DEPARTMENT OF CIVIL ENGINEERING

LABORATORY MANUAL

FOR

CONSTRUCTION WORK PRACTICE LAB,
6TH SEMESTER

C. V. RAMAN POLYTECHNIC

(Affiliated to SCTE & VT and Approved by Govt. Odisha)
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Vision:

Civil engineering department is committed to impart knowledge and excellence in civil Engineering to the students and to produce civil engineers of high calibre, technical skills and ethical values to meet current and future challenges.

Mission:

M1: To produce civil engineers with quality technical skills aligned with industry needs to solve real life problems of the society.

M2: To create teaching learning environment for students to acquire knowledge as per need and to motivate towards entrepreneurship and to pursue higher studies.

M3: To serve construction industries, civil engineering profession and the community at large through dissemination of knowledge and technical services to improve quality of life and enhance employability.

M4: To inculcate self-learning attitude and professionalism.

Program Educational Objectives (PEOs)

PEO1- To analyze in civil engineering profession or Higher education by acquiring thorough knowledge and concepts in fundamentals of engineering.

PEO2-To Apply knowledge and skills to real life problems and there by rendering safe and economical structures against natural calamities and also environmentally sustainable and useful to society.

PEO3- To understand entrepreneurial endeavors and to develop effective communication skill and passion for learning.

Program Specific outcomes (PSO)

PSO1- Able to meet the needs of public in the design and execution of quality construction work considering health, safety, cultural and environmental factors.

PSO2- Analyze and design regular and complex structures applying knowledge of building analysis software package.

PSO3- Able to work effectively as an individual or in a team having acquired leadership skills and manage projects in multidisciplinary environment.

Aim of the experiment:

Study of tools required for construction of masonry.

Apparatus Required:

Common Masonry Tools used in Masonry Construction:

01. Trowel

02. Corner trowel

a) Outside Corner Trowel

b) Inside Corner Trowel

03. Setting Out Square or Mason Square

04. Plumb Rule and Bob

05. Spirit Level

06. Line and Pins

07.Water Level

08. Boning rods

09. Spades (Phavadas)

10. Mortar Pan/Ghamela

11. Jointer

Masonry Tools for Stone Masonry:

12. Bevel

13. Pick Axe

14. Crow Bar

15. Chisel

16. Wood Handled Chisel

17. Drafting Chisel

18. Tooth Chisel

19. Boaster

20. Spalling Hammer

21. Mash Hammer

22. Mallet (Wooden Hammer)

23. Dummy (Iron Hammer)

24. Scabbling Hammer

25. Waller's Hammer

26. Club Hammer

27. Pitching Tool

28. Gauge

29. Punch

30. Point

31. Claw tool

32. Nicker (Broad Tool)

33. Jumper

34. Wedge and Feathers

35. Gad

36. Drag

37. Hand Saw

38. Circular Saw

39. Cross-cut-saw

40. Frame Saw

Masonry Tools for Brick Masonry:

41. Brick Hammer

42. Lump Hammer and Bolster

43. Double-end Comb Hammer or Skutch

44. Straight Edge

45. Brickwork Gauge Rod

46. Bricklaying Trowel

Theory:

Masonry work dates back to ancient times, so are the masonry tools. According to Prof. 'M. M. Goyal' (Author of Construction Handbook for Civil Engineers and Architects), masonry is the proper assemblage of masonry units bonded together with mortar. At the construction site numerous construction tools can be seen, each having specific purpose. We use these tools in the construction process to complete the particular work.

Masonry work requires tools for various purposes, i.e. for handling of mortar, for the dressing of stone, for cutting of bricks to get required shape etc. As it goes with traditions in existence since the days of the Ancient Indian and Egypt, masonry deals with some common elements as crushed stones from the earth and simple metal tools.

Common Masonry Tools used in Masonry Construction-

01. Trowel

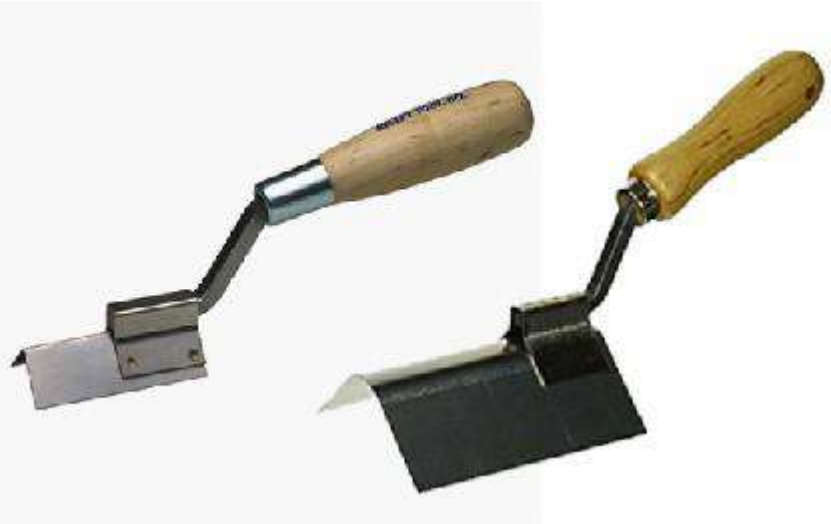
The basic masonry trowel is made up of stainless steel with a plastic/ wooden handle. The ends of trowel may be bull nosed or pointed. This is used to lift and spread mortar in joints during masonry construction. There are different kinds and sizes of trowels used in masonry work.

02. Corner Trowel

It is one of the common modifications of the basic trowel. It is used for shaping corners of the wall. They are two types of Corner Trowel.

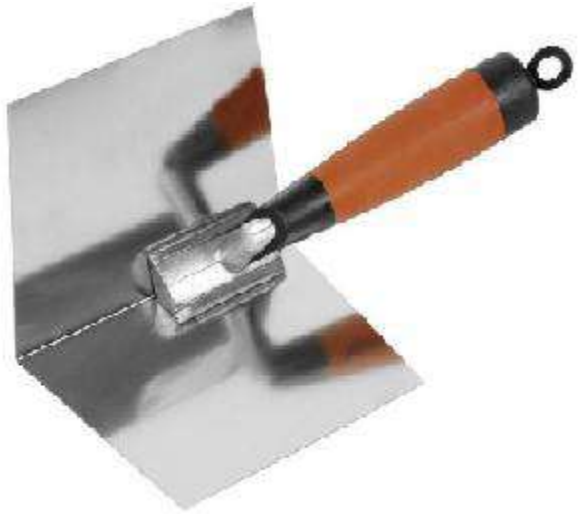
(A) Outside Corner Trowel

There are different designs of outside corner trowel but the one shown at left side with shorter flanges is the most common. These outside corner trowel can have a sharp 90-degree angle or a bull nose (rounded) edge.



(B) Inside Corner Trowel

These are more common than the outside corner trowel, just because corner aid is used on the outside corners. They have standard features, comparable to an outside corner tool but also have adjustable models that can get wider or narrower, depending on the angle of the corner.

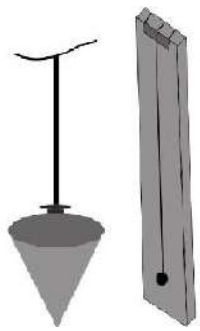


03. Setting Out Square or Mason Square

It is used to set out right angles at the corner of masonry wall. This is very important and basic tool used in masonry work. This tool has “L” shape. It is made of flat steel having each arm about 0.5 m long.

04. Plumb Rule and Bob

This basic masonry tool is used to check the verticality of walls. It consists of a string tied to a weight at bottom called bob and straight wood board with uniform edges called plumb rule. On its center a groove is provided in which plumb bob is placed. When the rule is placed vertically with the wall, the plumb bob must be in the groove line indicating the perfect vertical wall. If the plumb ball does not fall on the groove line, the wall will not be vertical.



05. Spirit Level

It is used to check the horizontality and verticality of the surfaces. Spirit level is made of hard plastic or wood with bubble tube in the middle. The bubble tube is partially filled with alcohol in such a way that, an air bubble is formed in it. The spirit level is placed on surface of masonry wall and bubble is checked. The surface is called leveled when the bubble in the tube settles at middle of tube.

06. Line and Pins

It is used to maintain the alignment of the work-in-progress. Line and pins consist of a string whose ends are connected with two solid metal rods with pin points. It is used to level line and the alignment of brick course while brick laying in brick masonry work.

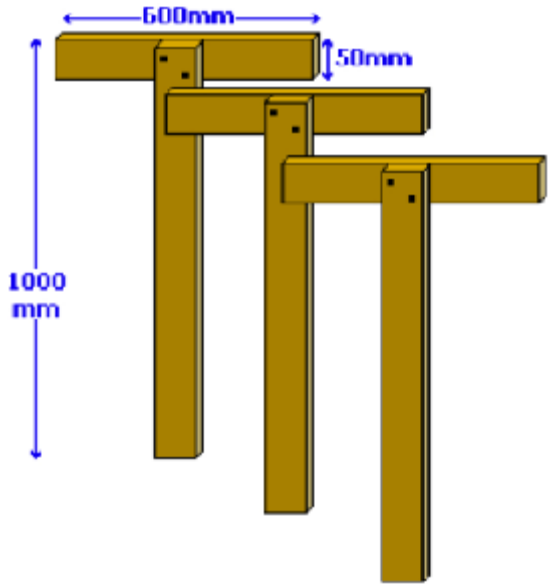
07. Water Level

It is used to transfer and check level. It is a simple tool to measure the level at two different points. It is a tool that works on the principle that water always seeks its own level. It consists of flexible tube with liquid, and the liquid at both ends will be at the same level whether you're holding them together or spreading them a hundred feet apart.

08. Boning rods

They are It is used for levelling from two fixed points in surveying. It consists of an upright pole having a horizontal board at its top, forming a 'T 'shaped rod. Boning rods are made in set of three rods, and many consist of three 'T' shaped

rods, each of equal shape and size, or two rods identical to each other and a third one consisting of longer rod with a movable or detachable ‘T’ piece. The third one is called traveler or traveling rod.



09. Spades (phavadas)

They are used to mix mortar and also used to place cement, mortar, concrete in head pan. Spade is also used to dig the soil for foundation trenches etc. It consists of metal plate at the end of long wooden handle.

10. Mortar Pan / ghamela

Mortar pan is commonly used in construction sites and is made of iron or plastic. It is a vessel made of rigid plastic or steel used to hold or carry sand, cement, mortar and concrete. It is also used to mix mortar and to lift mortar on working site. To use a mortar pan, fill it with a quantity of material i.e. sand, cement, mortar etc. that you are comfortable with carrying.

11. Jointer

A jointer in masonry construction is a tool in the form of a striking iron or a striking tool used to finish the horizontal or the vertical mortar joints. A jointer or brick jointer is a hand tool designed to imprint grooves into recently filled mortar joints at the stage when they are starting to set. Using a brick jointer helps to improve and visual impact and the lifespan of the mortar. Jointer is used to refer to any tool which can shape the mortar between bricks.

12. Bevel

It is employed to set out angles. It comprises of two slotted blades of steel and fixed with each other with thumb screw. It is a tool consisting of two rules or arms joined together and opening to any angle.

13. Pick Axe

It is employed for rough dressing of stones and to split the stones in the quarry. It has a long head pointed at both ends.

14. Crow Bar

It is employed for dressing the surface of stones. This consists of an iron edge with a number of teeth from 3 mm to 9 mm.

15. Chisel

They are used with mallets and with hammers. A chisel is used for normal splitting, roughing out and shaping the stone. Chisels are available in different sizes with bladed, flat, tapered and other shaped chipping points. Blade of chisel is made from iron or metal and the handle is made from wood.

16. Wood handled chisel

It is used to dress soft stones. A chisel is a tool with a characteristically shaped cutting edge of blade on its end, for carving or cutting stone by hand. Its handle is made from wood or plastic.

17. Drafting Chisel

It is a chisel especially used for cutting a border or line at the edge of a stone. They come in different types of size. Grooves are made with the drafting chisel at the all four edges of stone. And, these stones are used in plinths and at corners in building.

18. Tooth Chisel

Tooth chisel is also used for fine dressing. It is a hand-held tool of metal consisting of a long shaft, with a toothed cutting edge at one end. It is again usually hit with a mallet or metal hammer. The number of teeth on this cutting edge varies, generally between three and five, but a variation with two teeth also exists. The tooth chisel is normally used between roughing-out and finishing, to clear away the rough marks left by the point chisel and prepare the surface for finer work.

19. Boaster

Tooth chisel is also used for fine dressing. It is a hand-held tool of metal consisting of a long shaft, with a toothed cutting edge at one end. It is again usually hit with a mallet or metal hammer. The number of teeth on this cutting edge varies, generally between three and five, but a variation with two teeth also exists. The tooth chisel is normally used between roughing-out and finishing, to clear away the rough marks left by the point chisel and prepare the surface for finer work.

20. Spalling Hammer

It is a stone mason's tool. It is a heavy hammer used for cutting, shaping and rough dressing of stones. It has a beveled striking face. It is a large hammer usually with a flat face and straight peen for rough dressing and breaking of stone.

21. Mash Hammer

A mash hammer is also known as a stone mason's hammer. It is used to hit and drive chisel for rough dressing of stone. It is double-sided with two striking faces, most often used in stone masonry work. It should only be used to strike stones, but can also be used for such tasks as chipping away mortar in stone masonry. This hammer consists of a wooden handle to which is attached a heavy head, usually made of metal.

22. Mallet (Wooden Hammer)

It is a basic tool used for shaping of stone. It is a wooden hammer used for driving wooden headed chisels. It usually has a large head.

23. Dummy (Iron Hammer)

It is used for carving of stones. It has also large round shape head which is made of iron. Its handle is made up of wood.

Also Read: Difference Between Brick Masonry and Stone Masonry

24. Scabbling Hammer

Scabbling also called scappling is the process of reducing stone while dressing of stone. In scabbling dressing, only irregular angels are taken off with a scabbling hammer. Hence scabbling hammer is a tool used to break small projections of stones or removing irregular bushings from the face of stone. It has a large head made of iron and wooden handle.

25. Waller's Hammer

It is used for removing spalls in stone masonry work. It also consists of iron head and wooden handle.

26. Club Hammer

It is used to strike arrow -headed chisels. It is also useful for light demolition work, driving masonry nails, and for use with a steel chisel when cutting stone. Its weight drives the chisel more deeply into the material being cut than any lighter hammers. It also consists of iron head and wooden handle like other stone masonry tools.

27. Pitching Tool

Pitching tool is a hand driven tool comprising of a long edge with a thick point. The 'working-edge' of the pitching tool has a broad flat face that is generally ground to an angle just slightly-off the perpendicular. It is mainly used to make stones of required size. If the carving block of the stone has flat-sawn faces, then this tool can be used to remove a great deal of waste material at the initial stages of carving.

28. Gauge

It is employed to dress stones for spring, course, cornice, coping etc. It is made of metal.

29. Punch

It is employed to dress the hard stones roughly. It is one-piece rod-shaped tool made from metal designed to be struck by hammer. It's one end is pointed and other is round shape.

30. Point

It is employed for roughly dressing the hard and tough stones. Point is also used for roughing out areas and knocking off high spots in stones. Point tool is used after any initial work with the pitching tool. Both point and punch are used to rough-out the form but the latter tapers to a small cutting edge of stone whereas the former tapers to a single point of the stone.

31. Claw Tool

It is employed for dressing the surface of stones. This consists of an edge with a number of teeth from 3 mm to 9 mm. Claw tool is used after the coarse carving with the point tool. The claw tool, with its row of pointed teeth, acts like a rake to even out the surface irregularities left by the point. While using this tool, care should be taken to ensure all of the chisel's teeth are in contact with the stone, in order to prevent breakage.

32. Nicker (Broad tool)

The mason's nicker (Broad tool) is made from high quality steel. The blade is thicker and beveled on both sides to create a cutting blade. It is held at right angles to the stone and hit with a hammer to split the stone.

33. Jumper

It is a long drilling tool consisting of an iron bar with a chisel-edged steel tip at one or both ends, operated by striking it against the rock, turning it a little with each blow. They are used to bore holes for blasting purposes in a quarry by quarry workers and masons.

34. Wedge and Feathers

It is an oldest yet, one of the best tools to split the stone. It is a three-piece set tool. Each set of tool consists of a metal wedge (also called plug), and two shims (also called feathers). The feathers are tapered and curved at the top and wide at the bottom. When the two feathers are arranged on either side of the wedge, the combined width of the set is the same at both ends. They are employed for cutting the stones after they have been bored with a jumper.

35. Gad

Gad is a small, steel, wedge-shaped tool used for splitting of the stone

36. Drag

It is employed to level a stone surface. It consists of blades set at alternating angles, between 15 and 30 degrees, over the length of a block of wood. The blades are toothed to provide even removal of surface material. Some drags can be fitted with specially shaped blades to follow convex surfaces.

37. Hand Saw

It is used to cut soft stones. It is a saw with wide cross-cut toothed steel blade and wooden/plastic handle at one end. I It is used by one hand.

38. Circular Saw

A circular saw is either hand held or affixed to a substrate. It runs on electricity and is provided with a toothed or abrasive blade/disc which has the ability to cut different materials including wood, stone, brick, metals, plastic by using a rotary motion that spins around an arbor.

39. Cross-cut-saw

It is used to cut hard stones. It is designed specifically for rough cutting. It has a comparatively thick blade, with large, beveled teeth. Traditional 2-man crosscut saws (felling saws) have a handle on each end and are meant to be used by two people to cut stones.

40. Frame Saw

This is used to cut large blocks of stones. It consists of a comparatively narrow and flexible blade held under tension within a (generally wooden) rectangular frame called sash or gate. The blade is held perpendicular to the plane of the frame, so that the stone passes through the center of the frame.

41. Brick Hammer

It is used for rough cutting of bricks in different shapes and sizes. One end of the hammer is square and another end is sharp-edged. It has one flat traditional face and a short or long chisel shaped blade. It is also used to push the bricks if they come out from the course line.

42. Lump Hammer and Bolster

Lump hammer is used for light demolition work or to break masonry. In order to cut brick accurately, a steel chisel with a very wide blade called bolster is employed.

43. Double-end Comb Hammer or Skutch

It is used to remove surplus material after cutting of bricks by bolster, for greater accuracy. The Hammer has two groove components for double sided use. Comb of hammer is a made from iron or similar metal whereas handle is made up of plastic or wood.

44. Straight Edge

Straight edge act as extensors to mason's level. They are used when levels are shorter than the area that needs to be measured or assessed. The middle section of the top of the straight edge should be horizontally parallel to the bottom section. It is used for checking the straightness of brickwork.

45. Brickwork Gauge Rod

It is similar to straighten edges on which levels of different courses of bricks including sills and lintels are marked. It may be as long as the height of the ceiling. It is used to confirm that courses are maintained at correct levels.

46. Bricklaying Trowel- It is a flat triangular trowel used in bricklaying for cutting brick and spreading mortar or cement. The trowel is also used to tap bricks down on to the bed and can be used for random cutting of soft bricks. They come in various shapes and sizes depending on the task.

14. Crow Bar

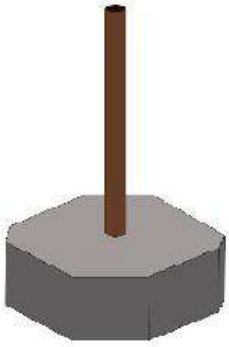
15. Chisel

16. Wood handled chisel

17. Drafting Chisel

18. Tooth Chisel

19. Boaster



20. Spalling Hammer

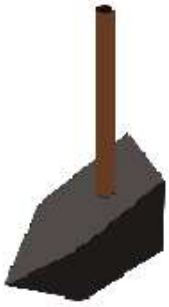
21. Mash Hammer

22. Mallet

(Wooden Hammer)

23. Dummy

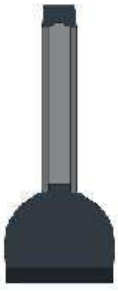
(Iron Hammer)



24. Scabbling Hammer

25. Waller's Hammer

26. Club Hammer



27. Pitching Tool

28. Gauge

29. Punch

30. Point

31. Claw Tool

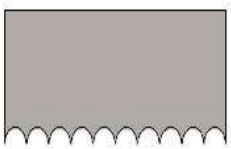
32. Nicker

(Broad tool)

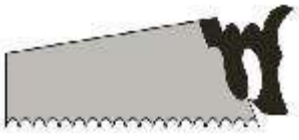
33. Jumper

34. Wedge and Feathers

35. Gad



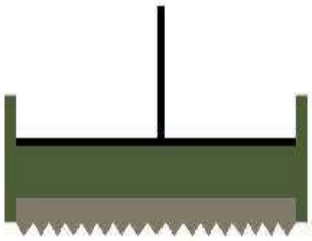
36. Drag



37. Hand Saw

38. Circular Saw

39. Cross-cut-saw



40. Frame Saw

41. Brick Hammer

42. Lump Hammer and Bolster 43. Double-end Comb Hammer or Skutch

44. Straight Edge 45. Brickwork Gauge Rod

46. Bricklaying Trowel

Conclusion:

To sum up, the list of masonry tools is exhaustive. Here we have made an arduous task of listing out the masonry tools and its functions. Proper tools are essential aspect of all constructions, big or small. Though there are a number of tools, most of the masonry tools are the upgraded version of the same old basic tools. Equipping the construction site with the adequate construction tools is essential to achieve good quality timely results. For every construction activity, there is always an optimal combination of tools, equipment and labour. According to 'IS 1661: 1972' (Code of Practice for Application of Cement and Cement-Lime Plaster Finishes), all tools shall be cleaned by scraping and washing at the end of each day's work, or after use with different materials. Metal tools shall be cleaned and greased after each operation. The tools shall be examined and thoroughly cleaned before plastering is commenced. Cleanliness is particularly important with cement plasters, where contamination with set material may seriously affect the performance as well as reduce the effective life of the tools.

Aim of the experiment:

Lay out Plan of a building.

Apparatus Required:

1. Chain and Tape
2. Nylon Thread
3. Hammer
4. Wooden pegs
5. Steel bars

Materials- Lime powder, nail

Theory:

After finalising the building plan and design of the structural component, including foundations, the construction activity can be started.After that, the first step in construction activity is site clearance. It was then marking foundation trenches which are going to be excavated. The excavation lines which are marked on site is known as building layout.

How to Build Layout:

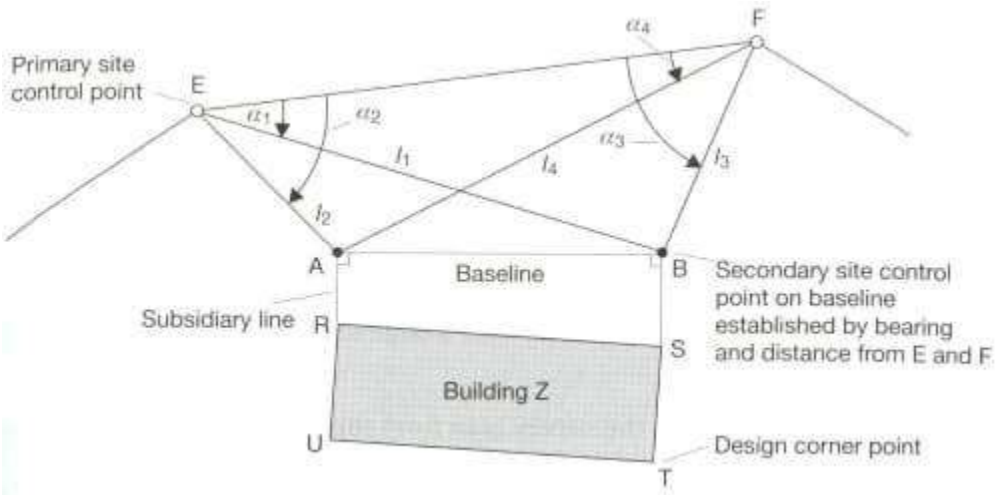
1. To set out a building after transferring the architectural proposal from drawing into the ground. It establishes location points of the site boundaries, columns, foundation, centre line of wall and other necessary data and level.
2. The whole structure will be located due to this initial set out. Accurate set out is the key part of this construction work and errors are very expensive & it needs so much time for correction.
3. The structure position and orientation is generally detailed in engineers drawing, and it showed how the layout would be arranged.
4. The controlling points of the structure are marked. After that, all the operations will proceed.

Procedure:

Step 1. Temporary Benchmark

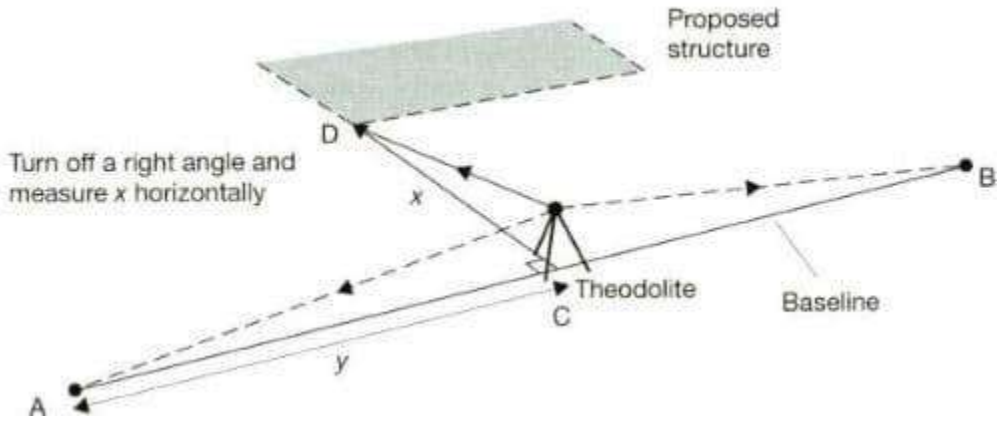
1. A temporary benchmark is a fixed point with known elevation. It's the fixed point which starts all level related works.
2. After that, a peg or steel angle is placed in that remarked place.
3. Temporary benchmark indicated all drawings with levels and vertical dimensions expressed in meters to three decimal places.

Step 2. Baseline



1. All the layout task is done is creating a baseline.
2. The baseline is a straight reference line is a respect to which the building corners are located.
3. Sometimes it coincides with the building line but doesn't create any problem.

Step 3. Horizontal Controls



1. Horizontal control is points which are also known as coordinates with respect to specific issues.

2. Control points should be used so that each point of the plan can be located on the ground.

Step 4. Vertical Controls

The Vertical control points are specified to a vertical datum– often a timber post in concrete. These levels are generally established during the levelling phase by using a theodolite.

What Is Method of Layout of Building?

- At first, You need to mark the **building layout and tied a line** to the **corner posts, a nail in the top of the post.**
- A theodolite is placed to find out the **corners at 90-degree angle** after that ranging rod is **required to find the straight line between two points.**
- Corner posts are usually timber posts which are **usually 50 mm x 50 mm set in the ground and marked with a nail at the centre of the centre.**

- The outlines are **marked by dry lime powder.**
- Profile boards are set at a **height of 0.6-1 meter.**
- When the outline of a **building is more complex than a simple rectangle**, then it's **necessary to fix up some points.**
- Sometimes for the **irregular building shape**, at first layout a large rectangle which will cover the entire building. Once it will be done **deductions, and alternative can be made to obtain the layout.**

Some steps are followed for creating the layout of a building. Those steps are-

- **Trenches**
- **Reduced Level Excavation**
- **Framed Building**

Step 1. Trenches

- The layout **trenches are done for excavation work**. The excavation work is done for **excavating the walls, trenches, etc.**
- Next, we need to find out a **trench position, width, depth.** Profile boards should be **kept at the 2 m clear from the trench position.**
- Pegs are set at the bottom of the trench to mark the **top of the concrete strip.**
- By using a spirit level, the corners of the **wall are transferred** from the intersecting **line to mortar spots in the foundation.**
- When we are cutting trenches, we need to execute the whole work with **great care; specially there is a possibility of side caving.**

Step 2. Reduced Level Excavation

- The reduced level is set out **working from the baseline**. Corner posts are fixed outline of the excavation area but **marked with sand.**
- After controlling the **depth of the excavation, sight rails are set.**
- After that, the traveller is **controlling excavated levels between profiles boards.**
- Finally, the height of the traveller has desired to the **sight rail level minus the formation level of the excavated area.**

Step 3. Framed Building

- The framed building is one of the buildings which are **related to the grid**. The intersection points of the **gridline are marked as the centre point.**
- The grid layout is established by **theodolite and intersection is marked with pegs.**
- Once the grid has set, it's **ready for excavation work.**

Conclusion:

After this experiment, a student should be able to do layout of a building as per sketch. Follow safe work procedure; check the correctness of dimensions of work done.

Aim of the Experiment- Bar bending and fabrication of reinforcements for a beam.

Apparatus Required-

1. Bending Lever
2. Measuring Tape
3. Pin plate
4. Plomb bob
5. Binding hook
6. Bar cutting machine
7. Bar bending machine
8. Sledge and ball peen hammer
9. Chisel

Consumables-

1. Binding wire
2. Chalk piece
3. Line thread
4. Cotton waste

Safety gadgets-

1. Safety helmet
2. Safety shoe
3. Cotton and hand gloves

Materials-

Steel rebar of different diameters

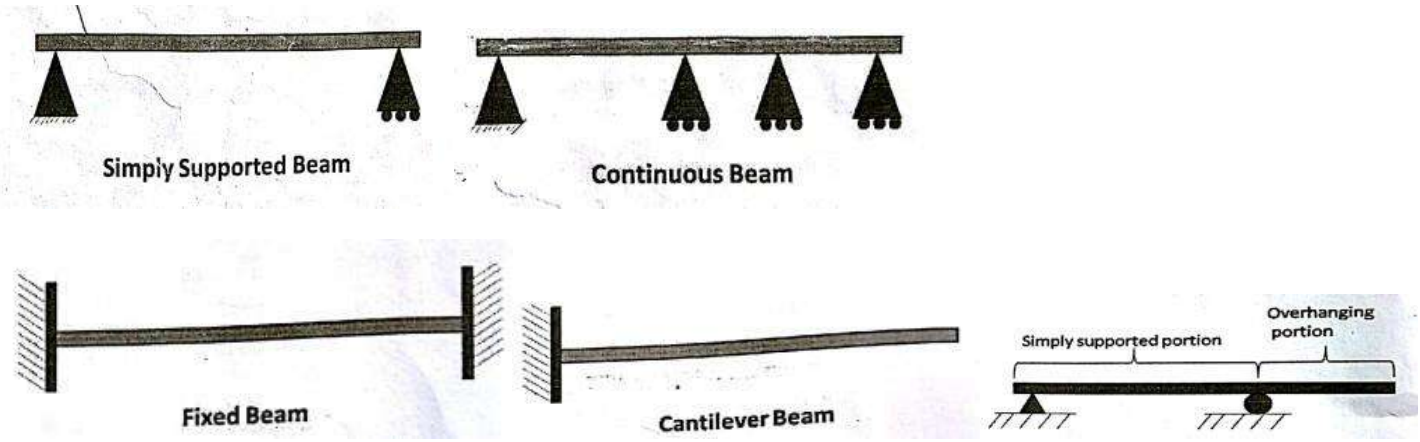
Theory-

Beam: A horizontal or inclined structural member spanning a distance between one or more supports, and carrying vertical loads across its longitudinal axis, as a girder, joist, purlin, or rafter.

Beams are rectangular or square in cross section, and carry floor slab or roof slab and transfer all the loads including its self weight to column or wall.

Types of beams:

1. Simply supported beams: Supported freely at both ends
2. Continuous beam: Supported at more than two points
3. Fixed beam: Both ends of the beam are rigidly supported
4. Cantilever beam: Fixed in a wall or column at one end with the other end overhanging and free. This beam has tension zone at top side and compression zone at the bottom side.
5. Overhanging beam: In this type of beam the ends extends beyond the wall or column of the support.



RCC beams: It is of two types-

1. Singly reinforced beam- In this type of beam reinforcement is provided only in the tension zone and compression is wholly resisted by concrete.

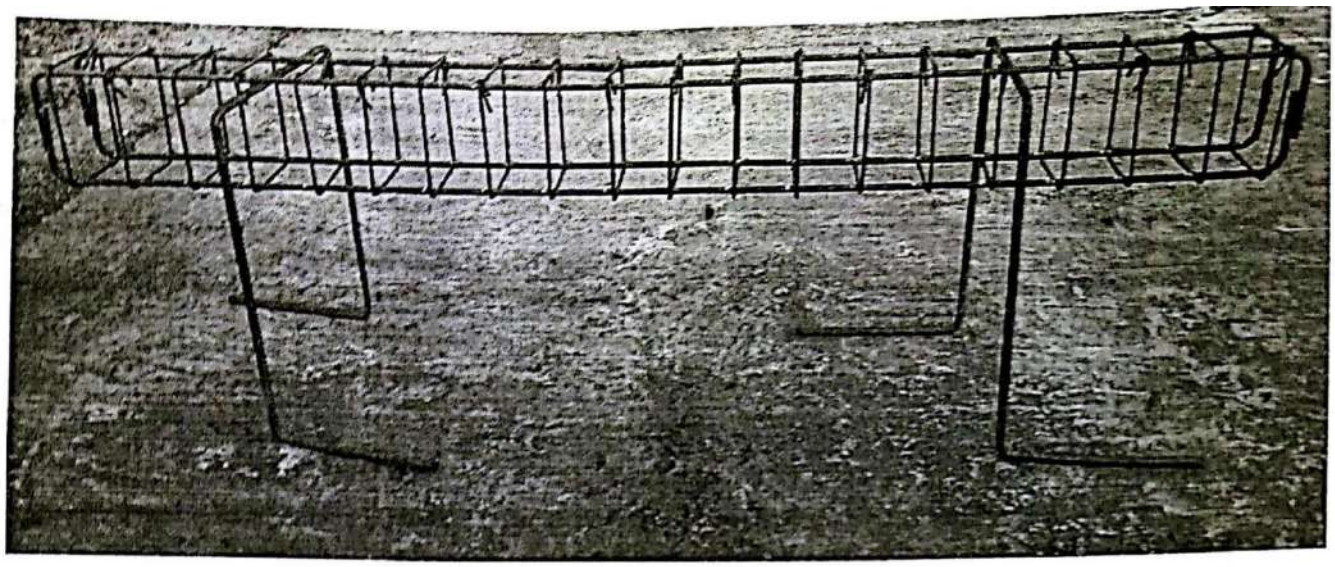
2. Doubly reinforced beam- Here reinforcement is provided in both tension and compression zone. This type of beam is used when depth of the beam is restricted due to various reasons like head room requirements, aesthetic appearance, availability of space , etc.

Beams used in buildings and bridges:

1. Girder: It is the primary horizontal member carrying loads from other beams and slabs connected to it.
2. Joists: A smaller rectangular sectional member arranged parallel from wall to wall in a building, or resting on girders. It is a support structure between girders
3. Purlins: Roof beams spanning between trusses.
4. Lintels: It is a horizontal structural member supporting a wall over door and window opening. They have width equal to the thickness of wall.

Types of beam on usage basis: Tie beam, Plinth beam, Lintel beam, Roof beam

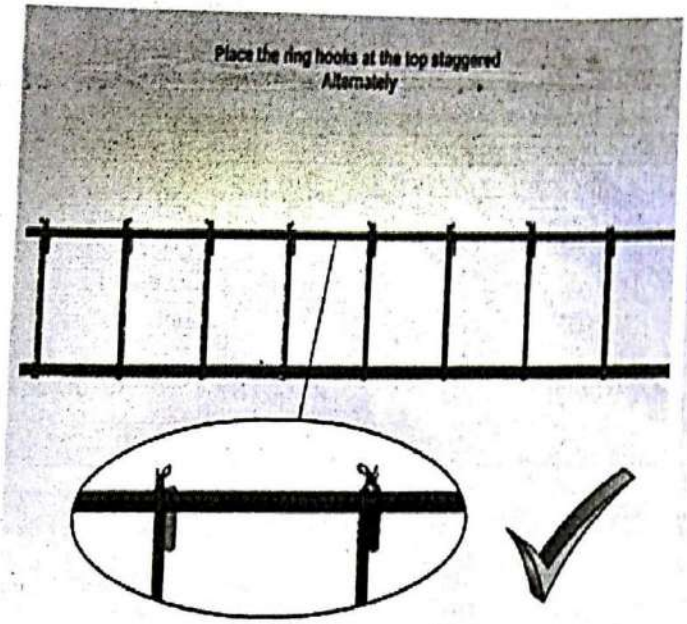
Procedure:

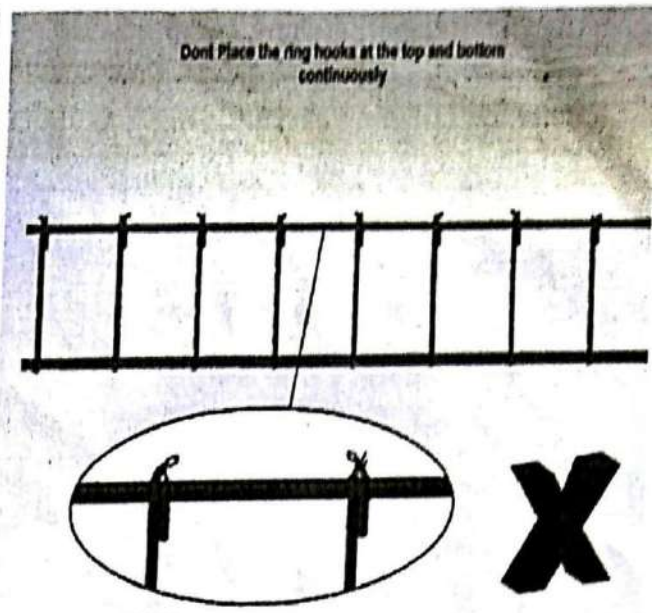


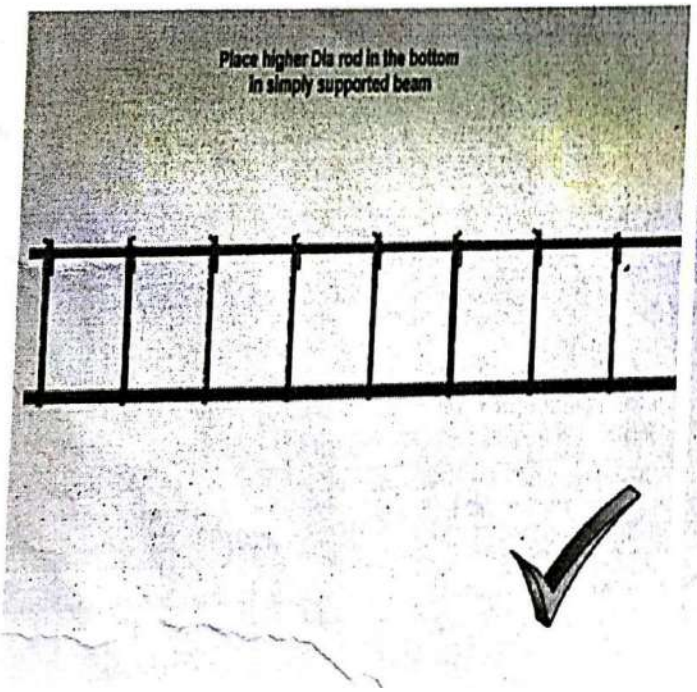
- [ ] Collect the necessary tools, equipment, consumables, and materials near work place.

