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How CPM cuts construction time and money

Newest thing to hit the construction management industry is a tool called CPM (critical path method) or network planning. Used intelligently, it can cut total project costs up to 25%, slash total time by 10 to 30% and free management from 90% of routine decision-making

BENEFITS OF NETWORK PLANNING

- Makes you think about a project in more detail, tending to prevent omission of tasks.
- Tells you accurately how long a project will take and what jobs must be kept on time to meet the schedule.
- Simplifies advance work assignments and helps improve communications between those responsible for a project.
- Assists you in evaluating and forecasting the outcome of alternate plans of action.
- Focuses attention on potentially troublesome tasks and allows you to pinpoint corrective action.
- Fixes responsibility and provides a permanent record of assignments.
- Insures continuity of action, even with changes in personnel.
- Encourages personnel at all management levels to contribute to effective job planning.
- Simplifies periodic re-evaluation and rescheduling.
- Provides a uniform system of planning, scheduling and reporting.
- Measures proposed changes against time, money and manpower yardsticks.
- Shows proper relationships between all tasks.
- Provides a graphic picture of the work that encourages making accurate and prompt field decisions where needed.
- Shows what to expedite.
- Encourages accurate and continuous control of buying operations and subcontractor performance.
- Separates planning of the task sequence from assignment of time values to each task, making project scheduling less susceptible to time distortions.

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MANAGEMENT decisions — how do you make them? By instinct? By objective analysis? Or by a dash of emotion, mixed with large doses of technical knowledge and experience?

Whatever method you use, decisions are almost always based upon a complex combination of all of these. Oddly enough, the major job facing the competent manager today is not how to make the decision, but how to justify it to himself and others, how to communicate with the staff or company that is to carry out the program, and how to sharpen the implementation process.

Management Breakthrough

A relatively new technique of expression called network planning (NP), or critical path method (CPM), has entered the building industry picture, and shows great promise for those who use it intelligently as an aid to their managerial abilities. The NP concept is simple. *A network plan is the graphic charting of a series of end-to-end tasks, none of which can start until those preceding have been completed.* A sequence of these tasks makes up a complete project.

Networks vary in complexity. To

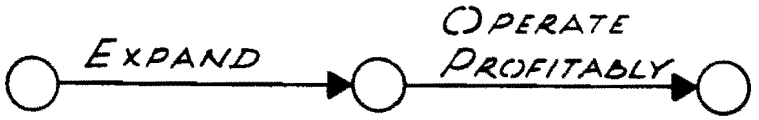

Figure 1

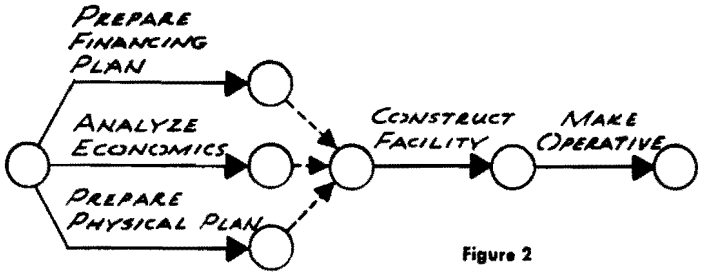

Figure 2

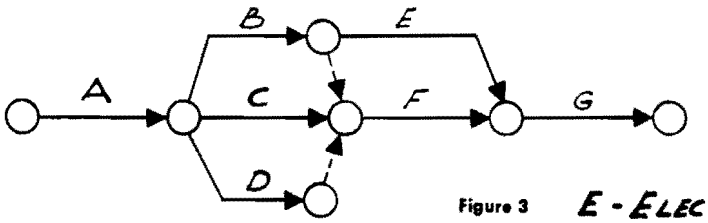

Figure 3

E - ELECTRICIAN
P - PIPEFITTER

TASK	CREW SIZE	TOTAL MAN DAYS REQD	DURATION IN WORKING DAYS
A	1 E 2 P	6	2
B	2 E 1 P	9	3
C	3 E 0 P	3	2
D	4 E 4 P	32	4
E	3 E 2 P	10	2
F	2 E 1 P	6	2
G	1 E 1 P	2	1

Figure 4

illustrate, let's examine a typical set of action levels in a corporate expansion program. At the top is the plan of action for the president. (Figure 1).

The vice president in charge of operations receives his assignment by an even more definite network plan (Figure 2).

From this operational network, the architect, the engineer, the contractor, and the comptroller prepare their work plans. These plans require detailed networks because they actually allocate large quantities of manpower and resources. In fact, it is not uncommon for a contractor's plan of action to be expressed by a network of several hundred individual tasks such as the one superimposed on these two pages. In turn each of these tasks may be broken down into smaller units of action. Let's look at one of these smaller sub networks and see what it is and how it's used.

Figure 3 is a detailed network plan of one of the tasks shown in the contractor's network. Requirements for the project action plan diagrammed in Figure 3 are that:

A must be done first

B, C, and D cannot start until A is complete

E follows B directly

F cannot start until B, C, and D are complete

G must follow E and F

Each letter in the net represents a specific task.

Ground Rules for Graphics

To depict this set of actions graphically we follow a set of rules:

1) Each solid arrow must represent a single activity or task.

2) Where a relation exists between tasks, but no activity connects them, a dotted line called a dummy or restraint is used to show the relationship.

3) Arrow junctions, indicated by circles, or nodes, are momentary points in time and signify the start or completion of a task.

4) No two arrows may have the same starting and finishing nodes.

5) Tasks originating from a node cannot be started until all tasks terminating at that node have been completed.

6) The logic of the action plan must be explicitly stated. Constant reference to rule five will help prevent errors in logic statement.

Imagine you are the person responsible for executing the plan in Figure 3. You naturally want to know how long it will take to do the job. Notice, this is the first mention of time as a factor. Until now, our concern has been to produce a workable action plan. In fact, one of the major advantages of the network technique is that it does separate project planning from time assignments and thus minimizes plan distortions caused by concurrent worries about time requirements.

Time Assignments

There are several methods of assigning times but let's use one that gives us flexibility for future adjustment of the network. In our example assume the work shown requires two trades, electricians (E), and pipefitters (P). Assignment of manpower is shown in Figure 4.

The estimated durations (d) from the table are entered on the corresponding arrows in the network plan. (Figure 5) Dummy arrows are assigned zero duration.

By a series of simple computations the earliest start (ES) and latest finish (LF) time limitations are determined for each task. ES's are the earliest possible times a task can start from each node as-

(continued on next page)

MAKE MONEY

Network planning can be used in the office, and in the field; it can help plan a financing and leasing program, or chart a public relations campaign; it can show a new secretary how to process a change order, or an experienced manager how to construct a multi-million-dollar high rise office building

suming all previous tasks are completed on time. ES times are figured from the beginning to the end of the network with the earliest start at the last node being the duration of the project. LF's are the latest allowable times a task can finish at each node without affecting the completion time of the entire project. LF times are computed by figuring back to the beginning along each path in the network.

In our example, the longest time sequence of tasks is through A, D, F, and G, a path which takes nine working days to traverse. The other paths (ABEG, ABFG, and ACFG) must then have spare time available since none take as long as ADFG. This spare time is called float.

Total float (TF) is the amount of time that any task can be delayed without delaying the entire project. It is computed by subtracting the duration of a task from the total time available to accomplish it. For instance, task B can start as early as 3 (ES), takes three days to complete, but doesn't have to be finished until 7 (LF). Thus there are 7–3=4 days available to do the three-day task. Task B then has one day float that can be used as job conditions dictate.

Similarly, task E is found to have 9–6=3 days available, but the task only takes two days. Therefore task E also has one day total float. Observe though, it is the same day that is available for task B or E and it can be used for one or the other, but not for both.

The Bottleneck Route

The path (or paths) through the network which takes the longest time to complete is the critical path. As a working definition, we say that the tasks within a project that have minimum total float time available (usually zero) are on the critical path. So, the critical path is the longest path through the project, but is the shortest time in which the project can be completed.

At this point, we know this about our job from the network:

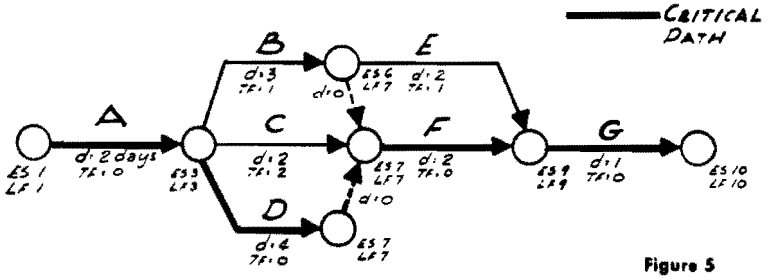

Figure 5

Method of Computation

Early start times (ES) are computed by adding the task duration to the ES time at the beginning node of the task. Where two or more arrow heads enter a node the ES time at that node is the latest of the computed early start times.

Latest finish times (LF) are computed by subtracting the task duration from the LF time at the end node of the task. Where two or more arrow tails leave a node the LF time at that node is the earliest of the computed latest finish times.

1) Everybody on the project is familiar with the work sequence and how many working days are allocated to their tasks.

2) Management knows how long the project will take and when it can expect each task to start and finish if the job is to be on time.

3) Management has an advance look at where trouble might develop by analyzing the critical path tasks.

4) Purchasing can be scheduled at times when buying conditions are best.

5) The effect of changes upon completion dates can be seen easily.

6) Replanning of the project (for example because of anticipated strikes or material shortages) can be accomplished with full knowledge of the impact of the change in plan upon the rest of the work.

Better Use of Manpower

If we went no further than preparing the plan and assigning times, NP would be of great benefit. But there are other uses for the network. By our data table in Figure 4 we can inject the concept of scheduling and resource allocation into the program. Look at Figure 5. Only four of the tasks, A, D, F, and G are actually scheduled with definite starting and completion dates. These are critical tasks which have no float time available. The other three tasks, B, C, and E have some leeway.

The question is — when are the best times to start and complete the noncritical tasks?

To determine these times we should first define our objectives. Assume that management wants to complete the project in minimum time and keep a crew size of about six electricians and five pipefitters.

Several approaches can be used, but I suggest that first, a simple bar chart be drawn showing each task starting at the earliest possible starting time, and continuing for its assigned duration. (Figure 6) The daily crew work force should also be shown on the chart based upon Figure 4 data. This method of scheduling the project by starting each task at the ES time, gives a variation in manpower assignments ranging from a maximum of eight electricians and six pipefitters down to one of each trade. Further,

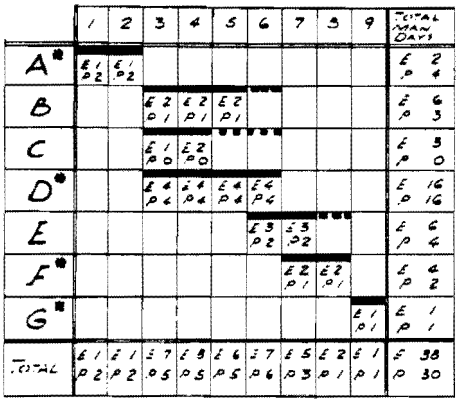

Figure 6

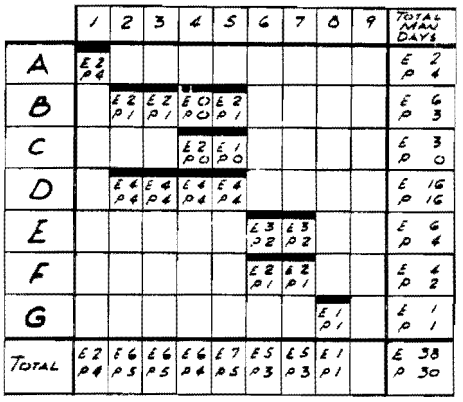

Figure 8

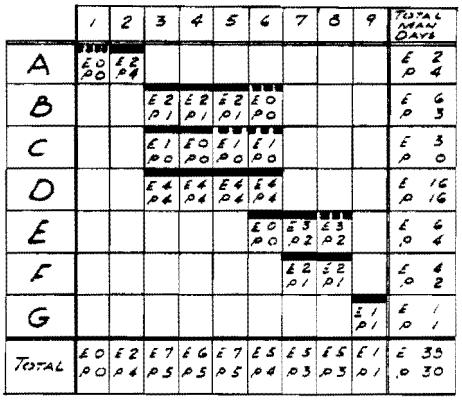

Figure 7

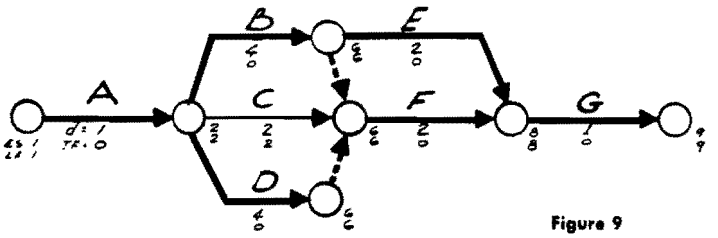

Figure 9

the fluctuation over the nine day period shows poor work continuity, and the project completion time hasn't been shortened.

Therefore a second reassignment is made using some of the float time from noncritical tasks (Figure 7).

Carrying out the project in this manner gives better manpower leveling characteristics by reducing the maximum required number of electricians from eight to seven, and the maximum required number of pipefitters from six to five. We have also cut the time of the project by one day by assigning additional available manpower to Task A. (In many cases doubling the crew size doesn't cut the required time in half, although for this small task we have assumed it does).

Analyzing our second schedule, we can still see additional modifications which will further smooth out the work assignments to give the final schedule and manpower allocation shown in Figure 8. By two visual adjustments to the original network and schedule we have now prepared a work assignment pattern that better fulfills the management objectives of cutting project time and minimizing crew size.

The last check made is a re-examination of the network to see if the schedule changes have necessitated a revision of the work plan (Figure 9). Inspection of the adjusted network shows there are no major changes except a reduction in the total length of the project by one day. Notice, when the new durations were assigned, elapsed times were used (such as for Task B where there is a one day interruption in the work).

Computered CPM

Our example has been a simple one, and the analysis quite easy. But visualize how complex the scheduling and resource allocation could become for many concurrent projects containing several hundred individual tasks. In such cases we usually resort to an electronic computer to furnish the multitude of arithmetical and logical conclusions needed to make decisions. For networks between 100 and 200 tasks, however, and where the only data required is the ES, LF, and total float information, hand computations by a good estimator will prove adequate, though slow.

In summary, we have discussed four application levels of NP:

1) The plan of action.

2) The arithmetical computation of ES, LF, and total float for each task.

3) The project schedule derived *from* the network.

4) The allocation of resources. #

Mr. Stephenson is a consulting engineer with a diversified background in land planning, facilities location and building design and construction. He has been associated with such firms as Smith, Hinchman and Grylls, Victor Gruen Associates and the H. F. Campbell Company. With the latter two organizations, Mr. Stephenson occupied executive positions as vice president. He has taught courses on the use of the critical path method in the construction industry, and since 1953, has been actively involved at a management level with the planning, programming, design and construction of millions of dollars worth of industrial, commercial and public facilities in all parts of the U.S. This broad experience has given Mr. Stephenson an understanding of both large and small management, and for the need to solve problems through a creative, systematic and knowledgeable approach.

(2)

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NETWORK PLANNING ABBREVIATIONS

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

H02-t

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

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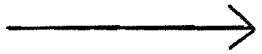
POURG	Pouring
PRES	Pressure
PRM	Primary
PROT	Protection
PRS	Piers
PVG	Paving
RAD	Radiant
RAILG	Railing
RD	Road
REINF	Reinforcing
REL	Relocate
REQD	Required
RESIL	Resilient
RESTL	Reinforcing steel
REMV	Remove
RFG	Roofing
RISR	Riser
RM	Room
RR	Railroad
RSC	Rolling steel curtain
RUBB	Rubber
RUFF	Rough
S	South
SBSTNTLY	Substantially
SDWK	Sidewalk
SETTG	Setting
SEWR	Sewer
SHT	Sheet
SIDG	Siding
SLB	Slab
SOG	Slab on grade
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
TEMP	Temporary
TFT	Total float time
TK	Tank
TO/R	Toilet room
TPG	Topping
TR	Trim
T/R	Time restraint
TRANSFRMR	Transformer
TRD	Tread
TST	Test
TWR	Tower
UG	Underground
ULG	Unloading
UTIL	Utility
US	Underside
U T/R	Updating time restraint
VP	Vapor barrier
VENTILTR	Ventilator
VEST	Vestibule
W	West
WASHG	Washing
WK	Work
WLKWY	Walkway
WLL	Wall
WNDW	Window
WP	Waterproofing
WTR	Water
W T/R	Weather time restraint

NETWORK PLANNING MINITEXT

Symbols

1. Arrow or task 

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

2. Circle or node

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

3. Dotted or dummy arrow

   A symbol representing the existence of a relationship between tasks. Dummies have no resources allocated.

   Note: 95% of the time a dummy goes from <u>end</u> of one task to <u>start</u> of another.

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 single tasks, nodes and dummies must be explicit.

Steps in Network Planning

1. Define scope of work.

2. Draw logic plan.

3. Approve logic plan.

4. Assign durations.

5. Compute ES, LF and TF

6. Analyze and recompute, if necessary. (May make additional resource allocation)

7. Issue.

Rules for Numbering Nodes

1. It is recommended the numbering sequence move down and to the right.

2. Normally, twenty numbers per hundred should be reserved for future use, and noted on diagram.

3. A node, having two or more arrows entering, or two or more arrows leaving, is numbered.

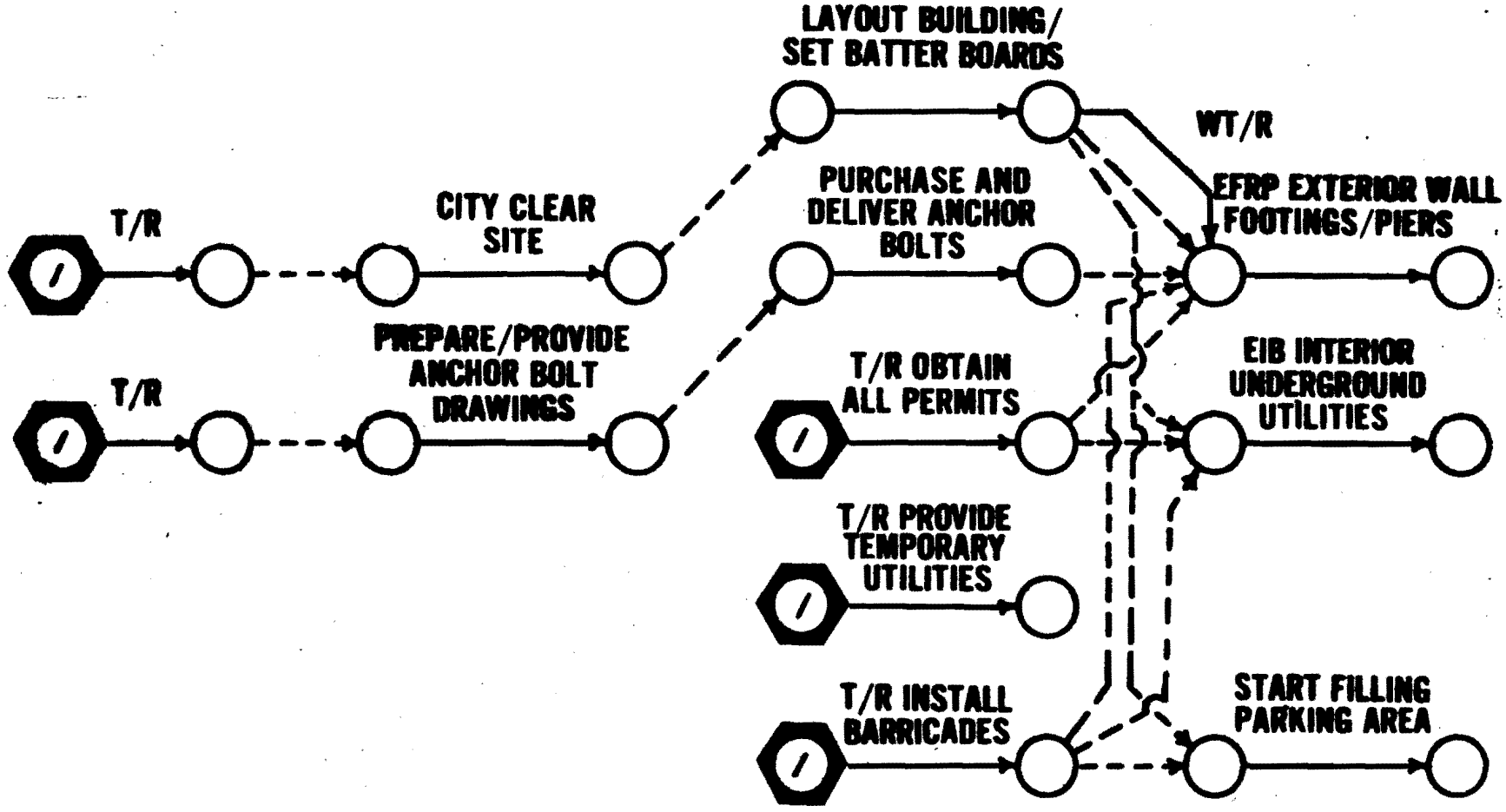
4. A node, having a single arrow entering, and a single arrow leaving, does not have to be numbered unless required by rule 5.

5. No more than one node in a sequence should be without a number.

Note: Node numbers are used to identify tasks. The final measure of whether node numbers are assigned correctly is whether any task in the network can be identified uniquely (the only one in the network) by its pair of node numbers.

i is the initial node number designation.

j is the end node number designation.


LAYOUT BUILDING/
SET BATTER BOARDS
WT/R
T/R
CITY CLEAR
SITE
PURCHASE AND
DELIVER ANCHOR
BOLTS
EFRP EXTERIOR WALL
FOOTINGS/PIERS
PREPARE/PROVIDE
ANCHOR BOLT
DRAWINGS
T/R
T/R OBTAIN
ALL PERMITS
EIB INTERIOR
UNDERGROUND
UTILITIES
T/R PROVIDE
TEMPORARY
UTILITIES
T/R INSTALL
BARRICADES
START FILLING
PARKING AREA

WORKING DAY CALENDAR FOR 1968 AND 1969 USING JAN 2,1968 AS 1ST DAY (DAY 0)

1969

DATE	DAY NO.	DATE	DAY NO.	DATE	DAY NO.	DATE	DAY NO.	DATE	DAY NO.
102	256	103	257	106	258	107	259	108	260
109	261	110	262	113	263	114	264	115	265
116	266	117	267	120	268	121	269	122	270
123	271	124	272	127	273	128	274	129	275
130	276	131	277	203	278	204	279	205	280
206	281	207	282	210	283	211	284	212	285
213	286	214	287	217	288	218	289	219	290
220	291	221	292	224	293	225	294	226	295
227	296	228	297	303	298	304	299	305	300
306	301	307	302	310	303	311	304	312	305
313	306	314	307	317	308	318	309	319	310
320	311	321	312	324	313	325	314	326	315
327	316	328	317	331	318	401	319	402	320
403	321	404	322	407	323	408	324	409	[illegible]
410	326	411	327	414	328	415	329	416	[illegible]
417	331	418	332	421	333	422	334	423	[illegible]
424	336	425	337	428	338	429	339	430	340
501	341	502	342	505	343	506	344	507	345
508	346	509	347	512	348	513	349	514	350
515	351	516	352	519	353	520	354	521	355
[illegible]	356	523	357	526	358	527	359	528	360
[illegible]	361	602	362	603	363	604	364	605	365
606	366	609	367	610	368	611	369	612	370
613	371	616	372	617	373	618	374	619	[illegible]
620	376	623	377	624	378	625	379	626	[illegible]
627	381	630	382	701	383	702	384	703	385
707	386	708	387	709	388	710	389	711	390
714	391	715	392	716	393	717	394	718	395
721	396	722	397	723	398	724	399	725	400
[illegible]	401	729	402	730	403	731	404	801	405
804	406	805	407	806	408	807	409	808	410
811	411	812	412	813	413	814	414	815	415
818	416	819	417	820	418	821	419	822	420
825	421	826	422	827	423	828	424	829	425
902	426	903	427	904	428	905	429	908	430
909	431	910	432	911	433	912	434	915	435
916	436	917	437	918	438	919	439	922	440
923	441	924	442	925	443	926	444	929	445
930	446	1001	447	1002	448	1003	449	1006	450
1007	451	1008	452	1009	453	1010	454	1013	455
1014	456	1015	457	1016	458	1017	459	1020	460
1021	461	1022	462	1023	463	1024	464	1027	465
1028	466	1029	467	1030	468	1103	469	1104	470
1105	471	1106	472	1107	473	1110	474	1111	475
1112	476	1113	477	1114	478	1117	479	1118	480
1119	481	1121	482	1124	483	1125	484	1126	485
7	486	1128	487	1201	488	1202	489	1203	490
4	491	1205	492	1208	493	1209	494	1210	495
1211	496	1212	497	1215	498	1216	499	1217	500
1218	501	1219	502	1222	503	1223	504	1224	505
1226	506	1229	507	1230	508	1231	509		

RALPH J. STEPHENSON, P.E.

WORKING DAY CALENDAR FOR 1968 AND 1969 USING JAN 2,1968 AS 1ST DAY (DAY 0)

1968

DATE	DAY NO.	DATE	DAY NO.	DATE	DAY NO.	DATE	DAY NO.	DATE	DAY NO.
102	0	103	1	104	2	105	3	108	4
109	5	110	6	111	7	112	8	115	9
116	10	117	11	118	12	119	13	122	14
123	15	124	16	125	17	126	18	129	19
130	20	131	21	201	22	202	23	205	24
206	25	207	26	208	27	209	28	212	29
213	30	214	31	215	32	216	33	219	34
220	35	221	36	222	37	223	38	226	39
227	40	228	41	229	42	301	43	304	44
305	45	306	46	307	47	308	48	311	49
312	50	313	51	314	52	315	53	318	54
319	55	320	56	321	57	322	58	325	59
326	60	327	61	328	62	329	63	401	64
402	65	403	66	404	67	405	68	408	69
409	70	410	71	411	72	412	73	415	74
416	75	417	76	418	77	419	78	422	79
423	80	424	81	425	82	426	83	429	84
430	85	501	86	502	87	503	88	506	89
507	90	508	91	509	92	510	93	513	94
514	95	515	96	516	97	517	98	520	99
521	100	522	101	523	102	524	103	527	104
528	105	529	106	531	107	603	108	604	109
605	110	606	111	607	112	610	113	611	114
612	115	613	116	614	117	617	118	618	119
619	120	620	121	621	122	624	123	625	124
626	125	627	126	628	127	701	128	702	129
703	130	705	131	708	132	709	133	710	134
711	135	712	136	715	137	716	138	717	139
718	140	719	141	722	142	723	143	724	144
725	145	726	146	729	147	730	148	731	149
801	150	802	151	805	152	806	153	807	154
808	155	809	156	812	157	813	158	814	159
815	160	816	161	819	162	820	163	821	164
822	165	823	166	826	167	827	168	828	169
829	170	830	171	903	172	904	173	905	174
906	175	909	176	910	177	911	178	912	179
913	180	916	181	917	182	918	183	919	184
920	185	923	186	924	187	925	188	926	189
927	190	930	191	1001	192	1002	193	1003	194
1004	195	1007	196	1008	197	1009	198	1010	199
1011	200	1014	201	1015	202	1016	203	1017	204
1018	205	1021	206	1022	207	1023	208	1024	209
1025	210	1028	211	1029	212	1030	213	1031	214
1101	215	1104	216	1105	217	1106	218	1107	219
1108	220	1111	221	1112	222	1113	223	1114	224
1115	225	1118	226	1119	227	1120	228	1122	229
1125	230	1126	231	1127	232	1128	233	1129	234
1202	235	1203	236	1204	237	1205	238	1206	239
1209	240	1210	241	1211	242	1212	243	1213	244
1216	245	1217	246	1218	247	1219	248	1220	249
1223	250	1224	251	1226	252	1227	253	1230	254
1231	255								

(6)

SCOPE OF WORK CHECKLIST

BOWLING LANE AND UTILITY WAREHOUSE

City of Growville

Bizee Butler Buildership

Anytown U.S.A.

Contractors 1-4-68

Site Work - (Work outside building line and within property line)

Make curb cuts
City strip site
Provide temporary utilities
Install sidewalks
Install fencing

Substructure - (Footings, foundation walls, and all related work)

Lay out building
Set batter boards
EFRP wall footings
Install UG utilities
Lay vapor barrier

Superstructure - (All structural frame resting on substructure)

Erect rigid frame
Install fill-in items

Exterior Skin - (All work to close building to weather)

Install overhead doors
Install roof panels
Install aluminum entries and glaze
Install exterior trim and gutters

Interior Rough Work - (Interior work which can be totally or partially exposed to weather)

Erect interior masonry
Install overhead sheet metal work
Install rough electrical work

Interior Finish Work - (Interior work which must be partially or totally protected from weather)

Lay resilient tile
Install toilet room partitions and accessories
Install ceiling light fixtures
Install trim and millwork

Systems Work - (Work which collectively makes up a total operating unit)

Install furnace room
Install condensers
Install bowling lanes

RALPH J. STEPHENSON
CONSULTING ENGINEER

6a

SCOPE OF WORK CHECKLIST

Site Work - (Work outside building line and within property line or contract limits)

Substructure - (Footings, foundation walls, and all related work)

Superstructure - (All structural frame resting on substructure)

Exterior Skin - (All work to close building to weather)

Interior Rough Work - (Interior work which can be totally or partially exposed to weather)

Interior Finish Work - (Interior work which must be partially or totally protected from weather)

Systems Work - (Work which collectively makes up a total operating unit)

RALPH J. STEPHENSON
CONSULTING ENGINEER

Network Analysis Rating Sheet - WHIF

Network Being Rated _____

_____

_____

Ratings:

Excellent	4
Good	3
Fair	2
Poor	1

Factor to be rated	Rating
1. Clarity of network. Is it largely self explanatory?	____
2. Accuracy of network. Does it correctly depict the scheme of action?	____
3. Clarity of explanation. Was the network interpreted well to you?	____
4. Diagramming technique. Was the network logic shown correctly?	____
5. Time assignments. Were the durations reasonable?	____
6. Analysis of WHIF question. Was the WHIF situation you presented well understood, evaluated properly and correctly solved or resolved?	____
7. Computations. Were the ES, LF, TF and critical path correctly computed?	____
8. General rating. How well did the entire team prepare, present and use their network plan?	____
Total	____

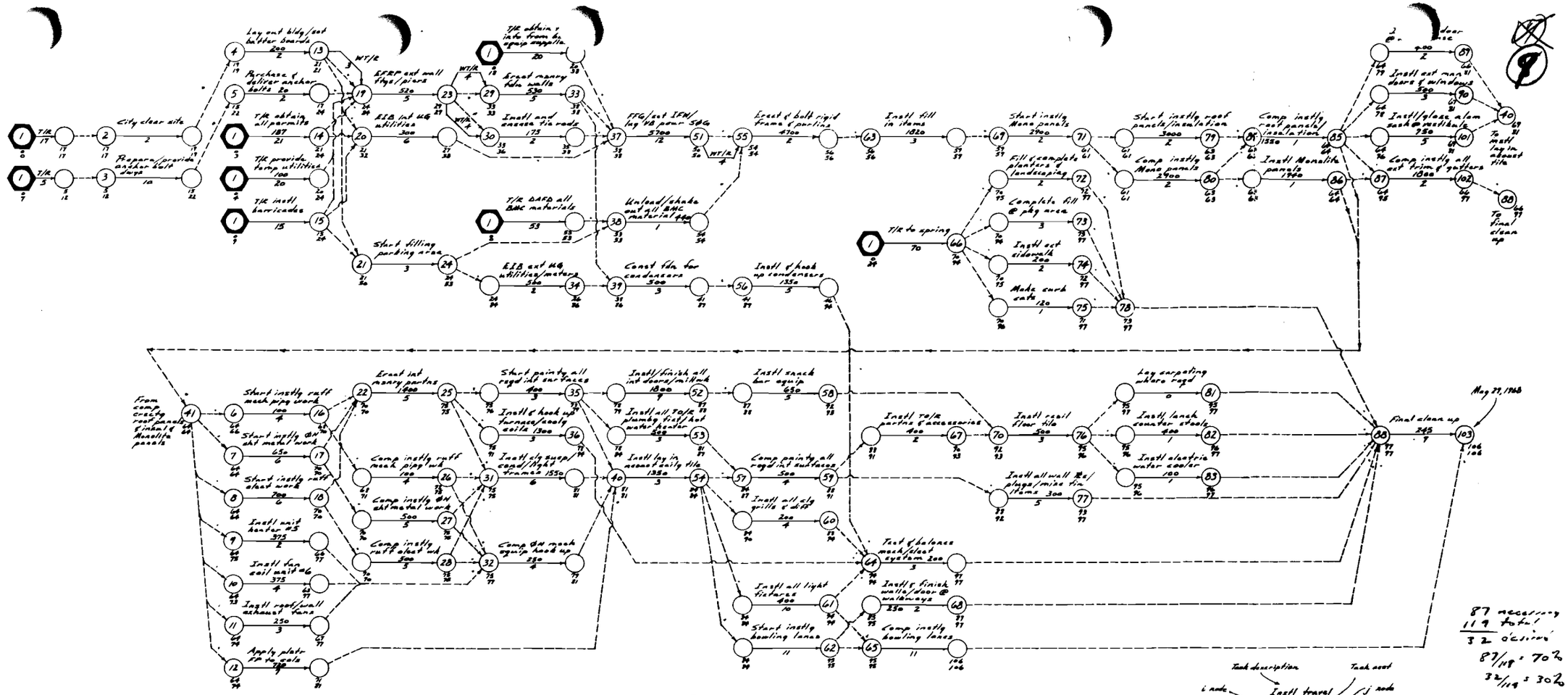
(highest possible - 32)

Input Data for _____

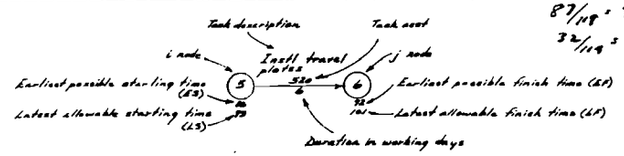
DATE _____ SHT. _____

RALPH J. STE[illegible]NSON
CONSULTING ENG[illegible]ER

i	j	d	Code	Description



87 necessary
119 total
32 dummies
87/119 = 70%
32/119 = 30%



ARROW DATA KEY

COLOR CODING:

GREEN - TASK ON TIME - NOT PAST EF DATE
ORANGE - TASK ON TIME - PAST EF DATE
BLUE - TASK BEHIND - NOT PAST LF DATE
YELLOW - TASK BEHIND - PAST LF DATE

GENERAL NOTES:

- ERECTION OF MASONRY INCLUDES INSTALLATION OF LINTELS, SONGBIT LINTELS, FRAMES, AND ALL OTHER ANCHORS ITEMS
- STONE PLANTING BOX MASONRY ERECTED WITH MASONRY FOUNDATION WALLS
- INSTALLATION OF DOORS INCLUDES HARDWARE

SPECIAL ABBREVIATIONS:

- BMC BUTLER MFG CO.
- EXFP EXCAVATE, FORM, REINFORCE, POUR
- EIB EXCAVATE, INSTALL, BACKFILL
- FFG FILL & FINE GRADE
- HM HOLLOW METAL
- IFW IN FLOOR WORK - INCLUDES CONDUIT, REINF, SCREEDS, INSERTS, BOLTS
- OH OVERHEAD
- T/R TIME RESTRAINT
- UG UNDERGROUND
- VB VAPOR BARRIER
- WT/R WEATHER TIME RESTRAINT

ITEM PROCESSING SCHEDULE

Item	Shop drgs to be submitted	Shop drgs to be approved	Fabrication to be complete	Delivered to job site	Remarks
Anchor bolts	1/23 (15)			1/30 (20)	Purchased locally
T/R rods				2/16 (33)	
BMC material	1/26 (18)			3/15 (53)	*Order submitted
Condensers				3/26 (60)	
Fdn data re lines				2/13 (30)	From equip mfr
HM door frames				3/15 (53)	
Unit heater #5				4/4 (70)	
Fan coil unit #6				4/9 (70)	
Roof exhaust fans				4/9 (70)	
Furnaces/cooly coils				4/16 (75)	
Wood doors	2/27 (40)	3/5 (45)	4/2 (65)	4/9 (70)	
Sauna bar equip	2/27 (40)	3/12 (50)	4/9 (70)	4/23 (80)	
Light fixtures				4/23 (80)	
T&R partitions	2/27 (40)	3/12 (50)	4/9 (70)	4/23 (80)	
Lunch counter stools				5/7 (90)	
Elect water coolers				5/7 (90)	
Elect power panels	1/23 (15)	1/30 (20)	3/5 (45)	3/26 (60)	Plant may go on strike
Alum. sash	2/13 (30)	2/20 (35)	3/12 (50)	3/26 (60)	
OH doors	2/20 (35)	2/27 (40)	3/12 (50)	3/26 (60)	
Metal doors	2/13 (30)	2/27 (40)	3/19 (55)	3/26 (60)	
Ext windows	2/20 (35)	2/27 (40)	3/19 (55)	3/26 (60)	

MONITORING RECORD

DATE		DATE		DATE	

RESERVED WORK NOS.

39	96	99	96
42	47	72	97
43	48	73	98
44	49	74	99
45	50	75	100

ISSUE RECORD

ISSUE #	DATE
1	JAN 10, 68

L.N. 1
W.N. 103

67:61

NETWORK PLAN FOR BOWLING LANES & UTILITY WAREHOUSE

CITY OF GROWVILLE

BIZEE BUTLER BUILDERSHIP

ANYTOWN, U.S.A.

CONTRACTORS

BMS 2
JAN 10, 1968

1

Prepared by Ralph J. Stephenson, P.E. Drawn by m.j.h.

(10)

RALPH J. STEPHENSON
CONSULTING ENGINEER

NETWORK PLAN PRINTOUT

for

BOWLING LANE AND UTILITY WAREHOUSE

City of Growville

Bizee Butler Buildership

Anytown U.S.A.

Contractors

Issue #1 Jan. 10, 1968

BMS 2

1/10/68

Prepared by R.J.S.

NETWORK PLAN FOR BOWLING LANES AND UTILITY WAREHOUSE
CITY OF GROWVILLE
BMS NO. 2
ISSUE NO. 1 JAN. 10. 1968 DRAWING ISSUED NO. 1
NETWORK PREPARED BY RALPH J STEPHENSON. P.E.

ITEMS WITH CP IN TFT COLUMN ARE ON THE CRITICAL PATH.
WORKING DAYS ARE STATED AS MONTH. DATE AND YEAR IN ES.LS.EF.LF

I	J	DYS	CD	JOB DESCRIPTION	NODE SEQUENCE ES	LS	EF	LF	TFT
1	2	17	0	T/R	1028	1028	1248	1248	CP
1	3	5	0	T/R	1028	1118	1088	1178	7
1	14	21	187	T/R OBTAIN ALL PERMITS	1028	1058	1308	2028	3
1	15	15	0	T/R INSTL BARRICADES	1028	1158	1228	2028	9
1	19	20	100	T/R PROVIDE TEMP UTILITIES	1028	1088	1298	2028	4
1	37	20	0	T/R OB FDN INFO FRM BWLG EQ SUP	1028	1268	1298	2228	18
1	38	53	0	T/R DAFD ALL BMC MATERIALS	1028	1028	3148	3148	CP
1	66	70	0	T/R TO SPRING	1028	2058	4088	5108	24
2	4	2	0	CITY CLEAR SITE	1258	1258	1268	1268	CP
3	5	10	0	PREP/PROVIDE ANCHOR BLT DRAWING	1098	1188	1228	1318	7
4	13	2	200	LAY OUT BLDG/SET BATTER BOARDS	1298	1298	1308	1308	CP
5	19	2	20	PURCHASE AND DEL ANCHOR BOLTS	1238	2018	1248	2028	7
6	16	4	100	START INSTLG RUFF MECH PIPG WK	4018	4038	4048	4088	2
7	17	6	650	START INSTLG OH SHT MTL WORK	4018	4018	4088	4088	CP
8	18	6	700	START INSTLG RUFF ELECT WORK	4018	4018	4088	4088	CP
9	32	2	375	INSTL UNIT HEATER NO. 5	4018	4168	4028	4178	11
10	32	4	375	INSTL FAN COIL UNIT NO. 6	4018	4128	4048	4178	9
11	32	3	250	INSTL ROOF/WALL EXHAUST FANS	4018	4158	4038	4178	10
12	40	7	720	APPLY PLSTR FP TO COLS	4018	4158	4098	4238	10
13	19	3	0	WT/R	1318	1318	2028	2028	CP
13	19		0	D	1318	2058	1308	2028	3
13	20		0	D	1318	2158	1308	2148	11
13	21		0	D	1318	3128	1308	3118	29
14	19		0	D	1318	2058	1308	2028	3
14	20		0	D	1318	2158	1308	2148	11
15	19		0	D	1238	2058	1228	2028	9
15	20		0	D	1238	2158	1228	2148	17
15	21		0	D	1238	3128	1228	3118	35
16	22		0	D	4058	4098	4048	4088	2
16	26	4	100	COMP INSTLG RUFF MECH PIPG WORK	4058	4108	4108	4158	3
17	22		0	D	4098	4098	4088	4088	0
17	27	5	500	COMP INSTLG OH SHT METAL WORK	4098	4098	4158	4158	CP
18	22		0	D	4098	4098	4088	4088	0
18	28	5	500	COMP INSTLG RUFF ELECT WORK	4098	4098	4158	4158	CP
19	23	5	520	EFRP EXT WALL FTGS/PIERS	2058	2058	2098	2098	CP
20	37	6	300	EIB INT UG UTILITIES	1318	2158	2078	2228	11
21	24	3	0	START FILLING PARKING AREA	1318	3128	2028	3148	29
22	25	5	1400	ERECT INT MSNRY PARTNS	4098	4098	4158	4158	CP
23	29	4	0	WT/R	2128	2128	2158	2158	CP
23	29		0	D	2128	2168	2098	2158	4
23	30	4	0	WT/R	2128	2158	2158	2208	3
23	30		0	D	2128	2218	2098	2208	7
24	34	2	500	EIB EXT UG UTIL/METERS	2058	4298	2068	4308	60
24	38		0	D	2058	3158	2028	3148	29

25	31		0	D	4168	4168	4158	4158	0
25	35	3	400	START PAINTG ALL REQD INT SURF	4168	4178	4188	4198	1
25	36	3	1300	INSTL+HOOK FURNCE/COOLG COILS	4168	5088	4188	5108	16
26	31		0	D	4118	4168	4108	4158	3
26	32		0	D	4118	4188	4108	4178	5
27	31		0	D	4168	4168	4158	4158	0
27	32		0	D	4168	4188	4158	4178	2
28	31		0	D	4168	4168	4158	4158	0
28	32		0	D	4168	4188	4158	4178	2
29	33	5	530	ERECT MSNRY FDN WALLS	2168	2168	2228	2228	CP
30	37	2	175	INSTL AND ENCASE TIE RODS	2168	2218	2198	2228	3
31	40	6	1550	INSTL CLG SUSP/COND/LIGHT FRAME	4168	4168	4238	4238	CP
32	40	4	250	COMP OH MECH EQUIP HOOK UP	4168	4188	4198	4238	2
33	37		0	D	2238	2238	2228	2228	0
33	39		0	D	2238	5018	2228	4308	48
34	39		0	D	2078	5018	2068	4308	60
35	40		0	D	4198	4248	4188	4238	3
35	52	9	1800	INSTL/FINISH ALL INT DRS/MILWK	4198	4228	5018	5028	1
35	53	3	500	INSTL AL TO/R PLMB FXT/HT WT HT	4198	4298	4238	5018	6
36	64		0	D	4198	5138	4188	5108	16
37	51	12	5700	FFG/SET IFW/LAY VB/POUR SOG	2238	2238	3118	3118	CP
38	55	1	440	UNLOAD/SHAKE OUT AL BMC MATERL	3158	3158	3158	3158	CP
39	56	3	500	CONST FDN FOR CONDENSERS	2238	5018	2278	5038	48
40	54	3	1350	INSTL LAY IN ACOUS CLG TILE	4248	4248	4268	4268	CP
41	6		0	D	4018	4038	3298	4028	2
41	7		0	D	4018	4018	3298	3298	0
41	8		0	D	4018	4018	3298	3298	0
41	9		0	D	4018	4168	3298	4158	11
41	10		0	D	4018	4128	3298	4118	9
41	11		0	D	4018	4158	3298	4128	10
41	12		0	D	4018	4158	3298	4128	10
51	55	4	0	WT/R	3128	3128	3158	3158	CP
51	55		0	D	3128	3188	3118	3158	4
52	58	5	650	INSTL SNACK BAR EQUIP	5028	5038	5088	5098	1
53	57		0	D	4248	5028	4238	5018	6
54	57		0	D	4298	5028	4268	5018	3
54	60	4	200	INSTL ALL CLG GRILLS+DIFF	4298	5078	5028	5108	6
54	61	10	400	INSTL ALL LIGHT FIXTURES	4298	4298	5108	5108	CP
54	62	11	0	START INSTLG BOWLING LANES	4298	4298	5138	5138	CP
55	63	2	4700	ERCT+BOLT RIGID FRAM+PURLINS	3188	3188	3198	3198	CP
56	64	5	1350	INSTL+HOOK UP CONDENSERS	2288	5068	3058	5108	48
57	59	4	500	COMP PAINTG ALL REQD INT SURF	4298	5028	5028	5078	3
58	70		0	D	5098	5108	5088	5098	1
59	67	2	400	INSTL TO/R PRTNS+ACCESSORIES	5038	5088	5068	5098	3
59	77	5	300	INST AL WL PLS/PLUGS/MIS FIN IT	5038	5098	5098	5158	4
60	64		0	D	5038	5138	5028	5108	6
61	64		0	D	5138	5138	5108	5108	0
61	65		0	D	5138	5148	5108	5138	1
62	65		0	D	5148	5148	5138	5138	0
62	68	2	250	INST/FIN WLS/DR AT WALKWAYS	5148	5148	5158	5158	CP
63	69	3	1820	INSTL FILL IN ITEMS	3208	3208	3228	3228	CP
64	88	3	200	TEST+BALNC MEC/ELEC SYSTEM	5138	5138	5158	5158	CP
65	103	11	0	COMP INSTLG BOWLING LANES	5148	5148	5288	5288	CP
66	72	2	0	FIL/COMP PLANTRS/LANDSCAPING	4098	5148	4108	5158	25
66	73	3	0	COMPLETE FILL AT PKG AREA	4098	5138	4118	5158	24

66	74	2	200	INSTL EXT SIDEWALK	4098	5148	4108	5158	25
66	75	1	120	MAKE CURB CUTS	4098	5158	4098	5158	26
67	70		0	D	5078	5108	5068	5098	3
68	88		0	D	5168	5168	5158	5158	0
69	71	2	2900	START INSTL MONO PANELS	3258	3258	3268	3268	CP
70	76	3	500	INSTL RESIL FLOOR TILE	5098	5108	5138	5148	1
71	79	2	3000	ST INSTL RF PANELS/INSULATION	3278	3278	3288	3288	CP
71	80	2	2900	COMP INSTLG MONO PANELS	3278	3278	3288	3288	CP
72	78		0	D	4118	5168	4108	5158	25
73	78		0	D	4128	5168	4118	5158	24
74	78		0	D	4118	5168	4108	5158	25
75	78		0	D	4108	5168	4098	5158	26
76	81		0	LAY CARPETING WHERE REQD	5148	5168	5138	5158	2
76	82	1	400	INSTL LUNCH COUNTER STOOLS	5148	5158	5148	5158	1
76	83	1	100	INSTL ELECT WATER COOLER	5148	5158	5148	5158	1
77	88		0	D	5108	5168	5098	5158	4
78	88		0	D	4128	5168	4118	5158	24
79	84		0	D	3298	3298	3288	3288	0
80	84		0	D	3298	3298	3288	3288	0
80	86	1	1940	INSTL MONOLITE PANELS	3298	3298	3298	3298	CP
81	88		0	D	5148	5168	5138	5158	2
82	88		0	D	5158	5168	5148	5158	1
83	88		0	D	5158	5168	5148	5158	1
84	85	1	1550	COMP INSTL ROOF PNLS/INSULATION	3298	3298	3298	3298	CP
5	41		0	D	4018	4018	3298	3298	0
85	87		0	D	4018	5148	3298	5138	31
85	89	2	400	INSTL OH DOOR AT WAREHOUSE	4018	4228	4028	4238	15
85	90	3	500	INSTL EXT MAN DOORS+WINDOWS	4018	4198	4038	4238	14
85	101	5	750	INSTL/GLAZE ALUM SASH/VESTIBUL	4018	4178	4058	4238	12
86	41		0	D	4018	4018	3298	3298	0
86	87		0	D	4018	5148	3298	5138	31
87	102	2	1800	COMP INSTL ALL EXT TRIM+GUTERS	4018	5148	4028	5158	31
88	103	9	245	FINAL CLEANUP	5168	5168	5288	5288	CP
89	40		0	D	4038	4248	4028	4238	15
90	40		0	D	4048	4248	4038	4238	14
101	40		0	D	4088	4248	4058	4238	12
102	88		0	D	4038	5168	4028	5158	31

TOTAL PROJECT COST = $50067.00 DURATION CALCULATED = 106 DAYS

NETWORK PLAN FOR BOWLING LANES AND UTILITY WAREHOUSE
CITY OF GROWVILLE
BMS NO. 2
ISSUE NO. 1 JAN. 10. 1968 DRAWING ISSUED NO. 1
NETWORK PREPARED BY RALPH J STEPHENSON. P.E.

ITEMS WITH CP IN TFT COLUMN ARE ON THE CRITICAL PATH.
WORKING DAYS ARE STATED AS MONTH. DATE AND YEAR IN ES.LS.EF.LF

I	J	DYS	CD	JOB DESCRIPTION	EARLY START SEQUENCE ES	LS	EF	LF	TFT
1	14	21	187	T/R OBTAIN ALL PERMITS	1028	1058	1308	2028	3
1	19	20	100	T/R PROVIDE TEMP UTILITIES	1028	1088	1298	2028	4
1	37	20	0	T/R OB FDN INFO FRM BWLG EQ SUP	1028	1268	1298	2228	18
1	66	70	0	T/R TO SPRING	1028	2058	4088	5108	24
1	38	53	0	T/R DAFD ALL BMC MATERIALS	1028	1028	3148	3148	CP
1	3	5	0	T/R	1028	1118	1088	1178	7
1	15	15	0	T/R INSTL BARRICADES	1028	1158	1228	2028	9
1	2	17	0	T/R	1028	1028	1248	1248	CP
3	5	10	0	PREP/PROVIDE ANCHOR BLT DRAWING	1098	1188	1228	1318	7
5	19	2	20	PURCHASE AND DEL ANCHOR BOLTS	1238	2018	1248	2028	7
2	4	2	0	CITY CLEAR SITE	1258	1258	1268	1268	CP
4	13	2	200	LAY OUT BLDG/SET BATTER BOARDS	1298	1298	1308	1308	CP
13	19	3	0	WT/R	1318	1318	2028	2028	CP
21	24	3	0	START FILLING PARKING AREA	1318	3128	2028	3148	29
20	37	6	300	EIB INT UG UTILITIES	1318	2158	2078	2228	11
24	34	2	500	EIB EXT UG UTIL/METERS	2058	4298	2068	4308	60
19	23	5	520	EFRP EXT WALL FTGS/PIERS	2058	2058	2098	2098	CP
23	29	4	0	WT/R	2128	2128	2158	2158	CP
23	30	4	0	WT/R	2128	2158	2158	2208	3
30	37	2	175	INSTL AND ENCASE TIE RODS	2168	2218	2198	2228	3
29	33	5	530	ERECT MSNRY FDN WALLS	2168	2168	2228	2228	CP
37	51	12	5700	FFG/SET IFW/LAY VB/POUR SOG	2238	2238	3118	3118	CP
39	56	3	500	CONST FDN FOR CONDENSERS	2238	5018	2278	5038	48
56	64	5	1350	INSTL+HOOK UP CONDENSERS	2288	5068	3058	5108	48
51	55	4	0	WT/R	3128	3128	3158	3158	CP
38	55	1	440	UNLOAD/SHAKE OUT AL BMC MATERL	3158	3158	3158	3158	CP
55	63	2	4700	ERCT+BOLT RIGID FRAM+PURLINS	3188	3188	3198	3198	CP
63	69	3	1820	INSTL FILL IN ITEMS	3208	3208	3228	3228	CP
69	71	2	2900	START INSTL MONO PANELS	3258	3258	3268	3268	CP
71	79	2	3000	ST INSTL RF PANELS/INSULATION	3278	3278	3288	3288	CP
71	80	2	2900	COMP INSTLG MONO PANELS	3278	3278	3288	3288	CP
80	86	1	1940	INSTL MONOLITE PANELS	3298	3298	3298	3298	CP
84	85	1	1550	COMP INSTL ROOF PNLS/INSULATION	3298	3298	3298	3298	CP
9	32	2	375	INSTL UNIT HEATER NO. 5	4018	4168	4028	4178	11
85	89	2	400	INSTL OH DOOR AT WAREHOUSE	4018	4228	4028	4238	15
87	102	2	1800	COMP INSTL ALL EXT TRIM+GUTERS	4018	5148	4028	5158	31
11	32	3	250	INSTL ROOF/WALL EXHAUST FANS	4018	4158	4038	4178	10
85	90	3	500	INSTL EXT MAN DOORS+WINDOWS	4018	4198	4038	4238	14
6	16	4	100	START INSTLG RUFF MECH PIPG WK	4018	4038	4048	4088	2
0	32	4	375	INSTL FAN COIL UNIT NO. 6	4018	4128	4048	4178	9
85	101	5	750	INSTL/GLAZE ALUM SASH/VESTIBUL	4018	4178	4058	4238	12
7	17	6	650	START INSTLG OH SHT MTL WORK	4018	4018	4088	4088	CP
8	18	6	700	START INSTLG RUFF ELECT WORK	4018	4018	4088	4088	CP
12	40	7	720	APPLY PLSTR FP TO COLS	4018	4158	4098	4238	10

16	26	4	100	COMP INSTLG RUFF MECH PIPG WORK	4058	4108	4108	4158	3
66	75	1	120	MAKE CURB CUTS	4098	5158	4098	5158	26
66	72	2	0	FIL/COMP PLANTRS/LANDSCAPING	4098	5148	4108	5158	25
66	74	2	200	INSTL EXT SIDEWALK	4098	5148	4108	5158	25
66	73	3	0	COMPLETE FILL AT PKG AREA	4098	5138	4118	5158	24
17	27	5	500	COMP INSTLG OH SHT METAL WORK	4098	4098	4158	4158	CP
18	28	5	500	COMP INSTLG RUFF ELECT WORK	4098	4098	4158	4158	CP
22	25	5	1400	ERECT INT MSNRY PARTNS	4098	4098	4158	4158	CP
25	35	3	400	START PAINTG ALL REQD INT SURF	4168	4178	4188	4198	1
25	36	3	1300	INSTL+HOOK FURNCE/COOLG COILS	4168	5088	4188	5108	16
32	40	4	250	COMP OH MECH EQUIP HOOK UP	4168	4188	4198	4238	2
31	40	6	1550	INSTL CLG SUSP/COND/LIGHT FRAME	4168	4168	4238	4238	CP
35	53	3	500	INSTL AL TO/R PLMB FXT/HT WT HT	4198	4298	4238	5018	6
35	52	9	1800	INSTL/FINISH ALL INT DRS/MILWK	4198	4228	5018	5028	1
40	54	3	1350	INSTL LAY IN ACOUS CLG TILE	4248	4248	4268	4268	CP
54	62	11	0	START INSTLG BOWLING LANES	4298	4298	5138	5138	CP
54	61	10	400	INSTL ALL LIGHT FIXTURES	4298	4298	5108	5108	CP
54	60	4	200	INSTL ALL CLG GRILLS+DIFF	4298	5078	5028	5108	6
57	59	4	500	COMP PAINTG ALL REQD INT SURF	4298	5028	5028	5078	3
52	58	5	650	INSTL SNACK BAR EQUIP	5028	5038	5088	5098	1
59	67	2	400	INSTL TO/R PRTNS+ACCESSORIES	5038	5088	5068	5098	3
59	77	5	300	INST AL WL PLS/PLUGS/MIS FIN IT	5038	5098	5098	5158	4
70	76	3	500	INSTL RESIL FLOOR TILE	5098	5108	5138	5148	1
64	88	3	200	TEST+BALNC MEC/ELEC SYSTEM	5138	5138	5158	5158	CP
35	103	11	0	COMP INSTLG BOWLING LANES	5148	5148	5288	5288	CP
76	82	1	400	INSTL LUNCH COUNTER STOOLS	5148	5158	5148	5158	1
76	83	1	100	INSTL ELECT WATER COOLER	5148	5158	5148	5158	1
76	81		0	LAY CARPETING WHERE REQD	5148	5168	5138	5158	2
62	68	2	250	INST/FIN WLS/DR AT WALKWAYS	5148	5148	5158	5158	CP
88	103	9	245	FINAL CLEANUP	5168	5168	5288	5288	CP

TOTAL PROJECT COST = $50067.00 DURATION CALCULATED = 106 DAYS

NETWORK PLAN FOR BOWLING LANES AND UTILITY WAREHOUSE
CITY OF GROWVILLE
BMS NO. 2
ISSUE NO. 1 JAN. 10, 1968 DRAWING ISSUED NO. 1
NETWORK PREPARED BY RALPH J STEPHENSON, P.E.

ITEMS WITH CP IN TFT COLUMN ARE ON THE CRITICAL PATH.
WORKING DAYS ARE STATED AS MONTH, DATE AND YEAR IN ES,LS,EF,LF

I	J	DYS	CD	JOB DESCRIPTION	LATE START SEQUENCE ES	LS	EF	LF	TFT
1	38	53	0	T/R DAFD ALL BMC MATERIALS	1028	1028	3148	3148	CP
1	2	17	0	T/R	1028	1028	1248	1248	CP
1	14	21	187	T/R OBTAIN ALL PERMITS	1028	1058	1308	2028	3
1	19	20	100	T/R PROVIDE TEMP UTILITIES	1028	1088	1298	2028	4
1	3	5	0	T/R	1028	1118	1088	1178	7
1	15	15	0	T/R INSTL BARRICADES	1028	1158	1228	2028	9
3	5	10	0	PREP/PROVIDE ANCHOR BLT DRAWING	1098	1188	1228	1318	7
2	4	2	0	CITY CLEAR SITE	1258	1258	1268	1268	CP
1	37	20	0	T/R OB FDN INFO FRM BWLG EQ SUP	1028	1268	1298	2228	18
4	13	2	200	LAY OUT BLDG/SET BATTER BOARDS	1298	1298	1308	1308	CP
13	19	3	0	WT/R	1318	1318	2028	2028	CP
5	19	2	20	PURCHASE AND DEL ANCHOR BOLTS	1238	2018	1248	2028	7
1	66	70	0	T/R TO SPRING	1028	2058	4088	5108	24
9	23	5	520	EFRP EXT WALL FTGS/PIERS	2058	2058	2098	2098	CP
23	29	4	0	WT/R	2128	2128	2158	2158	CP
20	37	6	300	EIB INT UG UTILITIES	1318	2158	2078	2228	11
23	30	4	0	WT/R	2128	2158	2158	2208	3
29	33	5	530	ERECT MSNRY FDN WALLS	2168	2168	2228	2228	CP
30	37	2	175	INSTL AND ENCASE TIE RODS	2168	2218	2198	2228	3
37	51	12	5700	FFG/SET IFW/LAY VB/POUR SOG	2238	2238	3118	3118	CP
21	24	3	0	START FILLING PARKING AREA	1318	3128	2028	3148	29
51	55	4	0	WT/R	3128	3128	3158	3158	CP
38	55	1	440	UNLOAD/SHAKE OUT AL BMC MATERL	3158	3158	3158	3158	CP
55	63	2	4700	ERCT+BOLT RIGID FRAM+PURLINS	3188	3188	3198	3198	CP
63	69	3	1820	INSTL FILL IN ITEMS	3208	3208	3228	3228	CP
69	71	2	2900	START INSTL MONO PANELS	3258	3258	3268	3268	CP
71	79	2	3000	ST INSTL RF PANELS/INSULATION	3278	3278	3288	3288	CP
71	80	2	2900	COMP INSTLG MONO PANELS	3278	3278	3288	3288	CP
80	86	1	1940	INSTL MONOLITE PANELS	3298	3298	3298	3298	CP
84	85	1	1550	COMP INSTL ROOF PNLS/INSULATION	3298	3298	3298	3298	CP
7	17	6	650	START INSTLG OH SHT MTL WORK	4018	4018	4088	4088	CP
8	18	6	700	START INSTLG RUFF ELECT WORK	4018	4018	4088	4088	CP
6	16	4	100	START INSTLG RUFF MECH PIPG WK	4018	4038	4048	4088	2
17	27	5	500	COMP INSTLG OH SHT METAL WORK	4098	4098	4158	4158	CP
18	28	5	500	COMP INSTLG RUFF ELECT WORK	4098	4098	4158	4158	CP
22	25	5	1400	ERECT INT MSNRY PARTNS	4098	4098	4158	4158	CP
16	26	4	100	COMP INSTLG RUFF MECH PIPG WORK	4058	4108	4108	4158	3
10	32	4	375	INSTL FAN COIL UNIT NO. 6	4018	4128	4048	4178	9
11	32	3	250	INSTL ROOF/WALL EXHAUST FANS	4018	4158	4038	4178	10
12	40	7	720	APPLY PLSTR FP TO COLS	4018	4158	4098	4238	10
9	32	2	375	INSTL UNIT HEATER NO. 5	4018	4168	4028	4178	11
31	40	6	1550	INSTL CLG SUSP/COND/LIGHT FRAME	4168	4168	4238	4238	CP
85	101	5	750	INSTL/GLAZE ALUM SASH/VESTIBUL	4018	4178	4058	4238	12
25	35	3	400	START PAINTG ALL REQD INT SURF	4168	4178	4188	4198	1

32	40	4	250	COMP OH MECH EQUIP HOOK UP	4168	4188	4198	4238	2
85	90	3	500	INSTL EXT MAN DOORS+WINDOWS	4018	4198	4038	4238	14
85	89	2	400	INSTL OH DOOR AT WAREHOUSE	4018	4228	4028	4238	15
35	52	9	1800	INSTL/FINISH ALL INT DRS/MILWK	4198	4228	5018	5028	1
40	54	3	1350	INSTL LAY IN ACOUS CLG TILE	4248	4248	4268	4268	CP
24	34	2	500	EIB EXT UG UTIL/METERS	2058	4298	2068	4308	60
35	53	3	500	INSTL AL TO/R PLMB FXT/HT WT HT	4198	4298	4238	5018	6
54	62	11	0	START INSTLG BOWLING LANES	4298	4298	5138	5138	CP
54	61	10	400	INSTL ALL LIGHT FIXTURES	4298	4298	5108	5108	CP
39	56	3	500	CONST FDN FOR CONDENSERS	2238	5018	2278	5038	48
57	59	4	500	COMP PAINTG ALL REQD INT SURF	4298	5028	5028	5078	3
52	58	5	650	INSTL SNACK BAR EQUIP	5028	5038	5088	5098	1
56	64	5	1350	INSTL+HOOK UP CONDENSERS	2288	5068	3058	5108	48
54	60	4	200	INSTL ALL CLG GRILLS+DIFF	4298	5078	5028	5108	6
25	36	3	1300	INSTL+HOOK FURNCE/COOLG COILS	4168	5088	4188	5108	16
59	67	2	400	INSTL TO/R PRTNS+ACCESSORIES	5038	5088	5068	5098	3
59	77	5	300	INST AL WL PLS/PLUGS/MIS FIN IT	5038	5098	5098	5158	4
70	76	3	500	INSTL RESIL FLOOR TILE	5098	5108	5138	5148	1
66	73	3	0	COMPLETE FILL AT PKG AREA	4098	5138	4118	5158	24
64	88	3	200	TEST+BALNC MEC/ELEC SYSTEM	5138	5138	5158	5158	CP
87	102	2	1800	COMP INSTL ALL EXT TRIM+GUTERS	4018	5148	4028	5158	31
66	72	2	0	FIL/COMP PLANTRS/LANDSCAPING	4098	5148	4108	5158	25
66	74	2	200	INSTL EXT SIDEWALK	4098	5148	4108	5158	25
65	103	11	0	COMP INSTLG BOWLING LANES	5148	5148	5288	5288	CP
52	68	2	250	INST/FIN WLS/DR AT WALKWAYS	5148	5148	5158	5158	CP
66	75	1	120	MAKE CURB CUTS	4098	5158	4098	5158	26
76	82	1	400	INSTL LUNCH COUNTER STOOLS	5148	5158	5148	5158	1
76	83	1	100	INSTL ELECT WATER COOLER	5148	5158	5148	5158	1
76	81		0	LAY CARPETING WHERE REQD	5148	5168	5138	5158	2
88	103	9	245	FINAL CLEANUP	5168	5168	5288	5288	CP

TOTAL PROJECT COST = $50067.00 DURATION CALCULATED = 106 DAYS

NETWORK PLAN FOR BOWLING LANES AND UTILITY WAREHOUSE
CITY OF GROWVILLE
BMS NO. 2
ISSUE NO. 1 JAN. 10. 1968 DRAWING ISSUED NO. 1
NETWORK PREPARED BY RALPH J STEPHENSON. P.E.

ITEMS WITH CP IN TFT COLUMN ARE ON THE CRITICAL PATH.
WORKING DAYS ARE STATED AS MONTH. DATE AND YEAR IN ES.LS.EF.LF

I	J	DYS	CD	JOB DESCRIPTION	LATE FINISH SEQUENCE ES	LS	EF	LF	TFT
1	3	5	0	T/R	1028	1118	1088	1178	7
1	2	17	0	T/R	1028	1028	1248	1248	CP
2	4	2	0	CITY CLEAR SITE	1258	1258	1268	1268	CP
4	13	2	200	LAY OUT BLDG/SET BATTER BOARDS	1298	1298	1308	1308	CP
3	5	10	0	PREP/PROVIDE ANCHOR BLT DRAWING	1098	1188	1228	1318	7
1	14	21	187	T/R OBTAIN ALL PERMITS	1028	1058	1308	2028	3
1	19	20	100	T/R PROVIDE TEMP UTILITIES	1028	1088	1298	2028	4
1	15	15	0	T/R INSTL BARRICADES	1028	1158	1228	2028	9
13	19	3	0	WT/R	1318	1318	2028	2028	CP
5	19	2	20	PURCHASE AND DEL ANCHOR BOLTS	1238	2018	1248	2028	7
19	23	5	520	EFRP EXT WALL FTGS/PIERS	2058	2058	2098	2098	CP
23	29	4	0	WT/R	2128	2128	2158	2158	CP
23	30	4	0	WT/R	2128	2158	2158	2208	3
1	37	20	0	T/R OB FDN INFO FRM BWLG EQ SUP	1028	1268	1298	2228	18
20	37	6	300	EIB INT UG UTILITIES	1318	2158	2078	2228	11
29	33	5	530	ERECT MSNRY FDN WALLS	2168	2168	2228	2228	CP
30	37	2	175	INSTL AND ENCASE TIE RODS	2168	2218	2198	2228	3
37	51	12	5700	FFG/SET IFW/LAY VB/POUR SOG	2238	2238	3118	3118	CP
1	38	53	0	T/R DAFD ALL BMC MATERIALS	1028	1028	3148	3148	CP
21	24	3	0	START FILLING PARKING AREA	1318	3128	2028	3148	29
51	55	4	0	WT/R	3128	3128	3158	3158	CP
38	55	1	440	UNLOAD/SHAKE OUT AL BMC MATERL	3158	3158	3158	3158	CP
55	63	2	4700	ERCT+BOLT RIGID FRAM+PURLINS	3188	3188	3198	3198	CP
63	69	3	1820	INSTL FILL IN ITEMS	3208	3208	3228	3228	CP
69	71	2	2900	START INSTL MONO PANELS	3258	3258	3268	3268	CP
71	79	2	3000	ST INSTL RF PANELS/INSULATION	3278	3278	3288	3288	CP
71	80	2	2900	COMP INSTLG MONO PANELS	3278	3278	3288	3288	CP
80	86	1	1940	INSTL MONOLITE PANELS	3298	3298	3298	3298	CP
84	85	1	1550	COMP INSTL ROOF PNLS/INSULATION	3298	3298	3298	3298	CP
7	17	6	650	START INSTLG OH SHT MTL WORK	4018	4018	4088	4088	CP
8	18	6	700	START INSTLG RUFF ELECT WORK	4018	4018	4088	4088	CP
6	16	4	100	START INSTLG RUFF MECH PIPG WK	4018	4038	4048	4088	2
17	27	5	500	COMP INSTLG OH SHT METAL WORK	4098	4098	4158	4158	CP
18	28	5	500	COMP INSTLG RUFF ELECT WORK	4098	4098	4158	4158	CP
22	25	5	1400	ERECT INT MSNRY PARTNS	4098	4098	4158	4158	CP
16	26	4	100	COMP INSTLG RUFF MECH PIPG WORK	4058	4108	4108	4158	3
10	32	4	375	INSTL FAN COIL UNIT NO. 6	4018	4128	4048	4178	9
11	32	3	250	INSTL ROOF/WALL EXHAUST FANS	4018	4158	4038	4178	10
9	32	2	375	INSTL UNIT HEATER NO. 5	4018	4168	4028	4178	11
25	35	3	400	START PAINTG ALL REQD INT SURF	4168	4178	4188	4198	1
12	40	7	720	APPLY PLSTR FP TO COLS	4018	4158	4098	4238	10
31	40	6	1550	INSTL CLG SUSP/COND/LIGHT FRAME	4168	4168	4238	4238	CP
85	101	5	750	INSTL/GLAZE ALUM SASH/VESTIBUL	4018	4178	4058	4238	12
32	40	4	250	COMP OH MECH EQUIP HOOK UP	4168	4188	4198	4238	2

85	90	3	500	INSTL EXT MAN DOORS+WINDOWS	4018	4198	4038	4238	14
85	89	2	400	INSTL OH DOOR AT WAREHOUSE	4018	4228	4028	4238	15
40	54	3	1350	INSTL LAY IN ACOUS CLG TILE	4248	4248	4268	4268	CP
24	34	2	500	EIB EXT UG UTIL/METERS	2058	4298	2068	4308	60
35	53	3	500	INSTL AL TO/R PLMB FXT/HT WT HT	4198	4298	4238	5018	6
35	52	9	1800	INSTL/FINISH ALL INT DRS/MILWK	4198	4228	5018	5028	1
39	56	3	500	CONST FDN FOR CONDENSERS	2238	5018	2278	5038	48
57	59	4	500	COMP PAINTG ALL REQD INT SURF	4298	5028	5028	5078	3
52	58	5	650	INSTL SNACK BAR EQUIP	5028	5038	5088	5098	1
59	67	2	400	INSTL TO/R PRTNS+ACCESSORIES	5038	5088	5068	5098	3
1	66	70	0	T/R TO SPRING	1028	2058	4088	5108	24
54	61	10	400	INSTL ALL LIGHT FIXTURES	4298	4298	5108	5108	CP
56	64	5	1350	INSTL+HOOK UP CONDENSERS	2288	5068	3058	5108	48
54	60	4	200	INSTL ALL CLG GRILLS+DIFF	4298	5078	5028	5108	6
25	36	3	1300	INSTL+HOOK FURNCE/COOLG COILS	4168	5088	4188	5108	16
54	62	11	0	START INSTLG BOWLING LANES	4298	4298	5138	5138	CP
70	76	3	500	INSTL RESIL FLOOR TILE	5098	5108	5138	5148	1
59	77	5	300	INST AL WL PLS/PLUGS/MIS FIN IT	5038	5098	5098	5158	4
66	73	3	0	COMPLETE FILL AT PKG AREA	4098	5138	4118	5158	24
64	88	3	200	TEST+BALNC MEC/ELEC SYSTEM	5138	5138	5158	5158	CP
87	102	2	1800	COMP INSTL ALL EXT TRIM+GUTERS	4018	5148	4028	5158	31
66	72	2	0	FIL/COMP PLANTRS/LANDSCAPING	4098	5148	4108	5158	25
66	74	2	200	INSTL EXT SIDEWALK	4098	5148	4108	5158	25
62	68	2	250	INST/FIN WLS/DR AT WALKWAYS	5148	5148	5158	5158	CP
66	75	1	120	MAKE CURB CUTS	4098	5158	4098	5158	26
76	82	1	400	INSTL LUNCH COUNTER STOOLS	5148	5158	5148	5158	1
76	83	1	100	INSTL ELECT WATER COOLER	5148	5158	5148	5158	1
76	81		0	LAY CARPETING WHERE REQD	5148	5168	5138	5158	2
65	103	11	0	COMP INSTLG BOWLING LANES	5148	5148	5288	5288	CP
88	103	9	245	FINAL CLEANUP	5168	5168	5288	5288	CP

TOTAL PROJECT COST = $50067.00 DURATION CALCULATED = 106 DAYS

NETWORK PLAN FOR BOWLING LANES AND UTILITY WAREHOUSE
CITY OF GROWVILLE
BMS NO. 2
ISSUE NO. 1 JAN. 10, 1968 DRAWING ISSUED NO. 1
NETWORK PREPARED BY RALPH J STEPHENSON, P.E.

ITEMS WITH CP IN TFT COLUMN ARE ON THE CRITICAL PATH.
WORKING DAYS ARE STATED AS MONTH, DATE AND YEAR IN ES,LS,EF,LF

I	J	DYS	CD	JOB DESCRIPTION	TOTAL FLOAT SEQUENCE ES	LS	EF	LF	TFT
1	2	17	0	T/R	1028	1028	1248	1248	CP
2	4	2	0	CITY CLEAR SITE	1258	1258	1268	1268	CP
4	13	2	200	LAY OUT BLDG/SET BATTER BOARDS	1298	1298	1308	1308	CP
13	19	3	0	WT/R	1318	1318	2028	2028	CP
19	23	5	520	EFRP EXT WALL FTGS/PIERS	2058	2058	2098	2098	CP
23	29	4	0	WT/R	2128	2128	2158	2158	CP
29	33	5	530	ERECT MSNRY FDN WALLS	2168	2168	2228	2228	CP
37	51	12	5700	FFG/SET IFW/LAY VB/POUR SOG	2238	2238	3118	3118	CP
1	38	53	0	T/R DAFD ALL BMC MATERIALS	1028	1028	3148	3148	CP
51	55	4	0	WT/R	3128	3128	3158	3158	CP
38	55	1	440	UNLOAD/SHAKE OUT AL BMC MATERL	3158	3158	3158	3158	CP
55	63	2	4700	ERCT+BOLT RIGID FRAM+PURLINS	3188	3188	3198	3198	CP
63	69	3	1820	INSTL FILL IN ITEMS	3208	3208	3228	3228	CP
69	71	2	2900	START INSTL MONO PANELS	3258	3258	3268	3268	CP
71	79	2	3000	ST INSTL RF PANELS/INSULATION	3278	3278	3288	3288	CP
71	80	2	2900	COMP INSTLG MONO PANELS	3278	3278	3288	3288	CP
80	86	1	1940	INSTL MONOLITE PANELS	3298	3298	3298	3298	CP
84	85	1	1550	COMP INSTL ROOF PNLS/INSULATION	3298	3298	3298	3298	CP
7	17	6	650	START INSTLG OH SHT MTL WORK	4018	4018	4088	4088	CP
8	18	6	700	START INSTLG RUFF ELECT WORK	4018	4018	4088	4088	CP
17	27	5	500	COMP INSTLG OH SHT METAL WORK	4098	4098	4158	4158	CP
18	28	5	500	COMP INSTLG RUFF ELECT WORK	4098	4098	4158	4158	CP
22	25	5	1400	ERECT INT MSNRY PARTNS	4098	4098	4158	4158	CP
31	40	6	1550	INSTL CLG SUSP/COND/LIGHT FRAME	4168	4168	4238	4238	CP
40	54	3	1350	INSTL LAY IN ACOUS CLG TILE	4248	4248	4268	4268	CP
54	61	10	400	INSTL ALL LIGHT FIXTURES	4298	4298	5108	5108	CP
54	62	11	0	START INSTLG BOWLING LANES	4298	4298	5138	5138	CP
64	88	3	200	TEST+BALNC MEC/ELEC SYSTEM	5138	5138	5158	5158	CP
62	68	2	250	INST/FIN WLS/DR AT WALKWAYS	5148	5148	5158	5158	CP
65	103	11	0	COMP INSTLG BOWLING LANES	5148	5148	5288	5288	CP
88	103	9	245	FINAL CLEANUP	5168	5168	5288	5288	CP
25	35	3	400	START PAINTG ALL REQD INT SURF	4168	4178	4188	4198	1
35	52	9	1800	INSTL/FINISH ALL INT DRS/MILWK	4198	4228	5018	5028	1
52	58	5	650	INSTL SNACK BAR EQUIP	5028	5038	5088	5098	1
70	76	3	500	INSTL RESIL FLOOR TILE	5098	5108	5138	5148	1
76	82	1	400	INSTL LUNCH COUNTER STOOLS	5148	5158	5148	5158	1
76	83	1	100	INSTL ELECT WATER COOLER	5148	5158	5148	5158	1
6	16	4	100	START INSTLG RUFF MECH PIPG WK	4018	4038	4048	4088	2
32	40	4	250	COMP OH MECH EQUIP HOOK UP	4168	4188	4198	4238	2
76	81		0	LAY CARPETING WHERE REQD	5148	5168	5138	5158	2
1	14	21	187	T/R OBTAIN ALL PERMITS	1028	1058	1308	2028	3
23	30	4	0	WT/R	2128	2158	2158	2208	3
30	37	2	175	INSTL AND ENCASE TIE RODS	2168	2218	2198	2228	3
16	26	4	100	COMP INSTLG RUFF MECH PIPG WORK	4058	4108	4108	4158	3

57	59	4	500	COMP PAINTG ALL REQD INT SURF	4298	5028	5028	5078	3
59	67	2	400	INSTL TO/R PRTNS+ACCESSORIES	5038	5088	5068	5098	3
1	19	20	100	T/R PROVIDE TEMP UTILITIES	1028	1088	1298	2028	4
59	77	5	300	INST AL WL PLS/PLUGS/MIS FIN IT	5038	5098	5098	5158	4
35	53	3	500	INSTL AL TO/R PLMB FXT/HT WT HT	4198	4298	4238	5018	6
54	60	4	200	INSTL ALL CLG GRILLS+DIFF	4298	5078	5028	5108	6
1	3	5	0	T/R	1028	1118	1088	1178	7
3	5	10	0	PREP/PROVIDE ANCHOR BLT DRAWING	1098	1188	1228	1318	7
5	19	2	20	PURCHASE AND DEL ANCHOR BOLTS	1238	2018	1248	2028	7
1	15	15	0	T/R INSTL BARRICADES	1028	1158	1228	2028	9
10	32	4	375	INSTL FAN COIL UNIT NO. 6	4018	4128	4048	4178	9
11	32	3	250	INSTL ROOF/WALL EXHAUST FANS	4018	4158	4038	4178	10
12	40	7	720	APPLY PLSTR FP TO COLS	4018	4158	4098	4238	10
20	37	6	300	EIB INT UG UTILITIES	1318	2158	2078	2228	11
9	32	2	375	INSTL UNIT HEATER NO. 5	4018	4168	4028	4178	11
85	101	5	750	INSTL/GLAZE ALUM SASH/VESTIBUL	4018	4178	4058	4238	12
85	90	3	500	INSTL EXT MAN DOORS+WINDOWS	4018	4198	4038	4238	14
85	89	2	400	INSTL OH DOOR AT WAREHOUSE	4018	4228	4028	4238	15
25	36	3	1300	INSTL+HOOK FURNCE/COOLG COILS	4168	5088	4188	5108	16
1	37	20	0	T/R 08 FDN INFO FRM BWLG EQ SUP	1028	1268	1298	2228	18
1	66	70	0	T/R TO SPRING	1028	2058	4088	5108	24
66	73	3	0	COMPLETE FILL AT PKG AREA	4098	5138	4118	5158	24
66	72	2	0	FIL/COMP PLANTRS/LANDSCAPING	4098	5148	4108	5158	25
66	74	2	200	INSTL EXT SIDEWALK	4098	5148	4108	5158	25
66	75	1	120	MAKE CURB CUTS	4098	5158	4098	5158	26
21	24	3	0	START FILLING PARKING AREA	1318	3128	2028	3148	29
87	102	2	1800	COMP INSTL ALL EXT TRIM+GUTERS	4018	5148	4028	5158	31
39	56	3	500	CONST FDN FOR CONDENSERS	2238	5018	2278	5038	48
56	64	5	1350	INSTL+HOOK UP CONDENSERS	2288	5068	3058	5108	48
24	34	2	500	EIB EXT UG UTIL/METERS	2058	4298	2068	4308	60

TOTAL PROJECT COST = $50067.00 DURATION CALCULATED = 106 DAYS

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Project ______________________ **Date** __________ **RALPH J. STEPHENSON**
Sht __________ CONSULTING ENGINEER

ITEM PROCESSING SCHEDULE

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

Project:____

Sheet:________________

Ralph J. Stephenson
Consulting engineer

ITEM PROCESSING SCHEDULE

Item	Date shop drawings to be submitted			Date of shop drawing approval			Date fabrication complete	Date item on job site
	Subm1	Subm2	Subm3	Subm1	Subm2	Subm3		

Date May 10

Project: Lake City Community College

Page 1

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

Abbreviations

Fabric = Fabricate

Wkg=Working

Dys = Days

Requird = Required

DTO = Date to order (calendar)

DOJ = Date on job (calendar)

DO = Date ordered (calendar)

Purchasing Schedule Example

Date _____

Project:

Page_____

Item	Code	Contractor or Vendor	Code	Lead Time Reqd.-wkg.dys.					Earliest		Latest		Best		Actual		Remarks
				Detail	Approve	Fabric	Deliver	Total	DTO	DOJ	DTO	DOJ	DTO	DOJ	DO	DOJ	
Struct Steel																	
Alum sash																	
Excavation																	
Roofing																	
Brick																	
Plastering																	

Abbreviations

Fabric = Fabricate

Wkg=Working

Dys = Days

Requird = Required

DTO = Date to order (calendar)

DOJ = Date on job (calendar)

DO = Date ordered (calendar)

Purchasing Schedule Example

14

WHIF #1

What happens if .....

five days before all BMC components are due on the job, the plant telegraphs Ben Bizee that Monopanl will be delivered to the job five days later than anticipated?

Evaluate:

(1) Impact of delay on job plan.

(2) Impact of delay on finish date.

(3) What field and office adjustments must be made to bring the project back on schedule.

15

WHIF #2

What happens if .....

on March 25th the bowling equipment manufacturer phones and asks if they could start their bowling lane and equipment installation the middle of April instead of in late April? The reason is a reliable report of a wildcat strike among field installers of bowling equipment the last half of May. The information is confidential, but accurate.

Evaluate:

(1) Impact of situation on job plan.

(2) Impact of situation on finish date.

(3) What field and office actions must be taken to accommodate this trade under these revised conditions.

BMS 2
RJS 1-24-68

(16)

Project Status as of Monitoring #1

February 2, 1968

Task	Color Code	Status	Was completed	Will be complete
1 - 14		Complete	1/20/68	---
1 - 19		Complete	2/1/68	---
1 - 37		Not yet requested	---	---
1 - 38		Ordered 1/20/68	---	3/14/68
1 - 15		Complete	2/1/68	---
3 - 5		Complete	1/31/68	---
5 - 19		Complete	2/1/68	---
2 - 4		Complete	1/26/68	---
4 - 13		Complete	1/30/68	---
21 - 24		In work 5%	---	3/14/68
20 - 37		In work 25%	---	2/12/68

BMS 2
RJS 1-24-68

(17)

Project Status as of Monitoring #2

February 16, 1968

Task	Color Code	Status	Was completed	Will be complete
24 - 34		50% comp	---	3/1/68
19 - 23		Complete	2/11/68	---
30 - 37		To start tomorrow	---	2/19/68
29 - 33		In work 5%	---	2/24/68
37 - 51		In work 5%	---	3/11/68
1 - 37		Not yet requested	---	---
1 - 38		Factory says no!	---	3/20/68
21 - 24		Complete	2/10/68	---
20 - 37		In work, still 25%	---	2/25/68

BMS 2
RJS 1-24-68

(18)

Project Status as of Monitoring #3

March 1, 1968

Task

Task	Color Code	Status	Was completed	Will be complete
24 - 34		70% complete	---	3/15/68
30 - 37		Complete	2/23/68	---
29 - 33		Complete	2/22/68	---
37 - 51		In work 20%	---	?
1 - 37		Complete	2/25/68	---
1 - 38		Back on time	---	3/11/68
20 - 37		Complete	2/24/68	---

BMS 2
RJS 1-24-68

RALPH J. STEPHENSON
CONSULTING ENGINEER

Project Status as of Monitoring #4

March 15, 1968

Task	Color Code	Status	Was completed	Will be complete
1 - 38		Arrived today		---
37 - 51		Complete	3/15/68	---
24 - 34		Complete	3/8/68	---
39 - 56		Complete	3/13/68	---

RALPH J. STEPHENSON
CONSULTING ENGINEER

(20)

Project Status as of Monitoring #5

March 29, 1968

Task	Color Code	Status	Was completed	Will be complete
51 - 55		Passed	Not used	---
38 - 55		Complete	Morning of 3/19/68	---
55 - 63		Complete	Evening of 3/27/68	---
63 - 69		Complete	Evening of 3/28/68	---
69 - 71		50% complete	---	---

RALPH J. STEPHENSON
CONSULTING ENGINEER

(21)

Project Status as of Monitoring #6

April 12, 1968

Task	Color Code	Status	Was completed	Will be complete
69 - 71		Complete	Evening of 3/29/68	---
71 - 79		Complete	" " 4/2/68	---
71 - 80		Complete	" " 4/2/68	---
84 - 85		Complete	" " 4/3/68	---
80 - 86		Complete	" " 4/3/68	---
87 - 102		Complete	" " 4/5/68	---
6 - 16		Complete	" " 4/5/68	---
7 - 17		Complete	" " 4/9/68	---
8 - 18		Complete	" " 4/9/68	---
9 - 32		70%	---	Evening of 4/16/68
10 - 32		80%	---	" " 4/17/68
11 - 32		0%	---	On job 4/17/68
12 - 40		Complete	Evening of 4/11/68	
22 - 25		90%		Evening of 4/15/68

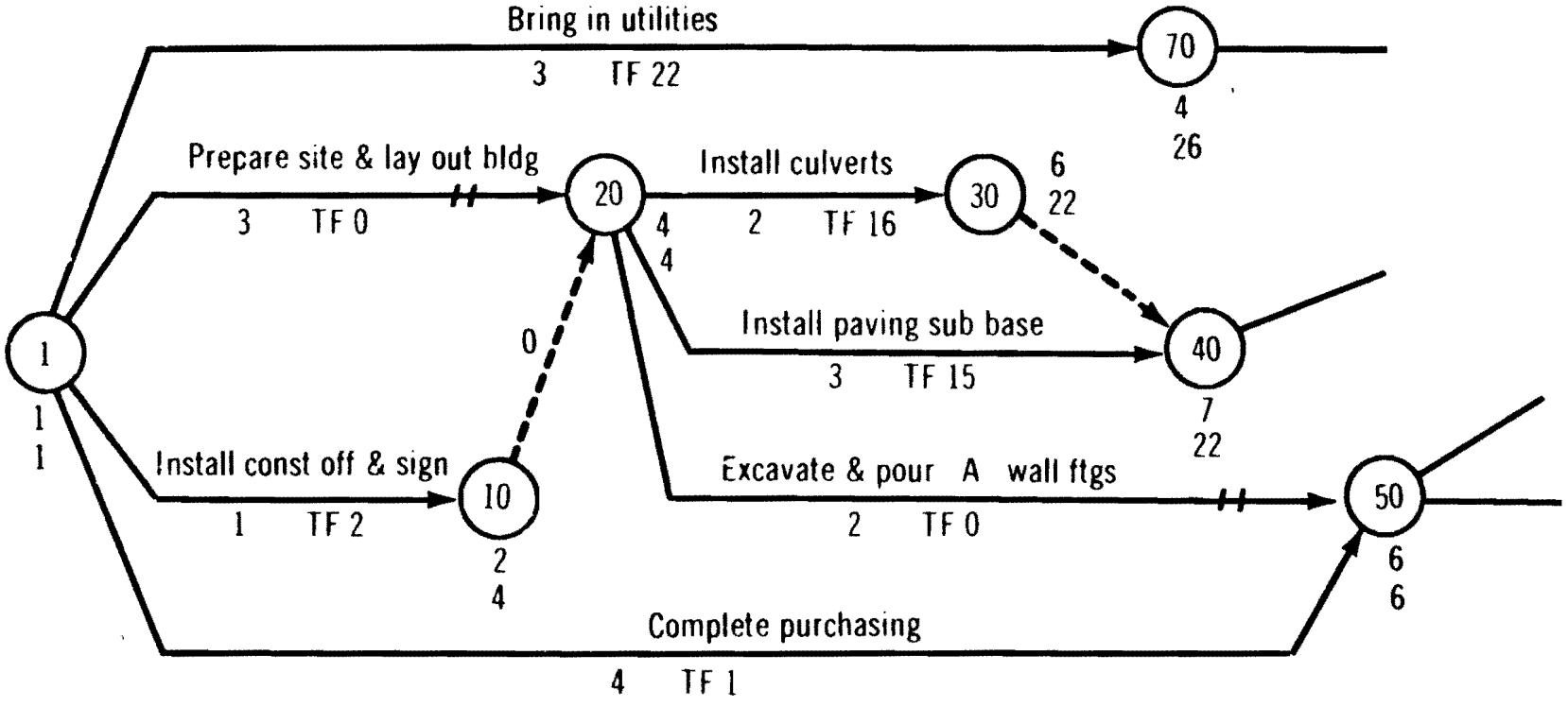
RALPH J. STEPHENSON
CONSULTING ENGINEER

(22)

Project Status as of Monitoring #7

April 26, 1968

Task	Color Code	Status	Was completed	Will be complete
9 - 32		Complete	Evening of 4/15/68	---
10 - 32		Complete	" " 4/17/68	---
11 - 32		Complete	" " 4/18/68	---
22 - 25		Complete	" " 4/15/68	---
16 - 26		Complete	" " 4/12/68	---
17 - 27		Complete	" " 4/16/68	---
18 - 28		Complete	" " 4/15/68	---
25 - 35		Complete	" " 4/19/68	---
25 - 36		Complete	" " 4/18/68	---
31 - 40		Complete	" " 4/23/68	---
32 - 40		Complete	" " 4/22/68	---
35 - 52		65% comp	---	Evening of 5/1/68
35 - 53		80% comp	---	" " 4/29/68
40 - 54		90% comp	---	" " 4/26/68
54 - 62		10% comp	---	---
85 - 101		Complete	Evening of 4/18/68	---
85 - 90		Complete	" " 4/18/68	---
85 - 89		Complete	" " 4/18/68	---



3 B Cosmetic Company Plant Partial Network

Project: 3 B Cosmetic Company Plant

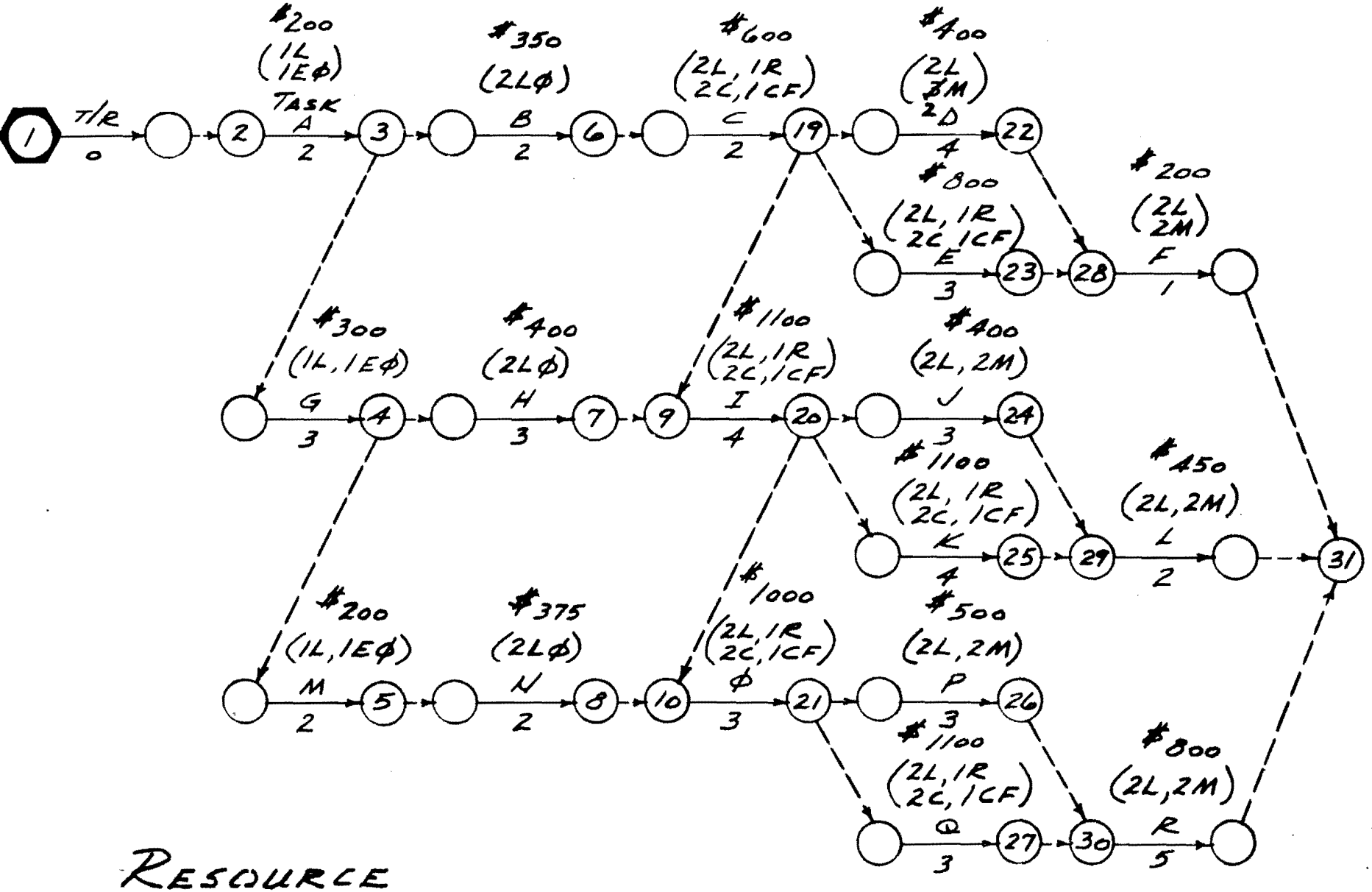
Date: Sept. 25

Report No. 3

Start Node	Finish Node	Actual Start	Actual Fin.	Days to Comp.	% Comp.	Remarks
1	10	1	2	–	100	Carp. from conc. sub did entire task.
1	20	1	–	1	95	To be comp. by start of 4th day
1	50	1	–	?	5	Need rest of mech. dwgs.
1	70	2	–	5	30	Might be delay in gas service approval

SIGNED: John Colt

Suggested Daily Job Report Form



Resource Allocation

Ralph J. Stephenson, P.E.

