Project Controls for Optimal Execution

Scheduling Techniques to Optimize Execution

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Scheduling & Information Services, Inc.

www.1sis.com

Agenda

- Scheduling Practices and Project Success
- Schedule Development
- Schedule Risk Analysis
- Project Execution
- Capturing Delays and Impacts~

Scheduling Practices and Project Success

- Dr. Andrew F. Griffith, PE
  - Hypothesis:
    - There is a positive and significant relationship between scheduling practices used early in the project life-cycle and the ultimate success of the project.
  - Independent Project Analysis, Inc. based study
    - 494 completed major industrial capital projects (72% from North America, 58% petro-chemical)
    - Projects authorized from 1993 to 2003 (Median Q3 2000)
    - Average cost of $24MM, median $4.3MM, range $100k to $934MM
    - 59 different owner organizations~

Scheduling Practices and Project Success

- Methodology:
  - IPA project data collected at project authorization and project completion
  - Measures of project success:
    - Absolute cost performance relative to the industry benchmark for comparable projects (Cost Index)
    - Absolute execution schedule performance relative to the industry benchmark for comparable projects (Schedule Index)
    - Cost growth relative to the estimated cost at the time of project execution, and
    - Schedule slip relative to the planned project finish date set at the time of authorization~

Scheduling Practices and Project Success

- At the time of authorization, successful projects had the following schedule characteristics:
  - Integration of all project phases into a single schedule
    - Definition / FEL, Detail Design, Procurement, Construction and Startup
  - Application of Critical Path Method (CPM)
  - Resource loading of the project schedule, and
  - Detailed review of the schedule by the core project team~

Scheduling Practices and Project Success

Outcome Metric	Projects with Integrated Schedules	Projects without Integrated schedules
Absolute Cost Index Project Cost / Industry Avg.	0.96	1.02
Percent Schedule Slip	8%	26%

Scheduling Practices and Project Success

Outcome Metric	Projects that applied CPM	Projects that did not apply CPM
Absolute Cost Index	0.97	1.02
Percent Cost Growth	0%	6%
Percent Schedule Slip	14%	26%

Scheduling Practices and Project Success

Outcome Metric	Resource Loaded Schedules	Non Resource Loaded schedules
Absolute Cost Index	0.95	1.02
Percent Schedule Slip	9%	19%

Scheduling Practices and Project Success

Outcome Metric	Projects that did Core Team reviews	Projects that did not do Core Team reviews
Percent Cost Growth	0%	11%

Scheduling Practices and Project Success

- Project Definition Rating:
  - No schedule – 3% (15 projects)
  - Milestone schedule – 55% (272 projects)
  - CPM Network schedule – 29% (143 projects)
  - CPM Network with resource loading – 13% (64 projects)~

Scheduling Practices and Project Success

Outcome Metric	Resource Loaded CPM	CPM	Milestone
Absolute Cost Index	0.95	0.98	1.03
Percent Cost Growth	-1%	2%	5%
Absolute Schedule Performance	0.91	0.97	1.04
Percent Schedule Slip	2%	19%	25%

Scheduling Practices and Project Success

- Summary of Dr. Griffith's findings:
  - Fully Integrated schedule
  - Use Critical Path Method (CPM)
  - Resource load the schedule
  - Early detailed review of the schedule by the core project team~

Scheduling Practices and Project Success

- Projects with the highest level of schedule definition at authorization had on average:
  - 8% lower cost
  - 13% faster schedules
- They were more predictable:
  - 6% less cost growth
  - 23% less schedule slip~

Schedule Development

- Project Schedule Structure
  - Contractual Language
  - Clear DOR
  - WBS
    - Easily understood
    - Supports the major phases of the project
    - Supports the major components of the project
  - Coding
    - Responsibility
    - Phase
    - Area (physical or administrative area)
    - Activity ID structure
  - Calendars~

Schedule Development

- Master Project/Subproject structure
  - Time and cost savings
    - Dates are synchronized between schedules
    - Information updated one time only
    - Concurrent updating of schedules
  - Ability to link between projects
    - Schedules stay synchronized even when checked out
    - Links between projects are maintained at the master schedule level
    - Activity coding dictionaries, layouts, and filters are synchronized
  - Ability to "check out and check in" a project to individual companies for their updating.
    - Ability to do schedule comparisons both at the master project and sub project levels~

Schedule Development

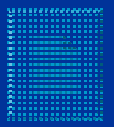
- Master Project/Subproject structure
  - Subprojects are useable during the month without effecting the master schedule.
    - 3 week look ahead
    - "what if" analysis
  - Subprojects can be transmitted as legal documents
  - Security
    - Each entity has access to only their subproject.
    - Subprojects do not have access to activities in the master other than viewing linked activities.
    - Data dictionary structure is controlled at the master level~

Schedule Development

- Standards/ Definitions /Conventions
  - Activities
    - Criteria (scope, duration)
    - Descriptions: Verb, Noun, Location
    - Understandable when taken out of context
  - Resources
    - Major disciplines (electricians, welders, ironworkers…)
    - Major Equipment~

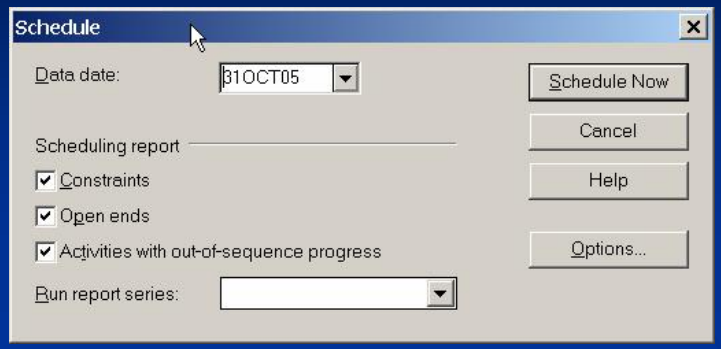
Schedule Development

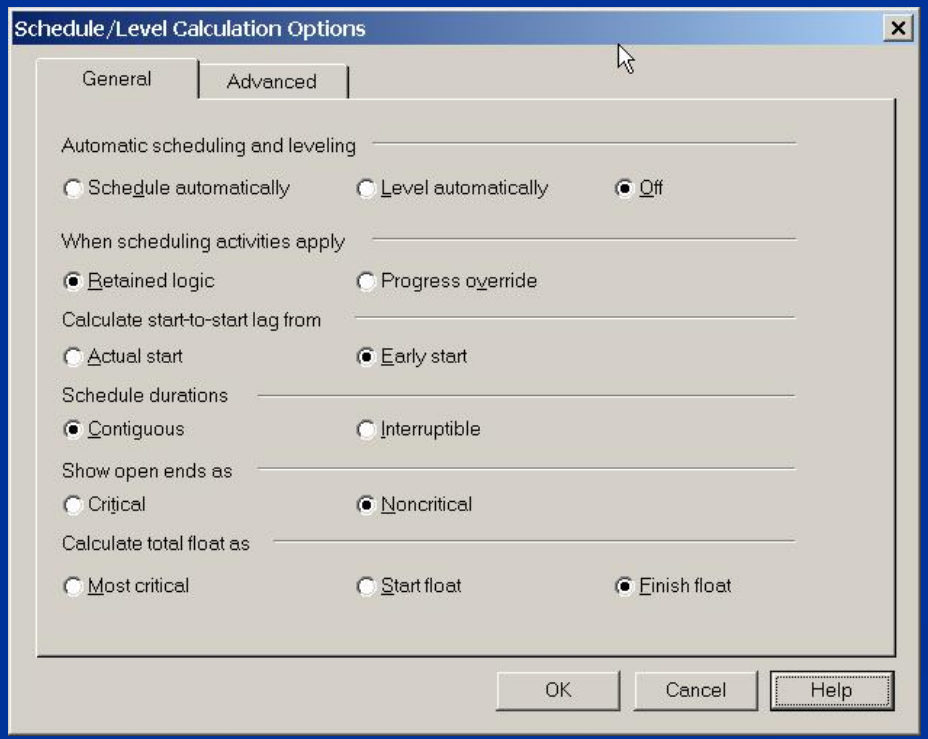
- Standards / Definitions / Conventions
  - Numbering scheme and format for:
    - Filters
    - Layouts
    - Reports
  - Conventions for Adding Activities
  - Master Project / Subproject Check In / Out Process
  - Updating Cycle / Process
  - Target Schedules
  - Reproducible from week to week
  - Provides appropriate information for each entity:
    - Owner
    - Engineer / Architect
    - Contractor
    - Subcontractor~

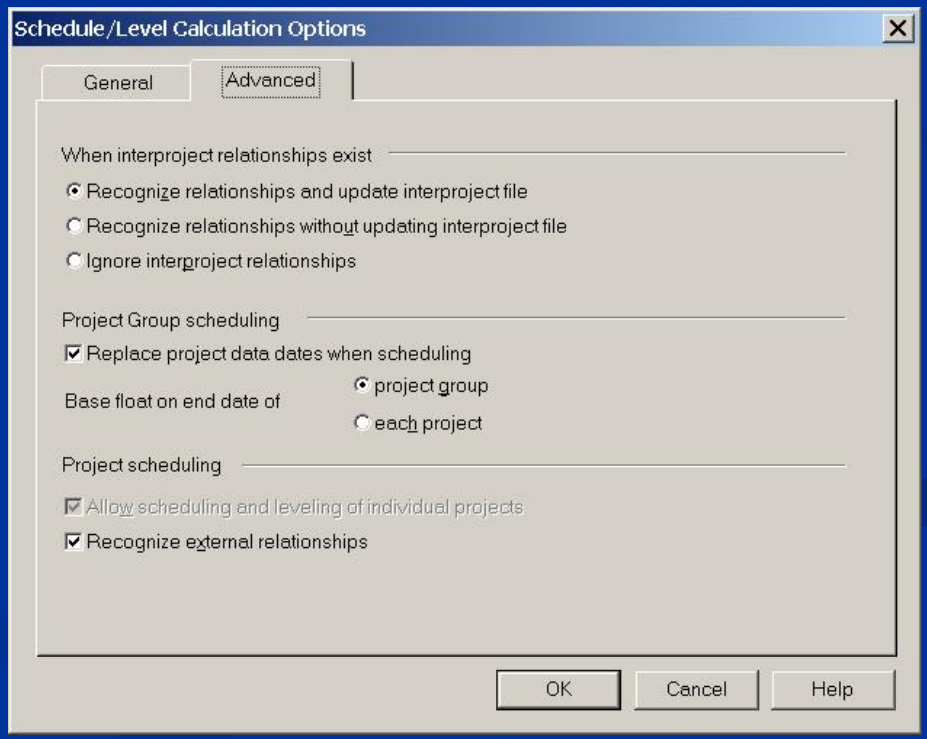


Schedule Development

- Software Configuration
  - Schedule calculations

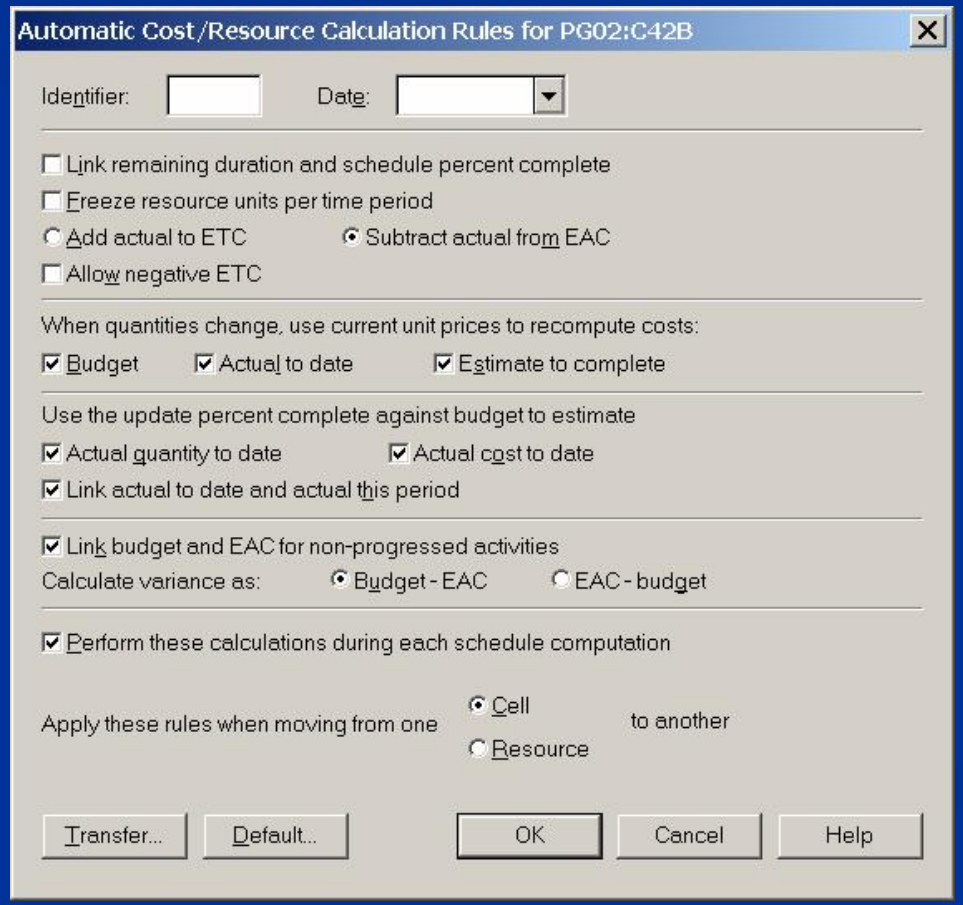






Schedule Development

- Software Configuration
  - Resource/Cost



Schedule Development

- Schedule Integrity
  - QA steps
    - Close open ends
    - Remove Mandatory and Start/Finish On constraints
    - Justify every constraint used
    - Verify contractual Milestones / Dates are entered
    - Balance resource loading to the estimate
    - Review Float
      - Low Float
      - High Float
    - “Test” the schedule~

Schedule Development

- Schedule Integrity Check
  - Schedule reports:
    - P3 
    - Suretrak 

Schedule Development

- PertMaster “Sanity Check” reports

Sanity Check Report

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Project Title	CSI
Project Name	D:\0SIS\CSI\BASE.pln

Sanity Report Summary

A breakdown of the problems encountered in the project.

Section	Number of Problems
Constraints	No problems found.
Open-ended Tasks (start and finish tasks)	1
Out of sequence updates (broken logic)	No problems found.
Links with lags longer than 0 units	18
Negative lags	4
Positive lags on Finish to Start links	14
Start To Finish links	No problems found.
Lags between tasks with different calendars	No problems found.
FF to a Milestone	No problems found.
SS from a Milestone	No problems found.
Start Milestones driving Summary completion date	No problems found.
Links To/From Summary Tasks	No problems found.

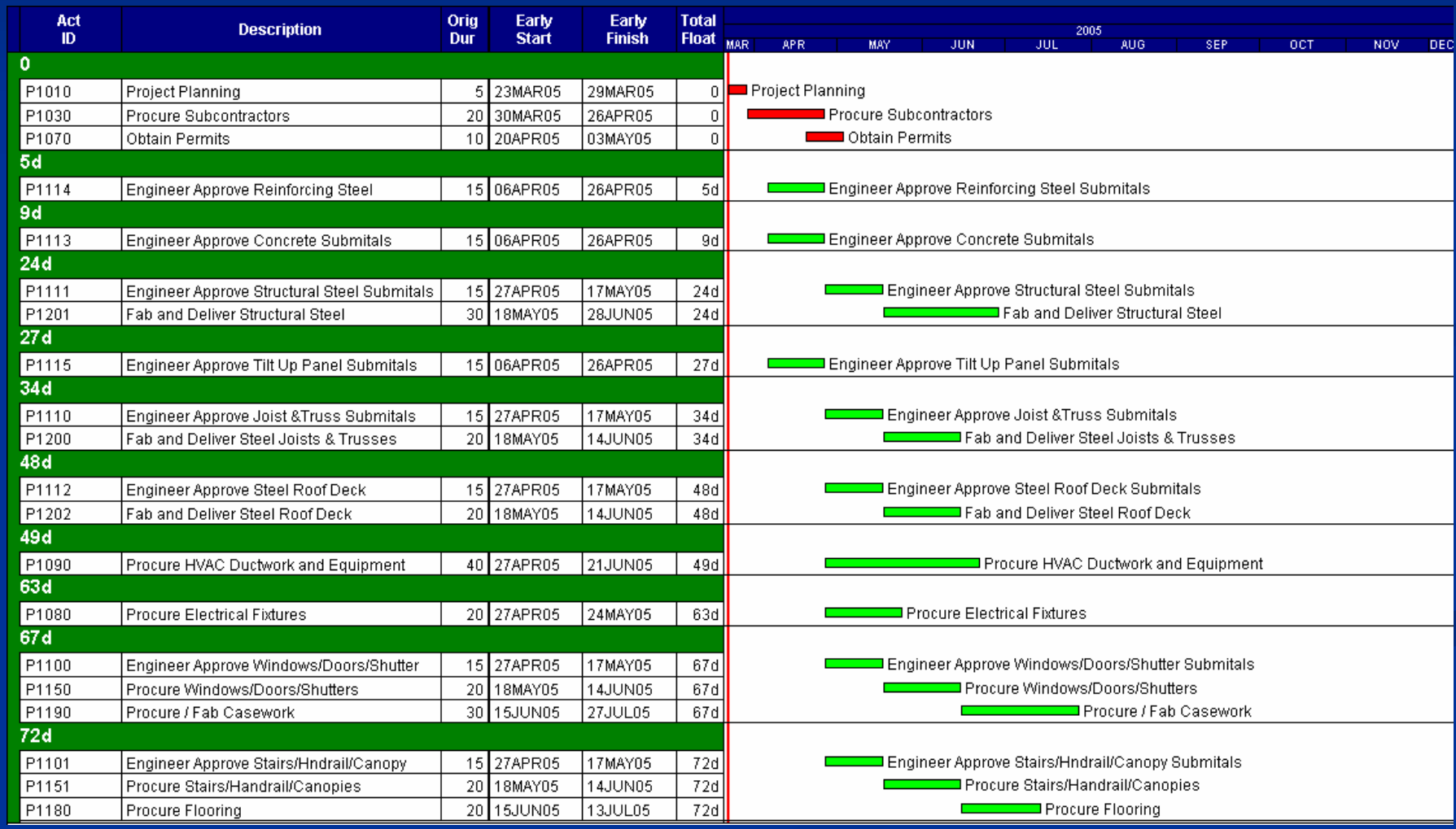
Schedule Development

- Constraint documentation

Act ID	Activity Description	Constraint Start Type	Constraint Start	Constraint Finish Type	Constraint Finish	Constraint Record
Rawson Builders Supply Exterior Glass						
0432	Install Wood Doors and Hardware FL1_VEH	No-earlier-than	11/21/05			Resources not available
0431	Install Wood Doors and Hardware FL1A	No-earlier-than	11/21/05			Resources not available
0430	Install Wood Doors and Hardware FL1B	No-earlier-than	11/21/05			Resources not available
0429	Install Wood Doors and Hardware FL1C	No-earlier-than	11/21/05			Resources not available
0428	Install Wood Doors and Hardware FL1D	No-earlier-than	11/21/05			Resources not available
0427	Install Wood Doors and Hardware FL1E	No-earlier-than	11/21/05			Resources not available
0426	Install Wood Doors and Hardware FL1F	No-earlier-than	11/21/05			Resources not available
Thyssen Krupp Elevator						
0535	Receive Elevators on site			No-earlier-than	11/07/05	5 Days aftr Vendor Ship

Schedule Development

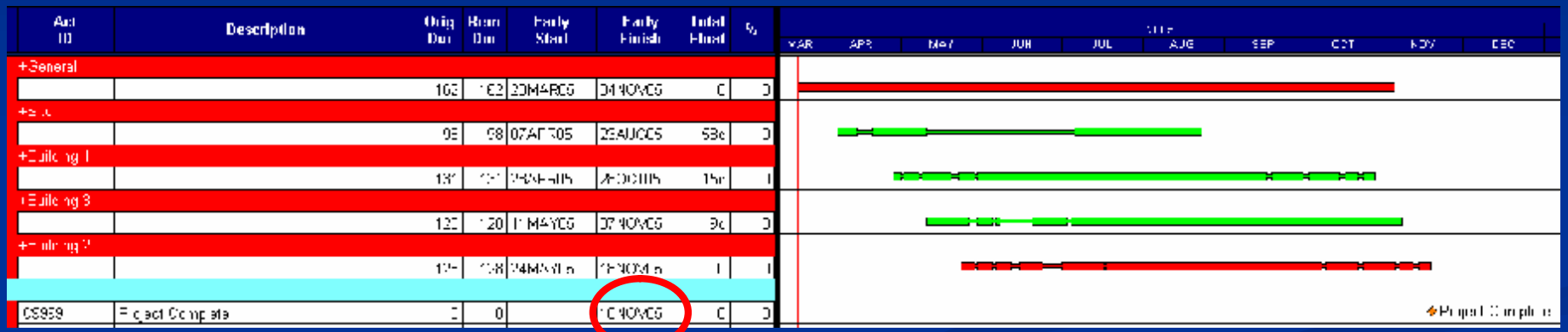
- Float Review



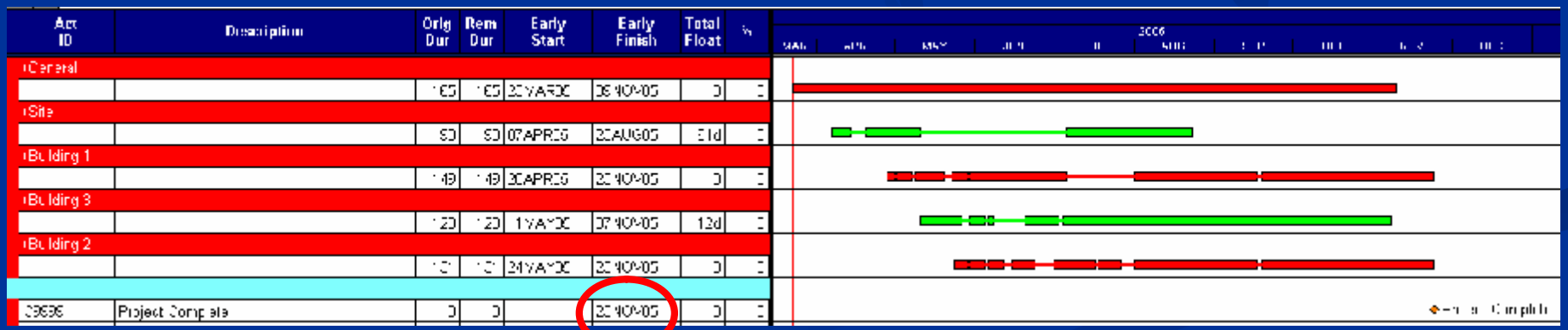
Act ID	Description	Orig Dur	Early Start	Early Finish	Total Float
0					
P1010	Project Planning	5	23MAR05	29MAR05	0
P1030	Procure Subcontractors	20	30MAR05	26APR05	0
P1070	Obtain Permits	10	20APR05	03MAY05	0
5d					
P1114	Engineer Approve Reinforcing Steel	15	06APR05	26APR05	5d
9d					
P1113	Engineer Approve Concrete Submitals	15	06APR05	26APR05	9d
24d					
P1111	Engineer Approve Structural Steel Submitals	15	27APR05	17MAY05	24d
P1201	Fab and Deliver Structural Steel	30	18MAY05	28JUN05	24d
27d					
P1115	Engineer Approve Tilt Up Panel Submitals	15	06APR05	26APR05	27d
34d					
P1110	Engineer Approve Joist &Truss Submitals	15	27APR05	17MAY05	34d
P1200	Fab and Deliver Steel Joists & Trusses	20	18MAY05	14JUN05	34d
48d					
P1112	Engineer Approve Steel Roof Deck	15	27APR05	17MAY05	48d
P1202	Fab and Deliver Steel Roof Deck	20	18MAY05	14JUN05	48d
49d					
P1090	Procure HVAC Ductwork and Equipment	40	27APR05	21JUN05	49d
63d					
P1080	Procure Electrical Fixtures	20	27APR05	24MAY05	63d
67d					
P1100	Engineer Approve Windows/Doors/Shutter	15	27APR05	17MAY05	67d
P1150	Procure Windows/Doors/Shutters	20	18MAY05	14JUN05	67d
P1190	Procure / Fab Casework	30	15JUN05	27JUL05	67d
72d					
P1101	Engineer Approve Stairs/Hndrail/Canopy	15	27APR05	17MAY05	72d
P1151	Procure Stairs/Handrail/Canopies	20	18MAY05	14JUN05	72d
P1180	Procure Flooring	20	15JUN05	13JUL05	72d

Schedule Development

- Schedule Testing



Act ID	Description	Orig Dur	Rem Dur	Early Start	Early Finish	Total Float	%
+General							
		163	162	20MAR06	04NOV06	0	0
+Site							
		95	98	07APR05	23AUG05	53d	0
+Building 1							
		137	137	28APR05	26OCT05	15d	1
+Building 3							
		122	120	1MAY06	27NOV06	9d	0
+Building 2							
		124	128	24MAY06	29NOV06	1	1
03959	Project Complete	0	0		04NOV06	0	0



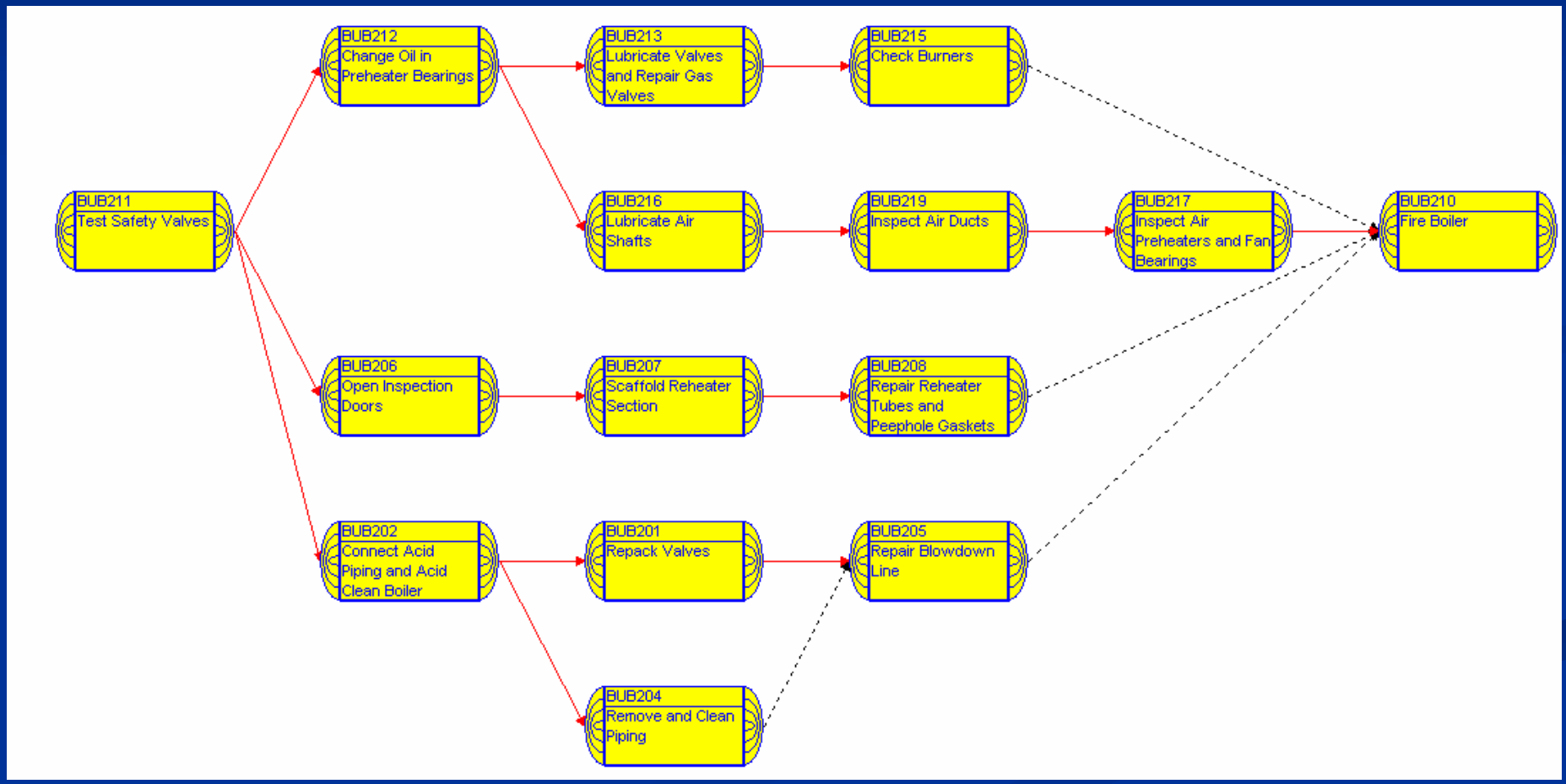
Act ID	Description	Orig Dur	Rem Dur	Early Start	Early Finish	Total Float	%
+General							
		165	165	20MAR06	30NOV06	0	0
+Site							
		93	93	07APR05	23AUG05	51d	0
+Building 1							
		149	149	28APR05	26OCT06	0	0
+Building 3							
		120	120	1MAY06	27NOV06	12d	0
+Building 2							
		131	131	24MAY06	29NOV06	0	0
03936	Project Complete	0	0		29NOV06	0	0

Schedule Development

- Schedule Integrity
  - Review cycle
    - Scheduler's Peer Review
    - Project Manager / Superintendent
    - Core Team (Stakeholders)
  - First Iteration
    - Hard Logic – Focus on what's physically possible
    - No resource leveling or soft logic
  - Second Iteration
    - Soft or Preferential Logic added
    - Resources leveled~

Schedule Development

- Logic Review



Risk Analysis

- Some of Pertmaster's Features
  - Risk Analysis
    - Monte Carlo Simulation
  - Cost Analysis and Cost Risks
  - Individual Task Analysis and Entire Project Analysis
  - Tornado Graphs
  - Probabilistic Branching / Task Exists?
  - Resource Risk
  - Schedule Comparisons
  - Network Diagrams / PERT
- Pertmaster: www.pertmaster.com ~

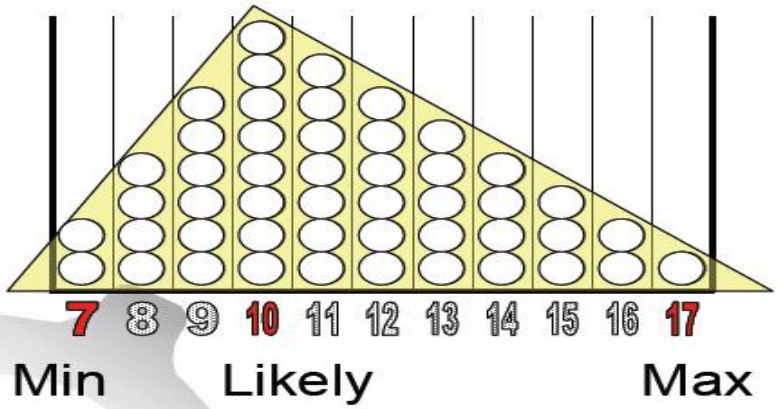
Risk Analysis

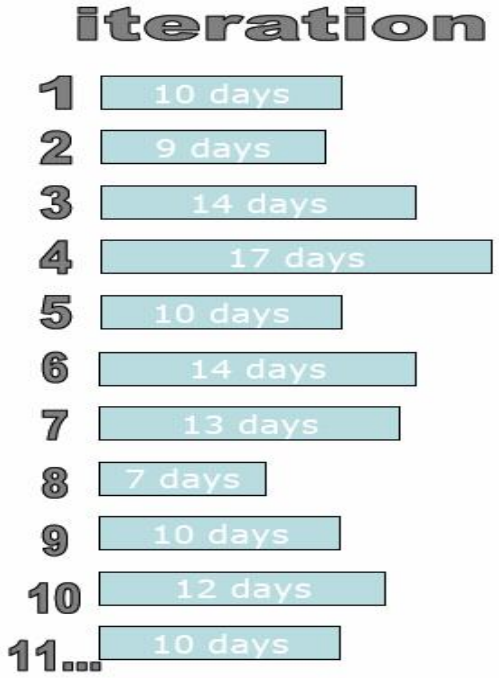
- Single Path (CPM) vs. Monte Carlo technique
  - 3 Durations (min, most likely ,max) using a Triangular Distribution
  - Each iteration has it's own critical path (1000 iterations)
  - CPM - **Does not take uncertainty into account**
  - Traditional CPM shows only 1 critical path
- Distribution graph presents likelihood of finish dates~

Risk Analysis

How Does Monte-Carlo Simulation Work?

