Bar Bending & Concreting Level II

Learning Guide # 30

Unit of Competence: Install and Fix Reinforcement Bar

Module Title: Installing and Fixing Reinforcement Bar

LG Code: EIS BBC2 M09 LO2- LG-30

TTLM Code: EIS BBC2 TTLM 1019 v1

LO2: Prepare for reinforcement placement

Instruction Sheet	Learning Guide # 30

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics

2.1 Checking formwork for completion and conformity to receive reinforcement
2.2 Cutting and bending Reinforcement bars

2.3 Tying bars

2.4 Cutting reinforcement sheets to required size

2.5 Attaching Solidifying rods to panels to facilitate handling processes

2.6 Locating bar chairs/spacers

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

2.1 Check formwork for completion and conformity to receive reinforcement

2.2 Cut and bend reinforcement bars to required set out and specifications

2.3 Tie bars to designed configuration from plans/ specifications

2.4 Cut reinforcement sheets to required sizes

2.5 Attach solidifying rods to panels as required to facilitate handling processes

2.6 Locate bar chairs/spacers to requirements of reinforcement schedule and Plans/specifications

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7.
3. Read the information written for each “Information Sheets given below
4. Accomplish the “Self-check after reading & understanding of each information sheet
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet
6. Lastly do the “LAP test
7. If you have any question ask your teacher

Information Sheet- 1	Checking formwork for completion and conformity to receive reinforcement

2.1 Checking formwork for completion and conformity to receive reinforcement

When concrete is placed, it is in a plastic stage and requires to be supported by temporary supports and casing of the desired shape till it becomes sufficiently strong to support its own weight. This temporary casing is known as formwork or shuttering. The term mold is sometimes used to indicate formwork for relatively small units such as lintels, cornices, etc.

A good formwork should satisfy the following

- Tightness
- Strength Rigidity
- Containment
- Good alignment;
- Surface finish;
- Durability;
- Resistance to leakage;
- Accuracy;
- Ease of handling;
- Finish and re-use potential;
- Access for concrete;
- Ease of stripping and Economy

Inspection

The person in charge should inspect the overall formwork activities for accuracy of its dimension, straight alignment and strong stiffness for the purpose it is intended. That is, the operation needs special check at different stages following a sort of checklist as below:

At planning stage:

- Is the formwork documentation provided in an easily understood format?
- Has the formwork designer approved any changes and has the formwork documentation been amended?
- Have workers received proper instruction and competency based training?
- Are plant operators certified to operate equipment?
- Are workers correctly attired / possess appropriate PPE?
- Is lighting of the work area adequate?
- Has external protection been considered (i.e. screens / scaffolding / barricading / warning signs)?
- Have measures been taken to prevent mobile plant from striking formwork (i.e. exclusion zones)?

At construction stage:

- Is the formwork assembly free from defects?
- Have any defects in the formwork assembly been reported to the formwork contractor?
- Is the area free of obstructions?
- Have ground conditions and foundations been checked as adequate?
- Are formwork components consistent with specifications?
- Have frames been assembled correctly?
- Have diagonal braces been assembled on frames?
- Are frames greater than 2 meters in heights tied in position?
- Do base plates have full bearing on sole plates?
- Are inclined props securely tied?
- Are all bearers positioned over the center of 'U' heads?
- Are correct pins used in props and frames?

- Is formwork deck level and within tolerances?
- Have precautions been taken against water erosion?
- Have precautions been taken to prevent the dislodgement of formwork?
- Has the formwork been inspected prior to the placement of concrete?
- Are all fittings tight and unlikely to become loose when concrete is vibrated?
- Have observer(s) been positioned?
- Is there a system of communication in place with all workers?
- Are workers trained in the placement of concrete?
- Are all workers aware of the maximum concrete pour rates?

Checking Slab Formwork

- Check whether the formwork is fixed properly or not for example sleeves and supports.
- Damaged materials employed for formwork or shutter should not be utilized.
- All formwork surfaces in contact with concrete need to be treated with shuttering oil and dampen with water sometime prior to concrete placement.
- check the level of the projected top surface of the slab and place level strips if necessary to mark the exact level.

Fig. 1: Checking level of slab shuttering

Checking Slab Reinforcement

- Check and approve that reinforcements are fixed as per the approved drawings.

- Examine reinforcement spacing (including vertical and horizontal spacing) and cover.
- Ensure that adequate support for reinforcements are provided to prevent any movement during concreting process.
- Loose ties along the splices of reinforcement bars must be tightened again.
- Free end of binding wires shall be bended inward.

Fig. 2: Slab reinforcement checking

Self-Check 1	Multiple choice

Instruction: Select the best answer and encircle the letter

:

1. The person in charge should inspect the overall formwork activities for

   A/ Accuracy of formwork dimension

   B/ Straight alignment of the form work

   C/ Strong stiffness for the purpose it is intended of the form work

   D/ All of the above are correct

2. One of the following is the requirement of a good formwork

   A/ Strength Rigidity

   B/ Surface finish & Durability

   C/ Resistance to leakage & Tightness

   D/ All of the above

3. Have workers received proper instruction and competency based training is?

   A/ checklist at planning stage

   B/ checklist at construction stage

   C/ checklist at supervision stage

   D/ A & B are correct

Note: **Satisfactory rating - 2 points** **Unsatisfactory - below 2 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Information Sheet- 2	Cutting and bending Reinforcement bars

2.2 Cutting and bending Reinforcement bars

For smaller works in rural areas the reinforcement bars are cut and bent on site. This requires some skill and the appropriate tools. The reinforcement bar bending schedule describes what type of bars to prepare in terms of size, shape and numbers of each type.

The stirrup is the outer frame that holds the load bearing bars in the correct position. These are prepared on site using 10mm diameter bars. The exact length of the bars for stirrups needs to be carefully calculated based on the dimensions of the column or beam. The re-bars have to be covered all round with at least 25mm to 30mm concrete. The stirrups therefore need to be cut and bent to allow for sufficient coverage.

Make sure the end bend is minimum 50mm.

Hand Tools & Equipment for Cutting and bending bars

Hand Tools

Hack Saw: - Used for cutting reinforcement bar. The bar should be held firmly in the vice while cutting. The blade should be tightened to the frame of the hacksaw properly and never use blunt blade when cutting.

Bar Bender:- Used for straitening and bending of reinforcement bar with the help of hook type bender mounted on bench on wood board. Usually there is different size for different reinforcement bar size and Select current size that fits the diameter of the reinforcement.

Hook Type Bar Bender:- Used for right and left hand bending of reinforcing bar manually. It should be mounted on wood board or bench when being used.

Machines

Reinforcement Cutter

It is used for cutting and bending reinforcement bars made of rugged cast iron construction, mounted on wood board or bench. It is built for heavy duty.

Electrical Bending Machine

An electrical bending machine is a machine used to bend reinforcement bars mechanically according to the design or working drawings. Provided the machine is adjusted correctly, precise output can be obtained.

The rebar shall be bend according to the approved bar bending schedule and shop drawing. The bending works will be carried out using rebar bending machines located within the same area where the cutting machines are located.

