

Dura-Lator : A Project Duration Calculator

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John C. Hildreth
Virginia Tech

Abstract

The completion date for a project is influenced by the number of adverse days expected during the performance period. The number of adverse days experienced depends on the time of year at which work starts. The Dura-Lator is a project duration calculator designed to illustrate the effect of project start date on the completion date. For the year in which work is expected to start, the required working days is applied to the project calendar to calculate the completion date if the work were to begin any week in that year. The effect of project start date is presented by plotting the completion date and calendar duration against start date.

Invent the Future

Dura-Lator : A Project Duration Calculator

Introduction

The Dura-Lator is a project duration calculator designed to illustrate the effect of project start date on the completion date. The number of working days required to complete the work is applied to a project calendar to calculate the project completion date. The effect of project start date is shown by assuming the project to begin each Monday in a given year, calculating the completion date and calendar day duration, and presenting the results by plotting the completion date and calendar duration against start date.

The Dura-Lator is designed to aid in determining an appropriate fixed completion date on projects for which a pre-advertisement CPM schedule has not been developed. These are projects that are likely to be performed during no more than 2 construction seasons, including a single winter season. It is anticipated that projects requiring 3 or more construction seasons to complete are of sufficient size and complexity that a CPM schedule will be used to determine the fixed completion date.

Requirements

The Dura-Lator is a Microsoft *Excel* template and a hardware configuration running *Excel* version 2003 or newer is recommended. It has been tested and found compatible with *Excel* 2000 and 2002. The user needs only to copy the **Dura-Lator v13.xlt** file to the folder containing the Microsoft template files. In Windows XP, this folder is:

C:\Documents and Settings\[*username*]\Application Data\Microsoft\Templates

where [*username*] is the name of the user account under which the template will be used.

The Dura-Lator can be made more easily accessible by creating a shortcut on the Desktop. To create a shortcut:

1. Right-click an open area on the desktop, point to **New**, and then select **Shortcut**.
2. Select **Browse**.
3. Locate and select the Dura-Lator.xlt file and select **OK**.
4. Select **Next** to continue.
5. Type a name for the shortcut and select **Finish** to create the shortcut on the desktop.

Running Dura-Lator

To start the Dura-Lator from an active *Excel* window:

1. Select **New** from the **File** menu
2. The **Task Pane** will appear and select the **On My Computer** option from the **Templates** section
3. Select the **Dura-Lator** from the list of templates on the **General** tab
4. A new instance of the Dura-Lator is opened.

Alternatively, double-click the shortcut to start the Dura-Lator from a shortcut. Upon startup, the Dura-Lator information window is presented. Select **OK** to close the information window and begin using the Dura-Lator.



Figure 1: Dura-Lator Information Window

Dura-Lator Workbook

The Dura-Lator consists of two worksheets:

1. The **Dura-Lator** worksheet serves as the interface for the user to input data, execute the program, view the help information, and view the summary results.
2. The **Duration Plot** graphically presents the effect of start date on calendar duration and completion date.

Help information pertaining to the Dura-Lator can be displayed by clicking the **Help** button and can be found in Table 1.

Dura-Lator Worksheet

The user can input data, execute the program, view the help information, and view the summary results from the Dura-Lator worksheet. Project data is input into the cells marked in yellow and summary results are presented in the cells marked in green. The program is executed by clicking the **Calculate Completion Date** button and the help information is viewed by clicking the **Help** button.

Month	Calendar Days	Workdays per Week	Adverse Days	Working Days
Jan	31	5	12	13
Feb	28	5	10	12
Mar	31	5	9	15
Apr	30	5	8	15
May	31	5	9	15
Jun	30	5	8	15
Jul	31	5	8	16
Aug	31	5	7	17
Sep	30	5	7	16
Oct	31	5	6	17
Nov	30	5	7	16
Dec	31	5	9	15
Total			100	182

Start Year	2007
Required Working Days	90

Calculate Completion Date	Help
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	Start Week	Completion Date	Calendar Days
Shortest	18-Jun-07	4-Dec-07	169
Longest	19-Nov-07	2-Jun-08	196

