Project Time Management

Institute for Facilities Management

Course Objectives

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

Outline

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

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

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

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

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

Insufficient Construction Time

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

Prioritizing Goals

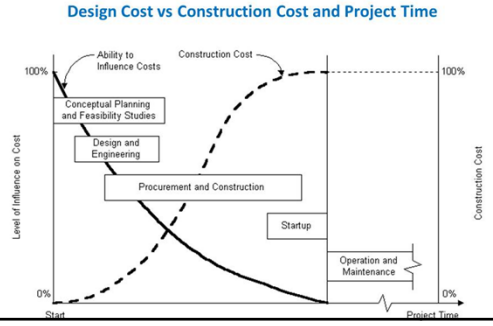
A project without sufficient time has lessened the importance of the cost and quality goals to time

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 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

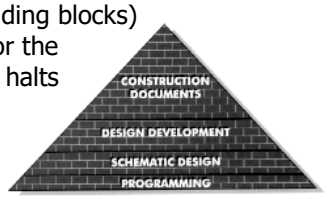
Construction Documents

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

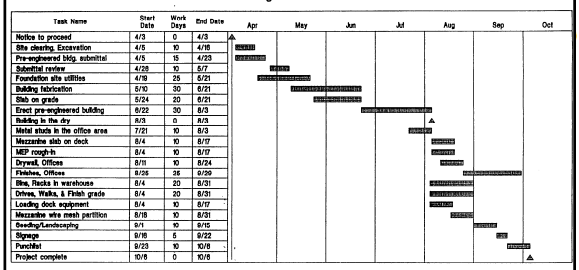
The schedule is the project team's tool for managing construction time

Construction Schedule

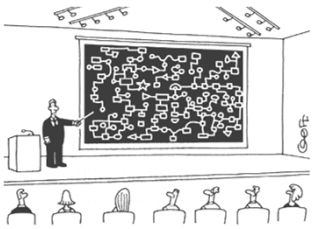
Select an appropriate scheduling tool for the project

Campus Maintenance Warehouse
Figure 62-8

Task Name	Start Date	Work Days	End Date
Notice to proceed	4/3	0	4/3
Site clearing, Excavation	4/5	10	4/16
Pre-engineered bldg. submittal	4/5	15	4/23
Submittal review	4/26	10	5/7
Foundation site utilities	4/19	25	5/21
Building fabrication	5/10	30	6/21
Slab on grade	5/24	20	6/21
Erect pre-engineered building	6/22	30	8/3
Building in the dry	8/3	0	8/3
Metal studs in the office area	7/21	10	8/3
Mezzanine slab on deck	8/4	10	8/17
MEP rough-in	8/4	10	8/17
Drywall, Offices	8/11	10	8/24
Finishes, Offices	8/26	35	9/30
Bins, Racks in warehouse	8/4	20	8/31
Drives, Walks, & Finish grade	8/4	20	8/31
Loading dock equipment	8/4	10	8/17
Mezzanine wire mesh partition	8/18	10	8/31
Seeding/Landscaping	9/1	10	9/15
Signage	9/18	5	9/22
Punchlist	9/23	10	10/6
Project complete	10/6	0	10/6



Critical Path Schedules



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

Critical Path Schedules

Early Start & Early Finish

Late Start &
Late Finish

Float

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

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

Look-Ahead Schedules

Scheduling Considerations

Seasonal timing
Manpower availability
Long lead items

Scheduling Strategies

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

Time Extensions

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

Schedule Delays

Non-excusable
Excusable (Non-compensable)
Compensable

Non-Excusable Delays

Contractor's Fault

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

Excusable Delays

Nobody's Fault

Weather delays, strikes,
acts of God, etc.

Non-compensable

Compensable Delays

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

Scope changes, design errors, etc.

Schedule Management

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

Contractual Strategies & Incentives

Bidding Strategies

Phase the construction

Direct purchase long lead items

Bid an alternative schedule

Contractual Requirements

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

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

Liquidated Damages

Eliminates arguments over valuation

Less risk for the contractor

Must be a reasonable projection of damages

Liquidated Damages

Limits the amount owner may collect

Need not be damaged to collect

Contractor may build damages into the bid

Bonus/Penalty Clause

Penalty must be balanced by a bonus

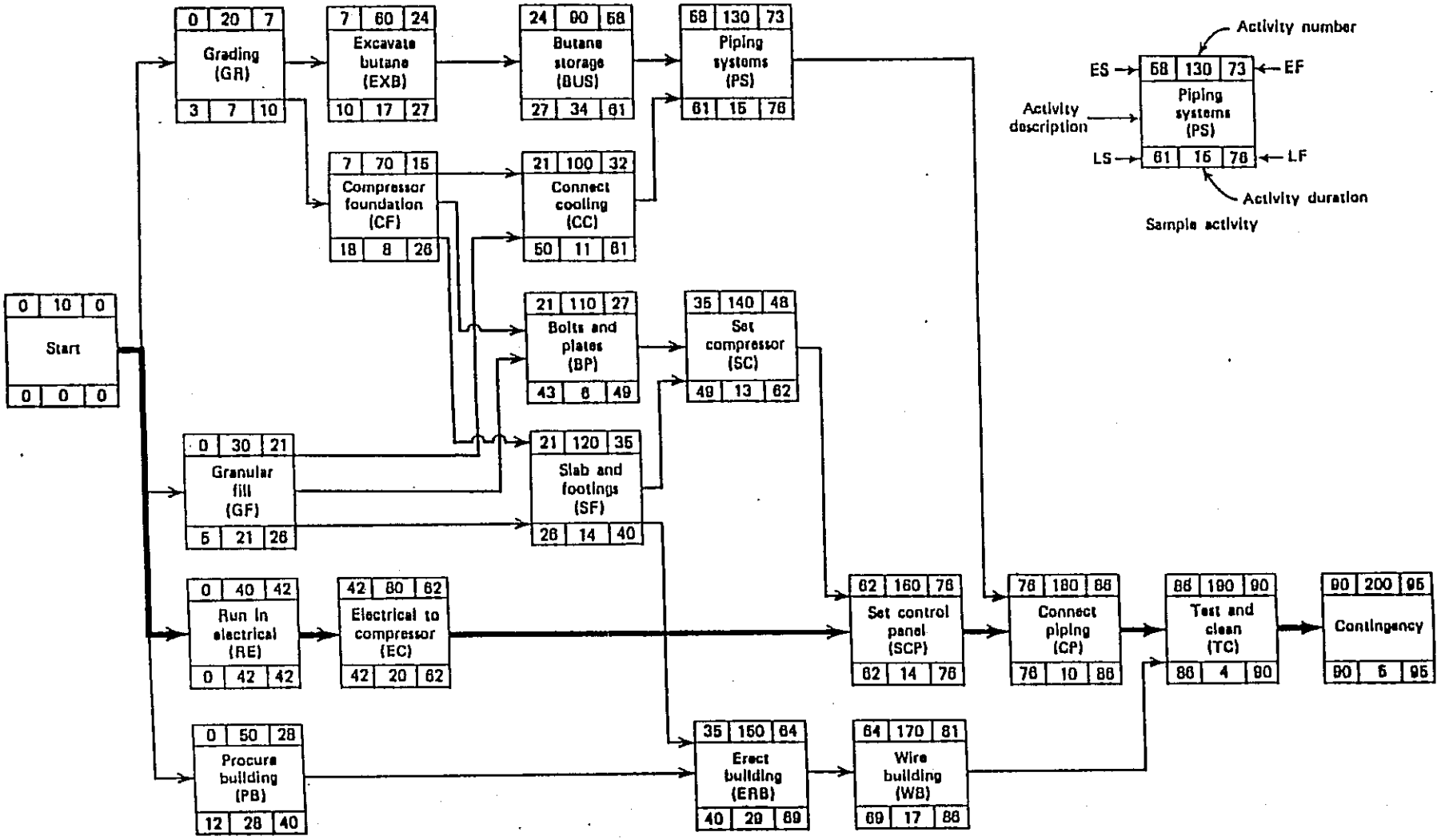
Provides contractor with a positive incentive

