

A Framework for Schedule Design Planning for Schedule Development



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**AACE International's 52nd Annual Meeting
and ICEC's 6th World Congress**

on Cost Engineering, Project Management, and Quantity Surveying

Schedule Design - Introduction

- A proper schedule addresses the needs of project management in balance with the requirements of the specifications, providing accurate predictive capabilities with an appropriate level of detail that ensures a nimble yet accurate management tool.
- Such schedules are not put together mindlessly; they must be intentionally designed to achieve this purpose.

Schedule Design - Introduction

- Schedules are rarely Designed; rather, Schedulers tend to move directly into Schedule Planning and Development.
 - The focus is generally on the mechanics of Development, not the reason for the schedule.
 - Decisions such as level of detail, reporting needs, end user needs, abilities of the input user, and others, are allowed to develop as an offshoot of Schedule Planning and Development.

Schedule Design - Introduction

- Following a Framework for Schedule Design will ensure that project schedules will meet all participant's needs, from Project Superintendents to the Project's End User.
 - Building a schedule is a project in itself, and Design is planning for a Schedule Planning and Development.
 - Good Design will yield significant benefits by achieving project team buy-in at the Design phase.
- Purpose: to provide a detailed and structured approach to designing a schedule, with a checklist and question and answer approach that allows the scheduler / planner to leverage their planning time into a good layout for the full Schedule Planning and Development process.

Schedule Design - Background

- Why design a schedule?
 - A schedule meets the criteria for a “project” in itself.
 - A schedule is a guideline or plan for a project.
 - A schedule provides a a methodical approach for a project.
 - Keeps the Schedule Planning and Development on track.
 - Prevents rework due to late understanding of needs.
 - Allows buy-in from end users prior to Development.
 - Makes the Schedule Planning and Development session much more meaningful.
 - Documents the assumptions and intention of the schedule.
 - For reviewer and approver.
 - For future reference.
 - To facilitate changes in schedulers.
 - Place to capture Lessons Learned.

Schedule Design - Background

- What is Schedule Design, and how does it differ from Schedule Planning and Development?
- What is the uniform taxonomy of these terms, and what is their relationship to one another?
- Total Cost Management Framework provides good definitions of the differences.



Schedule Design - Background

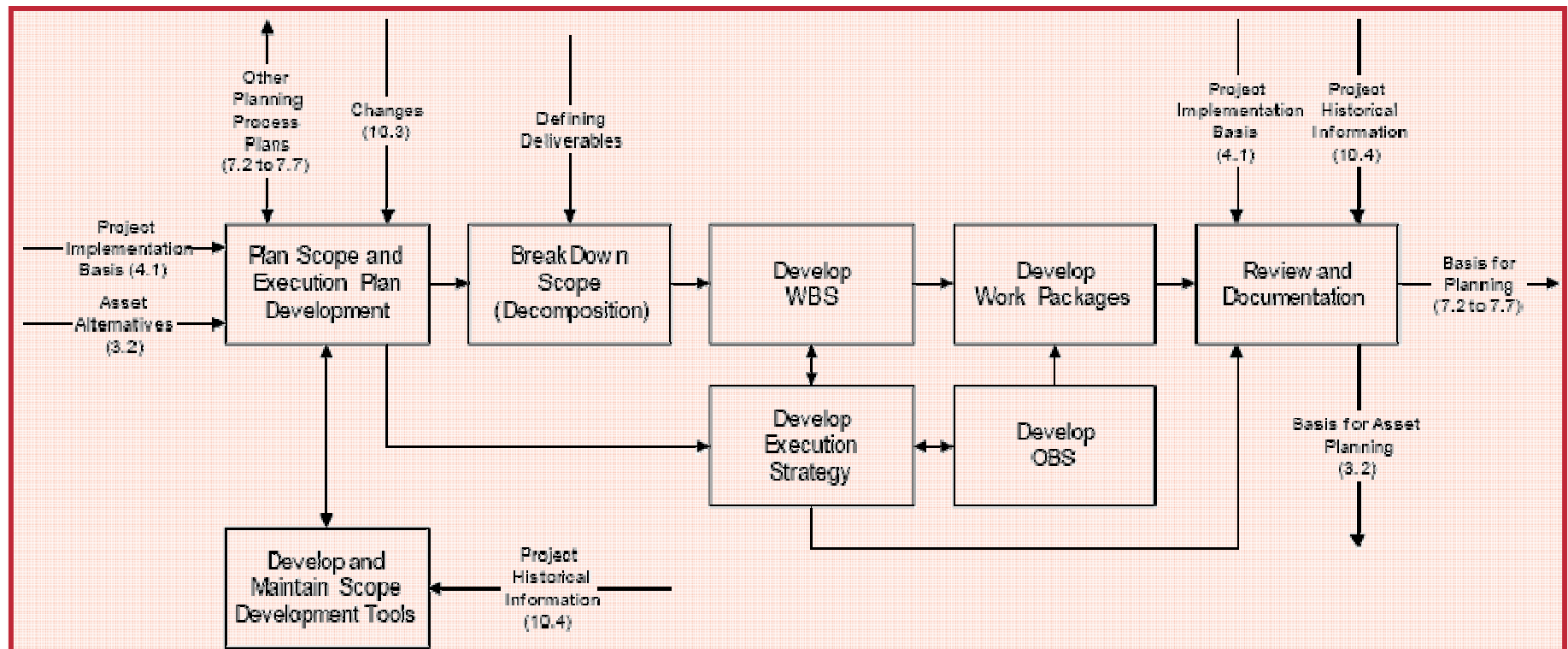
- Design vs. Development.
 - Schedule Design exists primarily in **7.1 Project Scope and Execution Strategy Development.**
 - Planning and Development exist in **7.2 Schedule Planning and Development.**

Schedule Design - Background

- 7.1 Project Scope and Execution Strategy Development.
 - *“The project scope and execution strategy development process translates the project implementation basis (i.e., asset scope, objectives, constraints, and assumptions) into controllable project scope definition and an execution strategy.”*
 - *The project scope defines what the work is (i.e., the work that must be performed to deliver a product, service, or result with the specified features and functions).*
 - *The execution strategy establishes criteria for how the work will be implemented (i.e., the general approach through which the work will be performed.)”*

Schedule Design - Background

- TCM 7.1 Process Map.

