PROJECT TIME MANAGEMENT

INSTITUTE FOR FACILITIES MANAGEMENT

FACULTY: T. MARK MILLER, P.E, MEM, M.ASCE

AIA Continuing Education Provider

1

AIA CREDITS

Credit(s) earned on completion of this course will be reported to American Institute of Architects (AIA) Continuing Education Session (CES) for AIA members.

Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

AIA Continuing Education Provider

2

407 PROJECT TIME MANAGEMENT APPAU201909L

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.

AIA Continuing Education Provider

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

AIA Continuing Education Provider

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

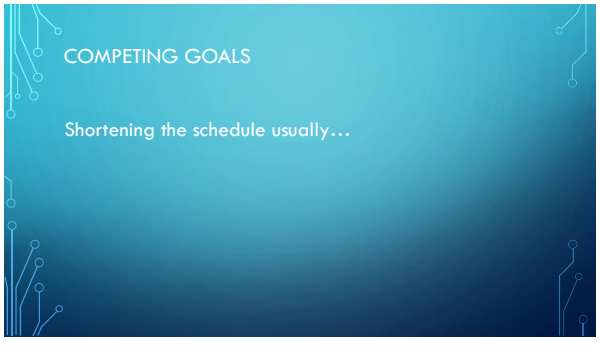
6


BASIC GOALS OF A PROJECT – AS SEEN BY CAMPUS CLIENT
LOWEST COST
QUALITY
SHORTEST TIME

7


BASIC GOALS OF A PROJECT – IN REALITY
LOWEST REASONABLE COST
HIGHEST QUALITY TO MATCH EXPECTED LIFE
ESTABLISHED TIME FRAME

8


COMPETING GOALS
Shortening the schedule usually…

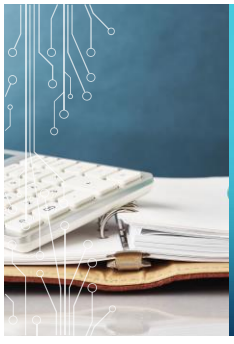
9

COMPETING GOALS

Shortening the schedule usually…

…drives up cost and/or lowers quality.

10



PRIORITIZING GOALS

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

11

PROJECT TIME MANAGEMENT

12

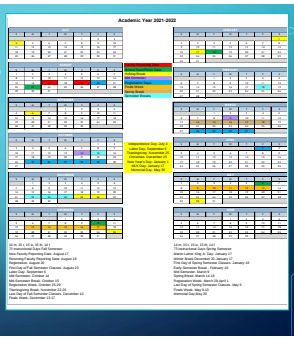
CAMPUS CHALLENGES

MANAGING PROJECT TIMELINES IN A CAMPUS ENVIRONMENT IS PARTICULARLY CHALLENGING

13

CAMPUS CHALLENGES

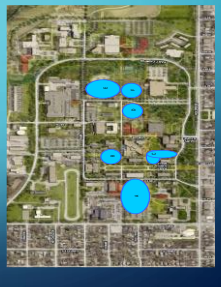
- Immovable completion dates
- Compressed and restrictive construction windows



14

CAMPUS CHALLENGES

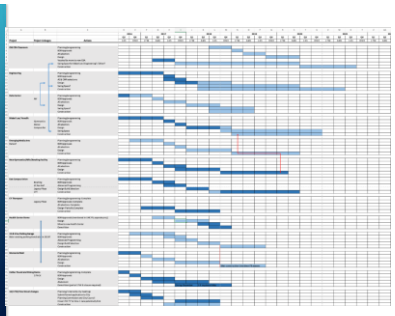
- Projects requested late
- Multiple projects conflicts