Summary

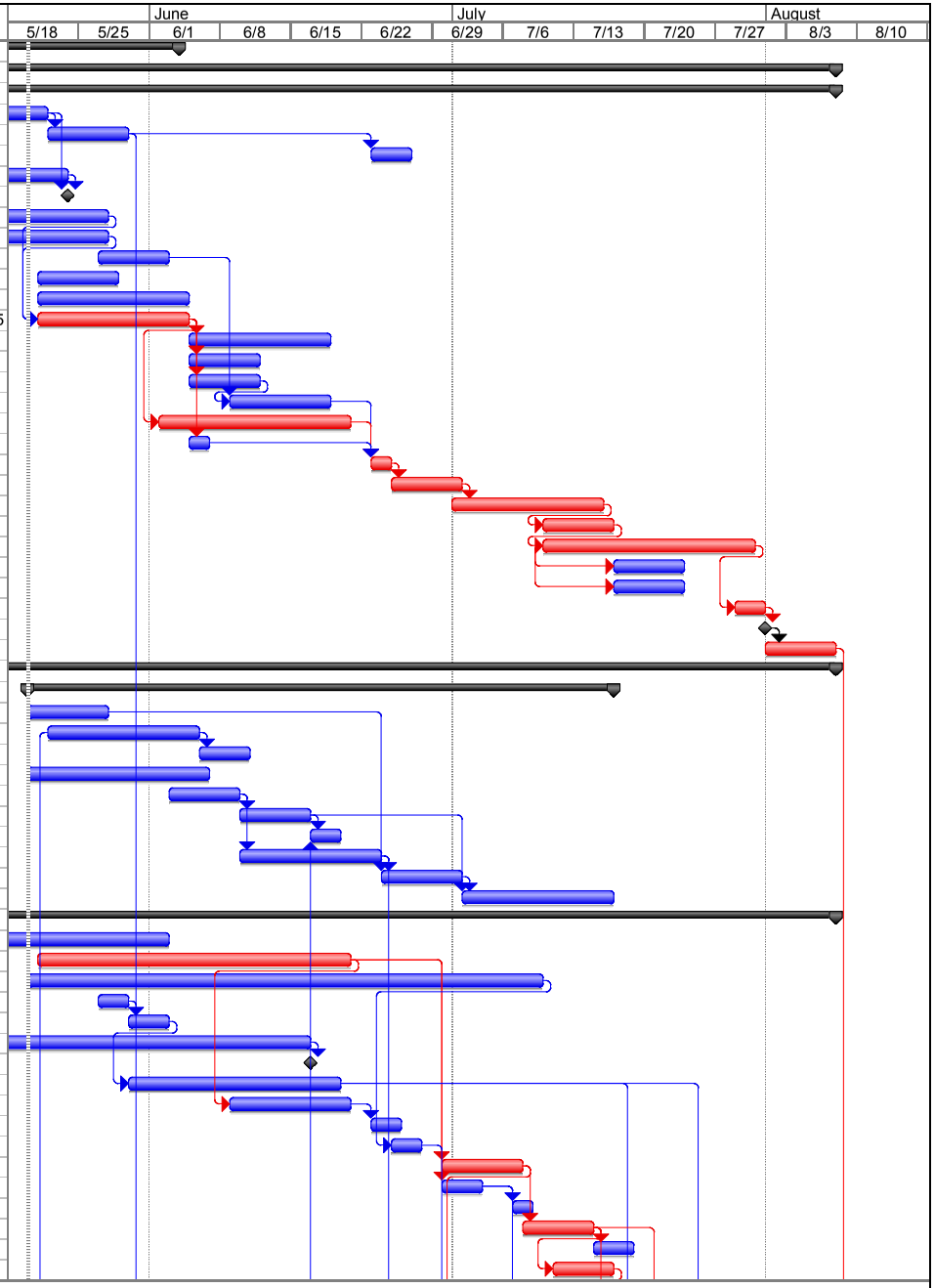
Prioritize the project goals of cost, quality, and time

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


0 20 7
Grading (GR)
3 7 10
7 60 24
Excavate butane (EXB)
10 17 27
24 90 68
Butane storage (BUS)
27 34 61
68 130 73
Piping systems (PS)
61 15 76
7 70 15
Compressor foundation (CF)
18 8 26
21 100 32
Connect cooling (CC)
50 11 61
0 10 0
Start
0 0 0
21 110 27
Bolts and plates (BP)
43 6 49
35 140 48
Set compressor (SC)
49 13 62
0 30 21
Granular fill (GF)
5 21 26
21 120 35
Slab and footings (SF)
26 14 40
0 40 42
Run in electrical (RE)
0 42 42
42 80 62
Electrical to compressor (EC)
42 20 62
62 160 78
Set control panel (SCP)
62 14 76
78 180 88
Connect piping (CP)
78 10 88
88 190 90
Test and clean (TC)
88 4 90
90 200 95
Contingency
90 5 95
0 50 28
Procure building (PB)
12 28 40
35 150 64
Erect building (ERB)
40 29 69
64 170 81
Wire building (WB)
69 17 86
Activity number
ES
68 130 73
EF
Activity description
Piping systems (PS)
LS
61 15 76
LF
Activity duration
Sample activity

