proceeds, the owner begins to revise his work and add to your contract. Some of these owner revisions do not change Douglas' operations but delay completion of your superstructure work since decisions are not made promptly by Crystal. For those revisions which obviously change the price, you are issued change orders. For owner activities that affect you but don't cause apparent increases in your costs, no concern is shown by Crystal whatsoever.

Now, however, you, as the project manager, realize that your costs due to owner imposed restraints are getting serious. You had prepared a good critical path diagram at the start of the project. You also have accumulated all of the information on what delays were imposed, who imposed them and which tasks were affected. Your next course of action calls for considering several questions:

1) Do you do anything? If the answer is no, why?

2) If the answer is yes, what do you do first?

3) What records will be required to support a claim for additional costs?

4) What could you have done to avoid what will be an obviously unpleasant confrontation with your client regarding extra work and extra cost? What should you do now?

H/O 172 9/77

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Case Study #10

The Case of the Frozen Job

It is winter and you are temporarily shutting down outside work on this new 190 thousand square foot 2-story reinforced concrete department store (as agreed in early negotiations with the owner). Frank Babbet, the owner's representative, is astonished. He was not aware of the winter shutdown agreement, having been assigned to the job by your client, Lathrup Merchandisers, after it had started in the field. He is very angry that nobody had said anything to him up to now about the shutdown. In fact, when he was assigned to the project about two months after it started, he participated in the critical path diagramming session with you and the other contractors. The diagrams were prepared by an owner's network consultant with whom you get along very well. These diagrams make no mention of a winter shutdown but do allow a comfortable amount of winter weather delay time within the tasks.

Your original agreement with the owner to shut the job down was oral and the man with whom you discussed it has been reassigned to another city so is not available for discussions or confirmation. You sense you are in trouble and, as project manager and superintendent for your company, must sit down and think this problem through.

1) Where did you and your company make your basic mistake if any?

2) What should you have done to protect your original position and agreement?

3) The new owner representative is competent and understanding. He has an excellent reputation for being fair but firm. What should your approach to him be?

4) How do you visualize your company salvaging its reputation, its profit, and the account?

5) Should you have gone on record early about the shutdown agreement? How?

6) Should the procedure have been incorporated in the early network diagram prepared with the owner? How?

H/O 173 9/77

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Case Study #11

The Case of the Missing Slab on Grade

It is September 15. The contract has just been let for a new addition to Stockton High School and your firm, Detail Systems, Inc. has been awarded the entire mechanical contract.

A pre-proposal network diagram was prepared by the owner and his consultant showing a broad time structure within which each of the building elements of the project was to be occupied. The occupancy move diagram had been provided to all contractors at the pre-bid meeting. You received a copy, as did the successful general contractor. You are now a sub to this general contractor. Your own position is as project manager and in reviewing the job, you reaffirm it is going to be difficult and require continuous effort on your part to meet the target occupancy dates.

The owner has retained a well respected consultant to prepare the detailed job network in conjunction with the contractors selected. You are at the first meeting, ready to prepare the plan and after about two hours of discussion are shocked to learn that the general contractor has decided, because of long steel delivery dates and longer than expected durations required for close-in masonry, he will defer pouring the slab on grade until next spring on one of the major new facilities of the project.

You perceive immediately this will be very harmful to you and the electrical contractor since the change runs counter to the diagram of work you prepared having a slab on grade available from which to work. It also is not in accordance with the plan of work you gave the general when you were awarded the contract.

The owner is startled at the general's action since the general contractor's attitude toward him is that he cannot finish the first facility of the program as had been shown in the occupancy diagrams even though he, the general, was well aware of the requirement when he bid the job.

The meeting has reached a crisis. The owner is an understanding and competent man. The architect is young, ambitious but is a comer. The general is not a strong contractor. Things are, at this moment, very tense.

Consider these questions:

1) What is your role in the situation?
2) How do you react to or with the general contractor?
3) How do you react to or with the electrical subcontractor?
4) How can you help everybody get out of this dilemma?
5) What problems will the project probably face throughout its life?
6) What could you have done earlier to prevent such difficulties from arising?

H/O 174 9/77

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Section #8

Reference material

- ***Definitions*** - project management glossary
  - **Abatement**
    The process of correcting a perceived and/or hazardous condition at a geographic location. For instance the removal of a hazardous spill of toxic chemicals.

    The question of hazard or not, required correction or not, the appropriateness or not of the abatement action required is often in dispute.
  - **Acceleration**
    Contract work performed in a time period shorter than that originally contemplated by the contract; or contract work performed on time when the contractor is entitled to an extension of time for his performance.
  - **Administration**
    Those activities considered to be supportive of the ex'e'cutive operations in an organization. Administrative costs may be considered the cost of management.
  - **Administrative Settlement**
    A resolution of a dispute through discussion between the disputing parties and agreement upon a mutually satisfactory settlement.
  - **Advisory Relations**
    The interaction of parties related to each other by an obligation, either contractual or informal, where the service performed is of an advisory nature only.
  - **Agency Authority**
    A relation in which one person or organization acts on behalf of another with the other person's or organization's formal authority.
  - **Agent**
    A person or firm whose acts are asserted by the third party to bind the principal.
  - **Agreement - partially qualified**
    An agreement made based on a moderately broad range of measuring values used somewhat consistently by the principal. The selection of an agent or contractor is normally made with some or full visible competition.
  - **Agreement - totally negotiated**
    An agreement made based on a very broad range of measuring values applied as desired by the principal. The selection of an agent or contractor is usually made with very little visible competition.
  - **Agreement - totally qualified**
    An agreement made based on very narrow range of measuring values, i.e. price, but used consistently by the principal. The selection of a agent or contractor is normally made with full visible competition.
  - **Alternative dispute resolution - adr**
    In its generic form, is a method of resolving disputed construction claims outside the courtroom.

    Includes systems of resolving disputes in planning, design and construction by cooperative, internal, or third party assistance methods that are alternatives to conventional dispute resolution methods currently in common use. Conventional methods are usually considered to be litigation and binding arbitration.

    Alternative dispute resolution may make use of non traditional combinations of conventional dispute methods.

- **Apparent Authority**
  A situation in which one person or organization acts on behalf of another person or organization without the other person's or organization's formal authority.
- **Arbitration**
  A method for settling disputes whereby an officially designated third party (usually one to three people) hears and considers arguments and determines an equitable settlement. Usually considered binding upon the parties.
- **Assigned Contractual Relations**
  The interconnection of those parties bound by subsequent assignment of a contract to other than the initial parties.
- **Audit - as applied to projects**
  Inspect, analyze & evaluate project status, management and health against criteria established as a standard of performance for any give point in time. The audit encompasses such measurements as:

  - Physical condition of project
  - Project progress
  - Procurement status relative to needs
  - Project management techniques in use as reflected by project health
  - Project team performance as reflected in project health
  - Where appropriate, progress measured against expected money flow
  - Resources allocation
  - Status of interrelations between major parties to the project
  - Trends in project progress
  - Trends toward or away from claim prone status

  Each auditing situation is unique and the scope of the audit should be determined as specially fits each individual project and project team. All, or a part of the above measurements might be used to make the audit.

  Auditing usually is done through the following steps listed in rough order

  - Make pre inspection review of measurement standards to be used
  - Inspect project
  - Discuss inspection observations & perceived project status with key project staff
  - Evaluate current interrelation between procurement and field installation needs
  - Identify areas of administrative (supportive) operational difficulty & strength
  - Identify areas of line (ex'e'cutive) operational difficulty & strength
  - Prepare monitoring documents from current network issues
  - Evaluate need for project plan update
  - Update current network models as may be appropriate or required
  - Prepare & submit report of project audit

- **Authority**
  The prerogatives, either vested or acquired over a long period of time, that allows an individual to carry out their responsibilities and duties. This includes the right to determine, adjudicate, or otherwise settle issues or disputes; the right to control, command, or determine.

- **Basic Contractual Relations**
  The interconnection of those parties bound by the initial contract to perform in a certain manner for certain considerations to be paid.
- **Bench Trial**
  A trial before a judge without the benefit of a jury.
- **Building Components**
  The basic units into which most building construction projects can be divided. Usually the components represent distinct construction & construction related actions that have common characteristics.
  - Front end work (few)
    All non construction project related work concerning real estate, financing and pre construction leasing.
  - Design work (des)
    Project related work that concerns production and issuing of contract documents
  - Procurement (pro)
    Work related to solicitation of proposals, award of subcontracts, preparation of submittals, approval of submittals, and fabrication and delivery of materials & equipment to the job site.
  - On site work (osi)
    All project work outside the building line and inside the property or hoarding (contract boundary) line.
  - Off site work (ofs)
    All work outside the property or hoarding line that is included in the project contract scope of work.
  - Substructure work(sbw)
    All foundation work upon which the superstructure bears directly or indirectly. Also includes site preparation for start of field work on the building area.
  - Superstructure work (ssw)
    All major structural load carrying components that bear on the substructure directly or indirectly.
  - Exterior skin (esk)
    All elements required to close the building to weather.
  - Interior rough work (irw)
    All interior building components that can be exposed totally or in part to weather.
  - Interior finish work (ifw)
    All interior building components that must be protected totally or in part from weather.
  - Unit systems work (usy)
    All work that can be installed as a unit & is somewhat isolated during construction from other components of the building
- **Bulletin**
  An official notice that a change is being considered and that it is desired that those affected parties to the contract provide an estimate of the cost of the proposed change. The bulletin is often given other names such as change estimate request, request for proposal, or proposed change notice.
- **Business Model**
  A graphic depiction of the elements which make up a business entity. The model usually identifies premises, objectives, and implementation. It recognizes basic business functions, business activities and manager activities.

- **Cardinal Change**
  A change that is outside the scope of the contract.
- **Change**
  Any revisions to the contract documents that alter the scope of work agreed to.
- **Change Order**
  An official notice that the changes specified in the change order are to be done. A properly executed change order is a revision to the scope of work and the contract documents.
- **Claim**
  A demand for something as due; an assertion of a right or an alleged right. In construction generally a demand for something as due, or in which the demand is disputed.
- **Claim Avoidance**
  A technique and procedure for generation of situations in which the demand for what is due as a result of a contract agreement is honored without formal dispute, or in which the dispute is settled by an administrative settlement.
- **Claim Potential**
  The measure of potential that any project has to encounter disputes during its implementation.
- **Closed Shop**
  A work area in which only union workers can be employed on the job.
- **Closed System**
  A system in which there is no import or export of information or physical materials, and in which, therefore, there is no change of components.
- **Color coding**
  • Green - Activity on time - currently not past earliest possible finish date.

  • Orange - Activity on time - currently past earliest possible finish date, but will make or better scheduled or latest possible finish date.

  • Blue - Task behind - will not make scheduled or latest allowable finish date

  • Yellow - Task behind - currently past latest allowable finish date
- **Commitment**
  The state of giving a tangible or intangible benefit in a trusting and honorable manner. The act of pledging oneself.
- **Construction Management**
  A system of attempting to better manage the construction process by providing expert construction knowledge and resources throughout all phases of the project. The goal of the process is to make available to the participants, information best provided by an expert skilled in construction practices, so that when the project moves into the field the managers can provide the owner with the highest potential for project success.
- **Constructive Change**
  An owner's action or inaction that has the same effect as a written directive.
- **Contested claim**
  A demand or claim in which the demand is disputed.
- **Continuous**
  Uninterrupted in time; without cessation.
- **Continuum**
  A continuous or ongoing series of actions, normally uninterrupted.

