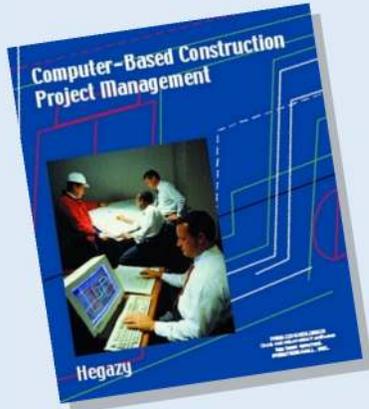


Software for Simplified Project Management for the Trade Contractor, General Contractor, and Owner



Detailed concepts can be found in the textbook shown.

Contents	Page
EasyPlan Features	2
Quick Tutorial	3
Case 1: Trench Project	9
Case 2: House Project	14
EasyPlan Utilities	24

Limitations:

Finish-to-start relations.
3 predecessors and 3 for each activity.
3 optional estimates per activity.

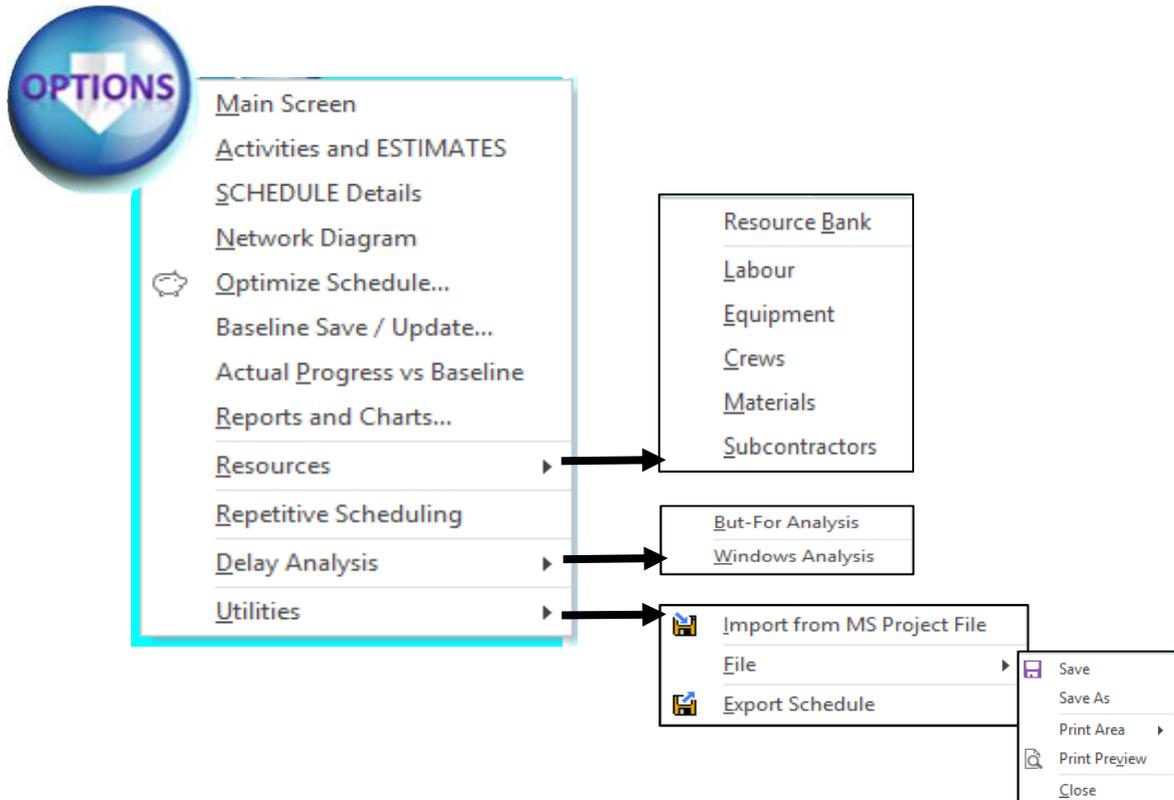
Important Setup Note:

Before using EasyPlan, we need to setup Excel to allow using Macros. In Excel, do the following:

FILE Options Trust Center Trust Center Settings... Macro Settings

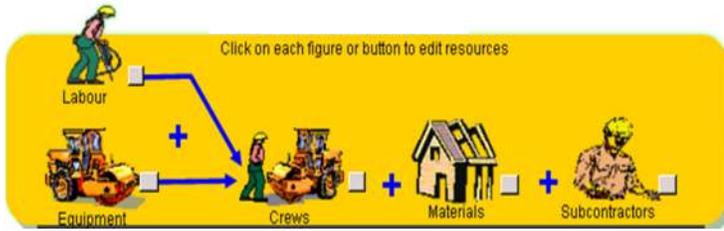
Enable all macros (not recommended; potentially dangerous code can run)
 Trust access to the VBA project object model

One Button Interface



EasyPlan Features: Missing in Commercial Scheduling Software

1. Resource bank that links Scheduling with Estimating



2. Not one ... but three estimates / activity

Activity	Description	1		2		3	
		Cost1	Dur1	Cost2	Dur2	Cost3	Dur3
1	Excavation	\$2,000	2.0	\$2,000	2.0	\$3,000	1.0
2	Foundation	\$2,000	2.0	\$2,000	2.0	\$3,000	1.0
3	Joining Wall	\$1,000	1.0	\$1,000	1.0	\$1,000	1.0
4	House Walls	\$4,000	4.0	\$3,000	3.0	\$5,000	2.0

3. Powerful cost optimization

Select the best combination of construction options for all activities, to meet project constraints.

Schedule Improvement

Meet Deadline & Resource Limits:

Quick Heuristic Solution

Optimization (Longer time) Cycles
(Use 100s of cycles to greatly improve solution)

Price Refinement:

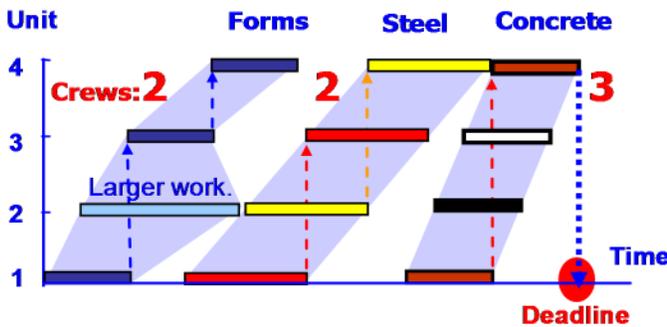
Minimize Cash Flow & Interest Charges

Cancel Proceed

4. Cash flow analysis & indirect costs



5. Repetitive scheduling for High-rise, roads, etc.



6. Price adjustment & fine-tuning

Activity	Description	Cost Adj. (%)	Red = Completed; Blue = Remaining					
			1	2	3	4	5	6
1	Excavation	5.0	50%	50%				
2	Foundation				50%	50%		
3	Joining Wall						100%	
4	House Walls	-5.0						25%
5	House Roof							
6	Select Finishes	5.0	100%					
7	Interior Finishes	-5.0						
8	Clean Up							
9	Fab. Garage Doors	5.0	17%	17%	17%	17%	17%	17%
10	Garage Walls							33%
11	Garage Roof	-5.0						
12	Garage Doors							

7. Extensive reports

Sum of TotalCost	Description	Contr. Item	Contr. Qu	Item Unit	ContUC	Total
	Clean Up	Item8	1.00	unit	\$1,000.0	\$1,000
	Excavation	Item1	1.00	unit	\$2,000.0	\$2,000
	Fab. Garage Doors	Item9	1.00	unit	\$6,000.0	\$6,000
	Foundation	Item2	1.00	unit	\$2,000.0	\$2,000
	Garage Doors	Item12	1.00	unit	\$2,000.0	\$2,000
	Garage Roof	Item11	1.00	unit	\$2,000.0	\$2,000
	Garage Walls	Item10	1.00	unit	\$3,000.0	\$3,000
	House Roof	Item5	1.00	unit	\$3,000.0	\$3,000
	House Walls	Item4	1.00	unit	\$4,000.0	\$4,000
	Interior Finishes	Item7	1.00	unit	\$3,000.0	\$3,000
	Joining Wall	Item3	1.00	unit	\$1,000.0	\$1,000
	Select Finishes	Item6	1.00	unit	\$1,000.0	\$1,000
	Grand Total					\$30,000

Reports and Charts:

Summary Reports: Full Activity Report
 Budget / Category Reports
 Payment Report

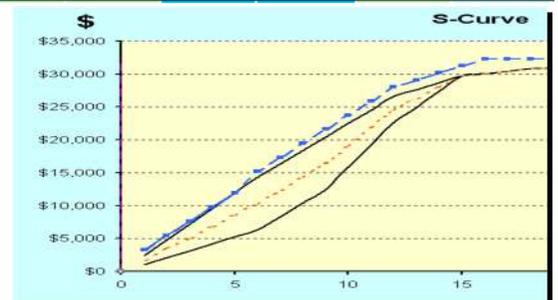
Schedule Charts: Cash Flow Chart
 Histogram for L1
 Histogram for E3
 Histogram for M1

Progress Charts: Progress S-Curve
 Earned-Value Chart
 Progress Indices

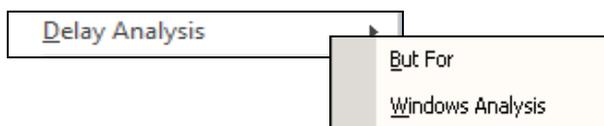
Cancel OK

8. Daily Records of site events & Earned-Value Control

	5-1-16	6-1-16	7-1-16	8-1-16	9-1-16	10-1-16
Plan:	50%	50%				
Actual:	25%	0	25%	C	50%	



9. Delay Analysis



10. Many Advanced Features

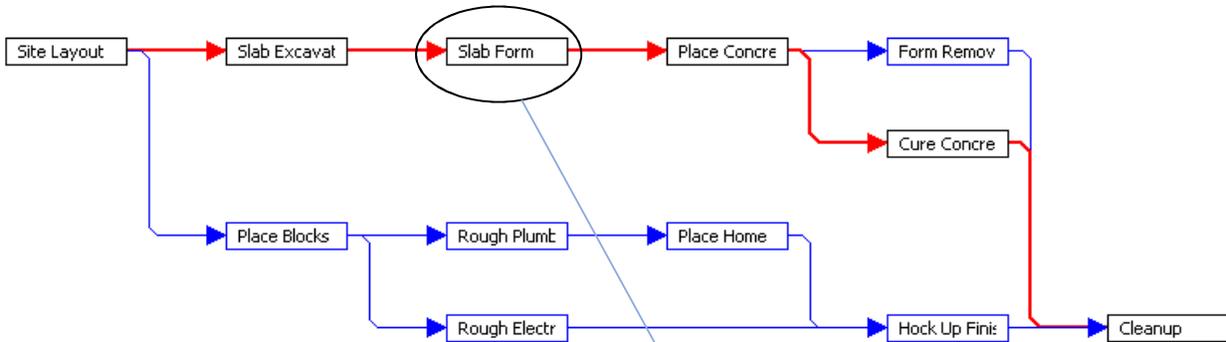
- Indirect-cost estimation.
- Analysis of competitors to estimate markup.
- Site layout optimization.
- Import from & Export to Microsoft Project.

