NAC Executive Insights

Estimating Construction Change Orders

Key Points

- Change orders are an inevitable part of construction. Both owner and contractor should expect changes to occur.
- Development of change orders requires a high-quality estimate to protect both the contractor and owner.
- Change logs must be current, comprehensive, and well documented.
- Change order estimate processes and procedures should be clearly established and reviewed and agreed to by the client before the first change order and are best incorporated into the contract.
- Change order estimates must clearly describe the change for which relief is being sought by contrasting the changed state with the contract baseline.
- Projects with high degrees of change experience stress, which limits communication when more communication is required.
- Trust is essential, but complete and timely records facilitate trust.

Introduction

Change orders are an inevitable part of construction projects. Change orders are revisions or additions to an existing construction or engineering contract and are used to modify the original agreement of the parties.

Typically change orders are used to adjust scope, price, and/or schedule after the contract is executed. Change orders must meet prerequisites for valid formation (offer and acceptance). Each change order must:

- Identify the contract section being changed.
- Specify the change in the work or services.
- Specify what each party will provide/promise as part of the change.
- Specify the authority of the parties signing the change order.

Change is defined as “an alteration or variation in scope or schedule for completing the work required for the project.” Two common categories of scope change include directed changes by the owner and constructive changes identified by the contractor as a result of the action or inaction of the owner. Directed changes can become constructive changes if the contractor believes they are impacted by the directed change.

A change also can include revisions to the contract's terms and conditions as well as changes to various management and administrative processes.

Changes arise from any of several potential sources, including:

- Changed owner requirements/project scope
    - These may occur even before contractor is on site.
- Changes to long-lead equipment or materials, including owner-furnished equipment and materials
- Changed geotechnical conditions
    - Material/hydrological
    - Hazardous/toxic materails
- Changed regulatory requirements
- Delays in permitting, especially environmental permits
- Delayed apperovals from owner
- Third-party delays outside the contractor's control
- Owner requested acceleration or slow down
- Delayed receipt of owner-furnished equipment and materials

The list is far from comprehensive since it focuses on changes from outside the contractor's control. Change orders also can result from initiatives arising from the contractor. These can include:

- Project acceleration (creating a benefit for owner).
- Changed means & methods to minimize potential regulatory or third-party concerns and risks.
- Changed project execution methodology to respond to changes in labor availability or quality.
    - Offsite fabrication and modularization are examples.

Development of change orders requires a high quality estimate to protect both the contractor (by ensuring that all costs of change have been considered) and the owner (to ensure they are not paying for the same elements of work twice). All project participants should have a comprehensive, workable and agreed to process for identifying and managing change. Well developed estimates of construction change orders become even more important in any dispute resolution process that may result.

High Quality Estimate

Most construction change orders arise as the project work is underway and as such, the estimate quality should be very high. This would tend to be equivalent to a Class 1 estimate as defined by AACE International (Association for the Advancement of Cost Engineering)[1]. In some instances, owner driven changes occur early in the project, sometimes between bid and initiation of work, and as such, use of a Class 2 bid type estimate may be more appropriate.

[1] Other cost estimate classification systems exist and are used in various international settings.

Class 1 estimates are generally prepared for only portions of a project and in the case of a change order estimate only for those portions of the project directly or indirectly impacted by the change. Class 1 estimates are typical in subcontractor bids or in check estimates performed by the owner, construction manager, or quantity surveyor.

Class 1 estimates tend to be highly deterministic and are underpinned by specific cost lines in the original estimate or the cost baseline already established for the project. Key determinants in change order estimate accuracy include:

- Project complexity.
- Quality of change information and understanding of extent of change and its implications.
- Impact of any resultant engineering changes.
- Contingency determination, especially as it relates to:
    - Schedule impacts from out of sequence construction.
    - Degree of correlation among various elements of the project work breakdown structure.
    - Impacts on indirect field costs.
    - Degree of rework required.

