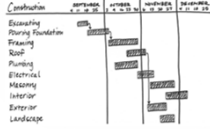


PROJECT TIME MANAGEMENT

INSTITUTE FOR FACILITIES MANAGEMENT



FACULTY: T. MARK MILLER, P.E., MEM, M.ASCE
ASSISTANT VICE PRESIDENT
FACILITIES MANAGEMENT & PLANNING
THE PENNSYLVANIA STATE UNIVERSITY

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

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407 PROJECT TIME MANAGEMENT APPALU201909L

COURSE DESCRIPTION

Explore why university building and renovation projects require so much time.

Learn the fundamentals of project time management and the impact time has on the project budget.

Review the various strategies that owners may employ to manage time more effectively.

Discuss schedule incentive clauses including liquidated damages, actual damages, and bonus/penalty clauses.

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3

LEARNING OBJECTIVES

- Learn why higher education projects require so much time
- Learn fundamentals of time management
- Review various strategies to manage time more effectively
- Discuss schedule incentives clauses in contracts

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4

COURSE OBJECTIVES

- Explore the challenges with managing a campus project schedule
- Review industry practices and contractual issues
- Discuss incentive clauses

5

OUTLINE

1. Project Time Management
2. Design Time Management
3. Project/Construction Time Management
4. Contractual Incentives

6

BASIC GOALS OF A PROJECT



LOWEST COST



HIGHEST QUALITY



SHORTEST TIME

7

COMPETING GOALS

Shortening the schedule usually...

8

COMPETING GOALS

Shortening the schedule usually...

...drives up cost and/or lowers quality.

9



PRIORITIZING GOALS

A project without sufficient time has subordinated the importance of the cost and quality goals to time

10

**PROJECT TIME
MANAGEMENT**

11

**CAMPUS
CHALLENGES**

MANAGING
PROJECT TIMELINES
IN A CAMPUS
ENVIRONMENT IS
PARTICULARLY
CHALLENGING

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CAMPUS CHALLENGES

- Immovable completion dates
- Compressed and restrictive construction windows

13

CAMPUS CHALLENGES

- Projects requested late
- Multiple projects conflicts

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CAMPUS CHALLENGES

- Multiple projects conflicts

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CAMPUS CHALLENGES

- Project complexity
 - Property Acquisition
 - Demo or remediation of proposed site
 - Existing utilities or infrastructure
 - Campus master plans
 - Historic districts of facilities
 - Environmental impacts
 - Multiple users



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CAMPUS CHALLENGES



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CAMPUS CHALLENGES

- Funding process
 - State funding
 - Debt
 - Donor
 - Unit funds
 - Grants

Name	Description	Funding Category	Start	End	Budget	Committed	Available	Current
State	State	State	01/01/2000	12/31/2020	10000000	0	10000000	0
Local	Local	Local	01/01/2000	12/31/2020	10000000	0	10000000	0
Donor	Donor	Donor	01/01/2000	12/31/2020	10000000	0	10000000	0
Unit	Unit	Unit	01/01/2000	12/31/2020	10000000	0	10000000	0
Grant	Grant	Grant	01/01/2000	12/31/2020	10000000	0	10000000	0
Other	Other	Other	01/01/2000	12/31/2020	10000000	0	10000000	0
Total					50000000	0	50000000	0

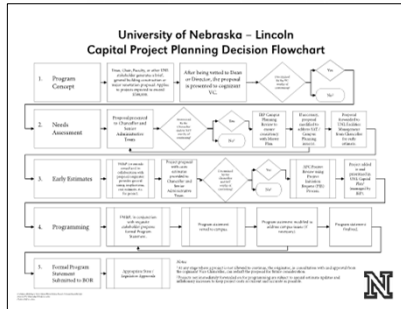
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CAMPUS CHALLENGES

- Permitting process
 - Who is the AHJ at your campus??
- Board/administrative/regulatory approvals***
- Decision-making process
- Number of people involved

