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Chapter

7

Dealing with Difficult Issues at the Construction Site

There are a number of complex issues that arise on the construction site that can severely impact the normal progress of activities and require a lot of the project superintendent's time. These occurrences deviate from the contract requirements as spelled out in the plans and specifications, and the project superintendent must be able to recognize them early on, alert the project manager, and be prepared to deal with them.

Five of these difficult issues involve:

- Site-related problems involving differing or materially different conditions and unforeseen subsurface conditions
- A change in conditions
- Drawing coordination problems
- Delays and the problems they create
- Requests by an owner to accelerate the work after recognizing that delays have occurred

Site-Related Problems

Among the most frequent problems arising on the job site are those involving site work and site-related matters. Geotechnical investigations and reports can only go so far in evaluating what is under the surface, and when the geotech takes "representative samples of soil conditions," they are just that, a *sampling* of conditions.

The geotechnical report and its ambiguities

Included in most bid documents issued by an architect to a general contractor, in which substantial amounts of site work are involved. The bid document include a report on subsurface conditions that that we all know as the geo tech report. Its purpose is to advise the contractor of representative subsurface conditions in order for that contractor to better prepare their estimate for site work. The report generally will include a number of test borings and possibly a test pit or two.

The basic essentials of a geotechnical report are:

- A narrative summary of the subsurface exploration activities to include test boring logs, test pits (if applicable) and ground water information
- An interpretation and an analysis of the data obtained from the subsurface exploration
- Specific structural design recommendations (soil-bearing capacities)
- A narrative of the conditions and any anticipated problems
- Special provisions relating to this specific site

Because only a limited site exploration will have taken place, the geotech must include disclaimers in their report, and justifiably so.

Typical disclaimers in the geotech report are:

> Professional judgments and recommendations are presented in this report and are based partly on the evaluation of the technical information gathered and partly on our general knowledge and experience with subsurface conditions in area where this information was obtained.
>
> We do not guarantee the performance of the project in any respect other than that of engineering work and the judgment rendered meets the standard of care for the profession. It should be noted that the borings may not represent potentially unfavorable subsurface conditions between each boring. If during construction soil conditions are encountered that vary for those discussed in this report or historical reports or if design loads and/or configurations change, we should be notified immediately in order that we may evaluate effects, if any, on foundation performance. The recommendations presented in this report are applicable only to this specific site. These data should not be used for other purposes.

More specific disclaimers are included with the test boring logs for example:

> The boring logs for B2 thru B10 are representative of the conditions at the location where each boring was made but conditions may vary between borings.

The purpose of the geotech report is to give the bidding contractors some idea of what the subsurface conditions are in general, but this report cautions bidders that conditions may vary considerably from area to area, often in the distance of just a few feet.

But this report, while acting only as a guide, is meant to give a contractor a reasonable idea of what they may encounter—how much contingency should the

general contractor include in their site work estimate or, as a bidding strategy, if no contingency should be included in the hope that the bid will be a winning one.

Two critical phrases and words

In this discussion so far, there are two critical words/phrases that will come up if a dispute or claim arises with respect to site work issues (as well as in many other types of disputes and claims):

Standard of Care—The geotech indicated in their report that their engineering work and judgment met the *standard of care of our profession*. This statement, in effect, allows that there is room for error in the report, but no more than would be held as a standard for their industry. In simple terms, "We're not perfect, but we've done a pretty good job, as much as you could expect from any engineer."

Reasonable—The courts look for a "reasonable man" approach when ruling on many disputes and claims. What would a reasonable man do or assume in this situation? Does the geotech report present a "reasonable" prebid site investigation? Does the contractor display knowledge "reasonably ascertainable by a prudent bidder" in interpreting the report?

These two terms "standard of care" and "reasonable" form the basis of many other claims and disputes between design consultants and contractors, whether they be site conditions, design errors and omissions, or coordination problems.

Differing Conditions or Materially Different Conditions

Bearing in mind that a contractor will have based their site work estimate and their subsequent bid on the information contained in the bid documents, which include the geotech report, the specifications and plans, and a site visit, what happens if, on being awarded the job and commencing construction, they find site conditions much different from what they initially anticipated?

These "differences" can take many forms in both quality and quantity:

Soil variations—What was expected—What was uncovered:

- Boulders
- Gravel
- Sand
- Silt
- Clay
- Humus
- Decomposed vegetation

Rock—What as anticipated—What was encountered

- Top of rock elevation
- Quantity
- Hardness
- Ripability
- Boreability
- Permeability

How The Government Looks at Differing Conditions

When government road building contracts are awarded, they often include lots of unit prices: prices for off-site fill, placement and compaction of structural fill, unit prices for hauling excess material off-site. These unit prices are accompanied by anticipated quantities for each item. Several government agencies use the "15% rule." If the actual quantity required exceeds 15 percent of the quantity in the bid documents, a differing or changed condition has occurred and the contractor may be allowed to change their unit price to reflect these changed quantities.

In the late 1990s, the Federal Highway Administration, in response to a request from then Senator Frank Lautenberg of New Jersey, addressed the matter of differing conditions as follows:

> We recognize that after a contract gets underway, conditions may change or circumstances may exist that were not anticipated during preparation of the plans, specifications and estimates. Our governing legislation and our implementing regulations allow for change orders within the scope of work covered by the contract. In awarding contracts by Federal-aid highway projects, the State transportation department must include a standardized clause on changed conditions to provide for an adjustment of contract terms if the altered character of the work differs materially from that of the original contract or if a major item of work is increased or decreased by more than 25% of the original contract value.

Steps to follow when differing conditions are encountered

Early recognition of the problem is essential so that documentation of events can commence as soon as those early discoveries are made.

The time to begin documenting any potential for a differing conditions claim should commence when the project superintendent feels that the conditions being encountered are entirely different from what was expected and that extra costs will be incurred if these conditions continue. Even if, as the site work continues, it turns out that this initial "differing condition" disappears and no problem actually exists, it is better to anticipate this than not.

When conditions do occur and persist, the superintendent should take the following steps:

1. Call the home office and alert the project manager to the conditions being encountered.
2. On first discovery of the differing condition(s), note the time, date, and condition observed, because this will act as the first period when a "compensable" claim, if this situation turns into a dispute or claim, will have originated.
3. Assemble the necessary field documentation:
   i. Written notification entered in the daily log.
   ii. Photos or videos of the situation encountered.
   iii. Statements from concerned field personnel such as an excavating subcontractor's foreman, equipment operator, laborers working with the equipment, and inspectors.
   iv. Prepare a report to include the site related operations taking place at the time, that is, underground utility work, concrete foundations, and so on. Include the number of men working in each operation affected by the differing conditions and a brief description of their work and whether the discovery of the differing conditions may impede or otherwise affect their work or the work of others to follow. (If any of the foremen for these trades indicate that the differing conditions have no impact on their trade, so note, so that if later the subcontractor makes a claim it can be somewhat muted.)
4. The project manager may wish to alert the architect/owner of these preliminary findings just in case the matter proceeds further and increased costs are involved.

There are two basic types of site work claims as categorized by the legal profession—Type I and Type II.