Figure 2: Dura-Lator User Interface

Table 1: Dura-Lator Help Information

Help Topic	Information
About the Dura-Lator	<p>The Dura-Lator applies a project work schedule to show the effect of project start date on the completion date.</p> <p>The year in which the project is expected to begin is used to determine the completion date for the project starting any Monday in that year. The required number of working days is applied to the project calendar to calculate the completion date.</p> <p>Project completion dates are plotted against start dates, along with the corresponding number of calendar days. The shortest and longest project durations and corresponding project dates are reported.</p>
Data input requirements	<p>Input data is signified by the yellow background and includes:</p> <ol style="list-style-type: none"> 1) Workdays per week 2) Adverse weather days per month 3) Start year 4) Required number of working days <p>The workdays and adverse weather days are used to calculate the number of working days available each month. The working days constitute the project calendar to which the required number of working days is applied.</p> <p>The start year is used to determine the dates for Mondays in the year.</p>
Workdays per week	<p>The number of days in the standard work week. It may vary by month and is used to calculate the number of adverse weather days occurring during the work week.</p>
Adverse weather days	<p>The number of calendar days on which weather is expected to be sufficiently adverse as to prohibit work scheduled. It is strongly recommended that the number of adverse weather days be based on historical weather records.</p>
Start year	<p>The start year is the year in which work is scheduled to begin. The project is assumed to begin on each Monday of the year and the corresponding completion date and required number of calendar days is calculated.</p>
Required working days	<p>The number of work days required to complete the project</p>
Calculating completion dates	<p>The project is assumed to start on each Monday of the start year and the corresponding completion date is calculated by applying the required number of working days to the project schedule.</p> <p>If the calculated completion date falls on a weekend (Sat. or Sun.), the the date of the following Monday is returned.</p>
Duration plot	<p>The duration plot shows for any start date (x-axis) the corresponding:</p> <ol style="list-style-type: none"> 1) Number of required calendar days (left y-axis) 2) Completion date (right y-axis)

Input Data

Input data consists of monthly project calendar data and project duration data. Monthly calendar data is the anticipated number of adverse days for the month and number of workdays per week. Adverse days are those days on which work can not be performed due to conditions (e.g. weather conditions, environmental restrictions, traffic constraints, etc.) beyond the control of the contractor. The number of workdays per week is used to calculate the number of potential working days and number of those potential days on which adverse conditions can be expected to occur. The number of working days is the difference between the potential and adverse working days.

$$\text{Working days} = (\text{Calendar days} - \text{Adverse days}) * (\text{Work days per week} / 7)$$

The number of working days is rounded down to provide the whole number of working days shown in column 6. For example using the month of January and data shown in Figure 2:

$$\text{Working days} = (31 - 12) * (5 / 7) = 13.6 \text{ days rounded down to 13 days}$$

The number of workdays per week must be a whole number between 0 and 7 and the number of adverse days must be a whole number between 0 and the number of calendar days for the month.

Project duration data consists of the anticipated number of working days required to complete the work and the year in which work is expected to start. The number of required working days must be a whole number between 30 and 2000. The start year must be input as a whole number.

Executing the Program

Once the required input data is provided, the program is executed by clicking the **Calculate Completion Date** button on the Dura-Lator worksheet. Execution of the program consists of using the date of each Monday in the start year as the beginning date of the project and applying the working days calendar to calculate the corresponding completion date.

If the input data is modified, it is necessary to click the **Calculate Completion Date** button again to recalculate the results.

Results

The results are the calculated completion dates and the corresponding number of calendar days required to complete the work. The results are summarized as the shortest and longest number of calendar days required to complete the work and corresponding start and finish dates. This summary is presented on the Dura-Lator worksheet in the cells marked in green and is presented as Figure 3. The full set of results is presented graphically on the Duration Plot, presented as Figure 4.