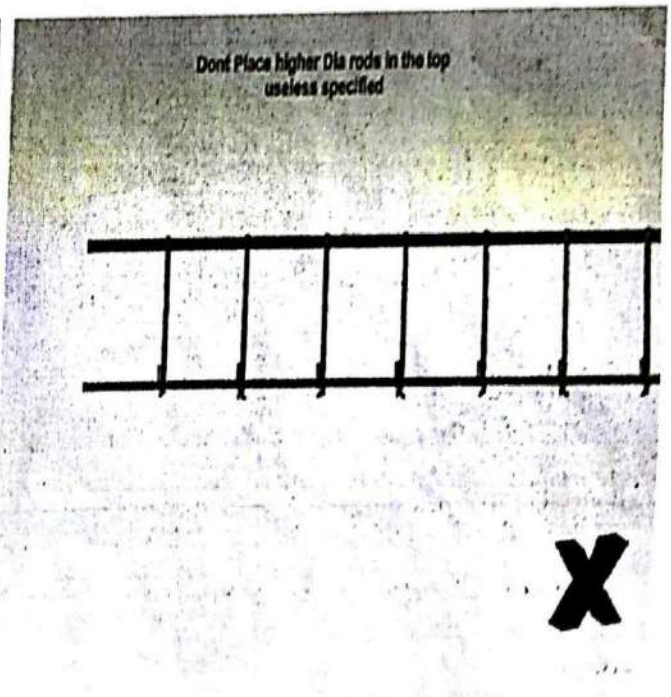
- Make a temporary table on the work place.
- Place top & bottom bar of the beam on the work table made out of bars.
- Mark the spacing of rings on all top and bottom bar starting from one end using measuring tope.
- Place two top bar & position on the working table
- Insert all stirrups into the bar taking correct to stagger the end hooks.
- Position all rings on the marking and tie using binding wires.
- Insert other two bottom bar in to the ring from one end.
- Tie end L bend of the top and bottom bar with one another.
- Position all stirrups on the marking to vertical and tie using binding wire at the bottom.
- Check the spacing is stability of the stirrups as per the assessment standards.

Do's and Don'ts:

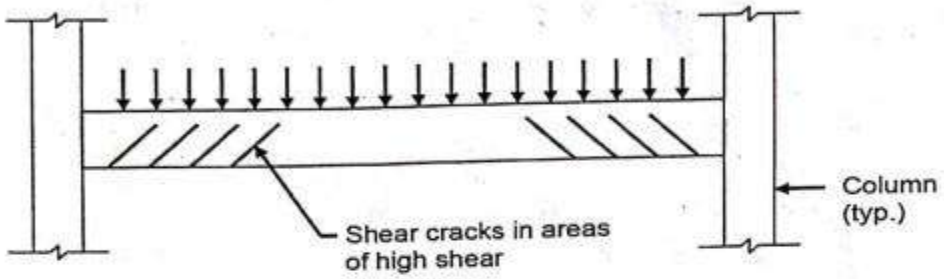








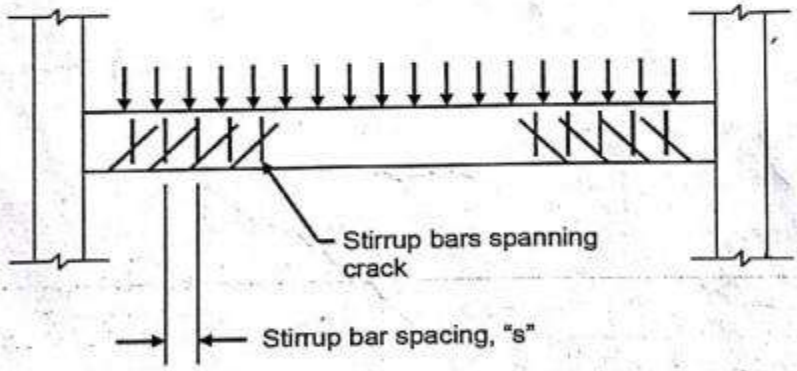
- In members where the shear strength provided by the concrete is not sufficient to resist the design loads shear reinforcement is often detailed. Shear reinforcement is typically perpendicular to the longitudinal reinforcement and thus oriented vertically in a typical beam. The idea behind shear reinforcement is to arrest the development of the diagonal tension cracking, and, generally, shear reinforcement is detailed such that any potential diagonal tension crack will have to cross two such reinforcements.
- Heavy loads on concrete beams produce diagonal shear cracks



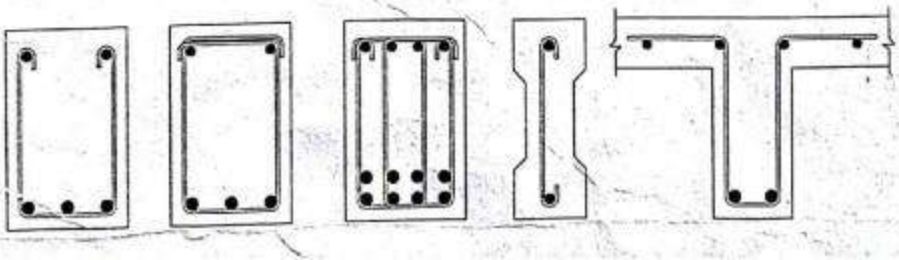
Cracking in beams is normal and indicates the tension bars are actually working.

Excessive cracking needs to be controlled by additional bars called stirrups

Placed perpendicular to the cracks

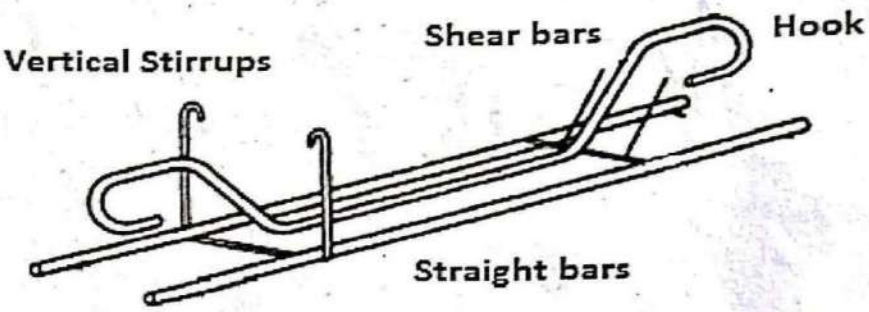


Stirrups may take the shape of the following typical configurations:



We can also provide bent-up bars/ shear bars to arrest shear failure.

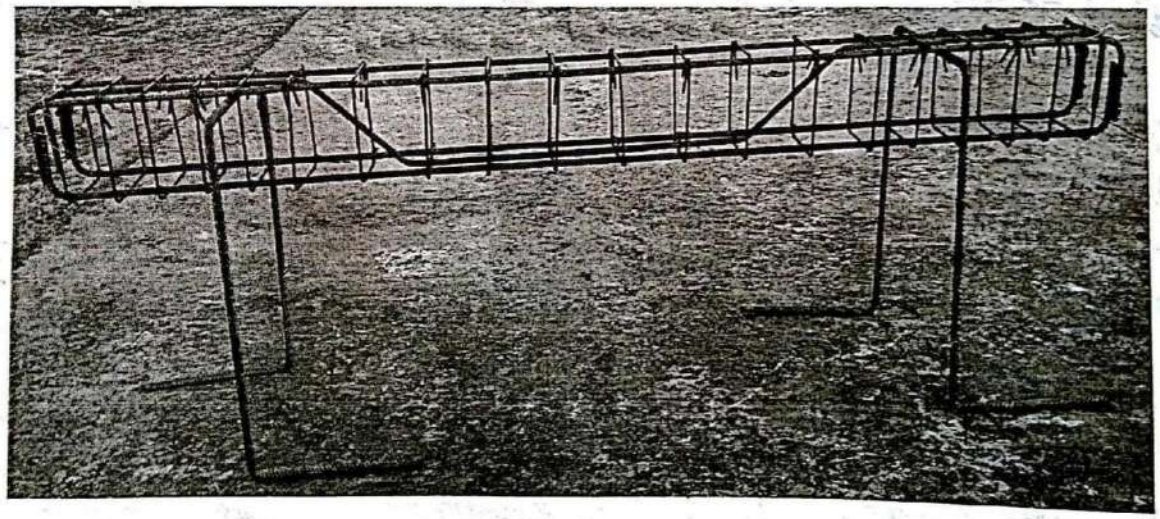
The purpose of both straight and bent-up bars is to resist the bending tension in the bottom of a beam. A beam requires fewer bars near the ends of a span because the bending moment is smaller near the span ends than at the span center. However, the shear forces are larger at the span ends, and this condition causes diagonal tension in the beam. This area is where the inclined portion of the bent-up bar is placed to resist the diagonal tension due to shear. When the bent-up bars cannot resist all of the diagonal tension, U-shaped bars (called stirrups) are added.



If a section of beam is supporting on more shear force and it steel provided at top is bottom is not sufficient to like that shear force in these case shear bar is used.

Prepare a bar bending schedule for given sketch of beam with shear bar.

Beam with shear bar:



Method Statement:

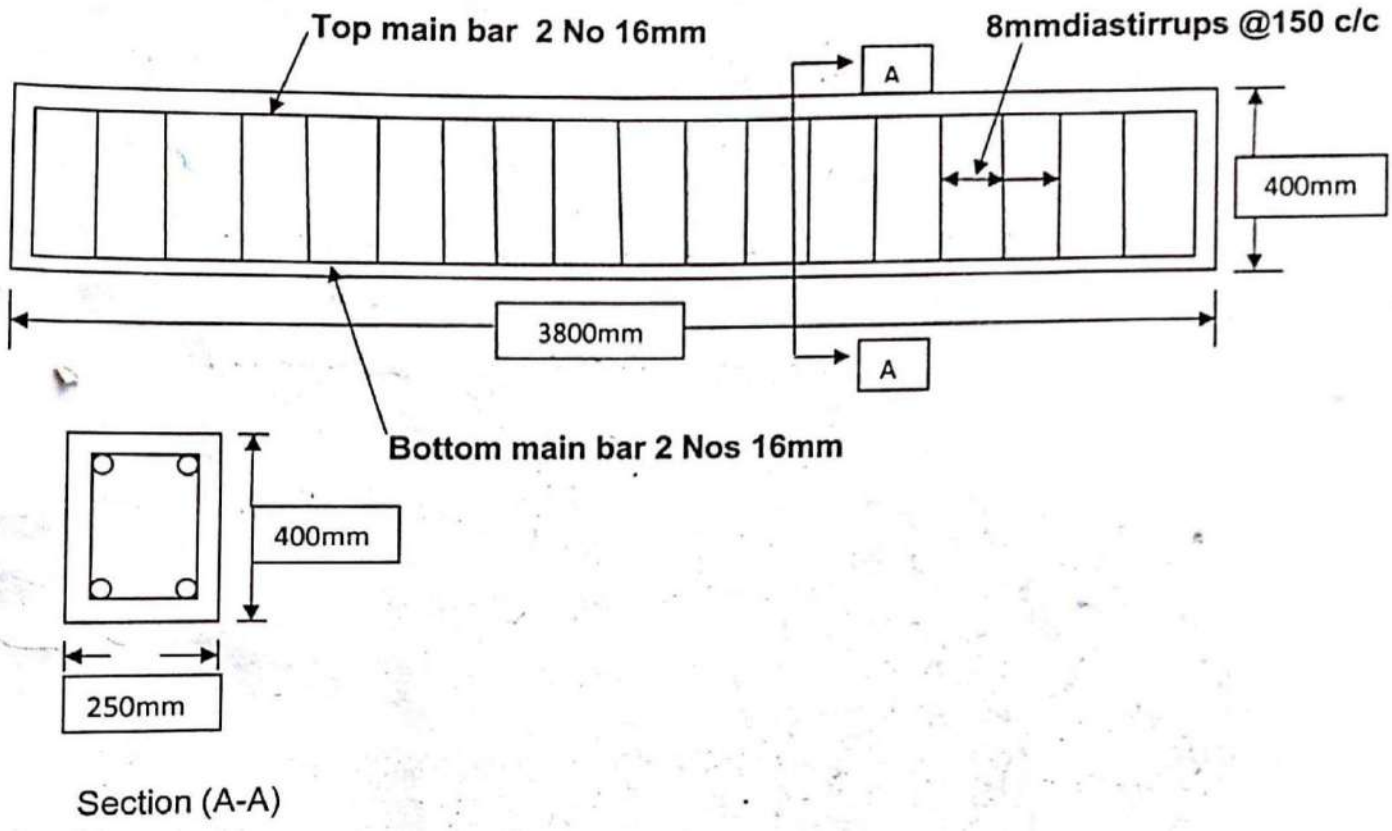
- Collect the necessary tools, equipment, consumables, and material, near work place.
- Let us know the step by step method for beam with shear bar.

- Before going to commence the work install work table, made out of bars on the work spot.
- Place top & bottom bars of the beam on the work table.

- Mark the spacing of ring on one bar starting from one end using measurement tape.
- Again bars using tri square, and transfer the spacing mark to the other bars by chalk.
- Place top bars on the work table & position.
- Insert all rings into the top bars one by one.
- While inserting ring keep the end hooks staggered alternately.
- Position the rings on the marking & tie by one using binding wires.
- Insert bottom bars into the rings from one end slowly.
- Position the L bend of the top & bottom bars to over lap top & other and tie the bars using binding wires.
- Position the rings on the marking and tie with the bottom bars using binding wires.
- While remaining position the rings keep them vertical to both top and bottom bars.
- Insert two shear bars in the cage for one end position.
- Mark the spacing of shear bars on two rings by using measurement tape on both sides.
- Position the top of crank on the marking and tie the shear bars with rings.
- Tie the junction of shear bars & rings at bottom using binding wires finally.
- Check the spacing & stability of the rings as per the assessment standards.

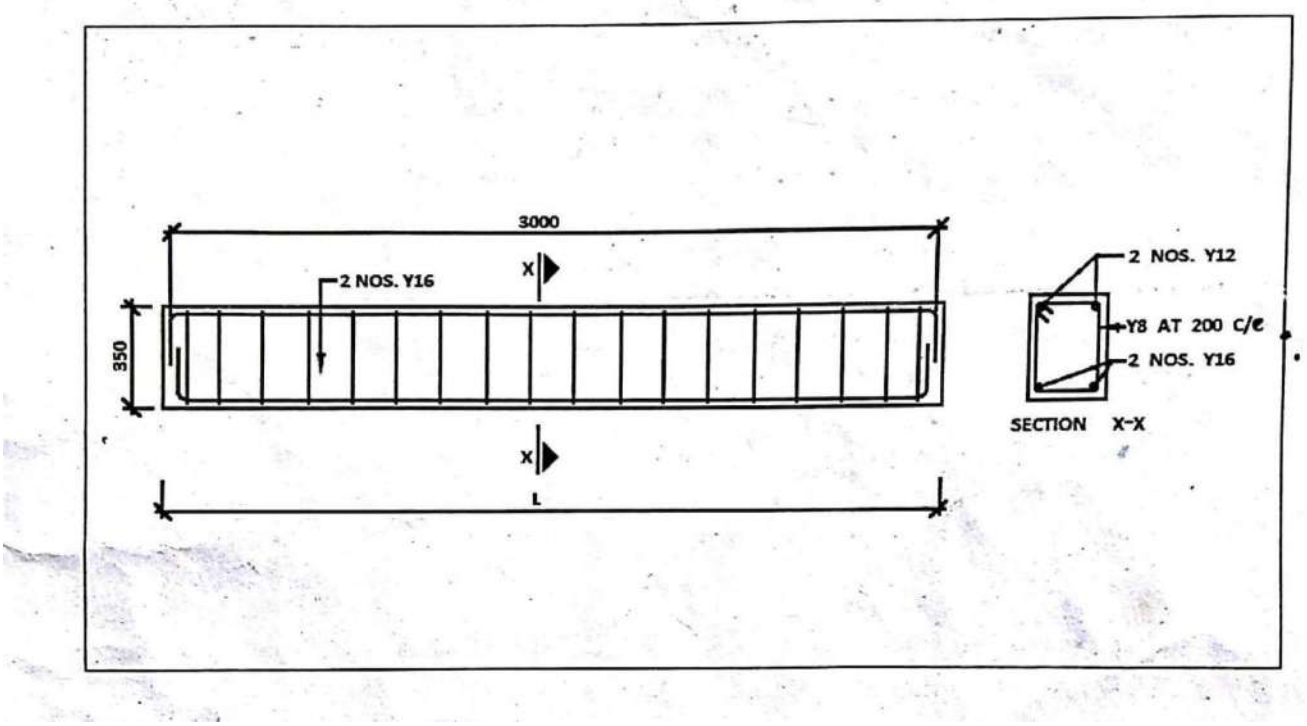
Observation/ Task-

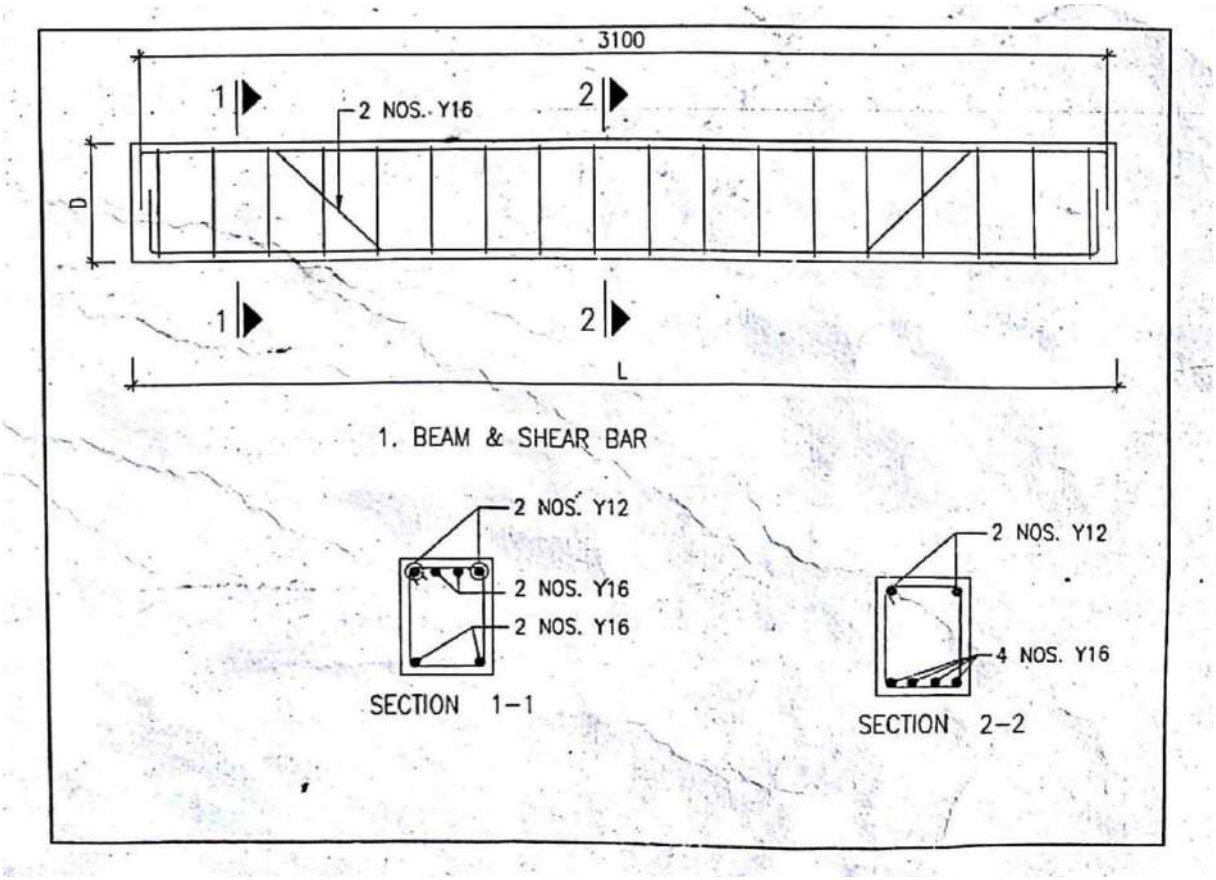
- Prepare a bar bending schedule for the given sketch of beam



Section (A-A)

Exercise Sketch:





Conclusion:

After this experiment, a student should be able to select, cut, bend and form cage for beam with shear bars as per sketch. Follow safe work procedure, check the correctness of dimensions of work done.

Aim of the experiment:

Bar bending and fabrication of reinforcements for a column.

Apparatus Required:

1. Bending Lever
2. Measuring Tape
3. Pin plate
4. Plomb bob
5. Binding hook
6. Bar cutting machine
7. Bar bending machine
8. Sledge and ball peen hammer
9. Chisel

Consumables-

1. Binding wire
2. Chalk piece
3. Line thread
4. Cotton waste

Safety gadgets-

1. Safety helmet
2. Safety shoe
3. Cotton and hand gloves

Materials-

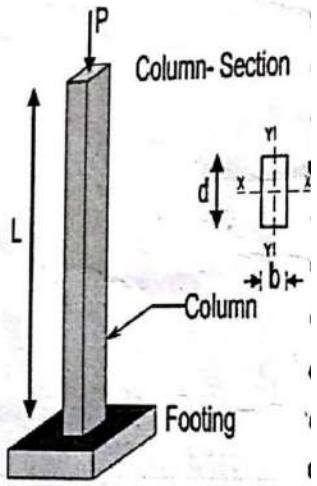
Steel rebar of different diameters

Theory:

Column:

- A column is a structural member provided to carry a compressive load and whose effective length exceeds three times its least lateral dimension.
- Column may be cast in any of the following shapes, square, rectangle, Circular, hexagonal, octagonal etc.
- In column longitudinal reinforcement is provided to resist compressive Loads along with concrete.
- Reinforced concrete column may be classified into:

1. Tied column: A tied column is provided with longitudinal steel bars held in positions by a number of separate ties at a uniform spacing.
2. Spirally reinforced column: A circular column provided with longitudinal steel bars wrapped by a closely spaced spirals.
3. Composite column: It consists of a structural steel or cast iron column thoroughly encased in concrete reinforced with Longitudinal and lateral or spiral reinforcement.
4. Concrete filled pipe column: It consists of a steel pipe filled with Concrete and May sometimes be provided with reinforcement.



Longitudinal reinforcement:

a) The cross sectional area of longitudinal reinforcement shall be not less than 0.8% of gross sectional area of column.

b) A minimum of 4 (four) bars have to provided in square/rectangle column, and 6 (six) bars in circular column.

c) The size of the longitudinal bars in a column shall be not less than 12mm.

d) Spacing of longitudinal bar measured along the periphery of the column shall not exceed 300mm.

e) The longitudinal bars shall not be less than 12mm in diameter.

Transverse Reinforcement:

a) It is in a form of lateral ties or spiral rings to give effective lateral Support to the longitudinal bars against buckling.

b) Transverse reinforcement shall not be less than $1/4^{th}$ of diameter Of largest longitudinal bar and in no case less than 5mm in dia.

Spacing of transverse links:

a) This shall not exceed the least of the following:

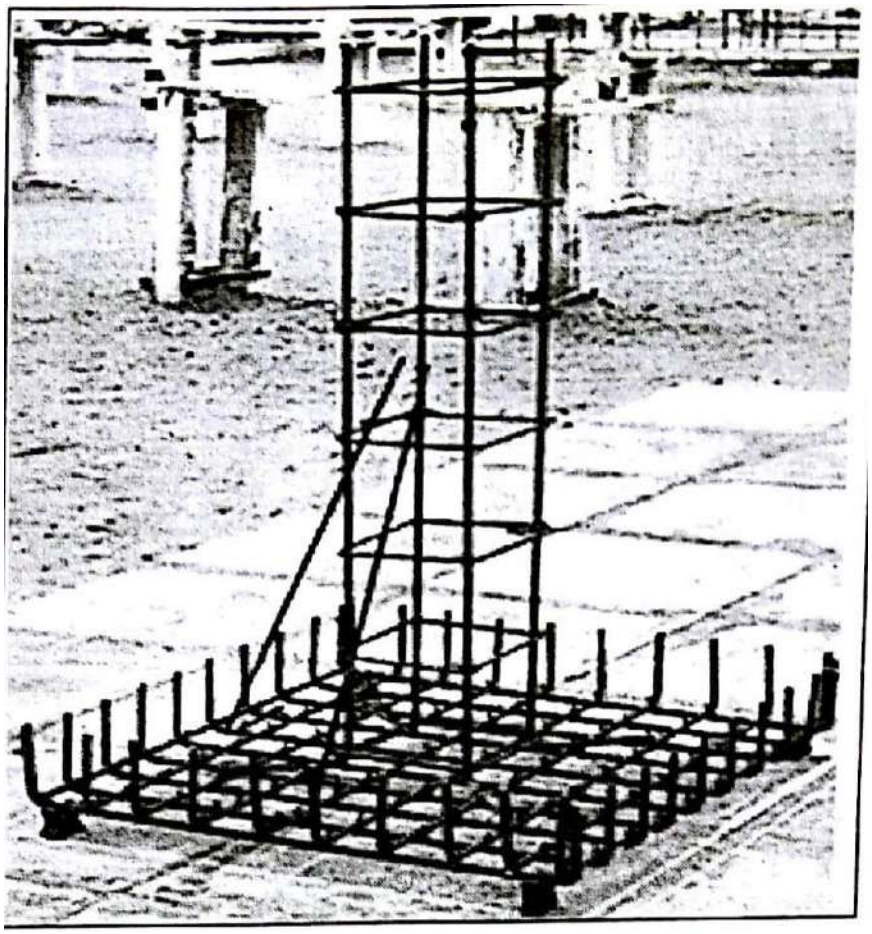
b) The least lateral dimension of the column.

c) Sixteen times the diameter of the smallest longitudinal reinforcement rods in the column.

d) Forty eight times the diameter of the transverse reinforcement.

e) Short and long column: A column will be considered as short when the ratio of effective length to its least lateral dimension is less than or equal to 12. When this ratio exceeded the column will be considered as a long column.

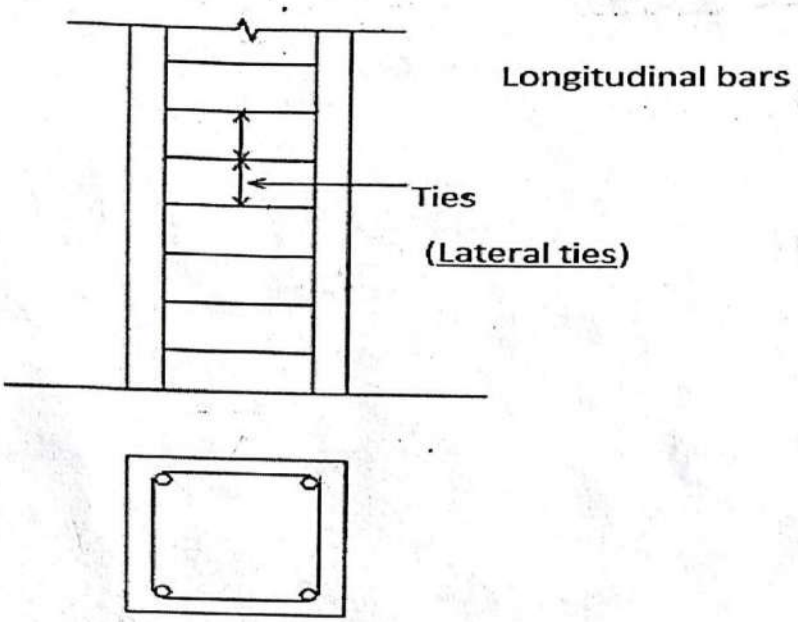
In buildings columns are provided to support the Roofing and flooring systems effectively and to Transmit the loads safely to the foundations. Column is also sometimes called as pillar.



Classification of column:

- Type of transverse reinforcement on the bases of transverse reinforcement this is tie, the column may be classified as.

Column with lateral ties:



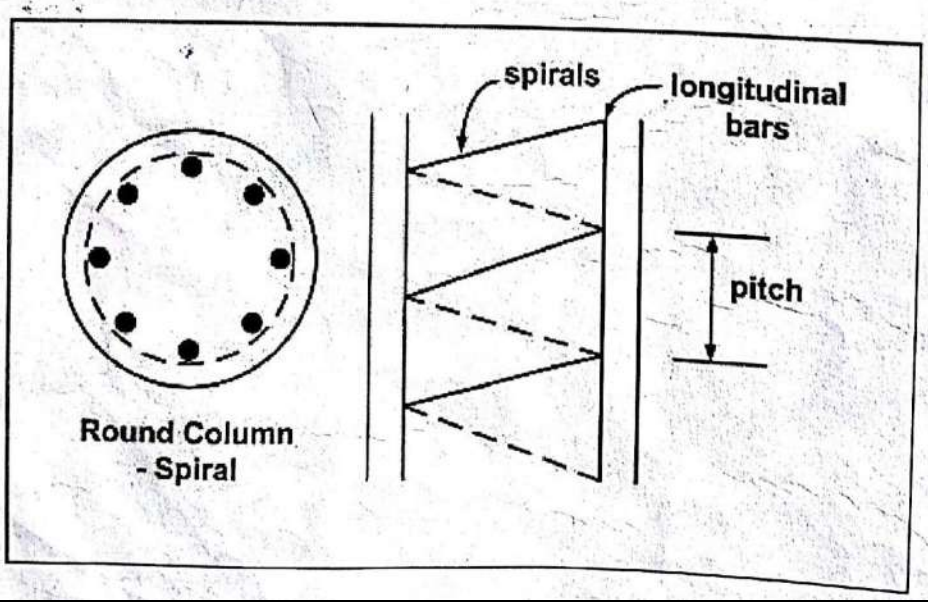
Helical reinforcement column:

- Under this the transverse reinforcement is provided in the form of lateral ties on linked at fixed spacing prefer the following figures.

Helical reinforced columns:

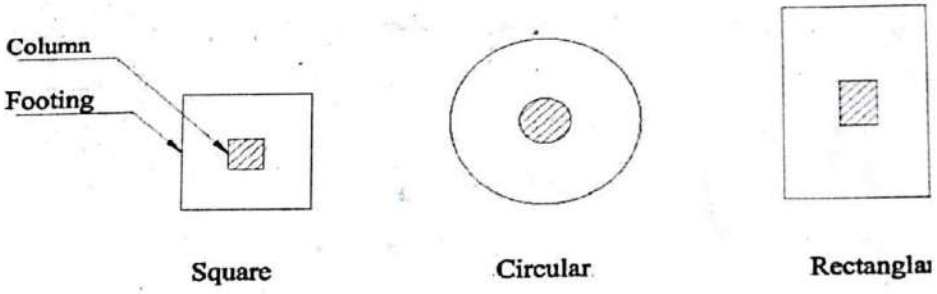
- In case of circular column the transverse reinforcement is provide in the formed of helical stands, place along the circular as shown in the

Column figure:



Shape of cross section:

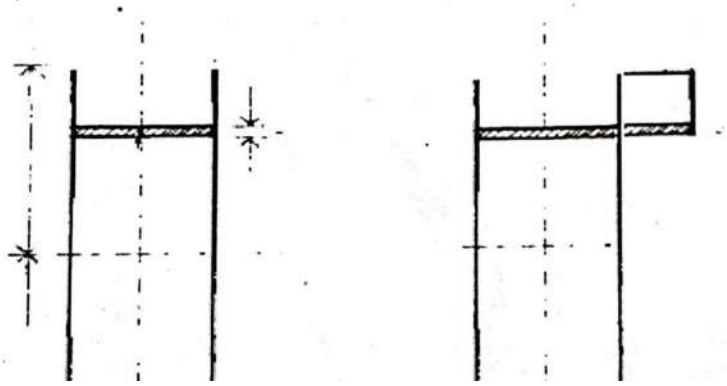
- On the bases of shape of cross section column may be classified as square, rectangular, circular etc.



Square Circular Rectangla

Nature of loading:

- The column is classified depending on natural of loading as axially loading column and eccentrically loading column.



Procedure:

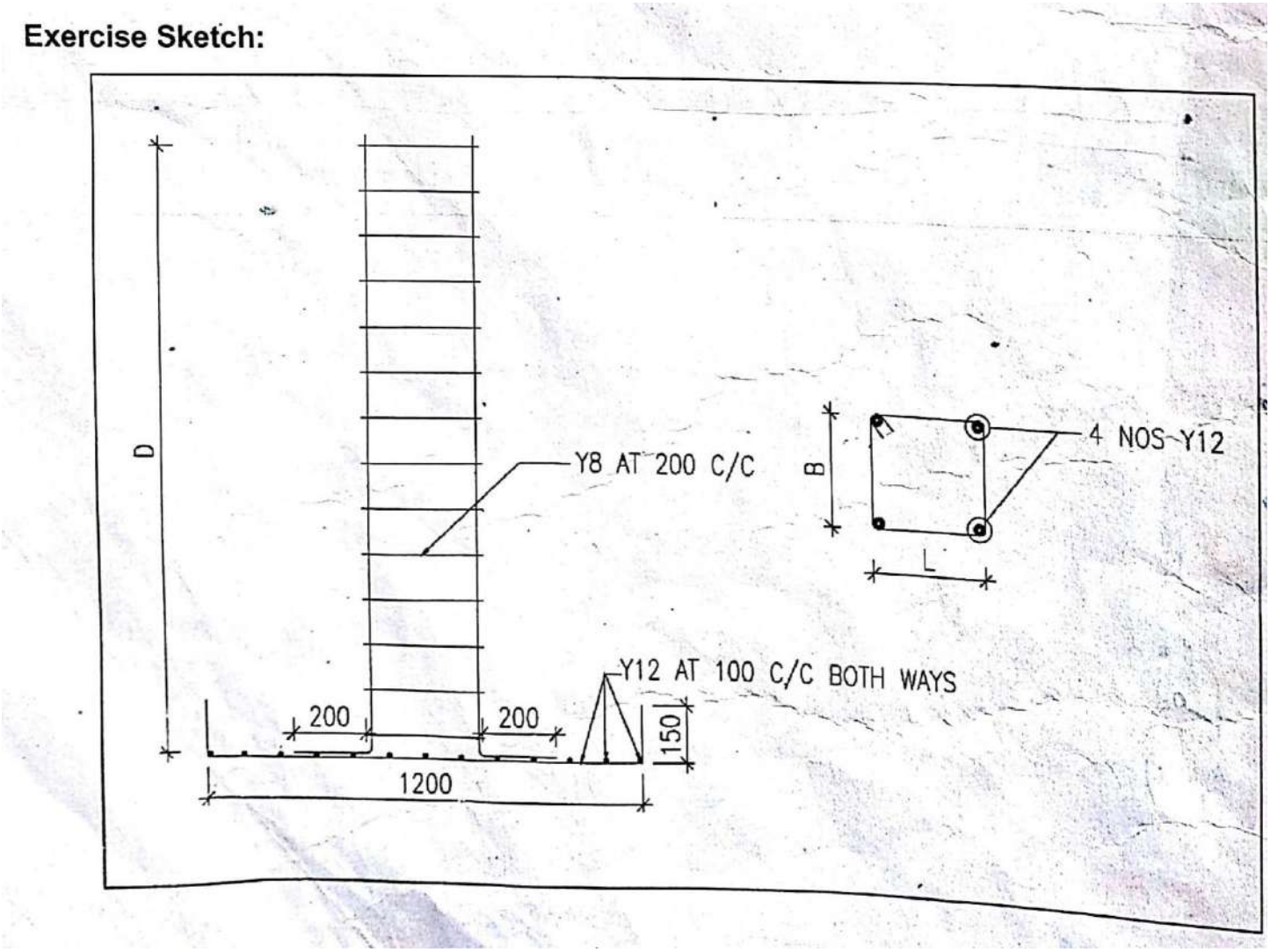
- Collect the necessary tools, equipment, consumables, and material, near work place.
- Let s know the step by step method for fabricating cage for column & its base set in position.

