

Project Time Management

Institute for Facilities Management



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407 Project Time Management APPAU201909L

Course Objectives

- ✓ 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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Learning Objectives

1. Learn why higher education building and renovations require so much time.
2. Learn fundamentals of time management
3. Review various strategies to manage time more effectively.
4. Discuss schedule incentives clauses in contracts.

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What area of Facilities Management do you represent?

- A. Administration
- B. Operations & Maintenance
- C. Utilities
- D. Design & Construction

Project Time Management

Campus Challenges

Managing project timelines in a campus environment is particularly challenging



Campus Challenges

Immovable completion dates
Compressed and restrictive construction windows
Projects requested late



Campus Challenges

Project complexity
Funding process
Permitting process



"The key to time management is strict and disciplined adherence to a rigid schedule, while remaining flexible enough to let anything happen at any time."

Campus Challenges

Board/administrative/regulatory approvals
Decision-making process
Number of people involved



Basic Goals of a Project

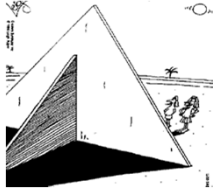
Lowest Cost
Highest Quality
Shortest Time



Competing Goals

Competing Goals

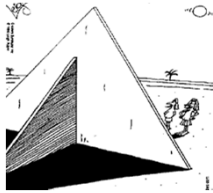
Shortening the schedule usually...



"Excellent! Pharaoh will be quite pleased. You have finished construction on time and within budget."

Competing Goals

Shortening the schedule usually drives up cost and/or lowers quality



"Excellent! Pharaoh will be quite pleased. You have finished construction on time and within budget."

Insufficient Design Time

Reduces the opportunity for optimizing value and lowering project expenses



Is the following statement True or False?
Unclear drawings and/or specifications lead to lower project costs for the Owner.

- A. True
- B. False

Insufficient Design Time

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

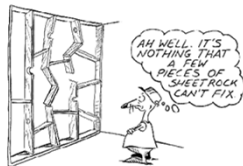


Insufficient Construction Time

Drives up bids in covering acceleration costs and higher risks

Limits the amount of time available for quality workmanship

Reduces competition



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

BID TABULATION

Life Sciences Building
MU Project No. 980083

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	\$258,000	\$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

BID TABULATION

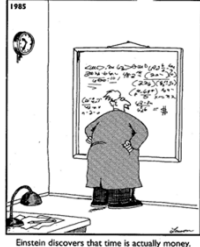
Memorial Stadium

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
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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

Prioritizing Goals

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



The much needed roof replacement will eliminate complaints and avoid further damage to the building interior.

- A. Quality, Cost, Timing
- B. Quality, Timing, Cost
- C. Cost, Timing, Quality
- D. Cost, Quality, Timing
- E. Timing, Cost, Quality

The new Alumni center, named after it's donor, will provide an inviting venue to host other potential donors.

- A. Quality, Cost, Timing
- B. Quality, Timing, Cost
- C. Cost, Timing, Quality
- D. Cost, Quality, Timing
- E. Timing, Cost, Quality

The stadium luxury boxes will enhance the revenue streams of the Athletics Department and fund much needed improvements in other sports.

- A. Quality, Cost, Timing
- B. Quality, Timing, Cost
- C. Cost, Timing, Quality
- D. Cost, Quality, Timing
- E. Timing, Cost, Quality

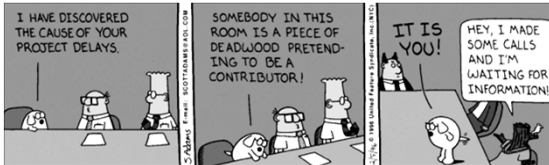
The dean's funding commitment underestimated the needs of a highly recruited faculty member for the scope of their laboratory research renovation.

- A. Quality, Cost, Timing
- B. Quality, Timing, Cost
- C. Cost, Timing, Quality
- D. Cost, Quality, Timing
- E. Timing, Cost, Quality

Design Time Management

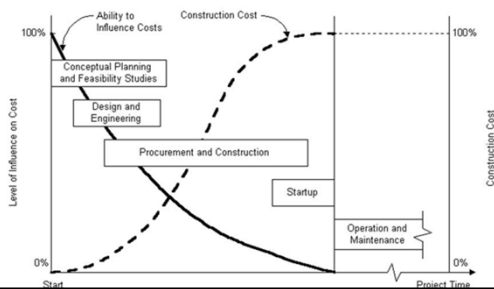
Time is a Finite Resource

The time allotted for construction is inversely proportional to the time taken for design



Time is a Finite Resource

Design Cost vs Construction Cost and Project Time



Design Phases

Programming

Determines and describes the facility needs



Program and Planning Issues The primary objective of the Basketball Arena is to provide the University with a state-of-the-art facility with significant spectator amenities. The University wants to create a facility that will be the model for new collegiate sports arenas. The arena will be an integral part of the Sports Park concept.

