EXERCISE
With MICROSOFT PROJECT

1. Build a GANTT Chart from the WBS (list of tasks) and display the Critical Path . You will define when necessary: Tasks / Phases / Milestones

   - General rules to follow :
     - Project start on Monday 03APR17
     - We have some constraints :
       - Wait 5 days between carpentry and roof → *Lag = wait time*

       - Water tightness may start 10 days before end of walls building → *Lead = Acceleration time*

       - Carpentry must start when Wall building is completed
       - Electricity and Plumbing are starting in parallel → *Start-to-start*

       - Quality controls tasks must end at the same time as the last activity of its phase → *Finish to Finish*

       - Garden can start when Shell Phase is completed

       - Days off : Monday 17APR17 / Monday 01MAY17 / Monday 08MAY17 / Thursday 25MAY17 / Monday 05JUNE17 / Friday 14JULY17 / Tuesday 15AUG17

       - One working week : 35 hours / from Monday to Friday / each day is 7h (8AM to noon / 2PM to 5PM)

Phases	Tasks	Resources	Effort People / days	Equipment / costs
House	Start	None (Milestones)	0	0
Foundations	Earthwork (terrassement)	Earth Worker	5	500
Foundations	Foundation	Foundation builder	4	2000
Foundations	Quality control #1	Expert	1	200
Shell	Walls building	Wall builder	80	10000
Shell	Water tightness (Étanchéité à l'eau)	Specialist	15	2000
Shell	Carpentry (Charpente)	Carpenter	12	3500
Shell	Roof installation	Carpenter	6	3000
Shell	Quality control #2	Expert	2	200
2nd level Shell	Plumbing	Plumber	8	3000
2nd level Shell	Electricity	Electrician	5	1500
2nd level Shell	Quality control #3	Expert	1	200
Paintings	Painting – inside	Painter	8	1000
Paintings	Painting - outside	Painter	4	200
Gardening	Garden setting	Gardener	10	4000
House	Final Control	Expert	2	1000

Resources	Quantity	Cost /hour
Carpenter	1	96
Water tightness Specialist	1	115
Electrician	1	128
Gardener	0.5	60
Earth Worker	1	150
Foundation builder	2	150
Wall builder	4	85
Plumber	1	128
Painter	1	85
Expert	1	200

Using information of Gantt and financial data, define :
- Total budget not to exceed **150000 euros**
- Total duration not to exceed **70 working days**

Comments :
- There is a 10000e penalty for any additional working days delay
- You can negotiate additional resources – only on Wall builders to minimize the risk of delay

STEPS :

1 . Define Project Start Date : Click **Project tab → Project Information →** Fill **Start Date**

