Metal Casting
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Module - 02
Sand Casting Process
Lecture – 01
Terminology and Tools Sand Moulding

Good morning friends. For the past few classes we have been learning about the introduction and overview of the casting process. We have seen how the casting process evolved, has evolved and how it has taken the changes during all these centuries. And today we are going to see the terminology and tools of sand moulding process. Before we go into this terminology and tools, let us make a quick review of what we have learnt so far.

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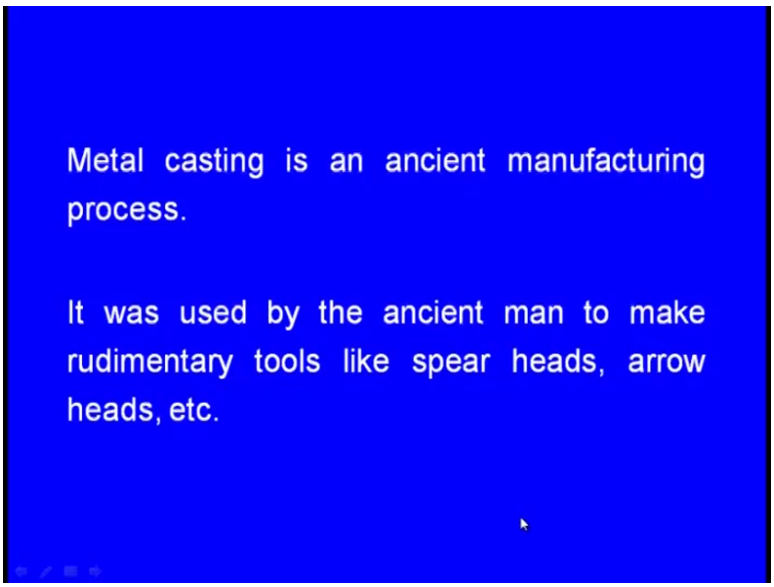

Metal casting is an ancient manufacturing process. It was used by the ancient man to make rudimentary tools like spear heads, arrow heads and so on. And later this was used for making art castings also.

Now, here we can see the simple principle.

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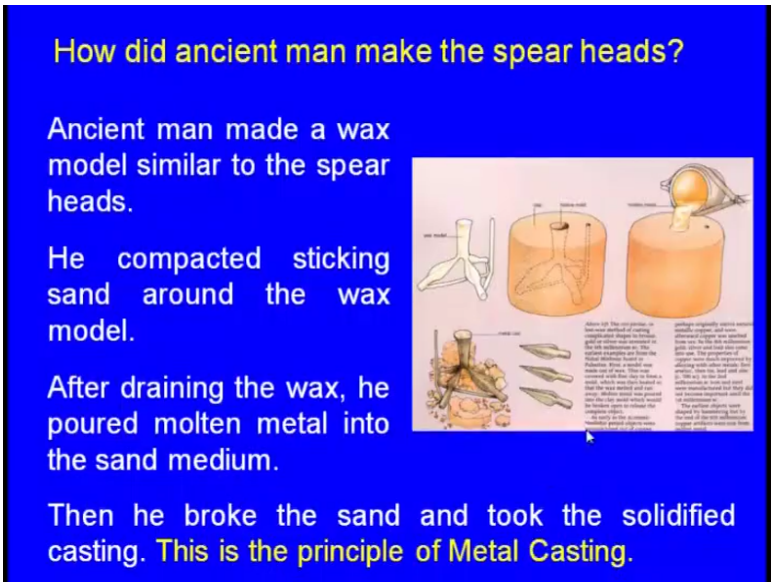

The ancient man wanted to make the spear heads. So, what he has done first? So, initially he made a wax model. This wax model he kept it inside the sand medium or he compacted the sticking sand medium around the wax model. Then he heated the system. Then what happened? The all the wax inside this sand medium has melted and drained out. Now he has melted the metal and the molten metal is poured into this sand medium. What is there inside the sand medium? A hollow cavity and whose shape is similar to the this spear so assembly. Now after some time the molten metal has solidified, then he has broken this sand medium.

Now, afterwards he has separated the spear heads. So, this is the principle of the metal casting process. Whenever we want to make a particular component, a similar shape or a similar cavity is created inside a moulding medium. Then we melt the metal and pour that metal into that mould medium, and after the melt solidifies then we break the mould medium. So, this is the simple principle of the metal casting process. So, this model that is used for making the what say cavity is known as the pattern, right?

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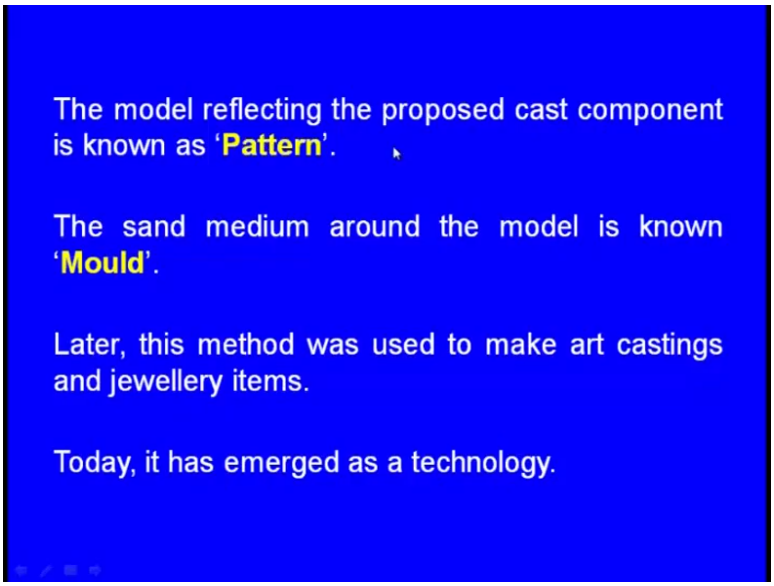

The model reflecting the proposed cast component is known as pattern.

Similarly, the sand medium around the model is known as mould. Today it has emerged as the technology.

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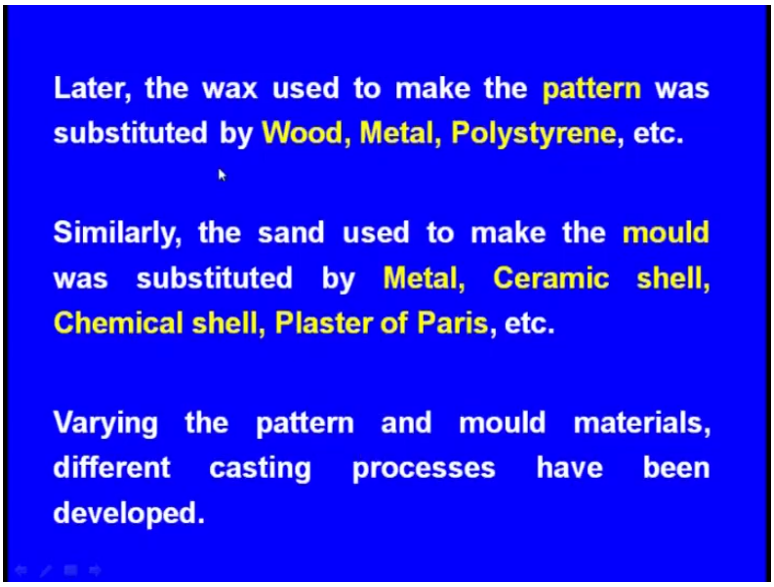

Later the wax used to makes make the pattern was substituted by wood metal polystyrene etcetera. Means, wax is also still in use to make the pattern to make the hollow cavity. In addition to the wax people are using wood metal and polyester and so on, and more materials are there. Similarly, the ancient man made the sand as the

compacting medium around the pattern. Today sand is also used in addition to the sand. So, people are also using metallic medium, ceramic shell, chemical shell, plaster of Paris, these are the what say moulding mediums into which the molten metal is poured.

So, varying the pattern on the moulding materials different casting process have been developed. Accordingly, we have seen the classification. So, this is the classification we have seen.

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Conventional moulding process, chemicals and moulding process, permanent moulding process and special casting process.

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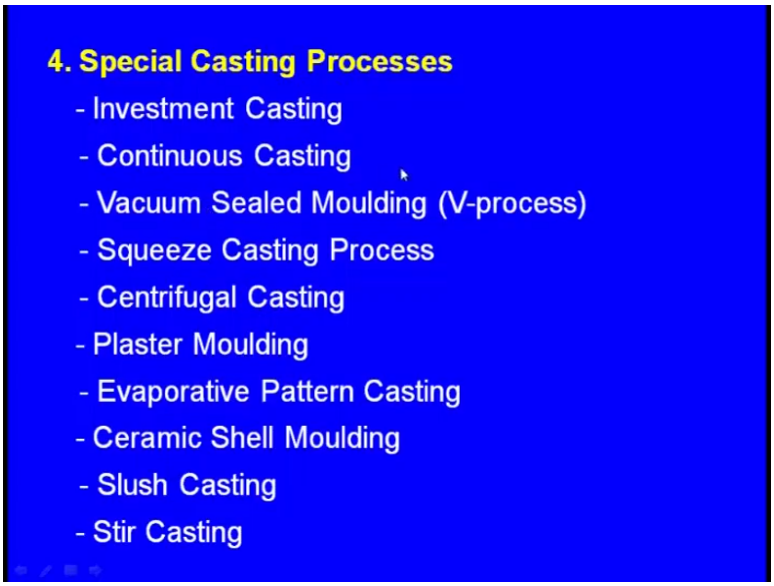

For the past of few lectures we have been seen and learning the overview of these casting process. Of course, we are going to learn each and every process of these all these process in detail in the subsequent process. Now we will see the sand what say conventional moulding process; that is the sand moulding.

