

CPM SEMINAR

GRANGER CONSTRUCTION CO

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Presented by

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- CRITICAL PATH PLANNING
- LAND PLANNING
- MANAGEMENT CONSULTING
- PLANT LOCATION

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ABOUT RALPH J. STEPHENSON, P. E.

Mr. Stephenson is an engineering consultant with a diversified background in land planning, facilities location, building design and construction, critical path method and technical management.

Educated 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, and the H. F. Campbell Company. With the latter two organizations Mr. Stephenson occupied executive positions as vice president. In 1962 he started his own consulting practice, specializing primarily in operational and management areas for owners, designers and contracting firms.

He is a registered professional engineer in the states of 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, Michigan Association of the Professions and the Great Lakes Area Development Council.

Since 1953 Mr. Stephenson has been associated at middle and upper management levels with the planning, programming, design, construction and operation of billions of dollars of industrial, commercial and public facilities in all parts of the United States and Canada. He has taught many technical and management seminars in the United States, Canada and Europe and has authored several magazine articles. He has also co-authored a book on critical path method. His broad experience has given him an understanding and appreciation of the nature of small, medium and large companies and for the need to solve their management problems through creative systematic and knowledgeable approaches.

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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!

APPROACH PATTERNS:

1. Improve capabilities
2. Gain control
3. Create - Don't adapt
4. Experiment
5. Expand conceptual grasp
6. Don't deadhead - Keep learning
7. Solve problems
8. Define objectives

GLOSSARY OF TERMS USED IN PROJECT MANAGEMENT

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 executive 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.

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 CONTRACTURAL REALTIONS - The interconnection of those parties bound by subsequent assignment of a contract to other than the initial parties.

AUTHORITY - The leverage, either vested or acquired over a long period of time, that allows an individual to carry out their responsibilities and duties.

BASIC CONTRACTURAL 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.

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.

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.

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 a 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.

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 a 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.

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.

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.

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.

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.

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-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.

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.

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.

DOCUMENT CONTROL SYSTEM - A method of receiving, classifying, marking, 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 stoppages 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.

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.

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. Contrasts with project operations.

GENERAL CONDITIONS - The portion of the contract agreement that contains contractual-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.)

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.

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.

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.

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.

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 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.

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.

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.

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 plan 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.

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.

OPEN SHOP - A work area in which both union and non union workers can be employed on similar tasks.

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.

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.

PROBLEM - A deviation from an accepted and/or approved standard of performance.

PROFIT - EDUCATIONAL & TRAINING - Fulfilment 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.

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

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 subperiod 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 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 - DIRECT - Asked with strong indication as to who or whom should answer.

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 - 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.

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.

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.

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.

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.

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.

SUPERIOR KNOWLEDGE - The owner's withholding specific data on matters of substance not known to contracting parties during the pre contract period.

SUSPENSION - An owner's or owner's agent action of stopping all or a part of the work.

TALENT - A capacity for achieving identifiable success. Usually talent is considered an abstract resources.

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.

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. $(LF-ES)-DURATION=TF$.

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.

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 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.

UPSET PRICE - A guaranteed maximum price agreed to in a time and material contract. (See time and material contract).

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.

WORKING DRAWINGS - The set of contract drawings that pictorially show the intended appearance of a job when complete.

glossary terms d156, ho 214

Summary of the Nine Master Keys of Management

(Adapted from the Nine Master Keys of Management
by Lester R. Bittel)

Three requirements of the good manager

- A. Acquire a discerning (unique) point of view
- B. Follow an effective mode of action
- C. Employ a sensitive touch in interpersonal relationships

A Discerning Point of View

Action #1 - Apply situational thinking

Result #1 - Your decisions will be more objective and less impulsive

Action #2 - Identify vital targets

Result #2 - You'll quickly recognize turning points in critical situations

Action #3 - Prepare for the probable

Result #3 - You'll be less flappable in difficult situations

An Effective Mode of Action

Action #4 - Focus on performance criteria

Result #4 - You'll better satisfy yourself and your superiors

Action #5 - Act from a plan

Result #5 - You'll be able to get projects under way quickly and with certainty

Action #6 - Manage by exception

Result #6 - You'll accomplish more work than you ever thought possible

A Feeling for People

Action #7 - Develop your confidence in others

Result #7 - You'll find that people cooperate more freely

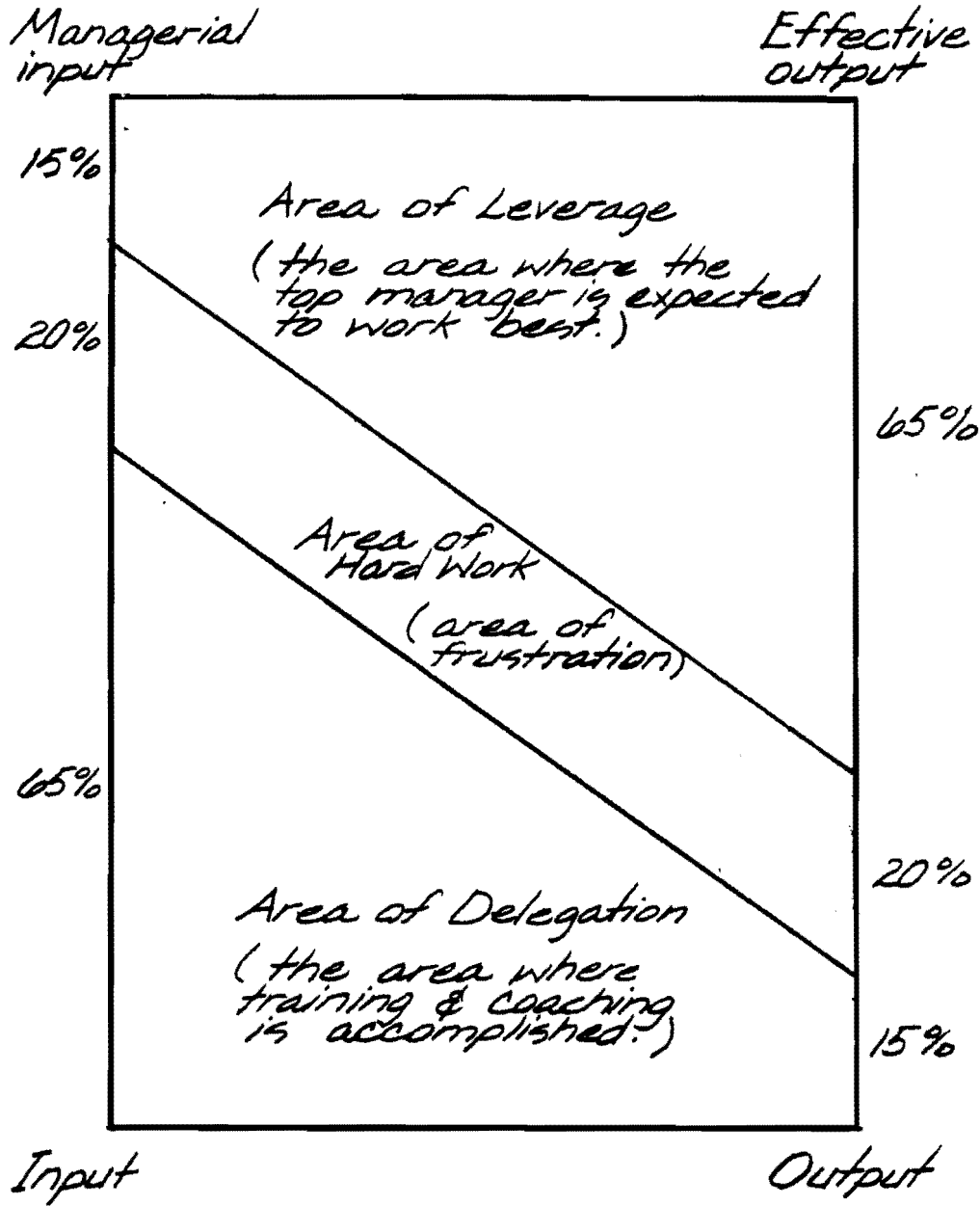
Action #8 - Employ the power of training

Result #8 - You'll find that employee attitudes improve

Action #9 - Know your true self

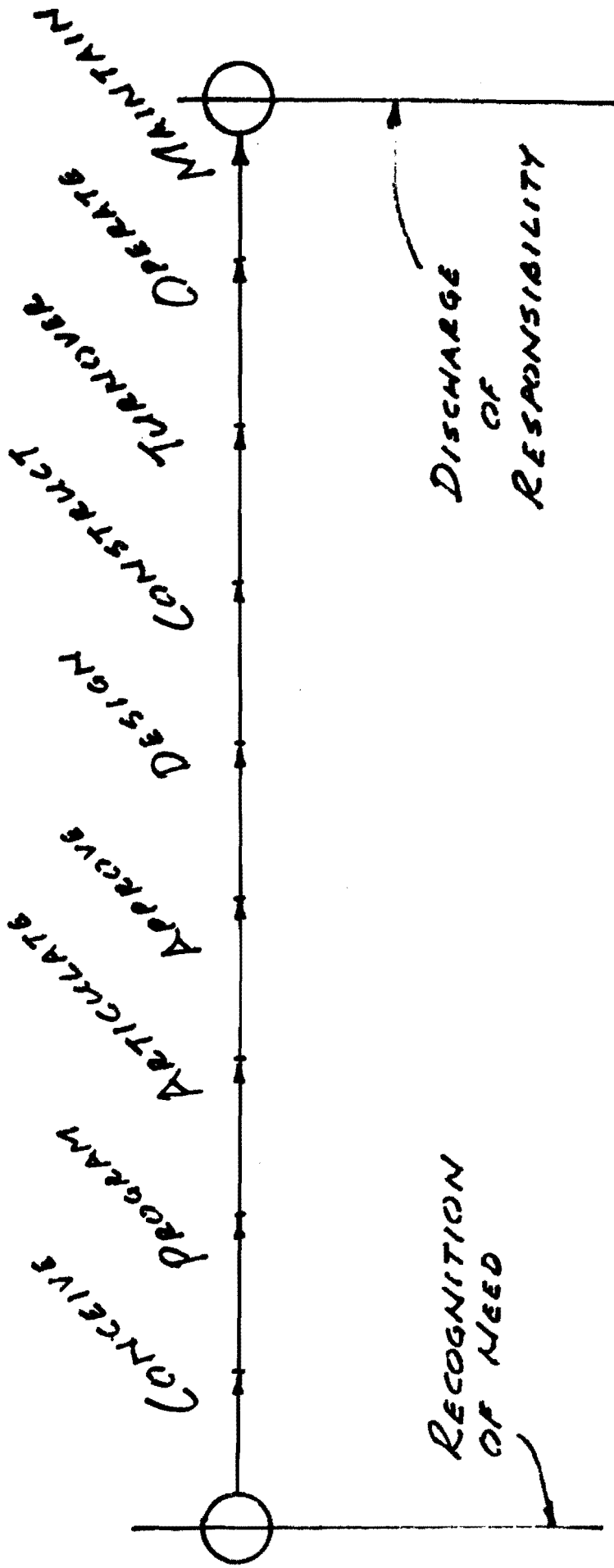
Result #9 - When you truly comprehend your whole self you'll find people responding to your ideas more directly and often more favorably

Remember: If you don't care who gets the credit,
you can accomplish anything.



MANAGERIAL LEVERAGE

DS 2/4/72



LINE OF ACTION

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 AND ANSWERS

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.

HOW DOES IT WORK?

A project seems to require nine major steps, done well, to be successful.

1. Goals and objectives for the project must be clearly identified and articulated.
2. Starting, intermediate, and ending measuring points should be established early in the project life.
3. A plan showing desired and necessary courses of action from beginning to end of the project must be set.
4. The plan should be translated into schedules, and the resources needed should be determined and balanced for most profitable performance.
5. The project organization is built under (not over) the resources required to give resource management quality, continuity, and monitorability.
6. A method of isolating, identifying and correcting deviations from desired performance

standards must be designed and put into action.

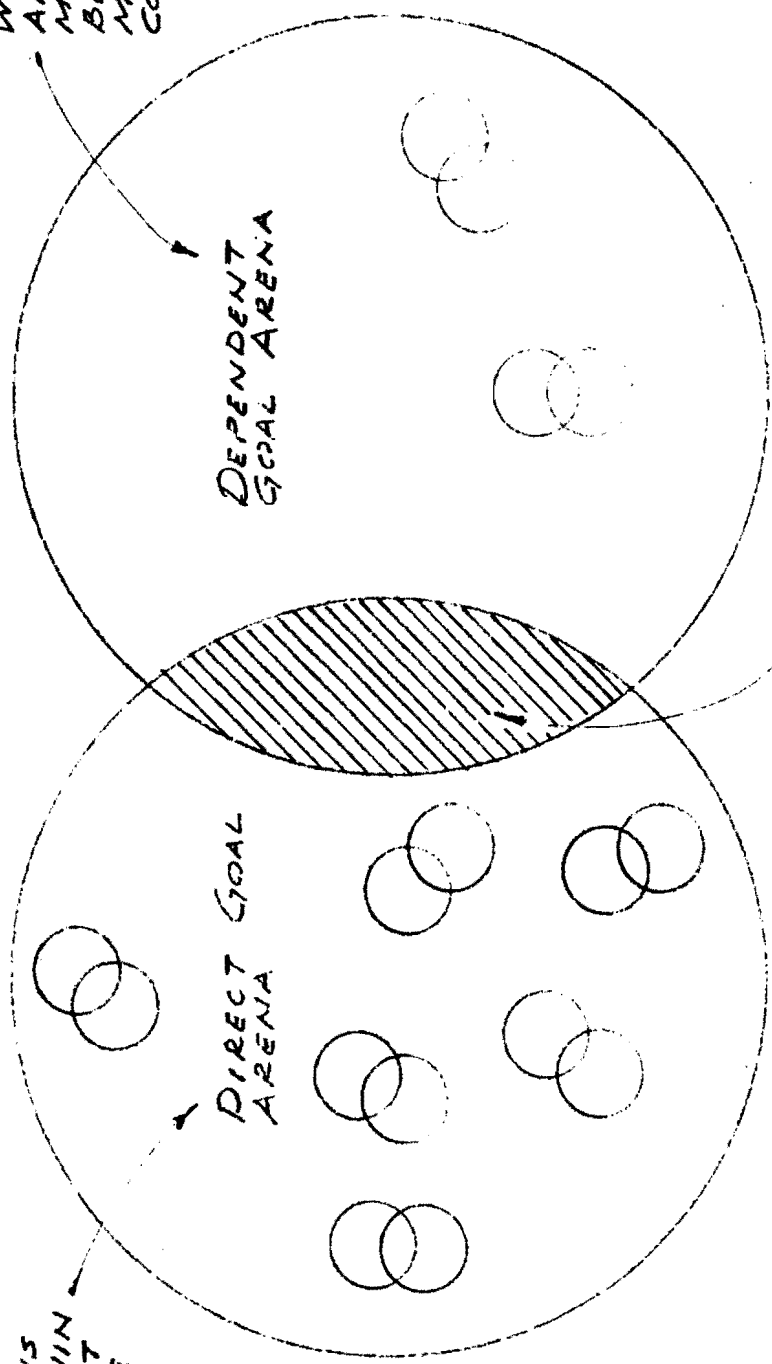
7. The needed resources are next assembled and the team gets to work.