2. Define Working time : Working hours and days off

        a – Working hours : **Project tab → Change Working Time → Work Weeks**
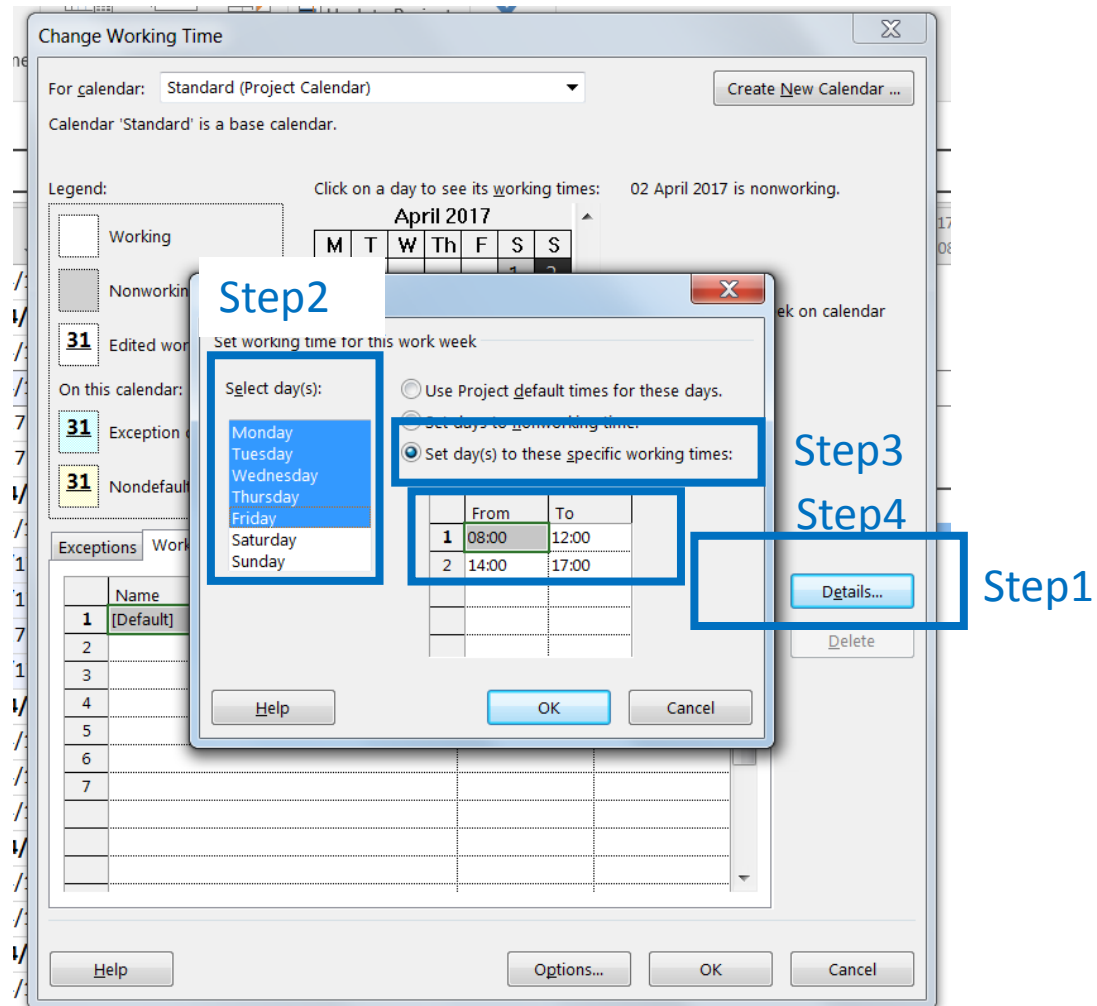
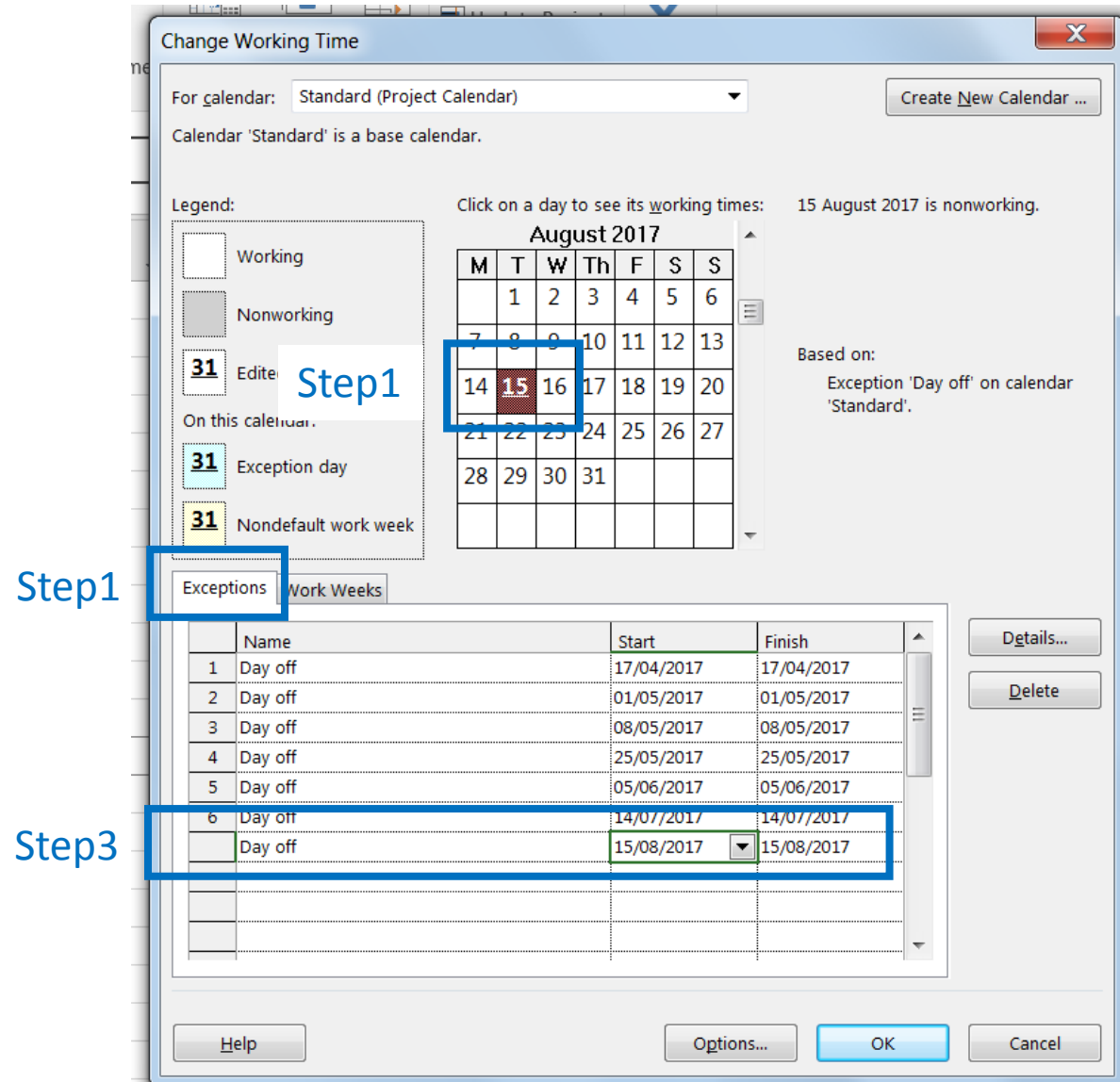2. Define Working time : Working hours and days off

a – Working hours : **Project tab → Change Working Time → Work Weeks**

Monday 17APR17
Monday 01MAY17
Monday 08MAY17
Thursday 25MAY17
Monday 05JUNE17
Friday 14JULY17
Tuesday 15AUG17