The Type I and Type II Claims as They Relate to Site Work

Type I Claim. This claim is based on the contractor's statement that the site conditions encountered differ from the contract document representations. To support this type of claim, a contractor must show that:

- The contract documents indicate the subsurface or latent conditions that form the basis of their claim.
- The contractor's interpretation of the contract documents is *reasonable*.
- The contractor relied on the indications of the subsurface or latent conditions in the documents in the preparation of their estimate.
- The subsurface or latent conditions *actually* encountered at the site were *materially different* from those represented in the contract.
- The actual conditions encountered must have been *reasonably* unforeseeable.
- The costs in the claim must be solely attributable to the materially different subsurface conditions.

What constitutes the "representations" in the contract that the contractor relied on when preparing their estimate?

- Any "existing conditions" drawings
- Indication of any structures on the site that were to be demolished
- Any buried utilities
- Existing or proposed contours and existing waterways
- Reports of subsurface investigations (the geotech report)
- Boring logs, test pit data

Type II Claim. This claim is based on conditions that differ from those usually found on similar projects. Even in the case in which there are no accompanying contract representations or reports regarding subsurface or latent physical site conditions, a contractor may still initiate a claim for an equitable adjustment to their contract if they have encountered a differing site condition. The Type II claim requests an adjustment if the contractor encounters an unknown or unusual condition(s) that is materially different from one ordinarily encountered and when the contractor is unconcerned about any representations in the contract. This claim is a bit more tricky inasmuch as it is the contractor's burden to prove that what was encountered was not normal nor could have been anticipated from a study of the contract documents or by a site inspection or by the general knowledge of the contractor.

The contractor in a Type II claim must prove:

- What the usual conditions the contractor would have anticipated encountering on the site would have been.
- What actual physical conditions were encountered.
- That the physical conditions encountered differed *materially* from the known and from the usual.
- The conditions encountered caused an increase in the cost of work.

Some other suppositions involving a Type II claim are:

Forseeabililty—not only must the conditions encountered differ materially from the contract indications but also they must have been unforeseeable based on the information presented to the owner in the form of bid documents. The contractor must not have anticipated the conditions they encountered by virtue of the information in the bid document, an inspection of the site or from the contractors' general experience.

Reliance—the contractor must have relied on the assertions made in the bid documents. In some cases, an owner may argue that if public records are available in a town engineer's office that may shed some light on a site's condition, a contractor has a duty to search out these records (not all courts agree with that premise).

Unusual conditions—although a contractor is not entitled to expect the best and most favorable conditions, likewise, are they not expected to anticipate the worst. The more extreme the condition, the easier it will be for the contractor to stake out their case effectively.

Countering the contractor's claim

The owner or their design consultants may not readily accept the contractor's claim and could counter with a number of arguments that include one or more of the following rebuttals:

- The encountered conditions reported by the contractor are not *really* different from the data in the bid documents.
- The encountered conditions should have been *anticipated* by the contractor.
- The project was *not managed properly* and hence the claim which tries to recoup costs due to mismanagement.
- The contractor should have *conducted a more thorough site inspection* and possibly requested permission to dig test pits or make further subsurface investigations.
- The excavating equipment was not the right size and capacity and was in such poor shape that it could not adequately handle the assigned task(s).
- The contractor's operators were inexperienced.

These are the kinds of comments to be expected when preparing a claim for differing conditions and all documentation should be prepared with those thoughts in mind.

A Change in Conditions

Although similar in nature to the differing or materially differing conditions concept, a change in conditions situation can occur for many reasons not related to site work. A change in conditions situation is often linked to problems occuring as the building rises, as opposed to differing conditions being associated with problems with site work issues.

When the nature of the project's superstructure changes *materially* from the concept presented in the bid documents, a case may be made for a change in conditions claim. The contractor is basically stating that their game plan to administer and manage the projects has now completely changed.

A change in conditions can occur when scores of requests for information are generated by the general contractor and their subcontractors because of ambiguities or contradictory statements in the plans or specifications. Because of the time lag between the issuance and response to these RFIs, a smooth work flow is not possible and can cause a loss in productivity. The same could be true if the architect floods the project with scores or hundreds of architect

supplementary instructions (ASI) to the point at which subcontractors delay ordering equipment or find that they need additional staff just to handle this deluge of paperwork. This would present a condition that is much changed from an initial *reasonable* approach to the project.

The addition of major change orders that materially change the nature of the project also would create a change in conditions situation in which the contractor must include sufficient costs to be compensated for these changes as well as the added cost to administer them. An owner deciding to completely redesign one or two 10,000-square-foot floors in a multistory commercial building, as an obvious example, may create a changed condition, because the previously planned work schedules of many subcontractors will be affected by the delays in implementing the work while these design changes and related coordination issues are resolved.

The costs association with the impact created by a change in conditions can include:

- Increased administrative and management costs.
- Costs associated with the delays as this new work is folded into the prior scope of work of both general contractor and their subcontractors.
- Potential change in the baseline schedule and the sequencing of subcontractor work.
- A need to expedite material and equipment deliveries.
- An increase in trade manpower—either added crews or premium time work for existing ones.

If responses to RFIs, ASIs, and problems concerning coordination issues are not forthcoming from the architect in a reasonable time frame, the project superintendent or project manager must alert the owner/architect that further delays will impact the orderly progression of construction activities and thereby set up a change in conditions scenario.

Any ensuing delays will be disruptive to one degree or another. There is another term that all project superintendents should be familiar with as they ponder these differing or materially different concepts—the constructive change proposal.

Constructive changes

Some change order requests can be made even if they appear outside the contractual right to make changes per the provisions in the contract governing change orders. This concept is called a constructive change order and differing conditions fall within that category or concept. If the differing condition had been known before submitting the bid, the contractor's bid price would have been higher; after contract signing, this condition, in effect, increases the contract sum and can be considered a change order. An owner's representative requiring the

contractor to perform work that is outside the scope of the original contract will have created a constructive change.

Delays and the Problems They Create

Before starting down the road to a delay claim, look for a "no damages for delay" clause in the contract with the owner. If the contractor's claim is that their work was delayed as a result of any differing or materially differing conditions, this clause may prevent the contractor from receiving monetary compensation and may only entitle the contractor to additional time in which to complete the work; as we shall see, however, that has value when liquidated damages apply.

Delays occurring during the life of a construction project can be categorized as follows:

Excusable delay—a delay whereby the contractor is granted a time extension but no monetary compensation. When liquidated damages are included in the contract and the contractor is assessed a specific dollar amount for each day's delay in completing the project, the ability to extend the completion time is vitally important. Excusable delays can take the form of Acts of God, fires, or other significant accidents, transportation delays over which the contractor has no control, labor strikes, or unusually severe weather.

Concurrent delay—delays that occur when two or more delays are created within the same time frame, both of which impact the project's completion date, and those for which it appears that both owner and contractor are responsible. Neither party can recover damages if concurrent delays occur.

Compensable delay—delays for which damages can be claimed and are caused by elements beyond the control of the contractor but within control of the owner, including the owner's design consultants.