Fig.3 Example of bar bending machine

Fig.4 Example of cut & bent bar

Step to Cutting Rebar

1. The first step to cutting rebar is to measure it. It is usually sold in lengths of about 20 feet. It's likely that you will be working with long pieces of rebar, so before you cut it is important to take accurate measurements.
2. Take the proper safety precautions when cutting steel. Rebar can be very heavy, and the ends are sharp. While you're working with it and using a metal blade to cut a metal surface, it will make sparks, and there will be metal shavings flying in the air.
   Use caution and wear proper safety equipment. Consider wearing a mask , some goggles and gloves as well as a long sleeve shirt, pants, and work boots
3. Be sure that your workspace is large enough to accommodate rebar. The length of them can v ar y from 8 to 60 feet. When working with it being an open space is it ideal and clear of any obstructions.
4. Cutting the Rebar
   - ❖ The first step is to make sure that you are using the wheel, which is designed to cut metal. It should be durable enough and strong enough to cut the steel.
   - ❖ After, make sure that you secure the rebar. A good way to do that is to place it in a vice or a clamp.

❖ Then approach it directly and make a cut straight down. The cut might not be very clean, but this method is faster than many other

Self-Check 1	Multiple choice

Instruction: Select the best answer and encircle the letter

1. For smaller works in rural areas the reinforcement bars are cut and bent

   A/ on working site

   B/ In the shop where power hack saw is available

   C/ It is not necessary to prepare reinforcement bars for small work

   D/ All of the above are correct

2. One of the following hand tools is used for cutting reinforcement bar

   A/ Manual shear cutter

   B/ Hack Saw

   C/ Electrical shear machine

   D/ None of the above

3. What is the main advantage of stirrup in concrete work?

   A/To enable the concrete to resist shear stresses

   B/ To keep the bar in their correct position until the concrete is laid

   C/To support compression force

   D/ A & B are correct

4. It is a machine used to bend reinforcement bars mechanically according to the design or working drawings

   A/ Electrical shear machine

   B/ Manual shear cutter

C/ Hack Saw

D/ B & C are correct

Note: **Satisfactory rating - 2 points Unsatisfactory - below 2 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Operation Sheet- 1	Cutting and bending bars

PROCEDURE for Cutting and bending bars

Step 1-. Prepare and clear a level area with suitable space for cutting and bending the required reinforcement bars.

Step 2. Prepare the reinforcement bar bending schedule

Step 3. Prepare all the necessary tools and bending table required to cut and bend the Reinforcement bars.

Step 4. Measure the correct total length, cut and bend according to the schedule.

Step 5. Before continuing with the remaining bars, check again that the pilot bar conforms exactly to the required shape and size.

Step 6. If it does, continue preparing the remaining bars of this particular shape**.**

Information Sheet- 3	Tying bars

2.3 Tying bars

Tying is normally carried out by using 1 – 1.5 mm diameter black wire, care being taken to select the approximate sizes. Loose ends of the tie must be either be cut off or bent so that they can not cause any harm by rusting and showing through the concrete face. Possibly the mesh (cape) can be welded together according to the specification given on the contract document instead of using tying wire.

The stirrups are tied onto the main bars using binding wire. For slabs the reinforcement bars are usually arranged and tied together when the formwork has been completed. The main bars are at the bottom, while the distribution bars are laid and fixed on top of them.

Tie wire is used to hold rebar in place to ensure that when concrete is placed the bars do not shift out of position.

NOTE: Tie wire adds nothing to the strength of the steel.

A number of different types of ties can be used with reinforcing bars; some are more effective than others. The following figure shows six types of ties that are identified below according to the letters of the alphabet used to show individual ties.

A. SNAP TIE or SIMPLE TIE. The wire is simply wrapped once around the two crossing bars in a diagonal manner with the two ends on top. These are twisted together with a pair of side cutters until they are very tight against the bars. Then the loose ends of the wire are cut off. This tie is used mostly on floor slabs.

B. WALL TIE. This tie is made by going about 11/2 times around the vertical bar, then diagonally around the intersection, twisting the two ends together until the connection is tight, but without breaking the tie wire, then cutting off the excess. The wall tie is used on light vertical mats of steel.

C. DOUBLE-STRAND SINGLE TIE. This tie is a variation of the simple tie. It is especially favored for heavy work

D. SADDLE TIE. The wires pass halfway around one of the ban on either side of the crossing bar and are brought squarely or diagonally around the crossing bar with the ends twisted together and cut off. This tie is used on special locations, such as on walls.

E. SADDLE TIE WITH TWIST. This tie is a variation of the saddle tie. The tie wire is carried completely around one of the bars, then squarely across and halfway around the other, either side of the crossing bars, and finally brought together and twisted either squarely or diagonally across. The saddle tie with twist is used for heavy mats that are to be lifted by a crane.

F. CROSS TIE or FIGURE-EIGHT TIE. This type of tie has the advantage of causing little or no twist in the bars.

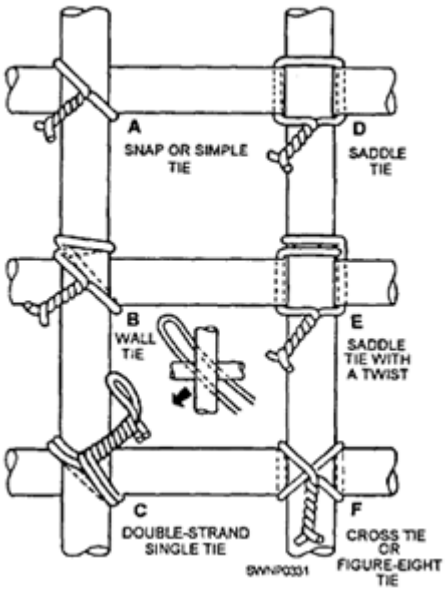


Figure.5 Six types of ties.

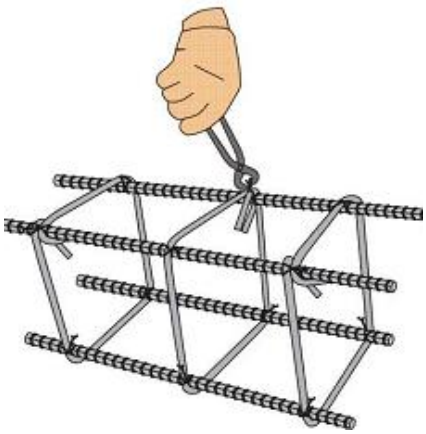
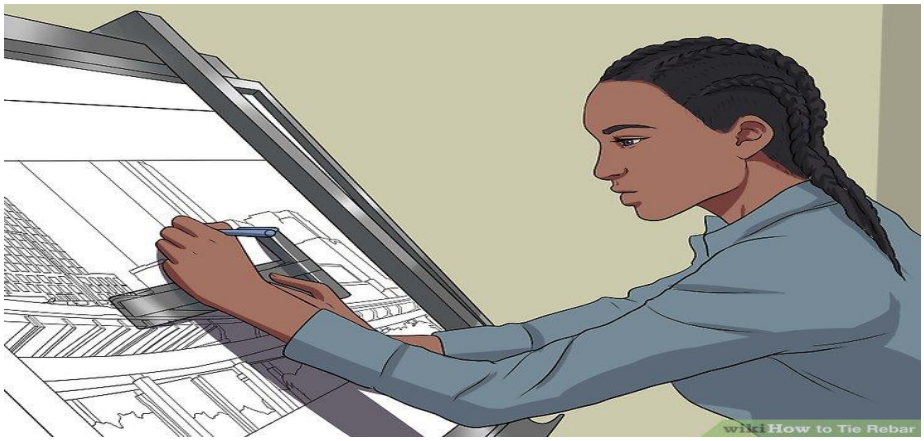