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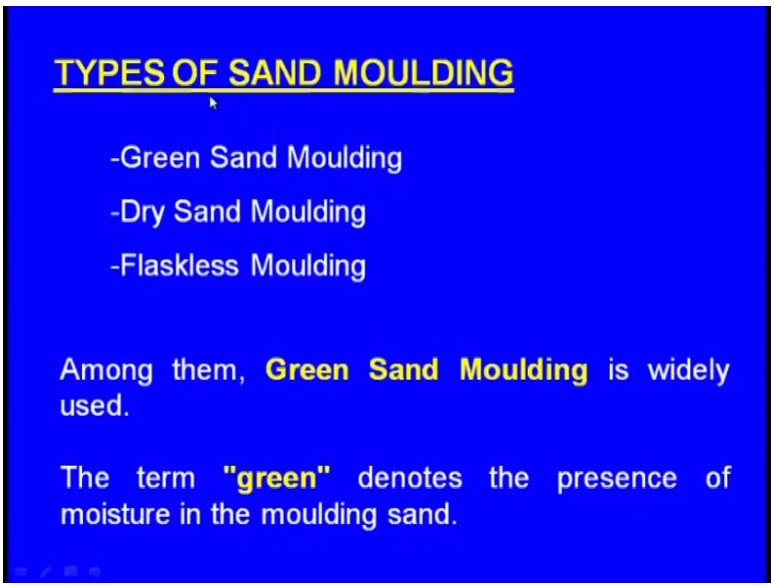

Now, the types of the sand moulding. The basic types of the sand moulding are the green sand moulding, dry sand moulding and flaskless moulding. Among them green sand moulding is widely used. First of all, what is this mean word green; what is meant by

green sand moulding. Green sand moulding means when the moisture is present, then that sand is known as the green sand. Way when the moisture is present with that sand if we make the mould and we pour the molten metal, then it is known as the green sand moulding. Now what are the ingredients of the green sand?

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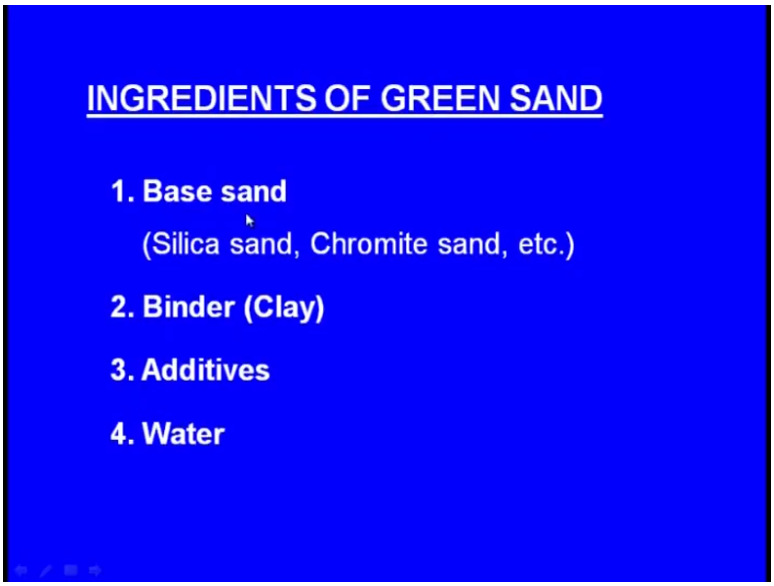

First ingredient and the main ingredient is the base sand. The base sand could be silica sand, chromite sand, zircon sand and so on. And there will be a binder, it is also known as the clay. The third ingredient is the additive. Like starch, sea coal, and so on. Next one, finally the moisture. So, these 4 are the ingredients of the green sand. Now let us see the important casting terms. So, these are the importing casting terms; are the important sand moulding terms.

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One is the flask. Second one pattern. Third one mould. 4th one parting line. Fifth one facing sand. 6th one vent holes. 7th one pouring basin. 8th one sprue. Ninth one runner. Tenth one gate. 11th one riser. Twelfth one core. 13th one core prints. 14th one chaplets and finally, the 15th one chills.

Few more casting terms will be there, and those terms will be seen when we come across them. First let us see the flask.

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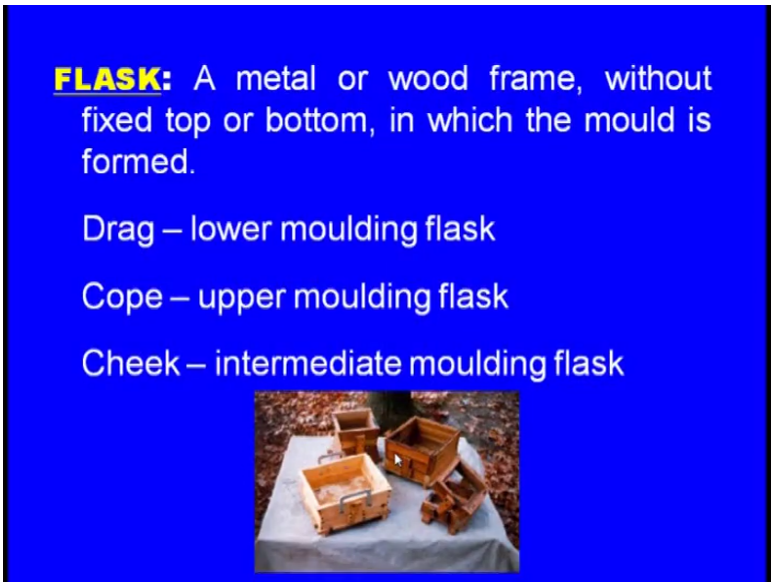

A metal are wood frame without fixed or top bottom into which the mould is formed. It say what say metallic are wooden box without top and bottom. In that we compact the moulding sand. Inside that we keep the pattern and compact the sand around that pattern. Later that pattern will be withdrawn and the sand will be compacted inside this flask. Again, this flask is 3 types drag cope and cheek. Generally, in the sand moulding process we use 2 moulding boxes. One is the drag and the second one is the cope.

Drag means the lower moulding flask. Whereas, cope means upper moulding flask. Sometimes depending upon the complexity of the component we also use an intermediate moulding flask, it is known as cheek. So, here we can see these are the moulding boxes. Here we can see yes, these are all the moulding boxes. Sometimes the what say drag box or the cope box they look similar. If that same box is used as the lower moulding box, it is known as drag. If it is used as the upper moulding box it is known as cope.

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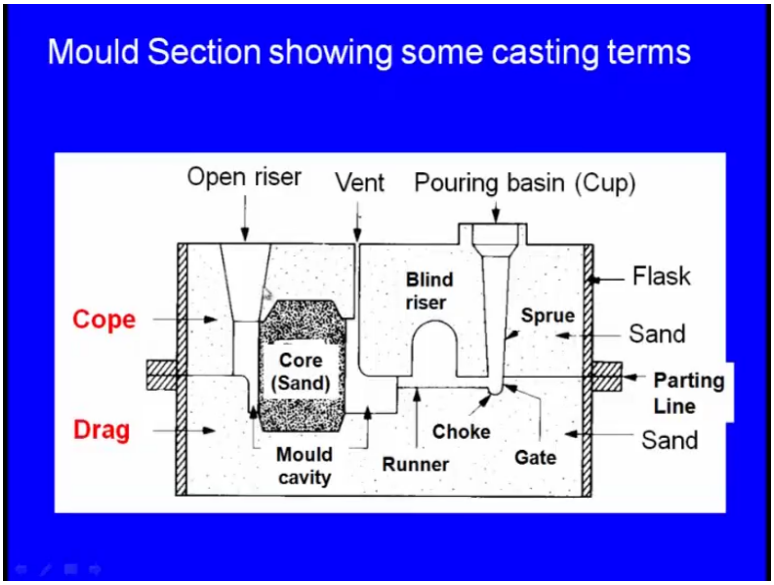

And here we can see this is the section of a what say sand mould. And here we can see, so this is a one what say moulding box here. Here we can see this is one moulding box. And here this is another moulding box. And this is the mould cavity. Means, using some pattern, so a cavity has been created. And we want your component with some hollow cavity inside. So, we also kept a core. So, this is a sand core, means what is happening? The molten metal passes this way through pouring basin, and it passes through the sprue,

and it passes through the runner. Now this is the mould cavity. And it flows around this sand core, it flows around the sand core finally, as we keep pouring the molten metal it raises and it reaches this level. Then we stop pouring the molten metal.

So, to make this system we have used 2 moulding boxes. One is the lower moulding box; that is known as drag, and the upper moulding box that is known as the cope. So now, we have understood. So, the lower moulding box means, this is the drag and this is the cope. Maybe in the next section the maybe this box may be used as the drag, then that will be called that will be the a lower moulding box and that will be the drag; are this will be used as the upper modeling flask then it will become the cope.

Now, let us see we have seen that sometimes we also use an intermediate what say moulding box.

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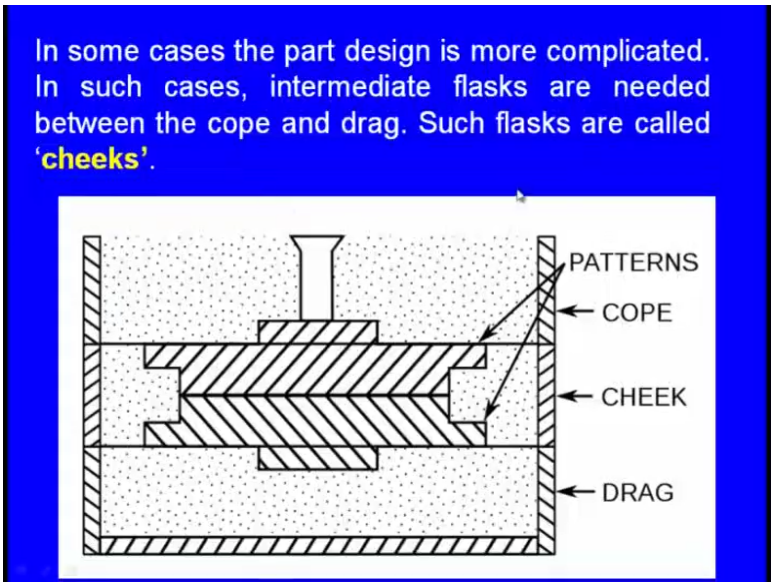

So, here such case comes. Here there is a complex geometry is there, right? So, with this for this kind of geometry with 2 boxes or the cope or drag it is very difficult; that is why we are using the third moulding flask. So, this is known as the cheek. So, here you can see this is the mould, this is the section of the mould. And this is the lower moulding box; that is the drag, and this is the upper moulding box. That is the cope and this is the intermediate moulding flask; that is the cheek. And this is of course, is the pattern. So, this will be removed afterwards. Means, we will separate these boxes, and we will be withdraw the pattern, then we pour the molten metal. So, this is the purpose of the cheek.

next let us see the pattern.

