



Effective Change Order Management

James M. Bolin

Copyright © 2018 Long International, Inc.



LONG INTERNATIONAL



Effective Change Order Management

James M. Bolin

Table of Contents

ABSTRACT..... 1

1. CHANGE ORDER DEFINITION AND OTHER CHANGE ORDER-RELATED CONSIDERATIONS 2

2. FACTORS THAT ESTABLISH A CHANGE ORDER..... 4

3. CHANGE ORDER BACKLOG 6

4. FACTORS RESULTING FROM CHANGE ORDERS THAT INFLUENCE A PROJECT’S PERFORMANCE AND COSTS 7

5. METHODS FOR CHANGE ORDER BASIS OF CALCULATION..... 9

6. PROCEDURES FOR INITIATING A CHANGE ORDER..... 10

7. EVALUATION AND VERIFICATION OF COSTS 12

7.1 UNIT PRICE12

7.2 LUMP SUM.....12

7.3 TIME AND MATERIALS (T&M).....14

8. EVALUATION OF TIME IMPACT 15

9. CHANGE ORDER NEGOTIATIONS AND RESOLUTION 16

10. FINALIZATION OF THE CHANGE ORDER 18

10.1 CHANGE ORDER (FORM 04).....18

10.2 CHANGE ORDER LOG (FORM 05).....18

10.3 MONTHLY PROJECT SCHEDULE UPDATES.....18

10.4 RECORD OR AS-BUILT DRAWINGS18

11. CHANGE ORDER PROCEDURES AND RECOMMENDED PRACTICES..... 19

12. THE CHANGE MANAGEMENT PROCESS 21

13. SUMMARY 23

REFERENCES..... 24

List of Figures

Figure 1: Example of a Construction Change Order Procedure..... 22



Effective Change Order Management

James M. Bolin

Table of Contents

(continued)

APPENDIX: SAMPLE CHANGE ORDER FORMS

FORM 01 – DEVIATION REQUEST	A - 1
FORM 02 – INITIATOR CHANGE ORDER REQUEST	A - 2
FORM 03 – CHANGE ORDER TECHNICAL JUSTIFICATION	A - 3
FORM 04 – CHANGE ORDER.....	A - 4
FORM 05 – CHANGE ORDER LOG.....	A - 5



Effective Change Order Management

ABSTRACT: The preparation, estimation, and resolution of Change Orders can present challenges to any engineering and construction project. The all-too-common practice of ignoring, delaying, or taking a prejudicial approach to the processing and resolution of Change Orders can potentially lead to distrust between the parties while the issues remain unresolved. This inappropriate practice often results in an interruption in the flow of the work, an increase in the costs of the project, delays to contract milestones, and possibly an extended date for project completion.

Change Orders can also become unmanageable if the process is not sufficiently defined, or if the individuals involved in the preparation and administration of the Change Orders on a project are inexperienced. As is often the case, claims and disputes occur when the Change Orders on a project are not properly addressed. Therefore, the timely resolution of Change Order issues is key to a project's success.

The following topics are discussed:

- Change Order definition and other Change Order-related considerations;
- The reasons that a potential Change Order may be introduced on a project;
- Factors resulting from Change Orders that influence a project's performance and costs;
- The various methods of calculation that may be used to estimate the cost of a potential Change Order;
- Procedures for initiating a Change Order;
- The development of an independent estimate for the owner's¹ use in comparing and validating the contractor's Change Order cost proposal;
- Review of the contractor's request for an extension to the time for project completion as a result of a Change Order;
- Successful negotiation and finalization of a Change Order; and
- Change Order recommended practices and procedures.

¹ The term "owner" herein implies reference to the owner or the owner's representative.



Effective Change Order Management

1. CHANGE ORDER DEFINITION AND OTHER CHANGE ORDER-RELATED CONSIDERATIONS

A Change Order is a document that contractually alters an original agreement between the signed parties. Relative to construction, a Change Order is the result of an owner-approved revision to terms and conditions (*e.g.*, scope of work, timeframe for performance, price, etc.) that are defined in a contract for a project.

Comparatively, Field Work Orders (FWO) are directives from an engineer or construction manager that either clarify or request minor changes to the contract documents. FWOs are typically minor revisions that usually do not have a significant impact the contract budget or schedule.

Change Orders can be either directed by the owner or requested by the contractor. Depending upon its specific requirements, a change may or may not impact a project's contractual cost and schedule. In the circumstances that the cost is affected, a change may be represented as either an increase or a credit. Similarly, the durations of activities in a project schedule that are identified with a change may be extended or reduced. If these activities are on the schedule's critical path, the date for the completion of a project may be impacted.

It is important that the scope of the work for the project be completely defined in the contract so that disagreements over scope changes can be minimized. However, it is common on projects that the parties find disagreement over what scope or factors may comprise a change order and/or its impact. This disagreement is not unusual because the nature of each change will predictably affect each party in different ways.

The resolution of Change Orders can also become the source of disputed issues between the owner and the contractor on projects. The disputed issues become further intensified if the change order process is inadequately managed. The owner's and the contractor's diverging and competing interests relative to the changes on a project may also become a factor in judiciously resolving the differences.

The owner's priorities are focused on predicting and controlling the costs so that the funding, which is budgeted for a project, does not become jeopardized. Also, the owner usually places a high priority on achieving a certain completion date for the project, and often will include contractual liquidated damages to be paid by the contractor if the contractual completion date is not achieved, absent any delays for which the contractor may be entitled to a time extension.