At times, compensable delays may be cause for an owner to request that the project be accelerated so that the original completion date is maintained. This often occurs in commercial construction when an owner has signed leases for their rentable space, guaranteeing occupancy on a date certain and the monetary penalties for failing to meet that date may outweigh the cost to accelerate.

A public or private school must be able to meet the opening date, or even a sports complex faced with team schedules and opening day ticket sales may have no choice but to direct the contractor to accelerate if they have already agreed that the delays were compensable.

Documenting delays

Delays can be documented in several ways:

- By letter, advising the owner or architect of the delay, the reason for the delay, and the potential impact on the schedule (if known) or indicating an impact that is to be determined, if unknown.

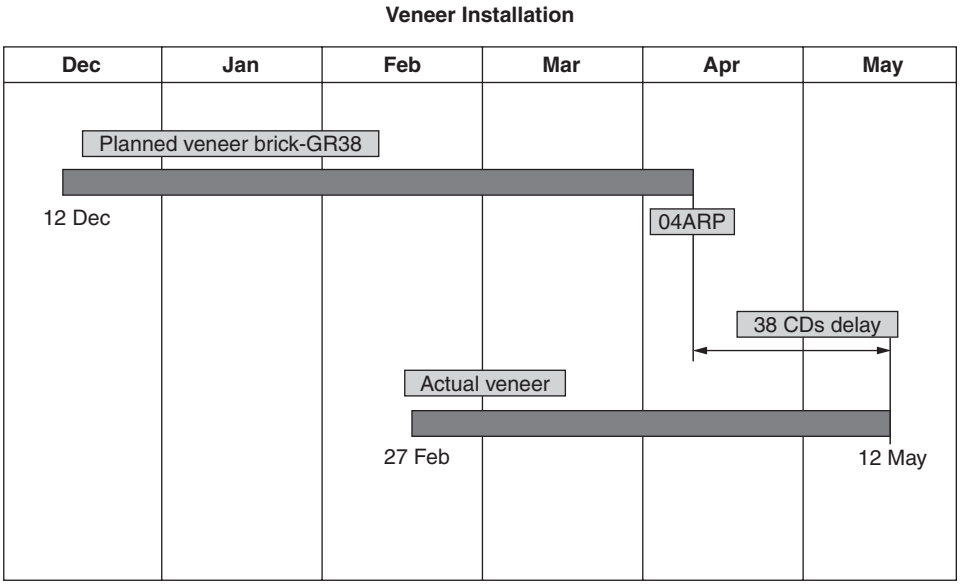

Figure 7-1 Bar chart representing mason subcontractor's brick veneer planned vs. actual schedule.

- By inserting a statement in the daily log to the effect that the general contractor or subcontractor has indicated a potential delay if a shop drawing is not returned quickly, or an RFI or other A/E queries are not answered in a reasonable time frame. The entry also can state that other trades may incur delays in their work, as an early warning sign in case this is needed later.
- By issuing a revised CPM schedule showing the impact of the delays and transmitting this revised edition to the owner/architect with an explanatory letter.
- By having affected subcontractors submit a "planned" versus "actual" subschedule of their work in support of a potential delay claim. Figure 7-1 is a simple planned versus actual bar chart submitted by a mason subcontractor installing a brick veneer façade.

Calculating the Cost of the Delay

There are any number of ways to determine the approximate cost of a delay, and the project superintendent, aware of the methods by which these costs can be compiled, will be more likely to recognize and track them as they occur. These costs can include:

- Added labor and material costs
- Added equipment costs or idle equipment costs

- Extended general conditions
- Labor or material escalation costs
- Lost productivity
- Subcontractor costs, including labor, material escalation, equipment rentals
- Bond fees and insurance premiums
- Interest on borrowed funds
- Home office overhead
- Costs to assemble and prepare documentation to support the delay
- Costs to prepare various CPM schedules including subschedules to support the delay claim
- Consultants engaged to collect, analyze, and prepare reports

The Total Cost Approach

This approach utilizes the total cost of the project minus its estimated cost and is used when the impact of the delay/disruption to the project is so pervasive that it is impossible to segregate the cost on any part or parts of the project. To prove a total cost claim, the burden of proof rests with the contractor to prove that their estimate was reasonable and that they incurred no extra costs beyond those created by the owner. In other words, the contractor didn't incur those extra costs because of the delay but did so because of a bad estimate of the work, bad buy-outs, or bad management of the work. The courts look askance at the total cost approach and have established fairly vigorous standards that the contractor has to meet; the original price must be accurate and complete in scope, any overruns cannot be as a result of performance problems encountered by the contractors unrelated to the claim and the actual additional costs incurred must be reasonable.

Modified Total Cost

This approach will deduct any contractor induced cost overruns from the total cost of the project leaving only those attributable to the delay. This will be presented as follows:

Actual cost minus: original estimated cost

Minus: extent to which the estimate was low

Minus: cost for which the owner is not responsible

This approach can often be employed when the claim involves an isolated activity such as site work, foundations, or drywall, for example, that have been affected by the dispute/claim.

Measured Mile Approach

This method compares productivity on the unimpacted portion of work with productivity on the impacted portion of the work. This works best when the activity, once again, can be isolated.

Cast-in-place concrete subcontractors often use this method to substantiate their claim for lost productivity. Years and years of pricing concrete by the cubic yard, including forming, reinforcing, placing, and form stripping generates "average" in-place cubic yard costs. Approaching a new project, the subcontractor will determine whether their database costs needs "tweaking" to reflect an increase in material or labor rates, the complexity of the new project or whether they can simply rollover the same cost structure as a recently completed job. When the production of cast-in-place concrete is disrupted by actions or inactions of the owner or general contractor, this subcontractor will begin to tracks costs going forward from the point of impact.

A hypothetical measured mile claim would follow this pattern, assuming a total contract to place 2500 cubic yards of concrete, half of which was placed under unimpacted conditions:

Estimate based on 2500 cubic yards at \$750.00/cy = contract amount of \$1,875,000

Unimpacted—1250 cubic yards @ \$750.00 = \$937,500 (measured mile)

Impacted—1250 cubic yards @ a cost of \$925.00 = \$1,156,250

Added cost due to delays \$1.156,250 – \$937,500 = \$218,750

Revised contract sum via requested change order = \$2,093,250

Request for an extra in the amount of \$218,750

Industry Estimating Guides

Industry guides such as R.S. Means, Sweets, and BNI Cost Books provide baseline estimating data that can be adjusted for geographic areas. However, many experts state that these guides are not as accurate as those developed by local contractors.

Any such guidebook estimating or online estimating service information should be cross-checked against locally developed database costs to validate one source or another.

Lost Productivity Concerns

When delays occur in the project and the general contractor notifies an owner that additional costs will probably ensue, most of these costs will originate with the subcontractors who generally perform the majority of the trade work on the job. Of course, general contractors who self-perform work also will be affected.

Lost productivity costs are one of the most difficult to present or dispute. There are a number of studies pertaining to lost productivity, but most have dealt with lost productivity associated with working extended hours. The Bureau of Labor Statistics, the Business Roundtable, the Construction Industry Institute, and the National Electrical Contractors Association have all conducted studies that show how productivity decreases significantly when a worker continues to work consecutive weeks with 2 to 4, or more, hours of overtime daily.