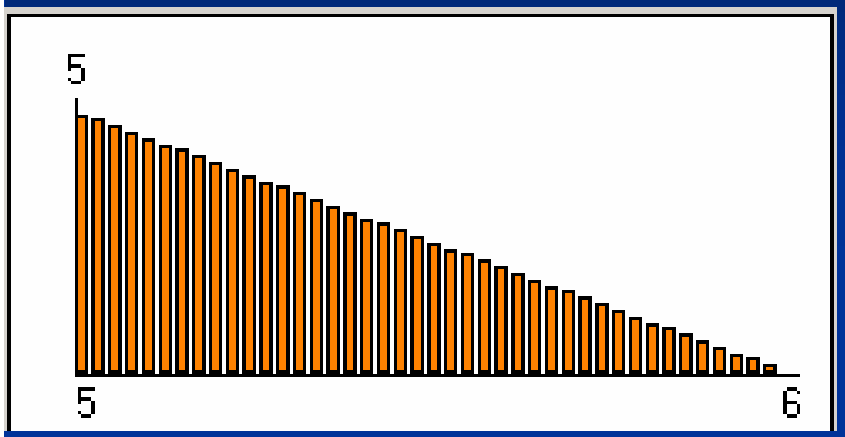
- One ball is selected for each iteration.
- Constrained by envelope
- Multiple iterations

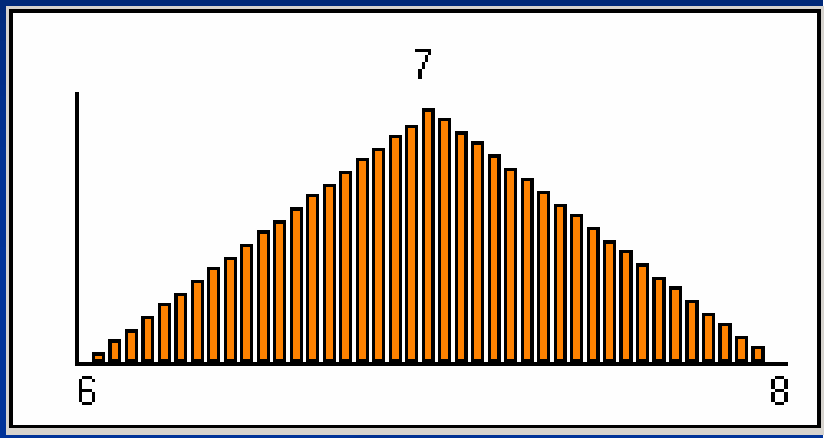


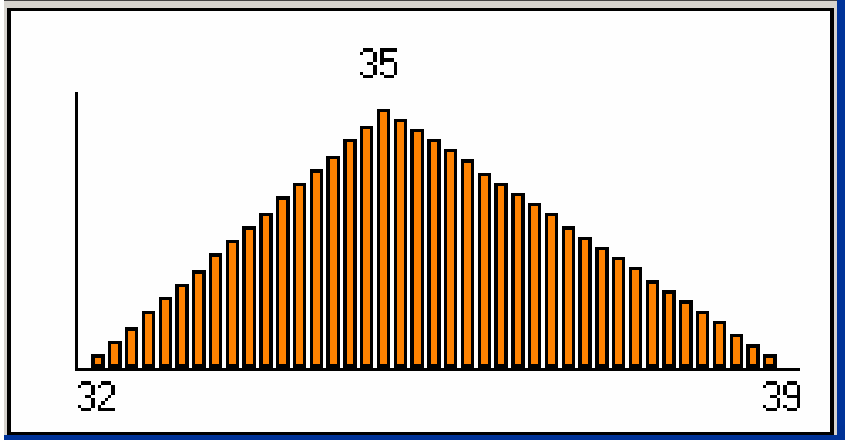


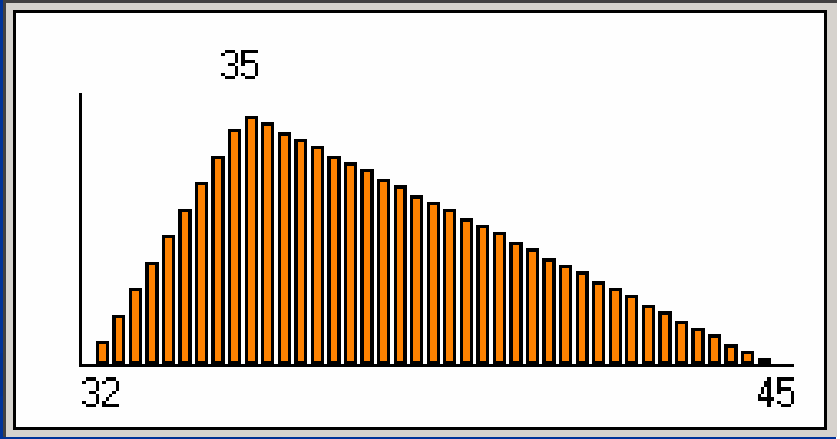
PertMaster
Project Analytics

Distribution Triangle for Individual Activities

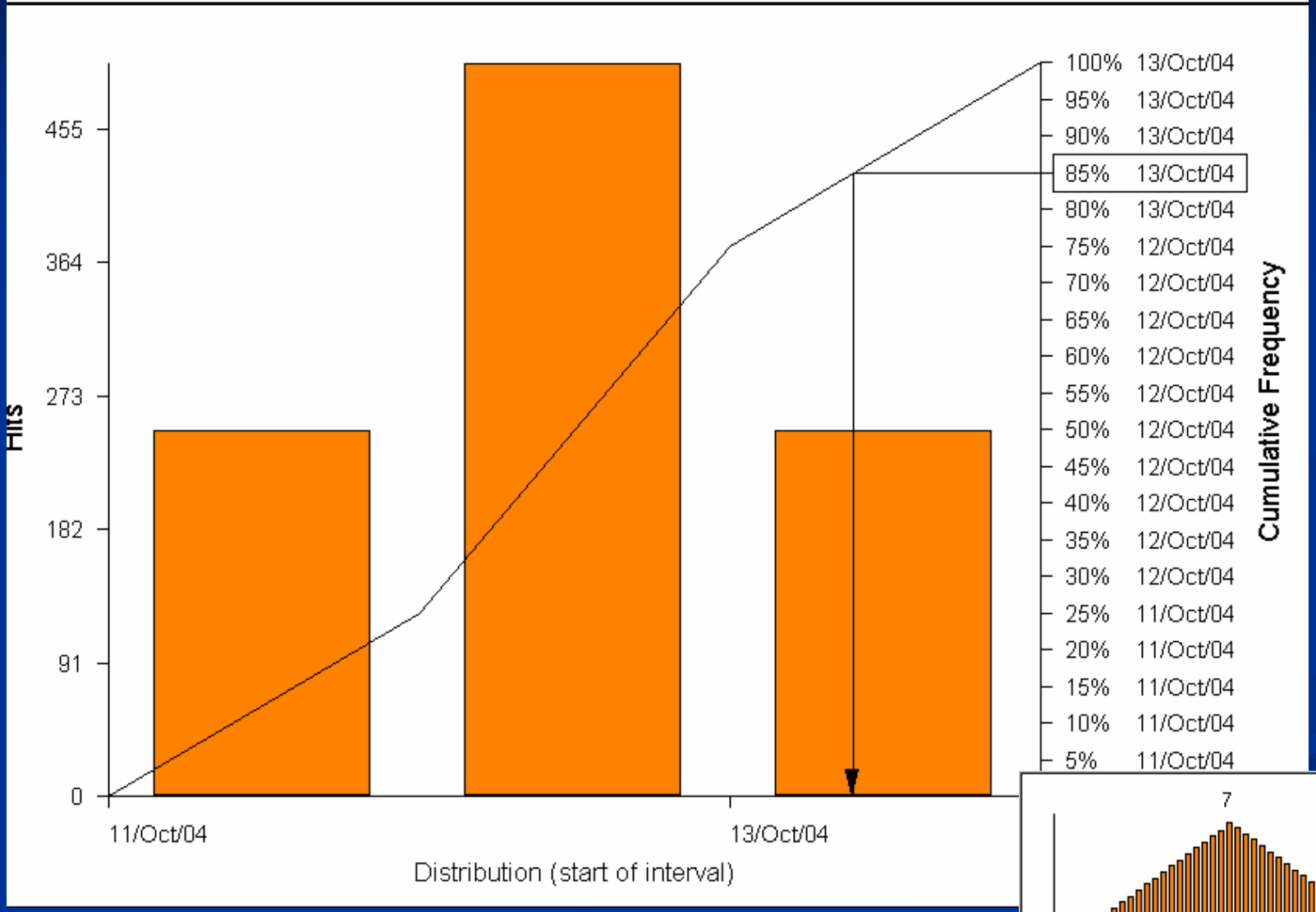






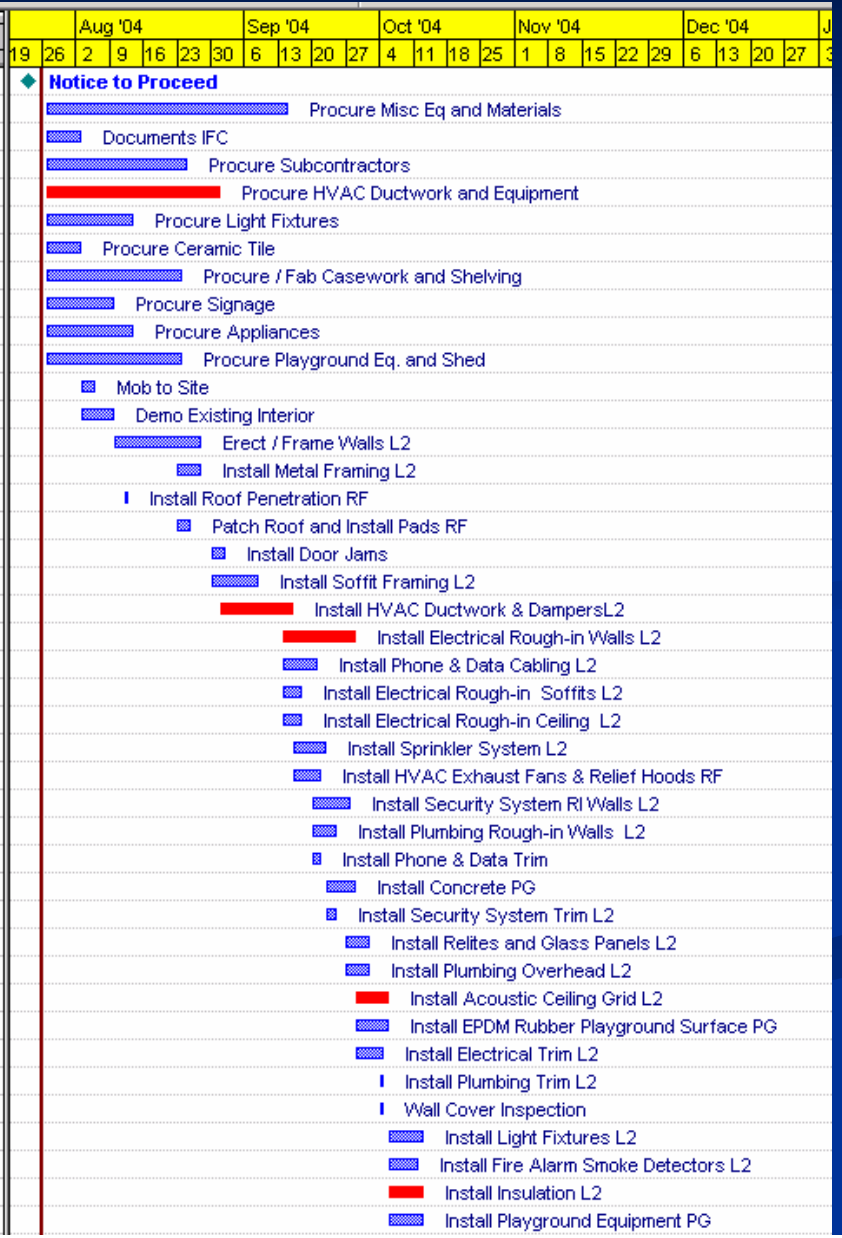


Distribution Triangle for Individual Activities



Baseline Schedule in Pertmaster

Name	Description	Rem Duration	Min Dur	Likely Dur	Max Dur	Duration Function
1000	**Notice to Proceed**	**0**				
1030	Procure Misc Eq and Materials	35	32	35	39	Triangle(32,35,39)
1020	Documents IFC	5	5	5	6	Triangle(5,5,6)
1060	Procure Subcontractors	21	19	21	23	Triangle(19,21,23)
1110	Procure HVAC Ductwork and Equipment	26	23	26	29	Triangle(23,26,29)
1680	Procure Light Fixtures	14	13	14	15	Triangle(13,14,15)
1730	Procure Ceramic Tile	5	5	5	6	Triangle(5,5,6)
1750	Procure / Fab Casework and Shelving	20	18	20	22	Triangle(18,20,22)
1770	Procure Signage	10	9	10	11	Triangle(9,10,11)
1780	Procure Appliances	14	13	14	15	Triangle(13,14,15)
1790	Procure Playground Eq. and Shed	20	18	20	22	Triangle(18,20,22)
1040	Mob to Site	3	3	3	3	Triangle(3,3,3)
1050	Demo Existing Interior	5	5	5	6	Triangle(5,5,6)
1200	Erect / Frame Walls L2	14	13	14	15	Triangle(13,14,15)
1400	Install Metal Framing L2	5	5	5	6	Triangle(5,5,6)
1640	Install Roof Penetration RF	1	1	1	1	Triangle(1,1,1)
1650	Patch Roof and Install Pads RF	3	3	3	3	Triangle(3,3,3)
1530	Install Door Jams	3	3	3	3	Triangle(3,3,3)
1590	Install Soffit Framing L2	7	6	7	8	Triangle(6,7,8)
1220	Install HVAC Ductwork & DampersL2	10	9	10	11	Triangle(9,10,11)
1240	Install Electrical Rough-in Walls L2	11	10	11	12	Triangle(10,11,12)
1260	Install Phone & Data Cabling L2	5	5	5	6	Triangle(5,5,6)
1560	Install Electrical Rough-in Soffits L2	4	4	4	4	Triangle(4,4,4)
1570	Install Electrical Rough-in Ceiling L2	4	4	4	4	Triangle(4,4,4)
1300	Install Sprinkler System L2	5	5	5	6	Triangle(5,5,6)
1520	Install HVAC Exhaust Fans & Relief Hoods	4	4	4	4	Triangle(4,4,4)
1270	Install Security System Rl Walls L2	6	5	6	7	Triangle(5,6,7)
1280	Install Plumbing Rough-in Walls L2	5	5	5	6	Triangle(5,5,6)
1550	Install Phone & Data Trim	2	2	2	2	Triangle(2,2,2)
1500	Install Concrete PG	4	4	4	4	Triangle(4,4,4)
1540	Install Security System Trim L2	2	2	2	2	Triangle(2,2,2)
1330	Install Relites and Glass Panels L2	5	5	5	6	Triangle(5,5,6)
1600	Install Plumbing Overhead L2	5	5	5	6	Triangle(5,5,6)
1440	Install Acoustic Ceiling Grid L2	5	5	5	6	Triangle(5,5,6)
1510	Install EPDM Rubber Playground Surface F	5	5	5	6	Triangle(5,5,6)
1580	Install Electrical Trim L2	4	4	4	4	Triangle(4,4,4)
1610	Install Plumbing Trim L2	1	1	1	1	Triangle(1,1,1)
1120	Wall Cover Inspection	1	1	1	1	Triangle(1,1,1)
1250	Install Light Fixtures L2	5	5	5	6	Triangle(5,5,6)
1310	Install Fire Alarm Smoke Detectors L2	4	4	4	4	Triangle(4,4,4)
1320	Install Insulation L2	5	5	5	6	Triangle(5,5,6)
1480	Install Playground Equipment PG	5	5	5	6	Triangle(5,5,6)



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1110	Procure HVAC Ductwork and Equipment	26	23	26	29	Triangle(23,26,29)
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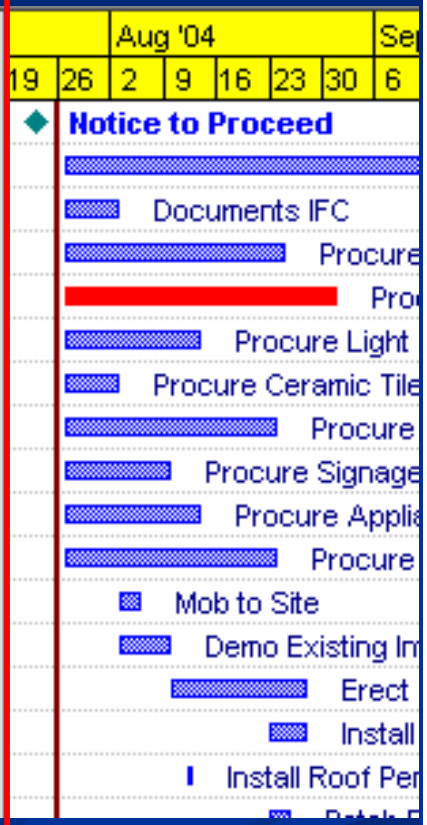
1640	Install Roof Penetration RF	1	1	1	1	Triangle(1,1,1)

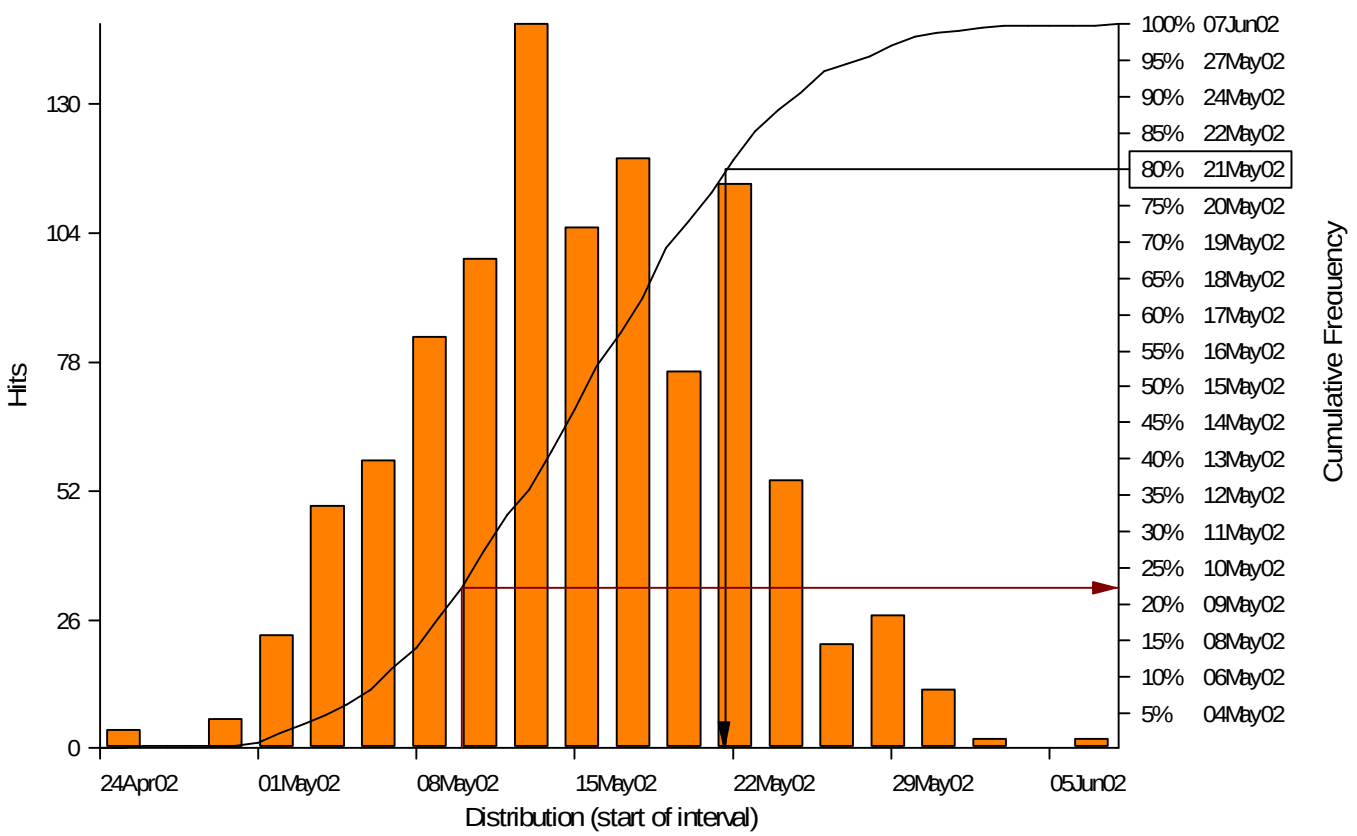


Min and Max are 10% of Most Likely or Original Duration

Finish Date Analysis

Risk Project

Entire Plan : Finish Date



Analysis

Simulation:	Latin Hypercube
Iterations:	1000

Convergence

Plan Finish Date:
Converged in 200 iterations
(variation < 1% over 100 iterations)
Total Plan Cost:
Converged in 200 iterations
(variation < 1% over 100 iterations)

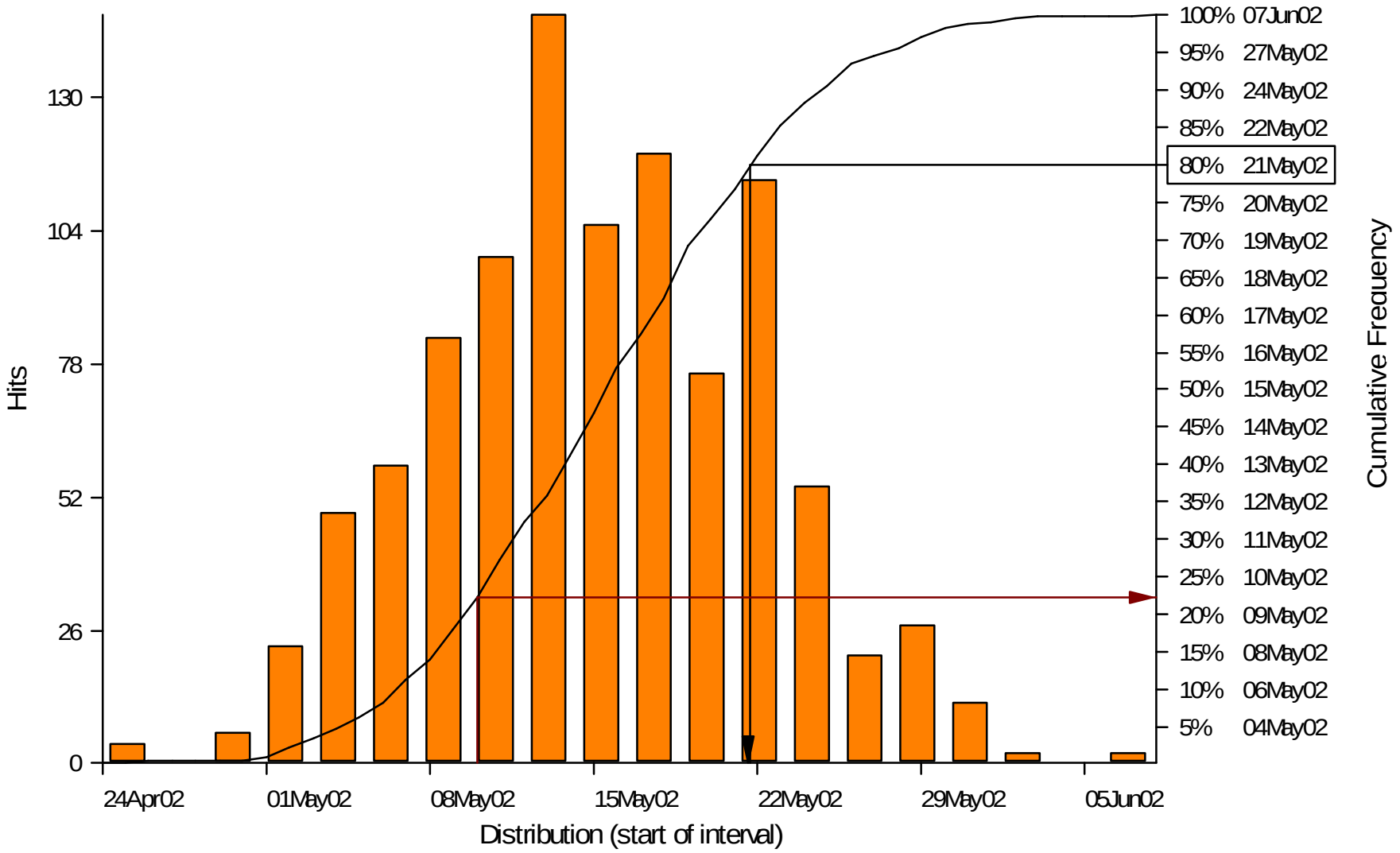
Statistics

Minimum:	24Apr02
Maximum:	07Jun02
Mean:	15May02
Median:	15May02
Mode:	12May02
Max Hits:	146
Std Deviation:	6.968
Variance:	48.55
Skewness:	0.056
Kurtosis:	2.752

Selected Confidence 80%:	21May02
Deterministic Finish:	09May02
Probability	22%

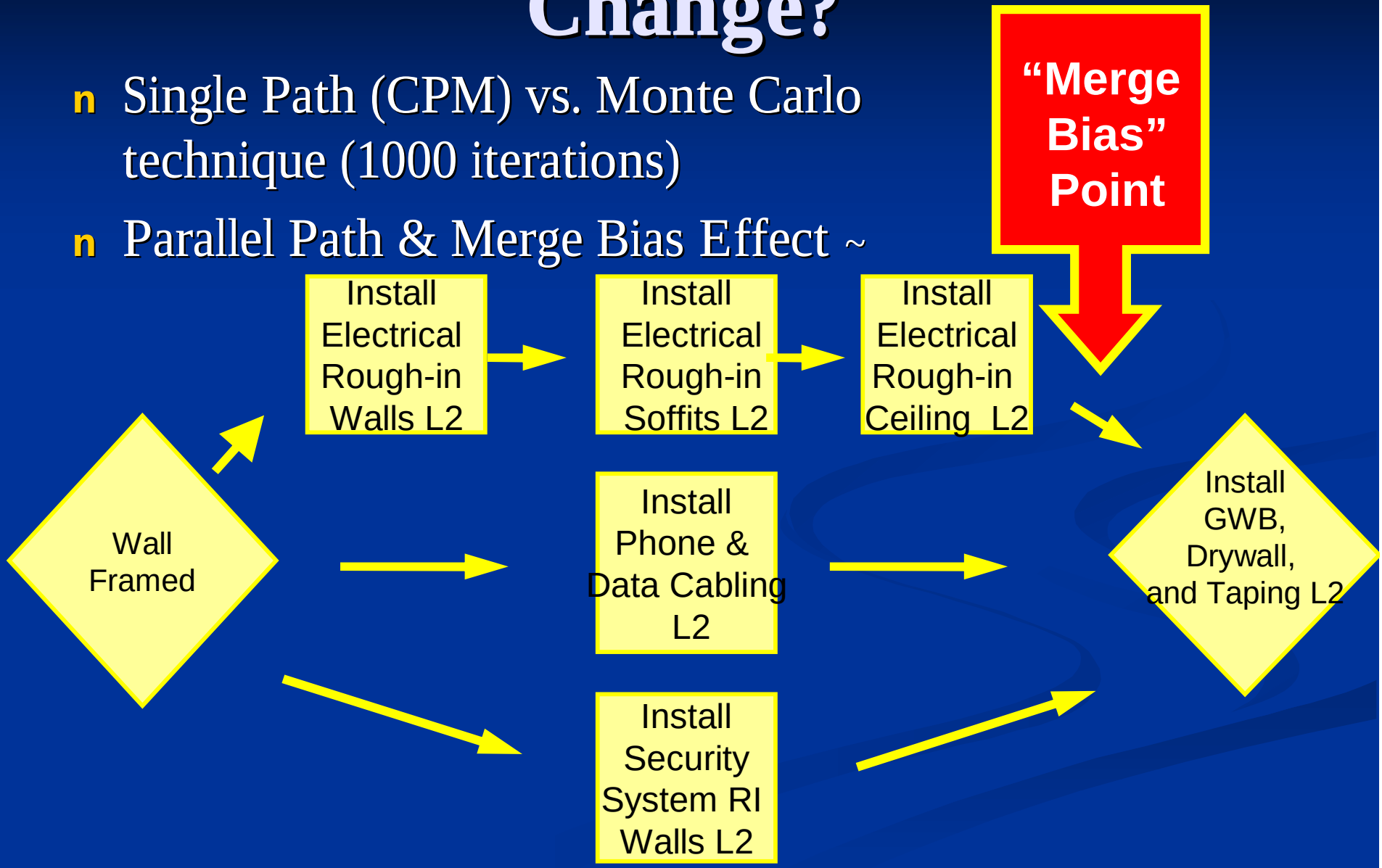
Risk Project

Entire Plan : Finish Date



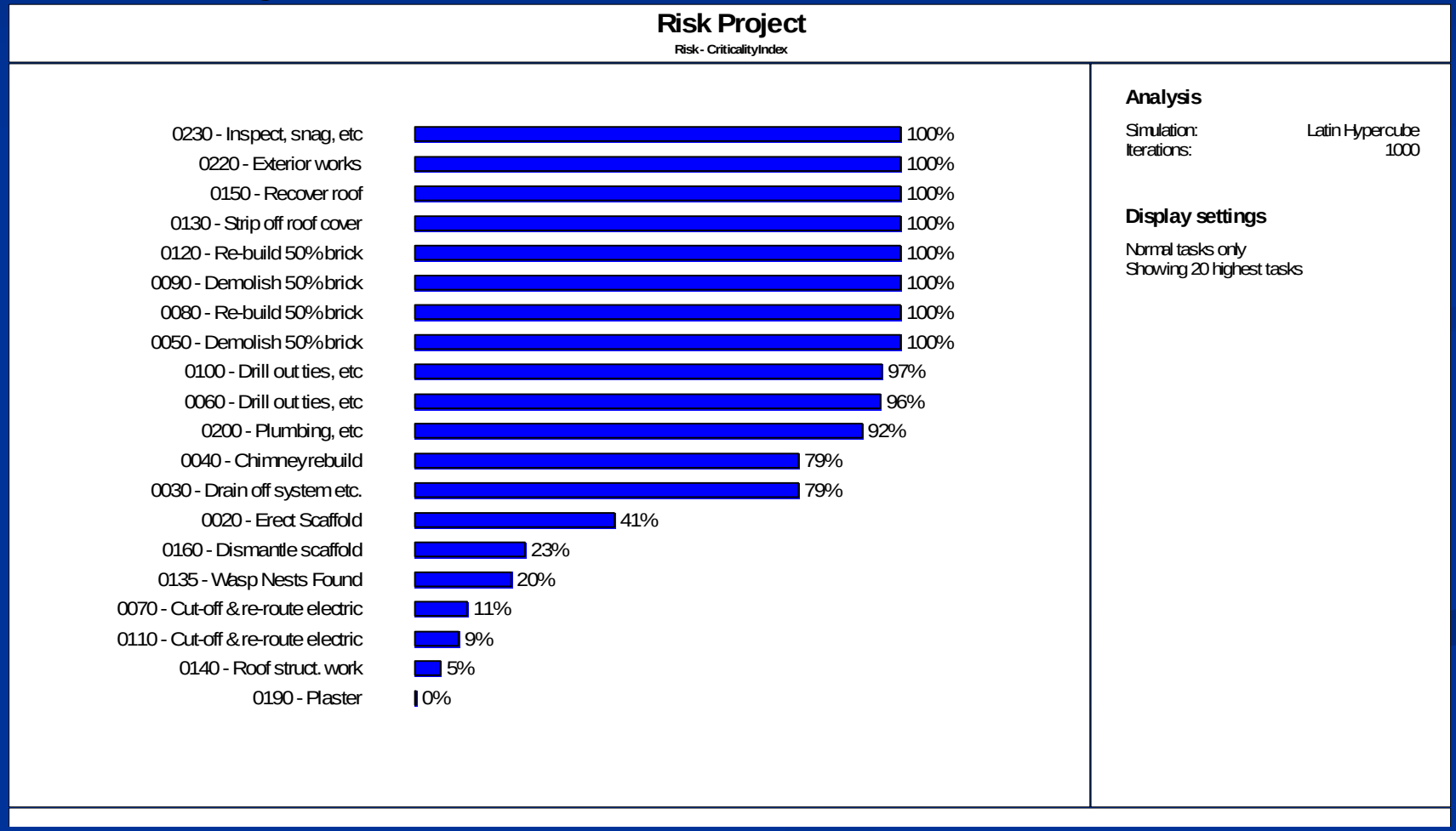
Why Did the Finish Date Change?