The key components of the arena are:

- 16,800 seating capacity for basketball
- 34 Private Suites
- Men's and Women's Basketball Offices and Practice Court Facility
- Athletic Department Offices

Building Program by Components	Area	
	Seating Bowl and Suites	113,739 S.F.
	Box Office	1,720 S.F.
	Building Operations	35,375 S.F.
	Food Service Facilities	16,122 S.F.
	Merchandise Facilities	2,816 S.F.
	Athletic Department Offices	9,150 S.F.
	Media	4,770 S.F.
	Spectator Facilities	100,305 S.F.
	Team Facilities	19,809 S.F.
	Total	303,806 S.F.
	Total Unassignable	45,860 S.F.
	Total Gross	349,666 S.F.

PROGRAM SUMMARY
The space program indicates the new construction will incorporate the following:

Housing Facility

Type of Space	Net Assignable Square Feet
Residential Living Spaces	110,357
Community and Common Spaces	20,785
Support Spaces	5,408
Living/Learning Spaces	2,730
Total Net Assignable Square Feet	139,260


Dining Facility

Type of Space	Net Assignable Square Feet
Kitchen	5,015
Servery	5,959
Dining	7,128
Offices	5,459
Total Net Assignable Square Feet	23,561

Design Phases

Programming
Determines and describes the facility needs

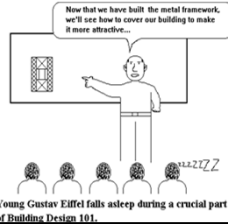
Schematic Design
Determines the scale and relationship of the project components



Design Phases

Design Development

Fixes and describes the size and character of the entire project and building systems



Design Phases

Design Development

Fixes and describes the size and character of the entire project and building systems

Construction Documents

Details the project for bidding and constructing purposes



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



Design Schedules Crash...

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



Project Team Orientation

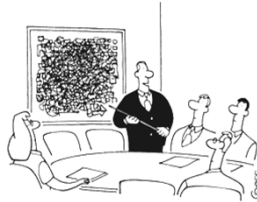
Clients and decision-makers need to understand and work with the discreet phases of design



Construction Time Management

Construction Schedule

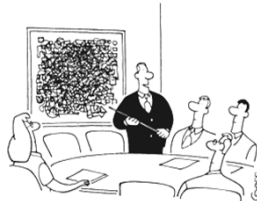
The schedule is the project team's tool for managing construction time



"And that's our plan. Any questions?"

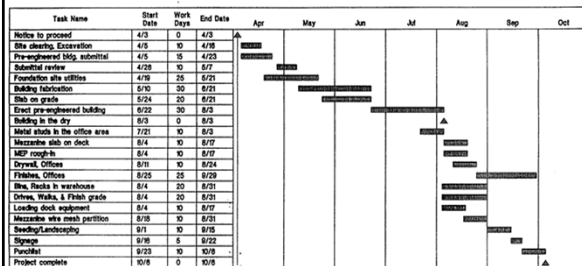
Construction Schedule

Select an appropriate scheduling tool for the project

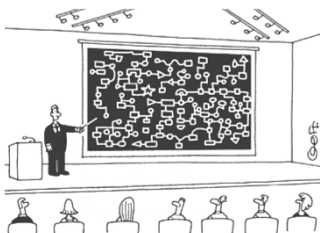


"And that's our plan. Any questions?"

Campus Maintenance Warehouse
Figure 62-8



Critical Path Schedules



"This is our plan for the next 1,000 years."

Critical Path Schedules

Early Start & Early Finish



"We were way ahead of schedule, so we revised the schedule. Now we're way behind schedule because we lost too much time revising the schedule. What we need is a schedule to help us revise our schedules on schedule."

Critical Path Schedules

Early Start & Early Finish

Late Start & Late Finish



"We were way ahead of schedule, so we revised the schedule. Now we're way behind schedule because we lost too much time revising the schedule. What we need is a schedule to help us revise our schedules on schedule."