The Business Roundtable study reveals that worker productivity drops from 100 percent to about 87 percent after only 1 to 50-hour workweek.

The Mechanical Contractor's Association of America (MCAA) publishes a book addressing productivity in their industry, *Change Orders, Productivity, Overtime—A Primer for the Construction Industry*, and the concept in this manual has been accepted by some courts in cases dealing with lost productivity issues.

Some Court Decisions Relating to Productivity

A look at how the courts view claims for lost productivity will provide more insight into the complexity of this issue. The processes for establishing lost productivity set forth in the MCAA manual, available to their members and the public at large, have been recognized and referred to in several government review board decisions.

In the appeal of *P.J.Dick,Inc.(2001 WL 1219552 VABCA No.5597,01.2 BCA para 31,657* the contractor's expert testified that their client's labor productivity was impacted because of continuous revisions to the design. The same expert said that although the measured mile approach is often the preferred method of dealing with these increased costs, there was no period when the work was not affected by the design problems or the ensuing acceleration and that the damages should be based on the MCAA manual of change orders. The board found the contractor's quantification of loss based on this manual as a reasonable approach.

Hensel Phelps Construction Company vs. General Services Administration (2001 WL 43961) GSBCA 01-1, BCA Par 31,249 found the GSA board accepting the claimant's use of the factors in the MCAA manual affecting labor productivity. Once again, the Measured Mile was considered less accurate than the valuation produced by using the manual; it should be noted, however, that the claimant was a mechanical contractor.

In another case, *S.Leo Harmonay, Inc vs. Binks Mfg Co.* (S.D.N.Y. 1984 597 Supp.1014 (Harmonay), the U.S. district court upheld the MCAA manual labor inefficiency factors in ruling on a loss of productivity claim. The measured mile approach was used by the claimant but it was backed up by information gleaned form the MCAA manual. The court awarded damages based on Harmonay's claim that they had incurred a 30 percent loss in productivity as a result of the following factors, all of which combined to create confusion and frequent interruptions to the progression of work:

- Excessive work hours
- Overly crowded conditions

- Unavailability of tools, materials, and storage
- The defendant's delay in supplying drawings
- The constant revision of the contract drawings

Drawing Coordination Problems

The question of the contractor's responsibility to review the plans and specifications is often brought to light by an owner or their architect when subcontractors and the general contractor uncover significant coordination problems during the start of construction. One response might be, "You, the contractor, had an obligation to review the drawings and notify me (the owner or architect) promptly of any design, errors or omissions—just read Article 3 of the General Conditions in your contract."

Look at Article 3.2.2 of A.I.A. Document A201—General Conditions, in which it is stated just that wording. But read further, because 3.2.2 also states that this review is made only in the contractor's capacity as a *builder* and not as a licensed *design professional*. See also Article 3.2.3, in which it is stated that the contractor is not liable for errors, omissions, inconsistencies, or for differences between field measurements, unless the contractor recognized such error and *knowingly* failed to report them to the architect.

There are two aspects to drawing coordination problems: one has to do with the responsibility of the contractor to comply with the coordination process included in the contract's specifications, and the other concerns incomplete coordination by the various design consultants engaged by the architect—the civil, structural, and MEP engineers during their preparation of the bid documents.

The contractor's responsibility is to coordinate the work of the various trades, as called for in the specifications, which usually involves the installation of various systems and components in chases, partitions, and the space above the ceiling. A typical specification requirement will read:

Coordination Documents:

A. General: Prepare coordination drawings for areas where close coordination is required for installation of products and materials fabricated off-site by separate entities and where limited space necessitates maximum utilization of space for efficient installation of different components.

   Coordination drawings include, but are not necessarily limited to:

   a. Structure
   b. Partition/room layout
   c. Ceiling layout and heights
   d. Light fixtures
   e. Access panels
   f. Sheet metal, heating coils, boxes, grilles, diffusers and similar items
   g. All heating piping and valves
   h. Smoke and fire dampers
   i. Soil, waste, and vent piping
   j. Major water

k. Roof drain piping
l. Major electrical conduit runs, panelboards, feeder conduit and racks of branch conduits
m. Above ceiling miscellaneous metal
n. Sprinkler piping and heads
o. All equipment, including items in the contract as well as OFCI and OFI (owner furnished items)
p. Equipment located above finished ceiling requiring access for maintenance and service. In locations where acoustical lay-in ceilings occur, indicate areas in which the required access area may be greater that the suspended grid system
q. Existing conditions, including but not limited tio, mechanical, plumbing, fire protection and electrical items
r. Seismic restraints

The contractor shall circulate coordination drawings to the following subcontractors and any other installer whose work might conflict with the other work. Each of these subcontractors shall accurately and neatly show actual size and location of respective equipment and work. Each subcontractor shall note apparent conflicts, suggest alternate solutions and return drawings to the contractor .

1. Elevator subcontractor
2. Plumbing subcontractor
3. Fire protection subcontractor
4. Electrical discipline subcontractor
5. Control system subcontractor

When the contractor determines that all equipment or piping will not fit in its allotted space and advises the architect, they should receive directions on how to proceed, that is, lower the ceiling height, increase a wall section or chase, or possibly change the size or configuration of ductwork to avoid conflicts and ensure that everything fits. Sample Letter 67 can be used as a framework for advising the architect of conflicts, offering options, and requesting a prompt response to avoid effecting job progress.

This is a rather straightforward process and, at times, a subcontractor may incur an extra cost for the changes required. If this is the case, this request will be passed on to the architect for review and either comment or approval.

Major coordination problems occur when the contract drawings have not been properly coordinated and issued as bid documents. The contractor has a right to assume that these drawings are substantially correct, but the attention to detail that accompanies start of construction often uncovers major problems with the "contract" drawings that surface at that time.

Problems that Inadequate Coordination Create

Nothing creates more havoc on a construction site than the discovery of serious coordination problems in the "issued for construction" drawings.

- Foundation drawing dimensions that fail to line up with the column dimensions of the superstructure.

Company Letterhead

Architects Associates
555 New Hampshire Place
Washington, D.C. 22222

Re: Capital Towers
Washington,D.C

Attention: Mr. John Baker

Dear Mr. Baker:

During the coordination process, we determined that the size of some ductwork above the ceiling in Rooms 205-210 will not fit in its allotted space. In order to permit all electrical, plumbing and fire protection piping and associated fittings to fit into the 22″ space above the ceiling and maintain the design ceiling height, we recommend that the configuration of the 24″ x 16″ inch duct be re-configured to 36″ x 12″.

If this is not acceptable, we recommend that the ceiling height be dropped from 8′0″ to 7′9″ to accommodate all MEP and fire protection work.

Either options can be achieved at no additional cost to the owner. We would appreciate your response not later than (date) in order not to effect job progress.

With best regards,

Project Superintendent

Letter 67 Letter to architect advising of conflict in coordination process and recommended solutions to the problem.