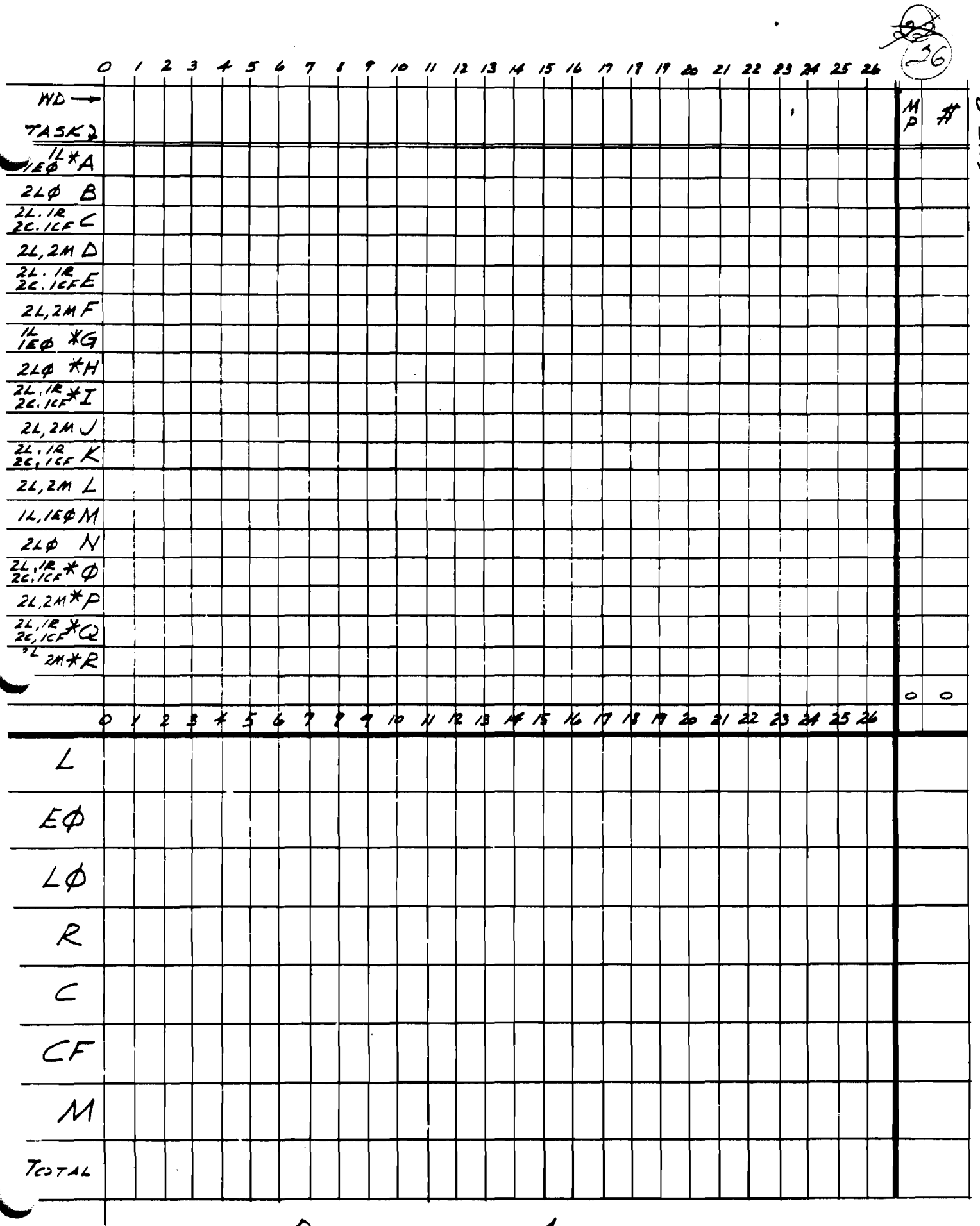
May 29, 1968

Reserved Node Nos.

11	15
12	16
13	17
14	18

25

Sht 1



SHT 2

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2LΦ B			
2L.1R 2C.1CF C			
2L,2M D			
2L.1R 2C.1CF E			
2L,2M F			
1L 1EΦ *G			
2LΦ *H			
2L.1R 2C.1CF *I			
2L,2M J			
2L.1R 2C,1CF K			
2L,2M L			
1L,1EΦ M			
2LΦ N			
2L,1R 2C,1CF *Φ			
2L,2M *P			
2L,1R 2C,1CF *Q			
2L 2M *R			
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RESOURCE ALLOCATION

MAY 29, 1968

RALPH J. STEPHENSON, P.E.

(27)
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// XEQ REPRO

CRITICAL PATH FOR LAKE CITY COMMUNITY COLLEGE, LECTURE HALL
LAKE CITY
PROJECT 66 4 ISSUE NO. 1 MAY 10,
DRAWINGS ISSUED 1, 2 DAY 1 IS JAN 3
NETWORK PREPARED BY STRONG CONSTRUCTION COMPANY, LAKE CITY
PROJECT CONSULTANT RALPH J. STEPHENSON, P.E.

ITEMS WITH * IN TFT COLUMN ARE ON THE CRITICAL PATH.
WORKING DAYS ARE STATED AS MONTH AND DATE IN ES,LS,EF,LF

					NODE SEQUENCE					
I	J	DYS	CD	JOB DESCRIPTION	ES	EF	LS	LF	TF	FF
0	1	0			102	102	102	102	*	0
1	2	96		T/R	102	516	102	516	*	0
1	8	102	L	DAFD EXT HM FRAMES	102	524	104	526	2	2
1	15	110	L	DAFD SUPPLY FAN	102	606	121	627	15	6
1	16	125	L	DAFD ROOF STRUCT STEEL	102	627	104	629	2	2
1	33	136	L	T/R DAFD COMPRESSORS	102	713	228	909	41	19
1	34	144	L	T/R DAFD ALUM SASH&ENTRIES	102	725	113	805	9	3
1	39	120	L	T/R DAFD INT HM FRAMES	102	620	225	816	40	38
1	72	150	L	T/R DAFD INT HARDWARE	102	802	225	928	40	38
2	3	3	L	STRIP SITE AND LAY OUT BLDG	516	519	516	519	*	0
2	4	2	L	LAY UP&APPROVE BRICK SAMPLE WALL	516	518	517	519	1	0
2	5	1	L	SET CONSTRUCTION OFFICES&SIGN	516	517	518	519	2	0
2	41	2	L	INSTL TEMP RDS AND UTILITIES	516	518	517	519	1	0
2	42	4	L	INSTL TEMP PROT AT EXTG BLDG OPENG	516	520	520	526	4	0
3	6	0	L	D	519	519	519	519	*	0
4	6	0	L	D	518	518	519	519	1	1
5	6	0	L	D	517	517	519	519	2	2
6	7	5	L	ST EFRP MSNRY WALL FTGS	519	526	519	526	*	0
7	8	0	L	D	526	526	526	526	*	0
7	10	5	L	COMP EFRP MSNRY WALL FTGS	526	603	603	610	5	0
8	9	10	L	START ERECTG EXT HM AND MSNRY	526	610	526	610	*	0
9	11	0	L	D	610	610	610	610	*	0
9	12	2	L	ST EXT/INT RUFF BKFLG	610	614	622	624	8	0
9	13	2	L	CONST EQUIP BASES AT MECH EQUIP RM	610	614	623	627	9	0
10	11	0	L	D	603	603	610	610	5	5
11	14	10	L	FINISH ERECTG EXT HM AND MSNRY	610	624	610	624	*	0
12	14	0	L	D	614	614	624	624	8	8
13	15	0	L	D	614	614	627	627	9	9
14	16	3	L	COMP EXT/INT RUFF BKFLG	624	629	624	629	*	0
15	16	2	L	SET SUPPLY FAN AT MECH EQUIP ROOM	614	616	627	629	9	9
16	17	8	L	ERECT ROOF STRUCT STEEL	629	712	629	712	*	0
17	18	5	L	ST INSTLG EQUIP&PIPG AT MECH ROOM	712	719	817	824	26	0
17	19	3	L	ERECT ROOF MTL DECK&NAILERS	712	715	715	720	3	0
17	20	4	L	ERECT STONE COPING	712	718	805	811	18	0
17	21	6	L	EIB UG UTIL&DUCT WORK	712	720	712	720	*	0
18	26	0	L	D	719	719	824	824	26	4
19	22	0	L	D	715	715	811	811	19	1
19	23	0	L	D	715	715	720	720	3	3
19	24	5	L	MAKE ALTERATIONS TO EXISTG WALLS	715	722	930	1007	54	0
20	22	0	L	D	718	718	811	811	18	0
21	23	0	L	D	720	720	720	720	*	0
22	25	5	L	LAY INSUL AND ROOFING	718	725	811	818	18	0
3	28	4	L	FFG&SET IFW FOR SOG	720	726	720	726	*	0
4	27	0	L	D	722	722	1007	1007	54	1

25	26	0	L	D	725	725	824	824	22	0
25	27	0	L	D	725	725	1007	1007	53	0
25	30	6	L	INSTL PLSTR SOFFIT/FASCIA/VESTIBULE	725	802	818	826	18	0
25	31	2	L	INSTL ROOF MTD MECH EQUIP	725	727	824	826	22	0
25	43	15	L	INSTL CURBS/PARKING LOTS/SIDEWALKS	725	815	930	1021	48	0
26	33	11	L	ST INSTLG DUCT WORK AT MECH ROOM	725	809	824	909	22	0
27	29	10	L	COMP ALL EXT CALKING AND TRIM	725	808	1007	1021	53	0
28	32	2	L	CONST SOG	726	728	726	728	*	0
29	80	0	L	D	808	808	1021	1021	53	53
30	56	0	L	D	802	802	829	829	19	17
30	58	0	L	D	802	802	826	826	18	14
31	56	0	L	D	727	727	829	829	23	21
31	58	0	L	D	727	727	826	826	22	18
32	34	0	L	D	728	728	805	805	6	0
32	36	11	L	ST INSTLG OH DUCT WORK	728	812	728	812	*	0
32	37	8	L	ST INSTLG OH PIPING	728	809	802	812	3	0
32	38	10	L	ST INSTLG RUFF ELECT WORK	728	811	729	812	1	0
33	35	20	L	CO INSTL ALL MCH/ELT WK/MCH EQ RM	809	907	909	1007	22	0
34	40	9	L	INSTL+GLAZE EXT ALUM SASH+ENTRS	728	810	805	818	6	2
35	71	0	L	D	907	907	1007	1007	22	9
36	39	0	L	D	812	812	816	816	2	0
36	40	0	L	D	812	812	818	818	4	0
36	53	10	L	CO INSTLG OH DUCT WORK+INSUL	812	826	812	826	*	0
37	40	0	L	D	809	809	818	818	7	3
37	54	10	L	CO INSTLG OH PIPING	809	823	812	826	3	0
38	40	0	L	D	811	811	818	818	5	1
38	55	10	L	CO INSTLG RUFF ELECT WORK	811	825	812	826	1	0
39	51	9	L	ERECT INT MSNRY WALLS	812	825	816	829	2	0
40	52	6	L	ST INSTLG CLG SUSP SYSTEM	812	822	818	826	4	0
41	6	0	L	D	518	518	519	519	1	1
42	8	0	L	D	520	520	526	526	4	4
43	80	0	L	D	815	815	1021	1021	48	48
51	56	0	L	D	825	825	829	829	2	0
52	56	0	L	D	822	822	829	829	5	3
52	57	0	L	D	822	822	826	826	4	4
52	58	0	L	D	822	822	826	826	4	0
53	57	0	L	D	826	826	826	826	*	0
54	57	0	L	D	823	823	826	826	3	3
55	57	0	L	D	825	825	826	826	1	1
56	59	5	L	INSTL PLSTR CLGS AT TO/R AND JC	825	901	829	906	2	0
57	61	5	L	COMP INSTLG CLG SUSP SYSTEM	826	902	826	902	*	0
58	60	5	L	ST INSTLG LAY IN CLG TILE	822	829	826	902	4	0
59	62	5	L	T/R DRY PLSTR AT TO/R AND JC	901	909	906	913	2	0
59	63	2	L	INSTL CERAMIC TILE AT TO/R AND JC	901	906	1005	1007	23	0
60	61	0	L	D	829	829	902	902	4	4
60	65	4	L	ST INSTLG CLG LIGHT FIXT+DIFFUSER	829	902	915	921	12	0
61	64	6	L	COMP INSTLG LAY IN CLG TILE	902	913	902	913	*	0
62	66	0	L	D	909	909	913	913	2	2
63	68	3	L	INSTL PLUMBG FIXT AT TO/R AND JC	906	909	1007	1012	23	0
64	66	0	L	D	913	913	913	913	*	0
64	67	0	L	D	913	913	921	921	6	0
65	67	0	L	D	902	902	921	921	12	6
66	69	9	L	PAINT ALL REQD INT SURFACES	913	926	913	926	*	0
67	70	5	L	CO INSTLG CLG LIGHT FIXT/DIFFUSERS	913	920	921	928	6	0
68	73	4	L	INSTL TO/R METAL PARTNS/ACCESSORIES	909	915	1012	1018	23	0

69	72	0	L	D	926	926	928	928	2	0
69	74	12	L	INSTL/FIN ALL MILLWK/CLASSRM EQUIP	926	1012	926	1012	*	0
69	75	10	L	INS ALL WAL PLS PLUGS/MISC FIN ITEM	926	1010	1004	1018	6	0
70	71	0	L	D	920	920	1007	1007	13	0
70	72	0	L	D	920	920	928	928	6	4
71	80	10	L	ACT TEST BALANCE MECH/ELECT SYSTEMS	920	1004	1007	1021	13	13
72	76	10	L	INSTL+FIN ALL INT DOORS	926	1010	928	1012	2	2
73	78	0	L	D	915	915	1018	1018	23	23
74	76	0	L	D	1012	1012	1012	1012	*	0
75	78	0	L	D	1010	1010	1018	1018	6	6
76	77	4	L	START INSTLG RESIL FLOOR TILE	1012	1018	1012	1018	*	0
77	78	0	L	D	1018	1018	1018	1018	*	0
77	79	2	L	INSTL ELECTRIC WATER COOLERS	1018	1020	1019	1021	1	0
78	80	3	L	COMP INSTLG RESIL FLOOR TILE	1018	1021	1018	1021	*	0
79	80	0	L	D	1020	1020	1021	1021	1	1
80	91	15	L	FINAL CLEAN UP AND PUNCH LIST	1021	1111	1021	1111	*	0

- PROJECT COST

PROJECT COMPLETION 222 DAYS

(27)
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CRITICAL PATH FOR LAKE CITY COMMUNITY COLLEGE, LECTURE HALL
LAKE CITY
PROJECT 66 4 ISSUE NO. 1 MAY 10.
DRAWINGS ISSUED 1, 2 DAY 1 IS JAN 3
NETWORK PREPARED BY STRONG CONSTRUCTION COMPANY, LAKE CITY
PROJECT CONSULTANT RALPH J. STEPHENSON, P.E.

ITEMS WITH * IN TFT COLUMN ARE ON THE CRITICAL PATH.
WORKING DAYS ARE STATED AS MONTH AND DATE IN ES,LS,EF,LF

					EARLY START SEQUENCE					
I	J	DYS	CD	JOB DESCRIPTION	ES	EF	LS	LF	TF	FF
1	15	110	L	DAFD SUPPLY FAN	102	606	121	627	15	6
1	8	102	L	DAFD EXT HM FRAMES	102	524	104	526	2	2
1	39	120	L	T/R DAFD INT HM FRAMES	102	620	225	816	40	38
1	34	144	L	T/R DAFD ALUM SASH&ENTRIES	102	725	113	805	9	3
1	16	125	L	DAFD ROOF STRUCT STEEL	102	627	104	629	2	2
1	72	150	L	T/R DAFD INT HARDWARE	102	802	225	928	40	38
1	2	96		T/R	102	516	102	516	*	0
1	33	136	L	T/R DAFD COMPRESSORS	102	713	228	909	41	19
2	5	1	L	SET CONSTRUCTION OFFICES&SIGN	516	517	518	519	2	0
2	4	2	L	LAY UP&APPROVE BRICK SAMPLE WALL	516	518	517	519	1	0
2	41	2	L	INSTL TEMP RDS AND UTILITIES	516	518	517	519	1	0
2	3	3	L	STRIP SITE AND LAY OUT BLDG	516	519	516	519	*	0
2	42	4	L	INSTL TEMP PROT AT EXTG BLDG OPENG	516	520	520	526	4	0
6	7	5	L	ST EFRP MSNRY WALL FTGS	519	526	519	526	*	0
8	9	10	L	START ERECTG EXT HM AND MSNRY	526	610	526	610	*	0
7	10	5	L	COMP EFRP MSNRY WALL FTGS	526	603	603	610	5	0
11	14	10	L	FINISH ERECTG EXT HM AND MSNRY	610	624	610	624	*	0
9	12	2	L	ST EXT/INT RUFF BKFLG	610	614	622	624	8	0
9	13	2	L	CONST EQUIP BASES AT MECH EQUIP RM	610	614	623	627	9	0
15	16	2	L	SET SUPPLY FAN AT MECH EQUIP ROOM	614	616	627	629	9	9
14	16	3	L	COMP EXT/INT RUFF BKFLG	624	629	624	629	*	0
16	17	8	L	ERECT ROOF STRUCT STEEL	629	712	629	712	*	0
17	19	3	L	ERECT ROOF MTL DECK&NAILERS	712	715	715	720	3	0
17	20	4	L	ERECT STONE COPING	712	718	805	811	18	0
17	18	5	L	ST INSTLG EQUIP&PIPG AT MECH ROOM	712	719	817	824	26	0
17	21	6	L	EIB UG UTIL&DUCT WORK	712	720	712	720	*	0
19	24	5	L	MAKE ALTERATIONS TO EXISTG WALLS	715	722	930	1007	54	0
22	25	5	L	LAY INSUL AND ROOFING	718	725	811	818	18	0
23	28	4	L	FFG&SET IFW FOR SOG	720	726	720	726	*	0
26	33	11	L	ST INSTLG DUCT WORK AT MECH ROOM	725	809	824	909	22	0
27	29	10	L	COMP ALL EXT CALKING AND TRIM	725	808	1007	1021	53	0
25	31	2	L	INSTL ROOF MTD MECH EQUIP	725	727	824	826	22	0
25	43	15	L	INSTL CURBS/PARKING LOTS/SIDEWALKS	725	815	930	1021	48	0
25	30	6	L	INSTL PLSTR SOFFIT/FASCIA/VESTIBULE	725	802	818	826	18	0
28	32	2	L	CONST SOG	726	728	726	728	*	0
32	36	11	L	ST INSTLG OH DUCT WORK	728	812	728	812	*	0
32	38	10	L	ST INSTLG RUFF ELECT WORK	728	811	729	812	1	0
32	37	8	L	ST INSTLG OH PIPING	728	809	802	812	3	0
34	40	9	L	INSTL&GLAZE EXT ALUM SASH&ENTRS	728	810	805	818	6	2
37	54	10	L	CO INSTLG OH PIPING	809	823	812	826	3	0
33	35	20	L	CO INSTL ALL MCH/ELT WK/MCH EQ RM	809	907	909	1007	2	0
38	55	10	L	CO INSTLG RUFF ELECT WORK	811	825	812	826	1	0
6	53	10	L	CO INSTLG OH DUCT WORK&INSUL	812	826	812	826	*	0
10	52	6	L	ST INSTLG CLG SUSP SYSTEM	812	822	818	826	4	0

39	51	9	L	ERECT INT MSNRY WALLS	812	825	816	829	2	0
8	60	5	L	ST INSTLG LAY IN CLG TILE	822	829	826	902	4	0
56	59	5	L	INSTL PLSTR CLGS AT TO/R AND JC	825	901	829	906	2	0
57	61	5	L	COMP INSTLG CLG SUSP SYSTEM	826	902	826	902	*	0
60	65	4	L	ST INSTLG CLG LIGHT FIXT+DIFFUSER	829	902	915	921	12	0
59	63	2	L	INSTL CERAMIC TILE AT TO/R AND JC	901	906	1005	1007	23	0
59	62	5	L	T/R DRY PLSTR AT TO/R AND JC	901	909	906	913	2	0
61	64	6	L	COMP INSTLG LAY IN CLG TILE	902	913	902	913	*	0
63	68	3	L	INSTL PLUMBG FIXT AT TO/R AND JC	906	909	1007	1012	23	0
68	73	4	L	INSTL TO/R METAL PARTNS/ACCESSORIES	909	915	1012	1018	23	0
67	70	5	L	CO INSTLG CLG LIGHT FIXT/DIFFUSERS	913	920	921	928	6	0
66	69	9	L	PAINT ALL REGD INT SURFACES	913	926	913	926	*	0
71	80	10	L	ACT TEST BALANCE MECH/ELECT SYSTEMS	920	1004	1007	1021	13	13
69	75	10	L	INS ALL WAL PLS PLUGS/MISC FIN ITEM	926	1010	1004	1018	6	0
72	76	10	L	INSTL+FIN ALL INT DOORS	926	1010	928	1012	2	2
69	74	12	L	INSTL/FIN ALL MILLWK/CLASSRM EQUIP	926	1012	926	1012	*	0
76	77	4	L	START INSTLG RESIL FLOOR TILE	1012	1018	1012	1018	*	0
77	79	2	L	INSTL ELECTRIC WATER COOLERS	1018	1020	1019	1021	1	0
78	80	3	L	COMP INSTLG RESIL FLOOR TILE	1018	1021	1018	1021	*	0
80	91	15	L	FINAL CLEAN UP AND PUNCH LIST	1021	1111	1021	1111	*	0

- PROJECT COST

PROJECT COMPLETION 222 DAYS

CRITICAL PATH FOR LAKE CITY COMMUNITY COLLEGE, LECTURE HALL
LAKE CITY
ROJECT 66 4 ISSUE NO. 1 MAY 10,
RAWINGS ISSUED 1, 2 DAY 1 IS JAN 3
NETWORK PREPARED BY STRONG CONSTRUCTION COMPANY, LAKE CITY
PROJECT CONSULTANT RALPH J. STEPHENSON, P.E.

ITEMS WITH * IN TFT COLUMN ARE ON THE CRITICAL PATH.
WORKING DAYS ARE STATED AS MONTH AND DATE IN ES,LS,EF,LF

					LATE START SEQUENCE					
I	J	DYS	CD	JOB DESCRIPTION	ES	EF	LS	LF	TF	FF
1	2	96		T/R	102	516	102	516	*	0
1	8	102	L	DAFD EXT HM FRAMES	102	524	104	526	2	2
1	16	125	L	DAFD ROOF STRUCT STEEL	102	627	104	629	2	2
1	34	144	L	T/R DAFD ALUM SASH&ENTRIES	102	725	113	805	9	3
1	15	110	L	DAFD SUPPLY FAN	102	606	121	627	15	6
1	39	120	L	T/R DAFD INT HM FRAMES	102	620	225	816	40	38
1	72	150	L	T/R DAFD INT HARDWARE	102	802	225	928	40	38
1	33	136	L	T/R DAFD COMPRESSORS	102	713	228	909	41	19
2	3	3	L	STRIP SITE AND LAY OUT BLDG	516	519	516	519	*	0
2	4	2	L	LAY UP&APPROVE BRICK SAMPLE WALL	516	518	517	519	1	0
2	41	2	L	INSTL TEMP RDS AND UTILITIES	516	518	517	519	1	0
2	5	1	L	SET CONSTRUCTION OFFICES&SIGN	516	517	518	519	2	0
6	7	5	L	ST EFRP MSNRY WALL FTGS	519	526	519	526	*	0
2	42	4	L	INSTL TEMP PROT AT EXTG BLDG OPENG	516	520	520	526	4	0
8	9	10	L	START ERECTG EXT HM AND MSNRY	526	610	526	610	*	0
7	10	5	L	COMP EFRP MSNRY WALL FTGS	526	603	603	610	5	0
11	14	10	L	FINISH ERECTG EXT HM AND MSNRY	610	624	610	624	*	0
9	12	2	L	ST EXT/INT RUFF BKFLG	610	614	622	624	8	0
9	13	2	L	CONST EQUIP BASES AT MECH EQUIP RM	610	614	623	627	9	0
14	16	3	L	COMP EXT/INT RUFF BKFLG	624	629	624	629	*	0
15	16	2	L	SET SUPPLY FAN AT MECH EQUIP ROOM	614	616	627	629	9	9
16	17	8	L	ERECT ROOF STRUCT STEEL	629	712	629	712	*	0
17	21	6	L	EIB UG UTIL&DUCT WORK	712	720	712	720	*	0
17	19	3	L	ERECT ROOF MTL DECK&NAILERS	712	715	715	720	3	0
23	28	4	L	FFG&SET IFW FOR SOG	720	726	720	726	*	0
28	32	2	L	CONST SOG	726	728	726	728	*	0
32	36	11	L	ST INSTLG OH DUCT WORK	728	812	728	812	*	0
32	38	10	L	ST INSTLG RUFF ELECT WORK	728	811	729	812	1	0
32	37	8	L	ST INSTLG OH PIPING	728	809	802	812	3	0
17	20	4	L	ERECT STONE COPING	712	718	805	811	18	0
34	40	9	L	INSTL&GLAZE EXT ALUM SASH&ENTRS	728	810	805	818	6	2
22	25	5	L	LAY INSUL AND ROOFING	718	725	811	818	18	0
37	54	10	L	CO INSTLG OH PIPING	809	823	812	826	3	0
38	55	10	L	CO INSTLG RUFF ELECT WORK	811	825	812	826	1	0
36	53	10	L	CO INSTLG OH DUCT WORK&INSUL	812	826	812	826	*	0
39	51	9	L	ERECT INT MSNRY WALLS	812	825	816	829	2	0
17	18	5	L	ST INSTLG EQUIP&PIPG AT MECH ROOM	712	719	817	824	26	0
25	30	6	L	INSTL PLSTR SOFFIT/FASCIA/VESTIBULE	725	802	818	826	18	0
40	52	6	L	ST INSTLG CLG SUSP SYSTEM	812	822	818	826	4	0
26	33	11	L	ST INSTLG DUCT WORK AT MECH ROOM	725	809	824	909	22	0
25	31	2	L	INSTL ROOF MTD MECH EQUIP	725	727	824	826	22	0
58	60	5	L	ST INSTLG LAY IN CLG TILE	822	829	826	902	4	0
57	61	5	L	COMP INSTLG CLG SUSP SYSTEM	826	902	826	902	*	0
56	59	5	L	INSTL PLSTR CLGS AT TO/R AND JC	825	901	829	906	2	0
61	64	6	L	COMP INSTLG LAY IN CLG TILE	902	913	902	913	*	0
59	62	5	L	T/R DRY PLSTR AT TO/R AND JC	901	909	906	913	2	0
33	35	20	L	CO INSTL ALL MCH/ELT WK/MCH EQ RM	809	907	909	1007	22	0
66	69	9	L	PAINT ALL REGD INT SURFACES	913	926	913	926	*	0

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58	60	5	L	ST INSTLG LAY IN CLG TILE	822	829	826	902	4	0
56	59	5	L	INSTL PLSTR CLGS AT TO/R AND JC	825	901	829	906	2	0
57	61	5	L	COMP INSTLG CLG SUSP SYSTEM	826	902	826	902	*	0
60	65	4	L	ST INSTLG CLG LIGHT FIXT+DIFFUSER	829	902	915	921	12	0
59	63	2	L	INSTL CERAMIC TILE AT TO/R AND JC	901	906	1005	1007	23	0
33	35	20	L	CO INSTL ALL MCH/ELT WK/MCH EQ RM	809	907	909	1007	22	0
59	62	5	L	T/R DRY PLSTR AT TO/R AND JC	901	909	906	913	2	0
63	68	3	L	INSTL PLUMBG FIXT AT TO/R AND JC	906	909	1007	1012	23	0
61	64	6	L	COMP INSTLG LAY IN CLG TILE	902	913	902	913	*	0
68	73	4	L	INSTL TO/R METAL PARTNS/ACCESSORIES	909	915	1012	1018	23	0
67	70	5	L	CO INSTLG CLG LIGHT FIXT/DIFFUSERS	913	920	921	928	6	0
66	69	9	L	PAINT ALL REQD INT SURFACES	913	926	913	926	*	0
71	80	10	L	ACT TEST BALANCE MECH/ELECT SYSTEMS	920	1004	1007	1021	13	13
69	75	10	L	INS ALL WAL PLS PLUGS/MISC FIN ITEM	926	1010	1004	1018	6	0
72	76	10	L	INSTL+FIN ALL INT DOORS	926	1010	928	1012	2	2
69	74	12	L	INSTL/FIN ALL MILLWK/CLASSRM EQUIP	926	1012	926	1012	*	0
76	77	4	L	START INSTLG RESIL FLOOR TILE	1012	1018	1012	1018	*	0
77	79	2	L	INSTL ELECTRIC WATER COOLERS	1018	1020	1019	1021	1	0
78	80	3	L	COMP INSTLG RESIL FLOOR TILE	1018	1021	1018	1021	*	0
80	91	15	L	FINAL CLEAN UP AND PUNCH LIST	1021	1111	1021	1111	*	0

- PROJECT COST

PROJECT COMPLETION 222 DAYS

ERRONEOUS

OUT

Ralph J. Stephenson

CRITICAL PATH FOR LAKE CITY COMMUNITY COLLEGE, LECTURE HALL
LAKE CITY
PROJECT 66 4 ISSUE NO. 1 MAY 10,
DRAWINGS ISSUED 1, 2 DAY 1 IS JAN 3
NETWORK PREPARED BY STRONG CONSTRUCTION COMPANY, LAKE CITY
PROJECT CONSULTANT RALPH J. STEPHENSON, P.E.

ITEMS WITH * IN TFT COLUMN ARE ON THE CRITICAL PATH.
WORKING DAYS ARE STATED AS MON H AND DATE IN ES,LS,EF,LF

					LATE FINISH SEQUENCE					
I	J	DYS	CD	JOB DESCRIPTION	ES	LF	LS	LF	TF	FF
1	2	96		T/R	102	516	102	516	*	
2	3	3	L	STRIP SITE AND LAY OUT BLDG	516	519	516	519	*	
2	4	2	L	LAY UP&APPROVE BRICK SAMPLE WALL	516	518	517	519	1	
2	41	2	L	INSTL TEMP RDS AND UTILITIES	516	518	517	519		
2	5	1	L	SET CONSTRUCTION OFFICES&SIGN	516	517	518	519	2	
1	8	102	L	DAFD EXT HM FRAMES	102	524	124	526	2	2
6	7	5	L	ST EFRP MSNRY WALL FTGS	519	524	519	526	*	0
2	42	4	L	INSTL TEMP PROT AT EXTG BLDG OPENG	516	522	520	526	4	0
3	9	10	L	START ERECTG EXT HM AND MSNRY	526	610	526	620	*	0
7	10	5	L	COMP EFRP MSNRY WALL FTGS	526	603	603	610	5	0
11	14	10	L	FINISH ERECTG EXT HM AND MSNRY	610	624	610	624	*	
9	12	2	L	ST EXT/INT ROFF BKFLG	610	614	622	624	8	0
1	15	110	L	DAFD SUPPLY FAN	102	605	121	624	15	0
9	13	2	L	CONST EQUIP BASES AT MECH EQUIP RM	610	614	623	627	7	1
1	16	125	L	DAFD ROOF STRUCT STEEL	102	624	104	626	2	2
14	16	3	L	COMP EXT/INT ROFF BKFLG	624	629	624	629	0	0
5	16	2	L	SET SUPPLY FAN AT MECH EQUIP ROOM	614	616	627	629	7	2
16	17	8	L	ERECT ROOF STRUCT STEEL	624	712	629	712	0	0
17	21	6	L	EIB UG UTIL&DUCT WORK	712	720	712	720	0	0
17	19	3	L	ERECT ROOF MTL DECKING&LERS	712	715	715	720	3	3
23	28	4	L	FFG&SET IFW FOR SOG	720	726	720	726	0	0
28	32	2	L	CONST SOG	726	728	726	728	0	0
1	34	144	L	T/R DAFD ALUM GAS &ENTRIES	102	725	115	801	7	7
17	20	4	L	ERECT STONE COPING	712	716	805	811	19	0
32	36	11	L	ST INSTLG OH DUCT WORK	728	812	728	812	*	0
32	38	10	L	ST INSTLG ROFF ELECT WORK	728	811	729	812	1	0
32	37	8	L	ST INSTLG OH PIPING	728	809	802	810	2	2
1	39	120	L	T/R DAFD INT HM FRAMES	102	620	225	816	76	76
34	40	9	L	INSTL&GLAZE EXT ALUM SASH&LNTRS	728	810	805	818	7	7
22	25	5	L	LAY INSUL AND ROOFING	718	725	811	818	53	0
17	18	5	L	ST INSTLG EQUIP&PIPG AT MECH ROOM	712	719	617	824	29	7
37	54	10	L	CO INSTLG OH PIPING	809	823	812	826	3	3
38	55	10	L	CO INSTLG ROFF ELECT WORK	811	825	812	826	1	1
36	56	10	L	CO INSTLG OH DUCT WORK&INSUL	812	826	812	826	0	0
25	30	6	L	INSTL PLSTR SOFFIT/FASCIA/VESTIBULE	729	802	818	824	18	7
40	52	6	L	ST INSTLG CLG SUSP SYSTEM	812	822	818	826	2	2
29	31	2	L	INSTL ROOF MTD MECH EQUIP	729	731	824	826	27	27
39	51	9	L	ERECT INT MSNRY WALLS	812	825	817	826	1	1
58	60	5	L	ST INSTLG LAY IN CLG TILE	822	826	821	826	1	1
57	61	5	L	COMP INSTLG CLG SUSP SYSTEM	825	902	826	902	1	1
56	59	5	L	INSTL PLSTR CLGS AT TO/R AND TC	826	901	826	901	0	0
1	33	136	L	T/R DAFD COMPRESSORS	102	715	126	824	44	44
35	44	11	L	ST INSTLG DUCT WORK AT MECH ROOM	728	809	824	901	44	44
59	62	5	L	T/R DRY PLSTR AT TO/R AND TC	901	905	901	905	0	0

1	64	6	L	COMP INSTLG LAY IN CLG TILE	902	913	902	913	*	0
	65	4	L	ST INSTLG CLG LIGHT FIXT+DIFFUSER	829	902	915	921	12	0
66	69	9	L	PAINT ALL REGD INT SURFACES	913	926	913	926	*	0
1	72	150	L	T/R DAFD INT HARDWARE	102	802	225	928	40	38
67	70	5	L	CO INSTLG CLG LIGHT FIXT/DIFFUSERS	913	920	921	928	6	0
19	24	5	L	MAKE ALTERATIONS TO EXISTG WALLS	715	722	930	1007	54	0
59	63	2	L	INSTL CERAMIC TILE AT TO/R AND JC	901	906	1005	1007	23	0
33	35	20	L	CO INSTL ALL MCH/ELT WK/MCH EQ RM	809	907	909	1007	22	0
63	68	3	L	INSTL PLUMBG FIXT AT TO/R AND JC	906	909	1007	1012	23	0
72	76	10	L	INSTL+FIN ALL INT DOORS	926	1010	928	1012	2	2
69	74	12	L	INSTL/FIN ALL MILLWK/CLASSRM EQUIP	926	1012	926	1012	*	0
68	73	4	L	INSTL TO/R METAL PARTNS/ACCESSORIES	909	915	1012	1018	23	0
69	75	10	L	INS ALL WAL PLS PLUGS/MISC FIN ITEM	926	1010	1004	1018	6	0
76	77	4	L	START INSTLG RESIL FLOOR TILE	1012	1018	1012	1018	*	0
27	29	10	L	COMP ALL EXT CALKING AND TRIM	725	808	1007	1021	53	0
25	43	15	L	INSTL CURBS/PARKING LOTS/SIDEWALKS	725	815	930	1021	48	0
71	80	10	L	ACT TEST BALANCE MECH/ELECT SYSTEMS	920	1004	1007	1021	13	13
77	79	2	L	INSTL ELECTRIC WATER COOLERS	1018	1020	1019	1021	1	0
78	80	3	L	COMP INSTLG RESIL FLOOR TILE	1018	1021	1018	1021	*	0
80	91	15	L	FINAL CLEAN UP AND PUNCH LIST	1021	1111	1021	1111	*	0

- PROJECT COST

PROJECT COMPLETION 222 DAYS

CRITICAL PATH FOR LAKE CITY COMMUNITY COLLEGE, LECTURE HALL
LAKE CITY
PROJECT 66 4 ISSUE NO. 1 MAY 10,
DRAWINGS ISSUED 1, 2 DAY 1 IS JAN 3
NETWORK PREPARED BY STRONG CONSTRUCTION COMPANY, LAKE CITY
PROJECT CONSULTANT RALPH J. STEPHENSON, P.E.

TOTAL FLOAT SEQUENCE

ITEMS WITH * IN TFT COLUMN ARE ON THE CRITICAL PATH.
WORKING DAYS ARE STATED AS MONTH AND DATE IN ES,LS,EF,LF

I	J	DYS	CD	JOB DESCRIPTION	ES	EF	LS	LF	TF	FF
1	2	96		T/R	102	516	102	516	*	0
2	3	3	L	STRIP SITE AND LAY OUT BLDG	516	519	516	519	*	0
6	7	5	L	ST EFRP MSNRY WALL FTGS	519	526	519	526	*	0
8	9	10	L	START ERECTG EXT HM AND MSNRY	526	610	526	610	*	0
11	14	10	L	FINISH ERECTG EXT HM AND MSNRY	610	624	610	624	*	0
14	16	3	L	COMP EXT/INT RUFF BKFLG	624	629	624	629	*	0
16	17	8	L	ERECT ROOF STRUCT STEEL	629	712	629	712	*	0
17	21	6	L	EIB UG UTIL&DUCT WORK	712	720	712	720	*	0
23	28	4	L	FFG&SET IFW FOR SOG	720	726	720	726	*	0
28	32	2	L	CONST SOG	726	728	726	728	*	0
32	36	11	L	ST INSTLG OH DUCT WORK	728	812	728	812	*	0
36	53	10	L	CO INSTLG OH DUCT WORK&INSUL	812	826	812	826	*	0
57	61	5	L	COMP INSTLG CLG SUSP SYSTEM	826	902	826	902	*	0
61	64	6	L	COMP INSTLG LAY IN CLG TILE	902	913	902	913	*	0
66	69	9	L	PAINT ALL REGD INT SURFACES	913	926	913	926	*	0
69	74	12	L	INSTL/FIN ALL MILLWK/CLASSRM EQUIP	926	1012	926	1012	*	0
76	77	4	L	START INSTLG RESIL FLOOR TILE	1012	1018	1012	1018	*	0
8	80	3	L	COMP INSTLG RESIL FLOOR TILE	1018	1021	1018	1021	*	0
80	91	15	L	FINAL CLEAN UP AND PUNCH LIST	1021	1111	1021	1111	*	0
2	4	2	L	LAY UP&APPROVE BRICK SAMPLE WALL	516	518	517	519	1	0
2	41	2	L	INSTL TEMP RDS AND UTILITIES	516	518	517	519	1	0
32	38	10	L	ST INSTLG RUFF ELECT WORK	728	811	729	812	1	0
38	55	10	L	CO INSTLG RUFF ELECT WORK	811	825	812	826	1	0
77	79	2	L	INSTL ELECTRIC WATER COOLERS	1018	1020	1019	1021	1	0
2	5	1	L	SET CONSTRUCTION OFFICES&SIGN	516	517	518	519	2	0
1	8	102	L	DAFD EXT HM FRAMES	102	524	104	526	2	2
1	16	125	L	DAFD ROOF STRUCT STEEL	102	627	104	629	2	2
39	51	9	L	ERECT INT MSNRY WALLS	812	825	816	829	2	0
56	59	5	L	INSTL PLSTR CLGS AT TO/R AND JC	825	901	829	906	2	0
59	62	5	L	T/R DRY PLSTR AT TO/R AND JC	901	909	906	913	2	0
72	76	10	L	INSTL&FIN ALL INT DOORS	926	1010	928	1012	2	2
17	19	3	L	ERECT ROOF MTL DECK&NAILERS	712	715	715	720	3	0
32	37	8	L	ST INSTLG OH PIPING	728	809	802	812	3	0
37	54	10	L	CO INSTLG OH PIPING	809	823	812	826	3	0
2	42	4	L	INSTL TEMP PROT AT EXTG BLDG OPENG	516	520	520	526	4	0
40	52	6	L	ST INSTLG CLG SUSP SYSTEM	812	822	818	826	4	0
58	60	5	L	ST INSTLG LAY IN CLG TILE	822	829	826	902	4	0
7	10	5	L	COMP EFRP MSNRY WALL FTGS	526	603	603	610	5	0
34	40	9	L	INSTL&GLAZE EXT ALUM SASH&ENTRS	728	810	805	818	6	2
67	70	5	L	CO INSTLG CLG LIGHT FIXT/DIFFUSERS	913	920	921	928	6	0
69	75	10	L	INS ALL WAL PLS PLUGS/MISC FIN ITEM	926	1010	1004	1018	6	0
9	12	2	L	ST EXT/INT RUFF BKFLG	610	614	622	624	8	0
9	13	2	L	CONST EQUIP BASES AT MECH EQUIP RM	610	614	623	627	9	0
15	16	2	L	SET SUPPLY FAN AT MECH EQUIP ROOM	614	616	627	629	9	9

1	34	144	L	T/R DAFD ALUM SASH+ENTRIES	102	725	113	805	9	3
60	65	4	L	ST INSTLG CLG LIGHT FIXT+DIFFUSER	829	902	915	921	12	0
71	80	10	L	ACT TEST BALANCE MECH/ELECT SYSTEMS	920	1004	1007	1021	13	13
1	15	110	L	DAFD SUPPLY FAN	102	606	121	627	15	6
17	20	4	L	ERECT STONE COPING	712	718	805	811	18	0
22	25	5	L	LAY INSUL AND ROOFING	718	725	811	818	18	0
25	30	6	L	INSTL PLSTR SOFFIT/FASCIA/VESTIBULE	725	802	818	826	18	0
25	31	2	L	INSTL ROOF MTD MECH EQUIP	725	727	824	826	22	0
26	33	11	L	ST INSTLG DUCT WORK AT MECH ROOM	725	809	824	909	22	0
33	35	20	L	CO INSTL ALL MCH/ELT WK/MCH EQ RM	809	907	909	1007	22	0
59	63	2	L	INSTL CERAMIC TILE AT TO/R AND JC	901	906	1005	1007	23	0
63	68	3	L	INSTL PLUMBG FIXT AT TO/R AND JC	906	909	1007	1012	23	0
68	73	4	L	INSTL TO/R METAL PARTNS/ACCESSORIES	909	915	1012	1018	23	0
17	18	5	L	ST INSTLG EQUIP+PIPG AT MECH ROOM	712	719	817	824	26	0
1	39	120	L	T/R DAFD INT HM FRAMES	102	620	225	816	40	38
1	72	150	L	T/R DAFD INT HARDWARE	102	802	225	928	40	38
1	33	136	L	T/R DAFD COMPRESSORS	102	713	228	909	41	19
25	43	15	L	INSTL CURBS/PARKING LOTS/SIDEWALKS	725	815	930	1021	48	0
27	29	10	L	COMP ALL EXT CALKING AND TRIM	725	808	1007	1021	53	0
19	24	5	L	MAKE ALTERATIONS TO EXISTG WALLS	715	722	930	1007	54	0

- PROJECT COST

PROJECT COMPLETION 222 DAYS

For Lake City Network

(28)

RALPH J. STEPHENSON

CONSULTING ENGINEER

WORKING DAY CALENDAR

DAY 1 IS JAN. 3, 1966

DAY	DATE	DAY	DATE	DAY	DATE	DAY	DATE	DAY	DT
1	1.03	2	1.04	3	1.05	4	1.06	5	1.07
6	1.10	7	1.11	8	1.12	9	1.13	10	1.14
11	1.17	12	1.18	13	1.19	14	1.20	15	1.21
16	1.24	17	1.25	18	1.26	19	1.27	20	1.28
21	1.31	22	2.01	23	2.02	24	2.03	25	2.04
26	2.07	27	2.08	28	2.09	29	2.10	30	2.11
31	2.14	32	2.15	33	2.16	34	2.17	35	2.18
36	2.21	37	2.22	38	2.23	39	2.24	40	2.25
41	2.28	42	3.01	43	3.02	44	3.03	45	3.04
46	3.07	47	3.08	48	3.09	49	3.10	50	3.11
51	3.14	52	3.15	53	3.16	54	3.17	55	3.18
56	3.21	57	3.22	58	3.23	59	3.24	60	3.25
61	3.28	62	3.29	63	3.30	64	3.31	65	4.01
66	4.04	67	4.05	68	4.06	69	4.07	70	4.08
71	4.11	72	4.12	73	4.13	74	4.14	75	4.15
76	4.18	77	4.19	78	4.20	79	4.21	80	4.22
81	4.25	82	4.26	83	4.27	84	4.28	85	4.29
86	5.02	87	5.03	88	5.04	89	5.05	90	5.06
91	5.09	92	5.10	93	5.11	94	5.12	95	5.13
96	5.16	97	5.17	98	5.18	99	5.19	100	5.20
101	5.23	102	5.24	103	5.25	104	5.26	105	5.27
106	5.31	107	6.01	108	6.02	109	6.03	110	6.06
111	6.07	112	6.08	113	6.09	114	6.10	115	6.13
116	6.14	117	6.15	118	6.16	119	6.17	120	6.20
121	6.21	122	6.22	123	6.23	124	6.24	125	6.27
126	6.28	127	6.29	128	6.30	129	7.01	130	7.05
131	7.06	132	7.07	133	7.08	134	7.11	135	7.12
136	7.13	137	7.14	138	7.15	139	7.18	140	7.19
141	7.20	142	7.21	143	7.22	144	7.25	145	7.26
146	7.27	147	7.28	148	7.29	149	8.01	150	8.02
151	8.03	152	8.04	153	8.05	154	8.08	155	8.09
156	8.10	157	8.11	158	8.12	159	8.15	160	8.16
161	8.17	162	8.18	163	8.19	164	8.22	165	8.23
166	8.24	167	8.25	168	8.26	169	8.29	170	8.30
171	8.31	172	9.01	173	9.02	174	9.06	175	9.07
176	9.08	177	9.09	178	9.12	179	9.13	180	9.14
181	9.15	182	9.16	183	9.19	184	9.20	185	9.21
186	9.22	187	9.23	188	9.26	189	9.27	190	9.28
191	9.29	192	9.30	193	10.03	194	10.04	195	10.05
196	10.06	197	10.07	198	10.10	199	10.11	200	10.12
201	10.13	202	10.14	203	10.17	204	10.18	205	10.19
206	10.20	207	10.21	208	10.24	209	10.25	210	10.26
211	10.27	212	10.28	213	10.31	214	11.01	215	11.02
216	11.03	217	11.04	218	11.07	219	11.08	220	11.09
221	11.10	222	11.11	223	11.14	224	11.15	225	11.16
226	11.17	227	11.18	228	11.21	229	11.22	230	11.23
231	11.25	232	11.28	233	11.29	234	11.30	235	12.01
236	12.02	237	12.05	238	12.06	239	12.07	240	12.08
241	12.09	242	12.12	243	12.13	244	12.14	245	12.15
246	12.16	247	12.19	248	12.20	249	12.21	250	12.22
251	12.23	252	12.27	253	12.28	254	12.29	255	12.30

(29)

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

Project Status as of Monitoring #1

Lake City Community College

Date June 3

Task	Color Code	Status	Was complete	Will be complete
1 - 2		Complete	----	----
1 - 8		Delivered	5/20	----
1 - 15		To be delivered	----	6/20
1 - 16		To be delivered	----	6/27
1 - 33		To be delivered	----	8/1
1 - 34		To be delivered	----	8/1
1 - 39		Delivered	5/20	----
1 - 72		To be delivered	----	8/2
2 - 3		Complete	Morning 5/19	----
2 - 4		Complete	Morning 5/19	----
2 - 5		Complete	Morning 5/17	----
2 - 41		80% complete	----	6/6
2 - 42		Complete	Morning 5/25	----
6 - 7		Complete	Morning 5/26	----
8 - 9		75% complete	----	6/8
7 - 10		90% complete	----	6/7

(30)

RALPH J. STEPHENSON
CONSULTING ENGINEER

Project Status as of Monitoring #2

Lake City Community College

Date June 24

Task	Color Code	Status	Was completed	Will be complete
8 - 9		Complete	6/8	----
7 - 10		Complete	6/7	----
9 - 12		Complete	6/10	----
11 - 14		80% Complete	----	6/28
9 - 13		Complete	6/17	----
1 - 15		On job	6/24	----
15 - 16		50% Complete	----	6/27
2 - 41		Complete	6/8	----
1 - 16		Delayed - will be delivered		7/1

RALPH J. STEPHENSON
CONSULTING ENGINEER

Project Status as of Monitoring #3

Lake City Community College

Date July 15

Task	Color Code	Status	Was completed	Will be complete
11 - 14		Complete	6/29	----
14 - 16		Complete	7/1	----
15 - 16		Complete	6/27	----
1 - 16		On job	7/1	----
16 - 17		Complete	7/15	----
1 - 33		To be delivered	8/1	8/1
1 - 34		To be delivered	8/1	8/1
1 - 72		To be delivered	9/30	9/30

RALPH J. STEPHENSON
CONSULTING ENGINEER

Project Status as of Monitoring #4

Lake City Community College

Date Aug. 5

Task	Color Code	Status	Was completed	Will be complete
17 - 18		70% complete	----	----
17 - 19		Complete	7/20	----
17 - 20		Complete	8/5	----
17 - 21		Complete	7/21	----
19 - 24		Not started	----	----
23 - 28		Complete	7/27	----
22 - 25		90% Complete	----	----
28 - 32		Complete	7/28	----
34 - 40		10% Complete	----	----
1 - 34		On job	8/1	----
32 - 36		40% Complete	----	----
32 - 37		60% Complete	----	----
32 - 38		40% Complete	----	8/15

(33)

RALPH J. STEPHENSON
CONSULTING ENGINEER

Project Status as of Monitoring # ____

Date _____

Task	Color Code	Status	Was completed	Will be complete

RALPH J. STEPHENSON, CONSULTING ENGINEER
INSTITUTE FOR CONSTRUCTION MANAGEMENT
CRITICAL PATH FOR TRIARD MANUFACTURING COMPANY DAY 1 IS

THIS LISTING IS IN NODE SEQUENCE
ITEMS WITH * IN TFT COLUMN ARE ON THE CRITICAL PATH

		DAYS	JOB RESPONSIBILITY AND DESCRIPTION	ES	EF	LS	LF	TFT	FFT
	1	1	T/R		1		1	*	
1	3	1	T/R	1	2	1	2	*	
1	19	30	W/TR	1	31	9	39	8	
1	43	3	4BRING UTILITIES FROM P/L	1	4	23	26	22	21
1	43	3	6BRING UTILITIES FROM P/L	1	4	23	26	22	21
3	5	1	2ERECT SIGN+CONST OFF	2	3	4	5	2	
3	7	3	1PREPARE SITE/LAY OUT BLDG	2	5	2	5	*	
3	7	3	3PREPARE SITE/LAY OUT BLDG	2	5	2	5	*	
3	9	4	2COMPLETE PURCHASING	2	6	3	7	1	1
5	7	0	D	3	3	5	5	2	2
7	9	2	4EXC/POUR A WALL FTGS	5	7	5	7	*	
7	9	2	5EXC/POUR A WALL FTGS	5	7	5	7	*	
7	15	3	33INSTL PVG SUB BASE	5	8	14	17	9	
7	15	3	4INSTL PVG SUB BASE	5	8	14	17	9	
7	17	2	60INSTL CULVERTS/SITE DRAINS	5	7	15	17	10	
7	17	2	33INSTL CULVERTS/SITE DRAINS	5	7	15	17	10	
9	11	2	4EXC/POUR B WALL FTGS	7	9	11	13	4	
9	11	2	5EXC/POUR B WALL FTGS	7	9	11	13	4	
9	13	6	5FORM/POUR A EXT FDN WALLS	7	13	7	13	*	
11	13	0	D	9	9	13	13	4	4
11	23	3	4INSTL INT FTGS	9	12	14	17	5	5
11	23	3	5INSTL INT FTGS	9	12	14	17	5	5
13	23	4	5FORM/POUR B EXT FDN WALLS	13	17	13	17	*	
15	19	0	D	8	8	39	39	31	23
15	21	0	D	8	8	22	22	14	
15	23	0	D	8	8	17	17	9	9
17	21	0	D	7	7	22	22	15	1
17	23	0	D	7	7	17	17	10	10
19	90	3	33INSTALL EXT PAVING	31	34	39	42	8	8
21	27	10	60PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
21	27	10	4PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
21	27	10	34PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
23	25	3	10ERECT A STRUCT STEEL	17	20	17	20	*	
25	29	2	12ERECT A METAL DECK	20	22	21	23	1	
25	31	3	10ERECT B STRUCT STEEL	20	23	20	23	*	
25	33	4	11INSTL A SILL WALLS	20	24	20	24	*	
25	33	4	9INSTL A SILL WALLS	20	24	20	24	*	
27	79	8	34LAY R/R TRK+INSTL SWITCH	18	26	32	40	14	14
29	35	0	D	22	22	24	24	2	1
29	41	3	13INSTALL A ROOFING	22	25	23	26	1	
31	35	0	D	23	23	24	24	1	
31	37	0	D	23	23	24	24	1	1
	57	4	60INSTL U/G UTILITIES IN BLDG	23	27	23	27	*	
1	57	4	4INSTL U/G UTILITIES IN BLDG	23	27	23	27	*	
33	37	0	D	24	24	24	24	*	
33	47	2	10ERECT A EXT MTL WALL PANELS	24	26	25	27	1	1
33	47	2	18ERECT A EXT MTL WALL PANELS	24	26	25	27	1	1

35	39	2	12	ERECT B METAL DECK	23	25	24	26	1	
37	45	3	11	INSTL B SILL WALLS	24	27	24	27	*	
37	45	3	9	INSTL B SILL WALLS	24	27	24	27	*	
39	41	0		D	25	25	26	26	1	
39	43	0		D	25	25	26	26	1	
39	59	0		D	25	25	29	29	4	4
41	49	1	13	INSTL B ROOFING	25	26	26	27	1	
43	49	1	80	INSTL TEMP LIGHT/POWER	25	26	26	27	1	
43	49	1	2	INSTL TEMP LIGHT/POWER	25	26	26	27	1	
45	47	0		D	27	27	27	27	*	
45	79	4	20	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
45	79	4	11	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
45	79	4	21	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
47	59	2	16	ERECT B EXT MTL WALL PANELS	27	29	27	29	*	
47	59	2	18	ERECT B EXT MTL WALL PANELS	27	29	27	29	*	
49	51	5	70	INSTL O/H FIRE PROT WORK	26	31	27	32	1	
49	53	5	60	INSTL UNIT HTRS+O/H PIPING	26	31	27	32	1	
49	55	5	80	INSTL O/H WIRING	26	31	27	32	1	
51	65	0		D	31	31	32	32	1	1
51	79	5	70	TEST/COMP/ACTIVATE/F/P SYSTEM	31	36	35	40	4	4
53	61	0		D	31	31	37	37	6	
53	65	0		D	31	31	32	32	1	1
55	61	0		D	31	31	37	37	6	
55	65	0		D	31	31	32	32	1	1
57	59	2	4	FFG+INSTL IN FL WK FOR FOG	27	29	27	29	*	
57	59	2	8	FFG+INSTL IN FL WK FOR FOG	27	29	27	29	*	
59	63	3	8	POUR FLOOR SLAB	29	32	29	32	*	
61	79	3	60	ACTIVATE/TEST/BAL HTG SYS	31	34	37	40	6	6
63	65	0		D	32	32	32	32	*	
63	69	3	14	INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
63	69	3	28	INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
63	69	3	39	INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
63	79	3	80	INSTL O/H CRANE+ELECTRIFY	32	35	37	40	5	5
63	79	3	35	INSTL O/H CRANE+ELECTRIFY	32	35	37	40	5	5
65	67	3	39	PAINT BLDG INTERIOR	32	35	32	35	*	
67	79	5	80	HANG+LAMP LIGHTS	35	40	35	40	*	
69	79	3	60	COMPLETE TOILET ROOM	35	38	37	40	2	2
79	90	2	2	CLEAN UP+PUNCH LIST	40	42	40	42	*	

PROJECT COST

PROJECT COMPLETION 42

RALPH J. STEPHENSON, CONSULTING ENGINEER
INSTITUTE FOR CONSTRUCTION MANAGEMENT
CRITICAL PATH FOR TRIARD MANUFACTURING COMPANY DAY 1 IS

THIS LISTING IS IN EARLY START SEQUENCE
ITEMS WITH * IN TFT COLUMN ARE ON THE CRITICAL PATH

		DAYS	JOB RESPONSIBILITY AND DESCRIPTION	ES	EF	LS	LF	TFT	FFT
	1	1	T/R		1		1	*	
1	3	1	T/R	1	2	1	2	*	
1	43	3	4BRING UTILITIES FROM P/L	1	4	23	26	22	21
1	43	3	6BRING UTILITIES FROM P/L	1	4	23	26	22	21
1	19	30	W/TR	1	31	9	39	8	
3	5	1	2ERECT SIGN+CONST OFF	2	3	4	5	2	
3	7	3	1PREPARE SITE/LAY OUT BLDG	2	5	2	5	*	
3	7	3	3PREPARE SITE/LAY OUT BLDG	2	5	2	5	*	
3	9	4	2COMPLETE PURCHASING	2	6	3	7	1	1
7	9	2	4EXC/POUR A WALL FTGS	5	7	5	7	*	
7	9	2	5EXC/POUR A WALL FTGS	5	7	5	7	*	
7	17	2	60INSTL CULVERTS/SITE DRAINS	5	7	15	17	10	
7	17	2	33INSTL CULVERTS/SITE DRAINS	5	7	15	17	10	
7	15	3	33INSTL PVG SUB BASE	5	8	14	17	9	
7	15	3	4INSTL PVC SUB BASE	5	8	14	17	9	
9	11	2	4EXC/POUR B WALL FTGS	7	9	11	13	4	
9	11	2	5EXC/POUR B WALL FTGS	7	9	11	13	4	
9	13	6	5FORM/POUR A EXT FDN WALLS	7	13	7	13	*	
21	27	10	60PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
21	27	10	4PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
21	27	10	34PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
11	23	3	4INSTL INT FTGS	9	12	14	17	5	5
11	23	3	5INSTL INT FTGS	9	12	14	17	5	5
13	23	4	5FORM/POUR B EXT FDN WALLS	13	17	13	17	*	
23	25	3	10ERECT A STRUCT STEEL	17	20	17	20	*	
27	79	8	34LAY R/R TRK+INSTL SWITCH	18	26	32	40	14	14
25	29	2	12ERECT A METAL DECK	20	22	21	23	1	
25	31	3	10ERECT B STRUCT STEEL	20	23	20	23	*	
25	33	4	11INSTL A SILL WALLS	20	24	20	24	*	
25	33	4	9INSTL A SILL WALLS	20	24	20	24	*	
29	41	3	13INSTALL A ROOFING	22	25	23	26	1	
35	39	2	12ERECT B METAL DECK	23	25	24	26	1	
31	57	4	60INSTL U/G UTILITIES IN BLDG	23	27	23	27	*	
31	57	4	4INSTL U/G UTILITIES IN BLDG	23	27	23	27	*	
33	47	2	10ERECT A EXT MTL WALL PANELS	24	26	25	27	1	1
33	47	2	18ERECT A EXT MTL WALL PANELS	24	26	25	27	1	1
37	45	3	11INSTL B SILL WALLS	24	27	24	27	*	
37	45	3	9INSTL B SILL WALLS	24	27	24	27	*	
41	49	1	13INSTL B ROOFING	25	26	26	27	1	
43	49	1	80INSTL TEMP LIGHT/POWER	25	26	26	27	1	
43	49	1	2INSTL TEMP LIGHT/POWER	25	26	26	27	1	
49	51	5	70INSTL O/H FIRE PROT WORK	26	31	27	32	1	
49	53	5	60INSTL UNIT HTRS+O/H PIPING	26	31	27	32	1	
49	55	5	80INSTL O/H WIRING	26	31	27	32	1	
47	59	2	16ERECT B EXT MTL WALL PANELS	27	29	27	29	*	
47	59	2	18ERECT B EXT MTL WALL PANELS	27	29	27	29	*	
57	59	2	4FFG+INSTL IN FL WK FOR FOG	27	29	27	29	*	

57	59	2	8	FFG+INSTL IN FL WK FOR FOG	27	29	27	29	*	
45	79	4	20	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
45	79	4	11	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
45	79	4	21	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
59	63	3	8	POUR FLOOR SLAB	29	32	29	32	*	
19	90	3	33	INSTALL EXT PAVING	31	34	39	42	8	8
61	79	3	60	ACTIVATE/TEST/BAL HTG SYS	31	34	37	40	6	6
51	79	5	70	TEST/COMP/ACTIVATE/F/P SYSTEM	31	36	35	40	4	4
63	69	3	14	INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
63	69	3	28	INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
63	69	3	39	INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
63	79	3	80	INSTL O/H CRANE+ELECTRIFY	32	35	37	40	5	5
63	79	3	35	INSTL O/H CRANE+ELECTRIFY	32	35	37	40	5	5
65	67	3	39	PAINT BLDG INTERIOR	32	35	32	35	*	
69	79	3	60	COMPLETE TOILET ROOM	35	38	37	40	2	2
67	79	5	80	HANG+LAMP LIGHTS	35	40	35	40	*	
79	90	2	2	CLEAN UP+PUNCH LIST	40	42	40	42	*	

PROJECT COST

PROJECT COMPLETION 42

RALPH J. STEPHENSON, CONSULTING ENGINEER
INSTITUTE FOR CONSTRUCTION MANAGEMENT
CRITICAL PATH FOR TRIARD MANUFACTURING COMPANY DAY 1 IS

THIS LISTING IS IN LATE START SEQUENCE
ITEMS WITH * IN TFT COLUMN ARE ON THE CRITICAL PATH

		DAYS	JOB RESPONSIBILITY AND DESCRIPTION	ES	EF	LS	LF	TFT	FFT
1	1	1	T/R		1		1	*	
1	3	1	T/R	1	2	1	2	*	
3	7	3	1PREPARE SITE/LAY OUT BLDG	2	5	2	5	*	
3	7	3	3PREPARE SITE/LAY OUT BLDG	2	5	2	5	*	
3	9	4	2COMPLETE PURCHASING	2	6	3	7	1	1
3	5	1	2ERECT SIGN+CONST OFF	2	3	4	5	2	
7	9	2	4EXC/POUR A WALL FTGS	5	7	5	7	*	
7	9	2	5EXC/POUR A WALL FTGS	5	7	5	7	*	
9	13	6	5FORM/POUR A EXT FDN WALLS	7	13	7	13	*	
1	19	30	W/TR	1	31	9	39	8	
9	11	2	4EXC/POUR B WALL FTGS	7	9	11	13	4	
9	11	2	5EXC/POUR B WALL FTGS	7	9	11	13	4	
13	23	4	5FORM/POUR B EXT FDN WALLS	13	17	13	17	*	
7	15	3	331INSTL PVG SUB BASE	5	8	14	17	9	
7	15	3	4INSTL PVG SUB BASE	5	8	14	17	9	
11	23	3	4INSTL INT FTGS	9	12	14	17	5	5
11	23	3	5INSTL INT FTGS	9	12	14	17	5	5
7	17	2	601INSTL CULVERTS/SITE DRAINS	5	7	15	17	10	
7	17	2	331INSTL CULVERTS/SITE DRAINS	5	7	15	17	10	
23	25	3	10ERECT A STRUCT STEEL	17	20	17	20	*	
25	31	3	10ERECT B STRUCT STEEL	20	23	20	23	*	
25	33	4	111INSTL A SILL WALLS	20	24	20	24	*	
25	33	4	9INSTL A SILL WALLS	20	24	20	24	*	
25	29	2	12ERECT A METAL DECK	20	22	21	23	1	
21	27	10	60PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
21	27	10	4PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
21	27	10	34PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
1	43	3	4BRING UTILITIES FROM P/L	1	4	23	26	22	21
1	43	3	6BRING UTILITIES FROM P/L	1	4	23	26	22	21
29	41	3	131INSTALL A ROOFING	22	25	23	26	1	
31	57	4	601INSTL U/G UTILITIES IN BLDG	23	27	23	27	*	
31	57	4	4INSTL U/G UTILITIES IN BLDG	23	27	23	27	*	
35	39	2	12ERECT B METAL DECK	23	25	24	26	1	
37	45	3	111INSTL B SILL WALLS	24	27	24	27	*	
37	45	3	9INSTL B SILL WALLS	24	27	24	27	*	
33	47	2	10ERECT A EXT MTL WALL PANELS	24	26	25	27	1	1
33	47	2	18ERECT A EXT MTL WALL PANELS	24	26	25	27	1	1
41	49	1	131INSTL B ROOFING	25	26	26	27	1	
43	49	1	801INSTL TEMP LIGHT/POWER	25	26	26	27	1	
43	49	1	2INSTL TEMP LIGHT/POWER	25	26	26	27	1	
49	51	5	701INSTL O/H FIRE PROT WORK	26	31	27	32	1	
49	53	5	601INSTL UNIT HTRS+O/H PIPING	26	31	27	32	1	
9	55	5	801INSTL O/H WIRING	26	31	27	32	1	
47	59	2	16ERECT B EXT MTL WALL PANELS	27	29	27	29	*	
47	59	2	18ERECT B EXT MTL WALL PANELS	27	29	27	29	*	
57	59	2	4FFG+INSTL IN FL WK FOR FOG	27	29	27	29	*	
57	59	2	8FFG+INSTL IN FL WK FOR FOG	27	29	27	29	*	

59	63	3	8	POUR FLOOR SLAB	29	32	29	32	*	
27	79	8	34	LAY R/R TRK+INSTL SWITCH	18	26	32	40	14	14
65	67	3	39	PAINT BLDG INTERIOR	32	35	32	35	*	
63	69	3	14	INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
63	69	3	28	INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
63	69	3	39	INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
51	79	5	70	TEST/COMP/ACTIVATE/F/P SYSTEM	31	36	35	40	4	4
67	79	5	80	HANG+LAMP LIGHTS	35	40	35	40	*	
45	79	4	20	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
45	79	4	11	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
45	79	4	21	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
61	79	3	60	ACTIVATE/TEST/BAL HTG SYS	31	34	37	40	6	6
63	79	3	80	INSTL O/H CRANE+ELECTRIFY	32	35	37	40	5	5
63	79	3	35	INSTL O/H CRANE+ELECTRIFY	32	35	37	40	5	5
69	79	3	60	COMPLETE TOILET ROOM	35	38	37	40	2	2
19	90	3	33	INSTALL EXT PAVING	31	34	39	42	8	8
79	90	2	2	CLEAN UP+PUNCH LIST	40	42	40	42	*	

PROJECT COST

PROJECT COMPLETION 42

RALPH J. STEPHENSON, CONSULTING ENGINEER
INSTITUTE FOR CONSTRUCTION MANAGEMENT
CRITICAL PATH FOR TRIARD MANUFACTURING COMPANY DAY 1 IS

THIS LISTING IS IN LATE FINISH SEQUENCE
ITEMS WITH * IN TFT COLUMN ARE ON THE CRITICAL PATH

		DAYS	JOB RESPONSIBILITY AND DESCRIPTION	ES	EF	LS	LF	TFT	FFT
	1	1	T/R		1		1	*	
1	3	1	T/R	1	2	1	2	*	
3	7	3	1PREPARE SITE/LAY OUT BLDG	2	5	2	5	*	
3	7	3	3PREPARE SITE/LAY OUT BLDG	2	5	2	5	*	
3	5	1	2ERECT SIGN+CONST OFF	2	3	4	5	2	
3	9	4	2COMPLETE PURCHASING	2	6	3	7	1	1
7	9	2	4EXC/POUR A WALL FTGS	5	7	5	7	*	
7	9	2	5EXC/POUR A WALL FTGS	5	7	5	7	*	
9	13	6	5FORM/POUR A EXT FDN WALLS	7	13	7	13	*	
9	11	2	4EXC/POUR B WALL FTGS	7	9	11	13	4	
9	11	2	5EXC/POUR B WALL FTGS	7	9	11	13	4	
13	23	4	5FORM/POUR B EXT FDN WALLS	13	17	13	17	*	
7	15	3	33INSTL PVG SUB BASE	5	8	14	17	9	
7	15	3	4INSTL PVG SUB BASE	5	8	14	17	9	
11	23	3	4INSTL INT FTGS	9	12	14	17	5	5
11	23	3	5INSTL INT FTGS	9	12	14	17	5	5
7	17	2	60INSTL CULVERTS/SITE DRAINS	5	7	15	17	10	
7	17	2	33INSTL CULVERTS/SITE DRAINS	5	7	15	17	10	
23	25	3	10ERECT A STRUCT STEEL	17	20	17	20	*	
25	31	3	10ERECT B STRUCT STEEL	20	23	20	23	*	
25	29	2	12ERECT A METAL DECK	20	22	21	23	1	
25	33	4	11INSTL A SILL WALLS	20	24	20	24	*	
25	33	4	9INSTL A SILL WALLS	20	24	20	24	*	
1	43	3	4BRING UTILITIES FROM P/L	1	4	23	26	22	21
1	43	3	6BRING UTILITIES FROM P/L	1	4	23	26	22	21
29	41	3	13INSTALL A ROOFING	22	25	23	26	1	
35	39	2	12ERECT B METAL DECK	23	25	24	26	1	
31	57	4	60INSTL U/G UTILITIES IN BLDG	23	27	23	27	*	
31	57	4	4INSTL U/G UTILITIES IN BLDG	23	27	23	27	*	
37	45	3	11INSTL B SILL WALLS	24	27	24	27	*	
37	45	3	9INSTL B SILL WALLS	24	27	24	27	*	
33	47	2	10ERECT A EXT MTL WALL PANELS	24	26	25	27	1	1
33	47	2	18ERECT A EXT MTL WALL PANELS	24	26	25	27	1	1
41	49	1	13INSTL B ROOFING	25	26	26	27	1	
43	49	1	80INSTL TEMP LIGHT/POWER	25	26	26	27	1	
43	49	1	2INSTL TEMP LIGHT/POWER	25	26	26	27	1	
47	59	2	16ERECT B EXT MTL WALL PANELS	27	29	27	29	*	
47	59	2	18ERECT B EXT MTL WALL PANELS	27	29	27	29	*	
57	59	2	4FFG+INSTL IN FL WK FOR FOG	27	29	27	29	*	
57	59	2	8FFG+INSTL IN FL WK FOR FOG	27	29	27	29	*	
21	27	10	60PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
21	27	10	4PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
21	27	10	34PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
49	51	5	70INSTL O/H FIRE PROT WORK	26	31	27	32	1	
49	53	5	60INSTL UNIT HTRS+O/H PIPING	26	31	27	32	1	
49	55	5	80INSTL O/H WIRING	26	31	27	32	1	
59	63	3	8POUR FLOOR SLAB	29	32	29	32	*	

65	67	3	39	PAINT BLDG INTERIOR	32	35	32	35	*	
63	69	3	14	INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
63	69	3	28	INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
63	69	3	39	INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
1	19	30		W/TR	1	31	9	39	8	
27	79	8	34	LAY R/R TRK+INSTL SWITCH	18	26	32	40	14	14
51	79	5	70	TEST/COMP/ACTIVATE/F/P SYSTEM	31	36	35	40	4	4
67	79	5	80	HANG+LAMP LIGHTS	35	40	35	40	*	
45	79	4	20	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
45	79	4	11	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
45	79	4	21	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
61	79	3	60	ACTIVATE/TEST/BAL HTG SYS	31	34	37	40	6	6
63	79	3	80	INSTL O/H CRANE+ELECTRIFY	32	35	37	40	5	5
63	79	3	35	INSTL O/H CRANE+ELECTRIFY	32	35	37	40	5	5
69	79	3	60	COMPLETE TOILET ROOM	35	38	37	40	2	2
19	90	3	33	INSTALL EXT PAVING	31	34	39	42	8	8
79	90	2	2	CLEAN UP+PUNCH LIST	40	42	40	42	*	

PROJECT COST

PROJECT COMPLETION 42

RALPH J. STEPHENSON, CONSULTING ENGINEER
INSTITUTE FOR CONSTRUCTION MANAGEMENT
CRITICAL PATH FOR TRIARD MANUFACTURING COMPANY DAY 1 IS

THIS LISTING IS IN TOTAL FLOAT SEQUENCE
ITEMS WITH * IN TFT COLUMN ARE ON THE CRITICAL PATH

		DAYS	JOB RESPONSIBILITY AND DESCRIPTION	ES	EF	LS	LF	TFT	FFT
	1	1	T/R		1		1	*	
1	3	1	T/R	1	2	1	2	*	
3	7	3	1PREPARE SITE/LAY OUT BLDG	2	5	2	5	*	
3	7	3	3PREPARE SITE/LAY OUT BLDG	2	5	2	5	*	
7	9	2	4EXC/POUR A WALL FTGS	5	7	5	7	*	
7	9	2	5EXC/POUR A WALL FTGS	5	7	5	7	*	
9	13	6	5FORM/POUR A EXT FDN WALLS	7	13	7	13	*	
13	23	4	5FORM/POUR B EXT FDN WALLS	13	17	13	17	*	
23	25	3	10ERECT A STRUCT STEEL	17	20	17	20	*	
25	31	3	10ERECT B STRUCT STEEL	20	23	20	23	*	
25	33	4	11INSTL A SILL WALLS	20	24	20	24	*	
25	33	4	9INSTL A SILL WALLS	20	24	20	24	*	
31	57	4	60INSTL U/G UTILITIES IN BLDG	23	27	23	27	*	
31	57	4	4INSTL U/G UTILITIES IN BLDG	23	27	23	27	*	
37	45	3	11INSTL B SILL WALLS	24	27	24	27	*	
37	45	3	9INSTL B SILL WALLS	24	27	24	27	*	
47	59	2	16ERECT B EXT MTL WALL PANELS	27	29	27	29	*	
47	59	2	18ERECT B EXT MTL WALL PANELS	27	29	27	29	*	
57	59	2	4FFG+INSTL IN FL WK FOR FOG	27	29	27	29	*	
57	59	2	8FFG+INSTL IN FL WK FOR FOG	27	29	27	29	*	
59	63	3	8POUR FLOOR SLAB	29	32	29	32	*	
65	67	3	39PAINT BLDG INTERIOR	32	35	32	35	*	
67	79	5	80HANG+LAMP LIGHTS	35	40	35	40	*	
79	90	2	2CLEAN UP+PUNCH LIST	40	42	40	42	*	
3	9	4	2COMPLETE PURCHASING	2	6	3	7	1	1
25	29	2	12ERECT A METAL DECK	20	22	21	23	1	
29	41	3	13INSTALL A ROOFING	22	25	23	26	1	
35	39	2	12ERECT B METAL DECK	23	25	24	26	1	
33	47	2	10ERECT A EXT MTL WALL PANELS	24	26	25	27	1	1
33	47	2	18ERECT A EXT MTL WALL PANELS	24	26	25	27	1	1
41	49	1	13INSTL B ROOFING	25	26	26	27	1	
43	49	1	80INSTL TEMP LIGHT/POWER	25	26	26	27	1	
43	49	1	2INSTL TEMP LIGHT/POWER	25	26	26	27	1	
49	51	5	70INSTL O/H FIRE PROT WORK	26	31	27	32	1	
49	53	5	60INSTL UNIT HTRS+O/H PIPING	26	31	27	32	1	
49	55	5	80INSTL O/H WIRING	26	31	27	32	1	
3	5	1	2ERECT SIGN+CONST OFF	2	3	4	5	2	
63	69	3	14INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
63	69	3	28INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
63	69	3	39INSTL/PAINT TOILET ROOM WALLS	32	35	34	37	2	
69	79	3	60COMPLETE TOILET ROOM	35	38	37	40	2	2
9	11	2	4EXC/POUR B WALL FTGS	7	9	11	13	4	
9	11	2	5EXC/POUR B WALL FTGS	7	9	11	13	4	
51	79	5	70TEST/COMP/ACTIVATE/F/P SYSTEM	31	36	35	40	4	4
11	23	3	4INSTL INT FTGS	9	12	14	17	5	5
11	23	3	5INSTL INT FTGS	9	12	14	17	5	5
63	79	3	80INSTL O/H CRANE+ELECTRIFY	32	35	37	40	5	5

63	79	3	35	INSTL O/H CRANE+ELECTRIFY	32	35	37	40	5	5
61	79	3	60	ACTIVATE/TEST/BAL HTG SYS	31	34	37	40	6	6
1	19	30		W/TR	1	31	9	39	8	
19	90	3	33	INSTALL EXT PAVING	31	34	39	42	8	8
7	15	3	33	INSTL PVG SUB BASE	5	8	14	17	9	
7	15	3	4	INSTL PVG SUB BASE	5	8	14	17	9	
45	79	4	20	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
45	79	4	11	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
45	79	4	21	INSTL EXT DOORS IN A AND B	27	31	36	40	9	9
7	17	2	60	INSTL CULVERTS/SITE DRAINS	5	7	15	17	10	
7	17	2	33	INSTL CULVERTS/SITE DRAINS	5	7	15	17	10	
21	27	10	60	PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
21	27	10	4	PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
21	27	10	34	PREPARE R/R TRK SUBBSE/DRAINGE	8	18	22	32	14	
27	79	8	34	LAY R/R TRK+INSTL SWITCH	18	26	32	40	14	14
1	43	3	4	BRING UTILITIES FROM P/L	1	4	23	26	22	21
1	43	3	6	BRING UTILITIES FROM P/L	1	4	23	26	22	21

PROJECT COST PROJECT COMPLETION 42

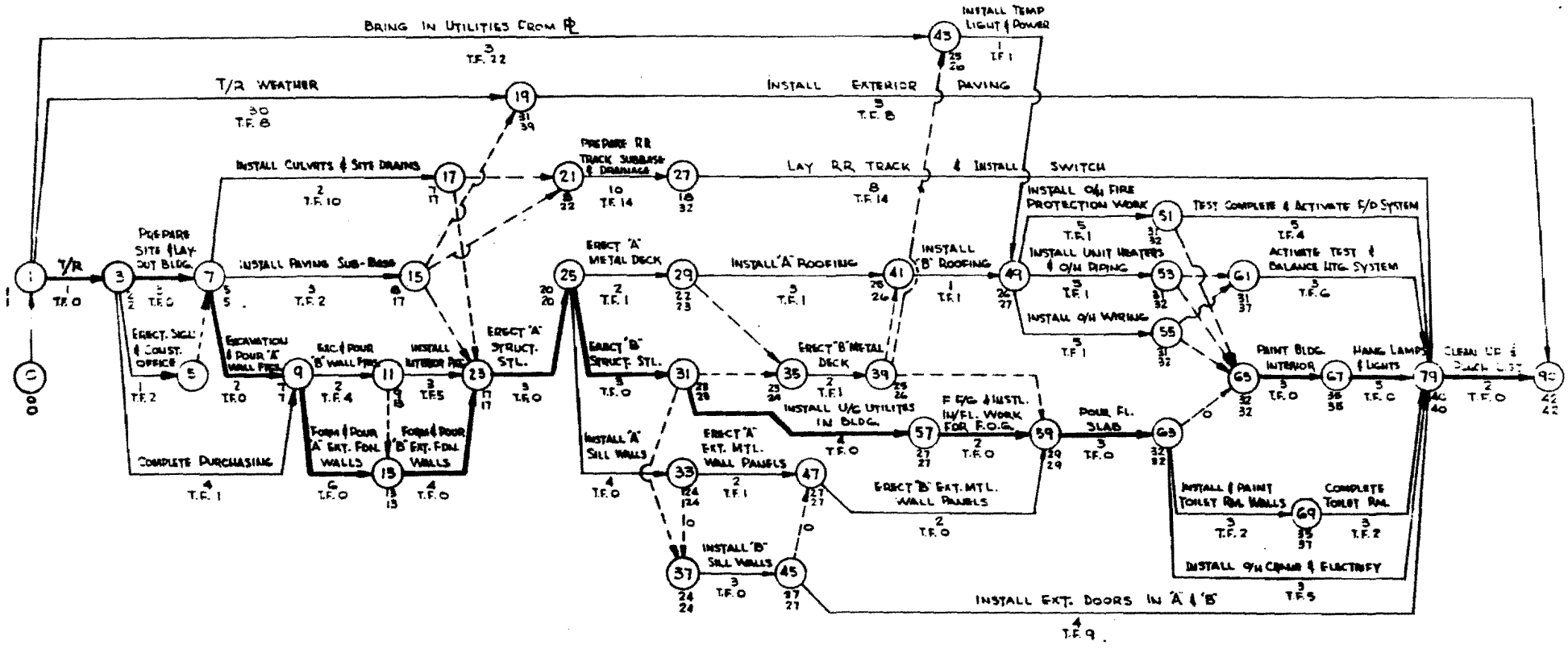
Ralph J. Stephenson 35

ORKING DAY CALENDAR FOR 1967 + 1968

DAY 1 IS JAN. 3.

1967

DAY	DATE	DAY	DATE	DAY	DATE	DAY	DATE	DAY	DT
1	1.03	2	1.04	3	1.05	4	1.06	5	1.09
6	1.10	7	1.11	8	1.12	9	1.13	10	1.16
11	1.17	12	1.18	13	1.19	14	1.20	15	1.23
16	1.24	17	1.25	18	1.26	19	1.27	20	1.30
21	1.31	22	2.01	23	2.02	24	2.03	25	2.06
26	2.07	27	2.08	28	2.09	29	2.10	30	2.13
31	2.14	32	2.15	33	2.16	34	2.17	35	2.20
36	2.21	37	2.22	38	2.23	39	2.24	40	2.27
41	2.28	42	3.01	43	3.02	44	3.03	45	3.06
46	3.07	47	3.08	48	3.09	49	3.10	50	3.13
51	3.14	52	3.15	53	3.16	54	3.17	55	3.20
56	3.21	57	3.22	58	3.23	59	3.24	60	3.27
61	3.28	62	3.29	63	3.30	64	3.31	65	4.03
66	4.04	67	4.05	68	4.06	69	4.07	70	4.10
71	4.11	72	4.12	73	4.13	74	4.14	75	4.17
76	4.18	77	4.19	78	4.20	79	4.21	80	4.24
81	4.25	82	4.26	83	4.27	84	4.28	85	5.01
86	5.02	87	5.03	88	5.04	89	5.05	90	5.08
91	5.09	92	5.10	93	5.11	94	5.12	95	5.15
96	5.16	97	5.17	98	5.18	99	5.19	100	5.22
101	5.23	102	5.24	103	5.25	104	5.26	105	5.29
106	5.31	107	6.01	108	6.02	109	6.05	110	6.06
111	6.07	112	6.08	113	6.09	114	6.12	115	6.13
116	6.14	117	6.15	118	6.16	119	6.19	120	6.20
121	6.21	122	6.22	123	6.23	124	6.26	125	6.27
126	6.28	127	6.29	128	6.30	129	7.03	130	7.05
131	7.06	132	7.07	133	7.10	134	7.11	135	7.12
136	7.13	137	7.14	138	7.17	139	7.18	140	7.19
141	7.20	142	7.21	143	7.24	144	7.25	145	7.26
146	7.27	147	7.28	148	7.31	149	8.01	150	8.02
151	8.03	152	8.04	153	8.07	154	8.08	155	8.09
156	8.10	157	8.11	158	8.14	159	8.15	160	8.16
161	8.17	162	8.18	163	8.21	164	8.22	165	8.23
166	8.24	167	8.25	168	8.28	169	8.29	170	8.30
171	8.31	172	9.01	173	9.05	174	9.06	175	9.07
176	9.08	177	9.11	178	9.12	179	9.13	180	9.14
181	9.15	182	9.18	183	9.19	184	9.20	185	9.21
186	9.22	187	9.25	188	9.26	189	9.27	190	9.28
191	9.29	192	10.02	193	10.03	194	10.04	195	10.05
196	10.06	197	10.09	198	10.10	199	10.11	200	10.12
201	10.13	202	10.16	203	10.17	204	10.18	205	10.19
206	10.20	207	10.23	208	10.24	209	10.25	210	10.26
211	10.27	212	10.30	213	10.31	214	11.01	215	11.02
216	11.03	217	11.06	218	11.07	219	11.08	220	11.09
221	11.10	222	11.13	223	11.14	224	11.15	225	11.16
226	11.17	227	11.20	228	11.21	229	11.22	230	11.24
231	11.27	232	11.28	233	11.29	234	11.30	235	12.01
236	12.04	237	12.05	238	12.06	239	12.07	240	12.08
241	12.11	242	12.12	243	12.13	244	12.14	245	12.15
246	12.18	247	12.19	248	12.20	249	12.21	250	12.22
251	12.26	252	12.27	253	12.28	254	12.29		



Ralph J. Stephenson

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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.

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CPM Exercise #2

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

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

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Exercise #3

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

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CPM QUIZ #1

T F 1. The various network planning techniques such as CPM, PERT, LESS and others are radically different from each other in their basic concept.

2. Which of the following action plans is based upon the idea of network planning?

Music_____ Road maps_____ Text books_____

T F 3. The rise of network planning has come about through the successful blending of applied working knowledge with theoretical operation research methods.

T F 4. CPM is action oriented.

T F 5. Normally a project to be planned with CPM must have a definite starting and completion point.

T F 6. A network plan can help everyone on the job if used correctly as a management tool.

T F 7. Network plans should reflect both desire and necessity in the action depicted.

T F 8. A dummy arrow represents an activity.

T F 9. A task starting at a node might begin before all the tasks entering the node are complete.

T F 10. If a task can or should start from a node before all the tasks entering and ending at the node are complete, the logic of the network plan is faulty.

T F 11. A person preparing a network plan does not have to know as much about the work procedure as in other methods of planning and scheduling.

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CPM

QUIZ 2

T	F	1.	The assignment of times to a network is an important part of the project planning phase.
T	F	2.	In construction it is recommended that three time values be assigned each task - most likely, optimistic and pessimistic.
T	F	3.	When assigning times, it is generally best to use elapsed time for each task.
T	F	4.	It is necessary to assign times working from the beginning toward the end of the network.
T	F	5.	Management by exception is constant supervision of all tasks regardless of their condition, status, or current progress.
T	F	6.	Node numbers should bear a definite relationship to assigned times.
T	F	7.	The critical path is the longest time sequence of tasks through the network plan.
T	F	8.	The time along the critical path is the shortest time in which the entire project can be completed.
T	F	9.	Late finish times are computed from the beginning of the network toward the end.
T	F	10.	Total float must be computed in a definite sequence through the network.
T	F	11.	The early start at a node is the smallest of all computer early start times at that node.
T	F	12.	The most efficient way to do a project is to start all tasks at the early start time.
T	F	13.	The game of WHIF is an abstract exercise and actually serves no practical purpose in the working evaluation of a field condition.
T	F	14.	A working day calendar will always have gaps for week ends and holidays.

4/12

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CPM QUIZ CE2A

T	F	1.	Network planning cannot be utilized in managing by exception.
T	F	2.	Separating each task from its related tasks by a dummy helps avoid logic errors.
T	F	3.	All nodes should be numbered when using the dummy separation technique of diagramming.
T	F	4.	Approvals of the network should be obtained only after preliminary computations are complete.
T	F	5.	Use of management-by-exception requires an increase in your span of control.
T	F	6.	The three diagramming techniques - horizontal action, horizontal location and block - are never used in conjunction with each other.
T	F	7.	The sequence of diagramming consists of the following steps in order: define scope, establish durations, draw diagram, approve, assign durations, compute, analyze, adjust, issue.
T	F	8.	Every task in a network must start at the ES time or it is behind schedule.
T	F	9.	A scheduled task is one that is locked into position so far as its start and finish time targets are concerned.
T	F	10.	There is always only one critical path through a network.
T	F	11.	Everyone concerned with preparing the network plan should be at the planning conference together.

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CPM QUIZ #3

T F 1. A computed network plan is a schedule.

T F 2. There is no room for the application of bar charts in critical path technique.

T F 3. The first step in establishing criteria for resource allocation is to define management objectives.

T F 4. Critical path tasks are the only tasks in a critical path plan that have been scheduled once ES/LF times are computed.

T F 5. It is generally best to assign times to a network plan in conjunction with all parties concerned with the plan.

T F 6. The key data in a network plan is task duration, ES times, LF times and TF times.

T F 7. The duration of any task is always directly proportional to the crew size.

T F 8. Dummy arrows cannot fall on the critical path.

T F 9. The owner should be exposed to the network plan and should understand what it means.

T F 10. A task having float time available can be on the critical path in CPM.

T F 11. The three elements of network planning technique are plan, time and physical resources.

T F 12. The use of resource allocation through network planning encourages the assimilating of accurate manpower assignment records.

T F 13. The network plan works against the field forces in that it does not allow them to have a strong voice in the prosecution of the job.

T F 14. The value of separating planning of a job and time assignments to the job is that it makes the entire scheduling process less susceptible to time distortions.

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CPM QUIZ #4

T F 1. A network plan without controls is effective.

T F 2. The network plan cannot be used for a project evaluation upon the completion of the project.

T F 3. Field reporting with CPM should be kept simple.

T F 4. There are no advantages to having a computer available to run a CPM program.

T F 5. A task can be behind schedule and still not have used any float time.

T F 6. The use of critical path data to manage purchasing is not recommended.

T F 7. It is often possible to control a job day to day in the field from the computer printout.

T F 8. CPM simplifies evaluation and forecasting of the outcome of alternate plans of action.

T F 9. One of the most valuable roles of the computer in critical path planning is that it allows rapid, inexpensive simulation of several different courses of action.

T F 10. Only one array of printout information should be utilized when computers are available.

T F 11. Anticipation of cash requirements is normally not a consideration in planning a major construction project.

T F 12. It is necessary to include all dummy restraints in the printout obtained from the computing equipment.

T F 13. The ES listing is generally recommended as the master sheet from which changes are noted and made.

T F 14. The TF listing is used to evaluate the degree of criticality of any task in the network.

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CPM QUIZ #5

T	F	1.	Monitoring a network always results in an updating.
T	F	2.	Orange and blue codings result from discretionary situations.
T	F	3.	Monitoring must be accomplished by a personal on-site inspection.
T	F	4.	Any slippage of a project should be reflected in an immediate updating of the network.
T	F	5.	Routine monitoring reports never are combined with creative analytical observations.
T	F	6.	On-site project inspections must use the LF printout as the check off listing.
T	F	7.	Account is taken of possible logic alternatives when preparing a creative analytical report.
T	F	8.	Monitoring reports wherever possible should be reviewed with line personnel directing the project.
T	F	9.	Updating may or may not reflect revisions to the logic plan.
T	F	10.	Generally a slippage of 5 to 10 time units in a detailed network is permissible without updating immediately.
T	F	11.	Part of the routine monitoring report is a projection of project conditions in the immediate and near future.
T	F	12.	Distribution of all monitoring reports should be kept to an absolute minimum.
T	F	13.	The monitoring process as a routine procedure does not have to be explained to project personnel.
T	F	14.	Updating is routine and can be done without reviewing the logic plan.
T	F	15.	All the above questions could be answered another way than you answered.

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Consulting Engineer

#5

General Bibliography
(from RJS personal library)

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Management by Objective	George S. Odiorne	Pitman Publishing Company 20 East 46 Street New York, New York 10017
New Decision Making Tools for Managers	Edward C. Bursh John F. Chapman	Harvard University Press Cambridge 38, Mass.
Design for Decision	Irwin D. J. Bross	MacMillan Company 866 Third Avenue New York, New York 10022
How to Attract Good Luck	A. H. Z. Carr	Cornerstone Library Divn. of Pocket Books, Inc. Rockefeller Center 630 Fifth Avenue New York, New York 10020
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RJS - AGCK
Exhibit 11

General Bibliography
Page 2

Title	Author	Publisher
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Boeckh's Manual of Appraisals	E. H. Boeckh	E. H. Boeckh and Associates

RJS - AGCK
Exhibit 11

WHAT IS NEEDED TO MOVE INTO DESIGN AND BUILD?

