A Structured Approach to Minimum Cost Recovery Scheduling

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Background

- Project management requires
  - nimble response to daily occurrences on a project
  - hundreds of quick decisions
  - problems trend to promote crisis management
- PM often evolves into a pattern of crisis project management.
- Three steps to eliminating systematic crisis management:
  1. Development of a scheduling program – place a company on a schedule-driven project management program
  2. Project management recovery system - develop a structured approach to dealing with delays from a project management perspective
  3. Scheduling recovery system – develop a clear prioritized process for analyzing schedules and providing recovery suggestions and solutions.

Step One – Institute a Schedule-Driven Program

- If a program has symptoms that include
  - late completion of projects
  - just-in-time completion of projects
  - Consistent two-minute warning completions
  - Budget-busting completions
- The company needs to put a schedule-driven program in place.
- Implementing the new program consists of:
  - Senior Management buy-in for:
    - Planning and scheduling
    - Dedicated schedule development
    - Elimination of crisis management
    - Good analytical software
  - A process of mandated schedule development, updating and analysis, with consistent monitoring

Step 1 Schedule-Driven Program

3. Development of effective and simple reports
   a. Senior level management reports
      i. At-a-glance style
      ii. All Projects
      iii. Clear, meaningful metrics
   b. Project level management reports
      i. Predictive information
      ii. Focus on Critical Path work
      iii. Clear, meaningful metrics
4. Training the entire PM team in scheduling philosophy
5. Selection & training of the primary scheduler
6. Implementation of the process, with scheduling taking a prominent role in PM meetings
7. Follow through to ensure the process is adopted
8. Assessment of results

Step 1 Schedule-Driven Program

- Senior management
  - little recognition of the problems behind visible symptoms
  - uses management “club” to treat those symptoms.
  - management club is used for PM’s to work harder, so all the problems would go away.
- Senior management must be convinced
  - stop focusing on the project managers “failings”
  - support dedicating time to planning the projects.
- Project managers have so many responsibilities that they cannot control
  - Invoicing, cost control, budgeting
  - problem resolution, client communications
  - resource management
  - communications & paperwork demands
- Scheduling will not be consistently managed.
- Senior management must mandate a schedule-driven program.

Step 1 Schedule-Driven Program

- The scheduling program:
  - Written down
  - Explained step by step
- Every project (no matter how small):
  - Have a schedule developed
  - Must be managed by the schedule
  - Have the project management team in agreement with the plan
  - Schedule process must be reported
  - Schedule must be updated weekly
  - Schedule prominent in meeting agenda.
- Running meetings by the schedule is the best way to show dedicated schedule planning.
- Once schedule is updated, results reported.
- If slippage reported, must involve resolution.

Step 1 Schedule-Driven Program

- Developing senior management reports is crucial;

Management Schedule Report

Tazewell Place - Harbor

Contract Substantial Completion date is	6/13/2007	Original Production Completion Date is		6
Current predicted Contract Completion date is	5/17/2007	As of this update, we are	ahead	27 calendar days
Current predicted Production Completion date is	5/17/2007	As of this update, we are	ahead	27 calendar days
9/8/2006 Update: Production Completion Date was	5/15/2007	Since the last update, we	lost	2 calendar days

Principal Reasons for Changes in this Schedule Report:

Update Data Date 04Oct06
Project slipped 2 days for the first time in 4 updates. Set Shoring DP-28, on the DP01 side of the building, 8th Floor, slipped 2 days and was the driving cause for delay. The Crit
DP01 side of the building, through the exterior wall form and rebar, then the deck shoring, formwork, rebar, and pour, then back to buttoning up the walls and the cycle starts agai
DP01 side of the building in this sequence WILL delay the project, on a day per day delay.

DP-29 shoring finished 1 day early, but since DP-28 slipped, this early finish did not advance the project completion.

Critical Issues to Watch

The Longest Path (Critical Path) runs through the DP-28 pour, then over to buttoning up Shear Walls 1 and 3 (WP176, 178, 175, 173, 177, 179, 174) and then up to Set Shoring on DP-30 the next deck above DP-28 on the DP01 side.