	Start Week	Completion Date	Calendar Days
Shortest	18-Jun-07	4-Dec-07	169
Longest	19-Nov-07	2-Jun-08	196

Figure 3: Results Summary

The start date shown on the x-axis is the date on which work begins. The minor divisions of the x-axis are 7 days and the major divisions 28 days. The dates shown along the x-axis are every fourth Monday throughout the year. The thin blue line indicates the number of calendar days required to complete the work, as shown on the left y-axis. The heavy red line indicates the corresponding project completion date, as shown on the right y-axis. The divisions of the y-axes will vary with the difference between the maximum and minimum number of required calendar days.

From Figure 3, the minimum number of required calendar days is 169 days when work begins on 18-Jun-07 and the maximum is 196 days corresponding to 3 start dates near the end of 2007. The earliest possible completion date is 9-Jul-07 if work begins on 1-Jan-07 and the latest completion date is 4-July-08 if work begins on 24-Dec-07.

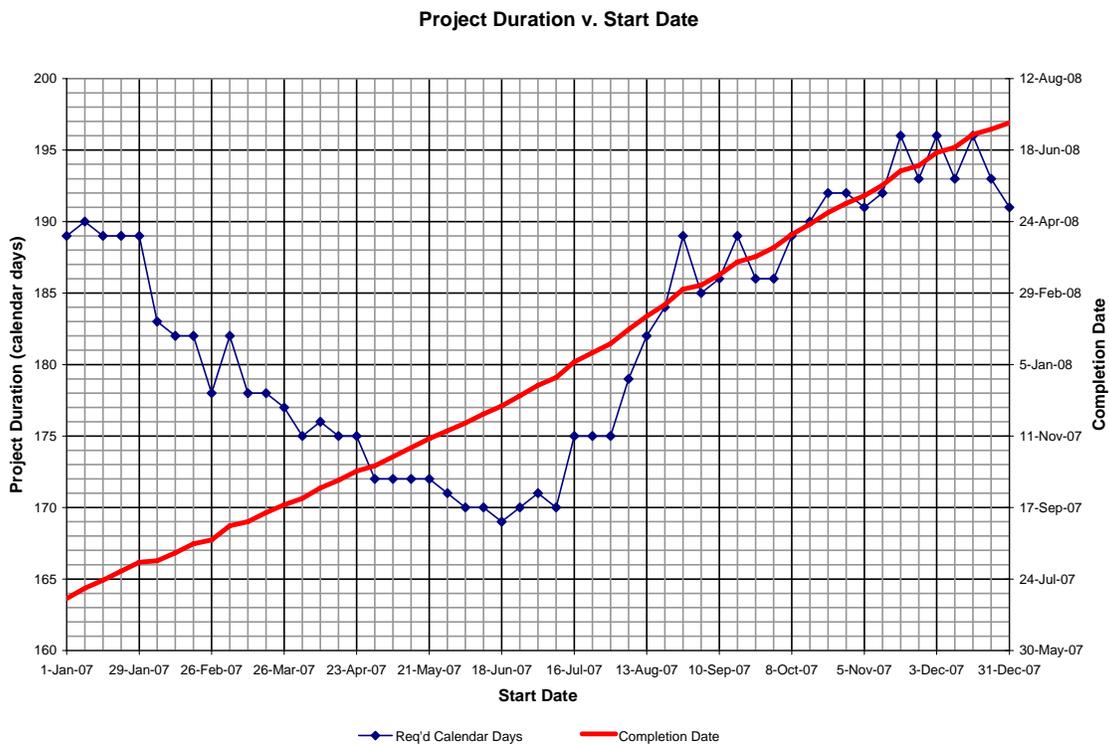


Figure 4: Project Duration Plot

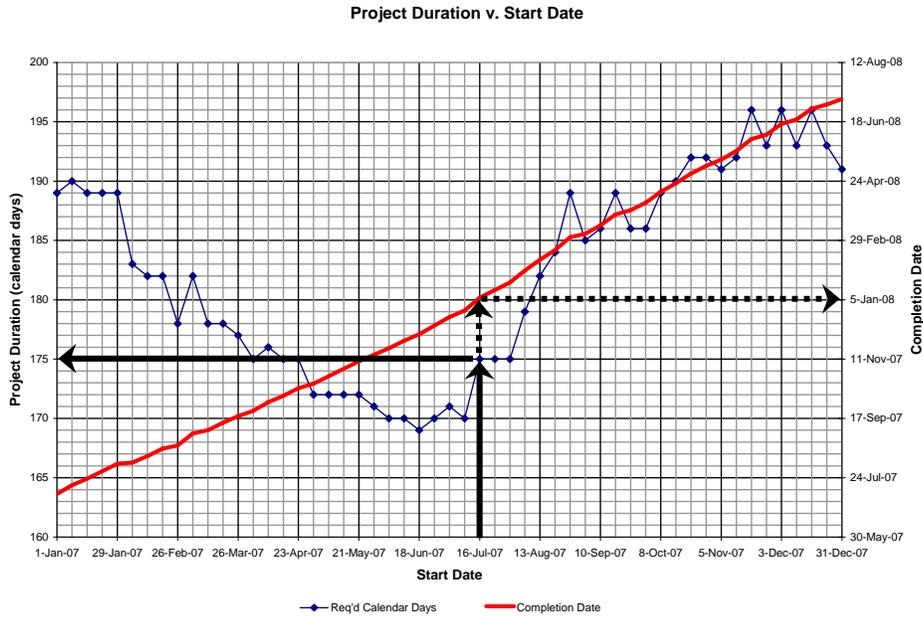