A. Functional needs to be filled.

1. Sales
2. Engineering
3. Architecture
4. Estimating
5. Real estate
6. Finance
7. Legal
8. Graphics
9. Construction
10. Maintenance

All These Functions Must Be Filled In A Total Design Build Operation Irrespective Of Size Of Project Or Size Of Firm . . . . . All Are Necessary.

B. What talents are required to move into design and build?

1. Sales

   a. Prospects must be located and screened early
   b. Must avoid pure competitive price bidding (single value competition)
   c. Salesmen must know design build business thoroughly
   d. Salesmen must know how to use technical assistance, and technical assistance must be available throughout sales period
   e. Good judgment required of salesmen to avoid misuse of material and assistance submitted to clients
   f. Good presentation techniques essential

2. Technical

   a. Must have competent engineering and architectural capabilities or sources available currently
   b. Should have real estate know-how and available real estate services and advice; detail knowledge not essential but helpful
   c. Should know financing techniques; detail knowledge not essential but helpful
   d. Must have construction staff sympathetic to systems design and other design-build concepts. Technical staff must, in turn, be sympathetic towards construction and understand how design and construction fit together
   e. Must have good estimators capable of translating concepts into costs and costs into design documents for construction
   f. Organization must be mobile with interchangeable talents
   g. Graphic and writing talents should be available, preferably on internal staff
   h. Should have good legal advice source currently available
   i. Should have good cost accounting system well related to construction operation

WHAT IS NEEDED TO MOVE INTO DESIGN AND BUILD?
(Continued)

3. Administrative

   a. Good grasp of a multitude of business techniques essential
   b. Executives must understand and be sympathetic to sales, design, construction and the total service concept
   c. Administrators should know real estate and financing elements of environmental construction
   d. Executives must have a grasp of selling construction to laymen. A design build firm often deals with persons unfamiliar with design and construction

4. Construction capacity

   a. Must know how to manage construction
   b. Must have good buying abilities (not sharp or shopping oriented, but good)
   c. Superintendents should strive for good project liaison and understand the importance of continuing sales on the job
   d. Must minimize callbacks by doing a good job initially. Single responsibility pattern makes it imperative that you as a design build firm complete the work so it performs well
   e. All field and office personnel must be sympathetic and understand the design-build concept

FINDING AND SELLING-TO DESIGN/BUILD PROSPECTS

A. Definitions

1. Phase 1 Selling - Activities aimed at locating prospects and generating general knowledge about them prior to specific projects being available. Includes informing the prospect about you.

2. Phase 2 Selling - Activities geared to proposing and obtaining specific project commissions from prospects.

3. Profiling - A selective, flexible, dynamic, operable system of screening prospects and projects for optimum results in phase 1 and phase 2 selling.

B. Phase 1 Selling Techniques

1. Phone calls

   a. Should, if appropriate and possible, lead to a personal visit.
   b. Use phone to open doors that lead to personal visits with legitimate and likely prospects.
   c. Phone calls should usually result in a decision, recommendation or job award.

2. Correspondence

   a. Use project correspondence as a basic tool, not as a casual communication medium. Reading time is at a premium.
   b. Follow decision phone calls by a confirming letter to avoid later misunderstanding.

3. Personal visits

   a. Keep visits short and valuable to prospect. Always ask "How am I helping the prospect do his job better?"
   b. Show graphic material about your company.
   c. Show examples of your work. (clear with other owners if necessary)
   d. Stress single responsibility pattern.
   e. Answer questions accurately, honestly, briefly. Don't dally; a prospect's time is valuable.
   f. Leave something interesting and useful with the prospect.
   g. See all the decision makers possible when you visit the prospect, but start with the top man or woman.

4. Use of your staff

   a. Where prospect is good (likely to build), utilize useful staff talents in phase 1 selling visits.
   b. Brief staff members before such meetings.
   c. Have a good reason for staff members to accompany you when visiting prospect.
   d. Introduce staff members fully to the prospect. Make certain he understands who they are and how they relate to him.
   e. Remember the importance of generating confidence. Make certain staff members accompanying you understand this.

FINDING AND SELLING-TO DESIGN/BUILD PROSPECTS
(Continued)

C. Phase 1 Profiling

1. Financial report analysis

2. Response mailing

3. Control point use

   a. Available industrial parks
   b. Available financing
   c. Available tenants
   d. Available land
   e. Available services

4. Prospect financial strength analysis

5. Prospect growth analysis

6. Prospect SIC classification

D. Phase 2 Selling Techniques (When proposing on a specific project)

1. Proper determination of scope of work is essential. If project outline specification is available, take advantage of it. You may have a ready-made scope of work immediately.

2. As you determine project characteristics with prospect, be specific, and make him be explicit.

3. Visit the project location and make a site and area evaluation.

4. Obtain local codes and ordinances.

5. Learn about sub-contractors you are likely to deal with in the area.

6. Acquire labor and material costs in the area.

7. Learn all about any competition you have or might have.

8. Do not indiscriminately give away information that might be used against you to generate single value competition.

9. If you can't collect proper data about the project because of lack of time, experience or knowledge, get someone on the job who can.

10. Make certain the prospect knows you are collecting information. This is one direct method of showing how competent you really are, particularly if it is your first technical contact with the prospect.

11. Keep prospect generally notified of your progress.

12. Sell the prospect's entire decision-making organization throughout the Phase 2 period - you are getting close to a contract.

13. Find all control points that give you unique advantages; these may include financing, land, or others.

FINDING AND SELLING-TO DESIGN/BUILD PROSPECTS
(Continued)

14. Use graphic aids for Phase 2 selling, and use them continually. Such helps as network plans, decision tables, curves, charts, anything the owner or prospect can understand quickly and use himself will be of value to you and him.

15. Personally present your proposal to the prospect decision-makers.

16. Know the project.

E. Phase 2 Profiling

1. Project type

2. Project size

3. Project cost

4. Project location

5. Your current work load

6. Management objectives of you and prospect

7. History of success in similar projects

8. Current chances of getting project

9. Type of contract possible

REMEMBER -

- The prospect must ultimately trust somebody, MAKE IT YOU, NOW.

- Mutual confidence and trust - the prospect's in you and yours in the prospect - is the best protection you have against him shopping your sales and contract information.

May 15, 1969

Mr. Oliver K. Stimson, President
Stimson Manufacturing Company
Leeds, Ohio 21639

Re: Proposal for Construction of New Plant and Office Facility in Crowfoot, Ohio

Proposal: #3642-69

Dear Mr. Stimson:

We are pleased to submit our proposal for the construction of your new plant and office building in Crowfoot, Ohio. This proposal includes all services required to design, construct and turn over this facility to you complete. Design and construction will be in accordance with the accompanying proposal documents:

Drawing 1	General Site Plan
Drawing 2	Manufacturing Plant Floor Plan
Drawing 3	Office Floor Plan
Drawing 4	Sections and Elevations of Office and Plant
Drawing 5	Summary Construction Network Diagram
Specifications	- Project performance specification dated December 20, 1968 entitled Performance Project Specification for New Manufacturing and Office Plant, Stimson Manufacturing Company, Crowfoot, Ohio. Project #3642-69

Full information regarding items to be furnished, descriptions of the procedures to be followed, a network plan of the project showing tentative completion dates along with a full outline of the performance expected of this facility are contained in the drawings and specification listed above. We have discussed with you in detail the various contract methods of providing our services on this facility and it is our opinion that a firm price would best accomplish your management objectives and insure construction of the project within your financial requirements. We propose to provide all design, construction management, coordination, and turn-over services for the total sum of Three Hundred Ninety Eight Thousand Six Hundred Twenty Eight Dollars ($398,628.00). Design and engineering work on this project requiring the services of registered professional personnel will be furnished in accordance with these requirements. Method of payment is as described in the Project Specification under Payment - Page 3.

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pg 2

Re: Proposal for Construction of New Plant and Office Facility
in Crowfoot, Ohio

Proposal: 3642-69

Your signature of acceptance on this proposal letter will be sufficient to initiate our work in the preparation of design documents and construction on the Crowfoot Plant.

We appreciate your trust and confidence in our ability to provide this significant addition to your present plant and thank you for the privilege of working with you.

Sincerely yours,

Leonard A. Ballentine

Leonard A. Ballentine, President
Ballentine Construction Company

Accepted by _____

this _____ day of 19 _____.

CONTRACT CHARACTERISTICS

Quality of Arrangement

Negotiated - value competition only

Qualified - limited multiple value competition allowed

Unqualified - single value competition demanded

Services & Materials Provided

BMC material only

BMC material and erection

Plan commitment

Limited trades - construction only

All trades - construction only

Limited design and construction

All design and construction

Provide all labor, material and management

Provide some labor, material and management

Provide management only

Type of Contract Possible

Fixed cost - limited trades contract

Fixed cost - all trades contract

Fixed cost - limited trades work plus fee for other trade management

Time and material, plus fee - limited trades - with upset price

Time and material, plus fee - limited trades - with upset price & shared savings

Time and material, plus fee - all trades - with no upset price

Exhibit 2.16 SWS-1

		Have not built or remodeled lately				Have built new plant recently				Remodeled existing plant recently				Acquired existing plant from others recently				Have sold existing plants of theirs recently			
Are sales up?		Y	Y	N	N	Y	Y	N	N	Y	Y	N	N	Y	Y	N	N	Y	Y	N	N
Are profits up?		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Prospect action	Your action																				
Investigate new construction now	Make personal call now	X								X		X						X	X		
Investigate rehabilitation of existing now - new facilities later	Write or phone now - personal call in 6 months or sooner		X												X						
No new facilities now but in near future	Write or phone now - personal call in 6 months or sooner			X		X								X		X					
No new facilities now but suddenly in future	Write or phone now and periodically				X								X		X		X				X
Investigate new facilities in moderate future, some study now	Write or phone periodically							X												X	
Defer new construction investigation in immediate future	Hold off heavy sales contract for now						X		X		X										

Exhibit 2.02 SWS-1 RJS

Note:

If answer to any of first three questions is no, don't propose on D & B basis

	1	2	3	4	5			
Negotiated or qualified arrangement possible?	Y	Y	Y	Y	Y			
Private project?	Y	Y	Y	Y	Y			
Do we have good A/E and all trade estimating services available?	Y	Y	Y	Y	Y			
Can we provide time to prepare good D/B proposal?	Y	N	N	N	N			
Do we control land and/or financing?	-	-	-	-	-			
Is prospect engineering or management oriented?	-	Y	N	N	N			
Have we built successfully for prospect previously?	-	-	Y	-	N			
Have we built similar D/B project previously?	-	-	Y	N	Y			
Propose on D/B	x	x	x					
Don't propose on D/B basis				x	x			
Go to plan commitment table								
Go to supply only table								
Go to supply & erect table								
Go to limited trades only table								
Go to all trades table								

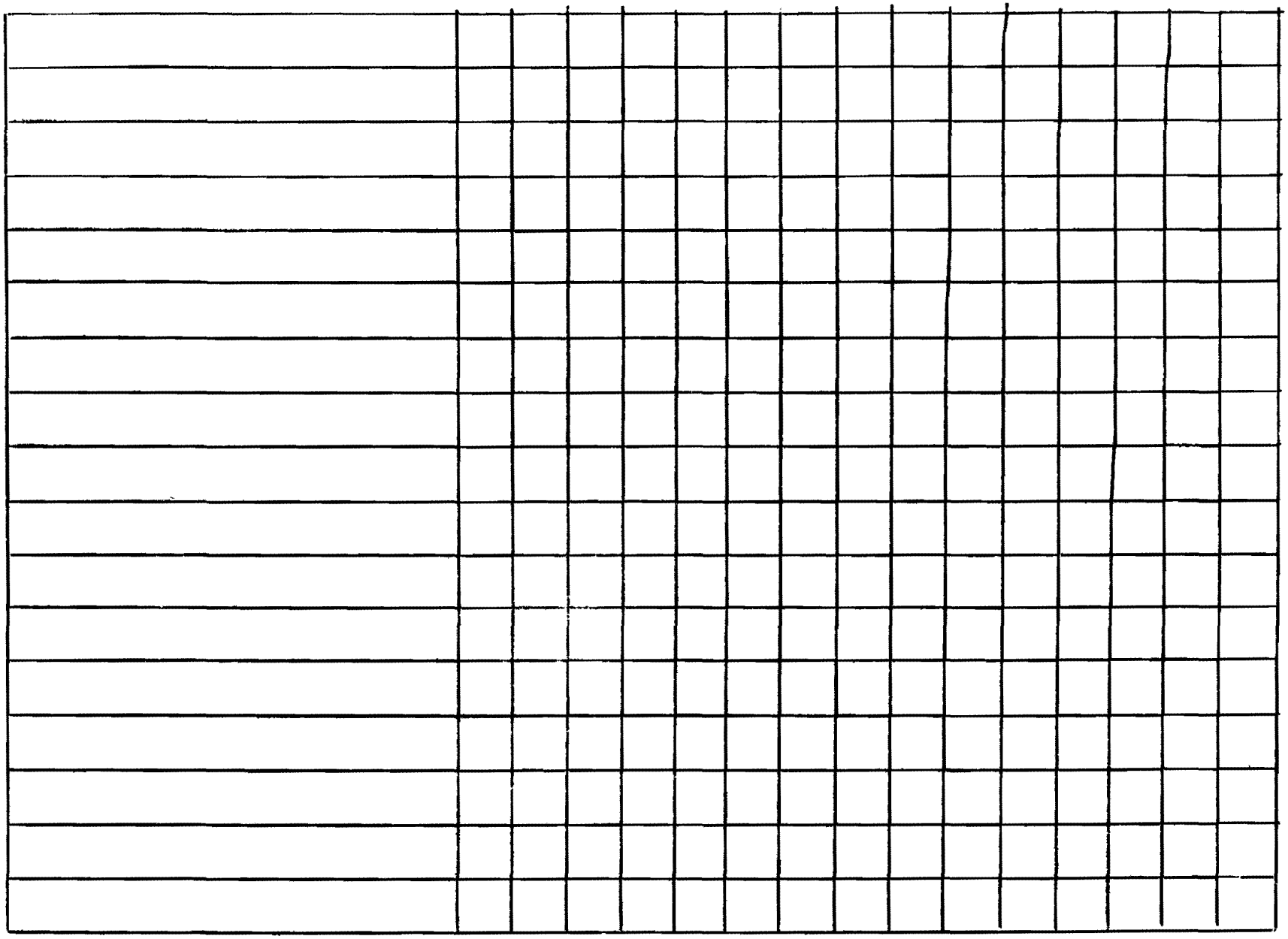
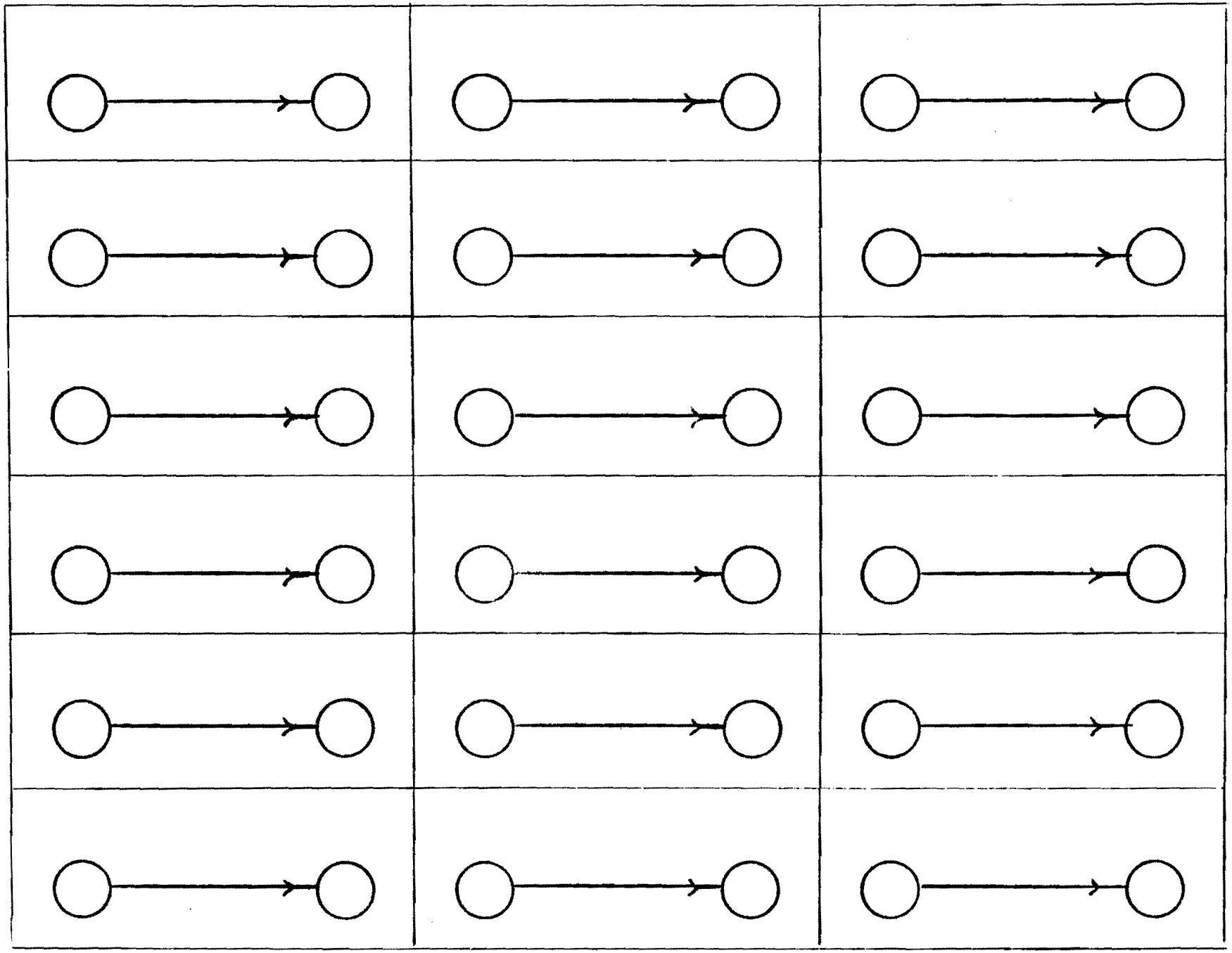
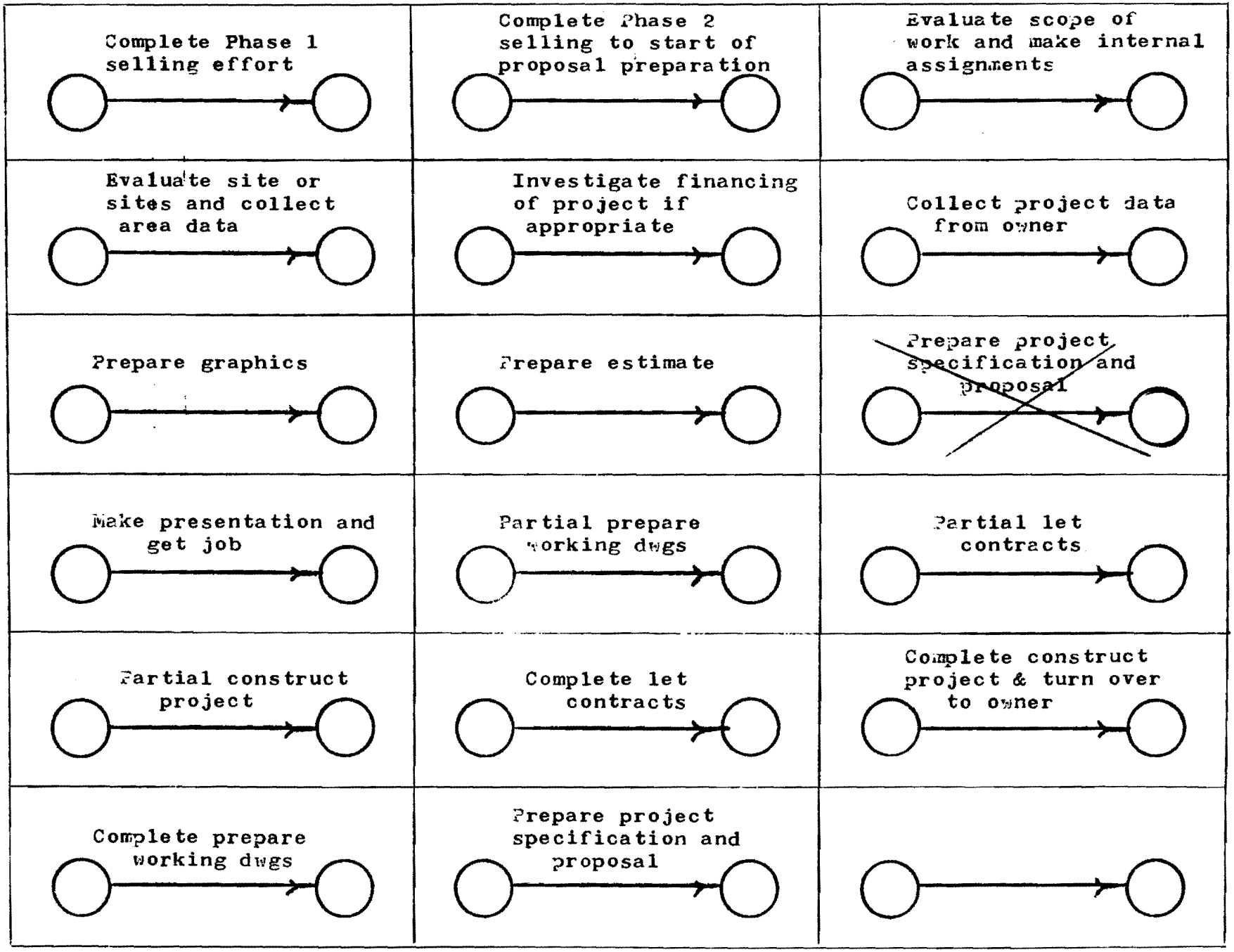


Exhibit 2.03 SWS-1 RJS





Ralph J. Stephenson. P.E.

SMS-1 - Exhibit No. 2.09

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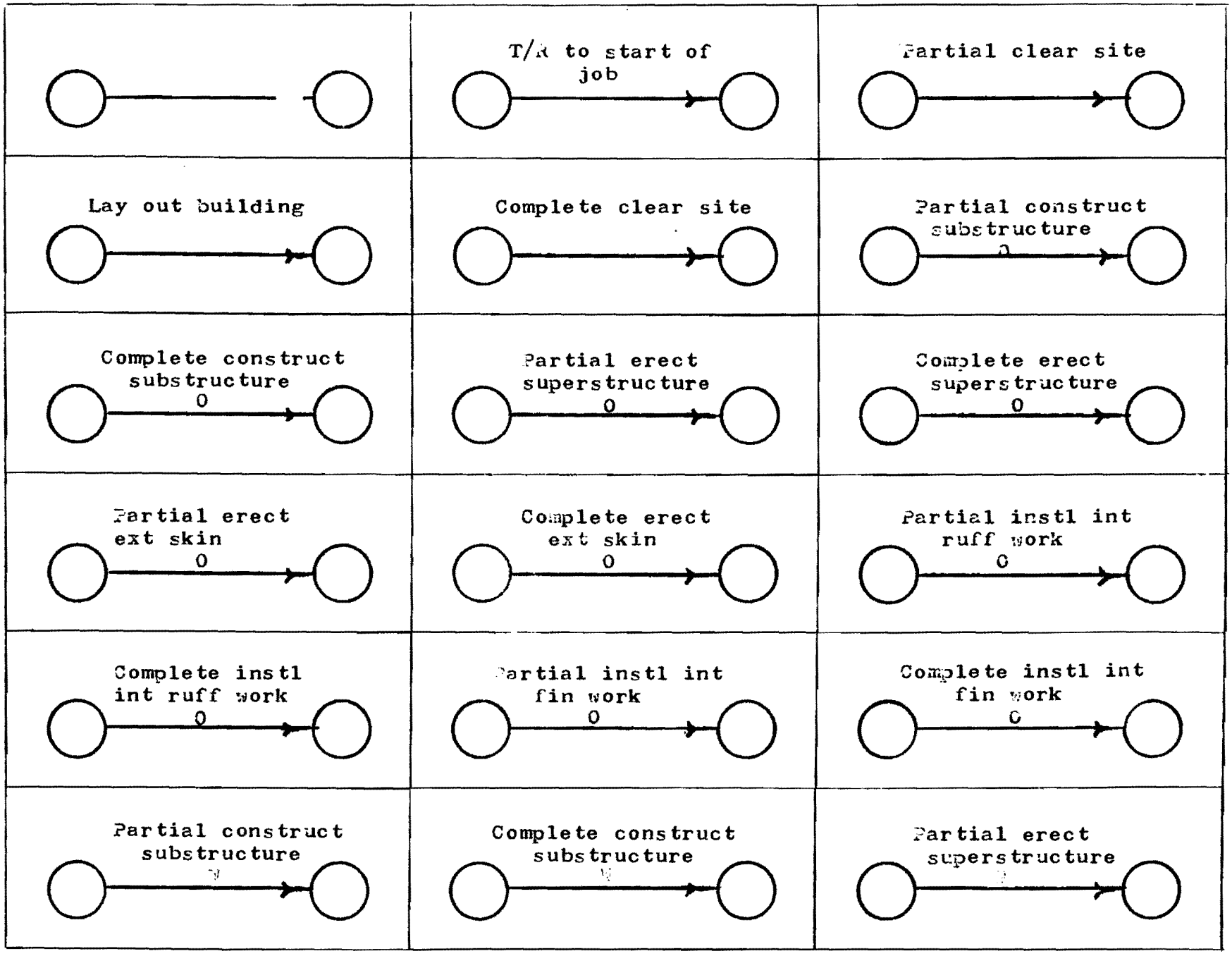

Ralph J. Stephenson, P. E.

S'C-1 - Exhibit No. 2.10

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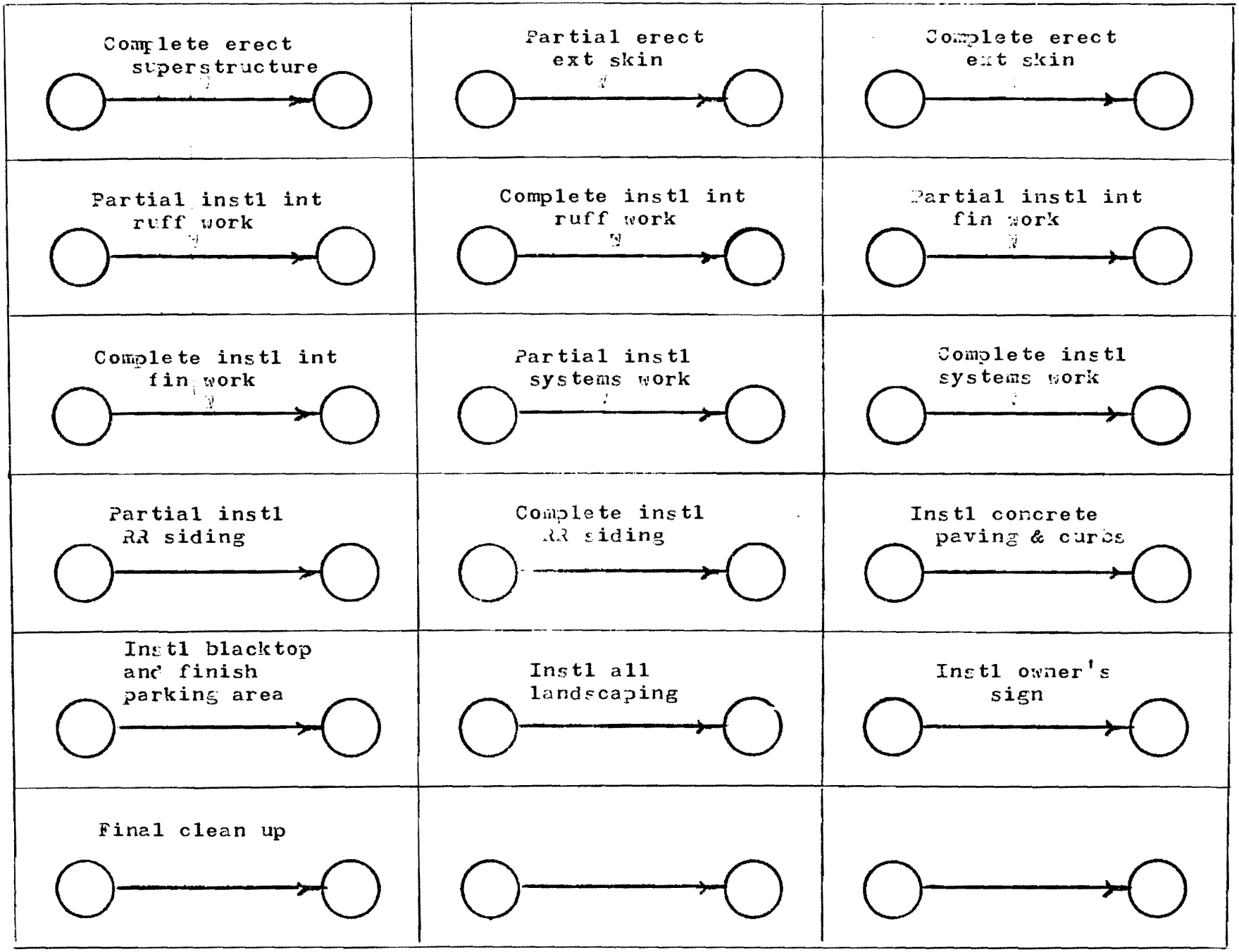
Page 1


Complete erect superstructure
Partial erect ext skin
Complete erect ext skin
Partial instl int ruff work
Complete instl int ruff work
Partial instl int fin work
Complete instl int fin work
Partial instl systems work
Complete instl systems work
Partial instl RR siding
Complete instl RR siding
Instl concrete paving & curbs
Instl blacktop and finish parking area
Instl all landscaping
Instl owner's sign
Final clean up

WORKING DAY CALENDAR STARTING JANUARY 2, 1968 H F CAMPBELL CO.

--DAYS-->	1	2	3	4	5	6	7	8	9	10
1 -10	1028	1038	1048	1058	1088	1098	1108	1118	1128	1158
11 -20	1168	1178	1188	1198	1228	1238	1248	1258	1268	1298
21 -30	1308	1318	2018	2028	2058	2068	2078	2088	2098	2128
31 -40	2138	2148	2158	2168	2198	2208	2218	2228	2238	2268
41 -50	2278	2288	2298	3018	3048	3058	3068	3078	3088	3118
51 -60	3128	3138	3148	3158	3188	3198	3208	3218	3228	3258
61 -70	3268	3278	3288	3298	4018	4028	4038	4048	4058	4088
71 -80	4098	4108	4118	4128	4158	4168	4178	4188	4198	4228
81 -90	4238	4248	4258	4268	4298	4308	5018	5028	5038	5068
91-100	5078	5088	5098	5108	5138	5148	5158	5168	5178	5208
101-110	5218	5228	5238	5248	5278	5288	5298	5318	6038	6048
111-120	6058	6068	6078	6108	6118	6128	6138	6148	6178	6188
121-130	6198	6208	6218	6248	6258	6268	6278	6288	7018	7028
131-140	7038	7058	7088	7098	7108	7118	7128	7158	7168	7178
141-150	7188	7198	7228	7238	7248	7258	7268	7298	7308	7318
151-160	8018	8028	8058	8068	8078	8088	8098	8128	8138	8148
161-170	8158	8168	8198	8208	8218	8228	8238	8268	8278	8288
171-180	8298	8308	9038	9048	9058	9068	9098	9108	9118	9128
181-190	9138	9168	9178	9188	9198	9208	9238	9248	9258	9268
191-200	9278	9308	10018	10028	10038	10048	10078	10088	10098	10108
201-210	10118	10148	10158	10168	10178	10188	10218	10228	10238	10248
211-220	10258	10288	10298	10308	10318	11018	11048	11058	11068	11078
221-230	11088	11118	11128	11138	11148	11158	11188	11198	11208	11218
231-240	11228	11258	11268	11278	11298	12028	12038	12048	12058	12068
241-250	12098	12108	12118	12128	12138	12168	12178	12188	12198	12208
251-260	12238	12248	12268	12278	12308	12318	1029	1039	1069	1079
261-270	1089	1099	1109	1139	1149	1159	1169	1179	1209	1219
271-280	1229	1239	1249	1279	1289	1299	1309	1319	2039	2049
281-290	2059	2069	2079	2109	2119	2129	2139	2149	2179	2189
291-300	2199	2209	2219	2249	2259	2269	2279	2289	3039	3049
301-310	3059	3069	3079	3109	3119	3129	3139	3149	3179	3189
311-320	3199	3209	3219	3249	3259	3269	3279	3289	3319	4019
321-330	4029	4039	4049	4079	4089	4099	4109	4119	4149	4159
331-340	4169	4179	4189	4219	4229	4239	4249	4259	4289	4299
341-350	4309	5019	5029	5059	5069	5079	5089	5099	5129	5139
351-360	5149	5159	5169	5199	5209	5219	5229	5239	5269	5279
361-370	5289	5299	6029	6039	6049	6059	6069	6099	6109	6119
371-380	6129	6139	6169	6179	6189	6199	6209	6239	6249	6259
381-390	6269	6279	6309	7019	7029	7039	7079	7089	7099	7109
391-400	7119	7149	7159	7169	7179	7189	7219	7229	7239	7249
401-410	7259	7289	7299	7309	7319	8019	8049	8059	8069	8079
411-420	8089	8119	8129	8139	8149	8159	8189	8199	8209	8219
421-430	8229	8259	8269	8279	8289	8299	9029	9039	9049	9059
431-440	9089	9099	9109	9119	9129	9159	9169	9179	9189	9199
441-450	9229	9239	9249	9259	9269	9299	9309	10019	10029	10039
451-460	10069	10079	10089	10099	10109	10139	10149	10159	10169	10179
461-470	10209	10219	10229	10239	10249	10279	10289	10299	10309	10319
471-480	11039	11049	11059	11069	11079	11109	11119	11129	11139	11149
481-490	11179	11189	11199	11209	11219	11249	11259	11269	11289	12019
491-500	12029	12039	12049	12059	12089	12099	12109	12119	12129	12159
501-510	12169	12179	12189	12199	12229	12239	12249	12269	12299	12309
511-520	12319	0	0	0	0	0	0	0	0	0

LAST DIGIT IS YEAR 8=1968 9=1969

WORKING DAY CALENDAR STARTING JANUARY 2, 1970 H F CAMPBELL CO.

--DAYS-->	1	2	3	4	5	6	7	8	9	10
511-520	0	1020	1050	1060	1070	1080	1090	1120	1130	1140
521-530	1150	1160	1190	1200	1210	1220	1230	1260	1270	1280
531-540	1290	1300	2020	2030	2040	2050	2060	2090	2100	2110
541-550	2120	2130	2160	2170	2180	2190	2200	2230	2240	2250
551-560	2260	2270	3020	3030	3040	3050	3060	3090	3100	3110
561-570	3120	3130	3160	3170	3180	3190	3200	3230	3240	3250
571-580	3260	3270	3300	3310	4010	4020	4030	4060	4070	4080
581-590	4090	4100	4130	4140	4150	4160	4170	4200	4210	4220
591-600	4230	4240	4270	4280	4290	4300	5010	5040	5050	5060
601-610	5070	5080	5110	5120	5130	5140	5150	5180	5190	5200
611-620	5210	5220	5250	5260	5270	5280	6010	6020	6030	6040
621-630	6050	6080	6090	6100	6110	6120	6150	6160	6170	6180
631-640	6190	6220	6230	6240	6250	6260	6290	6300	7010	7020
641-650	7060	7070	7080	7090	7100	7130	7140	7150	7160	7170
651-660	7200	7210	7220	7230	7240	7270	7280	7290	7300	7310
661-670	8030	8040	8050	8060	8070	8100	8110	8120	8130	8140
671-680	8170	8180	8190	8200	8210	8240	8250	8260	8270	8280
681-690	8310	9010	9020	9030	9040	9080	9090	9100	9110	9140
691-700	9150	9160	9170	9180	9210	9220	9230	9240	9250	9280
701-710	9290	9300	10010	10020	10050	10060	10070	10080	10090	10120
711-720	10130	10140	10150	10160	10190	10200	10210	10220	10230	10260
721-730	10270	10280	10290	10300	11020	11030	11040	11050	11060	11090
731-740	11100	11110	11120	11130	11160	11170	11180	11190	11200	11230
741-750	11240	11250	11270	11300	12010	12020	12030	12040	12070	12080
751-760	12090	12100	12110	12140	12150	12160	12170	12180	12210	12220
761-770	12230	12240	12280	12290	12300	12310	1041	1051	1061	1071
771-780	1081	1111	1121	1131	1141	1151	1181	1191	1201	1211
781-790	1221	1251	1261	1271	1281	1291	2011	2021	2031	2041
791-800	2051	2081	2091	2101	2111	2121	2151	2161	2171	2181
801-810	2191	2221	2231	2241	2251	2261	3011	3021	3031	3041
811-820	3051	3081	3091	3101	3111	3121	3151	3161	3171	3181
821-830	3191	3221	3231	3241	3251	3261	3291	3301	3311	4011
831-840	4021	4051	4061	4071	4081	4091	4121	4131	4141	4151
841-850	4161	4191	4201	4211	4221	4231	4261	4271	4281	4291
851-860	4301	5031	5041	5051	5061	5071	5101	5111	5121	5131
861-870	5141	5171	5181	5191	5201	5211	5241	5251	5261	5271
871-880	5281	6011	6021	6031	6041	6071	6081	6091	6101	6111
881-890	6141	6151	6161	6171	6181	6211	6221	6231	6241	6251
891-900	6281	6291	6301	7011	7021	7061	7071	7081	7091	7121
901-910	7131	7141	7151	7161	7191	7201	7211	7221	7231	7261
911-920	7271	7281	7291	7301	8021	8031	8041	8051	8061	8091
921-930	8101	8111	8121	8131	8161	8171	8181	8191	8201	8231
931-940	8241	8251	8261	8271	8301	8311	9011	9021	9031	9071
941-950	9081	9091	9101	9131	9141	9151	9161	9171	9201	9211
951-960	9221	9231	9241	9271	9281	9291	9301	10011	10041	10051
961-970	10061	10071	10081	10111	10121	10131	10141	10151	10181	10191
971-980	10201	10211	10221	10251	10261	10271	10281	10291	11011	11021
981-990	11031	11041	11051	11081	11091	11101	11111	11121	11151	11161
991****	11171	11181	11191	11221	11231	11241	11261	11291	11301	12011

LAST DIGIT IS YEAR 0=1970 1=1971

RALPH J. STEPHENSON, P.E.

WORKING DAY CALENDAR FOR 1968 AND 1969 USING JAN 2,1968 AS 1ST DAY (DAY 0)

1968

DATE	DAY NO.	DATE	DAY NO.	DATE	DAY NO.	DATE	DAY NO.	DATE	DAY NO.
102	0	103	1	104	2	105	3	108	4
109	5	110	6	111	7	112	8	115	9
116	10	117	11	118	12	119	13	122	14
123	15	124	16	125	17	126	18	129	19
130	20	131	21	201	22	202	23	205	24
206	25	207	26	208	27	209	28	212	29
213	30	214	31	215	32	216	33	219	34
220	35	221	36	222	37	223	38	226	39
227	40	228	41	229	42	301	43	304	44
305	45	306	46	307	47	308	48	311	49
312	50	313	51	314	52	315	53	318	54
319	55	320	56	321	57	322	58	325	59
326	60	327	61	328	62	329	63	401	64
402	65	403	66	404	67	405	68	408	69
409	70	410	71	411	72	412	73	415	74
416	75	417	76	418	77	419	78	422	79
423	80	424	81	425	82	426	83	429	84
430	85	501	86	502	87	503	88	506	89
507	90	508	91	509	92	510	93	513	94
514	95	515	96	516	97	517	98	520	99
521	100	522	101	523	102	524	103	527	104
528	105	529	106	531	107	603	108	604	109
605	110	606	111	607	112	610	113	611	114
612	115	613	116	614	117	617	118	618	119
619	120	620	121	621	122	624	123	625	124
626	125	627	126	628	127	701	128	702	129
703	130	705	131	708	132	709	133	710	134
711	135	712	136	715	137	716	138	717	139
718	140	719	141	722	142	723	143	724	144
725	145	726	146	729	147	730	148	731	149
801	150	802	151	805	152	806	153	807	154
808	155	809	156	812	157	813	158	814	159
815	160	816	161	819	162	820	163	821	164
822	165	823	166	826	167	827	168	828	169
829	170	830	171	903	172	904	173	905	174
906	175	909	176	910	177	911	178	912	179
913	180	916	181	917	182	918	183	919	184
920	185	923	186	924	187	925	188	926	189
927	190	930	191	1001	192	1002	193	1003	194
1004	195	1007	196	1008	197	1009	198	1010	199
1011	200	1014	201	1015	202	1016	203	1017	204
1018	205	1021	206	1022	207	1023	208	1024	209
1025	210	1028	211	1029	212	1030	213	1031	214
1101	215	1104	216	1105	217	1106	218	1107	219
1108	220	1111	221	1112	222	1113	223	1114	224
1115	225	1118	226	1119	227	1120	228	1122	229
1125	230	1126	231	1127	232	1128	233	1129	234
1202	235	1203	236	1204	237	1205	238	1206	239
1209	240	1210	241	1211	242	1212	243	1213	244
1216	245	1217	246	1218	247	1219	248	1220	249
1223	250	1224	251	1226	252	1227	253	1230	254
1231	255								

WORKING DAY CALENDAR FOR 1968 AND 1969 USING JAN 2,1968 AS 1ST DAY (DAY 0)

1969

DATE	DAY NO.	DATE	DAY NO.	DATE	DAY NO.	DATE	DAY NO.	DATE	DAY NO.
102	256	103	257	106	258	107	259	108	260
109	261	110	262	113	263	114	264	115	265
116	266	117	267	120	268	121	269	122	270
123	271	124	272	127	273	128	274	129	275
130	276	131	277	203	278	204	279	205	280
206	281	207	282	210	283	211	284	212	285
213	286	214	287	217	288	218	289	219	290
220	291	221	292	224	293	225	294	226	295
227	296	228	297	303	298	304	299	305	300
306	301	307	302	310	303	311	304	312	305
313	306	314	307	317	308	318	309	319	310
320	311	321	312	324	313	325	314	326	315
327	316	328	317	331	318	401	319	402	320
403	321	404	322	407	323	408	324	409	[illegible]5
410	326	411	327	414	328	415	329	416	[illegible]30
417	331	418	332	421	333	422	334	423	335
424	336	425	337	428	338	429	339	430	340
501	341	502	342	505	343	506	344	507	345
508	346	509	347	512	348	513	349	514	350
515	351	516	352	519	353	520	354	521	355
522	356	523	357	526	358	527	359	528	360
[illegible]9	361	602	362	603	363	604	364	605	365
[illegible]6	366	609	367	610	368	611	369	612	370
613	371	616	372	617	373	618	374	619	[illegible]75
620	376	623	377	624	378	625	379	626	[illegible]80
627	381	630	382	701	383	702	384	703	385
707	386	708	387	709	388	710	389	711	390
714	391	715	392	716	393	717	394	718	395
721	396	722	397	723	398	724	399	725	400
[illegible]28	401	729	402	730	403	731	404	801	405
804	406	805	407	806	408	807	409	808	410
811	411	812	412	813	413	814	414	815	415
818	416	819	417	820	418	821	419	822	420
825	421	826	422	827	423	828	424	829	425
902	426	903	427	904	428	905	429	908	430
909	431	910	432	911	433	912	434	915	435
916	436	917	437	918	438	919	439	922	440
923	441	924	442	925	443	926	444	929	445
930	446	1001	447	1002	448	1003	449	1006	450
1007	451	1008	452	1009	453	1010	454	1013	455
1014	456	1015	457	1016	458	1017	459	1020	460
1021	461	1022	462	1023	463	1024	464	1027	465
1028	466	1029	467	1030	468	1103	469	1104	470
1105	471	1106	472	1107	473	1110	474	1111	475
1112	476	1113	477	1114	478	1117	479	1118	480
1119	481	1121	482	1124	483	1125	484	1126	485
[illegible]27	486	1128	487	1201	488	1202	489	1203	490
[illegible]	491	1205	492	1208	493	1209	494	1210	495
[illegible]11	496	1212	497	1215	498	1216	499	1217	500
1218	501	1219	502	1222	503	1223	504	1224	505
1226	506	1229	507	1230	508	1231	509		

WORKING DAY CALENDAR STARTING JANUARY 2, 1969 R J STEPHENSON, P.E.

--DAYS-->	1	2	3	4	5	6	7	8	9	10
1 -10	1029	1039	1069	1079	1089	1099	1109	1139	1149	1159
11 -20	1169	1179	1209	1219	1229	1239	1249	1279	1289	1299
21 -30	1309	1319	2039	2049	2059	2069	2079	2109	2119	2129
31 -40	2139	2149	2179	2189	2199	2209	2219	2249	2259	2269
41 -50	2279	2289	3039	3049	3059	3069	3079	3109	3119	3129
51 -60	3139	3149	3179	3189	3199	3209	3219	3249	3259	3269
61 -70	3279	3289	3319	4019	4029	4039	4049	4079	4089	4099
71 -80	4109	4119	4149	4159	4169	4179	4189	4219	4229	4239
81 -90	4249	4259	4289	4299	4309	5019	5029	5059	5069	5079
91-100	5089	5099	5129	5139	5149	5159	5169	5199	5209	5219
101-110	5229	5239	5269	5279	5289	5299	6029	6039	6049	6059
111-120	6069	6099	6109	6119	6129	6139	6169	6179	6189	6199
121-130	6209	6239	6249	6259	6269	6279	6309	7019	7029	7039
131-140	7079	7089	7099	7109	7119	7149	7159	7169	7179	7189
141-150	7219	7229	7239	7249	7259	7289	7299	7309	7319	8019
151-160	8049	8059	8069	8079	8089	8119	8129	8139	8149	8159
161-170	8189	8199	8209	8219	8229	8259	8269	8279	8289	8299
171-180	9029	9039	9049	9059	9089	9099	9109	9119	9129	9159
181-190	9169	9179	9189	9199	9229	9239	9249	9259	9269	9299
191-200	9309	10019	10029	10039	10069	10079	10089	10099	10109	10139
201-210	10149	10159	10169	10179	10209	10219	10229	10239	10249	10279
211-220	10289	10299	10309	10319	11039	11049	11059	11069	11079	11109
221-230	11119	11129	11139	11149	11179	11189	11199	11209	11219	11249
231-240	11259	11269	11289	12019	12029	12039	12049	12059	12089	12099
241-250	12109	12119	12129	12159	12169	12179	12189	12199	12229	12239
251-260	12249	12269	12299	12309	12319	1020	1050	1060	1070	1080
261-270	1090	1120	1130	1140	1150	1160	1190	1200	1210	1220
271-280	1230	1260	1270	1280	1290	1300	2020	2030	2040	2050
281-290	2060	2090	2100	2110	2120	2130	2160	2170	2180	2190
291-300	2200	2230	2240	2250	2260	2270	3020	3030	3040	3050
301-310	3060	3090	3100	3110	3120	3130	3160	3170	3180	3190
311-320	3200	3230	3240	3250	3260	3270	3300	3310	4010	4020
321-330	4030	4060	4070	4080	4090	4100	4130	4140	4150	4160
331-340	4170	4200	4210	4220	4230	4240	4270	4280	4290	4300
341-350	5010	5040	5050	5060	5070	5080	5110	5120	5130	5140
351-360	5150	5180	5190	5200	5210	5220	5250	5260	5270	5280
361-370	6010	6020	6030	6040	6050	6080	6090	6100	6110	6120
371-380	6150	6160	6170	6180	6190	6220	6230	6240	6250	6260
381-390	6290	6300	7010	7020	7060	7070	7080	7090	7100	7130
391-400	7140	7150	7160	7170	7200	7210	7220	7230	7240	7270
401-410	7280	7290	7300	7310	8030	8040	8050	8060	8070	8100
411-420	8110	8120	8130	8140	8170	8180	8190	8200	8210	8240
421-430	8250	8260	8270	8280	8310	9010	9020	9030	9040	9080
431-440	9090	9100	9110	9140	9150	9160	9170	9180	9210	9220
441-450	9230	9240	9250	9280	9290	9300	10010	10020	10050	10060
451-460	10070	10080	10090	10120	10130	10140	10150	10160	10190	10200
461-470	10210	10220	10230	10260	10270	10280	10290	10300	11020	11030
471-480	11040	11050	11060	11090	11100	11110	11120	11130	11160	11170
481-490	11180	11190	11200	11230	11240	11250	11270	11300	12010	12020
491-500	12030	12040	12070	12080	12090	12100	12110	12140	12150	12160
501-510	12170	12180	12210	12220	12230	12240	12280	12290	12300	12310

RALPH J. STEPHENSON

Consulting Engineer

The Project Program

(Project Bible)

is

A narrative oriented statement of the character of the prospect's operation, the requirements of the prospect, and the character of the environment you are about to design and construct. It is in part derived from phase 1 and 2 selling efforts and from the information obtained by use of the building requirements check list.

Contents of A Project Program (Project Bible)

Should contain specific data about:

1. Name of project

2. Location of project

3. Nature of project (What is it supposed to do?)

4. Participants

5. Addresses and phone numbers

6. Codes and ordinances applicable

RALPH J. STEPHENSON

Consulting Engineer

Contents of A Project Program (Project Bible)

Should contain specific data about: (Continued)

7. Expansion needs

8. Community needs

9. Dimensional characteristics

10. Cost goals

11. Functional needs

12. Material handling needs

13. Receiving needs

14. Shipping needs

15. Parking needs

16. Advertising needs

17. Aesthetic needs

18. Structural needs

Contents of A Project Program (Project Bible)

Should contain specific data about: (Continued)

19. Communication needs

20. Storage needs

21. Trash disposal needs

22. Special hazard problems

23. Heating and air conditioning needs

24. Lighting needs

25. Power needs

26. Recreational needs

27. Plumbing needs

March 15, 1969

Mr. James T. Donnelly
President & General Manager
Donnelly, Inc.
Hull, Georgia 46235

Re: Proposal for Construction of New Office Building in Coster, Georgia
Project 69-325

Dear Mr. Donnelly:

We propose to provide the professional design and construction services required to build and turn over to you your new office building to be located in Coster, Georgia at the intersection of LaGrange and Peach Roads. Performange specifications for your new facility, along with the drawings and site plans necessary to define the scope of work, are contained in the attached documents. These include:

Drawing 1 - General area plan

Drawing 2 - Building and facilities site plan

Drawing 3 - Floor plan

Drawing 4 - Elevations and sections

Drawing 5 - Details of future horizontal expansion

Specifications - Outline performance specification

All documents listed above are dated December 20, 1969 and bear the name of the project.

After a detailed review with you and your executive staff, we feel that our services would best be furnished on a management arrangement whereby we provide the labor and material for construction of foundations, floor slabs on grade and erection of super structure and close-in. We also will install, with our own forces, all rough and finish carpentry work, all masonry work and all interior painting.

For construction operations directly under our control as outlined above, we will charge you at cost in accordance with job records which will be maintained throughout the length of the project and submitted to you with our monthly request for payment. All job cost records will be open for your inspection at any time. The breakdown of items to be charged on a time and material basis are detailed in the performance outline specification on Page 40 under Items Included in Time and Material Charges to the Project. Remaining work will be let to sub-contractors mutually selected by our respective organizations and at a cost approved by both. We will let all such contracts supervise their execution and process all payments to them as your agent.

Re: Proposal for Construction of New Office Building in Coster, Georgia
Project 69-325

For the above services we shall receive from you a management fee in the amount of Eighteen Thousand Dollars ($18,000) - payable on a proportionate basis to the billing each month relative to the estimated total cost. This fee will include design and engineering services, construction overhead, profit and general condition costs, as defined in the previously mentioned section of the performance description.

We are very pleased to work with you on this program, particularly since it represents an expression of mutual trust. I am certain it will also result in lowered job costs.

All engineering and technical services provided will be under the supervision of a registered architect or engineer.

We are looking forward to beginning our work in the very near future and your signature in the space provided below will be sufficient for us to initiate our work on the design documents.

Thank you very much for your confidence.

Sincerely yours,

Walter Gimstone

Walter Gimstone, President
Gimstone Construction Services, Inc.

Accepted by _____

this _____ day of 19_____.

Exhibit 2.14 SWS-1
RJS

RALPH J. STEPHENSON
Consulting Engineer

The Role of the Estimate & the Proposal

Definitions

Estimate - An approximate statement of what would be charged for certain work to be done submitted by one ready to undertake the work. (American College Dictionary)

Proposal - A plan or scheme proposed. (American College Dictionary)

Indexing - The application to previously well defined estimating units (usually proven by in-place cost experience) of a series of percentage factors so as to relate a then condition to a now condition.

Profiling - Preparation and use of a selective, flexible and operable system of screening for optimum results.

General Observations

1. Before any estimate of any type is prepared, some valid and serious profiling should be done. Profiling tools include financial ratings, Dun & Bradstreet reports, Standard Industrial Classifications and decision tables.

2. An estimate and a proposal are two different objects. Proposing is the real key to success in any competitive field!

3. A proposal reflects consideration of a myriad of factors relating to your approach. You should propose, not bid.

4. Some commonly used methods of estimating include:

   a. By area and building profile
   b. By volume and building profile
   c. By system and building profile
   d. By quantity survey and unit cost
   e. By appraisal replacement
   f. By assembly of other-source estimates

   Note: All above methods must be subjected to indexing.

5. Factors making up a construction index include:

   a. Construction volume in area
   b. Company work load
   c. Season of year
   d. Type of facility to be constructed
   e. Material costs

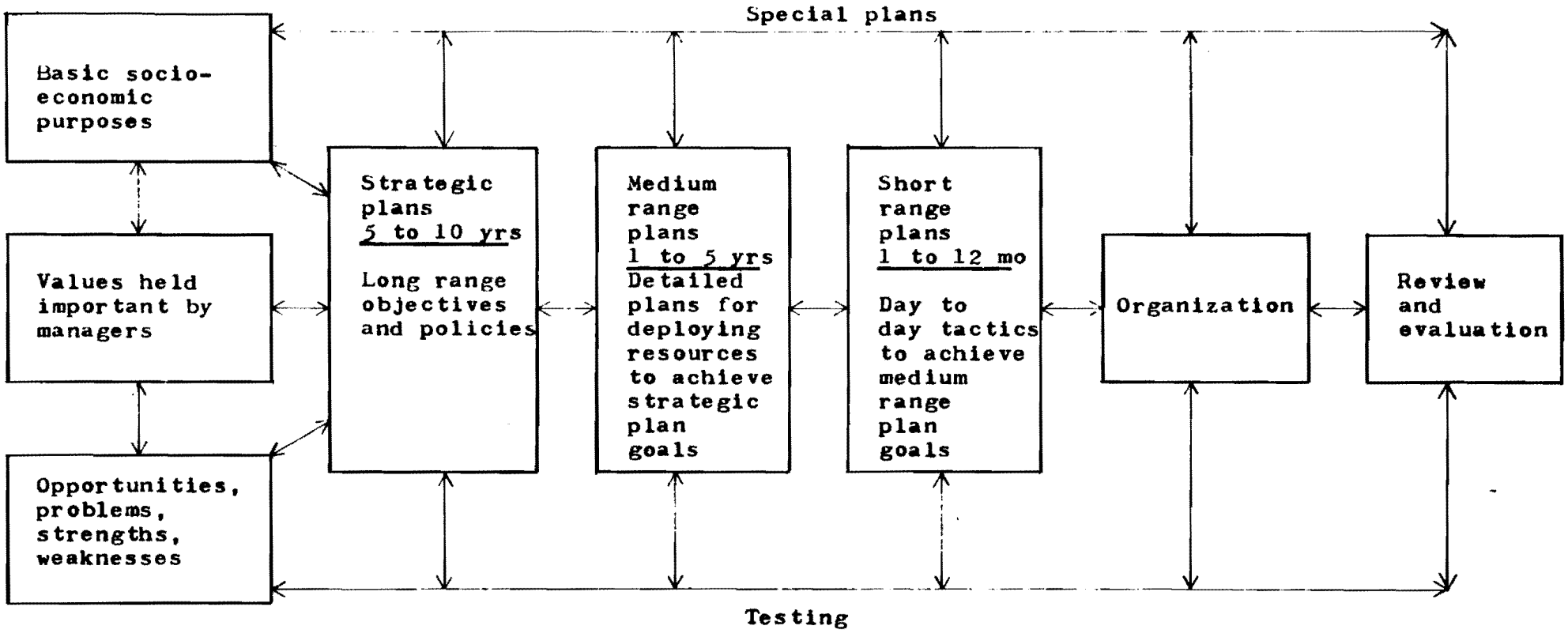
The Role of the Estimate & the Proposal

5. Factors making up a construction index include: (Continued)

   f. Labor costs
   g. Labor efficiency
   h. Labor availability
   i. Trade contract expiration dates
   j. Prevalence of union trades
   k. Type of construction to be used

A SIMPLIFIED MODEL OF ANY BUSINESS

Adapted from George A. Steiner..Top Management Planning



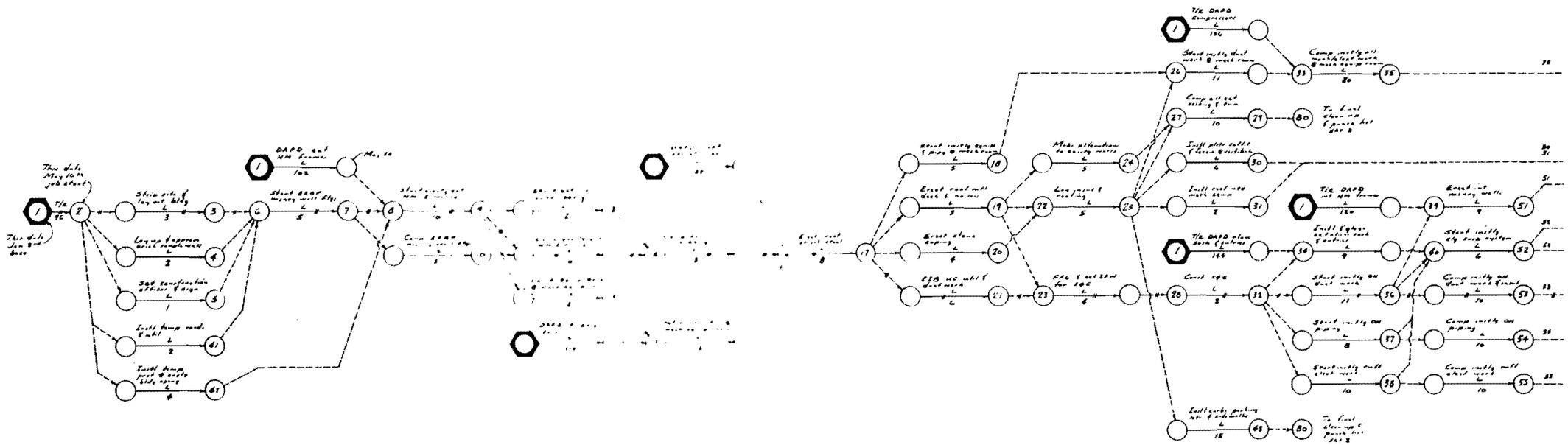
THESE ARE THE PREMISES FROM WHICH YOUR BUSINESS DERIVES ITS CHARACTER

THESE ARE THE PLANS WHICH SHOW HOW RESOURCES, TACTICS AND STRATEGY ARE USED TO ACHIEVE YOUR BUSINESS OBJECTIVES

THESE ARE THE IMPLEMENTATION AND REVIEW METHODS THAT TRANSLATE YOUR PLANS INTO ACTION

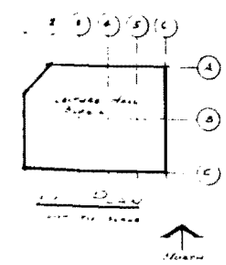
RALPH J. STEPHENSON
CONSULTING ENGINEER

AGCD
1/21/70



ABBREVIATIONS

ALUM	ALUMINUM
BKFLG	BACK FILLING
CLG	CEILING
COMP/RO	COMPLETE
DAPD	DETAIL, APPROVE, FABRICATE & DELIVER
EF	EARLIEST POSSIBLE FINISH TIME
EFRP	ELEVATE FORM, REINFORCE & POUR
EIG	ELEVATE, INSTALL & BACKFILL
ELECT	ELECTRICAL
EQUIP	EQUIPMENT
ERECTG	ERECTING
ES	EARLIEST POSSIBLE STARTING TIME
EXT	EXTERIOR
FIN	FINISH
FIXT	FIXTURE
FTGS	FOOTINGS
HM	HOLLOW METAL
INSTLG	INSTALLING
INSUL	INSULATION
INT	INTERIOR
JC	JANITOR CLOSET
LF	LATEST ALLOWABLE FINISH TIME
LS	LATEST ALLOWABLE STARTING TIME
MECH	MECHANICAL
MISC	MISCELLANEOUS
MSNRY	MASONRY
MTD	MOUNTED
MTL	METAL
OH	OVERHEAD
PARTNS	PARTITIONS
PIPG	PIPING
PL	PLATES
PLATE	PLASTER
PLUMBG	PLUMBING
REQD	REQUIRED
RESIL	RESILIENT
RUBR	RUBBER
SBG	SLAB ON GROUND
STRUCT	STRUCTURAL
SUSP	SUSPENSION
TOT	TOTAL FLOAT TIME
TOL	TOILET ROOM
TIR	TIME RESTRAINT
UG	UNDER GROUND
UTIL	UTILITIES



MONITORING RECORD

DATE	DATE	DATE

ISSUE RECORD

ISSUE #	DATE
1	MAY 10

RESERVED NODE NOS.

44	46
45	47
47	48
48	49
49	50

HN 55

PROJECT 66-4

NETWORK PLAN FOR LAKE CITY COMMUNITY COLLEGE · LECTURE HALL

LAKE CITY

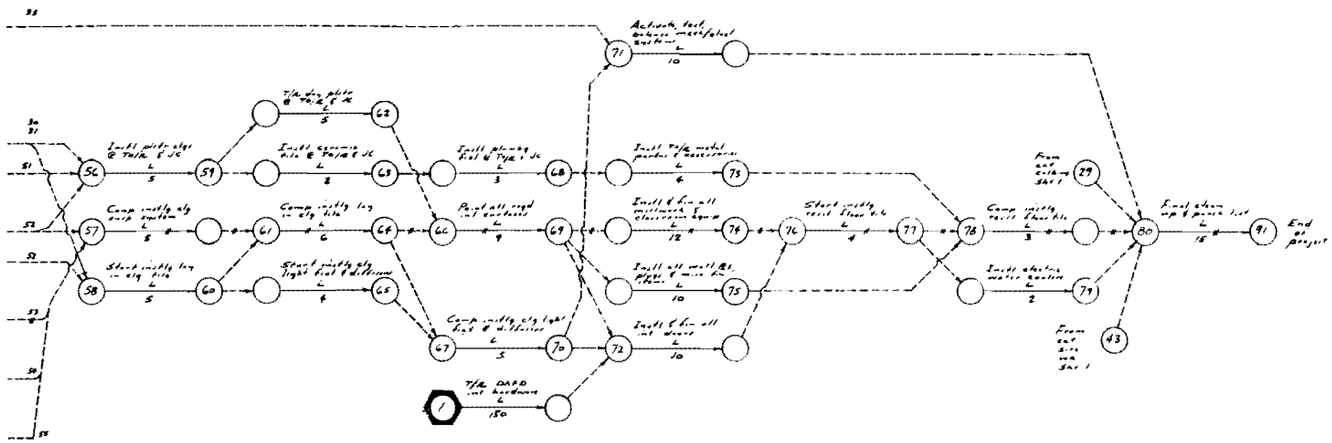
STRONG CONSTRUCTION CO.
LAKE CITY
GENERAL CONTRACTORS

RALPH J. STEPHENSON PE
CONSULTANT

MAY 10

1

Model Line



Monitoring Record			Issue Record	
Date	Date	Date	Issue #	Date
			1	MAY 10

Reserved Node Nos

81	94
82	87
83	88
84	89
85	90

MAY 91

Project 66:4

Network Plan for Lake City Community College - Lecture Hall

Lake City

Strong Construction Co
Lake City
General Contractors

Ralph J Stephenson PE
Consultant

MAY '91

2

WORKING DAY CALENDAR STARTING JANUARY 2, 1970

R J STEPHENSON, P.E.

LAST DIGIT IS YEAR 0 = 1970 1 = 1971

--DAYS-->	1	2	3	4	5	6	7	8	9	10
1 -10	1020	1050	1060	1070	1080	1090	1120	1130	1140	1150
11 -20	1160	1190	1200	1210	1220	1230	1260	1270	1280	1290
21 -30	1300	2020	2030	2040	2050	2060	2090	2100	2110	2120
31 -40	2130	2160	2170	2180	2190	2200	2230	2240	2250	2260
41 -50	2270	3020	3030	3040	3050	3060	3090	3100	3110	3120
51 -60	3130	3160	3170	3180	3190	3200	3230	3240	3250	3260
61 -70	3270	3300	3310	4010	4020	4030	4060	4070	4080	4090
71 -80	4100	4130	4140	4150	4160	4170	4200	4210	4220	4230
81 -90	4240	4270	4280	4290	4300	5010	5040	5050	5060	5070
91-100	5080	5110	5120	5130	5140	5150	5180	5190	5200	5210
101-110	5220	5250	5260	5270	5280	6010	6020	6030	6040	6050
111-120	6080	6090	6100	6110	6120	6150	6160	6170	6180	6190
121-130	6220	6230	6240	6250	6260	6290	6300	7010	7020	7060
131-140	7070	7080	7090	7100	7130	7140	7150	7160	7170	7200
141-150	7210	7220	7230	7240	7270	7280	7290	7300	7310	8030
151-160	8040	8050	8060	8070	8100	8110	8120	8130	8140	8170
161-170	8180	8190	8200	8210	8240	8250	8260	8270	8280	8310
171-180	9010	9020	9030	9040	9080	9090	9100	9110	9140	9150
181-190	9160	9170	9180	9210	9220	9230	9240	9250	9280	9290
191-200	9300	10010	10020	10050	10060	10070	10080	10090	10120	10130
201-210	10140	10150	10160	10190	10200	10210	10220	10230	10260	10270
11-220	10280	10290	10300	11020	11030	11040	11050	11060	11090	11100
221-230	11110	11120	11130	11160	11170	11180	11190	11200	11230	11240
231-240	11250	11270	11300	12010	12020	12030	12040	12070	12080	12090
241-250	12100	12110	12140	12150	12160	12170	12180	12210	12220	12230
251-260	12240	12280	12290	12300	12310	1041	1051	1061	1071	1081
261-270	1111	1121	1131	1141	1151	1181	1191	1201	1211	1221
271-280	1251	1261	1271	1281	1291	2011	2021	2031	2041	2051
281-290	2081	2091	2101	2111	2121	2151	2161	2171	2181	2191
291-300	2221	2231	2241	2251	2261	3011	3021	3031	3041	3051
301-310	3081	3091	3101	3111	3121	3151	3161	3171	3181	3191
311-320	3221	3231	3241	3251	3261	3291	3301	3311	4011	4021
321-330	4051	4061	4071	4081	4091	4121	4131	4141	4151	4161
331-340	4191	4201	4211	4221	4231	4261	4271	4281	4291	4301
341-350	5031	5041	5051	5061	5071	5101	5111	5121	5131	5141
351-360	5171	5181	5191	5201	5211	5241	5251	5261	5271	5281
361-370	6011	6021	6031	6041	6071	6081	6091	6101	6111	6141
371-380	6151	6161	6171	6181	6211	6221	6231	6241	6251	6281
381-390	6291	6301	7011	7021	7061	7071	7081	7091	7121	7131
391-400	7141	7151	7161	7191	7201	7211	7221	7231	7261	7271
401-410	7281	7291	7301	8021	8031	8041	8051	8061	8091	8101
411-420	8111	8121	8131	8161	8171	8181	8191	8201	8231	8241
421-430	8251	8261	8271	8301	8311	9011	9021	9031	9071	9081
431-440	9091	9101	9131	9141	9151	9161	9171	9201	9211	9221
441-450	9231	9241	9271	9281	9291	9301	10011	10041	10051	10061
451-460	10071	10081	10111	10121	10131	10141	10151	10181	10191	10201
61-470	10211	10221	10251	10261	10271	10281	10291	11011	11021	11031
71-480	11041	11051	11081	11091	11101	11111	11121	11151	11161	11171
481-490	11181	11191	11221	11231	11241	11261	11291	11301	12011	12021
491-500	12031	12061	12071	12081	12091	12101	12131	12141	12151	12161
501-510	12171	12201	12211	12221	12231	12271	12281	12291	12301	

RALPH J. STEPHENSON, P.E.
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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.

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

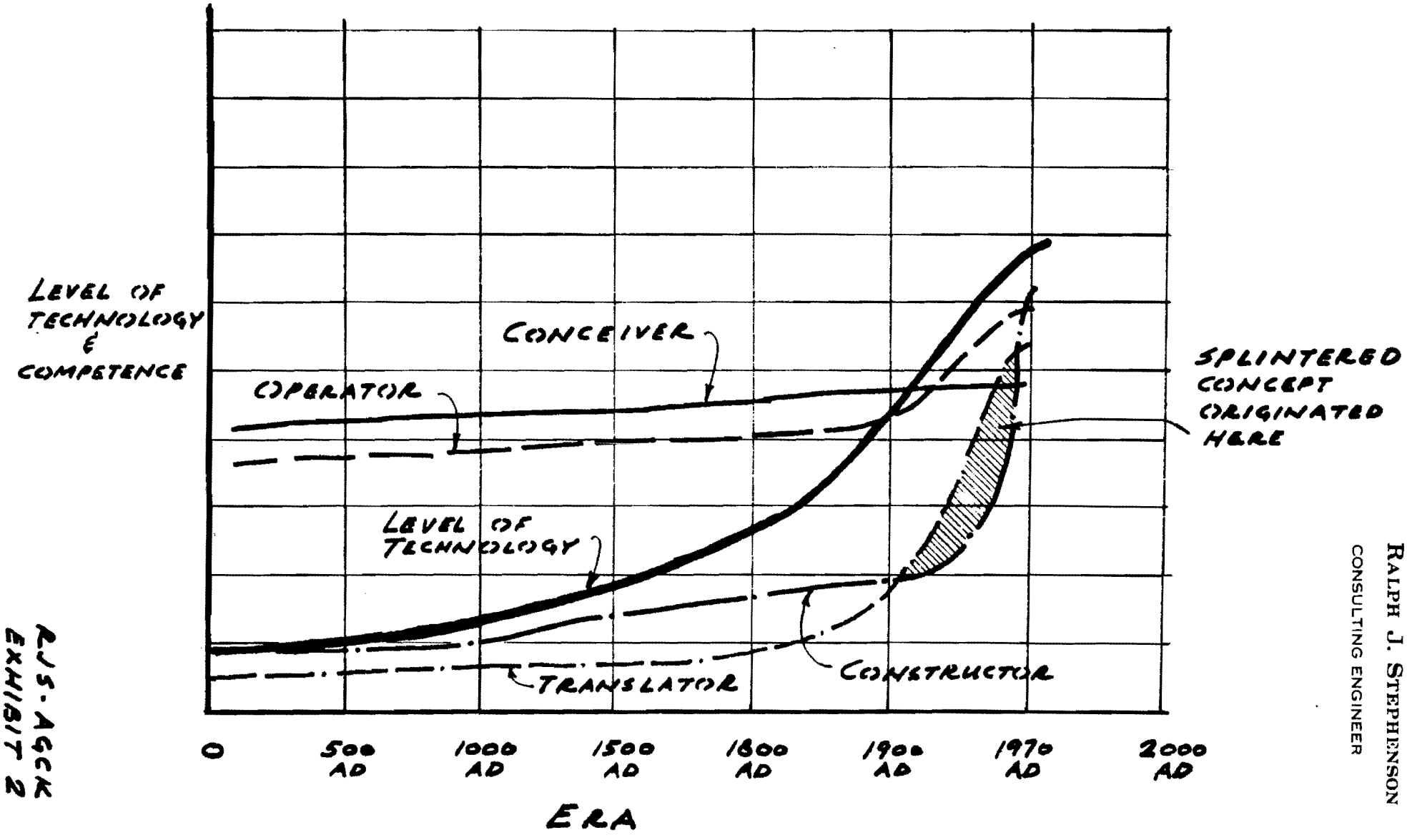
The LF sequence lists all tasks in ascending order of their latest allowable finish dates. This list is used the same as the late start list but by applying the procedure to the late finish column.

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.

LEVEL OF TECHNOLOGY



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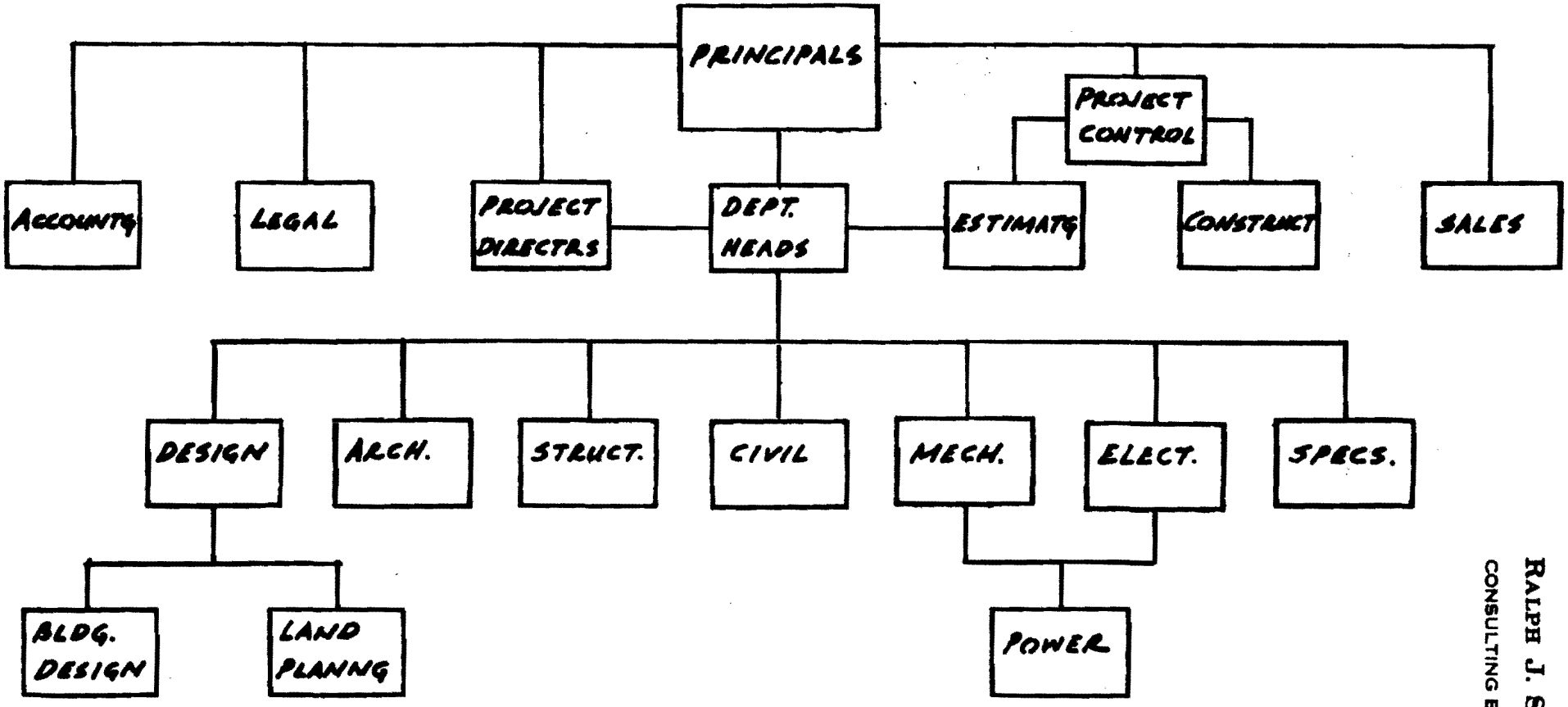
RJS-AGCK
EXHIBIT 2

6F

FUNCTIONAL ORGANIZATION OF A MODERATE SIZE ARCHITECTURAL ENGINEERING (A/E) FIRM



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BUS-ARCH EXHIBIT G

RALPH J. STEPHENSON

Consulting Engineer

Characteristics of a Contract

A. Quality of Arrangements Possible

1. Negotiated - value competition only
2. Qualified - limited multiple - value competition possible
3. Unqualified - single value competition demanded

B. Services & Materials Provided

1. Provide all labor, material and management
2. Provide some labor, material and management
3. Provide management only
4. Provide material only
5. Provide labor only

→ a. Limited trades
→ b. All trades

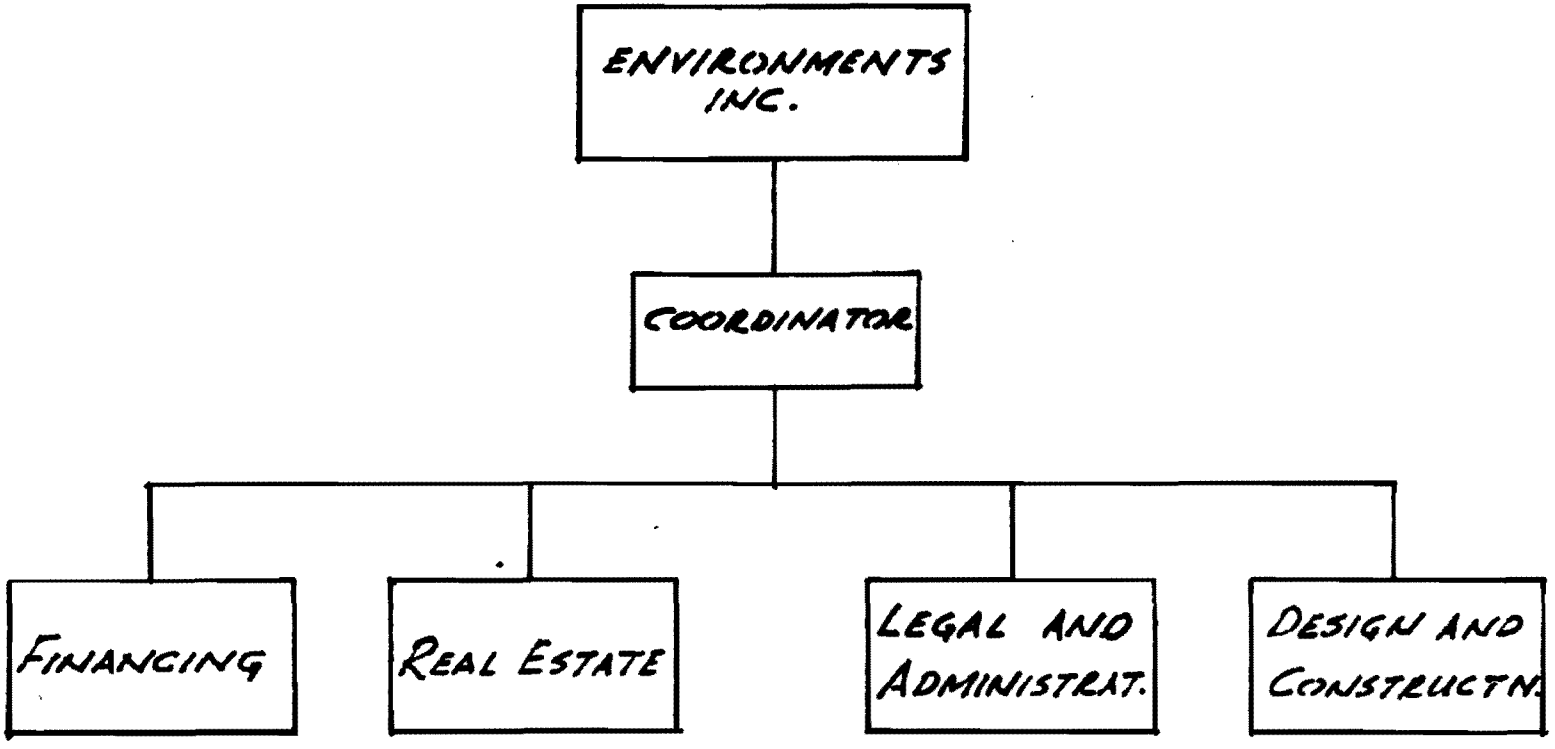
C. Type of Contract Possible

1. Fixed cost - limited trades
2. Fixed cost - all trades
3. Fixed cost - limited trades plus fee for other trades management
4. Time and material plus fee - limited trades
5. Time and material plus fee - all trades

→ a. With upset price
→ b. With upset price and shared saving
→ c. With no upset price

RJS - AGCK
Exhibit 3

PROJECT ?



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R/S. AGCK
EXHIBIT 7

R J STEPHENSON,P.E. 2-YR WORKING DAY CALENDAR STARTING JAN. 4, 1971 PAGE 1

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
JAN 1971		26	40	22	79	17	118	12	157	07	196	02	235
04	1	MAR		23	80	18	119	13	158	08	197	03	236
05	2	01	41	26	81	21	120	16	159	11	198	06	237
06	3	02	42	27	82	22	121	17	160	12	199	07	238
07	4	03	43	28	83	23	122	18	161	13	200	08	239
08	5	04	44	29	84	24	123	19	162	14	201	09	240
11	6	05	45	30	85	25	124	20	163	15	202	10	241
12	7	08	46	MAY		28	125	23	164	18	203	13	242
13	8	09	47	03	86	29	126	24	165	19	204	14	243
14	9	10	48	04	87	30	127	25	166	20	205	15	244
15	10	11	49	05	88	JLY		26	167	21	206	16	245
18	11	12	50	06	89	01	128	27	168	22	207	17	246
19	12	15	51	07	90	02	129	30	169	25	208	20	247
20	13	16	52	10	91	06	130	31	170	26	209	21	248
21	14	17	53	11	92	07	131	SEP		27	210	22	249
22	15	18	54	12	93	08	132	01	171	28	211	23	250
25	16	19	55	13	94	09	133	02	172	29	212	27	251
26	17	22	56	14	95	12	134	03	173	NOV		28	252
27	18	23	57	17	96	13	135	07	174	01	213	29	253
28	19	24	58	18	97	14	136	08	175	02	214	30	254
29	20	25	59	19	98	15	137	09	176	03	215	JAN 1972	
8		26	60	20	99	16	138	10	177	04	216	03	255
01	21	29	61	21	100	19	139	13	178	05	217	04	256
02	22	30	62	24	101	20	140	14	179	08	218	05	257
03	23	31	63	25	102	21	141	15	180	09	219	06	258
04	24	APR		26	103	22	142	16	181	10	220	07	259
05	25	01	64	27	104	23	143	17	182	11	221	10	260
08	26	02	65	28	105	26	144	20	183	12	222	11	261
09	27	05	66	JNE		27	145	21	184	15	223	12	262
10	28	06	67	01	106	28	146	22	185	16	224	13	263
11	29	07	68	02	107	29	147	23	186	17	225	14	264
12	30	08	69	03	108	30	148	24	187	18	226	17	265
15	31	09	70	04	109	AUG		27	188	19	227	18	266
16	32	12	71	07	110	02	149	28	189	22	228	19	267
17	33	13	72	08	111	03	150	29	190	23	229	20	268
18	34	14	73	09	112	04	151	30	191	24	230	21	269
19	35	15	74	10	113	05	152	OCT		26	231	24	270
22	36	16	75	11	114	06	153	01	192	29	232	25	271
23	37	19	76	14	115	09	154	04	193	30	233	26	272
24	38	20	77	15	116	10	155	05	194	DEC		27	273
25	39	21	78	16	117	11	156	06	195	01	234	28	274

J STEPHENSON•P•E• 2-YR WORKING DAY CALENDAR STARTING JAN• 4• 1971 PAGE

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/
JAN 31	275		24	314		18	353		14	392		08	431		02	470		
FEB 1972			27	315		19	354		17	393		11	432		03	471		
	01	276		28	316		22	355		18	394		12	433		06	472		
	02	277		29	317		23	356		19	395		13	434		07	473		
	03	278		30	318		24	357		20	396		14	435		08	474		
	04	279		31	319		25	358		21	397		15	436		09	475		
	07	280	APR				26	359		24	398		18	437		10	476		
	08	281		03	320		30	360		25	399		19	438		13	477		
	09	282		04	321		31	361		26	400		20	439		14	478		
	10	283		05	322	JNE				27	401		21	440		15	479		
	11	284		06	323		01	362		28	402		22	441		16	480		
	14	285		07	324		02	363		31	403		25	442		17	481		
	15	286		10	325		05	364	AUG				26	443		20	482		
	16	287		11	326		06	365		01	404		27	444		21	483		
	17	288		12	327		07	366		02	405		28	445		22	484		
	18	289		13	328		08	367		03	406		29	446		24	485		
	21	290		14	329		09	368		04	407	OCT				27	486		
	22	291		17	330		12	369		07	408		02	447		28	487		
	23	292		18	331		13	370		08	409		03	448		29	488		
	24	293		19	332		14	371		09	410		04	449		30	489		
	25	294		20	333		15	372		10	411		05	450	DEC	1972		
	28	295		21	334		16	373		11	412		06	451		01	490		
	29	296		24	335		19	374		14	413		09	452		04	491		
MAR				25	336		20	375		15	414		10	453		05	492		
	01	297		26	337		21	376		16	415		11	454		06	493		
	02	298		27	338		22	377		17	416		12	455		07	494		
	03	299		28	339		23	378		18	417		13	456		08	495		
	06	300	MAY				26	379		21	418		16	457		11	496		
	07	301		01	340		27	380		22	419		17	458		12	497		
	08	302		02	341		28	381		23	420		18	459		13	498		
	09	303		03	342		29	382		24	421		19	460		14	499		
	10	304		04	343		30	383		25	422		20	461		15	500		
	13	305		05	344	JLY				28	423		23	462		18	501		
	14	306		08	345		03	384		29	424		24	463		19	502		
	15	307		09	346		05	385		30	425		25	464		20	503		
	16	308		10	347		06	386		31	426		26	465		21	504		
	17	309		11	348		07	387	SEP				27	466		22	505		
	20	310		12	349		10	388		01	427		30	467		26	506		
	21	311		15	350		11	389		05	428		31	468		27	507		
	22	312		16	351		12	390		06	429	NOV				28	508		
	23	313		17	352		13	391		07	430		01	469		29	509		

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

QUESTIONS OF HELP IN SETTING OBJECTIVES FOR BUSINESS MODEL

1. What business are we in?
2. What is our principal product or service?
3. What market do we serve?
4. What common qualities define our customers?
5. What is our predominant image with clients?
6. What is our major competitive edge over others in our business?
7. Where are we at a disadvantage in comparison to our competitors?
8. What business do we want to be in 5 years from now?
9. What major changes will we need to make to get there?
10. What is our present return on investment?
11. What return on investment is reasonable for persons in our kind of business?
12. What share of market do we now have?
13. What share of market do we want next month? Next year?
14. What is the major strength of our organization? How are we using it?
15. What is our major organizational weakness?
16. How can we solve it?
17. What are our specific goals for profit improvement?
18. In what ways do our personnel policies chafe our employees?
19. To what degree can we count on our key people?
20. How can we finance growth?

The above are habit forming questions designed to <u>force</u> you to look ahead.

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

Questions of help in making the business model -

1. What business am I in?
2. What is my place in the industry?
3. What customers am I serving?
4. Where is my market?
5. What is my company image to my customers?
6. What business do I want to be in 5 years from now?
7. What are my specific goals for profit improvement?
8. ~~Need I have~~ What plans for product improvement? do I need
9. If so, what?
10. What is my greatest strength?
11. Am I using it well?
12. What is my greatest problem?
13. How am I to solve it?
14. What share of the market do I want? Next month? Next year?
15. Are my personnel policies acceptable to employees? In what ways? Where ~~are they~~ do they check
16. How can I finance growth?

These are habit forming questions designed to force you to look ahead.

do not mail this

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

2-YR WORKING-DAY CALENDAR STARTING JAN. 3, 1972

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DTE	W/D
JAN 1972		FEB 25	40	APR 20	79	JNE 15	118	AUG 10	157	OCT 05	196	DEC	
03	1	28	41	21	80	16	119	11	158	06	197	01	236
04	2	29	42	24	81	19	120	14	159	09	198	04	237
05	3	MAR		25	82	20	121	15	160	10	199	05	238
06	4	01	43	26	83	21	122	16	161	11	200	06	239
07	5	02	44	27	84	22	123	17	162	12	201	07	240
10	6	03	45	28	85	23	124	18	163	13	202	08	241
11	7	06	46	MAY		26	125	21	164	16	203	11	242
12	8	07	47	01	86	27	126	22	165	17	204	12	243
13	9	08	48	02	87	28	127	23	166	18	205	13	244
14	10	09	49	03	88	29	128	24	167	19	206	14	245
17	11	10	50	04	89	30	129	25	168	20	207	15	246
18	12	13	51	05	90	JLY		28	169	23	208	18	247
19	13	14	52	08	91	03	130	29	170	24	209	19	248
20	14	15	53	09	92	05	131	30	171	25	210	20	249
21	15	16	54	10	93	06	132	31	172	26	211	21	250
24	16	17	55	11	94	07	133	SEP		27	212	22	251
25	17	20	56	12	95	10	134	01	173	30	213	26	252
26	18	21	57	15	96	11	135	05	174	31	214	27	253
27	19	22	58	16	97	12	136	06	175	NOV		28	254
28	20	23	59	17	98	13	137	07	176	01	215	29	255
31	21	24	60	18	99	14	138	08	177	02	216	JAN 1973	
FEB		27	61	19	100	17	139	11	178	03	217	02	256
01	22	28	62	22	101	18	140	12	179	06	218	03	257
02	23	29	63	23	102	19	141	13	180	07	219	04	258
03	24	30	64	24	103	20	142	14	181	08	220	05	259
04	25	31	65	25	104	21	143	15	182	09	221	08	260
07	26	APR		26	105	24	144	18	183	10	222	09	261
08	27	03	66	30	106	25	145	19	184	13	223	10	262
09	28	04	67	31	107	26	146	20	185	14	224	11	263
10	29	05	68	JNE		27	147	21	186	15	225	12	264
11	30	06	69	01	108	28	148	22	187	16	226	15	265
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15	32	10	71	05	110	AUG		26	189	20	228	17	267
16	33	11	72	06	111	01	150	27	190	21	229	18	268
17	34	12	73	07	112	02	151	28	191	22	230	19	269
18	35	13	74	08	113	03	152	29	192	24	231	22	270
21	36	14	75	09	114	04	153	OCT		27	232	23	271
22	37	17	76	12	115	07	154	02	193	28	233	24	272
23	38	18	77	13	116	08	155	03	194	29	234	25	273
24	39	19	78	14	117	09	156	04	195	30	235	26	274

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

2-YR WORKING-DAY CALENDAR STARTING JAN. 3, 1972

DATE	W/D
1973	
JAN. 29	275
30	276
31	277
FEB	
01	278
02	279
05	280
06	281
07	282
08	283
09	284
12	285
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15	308
16	309
19	310
20	311
21	312
22	313
MAR	23 314
	26 315
	27 316
	28 317
	29 318
	30 319
APR	
	02 320
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	25 337
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	01 341
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	04 344
	07 345
	08 346
	09 347
	10 348
	11 349
	14 350
	15 351
	16 352
MAY	17 353
	18 354
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	22 356
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	30 361
	31 362
JNE	
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	04 364
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	26 380
	27 381
	28 382
	29 383
JLY	
	02 384
	03 385
	05 386
	06 387
	09 388
	10 389
	11 390
	12 391
JLY	13 392
	16 393
	17 394
	18 395
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	23 398
	24 399
	25 400
	26 401
	27 402
	30 403
	31 404
AUG	
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	07 409
	08 410
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	30 426
	31 427
SEP	
	04 428
	05 429
	06 430
SEP	07 431
	10 432
	11 433
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	27 445
	28 446
OCT	
	01 447
	02 448
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	17 459
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	24 464
	25 465
	26 466
	29 467
	30 468
	31 469
NOV	
NOV	01 470
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	05 472
	06 473
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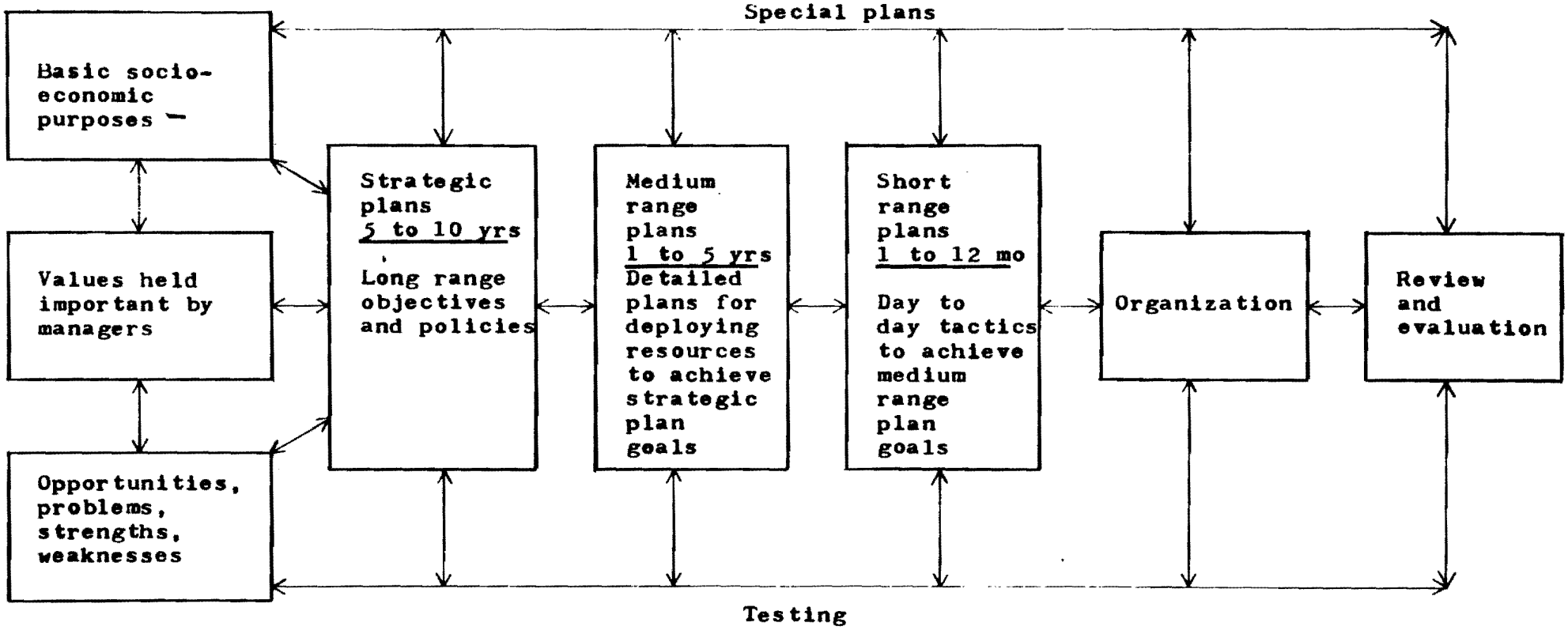
	20 504
	21 505
	24 506
	26 507
	27 508
	28 509
DTE	W/D
DEC 31	510

A SIMPLIFIED MODEL OF ANY BUSINESS

Adapted from George A. Steiner..Top Management Planning



THESE ARE THE PREMISES FROM WHICH YOUR BUSINESS DERIVES ITS CHARACTER

THESE ARE THE PLANS WHICH SHOW HOW RESOURCES, TACTICS AND STRATEGY ARE USED TO ACHIEVE YOUR BUSINESS OBJECTIVES

THESE ARE THE IMPLEMENTATION AND REVIEW METHODS THAT TRANSLATE YOUR PLANS INTO ACTION

RALPH J. STEPHENSON
CONSULTING ENGINEER

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THE BUSINESS MODEL - TYPICAL ELEMENTS

When constructing a business model confusion often arises as to the method of statement and degree of explicitness in stating premises, plans and objectives. The sample statements below are guides to formulating an approach to the construction of a business model. These statements are intended to provide a pattern by which you can be specific about the characteristics of your business.

