## How to Calculate Earned Value in Primayera P6

Earned Value Management (EVM), or Earned Value Analysis, is a technique used to measure the performance and progress of a project. The basic premise of earned value is that the cost spent is relative to the work completed. In other words, earned value is a way of placing a monetary value on the progress of work achieved. With earned value, you can tell if your project is behind schedule or over budget at any given time.

Generally, you can plan projects with budgeted costs and/or actual costs. Budgeted costs are how much you plan to spend. Actual costs are how much you actually spent. However, it isn't possible to compare the work achieved with these two values alone. This is where earned value comes in. With earned value, you are able to see if you have poor project planning. Poor project planning may not have been apparent if your were just monitoring the budgeted and actual costs and durations.

#### What is Earned Value?

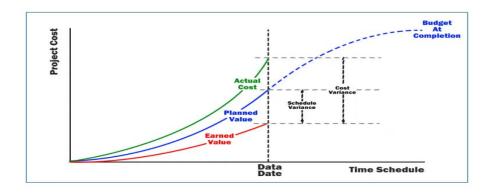
Earned value is a monetary value that shows the amount of work achieved on a project. Regardless of how much you planned to spend or actually spent, earned value indicates the value of the project's progress.

Earned value management requires 3 basic elements for its calculations: Planned Value (PV), Earned Value (EV), and Actual Cost (AC).

**Planned Value (PV)** is the budget for the work scheduled to be completed by a specified date. This is sometimes also referred to as the budgeted cost of work scheduled. This is how much you plan to spend on the project based on the assigned resources and expenses.

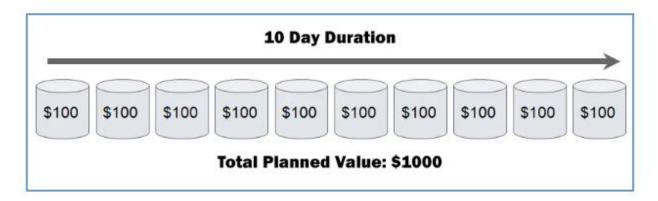
**Earned Value (EV)** is a monetary value for the progress of work completed. Put simply, this is the amount of money that you should have spent for the amount of work that you have completed.

**Actual Cost** (**AC**) is the actual monetary value spent on the project. The actual cost of the project will come about as the project progresses and you add actual cost values to activities.

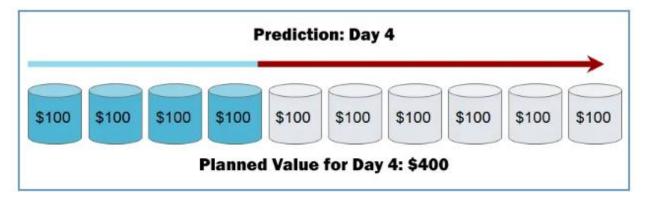


#### **How is Earned Value Calculated?**

To best understand how earned value is calculated, we are going to look at a simple example project. In the following example, we have a project to construct 10 concrete columns for a building. Each column should take 1 day to build and has a budgeted cost of \$100. This means that we are planning on spending \$100 per day for 10 days, with a total project cost of \$1000. This is the Planned Value for the project – \$1000 total, at \$100 per day.



Based on this baseline schedule, we would assume that by the end of day 4, we would have 4 columns built and \$400 spent. Therefore, our Planned Value for day 4 of this project would be \$400.



However, once the actual activities started, our field crew informed us that things didn't go as planned. At the end of day 4, we have only completed 2 columns. We were also informed that each column actually costs \$200 to build. This would make our Actual Cost on day 4 of this project \$400.



We can now calculate the Planned Value, Earned Value and Actual Cost for this project by the end of day 4:

- ➤ We had planned to spend \$100 per day on this project, according to the baseline schedule. Because we are now on day 4, our Planned Value is \$400 the amount we had planned to spend by this point in the project.
- ➤ However, in actuality, we have only created 2 columns. Based on our baseline schedule, the completion of two columns should have cost us \$200, at \$100 per column. By day 4, our Earned Value is \$200 the amount we had planned to spend based on the actual work completed.
- ➤ We have only created 2 columns that each cost \$200. Thus, the Actual Cost at this point is \$400. This is the amount we have actually spent so far.

Using this information, we can compare the Planned Value and Actual Cost to the Earned Value. This can help us determine whether the project is behind schedule or over budget.