3. Define Options : *File / Options* (step1)

a – **"Display"** → Select Currency and set decimal digits=0 (Step2)

b- **"Schedule"** → Update Default start time (8:00) and Default End time (17:00) , Hours per day (7h), Hours per day (7), Hours per week (35h) , Show assignment units as a decimal, Durations entered in days, Work entered in days (Step3)

4. Define New Tasks as automatically scheduled (step1)
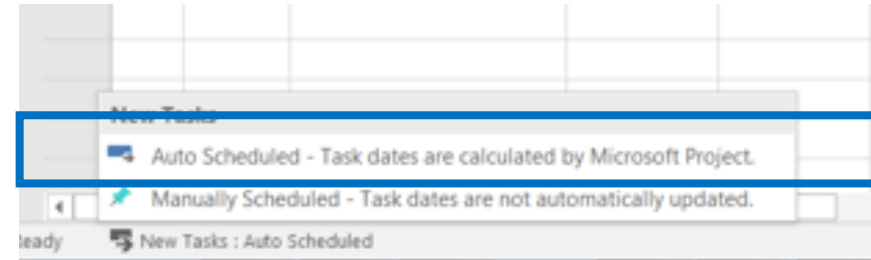
Step1

5. Define **WBS** :
      a – Start with Project Name (House Project)
      b – Define Phases
      c – Defines Tasks and Milestones

Slides#13&15

6. Define **Effort** :
      a- Decline efforts in **duration** column

Slides#15/16/17

7. Define **Tasks Dependencies**
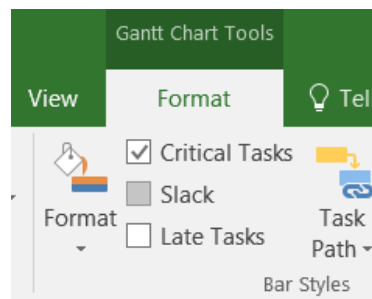
Slides#21 to 25

Except the below constraints, Tasks dependencies are defined to minimize risks and according to reasonable working conditions

      - Wait 5 days between carpentry and roof
      - Water tightness may start 10 days before end of walls building
      - Quality controls tasks must end at the same time as the last activity of its phase