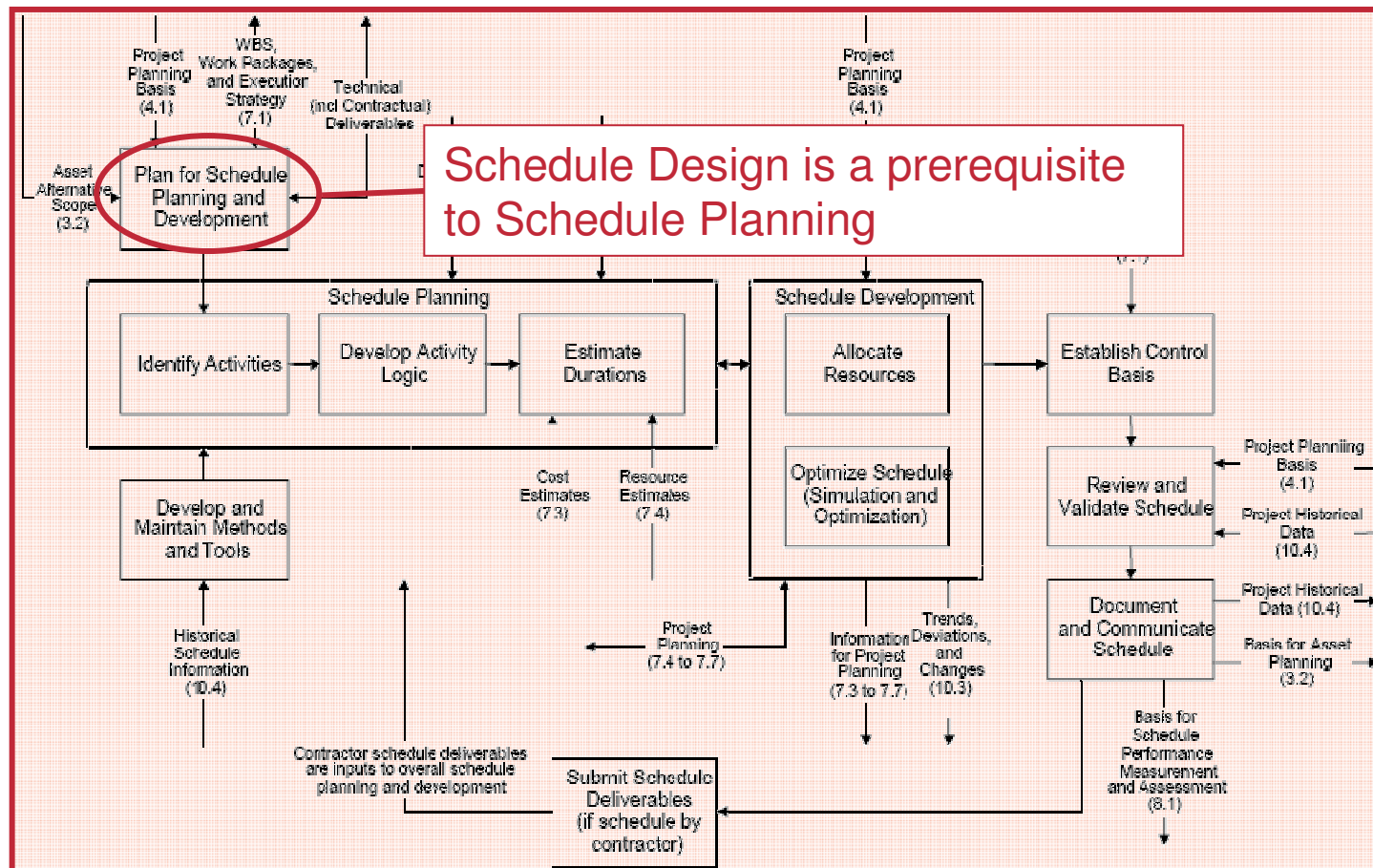


Schedule Design - Background

- **7.2 Schedule Planning and Development.**
 - *“Schedule planning and development are the processes for the planning of work over time in consideration of the costs and resources for that work. Schedule planning and schedule development are separate, but related, sub-processes that call for different skills and knowledge emphasis.*
 - Schedule planning consists of breaking work package scope into activities, and logically ordering those activities into the sequence in which they will be best performed. Result is a detailed, but conceptual, non-resource driven, schedule.
 - Schedule development consists of enhancing the model created in planning and allocating available resources, to iteratively generate the as-planned schedule model that becomes the schedule control baseline.

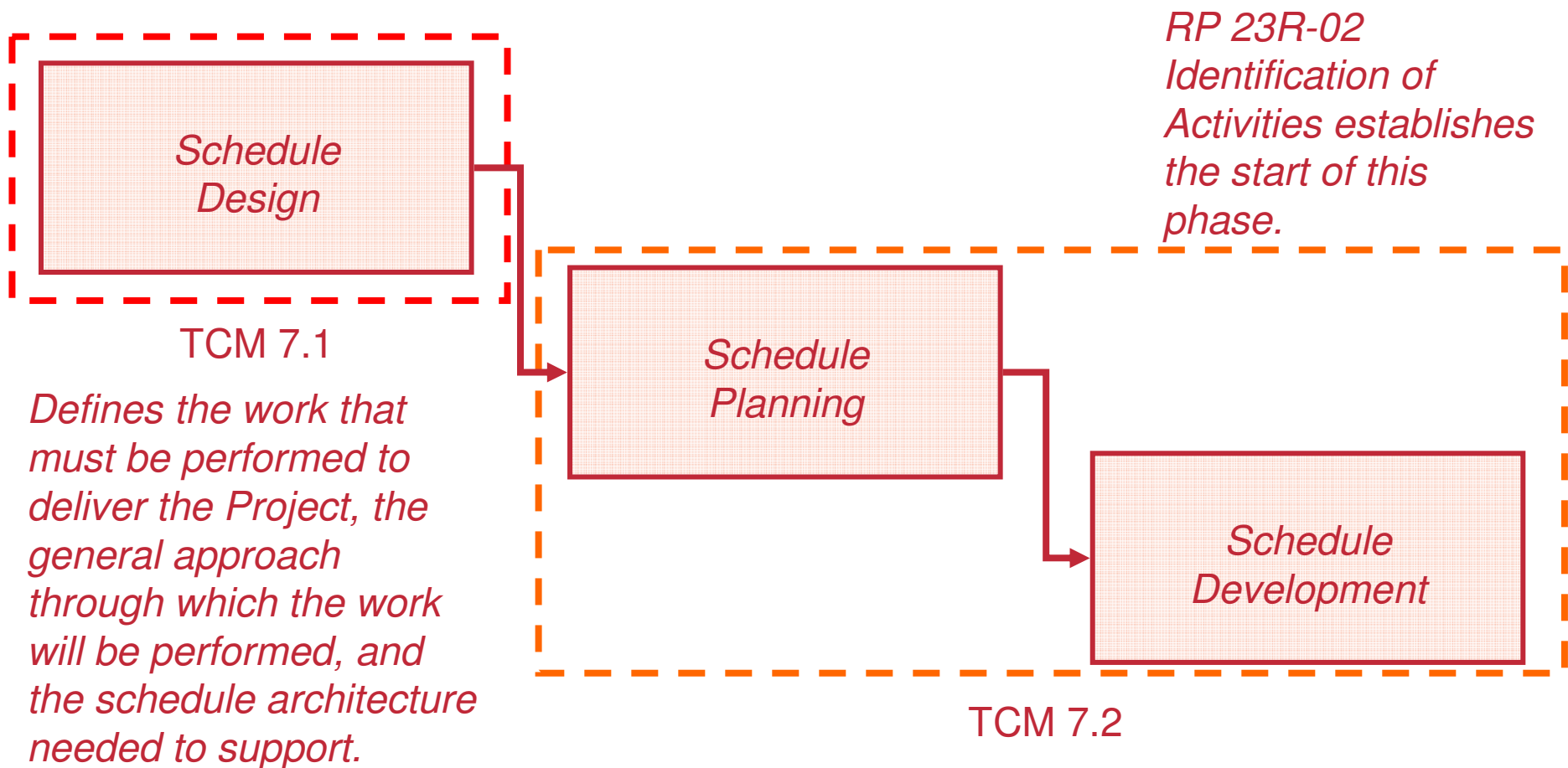
Schedule Design - Background

- TCM 7.2 Process Map.



Schedule Design - Background

- Summary of Process Maps.



Schedule Design - Background

- Note on PSP Scope of Knowledge RP 14R-90.
 - “Schedule Development” is defined to encompass what TCM refers to as Design and Development.
 - RP 14R-90 also uses the terms “Planning” and “Scheduling” to define some of these functions.
 - TCM and the PSP Scope of Knowledge have unresolved overlap in terminology.
 - Clearly, both Design and Development are part of the Skills and Knowledge of a Planning and Scheduling Professional.
 - This presentation uses TCM framework to drive definitions and delineate the Design process.

Schedule Design - Background

- Design vs. Development – How PMI & PMBOK handles it?
 - PMBOK identifies six Project Time Management processes, usually defined as part of the project lifecycle, Section 2.1 of PMBOK.
 - Activity Definition.
 - Activity Sequencing.
 - Activity Resource Estimating.
 - Activity Duration Estimating.
 - Schedule Development.
 - Schedule Control.
 - These processes are preceded by a planning effort by the project management team, which is part of PMBOK's "Develop Project Management Plan", PMBOK Section 4.3 (which sets the format and establishes criteria for developing the project schedule).
 - These processes are documented in what PMBOK calls a Schedule Management Plan, which is contained in the project management plan, in the introduction to Section 4.3, Project Integration Management.

Schedule Design - Background

- PMBOK Process Inputs.
 - The inputs for the different Time Management Processes are listed as:
 - Activity list.
 - Product description.
 - Mandatory dependencies.
 - Discretionary dependencies.
 - External dependencies.
 - Resource requirements.
 - Resource capabilities.
 - Historical information.
 - Identified risks.
 - Constraints.
 - Assumptions.
 - All of these items, along with the Schedule Management Plan, are part of Schedule Design, but PMBOK does not offer clear definition and delineation of Schedule Design.
 - The Time Management Processes do not include Schedule Design.

Schedule Design - Background

- Design vs. Development – why emphasize the distinction?
 - Design tends to be ignored in favor of jumping right into development.
 - Many schedulers elect to begin creating activities instead of Designing.
 - Work is subsequently repetitive, with lots of potential for rework.
 - Results tend to be disorganized.
- Avoid planning mistakes and problems.