15

CAMPUS CHALLENGES

- Multiple projects conflicts



16

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

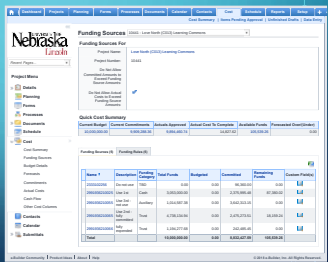
17

CAMPUS CHALLENGES

18

CAMPUS CHALLENGES

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



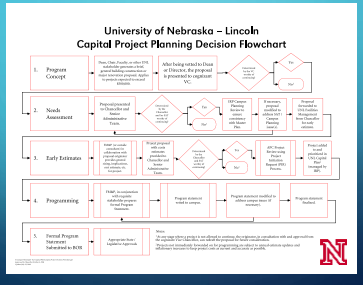
19

CAMPUS CHALLENGES

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

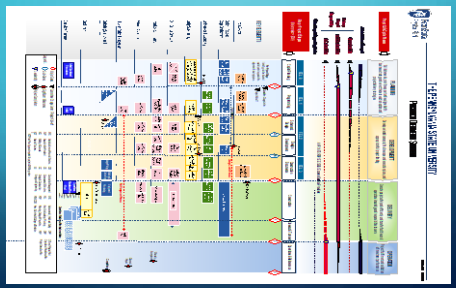
20

CAMPUS CHALLENGES



21

CAMPUS CHALLENGES



22

DESIGN TIME MANAGEMENT

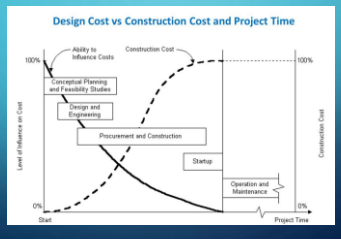
23

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

24

TIME IS A FINITE RESOURCE



25

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

26

UNIVERSITY OF NEBRASKA - LINCOLN
MABEL LEE HALL RENOVATION

Program Statement Report

27

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

28

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

29

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

30

PROJECT LOCATION

Mabel Lee Hall Renovation

31

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

32

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

33

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	2,000,000
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

34

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 $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

35

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

36

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

37

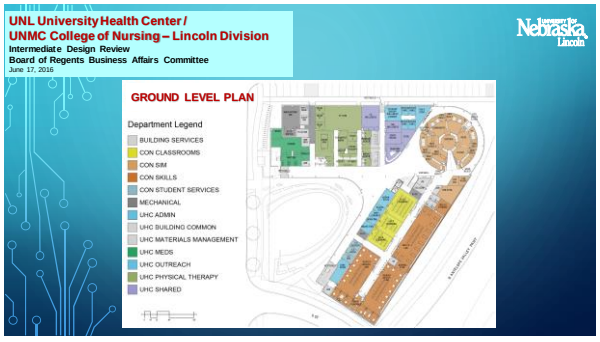
UNL University Health Center /
UNMC College of Nursing – Lincoln Division
Intermediate Design Review
Board of Regents Business Affairs Committee
June 17, 2016

38

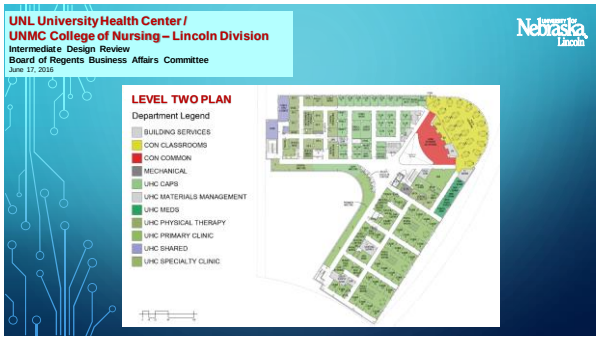
UNL University Health Center /
UNMC College of Nursing – Lincoln Division
Intermediate Design Review
Board of Regents Business Affairs Committee
June 17, 2016