EasyPlan Quick Tutorial

a. Before Using EasyPlan:

Before you use EasyPlan or any other project management software, you need to do some manual planning work to identify the project activities, construction options, available resources, and the sequence of work among the project activities. Based on these, your team can draw the **project network** such as the one shown below. The network diagram is very beneficial. For example, if the SLAB FORM activity is delayed for any reason, you can directly tell the affected activities so that you make proper corrective actions.

Notice that for each of the project activities, you need to perform quantity take off, get quotes from suppliers and subcontractors, investigate if you are able to perform the work by in-house crews or using subcontractors, etc. Once this is done, you are ready to use EasyPlan to develop an optimum plan that saves you time and money.



Data for each activity:

- Estimate 1: time, cost, & resources
- Estimate 2: time, cost, & resources
- Estimate 3: time, cost, & resources

b. Starting a New Project

Start by activating **EasyPlan**. Use **File – Save As** to rename the project.

In the “Main Screen”, input the general data for the project and the **constraints** you have, such as:

EasyPlan © Dr. Tarek Hegazy, 2002-2016 University of Waterloo, tarek@uwaterloo.ca

Tutorial

Project Information

Three Key Resources		
Code:	Limit:	Used:
L2	2.0	4.0

Workdays: SA FR

No. of Activities: 6

Start Date: 5-Jan-16

Deadline (Days): 8

Penalty (\$/d): 5,000

Incentive (\$/d): 1,000

Indirect (\$/d): 50

Report Every (d): 2

i / Period (%): 1.00

Markup (%): 10.00

Hold Back (%): 5.0

Down Payment (%):

Suppliers credit (%):

Project Cost = \$31,650

Duration (days) = 13.0

Project End Date: 17-Jan-16

Warning: Resources exceed limits!..You need to optimize the schedule.

Warning: Duration exceeds deadline!..You need to optimize the schedule.

- Start date;
- Project deadline duration;
- Working days and weekends;
- Three key **resource** categories and their daily availability limits;
- Penalty & incentive amounts; and
- Other contract provisions as shown.

Notice the warnings below.

c. Specifying the Project Activities & their estimates

3 ways you can specify the project activities:

EasyPlan combines full Estimating with its Scheduling, Optimization, and unique progress tracking.



Utilities
Import from MS Project File

1. Import from Microsoft Project

Select the Microsoft project file to import. It has the activities, relationships, and resources.

OR



Activities and ESTIMATES

2. Add activities and manually enter the durations and costs for 3 estimates

Activities & 3 Estimates

Add Activity below current | Delete Current Activity | Estimates based on quantity and crew rates | Direct User-Input of cost, duration & resources

You may add few extra activities to avoid changes later. Do Not use Copy+paste.

Activity	Description	Cheap Estimate			Moderate Estimate			Expensive Estimate			Productivity (0-1)		
		Cost1	Dur1	L5	Cost2	Dur2	L5	Cost3	Dur3	L5	Winter	Spring	Fall
1	Excavation	\$2,000	2.0	2.0	\$3,000	1.0	2.0				1.00	1.00	1.00
2	Foundation	\$2,000	2.0	2.0	\$3,000	1.0	2.0				1.00	1.00	1.00

Seasonal productivity factors.

Two ways to specify optional estimates in EasyPlan:

3. Add activities and enter Labour, Equip. & Crews rates, and the work quantity. EasyPlan will calculate the durations, costs, and resource needs

Activities & 3 Estimates

Add Activity below current | Delete Current Activity | Estimates based on quantity and crew rates | Direct User-Input of cost, duration & resources

Add/Delete enabled only after clearing actual progress. Do Not use Copy-Paste.

Data Sheet

Activity	Description	Contr. Quant.	Item Unit	Contr. Item	Desc. Level-1	Desc. Level-2	Supervisor	Cheap Estimate		Moderate Estimate		Expensive Estimate	
								Cost1	Dur1	Cost2	Dur2	Cost3	Dur3
1	Excavation	1.00	unit	Item1				\$18,006	8.0				
2	Foundation	1.00	unit	Item2				\$11,055	6.0				

White cells are user inputs

Select the cell of an activity estimate & click Edit.

Estimate Details

Estimate: 1 for Activity: B-Sanitary Main
Estimate Desc: First Option

Select a Crew or a Subcontractor

Edit	CREW: CR7-CR7: \$1,655/day	\$1655.44
Edit	SUBcontractor:	\$0.00

Activity Quantity (1.0 for L-Sum): 3
Crew Production Quantity / 8-hour: 0.5
Crew Work Hours / 8

Edit Material Type: M12-Material for Ac: \$19/m3
Material Quantity / day: 10.00

Material Cost: \$187.00

Cost Estimate (\$): \$11054.64
Duration (days): 6.00

Seasonal Productivity Factors (0 to 1): Winter: 1, Spring: 1, Fall: 1

First Estimate is: 6 days and \$11,054.64

Note on Resources



Resources
Resource Bank

Even before you start estimating, you may store all your available labour, equipment, materials, crews, and subcontracts in EasyPlan's Resource Bank.

In your inputs, make sure to write the code of the resource used in the appropriate cells. To help in this process, you may print the various resource sheets.

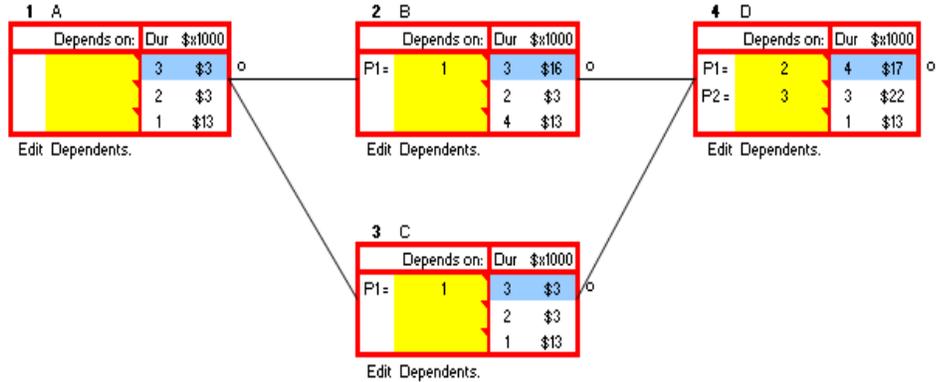
Hide Resource Bank

Click on each figure or button to edit resources

d. Adding Activity Relations & Schedule Details

Two ways to specify the logical relations:

1. Using the Network diagram to edit / change activity Depends in the **yellow cells** directly.



OPTIONS Network Diagram

OR

OPTIONS SCHEDULE Details

2. Specifying activity dependents directly in the Schedule.

Schedule: Key options are in the white cells below.

Select which of the three optional estimates (1, 2, or 3) is used in each activity. Time & cost change accordingly.

		Total Cost = \$44,800		Duration = 16.0 Days		Early Bar Chart							
(12 Activities)		Activity Options		Predecessors			1/1/04	4/1/04	5/1/04				
Activity	Description	Activity Duration	Activity Cost \$x1,000	P1	P2	P3	Start Delay	Change Allowed	Method Used	Cost Adjust. (%)	1	2	3
1	Excavation	2.0	\$2.00					Yes	1		50%	50%	
2	Foundation	2.0	\$2.00	1				Yes	1				50%
3	Joining Wall	1.0	\$1.00		2			Yes	1				
4	House Walls	4.0	\$4.00		3			Yes	1				
5	House Roof	3.0	\$3.00		4			Yes	1				

Up to three predecessors for each activity.

If we delay the start of any activity, we avoid having all activities running in parallel.

e. Optimizing the Schedule

If your schedule extends beyond the deadline or the amount of resources used is more than you have, the main screen will give you a warning that you need to optimize the schedule.

OPTIONS Optimize Schedule...

Schedule Improvement

Meet Deadline & Resource Limits:

Quick Heuristic Solution

Optimization (Longer time) Cycles
 (Use 100s of cycles to greatly improve solution)

Price Refinement:

Minimize Cash Flow & Interest Charges

Cancel Proceed

1 A Quick solution to meet deadline and resource limits.

2 A more detailed way to improve the solution.

3 Another option to adjust the schedule and improve the cash flow.

See screen captures in next page.

Total Cost = \$44,000		Duration = 10.0 Days		Optimization: EasyPlan tries to introduce small start delays in some activities to avoid resource conflicts. Also, EasyPlan selects a combination of construction methods that meets deadline with minimum cost.							Early Bar Chart 1/1/04 4/1/04 5/1/04 6/1/04																																																																																																					
(12 Activities)		Activity Options									<table border="1"> <tr> <th>Activity</th> <th>Description</th> <th>Activity Duration</th> <th>Activity Cost \$1,000</th> <th>P1</th> <th>P2</th> <th>P3</th> <th>Start Delay</th> <th>Change Allowed</th> <th>Method Used</th> <th>Cost Adjust. (%)</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> <tr> <td>1</td> <td>Excavation</td> <td>1.0</td> <td>\$3.00</td> <td></td> <td></td> <td></td> <td></td> <td>Yes</td> <td>3</td> <td>5.0%</td> <td>100%</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>Foundation</td> <td>1.0</td> <td>\$3.00</td> <td>1</td> <td></td> <td></td> <td></td> <td>Yes</td> <td>3</td> <td></td> <td></td> <td>100%</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>Joining Wall</td> <td>1.0</td> <td>\$1.00</td> <td>2</td> <td></td> <td></td> <td></td> <td>Yes</td> <td>3</td> <td></td> <td></td> <td></td> <td>100%</td> <td></td> </tr> <tr> <td>4</td> <td>House Walls</td> <td>2.0</td> <td>\$5.00</td> <td>3</td> <td></td> <td></td> <td></td> <td>Yes</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td>50%</td> </tr> <tr> <td>5</td> <td>House Roof</td> <td>2.0</td> <td>\$5.00</td> <td>4</td> <td></td> <td></td> <td></td> <td>Yes</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>6</td> <td>Select Finishes</td> <td>1.0</td> <td>\$1.00</td> <td></td> <td></td> <td></td> <td>2</td> <td>Yes</td> <td>3</td> <td>-5.0%</td> <td></td> <td></td> <td>100%</td> <td></td> </tr> </table>				Activity	Description	Activity Duration	Activity Cost \$1,000	P1	P2	P3	Start Delay	Change Allowed	Method Used	Cost Adjust. (%)	1	2	3	4	1	Excavation	1.0	\$3.00					Yes	3	5.0%	100%				2	Foundation	1.0	\$3.00	1				Yes	3			100%			3	Joining Wall	1.0	\$1.00	2				Yes	3				100%		4	House Walls	2.0	\$5.00	3				Yes	3					50%	5	House Roof	2.0	\$5.00	4				Yes	3						6	Select Finishes	1.0	\$1.00				2
Activity	Description	Activity Duration	Activity Cost \$1,000	P1	P2	P3	Start Delay	Change Allowed	Method Used	Cost Adjust. (%)	1	2	3	4																																																																																																		
1	Excavation	1.0	\$3.00					Yes	3	5.0%	100%																																																																																																					
2	Foundation	1.0	\$3.00	1				Yes	3			100%																																																																																																				
3	Joining Wall	1.0	\$1.00	2				Yes	3				100%																																																																																																			
4	House Walls	2.0	\$5.00	3				Yes	3					50%																																																																																																		
5	House Roof	2.0	\$5.00	4				Yes	3																																																																																																							
6	Select Finishes	1.0	\$1.00				2	Yes	3	-5.0%			100%																																																																																																			

Optimization options 1 & 2 change the values in these two columns until an optimum combination is determined.