- Before going to commerce the work, mark the dimension of footing mat and column as per the sketch on the work spot.
- Mark the spacing of main bars on both sides of footing mat.
- Now place main bars one by one from one ends on the marking.
- Mark the spacing of distribution bars on the first and end main bars.
- Place two distribution bars in opposite direction above and marking on main bar.
- Tie the bars at the junction of two bars and the top of L bend with binding wires.
- Put cover block one each below the ties of the junction to two bars.
- Tie the distribution bars with balance main bars using binding wires.
- Place other distribution bars one the marking and tie with the main bars firmly by binding hook.
- After tying all footing mat bars place one column ring on the mat above the column mark
- New insert L- bend of one column bar in to the ring place diagonally on the mat and tie with binding wires.
- Insert place other three column bars diagonally into the using, the tie L- bend of the bar using binding hooks.

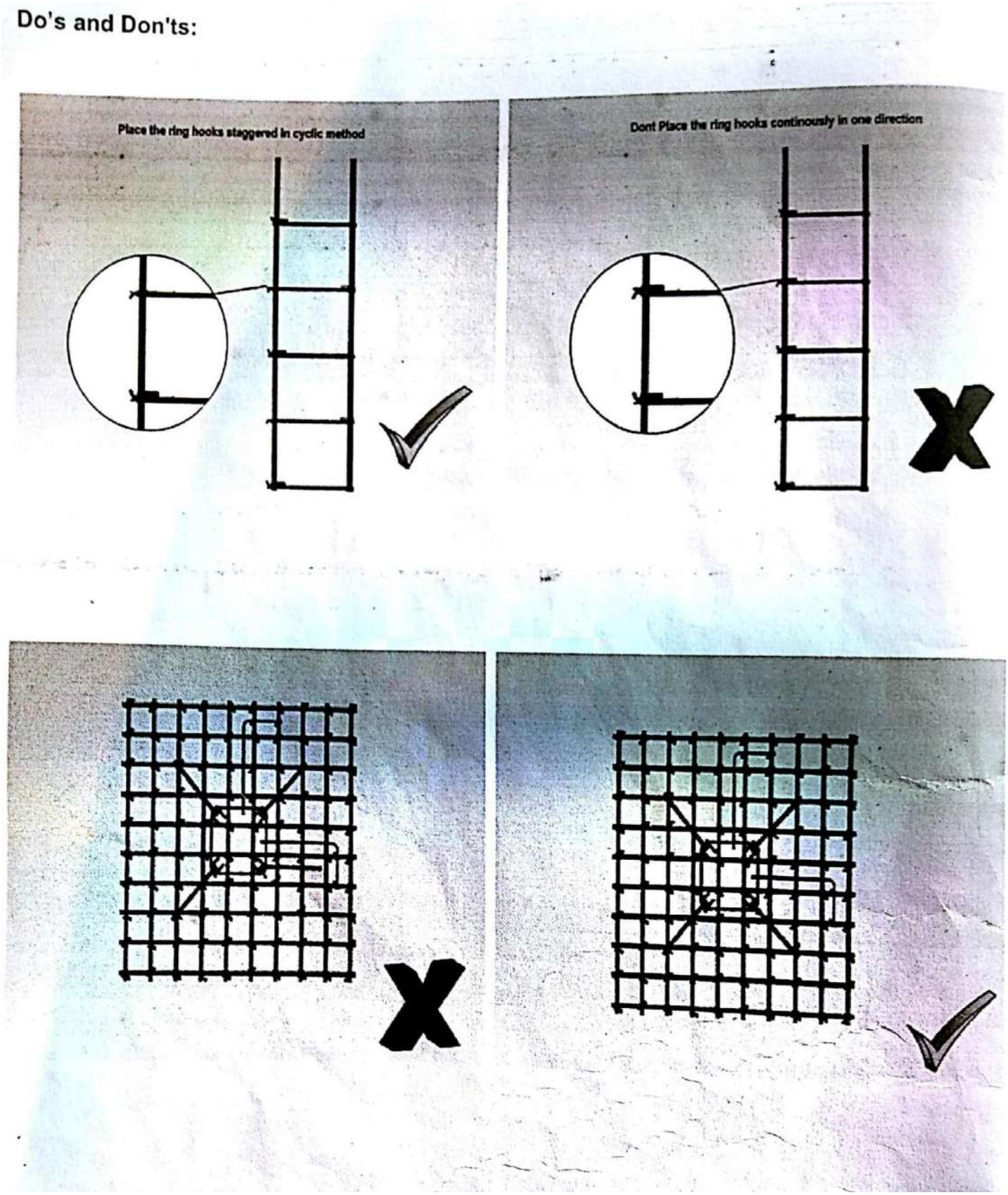
- Insert remaining rings into column bars one by one.
- Position the rings at the markings on the column bars one by one and tie security with column bars.
- Place one supporting bit rod on the mat and tie L position with the mat bar.
- Now check the vertically of the column bars on one side using plumb bob, align and set the column bars vertical, than secure the column cage be tying with the top of supporting bit bars.
- Place one more supporting bit bar on the adjustment side of the cage set the vertical of the column bars using plumb bob and tie with binding wires.
- Check the spacing of the main and distribution bars of footing mat and column rings using measurement tape as per the assessment standards.
- Check the vertically of the column using plumb bob on both sides of the cage as per the assessment standards.

Observation/ Task:

Exercise Sketch:



Do's and Don'ts:



Conclusion:

After this experiment, a student should be able to select, cut, bend and form in-situ cage for column and base as per sketch and schedule. Follow safe work procedure, check the correctness of dimensions of work done.

Aim of the experiment:

Bar bending and fabrication of reinforcements for a column with crank bars.

Apparatus Required:

1. Bending Lever
2. Measuring Tape
3. Pin plate
4. Plomb bob
5. Binding hook
6. Bar cutting machine
7. Bar bending machine
8. Sledge and ball peen hammer
9. Chisel

Consumables-

1. Binding wire
2. Chalk piece
3. Line thread
4. Cotton waste

Safety gadgets-

1. Safety helmet
2. Safety shoe
3. Cotton and hand gloves

Materials-

Steel rebar of different diameters

Theory:

Splices:

Splicing is required when a bar isn't long enough or a joint is required. Bars may be intentionally left short for constructability and transportation concerns.

Splicing is done in a staggered manner.

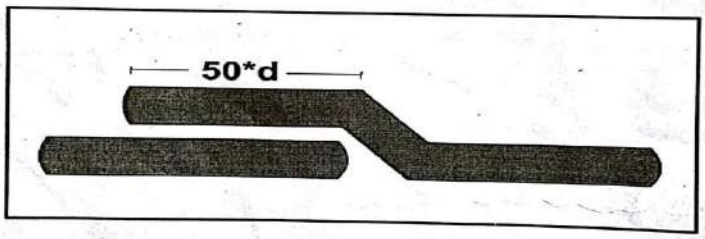
Lap Splices:

The preferred method of splicing two bars together is a lap splice, where the two bars overlap each other for some minimum distance. This distance is the splice length.

The "**kink**" in the bar is a symbol to indicate that the two bars are in physical contact and wired together.

Tie wires on splices are used to hold the bars in position. The strength of the lap splices comes from the bond of the bars to the surrounding concrete, not from the tie wire.

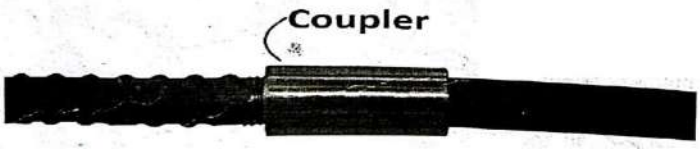
The splice length varies depending on the size of the bars, epoxy coating, strength of the concrete, and the structural requirements.



Mechanical Couplers:

It is sometimes necessary to attach bars together without the benefit of a lap splice. This requirement may arise due to geometric or constructability limitations. In cases where a splice is required, but a lap splice cannot be fit, a mechanical coupler may be used.

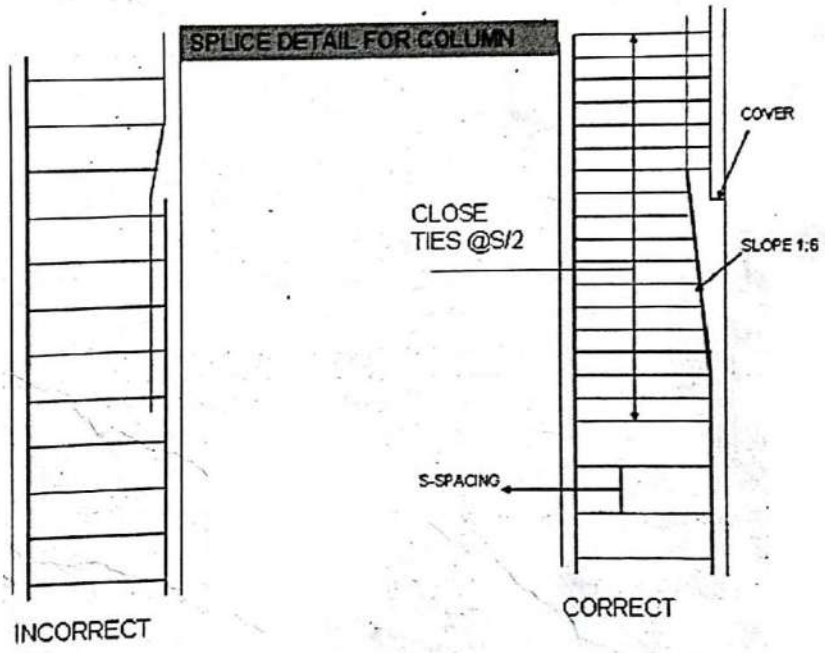
Mechanical couplers provide a physical connection between two bars.

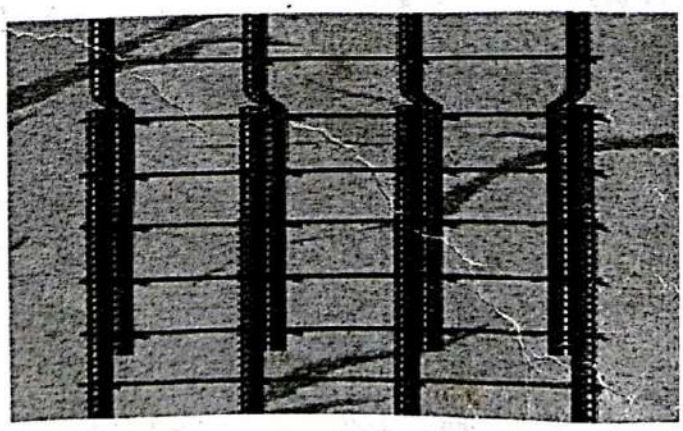


Welded Splices:

In cases where neither a lap splice nor a mechanical coupler can fit, it is acceptable to specify a welded connection between bars. Generally this occurs with especially large bars, where the lap splice length is long and mechanical couplers are exceptionally large.

- Splice is required to transfer force from none pant to another method of placing include lapping, welding & mechanical means lap slices should not be used for bars longer than 36mm for diameter bars may be welded in cage when welding is not practical in which are addition spiral 36mm may be permitted in which are addition spiral should be provided around the lapped bar to maintain proper cover to the main bar, bar shall be crank at the time of lapping for lapping make the joggle in bar dia is more than 12mm at the time of joggle maintain the slope is equal to 01 horizontal and 06 vertical (1:6) number of bar lapping at one section should not be more than 50% of the total no's of bar lap splice shall be consider as staged is the center distance of the splice is mat less than 1-3 times lap length.





Procedure:

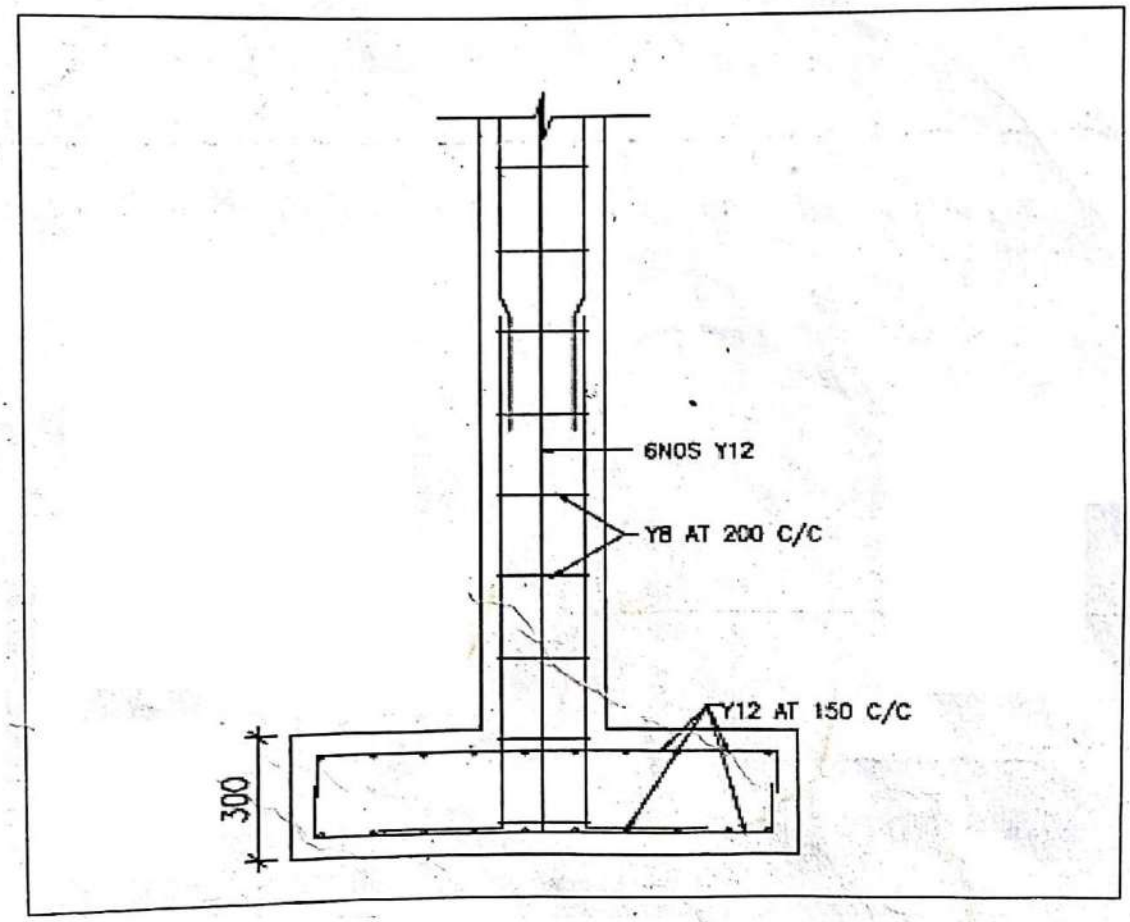
- Collect the necessary tools, equipment, consumables, and material, near work place.
- Let us the step methods for fabricating cage for column in corpora ting crank bar.

- Before going to commence the work mark the dimension of footing mat & column as per the sketch on the work spat.
- Mark the spacing of main bars on both side of footing mat.
- Now place main bars one by one from are end on the marking.
- Mark the spacing distribution bars on the first end main bars.
- Place two distribution bars in opposite direction above the marking on main bar.
- Tie the bars at the junction of two bras and the L bend with binding wires.
- Put cover block the bottom mat at bars corners & center of longer spans to avoid staging
- Place other distribution bars on the marking & tie with the main bar firmly.
- After tying all bottom mat bars place one column ring on the mat above the column marking.
- Now inset L bend of one column bar in to the ring place diagonally on the mat & tie with binding wires.
- Place one supporting bit bar on the adjustment side of bottom mat & tie the L bend on the mat.
- Now checking vertically of the column bar on one side using plumb bob, align & set the column bar vertical than secure the bar tying with of supporting bit bar.
- Insert two more column bar in to the same side of the ring, tie the L bend of the bars using binding wires & secure with supporting bit bar.
- Insert remaining three column bars one be one & tie in the similar method on the other sides
- Place three chairs on the bottom mat evenly & tie using binding wires.
- Place distribution bras of top mat upside down words over the chairs.
- Place main bars cover the distribution bars position on the marking & tie L bend at corners first & the other joints next similarly.
- Mark the spacing of rings on the column bars opposite to each other.
- Insert all rings into the column bars one by one staggered.
- Tie one ring on the stop marking & remove both supporting bit bras the column bars.
- Position all the rings at the marking on column bars & tie one by one.
- Insert on supporting bit bars in to the footing on one side & tie on the bottom mat.
- Now check the vertically the column bars using plumb bob, align & set the column bars vertical the secure the column cage may tying of the top of supporting bit bars.
- Place one more supporting bit bar on the adjustment side of the cage set the vertically of the column bans using plumb bob & tie with binding wires.
- Mark the spacing of rings on the two column bars above the top ring placed eqhliev
- Insert the crank / joggle bar position at middle short bar on one side of the column position & tie firmly at minimum two places tie top & bottom.
- Insert two more crank/joggle bars anther opposite side short bars, position & tie similarly.
- Now position one ring at the marking on the of column bars & tie one by one.

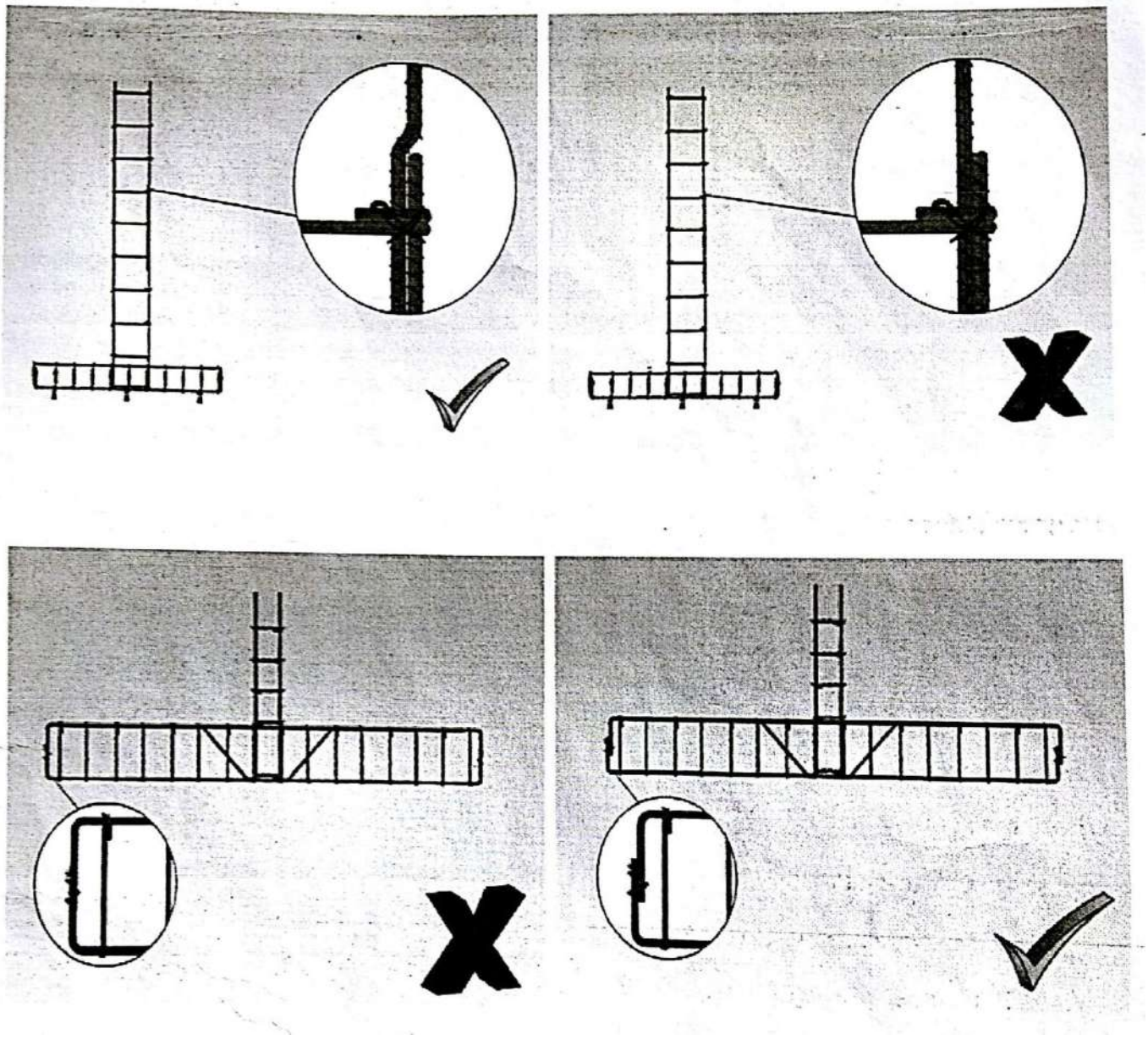
- Check the spacing of the main & distribution bars of footing top mat & spacing of column rings using measurement tape as per the assessment standards.
- Check the vertically of the column using plumb bob on both sides of the cages as per the assessment standards.

Observation/ Task:

Exercise Sketch:



Do's and Don'ts:



Conclusion:

After this experiment, a student should be able to select, cut, bend and form in-situ cage for column incorporating crank bars as per sketch and schedule. Follow safe work procedure; check the correctness of dimensions of work done.

Aim of the experiment:

Bar bending and fabrication of reinforcements for a slab.

Apparatus Required:

1. Bending Lever
2. Measuring Tape
3. Pin plate
4. Plomb bob
5. Binding hook
6. Bar cutting machine
7. Bar bending machine
8. Sledge and ball peen hammer
9. Chisel

Consumables-

1. Binding wire
2. Chalk piece
3. Line thread
4. Cotton waste

Safety gadgets-

1. Safety helmet
2. Safety shoe
3. Cotton and hand gloves

Materials-

Steel rebar of different diameters

Theory:

Slab is a shallow, reinforced concrete structural member that is very wide compared with depth, spanning between beams, girders or columns. Slabs are used for floors, roofs and bridge decks. They support the imposed loads directly and transfer the same safely to the supporting elements such as beams, walls, columns, etc.

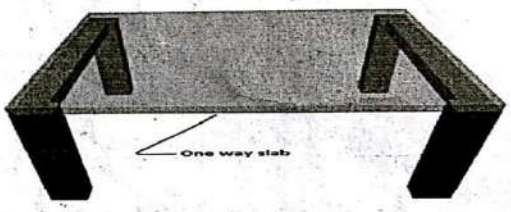
Classification of slabs:

- **According to number of supports provided in the direction of spanning:**

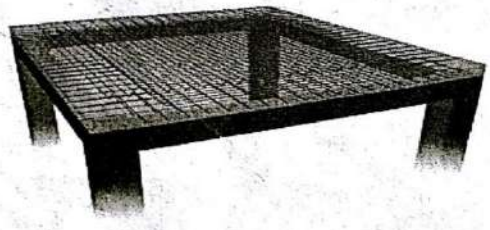
1. Cantilever slab (with one support)
2. simply supported slabs (with two supports), and
3. Continuous slabs (more than two supports)

- **Depending on the direction of spanning (direction of distribution of loads) :**

1. One way slab: When slab is supported along any two opposite edges only it is termed as one way slab. However the load on the slab is transferred to these two supports only and hence main reinforcement is provided in the direction perpendicular to the supported sides. The entire loads on the slab are carried by the short span only. Also the length by breadth ratio of one way slab is greater than 2.



2. Two way slab: When slab is supported along all the four directions and the load on it is distributed in both directions it is termed as two way slab. However the greater part of the loads is carried by short span only. In two way slab reinforcement is provided in both directions. Also the length by breadth ratio of two way slab is less than or equal to 2.



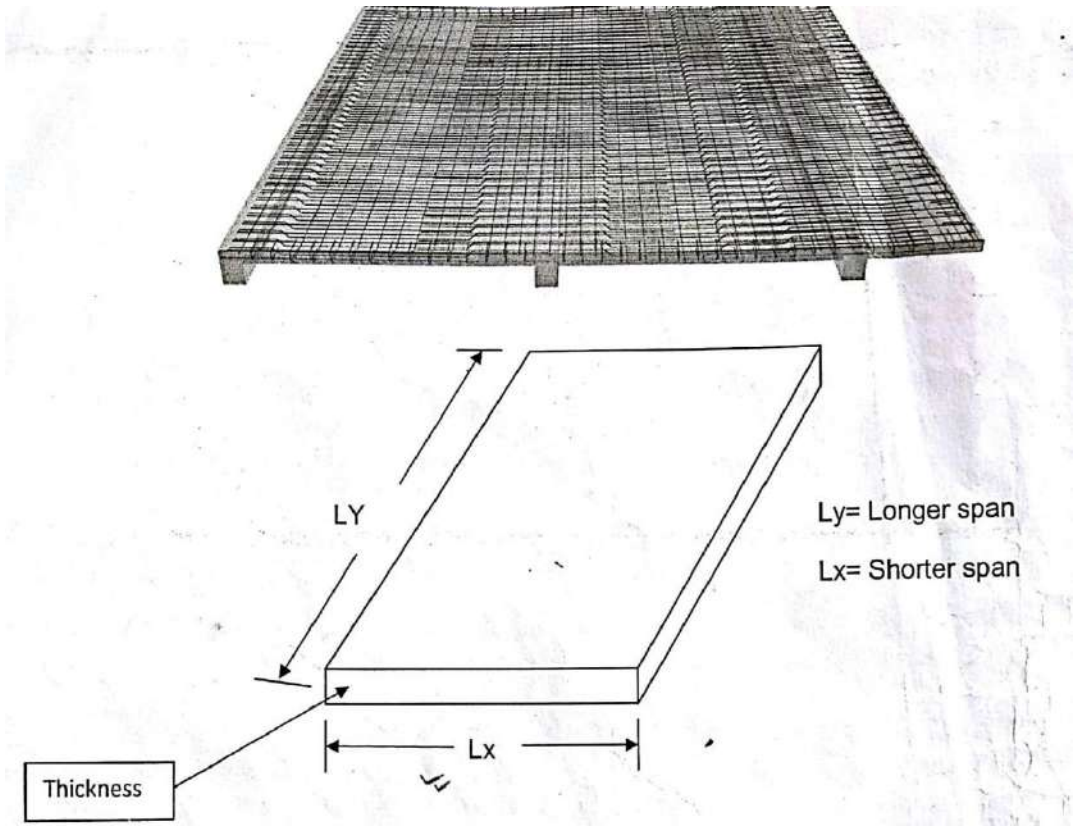
Reinforcement for slab:

Main bars:

1. The reinforcement shall not be less than 0.12% of gross sectional area when high grade Fe 415 bars are used and 0.15% of gross sectional area when mild steel Fe 250 bars are used.
2. The diameter of main bar may be 8mm or 10mm when Fe 415 steel is used and 10mm to 12mm when mild steel Fe 250 bars are used. The diameter of bar shall not exceed one-eighth of the thickness of the slab.
3. The maximum spacing of main bar shall not exceed the following:
   a) Three times the effective depth of the slab,
   b) 300mm.
4. The minimum spacing of the bars shall not be less than 75mm for satisfactory concreting.

Distribution bars:

1. The reinforcement shall not be less than 0.12% of gross sectional area when high grade Fe 415 bars are used and 0.15% of gross sectional area when mild steel Fe 250 bars are used.
2. Generally 8mm diameter bars of high grade Fe 415 steel are used.
3. The maximum spacing of main bar shall not exceed the following:
   I. Five times the effective
   II. 300mm



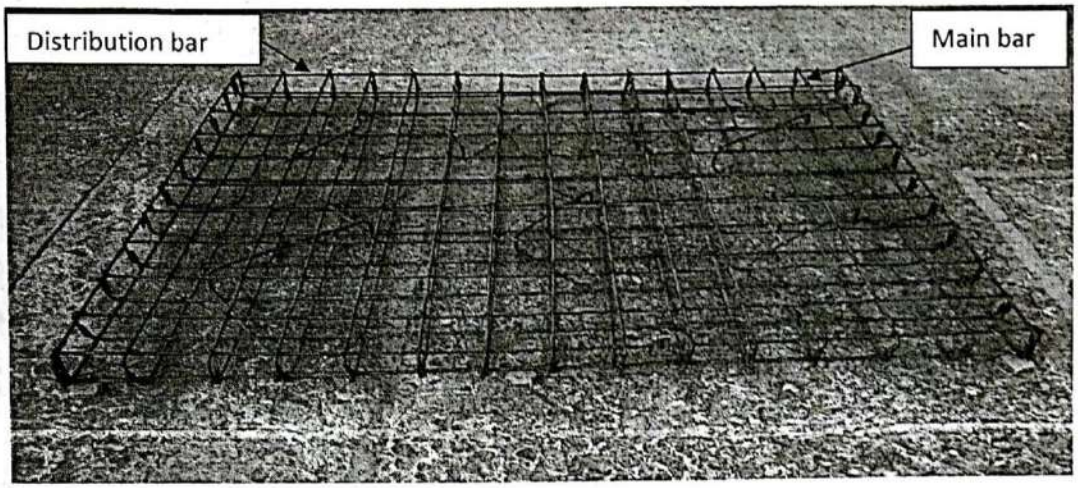
For the practical design purpose the slab is configures as under:

One way slab:

- One way slab are these in which the length in more than the twice of the breadth.
  Example No-01:
- The length of one slab is 8mt and breadth 3mt fined our find out whether the slab is one way on two way slab.

$\frac{LY}{Lx} = \frac{8}{3}$ = 2.66>2 (One way slab)

Two way slab:



- Something the slab are supports on four sides then the two way spanning action accrues types of slab are known as two way slab.
  Example No-01:
- The length of one slab is 4mt and breadth is 3mt find out whether the slab is one way on tow way slab

$\frac{LY}{Lx} = \frac{4}{3}$ =1.33 <2 (Two way slab)

- Prepare a bar bending schedule for given sketch of the slab.

Procedure:

Note:

- In one way slab main bar should be always shooter span direction.
- Generally, we provides 15mm clear cover to the reinforcement in slab but if main bar dia of bar
  (Main bar)
- The minimum dia of main bar should not be less than 8mm ∅

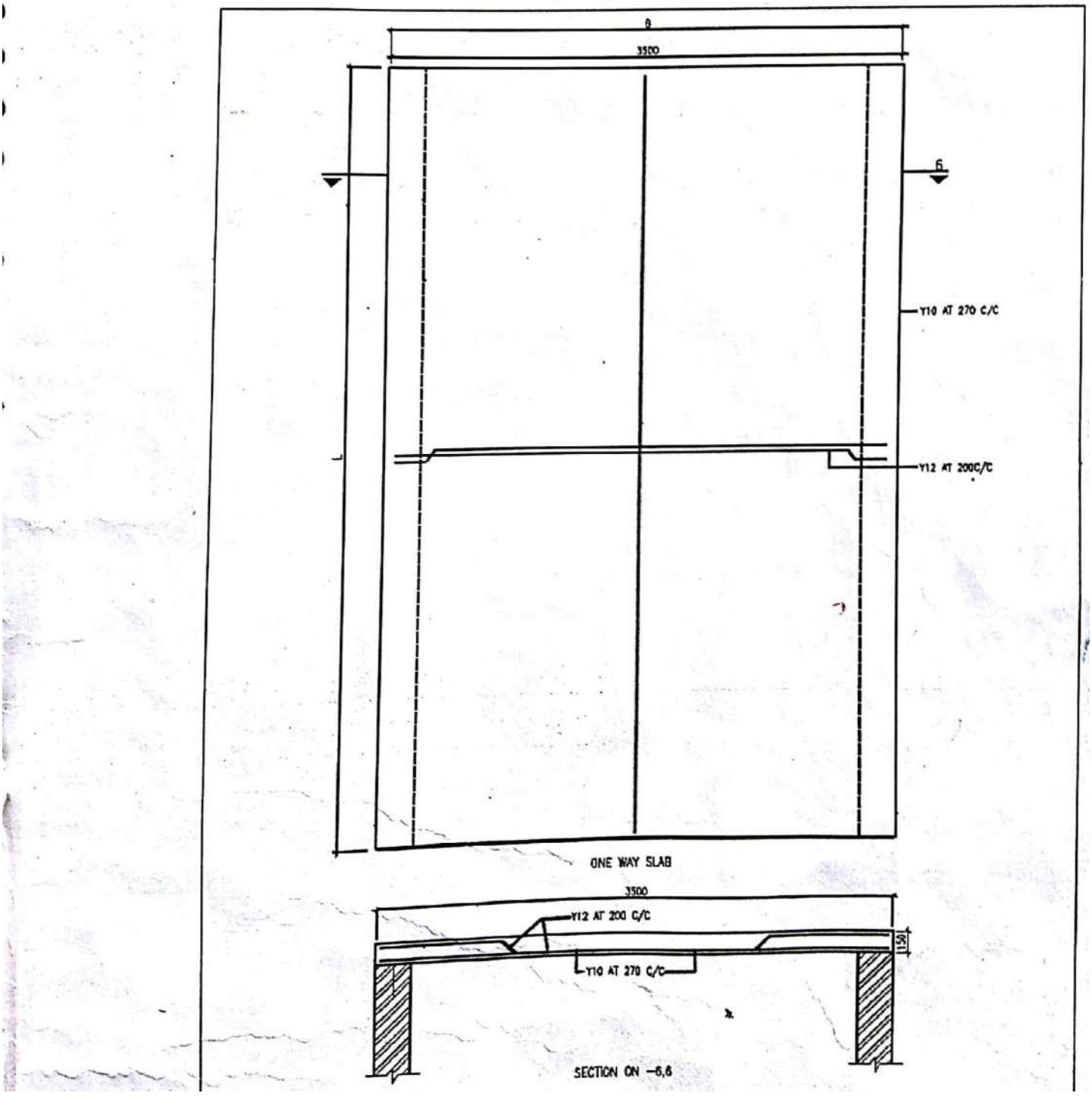
Method Statement:

- the necessary tools, equipment, consumables, and material, near work place.
- Mark the spacing of main and distribution bar on both sides using steel tape.
- Place eight distribution bar to gather on one longer and end mark the spacing of main bar.

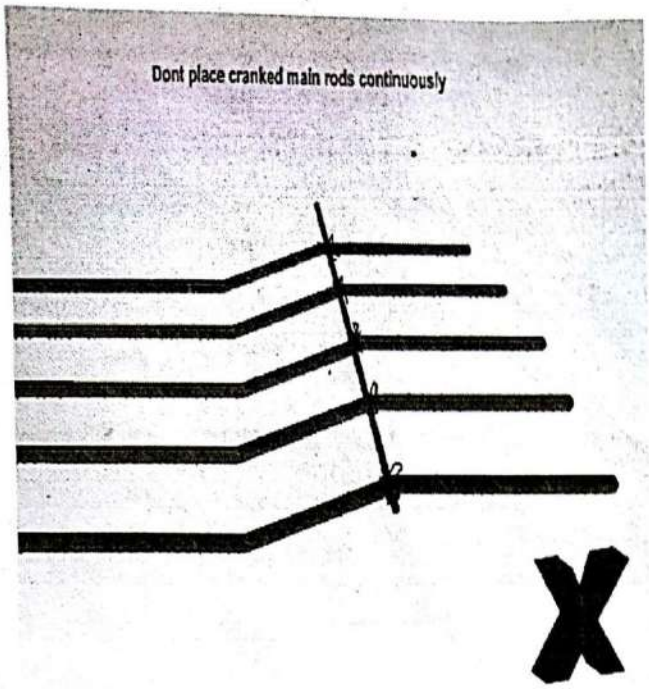
- Place one distribution bar on one end of longer side near the crank position of main bar.
- Place main bar over this distribution bar at alternate spacing.
- Lift and tie the distribution bar on the crank position at top.
- Place on more distribution bar on the opposite side on top of the main bar similarly hear the crank position.
- Place remaining main bar over the distribution bar similar to earlier position and tie the crank with distribution bar using binding wires.
- Check the straightness of cranked position of bar and align using line thread.
- Place distribution bar above the main bar 04 No's in cranked position and 06 No's in the middle position, position and tie using binding hook on the bottom mat.
- Place extra bar in cranked position over the distribution bar in between existing bar and tie using binding wire.
- Insert chairs between upper and bottom main bar in cranked position and tie using binding wires.
- Lift the slab mat and place cover blocks below junction of bar.
- Check the spacing of main & distribution bar of the slab and other parameters using assessment sheet.