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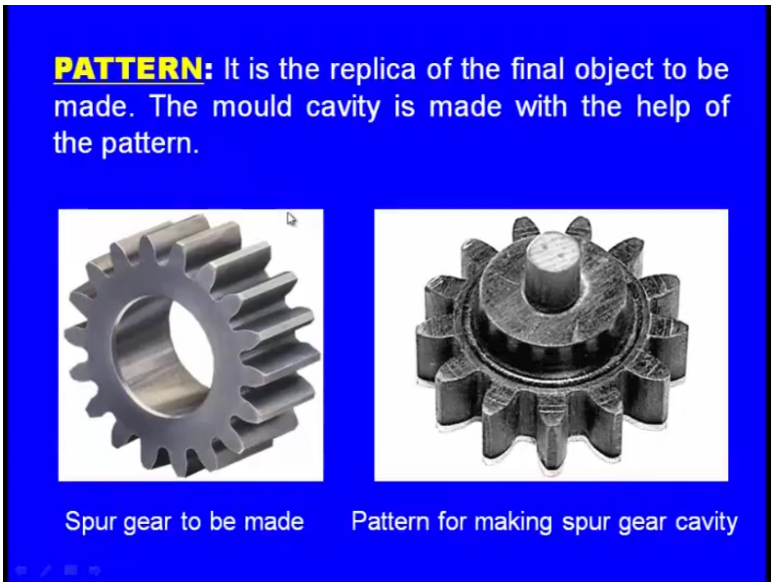

What is this pattern? It is the replica of the final object to be made. The mould cavity is made with the help of the pattern. What the ancient man has done? He wanted to make a spearhead. So, in the same of the same spearhead he made a wax model. That wax model was called as the pattern. Similarly, whenever we want to make a particular component. Initially we have to make a model. And that model should be same as that of the final component most of the times. And this model is known as the pattern. And here we can see this is a spur gear, which is used in the automotive. This is our object we wanted to make the spur gear. And for that means, what we have to do? Inside a sand medium we have to create a hollow cavity, whose shape is similar to the spur gear.

Now, for that we you we have to use a pattern. So, this is the pattern. So, this pattern will be kept inside the moulding box, around that moulding sand will be compacted. Of course, we use the 2 moulding boxes, and afterwards we a withdraw this pattern from the sand mould. Then what happens? A hollow cavity is created, whose shape is similar to the spur gear. Then we pour the molten metal. So, pattern means it is the moral for creating the hollow cavity inside the sand mould. Pattern means it resembles the final component to be made. Most of the times this pattern is made up of wood. Sometimes it is also made up of metal, and sometimes it is also made up of wax.

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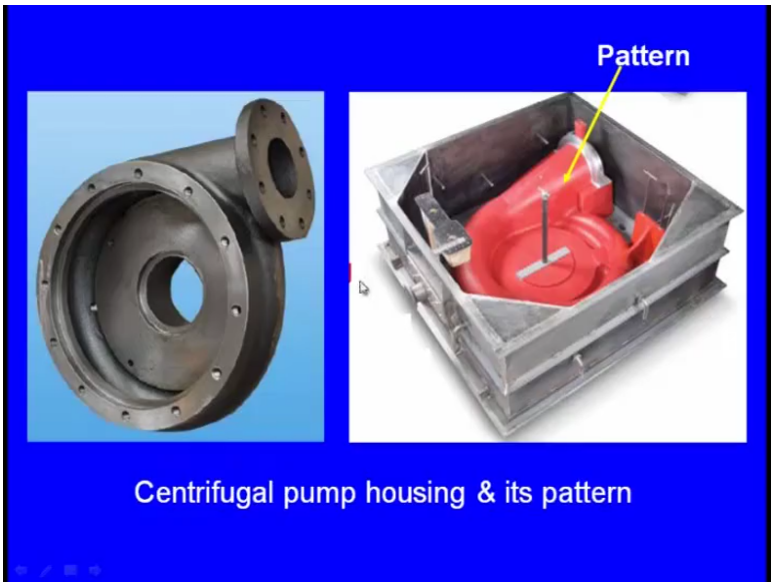

And here you can see we wanted to manufacture the what say a housing of a centrifugal pump. So, this is the housing of a centrifugal pump. And here we can see this is the pattern for that. So, here we can see these are the moulding boxes, right? And in this moulding box we have kept the pattern. This is a what say pattern. Mostly this is a wooden pattern. And around this wooden pattern we put the moulding sand compacted around it, then after the compaction is over we remove it. Then we pour the molten metal. So, this is the concept of the pattern.

Next let us see the mould.

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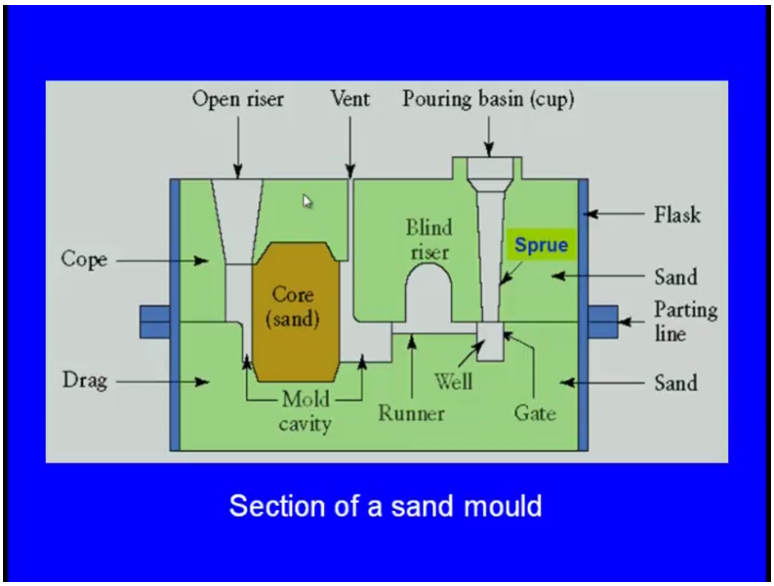

What is this mould? The sand compacted inside the moulding boxes and around the pattern with features or with provisions to more pour the molten metal, with provisions to get a riser to see that the cavity is filled with the molten metal. With all these features with all these provisions that system is known as the mould. Here we can see this is the lower moulding box the drag. This is the upper moulding box the cope, and this is the mould cavity, and this is a sand core means the molten metal comes like this and it flows around the core and finally it raises like this. Then how we pour the molten metal? We have made a provision a vertical passage. We call this as the sprue. Then this molten metal comes through this way and a horizontal passage is there; that is known as the runner, and it passes through the runner. Finally, it enters into the cavity. Once the cavity is filled with the molten metal it raises to the riser. Then we stop the pour stop pouring the molten metal.

So, the compacted sand medium with hollow cavity in side with all the provisions to pour the molten metal and to see the what say that the cavity is filled in the molten metal. With all this provisions we call it as the mould. Next one the parting line.

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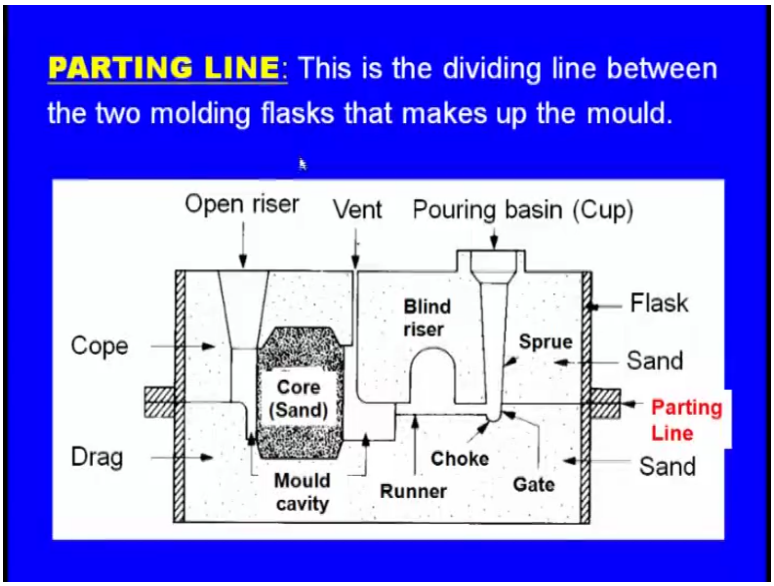

Here we can see again the section of the mould. And this is the what say drag box, and this is the cope box and yes, the molten metal comes this way. This is this sprue and it passes through the runner, yes it passes through or you through the cavity, it fills the cavity, then it rises like this. And here remember that the drag and the cope between the drag and cope there is a separation. So, that separation the line which separates the cope and drag is known as the parting line.

Next let us see the facing sand.