For the contractor, Change Orders entail several factors, which can be potentially complicated. First, Change Orders are often viewed as a means of increasing the scope of a project and offer a source of additional revenue. However, this supplemental work can also present the contractor with the problem of having to proceed with the completion of change-related scope of work prior to negotiating and finalizing the entitlement and payment for a change. The contract may require the



Effective Change Order Management

contractor to proceed with the extra work pending the resolution of the valuation of a Change Order, which may also require the contractor to finance the cost of the alleged additional work until resolution occurs. The contractor will normally proceed with scope changes if it is confident that it will be fairly compensated for the alleged extra work at a later date. The contractor also has an incentive to complete the contract work in a timely manner because “time equals money,” *i.e.*, the contractor’s field staff and other time-related costs continue to rise if the contract work is delayed beyond its planned completion date.

Construction contracts often include conflicting clauses regarding changed work. On one hand, a contract may state that the contractor cannot proceed with the work for a change in the absence of a written and approved Change Order. On the other hand, language in a contract may also state that the owner has the right to order the contractor to perform extra work without an agreement for compensation. These conflicting clauses place the contractor in a position of having to make a choice between performing the extra work at the risk of having to later possibly accept a reduced payment, no payment, or making the decision to refuse to proceed with completing the work. The later choice, however, may place the contractor in a position of default, which could possibly result in the contractor being terminated on a project by the owner.



Effective Change Order Management

2. FACTORS THAT ESTABLISH A CHANGE ORDER

A number of different factors can influence the development of Change Orders on projects. These elements can result from either foreseen or unforeseen conditions and include, but are not limited to the following:

- DESIGN MODIFICATIONS – Involves revisions to the contract drawings and specifications on a project. These changes are usually initiated by the owner, the owner’s representative, or the owner’s engineer. Design Modifications generally account for the primary cause of Change Orders on projects.
- ERRORS AND OMISSIONS – Addresses the items that are determined to be defective or missing in the contract set of drawings and specifications.
- CHANGED CONDITIONS – This change reflects the actual physical conditions that were encountered but were unforeseen and materially differed from the conditions that were identified in the contract documents, or were conditions that were not normally found in the area of the project site.
- ADDITIONAL/REDUCED WORK SCOPE – At the owner’s discretion, the contract scope of work may be expanded as a result of enhancements to the design or reduced because of budget considerations and value engineering.
- OWNER-DIRECTED SCHEDULE ACCELERATION OR SLOWDOWN – Based on the owner’s directive to modify the contractor’s planned performance on a project, the contractor incurs additional costs and expenses when the scheduled project performance is accelerated or delayed. In addition, if the contractor does not receive justifiable time extensions for excusable delays, it may require that the contractor accelerate the work to compensate for the delays and meet the contractual milestone dates.
- WORK SEQUENCING – This change is a result of the owner’s requirement to revise the contractor’s planned sequence for completing the work tasks on a project. The owner’s directive may impact the contractor’s scheduled and available labor, material, and equipment, and the contract time for completing a project.
- ADJUSTMENTS TO UNIT PRICING – This change is based on cost overruns that are the result of revisions to the contract unit prices. Increases in a contract item budgeted quantity or a material item budgeted quantity are the most common reasons for an adjustment to a unit price.



Effective Change Order Management

- FORCE MAJEURE DELAYS – Generally include extensions to the project schedule that are based on events for which neither the owner nor the contractor is accountable or have the ability to control, such as: 1) acts of God; 2) unforeseen labor shortages; 3) strikes and disputes; and 4) unusual weather-related delays.
- ADDED COST INCENTIVES – Implemented by the owner to encourage the contractor's participation in value engineering on a project. A cost incentive by the owner may also be made to entice the contractor's acceleration of the completion of a project.
- DELAYED, DENIED, OR RESTRICTED ACCESS TO A PROJECT SITE – Occurs when a contractor is unable to fully access a project site due to the owner's inability to grant access or obtain permits.
- INAPPROPRIATE REJECTION OF THE CONTRACTOR'S WORK – Based on the owner's incorrect rejection of work elements that were completed by the contractor. A change order may be appropriate if subsequent investigation later indicates that the work completed was acceptable and in accordance with the terms and conditions of a contract.
- DELAYS TO OWNER-SUPPLIED SERVICES AND MATERIALS – Impacts to a project schedule that are a result of the owner's inability to provide the services, permanent materials, and/or equipment within a timeframe that is consistent with the requirements that are defined in a contract.



Effective Change Order Management

3. CHANGE ORDER BACKLOG

It is advantageous to both the owner and the contractor that potential Change Orders on a project are processed in a fair, equitable, and timely manner. The failure to do so most often results in an increased probability of extended disputes and claims between the owner and the contractor.

A significant amount of Change Order backlog, in terms of quantity and value, is indicative of a project that is in trouble. The backlog is typically attributed to the above-average submission of Change Order Requests by the contractor and/or the owner's inability or reluctance to promptly process the potential Change Orders.

A large backlog of unresolved potential Change Orders generally falls into one of the following categories:

- UNDISPUTED – Includes potential Change Orders that are not in contention and their processing is delayed because of inadequate administrative support, procedures, or funding.
- DISPUTED – There are two reasons for a potential Change Order to be disputed. In the first case, the owner and the contractor are unable to come to an agreement that the scope of work that is identified in the potential Change Order actually represents a change to the contract scope. In the second case, the owner and the contractor both agree that the work scope is a change to the contract scope of work, but are unable to agree on the value or cost of the potential Change Order and/or its time impact. For potential Change Orders that are disputed, the approval and compensation may be delayed. The issues, if they are ignored or unresolved, can later become claims.