- **Contract Document Matrix**
  A two dimensional grid in which the rows contain action items for the various project components and the columns usually designate the geographic location of the item. At the intersection of a row and a column is inserted the designation of the contract document package in which the information is contained.
- **Contract Documents**
  Usually considered to be the documents which provide the full definition of the scope of work for which the parties are legally responsible. Could include the agreement, the drawings, the specifications, instructions to bidders, addendum, and any other material included by mutual agreement and clearly identified as part of the contract.
- **Contractor**
  The party, where there is a principal and a contractor, who agrees to the doing or not doing of some definite thing for a stipulated sum.
- **Control**
  Maintaining firm, competent managerial direction of any given situation. Controlling leads to achievement. It is usually accomplished by the invisible use of leverage.
- **Critical Path Method**
  A mathematical modeling technique which allows the user to establish ranges within which resources can or must be used.
- **Critical Transition Point**
  The point in a project delivery system at which the responsibility and authority for the work passes from the supportive group to the ex'e'cutive group.
- **Culture - business**
  A way of doing business that has been generated by a group of human beings and is passed along from one business generation to another, generally by unstructured communication.
- **Cuts**
  Excerpts from catalogs, drawings, or flyers that depict a configuration to be used in the construction process.
- **Daily Reports**
  Daily technical reports about the project containing data on manpower, weather, major activities, equipment on job, and other job related statistical information. Usually the daily report form is preprinted and in loose leaf form.
- **Decision Table**
  A tabular display of information depicting a defined situation which permits alternative courses of action to be evaluated by yes or no answers to explicit questions.
- **Decision Tree**
  A graphic device showing alternate courses of action from beginning a given situation point. The decision tree is used to graphically show the impact of various possible decisions at any given point in the decision process. It can be quantified or unquantified.
- **Decision-To-Action Time Span**
  The amount of time required from the point at which a decision is made to the point where the decision is implemented. In a management structure it is important to insure that the full span of time from decision to action is covered, from shortest to longest.
- **Defective or Deficient Contract Documents**
  Contract documents which do not adequately portray the true scope of work to be done under the contract.

- **Delay**
  A problem or situation beyond the control of the contractor, and not resulting from the fault or negligence of the contractor, which prevents him from proceeding with part or all of the work.
- **Deposition**
  A written record of sworn testimony, made before a public officer for purposes of a court action. Usually the deposition is in the form of answers to questions posed by a lawyer. Depositions are used for the discovery of information, or as evidence at a trial.
- **Design/build**
  A method of providing total design and construction services under one cost and liability umbrella. Usually a design/build contract is based on a scope of work performance specification prepared by the owner or user. The ultimate aim of the design and build system is to provide a single source management and liability for the total facility program.
- **Destructive conflict**
  Animosity or disagreement which results in lowering the potential for an individual or organization to succeed.
- **Development**
  A business operation in which the primary goal is to locate and produce profitable and marketable real estate assets.
- **Diary**
  Similar to a log but dealing more with personal observations of the individual writing it relative to his feelings about the job and the people.
- **Differing Site Conditions**
  Where actual site conditions differ materially from those indicated in the contract documents; or where unknown physical conditions at the site differ materially from those ordinarily expected to be encountered in work of the nature contemplated by the contract.
- **Directed Change**
  A written or verbal change that falls within the scope of the contract. The owner has the responsibility of paying for the change.
- **Discrete**
  Consisting of, or characterized by distinct or individual parts; discontinuous.
- **Dispute resolution board - drb**
  A method of dispute resolution where project participants establish procedures, by contract, to proactively settle disputes as they arise during the course of the project.

  drb's seek to anticipate problems and get the parties to resolve them before the problems harden into formal claims.
- **Document Control System**
  A method of receiving, classifying, marketing, storing, and retrieving documents received and sent on a project.
- **Dysfunction - Organizational**
  An organizational problem that hinders or prevents achieving objectives. May be temporary or permanent.
- **Early Finish (EF)**
  The earliest possible date by which a task can finish in a network model if it has been started at its early start date.

- **Early Start (ES)**
  The earliest possible date at which a task can begin in a network model if all tasks immediately preceding it have been completed by their early finish dates.
- **Education**
  The teaching and learning process by which the principles of doing things are conveyed to the learner.
- **Effective**
  Of a nature that achieves identifiable goals and objectives in accordance with an action plan, and achieves worthwhile peripheral goals through intermediate accomplishments.
- **Elapsed Duration**
  The estimated or actual amount of calendar or clock time an activity requires to accomplish, considering all direct and indirect influences upon the task's activities. Includes temporary work delays and stoppage due to influencing actions on the task.
- **Enrichment**
  Adding to the scope of work originally contracted for with the intent to avoid being charged or paying for the extra work. Often seen in as-noted remarks on submittals, or on inadequate identification of scope of work in a bulletin or change order.
- **Ex'-e cutive**
  The executing arm of the organization closest to the flow of expense and income experienced in achieving the organization's prime objectives. Closely related to line operations.
- **Feedback Loop**
  The loop of communication around a project through which information is conveyed to and through the various components of the project.
- **Field Order**
  An official notice that the actions or changes described in the field order are to be done. The field order is usually issued only in emergency situations where the time between decision and action does not permit issuance of a bulletin followed by a change order. A method of payment is usually specified in the field order.
- **Free Enterprise System**
  An economic system under which the means of production, distribution and exchange are in large measure privately owned and directed.
- **Functional - as related to management**
  Designed or adapted to perform some specialized activity or duties, usually concerned with the continuous operation of the company.
- **Functional Operations**
  Management and staff direction of the application of resources to accomplish each specialized activity. Usually defined as a department or division of the company. Usually concerned with continuous operations of the organization. Contrasts with project operations.
- **General Conditions**
  The portion of the contract agreement that contains contractural-legal requirements for the work.
- **General Requirements**
  The portion of the contract agreement that contains overall technical support specifications governing work on the job.
- **Generic Construction (G)**
  The field of business practice that encompasses all phases of the construction industry, including programming, planning, designing, building, operating, and maintaining facilities.

Described best as the full set of activities shown in the line of action. (See line of action.)

- **Goals**
  The unquantified desires of an organization or individual expressed without time or other resources assigned. (See objectives for related definitions.)
- **Graphics Oriented Data Processing**
  Data processing in which the majority of the information is entered or gained by the use of a joy stick, mouse or other control which gives direct hand related movement and entry onto a console screen.
- **Guaranteed Maximum Price (gmp)**
  The price for a specified scope of work to be provided by a contractor that contractually binds his performance to a specified guaranteed maximum price. Often the guaranteed maximum price is tied to a time and material performance with the price not to exceed the agreed upon maximum.
- **Hard Money**
  A total price agreed to for the entire work, and to be paid in a mutually satisfactory schedule of payments.
- **Histogram**
  A graph showing a quantity on the vertical axis measured against equal intervals of time shown on the horizontal axis. In construction, often a depiction of the resources required per day over a period of time.
- **Horizontal Growth (Integration)**
  A management system that emphasizes diversifying by expanding existing functions by classes. For instance a design office could accomplish horizontal integration through dividing their operations into various kinds of projects such as commercial, institutional and industrial. These all use the same or similar functional disciplines but the organization is divided into separate groups that concentrate mainly on one of the three main building types.
- **Hygiene**
  The elements in an organizational situation that are acceptable to an individual but do not necessarily motivate him. These same elements, if unacceptable to the individual, may act as negative influences.
- **Interfaces**
  Points at which different but related activities exert direct influences upon each other. Interfaces are often the points where direct objective activities contact dependent objective activities. Poor management of interface situations usually causes problems and dysfunctions.
- **Isoquant Line**
  A line drawn on a network model and connecting some or all equal date or resource points on the activities shown. The date isoquant line is the equivalent of a straight line in a time scaled bar chart.
- **Issue resolution**
  A method of reaching agreement and closing out disputes and problems at the lowest possible management level, in the shortest possible time, and with the lowest potential for residual hard feelings.
- **Jury Trial**
  A trial before a jury.
- **Late Finish (LF)**
  The latest allowable date by which a task can be completed in a network model without forcing those tasks that follow past their latest allowable start dates.

- **Late Start (LS)**
  The latest allowable date by which a task can be started in a network model without forcing those tasks that follow past their latest allowable starting dates.
- **Laundry list**
  A list of items, usually at random, that are to be classified, rearranged and used to build specifically sequenced tabulations, network models, narrative schedules or other systems of which the items in the laundry list are a component.
- **Leverage**
  The effective use of vested and earned authority to solve problems and achieve goals and objectives.
- **Life Cycle Cost**
  The total cost of a system over its entire defined life.
- **Limited agent**
  The individual or organization acting as an agent and authorized to do only what is specified or what is reasonable to believe the principal wants done. A contract can be used to define the amount of authority to be granted an agent.
- **Line Activities**
  Those activities that are most closely identified with the flow of basic expense and income related to the prime objectives of an organization.
- **Line of Action**
  A sequential statement of activities necessary to conceive, design, build and operate an environment. Related to the generic (G) construction process.
- **Litigation**
  The process of contending in court, either as a plaintiff or a defendant.
- **Log**
  A permanently bound, dated, hand written record of job related events that have occurred on a project. The log is usually in ink, and is maintained by an individual in responsible charge of the work with which the record deals.
- **Maladministration**
  The interference of the owner in the right of the contractor to develop and enjoy the benefits of least cost performance.
- **Manage**
  To define, assemble and direct the application of resources.
- **Management**
  The act and manner of managing.
- **Management by Exception (MX)**
  A measuring and monitoring system that sounds an alarm to the manager when problems have appeared or are about to appear, and remains silent when there are no problems. The system identifies the problem area, thus permitting the effective manager to manage the exception while leaving the smoothly running operations to continue running smoothly.
- **Managerial Grid**
  A numerical grid which positions a manager in a matrix by defining his concern for people as compared to his concern for production. This grid has been highly developed by Blake and Mouton and is useful in establishing managerial systems that are desirable and needed.
- **Marketing**
  The process of conceiving, formulating and implementing a process by which the ultimate service or product of an organization can be successfully sold.

- **Matrix**
  A two or more dimensional display of related data.
- **Matrix Management**
  A management technique that employs a multiple command system. Usually results in one employee having two or more bosses on a time to time basis.
- **Mediation**
  An attempt to effect a settlement between disputing parties through the unbiased efforts of an objective third party, usually well known to those in dispute and acceptable to them. Mediation differs from arbitration in that it generally involves a single individual as the ruling party, is less formal, and is generally not binding. (This definition of mediation varies with the degree of legal significance attached the resolution of disputes, and the dispute location.)
- **Merit Shop**
  A work area in which the workers may be either union or not, and in which there are no major jurisdictional boundaries governing assignment of work.
- **Minitrial**
  A private process where opposing parties present condensed versions of their cases, both to designated executive representatives, and to an impartial advisor, and then negotiate.

  The executives hear both sides, thus gaining a first hand perspective of the parties positions. The impartial advisor then points out possible outcomes an helps the parties to settle, if possible. Minitrials provide a structure to negotiate and ground rules to facilitate settlement.
- **Mission**
  A statement of the most important result to be achieved by the project being successfully completed.
- **Money Flow**
  The flow of income and expense measured against time.
- **Monitoring**
  Measurement of current project conditions and position against the standards of performance set for the job.
- **Motivation**
  The elements of a given situation that encourage and make effective, successful and meaningful, the activities of those engaged in the situation.
- **Must list**
  Those items that must be included in the scope of work to make the project a go. If any of the items in the must list are not able to be included the project is a no-go.
- **Network**
  A system of interconnected, interacting components. Usually a part of an open system.
- **Network Plan**
  A graphic statement of the action standard of performance to be used in achieving project objectives.
- **Network Planning**
  A graphic technique of showing necessary and desired actions needed to achieve end, intermediate and peripheral objectives.
- **Objectives**
  Quantified targets derived from established goals (see goals). The most commonly used resources in converting goals to objectives are money, time, human abilities, human actions, equipment, and space.

- **Objectives - Dependent**
  Objectives to be achieved that are affected by major influences beyond the manager's direct control. The dependent goal may be predictable or unpredictable.