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Material Procurement**	**100 days**	**Tue 1/14/14**	**Tue 6/3/14**	
9	**Construction**	**110 days**	**Wed 3/5/14**	**Thu 8/7/14**	
10	**Indoor Turf Building**	**110 days**	**Wed 3/5/14**	**Thu 8/7/14**	
11	PEMB - Roofing and wall panels	56 days	Wed 3/5/14	Wed 5/21/14	
12	PEMB - wall insulation	5 days	Thu 5/22/14	Thu 5/29/14	11
13	OH Door Installation	4 days	Mon 6/23/14	Thu 6/26/14	12
14	Kalwall Installation	9 days	Tue 5/13/14	Fri 5/23/14	
15	*Permanent building dry-in	0 days	Fri 5/23/14	Fri 5/23/14	14,11
16	Fire Protection Rough-in	20 days	Tue 4/29/14	Tue 5/27/14	
17	Electrical Overhead Rough-in	19 days	Wed 4/30/14	Tue 5/27/14	
18	Duct Sock Hangers	5 days	Tue 5/27/14	Mon 6/2/14	
19	Masonry Walls for Stair	5 days	Wed 5/21/14	Wed 5/28/14	
20	Metal Stud Walls	10 days	Wed 5/21/14	Wed 6/4/14	
21	Paint High Roof Structure	10 days	Wed 5/21/14	Wed 6/4/14	16FS-5 days,17FS-5
22	Install Sprinkler Cages	10 days	Thu 6/5/14	Wed 6/18/14	21
23	Paint Lower Structural Steel	5 days	Thu 6/5/14	Wed 6/11/14	21
24	Install Fabric Panels at the ceiling	5 days	Thu 6/5/14	Wed 6/11/14	21
25	Hang Light Fixtures	8 days	Mon 6/9/14	Wed 6/18/14	4,18,24FS-3 days
26	Sports Equipment Installation	15 days	Mon 6/2/14	Fri 6/20/14	21FS-3 days
27	Install Scoreboard	2 days	Thu 6/5/14	Fri 6/6/14	21
28	Above 15' Punch List	2 days	Mon 6/23/14	Tue 6/24/14	25,27,26
29	Turf Leveliing course and insulation	5 days	Wed 6/25/14	Tue 7/1/14	28
30	Installation of in floor heating piping	10 days	Tue 7/1/14	Tue 7/15/14	29FS-1 day
31	Installation and fine grading of the final base m	5 days	Thu 7/10/14	Wed 7/16/14	30FS-4 days
32	Sports Turf Installation	15 days	Thu 7/10/14	Wed 7/30/14	31FS-5 days
33	Install Wall Pads	5 days	Thu 7/17/14	Wed 7/23/14	32SS+5 days
34	Misc. Hardware and Finishes	5 days	Thu 7/17/14	Wed 7/23/14	32SS+5 days
35	Final Cleaning	3 days	Tue 7/29/14	Thu 7/31/14	32FS-2 days
36	*Building Clean	0 days	Thu 7/31/14	Thu 7/31/14	35
37	Contractor Punch List	5 days	Fri 8/1/14	Thu 8/7/14	36
38	**Link Building**	**61 days**	**Tue 5/13/14**	**Thu 8/7/14**	
39	**Exterior Construction**	**40 days**	**Tue 5/20/14**	**Wed 7/16/14**	
40	Exterior East Wall Framing	5 days	Tue 5/20/14	Tue 5/27/14	
41	Installation of Duct Work on the Roof	10 days	Thu 5/22/14	Thu 6/5/14	
42	Roof top Gas piping connections to the RT	3 days	Fri 6/6/14	Tue 6/10/14	41
43	Z-Furring and Rigid Insulation	13 days	Tue 5/20/14	Fri 6/6/14	
44	Precast Veneer - East Wall	5 days	Tue 6/3/14	Mon 6/9/14	
45	Metal Building Siding in Courtyard and We	5 days	Tue 6/10/14	Mon 6/16/14	44
46	Erect Roof Stair	3 days	Tue 6/17/14	Thu 6/19/14	45,92
47	Dri-Design Metal Panels - East Wall	10 days	Tue 6/10/14	Mon 6/23/14	44
48	Exterior Storefront and Entries	6 days	Tue 6/24/14	Tue 7/1/14	40,47
49	Roof Edge Copings	10 days	Wed 7/2/14	Wed 7/16/14	45,48
50	**Interior Construction**	**61 days**	**Tue 5/13/14**	**Thu 8/7/14**	
51	Interior Masonry Wall - Restrooms	12 days	Thu 5/15/14	Mon 6/2/14	
52	Interior Masonry Walls - Storage Areas	22 days	Wed 5/21/14	Fri 6/20/14	
53	MEP Overhead Rough-in - Phase 2	35 days	Tue 5/20/14	Wed 7/9/14	
54	Acoustic Spray - Mech / Elec Room	3 days	Tue 5/27/14	Thu 5/29/14	
55	Paint - Mech / Elec Room	2 days	Fri 5/30/14	Mon 6/2/14	54
56	Electrical Room Equipment	24 days	Tue 5/13/14	Mon 6/16/14	
57	*Permanent Power	0 days	Mon 6/16/14	Mon 6/16/14	56
58	Mechanical Room Equipment Piping & Ins	15 days	Fri 5/30/14	Thu 6/19/14	55FS-2 days
59	Metal Stud Framing and Drywall	10 days	Mon 6/9/14	Fri 6/20/14	52FS-10 days
60	Paint Drywall walls and soffits	3 days	Mon 6/23/14	Wed 6/25/14	59
61	Paint Roof Structure in open areas	3 days	Wed 6/25/14	Fri 6/27/14	53FS-10 days
62	Sealing Masonry Walls	5 days	Mon 6/30/14	Mon 7/7/14	52FS+5 days
63	Paint CMU walls	4 days	Mon 6/30/14	Thu 7/3/14	52FS+5 days
64	Wood Paneling at Entry	2 days	Mon 7/7/14	Tue 7/8/14	63
65	Ceiling Grid	5 days	Tue 7/8/14	Mon 7/14/14	62
66	Acoustic Wall Paneling in Conf Room	4 days	Tue 7/15/14	Fri 7/18/14	65
67	Light Fixtures in Grid	4 days	Fri 7/11/14	Wed 7/16/14	65FS-2 days



University of Iowa HTRC - Indoor Turf Addition
Project Schedule Printed Tue 5/20/14

RUSSELL CONSTRUCTION

RUSSELL
CONSTRUCTION COMPANY

Period: 1/6/2013 **Thru:** 1/26/2014

Job Name: : HTRC **PM:** Brian Hedgren / Jill Meyer

Job Number: 01-13-4002 **Supt:** Travis Benz

Look-Ahead Schedule

Contractor	Activity	1/6/14 Mon	1/7/14 Tue	1/8/14 Wed	1/9/14 Thur	1/10/14 Fri	1/11/14 Sat	1/12/14 Sun	1/13/14 Mon	1/14/14 Tues	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
Rathje	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									
	Start erecting steel on the ground.										X	X	X			X	X	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 rough-ins in the link area.															X	X	X	X	X		

CONSTRUCTION CLAIMS MONTHLY

Devoted exclusively to the problems of construction contracting.