Schedule Design - Background

- Poorly designed Activity Coding:

Activity ID	Activity Description	Floor	Vert Align	Orig Dur	Rem Dur	Early Start	Early Finish
OWN Owner Responsibilities & Decisions							
FULL Full Building Work							
FULL Full Building Work							
						20JUL07A	
						20JUL07A	
DELY Delays & Time Related Impacts							
ADM Administration							
420	Delay to issuing 100% construction			485*	0*	24AUG05A	
MS Phases and Milestones							
ADM Administration							

Repetitive Activity Coding and Grouping Levels due to lack of forethought in structure

Schedule Design - Background

- Activities driving the Work Breakdown Structure:

Unique ID	WBS	Task Name	Start	Finish	Duration
1	1	☐ Monument Plaza Rehabilitation	Wed 7/19/06	Fri 9/29/06	53 days
2	1.1	Contract Award	Wed 7/19/06	Wed 7/19/06	1 day
3	1.2	☐ Administrative Activities	Thu 7/20/06	Wed 8/2/06	10 days
36	1.3	☐ Material Delivery	Fri 7/28/06	Thu 9/14/06	35 days
11	1.4	☐ Mobilization	Fri 7/21/06	Tue 8/1/06	8 days
21	1.5	☐ Demolition	Tue 8/1/06	Tue 8/8/06	6 days
30	1.6	☐ New Work/Monument	Tue 8/8/06	Fri 9/29/06	39 days
52	1.7	☐ New Work/Virtual Viewer	Fri 7/28/06	Tue 9/26/06	43 days
74	1.8	Monument Plaza Rehabilitation Comple	Fri 9/29/06	Fri 9/29/06	0 days
77					
78	2	☐ Neck of Land Welcome Center	Fri 7/28/06	Wed 2/28/07	154 days
262	2.1	Moblization for Welcome Center	Fri 7/28/06	Thu 8/3/06	5 days
88	2.2	☐ Submittals/Approvals/Fabricate and Del	Fri 8/4/06	Thu 11/23/06	80 days
102	2.3	☐ Site Grading and Utilities	Fri 8/4/06	Wed 2/28/07	149 days
110	2.4	☐ Foundations	Wed 8/16/06	Fri 9/29/06	33 days
281	2.5	☐ Building Shell	Mon 10/2/06	Fri 1/19/07	80 days
338	2.6	☐ Interior Construction	Mon 11/27/06	Fri 2/9/07	55 days
307	2.7	☐ Testing & Closeout	Fri 2/2/07	Wed 2/28/07	19 days
347	2.8	Project Complete	Wed 2/28/07	Wed 2/28/07	0 days

Inconsistent levels of detail due to unorganized activity entry.

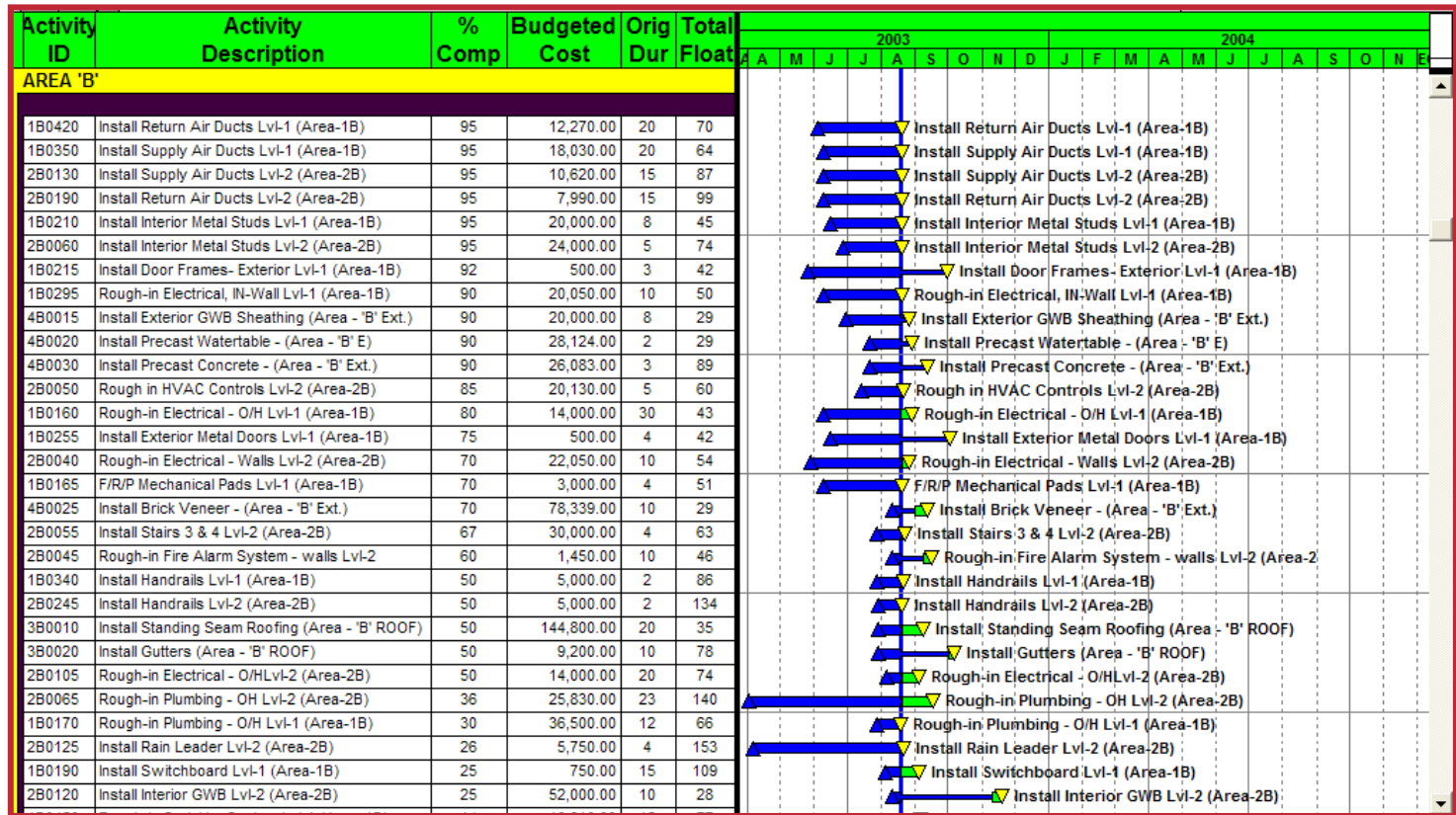
Hinders grouping and comparison.

Schedule Design - Background

- Lack of Good Area Definition preventing activity closeout:

Areas are so broadly defined that activities sit at nearly complete for large parts of the project.