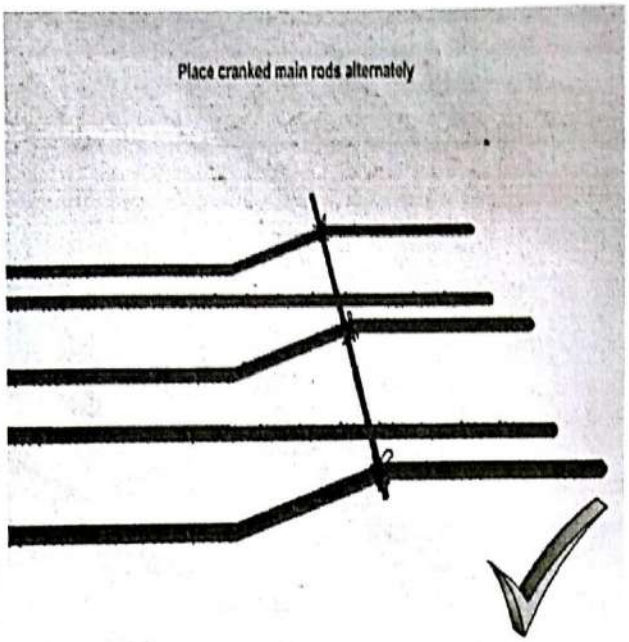
Observation/ Task:

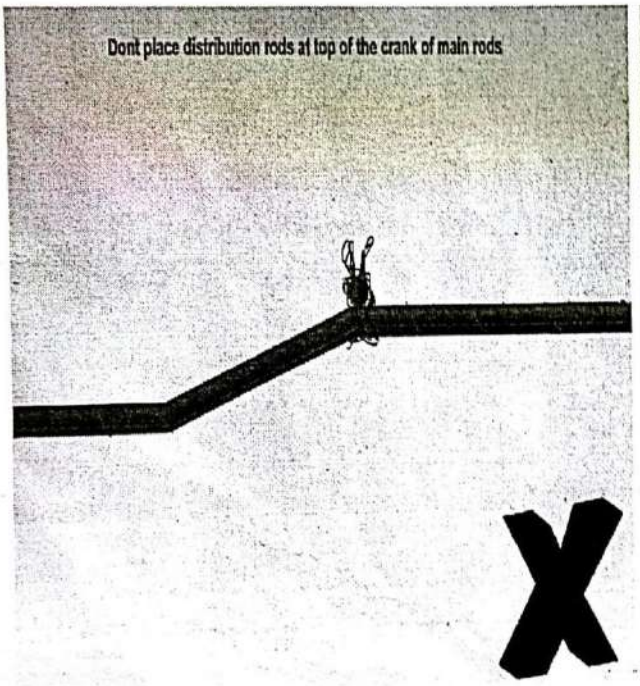
Exercise Sketch:

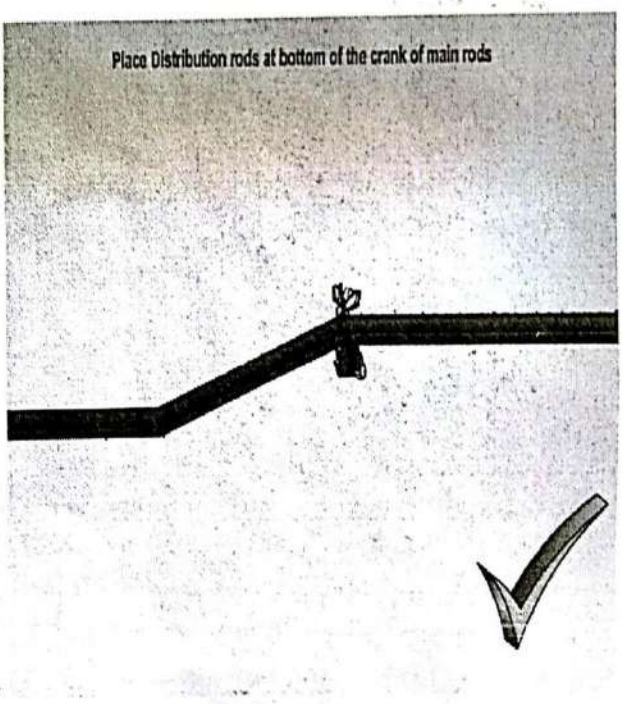


Do's and Don'ts:









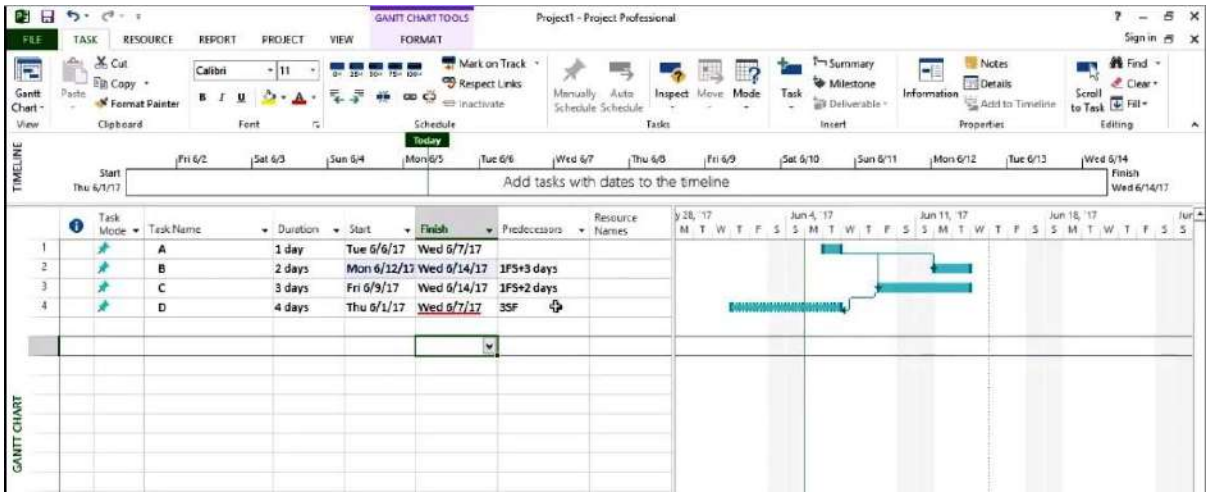
Conclusion:

After this experiment, a student should be able to select, cut, bend and form mats with end hooks for slab as per sketch. Follow safe work procedure, check the correctness of dimensions of work done

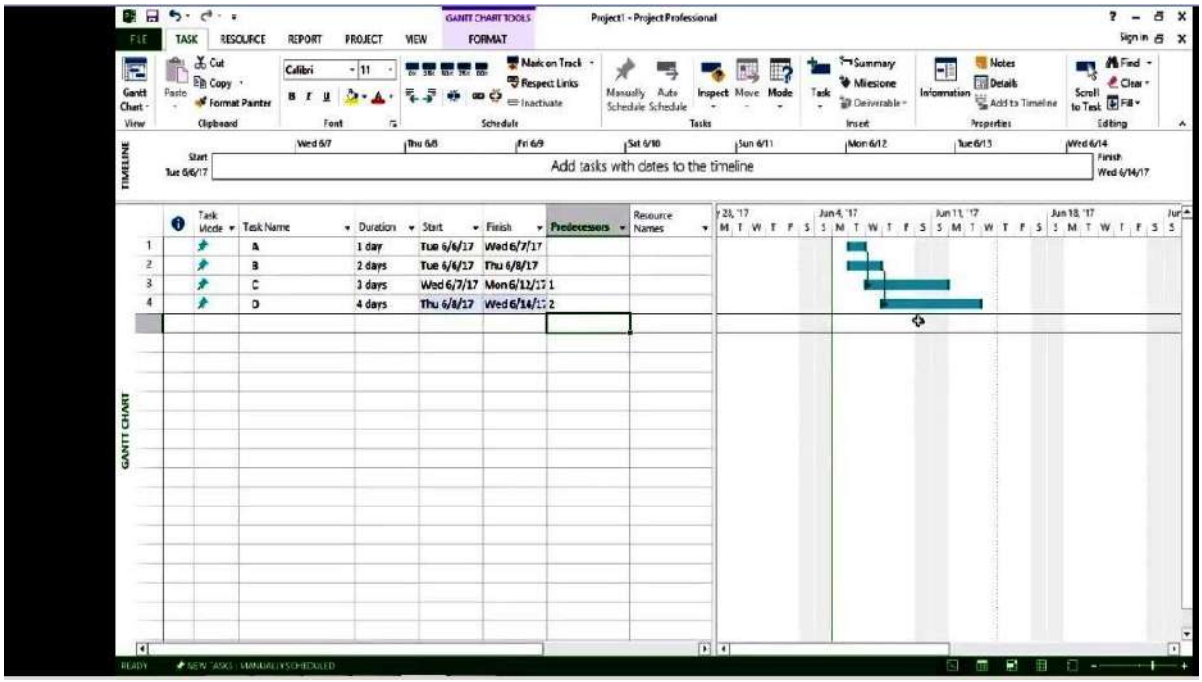
Aim of experiment- Types of predecessors

Procedure-

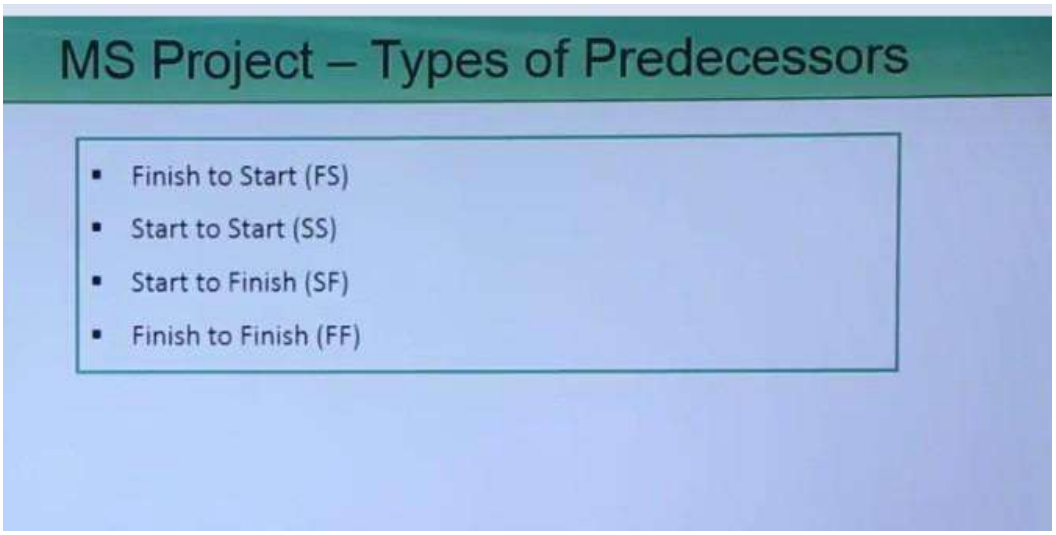
1. To define relation between 2 successor tasks, we use predecessors.

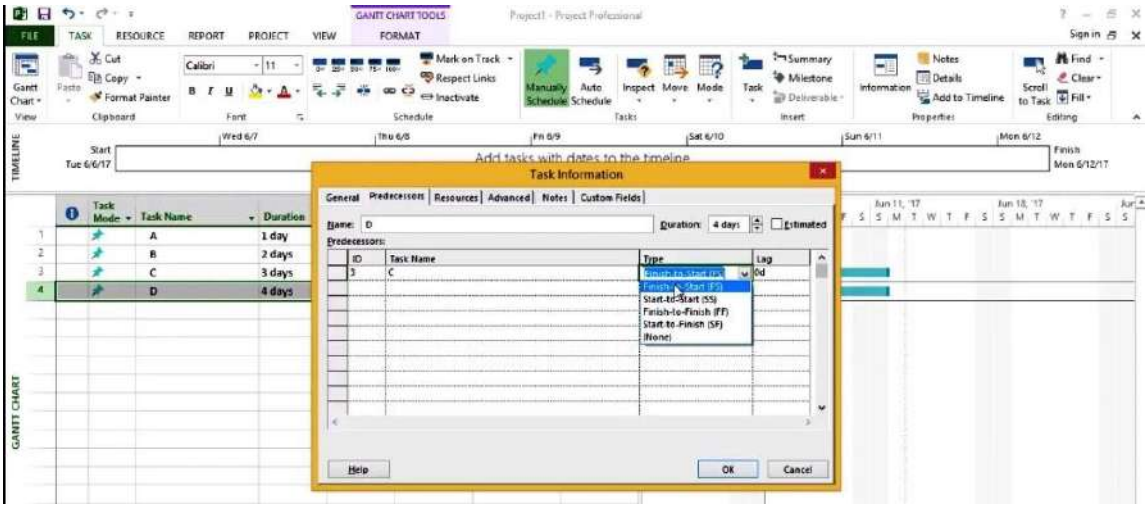


2. Under task name col. Type A Enter ↵
3. Task mode -> manually schedule
4. Take duration- 1 day
5. In start col. Assign date
6. Finish automatically taken
7. Take task B- duration -2 days
8. On the right side blue horizontal lines show Gantt chart
9. Take task C and D for 3 and 4 days
10. For task names no.s associated are test ids (1,2,3,…)
11. Make prede. Of C as A, (in pred. col. Right click insert col. Shows various options)
12. For C type 1 Enter ↵
13. Take B as pred. of D, in D line type 2 in pred col.
14. In this case start dates also changed.
15. In D st. date also same as finish date of B.



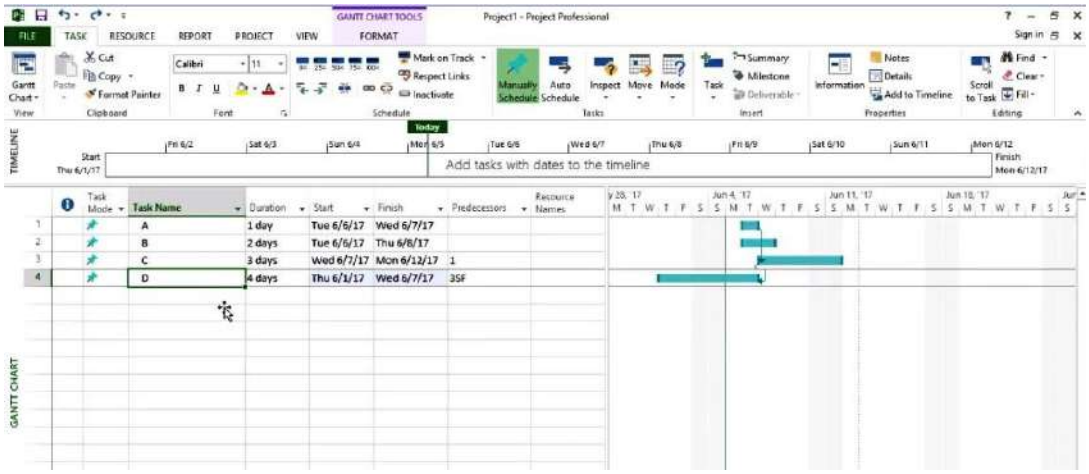
Types-





16. Double clk on task- Task info- pred.- type of pred.

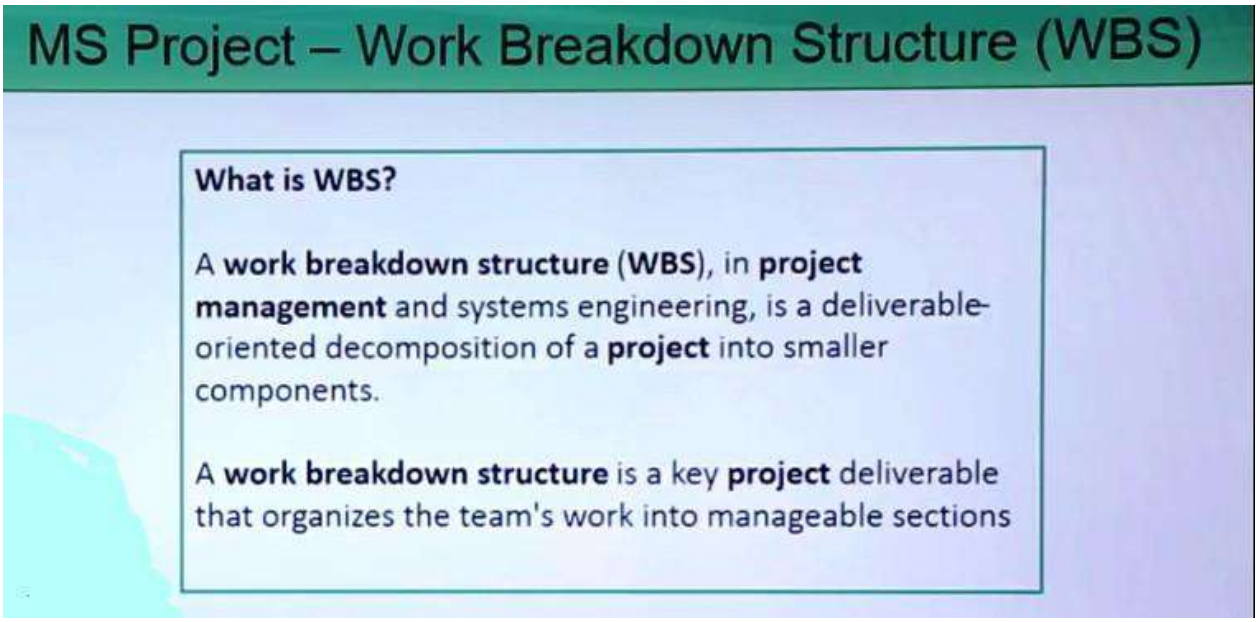
17. Task name A/B/C
18. Choose C- type col. Clk ⌄->it shows 5 types of pred.
19. Choose 1st- ok
20. D starts after C ends
21. If we choose SS (start to start)- D begins along with C simultaneously.
22. In pred. col.- 3SS- tasks C and D starts at same time.
23. If we choose FF (finish to finish)- task C and D finish simultaneously

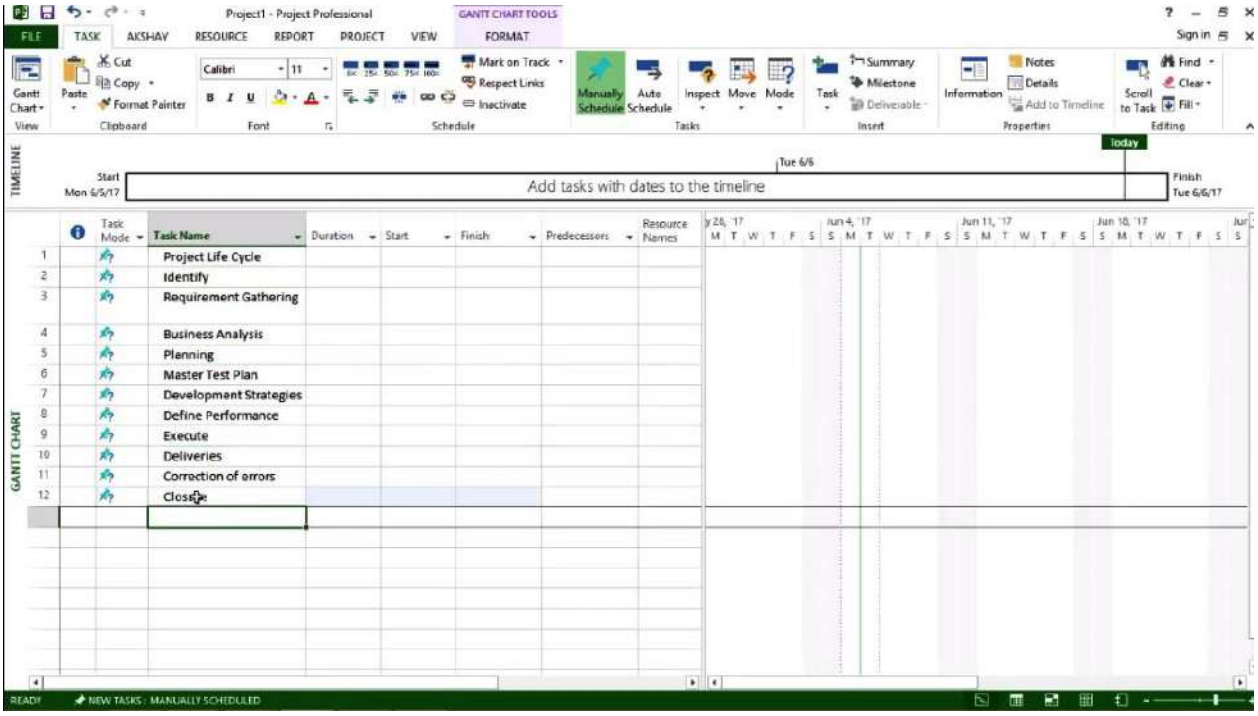


24. Lag- Clk on C- choose task A- lag- 2 days –ok
25. C starts after 2 days gap of finishing A. Also we can type the relation.

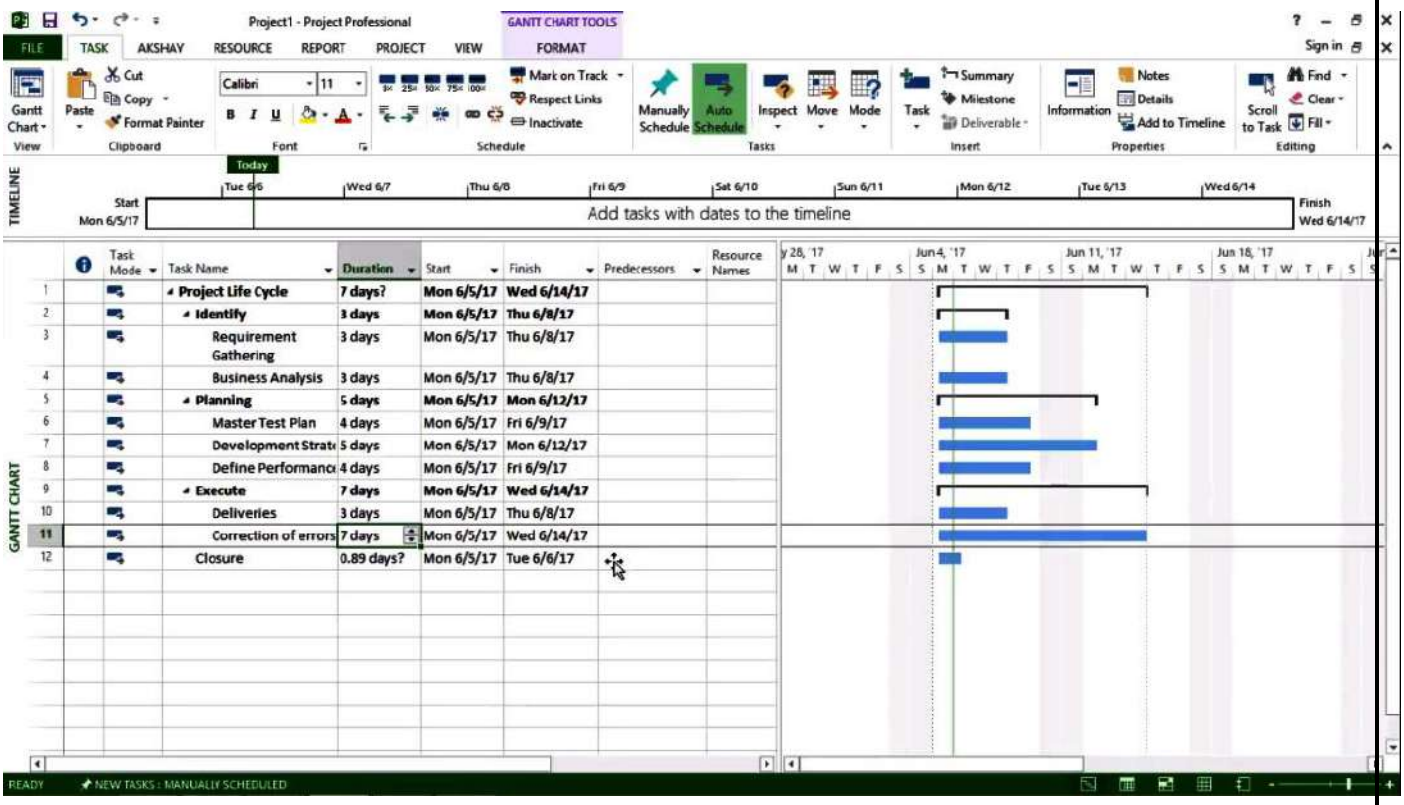
****

Work Break down Structure-

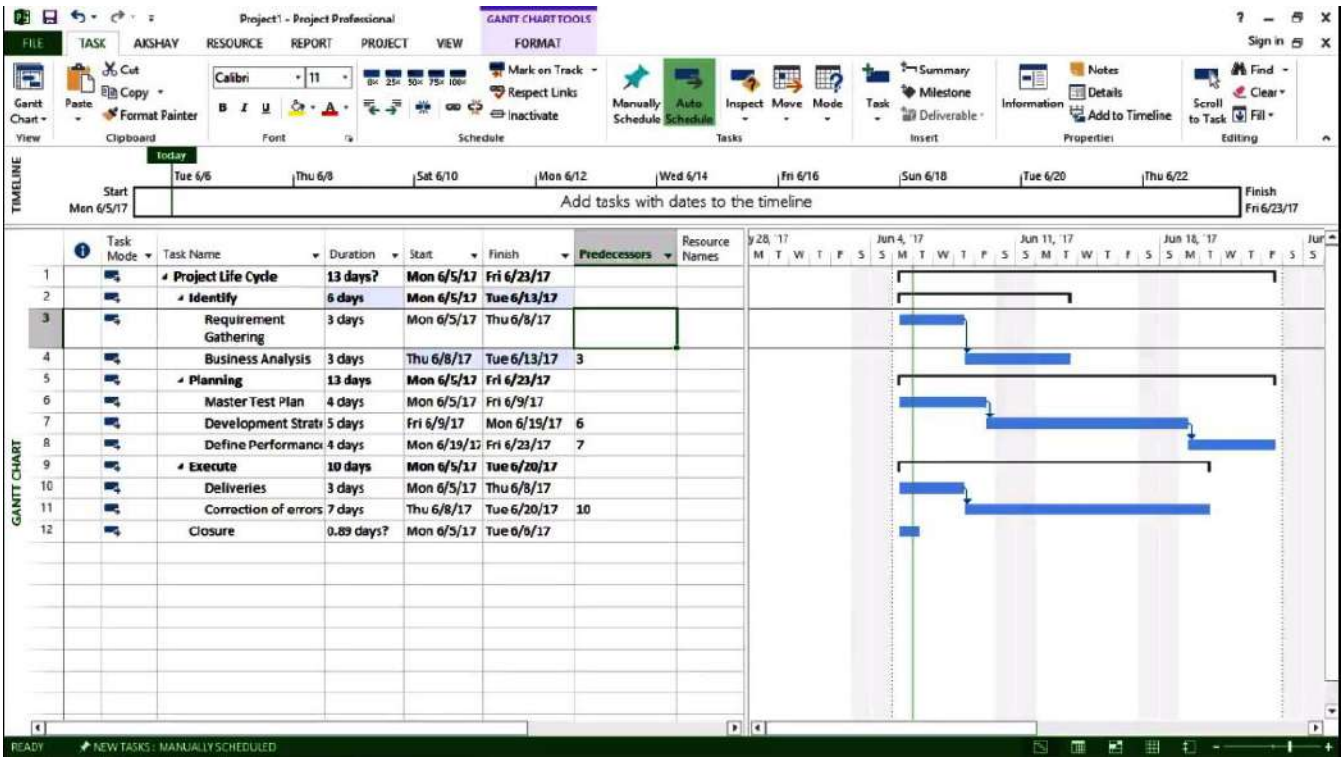




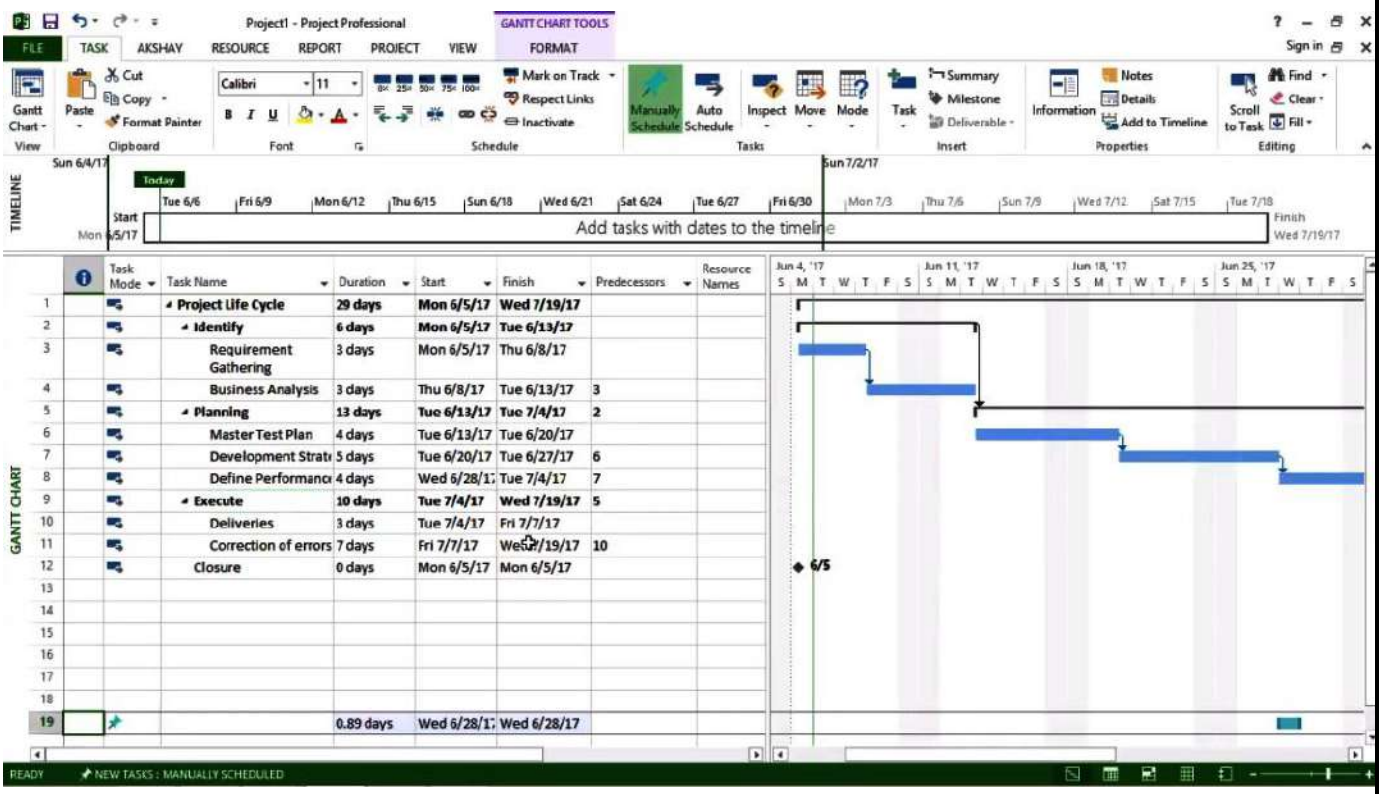
1. First we take different tasks and sub tasks.
2. As shown above we have to link different components.
3. For this we select the sub components/ tasks. Then go to Task- Indent task (-> ⁼)
4. Repeat for other tasks.
5. Assign durations.
6. Select all. Then auto schedule.



7. Make corrections to total no. of days by assigning pred. to tasks.

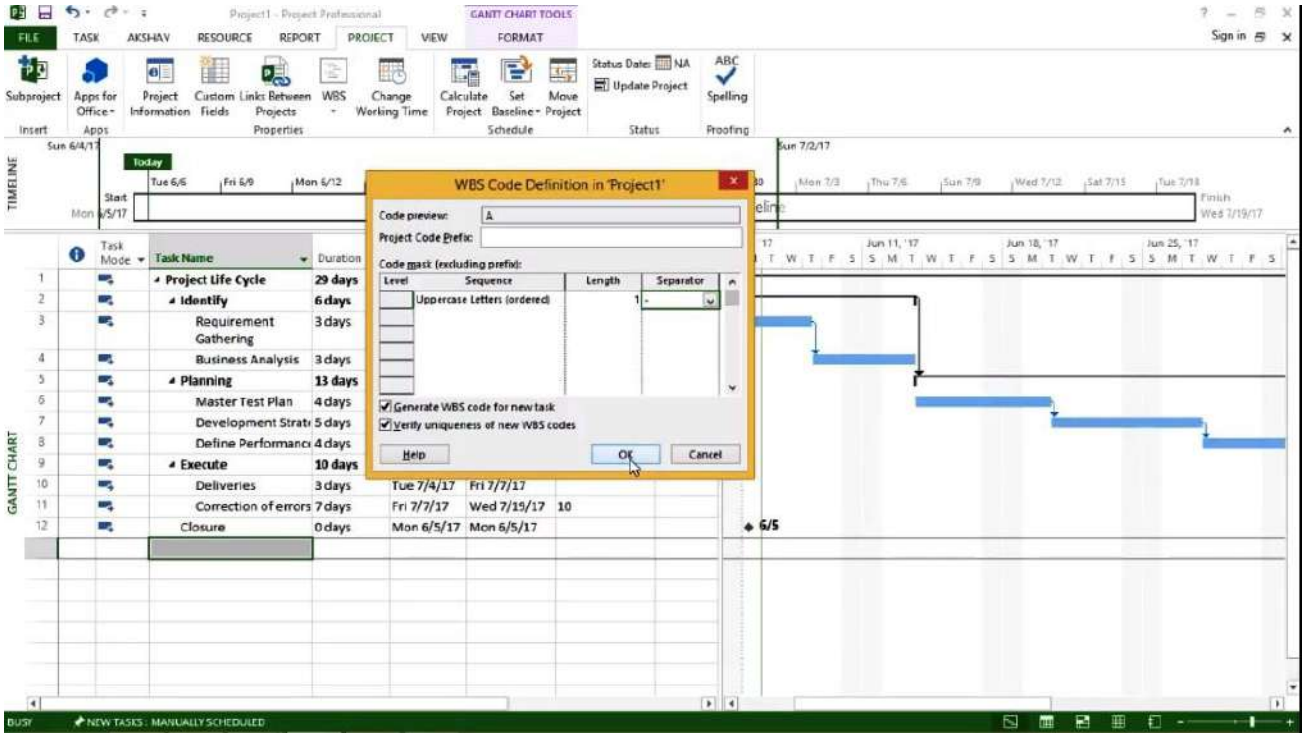


8. Then we interconnect the main tasks by indent options
9. Take closure duration=0 days.

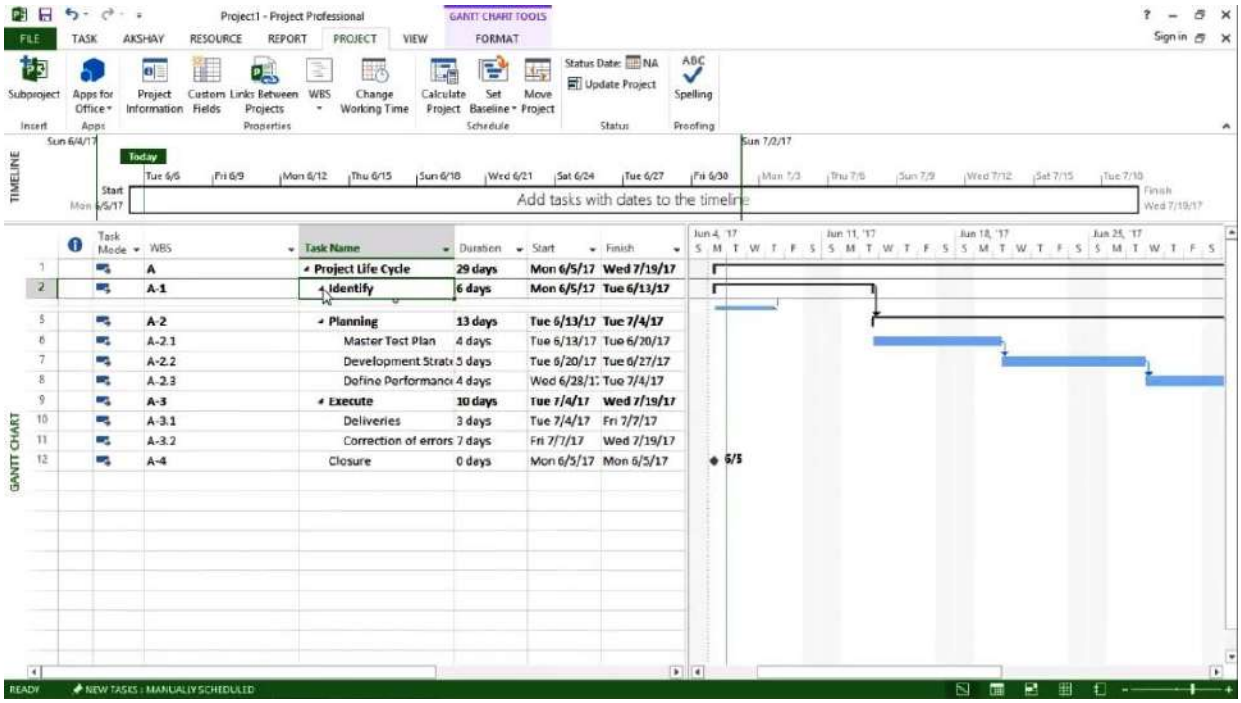


Naming in WBS-

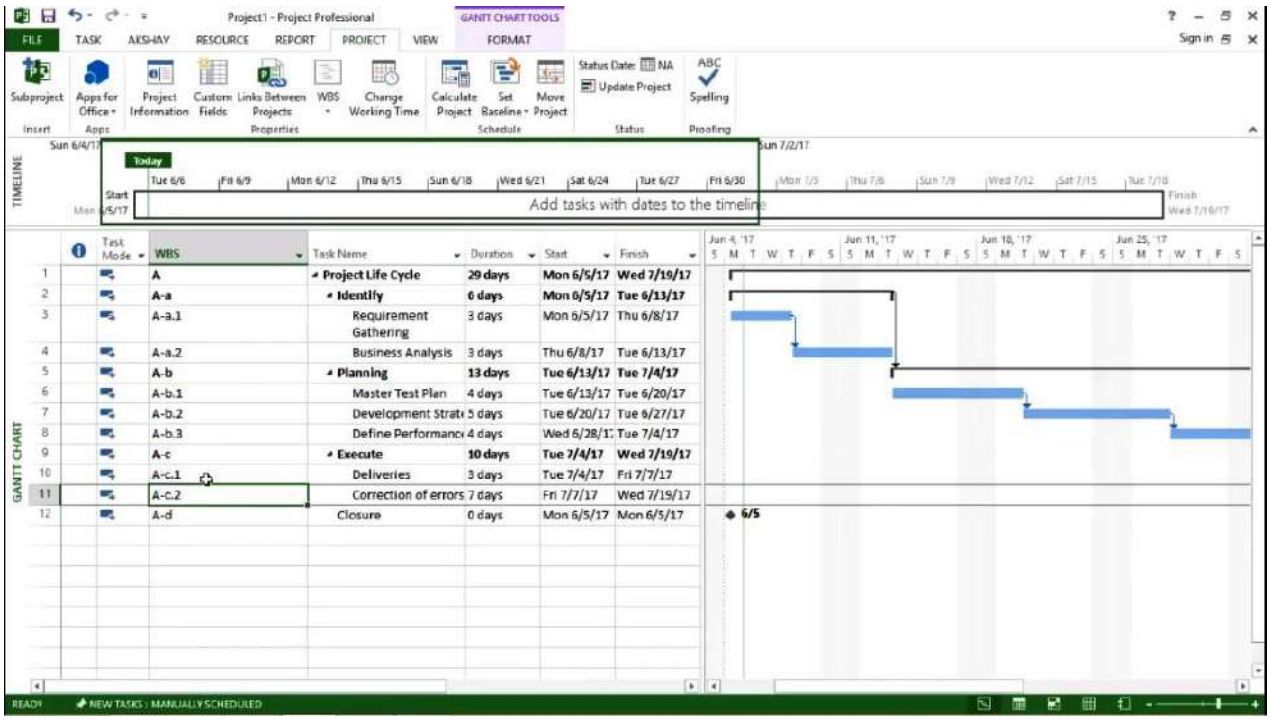
1. In project tab – WBS- Define code
2. In Sequence optn. Choose upper case letters, take length-1, separator-> -(hypen)
3. Ok



