



مدیریت تغییرات قراردادی در پروژه‌های EPC

فرایند یکپارچه + نکات حیاتی
(بر اساس اسنادی از AACE و PMI و Long International)

ارائه دهنده:

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What we will learn?

- ❑ Introduction
- ❑ Change Order Definition and Other Change Order-related Considerations
 - ❖ Change Order Definition
 - ❖ Change Management Defined
 - ❖ Demonstrated Elements of a Change and Change Order
- ❑ Change Order Procedures

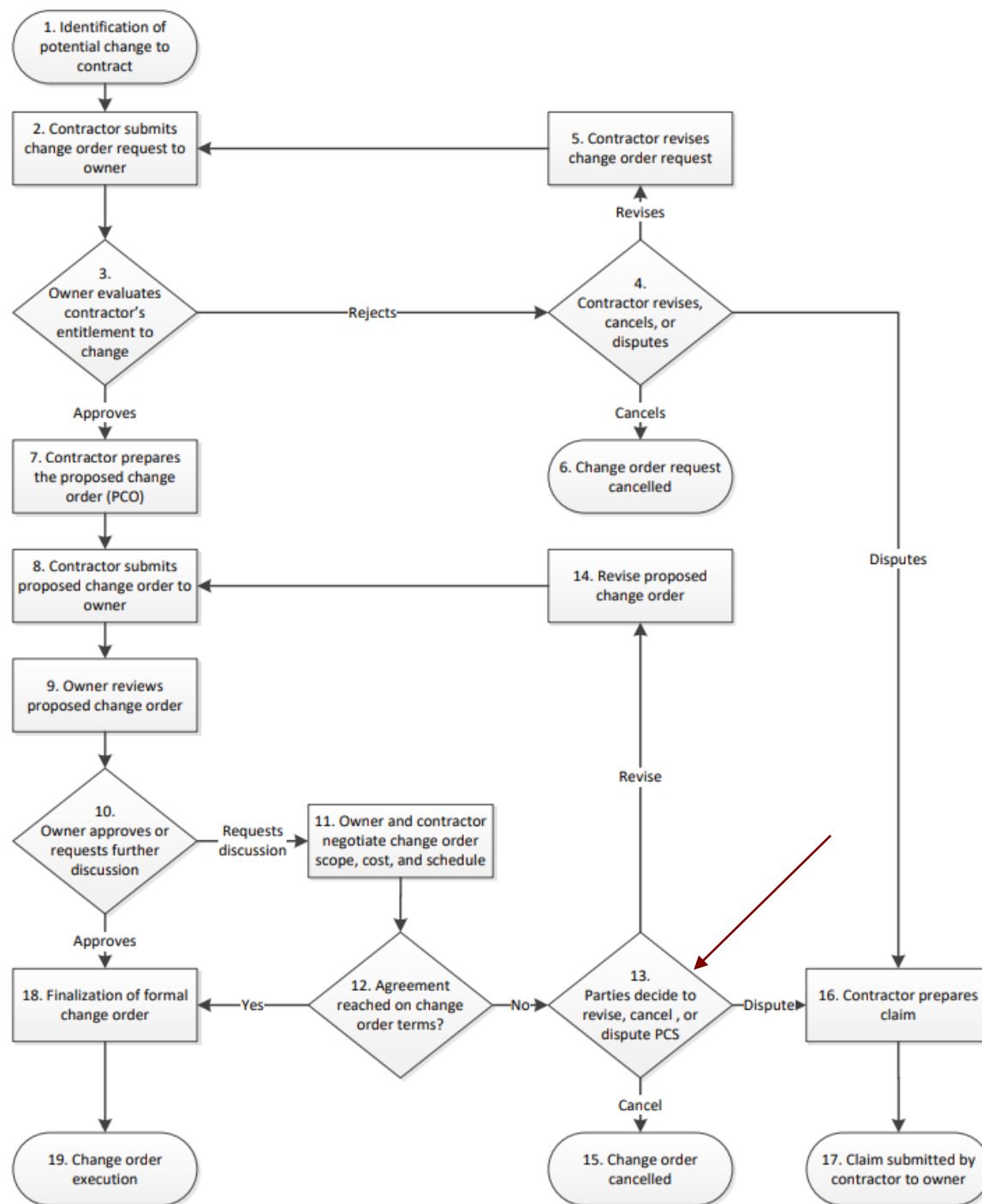
What we will learn?

☐ Change Management Process

1. Identification of Potential Change to Contract
2. Contractor Submits Change Order Request to Owner
3. Owner Evaluates Contractor's Entitlement to Change
4. Contractor Revises or Cancels Change Order Request, or Disputes Owner's Change Order Request Rejection
5. Prepare the Proposed Change Order
6. Owner Reviews Proposed Change Order
7. Owner Decision to Approve or Request Further Discussion
8. Owner and Contractor Negotiate Change Order
9. Agreement Reached on Change Order
10. Parties' Decision to Revise, Cancel or Dispute PCO
11. Revise Proposed Change Order
12. Change Order Cancelled
13. Contractor Prepares Claim
14. Claim Submitted by Contractor to Owner
15. Finalization of Formal Change Order
16. Change Order Execution

What we will learn?

- ☐ Change Management Document Control
- ☐ Change Management Related to Scheduling
 - ❖ Guidelines
 - ❖ Scope Change – Identification and Documentation
 - ❖ Delays – Identification and Documentation
 - ✓ Prospective Time Impact Analysis
 - ✓ Claims Avoidance and Monitoring
- ☐ Appendix: Sample Change Management Template
- ☐ Final Notes:
 - ❖ Conclusion
 - ❖ Other References
 - ❖ Contributors





10. Parties' Decision to Revise, Cancel or Dispute PCO (Box 13)

- ❑ The **change management terms** found in construction contracts often state that the **contractor cannot commence** work until a change order has been **executed**;

however, this process is often by-passed.

- ❑ In the **interest of avoiding** further impacts to the project schedule and maintaining a good relationship with the owner,

the **contractor may agree** to

1. Commence the changed work and finalize the change order **concurrently** or
2. **After** the work has been **completed**.

*With this bypass of the change management process, **cancelling the PCO** is a less viable option.*

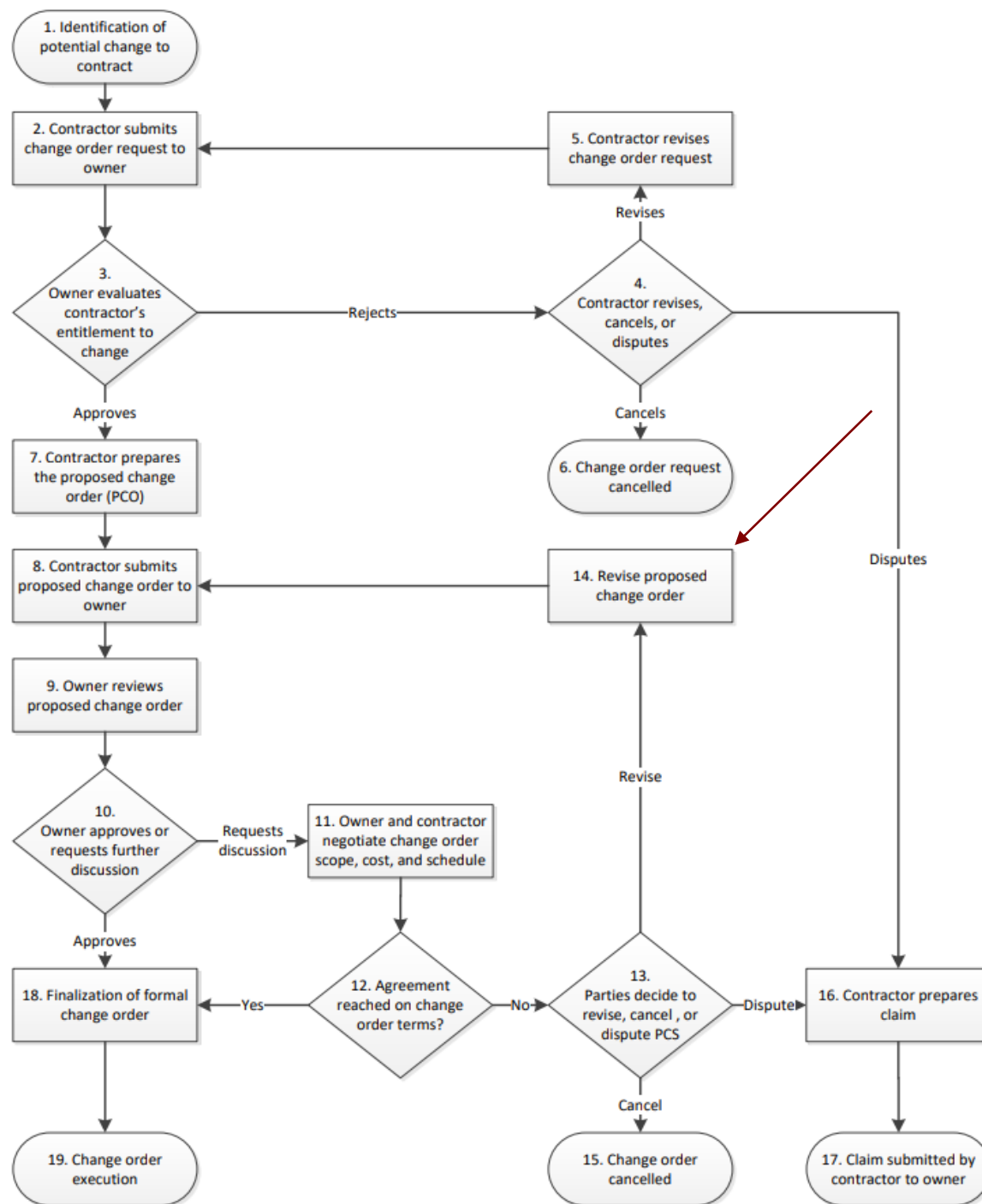


10. Parties' Decision to Revise, Cancel or Dispute PCO (Box 13)

☐ If there **remain unresolvable differences** between the owner and the contractor concerning a PCO,

the parties may conclude that **agreement cannot be reached**.