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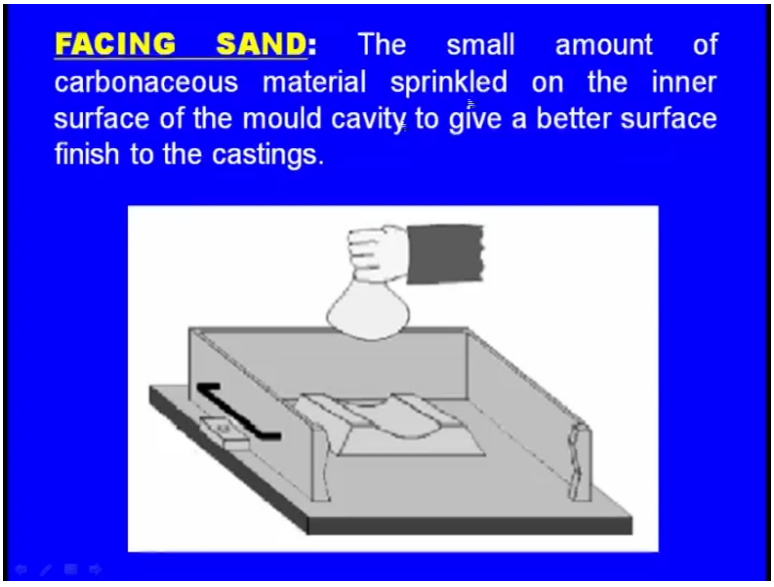

It is the small amount of carbonaceous material sprinkled on the inner surface of the mould cavity to give a better surface to the castings. Suppose this is the moulding box and this is the pattern. And over this pattern and around this pattern we put the what say sand and compact it. Generally, what happens the we if we use the wooden pattern. The wooden pattern will have a rough texture. And because of these rough texture even the sand what say sand cavity surface will develop a rough texture. Because of that when we pour the molten metal, the even the solidified casting will develop a rough surface.

So, we want to minimize this rough surface. So, that is why over this pattern before we compact this sand around the pattern, and above the pattern we sprinkle a what say fine carbonaceous material. Carbonaceous material is sprinkled a thin layer is created around the pattern. So, because of that the rough surface or the rough texture of the pattern will have a minimum effect on the surface roughness of the solidified casting. So, that is all that is all about the facing sand. Next let us see the vent holes.

Now again we see this is the ross section of the mould, yes, the molten metal will be coming like this through the what is says sprue.

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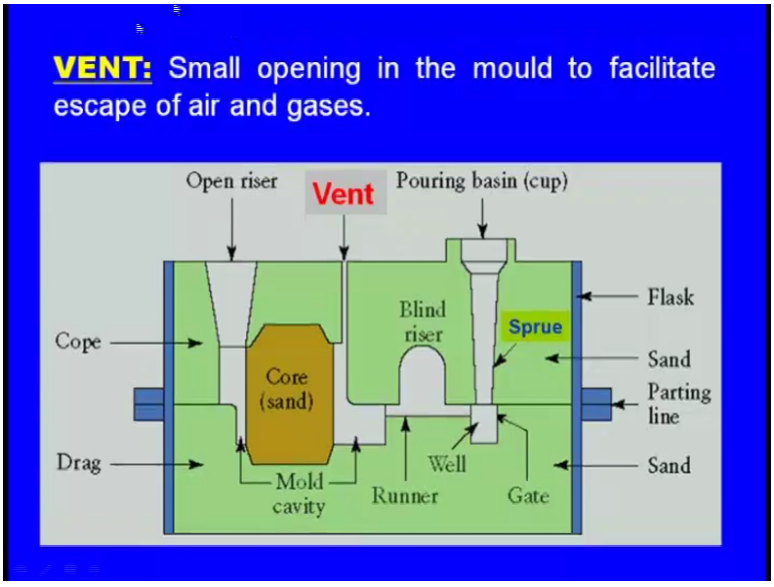

And it passes through the runner, and it flows around the core, and finally it raises. Remember that the moulding sand contains the moisture. As soon as the molten metal enters into the cavity the moisture in this moulding sand evaporates. Immediately it turns into steam. As we keep pouring the molten metal the steam escapes through the riser. But

within seconds of time the full cavity including the riser will be filled with the molten metal. Before the molten metal has filled this riser the steam you on the other gases used to escape through the riser, afterwards they cannot escape. Then what to do? If they cannot escape they will be occupying inside the mould cavity, and later they will lead to defects.

So, somehow, we have to make a provision. So, that this hot gases and steam escape from the mould to minimize the defects. That is why we create narrow holes inside the moulds. A thin holes from the surface of the external surface of the mould till the mould cavity a thin holes are created. These are known as the vent holes. Here we can see this is a vent hole. A small hole from the external surface of the mould, till the what say inner surface of the mould cavity. So, this is a small opening in the mould to facilitate escape of air and the other gases.

Next let us see the pouring basin.

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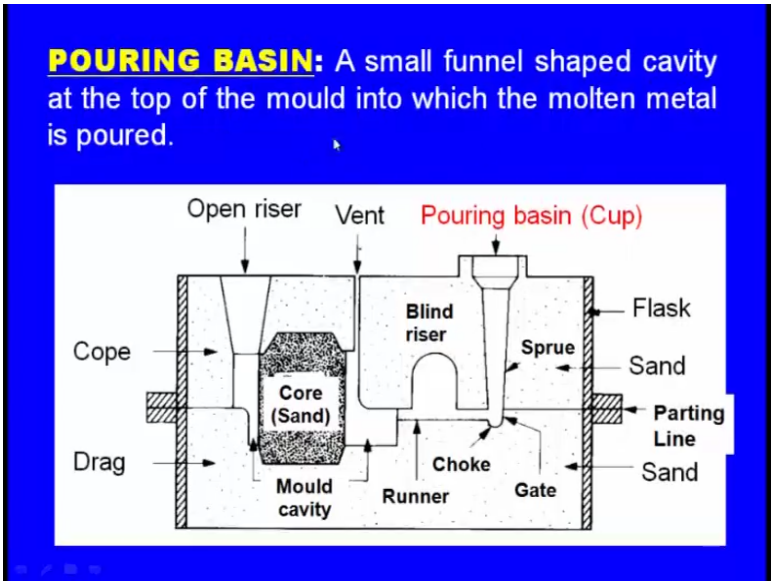

Again, let us see the same cross section, and yes initially we pour the molten metal from the top. So, and this is a vertical passage, but the vertical passage sometimes it is narrow. If it is narrow it is very difficult to pour the molten metal. The molten metal may spill outside. That is why the entrance should be wider to facilitate the easy pouring of the molten metal. So, here that is the pouring basin or the pouring cup. So, here you can see this vertical passage of the molten metal is narrow, but this is the entrance this is the

entrance is wide. This is known as the pouring basin or the pouring cup. So, it is a small funnel shaped cavity at the top of the mould into which the molten metal is poured.

Next let us see the sprue.

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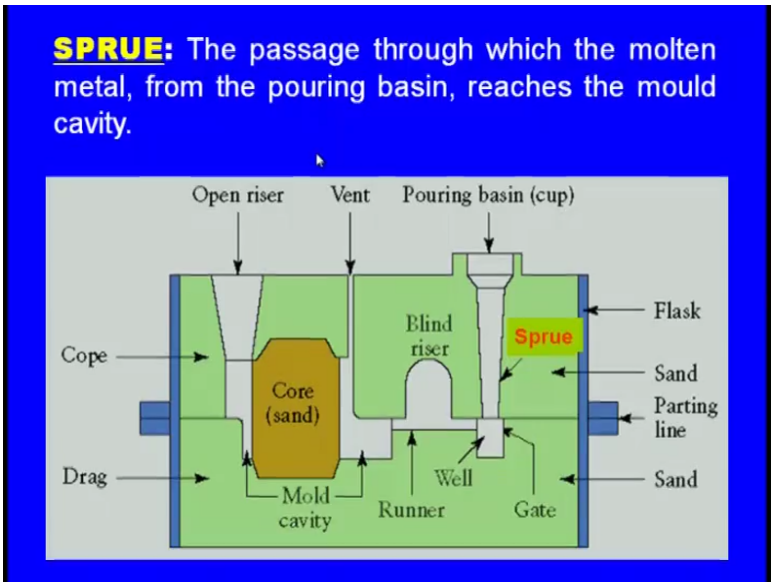

Again, let us see the same cross section. Yes, the molten metal is poured into the pouring basin. And it has to reach the mould cavity. Means there is a vertical passage and there is a horizontal passage. This vertical passage is known as sprue. The passage through which the molten metal from the pouring basin reaches the mould cavity is known as sprue. Next let us see the runner.

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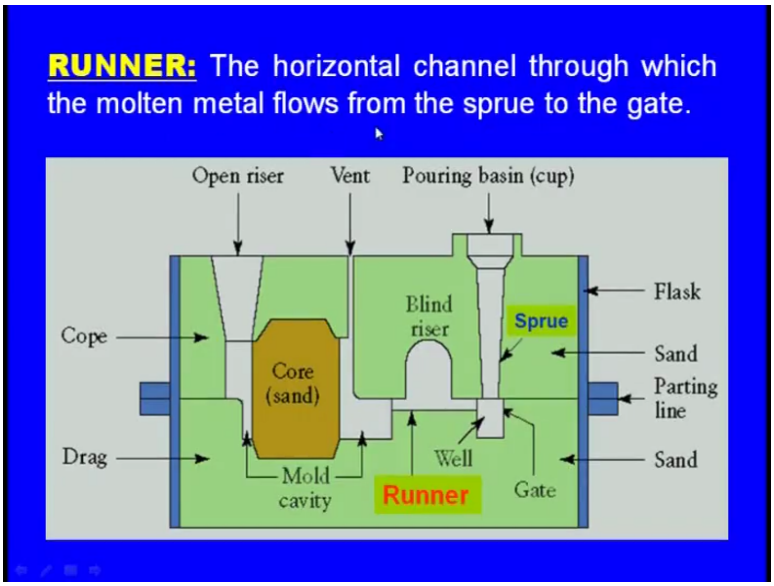

A horizontal channel. Through which the molten metal flows from the sprue to the gate. So, this is the pouring cup we have seen, and this is this sprue the vertical passage. Initially it with molten metal is poured into the pouring basin and it passes through this sprue. And of course, here is another what say part that is this proven, and it comes here then it passes through the runner. Finally, it enters into the mould cavity. This horizontal passage is known as the runner.