Effective Change Order Management

4. FACTORS RESULTING FROM CHANGE ORDERS THAT INFLUENCE A PROJECT'S PERFORMANCE AND COSTS

There are numerous elements that can influence the cost of a Change Order. The work for Change Orders can necessitate that the contractor redirect the labor, material, and equipment resources that were originally budgeted, scheduled, and designated to be used to support the completion of the tasks identified for the contract scope of work. As a result, the contractor's plan for completing the project may be impacted. The factors from Change Orders that may affect the planned performance of a project include the following:

- ORIGINAL PROJECT SCOPE – Change Orders can have a combination of direct, indirect, and cumulative impact on the cost and schedule to perform the original scope of work on a project. During the later phases of a project, the impacts that are the result of a change can become even more significant and complex. The reason for this is because during the later stages of a project, construction is in full swing and there are more parties and elements engaged. It also becomes more difficult and less efficient to implement a change as time progresses on a project.
- LOSS IN PRODUCTIVITY – The contractor will evaluate how the work for the change will be performed and what effect that this added work will have on the original contract scope of work. If the work related to a change places the contractor's labor and equipment resources in competition with the original project scope of work, the performance of project work may be adversely affected. The Construction Industry Institute notes that “on projects with less than six percent of hours spent on changes, productivity was better than planned.”² Conversely, when more than six percent of planned hours were spent on changes, productivity was worse than planned.
- SCHEDULE INTERFERENCES – The contractor should consider whether the work defined for a change will have any effect on the sequence and duration of the activities in the contract schedule. If the activities on the schedule's critical or near-critical paths are impacted by scope changes, the contract completion date of a project may be extended unless acceleration of the work is performed. The dates for contractual milestones may also be affected by the additional work scope. Disruptions to the schedule from a Change Order may result in additional costs, irrespective of any change to the completion date.

² Construction Industry Institute, “Project Change Management,” Special Publication 43-1, November 1994, p. 7.



Effective Change Order Management

- SUBCONTRACT IMPACTS – The contractor notifies and shares with its subcontractors, the documentation for each potential Change Order affecting a given subcontractor’s work. Based on this information, the contractor instructs its subcontractors to fully evaluate the cost and the schedule impact that a potential Change Order may have on their contract work scope. This information is then incorporated into the Change Order documentation that is submitted by the contractor to the owner.
- CUMULATIVE IMPACT OF MULTIPLE CHANGES – The contractor must evaluate the collective impact that Changes Orders have on the contractor’s resources, including its administration, field supervision, labor, equipment, schedule, site congestion, etc. As the number of Change Orders becomes more prevalent and the performance of the work related to the Change Orders becomes more compressed, the contractor’s planned productivity for performing the original contract work scope can become diminished. Therefore, it is important that the contractor assess the collective impact that the numerous change orders may have as the project progresses. This includes identifying and appraising the anticipated cumulative demands that the extra work places on the planned work effort and resources. The failure to do so may require the contractor to file a claim at the end of a project to collect for the cumulative impact from all the Change Orders. It is also important to note that the impact and effect of the Change Orders may be more important than the number of changes.
- EXPOSED RISK – Contractors should also take into account any uncertainties that may be associated with the revised work scope as part of the assessment of a potential Change Order. Additional cost and time should be added by the contractor to its cost proposal submittal for a potential Change Order as a contingency to compensate for the possible impact from these undefinable factors.



Effective Change Order Management

5. METHODS FOR CHANGE ORDER BASIS OF CALCULATION

The pricing for potential Change Orders can be developed using one of several methods. The choice of method can be established by the contract, from a post contract agreement between the owner and the contractor, or at the contractor's discretion. Each of the methods has distinct advantages and disadvantages that are dependent upon the nature of a project and the requirements specific to the given change. The pricing is typically based on one of the following practices:

- UNIT PRICE – Based upon the unit price items that are approved as part of a project's construction contract between the owner and the contractor.
- LUMP SUM – The owner and the contractor agree that the added work scope, which is defined by the change, will be completed on a fixed price basis, including the costs of the contractor's overhead and profit. A contractor accepts the risks and liabilities that are associated with completing the extra work for an agreed to price when the extra work is completed using this method. To ensure that adequate compensation is included in the contractor's pricing for the proposed Change Order, the contractor will include additional costs for contingency to offset the risks and unknowns that it perceives to be associated with the added work scope. The estimated costs are then evaluated and negotiated between the owner and the contractor to ensure that the finalized cost for completing the extra work is fair and reasonable.
- TIME AND MATERIALS (T&M) – In using this method, the value of the scope of the extra work that is identified for a potential Change Order is based on the actual direct expenses for supervision, labor, materials, equipment, etc., that are incurred by the contractor. Factors are also included that address the allowances for the contractor's overhead and profit requirements. For many projects, the provisions for the contractor's overhead and profit factors are addressed in the General Conditions section of a project's specifications or in the Changes section of the Contract. When the extra work for a potential Change Order is completed on a T&M basis, the associated risks and liabilities become the owner's responsibility. The T&M method for basing the cost estimate is often used if an agreement on the value of the extra work for a potential Change Order cannot be reached between the owner and the contractor or if the full scope of the change cannot be clearly defined at the time that the Change Order is identified and the owner directs the contractor to proceed with completing the work. Also, the contractor may opt to use the T&M method if the contractor prefers not to assume the risks that may be associated with a potential Change Order.



Effective Change Order Management

6. PROCEDURES FOR INITIATING A CHANGE ORDER

The contract typically provides that either the owner or the contractor is entitled to introduce a Change Order. The procedures for initiating a Change Order have a tendency to differ between projects, as owners and construction managers each have their own established requirements and preferences. Although there may be some variances, the following items address the practices that are normally expected on a project.