❖ In these instances, the parties must decide on **one of three options** concerning the future of the unresolved PCO:

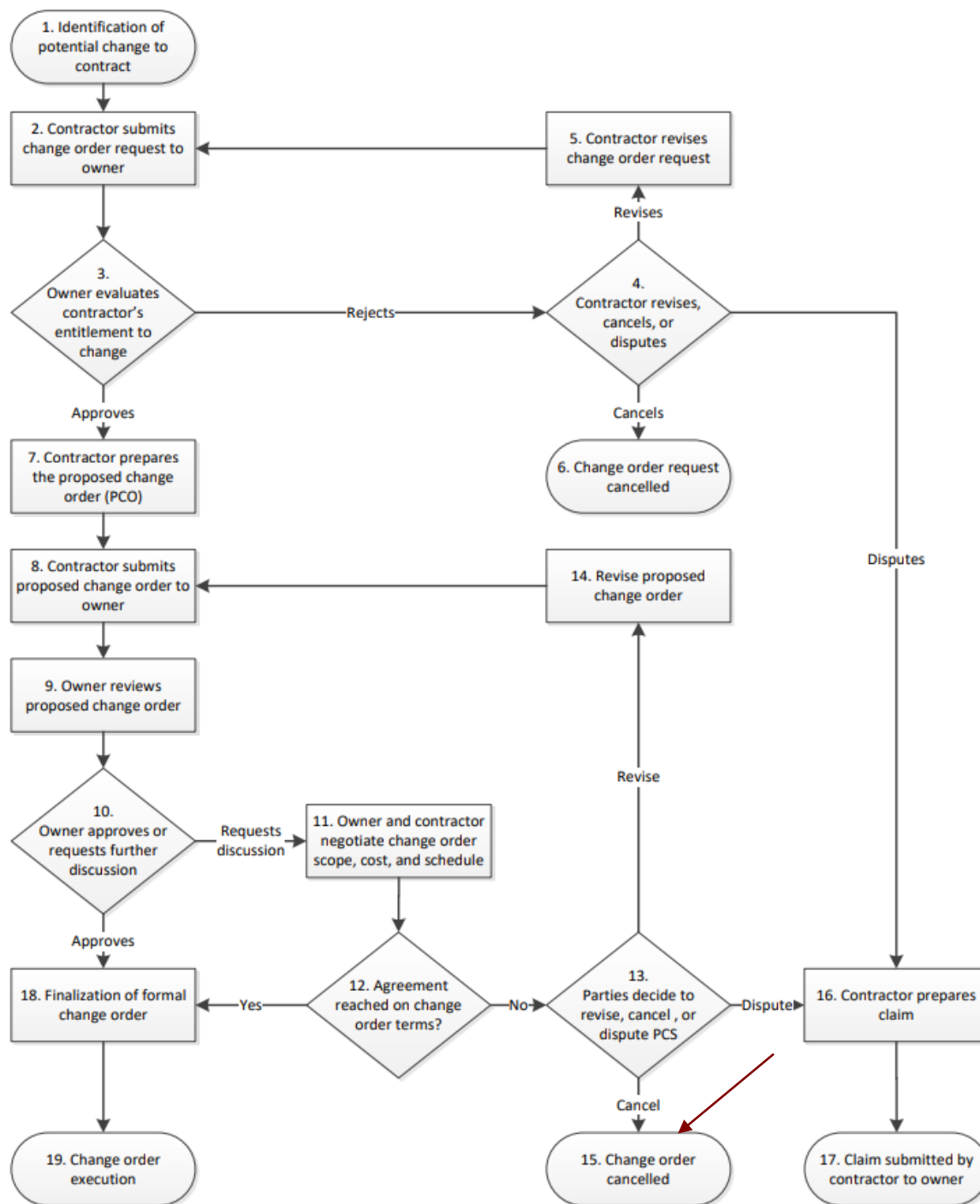




10. Parties' Decision to Revise, Cancel or Dispute PCO (Box 13)

❑ Option 1 (Box 14):

- ❖ The parties choose to continue to **try to find a common ground**, which may include more revisions and discussions.
- ❖ **Attempts are often made** to resolve differences at higher levels of management in **both organizations**.
- ❖ This may **prolong the process** of executing a change order in a timely manner, which increases the **possibility** that a **dispute** will **arise**
if the **contractor agreed** to perform the work even before
agreement was reached on the scope, cost and/or schedule impact.

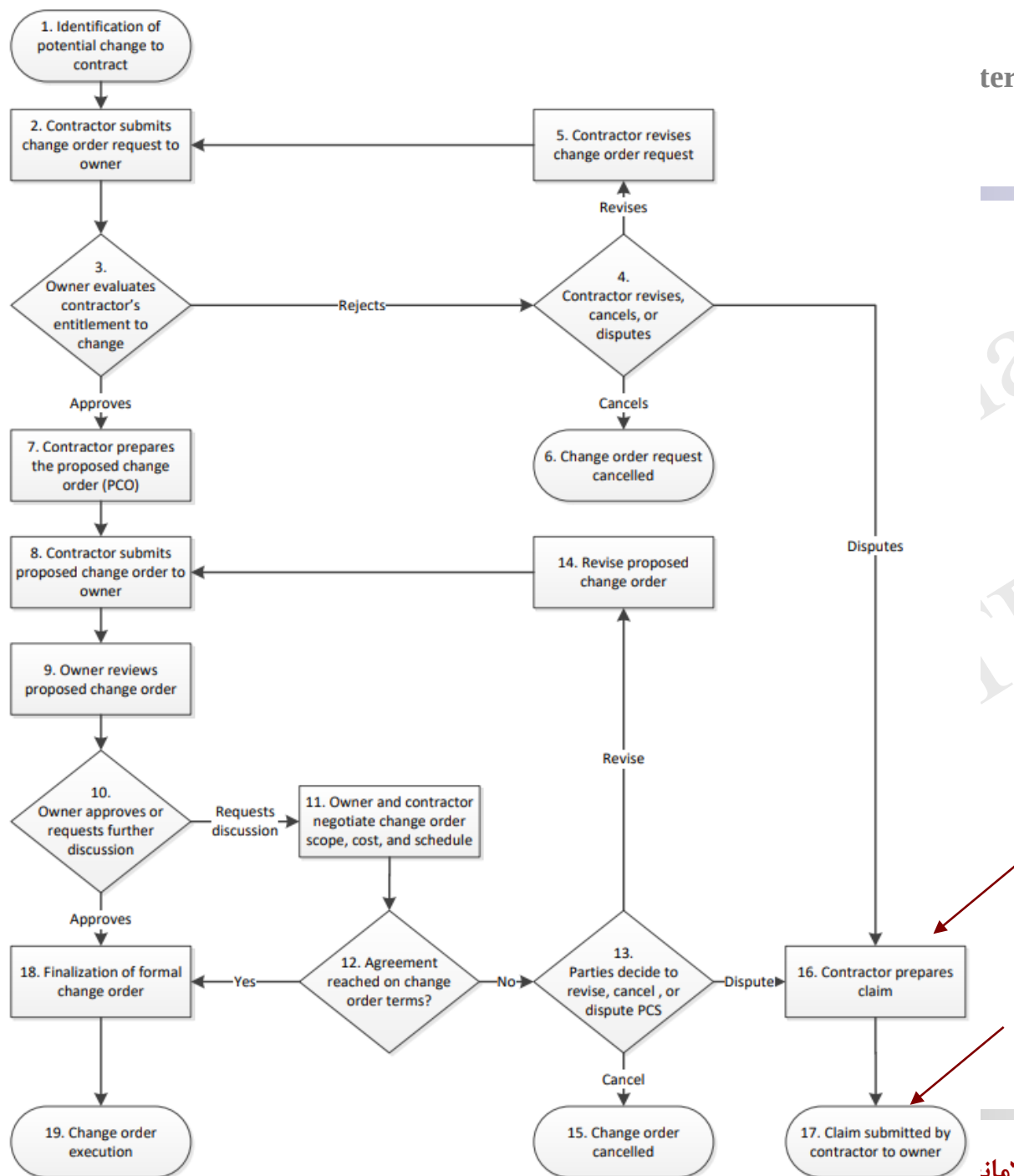




10. Parties' Decision to Revise, Cancel or Dispute PCO (Box 13)

☐ Option 2 (Box 15):

- ❖ The **parties agree** to cancel the changed work, and therefore, the PCO.