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 the work draws to a close.

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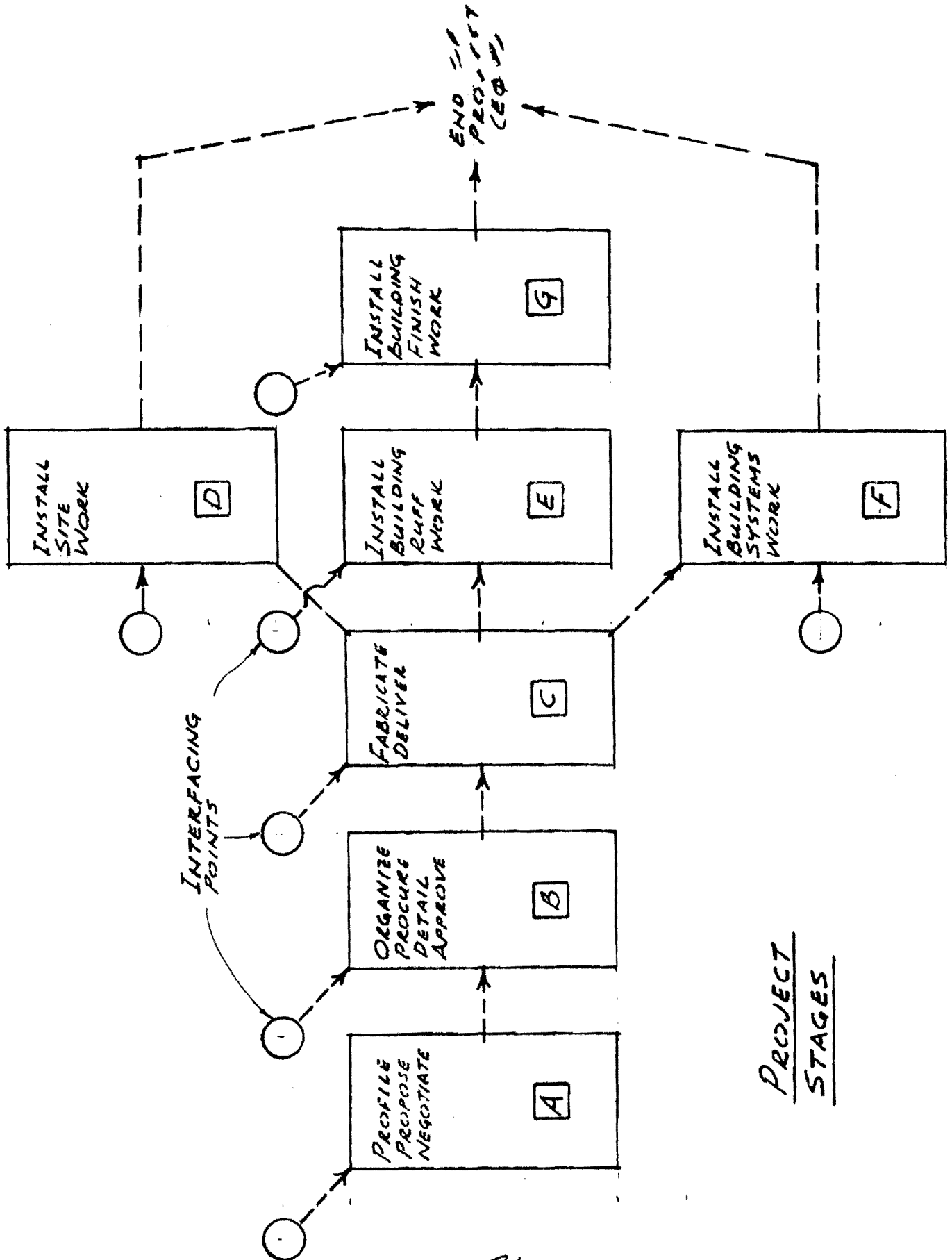
TARGETS TO BE
ACHIEVED BUT
WHICH ARE
AFFECTED BY
MAJOR INFLUENCES
BEYOND THE
MANAGER'S
CONTROL

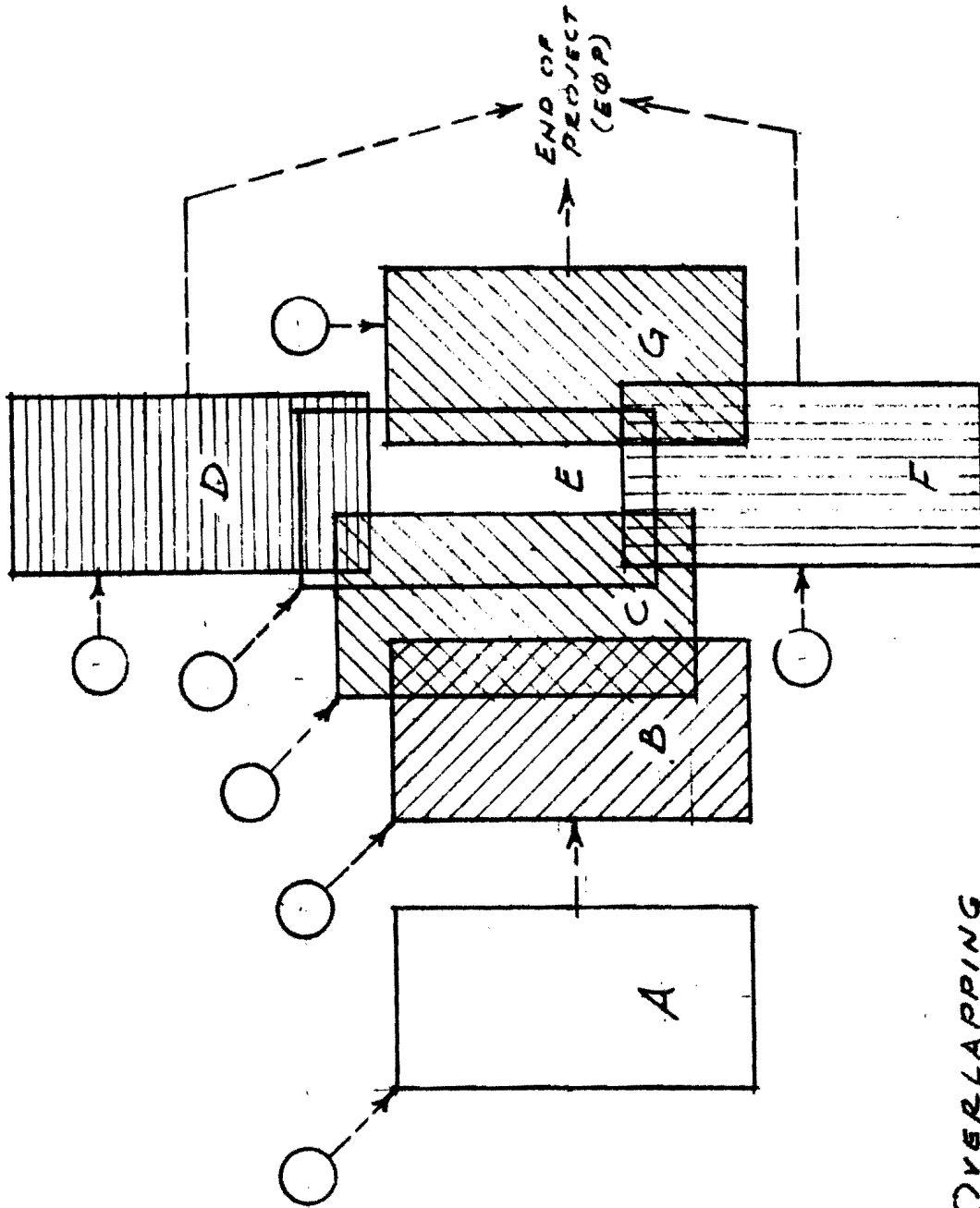


TARGETS TO BE
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CONDITIONS
WELL WITHIN
THE DIRECT
INFLUENCE
OF THE
MANAGER

THIS INTERSECTION IS
WHERE THE GOOD PM
IS USUALLY FOUND TO
EXCEL; MANAGING THE
INTERFACES BETWEEN
DIRECT GOALS & DEPENDENT
GOALS.

THE DIG/DEG INTERSECTION





OVERLAPPING
PROJECT
STAGES

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)

WHAT FACTORS INFLUENCE PROFIT?

Business Volume	Size of Project
Field Efficiency (Effectiveness)	Quality of Dwgs & Specs
Office Efficiency (Effectiveness)	Location
Executive Competence	Labor Relations
Executive Interest	Caliber of Field Managers
Diversity of Operation (Hedging)	Expediting Effectiveness
Types of Contracts	Project Planning
Quality of Estimating	Project Scheduling
Unit Costs	Withheld Amounts
Area Work Volume	Availability of Labor
Season of Year	Billing Procedures
Local Economy	Inventory Practices
National Economy	Internal Education
Governmental Policies	Internal Training
Caliber of Participating Contractors	Type of Business
Caliber of Competing Contractors	Experience
Caliber of Suppliers	Reputation
Delivery Dates	Staff Honesty
Amount of Warranty Work	Caliber of Purchasing Skills
Caliber of Owner or Client	Profiling Procedures
Type of Project	Organizational Plans

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 answer
 - 1. What?
 - 2. Where?
 - 3. When?
 - 4. How?
 - 5. Who?
- B. Five essential planning actions for the manager to take
 - 1. Set goals and objectives
 - 2. Prepare an action plan
 - 3. Organize the work
 - 4. Assemble the resources needed
 - 5. Do the job
- C. Set goals and objectives
 - 1. Definitions
 - a. Goals - Targets, desires, wishes and aims expressed without a time scale.
 - b. Objectives - expressed goals upon which a time frame has been imposed.
 - 2. The DIG/DEG/DOG
 - 3. Be specific when setting objectives.
 - 4. Set objectives so that movement toward their achievement can be measured.
- D. Prepare an action plan
 - 1. May be verbal, written or visual
 - 2. May be strategic or tactical, detailed or summary
 - 3. May be short, medium or long range (the manager must set the planning 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, the greater the probability that longer range needs, which truly measure the manager's effectiveness, will remain unfilled.
 - b. The higher you are in the management structure, the larger and longer the planning scale you must use.
 - c. The concepts of decision to action time span
 - 4. Plan the work and work the plan!
- E. Organize the work
 - 1. Plans should be built upon maximum integration of management viewpoints.
 - 2. Establish relationships through functional diagramming 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. Grapevine often used for informal feedback
 - b. Formal feedback system should be built by specific assignment (must have a standard of performance for the feedback system to work well).
- 5. Organize to accomplish goals and objectives.
 - a. Keep organization lean - avoid unnecessary overhead
 - b. Make provisions in the organization to delegate and train
 - c. Tend to build around targets and needs rather than people (there are major exceptions to this - watch carefully)
 - d. Provide for proper grading of decision to action time spans
- F. Common planning failures
 - 1. Not touching all organizational bases - what, where, when, how and who
 - 2. Committing to too many goals and objectives at one time
 - 3. Underestimating the value and need for good forward planning
 - 4. Failure to challenge plans and actions at the right time.
 - 5. Not providing proper escape hatches and safeguards
 - 6. Failure to encourage timely, knowledgeable participation
 - 7. Not obtaining higher level approvals of goals and objectives
 - 8. Inadequate monitoring and control of costs, progress, documentation and resource loading
 - 9. Poor assignment of duties, responsibilities and actions
 - 10. Failure to understand that planning is a major task of the manager

act pln,d156, ho216

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.

REMEMBER - KEEP SYMBOLS SIMPLE!

Rules of Job Planning

1. All tasks preceding 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.

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.

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.

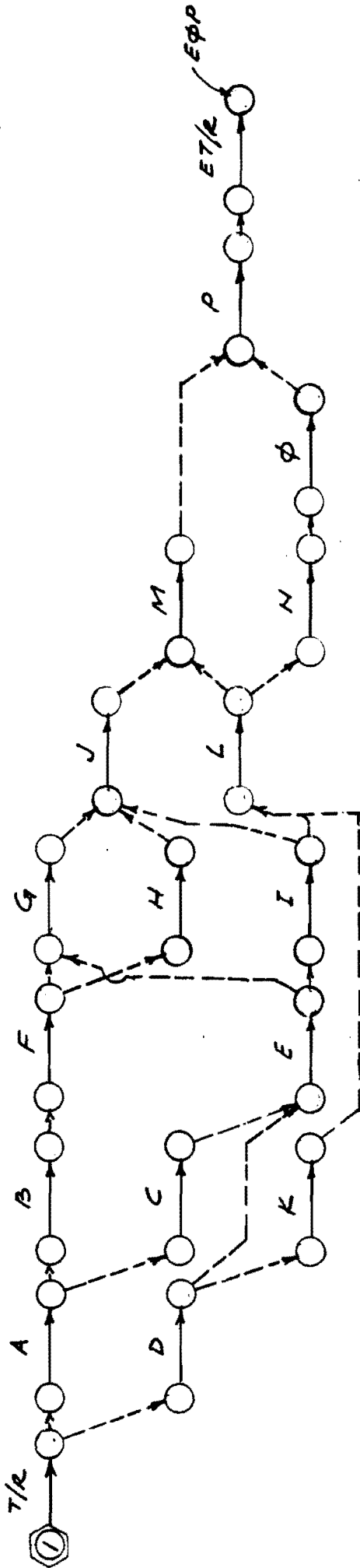
Z2	C6	M4
T4	W1	R5
L1	S3	U2
X3	B1	A2
N4	D2	F3
Q2	V3	G4
H3	K1	

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.

