هيئة كفاءة الإنفاق والمشروعات الحكومية
Expenditure Efficiency & Projects Authority

# EXPRO National Manual for Projects Management

## Volume 7, Chapter 4

## Project Schedule Contingency Procedure

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# 1.0 PURPOSE

The assessment of schedule risk and development of schedule contingency is a fundamental part of project schedule development. The purpose of this procedure is to outline responsibilities, processes, and criteria for handling project schedule contingency.

This procedure applies to works performed under all Government construction projects executed throughout the Kingdom of Saudi Arabia.

# 2.0 SCOPE

Schedule Contingency is to be evaluated for all projects at each stage of the project. It is essential to reduce risk of schedule delays and to communicate to management and stakeholder reasonable schedule expectations.

# 3.0 DEFINITIONS

| Definitions | Description |
|---|---|
| Schedule Bare Duration | Project duration determined per Critical Path |
| Schedule Contingency | Schedule contingency is the amount of time and associated costs that should be included in certain elements of the project schedule to provide for uncertainties in the duration required to complete the project. |
| Schedule Target Completion | Schedule completion dates targeted by the project team, and defined per bare schedule. |
| Schedule Contractual Completion | Schedule completion dates commercially agreed in the project contract. |

Please see document “EPM-KPP-PR-000001 Project Planning & Scheduling Procedure” for general definitions.

# 4.0 REFERENCES

1. EPM-KPP-PR-000001 - Project Planning and Scheduling Definitions and Concepts Procedure

# 5.0 RESPONSIBILITIES

Project Team is responsible to provide input to the risk assessment.

Project Lead Planner leads the schedule risk assessment effort. Either performing the risk sessions with the team and follow-on risk evaluation himself, or requesting 3rd party help.

Project Lead Trend Engineer (or Lead Cost Engineer) has close interaction with Project Lead Planner to inform and discuss schedule implications of trends as they are being identified.

Project Risk Manager has close interaction with Project Lead Planner to discuss and evaluate schedule implications of identified project risks.

# 6.0 PROCESS

## 6.1 SCHEDULE CONTINGENCY DEFINITION

Schedule Contingency is a time allowance added to the bare schedules or subcontractor schedules to address uncertainties within the project schedule, the project scope or subcontractor performance. The amount of contingency required is related to the probability of those uncertainties occurring.

Risk factors included in the risk analysis may include:

- Quantity Variances:
  Changes in quantities occur due to low estimates, late adds, design evolution, and the fact that construction quantities are normally more than neat design quantities.
- Engineering design:
  Uncertainty can be due to late vendor information, design review, unexpected design difficulties, and production. Note that client design changes and other client delays shall not be part of schedule contingency as those cases are addressed in the scope change process.
- Material and equipment delivery::
  Normally due to uncertainty in specifications, bidding process, manufacture, in factory quality control and delivery duration.
- Construction:
  Uncertainty variation in productivity, mobilization of construction equipment, minor labor issues, and the like.
- Pre-operational testing and commissioning:

  Uncertainty testing electrical systems, mechanical equipment alignment, verification of digital controls systems, and the like

Schedule contingency is many times misunderstood as being float. It is not. Contingency is an empirically calculated value based on a team's risk assessment, and is time that WILL be required to finish the project.

Schedule contingency shall be shown as a single activity at the end of the project.