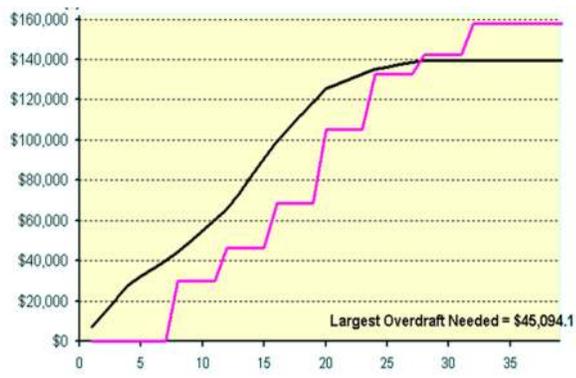
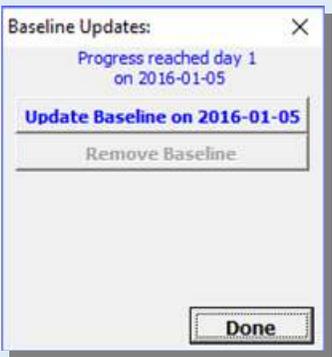
In option 3 Assigning 5% extra cost to early activities and subtracting 5% from later ones, cash flow is improved and interest charges are reduced.

f. Saving the Baseline



Baseline Save / Update...

Once you determine a schedule that meets deadline and resource limits, it is time to save this schedule as a **Baseline** for the project so that can be used for progress evaluation.



Cash flow curve is one EasyPlan reports.

g. Project Control



Actual Progress vs Baseline

Progress recording and updating the schedule is one key benefit of Easyplan. Once you start entering actual progress (see next page), you will notice that the bar chart shows different colors for each activity, as follows:

Progress vs Baseline Chart

Baseline:	50%	50%			
Actual:	10%	0	10%	40%	40%

Actual Completed Work + Remaining Work
 (user input) 20% in 3 days, with owner Delay (0) in the 2nd day. (automatically calculated)

Remaining Work Calculated in two ways:

- a) Following **baseline speed** (default): Since baseline = 50% /day, the remaining 80% takes 2 days
- b) Following **actual speed**: Since actual = 10% /day, the remaining 80% takes 8 days.

In EasyPlan, you can decide the way remaining work is calculated by setting this option:

Remaining Work:

100%	Baseline speed
	+ Actual speed
Weight (0 to 1)	

3 Ways to enter actual progress:

		Clear All Progress		Enter Daily Progress					
		(6 Activities)			5-1-16	6-1-16	7-1-16		
Activity ID	Description	Actual Cost Todate		1	2	3			
1	A-Excavation			50%	50%				
				10%	0	45%			

All site events including delays by any party are entered on the actual bar chart.

1 Click on the “Enter Daily Progress” button and EasyPlan will present a form to enter the events that took place every day.

Activity Progress: ×

On day 1 (2016-01-05) (A-Excavation) has:

Progress: Delay:

Value:

Work done today: 10 %.

Owner-directed acceleration?

Yes No

Resource difficulties

Workers' Morale Today:

😊 😐 😞

Delete all activity progress

Delete this day's progress

Cancel OK

Notice the 10% progress in the bar chart on day 1.

2 Select the actual progress cell and **directly enter**:

- A value from 0 to 1.0, say 0.5 to represent 50% progress;
- Letter **O** for owner delay;
- Letter **C** for contractor delay;
- **C+O** if both; or
- Letter **N** for third-party delay.

3 Select the actual progress cell and **click on the yellow button**, then use the form below.

Activity Progress: ×

On day 2 (2016-01-06) (A-Excavation) has:

Progress: Delay:

Due to:

Owner (O)

Contractor (C)

Both C+O

Neither, Weather, etc.

Unexpected Soil Condition.

Workers' Morale Today:

😊 😐 😞

Delete all activity progress

Delete this day's progress

Cancel OK

Notice the “O” delay in the bar chart on day 2.

Note:

- Remaining
- Plan

To help site personnel in progress recording, Put the “Remaining” option **off** then print the planned Schedule alone.

Present this chart to site personnel for manually recording of daily progress. You can enter these records to EasyPlan either daily or every few days.

		5-1-16	6-1-16	7-1-16	8-1-16	9-1-16	10-1-16	11-1-16	12-1-16	13-1-16	14-1-16	15-1-16	16-1-16	17-1-16
		1	2	3	4	5	6	7	8	9	10	11	12	13
Activity ID	Description													
1	A-Excavation	50%	50%											
2	B-Sanitary Main			50%	50%									
3	C-Footing 1			25%	25%	25%	25%							
4	D-Footing 2							25%	25%	25%	25%			
5	E-Wall 1							33%	33%	33%				
6	F-Wall 2											33%	33%	33%

h. Project Reports

EasyPlan has various reports and charts that are useful both before and after start of construction. One of these is a Cash Flow chart that facilitates your financing decisions. Similarly, you can view a bid proposal report and resource profiles.



Reports and Charts...

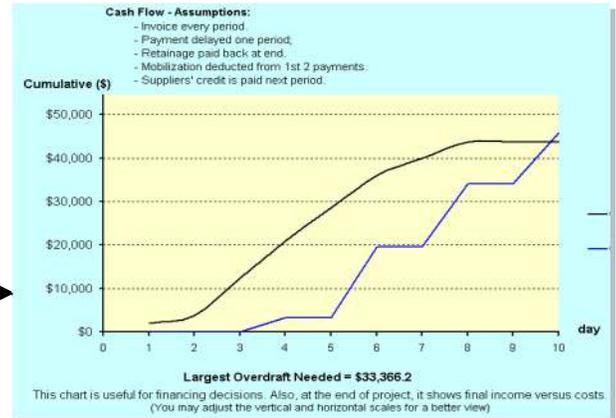
Reports and Charts:

Summary Reports: Full Activity Report
 Budget / Category Reports
 Payment Report

Resource Charts: Histogram for L1
 Histogram for E2
 Histogram for M4

Progress Charts: Cash Flow Chart
 Progress S-Curve
 Earned-Value Chart
 Progress Indices

Cancel OK



Bid proposal Report:

Budget / Category Reports

Bid price for each activity.

Current Budget Report: Current Schedule

Sum of TotalCost	Description	Contr. Item	Contr. Qu	Item Uni	ContUC	Total
A	Item1	1.00	unit	\$3,141.3	\$3,141	
B	Item2	1.00	unit	\$20,853.0	\$20,853	
C	Item3	1.00	unit	\$5,567.5	\$5,568	
D	Item4	1.00	unit	\$21,836.4	\$21,836	
E	Item5	1.00	unit	\$24,262.7	\$24,263	
F	Item6	1.00	unit	\$18,197.0	\$18,197	
G	Item7	1.00	unit	\$15,528.1	\$15,528	
H	Item8	1.00	unit	\$19,908.3	\$19,908	
I	Item9	1.00	unit	\$6,563.8	\$6,564	
J	Item10	1.00	unit	\$7,278.8	\$7,279	
K	Item11	1.00	unit	\$10,203.2	\$10,203	
Grand Total					\$153,340	

Cost per category report:

Budget / Category Reports

Very useful report about any part of the project.

Category Report:

Desc. Level-1: House
 Desc. Level-2: Civil
 Super-visor: (All)

Amount	Description	Total
A		\$3,141
B		\$20,853
C		\$5,568
Grand Total		\$29,562

Payment Report:

For project control purposes, EasyPlan has a wide range of reports and charts to support you in identifying project status, actual versus planned progress, corrective actions, and payment reports. Two examples are the payment report and the project S-curve.

We specify the report period.

Period: From day: 1 To day: 12

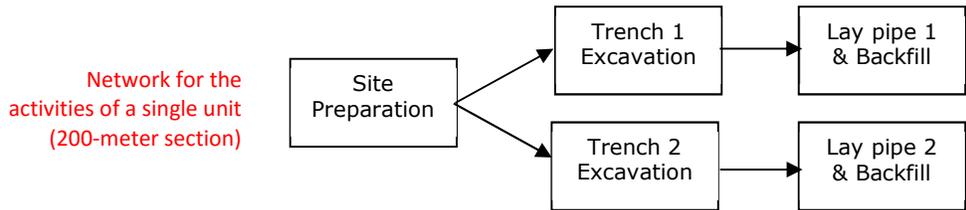
Activity	Description	Baseline Budget (\$)	Planned Progress (%)	Actual Progress (%)	\$ Total Owing To End of Day 12	\$ Total Paid Before Day 1	\$ Payable Before Deductions
1	Excavation	\$2,464	100.0%	100.0%	\$2,464		\$2,464
2	Foundation	\$2,464	100.0%	100.0%	\$2,464		\$2,464
3	Joining Wall	\$1,232	100.0%	100.0%	\$1,232		\$1,232
4	House Walls	\$4,928	100.0%	50.0%	\$2,464		\$2,464
5	House Roof	\$6,160	100.0%				
6	Select Finishes	\$1,232	100.0%				
7	Interior Finishes	\$4,928	50.0%				
8	Clean Up	\$1,232					
9	Fab. Garage Doors	\$7,392	100.0%	17.0%	\$1,257		\$1,257

Notice the actual versus planned progress for that period.

Case 1: Trench Project

- You are involved in a 200-meter trench project in a new subdivision. Work will start May 1, 2016 under the following conditions:
- Deadline is 10 days; Penalty for late completion = \$5,000/day, Bonus for early completion = \$1000/day.
- Indirect cost = \$50/day; Contractor's markup = 10%; Reporting period = every 2 days; Interest rate is 1% per period; Owner's holdback = 5% (payable at end); and Workers (L5) availability limit is 3 / day.