- DEVIATION REQUEST [FORM 01³] – The contractor completes and submits a “Deviation Request” form to the owner or its representative on a project. The purpose of this form is to document the deviations that have been determined from the original contract documents. This form serves as a notification by the contractor of any changed conditions, omissions, or discrepancies that may result in extra work. The owner can either approve or disapprove the request, dependent on the validity or justification of the change.
- INITIATOR CHANGE ORDER REQUEST [FORM 02] – This form can be initiated by the owner, the owner’s representative, a project engineer, or the contractor. The preparation and submittal of this form are intended to define the scope of work that is involved in completing a potential change and to demonstrate the justification for the change. The owner’s signed endorsement indicates its authorization to proceed with the issuance of a Change Order. The Change Order Request offers notification on a project that the possibility exists for an adjustment to the contract price and schedule as a result of a potential Change Order.
- CHANGE ORDER TECHNICAL JUSTIFICATION [FORM 03] – This form is usually prepared by the owner’s representative or a project engineer. The intent of this form is to provide the owner with documented credibility and justification relative to completing the work scope for a potential Change Order.

An important step in the initiation process is for the originator to classify whether the change is required or elective, and for the owner to confirm and approve this designation. The determination of whether a change is required or elective will influence the justification for the change and how the change will be evaluated. The differences between the two classifications include the following:

³ Samples of the forms (Forms 01–05) are provided in the Appendix.



Effective Change Order Management

- Required changes must be implemented, and typically include those changes that are necessary to meet:⁴
 - the basic, defined venture/business objectives;
 - regulatory or legal requirements; and/or
 - defined safety and engineering standards.
- Elective changes are those that are proposed to enhance the project, but are not required to meet the original project objectives. Therefore, elective changes may or may not be implemented. This type of change is not mandated.⁵

The owner's authorization of the Change Order initiation communicates to all parties that the justification and documentation that is required in advance of implementing the Change Order have been met.

⁴ Construction Industry Institute, "Project Change Management," Special Publication 43-1, November 1994, p. 15.

⁵ Id.



Effective Change Order Management

7. EVALUATION AND VERIFICATION OF COSTS

The owner must have confidence that the contractor's assessment of the costs to complete the extra work for a potential Change Order is fair and reasonable. There are several actions that the owner can undertake to avoid being overcharged. The owner's approach in reviewing the proposed costs for a potential Change Order is dependent upon the method of calculation that was used by the contractor and agreed to by the owner in preparing the estimate. How the costs are reviewed and verified is determined by whether the costs were based on a unit price, lump sum, or a T&M type of estimate. The requirements for evaluating estimates that are based on one of these three methods are discussed below:

7.1 UNIT PRICE

In many construction bid forms, the owner includes a listing of unit price items that the contractor completes by filling in the rates for each item as part of its bid proposal submittal. These unit price rates are typically inclusive of the total estimate of direct and indirect costs, including the contractor's overhead, profit, contingency, etc. Therefore, the construction contract between the owner and the contractor will include the unit prices that were proposed by the awarded contractor. For validating the costs of a proposed Change Order, the owner needs to verify the material quantities that the contractor is reporting for the extra work and compare the unit prices that the contractor has applied to the material quantities with those unit prices that are identified in the contract. The proposed change order unit prices should be the same as the unit prices that are included in the contract.

7.2 LUMP SUM

The owner should prepare an independent cost estimate of the scope of work for each potential Change Order. This cost estimate should be detailed and comprehensive in format because it is used as the basis for comparing and validating the material quantities, labor production rates, and pricing that are proposed in the contractor's submittal for the potential Change Order.

If possible, the independent cost estimate should be completed in advance of receiving the potential Change Order pricing from the contractor so that a review can be completed without delay.

The owner's independent cost estimate should be based on current market rates and costs as well as those rates and costs that may be specifically established in the contract documents. It is important that the component rates and costs be fair, representative of the work on a project, and defensible. The direct and indirect costs should take into account the following:

- WAGE RATES – If a project is supported by union craft labor, the current hourly rates are generally available for the location specific to a project in a published format or on the Internet. Often, the contractor will also provide a



Effective Change Order Management

copy of the craft labor rates used on a project upon request. The rates that are used in developing the independent estimate need to be inclusive of payroll burdens, fringe benefits, taxes, and insurance. If it is apparent that these rates do not include those provisions, a factor of approximately 30 percent can be added. However, consideration must also be given to other elements that may be required for a project and which may increase the cost of labor, such as work schedule (i.e., overtime work), per diem and transportation allowances, etc.

- MATERIAL COSTS – For its estimate, the contractor will generally base the unit costs of the permanent materials on actual invoiced costs, or quoted costs that are solicited from the material vendors and suppliers. This information, however, is often not made available to the owner. The options for obtaining this information are to either contact and request the information directly from vendors or suppliers, or base the unit material costs on the current rates that are published in a cost guide, such as R.S. Means, Lee Saylor Construction Cost Index, Page, Richardson Process Plant Construction Estimating Standards, etc. If required, additional allowances for handling, shipping, storage, tariffs, and duties should also be considered and appropriately accounted for where required.
- EQUIPMENT COSTS – The contractor commonly will use its corporate rates for owned equipment or rental rates on leased equipment as the basis for the estimated equipment costs. The owner usually will not have access to the rates that the contractor used unless such rates are included in the contract. As an alternative, equipment rental firms can be contacted directly and the rates for the equipment solicited. Also, estimating publications such as R.S. Means address the average monthly, weekly, daily, and hourly rental rates for many equipment items and the hourly operating cost for each.
- SUBCONTRACT COSTS – If the work or part of the work for a proposed Change Order is to be completed by a subcontractor, the contractor will often attach a copy of a subcontractor's quotation or estimate. The contractor will apply an additional percentage to a subcontractor's price to cover the contractor's costs for supervision, administration, and profit. If the extra work delays the contract schedule, the contractor may also request additional compensation to cover the extended overhead on a project. The owner's approach to evaluating a subcontractor's costs for labor, materials, equipment, overhead and profit should follow the same process that the owner uses in verifying the reasonableness of the contractor's costs.