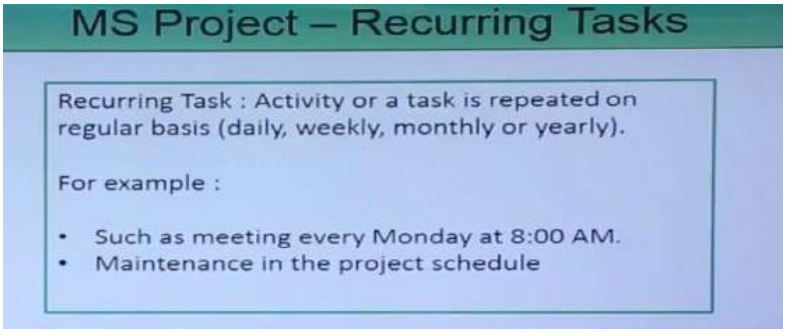
4. Add column- choose WBS
5. Main proj.- Project life cycle
6. All other tasks are indented



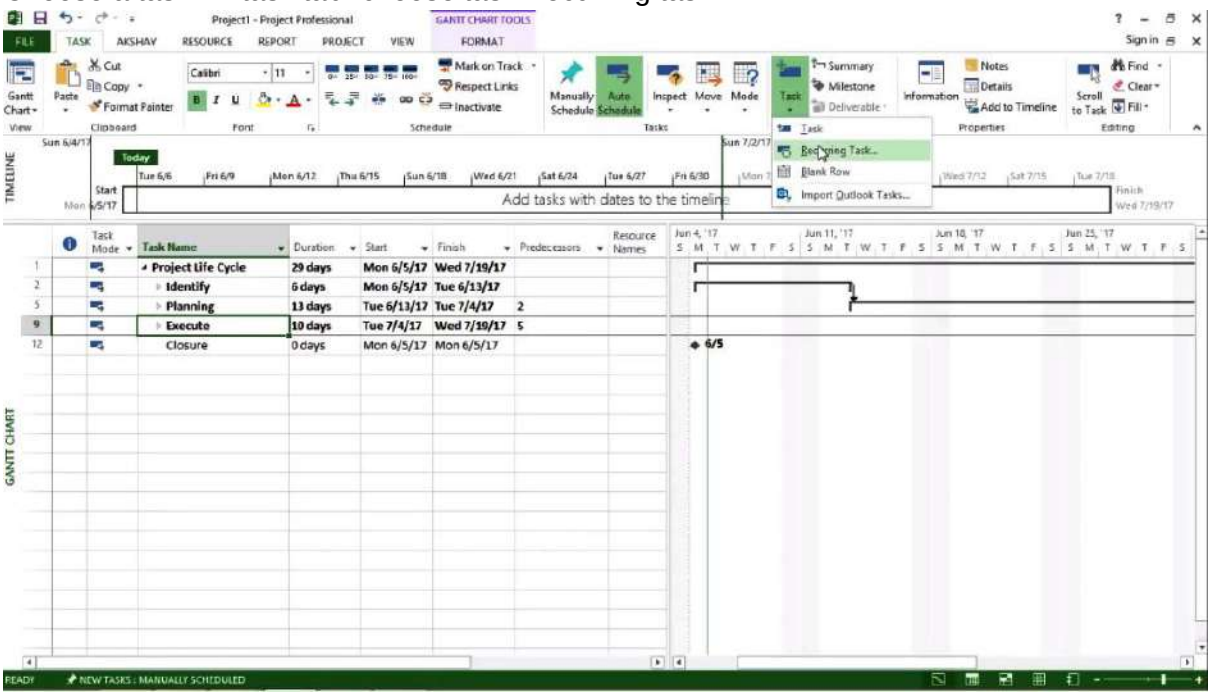
7. For large projects, choose lower case also in define code



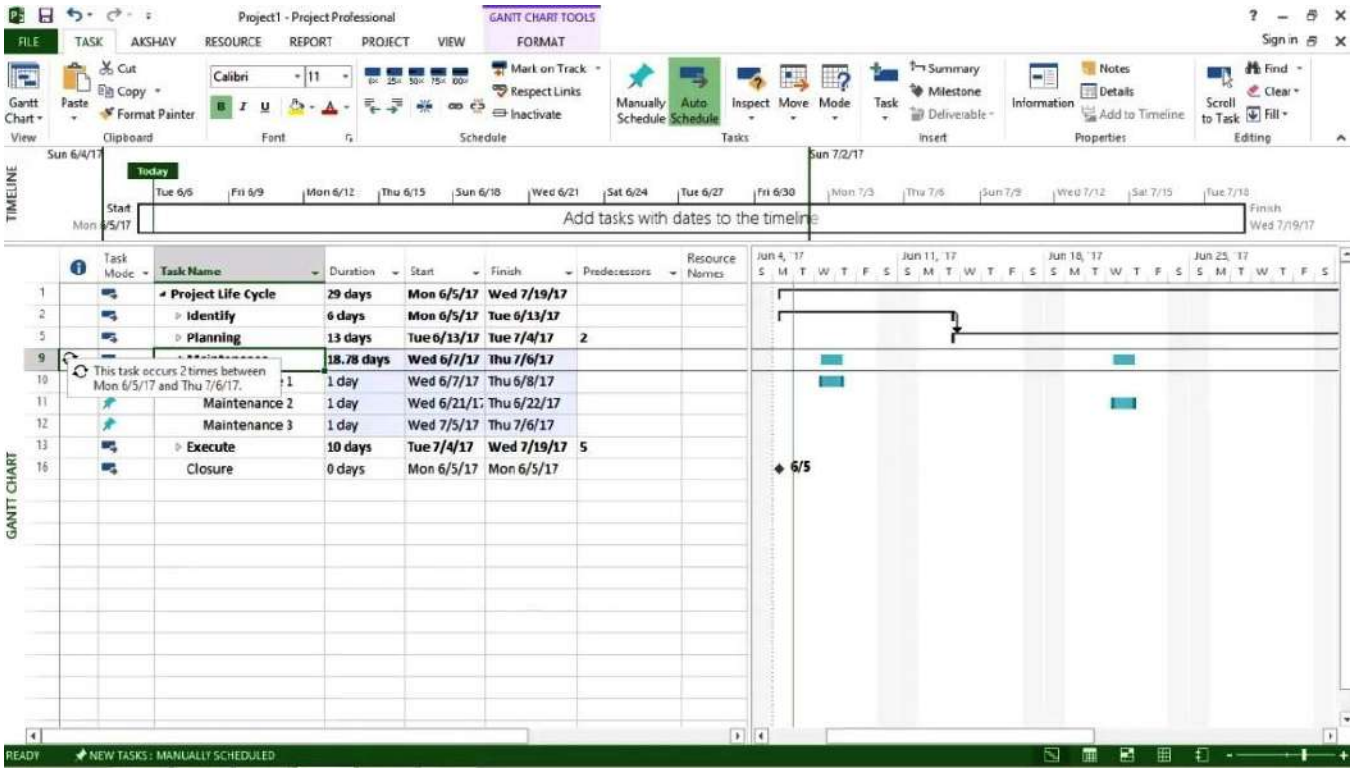
Recurring tasks-

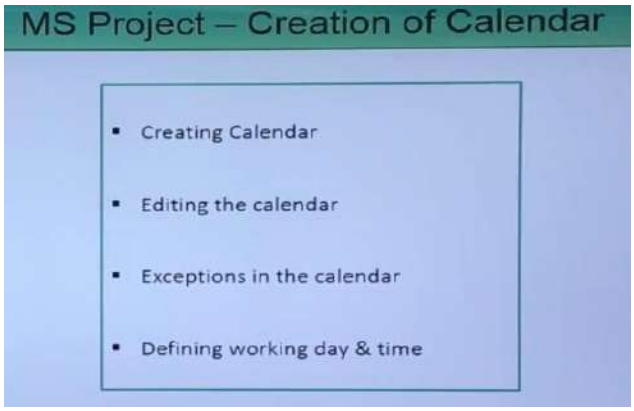


1. Choose a task- In task tab- choose task- recurring task

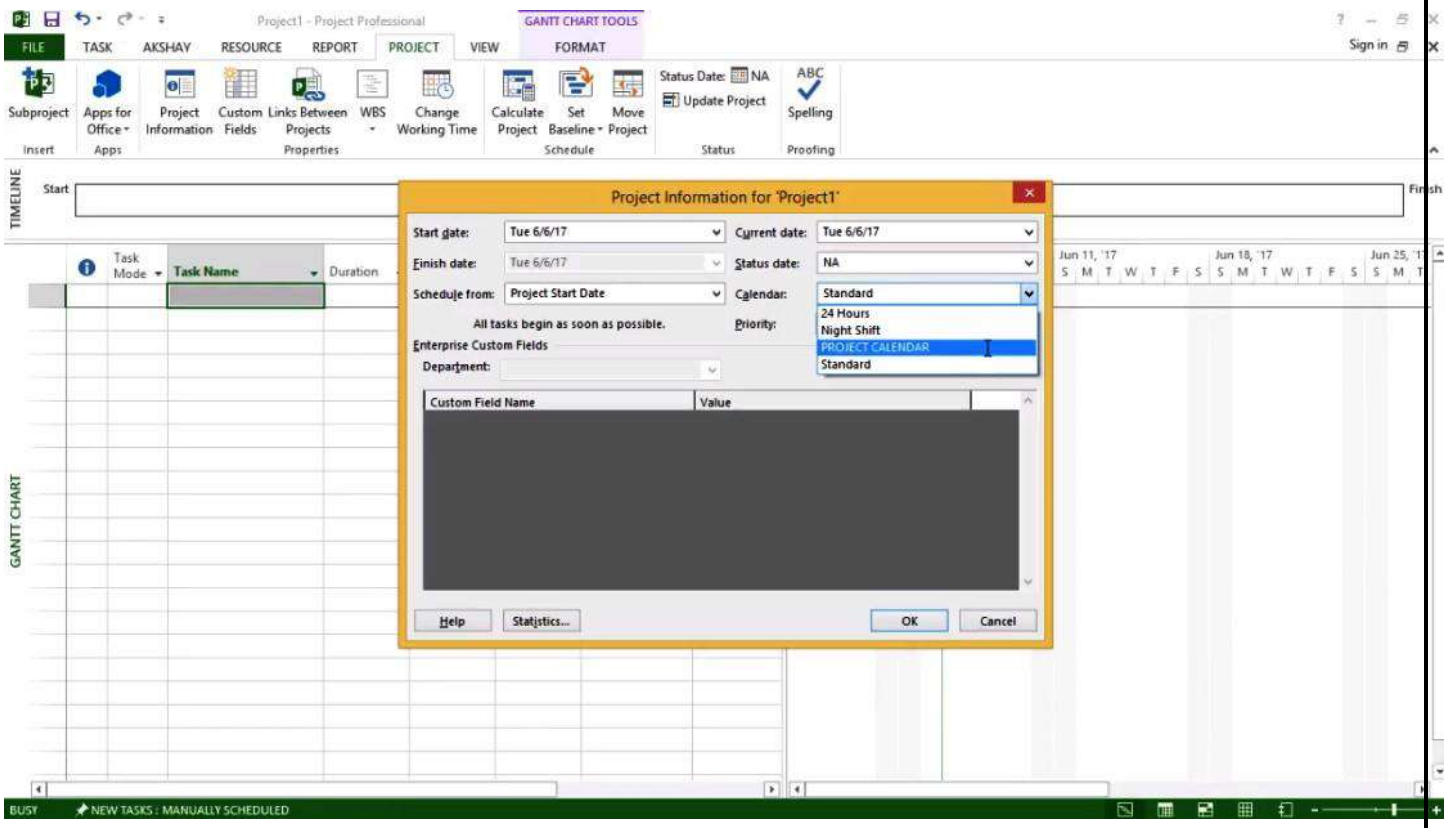


2. Put a task name- Maintenance, duration- 1 day, weekly , recur every 2, on Wednesday.
3. Start same as project. End by 1 month. Make them auto schedule
4. Make execute pred. of maintenance.

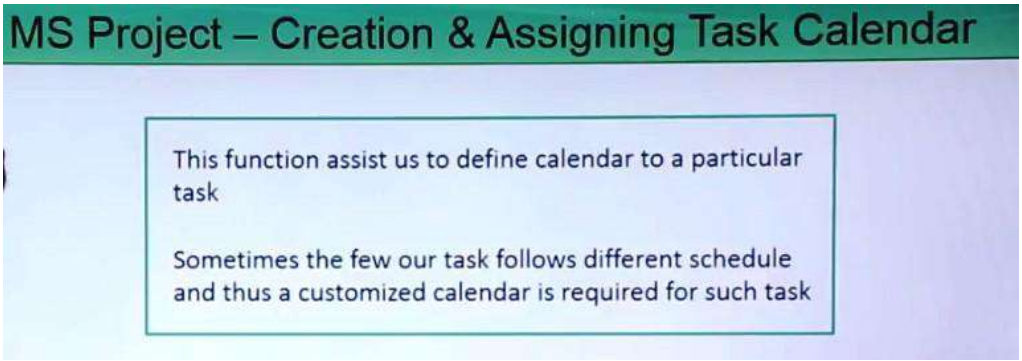




1. In project tab- Proj. info- calendar- proj calendar- ok

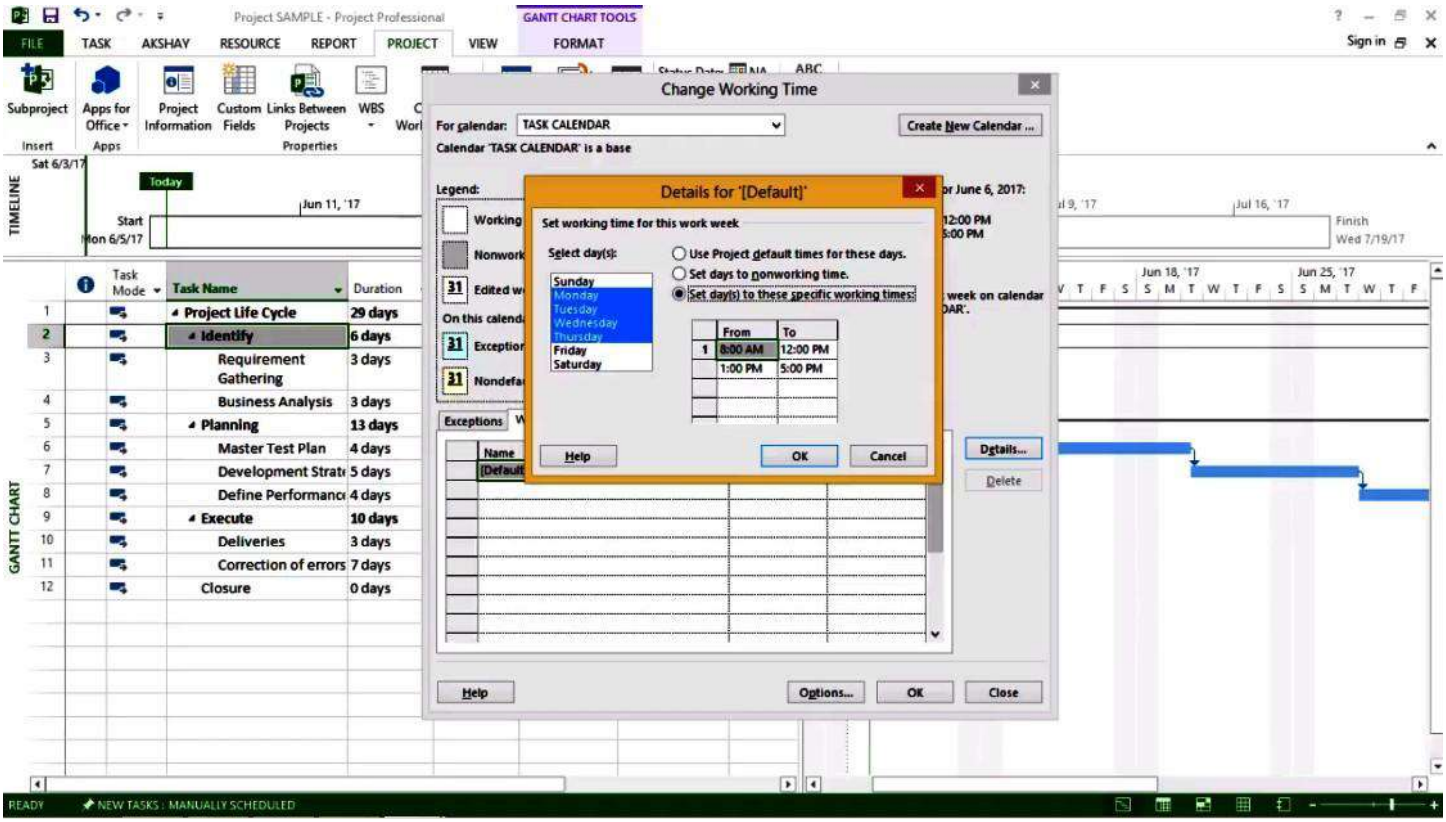


2. In right side upper time line right vlk- time scale- proj. cal.
3. Time scale – Non working time- colour



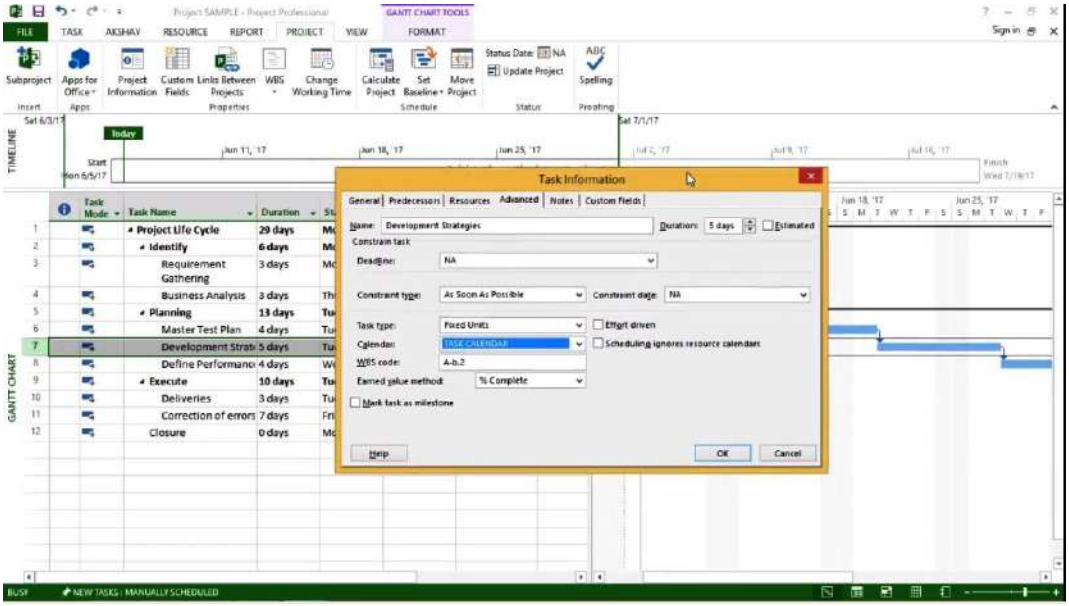
Creation-

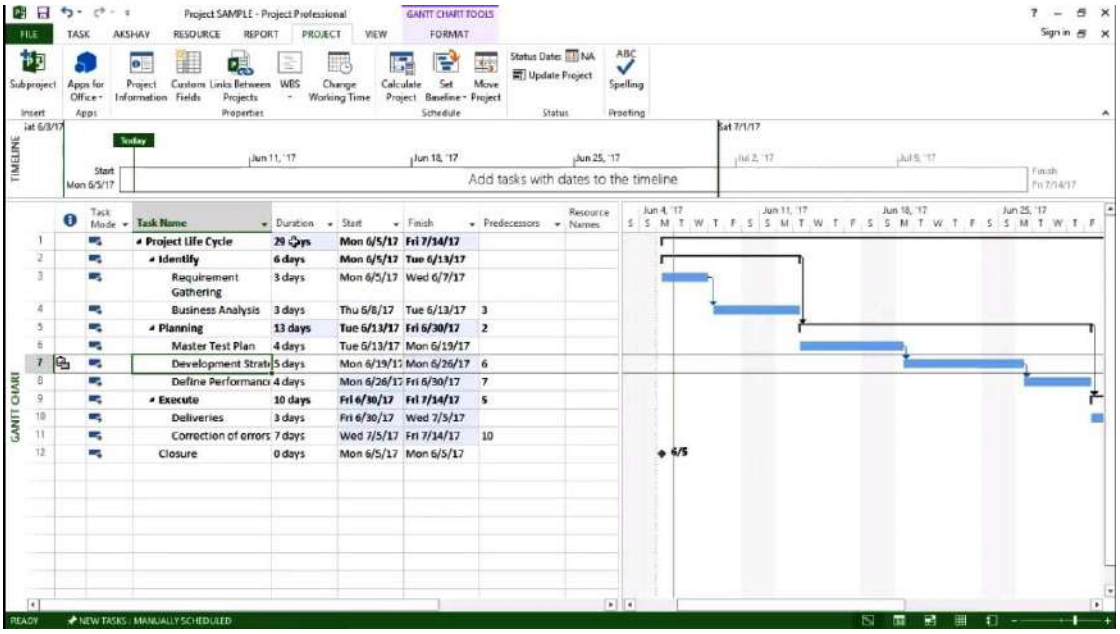
1. In project tab-Change work time
2. Create new calendar- Name task calendar
3. Work week- work time
4. Exceptions- write holidays with date



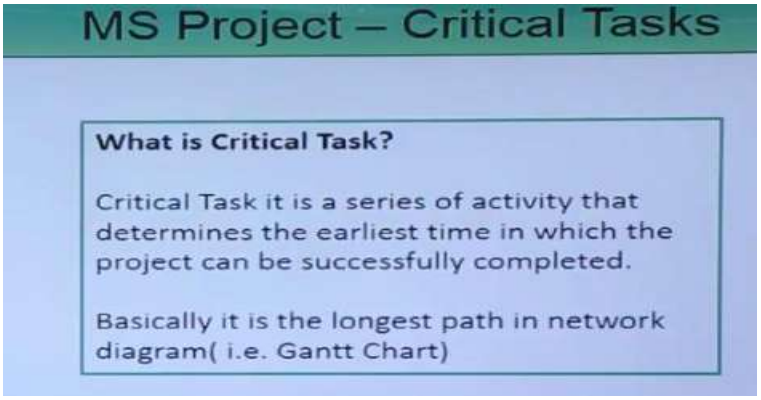
Assign-

1. Double clk task- advanced
2. In calendar- select task calendar- ok
3. Proj info- calendar- task calendar- ok

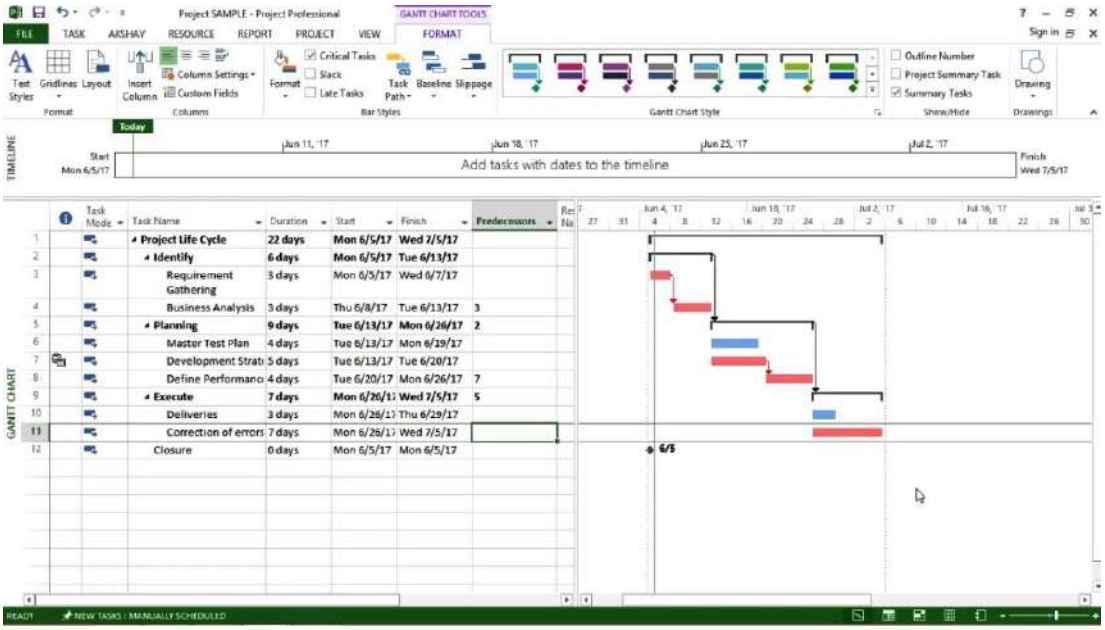




Critical task-

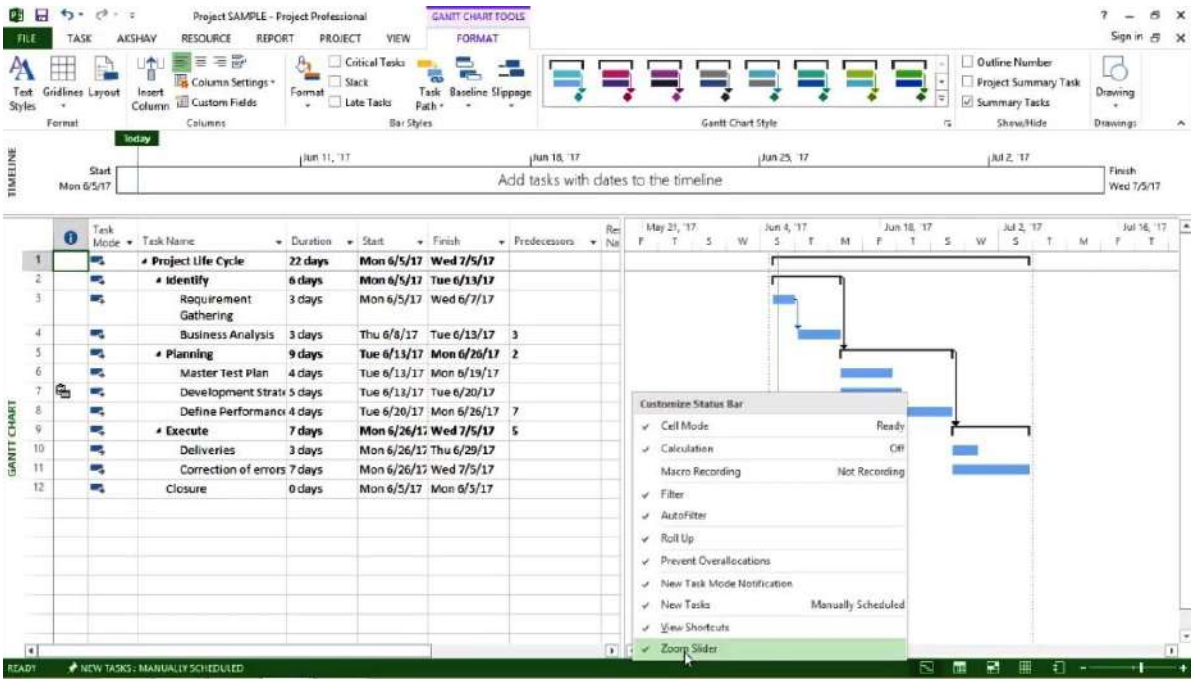


1. In format- critical task
2. Right clk on gantt chart- show/ hidden bar- critical tasks



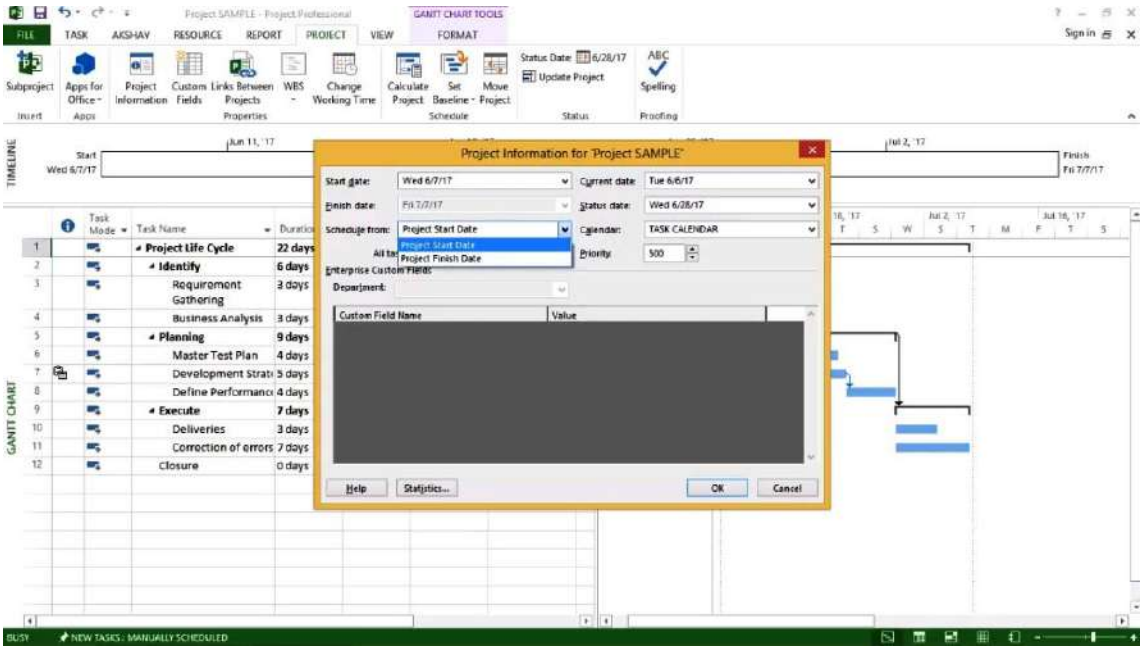
Status bar-

1. Below screen- Green bar
2. Right clk- make any option on/off
3. Task usage- layout changed, team planner, resource sheet



Project info. Tool-

1. Project- project information- To make changes in all tasks
2. Proj. info. Start date- wed.- all dates changed
3. Current date taken from calendar

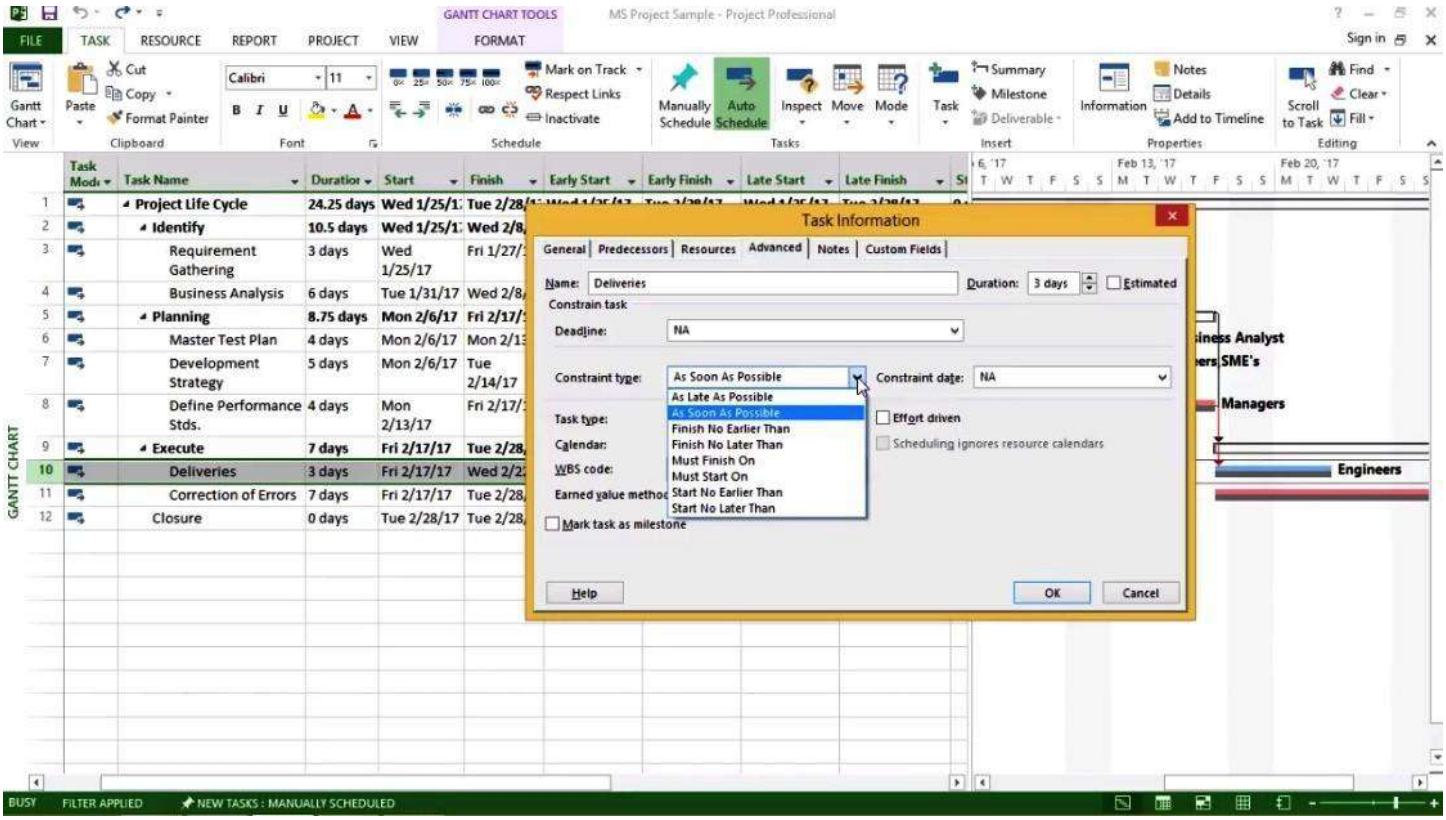


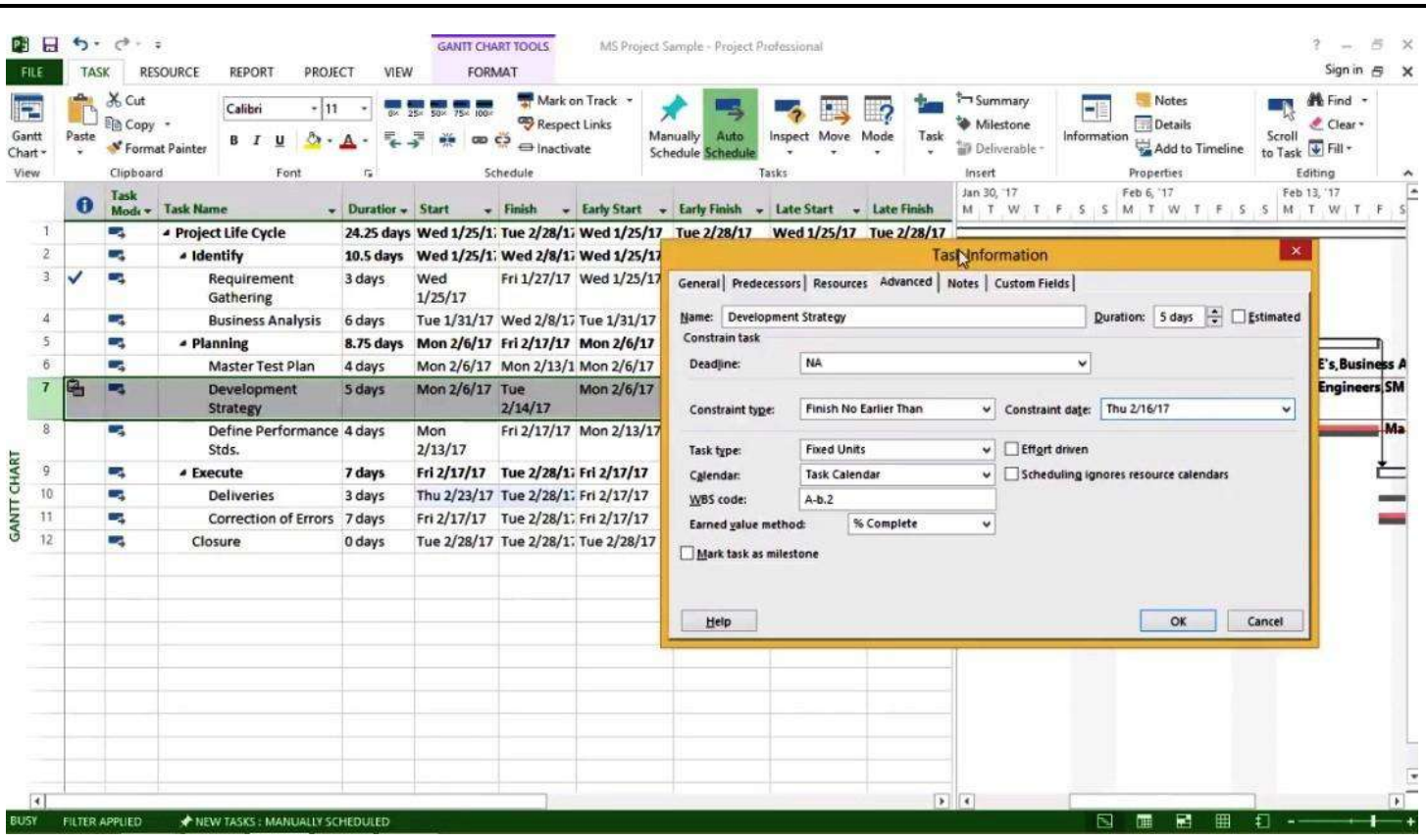
MS Project – Tasks Constraints

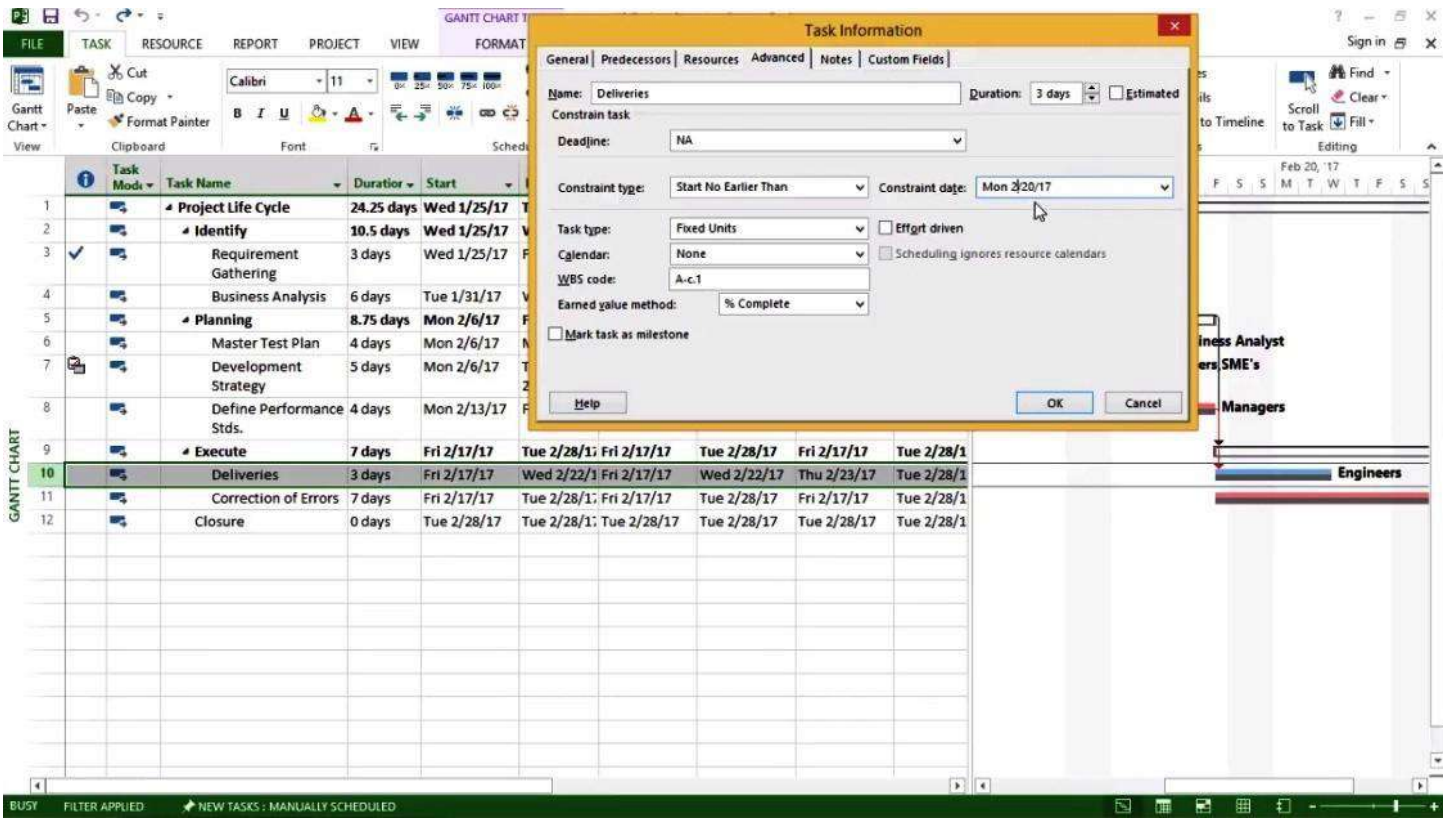
Task Constraints. **Tasks** in Microsoft Project have **constraints** that require that the start and/or finish date of a **task** be no later than, no earlier than, or on a specific date. **Constraints** are not enforced at all for manual **tasks**, and for automatic **tasks**, they are only enforced when the work plan is rescheduled.