  Dependent goals, while usually beyond the manager's control, may well be within the company's ability to reach. Lack of correlation between company and individual effort to achieve a manager's goals that are affected by others, may cause severe dysfunctions.
- **Objectives - Direct**
  Objectives that can be achieved by managing conditions within the manager's direct influence.
- **Objectives - End**
  Objectives realized from and upon total completion of the defined project work.
- **Objectives - Intermediate**
  Objectives achieved at specific and identifiable stages of the project, i.e. partial occupancy of a building, turnover of a mechanical system for temporary heat, or completion and issuance of foundation plans for early start of construction.
- **Objectives - Peripheral**
  Objectives realized on an ongoing basis through the life of the project and achieved as an indirect result of project activities. Peripheral objectives may be personal, professional, technical, financial or social. Peripheral objectives might include staff promotion, profitable subcontractor operations, specialized experience, or achievement of design excellence in a special field.
- **Ongoing Organization**
  The arrangement and interrelationships of people charged with providing supportive action on an ongoing basis within the company. Examples of functions contained within the ongoing design or construction organization are estimating, administration, legal, marketing, sales, purchasing, and accounting.
- **Open Shop**
  A work area in which both union and non union workers can be employed on similar tasks.
- **Open system**
  A system which exchanges energy, information and physical components with its environments.
- **Organization**
  The arrangement of resources (talent, skill, money, time, space, people, et al) that has evolved, or been selected, to accomplish the functions, activities, and management, and goals and achieve the objectives of a business or institution.
- **Organizational Structure**
  The categories of parties to the planning/design/construction/operation process and how they are organized for the work. The organizational structure is shown by a set of relations between the parties that identifies the responsibility and authority lines along which the project is to be implemented.
- **Owner Furnished Items**
  Those items furnished by the owner according to the contract documents.
- **Partnering - Associated General Contractors**
  A way of achieving an optimum relationship between a customer and a supplier. A method of doing business in which a person's word is their bond, and where people accept responsibility for their actions.

Partnering is not a business contract, but a recognition that every business contract includes an implied covenant of good faith.

- **Partnering - Construction Industry Institute**
  A long term commitment between two or more organizations for the purpose of achieving specific business objectives by maximizing the effectiveness of each participant's resources.

  This requires changing traditional relationships to a shared culture without regard to organizational boundaries. The relationship is based upon trust, dedication to common goals, and an understanding of each other's individual expectations and values. Expected benefits include improved efficiency and cost effectiveness, increased opportunity for innovation, and the continuous improvement of quality products and services.
- **Partnering - suggested base statement**
  A method of conducting business in the planning, design, and construction profession without the need for unnecessary, excessive and/or debilitating external party involvement.
- **Partnering charter**
  The basic manual for operating a partnering system. Contains at a minimum, the mission of the project team, and their objectives for the project. Usually is signed by those writing the document.

  The charter is an agreement in principle and must not supersede or supplant the design and construction contracts in place or to be written.
- **Peer Review**
  A partial or full audit evaluation of the project done by objectively based individuals or organizations outside those owning, designing, building or operating the facility.
- **Percentage Fee**
  A fee determined ultimately by a percentage of project cost, all as specified by the contract.
- **Planning**
  Establishing and arranging necessary and desired actions leading to end, intermediate and peripheral objectives.
- **Positive conflict**
  Hostility that is managed so that its resolution raises the potential for individuals or organizations to succeed at being excellent.
- **Prime Contractor**
  A contractor whose business agreement is directly with the organization providing primary financing for the project.
- **Principal**
  A person who authorizes another to act as his agent, or a person primarily liable for an obligation.
- **Pro Forma - in real estate development**
  A financial model unusually built early in a construction program to show by projecting income and expenses, how the money flow to and from the project will occur. It is often used to establish the capital amount to be allocated to a project based on simulated operating conditions. The term pro forma means according to form.
- **Problem**
  A deviation from an accepted and/or approved standard of performance.

- **Profiling**
  The preparation and use of a selective, flexible and tailored systems of screening projects for potential participation.
- **Profit - Educational & Training**
  Fulfillment of learning and teaching goals held by individuals and their companies.
- **Profit - Financial**
  Fundamentally, the difference between organizational cash income and organizational cash expense. Further definitions of financial profit are complex and often unique to an organization or project.
- **Profit - Self Actualization**
  Personal fulfillment realized after basic needs of shelter, safety, protection, love and freedom from hunger are achieved.
- **Profit - Socio Economic**
  Company, group or individual achievement of social objectives within a financially profitable set of activities.
- **Profit - Value System**
  Company and project fulfillment of personal, professional, technical, social and financial values held important by individuals and groups related to the company.
- **Program - as defining a step in the design process**
  A narrative oriented statement of the needs and character of the proposed user operation, the requirements of the user and owner, the nature of the environment to be planned, designed and built, and the corresponding characteristics of the space that will satisfy these needs and requirements. Sometimes called the brief.
- **Program - as defining a total environmental effort**
  A major environmental construction effort made up of several projects
- **Project - as a set of work actions**
  A set of work actions having identifiable objectives, and a beginning and an end.
- **Project - as related to management**
  A specific management assignment to achieve a set of objectives by accomplishing a group of related, discrete operations which have a defined beginning & end.
- **Project Delivery System**
  A method of assembling, grouping, organizing & managing project resources so as to best achieve project goals & objectives.
- **Project Director**
  The individual responsible for implementation of several projects upon which his company is engaged.
- **Project History**
  A tabulation of the major events on the job, chronologically arranged for easy reference. Subjects included in the history should be:

  -The plan or schedule governing the sub period of the history.
  -A brief recap of the major activities having an impact on the job.
  -A reference to the documents in which the activities referred to are shown in detail.
  -A summary of important job related conferences.
  -Notes regarding points that may help resolve potential problems.
  -Problems impacting on the job including reasons why the problems prevented proper progress.

  The purpose of the project history is to give a quick, accurate look at past job events in a

glance. The degree of detail is dictated by the potential for trouble that exists.

- **Project Manager**
  One who helps establish objectives generated by a need, plans how these objectives are to be reached through a set of work actions, and then assembles and directs the application of available resources to achieve the objectives on one or more projects.

  Usually the project manager is most concerned with supportive actions which bring resources to the point of effective use.
- **Project Operations**
  Management and staff direction of resources to accomplish overall project activities. Contrasts with functional operations.
- **Project Organization**
  The arrangement and interrelations of people charged with actually achieving project objectives. (See organizational structure.)
- **Project Schedule Report**
  A narrative listing of network activities and the corresponding data re each action. The project schedule report is normally developed in a data base format from which selective reports and arrays can be prepared.
- **Project Stages**
  The groupings of actions that make up the entire project work sequence.
- **Project Superintendent**
  The manager involved in the actual construction process and most directly responsible for the expenditure of funds to carry out the project. Usually the superintendent is responsible for field execution of the work.
- **Question - Closed**
  Questions that can be answered with a yes or no, or with a simple statement of fact.
- **Question - Direct**
  Asked with strong indication as to who or whom should answer.
- **Question - Open**
  Questions that cannot be answered with a yes or no, or a simple statement of fact.
- **Question - Overhead**
  Asked of a group without indication as to who or whom is to answer.
- **Question - Relay**
  Passed along to someone else by the party originally asked.
- **Question - Reverse**
  Returned to the questioner by rephrasing or rewording the original question.
- **Record**
  Any retained information that can be effectively used in the future.
- **Relations - Formal Functional**
  Organizational connections that concern distribution and use of data, information and decisions that flow along formally defined transmission lines. Formal functional communications are usually written and are normally both from and to individuals and groups.

  Formal relations are precisely defined and most day to day business is accomplished within the formal relation framework. The line expressing a formal functional relation usually has an arrowhead at each end to show a mutual exchange of responsibility and

authority. If there is a higher authority to be implied a single arrowhead can be used pointing to the superior party.

- **Relations - Informal**
  The natural channels along which organizationally related material is most easily and comfortably transmitted. The informal relation exists by mutual consent of the parties to the relation, and is stimulated to maximum effectiveness by a mutual profit gained from the relation.

  Little, if any, authority normally is expressed in informal relations. Communications are usually oral and one to one. Often informal relations define the hidden organization structure. A line defining an informal relation is usually shown dotted with an arrowhead at each end.
- **Relations - Reporting**
  The official channels through which each individual conveys, or is given raises, appraisals and evaluations; is fired, assigned or is provided professional, vocational and personal identity in the organization. The true organizational superior of an employee is usually that individual with whom he maintains a reporting relation. The line expressing reporting relations has an arrowhead at one end pointing to the superior.
- **Relations - Staff**
  The business patterns through which a person or group provides consulting services necessary to achieve goals and objectives. Staff personnel usually have little or no authority over those outside the staff group. The line expressing staff relations has an arrowhead at each end.
- **Relations - Temporary**
  Those relations created when extraordinary or unusual management demands must be met. The temporary relation is usually unstable and should be kept active for only short periods of time. The line expressing a temporary relation can have an arrowhead at one or both ends depending on the nature of the relations.

  Extensive use of temporary relations creates business dysfunctions, breaks down morale and causes internal tensions.
- **Resolve**
  To find and implement a solution to a problem, a dysfunction or an issue of conflict.
- **Resource Allocation**
  The assignment of project resources such as money, time, space, people and equipment to activities that must be done to achieve project objectives. Usually resource allocation is done to achieve effectiveness in project work measures such as profitability, timely completion and quality of work.
- **Resource Leveling**
  The use of resource allocation to even out the use of resources within a given set of time, money, space, people or equipment conditions. Resource leveling is a special form of resource allocation with its prime use being to maintain a nearly equal assignment of resources to activities and projects for their entire duration.
- **Resources**
  The tools of the supportive and ex'e'cutive manager. Resources include time, talent, tools, equipment, time, money, experience, space, materials, as well as intangibles, such as enthusiasm, morale and leverage.

- **Responsibility**
  The assignment, spoken or understood, that a person in an organization has as his part in maintaining the organization's health and vitality.
- **Schedule**
  A graphic or written tabulation of project activities showing where the activities are to start and finish. The schedule is derived from the plan of action and the network model by locking the tasks and the resources they require into a specific time position.
- **Selling**
  Establishing and implementing the strategy of achieving the objectives of the marketing plan. The physical process of closing the negotiation for services and products for a consideration.
- **Shop Drawing**
  A submittal in the form of a drawing, usually made specially for the application shown. Shop drawings usually show details of fabrication and installation.
- **Situational Thinking**
  The ability to accurately evaluate a set of project influences by mentally moving from a long overview (macro) of them to a detailed picture (micro) and back, and being able to stop anywhere in between to consider other scale pictures of these influences and their relationships.
- **Span of Control**
  The number of organizationally related individuals a manager directly controls on a one to one basis.
- **Specialized Construction (S)**
  The field of business practice that encompasses single phases of the construction profession. Examples of "S" construction organizations are architectural/engineering offices, mechanical contractors, plastering contractors, and planning consultants, among others. Includes nearly any single organizational unit active in design, planning, construction or related fields.
- **Specification**
  A narrative description of the various materials and systems to be incorporated in the work. The specification concentrates on identifying quality of materials, source of materials, allowable practices, and general requirements and conditions of the contract performance.
- **Staff**
  A supportive unit of any organization in which the basic function is usually advisory in nature. Staff functions are occasionally defined as overhead or non production. They are considered to be the organizational partner of line operations. (See staff relations and line activities.)
- **Standard of Performance**
  A well defined, explicitly stated, approved and accepted statement of the measurements to be used as a gage of performance, and goal and objective achievement.
- **Sub Contractor**
  A contractor whose business agreement is directly with a prime contractor
- **Submittal**
  Any document submitted by contracting parties to the owner's agents for review for accuracy, responsibility of design, general arrangement, and approval. Submittals are used by the fabricator and the installer to show adequate details so the intent of the contract documents can be achieved. There is a mild ongoing professional controversy as to whether approved submittals are contract documents. Generally they are not considered contract documents, but aids to better fabrication and installation procedures.