With a simple project like this, it is easy to manually calculate these different values. However, you can also automatically perform Earned Value Management using Primavera P6 Professional.

# **Setting Up P6 for Earned Value Management**

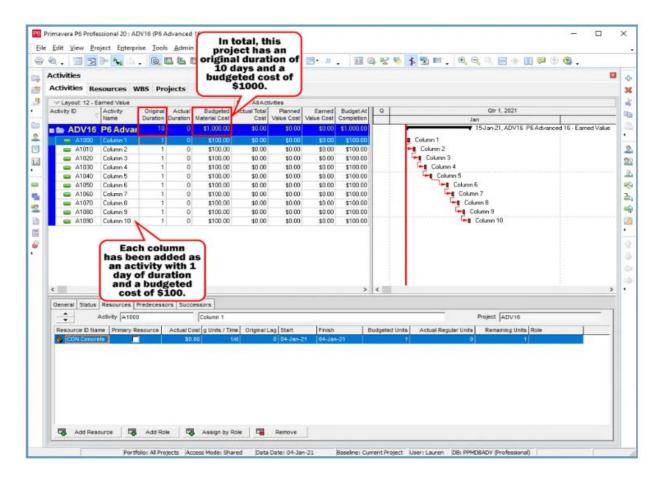
There are seven steps that you must complete in order to set up Primavera P6 for Earned Value Management:

- Step 1: Cost-load the project with resources that don't automatically compute actuals
- Step 2: Create and assign a baseline to calculate earned value
- Step 3: Setup the activity table columns for Earned Value Management
- **Step 4**: Adjust all activity types to Physical
- **Step 5**: Set the technique for computing Performance Percent Complete for each WBS layer
- Step 6: Status the activities with actuals and reschedule the project
- Step 7: Set the technique for computing Estimate to Complete for each WBS layer

Setting up the program to calculate earned value can be complicated. To get the best results, we recommend that you follow these steps.

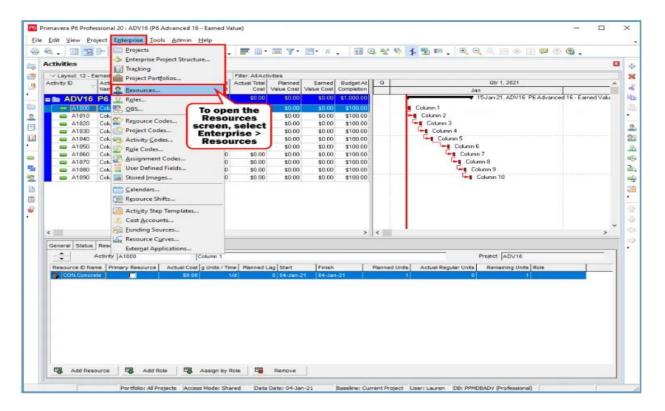
## Step 1: Cost-load the project with resources that don't automatically compute actuals

The first thing you'll need to do is make sure that you're working with a cost loaded schedule with a tight logical path. Create a project in P6 for the earned value example we looked at earlier, with the construction of the 10 columns over 10 days. Each column is represented by an activity, each with a duration of 1 day. Each activity has been assigned a material resource of concrete and has a budgeted cost of \$100, with a total budgeted cost of \$1000.

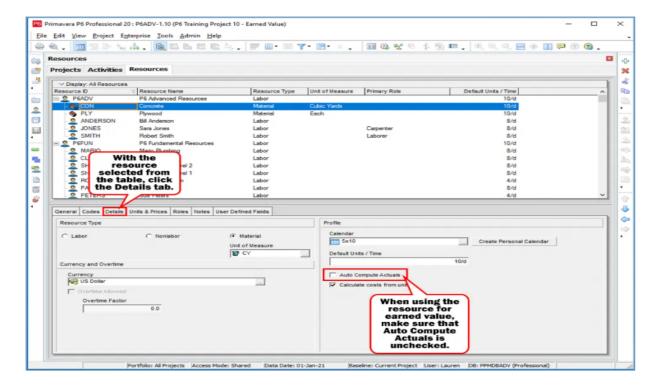


Note: when you are calculating earned value, the resources you use should NOT automatically compute actuals. This is because actuals should be based on actual costs incurred and actual hours booked. We do not want the resources to automatically compute these values based on our original estimates.