- Single Path (CPM) vs. Monte Carlo technique (1000 iterations)
- Parallel Path & Merge Bias Effect ~



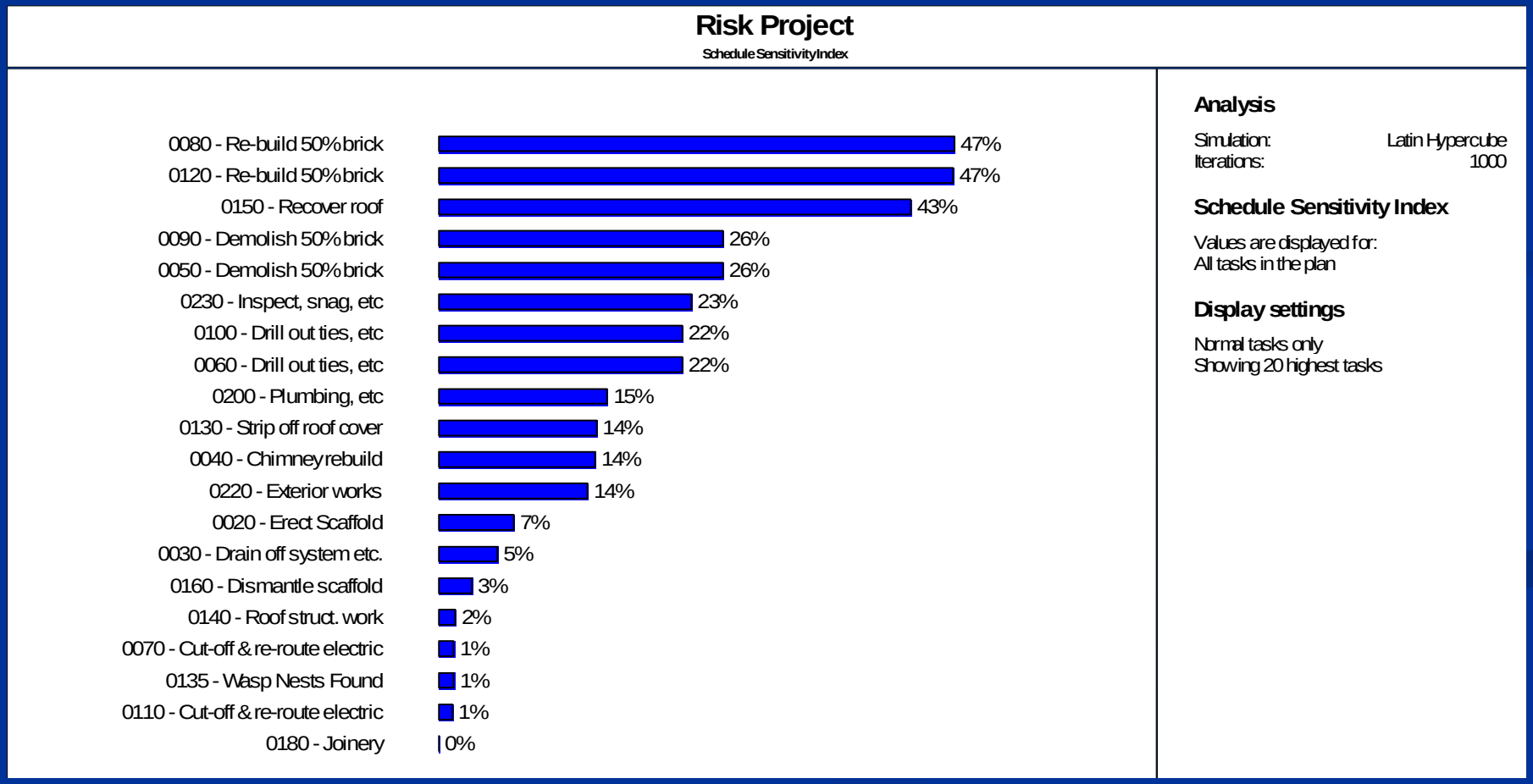
Tornado Graphs – Criticality Index

- During the risk analysis iterations, the number of times an activity was critical is recorded ~



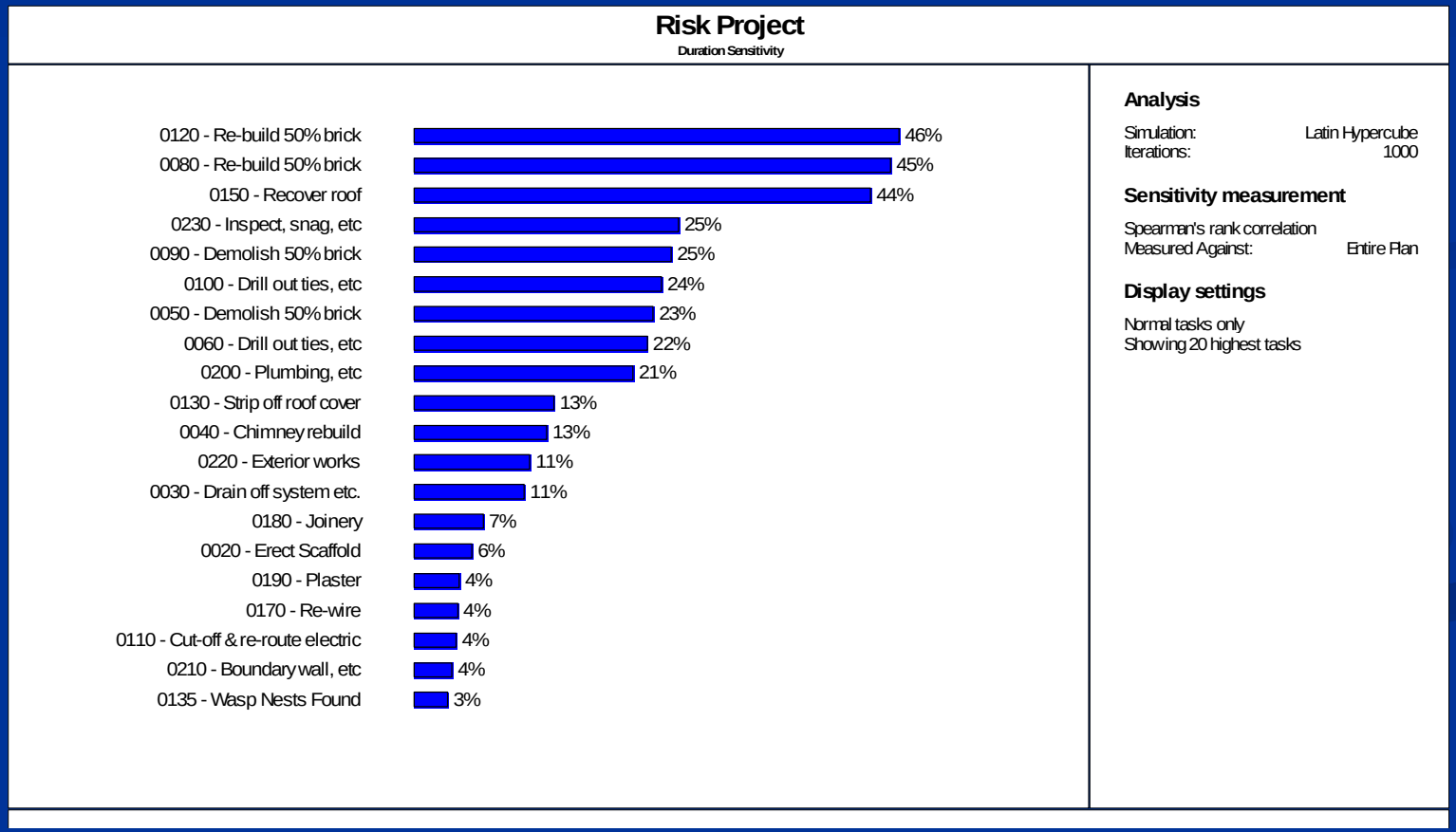
Schedule Sensitivity Index

- The SSI identifies and ranks the tasks most likely to influence the project duration / finish ~



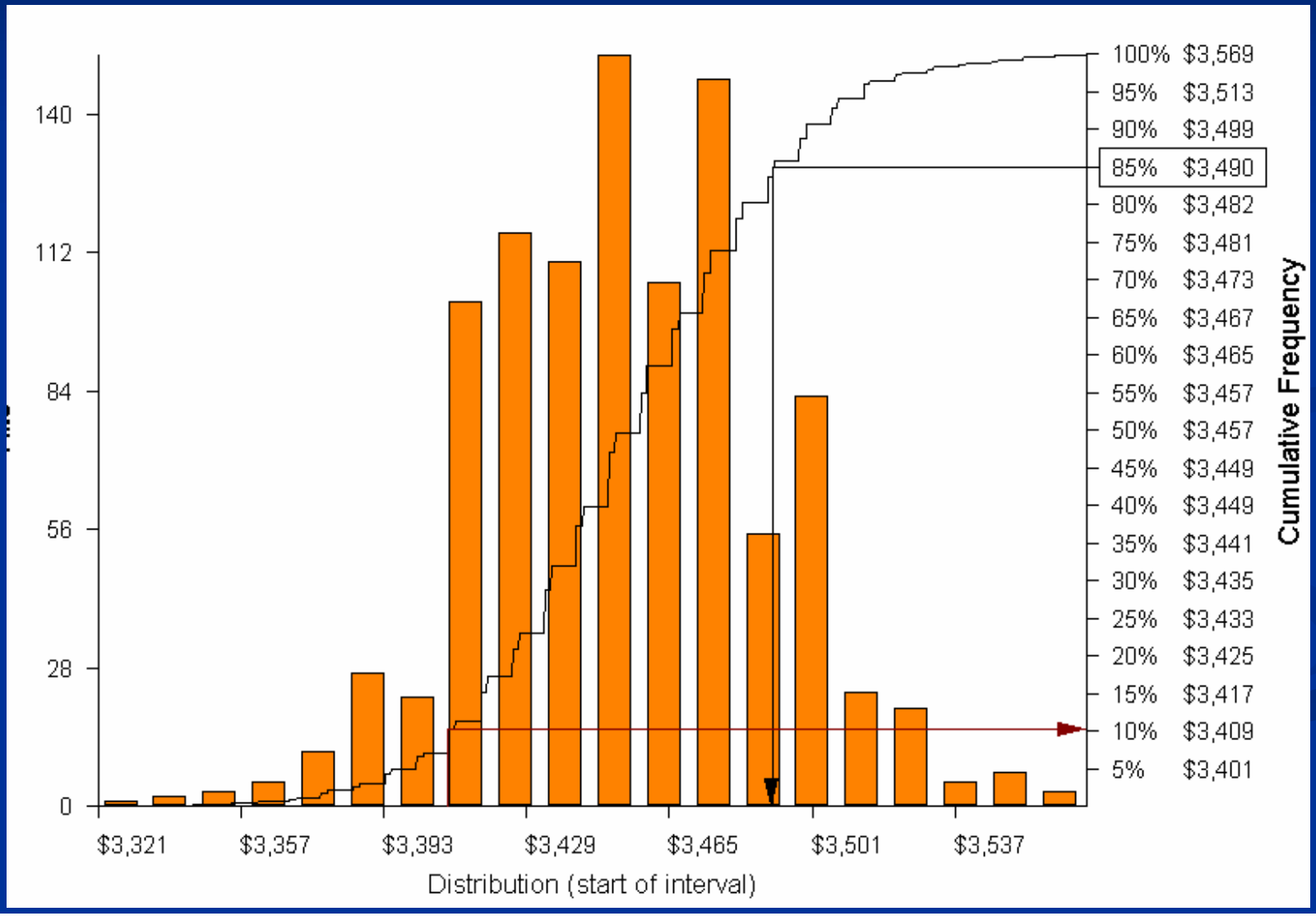
Duration Sensitivity

- Correlation between the duration of a task and the duration of the project.
- The task with the highest duration sensitivity is the task that is most likely to increase the project duration ~.



Cost Risk

- Can be view by activity or entire project ~



Project Execution

- What to do with all of the brightly colored wallpaper~

Project Execution

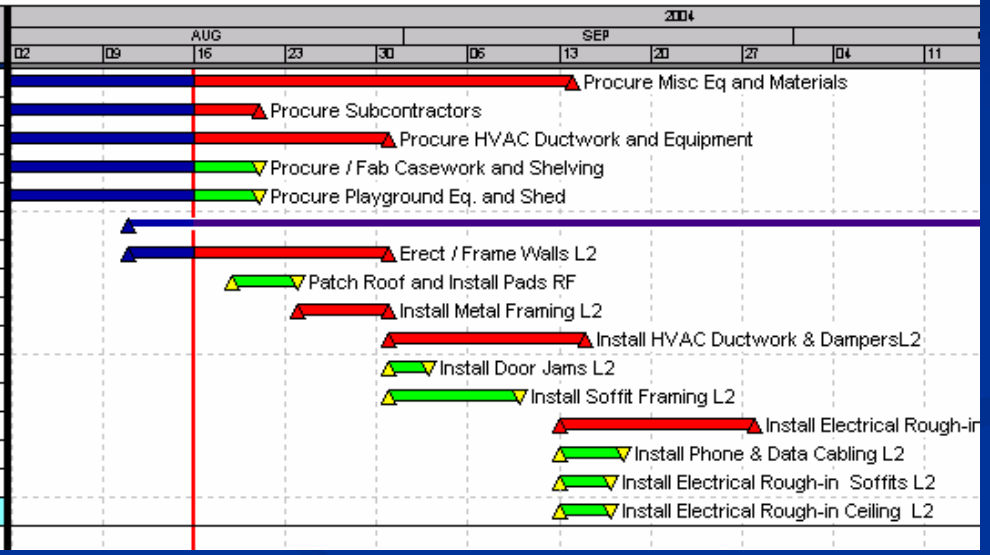
- Field use
  - Communication Tools
    - Short Interval Schedules
    - Discipline Reports
    - Critical Path
  - Planning Tools
    - Resource Histograms~

4 Week Schedule

Layout: ALL - All Activities No Sor | Filter: 4WK - Four week lookah | Lower views:

1570

Act ID	Activity Description	Original Duration	Percent Complete	Early Start
1030	Procure Misc Eq and Materials	35	60	26JUL04
1060	Procure Subcontractors	21	85	26JUL04
1110	Procure HVAC Ductwork and Equipment	26	40	26JUL04
1750	Procure / Fab Casework and Shelving	20	75	26JUL04
1790	Procure Playground Eq. and Shed	20	75	26JUL04
1070	Construction Hammock	76 *	4	11AUG04
1200	Erect / Frame Walls L2	14	45	11AUG04
1650	Patch Roof and Install Pads RF	3	0	19AUG04
1400	Install Metal Framing L2	5	0	24AUG04
1220	Install HVAC Ductwork & DampersL2	10	0	31AUG04
1530	Install Door Jams L2	3	0	31AUG04
1590	Install Soffit Framing L2	7	0	31AUG04
1240	Install Electrical Rough-in Walls L2	11	0	13SEP04
1260	Install Phone & Data Cabling L2	5	0	13SEP04
1560	Install Electrical Rough-in Soffits L2	4	0	13SEP04
1570	Install Electrical Rough-in Ceiling L2	4	0	13SEP04



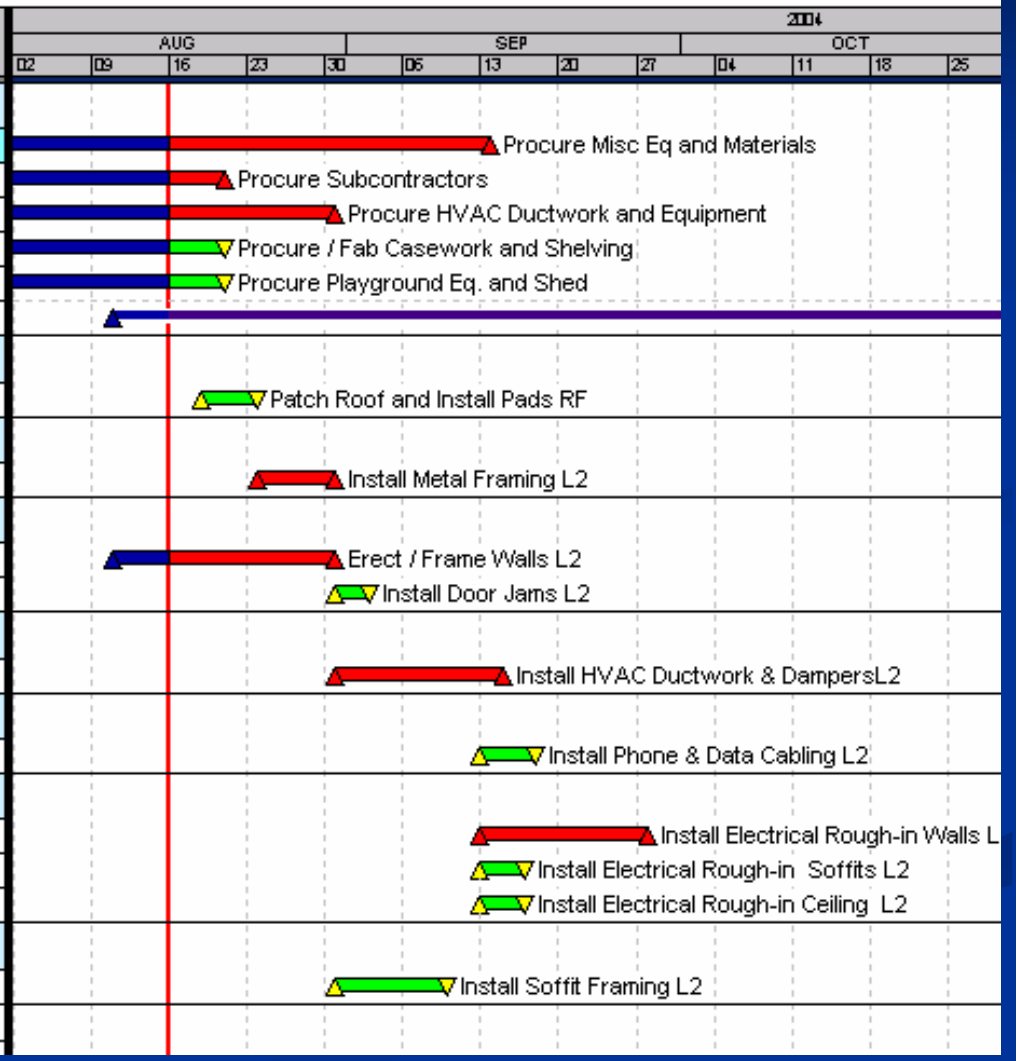
- Data Date + 28 Days
  - Activities in progress
  - Activities that will start within 28 days ~

4 Week Schedule x Subcontractor

Layout: SUB - Org. by Subcontra | Filter: 4WK - Four week lookah | Lower views:

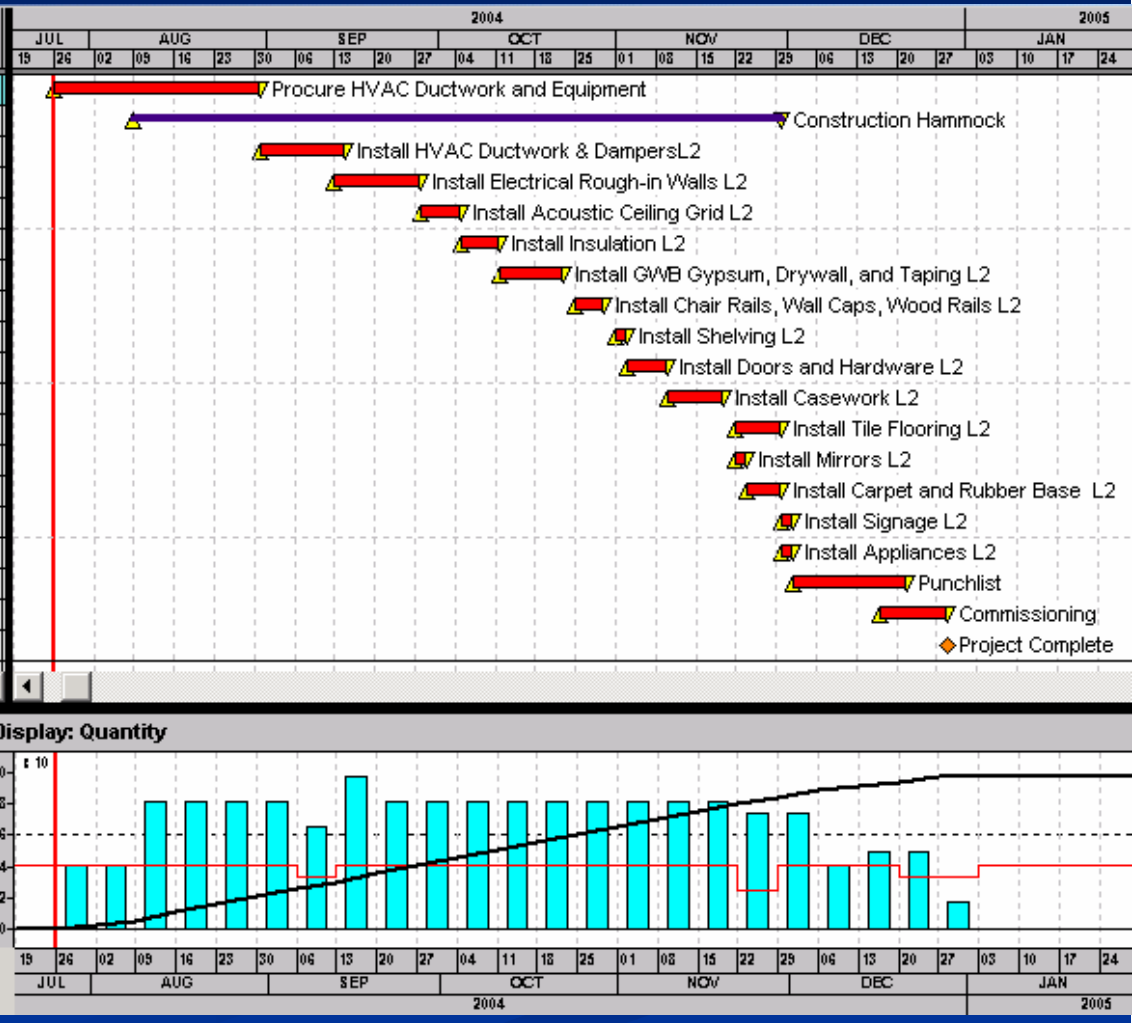
1030

Act ID	Description	Original Duration	Early Start	Early Finish
Contractor				
1030	Procure Misc Eq and Materials	35	26JUL04	13SEP04
1060	Procure Subcontractors	21	26JUL04	20AUG04
1110	Procure HVAC Ductwork and	26	26JUL04	30AUG04
1750	Procure / Fab Casework and Shelving	20	26JUL04	20AUG04
1790	Procure Playground Eq. and Shed	20	26JUL04	20AUG04
1070	Construction Hammock	76 *	11AUG04	29NOV04
Roofing - Costner Roofing				
1650	Patch Roof and Install Pads RF	3	19AUG04	23AUG04
Metal - Nicholas & Sons Metals				
1400	Install Metal Framing L2	5	24AUG04	30AUG04
Rough Carpentry Framing - Carpenter Capentry				
1200	Erect / Frame Walls L2	14	11AUG04	30AUG04
1530	Install Door Jams L2	3	31AUG04	02SEP04
HVAC - Sprint HVAC Services				
1220	Install HVAC Ductwork & DampersL2	10	31AUG04	14SEP04
Telecommunications - Renzl Telecommunications				
1260	Install Phone & Data Cabling L2	5	13SEP04	17SEP04
Electric - Sparky Electric Company				
1240	Install Electrical Rough-in Walls L2	11	13SEP04	27SEP04
1560	Install Electrical Rough-in Soffits L2	4	13SEP04	16SEP04
1570	Install Electrical Rough-in Ceiling L2	4	13SEP04	16SEP04
Finish Carpentry / Millwork - Alberts Carpentry				
1590	Install Soffit Framing L2	7	31AUG04	09SEP04



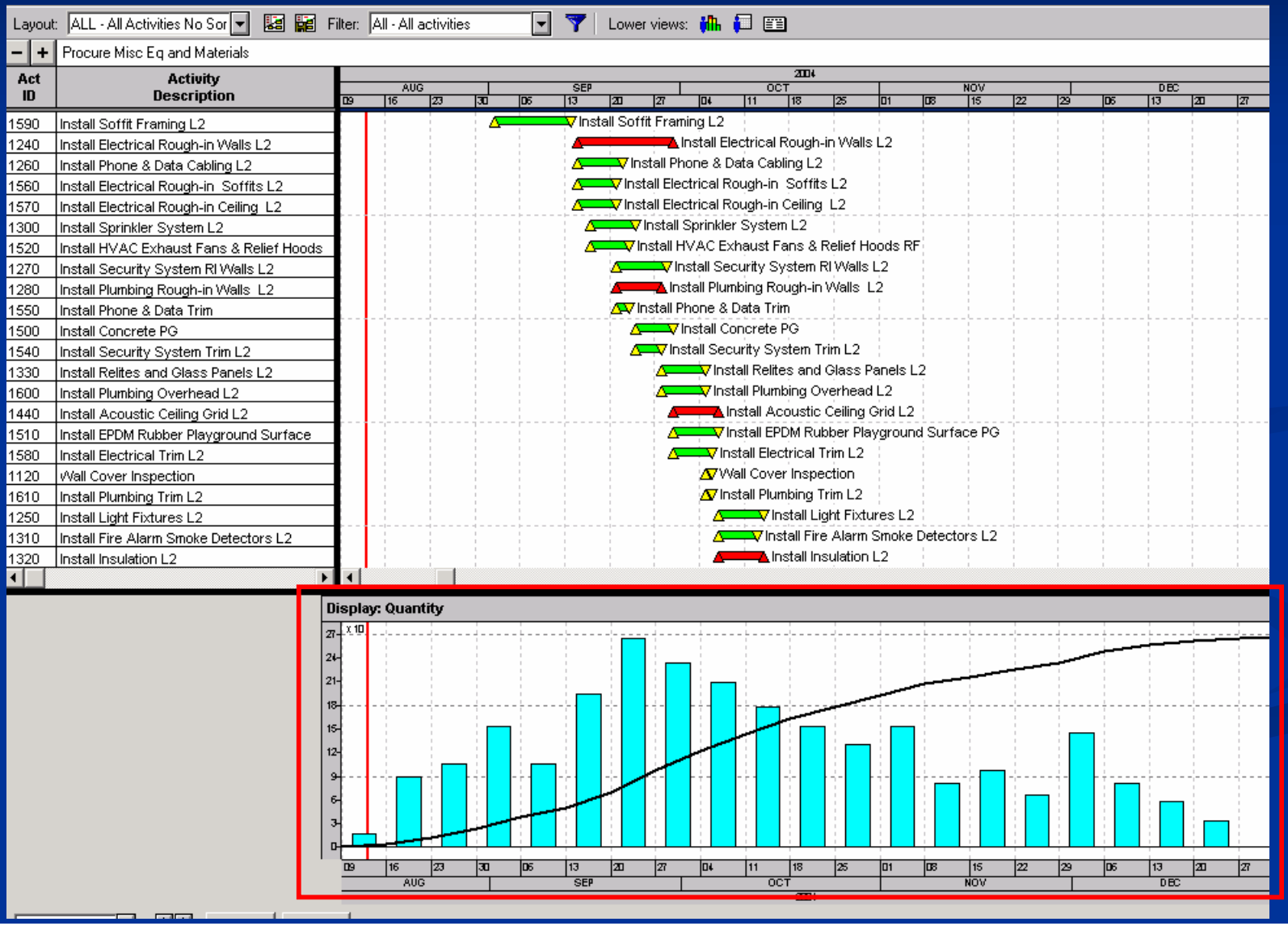
Critical Path Activities

Act ID	Description	Early Start	Early Finish	Total Float
1110	Procure HVAC Ductwork and	26JUL04	30AUG04	0
1070	Construction Hammock	09AUG04	29NOV04	0
1220	Install HVAC Ductwork & DampersL2	31AUG04	14SEP04	0
1240	Install Electrical Rough-in Walls L2	13SEP04	27SEP04	0
1440	Install Acoustic Ceiling Grid L2	28SEP04	04OCT04	0
1320	Install Insulation L2	05OCT04	11OCT04	0
1430	Install GWB Gypsum, Drywall, and	12OCT04	22OCT04	0
1390	Install Chair Rails, Wall Caps, Wood	25OCT04	29OCT04	0
1470	Install Shelving L2	01NOV04	02NOV04	0
1360	Install Doors and Hardware L2	03NOV04	09NOV04	0
1350	Install Casework L2	10NOV04	19NOV04	0
1370	Install Tile Flooring L2	22NOV04	29NOV04	0
1420	Install Mirrors L2	22NOV04	23NOV04	0
1380	Install Carpet and Rubber Base L2	24NOV04	29NOV04	0
1450	Install Signage L2	30NOV04	01DEC04	0
1460	Install Appliances L2	30NOV04	01DEC04	0
1080	Punchlist	02DEC04	21DEC04	0
1090	Commissioning	17DEC04	28DEC04	0
1100	Project Complete		28DEC04	0