SITE PLAN

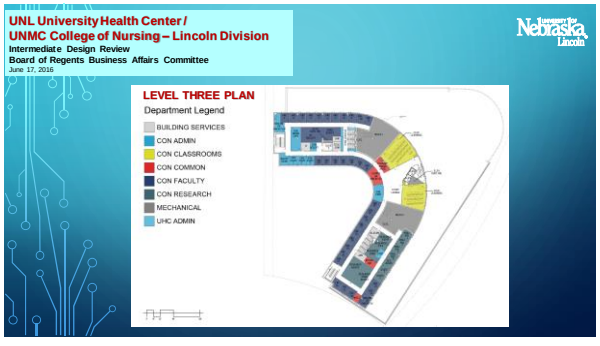
39


UNL University Health Center /
UNMC College of Nursing – Lincoln Division
Intermediate Design Review
Board of Regents Business Affairs Committee
June 17, 2016
GROUND LEVEL PLAN
Department Legend
BUILDING SERVICES
CON CLASSROOMS
CON SIM
CON SKILLS
CON STUDENT SERVICES
MECHANICAL
UHC ADMIN
UHC BUILDING COMMON
UHC MATERIALS MANAGEMENT
UHC MEDS
UHC OUTREACH
UHC PHYSICAL THERAPY
UHC SHARED

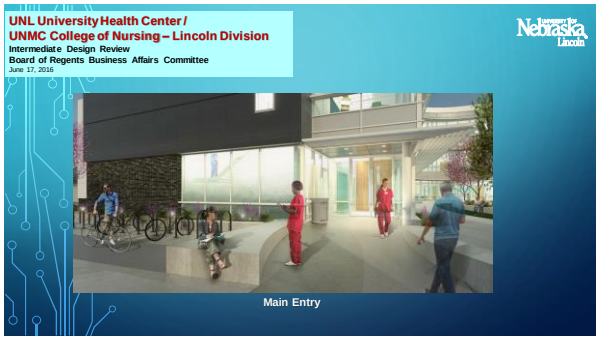
40


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

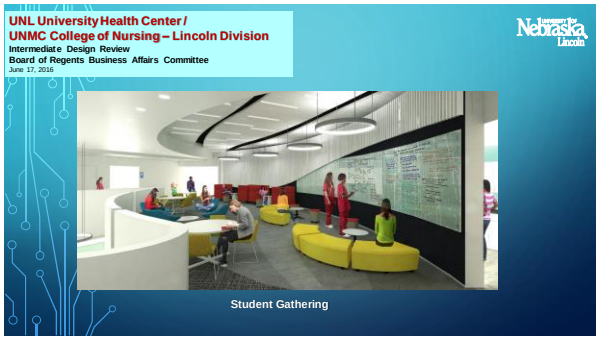
41


UNL University Health Center /
UNMC College of Nursing – Lincoln Division
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