Type of constraint :

1. As soon as possible
2. As late as possible
3. Finish no earlier than
4. Must Finish On
5. Must Start On
6. Start on Earlier than
7. Start no Later than




GANTT CHART TOOLS
MS Project Sample - Project Professional
FILE
TASK
RESOURCE
REPORT
PROJECT
VIEW
FORMAT
Sign in
Gantt Chart
Paste
Cut
Copy
Format Painter
Calibri
11
Mark on Track
Respect Links
Inactivate
Manually Schedule
Auto Schedule
Inspect
Move
Mode
Task
Summary
Milestone
Deliverable
Information
Notes
Details
Add to Timeline
Scroll to Task
Find
Clear
Fill
View
Clipboard
Font
Schedule
Tasks
Insert
Properties
Editing
Task Mode
Task Name
Duration
Start
Finish
Early Start
Early Finish
Late Start
Late Finish
1 Project Life Cycle 24.25 days Wed 1/25/17 Tue 2/28/17 Wed 1/25/17 Tue 2/28/17 Wed 1/25/17 Tue 2/28/17
2 Identify 10.5 days Wed 1/25/17 Wed 2/8/17 Wed 1/25/17
3 Requirement Gathering 3 days Wed 1/25/17 Fri 1/27/17 Wed 1/25/17
4 Business Analysis 6 days Tue 1/31/17 Wed 2/8/17 Tue 1/31/17
5 Planning 8.75 days Mon 2/6/17 Fri 2/17/17 Mon 2/6/17
6 Master Test Plan 4 days Mon 2/6/17 Mon 2/13/17 Mon 2/6/17
7 Development Strategy 5 days Mon 2/6/17 Tue 2/14/17 Mon 2/6/17
8 Define Performance Stds. 4 days Mon 2/13/17 Fri 2/17/17 Mon 2/13/17
9 Execute 7 days Fri 2/17/17 Tue 2/28/17 Fri 2/17/17
10 Deliveries 3 days Thu 2/23/17 Tue 2/28/17 Fri 2/17/17
11 Correction of Errors 7 days Fri 2/17/17 Tue 2/28/17 Fri 2/17/17
12 Closure 0 days Tue 2/28/17 Tue 2/28/17 Tue 2/28/17
Jan 30, '17
Feb 6, '17
Feb 13, '17
Task Information
General
Predecessors
Resources
Advanced
Notes
Custom Fields
Name: Development Strategy
Duration: 5 days
Estimated
Constrain task
Deadline: NA
Constraint type: Finish No Earlier Than
Constraint date: Thu 2/16/17
Task type: Fixed Units
Effort driven
Calendar: Task Calendar
Scheduling ignores resource calendars
WBS code: A-b.2
Earned value method: % Complete
Mark task as milestone
Help
OK
Cancel
GANTT CHART
BUSY
FILTER APPLIED
NEW TASKS : MANUALLY SCHEDULED

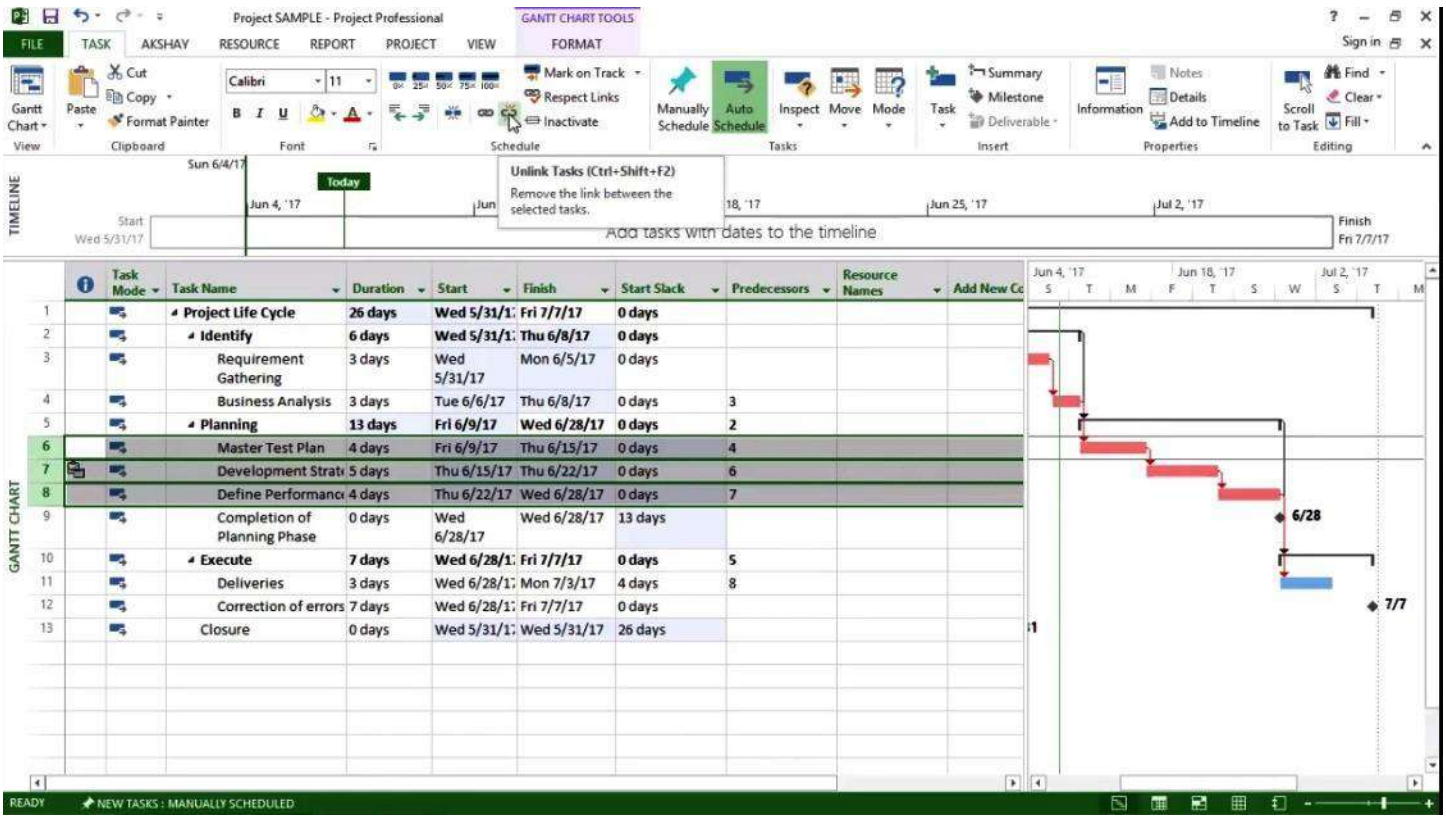

FILE
TASK
RESOURCE
REPORT
PROJECT
VIEW
FORMAT
Sign in
Gantt Chart
Paste
Cut
Copy
Format Painter
Calibri
11
Scroll to Task
Find
Clear
Fill
Editing
Task Mode
Task Name
Duration
Start
1 Project Life Cycle 24.25 days Wed 1/25/17
2 Identify 10.5 days Wed 1/25/17
3 Requirement Gathering 3 days Wed 1/25/17
4 Business Analysis 6 days Tue 1/31/17
5 Planning 8.75 days Mon 2/6/17
6 Master Test Plan 4 days Mon 2/6/17
7 Development Strategy 5 days Mon 2/6/17
8 Define Performance Stds. 4 days Mon 2/13/17
9 Execute 7 days Fri 2/17/17 Tue 2/28/17 Fri 2/17/17 Tue 2/28/17 Fri 2/17/17 Tue 2/28/1
10 Deliveries 3 days Fri 2/17/17 Wed 2/22/17 Fri 2/17/17 Wed 2/22/17 Thu 2/23/17 Tue 2/28/1
11 Correction of Errors 7 days Fri 2/17/17 Tue 2/28/17 Fri 2/17/17 Tue 2/28/17 Fri 2/17/17 Tue 2/28/1
12 Closure 0 days Tue 2/28/17 Tue 2/28/17 Tue 2/28/17 Tue 2/28/17 Tue 2/28/17 Tue 2/28/1
Task Information
General
Predecessors
Resources
Advanced
Notes
Custom Fields
Name: Deliveries
Duration: 3 days
Estimated
Constrain task
Deadline: NA
Constraint type: Start No Earlier Than
Constraint date: Mon 2/20/17
Task type: Fixed Units
Effort driven
Calendar: None
Scheduling ignores resource calendars
WBS code: A-c.1
Earned value method: % Complete
Mark task as milestone
Help
OK
Cancel
Feb 20, '17
Engineers
Managers
GANTT CHART
BUSY
FILTER APPLIED
NEW TASKS : MANUALLY SCHEDULED

MS Project – Link & Unlinks Tasks

In Project 2013, outdenting and indenting are the functions you use to move tasks to higher or lower levels

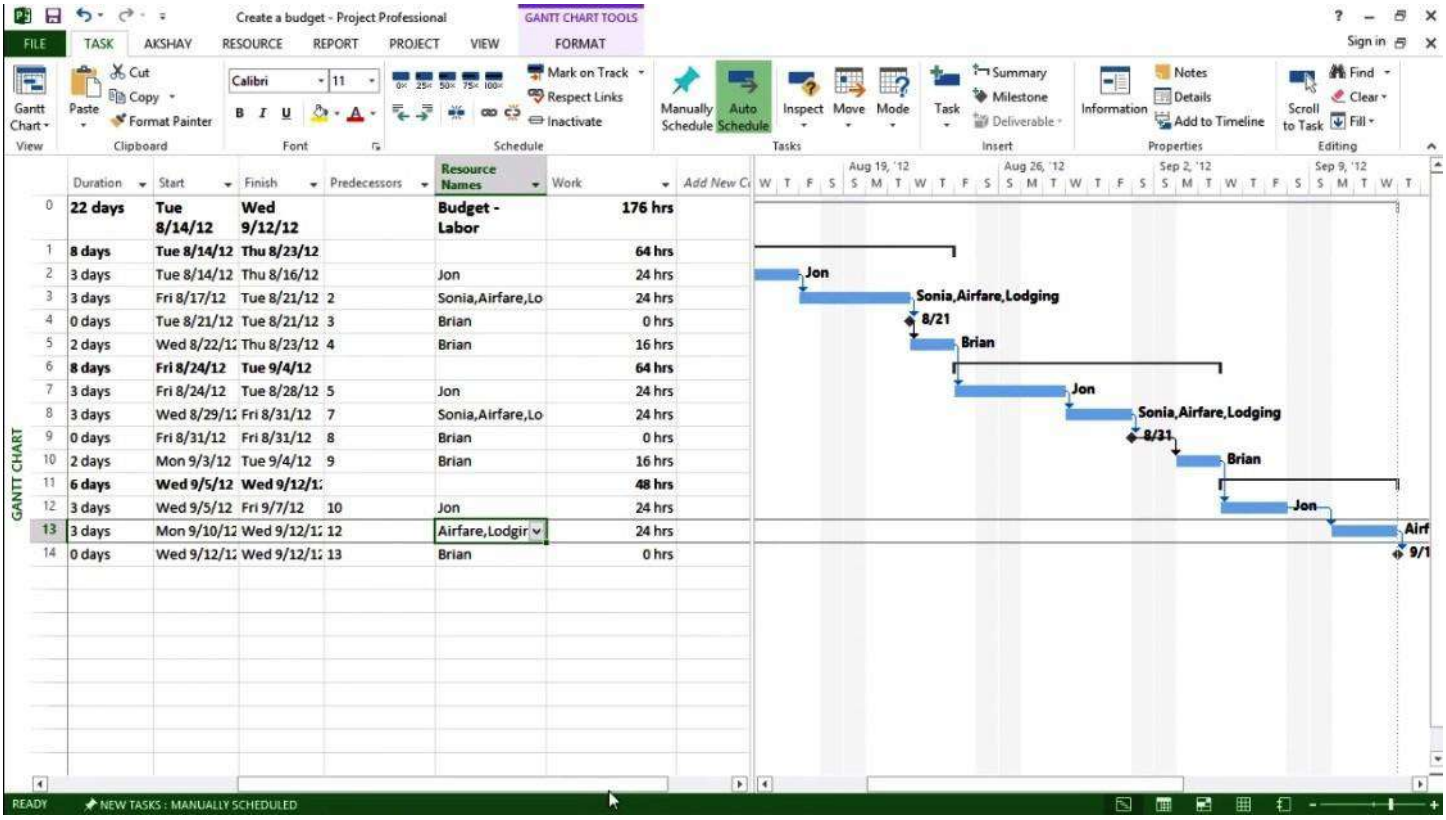
Outdenting a task moves it up a level in the outline. When outdented, a task is moved to a higher level of detail; in other words, it's less detailed.

Indenting a task moves it down a level in the outline (literally indenting the task to the right in the outline) and puts it at a deeper level of detail. Whenever you indent one or more tasks, the task above becomes the summary task.



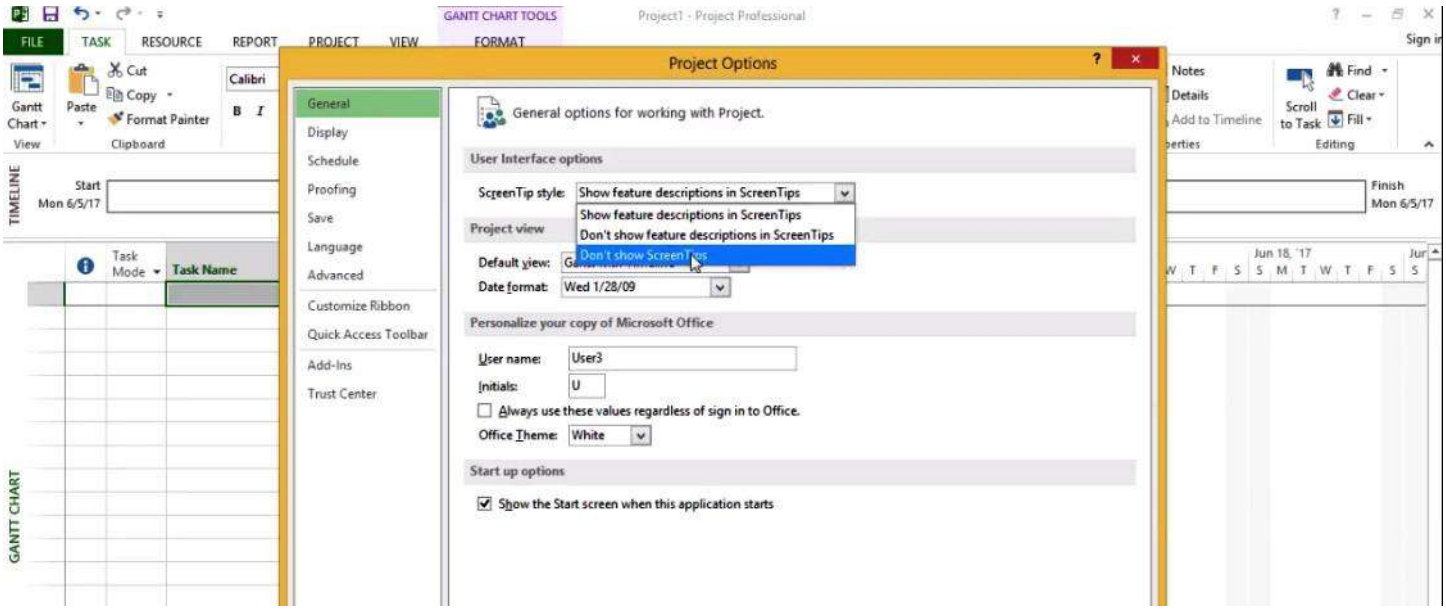
MS Project – Use of Template

Templates help us to ensure the success of future projects by capturing successful strategies from past projects, such as (task relationships, assigning calendar,etc) that were especially productive in the project.

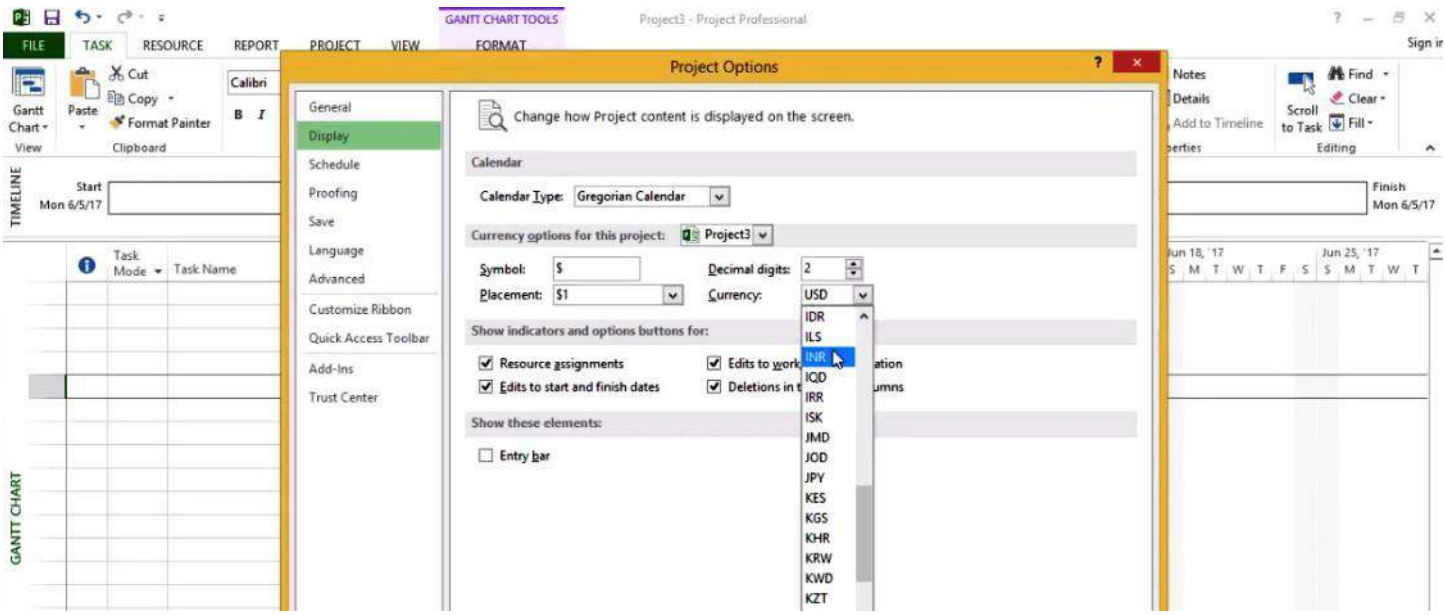


Various options in MSP-

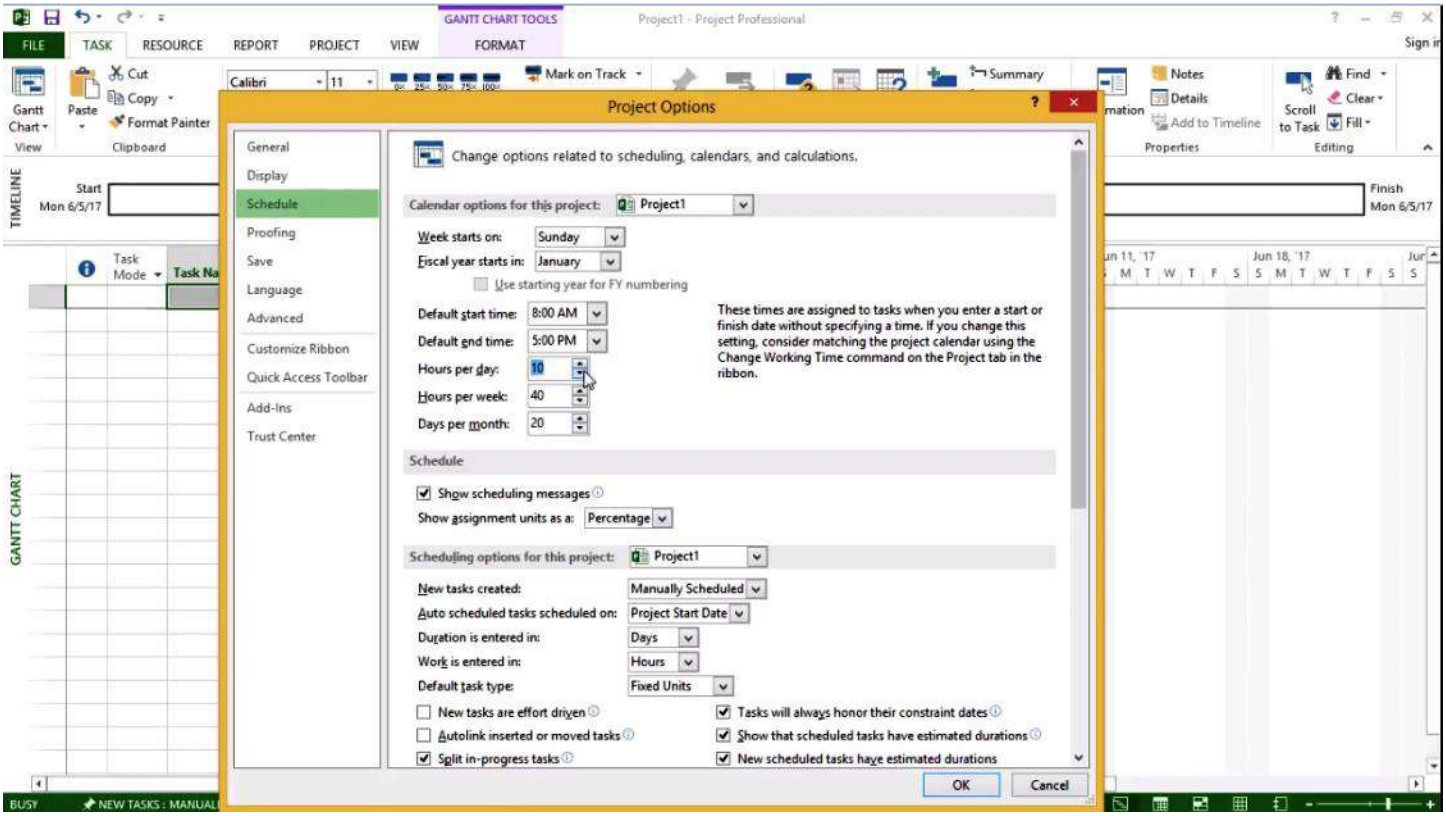
1. Go to file tab- last optn.- option tab- proj. option- General- screen tip style- Don't show tips- no tips shown. If we choose show desc.- all tips shown.

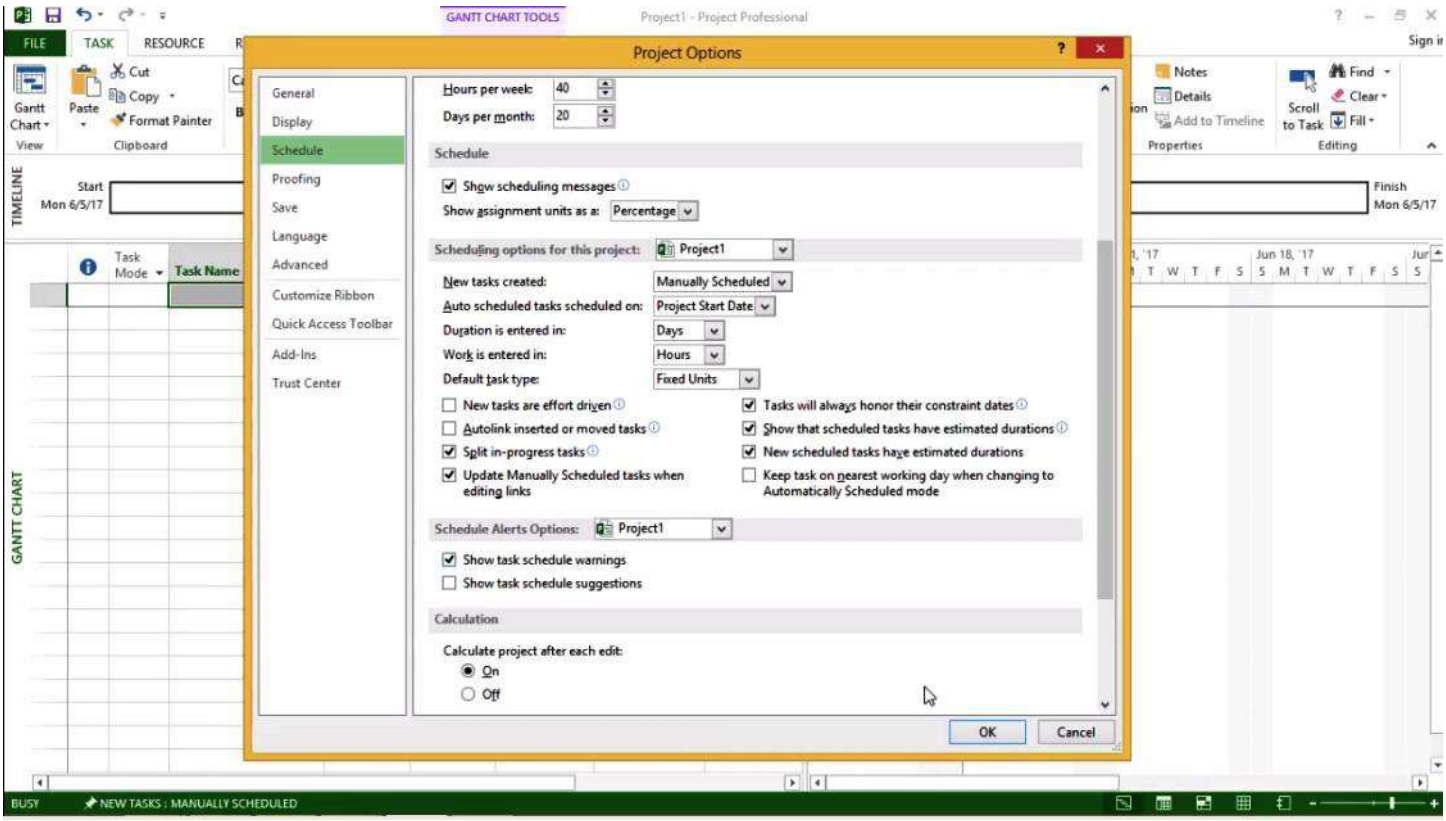


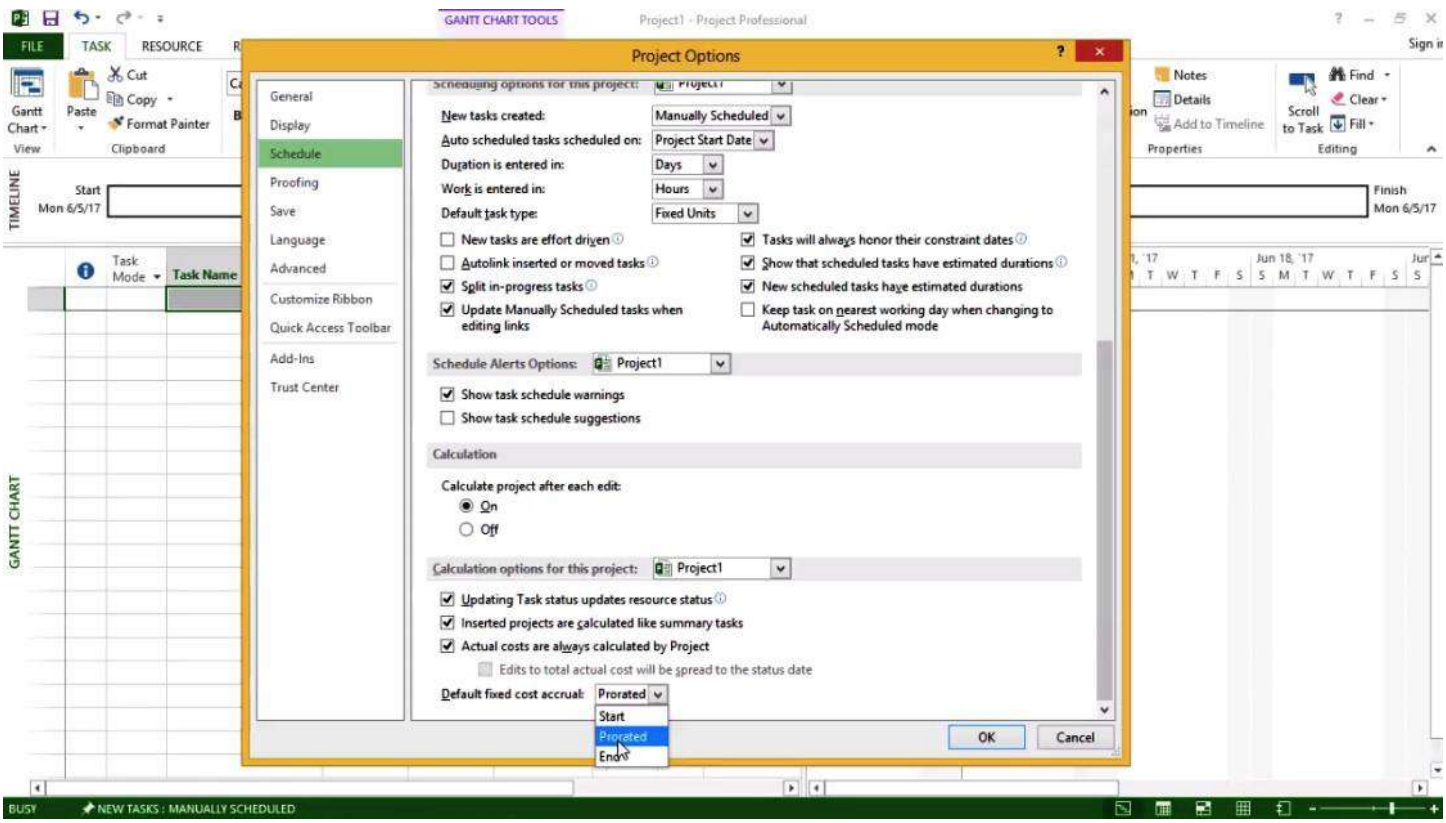
2. In proj. view option if we choose only Gantt chart- no time line.
3. If we choose gantt with time line- time line shown
4. In date format optn. We can modify date style.
5. In display tab- calendar type- by default. Gregorian taken
6. We can change currency option to INR.



7. In file- option- Schedule- Calender option- all new proj., week st., Fiscal yr st.
8. In Schedule option- Manual/ Auto.
9. In last option of schedule- Default fixed cost- prorated (to divide asset in proj.)