Critical Path Schedules

Early Start & Early Finish

Late Start &
Late Finish

Float



"We were way ahead of schedule, so we revised the schedule. Now we're way behind schedule because we lost too much time revising the schedule. What we need is a schedule to help us revise our schedules on schedule."

Critical Path Schedules

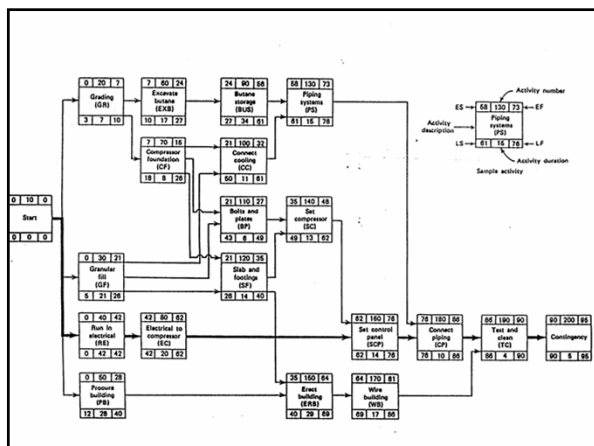
Float is defined as the time between the earliest possible completion of an activity and the latest required completion

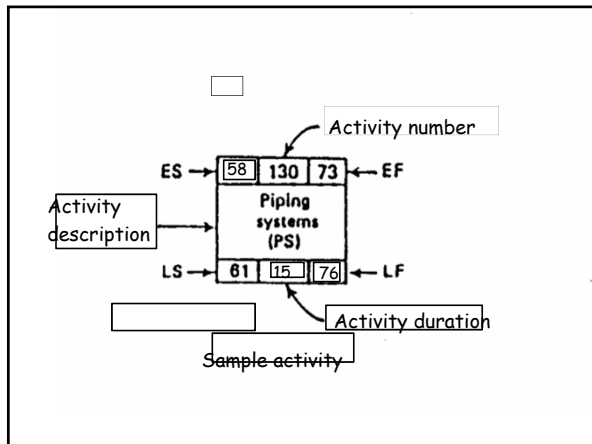
Most activities have float time

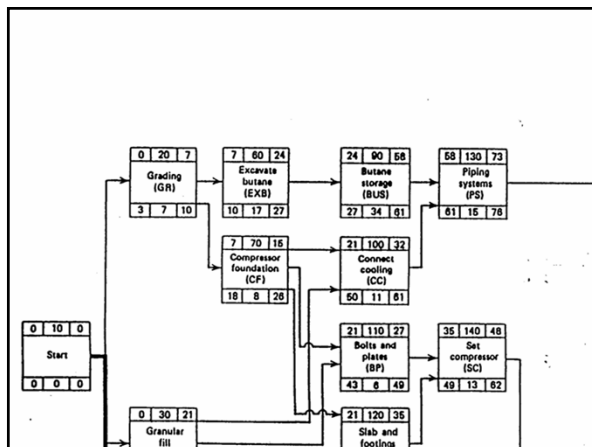
Critical activities do not have float time

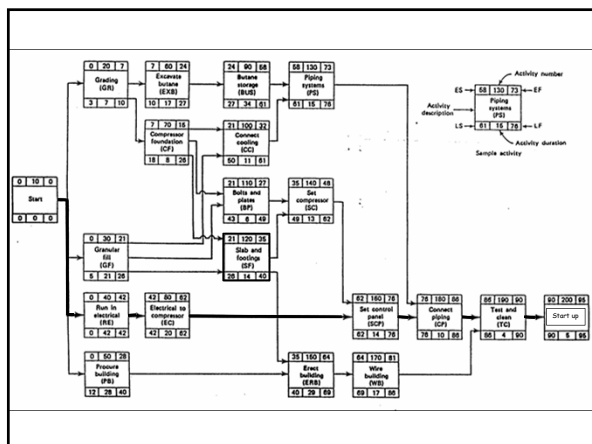


"And this activity had so much float that it floated out of the schedule!"