1. Premises

The basic premises upon which your business is built determine its character. These consist of three major classifications - basic socio-economic purposes, value systems of your employees and managers, and the opportunities, problems, strengths and weaknesses of the organization. Examples of how each might be stated are given below.

a) Basic socio-economic purposes

- to practice contributive design and construction in such fashion as to serve the public, health, welfare and safety, be of value to our clients and provide our company staff a sense of worth and accomplishment.

- to design and construct competently so the extra value return on excellent work will accrue to the employees.

Socio-economic purpose statements should reflect the obligation that your company has to society and the corresponding return on this investment you expect from society. They state your justification for remaining in business.

b) Values held important by employees and managers

The values displayed by individuals in any company paint a picture of that organization's attitudes. What the employee or manager considers of high value will ultimately reflect itself in an appreciation of that same trait in those with whom he must deal. Typical values that may be exhibited and are to be noted in this section of the model include:

- Pride of workmanship
- Belief in generating positive values in others
- Mutual internal trust
- Strong desire for contributive social career
- Highly money oriented
- Work of firm low on action priority list
- Belief in straightforward, honest buying procedures
- Retaliatory

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The overall statement of values collected by analyzing each key person in the company often paints an excellent collective picture of the total firm value structure.

c) Opportunities, problems, strengths and weaknesses

Occasionally confusion exists about the differences in opportunities and strengths as well as in problems and weaknesses. Opportunities represent the chance to convert a prospect into a client, the chance to make a good return on a real estate investment, the possibility, by a few extra hours at work, of meeting a specially good prospect. Strengths are those characteristics inherent within the company and individuals in the company that allow good opportunities to become profitable realities.

Problems and weaknesses have the same relationship. Problems are those specific occurrences or sometimes lack of occurrences that are causing trouble. They may include excessive warehouse pilferage, too many one-project clients or excessively high sub contract costs. The weaknesses concern characteristics of the company and individuals in approaching these problems and solving them. As with strengths, weaknesses are inherent in the company.

Strengths and weaknesses must be amplified or corrected by working with the individuals concerned. Opportunities and problems are handled best by utilizing the strengths possessed by the organization. Examples of each follow:

- Opportunities
  - Can purchase sizable real estate acreage inexpensively
  - Have ready pool of graduate engineers from local college
  - Have market control over high demand project
- Strengths
  - Excellent financing know how available
  - Good staff understanding of design/build estimating
  - Excellent training and education program
  - Good presentation techniques
- Problems
  - Inaccurate estimating
  - Construction supervision inadequately trained
  - Poor middle management structure
- Weaknesses
  - Lack of leadership in construction division
  - Accounting department's judgment faulty

- Weaknesses (Cont.)

  - Board of directors unresponsive to construction company needs
  - Experience limited, staff able to build only small steel framed buildings
  - Excessive paternalism at top management levels
  - Over-dependency upon company president

2. Plans and Objectives

Plans and objectives are divided basically into three types - strategic plans, covering a 5 to 10 year period in the future; medium range plans covering a 1 to 5 year period in the future; and short range or tactical plans covering from now to 12 months in the future. Typical plan statements might be as follows:

- Strategic plan objectives

  - to expand geographically by deliberate diversification and strengthening of related business activities. Geographic expansion should be in response to market place demand stimulated by institutional and response advertising. The market area should be increased in 10 years to an approximate radius of 300 miles from the home base office. The five to ten year plan should also anticipate expansion to a Canadian market in or near Toronto and to within a 50 mile radius of that metropolitan area.

  - to provide all personnel in the company a stock plan by which the employees' investment portfolios can be built of internally generated financial opportunities. In today's dollars the initial employee investment gift should range between $100 and $5,000 depending upon his position and responsibility. The investment opportunity should be one that returns him a yearly income at least equal to 5% of his basic salary. Investments should be financed jointly by the employee and the company.

- Medium range plans

  - to generate a series of held organizations performing the functions of real estate, acquisition and sales, financing of industrial properties, and holding and developing of commercial and industrial properties. These organizations should be separate companies with majority stock control held by the parent firm's management. Held company management should be autonomous.

  - to expand geographic operations to a radius of 150 miles from the home base operation. This demands a planned sales effort to penetrate the market and generate level 1 selling prospects. Sales force upgrading and additions will be necessary for this penetration.

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- Short range plans

  - to initiate a comprehensive and immediate study and analysis of investment opportunities based upon present worth position. This should include real estate for industrial development, real estate for commercial development, real estate for residential development, financing of construction by syndication, and manufacture of all wood and flexible plastic products used in our basic construction methods.

  - to completely evaluate and revise the present estimating system from a trade orientation to a task orientation. This, to conform to our recently adopted scheduling and cash flow techniques.

  - to retain one architect and one mechanical/electrical engineer on the in-house staff to better provide design and build services.

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June 14, 1972

Subject: Monitoring Report #1

Lake City Community College Lecture Hall

Project: 66:4

Date of Monitoring: June 3, 1972 (working day 110)

Actions taken:

- Inspected project
- Reviewed general progress with Mr. Carl Franklin, superintendent
- Color coded field networks
- Evaluated job progress

During early stages of the Lake City project, monitorings will be made every other week. Frequency will vary later as additional trades are brought on the job and progress smooths out. Copies of monitoring reports will be sent to Mr. Carl Franklin, job superintendent, Mr. William Litt, project manager for the contractor and Mr. Joseph Rindquist, Director of Physical Plant for the college.

As of June 3 (working day 110) the project is in fair condition with major building work meeting early start/early finish dates. Presently the building has been laid out, wall footings are 90% complete, and erection of hollow metal and exterior masonry is well in work. Expediting on hollow metal was good, with delivery to the job site May 20th, well in time for start of exterior masonry. Other projected deliveries appear currently in line with early finish/late finish target dates.

One item that lags is installation of temporary roads and utilities. This task was due for a late finish of May 18 (working day 100). Presently it is expected to finish on June 6 (working day 112), giving a projected lag of approximately 12 working days. The task was inserted in its present position in the logic plan to allow easy delivery of heavy brick loads. To date the weather has been relatively dry and deliveries have been no problem. However, if the weather turns wet, the delayed road installation can be serious. Reason for the delay was that the owner was unable to move stockpiled athletic field bleachers as promised on May 16th. These were moved on May 25th (working day 104).

Reviewing items to start, continue or be completed in the next two weeks, we find the following, read from the late start and late finish sequences:

- Complete, excavate, form, reinforce and pour masonry wall footings

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- Continue erect hollow metal and exterior masonry
- Complete temporary roads and utilities
- Expedite delivery of roof structural steel
- Expedite delivery of supply fan at mechanical room
- Continue buying out and expediting all long lead time items

Overall, the project is moving well with several critical points coming up within the next two weeks to a month. The most important of these at present is to insure structural steel is delivered by June 29 (working day 128). Erection of steel is critical and unlocks all succeeding work.

Ralph J. Stephenson, P.E.

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To: Mr. Carl Franklin
Mr. William Litt
Mr. Joseph Rindquist

/ NETWORK LISTING

NETWORK MODEL FOR LAKE CITY

R. J. STEPHENSON P.E. CONSULTANT
DATES ARE SHOWN AS MONTH.DAY.YR CP IN TFT COL INDICATES CRITICAL ITEM

ISSUE NO. 1 MAY 10
DWGS ISSUED 1,2

I ND	J ND	JOB DUR	COST	LOC	JOB DESCRIPTION	NODE SEQUENCE EARLY START	LATE START	EARLY FINSH	LAUE FINSH	TTL FLT
1	2	96	0		T/R	1032	1032	5152	5152	CP
1	8	102	2000	LA	DAFD EXT HM FRAMES	1032	1052	5232	5252	2
1	15	110	4000	LM	DAFD SUPPLY FAN	1032	1242	6052	6262	15
1	16	125	11500	LA	DAFD RF STRUCT STEEL	1032	1052	6262	6282	2
1	33	136	6000	LM	T/R DAFD COMPRESSORS	1032	2292	7122	9082	41
1	34	144	2100	LA	T/R DAFD ALUM SASH & ENTRIES	1032	1142	7242	8042	9
1	39	120	2000	LA	T/R DAFD INT HM FRAMES	1032	2282	6192	8152	40
1	72	150	1200	LA	T/R DAFD INT HARDWARE	1032	2282	8012	9272	40
2	3	3	6500	LA	STRIP SITE & LAYOUT BLDG	5162	5162	5182	5182	CP
2	4	2	200	LA	LAY UP & AP BRK SAMPLE WLL	5162	5172	5172	5182	1
2	5	1	500	LA	SET CONSTRUCTION OFC & SIGN	5162	5182	5162	5182	2
2	41	2	700	LA	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
2	41	2	2000	LM	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
2	41	2	1500	LE	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
2	42	4	400	LA	INSTL TEMP PROT EXTG BLDG OP	5162	5222	5192	5252	4
3	6	0	0		D	5192	5192	5182	5182	CP
4	6	0	0		D	5182	5192	5172	5182	1
5	6	0	0		D	5172	5192	5162	5182	2
6	7	5	2500	LA	ST EFRP MSNRY WLL FTGS	5192	5192	5252	5252	CP
7	8	0	0		D	5262	5262	5252	5252	CP
7	10	5	2500	LA	COMP EFRP MSNRY WLL FTGS	5262	6052	6022	6092	5
8	9	10	8000	LA	ST ERECTG EXT HM & MSNRY	5262	5262	6092	6092	CP
9	11	0	0		D	6122	6122	6092	6092	CP
9	12	2	400	LA	ST EXT/INT RUFF BKFLG	6122	6222	6132	6232	8
9	13	2	650	LA	CONSTR EQPT BASES/MECH ROOM	6122	6232	6132	6262	9
10	11	0	0		D	6052	6122	6022	6092	5
11	14	10	8000	LA	C ERECTG EXT HM & MSNRY	6122	6122	6232	6232	CP
12	14	0	0		D	6142	6262	6132	6232	8
13	15	0	0		D	6142	6272	6132	6262	9
14	16	3	400	LA	C EXT/INT RUFF BKFLG	6262	6262	6282	6282	CP
15	16	2	1200	LM	SET SUPPLY FAN MECH EQUIP RM	6142	6272	6152	6282	9
16	17	8	12500	LA	ER RF STRUCT STEEL	6292	6292	7112	7112	CP
17	18	5	6100	LM	ST INSTLG EQUIP&PIPG MECH RM	7122	8172	7182	8232	26
17	19	3	9500	LA	ER RF MTL DK & NAILERS	7122	7172	7142	7192	3
17	20	4	1200	LA	ER STONE COPING	7122	8072	7172	8102	18
17	21	6	5500	LM	EIB UG UTIL & DUCT WORK	7122	7122	7192	7192	CP
18	26	0	0		D	7192	8242	7182	8232	26
19	22	0	0		D	7172	8112	7142	8102	19
19	23	0	0		D	7172	7202	7142	7192	3
19	24	5	1380	LA	MAKE ALT TO EXISTG WLLS	7172	10022	7212	10062	54
20	22	0	0		D	7182	8112	7172	8102	18
21	23	0	0		D	7202	7202	7192	7192	CP

I ND	J ND	JOB DUR	COST		JOB DESCRIPTION	EARLY START	LATE START	EARLY FINSH	LATE FINSH	TTL FLT
22	25		511000	LA	LAY INSUL & RFG	7182	8112	7242	8172	18
23	28	4	2500	LA	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
23	28	4	200	LM	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
23	28	4	2200	LE	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
24	27	0	0		D	7242	10092	7212	10062	54
25	26	0	0		D	7252	8242	7242	8232	22
25	27	0	0		D	7252	10092	7242	10062	53
25	30	6	2400	LA	INS PLSTR SFT & FASCIN VEST	7252	8182	8012	8252	18
25	31	2	7000	LM	INSTL RF MTD MECH EQUIP	7252	8242	7262	8252	22
25	43	15	2800	LA	INS CURBS PKG LOTS & SDWKS	7252	10022	8142	10202	48
26	33	11	1100	LM	ST INSTLG DUCT WK AT MECH RM	7252	8242	8082	9082	22
27	29	10	800	LA	C ALL EXT CALKING & TRIM	7252	10092	8072	10202	53
28	32	2	5400	LA	CONST SOG	7262	7262	7272	7272	CP
29	80	0	0		D	8082	10232	8072	10202	53
29	80	0	0		D	8082	10232	8072	10202	53
30	56	0	0		D	8022	8292	8012	8282	19
30	58	0	0		D	8022	8282	8012	8252	18
31	56	0	0		D	7272	8292	7262	8282	23
31	58	0	0		D	7272	8282	7262	8252	22
32	34	0	0		D	7282	8072	7272	8042	6
32	36	11	5100	LM	ST INSTLG OH DUCT WK	7282	7282	8112	8112	CP
32	37	8	3200	LM	ST INSTNG OH PIPING	7282	8022	8082	8112	3
32	38	10	2500	LE	ST INSTLG RUFF ELECT WK	7282	7312	8102	8112	1
33	35	20	4400	LM	C INS AL MH/EL WK MH EQUIP RM	8092	9112	9062	10062	22
33	35	20	4400	LE	C INS AL MH/EL WK MH EQUIP RM	8092	9112	9062	10062	22
34	40	9	2500	LA	INS & GLZ EXT ALUM SH & ENTRS	7282	8072	8092	8172	6
35	71	0	0		D	9072	10092	9062	10062	22
36	39	0	0		D	8142	8162	8112	8152	2
36	40	0	0		D	8142	8182	8112	8172	4
36	53	10	5000	LM	C INS OH DUCK WK & INSUL	8142	8142	8252	8252	CP
37	40	0	0		D	8092	8182	8082	8172	7
37	54	10	3300	LM	C INSTLG OH PIPING	8092	8142	8222	8252	3
38	40	0	0		D	8112	8182	8102	8172	5
38	55	10	3000	LE	C INSTLG RUFF ELECT WK	8112	8142	8242	8252	1
39	51	9	2600	LA	ER INT MSNRY WLLS	8142	8162	8242	8282	2
40	52	6	3500	LA	ST INSTLG CLG SUSP SYSTEM	8142	8182	8212	8252	4
41	6	0	0		D	5182	5192	5172	5182	1
42	8	0	0		D	5222	5262	5192	5252	4
43	80	0	0		D	8152	10232	8142	10202	48
43	80	0	0		D	8152	10232	8142	10202	48
51	56	0	0		D	8252	8292	8242	8282	2
52	56	0	0		D	8222	8292	8212	8282	5
52	57	0	0		D	8222	8282	8212	8252	4
52	58	0	0		D	8222	8282	8212	8252	4
53	57	0	0		D	8282	8282	8252	8252	CP
54	57	0	0		D	8232	8282	8222	8252	3
55	57	0	0		D	8252	8282	8242	8252	1
56	59	5	800	LA	INS PLSTR CLGS TO/R & JC	8252	8292	8312	9052	2
57	61	5	3500	LA	C INS CLG SUSP SYSTEM	8282	8282	9012	9012	CP
58	60	5	1200	LA	ST INSTLG LAY IN CLG TILE	8222	8282	8282	9012	4
59	62	5	200	LA	T/R DRY PLSTR TO/R & JC	9012	9062	9082	9122	2
59	63	2	1100	LA	INS CT TO/R & JC	9012	10052	9052	10062	23
60	61	0	0		D	8292	9052	8282	9012	4

I ND	J ND	JOB DUR	COST		JOB DESCRIPTION	EARLY START	LATE START	EARLY FINSH	LATE FINSH	TTL FLT
60	65	4	5000	LE	ST INS CLG ST FIXT & DIFF	8292	9152	9012	9202	12
61	64	6	1400	LA	C INSTLG LAY IN CLG TILE	9052	9052	9122	9122	CP
62	66	0	0		D	9112	9132	9082	9122	2
63	68	3	3800	LM	INSTL PLUMBG FIXT TO/R & JC	9062	10092	9082	10112	23
64	66	0	0		D	9132	9132	9122	9122	CP
64	67	0	0		D	9132	9212	9122	9202	6
65	67	0	0		D	9052	9212	9012	9202	12
66	69	9	1200	LA	PNT AL REGD INT SURFACES	9132	9132	9252	9252	CP
67	70	5	5500	LE	C INS CLG LT FIXT & DIFF	9132	9212	9192	9272	6
68	73	4	1800	LA	INS TO/R MTL PARTNS & ACCESS	9112	10122	9142	10172	23
69	72	0	0		D	9262	9282	9252	9272	2
69	74	12	4000	LA	INS&FIN AL MLLWK&CLASSRM EQUIP	9262	9262	10112	10112	CP
69	75	10	2200	LM	INS AL WLL PLS PLGS&MISC FN IM	9262	10042	10092	10172	6
69	75	10	2200	LE	INS AL WLL PLS PLGS&MISC FN IM	9262	10042	10092	10172	6
70	71	0	0		D	9202	10092	9192	10062	13
70	72	0	0		D	9202	9282	9192	9272	6
71	80	10	2000	LM	ACT TEST BAL MECH/ELECT SYS	9202	10092	10032	10202	13
71	80	10	1800	LE	ACT TEST BAL MECH/ELECT SYS	9202	10092	10032	10202	13
72	76	10	2500	LA	INS & FIN AL INT DRS	9262	9282	10092	10112	2
73	78	0	0		D	9152	10182	9142	10172	23
74	76	0	0		D	10122	10122	10112	10112	CP
75	78	0	0		D	10102	10182	10092	10172	6
76	77	4	1600	LA	ST INS RESIL FL TILE	10122	10122	10172	10172	CP
77	78	0	0		D	10182	10182	10172	10172	CP
77	79	2	1000	LM	INS ELECT WATER COOLERS	10182	10192	10192	10202	1
78	80	3	1400	LA	C INSTLG RESIL FL TILE	10182	10182	10202	10202	CP
79	80	0	0		D	10202	10232	10192	10202	1
80	91	15	300	LA	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP
80	91	15	300	LM	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP
80	91	15	300	LE	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP

TOTAL PROJECT COST = 220430.00 DURATION CALCULATED = 222

NETWORK MODEL FOR LAKE CITY

. J. STEPHENSON P.E. CONSULTANT
ATES ARE SHOWN AS MONTH,DAY,YR CP IN TFT COL INDICATES CRITICAL ITEM

ISSUE NO. 1 MAY 10
DWGS ISSUED 1,2

I	J	DAYS	LOC CD	AND DESCRIPTION	EARLY START SEQUENCE E/S	L/S	E/F	L/F	TF
1	15	110 4000	LM	DAFD SUPPLY FAN	1032	1242	6052	6262	15
1	39	120 2000	LA	T/R DAFD INT HM FRAMES	1032	2282	6192	8152	40
1	72	150 1200	LA	T/R DAFD INT HARDWARE	1032	2282	8012	9272	40
1	8	102 2000	LA	DAFD EXT HM FRAMES	1032	1052	5232	5252	2
1	34	144 2100	LA	T/R DAFD ALUM SASH & ENTRIES	1032	1142	7242	8042	9
1	16	12511500	LA	DAFD RF STRUCT STEEL	1032	1052	6262	6282	2
1	2	96 0		T/R	1032	1032	5152	5152	CP
1	33	136 6000	LM	T/R DAFD COMPRESSORS	1032	2292	7122	9082	41
2	5	1 500	LA	SET CONSTRUCTION OFC & SIGN	5162	5182	5162	5182	2
2	4	2 200	LA	LAY UP & AP BRK SAMPLE WLL	5162	5172	5172	5182	1
2	41	2 700	LA	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
2	41	2 2000	LM	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
2	41	2 1500	LE	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
2	3	3 6500	LA	STRIP SITE & LAYOUT BLDG	5162	5162	5182	5182	CP
2	42	4 400	LA	INSTL TEMP PROT EXTG BLDG OP	5162	5222	5192	5252	4
6	7	5 2500	LA	ST EFRP MSNRY WLL FTGS	5192	5192	5252	5252	CP
8	9	10 8000	LA	ST ERECTG EXT HM & MSNRY	5262	5262	6092	6092	CP
7	10	5 2500	LA	COMP EFRP MSNRY WLL FTGS	5262	6052	6022	6092	5
11	14	10 8000	LA	C ERECTG EXT HM & MSNRY	6122	6122	6232	6232	CP
9	12	2 400	LA	ST EXT/INT RUFF BKFLG	6122	6222	6132	6232	8
9	13	2 650	LA	CONSTR EQPT BASES/MECH ROOM	6122	6232	6132	6262	9
15	16	2 1200	LM	SET SUPPLY FAN MECH EQUIP RM	6142	6272	6152	6282	9
14	16	3 400	LA	C EXT/INT RUFF BKFLG	6262	6262	6282	6282	CP
16	17	812500	LA	ER RF STRUCT STEEL	6292	6292	7112	7112	CP
17	19	3 9500	LA	ER RF MTL DK & NAILERS	7122	7172	7142	7192	3
17	20	4 1200	LA	ER STONE COPING	7122	8072	7172	8102	18
17	18	5 6100	LM	ST INSTLG EQUIP&PIPG MECH RM	7122	8172	7182	8232	26
17	21	6 5500	LM	EIB UG UTIL & DUCT WORK	7122	7122	7192	7192	CP
19	24	5 1380	LA	MAKE ALT TO EXISTG WLLS	7172	10022	7212	10062	54
22	25	511000	LA	LAY INSUL & RFG	7182	8112	7242	8172	18
23	28	4 2500	LA	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
23	28	4 200	LM	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
23	28	4 2200	LE	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
27	29	10 800	LA	C ALL EXT CALKING & TRIM	7252	10092	8072	10202	53
26	33	11 1100	LM	ST INSTLG DUCT WK AT MECH RM	7252	8242	8082	9082	22
25	31	2 7000	LM	INSTL RF MTD MECH EQUIP	7252	8242	7262	8252	22
25	43	15 2800	LA	INS CURBS PKG LOTS & SDWKS	7252	10022	8142	10202	48
25	30	6 2400	LA	INS PLSTR SFT & FASCIN VEST	7252	8182	8012	8252	18
28	32	2 5400	LA	CONST SOG	7262	7262	7272	7272	CP
32	38	10 2500	LE	ST INSTLG RUFF ELECT WK	7282	7312	8102	8112	1
32	36	11 5100	LM	ST INSTLG OH DUCT WK	7282	7282	8112	8112	CP
32	37	8 3200	LM	ST INSTNG OH PIPING	7282	8022	8082	8112	3
34	40	9 2500	LA	INS & GLZ EXT ALUM SH & ENTRS	7282	8072	8092	8172	6

I	J	DAYS		LOC CD	AND DESCRIPTION	EARLY START SEQUENCE E/S	L/S	E/F	L/F	TF
37	54	10	3300	LM	C INSTLG OH PIPING	8092	8142	8222	8252	3
33	35	20	4400	LM	C INS AL MH/EL WK MH EQUIP RM	8092	9112	9062	10062	22
33	35	20	4400	LE	C INS AL MH/EL WK MH EQUIP RM	8092	9112	9062	10062	22
38	55	10	3000	LE	C INSTLG RUFF ELECT WK	8112	8142	8242	8252	1
36	53	10	5000	LM	C INS OH DUCK WK & INSUL	8142	8142	8252	8252	CP
40	52	6	3500	LA	ST INSTLG CLG SUSP SYSTEM	8142	8182	8212	8252	4
39	51	9	2600	LA	ER INT MSNRY WLLS	8142	8162	8242	8282	2
58	60	5	1200	LA	ST INSTLG LAY IN CLG TILE	8222	8282	8282	9012	4
56	59	5	800	LA	INS PLSTR CLGS TO/R & JC	8252	8292	8312	9052	2
57	61	5	3500	LA	C INS CLG SUSP SYSTEM	8282	8282	9012	9012	CP
60	65	4	5000	LE	ST INS CLG ST FIXT & DIFF	8292	9152	9012	9202	12
59	63	2	1100	LA	INS CT TO/R & JC	9012	10052	9052	10062	23
59	62	5	200	LA	T/R DRY PLSTR TO/R & JC	9012	9062	9082	9122	2
61	64	6	1400	LA	C INSTLG LAY IN CLG TILE	9052	9052	9122	9122	CP
63	68	3	3800	LM	INSTL PLUMBG FIXT TO/R & JC	9062	10092	9082	10112	23
68	73	4	1800	LA	INS TO/R MTL PARTNS & ACCESS	9112	10122	9142	10172	23
67	70	5	5500	LE	C INS CLG LT FIXT & DIFF	9132	9212	9192	9272	6
66	69	9	1200	LA	PNT AL REGD INT SURFACES	9132	9132	9252	9252	CP
71	80	10	2000	LM	ACT TEST BAL MECH/ELECT SYS	9202	10092	10032	10202	13
71	80	10	1800	LE	ACT TEST BAL MECH/ELECT SYS	9202	10092	10032	10202	13
72	76	10	2500	LA	INS & FIN AL INT DRS	9262	9282	10092	10112	2
69	75	10	2200	LM	INS AL WLL PLS PLGS&MISC FN IM	9262	10042	10092	10172	6
69	75	10	2200	LE	INS AL WLL PLS PLGS&MISC FN IM	9262	10042	10092	10172	6
69	74	12	4000	LA	INS&FIN AL MLLWK&CLASSRM EQUIP	9262	9262	10112	10112	CP
76	77	4	1600	LA	ST INS RESIL FL TILE	10122	10122	10172	10172	CP
77	79	2	1000	LM	INS ELECT WATER COOLERS	10182	10192	10192	10202	1
78	80	3	1400	LA	C INSTLG RESIL FL TILE	10182	10182	10202	10202	CP
80	91	15	300	LA	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP
80	91	15	300	LM	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP
80	91	15	300	LE	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP
0										
0					TOTAL PROJECT COST = 220430.00		DURATION CALCULATED =			222

NETWORK MODEL FOR LAKE CITY

• J• STEPHENSON P•E• CONSULTANT
DATES ARE SHOWN AS MONTH,DAY,YR CP IN TFT COL INDICATES CRITICAL ITEM
ISSUE NO. 1 MAY 10
DWGS ISSUED 1,2

I	J	DAYS		LOC CD	AND DESCRIPTION	LATE START SEQUENCE E/S	L/S	E/F	L/F	TF
1	2	96	0		T/R	1032	1032	5152	5152	CP
1	8	102	2000	LA	DAFD EXT HM FRAMES	1032	1052	5232	5252	2
1	16	12511500		LA	DAFD RF STRUCT STEEL	1032	1052	6262	6282	2
1	34	144	2100	LA	T/R DAFD ALUM SASH & ENTRIES	1032	1142	7242	8042	9
1	15	110	4000	LM	DAFD SUPPLY FAN	1032	1242	6052	6262	15
1	39	120	2000	LA	T/R DAFD INT HM FRAMES	1032	2282	6192	8152	40
1	72	150	1200	LA	T/R DAFD INT HARDWARE	1032	2282	8012	9272	40
1	33	136	6000	LM	T/R DAFD COMPRESSORS	1032	2292	7122	9082	41
2	3	3	6500	LA	STRIP SITE & LAYOUT BLDG	5162	5162	5182	5182	CP
2	4	2	200	LA	LAY UP & AP BRK SAMPLE WLL	5162	5172	5172	5182	1
2	41	2	700	LA	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
2	41	2	2000	LM	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
2	41	2	1500	LE	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
2	5	1	500	LA	SET CONSTRUCTION OFC & SIGN	5162	5182	5162	5182	2
6	7	5	2500	LA	ST EFRP MSNRY WLL FTGS	5192	5192	5252	5252	CP
2	42	4	400	LA	INSTL TEMP PROT EXTG BLDG OP	5162	5222	5192	5252	4
8	9	10	8000	LA	ST ERECTG EXT HM & MSNRY	5262	5262	6092	6092	CP
7	10	5	2500	LA	COMP EFRP MSNRY WLL FTGS	5262	6052	6022	6092	5
11	14	10	8000	LA	C ERECTG EXT HM & MSNRY	6122	6122	6232	6232	CP
9	12	2	400	LA	ST EXT/INT RUFF BKFLG	6122	6222	6132	6232	8
9	13	2	650	LA	CONSTR EQPT BASES/MECH ROOM	6122	6232	6132	6262	9
14	16	3	400	LA	C EXT/INT RUFF BKFLG	6262	6262	6282	6282	CP
15	16	2	1200	LM	SET SUPPLY FAN MECH EQUIP RM	6142	6272	6152	6282	9
16	17	812500		LA	ER RF STRUCT STEEL	6292	6292	7112	7112	CP
17	21	6	5500	LM	EIB UG UTIL & DUCT WORK	7122	7122	7192	7192	CP
17	19	3	9500	LA	ER RF MTL DK & NAILERS	7122	7172	7142	7192	3
23	28	4	2500	LA	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
23	28	4	200	LM	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
23	28	4	2200	LE	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
28	32	2	5400	LA	CONST SOG	7262	7262	7272	7272	CP
32	36	11	5100	LM	ST INSTLG OH DUCT WK	7282	7282	8112	8112	CP
32	38	10	2500	LE	ST INSTLG RUFF ELECT WK	7282	7312	8102	8112	1
32	37	8	3200	LM	ST INSTNG OH PIPING	7282	8022	8082	8112	3
17	20	4	1200	LA	ER STONE COPING	7122	8072	7172	8102	18
34	40	9	2500	LA	INS & GLZ EXT ALUM SH & ENTRS	7282	8072	8092	8172	6
22	25	511000		LA	LAY INSUL & RFG	7182	8112	7242	8172	18
37	54	10	3300	LM	C INSTLG OH PIPING	8092	8142	8222	8252	3
38	55	10	3000	LE	C INSTLG RUFF ELECT WK	8112	8142	8242	8252	1
36	53	10	5000	LM	C INS OH DUCK WK & INSUL	8142	8142	8252	8252	CP
39	51	9	2600	LA	ER INT MSNRY WLLS	8142	8162	8242	8282	2
17	18	5	6100	LM	ST INSTLG EQUIP&PIPG MECH RM	7122	8172	7182	8232	26
25	30	6	2400	LA	INS PLSTR SFT & FASCIN VEST	7252	8182	8012	8252	18
40	52	6	3500	LA	ST INSTLG CLG SUSP SYSTEM	8142	8182	8212	8252	4

I	J	DAYS	LOC CD	AND DESCRIPTION	LATE START SEQUENCE E/S	L/S	E/F	L/F	TF
6	33	11 1100	LM	ST INSTLG DUCT WK AT MECH RM	7252	8242	8082	9082	22
25	31	2 7000	LM	INSTL RF MTD MECH EQUIP	7252	8242	7262	8252	22
58	60	5 1200	LA	ST INSTLG LAY IN CLG TILE	8222	8282	8282	9012	4
57	61	5 3500	LA	C INS CLG SUSP SYSTEM	8282	8282	9012	9012	CP
56	59	5 800	LA	INS PLSTR CLGS TO/R & JC	8252	8292	8312	9052	2
61	64	6 1400	LA	C INSTLG LAY IN CLG TILE	9052	9052	9122	9122	CP
59	62	5 200	LA	T/R DRY PLSTR TO/R & JC	9012	9062	9082	9122	2
33	35	20 4400	LM	C INS AL MH/EL WK MH EQUIP RM	8092	9112	9062	10062	22
33	35	20 4400	LE	C INS AL MH/EL WK MH EQUIP RM	8092	9112	9062	10062	22
66	69	9 1200	LA	PNT AL REGD INT SURFACES	9132	9132	9252	9252	CP
60	65	4 5000	LE	ST INS CLG ST FIXT & DIFF	8292	9152	9012	9202	12
67	70	5 5500	LE	C INS CLG LT FIXT & DIFF	9132	9212	9192	9272	6
69	74	12 4000	LA	INS&FIN AL MLLWK&CLASSRM EQUIP	9262	9262	10112	10112	CP
72	76	10 2500	LA	INS & FIN AL INT DRS	9262	9282	10092	10112	2
19	24	5 1380	LA	MAKE ALT TO EXISTG WLLS	7172	10022	7212	10062	54
25	43	15 2800	LA	INS CURBS PKG LOTS & SDWKS	7252	10022	8142	10202	48
69	75	10 2200	LM	INS AL WLL PLS PLGS&MISC FN IM	9262	10042	10092	10172	6
69	75	10 2200	LE	INS AL WLL PLS PLGS&MISC FN IM	9262	10042	10092	10172	6
59	63	2 1100	LA	INS CT TO/R & JC	9012	10052	9052	10062	23
27	29	10 800	LA	C ALL EXT CALKING & TRIM	7252	10092	8072	10202	53
63	68	3 3800	LM	INSTL PLUMBG FIXT TO/R & JC	9062	10092	9082	10112	23
71	80	10 2000	LM	ACT TEST BAL MECH/ELECT SYS	9202	10092	10032	10202	13
71	80	10 1800	LE	ACT TEST BAL MECH/ELECT SYS	9202	10092	10032	10202	13
68	73	4 1800	LA	INS TO/R MTL PARTNS & ACCESS	9112	10122	9142	10172	23
76	77	4 1600	LA	ST INS RESIL FL TILE	10122	10122	10172	10172	CP
78	80	3 1400	LA	C INSTLG RESIL FL TILE	10182	10182	10202	10202	CP
77	79	2 1000	LM	INS ELECT WATER COOLERS	10182	10192	10192	10202	1
80	91	15 300	LA	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP
80	91	15 300	LM	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP
80	91	15 300	LE	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP
0									
0				TOTAL PROJECT COST = 220430.00		DURATION CALCULATED =			222

NETWORK MODEL FOR LAKE CITY

J. STEPHENSON P.E. CONSULTANT
ATES ARE SHOWN AS MONTH,DAY,YR CP IN TFT COL INDICATES CRITICAL ITEM
ISSUE NO. 1 MAY 10
DWGS ISSUED 1,2

I	J	DAYS	LOC CD	AND DESCRIPTION	LATE FINISH SEQUENCE E/S	L/S	E/F	L/F	TF
1	2	96 0		T/R	1032	1032	5152	5152	CP
2	3	3 6500	LA	STRIP SITE & LAYOUT BLDG	5162	5162	5182	5182	CP
2	4	2 200	LA	LAY UP & AP BRK SAMPLE WLL	5162	5172	5172	5182	1
2	41	2 700	LA	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
2	41	2 2000	LM	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
2	41	2 1500	LE	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
2	5	1 500	LA	SET CONSTRUCTION OFC & SIGN	5162	5182	5162	5182	2
1	8	102 2000	LA	DAFD EXT HM FRAMES	1032	1052	5232	5252	2
6	7	5 2500	LA	ST EFRP MSNRY WLL FTGS	5192	5192	5252	5252	CP
2	42	4 400	LA	INSTL TEMP PROT EXTG BLDG OP	5162	5222	5192	5252	4
8	9	10 8000	LA	ST ERECTG EXT HM & MSNRY	5262	5262	6092	6092	CP
7	10	5 2500	LA	COMP EFRP MSNRY WLL FTGS	5262	6052	6022	6092	5
11	14	10 8000	LA	C ERECTG EXT HM & MSNRY	6122	6122	6232	6232	CP
9	12	2 400	LA	ST EXT/INT RUFF BKFLG	6122	6222	6132	6232	8
1	15	110 4000	LM	DAFD SUPPLY FAN	1032	1242	6052	6262	15
9	13	2 650	LA	CONSTR EQPT BASES/MECH ROOM	6122	6232	6132	6262	9
1	16	12511500	LA	DAFD RF STRUCT STEEL	1032	1052	6262	6282	2
14	16	3 400	LA	C EXT/INT RUFF BKFLG	6262	6262	6282	6282	CP
15	16	2 1200	LM	SET SUPPLY FAN MECH EQUIP RM	6142	6272	6152	6282	9
16	17	812500	LA	ER RF STRUCT STEEL	6292	6292	7112	7112	CP
17	21	6 5500	LM	EIB UG UTIL & DUCT WORK	7122	7122	7192	7192	CP
17	19	3 9500	LA	ER RF MTL DK & NAILERS	7122	7172	7142	7192	3
23	28	4 2500	LA	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
23	28	4 200	LM	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
23	28	4 2200	LE	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
28	32	2 5400	LA	CONST SOG	7262	7262	7272	7272	CP
1	34	144 2100	LA	T/R DAFD ALUM SASH & ENTRIES	1032	1142	7242	8042	9
17	20	4 1200	LA	ER STONE COPING	7122	8072	7172	8102	18
32	36	11 5100	LM	ST INSTLG OH DUCT WK	7282	7282	8112	8112	CP
32	38	10 2500	LE	ST INSTLG RUFF ELECT WK	7282	7312	8102	8112	1
32	37	8 3200	LM	ST INSTNG OH PIPING	7282	8022	8082	8112	3
1	39	120 2000	LA	T/R DAFD INT HM FRAMES	1032	2282	6192	8152	40
34	40	9 2500	LA	INS & GLZ EXT ALUM SH & ENTRS	7282	8072	8092	8172	6
22	25	511000	LA	LAY INSUL & RFG	7182	8112	7242	8172	18
17	18	5 6100	LM	ST INSTLG EQUIP&PIPG MECH RM	7122	8172	7182	8232	26
37	54	10 3300	LM	C INSTLG OH PIPING	8092	8142	8222	8252	3
38	55	10 3000	LE	C INSTLG RUFF ELECT WK	8112	8142	8242	8252	1
36	53	10 5000	LM	C INS OH DUCK WK & INSUL	8142	8142	8252	8252	CP
25	30	6 2400	LA	INS PLSTR SFT & FASCIN VEST	7252	8182	8012	8252	18
40	52	6 3500	LA	ST INSTLG CLG SUSP SYSTEM	8142	8182	8212	8252	4
25	31	2 7000	LM	INSTL RF MTD MECH EQUIP	7252	8242	7262	8252	22
9	51	9 2600	LA	ER INT MSNRY WLLS	8142	8162	8242	8282	2
8	60	5 1200	LA	ST INSTLG LAY IN CLG TILE	8222	8282	8282	9012	4

I	J	DAYS		LOC CD	AND DESCRIPTION	LATE FINISH SEQUENCE E/S	L/S	E/F	L/F	TF
57	61	5	3500	LA	C INS CLG SUSP SYSTEM	8282	8282	9012	9012	CP
56	59	5	800	LA	INS PLSTR CLGS TO/R & JC	8252	8292	8312	9052	2
1	33	136	6000	LM	T/R DAFD COMPRESSORS	1032	2292	7122	9082	41
26	33	11	1100	LM	ST INSTLG DUCT WK AT MECH RM	7252	8242	8082	9082	22
61	64	6	1400	LA	C INSTLG LAY IN CLG TILE	9052	9052	9122	9122	CP
59	62	5	200	LA	T/R DRY PLSTR TO/R & JC	9012	9062	9082	9122	2
60	65	4	5000	LE	ST INS CLG ST FIXT & DIFF	8292	9152	9012	9202	12
66	69	9	1200	LA	PNT AL REGD INT SURFACES	9132	9132	9252	9252	CP
1	72	150	1200	LA	T/R DAFD INT HARDWARE	1032	2282	8012	9272	40
67	70	5	5500	LE	C INS CLG LT FIXT & DIFF	9132	9212	9192	9272	6
33	35	20	4400	LM	C INS AL MH/EL WK MH EQUIP RM	8092	9112	9062	10062	22
33	35	20	4400	LE	C INS AL MH/EL WK MH EQUIP RM	8092	9112	9062	10062	22
19	24	5	1380	LA	MAKE ALT TO EXISTG WLLS	7172	10022	7212	10062	54
59	63	2	1100	LA	INS CT TO/R & JC	9012	10052	9052	10062	23
69	74	12	4000	LA	INS&FIN AL MLLWK&CLASSRM EQUIP	9262	9262	10112	10112	CP
72	76	10	2500	LA	INS & FIN AL INT DRS	9262	9282	10092	10112	2
63	68	3	3800	LM	INSTL PLUMBG FIXT TO/R & JC	9062	10092	9082	10112	23
69	75	10	2200	LM	INS AL WLL PLS PLGS&MISC FN IM	9262	10042	10092	10172	6
69	75	10	2200	LE	INS AL WLL PLS PLGS&MISC FN IM	9262	10042	10092	10172	6
68	73	4	1800	LA	INS TO/R MTL PARTNS & ACCESS	9112	10122	9142	10172	23
76	77	4	1600	LA	ST INS RESIL FL TILE	10122	10122	10172	10172	CP
25	43	15	2800	LA	INS CURBS PKG LOTS & SDWKS	7252	10022	8142	10202	48
27	29	10	800	LA	C ALL EXT CALKING & TRIM	7252	10092	8072	10202	53
71	80	10	2000	LM	ACT TEST BAL MECH/ELECT SYS	9202	10092	10032	10202	13
71	80	10	1800	LE	ACT TEST BAL MECH/ELECT SYS	9202	10092	10032	10202	13
78	80	3	1400	LA	C INSTLG RESIL FL TILE	10182	10182	10202	10202	CP
77	79	2	1000	LM	INS ELECT WATER COOLERS	10182	10192	10192	10202	1
80	91	15	300	LA	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP
80	91	15	300	LM	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP
80	91	15	300	LE	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP
0										
0					TOTAL PROJECT COST = 220430.00		DURATION CALCULATED =			222

NETWORK MODEL FOR LAKE CITY

. J. STEPHENSON P.E. CONSULTANT
DATES ARE SHOWN AS MONTH,DAY,YR CP IN TFT COL INDICATES CRITICAL ITEM

ISSUE NO. 1 MAY 10
DWGS ISSUED 1,2

I	J	DAYS	LOC CD	AND DESCRIPTION	TOTAL FLOAT SEQUENCE E/S	L/S	E/F	L/F	TF
1	2	96 0		T/R	1032	1032	5152	5152	CP
2	3	3 6500	LA	STRIP SITE & LAYOUT BLDG	5162	5162	5182	5182	CP
6	7	5 2500	LA	ST EFRP MSNRY WLL FTGS	5192	5192	5252	5252	CP
8	9	10 8000	LA	ST ERECTG EXT HM & MSNRY	5262	5262	6092	6092	CP
11	14	10 8000	LA	C ERECTG EXT HM & MSNRY	6122	6122	6232	6232	CP
14	16	3 400	LA	C EXT/INT RUFF BKFLG	6262	6262	6282	6282	CP
16	17	812500	LA	ER RF STRUCT STEEL	6292	6292	7112	7112	CP
17	21	6 5500	LM	EIB UG UTIL & DUCT WORK	7122	7122	7192	7192	CP
23	28	4 2500	LA	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
23	28	4 200	LM	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
23	28	4 2200	LE	FFG & SET IFW FOR SOG	7202	7202	7252	7252	CP
28	32	2 5400	LA	CONST SOG	7262	7262	7272	7272	CP
32	36	11 5100	LM	ST INSTLG OH DUCT WK	7282	7282	8112	8112	CP
36	53	10 5000	LM	C INS OH DUCK WK & INSUL	8142	8142	8252	8252	CP
57	61	5 3500	LA	C INS CLG SUSP SYSTEM	8282	8282	9012	9012	CP
61	64	6 1400	LA	C INSTLG LAY IN CLG TILE	9052	9052	9122	9122	CP
66	69	9 1200	LA	PNT AL REGD INT SURFACES	9132	9132	9252	9252	CP
69	74	12 4000	LA	INS&FIN AL MLLWK&CLASSRM EQUIP	9262	9262	10112	10112	CP
76	77	4 1600	LA	ST INS RESIL FL TILE	10122	10122	10172	10172	CP
78	80	3 1400	LA	C INSTLG RESIL FL TILE	10182	10182	10202	10202	CP
80	91	15 300	LA	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP
80	91	15 300	LM	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP
80	91	15 300	LE	FINAL CLEAN UP & PUNCH LIST	10232	10232	11102	11102	CP
2	4	2 200	LA	LAY UP & AP BRK SAMPLE WLL	5162	5172	5172	5182	1
2	41	2 700	LA	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
2	41	2 2000	LM	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
2	41	2 1500	LE	INSTL TEMP ROADS & UTIL	5162	5172	5172	5182	1
32	38	10 2500	LE	ST INSTLG RUFF ELECT WK	7282	7312	8102	8112	1
38	55	10 3000	LE	C INSTLG RUFF ELECT WK	8112	8142	8242	8252	1
77	79	2 1000	LM	INS ELECT WATER COOLERS	10182	10192	10192	10202	1
2	5	1 500	LA	SET CONSTRUCTION OFC & SIGN	5162	5182	5162	5182	2
1	8	102 2000	LA	DAFD EXT HM FRAMES	1032	1052	5232	5252	2
1	16	12511500	LA	DAFD RF STRUCT STEEL	1032	1052	6262	6282	2
39	51	9 2600	LA	ER INT MSNRY WLLS	8142	8162	8242	8282	2
56	59	5 800	LA	INS PLSTR CLGS TO/R & JC	8252	8292	8312	9052	2
59	62	5 200	LA	T/R DRY PLSTR TO/R & JC	9012	9062	9082	9122	2
72	76	10 2500	LA	INS & FIN AL INT DRS	9262	9282	10092	10112	2
17	19	3 9500	LA	ER RF MTL DK & NAILERS	7122	7172	7142	7192	3
32	37	8 3200	LM	ST INSTNG OH PIPING	7282	8022	8082	8112	3
37	54	10 3300	LM	C INSTLG OH PIPING	8092	8142	8222	8252	3
2	42	4 400	LA	INSTL TEMP PROT EXTG BLDG OP	5162	5222	5192	5252	4
40	52	6 3500	LA	ST INSTLG CLG SUSP SYSTEM	8142	8182	8212	8252	4
58	60	5 1200	LA	ST INSTLG LAY IN CLG TILE	8222	8282	8282	9012	4

I	J	DAYS	LOC CD	AND DESCRIPTION	TOTAL E/S	FLOAT L/S	SEQUENCE E/F	L/F	TF
7	10	5 2500	LA	COMP EFRP MSNRY WLL FTGS	5262	6052	6022	6092	5
34	40	9 2500	LA	INS & GLZ EXT ALUM SH & ENTRS	7282	8072	8092	8172	6
67	70	5 5500	LE	C INS CLG LT FIXT & DIFF	9132	9212	9192	9272	6
69	75	10 2200	LM	INS AL WLL PLS PLGS&MISC FN IM	9262	10042	10092	10172	6
69	75	10 2200	LE	INS AL WLL PLS PLGS&MISC FN IM	9262	10042	10092	10172	6
9	12	2 400	LA	ST EXT/INT RUFF BKFLG	6122	6222	6132	6232	8
9	13	2 650	LA	CONSTR EQPT BASES/MECH ROOM	6122	6232	6132	6262	9
15	16	2 1200	LM	SET SUPPLY FAN MECH EQUIP RM	6142	6272	6152	6282	9
1	34	144 2100	LA	T/R DAFD ALUM SASH & ENTRIES	1032	1142	7242	8042	9
60	65	4 5000	LE	ST INS CLG ST FIXT & DIFF	8292	9152	9012	9202	12
71	80	10 2000	LM	ACT TEST BAL MECH/ELECT SYS	9202	10092	10032	10202	13
71	80	10 1800	LE	ACT TEST BAL MECH/ELECT SYS	9202	10092	10032	10202	13
1	15	110 4000	LM	DAFD SUPPLY FAN	1032	1242	6052	6262	15
17	20	4 1200	LA	ER STONE COPING	7122	8072	7172	8102	18
22	25	511000	LA	LAY INSUL & RFG	7182	8112	7242	8172	18
25	30	6 2400	LA	INS PLSTR SFT & FASCIN VEST	7252	8182	8012	8252	18
25	31	2 7000	LM	INSTL RF MTD MECH EQUIP	7252	8242	7262	8252	22
26	33	11 1100	LM	ST INSTLG DUCT WK AT MECH RM	7252	8242	8082	9082	22
33	35	20 4400	LM	C INS AL MH/EL WK MH EQUIP RM	8092	9112	9062	10062	22
33	35	20 4400	LE	C INS AL MH/EL WK MH EQUIP RM	8092	9112	9062	10062	22
59	63	2 1100	LA	INS CT TO/R & JC	9012	10052	9052	10062	23
63	68	3 3800	LM	INSTL PLUMBG FIXT TO/R & JC	9062	10092	9082	10112	23
68	73	4 1800	LA	INS TO/R MTL PARTNS & ACCESS	9112	10122	9142	10172	23
17	18	5 6100	LM	ST INSTLG EQUIP&PIPG MECH RM	7122	8172	7182	8232	26
1	39	120 2000	LA	T/R DAFD INT HM FRAMES	1032	2282	6192	8152	40
1	72	150 1200	LA	T/R DAFD INT HARDWARE	1032	2282	8012	9272	40
1	33	136 6000	LM	T/R DAFD COMPRESSORS	1032	2292	7122	9082	41
25	43	15 2800	LA	INS CURBS PKG LOTS & SDWKS	7252	10022	8142	10202	48
27	29	10 800	LA	C ALL EXT CALKING & TRIM	7252	10092	8072	10202	53
19	24	5 1380	LA	MAKE ALT TO EXISTG WLLS	7172	10022	7212	10062	54
0									
0				TOTAL PROJECT COST = 220430.00			DURATION CALCULATED =		222

Line of Balance Case Study

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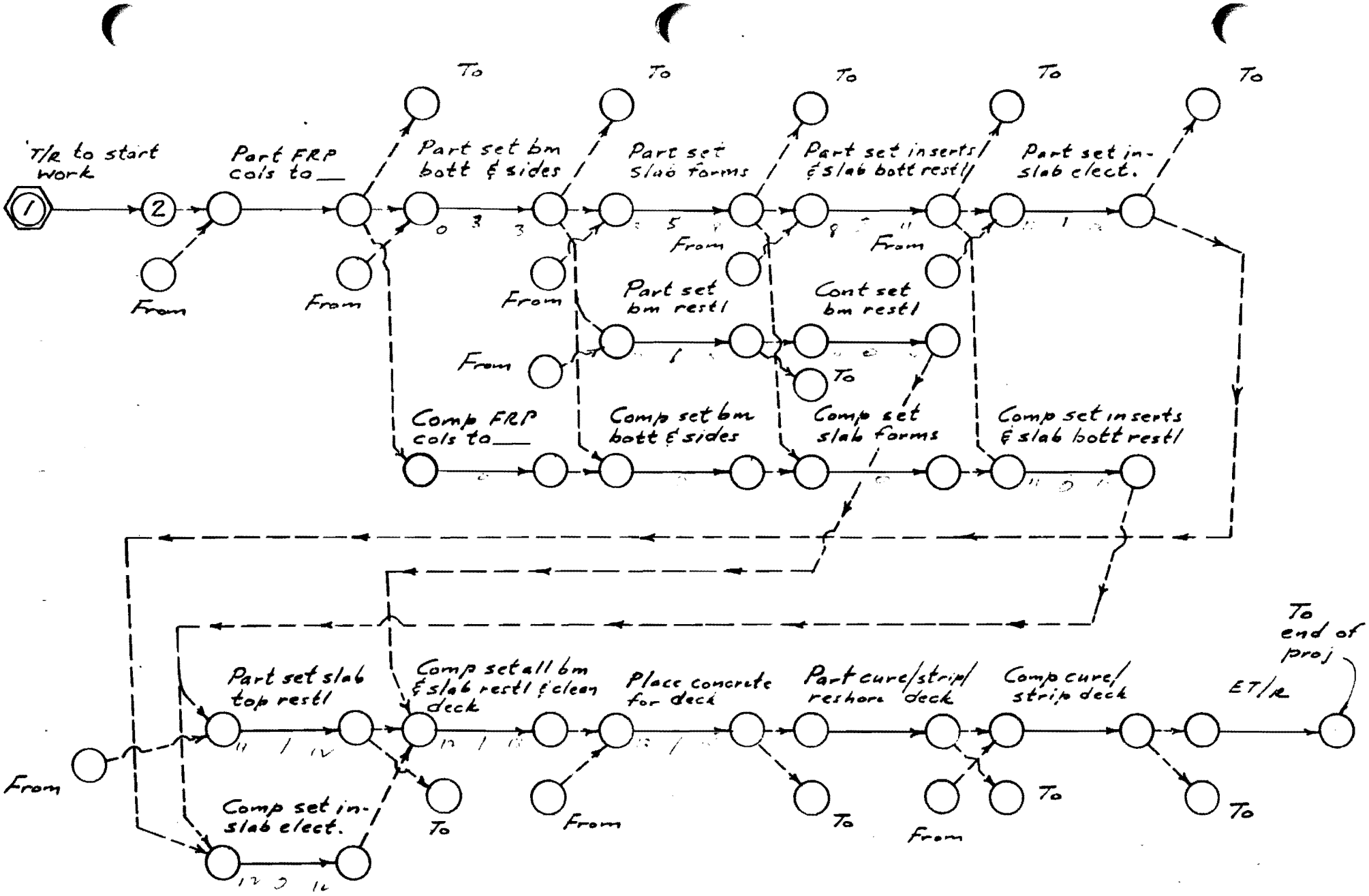
Task			Number of units started and/or complete as of (WD 44)	(WD 50)	(WD 56)	(WD 68)
1 - 2	Instl mech/elect ruffin wk	A (start)	15	17	18	20
		B (complete)	14	17	18	20
3 - 4	Instl frames, studs, insul, in wall work	C (s)	13	16	18	20
		D (c)	13	16	17	20
5 - 6	Instl gyp board	E (s)	13	16	17	20
		F (c)	13	16	17	20
7 - 10	Tape & sand gyp board	G (s)	13	16	17	20
		H (c)	13	15	16	20
8 - 11	Instl ceramic tile @ bathroom	I (s)	13	15	16	20
		J (c)	13	15	16	20
9 - 12	Instl unit heater & AC	K (s)	13	15	16	20
		L (c)	13	15	16	20
13 - 15	Apply textured paint	M (s)	13	15	16	20
		N (c)	13	15	16	20
14 - 16	Instl acoustic clg tile	O (s)	13	14	15	20
		P (c)	12	14	15	19
17 - 19	Instl bathroom plumbing & light fixtures	Q (s)	12	14	15	19
		R (c)	12	14	15	19
18 - 20	Instl bathroom vanity	S (s)	11	14	15	20
		T (c)	11	14	15	19
21 - 23	Instl doors & hardware	U (s)	11	14	15	19
		V (c)	11	13	15	19
22 - 24	Complete final painting	W (s)	11	13	14	19
		X (c)	11	13	14	19
25 - 26	Instl floor covering & cleanup	Y (s)	11	13	14	19
		Z (c)	10	12	13	18

SSTNPS
8/23/72



DETAILED NETWORK PLAN FOR ONE POUR

PCA 2/25/73

RALPH J. STEPHENSON, P.E.
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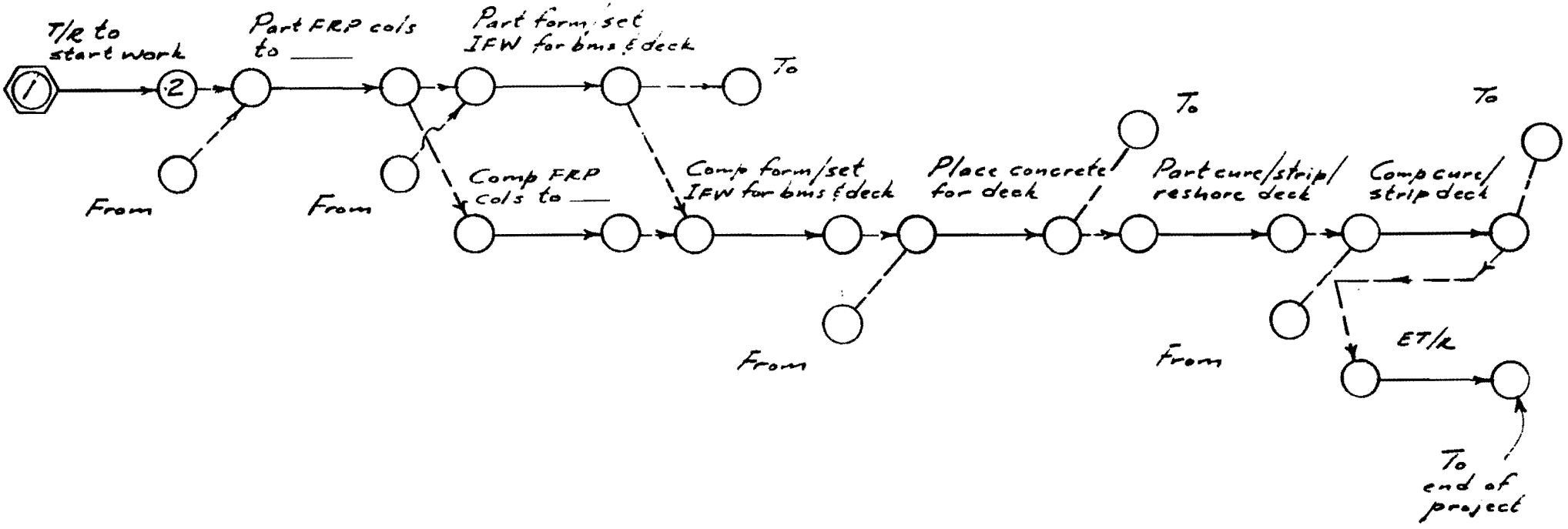

SUMMARY NETWORK PLAN FOR ONE POUR

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PCA 2/25/73

78
(2 pages)

D and DK Abbreviations

K MART

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October 4, 1971

/	And
⁄	And
ACOUS	Acoustic
AGA	Applicable Government Agency
ANC	Anchor
AP	Approve or approval
APP	Approve or approval
APP/RET	Approve and return
APPL	Approval
ARCH	Architect
AUT	Automatic
BAL	Balance
BLDG	Building
BLTS	Bolts
BM	Beam
BN	Bin
BUR	Bureau
CARP	Carpentry
CER	Ceramics
CLR	Color
COL	Column
CON	Concrete
COV	Covering
CRIT	Criteria
D	Approval periods (details, deliveries)
DEL	Delivery
DEP	Department
DES	Design
DIM	Dimension
DK	Dock
DK	Tenant information drawings
DR	Drainage
DR	Door
DRS	Doors
DRWG	Driveway
DW	Drawings
DWGS	Drawings
EAS	Easements
ELECT	Electrical
EQUIP	Equipment
FAB/DEL	Fabricate and deliver
FDN	Foundation
FIX	Fixture
FL	Floor
F MT	Food market
FR	From
FRMS	Frames
GLAZG	Glazing
HM	Hollow metal
K MT	K Mart
LAYOT	Layout
LGA	Local Government Agency
LN	Line
LOC	Location
LST	List
LTG	Lighting
LVLR	Leveller
MAJ	Major
MAT	Material
MEZ	Mezzanine
MECH	Mechanical
MI	Miscellaneous iron
MNUS	Minus
MTG	Mortgage
MTL	Metal
MUN	Municipal
OBT	Obtain
OH	Overhead
OP	Operator
OPNG	Opening
ORD	Order
ORIG	Original
OUTFT	Outfit

D and DK Abbreviations

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K MART Page two

PARTNS	Partitions
PC	Precast
PER	Permit
PKG	Parking
PLK	Plank
PNLS	Panels
PR	Provide
PREP	Prepare
PRE/SBT	Prepare and submit
PWR	Power
R	Rear
RES	Resilient
RELOC	Relocation
RESIL	Resilient
RESTL	Resteel
RET	Return
REV	Revised
ROOFG	Roofing
RTG	Rating
SAN	Sanitary
SEL	Select
SMPLS	Samples
SNK	Snack
SPRINKLR	Sprinkler
SPRKLR	Sprinkler
ST	Start
ST	Storm
STK	Stock
STL JST	Steel joists
STR	Strain
STR STL	Structural steel
SUBMT	Submit
SWR	Sewer
SYS	System
TBA	Tire, battery, accessories
TEL	Telephone
TEN	Tenant (SSK)
TL	Tile
TOLT	Toilet
T/R	Time restraint
TRK	Track
UF	Underfloor
UTIL	Utility
VINL	Vinyl
WD/S	Working drawings and specs
WIS	Wisconsin
WKG	Working
WL	Wall
WLL	Wall
WTR	Water

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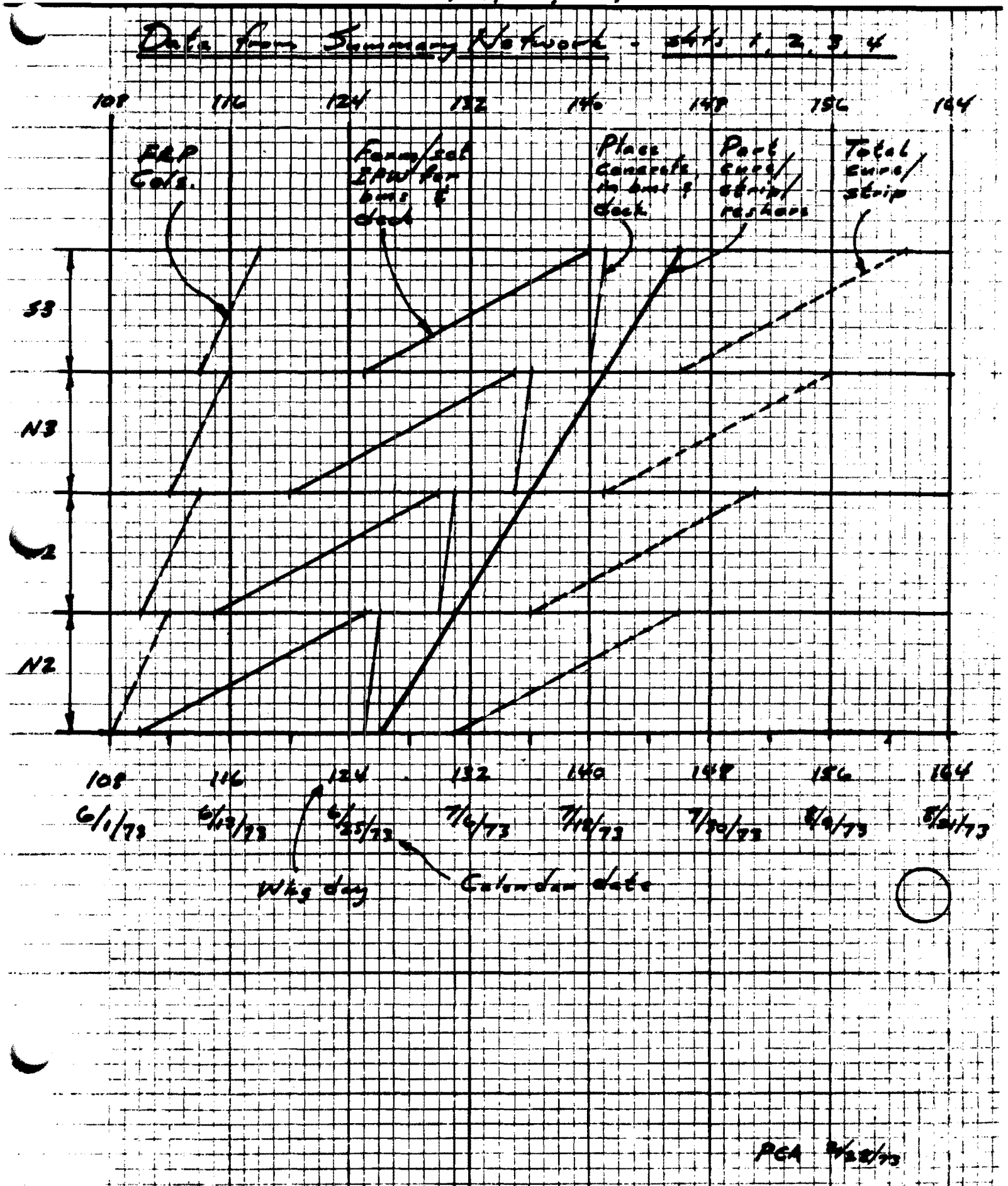
Subject Slant Chart - Floor Pours Date 3/1/73

N2, S2, N3, S3 Page (1)

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



PCA 3/22/73

NETWORK PLANNING: NEW MANAGEMENT TOOL

by **RALPH J. STEPHENSON**—Consulting Engineer

PLANNING IS THE APPLICATION OF LOGIC TO ACTION • A NETWORK IS THE GRAPHIC STATEMENT OF THIS LOGIC

THE NETWORK PLANNING CONCEPT (NP) is simple. *A network plan is basically the charting of a series of end-to-end tasks, none of which can start until the one preceding has been completed.* An entire sequence of these tasks makes up a complete project.

When the project is diagramed by task sequence, the first phase of a network plan is complete. The second phase is the assignment of time values to each task, and the third phase is the allocation of manpower and material resources. Completion of the network plan comes with the preparation of a schedule and a control system from the graphic diagram.

Development of network planning as a management tool dates back to 1957. Initial work on the technique was done by a duPont Corp. operations group assigned to speed transition of new products from research into production. Out of their studies came the Critical Path Method (CPM).

Simultaneously, the Navy was devising a system to plan and co-ordinate the work of nearly 3,000 contractors and agencies on the Polaris missile program. From the Polaris project came a Program Evaluation and Review Technique (PERT), which is credited with helping advance Polaris development by at least two years.

Today many Detroit industries are using networks to plan complex projects. For example, Chrysler's Mexico Project Group, with assistance from the company's Operations Research Staff, recently planned their new engine plant in Mexico with NP. Procurement and installation of tooling, building facilities, and machinery is being scheduled under network control.

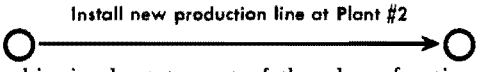
The NP method has many applications. It can be used to plan design operations, construction projects, administrative programs, maintenance operations, model change-overs, and practically any other series of actions that, when combined, form a complete program having a start and a finish.

The multitude of different names applied to network methods, such as CPM, PERT, PACT, LESS, PRISM, and PACE merely distinguish the application techniques. For example, CPM has traditionally been considered activity-oriented and PERT event-oriented. However, these differences are gradually melting away, and the generic term Network Planning is now commonly used to describe this type of operational programming.

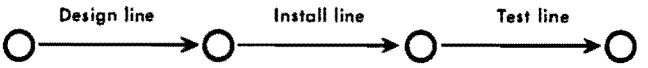
Phase One: Diagraming Task Sequence

Let's look at an example of network planning.

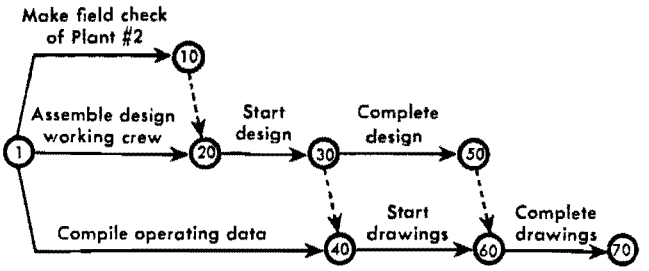
The Vice President in Charge of Operations for an automobile company calls his Production Manager one morning and says, "Frank, the Board's given us an OK to install that new production line at Plant Two. Let's get started." Using nodes (circles representing the start or finish of an activity) and arrows (each representing an activity), we can translate the Vice President's instructions into graphic form as:



From this simple statement of the plan of action evolves a more detailed interpretation by the Production Manager. Frank calls in his Chief Engineer and says, "Joe, we're installing a new line at Plant Two. I want you to handle the job and to do it in three stages—design, installation, and testing—in that order." Graphically, he is saying:



Joe takes the project to the manager of the design group, who then plans the first stage in more detail. The Design Manager's plan might look like this:



From here on, the plan for each task can get as detailed as desired, or as needed.

In this first phase of NP, we have developed a complete and specific action plan for the project. In the second phase, times are assigned to each task in the action plan. Notice, by waiting till now to assign times, we have separated planning of the project from the influence of time and encouraged each echelon of management to concentrate on how it can best accomplish the job assigned to it through development of an effective action plan.

Phase Two: Assigning Time Values

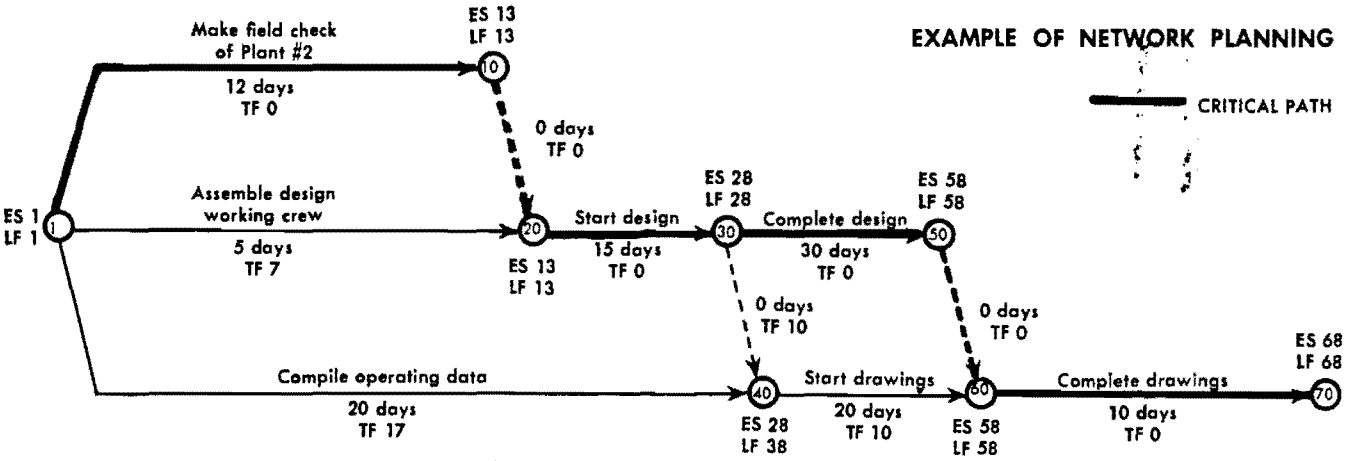
The time values assigned to each task are estimated as realistically as possible and represent the best judgment of the group actually doing the task. Sometimes, when probability factors are a consideration, three times—optimistic, pessimistic, and most likely—are selected and a weighted figure used.

In our example, we have selected only one time value for each action. Broken-line arrows, called dummies, are given a time value of zero and indicate that no action occurs along them but that a relationship exists between the tasks they connect.

By a series of simple computations, we can determine the Earliest Possible Start (ES) and the Latest Allowable Finish (LF) time limitations for each task in the action plan. *ES is the earliest possible time a task can start, assuming all previous tasks were completed on time,* and is figured from the beginning to the end of the network plan. The earliest start at the last node is the duration of the project. *LF is the latest allowable time a task can finish without affecting the completion time of the entire project.* Figuring back to the beginning along each path gives the latest allowable finish times at each node.

In the example, the longest sequence of tasks through the project is along nodes 1 — 10 — 20 — 30 — 50 — 60 — 70, a path which takes 67 working days to traverse. The tasks on the other paths have spare time, since none of these paths take as long to travel as the longest sequence. *Total Float (TF) is the amount of time that any task can be delayed without delaying the entire project.* To compute it, Total Float = Latest Finish – Earliest Start – Duration (length of time required to complete each task). For instance, task 1 – 20 could be delayed as long as seven days without delaying the entire project. (Path 1 – 20 takes 5 days. Path 1 – 10 – 20 takes 12 days. 12 – 5 = 7 days). Therefore, task 1 – 20 is said to have seven days Total Float.

The path (or paths) through the project plan which takes the longest time to complete is the Critical Path. Knowledge



GROUND RULES FOR NETWORK DIAGRAMING

1. Each solid arrow must represent a single activity or task.
2. Arrow length has no scale.
3. Arrow junctions, indicated by nodes, are events and signify the start or completion of a task.
4. Tasks originating from a node cannot be started until all tasks terminating at that node have been completed.
5. If a relationship exists between tasks, but no activity connects them, a dummy is used to show the relation.
6. Nodes should be numbered so that all arrows proceed from a lower to a higher number.
7. No two arrows may have the same set of nodal numbers.
8. The logic must be explicitly stated. Constant reference to Rule 4 will help prevent errors in logic statement.

of the specifics concerning this critical path gives management first-rate control potential over the operation. As a working definition, we say that the tasks within any project that have a minimum total float time available (usually zero) fall on the critical path.

By taking the total duration of the design phase and adding to it the times for the installation and testing stages (for which similar network plans would be made up), the Production Manager can give the company Vice President the total time it will take to get the new facility into full production. Now everyone up and down the management line knows exactly what they're to do, when they can start, when they must finish, and how much float time they have for the non-critical tasks.

Phase Three: Allocating Manpower and Materials

The third phase of network diagram utilization is applying the information to allocation of manpower and material resources. The goal of this resource allocation is to accomplish the project at a minimum cost in project expenditures, downtime, and other business-out expenses.

For instance, we see in the example that if the field check were speeded up by authorizing overtime, we could reduce the total time of the design phase and, consequently, get the new line into production faster. If the overtime costs were less than the gain from earlier production time, the move would be justified. On the other hand, it is obvious from the network plan that speeding up the compilation of data by overtime work would be useless. Actually, it might even be possible to reassign some personnel from the data compilation crew to the field check crew and eliminate overtime expense on a crash program.

Our example is a simple one, and its analysis is quite easy. But visualize how complex the analysis of a plan could become if it contained several hundred or several thousand individual tasks. In such cases, we usually resort to a computer to furnish us the multitude of arithmetical and logical conclusions needed to make decisions. For networks up to a hundred tasks, however, hand computation methods prove to be adequate, although slow.

Controls Are Essential in NP

Control of a completed network plan is essential. A decision to use NP without providing adequate control of its execution is neither effective nor complete. Therefore, concurrently with the preparation of a network plan, policies should be established to insure its proper control.

Controls are generally of two types: secondary and primary. Secondary controls are those imposed by routine progress reviews. They may appear as minor changes in the plan-time-cost network but do not affect final completion dates or final project costs. Primary controls are those exerted through major progress and policy reviews concerned with time and cost revisions.

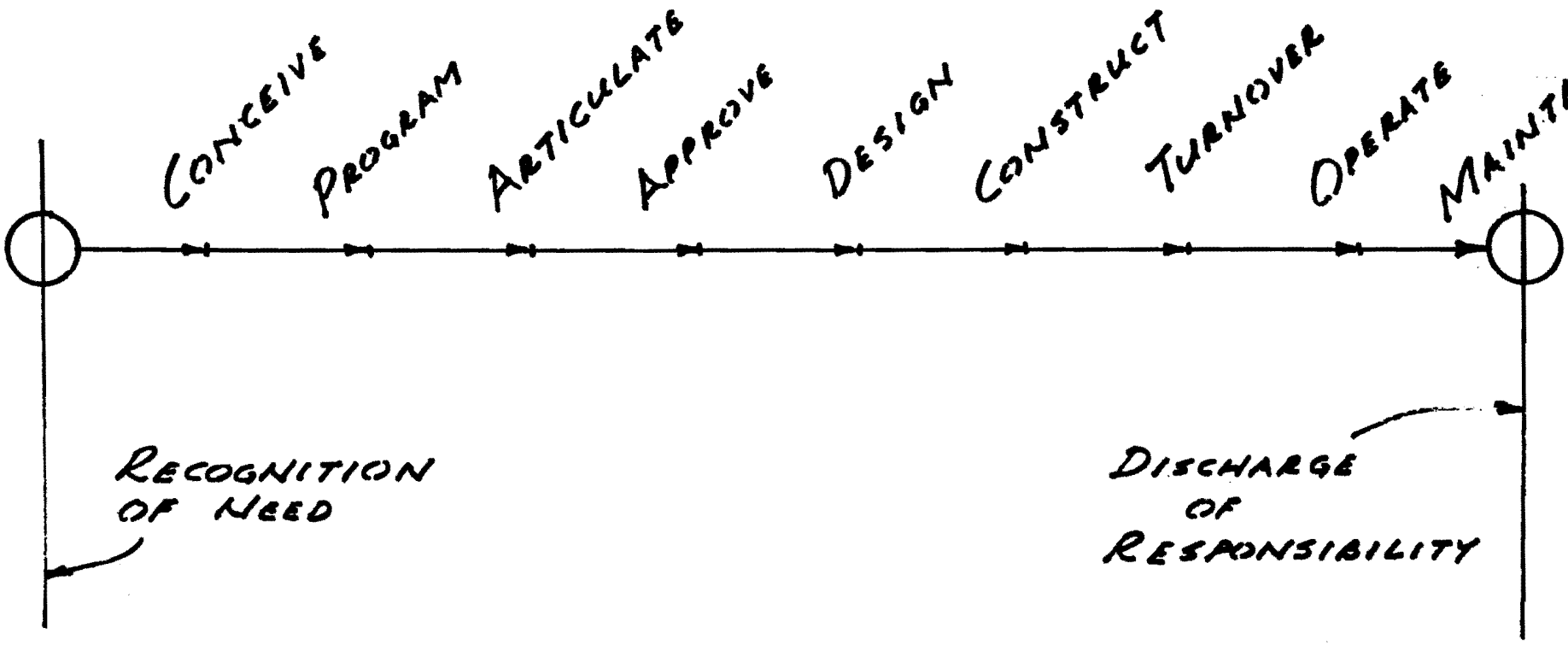
A job schedule and a reporting method must be established as part of the control system. The need for such a schedule is apparent from our example. In the diagram we have defined clearly what happens to the tasks on the critical path. However, we have not directed how the remaining non-critical tasks are to be fitted into the action plan, except to say that they can be done between this point in time and that point in time. A schedule is now needed to tell everyone *how* the entire job is to be performed.

Hand-in-hand with scheduling goes form control to record keeping. Form control with network systems is far simpler than with most other planning methods. The reason is that, since so much information appears on the network plan, it is convenient to report almost totally by reference to the diagram and to maintain records directly on the network.

Those working with network planning now are pioneers in a brand new field of management science. Network planning, correctly applied, makes possible sizable benefits in time and money for an alert organization. Potential applications are vast: the only limitations on NP's usefulness are those imposed by the user's imagination.

ADVANTAGES OF NETWORK PLANNING

- Makes you think about a project in more detail, tending to prevent omission of tasks
- Tells you accurately how long a project will take and what jobs must be kept on time to meet the schedule
- Simplifies advance work assignments and helps improve communications between those responsible for a project
- Assists you in evaluating and forecasting the outcome of alternate plans of action
- Focuses attention on potentially troublesome tasks and allows you to pinpoint corrective action
- Fixes responsibility and provides a permanent record of assignments
- Insures continuity of action, even with changes in personnel
- Encourages personnel at all management levels to contribute to effective job planning
- Simplifies periodic re-evaluation and rescheduling
- Provides a uniform system of planning, scheduling, and reporting
- Measures proposed changes against time, money, and manpower yardsticks
- Shows proper relationships between all tasks
- Provides a graphic picture of the work that encourages making accurate and prompt field decisions where needed
- Shows what to expedite
- Encourages accurate and continuous control of buying operations and subcontractor performance
- Separates planning of the task sequence from assignment of time values to each task, making project scheduling less susceptible to time distortions.



LINE OF ACTION

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DB 2/4/72

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PARTICIPANTS IN DESIGNING AND BUILDING ENVIRONMENTS

There are four basic participants in the process of designing and building environments. These are the

- Conceivers
- Translators
- Constructors
- Operators

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

Translators - Those who translate the concept into construction language. Traditionally, we think of the architect/engineer as the translator. However, careful thought on this matter will show that there are many others who translate the conceiver's fundamental idea into some kind of understandable, workable construction language. Sub contractors, suppliers, vendors, manufacturers, contractors, the conceiver, himself, may all play a role in translating.

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

Operators - Those who take over the completed physical environment and make it function on a continuing basis. Usually, the party responsible for this is an owner or tenant working through a plant engineer or building supervisor. In some instances the design/build contractor can become involved on a maintenance and operational basis, particularly if he has designed and built under a gross lease contract.

Identification of the parties to a project is important because it assists in defining the most important individuals in a given project situation. By accurate identification of the individuals concerned, their functional authority and responsibility can be established and optimum use made of their assistance.

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ELEMENTS OF THE LINE OF ACTION

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

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

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

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

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

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

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

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

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

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

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

Neglect of good turnover procedures is often the cause of serious callback problems. We certainly wouldn't turn a complex piece of machinery over to an amateur operator and expect he would make it perform 100% right from the start. Neither should we assume that an owner can take a new environment that has just been built for him and immediately operate it at full efficiency. Time should be spent during turnover to explain how this environment is to function.

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

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

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

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KINDS OF ESTIMATES

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

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

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

1. Point in time at which estimate is prepared

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

2. Scale of detail required

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

3. Estimating methodology

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

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3. Estimating methodology (Cont.)

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

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

4. Life span covered by costing

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

5. Data available

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

6. Ultimate use of estimate

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

7. Number of elements estimated relative to total

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

8. Competitive situation

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

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8. Competitive situation (Cont.)

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

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

9. Role of estimate in setting final cost

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

10. Control position occupied

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

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

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SALES/PROFITS ANALYSIS

Combinations Possible

Sales Up Profits Up	Built new plant(s) recently
Sales Up Profits Down	Remodeled existing plant(s) recently
	Acquired existing plant(s) from others recently
Sales Down Profits Down	Sold existing plant(s) of theirs recently
Sales Down Profits Up	Have not built new plant(s) or remodeled recently

Apply on Business Unit Basis

Sales Up / Profits Up

1. May stabilize - no new construction
2. Probably diversify - business acquisition
3. May thrust into traditionally popular market - expand plant
4. May construct luxury facilities
5. May acquire balance businesses

→ Definitely interested in new construction (new potential)

Sales Up / Profits Down

1. Will seek to lower production costs
2. Will thin existing product line
3. May add acquired product lines proven successful
4. Will re-examine internal policies

→ Probably not interested in new construction but in rehabilitation of old facilities (Gradual potential)

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SALES/PROFITS ANALYSIS
(Continued)

Sales Down
Profits Down

1. Will seek to improve marketing procedures
2. Will seek product diversification
3. Will thin existing product line
4. May add acquired product line proven successful (doubtful)
5. Will totally re-examine internal policies

Probably not interested in new construction now but will be very shortly or out of business (explosive potential)

Sales Down
Profits Up

1. Will diversify product line
2. Will strengthen sales program
3. Will maintain present status on facilities (temporary)
4. Will acquire balance businesses
5. Will actively plan expansion

Probably no new construction now but need will pressure additional facilities in moderate future (near future potential)

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2-YR WORKING-DAY CALENDAR STARTING JAN. 2, 1974

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
JAN		FEB	26 40	APR	22 79	JNE	17 118	AUG	12 157	OCT	07 196	DEC	02 235
02	1		27 41		23 80		18 119		13 158		08 197		03 236
03	2		28 42		24 81		19 120		14 159		09 198		04 237
04	3	MAR			25 82		20 121		15 160		10 199		05 238
07	4		01 43		26 83		21 122		16 161		11 200		06 239
08	5		04 44		29 84		24 123		19 162		14 201		09 240
09	6		05 45		30 85		25 124		20 163		15 202		10 241
10	7		06 46	MAY			26 125		21 164		16 203		11 242
11	8		07 47		01 86		27 126		22 165		17 204		12 243
14	9		08 48		02 87		28 127		23 166		18 205		13 244
15	10		11 49		03 88	JLY			26 167		21 206		16 245
16	11		12 50		06 89		01 128		27 168		22 207		17 246
17	12		13 51		07 90		02 129		28 169		23 208		18 247
18	13		14 52		08 91		03 130		29 170		24 209		19 248
21	14		15 53		09 92		05 131		30 171		25 210		20 249
22	15		18 54		10 93		08 132	SEP			28 211		23 250
23	16		19 55		13 94		09 133		03 172		29 212		24 251
24	17		20 56		14 95		10 134		04 173		30 213		26 252
25	18		21 57		15 96		11 135		05 174		31 214		27 253
28	19		22 58		16 97		12 136		06 175	NOV			30 254
[illegible]	20		25 59		17 98		15 137		09 176		01 215		31 255
[illegible]	21		26 60		20 99		16 138		10 177		04 216	JAN	1975
31	22		27 61		21 100		17 139		11 178		05 217		02 256
FEB			28 62		22 101		18 140		12 179		06 218		03 257
01	23		29 63		23 102		19 141		13 180		07 219		06 258
04	24	APR			24 103		22 142		16 181		08 220		07 259
05	25		01 64		28 104		23 143		17 182		11 221		08 260
06	26		02 65		29 105		24 144		18 183		12 222		09 261
07	27		03 66		30 106		25 145		19 184		13 223		10 262
08	28		04 67		31 107		26 146		20 185		14 224		13 263
11	29		05 68	JNE			29 147		23 186		15 225		14 264
12	30		08 69		03 108		30 148		24 187		18 226		15 265
13	31		09 70		04 109		31 149		25 188		19 227		16 266
14	32		10 71		05 110	AUG			26 189		20 228		17 267
15	33		11 72		06 111		01 150		27 190		21 229		20 268
18	34		12 73		07 112		02 151		30 191		22 230		21 269
19	35		15 74		10 113		05 152	OCT			25 231		22 270
20	36		16 75		11 114		06 153		01 192		26 232		23 271
21	37		17 76		12 115		07 154		02 193		27 233		24 272
22	38		18 77		13 116		08 155		03 194		29 234		27 273
25	39		19 78		14 117		09 156		04 195	DEC			28 274

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1975													
JAN 29	275	MAR 25	314	MAY 19	353	JLY 15	392	SEP 09	431	NOV 03	470	DEC 31	510
30	276	26	315	20	354	16	393	10	432	04	471		
31	277	27	316	21	355	17	394	11	433	05	472		
FEB		28	317	22	356	18	395	12	434	06	473		
03	278	31	318	23	357	21	396	15	435	07	474		
04	279	APR		27	358	22	397	16	436	10	475		
05	280	01	319	28	359	23	398	17	437	11	476		
06	281	02	320	29	360	24	399	18	438	12	477		
07	282	03	321	30	361	25	400	19	439	13	478		
10	283	04	322	JNE		28	401	22	440	14	479		
11	284	07	323	02	362	29	402	23	441	17	480		
12	285	08	324	03	363	30	403	24	442	18	481		
13	286	09	325	04	364	31	404	25	443	19	482		
14	287	10	326	05	365	AUG		26	444	20	483		
17	288	11	327	06	366	01	405	29	445	21	484		
18	289	14	328	09	367	04	406	30	446	24	485		
19	290	15	329	10	368	05	407	OCT		25	486		
20	291	16	330	11	369	06	408	01	447	26	487		
21	292	17	331	12	370	07	409	02	448	28	488		
24	293	18	332	13	371	08	410	03	449	DEC			
25	294	21	333	16	372	11	411	06	450	01	489		
26	295	22	334	17	373	12	412	07	451	02	490		
27	296	23	335	18	374	13	413	08	452	03	491		
28	297	24	336	19	375	14	414	09	453	04	492		
MAR		25	337	20	376	15	415	10	454	05	493		
03	298	28	338	23	377	18	416	13	455	08	494		
04	299	29	339	24	378	19	417	14	456	09	495		
05	300	30	340	25	379	20	418	15	457	10	496		
06	301	MAY		26	380	21	419	16	458	11	497		
07	302	01	341	27	381	22	420	17	459	12	498		
10	303	02	342	30	382	25	421	20	460	15	499		
11	304	05	343	JLY		26	422	21	461	16	500		
12	305	06	344	01	383	27	423	22	462	17	501		
13	306	07	345	02	384	28	424	23	463	18	502		
14	307	08	346	03	385	29	425	24	464	19	503		
17	308	09	347	07	386	SEP		27	465	22	504		
18	309	12	348	08	387	02	426	28	466	23	505		
19	310	13	349	09	388	03	427	29	467	24	506		
20	311	14	350	10	389	04	428	30	468	26	507		
21	312	15	351	11	390	05	429	31	469	29	508		
24	313	16	352	14	391	08	430	NOV		30	509		

DØ ME 'S DITTØ

Input Data for ____________________

Date ________
Sht. ________

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i	j	d	Resp.	Code		Description
1 2 3	4 5 6	8 9 10	14 15	17 18 19		21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

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JAN 1973		FEB	26 40	APR	20 79	JNE	15 118	AUG	10 157	OCT	05 196	DEC	
02	1		27 41		23 80		18 119		13 158		08 197		03 236
03	2		28 42		24 81		19 120		14 159		09 198		04 237
04	3	MAR			25 82		20 121		15 160		10 199		05 238
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17	12		13 51		07 90		02 129		28 169		23 208		18 247
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19	14		15 53		09 92		05 131		30 171		25 210		20 249
22	15		16 54		10 93		06 132		31 172		26 211		21 250
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12	285	08	324	03	363	30	403	24	442	18	481		
13	286	09	325	04	364	31	404	25	443	19	482		
14	287	10	326	05	365	AUG		26	444	20	483		
15	288	11	327	06	366	01	405	27	445	21	484		
18	289	12	328	07	367	02	406	30	446	22	485		
19	290	15	329	10	368	05	407	OCT		25	486		
20	291	16	330	11	369	06	408	01	447	26	487		
21	292	17	331	12	370	07	409	02	448	27	488		
22	293	18	332	13	371	08	410	03	449	29	489		
25	294	19	333	14	372	09	411	04	450	DEC			
26	295	22	334	17	373	12	412	07	451	02	490		
27	296	23	335	18	374	13	413	08	452	03	491		
28	297	24	336	19	375	14	414	09	453	04	492		
MAR		25	337	20	376	15	415	10	454	05	493		
01	298	26	338	21	377	16	416	11	455	06	494		
04	299	29	339	24	378	19	417	14	456	09	495		
05	300	30	340	25	379	20	418	15	457	10	496		
06	301	MAY		26	380	21	419	16	458	11	497		
07	302	01	341	27	381	22	420	17	459	12	498		
08	303	02	342	28	382	23	421	18	460	13	499		
11	304	03	343	JLY		26	422	21	461	16	500		
12	305	06	344	01	383	27	423	22	462	17	501		
13	306	07	345	02	384	28	424	23	463	18	502		
14	307	08	346	03	385	29	425	24	464	19	503		
15	308	09	347	05	386	30	426	25	465	20	504		
18	309	10	348	08	387	SEP		28	466	23	505		
19	310	13	349	09	388	03	427	29	467	24	506		
20	311	14	350	10	389	04	428	30	468	26	507		
21	312	15	351	11	390	05	429	31	469	27	508		
22	313	16	352	12	391	06	430	NOV		30	509		

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EXERCISE #4

- Project starts with T/R task A

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

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

- Task F follows task C and precedes task J

- Tasks G and H are restrained by task D

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

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

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

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

- Task B restrains tasks G, H and J

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QUIZ 6

1. What is the usual order of steps in preparing a network model for issue?

( ) Quantify logic plan
( ) Approve logic plan
( ) Analyze mathematical model and recycle, if necessary
( ) Define scope of work
( ) Apply CPM computations
( ) Prepare logic plan

2. Assume you are the project manager (in charge of the project). Which of the six steps listed in Question No. 1 would you consider the two most critical, and requiring your highest management skill and experience?

3. What are some of the advantages of the dummy separation method over direct end to start graphics. (Check advantages)

( ) Revisions to logic plan can be made more easily
( ) Requires less drafting paper
( ) LS's and LF's may be read directly from the network model for each task
( ) Requires fewer node numbers
( ) Helps speed the planning - thinking - writing process when preparing the rough logic plan
( ) Keeps down the number of restraints (dummies & tasks) to be written on data processing input form
( ) Helps avoid logic errors
( ) Saves diagramming time

QUIZ 6
(continued)

4. At what stage of the project planning process with networks is it most helpful to prepare the summary network model (level #1)?

( ) Near completion to show what has been done
( ) At the midpoint when everyone has a good feel for the job
( ) At the early stages of the project to give a comprehensive overlook at the major intermediate goals

5. Network planning may be helpful in planning (Check those applicable.)

( ) Obtaining project financing
( ) Remodeling a building
( ) Preparing working drawings and specs
( ) Estimating a job
( ) Mass producing a factory product (such as light bulbs)
( ) Purchasing and improving land for building
( ) A public relations program for your firm

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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.