Secondary (Near Critical) Issues to Wat

Near Critical work for this period is: Columns on DP-26 and DP-28, and t
College and the DP02 corner of Boush Street.

Future Milestones	Dates
R/F/Pour columns DP-26	4-Oct-06
Pour deck DP-28	11-Oct-06
Pour deck DP-29	12-Oct-06

Legend

Step 1 Schedule-Driven Program

- Senior management must take report when they drive by sites. This provides overview of planned visual progress.
- Project manager gets a copy of report, so he knows what information is reported.
- Project manager level reports
  - single most important report - Critical Path
  - project manager understands the use
  - PM walks the job with the report in hand
  - PM verifies that Critical Path is being worked
  - PM also verifies that other “mass volume” work is progressing and not eroding Total Float (or Free Float)

Step 1 Schedule-Driven Program

- Best to keep update & report weekly (full metrics monthly)
- Report should include general status summaries:

APMT Dashboard 10/7/2005

Schedule Status

Project	Phase		Status			NTP	Contract Finish	Early Finish	Contract Time Expired
Dredge	Construction	50%	Ahead	28	CD	5/4/2005	1/16/2006	12/19/2005	57.4%
Wharf	Construction	39%	Behind	34	CD	11/29/2004	11/18/2006	12/22/2006	42.2%
Yard	Construction	5%	On Time			7/11/2005	7/30/2007	7/30/2007	10.6%
Off Site Road	Design Build		On Time			8/1/2005	1/15/2007	1/15/2007	11.0%
Wetlands	Design Complete		N/A			N/A			
Dominion	Design - Various		N/A			N/A			
Buildings	Design		N/A			N/A			
On Site Rail	Design - Concept		N/A			N/A			
Off Site Rail	Design - Concept		N/A			N/A			

Current Issues

Project	Date	Description	TF	Notes	BIC
Wharf	7/13/2005	#18 Tierods	N/A	Cold galvanizing of tierod threads has clogged threads preventing couplings from being attached. *Not critical*	CH2MHILL
Wharf	7/15/2005	HZ bulkhead Eastward deflection by 24-inches	?	Design correction completed. Contractor given NTP. Schedule affects will be assesed when 36" piles (A-F) must stop due to repair operation.	CH2MHILL
Wharf	8/1/2005	HZ bulkhead 252 - 437	N/A	Shear studs missing (see non-compliance notices) *Not critical*	Weeks
Wharf	8/3/2005	Concrete pile damage	-15	First 3 driven piles developed cracks. Waiting on repair methods from Weeks.	Weeks
Wharf	8/17/2005	Concrete pile out of tol.	N/A	Joints between sections are greater than allowed 1/4-inch. *Not critical*	Weeks

Open Non-compliance Notice

Project	Date	Title	TF	Notes	BIC
Wharf	6/23/2005	Submittal Schedule	N/A	Submittal schedule not providedas required by specifications	Weeks
Wharf	6/23/2005	Holes cut in AZ-18 piles	N/A	Holes cut to allow water drainage during jetting operations	Weeks
Wharf	8/1/2005	Improper handling walers	N/A	Unloading without protection causing surface coat scratches	Weeks
Wharf	8/2/2005	AZ-18 w/o shear studs	N/A	AZ-18's stabbed w/o shear studs	Weeks
Wharf	8/4/2005	AZ-18 w/o shear studs	N/A	AZ-18's being driven w/o shear studs	Weeks
Wharf	9/17/2005	Out of tolerance 36" pile	N/A	Joint offsets greater than 1/4"	Weeks
Wharf	8/18/2005	Improper handling AZ-18	N/A	Scratched coating	Weeks
Wharf	8/22/2005	Out of tolerance 36" pile	N/A	Joint offsets greater than 1/4"	Weeks

RFIs

Project	Open	Closed	Avg Time Out
Wharf	9	55	
Yard	4	14	
Buildings	0	0	
On Site Rail	0	0	