8 – Display **Critical Path**

9 – Define Resources and associated costs

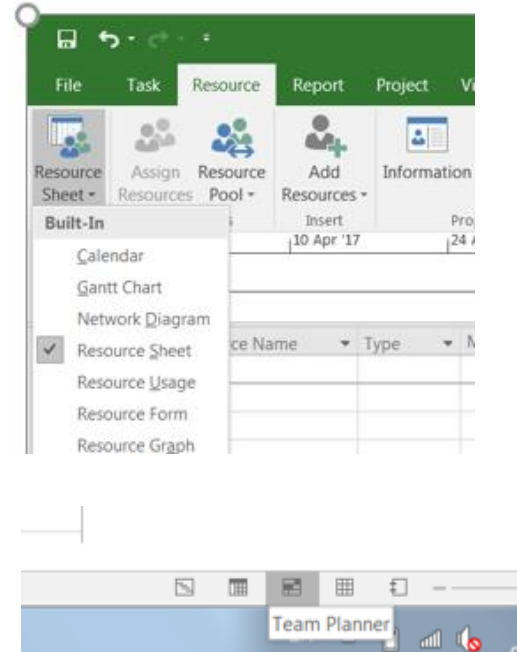| ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**House Project**	**132 days**	**Mon 03/04/1**	**Thu 12/10/1**	
2		**Foundations**	**9 days**	**Mon 03/04/1**	**Thu 13/04/1**	
3		Earthwork	5 days	Mon 03/04/1	Fri 07/04/17	
4		Foundation	4 days	Mon 10/04/1	Thu 13/04/17	3
5		Quality Control#	1 day	Thu 13/04/17	Thu 13/04/17	4FF
6		End of Foundatic	0 days	Thu 13/04/17	Thu 13/04/17	5
7		**Shell**	**103 days**	**Fri 14/04/17**	**Thu 14/09/1**	
8		Walls building	80 days	Fri 14/04/17	Fri 11/08/17	6
9		Water tightness	15 days	Mon 31/07/1	Mon 21/08/1	8FS-10 days
10		Carpentry	12 days	Mon 14/08/1	Wed 30/08/1	8
11		Roof installation	6 days	Thu 07/09/17	Thu 14/09/17	10FS+5 days
12		Quality control #	2 days	Wed 13/09/1	Thu 14/09/17	11FF
13		End of Shell	0 days	Thu 14/09/17	Thu 14/09/17	12
14		**2nd Level Shell**	**8 days**	**Fri 15/09/17**	**Tue 26/09/1**	
15		Plumbing	8 days	Fri 15/09/17	Tue 26/09/17	13
16		Electricity	5 days	Fri 15/09/17	Thu 21/09/17	15SS
17		Quality control #	1 day	Tue 26/09/17	Tue 26/09/17	15FF;16FF
18		End of 2nd Level	0 days	Tue 26/09/17	Tue 26/09/17	17
19		**Paintings**	**12 days**	**Wed 27/09/1**	**Thu 12/10/1**	
20		Painting : Inside	8 days	Wed 27/09/1	Fri 06/10/17	18
21		Painting : Outside	4 days	Mon 09/10/1	Thu 12/10/17	20
22		End of Painting	0 days	Thu 12/10/17	Thu 12/10/17	21
23		**Gardening**	**10 days**	**Fri 15/09/17**	**Thu 28/09/1**	
24		Garden setting	10 days	Fri 15/09/17	Thu 28/09/17	13
25		End of Gardening	0 days	Thu 28/09/17	Thu 28/09/17	24
26		**Final Control**	2 days	Wed 11/10/1	Thu 12/10/17	6FF;13FF;22FF;25I
27		End of the house	0 days	Thu 12/10/17	Thu 12/10/17	26
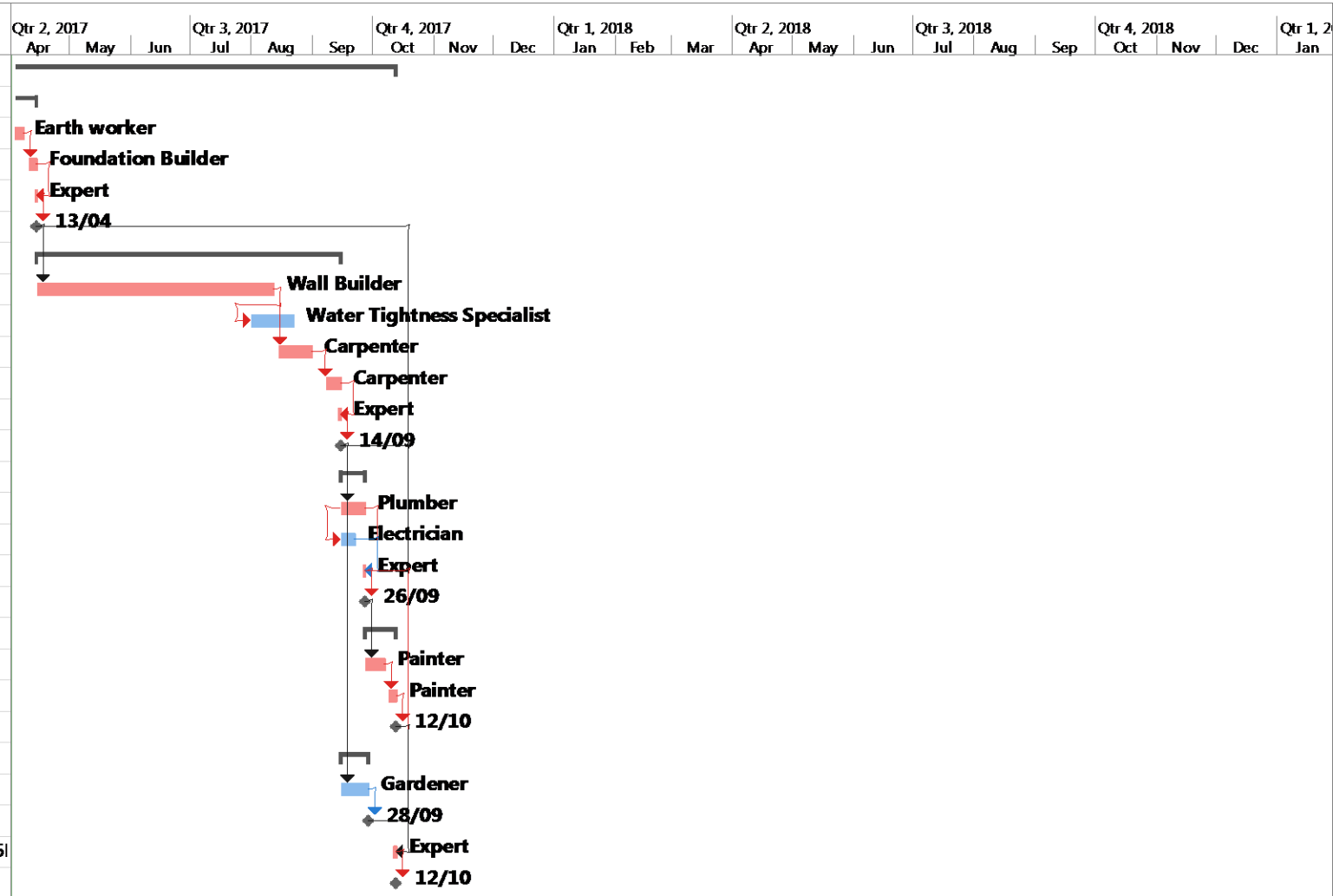
9 – Define Resources and associated costs
- either **Resources / Resource Sheet / Resource / Sheet**

- Or click on Team Planner

Resources	Quantity	Cost /hour
Carpenter	1	96
Water tightness Specialist	1	115
Electrician	1	128
Gardener	0.5	60
Earth Worker	1	150
Foundation builder	2	150
Wall builder	4	85
Plumber	1	128
Painter	1	85
Expert	1	200