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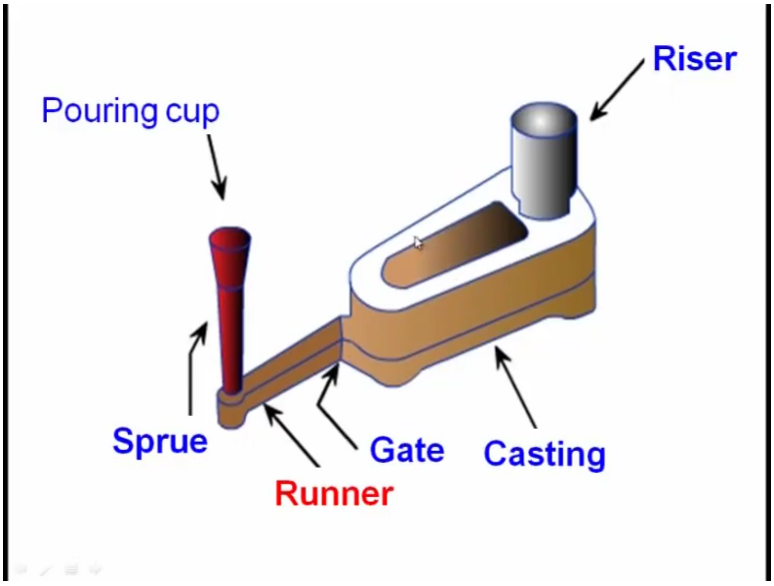

And here you can see this is a casting, and this is the pouring cup and this is the sprue. And this is the what is say well, and this is the casting. This is the casting and this is the riser this whole thing is inside the compacted sand medium.

Now, this horizontal passage which corrects this sprue and the mould cavity is known as the runner. Next let us see the gate.

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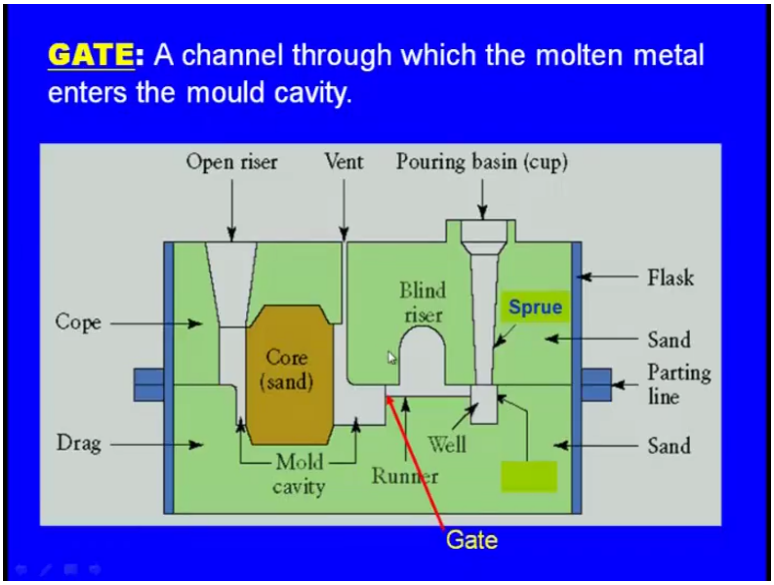

Yes, let us see the same cross section, and yes this is the pouring cup, and the molten metal is poured into the pouring cup, and it passes through this sprue and it passes through the runner, and here is the mould cavity. And between the mould cavity and the runner there is a small cross section, which is the entry entrance to the molten metal. This entrance is known as the gate. A channel through which the molten metal enters the mould cavity. This is known as the gate.

Next let us see the riser.

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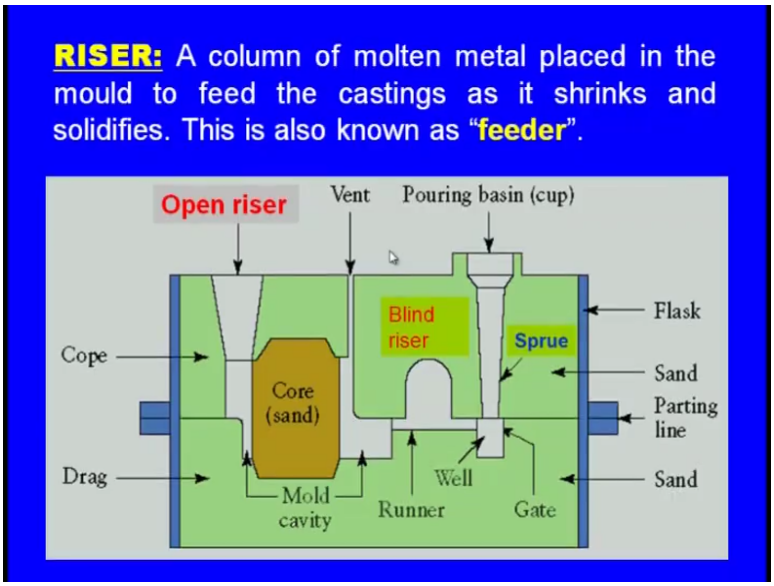

Yes, again let us see the same cross section. The molten metal yes, it is poured into the pouring cup. And it passes through the sprue. And it passes through the runner, the horizontal passage and it fills into the mould cavity around the core. Then once the cavity is filled with the molten metal, it rises in the again in this vertical, what say channel. This is known as the riser. Riser means a column of molten metal placed in the mould to feed the casting as it shrinks and solidifies. This is also known as the feeder. What it is exactly doing to the casting?

Now, we pour the molten metal into the mould cavity. And after some time, it starts solidifies. It is solidifies, as it is solidifying what happens? It shrinks, now it is size becomes smaller and smaller. Whereas, the mould cavity is something which we designed for a particular component, and the molten metal as it is undergoing solidification, it is it is shrinking and it is shrinking. It is the time to prevent the shrinking, this metal in the riser comes and compensates the shrinkage. As the molten metal during the solidification is undergoing shrinkage. The molten metal from the riser he comes and compensates that the shrinkage. The problem is we have to ensure that the molten metal in the riser continues to be in liquid straight for a longer period. Then only it can supply the liquid metal to the solidified the casting which is being solidified; that is why because it is supplying or because it is feeding the liquid metal to the casting which is being solidified. It is also known as the feeder.

So, it is main purpose is to feed the casting during solidification. It supplies the required molten metal to compensate the shrinkage; that is the primary purpose of the riser. There are the secondary purposes. Whereas, the molten metal or what say is filled with the cavity it rises here. Once it comes here it is an indication that the cavity is filled with the molten metal. That time we stopped pouring the molten metal. This is the secondary purpose of the riser. The third purpose is a immediately after pouring the molten metal the moisture inside this sand evaporates that hot gases and steam escapes through the riser coal. So, this is another secondary purpose, but the primary purpose is to feed the casting which is being solidified.

So, this is a important component of the moulding system. And here we can see this is the pouring cup and this the casting and this is the riser. Next let us see the core. What is this core?

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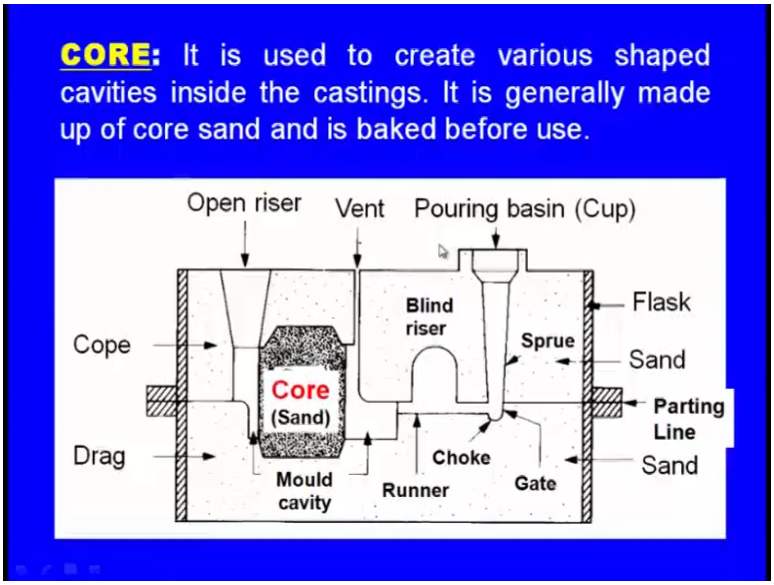

It is used to create various shaped cavities inside the castings. It is generally made up of course, and is baked before use. And here we can see this is the section of the mould and this is the mould cavity, this is the mould cavity. The molten metal comes like this. And it flows through the it what say runner, and it flows around the core and finally, it rises through the riser. We wanted to create a hollow cavity inside the casting; that is why say you after the solidification when we separate these 2 moulding boxes, and when we break the sand right. So, we get the solidified casting, but inside solidified casting, there

is a sand core. This also used to be broken. When we break this core what happens? Inside this solidified casting we can get a hollow cavity. So, this is the purpose of the core. Core is used to create various shaped cavities inside the castings. These are made of the core sand and this should be baked for additional strength.

Next one let us see the core prints.