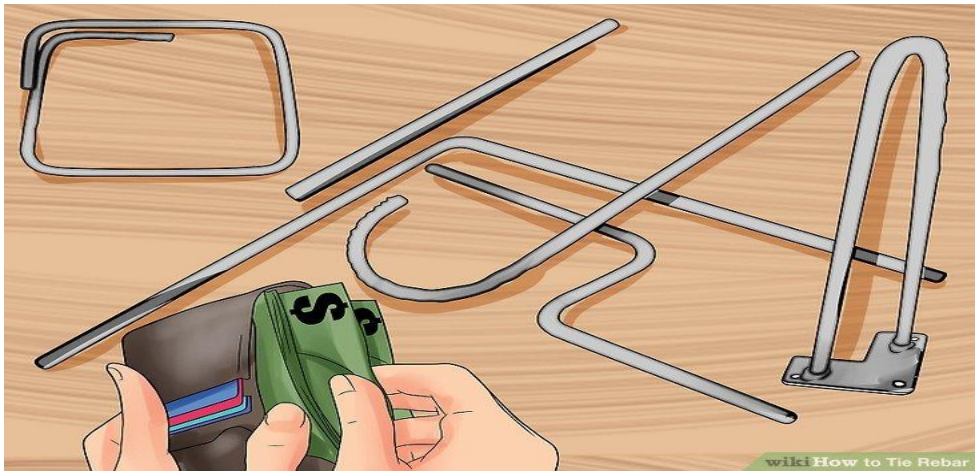
Figure.6 tying bar

- **How to Tie Rebar**

Building with concrete involves many steps to achieve the best results, including forming, grading, placing, and finishing. One critical step is placing the reinforcing bars, or *rebar*, correctly, and this article will explain how this is done.



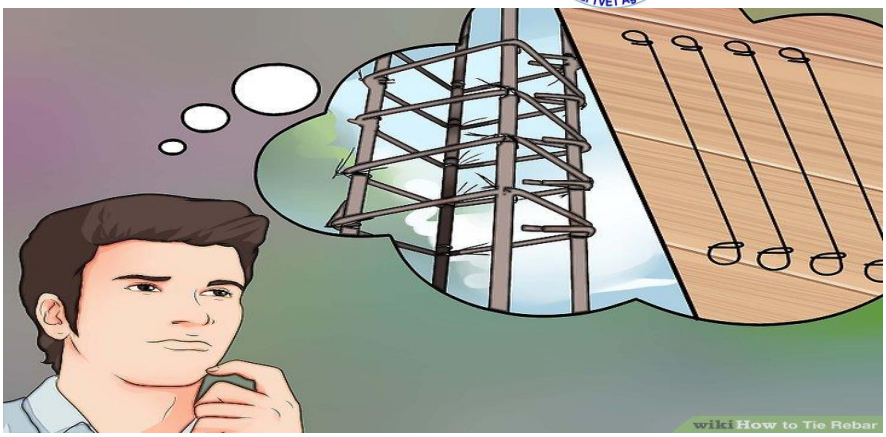
Steps 1 Plan the project. For structural concrete construction, an engineer and architect will usually do the technical design work and provide specific information regarding the sizes, configuration, and placement of rebar in the associated concrete work. Planning the actual fabrication and placement, as well as the schedule of the work is your first task



Step 2 Purchase the rebar. For simple projects like typical building foundations and slab reinforcement, you can most likely buy the necessary rebar from a building supply center or home improvement warehouse. For complicated applications such as grade beams, foundation walls, tanks, and other projects, you will need to have specific shapes formed by a rebar fabrication specialist. Here are some examples:

- Stirrups - These are shaped rebar that hold the lateral reinforcement in a certain configuration, often called a cage. They create a framework that keeps these larger bars in position, and may be round, square, rectangular, or even complex combinations of shapes.[1]
- Dowels - These are usually L shapes, or straight lengths of rebar with a ninety degree bend on one end.
- Corner bars - These are also L shapes, with each side of the ell the same length.
- Offset bends - These range from a simple Z shape to complex angles, used in reinforcing concrete walkway steps and steps (changes in elevation) in concrete footings.
- Hairpins - These are U shaped rebar that are often used to interlock two or more individual mats of rebar to give lateral strength to the concrete casting.
- Candy canes - As the name implies, these are straight lengths of rebar with a U shaped bend on one or both ends, again to interlock two or more parallel reinforcing mats.

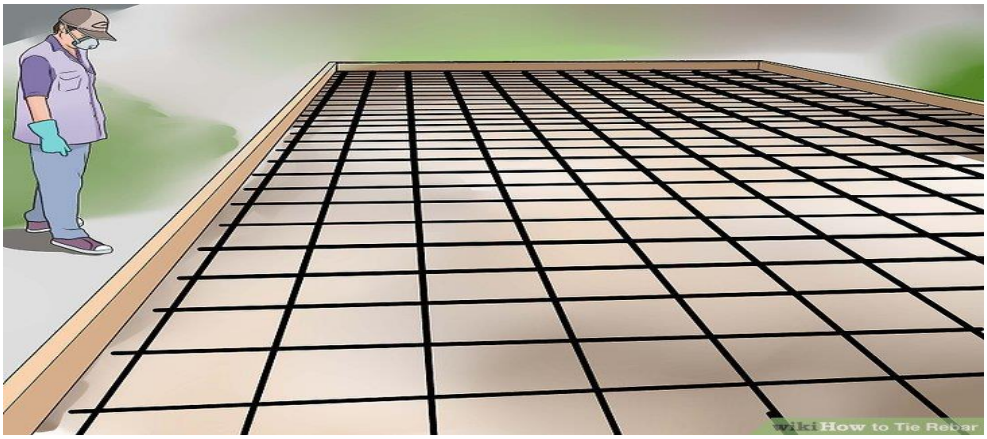
Step 3. Consult your reinforcing placement drawings/plan. If you purchase your rebar from a fabricator, the supplier will usually review your structural engineer's or architect's plans and produce a shop drawing with details and identifying tags for each type of rebar used in the project. For simpler projects, your building plans should provide spacing requirements and bar sizes. Use these documents to determine where and what rebar is needed in individual locations.



