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SCHEDULING 101 - INTRODUCTION TO THE CRITICAL PATH METHOD & ANALYSIS

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AGENDA

CRITICAL PATH METHOD (CPM) FUNDAMENTALS

Explanation of the CPM process

SCHEDULE DEVELOPMENT

How to build a CPM schedule

SCHEDULE UPDATES & MAINTENANCE

How to update and maintain a CPM schedule

INTRO TO DELAY ANALYSIS & CLAIMS

Proving delays – Intro to Forensic Schedule Analysis

Developing claims – Basic elements for successful claims

PRACTICAL EXAMPLE

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THE CRITICAL PATH METHOD (CPM)

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CPM DEFINED

- PMI defines the Critical Path of a Project as:

  "The continuous string(s) of critical activities in the schedule between the Start and Finish of the project. The sum of the activity durations in the Critical Path is equal to the Project's Duration; therefore, a delay to any Critical Activity will result in a delay to the Project Completion Date."

Kramer, S. W. & Jenkins, J. L. (2006). Understanding the basics of CPM calculations: what is scheduling software really telling you? Paper presented at PMI® Global Congress 2006—North America, Seattle, WA. Newtown Square, PA: Project Management Institute

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CPM DEVELOPMENT

- Algorithms developed by two DuPont mathematicians
- Testing CPM – December 1957
- Construction of $10M chemical plant in Louisville, Kentucky
- Two independent scheduling teams (Standard vs. CPM)
- Findings:
  - CPM team was able to implement changes/revisions to the schedule much faster
    - 10% of the time required by the standard team
  - CPM better identified critical material deliveries
    - “Normal” team arbitrarily assigned critical tasks
    - Missed three (3) of the critical material deliveries
- Larger testing program implemented on plant shutdowns – 37.6% reduction

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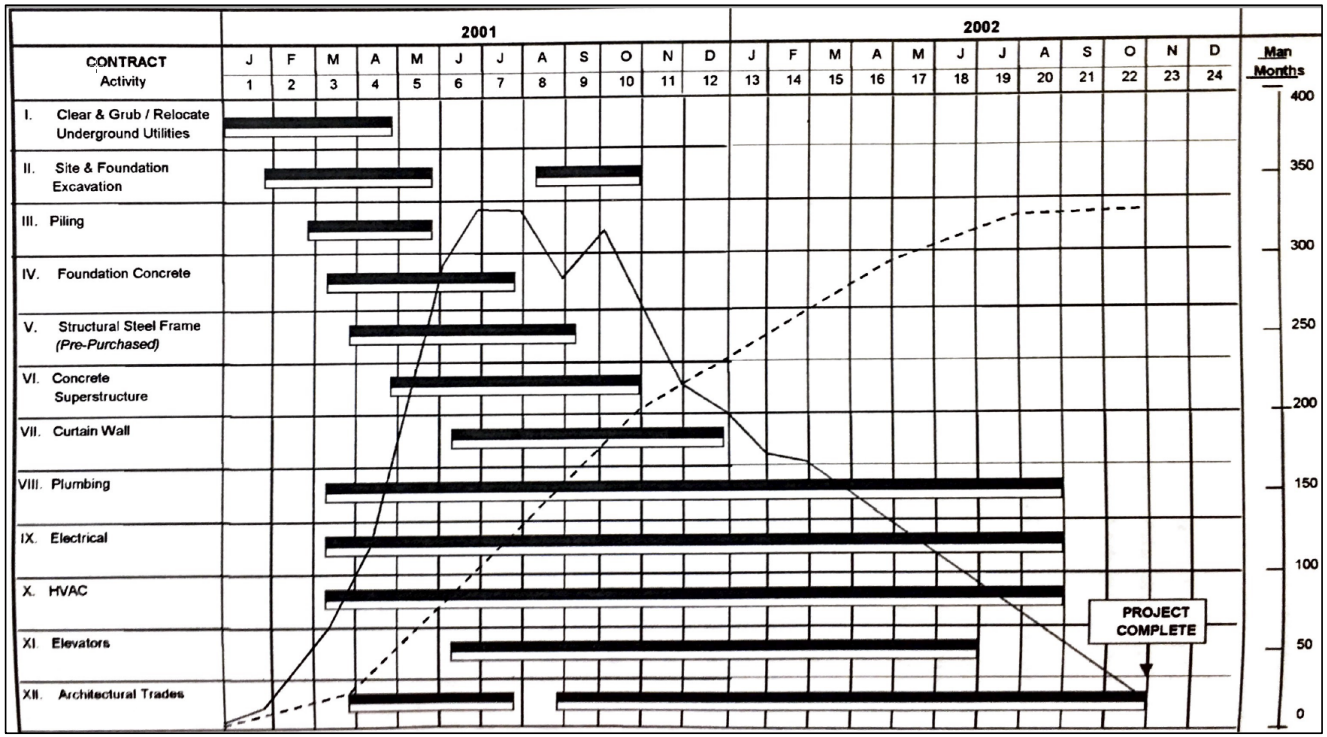
INTRO TO CPM

- Bar Charts
  - Most common scheduling technique up until the 1970s
  - Start/Finish dates for select tasks or features of work
- Major Flaw – Doesn't consider interdependencies of parts of the work



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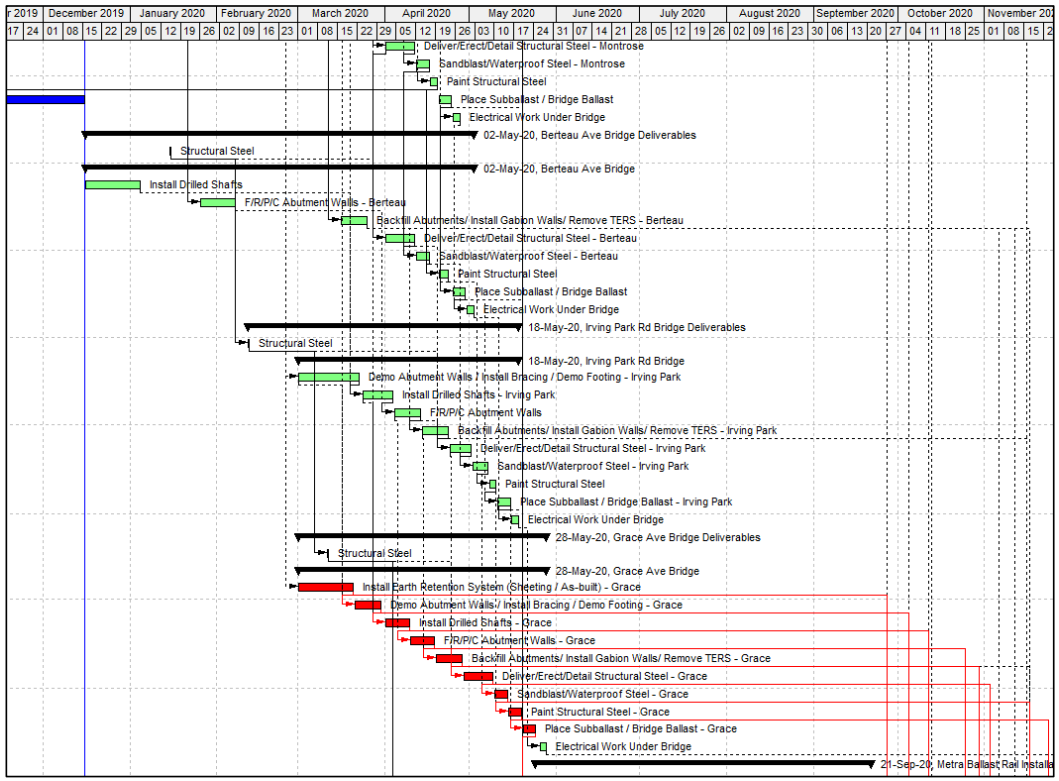
INTRO TO CPM



- Construction projects are too complex for simple bar charts
- The complete scope and interdependencies of each task need to be fully understood and incorporated into the model
- Critical Path Method (CPM)

"A description of when each activity in a project can be accomplished and must be finished so as to be completed timely."