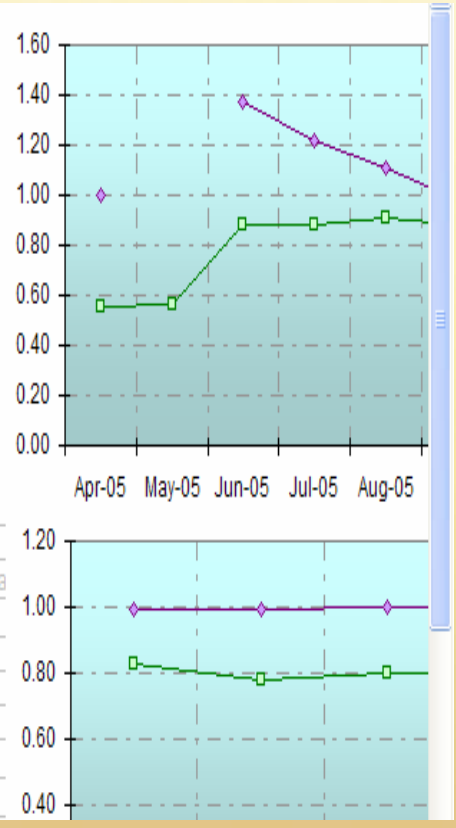
Submittals

Project	Open	Reviewed	Avg Time Out
Wharf	34	186	43.4
Yard	10	37	22.4
Buildings	0	0	0.0
On Site Rail	0	0	0.0

Step 1 Schedule-Driven Program

- Provide project managers with additional standard reports - Earned Value metrics

1	Wharf												
2	2005	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	Earned Value ($M)				6.0	8.9	22.1	30.5	36.4	36.5	42.8	46.8	51.0
4	Actual Cost ($M)				6.0	4.6	17.4	27.7	27.7	37.2	38.3	43.4	45.9
5	CPI[1]				1.00	1.90	1.37	1.22	1.11	0.98	1.12	1.08	1.11
6	SPI[2]				0.55	0.56	0.88	0.88	0.91	0.88	0.88	0.87	0.89
7	2006	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
8	Earned Value ($M)	56.4	60.9	60.7	72.0	78.2	82.5	87.1	85.9				
9	Actual Cost ($M)	52.2	55.2	60.4	70.0	76.5	80.6	83.8	90.7				
10	CPI[1]	1.08	1.10	1.00	1.03	1.02	1.02	1.04	0.95				
11	SPI[2]	0.70	0.90		0.96	0.97	0.99	0.95	0.91				
12	Yard												
13	2005	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
14	Earned Value ($M)											16.7	18.2
15	Actual Cost ($M)											16.8	18.4
16	CPI[1]											0.99	0.99
17	SPI[2]											0.83	0.78
18	2006	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
19	Earned Value ($M)	19.5	22.9	29.0	32.4	35.4	40.6	44.5	53.1				
20	Actual Cost ($M)	19.5	23.3	29.2	32.3	35.2	40.9	46.5	53.1				
21	CPI[1]	1.00	0.99	0.96	1.00	1.01	0.99	0.96	1.00				
22	SPI[2]	0.80	0.80	0.86	0.87	0.88	0.87	0.84	0.85				