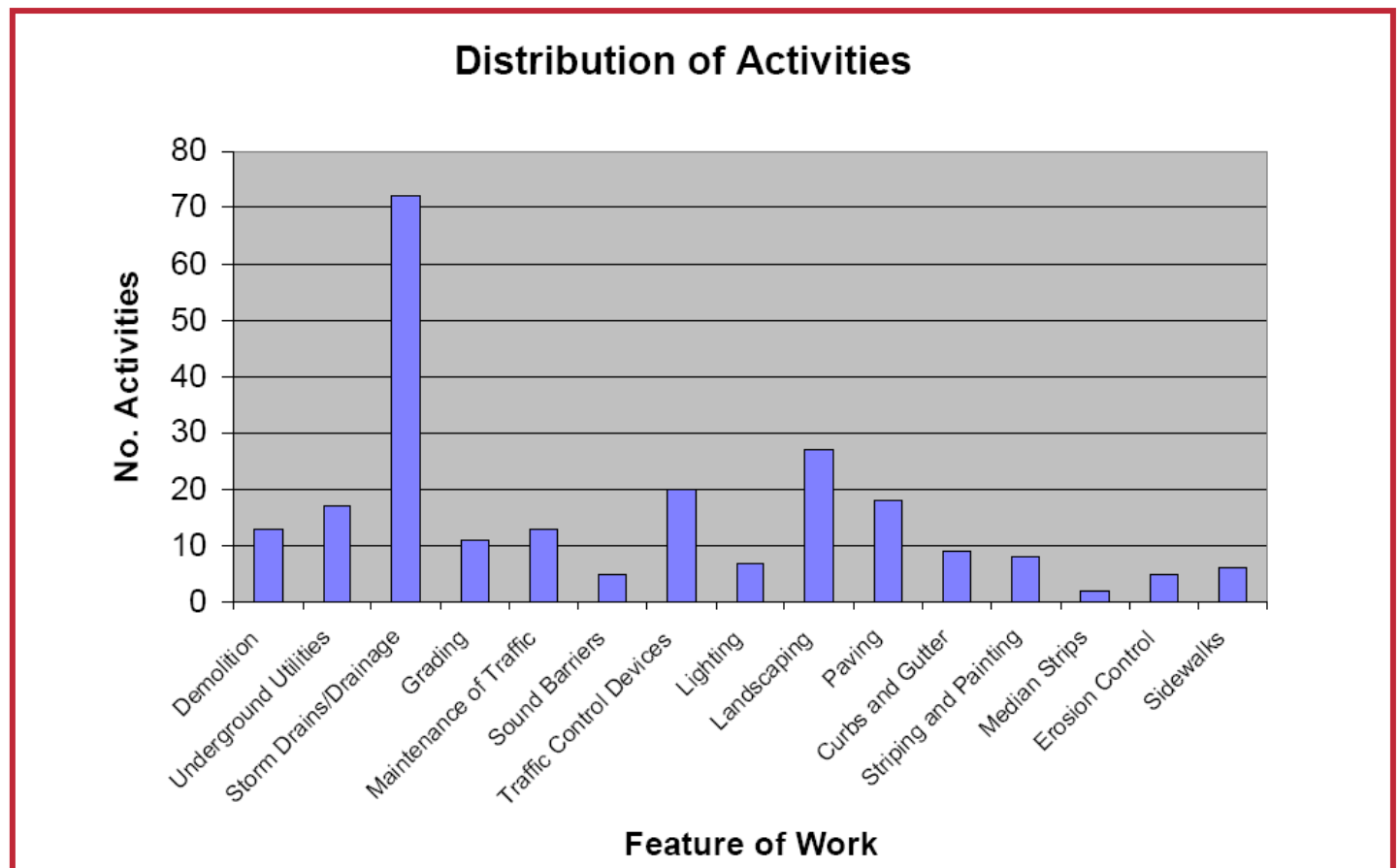
Hinders productivity analysis, good cost loading, accurate as-built dates.



Schedule Design - Background

- Inconsistency in level of detail throughout trades:

Some trades are heavily developed while others are left with summary-level activities only.



Schedule Design – Components of the Design Process

- **Scope of Design vs. Development.**
 - Design – Conceptualizing the schedule.
 - Planning the Schedule.
 - Starting with the end in mind.
 - Providing concept of final product.
 - Creating organizational structure to fulfill the concept.
- **Timing.**
 - Must be done prior to Schedule Planning and Development.

Schedule Design – Components of the Design Process

- Documentation and use of Schedule Design.
 - Create a book or binder.
 - Use the highest level of checklist outline items as tabs.
 - Use the book as basis for schedule submittal documentation.
 - Keep the book current during project.
 - Use the book for handoff between schedulers.
 - Share a copy of the book with superintendent/PM.

Schedule Design – Components of the Design Process

- ❑ Schedule Design Process.
 - ❑ Development of Controllable Project Scope Definition.
 - ❑ Development of Execution Strategy.

Schedule Design Checklist

Development of Controllable Project Scope Definition

Collection of Inputs

- Project Implementation Basis (or Project Plan) (TCM 4.1).

- Project Historical Information (TCM 10.4).

- Change Management Plan (TCM 10.3).

- Team Players.

- Other Planning Process Plans (TCM 7.2 to 7.7).

Develop Work Breakdown Structure

Schedule Design Checklist - Development of Controllable Project Scope Definition

- Project Implementation Basis (or Project Plan) (TCM 4.1).
 - Contract (TCM 7.7).
 - Notice to Proceed or Release Letter.
 - Project Drawings.
 - Area Designation Plan.
 - Sequencing plan.
 - Specifications.
 - Scheduling Specification.
 - Scope of Work definition.
 - Liquidated Damages schedule.
 - Owner-provided items & scope.

Schedule Design Checklist - Development of Controllable Project Scope Definition

Schedule Specification – General Contents.

Schedule Specifications

● Content of Schedule Specifications

- Related specifications
- Software requirements
- Data exchange requirements
- Master dictionaries/reports
- Preconstruction meeting
- Qualifications of scheduler
- Required submittal contents
- Owner mandated milestone treatment
- Float ownership
- Prohibitions on manipulation
- Planning units/calendar requirements
- CPM Network requirements
- Duration definitions & restrictions
- Initial schedule submission
- Full detailed project schedule (baseline) submission
- Schedule updates
- Delays & time extensions
- Early completion schedules
- Final as-built submittal
- Short interim schedules
- Cost & Resource loading
- Narrative Requirements

Schedule Design Checklist - Development of Controllable Project Scope Definition

- Project Implementation Basis (or Project Plan) (TCM 4.1).
 - Owner milestones, phases, or master schedules.
 - Estimate & quantity surveys/bills of materials. (TCM 7.3).
 - Any existing internal WBS.
 - Owner separate contracts and scope (coordination between this and other external projects).
 - Value Analysis and Engineering (TCM 7.5).

Schedule Design Checklist - Development of Controllable Project Scope Definition

- Project Historical Information (TCM 10.4).
 - Collection of data from the Project Historical Database.
 - Actual Schedule Data.
 - Actual Resource Data.
 - Project Lessons Learned.
 - Incorporation of this data aids in development of Execution Plan.

Schedule Design Checklist - Development of Controllable Project Scope Definition

- Change Management Plan (TCM 10.3).
 - Notification requirements.
 - Methodology allowed.
 - Quality control process.
 - Process flowchart.

Schedule Design Checklist - Development of Controllable Project Scope Definition

Change Management Plan Control Process.

Preparing a TIA

- Verify schedule (the current schedule)
 - Test for reasonableness
 - Ensure schedule logic models the actual project sequencing
 - Check for constraints
 - If constraints exist, establish methodology
 - Remove constraints, if possible
 - Insert logic to replace constraints
 - Verify accuracy of changes
 - Document use of methodology