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CHARACTERISTICS OF A CPM SCHEDULE

- A CPM Schedule is a scheduling method which calculates the start, finish, float and critical path for a schedule based on the network of activities
- Key Characteristics:

Logic

Float

Critical Path

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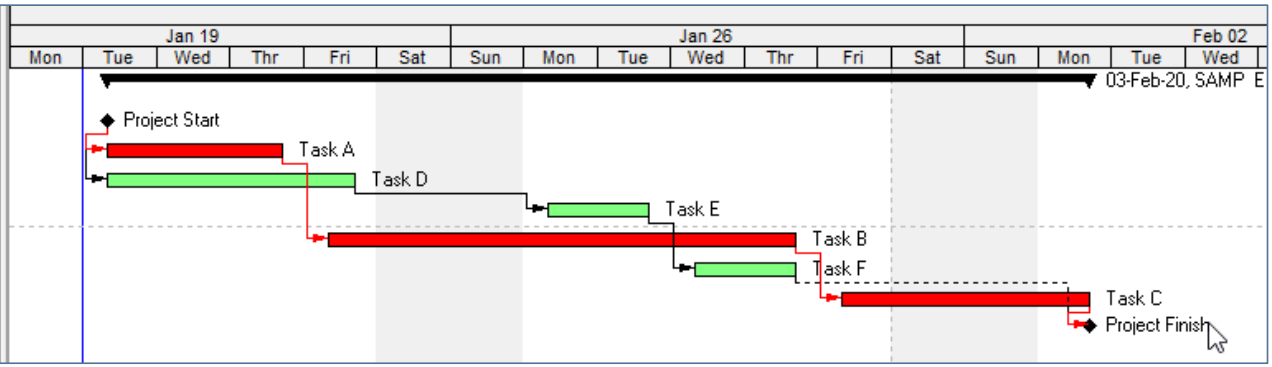
VISUAL EXAMPLE OF CPM CHARACTERISTICS

Activity ID	Activity Name	Original Duration	Start	Finish	Total Float
SAMP Example Project		10	21-Jan-20	03-Feb-20	0
START	Project Start	0	21-Jan-20		0
A	Task A	3	21-Jan-20	23-Jan-20	0
D	Task D	4	21-Jan-20	24-Jan-20	2
E	Task E	2	27-Jan-20	28-Jan-20	2
B	Task B	5	24-Jan-20	30-Jan-20	0
F	Task F	2	29-Jan-20	30-Jan-20	2
C	Task C	2	31-Jan-20	03-Feb-20	0
FINISH	Project Finish	0		03-Feb-20	0



- Logic is the arrows between bars (more often this is hidden in printouts).
- Float is calculated in Total Float column and visually apparent in horizontal spacing between activities.
  - Don’t forget about weekends or holidays!
- Critical Path is in red, note zero total float for all critical activities.

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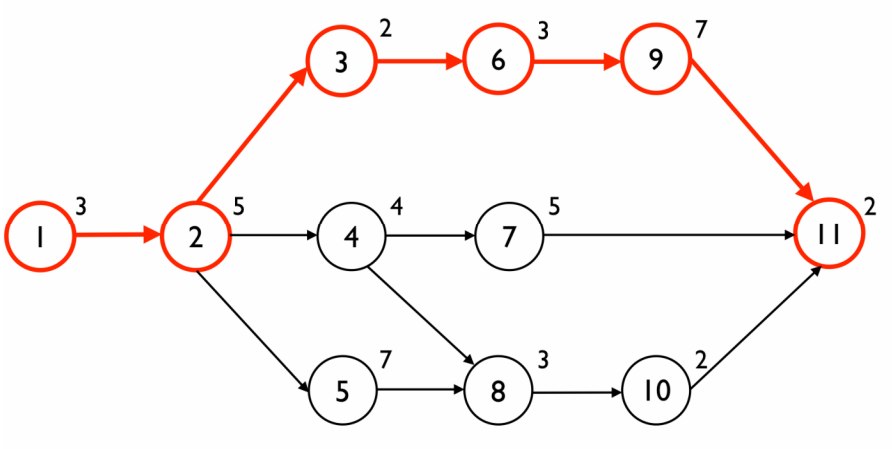
ANOTHER WAY OF LOOKING AT THE SCHEDULE AND CRITICAL PATH



Activity on Node Diagram

CPM TERMINOLOGY

To implement the critical path scheduling method, specific terminology defining the various interdependencies between the activities had to be developed. The following definitions are recognized by scheduling professionals throughout the construction industry.

- **CRITICAL PATH**: The continuous string(s) of critical activities in the schedule between the Start and Finish of the project. The sum of the activity durations in the Critical Path is equal to the Project's Duration; therefore, a delay to any Critical Activity will result in a delay to the Project Completion Date.
- **Duration**: The amount of time required to complete each activity in the schedule.
- **Predecessor**: The activity occurring prior to a subsequent activity, connected by a relationship
- **Successor**: The activity occurring after a previous activity, connected by a relationship
- **Critical Activity**: Any activity in the schedule that does not have any available float, and directly affects the projects completion date; Total Float=0
- **Total Float (TF)**: The maximum number of days the activity can be delayed without delaying the project completion date.
- **Free Float (FF)**: The maximum number of days the activity can be delayed without delaying any succeeding activity
- **Early Start (ES)**: The earliest date an activity can possibly start
- **Early Finish (EF)**: The earliest date that an activity can possibly finish
- **Late Finish (LF)**: The latest possible date an activity can finish without delaying the project completion date.
- **Late Start (LS)**: The latest possible date an activity can start without delaying the project completion date.

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CPM TERMINOLOGY

- **Relationship** : The logic between activities, determining a successors start and finish dates
  - **FS = Finish to Start**
  - **SS = Start to Start**
  - **FF = Finish to Finish**
  - **SF = Start to Finish**
- **Lag (or Slack)**: Scheduled interval between activities, usually based on the relationship.
- **Work Breakdown Structure (WBS)**: A series of activities that can be grouped together based on their interdependencies, usually these groups are strung together to create an overall project schedule.
- **Calendar**: Most scheduling software has customizable calendars, allowing you to establish the number of hours worked in a period of time, and exclude holidays and days off; these parameters will be used in the algorithms for calculating progress.
- **Constraints**: A condition imposed by the scheduler defining the start or finish date of an activity, not justified by the Float calculation.
- **Resources**: Resource loaded schedules can have quantities of labor, equipment, costs, and other data in the schedule and these parameters will be used to calculate production rates, progress and forecasted durations to complete; in the case of costs assigned to Earned Values (EV) can also be calculated.