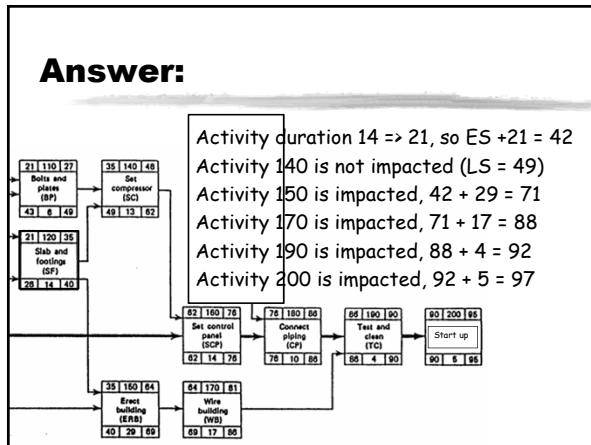


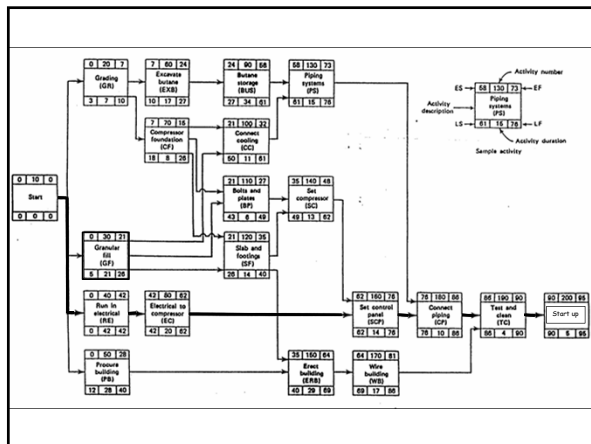


Assuming all other activities keep to their original durations, when will start up be completed if activity 120 takes 21 days instead of 14?

- A. Day 92
- B. Day 95
- C. Day 97
- D. Day 101

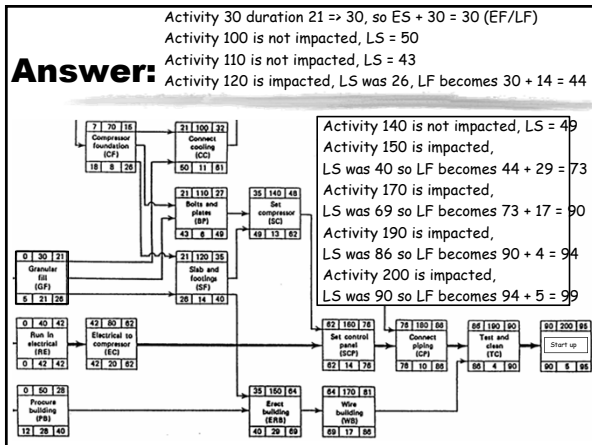
Answer:

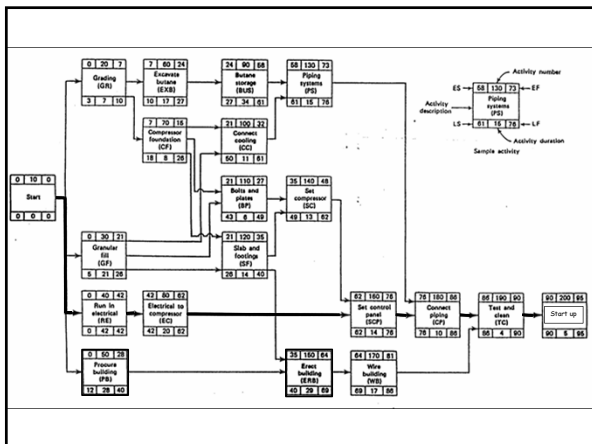




Assuming all other activities keep to their original durations, what activities are on the critical path after activity 30 takes 30 days to finish instead of 21?

- A. 120, 140 & 160
- B. 80, 160 & 180
- C. 150, 170 & 190
- D. 100, 130 & 180

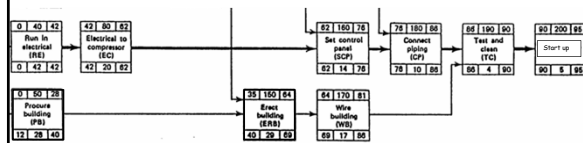




If Activity 50 (Procure building) is completed on Day 33 and Activity 150 is completed on Day 70, when will start up be completed?