	Resource Name	Type	Material Label	Initia	Group	Max. Units	Std. Rate	Ov
	Earth worker	Work		E		1	150 €/hr	
	Foundation Builder	Work		F		2	150 €/hr	
	Expert	Work		E		1	200 €/hr	
	Wall Builder	Work		W		4	85 €/hr	
	Water Tightness Specialist	Work		W		1	115 €/hr	
	Carpenter	Work		C		1	96 €/hr	
	Plumber	Work		P		1	128 €/hr	
	Electrician	Work		E		1	128 €/hr	
	Painter	Work		P		1	85 €/hr	
	Gardener	Work		G		0.5	85 €/hr	

9. Define Resources and associated costs :
- In Gantt Chart

		Garden setting	10 days	Fri 15/09/17	Thu 28/09/17	13		Gardener

- In Resources Sheet

	Painter	Work	P		1	85 €/hr	0 €/hr	0 €	Prorated	Standard
	Gardener	**Work**	**G**		**0.5**	**85 €/hr**	**0 €/hr**	**0 €**	**Prorated**	**Standard**

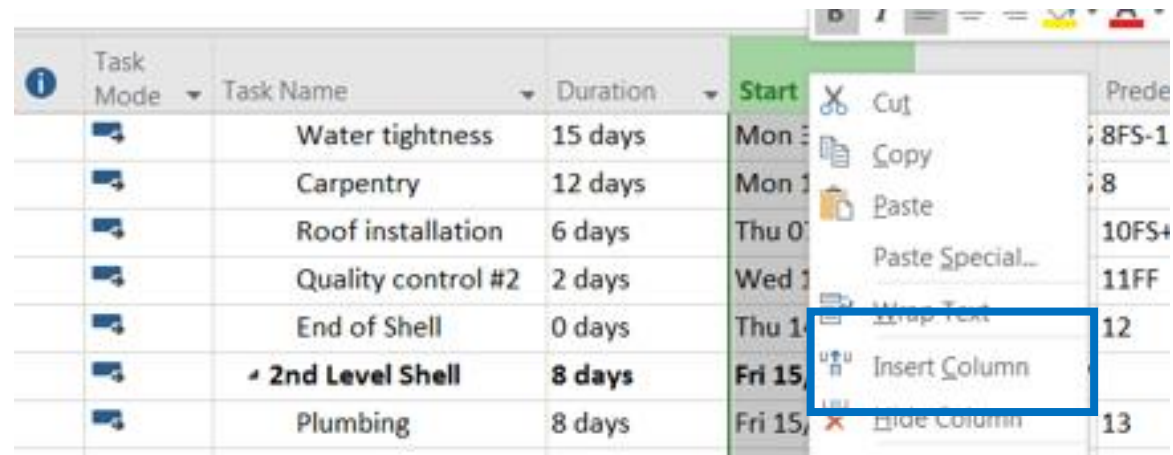👉 **it is highlighted by the red color for the over-allocated resource**

Comment : to resolve Resource Over Allocation
- either change the scope (reduce the amount of work),
- Or assign more resources
- or accept a longer schedule to resolve overallocation.

9. Define Resources and associated costs :
- In addition of cost/hour, we need to add the fixed cost :
Next to duration column, add new columns "Fixed Cost" and "Cost"

10. Project Duration and Budget constraints

Constraints :
- Total budget not to exceed 150000 euros → **OK**
- Total duration not to exceed 70 working days → **NOT OK**

▲ House Project	132 days	144 909 €	0 €	Mon 03/04/1	Thu 12/10/17

- **CRITICAL PATH vs Resources :**
  - Quantity of each resource is 1 except for Foundation Builder (*2) and Wall Builder (*4)

INITIAL :

	Foundation	4 days	6 200 €	2 000 €	Mon 10/04/17	Thu 13/04/17

Step2

Step1

Task Information

General | Predecessors | Resources | Advanced | Notes | Custom Fields

Name: Foundation   Duration: 4 days ☐ Estimated

Resources:

Resource Name	Units	Cost
Foundation Builder	1.00	4 200 €

▲ House Project	140 days
▲ Foundations	9 days
Earthwork	5 days
Foundation	4 days
Quality Control#1	1 day

Resource Name	Units
Foundation Builder	2.00

FINAL :

	Foundation	2 days	6 200 €	2 000 €	Mon 10/04/17	Tue 11/04/17	3

10. Project Duration and Budget constraints

- **CRITICAL PATH vs Resources :**
  - Quantity of each resource is 1 except for Foundation Builder (*2) and Wall Builder (*4)

INITIAL :

| | | Walls building | 80 days | 57 600 € | 10 000 € | Wed 12/04/17 | Wed 09/08/17 | 6 |

⊿ **Shell**	**108 days**	**93 2**		
Walls building	80 days	57 6		
Water tightness	15 days	14 0		

Resources:

Resource Name	Units	Cost
Wall Builder	4.00	47 600 €

FINAL :

| | | Walls building | 20 days | 57 600 € | 10 000 € | Wed 12/04/17 | Fri 12/05/17 | 6 |

Conclusion :
- Total budget not to exceed 150000 euros → **OK**
- Total duration not to exceed 70 working days → **NOT OK**

| ⊿ House Project | 73 days | 144 909 € | 0 € | Mon 03/04/1 | Thu 20/07/17 |

However, I can negotiate additional resources – only on Wall builders to minimize the risk of delay → So if I use 5 wall builders iso 4 :