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CPM TODAY

- Near universal adoption at this point
  - Oracle – Primavera P6
  - MS Project
  - Autodesk Build
  - Procore – Scheduling module
- Prevalence of CPM aided by the Federal government's adoption
- UFGS formally modified its standard specification to require Primavera P6 in 2015

PART 2 PRODUCTS

2.1 SOFTWARE

The scheduling software utilized to produce and update the schedules required herein must be capable of meeting all requirements of this specification.

2.1.1 Government Default Software

The Government intends to use Primavera P6.

2.1.2 Contractor Software

Scheduling software used by the contractor must be commercially available from the software vendor for purchase with vendor software support agreements available. The software routine used to create the required sdef file must be created and supported by the software manufacturer.

2.1.2.1 Primavera

If Primavera P6 is selected for use, provide the "xer" export file in a version of P6 importable by the Government system.

2.1.2.2 Other Than Primavera

If the contractor chooses software other than Primavera P6, that is compliant with this specification, provide for the Government's use two licenses, two computers, and training for two Government employees in the use of the software. These computers will be stand-alone and not connected to Government network. Computers and licenses will be returned at project completion.

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RECAP – CRITICAL PATH METHOD (CPM) SCHEDULE

- Creates a model for completion of a project given the following:
  - A list of all required activities
  - The duration for each activity
  - The interdependencies between the activities

- From this the longest path that drives the completion date is identified → **the critical path**

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BUILDING CPM SCHEDULES

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BUILDING A SCHEDULE - ACTIVITIES

WHERE DO WE START???

Activity List Based On…

- **Contractual Requirements**
- **Drawings**
- **Specifications**
- **Team member Input**
- **Subcontractors & Suppliers**

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BUILDING A CPM SCHEDULE

NATURAL SEQUENCE OF ACTIVITIES BASED ON DESIGN & SCOPE

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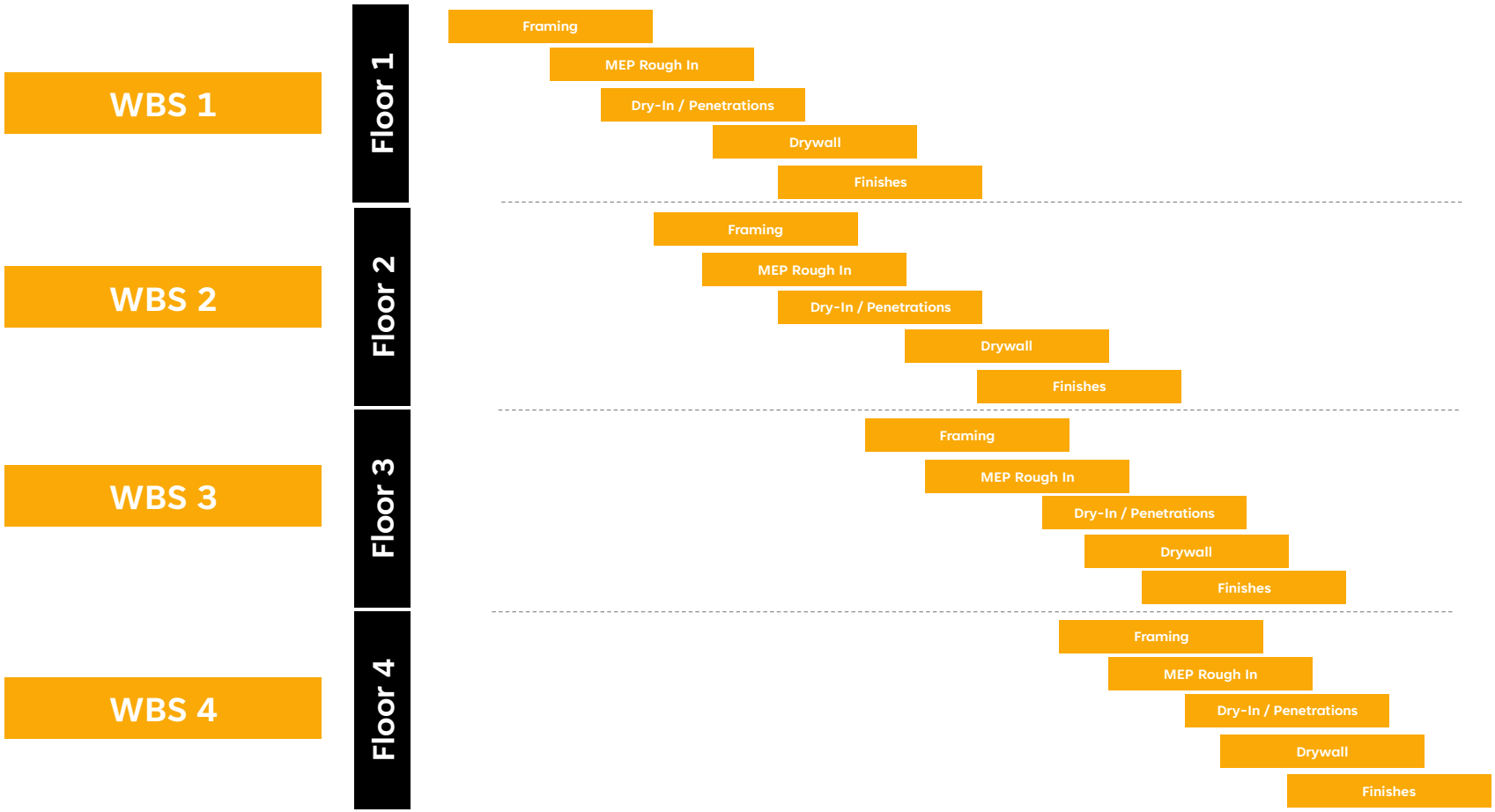
BUILDING A CPM SCHEDULE (USING A WBS)