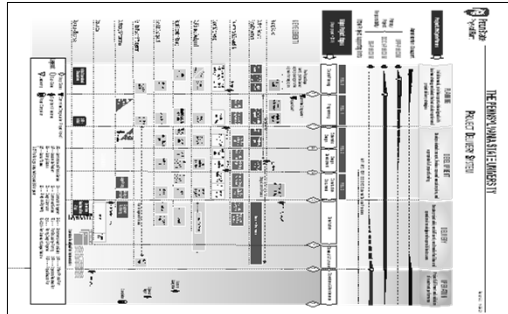
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CAMPUS CHALLENGES



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CAMPUS CHALLENGES



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DESIGN TIME MANAGEMENT

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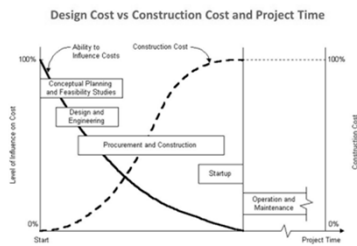
INSUFFICIENT DESIGN TIME

Reduces the opportunity for optimizing value and lowering project expenses

Lowers the quality of the design documents leading to higher bids and change orders

23

TIME IS A FINITE RESOURCE



24

DESIGN PHASES

Programming

- Determines and describes the facility needs
- Heavy focus on campus and customer engagement at this stage
- Usually a separate effort then the actual design
- Often leads to a program statement document

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UNIVERSITY OF NEBRASKA - LINCOLN MABEL LEE HALL RENOVATION

Program Statement Report



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PROJECT BACKGROUND

The College of Education and Human Sciences (CEHS) is conducting 21st-century teaching, learning, education and research in an incompatible 50-year old physical education building.

CEHS programs co-exist next to and below recreation and athletic spaces used by Campus Recreation, the Women's Gymnastics team, and the Hixson-Lied College of Fine and Performing Arts Dance program.

Only 54% of the square footage is used for CEHS Programs. The remaining space is allocated to recreation, dance and athletic functions.

Classrooms lack useful instructional space, limiting effectiveness in carrying out quality teaching, research, outreach and engagement.

Mabel Lee Hall Renovation



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PROJECT DESCRIPTION

Renovation of Mabel Lee Hall will provide a high quality academic building, suitable for state-of-the-art teaching, research and academic engagement with the community through three vital enhancements:

1. Bringing together faculty and students from three primary CEHS programs currently located in separate facilities:
 - Teacher Learning and Teacher Education (TLTE)
 - Nebraska Center for Research on Children, Youth, Families and Schools (CYFS)
 - Child Youth and Family Studies (CYAF)
2. Creating 21st Century Teaching Laboratories that serve as models for classroom teaching in elementary, middle and secondary schools
3. Elevating and showcasing teacher education and the human service professions on the UNL campus and in Nebraska

Mabel Lee Hall Renovation



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PROJECT OBJECTIVES

A renovated Mabel Lee Hall will allow CEHS students, faculty, staff and stakeholders to:

- Build community within the college
- Create new approaches to teaching and learning; generate new knowledge and research; and develop new methods of working with children, youth, families, schools and communities
- Collaborate and Cooperate - across disciplines, age-groups, departments, and among the various elements of the CEHS mission – teaching, research and outreach/extension
- Recruit new students and faculty
- Engage in active learning, teaching, and research

Mabel Lee Hall Renovation



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PROJECT LOCATION



Mabel Lee Hall Renovation



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STRATEGIC ALIGNMENT

This project complies with the following select objectives of the University Strategic Planning Framework for 2014-2016:

- 1.b.i. "Increase enrollment, consistent with quality imperatives, to serve Nebraska's goals for increased educational attainment."
- 4.a. "Increase external support for research and scholarly activity."
- 4.b. "Increase undergraduate and graduate student participation in research and its application."
- 4.d. "Improve the quantity and quality of research space through public and private support."
- 4.e. "Focus resources on areas of strength in research where the university has the opportunity for regional, national and international leadership and in areas of strategic importance to the health and economic strength of Nebraska."
- 5.d. "Support entrepreneurship education, training and outreach."
- 5.e. "Collaborate with the public and private sectors to build successful regional, multistate, international linkages."
- 6.d.i. "Promote entrepreneurship and revenue-generating opportunities."
- 6.d.ii. "Collaborate with the University of Nebraska Foundation to secure private support."