- Total → **OK**
- Total duration → **OK**

| ⊿ House Project | 69 days | 144 909 € | 0 € | Mon 03/04/1 | Thu 13/07/17 |

11. Define Baselines :

a – If "**Cost**" and "**Duration**" values are below Costs and Duration constraints, you have reached **the Baseline Level**
So you can save the Baseline → *Project Tab → Schedule group → Set Baseline → OK*.
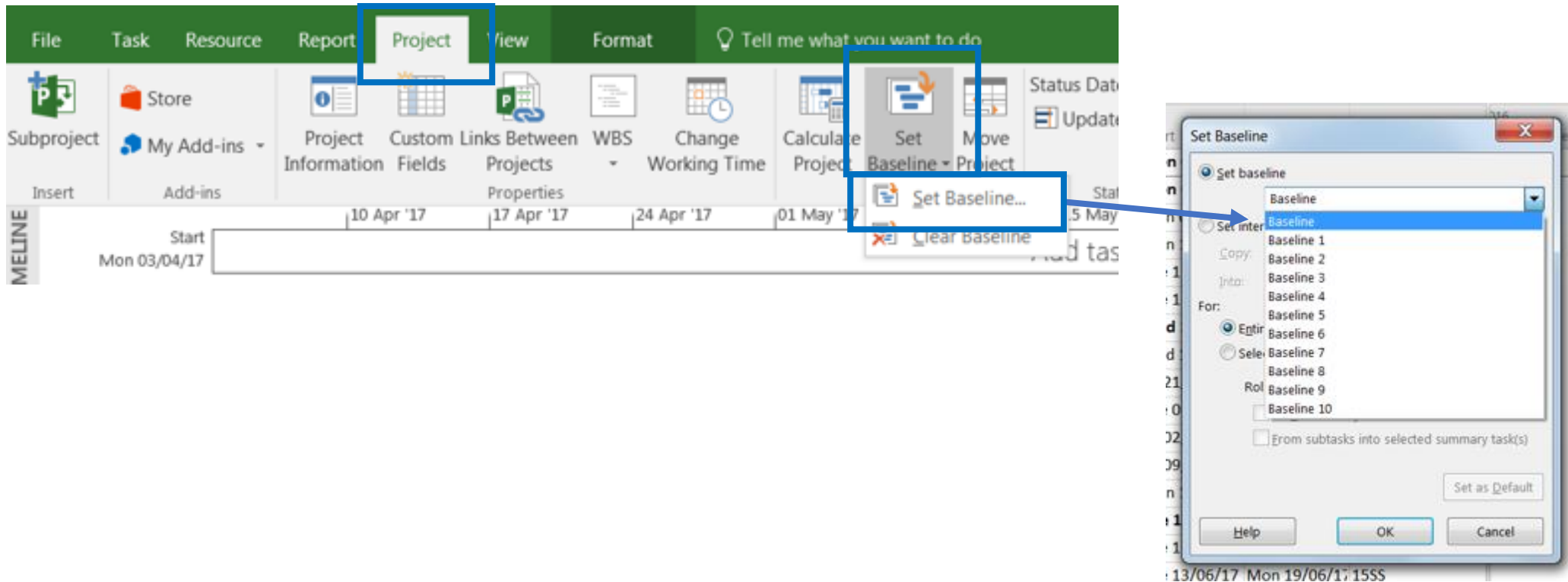
Phases	Tasks	PLANNED Effort People / days	ACTUALS DURATION	ACTUAL % of completion
House	Start	0	0	
Foundations	Earthwork	5	5	100%
Foundations	Foundation	4	4	100%
Foundations	Quality control #1	1	1	100%
Shell	Walls building	80	80	100%
Shell	Water tightness	15	15	100%
Shell	Carpentry	12	**16**	