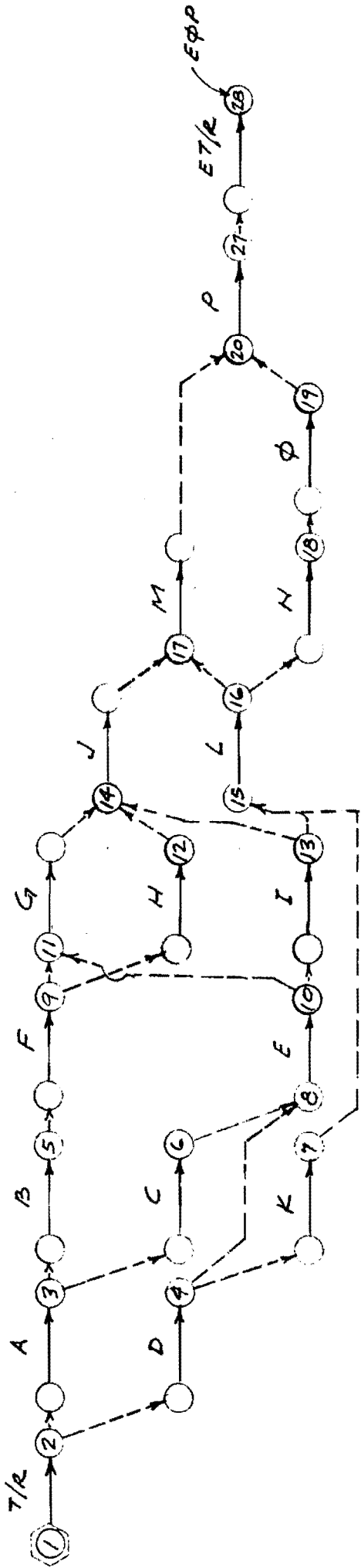
EXERCISE #4

- 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



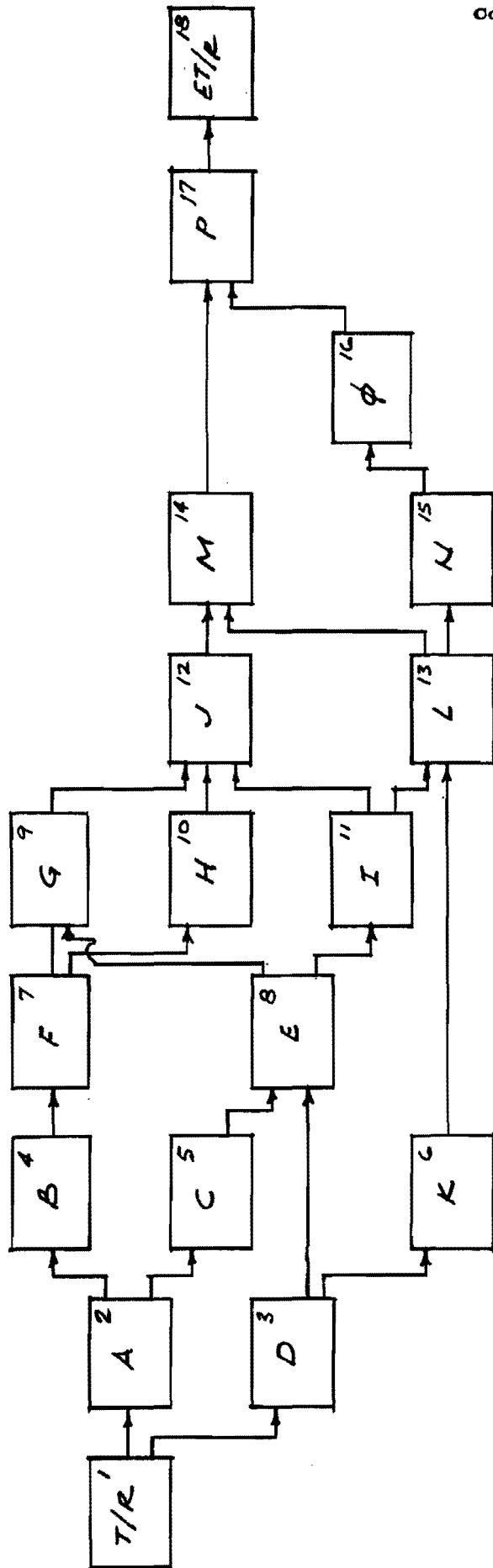
Reserved Node Mor.

SOLUTION TO EXERCISE # 1
ARROW DIAGRAM



Reserved Node Nos.
21 24
22 25
23 26

SOLUTION TO EXERCISE # 1
ARROW DIAGRAM



SOLUTION TO EXERCISE #1
PRECEDENCE DIAGRAM

4-YR. WORKING DAY CALENDAR STARTING JAN. 2, 1986

Date	W/D	Date	W/D	Date	W/D	Date	W/D	Date	W/D
Jan 1986									
02	1	13	51	22	101	04	151	16	203
03	2	14	52	23	102	05	152	17	204
06	3	17	53	27	103	06	153	20	205
07	4	18	54	28	104	07	154	21	206
08	5	19	55	29	105	08	155	22	207
09	6	20	56	30	106	11	156	23	208
10	7	21	57	June		12	157	24	209
13	8	24	58	02	107	13	158	27	210
14	9	25	59	03	108	14	159	28	211
15	10	26	60	04	109	15	160	29	212
16	11	27	61	05	110	18	161	30	213
17	12	28	62	06	111	19	162	31	214
20	13	31	63	09	112	20	163	Nov	
21	14	Apr		10	113	21	164	03	215
22	15	01	64	11	114	22	165	04	216
23	16	02	65	12	115	25	166	05	217
24	17	03	66	13	116	26	167	06	218
27	18	04	67	16	117	27	168	07	219
28	19	07	68	17	118	28	169	10	220
29	20	08	69	18	119	29	170	11	221
30	21	09	70	19	120	Sept		12	222
31	22	10	71	20	121	02	171	13	223
Feb		11	72	23	122	03	172	14	224
03	23	14	73	24	123	04	173	17	225
04	24	15	74	25	124	05	174	18	226
05	25	16	75	26	125	08	175	19	227
06	26	17	76	27	126	09	176	20	228
07	27	18	77	30	127	10	177	21	229
10	28	21	78	July		11	178	24	230
11	29	22	79	01	128	12	179	25	231
12	30	23	80	02	129	15	180	26	232
13	31	24	81	03	130	16	181	28	233
14	32	25	82	07	131	17	182	Dec	
17	33	28	83	08	132	18	183	01	234
18	34	29	84	09	133	19	184	02	235
19	35	30	85	10	134	22	185	03	236
20	36	May		11	135	23	186	04	237
21	37	01	86	14	136	24	187	05	238
24	38	02	87	15	137	25	188	08	239
25	39	05	88	16	138	26	189	09	240
26	40	06	89	17	139	29	190	10	241
27	41	07	90	18	140	30	191	11	242
28	42	08	91	21	141	Oct		12	243
Mar		09	92	22	142	01	192	15	244
03	43	12	93	23	143	02	193	16	245
04	44	13	94	24	144	03	194	17	246
05	45	14	95	25	145	06	195	18	247
06	46	15	96	28	146	07	196	19	248
07	47	16	97	29	147	08	197	22	249
10	48	19	98	30	148	09	198	23	250
11	49	20	99	31	149	10	199	24	251
12	50	21	100	Aug		13	200	26	252
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						15	202	30	254
								31	255

4-YR. WORKING DAY CALENDAR STARTING JAN. 2, 1986

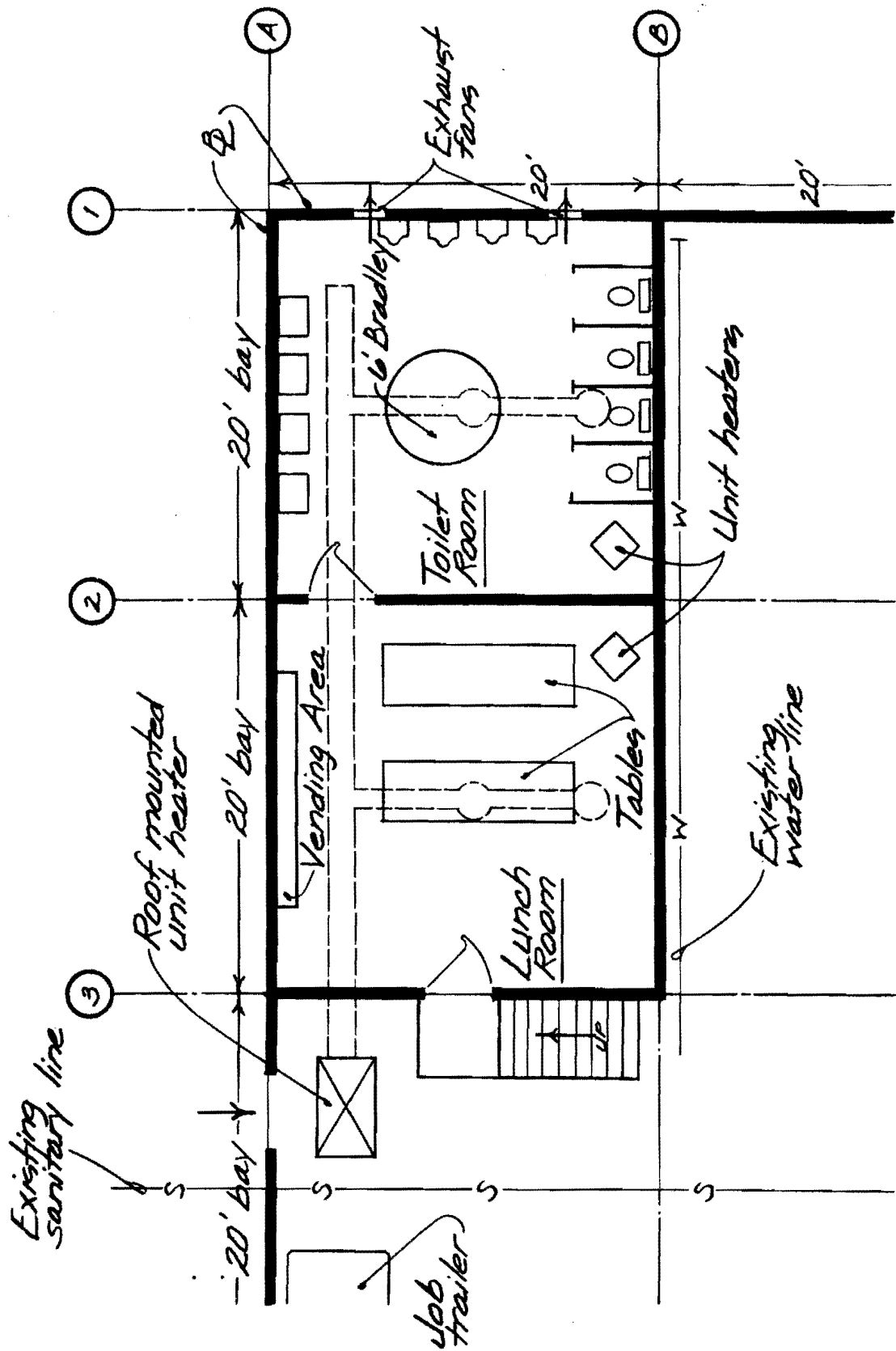
Date	W/D	Date	W/D	Date	W/D	Date	W/D	Date	W/D
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06	258	17	308	28	359	10	410	22	462
07	259	18	309	29	360	11	411	23	463
08	260	19	310	June		12	412	26	464
09	261	20	311	01	361	13	413	27	465
12	262	23	312	02	362	14	414	28	466
13	263	24	313	03	363	17	415	29	467
14	264	25	314	04	364	18	416	30	468
15	265	26	315	05	365	19	417	Nov	
16	266	27	316	08	366	20	418	02	469
19	267	30	317	09	367	21	419	03	470
20	268	31	318	10	368	24	420	04	471
21	269	Apr		11	369	25	421	05	472
22	270	01	319	12	370	26	422	06	473
23	271	02	320	15	371	27	423	09	474
26	272	03	321	16	372	28	424	10	475
27	273	06	322	17	373	31	425	11	476
28	274	07	323	18	374	Sept		12	477
29	275	08	324	19	375	01	426	13	478
30	276	09	325	22	376	02	427	16	479
Feb		10	326	23	377	03	428	17	480
02	277	13	327	24	378	04	429	18	481
03	278	14	328	25	379	08	430	19	482
04	279	15	329	26	380	09	431	20	483
05	280	16	330	29	381	10	432	23	484
06	281	17	331	30	382	11	433	24	485
09	282	20	332	July		14	434	25	486
10	283	21	333	01	383	15	435	27	487
11	284	22	334	02	384	16	436	30	488
12	285	23	335	06	385	17	437	Dec	
13	286	24	336	07	386	18	438	01	489
16	287	27	337	08	387	21	439	02	490
17	288	28	338	09	388	22	440	03	491
18	289	29	339	10	389	23	441	04	492
19	290	30	340	13	390	24	442	07	493
20	291	May		14	391	25	443	08	494
23	292	01	341	15	392	28	444	09	495
24	293	04	342	16	393	29	445	10	496
25	294	05	343	17	394	30	446	11	497
26	295	06	344	20	395	Oct		14	498
27	296	07	345	21	396	01	447	15	499
Mar		08	346	22	397	02	448	16	500
02	297	11	347	23	398	05	449	17	501
03	298	12	348	24	399	06	450	18	502
04	299	13	349	27	400	07	451	21	503
05	300	14	350	28	401	08	452	22	504
06	301	15	351	29	402	09	453	23	505
09	302	18	352	30	403	12	454	24	506
10	303	19	353	31	404	13	455	28	507
11	304	20	354	Aug		14	456	29	508
12	305	21	355	03	405	15	457	30	509
		22	356	04	406	16	458	31	510
				05	407	19	459		