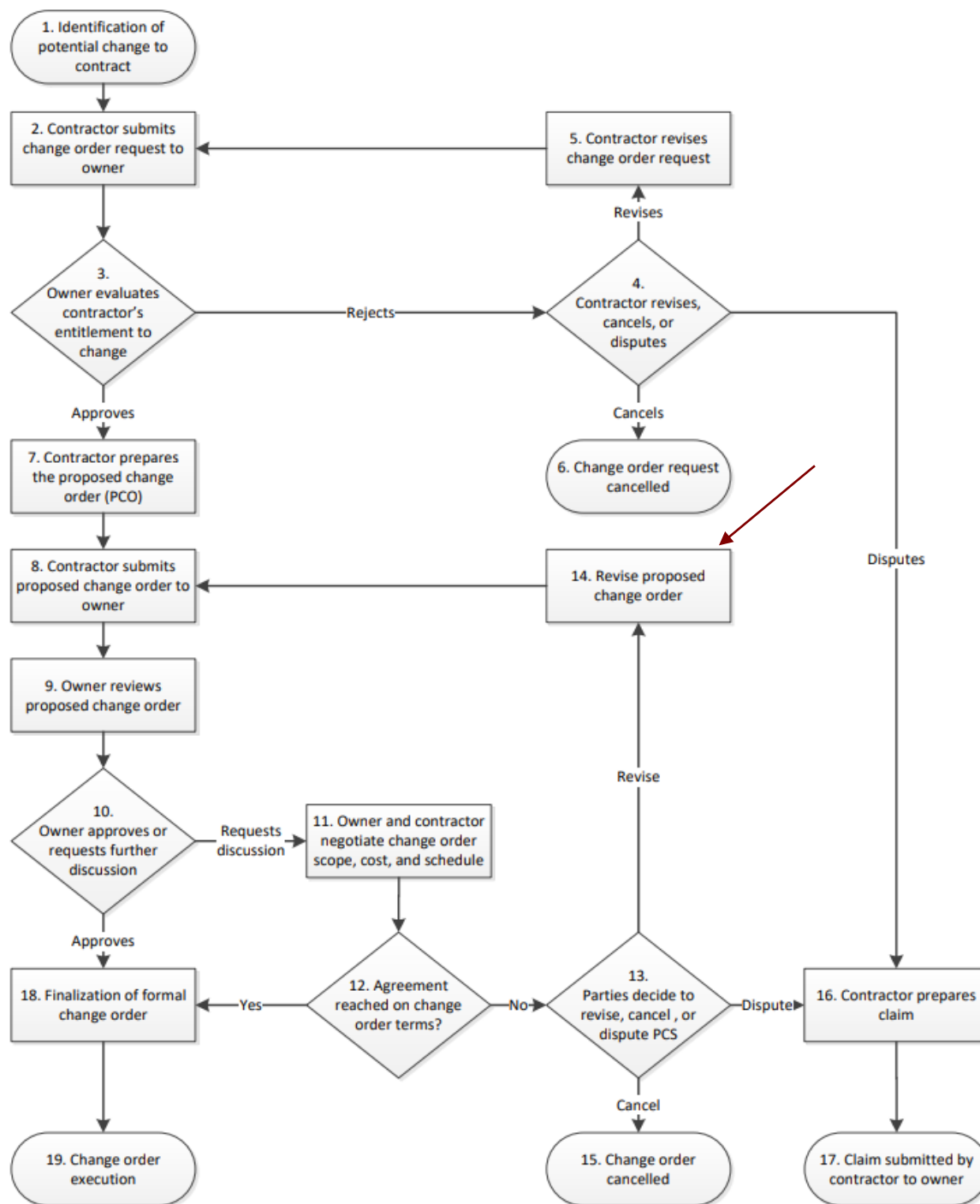


10. Parties' Decision to Revise, Cancel or Dispute PCO (Box 13)

❑ Option 3 (Boxes 16 and 17):

❖ The **parties may decide** that they cannot come to an agreement on the PCO's scope, cost, and/or schedule impacts.

1. If the **owner demands** that the changed work be performed, it may issue a directed change order.
2. If the **contractor deems** the directed change order is substantial enough in terms of cost and schedule impacts,
the **contractor may proceed** under protest and will often prepare and eventually submit a formal claim to the owner.





11. Revise Proposed Change Order (Box 14)

- ☐ As a result of owner comments, negotiations between the parties, or the introduction of new information,

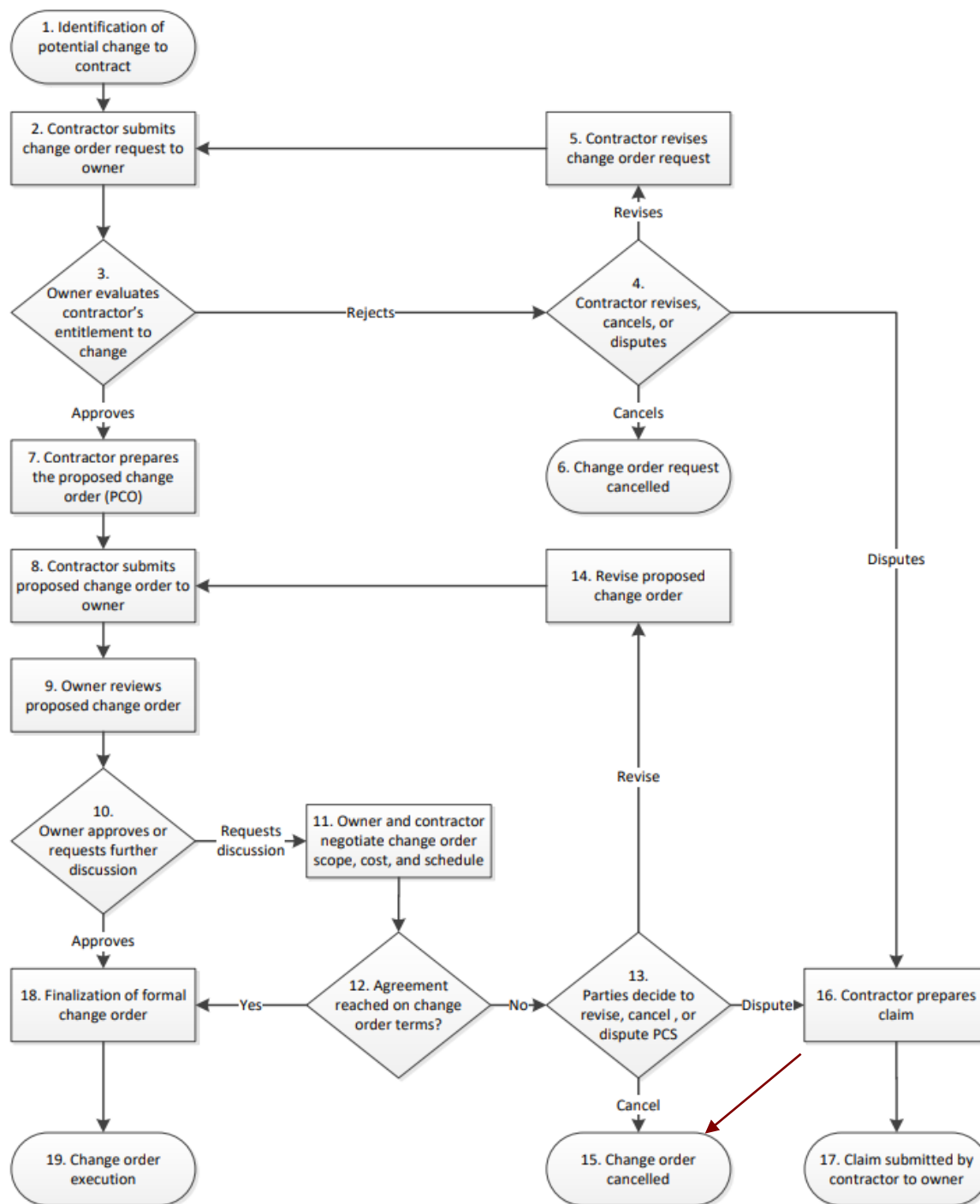
the **contractor** may choose to **revise the PCO**.

- ☐ **Revisions** to the PCO may become an iterative process as a result of **multiple negotiation meetings** between the parties.

- ☐ **Revisions** to a PCO should be a collaborative process between the owner and contractor.

- ☐ Once the **revision is complete**,
it is **submitted** to the owner for review.

The owner should be **cognizant of any forecasted impacts** to **contingency and/or management reserve** budgets affected by the change **(See Box 8)**.