By default, resources will automatically have the **Auto Compute Actuals** setting turned on. To turn this option off, you will need to navigate to the Resources screen by selecting **Enterprise** > **Resources**.



Select the resource you would like to use from the table and then navigate to the **Details** tab. Here, there is an option to **Auto Compute Actuals**. By default, this will be checked, so it is important to uncheck it if you are going to use the resource to calculate earned value. You will want to do this before assigning the resources to activities in your project.

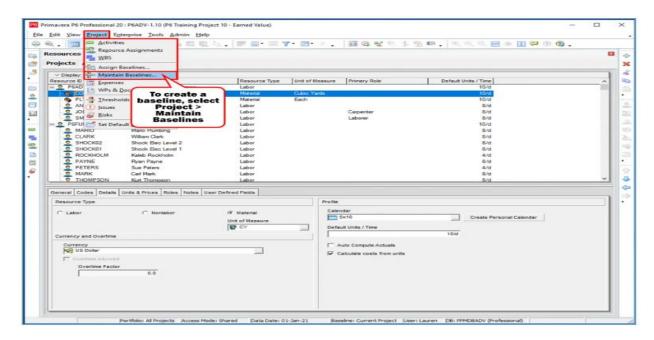


Currently, my material resource, Concrete, does not have Auto Compute Actuals checked.

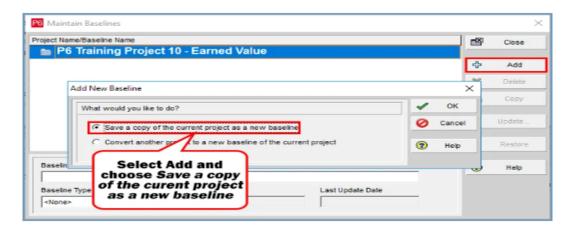
# Step 2: Create and assign a baseline to calculate earned value

Next, you will need to create a baseline and assign it to the project. You will not be able to track variance on a project unless you have created and assigned a baseline. Earned value is all about comparing your current schedule with your original schedule. In other words, comparing your actual progress with your planned progress. Where there are differences, P6 will calculate different data sets to help quantify any deviation from the baseline.

To create a new baseline for the project, select **Project > Maintain Baselines.** 

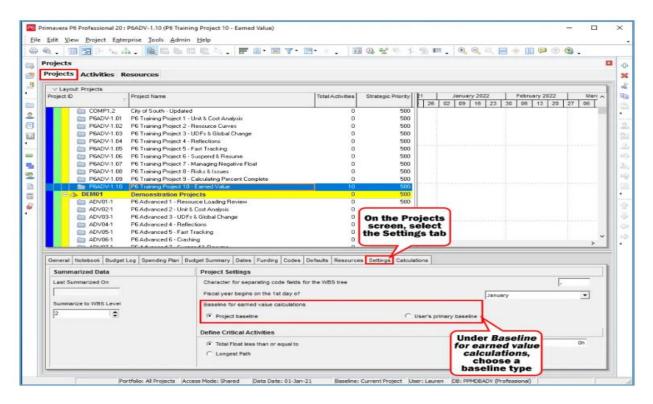


In the Maintain Baselines window, select Add and choose to Save a copy of the current project as a new baseline. This will automatically save the project as it currently is as a baseline.



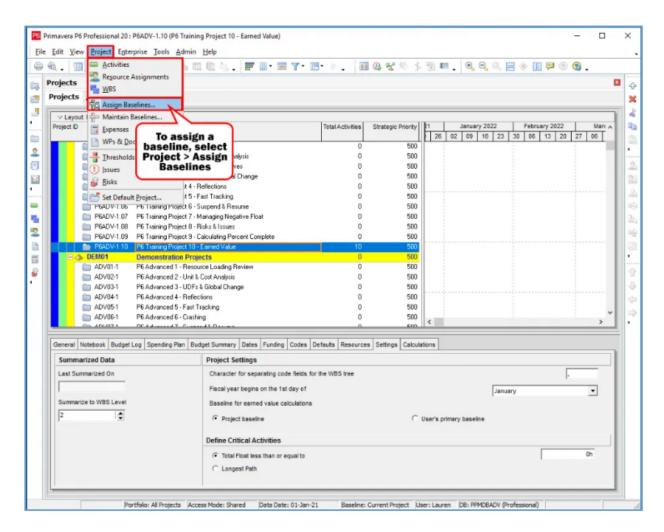
With this baseline created, you will now need to assign it to the project. However, before doing that, you will need to tell P6 which baseline you will be using to calculate earned value. You can do this in the **Projects** window. If this is not already open, you can open the Projects window by selecting **Enterprise** > **Projects**.