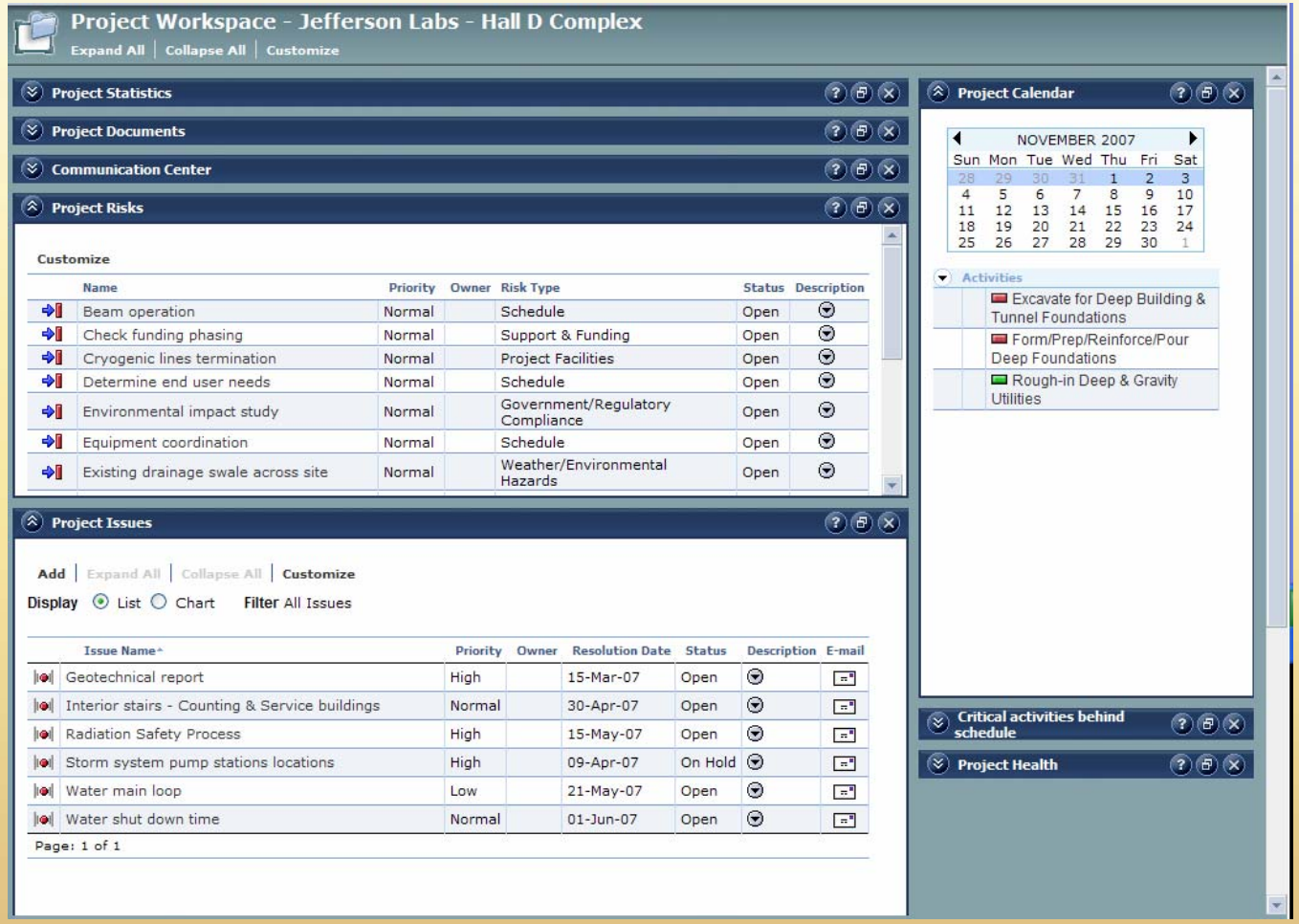


Step 1 Schedule-Driven Program

- Customized reports – PM - myPrimavera

Step 1 Schedule-Driven Program

- Customized reports – PM - myPrimavera



Step 2

Project Management Recovery

Step 2 Project Management Recovery

- Develop strategy for addressing slippage
  - Brainstorm before need
  - Use Lessons Learned approach
  - Develop checklist
- Divide strategy into source categories
  - Design clarity
    - Incomplete, inaccurate documents
  - Planning
    - Slow buy-out, poor schedules
  - Project Management
    - Resource problems, Critical Path monitoring
  - Change Management
    - Unforeseen conditions, owner requests

Step 2 PM Recovery

- Design Source Slippage Recovery
  - Use RFI system
    - Monitor & document
    - Watch for patterns of response delay
  - String dimensions & identify problems early
    - Get answers prior to shop drawings
  - Constructability review
    - Submit RFI's for all issues
    - Use results in planning
  - Document substandard plans & specs
  - Monitor quality of reissued drawings
    - Prepare TIA's for all changes

Step 2 PM Recovery

- Design Clarity Source Recovery
  - Use standard scope of work forms
    - Ensure no scope holes
    - Identify unclear scope
    - Use bid process to assign all scope