- Openings provided for pipe and duct risers on the structural or architectural drawings, or both, in conflict with the size and location, or both, as depicted on the MEP drawings.
- Elevator shaft opening locations and dimensions, or both, shown on the structural drawings are at variance with the architectural drawings.
- Prestressed slab edge dimensions varying from the architectural thereby throwing all riser/duct risers out of kilter

And the list can go on.

The architect's obligation

A typical architect and engineering services agreement with an owner will read something like this, when referring to the preparation of coordination drawings:

> Prepare coordination drawings in CAD with each trade/discipline on a separate layer, in specified color. The Architect/Engineer shall submit reproducible copies of CAD drawing files in the order described here:
>
> a. Structural drawings shall include location and sizes of column, beams and other structural members as well as wall, roof and slab penetrations and will be provided to mechanical, electrical, low voltage and plumbing Design Engineers for coordination. Structural items shall be indicated using black lines.
> b. HVAC design engineer shall indicate all ductwork, piping and equipment complete with installation and service clearances, duct and pipe sizes, fitting types and sizes, top or bottom of pipe elevations, distances of pipes and equipment from building reference points and hanger/support locations. Upon completion, drawings shall be forwarded to the plumbing design engineer for further coordination. HVAC items shall be indicated using orange lines.
> c. Plumbing design engineer will indicate all plumbing lines and equipment complete with installation and service clearances, pipe sizes, fitting types and sizes top or bottom of pipe elevations, distances of pipes and equipment from building reference points and hanger/support locations. Upon completion, drawings shall be forwarded to the electrical design engineer for further coordination. All plumbing items shall be indicated using blue lines.
> d. Electrical and Low Voltage design engineer will indicate service and feeder conduits runs and other electrical equipment complete, including low voltage with installation and service clearance, sizes, top or bottom of conduit and rack elevations, distances from building reference points and hanger/support locations. Upon completion all drawings are to be forwarded to the architect.

These procedures will be of value to the project superintendent, if contract drawing coordination problems arise. These are some of the standard procedures that an architect should follow. Do you think your problems have occurred because one or more of these steps had not been taken?

The precedence of services for coordination drawings

If and when conflicts occur during the general contractor's coordinated drawing process, there are certain guidelines that can be followed to resolve conflicts.

1. Structural and partitions have the highest priority, followed by:
2. Equipment location and access for service and maintenance
3. Ceiling system and recessed light fixtures
4. Gravity drainage lines—waste, storm water
5. High-pressure ductwork, fire dampers, and devices
6. Large pipe mains, their valves, and other related devices
7. Pneumatic tube and material conveying systems

8. Low-pressure ductwork, diffusers, registers, grilles, and HVAC equipment
9. Fire protection piping, hangers, associated devices, and heads
10. Small piping, tubing, electrical conduit, and related devices
11. Sleeves through rated partitions
12. Access panels

Using these precedents as a guide, the general contractor can advise the architect that conflicts have developed during the subcontractor coordination process, and this order of precedents will be used to resolve those conflicts.

Help Is on the Way—Building Information Modeling (BIM)

New software programs available to the architect and engineer have changed the design process from the creation of a two-dimensional paper plan approach familiar to us all, to a computer-generated three-dimensional model. This process is known as building information modeling (BIM) and the 3D model that it produces is called a building information model, a parametric representation of the project from which observations can be made and data extracted to improve the quality of the building during the design stage. By adding "time" to the model representing the actual sequencing of construction, BIM adds another dimension—the fourth, or 4D. When the program produces quantities of materials as the design progresses, this is called the fifth dimension, or 5D.

The BIM process allows each contributor to the design, architect, structural, civil, and MEP engineers, to see what their predecessor has produced so they can comment on any changes that they need to make to incorporate their portion of the work into the project, before anything is finalized and printed out on paper.

As an example, a 3D image created by the structural engineer is passed around, electronically, to the architect and the MEP designers who add their components. Conflicts among piping, ductwork, and electrical components will be immediately identified through a clash check, and the necessary corrections can be made, allowing design to continue. The old process of checking for errors and coordination problems before issuing the construction drawings will have taken place during design and not afterward.

Tocci Building Companies, headquartered in Woburn, Massachusetts, is a provider of CM and design-build construction services and employs BIM to better serve their Northeast client base. They are able to spot simple conflicts during the preconstruction stage using BIM, saving their clients both time and money. Figure 7-2 is an example of the process Tocci employs, whereby the MEP designer having little latitude in redirecting a gravity flow sanitary line causes a conflict with the structural steel designer's W8 $\times$ 28 beam. A solution is to increase the size of the beam to a W24 $\times$ 55 to afford adequate beam penetration and keep the sanitary line in its gravity mode. When this change is made in the design stage, its cost is approximately $1400; if corrected in the field

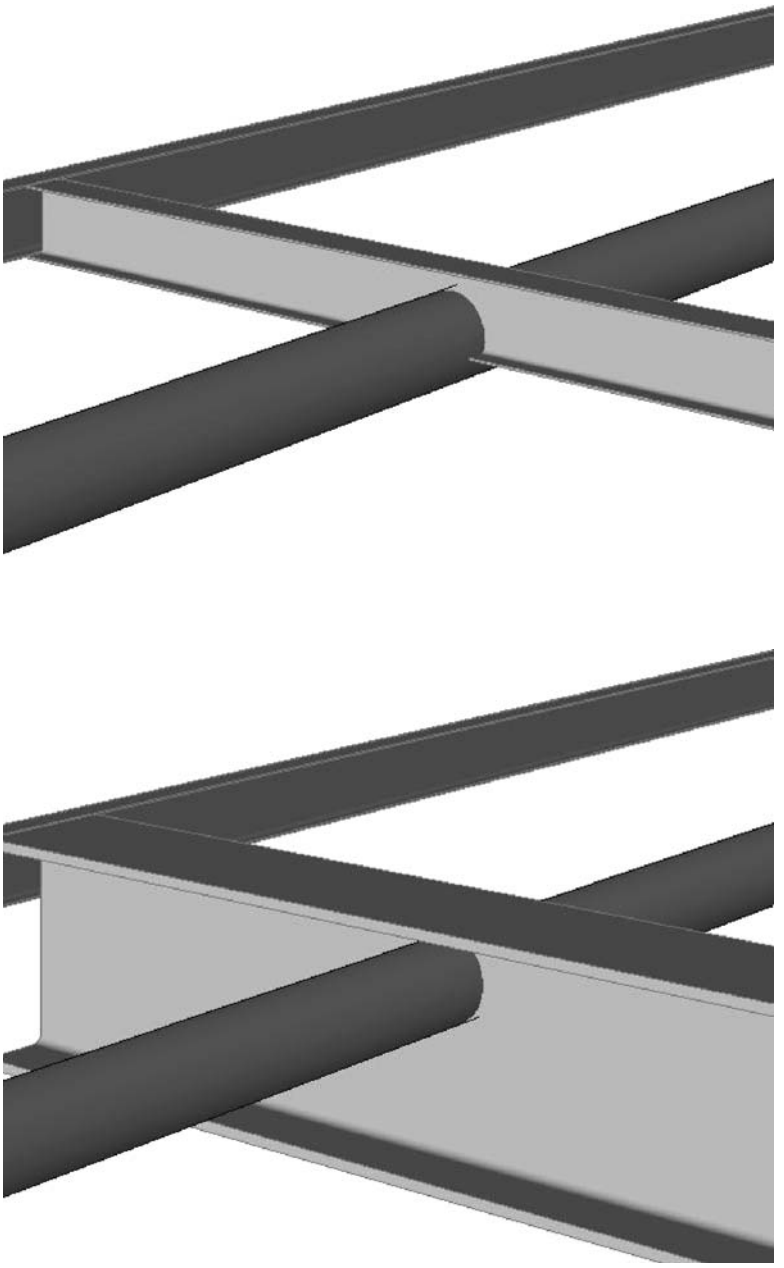

Figure 7-2 Conflict between sanitary line and steel beam uncovered and corrected during BIM design process *(Courtesy—Tocci Building Companies, 660 Main Street, Woburn, MA).*

during construction, the cost soars to about $27,000 according to Tocci's calculations.