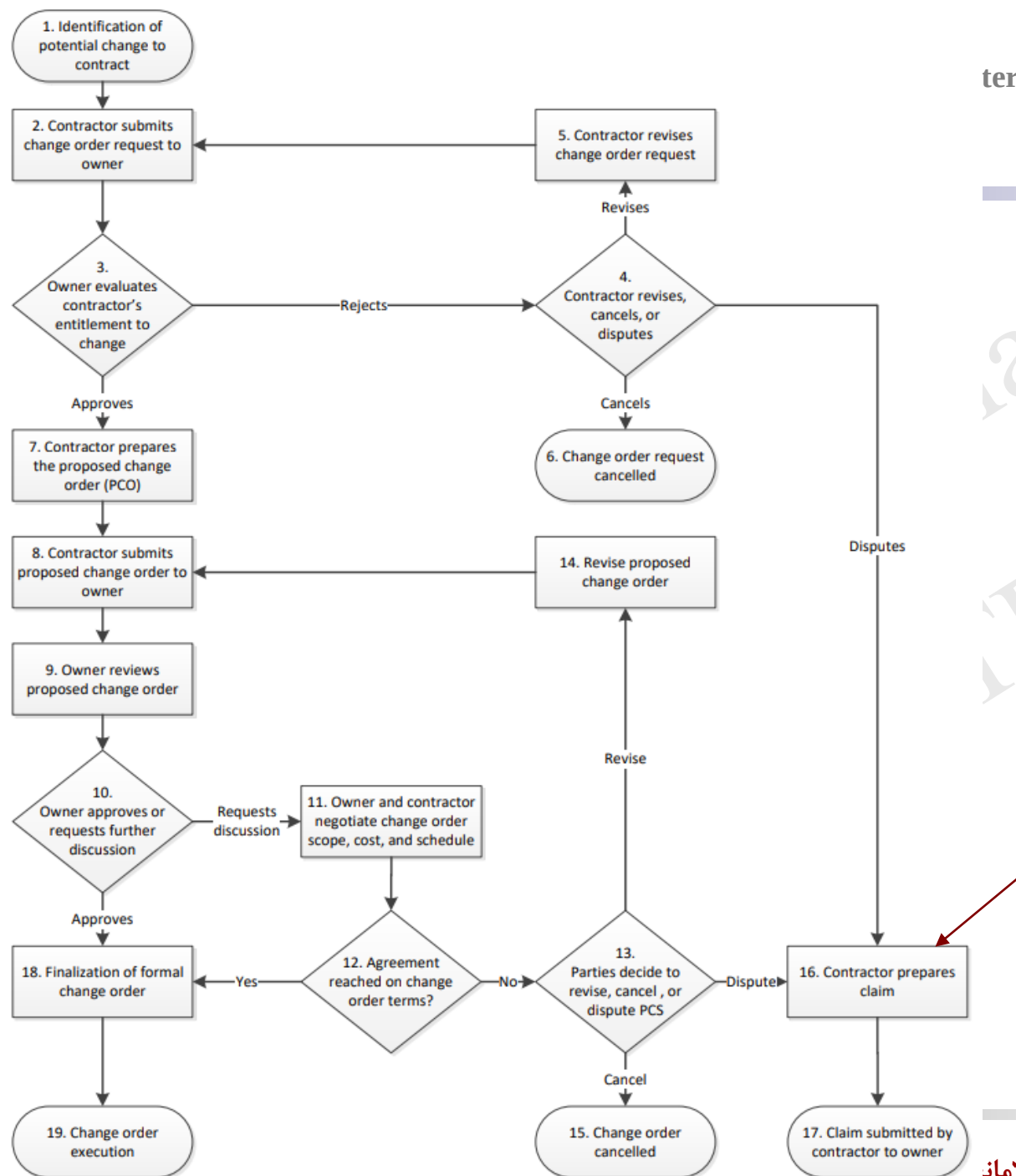




12. Change Order Cancelled (Box 15)

☐ If the **owner determines** that

1. Price of the work or the schedule impact is **more than** it expected or can **tolerate**, and
2. Parties **cannot come** to an amicable agreement on the PCO,
the **change request** can be cancelled,
assuming that the **contractor had not already** started or performed
the work.





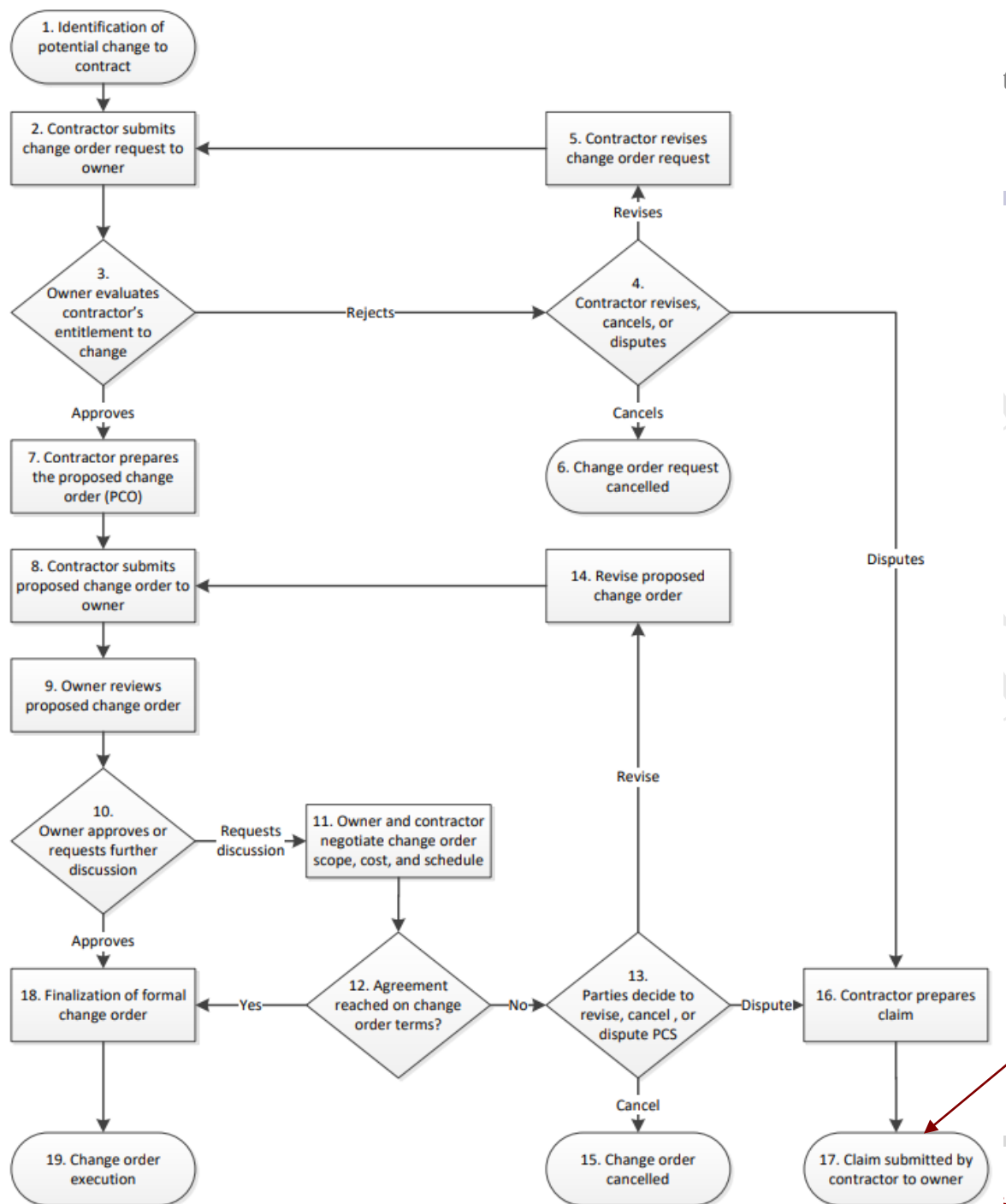
13. Contractor Prepares Claim (Box 16)

- ☐ A claim is defined as,
 - ❖ “A demand or assertion of rights by one party against another for damages **sustained** under the terms of a legally binding contract.
 - ❖ Damages might include money, time, or other compensation to make the claimant whole.”
- ☐ Most often, the **contractor** is the party that prepares and submits a **claim**.
- ☐ After **exhausting all other possibilities**,
preparing and submitting a claim should be the **last option** that a contractor uses to **resolve a change impacting** its project cost and/or schedule.



13. Contractor Prepares Claim (Box 16)

- ☐ To **prepare a claim** the contractor should follow a **similar process** that was used to prepare the proposed change order.
- ☐ In addition, the claim should include **relevant communications** between the parties during the negotiation process.





14. Claim Submitted by Contractor to Owner (Box 17)

☐ The **purpose** for preparing and submitting a claim to another party is to put that **party on notice** that

1. There is a **claim** concerning a specific portion of the work on the project, and

2. From the **perspective of the claimant**,

1. Necessary narrative,

2. Supporting information,

3. Data, and

4. Analyses

are sufficiently provided to demonstrate its **entitlement** to disputed damages.

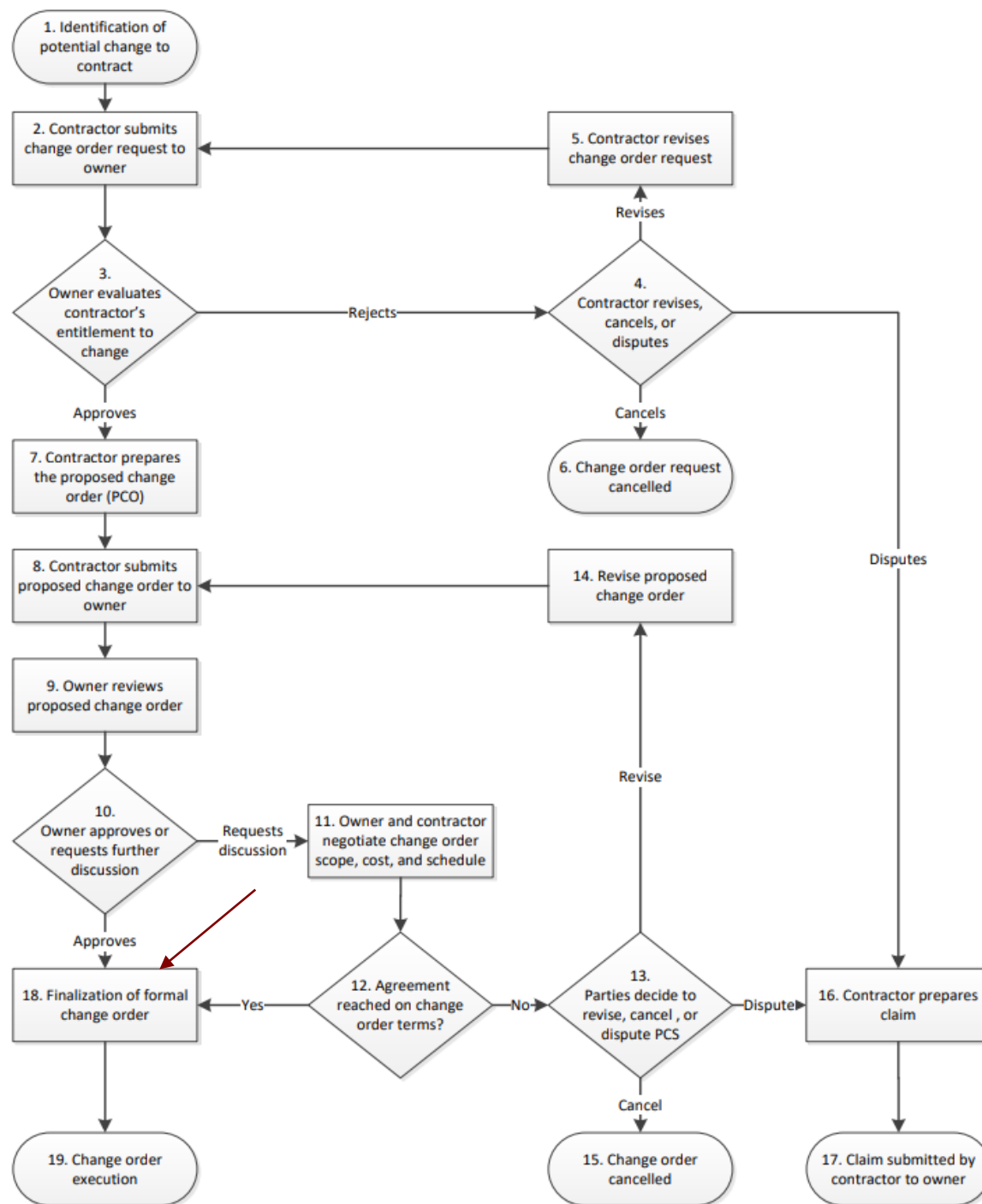


14. Claim Submitted by Contractor to Owner (Box 17)

❑ Although **claims** can be negotiated internally between the parties' organizations,

- ❖ Most often they are adjudicated by third parties, such as
- ❖ Dispute resolution boards,
- ❖ Arbitration tribunals,
- ❖ The court system, or
- ❖ Other alternative dispute resolution entities or processes.