- **Sum zero**
  A situation in which there is a winner and a loser. The loser often will lose what the winner wins.
- **Superior Knowledge**
  The owner's withholding specific data on matters of substance not known to contracting parties during the pre contract period.
- **Supportive**
  The administrative group of the project organization which is responsible for bringing resources to the point of use by the ex'e'cutive project group.
- **Suspension**
  An owner's or owner's agent action of stopping all or a part of the work.
- **System**
  An assemblage or combination of things or parts forming a complex or unitary whole.
- **Talent**
  A capacity for achieving identifiable success. Usually talent is considered an abstract resource.
- **Termination**
  The dismissal of a contractor, from a project, for convenience, resulting from factors beyond the contractor's control, or for default when the contractor's performance is not acceptable.
- **Text Oriented Data Processing**
  Data processing in which the majority of information is entered or gained by the use of a key operated control panel such as a keyboard. The signals are usually entered in discrete elements.
- **Third Party**
  A party to a contract or agency agreement other than the principal or agent.
- **Time and Material Contract**
  An agreement in which payment for services and material is made only for those services and materials actually furnished. There may, or may not, be imposed a not-to-exceed amount on the total cost.
- **Total Float (TF)**
  The amount of discretionary time available to a task. The total float is the difference between the early and late starts or finishes. Formally, it is defined as the duration of the task, subtracted from the difference between the late finish (LF) and the early start (ES): i.e. (LF-ES)-DURATION=TF.
- **Total quality management (TQM)***
  The managing process which helps insure that the quality of all components, and of the final product in the planning, design and construction of any facility is maintained at a level which meets the client's program performance requirements.
- **Traditional**
  Pertaining to those qualities of an organization, civilization or other culture that are handed down from generation to generation. Usually the transfer is by word of mouth or by practice.
- **Training**
  The teaching and learning process by which specific, explicit methods and systems of doing something, usually by rote, are conveyed to the learner.
- **Translation**
  Recasting standard of performance information and data into graphic, narrative, mental, oral or other forms, to insure optimum use by those involved.

- **Trust**
  Reliance on an organizational or individual or integrity, justice, fairness, good judgment, and other relational qualities that give confidence in the performance of the duties demanded of the organization or the individual.
- **Turnaround Time**
  The amount of time required to process submittals.
- **Turnover Cycle**
  In the construction or fabrication of several similar units, the amount of time required from the completion of one unit to the completion of the succeeding unit.
- **Ultimate Decision Maker (UDM)**
  The individual or group at the lowest management level that has the authority to make a final binding decision in any job related matter.
- **Unilateral Meetings**
  A decision meeting at which only a portion of the parties affected are invited to participate.
- **Union Shop**
  A geographic work area in which all labor classified participants are required to belong to a specified union.
- **Updating**
  The process of revising and reissuing a project network model to bring it into conformance with a current desired and necessary plan of action. Updating often, but not always, results from monitoring and evaluating the project. Usually the updating is done when it is found that the current plan of work does not adequately depict the actual conditions under which the project is being executed.
- **Upset Price**
  A guaranteed maximum price agreed to in a time and material contract. (See time and material contract.)
- **Value**
  The increase in worth of an open system to which an item of value has been added. Often multiplied by the weight of a factor to give the weight & value rating of a factor to help determine a choice of alternatives.
- **Value added**
  The improvement in the worth of anything that results from the efforts, contribution and involvement of specific people, processes, materials and ideas.
- **Vertical Growth (Integration)**
  A management system that encourages diversifying by adding new functions to existing functions. New functions added usually bear an organizational relation to the existing. An example of vertical integration is incorporating real estate control, building design, financing, construction, leasing and asset management into a single development operation.
- **Vested Authority**
  The endowing of privileges, strength and leverage from a superior, usually to a subordinate. Generally gained quickly, rather than being earned by long and proven service in a related field within the organization.
- **Want list**
  Those items that are wanted and can be included in the scope of work, over and above the must list items, since they provide a definable and acceptable rate of return on their cost.
- **Weight**
  The relative importance of a factor being used to help evaluate a choice. The importance is frequently measured by a numeric scale from 1 to 10, in which a very high positive

influence is indicated by a rating of 10. A very low influence is indicated by a rating of 01.

Degrees of importance between the highest and the lowest are indicated by number ratings from 02 through 09. The weight of a factor multiplied by the value added by the decision choice being considered gives a weight & value rating of a factor to help determine a choice of alternatives.

- **Win - win**
  A situation in which there are no losers. Usually some parties win more than other parties win.
- **Wish list**
  Those items that the owner and the user wish they could include but might not be able to due to budgetary or other reasons. Wish list items are best added, not deleted, as the project moves into construction.
- **Working Drawings**
  The set of contract drawings that pictorially show the intended appearance of a job when complete.

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CPM EXERCISE #2

Z, T, & L are the first tasks and can be concurrent.
X must be complete before N can start.
Q follows H.
C must follow L and precede W.
S follows B & W and precedes D & V.
N must be complete before M can begin.
K & D must be complete before R & X can start.
A must follow Z.
G precedes Q and follows V.
H cannot begin until F & R are complete.
D must be complete before F can start.
U follows B and precedes K.
W cannot start until T is complete.
M is the last task & follows Q.
B cannot begin until A & T are complete.

Z2	C6	M4
T4	W1	R5
L1	S3	U2
X3	B1	A2
N4	D2	F3
Q2	V3	G4
H3	K1	

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EXERCISE #3

1. Project begins with a time restraint (T/R) followed directly by task A.
2. Task A restrains tasks B and G.
3. Task H follows task G.
4. Task M follows task G and restrains task N.
5. Task C is restrained by B and restrains D, E and I.
6. Task I is restrained by H and restrains J, K and O.
7. Task O is restrained by N and restrains P and Q.
8. Tasks D and E restrain F.
9. Task L cannot start until J and K are complete.
10. Tasks P and Q must be complete before R can start.
11. Tasks F, L and R are not related to each other but can be completed simultaneously.
12. When tasks F, L and R are complete the project is complete.

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EXERCISE #4

- Project starts with T/R task A

- Tasks B, C, D follow task A directly and can be concurrent

- Task E is restrained by task C and restrains tasks G, H and J

- Task F follows task C and precedes task J

- Tasks G and H are restrained by task D

- Task K is restrained by tasks G, H and J and must be done before tasks N and M can begin

- Task L is restrained by task K and must be complete before task P can start

- Task P is restrained by tasks M and N and restrains task Q from beginning

- Task R cannot begin until task Q is complete and R is the last task in the network

- Task B restrains tasks G, H and J

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PMI Thinking - from Mr. DeBono's book on thinking

Mr. DeBono, an expert in the analysis and improvement of thinking patterns and methods, suggests a simple method of improving your decision making by improving your thinking habits

Mr. DeBono calls his technique PMI. It involves a short pause period before answering a prime question, during which the decision maker examines three aspects of the question, its pluses (P), its minuses (M), and its interesting features. Use of PMI on a specific question should take only a
relatively short time. For practice exercises, Mr. DeBono suggests 3 to 5 minutes for the whole PMI process. However the time period will vary depending on the time available and the nature of the question.

PMI is not a decision making process; it is a thinking process to be combined with other decision tools to help improve your thought processes, and consequently make better decisions than you do now.

A point to be stressed before using PMI, according to Mr. DeBono is to think slower but think better! Most of us jump too rapidly to a position that must then be defended irrespective of our second thoughts on the conclusions reached. Thus are born the often destructive self fulfilling
prophecies. PMI can help reduce the probability of taking indefensible stands on critical issues.

To use PMI first frame the question or situation you are addressing in clear, easily understood terms. For instance in considering a project delivery system, let us assume there is a choice available between using traditional, hard money methods compared to non traditional dovetailed guaranteed maximum price methods.

Taking each method individually let us see how our thinking about the systems can be improved with PMI. Again to be stressed is that PMI is not a decision making technique; it is a thinking technique from which more effective decisions can result.

1.) Select one of the methods to consider first, say, the non traditional, hard money delivery method (method 1).

2.) Visualize or write all of the good points (the pluses) you can think of about method 1. Keep your mind only on the positives. This is called directional thinking.

3.) Visualize or write all the negatives or detracting points of method 1. Keep your mind directed toward the negatives.

4.) Visualize or write all the interesting features about method 1 you can conjure up in a few minutes of thought. Mr. DeBono suggests you say to yourself. "It would be interesting in considering method 1, if....."

5.) Repeat the process with project delivery method 2.

6.) Make the decisions you are charged with using any of the decision making tools available to you.

Notice the stress in the above step by step procedure on **thinking** about the matter. It is thinking that encourages better use of the powerful scientific management tools available.

Think more slowly - think better!

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CREATIVITY AND HOW IT IS USED IN PROJECT MANAGEMENT

Creative thinking is an essential ingredient to successful project management. It helps the alert project manager to solve problems, establish management patterns, provide leadership and motivation, and to insure that design, quality and cost integrity of a project is maintained.

Creative thinking is applied to the management process on a routine basis by continuing to learn with an open mind; being among the first to accept something new while being among the last to discard the old.

There is also a special requirement for creative thinking that demands getting rid of what Roger von Oech in his book, A WHACK ON THE SIDE OF THE HEAD, calls mental locks. These mental locks are recognized by such familiar phrases as:

1. I'm looking for the right answer.
2. That isn't logical.
3. Be certain to follow the rules.
4. Let's be practical about this.
5. And don't make any mistakes.
6. Playing is a waste of time.
7. That's not my area of work.
8. Don't be silly.
9. But I'm not a creative person

The above statements indicate a set pattern of thinking, that when used blindly, get in the way of the creative process.

Other major obstacles to thinking creatively include making premature judgments, and excessive use of the self fulfilling prophecy. The self fulfilling prophecy usually indicates you have your mind made up before even starting any heavy thinking about the idea. You then never give your brain a chance to do any creative thinking.

Remember, it is nearly impossible to be creative and judgmental at the same time. So, in project management it is a good idea when creatively considering a complex matter to prepare a random, or non judgmental, laundry list of things that have to be done or thought about. The list should include all items within reason, whether or not you and the others involved think it should be included. Often the combination of a single idea

of doubtful merit is a brilliant thought in league with other ideas.

Processes of creatively tackling a problem have been used for hundreds of years by many excellent thinkers. The creative procedure can be described in six major steps.

1. Gather all facts that time will allow, about the subject under consideration. Try not to be judgmental while you are collecting information.

2. Think hard about the data and the other information you have gathered in relation to the problem or situation you are involved with.

3. Forget about the problem! Let the material looked at so far, and the ideas you might have, get mulled over by your subconscious. This period is called gestation.

4. Ideas (illumination!) will usually start springing to mind soon after the gestation period starts. However, in some cases it might take several days, weeks, or even months. Be alert for the sudden revelation of the solution. When the solution or idea or lost thought appears grab it and write it down!

5. Act on the solution, idea or thought!

6. Follow up and check to see if the solution was a good one and if it has worked.

Creativity is a simple, elegant way of life. All you must do to enjoy it is to unlock your thinking, exercise your mind and use your imagination!

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QUESTIONS TO CONSIDER

Guides to Ethical Decision Making

1. **Is my decision legal?**

   • Does it violate civil law or company policy?

2. **Is my decision balanced?**

   • Is it fair to all concerned in the short and long term situation. Does it avoid sum zero situations?

3. **How will my decision make me feel about myself?**

   • Will it make me proud?

   • Will I feel good if it is published in the newspaper?

   • Will I feel good if my family finds out about it?

Adapted from "The Power of Ethical Management"
by Kenneth Blanchard & Norman Vincent Peale

- **Ralph J. Stephenson PE**
  - **Construction retentions, collections and final payment - ho 259**
  - **Introduction - Payment as a lifeline**

Lifeline has many definitions but one in particular strikes me as being most appropriate to the construction profession; "A lifeline is a line or rope for saving life".

Payment or money flow on a construction project can be just that - a line of strength that can preserve the life, vigor and integrity of a project, or a line of weakness that can cast the project adrift.

Successful firms are not often heard complaining about payment. This oddity bears close examination from those seeking to emulate them.