Manpower Loading

Bar Chart View / Histogram

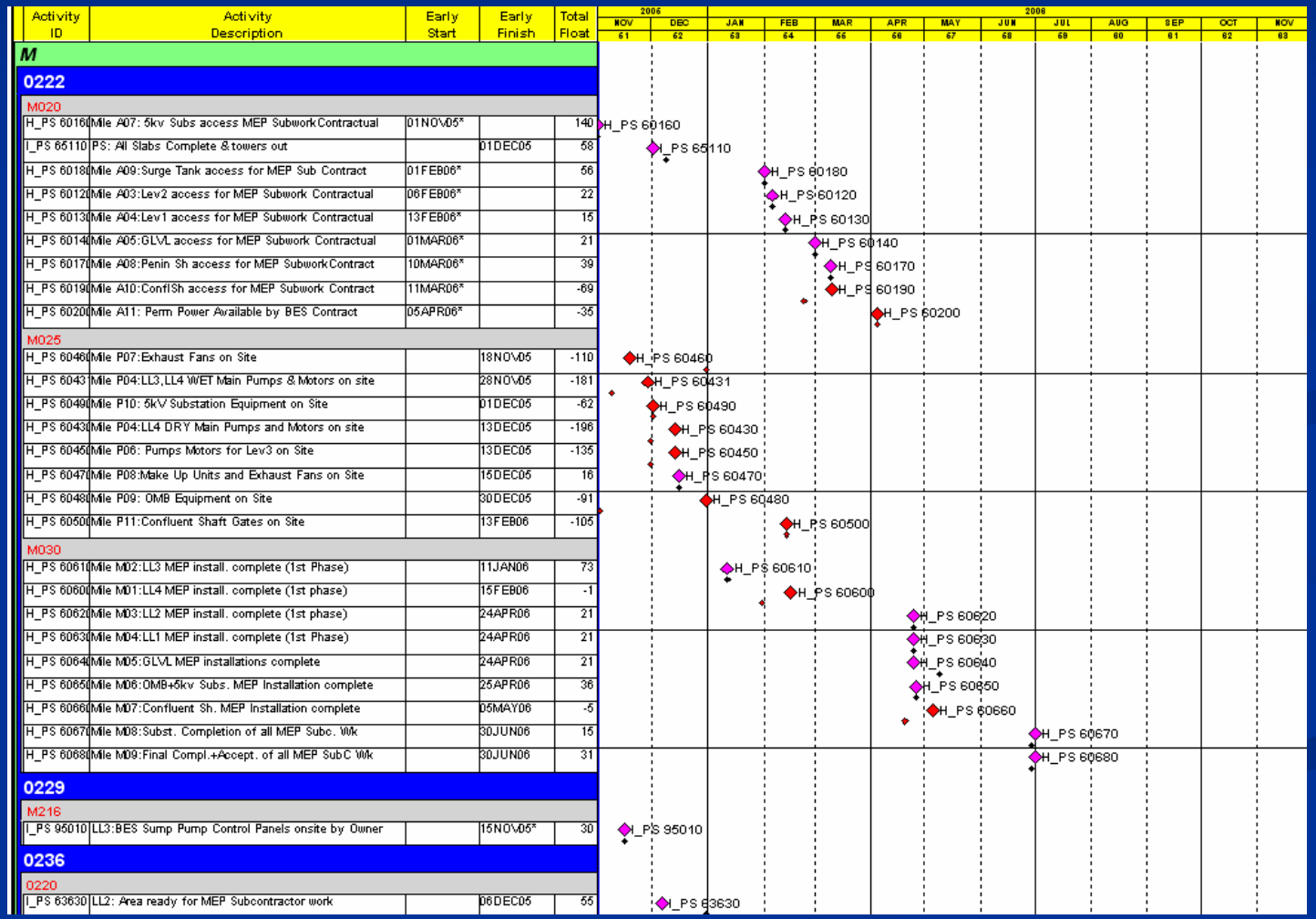


Project Execution

- Management use
  - Communication Tools
    - Critical Path
    - Milestone Summary
    - Phase Summary
    - Variance reports
  - Planning Tools
    - 3 Month Lookahead
    - Combined Histograms
    - Risk Reports~

Management Use

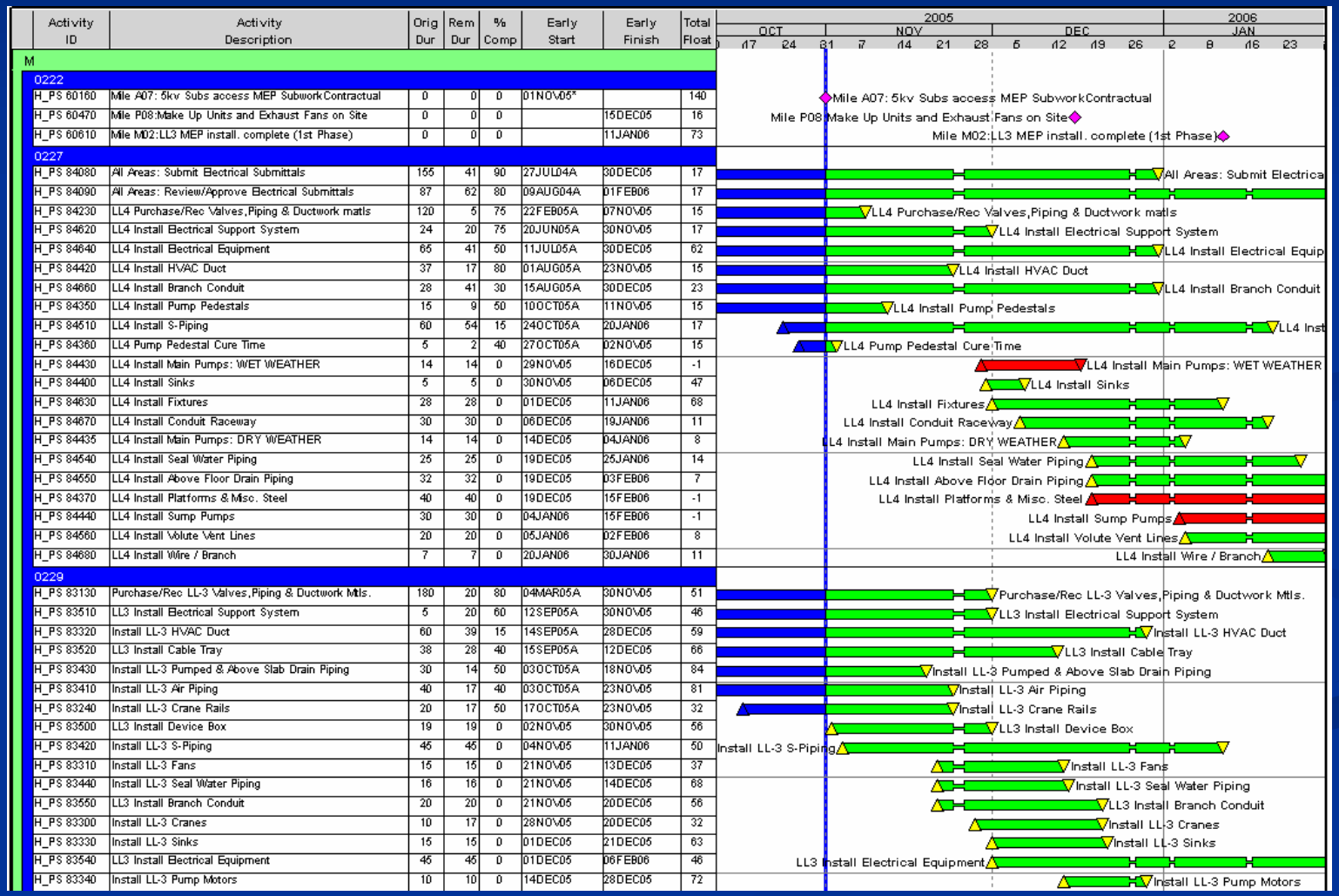
- Milestone Summary



Activity ID	Activity Description	Early Start	Early Finish	Total Float
M				
0222				
M020				
H_PS 60160	Mile A07: 5kv Subs access MEP Subwork Contractual	01NOV05*		140
I_PS 65110	PS: All Slabs Complete & towers out		01DEC05	58
H_PS 60180	Mile A09:Surge Tank access for MEP Sub Contract	01FEB06*		56
H_PS 60120	Mile A03:Lev2 access for MEP Subwork Contractual	06FEB06*		22
H_PS 60130	Mile A04:Lev1 access for MEP Subwork Contractual	13FEB06*		15
H_PS 60140	Mile A05:GLVL access for MEP Subwork Contractual	01MAR06*		21
H_PS 60170	Mile A08:Penin Sh access for MEP Subwork Contract	10MAR06*		39
H_PS 60190	Mile A10:Confl Sh access for MEP Subwork Contract	11MAR06*		-69
H_PS 60200	Mile A11: Perm Power Available by BES Contract	05APR06*		-35
M025				
H_PS 60460	Mile P07:Exhaust Fans on Site		18NOV05	-110
H_PS 60431	Mile P04:LL3,LL4 WET Main Pumps & Motors on site		28NOV05	-181
H_PS 60490	Mile P10: 5kV Substation Equipment on Site		01DEC05	-62
H_PS 60430	Mile P04:LL4 DRY Main Pumps and Motors on site		13DEC05	-196
H_PS 60450	Mile P06: Pumps Motors for Lev3 on Site		13DEC05	-135
H_PS 60470	Mile P08:Make Up Units and Exhaust Fans on Site		15DEC05	16
H_PS 60480	Mile P09: OMB Equipment on Site		30DEC05	-91
H_PS 60500	Mile P11:Confluent Shaft Gates on Site		13FEB06	-105
M030				
H_PS 60610	Mile M02:LL3 MEP install. complete (1st Phase)		11JAN06	73
H_PS 60600	Mile M01:LL4 MEP install. complete (1st phase)		15FEB06	-1
H_PS 60620	Mile M03:LL2 MEP install. complete (1st phase)		24APR06	21
H_PS 60630	Mile M04:LL1 MEP install. complete (1st Phase)		24APR06	21
H_PS 60640	Mile M05:GLVL MEP installations complete		24APR06	21
H_PS 60650	Mile M06:OMB+5kv Subs. MEP Installation complete		25APR06	36
H_PS 60660	Mile M07:Confluent Sh. MEP Installation complete		05MAY06	-5
H_PS 60670	Mile M08:Subst. Completion of all MEP Subc. Wk		30JUN06	15
H_PS 60680	Mile M09:Final Compl.+Accept. of all MEP SubC Wk		30JUN06	31
0229				
M216				
I_PS 95010	LL3:BES Sump Pump Control Panels onsite by Owner		15NOV05*	30
0236				
0220				
I_PS 63630	LL2: Area ready for MEP Subcontractor work		06DEC05	55

Management Use

- 3 Month Look Ahead



Activity ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Total Float
M							
0222							
H_PS 60160	Mile A07: 5kv Subs access MEP SubworkContractual	0	0	0	01NOV05*		140
H_PS 60470	Mile P08:Make Up Units and Exhaust Fans on Site	0	0	0		15DEC05	16
H_PS 60610	Mile M02:LL3 MEP install. complete (1st Phase)	0	0	0		11JAN06	73
0227							
H_PS 84080	All Areas: Submit Electrical Submittals	155	41	90	27JUL04A	30DEC05	17
H_PS 84090	All Areas: Review/Approve Electrical Submittals	87	62	80	09AUG04A	01FEB06	17
H_PS 84230	LL4 Purchase/Rec Valves,Piping & Ductwork matls	120	5	75	22FEB05A	07NOV05	15
H_PS 84620	LL4 Install Electrical Support System	24	20	75	20JUN05A	30NOV05	17
H_PS 84640	LL4 Install Electrical Equipment	65	41	50	11JUL05A	30DEC05	62
H_PS 84420	LL4 Install HVAC Duct	37	17	80	01AUG05A	23NOV05	15
H_PS 84660	LL4 Install Branch Conduit	28	41	30	15AUG05A	30DEC05	23
H_PS 84350	LL4 Install Pump Pedestals	15	9	50	10OCT05A	11NOV05	15
H_PS 84510	LL4 Install S-Piping	60	54	15	24OCT05A	20JAN06	17
H_PS 84360	LL4 Pump Pedestal Cure Time	5	2	40	27OCT05A	02NOV05	15
H_PS 84430	LL4 Install Main Pumps: WET WEATHER	14	14	0	29NOV05	16DEC05	-1
H_PS 84400	LL4 Install Sinks	5	5	0	30NOV05	06DEC05	47
H_PS 84630	LL4 Install Fixtures	28	28	0	01DEC05	11JAN06	68
H_PS 84670	LL4 Install Conduit Raceway	30	30	0	06DEC05	19JAN06	11
H_PS 84435	LL4 Install Main Pumps: DRY WEATHER	14	14	0	14DEC05	04JAN06	8
H_PS 84540	LL4 Install Seal Water Piping	25	25	0	19DEC05	25JAN06	14
H_PS 84550	LL4 Install Above Floor Drain Piping	32	32	0	19DEC05	03FEB06	7
H_PS 84370	LL4 Install Platforms & Misc. Steel	40	40	0	19DEC05	15FEB06	-1
H_PS 84440	LL4 Install Sump Pumps	30	30	0	04JAN06	15FEB06	-1
H_PS 84560	LL4 Install Volute Vent Lines	20	20	0	05JAN06	02FEB06	8
H_PS 84680	LL4 Install Wire / Branch	7	7	0	20JAN06	30JAN06	11
0229							
H_PS 83130	Purchase/Rec LL-3 Valves,Piping & Ductwork Mtls.	180	20	80	04MAR05A	30NOV05	51
H_PS 83510	LL3 Install Electrical Support System	5	20	60	12SEP05A	30NOV05	46
H_PS 83320	Install LL-3 HVAC Duct	60	39	15	14SEP05A	28DEC05	59
H_PS 83520	LL3 Install Cable Tray	38	28	40	15SEP05A	12DEC05	66
H_PS 83430	Install LL-3 Pumped & Above Slab Drain Piping	30	14	50	03OCT05A	18NOV05	84
H_PS 83410	Install LL-3 Air Piping	40	17	40	03OCT05A	23NOV05	81
H_PS 83240	Install LL-3 Crane Rails	20	17	50	17OCT05A	23NOV05	32
H_PS 83500	LL3 Install Device Box	19	19	0	02NOV05	30NOV05	56
H_PS 83420	Install LL-3 S-Piping	45	45	0	04NOV05	11JAN06	50
H_PS 83310	Install LL-3 Fans	15	15	0	21NOV05	13DEC05	37
H_PS 83440	Install LL-3 Seal Water Piping	16	16	0	21NOV05	14DEC05	68
H_PS 83550	LL3 Install Branch Conduit	20	20	0	21NOV05	20DEC05	56
H_PS 83300	Install LL-3 Cranes	10	17	0	28NOV05	20DEC05	32
H_PS 83330	Install LL-3 Sinks	15	15	0	01DEC05	21DEC05	63
H_PS 83540	LL3 Install Electrical Equipment	45	45	0	01DEC05	06FEB06	46
H_PS 83340	Install LL-3 Pump Motors	10	10	0	14DEC05	28DEC05	72

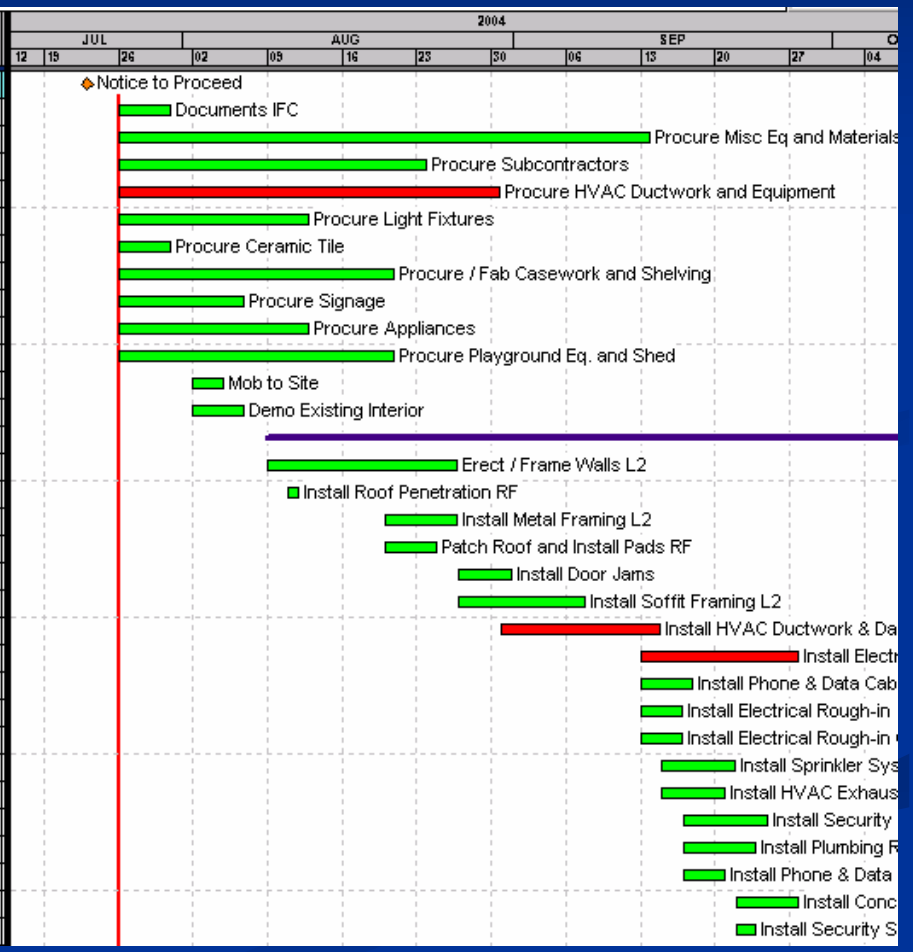
Management Use

- Period Analysis
  - Last Period vs. Current Period
  - Baseline plan vs. Current Period
- “Bang for the Buck”
  - Float and Resource Analysis to determine which activity progress/completion will yield the best results
  - Identify tighter sequential activity coordination
- “Finish on Friday”
  - Identify which tasks need to finish this week to keep things on track
  - Helps prevent the 95% and holding syndrome~

Management Use

Establish the Baseline Schedule for Variance Comparison

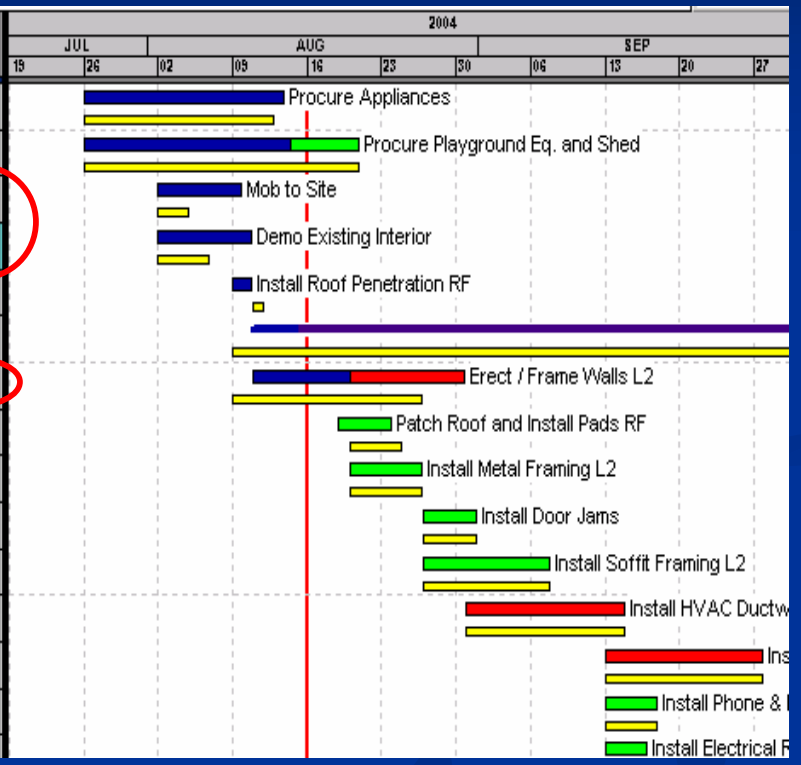
Act ID	Description	Orig Dur	Rem Dur	Actual Duration	Early Start	Early Finish	Total Float	%
1000	Notice to Proceed	0	0	0	23JUL04 A			100
1020	Documents IFC	5	5	0	26JUL04	30JUL04	2d	0
1030	Procure Misc Eq and Materials	35	35	0	26JUL04	13SEP04	7d	0
1060	Procure Subcontractors	21	21	0	26JUL04	23AUG04	2d	0
1110	Procure HVAC Ductwork and Equipment	26	26	0	26JUL04	30AUG04	0	0
1680	Procure Light Fixtures	14	14	0	26JUL04	12AUG04	68d	0
1730	Procure Ceramic Tile	5	5	0	26JUL04	30JUL04	79d	0
1750	Procure / Fab Casework and Shelving	20	20	0	26JUL04	20AUG04	56d	0
1770	Procure Signage	10	10	0	26JUL04	06AUG04	78d	0
1780	Procure Appliances	14	14	0	26JUL04	12AUG04	74d	0
1790	Procure Playground Eq. and Shed	20	20	0	26JUL04	20AUG04	59d	0
1040	Mob to Site	3	3	0	02AUG04	04AUG04	2d	0
1050	Demo Existing Interior	5	5	0	02AUG04	06AUG04	2d	0
1070	Construction Hammock	78 *	78 *	0	09AUG04	29NOV04	0	0
1200	Erect / Frame Walls L2	14	14	0	09AUG04	26AUG04	2d	0
1640	Install Roof Penetration RF	1	1	0	11AUG04	11AUG04	61d	0
1400	Install Metal Framing L2	5	5	0	20AUG04	26AUG04	2d	0
1650	Patch Roof and Install Pads RF	3	3	0	20AUG04	24AUG04	61d	0
1530	Install Door Jams	3	3	0	27AUG04	31AUG04	44d	0
1590	Install Soffit Framing L2	7	7	0	27AUG04	07SEP04	55d	0
1220	Install HVAC Ductwork & DampersL2	10	10	0	31AUG04	14SEP04	0	0
1240	Install Electrical Rough-in Walls L2	11	11	0	13SEP04	27SEP04	0	0
1260	Install Phone & Data Cabling L2	5	5	0	13SEP04	17SEP04	10d	0
1560	Install Electrical Rough-in Soffits L2	4	4	0	13SEP04	16SEP04	52d	0
1570	Install Electrical Rough-in Ceiling L2	4	4	0	13SEP04	16SEP04	7d	0
1300	Install Sprinkler System L2	5	5	0	15SEP04	21SEP04	4d	0
1520	Install HVAC Exhaust Fans & Relief Hoods	4	4	0	15SEP04	20SEP04	47d	0
1270	Install Security System RI Walls L2	6	6	0	17SEP04	24SEP04	10d	0
1280	Install Plumbing Rough-in Walls L2	5	5	0	17SEP04	23SEP04	2d	0
1550	Install Phone & Data Trim	2	2	0	17SEP04	20SEP04	10d	0
1500	Install Concrete PG	4	4	0	22SEP04	27SEP04	29d	0
1540	Install Security System Trim L2	2	2	0	22SEP04	23SEP04	41d	0



Management Use

Using the Variance Reports to Illustrate Delays and Impacts
Week 4: Current to Baseline Schedule Comparison

Act ID	Description	Orig Dur	Rem Dur	Actual Duration	Early Start	Early Finish	Total Float	%	Finish Variance
1780	Procure Appliances	14	0	15	26JUL04 A	13AUG04		100	-1
1790	Procure Playground Eq. and Shed	20	5	15	26JUL04 A	20AUG04	59d	75	0
1040	Mob to Site	3	0	6	02AUG04 A	09AUG04		100	-3
1050	Demo Existing Interior	5	0	7	02AUG04 A	10AUG04		100	-2
1640	Install Roof Penetration RF	1	0	2	09AUG04 A	10AUG04		100	1
1070	Construction Hammock	76 *	73 *	3	11AUG04 A	29NOV04	0	4	0
1200	Erect / Frame Walls L2	14	11	3	11AUG04 A	30AUG04	0	45	-2
1650	Patch Roof and Install Pads RF	3	3	0	19AUG04	23AUG04	62d	0	1
1400	Install Metal Framing L2	5	5	0	20AUG04	26AUG04	2d	0	0
1530	Install Door Jams	3	3	0	27AUG04	31AUG04	44d	0	0
1590	Install Soffit Framing L2	7	7	0	27AUG04	07SEP04	55d	0	0
1220	Install HVAC Ductwork & DampersL2	10	10	0	31AUG04	14SEP04	0	0	0
1240	Install Electrical Rough-in Walls L2	11	11	0	13SEP04	27SEP04	0	0	0
1260	Install Phone & Data Cabling L2	5	5	0	13SEP04	17SEP04	10d	0	0
1560	Install Electrical Rough-in Soffits L2	4	4	0	13SEP04	16SEP04	52d	0	0

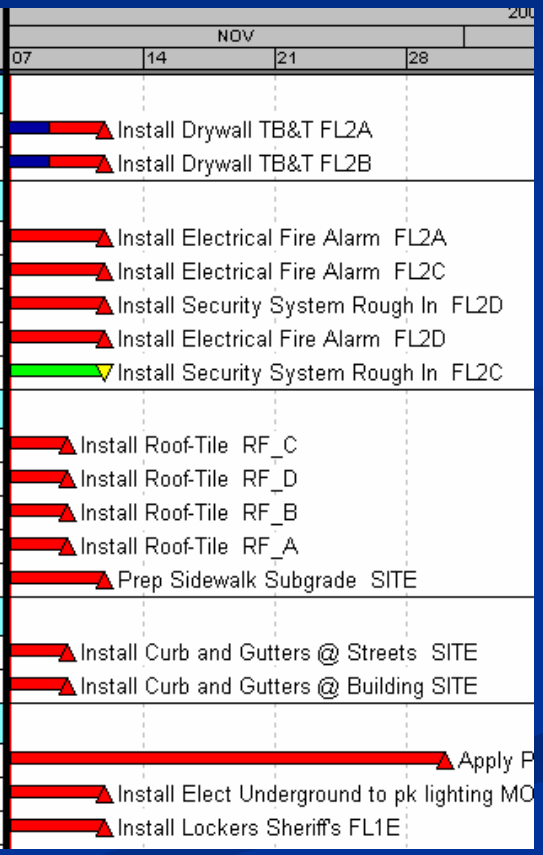


- Late Activities – Why?
- Create Plan to Mitigate / Recover ~

Management Use

- "Bang for the Buck"

Act ID	Description	Orig Dur	% Comp	Total Float	Early Start	Early Finish
95						
0471	Install Drywall TB&T FL2A	25	95	-67d	10/12/05 A	11/11/05
0472	Install Drywall TB&T FL2B	25	95	-68d	10/22/05 A	11/11/05
90						
0192	Install Electrical Fire Alarm FL2A	3	90	-29d	09/26/05 A	11/11/05
0210	Install Electrical Fire Alarm FL2C	3	90	-29d	09/26/05 A	11/11/05
0030	Install Security System Rough In FL2D	8	90	-34d	10/07/05 A	11/11/05
0219	Install Electrical Fire Alarm FL2D	10	90	-29d	10/07/05 A	11/11/05
0031	Install Security System Rough In FL2C	8	90	18d	10/07/05 A	11/11/05
85						
0247	Install Roof-Tile RF_C	3	85	-27d	06/13/05 A	11/09/05
0249	Install Roof-Tile RF_D	7	85	-27d	06/13/05 A	11/09/05
0245	Install Roof-Tile RF_B	3	85	-27d	06/20/05 A	11/09/05
0239	Install Roof-Tile RF_A	7	85	-27d	06/27/05 A	11/09/05
0720	Prep Sidewalk Subgrade SITE	5	85	-57d	08/25/05 A	11/11/05
80						
0716	Install Curb and Gutters @ Streets SITE	12	80	-52d	09/16/05 A	11/09/05
0916	Install Curb and Gutters @ Building SITE	10	80	-50d	09/16/05 A	11/09/05
75						
0261	Apply Paint FL1_VEH	3	75	-44d	08/09/05 A	11/29/05
1028	Install Elect Underground to pk lighting MOT	5	75	-36d	09/21/05 A	11/11/05
0532	Install Lockers Sheriff's FL1E	5	75	-34d	09/22/05 A	11/11/05



Capturing Delays and Impacts

- Illustrating / Documenting
- Forecasting
- “What if” analysis~

Delays & Impacts

- Use the schedule to illustrate impacts from the following types of events:
  - Non–excusable, Non–compensable
    - Subcontractor Performance
    - Contractor Performance
  - Excusable, Non–compensable
    - Force Majeure
  - Excusable, Compensable
    - Design Error
    - RFI's~

Delays & Impacts

- Delays & Impacts always need to be evaluated against the current plan
  - Document and illustrate the delay
  - Analyze the impact
  - Get acknowledgement of the delay~

Delays & Impacts

- Subcontractor Delays can be recognized by the general or the sub.
- Delays are addressed in the schedule after a known or potential impact has been identified.
  - Start or Finish Date Variance
  - Const. Sequence change
  - Performance issue (low % complete)~