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PROJECT MANAGEMENT

AN EXPLORATORY LOOK

Definition:

Project - A set of work actions having identifiable objectives.

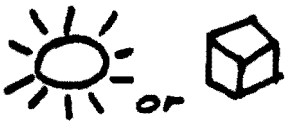
Effective - Of a nature that accomplishes identifiable objectives in accordance with the action plan, and achieves specified peripheral goals resulting from intermediate actions.

Manage - To direct the application of available resources.

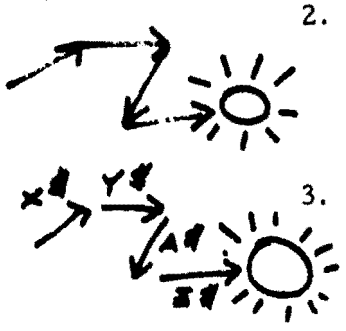
Question?: What is different about project organization as compared to the ongoing parent organization?

1. Project organization is usually temporary (relatively).
2. Project organization may be on a different base than the ongoing parent organization.
3. Project authority positions tend to be vested first and earned later.

What is it?: A project seems to have the following characteristics (features) and requirements.



1. Its objectives must be clearly defined.
2. The desired course of action from start to finish is (and if it isn't, should be) explicitly stated as a standard of performance (if you can't plan it, you can't do it!)



3. The resources required to do each action from beginning to end are identified and made countable.

RALPH J. STEPHENSON, P.E.
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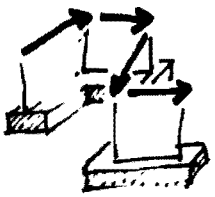
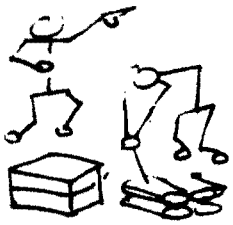
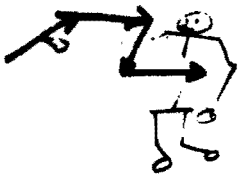


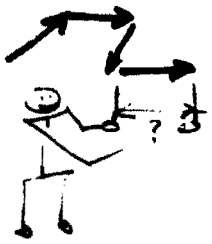
4. An organization structure should be (or is best) built under (not over) the resource framework to give the resource frame quality, continuity and monitorbility.



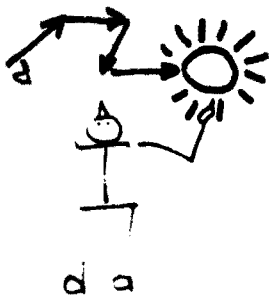
5. The resources needed to do the project can be assembled and put to work.



6. A method of isolating, identifying and correcting deviations from the standards of expected performance has to be devised and applied.



7. The performance should be measured to reward competence, and correct and improve lesser efforts as the project proceeds and upon its completion.



8. Outside management (ongoing management) usually sets both the starting and ending of the project.

d a

PROJECT SCHEDULE STATUS - LAKE CITY RALPH J. STEPHENSON, P.E. CONSULTANT

LISTING IS IN LATE START SEQUENCE

1 ARCHITECTURAL ACTIVITIES FROM 6-05-72 TO 6-23-72

I	J	TASK DESCRIPTION	-DEADLINE- START	FINISH	TOTAL DAYS	COMMENT	DAYS LATE
1	16	LA DAFD RF STRUCT STEEL	1 5 72	6 28 72	125	JOB IS STARTED WILL CONTI	
1	34	LA T/R DAFD ALUM SASH & ENTRIES	1 14 72	8 4 72	144	JOB IS STARTED WILL CONTI	
1	72	LA T/R DAFD INT HARDWARE	2 28 72	9 27 72	150	JOB IS STARTED WILL CONTI	
2	41	LA INSTL TEMP ROADS & UTIL	5 17 72	5 18 72	2	FINISH IS LATE	10
8	9	LA ST ERECTG EXT HM & MSNRY	5 26 72	6 9 72	10	SHOULD FINISH	
7	10	LA COMP EFRP MSNRY WLL FTGS	6 5 72	6 9 72	5	SHOULD FINISH	
11	14	LA C ERECTG EXT HM & MSNRY	6 12 72	6 23 72	10	SHOULD START AND FINISH	
9	12	LA ST EXT/INT RUFF BKFLG	6 22 72	6 23 72	2	SHOULD START AND FINISH	
9	13	LA CONSTR EQPT BASES/MECH ROOM	6 23 72	6 26 72	2	SHOULD START AND CONTINUE	

2 MECHANICAL ACTIVITIES FROM 6-05-72 TO 6-23-72

I	J	TASK DESCRIPTION	-DEADLINE- START	FINISH	TOTAL DAYS	COMMENT	DAYS LATE
1	15	LM DAFD SUPPLY FAN	1 24 72	6 26 72	110	JOB IS STARTED WILL CONTI	
1	33	LM T/R DAFD COMPRESSORS	2 29 72	9 8 72	136	JOB IS STARTED WILL CONTI	
2	41	LM INSTL TEMP ROADS & UTIL	5 17 72	5 18 72	2	FINISH IS LATE	10

3 ELECTRICAL ACTIVITIES FROM 6-05-72 TO 6-23-72

I	J	TASK DESCRIPTION	-DEADLINE- START	FINISH	TOTAL DAYS	COMMENT	DAYS LATE
2	41	LE INSTL TEMP ROADS & UTIL	5 17 72	5 18 72	2	FINISH IS LATE	10

PROJECT SCHEDULE STATUS - LAKE CITY

RALPH J. STEPHENSON, P.E. CONSULTANT

LISTING IS IN LATE START SEQUENCE

1 ARCHITECTURAL ACTIVITIES FROM 6-26-72 TO 7-14-72

I	J	-DEADLINE- START	FINISH	TOTAL DAYS	COMMENT	DAYS LATE
TASK DESCRIPTION						
1	16	1 5 72	6 28 72	125	JOB IS STARTED WILL CONTI	
LA	DAFD RF STRUCT STEEL					
1	34	1 14 72	8 4 72	144	JOB IS STARTED WILL CONTI	
LA	T/R DAFD ALUM SASH & ENTRIES					
1	72	2 28 72	9 27 72	150	JOB IS STARTED WILL CONTI	
LA	T/R DAFD INT HARDWARE					
11	14	6 12 72	6 23 72	10	JOB IS STARTED WILL CONTI	
LA	C ERECTG EXT HM & MSNRY					

2 MECHANICAL ACTIVITIES FROM 6-26-72 TO 7-14-72

I	J	-DEADLINE- START	FINISH	TOTAL DAYS	COMMENT	DAYS LATE
TASK DESCRIPTION						
1	33	2 29 72	9 8 72	136	JOB IS STARTED WILL CONTI	
LM	T/R DAFD COMPRESSORS					
15	16	6 27 72	6 28 72	2	JOB STARTED EARLY	
LM	SET SUPPLY FAN MECH EQUIP RM					

PROJECT SCHEDULE STATUS - LAKE CITY
RALPH J. STEPHENSON, P.E. CONSULTANT

LISTING IS IN LATE START SEQUENCE

1 ARCHITECTURAL ACTIVITIES FROM 7-17-72 TO 8-03-72

I	J	-DEADLINE- START	FINISH	TOTAL DAYS	COMMENT	DAYS LATE
TASK DESCRIPTION						
1	34	1 14 72	8 4 72	144	JOB IS STARTED WILL CONTI	
LA	T/R DAFD ALUM SASH & ENTRIES					
1	72	2 28 72	9 27 72	150	JOB IS STARTED WILL CONTI	
LA	T/R DAFD INT HARDWARE					
17	19	7 17 72	7 19 72	3	SHOULD START AND FINISH	
LA	ER RF MTL DK & NAILERS					
23	28	7 20 72	7 25 72	4	SHOULD START AND FINISH	
LA	FFG & SET IFW FOR SOG					
28	32	7 26 72	7 27 72	2	SHOULD START AND FINISH	
LA	CONST SOG					

2 MECHANICAL ACTIVITIES FROM 7-17-72 TO 8-03-72

I	J	-DEADLINE- START	FINISH	TOTAL DAYS	COMMENT	DAYS LATE
TASK DESCRIPTION						
1	33	2 29 72	9 8 72	136	JOB IS STARTED WILL CONTI	
LM	T/R DAFD COMPRESSORS					
17	21	7 12 72	7 19 72	6	START IS LATE	3
LM	EIB UG UTIL & DUCT WORK					
23	28	7 20 72	7 25 72	4	SHOULD START AND FINISH	
LM	FFG & SET IFW FOR SOG					
32	36	7 28 72	8 11 72	11	SHOULD START AND CONTINUE	
LM	ST INSTLG OH DUCT WK					
32	37	8 2 72	8 11 72	8	SHOULD START AND CONTINUE	
LM	ST INSTNG OH PIPING					

3 ELECTRICAL ACTIVITIES FROM 7-17-72 TO 8-03-72

I	J	-DEADLINE- START	FINISH	TOTAL DAYS	COMMENT	DAYS LATE
TASK DESCRIPTION						
23	28	7 20 72	7 25 72	4	SHOULD START AND FINISH	
LE	FFG & SET IFW FOR SOG					
32	38	7 31 72	8 11 72	10	SHOULD START AND CONTINUE	
LE	ST INSTLG RUFF ELECT WK					

PROJECT SCHEDULE STATUS - LAKE CITY
RALPH J. STEPHENSON, P.E. CONSULTANT

LISTING IS IN LATE START SEQUENCE

1 ARCHITECTURAL ACTIVITIES FROM 8-07-72 TO 8-25-72

I	J	TASK	DESCRIPTION	-DEADLINE- START	FINISH	TOTAL DAYS	COMMENT	DAYS LATE
1	72	LA	T/R DAFD INT HARDWARE	2 28 72	9 27 72	150	JOB IS STARTED WILL CONTI	
34	40	LA	INS & GLZ EXT ALUM SH & ENTRS	8 7 72	8 17 72	9	SHOULD FINISH	
22	25	LA	LAY INSUL & RFG	8 11 72	8 17 72	5	SHOULD FINISH	
39	51	LA	ER INT MSNRY WLLS	8 16 72	8 28 72	9	SHOULD START AND CONTINUE	
25	30	LA	INS PLSTR SFT & FASCIN VEST	8 18 72	8 25 72	6	SHOULD START AND FINISH	
40	52	LA	ST INSTLG CLG SUSP SYSTEM	8 18 72	8 25 72	6	SHOULD START AND FINISH	

2 MECHANICAL ACTIVITIES FROM 8-07-72 TO 8-25-72

I	J	TASK	DESCRIPTION	-DEADLINE- START	FINISH	TOTAL DAYS	COMMENT	DAYS LATE
1	33	LM	T/R DAFD COMPRESSORS	2 29 72	9 8 72	136	JOB IS STARTED WILL CONTI	
32	36	LM	ST INSTLG OH DUCT WK	7 28 72	8 11 72	11	SHOULD FINISH	
32	37	LM	ST INSTNG OH PIPING	8 2 72	8 11 72	8	SHOULD FINISH	
36	53	LM	C INS OH DUCK WK & INSUL	8 14 72	8 25 72	10	SHOULD START AND FINISH	
37	54	LM	C INSTLG OH PIPING	8 14 72	8 25 72	10	SHOULD START AND FINISH	
17	18	LM	ST INSTLG EQUIP&PIPG MECH RM	8 17 72	8 23 72	5	SHOULD FINISH	
25	31	LM	INSTL RF MTD MECH EQUIP	8 24 72	8 25 72	2	SHOULD START AND FINISH	
26	33	LM	ST INSTLG DUCT WK AT MECH RM	8 24 72	9 8 72	11	SHOULD START AND CONTINUE	

PROJECT SCHEDULE STATUS - LAKE CITY

RALPH J. STEPHENSON, P.E. CONSULTANT

LISTING IS IN LATE START SEQUENCE

3 ELECTRICAL ACTIVITIES FROM 8-07-72 TO 8-25-72

I	J	-DEADLINE- START	FINISH	TOTAL DAYS	COMMENT	DAYS LATE
TASK DESCRIPTION						
32	36	7 31 72	8 11 72	10	SHOULD FINISH	
LE	ST	INSTLG RUFF ELECT WK				
38	55	8 14 72	8 25 72	10	SHOULD START AND FINISH	
LE	C	INSTLG RUFF ELECT WK				

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

Looking ahead to the next two week period, reading directly from the late start and late finish sequence, we find the following tasks should be started, put in work or completed:

- Construct exterior wall footings and piers
- Install underground utilities
- Begin erection of masonry foundation walls
- Continue filling parking area
- Obtain information from bowling equipment supplier
- Expedite deliveries of BMC materials

Ralph J. Stephenson, P.E.

RJS/m

To: Mr. James Truehart
Field Superintendent

Mr. Charles Rock, President
Rock Building Systems

Mayor Ted Letts

Field File

Office File

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

February 1, 19__

Subject: Monitoring Report #1

Bowling Lanes & Utility Warehouse

Smith, Illinois

Contractor: Rock Building Systems

Smith, Illinois

Date of Monitoring: February 1, 19__ (working day 23)

Monitored from Issue #2

Actions taken:

- Inspected project
- Consulted with superintendent re job progress
- Evaluated job progress
- Color coded field networks

Target completion date: May 29, 19__ (working day 106)

General Summary

As of February 1, 19__ (working day 23), the project is moving fairly well. Most tasks are meeting targets between early and late start dates, although there is too much trending toward late starts at this early point in the job.

Information regarding foundations and slab inserts has not yet been requested from the bowling equipment supplier. This data should be obtained as soon as possible since it is expected, with the current progress of the job, we will begin sub-base preparation for the slab on grade on or about February 22, 19__ (working day 38). The information is critical for this slab on grade operation.

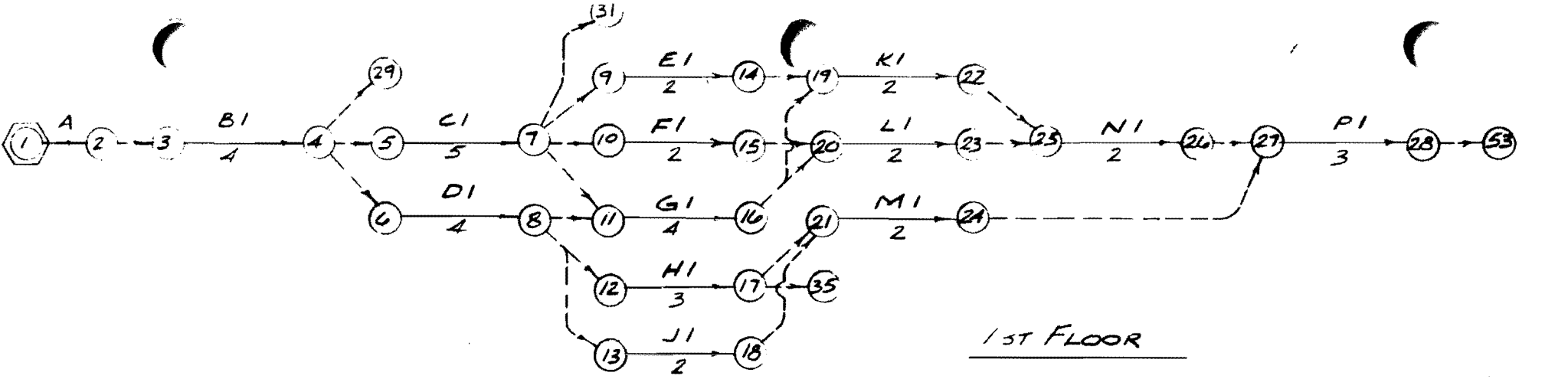
Butler materials have been ordered and are currently scheduled in on March 14, 19__ (working day 53). Fabrication is presently proceeding on schedule but a constant check should be made on delivery.

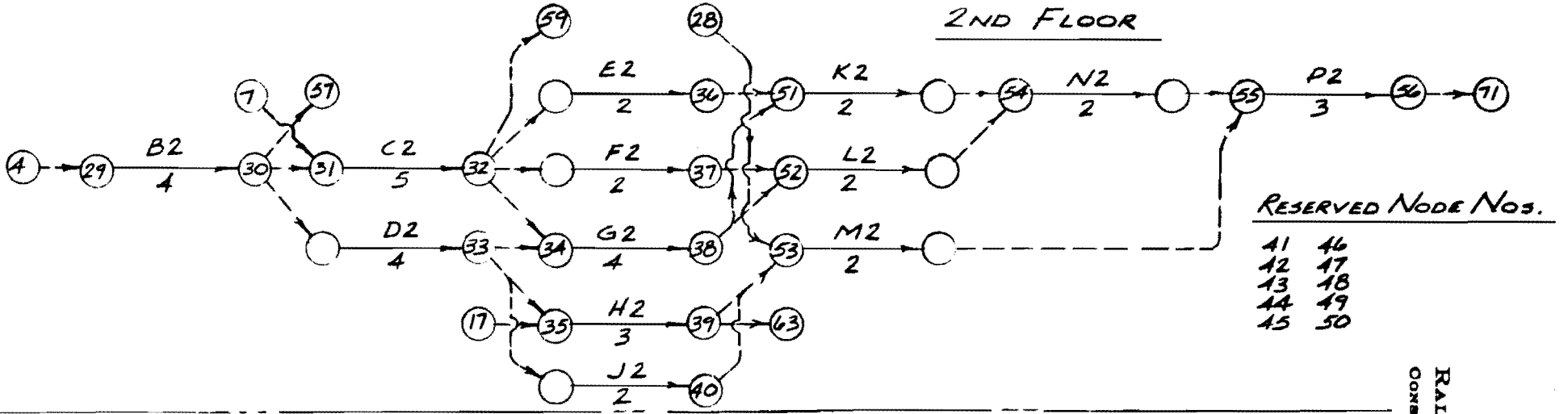
RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

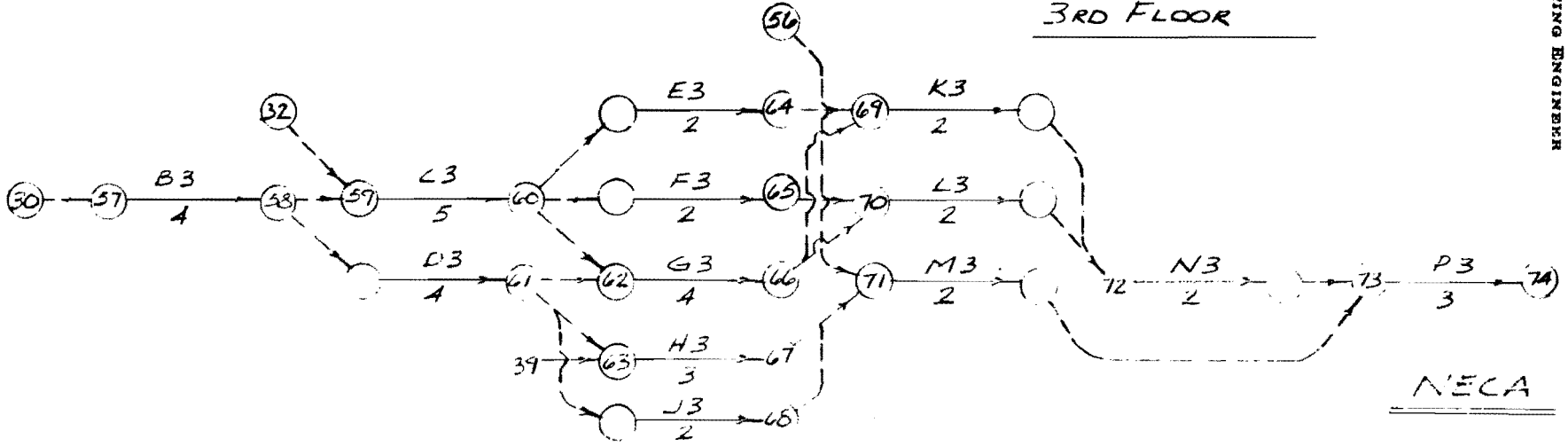
WHAT FACTORS INFLUENCE PROFIT?

Business Volume
Field Efficiency (Effectiveness)
Office Efficiency (Effectiveness)
Executive Competence
Executive Interest
Diversity of Operation (Hedging)
Types of Contracts
Quality of Estimating
Unit Costs
Area Work Volume
Season of Year
Local Economy
National Economy
Governmental Policies
Caliber of Participating Contractors
Caliber of Competing Contractors
Caliber of Suppliers
Delivery Dates
Amount of Warranty Work
Caliber of Owner or Client
Type of Project

Size of Project
Quality of Dwgs & Specs
Location
Labor Relations
Caliber of Field Managers
Expediting Effectiveness
Project Planning
Project Scheduling
Withheld Amounts
Availability of Labor
Billing Procedures
Inventory Practices
Internal Education
Internal Training
Type of Business
Experience
Reputation
Staff Honesty
Caliber of Purchasing Skills
Profiling Procedures
Organizational Plans

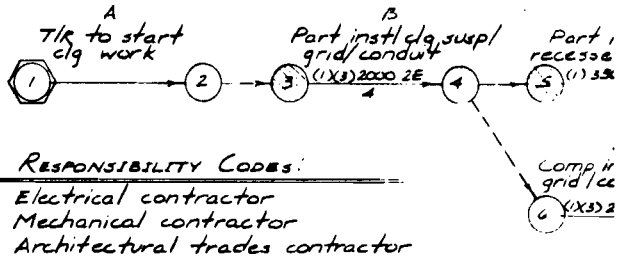






RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

K.B.

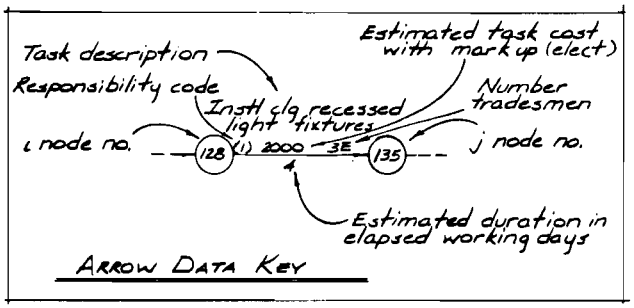


Responsibility Codes:

1 Electrical contractor
2 Mechanical contractor
3 Architectural trades contractor

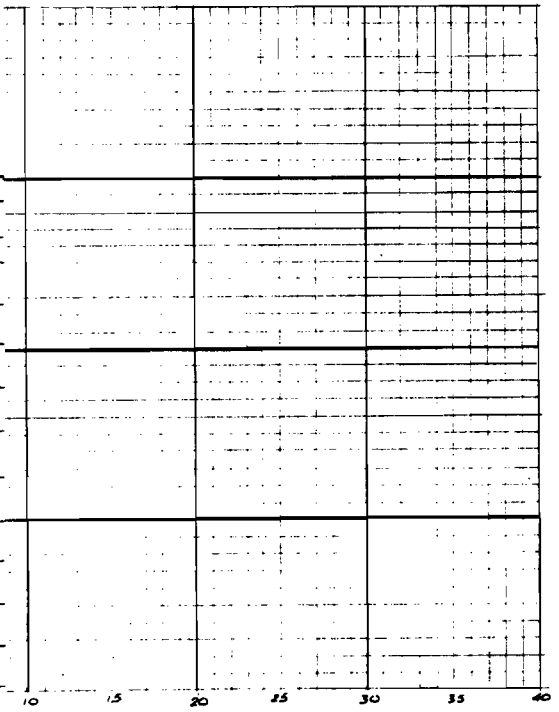
* General Notes:

- Mech/elect trim includes wall plates, plugs, convector covers, escutcheons, control covers, clocks



Arrow Data Key

Row #	i node no.	j node no.	duration	Task description and Responsibility codes	Month / Date / Wkg Day
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)



ng Days & Dates

Figure #2 - #3 Slant Chart

NBCA

CORD	Network Planning Worksheet
DATE	Ceiling Installation Network
	Bar Chart & Slant Chart

RALPH J. STEPHENSON, P.E.
15084 WARWICK ROAD
DETROIT, MICHIGAN 48223
CONSULTANT PH 273-5026

3

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

2-YR WORKING-DAY CALENDAR STARTING JAN. 2, 1975

DATE	W/D
JAN 1975	
02	1
03	2
06	3
07	4
08	5
09	6
10	7
13	8
14	9
15	10
16	11
17	12
20	13
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MAR	
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30	106
JUNE	
02	107
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30	127
JLY	
01	128
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26	232
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DEC	
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16	245
17	246
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30	254
31	255

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

2-YR WORKING-DAY CALENDAR STARTING JAN. 2, 1975

DATE W/D	DATE W/D	DATE W/D	DATE W/D	DATE W/D
JAN 1976	15 307	27 359	09 410	21 462
02 256	16 308	28 360	10 411	22 463
05 257	17 309	31 361	11 412	25 464
06 258	18 310	JNE	12 413	26 465
07 259	19 311	01 362	13 414	27 466
08 260	22 312	02 363	16 415	28 467
09 261	23 313	03 364	17 416	29 468
12 262	24 314	04 365	18 417	NOV
13 263	25 315	07 366	19 418	01 469
14 264	26 316	08 367	20 419	02 470
15 265	29 317	09 368	23 420	03 471
16 266	30 318	10 369	24 421	04 472
19 267	31 319	11 370	25 422	05 473
20 268	APR	14 371	26 423	08 474
21 269	01 320	15 372	27 424	09 475
22 270	02 321	16 373	30 425	10 476
23 271	05 322	17 374	31 426	11 477
26 272	06 323	18 375	SEP	12 478
27 273	07 324	21 376	01 427	15 479
28 274	08 325	22 377	02 428	16 480
29 275	09 326	23 378	03 429	17 481
30 276	12 327	24 379	07 430	18 482
FEB	13 328	25 380	08 431	19 483
? 277	14 329	28 381	09 432	22 484
3 278	15 330	29 382	10 433	23 485
04 279	16 331	30 383	13 434	24 486
05 280	19 332	JLY	14 435	26 487
06 281	20 333	01 384	15 436	29 488
09 282	21 334	02 385	16 437	30 489
10 283	22 335	06 386	17 438	DEC
11 284	23 336	07 387	20 439	01 490
12 285	26 337	08 388	21 440	02 491
13 286	27 338	09 389	22 441	03 492
16 287	28 339	12 390	23 442	06 493
17 288	29 340	13 391	24 443	07 494
18 289	30 341	14 392	27 444	08 495
19 290	MAY	15 393	28 445	09 496
20 291	03 342	16 394	29 446	10 497
23 292	04 343	19 395	30 447	13 498
24 293	05 344	20 396	OCT	14 499
25 294	06 345	21 397	01 448	15 500
26 295	07 346	22 398	04 449	16 501
27 296	10 347	23 399	05 450	17 502
MAR	11 348	26 400	06 451	20 503
01 297	12 349	27 401	07 452	21 504
02 298	13 350	28 402	08 453	22 505
03 299	14 351	29 403	11 454	23 506
04 300	17 352	30 404	12 455	27 507
5 301	18 353	AUG	13 456	28 508
8 302	19 354	02 405	14 457	29 509
09 303	20 355	03 406	15 458	30 510
10 304	21 356	04 407	18 459	31 511
11 305	25 357	05 408	19 460	
12 306	26 358	06 409	20 461	

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5020

2-YR WORKING-DAY CALENDAR STARTING JAN. 2, 1976

DATE	W/D
JAN 1976	
02	1
05	2
06	3
07	4
08	5
09	6
12	7
13	8
14	9
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MAR	
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26	61
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31	64
APR	
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25	102
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27	104
28	105
31	106
JNE	
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24	124
25	125
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29	127
30	128
JLY	
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19	140
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23	144
26	145
27	146
28	147
29	148
30	149
AUG	
02	150
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R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

2-YR WORKING-DAY CALENDAR STARTING JAN. 2, 1976

DATE	W/D
JAN 1977	
03	256
04	257
05	258
06	259
07	260
10	261
11	262
12	263
13	264
14	265
17	266
18	267
19	268
20	269
21	270
24	271
25	272
26	273
27	274
28	275
31	276
FEB	
01	277
02	278
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14	286
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22	292
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24	294
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MAR	
01	297
02	298
03	299
04	300
7	301
08	302
09	303
10	304
11	305
14	306
MAR	15 307
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APR	
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MAY	
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	26 358
MAY	27 359
	30 360
	31 361
JNE	
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AUG	09 410
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NOV	
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R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

2-YR WORKING-DAY CALENDAR STARTING JAN. 2, 1976

WK	TO MO	TO DAY	MO	DAY	WORKING DAY NO. MON	TUE	WED	THR	FRI	COMMENT
0	JAN	1	JAN	2	0	0	0	0	1	
1	JAN	5	JAN	9	2	3	4	5	6	
2	JAN	12	JAN	16	7	8	9	10	11	
3	JAN	19	JAN	23	12	13	14	15	16	
4	JAN	26	JAN	30	17	18	19	20	21	
5	FEB	2	FEB	6	22	23	24	25	26	
6	FEB	9	FEB	13	27	28	29	30	31	
7	FEB	16	FEB	20	32	33	34	35	36	
8	FEB	23	FEB	27	37	38	39	40	41	
9	MAR	1	MAR	5	42	43	44	45	46	
10	MAR	8	MAR	12	47	48	49	50	51	
11	MAR	15	MAR	19	52	53	54	55	56	
12	MAR	22	MAR	26	57	58	59	60	61	
13	MAR	29	APR	2	62	63	64	65	66	
14	APR	5	APR	9	67	68	69	70	71	
15	APR	12	APR	16	72	73	74	75	76	
16	APR	19	APR	23	77	78	79	80	81	
17	APR	26	APR	30	82	83	84	85	86	
18	MAY	3	MAY	7	87	88	89	90	91	
19	MAY	10	MAY	14	92	93	94	95	96	
20	MAY	17	MAY	21	97	98	99	100	101	
[illegible]	MAY	24	MAY	28	0	102	103	104	105	
[illegible]	MAY	31	JNE	4	106	107	108	109	110	
23	JNE	7	JNE	11	111	112	113	114	115	
24	JNE	14	JNE	18	116	117	118	119	120	
25	JNE	21	JNE	25	121	122	123	124	125	
26	JNE	28	JLY	2	126	127	128	129	130	
27	JLY	5	JLY	9	0	131	132	133	134	
28	JLY	12	JLY	16	135	136	137	138	139	
29	JLY	19	JLY	23	140	141	142	143	144	
30	JLY	26	JLY	30	145	146	147	148	149	
31	AUG	2	AUG	6	150	151	152	153	154	
32	AUG	9	AUG	13	155	156	157	158	159	
33	AUG	16	AUG	20	160	161	162	163	164	
34	AUG	23	AUG	27	165	166	167	168	169	
35	AUG	30	SEP	3	170	171	172	173	174	
36	SEP	6	SEP	10	0	175	176	177	178	
37	SEP	13	SEP	17	179	180	181	182	183	
38	SEP	20	SEP	24	184	185	186	187	188	
39	SEP	27	OCT	1	189	190	191	192	193	
40	OCT	4	OCT	8	194	195	196	197	198	
41	OCT	11	OCT	15	199	200	201	202	203	
42	OCT	18	OCT	22	204	205	206	207	208	
43	OCT	25	OCT	29	209	210	211	212	213	
44	NOV	1	NOV	5	214	215	216	217	218	
45	NOV	8	NOV	12	219	220	221	222	223	
46	NOV	15	NOV	19	224	225	226	227	228	
[illegible]	NOV	22	NOV	26	229	230	231	0	232	
[illegible]	NOV	29	DEC	3	233	234	235	236	237	
49	DEC	6	DEC	10	238	239	240	241	242	
50	DEC	13	DEC	17	243	244	245	246	247	
51	DEC	20	DEC	24	248	249	250	251	0	
52	DEC	27	DEC	31	252	253	254	255	0	

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R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

2-YR WORKING-DAY CALENDAR STARTING JAN. 2, 1976

WK	TO MO	TO DAY	MO	DAY	WORKING DAY NO. MON	TUE	WED	THR	FRI	COMMENT
1	JAN	3	JAN	7	256	257	258	259	260	
2	JAN	10	JAN	14	261	262	263	264	265	
3	JAN	17	JAN	21	266	267	268	269	270	
4	JAN	24	JAN	28	271	272	273	274	275	
5	JAN	31	FEB	4	276	277	278	279	280	
6	FEB	7	FEB	11	281	282	283	284	285	
7	FEB	14	FEB	18	286	287	288	289	290	
8	FEB	21	FEB	25	291	292	293	294	295	
9	FEB	28	MAR	4	296	297	298	299	300	
10	MAR	7	MAR	11	301	302	303	304	305	
11	MAR	14	MAR	18	306	307	308	309	310	
12	MAR	21	MAR	25	311	312	313	314	315	
13	MAR	28	APR	1	316	317	318	319	320	
14	APR	4	APR	8	321	322	323	324	325	
15	APR	11	APR	15	326	327	328	329	330	
16	APR	18	APR	22	331	332	333	334	335	
17	APR	25	APR	29	336	337	338	339	340	
18	MAY	2	MAY	6	341	342	343	344	345	
19	MAY	9	MAY	13	346	347	348	349	350	
20	MAY	16	MAY	20	351	352	353	354	355	
21	MAY	23	MAY	27	0	356	357	358	359	
	MAY	30	JNE	3	360	361	362	363	364	
	JNE	6	JNE	10	365	366	367	368	369	
24	JNE	13	JNE	17	370	371	372	373	374	
25	JNE	20	JNE	24	375	376	377	378	379	
26	JNE	27	JLY	1	380	381	382	383	384	
27	JLY	4	JLY	8	0	385	386	387	388	
28	JLY	11	JLY	15	389	390	391	392	393	
29	JLY	18	JLY	22	394	395	396	397	398	
30	JLY	25	JLY	29	399	400	401	402	403	
31	AUG	1	AUG	5	404	405	406	407	408	
32	AUG	8	AUG	12	409	410	411	412	413	
33	AUG	15	AUG	19	414	415	416	417	418	
34	AUG	22	AUG	26	419	420	421	422	423	
35	AUG	29	SEP	2	424	425	426	427	428	
36	SEP	5	SEP	9	0	429	430	431	432	
37	SEP	12	SEP	16	433	434	435	436	437	
38	SEP	19	SEP	23	438	439	440	441	442	
39	SEP	26	SEP	30	443	444	445	446	447	
40	OCT	3	OCT	7	448	449	450	451	452	
41	OCT	10	OCT	14	453	454	455	456	457	
42	OCT	17	OCT	21	458	459	460	461	462	
43	OCT	24	OCT	28	463	464	465	466	467	
44	OCT	31	NOV	4	468	469	470	471	472	
45	NOV	7	NOV	11	473	474	475	476	477	
46	NOV	14	NOV	18	478	479	480	481	482	
4	NOV	21	NOV	25	483	484	485	0	486	
4	NOV	28	DEC	2	487	488	489	490	491	
49	DEC	5	DEC	9	492	493	494	495	496	
50	DEC	12	DEC	16	497	498	499	500	501	
51	DEC	19	DEC	23	502	503	504	505	506	
52	DEC	26	DEC	30	0	507	508	509	510	

This replace 1-84 underneath

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Master Responsibility Code List

K-Marts

1	Malan
2	Mechanical
3	Electrical
4	Structural steel
5	Sprinkler
6	Site excavation
7	Tenant (K-Mart)
8	Governmental agencies
9	Site utility
10	Gas co.
11	Power co.
12	Telephone co.
13	Paving
14	Precast concrete
15	Metal deck
16	Roofing
17	Building concrete
18	Site concrete
19	Fencing
20	Landscaping
21	Masonry
22	Painting
23	Miscellaneous iron
24	Parking lot striping & signs
25	Sash and glazing
26	Carpentry
27	Resilient flooring
28	Ceramic
29	Acoustic
30	DC items (award contract)
31	D items (shop drawings, approvals, deliveries)
32	OH door
33	Dry wall
34	TO/R partitions
35	Site storm
36	Site sanitary
37	Site water
38	Site electrical
39	Other tenants
40	Hollow metal frames & doors
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H/C 101

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PROJECT PLANNING AND MANAGEMENT FOR THE MECHANICAL CONTRACTOR - MAJOR TOPIC OUTLINE

I. Class Greeting and Introductions

II. Definition and Overlook of Subject

- A. Purpose of seminar
- B. Project definitions and nature
- C. Objectives - What are they?
- D. Project planning - What is it?
- E. Organizing the project
- F. Communication - its effective use
- G. Measuring performance
- H. Controlling the rudder of the project ship
- I. Correcting

III. Defining Objectives

- A. End objectives
- B. Intermediate objectives
- C. Peripheral objectives

IV. Planning the Project

- A. Setting the scope and scale
- B. Preparing and quantifying the plan
- C. Analyzing the plan
- D. Translating the plan

PROJECT PLANNING AND MANAGEMENT
FOR THE MECHANICAL CONTRACTOR
MAJOR TOPIC OUTLINE

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V. Organizing the Project Work

- A. Identifying needed resources
- B. Setting project relationships
- C. Setting project documentation
- D. Establishing ground rules (policies)
- E. Mobilizing and starting

VI. Monitoring and Measuring Project Performance

- A. Selecting the monitoring and measuring method
- B. Setting the monitoring standard
- C. Monitoring and measuring procedures

VII. Controlling and Correcting

- A. Basics of problem identification
- B. Solving the problem
- C. Now and future problem situations
- D. What to do with the problem solution
- E. Motivation and leverage

VIII. Summary

- A. Summary of project planning and management processes
- B. Guidelines for coaching your company staff in effective project planning and management
- C. Closing remarks

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CASE STUDY M1 - DEFINITION OF OBJECTIVES

Your firm has just been successful in obtaining a prime mechanical contract for a new three story commercial office building measuring 150 ft. by 150 ft. The building contains a core utility space housing elevators, stairs, riser shafts, toilet rooms and telephone, electrical and janitor closets. Perimeter spaces are standard rental areas and will be finished out with a smooth concrete floor, acoustic ceiling, lights and a modular diffuser pattern.

Presently it appears your firm may do the tenant improvement mechanical work but this is not yet certain.

The owner has appointed two other prime contractors, architectural/structural and electrical, and is coordinating all prime contracts through his properties department. This department is fairly experienced although the individual in charge of your project is young, new and stubborn, but smart.

Cost of the project is about $3,000,000 with $700,000 in mechanical work.

The owner has asked that occupancy of the building be from the top floor down and out at the first level and on a staggered basis.

This is your first commercial project as a responsible field superintendent. Your experience includes several successful similar commercial projects as a journeyman and as a working foreman.

It has been decided by your office to try a new system of project management whereby the field office will be responsible for preparing necessary sheet metal and piping shop drawings, preparing requests for payments and maintaining all relations with the owner, other primes and the architect/engineer.

You have been assigned a field detailer - a young man, lots of promise, very personable who is presently going to local engineering school, taking electrical engineering. Your lead men on sheet metal,

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plumbing, sprinkler and pipe fitting trades are, for the most part, young, hard working and anxious to learn. However, John Lynch, the lead man on sheet metal work, tends to be heavy handed, and quite often aggravates and offends people with whom he is working. The sprinkler lead man will need plenty of help from you since he has never been on his own on a project of this size or type before.

The owner wants quality work and is willing to pay to get it. The architectural engineering firm has a moderately good technical reputation, tends to design economically and will cooperate so long as they are given the legitimate help that they have come to expect from congenial and competent contractors. You have never worked with them before.

Your personal goal on this project is to do such a bangup job that your position as a field superintendent will be strengthened and that hopefully it will bring you enough stature in the firm to allow your company to financially encourage you to finish your college education.

You have had one year of university in mechanical engineering, are married and have three small children, all under ten years old.

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PROJECT STAGE SCOPE OF WORK CHECK LIST

Stage A - Profile, propose and negotiate (obtain the job)

Stage B - Organize, procure, detail and approve (in house and external)

Stage C - Fabricate and deliver (in house and external)

Stage D - Install site work (work outside the building line but within the property line or contract limits)

Stage E - Install building rough work (work which can be totally or partially exposed to weather)

Stage F - Install building systems work (work on definable, isolated operating units)

Stage G - Install building finish work (work which must be partially or totally protected from weather - usually installed after building close-in)

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INTERFACING RESTRAINTS ON PROJECT STAGES

Restrain Stage B - Organize, procure, detail and approve (in house and external)

Restrain Stage C - Fabricate and deliver (in house and external)

Restrain Stage D - Install site work

Restrain Stage E - Install building rough work

Restrain Stage F - Install building systems work

Restrain Stage G - Install building finish work

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GLOSSARY OF TERMS USED IN

PROJECT PLANNING AND MANAGEMENT

Dysfunction - organizational

An organizational problem that hinders or prevents achieving objectives - may be temporary or permanent.

Education

The teaching and learning process by which principles of doing things are conveyed to the learner.

Effective

Of a nature that accomplishes identifiable end objectives in accordance with an action plan, and achieves worthwhile peripheral goals resulting from intermediate accomplishments.

Goals

Similar to objectives but quite often applied to individual effort rather than group or company effort.

Goals - dependent

Targets to be achieved, but affected by major influences beyond the manager's control. (Note: dependent goals, while beyond a manager's control, may be well within his company's ability to achieve. Lack of correlation between company and individual effort in achieving a manager's dependent goals may cause severe organizational dysfunctions.)

Goals - direct control

Targets achieved by managing conditions well within the direct influence of the manager.

Interfaces

Points at which different but related activities exert direct influence upon each other. Interfaces are often the influence points where direct control goal activities contact dependent goal activities. Poor management of interface situations usually causes problems.

Leverage

The effective use of vested and earned authority to solve problems and achieve objectives.

Line of action

A sequential statement of the activities necessary to conceive, design, build and operate an environment.

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 or are about to arise, and remains silent when there are no problems. The system explicitly identifies the problem area, thus permitting the effective manager to manage the exception while leaving smoothly running operations to continue running smoothly.

Monitoring

Measurement of current project conditions and position against the standard of performance.

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Network Plan

A graphic statement of the action standard of performance expected to be used in achieving project objectives.

Objectives - end

Those objectives that are realized from and upon total completion of the project work.

Objectives - intermediate

Those objectives achieved at specific and identifiable stages of the project, i.e. partial occupancy of a building, or turn-over of a mechanical system for temporary heat.

Objectives - long range

Usually applied to organizational objectives to be achieved within a 5 to 10 year period. Sometimes called strategic objectives.

Objectives - medium range

Organizational objectives to be achieved within a 1 to 5 year period. Sometimes called tactical objectives.

Objectives - peripheral

Those 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. Examples of peripheral objectives might include staff promotion, profitable subcontractor operations or specialized experience.

Objectives - short range

Organizational goals to be achieved between now and 1 year. Sometimes called operational or short term tactical objectives.

Problem

A deviation from an accepted standard of performance.

Profiling

A selective, flexible, dynamic operable system of screening projects, people, activities and other elements of a project to achieve optimum results, as defined by established plans and objectives.

Profit - education

Company and project fulfillment of learning goals held by individuals or groups involved.

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 situation.
(Note: very difficult to explicitly define.)

Profit - value system

Company and project fulfillment of personal, professional, technical, social and financial values held important by individuals and groups.

Project

A set of work actions having identifiable end objectives.

Project stages

A sequential definition of the action steps to be taken in successfully carrying out a project.

Relations - formal functional

Project relationships 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 one to many or many to one in nature. Formal relations are precisely defined and most day to day business is accomplished within the formal relation framework.

Relations - informal functional

The natural channels along which organizationally related material is most easily, comfortably and quickly transmitted. The informal relation usually exists by consent and is stimulated to maximum effectiveness by a mutual profit gained from the relation. There is little, if any, authority normally expressed in informal relations. Communication is usually oral and one to one. Often informal relations define the hidden organizational structure.

Relations - occasional or temporary

Those created when extraordinary or unusual management demands arise. The temporary relationship is, by its nature, unstable and should seldom be adopted as a permanent active arrangement. Extensive use of informal functional relationships creates business dysfunctions, breaks down morale and causes internal tensions difficult to resolve.

Relations - reporting

The official channels through which each individual conveys or is given raises, appraisals and evaluations; is fired, assigned, reassigned, and is provided professional, vocational and personal identity. Usually is a one to one communication. The true organizational superior of an employee is usually that individual with whom he maintains a reporting relation.

Relations - staff

Those business relations through which a person or group provides advisory services necessary to accomplish goals. Staff personnel usually act in a consulting capacity with little or no authority relative to those outside the staff group.

Resources

The tools and raw materials used by the manager to achieve objectives (i.e. time, money, space, equipment, manpower, leverage, ability, land).

Span of control

The number of organizationally related individuals a manager directly controls. Span of control is signified by the number of one to one relations a manager maintains.

Standard of performance

A well defined, explicitly stated, approved and accepted statement of the measurement object to be used as a gage of performance and goal achievement.

Training

The teaching and learning processes by which specific, explicit methods and systems of doing something are conveyed to the learner.

Translation

Recasting standard of performance information and data into graphic, narrative, mental, oral or other form to insure optimum use by all involved.

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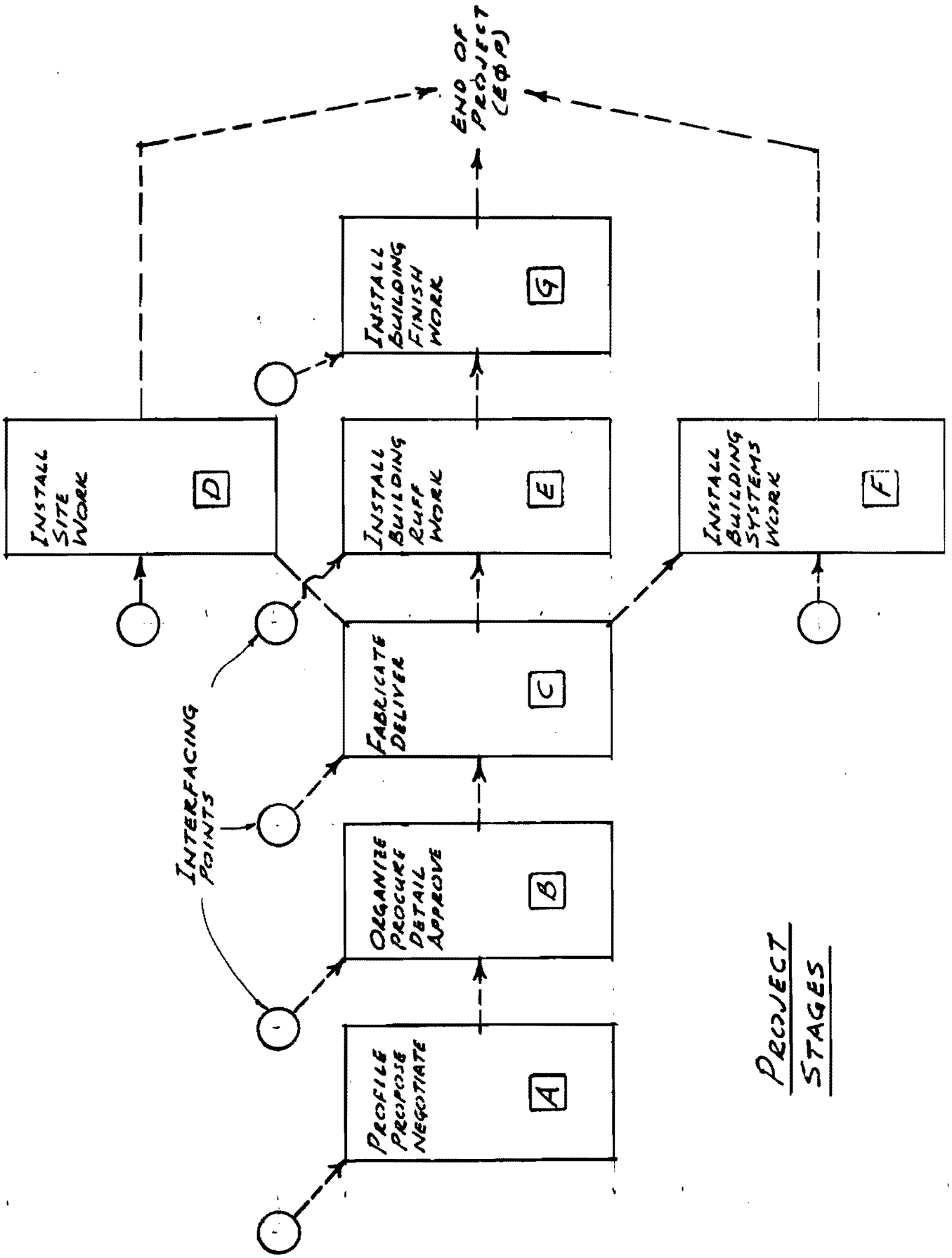

PROJECT STAGES

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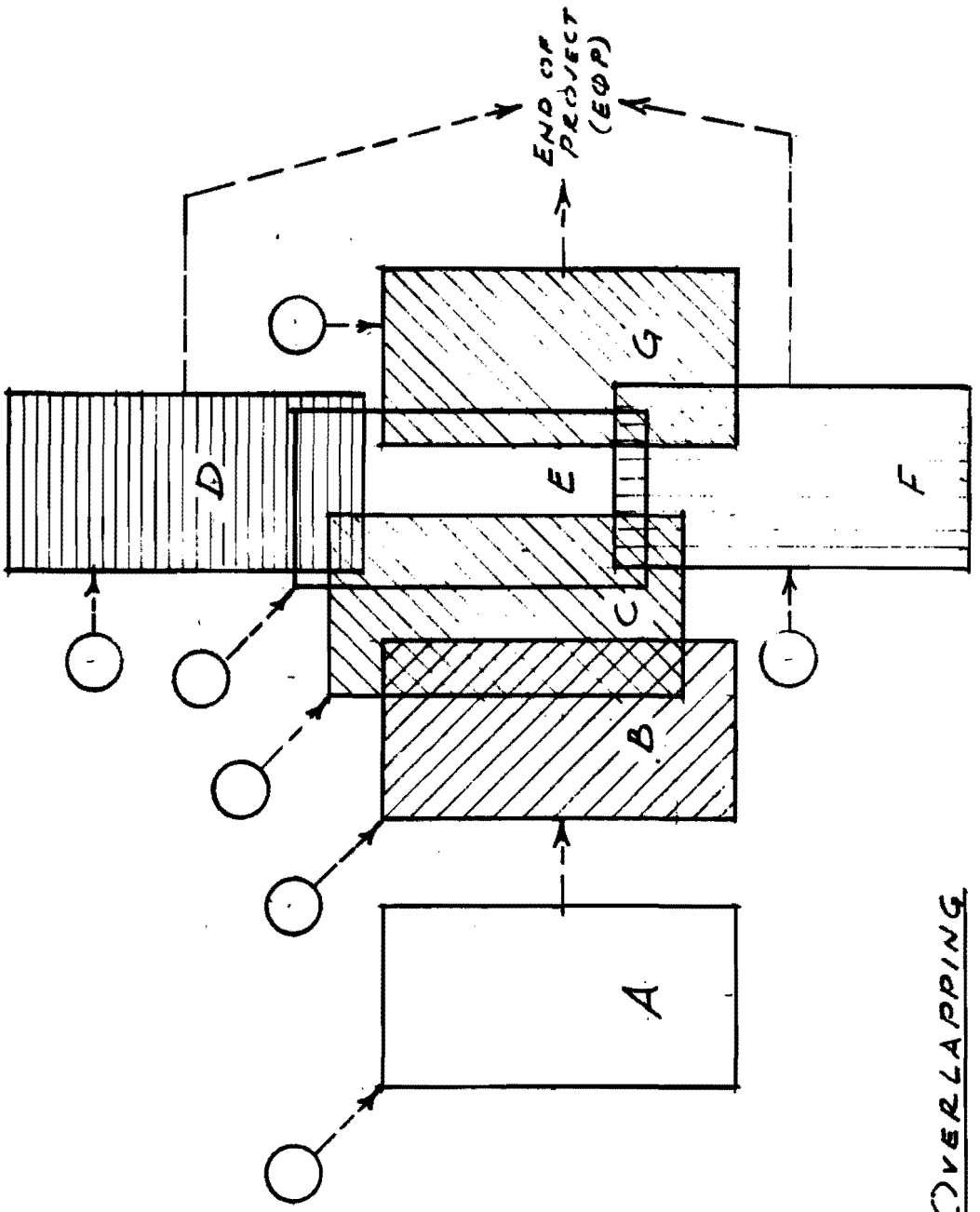
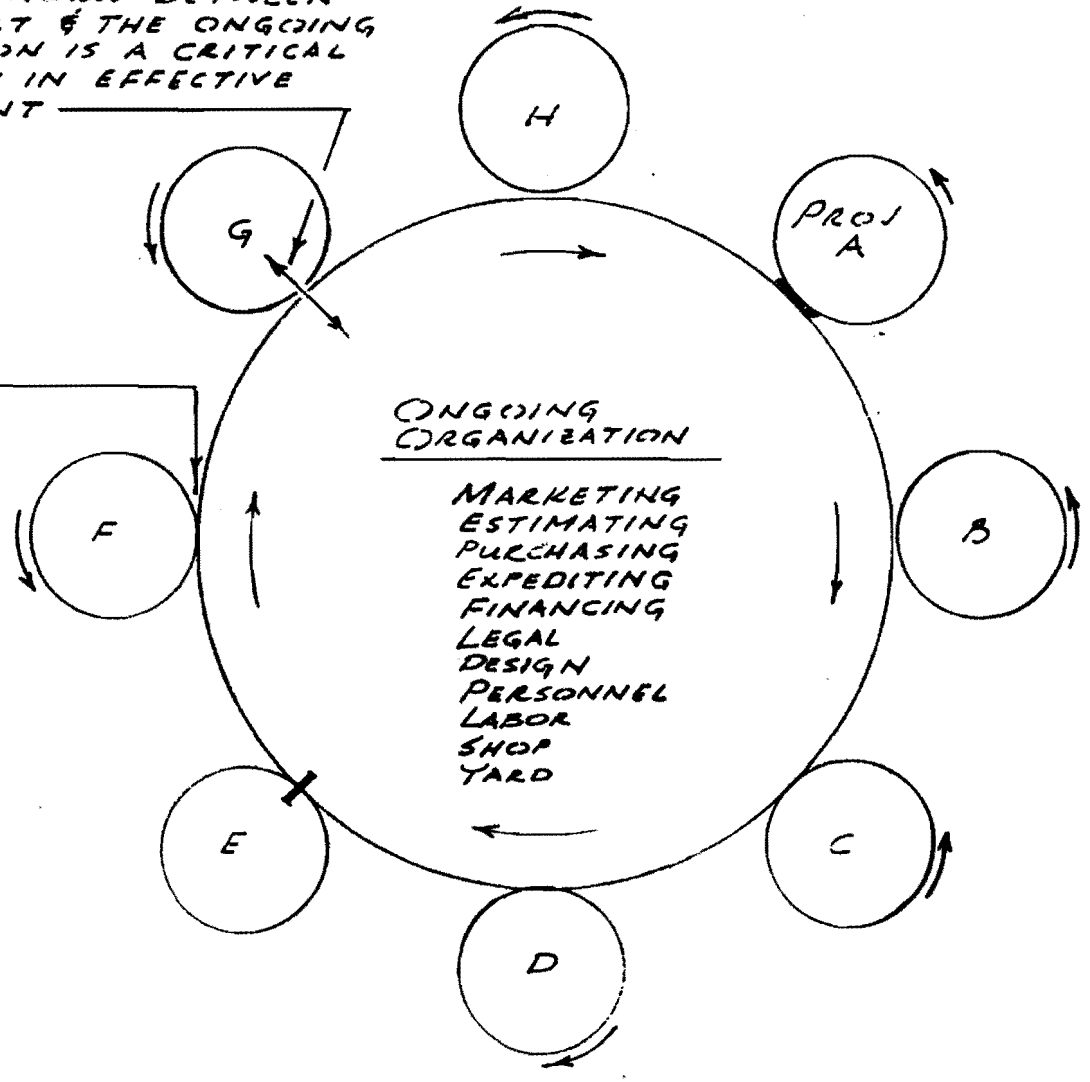


OVERLAPPING PROJECT STAGES

A CLEAR WINDOW BETWEEN THE PROJECT & THE ONGOING ORGANIZATION IS A CRITICAL INGREDIENT IN EFFECTIVE MANAGEMENT

A SMOOTH INTERFACING SURFACE IS ESSENTIAL TO GOOD PROJECT DIRECTION



+ GOALS & OBJECTIVES

THE RELATION OF PROJECT MANAGEMENT TO ONGOING MANAGEMENT

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EXAMPLE OF BASIC FUNCTIONAL COMPANY RELATIONS (DEPARTMENTAL)

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EXAMPLE OF BASIC FUNCTIONAL DEPARTMENT RELATIONSHIPS (INDIVIDUAL)

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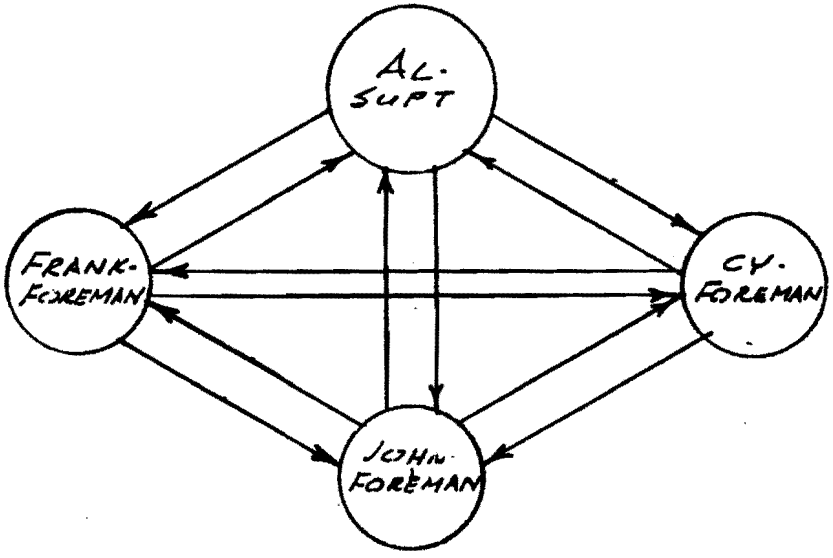
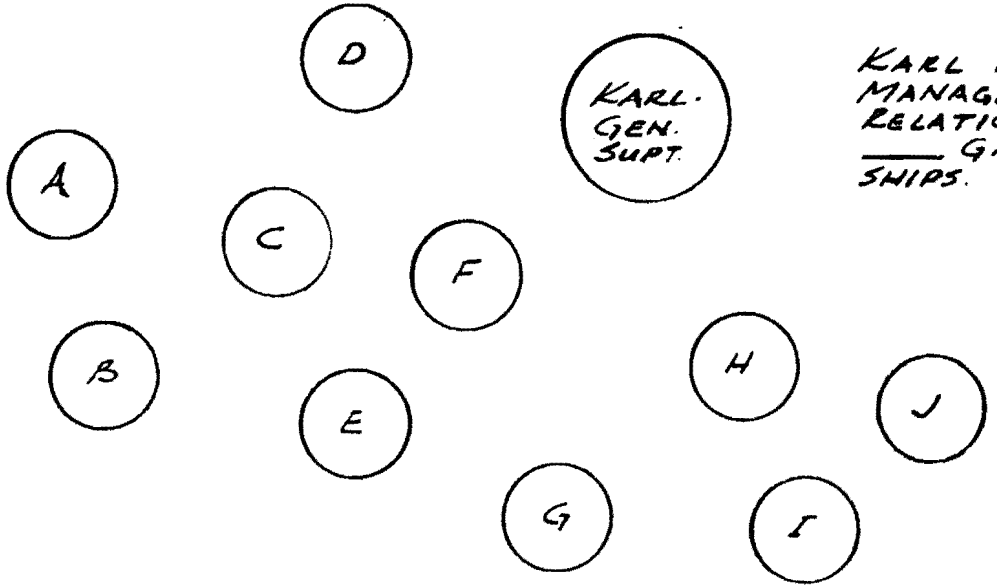
END, INTERMEDIATE & PERIPHERAL OBJECTIVES

SPAN OF MANAGEMENT PRINCIPLES



AL MANAGES ___ INDIVIDUAL RELATIONSHIPS & ___ GROUP RELATIONSHIPS.



KARL MAY HAVE TO MANAGE ___ INDIVIDUAL RELATIONSHIPS & ___ GROUP RELATIONSHIPS.

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Teaching Outline for In-House Training and Education in Project Planning and Management

(Time allocation is for a total class or coaching period of 16 hours)

I. Introduction ($\frac{1}{2}$ hour)

A. Importance of good project planning and management

1. Well planned projects are usually profitable.
2. An increase in planning time (within limits) usually reduces execution time.
3. Effective communication demands good planning.
4. If you can't plan it, you can't manage it!

B. Elements of good project work

1. Proper objectives
2. A sound plan
3. Well organized resources
4. A management by exception system
5. Firm, fair management
6. A sensible control and correction process

II. Defining objectives (2 hours)

A. Kinds of objectives

1. End
2. Intermediate
3. Peripheral

B. Manager goals

1. Direct
2. Dependent

III. Planning the project (8 hours)

A. Define the scope of project work

B. Prepare the plan

1. Basics of arrow diagramming
2. Approving the logic
3. Assigning resources
   a. Time
   b. Manpower
   c. Money
   d. Equipment
   e. Space
   f. Others

III. Planning the project

B. Prepare the plan (continued)

4. Computing the plan
   a. Early starts and finishes
   b. Late finishes and starts
5. Evaluating the plan (WHIF)
6. Outside interfaces
7. Delivery restraints
8. Weather restraints

C. Translate the plan

1. Bar charts
2. Cash flow
3. Slant charts
4. Purchasing schedules
5. Item processing schedules
6. Computer runs

IV. Organizing the project (2 hours)

A. Basic organizational relations

1. Formal
2. Informal
3. Reporting
4. Staff
5. Temporary

B. Graphics of organizational structure

C. Span of control principles

D. Project documentation

1. Keep it simple
2. Be thorough
3. Be objective
4. Be right

E. Keeping the project team effective

1. Hygiene
2. Motivation

V. Monitoring and measuring performance (2 hours)

A. Management by exception

B. The importance of a proper standard of performance

V. Monitoring and measuring performance (continued)

C. Monitoring the project

1. Inspect
2. Measure
3. Evaluate
4. Report

D. Color coding the network plan

E. Identifying problem areas

1. Now problems
2. Future problems

F. Evaluation

1. Qualitative
2. Quantitative

VI. Controlling and correcting ($1\frac{1}{2}$ hours)

A. Problem solving steps

1. Define problem
2. Interpret facts
3. Consider possible solutions
4. Test possible solutions against objectives
5. Decide on course of action
6. Implement course of action
7. Follow up
8. Evaluate and record results

B. Leverage in problem solving

1. Vested
2. Earned

C. Problem documentation

D. Liability implications

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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

Claim Prone Job Characteristics
(continued)

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

i. Large numbers of allowance items.

j. Zero (or excessively small) tolerance specifications.

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

l. Inexperienced specialty contractors.

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

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

o. Location in strike prone areas.

p. Location in jurisdictionally sensitive areas.

q. Heavy use specified for untried products and equipment.

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

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

t. Multi responsibility payment structures.

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

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

v. Poor owner reputation.

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UPDATING

A revision of the network model to reflect needed changes to the logic plan or task resources as of a given date.

STEPS IN UPDATING

1. Determine need to update.
2. Remove completed tasks from the computer printout.
3. Correct and revise arrow diagram and computer printout.
4. Make new computer run and check with revised model.
5. Make final network and computer run revisions and issue updated network model and translations.

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STEPS IN MONITORING

1. Make pre inspection review of network model.

2. Personally inspect current project work.

3. Confer with key project management personnel.

4. Make qualitative/quantitative evaluation of project.

5. Identify problems - current and potential.

6. Prepare report.

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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.

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Monitoring #1

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

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

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Monitoring #2

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

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

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SCOPE OF WORK CHECKLIST ITEMS

1. Conditions existing as of the defined start of project work.
(Permits, contracts, easements, obstructions, pre-ordered materials, agreements, etc.)

2. Front end work
(Work involving permits, contract documents, procurement, detailing, fabrication, deliveries, approvals and other non-construction project items)

3. Off-site work
(Work outside the project property line that has a direct influence and is of importance to achieving project goals)

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4. Site work
(Work outside the building line and within the property line or contract limits)

5. Substructure
(Footings, foundation walls, piling, caissons and all related work which transmits loads to the sub-soil)

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6. Superstructure
(All structural items which directly or indirectly transmit building loads back to the substructure)

7. Exterior skin
(All work to close the building to weather)

8. Interior rough work
(Interior work which can be totally or partially exposed to weather)

9. Interior finish work
(Interior work which must be partially or totally protected from weather)

10. Systems work
(Work which collectively makes up a total operating unit and can be identified as a separate work project from other project elements)

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Case Study A1 - Definition of Objectives

You work in the properties department of a firm of reputable, moderate size developers who specialize in financing, constructing and managing commercial properties. The company has just contracted to build and will be the owner and landlord of a new three story commercial office building measuring 150' x 150'. The building contains a core utility space which houses elevators, stairs, riser shafts, toilet rooms and telephone, electrical and janitor closets. Perimeter spaces consist of standard rental areas and will be finished with a smooth concrete floor, acoustic ceiling, lights and a modular diffuser pattern.

As the space is leased, you, the landlord, will install tenant improvements consisting of carpeting, partitions, doors and other items covered by the lease. The tenant will have an opportunity to add additional cost items to the basic tenant allowances at his expense, subject to your approval.

You have let contracts on the job to three prime contractors, architectural/ structural, mechanical and electrical. Your duties are as the properties department full time project manager. The properties department is new and you have only been with the firm a few months. You recognize you have the right education for the job, are interested in the work and are anxious to learn. However, you also recognize you are somewhat inexperienced, a little young for the responsibilities you have been given and have a tendency to be more stubborn than is necessarily good for you and those who must work with you.

Cost of the office building is about $3 million. It represents a sizable investment, one of the largest your company has ever made. In conjunction with your superiors in the properties department, you have decided you would like to have occupancy of the building from the top floor down and out at the first level and on a staggered basis with the floors being delivered in sequence.

This is your first major project with your new firm, although your experience includes the project management of several successful jobs for a moderate size general contractor in the community. These were accomplished over the previous four years of your employment.

You have met the three superintendents for the three prime contractors and each appears competent in his own discipline.

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The superintendent for the architectural/structural trades contractor is about ten years older than you, has extensive experience and probably will tend to be very aggressive on the job. However, his reputation is excellent and he appears very cooperative.

The mechanical superintendent is about fifteen years older than you. He has not said much in your meetings and you sense that he is highly concerned with protecting his company's rights on the job. He is, however, you judge, very competent, although you have also heard that he has a stubborn streak that tends to show up frequently during decision situations.

The electrical superintendent is about your age, a graduate electrical engineer, but with good journeyman experience since he started in the trades very young. He probably is the sharpest of the three superintendents and you have already noticed that he tends to look to you as his peer rather than the other two superintendents.

All three primes will have their detailing and accounting work done in the home office and will maintain a very small field administrative operation. You, as the owner, want quality work and are willing to pay to get it. Your architect/engineer has a moderately good technical reputation, designs economically and is very cooperative so long as he is given the legitimate help that he has come to expect from congenial and competent owners and contractors. You have never worked with him before.

Your personal goals in this project are to do an excellent job and to gain additional good reputation as a competent, conscientious field project manager. Hopefully, the experience and stature will encourage the company to help you with your ongoing education. You have had two years of college in construction engineering, are married and have a small child two years old.

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6-YEAR WORKING DAY CALENDAR STARTING JAN 2, 1976

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
JAN 1976		15	52	26	104	09	155	21	207
02	1	16	53	27	105	10	156	22	208
05	2	17	54	28	106	11	157	25	209
06	3	18	55	JNE		12	158	26	210
07	4	19	56	01	107	13	159	27	211
08	5	22	57	02	108	16	160	28	212
09	6	23	58	03	109	17	161	29	213
12	7	24	59	04	110	18	162	NOV	
13	8	25	60	07	111	19	163	01	214
14	9	26	61	08	112	20	164	02	215
15	10	29	62	09	113	23	165	03	216
16	11	30	63	10	114	24	166	04	217
19	12	31	64	11	115	25	167	05	218
20	13	APR		14	116	26	168	08	219
21	14	01	65	15	117	27	169	09	220
22	15	02	66	16	118	30	170	10	221
23	16	05	67	17	119	31	171	11	222
26	17	06	68	18	120	SEP		12	223
27	18	07	69	21	121	01	172	15	224
28	19	08	70	22	122	02	173	16	225
29	20	09	71	23	123	03	174	17	226
30	21	12	72	24	124	07	175	18	227
FEB		13	73	25	125	08	176	19	228
02	22	14	74	28	126	09	177	22	229
03	23	15	75	29	127	10	178	23	230
04	24	16	76	30	128	13	179	24	231
05	25	19	77	JLY		14	180	26	232
06	26	20	78	01	129	15	181	29	233
09	27	21	79	02	130	16	182	30	234
10	28	22	80	06	131	17	183	DEC	
11	29	23	81	07	132	20	184	01	235
12	30	26	82	08	133	21	185	02	236
13	31	27	83	09	134	22	186	03	237
16	32	28	84	12	135	23	187	06	238
17	33	29	85	13	136	24	188	07	239
18	34	30	86	14	137	27	189	08	240
19	35	MAY		15	138	28	190	09	241
20	36	03	87	16	139	29	191	10	242
23	37	04	88	19	140	30	192	13	243
24	38	05	89	20	141	OCT		14	244
25	39	06	90	21	142	01	193	15	245
26	40	07	91	22	143	04	194	16	246
27	41	10	92	23	144	05	195	17	247
MAR		11	93	26	145	06	196	20	248
01	42	12	94	27	146	07	197	21	249
02	43	13	95	28	147	08	198	22	250
03	44	14	96	29	148	11	199	23	251
04	45	17	97	30	149	12	200	27	252
05	46	18	98	AUG		13	201	28	253
08	47	19	99	02	150	14	202	29	254
09	48	20	100	03	151	15	203	30	255
10	49	21	101	04	152	18	204		
11	50	24	102	05	153	19	205		
12	51	25	103	06	154	20	206		

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
JAN 1977		15	307	26	359	09	410	21	462
03	256	16	308	27	360	10	411	24	463
04	257	17	309	31	361	11	412	25	464
05	258	18	310	JNE		12	413	26	465
06	259	21	311	01	362	15	414	27	466
07	260	22	312	02	363	16	415	28	467
10	261	23	313	03	364	17	416	31	468
11	262	24	314	06	365	18	417	NOV	
12	263	25	315	07	366	19	418	01	469
13	264	28	316	08	367	22	419	02	470
14	265	29	317	09	368	23	420	03	471
17	266	30	318	10	369	24	421	04	472
18	267	31	319	13	370	25	422	07	473
19	268	APR		14	371	26	423	08	474
20	269	01	320	15	372	29	424	09	475
21	270	04	321	16	373	30	425	10	476
24	271	05	322	17	374	31	426	11	477
25	272	06	323	20	375	SEP		14	478
26	273	07	324	21	376	01	427	15	479
27	274	08	325	22	377	02	428	16	480
28	275	11	326	23	378	06	429	17	481
31	276	12	327	24	379	07	430	18	482
FEB		13	328	27	380	08	431	21	483
01	277	14	329	28	381	09	432	22	484
02	278	15	330	29	382	12	433	23	485
03	279	18	331	30	383	13	434	25	486
04	280	19	332	JLY		14	435	28	487
07	281	20	333	01	384	15	436	29	488
08	282	21	334	05	385	16	437	30	489
09	283	22	335	06	386	19	438	DEC	
10	284	25	336	07	387	20	439	01	490
11	285	26	337	08	388	21	440	02	491
14	286	27	338	11	389	22	441	05	492
15	287	28	339	12	390	23	442	06	493
16	288	29	340	13	391	26	443	07	494
17	289	MAY		14	392	27	444	08	495
18	290	02	341	15	393	28	445	09	496
21	291	03	342	18	394	29	446	12	497
22	292	04	343	19	395	30	447	13	498
23	293	05	344	20	396	OCT		14	499
24	294	06	345	21	397	03	448	15	500
25	295	09	346	22	398	04	449	16	501
28	296	10	347	25	399	05	450	19	502
MAR		11	348	26	400	06	451	20	503
01	297	12	349	27	401	07	452	21	504
02	298	13	350	28	402	10	453	22	505
03	299	16	351	29	403	11	454	23	506
04	300	17	352	AUG		12	455	27	507
07	301	18	353	01	404	13	456	28	508
08	302	19	354	02	405	14	457	29	509
09	303	20	355	03	406	17	458	30	510
10	304	23	356	04	407	18	459		
11	305	24	357	05	408	19	460		
14	306	25	358	08	409	20	461		

H/O 133

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6-YEAR WORKING DAY CALENDAR STARTING JAN 2, 1976

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
JAN	1978	15	562	26	614	09	665	23	717
03	511	16	563	30	615	10	666	24	718
04	512	17	564	31	616	11	667	25	719
05	513	20	565	JNE		14	668	26	720
06	514	21	566	01	617	15	669	27	721
09	515	22	567	02	618	16	670	30	722
10	516	23	568	05	619	17	671	31	723
11	517	24	569	06	620	18	672	NOV	
12	518	27	570	07	621	21	673	01	724
13	519	28	571	08	622	22	674	02	725
16	520	29	572	09	623	23	675	03	726
17	521	30	573	12	624	24	676	06	727
18	522	31	574	13	625	25	677	07	728
19	523	APR		14	626	28	678	08	729
20	524	03	575	15	627	29	679	09	730
23	525	04	576	16	628	30	680	10	731
24	526	05	577	19	629	31	681	13	732
25	527	06	578	20	630	SEP		14	733
26	528	07	579	21	631	01	682	15	734
27	529	10	580	22	632	05	683	16	735
30	530	11	581	23	633	06	684	17	736
31	531	12	582	26	634	07	685	20	737
FEB		13	583	27	635	08	686	21	738
01	532	14	584	28	636	11	687	22	739
02	533	17	585	29	637	12	688	24	740
03	534	18	586	30	638	13	689	27	741
06	535	19	587	JLY		14	690	28	742
07	536	20	588	03	639	15	691	29	743
08	537	21	589	05	640	18	692	30	744
09	538	24	590	06	641	19	693	DEC	
10	539	25	591	07	642	20	694	01	745
13	540	26	592	10	643	21	695	04	746
14	541	27	593	11	644	22	696	05	747
15	542	28	594	12	645	25	697	06	748
16	543	MAY		13	646	26	698	07	749
17	544	01	595	14	647	27	699	08	750
20	545	02	596	17	648	28	700	11	751
21	546	03	597	18	649	29	701	12	752
22	547	04	598	19	650	OCT		13	753
23	548	05	599	20	651	02	702	14	754
24	549	08	600	21	652	03	703	15	755
27	550	09	601	24	653	04	704	18	756
28	551	10	602	25	654	05	705	19	757
MAR		11	603	26	655	06	706	20	758
01	552	12	604	27	656	09	707	21	759
02	553	15	605	28	657	10	708	22	760
03	554	16	606	31	658	11	709	26	761
06	555	17	607	AUG		12	710	27	762
07	556	18	608	01	659	13	711	28	763
08	557	19	609	02	660	16	712	29	764
09	558	22	610	03	661	17	713		
10	559	23	611	04	662	18	714		
[illegible]	560	24	612	07	663	19	715		
[illegible]	561	25	613	08	664	20	716		

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
JAN	1979	14	816	25	868	08	919	22	971
02	765	15	817	29	869	09	920	23	972
03	766	16	818	30	870	10	921	24	973
04	767	19	819	31	871	13	922	25	974
05	768	20	820	JNE		14	923	26	975
08	769	21	821	01	872	15	924	29	976
09	770	22	822	04	873	16	925	30	977
10	771	23	823	05	874	17	926	31	978
11	772	26	824	06	875	20	927	NOV	
12	773	27	825	07	876	21	928	01	979
15	774	28	826	08	877	22	929	02	980
16	775	29	827	11	878	23	930	05	981
17	776	30	828	12	879	24	931	06	982
18	777	APR		13	880	27	932	07	983
19	778	02	829	14	881	28	933	08	984
22	779	03	830	15	882	29	934	09	985
23	780	04	831	18	883	30	935	12	986
24	781	05	832	19	884	31	936	13	987
25	782	06	833	20	885	SEP		14	988
26	783	09	834	21	886	04	937	15	989
29	784	10	835	22	887	05	938	16	990
30	785	11	836	25	888	06	939	19	991
31	786	12	837	26	889	07	940	20	992
FEB		13	838	27	890	10	941	21	993
01	787	16	839	28	891	11	942	23	994
02	788	17	840	29	892	12	943	26	995
05	789	18	841	JLY		13	944	27	996
06	790	19	842	02	893	14	945	28	997
07	791	20	843	03	894	17	946	29	998
08	792	23	844	05	895	18	947	30	999
09	793	24	845	06	896	19	948	DEC	
12	794	25	846	09	897	20	949	03	1000
13	795	26	847	10	898	21	950	04	1001
14	796	27	848	11	899	24	951	05	1002
15	797	30	849	12	900	25	952	06	1003
16	798	MAY		13	901	26	953	07	1004
19	799	01	850	16	902	27	954	10	1005
20	800	02	851	17	903	28	955	11	1006
21	801	03	852	18	904	OCT		12	1007
22	802	04	853	19	905	01	956	13	1008
23	803	07	854	20	906	02	957	14	1009
26	804	08	855	23	907	03	958	17	1010
27	805	09	856	24	908	04	959	18	1011
28	806	10	857	25	909	05	960	19	1012
MAR		11	858	26	910	08	961	20	1013
01	807	14	859	27	911	09	962	21	1014
02	808	15	860	30	912	10	963	24	1015
05	809	16	861	31	913	11	964	26	1016
06	810	17	862	AUG		12	965	27	1017
07	811	18	863	01	914	15	966	28	1018
08	812	21	864	02	915	16	967	31	1019
09	813	22	865	03	916	17	968		
12	814	23	866	06	917	18	969		
13	815	24	867	07	918	19	970		

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

6-YEAR WORKING DAY CALENDAR STARTING JAN 2, 1976

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
JAN	1980	13	1071	27	1123	07	1174	21	1226
02	1020	14	1072	28	1124	08	1175	22	1227
03	1021	17	1073	29	1125	11	1176	23	1228
04	1022	18	1074	30	1126	12	1177	24	1229
07	1023	19	1075	JNE		13	1178	27	1230
08	1024	20	1076	02	1127	14	1179	28	1231
09	1025	21	1077	03	1128	15	1180	29	1232
10	1026	24	1078	04	1129	18	1181	30	1233
11	1027	25	1079	05	1130	19	1182	31	1234
14	1028	26	1080	06	1131	20	1183	NOV	
15	1029	27	1081	09	1132	21	1184	03	1235
16	1030	28	1082	10	1133	22	1185	04	1236
17	1031	31	1083	11	1134	25	1186	05	1237
18	1032	APR		12	1135	26	1187	06	1238
21	1033	01	1084	13	1136	27	1188	07	1239
22	1034	02	1085	16	1137	28	1189	10	1240
23	1035	03	1086	17	1138	29	1190	11	1241
24	1036	04	1087	18	1139	SEP		12	1242
25	1037	07	1088	19	1140	02	1191	13	1243
28	1038	08	1089	20	1141	03	1192	14	1244
29	1039	09	1090	23	1142	04	1193	17	1245
30	1040	10	1091	24	1143	05	1194	18	1246
31	1041	11	1092	25	1144	08	1195	19	1247
FEB		14	1093	26	1145	09	1196	20	1248
01	1042	15	1094	27	1146	10	1197	21	1249
04	1043	16	1095	30	1147	11	1198	24	1250
05	1044	17	1096	JLY		12	1199	25	1251
06	1045	18	1097	01	1148	15	1200	26	1252
07	1046	21	1098	02	1149	16	1201	28	1253
08	1047	22	10[illegible]	03	1150	17	1202	DEC	
11	1048	23	1100	07	1151	18	1203	01	1254
12	1049	24	1101	08	1152	19	1204	02	1255
13	1050	25	1102	09	1153	22	1205	03	1256
14	1051	28	1103	10	1154	23	1206	04	1257
15	1052	29	1104	11	1155	24	1207	05	1258
18	1053	30	1105	14	1156	25	1208	08	1259
19	1054	MAY		15	1157	26	1209	09	1260
20	1055	01	1106	16	1158	29	1210	10	1261
21	1056	02	1107	17	1159	30	1211	11	1262
22	1057	05	1108	18	1160	OCT		12	1263
25	1058	06	1109	21	1161	01	1212	15	1264
26	1059	07	1110	22	1162	02	1213	16	1265
27	1060	08	1111	23	1163	03	1214	17	1266
28	1061	09	1112	24	1164	06	1215	18	1267
29	1062	12	1113	25	1165	07	1216	19	1268
MAR		13	1114	28	1166	08	1217	22	1269
03	1063	14	1115	29	1167	09	1218	23	1270
04	1064	15	1116	30	1168	10	1219	24	1271
05	1065	16	1117	31	1169	13	1220	26	1272
06	1066	19	1118	AUG		14	1221	29	1273
07	1067	20	1119	01	1170	15	1222	30	1274
10	1068	21	1120	04	1171	16	1223	31	1275
11	1069	22	1121	05	1172	17	1224		
12	1070	23	1122	06	1173	20	1225		

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
JAN	1981	16	1327	28	1379	10	1430	22	1484
02	1276	17	1328	29	1380	11	1431	23	1485
05	1277	18	1329	JNE		12	1432	26	1486
06	1278	19	1330	01	1381	13	1433	27	1487
07	1279	20	1331	02	1382	14	1434	28	1488
08	1280	23	1332	03	1383	17	1435	29	1489
09	1281	24	1333	04	1384	18	1436	30	1490
12	1282	25	1334	05	1385	19	1437	NOV	
13	1283	26	1335	08	1386	20	1438	02	1491
14	1284	27	1336	09	1387	21	1439	03	1492
15	1285	30	1337	10	1388	24	1440	04	1493
16	1286	31	1338	11	1389	25	1441	05	1494
19	1287	APR		12	1390	26	1442	06	1495
20	1288	01	1339	15	1391	27	1443	09	1496
21	1289	02	1340	16	1392	28	1444	10	1497
22	1290	03	1341	17	1393	31	1445	11	1498
23	1291	06	1342	18	1394	SEP		12	1499
26	1292	07	1343	19	1395	01	1446	13	1500
27	1293	08	1344	22	1396	02	1447	16	1501
28	1294	09	1345	23	1397	03	1448	17	1502
29	1295	10	1346	24	1398	04	1449	18	1503
30	1296	13	1347	25	1399	08	1450	19	1504
FEB		14	1348	26	1400	09	1451	20	1505
02	1297	15	1349	29	1401	10	1452	23	1506
03	1298	16	1350	30	1402	11	1453	24	1507
04	1299	17	1351	JLY		14	1454	25	1508
05	1300	20	1352	01	1403	15	1455	27	1509
06	1301	21	1353	02	1404	16	1456	30	1510
09	1302	22	1354	06	1405	17	1457	DEC	
10	1303	23	1355	07	1406	18	1458	01	1511
11	1304	24	1356	08	1407	21	1459	02	1512
12	1305	27	1357	09	1408	22	1460	03	1513
13	1306	28	1358	10	1409	23	1461	04	1514
16	1307	29	1359	13	1410	24	1462	07	1515
17	1308	30	1360	14	1411	25	1463	08	1516
18	1309	MAY		15	1412	28	1464	09	1517
19	1310	01	1361	16	1413	29	1465	10	1518
20	1311	04	1362	17	1414	30	1466	11	1519
23	1312	05	1363	20	1415	OCT		14	1520
24	1313	06	1364	21	1416	01	1467	15	1521
25	1314	07	1365	22	1417	02	1468	16	1522
26	1315	08	1366	23	1418	05	1469	17	1523
27	1316	11	1367	24	1419	06	1470	18	1524
MAR		12	1368	27	1420	07	1471	21	1525
02	1317	13	1369	28	1421	08	1472	22	1526
03	1318	14	1370	29	1422	09	1473	23	1527
04	1319	15	1371	30	1423	12	1474	24	1528
05	1320	18	1372	31	1424	13	1475	28	1529
06	1321	19	1373	AUG		14	1476	29	1530
09	1322	20	1374	03	1425	15	1477	30	1531
10	1323	21	1375	04	1426	16	1478	31	1532
11	1324	22	1376	05	1427	19	1479		
12	1325	26	1377	06	1428	20	1480		
13	1326	27	1378	07	1429	21	1481		

H/O 133

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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.

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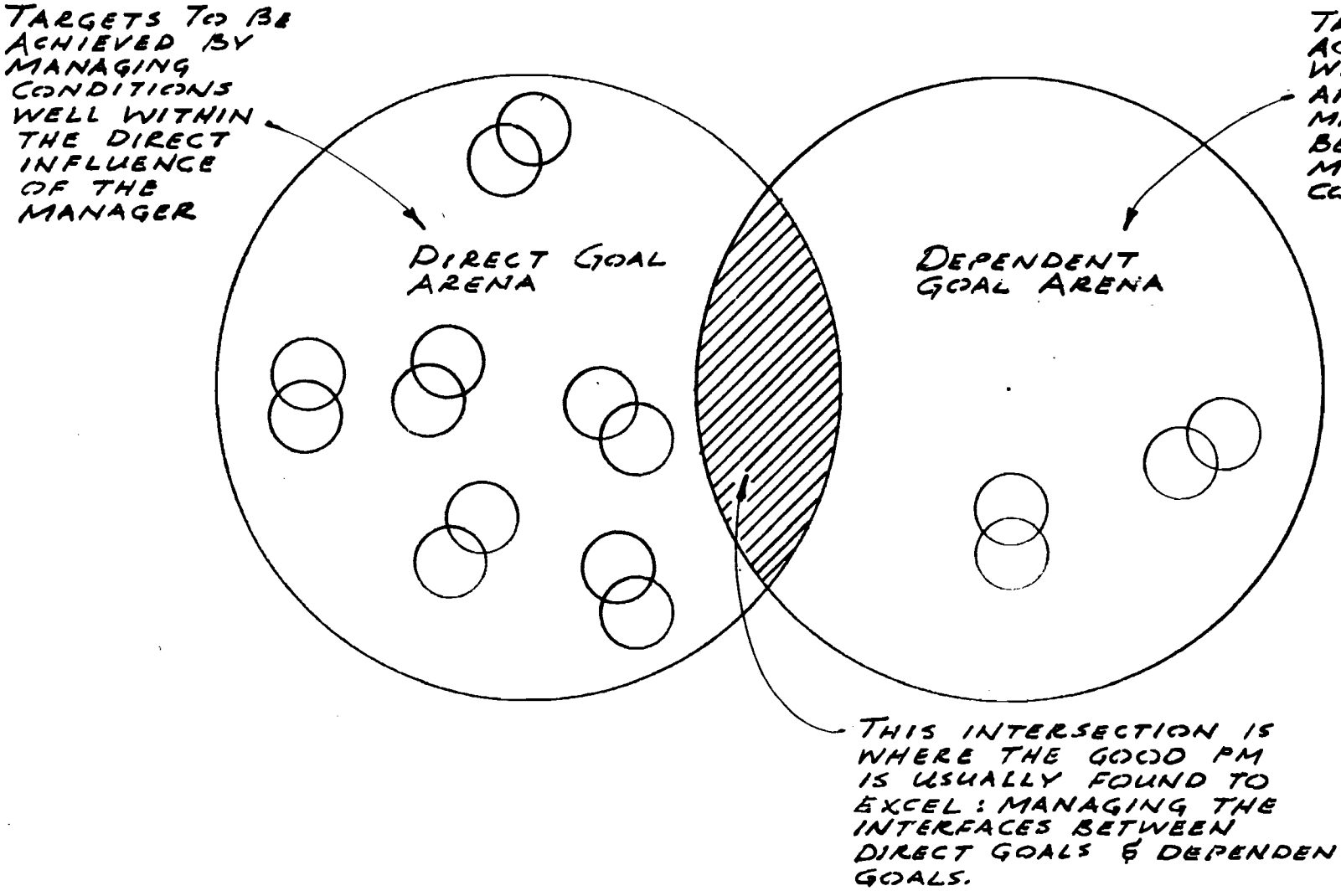
Chicago Area Weather

Source: Jack Kolstadt

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



THE DIG/DEG INTERSECTION

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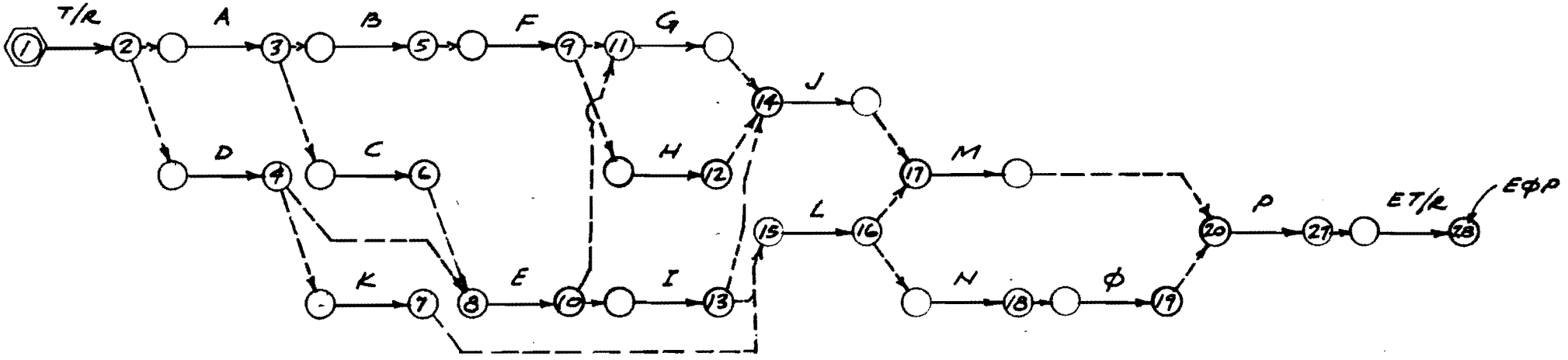

Reserved Node Nos.	
21	24
22	25
23	26

SOLUTION TO EXERCISE #1

ARROW DIAGRAM

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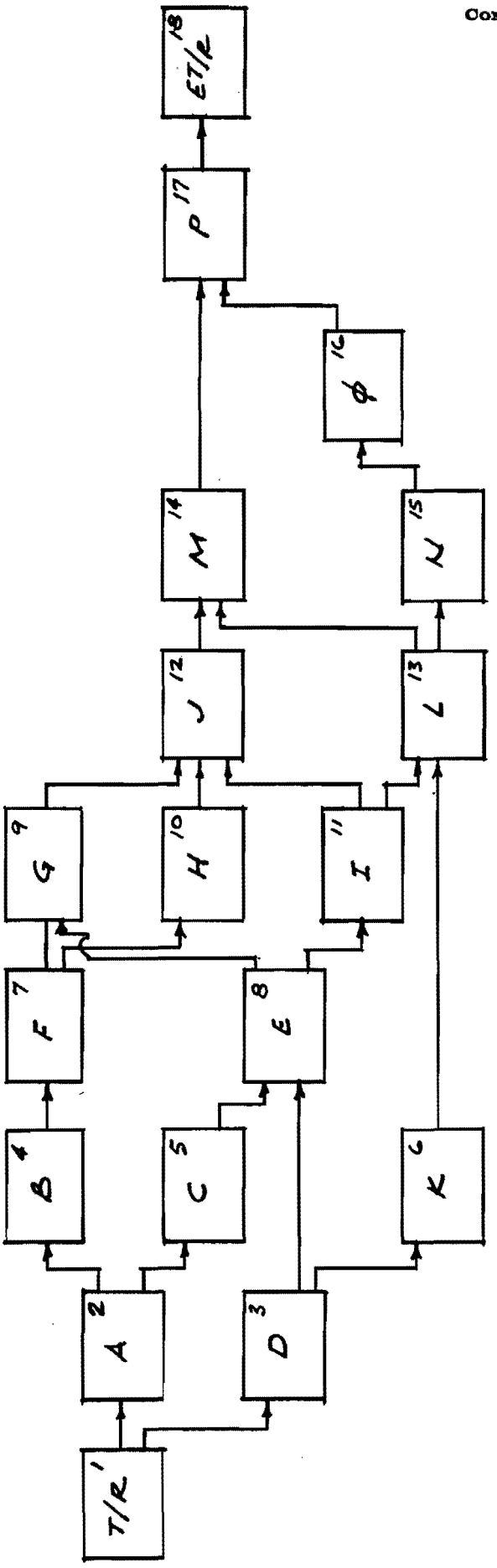

SOLUTION TO EXERCISE #1
PRECEDENCE DIAGRAM

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JOB DESCRIPTION ELEMENTS

Position Title _____

_____

_____

1. The purpose of the job is to:

2. The responsibilities of the position are:

3. Activities and duties required of the person in the job are:

4. The authority of the person in the job encompasses:

5. Functional relations of the position are:

	From	To
Formal		
Informal		
Reporting		
Staff		
Temporary		

6. Qualifications required for the position are:

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CONSULTING ENGINEER

November 1,

Subject: Monitoring Report #1

New Office Facility

Highland and Moran, Keith, Iowa

Victoria Mechanical Company

Project: 76:10

Monitored from Issue #1 dated April 26,

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

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

Actions taken:

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

General Summary

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

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

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

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

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

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

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

Ralph J. Stephenson, P.E.

RJS
m

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

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 nutshall, 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.