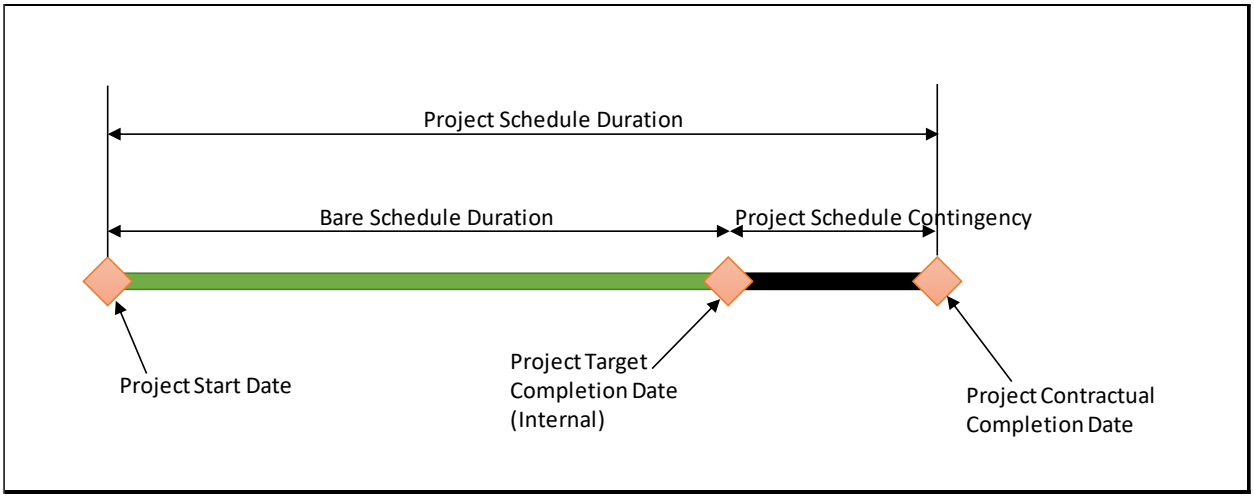


**Figure 01 - Key Project Milestones and Schedule Contingency**

Other risks that may impact the schedule contingency and/or may trigger a reassessment/recalculation of the schedule contingency are:

- Scope Changes:
  Scope changes will in many cases require a negotiated cost and schedule extension with the subcontractors, maintaining same amount of subcontractor schedule contingency. Only if the scope change is significant, schedule contingency might need to be recalculated.
- Owner Impacts:
  Normally treated as scope changes. Owner would normally be the Entity or similar.

- Force Majeure Events:
  Events for which the subcontractor is protected or limited contractually, but needs to be accounted for at Entity or similar. Typically, these include: severe weather conditions (hopefully "severe" is a contractually defined term with contractor/subcontractor), changes in law, major strikes, payment delays to contractor/subcontractor, …

## 6.2 PROCEDURE

Schedule contingency shall be determined through a structured methodology, as described below:

### 6.2.1 Required Probability for achieving project completion

The reason schedule contingency exists is to provide project management a schedule timeline that has an acceptable probability of success. The acceptable risk criteria is determined by management beforehand, and normally is around 70% to 80% probability of meeting the end date.

### 6.2.2 Preparation of the Schedule for the Risk Analysis

The Lead Planner needs to make sure the schedule responds correctly to changes in durations. This means checking for correct logic, eliminating open ends, eliminating constraints and confirming critical paths.

Minimum schedule quality checks required include:

1) Software packages like Primavera P6 do not do a proper job in highlighting all open ends. The lead planner needs to review and confirm that all activities to be reviewed in the risk analysis session have starts with predecessors, and finishes with successors.
2) Critical paths have to be reviewed to confirm their "relevance". If a critical path looks suspect, a close review and revision of logic needs to be undertaken.
3) Constraints need to be reduced to the absolute minimum.

The next step is to select the activities to be reviewed in the risk review session(s). Only in rare cases should the whole schedule be risk reviewed by the team in the risk workshop, as it would involve too much time by the team. The team needs to focus on the essential activities of schedule risk, mostly determined by critical path and near critical paths (at least 3 critical paths) and key issues that create variation in schedule like labor and equipment productivity.

### 6.2.3 The Risk Review Session

The Lead Planner calls for a risk review session with all team members that have knowledge of the critical paths to be addressed. It is advisable that management is present as well, so as "incentivize" team members to attend and contribute. Moreover management will get firsthand knowledge of the team's perceived risks.