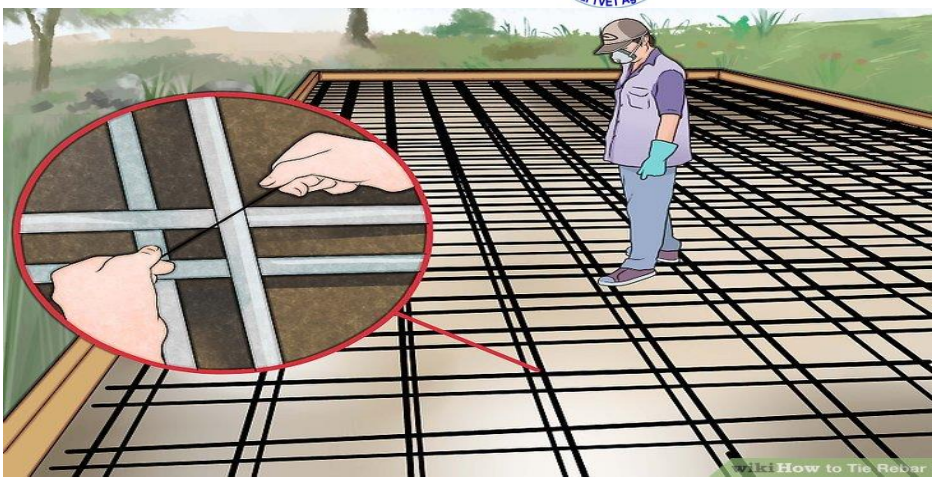
Steps 4 Choose the method you will use to tie the rebar. Most times, rebar is tied with annealed steel wire, either bought in four pound bulk rolls, or if using a bag tie spinner, in bundles of precut wire pieces with loops formed on both ends. The latter are easier for novices to use, but somewhat more expensive, the former is often the choice of experience rebar tiers (rod busters).[2]

Steps 5. Prepare the area where the concrete is to be placed. The ground should be graded and compacted after any needed subgrading, excavations, and underground rough ins for plumbing and electrical utilities is finished. Lay out the actual perimeter or form lines for the concrete placement after the grading and compaction and associated testing is done.

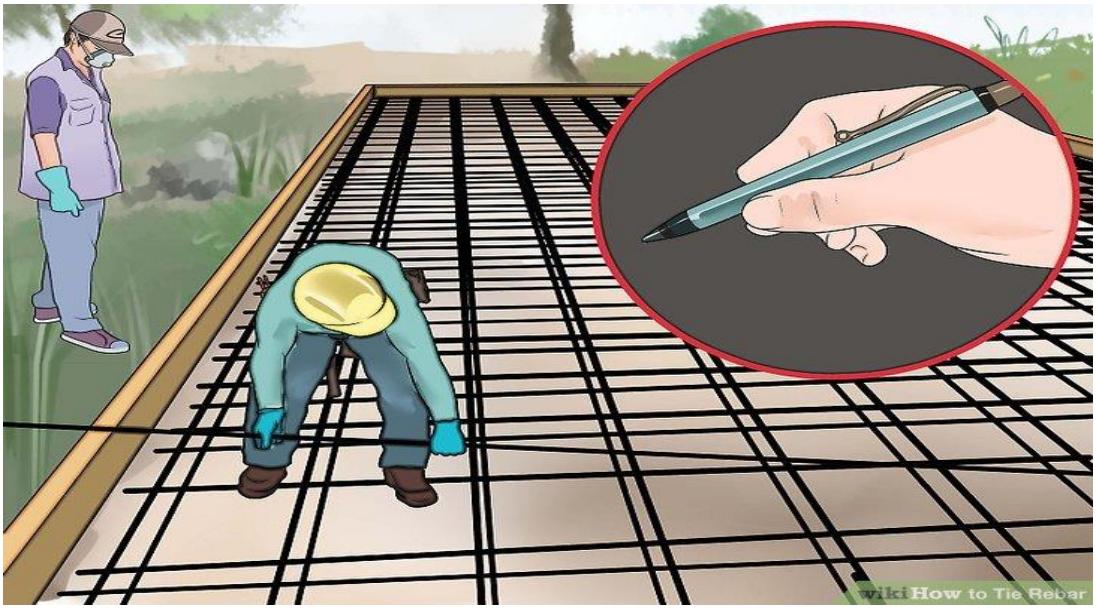
Steps 6. Decide whether the concrete forms will be installed prior to placing your rebar. For large footings where heavy rebar is to be used, the formwork usually is done first, for concrete walls and grade beams, one side of the form may be built prior to tying the rebar, but the rebar will need to be tied in place before the formwork is completed so bars can be positioned and tied in place. For concrete slabs, the subgrade (ground underneath the slab) is often pre-treated for termites, and a moisture barrier or dampproofing is installed before the mat is tied.



Steps 7 Shake out the rebar.[3] This involves removing individual bars, stirrups, and dowels from their respective bundles according to the placement drawing counts. An example would be a slab measuring 12 feet (3.7 m) by 12 feet (3.7 m) with rebars at 8 inch (20.3 cm) centers in one direction, and 12 inch (30.5 cm) centers the other. Determine the size of bars required in each direction, mark two or three bars with the appropriate layout measurements in each direction, and count the marks to determine how many rebar are required for each direction. Often, the placement drawings are specific, such as "18 (number 5) rebar, 11 foot 6 inches (15.2 cm) long, one half each way". This gives the following information: You need the given quantity, 18, rebar, size 5 (5/8 inch diameter), with 9 bars laying in each direction, the top rows perpendicular to the bottom ones.



Steps 8. Tie your rebar. This is the primary focus of this article. Tying the bars so that they remain in their correct respective positions is critical to achieve the desired strength of the completed concrete structure.



Steps 9. Place each rebar in its respective position according to the layout described in the previous steps. The layout bars (or mark bars) can be marked with a soapstone marker, a paint pen, a piece of lumber crayon, or with spray paint.

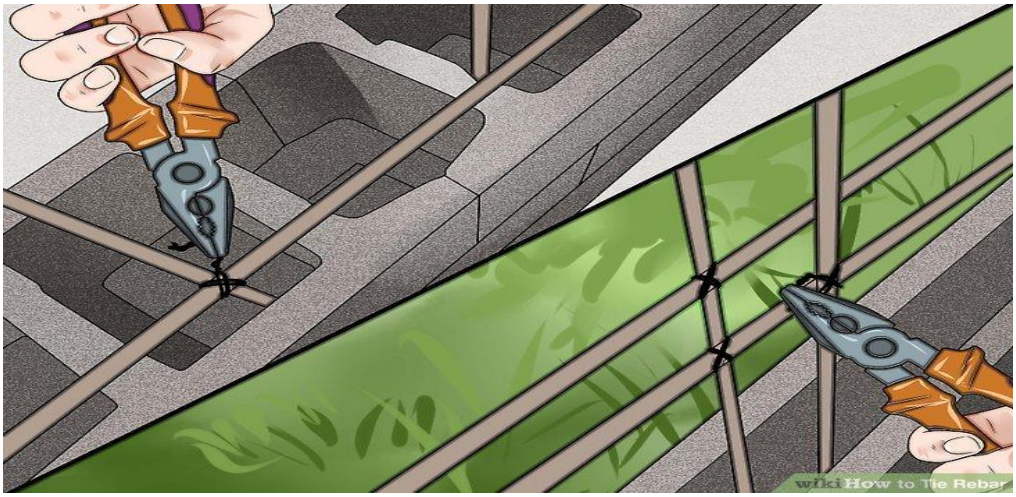
Steps 10. Select the appropriate type of tie you will use. For the bag ties (Snap Ties, not to be confused with the snap ties described later). For ordinary slab mats, where the force of the concrete interacting with the rebar during its placement is minimal, and movement of the mats is unlikely, using a simple, single twist of wire around each rebar intersection, twisted

together tightly, will suffice. This tie is known as a snap tie, and can be made with the snap tie precut ties and a spinner, noted earlier. It can also be done easily with a pair of 9 inch (22.9 cm) lineman's pliers and bulk wire held on the rod buster's work belt in a wire reel. For other applications where the force of the concrete placement may displace the rebars, or where more strength is needed to hold bars in the proper configuration, more complicated ties may be used. Here are some of them, with a simplified description of how they are made:[4]