Effective Change Order Management

- SMALL TOOLS AND CONSUMABLES – The contractor normally includes an allowance to offset the replacement cost for small tools and for the purchase of construction supplies and consumable items. This allowance is most often calculated as a percentage of the total direct labor cost, or on a cost per man hour basis.
- OVERHEAD – To cover the costs of the contractor’s home office and field management and overhead, the contractor will include a cost allowance that is based on the actual financial requirements for the corporate and the field offices. The percentage, as a factor of the total direct cost for the extra work, varies between contractors and projects. Percentages between 8.0 percent and 15.0 percent are usually considered reasonable.
- PROFIT – The contractor’s profit, as a percentage of the sum of the total direct and indirect costs, should be within a reasonable range. Typically, the contractor’s profit on change order work is not expected to exceed 10.0 percent, and could be lower.

7.3 TIME AND MATERIALS (T&M)

For extra work that is completed on a T&M basis, the contractor’s unit rates and markups for overhead and profit that are applied to the contractor’s actual costs for Change Orders are based on either 1) the rates that were solicited during the bidding phase of a project and included as part of the project’s construction contract between the owner and the contractor, or 2) the unit pricing and markups that were negotiated between the owner and the contractor following the award of a construction contract.

At the completion of the work for a Change Order, the contractor will submit the copies of the daily work reports for the extra work to the owner as part of the contractor’s monthly payment request submittal. These reports document the actual labor, material, and equipment resources that were expended by the contractor on an hourly or daily basis⁶ to complete the extra work scope that is defined by the Change Order.

In addition to the daily work reports, the owner can request that the contractor submit as backup, copies of the invoices from its subcontractors, material vendors, and suppliers that were involved in supporting the work for the Change Order.

⁶ Note that the contractor’s documentation of the quantities and costs for the labor and equipment resources can be based on hours or days and is dependent upon the actual duration of the work for the change. For example, if the work took less than a day to complete, then the time and costs for the Change would be summarized in hours. If the work took a minimum of one day’s time to complete, the time and costs would be expected to be summarized in days.



Effective Change Order Management

8. EVALUATION OF TIME IMPACT

The contract schedule for a project may be impacted or delayed by the work involved in completing a Change Order. If the extra work is determined to be non-critical as a result of the absorption of the total float on the affected activities, the completion date of the contract schedule will remain unchanged. However, if the changed work is found to extend or delay the completion of activities that are on the critical path of the schedule, the completion date of a project will slip from the planned date. When evaluating the potential time impact for Change Orders, consideration should be given to the following:

- It is important for the owner to complete an independent analysis of the contract schedule for a project to identify the activities that are affected by the proposed changed work and to verify whether the scope of work for a potential Change Order impacts the schedule and the contract completion date.
- Consideration should also be given to the cumulative impact of multiple Change Orders on the contract schedule, which could affect the labor productivity of the unchanged work and delay its completion.
- The timely identification of potential issues and delays on projects permit the development of recovery schedules that may help to mitigate some or all of the potential delay.
- The owner should consider including a procedure in the contract scheduling specification that defines the procedures relative to the preparation, format, and submittal of the contractor's schedule analysis for potential Change Orders. The procedure should also address the approval process and the incorporation of the ratified revisions into the contract schedule.



Effective Change Order Management

9. CHANGE ORDER NEGOTIATIONS AND RESOLUTION

The method by which the Change Order was priced usually dictates the level of negotiation that may be required to resolve the additional costs and time. If the work for the proposed Change Order proceeded on a Unit Cost basis, it is characteristic that the unit rates that are used were established on the project and agreed to prior to the start of the work for the Change. The negotiations for this type of change are then focused on the quantities reported to be used by the contractor and whether the change warranted an extension of time to the project schedule.

Similarly, for Change Order work to be completed on a Time and Materials basis, it is expected that the unit hourly rates for labor and equipment for the project have been ascertained in advance of the start of work for the Change Order. Therefore, the owner's approval of the costs for the Change Order is based on a review of the time card records and copies of material invoices presented by the contractor, and potentially, the subcontractor invoices. The schedule for the project is also evaluated to determine whether the work for the proposed Change Order may have affected the completion of critical milestone dates or the overall project completion date.

If the proposed Change Order was priced on a Lump Sum basis, the contractor's estimate proposal is inclusive of the risk that is relative to completing the scope of work for the change. The contractor may also consider that the estimate details for the cost of the proposed Change Order are proprietary. For this Change Order method of cost calculation, the elements for negotiations and resolution include the following considerations:

- The preparation of an independent cost estimate and a schedule analysis of the work scope defined by a potential Change Order by the owner are advantageous. The independent estimate and schedule information helps to better familiarize the owner with the specific work scope requirements and issues relative to a potential Change Order and also provides a basis for comparison from which to better evaluate and negotiate the contractor's change proposal.
- If the timing allows, the cost and time impact of a potential Change Order should be established and settled upon prior to proceeding with the start of the work for a Change Order. Due to the speed at which projects progress and the urgency of completing the Change Order work, the prospect of evaluating the estimated cost and time impact in advance is not always possible. When the contractor's proposal is prepared during or following the completion of the work for a Change Order, the estimate is generally based on the contractor's accounting of the actual man hours expended, the actual quantities of materials used, and the actual operating hours for the construction equipment items utilized. Because the estimate is relying on the contractor's records, the owner's validation can be more difficult than completing an evaluation of the



Effective Change Order Management

contractor's proposal that was prepared in advance of proceeding with the work. The reason for this difficulty is that the contractor's records may not be made available to the owner if such costs are co-mingled with the base scope of work which is paid for on a lump sum or fixed price basis. If, however, they are made available, the records are often not as complete or comprehensive as they should be.