5. Check for concurrent delays not modeled in analysis

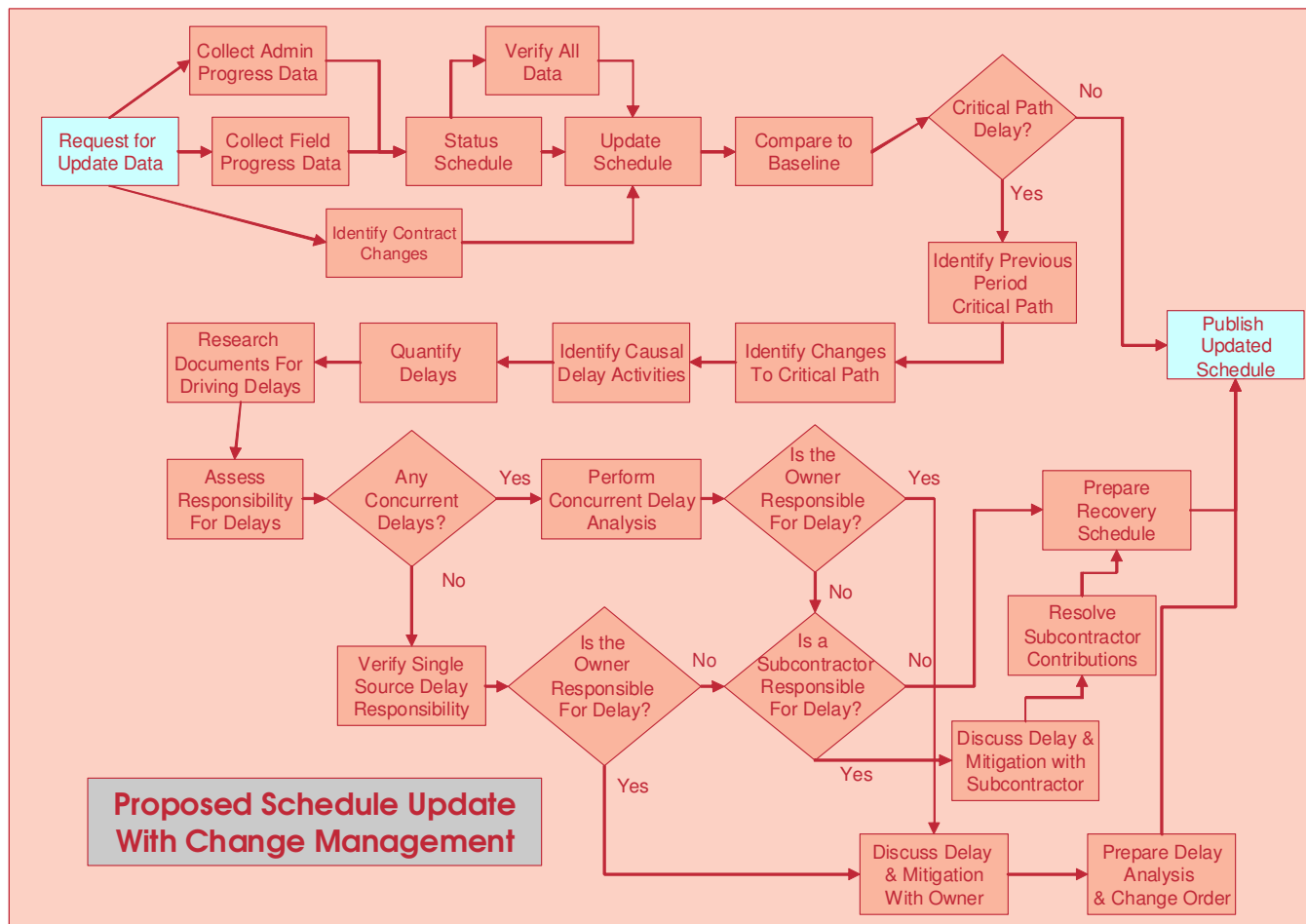
- a. Are there any other delays in the project?
 - i. If no, proceed.
 - ii. If yes, are they identified?
 1. Are they modeled in the update? Verify accuracy
 2. Are they modeled in the fragnet insertion? Verify accuracy
 3. Are they concurrent? Verify accuracy
 4. Are they pacing delays? Verify accuracy
 - a. Has the contractor taken advantage of delay to re-sequence other work?
 - b. Is the unaffected work proceeding as planned?

6. Verify fragnet insertion in schedule

- a. Does the insertion match the narrative?
 - i. If yes, proceed.
 - ii. If no, reject.
- b. Are there any changes in the schedule other than the insertion?
 - i. Run a Digger report and check for additional changes
 1. If yes, reject.
 2. If no, proceed.
 - ii. Check for missed changes:
 1. Added constraints
 2. Changes in relationship types
 3. Changes in calendars
 4. Check software settings, especially Progress Override vs. Retained Logic
 - a. If original schedule used PO setting, reconsider reasonableness, see item above!
 - i. Use of PO in original schedule means the schedule did not model the project, poor choice.
 - ii. Retained Logic keeps original planned logic
 - iii. If the project has out-of-sequence work, it may no longer model the actual progress of the project and could require schedule revisions to make the schedule reasonable
 - iii. Zero out the durations of activities in the fragnet and recalculate
 1. If calculation yields identical completion date with un-impacted schedule, proceed.
 2. If the completion date changes, reject.
- c. Review the first and last activities of the fragnet

Schedule Design Checklist - Development of Controllable Project Scope Definition

Change Management Plan Process Flowchart.



Schedule Design Checklist - Development of Controllable Project Scope Definition

Team Players.

- Organizational Chart.

- Identify the Schedule Users.

 - Who has Input?

 - Who Updates?

 - Who Checks for Accuracy?

 - Who Reviews?

 - Who approves?

- Identify Responsibility Assignment Matrix (RAM).

Schedule Design Checklist - Development of Controllable Project Scope Definition

RAM Example (based on PMBOK RACI Chart).

RACI Chart (from PMBOK)	Roles				
	Project Controls Manager	Scheduler	Project Manager	Superintendent	Assistant Super
Schedule Design	R	I	C	C	I
Schedule Development	A	R	C	C	I
Schedule Statusing	I	A	I	A	R
Schedule Updating/Analysis	C	R	A	I	I
Schedule Reporting	C	R	I	I	A
Change Management	C	R	I	A	A
Recovery	C	R	I	A	I
Closeout	I	A	I	C	R

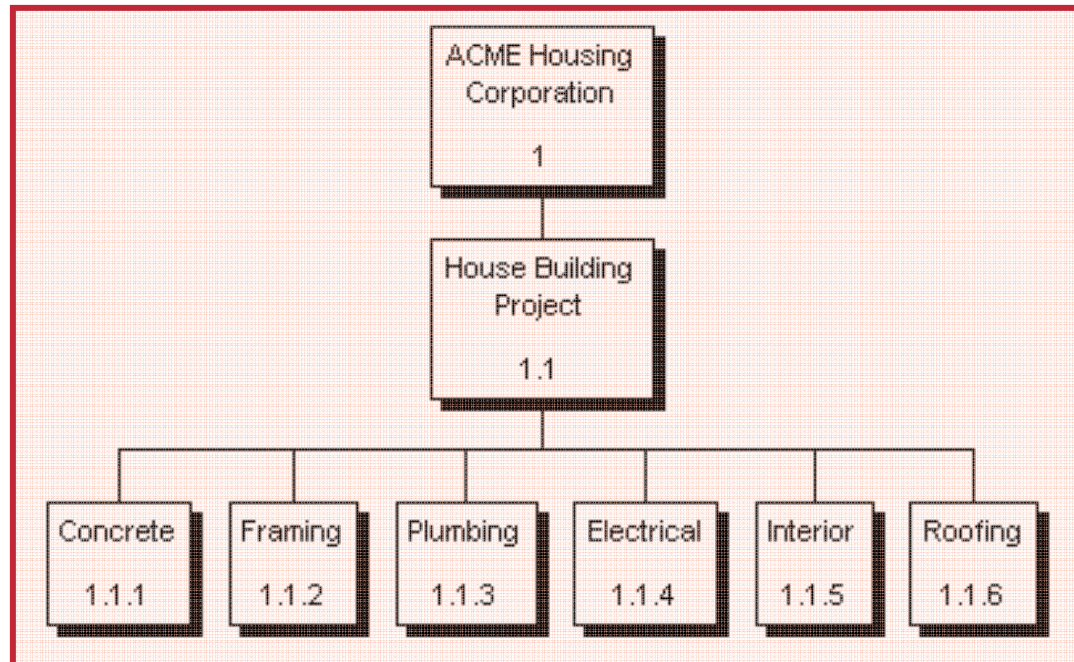
R = Responsible, A = Accountable, C = Consult, I = Inform

Schedule Design Checklist - Development of Controllable Project Scope Definition

- Other Planning Process Plans (TCM 7.2 to 7.7).
 - Many of these processes have been covered in other items.
 - We recommend reading the publication.

Schedule Design Checklist - Development of Controllable Project Scope Definition

- ❑ Develop Work Breakdown Structure.
 - ❑ Translate asset scope into component deliverables (“decomposition”).
 - ❑ Ensure consistency in WBS levels, to facilitate comparison.