- A. Day 95
- B. Day 96
- C. Day 101
- D. Day 106

Answer:



If Activity 50 is completed on day 33 => no resulting delay impact since LF = 40
 If Activity 150 is completed on day 70 =>
 Activity 150 is impacted, LF was 69, the activity is delayed by 1 day, LF becomes 70
 Activity 170 is impacted, LS was 69 so LF becomes 70 + 17 = 87
 Activity 190 is impacted, LS was 86 so LF becomes 87 + 4 = 91
 Activity 200 is impacted, LS was 90 so LF becomes 91 + 5 = 96

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



"Our project failed. However, we did sell our planning chart to an art collector for \$2 million, thereby exceeding our projected goals by 500%."

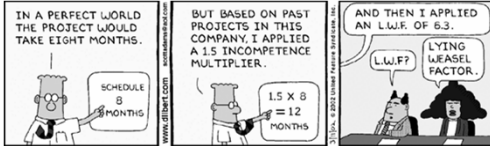
Scheduling Strategies

Building in extra lead time allows time for...

...shop drawing approval

...long delivery items

...planning the execution of the work



Owner response to Contractor asking if the Owner built float into the project schedule.



Time Extensions

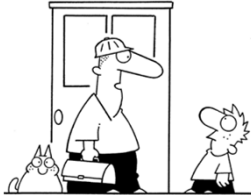
A time extension is warranted only if an excusable or compensable delay impacts the critical path



"It took us five days to figure out how to finish our project two days early. That's why we're three days late."

Schedule Delays

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



"What do we make where I work?
Mostly we make excuses."

Non-Excusable Delays

Contractor's Fault

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



"That's fine," I said. "Good nose," I said. But no, you had to go and hit the chisel one more time!

Excusable Delays

Nobody's Fault

- Weather delays, strikes,
- acts of God, etc.

Non-compensable



Acts of God

Compensable Delays

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

Scope changes, design errors, etc.



The Contractor will finish late because of the delayed shipment of the Owner specified Chinese granite floor tiles.

- A. Non-Excusable
- B. Excusable
- C. Compensable

The Contractor will be delayed because the carpenter's union contract expired and there were no carpenters working for a period of three weeks.

- A. Non-Excusable
- B. Excusable
- C. Compensable

The Contractor will be delayed in completing the project because the Architect took an extended amount of time to clarify something in the drawings.

- A. Non-excusable
- B. Excusable
- C. Compensable

The Contractor will be delayed because of the hurricane in North Carolina?

- A. Non-excusable
- B. Excusable
- C. Compensable

Schedule Management

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



"I'm pleased to report that our project is ahead of schedule and under budget... not bad for the first hour!"

Contractual Strategies & Incentives

Bidding Strategies

Phase the construction



Thanks guys! But can you shorten the schedule for the next one to 20 years?

Bidding Strategies

Direct purchase long lead items



Evaluation Reminder



"Go tell the workers that I'm serious about this quality crap."

Contractual Requirements

Specify owner's rights and contractor's duties related to schedule delays



"The paper and ink content is within acceptable norms, but the contract itself appears to have too many clauses."

Schedule Incentive Clauses

Three types:

- Actual Damages
- Liquidated Damages
- Bonus/Penalty



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



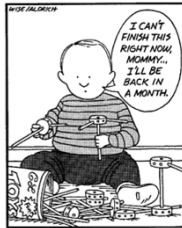
The builder missed so many deadlines, the Pharaoh had to use it as a tomb!

Liquidated Damages

Eliminates arguments over valuation

Less risk for the contractor

Must be a reasonable projection of damages



Your contractor as a child.

Liquidated Damages

Limits the amount owner may collect

Need not be damaged to collect

Contractor may build damages into the bid



Liquidated Damages

KU to pay more to speed up work

Contractor falls behind schedule

By JOHN L. PETERSON
The Kansas City Star

TOPICS — A Kansas City contractor fell so far behind on completing improvements to the University of Kansas' football stadium that the school has agreed to give him a bonus of \$300,000 to speed up the work.

University officials were worried that the new press box and 36 luxury suites wouldn't be finished in time for the opening game against Cal State-Norridge on Sept. 14. In fact, there was concern

was Aug. 13.

The original contract called for penalties if the work was completed late. However, the company estimated that the overtime needed to meet the deadline would cost more than the paying the penalties.

Pat Warren, an assistant KU ath-

Because KU set the liquidated damages too low they had no contractual standing to force Walton to complete on time when Walton decided to accept damages instead.

- A. True
- B. False

Bonus/Penalty Clause

Penalty must be balanced by a bonus

Provides contractor with a positive incentive



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

This concludes The American
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