Class 1 estimates typically have accuracy in the range of -10 to +15 percent, while Class 2 estimates would be associated with a range from -15 to +20 percent.

Elements of Good Change Management and Estimates

Good quality change orders are founded on a high quality change management process that is both well documented and timely. Delay and slowed decision making are project killers and directly and indirectly impact project outcomes.

Elements of high quality change management and change order estimates include:

- Clear and unambiguous understanding of the owner and contractor's roles:
    - Owner Role
        - Owner has unilateral power to change work within limits, for example:
            - revise designs
            - correct defects or deficiencies in the plans and specifications
            - revise schedule
        - Owner's change order direction should include all needed information to make a reasonable and realistic estimate of increased costs and time, such as changes that:
            - affect the scope of work.
            - adjust the contract sum.
            - extend the completion date.

                - amend the contract.
            - Must be documented with a change order.
    - Contractor Role
        - Identify the cost of the change.
        - Contractor may request a change order for reasons such as:
            - unknown conditions, e.g., subsurface conditions.
            - use of substitute materials or equipment.
            - deficiencies in plans and specifications.
        - Contractor's change order request should include:
            - reason for proposed change.
            - reference to the plans and specifications relating to the change.
            - benefit to owner and project, and effect of change on project sequence.
            - effect of proposed change on contract time and price in sufficient detail to permit proper evaluation by owner.
            - reasonable but definite time period for owner to accept or reject change proposal without creating a delay in project schedule.
- A shared understanding on base contract scope is essential.
    - Resolution of differing interpretations of functional specifications and scope is essential to change management.
    - Functional specifications do not sufficiently define scope since owners and designers often have different interpretations. Comprehensive scope discussions on interpretations should occur and be documented.
- Change logs must be current, comprehensive, and well documented.
    - Change logs should record delays caused by owner actions, such as provision of information and longer than contractually provided for review and approval periods.
        - An efficient Request for Information (RFI) process is essential.
        - Timely notification, no later than the time frames required in the contract, is important to both project performance and the management of change.
    - Change logs should reflect ongoing, frequent "small changes" by owner and any imposition of added testing, signoffs, or excessive meetings.
    - Attention must be paid to any contractual notification requirements even if no change order for time or money is sought.
    - Changes and change orders often exceed expectations. Change logs and the basis for a change should be kept current and shared with the client even if not ultimately recoverable.
- Change order estimate processes and procedures should be clearly established and reviewed and agreed to by the client before the first change order. Preferably the basis for change order estimates is established in the prime contract.

    - Change order estimating procedures need to allow for higher contingencies than base estimates to account for disruption. These procedures should be reflected in the contract.
- Change order estimates must clearly describe the change for which relief is being sought by contrasting the changed state with the contract baseline.
    - Change order scope suffers from the same challenges as contractual baselines, namely incomplete or inadequate scope definition.
- Change order estimates must:
    - Explicitly state the uncertainty associated with an estimate.
    - Recognize and explicitly state that the expected value does not include unknown risks not explicitly considered by the estimator. Recognize that any sensitivity analyses suffer from the same shortcoming.
    - Recognize and apply extra effort when multiple changes are occurring simultaneously.
    - Disruptions caused by single changes are amplified if multiple changes are occurring simultaneously. There is a network effect.
- Project acceleration sets up new feedback loops with amplifying effects (positive or negative).
- Projects with high degrees of change experience stress, which limits communication when more communication is required.
- Trust is essential, but complete and timely records facilitate trust.
- Change order work must be approved before proceeding.

Summary

Change may be the only constant in construction and, by extension, change orders are a way of life. Both owner and contractor require high quality estimates of change. These estimates are best founded on high quality project scopes and other baselines. The basis for change order estimates begins with a robust description of the change and is ideally undertaken within a framework for change estimates agreed to at time of contract.

About the Author

Bob Prieto was elected to the National Academy of Construction in 2011. He is a senior executive who is effective in shaping and executing business strategy and a recognized leader within the infrastructure, engineering, and construction industries.