Schedule Design – Components of the Design Process

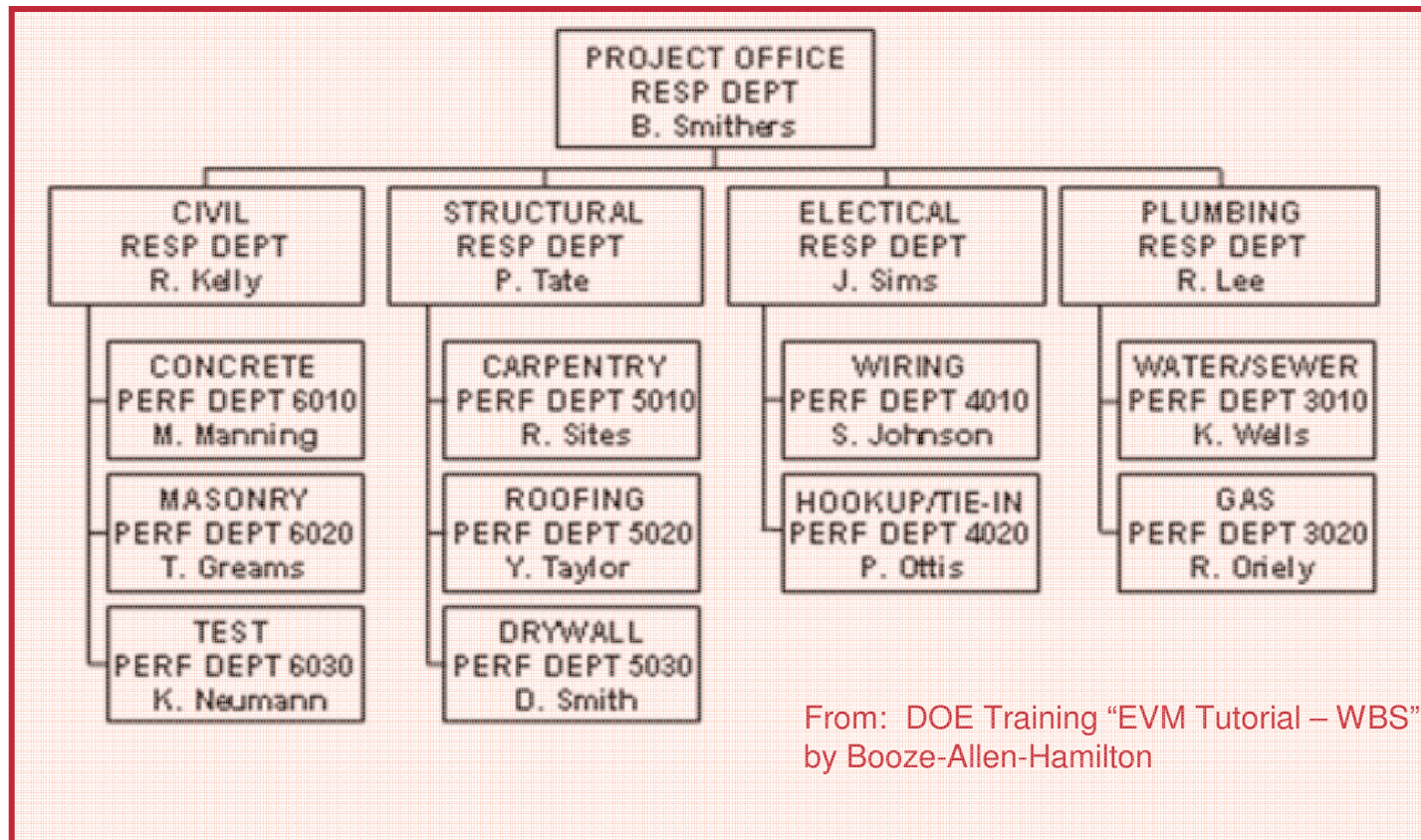
- ❑ Schedule Design Process.
 - ❑ Development of Controllable Project.
Scope Definition.
 - ❑ Development of Execution Strategy.

Schedule Design Checklist

- Development of Controllable Execution Strategy.
 - Organizational Breakdown Structure.
 - Work Package Development.
 - Schedule Design Output (Software Driven).
 - Outline Schedule.
 - Risk Analysis.
 - Definition of Processes.

Schedule Design Checklist - Development of Execution Strategy

□ Organizational Breakdown Structure.



Schedule Design Checklist - Development of Execution Strategy

Work Package Development.

- By Contract.
- As assigned by Client.

VI. Work Packages

Division 2 and 5 Specifications require the following Work Packages:

- Superstructure Waterproofing
- Corrosion Protection of Structural Steelwork
- Movements and Tolerances Specification for Structural Steel
- Structural Steel Superstructure
- Cast in Place Concrete

Schedule Design Checklist - Development of Execution Strategy

- Schedule Design Output (Software Driven)
 - Software Identification.
 - Specific software.
 - Required minimum and versions allowed.
 - Enterprise specific issues.
 - Users identified.
 - Schedules used for import or data source.
 - Levels of access.
 - Validation process.
 - For master schedules, establish data dates.

Schedule Design Checklist - Development of Execution Strategy

Schedule Design Output (Software Driven).

Purpose of Work Product.

What the Schedule can be used for (purpose).

Superintendent work schedule.

Buyout schedule.

Justification of time requests.

Claims/Dispute Resolution.

Reports Generated from the Schedule.

Who receives reports.

List of reports.

Samples of reports.

Glossary/Lexicon of ambiguous terms.

Schedule Design Checklist - Development of Execution Strategy – Example of Lexicon

General Notes Regarding this Report:

- “Program,” “Programme,” and “Baseline CPM,” and “Schedule” all have the same definition and are used interchangeably.
- “Snagging” and “Punch-out” have the same definition and are used interchangeably.
- “Fixed” and “Rough-in” have roughly the same definition. For clarification purposes, “Fixed” has been used in this Program.
- “Conventional concrete” is defined as post-tension poured-in-place concrete.
- “Wild Air” is defined as a stage in construction, for which the building is closed in by perimeter walls and ventilation has started. (Ventilation only, not complete environmental controls or functioning air conditioning.) This term is used in lieu of “environmental controls,” or “drying –in” as wet weather is not a real factor in Dubai.
- “Raft” construction consists of the foundation including but not limited to piles, grade beams, footers, and slab-on-grade.

Schedule Design Checklist - Development of Execution Strategy

- Schedule Design Output (Software Driven)
 - Level of Detail.
 - Determine approach:
 - Bottom-up (starting with detailed activities).
 - Top-down (starting with summary schedule).
 - Both (prepare Top-down, then Bottom-up).
 - Identify frequency of updates.
 - Establish smallest activity duration range.

Schedule Design Checklist - Development of Execution Strategy

Schedule Design Output (Software Driven)

Codes Dictionary.

For tracking and monitoring work:

Work Phase.

Structure.

Area.

Floor or Station.

Location.

For Project Management:

Responsibility.

Work Shifts.

Costs.

Resource.

Specification.

Change management.

Schedule Design Checklist - Development of Execution Strategy

- ❑ Schedule Design Output (Software Driven)
 - ❑ Weather Planning & Calendars.
 - ❑ Weather planning.
 - ❑ Expected adverse weather.
 - ❑ Identify source or specification requirement.
 - ❑ Identify methodology.
 - ❑ Identify accounting method for actual weather.
 - ❑ Establish number of calendars needed.
 - ❑ Define calendars and application.

Schedule Design Checklist - Development of Execution Strategy

Example of Calendar Section:

- **Calendars are defined as follows:**
 - Calendar 1 – 24 hours a day, 7 days a week.
 - Calendar 2 – 24 hours a day, only Fridays off. (This is the Default Calendar.)
 - Calendar 3 – Night Shift, only Fridays off.
 - Calendar 4 – Night Shift, 24 hours a day, 7 days a week.
 - Please note that 01140/1.9.a. requires that the Contractor notify the Client regarding multiple shifts, etc. This has been accomplished by using Day and Night shift calendars as well as by incorporating multiple crew codes into the Program. (For more on Crews, please refer to the Resources section of this report.)

Schedule Design Checklist - Development of Execution Strategy

- Schedule Design Output (Software Driven)
 - Cost & Resources.
 - Estimate & correlation to cost loading.
 - Bill of Quantities & use in resources.
 - Resource Crew descriptions.
 - Equipment descriptions.
 - How actual production will be monitored.
 - Earned Value Management System.

Schedule Design Checklist - Development of Execution Strategy

Outline Schedule.

Outline Schedule.

Key Activities being tracked.

Client Milestones.

Long Lead Items.

WBS Structure.

Other Contracts on Project.

Narrative Basis and Assumptions.

Procedure Used to create the Schedule.

Definitions/lexicon.

Description of sequence of work per structure.

Schedule Design Checklist - Development of Execution Strategy

Narrative Basis.

Contractor Narrative

SPECIFIC AREAS OF WORK

Phasing of the project is as follows:

1. **Phase 1:** Includes storm drain, along with earthwork, paving, striping, signalization and miscellaneous concrete work, on the South bound side of Rt. 60, from station 15+55 to 32+45. On the North bound side storm drain, along with earthwork, paving, striping, signalization and miscellaneous concrete work, will be completed from station 32+00 to 42+20.
2. **Phase 2:** Traffic will be split around the existing medians on Rte. 60 to the outside work area that was completed during phase 1, and E.V. Williams, Inc. will saw cut the existing pavement, remove the asphalt, install temporary, and permanent storm drain, and then pave the medians to the top of the intermediate mix asphalt.
3. **Phase 3:** Traffic will then be moved to the Phase 1 work, to allow E.V. Williams, to complete tie ins of existing roads, complete the storm drainage, finish installing light poles, and signals, also completing the widening of Rt. 60 on both the North bound side and the south bound sides.
4. **Phase 4:** The final stage of work where traffic is split between the median into single lanes, one northbound and one southbound. E.V. Williams, Inc. will complete any remaining median work required at the time, the final paving and striping, brick paver crosswalks, lighting signalization and landscaping.