The contractor's team studied the drawings, specifications, and other contract documents, then did some planning tasks that resulted in dividing the project into 5 work packages (activities). Optional estimates per activity were identified as shown in the following table. Activity relationships are also shown. Some other identified information is as follows:



No.	Description	Depends on	Estimate 1			Estimate 2			Estimate 3		
			Cost	Duration	Workers	Cost	Duration	Workers	Cost	Duration	Workers
1	Site Preparation	---	\$5,000	4.0	3.0	\$7,000	2.0	3.0			
2	Trench 1 Excavation	1	\$5,000	4.0	3.0				\$10,000	2.0	2.0
3	Trench 2 Excavation	1	\$5,000	4.0	2.0	\$6,000	3.0	2.0	\$7,000	2.0	2.0
4	Lay Pipe 1 & Backfill	2	\$5,000	4.0	3.0	\$6,000	2.0	2.0	\$7,000	1.0	2.0
5	Lay Pipe 2 & Backfill	3	\$5,000	4.0	3.0	\$8,000	3.0	2.0	\$9,000	2.0	2.0

Requirements:

Part A: Enter the project data into EasyPlan. Determine the optimum execution plan that meets both the **deadline and resource limits**.

Part B: Your Company wants to develop a plan to trench a full stretch of two kilometers (i.e., **10 repetitive units** of the 200-meter standard section). The project has a **deadline of 18 days**. All activities and estimates data are the same as above. One constraint is that you cannot provide more than **four crews** for any activity. Also, Sections 1 and 10 do not require "Site Preparation" work. Use EasyPlan to propose a cost-effective schedule that satisfies the project constraints.

Step-By-Step Solution

Part A: 1. Prepare Project Data

Before using EasyPlan, you need the following data:

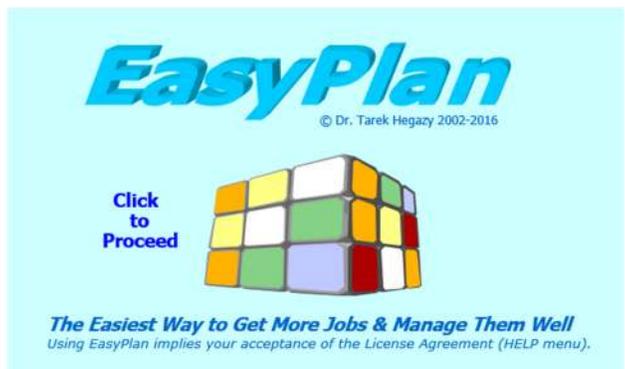
- Project work packages (activities);
- Logical order of executing the activities (which comes first, which follows, etc.);
- Available resources such as equipment, crews, and materials;
- Work quantities, suppliers' quotes, etc.; and
- Contract provisions such as deadline, payment frequency, etc.

2. Start EasyPlan

Activate EasyPlan. Click on the middle figure to proceed.

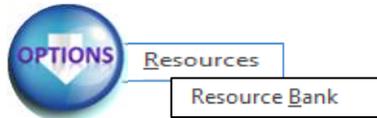
3. Rename Your Project

Use **File – Save As** to rename the project to a new name of your choice.



4. Specify Your Resources

Let's now specify that we have a key labour resource (code L5). To access the labour sheet, Activate the **Resource Bank** as follows:



Then, click on the picture of the labour to view the labour sheet.



In the Labour sheet, add a new labour category. Then, change the data of the new category to **L5**. Notice that all labour codes start with letter **L**. Once done, return to the **Main Screen** and **hide** the **Resource Bank**.



Code	Description	Rate/hr	Basic Rate/hr
L1	Imported Labour	\$23.7	\$15.0
L2	Labour2	\$39.5	\$25.0
L3	Asbestos_Foreman	\$46.6	\$29.5
L5	Example Worker	\$39.5	\$25.0

5. Enter General Information

In the "Main Screen", enter the data and constraints:

- Start date and Working days;
- Three key resource categories and their limit;
- Project deadline duration;
- Penalty & incentive amounts; and
- Other contract provisions as shown.

Project Information

Three Key Resources			Start Date:	5-Jan-16
Code:	Limit:	Used:	Deadline (Days):	10
L5	3.0		Penalty (\$/d):	5,000
			Incentive (\$/d):	1,000
			Indirect (\$/d):	50
			Report Every (d):	2
			i / Period (%):	1.00
			Markup (%):	10.00
			Hold Back (%):	5.0
			Down Payment (%):	
			Suppliers credit (%):	

Workdays: SA FR

6. Specify the Activities



Make sure to select the **Direct User-Input of cost, duration & resources** option because the costs and durations are given to us in Page 9.

Select any activity and use **Add Activity below current** to add new activities so the total becomes 5 for our project.

Notice the resource needs can be specified here. Also you can change the seasonal productivity factors.

Start entering the estimates' data in the white cells. Notice that the estimates are arranged as **Cheap, Moderate, and Expensive**.

Once done, the screen will look like this:

Note:

You can use the **More>** button to enter other activity data such as work quantity, the supervisor's name, and whether it is civil, electrical, mechanical or any work category or project area

Activities & 3 Estimates

Add Activity below current
Delete Current Activity

 Estimates based on quantity and crew rates
 Direct User-Input of cost, duration & resources

You may add few extra activities to avoid changes later. Do Not use Copy-Paste.

Activity	Description	Cheap Estimate			Moderate Estimate			Expensive Estimate			Productivity (0-1)		
		Cost1	Dur1	L5	Cost2	Dur2	L5	Cost3	Dur3	L5	Winter	Spring	Fall
1	Site Preparation	\$5,000	4.0	3.0	\$7,000	2.0	3.0				1.00	1.00	1.00
2	Trench 1 Excavation	\$5,000	4.0	3.0				\$10,000	2.0	2.0	1.00	1.00	1.00
3	Trench 2 Excavation	\$5,000	4.0	2.0	\$6,000	3.0	2.0	\$7,000	2.0	2.0	1.00	1.00	1.00
4	Lay Pipe 1 & Backfill	\$5,000	4.0	2.0	\$6,000	2.0	2.0	\$7,000	1.0	2.0	1.00	1.00	1.00
5	Lay Pipe 2 & Backfill	\$5,000	4.0	3.0	\$8,000	3.0	2.0	\$9,000	2.0	2.0	1.00	1.00	1.00

7. Specify Work Sequence & Schedule Details



SCHEDULE Details

Select which estimate (1, 2, Or 3) here.

Duration (days) = 12.0		Views:		Early Bar Chart (No User Inputs)																						
(5 Activities)		Activity Options																								
Activity ID	Description	Logical Relations	Activity Options	Cost Details	Time Details	Resource Details	Actual Progress	P1	P2	P3	Start Delay	Change Allowed	Method Used	Cost Adjust. (%)	1	2	3	4	5	6	7	8	9	10	11	12
1	Site Preparation											Yes	1		25%	25%	25%	25%								
2	Trench 1 Excavat							1				Yes	1						25%	25%	25%	25%				
3	Trench 2 Excavat							1				Yes	1						25%	25%	25%	25%				
4	Lay Pipe 1 & Bac			4	\$5.0			2				Yes	1										25%	25%	25%	25%
5	Lay Pipe 2 & Bac			4	\$5.0			3				Yes	1										25%	25%	25%	25%

We enter up to 3 predecessors for each activity.

If we delay the start of any activity, we avoid having all activities running in parallel, thus using many resources.

After entering the logical relations as above, we set each activity to use the cheapest estimate (1). Accordingly, the project becomes 12 days (2 days beyond deadline). Because of the penalty, total cost becomes \$35,600 as shown at the top of the schedule.

Three Key Resources		
Code:	Limit:	Used:
L5	3.0	5.0

In the Main Screen, , we notice we have two warnings: Deadline is exceeded, and We use 5 of the L5 resource (2 more than available).

Warning: Resources exceed limits
Warning: Duration exceeds deadline

8. Optimize the Schedule



Optimize Schedule...

Quick Heuristic Solution

Activating the schedule optimization, the quick solution was able to find a schedule that meets the deadline (10 days) and uses 3 L5 resources (same as daily limit). Project cost is only \$39,450. The resulting schedule (below) selects the proper work methods (estimates) and some start delays to satisfy our objectives with minimum cost.

Cost = \$39,450		Views:		Early Bar Chart (No User Inputs)																						
Dur. (days) = 9.0		Activity Options																								
Activity ID	Description	Activity Duration	Activity Cost x\$1,000	P1	P2	P3	Start Delay	Change Allowed	Method Used	Cost Adjust. (%)	1	2	3	4	5	6	7	8	9							
1	Site Preparation	2	\$7.0					Yes	2		50%	50%														
2	Trench 1 Excavat	2	\$10.0	1			2	Yes	3						50%	50%										
3	Trench 2 Excavat	2	\$7.0	1				Yes	3				50%	50%												
4	Lay Pipe 1 & Bac	1	\$7.0	2			2	Yes	3																100%	
5	Lay Pipe 2 & Bac	2	\$9.0	3			2	Yes	3													50%	50%			

Decisions made by the optimization.

We can also try to improve the schedule further by selecting:

Optimization (Longer time)

50 Cycles

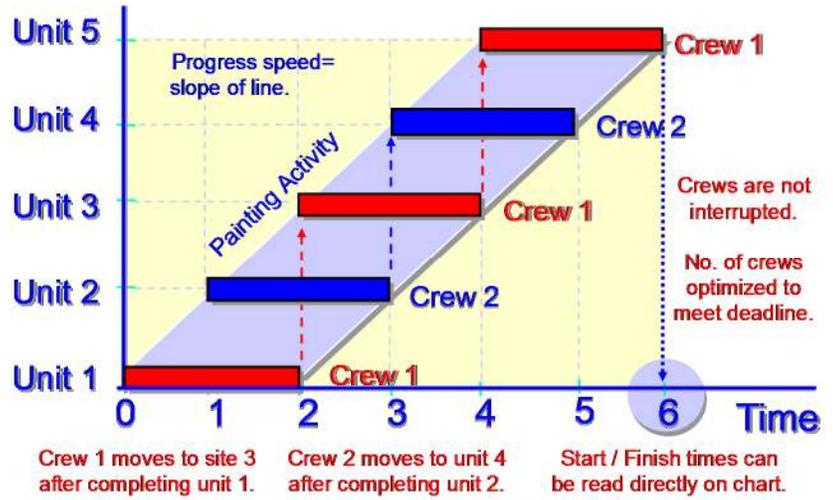
But for this project, no better solution was obtained.

This schedule is the solution to Part A of this project. Now it is time to save your file. You can also save the schedule as a baseline, then add actual progress to update the schedule, as done in the next project.