Most construction contracts specify the forum for the dispute resolution process.



15. Finalization of Formal Change Order (Box 18)

- ❑ Once the owner and contractor have **reached an accord** concerning the scope, price and/or schedule impacts associated with a PCO,
the **change order status** should transition from proposed to finalized for execution.



15. Finalization of Formal Change Order (Box 18)

- ☐ The **prepared change order records** should include
all scope, pricing, schedule information, and analyses agreed upon by both parties.
- ☐ Additionally, any meeting minutes, photographs, requests for information (RFI), other relevant documentation, as well as correspondence between the parties during their negotiation of the PCO should be included.

This extensive package of information will help toward resolving any disputes that may arise later in the project.



15. Finalization of Formal Change Order (Box 18)

- ☐ Depending on the **contract terms**, either party can **prepare** the final change order document.
- ☐ A change order should be executed to **formalize** the change to the contract **after it has been resolved** and a **final disposition** has been determined, **even when the claim** submitted resulted from a disputed PCO.



15. Finalization of Formal Change Order (Box 18)

☐ Finalization of the change order

- ❖ Typically, the **Change Order documentation** is captured in the following formats:



15. Finalization of Formal Change Order (Box 18)

❑ Finalization of the change order

❖ **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
 1. Complete and final language that defines the total cost or credit impact, in addition to
 2. 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.

Change order form template

Owner Name Here		Change Order		Change Order No.
				Revision No.
Client/Project:				Potential Change No.
				Document No.
				Contract No.
				Date:
Change Order Title:				
Part 1 - Reason / Cause for Change				
☐ Safety	☐ Cost	☐ Schedule		
☐ Operations/Maintenance	☐ Extra Work	☐ Design Development		
Detailed Description, History, and Cause of Change (Attach additional sheets as necessary):				
Referenced Supporting Documents:				
Part 2 - Schedule Impact				
Schedule Impact to Project Substantial Completion Date (Number of Days):				
Describe in detail the delay impacts and attach delay analysis (attach additional sheets as necessary):				
Part 3 - Cost Impact				
(Attach Detailed Estimate as necessary)		Hours	Cost	
Engineering				
Project Management				
Procurement				
Material/Equipment				
Construction				
Sub-total:				
Overhead and Profit				
Total:				
Part 4 - Approval				
Owner Responsible Manager		Contractor Responsible Manager		
Printed Name:		Printed Name:		
Title:		Title:		
Company Name:		Company Name:		
Signature:		Signature:		
Date:		Date:		



Change order: Sample form 04

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.

Item	Description of Changes	Increase in Contract Amount (\$)	Decrease in Contract Amount (\$)	Contract Time Extension (Cal. Days)
Totals		\$	\$	
	Net Change in Contract Amount (Increase or Decrease)		\$	

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 _____



15. Finalization of Formal Change Order (Box 18)

☐ Finalization of the change order

❖ **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.

[illegible]





15. Finalization of Formal Change Order (Box 18)

❑ Finalization of the change order

❖ 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.



15. Finalization of Formal Change Order (Box 18)

☐ Finalization of the change order

❖ MONTHLY PROJECT SCHEDULE UPDATES

- ✓ 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.

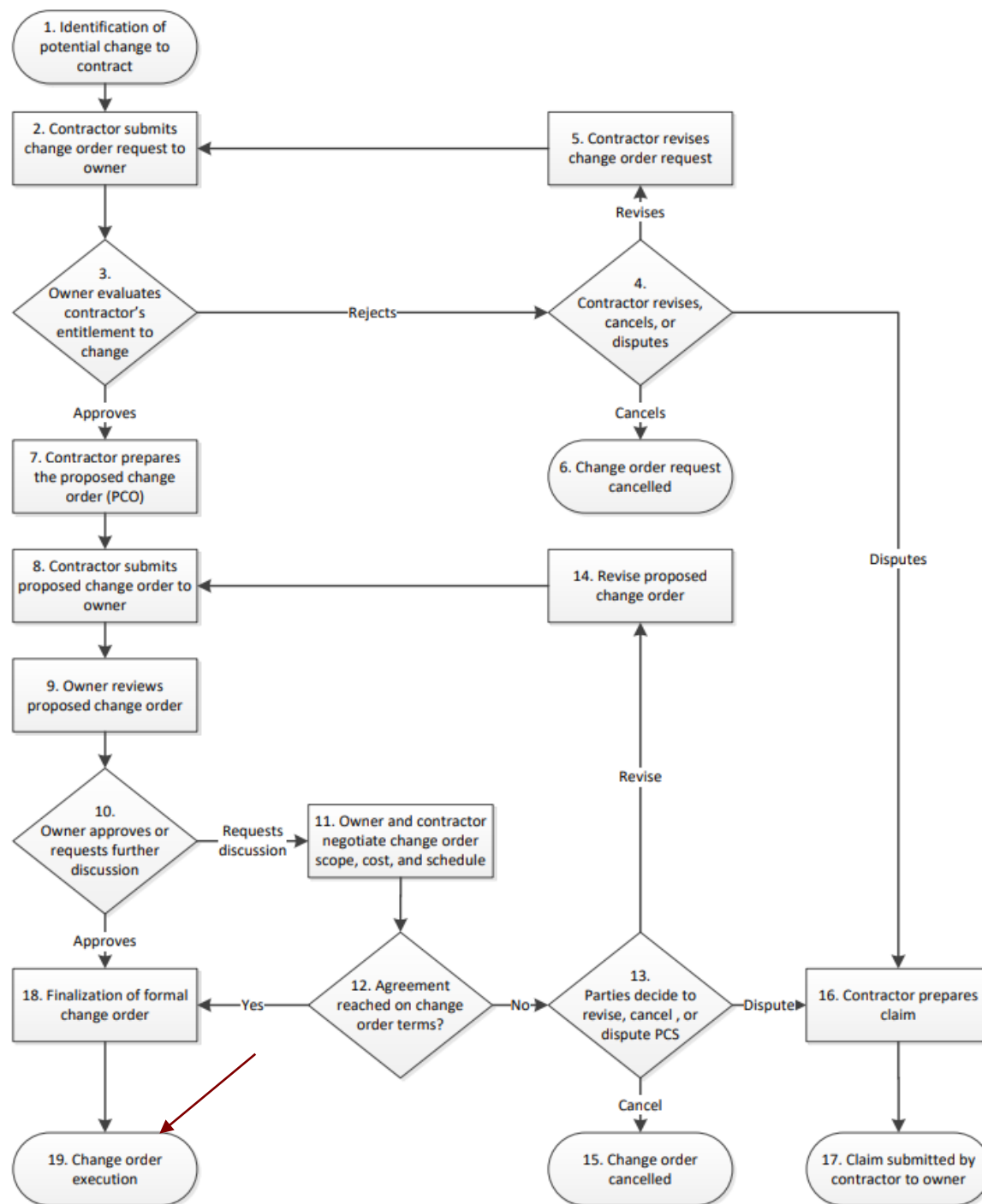


15. Finalization of Formal Change Order (Box 18)

❑ Long: Finalization of the change order

❖ 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.





16. Change Order Execution (Box 19)

- ☐ The last step concerning a recognized project scope change is the **execution** of a change order; whether it is
1. An **agreed-upon change** between the parties or
 2. A **disputed claim** that has been **resolved**.



16. Change Order Execution (Box 19)

- ☐ Execution of a change order entails **signatures** by both parties on a change order form,

signifying their agreement to all terms and conditions identified in the document.
- ☐ Depending on the terms of the contract, signatures can be faxed, communicated via esignature, or wet ink signatures.
- ☐ It is recommended that **all signatures be dated**.
- ☐ These **dates may differ** from the effective date specified in the change order.

Change Management Document Control



Change Management Document Control

- ☐ It is important that the **owner and contractor** keep well-organized and complete records for each change,
regardless of whether the change was fully executed or not.
- ☐ The documentation included in the file should be **relevant to the change issue**; and should **support or refute** a party's contractual right to the change, causation, the cost, and the schedule impacts.
- ☐ In **anticipation** of change negotiations,
a **well-organized change management document control system** will facilitate **quick access to information**
that either **supports or refutes** the changes or **claims** under consideration.

Change Management Related to Scheduling



Best practices

- ❑ **All changes** to a project and its schedule need to be **incorporated** into the schedule as soon as the project **team is aware** that there is a change, be it a delay or change of scope.
- ❑ Not all delays or changes necessarily impact the schedule, but **if** those changes are **not included** in the schedule the project team will never know if in fact they **will or will not impact it**

Recommended practice

☐ The cause of the change

—**no matter** the reason or who is at fault—

should be **dealt** with as soon as it becomes **evident**.



Scope change – Identification and documentation: Guidelines

- ❑ A **change of scope** means that there is a significant **addition** to or **subtraction** from the project's **original scope of work**.
- ❑ The **general contractor** is **not going** to add or subtract scope of work **on his own** because then he or she would be in default of the contract.
- ❑ An **owner** can **decide** (usually after the project has already started) that he or she doesn't like a certain aspect of the original scope or wants to add/change that scope.
 - ❖ The reason makes no difference.