In the Projects table, select the desired project and use the **Settings** tab to choose a baseline to use for earned value. By default, this will be set to the **Project Baseline**, but you can also use the **User's Primary Baseline**.

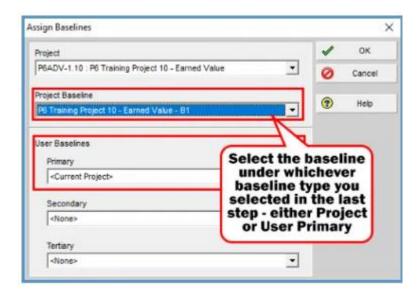


You can choose to use either baseline. However, you'll want to make sure to assign the created baseline to whichever option you choose.

Next, you can assign the newly created baseline by selecting **Project > Assign Baselines**.



In the **Assign Baselines** window, select the baseline of the project that you just created under whichever baseline type you selected in the last step. This will be either **Project Baseline** or the **User's Primary Baseline**—then press **OK**.



# Step 3: Setup the activity table columns for Earned Value Management

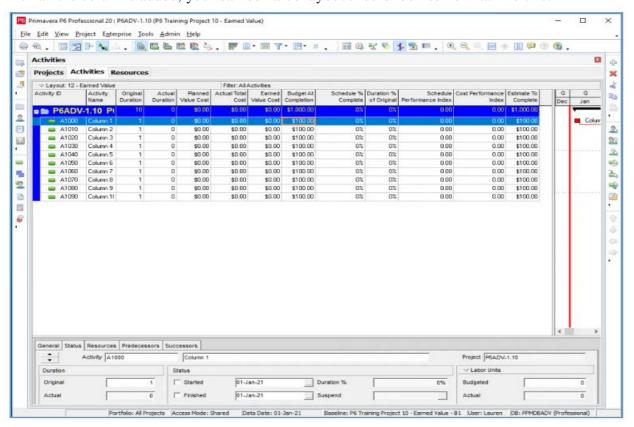
The next step would be to set up the activity table for Earned Value Management. After adding the desired columns, recommend that you save the configuration as a layout for use later on.

There are a variety of different columns that you can add to help you calculate earned value. However, the following columns display:

- Original Duration
- Actual Duration
- Planned Value Cost
- Actual Cost
- Earned Value Cost
- Budget At Completion
- Duration % Complete of Original
- Performance % Complete
- Schedule Performance Index
- Cost Performance Index
- Estimate to Complete

To add these columns to the activity table, select **View > Columns**. Move the desired columns from **Available Options** to **Selected Options**, and select **OK**.

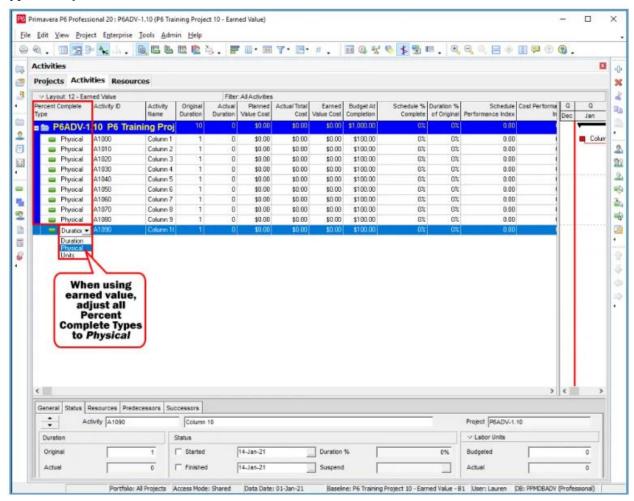
With all the columns added, your earned value layout should look somewhat like this:



# Step 4: Adjust all activity Percent Complete Types to Physical

Next, you will need to adjust all activity types to **Physical**. This is because you can only calculate earned value when the duration of the activity is separate from the percent of work completed. For this reason, you will want to be using the **Physical Percent Complete** type for all activities you will be performing Earned Value Management on.