SUBCONTRACTOR: / SCOPE DESCRIPTION	Ron Stephens		Hudgins		T & R	
	INCL		INCL		INCL	
BASE BID						
Engineering						
Testing						
Curb/walk demolition						
Clearing & Grubbing						
Erosion Control						
Maintenance of EC while onsite						
Slope Protection - temp seed						
Inlet Protection						
Tree Protection						
Construction Entrance						
Maintenance of CE						
Traffic control & plan						
Traffic barricades						
Strip topsoil & stockpile						

Step 2 PM Recovery

- Planning Source Slippage Recovery
  - Schedule the buyout process
    - Include all procurement items
    - Incorporate into schedule delivery/install
  - Prioritize the buyout
    - Do not allow convenience buyout
    - Monitor open buyout in schedule
  - Provide clear Area Designation Plan
    - Mirror the contract documents
    - Subs and foremen must understand it
  - Schedule the submittal process
  - Monitor delivery items
  - Watch submittal/approval cycles
  - Sequence the shop drawings

Step 2 PM Recovery

- Project Management Source
  - Review & include admin process in schedule
  - Schedule ALL Owner responsibilities
  - Focus on historically weak subcontractors
  - Keep resources at forefront of planning
    - Resource load schedule
    - Get commitment about crew sizes from subs
    - React immediately to under-staffing
    - Work to minimize substitution of good workers
  - Involve responsible subs in recovery discussions
  - Stress working the Critical Path
  - Treat dry-in as major milestone & monitor
  - Create and evaluate lay-down area

(cont.)

Step 2 PM Recovery

- Project Management Source Recovery
  - Emphasize sequenced materials storage
  - Mandate site organization for efficiency
  - Consider use of materials distribution crew
  - Mandate helper/labor use as appropriate
  - Give access priority to CP trades
  - Create & maintain travel corridors
  - Keep interior halls clean & lighted
  - Clean, clean, clean – entire site
  - Watch stair traffic flow and accommodate
  - Label floors & columns clearly
  - Restrict moisture from building, close openings

(cont.)

Step 2 PM Recovery

- Project Management Source Recovery
  - Develop & use tower crane schedule
    - Assign time block to each major trade
    - Trade has priority in their time block
  - Look at pre-assembly component opportunity
    - Prefab on ground
    - Prefab as per schedule sequencing
    - Set up bad weather assembly locations
  - Monitor delivery sequencing to meet schedule
  - Ensure QC is continuous (use completion lists)
  - Consider worker cash bonuses for production
  - Use additional workers rather than overtime

(cont.)

Step 2 PM Recovery

- Change Management Source Recovery
  - Use formal change management procedure
    - Institute it
    - Follow it
  - Clean up change ramifications
    - Do it every update
    - use TIA methodology for all change
  - Ensure PM team understands contract scope
  - Close out changes with schedule updates
    - Incorporate changes into schedule
    - Submit CO & time extension requests
    - Do it timely

Step 3

Schedule Recovery

Step 3 Schedule Recovery

- Scheduling Lessons Learned ideas
  - Huge opportunity
  - Incorporates legal ramifications
  - Provides risk management
  - Be prepared to use historical data to suggest recovery strategies
  - Plan for good schedule maintenance
    - Identifies source of delays/slippages
    - Analysis can identify constructive acceleration
    - Provides ability to supply timely notification
    - Involve responsible party in recovery
      - Owner
      - Trade contractor
  - Incorporate risk management planning in schedule development
  - Develop good checklist (during development)

Step 3 Schedule Recovery

- Checklist ideas when recovery required
  - Clean up issues and schedule
    - Clean up outstanding claims/time impacts
    - Determine causal activities for delay
    - Identify responsibility
    - Notify responsible parties
    - Involve responsible parties in recovery
    - Be careful if responsible party is weak player
  - Review efficiency of work
    - Solicit contractor identification of disruption
    - Involve foremen and superintendents
    - Discuss practical crew sizes, materials flow
    - Isolate potential delay problems

(cont.)