The bottom line is that the change is significant enough that the general contractor has to rethink how the project is going to come together based on the new scope of work.

Do we need always to change the schedule as a revised one?



Scope change – Identification and documentation: Guidelines

- ❑ If a project does **not experience a significant change** in the scope of work, there is **no need to worry** about or track it.
- ❖ If, however, there is a significant change, it must be accounted for.

When should what-if analysis conducted?

Scope change – Identification and documentation: Best practices

1. Once the **general contractor** is made aware that a change in scope is on the horizon, and
2. Once they have **enough general information** about what that change is, a **what-if schedule** can be created which will be derivative of the current working schedule.

What if we have only summary-level information?



Scope change – Identification and documentation: Best practices

❑ The **new information**, which will be a **summary level add on** the first go around, can be added and

then **become more detailed** as new information becomes known and available.

❖ Of course, the **new scope of work** also has to be plugged into the **current logic**.

❖ Doing so will allow an **analysis of the impact** of that added scope on the critical path and the end date of the project.

What if the final results are different?



Scope change – Identification and documentation: Best practices

- ☐ Once all of that is known, the **end result** may be a total rework of the schedule in order to **account for the additional work** and still **maintain the original end date**.
- ☐ That **may or may not be possible**, but the **scheduler/planner** should **make the attempt**, because the **owner will require** it.

When what-if schedule become official?

Scope change – Identification and documentation: Best practices

☐ Once

1. The change of scope is priced and
2. The impacts to the schedule known and
3. Approved by the owner by a change order or some other official mechanism,
the what-if schedule will become the **official schedule**.

It becomes a new baseline or updated schedule?

Scope change – Identification and documentation: Best practices

- ☐ This schedule will usually become the new baseline because the significant changes made to the original schedule will require it.
- ☐ The **project now has a new plan**,
so tracking the new one against the original one will **no longer make any sense** to anyone.

Scope change – Identification and documentation: Recommended practice

- ❑ As soon as enough is known about the projected change in scope,

ALL the steps to account for it—

whether it is an addition or a subtraction of work—

need to be **connected to** their proper predecessors and successors through logic relationships.

What is the reason for that?



Scope change – Identification and documentation: Recommended practice

- ❑ At first the information will be **summary** in nature and a **guess** as to activity description, duration, and logic, but tone must start somewhere.
- ❑ **Start** as soon as you **know** it so **you can determine the possible impacts** on the schedule.
- ❑ **If you wait** until you know all the information and then add that information/scope of work into the schedule in order to determine the impact, you will **more than likely shock** the project team and stakeholders.
- ❑ It is better to let the team know the possible **impacts early on**.

Then, as more new information is made available and that information is included in the schedule, the effects of that added information on the schedule will be easier for the stakeholders to take.

Scope change – Identification and documentation: Advisories

- ☐ Changes should **not** be made to the schedule, or work begun on the scope change **until you have it in writing** to do so.
- ☐ Do **not do anything on verbal** direction from the owner.

Delay-caused by contractor?



Delays – Identification and documentation: Guidelines

- ❑ A delay caused by the general contractor or one of his subcontractors could include a **lack of production** by one of them due to
 - ❖ Lack of manpower or materials,
 - ❖ Poor planning,
 - ❖ Subcontractor insolvency,
 - ❖ Unforeseen conditions, or
 - ❖ A number of other factors.



Delays – Identification and documentation: Guidelines

- ☐ Note that the **general contractor is responsible** for all of his/her subcontractors and their performance.
- ☐ If a **subcontractor** is found to be the **reason for the delay** to a project, it is the **general contractor's responsibility** to try to **recover lost time**.
- ☐ That usually means it is going to also **cost more money to recover**.
- ☐ Once the delay is accounted for and hopefully mitigated, the general contractor usually then **goes after his/her subcontractor** to recover any costs incurred during the recovery.
- ☐ Also, the **schedule to recover lost time** due to the delay is called a recovery schedule.

Delay-caused by owner?



Delays – Identification and documentation: Guidelines

❑ A delay caused by the owner can be due to

- ❖ A lack of timely decision making,
 - ❖ Poor planning of owner responsibilities,
 - ❖ A change of scope,
 - ❖ A change order,
 - ❖ Financial difficulties, or
 - ❖ A change of market considerations,
- to name a few.



Delays – Identification and documentation: Guidelines

- ☐ If a **project suffers an owner-caused** delay, the mechanism to get the project back on track is the creation of an acceleration schedule.
- ☐ **Even though the owner caused** the delay,
 - he or she will still want the project to come in **on time per the contract** and to accomplish that,
 - he or she will direct the general **contractor to accelerate** the work in order to recover lost time.
- ☐ That cost to accelerate will be **attributed to the owner**.
- ☐ The hope is that the **delay can be mitigated** by acceleration of the work.

Fore majeure delay by contractor?



Delays – Identification and documentation: Guidelines

- ☐ A **force majeure delay** is also called an “act of God” delay.
- ☐ It is a delay **beyond the ability** of anyone to foresee.
- ☐ These delays can include above and **beyond normal weather** (floods, earthquakes, tornadoes, hurricanes, and extreme wind), fire, union strikes, war, and civil unrest.
- ☐ If a **force majeure delay is encountered**, the effect of the delay to a project could be **miniscule or major depending** on the severity of the delay event.
- ☐ The general contractor will get the additional time, but will **not be allowed** to collect the **additional general conditions** to complete the project.

Two purposes of tracking and accounting for a delay?



Delays – Identification and documentation: Purpose

- ☐ The **primary purpose** of tracking and accounting for a delay is to allow the project team to assess the impact of the delay on the project.
- ☐ The **secondary purpose** is to figure out who is responsible for the delay and who will then have to pay for it.



Delays – Identification and documentation: Default condition

- ☐ **As soon as either** the general contractor, one of the subcontractors, or the owner is aware that a delay exists or is imminent,
the delay **must be accounted** for in the project schedule to **assess its impact**.
- ☐ Any delay to a project or potential delay needs to be dealt with as **soon as it is known** that it exists
in order for all stakeholders of the project to be able to react to it and hopefully mitigate it before it ends up on the critical path.

Another objective?



Delays – Identification and documentation: Best practices

❑ **One of the objectives** of a project schedule is to relate the truth of

❖ How the project was planned (the as-planned condition) and

❖ How it was actually built (the as-built condition).

❑ That being the case,

when a delay is encountered, the **incorporation of that delay** into the project schedule,

no matter who is at fault or responsible for it,

needs to be addressed and accounted for to **assess its impact** on the project's critical path.

So as soon as a delay is encountered the steps to mitigate it must be included and added to the schedule

It starts by what?



Delays – Identification and documentation: Best practices

- ❑ At first, the **actual steps (activities)** and **durations** may be a **guesstimate** and summary in content.
- ❑ As time goes by,
more will be known about the steps to **mitigate the delay**, and the **summary activities** will become **more detailed** and the durations and logic more realistic.

The **tendency** in construction projects is to **hide the delay and/or delay** the reporting of it to the project team **because no one wants to admit** that they are responsible for it.

Is it a good strategy?



Delays – Identification and documentation: Best practices

- ❑ The **general thinking** by those responsible is that
if they delay reporting it maybe they can mitigate it, and
they **hope that no one will notice** that it ever occurred.

- ❖ This is **not a recommended practice**.

*The delay should be **reported as soon** as it becomes known so that the project team can react to it immediately, thereby giving them the **greatest amount of time to mitigate it**.*

*This is **true for all three types** of delay. There will be plenty of time to assign responsibility later.*



Delays – Prospective time impact analysis: Guidelines

- ☐ There are many definitions for **time impact analysis** and they all are valid.
- ☐ Following is a listing of some of those definitions:

Prepared by Dr. Alavipour
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Delays – Prospective time impact analysis: Guidelines

❑ Following is a listing of some of those definitions:

1. **Prospective Time Impact Analysis** is the **official term** for accounting for the delays mentioned in Identification and Documentation.



Delays – Prospective time impact analysis: Guidelines

❑ Following is a listing of some of those definitions:

2. Per AACE International Recommended Practice No. 52R-06 (AACE, 2006) –

“Time Impact Analysis as applied in Construction”:

- a. “Provides **guidelines** for the project to assess and quantify the effects of an unplanned event or events on current project completion.”
- b. “The TIA is a ‘**forward looking**,’ prospective schedule analysis technique that adds a **modeled delay** to an accepted contract schedule to determine the **possible impact of that delay** to project completion.”



Delays – Prospective time impact analysis: Guidelines

❑ Following is a listing of some of those definitions:

3. In their book, CPM in Construction Management—6th Edition, James O’Brien and Fred Plotnick (2006) define time impact evaluation as

*“Use of a **Fragnet** or **sub network** to evaluate the **impact** of an **event** such as a **change of order** or **unusual** occurrence on the baseline schedule;
known as TIE.*

This is also known as time impact analysis (TIA).”

Delays – Prospective time impact analysis: Guidelines

❑ Following is a listing of some of those definitions:

4. From his paper, Preparing & Analyzing a Prospective Contemporaneous Time Impact Analysis, Chris Carson (2007) cites **contemporaneous perspective** – Performed to “**look ahead**” during the project – Performed at moment of **start of impact** – Called **Contemporaneous Time Impact Analysis (TIA)** – **Compare** the predicted completion of the schedule just **prior to the date** of the “delay event” to the **predicted completion** of the schedule after **inserting a fragnet** of impact activities into the schedule

Reasons for selecting TIA?



Delays – Prospective time impact analysis: Purpose

❑ The **reasons for use** are:

- ❖ A time impact analysis (TIA) is the **best methodology** for determining the extent of **impact** from a potential delay event.
- ❖ When done in a **prospective or forward-looking** manner, a TIA can promote negotiation and ultimate **settlement of any ramifications** of a delay event.
- ❖ Sometimes a TIA is **mandated** in the project contract **specifications**.
- ❖ A TIA is the best way to **evaluate expected impacts** resulting from changed conditions.
- ❖ A TIA **supports negotiation** of time extensions due to **changed conditions**.
- ❖ A TIA **enables** the **sharing of risk**.
- ❖ A TIA helps to keep the **project on track** with an accurate schedule.