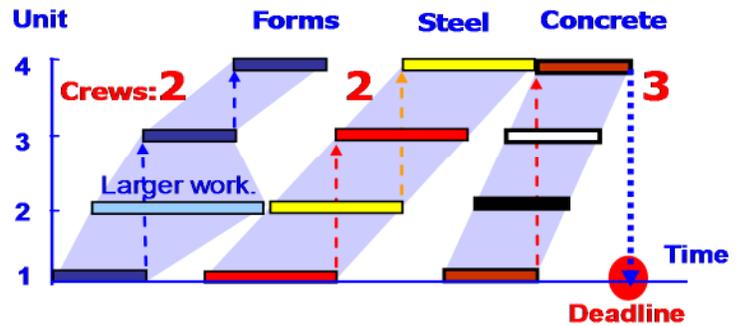
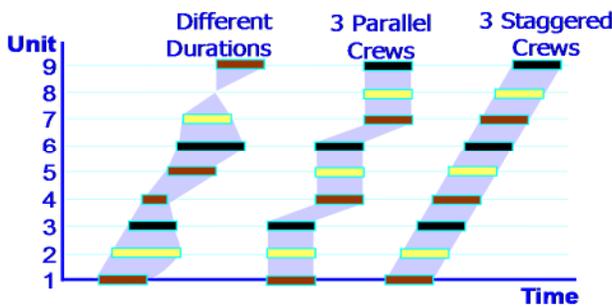
Part B: Repetitive Schedule

Background: EasyPlan has made repetitive scheduling simple and straightforward. It helps you determine the necessary crews and their detailed work assignment that to meet deadlines in the cheapest manner. It schedules crews to work continuously without interruption, to develop a learning momentum.

One example of a repetitive schedule is shown here of two crews working in one activity (e.g., painting) along five units. Crews are color-coded. Notice the vertical axis is the unit number.



Other figures of repetitive schedules are shown below with various ways to schedule crews.



- To work on part B of this project Use **File – Save As** to rename the project to a new name of your choice.
- Then, let's go to the schedule **SCHEDULE Details** and clear all the start delays and set all activities to use the cheapest option. The schedule will be the one in step 7.
- This is the cheapest schedule for a single unit. We are ready now for repetitive scheduling of the 10 units.
- Don't worry that the schedule has resource issues. We are not concerned with individual units in this case.
- We now activate repetitive scheduling: **Repetitive Scheduling** and you will see the repetitive scheduling form as follows:
-

Repetitive Units.

Navigation to each activity.

Repetitive-Activities | Conditional-Methods |
Overall Repetitive Units: Deadline: Days

Site Preparation (1/5)

<< Previous Next >> From Unit: to Unit:

Standard Units:	Duration (days)	Cost (\$)	Max. Crews	Selected Method:
Method1:	4	5000	4	<input checked="" type="radio"/> 1
Method2:	2	7000	4	<input type="radio"/> 2
Method3:	0	0	0	<input type="radio"/> 3

Special Units:

Unit No. 2: is % of a standard unit.

Note: In EasyPlan, you cannot enter actual progress data for a repetitive schedule. To overcome this, export your repetitive schedule to a MS Project file, then, import that file to a new EasyPlan project.

Cancel
Proceed

Overall Deadline.

"Site Preparation" is not needed in the first and last units. We set it from unit 2 to unit 9.

3 estimates for standard units and maximum available crews set to 4

If any of the units is not standard, you can set its duration & cost here

- After selecting each activity one-by-one and setting its crew limit, we are ready to proceed.
- The resulting schedule is shown below. Notice the project is 20 days with a total cost of \$251,000.

Data related to the activity selected at the cursor.

Project Duration (d): 20
Total Cost (\$): \$251,000

Selected Task: Site Preparation \$ of unit: \$5,000 \$ of all units: \$40,000
Crews: 4 Method: 1 Start: 5 Finish: 8 Duration: 4

Project Start: 5-Jan-16 Path: 2/2 Cursor Time: 5

Deadline (18 days) is not met...Try Optimization.

Note: To enter actual progress, export a MS Project file and

Note: This version does not allow you to enter actual progress for a repetitive project. To overcome this, export your repetitive schedule to a MS Project file, then, re-import it into EasyPlan.

Various options to organize the crews and manually improve the schedule

Save & Re-Load a desired solution

Various detailed reports.

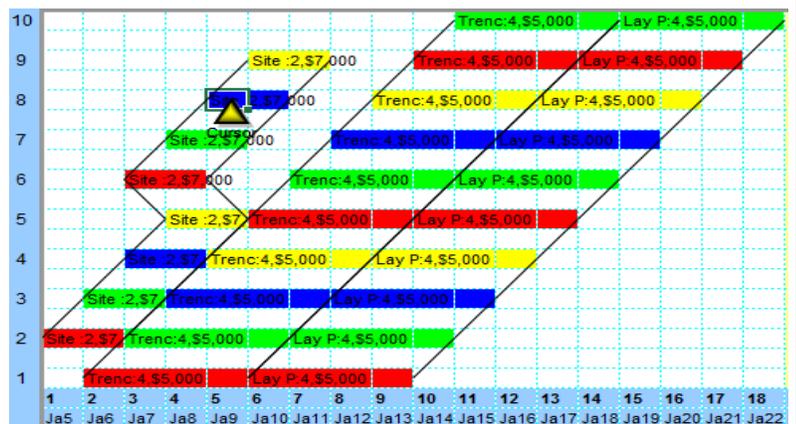
- Notice the crews are arranged in a parallel manner. We can try other arrangements or manually change the number of crews to see the impact on the project duration and cost.

- For example, if we select the **first activity** and then select the **Method** button to change the method used from 1 (cheap and slow) to 2 (faster and more expensive). Accordingly, we will find that the schedule is reduced from 20 days to **18 days, which meets the deadline**, but the total cost changes to **\$256,900**. The schedule looks as follows:

- It is also possible to optimize the schedule, or change the crew arrangement (as shown), from the options on the left side. After the optimization, various reports can be generated to communicate the final plan to site personnel.

This schedule is the solution to Part B of this project.

Next project will show even more features of EasyPlan.



Case 2: House Project

In a small installation project for a mobile home with a garage, the contract information is as follows:

- Project start date is Jan. 5, 2016 and deadline is 14 days.
- Penalty for late completion = \$5,000/day, incentive for early completion = \$1000/day.
- A reporting period is 3 days and interest rate is 1% per period.
- Owner makes a 5% retention (holdback) of each invoice, which are payable with last payment.

Contractor's Initial Planning

The contractor's team studied the drawings, specifications, and other contract documents, then did some planning tasks that resulted in dividing the project into 12 work packages (activities). Optional estimates per activity were identified as shown in the following table. Activity relationships are also shown. Some other identified information is as follows:

- Each activity uses 2 labors (L5) daily. The limit available of the L5 resources is 4 per day.
- Your Markup is 10% and Indirect cost = \$300/day.

Activity	Description	Depends on	Estimate no. 1 (Cheap)		Estimate no. 2 (Moderate)		Estimate no. 3 (Expensive)	
			Dur. (d)	Cost (\$)	Dur. (d)	Cost (\$)	Dur. (d)	Cost (\$)
1	Excavation	---	2	2,000	1	3,000	--	---
2	Foundation	1	2	2,000	1	3,000	--	---
3	Joining Wall	2	1	1,000	--	---	--	---
4	House Walls	3	4	4,000	3	3,000	2	5,000
5	House Roof	4	3	3,000	2	5,000	--	---
6	Select Finishes	---	1	1,000	--	---	--	---
7	Interior Finishes	5, 6	3	3,000	2	4,000	--	---
8	Clean Up	7, 12	1	1,000	--	---	--	---
9	Fab. Garage Doors	---	6	6,000	4	10,000	2	12,000
10	Garage Walls	3	3	3,000	2	5,000	--	---
11	Garage Roof	10	2	2,000	1	3,000	--	---
12	Garage Doors	9, 11	2	2,000	--	---	--	---

Requirements:

Part A: Enter the project data into EasyPlan. If seasonal productivity factors are: Winter (70%), Fall (90%), and Spring (100%) for the "Excavation" and "Foundation" works, what is the effect of starting the project in Jan. 5, 2016, or July 1, 2016 or Oct. 1, 2016.

Put the seasonal productivity factors back to 1.0 for all activities and the project start date to Jan. 5, 2016, then determine the optimum execution plan that meets both the **deadline and resource limits**. Save the baseline plan.

Part B: During actual progress, the following events occurred during **the first 8 days** of the project:

- **Day 1:** excavation progressed as planned and no other work was done.
- **Day 2:** the contractor encountered unexpected rock (an owner-related problem). Accordingly, Excavation was stopped until a new machine is procured. No other work was done on day 2.
- **Days 3 and 4:** the new excavation equipment did not arrive yet. No other work was done.
- **Day 5:** the new excavation equipment started working and all remaining excavation work was completed that day. No other work done.
- **Days 6 and 7:** Foundation work was started and completed.
- **Day 8:** work on the Joining Wall was started and completed.
- Actual costs until day 8 are assumed to be \$5,000 for each of the started activities.

What is the expected project duration and cost in light of these events? And, What is your optimum corrective action plan?

Part C: Multiple Homes

Your company wants to bid on a project to install 15 mobile homes and meet a deadline of 30 days.

C.1) Use EasyPlan to propose a cost-effective schedule and a bid proposal that satisfies the following project constraints:

- Tentative project start date is July 1, 2016;
- Indirect costs = \$500/day; Penalty = \$10,000/day; and Bonus = \$5,000/day;
- Markup = 5%; Retainage (owner's hold back) = 10%;
- Reporting period is every 3 days; and Interest / period = 1%.
- Seasonal productivity factors for all activities = 1.0;
- No "Excavation" is needed for the first two and the last two homes;
- The "Select Interior Finishes" and "Fabrication of Garage Doors" are not repetitive activities;
- Only one supplier is able to do all the "Fabrication of Garage Doors" for the 15 homes in 20 days for \$150,000.
- "House Walls" for homes 3, 4, and 8 will require 50% of the time and cost of a typical house. Also, "House Roof" for the last two homes will require double the time and cost of typical homes;
- To improve maneuverability, "Install Interior Finishes" will begin at the last home, and will proceed until the first one. However, if this option delays the schedule, just proceed from unit 1 to 15;
- You have only four crews for the "Install Interior Finishes" work; and
- The two activities "House Roof" and "Garage Roof" will use the same method for both activities (either Method 1 or Method 2). Also, you have a maximum of four roofing crews.

C.2) You need also decide which one of the following three options offered by the owner is best for your project:

- A lower interest rate of 0.5% per period;
- A suppliers' credit of 40%; or
- A 15% down payment.

Hint: EasyPlan does not offer a bid report or a cash flow chart for repetitive schedules. To circumvent that, export your best repetitive schedule into a MS Project file and then re-import that file to a new EasyPlan file. Then, experiment with the three cash flow options above.

C.3) Print your schedule and your cash flow curve.

Step-By-Step Solution

Part A: 1. Prepare Project Data

Before using EasyPlan, you need the following data:

- Project work packages (activities);
- Logical order of executing the activities (which comes first, which follows, etc.);
- Available resources such as equipment, crews, and materials;
- Work quantities, suppliers' quotes, etc.; and
- Contract provisions such as deadline, payment frequency, etc.

2. Start EasyPlan

Activate EasyPlan. Click on the middle figure to proceed.