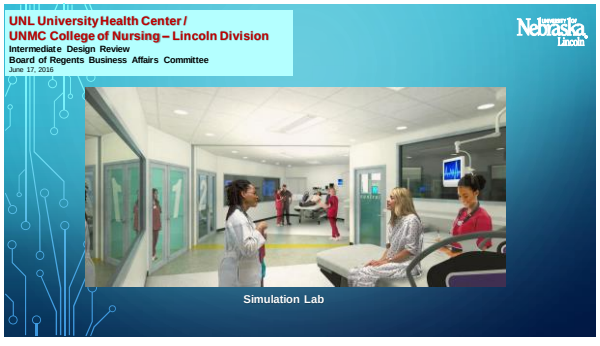
42


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

43


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

44


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

45

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

SPACE PROGRAM SUMMARY

Description		BOR Program	Design Development	
Use Code	Space	NSF	NSF	Delta to BOR program
	College of Nursing			
100	Classroom Facilities	12,648	12,041	(598)
200	Lab Facilities	5,880	7,313	1,433
300	Office Facilities	7,182	8,606	1,424
400	Study Facilities	100	50	(50)
600	General Use Facilities	2,264	2,503	239
700	Restrooms	800	570	(230)
WW	Circulation Area	150	204	54
XX	Building Service Area	130	972	842
	Total NSF	29,134	32,258	3,123
	Efficiency	64%	66.3%	
	Gross Area	45,520	52,803	
	University Health Clinic			
100	Building Common Spaces	2,384	1,992	(540)
200	Classroom Facilities	1,100	1,100	60
300	Office Facilities	9,950	10,227	277
400	Study Facilities	75	75	0
600	General Use Facilities	504	441	(59)
800	Health Clinic Facilities	18,524	19,263	343
	Total NSF	32,585	33,065	81
	Program Efficiency	60%	61.3%	
	Gross Square Foot	54,970	53,907	
	Combined Programs			
	Total Building NSF	61,121	65,308	
	Total Building Efficiency	61.8%	61.9%	
	Total Building GSF	100,504	107,016	6,518

46

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

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**

47

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

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	3,713,660
College of Nursing	674,660		
University Health Center	2,166,000		
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**

48

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

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 17th, 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

49

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

REQUEST APPROVAL OF THE INTERMEDIATE DESIGN

PERSPECTIVE VIEW FROM ANTELOPE VALLEY PARKWAY

50

DESIGN PHASES

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

51

DESIGN PHASES

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

52

DESIGN PHASES

Bidding

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

53

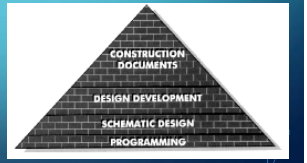
BUILDING THE PYRAMID

Designing is a process of building upon decisions...

like blocks in a pyramid

Decisions (the building blocks) must

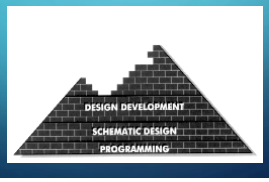
be timely or the building process halts



54

DESIGN SCHEDULES CRASH...

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



55

PROJECT TEAM ORIENTATION

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

56

CONSTRUCTION TIME MANAGEMENT

57

INSUFFICIENT CONSTRUCTION TIME

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

58

PROJECT/CONSTRUCTION SCHEDULE

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

59

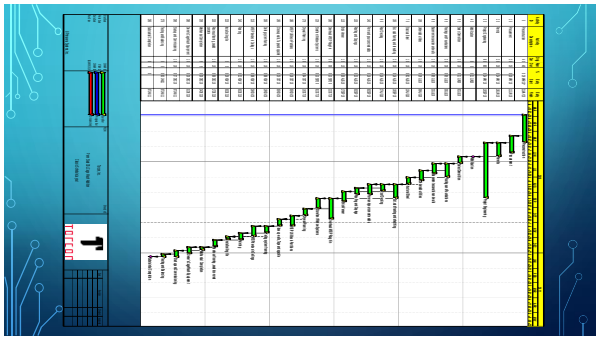
COMMON SCHEDULING TOOLS

- 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)

60


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

61



62


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

63

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

64

CRITICAL PATH SCHEDULES - BASICS

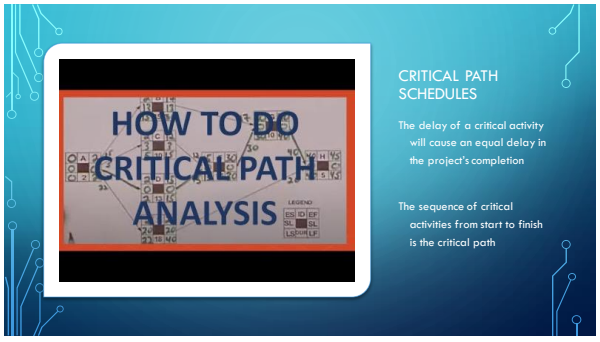
- Earliest Finish (EF)
  - Earliest a task can be completed based on its duration and early start time
- Latest Finish (LF)
  - Latest a task can be completed based on duration and its latest start time