Volume 11 Number 11 November 1989

LIQUIDATED DAMAGES

It is customary in the construction industry for contracts to call for liquidated damages. Liquidated damages are a stipulated, per diem amount the contractor pays the project owner for completing the facility later than the contractually established deadline. They represent the owner's delay damages.

The liquidated damages provision of a contract is usually quite succinct. The contractor is allowed a stated number of calendar days from notice to proceed to complete the work and is subject to liquidated damages of a stated dollar amount for each day beyond that date that the work remains incomplete.

The simplicity of the provision and the apparently mechanistic manner in which it is applied could lead one to believe that there is little to discuss regarding liquidated damages. This is not the case.

Many factors affect the enforceability of liquidated damages provisions, as well as the computation of the damages. When a project is delayed by multiple factors, the question of apportionment arises. Contractors may argue that the damages have been waived by the owner. And subcontractors and other third parties may be affected by liquidated damages provisions. This two-part article addresses these issues.

Enforceability

The basic rule is that a liquidated damages provision is enforceable if the amount represents a reasonable forecast, at the time of contract formation, of the actual damages the owner might incur if the project is not completed by the contractual deadline. It is recognized that a precise determination of the owner's delay damages is not possible. This is why it is desirable to "liquidate" the damages; that is, to reduce them in advance to a sum certain. But a project owner must be able to show that it made a good faith effort to estimate its actual delay damages at the time the amount was inserted in the contract.

The improper establishment of the daily liquidated damages amount is the most common basis for a contractor's successful challenge of the enforceability of a liquidated damages clause. If the owner made no reasonable attempt to forecast its actual delay damages, the provision will be considered an unenforceable penalty, or an attempt to provide a negative incentive for timely contractor performance. *San Ore-Gardner v. Missouri Pacific Railroad Co.*, 658 F.2d 562 (8th Cir. 1981); CCM December 1981, p. 2. *Appeal of Great Western Utility Corp.*, ENG BCA No. 4934 (April 5, 1985); CCM July 1985, p. 6.

The easiest case, from a contractor's point of view, occurs when the project owner fails to establish the precise daily amount of the liquidated damages. In one case, a government agency argued that the liquidated damages clause established in the federal regulations is automatically incorporated, as a matter of law, into every contract.

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(Continued from page 1)

Therefore, argued the agency, it could assess liquidated damages against the contractor even though no provision appeared in the contract. The Armed Services Board of Contract Appeals rejected this contention, noting that the standard federal clause failed to establish the per diem amount and was therefore unenforceable until it was adapted to a specific contract. *Appeal of Jacqueline Howell, Ltd.*, ASBCA No. 27026 (September 30, 1982); CCM December 1982, p. 6.

A more common situation occurs when an owner uses a rote formula for determining the amount of liquidated damages and is unable to justify the validity of its formula. These formulas are particularly prevalent in public contracting. In one case, Navy guidelines called for liquidated damages of six dollars per day per resident when constructing residential quarters. This resulted in a clause calling for liquidated damages of $1728 per day in one contract. The Armed Services Board of Contract Appeals concluded that the Navy had made no effort to estimate its actual off-base living expenses in the event of late completion and the clause was therefore an unenforceable penalty. *Appeal of Fred A. Arnold*, ASBCA No. 26867 (January 10, 1986); CCM April 1986, p. 5.

Frequently, courts and administrative boards do not even need to address the justification for the formula itself because agencies misapply their own formulas. In the *Appeal of Weddle Plumbing & Heating Co.*, VABCA No. 2209 (September 27, 1985); CCM December 1985, p. 6, Veterans Administration guidelines called for liquidated damages of $55 per day for contracts within a certain dollar range. A VA engineer felt this was insufficient and raised the amount to $100 per day. The Veterans Administration Board of Contract Appeals said this rendered the clause unenforceable.

In another case, government guidelines called for liquidated damages of $50 per day, but the contract stated the damages at $125 per day. The Armed Services Board of Contract Appeals said it had no objection to the use of properly crafted schedules or guidelines, but when the government exceeded its own guidelines without explanation, the entire clause automatically became an unenforceable penalty. *Appeal of Dave's Excavation*, ASBCA No. 36161 (June 8, 1988); CCM October 1988, p. 5.

Another way for project owners to render their liquidated damages clauses unenforceable is to reduce the original daily rate after contract formation. In the *Appeal of Coliseum Construction, Inc.*, ASBCA No. 36642 (December 6, 1988); CCM March 1989, p. 4, the contract called for liquidated damages of $1820 per day. The government's contracting officer decided this was excessive and assessed the tardy contractor at a rate of $220 per day. The Armed Services Board of Contract Appeals said this was a tacit acknowledgment that no reasonable effort had been made to predict damages at the time of contract formation. Even if $220 per day was a fair approximation of the government's actual delay damages, the entire clause was unenforceable and the government could not assess any liquidated damages.

Before leaving the topic of enforceabilty, it is important to reiterate that the validity of a liquidated damages clause is determined by looking back to the time at which the contract was formed. If a reasonable effort was made to estimate damages, the clause is enforceable regardless of the actual delay damages the owner ultimately does or does not incur.

In one case, the contract documents authorized the owner to occupy and use the building prior to final completion and acceptance. The contractor, who had been assessed liquidated damages of $100 per day, argued that the owner had been using the building for much of that period and had incurred no actual damages. The California Court of Appeal said this was irrelevant. An enforceable liquidated damages clause will apply regardless of the absence of actual delay damages. *Vrgora v. Los Angeles Unified School District*, 200 Cal.Rptr. 130 (Cal.App. 1984); CCM June 1984, p. 3.

In another case, the contractor was assessed liquidated damages for completing the project 22 days behind schedule. The owner had left the building sitting unoccupied for five months after final acceptance. The contractor argued that its 22-day delay had obviously not caused any actual damages. But again, it was ruled that if the liquidated damages amount is a reasonable estimate of delay damages at the time the contract is formed, the clause is enforceable regardless of whether or not the owner ultimately suffers actual damages due to the late completion of the project. *Appeal of Preston-Brady Co., Inc.*, VABCA No. 1892 (March 3, 1987); CCM May 1987, p. 6.