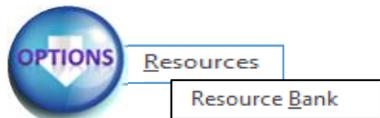
3. Rename Your Project

Use **File – Save As** to rename the project to a new name of your choice.



4. Specify Your Resources

Let's now specify that we have a key labour resource (code L5). To access the labour sheet, Activate the **Resource Bank** as follows:



Then, click on the picture of the labour to view the labour sheet.



In the Labour sheet, add a new labour category. Then, change the data of the new category to **L5**. Notice that all labour codes start with letter **L**. Once done, return to the **Main Screen** and **hide** the **Resource Bank**.



Code	Description	Rate/hr	Basic Rate/hr
L1	Imported Labour	\$23.7	\$15.0
L2	Labour2	\$39.5	\$25.0
L3	Asbestos_Foreman	\$46.6	\$29.5
L5	Example Worker	\$39.5	\$25.0

5. Enter General Information

In the **"Main Screen"**, enter the data and constraints:

- Start date and Working days;
- Three key resource categories and their limit;
- Project deadline duration;
- Penalty & incentive amounts; and
- Other contract provisions as shown.

Project Information			
Three Key Resources			Start Date: 5-Jan-16
Code:	Limit:	Used:	Deadline (Days): 14
L5	4.0	4.0	Penalty (\$/d): 5,000
			Incentive (\$/d): 1,000
			Indirect (\$/d): 300
			Report Every (d): 3
			i / Period (%): 1.00
			Markup (%): 10.00
			Hold Back (%): 5.0
			Down Payment (%):
			Suppliers credit (%):
Workdays: SA <input checked="" type="checkbox"/> FR			

6. Specify the Activities



Activities and ESTIMATES

Make sure to select the **Direct User-Input of cost, duration & resources** option because the costs and durations are given to us.

Select any activity and use **Add Activity below current** to add new activities so the total becomes 12 for our project.

Notice the resource needs (**2 L5 for each activity**) can be specified here. Also you can change the seasonal productivity factors. Start entering the estimates' data in the white cells. Notice that the estimates are arranged as **Cheap, Moderate, and Expensive**.

Once done, the screen will look like this:

Note:

You can use the **More>** button to enter other activity data such as work quantity, the supervisor's name, and whether it is civil, electrical, mechanical or any work category or project area

Activities & 3 Estimates														Productivity (0-1)				
<input type="button" value="Add Activity below current"/> <input type="button" value="Delete Current Activity"/> <input type="checkbox"/> Estimates based on quantity and crew rates <input checked="" type="checkbox"/> Direct User-Input of cost, duration & resources																		
You may add few extra activities to avoid changes later. Do Not use Copy-Paste.																		
More>	Cheap Estimate					Moderate Estimate					Expensive Estimate							
Activity	Description	Cost1	Dur1	L5		Cost2	Dur2	L5		Cost3	Dur3	L5		Winter	Spring	Fall		
1	Excavation	\$2,000	2.0	2.0		\$3,000	1.0	2.0						1.00	1.00	1.00		
2	Foundation	\$2,000	2.0	2.0		\$3,000	1.0	2.0						1.00	1.00	1.00		
3	Joining Wall	\$1,000	1.0	2.0										1.00	1.00	1.00		
4	House Walls	\$4,000	4.0	2.0		\$3,000	3.0	2.0		\$5,000	2.0	2.0		1.00	1.00	1.00		
5	House Roof	\$3,000	3.0	2.0		\$5,000	2.0	2.0						1.00	1.00	1.00		
6	Select Finishes	\$1,000	1.0	2.0										1.00	1.00	1.00		
7	Interior Finishes	\$3,000	3.0	2.0		\$4,000	2.0	2.0						1.00	1.00	1.00		
8	Clean Up	\$1,000	1.0	2.0										1.00	1.00	1.00		
9	Fab. Garage Doors	\$6,000	6.0	2.0		\$10,000	4.0	2.0		\$12,000	2.0	2.0		1.00	1.00	1.00		
10	Garage Walls	\$3,000	3.0	2.0		\$5,000	2.0	2.0						1.00	1.00	1.00		
11	Garage Roof	\$2,000	2.0	2.0		\$3,000	1.0	2.0						1.00	1.00	1.00		
12	Garage Doors	\$2,000	2.0	2.0										1.00	1.00	1.00		

Productivity factors

7. Specify Work Sequence & Schedule Details



SCHEDULE Details

Select which estimate (1, 2, Or 3) here.

Schedule											Early Bar Chart (No User Inputs)					
Total Cost = \$44,800 Duration (days) = 16.0 Views: (12 Activities) Activity Options -											5-1-16	6-1-16	7-1-16	8-1-16	9-1-16	10-1-16
Activity ID	Description	Activity Duration	Activity Cost x\$1,000	P1	P2	P3	Start Delay	Change Allowed	Method Used	Cost Adjust. (%)	1	2	3	4	5	6
1	Excavation	2	\$2.0					Yes	1		50%	50%				
2	Foundation	2	\$2.0	1				Yes	1				50%	50%		
3	Joining Wall	1	\$1.0	2				Yes	1						100%	
4	House Walls	4	\$4.0	3				Yes	1							25%
5	House Roof	3	\$3.0	4				Yes	1							
6	Select Finishes	1	\$1.0					Yes	1		100%					
7	Interior Finishes	3	\$3.0	5	6			Yes	1							
8	Clean Up	1	\$1.0	7	12			Yes	1							
9	Fab. Garage Doo	6	\$6.0					Yes	1		17%	17%	17%	17%	17%	17%
10	Garage Walls	3	\$3.0	3				Yes	1							33%
11	Garage Roof	2	\$2.0	10				Yes	1							
12	Garage Doors	2	\$2.0	9	11			Yes	1							

We enter up to three predecessors for each activity.

If we delay the start of any activity, we avoid having all activities running in parallel, thus using many resources.

After entering the logical relations as above, we set each activity to use the cheapest estimate (1). Accordingly, the project becomes 16 days (**2 days beyond deadline**). Because of the penalty, total cost becomes **\$44,800** as shown at the top of the schedule. In the Main Screen, we notice we **have two warnings**: Deadline is exceeded, and We use six of the L5 resource (two more than available).

Main Screen		
Three Key Resources		
Code:	Limit:	Used:
L5	4.0	6.0

Warning: Resources exceed limits
Warning: Duration exceeds deadline

Part A: To examine In the effect of productivity factors, go to the Activities and Estimates [Activities and ESTIMATES](#), change the productivity factors for the excavation and foundation as shown, then go to the main screen

More>		Winter	Spring	Fall
Activity	Description			
1	Excavation	0.70	1.00	0.90
2	Foundation	0.70	1.00	0.90

[Main Screen](#). You will notice the project duration became 18 days and cost became \$57,114. Now change the project start date to Oct. 1, 2016 and then to July 1, 2016. The results are shown in the following table.

Start	Jan. 5	July 1	Oct. 1
Duration	18	16	18
Cost	\$57,114	\$44,800	\$55,840

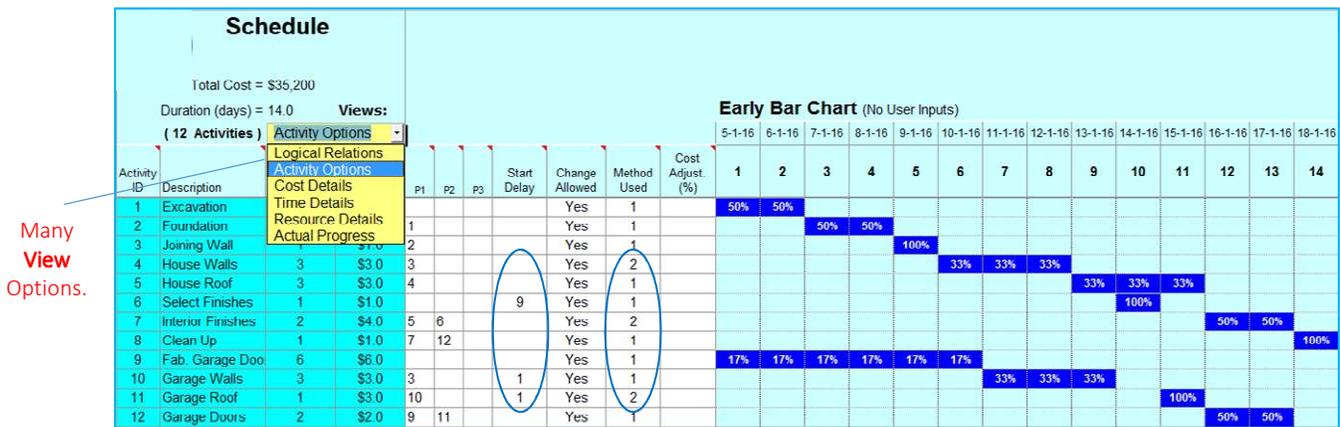
Once done, let's put the productivity factors back to 1.0 for all activities and the project start date to Jan. 5, 2016.

8. Optimize the Schedule

[Optimize Schedule...](#)

Quick Heuristic Solution

Activating the schedule optimization, the quick solution was able to find a schedule that **meets the deadline (14 days)** and uses 4 L5 resources (same as daily limit). Project cost is only **\$35,200**. The resulting schedule (below) selects the proper work methods (estimates) and some start delays that satisfy our objectives with minimum cost.



Decisions made by the optimization.

We can also try to improve the schedule further by selecting: [Optimize Schedule...](#)

Optimization (Longer time) 50 Cycles

Part B: 9. Save the Baseline

Once the satisfactory schedule is obtained, we now save it as our project Baseline: 14 days and \$35,200.

[Baseline Save / Update...](#)

[Update Baseline on 2016-01-05](#)

[Done](#)

This schedule is the solution to Part A of this project.

Part B: 10. Record Progress

To answer **Part B**, we need to enter the given actual progress data for the first 8 days. We select the following options:

[Actual Progress vs Baseline](#)

Remaining
 Plan

Remaining Work:
100% Baseline speed
+ Actual speed
Weight (0 to 1)

Now, we continue entering data using the entry options discussed in page 7, until day 8. Easiest way is to enter the daily information using the [Enter Daily Progress](#) button. Accordingly, the resulting schedule is shown below with duration extended to **17 days**.

Actual progress is recorded as a daily %. Also, reasons for delays are shown as comments on the cells.