- For the negotiations to be successful, it is important that the owner and the contractor be objective in their analysis of the cost and time to complete the work scope that is defined by the potential Change Order. Frequently, the process suffers because of differing personalities and from heightened emotions. To be productive, the focus of the negotiations should remain on the factual circumstances that are related to the Change Order.
- During negotiations, disagreements are often experienced, which can impede the progress for finalizing the Change Order. It is important to actively resolve any disputes as they develop so that an accord between parties can be reached in a timely manner. This attention by the parties will help to minimize the filing of claims on a project.



Effective Change Order Management

10. FINALIZATION OF THE CHANGE ORDER

Following the negotiation and resolution of the cost and time elements of a potential Change Order, the scope that is defined by the Change Order needs to be fully documented and reported. Typically, the Change Order documentation is captured in the following formats:

10.1 CHANGE ORDER (FORM 04)

Following the conclusion of the negotiations and the attainment of an equitable settlement, a formal Change Order document is prepared by the owner in conjunction with the contractor. This document contains the complete and final language that defines the total cost or credit impact, in addition to any schedule revisions that are related to the change in the contract scope of the work. The endorsement of the Change Order contractually binds all the involved parties.

10.2 CHANGE ORDER LOG (FORM 05)

This document is often prepared and updated by the owner, but the contractor could be responsible for the preparing and updating the Change Order Log with review and approval by the owner. The purpose of the log is to provide a current summary of the Change Order activity for a project.

10.3 MONTHLY PROJECT SCHEDULE UPDATES

Typically on projects, the construction contract requires the contractor to prepare and update the contract schedule on a monthly basis. In addition to updating the status of activities that are in-progress or completed during the reporting period, the contractor addresses in the contract schedule the details of the logic revisions and impacts that were agreed as part of the Change Order negotiations between the owner and the contractor. It is important that the owner review the contractor's monthly schedule update submittal to ensure that the revisions that were agreed to in the Change Order have been correctly identified and implemented.

10.4 RECORD OR AS-BUILT DRAWINGS

As a part of its contract obligations, the contractor is typically compelled to mark up the contract drawings with the as-built details for a project. This task also includes the revisions that were addressed and approved in the Change Order documents. The owner should periodically review the level of detail and progress of the contractor's as-built drawings. Any deficiencies should be immediately addressed.



Effective Change Order Management

11. CHANGE ORDER PROCEDURES AND RECOMMENDED PRACTICES

Changes often have a major impact on the success of projects. The procedures that are defined for change management in the general conditions sections of most construction contracts address the steps to take following the initiation of a Change Order. However, these guidelines do not normally identify the requirements for managing the change and its impacts. Items that should be considered as part of a project's Change Order procedure include the following:

For the design and pre-construction phases of a project:

- Written contracts, agreements, procedures, and roles and responsibilities should be established and accepted during a project's early phases. Difficulties and issues may arise that may affect the execution of the work if these documents are not in-place.
- Define and establish a detailed change management process for the project that is part of the design plan and procedures for the project.
- Anticipate that changes will inevitably occur on a project and plan for it accordingly. If the necessary steps for managing changes are not taken, the Change Order process will not be managed well and the project will suffer.
- Attentively monitor the trending of the project's design progress. At the completion of the work related to the design, it is important that the owner initiate and communicate a "freeze" of the design. Any revisions to the established scope of work will be measured against this baseline for the design.
- During the design and pre-construction phases of the project, identify areas of uncertainty and areas lacking fully defined scope. Evaluate the risks that may be associated with these areas.
- Conduct constructability reviews and institute a value engineering program to assess the feasibility of the project's design and defined work scope.
- Introduce changes as early as possible during a project in order to help minimize the impact of the change. Comparatively, it is more cost effective to include changes early in a project than to wait until the later stages of the project.
- Fully define the work scope for each change in terms that are understood by all parties. This clear and concise definition helps to reduce confusion or the misinterpretation of the requirements of a change by the parties.



Effective Change Order Management

- Avoid delaying the approval of changes that will ultimately be approved. This tactic results in the changes being pushed to later in the project where they become more costly to implement. It is a misconception to believe that the issues related to Change Orders resolve themselves.
- Authorization for a change should be mandatory before implementation, regardless of the type of agreement or contract. Authorization should be timely and decisive.⁷
- In advance of releasing the project design and bid package documents for tender and construction, ensure that the documents are complete and fully definitive.

For the construction phase of a project:

- Evaluate the contractor's bid proposal to ensure that the documents are complete and that the cost and schedule reasonably represent the scope objectives and timelines required for the project.
- Review the contractor's construction procedures, methods, and resources to confirm the contractor's capabilities and flexibility to handle the types, magnitudes, and quantities of change orders that are expected for the project.
- Establish a comprehensive system for budget and schedule baseline control.
- Process, approve, and execute Change Orders in a timely manner to avoid disputes and claims that may affect the progress and completion of the project.
- Do not proceed with the work for Change Orders without authorization and avoid verbal authorization.
- To avoid confusion and misinterpretations of the work scope and requirements that are defined for Change Orders, work to ensure that the packages for each change are complete. Actively follow up with the parties involved and solicit any questions or requests for clarification.
- Conditions that are determined to be the general cause or the reoccurring factor for change orders on a project should be corrected.
- Detailed information from the changes should be collected and documented so that the data may be used to provide a historical reference on the current and future projects.