Reasons for performing TIA?



Delays – Prospective time impact analysis: Purpose

❑ Here are **reasons why a TIA** would be **performed** on a project:

- ❖ The project is **experiencing a delay** or **one is looming**.
- ❖ You have to determine **what the impact** of the delay event is going to be on the project, especially the **critical path**.
- ❖ The delay event has been inserted into the **current schedule** and **all of the appropriate logic** has been **hooked up**.
- ❖ You may have to **assume some durations** may have to be **assumed in the beginning**,

but as you **know more the details work** themselves out and the **delay event** can be **adjusted** accordingly.



Delays – Prospective time impact analysis: Purpose

❑ Here are **reasons why a TIA** would be **performed** on a project:

- ❖ You **compare** the schedule prior to inserting the delay event and note the changes.
- ❖ You **report out the results** of the insertion of the delay event into the schedule to **ALL of the stakeholders** and let the team assess the meaning of it all.
- ❖ The delay event may push the **overall duration** of the project, which will get **everyone's immediate attention** as to the seriousness of the delay.
- ❖ There will be **a lot of discussion** as to what can be done to **mitigate the delay**.
- ❖ Hopefully and eventually **everyone** will come to a **decision** as to how to **handle it**.



Delays – Prospective time impact analysis: Purpose

❑ Here are **reasons why a TIA** would be **performed** on a project:

❖ The **risk associated** with the eventual decision will be **shared**;

no one is going to **accept** it all

unless it is shown that there is **only one stakeholder responsible** for the delay.

❖ The **schedule** will be **accurate** and **tell the truth** about how the project is going to be completed.

In what situations mostly used?



Delays – Prospective time impact analysis: Default condition

❑ Situations for Use—Excusable Delay Events

- ❖ Late notice to proceed
- ❖ Undisclosed conditions
- ❖ Unknown site conditions
- ❖ Request for proposal
- ❖ Constructive change directive or change order
- ❖ Field order
- ❖ Scope change
- ❖ Contractor delay
- ❖ Owner delay
- ❖ Force majeure

How to prepare for a TIA?



Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

a. Verify the current schedule.

❖ Test for **reasonableness**.

- ✓ Is it an accurate schedule, depicting the proper scope of work for the project in sufficient detail for proper tracking of the work?
- ✓ Does the schedule tell the truth?

❖ Ensure that the schedule **logic** models the actual project sequencing.

❖ Check for **constraints**.

- ✓ If constraints exist, remove them by inserting the proper logic.



Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

a. Verify the current schedule.

- ❖ A properly built schedule should have only **two constraints**:
 - ✓ An early start constraint to kick the project off, and a late finish constraint at substantial completion or final project completion.
- ❖ All the activities in between should be **hooked by logic with a minimum** of one predecessor and one successor.
 - ✓ The use of a constraint on an interim milestone is **allowed** if the interim milestone is contractual or driving.



Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

b. Update the current schedule.

- ❖ Use the update date through the date that will reflect the situation **immediately prior to the beginning** of the changed condition.

Delays – Prospective time impact analysis: Best practices

☐ Preparing for a TIA:

c. Do not make any logic changes after the update.

Delays – Prospective time impact analysis: Best practices

☐ Preparing for a TIA:

d. Calculate the schedule and set the data date immediately prior to the beginning of the changed condition/delay event (to match the update data).

Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

e. Document the completion date.

- ❖ Be consistent and use a common activity such as “**substantial completion**” or an **interim milestone** for the point of comparison.
- ❖ Use the **early finish dates** for the entire project.



Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

f. Identify the reason for preparing the TIA.

- ❖ Changed condition
- ❖ Potential delay situation
- ❖ Force majeure

Delays – Prospective time impact analysis: Best practices

☐ Preparing for a TIA:

g. Create a copy of the reference schedule for use in the analysis, so the reference schedule can be used as a target schedule.



Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

h. Determine the scope of work required to document the changed condition or delay event.

List the assumptions:

- ❖ Scope of work—not just the physical work, but also any redesign, permitting, approvals, procurement, etc.
- ❖ Manpower and resources
- ❖ Sequencing rationale
- ❖ Note any questionable assumptions—especially in the very beginning of documenting the event; a lot of it may be guesswork depending on the severity of the event.
- ❖ Provide a narrative on how the work will be done.



Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

i. Create a fragnet of activities.

- ❖ Estimate the durations of the activities that make up the fragnet and document.
- ❖ Determine the appropriate logic to tie the new fragnet into the schedule.
- ❖ Insert the new fragnet into the schedule with the appropriate logic.
- ❖ Calculate the schedule.
- ❖ Note the completion dates.
- ❖ Recalculate the schedule.
- ❖ Again note the completion dates.
- ❖ Compare the completion dates: the completion date with the delay fragnet durations set to zero versus the completion date with the estimated durations.



Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

i. Create a fragnet of activities.

- ❖ Review the critical path changes and shifts.
 - ✓ Identify the critical path in the schedule prior to the insertion of the TIA.
 - ✓ Identify the critical path after the insertion of the TIA.
 - ✓ Compare and review the changes.
- ❖ Create a narrative and write-up of the conclusions and disseminate them to the stakeholders.
- ❖ Be prepared to discuss and defend.



Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

j. After the TIA is submitted and reviewed by the stakeholders:

- ❖ Negotiate a time extension, if any.
 - ✓ Remember: this will only happen if all the stakeholders believe the results of the analysis of the TIA.
- ❖ Document any decisions.
- ❖ Incorporate the TIA into the official schedule.
- ❖ Do this whether the TIA is accepted or not.



Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

j. After the TIA is submitted and reviewed by the stakeholders:

- ❖ Just because there are those who don't want to accept or approve the TIA, it doesn't mean it is invalid and that the delay event isn't going to occur and impact the project.
- ❖ The schedule should always reflect the truth.
- ❖ Publish the revised schedule and distribute to all.
- ❖ Provide a change order showing settlement, if applicable.
- ❖ Ideally, a TIA resolution should include any known delay issues or impacts to date.
- ❖ This may require that more than one TIA be performed.



Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

k. The benefits of TIAs:

❖ Benefits to the owner

- ✓ Participates in decisions that affect budget and completion
- ✓ Can negotiate requests for time and costs prior to work
- ✓ Encourages cooperation
- ✓ No lingering potential claims issues.
 - In other words, work out problems and issues early, come to an agreement, and then move on



Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

k. The benefits of TIAs:

❖ Benefits to the owner

- ✓ Budget and completion information will always be current and reasonably accurate after agreement is reached
- ✓ Allows owners to take advantage of pricing opportunities
- ✓ Reduces or eliminates the need for unilateral modifications
- ✓ Shares performance and cost risks



Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

1. Benefits to the contractor:

- ❖ A prospective TIA is a relatively simple analysis compared to an after-the-fact retrospective TIA and a claim.
- ❖ Receives timely time extensions.
- ❖ Builds good documentation even if the TIA is rejected.
- ❖ Allows negotiation prior to spending money or doing work.
- ❖ Minimal memory problems compared to old issues.
- ✓ Documenting and creating a TIA while it is in progress is a lot easier than doing it after the fact, and maybe years after the delay event occurred.



Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

1. Benefits to the contractor:

- ❖ Allows for pacing of the other trades.
- ❖ Fair preparation of a TIA builds credibility.
- ❖ Builds in understanding of risk and pricing.



Delays – Prospective time impact analysis: Best practices

❑ Preparing for a TIA:

m. Disadvantages of using TIAs:

- ❖ The process requires scheduling personnel with more analytical experience, skills, and knowledge.
- ❖ Some added time burden to those preparing the TIA, but a lot less than building a claim after the fact.
- ❖ Less attorney and consultant revenue, which is mainly a disadvantage to the attorneys.



Delays – Claims avoidance and monitoring

- ❑ The **level** of documentation, communication, and control through the life of a project makes schedules a live form of agreement from initiation to close-out phases.
- ❑ **Adverse conditions** in a claim arising out of
 - ❖ Poor documentation,
 - ❖ Contract conditions, or
 - ❖ Interpretation of rightscan end up in expensive legal disputes and litigation.



Delays – Claims avoidance and monitoring: Guidelines

- ❑ **Any deviation** that significantly affects the contractor's or owner's **assumptions** in **profitable execution** of the contract forms the **basis of a claim**.

Claims from the contractor commonly arise?



Delays – Claims avoidance and monitoring: Guidelines

❑ Claims from the contractor commonly arise for the following reasons:

- ❖ Owner-initiated changes;
- ❖ Differing ground conditions;
- ❖ Poor contract documents;
- ❖ Natural causes or force majeure;
- ❖ Access restraints or limitations from interfacing contracts that impact the contractor's ability to perform the project efficiently;
- ❖ Failure of the owner to make timely decisions; and
- ❖ Failure of the owner to provide owner-purchased material on a timely basis.

Owner?



Delays – Claims avoidance and monitoring: Guidelines

❑ Claims from an owner can arise for the following reasons:

- ❖ Poor contract documents;
- ❖ Failure of the contractor to meet the schedule; and
- ❖ Failure of the contractor to provide the necessary resources (manpower and material) to meet project requirements.

Schedule delay analysis in case of a claim?



Delays – Claims avoidance and monitoring: Guidelines

- ☐ A schedule delay analysis,
in **case of a claim**,
can involve a **complex process** in interpretations and entitlement under the contract provisions.
- ☐ Since **aggravated claims** can lead to legal disputes,
prevention and avoidance techniques should be carefully formed in consultation with project **legal advice**.
- ☐ This **Best Practice Guide** should only be used as a guide in the **formulation** of a project framework in schedule documentation and claim avoidance techniques.