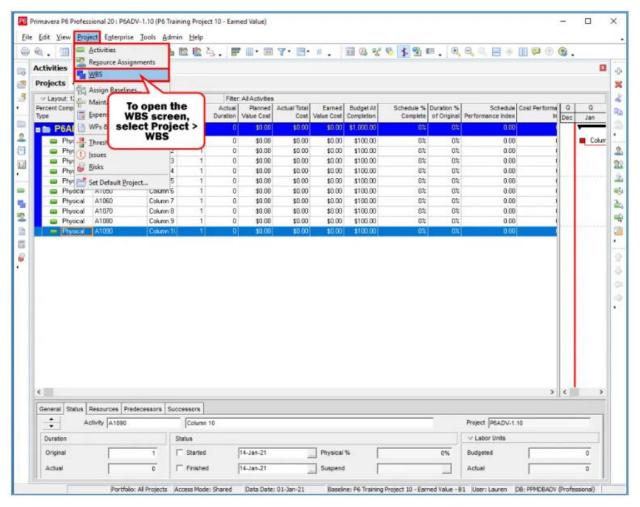
The easiest way to do this to all activities simultaneously is to add the **Percent Complete Type** column to the layout. With the column displaying, you can quickly adjust each activity type to **Physical**.



You could keep the **Percent Complete Type** column displaying. However, because Earned Value Management uses so many columns already, you may want to remove it after performing this step.

# Step 5: Set the technique for computing Performance Percent Complete for each WBS layer

You then will need to set up how P6 is going to calculate the earned value costs. You can do this in the WBS screen, which you can open by selecting **Project** > **WBS**.

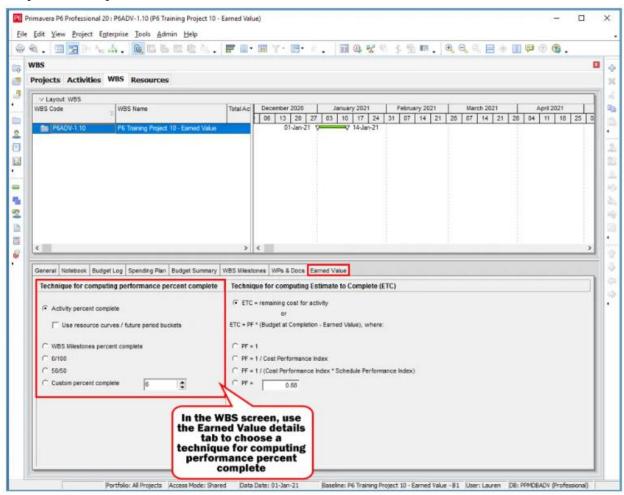


In the details section, select the **Earned Value** tab. Using the left side of the tab, you can determine the technique for computing **Performance Percent Complete**. This is the amount of work actually performed on activities after actuals are entered. Essentially, this is the way that you will be earning value for activities within the selected WBS element.

Activity Percent Complete is selected by default. This means that the activity will earn value for the activity percentage that has been completed. You can also choose to earn value based on WBS Milestones. As they complete, activities within the layer will earn a portion of the completed total cost for that WBS. The final 3 options are 0/100, 50/50, and custom percent complete. Selecting one of these options will cause each activity below the WBS element to earn value based on these criteria. For example, if you were to choose the 0/100 option, activities in this WBS element would not earn any value until they have an Actual Finish date and a status of Completed. At that point, the activity would earn the full budgeted value.

You cannot enter Performance percent complete techniques for individual activities. They can only inherit the technique from their immediate parent WBS element. Because you were only using one WBS layer for my project, I don't need to adjust too much here. To keep things

simple, you have to keep Activity Percent Complete selected as your performance percent complete technique.