- Figure 8 ties - These are made by pulling the wire around the rear (from the rod buster) bar, diagonally across the front bar, back around the rear bar, diagonally in the opposite direction across the front bar, and then twisting back around the beginning wire. You then cut the wire feeding off the reel, and bend the cut ends back towards the tie so no sharp ends project from the tie. These ties will help hold perpendicular bars tightly together while helping to prevent them from racking, or moving diagonally.
- Saddle ties - Similar to the figure 8 tie, you begin by passing the wire feeding from your reel behind the rear bar, then across the front bar staying parallel to the bar. You then pass it behind the rear bar again, back around the front bar on the opposite side. You now twist the ends together, cut the feed wire, and bend the cut ends back. This tie is often used when tying rebar for walls or other vertical application where the rodbuster will actually climb on the rebar framework to access higher portions of the wall. The figure 8 and saddle tie can often be interchanged, however, technically speaking, there are advantages to each one in certain circumstances.
- Combinations of figure 8 and saddle ties with additional wraps around vertical rebars can be used to increase the hold of the tie so bars cannot slip downward when weight is applied to them or the plastic concrete is dropped into the form.

Steps 11 Use your pliers for tying these ties efficiently. For all the above mentioned ties, you pull the feeding end from the wire reel with your non-dominant (hereafter regarded as left, please reverse for right handed persons) hand. Grip the end of the wire with your pliers in your right hand, and poke, or push it behind the rebar described in the first step of your chosen tie. Bend or angle

the end toward the place you will be grabbing the end in the next step of the tie, then reach from that side, grip it again with the pliers, pull it toward the next place you will route it to, pulling enough slack wire to complete the tie. Hold resistance on the wire with your left hand, so the wire bends snugly against the bar you are wrapping in each stage of the tie. Release the wire so that the pliers can be used to grip it, and do so, pulling the end around the bar and twist the two ends of the wire together. Pull or tug the wire with the pliers so the tie is tight.[5]



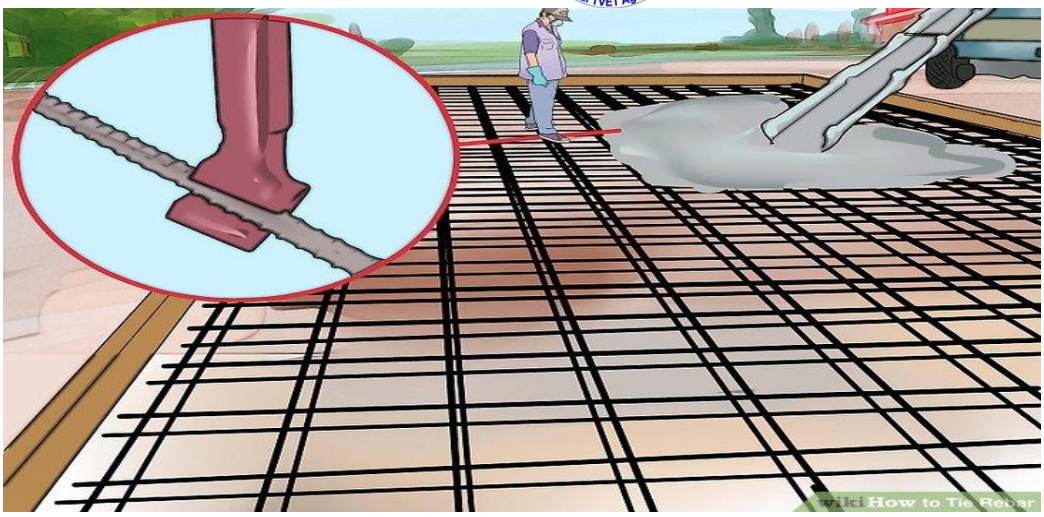
Steps 12. Tie all the bars required in their correct positions. Check your plans to make sure each component of the reinforcement is in place. Often, in structural concrete reinforcement, you will find several elements that interface together in addition to the basic rebar mat discussed so far. Here are a few to note:

- Block dowels - When placing a concrete foundation which will have concrete masonry units (block) erected on it, you will usually find the plans require installing block dowels, or vertical rebar to reinforce cells at a required spacing to give the subsequent block wall sufficient strength to withstand conditions to which it will be exposed, or to help it support loads it will carry as an overall part of the structure you are building. These bars are tied to the foundation rebar (footing bars) in a location that will place them in the center of individual block cells. For them to be placed

correctly, you will need to establish the wall line, then determine the spacing of these cells. If your layout begins at a corner, using 8X16 inch regular block, you can place the first dowel 4 inches (10.2 cm) inside the outside wall line, 4 inches (10.2 cm) from the corner, then space additional bars at their required distances in multiples of 8 inches (20.3 cm). For example, at 16, 24, or 32 inch centers. This is known as blockwork spacing.

- Bulkhead dowels - In instances where a footing will not be completed in a single concrete placement, you will need to dowel out of the bulkhead form so the next placement will be structurally tied to the latter one. Make sure the dowels extend far enough that the lateral reinforcement will overlap enough to maintain the strength of the rods used. Typically, rebar lap is calculated in bar diameters. An example would be the number 5 rebar mentioned earlier. It has a diameter of 5/8 of an inch, and the required lap might be 40 bar diameters. Multiplying the diameter 5/8 by 40, you will get 200⁄8 or 25 inches (63.5 or 63.5 cm).
- Note that in structural concrete, other types of imbeds and inserts may be required. Place rebar in such a manner as to allow installation of anchor bolts, sleeves, embedded weld plates, inserts, or other items in their respective correct locations without interference. In general terms, these items require more precise positioning, so offsetting one or two rebars may be required.

Steps 13. Chair or support your rebar. Once the mat or cage is assembled, you must hold it in position so the the concrete will cover it completely. Rebar chairs or concrete brick are often used for this purpose. Place these positioners at a spacing that will not allow the rebar to bend or deflect enough to reduce the coverage you wish to obtain with the concrete you place in you forms. For a 12 inch (30.5 cm) thick footing, the rebar mat is usually placed about 4 inches (10.2 cm) from the bottom of the concrete, and side clearances range from 2 to 4 inches (5.1 to 10.2 cm).



Steps 14. Observe the rebar configuration while the concrete is placed. If shifting occurs, support the rebars with a handled tool like a shovel wedged so that you can achieve sufficient leverage to hold its position, or alter the direction of flowing concrete so force is applied in the opposite direction.

Observe the rebar configuration while the concrete is placed. If shifting occurs, support the rebars with a handled tool like a shovel wedged so that you can achieve sufficient leverage to hold its position, or alter the direction of flowing concrete so force is applied in the opposite direction.