Shop drawings also can be created during this design process, and, carrying that step a little further, if a steel subcontractor has already been engaged by the general contractor, a cutting list can be prepared after the steel design has been completed, shipped to the mill to obtain a rolling schedule, and dramatically speed up the entire structural steel cycle.

Tocci also uses BIM to create a virtual schedule that can be used to compare with actual construction progress in the field. Figure 7-3 shows this scheduled progression of construction activity in these simulated progress presentations:

- 12.22.06—Concrete slabs on grade completed, bearing walls in progress
- 01.05.07—Bearing walls in progress, portion of second-floor deck poured
- 02.23.07—Upper floor and wall construction in progress
- 05.18.07—Roof deck in place, penthouse construction under way
- 06.08.07—Roofing complete except for certain areas of penthouse

John Tocci, the company's principal, lists several builder-specific benefits when BIM is integrated into the project design:

- The ability to identify collisions between various design components during the design and preconstruction phase, thereby avoiding them in the field.
- The ability to visualize the building and construction in a simulated environment.

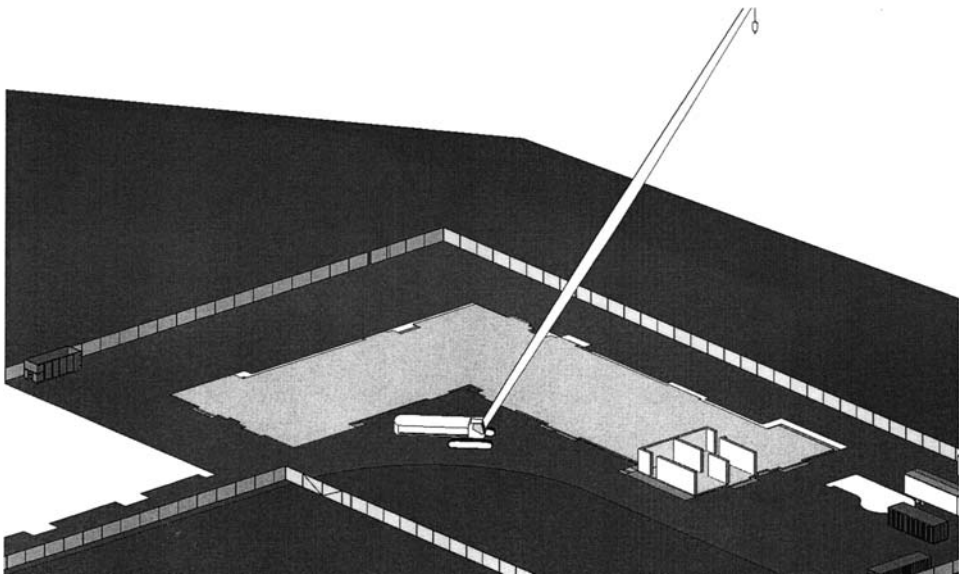

Figure 7-3 Using BIM to develop a virtual building construction schedule *(Courtesy—Tocci Building Companies, 660 Main Street, Woburn, MA).*

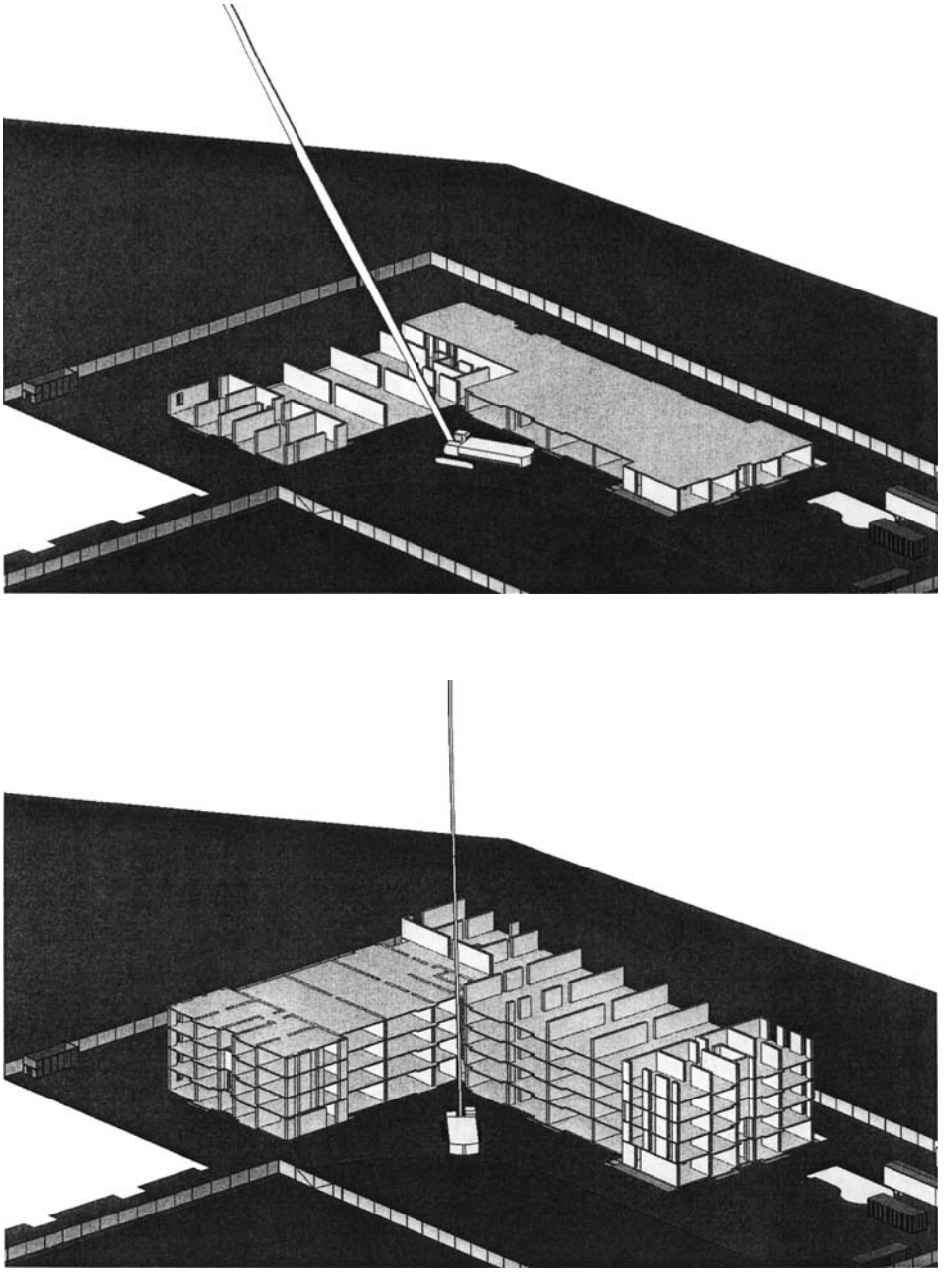

Figure 7-3 (*Continued*)