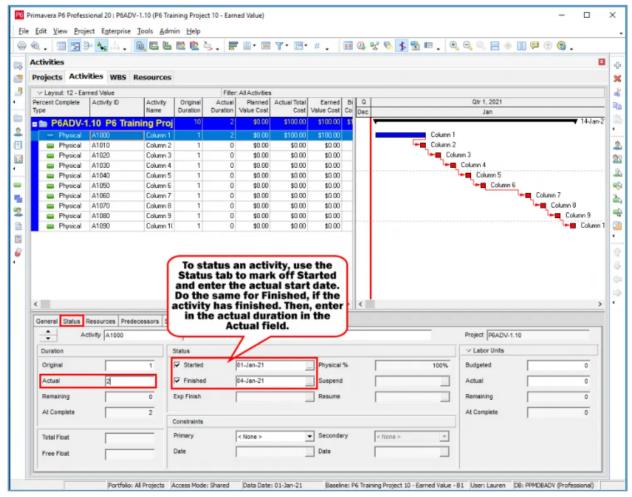


## Step 6: Status the activities with actuals and reschedule the project

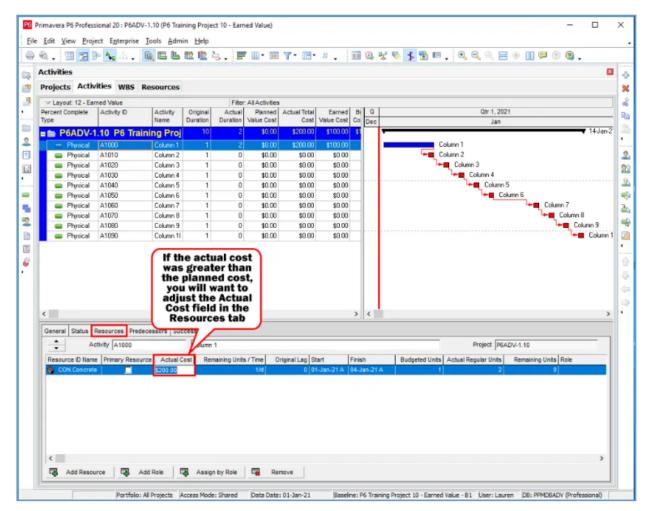
At this point, you can now begin to status the project to show the actual work completed and the actual costs spent. You can do this back on the Activities screen.

Going back to the original earned value example, it is now day 4 of the project. 2 columns have been built so far, so I'll need to update the statuses of activities Column 1 and Column 2.

Starting with Column 1, I'll use the **Status** tab of the details section to mark off that the activity has both **Started** and **Finished**. Because this column actually took 2 days to complete, I'll adjust the **Actual Duration** to 2.



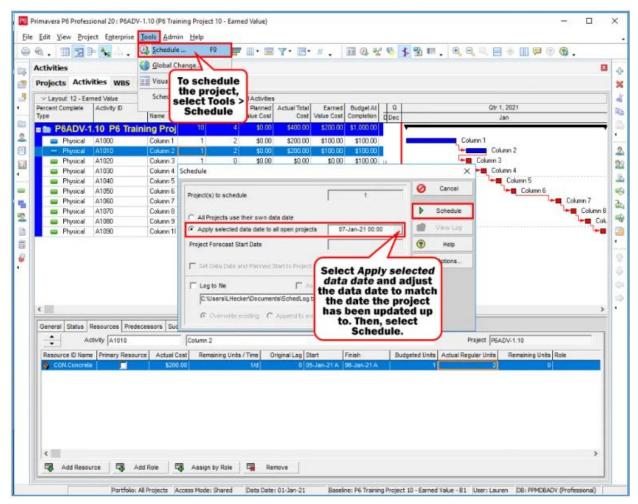
You were also need to add in the actual costs, which you can do in the **Resources** tab. Although we were planning on only spending \$100 per column, this column actually costs \$200. I'll show this by setting the **Actual Units** for the resource to 2. This will automatically adjust the **Actual Cost** to \$200.



You have todo the same thing for Column 2, which also took 2 days to complete and had an actual cost of \$200.

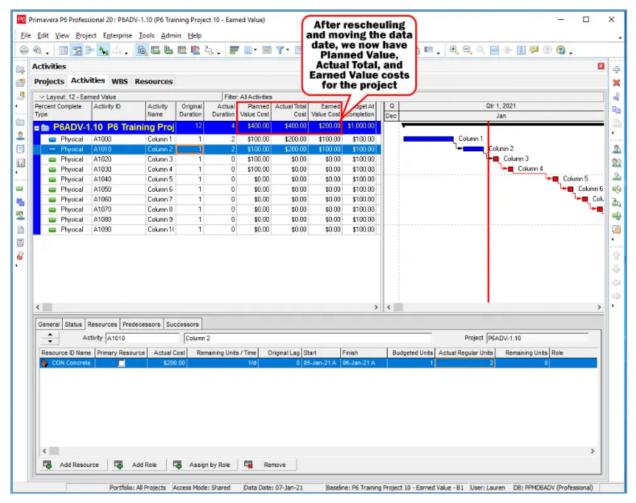
You can view and contrast the Actual Duration for the activities with the Original Duration from the table. The Planned Value and Earned Value fields will not automatically update with this schedule progress. You will have to move the data forward and recalculate the schedule for these fields to populate.