65

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

66



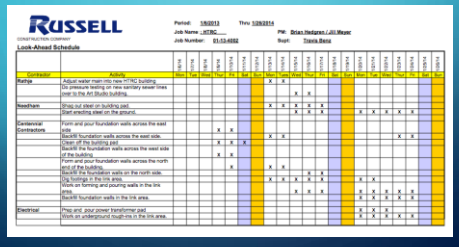
CRITICAL PATH SCHEDULES

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

67

LOOK-AHEAD SCHEDULES


RUSSELL
CONSTRUCTION COMPANY

Period: 1/6/2013 Thru 1/26/2014
Job Name : HTRC
Job Number: 01-13-4002
PM: Brian Hedgren / Jill Meyer
Supt: Travis Benz

Look-Ahead Schedule

Contractor	Activity	1/6/14 Mon	1/7/14 Tue	1/8/14 Wed	1/9/14 Thu	1/10/14 Fri	1/11/14 Sat	1/12/14 Sun	1/13/14 Mon	1/14/14 Tue	1/15/14 Wed	1/16/14 Thur	1/17/14 Fri	1/18/14 Sat	1/19/14 Sun	1/20/14 Mon	1/21/14 Tue	1/22/14 Wed	1/23/14 Thur	1/24/14 Fri	1/25/14 Sat	1/26/14 Sun
Rurtra	Adjust water main into new HTRC building								X	X												
	Do pressure testing on new sanitary sewer lines over to the Art Studio building										X	X										
Needham	Shag out steel on building pad								X	X	X	X	X			X	X	X	X	X		
	Start erecting steel on the ground										X	X	X									
Centennial Contractors	Form and pour foundation walls across the east side				X	X																
	Backfill foundation walls across the east side.								X	X									X	X		
	Clean off the building pad				X	X	X															
	Backfill the 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	X												
	Backfill the foundation walls on the north side.												X	X								
	Dig footings in the link area.								X	X	X	X	X			X	X					
	Work on forming and pouring walls in the link area.										X	X	X			X	X	X	X	X		
	Backfill foundation walls in the link area.															X	X	X	X	X		
Electrical	Prep and pour power transformer pad															X	X	X				
	Work on underground roughins in the link area.															X	X	X	X	X		

68

SCHEDULING CONSIDERATIONS

- Seasonal timing
- Manpower availability
- Long lead items

69

- Building in extra lead time allows time for...
  - ...shop drawing approval
  - ...long delivery items
  - ...planning the execution of the work

SCHEDULING STRATEGIES

70

TIME EXTENSIONS

- A time extension is warranted only if an excusable or compensable delay impacts the critical path

71

SCHEDULE DELAYS

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

72

NON-EXCUSABLE DELAYS

Contractor's Fault

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

73

EXCUSABLE DELAYS

Nobody's fault

Weather delays, strikes, acts of God, etc.

Non-compensable

74

COMPENSABLE DELAYS

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

Scope changes, design errors, etc.

75


SCHEDULE MANAGEMENT
Key to successful schedule management is
early recognition and response to delays

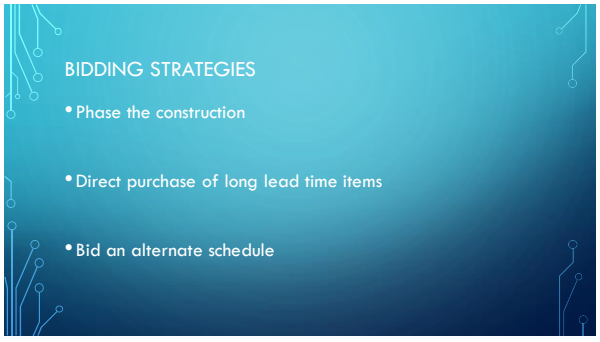
76


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

77


CONTRACTUAL STRATEGIES AND INCENTIVES

78


BIDDING STRATEGIES
• Phase the construction
• Direct purchase of long lead time items
• Bid an alternate schedule

79


This concludes The American Institute of Architects
Continuing Education Systems Course
AIA
Continuing
Education
Provider

80