Mabel Lee Hall Renovation



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MASTER PLAN COMPLIANCE

Renovation of Mabel Lee Hall complies with the current campus master plan document ("Plan Big") specifically in relation to the following principles:

- The fundamental principle for growth is to concentrate activity in the core. Concentrating development helps to enable interaction and interdisciplinary collaboration, allow efficient infrastructure investments, and protect land for open space activities.
- Plan Big seeks to enhance existing spaces to foster better cross-disciplinary collaboration. This supports UNL's celebration of innovation and excellence across campus learning environments by making learning more visible and engaged with the campus.
- Plan Big recommended that a renovation plan be put in place for UNL's teaching spaces to ensure that they remain competitive, enhance learning, and encourage innovation. Much of the furniture, lighting, technology, and finishes are older and many of the classrooms would benefit from new, more flexible furniture that allow for a variety of teaching styles.

Mabel Lee Hall Renovation



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PROJECT BUDGET

Construction	
General Construction	\$27,600,000
Site Work/Utilities	200,000
Fixed Equipment	0
In-House Construction	1,650,000
Construction Contingency	2,000,000
TOTAL CONSTRUCTION COSTS	\$31,450,000
Non-Construction	
Project Planning	207,000
Professional Consultant Fees	2,630,000
Professional In-house	650,000
Equipment - Capital	2,600,000
Equipment - Non-Capital	2,100,000
Land Acquisition	0
Artwork	350,000
Other	575,000
Non-Construction Contingency	38,000
TOTAL NON-CONSTRUCTION COSTS	\$8,550,000
TOTAL PROJECT COST	\$40,000,000

Mabel Lee Hall Renovation



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PROJECT SCOPE SUMMARY

Space Summary

Net Square Feet	93,100 NSF
Gross Square Feet	128,682 GSF

Cost Summary

Total Project Cost per Gross Square Foot	\$311
Construction Cost per Gross Square Foot	\$244

Total Project Cost

Total Project Cost	\$40,000,000
Construction Cost	\$31,450,000
Non-Construction Cost	\$8,550,000

Fiscal Impact

Additional Operational and Maintenance Costs Per Year	\$244,500
Additional Programmatic Costs Per Year	\$0

Mabel Lee Hall Renovation



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PROJECT SCHEDULE

Program Statement	June 1, 2017
A/E and Contractor Selection	August 11, 2017
Start Design	August 2017
Intermediate Design Review	February 2018
One Year Strategic Pause	September 2018
Receive Sub/Supplier Bids for Construction	September 2019
Start Construction	October 2019
Complete Construction	May 2021
Occupancy	July 2021

Mabel Lee Hall Renovation



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DESIGN PHASES

Schematic Design

- Determines the scale and relationship of the project components
- At a number of institutions, this is where the final budget is set
- Usually the start of A/E design contract

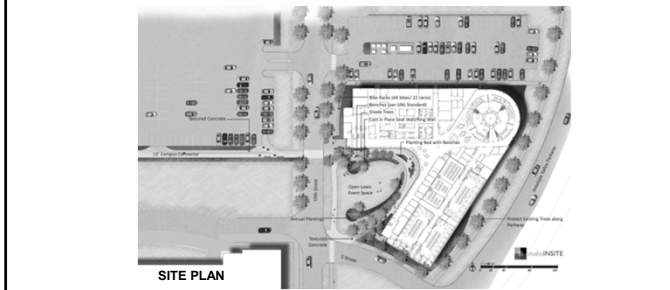
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UNL University Health Center /
UNMC College of Nursing – Lincoln Division
Intermediate Design Review
Board of Regents Business Affairs Committee
June 17, 2016