BUILDING A SCHEDULE – ACTIVITY LIST

USING EXCEL AS A STARTING POINT FOR DEVELOPING ACTIVITIES

Activity ID	WBS Code	Activity Name	Original Duration(h)	(*)Start	(*)Finish
A1000	TOCU013.TOCUPROCURE	Terrazo Tile Terminal Floor Replacement (PO 24808)	22	8/3/2022	9/2/2022
A1010	TOCU013.TOCUPROCURE	Deflectometer for Platform Analysis Procure & Ship	20	8/8/2022	9/28/2022
A1030	TOCU013.TOCUPROCURE	Albanene "Vellum" (PO 24859)	5	11/1/2022	11/7/2022
A1040	TOCU013.TOCUPROCURE	PVC Jackets (PO 24860)	30	7/29/2022	8/11/2022
D1000	TOCU013.TOCUDESIGN	Taxiway Platform Subsurface Analysis	10	9/28/2022	9/30/2022
D1010	TOCU013.TOCUDESIGN	Taxiway Platform Geotechnical Recomendation	5	10/3/2022	1/2/2023
D1020	TOCU013.TOCUDESIGN	Taxiway Platform Design Solution Submittal to AITSA	5	1/3/2023	1/13/2023
D1030	TOCU013.TOCUDESIGN	Taxiway Platform Review and Approve Submittal AITSA	10	1/16/2023	7/27/2023
D1040	TOCU013.TOCUDESIGN	Roofing Site Inspection and Leak Analysis	10	9/26/2022	8/2/2023
D1050	TOCU013.TOCUDESIGN	Roofing Proposed Solution Design to CNO	5	12/5/2022	8/3/2023
D1060	TOCU013.TOCUDESIGN	Roofing Proposed Solution Review and Analysis CNO	5	12/6/2022	8/4/2023
D1070	TOCU013.TOCUDESIGN	Roofing Proposed Solution Submittal to AITSA	5	12/9/2022	8/8/2023
D1080	TOCU013.TOCUDESIGN	Roofing Proposed Solution Review and Approve Submittal by AITSA	10	12/12/2022	8/10/2023
A1060	TOCU013.TOCUPROCURE	Roofing Proposed Solution Material Acquisition	40	8/9/2023	9/7/2023
A1070	TOCU013.TOCUPROCURE	Compra de Pintura (Varias)	15	8/15/2022	8/31/2022
A1080	TOCU013.TOCUPROCURE	ADELTE Material Delivery (Procure & Ship)	25	8/15/2022	9/30/2022
A1090	TOCU013.TOCUPROCURE	Terrazo Setting Materials & Grout Procurement (Local)	5	10/14/2022	10/19/2022
A1100	TOCU013.TOCUPROCURE	A/A Pruebas y Balance (Acta 2)	16	8/21/2023	9/11/2023
A1110	TOCU013.TOCUPROCURE	A/A Pruebas y Balance (Acta 3)	16	9/11/2023	10/3/2023
A1120	TOCU013.TOCUPROCURE	A/A Pruebas y Balance (Acta 4)	16	10/3/2023	10/24/2023
A1130	TOCU013.TOCUPROCURE	A/A Pruebas y Balance (Acta 5)	16	10/24/2023	11/15/2023
A1140	TOCU013.TOCUPROCURE	A/A Pruebas y Balance (Acta 6)	16	11/15/2023	12/6/2023
A1150	TOCU013.TOCUPROCURE	A/A Pruebas y Balance (Acta 7)	16	12/6/2023	12/28/2023
A1160	TOCU013.TOCUPROCURE	A/A Pruebas y Balance (Acta 8)	16	12/28/2023	1/19/2024
A1170	TOCU013.TOCUPROCURE	AITSA Mantenimiento A/A para Pruebas y Balanceo	110	7/31/2023	12/29/2023
D1081	TOCU013.TOCUDESIGN	Roofing Proposed Solution Mockup Installation	10	9/7/2023	9/21/2023
D1082	TOCU013.TOCUDESIGN	Roofing Proposed Solution Mockup Monitoring	75	9/21/2023	1/4/2024

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BUILDING A SCHEDULE - DURATIONS

- Estimated amount of time each activity will take to complete based on self-performance or subcontractor input.
- Factors:
  - Resource availability
  - Level of detail is a factor
    - Higher level of detail = shorter durations for activities

Q11:	(A) What duration shall the GC use for UPRR work on Phase 2? (B) Will the UPRR duration count towards the 30 month schedule requirement?
R11:	***(A) The UPRR will require 4 months between May 1 and November 1 to construct the track. (B) Yes***

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BUILDING A SCHEDULE - LOGIC/ RELATIONSHIPS

Hard Logic

Physical constraints

Technical constraints

Spec requirements

Fabrication & lead times

Soft Logic

Crew sequencing

Material/equipment availability

Logic assignments allow for calculation of **Total Float** otherwise it would just be a comparison of durations.

Durations and logic should be derived from pro-active collaboration with the subcontractors performing the work!

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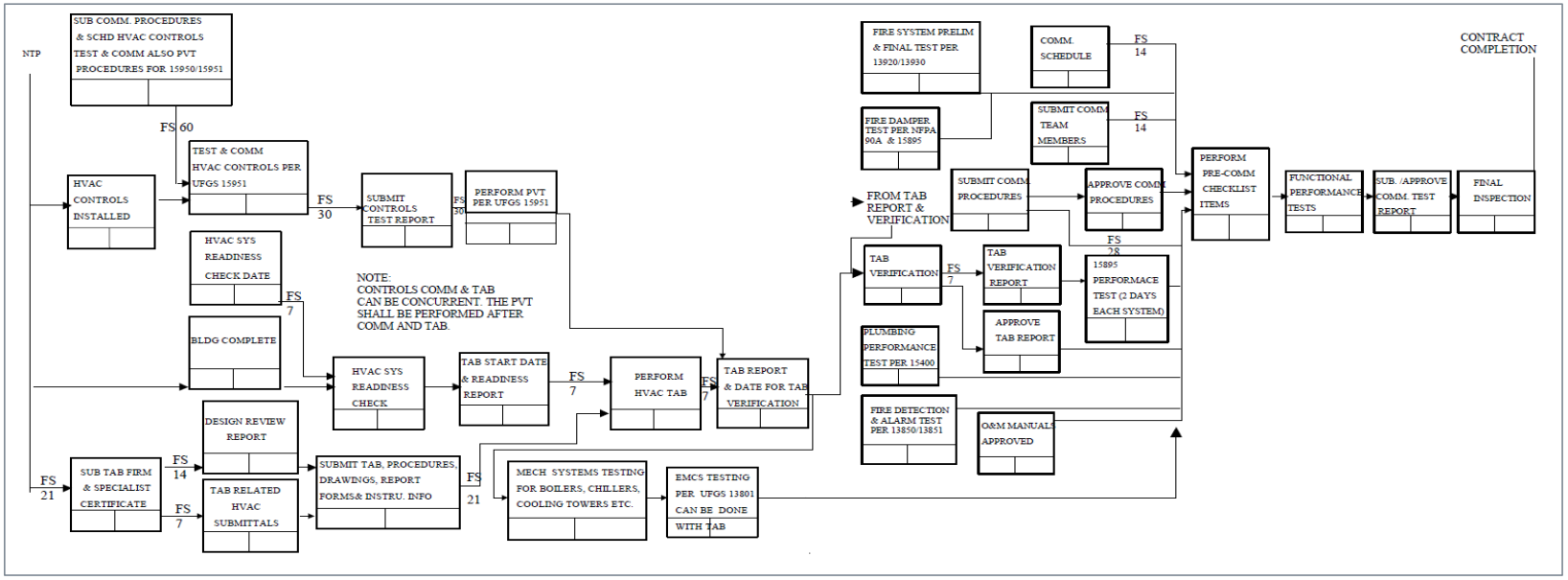
BUILDING A SCHEDULE – QUALITY CONTROL CHECK