- **General nature of cash flow in the construction industry**
  - Legal background for progress payments

Governed by the doctrine of conditions

Doctrine of conditions says that a party should not have to perform its promise without obtaining the other party's promised performance. The principle is central to any discussion of progress payments.

Who is required to perform first?

Common law requires that performance of services precede payment

  - Role and obligations of the payer

To maintain strong financial position that allows prompt payment when deserved

Makes people want to work for you

Improves potential for future reductions in proposal prices

To pay promptly and within the context of the contract

  - Role and obligations of the payee

To perform well and in accordance with your contract

To bill accurately and promptly

To follow the ground rules by which payments are to be made

Frequently the payee holds the key to successful payment for the work

Points for the payee to consider

Too often we in the construction industry blame everyone but ourselves for not being paid what we think is owed us promptly.

Many times the cause of slow or reduced payment lies with the payee, not the payer.

- **Conditions surrounding collections and payments**
  - Unsuccessful collections & payments often result from
    Mistrust - Inability to work honestly with unwritten standards
    Cupidity - Inordinate desire to get something for nothing
    Doubtful risk taking - A high risk has a corresponding high penalty
    Ultra conservatism - Excites suspicion and slows cash flow
    Incompetence - Produces a lack of desire to pay or work - no incentive
    Claim prone environment

The contested claim brings out the worst in everyone, and most particularly makes the payer reluctant to pay.

Understanding how to reduce the dust, noise and confusion that surround contested claims often can encourage prompt payment even in difficult conflicts.

Common causes of contested claims and their frequency are
Directed change - 48%
Constructive change - 42%
Defective or deficient contract documents - 41%
Delays - 41%
Constructive acceleration - 35%
Maladministration - 33%
Differing site conditions - 31%
Impossibility of performance - 18%
Superior knowledge - 18%
Termination - 7%

Stubborness - A balky mule cannot be depended on to pull the wagon
Dishonesty - Destroys incentives to play fair and pay promptly!

  - Successful collections & payments
    Trustful relations

Construction is a give and take situation. By the end of the job the gives and takes must balance out. The construction machinery is lubricated by the exchange of small favors.

Honesty

Honest people select their business associates carefully. Those who pay for services rendered generally recognize honesty in a company or an individual if they themselves are honest.

Competence

Competent people recognize competence in others. On most jobs, given the presence of a reasonable number of high value factors, the competent payee will be compensated fairly and promptly. Financial check and balance systems ask too many "why" questions to allow competent parties to remain unrewarded.

A willingness to give and take

All taking and no giving by either the payer or the payee will sink a project in a swamp of paper and a sea of red ink. The mistrust that results from this lack of informal give and take will grow to a monster unless it is replaced by a mutual confidence by the parties to the situation.

- **Retentions**
  - Often used for doubtful reasons
    - As a club to assure proper completion
    - To save interest payments for 10% of the job cost
    - To insure construction damage to completed work is repaired
    - To pay for anticipated contested claims
  - The problems of retention are old and will probably remain problems until
    - Properly addressed by the parties involved
    - There is agreement among like parties as to its impact
    - All parties to a contract behave according to their contract
  - Attitudes and realities about retention
    - In 1976 a survey was made of the American Subcontractors Association (ASA)
      - Showed average retention among members was $200,000
      - Members said would reduce bid price 3.7% if retention was eliminated
    - A recent survey of the American Subcontractors Association indicates
      - Subcontractors are willing to give lower bids to generals who
        - Pay them promptly
        - Offer them a fair and equitable contract
      - Of 200 respondents

89% said they give better bids to generals regularly or occasionally
90% did so because the general had prompt payment policies
91% said not paid within 3 days of billings
69% said not paid within 7 days of billings

Policies on retention
+ Recent AGC, ASC and ASA policy calls for payment within 7 days of billing
+ In 1974 GSA went to zero retention
+ At one time Department of Defense eliminated retentions
+ EPA once wrote retention requirements out of its grants
+ About 1984 Michigan Dept of Mgmt & Budget adopted zero retention
    Was required by the legislature
    Department had 2 choices
        Put money in escrow
            Problem - couldn't use state treasury for holding vehicl
            Problem - private holding would have too complicated
                Would have thousands of accounts
                Prohibitively expensive and cumberson
        Adopt a policy of total payment for completed line items
            Each line item was to be explicit
                On recent $2,000,000 job
                    Had about 1100 line items
                    Listed on 27 pages
                    Ranged in cost from $100 to nearly $70,000
    Adopted zero retention route
        Some state officials like it, some hate it
        Some contractors like it, some hate it
+ In 1983 the Office of Federal Procurement Policy decided that
    A uniform governmentwide policy should be implemented
    Retainage was not to be used as a substitute for good contract management
    An agency cannot withold funds without good cause
    Determinations on retainage are to be made on the basis of
        Contractor's past performance
        Liklihood that such performance will continue in the future
    Suggested that
        Retainage not exceed 10%
        That it be adjusted downwards as the contract approaches completion
        When contract is complete all retainages be paid promptly

Summary - there is no single attitude or reality re retentions!

- **Collections, or better yet, payments**
  - Direct payment from the owner
    Conventional method on self financed projects
    Success of method depends on the integrity and compentence of the owner
  - Direct payment from another contractor
    Evolved when general contractor did most of their own work
    The secondary payment process may be used as a club rather than a tool
  - Direct payment from another party
    Usually called the title company method
      Steps in the title company disbursement method
        A. Monthly draw requests received from the contractors
        B. Supporting documents reviewed by the appropriate tier of contractor
        C. Job inspected by inspecting architect retained by payer
        D. Payment made to the contractors directly
          Sometimes direct to subs
          Sometimes to general contractor for disbursement to subs
      Advantages
        Insures prompt payment to contractors
        Provides third party evaluation to gage performance
        Gives financing source full control of the money flow
        Tends to diminish tendency to front load or unbalance billings
      Disadvantages
        Removes some of prime contractor's leverage to get work done
        Creates excessive dependency on attitudes of financing source
        Owner plays secondary role in motivating performance
        Poorly qualified inspecting architect can create havoc
          Bad attitude toward contractors
          Jealousy between architect of record and inspecting architect
- **Final payment**
  - Elements of record used in closing out the job
    The punch list and the certificate of occupancy
      Usually these provide the rationale behind final payment being made
      You should decide early how the job is to be punched out
        Who is to do it?
        When is it to be done?

What standards of performance are to be used to measure acceptability
When is the contractor's punch list to be prepared?
When is the owner's punch list to be prepared?

The operating and maintenance manuals
Inadequate OMM submittals may be cause for non payment
Get them done and get them submitted!

- **Where successful collections and payment start**
  - The agreement

The starting point for cash flow success is preparation and execution of a well understood agreement up front

Often contractors take jobs that specify impossible performance

Leads to getting into a position where the owner, or the architect engineer feel they can withold payment for personal, subjective reasons, using the impossible clause as a legal reason.

Example: the witholding of payment because the contractor did not submit a acceptable schedule within a given period of time - usually an unreasonable time frame for preparation of a good plan of work and schedule.

Infeasible schedules
Inadequate contract documents
Unworkable contract agreements
Multiple primes
Installation of unknown systems
Undefined responsibility patterns

  - The client - either owner or contractor

Most payment-successful contractors profile a prospect before proposing on a job. This is done with any new client, and sometimes on previous clients with doubtful records.

Profiling a client should follows a basic pattern

What factors describe how a client will pay?
Personal integrity
Business integrity
Past payment record with you
Past payment record with others
Current financial strength

Nature of assembled project financing
Process used for approving payment and releasing funds
Attitudes of the architect/engineer toward you and paying
Methods of closing out jobs

- The project

As with the client, the project must also be profiled. Not every job is for everyone. Be very selective so as to optimize your opportunities for success.

What factors describe a good pay project for you

+ Your past experience in building such facilities
+ The client's past experience in building such facilities
+ Funding sources
  - Individuals
  - Syndicates
  - Trust funds
  - Pension funds
  - Political entities
+ Payment method
  - Direct payment
  - Title company payment
  - Inspecting architect
  - Payment method specified to be used for sub contractors
  - Retention specified

- Evaluating the job

Once the client and project factors are identified, it is necessary to analyze them for a decision as to whether the job is potentially a good job or a bad job. Good and bad is evaluated as to the risk and the return on investment.

A. Weigh each factor
   Weight each from one to ten as to its importance to you
   - One - totally unimportant to being paid
   - Ten - most critical to being paid

B. Assign values to the client and the project which you are proposing upon
   Values should be from one to ten
   - One - Client and project produce worst pay potential situation for factor
   - Ten - Client and project produce best pay potential situation for factor

C. Multiply the factor weight by the value to get a profile number

Example of profiling

How you might profile the payment potential of a new prospect.

Factor weights multiplied by value for client Jones
Honesty in business - 10 x 08 = 80
Past payment record with you 10 x 06 = 60
Past payment record with others 07 x 03 = 21
Current financial strength 07 x 05 = 35
Nature of assembled financing 05 x 07 = 35
Process for approving payment and releasing funds 08 x 09 = 72
Attitudes of the architect/engineer - 06 x 06 = 36
Method of closing out jobs 07 x 05 = 35
Factor weights multiplied by value for Jones project
Your past experience in building such facilities 05 x 08 = 40
Client past experience in building such facilities 04 x 04 = 16
Funding sources 08 x 08 = 64
Payment method 07 x 05 = 35

Total = 529 out of a total possible of 740, or a 71% potential for good payment relationship

- **Rules for getting paid promptly**
  - Be certain of your agreement and understand what it says
  - Be honest in your dealings and your intent
  - Fulfil your contract
  - Avoid legal entanglements and threats
  - Be willing to use the lubricating oil of small favors exchanged
- **If you aren't entitled to it don't try to get it!**
- **ho 259 - Dec, 87**

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Use of float time in project planning

What is float time? It is a number of working days determined by the total plan of work, and mathematically set by the logic of the network plan, by the durations assigned to each task, and by the completion date set for the project and its component parts.

Float is the amount of time between the earliest date an activity can start, according to a given plan of work, and the latest date it can start according to the same plan of work. Float time occurs in a task when the activities that restrain it are able to be completed before the latest date by which the restrained task must start, as determined by the latest allowable finish date of the project or project component.

Float time is not assigned by the planner, nor is it automatically allocated to activities that are traditionally critical.

Because of the nature of the construction business in which many normally unrelated organizations and individuals are brought together by agency and contract arrangements to do a job, float or discretionary time is potentially valuable to all parties to the job. Thus ownership of float time often becomes a subject of dispute and controversy.

A few guidelines which have seen general acceptance and some legal concurrence in practice are given below:

1. In a hard money fixed time contract the float time within the contract boundaries belongs to the contractor.

2. Ownership of float time should be established very early in a project. Where some question of ownership exists, the ownership rights should be noted on the plans and schedules of work prepared by the contractor.

3. On negotiated projects, where there may be a cost and time span to be mutually agreed on by the contracting parties as the project gets under way, ownership of float time is usually a matter to be worked out in advance as job conditions demand.

4. Relative to subcontractors, the ownership of float time within a hard money, fixed cost subcontract is usually set by implied consent, but normally rests with the prime

contractor under which the subcontractor is working.
In situations where there is very little interface between a prime contractor's tasks and his subcontractor's tasks, it is possible that ownership of self contained float may remain with the subcontractor.

5. Ownership of float time does not release a contractor from the obligation to provide a high quality service to the client. Where poor use of float time to the detriment of the job is encountered, fault for the poor performance will usually temper the ownership of the float.

* * *

In general most problems with float occur where approval delays are encountered, where intermediate project dates are not specified but are desired and imposed, when poor performance pushes tasks beyond scheduled end dates, or where uncontrollable obstacles to meeting project contract obligations appear.

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Closing Out A Construction Project

A random summary of close out guidelines for owners, architects, engineers and contractors

The process of closing out a construction project has emerged as one of the most important sequences of events a project team may encounter during the course of the project. Reasons for this are:

- The close out process usually results in a formal and legal acceptance of the facility by the owner or occupant. Thus responsibility for the correctness of the work passes from the design and construction team to the owner. The transition must be clear and indisputable to avoid contested claims and residual obligations.