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Intermediate Design Review
Board of Regents Business Affairs Committee
June 17, 2016



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Board of Regents Business Affairs Committee
June 17, 2016



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UNL University Health Center /
UNMC College of Nursing – Lincoln Division
Intermediate Design Review
Board of Regents Business Affairs Committee
June 17, 2016

LEVEL TWO PLAN

- Department Legend
- BUILDING SERVICES
 - CON CLASSROOMS
 - CON COMMON
 - MECHANICAL
 - UHC CAPS
 - UHC MATERIALS MANAGEMENT
 - UHC MEDS
 - UHC PHYSICAL THERAPY
 - UHC PRIMARY CLINIC
 - UHC SHARED
 - UHC SPECIALTY CLINIC



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UNL University Health Center /
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Intermediate Design Review
Board of Regents Business Affairs Committee
June 17, 2016

LEVEL THREE PLAN

- Department Legend
- BUILDING SERVICES
 - CON ADMIN
 - CON CLASSROOMS
 - CON COMMON
 - CON FACULTY
 - CON RESEARCH
 - MECHANICAL
 - UHC ADMIN



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Intermediate Design Review
Board of Regents Business Affairs Committee
June 17, 2016



Main Entry

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 Board of Regents Business Affairs Committee
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Student Gathering

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 June 17, 2016



Simulation Lab

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UNL University Health Center /
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 Intermediate Design Review
 Board of Regents Business Affairs Committee
 June 17, 2016

**SPACE
 PROGRAM
 SUMMARY**

Description	BDR Program		Design Development
	Net Area	Net Area	
College of Nursing			
100 Classroom Facilities	12,642	12,642	12,642
200 Lab Facilities	8,890	7,151	14,041
300 Office Facilities	1,102	5,828	1,454
400 Study Facilities	102	35	102
500 Storage Use Facilities	2,296	2,296	294
600 Restrooms	800	870	2,010
700 Conference Area	190	294	34
800 Teaching Lecture Area	120	870	153
900 Support	22,158	22,284	3,725
Subtotal	46,310	48,174	
College Area	448,910	434,600	
University Health Clinic			
100 Building Common Spaces	2,100	1,900	2,100
200 Classroom Facilities	1,100	1,100	40
300 Office Facilities	8,300	12,200	2,171
400 Study Facilities	78	78	31
500 Storage Use Facilities	300	441	28
600 Health Clinic Restrooms	13,100	13,900	2,643
700 Support	33,100	33,500	81
800 Program Administration	800	810	
900 Classroom Area	24,370	13,271	
Combined Programs			
Classroom Building NetP	42,12	43,320	
Classroom Building NetP	61,176	61,730	
Classroom Building NetP	103,298	105,050	4,318

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COMBINED UHC/CON BUDGET

Construction Costs	Program Statement	Intermediate Design
General Construction	\$29,372,000	\$29,177,000
UNL In-House Construction	1,491,000	1,686,000
Building Controls	1,067,000	
Fire alarm system	304,000	
Card Access/Keying	120,000	
UNL Landscaping	195,000	
Other Construction	27,000	27,000
Telecommunications	1,130,000	305,000
Construction Contingency	1,602,000	1,602,000
Subtotal – Construction Costs	\$33,622,000	\$32,797,000

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COMBINED UHC/CON BUDGET

Non-Construction Costs	Program Statement	Intermediate Design
Moveable Equipment – Furniture	\$960,000	\$960,000
College of Nursing	300,000	
University Health Center	660,000	
Special & Technical Equipment (ie. AV, Medical)	2,814,000	3,713,680
College of Nursing	674,660	
University Health Center	2,146,000	
Telecommunications/Security	873,000	
Project Design & Management	3,263,000	3,634,685
Artwork	175,000	100,340
Other Costs	318,000	151,000
Non-Construction Contingency	347,000	142,315
Subtotal – Construction Costs	7,877,000	8,702,000
Total Project Cost	\$41,499,000	\$41,499,000