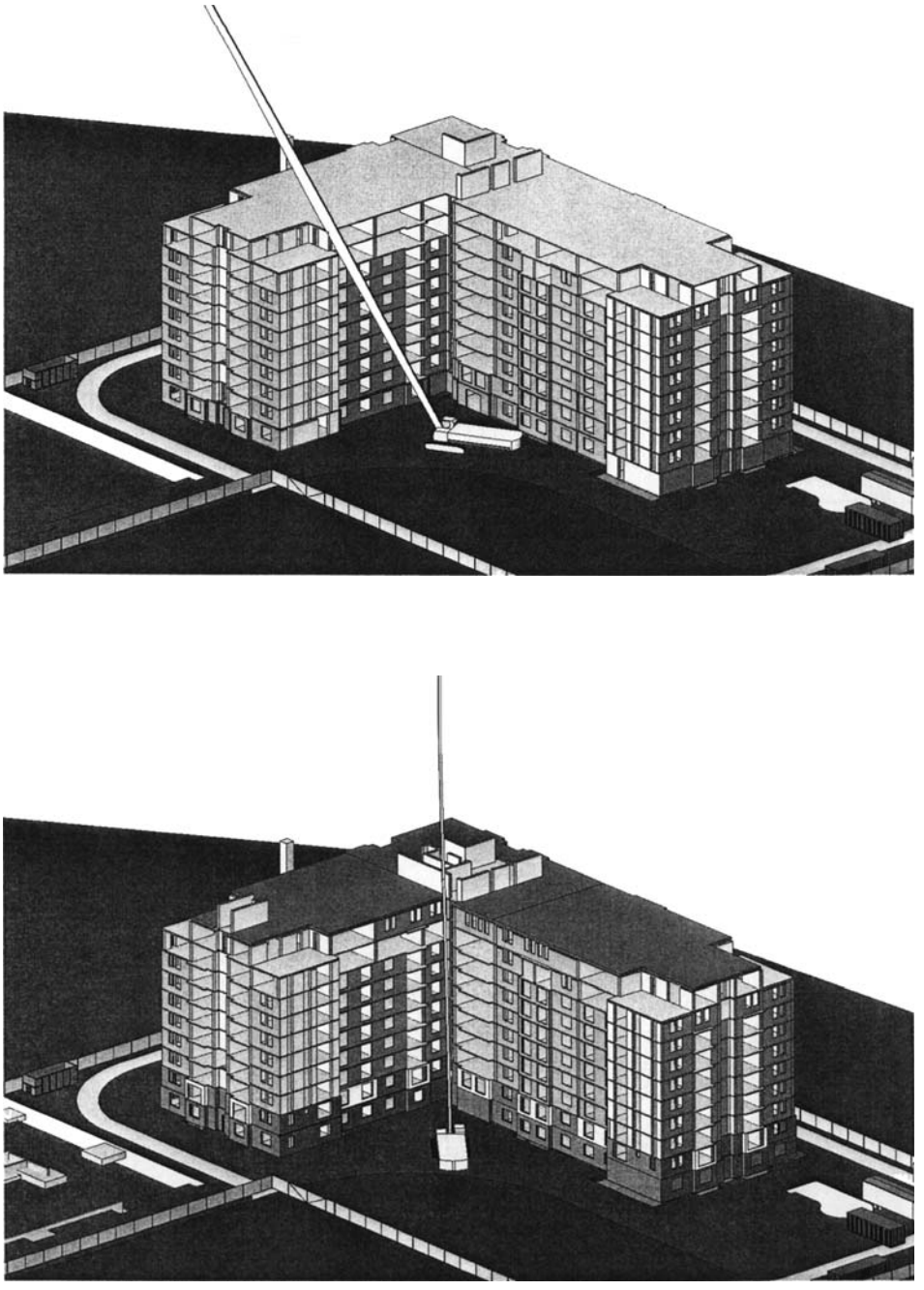

Figure 7-3 (*Continued*)

- The ability for all parties to do "what if" scenarios: aesthetics, cost, schedule.
- Higher reliability of unexpected field collision events allows for more off-site prefabrication of various components.
- More accurate exploration of value engineering possibilities.
- Partial trade coordination efforts performed during the design process, which reduce or eliminate this time-consuming operation when performed in the field.
- Reduction in general contractor or subcontractor Requests for Information, again a time-saving benefit.

As more and more owners recognize the value of BIM, contractors and design consultants will wonder how they ever operated without it.

Acceleration—Defined and Pursued

When extensive delays in the project occur and these delays are recognized by an owner as compensable, the owner may request the contractor to *accelerate* the work to complete the project as originally scheduled.

The term "acceleration" ought to be a part of every superintendent's vocabulary, because when it happens, it can unleash a whole torrent of actions—and problems.

Acceleration, in the legal sense, occurs when an owner recognizes that there have been delays to a construction project that ordinarily would extend its completion date, but the contractor is directed to maintain the original project completion schedule.

These instructions from an owner are known as a *demand for acceleration*. As discussed previously, the reasons for requesting acceleration are varied:

- If the "owner" is a public or private school and the delays encountered will prevent the school from opening in the Fall as planned, there is a strong need to complete the project as originally scheduled.
- Where loss of business because of late occupancy must be avoided or at least lessened.
- To take advantage of some tax breaks or depreciation.
- Vacating a previously functioning leased facility with a fixed lease when it is not possible to extend the lease or when the month-to-month costs are exorbitant.
- Work in a sports complex such as a baseball stadium must be completed by opening day, or as least those parts of the project that will impact the start of baseball.
- An owner of commercial space who has promised a tenant occupancy on a date certain may incur sufficient penalties to justify the cost to accelerate completion to allow occupancy per the terms of the lease.

There are two types of acceleration:

- Actual acceleration—occurs when an owner directs the contractor to complete the project ahead of the schedule as stated in the contract for construction.
- Constructive acceleration—occurs when the contractor is delayed by some owner/architect action or inaction. If the contractor has requested a project completion extension but the owner directs the contractor to complete the project according to the initial baseline schedule, constructive acceleration has been created and the contractor can pursue efforts to obtain monetary relief.