- % of Completion : Click any Task → *Task Tab → Schedule group → either 0%, 25%, 50%, 75% or 100%.*
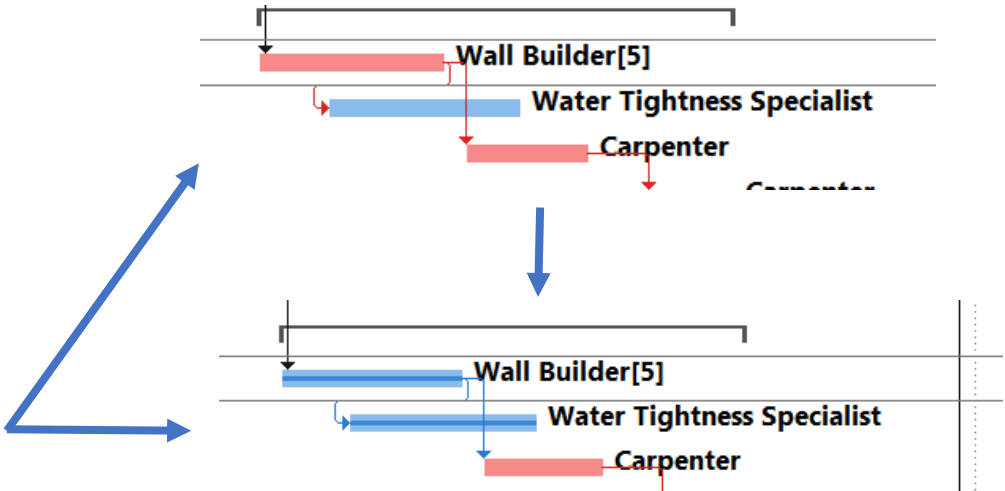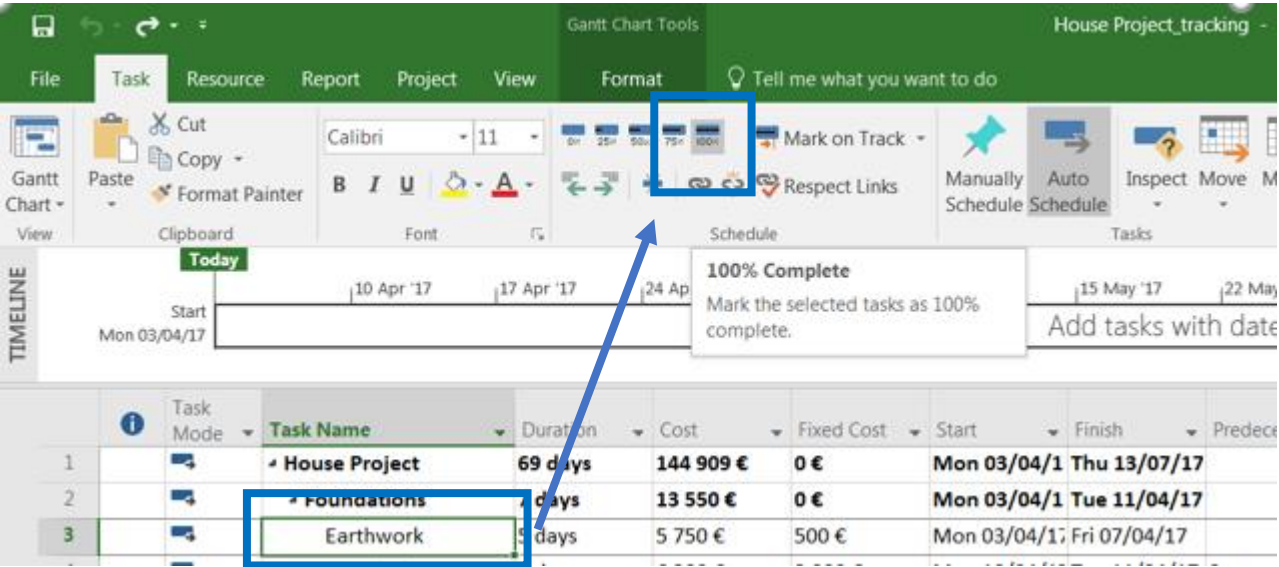
Comment : not anymore highlighted as critical Path

11. Tracking Progress

- Click *View tab → Data group → Tables → Tracking*

| Task Name	Act. Start	Act. Finish	% Comp.	Phys. % Comp.	Act. Dur.	Rem. Dur.	Act. Cost	Act. Work	A
◢ House Project	on 03/04/17	NA	35%	0%	5.65 days	47.35 days	85 225 €	105 days	
◢ Foundations	on 03/04/17	ue 11/04/17	100%	0%	7 days	0 days	13 550 €	10 days	
Earthwork	lon 03/04/17	Fri 07/04/17	100%	0%	5 days	0 days	5 750 €	5 days	
Foundation	lon 10/04/17	ue 11/04/17	100%	0%	2 days	0 days	6 200 €	4 days	
Quality Control	ue 11/04/17	ue 11/04/17	100%	0%	1 day	0 days	1 600 €	1 day	
End of Foundat	ue 11/04/17	ue 11/04/17	100%	0%	0 days	0 days	0 €	0 days	
◢ Shell	ed 12/04/17	NA	56%	0%	4.24 days	18.76 days	71 675 €	95 days	
Walls building	/ed 12/04/17	Fri 05/05/17	100%	0%	16 days	0 days	57 600 €	80 days	
Water tightness	Fri 21/04/17	lon 15/05/17	100%	0%	15 days	0 days	14 075 €	15 days	

- if you want to go back to initial format, Click *View tab → Data group → Tables → Entry*

- *If you select Tables → Entry*

| Task Mode	Task Name	Start	Finish	Late Start	Late Finish	Free Slack	Total Slack	Add
◢	◢ 2nd Level Shell	/lon 19/06/17	Thu 29/06/17	on 19/06/17	Fri 30/06/17	0 days	0 days	
◢	Plumbing	Mon 19/06/17	/Ved 28/06/17	lon 19/06/17	/ed 28/06/17	0 days	0 days	
◢	Electricity	Mon 19/06/17	Fri 23/06/17	Thu 22/06/17	/ed 28/06/17	3 days	3 days	
◢	Quality control	Thu 29/06/17	Thu 29/06/17	Thu 29/06/17	Thu 29/06/17	0 days	0 days	
◢	End of 2nd Level Shell	Thu 29/06/17	Thu 29/06/17	Fri 30/06/17	Fri 30/06/17	0 days	0 days	