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 4-YR. WORKING DAY CALENDAR STARTING JAN. 2, 1986

Date	W/D	Date	W/D	Date	W/D	Date	W/D
Jan 1986	01	13	51	04	151	16	203
02	1	14	52	05	152	17	204
03	2	15	53	06	153	20	205
06	3	18	54	07	154	21	206
07	4	19	55	08	155	22	207
08	5	20	56	11	156	23	208
09	6	21	57	12	157	24	209
10	7	24	58	13	158	27	210
13	8	25	59	14	159	28	211
14	9	26	60	15	160	29	212
15	10	27	61	18	161	30	213
16	11	28	62	19	162	31	214
17	12	29	63	20	163		
20	13	31	63	21	164	Nov	
21	14	01	64	22	165	03	215
22	15	02	65	23	166	04	216
23	16	03	66	25	167	05	217
24	17	04	67	26	168	06	218
27	18	07	68	27	169	07	219
28	19	08	69	28	170	10	220
29	20	09	70	29	171	11	221
30	21	10	71	30	172	12	222
31	22	11	72	01	173	13	223
Feb	23	14	73	03	174	14	224
03	23	15	74	04	175	17	225
04	24	16	75	05	176	18	226
05	25	17	76	08	177	19	227
06	26	18	77	09	178	20	228
07	27	19	78	10	179	21	229
10	28	20	79	11	180	24	230
11	29	22	80	12	181	25	231
12	30	23	81	15	182	26	232
13	31	24	82	16	183	28	233
14	32	25	83	17	184	Dec	
17	33	28	84	18	185	01	234
18	34	29	85	19	186	02	235
19	35	30	85	22	187	03	236
20	36	01	86	23	188	04	237
21	37	02	87	24	189	05	238
24	38	05	88	25	190	08	239
25	39	06	89	26	191	09	240
26	40	06	90	29	192	10	241
27	41	07	91	30	193	11	242
28	42	08	91	01	194	12	243
Mar	43	09	92	02	195	15	244
03	43	12	93	01	196	16	245
04	44	13	94	03	197	17	246
05	45	14	95	06	198	18	247
06	46	15	96	07	199	19	248
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10	48	19	98	09	201	23	250
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						31	255

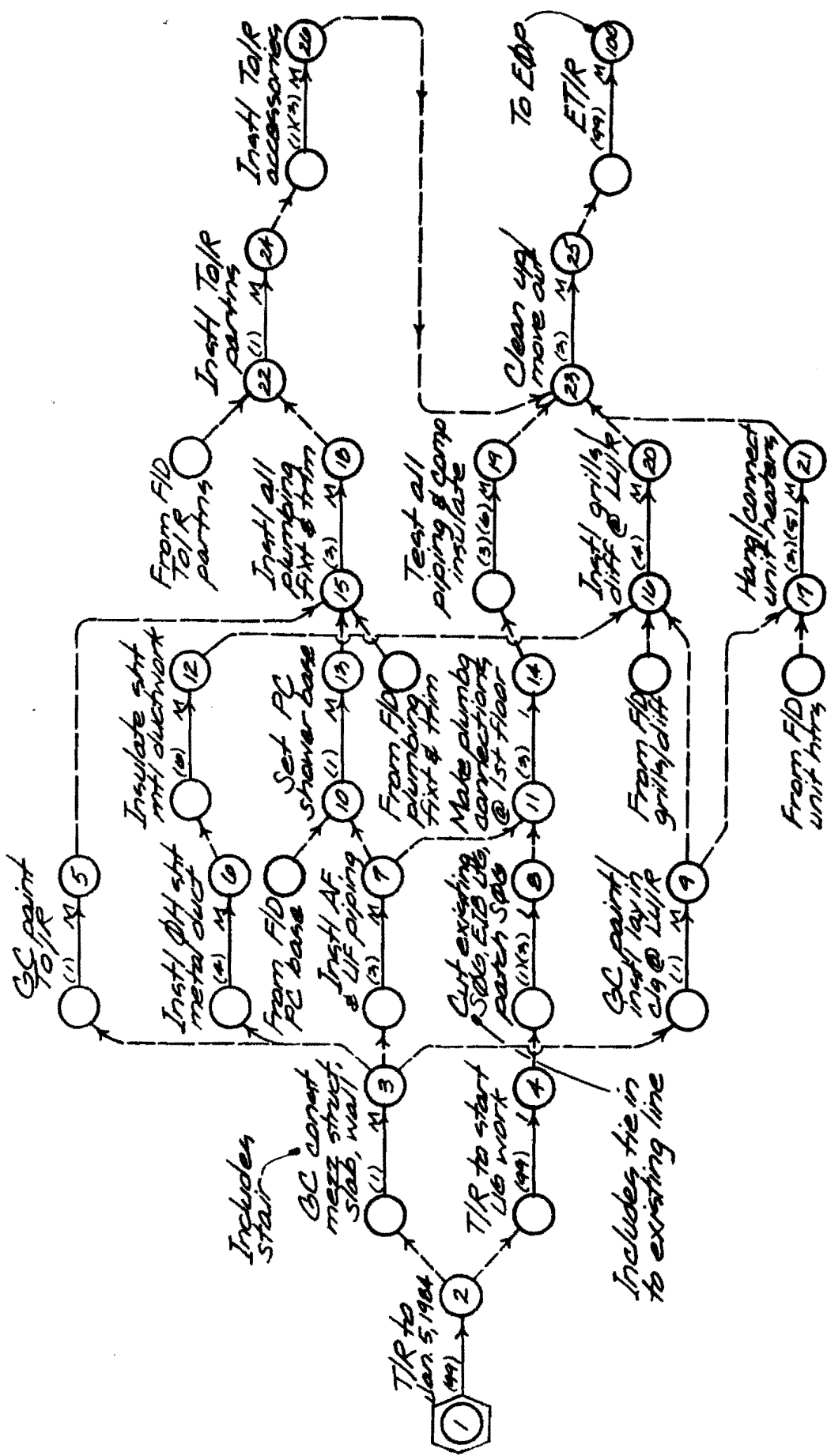
R.J. STEPHENSON, P.E. 15064 WARWICK DETROIT, MI. 48223 PH. 313-273-5026
 4-YR. WORKING DAY CALENDAR STARTING JAN. 2, 1986

Date	W/D	Date	W/D	Date	W/D	Date	W/D
Jan 1987	02	26	357	06	408	20	460
05	257	27	358	07	409	21	461
06	258	28	359	10	410	22	462
07	259	29	360	11	411	23	463
08	260	June		12	412	26	464
09	261	01	361	13	413	27	465
12	262	02	362	14	414	28	466
13	263	03	363	17	415	29	467
14	264	04	364	18	416	30	468
15	265	05	365	19	417	Nov	
16	266	08	366	20	418	02	469
19	267	09	367	21	419	03	470
20	268	10	368	24	420	04	471
21	269	11	369	25	421	05	472
22	270	12	370	26	422	06	473
23	271	15	371	27	423	09	474
26	272	16	372	28	424	10	475
27	273	17	373	31	425	11	476
28	274	18	374	Sept		12	477
29	275	19	375	01	426	13	478
30	275	22	375	02	427	16	479
Feb	277	23	377	03	428	17	480
02	278	24	378	04	429	18	481
03	278	25	379	08	430	19	482
04	279	15	329	09	431	20	483
05	280	16	330	26	432	23	484
06	281	17	331	10	432	24	485
09	282	20	332	11	433	24	485
10	283	20	332	14	434	25	486
11	283	21	333	15	435	27	487
12	284	22	334	16	436	30	488
13	285	23	335	17	437	Dec	
13	286	24	336	18	438	01	489
15	287	27	337	21	439	02	490
16	288	28	338	22	440	03	491
18	289	29	339	23	441	04	492
19	290	30	340	24	442	07	493
20	291	May		25	443	08	494
23	292	01	341	25	443	09	495
24	293	04	342	28	444	10	496
25	294	05	343	29	445	11	497
26	295	06	344	30	446	14	498
27	296	07	345	Oct		15	499
Mar	297	08	346	01	447	16	500
02	297	11	347	02	448	17	501
03	298	12	348	05	449	18	502
04	299	13	349	06	450	21	503
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06	301	15	351	08	452	23	505
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11	304	20	354	13	455	29	508
12	305	21	355	14	456	29	508
		22	356	15	457	30	509
				16	458	31	510
				19	459		



↑ NORTH
SCALE 1/8" = 1'-0"

STRAX COMPANY MEZZANINE
LUNCH & TOILET ROOM ADDITION



Responsibility Codes

- 1 Strax Manufacturing
- 2 Harbor Contracting - B.C.
- 3 Arco Mechanical Piping
- 4 Sency Sheet Metal
- 5 Bus Electric
- 6 Astro Insulators
- 99 Time restraints

Abbreviations

- | | | | |
|-----|--------------------|------|---------------------------|
| T/R | Time restraint | EIB | Excavate, instl, backfill |
| GC | General contractor | SDB | Slab on grade |
| UB | Underground | PC | Pre cast |
| OH | Overhead | To/R | Toilet room |
| AF | Above floor | LULR | Lunch room |
| UF | Under floor | / | 1st floor |
| FID | Fabricate/deliver | M | Mess floor |

PROFIT POTENTIAL LEVELS

In construction the concept of profit is complex and often misunderstood. There are many kinds of profit - financial, socio-economic, value system, self-actualization, education, enjoyment, technical and probably as many more equally important but less obvious.

If we view the various kinds of returns on investments relative to project management, it appears there are three major levels of profit potential available, that achieved by being certain to consider and include all elements of the project, that achieved by arranging these elements in an effective action sequence and the profit achieved by making effective use of discretionary or float time. These are identified as levels A, B and C respectively.

A brief discussion of each is given below.

Level A Profit Potential

The basic profit potential is realized when the manager and his project team have made certain to include all project elements in the estimating, planning and control process; when they have made certain that everything is counted and there are no missing pieces. Every element missed erodes the profit picture just as a missing piece of a jigsaw puzzle spoils the pleasure of assembling it.

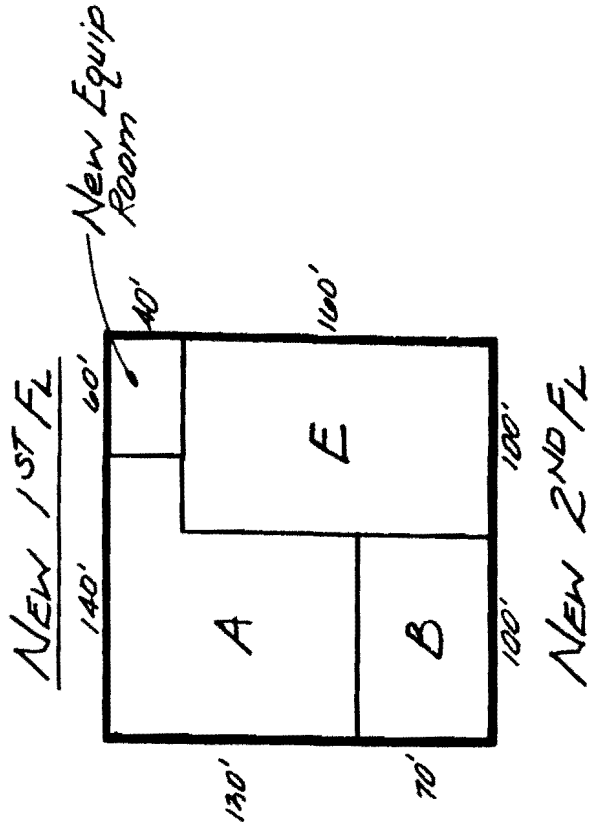
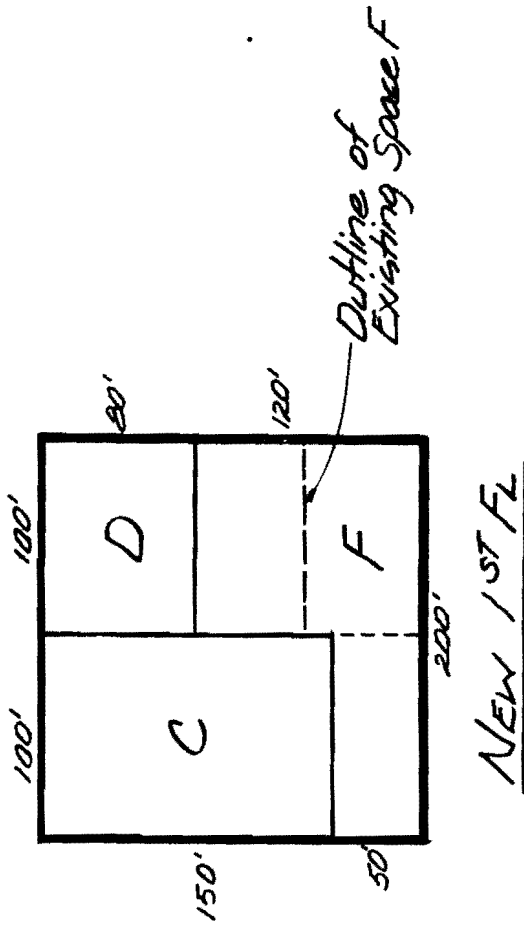
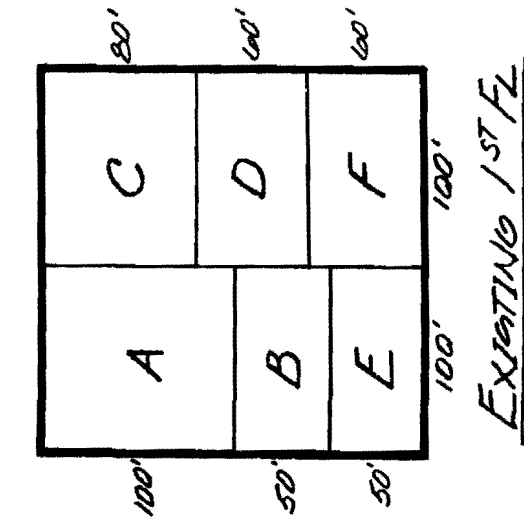
Level B Profit Potential

Once project elements are accounted for, they must be properly arranged in a logic pattern to produce the most effective plan of action. In any plan there are identified desired and necessary relationships. The proper expression of desired relations is a major factor in realizing level B profit potential. Here is where the true skill of the project manager begins to impact upon the job. The experienced, intelligent, knowledgeable manager will explore, simulate and select the most effective ways of assembling the job under his control. The level B profit potential is highest when the best ways have been selected.