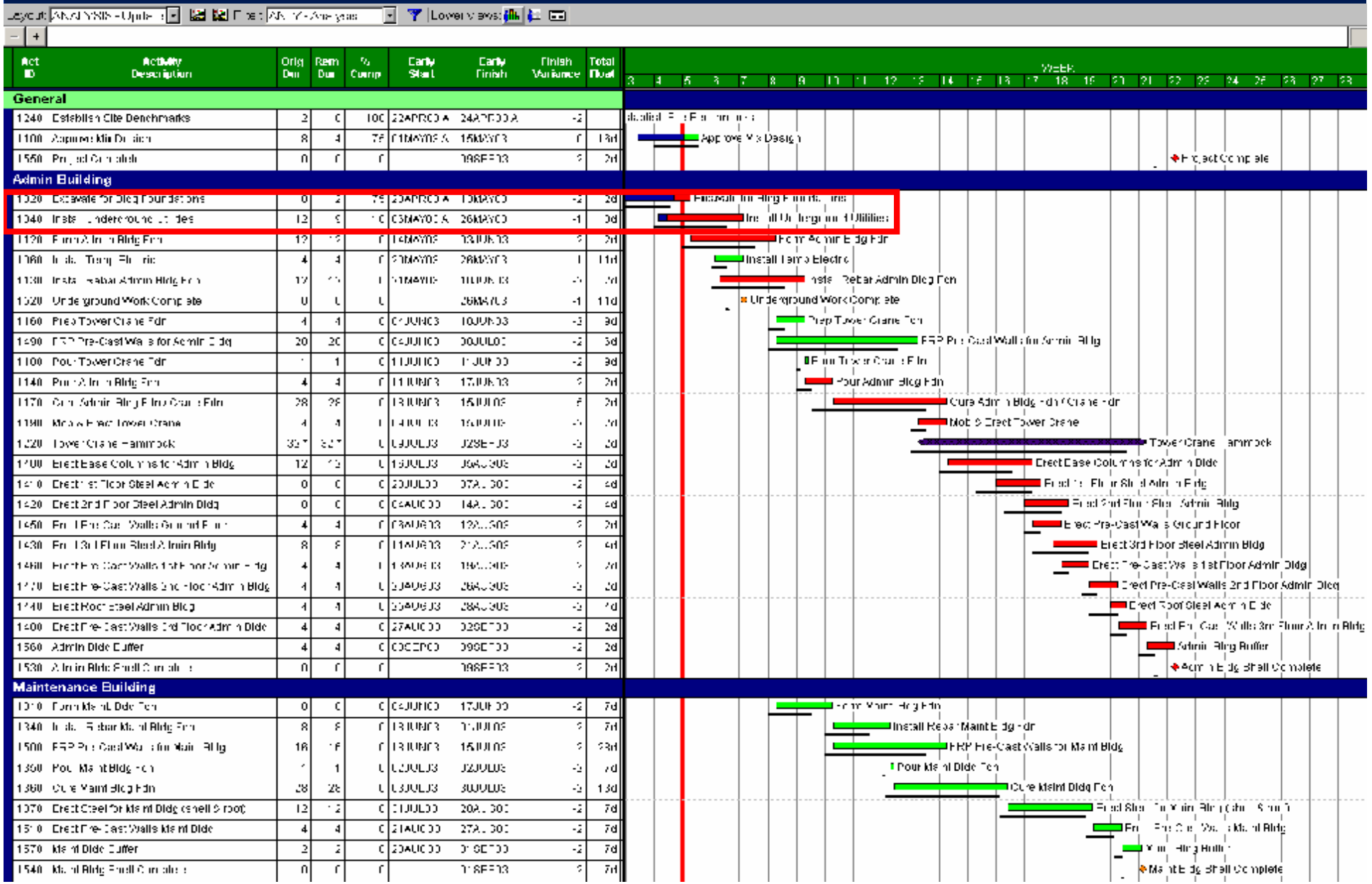
Delays & Impacts

- Delay recognition occurs at or just behind the data date.
  - Can be for work currently in progress or in the future
  - Very little advance warning
  - Generally not seen until late
  - Not readily acknowledged by the Sub or GC
  - Usually non-compensable~

Delays & Impacts

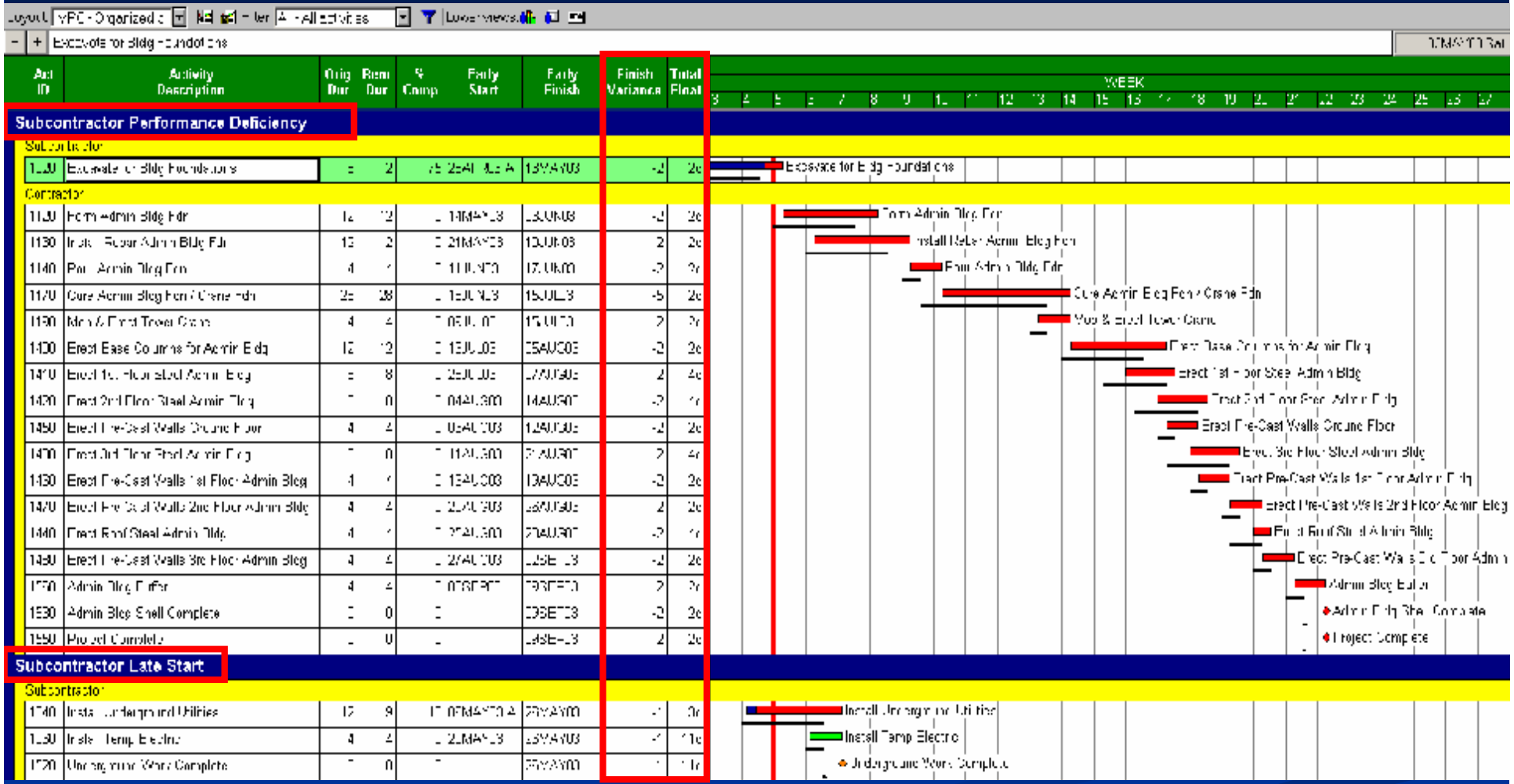
- Document the Impact
  - Enter actual dates, % complete
- Add coding to be able to group or filter the delay
  - Add additional activities if needed
  - Add notes to Log
- Show variance from target finish
- Develop recovery options~

Impact from a Subcontractor

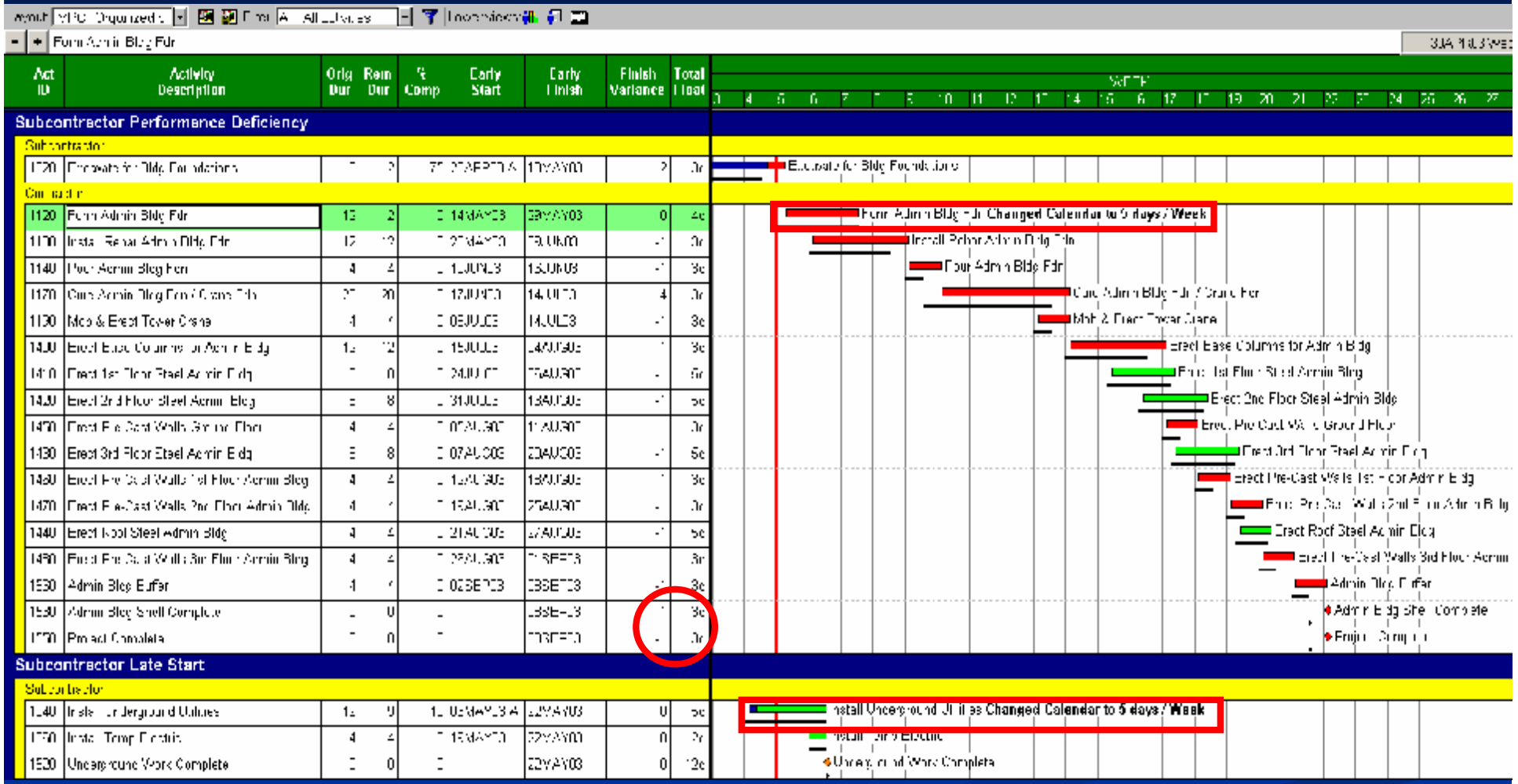


Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
General								
1240	Establish Site Benchmarks	2	0	100	22APR03 A	24APR03 A	-2	
1100	Approve Mix Design	8	4	75	01MAY03 A	15MAY03	0	13d
1550	Project Complete	0	0	0		19SEP03	9	0d
Admin Building								
1320	Excavate for Bldg Foundations	8	2	75	23APR03 A	13MAY03	-2	2d
1340	Install Underground Utilities	12	9	10	28MAY03 A	26MAY03	-1	3d
1120	Form Admin Bldg Ftgs	12	12	0	14MAY03	03JUN03	9	2d
1360	Install Temp Electric	4	4	0	29MAY03	29MAY03	1	11d
1330	Install Rebar Admin Bldg Ftgs	12	12	0	14MAY03	11JUN03	-2	2d
1320	Underground Work Complete	0	0	0		28MAY03	-1	11d
1160	Prep Tower Crane Fdn	4	4	0	04JUN03	10JUN03	-3	9d
1490	ERP Pre-Cast Walls for Admin Bldg	20	20	0	04JUN03	30JUL03	-2	5d
1100	Pour Tower Crane Fdn	1	1	0	11JUN03	11JUN03	-2	9d
1140	Pour Admin Bldg Ftgs	4	4	0	11JUN03	17JUN03	9	2d
1170	Cure Admin Bldg Ftgs/Tower Crane Fdn	28	28	0	13JUN03	16JUL03	8	2d
1180	Mobilize Erect Tower Crane	4	4	0	14JUN03	16JUN03	-2	2d
1220	Tower Crane Hammerhead	32.7	32.7	0	04JUL03	02SEP03	-2	2d
1700	Erect Base Columns for Admin Bldg	12	12	0	16JUL03	30AUG03	-2	2d
1410	Erect 1st Floor Steel Admin Bldg	0	0	0	23JUL03	07AUG03	-2	4d
1420	Erect 2nd Floor Steel Admin Bldg	0	0	0	04AUG03	14AUG03	-2	4d
1450	Fin Erect Pre-Cast Walls Ground Floor	4	4	0	28AUG03	12SEP03	9	2d
1430	Erect 3rd Floor Steel Admin Bldg	8	8	0	11AUG03	21AUG03	9	4d
1460	Erect Pre-Cast Walls 1st Floor Admin Bldg	4	4	0	13AUG03	19AUG03	9	2d
1470	Erect Pre-Cast Walls 2nd Floor Admin Bldg	4	4	0	25AUG03	28AUG03	-2	2d
1440	Erect Roof Steel Admin Bldg	4	4	0	25AUG03	28AUG03	-2	7d
1480	Erect Pre-Cast Walls 3rd Floor Admin Bldg	4	4	0	27AUG03	02SEP03	-2	2d
1560	Admin Bldg Buffer	4	4	0	03SEP03	09SEP03	-2	2d
1530	Admin Bldg Shell Complete	0	0	0		19SEP03	9	2d
Maintenance Building								
1110	Form Maint Bldg Ftgs	0	0	0	04JUN03	17JUN03	-2	7d
1340	Install Rebar Maint Bldg Ftgs	8	8	0	13JUN03	01JUL03	9	7d
1500	ERP Pre-Cast Walls for Maint Bldg	16	16	0	13JUN03	15JUL03	9	23d
1390	Pour Maint Bldg Fdn	1	1	0	02JUL03	02JUL03	-2	7d
1380	Cure Maint Bldg Fdn	28	28	0	03JUL03	30JUL03	-2	13d
1070	Erect Steel for Maint Bldg (shell & roof)	12	12	0	21JUL03	20AUG03	-2	7d
1510	Erect Pre-Cast Walls Maint Bldg	4	4	0	21AUG03	27AUG03	-2	7d
1570	Maint Bldg Buffer	2	2	0	28AUG03	01SEP03	-2	7d
1540	Maint Bldg Shell Complete	0	0	0		11SEP03	9	7d

Impact Illustrated



Impact Recovery Plan



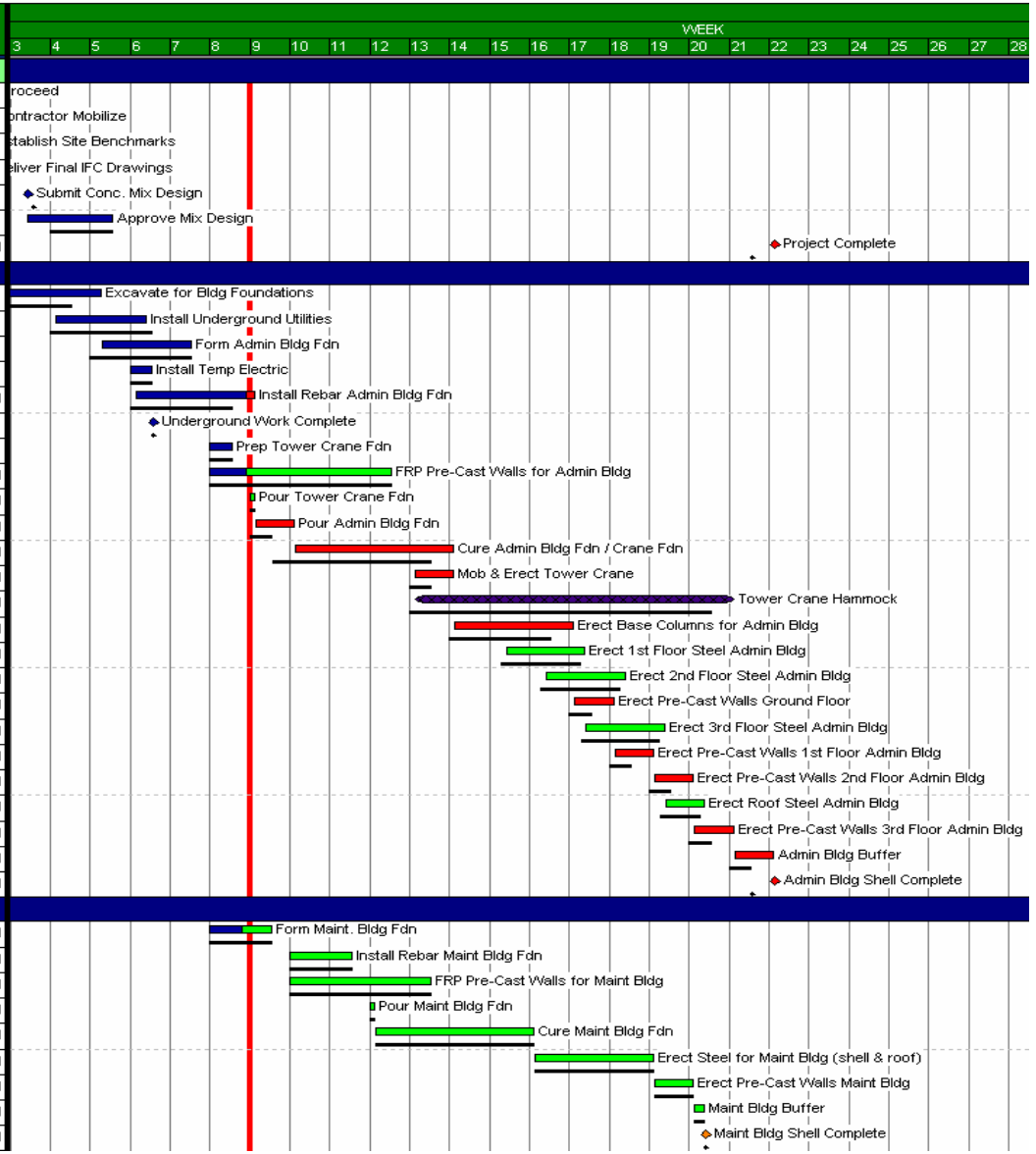
Uncontrollable Delays

- Delays are addressed in the schedule after the impact has been identified
  - Can impact work in progress or work in the future
  - Add the impact to the schedule
  - Add the “consequence” activity
  - Add logic or change durations to illustrate the impact~

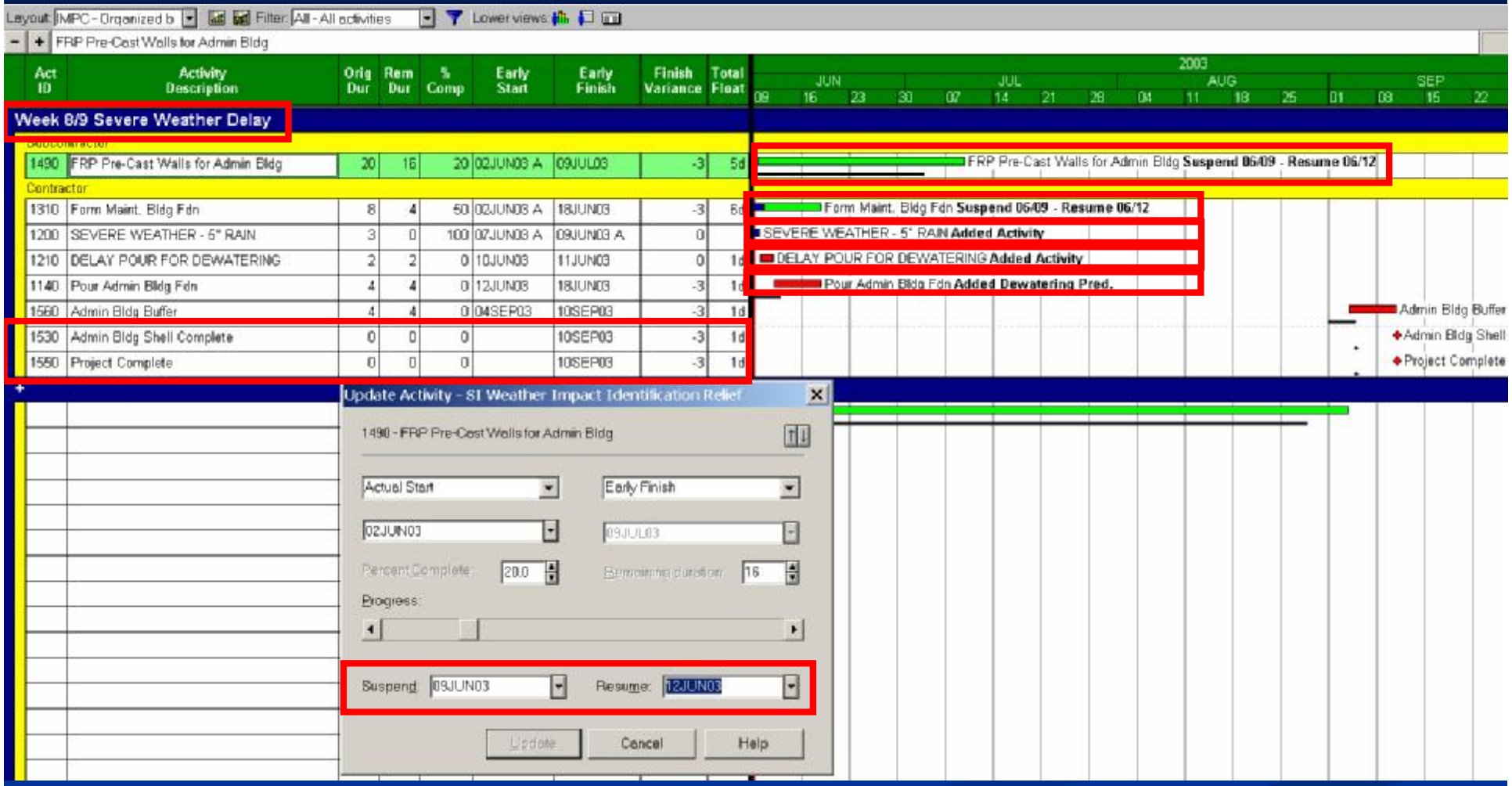
Impact from Weather - Start

Layout: BLDG - Organized b | Filter: All - All activities | Lower views:

Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
General								
1000	Notice to Proceed	0	0	100	14APR03 A		0	
1010	Contractor Mobilize	8	0	100	14APR03 A	24APR03 A	0	
1240	Establish Site Benchmarks	2	0	100	22APR03 A	24APR03 A	-2	
1110	Deliver Final IFC Drawings	0	0	100		23APR03 A	1	
1090	Submit Conc. Mix Design	0	0	100		30APR03 A	1	
1100	Approve Mix Design	8	0	100	01MAY03 A	15MAY03 A	0	
1550	Project Complete	0	0	0		08SEP03	-1	3d
Admin Building								
1020	Excavate for Bldg Foundations	8	0	100	28APR03 A	13MAY03 A	-2	
1040	Install Underground Utilities	12	0	100	06MAY03 A	21MAY03 A	1	
1120	Form Admin Bldg Fdn	12	0	100	14MAY03 A	29MAY03 A	0	
1060	Install Temp Electric	4	0	100	19MAY03 A	22MAY03 A	0	
1130	Install Rebar Admin Bldg Fdn	12	1	92	20MAY03 A	09JUN03	-1	3d
1520	Underground Work Complete	0	0	100		22MAY03 A	0	
1160	Prep Tower Crane Fdn	4	0	100	02JUN03 A	05JUN03 A	0	
1490	FRP Pre-Cast Walls for Admin Bldg	20	16	20	02JUN03 A	03JUL03	0	8d
1180	Pour Tower Crane Fdn	1	1	0	09JUN03	09JUN03	0	11d
1140	Pour Admin Bldg Fdn	4	4	0	10JUN03	16JUN03	-1	3d
1170	Cure Admin Bldg Fdn / Crane Fdn	28	28	0	17JUN03	14JUL03	-4	3d
1190	Mob & Erect Tower Crane	4	4	0	08JUL03	14JUL03	-1	3d
1220	Tower Crane Hammock	32 *	32 *	0	08JUL03	01SEP03	-1	3d
1400	Erect Base Columns for Admin Bldg	12	12	0	15JUL03	04AUG03	-1	3d
1410	Erect 1st Floor Steel Admin Bldg	8	8	0	24JUL03	06AUG03	-1	5d
1420	Erect 2nd Floor Steel Admin Bldg	8	8	0	31JUL03	13AUG03	-1	5d
1450	Erect Pre-Cast Walls Ground Floor	4	4	0	05AUG03	11AUG03	-1	3d
1430	Erect 3rd Floor Steel Admin Bldg	8	8	0	07AUG03	20AUG03	-1	5d
1460	Erect Pre-Cast Walls 1st Floor Admin Bldg	4	4	0	12AUG03	18AUG03	-1	3d
1470	Erect Pre-Cast Walls 2nd Floor Admin Bldg	4	4	0	19AUG03	25AUG03	-1	3d
1440	Erect Roof Steel Admin Bldg	4	4	0	21AUG03	27AUG03	-1	5d
1480	Erect Pre-Cast Walls 3rd Floor Admin Bldg	4	4	0	26AUG03	01SEP03	-1	3d
1560	Admin Bldg Buffer	4	4	0	02SEP03	08SEP03	-1	3d
1530	Admin Bldg Shell Complete	0	0	0		08SEP03	-1	3d
Maintenance Building								
1310	Form Maint. Bldg Fdn	8	4	50	02JUN03 A	12JUN03	0	9d
1340	Install Rebar Maint Bldg Fdn	8	8	0	16JUN03	26JUN03	0	9d
1500	FRP Pre-Cast Walls for Maint Bldg	16	16	0	16JUN03	10JUL03	0	30d
1350	Pour Maint Bldg Fdn	1	1	0	30JUN03	30JUN03	0	9d
1360	Cure Maint Bldg Fdn	28	28	0	01JUL03	28JUL03	0	15d
1370	Erect Steel for Maint Bldg (shell & roof)	12	12	0	29JUL03	18AUG03	0	9d
1510	Erect Pre-Cast Walls Maint Bldg	4	4	0	19AUG03	25AUG03	0	9d
1570	Maint Bldg Buffer	2	2	0	26AUG03	27AUG03	0	9d
1540	Maint Bldg Shell Complete	0	0	0		27AUG03	0	9d



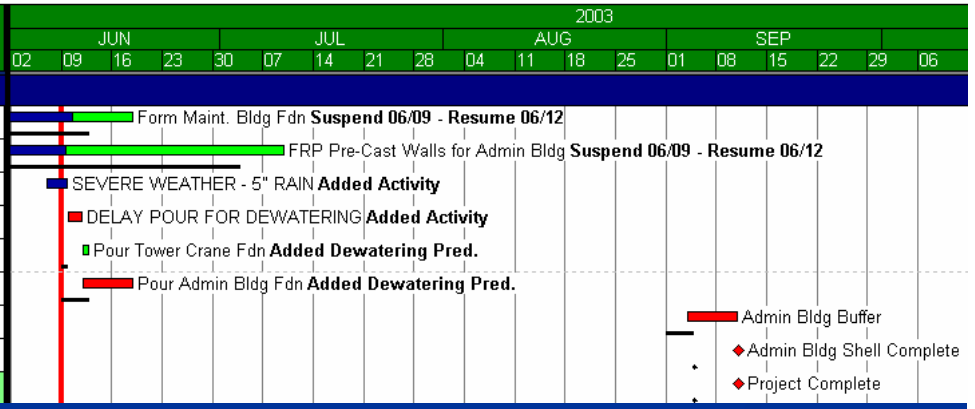
Impact from Weather - Illustrated

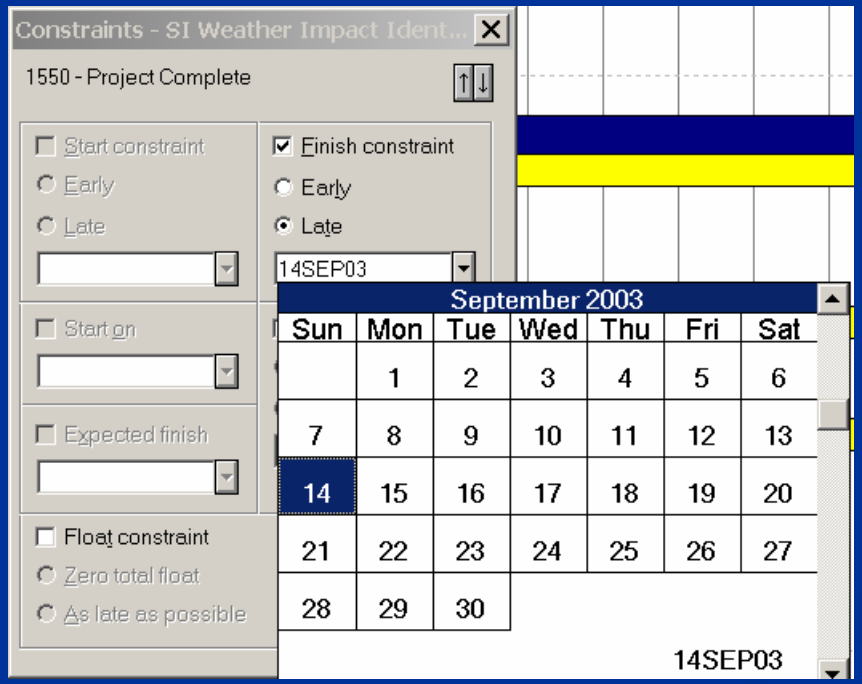


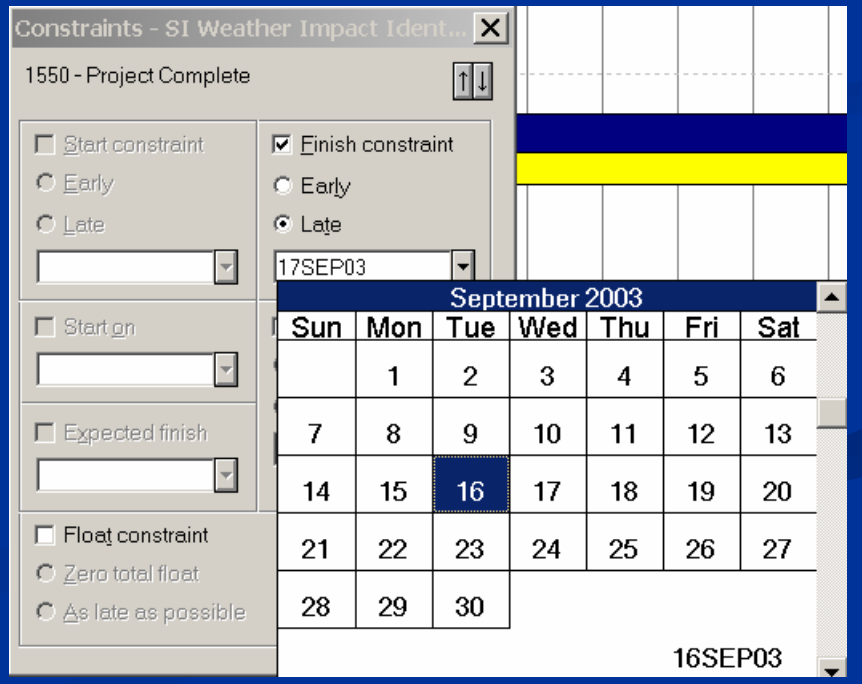
Impact from Weather - Extension

Layout: IMPC - Organized b | Filter: All - All activities | Lower views:

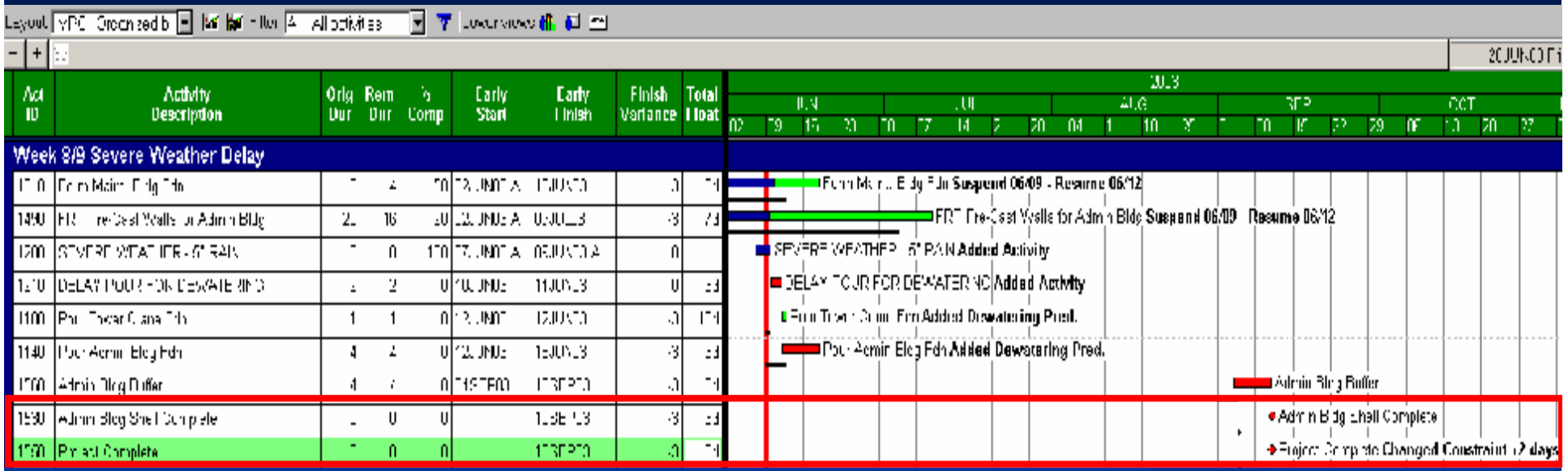
Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
Week 8/9 Severe Weather Delay								
1310	Form Maint. Bldg Fdn	8	4	50	02JUN03 A	18JUN03	-3	6d
1490	FRP Pre-Cast Walls for Admin Bldg	20	16	20	02JUN03 A	09JUL03	-3	5d
1200	SEVERE WEATHER - 5" RAIN	3	0	100	07JUN03 A	09JUN03 A	0	
1210	DELAY POUR FOR DEWATERING	2	2	0	10JUN03	11JUN03	0	1d
1180	Pour Tower Crane Fdn	1	1	0	12JUN03	12JUN03	-3	8d
1140	Pour Admin Bldg Fdn	4	4	0	12JUN03	18JUN03	-3	1d
1560	Admin Bldg Buffer	4	4	0	04SEP03	10SEP03	-3	1d
1530	Admin Bldg Shell Complete	0	0	0		10SEP03	-3	1d
1550	Project Complete	0	0	0		10SEP03	-3	1d







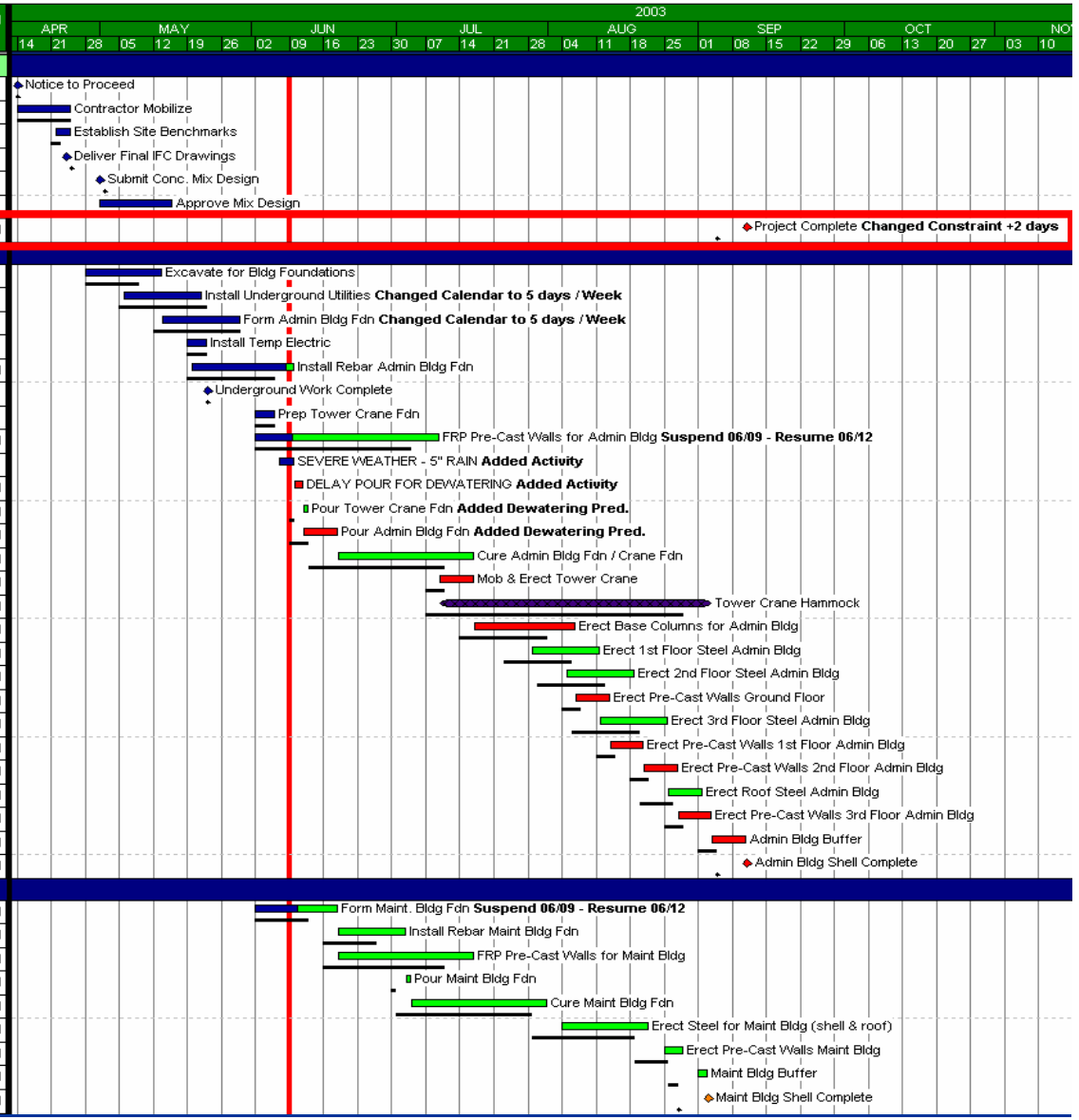
Impact from Weather - Extension



Impact from Weather - Final

Layout: BLDG - Organized b | Filter: All - All activities | Lower views:

Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
General								
1000	Notice to Proceed	0	0	100	14APR03 A		0	
1010	Contractor Mobilize	8	0	100	14APR03 A	24APR03 A	0	
1240	Establish Site Benchmarks	2	0	100	22APR03 A	24APR03 A	-2	
1110	Deliver Final IFC Drawings	0	0	100		23APR03 A	1	
1090	Submit Conc. Mix Design	0	0	100		30APR03 A	1	
1100	Approve Mix Design	8	0	100	01MAY03 A	15MAY03 A	0	
1550	Project Complete	0	0	0		10SEP03	-3	3d
Admin Building								
1020	Excavate for Bldg Foundations	8	0	100	28APR03 A	13MAY03 A	-2	
1040	Install Underground Utilities	12	0	100	06MAY03 A	21MAY03 A	1	
1120	Form Admin Bldg Fdn	12	0	100	14MAY03 A	29MAY03 A	0	
1060	Install Temp Electric	4	0	100	19MAY03 A	22MAY03 A	0	
1130	Install Rebar Admin Bldg Fdn	12	1	92	20MAY03 A	09JUN03	-1	5d
1520	Underground Work Complete	0	0	100		22MAY03 A	0	
1160	Prep Tower Crane Fdn	4	0	100	02JUN03 A	05JUN03 A	0	
1490	FRP Pre-Cast Walls for Admin Bldg	20	16	20	02JUN03 A	09JUL03	-3	7d
1200	SEVERE WEATHER - 5" RAIN	3	0	100	07JUN03 A	09JUN03 A	0	
1210	DELAY POUR FOR DEWATERING	2	2	0	10JUN03	11JUN03	0	3d
1180	Pour Tower Crane Fdn	1	1	0	12JUN03	12JUN03	-3	10d
1140	Pour Admin Bldg Fdn	4	4	0	12JUN03	18JUN03	-3	3d
1170	Cure Admin Bldg Fdn / Crane Fdn	28	28	0	19JUN03	16JUL03	-6	6d
1190	Mob & Erect Tower Crane	4	4	0	10JUL03	16JUL03	-3	3d
1220	Tower Crane Hammock	32 *	32 *	0	10JUL03	03SEP03	-3	3d
1400	Erect Base Columns for Admin Bldg	12	12	0	17JUL03	06AUG03	-3	3d
1410	Erect 1st Floor Steel Admin Bldg	8	8	0	29JUL03	11AUG03	-3	5d
1420	Erect 2nd Floor Steel Admin Bldg	8	8	0	05AUG03	18AUG03	-3	5d
1450	Erect Pre-Cast Walls Ground Floor	4	4	0	07AUG03	13AUG03	-3	3d
1430	Erect 3rd Floor Steel Admin Bldg	8	8	0	12AUG03	25AUG03	-3	5d
1460	Erect Pre-Cast Walls 1st Floor Admin Bldg	4	4	0	14AUG03	20AUG03	-3	3d
1470	Erect Pre-Cast Walls 2nd Floor Admin Bldg	4	4	0	21AUG03	27AUG03	-3	3d
1440	Erect Roof Steel Admin Bldg	4	4	0	26AUG03	01SEP03	-3	5d
1480	Erect Pre-Cast Walls 3rd Floor Admin Bldg	4	4	0	28AUG03	03SEP03	-3	3d
1560	Admin Bldg Buffer	4	4	0	04SEP03	10SEP03	-3	3d
1530	Admin Bldg Shell Complete	0	0	0		10SEP03	-3	3d
Maintenance Building								
1310	Form Maint. Bldg Fdn	8	4	50	02JUN03 A	18JUN03	-3	8d
1340	Install Rebar Maint Bldg Fdn	8	8	0	19JUN03	02JUL03	-3	8d
1500	FRP Pre-Cast Walls for Maint Bldg	16	16	0	19JUN03	16JUL03	-3	29d
1350	Pour Maint Bldg Fdn	1	1	0	03JUL03	03JUL03	-3	8d
1360	Cure Maint Bldg Fdn	28	28	0	04JUL03	31JUL03	-3	17d
1370	Erect Steel for Maint Bldg (shell & roof)	12	12	0	04AUG03	21AUG03	-3	8d
1510	Erect Pre-Cast Walls Maint Bldg	4	4	0	25AUG03	28AUG03	-3	8d
1570	Maint Bldg Buffer	2	2	0	01SEP03	02SEP03	-3	8d
1540	Maint Bldg Shell Complete	0	0	0		02SEP03	-3	8d



Impact from an RFI

- RFI's are initiated by GC or subcontractor
- RFI's are added to the schedule after a known or potential impact has been identified.
  - Commodity change
  - Qty change
  - Const. Sequence change
  - Design Clarification / Change~

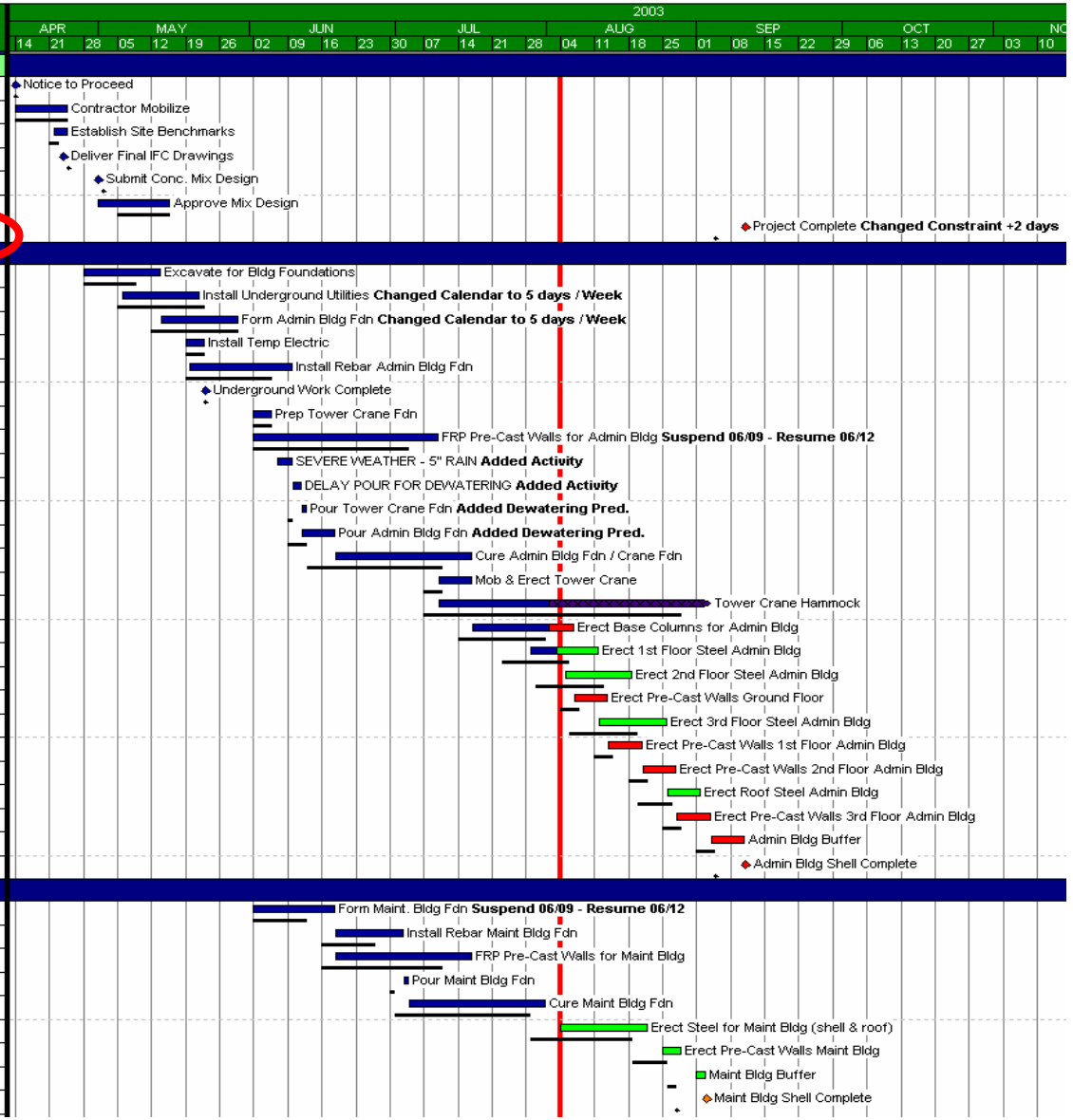
Impact from an RFI

- RFI's occur at or behind the data date
  - Can be for work currently in progress or for work in the future
- RFI's that don't go in the schedule
  - Dimensional clarifications – 2" or 3" Stenciling
  - Installation clarification – Torque to 100 ft lbs or 110 ft lbs~

RFI Impact - Start

Layout: BLDG - Organized b | Filter: All - All activities | Lower views:

Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
General								
1000	Notice to Proceed	0	0	100	14APR03 A		0	
1010	Contractor Mobilize	8	0	100	14APR03 A	24APR03 A	0	
1240	Establish Site Benchmarks	2	0	100	22APR03 A	24APR03 A	-2	
1110	Deliver Final IFC Drawings	0	0	100		23APR03 A	1	
1090	Submit Conc. Mix Design	0	0	100		30APR03 A	1	
1100	Approve Mix Design	8	0	100	01MAY03 A	15MAY03 A	0	
1550	Project Complete	0	0	0		10SEP03	-3	3d
Admin Building								
1020	Excavate for Bldg Foundations	8	0	100	28APR03 A	13MAY03 A	-2	
1040	Install Underground Utilities	12	0	100	06MAY03 A	21MAY03 A	1	
1120	Form Admin Bldg Fdn	12	0	100	14MAY03 A	29MAY03 A	0	
1060	Install Temp Electric	4	0	100	19MAY03 A	22MAY03 A	0	
1130	Install Rebar Admin Bldg Fdn	12	0	100	20MAY03 A	09JUN03 A	-1	
1520	Underground Work Complete	0	0	100		22MAY03 A	0	
1160	Prep Tower Crane Fdn	4	0	100	02JUN03 A	05JUN03 A	0	
1490	FRP Pre-Cast Walls for Admin Bldg	20	0	100	02JUN03 A	09JUL03 A	-3	
1200	SEVERE WEATHER - 5" RAIN	3	0	100	07JUN03 A	09JUN03 A	0	
1210	DELAY POUR FOR DEWATERING	2	0	100	10JUN03 A	11JUN03 A	0	
1180	Pour Tower Crane Fdn	1	0	100	12JUN03 A	12JUN03 A	-3	
1140	Pour Admin Bldg Fdn	4	0	100	12JUN03 A	18JUN03 A	-3	
1170	Cure Admin Bldg Fdn / Crane Fdn	28	0	100	19JUN03 A	16JUL03 A	-6	
1190	Mob & Erect Tower Crane	4	0	100	10JUL03 A	16JUL03 A	-3	
1220	Tower Crane Hammock	32 *	19 *	41	10JUL03 A	03SEP03	-3	3d
1400	Erect Base Columns for Admin Bldg	12	3	75	17JUL03 A	06AUG03	-3	3d
1410	Erect 1st Floor Steel Admin Bldg	8	5	38	29JUL03 A	11AUG03	-3	5d
1420	Erect 2nd Floor Steel Admin Bldg	8	8	0	05AUG03	18AUG03	-3	5d
1450	Erect Pre-Cast Walls Ground Floor	4	4	0	07AUG03	13AUG03	-3	3d
1430	Erect 3rd Floor Steel Admin Bldg	8	8	0	12AUG03	25AUG03	-3	5d
1460	Erect Pre-Cast Walls 1st Floor Admin Bldg	4	4	0	14AUG03	20AUG03	-3	3d
1470	Erect Pre-Cast Walls 2nd Floor Admin Bldg	4	4	0	21AUG03	27AUG03	-3	3d
1440	Erect Roof Steel Admin Bldg	4	4	0	26AUG03	01SEP03	-3	5d
1480	Erect Pre-Cast Walls 3rd Floor Admin Bldg	4	4	0	28AUG03	03SEP03	-3	3d
1560	Admin Bldg Buffer	4	4	0	04SEP03	10SEP03	-3	3d
1530	Admin Bldg Shell Complete	0	0	0		10SEP03	-3	3d
Maintenance Building								
1310	Form Maint. Bldg Fdn	8	0	100	02JUN03 A	18JUN03 A	-3	
1340	Install Rebar Maint Bldg Fdn	8	0	100	19JUN03 A	02JUL03 A	-3	
1500	FRP Pre-Cast Walls for Maint Bldg	16	0	100	19JUN03 A	16JUL03 A	-3	
1350	Pour Maint Bldg Fdn	1	0	100	03JUL03 A	03JUL03 A	-3	
1360	Cure Maint Bldg Fdn	28	0	100	04JUL03 A	31JUL03 A	-3	
1370	Erect Steel for Maint Bldg (shell & roof)	12	12	0	04AUG03	21AUG03	-3	8d
1510	Erect Pre-Cast Walls Maint Bldg	4	4	0	25AUG03	28AUG03	-3	8d
1570	Maint Bldg Buffer	2	2	0	01SEP03	02SEP03	-3	8d
1540	Maint Bldg Shell Complete	0	0	0		02SEP03	-3	8d

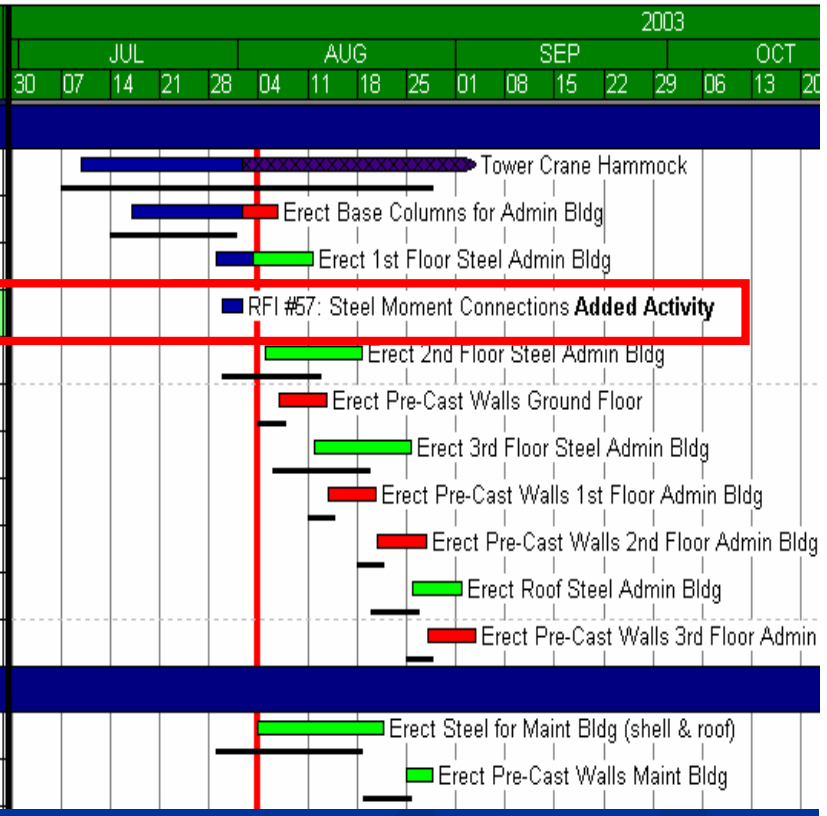


RFI Impact – Add RFI

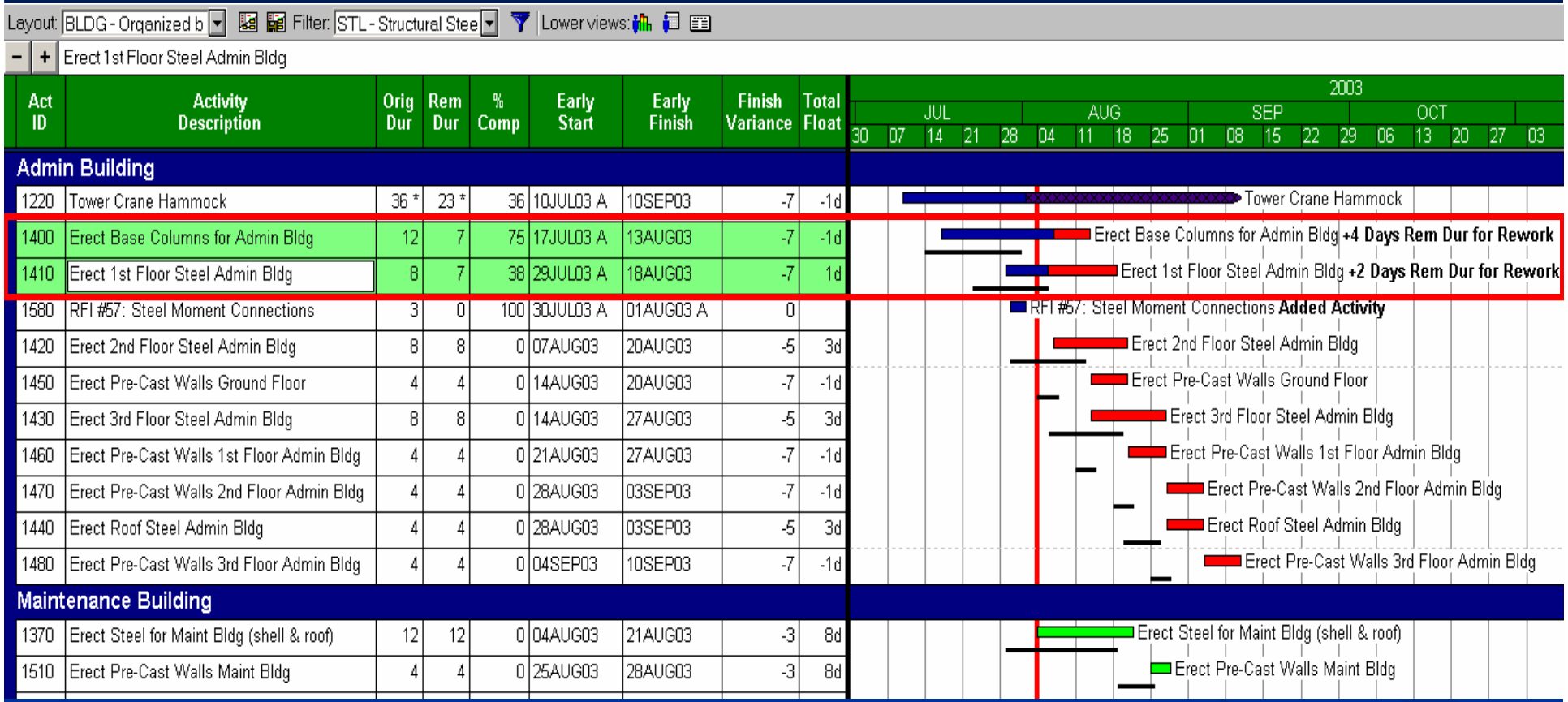
Layout: BLDG - Organized b | Filter: STL - Structural Stee | Lower views:

RFI #57: Steel Moment Connections

Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
Admin Building								
1220	Tower Crane Hammock	32 *	19 *	41	10JUL03 A	03SEP03	-3	3d
1400	Erect Base Columns for Admin Bldg	12	3	75	17JUL03 A	06AUG03	-3	3d
1410	Erect 1st Floor Steel Admin Bldg	8	5	38	29JUL03 A	11AUG03	-3	5d
1580	RFI #57: Steel Moment Connections	3	0	100	30JUL03 A	01AUG03 A	0	
1420	Erect 2nd Floor Steel Admin Bldg	8	8	0	05AUG03	18AUG03	-3	5d
1450	Erect Pre-Cast Walls Ground Floor	4	4	0	07AUG03	13AUG03	-3	3d
1430	Erect 3rd Floor Steel Admin Bldg	8	8	0	12AUG03	25AUG03	-3	5d
1460	Erect Pre-Cast Walls 1st Floor Admin Bldg	4	4	0	14AUG03	20AUG03	-3	3d
1470	Erect Pre-Cast Walls 2nd Floor Admin Bldg	4	4	0	21AUG03	27AUG03	-3	3d
1440	Erect Roof Steel Admin Bldg	4	4	0	26AUG03	01SEP03	-3	5d
1480	Erect Pre-Cast Walls 3rd Floor Admin Bldg	4	4	0	28AUG03	03SEP03	-3	3d
Maintenance Building								
1370	Erect Steel for Maint Bldg (shell & roof)	12	12	0	04AUG03	21AUG03	-3	8d
1510	Erect Pre-Cast Walls Maint Bldg	4	4	0	25AUG03	28AUG03	-3	8d



RFI Impact – Capture Rework



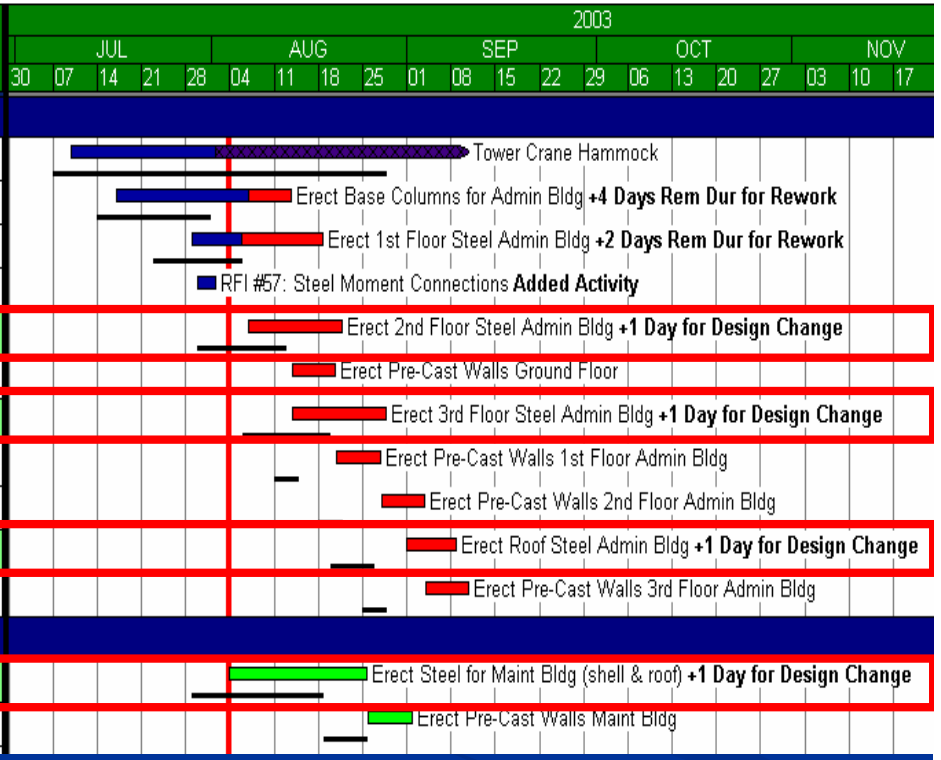
Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
Admin Building								
1220	Tower Crane Hammock	36 *	23 *	36	10JUL03 A	10SEP03	-7	-1d
1400	Erect Base Columns for Admin Bldg	12	7	75	17JUL03 A	13AUG03	-7	-1d
1410	Erect 1st Floor Steel Admin Bldg	8	7	38	29JUL03 A	18AUG03	-7	1d
1580	RFI #57: Steel Moment Connections	3	0	100	30JUL03 A	01AUG03 A	0	
1420	Erect 2nd Floor Steel Admin Bldg	8	8	0	07AUG03	20AUG03	-5	3d
1450	Erect Pre-Cast Walls Ground Floor	4	4	0	14AUG03	20AUG03	-7	-1d
1430	Erect 3rd Floor Steel Admin Bldg	8	8	0	14AUG03	27AUG03	-5	3d
1460	Erect Pre-Cast Walls 1st Floor Admin Bldg	4	4	0	21AUG03	27AUG03	-7	-1d
1470	Erect Pre-Cast Walls 2nd Floor Admin Bldg	4	4	0	28AUG03	03SEP03	-7	-1d
1440	Erect Roof Steel Admin Bldg	4	4	0	28AUG03	03SEP03	-5	3d
1480	Erect Pre-Cast Walls 3rd Floor Admin Bldg	4	4	0	04SEP03	10SEP03	-7	-1d
Maintenance Building								
1370	Erect Steel for Maint Bldg (shell & roof)	12	12	0	04AUG03	21AUG03	-3	8d
1510	Erect Pre-Cast Walls Maint Bldg	4	4	0	25AUG03	28AUG03	-3	8d