- The conditions imposed by the warranties on workmanship, systems and equipment must be clearly defined and accepted by all concerned if adequate guarantees of performance are to be placed in force.

- The design and construction team must have a definitive point in time where their contractual obligations have been fulfilled and they can consider their legal relations closed out so far as project design and construction administration and operations are concerned.

- The owner must have a specific point in time where he can consider the project legally his without any hang over potential encumbrances from the design or construction team.

- The design and construction team must be able to use the project as a facility which they have no hesitation in describing or showing to prospects and current clients.

- A well closed project is insurance of future good relations with specialty contractors on the job as subcontractors of the prime contractors.

- The properly closed project makes no unreasonable or unpredictable demands on the design and construction staff subsequent to the close out.

The close out process does not start as the construction phase is being completed but long before. Closing out is an ongoing action. Throughout all phases of the job the experienced construction team studies the documents and the work so as to set how each element can best be turned over to the owner in accordance with the contract.

Some of the many steps to be taken to properly close out a project are given below. The list is for all parties to the contract, since most are involved in the close out phase. Parties indicated in ( ) are those most concerned with the item. Where multiple parties are indicated it does not necessarily indicate the parties must participate together in the action.

The list is at random. (Note: This list will be arranged by categories as it is added to)

1. Prepare a construction record package. This set of documents was formerly called the as built drawing set. (contractor)

2. Obtain, where appropriate, a certificate of occupancy, or equivalent document, from the local building department, or other regulatory and enforcement agency. (owner, architect/engineer, contractor)

3. Prepare, distribute and have approved by the owner, the architect/engineer and the contractors, a punch out procedure. (contractor, architect/engineer, owner)

4. Punch out the project and complete the punch list requirements within an agreed upon time frame. (architect/engineer, contractor, owner)

5. Prepare, submit and accept the operating and maintenance manuals for the total project. (contractor, owner)

6. Clear final payments on the project and obtain proper waivers of lien. (contractor, owner)

7. Provide the owner with a proper set of construction documents for reference use. (contractor, owner)

8. Collect and store job logs, diaries, daily reports, test reports and all other documentation generated by the job activities. (contractor, owner, architect/engineer)

9. Bring all meeting minutes and record files up to date so as to permit easy use and retrieval of needed information. (contractor, owner, architect/engineer)

10. Collect and bind all official and unofficial project photos. (contractor, owner, architect/engineer)

11. Collect and record all project network plans, schedules and bar charts by issue number, subject and date. (contractor, owner)

12. Close out and store all correspondence and other record files. (contractor, owner, architect/engineer)

13. Assemble and properly store all shop drawings and other job related submittals. (contractor, owner, architect/engineer)

14. Request the architect/engineer of record to make an inspection resulting in the granting of a certificate of substantial completion. This may be required to to obtain a certificate of occupancy. (contractor, owner)

15. Plan and implement grand opening or preview festivities for major team members, company principals and others contributing to the planning, design and construction of the facility. (owner, contractor)

16. Each party should conduct their own job critique during which responsible parties to the project meet and identify points of strength and weaknesses in carrying out the job. One major product of this critique should be a set of recommendations for improvement of future performance, and documentation of the problems encountered and how they were resolved. (contractor, owner, architect/engineer)

17. Relinquish, or account for, all client owned tools, spare parts, and extra stocks of materials, rightfully the property of the owner. (contractor, owner)

18. Provide the owner copies of all releases, including final inspection certificates, occupancy permits, operating certificates, health department approvals and permits, and all other similar documents to allow the owner to occupy the building under full understanding of the conditions of the turnover. (contractor, owner, architect/engineer)

19. Label all electrical panel boxes, plumbing lines, valves and equipment as required for proper operation and maintenance. (contractor)

20. Provide all keys and keying schedules. (contractor, owner)

21. Submit a final statement of accounting, as required, to the owner and the architect/engineer. (owner, contractor, architect/engineer)

22. Obtain, prepare or issue a final change order reflecting adjustments to the contract sums not previously made by change orders. (contractor, architect/engineer, owner)

23. Send sincere thank you letters as appropriate to the owner, to the design team and to various contractors involved on the job. (contractor, architect/engineer)

24. Provide the owner a complete list of contractors and vendors participating in the job and indicating their installation responsibilities. (contractor)

25. Insure the owner is placed on the marketing call list, mailing list and other action tickler files as appropriate. (contractor, architect/engineer)

26. Arrange for such open house activities as may be desired or required (owner, contractor, architect/engineer)

27. Insure that your company identification is shown somewhere in the building if permitted. (owner, a/e and contractor)

28. Insure the project is as clean or better than called for in the specifications when your staff moves off the job. Don't lose the good will of the owner by leaving him a dirty job. (contractor)

29. Properly train and turn over the facility to the owner's representatives. Depending on the size and complexity of the project, the training process should begin from one to three months before occupancy. (owner, contractor)

30. Establish and approve the start of all warranty and guarantee periods for all material and equipment on the job prior to owner making the facility operative. (owner, contractor, architect/engineer)

31. Prepare and submit to the owner a Construction Record Package. This package should contain the following: (contractor)

a. The construction record set referred to above.
b. Specific warranties required by the specifications
c. Workmanship or maintenance bonds required
d. Maintenance agreements called for by the specifications
e. Damage and settlement surveys of the site and the facilities
f. Final property surveys of the site.

32. Submit a final billing to the owner containing a list of all incomplete items and a properly assigned cost to each item. (contractor)

33. Advise the owner of any insurance changes over existing or past requirements or dates. (contractor, architect/engineer)

34. Complete all pre start up testing, run in and instruction along with submission of operating and maintenance manuals. (contractor, owner)

Note: All pre start up and start up requirements should be fully described in the contract documents and clearly referenced to the warranty period.

35. Submit final meter readings for utilities, and measured records of stored fuel at the time of substantial completion. (contractor)

36. Submit to owner, the consent of surety to final payment if required. (contractor)

37. Have final inspection made by an experienced exterminator to rid the job of rodents, insects or other pests. (contractor, owner)

38. Read the full contract document requirements (drawings, specifications, and contract) for closing out the job. (contractor, owner, architect/engineer)

39. Provide the owner a certification as to the building area calculations including gross square footage,

leasable square footage, and area use assignments.

Ralph J. Stephenson PE PC
Consulting Engineer

Suggested Bibliography of Management Related Books

a starter list for the project manager's library

- **Managing Yourself Creatively** — Ted Pollock
  Hawthorn Books, Inc.
  260 Madison Avenue
  New York, New York

- **The Nine Master Keys of Management** — Lester Bittel
  McGraw Hill Book Company
  330 West 42nd Street
  New York, New York

- **It All Depends** — Harvey Sherman
  University of Alabama Press
  University of Alabama

- **Management - Tasks, Responsibilities, Practices** — Peter F. Drucker
  Harper & Row, Publishers, Inc.
  10 East 53rd Street
  New York, New York 1002

- **The Managerial Grid** — Blake & Mouton
  The Gulf Publishing Company
  Houston, Texas 77001

- **Top Management Planning** — George R. Steiner
  The MacMillan Company
  866 Third Avenue
  New York, New York 10022

- **Management by Exception** — Lester R. Bittel
  McGraw Hill Book Company
  330 West 42nd Street
  New York, New York 10036

- **Critical Path Method** — Radcliff, Kawal, Stephenson
  Cahners Publishing Company

Boston, Massachusetts 02116

- **Effective Psychology for Managers** — Mortimer R. Feinberg
  Prentice Hall, Inc.
  Englewood Cliffs, New Jersey

- **The Time Trap** — R. Alec MacKenzie
  Amacon
  135 W. 50th Street
  New York, New York 10020

- **Management - Theory and Practice** — Ernest Dale
  McGraw-Hill Book Company
  330 West 42nd Street
  New York, New York 10036

- **An Introduction to Decision Logic Tables** — Herman McDaniel
  John Wiley & Sons, Inc.
  605 Third Avenue
  New York, New York 10016

- **Management by Objective** — George S. Odiorne
  Pitman Publishing Company
  20 East 46th Street
  New York, New York 10017

- **How to Attract Good Luck** — A.H.Z Carr
  Cornerstone Library
  Divison of Pocket Books, Inc
  Rockerfeller Center
  670 Fifth Avenue
  New York, New York 10020

- **Synectics** — William J. J. Gordon
  Harper & Row Publishers, Inc
  49 East 33rd Street
  New York, New York 10016

- **The Speech Writing Guide** — James J. Welsh

John Wiley & Sons, Inc
605 Third Avenue
New York, New York 10016

- **The Executive Deskbook** — Auren Uris
  Van Nostrand Reinhold Company
  450 West 33rd Street
  New York, New York 10001

- **Formal Organization - a systems approach** — Carzo & Yanouzas
  Irwin - Dorsey Press
  Homewood, Illinois

- **Managing Architectural Projects** — David Haviland
  The American Institute of Architects
  1735 New York Avenue NW
  Washington, DC 20006

- **Before You Build**
  Her Majesty's Stationery Office
  Government Bookshops, England

- **A Professional Guide for Young Engineers** — William E. Wickenden
  Engineers Council for Professional Development

- **Legal Apects of Architecture, Engineering and the Construction Process** — Justin Sweet
  West Publishing Company
  St. Paul, Minnesota

- **Managing in Turbulent Times** — Peter F. Drucker
  Harper & Row, Publishers, Inc.
  10 East 53rd Street
  New York, New York 10022

- **Effective Meetings for Busy People** — William T. Carnes
  McGraw Hill, Inc.
  New York, New York

- **Give & Take** — Chester L. Karrass
  Thomas Y. Crowell Company
  New York

- **Smart Questions** — Dorothy Leeds
  McGraw Hill Book Company
  New York, New York

- **Managing Organizational Conflict** — Stephen P Robbins
  Prentice Hall, Inc.
  Englewood Cliffs, New Jersey

I. Alternative Dispute Resolution and Partnering - an overview - ho 388

A. Introduction

1. Why has construction become so adversarial?
   a) The process of dispute resolution is not well understood
   b) We are having increasing difficulty controlling the indirect predictable, and the unpredictable impacts on our jobs.
   c) Professional success requires we consider the following:
      (1) The design and construction professional is obliged, above all, to protect the health, welfare and safety of the public.
      (2) The legal professional is obliged, above all, to protect the interest of his or her client. These interests are defined by the body of law. Thus the body of law, not the law professional, is depended upon in legal resolutions to protect the health, welfare & safety of the public.
      (3) The legal process has moved too far outside the control of those depending on its proper use to fairly resolve damaging conflict.
   d) Business success requires we take certain business actions.
      (1) Provide a quality process leading to a well constructed facility.
      (2) Focus on profitable production of services and facilities.
      (3) Provide a mechanism by which destructive conflict can be managed by intelligent leaders.
      (4) Encourage early action on potentially damaging events.
      (5) Reduce exposure to professional liability claims and costs.
2. The existence of unresolved conflict and disputes often requires that a neutral view be considered useful as a tool for positive change.

B. Partnering is a system of conducting business with minimal destructive conflict.

1. Other names for partnering
   a) A gentleman's agreement
   b) "Let's look at the drawings a bit more closely."
   c) "Let's tally up the favor score?"
   d) "Let's settle this over a beer."
   e) A handshake agreement.