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

VICTORIA MECHANICAL COMPANY

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

RALPH J STEPHENSON P E - CONSULTANT

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

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

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

I	J	DAYS	LOC RSP	CD	AND DESCRIPTION	COST	NODE SEQUENCE E/S	L/S	E/F	L/F	TF
151	153	0	0		D		9176	10226	9166	10216	25
151	157	2	1	2	C INS HTG&CLNG PPG IN CLG	480	9176	10296	9206	11016	30
152	153	0	0		D		9206	10226	9176	10216	24
152	159	3	3	2	C INS RUFF ELEC CNDT&FDRS		9206	10286	9226	11016	28
153	158	4	4	2	ER INT MSNRY PARTNS		10016	10226	10066	10276	15
154	160	0	0		D		10016	11026	9306	11016	22
155	160	0	0		D		10126	11026	10116	11016	15
156	160	0	0		D		9216	11026	9206	11016	30
157	160	0	0		D		9216	11026	9206	11016	30
158	161	0	0		D		10076	10286	10066	10276	15
159	160	0	0		D		9236	11026	9226	11016	26
160	163	0	0		D		10126	11026	10116	11016	15
161	162	3	5	2	P ER STUDS FOR DRY WALL		10076	10286	10116	11016	15
162	163	0	0		D		10126	11026	10116	11016	15
162	165	4	5	2	C ER STUDS FOR DRY WALL		10126	11046	10156	11096	17
163	164	4	1	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
163	164	4	3	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
164	166	0	0		D		10196	11086	10186	11056	14
164	167	0	0		D		10196	11106	10186	11096	16
165	167	0	0		D		10186	11106	10156	11096	17
166	168	6	5	2	P HANG DRY WALL		11086	11086	11156	11156	0
167	168	4	1	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11156	16
167	168	4	3	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11156	16
168	169	6	5	2	C HANG DRY WALL		11166	11166	11236	11236	0
169	170	0	0		D		11246	11246	11236	11236	0
170	171	4	1	2	INS FIN TUBE PIPG	960	11246	11246	11306	11306	0
171	400	0	0		ET/R		12016	12016	11306	11306	0
0	0	0					0	0	0	0	0

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

VICTORIA MECHANICAL COMPANY

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

RALPH J STEPHENSON P E - CONSULTANT

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

I	J	DAYS	RSP	LOC CD	AND DESCRIPTION	COST	EARLY STRT SEQ E/S	L/S	E/F	L/F	TF
1	2	106	0		T/R TO START OF PROJECT		1026	1026	5316	5316	0
2	3	65	0	1	T/R POUR OUT 1ST FL SOG		6016	6226	8316	9226	15
2	4	69	0	2	T/R TO POUR OUT 2ND DECK		6016	6166	9076	9226	11
2	5	58	0	R	T/R TO C ER RF MTL DECK		6016	7206	8206	10086	34
2	6	70	0	R	T/R TO C LAY INSUL & RFG		6016	7166	9086	10226	32
2	7	102	0		T/R TO C EXT MSNRY&GLZNG		6016	6016	10226	10226	0
101	107	6	6	1	P INS SPRINKLER PIPG	2880	9086	9286	9156	10056	14
102	108	8	2	1	P INS SHT MTL DCTG&FTTNGS	4800	9086	9246	9176	10056	12
103	109	3	1	1	P INS DMSTC WTR PPG-CLG	720	9086	10016	9106	10056	17
104	110	4	1	1	P INS HTG&CLNG PPG IN CLG	960	9086	10066	9136	10116	20
105	111	9	1	1	INS TO/R PLUMBG RISERS	2160	9086	9236	9206	10056	11
106	112	4	3	1	P INS RUFF ELEC CNDT&FDRS		9086	9306	9156	10056	16
109	116	3	1	1	C INS DMSTC WTR PPG-CLG	720	9136	10146	9156	10186	23
134	140	3	1	2	P INS DMSTC WTR PPG-CLG	720	9136	10196	9156	10216	26
110	117	5	1	1	C INS HTG&CLNG PPG IN CLG	1200	9146	10126	9206	10186	20
112	119	3	3	1	C INS RUFF ELEC CNDT&FDRS		9146	10146	9166	10186	22
135	141	3	1	2	P INS HTG&CLNG PPG IN CLG	720	9146	10196	9166	10216	25
137	142	4	3	2	P INS RUFF ELEC CNDT&FDRS		9146	10186	9176	10216	24
107	114	5	6	1	C INS SPRINKLER PIPG	2400	9156	10126	9226	10186	18
132	138	6	6	2	P INS SPRINKLER PIPING	2880	9166	10146	9236	10216	20
140	156	3	1	2	C INS DMSTC WTR PPG-CLG	720	9166	10286	9206	11016	30
151	157	2	1	2	C INS HTG&CLNG PPG IN CLG	480	9176	10296	9206	11016	30
108	115	8	2	1	C INS SHT MTL DUCT&FTTNGS	4800	9206	10076	9296	10186	13
133	139	8	2	2	P INS SHT MTL DUCT FTTNGS	4800	9206	10116	9296	10206	15
152	159	3	3	2	C INS RUFF ELEC CNDT&FDRS		9206	10286	9226	11016	28
113	118	6	4	1	ER INT MSNRY PARTNS		9216	10066	9286	10136	11
136	153	8	1	2	INS TO/R PLMG RISERS	1920	9216	10126	9306	10216	15
138	154	5	6	2	C INS SPRINKLER PIPG	2400	9246	10266	9306	11016	22
118	121	3	5	1	P ER STUDS FOR DRY WALL		9296	10146	10016	10186	11
139	155	8	2	2	C INS SHT MTL DUCT&FTTNGS	4800	9306	10216	10116	11016	15
153	158	4	4	2	ER INT MSNRY PARTNS		10016	10226	10066	10276	15
121	124	3	5	1	C ER STUDS FOR DRY WALL		10046	10226	10066	10266	14
122	123	4	1	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
122	123	4	3	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
161	162	3	5	2	P ER STUDS FOR DRY WALL		10076	10286	10116	11016	15
126	127	3	1	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
126	127	3	3	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
162	165	4	5	2	C ER STUDS FOR DRY WALL		10126	11046	10156	11096	17
163	164	4	1	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
163	164	4	3	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11096	14
167	168	4	1	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11196	16
167	168	4	3	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11196	16
125	126	5	5	1	P HANG DRY WALL		10256	10256	10296	10296	0

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

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

VICTORIA MECHANICAL COMPANY

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

RALPH J STEPHENSON P E - CONSULTANT

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

I	J	DAYS	RSP	LOC CD	AND DESCRIPTION	COST	LATE STRT SEQ E/S	L/S	E/F	L/F	TF
1	2	106	0		T/R TO START OF PROJECT		1026	1026	5316	5316	0
2	7	102	0		T/R TO C EXT MSNRY&GLZNG		6016	6016	10226	10226	0
2	4	69	0	2	T/R TO POUR OUT 2ND DECK		6016	6166	9076	9226	11
2	3	65	0	1	T/R POUR OUT 1ST FL SOG		6016	6226	8316	9226	15
2	6	70	0	R	T/R TO C LAY INSUL & RFG		6016	7166	9086	10226	32
2	5	58	0	R	T/R TO C ER RF MTL DECK		6016	7206	8206	10086	34
105	111	9	1	1	INS TO/R PLUMBG RISERS	2160	9086	9236	9206	10056	11
102	108	8	2	1	P INS SHT MTL DCT&FTTNGS	4800	9086	9246	9176	10056	12
101	107	6	6	1	P INS SPRINKLER PIPG	2880	9086	9286	9156	10056	14
106	112	4	3	1	P INS RUFF ELEC CNDT&FDRS		9086	9306	9136	10056	16
103	109	3	1	1	P INS DMSTC WTR PPG-CLG	720	9086	10016	9106	10056	17
104	110	4	1	1	P INS HTG&CLNG PPG IN CLG	960	9086	10066	9136	10116	20
113	118	6	4	1	ER INT MSNRY PARTNS		9216	10066	9286	10136	11
108	115	8	2	1	C INS SHT MTL DUCT&FTTNGS	4800	9206	10076	9296	10186	13
133	139	8	2	2	P INS SHT MTL DUCT FTTNGS	4800	9206	10116	9296	10206	15
107	114	5	6	1	C INS SPRINKLER PIPG	2400	9166	10126	9226	10186	18
110	117	5	1	1	C INS HTG&CLNG PPG IN CLG	1200	9146	10126	9206	10186	20
136	153	8	1	2	INS TO/R PLMG RISERS	1920	9216	10126	9306	10216	19
109	116	3	1	1	C INS DMSTC WTR PPG-CLG	720	9136	10146	9156	10186	23
112	119	3	3	1	C INS RUFF ELEC CNDT&FDRS		9146	10146	9166	10186	22
118	121	3	5	1	P ER STUDS FOR DRY WALL		9296	10146	10016	10186	11
132	138	6	6	2	P INS SPRINKLER PIPING	2880	9166	10146	9236	10216	20
137	152	4	3	2	P INS RUFF ELEC CNDT&FDRS		9146	10186	9176	10216	24
122	123	4	1	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
122	123	4	3	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
134	140	3	1	2	P INS DMSTC WTR PPG-CLG	720	9136	10196	9156	10216	26
135	151	3	1	2	P INS HTG&CLNG PPG IN CLG	720	9146	10196	9166	10216	25
139	155	8	2	2	C INS SHT MTL DUCT&FTTNGS	4800	9306	10216	10116	11016	15
121	124	3	5	1	C ER STUDS FOR DRY WALL		10046	10226	10066	10266	14
153	158	4	4	2	ER INT MSNRY PARTNS		10016	10226	10066	10276	15
125	128	5	5	1	P HANG DRY WALL		10256	10256	10296	10296	0
138	154	5	6	2	C INS SPRINKLER PIPG	2400	9246	10266	9306	11016	22
126	127	3	1	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
126	127	3	3	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
140	156	3	1	2	C INS DMSTC WTR PPG-CLG	720	9166	10286	9206	11016	30
152	159	3	3	2	C INS RUFF ELEC CNDT&FDRS		9206	10286	9226	11016	28
161	162	3	5	2	P ER STUDS FOR DRY WALL		10076	10286	10116	11016	15
151	157	2	1	2	C INS HTG&CLNG PPG IN CLG	480	9176	10296	9206	11016	30
128	129	5	5	1	COMP HANG DRY WALL		11016	11016	11056	11056	0
163	164	4	1	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
163	164	4	3	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
162	165	4	5	2	C ER STUDS FOR DRY WALL		10126	11046	10156	11096	17
130	131	4	1	1	INS FIN TUBE PIPING	960	11056	11086	11116	11116	0

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

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

VICTORIA MECHANICAL COMPANY

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

RALPH J STEPHENSON P E - CONSULTANT

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

I	J	DAYS	RSP	LOC CD	AND DESCRIPTION	COST	LATE FINISH SEQ E/S	L/S	E/F	L/F	TF
1	2	106	0		T/R TO START OF PROJECT		1026	1026	5316	5316	0
2	3	65	0	1	T/R POUR OUT 1ST FL SOG		6016	6226	8316	9226	15
2	4	69	0	2	T/R TO POUR OUT 2ND DECK		6016	6166	9076	9226	11
101	107	6	6	1	P INS SPRINKLER PIPG	2880	9086	9286	9156	10056	14
102	108	8	2	1	P INS SHT MTL DCT&FTTNGS	4800	9086	9246	9176	10056	12
103	109	3	1	1	P INS DMSTC WTR PPG-CLG	720	9086	10016	9106	10056	17
105	111	9	1	1	INS TO/R PLUMBG RISERS	2160	9086	9236	9206	10056	11
106	112	4	3	1	P INS RUFF ELEC CNDT&FDRS		9086	9306	9136	10056	16
2	5	58	0	R	T/R TO C ER RF MTL DECK		6016	7206	8206	10086	34
104	110	4	1	1	P INS HTG&CLNG PPG IN CLG	960	9086	10066	9136	10116	20
113	118	6	4	1	ER INT MSNRY PARTNS		9216	10066	9286	10136	11
107	114	5	6	1	C INS SPRINKLER PIPG	2400	9166	10126	9226	10186	18
108	115	8	2	1	C INS SHT MTL DUCT&FTTNGS	4800	9206	10076	9296	10186	13
109	116	3	1	1	C INS DMSTC WTR PPG-CLG	720	9136	10146	9156	10186	23
110	117	5	1	1	C INS HTG&CLNG PPG IN CLG	1200	9146	10126	9206	10186	20
112	119	3	3	1	C INS RUFF ELEC CNDT&FDRS		9146	10146	9166	10186	22
118	121	3	5	1	P ER STUDS FOR DRY WALL		9296	10146	10016	10186	11
133	139	8	2	2	P INS SHT MTL DUCT FTTNGS	4800	9206	10116	9296	10206	15
132	138	6	6	2	P INS SPRINKLER PIPING	2880	9166	10146	9236	10216	20
134	140	3	1	2	P INS DMSTC WTR PPG-CLG	720	9136	10196	9156	10216	26
135	141	3	1	2	P INS HTG&CLNG PPG IN CLG	720	9146	10196	9166	10216	25
136	153	E	1	2	INS TO/R PLMG RISERS	1920	9216	10126	9306	10216	15
137	152	4	3	2	P INS RUFF ELEC CNDT&FDRS		9146	10186	9176	10216	24
2	6	70	0	R	T/R TO C LAY INSUL & RFG		6016	7166	9086	10226	32
2	7	102	0		T/R TO C EXT MSNRY&GLZNG		6016	6016	10226	10226	0
122	123	4	1	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
122	123	4	3	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
121	124	3	5	1	C ER STUDS FOR DRY WALL		10046	10226	10066	10266	14
153	158	4	4	2	ER INT MSNRY PARTNS		10016	10226	10066	10276	15
125	128	5	5	1	P HANG DRY WALL		10256	10256	10296	10296	0
126	127	3	1	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
126	127	3	3	1	C INS IN WLL MECH/ELEC WK	1440	10066	10276	10126	10296	13
138	154	5	6	2	C INS SPRINKLER PIPG	2400	9246	10266	9306	11016	22
139	155	8	2	2	C INS SHT MTL DUCT&FTTNGS	4800	9306	10216	10116	11016	15
140	156	3	1	2	C INS DMSTC WTR PPG-CLG	720	9166	10286	9206	11016	30
151	157	2	1	2	C INS HTG&CLNG PPG IN CLG	480	9176	10296	9206	11016	30
152	159	3	3	2	C INS RUFF ELEC CNDT&FDRS		9206	10286	9226	11016	28
161	162	3	5	2	P ER STUDS FOR DRY WALL		10076	10286	10116	11016	15
128	129	5	5	1	COMP HANG DRY WALL		11016	11016	11056	11056	0
163	164	4	1	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
163	164	4	3	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
162	165	4	5	2	C ER STUDS FOR DRY WALL		10226	11046	10256	11076	17
130	131	4	1	1	INS FIN TUBE PIPING	960	11086	11086	11116	11116	0

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

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

VICTORIA MECHANICAL COMPANY

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

RALPH J STEPHENSON P E - CONSULTANT

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

I	J	DAYS	LOC RSP	CD	AND DESCRIPTION	COST	TOTAL FLT SEQ E/S	L/S	E/F	L/F	TF
1	2	106	0		T/R TO START OF PROJECT		1026	1026	5316	5316	0
2	7	102	0		T/R TO C EXT MSNRY&GLZNG		6016	6016	10226	10226	0
125	128	5	5	1	P HANG DRY WALL		10256	10256	10296	10296	0
128	129	5	5	1	COMP HANG DRY WALL		11016	11016	11056	11056	0
130	131	4	1	1	INS FIN TUBE PIPING	960	11086	11086	11116	11116	0
131	400	12	0	1	ET/R		11126	11126	11306	11306	0
166	168	6	5	2	P HANG DRY WALL		11086	11086	11156	11156	0
168	169	6	5	2	C HANG DRY WALL		11166	11166	11236	11236	0
170	171	4	1	2	INS FIN TUBE PIPG	960	11246	11246	11306	11306	0
2	4	69	0	2	T/R TO POUR OUT 2ND DECK		6016	6166	9076	9226	11
105	111	9	1	1	INS TO/R PLUMBG RISERS	2160	9086	9236	9206	10056	11
113	118	6	4	1	ER INT MSNRY PARTNS		9216	10066	9286	10136	11
118	121	3	5	1	P ER STUDS FOR DRY WALL		9296	10146	10016	10186	11
122	123	4	1	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
122	123	4	3	1	P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11
102	108	8	2	1	P INS SHT MTL DCT&FTTNGS	4800	9086	9246	9176	10056	12
108	115	8	2	1	C INS SHT MTL DUCT&FTTNGS	4800	9206	10076	9296	10186	13
126	127	3	1	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
126	127	3	3	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13
101	107	6	6	1	P INS SPRINKLER PIPG	2880	9086	9286	9156	10056	14
121	124	3	5	1	C ER STUDS FOR DRY WALL		10046	10226	10066	10266	14
163	164	4	1	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
163	164	4	3	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14
2	3	65	0	1	T/R POUR OUT 1ST FL SOG		6016	6226	8316	9226	15
133	139	8	2	2	P INS SHT MTL DUCT FTTNGS	4800	9206	10116	9296	10206	15
136	153	8	1	2	INS TO/R PLMG RISERS	1920	9216	10126	9306	10216	15
139	155	8	2	2	C INS SHT MTL DUCT&FTTNGS	4800	9306	10216	10116	11016	15
153	158	4	4	2	ER INT MSNRY PARTNS		10016	10226	10066	10276	15
161	162	3	5	2	P ER STUDS FOR DRY WALL		10076	10286	10116	11016	15
106	112	4	3	1	P INS RUFF ELEC CNDT&FDRS		9086	9306	9136	10056	16
167	168	4	1	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11156	16
167	168	4	3	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11156	16
103	109	3	1	1	P INS DMSTC WTR PPG-CLG	720	9086	10016	9106	10056	17
162	165	4	5	2	C ER STUDS FOR DRY WALL		10126	11046	10156	11096	17
107	114	5	6	1	C INS SPRINKLER PIPG	2400	9166	10126	9226	10186	18
104	110	4	1	1	P INS HTG&CLNG PPG IN CLG	960	9086	10066	9136	10116	20
110	117	5	1	1	C INS HTG&CLNG PPG IN CLG	1200	9146	10176	9206	10186	20
132	138	6	6	2	P INS SPRINKLER PIPING	2880	9166	10146	9236	10216	20
112	119	3	3	1	C INS RUFF ELEC CNDT&FDRS		9146	10146	9166	10186	22
138	154	5	6	2	C INS SPRINKLER PIPG	2400	9246	10266	9306	11016	22
109	116	3	1	1	C INS DMSTC WTR PPG-CLG	720	9136	10146	9156	10186	23
137	152	4	3	2	P INS RUFF ELEC CNDT&FDRS		9146	10186	9176	10216	24
135	151	3	1	2	P INS HTG&CLNG PPG IN CLG	720	9146	10196	9166	10216	25

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

138154	5	6	2	C INS SPRINKLER PIPG	2400	9246	10266	9306	11016	22	
126127	3	1	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13	
126127	3	3	1	C INS IN WLL MECH/ELEC WK	1440	10086	10276	10126	10296	13	
140156	3	1	2	C INS DMSTC WTR PPG-CLG	720	9166	10286	9206	11016	30	
152159	3	3	2	C INS RUFF ELEC CNDT&FDRS		9206	10286	9226	11016	28	
161162	3	5	2	P ER STUDS FOR DRY WALL		10076	10286	10116	11016	15	
151157	2	1	2	C INS HTG&CLNG PPG IN CLG	480	9176	10296	9206	11016	30	
128129	5	5	1	COMP HANG DRY WALL		11016	11016	11056	11056		C
163164	4	1	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14	
163164	4	3	2	P INS IN WLL MECH/ELEC WK	1920	10136	11026	10186	11056	14	
162165	4	5	2	C ER STUDS FOR DRY WALL		10126	11046	10156	11096	17	
130131	4	1	1	INS FIN TUBE PIPING	960	11086	11086	11116	11116		C
166168	6	5	2	P HANG DRY WALL		11086	11086	11156	11156		C
167168	4	1	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11156	16	
167168	4	3	2	C INS IN WLL MECH/ELEC WK	1920	10196	11106	10226	11156	16	
131400	12	0	1	ET/R		11126	11126	11306	11306		C
168169	6	5	2	C HANG DRY WALL		11166	11166	11236	11236		C
170171	4	1	2	INS FIN TUBE PIPG	960	11246	11246	11306	11306		C
-99	-9										

WORK SHEET FOR UPDATE

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

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

RALPH J STEPHENSON P E - CONSULTANT

LISTING IS IN LATE START SEQUENCE

1 VICTORIA MECHNL
2 HVAC CONTRCTR
3 ELEC CONTRCTR
4 MASONRY CONTRCT
5 DRY WALL CONTRCT
6 SPRNKLR CONTRCTR
99 NOT ASSIGNED
SHOULD START AND FINISH 1
SHOULD START AND CONTINUE 2
SHOULD FINISH 3
JOB STARTED WILL CONTINUE 4
START IS LATE 5
FINISH IS LATE 6
JOB STARTED EARLY 7
TASK SUBSTANTIALLY COMPLT 8

1	2	106	0		T/R TO START OF PROJECT		1026	1026	5316	5316		C
2	7	102	0		T/R TO C EXT MSNRY&GLZNG		6016	6016	10226	10226		C
2	4	69	0	2	T/R TO POUR OUT 2ND DECK		6016	6166	9076	9226	11	
2	3	65	0	1	T/R POUR OUT 1ST FL SOG		6016	6226	8316	9226	15	
2	6	70	0	R	T/R TO C LAY INSUL & RFG		6016	7166	9086	10226	32	
2	5	58	0	R	T/R TO C ER RF MTL DECK		6016	7206	8206	10086	34	
105111	9	1	1		INS TO/R PLUMBG RISERS	2160	9086	9236	9206	10056	11	
102108	8	2	1		P INS SHT MTL DCT&FTTNGS	4800	9086	9246	9176	10056	12	
101107	6	6	1		P INS SPRINKLER PIPG	2880	9086	9286	9156	10056	14	
106112	4	3	1		P INS RUFF ELEC CNDT&FDRS		9086	9306	9136	10056	16	
103109	3	1	1		P INS DMSTC WTR PPG-CLG	720	9086	10016	9106	10056	17	
104110	4	1	1		P INS HTG&CLNG PPG IN CLG	960	9086	10066	9136	10116	20	
113118	6	4	1		ER INT MSNRY PARTNS		9216	10066	9286	10136	11	
108115	8	2	1		C INS SHT MTL DUCT&FTTNGS	4800	9206	10076	9296	10186	13	
133139	8	2	2		P INS SHT MTL DUCT FTTNGS	4800	9206	10116	9296	10206	15	
107114	5	6	1		C INS SPRINKLER PIPG	2400	9166	10126	9226	10186	18	
110117	5	1	1		C INS HTG&CLNG PPG IN CLG	1200	9146	10126	9206	10166	20	
136153	8	1	2		INS TO/R PLMG RISERS	1920	9216	10126	9306	10216	15	
109116	3	1	1		C INS DMSTC WTR PPG-CLG	720	9136	10146	9156	10186	23	
112119	3	3	1		C INS RUFF ELEC CNDT&FDRS		9146	10146	9166	10186	22	
118121	3	5	1		P ER STUDS FOR DRY WALL		9296	10146	10016	10186	11	
132138	6	6	2		P INS SPRINKLER PIPING	2880	9166	10146	9236	10216	20	
137152	4	3	2		P INS RUFF ELEC CNDT&FDRS		9146	10186	9176	10216	24	
122123	4	1	1		P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11	
122123	4	3	1		P INS IN WLL MECH/ELEC WK	1920	10046	10196	10076	10226	11	
134140	3	1	2		P INS DMSTC WTR PPG-CLG	720	9136	10196	9156	10216	26	
135151	3	1	2		P INS HTG&CLNG PPG IN CLG	720	9146	10196	9166	10216	25	
139155	8	2	2		C INS SHT MTL DUCT&FTTNGS	4800	9306	10216	10116	11016	15	
121124	3	5	1		C ER STUDS FOR DRY WALL		10046	10226	10066	10266	14	
153158	4	4	2		ER INT MSNRY PARTNS		10016	10226	10066	10276	15	
125128	5	5	1		P HANG DRY WALL		10256	10256	10296	10296		C

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

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

RALPH J STEPHENSON P E - CONSULTANT

LISTING IS IN LATE START SEQUENCE

ACTIVITIES FROM 9-24-76 TO 10-26-76
RETURN BY 10-19/76

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

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

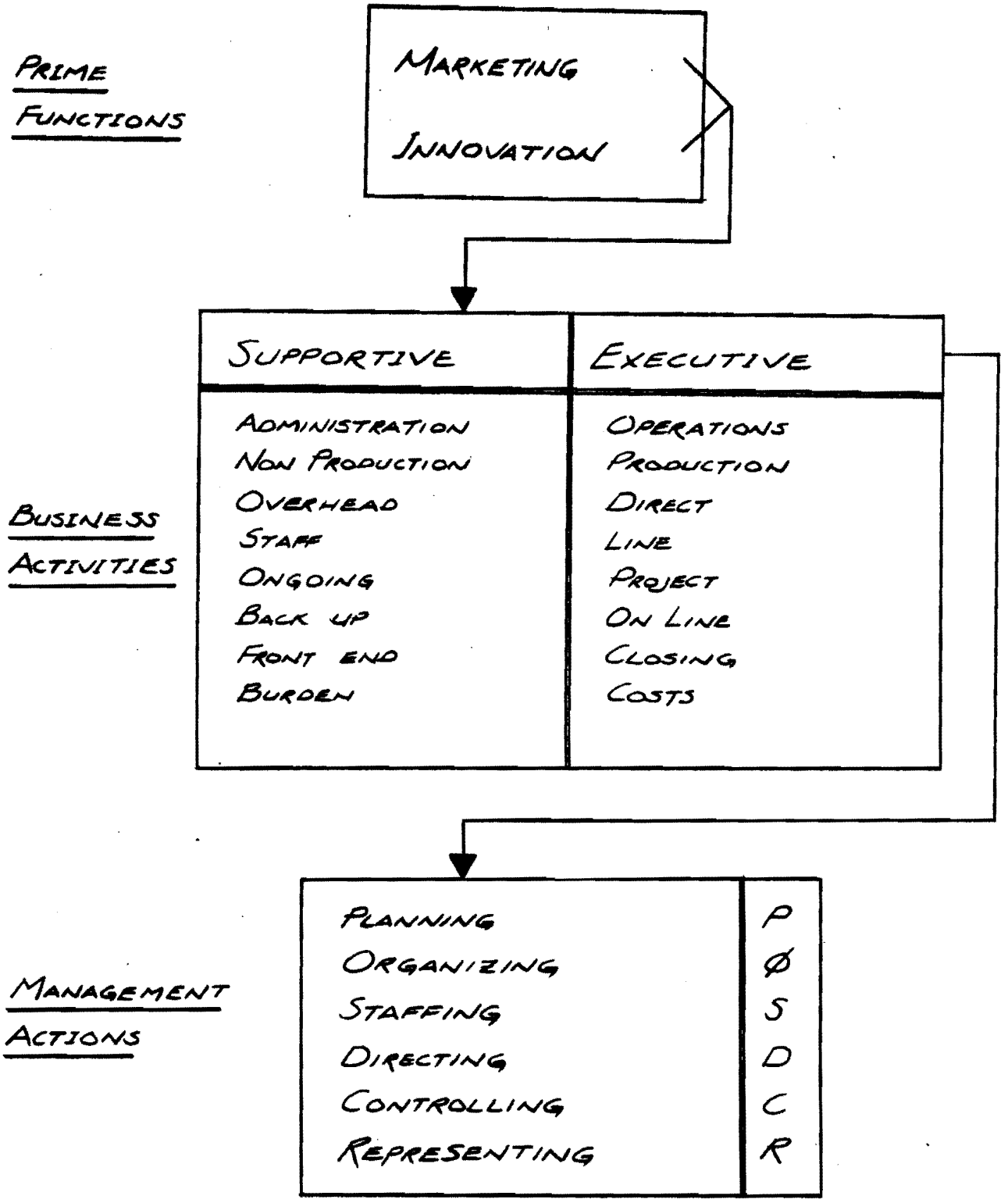
RETURN BY 10-19/76

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

W/C EMEA

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

ELEMENTS OF BUSINESS & MANAGEMENT



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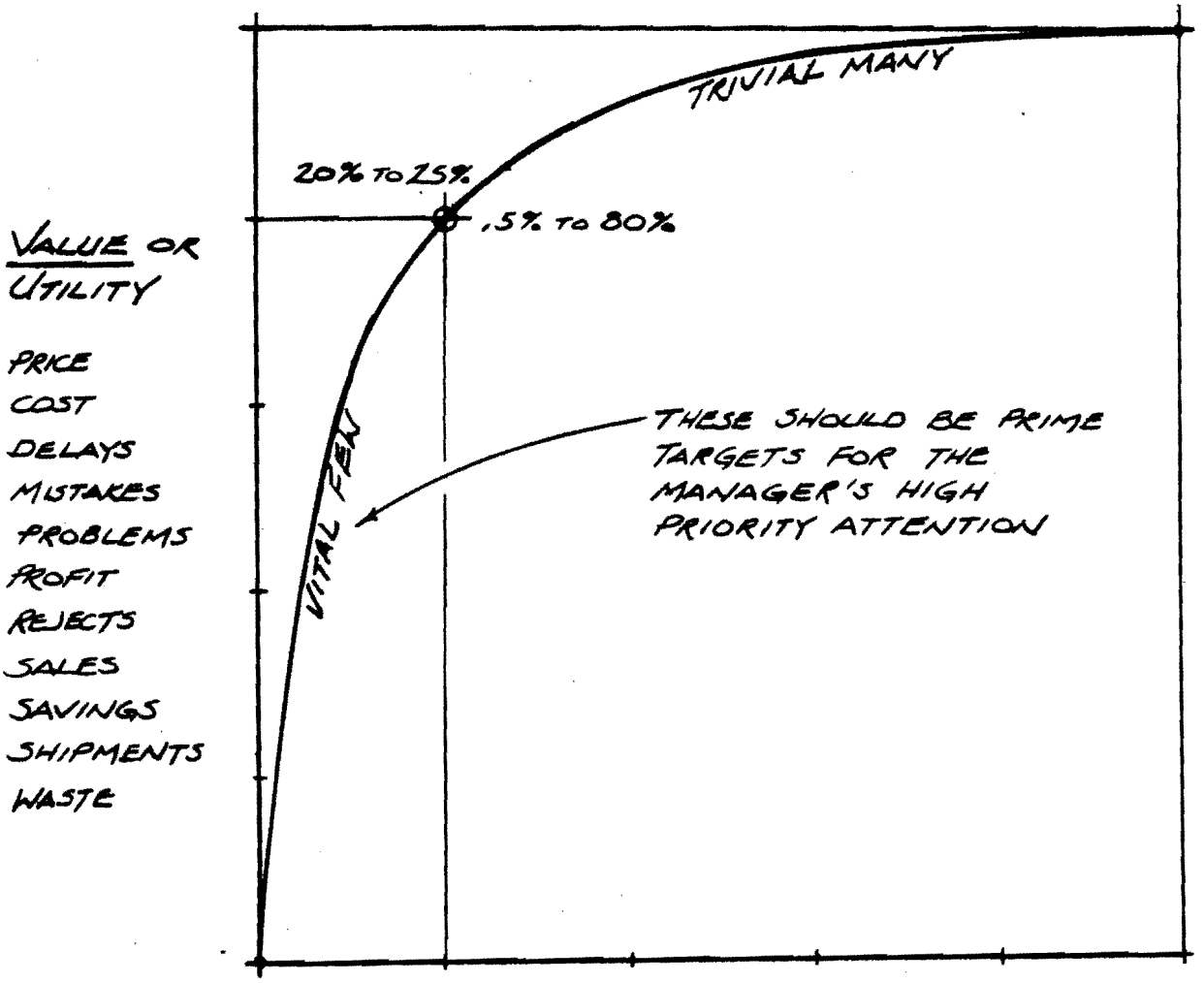
CONSULTING ENGINEER

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



VALUE OR UTILITY

PRICE
COST
DELAYS
MISTAKES
PROBLEMS
PROFIT
REJECTS
SALES
SAVINGS
SHIPMENTS
WASTE

OBJECTS OR RESOURCES

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

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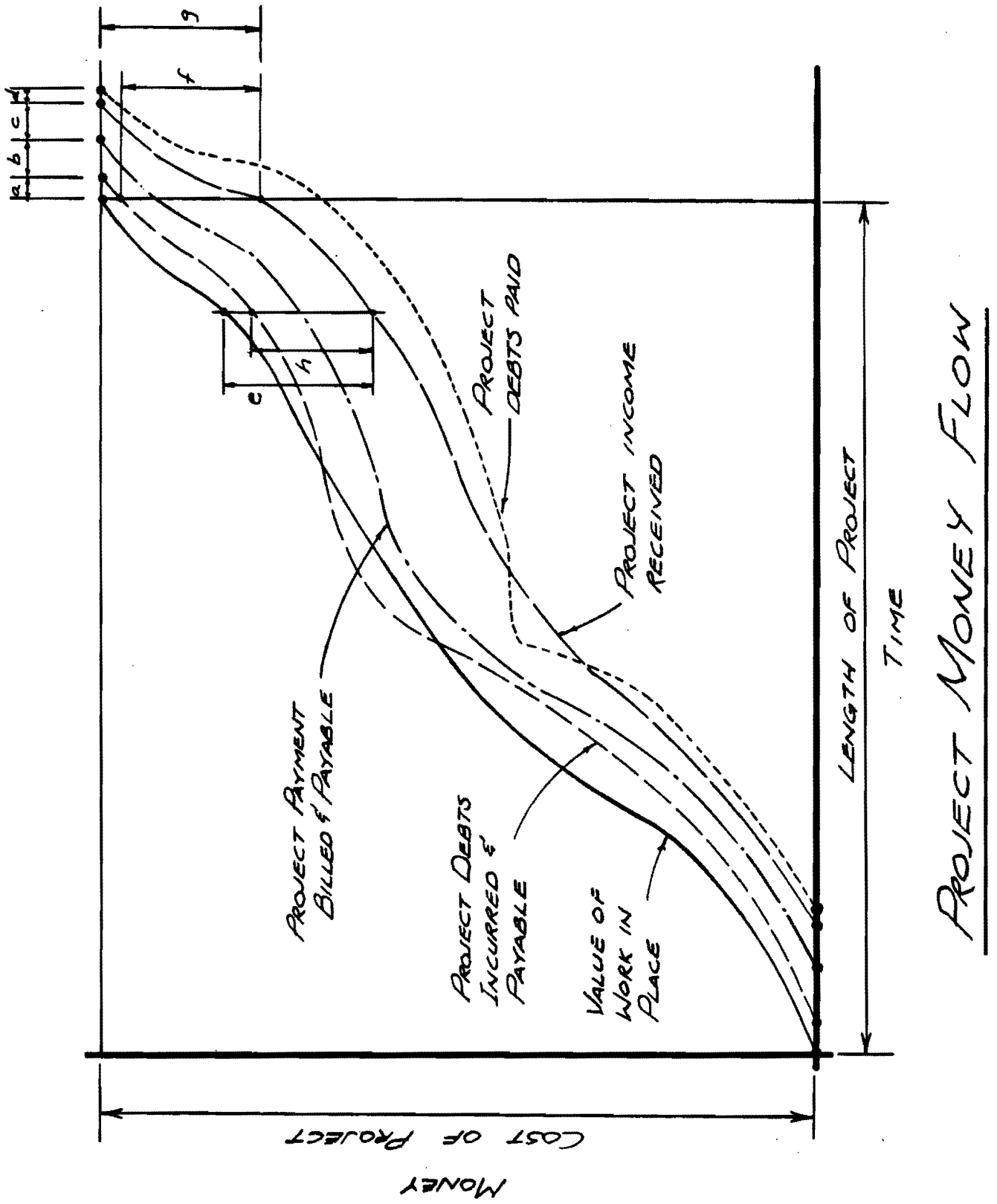

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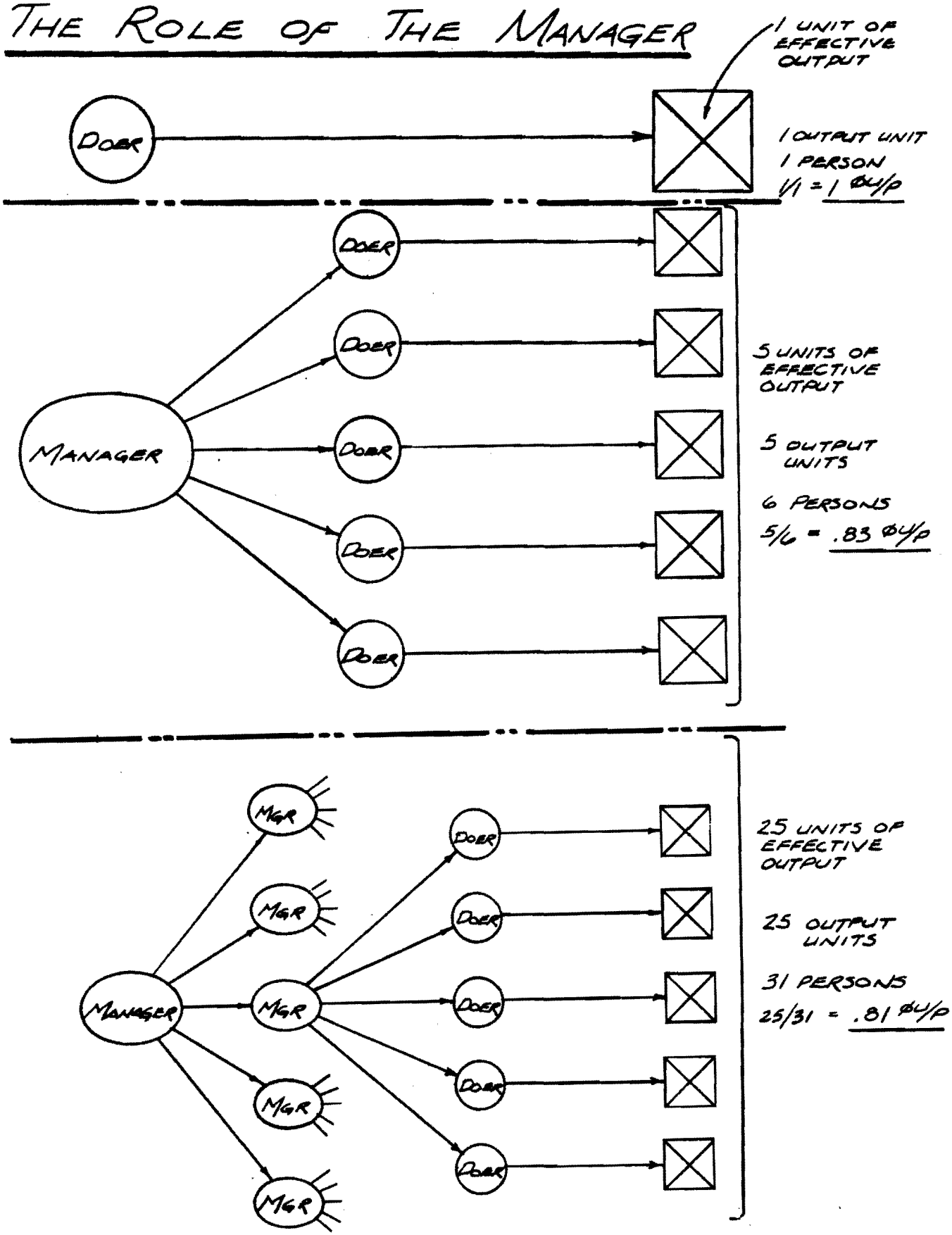
THE ROLE OF THE MANAGER



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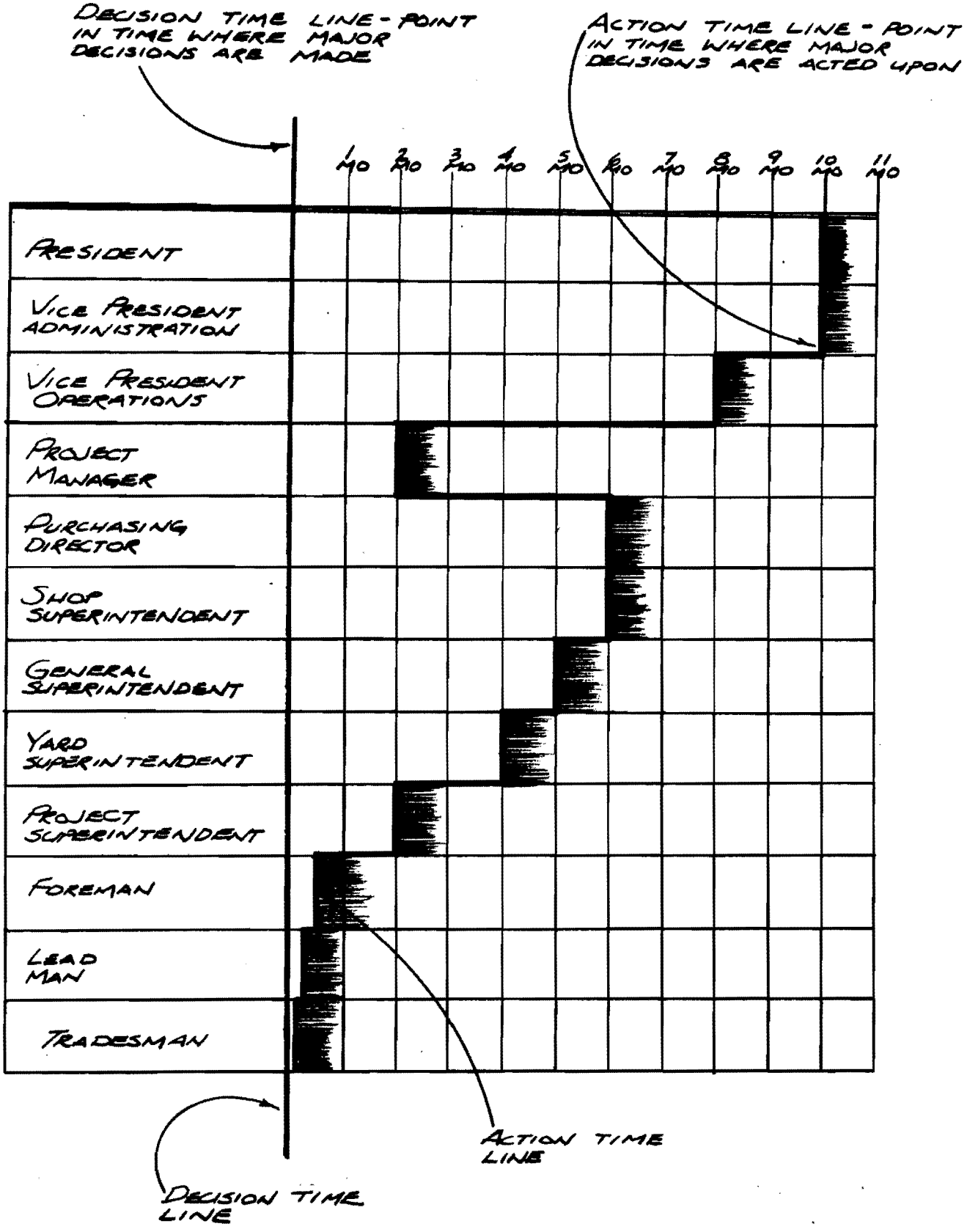
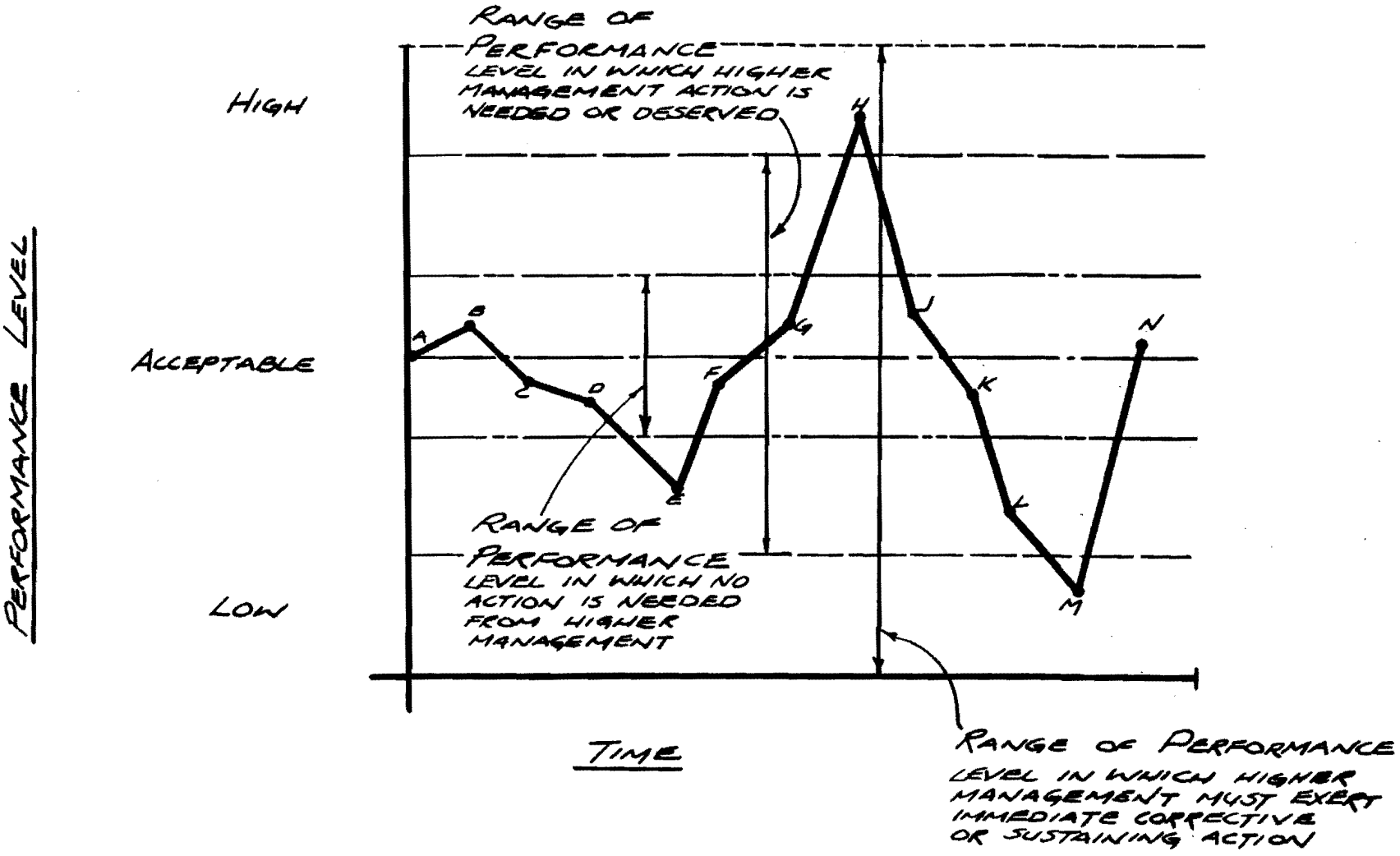
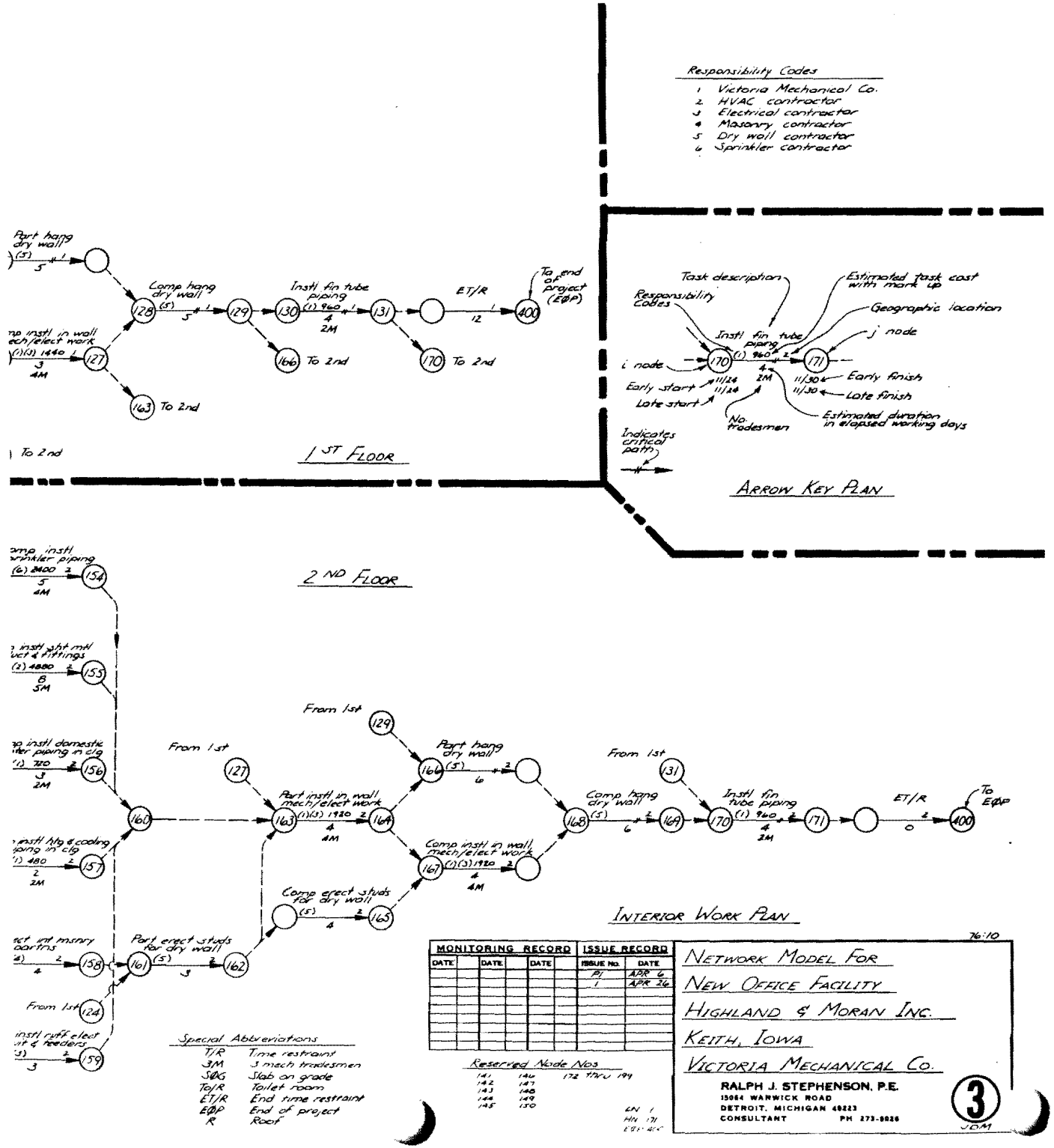
DECISION TO ACTION TIME SPAN





MANAGEMENT BY EXCEPTION (MX) AND PERFORMANCE LEVEL ACTIONS

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER


Responsibility Codes
1 Victoria Mechanical Co.
2 HVAC contractor
3 Electrical contractor
4 Masonry contractor
5 Dry wall contractor
6 Sprinkler contractor
Part hang dry wall
Comp hang dry wall
Instl fin tube piping
ET/R
To end of project (EØP)
To 2nd
1 ST FLOOR
Task description
Estimated task cost with mark up
Responsibility Codes
Geographic location
j node
i node
Early start
Late start
Early finish
Late finish
No. tradesmen
Estimated duration in elapsed working days
Indicates critical path
ARROW KEY PLAN
2 ND FLOOR
From 1st
Part instl in wall mech/elect work
Comp erect studs for dry wall
Part erect studs for dry wall
Comp instl in wall mech/elect work
To EØP
INTERIOR WORK PLAN
Special Abbreviations
T/R Time restraint
3M 3 mech tradesmen
SØG Slab on grade
To/R Toilet room
ET/R End time restraint
EØP End of project
R Roof
Reserved Node Nos
141 142 143 144 145 146 147 148 149 150
172 thru 199
MONITORING RECORD
DATE
ISSUE RECORD
ISSUE No.
DATE
P1 APR 6
1 APR 26
76:10
NETWORK MODEL FOR
NEW OFFICE FACILITY
HIGHLAND & MORAN INC.
KEITH, IOWA
VICTORIA MECHANICAL CO.
RALPH J. STEPHENSON, P.E.
15064 WARWICK ROAD
DETROIT, MICHIGAN 48223
CONSULTANT PH 273-9026
3
JDM

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

2-YR WORKING-DAY CALENDAR STARTING JAN. 3, 1977

DATE	W/D
JAN 1977	
03	1
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HC 152

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

2-YR WORKING-DAY CALENDAR STARTING JAN. 3, 1977

DATE	W/D
JAN 1978	
03	256
04	257
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6-YEAR WORKING DAY CALENDAR STARTING JAN 3, 1977 PAGE ✓

P J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
JAN 1979		14	561	25	613	08	664	22	716	JAN 1980		13	816	27	868	07	919	21	971
02	510	15	562	29	614	09	665	23	717	02	765	14	817	28	869	08	920	22	972
03	511	16	563	30	615	10	666	24	718	03	766	17	818	29	870	11	921	23	973
04	512	19	564	31	616	13	667	25	719	04	767	18	819	30	871	12	922	24	974
05	513	20	565	JNE		14	668	26	720	07	768	19	820	JNE		13	923	27	975
08	514	21	566	01	617	15	669	29	721	08	769	20	821	02	872	14	924	28	976
09	515	22	567	04	618	16	670	30	722	09	770	21	822	03	873	15	925	29	977
10	516	23	568	05	619	17	671	31	723	10	771	24	823	04	874	18	926	30	978
11	517	26	569	06	620	20	672	NOV		11	772	25	824	05	875	19	927	31	979
12	518	27	570	07	621	21	673	01	724	14	773	26	825	06	876	20	928	NOV	
15	519	28	571	08	622	22	674	02	725	15	774	27	826	09	877	21	929	03	980
16	520	29	572	11	623	23	675	05	726	16	775	28	827	10	878	22	930	04	981
17	521	30	573	12	624	24	676	06	727	17	776	31	828	11	879	25	931	05	982
18	522	APR		13	625	27	677	07	728	18	777	APR		12	880	26	932	06	983
19	523	02	574	14	626	28	678	08	729	21	778	01	829	13	881	27	933	07	984
22	524	03	575	15	627	29	679	09	730	22	779	02	830	16	882	28	934	10	985
23	525	04	576	18	628	30	680	12	731	23	780	03	831	17	883	29	935	11	986
24	526	05	577	19	629	31	681	13	732	24	781	04	832	18	884	SEP		12	987
25	527	06	578	20	630	SEP		14	733	25	782	07	833	19	885	02	936	13	988
26	528	09	579	21	631	04	682	15	734	28	783	08	834	20	886	03	937	14	989
29	529	10	580	22	632	05	683	16	735	29	784	09	835	23	887	04	938	17	990
30	530	11	581	25	633	06	684	19	736	30	785	10	836	24	888	05	939	18	991
31	531	12	582	26	634	07	685	20	737	31	786	11	837	25	889	08	940	19	992
FEB		13	583	27	635	10	686	21	738	FEB		14	838	26	890	09	941	20	993
01	532	16	584	28	636	11	687	23	739	01	787	15	839	27	891	10	942	21	994
02	533	17	585	29	637	12	688	26	740	04	788	16	840	30	892	11	943	24	995
05	534	18	586	JLY		13	689	27	741	05	789	17	841	JLY		12	944	25	996
06	535	19	587	02	638	14	690	28	742	06	790	18	842	01	893	15	945	26	997
07	536	20	588	03	639	17	691	29	743	07	791	21	843	02	894	16	946	28	998
08	537	23	589	05	640	18	692	30	744	08	792	22	844	03	895	17	947	DEC	
09	538	24	590	06	641	19	693	DEC		11	793	23	845	07	896	18	948	01	999
12	539	25	591	09	642	20	694	03	745	12	794	24	846	08	897	19	949	02	1000
13	540	26	592	10	643	21	695	04	746	13	795	25	847	09	898	22	950	03	1001
14	541	27	593	11	644	24	696	05	747	14	796	28	848	10	899	23	951	04	1002
15	542	30	594	12	645	25	697	06	748	15	797	29	849	11	900	24	952	05	1003
16	543	MAY		13	646	26	698	07	749	18	798	30	850	14	901	25	953	08	1004
19	544	01	595	16	647	27	699	10	750	19	799	MAY		15	902	26	954	09	1005
20	545	02	596	17	648	28	700	11	751	20	800	01	851	16	903	29	955	10	1006
21	546	03	597	18	649	OCT		12	752	21	801	02	852	17	904	30	956	11	1007
22	547	04	598	19	650	01	701	13	753	22	802	05	853	18	905	OCT		12	1008
23	548	07	599	20	651	02	702	14	754	25	803	06	854	21	906	01	957	15	1009
26	549	08	600	23	652	03	703	17	755	26	804	07	855	22	907	02	958	16	1010
27	550	09	601	24	653	04	704	18	756	27	805	08	856	23	908	03	959	17	1011
28	551	10	602	25	654	05	705	19	757	28	806	09	857	24	909	06	960	18	1012
MAR		11	603	26	655	08	706	20	758	29	807	12	858	25	910	07	961	19	1013
01	552	14	604	27	656	09	707	21	759	MAR		13	859	28	911	08	962	22	1014
02	553	15	605	30	657	10	708	24	760	03	808	14	860	29	912	09	963	23	1015
05	554	16	606	31	658	11	709	26	761	04	809	15	861	30	913	10	964	24	1016
06	555	17	607	AUG		12	710	27	762	05	810	16	862	31	914	13	965	26	1017
07	556	18	608	01	659	15	711	28	763	06	811	19	863	AUG		14	966	29	1018
08	557	21	609	02	660	16	712	31	764	07	812	20	864	01	915	15	967	30	1019
09	558	22	610	03	661	17	713			10	813	21	865	04	916	16	968	31	1020
12	559	23	611	06	662	18	714			11	814	22	866	05	917	17	969		
13	560	24	612	07	663	19	715			12	815	23	867	06	918	20	970		

6-YEAR WORKING DAY CALENDAR STARTING JAN 3, 1977

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
JAN 1977		15	52	26	104	09	155	21	207	JAN 1978		15	307	26	359	09	410	23	462
03	1	16	53	27	105	10	156	24	208	03	256	16	308	30	360	10	411	24	463
04	2	17	54	31	106	11	157	25	209	04	257	17	309	31	361	11	412	25	464
05	3	18	55	JNE		12	158	26	210	05	258	20	310	JNE		14	413	26	465
06	4	21	56	01	107	15	159	27	211	06	259	21	311	01	362	15	414	27	466
07	5	22	57	02	108	16	160	28	212	09	260	22	312	02	363	16	415	30	467
10	6	23	58	03	109	17	161	31	213	10	261	23	313	05	364	17	416	31	468
11	7	24	59	06	110	18	162	NOV		11	262	24	314	06	365	18	417	NOV	
12	8	25	60	07	111	19	163	01	214	12	263	27	315	07	366	21	418	01	469
13	9	28	61	08	112	22	164	02	215	13	264	28	316	08	367	22	419	02	470
14	10	29	62	09	113	23	165	03	216	16	265	29	317	09	368	23	420	03	471
17	11	30	63	10	114	24	166	04	217	17	266	30	318	12	369	24	421	06	472
18	12	31	64	13	115	25	167	07	218	18	267	31	319	13	370	25	422	07	473
19	13	APR		14	116	26	168	08	219	19	268	APR		14	371	28	423	08	474
20	14	01	65	15	117	29	169	09	220	20	269	03	320	15	372	29	424	09	475
21	15	04	66	16	118	30	170	10	221	23	270	04	321	16	373	30	425	10	476
24	16	05	67	17	119	31	171	11	222	24	271	05	322	19	374	31	426	13	477
25	17	06	68	20	120	SEP		14	223	25	272	06	323	20	375	SEP		14	478
26	18	07	69	21	121	01	172	15	224	26	273	07	324	21	376	01	427	15	479
27	19	08	70	22	122	02	173	16	225	27	274	10	325	22	377	05	428	16	480
28	20	11	71	23	123	06	174	17	226	30	275	11	326	23	378	06	429	17	481
31	21	12	72	24	124	07	175	18	227	31	276	12	327	26	379	07	430	20	482
FEB		13	73	27	125	08	176	21	228	FEB		13	328	27	380	08	431	21	483
01	22	14	74	28	126	09	177	22	229	01	277	14	329	28	381	11	432	22	484
02	23	15	75	29	127	12	178	23	230	02	278	17	330	29	382	12	433	24	485
03	24	18	76	30	128	13	179	25	231	03	279	18	331	30	383	13	434	27	486
04	25	19	77	JLY		14	180	28	232	06	280	19	332	JLY		14	435	28	487
07	26	20	78	01	129	15	181	29	233	07	281	20	333	03	384	15	436	29	488
08	27	21	79	05	130	16	182	30	234	08	282	21	334	05	385	18	437	30	489
09	28	22	80	06	131	19	183	DEC		09	283	24	335	06	386	19	438	DEC	
10	29	25	81	07	132	20	184	01	235	10	284	25	336	07	387	20	439	01	490
11	30	26	82	08	133	21	185	02	236	13	285	26	337	10	388	21	440	04	491
14	31	27	83	11	134	22	186	05	237	14	286	27	338	11	389	22	441	05	492
15	32	28	84	12	135	23	187	06	238	15	287	28	339	12	390	25	442	06	493
16	33	29	85	13	136	26	188	07	239	16	288	MAY		13	391	26	443	07	494
17	34	MAY		14	137	27	189	08	240	17	289	01	340	14	392	27	444	08	495
18	35	02	86	15	138	28	190	09	241	20	290	02	341	17	393	28	445	11	496
21	36	03	87	18	139	29	191	12	242	21	291	03	342	18	394	29	446	12	497
22	37	04	88	19	140	30	192	13	243	22	292	04	343	19	395	OCT		13	498
23	38	05	89	20	141	OCT		14	244	23	293	05	344	20	396	02	447	14	499
24	39	06	90	21	142	03	193	15	245	24	294	08	345	21	397	03	448	15	500
25	40	09	91	22	143	04	194	16	246	27	295	09	346	24	398	04	449	18	501
28	41	10	92	25	144	05	195	19	247	28	296	10	347	25	399	05	450	19	502
MAR		11	93	26	145	06	196	20	248	MAR		11	348	26	400	06	451	20	503
01	42	12	94	27	146	07	197	21	249	01	297	12	349	27	401	09	452	21	504
02	43	13	95	28	147	10	198	22	250	02	298	15	350	28	402	10	453	22	505
03	44	16	96	29	148	11	199	23	251	03	299	16	351	31	403	11	454	26	506
04	45	17	97	AUG		12	200	27	252	06	300	17	352	AUG		12	455	27	507
07	46	18	98	01	149	13	201	28	253	07	301	18	353	01	404	13	456	28	508
08	47	19	99	02	150	14	202	29	254	08	302	19	354	02	405	16	457	29	509
09	48	20	100	03	151	17	203	30	255	09	303	22	355	03	406	17	458		
10	49	23	101	04	152	18	204			10	304	23	356	04	407	18	459		
11	50	24	102	05	153	19	205			13	[illegible]	24	357	07	408	19	460		
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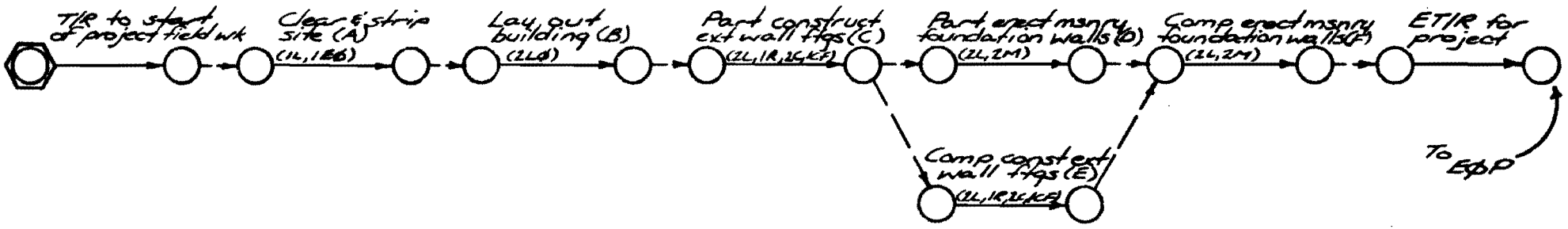

RESOURCE CODE

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

RESOURCE ALLOCATION

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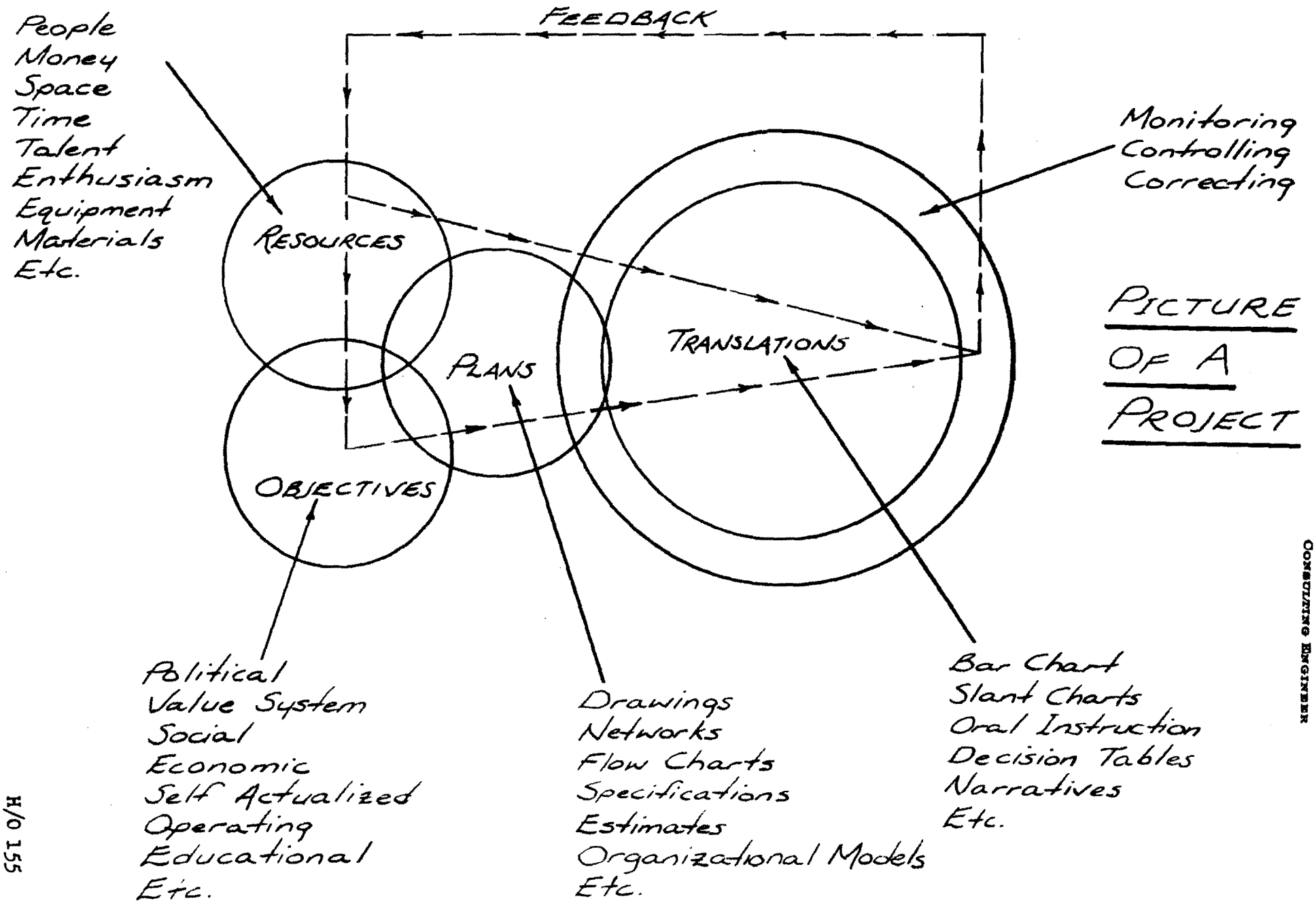

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QUIZ #1 - PROJECT MANAGEMENT

The Nature of a Project

T	F	1.	A project is a set of work actions having identifiable end objectives.
T	F	2.	Proper objectives and a sound plan are important to project success.
T	F	3.	The major participants in a construction project are usually the engineer and the general contractor.
T	F	4.	The project manager may be compared to a pump that keeps the project information and action blood stream circulating.
T	F	5.	Seldom, if ever, do the various stages of a project overlap with each other.
T	F	6.	A project organization is usually permanent.
T	F	7.	An adequate, acceptable standard of project performance is crucial to project success.
T	F	8.	The two basic business activities are supportive and ex'e-cutive.
T	F	9.	Effective project management does not require performance measurement.
T	F	10.	The good project manager avoids resolution of direct/dependent goal intersections.
T	F	11.	Peripheral goal definition and achievement are important to project success.

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QUIZ #2 - PROJECT MANAGEMENT

Project Planning

T F 1. To plan is to establish and arrange the necessary and desired actions leading to end, intermediate and peripheral objectives.

T F 2. Network systems are the only good form of planning.

T F 3. A summary network diagram shows each task in detail.

T F 4. Assignment of resources is recommended as the first step in effectively planning the job.

T F 5. The project plan should be designed to help all responsible participants achieve their objectives.

T F 6. The critical path is the longest time sequence of tasks in the network.

T F 7. The most effective way to manage a project is to start all tasks at their early start dates.

T F 8. Network models are used to manage by exception (MX).

T F 9. Separating each task from its related tasks by a dummy helps avoid logic errors.

T F 10. A task is scheduled when it is locked into a specific time to start and finish.

T F 11. Project networks should only show direct goal activities.

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QUIZ #3 - PROJECT MANAGEMENT

Project Organization

T F 1. A well structured organization is a prerequisite for effective management.

T F 2. In project work the organization should be set before objectives are defined.

T F 3. Project oriented organization can be somewhat compared in manufacturing to product oriented organization.

T F 4. Two major types of organization are the product or project centered and the function centered groupings.

T F 5. Supportive functions are not required for a project organization to work effectively.

T F 6. Under no conditions should a manager's span of control be greater than 10.

T F 7. A characteristic of the functional organization may be lengthy communications channels.

T F 8. The good project manager usually maintains a supportive role within his project.

T F 9. Project organization tends to be fluid.

T F 10. External challenges tend to keep the well balanced project organization keen and effective.

T F 11. The project manager should neglect hygiene and motivation because the next project will be a new cast of characters.

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New York, New York 10036

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GLOSSARY OF TERMS USED IN

PROJECT PLANNING AND MANAGEMENT

Administrative

Usually considered to be supportive of ex'e-cutive operations in an organization. Very simply, administrative costs may be considered the cost of management.

Authority

The leverage, either vested or earned, that allows an individual in an organization to effectively carry out his responsibilities.

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.

Control

Maintaining firm, fair, 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.

Decision table

A tabular display of information regarding 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.

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Decision tree

A graphic device showing alternate courses of action from 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.

Dysfunction - organizational

An organizational problem that hinders or prevents achieving objectives - may be temporary or permanent.

Early finish (EF)

The earliest possible time a task can finish in a network model if all of the tasks preceding it have been completed by their early finish dates.

Early start (ES)

The earliest possible time at which a task can begin in a network model if all tasks preceding it start at their earliest possible starting times.

Education

The teaching and learning process by which principles of doing things are conveyed to the learner.

Effective

Of a nature that accomplishes identifiable end objectives in accordance with an action plan, and achieves worthwhile peripheral goals resulting from intermediate accomplishments.

Elapsed duration

The estimated or actual amount of calendar or clock time an activity requires to accomplish considering all directly and indirectly related influences upon the task activity. This includes temporary work delays and stoppages due to influencing actions on the task.

Ex'e-cutive

The executing arm of the organization. This is the group and activities that are closest to the flow of expense and income in achieving the organization's prime objectives. It is closely related to line operations.

Fabrication facilities

Usually considered to be the physical location where materials and equipment are prepared and assembled ready for use.

Goals

Similar to objectives but quite often applied to individual effort rather than group or company effort.

Goals - dependent

Targets to be achieved, but affected by major influences beyond the manager's control. (Note: dependent goals, while beyond a manager's control, may be well within his company's ability to achieve. Lack of correlation between company and individual effort in achieving a manager's dependent goals may cause severe organizational dysfunctions.)

Goals - direct control

Targets achieved by managing conditions well within the direct influence of the manager.

Histogram

A graphic depiction of quantity plotted against various elements such as item function, item name or time.

Hygiene

The elements in a given situation that are acceptable to an individual but do not necessarily motivate him. These same factors, if unacceptable, act as negative influences upon the individual.

Interfaces

Points at which different but related activities exert direct influences upon each other. Interfaces are often the influence points where direct control goal activities contact dependent goal activities. Poor management of interface situations usually causes problems.

Late finish (LF)

The latest allowable time in a network model that a task can be completed without forcing those tasks that follow it past their latest allowable starting dates.

Late start (LS)

The latest allowable time at which a task in a network model can start without forcing the tasks that follow it past their latest allowable starting dates.

Leverage

The effective use of vested and earned authority to solve problems and achieve objectives.

Life cycle cost

The total cost of a system over its entire defined life.

Line activities

Those organizational activities that are most closely identified with the flow of basic expense and income related to the prime objectives of the organization.

Line of action

A sequential statement of the activities necessary to conceive, design, build and operate an environment.

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 or are about to arise, and remains silent when there are no problems. The system explicitly identifies the problem area, thus permitting the effective manager to manage the exception while leaving 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 & Mouton and is useful in establishing managerial systems that are both desirable and needed.

Money flow

The flow of income and expense plotted in amounts of money against time.

Monitoring

Measurement of current project conditions and position against the standard of performance.

Motivation

The elements of a given situation that encourage and make effective, successful and meaningful the activities of those engaged.

Network plan

A graphic statement of the action standard of performance expected to be used in achieving project objectives.

Network planning

A graphic technique of showing the necessary and desired actions needed to achieve end, intermediate and peripheral objectives.

Objectives - end

Those objectives that are realized from and upon total completion of the project work.

Objectives - intermediate

Those objectives achieved at specific and identifiable stages of the project, i.e. partial occupancy of a building, or turn-over of a mechanical system for temporary heat.

Objectives - long range

Usually applied to organizational objectives to be achieved within a 5 to 10 year period. Sometimes called strategic objectives.

Objectives - medium range

Organizational objectives to be achieved within a 1 to 5 year period. Sometimes called tactical objectives.

Objectives - peripheral

Those 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. Examples of peripheral objectives might include staff promotion, profitable subcontractor operations or specialized experience.

Objectives - short range

Organizational goals to be achieved between now and 1 year. Sometimes called operational or short term tactical objectives.

Ongoing organization

The arrangement and interrelationships of people charged with maintaining supportive actions provided by the ongoing elements of a company. Examples of functions contained in the ongoing organization are estimating, administration, legal, sales and purchasing.

Organization

The arrangement of resources (talent, skill, money, time, space, people, et al) that has evolved or been selected to accomplish the functions, activities, manager activities and goals of a business or institution.

Planning

Establishing and arranging the necessary and desired actions leading to end, intermediate and peripheral objectives.

Problem

A deviation from an accepted standard of performance.

Profiling

A selective, flexible, dynamic operable system of screening projects, people, activities and other elements of a project to achieve optimum results, as defined by established plans and objectives.

Profit - education

Company and project fulfillment of learning goals held by individuals or groups involved.

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 situation.
(Note: very difficult to explicitly define.)

Profit - value system

Company and project fulfillment of personal, professional, technical, social and financial values held important by individuals and groups.

Project

A set of work actions having identifiable end objectives.

Project Manager

That individual responsible for full implementation of a project through the authority and resources given him by his organization. Usually the project manager is most concerned with supportive action which brings resources to the point of effective use.

Project organization

The arrangement and interrelationships of people charged with implementing the end, intermediate and peripheral objectives of the project.

Project stages

A sequential definition of the action steps to be taken in successfully carrying out a project.

Project superintendent

The individual, usually in a construction program, who is most directly responsible for the expenditure of funds to carry out the project. The project superintendent is responsible for ex'e-cutive actions.

Question - direct

One asked with strong indications as to specifically who should reply.

Question - overhead

One asked of a group without indication as to who is to reply.

Question - relay

One passed along to someone else other than the party originally asked.

Question - reverse

One returned to the questioner by rephrasing or rewording the original question.

Relations - formal functional

Project relationships 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 one to many or many to one in nature. Formal relations are precisely defined and most day to day business is accomplished within the formal relation framework.

Relations - informal functional

The natural channels along which organizationally related material is most easily, comfortably and quickly transmitted. The informal relation usually exists by consent and is stimulated to maximum effectiveness by a mutual profit gained from the relation. There is little, if any, authority normally expressed in informal relations. Communication is usually oral and one to one. Often informal relations define the hidden organizational structure.

Relations - occasional or temporary

Those created when extraordinary or unusual management demands arise. The temporary relationship is, by its nature, unstable and should seldom be adopted as a permanent active arrangement. Extensive use of informal functional relationships creates business dysfunctions, breaks down morale and causes internal tensions difficult to resolve.

Relations - reporting

The official channels through which each individual conveys or is given raises, appraisals and evaluations; is fired, assigned, reassigned, and is provided professional, vocational and personal identity. Usually is a one to one communication. The true organizational superior of an employee is usually that individual with whom he maintains a reporting relation.

Relations - staff

Those business relations through which a person or group provides advisory services necessary to accomplish goals. Staff personnel usually act in a consulting capacity with little or no authority relative to those outside the staff group.

Resources

The tools of the supportive and ex'e-cutive manager. Resources can include manpower, 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 continued vitality.

Schedule

A graphic or written tabulation of project activities showing where they 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.

Span of control

The number of organizationally related individuals a manager directly controls. Span of control is signified by the number of one to one relations a manager maintains.

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 opposite of line activities.

Standard of performance

A well defined, explicitly stated, approved and accepted statement of the measurement object to be used as a gage of performance and goal achievement.

Structured organization

An arrangement of business elements that tends toward highly defined, formal functional definition. The structured organization, depending upon degree, can work exceptionally well or not at all. It tends to lead toward high overhead, excessive management layering and quite often, particularly in subsidized sectors, management paralysis. It is beneficial in that when well used, it tends to eliminate confusion and misconceptions regarding the role of the individual in the organization.

Talent

A capacity for achieving identifiable success. Usually talent is considered one of the abstract resources.

Time

The clock or calendar position assigned to activities. Usually in network systems time is measured in elapsed working days.

Total float (TF)

The amount of discretionary time available to a task in a network model. The total float is the difference between the early and late starts and finishes. It is one of the most important elements in the use of network systems.

Training

The teaching and learning processes by which specific, explicit methods and systems of doing something are conveyed to the learner.

Translation

Recasting standard of performance information and data into graphic, narrative, mental, oral or other form to insure optimum use by all involved.

Unstructured organization

An arrangement that encourages interrelations tending toward informal operations, minimal paper work, loosely defined reporting relations and high dependence upon individual initiative. It should be noted that the informal nature of this kind of organization demands continued challenge and excitement infused from the outside to maintain economic strength without being subsidized. Usually subsidization of the unstructured activity brings it to an end.

Value engineering

A simulation technique that encourages identification of the best function for the least cost (not only financial) in a given technical decision situation.

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QUIZ #4 - PROJECT MANAGEMENT

Monitoring, Controlling, Correcting

T F 1. With a good project team and a feasible plan of action, monitoring is not necessary.

T F 2. Monitoring by on-site inspection is preferred to remote monitoring through second and third hand information.

T F 3. A monitoring system should be kept as simple and straightforward as possible.

T F 4. Only direct goal activities should be monitored.

T F 5. Monitoring procedures should be agreed upon by the project team early in the project life.

T F 6. Monitoring is best done by the project line manager, (the man most directly responsible for performance).

T F 7. A written report should result from each monitoring session.

T F 8. Effective control is best exerted by being a noisy and conspicuous manager.

T F 9. A good monitoring system measures progress trends in the project.

T F 10. Both qualitative and quantitative measurements are made during a monitoring.

T F 11. It is inappropriate for the person monitoring a project to offer corrective suggestions.

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Pointers for Reading, Analyzing and Solving Case Studies

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

Pointer 1

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

Pointer 2

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

Pointer 3

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

Pointer 4

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

Pointer 5

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

Pointer 6

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

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Case Study #2

The Case of Filigree Company's Remodeled Computer Room

Filigree is a large national manufacturer of yard goods and embroidery supplies. They maintain a basic computer operation in La Crosse, Wisconsin, although their warehouses and manufacturing plants are spread throughout the United States, Canada and the British Isles.

The La Crosse center feeds all sales, inventory and other business statistical data to the far flung plant and office network of Filigree.

The computer center operates on a 24 hour day, 7 day per week basis. Your firm, the Steinman Construction Company, has been called in to suggest the sequence by which the computer room could be remodeled. It is a small job, approximately $700,000, but very critical to Filigree. The architect and engineer are on Filigree's staff and realize the importance of working closely with the selected contractor doing the work. Only very rough layouts have been prepared although Filigree's architect/engineer knows a great deal about the La Crosse office and has identified the location and capacity of most utility services in ceiling work and other elements important to installation of the new computer sector.

The existing operation must be maintained while the new space (gained from vacation of the area by the marketing division) is remodeled. The new space directly adjoins the existing computer room but is separated from it by a demountable partition.

As project manager and superintendent, you will be on the job and responsible for all trades. How would you go about planning this project?

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Case Study #4

The Wasted Treatment Plant

The project is a 26 million dollar waste treatment plant. You are the project manager and superintendent. Your involvement has been especially heavy for the past three weeks right after the job was obtained. It is apparent to you that the contract documents are poor, the owner is painfully indifferent to all influence except political pressures and the job is definitely claim prone.

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

Consider these questions:

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

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

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

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

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Case Study #5

The Sneaky Boiler Contractor

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

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

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

Consider these questions:

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

2) What steps should you take immediately?

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

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

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Case Study #11

The Case of the Missing Slab on Grade

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

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

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

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

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

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

Consider these questions:

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

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2-YR WORKING-DAY CALENDAR STARTING JAN. 3, 1978

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R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

2-YR WORKING-DAY CALENDAR STARTING JAN. 3, 1978

DATE	W/D
JAN 1979	
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R J ..EPHENSON, P.E. 15064 WARWICK DETROIT, MICH 4822. PH 313-273-5026

4-YR WORKING-DAY CALENDAR STARTING JAN. 3, 1978

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
JAN 1978		15	52	26	104	09	155	23	207	JAN 1979		14	306	25	358	08	409	22	461
03	1	16	53	30	105	10	156	24	208	02	255	15	307	29	359	09	410	23	462
04	2	17	54	31	106	11	157	25	209	03	256	16	308	30	360	10	411	24	463
05	3	20	55	JNE		14	158	26	210	04	257	19	309	31	361	13	412	25	464
06	4	21	56	01	107	15	159	27	211	05	258	20	310	JNE		14	413	26	465
09	5	22	57	02	108	16	160	30	212	08	259	21	311	01	362	15	414	29	466
10	6	23	58	05	109	17	161	31	213	09	260	22	312	04	363	16	415	30	467
11	7	24	59	06	110	18	162	NOV		10	261	23	313	05	364	17	416	31	468
12	8	27	60	07	111	21	163	01	214	11	262	26	314	06	365	20	417	NOV	
13	9	28	61	08	112	22	164	02	215	12	263	27	315	07	366	21	418	01	469
16	10	29	62	09	113	23	165	03	216	15	264	28	316	08	367	22	419	02	470
17	11	30	63	12	114	24	166	06	217	16	265	29	317	11	368	23	420	05	471
18	12	31	64	13	115	25	167	07	218	17	266	30	318	12	369	24	421	06	472
19	13	APR		14	116	28	168	08	219	18	267	APR		13	370	27	422	07	473
20	14	03	65	15	117	29	169	09	220	19	268	02	319	14	371	28	423	08	474
23	15	04	66	16	118	30	170	10	221	22	269	03	320	15	372	29	424	09	475
24	16	05	67	19	119	31	171	13	222	23	270	04	321	18	373	30	425	12	476
25	17	06	68	20	120	SEP		14	223	24	271	05	322	19	374	31	426	13	477
26	18	07	69	21	121	01	172	15	224	25	272	06	323	20	375	SEP		14	478
27	19	10	70	22	122	05	173	16	225	26	273	09	324	21	376	04	427	15	479
30	20	11	71	23	123	06	174	17	226	29	274	10	325	22	377	05	428	16	480
31	21	12	72	26	124	07	175	20	227	30	275	11	326	25	378	06	429	19	481
FEB		13	73	27	125	08	176	21	228	31	276	12	327	26	379	07	430	20	482
01	22	14	74	28	126	11	177	22	229	FEB		13	328	27	380	10	431	21	483
02	23	17	75	29	127	12	178	24	230	01	277	16	329	28	381	11	432	23	484
03	24	18	76	30	128	13	179	27	231	02	278	17	330	29	382	12	433	26	485
06	25	19	77	JLY		14	180	28	232	05	279	18	331	JLY		13	434	27	486
07	26	20	78	03	129	15	181	29	233	06	280	19	332	02	383	14	435	28	487
08	27	21	79	05	130	18	182	30	234	07	281	20	333	03	384	17	436	29	488
09	28	24	80	06	131	19	183	DEC		08	282	23	334	05	385	18	437	30	489
10	29	25	81	07	132	20	184	01	235	09	283	24	335	06	386	19	438	DEC	
13	30	26	82	10	133	21	185	04	236	12	284	25	336	09	387	20	439	03	490
14	31	27	83	11	134	22	186	05	237	13	285	26	337	10	388	21	440	04	491
15	32	28	84	12	135	25	187	06	238	14	286	27	338	11	389	24	441	05	492
16	33	MAY		13	136	26	188	07	239	15	287	30	339	12	390	25	442	06	493
17	34	01	85	14	137	27	189	08	240	16	288	MAY		13	391	26	443	07	494
20	35	02	86	17	138	28	190	11	241	19	289	01	340	16	392	27	444	10	495
21	36	03	87	18	139	29	191	12	242	20	290	02	341	17	393	28	445	11	496
22	37	04	88	19	140	OCT		13	243	21	291	03	342	18	394	OCT		12	497
23	38	05	89	20	141	02	192	14	244	22	292	04	343	19	395	01	446	13	498
24	39	08	90	21	142	03	193	15	245	23	293	07	344	20	396	02	447	14	499
27	40	09	91	24	143	04	194	18	246	26	294	08	345	23	397	03	448	17	500
28	41	10	92	25	144	05	195	19	247	27	295	09	346	24	398	04	449	18	501
MAR		11	93	26	145	06	196	20	248	28	296	10	347	25	399	05	450	19	502
01	42	12	94	27	146	09	197	21	249	MAR		11	348	26	400	08	451	20	503
02	43	15	95	28	147	10	198	22	250	01	297	14	349	27	401	09	452	21	504
03	44	16	96	31	148	11	199	26	251	02	298	15	350	30	402	10	453	24	505
06	45	17	97	AUG		12	200	27	252	05	299	16	351	31	403	11	454	26	506
07	46	18	98	01	149	13	201	28	253	06	300	17	352	AUG		12	455	27	507
08	47	19	99	02	150	16	202	29	254	07	301	18	353	01	404	15	456	28	508
09	48	22	100	03	151	17	203			08	302	21	354	02	405	16	457	31	509
10	49	23	101	04	152	18	204			09	303	22	355	03	406	17	458		
13	50	24	102	07	153	19	205			12	304	23	356	06	407	18	459		
14	51	25	103	08	154	20	206			13	305	24	357	07	408	19	460		

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

4-YR WORKING-DAY CALENDAR STARTING JAN. 3, 1978

DATE	W/D
JAN 1980	
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RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

CASE STUDY

The Unique Opportunity at Buffalo

You are a hard working, conscientious employee of Buffalo Development Company, a small diversified firm which concentrates on acquiring, planning, improving and marketing commercial and industrial properties. The scope of your firm's services includes real estate, property management, limited planning/architectural/engineering design (with outside consultant capabilities), construction, as well as necessary support activities such as financing, leasing and market studies.

The firm has grown from a small informally run organization of ten hard working people, all of whom considered themselves business peers, to a company having almost 70 employees, many responsible for multiple activities they inherited as the company grew. The problems that normally accompany growth including fuzzy responsibility definition, conflicting communication lines, increasingly frequent management paralysis, internal jockeying for position and apparent inequities in reimbursement and benefits, have begun to gnaw away at the company's ability to perform in the same high quality manner as previously.

Last month a unique opportunity opened to Buffalo for development of a major recreational parcel in New England. This would bring under company control nearly 5,000 acres of recreational land, offering exceptional development potential for skiing, swimming, hiking, backpacking, horseback riding, as well as a very lucrative opportunity for resort and commercial hotel facilities badly needed in the area.

The project is the catalyst that forces you to grips with the other problems that have begun to wear down the staff of Buffalo. Presume you are a person whose judgment is respected and to whom people in the company will listen.

(From this situation, we will build one or more problem cases that will simulate by role playing situations you may face as a responsible staff member of Buffalo.)

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

CASE STUDY

Foreman Jones has had a strained working relationship with General Superintendent Green for a number of years. The originating point of this strained relationship occurred some five years ago when Jones lost what he considered to be a political battle for the superintendent's position.

Mr. Jones has little respect for Superintendent Green; as he sees it, Mr. Green, his boss, is a politician who does his best to stay on the good side of the owner. Foreman Jones considers himself to be superior to his boss in overall knowledge of construction and ability to manage people.

On the other hand, Superintendent Green views Jones as one who is narrow-minded and continues to bear a grudge against him because he happened to be the successful one chosen for the job of superintendent. He views Foreman Jones as a threat because Jones would probably seize on any opportunity to make him look bad before the owner or other employees. As a result, he watches closely every move made by Jones and is critical of his work whenever the opportunity presents itself.

Due to the expansion of residential business, a decision is made to create another Superintendent for Residential Construction.