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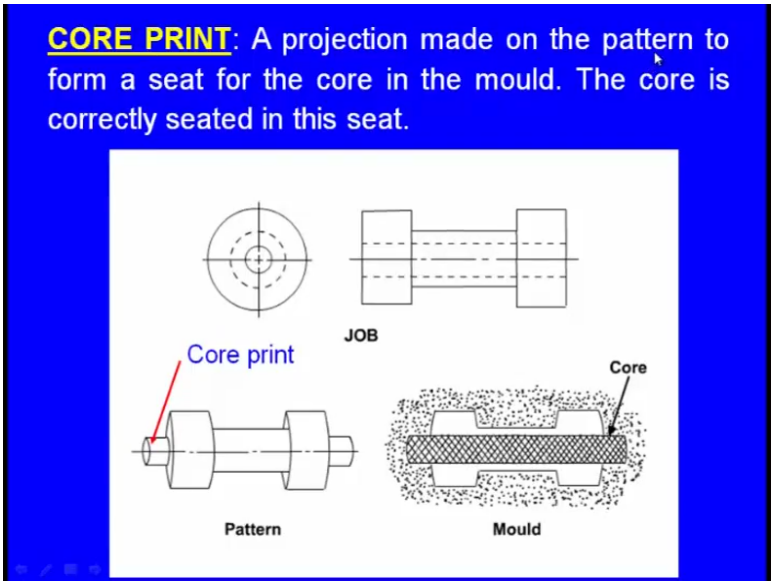

A projection made on the pattern to form a seat for the core in the mould. If the core is correctly seated in this seat. Now this is the casting. You can see the casting and there is an a what say actual core is there. To make this kind of casting we are using this pattern. So, you can suppress say if this is the casting. So, we definitely we need a pattern, but why your projection is here? Why your projection is here? Casting does not have a projection. So, that may be your question. We are what say keeping a projection on the pattern. There is a purpose, because we have to place a core inside the mould. So, here is the moulding boxes. The drag box will be like this. And the cope (Refer Time: 27:46) it will be like this. And we have to place the core inside, then only we get the axial central core. Where does this core rest? That is the question. It has to be supported. So, it has to be supported both the sets. Means, this side there should be a what say seat or a cavity in which the end of the core rests. The other side also there should be a cavity in which the other end of the core rests.

So, both sides additional cores are to be created. So, that the core rests in those holes. That is why even the pattern will have the additional projections here and here. When you take this pattern and do the moulding the mould will have additional holes on both the sides. Into this additional holes yes we make we place the pattern. So, what once the core print is the projection made on the pattern to form the seat for the core. And the core exactly what say is seated inside these seats. And also, yes, so even the core. We one can say that, what say size up the what say hole is only this much why it is so long? Because this additional portion of the core will be supported inside the seat. Even this additional portion of the core is also called as the core print.

Next one the chaplets.

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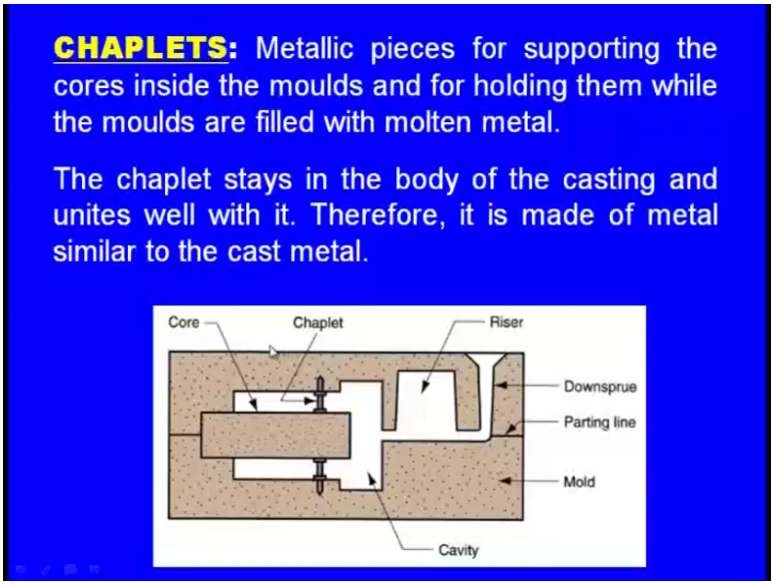

What are these chaplets? Chaplets are the metallic pieces for supporting the cores inside the moulds, and for holding them while the moulds are filled with the molten metal. Now you can see this is the mould, and yes if this is the parting line. Means, this is the drag box, and this is the core box, and this is a core. This is a diff this core is different from the previous case. In the previous case, the core is supported on both the sides. So, no support in between is required. Now what is happening is this is the core. This is the core and this is supported on one side. And the other end is not supported. Then what will happen? It will be falling down it will be leaning down. So, we have to support the core on the other side also. Now for that purpose, what we are doing? We are placing chaplets

here. One chaplet here and another chaplet here. These chaplets are the metallic projections, right? They will be supporting the core inside the moulding boxes. And these metallic pieces are the chaplets are made up of these same material as the top the cast material. Generally, the material will be such that there melting point will be little higher than the casting material so that even when you pour the molten metals.

So, it does not melt along with the molten metal into partly fuses, and the molten metal comes around this chaplet and the chaplet become part of the casting. That is the purpose of the chaplet. The chaplet stays inside a body of the casting, and unites well with it. Therefore, it is made up of metal similar to the cast metal. And here we can see another chaplet yes this is the drag box and this is the cope box.

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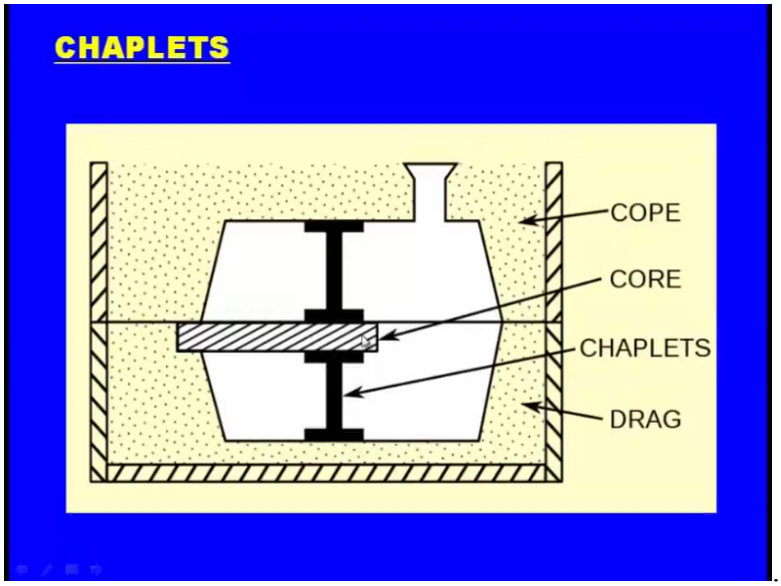

And here there is a core you see. Core is supported inside the mould only on the one side. This sand it is not supported. Then what happens? It falls down or it breaks down. To prevent that we are placing a chaplet here. You can see this is one chaplet here. And again, there is another chaplet here. The molten metal once we as it is coming inside, it flows around the chaplet. It flows around the chaplet partly fuses and it becomes the part of the casting.

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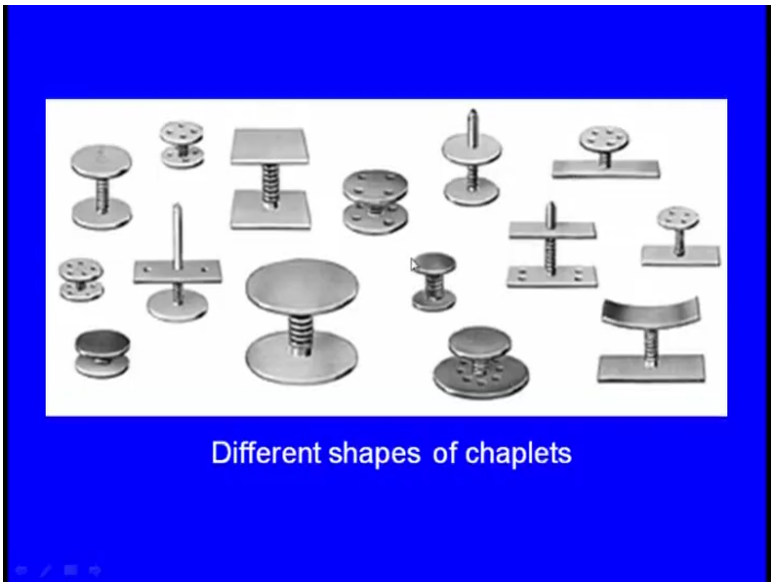

And these are the different shapes of the chaplets. You can see they are available in different sizes, and mean different shapes to cater the needs of the different 2 circumstances.

Next one the chills. What is chill?

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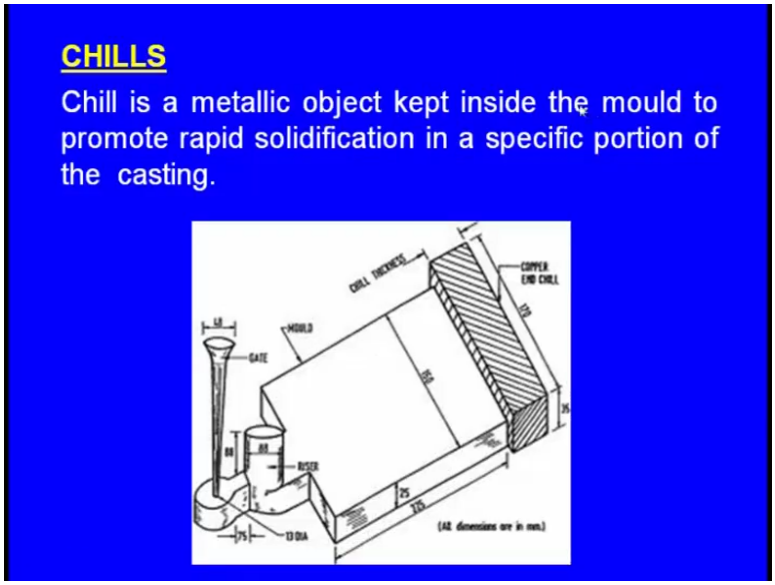

A chill is a metallic object kept inside the mould to promote rapid solidification in this specific portion of the casting. Suppose this is the casting, and this is the sprue. This is the sprue, and this is this sprue well, and this is the runner, this is the runner yes. And this

is the casting the molten metal flows like this through this sprue through the runner and it enters into the mould cavity. Now where this solidification has to start? The solidification has to start away from the what say, this is what say sprue right. And here there is a riser is also there this is the riser. So, the solidification should commence from the other end. Slowly the solidification should propagate towards the riser. This is the riser.