This doctrine can also work to a contractor's advantage. If the owner's actual delay damages exceed the liquidated damages assessment, the owner has no recourse. Recovery is limited to the liquidated amount. This was the case when a project owner tried unsuccessfully to sue a contractor for $340,000 of actual delay damages it allegedly incurred over and above the liquidated damages assessment. The owner's claim was denied. *X.L.O. Corporation v. John T. Brady and Co.* 482 N.Y.S.2d 476 (N.Y.A.D. 1984); CCM March 1985, p. 2.

In next month's conclusion, this article will discuss the determination of when a liquidated damages assessment should commence and end. It will also examine the apportionment of liquidated damages, waiver by the owner, and the effect on subcontractors and other third parties.

CONSTRUCTION CLAIMS MONTHLY

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LIQUIDATED DAMAGES - Part II.

Last month, the first part of this article addressed the enforceability of liquidated damages clauses. This month's conclusion examines the time period for computing liquidated damages, the apportionment of liquidated damages, waiver of liquidated damages, and the effects of liquidated damages clauses on subcontractors and other third parties.

Time Period

Liquidated damages start to run when the contractually established completion date has been reached. Most contracts, however, allow the contractor an extension of time for "excusable" delay; that is, delay in project completion that was beyond the control and without the fault of the contractor. Therefore, the contract completion date must be extended to account for excusable delay and liquidated damages cannot be assessed until that extended completion date is reached. *Davis v. Tillman*, 370 So.2d 1323 (La.App. 1979); CCM September 1979, p. 2. *Appeal of Sauter Construction Co.*, ASBCA No. 27050 (March 30, 1984); CCM June 1984, p. 6.

The most controversial aspect of computing the time period is the determination of when liquidated damages cease to run. Do they stop when the project is "substantially complete," e.g., fit for the owner's intended use and beneficial occupancy? Or do they continue to run until there has been final completion of the contract and final acceptance of the project by the owner? If the contract establishes the point at which liquidated damages cease to run, courts and administrative boards will abide by the agreement of the parties. But problems arise when the contract fails to address this issue.

Some courts have ruled that liquidated damages should run until final completion. In one case, where the construction contract said liquidated damages would be assessed until the "completion date" of the project, the Court of Appeals of North Carolina interpreted that to mean final completion and acceptance. The Court reasoned that if liquidated damages ceased upon substantial completion, there would be no incentive for the contractor to perform the punch list work and achieve final completion. *Ledbetter Brothers, Inc. v. North Carolina Department of Transportation*, 314 S.E.2d 761 (N.C.App. 1984); CCM August 1984, p. 4.

This reasoning is flawed. Liquidated damages are not supposed to function as a penalty or negative incentive. They are intended to compensate the owner for the loss of use of the facility caused by late completion. Once the owner gains use and occupancy of the facility, the liquidated damages should stop. Furthermore, the North Carolina court's fear of abandonment is unfounded. Even though a contractor has achieved substantial completion and liquidated damages have ceased to run, the contractor may still be terminated for default and assessed for the cost of completion if it fails to perform the punch list work. *Appeal of Mitchell Engineering & Construction Co., Inc.*, ENG BCA No. 3785 (April 4, 1989); CCM September 1989, p. 5.

As indicated in the preceding paragraph, the better reasoned and prevailing rule

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is that liquidated damages cease to run as soon as the contractor achieves substantial completion of the project. *Stone v. City of Arcola*, 536 N.E.2d 1329 (Ill.App. 1989); CCM August 1989, p. 2. *Appeal of Rivera Construction Co., Inc.*, ASBCA No. 30207 (April 12, 1988); CCM August 1988, p. 5. *Appeal of Wickham Contracting Co., Inc.*, IBCA No. 1301-8-79 (March 31, 1986); CCM June 1986, p. 5.

One final note needs to be made regarding the time computation for liquidated damages. At least one case has held that an owner need not wait until substantial completion and determination of the total period of delay to assess liquidated damages. The owner was allowed to start withholding liquidated damages prior to substantial completion based on the estimated period of late completion. *Appeal of KPM Corp.*, ASBCA No. 26540 (September 24, 1984); CCM January 1985, p. 5.

Waiver

The question of the timing of assessment of liquidated damages gives rise to the issue of waiver. Contractors sometimes argue that by failing to assess liquidated damages prior to final acceptance of the project, the owner waived the right to those damages. This argument has been rejected. Final acceptance may waive the owner's claims based on patent defects in the work itself, but not a claim for late completion. *Southbend Contractors, Inc. v. Parish of Jefferson*, 408 So.2d 1158 (La.App. 1982); CCM May 1982, p. 8.

Similarly, the release of retainage without deducting liquidated damages does not constitute a waiver of the right to later claim liquidated damages. *Illinois State Toll Highway Authority v. Gust K. Newberg, Inc.*, 531 N.E.2d 982 (Ill.App. 1988); CCM March 1989, p. 6.

On a related matter, it has been ruled that an owner does not lose the right to assess liquidated damages if a contractor abandons work prior to substantial completion. A contractor cannot rescind the liquidated damages clause or avoid its effects simply by walking off the job. *Pacific Employers Insurance Co. v. City of Berkeley*, 204 Cal.Rptr. 387 (Cal.App. 1984); CCM October 1984, p. 8.

Apportionment

Frequently a contractor completes a project behind schedule and a number of factors have contributed to the delay. The question then is whether the contractor can be assessed for liquidated damages. Some cases have held that when the owner and contractor have both contributed to the late completion of the project, no liquidated damages whatsoever can be assessed. No attempt should be made to apportion the causes of delay. The clause becomes unenforceable. *San Ore-Gardner v. Missouri Pacific Railroad Co.*, 496 F.Supp. 1337 (E.D. Arkansas 1980); CCM January 1981, p. 4.

The better and more prevalent rule, however, is that a contractor may be assessed liquidated damages for its share of the delay *unless* the project would have been completed on time *but for* the delay of the owner. *Aetna Casualty and Surety Co. v. Butte-Meade Sanitary Water District*, 500 F.Supp. 193 (E.D.S.D. 1980); CCM March 1981, p. 2.

There are practical limitations on the application of this rule, however. If the causes of delay cannot be apportioned with reasonable certainty, then no liquidated damages may be assessed. *Appeal of J.B.L. Construction Co., Inc.*, VABCA No. 1799 (November 7, 1985); CCM January 1986, p. 5. *Appeal of The Abright Company*, ENG BCA No. PCC-38 (September 20, 1981); CCM January 1982, p. 5. And concurrent delay makes apportionment impossible and prevents assessment of liquidated damages. *Appeal of C. D. Murray Co., Inc.*, ENG BCA No. 5018 (October 31, 1988); CCM February 1989, p. 4.