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PROJECT SCHEDULE

Phase	CON Program	UHC Program	Updated
Program Approval by Board of Regents	September 2008	June 2015	June 2015
Architect Approval by Board of Regents	August 2009	August 2015	August 2015
Program Verification Complete			October 2015
Schematic Design Complete			January 2016
Design Development Complete	March 2010		April 2016
Intermediate Design Review (BAC)		November 2015	June 17 th , 2016
Construction Documents Complete	July 2010		September 2016
Bids due	September 2010	May 2016	October 2016
Contract Award /Start Construction (9 months)	October 2010	June 2016	November 2016
Building Substantially Complete	February 2012	November 2017	May 2018
Open Building	May 2012	January 2018	July 2018

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REQUEST APPROVAL OF THE INTERMEDIATE DESIGN



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DESIGN PHASES

- Design Development
 - Fixes and describes the size and character of the entire project and building systems

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DESIGN PHASES

- Construction Documents
 - Details the project for bidding and constructing purposes

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DESIGN PHASES

Bidding

- Selection of General Contractor or for alternative delivery methods, sub packages

52

BUILDING THE PYRAMID

Designing is a process of building upon decisions...
like blocks in a pyramid

Decisions (the building blocks) must
be timely or the building process halts



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DESIGN SCHEDULES CRASH...

...when decisions are made or changed in the wrong phase of design; effectively dismantling the decision pyramid



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PROJECT TEAM ORIENTATION

- Clients and decision-makers need to understand and work with the discreet phases of design

55

**CONSTRUCTION
TIME MANAGEMENT**

56

INSUFFICIENT CONSTRUCTION TIME

- Drives up bids in covering acceleration costs and higher risks
- Limits the amount of time available for quality workmanship
- Reduces competition

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What does this bid tab tell us?

A/E: Ellerbe Becket

Bidder's Name	Base Bid	Alt. #1	Alt. #2	Alt. #3	Alt. #4
M.A. Mortensen Co.	\$10,279,000	\$334,000	\$123,000	\$12,000	\$113,000
Walton Construction Co	\$11,725,000	\$352,480	\$132,000	\$57,600	\$102,700
Reinhardt/Wilson	\$10,525,000	\$343,000	\$125,000	\$34,000	\$82,000
Curtiss Manes Schulte	\$10,279,000	\$145,805	\$131,086	\$30,432	\$92,000
Walsh Construction	\$9,193,000	\$365,000	\$132,000	\$10,000	\$90,000
Estimate	\$7,223,000	\$150,000	\$86,000	\$50,000	\$141,000

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What does this bid tab tell us?

A/E: BNIM Architects

Bidder's Name	Base Bid	Alt. #1	Alt. #2	Alt. #3	Alt. #4	Alt. #5
Fru-Con	\$45,789,000	\$228,500	\$1,200,000	\$344,000	\$570,000	\$500,000
McCarthy/Sircal	\$46,350,000	\$259,000	\$549,000	\$363,000	\$489,000	\$543,000
M.A. Mortensen Co.	\$45,249,000	\$255,000	\$638,000	\$276,000	\$519,000	\$545,000
BSI Constructors, Inc.	\$46,579,000	\$460,000	\$800,000	\$380,000	\$572,000	\$627,000
Walton Construction Co	\$46,996,000	\$203,000	\$576,000	\$381,000	\$546,000	\$516,000
J.E. Dunn	\$46,925,000	\$275,000	\$393,000	\$305,000	\$531,000	\$529,000
Turner Construction	\$47,200,000	\$435,500	\$633,150	\$518,400	\$600,000	\$600,000
River City Construction	\$45,172,000	\$293,000	\$543,000	\$325,000	\$612,000	\$539,000
Estimate	\$46,400,000	\$249,225	\$504,219	\$530,343	\$486,447	\$799,391

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PROJECT/CONSTRUCTION SCHEDULE