For each risk schedule activity, the team has to provide optimistic, probable, and pessimistic activity durations. The lead planner makes sure that this information is recorded and documented.

Furthermore, the lead planner needs to keep record of key decisions, assumptions, and action items resulting from the risk review sessions.

Risk events shall pertain only to project controlled scope of work. Therefore extreme weather events, sinking of ships with essential cargo, changes in law, country strikes, country cashflow problems… should not be considered in the schedule risk analysis, as these risks are normally handled separately in the contracts ("Force Majeure Events").

### 6.2.4 Determination of Required Schedule Contingency

The information gathered from the risk review sessions is then used by the Lead Planner to perform the duration probability analysis, using any Monte Carlo based schedule risk analysis tool.

Typical outputs from such software are probability distributions (Fig. 1) and Tornado Charts (Fig.2).

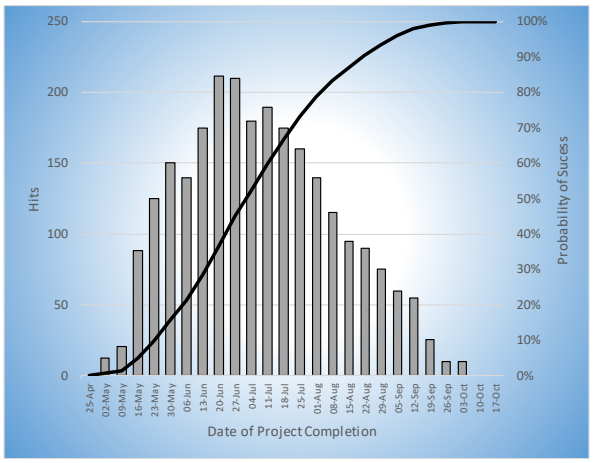


Figure 1: Probability Distribution

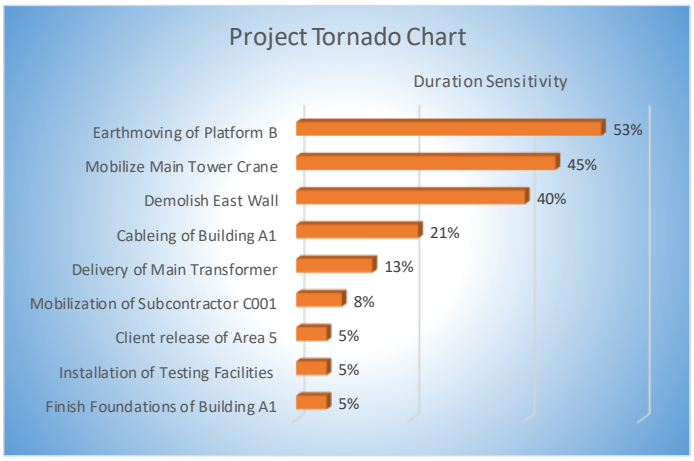


Figure 2: Tornado Chart

The required Schedule Contingency is determined by determining the delta of project completion dates between the bare schedule date and the date of completion at management requested probability, in example below, at 80%.

In the example shown in Figure3 below, the schedule contingency is 2 months (between 06-Jun and 01-Aug).