To reschedule the project, select **Tools > Schedule**. Select **Apply selected data date** and move the data date to match the statused activities. In this example, we have just completed the fourth workday for the project, so move the data date forward to the date of the fifth workday. Then, select **Schedule**.



With the schedule statused, the columns have populated. We can now see that this project has an **Actual Cost** of \$400, a **Planned Cost** of \$400, and an **Earned Value** of \$200.

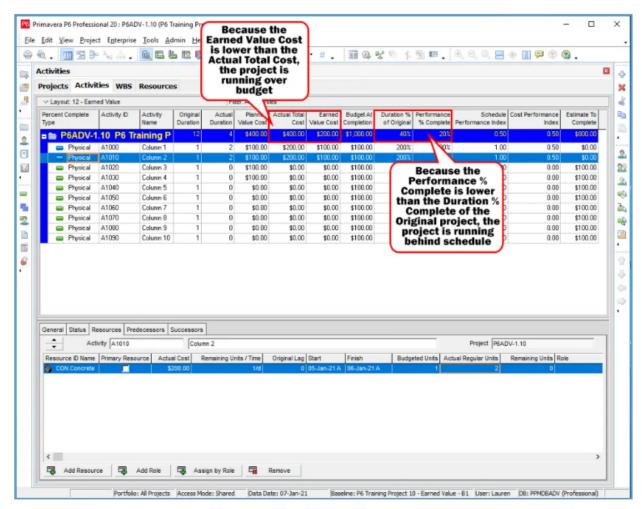
Again, the **Actual Cost** is how much we have spent so far in the project. By day 4, we have spent \$400. The **Planned Cost** is how much we had planned to spend by day 4 based on our baseline estimates. We had planned to have 4 columns finished at this point, each at a cost of \$100. The **Earned Value** is how much you have spent based on the amount of work you have completed. According to our baseline schedule, 2 completed columns should have cost \$200.



These were the same values that we were able to calculate manually. However, using Primavera P6, this information is available to us automatically. This can be useful for longer and more complex projects.

We can now analyze the schedule's performance and cost so far using the activity table columns. From the **Duration % Complete of the Original** column, we can see how much of the project we would have completed at this point. This is according to the baseline schedule. Right now, it is at 40% complete- this is how much the project was supposed to be completed by day 4. In the **Performance % Complete** column, we can see how much of the project we have actually completed based on the actual work done. This is currently 20%, as we have only built 2 columns. We can automatically tell that this project is running behind schedule.

For cost performance, we can see from the **Planned Value Cost** that we should have completed \$400 of work at this point. However, our **Actual Cost** is \$400 and we've only been able to achieve \$200 of work in this time, as shown by **Earned Value**. This shows that the project is also over budget.



We can get more information on the project's performance using the **Cost Performance Index**, **Schedule Performance Index**, and **Estimate to Complete** columns.

## What is the Cost Performance Index?

The **Cost Performance Index (CPI)** is a ratio of what was earned in value and the actual cost spent so far. An index less than 1 is over budget, and an index greater than 1 is under budget. This ratio is calculated using the following formula:

#### **Earned Value / Actual Cost = Cost Performance Index**

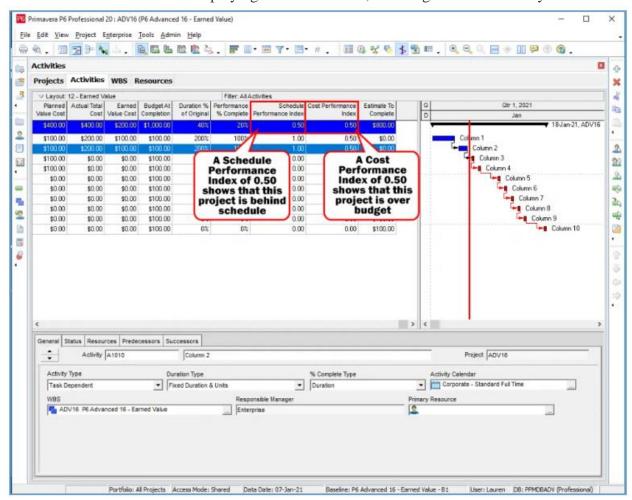
In this project, the Earned Value is \$200 and the Actual Cost is \$400. \$200 divided by \$400 would give us a ratio of 0.5. A Cost Performance Index of 0.5 lets us know that the schedule is currently over budget. Although we can compute the ratio manually, Primavera P6 will also provide it automatically when the **Cost Performance Index** column is displaying.