Figure 5: Duration Plot Example 1

From Figure 5, a work start date of 16-Jul-07 will require 175 calendar days to complete, corresponding to a completion date of 5-Jan-08. It is important to note that the type of work required at the end of the project may not be able to be performed during the winter season (e.g. paving or pavement markings).

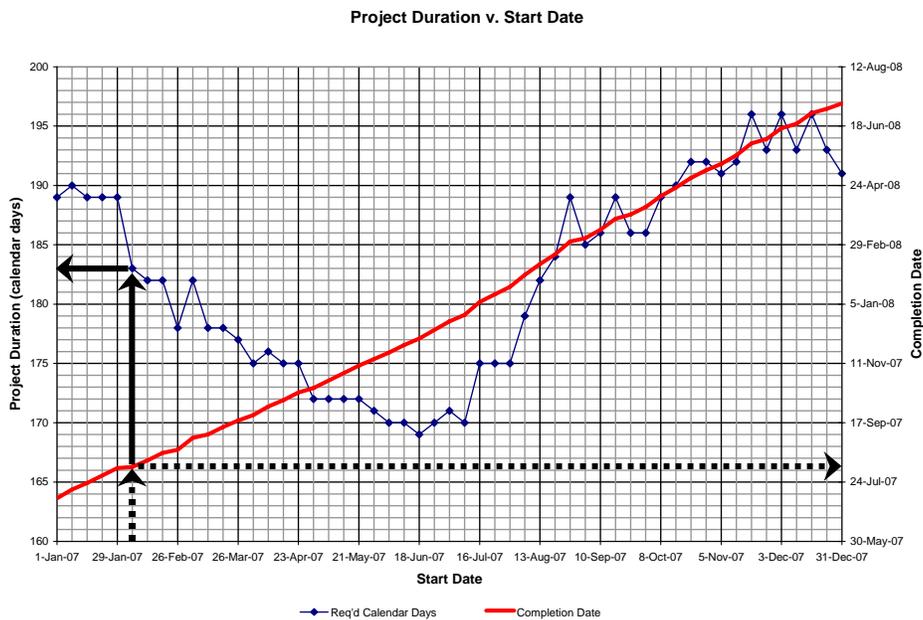


Figure 6: Duration Plot Example 2

As shown in Figure 5, a work start date of 5-Feb-07 will require 183 calendar days to complete, corresponding to a completion date of 7-Aug-07.

Saving the Dura-Lator File

When a new instance of the Dura-Lator is opened, a new workbook named **Dura-Lator v13 n .xls** is created where n is a number used to separate multiple files. The Dura-Lator v13 n .xls file is not saved and has no path associated with it. Therefore, the user will be prompted for a filename and location whether the selects **Save** or **Save As** option is selected from the **File** menu. Select either the **Save** or **Save As** option, provide the desired filename and location, and click **Save** to save the file.