RFI Impact – Capture Change

Layout: BLDG - Organized b | Filter: STL - Structural Stee | Lower views:

Erect Steel for Maint Bldg (shell & roof)

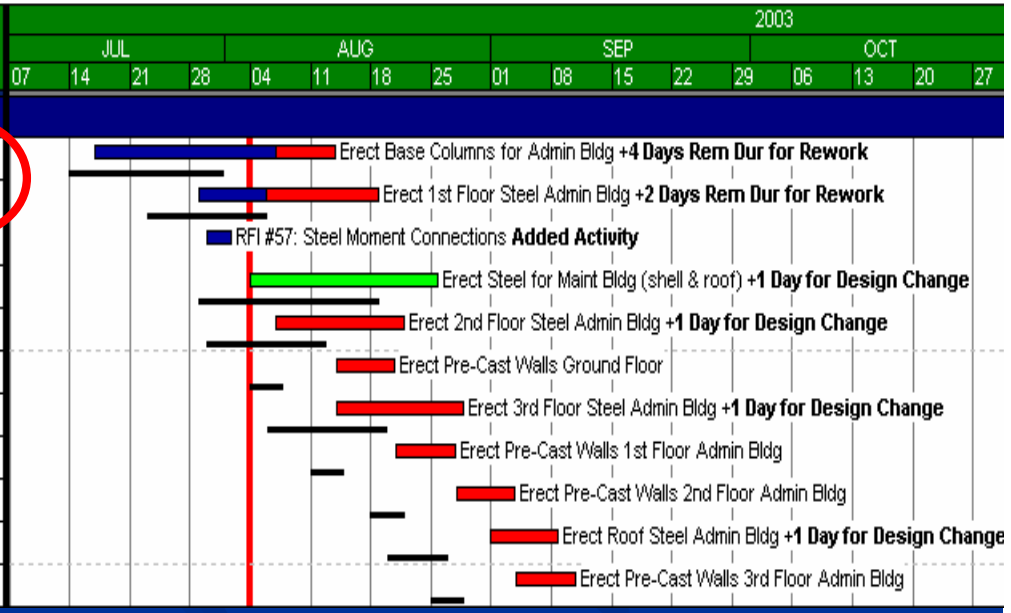
Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
Admin Building								
1220	Tower Crane Hammock	36 *	23 *	36	10JUL03 A	10SEP03	-7	-1d
1400	Erect Base Columns for Admin Bldg	12	7	75	17JUL03 A	13AUG03	-7	-1d
1410	Erect 1st Floor Steel Admin Bldg	8	7	38	29JUL03 A	18AUG03	-7	1d
1580	RFI #57: Steel Moment Connections	3	0	100	30JUL03 A	01AUG03 A	0	
1420	Erect 2nd Floor Steel Admin Bldg	8	9	0	07AUG03	21AUG03	-6	1d
1450	Erect Pre-Cast Walls Ground Floor	4	4	0	14AUG03	20AUG03	-7	-1d
1430	Erect 3rd Floor Steel Admin Bldg	8	9	0	14AUG03	28AUG03	-6	1d
1460	Erect Pre-Cast Walls 1st Floor Admin Bldg	4	4	0	21AUG03	27AUG03	-7	-1d
1470	Erect Pre-Cast Walls 2nd Floor Admin Bldg	4	4	0	28AUG03	03SEP03	-7	-1d
1440	Erect Roof Steel Admin Bldg	4	5	0	01SEP03	08SEP03	-7	1d
1480	Erect Pre-Cast Walls 3rd Floor Admin Bldg	4	4	0	04SEP03	10SEP03	-7	-1d
Maintenance Building								
1370	Erect Steel for Maint Bldg (shell & roof)	12	13	0	04AUG03	25AUG03	-4	7d
1510	Erect Pre-Cast Walls Maint Bldg	4	4	0	26AUG03	01SEP03	-4	7d



RFI Impact – Illustrated

Layout: IMPC - Organized b Filter: STL - Structural Stee Lower views:

Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
RFI Impact regarding Steel Connections								
1400	Erect Base Columns for Admin Bldg	12	7	75	17JUL03 A	13AUG03	-7	-1d
1410	Erect 1st Floor Steel Admin Bldg	8	7	38	29JUL03 A	18AUG03	-7	1d
1580	RFI #57: Steel Moment Connections	3	0	100	30JUL03 A	01AUG03 A	0	
1370	Erect Steel for Maint Bldg (shell & roof)	12	13	0	04AUG03	25AUG03	-4	7d
1420	Erect 2nd Floor Steel Admin Bldg	8	9	0	07AUG03	21AUG03	-6	1d
1450	Erect Pre-Cast Walls Ground Floor	4	4	0	14AUG03	20AUG03	-7	-1d
1430	Erect 3rd Floor Steel Admin Bldg	8	9	0	14AUG03	28AUG03	-6	1d
1460	Erect Pre-Cast Walls 1st Floor Admin Bldg	4	4	0	21AUG03	27AUG03	-7	-1d
1470	Erect Pre-Cast Walls 2nd Floor Admin Bldg	4	4	0	28AUG03	03SEP03	-7	-1d
1440	Erect Roof Steel Admin Bldg	4	5	0	01SEP03	08SEP03	-7	1d
1480	Erect Pre-Cast Walls 3rd Floor Admin Bldg	4	4	0	04SEP03	10SEP03	-7	-1d

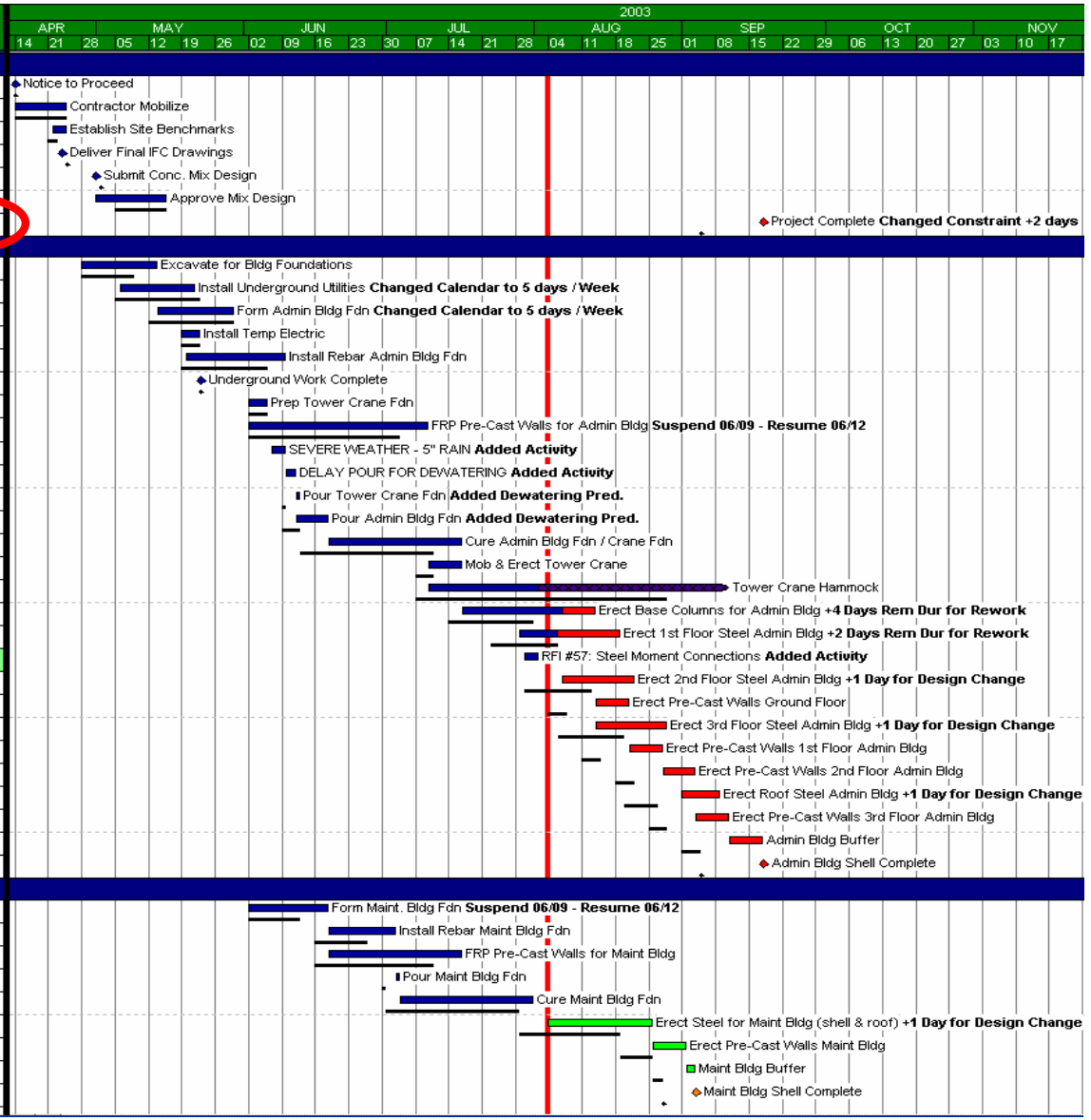


RFI Impact – Final

Layout: BLDG - Organized b | Filter: All - All activities | Lower views:

RFI #57: Steel Moment Connections

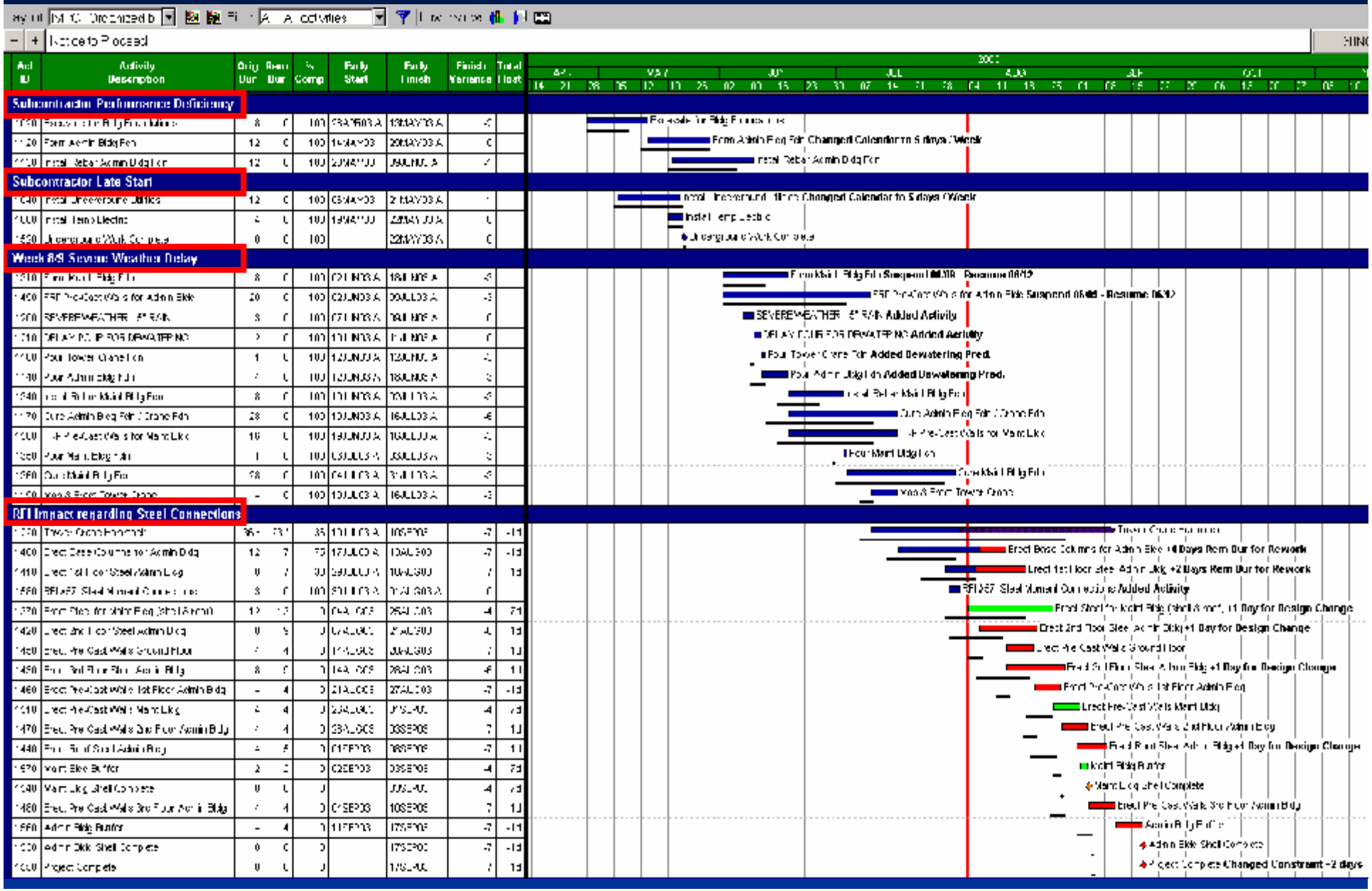
Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
General								
1000	Notice to Proceed	0	0	100	14APR03 A		0	
1010	Contractor Mobilize	8	0	100	14APR03 A	24APR03 A	0	
1240	Establish Site Benchmarks	2	0	100	22APR03 A	24APR03 A	-2	
1110	Deliver Final IFC Drawings	0	0	100		23APR03 A	1	
1090	Submit Conc. Mix Design	0	0	100		30APR03 A	1	
1100	Approve Mix Design	8	0	100	01MAY03	15MAY03 A	0	
1550	Project Complete	0	0	0		17SEP03	-7	-1d
Admin Building								
1020	Excavate for Bldg Foundations	8	0	100	28APR03 A	13MAY03 A	-2	
1040	Install Underground Utilities	12	0	100	06MAY03	21MAY03 A	1	
1120	Form Admin Bldg Fdn	12	0	100	14MAY03	29MAY03 A	0	
1060	Install Temp Electric	4	0	100	19MAY03	22MAY03 A	0	
1130	Install Rebar Admin Bldg Fdn	12	0	100	20MAY03	09JUN03 A	-1	
1520	Underground Work Complete	0	0	100		22MAY03 A	0	
1160	Prep Tower Crane Fdn	4	0	100	02JUN03 A	05JUN03 A	0	
1490	FRP Pre-Cast Walls for Admin Bldg	20	0	100	02JUN03 A	09JUL03 A	-3	
1200	SEVERE WEATHER - 5" RAIN	3	0	100	07JUN03 A	09JUN03 A	0	
1210	DELAY POUR FOR DEWATERING	2	0	100	10JUN03 A	11JUN03 A	0	
1180	Pour Tower Crane Fdn	1	0	100	12JUN03 A	12JUN03 A	-3	
1140	Pour Admin Bldg Fdn	4	0	100	12JUN03 A	18JUN03 A	-3	
1170	Cure Admin Bldg Fdn / Crane Fdn	28	0	100	19JUN03 A	16JUL03 A	-6	
1190	Mob & Erect Tower Crane	4	0	100	10JUL03 A	16JUL03 A	-3	
1220	Tower Crane Hammock	36 *	23 *	36	10JUL03 A	10SEP03	-7	-1d
1400	Erect Base Columns for Admin Bldg	12	7	75	17JUL03 A	13AUG03	-7	-1d
1410	Erect 1st Floor Steel Admin Bldg	8	7	38	29JUL03 A	18AUG03	-7	1d
1580	RFI #57: Steel Moment Connections	3	0	100	30JUL03 A	01AUG03 A	0	
1420	Erect 2nd Floor Steel Admin Bldg	8	9	0	07AUG03	21AUG03	-6	1d
1450	Erect Pre-Cast Walls Ground Floor	4	4	0	14AUG03	20AUG03	-7	-1d
1430	Erect 3rd Floor Steel Admin Bldg	8	9	0	14AUG03	28AUG03	-6	1d
1460	Erect Pre-Cast Walls 1st Floor Admin Bldg	4	4	0	21AUG03	27AUG03	-7	-1d
1470	Erect Pre-Cast Walls 2nd Floor Admin Bldg	4	4	0	28AUG03	03SEP03	-7	-1d
1440	Erect Roof Steel Admin Bldg	4	5	0	01SEP03	08SEP03	-7	1d
1480	Erect Pre-Cast Walls 3rd Floor Admin Bldg	4	4	0	04SEP03	10SEP03	-7	-1d
1560	Admin Bldg Buffer	4	4	0	11SEP03	17SEP03	-7	-1d
1530	Admin Bldg Shell Complete	0	0	0		17SEP03	-7	-1d
Maintenance Building								
1310	Form Maint. Bldg Fdn	8	0	100	02JUN03 A	18JUN03 A	-3	
1340	Install Rebar Maint Bldg Fdn	8	0	100	19JUN03 A	02JUL03 A	-3	
1500	FRP Pre-Cast Walls for Maint Bldg	16	0	100	19JUN03 A	16JUL03 A	-3	
1350	Pour Maint Bldg Fdn	1	0	100	03JUL03 A	03JUL03 A	-3	
1360	Cure Maint Bldg Fdn	28	0	100	04JUL03 A	31JUL03 A	-3	
1370	Erect Steel for Maint Bldg (shell & roof)	12	13	0	04AUG03	25AUG03	-4	7d
1510	Erect Pre-Cast Walls Maint Bldg	4	4	0	26AUG03	01SEP03	-4	7d
1570	Maint Bldg Buffer	2	2	0	02SEP03	03SEP03	-4	7d
1540	Maint Bldg Shell Complete	0	0	0		03SEP03	-4	7d



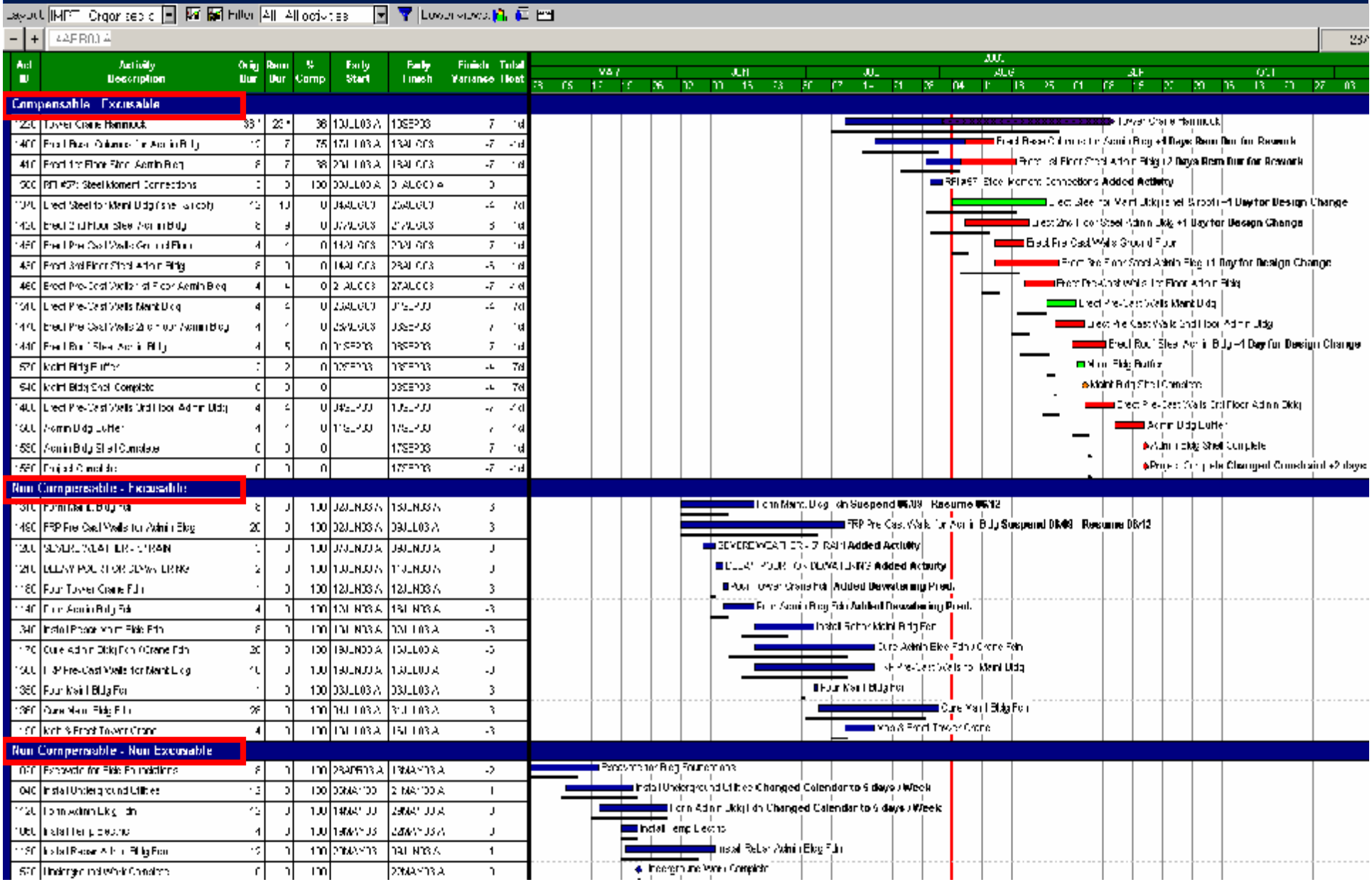
Analysis of Impacts

- Analyze Impacts Individually and as a whole
- Isolate the effect of each impact if possible
- Easier to do if analyzed at the time they happen~

Analysis of Impacts – By Event



Analysis of Impacts – By Type



Presentation of Impacts

- Illustrate Impacts, then:
  - Communicate the impact
  - Get acknowledgement of the impact
  - Get extension
  - Present Multiple Options for Recovery (with $'s)
  - Develop new plan to proceed forward~

Presenting Options - RFI

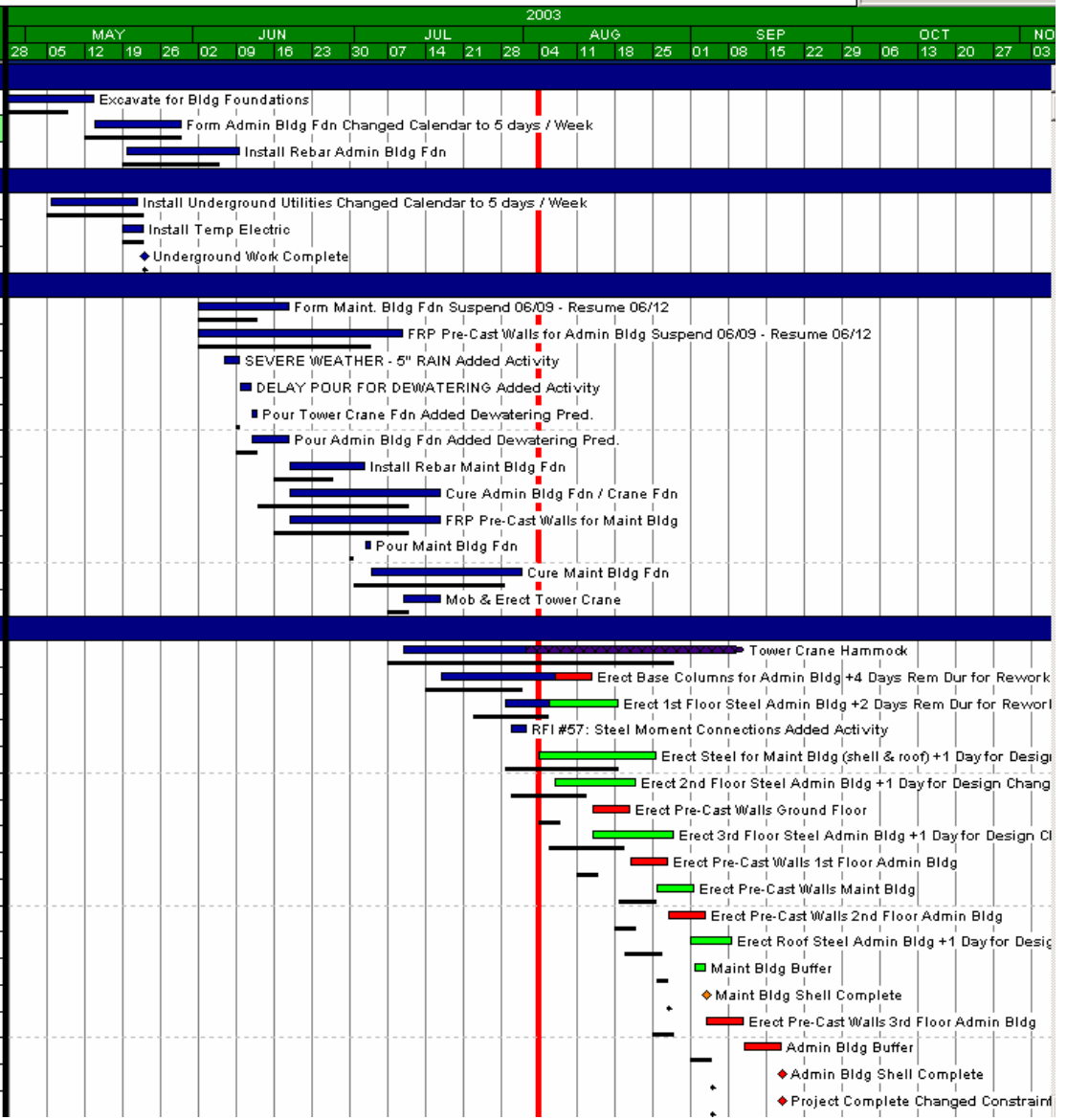
- Leave as is, finish 7 days late
  - Pro = costs and risks are known, plan is in place
  - Con = extended GC's, Equipment $'s
- Work crane related activities 5 or 6 days / Week
  - Pro = Finish sooner, decreased GC & Equip. $'s
  - Con = Increased direct $'s, Decreased Productivity, increased Safety exposure
- Re-sequence the work (if possible)
  - Pro = Finish sooner, decreased GC & Equip. $'s
  - Con = Increased Safety Risk, Decreased Productivity~

RFI Impact – Whole Schedule

Layout: IMPC - Organized b | Filter: All - All activities | Lower views:

1120 | 20AUG03 Wed

Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
Subcontractor Performance Deficiency								
1020	Excavate for Bldg Foundations	8	0	100	28APR03	13MAY03	-2	
1120	Form Admin Bldg Fdn	12	0	100	14MAY03	29MAY03	0	
1130	Install Rebar Admin Bldg Fdn	12	0	100	20MAY03	09JUN03 A	-1	
Subcontractor Late Start								
1040	Install Underground Utilities	12	0	100	06MAY03	21MAY03	1	
1060	Install Temp Electric	4	0	100	19MAY03	22MAY03	0	
1520	Underground Work Complete	0	0	100		22MAY03	0	
Week 8/9 Severe Weather Delay								
1310	Form Maint. Bldg Fdn	8	0	100	02JUN03 A	18JUN03 A	-3	
1490	FRP Pre-Cast Walls for Admin Bldg	20	0	100	02JUN03 A	09JUL03 A	-3	
1200	SEVERE WEATHER - 5" RAIN	3	0	100	07JUN03 A	09JUN03 A	0	
1210	DELAY POUR FOR DEWATERING	2	0	100	10JUN03 A	11JUN03 A	0	
1180	Pour Tower Crane Fdn	1	0	100	12JUN03 A	12JUN03 A	-3	
1140	Pour Admin Bldg Fdn	4	0	100	12JUN03 A	18JUN03 A	-3	
1340	Install Rebar Maint Bldg Fdn	8	0	100	19JUN03 A	02JUL03 A	-3	
1170	Cure Admin Bldg Fdn / Crane Fdn	28	0	100	19JUN03 A	16JUL03 A	-6	
1500	FRP Pre-Cast Walls for Maint Bldg	16	0	100	19JUN03 A	16JUL03 A	-3	
1350	Pour Maint Bldg Fdn	1	0	100	03JUL03 A	03JUL03 A	-3	
1360	Cure Maint Bldg Fdn	28	0	100	04JUL03 A	31JUL03 A	-3	
1190	Mob & Erect Tower Crane	4	0	100	10JUL03 A	16JUL03 A	-3	
RFI Impact regarding Steel Connections								
1220	Tower Crane Hammock	36 *	23 *	36	10JUL03 A	10SEP03	-7	3d
1400	Erect Base Columns for Admin Bldg	12	7	75	17JUL03 A	13AUG03	-7	3d
1410	Erect 1st Floor Steel Admin Bldg	8	7	38	29JUL03 A	18AUG03	-7	5d
1580	RFI #57: Steel Moment Connections	3	0	100	30JUL03 A	01AUG03 A	0	
1370	Erect Steel for Maint Bldg (shell & roof)	12	13	0	04AUG03	25AUG03	-4	11d
1420	Erect 2nd Floor Steel Admin Bldg	8	9	0	07AUG03	21AUG03	-6	5d
1450	Erect Pre-Cast Walls Ground Floor	4	4	0	14AUG03	20AUG03	-7	3d
1430	Erect 3rd Floor Steel Admin Bldg	8	9	0	14AUG03	28AUG03	-6	5d
1460	Erect Pre-Cast Walls 1st Floor Admin	4	4	0	21AUG03	27AUG03	-7	3d
1510	Erect Pre-Cast Walls Maint Bldg	4	4	0	26AUG03	01SEP03	-4	11d
1470	Erect Pre-Cast Walls 2nd Floor Admin	4	4	0	28AUG03	03SEP03	-7	3d
1440	Erect Roof Steel Admin Bldg	4	5	0	01SEP03	08SEP03	-7	5d
1570	Maint Bldg Buffer	2	2	0	02SEP03	03SEP03	-4	11d
1540	Maint Bldg Shell Complete	0	0	0		03SEP03	-4	11d
1480	Erect Pre-Cast Walls 3rd Floor Admin	4	4	0	04SEP03	10SEP03	-7	3d
1560	Admin Bldg Buffer	4	4	0	11SEP03	17SEP03	-7	3d
1530	Admin Bldg Shell Complete	0	0	0		17SEP03	-7	3d
1550	Project Complete	0	0	0		17SEP03	-7	3d