11. Tracking Progress

- If Carpentry is now 16d versus 12d initially planned
- *Format tab → Baseline → Select the Baseline you want to see as comparison*
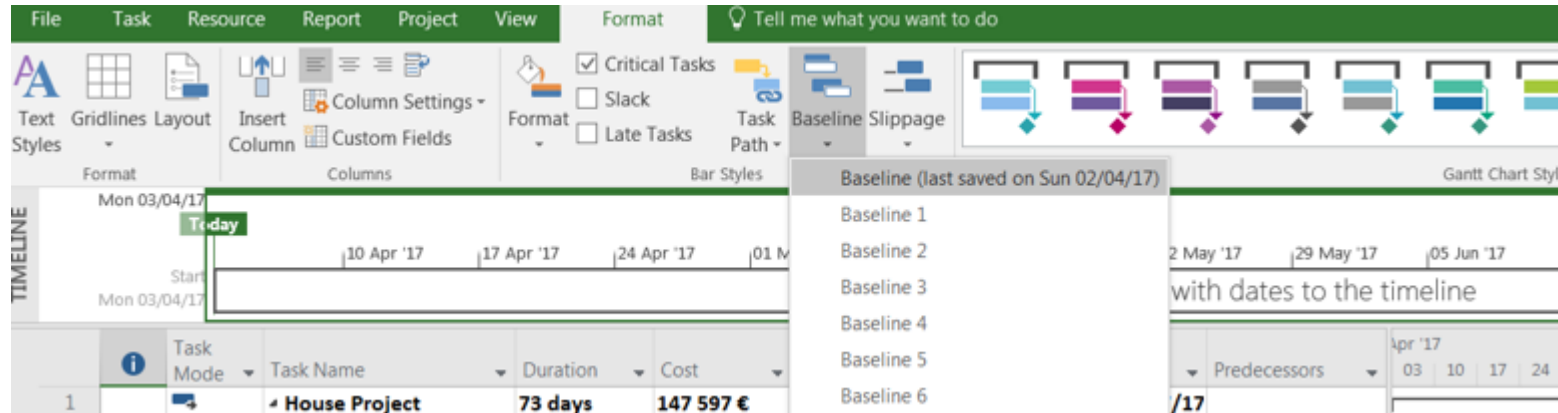
	Task Mode	Task Name	Duration	Cost	Fixed Cost	Start	Finish	Prede
		⊿ House Project	73 days	147 597 €	0 €	Mon 03/04/1	Thu 20/07/17	
✓		⊿ Foundations	7 days	13 550 €	0 €	Mon 03/04/1	Tue 11/04/17	
✓		Earthwork	5 days	5 750 €	500 €	Mon 03/04/17	Fri 07/04/17	
✓		Foundation	2 days	6 200 €	2 000 €	Mon 10/04/17	Tue 11/04/17	3
✓		Quality Control#1	1 day	1 600 €	200 €	Tue 11/04/17	Tue 11/04/17	4FF
✓		End of Foundations	0 days	0 €	0 €	Tue 11/04/17	Tue 11/04/17	5
		⊿ Shell	43 days	95 959 €	0 €	Wed 12/04/1	Fri 16/06/17	
✓		Walls building	16 days	57 600 €	10 000 €	Wed 12/04/17	Fri 05/05/17	6
✓		Water tightness	15 days	14 075 €	2 000 €	Fri 21/04/17	Mon 15/05/17	8FS-1
		Carpentry	16 days	14 252 €	3 500 €	Tue 09/05/17	Wed 31/05/17	8
		Roof installation	6 days	7 032 €	3 000 €	Fri 09/06/17	Fri 16/06/17	10FS+
		Quality control #2	2 days	3 000 €	200 €	Thu 15/06/17	Fri 16/06/17	11FF
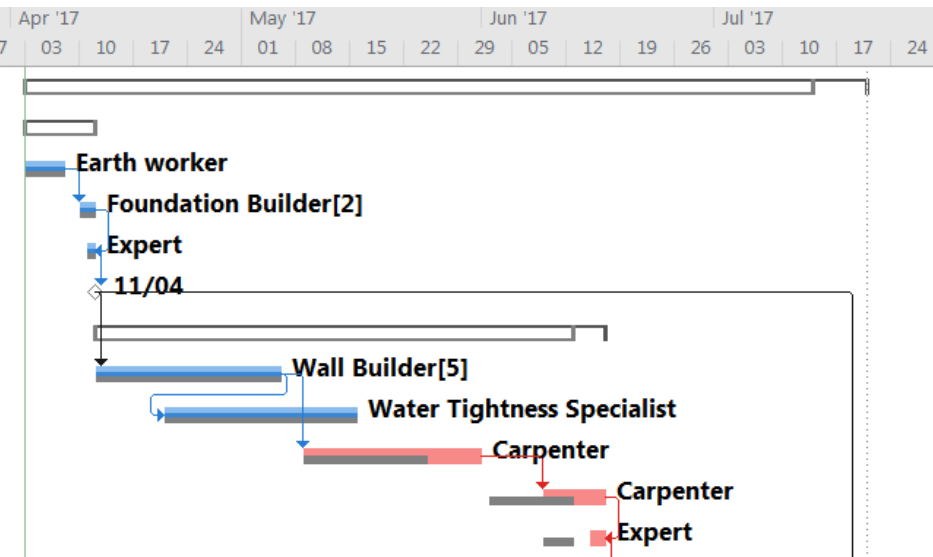
11. Tracking Progress
- If Carpentry is now 16d versus 12d initially planned
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