So now what we have? What happens if we leave the system like that? The whole thing starts solidifies almost paralleling. That we do not want. We want the other end the section away from the riser to solidify first. For that purpose, we have kept a metallic, what say piece or a steel block here. This hatched portion is the steel block. And this this is placed inside the mould cavity. And the molten metal when it comes in touch what say contact with this is this chill or the steel block it rapidly dissipates heat to the steel block. Because steel block rapidly absorbs the heat compared to the mould wall. Then what happens? Because this sand the what is the heat is rapidly absorbed by the steel block or the chill here this portion starts solidifying. Gradually the solidification propagates towards the riser.

So, this is the purpose of placing a chill. We wanted to promote what is say solidification. Here, quickly that is why we have kept a steel block here. This steel block is known as the chill. And that is the purpose of the chill.

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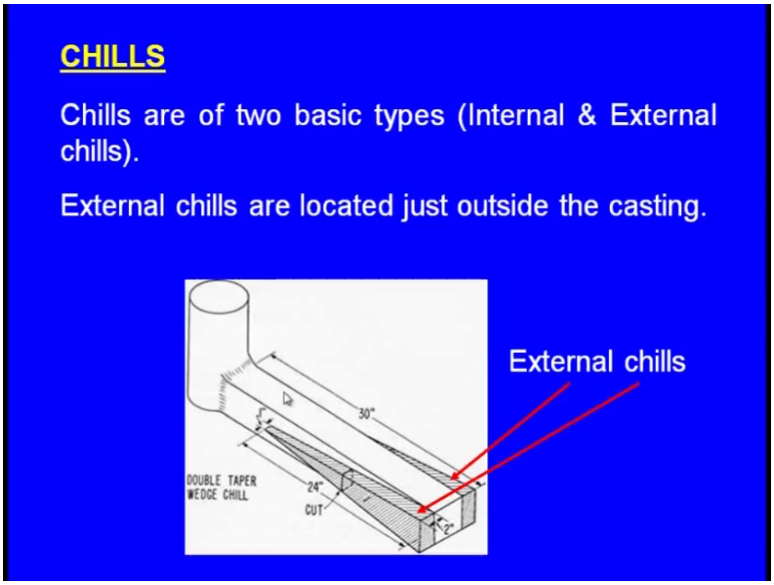

Chills are of 2 types. Internal chill and external chills. External chills are located outside the casting. And here we can see this is the casting. This is the casting yes, this is the riser. This is the riser, and the sprue must be somewhere here the sprue will be somewhere here. Now the rule is the casting should solidify such that the how it has to solidify? The section which is away from the riser must to solidify first. Then the solidification should propagate towards the riser. Means, this is the what say section which is away from the riser. So, we want this section to solidify first. So, for that purpose what we are doing we are keeping the one chill here, and one chill here. Chills means generally these are the steel blocks.

So, when we place the steel blocks inside the mould cavity, they absorb heat rapidly. And because of that the solidification commences here and it is propagates towards the riser. So, these are the external chills; which are located outside the casting inside and inside the moulding box, and there are internal chills also. Now we will see the internal chills. These are the; what say components, which are located inside the mould cavity.

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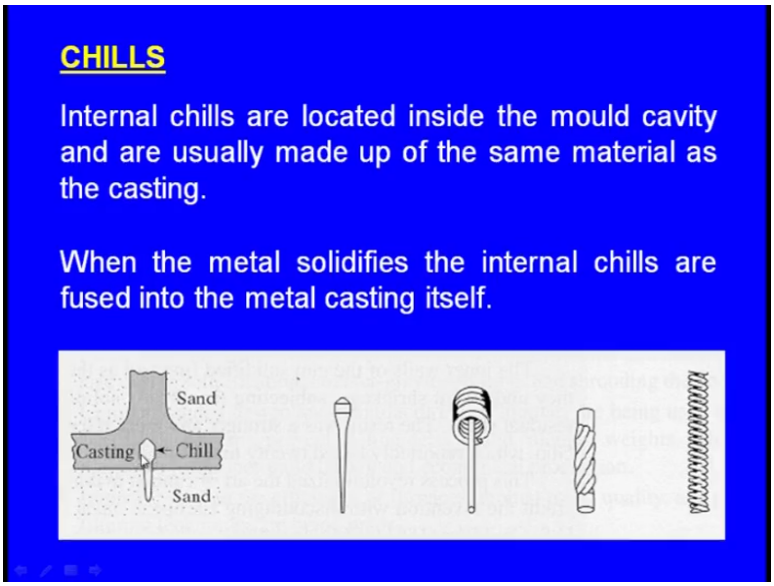

And are usually made up of the same material as that of the casting. And when the metal solidifies these internal chills are fused into the metal casting, and they become part of the casting. And here we can see are here there is a casting, and here there is a what is say possibility that a shrinkage cavity may develop. And here we want the metal so to

solidify quickly. For that purpose? We are placing a chill. So, this is the internal chill. So, this is made of a metallic what say material ok.

So, once we place this metallic component inside what happens? It will rapidly absorbs heat, and it what is say initiates solidification. And it makes a solidification faster, that is how we can avoid the shrinkage defect here. So, once it what is say we use it becomes part of the casting, and it can not be used it again. So, this is the limitation of the internal chill. Again, these are all the several different types of the internal chill. So, these are several shapes and several sizes they are available. So, depending upon our requirement and suitability we can choose any one. So, that is all about the chills.

Next one let us see the important moulding tools.

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So, these are the moulding box, moulding board, sands shovels, bellows, riddle, sand rammers, striking bar, trowel, gate cutters, slick, vent rod, sprue pin, riser pin, swab, draw spike, mullet and finally, the lifter.

We will see one by one.

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Now, the first moulding box these are made of the; what say generally these are the wooden boxes. Sometimes these are also made up of metallic points. So, generally we use 2 moulding boxes. The lower moulding box is known as the drag, and the upper moulding box is known as the cope.

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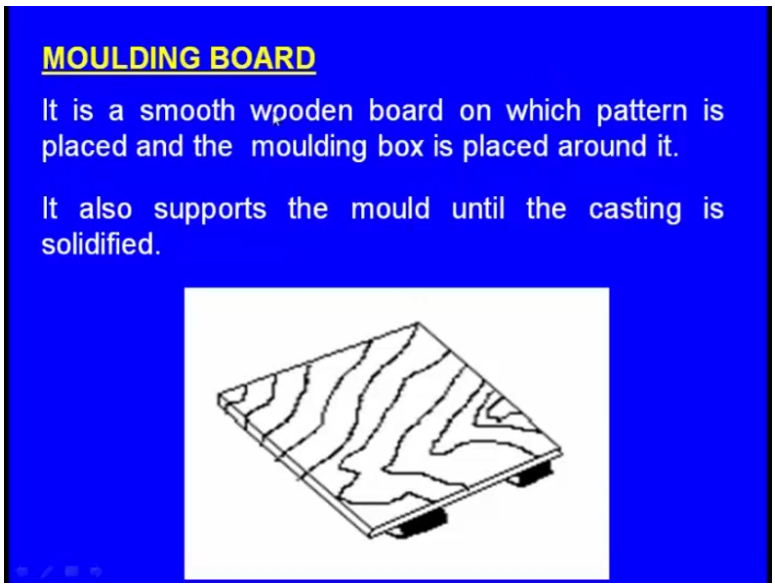

Next one this is the moulding board. It is a smooth wooden board on which the pattern is placed on the moulding box, right? So, this is the moulding board. Around that above that we place the moulding box. And above that we place the pattern, and both that

pattern we do the compacting. So, it also supports the mould until the casting is solidified. So, this is the moulding board. Next let us see the shovel.

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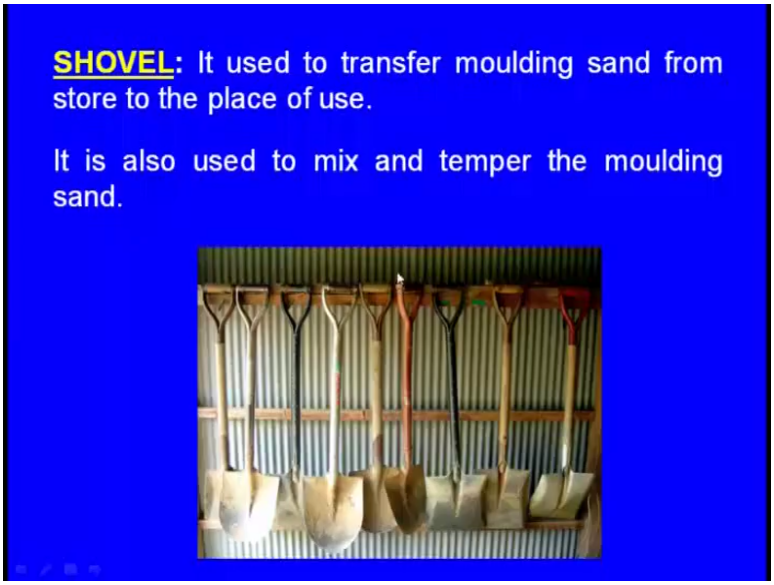

It is used to transfer moulding sand from the store to the place of use. In the store there will be a big lumps of sand will be there. So, we have to transfer. So, using these shovels we can transfer the moulding sand from the store to the place of use. It is also used to mix and temper the moulding sand with the water. So, this is the shovel.

Next one bellow.

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A bellow is used to blow loose sand particles from the pattern and also from the mould cavity. After we make the mould, after you withdraw the pattern sometimes loose sand particles will be inside the mould cavity. So, they should be removed very carefully. If and if we try to remove them manually the cavity will be what say, it will be destroyed the cavity is shape will be changed. That is why we use these bellows. With these bellows and we have to blow air where there are loose sand particles. These loose sand particles will be thrown out because of the air coming from the bellows. So, this is the purpose of the bellow.

Next one riddle. It consists of wire mesh fitted into a circular wooden frame.