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

2-YR WORKING-DAY CALENDAR STARTING JAN. 2, 1979

PAGE 2

DATE W/D	DATE W/D	DATE W/D	DATE W/D	DATE W/D
JAN 1980	13 307	27 359	07 410	21 462
02 256	14 308	28 360	08 411	22 463
03 257	17 309	29 361	11 412	23 464
04 258	18 310	30 362	12 413	24 465
07 259	19 311	JNE	13 414	27 466
08 260	20 312	02 363	14 415	28 467
09 261	21 313	03 364	15 416	29 468
10 262	24 314	04 365	18 417	30 469
11 263	25 315	05 366	19 418	31 470
14 264	26 316	06 367	20 419	NOV
15 265	27 317	09 368	21 420	03 471
16 266	28 318	10 369	22 421	04 472
17 267	31 319	11 370	25 422	05 473
18 268	APR	12 371	26 423	06 474
21 269	01 320	13 372	27 424	07 475
22 270	02 321	16 373	28 425	10 476
23 271	03 322	17 374	29 426	11 477
24 272	04 323	18 375	SEP	12 478
25 273	07 324	19 376	02 427	13 479
28 274	08 325	20 377	03 428	14 480
29 275	09 326	23 378	04 429	17 481
30 276	10 327	24 379	05 430	18 482
31 277	11 328	25 380	08 431	19 483
FEB	14 329	26 381	09 432	20 484
01 278	15 330	27 382	10 433	21 485
04 279	16 331	30 383	11 434	24 486
05 280	17 332	JLY	12 435	25 487
06 281	18 333	01 384	15 436	26 488
07 282	21 334	02 385	16 437	28 489
08 283	22 335	03 386	17 438	DEC
11 284	23 336	07 387	18 439	01 490
12 285	24 337	08 388	19 440	02 491
13 286	25 338	09 389	22 441	03 492
14 287	28 339	10 390	23 442	04 493
15 288	29 340	11 391	24 443	05 494
18 289	30 341	14 392	25 444	08 495
19 290	MAY	15 393	26 445	09 496
20 291	01 342	16 394	29 446	10 497
21 292	02 343	17 395	30 447	11 498
22 293	05 344	18 396	OCT	12 499
25 294	06 345	21 397	01 448	15 500
26 295	07 346	22 398	02 449	16 501
27 296	08 347	23 399	03 450	17 502
28 297	09 348	24 400	06 451	18 503
29 298	12 349	25 401	07 452	19 504
MAR	13 350	28 402	08 453	22 505
03 299	14 351	29 403	09 454	23 506
04 300	15 352	30 404	10 455	24 507
05 301	16 353	31 405	13 456	26 508
06 302	19 354	AUG	14 457	29 509
07 303	20 355	01 406	15 458	30 510
10 304	21 356	04 407	16 459	31 511
11 305	22 357	05 408	17 460	
12 306	23 358	06 409	20 461	

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5028

(181)

2-YR WORKING-DAY CALENDAR STARTING JAN. 2, 1979

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
JAN 1979		14	52	25	104	08	155	22	207
02	1	15	53	29	105	09	156	23	208
03	2	16	54	30	106	10	157	24	209
04	3	19	55	31	107	13	158	25	210
05	4	20	56	JNE		14	159	26	211
08	5	21	57	01	108	15	160	29	212
09	6	22	58	04	109	16	161	30	213
10	7	23	59	05	110	17	162	31	214
11	8	26	60	06	111	20	163	NOV	
12	9	27	61	07	112	21	164	01	215
15	10	28	62	08	113	22	165	02	216
16	11	29	63	11	114	23	166	05	217
17	12	30	64	12	115	24	167	06	218
18	13	APR		13	116	27	168	07	219
19	14	02	65	14	117	28	169	08	220
22	15	03	66	15	118	29	170	09	221
23	16	04	67	18	119	30	171	12	222
24	17	05	68	19	120	31	172	13	223
25	18	06	69	20	121	SEP		14	224
26	19	09	70	21	122	04	173	15	225
29	20	10	71	22	123	05	174	16	226
30	21	11	72	25	124	06	175	19	227
31	22	12	73	26	125	07	176	20	228
FEB		13	74	27	126	10	177	21	229
01	23	16	75	28	127	11	178	23	2
02	24	17	76	29	128	12	179	26	23
05	25	18	77	JLY		13	180	27	232
06	26	19	78	02	129	14	181	28	233
07	27	20	79	03	130	17	182	29	234
08	28	23	80	05	131	18	183	30	235
09	29	24	81	06	132	19	184	DEC	
12	30	25	82	09	133	20	185	03	236
13	31	26	83	10	134	21	186	04	237
14	32	27	84	11	135	24	187	05	238
15	33	30	85	12	136	25	188	06	239
16	34	MAY		13	137	26	189	07	240
19	35	01	86	16	138	27	190	10	241
20	36	02	87	17	139	28	191	11	242
21	37	03	88	18	140	OCT		12	243
22	38	04	89	19	141	01	192	13	244
23	39	07	90	20	142	02	193	14	245
26	40	08	91	23	143	03	194	17	246
27	41	09	92	24	144	04	195	18	247
28	42	10	93	25	145	05	196	19	248
MAR		11	94	26	146	08	197	20	249
01	43	14	95	27	147	09	198	21	250
02	44	15	96	30	148	10	199	24	251
05	45	16	97	31	149	11	200	26	252
06	46	17	98	AUG		12	201	27	253
07	47	18	99	01	150	15	202	28	254
08	48	21	100	02	151	16	203	31	2
09	49	22	101	03	152	17	204		
12	50	23	102	06	153	18	205		
13	51	24	103	07	154	19	206		

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

(JAN 2'79 =DAY 1) 4-YR WORKING-DAY CALENDAR STARTING JAN. 2, 1979 PAGE 1 of 2

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
JAN 1979		14	52	25	104	08	155	22	207	JAN 1980		13	307	27	359	07	410	21	462
02	1	15	53	29	105	09	156	23	208	02	256	14	308	28	360	08	411	22	463
03	2	16	54	30	106	10	157	24	209	03	257	17	309	29	361	11	412	23	464
04	3	19	55	31	107	13	158	25	210	04	258	18	310	30	362	12	413	24	465
05	4	20	56	JNE		14	159	26	211	07	259	19	311	JNE		13	414	27	466
08	5	21	57	01	108	15	160	29	212	08	260	20	312	02	363	14	415	28	467
09	6	22	58	04	109	16	161	30	213	09	261	21	313	03	364	15	416	29	468
10	7	23	59	05	110	17	162	31	214	10	262	24	314	04	365	18	417	30	469
11	8	26	60	06	111	20	163	NOV		11	263	25	315	05	366	19	418	31	470
12	9	27	61	07	112	21	164	01	215	14	264	26	316	06	367	20	419	NOV	
15	10	28	62	08	113	22	165	02	216	15	265	27	317	09	368	21	420	03	471
16	11	29	63	11	114	23	166	05	217	16	266	28	318	10	369	22	421	04	472
17	12	30	64	12	115	24	167	06	218	17	267	31	319	11	370	25	422	05	473
18	13	APR		13	116	27	168	07	219	18	268	APR		12	371	26	423	06	474
19	14	02	65	14	117	28	169	08	220	21	269	01	320	13	372	27	424	07	475
22	15	03	66	15	118	29	170	09	221	22	270	02	321	16	373	28	425	10	476
23	16	04	67	18	119	30	171	12	222	23	271	03	322	17	374	29	426	11	477
24	17	05	68	19	120	31	172	13	223	24	272	04	323	18	375	SEP		12	478
25	18	06	69	20	121	SEP		14	224	25	273	07	324	19	376	02	427	13	479
26	19	09	70	21	122	04	173	15	225	28	274	08	325	20	377	03	428	14	480
29	20	10	71	22	123	05	174	16	226	29	275	09	326	23	378	04	429	17	481
30	21	11	72	25	124	06	175	19	227	30	276	10	327	24	379	05	430	18	482
31	22	12	73	26	125	07	176	20	228	31	277	11	328	25	380	08	431	19	483
FEB		13	74	27	126	10	177	21	229	FEB		14	329	26	381	09	432	20	484
01	23	16	75	28	127	11	178	23	230	01	278	15	330	27	382	10	433	21	485
02	24	17	76	29	128	12	179	26	231	04	279	16	331	30	383	11	434	24	486
05	25	18	77	JLY		13	180	27	232	05	280	17	332	JLY		12	435	25	487
06	26	19	78	02	129	14	181	28	233	06	281	18	333	01	384	15	436	26	488
07	27	20	79	03	130	17	182	29	234	07	282	21	334	02	385	16	437	28	489
08	28	23	80	05	131	18	183	30	235	08	283	22	335	03	386	17	438	DEC	
09	29	24	81	06	132	19	184	DEC		11	284	23	336	07	387	18	439	01	490
12	30	25	82	09	133	20	185	03	236	12	285	24	337	08	388	19	440	02	491
13	31	26	83	10	134	21	186	04	237	13	286	25	338	09	389	22	441	03	492
14	32	27	84	11	135	24	187	05	238	14	287	28	339	10	390	23	442	04	493
15	33	30	85	12	136	25	188	06	239	15	288	29	340	11	391	24	443	05	494
16	34	MAY		13	137	26	189	07	240	18	289	30	341	14	392	25	444	08	495
19	35	01	86	16	138	27	190	10	241	19	290	MAY		15	393	26	445	09	496
20	36	02	87	17	139	28	191	11	242	20	291	01	342	16	394	29	446	10	497
21	37	03	88	18	140	OCT		12	243	21	292	02	343	17	395	30	447	11	498
22	38	04	89	19	141	01	192	13	244	22	293	05	344	18	396	OCT		12	499
23	39	07	90	20	142	02	193	14	245	25	294	06	345	21	397	01	448	15	500
26	40	08	91	23	143	03	194	17	246	26	295	07	346	22	398	02	449	16	501
27	41	09	92	24	144	04	195	18	247	27	296	08	347	23	399	03	450	17	502
28	42	10	93	25	145	05	196	19	248	28	297	09	348	24	400	06	451	18	503
MAR		11	94	26	146	08	197	20	249	29	298	12	349	25	401	07	452	19	504
01	43	14	95	27	147	09	198	21	250	MAR		13	350	28	402	08	453	22	505
02	44	15	96	30	148	10	199	24	251	03	299	14	351	29	403	09	454	23	506
05	45	16	97	31	149	11	200	26	252	04	300	15	352	30	404	10	455	24	507
06	46	17	98	AUG		12	201	27	253	05	301	16	353	31	405	13	456	26	508
07	47	18	99	01	150	15	202	28	254	06	302	19	354	AUG		14	457	29	509
08	48	21	100	02	151	16	203	31	255	07	303	20	355	01	406	15	458	30	510
09	49	22	101	03	152	17	204			10	304	21	356	04	407	16	459	31	511
12	50	23	102	06	153	18	205			11	305	22	357	05	408	17	460		
13	51	24	103	07	154	19	206			12	306	23	358	06	409	20	461		

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

(JAN 2'79 =DAY 1) 4-YR WORKING-DAY CALENDAR STARTING JAN. 2, 1979 PAGE 1 of 4

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
JAN 1980		16	563	28	615	10	666	22	718	JAN 1981		16	818	27	870	10	921	22	973
02	512	17	564	29	616	11	667	23	719	04	767	17	819	28	871	11	922	25	974
05	513	18	565	JNE		12	668	26	720	05	768	18	820	JNE		12	923	26	975
06	514	19	566	01	617	13	669	27	721	06	769	19	821	01	872	13	924	27	976
07	515	20	567	02	618	14	670	28	722	07	770	22	822	02	873	16	925	28	977
08	516	23	568	03	619	17	671	29	723	08	771	23	823	03	874	17	926	29	978
09	517	24	569	04	620	18	672	30	724	11	772	24	824	04	875	18	927	NOV	
12	518	25	570	05	621	19	673	NOV		12	773	25	825	07	876	19	928	01	979
13	519	26	571	08	622	20	674	02	725	13	774	26	826	08	877	20	929	02	980
14	520	27	572	09	623	21	675	03	726	14	775	29	827	09	878	23	930	03	981
15	521	30	573	10	624	24	676	04	727	15	776	30	828	10	879	24	931	04	982
16	522	31	574	11	625	25	677	05	728	18	777	31	829	11	880	25	932	05	983
19	523	APR		12	626	26	678	06	729	19	778	APR		14	881	26	933	08	984
20	524	01	575	15	627	27	679	09	730	20	779	01	830	15	882	27	934	09	985
21	525	02	576	16	628	28	680	10	731	21	780	02	831	16	883	30	935	10	986
22	526	03	577	17	629	31	681	11	732	22	781	05	832	17	884	31	936	11	987
23	527	06	578	18	630	SEP		12	733	25	782	06	833	18	885	SEP		12	988
26	528	07	579	19	631	01	682	13	734	26	783	07	834	21	886	01	937	15	989
27	529	08	580	22	632	02	683	16	735	27	784	08	835	22	887	02	938	16	990
28	530	09	581	23	633	03	684	17	736	28	785	09	836	23	888	03	939	17	991
29	531	10	582	24	634	04	685	18	737	29	786	12	837	24	889	07	940	18	992
30	532	13	583	25	635	08	686	19	738	FEB		13	838	25	890	08	941	19	993
FEB		14	584	26	636	09	687	20	739	01	787	14	839	28	891	09	942	22	994
02	533	15	585	29	637	10	688	23	740	02	788	15	840	29	892	10	943	23	995
03	534	16	586	30	638	11	689	24	741	03	789	16	841	30	893	13	944	24	996
04	535	17	587	JLY		14	690	25	742	04	790	19	842	JLY		14	945	26	997
05	536	20	588	01	639	15	691	27	743	05	791	20	843	01	894	15	946	29	998
06	537	21	589	02	640	16	692	30	744	08	792	21	844	02	895	16	947	30	999
09	538	22	590	06	641	17	693	DEC		09	793	22	845	06	896	17	948	DEC	
10	539	23	591	07	642	18	694	01	745	10	794	23	846	07	897	20	949	01	1000
11	540	24	592	08	643	21	695	02	746	11	795	26	847	08	898	21	950	02	1001
12	541	27	593	09	644	22	696	03	747	12	796	27	848	09	899	22	951	03	1002
13	542	28	594	10	645	23	697	04	748	15	797	28	849	12	900	23	952	06	1003
16	543	29	595	13	646	24	698	07	749	16	798	29	850	13	901	24	953	07	1004
17	544	30	596	14	647	25	699	08	750	17	799	30	851	14	902	27	954	08	1005
18	545	MAY		15	648	28	700	09	751	18	800	MAY		15	903	28	955	09	1006
19	546	01	597	16	649	29	701	10	752	19	801	03	852	16	904	29	956	10	1007
20	547	04	598	17	650	30	702	11	753	22	802	04	853	19	905	30	957	13	1008
23	548	05	599	20	651	OCT		14	754	23	803	05	854	20	906	OCT		14	1009
24	549	06	600	21	652	01	703	15	755	24	804	06	855	21	907	01	958	15	1010
25	550	07	601	22	653	02	704	16	756	25	805	07	856	22	908	04	959	16	1011
26	551	08	602	23	654	05	705	17	757	26	806	10	857	23	909	05	960	17	1012
27	552	11	603	24	655	06	706	18	758	MAR		11	858	26	910	06	961	20	1013
MAR		12	604	27	656	07	707	21	759	01	807	12	859	27	911	07	962	21	1014
02	553	13	605	28	657	08	708	22	760	02	808	13	860	28	912	08	963	22	1015
03	554	14	606	29	658	09	709	23	761	03	809	14	861	29	913	11	964	23	1016
04	555	15	607	30	659	12	710	24	762	04	810	17	862	30	914	12	965	27	1017
05	556	18	608	31	660	13	711	28	763	05	811	18	863	AUG		13	966	28	1018
06	557	19	609	AUG		14	712	29	764	08	812	19	864	02	915	14	967	29	1019
09	558	20	610	03	661	15	713	30	765	09	813	20	865	03	916	15	968	30	1020
10	559	21	611	04	662	16	714	31	766	10	814	21	866	04	917	18	969		
11	560	22	612	05	663	19	715			11	815	24	867	05	918	19	970		
12	61	26	613	06	664	20	716			12	816	25	868	06	919	20	971		
13	562	27	614	07	665	21	717			15	817	26	869	09	920	21	972		

RALPH J. STEPHENSON, P.E.
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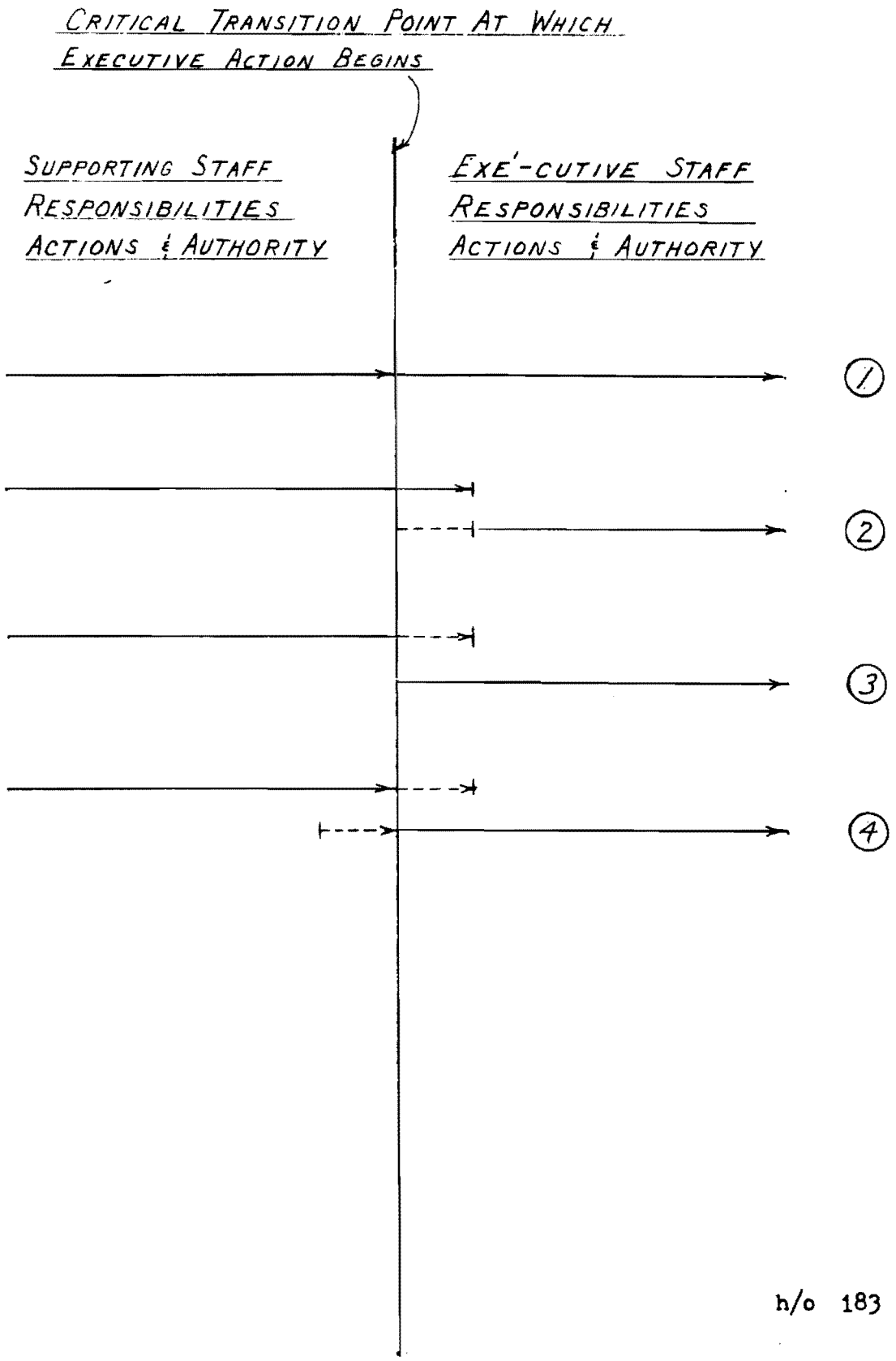

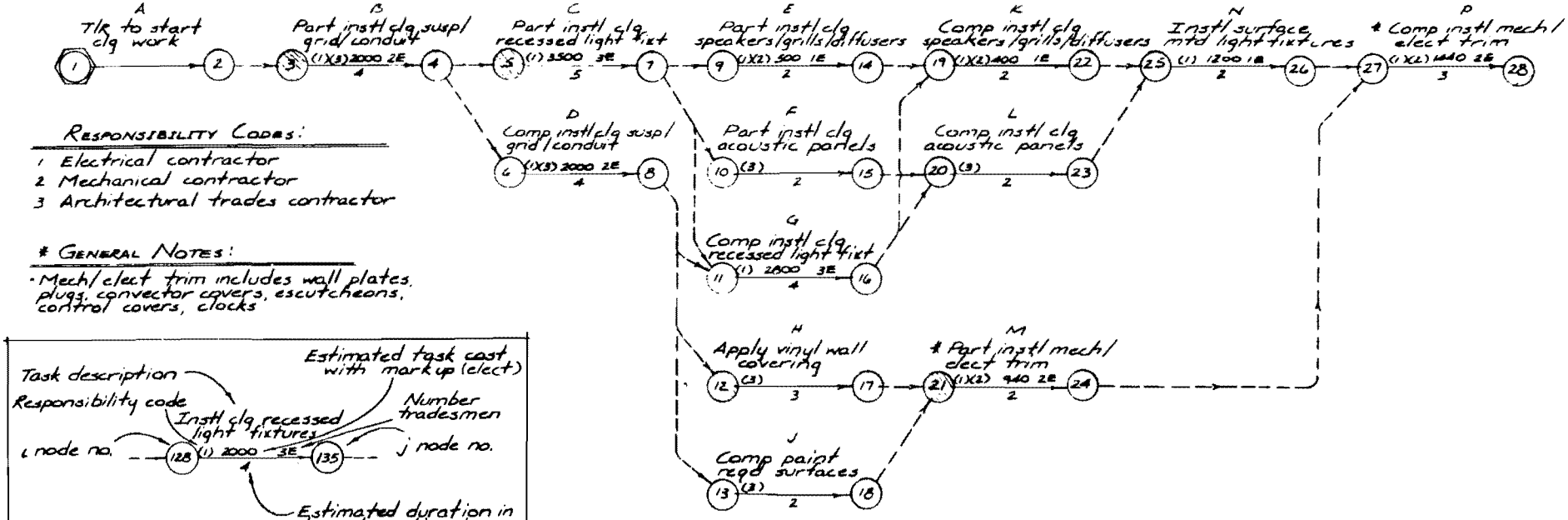

Figure #1 - Network Model

Activity #	i node no.	j node no.	duration	Task description and Responsibility codes	Month / Date / Wkg Day
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	Appl'g vinyl wall covering	(3)
8	13	18	2	Comp paint reqd surfaces	(3)
9	19	22	2	Comp instl clg speakers/grills/diff	(1) (3)
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

Ralph J. Stephenson, P.E.
Consulting Engineer

DESIGN/BUILD MATRIX

ACTIONS →

FUNCTIONS ↓

		A	B	C	D	E	F	G	H	I	
		CONCEIVE	PROGRAM	ARTICULATE	APPROVE	DESIGN	CONSTRUCT	TURN OVER	OPERATE	MAINTAIN	
1	SALES										
2	ENGINEERING										
3	ARCHITECTURE										
4	ESTIMATING										
5	REAL ESTATE										
6	FINANCE										
7	LEGAL										
8	GRAPHICS										
9	CONSTRUCTION										
10	MAINTENANCE										
11	MANAGEMENT										

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CONSULTING ENGINEER

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)

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

Turnover Cycle (t) Example

Definitions:

x = completion date in working days (wd)

i = starting date in working days

d = duration in elapsed working days to complete one unit

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

n = number of units

Basic equations:

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

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

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

Examples:

For x unknown

i = 160

d = 7 wd

t = 4 wd

n = 11 units

For i unknown

x = 325

d = 10 wd

t = 6 wd

n = 21 floors

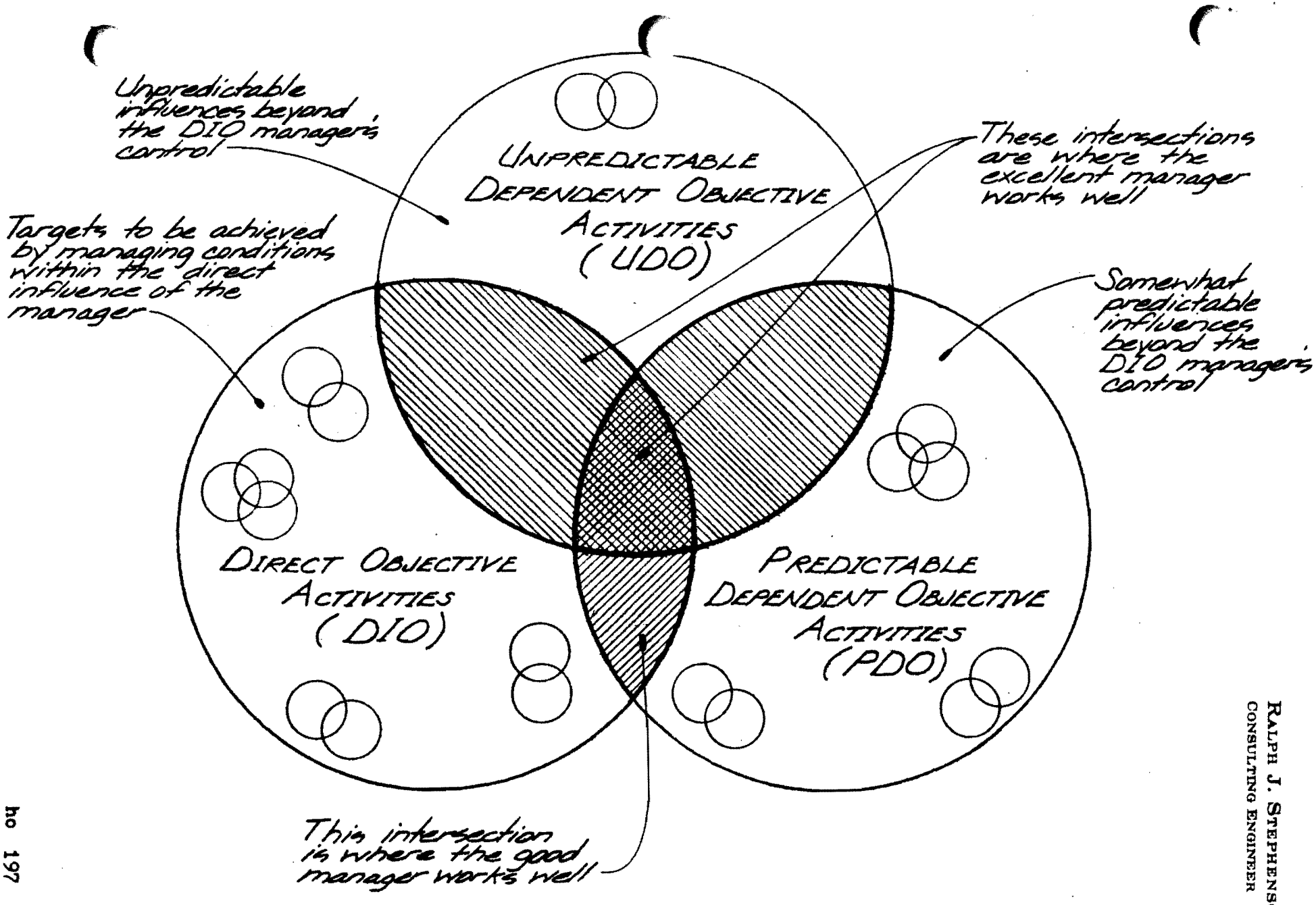
For t unknown

x = 352

i = 280

d = 9

n = 15 sectors



THE DIO/PDO/UDO INTERSECTION

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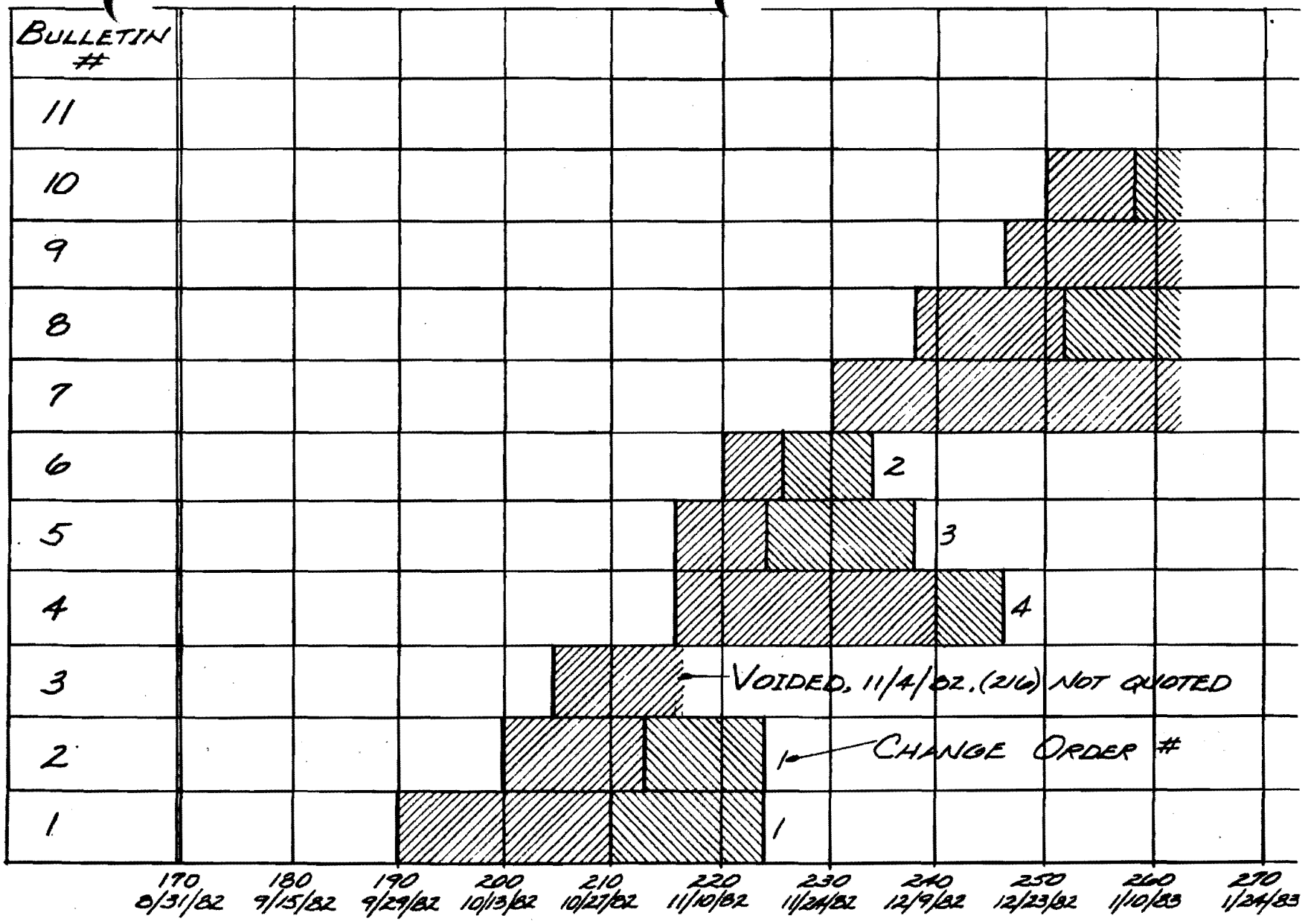


Bulletin quoting period

Quote evaluation period

BULLETIN/CHANGE ORDER RECORD

RALPH J. STEPHENSON, P. E.
CONSULTING ENGINEER

ho 198

RALPH J. STEPHENSON, P. E.
CONSULTING ENGINEER

QITAIN UNIVERSITY - PROJECT

ORGANIZATION STRUCTURE

Robert Hagel
Pres Hagel Mech Engrs

Charles Pedrick
Link & Associates

Fred Link
Pres Link & Assoc

Stan Weissman
Pres Weissman Electric - Elect Engrs

James Lea
QU Program Consultant

Frank Carlton
VP - QU Planning & Operations

Richard Goldmark
Alumnus of QU

George Deff
City Manager of Qitain

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

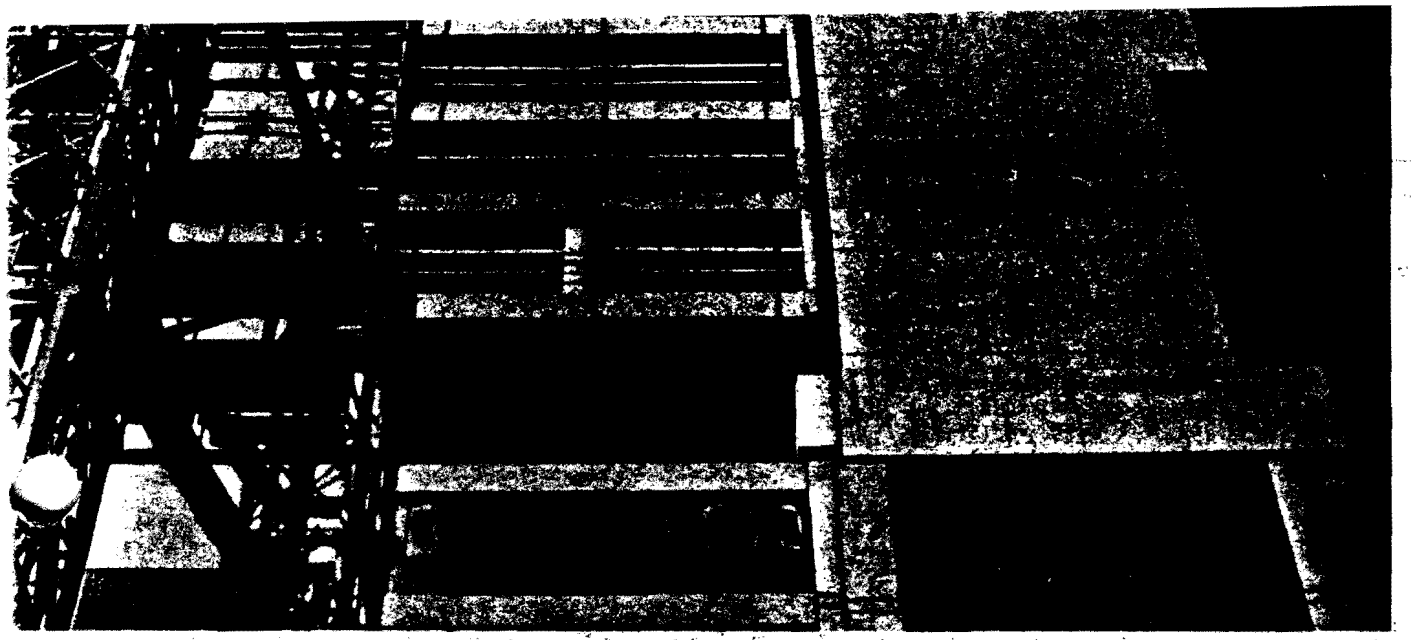
Abbreviations

NW Northwest
QA Quality Assurance

Equipment Activity Tabulation

Ralph J. Stephenson, P.E.
Consulting Engineer

ho 200



ulti-story precast job: re-sleeving's" the key

the photo above, precast construction can be starting at the 11th floor level of 27-story tment, one of four multi-story units in the ion Park project, Boston. It begins with the sive 7-by-2-foot precast transfer girders atop ed-concrete lower floors. It was planned at to core-drill some 500 8-inch holes in the ast floors to accommodate vertical fan-coil rs." Instead, early planning enabled M.J. erty Co., the mechanical contractor, to have ings boxed out in the precast planks at the te concrete plant, before delivery to site.

(Complete report, page 4)

In this issue...

Composite fitter-sheetmetal crew does solar panel work (photo, left). *page 22*

OSHA's proposed health rules eyed for impact on job sites. *page 9*

Planning and managing a project: it's a department store of ideas. *page 14*

Sampling of practical ideas for better planning and control. *page 17*

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

CLAIM AVOIDANCE DEFINITIONS

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.

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 contractural or informal, where the service performed is of an advisory nature only.

AGENCY AUTHORITY - A relation in which one person or organization act 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 orgnaization'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 RELATIONS - The interconnection of those parties bound by subsequent assignment of a contract to other than the initial parties.

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.

BULLETIN - An official notice that a change is being evaluated 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 or request for proposal.

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, 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 dispute, or in which the dispute is settled by a an amiable 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 construction manager can provide the owner with the best possible 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 make up 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.

CUTS - Extracts 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 information concerning statistical aspects of the work. Usually the

daily report form is preprinted and made up 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 any part 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.

DIARY - Similar to a log but dealing more with the 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.

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.

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 contained in the field order.

GENERAL CONDITIONS - The portion of the contract agreement that contains the contractural-legal requirements for the work.

GENERAL REQUIREMENTS - The portion of the contract

agreement that contains the overall technical support specifications governing all work on the job.

GENERIC CONSTRUCTION - The field of business practice that encompasses all phases of the construction industry, including programming, planning, designing, building, operating, and maintaining facilities.

HARD MONEY - A total price agreed to for the entire work, and to be paid in a mutually satisfactory schedule of payments.

INFORMAL RELATION - A relation maintained by a mutual need that is generally understood but undefined. The informal relation exists through a mutual need, and carries no authority or resonsibility other than that the parties wish to recognize.

JURY TRIAL - A trial before a jury.

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 occured 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.

MATRIX - A two or more dimensional display of related data.

MEDIATION - An attempt to effect a settlement between disputing parties through the unbiased efforts of an objective third party, usually known to those in dispute and acceptable to them as a mediator. Mediation differs from arbitration in that it usually 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.

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

ORGANIZATIONAL STRUCTURE - The catagories of parties to the planning/design/construction/operation process and how

they are organized for the work. The structure of the project is shown by a set of relations between the parties that identifies the reponsibility 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.

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

PROJECT HISTORY - A tabulation of the major events on the job, chronologically arranged on a spread sheet 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.
-Weather delays to the job including reasons the weather problem prevented proper progress.

The purpose of the project history is to give a quick and accurate look at past job events at a glance. The degree of detail should be 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.

SHOP DRAWING - A submittal in the form of a drawing, usually made specially for the application shown.

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.

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 during the bidding period

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

TERMINATION - The dismissal of a contractor from a project for convenience resulting from factors outside the job, 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.

TURNAROUND TIME - The amount of time required to process submittals.

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 matter involving disputes or other job related matters.

UNILATERAL MEETINGS - A decision meeting at which only a portion of the parties affected are invited to participate.

UNION SHOP - A work area in which all participants are required to belong to a specified union.

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

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

CASE STUDY NUMBER THREE

Keeping the Records Straight

On May 11,1982, The Charles T. Sierra Company was awarded the general contract for installing a new paint system in the Southeastern plant of Hirtwell Ltd., a very large and competitive manufacturer of metal and plastic enclosures for mechanical and electrical equipment.

Hirtwell has a reasonably good reputation as a manufacturer; however on construction projects they have been very harsh on their architects, engineers, contractors and suppliers. This reputation is generally recognized as coming from Franklin Johnson, the former Vice President of Facilities. Mr. Johnson retired several months before you were awarded the contract for the new job. His successor, Paul Rolla, has reorganized the company's facilities department, and most of Mr. Johnson's staff have left.

The project manager for Hirtwell on this job is Tom Begn, a pleasant, but inexperienced graduate engineer. The architect/engineer for Hirtwell is Jones and Higgins, a local firm in Tucson, the location of the new plant.

You are Lee F. James, the project manager for Charles T. Sierra, and your boss, Mr. Sierra, has told you that he wants this job thoroughly documented. He has built six projects ranging in size from one to five million dollars for Hirtwell over the last eight years and has had disputed claims on every one. Mr. Sierra feels the previous Sierra job management has been too loose and sloppy. This time he wants a change. You have never worked on a Hirtwell job before, but have had two similar projects to this one previously. On one you were the engineer and on the other you were the project manager.

Your company is presently experimenting with two microprocessors in addition to the main computer. The main computer is used primarily for accounting and payroll purposes. You have access to one of the microprocessors, and Mr. Sierra has encouraged you to get your imagination to work and find some real and profitable uses for the equipment. You have great interest in the small computers but have never used them.

The project cost is $3,225,000 on a hard money contract. The next lowest bidder on the job, you are told, had a price of four million.

There are three other prime contractors working on the project, all on different parts of the total program.

Their contracts are smaller than yours, but ultimately much of your work will be required to interface closely with theirs.

Part of your contract is to install a new paint spray system which is relatively untried except for pilot runs made by the fabricator. The owner is purchasing the equipment, but you are totally responsible for its installation, hook up, check run and test. Controls for the system are also in your contract.

Consider the following questions:

1. What characteristics of the project lead you to believe it is possibly claim prone?

2. How would careful documentation of the job help avoid the claim disputes?

3. What document information might you wish to store and retrieve for the job?

4. What must a document control system provide you and Sierra to help avoid the disputed claim?

5. Of what use might a microprocessor be to you in the control and tracking of documents

6. What document records would you keep for the project?

7. The job superintendent has never worked on a Hirtwell job before. What would you discuss with him and when, if you are all trying to avoid the disputed claim?

cav cssty three ho

SE TUCSON ABB

REC	ABB	MEANING	ORGANIZATION	CAT
49	BUL	BULLETIN		DT
74	COR	CHANGE ORDER		DT
75	HWM	HANDWRITTEN MEMO		DT
46	LTR	LETTER		DT
32	MLG	MAILGRAM		DT
48	PRQ	PAYMENT REQUEST		DT
50	PUO	PURCHASE ORDER		DT
47	SBM	SUBMITTAL		DT
30	TLX	TELEX		DT
69	TMS	TRANSMITTAL		DT
70	BIM	BIOTIC MECHANICS	MECHANICAL CONTRACTORS	NM
52	CAS	STRAND, CHAS. A. CO.		NM
5	CRR	CONTROL AND REGULATOR CO		NM
53	CTS	SIERRA, CHARLES T. CO.	CONSTRUCTORS	NM
6	FRS	FRENCH STEEL		NM
26	FXS	SKONE, FRED X.	TRE ENGINEER	NM
18	HWL	HIRTWELL LTD.		NM
55	JAH	JONES & HIGGINS	ARCH/ENGRS	NM
71	JTD	DARTH, JAMES T.	BIM CHIEF ENGR	NM
7	KLP	PAGE, KARL L.	FRS ESTIMATOR	NM
12	LFJ	JAMES, LEE F.	CTS PROJECT MANAGER	NM
17	PAR	ROLLA, PAUL A.	HWL VICE PRES	NM
8	RGH	HIAL, ROBERT G.	CTS VICE PRESIDENT	NM
9	RTK	KREITZ, ROBERT T.	CRR PROJECT ENGINEER	NM
25	TRE	TRIELECTRIC CO.	ELECTRICAL CONTRACTORS	NM
56	TSS	STIRTON, TOM T.	JAH PROJECT MGR	NM
13	TTB	BEGN, TOM T.	HWL PROJECT MANAGER	NM
66	ANB	ANCHOR BOLTS		SU
34	APV	APPROVAL		SU
60	CFR	COMPANY FROM		SU
2	COI	COILS		SU
22	CON	CONTRACT		SU
36	COS	COLOR SELECTION		SU
10	CST	COIL STEEL		SU
3	CTL	CONTROLS		SU
61	CTO	COMPANY TO		SU
65	CWK	CONCRETE WORK		SU
54	DAM	DAMAGED		SU
59	DCT	DOCUMENT TYPE		SU
31	DEF	DEFECTIVE		SU
11	DEL	DELIVERY		SU
67	EMB	EMBEDMENTS		SU
44	ENG	ENGINEERING		SU
1	FAN	FANS		SU
14	FRA	FOR REVIEW AND APPROVAL		SU
68	HLD	HOLD		SU
62	IFR	INDIVIDUAL FROM		SU
23	IST	INSTRUMENTATION		SU
63	ITO	INDIVIDUAL TO		SU
28	MCC	MOTOR CONTROL CENTER		SU
72	MEC	MECHANICAL		SU
27	MTR	MOTORS		SU
38	OLP	OFF LINE PRODUCTION		SU
45	PCH	PURCHASING		SU
73	PIT	PITS		SU
37	PNT	PAINT		SU
42	PRT	PROTOTYPE		SU
41	PSS	PAINT SPRAY SYSTEMS		SU

SE TUCSON ABB PAGE 2

REC	ABB	MEANING	ORGANIZATION	CAT
39	QUA	QUALITY ASSURANCE		SU
33	REL	RELEASE		SU
21	REV	REVISIONS		SU
29	RFI	REQUEST FOR INFORMATION		SU
19	RFP	REQUEST FOR PROPOSAL		SU
40	SAF	SAFETY		SU
43	SAL	SALES		SU
35	SBM	SUBMITTAL		SU
24	SFW	SOFTWEAR		SU
20	SHL	SHELL		SU
4	SPD	SHIPMENT DATES		SU
51	STS	STRUCTURAL STEEL		SU
58	TUO	TURNAROUND-SUBMITTALS		SU
57	UFV	FAN UNIT FIVE		SU
15	UON	FAN UNIT ONE		SU
16	URG	URGENT		SU
64	YR	YEAR		SU

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      TITLE=SE TUCSON ABB
      TYPE=R
      ROUTE=P

FM51: ABB
      MNG
      ORG
      CAT
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Charles T. Sierra Company 9/13/82
Constructors, Frigate, Indiana

MINUTES OF PROJECT MEETING #9 - SE Hirtwell, Tucson

Date of meeting: Friday,September 10, 1982
Place: Job site, Tucson
Time: 8:00 AM to 9:45 AM
Attending:

Paul A. Rolla VP, Hirtwell
Tom T. Begn Project Manager, Hirtwell
Robert T. Hial VP, Sierra
Lee F. James Project Manager, Sierra
Fred Teal Superintendent, Sierra
James T. Darth Chief Engineer, Biotics
Fred X. Skone Engineer, Trielectric
Tom T. Stirton Project Manager, Jones & Higgins

From: Lee F. James, Sierra

To: All attending, Robert T. Kreitz, CRR

General Summary:

Lee James reported that all pit and foundation work was meeting dates between early and late starts and finishes. Still having difficulty getting dimensional information about mechanical and electrical sleeve and thimble sizes and locations.

Tom Stirton reviewed bulletin/change order tracking and said that of 11 bulletins issued to date, 6 had been quoted and 5 had been converted to change orders. A change order for the sixth will be issued later this week.

James Darth discussed equip delivery from his procurement tracking sheets (copy attached). All equipment ordered and 40% of the shop drawings have been submitted, with 20% returned. Mr. Darth asked for selective improvement in submittal turnaround times.

Fred Skone reported that .....

can be improved.

Old Business:

9.5.10 The additional software data needed for

instrumentation has been received and sent to Tom Begn for owner review. Mr. Begn will confer directly with the architect/engineer re design characteristics. Action by TTB, TTS

9.8.3 Low strength concrete tests.....

resolved with no increase in cost.

New Business:

9.1 Paul Rolla said that a sizable addition to the work was under consideration by, and that it had been decided by Hirtwell to have it done under bulletin procedures, but that if the cost was more than budgeted it might be reissued for.....

good job.

Closing:

The next project meeting will be held Friday, September 24, 1982 at the job site, Tucson.

This report is the writer's interpretation of the matters discussed. The account will be considered agreed to by those attending the meeting and those receiving the report, unless Lee James of Sierra is notified within 2 weeks of your receipt of the report.

Lee F. James

Lee F. James, Project Manager,
Sierra

REC# DOC # DATE YR DCT CFR CTO IFR ITO
SUBJ CLASS
SUMMARY A
SUMMARY B

---

1 07115 0726 82 LTR CRR CTS RTK RGH
CTL/COI/SPD
COIL CONTROL ASSEMBLY SHIPPED 7/16/82

2 07116 0730 82 LTR CTS FRS RGH KLP
STS/DEL/DAM/RFI
STRUCTURAL STL DEL TO JOB DAMAGED. WHAT TO DO?

3 07117 0730 82 SBM CTS JAH LFJ TSS
SHD/FRA/UON/URG/FAN
DWG D2287433SBM FAN 1 SUBMITTED FOR APV. URGENT!

4 08001 0802 82 PRQ CTS HWL RGH PAR
PRQ
PYMT REQ 2. AMOUNT = 47243.45

5 08002 0802 82 BUL JAH CTS TSS LFJ
RFP/SHL/REV/FAN/UFV
BULL 8 REVISE SHELL SHAPE/FAN SIZE FOR UNIT 5

6 08003 0802 82 PUO CTS CRR RGH RTK
CON/CTL/IST/RFI/SFW
PURC ORD ISSUED FOR ADDTNL INSTRUMNTN
NEED MORE DATA RE:SOFTWARE

7 08004 0804 82 LTR CTS TRE LFJ FXS
MTR/MCC/RFI
REQUEST FOR MOTOR START REQUIREMENTS

8 08005 0804 82 MLG FRS CTS KLP RGH
STS/DAM
RESPONSE TO 07116. REFABBED STEEL SHPPD 8/4/82
RETURN ACTION MAILGRAM TO FOLLOW

9 08006 0805 82 HWM CTS CTS RGH LFJ
REL/APV/SBM/CDS/PNT
INSTRUCTIONS TO RELEASE PAINT COLORS FOR PURCHASE

10 08007 0806 82 LTR HWL CTS PAR RGH
SAF/PSS/RFI
REQUEST CHECK OF SAFETY REQMTS FOR PAINT SPRAY SYSTEM

REC# DOC # DATE YR DCT CFR CTO IFR ITO
SUBJ CLASS
SUMMARY A
SUMMARY B

---

11 08008 0809 82 LTR CTS HWL LFJ TBB
SHD/TUO
REQUEST TO EXPEDITE SHOP DWG TURNAROUND
PRESENTLY TAKING TOO LONG

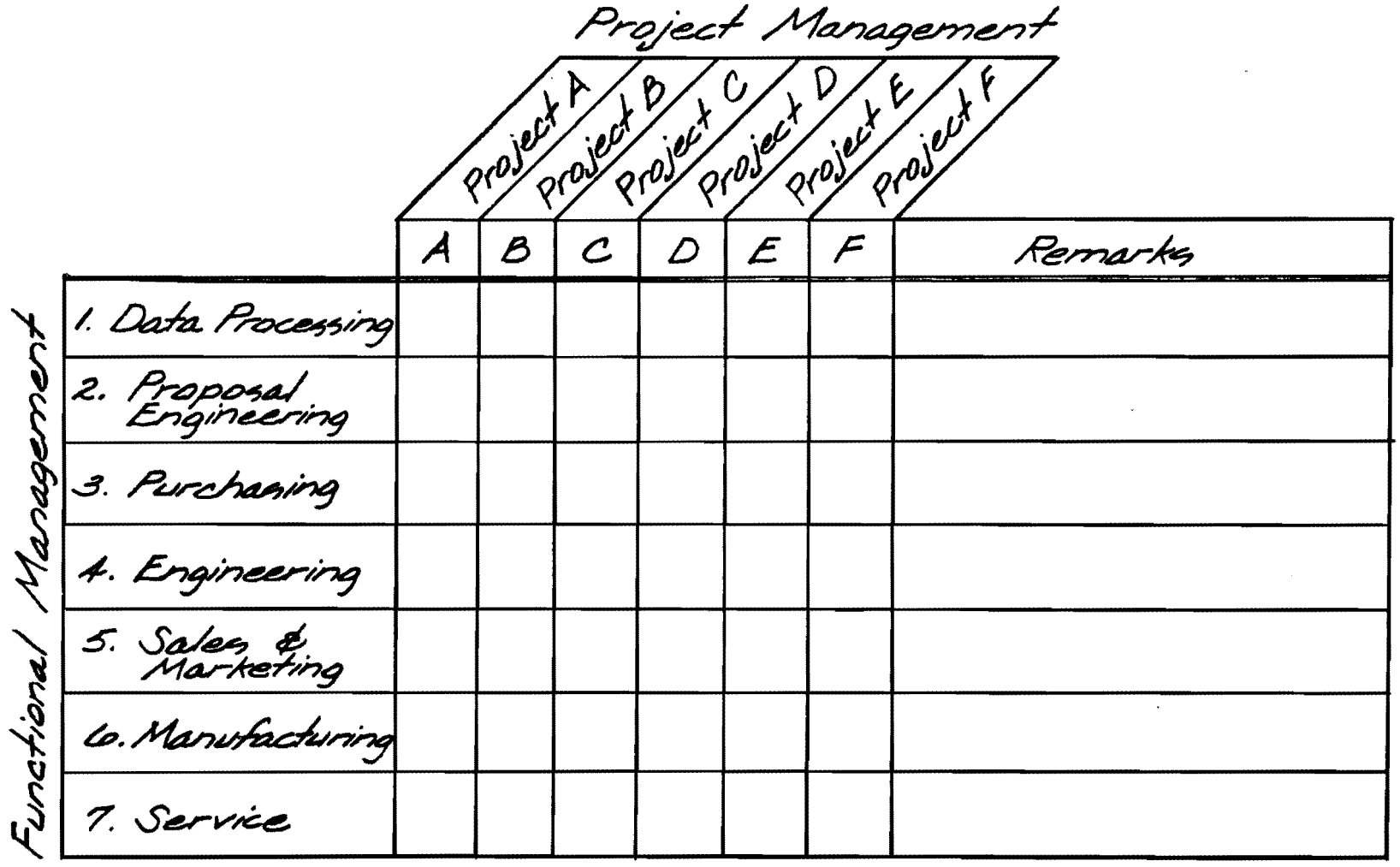
12 08009 0810 82 BUL JAH CTS TSS LFJ
RFP/CWK/ANB/EMB/PIT
BULLETIN #15-PRICE SOUTH PIT REVISIONS

13 08010 0810 82 LTR JAH CTS TSS LFJ
HLD/CWK/ANB/EMB
ENGINEER PUTS HOLD ON CONCRETE WORK AT SOUTH PITS
PENDING PRICING AND RELEASE OF COR

14 08011 0811 82 TMS CTS TRE LFJ FXS
BUL/RFP/EMB/ELE
REQUEST TO QUOTE BULL 15-S PIT REVISIONS

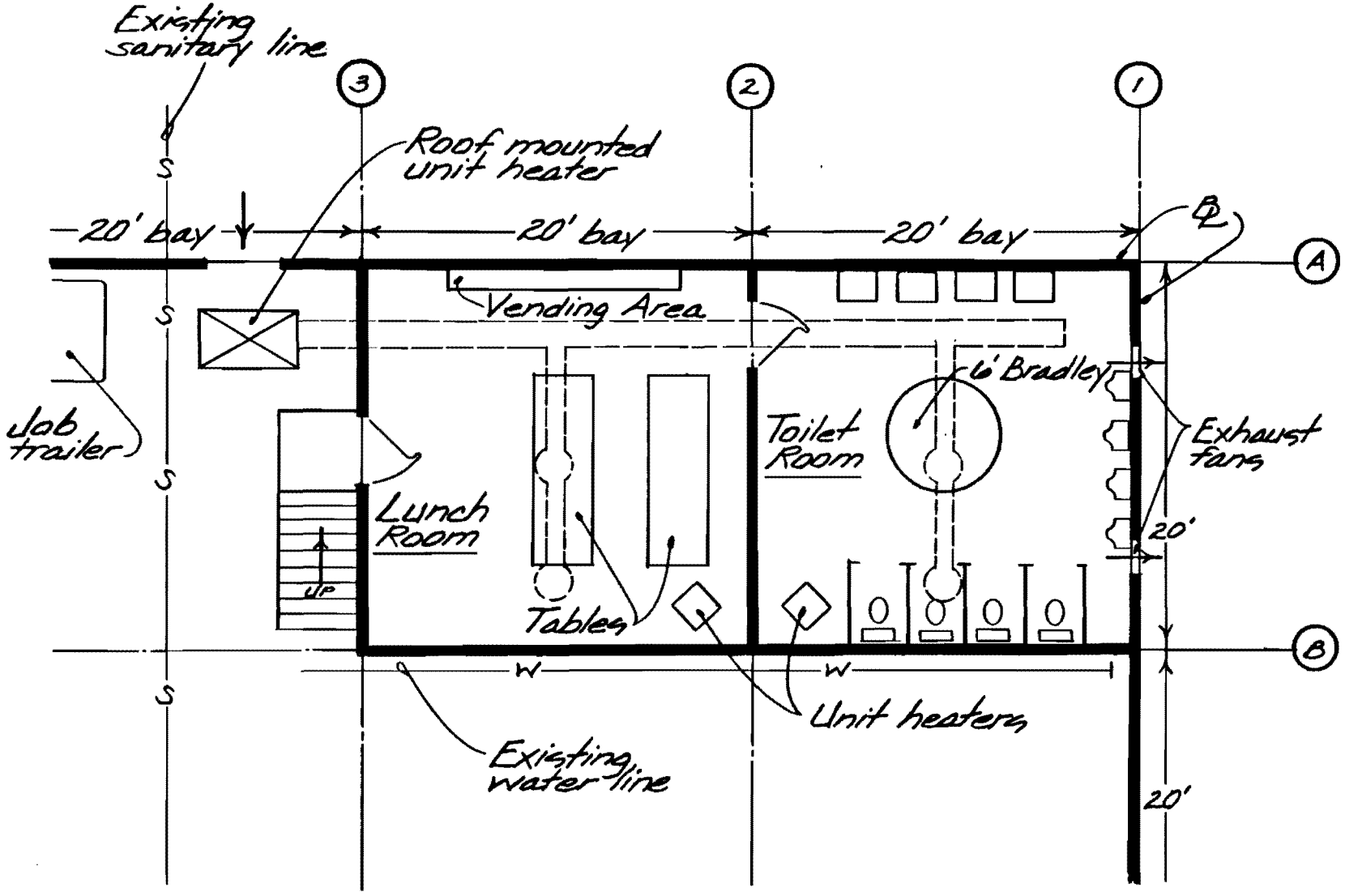
15 08012 0811 82 TMS CTS BIM LFJ JTD
BUL/RFP/ENB/MEC
REQUEST TO QUOTE BULL 15-SOUTH PIT REVISIONS

16 08013 0812 82 COR JAH CTS TSS LFJ
CWK/REV/ELV
CHANGE ORD 1-REVISE CONCRETE WALL ELEVATIONS



PROJECT/FUNCTIONAL MANAGEMENT MATRIX

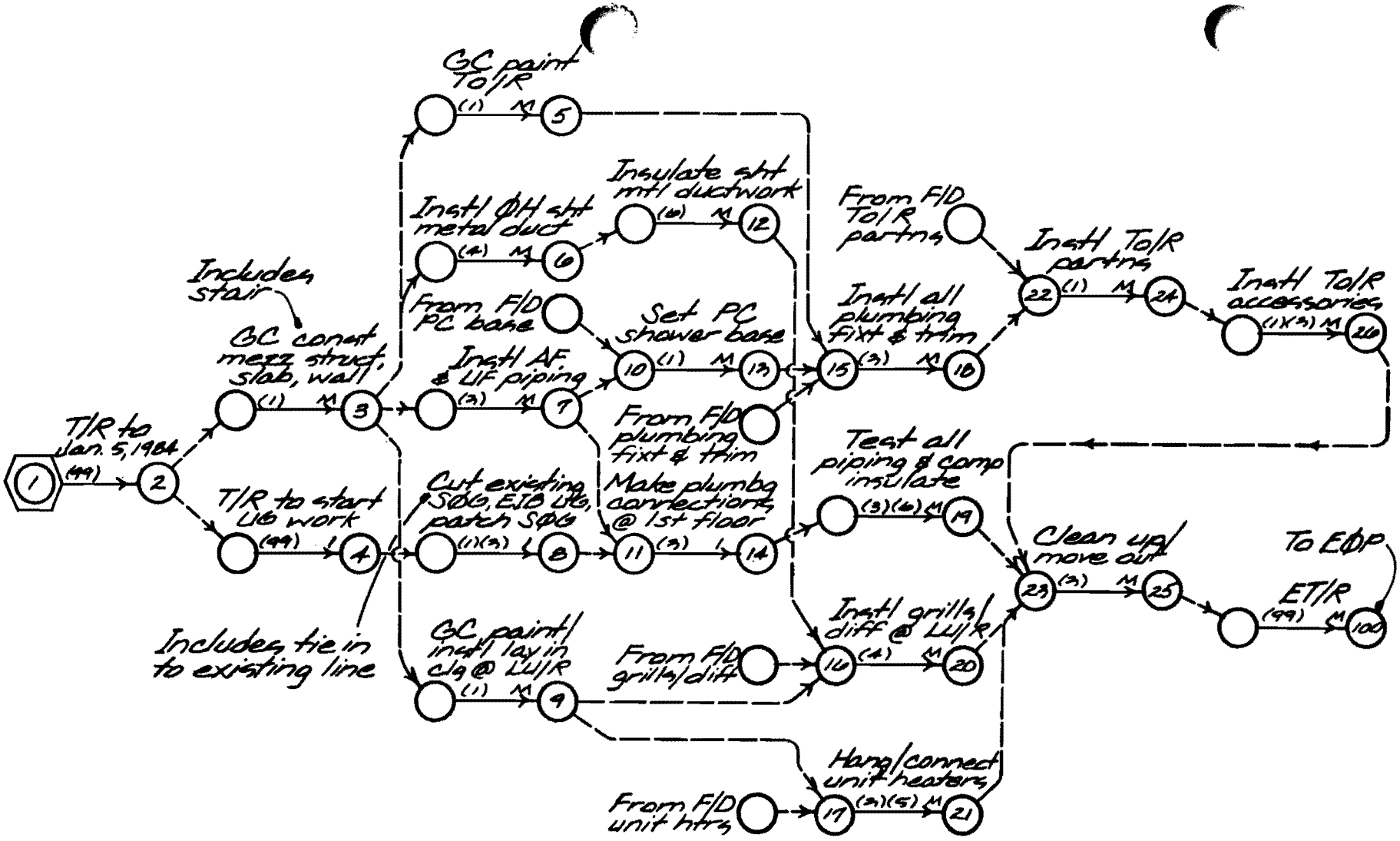
RALPH J. STEPHENSON, P.E., P.C.
CONSULTING ENGINEER



STRAX COMPANY MEZZANINE
LUNCH & TOILET ROOM ADDITION

NORTH
SCALE 1/8"=1'-0"

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

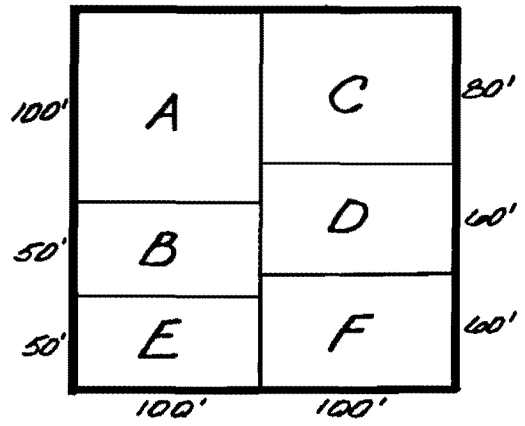


Responsibility Codes

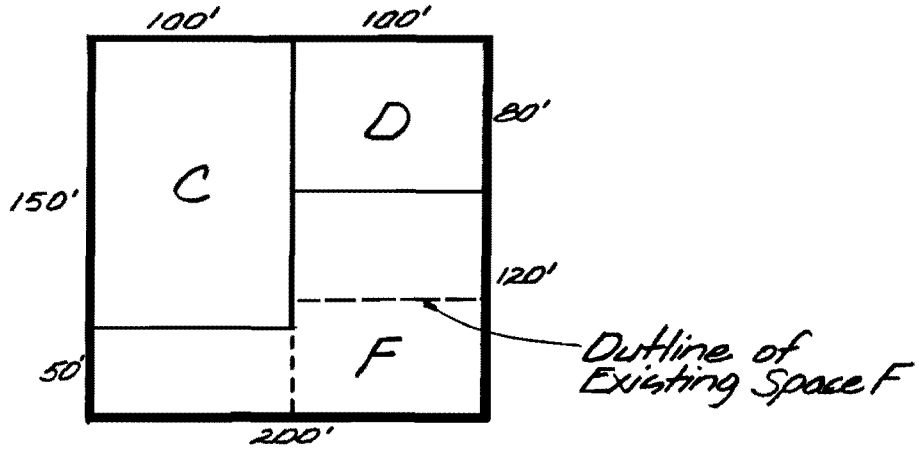
1	Strax Manufacturing
2	Harbor Contracting - G.C.
3	Arco Mechanical Piping
4	Sency Sheet Metal
5	Bus Electric
6	Astro Insulators
99	Time restraints

Abbreviations

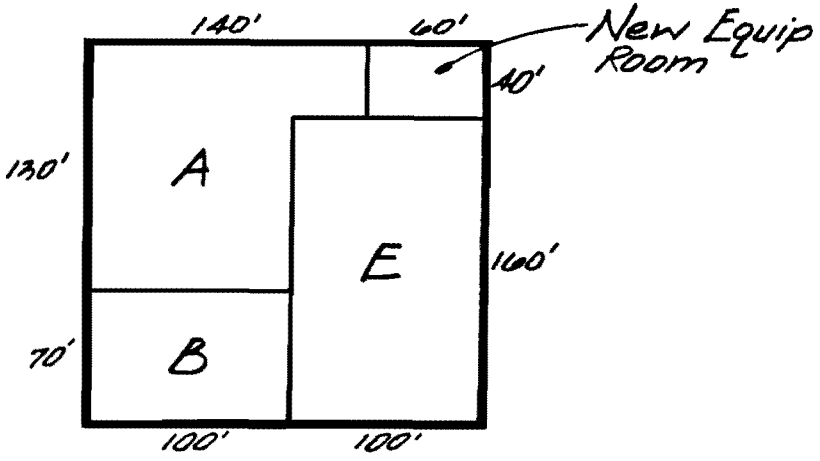
T/R	Time restraint	EJB	Excavate, instl, backfill
GC	General contractor	SØG	Slab on grade
UG	Underground	PC	Pre cast
ØH	Overhead	T⊘R	Toilet room
AF	Above floor	LU/R	Lunch room
UF	Under floor	1	1st floor
F/D	Fabricate/deliver	M	Mezz floor



EXISTING 1ST FL



NEW 1ST FL



NEW 2ND FL

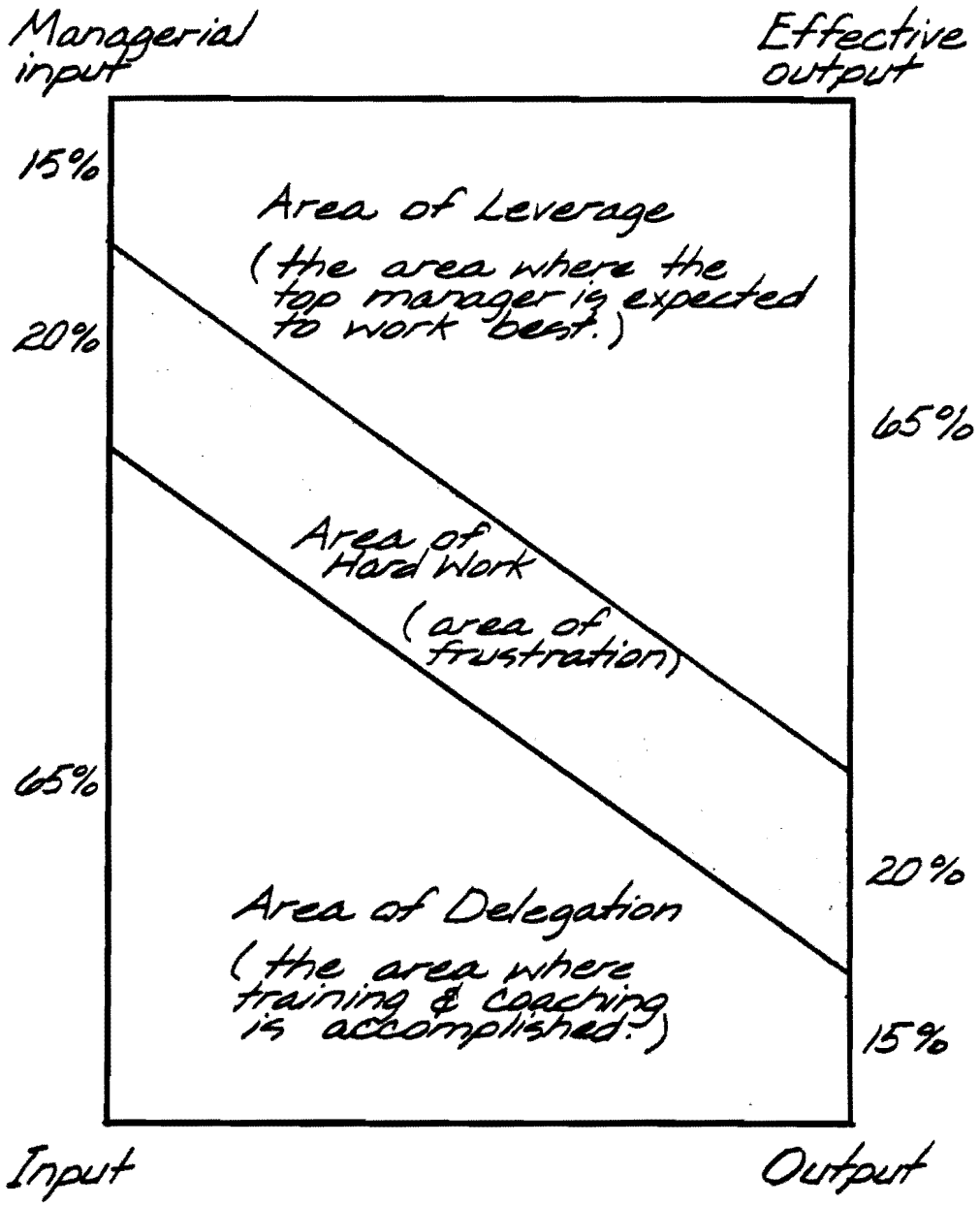
NORTH

SCALE: 1" = 100'

SUMMARY MOVE PLAN

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

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



MANAGERIAL LEVERAGE

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

2-YR WORKING-DAY CALENDAR STARTING JAN. 3, 1983

DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
			13 306		24 358		07 409		19 461
JAN 1984			14 307		25 359		08 410		22 462
	03 256		15 308		29 360		09 411		23 463
	04 257		16 309		30 361		10 412		24 464
	05 258		19 310		31 362		13 413		25 465
	06 259		20 311	JNE			14 414		26 466
	09 260		21 312		01 363		15 415		29 467
	10 261		22 313		04 364		16 416		30 468
	11 262		23 314		05 365		17 417		31 469
	12 263		26 315		06 366		20 418	NOV	
	13 264		27 316		07 367		21 419		01 470
	16 265		28 317		08 368		22 420		02 471
	17 266		29 318		11 369		23 421		05 472
	18 267		30 319		12 370		24 422		06 473
	19 268	APR			13 371		27 423		07 474
	20 269		02 320		14 372		28 424		08 475
	23 270		03 321		15 373		29 425		09 476
	24 271		04 322		18 374		30 426		12 477
	25 272		05 323		19 375		31 427		13 478
	26 273		06 324		20 376	SEP			14 479
	27 274		09 325		21 377		04 428		15 480
	30 275		10 326		22 378		05 429		16 481
	31 276		11 327		25 379		06 430		19 482
			12 328		26 380		07 431		20 483
	01 277		13 329		27 381		10 432		21 484
	02 278		16 330		28 382		11 433		23 485
	03 279		17 331		29 383		12 434		26 486
	06 280		18 332	JLY			13 435		27 487
	07 281		19 333		02 384		14 436		28 488
	08 282		20 334		03 385		17 437		29 489
	09 283		23 335		05 386		18 438		30 490
	10 284		24 336		06 387		19 439	DEC	
	13 285		25 337		09 388		20 440		03 491
	14 286		26 338		10 389		21 441		04 492
	15 287		27 339		11 390		24 442		05 493
	16 288		30 340		12 391		25 443		06 494
	17 289	MAY			13 392		26 444		07 495
	20 290		01 341		16 393		27 445		10 496
	21 291		02 342		17 394		28 446		11 497
	22 292		03 343		18 395	OCT			12 498
	23 293		04 344		19 396		01 447		13 499
	24 294		07 345		20 397		02 448		14 500
	27 295		08 346		23 398		03 449		17 501
	28 296		09 347		24 399		04 450		18 502
	29 297		10 348		25 400		05 451		19 503
MAR			11 349		26 401		08 452		20 504
	01 298		14 350		27 402		09 453		21 505
	02 299		15 351		30 403		10 454		24 506
	05 300		16 352		31 404		11 455		26 507
	06 301		17 353	AUG			12 456		27 508
	07 302		18 354		01 405		15 457		28 509
	08 303		21 355		02 406		16 458		31 510
	09 304		22 356		03 407		17 459		
	12 305		23 357		06 408		18 460		

R J STEPHENSON, P.E. 15064 WARWICK DETROIT, MICH 48223 PH 313-273-5026

(JAN 3'83 = DAY 1) 4-YR WORKING-DAY CALENDAR STARTING JAN. 3, 1983 PAGE

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DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D	DATE	W/D
		12	560	23	612	06	663	18	715			11	814	22	866	05	917	17	969
		13	561	24	613	07	664	21	716			12	815	23	867	06	918	20	970
JAN		14	562	28	614	08	665	22	717			13	816	27	868	07	919	21	971
02	511	15	563	29	615	09	666	23	718	JAN		14	817	28	869	08	920	22	972
03	512	18	564	30	616	12	667	24	719	02	766	17	818	29	870	11	921	23	973
04	513	19	565	31	617	13	668	25	720	03	767	16	819	30	871	12	922	24	974
07	514	20	566	JUN		14	669	28	721	06	768	19	820	JUN		13	923	27	975
08	515	21	567	03	618	15	670	29	722	07	769	20	821	02	872	14	924	28	976
09	516	22	568	04	619	16	671	30	723	08	770	21	822	03	873	15	925	29	977
10	517	25	569	05	620	19	672	31	724	09	771	24	823	04	874	18	926	30	978
11	518	26	570	06	621	20	673	NOV		10	772	25	824	05	875	19	927	31	979
14	519	27	571	07	622	21	674	01	725	13	773	26	825	06	876	20	928	NOV	
15	520	28	572	10	623	22	675	04	726	14	774	27	826	09	877	21	929	03	980
16	521	29	573	11	624	23	676	05	727	15	775	28	827	10	878	22	930	04	981
17	522	APR		12	625	26	677	06	728	16	776	31	828	11	879	25	931	05	982
18	523	01	574	13	626	27	678	07	729	17	777	APR		12	880	26	932	06	983
21	524	02	575	14	627	28	679	08	730	20	778	01	829	13	881	27	933	07	984
22	525	03	576	17	628	95	561	11	731	21	779	02	830	16	882	28	934	10	985
23	526	04	577	18	629	30	681	12	732	22	780	03	831	17	883	29	935	11	986
24	527	05	578	19	630	SEP		13	733	23	781	04	832	18	884	SEP		12	987
25	528	08	579	20	631	03	682	14	734	24	782	07	833	19	885	02	936	13	988
28	529	09	580	21	632	04	683	15	735	27	783	08	834	20	886	03	937	14	989
29	530	10	581	24	633	05	684	18	736	28	784	09	835	23	887	04	938	17	990
30	531	11	582	25	634	06	685	19	737	29	785	10	836	24	888	05	939	18	991
31	532	12	583	26	635	09	686	20	738	30	786	11	837	25	889	08	940	19	992
FEB		15	584	27	636	10	687	21	739	31	787	14	838	26	890	09	941	20	993
01	533	16	585	28	637	11	688	22	740	FEB		15	839	27	891	10	942	21	994
04	534	17	586	JLY		12	689	25	741	03	788	16	840	30	892	11	943	24	995
05	535	18	587	01	638	13	690	26	742	04	789	17	841	JLY		12	944	25	996
06	536	19	588	02	639	16	691	27	743	05	790	18	842	01	893	15	945	26	997
07	537	22	589	03	640	17	692	29	744	06	791	21	843	02	894	16	946	28	998
08	538	23	590	05	641	18	693	DEC		07	792	22	844	03	895	17	947	DEC	
11	539	24	591	08	642	19	694	02	745	10	793	23	845	07	896	18	948	01	999
12	540	25	592	09	643	20	695	03	746	11	794	24	846	08	897	19	949	02	1000
13	541	26	593	10	644	23	696	04	747	12	795	25	847	09	898	22	950	03	1001
14	542	29	594	11	645	24	697	05	748	13	796	28	848	10	899	23	951	04	1002
15	543	30	595	12	646	25	698	06	749	14	797	29	849	11	900	24	952	05	1003
18	544	MAY		15	647	26	699	09	750	17	798	30	850	14	901	25	953	08	1004
19	545	01	596	16	648	27	700	10	751	18	799	MAY		15	902	26	954	09	1005
20	546	02	597	17	649	30	701	11	752	19	800	01	851	16	903	29	955	10	1006
21	547	03	598	18	650	OCT		12	753	20	801	02	852	17	904	30	956	11	1007
22	548	06	599	19	651	01	702	13	754	21	802	05	853	18	905	OCT		12	1008
25	549	07	600	22	652	02	703	16	755	24	803	06	854	21	906	01	957	15	1009
26	550	08	601	23	653	03	704	17	756	25	804	07	855	22	907	02	958	16	1010
27	551	09	602	24	654	04	705	18	757	26	805	08	856	23	908	03	959	17	1011
28	552	10	603	25	655	07	706	19	758	27	806	09	857	24	909	06	960	18	1012
MAR		13	604	26	656	08	707	20	759	28	807	12	858	25	910	07	961	19	1013
01	553	14	605	29	657	09	708	23	760	MAR		13	859	28	911	08	962	22	1014
04	554	15	606	30	658	10	709	24	761	03	808	14	860	29	912	09	963	23	1015
05	555	16	607	31	659	11	710	26	762	04	809	15	861	30	913	10	964	24	1016
06	556	17	608	AUG		14	711	27	763	05	810	16	862	31	914	13	965	26	1017
07	557	20	609	01	660	15	712	30	764	06	811	19	863	AUG		14	966	29	1018
08	558	21	610	02	661	16	713	31	765	07	812	20	864	01	915	15	967	30	1019
11	559	22	611	05	662	17	714			10	813	21	865	04	916	16	968	31	1020

R.J. STEPHENSON, P.E. 15064 WARWICK DETROIT, MI. 48223 PH. 313-2735026

2-YR. WORKING DAY CALENDAR STARTING JAN. 3, 1984

Date	W/D	Date	W/D	Date	W/D	Date	W/D	Date	W/D
Jan 1984		13	51	23	102	03	152	16	203
03	1	14	52	24	103	06	153	17	204
04	2	15	53	25	104	07	154	18	205
05	3	16	54	29	105	08	155	19	206
06	4	19	55	30	106	09	156	22	207
09	5	20	56	31	107	10	157	23	208
10	6	21	57	Jun		13	158	24	209
11	7	22	58	01	108	14	159	25	210
12	8	23	59	04	109	15	160	26	211
13	9	26	60	05	110	16	161	29	212
16	10	27	61	06	111	17	162	30	213
17	11	28	62	07	112	20	163	31	214
18	12	29	63	08	113	21	164	Nov	
19	13	30	64	11	114	22	165	01	215
20	14	Apr		12	115	23	166	02	216
23	15	02	65	13	116	24	167	05	217
24	16	03	66	14	117	27	168	06	218
25	17	04	67	15	118	28	169	07	219
26	18	05	68	18	119	29	170	08	220
27	19	06	69	19	120	30	171	09	221
30	20	09	70	20	121	31	172	12	222
31	21	10	71	21	122	Sept		13	223
Feb		11	72	22	123	04	173	14	224
01	22	12	73	25	124	05	174	15	225
02	23	13	74	26	125	06	175	16	226
03	24	16	75	27	126	07	176	19	227
06	25	17	76	28	127	10	177	20	228
07	26	18	77	29	128	11	178	21	229
08	27	19	78	Jul		12	179	23	230
09	28	20	79	02	129	13	180	26	231
10	29	23	80	03	130	14	181	27	232
13	30	24	81	05	131	17	182	28	233
14	31	25	82	06	132	18	183	29	234
15	32	26	83	09	133	19	184	30	235
16	33	27	84	10	134	20	185	Dec	
17	34	30	85	11	135	21	186	03	236
20	35	May		12	136	24	187	04	237
21	36	01	86	13	137	25	188	05	238
22	37	02	87	16	138	26	189	06	239
23	38	03	88	17	139	27	190	07	240
24	39	04	89	18	140	28	191	10	241
27	40	07	90	19	141	Oct		11	242
28	41	08	91	20	142	01	192	12	243
29	42	09	92	23	143	02	193	13	244
Mar		10	93	24	144	03	194	14	245
01	43	11	94	25	145	04	195	17	246
02	44	14	95	26	146	05	196	18	247
05	45	15	96	27	147	08	197	19	248
06	46	16	97	30	148	09	198	20	249
07	47	17	98	31	149	10	199	21	250
08	48	18	99	Aug		11	200	24	251
09	49	21	100	01	150	12	201	26	252
12	50	22	101	02	151	15	202	27	253
								28	254
								31	255

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 ex'e-cutive operations in an organization. Administrative costs may be considered the cost of management.

ADMINISTRATIVE SETTLEMENT - A resolution of a dispute through discussion between the disputing parties and agreement upon a mutually satisfactory settlement.

ADVISORY RELATIONS - The interaction of parties related to each other by an obligation, either contractural 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 contractural-legal requirements for the work.

GENERAL REQUIREMENTS - The portion of the contract agreement that contains overall technical support specifications governing work on the job.

GENERIC CONSTRUCTION (G) - The field of business practice that encompasses all phases of the construction industry, including programming, planning, designing, building, operating, and maintaining facilities. Described best as the full set of activities shown in the line of action. (See line of action).

GOALS - The unquantified desires of an organization or individual expressed without time or other resources assigned. (see objectives for related definitions.)

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 occured 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 catagories 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 reponsibility 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 ECOMOMIC - 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 constuction 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

PRINCIPLES OF EFFECTIVE AND USEFUL RECORD KEEPING FOR THE PROJECT MANAGER

A. Definition of record - Any retained information that can be effectively used in the future.

B. Types of records used in G construction

1. Estimates
2. Cost reports
3. Field action reports
4. Logs
5. Testing reports
6. Monitoring reports
7. Project action plans
8. Project schedules
9. Money flow reports
10 Priority checklists
11. Phone records and logs
12. Procurement tabulations
13. Document control files
14. Project histories
15. Transmittals
16. Bulletins, change orders, field orders
17. Requests for information
18. Schedules of values
19. Requests for payment
20. Shop drawing logs
21. IOC's
22. Proposed change orders
23. Purchase orders
24. Meeting minutes
25. Proposals
26. Permits
27. Priority lists
28. Resource curves and histograms
29. Progress photos
30. Punch list tabulations
31. Sign offs on contract documents
32. Sample logs
33. Inspection reports

C. Reasons good design and construction project record keeping is essential.

1. Sizable increase in the number of people to whom project managers are accountable.
2. Increase in number of contested claims.
3. Higher quality design and construction performance being demanded in an increasingly competitive business and professional environment.
4. Demand for higher levels of cost control than ever before.
5. Documentation demands being made by more complex financing arrangements in design and construction.
6. Constant merging of disciplines with resulting extension of business arrangements into generic (G) construction. Demands better and better communications.

7. Increasing use of electronic equipment allowing easier and better record keeping.

D. Basic classes of records
   1. To record history of ex'e-cutive actions
      a. Daily reports
      b. Progress photos
      c. To do lists
   2. To record opinions
      a. Daily management logs
      b. Diaries
      c. Phone logs
   3. To record document processing
      a. Sample logs
      b. Shop drawing logs
      c. Transmittals
   4. To record tabulated data and information
      a. Bid spread sheets
      b. Subcontractor lists
      c. Project directories
      d. Bulletin to change order tracking
      e. Field order to change order tracking
      f. Document control files
   5. To record agreements and decisions
      a. Change orders
      b. Field orders
      c. Equipment data tabulations
      d. Meeting minutes
   6. To record supportive activities
      a. Phone logs
      b. Management logs
      c. Transmittals
   7. To record progress
      a. Color coded network models
      b. Monitoring reports
      c. Schedules of values
      d. Isoquant line comparisons
   8. To record changes to the work
      a. Bulletins
      b. Change orders
      c. Field orders
      d. Memos of clarification
   9. To record resource flow
      a. Money flow curves
      b. Manpower loading histograms
   10 To record approvals
      a. Certificate of occupancy
      b. Shop drawing approvals
      c. Punch list tabulations
      d. Certificate of substantial completion
      e. Document sign off - schematics, design development, preliminaries, final contract documents
   11. Record results
      a. Testing reports
      b. Inspection reports

E. Basic rules for preparing record keeping forms

1. If a standard data form works, use it
2. Display information in a logical sequence
3. Provide adequate space for proper data entries
4. Preprint everything possible - remember, it costs about $85 per hour for your manager if he is not engaged in a profitable management/decision activity. Use the manager's time well
5. Keep the form readable
6. Prepunch the form for binders. Use large hole punches
7. Be certain enough detail is requested; you can always skip non applicable spaces
8. Provide date and signature spaces
9. Review all forms at least every year to see what should be discarded, revised or added

records,d156

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 truely 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, knowledgable 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

MANAGE BY EXCEPTION

To manage by exception (MX) means to build and use an alarm system that goes off when something is wrong but otherwise remains silent.

A. MX provides management leverage
   1. MX payoff comes from forcing the manager to use forethought and self discipline
   2. Allows multiplying manager's energies and resources (the manager is a multiplier of the work of others)
   3. Allows use of input/output zones (modification of Pareto's Law)
      a. Zone 1 - A relatively small input of managerial resources gives control of a large part of the total results (critical zone for the manager)
      b. Zone 2 - A relatively large input contributes a small portion of the results (good delegation zone)
      c. Zone 3 -The zone where managerial input generates about the same corresponding amount of results (zero leverage, high frustration zone)
B. Examples of MX
   1. Thermostat
   2. Sprinkler system
   3. To do list
   4. Network model (CPM)
C. Questions to answer in MX
   1. What can I as a manager do that will contribute to achieving objectives? (planning)
   2. How can I determine if I am concentrating on the key items? (monitoring)
   3. What actions should I take to be most effective? (controlling and correcting)
D. Watch for the dangers in MX
   1. May encourage excessive conformity and misplaced self satisfaction
   2. May require excessive observation and data collection
   3. Tends to increase paper work
   4. If used incorrectly can give a false sense of security and well being
   5. Is silent only on items predetermined not to be critical. Conditions may change
E. The big advantage of MX is that much of the decision making is done in advance (much like a trouble shooter's manual, a decision tree or a decision table).
F. The manager must understand that once freed by a good MX system from the demands of routine work, he must fill his time with creative effort directed toward improving his plans, organization, staff and decisions.
G. MX is invaluable in detecting trends - movements toward or away from objectives.
H. Beware of overreaction to an MX alert. Remember MX is a tool of the manager, not the manager.
I. Four MX alert levels

1. No unusual difficulties - everything OK
2. Moderate deviations - the situation needs the manager's attention and analysis
3. Above average deviations - the performance is unacceptable and needs corrective action, or is excellent and may be desirable to sustain
4. Unusally large deviations - the performance is vitally disturbed or is so good as to demand investigation by the manager now

J. Methods of reporting with MX
   1. Word of mouth
      a. Fast
      b. No record left
      c. Listener may appear to comprehend, but might not
   2. Written
      a. Permanent record available
      b. Can be studied anytime
      c. Easily systematized
      d. Irregular reports may allow critical factors to go unnoticed
   3. Charted
      a. Good for presentation to large numbers of people with limited amounts of time
      b. Subject to scale misinterpretation
      c. Requires special resources and talents to do well
   4. Electronically reported
      a. Easily used on selective basis
      b. Data available quickly
      c. High processing error potential

mx, d156

Project History for Period #8

Schedules or Networks in Effect During Period:
Network model issue #4 dated 3/8/82, sheets 1, 2, 3, 4, 5

08001 8/2/82 - CTS submits payment request #2 to JAH. Amount of $47,243.45.

08002 8/2/82 - Bulletin #8 issued for revisions to shell shape and fan size for fan unit #3.

JAH APPEAR TO BE ASKING FOR A NO COST CHANGE. IS THIS SO?

08004 8/4/82 - CFR requests motor starter information from TRE. Need data for HWL electrical engineering department.

WHY COULDN'T HWL GET THIS INFORMATION FROM THE ARCHITECT/ENGINEER?

08005 8/4/82 - FRS writes CTS that structural steel delivered to the job damaged on 7/30/82 has been refabbed and will be shipped on 8/4/82. Instructions for return of damaged steel to follow.

08006 8/5/82 - RGH gives CTS instructions to release paint colors for purchase of materials.

WERE THE COLOR AND FINISH SCHEDULES RELEASED BY THE OWNER AND THE ARCHITECT PREVIOUSLY? IF NOT, WHY?

08007 8/6/82 - HTL writes CTS requesting check of safety requirements for the paint spray system. Checked these earlier but are concerned about possible violations in the proprietary equipment being used.

WAS THIS PART OF CTS CONTRACT REQUIREMENTS? WHAT WAS THE RESULT OF THE CHECK?

08008 8/9/82 - CTS requests HWL expedite shop drawing approvals. Presently taking an average of 24 working days from leaving CTS office to receipt back. Had agreed on 16 working days in June 1982.

HOW WERE THE SUBMITTALS TO BE DELIVERED AND PICKED UP BY CTS?

pjt his, d156

CASE STUDY - University of Qitain

Where Do We Go From Here?

Qitain University, a small private engineering, science, liberal arts school in the northwest United States city of Quitain, is about to embark on a major (for them) expansion plan. It involves the planning, design, and construction of a new university activities building, a modest athletic facility having a gym and indoor pool along with support facilities, and a small combined library and book store.

The expansion program has been written, the planner/architect/engineer selected, and the Board of Regents of the school have given the project a go ahead.

An organizational meeting is in progress with the following people in attendence:

-Frank Carlton - Vice President for university planning and operations

-James Tea - Program consultant for the university

-Fred Link - President of the planning/architectural firm of Link and Associates, the architects of record for the entire project

-Charles Redrock - Associate, chief architect and project manager on the project for Link and Associates

-Robert Hagel - President of Hagel Mechanical Engineering Company, the mechanical engineers for the project

-Stan Wiessman - President of Weissman Electric, the electrical engineers for the project

-Richard Goldmark - A wealthy alumnus and key mover in assembling the total funding for the program

The site of the new building group extends across two city public rights of way (ROW), Francis Avenue and Fourth Avenue. Some preliminary negotiations have been conducted with the City of Qitain by Mr. Carlton, of the University with the city manager, George Dell. It appears that vacation of the ROW's can be accomplished on a reasonable basis. Several live utilities are known to be in the two streets but exact sizes and locations have not yet been determined.

The discussion has generated several questions now being addressed. Some of these include:

1. The only available survey map of the area is an

in-house student survey prepared 10 years ago as a semester project. A new survey has not been budgeted and might be challenged as a cost by the Board of Regents.

Should a new survey be made?

Why?

What should a new survey contain?

2. Should the University retain a construction manager? If not, why? If yes, why?

3. How should the project be organized and what should be the role of the various parties involved?

4. Who should be the ULTIMATE DECISION MAKER on the project?

5. Should the University appoint a staff representative to the project? If so, what should be his authority, responsibilities and his activities?

6. The contracts for architectural, mechanical, and electrical design services are not yet awarded but all agree that the three firms at the meeting are the ones to do the job. With whom should the mechanical and electrical engineering contracts be with?

7. How do answers to the above questions affect the claim potential for the project?

8. If you were an alumnus and a local general contractor serving on the Board of Directors of the University, and acting as an ex officio advisor to the program group, how would you have answered questions 1 through 7 so as to maximize the potential for claim avoidance (CAV)?

9. What role would you recommend Mr. Goldmark be requested to play in the project?

cav cst 1, d156

CASE STUDY NUMBER TWO

What Do We Do With All This Equipment?

You are the general contractor (Young Construction Company) field superintendent on a new 140,000 square foot manufacturing plant being built for Telco, a large metal fabricating company,on a site adjoining its main manufacturing facility. The contract has been somewhat splintered by the desire of the owner to reuse several pieces of machinery and equipment now located in various parts of the existing plant. They also wish to provide several pieces of new equipment, some of which you and your subcontractors must set and hook up. Telco presently has several other contractors under direct contract to them on the job in the existing plant.

The contract drawings and specifications for your work are not very clear on who does what in this equipment installation and you are disturbed by the possibility that you may be middled into doing a sizable amount of work that is not really your responsibility.

In addition, the job to date has not gone too well for you and your subs, and they are reluctant to do any additional work, not clearly their responsibility. The mechanical contractor, Falstaff Inc., is proving to be particularly difficult. Gold Electric, the electrical contractor has been easy to get along with so far.

Typical of the problems that the equipment conditions pose can be seen by the following section from the specification:

> "Several pieces of equipment presently located in the present plant are to be relocated to the new plant and made operative there. Some of the existing equipment must not be deactivated until the new plant is operating. Work to be done includes, but is not limited to the following
>
> a. Two compressed air tanks located in the existing paint shop are to be reused. They are to be taken out of service only when the compressors in the new building are ready to run.
>
> b. Three paint spray booths were deactivated by the owner 4 years ago and removed and stored in the northwest corner of the existing building. The contractor is to reerect these in the locations designated on the drawings. Connections to the spray booths will be made by the owner."

The specification continues on in a like fashion describing nearly two dozen other items similar to those given in an example above. You are concerned that nobody in the owner's

office, your office, or among your subs has read this spec closely enough to clearly see the full scope of work for each party.

The owner's representative on the job is intelligent, interested in doing well for his company, and is well known for his fairness in dealing with contractors, architects, engineers, and other parties to his projects. He intensely dislikes surprises.

Consider the following questions:

1. How could you bring the full scope of work into view easily and clearly for each party to the job?

2. How would you convey your understanding of the scope of work to the owner?

3. How are your subcontractors involved in the clarification process?

4. What steps should you take to prevent the equipment problem from developing into a disputed claim?

5. How do you convey your concerns to the owner?

cav cst 2,d156

• 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.

List of Glossary Terms Used in Project Management

ACCELERATION
ADMINISTRATION
ADMINISTRATIVE SETTLEMENT
ADVISORY RELATIONS
AGENCY AUTHORITY
APPARENT AUTHORITY
ARBITRATION
ASSIGNED CONTRACTURAL REALTIONS
AUTHORITY
BASIC CONTRACTURAL RELATIONS
BENCH TRIAL
BUSINESS MODEL
BULLETIN
CARDINAL CHANGE
CHANGE
CHANGE ORDER
CLAIM
CLAIM AVOIDANCE
CLAIM POTENTIAL
CLOSED SHOP
CONSTRUCTION MANAGEMENT
CONSTRUCTIVE CHANGE
CONTRACT DOCUMENTS
CONTROL
CRITICAL PATH METHOD
CUTS
DAILY REPORTS
DEFECTIVE OR DEFICIENT
  CONTRACT DOCUMENTS
DELAY
DEPOSITION
DECISION TABLE
DECISION-TO-ACTION TIME SPAN
DECISION TREE
DIARY
DIFFERING SITE CONDITIONS
DIRECTED CHANGE
DOCUMENT CONTROL SYSTEM
DYSFUNCTION - ORGANIZATIONAL
EARLY FINISH (EF)
EARLY START (ES)
EDUCATION
EFFECTIVE
ELAPSED DURATION
ENRICHMENT
EX'E-CUTIVE
FIELD ORDER
FUNCTIONAL OPERATIONS
GENERAL CONDITIONS
GENERAL REQUIREMENTS
GENERIC CONSTRUCTION (G)
GOALS
MEDIATION
MERIT SHOP
MONEY FLOW
MONITORING
MOTIVATION
NETWORK PLAN
NETWORK PLANNING
OBJECTIVES
OBJECTIVE - DEPENDENT
OBJECTIVE - DIRECT
OBJECTIVE - END
OBJECTIVE - INTERMEDIATE
OBJECTIVE - PERIPHERAL
ONGOING ORGANIZATION
ORGANIZATION
OPEN SHOP
ORGANIZATIONAL STRUCTURE
OWNER FURNISHED ITEMS
PERCENTAGE FEE
PLANNING
PROBLEM
PROFIT - EDU & TRAINING
PROFIT - FINANCIAL
PROFIT - SELF ACTUALIZATION
PROFIT - SOCIO ECONOMIC
PROFIT - VALUE SYSTEM
PROJECT
PROJECT DIRECTOR
PROJECT HISTORY
PROJECT MANAGER
PROJECT OPERATIONS
PROJECT ORGANIZATION
PROJECT STAGES
PROJECT SUPERINTENDENT
QUESTION - DIRECT
QUESTION - OVERHEAD
QUESTION - RELAY
QUESTION - REVERSE
RECORD
RELATIONS - FORMAL FUNCTNAL
RELATIONS - INFORMAL
RELATIONS - TEMPORARY
RELATIONS - REPORTING
RELATIONS - STAFF
RESOURCES
RESPONSIBILITY
SCHEDULE
SHOP DRAWING
SPAN OF CONTROL
SPECIALIZED CONSTRUCTION(S)

HARD MONEY
HISTOGRAM
HYGIENE
INTERFACES
JURY TRIAL
LATE FINISH (LF)
LATE START (LS)
LEVERAGE
LIFE CYCLE COST
LINE ACTIVITIES
LINE OF ACTION
LITIGATION
LOG
MALADMINISTRATION
MANAGE
MANAGEMENT BY EXCEPTION (MX)
MANAGERIAL GRID
MATRIX
MATRIX MANAGEMENT
SPECIFICATION
STAFF
STANDARD OF PERFORMANCE
SUBMITTAL
SUPERIOR KNOWLEDGE
SUSPENSION
TALENT
TERMINATION
TIME & MATERIAL CONTRACT
TOTAL FLOAT (TF)
TRAINING
TRANSLATION
TURNAROUND TIME
TURNOVER CYCLE
ULTIMATE DECISION MAKER-UDM
UNILATERAL MEETINGS
UNION SHOP
UPSET PRICE
VESTED AUTHORITY
WORKING DRAWINGS

glossary list,d161

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 monitorbility.