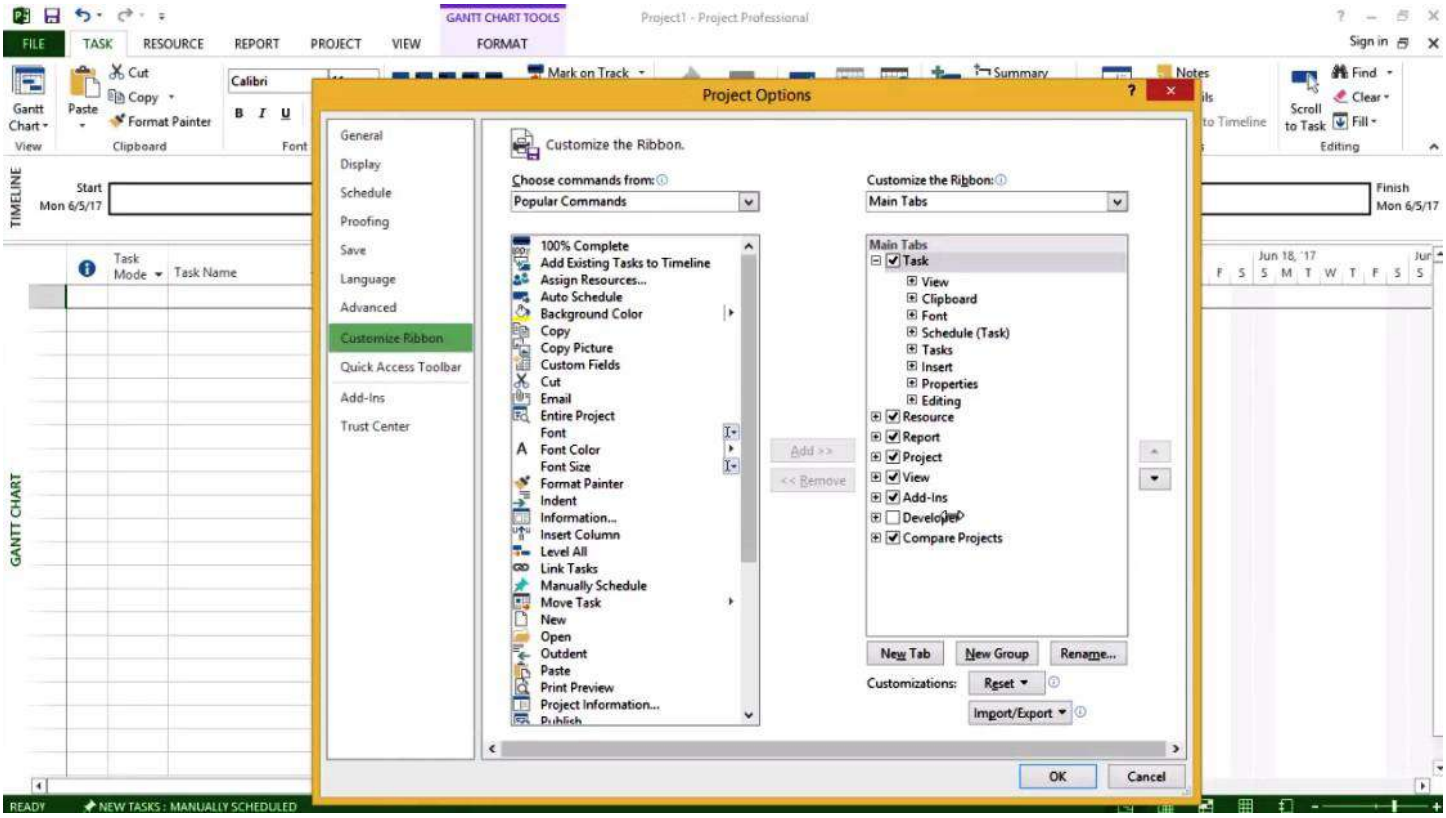

GANTT CHART TOOLS
Project1 - Project Professional
FILE
TASK
RESOURCE
REPORT
PROJECT
VIEW
FORMAT
Project Options
General
Display
Schedule
Proofing
Save
Language
Advanced
Customize Ribbon
Quick Access Toolbar
Add-Ins
Trust Center
Change options related to scheduling, calendars, and calculations.
Calendar options for this project: Project1
Week starts on: Sunday
Fiscal year starts in: January
Use starting year for FY numbering
Default start time: 8:00 AM
Default end time: 5:00 PM
Hours per day: 10
Hours per week: 40
Days per month: 20
These times are assigned to tasks when you enter a start or finish date without specifying a time. If you change this setting, consider matching the project calendar using the Change Working Time command on the Project tab in the ribbon.
Schedule
Show scheduling messages
Show assignment units as a: Percentage
Scheduling options for this project: Project1
New tasks created: Manually Scheduled
Auto scheduled tasks scheduled on: Project Start Date
Duration is entered in: Days
Work is entered in: Hours
Default task type: Fixed Units
New tasks are effort driven
Autolink inserted or moved tasks
Split in-progress tasks
Tasks will always honor their constraint dates
Show that scheduled tasks have estimated durations
New scheduled tasks have estimated durations
OK
Cancel
GANTT CHART
TIMELINE
BUSY
NEW TASKS : MANUAL

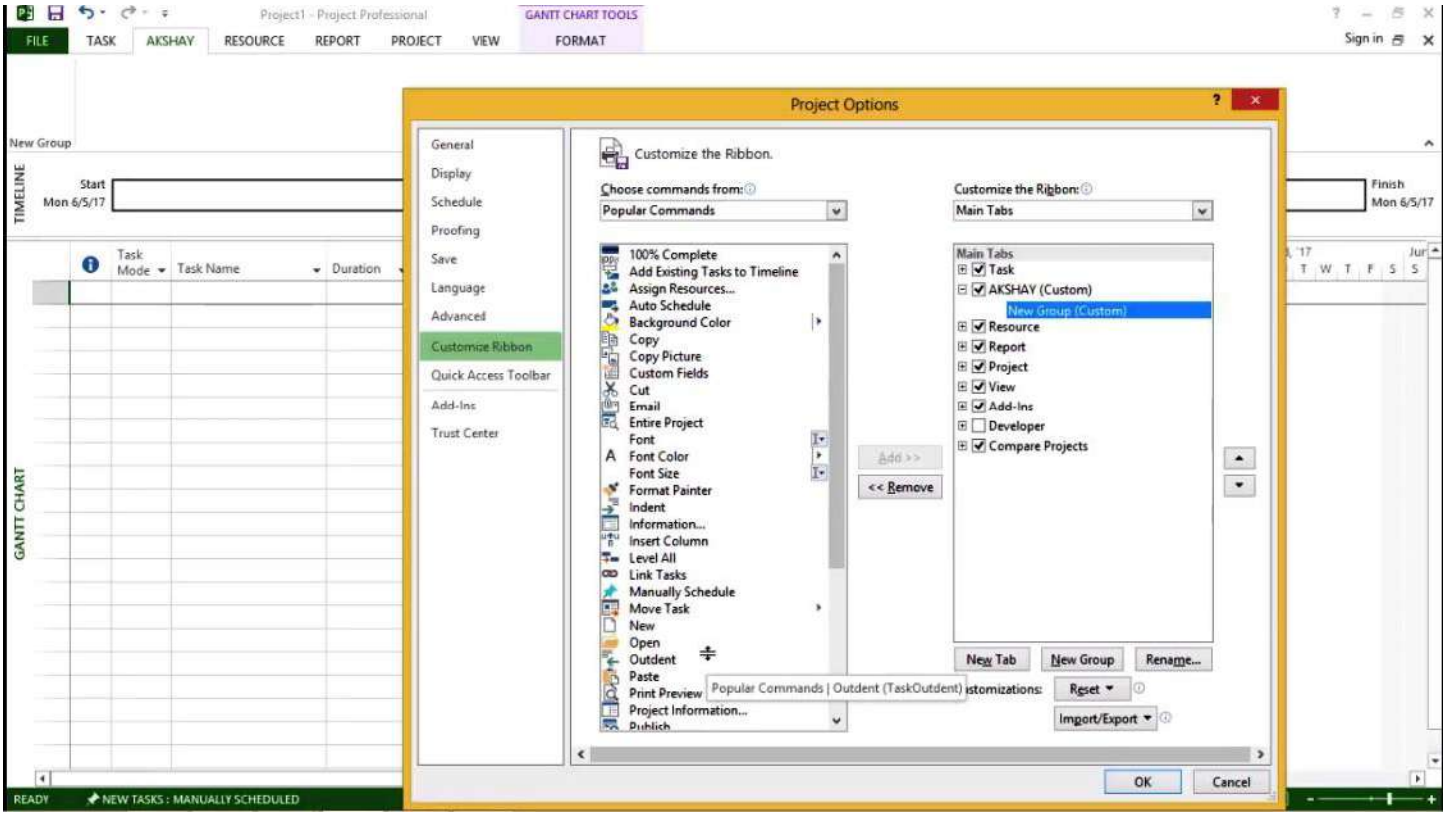

GANTT CHART TOOLS
Project1 - Project Professional
FILE
TASK
RESOURCE
Project Options
General
Display
Schedule
Proofing
Save
Language
Advanced
Customize Ribbon
Quick Access Toolbar
Add-Ins
Trust Center
Hours per week: 40
Days per month: 20
Schedule
Show scheduling messages
Show assignment units as a: Percentage
Scheduling options for this project: Project1
New tasks created: Manually Scheduled
Auto scheduled tasks scheduled on: Project Start Date
Duration is entered in: Days
Work is entered in: Hours
Default task type: Fixed Units
New tasks are effort driven
Autolink inserted or moved tasks
Split in-progress tasks
Update Manually Scheduled tasks when editing links
Tasks will always honor their constraint dates
Show that scheduled tasks have estimated durations
New scheduled tasks have estimated durations
Keep task on nearest working day when changing to Automatically Scheduled mode
Schedule Alerts Options: Project1
Show task schedule warnings
Show task schedule suggestions
Calculation
Calculate project after each edit:
On
Off
OK
Cancel
GANTT CHART
TIMELINE
BUSY
NEW TASKS : MANUALLY SCHEDULED



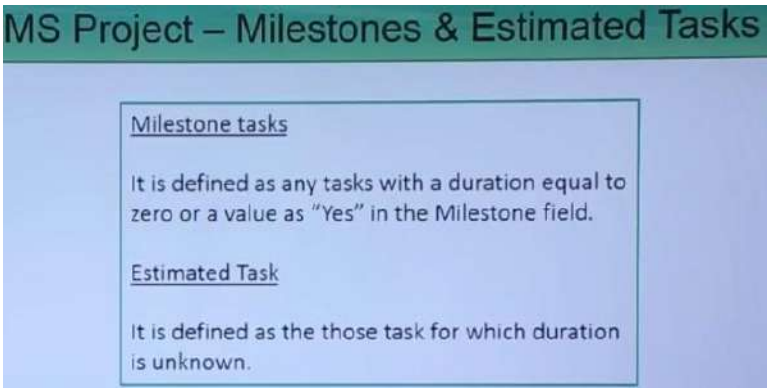
Ribbon-

10. Top tabs- File, task,…
11. By clk on any tab we can see contents below known as ribbon. We can collapse ribbon by clk- cntl+F1.
12. Rt. Clk/ optn- customize ribbon
13. We can choose new tab with different grps and can add any commands.

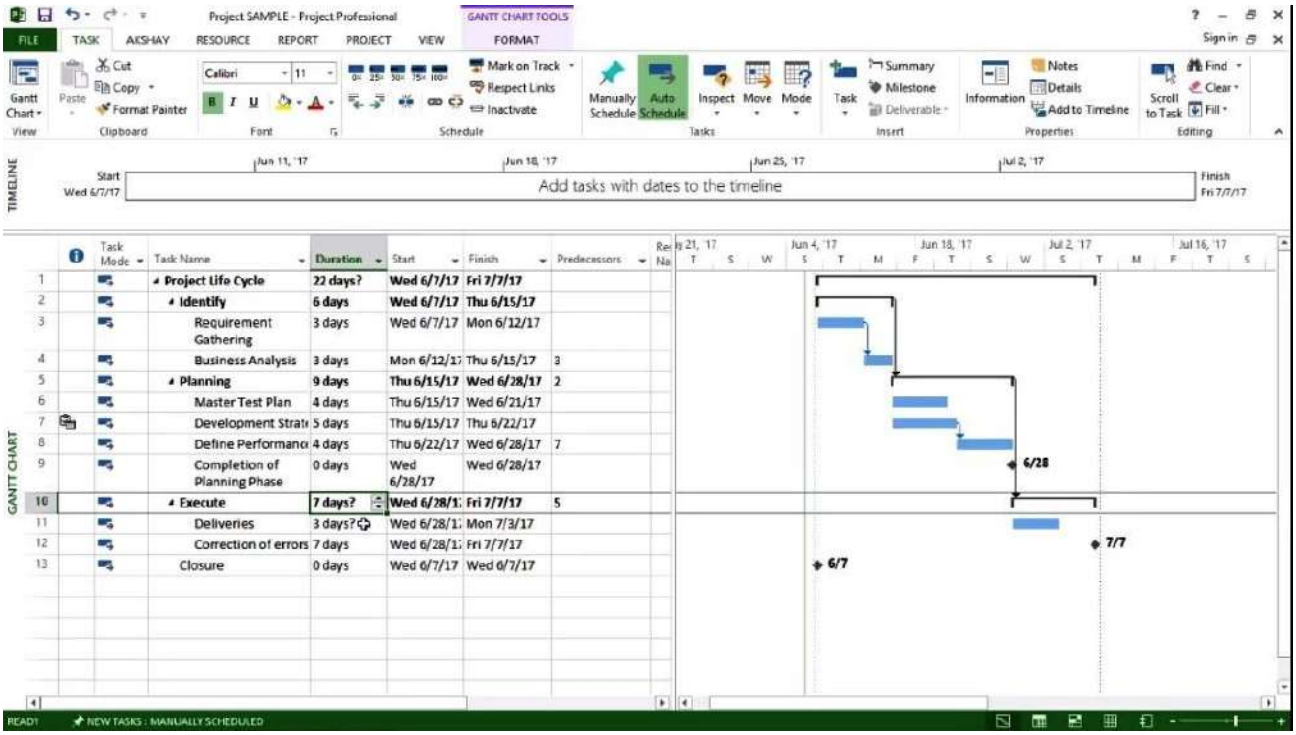



Project1 - Project Professional
GANTT CHART TOOLS
FILE
TASK
AKSHAY
RESOURCE
REPORT
PROJECT
VIEW
FORMAT
Sign in
New Group
TIMELINE
Start
Mon 6/5/17
Finish
Mon 6/5/17
Task Mode
Task Name
Duration
GANTT CHART
READY
NEW TASKS : MANUALLY SCHEDULED
Project Options
General
Display
Schedule
Proofing
Save
Language
Advanced
Customize Ribbon
Quick Access Toolbar
Add-Ins
Trust Center
Customize the Ribbon.
Choose commands from:
Popular Commands
100% Complete
Add Existing Tasks to Timeline
Assign Resources...
Auto Schedule
Background Color
Copy
Copy Picture
Custom Fields
Cut
Email
Entire Project
Font
Font Color
Font Size
Format Painter
Indent
Information...
Insert Column
Level All
Link Tasks
Manually Schedule
Move Task
New
Open
Outdent
Paste
Print Preview
Project Information...
Publish
Add >>
<< Remove
Customize the Ribbon:
Main Tabs
Main Tabs
Task
AKSHAY (Custom)
New Group (Custom)
Resource
Report
Project
View
Add-Ins
Developer
Compare Projects
New Tab
New Group
Rename...
Reset
Import/Export
Popular Commands | Outdent (TaskOutdent)
OK
Cancel

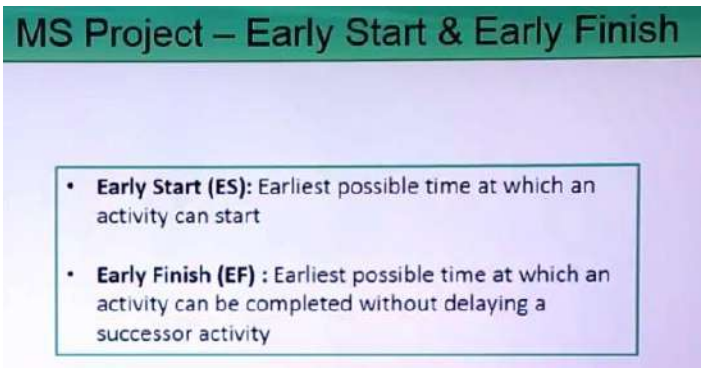
Milestone, ES,EF,LS,LF, Slack-

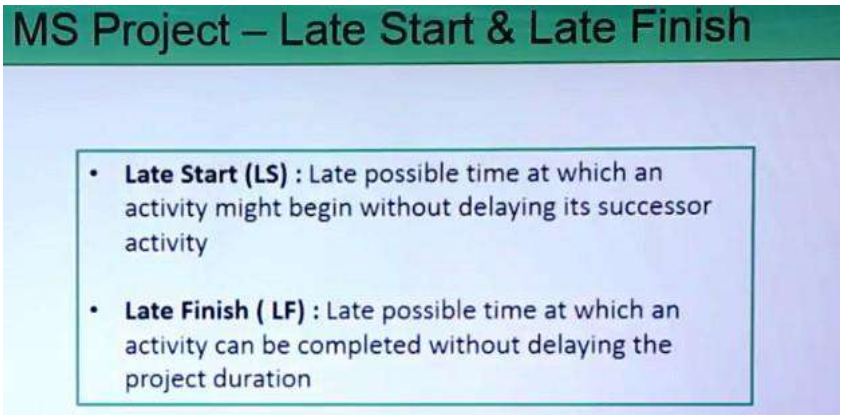


1. Choose task- rght clk- Completion of planning phase Enter ↵
2. Make it auto schedule- 0days
3. Then a mile stone created (A symbol of black diamond)
4. Also double click on task- task info- advanced- mark task as mile stone
5. To present estimated task- double clk on task- advanced- Duration- estimated-ok

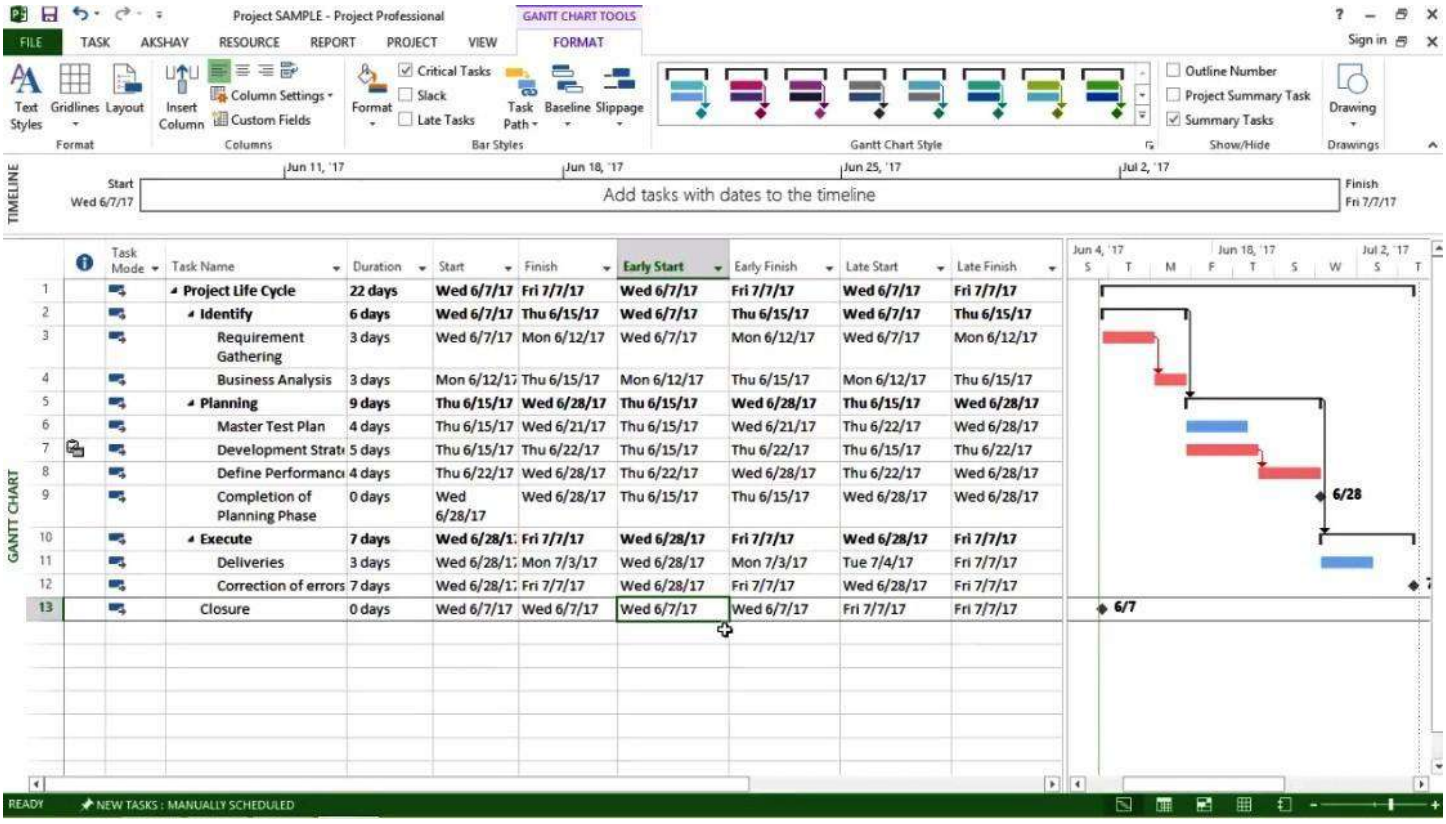


ES, EF, LS and LF

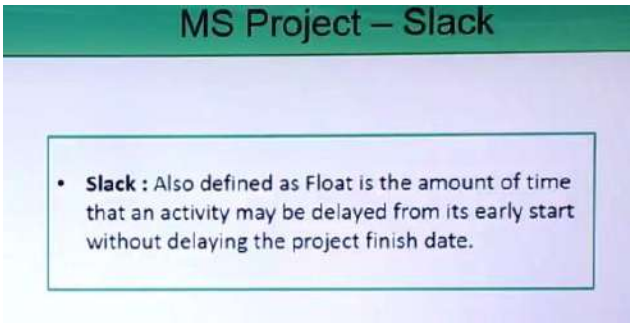




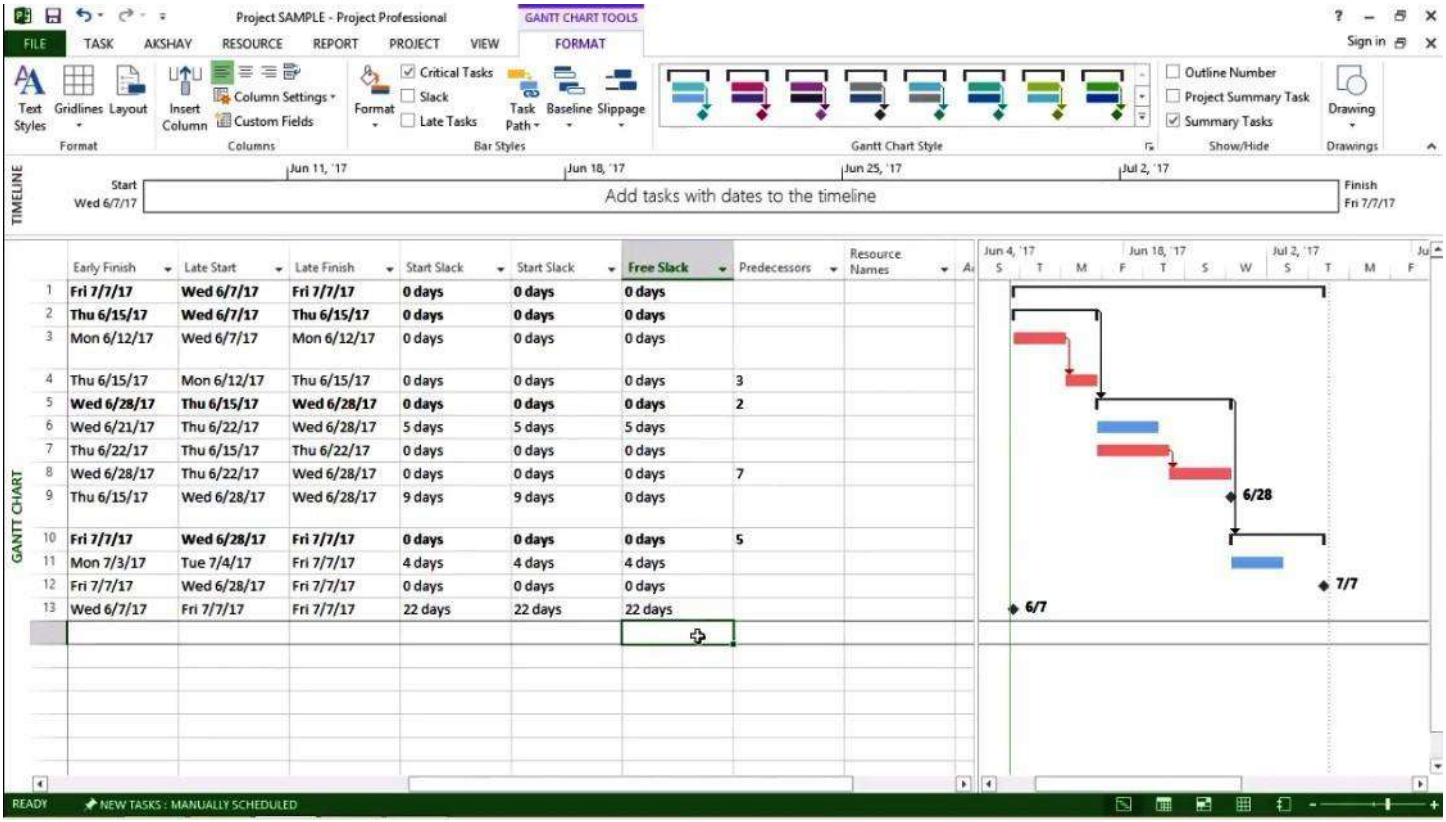
1. Column header- Right clk- Insert column- Early start Enter ↵
2. Insert column- EF (=ES+duration)
3. Insert column- LS/LF
4. Assign critical task



Slack-



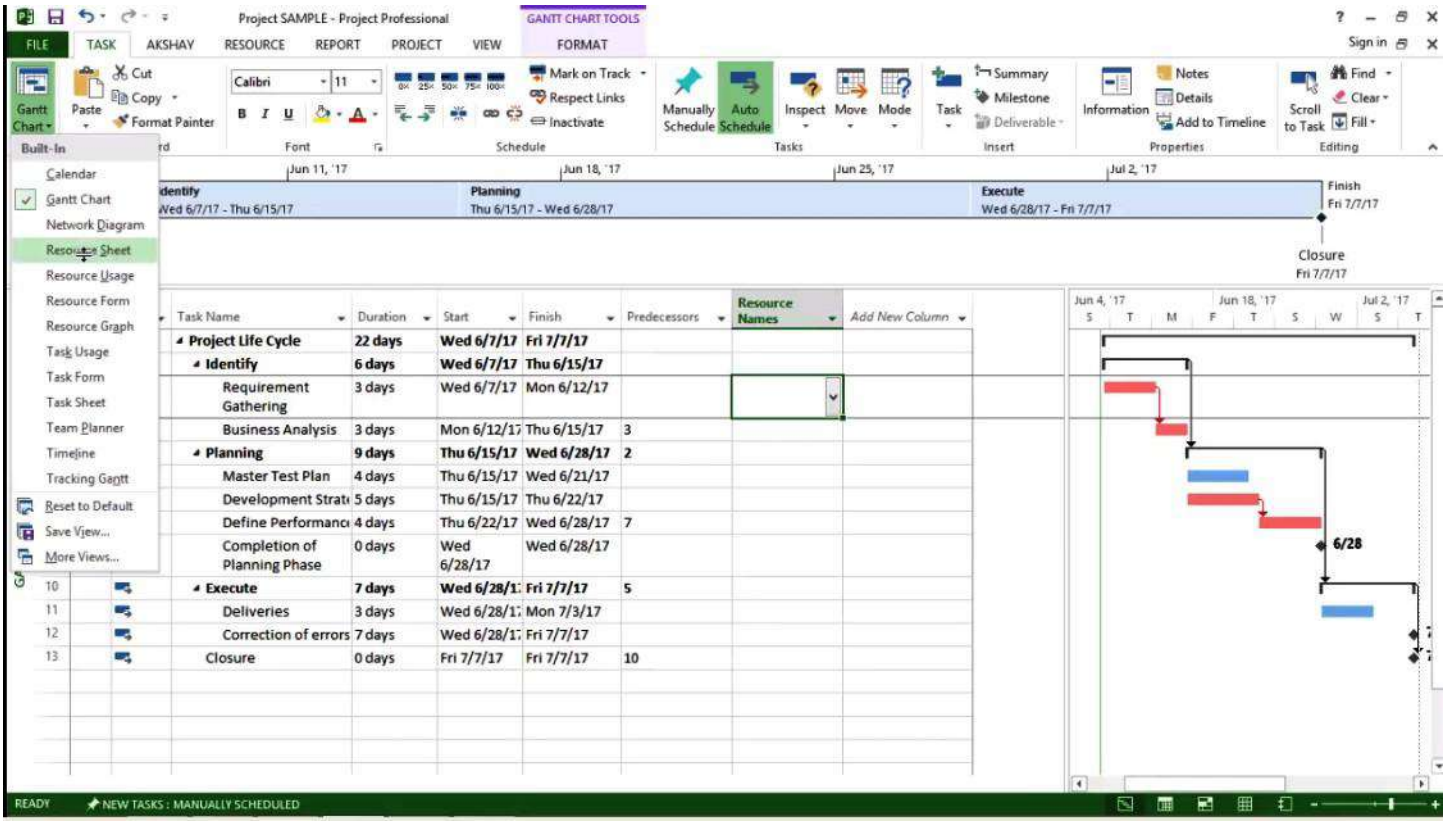
1. Insert column- Start slack (=LS-ES or LF-EF)
2. For critical tasks- slack=0
3. Insert column- Free slack (A task can be delayed without affecting finish date)

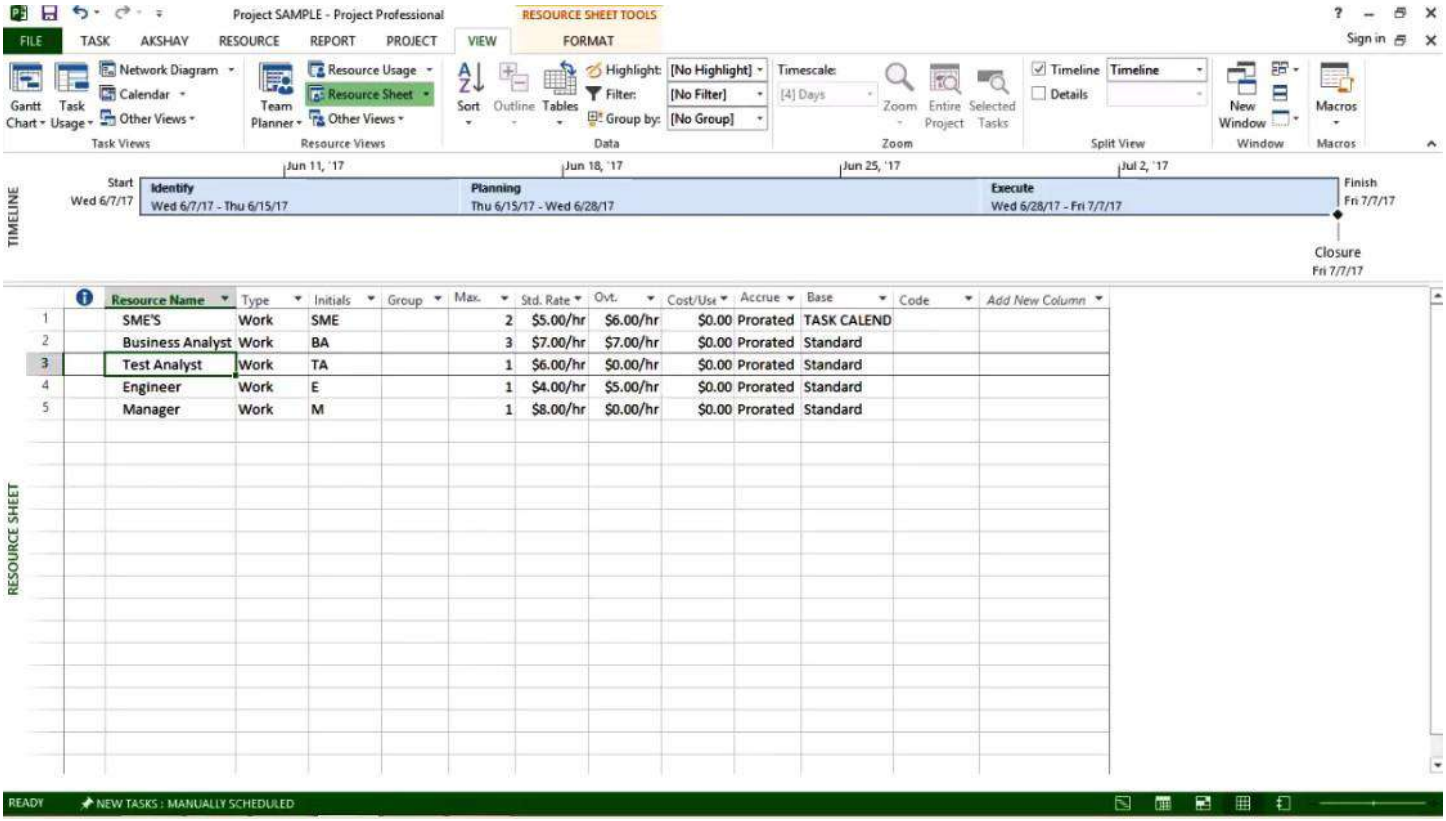


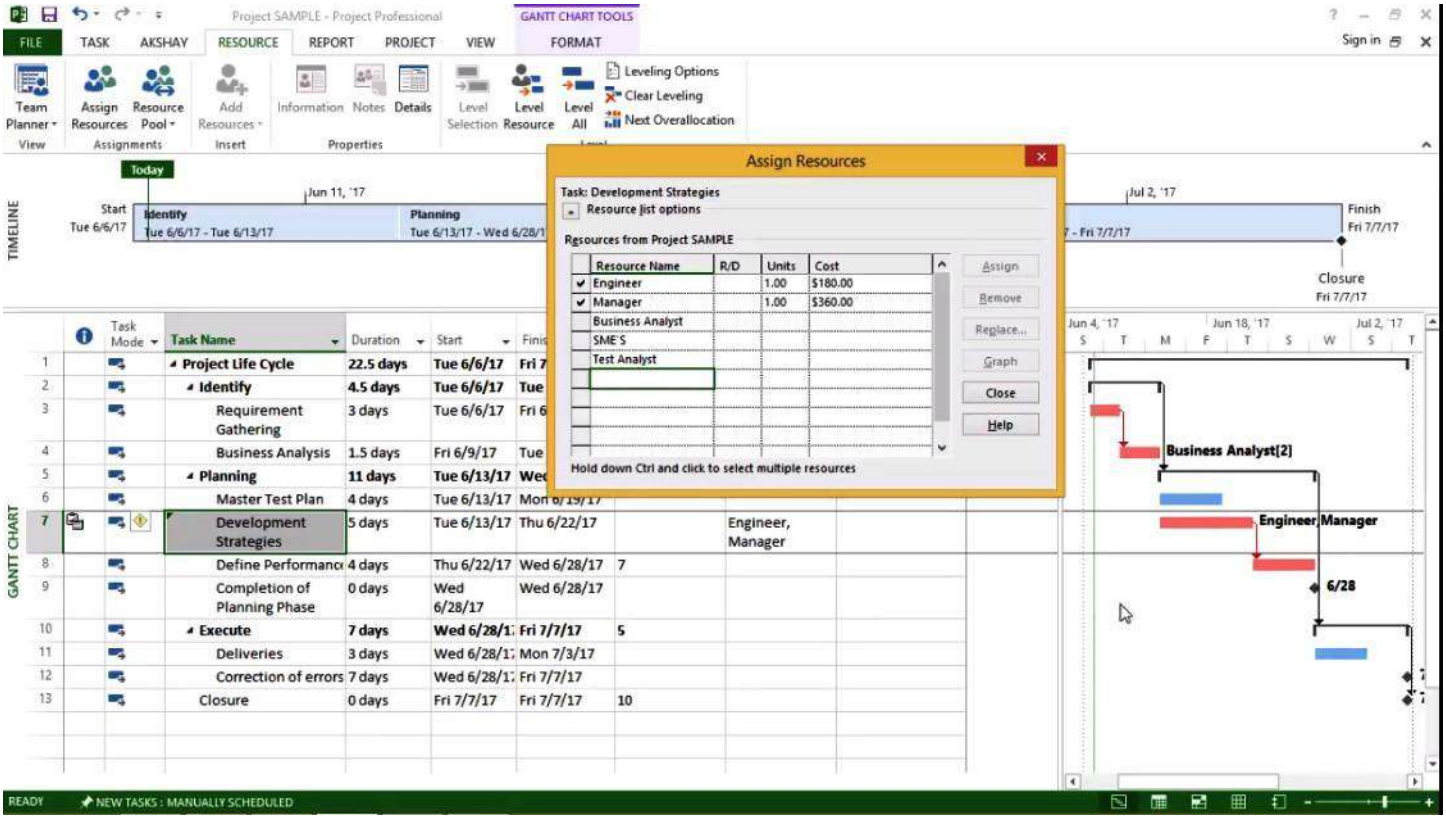
MS Project – Defining Resources

Resources are typically people included in your project plan, whether or not they are assigned to tasks.