⁷ Construction Industry Institute, "Project Change Management," Special Publication 43-1, November 1994, p. 29.



Effective Change Order Management

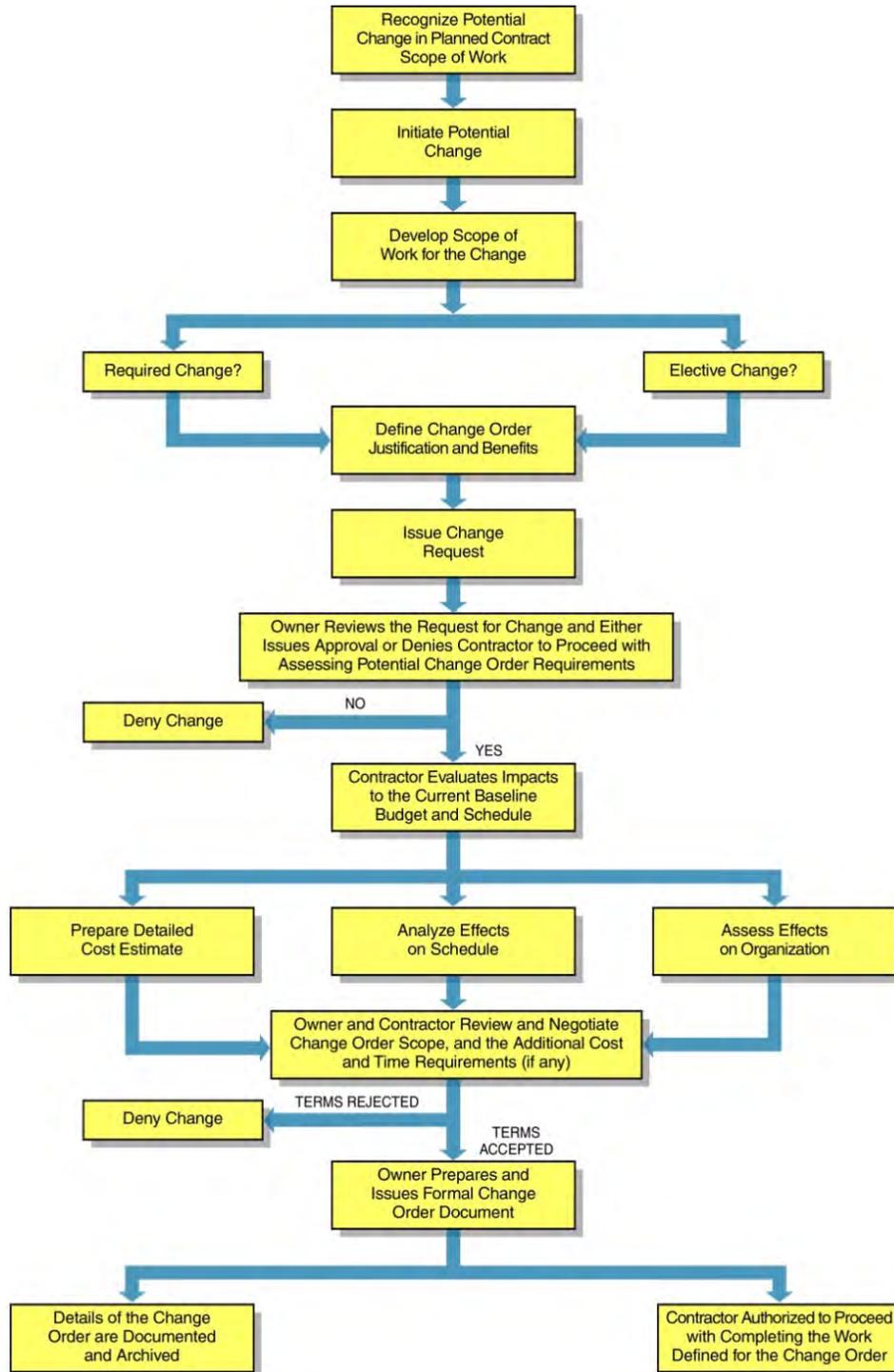
12. THE CHANGE MANAGEMENT PROCESS

There is no “one size fits all” process or set of procedures for Change Orders on projects. Owner’s, contractor’s and project specific requirements, contract types, management preferences, and logistical issues are a few of the many factors that may influence the structure of the change management process for a given project. Although there are expected differences in the change process between projects, the following diagram defines the basic elements and process that are typically expected during the construction phase of the project:



Effective Change Order Management

Figure 1: Example of a Construction Change Order Procedure





Effective Change Order Management

13. SUMMARY

Regardless of effort and the best intentions, project planning is an imperfect process. Change Orders are an inevitable occurrence on any construction project. Although the owner can take steps to help mitigate the number of changes on a project, it is impossible to fully eliminate the issues that impact a project's planned cost and schedule performance. There are simply too many unknowns and variables that are outside the control of management on any given project.

Often Change Orders can become a polarizing factor between the parties. The owner's objectives are to minimize the impact of Change Orders to the greatest extent possible as a measure of control over a project's budget and schedule. Comparatively, the contractor's interests may involve expanding the scope of work beyond that defined by the contract, in addition to boosting its projected revenue. The differing objectives between the parties can result in divergent positions and the inability to attain fair and equitable resolutions on changes. If the owner and/or the contractor elect to ignore or postpone the negotiation and settlement of Change Orders until the end of a project, the issues that may have been previously solvable have a greater potential of being disputed and becoming claims.