Steps 15. Cap or otherwise protect any exposed bars while working near them. Rebar that is sheared, or mechanically cut has very sharp surfaces at the location of these cuts. Construction workers have suffered serious injuries and have also been killed when they have fallen on projecting rebar dowels. Special rod caps made of high impact plastic with a metal plate embedded in them are required by the Occupational Safety and Health Administration (OSHA), in the United States.[6]

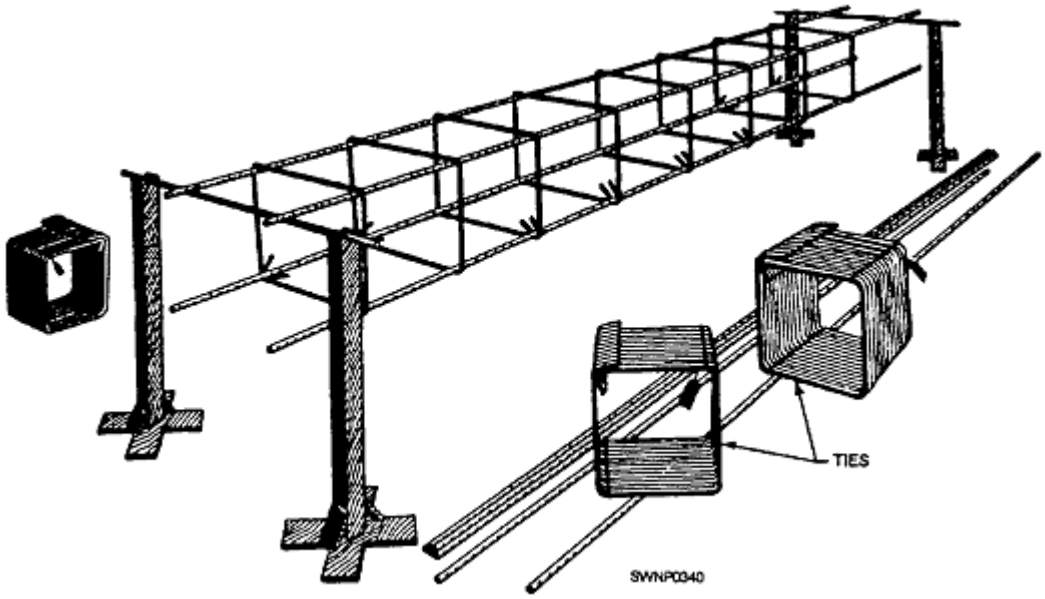


Figure.7 Column assembly.

The diagrams below show steps in fixing of reinforcement.

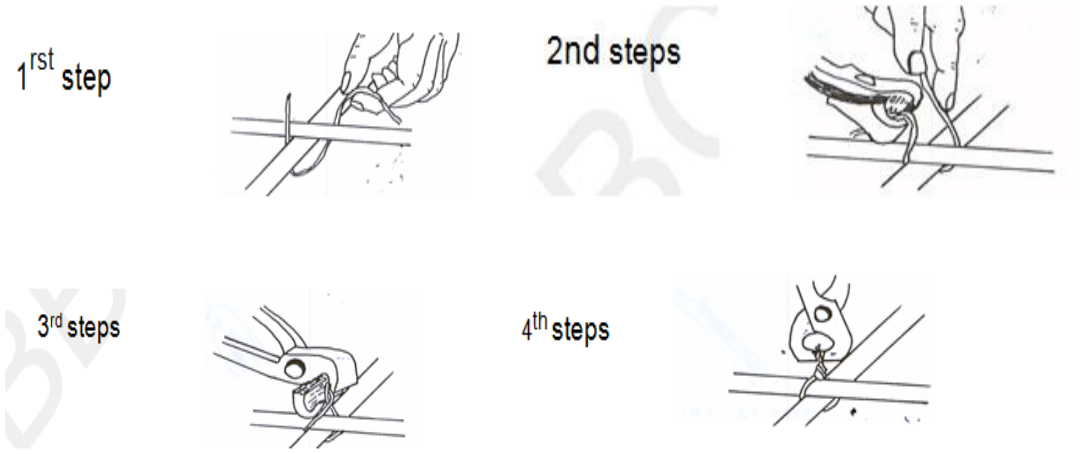


Fig.8 steps of fixing of reinforcement for slab

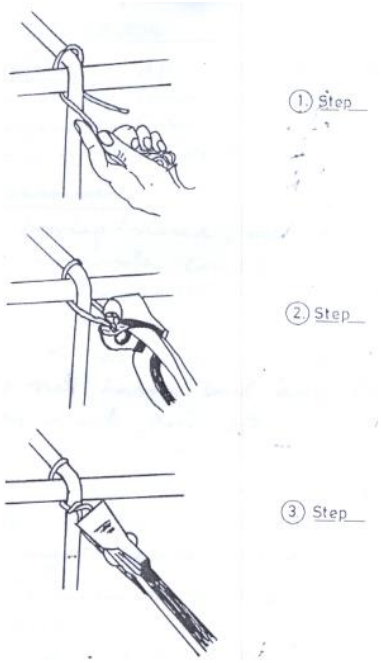


Fig.9 steps of fixing of reinforcement for beam or column

Self-Check 1	Multiple choice

Instruction: Select the best answer and encircle the letter

1. The stirrups are tied onto the main bars using

   A/ Binding wire

   B/Black wire

   C/Tie wire

   D/ All of the above are correct

2. For slabs the reinforcement bars are usually arranged and tied together when the formwork has been completed. This statement is

   A/ True

   B/ False

   C/It depend according to the engineer

   D/ None of the above

3. One of the following is adds nothing to the strength of the steel.

   A/ stirrup

   B/ Tie wire

   C/Rebar

   D/ A & B are correct

4. . ------- type of tie has the advantage of causing little or no twist in the bars

   A/ Saddle tie with twist

   B/ Snap tie or simple tie.

   C/ Cross tie or figure-eight tie

   D/ All of the above

Note: **Satisfactory rating - 2 points Unsatisfactory - below 2 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Operation Sheet- 1	Tying bars for beam or column

Procedure: For tying bars for beam or column

Step 1. Prepare and clear a level area with suitable space for tying beam and column reinforcement bars.

Step 2. Prepare a stand or a table for assembling the reinforcement bars.

Step 3. Check the exact size and shape of the reinforcement bars with the bending schedule.

Step 4. Start with two main bars by laying them parallel to each other.

Step 5. Distribute the stirrups along the two main bars with uniform spaces

Step 6 Fix the stirrups with binding wire to the two main bars.

Step 7 Slip in the remaining main bars and tie them to the stirrups.

Step 8 Make sure the stirrups are tied to the main bars in a right angle

Information Sheet- 4	Cutting reinforcement sheets to required size

2.4 Cutting reinforcement sheets to required size

Welded mesh reinforcement is made from metal rods with 3 to 40 mm diameter. These metal rods are perpendicular bonded by spot welding. Concrete reinforcing mesh used in residential, industrial and road construction, such as concrete footpaths and industrial and commercial ground slabs, precast panel construction and residential slabs and footings.

Our reinforcing mesh wire is ribbed steel rod, which creates improves bonding to concrete, minimizes any concrete cracking that may occur as a result of concrete shrinkage.

Smooth steel reinforcing mesh also can be manufactured according customers special requirement.

Specification of concrete reinforcing mesh:

Type: Concrete mesh heavy type (diameter of rods above 12 mm) and light type (diameter of rebar rods from 3 mm up to 10 mm).

Material: stainless steel rebars rods, galvanized steel rods (with its excellent resistance to corrosion, galvanized reinforcing mesh can be successfully used in wet conditions).

Mesh shape: rectangular or square.

Distance between rods 100, 200, 300, 400 and 500 mm.

