

# NEC3 Engineering and Construction Contract: Activity Schedules



**Dr Ron Watermeyer**  
SAICE President 2004  
Founder: Infrastructure Options  
watermeyer@ioptions.co.za

## INTRODUCTION

ISO 21500 (2012), *Guidance on Project Management*, defines an activity as an “identified component of work within a schedule that is required to be undertaken to complete a project.”

The PMI Global Standard (2008), *A Guide to the Project Management Body of Knowledge*, defines:

- an Activity List as “a documented tabulation of scheduled activities that shows the activity description, activity identifier, and a sufficient detailed scope of work description so project team members understand what work is to be performed”; and
- a Schedule (or Project Schedule) as “the planned dates for performing scheduled activities and planned dates for meeting scheduled milestones.”

The NEC3 Engineering and Construction Contract (ECC) makes provision for the following two Main Options:

- Option A: priced contract with Activity Schedule
- Option C: target contract with Activity Schedule

The questions that are frequently asked are: “What is an Activity Schedule in the NEC3 ECC?”, “What is the purpose of an Activity Schedule?”, “How does one compile an Activity Schedule?” and “What are the benefits of an Activity Schedule?”

## AN ACTIVITY SCHEDULE UNDER NEC3 ECC OPTIONS A AND C

The NEC3 ECC does not explicitly define an Activity Schedule. It defines it as a document “*which is identified in the Contract Data unless later changed in accordance with the contract*” (clause 11.2(20)). What it does say is that:

1. Information in the Activity Schedule is not Works Information or Site Information (clause 54.1).
2. The Contractor provides information which shows how each activity on the Activity Schedule relates to the operations on each programme that he submits for acceptance (clause 31.4).
3. The prices are the lump sum prices for each of the activities in the Activity Schedule, unless later changed in accordance with this contract (clause 11.2(30)).
4. If the Contractor changes a planned method of working at his discretion so that the activities on the Activity Schedule do not relate to the operations on the Accepted Programme, he submits a revision of the Activity Schedule to the Project Manager for acceptance (clause 54.2).
5. Assessments for changed Prices for compensation events are in the form of changes to the Activity Schedule (clause 63.12).

Under the NEC3 the contractor is required to show the following on each programme which he submits for acceptance by the project manager:

- the starting date, access dates, Key Dates and Completion Date (and if applicable sectional completion dates)
- planned Completion
- the order and timing of the operations which the Contractor plans to do in order to Provide the Works
- the order and timing of the work of the Employer and Others

as last agreed with them by the Contractor or, if not so agreed, as stated in the Works Information

- the dates when the Contractor plans to meet each Condition stated for the Key Dates and to complete other work needed to allow the Employer and Others to do their work
- provisions for float, time risk allowances, health and safety requirements and the procedures set out in the contract
- the dates when, in order to Provide the Works in accordance with his programme, the Contractor will need access to a part of the Site if later than its access date, acceptances, Plant and Materials and other things to be provided by the Employer, and information from Others
- for each operation, a statement of how the Contractor plans to do the work identifying the principal Equipment and other resources which he plans to use
- other information which the Works Information requires the Contractor to show on a programme submitted for acceptance.

Accordingly, an Activity Schedule as a minimum comprises a list of activities, which may be grouped together or listed on their own, with an amount entered against each activity linked to the Accepted Programme.

### THE ROLE OF THE ACTIVITY SCHEDULES IN THE NEC3

A Contractor is paid the amount for each completed activity identified in the Activity Schedule under Option A (priced contract with Activity Schedule).

Under Option C (target contract with activity schedule) the Activity Schedule is used to:

- adjust the total of Prices (target) when compensation events occur or when quotations for acceleration are accepted, and
- calculate the Contractor's share after Completion, i.e. the share of the difference between the total of Prices (sum of amounts for activities in the Activity Schedule) and the Price for Work done to Date (Defined Cost Plus the Fee).

The Activity Schedule is linked to the Accepted Programme, which also shows the order and timing of the operations that the Contractor plans to do in order to Provide the Works, provisions for float and time risk allowances and particulars about the intended use of principal Equipment and other resources, including subcontracted work. The Activity Schedule accordingly integrates time and money and allows cost models to be generated to optimise expensive or scarce resources. This also allows estimates at the time of tender to be made on the costs being generated directly by the method and timing of the construction.