The issue of apportionment arises in other contexts, as well. On a multiple prime contract project, the owner must show the extent to which a particular contractor contributed to the late completion of the project before assessing liquidated damages against that contractor. *Utica Mutual Insurance Co. v. DiDonato*, 453 A.2d 559 (N.J.Super.A.D. 1982); CCM March 1983, p. 4. And when two separate buildings are included in a single contract, liquidated damages may not be apportioned between the two buildings unless the contract expressly authorizes such allocation. *Appeal of Roberts Construction Co.*, ASBCA No. 35570 (March 8, 1989); CCM July 1989, p. 4.

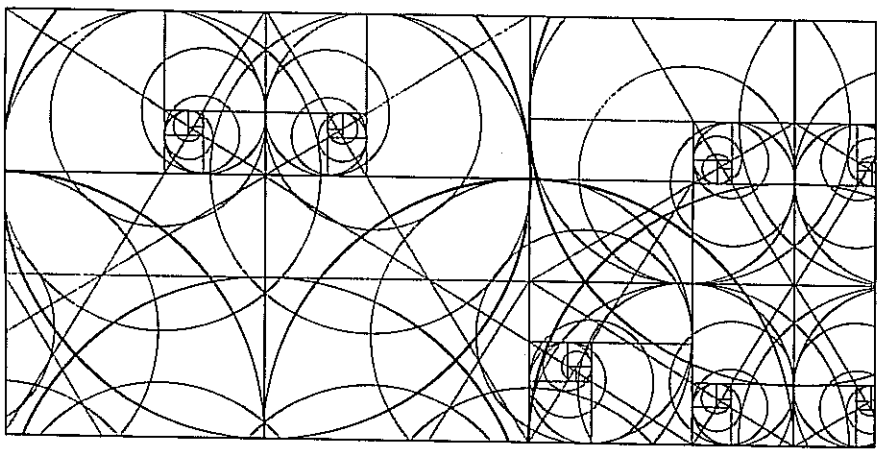
Subcontractors And Others

It is common, of course, for prime contractors to include liquidated damages provisions in the subcontracts they award. These clauses may establish a daily rate or may state that to the extent the subcontractor's delay causes the owner to assess liquidated damages against the prime contractor, the sub will indemnify the prime. These clauses are enforceable and subject to the same basic rules stated in the preceding sections of this article.

The limited role of a subcontractor in an overall project has led courts to articulate some additional safeguards for subcontractors. When a subcontractor is late completing its work, the prime contractor cannot assess liquidated damages for the entire period prior to completion of the project. The prime can assess liquidated damages only for the number of days the sub actually delayed the prime's completion. *Mattingly Bridge Co., Inc. v. Holloway & Son Construction Co.*, 694 S.W.2d 702 (Ky. 1985); CCM December 1985, p. 8. And when a project is functionally operational without completion of the subcontractor's portion of the work, the sub cannot be held liable for any of the liquidated damages assessed against the prime contractor. *U.S. for the Use and Benefit of Control Systems, Inc. v. The Arundel Corp.*, 814 F.2d 193 (5th Cir. 1987); CCM June 1987, p. 3.

Finally, other third parties sometimes take an interest in the liquidated damages clause found in the prime construction contract. Real estate developers sometimes claim that they are third-party beneficiaries of the contracts between municipalities and contractors building streets or utilities. The developers argue that they are entitled to recover the liquidated damages derived from contractors whose late completion delays a project. These claims are universally rejected. *Chard Realty, Inc. v. City of Shakopee*, 392 N.W.2d 716 (Minn.App. 1986); CCM November 1986, p. 3. *Coastland Corp. v. County of Currituck*, 734 F.2d 175 (4th Cir. 1984); CCM September 1984, p. 3.

FROM CONCEPT TO COMMISSIONING



Planning, Design, and Construction of Campus Facilities

Edited by Donald Guckert

6 Timing is Everything: Meeting the Challenge of Aggressive Project Schedules

by Donald Guckert

How typical is it at your campus to have plenty of time to design and build projects? How often are your clients in no hurry to occupy new facilities? Do your clients usually request their projects far enough in advance to meet their critical occupancy goals?

The time required to design and construct a campus project is one of the most underestimated aspects of our work. It is common, particularly on smaller projects and renovations, for campus clients to approach their projects with unrealistic time expectations and a critical completion date driven by the academic calendar. Even when we are able to complete a project on an extremely tight schedule, our reward is often heightened expectations from other clients who want their project completed with an even shorter turnaround time.

As facilities project managers, we must learn how to handle schedule constraints tied to the realities of funding cycles, research grants, academically driven dates, and other issues unique to a college campus. Understanding the dynamics involved with project schedules and taking advantage of time management techniques can help design and construction professionals successfully meet these challenging and often unrealistic schedules.

Prioritizing Project Goals

The three fundamental goals of any campus project are: 1) lowest cost, 2) highest quality, and 3) shortest time. Since these three goals vary in importance with each project, and the goals often conflict with each other, our clients need to prioritize these goals for their own project.

Sure, everyone wants low cost, but do they want it at the expense of quality? Is the completion date more important than the cost? Do we have adequate time allotted to ensure good quality? Early in the planning process, clients should be encouraged to evaluate their priorities. It may be more important, for example, to complete the campus bookstore by fall semester than to have the project cost 15 percent less or have meticulous workmanship. The priority of goals should be determined by the client, not the facilities project manager. Instead, our role is to point out the dynamics between cost, quality, and time.

Compressing a project schedule often diminishes quality and/or increases cost. Pushing the design professional with an aggressive timetable can result in a poor set of design documents due to a lack of time for careful preparation and review. Likewise, pushing the contractor to complete a project at a breakneck pace usually makes quality a casualty. It is unfortunate, but contractors often find cutting corners is their only option when forced to meet a tight schedule.

Like quality, cost can suffer when schedules are tight. In bidding the project, contractors may realize that the only way to meet the schedule is to work premium time. This premium time could involve longer workweeks, double shifts, or spot premium time. Working beyond the normal 40-hour week kicks in overtime pay; double shifts may incur shift differential pay; and both approaches yield productivity losses. Contractors may also pay premiums for expedited material and equipment. When contractors have to adjust their bids for these additional costs, campus clients end up paying for them in the form of higher bids.

A client who requests a project without sufficient time allotted has subordinated the cost and quality goals to time. However, on the positive side, if the project is given a sufficient amount of time for the

design and construction phases, both quality and cost can be optimized. It is our responsibility to educate our clients about the substantial benefits of submitting timely project requests.

Convincing clients to submit project requests with sufficient time for design and construction is a critical first step. However, facilities project managers then must meet the challenge of successfully managing the time that clients have provided.