Level C Profit Potential

This profit is highest when the job is scheduled well and a selection made as to where each task should be done in relationship to the discretionary time available to it. Often discretionary time is identified as float time. Where the good manager schedules the task when he has resource options (time, money, manpower, equipment, etc.) will largely determine how profitable the level C management work has been.

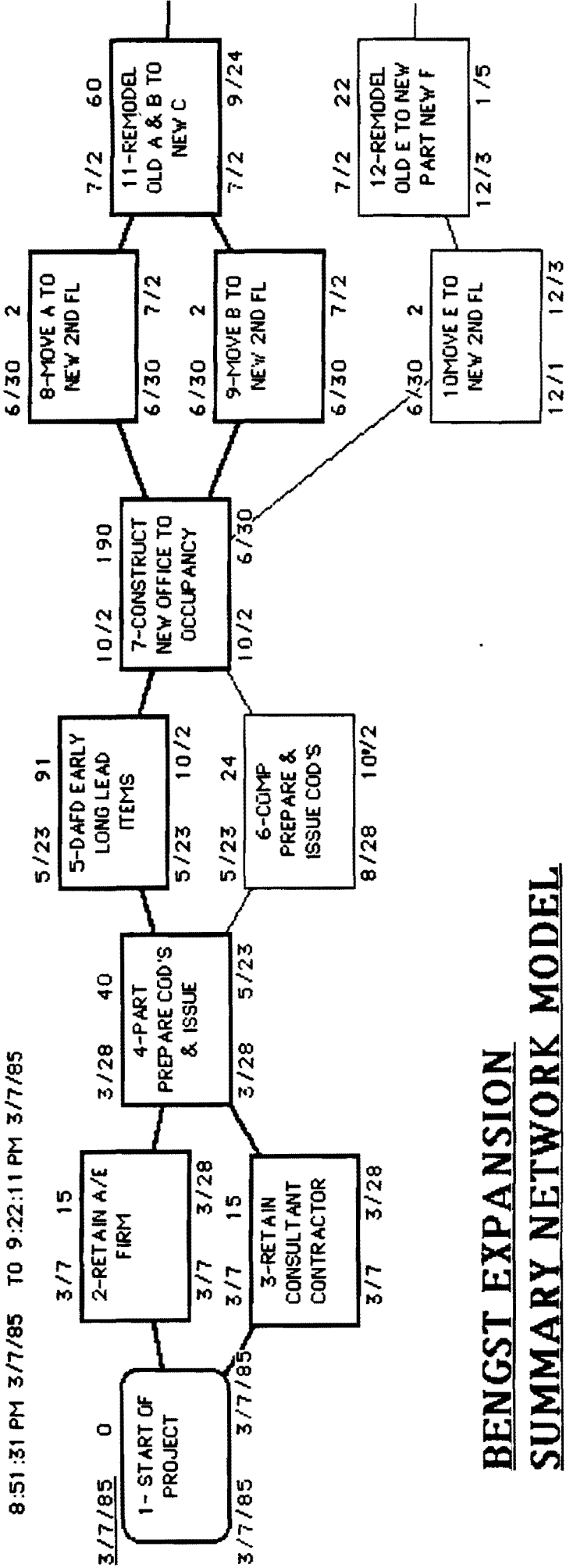
In a nutshell, level A profit potential deals with identifying all the elements involved. Level B profit potential is concerned with arranging these elements in a logical and effective action plan. The C level profit potential is engaged when the project is managed well by proper scheduling within allowable resource limits.



↑
 NORTH
 SCALE: 1" = 100'

SUMMARY MOVE PLAN

8:51:31 PM 3/7/85 TO 9:22:11 PM 3/7/85



BENGST EXPANSION SUMMARY NETWORK MODEL

Ralph J. Stephenson PE PC
Consulting Engineer

Chicago Area Weather

Source: Jack Kolstadt

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

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.

NETWORK PLANNING ABBREVIATIONS

A	Area	CONCT	Connect
ABV	Above	COND	Conduit
AC	Air condition	CONN	Connection
ACCESS	Accessories	CONST	Construct
ACOUST	Acoustic	CONT	Continue
ACT	Activate	COOLG	Cooling
AD	Approve, deliver	CONVTR	Convector
AFD	Approve, fabricate, deliver	CP	Cap
AL	All	CP	Complete
ALT	Alteration	CT	Ceramic tile
ALUM	Aluminum	CVR	Cover
AP	Approve		
ASMBLY	Assembly	D	Dummy
ASP	Asphalt	D	Duration
/	And	DAFD	Detail, approve, fabricate, deliver
/	At	DEMOL	Demolish
		DIFF	Diffuser
BAL	Balance	DK	Deck
BALC	Balcony	DPPRF	Damp proof
BD	Board	DR	Door
BKFL	Backfill	DRINKG	Drinking
BKFLG	Backfilling	DRN	Drain
BLDG	Building	DUCTWK	Ductwork
BLKG	Blocking	DWG	Drawing
BLT	Bolt		
BM	Beam	E	East
BRG	Bearing	EF	Early finish
BRK	Brick	EFRP	Excavate, form, reinforce, pour
BSE	Base	EIB	Excavate, install, backfill
BSMT	Basement	ELEC	Electric
		ELEV	Elevator
CASD	Check and approve shop drawings	ENERG	Energize
C/B	Columns and beams	EQUIP	Equipment
CER	Ceramic	ERCT	Erect
CL	Column line	ES	Early start
CLG	Ceiling	E T/R	End time restraint
CLKG	Calking	EXC	Excavation
CNTL	Control	EXP	Exposed
CO	Cutoff	EXT	Exterior
COATG	Coating	EXTG	Existing
COL	Column		
COMP	Complete		
CONC	Concrete		

RALPH J. STEPHENSON

CONSULTING ENGINEER

F	For	LAYG	Laying
FAB	Fabricate	LF	Late finish
FD	Fabricate, deliver	LN	Line
FDN	Foundation	LS	Late start
FFG	Fill, fine grade	LT	Light
FINL	Final	LTH	Lath
FL	Floor	LVL	Level
FLL	Fill		
FLSHG	Flashing		
FM	Form	MACH	Machinery
FMG	Forming	MECH	Mechanical
FN	Finish	MEMBRN	Membrane
FOG	Floor on grade	MEZZ	Mezzanine
FP	Fire protection	MH	Manhole
FRM	Frame	MLLWK	Millwork
FRP	Form, reinforce, pour	MISC	Miscellaneous
FRPS	Form, reinforce, pour, strip	MK	Make
		MSNRY	Masonry
FTG	Footing	MTL	Metal
FX	Fixture	MTR	Motor
GLAZG	Glazing	N	North
GRD	Grade	NLR	Nailer
GRDR	Girder	NT	Not
GRDG	Grading		
GRLL	Grill		
GRATG	Grating	OFD	Order, fabricate, deliver
GUT	Gutter	OH	Overhead
		OPNG	Opening
HD	Head		
HDWE	Hardware		
HM	Hollow metal	PARTN	Partition
HTR	Heater	PC	Precast
HU	Hookup	PERIM	Perimeter
		PH	Penthouse
I	Iron	PHS	Phase
I/C	In ceiling	PILG	Piling
IFW	In floor work	PIPG	Piping
INCLDG	Including	PKG	Parking
INSTL	Install	PL	Plate
INSTLG	Installing	PLCP	Pile cap
INSUL	Insulation or Insulate	PLG	Plug
		PLSTC	Plastic
INT	Interior	PLSTR	Plaster
ITMS	Items	PLTFM	Platform
		PLUMBG	Plumbing
JC	Janitor closet	PNL	Panel
		PNT	Paint
		PNTG	Painting

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POURG	Pouring	TEMP	Temporary
PRES	Pressure	TFT	Total float time
PRM	Primary	TK	Tank
PROT	Protection	TO/R	Toilet room
PRS	Piers	TPG	Topping
PVG	Paving	T/R	Time restraint
		TR	Trim
		TRANSFRMR	Transformer
RAD	Radiant	TRD	Tread
RAILG	Railing	TST	Test
RD	Road	TWR	Tower
REINF	Reinforcing		
REL	Relocate		
REQD	Required	UG	Underground
RESIL	Resilient	ULG	Unloading
RESTL	Reinforcing steel	UTIL	Utility
REMV	Remove	US	Underside
RFG	Roofing	U T/R	Updating time restraint
RISR	Riser		
RM	Room		
RR	Railroad		
RSC	Rolling steel curtain	VB	Vapor barrier
RUBB	Rubber	VENTILTR	Ventilator
RUFF	Rough	VEST	Vestibule
S	South	W	West
SBSTNTLY	Substantially	WASHG	Washing
SDWK	Sidewalk	WK	Work
SETTG	Setting	WLKWY	Walkway
SEWR	Sewer	WLL	Wall
SHT	Sheet	WNDW	Window
SIDG	Siding	WP	Waterproofing
SLE	Slab	WTR	Water
SOG	Slab on grade	W T/R	Weather time restraint
SPDRL	Spandrel		
SPRNKLR	Sprinkler		
SS	Structural steel		
SS	Substation		
ST	Start		
ST	Street		
STD	Stud		
STL	Steel		
STM	Steam		
STR	Stair		
STRP	Strip		
STRUCT	Structural		
SUPT	Support		
SURF	Surface		
SUSP	Suspension		
SWTCHGR	Switchgear		
SYS	System		

**Factors to be considered when evaluating network models - ho
260**

Factors are to be rated from 1 to 10 with 1 meaning the network fails to satisfy even minimum requirements of the factor. 10 means the factor is satisfied fully and expertly.

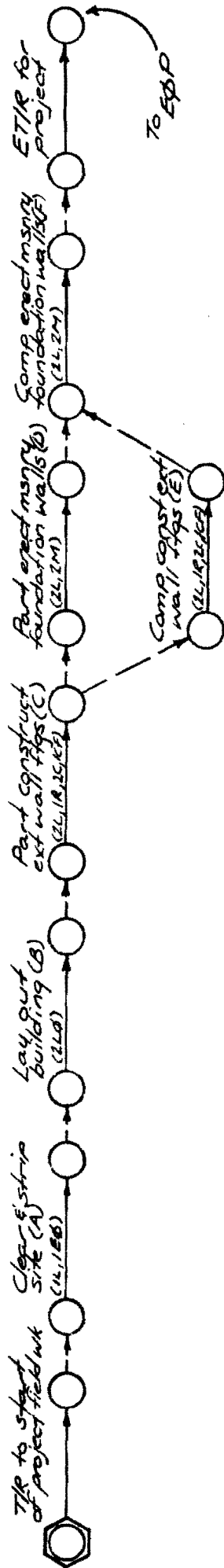
- ___1. Quality of goal & objective definition
Do the goals & objectives meet the needs of the project & of the project organization?
- ___2. Completeness of laundry list
Does the laundry list contain all reasonable activities to be accomplished for successful completion of the project?
- ___3. Accuracy of logic relationships
Are the interrelationships between activities shown correctly?
Are concurrent and sequential tasks properly diagrammed?
- ___4. Completeness of activity description
Is the exact definition of each activity apparent from reading the description?
- ___5. Reasonableness of duration assignment
Do the durations shown represent times to do the activity that are reasonable, and achieve the objectives of the project?
- ___6. Correctness of calculations
Are the ES/EF's & LS/LF's properly computed?
- ___7. Quality of network appearance
How well was the diagram presented? Could you understand what the job was all about from reading the network without explanation?
- ___8. Presence of abbreviations, task #'s, issue #'s, sheet #'s, codes & dates
Is there enough supplementary information on the logic plan so you can read it without having someone explain it to you?
- ___9. Overall appearance of network
Does the overall plan appearance reflect quality & competence of execution? Does it give you confidence that the person who prepared it knew what they were doing?

_____ Total

_____ Average (total divided by 9)

STEPS IN RESOURCE ALLOCATION

1. Prepare and quantify and compute network plan.
2. Prepare an ES/EF bar chart showing float time available.
3. Total the resources required for each day.
4. Plot a curve of the resource use per each day.
5. Determine and establish management objectives.
6. Plot fixed use resource daily use (critical tasks).
7. Adjust tasks with float time to fill out hollows in fixed resource curve.
8. Complete scheduling all tasks.