Mesh sheet width: 650 mm - 3800 mm.

Mesh sheet length: 850 mm, 6 m, 9 m, 12 m.

Standard reinforcing steel mesh sheet sizes are 6.0 m × 2.4 m. And 4.80 m × 2.4 m, 3.6 m × 2 m, 2 m × 4 m also offered.

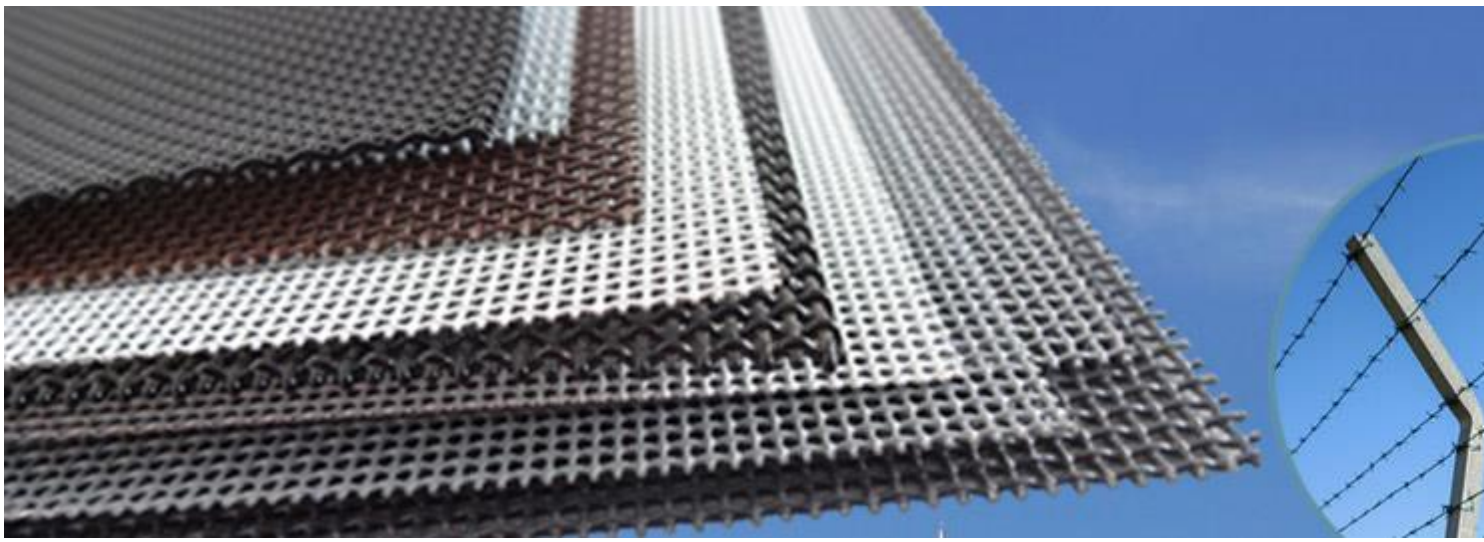


Fig. 10 mesh sheets

Concrete Slab Mesh:welded building wall reinforcement,also called Slab Mesh,

Concrete slab mesh is reinforced welded wire mesh panels. This reinforced welded wire mesh panels are made of galvanized welded wire mesh for constructional uses. For example, block slab structure reinforcing, and hollowed slabs reinforcement, building wall reinforcement and support wall reinforcement.

Specification of concrete slab mesh:

Material: hot dipped galvanized, electro galvanized or stainless steel.

Slab mesh sheets: length 6 m × width 2.4 m.

Mesh size: 200 × 200 mm or 100 × 100 mm.

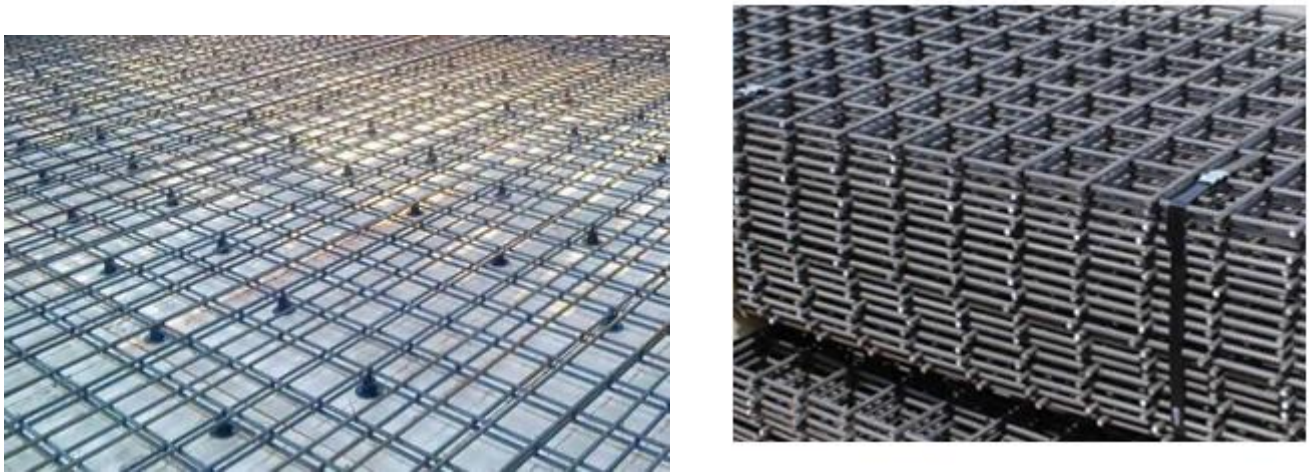


Fig. 11 mesh sheets

Self-Check 1	Multiple choice

Instruction: **Select the best answer and encircle the letter**

:

1. Where do you use concrete reinforcing mesh / reinforcement sheets?

   ,

   A/ Residential construction

   B/ Industrial construction

   C/ Road construction

   D/ All of the above are correct

2. What is the advantage of reinforcing mesh wire

   A/ It creates improves bonding to concrete

   .B/ Minimizes any concrete cracking that may occur as a result of concrete shrinkage

   C/It has no any advantage in construction work

   D/ A & B are correct

3. The Standard reinforcing steel mesh sheet sizes are

   A/ 6.0 m × 2.4 m & 4.80 m × 2.4 m

   B/ 3.6 m × 2 m

   C/ 2 m × 4 m

   D/ All are correct

Note: **Satisfactory rating - 2 points Unsatisfactory - below 2 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

2.5 Attaching Solidifying rods to panels to facilitate handling processes

Attaching stiffening rods to panels

A prefabricated panel is made of a plurality of elongated metal frame members attached together to form a panel framework. At least one stud is attached between two of the panel frame members and has a pair of elongated stud members attached together at each end thereof with a molded polymer composite end member to form a thermal break therein. A metal reinforcing rod is attached to each molded composite end member and extends the length of the stud and may be attached through to the roof rafters or trusses. The prefabricated panel may be filled with insulation and have an expanded metal mesh covering on one side to act as a stiffening for the framework and to support a lightweight concrete coating. A method of making a reinforcing stud and panel is provided including molding a pair of end stud members in a predetermined shape and selecting a pair of elongated metal stud members shaped for attachment to the molded end stud members and attaching each stud member at each end to one of the molded end members. An elongated reinforcing metal member is attached through the stud and to each molded end member to provide a reinforcing stud member easily attached to a panel. The method further includes attaching the reinforcing stud into a prefabricated panel.