Building the Pyramid: Decisions and Design

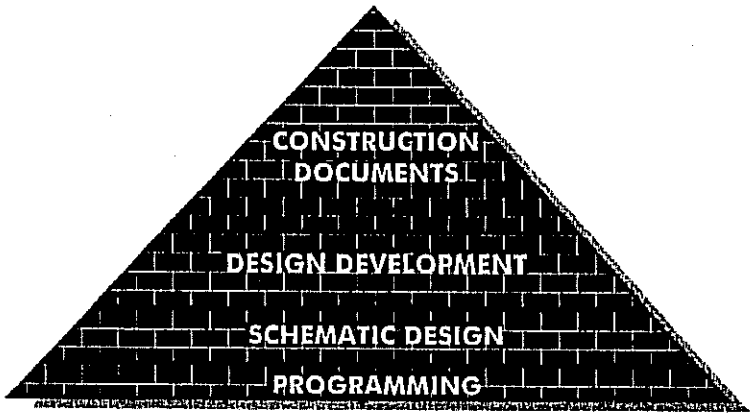
The four basic phases of project design are: 1) programming, 2) schematic design, 3) design development, and 4) construction documents. It is helpful to think of these four phases as building blocks in a pyramid.

Programming: All of the programming decisions stand at the base of the pyramid. In this phase, the client's space and program needs are analyzed and described.

Schematic design: The design team then works with the client to develop a general project layout based on their programming needs. This phase comprises the next few blocks in the pyramid.

Design development: Design development decisions—such as the level of interior finishes and types of mechanical systems—build on the schematic design. Design development is the third tier of the pyramid.

Construction documents: Finally, at the peak of the pyramid, decisions are made on all remaining details necessary to describe the project to the bidding market.



The pyramid analogy helps to portray the discrete phases of the project design. It also illustrates the problems that occur when a decision in an early design phase is reviewed and revised in a later phase. For example, a client may decide late in a project to change rooms 103 and 104 from two offices to a conference room. They see this decision as a simple erasure of a line on a drawing. For the design professional, if the "erasure of the line" is made during the design development or construction document phase, it may mean lighting alterations, changes in the ventilation requirements, relocation of utility chases, elimination of a door, reconfiguration of windows, addition of casework, and so on. Our decisions and design pyramid needs to be dismantled all the way back to the programming level and then rebuilt.

Clients tend to look at the design process as a flexible, open-ended period where everything is still on paper, and changes can be made at any time. However, we must inform clients why changes made late in the design process, such as converting two offices into a conference room, can cause design delays, increase costs, and have a serious impact on their overall schedule.

Scope creep is another common phenomenon of campus projects that can negatively affect the schedule. Scope creep also forces the dismantling of the decision pyramid, but with the added impact of more work to be designed and constructed. The schedule rarely is adjusted to match the increased scope because, as the name implies, the scope "creeps" up on the design team without them realizing the need for a corresponding schedule creep.

Design changes and scope creep are not the only reasons for design delays. The failure to make timely decisions can have an equally devastating impact on the schedule. The culture of an educational institution is one where most decisions are made by consensus. All constituents and stakeholders are invited to be heard and represented if the decision affects them. Unlike corporations, where authority to make decisions is sharply focused on a particular management representative, educational instititutions rarely give decision authority to one individual. Instead, several layers of decision makers may be involved with a campus project. While the "consensus decision" culture may work well with many issues confronting a university, it can be devastating to a project schedule, if not properly managed.

Outside design firms that are unaccustomed to working with institutional clients usually underestimate the time required to complete a campus design project. Consequently, the A/Es (architects/engineers) often find themselves falling behind schedule and rushing through the construction document phase to meet the target advertisement date.

When a project is initiated, project managers should emphasize to campus decision makers, particularly the client, how delayed decisions will hold up the design process. A delayed decision that stops the construction of our imaginary pyramid may be just as devastating as changes that dismantle the pyramid.

Keeping Construction On Track

Proper budgeting of time in the construction phase is critical to meeting a completion date. Usually construction schedules are set by a combination of the A/E's professional judgment and the owner's needs. Project managers should be aware of some inherent problems with construction schedules set in this manner.

It is all too common for a design team to become falsely optimistic about the construction schedule when time is running short due to design phase delays. Human nature drives the design team to grow ever more optimistic that everything will work out once we get to construction. Besides, there is an assumption, made by many, that contractors only work at the pace set by the schedule. If they are given too much time, they will never complete early. If they are given a challenging schedule, they will pace themselves accordingly to avoid the consequences of a delayed completion. While there may be some truth in this belief, applying it to the wrong set of schedule circumstances can lead to failure.

Contractors should be consulted about the budgeted time for construction. Even in a public, openly competitive environment, contractors who regularly bid on an institution's work often are receptive to giving input on how much time should be allowed. Facilities project managers should take advantage of this resource when setting schedules. We may not like what we hear, but the contractor's input can serve as a reality check that might avoid problems later.

Time Management Strategies

What if the project is still short on time, and the residence hall renovation absolutely must be completed by fall semester? This

would not be much of an article if the answer was to simply tell the client that more time is needed, and they should wait until spring semester.

There are a number of contractual strategies that may be employed if the construction schedule is tight. The first strategy is to prequalify contractors who will be allowed to bid the project. This is a very effective technique available to most private institutions, but few public institutions.

Institutions should consider prequalifying those contractors who have a solid track record on meeting demanding schedules. Prequalifying contractors who have done previous work for the institution or who have a comfortable working relationship with the campus may not always be the best choice in a tight schedule situation. In the construction industry, as in all industries, there is a large variance of management skills between companies. Project managers should look for contractors who utilize critical path (CPM) scheduling, have a system for tracking shop drawings, select subcontractors and suppliers on the basis of time as well as cost, manage the work of subcontractors, expedite vendor shipments, and take decisive action when delays are detected.

Even public institutions that are restricted from prequalifying contractors can build many of these management attributes into the postqualification requirements of the contract. Requiring the successful bidder to have CPM scheduling capabilities is not unreasonable, even for small projects. Additionally, requiring contractors to submit a schedule with their bids can force them to thoroughly consider the time allowed when putting together those bids.

Often, we must protect the institution from contractor management deficiencies—particularly in public bidding environments. It is often

said that the low bidder is the one who made the biggest mistake in putting the bid together. I would add, from a scheduling standpoint, that the low bidder is probably the one who is most unrealistic about how to meet an aggressive schedule.