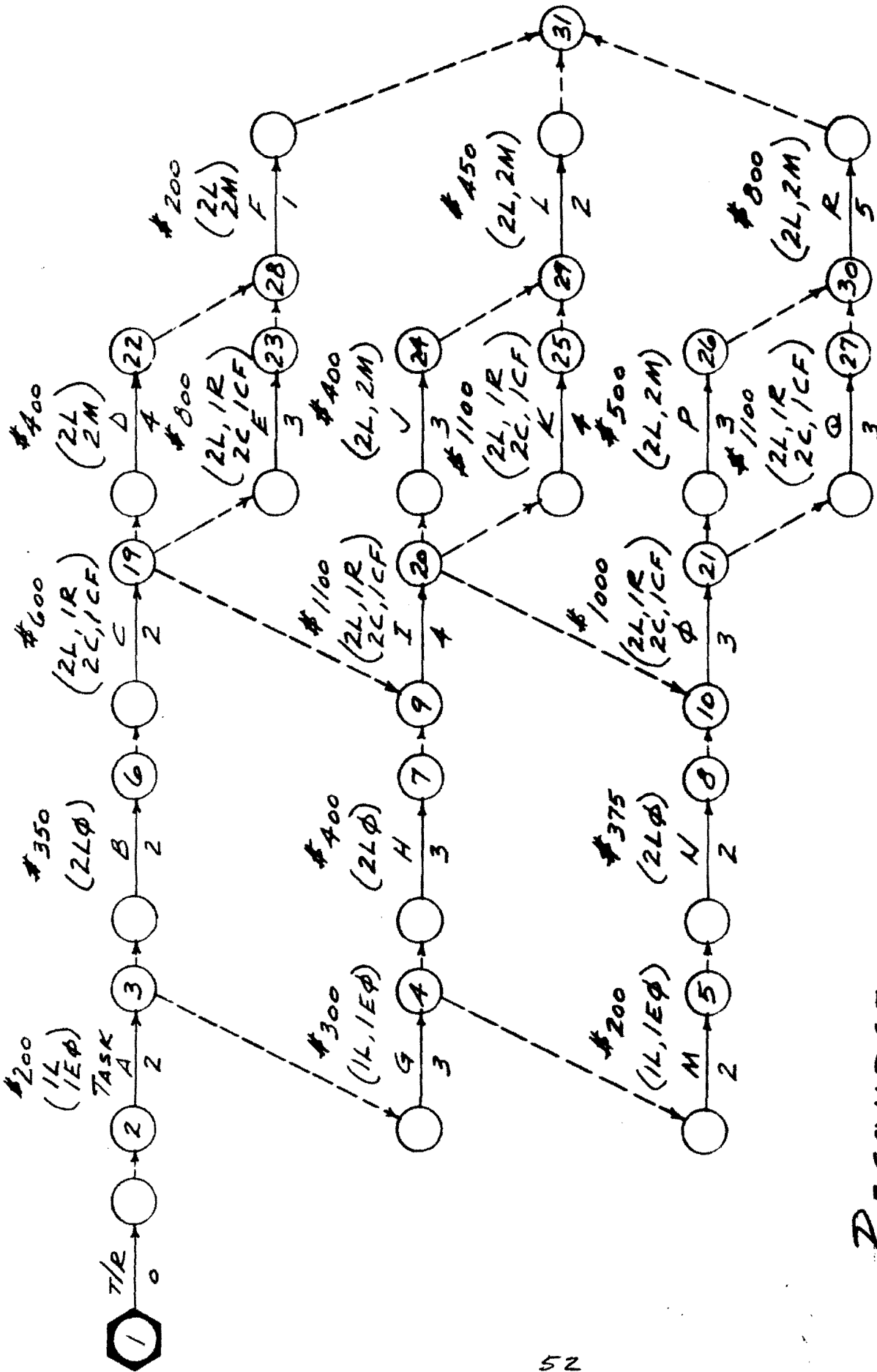


51

RESOURCE CODE

- L Labors
- Eq Equipment operators
- Lp Layout engineers
- R Reinforcing steel workers
- C Carpenters
- CF Cement finishers
- M Masons

RESOURCE ALLOCATION



RESOURCE

ALLOCATION

RESERVED CODE NOS.

- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18

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

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

WD →

TASK 2

1L *A

2L ϕ B

2L, 1R
2C, 1CF C

2L, 2M D

2L, 1R
2C, 1CF E

2L, 2M F

1L
1E ϕ *G

2L ϕ *H

2L, 1R *I
2C, 1CF

2L, 2M J

2L, 1R
2C, 1CF K

2L, 2M L

1L, 1E ϕ M

2L ϕ N

2L, 1R *O
2C, 1CF

2L, 2M *P

2L, 1R *Q
2C, 1CF

2L, 2M *R

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

M P

#

SMT 2

0

0

L

E ϕ

L ϕ

R

C

CF

M

TOTAL

RESOURCE ALLOCATION

MAY 29, 1968

53

RALPH J. STEPHENSON, P.E.

HO 26

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 26

SHT 2

WD →																											
TASK																											
1L *A																											
2L φ B																											
2L, 1R 2C, 1CF C																											
2L, 2M D																											
2L, 1R 2C, 1CF E																											
2L, 2M F																											
1L 1E φ *G																											
2L φ *H																											
2L, 1R 2C, 1CF *I																											
2L, 2M J																											
2L, 1R 2C, 1CF K																											
2L, 2M L																											
1L, 1E φ M																											
2L φ N																											
2L, 1R 2C, 1CF *O																											
2L, 2M *P																											
2L, 1R 2C, 1CF *Q																											
2L 2M *R																											

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

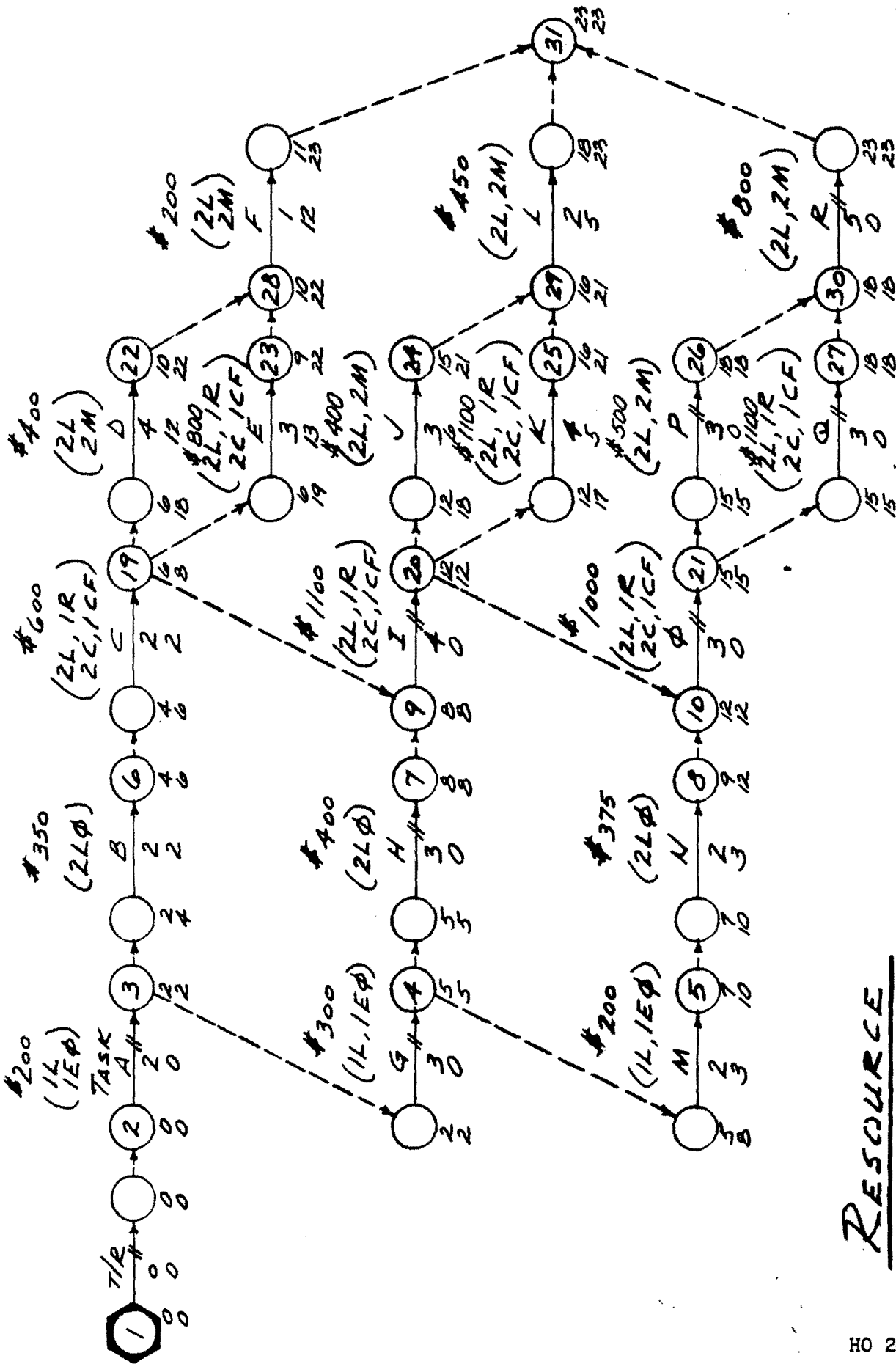
0 0

L																											
E φ																											
L φ																											
R																											
C																											
CF																											
M																											
TOTAL																											

RESOURCE ALLOCATION

MAY 29, 1968

RALPH J. STEPHENSON, P.E.



RESOURCE

ALLOCATION

RESERVED NODE NOS.

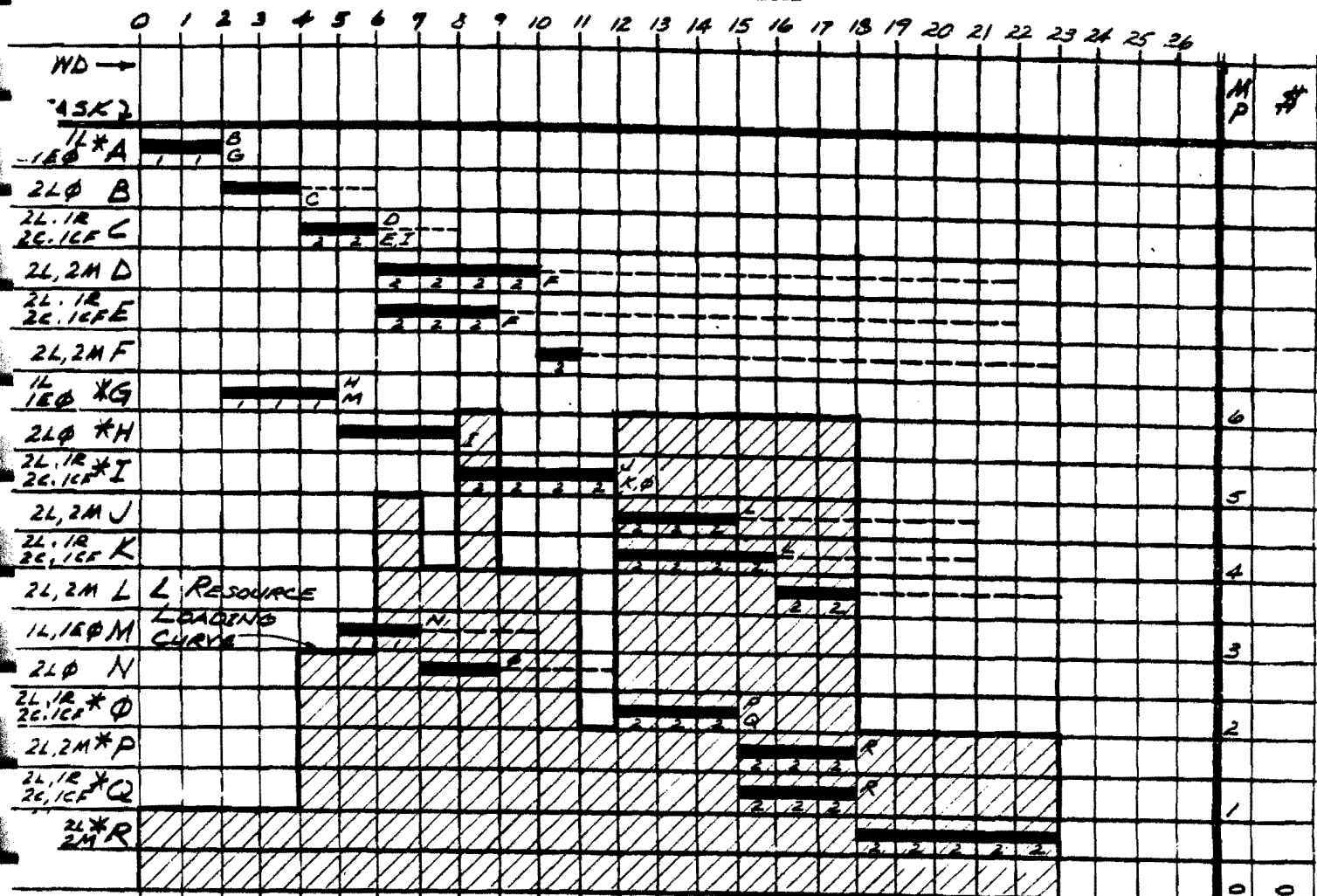
11	15
12	16
13	17
14	18

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MAY 29, 1968

ES/EF SCHEDULE

SMT 2



	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
EΦ		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					214

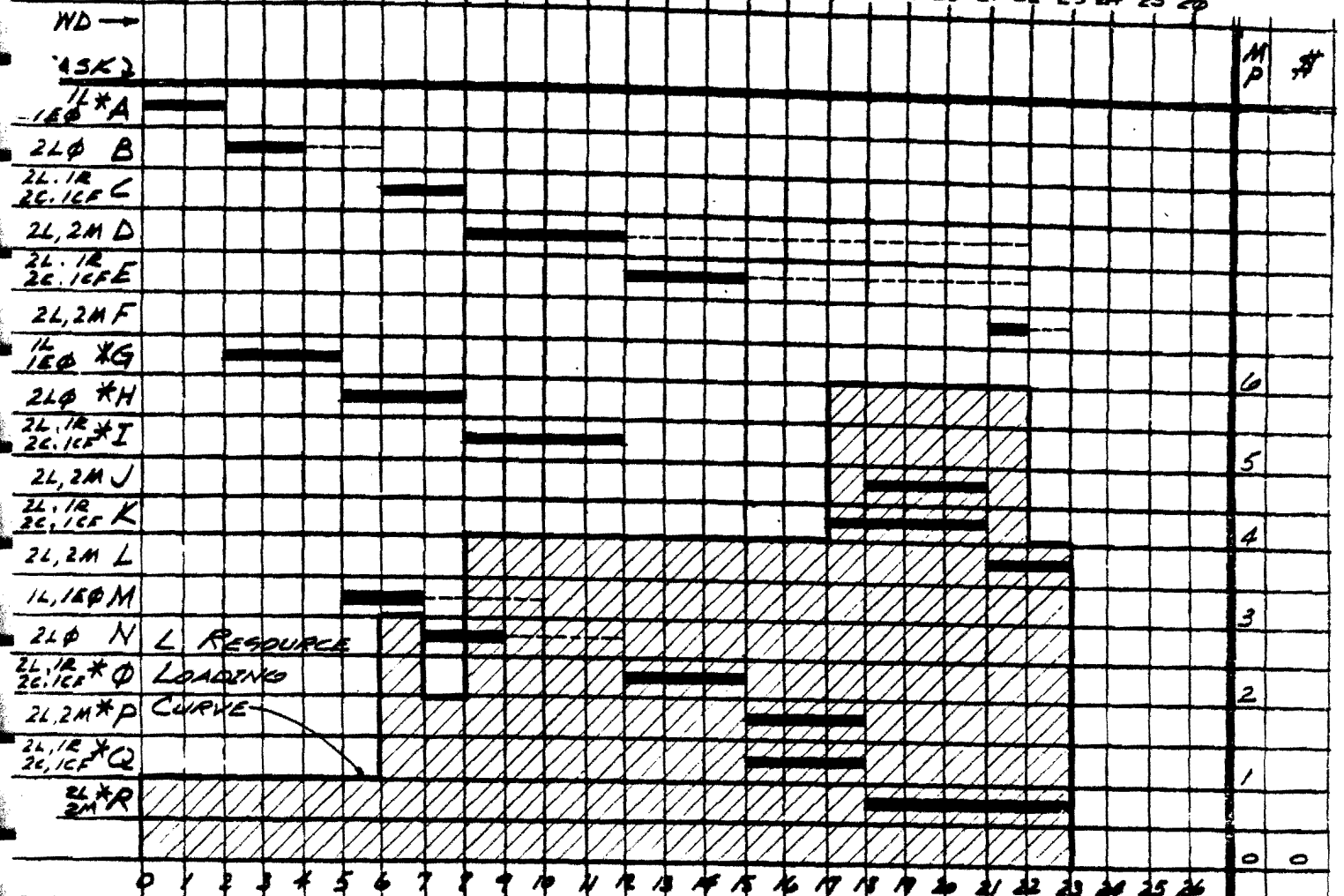
RESOURCE ALLOCATION #1

MAY 29, 1968

RALPH J. STEPHENSON, P.E.