- LEVEL OF DETAIL
- OPEN ENDS
- CONSTRAINTS
- CONTRACT REQUIREMENTS
- DEFINED RESPONSIBILITIES

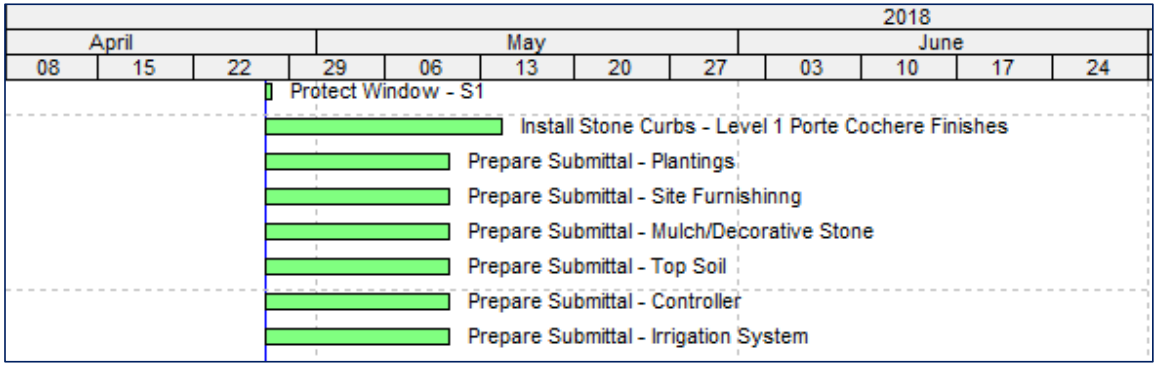
COMMON SCHEDULE DEFICIENCY – INSUFFICIENT DETAIL

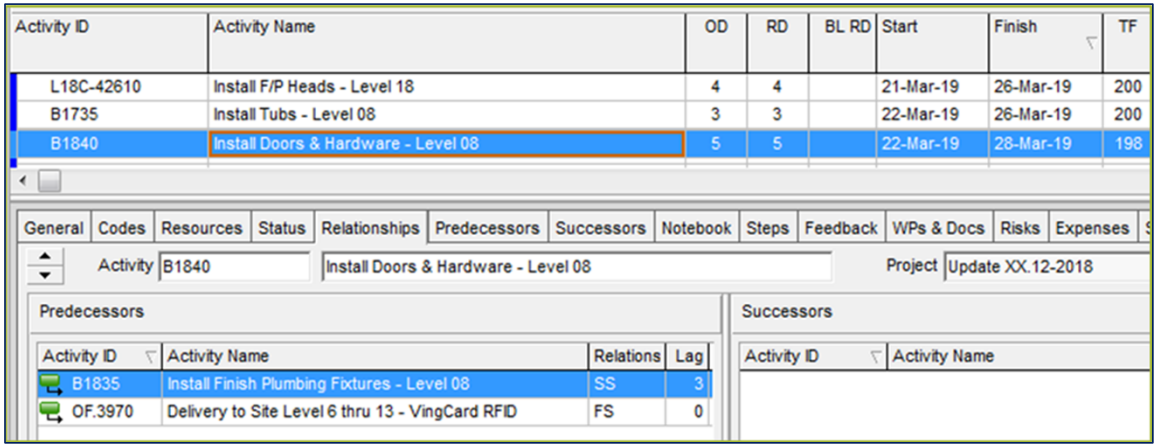
- Project schedules should be developed to an appropriate level of detail
- Oftentimes field personnel resist such efforts
  - Schedules can be summarized for use at the field level
  - 2 week lookaheads for field use and coordination
- Typically end up expanding detail later
  - Modifications to Baseline may require approval



COMMON SCHEDULE DEFICIENCY – MISSING ACTIVITY LOGIC (OPEN ENDS)

- Excessive Total Float
  - Activities with abnormally high Total Float values may indicate a missing logic tie
- Missing successors
  - If Late Finish = project completion date, missing some successor
- Missing predecessors
  - Interdependencies not considered “Ride the Data Date”

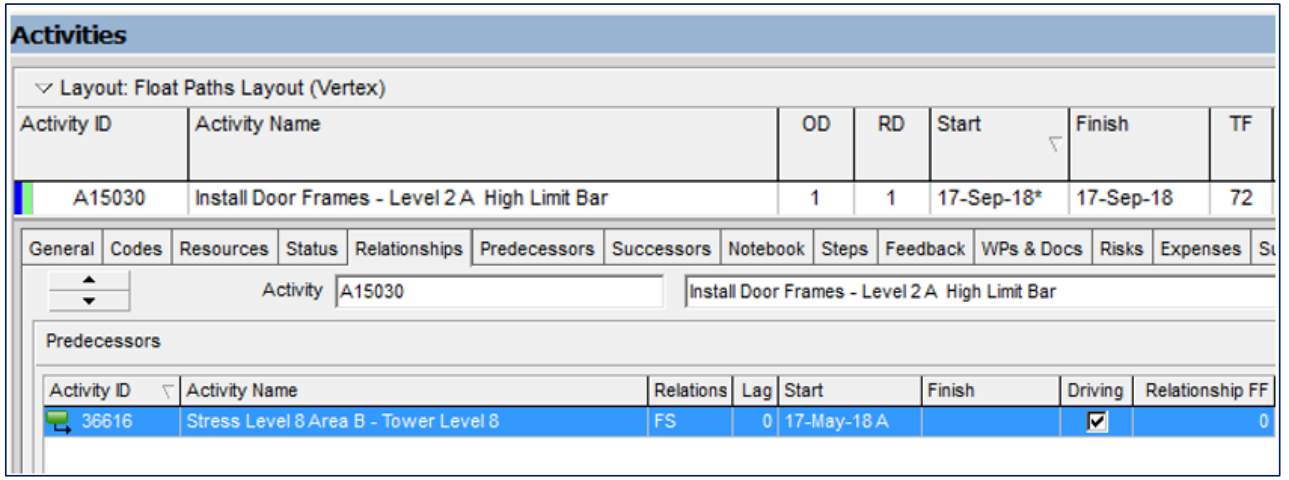




SCHEDULE EVALUATION – USE OF CONSTRAINTS

- Constraints should be limited to those required by contract
- Often used in place of activity logic which skews float calculations

Rather than tie the activity to a logical predecessor the Contractor just assigned a “Start on or after” constraint with what we assume is an estimated start date – but what determines that estimated start is not known



- Artificially consumes Float

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SCHEDULE EVALUATION – DELINEATION OF RESPONSIBILITY

- Each activity in the schedule should be the responsibility of single party

- Work by different contractors or under other parties' control should not be combined into a single activity
  - For example:
    - Submit/review/approve shop drawings
    - Form / rebar / place concrete
    - Trench and install pipe and backfill
    - MEP Rough-in

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SCHEDULE EVALUATION

Completeness

Delineation of Responsibility

Compliance

Quality

SCHEDULE UPDATING AND MAINTENANCE

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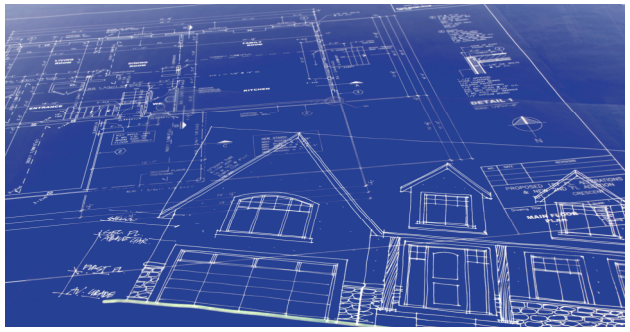
SCHEDULE UPDATES & MAINTENANCE –BASELINE SCHEDULE

A Baseline schedule is the approved schedule used for updating progress throughout the life of the project.