Owners faced with tight construction schedules will not want to award the contract to the contractor who bid a straight 40-hour workweek. Consequently, owners should consider requiring, through the specifications, that contractors work double shifts during the project or require them to carry a premium time allowance in their budget. Often, a jumpstart on the project is all that is needed to get ahead of the schedule. If all is going well midway through the project, the owner can always relax the double shift requirement or take a credit for the unused premium time allowance. Forcing the bidders to base their bids on a common scheduling approach levels the playing field and lowers the risk of a delayed project completion by the low bidder.

Another possible strategy is to bid the project based on two different schedules. As discussed earlier, when time is constrained, project costs usually rise. Bidding a shorter schedule as an alternative will reveal how much the aggressive schedule is costing. This strategy works simply by bidding a reasonable schedule, such as spring semester completion, as the base bid. The aggressive completion date, such as the earlier fall semester, then is packaged as an alternate. If the client decides to allow more time in order to save money, the decision is made on firm dollars. If the client decides to opt for an earlier completion, it demonstrates to the contractor that the owner is resolved to pay for, and thus enforce, the earlier completion date.

Restrictive Construction Windows

Construction windows, such as Christmas break, spring break, or summer break are targeted for many campus projects. Summer

break in particular is a period of high construction activity on college campuses. Summer break is also the time allotted for renovations or repairs to facilities that must remain in operation during the rest of the year.

The key to success with these construction windows is to build sufficient lead time into the schedule. Many renovation projects can be completed within a period of ten to twelve weeks of on-site construction, if all equipment and materials are delivered on time. The design consultant should verify that all specified products critical to the schedule are, in fact, available in the time frame required.

Timely delivery of materials and equipment is a function of shop drawing approval and manufacturing and delivery time, both of which are common causes of construction delays. Consequently, for a project with a summer construction window, the likelihood of meeting an August completion date is increased if the contract is awarded in January or February instead of April or May.

Schedule Incentive Clauses

Even when time management techniques, tools, and resources are available, contractors often lack the motivation to invest in using them. Schedule incentive clauses can provide a monetary incentive for a timely project completion. The most common incentive clauses assess a damage or a penalty on the contractor for a delayed project completion.

Actual damage clause: One type of contractual incentive is an actual damage clause. Under the actual damage clause, the contractor is responsible for reimbursing the owner for all damages actually incurred as a result of a delayed completion. Examples of actual damages include the expense of housing students in temporary facilities, lost bookstore revenue, and increased administrative costs

in managing the delayed project. However, actual damages can be difficult to collect because of disputes with the contractor as to whether or not the university really was damaged and to what extent. It is particularly difficult to determine the damages incurred when a classroom or auditorium is not ready for the first day of classes. It also should be noted that most construction firms do not like actual damage clauses because they impose an open-ended risk.

Liquidated damage clause: A liquidated damage clause may be used in lieu of an open-ended actual damage clause. The term "liquidated" merely signifies that the precise amount of daily damages has been established by contractual agreement. An advantage of the liquidated damage clause is the avoidance of future litigation between the owner and contractor over the valuation of damages.

Contractors generally prefer a liquidated damage clause because it reduces the likelihood of disputes with the owner over monetary damages if the project is delayed. However, setting a "daily damages" amount may backfire on the owner if a contractor develops a bid for the project that builds in the daily damages and "plan for" a late completion date. Even after figuring in the damages, the contractor may be able to underbid the competition because it does not have to pay acceleration costs to meet the aggressive deadline.

Across the industry, liquidated damages typically range from a few hundred to several thousand dollars per calendar day. The amount set for damages are legally enforceable, provided they are a reasonable forecast of the damages the owner would be expected to suffer in the event of a late completion. In court cases, where it has been proven that the amount was arbitrary, excessive, or unreasonable, the courts have found that the damages constituted a penalty and thus have ruled the liquidated damage clause unenforceable. Therefore, it

is important to validate the prescribed liquidated damages by developing and documenting a sound and fair basis for the determination of damages.

Finally, in several cases, the courts have ruled that the owner need not actually realize damages upon the late completion of a project in order to collect liquidated damages. Just a reasonable anticipation of damages at the time of bidding is necessary to mutually bind the contracting parties. Similarly, if the owner suffers damages for delay in excess of the prescribed damages, the owner is limited to the stipulated damages only.

Bonus/penalty clause: A third type of incentive clause is the bonus/penalty clause. Although the liquidated damage clause and bonus/penalty clause sometimes are used interchangeably, there is a definite legal distinction between the two. Two of the major differences are as follows:

1. Unlike liquidated damages, a bonus/penalty clause does not have to be a reasonable projection of damages (or benefits) realized by the owner for late (or early) completion.
2. If a penalty is stated, then an offsetting bonus needs to be specified as well.

It should be noted that there is a major pitfall in using bonus/penalty clauses. Many contractors have argued successfully that they were denied the opportunity to earn their bonus because of delayed decisions or actions, including change orders, on the part of the owner. Bonus/penalty projects can be documentation nightmares for the owner, where every decision or change order generates a corresponding request for a time extension. Thus, the use of bonus/penalty clauses should be limited to special cases with extremely well-crafted specifications.

Schedule Management

The goal of a schedule incentive clause is not to collect the damages. Instead, the goal is to complete the project on time. As creative and thorough as we may be with contractual clauses, nothing can substitute for competent time management. While schedule compliance is the responsibility of the contractor, as facilities project managers, we need to stay on top of the schedule and use the contractual tools available to us as schedule delays arise.

Early detection and response to delays is the key to meeting a project schedule, and the owner should require the contractor to take immediate action to compensate for delayed activities. This may involve adding additional workers, working overtime, and expediting critical deliveries. The contractors, not unlike the design team, tend to be falsely optimistic as time runs short. Falling into the trap of believing the contractor's assertion that there is enough time in the schedule to compensate for early delays has left many owners with a late project. Since each delay can lead to other delays, it is imperative to make up delays as soon as they occur.

Finally, even the best management strategies and practices cannot protect against unforeseen delays outside the contractor's control, such as abnormal weather and owner-caused delays. Building in a time buffer between the contractors completion date and the required occupancy date can help protect against such delays. Delays, like change orders, are a fact of today's construction efforts and we need to build in time contingencies to cover these risks.

Summary

Project managers can avoid many problems related to schedule compression by following these guidelines:

- Educate the campus client on the benefits of adequate lead time in requesting projects.

- Ask the client to 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.
- Act immediately when delays occur during design and construction.

Since the time required to design and construct a campus project remains one of the most underestimated aspects of our work, we must continually work to align client expectations with construction realities. But, despite our best efforts, eventually we find ourselves pressured to agree to an unachievable project schedule. The overarching need to complete a facility often clouds rational thinking and behavior. Yet, we must trust our professional experience and judgment and communicate realistically achievable completion dates. While we cannot accomplish the impossible, we have the tools, techniques, and tenacity to meet the challenges of aggressive project schedules.