LEVELED 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



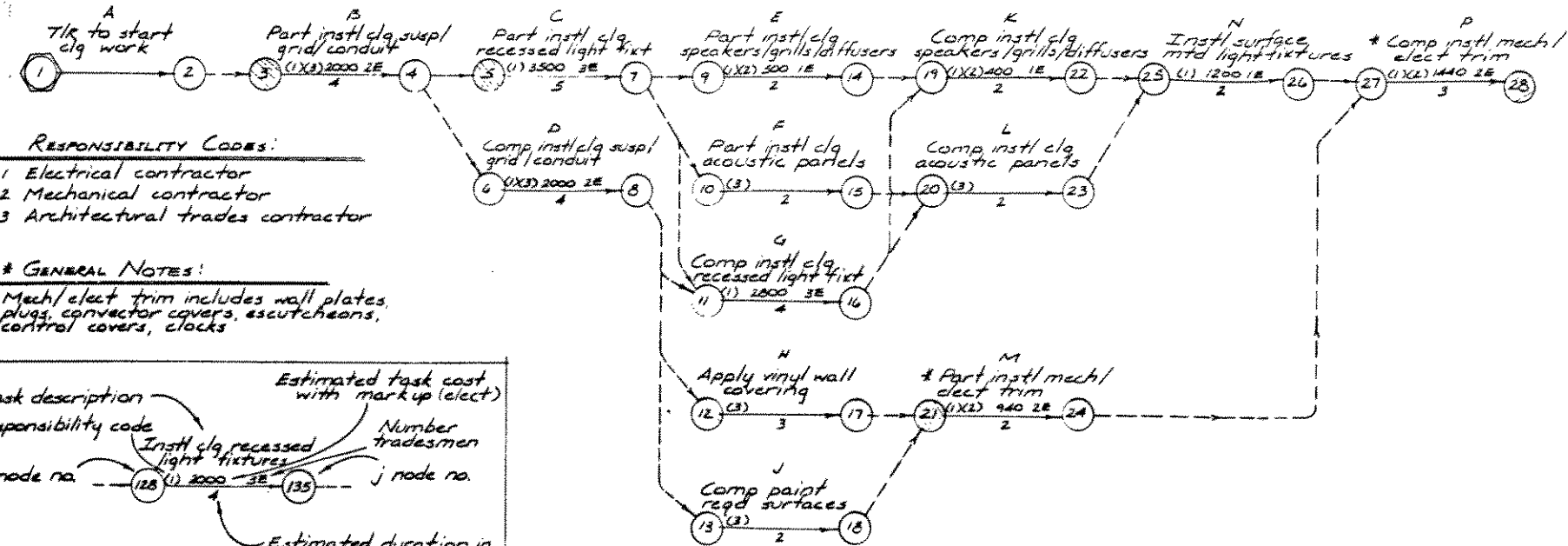
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	0	0
CP ONLY*	1	1	1	1	1				2	2	2	2	2	2	2	2	4	4	4	2	2	2	2					41	
FLAT ONLY	0	0	0	0	0	1	3	2	2	2	2	2	2	2	2	0	0	2	4	4	4	4	2					40	
TOTAL	1	1	1	1	1	1	3	2	4	4	4	4	4	4	4	4	6	6	6	6	6	4						81	

EΦ																												
LΦ																												
R																												
C																												
CF																												
M																												
TOTAL																												

RESOURCE ALLOCATION #2 HO 246

MAY 29, 1968

RALPH J. STEPHENSON, P.E.



RESPONSIBILITY CODES:
 1 Electrical contractor
 2 Mechanical contractor
 3 Architectural trades contractor

*** GENERAL NOTES:**
 - Mech/elect trim includes wall plates, plugs, convactor covers, escutcheons, control covers, clocks

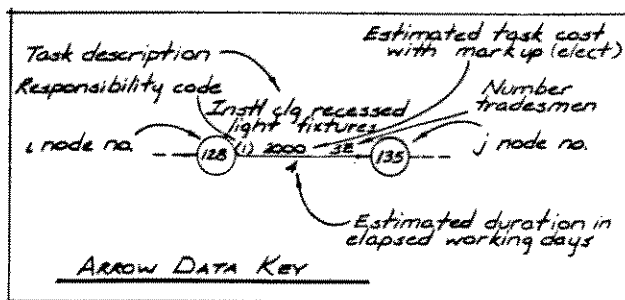
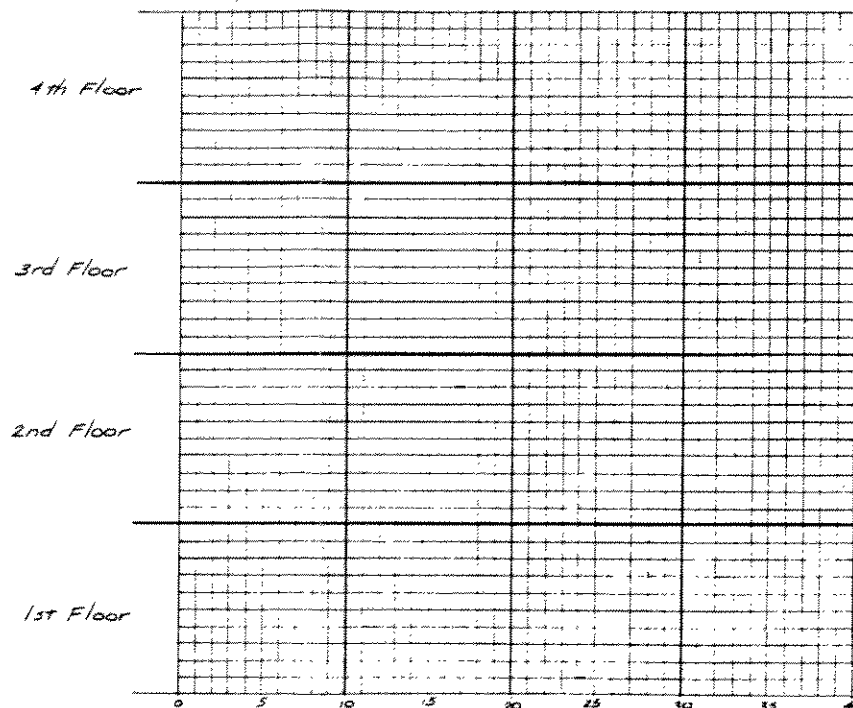


FIGURE #1 - NETWORK MODEL

R.O. #	i node no.	j node no.	dur	Task description and Responsibility codes	Month	
					Wkg Day	Date
1	3	4	4	Part instl clg susp/ grid/conduit (1) (3)		
2	5	7	5	Part instl clg recessed light fixt (1)		
3	6	8	4	Comp instl clg susp/ grid/conduit (1) (3)		
4	9	14	2	Part instl clg speakers/grills/diff (1) (2)		
5	10	15	2	Part instl clg acoustic panels (3)		
6	11	16	4	Comp instl clg recessed light fixt (1)		
7	12	17	3	Apply vinyl wall covering (3)		
8	13	18	2	Comp paint reqd surfaces (3)		
9	19	22	2	Comp instl clg speakers/grills/diff (1) (2)		
10	20	23	2	Comp instl clg acoustic panels (3)		
11	21	24	2	Part instl mech/ elect trim (1) (2)		
12	25	26	2	Instl surface mtd light fixtures (1)		
13	27	28	3	Comp instl mech/ elect trim (1) (2)		

FIGURE #2 BAR CHART



Working Days & Dates

FIGURE #3 SLANT CHART

MONITORING RECORD			ISSUE RECORD	
DATE	DATE	DATE	ISSUE No.	DATE
			1	10/24/74

RESERVED NODE NOS.

NETWORK PLANNING WORKSHEET
 CEILING INSTALLATION NETWORK
 BAR CHART & SLANT CHART

RALPH J. STEPHENSON, P.E.
 15054 WARWICK ROAD
 DETROIT, MICHIGAN 48223
 CONSULTANT PH 273-5026

3

Subject _____

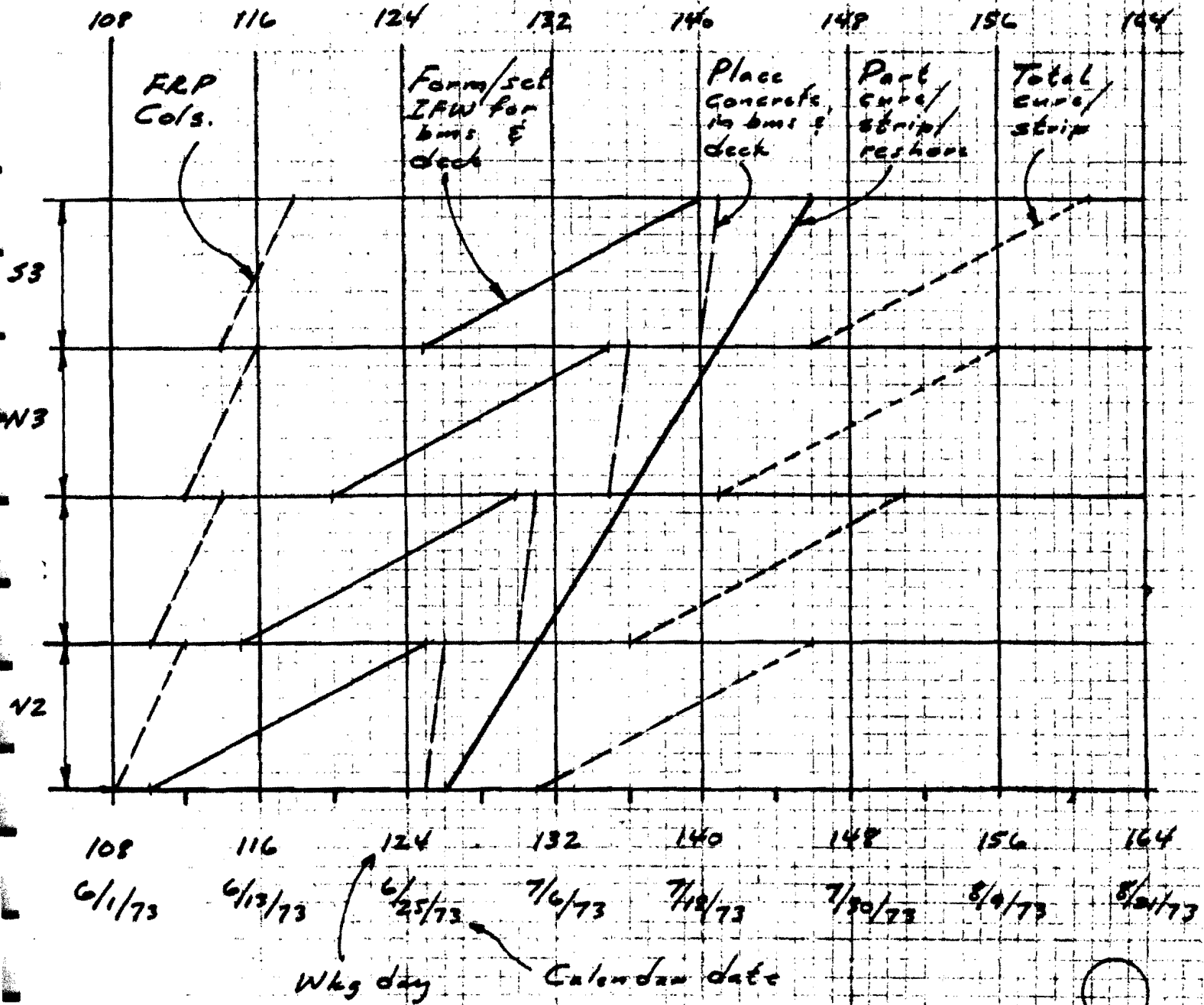
Slant Chart - Floor Pours

Date 8/1/73

N2, S2, N3, S3

Page ①

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



Project: Lake City Community College

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

Abbreviations

Fabric = Fabricate

Wkg = Working

Dys = Days

Required = Required

DTO = Date to order (calendar)

DOJ = Date on job (calendar)

DO = Date ordered (calendar)

Purchasing Schedule Example

PAVILLION PROJECT DRAWING ISSUE PAGE 1
 LISTED BY DATE OF ISSUE - DATE PRINTED: NOV 20 1983
 RALPH J. STEPHENSON PE PC

ITEM	ISS DWG	AW CT	SUB SHD	REV APP
PILING	11/22/83			
ANCHOR BOLTS	11/22/83			
FILE CAP RESTL	11/22/83			
ER SFACE 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

①	②	③	④	⑤	⑥	⑦	⑧
LINE #	EQUIPMENT DESCRIPTION & WHO FURNISHES	PRESENT LOCATION OF EQUIP	FINAL LOCATION	ACTION TAKEN & BY WHOM	ACTION TO BE TAKEN & BY WHOM	OTHER EQUIP AFFECTED	REMARKS
1	2 existing compressed air tanks (Telco)	Existing paint shop	New building paint dept	Relocate Set Hook up	Falstaff Young & Falstaff Falstaff	New compressors must be ready to run	
2	3 existing paint spray booths (Telco)	NW corner existing building	New building paint dept	Move & Set Hook up	Young Telco	-	
3	2 new paint spray booths (Falstaff)	New	New building paint dept	Erect Hook up	Young Telco	-	
4	6 existing column mounted jib cranes (Telco)	Col's 6C 5D 7D 4C	New bldg Col's 10A 11A 10B 11B 10C 11C	Remove Move & Inst	Telco Young	-	
5	2 new prefab shop offices 10'x15'x8' (Young)	New	1 in new bldg lab area 1 in existing bldg QA area	Erect Mech/ Elect	Young Telco	In existing bldg after Telco clears space (watch!)	