Contractors are required to submit details of their assessment of compensation events in the form of changes to the Activity Schedule with each quotation. Where the programme for the remaining work is altered by a compensation event, the Contractor is required to include alterations to the Accepted Programme. The revising of both the Activity Schedule and the Accepted Programme ensures that all the resources for the compensation event operations (the method statement) and forecasts of fixed, quantity-based and time-related actual costs are included in the quotation. This also allows alternatives to be considered to optimise changes in Prices versus changes in completion against the Employer's project objectives and time or cost constraints.

## WHAT IS THE DIFFERENCE BETWEEN A BILL OF QUANTITIES AND AN ACTIVITY SCHEDULE IN TERMS OF THE NEC3 ECC?

The ICE Civil Engineering Standard System of Measurement (CESMM3) – Southern African Edition – defines a Bill of Quantities as a “document that lists the items of work, the quantities and rates associated with each item to allow contractors to be paid at regular intervals an amount equal to the agreed rate for the work multiplied by the quantity of work completed.”

A Bill of Quantities under the NEC3 ECC is a document which is identified in the contract data and which is changed in accordance with this contract to accommodate implemented compensation events and for accepted quotations for acceleration. The Prices are defined as “the lump sums and the amounts obtained by multiplying the rates by the quantities for the items in the Bill of Quantities.”

A contractor is paid under Option B (priced contract with bill of quantities) the “quantity of the work which the Contractor has completed for each item in the Bill of Quantities multiplied by the rate and a proportion of each lump sum which is the proportion of the work covered by the item which the Contractor has completed.” Under Option D (target contract with bill of quantities) the Bill of Quantities is used to adjust the Prices when compensation events occur or when quotations for acceleration are accepted, and to calculate the contractor’s share after completion.

A difference of quantities can, in certain circumstances under Options B and D, be a compensation event. Inconsistencies in and departures from the rules for item descriptions and divisions of work into items in terms of the method of measurement in a Bill of Quantities are also compensation events.

Accordingly, where Bills of Quantities are used, the contractor is not at risk if quantities are incorrectly measured, items which should have been measured are not measured or a mistake is made. This is not the case with an Activity Schedule, as the contractor is required to take responsibility for quantities and the pricing of the works information.

## DEVELOPING AN ACTIVITY SCHEDULE

A work breakdown structure is a tree structure which shows a subdivision of effort required to achieve an objective. It provides a common framework for the natural development of the overall planning and control of a contract, and is the basis for dividing work into definable increments and tasks which can be resourced, cost and programmed.

A work breakdown structure should, as relevant, break down the works in the first instance into parts, e.g. in the case of buildings into:

1. external works and services, and
2. discrete buildings, discrete spaces within a building or the structure of a building, or any combination thereof.

These parts are then broken down into **elements**, e.g. in the case of buildings:

1. broad sub-systems which are functionally connected, e.g. external envelope, special dividers, roof, services etc, and
2. types of finishes, e.g. floor, internal wall, ceilings etc.

The ASAQS’s *Guide to Elemental Cost Estimating and Analysis for Building Works* (1998) presents a system for elemental estimating. This document subdivides buildings into elements – foundations, ground floor construction, structural frame, independent structural components, external envelope,

roofs, internal divisions, partitions, floor finishes, internal wall finishes, ceilings and soffits, fittings, electrical installation, internal plumbing, fire services, balustrades etc, and special installations.

Elements should in turn be broken down, where necessary, into logical groups of **components** and **assemblies**, e.g. the structure is broken down into foundations, surface beds, beams etc. Where a specific component forms a relatively high cost in relation to the works, the component should be subdivided into sub-components and sub-assemblies.

Not all activities in an Activity Schedule will necessarily relate to construction. They can also relate to design, testing or administrative activities.

An Activity Schedule needs to be prepared by the Contractor, particularly under Option A, as the Activity Schedule establishes the contractor’s cash flow. The activities also need to be structured around the contractor’s planned programme and method of working.