However, a resource could also include anything that is used to complete a project, including, equipment and other materials



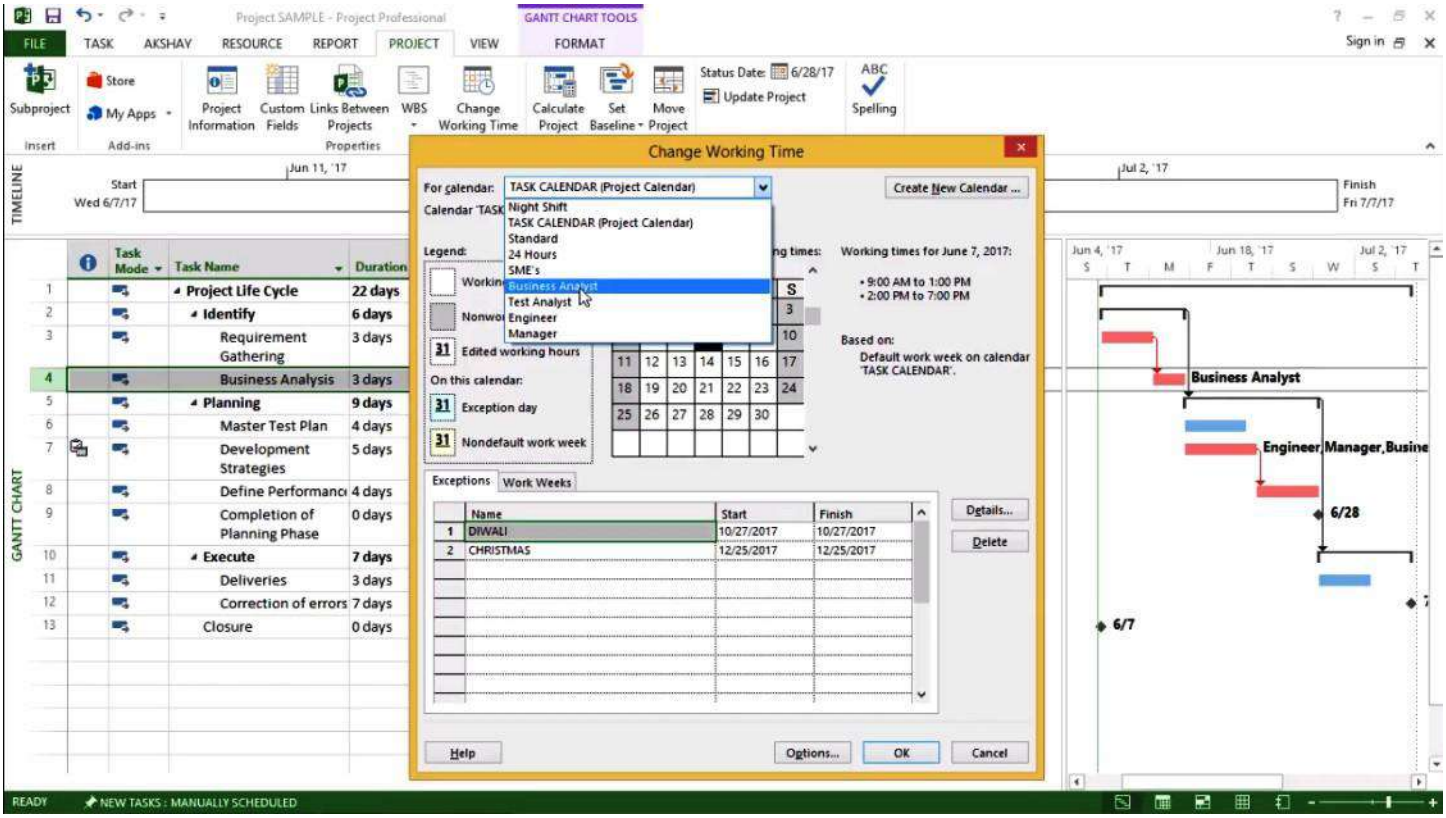

Project SAMPLE - Project Professional
RESOURCE SHEET TOOLS
FILE TASK AKSHAY RESOURCE REPORT PROJECT VIEW FORMAT
Sign in
Gantt Chart
Task Usage
Network Diagram
Calendar
Other Views
Team Planner
Resource Usage
Resource Sheet
Other Views
Sort
Outline
Tables
Highlight: [No Highlight]
Filter: [No Filter]
Group by: [No Group]
Timescale:
[4] Days
Zoom
Entire Project
Selected Tasks
Timeline
Timeline
Details
New Window
Macros
Task Views
Resource Views
Data
Zoom
Split View
Window
Macros
TIMELINE
Jun 11, '17
Jun 18, '17
Jun 25, '17
Jul 2, '17
Start
Wed 6/7/17
Identify
Wed 6/7/17 - Thu 6/15/17
Planning
Thu 6/15/17 - Wed 6/28/17
Execute
Wed 6/28/17 - Fri 7/7/17
Finish
Fri 7/7/17
Closure
Fri 7/7/17
RESOURCE SHEET
Resource Name
Type
Initials
Group
Max.
Std. Rate
Ovt.
Cost/Use
Accrue
Base
Code
Add New Column
1 SME'S Work SME 2 $5.00/hr $6.00/hr $0.00 Prorated TASK CALEND
2 Business Analyst Work BA 3 $7.00/hr $7.00/hr $0.00 Prorated Standard
3 Test Analyst Work TA 1 $6.00/hr $0.00/hr $0.00 Prorated Standard
4 Engineer Work E 1 $4.00/hr $5.00/hr $0.00 Prorated Standard
5 Manager Work M 1 $8.00/hr $0.00/hr $0.00 Prorated Standard
READY
NEW TASKS : MANUALLY SCHEDULED


Project SAMPLE - Project Professional
GANTT CHART TOOLS
FILE TASK AKSHAY RESOURCE REPORT PROJECT VIEW FORMAT
Sign in
Team Planner
Assign Resources
Resource Pool
Add Resources
Information
Notes
Details
Level Selection
Level Resource
Level All
Leveling Options
Clear Leveling
Next Overallocation
View
Assignments
Insert
Properties
Level
Today
TIMELINE
Jun 11, '17
Jul 2, '17
Start
Tue 6/6/17
Identify
Tue 6/6/17 - Tue 6/13/17
Planning
Tue 6/13/17 - Wed 6/28/1
Finish
Fri 7/7/17
Closure
Fri 7/7/17
Assign Resources
Task: Development Strategies
Resource list options
Resources from Project SAMPLE
Resource Name R/D Units Cost
Engineer 1.00 $180.00
Manager 1.00 $360.00
Business Analyst
SME'S
Test Analyst
Assign
Remove
Replace...
Graph
Close
Help
Hold down Ctrl and click to select multiple resources
GANTT CHART
Task Mode
Task Name
Duration
Start
Finis
1 Project Life Cycle 22.5 days Tue 6/6/17 Fri 7
2 Identify 4.5 days Tue 6/6/17 Tue
3 Requirement Gathering 3 days Tue 6/6/17 Fri 6
4 Business Analysis 1.5 days Fri 6/9/17 Tue
5 Planning 11 days Tue 6/13/17 Wed
6 Master Test Plan 4 days Tue 6/13/17 Mon 6/19/17
7 Development Strategies 5 days Tue 6/13/17 Thu 6/22/17 Engineer, Manager
8 Define Performanc 4 days Thu 6/22/17 Wed 6/28/17 7
9 Completion of Planning Phase 0 days Wed 6/28/17 Wed 6/28/17
10 Execute 7 days Wed 6/28/1 Fri 7/7/17 5
11 Deliveries 3 days Wed 6/28/1 Mon 7/3/17
12 Correction of errors 7 days Wed 6/28/1 Fri 7/7/17
13 Closure 0 days Fri 7/7/17 Fri 7/7/17 10
Jun 4, '17
Jun 18, '17
Jul 2, '17
Business Analyst[2]
Engineer,Manager
6/28
READY
NEW TASKS : MANUALLY SCHEDULED

MS Project – Resource Calendar

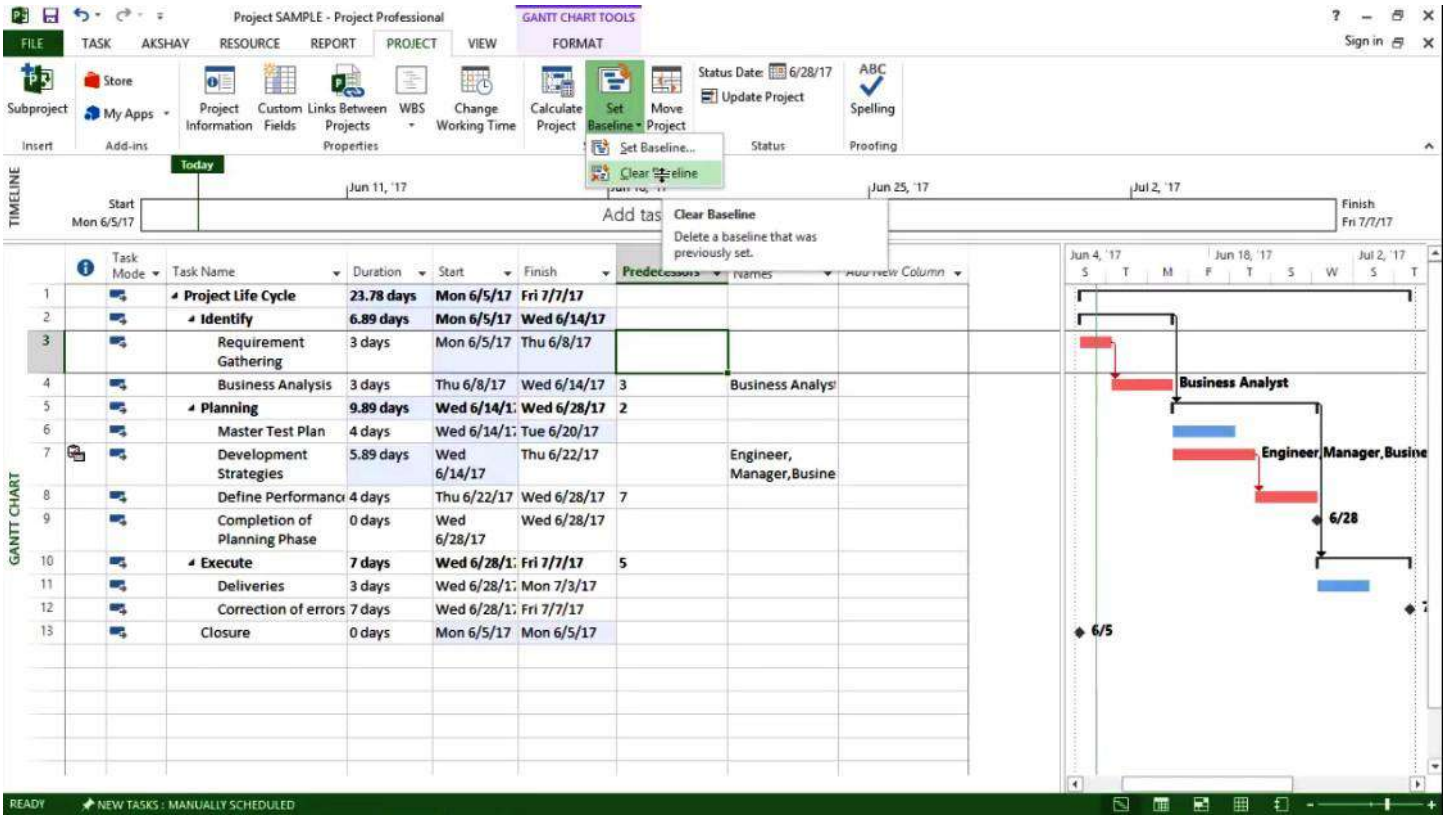
It can be defined as the calendar which has been assigned to a particular resource

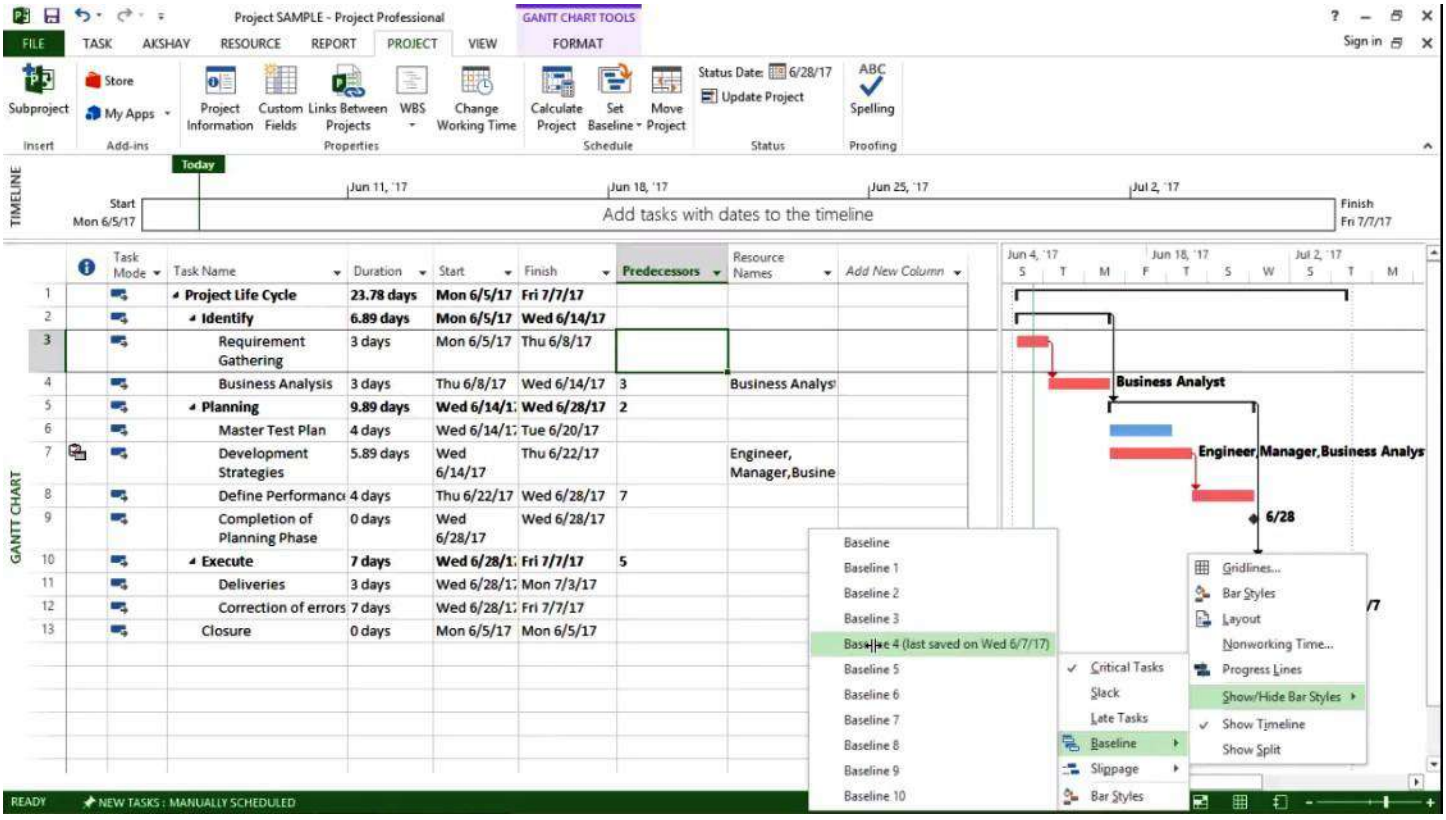
NOTE:
If a resource assigned to a task has a modified calendar, the resource works only during the specific hours that the task calendar and resource calendar have in common.



MS Project – Project Baseline

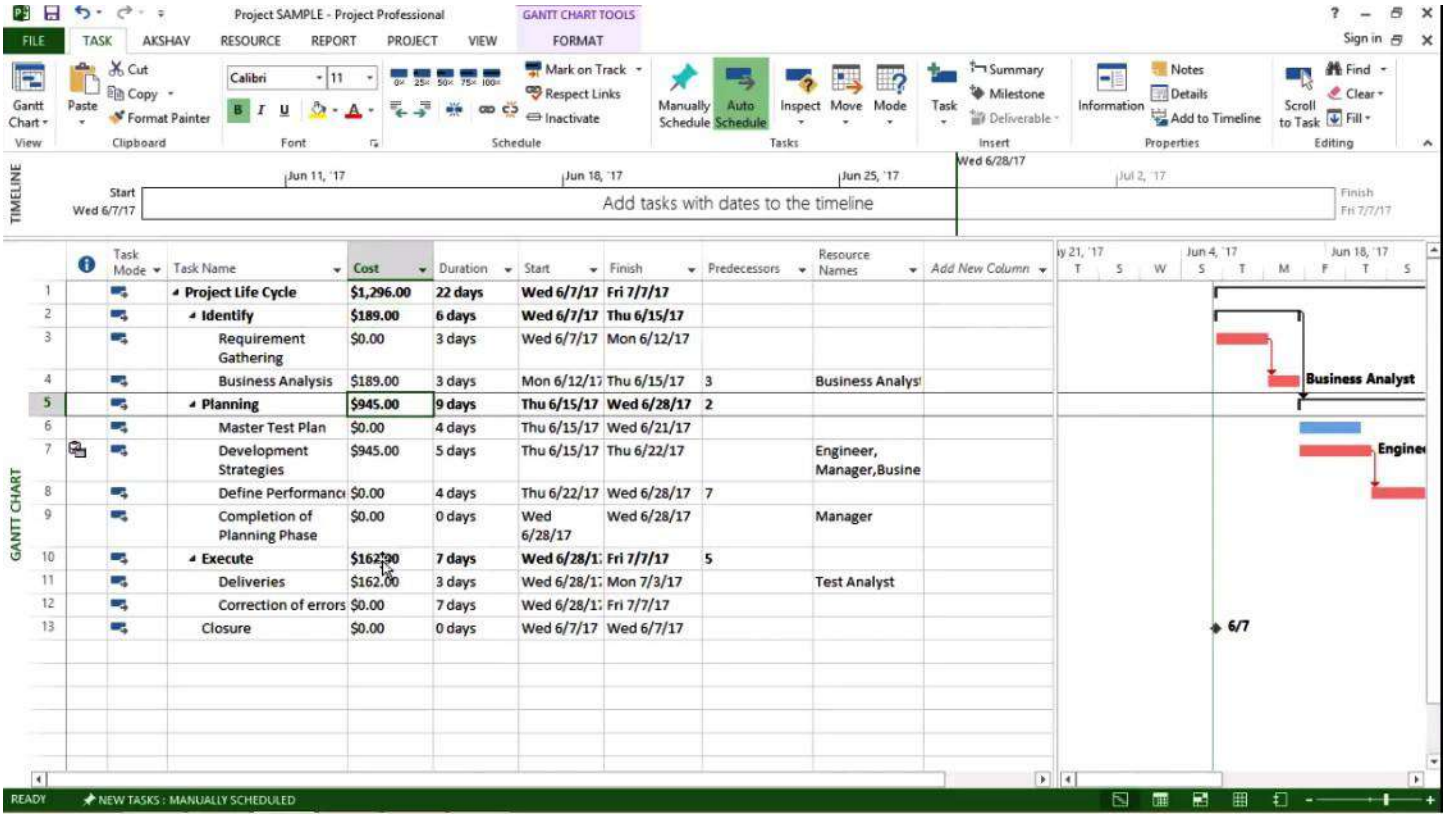
Setting up a baseline in Microsoft Project means keeping a check on your project progress


Project SAMPLE - Project Professional
GANTT CHART TOOLS
FILE
TASK
AKSHAY
RESOURCE
REPORT
PROJECT
VIEW
FORMAT
Sign in
Subproject
Store
My Apps
Project Information
Custom Fields
Links Between Projects
WBS
Change Working Time
Calculate Project
Set Baseline
Move Project
Status Date: 6/28/17
Update Project
Spelling
Insert
Add-ins
Properties
Status
Proofing
Set Baseline...
Clear Baseline
Clear Baseline
Delete a baseline that was previously set.
TIMELINE
Today
Start Mon 6/5/17
Jun 11, '17
Jun 18, '17
Jun 25, '17
Jul 2, '17
Finish Fri 7/7/17
GANTT CHART
Task Mode
Task Name
Duration
Start
Finish
Predecessors
Resource Names
Add New Column
1 Project Life Cycle 23.78 days Mon 6/5/17 Fri 7/7/17
2 Identify 6.89 days Mon 6/5/17 Wed 6/14/17
3 Requirement Gathering 3 days Mon 6/5/17 Thu 6/8/17
4 Business Analysis 3 days Thu 6/8/17 Wed 6/14/17 3 Business Analys
5 Planning 9.89 days Wed 6/14/17 Wed 6/28/17 2
6 Master Test Plan 4 days Wed 6/14/17 Tue 6/20/17
7 Development Strategies 5.89 days Wed 6/14/17 Thu 6/22/17 Engineer, Manager,Busine
8 Define Performanc 4 days Thu 6/22/17 Wed 6/28/17 7
9 Completion of Planning Phase 0 days Wed 6/28/17 Wed 6/28/17
10 Execute 7 days Wed 6/28/17 Fri 7/7/17 5
11 Deliveries 3 days Wed 6/28/17 Mon 7/3/17
12 Correction of errors 7 days Wed 6/28/17 Fri 7/7/17
13 Closure 0 days Mon 6/5/17 Mon 6/5/17
Jun 4, '17
Jun 18, '17
Jul 2, '17
Business Analyst
Engineer,Manager,Busine
6/28
6/5
READY
NEW TASKS : MANUALLY SCHEDULED


Project SAMPLE - Project Professional
GANTT CHART TOOLS
FILE
TASK
AKSHAY
RESOURCE
REPORT
PROJECT
VIEW
FORMAT
Sign in
Subproject
Store
My Apps
Project Information
Custom Fields
Links Between Projects
WBS
Change Working Time
Calculate Project
Set Baseline
Move Project
Status Date: 6/28/17
Update Project
Spelling
Insert
Add-ins
Properties
Schedule
Status
Proofing
TIMELINE
Today
Start Mon 6/5/17
Jun 11, '17
Jun 18, '17
Jun 25, '17
Jul 2, '17
Finish Fri 7/7/17
Add tasks with dates to the timeline
GANTT CHART
Task Mode
Task Name
Duration
Start
Finish
Predecessors
Resource Names
Add New Column
1 Project Life Cycle 23.78 days Mon 6/5/17 Fri 7/7/17
2 Identify 6.89 days Mon 6/5/17 Wed 6/14/17
3 Requirement Gathering 3 days Mon 6/5/17 Thu 6/8/17
4 Business Analysis 3 days Thu 6/8/17 Wed 6/14/17 3 Business Analys
5 Planning 9.89 days Wed 6/14/17 Wed 6/28/17 2
6 Master Test Plan 4 days Wed 6/14/17 Tue 6/20/17
7 Development Strategies 5.89 days Wed 6/14/17 Thu 6/22/17 Engineer, Manager,Busine
8 Define Performanc 4 days Thu 6/22/17 Wed 6/28/17 7
9 Completion of Planning Phase 0 days Wed 6/28/17 Wed 6/28/17
10 Execute 7 days Wed 6/28/17 Fri 7/7/17 5
11 Deliveries 3 days Wed 6/28/17 Mon 7/3/17
12 Correction of errors 7 days Wed 6/28/17 Fri 7/7/17
13 Closure 0 days Mon 6/5/17 Mon 6/5/17
Jun 4, '17
Jun 18, '17
Jul 2, '17
Business Analyst
Engineer,Manager,Business Analys
6/28
Baseline
Baseline 1
Baseline 2
Baseline 3
Baseline 4 (last saved on Wed 6/7/17)
Baseline 5
Baseline 6
Baseline 7
Baseline 8
Baseline 9
Baseline 10
Critical Tasks
Slack
Late Tasks
Baseline
Slippage
Bar Styles
Gridlines...
Bar Styles
Layout
Nonworking Time...
Progress Lines
Show/Hide Bar Styles
Show Timeline
Show Split
READY
NEW TASKS : MANUALLY SCHEDULED

MS Project – Cost

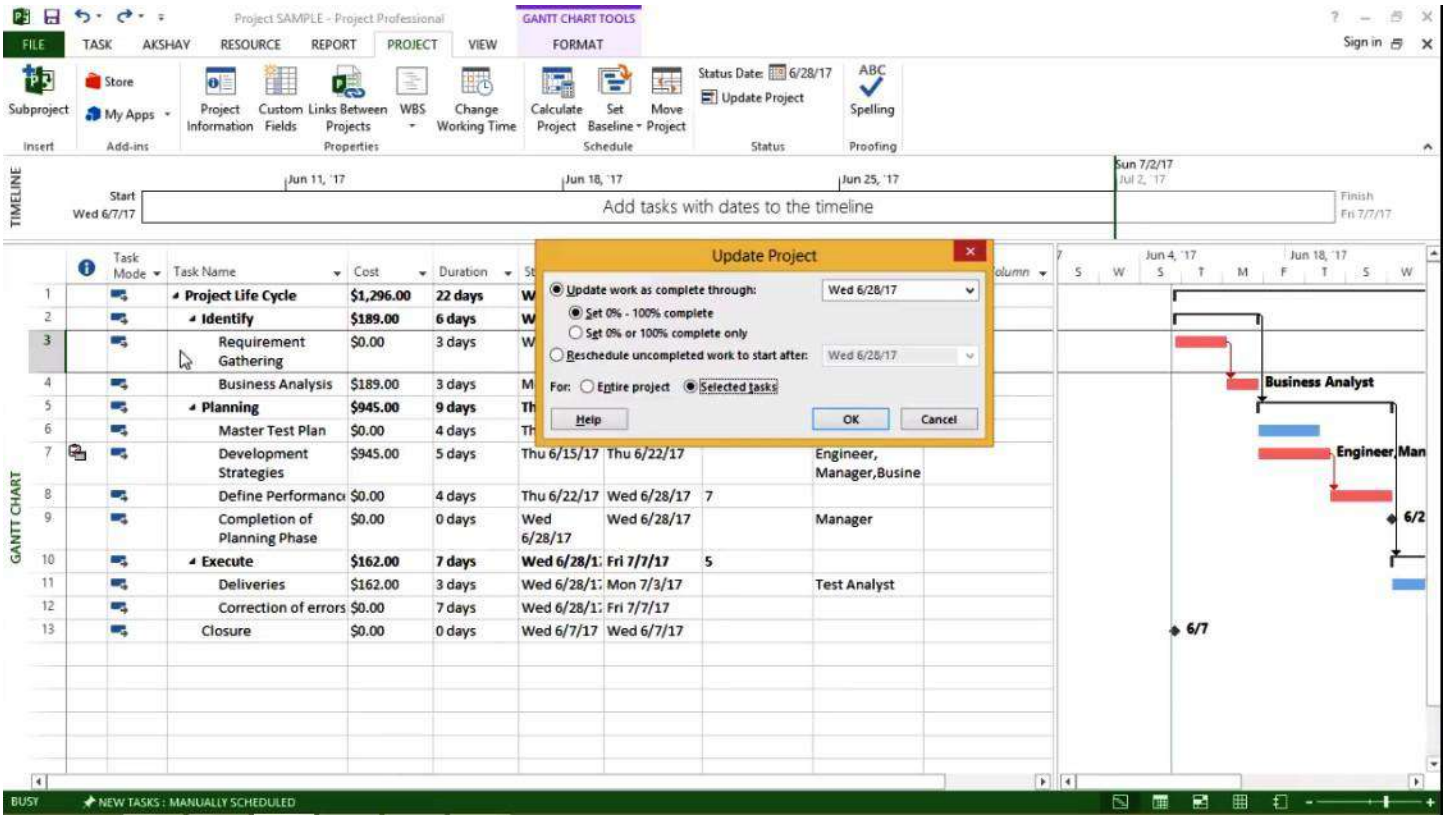
As the name suggest it helps us to calculate the cost/budget of particular task or entire project

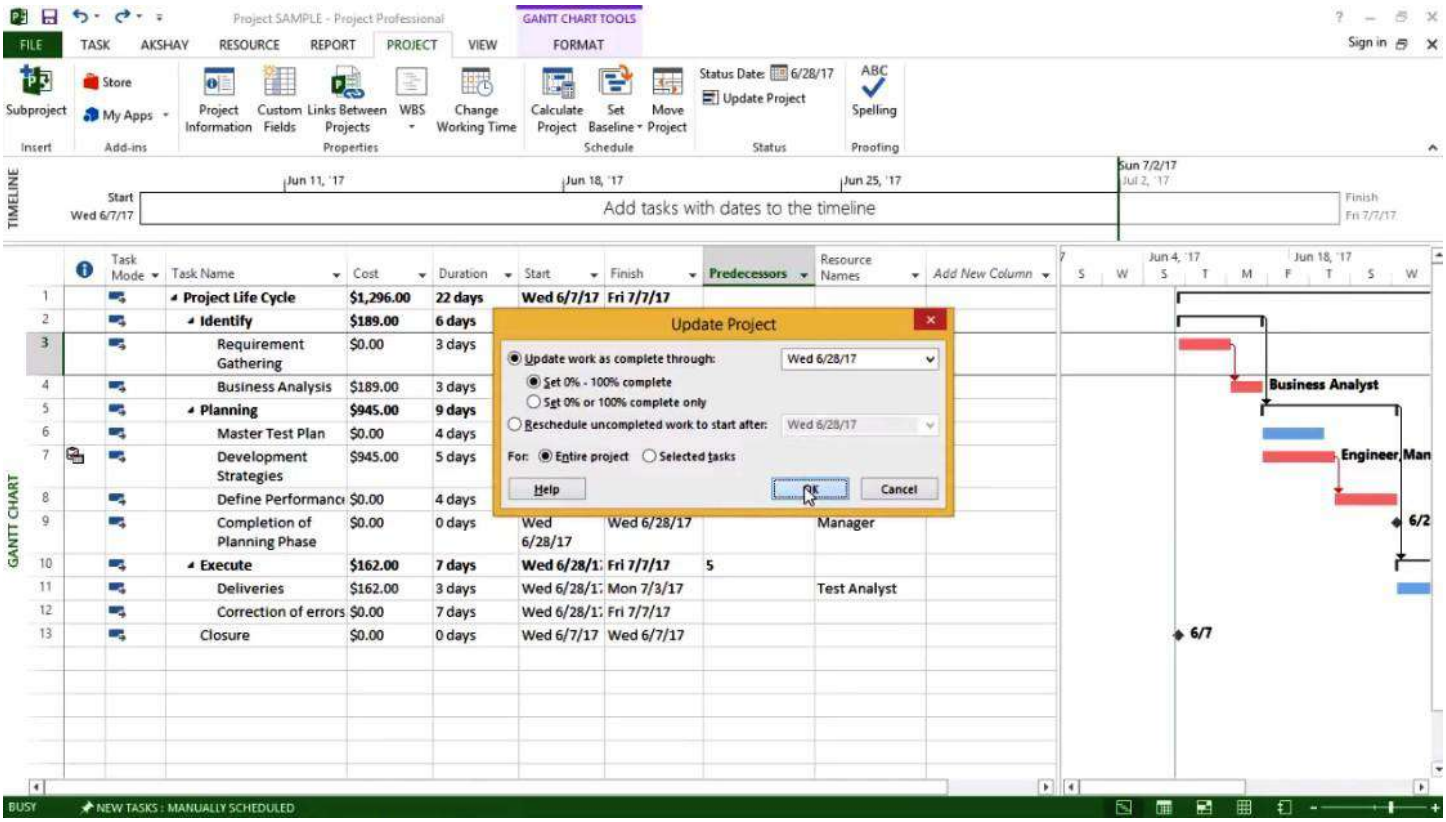


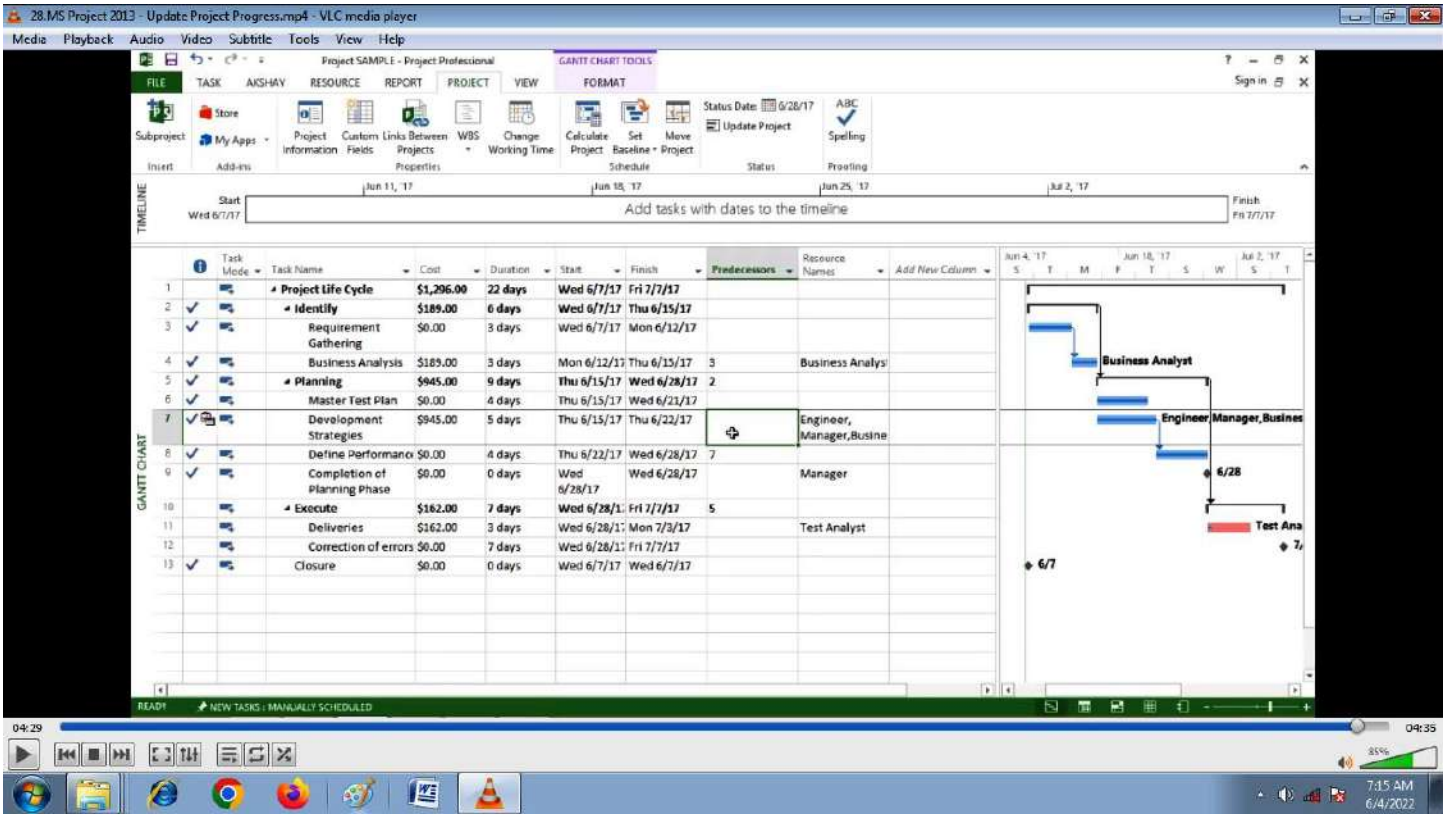
MS Project –Update Project Progress

As we work our project progresses, and we can update the plan with -

1. Actual start and finish dates
2. Actual work and remaining duration
3. Current percent complete and percent work complete.




Project SAMPLE - Project Professional
GANTT CHART TOOLS
FILE
TASK
AKSHAY
RESOURCE
REPORT
PROJECT
VIEW
FORMAT
Sign in
Subproject
Store
My Apps
Project Information
Custom Fields
Links Between Projects
WBS
Change Working Time
Calculate Project
Set Baseline
Move Project
Status Date: 6/28/17
Update Project
Spelling
Insert
Add-ins
Properties
Schedule
Status
Proofing
TIMELINE
Start Wed 6/7/17
Jun 11, '17
Jun 18, '17
Jun 25, '17
Sun 7/2/17
Jul 2, '17
Add tasks with dates to the timeline
Finish Fri 7/7/17
GANTT CHART
Task Mode
Task Name
Cost
Duration
Start
Finish
Predecessors
Resource Names
Add New Column
1 Project Life Cycle $1,296.00 22 days Wed 6/7/17 Fri 7/7/17
2 Identify $189.00 6 days
3 Requirement Gathering $0.00 3 days
4 Business Analysis $189.00 3 days
5 Planning $945.00 9 days
6 Master Test Plan $0.00 4 days
7 Development Strategies $945.00 5 days
8 Define Performanc $0.00 4 days
9 Completion of Planning Phase $0.00 0 days Wed 6/28/17 Wed 6/28/17 Manager
10 Execute $162.00 7 days Wed 6/28/1 Fri 7/7/17 5
11 Deliveries $162.00 3 days Wed 6/28/17 Mon 7/3/17 Test Analyst
12 Correction of errors $0.00 7 days Wed 6/28/17 Fri 7/7/17
13 Closure $0.00 0 days Wed 6/7/17 Wed 6/7/17
Update Project
Update work as complete through: Wed 6/28/17
Set 0% - 100% complete
Set 0% or 100% complete only
Reschedule uncompleted work to start after: Wed 6/28/17
For: Entire project Selected tasks
Help
OK
Cancel
Business Analyst
Engineer,Man
6/2
6/7
BUSY
NEW TASKS : MANUALLY SCHEDULED


28.MS Project 2013 - Update Project Progress.mp4 - VLC media player
Media Playback Audio Video Subtitle Tools View Help
Project SAMPLE - Project Professional
GANTT CHART TOOLS
FILE TASK AKSHAY RESOURCE REPORT PROJECT VIEW FORMAT
Sign in
Subproject Store My Apps Project Information Custom Fields Links Between Projects WBS Change Working Time Calculate Project Set Baseline Move Project Status Date: 6/28/17 Update Project Spelling
Insert Add-ins Properties Schedule Status Proofing
TIMELINE
Start Wed 6/7/17
Jun 11, '17
Jun 18, '17
Jun 25, '17
Jul 2, '17
Add tasks with dates to the timeline
Finish Fri 7/7/17
GANTT CHART
Task Mode
Task Name
Cost
Duration
Start
Finish
Predecessors
Resource Names
Add New Column
1 Project Life Cycle $1,296.00 22 days Wed 6/7/17 Fri 7/7/17
2 Identify $189.00 6 days Wed 6/7/17 Thu 6/15/17
3 Requirement Gathering $0.00 3 days Wed 6/7/17 Mon 6/12/17
4 Business Analysis $189.00 3 days Mon 6/12/17 Thu 6/15/17 3 Business Analys
5 Planning $945.00 9 days Thu 6/15/17 Wed 6/28/17 2
6 Master Test Plan $0.00 4 days Thu 6/15/17 Wed 6/21/17
7 Development Strategies $945.00 5 days Thu 6/15/17 Thu 6/22/17 Engineer, Manager,Busine
8 Define Performanc $0.00 4 days Thu 6/22/17 Wed 6/28/17 7
9 Completion of Planning Phase $0.00 0 days Wed 6/28/17 Wed 6/28/17 Manager
10 Execute $162.00 7 days Wed 6/28/1 Fri 7/7/17 5
11 Deliveries $162.00 3 days Wed 6/28/17 Mon 7/3/17 Test Analyst
12 Correction of errors $0.00 7 days Wed 6/28/17 Fri 7/7/17
13 Closure $0.00 0 days Wed 6/7/17 Wed 6/7/17
Business Analyst
Engineer,Manager,Busines
6/28
Test Ana
6/7
READY
NEW TASKS : MANUALLY SCHEDULED
04:29
04:35
7:15 AM
6/4/2022