#### What is the Schedule Performance Index?

The **Schedule Performance Index (SPI)** is a ratio of what we have earned in value and what we originally planned to spend at this time. Once again, an index less than 1 is behind schedule and an index greater than 1 is ahead of schedule. This ratio is calculated using the following formula:

### Earned Value / Planned Value = Schedule Performance Index

In this project, the Earned Value is \$200 and the Actual Cost is \$400. \$200 divided by \$400 would give us a ratio of 0.5. A Schedule Performance Index of 0.5 lets us know that the project is currently also behind schedule. Again, we can find this ratio manually, but with the **Schedule Performance Index** column displaying in Primavera P6, we can get it automatically.



Lastly, we can also look at the **Estimate to Complete** – but before we do that, we need to choose how P6 will compute this.

Primavera P6 Professional 20: ADV16 (P6 Advanced 16 - Earned Value) × Eile Edit Yiew Project Enterprise Jools Admin Help 는 . F III · = T · II · # . III @ 및 ♡ € €. X WBS (B ф Projects Activities WBS Resources 3 38 R ✓ Layout WBS WBS Categories WBS Name 2 1 i i -In the Earned Value tab on the WBS screen, you 1 0 E can choose technique for computing Estimate to 8 Complete General Notebook Budget Log Spending Plan Budget Summary WBS Milestones WPs & Docs Earned Value Technique for computing performance percent complete ETC = PF \* (Budget at Completion - Earned Value), where Use resource curves / future period buckets C PF = 1 C WBS Milestones percent complete C PF = 1 / Cost Performance Index C 0/100 C 50/50 C PF = 1 / (Cost Performance Index \* Schedule Performance In

Step 7: Set the technique for computing Estimate to Complete for each WBS layer

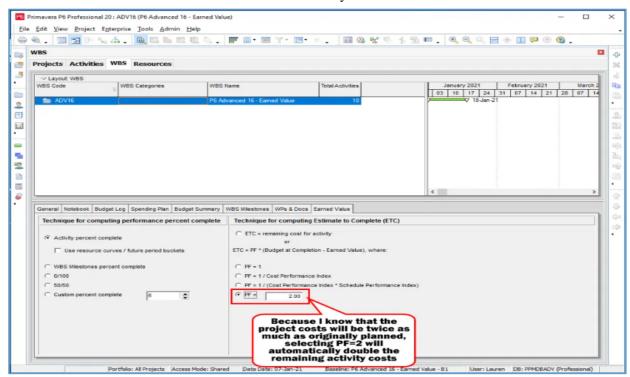
On the right side of the tab, there are several options for how to compute the ETC value. The first option is **ETC** = **remaining cost for activity**. This is a basic manual forecast that will not recalculate any of the ETC values based upon performance.

In the current project, we had originally planned to build 8 more columns, and each column was originally planned to cost \$100 each. Using this option would make the Estimate to Complete value be \$800. However, we now know that the planned costs weren't accurate. Keeping this option at ETC = remaining cost would not give us a good estimate for the rest of the project.

The remaining options all use a **Performance Factor** (PF). A Performance Factor is a multiplier that you can use to trend the remaining ETC values based on past project performances. You can base these performance factors on a simple 1 value, meaning not trending. Or, they can be set to trend based on the **Cost Performance Index** (CPI), **Schedule Performance Index** (SPI), or both.

You can also enter in a custom performance factor based on some other externally driven value. In this project, we now know how much each column will cost. Because we know that this amount is exactly twice as much as originally expected, choose the last option and set the

Performance Factor to 2. This will multiply our original planned costs by 2 – increasing them from \$100 to \$200 for the columns that we have not yet built.



Returning to the **Activities page**, we can now see the **Estimate to Complete** is now at \$1600. Adding in the \$400 that we have spent so far, this would make our **Estimate At Complete** be \$2000 in total. With each column continuing to cost \$200, this would be an accurate estimate for how much we now plan to spend on the project as a whole.