- The baseline should reflect the complete original scope of the work.
- Project specifications may have requirements for the baseline schedule.
  - Scheduling Platform
  - Specific Milestones and/or activities
  - Resource and/or Cost loading
- Typically, the schedule is a submittal requirement within a specified period after contracting.
- During construction, the baseline is used to measure the effect of impacts to the schedule.
  - Changes
  - Unforeseen conditions



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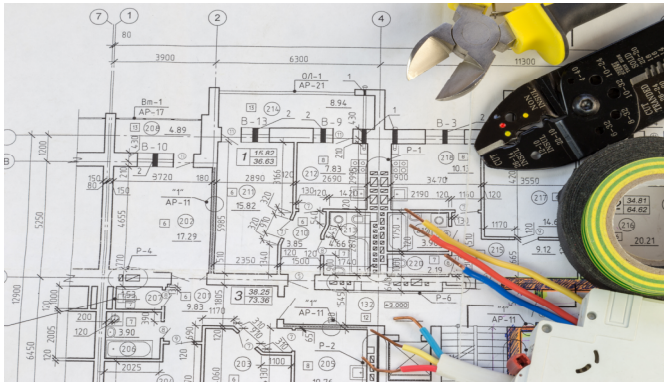
SCHEDULE UPDATES & MAINTENANCE – UPDATES

- Updates should be performed monthly as a **minimum** (biweekly recommended).
- Good practice calls for unique enumeration of updates.
  - TOCU001 – Approved Baseline
  - TOCU002 –(UPD001) Update June 2022
- Filter for “Incomplete Activities” for updating.
  - Use spreadsheet “Export” features if available.
  - Verify actual start and finish dates are added.
  - Verify percentage of completion coincides with field reports and/or costs to date.
- Identify any impacts or effects on the schedule in “notebook” or schedule report.
- Verify possible changes in the critical path of the project based on progress.
  - Check the TF of “Near Critical” activities.



SCHEDULE UPDATES & MAINTENANCE – MAINTENANCE

- Updating a schedule should also include schedule “maintenance”, a series of checks to ensure the updated schedule captures the current project conditions during the update period. We should consider the following as “maintaining” a project schedule.
  - Introduction of Approved Changes to the schedule.
  - Annotations and/or backup of unforeseen conditions.
  - Unusually frequent or severe weather events.
  - Consider “Suspending” activities that can’t progress.
    - Document causes attributable to others.
  - Document RFI’s affecting progress.
  - Strikes or material shortages (Force Majeure).

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PROVING DELAY – SCHEDULE BASED CLAIMS

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GOALS OF DELAY ANALYSIS

- Determine if time extension is warranted / relief from liquidated damages
- Support recovery of delay damages
- Defend against claims asserted by others
- Understand project schedule changes
- Evaluate milestone slippage
- Plan upcoming work and necessary resources

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NEGATIVE FLOAT FORECASTS

WHAT IS NEGATIVE FLOAT?

An activity has negative float when that activity's early finish date is pushed beyond the final completion date of the contract.

WHAT IS THE FINAL CONSTRAINT?

Typically, the final constraint is the substantial or final completion date of the project.

HOW IS THIS SHOWN IN THE SCHEDULE?

The final milestone of the schedule should be constrained to a specific date in the project schedule. Any activity which pushes out achievement of that milestone will have negative float.

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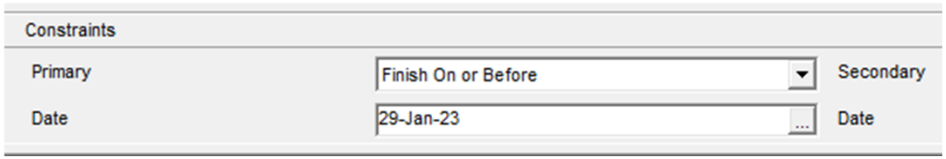
NEGATIVE FLOAT FORECASTS

Example Schedule with Negative Float

Activity ID	Activity Name	Original Duration	Actual Duration	Remaining Duration	Start	Finish	Total Float
		751	350	85	28-Feb-22 A	28-Oct-23	3 -195
MILESTONES		422	339	83	28-Feb-22 A	28-Oct-23	-191
100.ML	Notice of Award	1	1	0	28-Feb-22 A	28-Feb-22 A	
101.ML	NTP	0	0	0	05-Apr-22 A		
103.ML 1	Project Completion (01/29/2023)	0	0	0		28-Oct-23* 2	-272
102.ML	Construction Duration	298 4	452	120	05-Apr-22 A	28-Oct-23	-272

Snip of Status Tab



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TYPES OF DELAYS

1. Excusable Compensable Delays (Time & Money)

- E.g., Critical Differing Site Condition, Additional Work & Owner Delay Claim

2. Excusable Non-Compensable Delays (Time, No Money)

- E.g., Critical Weather Delays, Force Majeure & Concurrent Delays

3. Non-Excusable Delays (No Time, No Money)

- E.g., Contractor-Caused & Non-Critical Delays

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PROJECT SCHEDULE ANALYSIS PERSPECTIVES

Retrospective Analysis

- Can be performed during the project or after completion.
- Performed after the impact of the event is known
- Forensic

Prospective Analysis

- Performed while Project is ongoing
- Performed contemporaneously with delay event
- Estimate of Schedule Impact – not a forensic analysis

PROSPECTIVE ANALYSIS

- Time Impact Analysis is required on Federal projects

B. Time Impact Analysis (TIA):

1. When a Contract Modification is issued or the Contractor believes an extension of time is warranted, the Contractor shall submit to the Project Director/COR a written Time Impact Analysis (TIA) illustrating the influence of each Contract Modification or request for time extension on the Contract schedule.
2. The "Impacted As-Planned" method of TIA shall not be accepted.
3. The TIA proposal shall include a justification for the proposed revision and shall include a written narrative with supporting documentation developed from the PES.
4. The Contractor shall identify the cause of the time impact to the Project duration and the reason for an additional time request based on how a Contract Modification affects the critical path.
   a. Describe the impact upon total float.

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RETROSPECTIVE ANALYSIS

- USACE revised their standard scheduling spec in 2015
  - Section 3.8 REQUESTS FOR TIME EXTENSIONS:

> 3.8.3 Forensic Schedule Analysis (Retrospective Analysis)
>
> Prepare an analysis for approval by the Contracting Officer based on industry standard AACE 29R-03.

Taxonomy																
1	RETROSPECTIVE															
2	OBSERVATIONAL							MODELED								
3	Static Logic			Dynamic Logic				Additive				Subtractive				
4	3.1 Gross	3.2 Periodic		Contemporaneous Updates (3.3 As-Is or 3.4 Split)		3.5 Modified / Reconstructed Updates		3.6 Single Base[2]		3.7 Multi Base[1]		3.8 Single Simulation		3.9 Multi Simulation[1]		
5		Fixed Periods	Variable Windows	All Periods	Grouped Periods	Fixed Periods	Variable Windows	Global Insertion	Stepped Insertion	Fixed Periods	Variable Windows or Grouped	Global Extraction	Stepped Extraction	Fixed Periods	Stepped Extraction	
Common Names	As-Planned vs As-Built	Window Analysis		Contemporaneous Period Analysis, Time Impact Analysis, Window	Contemporaneous Period Analysis, Time Impact Analysis, Window Analysis	Contemporaneous Period Analysis, Time Impact Analysis	Window Analysis, Time Impact Analysis	Impacted As Planned, What-If	Time Impact Analysis, Impacted As-Planned	Time Impact Analysis	Window Analysis, Impacted As-Planned	Collapsed As-Built	Time Impact Analysis, Collapsed As-Built	Time Impact Analysis, Collapsed As-Built	Time Impact Analysis, Window Analysis, Collapsed As-Built	

MITIGATION EFFORTS

REVISING LOGIC

- Meet with superintendent and subcontractors to determine which activities may be completed concurrently, instead of in sequence.
- Break unnecessary logic ties.