C. Why is partnering applicable in today's construction industry?

1. What value is added by partnering?
   a) Lower costs to resolve conflicts.
   b) Quicker settlement of conflicts.
   c) Knowledgeable professionals make the resolution decisions.
   d) Decision makers are closer to the resolution process.
   e) Nature of decisions rendered lessen the probability of appeal.
   f) Participants gain privacy in the resolution process.
   g) Probability of fair resolution is increased by more timely consideration of the dispute.
   h) Helps cross critical transition points by setting the ground rules for the crossing
2. Where and why has partnering been successful?
   a) Comments on partnering from the Albuquerque District Corps of Engineers staff in a guide to partnering dated February, 1991

> ***"Our experience is positive based on six contracts with four of them substantially complete." Benefits include:***

(1) Disputes reduced - no formal claims.
(2) Common objectives achieved (schedule, safety, etc.).
(3) Increased responsiveness.
(4) Higher trust levels.
(5) Improved communication.
(6) Excellent cooperation & teamwork.
(7) Increased value engineering proposals.
(8) Developed expedited process for tracking and resolving open items.

b) Comments on partnering by Colonel Charles E. Cowen - Commander Portland District Corps of Engineers in a strategy for partnering in the public sector - April 15, 1991
(1) 80 to 100 % reduction in cost growth over the life of major contracts.
(2) Time growth in schedules virtually eliminated.
(3) Paper work reduced by 66%.
(4) All project engineering goals met or exceeded.
(5) Completion with no outstanding claims or litigation.
(6) Safety records significantly improved.
(7) Pleasure put back in the process for all participants.

c) Combination partnering relationships surveyed & studied by the Construction Industry Institute and reported in the publication ("In Search of Partnering Excellence" - July 1991).
(1) Shell Oil/SIP Engineering - 1984.
(2) DuPont/Fluor Daniel - 1986.
(3) Proctor & Gamble/Fluor Daniel - 1986.
(4) Proctor & Gamble/BGP - 1986.
(5) Shell Oil/Bechtel - 1987.
(6) DuPont/MK - Ferguson - 1987.
(7) Shell Oil/The Ralph M. Parsons Company - 1987.
(8) Alcan/Fluor Daniel - 1988.
(9) Union Carbide/Bechtel - 1988.
(10) DuPont/Day & Zimmerman - 1988.
(11) Great Northern Nekoosa/Rust International - 1988.
(12) Pillsbury/Fluor Daniel - 1989.
(13) Hoffman-LaRoche/Day & Zimmerman - 1989.
(14) Chevron/Bechtel - 1989.
(15) Bethlehem Steel/United Engineers & Constructors - 1989.
(16) Proctor & Gamble/M. W. Kellogg - 1989.
(17) Chevron/Besteel - 1990.
(18) DuPont/H. B. Zachry.

3. Situations in which partnering may be difficult to use
a) Where the parties intend to pay lip service only to the partnering effort.
b) Where individuals in key technical or management positions choose to resist intelligent discussion and fair decision making.
c) Where early commitments by the owner have made made good intercontract relationships difficult or impossible to maintain.
d) Where construction contracts are let as the documents are being released for field use.
e) Where several parties to the contract prefer to resolve disputes by contested claiming & binding resolution.
f) Where poor contract documents are made the basis of the partnering effort.

g) Where excessive, one sided conditions are placed on sub contractors by prime contractors.
h) Where unfair or obscure payment processing systems are specified and enforced.
i) Where risk has been poorly defined and unfairly allocated.

D. What are some of the ingredients of a successful partnering effort plan ?
1. Develop and maintain a strong desire to achieve project success for all.
2. Make intelligent commitments.
3. Avoid accepting or imposing unreasonable risk.
4. Work and act ethically, morally, and with integrity.
5. Work and act from a position of fairness rather than a position of power.
6. Suppress greed.
7. Try to establish an honest feeling of trust among participants.
8. Assign experience, competent people to responsible management positions.
9. Have empathy.
10. Prepare a good charter, a good partnership evaluation system, and a good issue resolution process.

E. Experiences and applications of the partnering concept.
1. What actions do others engage in that create problems for us, or do we engage in that create problems for others? (sample responses from an actual charter meeting.)
a) Giving directions to proceed without a timely change order.
b) Failing to establish clear chain of command.
c) General contractor covering general conditions costs by charging subs.
d) Lack of timely acceptance of work.
e) Lack of timely responses to
(1) RFI's.
(2) Approval of shop drawings.
(3) Site activity restrictions.
(4) Change orders.
(5) Value engineering.
(6) Acceptance of work.
f) Improper passing of general conditions responsibility to subs.
g) Lack of forum to evaluate and resolve open issues.
h) Slow submittal turn around.
i) Unreasonable punch lists.
j) Failure to recognize impact of changes on ongoing work.
k) Late submission of proposals.
l) Untimely submission of as-builts, operating & maintenance manuals, and training of user personnel.
m) Failure to maintain clean efficient, safe working conditions.
n) Do your own punchlists.
o) Pretest special systems - equipment start-up.
p) Untimely delivery of owner equipment.
q) Slow payment.
r) Design errors and omissions.
s) Resistance to solving problems perceived as *contractor problems.*
t) Changes issued in incomplete form (sketches & narrative).
u) Slow owner response to concurrent reviews & changes.
v) Pass through attitude by general contractor.
w) Bid shopping.

2. Recommendations to help resolve some of the problems we or others cause. (samples from an actual charter meeting.)
   a) Better communications.
   b) Less defensiveness/more openness.
   c) Fast dispute resolution.
   d) Don't take issues personally.
   e) Contractor review requests for information & submittals before processing.
   f) Be willing to propose/suggest solutions.
   g) Submittal schedule provided.
   h) Prioritization of submittals.
   i) Complete/thorough questions.
   j) Positive attitude.
   k) Recognition of owner's need to eventually occupy, operate and maintain facility/systems.
   l) Recognition of importance of paper work.
   m) Allowing necessary contract time for training.

F. Guidelines for the application and use of partnering concepts.
1. Determine the need for a partnering system.
2. Set goals and objectives to be gained from a partnering system.
3. Obtain management commitment for use of a partnering system.
4. Develop a partnering plan of action (the charter).
5. Obtain management commitment to a partnering plan.
6. Train and educate project participants in the partnering concept.
7. Create and implement an issue resolution system.
8. Create and implement a partnering review and evaluation process.
9. Charters - provided by courtesy of project management and staff as noted
   a) *Veteran's Administration Medical Center Replacement Hospital* - Detroit, Michigan
      (1) Mission statement

• We the undersigned recognize that we all have common objectives. We therefore agree to strive together to construct the Detroit VAMC safely, on time and within budget to the highest quality standards commensurate with its mission of serving veterans and the community.

• To achieve our mission we believe in the following principles
  - Commitment
  - Mutual trust
  - Integrity
  - Personal pride

      (2) Charter objectives
         (a) 01. Maintain open lines of communications.
            i) a. Recognize the need for quality information
            ii) b. Minimize submittal and response times in all matters
         (b) 02. Keep paper and administrative work to a minimum.
         (c) 03. Develop and implement an alternative conflict resolution system.
            i) a. Prompt resolution of conflicts at lowest possible level
            ii) b. Eliminate need for Contracting Officer decisions
            iii) c. Fair interpretation of ambiguities

iv) d. Be proactive (not reactive) in problem solving
v) e. Maintain objective attitude toward constructability and practicality
vi) f. Accept responsibility for your actions or inactions
vii) g. Have empathy in all matters
viii) h. Clearly describe changes to contract work

(d) 04. Limit cost growth.
i) a. Develop cost effective measures

(e) 05. Maintain clean, efficient, secure work site.
i) a. No lost time due to accidents
ii) b. Properly staff project
iii) c. Be a good neighbor

(f) 06. Seek to maintain good job morale and attitudes.
i) a. Promotion of partnering attitudes at all levels of contract administration
ii) b. Have fun
iii) c. Have pride in your product

(g) 07. Commit to quality control in all project related matters.
i) a. Do it right the first time
ii) b. Maintain proper work sequence
iii) c. Meet design intent
iv) d. Recognize owner's needs in occupation and operation of the facility

(h) 08. Close out job in proper and timely manner.
(i) 09. Maintain and implement a partnering evaluation system.

b) *Michigan Millers Mutual Insurance Addition & Renovation* - Lansing, Michigan
(1) Mission
(a) We the Project Team commit to construct a quality facility, on time and within budget, maximizing safety, communication, & cooperation so that all participants can be proud and profitable in their accomplishments.

(2) Objectives - to accomplish our mission we recognize a need to work to the following goals and objectives.
(a) Submittals
i) Clarify objectives and expectations of the submittal process.
ii) Minimize submittal and approval times.
iii) Provide accurate, prompt, clear, concise approvals.

(b) Payments
i) Make payments in accordance with the published flow chart process.

(c) Information processing & paperwork
i) Expedite all information and indicate desired response times .
ii) Maintain open lines of communication among Project Team members.
iii) Be available.
iv) Attempt to offer possible solutions to questions within a proper scope.
v) Provide clear responses to requests for information.

(d) Legal matters
i) No litigation.
ii) Settle disputes at originating level .

(e) Abatement
i) Establish, approve and publish a plan of abatement.
ii) Abate promptly.

(f) Planning and scheduling
  i) Provide, obtain, and use accurate activity information.
  ii) Clearly monitor the project against the plan and schedule.
  iii) Commit to, and fulfill man hour projections.
(g) Decision making
  i) A/E team to regularly inspect work and advise compliance.
  ii) Define and clearly communicate quality expectations.
  iii) Properly empower those at all decision making levels.
(h) Policies and procedures
  i) Prepare, review, approve and publish policies and procedures that will serve as guidelines to manage the project.
(i) Site layout and management
  i) Formulate and publish a trash removal & parking plan.
  ii) Properly establish and maintain bench marks and control lines.
(j) Processing revisions
  i) Provide written authorization prior to work proceeding.
  ii) Respond to requests for information, bulletins and change orders promptly.
  iii) Prepare, approve & publish a flow chart for processing revisions.
(k) Be a good partnering neighbor
  i) Commit to protecting your work and the work of others.
  ii) Show all participants due respect and acknowledgement.
  iii) Maintain proper work sequences.
(l) Total quality management (TQM)
  i) Prepare, approve, publish, and commit to a TQM program.

G. Alternative dispute resolution (ADR) systems and their application in construction.
1. What is ADR?
  a) In broadest terms, ADR is a method of resolving disputed design and construction claims outside the courtroom.
2. Why are disputes often not resolved promptly and fairly.
  a) Differences in goals and objectives of parties to the project
  b) Lack of clear understandings about the design and construction industry needs.
  c) Lack of value-added for outside interests through prompt and fair settlements.
  d) Excessive resort to legal based delays and road blocks to resolution.
  e) Excessive demands on resolution resources (courts, arbitrators, judges and other agencies involved).
  f) Greed.
3. The origin of the negotiated methods of dispute resolution.
  a) Informal negotiation *was* the delivery technique before excessive legal systems were imposed upon the industry. (or were accepted by us)
  b) Varies with the time.
    (1) In periods of exceptionally high economic activity money can be spent on expensive resolution methods to gamble on a high return on the investment.
    (2) In periods of low economic activity money must not be wasted on high risk, uncontrollable methods of expensive resolution.
  c) Today we cannot afford to spend our, nor our client's, money on high risk gambles. Therefore relatively low cost. non binding resolution processes have become popular.
  d) The acrimonious atmosphere surrounding binding resolution methods has proven demeaning, unpopular, negative, and harmful to how the professional can best do

business.