Clear All Progress		Enter Daily Progress		Views:																		
(12 Activities)		Actual Progress																				
Activity ID	Description	Activity Duration	Activity Cost x\$1,000	5-1-16	6-1-16	7-1-16	8-1-16	9-1-16	10-1-16	11-1-16	12-1-16	13-1-16	14-1-16	15-1-16	16-1-16	17-1-16	18-1-16	19-1-16	20-1-16	21-1-16		
1	Excavation	5	\$5.0	50%	50%			50%														
2	Foundation	2	\$5.0	50%	0	0	0	50%														
3	Joining Wall	1	\$5.0			50%	50%		50%	50%												
4	House Walls	2	\$5.0					100%			100%											
5	House Roof	2	\$5.0						33%	33%	33%											
6	Select Finishes	1	\$1.0									33%	33%	33%								
7	Interior Finishes	2	\$4.0									100%	100%									
8	Clean Up	1	\$1.0												50%	50%						
9	Fab. Garage Doors	10	\$6.0	17%	17%	17%	17%	17%	17%										50%	50%		
10	Garage Walls	2	\$3.0	C	C	C	C	C	C	C	C	17%	17%	17%	17%	17%	17%					
11	Garage Roof	1	\$3.0							33%	33%	33%										
12	Garage Doors	2	\$2.0												50%	50%						

Notice the powerful visual representation of EasyPlan that shows all the evolution of work. This is not existent in any other commercial software.

The project is now 3 days longer than deadline. In the Main Screen, you will notice the project duration is now 17 days and total cost is \$61,100. The project also is expected to require more than the available L5 resources. This is compared to the baseline of 14 days and \$35,200. The high cost is due to the high penalty for exceeding the deadline.

Main Screen

Three Key Resources		
Code:	Limit:	Used:
L5	4.0	8.0

Actual/Planned % = 16%/52% Project Cost = \$61,100
 Project End Date: 21-Jan-16 Duration (days) = 17.0

Warning: Resources exceed limits!..You need to optimize the schedule.
Warning: Duration exceeds deadline!..You need to optimize the schedule.

We now need to **re-optimize the schedule** to reduce cost, try to reduce project duration, and avoid resource over-allocation.

Optimize Schedule... Quick Heuristic Solution Proceed

Accordingly, the best we could do is to adjust the schedule (as shown below) so the project becomes 16 days with a total cost of \$67,800. This schedule does not exceed the resource limit. If we need to meet the strict 14-day deadline, we may change the estimates of some activities to reflect more productive work options. Then, we re-optimize the project using these better options.

Total Cost = \$67,800				Views:																					
Duration (days) = 16.0				(12 Activities) Activity Options																					
Activity ID	Description	Activity Duration	Activity Cost x\$1,000	P1	P2	P3	Start Delay	Change Allowed	Method Used	5-1-16	6-1-16	7-1-16	8-1-16	9-1-16	10-1-16	11-1-16	12-1-16	13-1-16	14-1-16	15-1-16	16-1-16	17-1-16	18-1-16	19-1-16	20-1-16
1	Excavation	5	\$5.0					Yes	2	50%	0	0	0	50%											
2	Foundation	2	\$5.0	1				Yes	2					50%	50%										
3	Joining Wall	1	\$5.0	2				Yes	1							100%									
4	House Walls	2	\$5.0	3				Yes	3									50%	50%						
5	House Roof	2	\$5.0	4				Yes	2											50%	50%				
6	Select Finishes	1	\$1.0	5			12	Yes	1													100%			
7	Interior Finishes	2	\$4.0	5	6			Yes	2														50%	50%	
8	Clean Up	1	\$1.0	7	12			Yes	1																100%
9	Fab. Garage Doo	10	\$12.0					Yes	3	C	C	C	C	C	C	C	C	50%	50%						
10	Garage Walls	2	\$5.0	3				Yes	2											50%	50%				
11	Garage Roof	1	\$3.0	10				Yes	2													100%			
12	Garage Doors	2	\$2.0	9	11			Yes	1														50%	50%	

Delay Analysis Windows Analysis

To identify the responsibility for the project delay, Let's analyze this schedule using the unique delay analysis feature of EasyPlan. You will see from the results below that the owner's interruptions were a major cause for the project delay. This gives solid ground for requesting time extension and relief from penalty payments. The delay analysis is a unique features of EasyPlan.

Windows Analysis

Project As-Built Duration (days) = 16.0
 Project Baseline Duration (days) = 14.0
 Compensable Owner delays (O) = 3.00, Owner Acceleration = 0.00.
 Contractor nonexcusable delays (C) = 1.00, Contractor Acceleration = 4.00.
 Excusable other party delays (N) = 0.00.

OK

Now it's time to save your file.

Part C: Repetitive Schedule

- Use **File – Save As** to rename the project to a new name of your choice.
- Because repetitive scheduling feature of EasyPlan is limited in this version to project planning before actual progress is entered, we need to clear the current progress. **Actual Progress vs Baseline** **Clear All Progress**
- Then, let's go to the schedule **SCHEDULE Details** and clear all the start delays and set all activities to use the cheapest option. The schedule will look as that in step 7, which is the cheapest schedule for a single home. We are now ready for repetitive scheduling of the 15 homes.
- Don't worry that the schedule has resource issues. We are not concerned with individual homes (units) in this case.

- In the Main Screen **Main Screen**, enter General Information:
- Start date and Working days; Penalty & incentive amounts; and other contract provisions as shown.

Three Key Resources			Start Date: 5-Jan-16	
Code:	Limit:	Used:	Deadline (Days):	30
			Penalty (\$/d):	10,000
			Incentive (\$/d):	5,000
			Indirect (\$/d):	500
			Report Every (d):	3
			i / Period (%):	1.00
			Markup (%):	10.00
			Hold Back (%):	5.0
			Down Payment (%):	
			Suppliers credit (%):	

Workdays: SA FR

- In the Activities and Estimates **Activities and ESTIMATES**, change the fabrication of garage doors to one estimate for \$150,000 and 20 days.
Notice that we enter the data of one unit only not to all the 15.

More>		Cheap Estimate				Moderate Estimate			
Activity	Description	Cost1	Dur1			Cost2	Dur2		
9	Fab. Garage Doors	\$150,000	20.0						

- We now activate repetitive scheduling: **Repetitive Scheduling** and you will see the repetitive scheduling form as follows:

Repetitive Data

Repetitive-Activities | Conditional-Methods

Overall Repetitive Units: 15 Deadline: 30 Days

Excavation (1/12)

<< Previous Next >> From Unit: 3 to Unit: 13

Standard Units:	Duration (days)	Cost (\$)	Max. Crews	Selected Method:
Method1:	2	2000	0	<input checked="" type="radio"/> 1
Method2:	1	3000	0	<input type="radio"/> 2
Method3:	0	0	0	<input type="radio"/> 3

Special Units:

Unit No. 3: is 100 % of a standard unit.

Note: In EasyPlan, you cannot enter actual progress data for a repetitive schedule. To overcome this, export your repetitive schedule to a MS Project file, then, import that file to a new EasyPlan project.

Cancel Proceed

Repetitive Units.

Overall Deadline.

Navigation to each activity.

Setup of special units for this activity.

- We now start entering all the constraints;
- Because "Excavation" is not needed in the first 2 units and the last 2 units, we set it from unit 3 to unit 13, as circled above;

- Because the "Select Finishes" and "Fabrication of Garage Doors" are not repetitive activities, we set them from unit 1 to unit 1 (i.e., in one unit only, not in all the 15), as follows:

Fab. Garage Doors (9/12)

<< Previous Next >>

From Unit: 1 to Unit: 1

Select Finishes (6/12)

<< Previous Next >>

From Unit: 1 to Unit: 1

- Because the "House Walls" for homes 3, 4, and 8 will require 50% more time and cost of typical house, we set it as follows:

House Walls (4/12)

<< Previous Next >>

From Unit: 1 to Unit: 15

Special Units:

Unit No. 3: is 50 % of a standard unit.

Unit No. 4: is 50 % of a standard unit.

Unit No. 8: is 50 % of a standard unit.

- Because "House Roof" for the last two homes (14 and 15) require double the time and cost, we do it as follows:

House Roof (5/12)

<< Previous Next >>

From Unit: 1 to Unit: 15

Unit No. 14: is 200 % of a standard unit.

Unit No. 15: is 200 % of a standard unit.

- Because the "Install Interior Finishes" will begin at the last home, and will proceed until the first one, we set it from unit 15 to unit 1, and we put a limit of four crews for this activity, as follows:

Interior Finishes (7/12)

<< Previous Next >> From Unit: 15 to Unit: 1

Standard Units:

	Duration (days)	Cost (\$)	Max. Crews	Zero means no limit.	Selected Method:
Method1:	3	3000	4	<input checked="" type="radio"/>	1
Method2:	2	4000	4	<input type="radio"/>	2

- The two activities "House Roof" and "Garage Roof" will use the same method for both activities (either Method 1 or Method 2). We specify two rules for that. Also, we add the max. of four crews for the house roof and the garage roof activities:

Repetitive-Activities Conditional-Methods

Rule:

If activity: **House Roof** uses

method 1 2 3 :i.e.,

THEN

activity: **Garage Roof** will use

method 1 2 3 :i.e.,

Add This New Rule

Repetitive-Activities Conditional-Methods

Rule:

If activity: **House Roof** uses

method 1 2 3 :i.e.,

THEN

activity: **Garage Roof** will use

method 1 2 3 :i.e.,

Add This New Rule

House Roof (5/12)

<< Previous Next >>

From Unit: 1 to Unit: 15

Standard Units:

	Duration (days)	Cost (\$)	Max. Crews	Zero means no limit.	Selected Method:
Method1:	3	3000	4	<input checked="" type="radio"/>	1
Method2:	2	5000	4	<input type="radio"/>	2

Garage Roof (11/12)

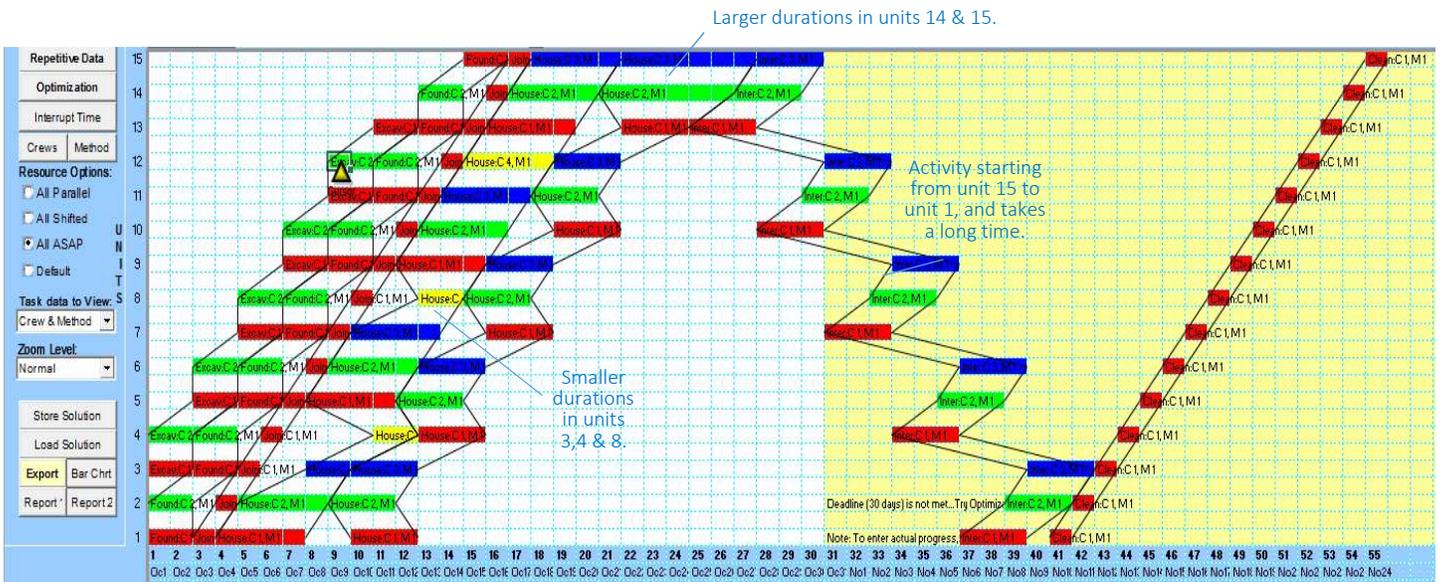
<< Previous Next >>

From Unit: 1 to Unit: 15

Standard Units:

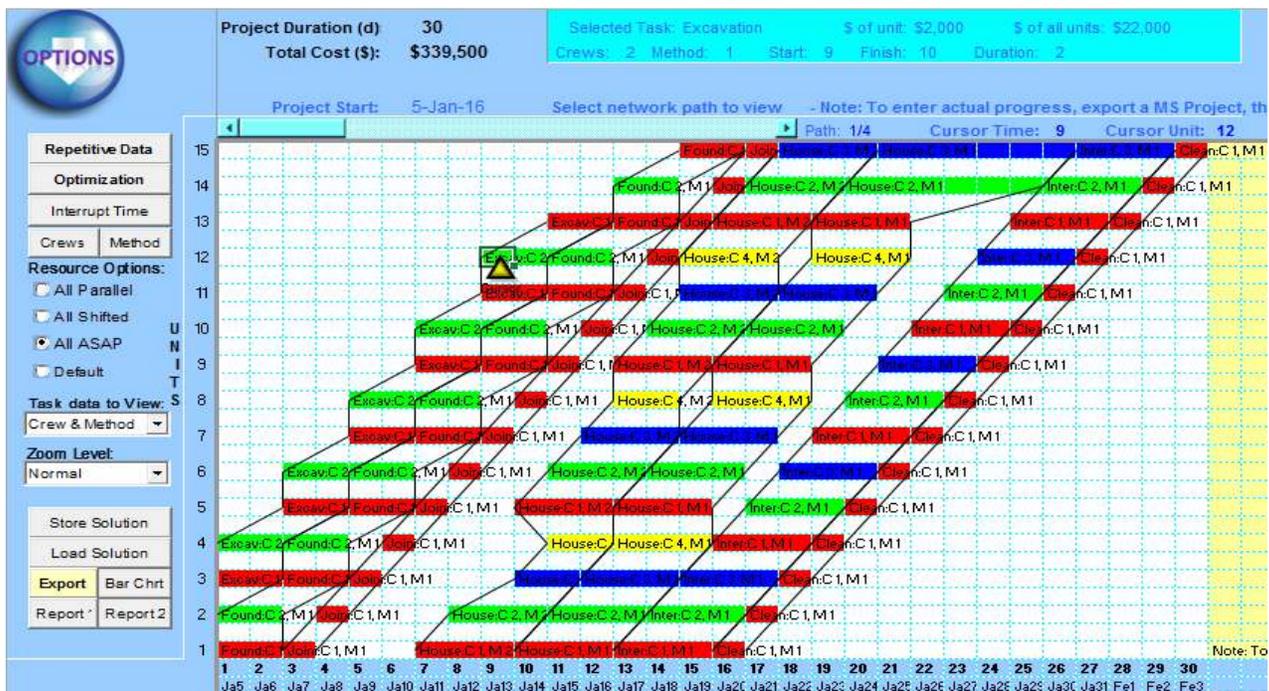
	Duration (days)	Cost (\$)	Max. Crews	Zero means no limit.	Selected Method:
Method1:	2	2000	4	<input checked="" type="radio"/>	1
Method2:	1	3000	4	<input type="radio"/>	2

- We are ready to view a schedule that meets all constraints. But wow, its 55 days, not 30 and the cost is \$485,500. It seems that starting the finishes from the top unit takes too much time. We need to tweak the schedule to our needs.



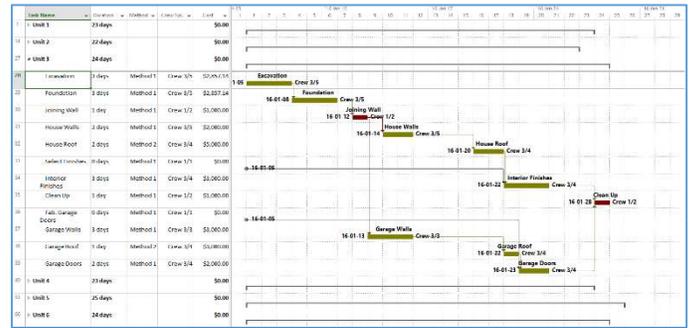
- First, we set the Interior finishes from unit 1 to 15, then we activate the repetitive schedule optimization option.

- After selecting the options in the following form, a schedule of 30 days and \$339,500 is obtained.



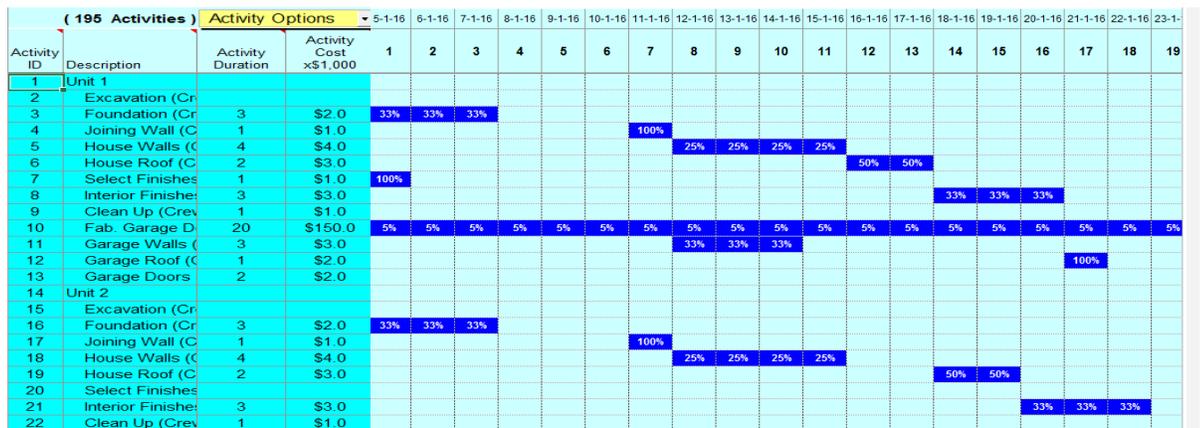
Optimum schedule.

- Because we are now satisfied with the repetitive schedule.
- let's export it to MS Project using the **Export** button. we get a file as shown, with all the 15 units and their activities. Notice the method column and the crew column. Save this MS Project file.

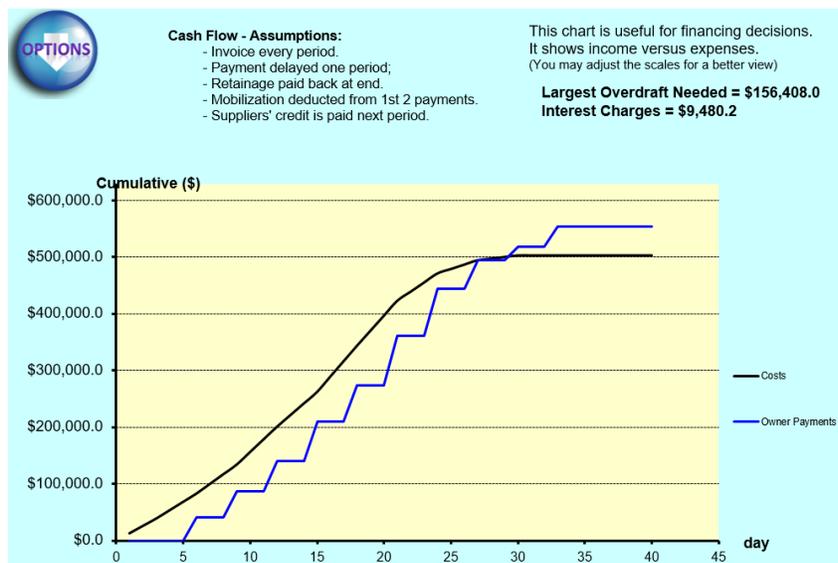


- Because EasyPlan does not allow progress updates or delay analysis for repetitive schedules, we can import the saved MS Project file, which will bring the file as a single project (not repetitive), to allow us to use progress-tracking features.

- In the Main Screen **Main Screen**, select **Utilities** then **Import from MS Project File** and select the saved MS project file. We get a message that 195 activities have been imported. In the schedule view, you will see all the activities of all units:



- Now, we can save this schedule as a baseline (as we did in part A) and then enter the actual progress against this baseline. We can also look at the various reports and charts, including a cash flow chart of all the 15 units or a full bid proposal report, as shown below.



EasyPlan Utilities

Indirect Cost Estimation

In the Main Screen, select the yellow button:

Indirect (\$/d): 500

Indirect Cot Estimation

Variable: > **WAGES AND SALARIES:** \$0 \$ / Day

Fixed:

- > **OFFICE EXPENSES:** \$0
- > **SITE INSTALLATIONS:** \$0
- > **OPERATION OF SITE INSTALLATIONS:** \$0
- > **OTHER:** \$541

Total Fixed Indirects: \$541 \$

Many indirect cost categories.

Competitor Analysis and Markup Estimation

Bid Analysis Program

Add / Delete Historical Bids

Analyse a New Bid

After adding historical bids & analyzing competitors' bids, simply by selecting the bidders, a winning markup is suggested.

Note: Make sure Excel's "AnalysisPack" Add-in is selected.

a) Enter Cost Estimate and Type:

Cost Estimate: \$1,500,000

Project Type: Building

Consider all competitors' past bids on similar projects.

Only past bids within \pm 20 % of estimate.

Results

Pessimistic Markup= 10.00 %

Optimistic Markup= 11.20 %

b) Select competitors:

- Competitor 1 Company A
- Competitor 2 Company B
- Competitor 3 Company C
- Competitor 4
- Competitor 5
- Competitor 6
- Competitor 7
- Competitor 8
- Competitor 9
- Competitor 10
- Competitor 11
- Competitor 12
- Competitor 13
- Competitor 14
- Competitor 15

Total Selected Bidders:

Site Layout Optimization

SITE LAYOUT PLANNING

Menu

Follow the Menu items one-by-one.

Start Drawing the Site Here.

Initial positions of the facilities to be placed

We can draw the site and optimally position all temporary facilities.