Step 3 Schedule Recovery

- Checklist ideas when recovery required
  - Review efficiency of work (continued)
    - Identify disruption issues between trades
    - Watch sub jumping into open space out of sequence
    - Monitor slipped start dates
      - Identify reason
        - Subcontractor mobilization
        - Superintendent coordination
    - Verify WORK THE SCHEDULE
    - Look for potential parallel Critical Path work
      - Actual concurrent work opportunities

(cont.)

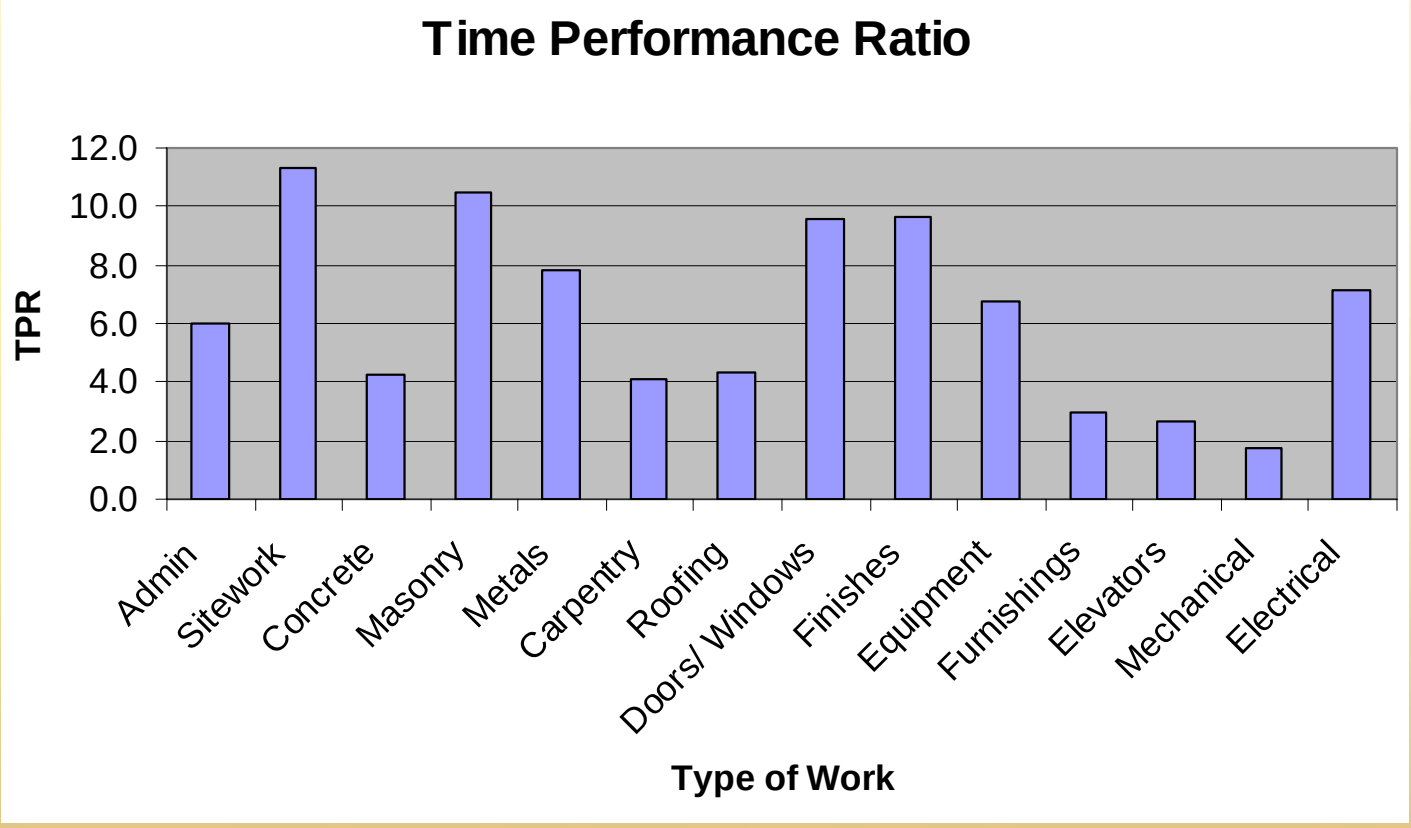
Step 3 Schedule Recovery

- Checklist ideas when recovery required
  - Review durations
    - Calculate OD / Path Duration Days / Total Float (TF+1)
      - "Importance Ratio" (IR)
      - Sort by IR, smallest to largest
      - Smallest IR activities = best recovery opportunity
      - Uses TF as a path value
    - Identify historical trades with AD < OD
      - Chase these areas for recovery
      - Use "Tipper" (TPR) report, TPR = AD/OD
      - Low TPR trades have contingency time available
      - Watch for high TPR values – monitor those trades
    - Review logic
      - Identify all out-of-sequence work
      - Separate hard logic from soft logic

(cont.)