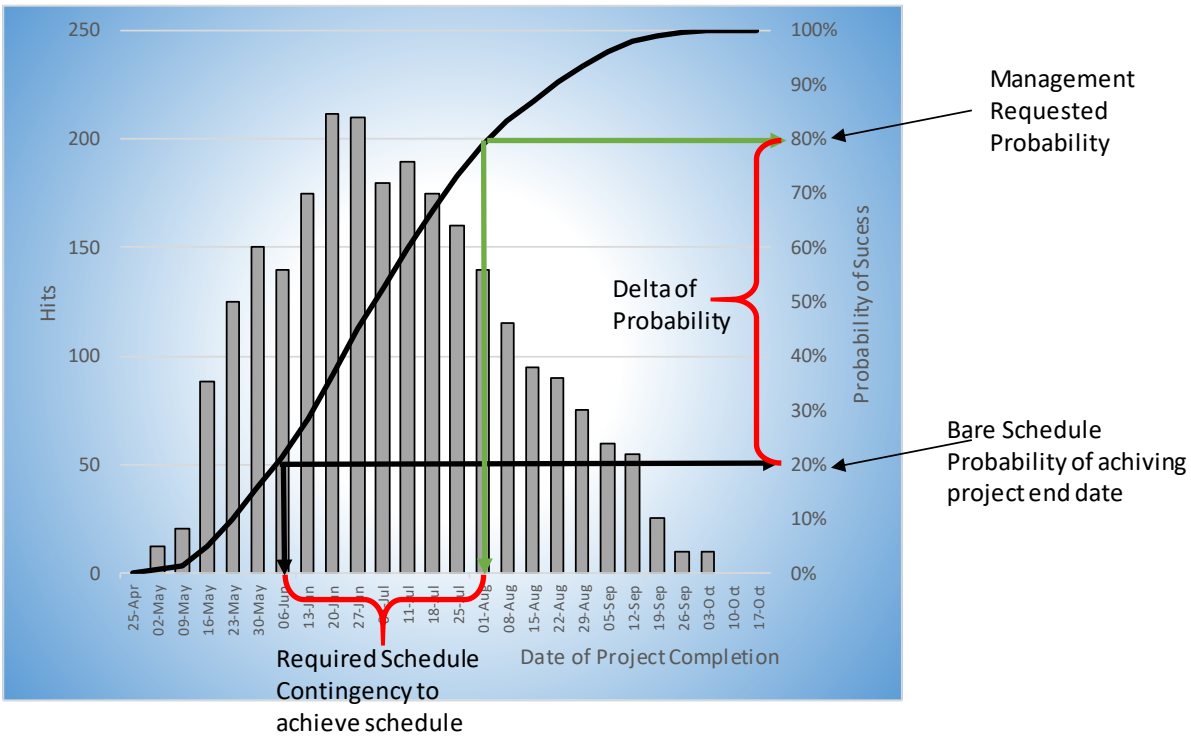


Figure 3: Example of Schedule Contingency Calculation

### 6.2.5 Schedule Risk Mitigation

All the results need to be discussed and agreed to by project management. If the schedule contingency is too high, management is likely to request schedule mitigation actions on the schedule risk items. These actions might involve extended work hours, night shift, more construction equipment, different constructability approaches, etc.

The tornado chart will provide guidance on what aspects produce the main risk reduction opportunities, for example in Figure 2 above, the “Earthmoving of Platform B”.

If mitigation changes are significant, the team will need to re-analyze the mitigated schedule portion and a new schedule contingency to be calculated.

### 6.2.6 Schedule Risk Report

Once the risk sessions are concluded, the mitigations agreed and included in the schedule, and the schedule contingency agreed, a report needs to be generated by the Lead Planner for reference purposes by the project. It has to include all information, including risk schedule, session notes, and duration inputs by the team, risk model, risk outputs, mitigations, and a narrative explaining the key players, outcomes and decisions of this exercise.

## 6.3 CONTINGENCY MAINTANANCE AND DRAW-DOWN

During the project execution phase, the project's team can draw down on the on the schedule contingency.

A well-defined contingency draw-down approach will:

- Regulate and provide visibility of contingency draw-down
- Provide responsibility and accountability
- Provide an audit trail and historic information

Contingency draw-down can occur when:

- An identified risk has occurred and has been reflected in the schedule activities
- An identified risk has expired
- When project management approved and funded schedule risk reduction initiatives
- When a new risk analysis indicates a reduction of risk exposure

# 7.0 ATTACHMENTS

N/A