- The schedule is the project team's tool for managing construction time
- Select an appropriate scheduling tool for the project

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COMMON SCHEDULING TOOLS

- Construction Gantt Chart
- Critical Path Method (CPM)
- Program Evaluation and Review Technique (PERT)
- Line of Balance (LOB)
- Resource Oriented Scheduling
- Q Scheduling
- Last Planner System (LPS)

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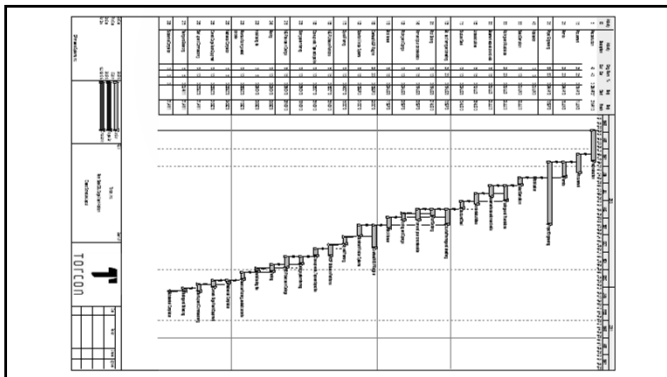
WHAT IS A GANTT CHART?



GANTT CHART

- Bar chart with several levels of detail
- Dependencies between tasks are considered as well as start and end dates
- Helps identify critical path and project duration
- Excellent visual tool and for creating project hierarchy

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CRITICAL PATH METHOD

- Probably most widely used during construction portion of project
- Considered legal standard when measuring project delays
- Graphical view of a project, dependencies between tasks, time and resources required for each activity
- Basically the longest sequence of tasks for the project

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CRITICAL PATH SCHEDULES - BASICS

- Early Start
 - Earliest time that a task can be started
- Late Start
 - Latest time in which a task can be started before it impacts project schedule

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CRITICAL PATH SCHEDULES - BASICS

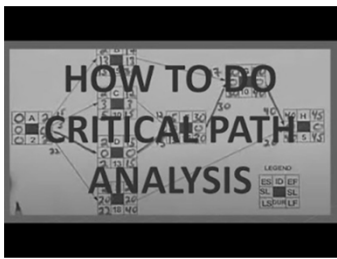
- Earliest Finish (EF)
 - Earliest a task can be completed based on its duration and early start time
- Latest Finish (LF)
 - Latest a task can be completed based on duration and its latest start time

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CRITICAL PATH SCHEDULES - BASICS

- Float is defined as
 - Time between the earliest possible completion of an activity and the latest required completion
- Most activities have float time
- Critical activities do not have float time

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CRITICAL PATH SCHEDULES

The delay of a critical activity will cause an equal delay in the project's completion

The sequence of critical activities from start to finish is the critical path

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LOOK-AHEAD SCHEDULES

RUSSELL CONSTRUCTION COMPANY
 Period: 1/20/23 To: 3/20/23
 Job Name: 10205 P/W: 2024-2025
 Job Number: 21-13-4002 Sup: Travis Best

Contractor	Activity	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mathis	Adjust water main into new #100 building								X	X																
	On-site testing on the existing street area prior to the #100 building								X	X																
Heedman	Stop out permit on existing job								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Start electrical work on the project								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Comstock	Form and pour foundation walls across the east side				X	X																				
Comstock	Backfill foundation walls across the east side				X	X																				
	Clear off the building pad				X	X																				
	Backfill foundation walls across the west side of the building				X	X																				
	Form and pour foundation walls across the north end of the building				X	X																				
	Backfill foundation walls on the north side				X	X																				
	Dig footing in the west area				X	X																				
	Backfill foundation walls in the west area				X	X																				
	Form and pour power transformer pad				X	X																				
	Form and pour power transformer pad				X	X																				