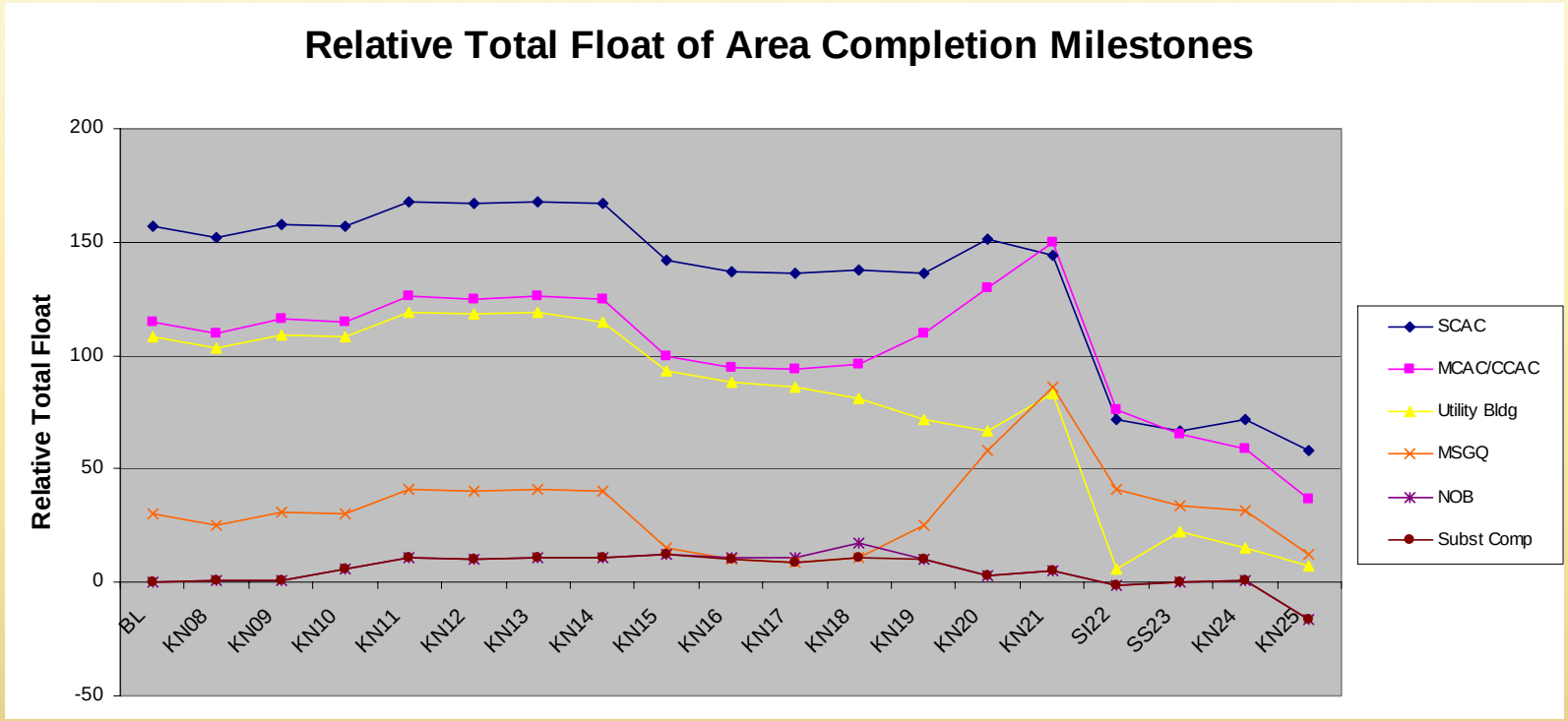
Step 3 Schedule Recovery

- Review Time Performance Ratio per trade (AD/OD)
  - In chart below Electrical contractor shows poor opportunity for recovery help, Mechanical contractor would be better choice



Step 3 Schedule Recovery

- Watch erosion of float, do not let it continue
  - Print by trade when assessing available resources



Step 3 Schedule Recovery

- Checklist ideas when recovery required
  - Review logic (continued)
    - Hard logic cannot be changed easily
    - Soft logic is good target for recovery
      - Resource restraints
        - Identify historical better performance
        - Increase resources
        - Additional crews
        - Remove resource logic if satisfied
      - Preferential restraints
        - Discuss with subcontractors
        - Use historical out-of-sequence work as basis
      - Space restraints
        - Organize by area
        - Look for light workload in areas
        - Verify against CP & move crew work

(cont.)

Step 3 Schedule Recovery

- Checklist ideas when recovery required
  - Resource Loading - Review Resources
    - Run resource comparison reports
    - Look for built-in contingency time
  - Filter by Areas
    - Look at Resource Table
    - Consider worker count in areas
    - Review CP in areas
    - Reallocate resources by CP by area
  - Load activities with Crews
    - Review Resource Table for 3 week look-ahead
    - Manually level crews to eliminate slippage
    - Discuss additional crews when stacked CP activities
    - Target areas and crews, don't just man-up

(cont.)

Step 3 Schedule Recovery

- Checklist ideas when recovery required
  - Resources
    - Look at repetitive tasks portion of work
      - Go to modified linear scheduling
        - Set up crews to follow each other
        - Promote competition
        - Take advantage of learning curve
  - Scheduling actions
    - Verify requirements for Substantial Completion
      - Revise logic if necessary (go to minimum)
    - Review CP (near critical)
      - Start at Data Date
      - Review every relationship