Sectioning of the project is as follows:

1. **Utilities and Storm Drain**
Section 1 – Station 15+55 to Station 20+40
Section 2 – Station 20+40 to Station 25+40
Section 3 – Station 25+40 to Station 32+45
Section 4 – Station 32+00 to Station 37+00



Alpha Corporation

Checklist for a Baseline Schedule Written Narrative

The purpose of the Narrative is to provide a summary of the work, explain the plan for construction, show how the schedule meets the specification and plan contractual requirements, identify potential problems, and summarize the Critical Path. The major components of the Written Narrative are:

- General description of the scope of work.
- Identification of any area designations.
- General description of the sequencing, including any necessary legend.
- Identification of any deviations from the contractually mandated sequencing.
- Identify any phasing.
- Identification of all Milestones that are contractually mandated.
- Identification of any other Milestones.
- Identify Traffic Control Plan, if applicable.
- Identification of problem areas of the project, and steps taken to limit risk.
- Identify any road closings, or utility coordination shutdowns, or other conflicts.
- List and explain Calendars.
- Explain Adverse Weather planning methodology incorporated in the schedule.
- Identify any unusual logic relationships, such as Start-to-Start or Finish-to-Finish Activity Types and rationale.
- Identify purpose and use of all relationship lags.
- Explain any Activity ID coding.

Schedule Design Checklist - Development of Execution Strategy

Example of Schedule Narrative Explanation:

Schedules:

- **01320/1.04 - Tender Works Schedule:** A detailed schedule depicting construction sequencing and dates at the Tender stage.
- **01320/1.05 – Schedule of Works:** This is a detailed Baseline CPM schedule. This schedule will be cost loaded, resource loaded with manpower and equipment, and incorporate the Bill of Quantities. This schedule will not only show construction activities, but will also demonstrate procurement and submittal activities. The submission of this schedule will include initial project histograms (for manpower, definable features of work, and submittal items) and a S-Curves (for costs, manpower, and submittal items.) Finally, this package will include any support data including but not limited to a Narrative explaining calendar usage, estimated average manpower, planned procurement of materials and equipment, etc.

Schedule Design Checklist - Development of Execution Strategy

Risk Analysis (TCM 7.6).

Risks and Constructability.

Brainstorming of issues.

Known problems & constructability (threats & opportunities).

Provisional Items.

Predicted Problems.

Lessons Learned.

Outside influences.

Site condition concerns.

Develop Risk Management Plan.


Initial process during baseline schedule development.

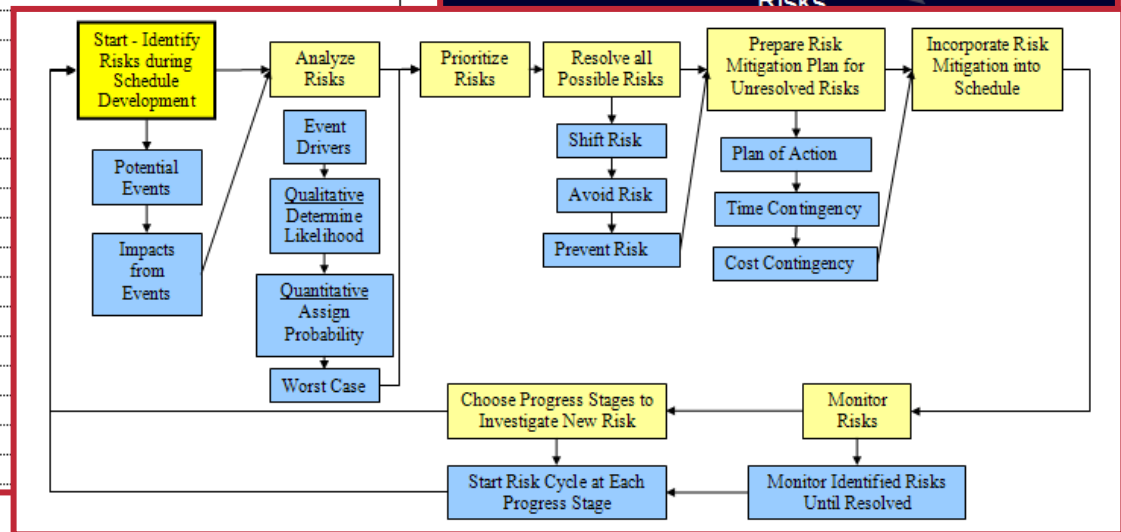
Process for use during updates.

Schedule Design Checklist - Development of Execution Strategy

Risk Management Plan.

- Based on PMBOK.

		Alpha Corporation 101 West Main Street Norfolk, VA 23510		Master Risk Management Checklist	
		Project: <input style="width: 150px; height: 20px;" type="text"/>			
Ord	Types	Risk Factors	Description/Explanation	Exi	
1	Plans/Specs	Stage of permit authority reviews			
1	Plans/Specs	Subconsultants (structural, civil, MEP)			
2	Quality Control	Distance to asphalt plant			
2	Quality Control	Distance to batch plant			
2	Quality Control	New process usage (RCC?)			
2	Quality Control	New product usage			
2	Quality Control	Proposed QA/QC program			
2	Quality Control	Technical level of project			
2	Quality Control	Type of specification			
3	Owner Influences	Land/site acquisition			
3	Owner Influences	Owner supplied equipment			
3	Owner Influences	Reputation of CM/project management			
3	Owner Influences	Reputation of Owner			
3	Owner Influences	Scope change			
4	Unforeseen Conditions	Ability to investigate subsurface			
4	Unforeseen Conditions	Age of subsurface information			
4	Unforeseen Conditions	Availability of as-built drawings			