MODIFYING CALENDARS

Modifying calendars includes going from 8- to 10-hour days, working Saturdays, working nights, and more.

ACCELERATING ACTIVITIES

If we can show that we have accelerated longer activities, such as procurement, we can shorten the expected duration of those activities. (This is generally frowned upon, so we need to show our work.

CLAIMS AND QUANTUM

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EXAMPLES OF DELAY CLAIM SUPPORTING SCHEDULE ANALYSIS

Delay claims must be supported by schedule analyses. Recall the FAR and USACE excerpts from previous slides. Some examples of those analysis methods are provided in the following slides.

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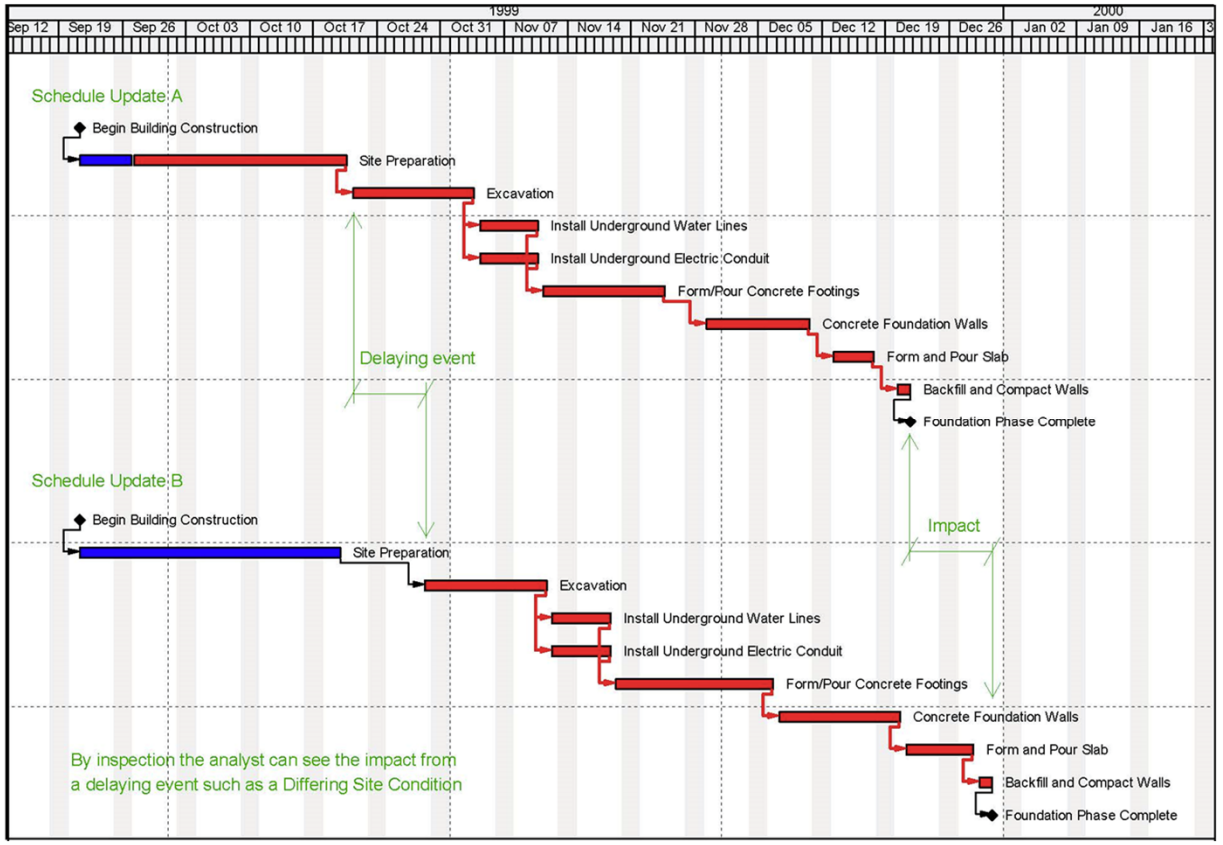
AS-PLANNED VS AS-BUILT



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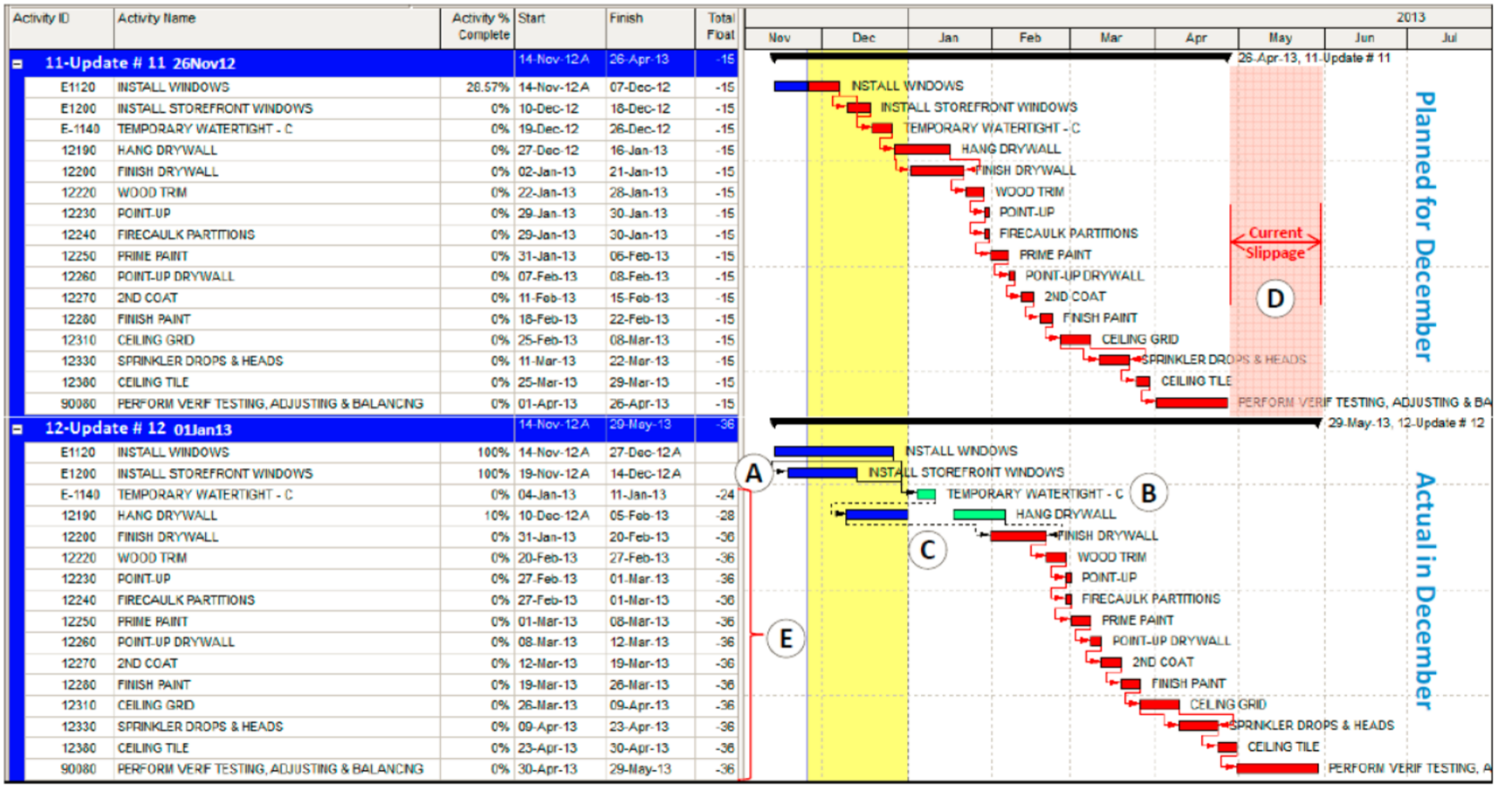
WINDOWS ANALYSIS