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 performence 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.

nine steps to pm,d161

The Bengst Corporation Expansion

The Bengst Corporation has been in the computer hardware manufacturing business for about 10 years and occupies a modest one story remote testing lab of 40,000 square feet in Tarry, Montana. Their main office and plant is in Billings, Montana. it contains nearly 25,000 square feet with an adjoining plant of 200,000 square feet.

The Tarry facility is visited frequently by Bengst middle and top managers. Many of them have shown a liking for the small community, and it has been decided by Mr. Bengst to gradually shift the headquarters of the firm to Tarry.

Bengst has been successful in quality hardware design and production, and have now begun to develop a related software program business for technical, business and home computer use. Their software has been well received and the Tarry building will be expanded to take care of some of the space problems being encountered. The cost of the program has been established from well prepared pro forma information. You are in possession of this data.

The Tarry facility is located on a beautiful 160 acre parcel of land bought several years ago by the founder of the company. The building is a one story structural steel frame with an attractive masonry and curtain wall exterior skin. Your firm, Jonquil and Associates, designed the original building eight years ago, but have done no work for Bengst in the intervening period.

Bengst wants to add one story of similar construction to the building and to concurrently develop a master plan for the entire site. Ultimately most major design and production facilities of the company may be moved to Tarry. In two years the volume of business done by the software division is expected to increase 1000%. The hardware division is expecting a 600% expansion within the next 5 years.

The president of the company Mr. Steel Bengst is very active in the expansion program and will watch your work carefully. He has appointed a young software designer at the Tarry plant, Karl Jong, to be the owner's project manager. Mr. Jong is 25 years old, has degrees in electrical engineering and business, and is considered one of the bright stars of the emerging manager group at Bengst.

You are the Jonquil project manager for the Bengst program. How would you go about planning, organizing, designing and getting this expansion plan in work and completed on time, meeting the quality standards of Bengst and your firm.

Some of the questions you will be expected to answer include:

1. How will you organize to do the building design and the master site planning?

2. Will Bengst be able to occupy the building while the 2nd floor addition is being built?

3. What is the time frame within which design and construction will occur?

4. What is the best method of letting constuction contracts?

5. What organization and decision making stucture do you desire the owner to establish.

6. What ownership arrangement is best for Bengst of the new facility as well as their existing facilities in Billings? Ready operating capital is essential to Bengst.

7. What pattern do you wish Jonquil's future relations with Bengst to take?

8. As an internal question, what steps will you take to insure that Jonquil's future relations with this client will remain as you wish them to be?

9. What level of staff talent will you assign to the job?

10. The home office of Jonquil is in Philadelphia. What local Tarry affiliations, if any, would you try to establish for the project work?

bengst csty,d161

CREATIVITY AND HOW IT IS USED IN PROJECT MANAGEMENT

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

Creative thinking is applied to the management process on a routine basis by continuing to learn with an open mind; being among the first to accept something new while being among the last to discard the old. There is also a special requirement for creative thinking that demands getting rid of what Roger von Oech in his book, A WHACK ON THE SIDE OF THE HEAD, calls mental locks. These mental locks are recognized by such familiar phrases as:

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

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

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

Remember, it is nearly impossible to be creative and judgemental at the same time. So, in project management it is a good idea when creatively considering a complex matter to prepare a random laundry list of things that have to be done or thought about. The list should include all items within reason whether you and the others involved think it should be included. Often the combination of a single idea of doubtful merit is a brilliant thought in league with other ideas.

Processes of creatively tackling a problem have been used for hundreds of years by many excellent thinkers. The steps seldom vary, although application of the method to each situation may differ widely.

The creative procedure can be described by seven steps

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

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

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

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

5. Act on the solution!

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

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

creativity,d 161

CASE STUDY - DEFINITION OF GOALS & OBJECTIVES

You have just been promoted to senior project manager for Vyvyan and Associates, a moderate size architectural firm of about 120 people. You are a registered architect with a bachelor's degree in architecture and a master's degree in urban planning. Your strong features brought you to the forefront of the project management group at Vyvyan and now you are recognized as the possible future vice president in charge of operations and projects.

Vyvyan is organized around strong functional operations, but has a management that understands and appreciates the value of project management. The firm has a good reputation for competent architectural design and good technical backup.

The design department under Jon Teleman tends to design expensively, but will listen if sound, rational reasons are given for disagreeing with their concepts.

The architectural department head, Carl Trilar, is a hard headed man of 39, who has a wealth of experience and is well thought of by his staff. He does not always agree with the design group and frequently revises major details without consulting the design team. This leads to hard feelings and recently has caused budget overruns on several weakly managed projects.

The engineering departments have tended to follow patterns set by the design and architectural department without too many problems or conflicts. However Mr. Vyvyan just brought in a new chief engineer, Bob Lott, who has already clashed with Carl Trilar in a dispute in which Mr. Lott sided with Jon Teleman.

Your firm has been contacted by a moderate size developer, The Dreyfus Corporation and offered an architectural and engineering commission to design a new 8 story office building of 240,000 square feet. The building is to be a tenant occupied structure with a core utility space containing elevators, stairs, riser shafts,toilet rooms and telephone, electrical and janitor closets. Perimeter spaces will consist of standard rental areas, and will be finished with a smooth concrete floor, acoustic ceiling, lights and diffusers.

As the space is leased Dreyfus will install tenant improvements consisting of carpeting, partitions, doors and other items covered by the standard lease. Tenants will have the option of adding additional items in their space subject to Dreyfus' approval.

You have worked for several months cultivating the Dreyfus organization in the hope Vyvyan would be awarded this

project. When Mr.Dreyfus called yesterday and said they had selected Vyvyan and Associates to do the work you were delighted. Mr. Vyvyan has told you he wants you to be the project manager and to develop a solid ongoing business and professional relation with Dreyfus.

Your pleasure has been somewhat dulled by the news that Dreyfus has also retained a general contracting firm, Spencer Brothers, an old line, reliable organization, to advise the design team on costs and construction materials and systems during the design period. Mr. Dreyfus is known to want Spencer to build the job on a negotiated basis. The chances of this happening are about 90%.

You have no bone to pick with Spencer but certain people in your firm, particularly Carl Triler, feel Spencer's appointment as a peer indicates a lack of confidence in you by Mr. Dreyfus. You don't share this opinion and feel there is a good chance to profit from the association with both Dreyfus and Spencer.

With this backgroud address the following question:

1. What goals would you set for the design work of Vyvyan and Associates?

2. What goals would you set for the relations between Dreyfus and Vyvan?

3. Translate the goals in 1, and 2 into some specific objectives.

4. What personal goals would you define for yourself in this situation?

5. Identify some of the department related peripheral goals that might emerge from the project organization.

6. Could you shape the goal setting of Dreyfus and Spencer? How, and in what direction?

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PREPARE FOR THE PROBABLE - Optimism, skepticism, and conservatism are ingredients a good manager knows how to mix and use, as a good cook knows how to prepare and serve food.

A. Over optimism is often the manager's enemy. It can blind him to the true needs for success.
B. Over pessimism is usually the manager's paralyzer. Improperly administered it makes action possible only DESPITE the pessimist.
C. A manager simply cannot afford to be surprised by the unexpected event.
D. An understanding of the statistics of happenings is essential if you are to manage well.
E. Several distribution patterns are seen in happenings.
  1. Normal distribution
  2. Poisson distribution
  3. Binomial distribution
F. Statistics are important to effective production.
G. Pareto's law is an example of a distribution
H. Normal distribution says that in every situation there are two extremes and a range of possibilities in between.
  1. Dice - 2's, 3's, 11's, 12's come up less frequently than 4's
  2. Distribution can be
    a. Skewed
    b. Tall
    c. Flat
    d. Symmetrical
I. Flat distribution - A large number of things go wrong over a long period of time. Deterioration of the situation is slow and often difficult for the manager to see. Hard to get a fix on. Anything can happen. The long run ultimately proves the distribution.
J. Tall distribution - When things go wrong they go wrong quickly. Deterioration is rapid and visible. Instability is easy to detect but usually failure occurs before the mediocre manager can do anything about it.
K. Several common managerial failings result from not understanding the meaning of chance and probability.
  1. The relation of luck and good fortune is not recognized.
  2. Over optimism casts a false glow on the situation. It may blind the manager to his true chance for success.
  3. Subjective temptations such as ego, greed, and false pride tend to over feed ambition.
  4. The manager may tend to lose his cool. (When things are going wrong and you have overextended yourself, pull back temporarily, and objectively evaluate the situation).
  5. You may tend to become overprotective and become fearful of risk even when the odds are good in favor of success.
L. Stabilizing your judgements - Use the knowledge of normal expectancies to guide your actions.
  1. Set your priorities in terms of the probable rather

than the merely possible. Always try to work from a position of strength.
2. Set attainable goals and objectives. Don't set them too high for either yourself or others.
3. Build safeguards into your plans.
4. Prepare fall back positions. These are merely preselected alternate plans of action.
5. Avoid demands for perfection. All statistical reasoning rules against its achievement.

pre pbl,d156

6/23/85

Common Causes of Contested Claims

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

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

However, there are claims, there always have been claims, and there will probably always be contested claims that those in construction should understand well.

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

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

1. Directed Change - 48%

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

Examples

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

Advice

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

2. Constuctive change - 42%

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

Examples

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

Advice

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

3. Defective or deficient contract documents - 41%

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

Examples

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

Advice

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

4. Delays - 41%

A delay situation beyond the control and not the fault of

the contractor.

Examples

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

Advice

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

5. Constructive acceleration - 35%

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

Examples

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

Advice

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

6. Maladministration - 33%

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

Examples

- Owner directs contractor to provide a certain space in a facility early without such early turn over having been specified.
- Owner directs contractor to start work on an

encumbered site.
- Architect/engineer unresponsive to legitimate requests for information.

Advice

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

7. Differing site conditions

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

Examples

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

Advice

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

8. Impossibility of performance - 18%

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

Examples

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

Advice

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

9. Superior knowledge - 18%

Witholding data or information during the precontract period that affects construction on matters of importance.

Examples

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

Advice

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

10. Termination - 7%

Dismissal from the project for convenience or default.

Examples

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

Advice

- Be certain the cause for dismissal is legitimate and well defined.

- Don't dismiss for minor reasons. Dismissal is serious business.
- If dismissing be certain proper notice is given.
- Insure the contract documents give you the right to dismiss.

Avoiding lawsuits,d161

APPLY SITUATIONAL THINKING - Continually try to widen the scope of your perception

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A. Impulsive, narrow minded men and women often fail as managers because they don't, or can't, realize what's going on around them.

B. Most inadequate managerial decisions are a result of

1. Failure to include enough significant factors

2. Delaying action until after cause-effect relations have changed

C. How a manager views a particular problem is likely to determine his success or failure in handling it.

D. Five failings the good manager must guard against

1. Vision too narrow - tunnel vision: limited mental perception

2. Assessments too subjective

3. Missing moving targets

4. Failing to allow for momentum

5. Trying to control the impossible

E. To use situational thinking

1. Sort out the overall picture

2. Identify and explore areas of minimum information

3. Seek out the meaningful and significant relationships

4. Look at, and use time as an asset, just like labor, materials, or money

5. Pretest your decisions whenever possible

6. Increase the number and range of your informal management interfaces

sit thk, d156

EMPLOY THE POWER OF TRAINING - A manager multiplies his own knowledge and skills when he teaches them to others

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1. Unguided learning will occur, but it is random, inexact, wasteful and tends to encourage bad habits
2. Good training usually results in good staff performance
3. Good staff performance allows the manager more time to concentrate on his major activities - planning, scheduling, initiating, directing and controlling
4. The need for good training is ongoing irrespective of how good or bad times are
5. The excellent manager will usually try to teach what he knows to those who wish to learn
6. The improvement cycle - inertia, initiative, insight and improvement
   a. Inertia is resistance to change, and initiative is its removal as a barrier to learning
      1.) Reasons for inertia
         a.) Fear for safety
         b.) Fear for security
         c.) Concern for comfort
         d.) Doubts about ability
         e.) Old habits and attitudes
         f.) Dislike for schooling
         g.) Preoccupation with other problems
      2.) Overcoming inertia
         a.) Use motivation to get going - habit to keep going
         b.) Motivation must be mainly furnished by supervision
         c.) Neutralizing fear
            (1.) Show that others similar to the subordinate have benefited from learning
            (2.) Show that added skills give more, not less, security through added employee value
            (3.) Acknowledge doubts as to aptitude or potential
            (4.) Criticize constructively and express willingness to tolerate learning mistakes
         d.) Show the employee that training will be truly relevant; that what he learns can be used now, for his and the company's benefit
         e.) Plan the training so the learner is rewarded with a quick and simple success experience
   b. Insights: key elements of a subject that deal with the intellectual, the physical and the procedural requirements of learning
      1.) Intellectual insights - those that concern the whole concept of what is to be learned
      2.) Physical insights - those that concern getting the physical feel of the process - the touch, tone, heft and smell of the job
      3.) Procedural insights - those related to

sequential demands of the operation
c. Improvement - Accelerated learning gained by overcoming inertia, taking initiative, gaining insights. Should be encouraged by
1.) Applying learned principals through exercises
2.) Stepping up challenges by increasing the level of difficulty
3.) Accelerating the flow of learning challenges until the rate of improvement levels off (this may constitute a return to the inertia plateau and signal the need for a new progress cycle)

7. The learning curve
a. As output or quantity doubles there is a uniform % drop in the time needed to produce this output
b. Some observed rates of learning
1.) Machining - 90 to 95%
2.) Short cycle bench assembly - 85 to 90%
3.) Equipment maintenance - 75 to 80%

8. Various types of teaching and learning
a. Training - is vocational and procedural
b. Education - teaches principles that can be universally applied
c. Coaching - depends upon guided dialogue between teacher and learner

9. The phases of a training program are planning, instruction, evaluation
a. Planning
1.) Survey and analyze needs
2.) Identify and analyze key learning need points
3.) Select training methods
4.) Prepare the training outline
b. Instruction
1.) Capture interest and arouse initiative
2.) Give insights
3.) Accelerate improvement
C. Evaluation
1.) Review progress
2.) Evaluate results
3.) Make plans to overcome the next inertia plateau

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WORKING WELL WITH PEOPLE - the key to multiplying your effectiveness

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A. Develop your confidence in others - the good manager reaches his objectives through the work of other people in whom he has confidence.

1. Learn about and understand the behavioral sciences
   a. Basic sciences are
      1.) Anthropology (heredity)
      2.) Psychology (attitudes and feelings)
      3.) Physiology (body characteristics)
      4.) Sociology (environmental and group influences and relations)
   b. The manager should start with the assumption that most people want to do a good job
   c. Most also want to share in the success of a common effort
   d. The good manager learns to avoid people manipulation
      1.) Manipulation is excessive management of other's feelings and emotions
      2.) Manipulation is often rooted in fear
      3.) Genuine interest and willingness to trust people is an effective thought pattern that will help avoid manipulation
      4.) Don't play behavioral games with your employees
   e. Motivation & maintenance
      1.) Maslow's basic motivational priorities
         a.) Man wants to be alive and stay alive
         b.) He wants to feel safe and secure
         c.) He wants to socialize with other people
         d.) He wants to feel worthy and respected
         e.) He needs to do the work he likes
      2.) Motivational elements
         a.) Nature of work
         b.) Recognition of achievement
         c.) Utilized abilities
         d.) Challenging assignments
         e.) Extended involvement and responsibility
         f.) Production of something of worth
      3.) Motivation is introduced into the work place by providing genuinely satisfying conditions that reflect the heirachy of human values
      4.) Maintenance - those job elements that do not in themselves motivate, but when missing, reduce the incentive to produce
         a.) Pay and benefits
         b.) Security
         c.) Working environment
         d.) Status
         e.) Social activity
      5.) Avoid managing by force
         a.) Force is primitive rather than scientific

b.) Force kills the qualities a good manager must encourage in his employees
(1.) Confidence
(2.) Spirit
(3.) Self reliance
(4.) Assurance
(5.) Self sufficiency

2. Know and understand the people you work with
a. Elements important in knowing your prople better
1.) Name, age, address
2.) Employment record
3.) Education
4.) Military service record
5.) Family and dependents
6.) Medical characteristics
7.) Off job interests
a.) Job related
b.) Recreation, hobbies
c.) Community
8.) Personal beliefs
9.) Personal habits
10.)Life goals
b. A good manager does not
1.) Pry for facts people don't want to reveal
2.) Gossip about people
3.) Reveal confidences
c. Knowing a person well is to become aware of him apart from the group
d. Knowing a person well can allow you to more properly place confidence in him

3. Express your respect and confidence if actually deserved
a. Should be expressed publicly and privately
b. Respect and confidence are reciprocal in a good working relation
c. Don't confuse being liked with being respected
d. The minds of people perceive both what management says AND what they do
e. The respected employee wants to be treated well and used well

4. Communicate freely
a. Within allowable boundaries keep people informed about
1.) What is going on in the larger picture around them
2.) What changes are planned
3.) What objectives have been set for their functional activities
b. Listen carefully to what your people are saying. Try to understand
1.) The outward message
2.) The feelings they are attempting to express but don't or can't
c. To watch out for in communications
1.) Use discretion as to what should and should

not be conveyed to your people. Don't show off superior access to information.
2.) Generally base your actions with people on what you actually know, rather than on what you think they may be thinking.
3.) Your suggestions as a peer are considered conversation: your suggestions as a boss are generally regarded as an order.

5. Provide people with challenging assignments
   a. To expect a lot from your staff or crew is to show respect for their abilities, initiative and perserverance
   b. Be firm but fair in assignment and in follow up. A boss does't have to be liked to be effective
   c. Usually challenging work is accompanied by a possibility of failure
   d. A challenging assignment should be doable
6. Delegate important tasks frequently
   a. Don't try to make all decisions about every job by yourself
   b. Let your people accept new responsibilities and to make occasional mistakes: that's the way they will learn and improve
   c. Make it known that the more important jobs that you delegate are training assignments. You then retain control of the activity and can make comparitive critiques of performance without offense.
   d. Don't be frightened of losing your influence through delegation (pie theory). Constructive delegation is the path to greater influence and power.
   e. The delegation sequence
      1.) First, use guided actions. Be available to help the man do the new work
      2.) Second, show him how to do the job, and encourage him to further delegate, where appropriate, by having him train or coach his subordinates in the activity
      3.) Third, delegate the whole job and involve the subordinate in the early planning as well as the activity itself
7. Study and understand the benefits and shortcomings of each subordinate's participation
   a. Hawthorne experiment (1927)-encouraging workers to get things off their chest was proven to increase production
   b. IBM (1950's)-job enlargement broadened divisions of labor. Improved quality, output and morale
   c. Harwood Manufacturing-controlled experiments in employee participation produced impressive improvement. Measured by using three different methods of conveying information about proposed operational revisions
   d. Texas Instruments-emphasized use of goal

oriented management rather than authority oriented management. Manager exerts most of his leadership in planning. Subordinates carry out the actual plan, control, do cycle.

e. American Telegraph and Telephone-used job enrichment process focussing on the work itself. Encouraged employee decisions on HOW the work was to be done. Resulted in money savings, reduced turnover and improvement in staff utilization.

wkg w11, d156

Where Do We Go From Here?

Qitain University, a small private engineering, science, liberal arts school in the northwest United States city of Quitain, is about to embark on a major (for them) expansion plan. It involves the planning, design, and construction of a new university activities building, a modest athletic facility having a gym and indoor pool along with support facilities, and a small combined library and book store.

The expansion program has been written, the planner/architect/engineer selected, and the Board of Regents of the school have given the project a go ahead.

An organizational meeting is in progress with the following people in attendence:

-Frank Carlton - Vice President for university Planning and Operations

-James Tea - Program consultant for the university

-Fred Link - President of the planning/architectural firm of Link and Associates, the architects of record for the entire project

-Charles Redrock - Associate, chief architect and project manager on the project for Link and Associates

-Robert Hagal - President of Hagal Mechanical Engineering Company, the mechanical engineers for the project

-Stan Wiessman - President of Weissman Electric, the electrical engineers for the project

-Richard Goldmark - A wealthy alumnus and key mover in assembling the total funding for the program

The site of the new building group extends across two city public rights of way (ROW), Francis Avenue and Fourth Avenue. Some preliminary negotiations have been conducted with the City of Qitain by Mr. Carlton, of the University with the city manager, George Dell. It appears that vacation of the ROW's can be accomplished on a reasonable basis. Several live utilities are known to be in the two streets but exact sizes and locations have not yet been determined.

org int, d156

IDENTIFY VITAL TARGETS - Which inputs and outputs most affect the results, the conditions, and the performance the manager wishes to achieve?

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

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

C. Must understand Pareto's law. Run samples of Pareto's principles.

D. Fewer than one third of the people a manager supervises require more than two thirds of his time. (Review this for accuracy)

E. Managerial misteps resulting from not understanding the vital target concept include:

1. Following prejudices
2. Sticking with pat systems
3. Doing what is easiest
4. Playing hunches

F. Picking the vital few

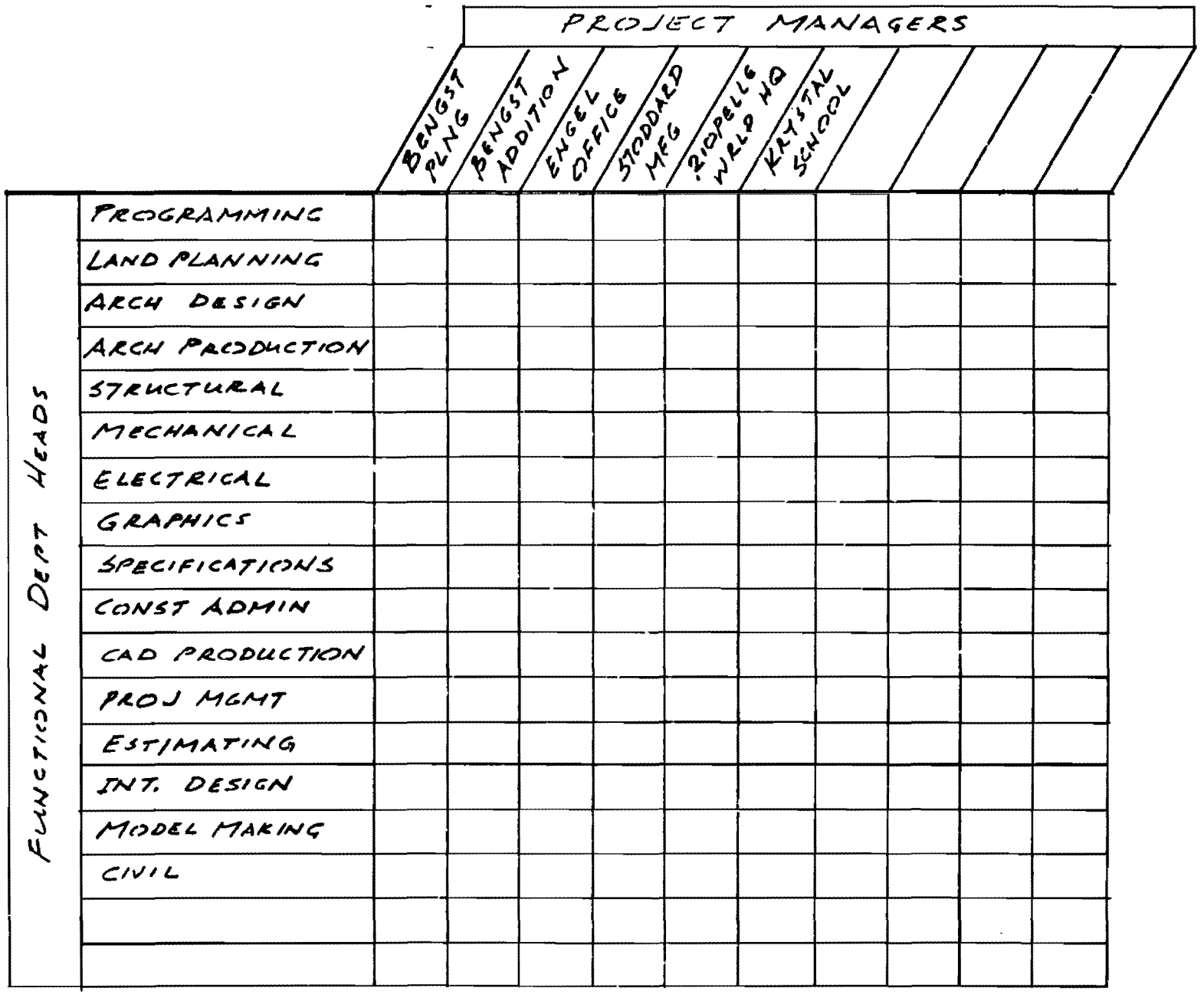
1. To do lists
2. Setting priorities
3. Rating systems
4. Critical tasks in network models

G. Moving from a situational view to the vital few. (change in perceptive scale.)

H. What to do with the trivial many

1. Delegate
2. Defer (how long?)

vit tgt,d156



A/E MANAGEMENT MATRIX

RALPH J. STEPHENSON, P.E.
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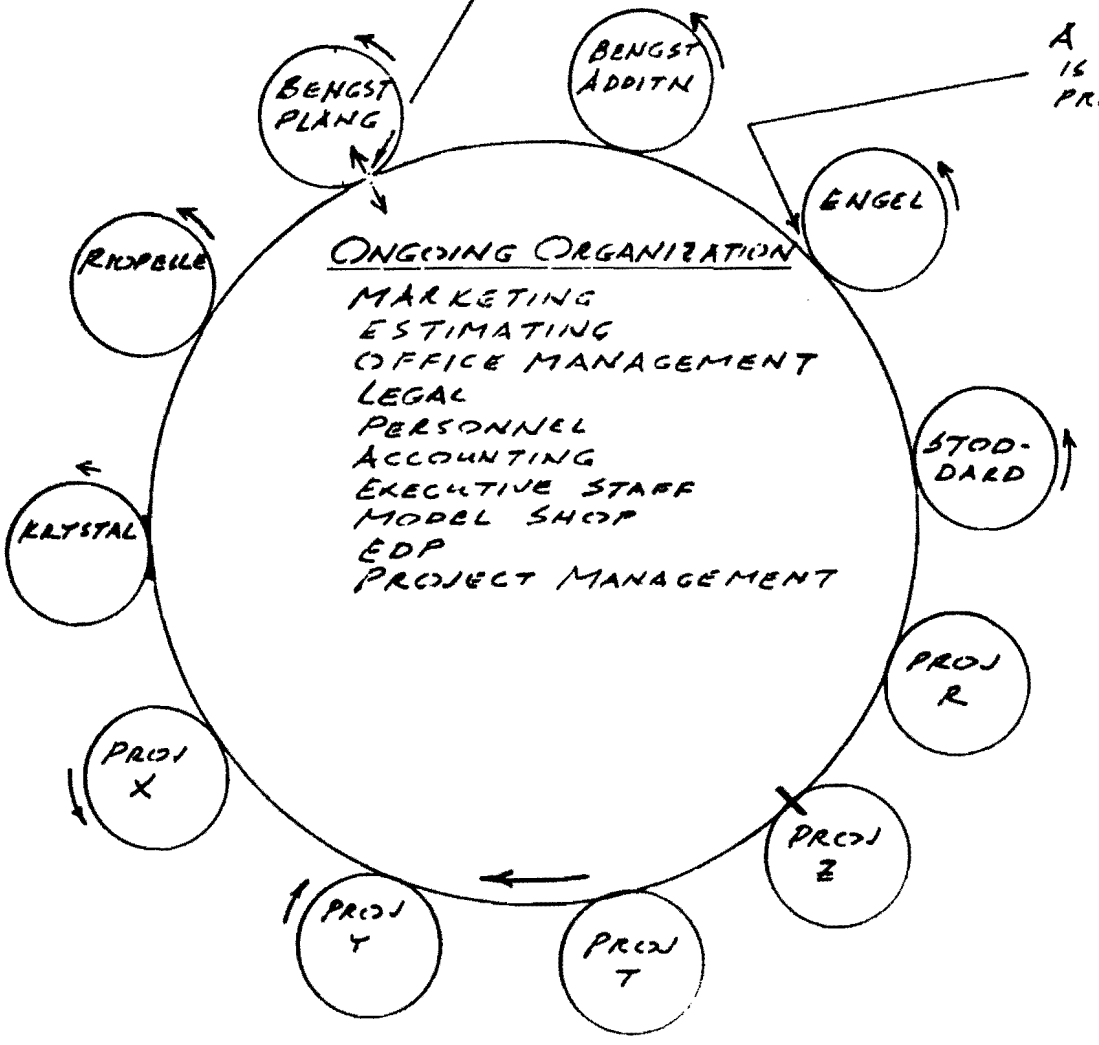
H/O 234

A CLEAR WINDOW BETWEEN THE PROJECT & THE ONGOING ORGANIZATION IS A CRITICAL INGREDIENT IN EFFECTIVE MANAGGMENT

A SMOOTH INTERFACING IS ESSENTIAL TO GOOD PROJECT DIRECTION



+ GOALS & OBJECTIVES

THE RELATION OF PROJECT MANAGEMENT TO ONGOING MANGEMENT - A/E

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

H/O 235

RALPH J. STEPHENSON, P. E.
CONSULTING ENGINEER

R.J. STEPHENSON, P.E. 15064 WARWICK DETROIT, MI. 48223 PH. 313-273-5026

2-YR. WORKING DAY CALENDAR STARTING JAN. 2, 1985

Date	W/D	Date	W/D	Date	W/D	Date	W/D	Date	W/D
Jan 1985									
02	1	14	52	24	103	06	153	17	204
03	2	15	53	28	104	07	154	18	205
04	3	18	54	29	105	08	155	21	206
07	4	19	55	30	106	09	156	22	207
08	5	20	56	31	107	12	157	23	208
09	6	21	57	Jun		13	158	24	209
10	7	22	58	03	108	14	159	25	210
11	8	25	59	04	109	15	160	28	211
14	9	26	60	05	110	16	161	29	212
15	10	27	61	06	111	19	162	30	213
16	11	28	62	07	112	20	163	31	214
17	12	29	63	10	113	21	164	Nov	
18	13	Apr		11	114	22	165	01	215
21	14	01	64	12	115	23	166	04	216
22	15	02	65	13	116	26	167	05	217
23	16	03	66	14	117	27	168	06	218
24	17	04	67	17	118	28	169	07	219
25	18	05	68	18	119	29	170	08	220
28	19	08	69	19	120	30	171	11	221
29	20	09	70	20	121	Sept		12	222
30	21	10	71	21	122	03	172	13	223
31	22	11	72	24	123	04	173	14	224
Feb		12	73	25	124	05	174	15	225
01	23	15	74	26	125	06	175	18	226
04	24	16	75	27	126	09	176	19	227
05	25	17	76	28	127	10	177	20	228
06	26	18	77	Jul		11	178	21	229
07	27	19	78	01	128	12	179	22	230
08	28	22	79	02	129	13	180	25	231
11	29	23	80	03	130	16	181	26	232
12	30	24	81	05	131	17	182	27	233
13	31	25	82	08	132	18	183	29	234
14	32	26	83	09	133	19	184	Dec	
15	33	29	84	10	134	20	185	02	235
18	34	30	85	11	135	23	186	03	236
19	35	May		12	136	24	187	04	237
20	36	01	86	15	137	25	188	05	238
21	37	02	87	16	138	26	189	06	239
22	38	03	88	17	139	27	190	09	240
25	39	06	89	18	140	30	191	10	241
26	40	07	90	19	141	Oct		11	242
27	41	08	91	22	142	01	192	12	243
28	42	09	92	23	143	02	193	13	244
Mar		10	93	24	144	03	194	16	245
01	43	13	94	25	145	04	195	17	246
04	44	14	95	26	146	07	196	18	247
05	45	15	96	29	147	08	197	19	248
06	46	16	97	30	148	09	198	20	249
07	47	17	98	31	149	10	199	23	250
08	48	20	99	Aug		11	200	24	251
11	49	21	100	01	150	14	201	26	252
12	50	22	101	02	151	15	202	27	253
13	51	23	102	05	152	16	203	30	254
								31	255

H/O 237

R.J. STEPHENSON, P.E. 15064 WARWICK DETROIT, MI. 48223 PH. 313-273-5026

2-YR. WORKING DAY CALENDAR STARTING JAN. 2, 1985

Date	W/D	Date	W/D	Date	W/D	Date	W/D	Date	W/D
Jan 1986		17	308	29	360	11	411	23	463
02	256	18	309	30	361	12	412	24	464
03	257	19	310	Jun		13	413	27	465
06	258	20	311	02	362	14	414	28	466
07	259	21	312	03	363	15	415	29	467
08	260	24	313	04	364	18	416	30	468
09	261	25	314	05	365	19	417	31	469
10	262	26	315	06	366	20	418	Nov	
13	263	27	316	09	367	21	419	03	470
14	264	28	317	10	368	22	420	04	471
15	265	31	318	11	369	25	421	05	472
16	266	Apr		12	370	26	422	06	473
20	268	01	319	13	371	27	423	07	474
21	269	02	320	16	372	28	424	10	475
22	270	03	321	17	373	29	425	11	476
23	271	04	322	18	374	Sept		12	477
24	272	07	323	19	375	02	426	13	478
27	273	08	324	20	376	03	427	14	479
28	274	09	325	23	377	04	428	17	480
29	275	10	326	24	378	05	429	18	481
30	276	11	327	25	379	08	430	19	482
31	277	14	328	26	380	09	431	20	483
Feb		15	329	27	381	10	432	21	484
03	278	16	330	30	382	11	433	24	485
04	279	17	331	Jul		12	434	25	486
05	280	18	332	01	383	15	435	26	487
06	281	21	333	02	384	16	436	28	488
07	282	22	334	03	385	17	437	Dec	
10	283	23	335	07	386	18	438	01	489
11	284	24	336	08	387	19	439	02	490
12	285	25	337	09	388	22	440	03	491
13	286	28	338	10	389	23	441	04	492
14	287	29	339	11	390	24	442	05	493
17	288	30	340	14	391	25	443	08	494
18	289	May		15	392	26	444	09	495
19	290	01	341	16	393	29	445	10	496
20	291	02	342	17	394	30	446	11	497
21	292	05	343	18	395	Oct		12	498
24	293	06	344	21	396	01	447	15	499
25	294	07	345	22	397	02	448	16	500
26	295	08	346	23	398	03	449	17	501
27	296	09	347	24	399	06	450	18	502
28	297	12	348	25	400	07	451	19	503
Mar		13	349	28	401	08	452	22	504
03	298	14	350	29	402	09	453	23	505
04	299	15	351	30	403	10	454	24	506
05	300	16	352	31	404	13	455	26	507
06	301	19	353	Aug		14	456	29	508
07	302	20	354	01	405	15	457	30	509
10	303	21	355	04	406	16	458	31	510
11	304	22	356	05	407	17	459		
12	305	23	357	06	408	20	460		
13	306	27	358	07	409	21	461		
14	307	28	359	08	410	22	462		

LISTED BY DATE OF ISSUE - DATE PRINTED: NOV 2 0 1983
RALPH J. STEPHENSON PE PC

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

SUBMITTAL TURN AROUND TIMES

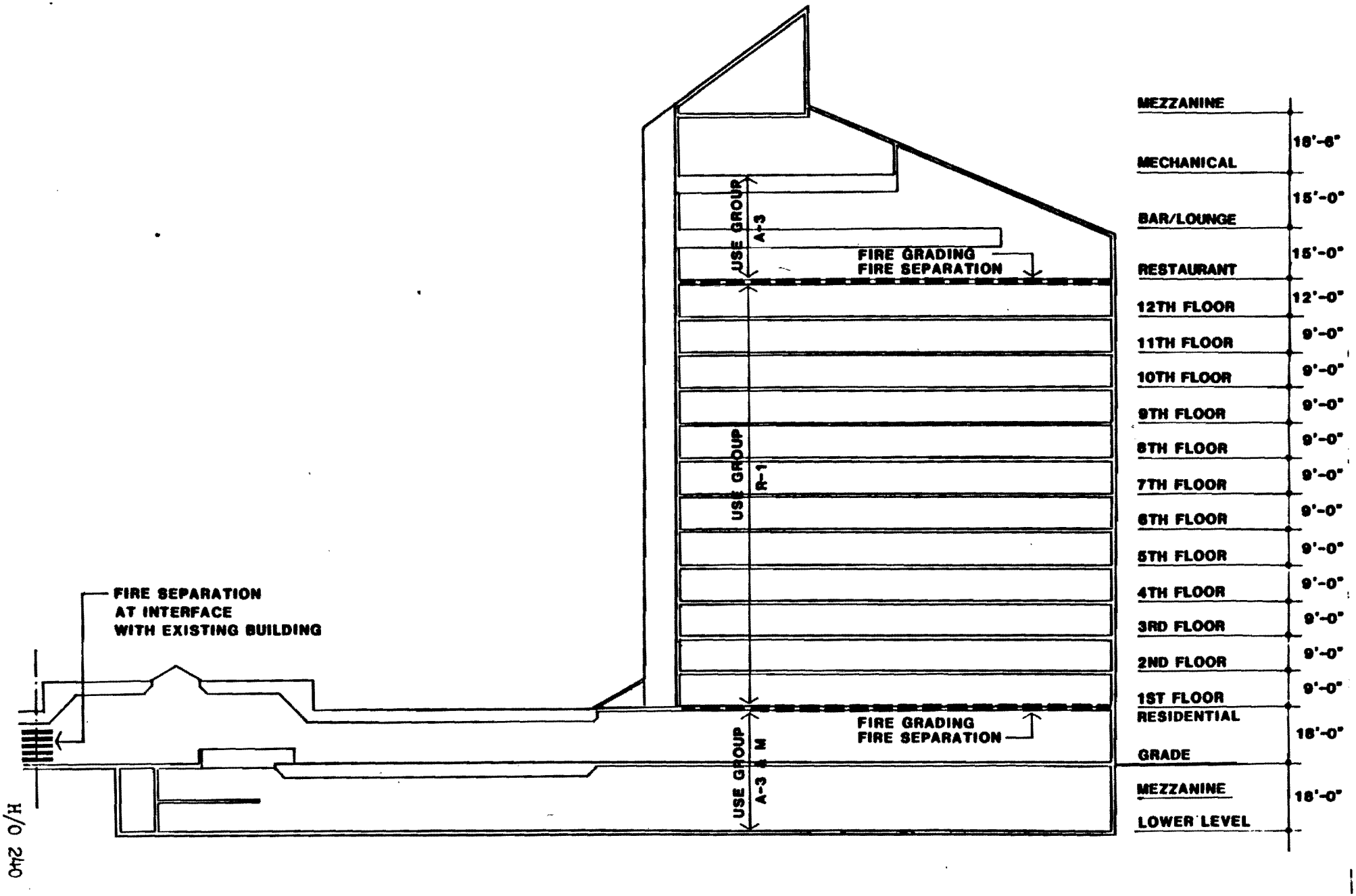
TIME REQUIRED IN WORKING DAYS

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

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

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

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER


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

H/O 240

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 ECAVATION	-	-	C	C	-	-	C	33
C	X	FRP PIT WALLS	-	-	-	-	C	-	-	189
C	-	BACKFILL EXT BUILDING WALLS	C	-	-	-	-	-	-	38
C	-	BACKFILL EXT RETAINING WALL	-	-	-	-	-	C	-	35
C	X	EFRP RETAINING WALL FOOTING	-	-	-	-	-	C	-	37
C	X	FRPS RETAINING WALL STEM	-	-	-	-	-	C	-	39
C	-	EXCAVATE FOR ALL SLABS ON GRADE	-	-	C	C	C	-	-	49
C	-	POUR OUT SUPPORTED DECKS	C	-	-	C	C	-	-	53
C	-	DEMOLISH EXISTING CANOPY	-	-	-	-	-	-	C	77
C	X	CURE, PART & TOTAL STRIP SUPTD DECKS	C	-	-	C	C	-	-	51
C	X	INSTL ELECT GROUNDING SYSTEM	C	-	-	-	-	-	-	52
C	X	FRPS COLUMNS ABOVE LOBBY LEVEL	C	-	-	-	C	-	-	54
C	X	FRPS COLS ABOVE LL MEZZ	-	-	C	C	C	-	-	43
C	X	CURE, STRIP & RESHORE SUPTD DECKS	C	-	-	C	C	-	-	50
C	X	ERECT MISC MTLS RELATED TO SS CONC WOR	C	-	-	-	-	-	-	190
C	X	CONSTRUCT LB SLABS ON GRADE	-	C	-	-	-	-	C	46
C	X	INSTL MISC IRON SKIN EMBEDS & SUPPORTS	C	-	-	-	C	-	-	56
C	X	COMP APPLY EXTERIOR WALL WATERPROOFING	C	-	-	-	-	-	-	42
C	X	FORM & SET IN FLOOR WORK FOR SUPTD DKS	C	-	-	C	C	-	-	55
C	X	INSTL EXPANSION JOINTS & RELATED EMBED	C	-	-	-	-	-	-	44
C	X	CONSTRUCT LL SLABS ON GRADE	C	-	C	C	C	-	-	57
C	X	INSTL MATERIAL & PERSONNEL HOIST	C	-	-	-	-	-	-	47
C	X	PROVIDE CONTRACT C HOISTING	C	-	-	-	-	-	-	48
C	X	CONSTRUCT TOWER LL MEZZ DECK	-	-	C	-	C	-	-	41

I	S	ACTIVITY DESC	AL	LB	LL	LR	TW	SI	EB	REC#
D	X	FURNISH ELEVATOR EMBEDMENTS	-	-	-	-	D	-	-	192
D	X	INSTALL ELEVATOR RAILS, EQUIP, CAB	-	-	-	-	D	-	-	58
D	X	INSTALL ELEVATOR HYDRAULIC CYLINDER	-	-	-	-	D	-	-	59
E	X	ERECT LR METAL FLOOR & ROOF DECK	-	-	-	E	-	-	E	108
E	X	ERECT, PLUMB & BOLT LR STRUCT STL & JS	-	-	-	E	-	-	E	107
F	X	INSTL EXT SKIN MISC METALS	F	-	-	-	-	-	-	60
F	X	INSTALL SLIDING DOORS	-	-	-	-	F	-	-	79
F	X	INSTALL CURTAIN WALL GLASS	-	-	-	-	F	-	-	82
F	X	ERECT ALUM SIDING	-	-	-	-	F	-	-	75
F	X	ERECT CURTAIN WALL FRAMING	-	-	-	-	F	-	-	81
F	X	INSTALL BALCONY RAILS	-	-	-	-	F	-	-	78
G	X	INSTL PLUMBING FIXTURES	G	-	-	-	-	-	G	145
G	X	INSTL SPRINKLER HEADS	G	-	-	-	-	-	G	169
G	X	INSTL GRILLS & DIFFUSERS	G	-	-	-	-	-	G	139
G	X	INSTL FAN COIL UNITS	-	-	-	-	G	-	-	142
G	X	PROCURE FAN COIL UNITS	G	-	-	-	-	-	-	99
G	X	PROCURE WATER SOFTENER	G	-	-	-	-	-	-	94
G	X	PROCURE CHILLERS	G	-	-	-	-	-	-	101
G	X	PROCURE DOMESTIC WATER TANKS	G	-	-	-	-	-	-	93
G	X	PROCURE BOILER	G	-	-	-	-	-	-	100
G	X	PROCURE COOLING TOWER (OR COND)	G	-	-	-	-	-	-	98
G	X	PROCURE FIRE PUMPS	G	-	-	-	-	-	-	96
G	X	PROCURE HOT WATER TANK	G	-	-	-	-	-	-	91
G	X	PROCURE DOMESTIC WATER PUMPS	G	-	-	-	-	-	-	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

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

I	S	ACTIVITY DESC	AL	LB	LL	LR	TW	SI	EB	REC#
J	X	PAINT REQUIRED SURFACES	J	-	-	-	-	-	J	176
J	X	INSTL CLOSET DOORS	-	-	-	-	J	-	-	184
J	X	INSTL INT DOORS & HARDWARE	J	-	-	-	-	-	J	157
J	X	INSTL TOILET ROOM PARTITIONS	J	-	-	-	-	-	J	151
K	X	INSTL FOOD SERVICE ROUGH IN	K	-	-	-	-	-	-	154
K	-	FIELD MEASURE FOR FOOD SERVICE EQUIP	K	-	-	-	-	-	-	155
K	X	INSTL HOOD FIRE PROTECTION	K	-	-	M	M	-	-	138
K	-	RUN IN FOOD SERVICE EQUIP & TRAIN STAF	K	-	-	-	-	-	-	186
K	X	INSTALL FOOD SERVICE EQUIP	K	-	-	-	-	-	-	113
K	X	INSTL HOODS	K	-	-	M	M	-	-	135
K	X	FAB & DEL FOOD SERVICE EQUIP	K	-	-	-	-	-	-	156
K	X	INSTL FOOD SERVICE EQUIPMENT	K	-	-	-	-	-	-	153
M	X	ERECT TOWER METAL DK	-	-	-	-	M	-	-	195
M	X	ERECT, PLUMB & BOLT TOWER STRUCT STEEL	-	-	-	-	M	-	-	194
N	X	INSTALL EXT LOUVERS	-	-	-	N	N	-	-	76
N	X	INSTALL ROLLING STEEL DOORS	-	-	N	N	-	-	-	69
N	X	INSTALL EXT HOLLOW METAL DOORS	N	N	N	N	N	-	N	70
N	X	INSTALL EXT ENTRY FRAMING	N	N	-	N	N	-	N	84
N	X	INSTALL EXT HARDWARE	N	N	N	N	N	-	N	85
N	X	APPLY BALCONY TOPPINGS	-	-	-	-	N	-	-	83
N	X	ERECT EXTERIOR MASONRY	N	-	-	N	N	-	N	64
N	X	INSTALL EXT HOLLOW METAL FRAMES	N	N	N	N	N	-	N	71
N	X	ERECT STOREFRONT FRAMING	N	N	-	N	N	-	N	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

REMARKS 1
REMARKS 2
L TL DESCR
L TION

REC#	ROL#	P#	DTE	YR	CAM	FLM SPD	JOB #	F TY

SIDEWALK & ROAD INTO HOTEL AT TRAVERSE BAY RESORT

TRAVERSE RESORT DRIVEWAY
TRAVERSE CITY, MICH
53 0024 00 0904 84 XA ASA 100 84037 PCO

TRAVERSE BAY RESORT DESIGN CONFERENCE. WAYNE BRYAN, ED SIEGEL, CARMINE & JERRY SHEA DISCUSS A POINT WITH A BEAUTIFUL BACKGROUND
WAYNE,ED,CARMINE,JERRY MEET
TRAVERSE CITY, MICH
54 0024 01 0904 84 XA ASA 100 84037 PCO

CONDOMINIUMS AT TRAVERSE BAY RESORT FROM DEVELOPMENT OFFICE BALCONY
TRAVERSE RESORT CONDOMINIUMS
TRAVERSE CITY, MICH
55 0024 02 0904 84 XA ASA 100 84037 PCO

CONCRETE COLUMN CAPITAL IN KLING OFFICE SEMINAR ROOM. TAKEN AT PROJECT MANAGEMENT SEMINAR
KLING SEMINAR ROOM COL
.ADELPHIA, PENN
0024 03 0907 84 XA ASA 100 84034 PCO

PHIL BENNETT ENJOYING MOMENT OF RELAXATION AT KLING PROJECT MANAGEMENT SEMINAR
PHIL BENNET AT KLING SEMINAR
PHILADELPHIA, PENN
57 0024 02 0907 84 XA ASA 100 84034 PCO

BOB & BETTY INSPECT BASEMENT OF FARM HOUSE BEING TOURED BY BOB & BETH

BOB & BETTY IN HOUSE BSMT
NEAR SALINE, MICH
58 0024 05 0909 84 XA ASA 100 P PCO

DEMOLISHED AND REMOVED ROOF SLABS FROM WATER PLANT FLOCULATION TANK ROOFS
WATER PLANT PRECAST DECKS
FLINT, MICH
59 0024 06 0911 84 XA ASA 100 84026 PCO

CRANE REMOVING ROOF PLANK FROM FLOCULATION TANKS AT WATER PLANT

REMOVING PC AT WATER PLANT
FLINT, MICH
0024 07 0911 84 XA ASA 100 84026 PCO

CURRENT TO DO LIST - D124 - PRINTED: PAGE 1

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

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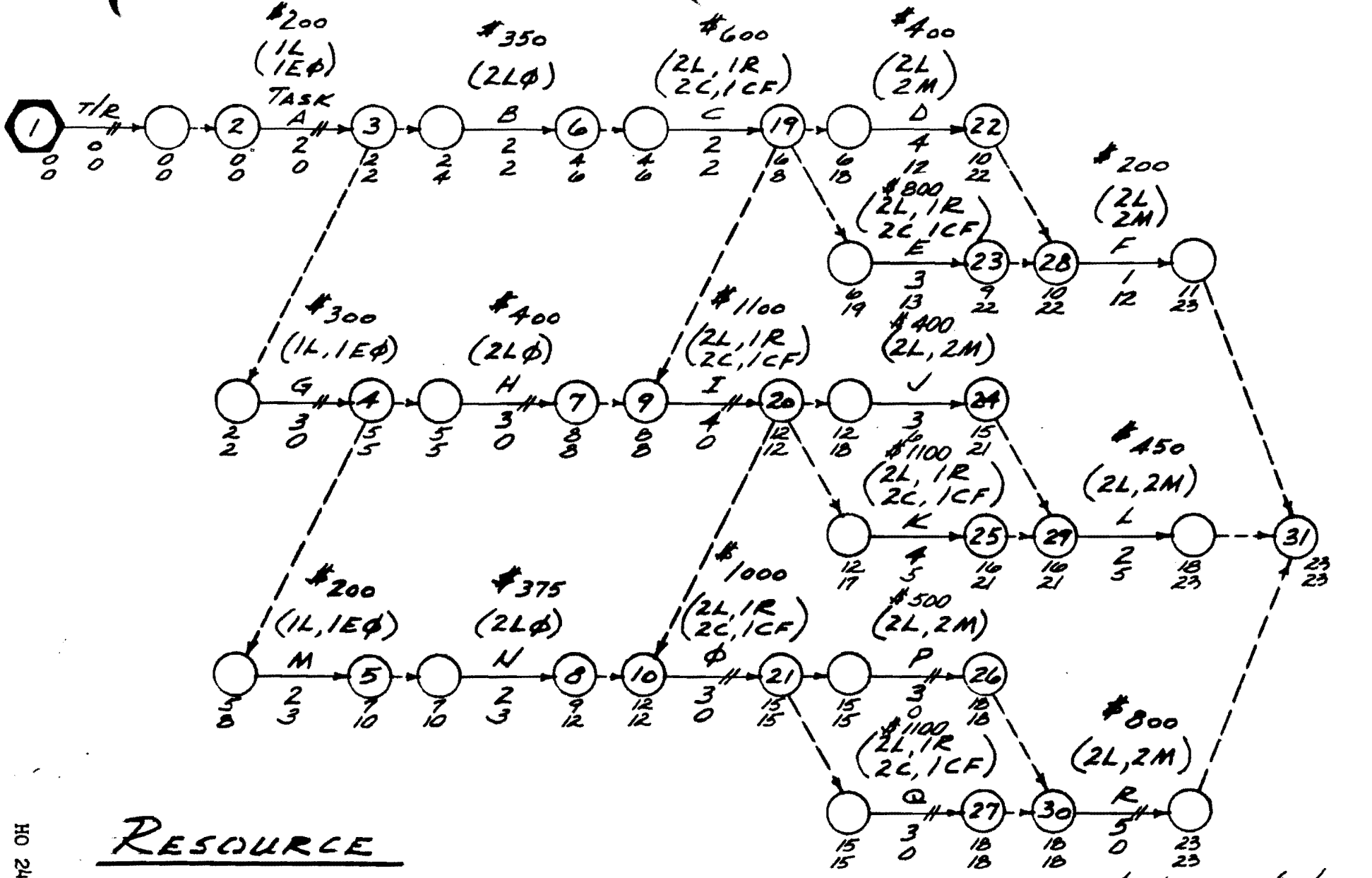


RESOURCE ALLOCATION

RESERVED NODE NOS.

11	15
12	16
13	17
14	18

RALPH J. STEPHENSON, P.E.

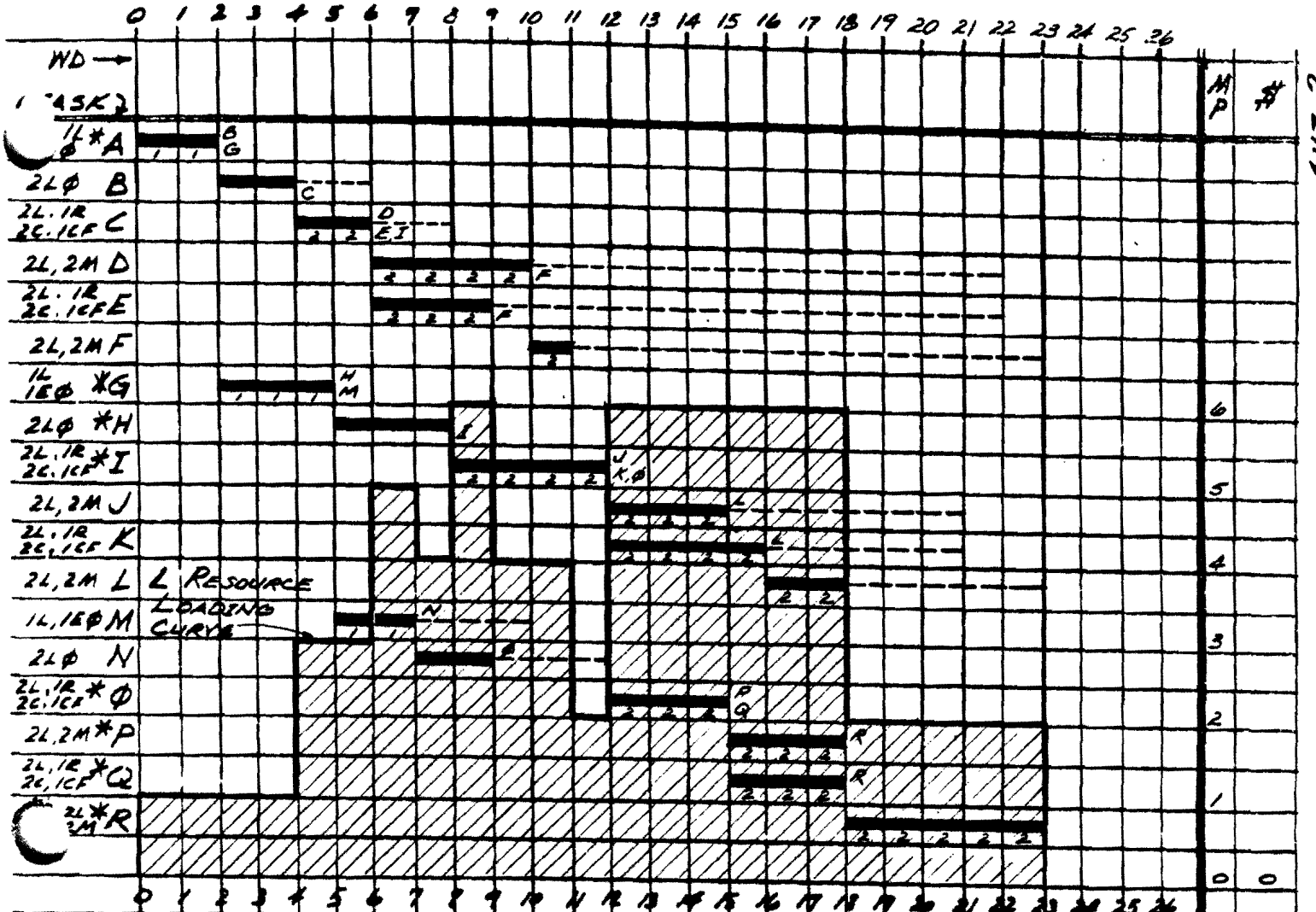
MAY 29, 1968

HO 244

O/H

SHT 1

ES/EF SCHEDULE



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

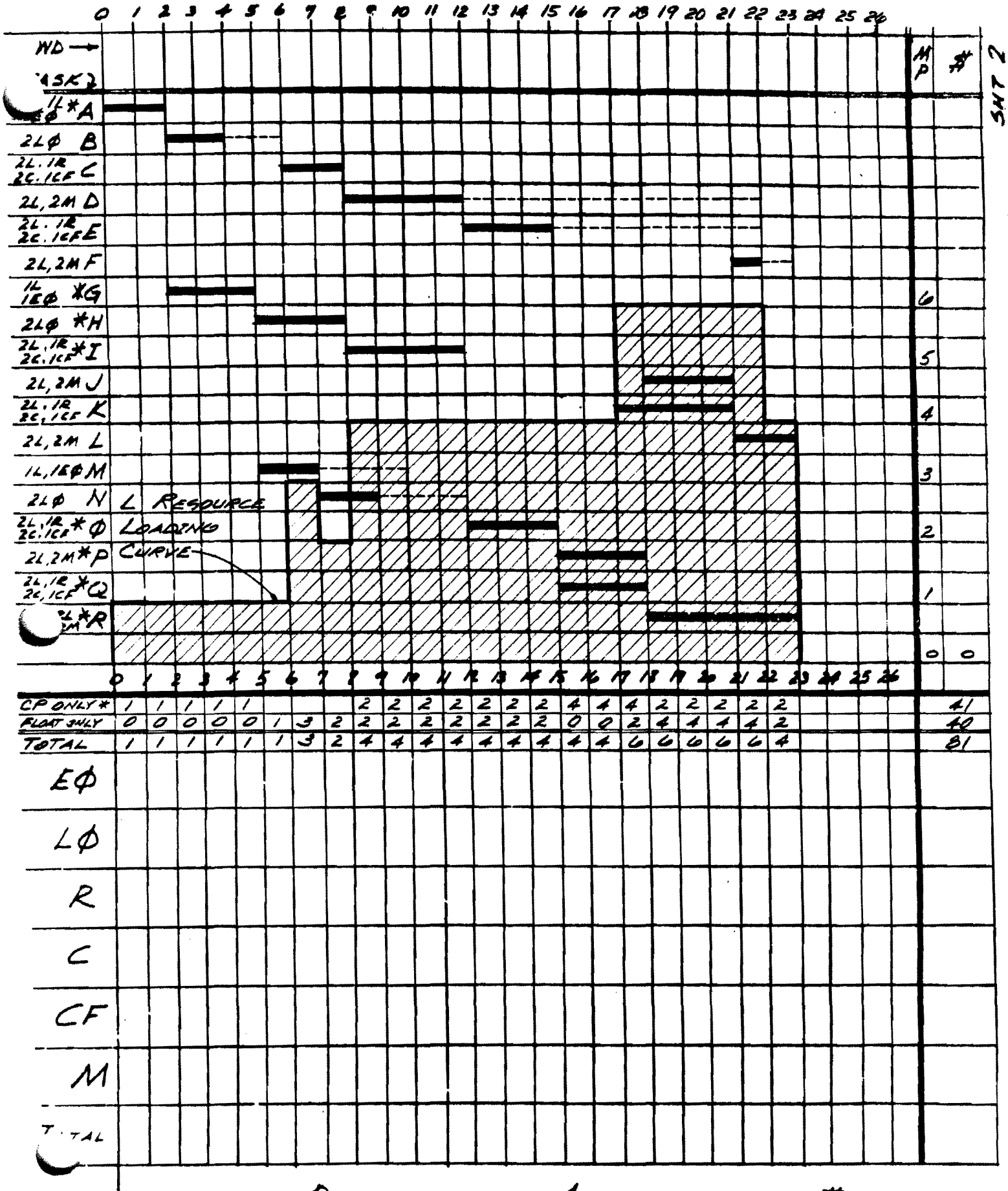
RESOURCE ALLOCATION #1

HO 245

MAY 29, 1968

RALPH J. STEPHENSON, P.E.

LEVELED SCHEDULE



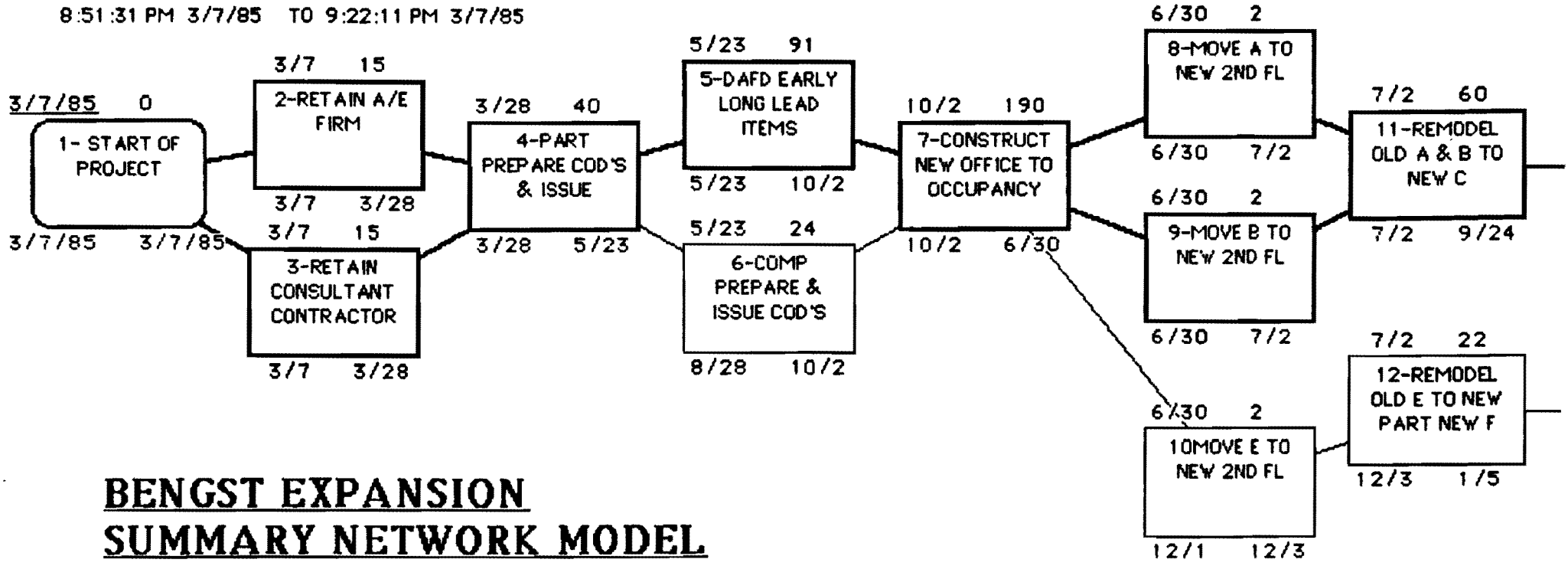
RESOURCE ALLOCATION #2

HO 246

MAY 29, 1968

RALPH J. STEPHENSON, P.E.

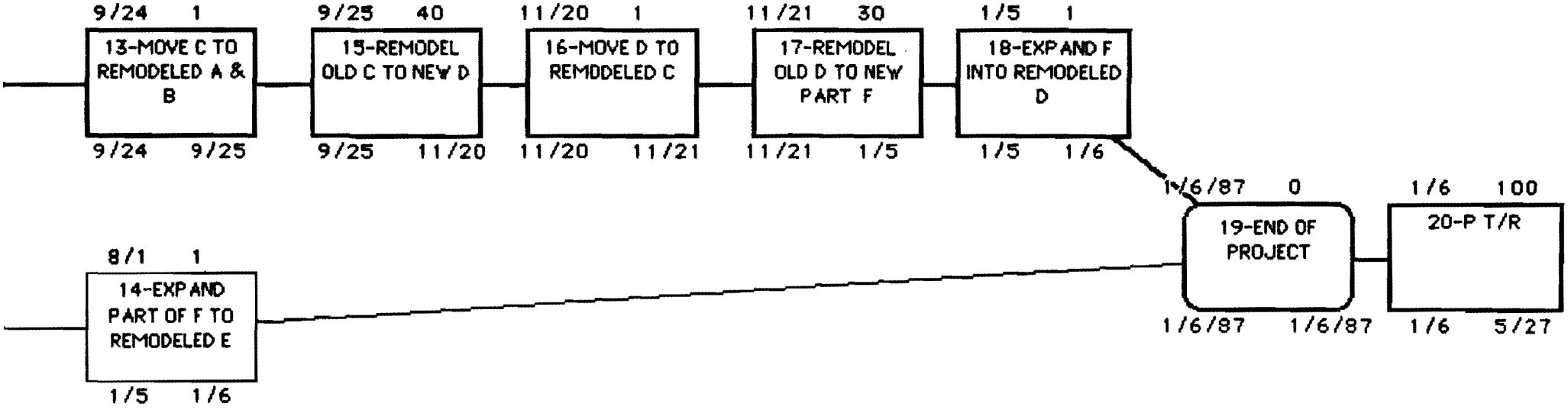
8:51:31 PM 3/7/85 TO 9:22:11 PM 3/7/85

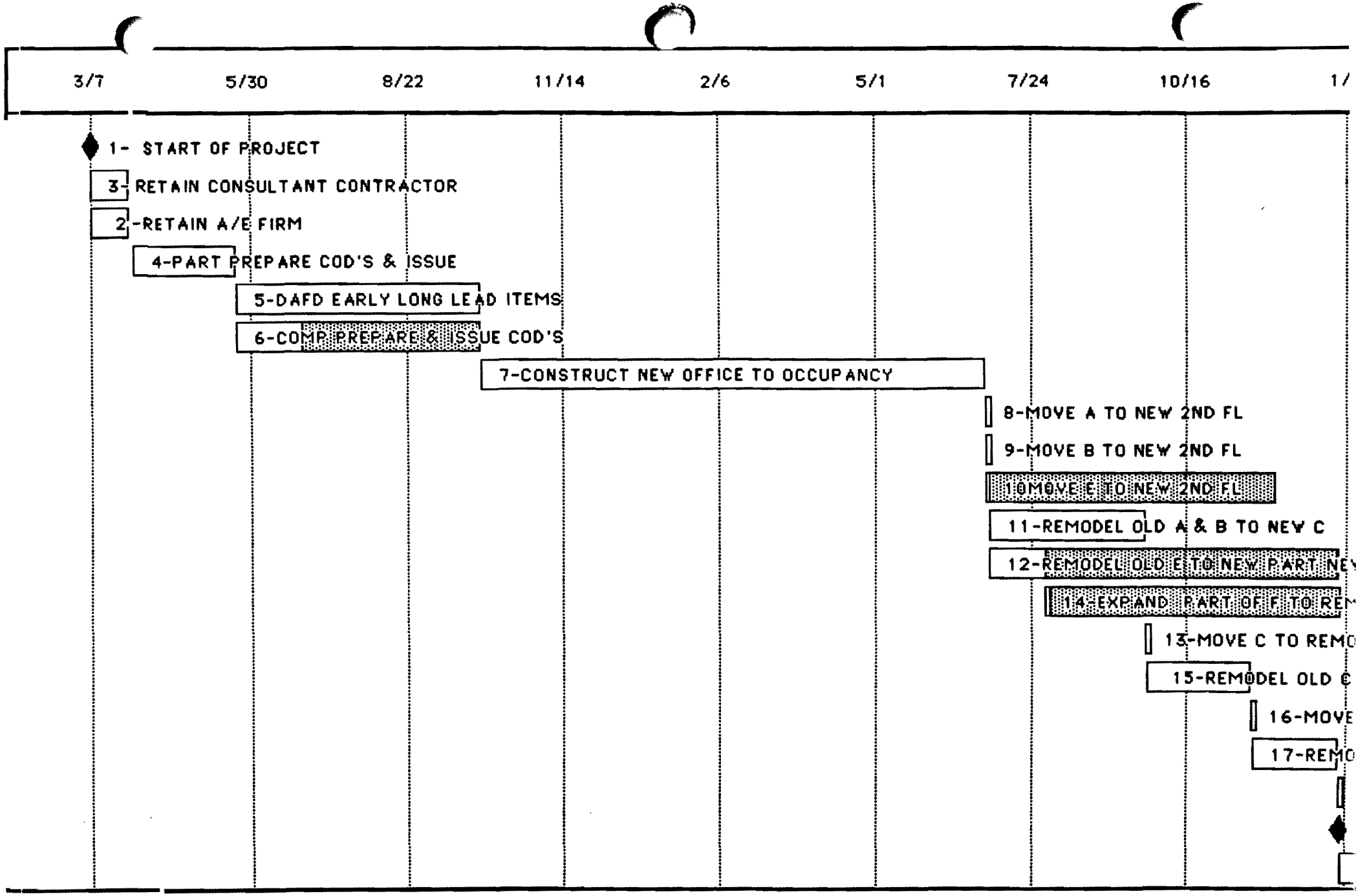


BENGST EXPANSION
SUMMARY NETWORK MODEL

Ralph J. Stephenson PE PC
Consulting Engineer

H/O 247
Pg. 1


9/24 1
13-MOVE C TO REMODELED A & B
9/24 9/25
9/25 40
15-REMODEL OLD C TO NEW D
9/25 11/20
11/20 1
16-MOVE D TO REMODDELED C
11/20 11/21
11/21 30
17-REMODEL OLD D TO NEW PART F
11/21 1/5
1/5 1
18-EXPAND F INTO REMODELED D
1/5 1/6
8/1 1
14-EXPAND PART OF F TO REMODELED E
1/5 1/6
1/6/87 0
19-END OF PROJECT
1/6/87 1/6/87
1/6 100
20-P T/R
1/6 5/27


3/7
5/30
8/22
11/14
2/6
5/1
7/24
10/16
1/
1- START OF PROJECT
3-RETAIN CONSULTANT CONTRACTOR
2-RETAIN A/E FIRM
4-PART PREPARE COD'S & ISSUE
5-DAFD EARLY LONG LEAD ITEMS
6-COMP PREPARE & ISSUE COD'S
7-CONSTRUCT NEW OFFICE TO OCCUPANCY
8-MOVE A TO NEW 2ND FL
9-MOVE B TO NEW 2ND FL
10MOVE E TO NEW 2ND FL
11-REMODEL OLD A & B TO NEW C
12-REMODEL OLD E TO NEW PART NE
14-EXPAND PART OF F TO RE
13-MOVE C TO REMO
15-REMODEL OLD C
16-MOVE
17-REMO

H/O 248
Pg. 1

	4/2	6/25
ELED E		
LED A & B		
NEW D		
TO REMODELED C		
. OLD D TO NEW PART F		
3-EXPAND F INTO REMODELED D		
-END OF PROJECT		
-P T/R		

H/O 248
Pg. 2

	Task Name	Days	Earliest Start	Earliest Finish	Latest Start	Latest Finish	Fixed Cost	Resource Cost	Fixed Inco
1	1- START OF PROJECT	0	3/7/85	3/7/85	3/7/85	3/7/85	0	0	
2	3-RETAIN CONSULTANT	15	3/7/85	3/28/85	3/7/85	3/28/85	0	0	
3	2-RETAIN A/E FIRM	15	3/7/85	3/28/85	3/7/85	3/28/85	0	0	
4	4-PART PREPARE COD'S &	40	3/28/85	5/23/85	3/28/85	5/23/85	0	0	
5	5-DAFD EARLY LONG LEAD	91	5/23/85	10/2/85	5/23/85	10/2/85	0	0	
6	6-COMP PREPARE & ISSUE COD'S	24	5/23/85	6/27/85	8/28/85	10/2/85	0	0	
7	7-CONSTRUCT NEW OFFICE	190	10/2/85	6/30/86	10/2/85	6/30/86	0	0	
8	8-MOVE A TO NEW 2ND FL	2	6/30/86	7/2/86	6/30/86	7/2/86	0	0	
9	9-MOVE B TO NEW 2ND FL	2	6/30/86	7/2/86	6/30/86	7/2/86	0	0	
10	10MOVE E TO NEW 2ND FL	2	6/30/86	7/2/86	12/1/86	12/3/86	0	0	
11	11-REMODEL OLD A & B TO	60	7/2/86	9/24/86	7/2/86	9/24/86	0	0	
12	12-REMODEL OLD E TO NEW PART	22	7/2/86	8/1/86	12/3/86	1/5/87	0	0	
13	14-EXPAND PART OF F TO	1	8/1/86	8/4/86	1/5/87	1/6/87	0	0	
14	13-MOVE C TO REMODELED A	1	9/24/86	9/25/86	9/24/86	9/25/86	0	0	
15	15-REMODEL OLD C TO NEW	40	9/25/86	11/20/86	9/25/86	11/20/86	0	0	
16	16-MOVE D TO REMODELED C	1	11/20/86	11/21/86	11/20/86	11/21/86	0	0	
17	17-REMODEL OLD D TO NEW	30	11/21/86	1/5/87	11/21/86	1/5/87	0	0	
18	18-EXPAND F INTO	1	1/5/87	1/6/87	1/5/87	1/6/87	0	0	
19	19-END OF PROJECT	0	1/6/87	1/6/87	1/6/87	1/6/87	0	0	

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Pg. 1

Resource 1	Resource 2	Resource 3	Resource 4	Resource 5	Resource 6

Friday July 9, 1982

Hitwell SE Tucson, Arizona

- All new bldg ftgs complete today at NE corner. Moving to NW corner ftg concrete work Monday.
- Still having trouble with delivery of embedments in pit walls. Biotic says dimension on dwgs wrong. Must clarify. Have mtg with Tom Monday to review.
- Hit flowing water at 9:00 A.M. ~~P.M.~~ on E & S-C. Began pumping at 10:15 A.M. today. Notified Tom Begay of Hitwell and Tom Stirton of Jones and Higgins of water at 9:45 AM today. Still pumping at 5:30 P.M. Will check Sat & Sunday on water levels. CT 7/9/82
- Rod busters & carpenters held up by water. Sent them home at 11:00 AM.
- Mr. Rolla and Mr. Stirton visited job at 1:15 P.M. Left at 2:30 P.M. Complimented housekeeping and progress (except water!)

R.J. STEPHENSON, P.E. 15064 WARWICK DETROIT, MI. PH. 313-2735026

4-YR. WORKING DAY CALENDAR STARTING JAN. 3, 1984

Date	W/D	Date	W/D	Date	W/D	Date	W/D	Date	W/D
Jan	1986	17	563	30	616	13	668	28	721
02	511	18	564	Jun		14	669	29	722
03	512	19	565	02	617	15	670	30	723
06	513	20	566	03	618	18	671	31	724
07	514	21	567	04	619	19	672	Nov	
08	515	24	568	05	620	20	673	03	725
09	516	25	569	06	621	21	674	04	726
10	517	26	570	09	622	22	675	05	727
13	518	27	571	10	623	25	676	06	728
14	519	28	572	11	624	26	677	07	729
15	520	31	573	12	625	27	678	10	730
16	521	Apr		13	626	28	679	11	731
17	522	01	574	16	627	29	680	12	732
20	523	02	575	17	628	Sept		13	733
21	524	03	576	18	629	02	681	14	734
22	525	04	577	19	630	03	682	17	735
23	526	07	578	20	631	04	683	18	736
24	527	08	579	23	632	05	684	19	737
27	528	09	580	24	633	08	685	20	738
28	529	10	581	25	634	09	686	21	739
29	530	11	582	26	635	10	687	24	740
30	531	14	583	27	636	11	688	25	741
31	532	15	584	30	637	12	689	26	742
Feb		16	585	Jul		15	690	28	743
03	533	17	586	01	638	16	691	Dec	
04	534	18	587	02	639	17	692	01	744
05	535	21	588	03	640	18	693	02	745
06	536	22	589	07	641	19	694	03	746
07	537	23	590	08	642	22	695	04	747
10	538	24	591	09	643	23	696	05	748
11	539	25	592	10	644	24	697	08	749
12	540	28	593	11	645	25	698	09	750
13	541	29	594	14	646	26	699	10	751
14	542	30	595	15	647	29	700	11	752
17	543	May		16	648	30	701	12	753
18	544	01	596	17	649	Oct		15	754
19	545	02	597	18	650	01	702	16	755
20	546	05	598	21	651	02	703	17	756
21	547	06	599	22	652	03	704	18	757
24	548	07	600	23	653	06	705	19	758
25	549	08	601	24	654	07	706	22	759
26	550	09	602	25	655	08	707	23	760
27	551	12	603	28	656	09	708	24	761
28	552	13	604	29	657	10	709	26	762
Mar		14	605	30	658	13	710	29	763
03	553	15	606	31	659	14	711	30	764
04	554	16	607	Aug		15	712	31	765
05	555	19	608	01	660	16	713		
06	556	20	609	04	661	17	714		
07	557	21	610	05	662	20	715		
10	558	22	611	06	663	21	716		
11	559	23	612	07	664	22	717		
12	560	27	613	08	665	23	718		
13	561	28	614	11	666	24	719		
14	562	29	615	12	667	27	720		

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4-YR. WORKING DAY CALENDAR STARTING JAN. 3, 1984

Date	W/D	Date	W/D	Date	W/D	Date	W/D	Date	W/D
Jan	1987	17	818	Jun		13	923	28	976
02	766	18	819	01	871	14	924	29	977
05	767	19	820	02	872	17	925	30	978
06	768	20	821	03	873	18	926	Nov	
07	769	23	822	04	874	19	927	02	979
08	770	24	823	05	875	20	928	03	980
09	771	25	824	08	876	21	929	04	981
12	772	26	825	09	877	24	930	05	982
13	773	27	826	10	878	25	931	06	983
14	774	30	827	11	879	26	932	09	984
15	775	31	828	12	880	27	933	10	985
16	776	Apr		15	881	28	934	11	986
19	777	01	829	16	882	31	935	12	987
20	778	02	830	17	883	Sept		13	988
21	779	03	831	18	884	01	936	16	989
22	780	06	832	19	885	02	937	17	990
23	781	07	833	22	886	03	938	18	991
26	782	08	834	23	887	04	939	19	992
27	783	09	835	24	888	08	940	20	993
28	784	10	836	25	889	09	941	23	994
29	785	13	837	26	890	10	942	24	995
30	786	14	838	29	891	11	943	25	996
Feb		15	839	30	892	14	944	27	997
02	787	16	840	July		15	945	30	998
03	788	17	841	01	893	16	946	Dec	
04	789	20	842	02	894	17	947	01	999
05	790	21	843	06	895	18	948	02	1000
06	791	22	844	07	896	21	949	03	1001
09	792	23	845	08	897	22	950	04	1002
10	793	24	846	09	898	23	951	07	1003
11	794	27	847	10	899	24	952	08	1004
12	795	28	848	13	900	25	953	09	1005
13	796	29	849	14	901	28	954	10	1006
16	797	30	850	15	902	29	955	11	1007
17	798	May		16	903	30	956	14	1008
18	799	01	851	17	904	Oct		15	1009
19	800	04	852	20	905	01	957	16	1010
20	801	05	853	21	906	02	958	17	1011
23	802	06	854	22	907	05	959	18	1012
24	803	07	855	23	908	06	960	21	1013
25	804	08	856	24	909	07	961	22	1014
26	805	11	857	27	910	08	962	23	1015
27	806	12	858	28	911	09	963	24	1016
Mar		13	859	29	912	12	964	28	1017
02	807	14	860	30	913	13	965	29	1018
03	808	15	861	31	914	14	966	30	1019
04	809	18	862	Aug		15	967	31	1020
05	810	19	863	03	915	16	968		
06	811	20	864	04	916	19	969		
09	812	21	865	05	917	20	970		
10	813	22	866	06	918	21	971		
11	814	26	867	07	919	22	972		
12	815	27	868	10	920	23	973		
13	816	28	869	11	921	26	974		
16	817	29	870	12	922	27	975		

R.J. STEPHENSON, P.E. 15064 WARWICK DETROIT, MI. 48223 PH. 313-2735026

2-YR. WORKING DAY CALENDAR STARTING JAN. 3, 1984

Date	W/D	Date	W/D	Date	W/D	Date	W/D	Date	W/D
Jan	1984	13	51	23	102	03	152	16	203
03	1	14	52	24	103	06	153	17	204
04	2	15	53	25	104	07	154	18	205
05	3	16	54	29	105	08	155	19	206
06	4	19	55	30	106	09	156	22	207
09	5	20	56	31	107	10	157	23	208
10	6	21	57	Jun		13	158	24	209
11	7	22	58	01	108	14	159	25	210
12	8	23	59	04	109	15	160	26	211
13	9	26	60	05	110	16	161	29	212
16	10	27	61	06	111	17	162	30	213
17	11	28	62	07	112	20	163	31	214
18	12	29	63	08	113	21	164	Nov	
19	13	30	64	11	114	22	165	01	215
20	14	Apr		12	115	23	166	02	216
23	15	02	65	13	116	24	167	05	217
24	16	03	66	14	117	27	168	06	218
25	17	04	67	15	118	28	169	07	219
26	18	05	68	18	119	29	170	08	220
27	19	06	69	19	120	30	171	09	221
30	20	09	70	20	121	31	172	12	222
31	21	10	71	21	122	Sept		13	223
Feb		11	72	22	123	04	173	14	224
01	22	12	73	25	124	05	174	15	225
02	23	13	74	26	125	06	175	16	226
03	24	16	75	27	126	07	176	19	227
06	25	17	76	28	127	10	177	20	228
07	26	18	77	29	128	11	178	21	229
08	27	19	78	Jul		12	179	23	230
09	28	20	79	02	129	13	180	26	231
10	29	23	80	03	130	14	181	27	232
13	30	24	81	05	131	17	182	28	233
14	31	25	82	06	132	18	183	29	234
15	32	26	83	09	133	19	184	30	235
16	33	27	84	10	134	20	185	Dec	
17	34	30	85	11	135	21	186	03	236
20	35	May		12	136	24	187	04	237
21	36	01	86	13	137	25	188	05	238
22	37	02	87	16	138	26	189	06	239
23	38	03	88	17	139	27	190	07	240
24	39	04	89	18	140	28	191	10	241
27	40	07	90	19	141	Oct		11	242
28	41	08	91	20	142	01	192	12	243
29	42	09	92	23	143	02	193	13	244
Mar		10	93	24	144	03	194	14	245
01	43	11	94	25	145	04	195	17	246
02	44	14	95	26	146	05	196	18	247
05	45	15	96	27	147	08	197	19	248
06	46	16	97	30	148	09	198	20	249
07	47	17	98	31	149	10	199	21	250
08	48	18	99	Aug		11	200	24	251
09	49	21	100	01	150	12	201	26	252
12	50	22	101	02	151	15	202	27	253
								28	254
								31	255

R.J. STEPHENSON, P.E. 15064 WARWICK DETROIT, MI. PH. 313-2735026

2-YR. WORKING DAY CALENDAR STARTING JAN. 3, 1984

Date	W/D	Date	W/D	Date	W/D	Date	W/D	Date	W/D
Jan	1985	14	307	28	359	08	410	22	462
02	256	15	308	29	360	09	411	23	463
03	257	18	309	30	361	12	412	24	464
04	258	19	310	31	362	13	413	25	465
07	259	20	311	Jun		14	414	28	466
08	260	21	312	03	363	15	415	29	467
09	261	22	313	04	364	16	416	30	468
10	262	25	314	05	365	19	417	31	469
11	263	26	315	06	366	20	418	Nov	
14	264	27	316	07	367	21	419	01	470
15	265	28	317	10	368	22	420	04	471
16	266	29	318	11	369	23	421	05	472
17	267	Apr		12	370	26	422	06	473
18	268	01	319	13	371	27	423	07	474
21	269	02	320	14	372	28	424	08	475
22	270	03	321	17	373	29	425	11	476
23	271	04	322	18	374	30	426	12	477
24	272	05	323	19	375	Sept		13	478
25	273	08	324	20	376	03	427	14	479
28	274	09	325	21	377	04	428	15	480
29	275	10	326	24	378	05	429	18	481
30	276	11	327	25	379	06	430	19	482
31	277	12	328	26	380	09	431	20	483
Feb		15	329	27	381	10	432	21	484
01	278	16	330	28	382	11	433	22	485
04	279	17	331	Jul		12	434	25	486
05	280	18	332	01	383	13	435	26	487
06	281	19	333	02	384	16	436	27	488
07	282	22	334	03	385	17	437	29	489
08	283	23	335	05	386	18	438	Dec	
11	284	24	336	08	387	19	439	02	490
12	285	25	337	09	388	20	440	03	491
13	286	26	338	10	389	23	441	04	492
14	287	29	339	11	390	24	442	05	493
15	288	30	340	12	391	25	443	06	494
18	289	May		15	392	26	444	09	495
19	290	01	341	16	393	27	445	10	496
20	291	02	342	17	394	30	446	11	497
21	292	03	343	18	395	Oct		12	498
22	293	06	344	19	396	01	447	13	499
25	294	07	345	22	397	02	448	16	500
26	295	08	346	23	398	03	449	17	501
27	296	09	347	24	399	04	450	18	502
28	297	10	348	25	400	07	451	19	503
Mar		13	349	26	401	08	452	20	504
01	298	14	350	29	402	09	453	23	505
04	299	15	351	30	403	10	454	24	506
05	300	16	352	31	404	11	455	26	507
06	301	17	353	Aug		14	456	27	508
07	302	20	354	01	405	15	457	30	509
08	303	21	355	02	406	16	458	31	510
11	304	22	356	05	407	17	459		
12	305	23	357	06	408	18	460		
13	306	24	358	07	409	19	461		

HOW TO SPRING THE TIME TRAP
From R. Alec Mackenzie's book The Time Trap

TIME WASTER
POSSIBLE CAUSES
SOLUTIONS

A. Lack of planning
   1. Failure to see the benefit
      a. Recognize that planning takes time but saves time in the end
   2. Action orientation
      a. Emphasize results, not activity
   3. Success without it
      a. Recognize that success is often in spite of, not because of, methods
B. Lack of priorities
   1. Lack of goals and objectives
      a. Write out goals and objectives
      b. Discuss priorities with subordinates
C. Overcommitment
   1. Wide span of interests
      a. Say no!
   2. Confusion in priorities
      a. Put first things first
   3. Failure to set priorities
      a. Develop a personal philosophy of time
      b. Relate priorities to a schedule of events
D. Management by crisis
   1. Lack of planning
      a. Apply the same solution as for lack of planning (see A. above)
   2. Unrealistic time estimates
      a. Allow more time
      b. Allow for interruptions
   3. Problem orientation
      a. Be opportunity oriented
   4. Reluctance of subordiantes to break bad news
      a. Encourage fast transmission of information as essential for timely corrective action
E. Haste
   1. Impatience with detail
      a. Take time to get it right. Save the time to do it over again
   2. Responding to the urgent
      a. Distinguish between the urgent and the important
   3. Lack of planning ahead
      a. Take time to plan. It repays itself many times over
   4. Attempting too much in too little time
      a. Attempt less
      b. Delegate more
F. Paperwork and reading
   1. Knowledge explosion
      a. Read selectively

b. Learn speed reading

2. Computerities
   a. Manage computer data by exception
3. Failure to screen
   a. Remember Pareto's law
   b. Delegate reading to subordinates

G. Routine and trivia
1. Lack of priorities
   a. Set and concentrate upon goals and objectives
   b. Delegate non essentials
2. Oversurveillance of subordinates
   a. Delegate; then give subordinates their head
   b. Look to results, not details or methods
3. Refusal to delegate; feeling of greater security dealing with operating detail
   a. Recognize that without delegation it is impossible to get anything done through others

H. Visitors
1. Enjoyment of socializing
   a. Do it elsewhere
   b. Meet visitors outside
   c. Suggest lunch if necessary
   d. Hold stand up conferences
2. Inability to say no
   a. Screen
   b. Say no
   c. Be unavailable
   d. Modify your open door policy

I. Telephone
1. Lack of self discipline
   a. Screen and group calls
   b. Be brief
2. Desire to be informed and involved
   a. Stay uninvolved with all but essentials
   b. Manage by exception

J. Meetings
1. Fear of responsibility for decisions
   a. Make decisions without meetings
2. Indecision
   a. Make decisions even when some facts are missing
3. Overcommunication
   a. Discourage unnecessary meetings
   b. Convene only those people needed for matters at hand
4. Poor leadership
   a. Use agendas
   b. Stick to the subject
   c. Prepare and distribute concise minutes as soon as possible after the meeting

K. Indecision
1. Lack of confidence in the facts
   a. Improve fact finding
   b. Improve validating procedures
2. Insistence on all the facts - paralysis of analysis
   a. Accept risks as inevitable
   b. Decide without all the facts

3. Fear of the consequences of a mistake
    a. Delegate the right to be wrong
    b. Use mistakes as a learning process
4. Lack of a rational decision-making process
    a. Get facts
    b. Set goals and objectives
    c. Check alternatives
    d. Check negative consequences
    e. Make decision
    f. Implement decision

L. Lack of delegation
1. Fear of subordinates' inadequacy
    a. Train
    b. Allow mistakes
    c. Replace if necessary
2. Fear of subordinates'competence
    a. Delegate fully, but within the subordinate's compentence
    b. Give credit
    c. Insure corporate growth to maintain challenge
3. Work overload on subordinates
    a. Balance workloads
    b. Staff up
    c. Reorder priorities

tim trp, ho252

MIND PROBER

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

Agree	Disagree	
		Talkative - chatty, always speaking
		Egotistic - self-centered, individualistic
		Empathetic - aware of another, compassionate
		Apprehensive - fearful, worried, afraid
		Unconventional - unusual, not the norm, rebellious
		Kind - gentle, considerate, warmhearted
		Rigid - still, unchanging, inflexible
		Impatient - excitable, unable to wait
		Sympathetic - comforting, understanding
		Reserved - restrained, self-controlled, shy
		Adventuresome - daring, willing to take chances
		Uncaring - lacking in warmth or sympathy
		Quiet - still, silent, not talkative
		Sarcastic - joking in a biting or cynical way
		Concerned - aware, caring, interested
		Distant - remote, inaccessible, removed
		Competitive - seeking to win, ambitious, achieving
		Apologetic - sorry, regretful, makes excuses
		Outgoing - sociable, friendly
		Independent - self-reliant, autonomous
		Sensitive - perceptive, touchy, nervous
		Meek - humble, submissive, patient
		Meticulous - extremely careful, scrupulous
		Suspicious - doubtful, distrust, uncertainty
		Fun-loving - playful, carefree, spontaneous
		Help-seeking - looking for assistance or comfort
		Charitable - generous, kind, giving
		Neighborly - friendly, amicable, familiar
		Achieving - accomplishing, persevering, striving
		Approval-seeking - wanting acceptance and praise
		Self-blaming - guilt, fault finding
		Precise - clearly defined, exact
		Guarded - kept safe, protected, watched over
		Carefree - free of worry or responsibilities
		Dependent - needing aid or assistance
		Comforting - soothing, relieved, consoling

MIND PROBER

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

Agree	Disagree	
		Affiliative - associated, connected
		Ambitious - enterprising, striving, eager
		Status-conscious - attentive to position and wealth
		Humble - reserved, self-conscious, modest
		Accurate - correct, clear-cut, beyond doubt
		Defensive - protective, shielded, careful
		Joking - witty, wisecracking, jesting
		Defenseless - unguarded, unprotected, needing shelter
		Consoling - solace, to cheer up
		Hospitable - welcoming, warm, receptive
		Goal-oriented - seeking success and achievement
		Seeks Attention - wanting to be noticed
		Obedient - compliant, amenable, dutiful
		Responsible - accountable, trustworthy
		Wary - cautious, watchful, on guard
		Playful - implish, mischievous, frivolous
		Trusting - confident, committed
		Protective - defended, guarded, careful
		Loyal - steadfast, faithful, devoted
		Striving - contending, exerting effort
		Seeks Recognition - wanting to be praised
		Yielding - deferring, relenting, gives in
		Tidy - neat, orderly, clean
		Secretive - covert, underhanded, concealed
		Pleasure-seeking - seeking gratification or delight
		Insecure - inadequate, unsure, shaky
		Nurturing - nourishing, supporting, fostering
		Individualistic - one-of-a-kind, independent
		Accomplishing - successful, to bring to completion
		Socially Striving - seeking respectability

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

Suggestions on Selling to Design/Build Clients

During a seminar several years ago Dr. Harvey Thomas, a behavioral psychologist, outlined several suggestions as to how the designer/builder could best cope with customer motivation and pricing problems. The words of advice from Dr. Thomas are excellent, and are reproduced below for consideration in generic (G) construction sales situations where motivation and pricing are potential problems.

To Increase Customer Motivation:

1. Give the prospect or customer a role to play.
2. Make intangible benefits you are offering, real.
3. Eliminate or minimize distractions to your discussions.
4. Emphasize the advantages of what you are offering.
5. Allow catharsis of the prospect or customer's fears.
6. Stimulate the prospect or customer's discontent with anything less than what you are offering.

To Deal with Pricing Problems:

1. Investigate possible smokescreens.
2. Use sandwich technique (i.e. advantages vs. disadvantages)
3. Broaden the customer's perspective to all advantages of your suggestions.
4. Match his or her needs against your offering and its advantages.
5. Examine costs - item by item. Don't hesitate to show your pricing work sheets.
6. Don't negotiate on the basis of generosity.
7. Create favorable illusions (i.e., give the prospect or customer a throwaway if appropriate).
8. Give the prospect or customer a less attractive choice.
9. Overstate the prospect or customer's objections.
10. Explore the cost of a bad decision or no decision.

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

Each point above should be examined and reviewed in detail. As quick reminders, they serve to emphasize the need to always be aware of what it is your prospects and customers require. Make sure you understand what motivates them; then always indicate and convey your desire to work with them to achieve the things that can be best obtained from you and you alone.