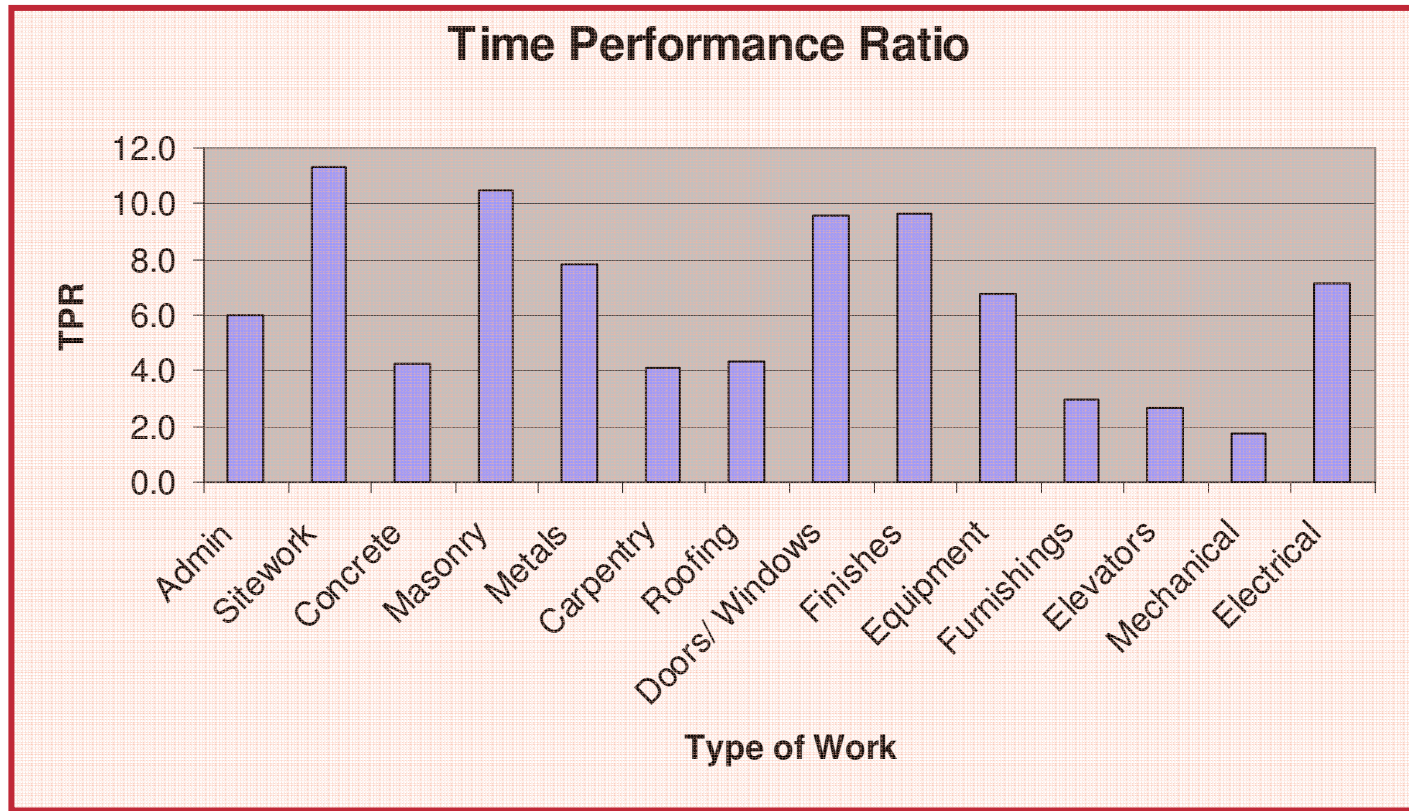


Schedule Design Checklist - Development of Execution Strategy

- Risk Analysis (TCM 7.6).
 - Time Contingencies.
 - Amounts.
 - Specific trade (from risk management plan).
 - Specific contractor contingency.
 - How carried.
 - Use historical data for reference.

Schedule Design Checklist - Development of Execution Strategy

Specific Trade Contingency Determination – Based on Historical Data.



Schedule Design Checklist - Development of Execution Strategy

□ Definition of Processes.

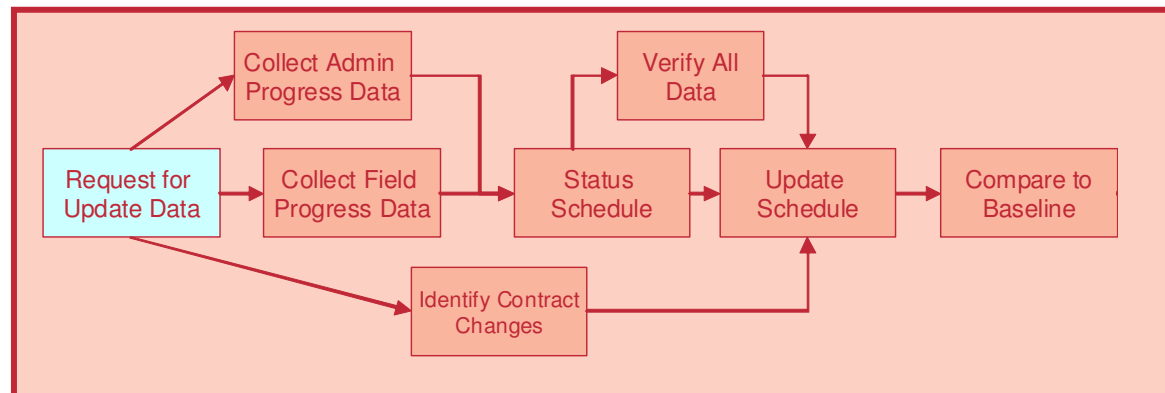
□ Update Process.

□ Frequency.

□ Data request and transmission.

□ Validation.

□ Process flowchart.



Schedule Design Checklist - Development of Execution Strategy

Establish Update process.

Schedule Updating

- **Frequency of Updates**
- **Data Collection**
- **Status Schedule**
- **Calculate**
- **Check for Out-of-Sequence Work**
- **Verify Schedule**
- **Analysis – On Time Completion**
- **Historical Trending & Statistics**
- **Analysis – Late Completion**
- **Reporting - Internal**
- **Narrative – External Reporting**

Schedule Design Checklist - Development of Execution Strategy

❑ Definition of Processes.

❑ Recovery Process.

- ❑ Identify what logic changes are acceptable without formal approval.
- ❑ Identify what constitutes a Revision requiring approval.
- ❑ Provide process description or flow chart.

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

Schedule Design Checklist - Development of Execution Strategy

Definition of Processes.

Dispute Resolution Process.

Review program for claims avoidance.

Reinforce planning for claims avoidance.

Identify specific program for claims avoidance during schedule updates and change management.

Identify steps if change management process fails or stalls.

Follow specifications.

Provide time frames for stages in process.

Provide process description or flow chart.

Schedule Design Checklist - Development of Execution Strategy

□ Reporting.

□ Define all reports.

□ Provide examples.

Management Schedule Report

Project: 14th and Main Parking Garage Date: 28-Apr-05

Distribute to: Steve Wayne John
Chuck Paul Dave
Jim

Contract Substantial Completion Date	05-Aug-05	Original Production Substantial Completion Date	05-Aug-05
Current Predicted Contract Completion Date	10-Jun-05	As of this update, we are	ahead 56 calendar days
Current Production Substantial Completion Date	10-Jun-05	As of this update, we are	ahead 56 calendar days
21-Mar-05 Update Completion	18-May-05	Since the last update, we	lost (23) calendar days

Principal Reasons for Change

Primary cause of delay is lack of manpower from Hall Brothers Electric (HBE). HBE's manning has been around 10 men, while SBB's superintendent estimates that at least 20 were required to complete work on time. In addition to their own work, HBE is delaying Johnson Controls. Also, water meter release is delaying installation of irrigation, sod, and certification of the backflow. Water meter is an owner issue. Gas meter release is delaying tying the generator in, which in turn is delaying emergency elevator recall system. Gas meter is waiting a response from the city of Richmond. The decking on the roof for the generator is not yet designed.

Next Period Critical Issues to Watch	Secondary Issues to Watch
All electrical work Water Meters (affects irrigation and sod installation) (Owner delay, as the state will not release until the owner resolves the need for a backflow preventer for the dry stand pipe) Gas Meter (affects generator and elevator completion) (Inspected, Jim Griffin contacted Paul Holt with the city, waiting response) Glass at window frames (pending change order) Decking at Generator Roof (not yet designed) Johnson Controls work (held up by HBE)	Design issue regarding bollards (Missing 3 per level in Stair 1, drawings show none in Stair 2) 2 Grilles in livewall missing (in fabrication) Waiting for LCP delivery Waiting on Chin Vu to accept toll booth mods (ADA) Vents and Louvers (delivery of remaining material in two weeks) Ceiling Tile Installation (waiting above ceiling inspection) Painting (waiting Clidewell contract) Striping (waiting Payne's Parking contract) Canopy soffits (waiting on HBE installation of lights, ordered but not delivered)

Milestones to Hit	Finish Date
2nd BCOM inspection Above Ceiling Inspection (cannot be conducted until HBE completes work)	

Other notes

1. The following contracts have not been signed:
a) Clidewell Brothers (painting)
b) Payne's Parking (striping)

Schedule Design

- **Conclusion.**

- At the end of this process, TCM 7.2 should be ready to begin.
- Although this requires an initial investment in time, there will be a savings during Planning/Development, and a reduction in rework.
- For success in Schedule Planning and Development, Schedule Design should be a completely different process.
- Process must be done prior to Development.
- Process and results documented.
- Documentation done in formal Schedule Design Book.
- Book used to provide continuity between schedulers or project managers.

Schedule Design

- Resources.
 - See Lance Stephenson's "Schedule Basis Memorandum" paper, also addresses schedule levels.
 - See AACEi's Total Cost Management.
 - See PMBOK for Risk Management process.
- Recommendations.
 - Get involved with AACEi and the Recommended Practices development.
 - Get involved with the CoS SEI Project developing Best Practices and Guidelines for Scheduling.
 - Get involved with CMAA in the Time Management development.

Schedule Design

Questions?

Recommendations?

A Framework for Schedule Design Planning for Schedule Development

TORONTO

A background image of the Toronto skyline, featuring the CN Tower and various skyscrapers, overlaid with a semi-transparent red filter. The word 'TORONTO' is written in large, white, outlined letters across the center of the image.

June 29 - July 2, 2008

at the Sheraton Centre

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