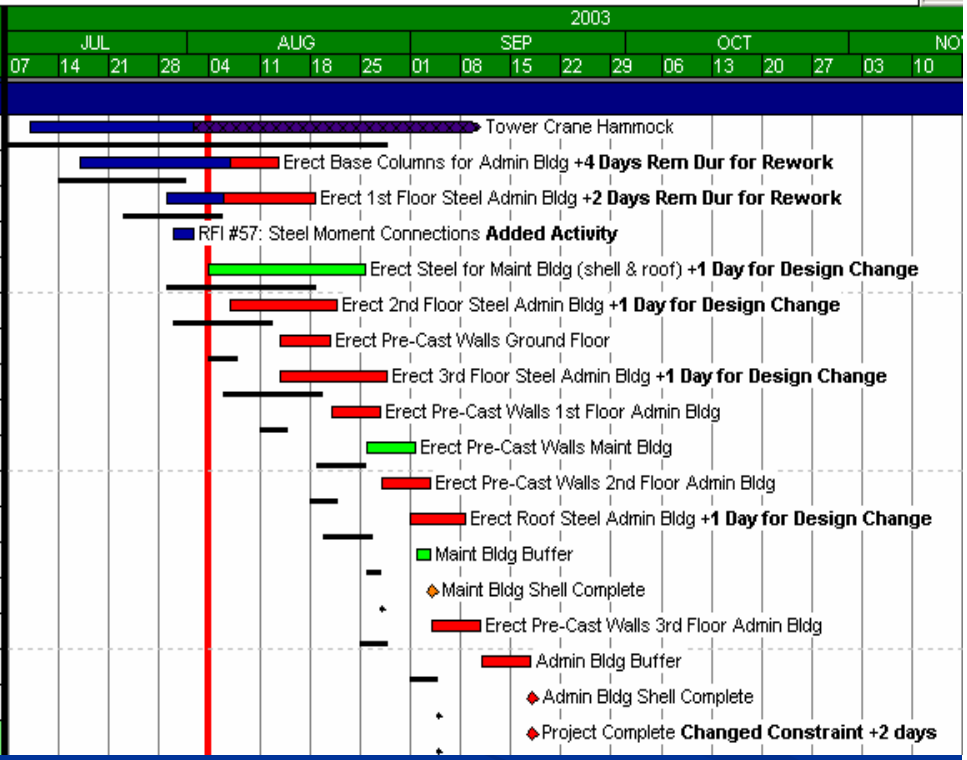


RFI Impact – Isolated

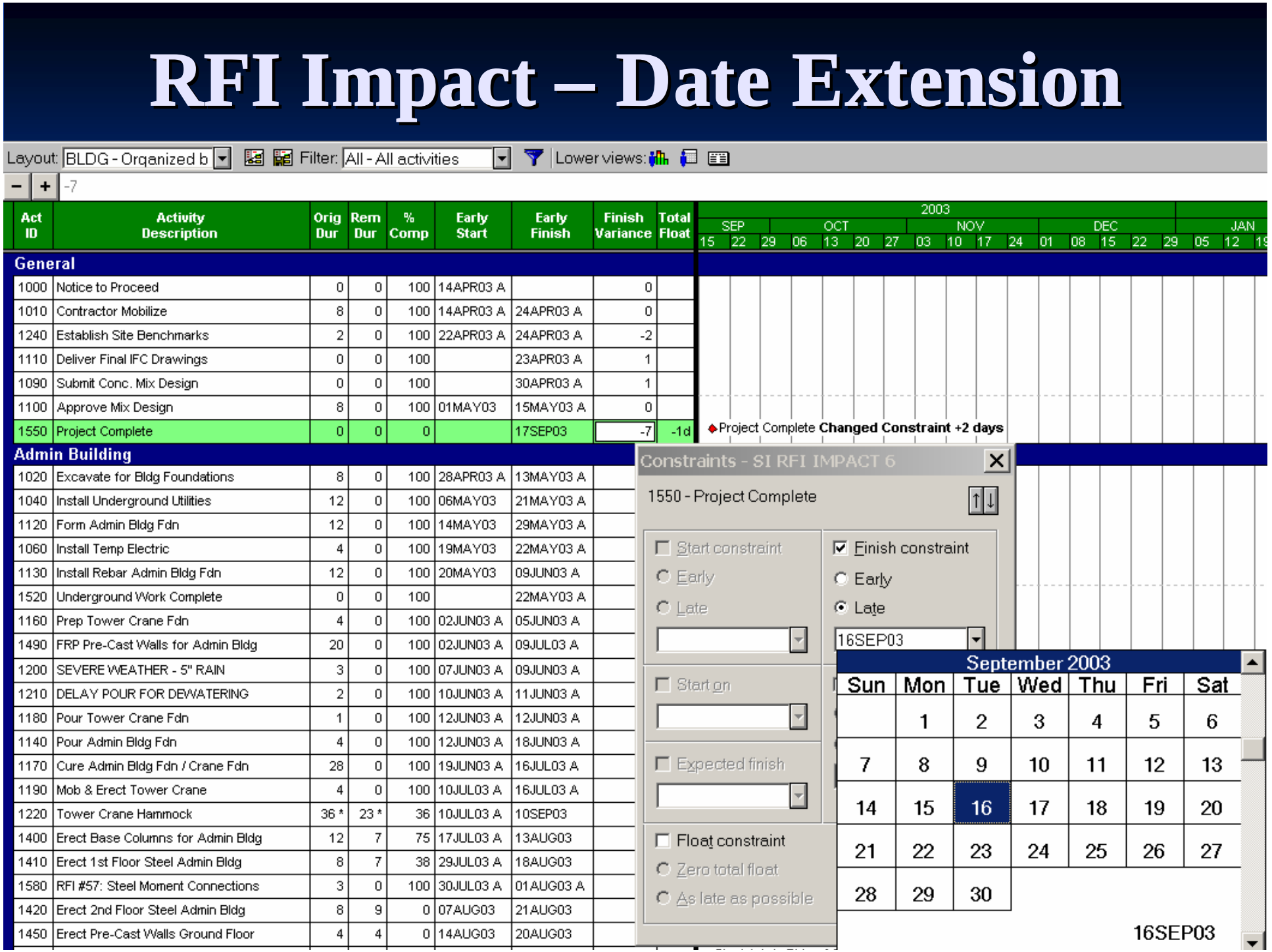
Layout: IMPC - Organized b | Filter: All - All activities | Lower views:

1550

Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
RFI Impact regarding Steel Connections								
1220	Tower Crane Hammock	36 *	23 *	36	10JUL03 A	10SEP03	-7	-1d
1400	Erect Base Columns for Admin Bldg	12	7	75	17JUL03 A	13AUG03	-7	-1d
1410	Erect 1st Floor Steel Admin Bldg	8	7	38	29JUL03 A	18AUG03	-7	1d
1580	RFI #57: Steel Moment Connections	3	0	100	30JUL03 A	01AUG03 A	0	
1370	Erect Steel for Maint Bldg (shell & roof)	12	13	0	04AUG03	25AUG03	-4	7d
1420	Erect 2nd Floor Steel Admin Bldg	8	9	0	07AUG03	21AUG03	-6	1d
1450	Erect Pre-Cast Walls Ground Floor	4	4	0	14AUG03	20AUG03	-7	-1d
1430	Erect 3rd Floor Steel Admin Bldg	8	9	0	14AUG03	28AUG03	-6	1d
1460	Erect Pre-Cast Walls 1st Floor Admin Bldg	4	4	0	21AUG03	27AUG03	-7	-1d
1510	Erect Pre-Cast Walls Maint Bldg	4	4	0	26AUG03	01SEP03	-4	7d
1470	Erect Pre-Cast Walls 2nd Floor Admin Bldg	4	4	0	28AUG03	03SEP03	-7	-1d
1440	Erect Roof Steel Admin Bldg	4	5	0	01SEP03	08SEP03	-7	1d
1570	Maint Bldg Buffer	2	2	0	02SEP03	03SEP03	-4	7d
1540	Maint Bldg Shell Complete	0	0	0		03SEP03	-4	7d
1480	Erect Pre-Cast Walls 3rd Floor Admin Bldg	4	4	0	04SEP03	10SEP03	-7	-1d
1560	Admin Bldg Buffer	4	4	0	11SEP03	17SEP03	-7	-1d
1530	Admin Bldg Shell Complete	0	0	0		17SEP03	-7	-1d
1550	Project Complete	0	0	0		17SEP03	-7	-1d

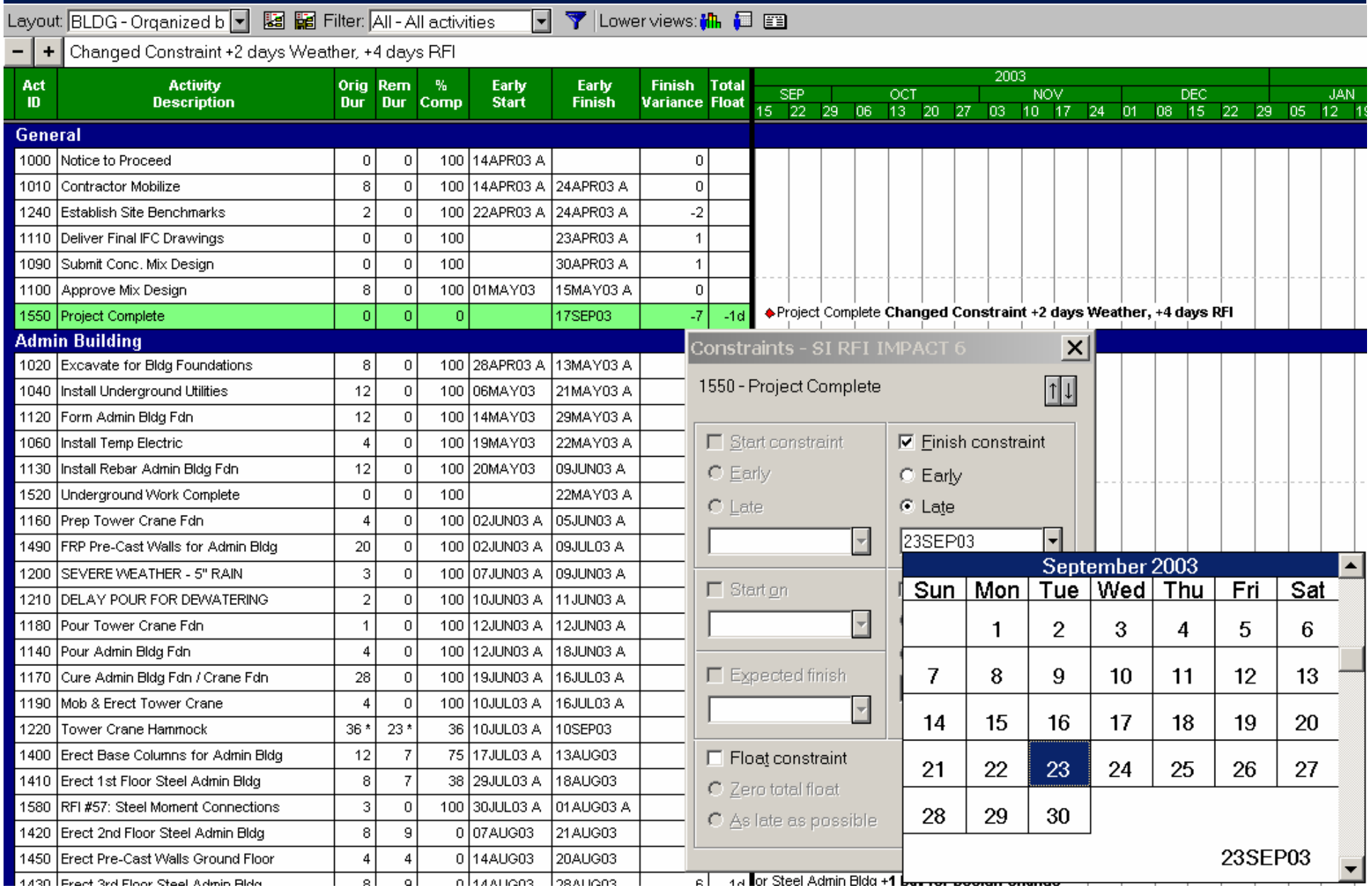


RFI Impact – Date Extension



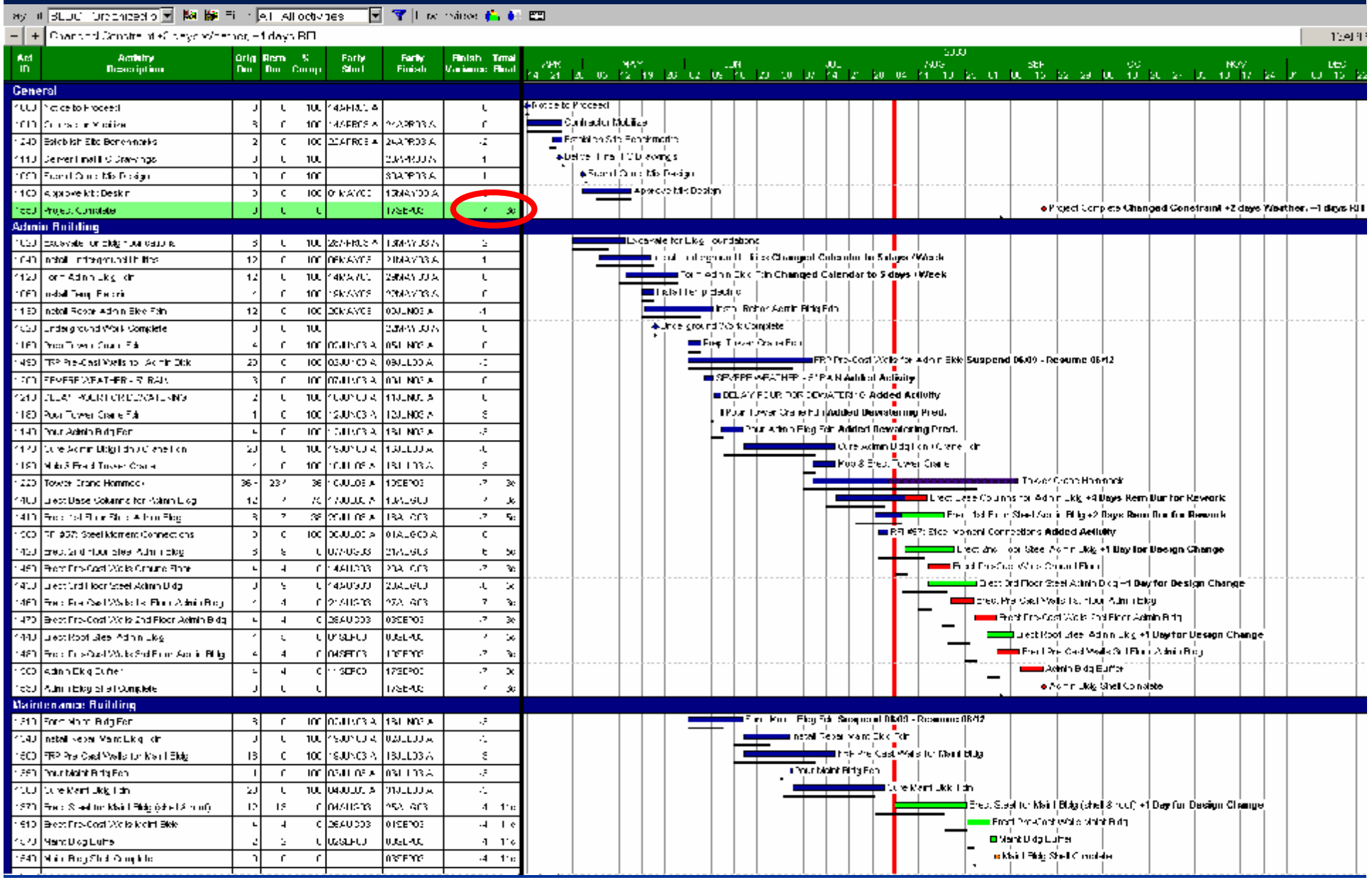
Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
General								
1000	Notice to Proceed	0	0	100	14APR03 A		0	
1010	Contractor Mobilize	8	0	100	14APR03 A	24APR03 A	0	
1240	Establish Site Benchmarks	2	0	100	22APR03 A	24APR03 A	-2	
1110	Deliver Final IFC Drawings	0	0	100		23APR03 A	1	
1090	Submit Conc. Mix Design	0	0	100		30APR03 A	1	
1100	Approve Mix Design	8	0	100	01MAY03	15MAY03 A	0	
1550	Project Complete	0	0	0		17SEP03	-7	-1d
Admin Building								
1020	Excavate for Bldg Foundations	8	0	100	28APR03 A	13MAY03 A		
1040	Install Underground Utilities	12	0	100	06MAY03	21MAY03 A		
1120	Form Admin Bldg Fdn	12	0	100	14MAY03	29MAY03 A		
1060	Install Temp Electric	4	0	100	19MAY03	22MAY03 A		
1130	Install Rebar Admin Bldg Fdn	12	0	100	20MAY03	09JUN03 A		
1520	Underground Work Complete	0	0	100		22MAY03 A		
1160	Prep Tower Crane Fdn	4	0	100	02JUN03 A	05JUN03 A		
1490	FRP Pre-Cast Walls for Admin Bldg	20	0	100	02JUN03 A	09JUL03 A		
1200	SEVERE WEATHER - 5" RAIN	3	0	100	07JUN03 A	09JUN03 A		
1210	DELAY POUR FOR DEWATERING	2	0	100	10JUN03 A	11JUN03 A		
1180	Pour Tower Crane Fdn	1	0	100	12JUN03 A	12JUN03 A		
1140	Pour Admin Bldg Fdn	4	0	100	12JUN03 A	18JUN03 A		
1170	Cure Admin Bldg Fdn / Crane Fdn	28	0	100	19JUN03 A	16JUL03 A		
1190	Mob & Erect Tower Crane	4	0	100	10JUL03 A	16JUL03 A		
1220	Tower Crane Hammock	36 *	23 *	36	10JUL03 A	10SEP03		
1400	Erect Base Columns for Admin Bldg	12	7	75	17JUL03 A	13AUG03		
1410	Erect 1st Floor Steel Admin Bldg	8	7	38	29JUL03 A	18AUG03		
1580	RFI #57: Steel Moment Connections	3	0	100	30JUL03 A	01AUG03 A		
1420	Erect 2nd Floor Steel Admin Bldg	8	9	0	07AUG03	21AUG03		
1450	Erect Pre-Cast Walls Ground Floor	4	4	0	14AUG03	20AUG03		

RFI Impact – Date Extension

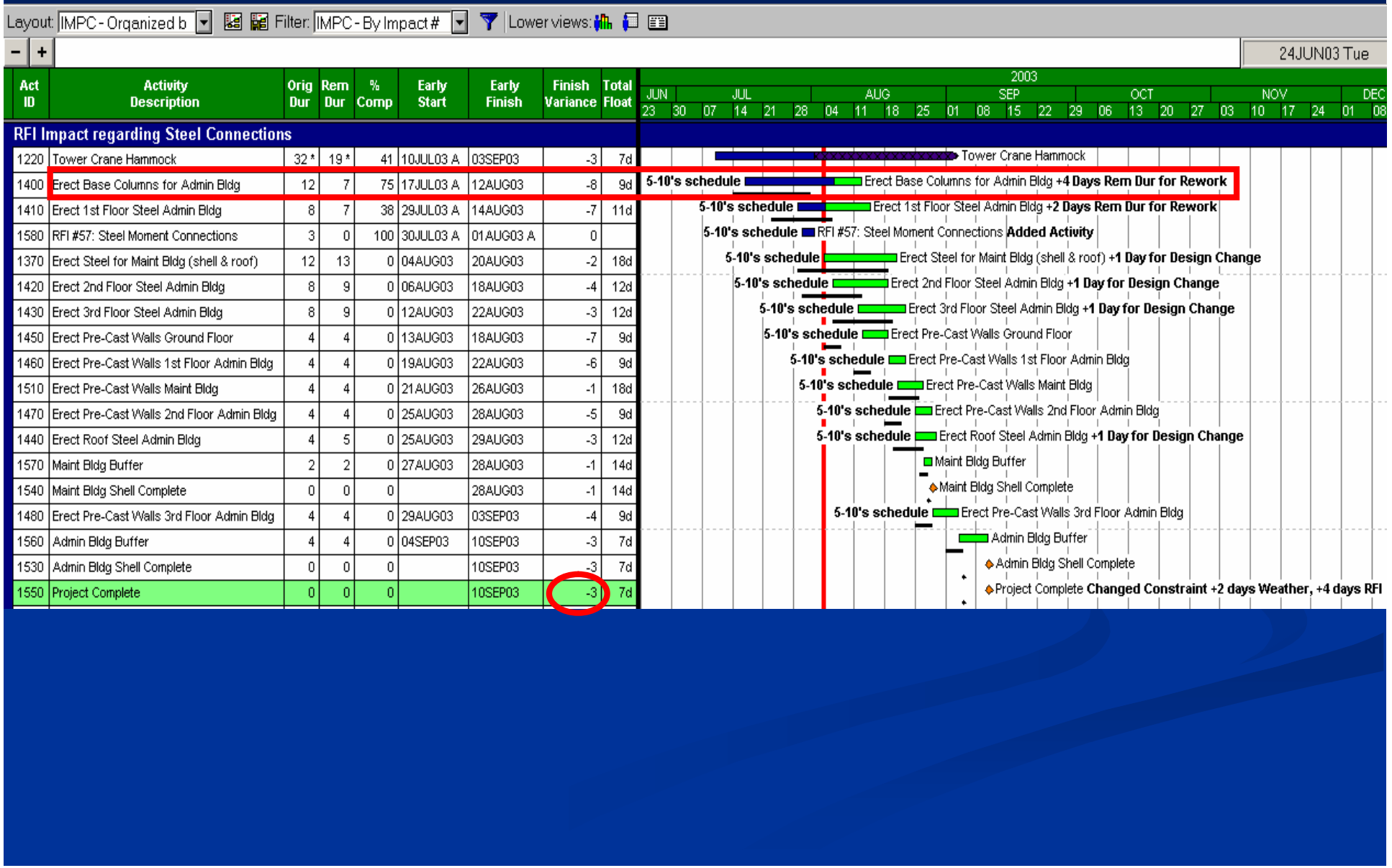


Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
General								
1000	Notice to Proceed	0	0	100	14APR03 A		0	
1010	Contractor Mobilize	8	0	100	14APR03 A	24APR03 A	0	
1240	Establish Site Benchmarks	2	0	100	22APR03 A	24APR03 A	-2	
1110	Deliver Final IFC Drawings	0	0	100		23APR03 A	1	
1090	Submit Conc. Mix Design	0	0	100		30APR03 A	1	
1100	Approve Mix Design	8	0	100	01MAY03	15MAY03 A	0	
1550	Project Complete	0	0	0		17SEP03	-7	-1d
Admin Building								
1020	Excavate for Bldg Foundations	8	0	100	28APR03 A	13MAY03 A		
1040	Install Underground Utilities	12	0	100	06MAY03	21MAY03 A		
1120	Form Admin Bldg Fdn	12	0	100	14MAY03	29MAY03 A		
1060	Install Temp Electric	4	0	100	19MAY03	22MAY03 A		
1130	Install Rebar Admin Bldg Fdn	12	0	100	20MAY03	09JUN03 A		
1520	Underground Work Complete	0	0	100		22MAY03 A		
1160	Prep Tower Crane Fdn	4	0	100	02JUN03 A	05JUN03 A		
1490	FRP Pre-Cast Walls for Admin Bldg	20	0	100	02JUN03 A	09JUL03 A		
1200	SEVERE WEATHER - 5" RAIN	3	0	100	07JUN03 A	09JUN03 A		
1210	DELAY POUR FOR DEWATERING	2	0	100	10JUN03 A	11JUN03 A		
1180	Pour Tower Crane Fdn	1	0	100	12JUN03 A	12JUN03 A		
1140	Pour Admin Bldg Fdn	4	0	100	12JUN03 A	18JUN03 A		
1170	Cure Admin Bldg Fdn / Crane Fdn	28	0	100	19JUN03 A	16JUL03 A		
1190	Mob & Erect Tower Crane	4	0	100	10JUL03 A	16JUL03 A		
1220	Tower Crane Hammock	36 *	23 *	36	10JUL03 A	10SEP03		
1400	Erect Base Columns for Admin Bldg	12	7	75	17JUL03 A	13AUG03		
1410	Erect 1st Floor Steel Admin Bldg	8	7	38	29JUL03 A	18AUG03		
1580	RFI #57: Steel Moment Connections	3	0	100	30JUL03 A	01AUG03 A		
1420	Erect 2nd Floor Steel Admin Bldg	8	9	0	07AUG03	21AUG03		
1450	Erect Pre-Cast Walls Ground Floor	4	4	0	14AUG03	20AUG03		
1430	Erect 3rd Floor Steel Admin Bldg	8	9	0	14AUG03	28AUG03	6	1d

RFI Impact – Revised End Date



Presenting Options – 5 Days / Week

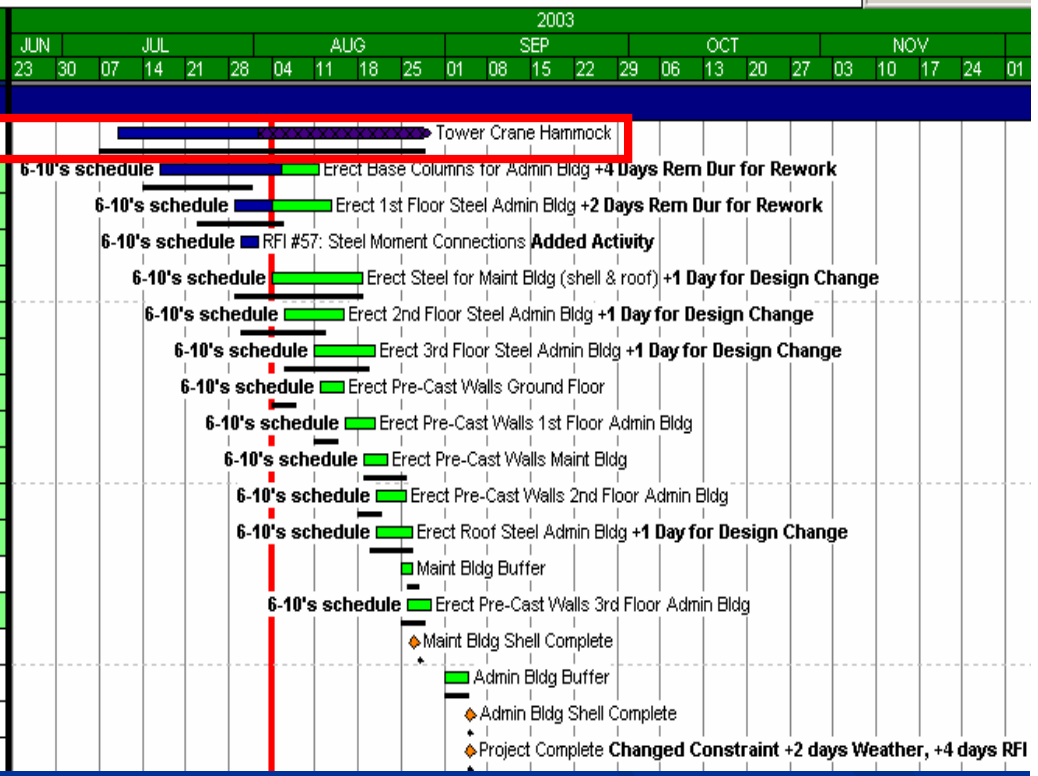


Presenting Options – 6 Days / Week

Layout: IMPC - Organized b Filter: IMPC - By Impact # Lower views:

Erect Pre-Cast Walls 3rd Floor Admin Bldg 23JUN03 Mc

Act ID	Activity Description	Orig Dur	Rem Dur	% Comp	Early Start	Early Finish	Finish Variance	Total Float
RFI Impact regarding Steel Connections								
1220	Tower Crane Hammock	29 *	16 *	45	10JUL03 A	29AUG03	0	10d
1400	Erect Base Columns for Admin Bldg	12	7	75	17JUL03 A	11AUG03	-9	15d
1410	Erect 1st Floor Steel Admin Bldg	8	7	38	29JUL03 A	13AUG03	-7	17d
1580	RFI #57: Steel Moment Connections	3	0	100	30JUL03 A	01AUG03 A	0	
1370	Erect Steel for Maint Bldg (shell & roof)	12	13	0	04AUG03	18AUG03	0	25d
1420	Erect 2nd Floor Steel Admin Bldg	8	9	0	06AUG03	15AUG03	-3	18d
1430	Erect 3rd Floor Steel Admin Bldg	8	9	0	11AUG03	20AUG03	-1	18d
1450	Erect Pre-Cast Walls Ground Floor	4	4	0	12AUG03	15AUG03	-7	15d
1460	Erect Pre-Cast Walls 1st Floor Admin Bldg	4	4	0	16AUG03	20AUG03	-5	15d
1510	Erect Pre-Cast Walls Maint Bldg	4	4	0	19AUG03	22AUG03	2	25d
1470	Erect Pre-Cast Walls 2nd Floor Admin Bldg	4	4	0	21AUG03	25AUG03	-3	15d
1440	Erect Roof Steel Admin Bldg	4	5	0	21AUG03	26AUG03	0	18d
1570	Maint Bldg Buffer	2	2	0	25AUG03	26AUG03	1	16d
1480	Erect Pre-Cast Walls 3rd Floor Admin Bldg	4	4	0	26AUG03	29AUG03	-1	15d
1540	Maint Bldg Shell Complete	0	0	0		26AUG03	1	16d
1560	Admin Bldg Buffer	4	4	0	01SEP03	04SEP03	0	10d
1530	Admin Bldg Shell Complete	0	0	0		04SEP03	0	10d
1550	Project Complete	0	0	0		04SEP03	0	10d



Capturing Delays and Impacts Summary

- Foundation of schedule must be sound
  - Cover scope of work for all parties
  - Coding structure
  - Logic
  - Durations
- Update Regularly
  - File, Save As, … for every update period
  - Capture AS, AF, % Comp., RD every week
  - Analyze the Update
  - Maintain scheduler's narrative & log~

Capturing Delays and Impacts Summary

- Capture the Impacts
  - Add impacts to the schedule as they happen
  - Log changes to the schedule
  - Code the impact
  - Analyze
- Communicate
  - Present the impact
  - Get Acknowledgement
  - Present Options
  - Make a new plan~

Scheduling Techniques Summary

- Solid Plan
  - Contractual Language
  - Integrated Schedule – 5 Phases
  - CPM, Resource Loaded
- Built Well
  - “Mechanics” are correct
  - Coding / Structure is sound
  - Protocol developed early~

Scheduling Techniques Summary

- Check the Schedule
  - Peer Review
  - Review with Core Team
  - Perform Risk Analysis
- Use the Schedule
  - Field Information
  - Management Information
- Capture the Problems
  - Illustrate Impacts
  - Forecast Delays
  - Provide Options~

The End

Scheduling Techniques to Optimize Execution
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References

- "Scheduling practices and project success (Paper PS05)." **Andrew F. Griffith.** *49th Annual Meeting, AACE International*, New Orleans, LA, June 26-29, 2005.
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  - http://www.pertmaster.com/