A method for building the panel and improved metal stud with molded composite ends has also been taught. However, the present invention is not to be construed as limited to the forms shown which are to be considered illustrative rather than restrictive.

1. A method of making a reinforcing stud comprising the steps of: molding a pair of stud end members in a predetermined shape, each said stud end member having a pair of slots formed therein;

selecting a pair of elongated metal stud members, each having two end portions and each having a pair of elongated flanges shaped to fit into each said molded stud end member pair of slots;

attaching each end portion of each said selected elongated metal stud member to one said molded stud end member; and attaching an elongated reinforcing metal member through each molded stud member between said pair of attached elongated metal stud members, whereby a prefabricated stud is formed having center reinforcement for attaching in a wall panel.

2. A method of making a reinforcing stud in accordance with claim 1 in which the step of molding a pair of end stud members includes molding polymer blocks having a filler material therein.

3. A method of making a reinforcing stud in accordance with claim 2 including the step of attaching one end of said elongated reinforcing metal member to a metal roof bracket for anchoring to a roof truss.

4. A method of making a reinforcing stud in accordance with claim 3 including the step of attaching said reinforcing stud into a preformed wall panel frame.

5. A method of making a reinforcing stud in accordance with claim 4 including the step of covering said preformed wall panel frame with an expanded metal mesh and coating said mesh with a lightweight concrete.

6. A method of making a reinforcing stud in accordance with claim 5 in which the step of molding a pair of end stud members having a pair of slots therein includes molding a pair of end stud members having a slot formed on opposite sides thereof positioned to receive one flange of each elongated metal stud member therein thereby forming a thermal firebreak in said stud.

7. A method of making a reinforcing stud in accordance with claim 6 in which the step of attaching an elongated reinforcing metal member includes attaching a rebar member through apertures formed in each said stud end stud member.

Self-Check 1	True or False

Instruction: **Say True or False**

:

1. At least one stud is attached between two of the panel frame members and has a pair of elongated stud members attached together at each end thereof with a molded polymer composite end member to form a thermal break therein
2. An elongated reinforcing metal member is attached through the stud and to each molded end member to provide a reinforcing stud member easily attached to a panel.
3. Attaching Solidifying rods to panels is used to facilitate handling processes

Note: **Satisfactory rating - 2 points Unsatisfactory - below 2 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Information Sheet- 6	Locating bar chairs/spacers

2.6 Locating bar chairs/spacers

When checking the placing and fixing of reinforcement the monitoring staff must pay special attention to ensure that the specified cover to reinforcement is achieved. Cover has the most significant effect on the long term durability of reinforced concrete and therefore of the structure.

Excess cover should be avoided as micro cracking due to bending stress can result in the growth and development of cracks and resulting corrosion of reinforcement or member loss due to spalling. The correct cover is required to ensure that reinforced concrete members meet their specified design requirement

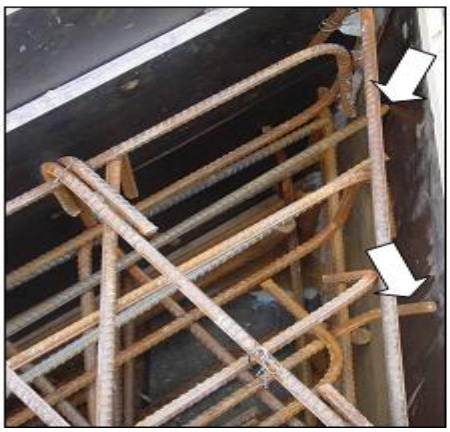


Fig.12 Insufficient cover to reinforcement Cage in forms

Fig.13 Correct cover blocks in place

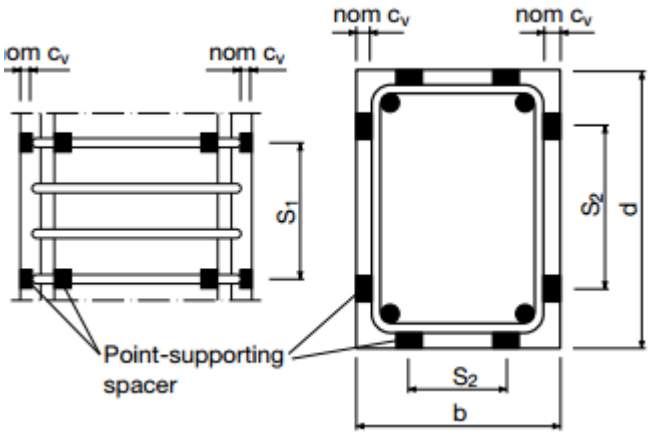
Spacers and chairs for concreting provide support for both reinforcing mesh and bar, ensuring that the correct cover of concrete over the reinforcement is achieved.

For some project contractor stock a full range of spacers, chairs and supports in different styles and materials including plastic, wire and concrete.

Take a look at our product catalogue or speak to our of our experienced Account Managers for individual products and sizing.
Spacers are used to ensure that the concrete cover specified for structures and structural elements made of reinforced concrete is adhered to, both before and during concreting.

Fig.14 Spacers type

Spacers Placing and determining number required



Spacer fixing distances

max. S_1 in longitudinal direction		
Ø longitudinal bars	columns	beams
up to 10 mm	50 cm	25 cm
12 to 20 mm	100 cm	50 cm
over 20 mm	125 cm	75 cm

max. S_2 in transverse direction		
b or d	columns	beams
up to 100 cm	2 pcs.	2 pcs.
over 100 cm	≥ 3 pcs.	≥ 3 pcs.
max. S_2	75 cm	50 cm

Fig.15 Spacers Placing distance

Self-Check 1	Multiple choice

Directions: Select the best answer and encircle the letter

1. ------- has the most significant effect on the long term durability of reinforced concrete

   A/ Concrete cover

   B/Stirrup

   C/Tie wire

   D/ All of the above are correct

2. Excess cover should be avoided as micro cracking due to bending stress

   A/ True

   B/ False

   C/ It depend on weather condition

   D/ None of the above

3. What makes support for both reinforcing mesh and bar, ensuring that the correct cover of concrete over the reinforcement

   A/Rebar

   B/ Spacers

   C/ chairs

   D/ B& C are correct

4. What kind material is used to made spacers, chairs and supports

   A/ plastic

   B/ wire

   C/ concrete

D/ All of the above

Note: **Satisfactory rating - 2 points Unsatisfactory - below 2 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Operation Sheet- 1	Preparing spacer for beam or column

Procedure for Preparing spacer for beam or column

Step 1. Prepare and clear a level area with suitable space for making timber mold or form work

Step 2. Prepare a timber mold to cast the spacer based on the given specification.

Step 3. Mix the ingredient using the ratio 1: 2 : 3

Step 4. Cut binding wire about 20cm long

Step 5. Discharge the fresh concrete to the timber mold

Step 6 Insert the binding wire to each mold of concrete.

Step 7 cure the caste for seven days

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 5 hour.

Task 1. Cut and Bend Bars for beam

Task 2 Tie bars for beam

Task 3 Prepare spacer for beam

List of Reference

https://www.wikihow.com/tie-bar

The Name of trainers who prepared this Learning Guide

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