4. ADR guidelines for effective project use
   a) A basic ADR principle - The earlier in a construction project that the participants employ dispute resolution techniques, the more these techniques will contribute to project success.
   b) Even when problems turn into disputes, litigation should not be the initial method used to resolve them.
   c) Non-binding dispute resolution should be attempted before resorting to binding dispute resolution.
   d) Advance commitment to ADR methods, contributes to effectively and fairly solving problems as they arise.
   e) A cooperative project environment helps prevent disputes.
   f) Jobsite dispute resolution often helps dispose of problems as they arise & before they multiply.
   g) Dispute resolution proceedings should be conducted expertly, and effectively by experienced design and construction practitioners.
5. Some resolution methods available
   a) Non binding
      (1) *Prevention methods* - produces maximum harmony - usually least cost.
         (a) Intelligent and proper risk allocation
            i) Risk should be assigned to the parties that can best manage or control the risk, i.e.
               (1) The owner, where construction begins before construction documents are complete - the contractor, where full, well prepared, and checked construction documents are available.
               (2) The architect, if the owner has prepared a well conceived and clearly stated program - the owner, if the a/e is expected to assemble and write the program.
            ii) Attempts to shift risks to architects, engineers or contractors not able to absorb these risks is not cost-effective
               (1) Reduces competition
               (2) Increases costs due to greater contingency allowances.
               (3) Increases costs and reduces effectiveness because of the potential for increased numbers and intensity of design & construction project disputes.
         (b) Incentives for cooperation
            i) Incentives or bonus provisions
            ii) Disincentives or penalty provisions
         (c) Partnering
            i) Stresses good faith agreements
            ii) Emphasizes teamwork
            iii) Encourages good communications
      (2) *Internal negotiation methods* - parties involved conduct negotiations - requires consensus - relatively cost free.
         (a) Direct negotiations (often starts at UDM level)
         (b) Step negotiations (starts at dispute originating level)
      (3) *Informal external neutral methods* - preselected external neutral serves as a informal dispute-resolver - relatively low cost.
         (a) Architect/engineer rulings

i) May be respected even though not legally binding.
ii) Must be impartial

(b) Dispute resolution board
i) One member selected by owner and approved by contractor; one by the contractor and approved by the owner; a third by the first two members. Third selection usually acts as chairman.
ii) Those selected should be from the design & construction industry.
iii) Must have no conflict of interest.
iv) Conduct investigations and hearings on disputes and publish prompt opinions re the dispute.

(4) *Formal external neutral method* - preselected external neutral(s) serves as formal dispute resolver - relatively low cost - usually requires considerable preparation, and may require legal assistance.
(a)
(b) Mediation - settlement conferences and informal hearings conducted by a neutral third party.
(c) Minitrial - private settlement method usually initiated by an agreement between the parties - less formal than mediation.
(d) Advisory opinion - neutral expert meets with both parties, obtains information from both, and render prediction as to the ultimate outcome if adjudicated.
(e) Advisory arbitration - abbreviated hearing before neutral expert(s). Arbitrator(s) issue advisory award, and render prediction as to ultimate outcome if adjudicated.

b) Binding
(1) *Outside of courtroom* - dispute given to knowledgeable third party - moderate cost - may require legal assistance.
(a) Binding arbitration
(b) Private judge
(2) *Inside of courtroom* - most expensive - usually requires legal assistance.
(a) Bench trial - before a judge
(b) Jury trial - before a jury

6. What is needed for success in resolving disputes?
a) A desire for a win - win resolution.
b) A desire for a fair resolution.
c) People in charge who want a resolution.
d) A dispute resolution technique that is acceptable to those involved.
e) Knowledge of how to arrive at a resolution system that can produce a decision.
f) An understanding of the belief that if you aren't entitled to it don't try to get it!

Ralph J. Stephenson PE PC
Consulting Engineer

OBLIGATIONS

Hierarchy of professional obligations as formulated by Dean Freund

- *Prime - Protection of public health, welfare & safety*
- *Secondary - Your employer or client*
- *Tertiary - Your peers*

Ralph J. Stephenson P.E. P.C.
Consulting Engineer

OBLIGATIONS & PROFESSIONAL NEEDS

- **The design and construction professional is obliged, above all, to protect the health, welfare and safety of the public.**

- **The legal professional is obliged, above all, to protect the interest of his or her client. These interests are supposed to be defined by the body of law. Thus the body of law, not the legal professional, is depended upon to protect the health, welfare & safety of the public - relative to the law.**

Ralph J. Stephenson P.E. P.C.
Consulting Engineer

OBLIGATIONS & BUSINESS NEEDS

- **To profitably produce services & facilities.**
- **To provide solutions.**
- **To measure the quality of the process you provide.**
- **To help manage destructive conflict.**
- **To encourage early action on potentially damaging events.**
- **To reduce professional liability costs.**

Ralph J. Stephenson P.E. P.C.
Consulting Engineer

HOW PROFESSIONAL OBLIGATIONS MAY CREATE A NEED FOR ADR

- The design and construction professional is obliged, above all, to protect the health, welfare and safety of the public.

- The legal professional is obliged, above all, to protect the interest of his or her client. These interests are supposed to be defined by the body of law. Thus the body of law, not the legal professional, is depended upon to protect the health, welfare & safety of the public.

Ralph J. Stephenson PE PC
Consulting Engineer

PEOPLE

Most people are honest, concerned, desirous of challenge, need attention, and welcome help in times of turmoil.

Ralph J. Stephenson PE PC
Consulting Engineer

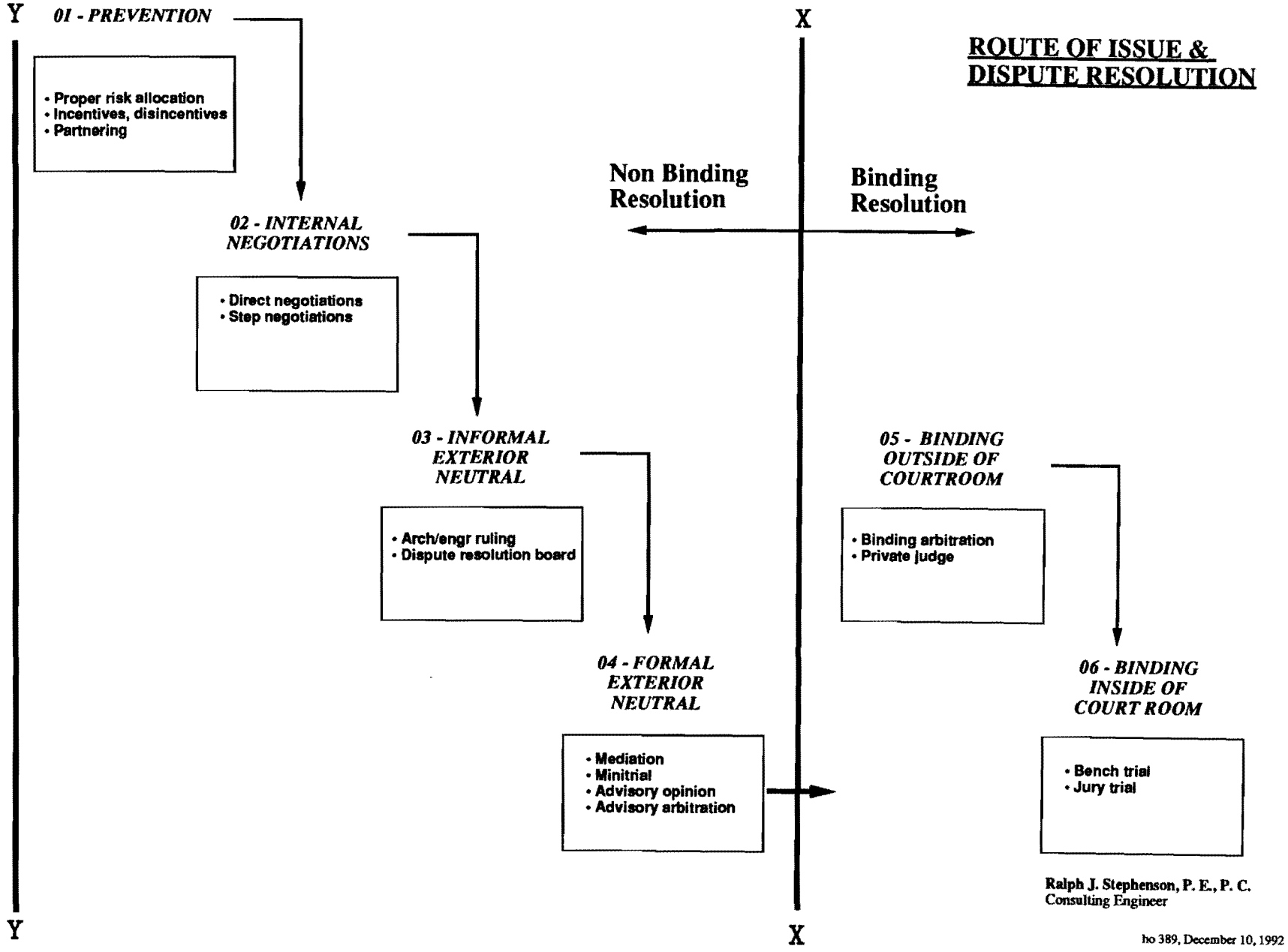
DESTRUCTIVE CONFLICT

Animosity or disagreement which results in lowering the potential for an individual or organization to succeed.

Ralph J. Stephenson PE PC
Consulting Engineer

POSITIVE CONFLICT

Hostility that is managed so that its resolution raises the potential for individuals or organizations to succeed at being excellent.



ROUTE OF ISSUE & DISPUTE RESOLUTION

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Ralph J. Stephenson, P. E., P. C.
Consulting Engineer

ho 389, December 10, 1992

MIND PROBER

RALPH J. STEPHENSON, P.E., P.C.
CONSULTING ENGINEER

Agree	Disagree	
		Talkative - chatty, always speaking
		Egotistic - self-centered, individualistic
		Empathetic - aware of another, compassionate
		Apprehensive - fearful, worried, afraid
		Unconventional - unusual, not the norm, rebellious
		Kind - gentle, considerate, warmhearted
		Rigid - still, unchanging, inflexible
		Impatient - excitable, unable to wait
		Sympathetic - comforting, understanding
		Reserved - restrained, self-controlled, shy
		Adventuresome - daring, willing to take chances
		Uncaring - lacking in warmth or sympathy
		Quiet - still, silent, not talkative
		Sarcastic - joking in a biting or cynical way
		Concerned - aware, caring, interested
		Distant - remote, inaccessible, removed
		Competitive - seeking to win, ambitious, achieving
		Apologetic - sorry, regretful, makes excuses
		Outgoing - sociable, friendly
		Independent - self-reliant, autonomous
		Sensitive - perceptive, touchy, nervous
		Meek - humble, submissive, patient
		Meticulous - extremely careful, scrupulous
		Suspicious - doubtful, distrust, uncertainty
		Fun-loving - playful, carefree, spontaneous
		Help-seeking - looking for assistance or comfort
		Charitable - generous, kind, giving
		Neighborly - friendly, amicable, familiar
		Achieving - accomplishing, persevering, striving
		Approval-seeking - wanting acceptance and praise
		Self-blaming - guilt, fault finding
		Precise - clearly defined, exact
		Guarded - kept safe, protected, watched over
		Carefree - free of worry or responsibilities
		Dependent - needing aid or assistance
		Comforting - soothing, relieved, consoling

E.C.3

MIND PROBER

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Agree	Disagree	
		Affiliative - associated, connected
		Ambitious - enterprising, striving, eager
		Status-conscious - attentive to position and wealth
		Humble - reserved, self-conscious, modest
		Accurate - correct, clear-cut, beyond doubt
		Defensive - protective, shielded, careful
		Joking - witty, wisecracking, jesting
		Defenseless - unguarded, unprotected, needing shelte
		Consoling - solace, to cheer up
		Hospitable - welcoming, warm, receptive
		Goal-oriented - seeking success and achievement
		Seeks Attention - wanting to be noticed
		Obedient - compliant, amenable, dutiful
		Responsible - accountable, trustworthy
		Wary - cautious, watchful, on guard
		Playful - implish, mischievous, frivolous
		Trusting - confident, committed
		Protective - defended, guarded, careful
		Loyal - steadfast, faithful, devoted
		Striving - contending, exerting effort
		Seeks Recognition - wanting to be praised
		Yielding - deferring, relenting, gives in
		Tidy - neat, orderly, clean
		Secretive - covert, underhanded, concealed
		Pleasure-seeking - seeking gratification or delight
		Insecure - inadequate, unsure, shaky
		Nurturing - nourishing, supporting, fostering
		Individualistic - one-of-a-kind, independent
		Accomplishing - successful, to bring to completion
		Socially Striving - seeking respectability

8.C4