For a project to be successful, it is important for management to be committed to processing Change Orders in an attentive and unbiased manner. It is beneficial for a project to establish a Change Order process with a defined set of procedures that is best suited to the requirements of a project, promotes open communications, is objective, and is structured to foster the resolution of Change Orders in an expeditious manner.

As Change Orders are negotiated and finalized, the information should be addressed as updates to the project record, including the project budget and schedule. The timely addition of change-related information provides management with a current perspective of the overall condition of a project, compared to its plan. This information also offers the ability for the parties to a contract to more accurately forecast the cost and time that will be required to complete the work for a project.



Effective Change Order Management

REFERENCES

Barrie, Donald S. and Paulson Jr., Boyd C., *Professional Construction Management*, McGraw Hill, Inc., 2nd ed., New York, New York, 1978, 1984.

Fisk, Edward, *Construction Project Administration*, John Wiley & Sons, Inc., New York, New York, 1978.

The Construction Industry Institute, *Project Change Management*, Special Publication 43-1, University of Texas, Austin, Texas, November 1994.

James M. Montgomery Consulting Engineers, Inc., *JMM Construction Management Manual*, CM 1102 Initiator Change Order Request, CM 1103 Change Order, CM 1106 Deviation Request, CM 1107 Technical Justification, 1987.

About the Author



James M. Bolin is a Senior Executive Consultant for Long International, and has nearly 35 years of experience in all aspects of project and construction management, pre-construction planning, and project cost/schedule controls. His qualifications include claims and change order analysis and resolution, preparation of fixed-cost proposals and budget baseline planning, site management and coordination, prime and subcontract development and administration, materials expediting and procurement, and critical path method (CPM) delay analysis, schedule development, progressing and reporting. This diverse expertise has been obtained through involvement on numerous project types, including: oil production facilities, pipelines, pump stations, water and wastewater treatment plants, mineral processing facilities, water storage, hydroelectric plants, hospital/medical, transit, airports, communications, and environmental remediation. The value of these projects has ranged from US\$50,000 to US\$360 million. Mr. Bolin is based in the Denver, Colorado area and can be contacted at jbolin@long-intl.com and (303) 798-5940.



APPENDIX

Sample Change Order Forms

FORM 01 – DEVIATION REQUEST

FORM 02 – INITIATOR CHANGE ORDER REQUEST

FORM 03 – CHANGE ORDER TECHNICAL JUSTIFICATION

FORM 04 – CHANGE ORDER

FORM 05 – CHANGE ORDER LOG



DEVIATION REQUEST

No. _____

Owner _____

Contractor _____

Project _____

Project No. _____

Date _____

Subject _____

Drawing Nos. _____

Specification Nos. _____

Original Contract Requirements _____

Reason for Deviation Request _____

Proposed Deviation _____

Any Change to Contract Cost? Yes No If Yes, Describe _____

Any Change to Contract Time? Yes No If Yes, Describe _____

APPROVED DISAPPROVED

CONTRACTOR

DATE

OWNER/OWNER'S REPRESENTATIVE

DATE



INITIATOR CHANGE ORDER REQUEST

No. _____

Project _____

Project No. _____ Contract No. _____ Contract Date _____

Contractor _____

Proposed/Submitted By Owner Owner's Rep Engineer Contractor

Name _____ Date _____

Change Order Justification _____

Description of Work to Be Performed _____

Contractor is authorized to proceed with this Change Yes No

On _____ DATE

Approved _____ OWNER _____ DATE _____



CHANGE ORDER TECHNICAL JUSTIFICATION

Potential Change Order No. _____

Contract Change Order No. _____

Contractor _____

Contract No. _____

Prepared / Submitted By Owner's Representative Engineer

Name _____ Date _____

Description of Change _____

Reason for Change _____

Alternatives Considered _____

Impact of Non-Incorporation _____

Approved _____

OWNER

DATE



CHANGE ORDER

Page ____ of ____

Project No. _____ Original Contract Amount \$ _____ Cal Days _____
Contractor _____ Previous Approved Changes \$ _____ Cal Days _____
Contract No. _____ Total Amount of this Change \$ _____ Cal Days _____
Contract Change Order No. _____ Revised Contract Amount \$ _____ Cal Days _____

This Change Order covers the changes to the subject contract as described herein. The Contractor shall construct and furnish the labor, materials, equipment that is necessary or required to complete the Change Order Items for a lump sum price agreed between the Contractor and _____, otherwise referred to as the Owner.

Table with 5 columns: Item, Description of Changes, Increase in Contract Amount (\$), Decrease in Contract Amount (\$), Contract Time Extension (Cal. Days). Includes a 'Totals' row and a 'Net Change in Contract Amount' row.

The amount of the Contract will be increased/decreased by the sum of \$ _____ and the contract time shall be extended by _____ calendar days. The undersigned Contractor approves the foregoing Change Order as to the changes, if any, in the contract price specified for each item, including any and all supervision costs and other miscellaneous costs relating to the change work, as to the extension of time allowed, if any, for completion of the entire work of said Change Order. The Contractor agrees to furnish all labor, materials and equipment and perform all other necessary work, inclusive of that directly or indirectly related to the approved time extension, required to complete the Change Order items. This document will become a supplement of the Contract and all provisions will apply hereto. It is understood that the Change Order shall be effective when approved by the Owner.

Recommended _____ ENGINEER DATE
Accepted _____ CONTRACTOR DATE
Approved _____ OWNER DATE