Abbreviations
 NW Northwest
 QA Quality Assurance
 EQUIPMENT ACTIVITY TABULATION

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 WKS DAYS	18 WKS DAYS	11 WKS 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.

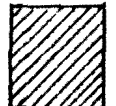
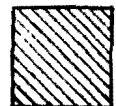
BULLETIN #	170	180	190	200	210	220	230	240	250	260	270
	8/31/82	9/15/82	9/29/82	10/13/82	10/27/82	11/10/82	11/24/82	12/9/82	12/23/82	1/10/83	1/24/83
11											
10											
9											
8											
7											
6											
5											
4											
3											
2											
1											

VOIDED, 11/4/82. (216) NOT QUOTED

CHANGE ORDER #

Bulletin quoting period

Quote evaluation period



BULLETIN/CHANGE ORDER RECORD

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

$$i = 160$$

$$d = 7 \text{ wd}$$

$$t = 4 \text{ wd}$$

$$n = 11 \text{ units}$$

For i unknown

$$x = 325$$

$$d = 10 \text{ wd}$$

$$t = 6 \text{ wd}$$

$$n = 21 \text{ floors}$$

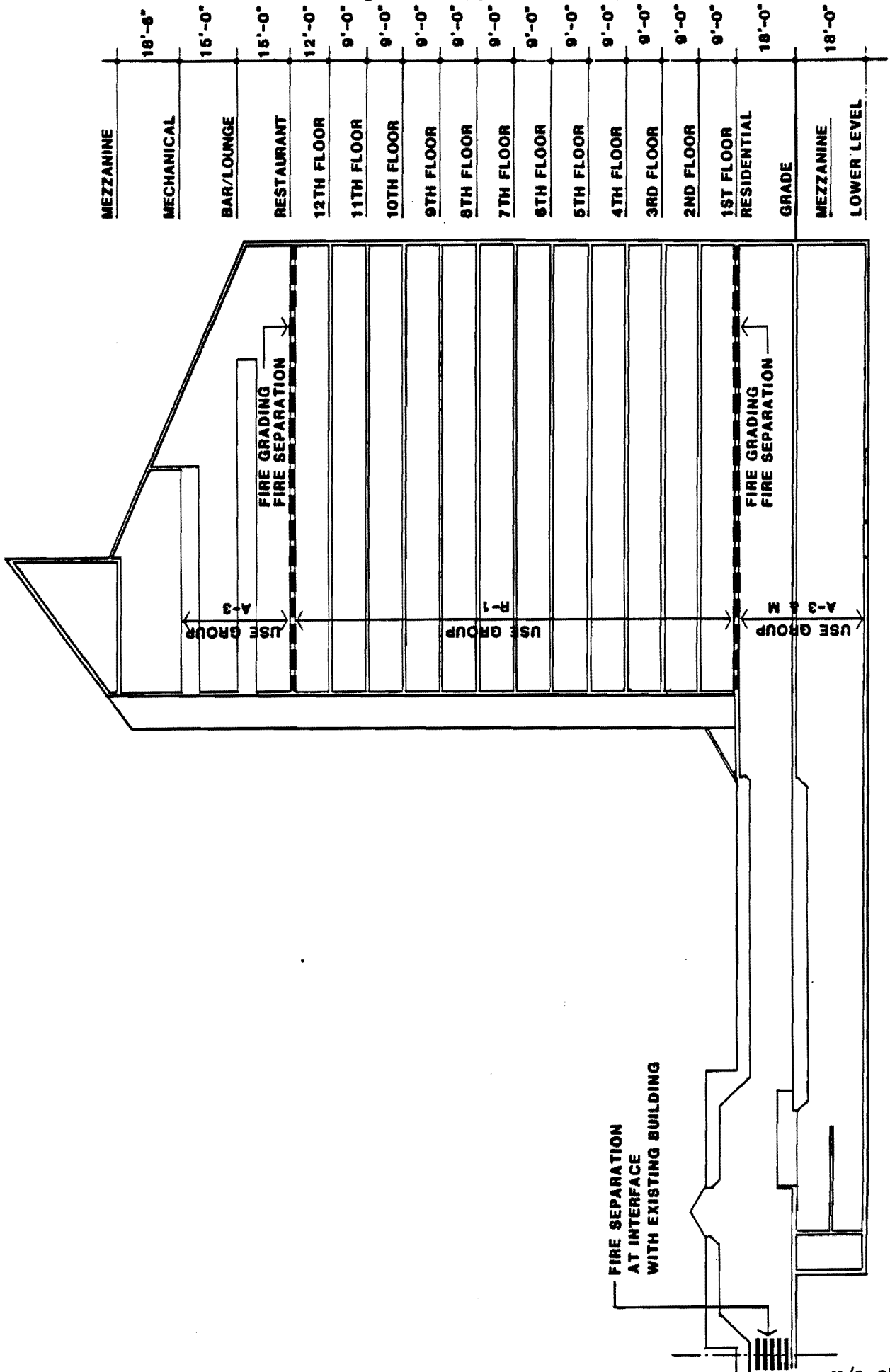
For t unknown

$$x = 352$$

$$i = 280$$

$$d = 9$$

$$n = 15 \text{ sectors}$$



MEZZANINE 18'-0"
 MECHANICAL 15'-0"
 BAR/LOUNGE 15'-0"
 RESTAURANT 12'-0"
 12TH FLOOR 9'-0"
 11TH FLOOR 9'-0"
 10TH FLOOR 9'-0"
 9TH FLOOR 9'-0"
 8TH FLOOR 9'-0"
 7TH FLOOR 9'-0"
 6TH FLOOR 9'-0"
 5TH FLOOR 9'-0"
 4TH FLOOR 9'-0"
 3RD FLOOR 9'-0"
 2ND FLOOR 9'-0"
 1ST FLOOR RESIDENTIAL 9'-0"
 GRADE 18'-0"
 MEZZANINE 18'-0"
 LOWER LEVEL

A-3
 USE GROUP

P-1
 USE GROUP

A-3 & M
 USE GROUP

FIRE GRADING
 FIRE SEPARATION

FIRE GRADING
 FIRE SEPARATION

FIRE SEPARATION
 AT INTERFACE
 WITH EXISTING BUILDING

CONTRACT DOCUMENT MATRIX SUMMARY
 GRAND TRAVERSE RESORT VILLAGE TOWER & LOW RISE
 D106 - RALPH J. STEPHENSON PE PC - DATE PRINTED: JAN 12 1985

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 EXCAVATION	-	-	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

CONTRACT DOCUMENT MATRIX SUMMARY
 GRAND TRAVERSE RESORT VILLAGE TOWER & LOW RISE
 D106 - RALPH J. STEPHENSON PE PC - DATE PRINTED: JAN 12 1985

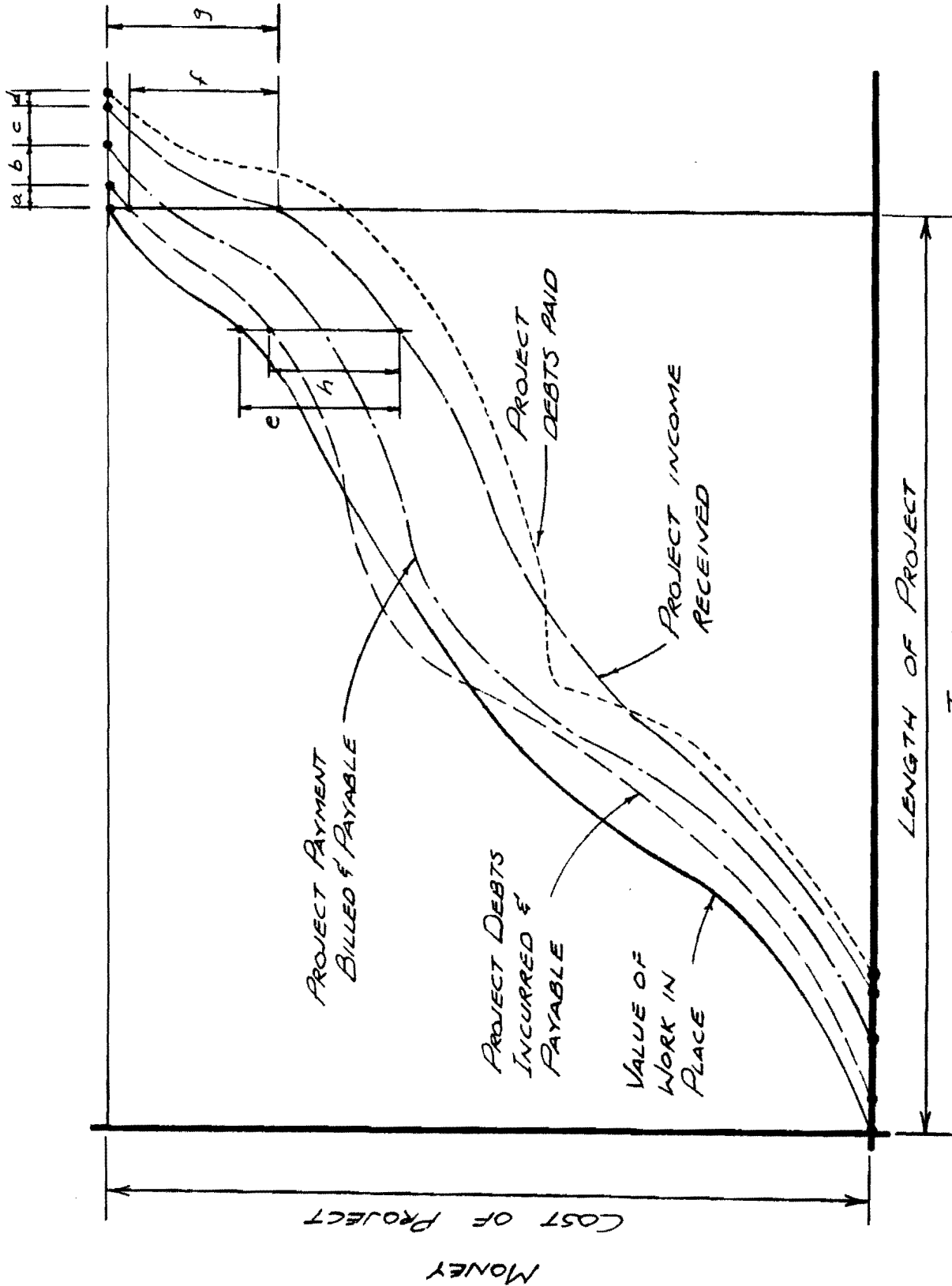
I	S	ACTIVITY DESC	AL	LB	LL	LR	TW	SI	EB	REC#
-	-	-----	-	-	-	-	-	-	-	----
D	X	FURNISH ELEVATOR EMBEDMENTS	-	-	-	-	D	-	-	192
D	X	INSTALL ELEVATOR RAILS, EQUIP, CAB	-	-	-	-	D	-	-	58
D	X	INSTALL ELEVATOR HYDRAULIC CYLINDER	-	-	-	-	D	-	-	59
E	X	ERECT LR METAL FLOOR & ROOF DECK	-	-	-	E	-	-	E	108
E	X	ERECT, 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	-	-	-	-	-	-	92
G	X	PROCURE AIR HANDLING UNITS	G	-	-	-	-	-	-	95
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	123
H	X	INSTL LIGHT FIXT	H	-	-	-	-	-	H	120
H	X	PROCURE EMERGENCY GENERATOR	H	-	-	-	-	-	-	87
H	X	PROCURE TRANSFORMERS	H	-	-	-	-	-	-	102

CONTRACT DOCUMENT MATRIX SUMMARY
 GRAND TRAVERSE RESORT VILLAGE TOWER & LOW RISE
 D106 - RALPH J. STEPHENSON PE PC - DATE PRINTED: JAN 10 1985

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	-	-	-	J	-	-	148
J	X	INSTL TRASH COMPACTOR	J	-	-	-	-	-	-	171
J	X	INSTL TRASH CHUTE	J	-	-	-	J	-	-	147
J	X	INSTALL INT HOLLOW METAL FRAMES	J	-	-	-	-	-	-	103
J	X	INSTALL DOCK LEVELLERS	J	-	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

CONTRACT DOCUMENT MATRIX SUMMARY
 GRAND TRAVERSE RESORT VILLAGE TOWER & LOW RISE
 D106 - RALPH J. STEPHENSON PE FC - DATE PRINTED: JAN 12 1985

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	67
N	X	INSTALL STOREFRONT GLASS	N	N	-	N	N	-	N	68
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



PROJECT MONEY FLOW

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.

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.

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

Monitoring Report #1
New Office Facility
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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.

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