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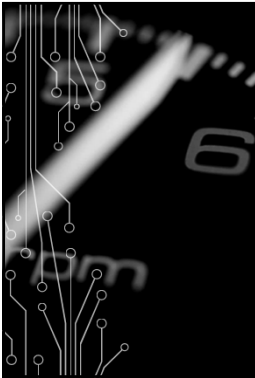
SCHEDULING CONSIDERATIONS

- Seasonal timing
- Manpower availability
- Long lead items

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<ul style="list-style-type: none">• Building in extra lead time allows time for...<ul style="list-style-type: none">• ...shop drawing approval• ...long delivery items• ...planning the execution of the work	<p>SCHEDULING STRATEGIES</p>
---	-------------------------------------

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	<p>TIME EXTENSIONS</p> <ul style="list-style-type: none">• A time extension is warranted only if an excusable or compensable delay impacts the critical path
---	---

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SCHEDULE DELAYS

- Non-excusable
- Excusable (Non-compensable)
- Compensable

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NON-EXCUSABLE DELAYS

Contractor's Fault

Poor planning, rework, insufficient manpower, poor management, late deliveries, etc.

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<p>Nobody's fault</p> <p>Weather delays, strikes, acts of God, etc.</p> <p>Non-compensable</p>	<p>EXCUSABLE DELAYS</p>
--	-------------------------

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COMPENSABLE DELAYS


Owner's (or A/E's) fault

Scope changes, design errors, etc.

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SCHEDULE MANAGEMENT

 Key to successful schedule management is

 early recognition and response to delays

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SCHEDULE MANAGEMENT

The key to successful schedule management is early recognition and response to delays.

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CONTRACTUAL STRATEGIES AND INCENTIVES

79

BIDDING STRATEGIES

- Phase the construction

- Direct purchase of long lead time items

- Bid an alternate schedule

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BID TABULATION

PROJECT NO. #970234
 LOCATION: Teaching Hospital
 DESCRIPTION: Endovascular Suite

Bidder's Name	Addendum	Bid Signed	Bid Bond	BSQ	Sub List	MBE/WBE	Base Bid #1	Base Bid #2
Sircal	Y	Y	Y	Y	Y	0%	\$420,000	no bid
Reinhardt	Y	Y	Y	Y	Y	1%	\$432,400	\$499,000
Pratt	Y	Y	Y	Y	Y	0%	\$451,900	no bid
McAfee	Y	Y	Y	Y	Y	0%	\$423,971	\$488,971
Crawford	Y	Y	Y	Y	Y	0%	\$409,200	\$489,200
Witch & Vaughn	Y	Y	Y	Y	Y	0%	\$438,800	\$483,800


Base Bid #1: Award Contract 1/7/98, Commence site work on 4/27/98, complete project on 6/26/98.
 Base Bid #2: Award Contract 1/7/98, Commence site work on 3/9/98, complete project on 4/13/98.

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CONTRACTUAL REQUIREMENTS

SPECIFY OWNER'S RIGHTS AND CONTRACTOR'S DUTIES RELATED TO SCHEDULE DELAYS

82



SCHEDULE INCENTIVE CLAUSES

- Three types:
 - Actual Damages
 - Liquidated Damages
 - Bonus/Penalty

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ACTUAL DAMAGES

Owner seeks reimbursement for damages actually incurred by the delay

Open-ended risk to contractor

Difficult to ascertain, burden of proof lies with the owner

84

LIQUIDATED DAMAGES

- Eliminates arguments over valuation
- Less risk for the contractor
- Must be a reasonable projection of damages

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LIQUIDATED DAMAGES

- Limits the amount owner may collect
- Need not be damaged to collect
- Contractor may build damages into the bid

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BONUS/PENALTY CLAUSE

- Penalty must be balanced by a bonus
- Provides contractor with a positive incentive

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SUMMARY



Prioritize the project goals of cost, quality, and time



Recognize the discrete phases of the design process and manage the decision-making process accordingly



Utilize contractual strategies as inducements and incentives for the contractor to meet the project schedule

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This concludes The American Institute of Architects
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