For the purpose of comparing tenders, or monitoring defined cost under Option C, it can be useful for the Employer to require the Contractor to develop the Activity Schedule around a particular work breakdown structure. Where this is required, the Employer should specify the parts and elements and some of the components. The Contractor should then be permitted to break any component into subcomponents, or to describe components where no descriptions are provided, and to extend the numbering system to accommodate such items.

The Activity Schedule should as a minimum contain the information shown in Table 1.

**Table 1** Example of minimum information required on an Activity Schedule

| Item Number | Programme Reference | Activity Description | Price excluding VAT |
|-------------|---------------------|----------------------|---------------------|
|             |                     |                      |                     |
|             |                     |                      |                     |
|             |                     |                      |                     |

## GETTING VALUE OUT OF AN ACTIVITY SCHEDULE IN THE TARGET CONTRACT OPTION

The Project Management Institute’s *Practice Standard for Earned Value Management* suggests that the three corner stones of Earned Value Management are:

■ **Planned Value** – the authorised budget assigned to the scheduled work to be accomplished

■ **Earned Value** – the value of the work performed expressed in terms of the budget assigned to that work

■ **Actual Cost** – total costs actually incurred and recorded in accomplishing work performed during a given time period.

**Planned Value** is the numeric reflection of the budgeted or planned work (Activity Schedule) that is scheduled to be performed (accepted programme). It sets the baseline against which actual progress is measured. Planned Value can only be changed through compensation events or accelerations, which change the Activity Schedule and the Accepted Programme, i.e. the latest programme accepted by the project manager.

**Earned Value** is a snapshot of progress measured in terms of completed and partially completed activities at a given point in time. This can readily be established from the Activity Schedule and the

accepted programme, as the activities in the Activity Schedule and accepted programme are linked to one another.

**Actual Cost** on the other hand, is an indication of the level of resources that have been expended to achieve the work performed to date. Defined Cost plus the fee in Option C (target contract with an Activity Schedule), allows cost to be forecasted and measured.

The relationship between Planned Value, Earned Value and Actual Cost can be readily understood should the cumulative values of these three metrics be plotted against one another. This will enable a manager to analyse where a project is and where it is headed, i.e. answer the questions:

■ **How are we doing time-wise?**

- Are we ahead or behind schedule?
- How efficiently are we using our time?
- When are we likely to finish work?

■ **How are we doing cost-wise?**

- Are we under or over our budget (target)?
- How efficiently are we using our resources?
- How efficiently must we use our remaining resources?
- What is the project likely to cost?
- Will we be under or over budget?
- What will the remaining work cost?

## OBSERVATIONS

An Activity Schedule can be likened to a series of bars on a Gantt chart, the difference being that each bar (activity) has a Price attached to it and the Contractor is paid for each completed activity whenever payment is assessed. Activity Schedules accordingly require the tenderer to programme the works before pricing it, and as such forcing him to prepare a more thorough tender. This leads to a reduction in risk pricing, but requires more time to prepare tenders.

Jon Broome in his book, *NEC3: A User's Guide* (2012), suggests that a rule of thumb is that it takes 10% more time to prepare a tender than a Bill of Quantities if the tenderers are provided with the quantities. On civil engineering projects it takes 20% – 30% more time if the Contractor is required to take off quantities. On building projects this can be more than 50%.

The assessment of the effect of a compensation event is easier and fairer than is the case in a Bill of Quantities. Changes in resources or methods associated with an activity can be compared with those stated in the Accepted Programme before the compensation event occurred. Assessment of amounts due to the Contractor is also easier and requires fewer hours to assess. Accordingly, the cost of managing and administering a price-based contract with an Activity Schedule (Option A) is less than a price-based contract with a Bill of Quantities (Option B).

The difficulty with target contracts with Bills of Quantities (Option D) is that the target is a running target, as it depends on the quantity of work that is required. The total of the prices (i.e. the final target) is only known after completion. The management and administration of a target contract with a Bill of Quantities (Option D) is significantly more than a target contract with an Activity Schedule (Option C), as the quantities need to be tracked and adjusted for compensation events to maintain a real-time target. ■