Delays – Claims avoidance and monitoring: Guidelines

❑ Delay claims involve **appropriate interpretation** of these key concepts under the contract:

- ❖ Excusable delay: Entitles the contractor to an equitable extension of time.
- ❖ Non-excusable delay: A delay for which the contractor has to either mitigate or bear penalties.
- ❖ Compensable time: Delays that legitimately impact the profit margins of the contractor and eligibility for additional compensation.
- ❖ Ownership of float: Floats can be client-owned, shared for first use, or contractor-owned.



Delays – Claims avoidance and monitoring: Guidelines

❑ Delay claims involve **appropriate interpretation** of these key concepts under the contract:

- ❖ Resource constraints: Assumptions of resource availability that may be contractually binding.

Associated claims could arise for **loss in productivity** or **acceleration**.

- ❖ Liquidated damages: An excusable delay may or may not entitle a waiver of liquidated damage based on contract conditions.

Best points in facilitating resolution?



Delays – Claims avoidance and monitoring: Best practices

- ❑ The **primary premise** of any claim rests on **deviation** from a baseline contract condition.
- ❑ Hence, the best practice in claim prevention and **facilitating just and swift resolution** is:
 - ❖ Documentation
 - ❖ Validating baselines
 - ❖ Monitoring variances
 - ❖ Tracking changes
 - ❖ Maintaining periodic updates
 - ❖ Settlement of time impact analysis
 - ❖ Communication and configuration
 - ❖ As-built and close-out

From a scheduling standpoint?



Delays – Claims avoidance and monitoring: Conduct planning reviews

❑ From a scheduling standpoint, recommended practices translate to:

❖ Independent expert review of contract documents, drawings, and specifications for high-risk projects.

- ✓ These reviews help an **independent expert review** the **integrity** of documents and its intent to the contractor.
- ✓ These reviews are **helpful** in
 - Identifying potential conflicts,
 - Verifying consistency in requirements, and
 - Verifying coordination and cross references within the contract documents.



Delays – Claims avoidance and monitoring: Conduct planning reviews

❑ From a scheduling standpoint, recommended practices translate to:

❖ Independent expert review of contract documents, drawings, and specifications for high-risk projects.

- ✓ For example, the **delivery of key equipment** on-site could have been set at 180 days in special provisions as a milestone for the general contractor, but allow for 240 days in lead time for a preselected vendor in the specifications pertaining to the equipment.
- ✓ Independent reviews obviously add burden to the project budget and are particularly **useful for contracts with significant interfaces** with other contracts or that involve **complex integration** of design from various sources.



Delays – Claims avoidance and monitoring: Conduct planning reviews

❑ From a scheduling standpoint, recommended practices translate to:

❖ Constructability reviews including review of milestones and associated risk assessments.

- ✓ This practice particularly applies to the **construction industry**.
- ✓ Constructability reviews involve **rigorous evaluations** of high-level schedule assumptions.
- ✓ These reviews can make **careful assessments** of
 - ✓ Risks from ambitious milestones,
 - ✓ Difficult interfaces, or
 - ✓ Phase assumptions in a project.

Delays – Claims avoidance and monitoring: Conduct planning reviews

❑ From a scheduling standpoint, recommended practices translate to:

❖ Pre-tender stakeholder and peer review of contract documents.

- ✓ A scheduler's review of contract documents,
particularly sections that impact the schedule,
can help with including relevant contract conditions that help in
validating, maintaining, and controlling a quality schedule.

Key points about baseline schedule?



Delays – Claims avoidance and monitoring: Validate the baseline schedule

- ❑ A **baseline schedule** is a key document for establishing an as-bid contract plan.
- ❑ In case of claims, the **baseline schedule** is generally accepted as a legal basis for
 1. Measuring variance and
 2. Contractor performance.
- ❑ The preparation of a baseline schedule and its validation are **key processes** that help in claim prevention.
- ❑ Typically, baseline schedule **preparation** and **review** require
 1. Careful review and
 2. Inclusion of applicable contract conditions.



Delays – Claims avoidance and monitoring: Validate the baseline schedule

- ❑ **Validating** a baseline requires a critical and expert review from an experienced scheduler.
- ❑ A baseline schedule should:
 - ❖ Contain no progress;
 - ❖ Have a closed CPM;
 - ❖ Identify all key milestones;
 - ❖ Have a well-defined WBS that agrees with project breakdown of scope of work;
 - ❖ Have a well-defined responsibility for the scope of work either by use of Organizational Breakdown Structure (OBS) or coding;
 - ❖ Include resource assignments, cost load, and activity coding to the group; and
 - ❖ Manage and communicate schedule information to all stakeholders.

Delays – Claims avoidance and monitoring: Validate the baseline schedule

- ❑ **Validating** a baseline requires a critical and expert review from an experienced scheduler.
- ❑ It should ensure that:
 - ❖ All contract conditions are satisfied;
 - ❖ All milestones and key assumptions including subcontractors are identified;
 - ❖ Float suppression techniques and lags are audited;
 - ❖ Superfluous predecessor and successor relationships for reducing float are audited; and
 - ❖ Resource-based relationships are carefully reviewed and conditionally accepted.

Key points about updated schedule?



Delays – Claims avoidance and monitoring: Maintain an updated contemporaneous schedule

- ☐ A **schedule updated** at a specific interval that is specified in the contract or required by the client is a contemporaneous record of an updated project plan.



Delays – Claims avoidance and monitoring: Maintain an updated contemporaneous schedule

❑ An **updated schedule** should include:

- ❖ **Verified** and **agreed** progress values for activities.
- ❖ If the project uses an **earned value process**,
ensure that applicable progress measurement rules are used **to evaluate progress**.
- ❖ **Auditing** out-of-sequence progress and modifying logic, where required,
to reflect **revisions to sequence of work**.
- ❖ **Update** the project plan document or
- ❖ **include** a narrative with the progress report to
 - ❖ document changes and update the project plan represented in the schedule.



Delays – Claims avoidance and monitoring: Maintain an updated contemporaneous schedule

❑ An **updated schedule** should include:

- ❖ **Addition** and **updating** of activities for **approved changes**.
- ❖ Updated WBS, OBS, cost accounts, and codes, as required, to be **consistent** with project configuration.
- ❖ **Updated** resource planning.
- ❖ Addition and tracking of risk issues, including
 - ✓ Suspension and resumption of work,
 - ✓ Potential weather days, or
 - ✓ Delay in access.



Delays – Claims avoidance and monitoring: Maintain an updated contemporaneous schedule

❑ An **updated schedule** should include:

- ❖ **Identification** of any potential delay issues,
notifications sent for potential time impact, and
what-if analysis provided for the projected delay.
- ❖ An **activity displaying float** may already be on a **critical path**
due to a potential change that is awaiting settlement of negotiation.



Delays – Claims avoidance and monitoring: Maintain an updated contemporaneous schedule

❑ An **updated schedule** should include:

❖ If the change requires **additional duration**

before the activity can be **started**,

the impact can only be seen in a **what-if analysis**.

❖ It is **not a recommended practice** to **track** all potential changes in approved schedule updates to maintain the sanity of schedule and cost projections,

yet it is imperative to perform **what-if analysis separately** for significant changes and **document** its potential impacts in updates.



Delays – Claims avoidance and monitoring: Maintain an updated contemporaneous schedule

❑ **Review** of schedule updates should additionally include:

- ❖ **Analysis** of schedule performance and variances.

- ❖ **Assessment** of responsibility for projected delay.

- ✓ In case of contractor delay, a **recovery schedule** should be **requested** to mitigate and arrest further delays.

- ✓ In case of delays not attributed to the contractor,

- a **time impact analysis** should be **requested** from the contractor.

- ❖ Communication of **updated schedule** and **performance reports** to stakeholders in accordance with the project communication plan.

- ❖ Good communication facilitates better control and timely intervention for swift resolution of claims.



Delays – Claims avoidance and monitoring: Update recovery schedules and perform time impact analysis

- ☐ A **recovery schedule** should be treated as a revised baseline schedule.

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Delays – Claims avoidance and monitoring: Update recovery schedules and perform time impact analysis

- ☐ Where a recognized delay has a cause beyond the contractor's control,
a time impact analysis (TIA) is an appropriate means for evaluating the impact,
analyzing it, and
agreeing on the recourse.
- ☐ While there are various methods for evaluating a time impact analysis (TIA),
the contemporaneous method is a widely adopted practice.
- ☐ A TIA typically involves development of a fragnet (a small section of a CPM
network)
that includes a network of activities resulting from the change or incident.

Delays – Claims avoidance and monitoring: Update recovery schedules and perform time impact analysis

- ☐ This fragnet is inserted into a contemporaneous schedule to evaluate projected delays.
- ☐ TIAs are effective tools in claim resolution and help in the determination of excusable, concurrent, and inexcusable delays.
- ☐ These analyses form the basis for recommendations on time extensions and waiver of liquidated damages.



Delays – Claims avoidance and monitoring: Create as-built schedule

- ☐ An as-built schedule is a validated record of actual progress and accomplishment of activities.
- ☐ It becomes a record document in evaluating case history for claims.
- ☐ Validating actual dates during schedule updates is recommended for maintaining a working as-built record.
- ☐ It becomes a valuable document for close-out.

Appendix: Sample Change Management Templates



Templates

مدیریت تغییرات قراردادی در پروژه‌های EPC
بر اساس اسنادی از AACE و PMI و Long International

- ☐ Templates provided during the lecture

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Final Notes



Conclusion

- ☐ The change management process is one of the most important aspects associated with a successful construction project.
- ☐ In the absence of a construction change management process defined in the construction contract, this recommended practice provides an option to consider.
- ☐ Each of the boxes identified in the process diagram should be further defined by the construction management team, including roles, responsibilities, and procedures.
- ☐ The change management process provided in this course can be modified to suit the needs of the user.

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