      - Look at concurrent work opportunities
      - Focus on dissimilar trades to avoid ramp-up

(cont.)

Step 3 Schedule Recovery

- Checklist ideas when recovery required
  - Scheduling actions
    - Compare out-of-sequence work with soft logic
      - See if this caused changes to the planned work
      - If this worked, duplicate the out-of-sequence work by removing the soft logic in future work
    - If this is done with FS changes to SS or FS with lags
      - Review carefully
      - Add FF relationships to control completion
    - See if critical trades can bring in additional resources to add another workday or shift
    - If trade has performed, look at overtime option
      - Last choice
      - Remember risks & inefficiencies of overtime

(cont.)

Step 3 Schedule Recovery

- Checklist ideas when recovery required
  - Scheduling actions
    - Print schedule with Free Float column exposed
    - Push contractors to work within FF values
      - Eliminate disruption
      - Eliminate slippage and delay to other trades
    - Provide interim milestones for important events
      - Celebrate achievement of every milestone
    - Review all Calendars
      - Assess non-work time
      - Verify appropriateness
      - Review weather calendars, look for contingency
      - Reduce non-work weather days if reasonable

Summary

- Every project runs into problems
- A Schedule-Driven Program is the most cost effective way to minimize slippage
- A proactive Project Management Recovery plan to deal with delays & slippage will improve response
- A proactive Schedule Recovery plan to deal with delay will improve response
- Brainstorming for Lessons Learned takes advantage of PM team experience
- Developing checklists allows LL to be applied to future problems
- Applying the three stages will ensure the ability to recover from almost any problems

Conclusion

“Project Management is what you are forced to do when you don’t Schedule!”

(Chris Carson, ~1986)

Questions?

Suggestions?

Comments?

War Stories?

A Structured Approach to Minimum Cost Recovery Scheduling

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