The legal elements of acceleration

The legal elements required to establish a claim for *constructive acceleration* are:

1. There is an excusable delay that entitles the contractor to a time extension.
2. The contractor submits a written request to the owner/architect for that time extension.
3. The request for a time extension is denied.
4. The owner issues a directive to accelerate performance to complete the project within the original time frame.
5. The contractor proceeds with the work at an accelerated pace and documents all costs associated with this process.
6. The contractor notifies the owner of their intent to file a claim to recover the costs to accelerate if the owner rejects the contractor's change order for the work.

There is a wide chasm between the theoretical approach to acceleration and the practical approach, much of which depends on the relationship between the owner and the contractor up to that point. If there is a lack of trust between both parties, the process of acceleration will become a nightmare; if there is trust between both parties, the process will become one of negotiation.

Acceleration and the problems it creates

Where a need to accelerate occurs in a geographic area of tight labor availability, many complications arise. There may not be enough workers available to increase existing crews; carpenters may have accelerate their work to complete the partition framing on, say, the second floor; and a shortage of plumbers may cause this area to remain idle while efforts are made to hire more plumbers or engage another plumbing contractor (at a premium) to augment the prime's workforce. The owner may question why they have paid the framing crew premium rates to accelerate the work and that area now stands idle.

This labor problem can manifest itself in other ways: Does it pay to keep a small crew of electricians on standby to wait until the framing crew completes their work, knowing that the electrical subcontractor either wants to be paid

for standby? Or they will take this crew to a productive site where they can generate income? If they demobilize that crew, they cannot guarantee that they will be able to return them to the acceleration site when requested.

Will the owner understand such a strategy and agree to reimburse the contractor for the cost of standby idle labor?

This is just one example of some of the traps that await the project superintendent.

It is extremely difficult, if not impossible, to assess precisely the true costs to accelerate a project. In most cases, there are too many variables that impact the clear path to definitive costs.

The general contractor must take into consideration:

- Additional field supervisory personnel to cover subcontractor shift work, possibly including added benefits such a meal allowance, increased travel pay to compensate for irregular working conditions.
- Potential increases in field office space, equipment, supplies.
- Additional home office staff to process more detailed payroll reports, possibly assigning one person in the office to handle acceleration documentation exclusively.
- Additional management personnel, assistance project managers, several field engineers to track and document acceleration activities and to substitute for the regular team on overtime and weekend work.
- Costs to heat or cool the building under construction during shift work and weekend work.
- Additional trucking costs to expedite materials that cannot wait for normal delivery schedules.
- The acceleration effort may preclude the general contractor from taking on new work because key managers and administrators are tied down to this site, hence, loss of profit or underutilized home office overhead.

Subcontractors will claim:

- They have been impacted by trade stacking, a situation in which one trade is working so closely behind, in front of, or overhead of another trade that it drastically affects their productivity.
- Out-of-sequence work, in which one trade is not allowed to complete their work from start to finish but must leave the area with work unfinished to allow another trade access, only to come back at a later date to complete their work.
- Lost productivity caused by any number of occurrences—working extended hours over a long period of time, for example, 3 to 4 weeks; lack of experienced personnel and inadequately trained workers that are less efficient and may produce substandard work requiring rework; waiting for materials or specialized tools and equipment.

All of these events affect costs, but they are all difficult to quantify and, when presented, equally difficult to defend. And it is easy for subcontractors to become overly ambitious in their presentation of their anticipated costs to accelerate.

Some of these subcontractor claims can include compensation for:

- Direct field overhead—more supervision required, an additional field office with all related costs of equipment and supplies.
- Indirect overhead—additional home office support staff and home office expenses if weekend or after-hours work is required.
- Loss of efficiency—as a result of any of the factors listed here; out-of-sequence work, trade stacking, and so on.
- Additional storage and handling costs to ensure that the added labor force has sufficient materials on site in case deliveries are slow or not available at night or on weekends.
- Interest on borrowed money to provide funds to meet higher payroll costs and stockpiled materials.
- Additional equipment brought to the site to cover peak work periods, which may remain idle during normal operations.
- Standby crews or additional pay incentives to persuade existing crews to work late shifts or weekends.

Documenting to lessen misunderstandings

Asking a subcontractor to submit a "not to exceed cost of work" will probably be cause for them to include a sizable contingency, and because it will be nearly impossible to determine, up front, the cost of this work, this contingency may well be warranted.

Having subcontractors submit acceleration costs on a weekly basis so that they can be reviewed by the project superintendent and the project manager when the work is fresh in everyone's mind is a good approach. These costs can be packaged and presented to the owner, also on a weekly basis with the intent of notifying them of the order of magnitude of the costs to date and with a qualifier that further review and analysis will be required before these costs are submitted for final approval.

Each subcontractor engaged in the acceleration effort should attempt to project their manpower and associated activities and present daily requirements to meet the accelerated pace. These documents also should be reviewed with the owner or their representative each week and all comments documented in a memo to the owner. Timely communication is essential during this entire process.

Communicating with the owner

Even an owner's agreement on interim costs can quickly disappear as more costs continue to accrue and these daily/weekly reports will keep that owner apprised of the direction in which the projected total costs is heading.

Start by acquainting the owner with the various methods of presenting the elements in an acceleration claim: measured mile, total cost approach, the concept of lost productivity as outlined in the MCA manual, trade stacking, and so on, so that they can gain some insight into the contractor's thinking as these costs are assembled. This may enlighten them to the difficulties in segregating these costs.

Because so many of these costs will be subjective, the potential for disagreement will be great, and prompt resolution is critical to any settlement of an acceleration claim.

Some Ground Rules for the Difficult Issues Addressed in This Chapter

Construction superintendents over their long and varied careers will encounter the difficult site conditions and coordination problems discussed in this chapter, as well as other situations of a similar nature that severely impact their daily work schedules.

The ground rules for dealing with these and other difficult situations can probably be distilled down to the following:

- Establish an environment of trust with the owner and their design consultants.
- Establish an environment of trust and fair dealings with the subcontractors on the site.
- Do not play the "blame game" but recognize the fact that others may not be entirely responsible for the problem.
- Resolve disputes quickly and equitably—do not allow them to linger, because each party becomes more entrenched as time goes on.

Someone said that a successful negotiation is one in which neither party is entirely happy with the results—not a bad concept to remember.

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End of Lesson Wrap-Up

Congratulations on completing this lesson! You've taken another important step in your journey to becoming a certified professional in the construction industry.

Up Next: Quiz Time

Before we move forward, there's a short quiz waiting for you. Remember, this quiz isn't designed to trip you up but to reinforce your understanding of the concepts we've covered. It's a way to ensure that you have grasped the essential elements of the lesson and are ready to build on this knowledge in subsequent modules.

You're Doing Great!

You're doing an excellent job so far, and we encourage you to keep up the momentum. Every quiz and lesson is a building block towards your ultimate goal of certification and professional advancement.

See You in the Next Lesson!

We are excited to continue this journey with you and look forward to seeing you in the next lesson. Keep up the great work and stay motivated—your future in construction management looks promising!

Keep learning, keep growing, and remember, we are here to support you every step of the way. See you soon for more learning and development

Contact Information:

Construction Management Certification
Website: www.ConstructionManagementCertification.com
Email: support@ConstructionManagementCertification.com