Activity ID	Activity Name	Activity % Complete	Start	Finish	Total Float
11-Update # 11 26Nov12			14-Nov-12 A	26-Apr-13	-15
E1120	INSTALL WINDOWS	26.57%	14-Nov-12 A	07-Dec-12	-15
E1200	INSTALL STOREFRONT WINDOWS	0%	10-Dec-12	18-Dec-12	-15
E-1140	TEMPORARY WATERTIGHT - C	0%	19-Dec-12	26-Dec-12	-15
12190	HANG DRYWALL	0%	27-Dec-12	16-Jan-13	-15
12200	FINISH DRYWALL	0%	02-Jan-13	21-Jan-13	-15
12220	WOOD TRIM	0%	22-Jan-13	28-Jan-13	-15
12230	POINT-UP	0%	29-Jan-13	30-Jan-13	-15
12240	FIRECAULK PARTITIONS	0%	29-Jan-13	30-Jan-13	-15
12250	PRIME PAINT	0%	31-Jan-13	06-Feb-13	-15
12260	POINT-UP DRYWALL	0%	07-Feb-13	08-Feb-13	-15
12270	2ND COAT	0%	11-Feb-13	15-Feb-13	-15
12280	FINISH PAINT	0%	18-Feb-13	22-Feb-13	-15
12310	CEILING GRID	0%	25-Feb-13	08-Mar-13	-15
12330	SPRINKLER DROPS & HEADS	0%	11-Mar-13	22-Mar-13	-15
12380	CEILING TILE	0%	25-Mar-13	29-Mar-13	-15
90080	PERFORM VERIF TESTING, ADJUSTING & BALANCING	0%	01-Apr-13	26-Apr-13	-15
12-Update # 12 01Jan13			14-Nov-12 A	29-May-13	-36
E1120	INSTALL WINDOWS	100%	14-Nov-12 A	27-Dec-12 A	
E1200	INSTALL STOREFRONT WINDOWS	100%	19-Nov-12 A	14-Dec-12 A	
E-1140	TEMPORARY WATERTIGHT - C	0%	04-Jan-13	11-Jan-13	-24
12190	HANG DRYWALL	10%	10-Dec-12 A	05-Feb-13	-28
12200	FINISH DRYWALL	0%	31-Jan-13	20-Feb-13	-36
12220	WOOD TRIM	0%	20-Feb-13	27-Feb-13	-36
12230	POINT-UP	0%	27-Feb-13	01-Mar-13	-36
12240	FIRECAULK PARTITIONS	0%	27-Feb-13	01-Mar-13	-36
12250	PRIME PAINT	0%	01-Mar-13	08-Mar-13	-36
12260	POINT-UP DRYWALL	0%	08-Mar-13	12-Mar-13	-36
12270	2ND COAT	0%	12-Mar-13	19-Mar-13	-36
12280	FINISH PAINT	0%	19-Mar-13	26-Mar-13	-36
12310	CEILING GRID	0%	26-Mar-13	09-Apr-13	-36
12330	SPRINKLER DROPS & HEADS	0%	09-Apr-13	23-Apr-13	-36
12380	CEILING TILE	0%	23-Apr-13	30-Apr-13	-36
90080	PERFORM VERIF TESTING, ADJUSTING & BALANCING	0%	30-Apr-13	29-May-13	-36

*Windows Analysis >>>>

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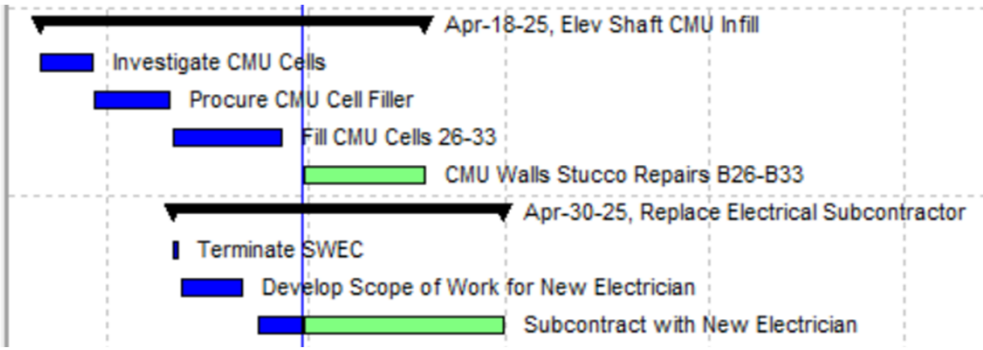
TIME IMPACT ANALYSIS (TIA)

Elev Shaft CMU Infill		37	17	Feb-19-25 A	Apr-18-25
A1490	Investigate CMU Cells	7	0	Feb-19-25 A	Feb-26-25 A
A1500	Procure CMU Cell Filler	7	0	Feb-27-25 A	Mar-10-25 A
A1510	Fill CMU Cells 26-33	13	0	Mar-11-25 A	Mar-27-25 A
A1530	CMU Walls Stucco Repairs B26-B33	17	17	Mar-31-25	Apr-18-25
Replace Electrical Subcontractor		15	27	Mar-11-25 A	Apr-30-25
A1540	Terminate SWEC	5	0	Mar-11-25 A	Mar-11-25 A
A1550	Develop Scope of Work for New Electric	5	0	Mar-12-25 A	Mar-21-25 A
A1560	Subcontract with New Electrician	5	27	Mar-24-25 A	Apr-30-25



A “fragnet” is inserted into the schedule to represent an unexpected impact not attributable to a scope item from the baseline schedule

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QUANTUM - EXAMPLE

HOW MANY DAYS WERE IMPACTED

Our TIA shows 12 working days of delay.

WHAT IS THE LIQUIDATED DAMAGES RATE?

LDs accrue at $1,000/day in calendar days.

WHAT IS THE BURN RATE?

Contractors can show that they expend $1,500/day running the project.

WHAT IS THE TOTAL CLAIM?

Recover 16 days of LDs and claim for 12 days of extended costs:
($1,000 x 16) + ($1,500 x 12) = $16,000 + $18,000 = $34,000 total

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FOR MORE INFORMATION

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