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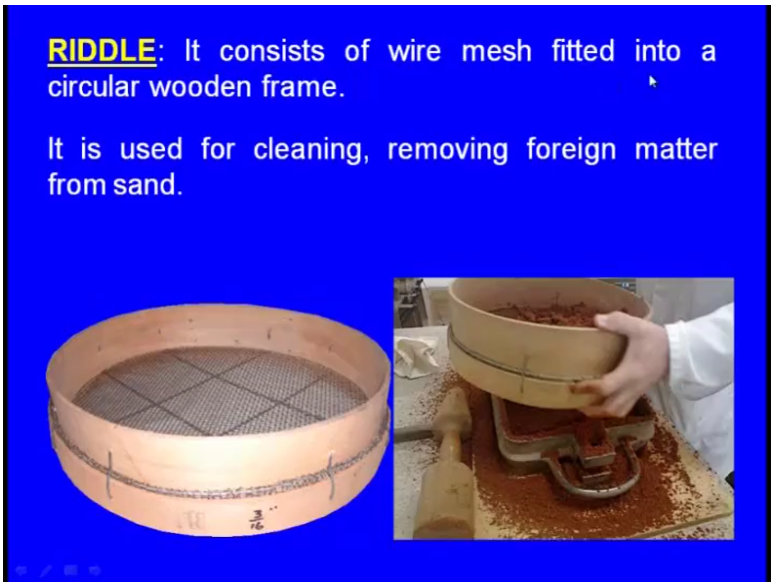

So, this is a what say a riddle. And here we can see wire mesh is there. So, it is used for cleaning and removing foreign matter, foreign particles from the sand. Here you can see this is the mouldeing box. So, instead of straightaway placing the moulding sand initially it is what say passed through the riddle. If there are any foreign particles are hard lumps. So, they will be eliminated only the smooth sand falls on the moulding box. That is the purpose of the riddle. Next one rammer.

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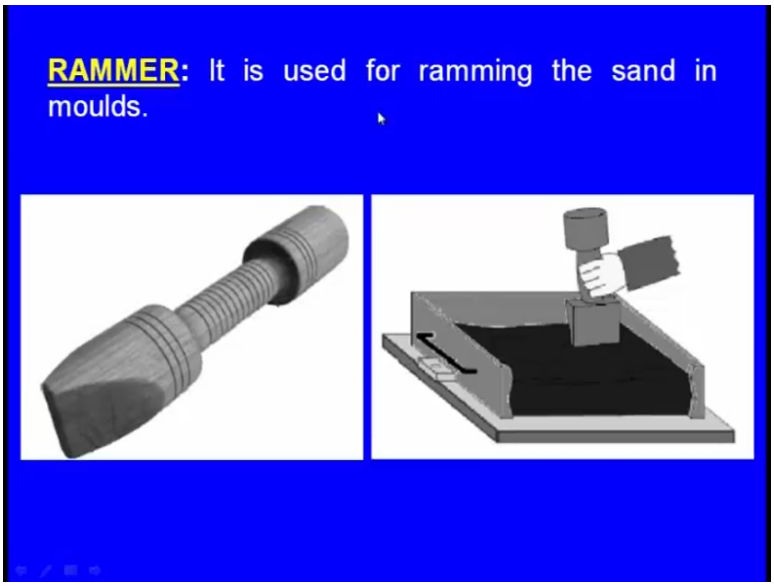

It is used for ramming the sand in the moulds. Ramming means tightly compacting. So, it is shape is like this. And this is the bounding box, and the pattern is inside above the pattern we have kept the moulding sand and it is to be ramped everywhere. This is known as the sand rammer or rammer.

Next one striking bar. After we what say mould the sand above the pattern, and inside the moulding box, there will be excess of sand above the moulding box. This excessive sand must be removed, it must be striked out. So, for that purpose we use the striking bar.

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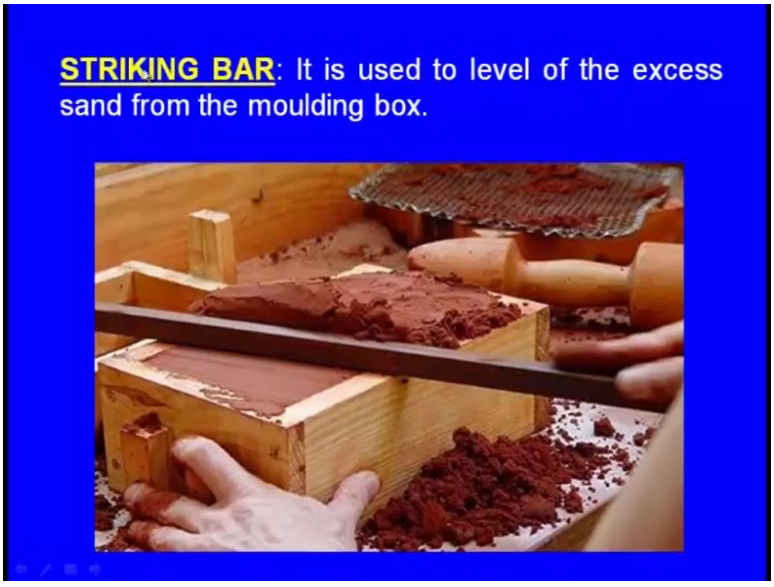

Here we can see this is the striking bar, and this is the excess sand the above the moulding box. So, this excess sand is removed by using the striking bar. So, it is used to level of the excess sand from the moulding box.

Next one trowel.

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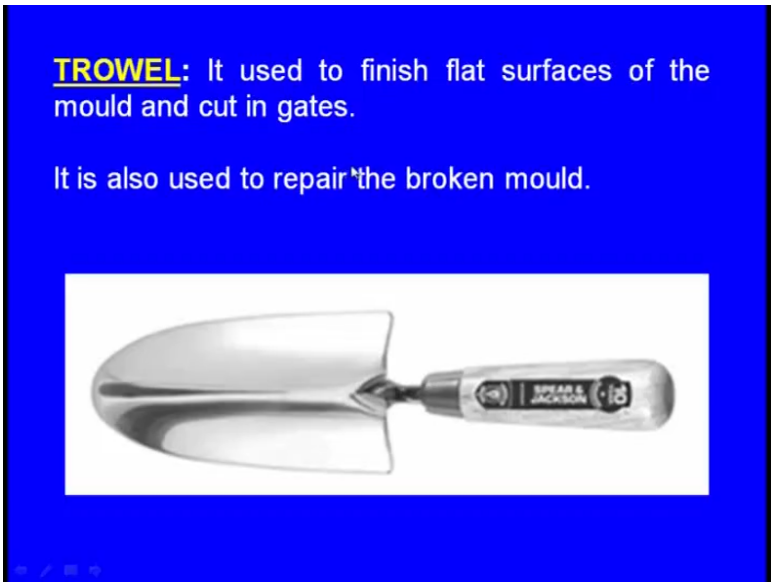

It is used to finish the flat surfaces of the mould and cut in gates. It is also used to repair the broken mould. If the mould is what say broken somewhere using the trowel we can repair it. And also, we can create the gates using the trowel. Next one the gate cutter.

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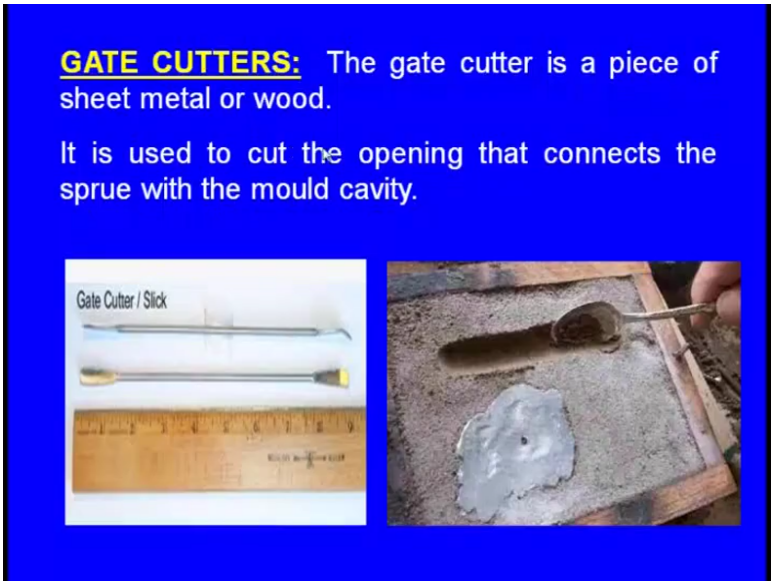

The gate cutter is a piece of sheet metal or wood. It is used to cut the opening that connects this sprue with the mould cavity. So, these are the gate cutters.

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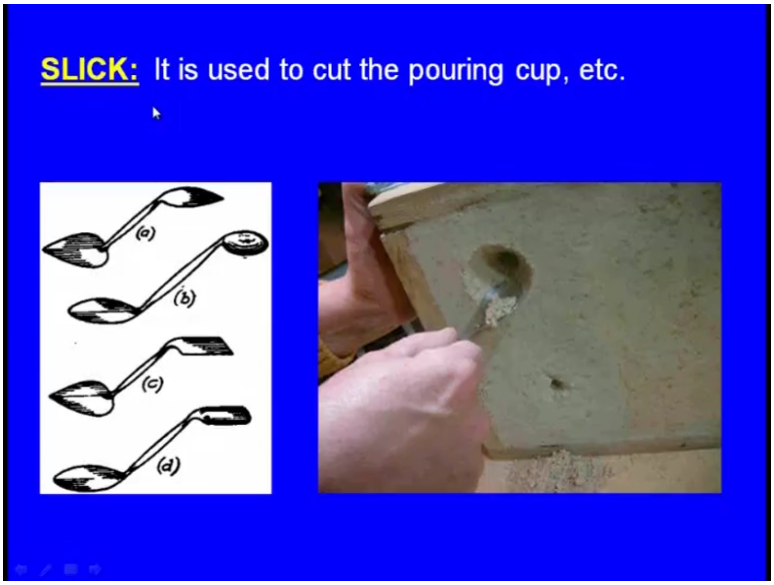

Next one slick. It is used to cut the pouring cup. Say this is the pouring cup, say this is the cope box. So, a what say wide opening has to be created that wire opening is the pouring cup or the pouring basin. So, this slick is used to cut the this pouring cup.

Next one vent rod. Sometime back in the moulding terms we have seen vent hole.

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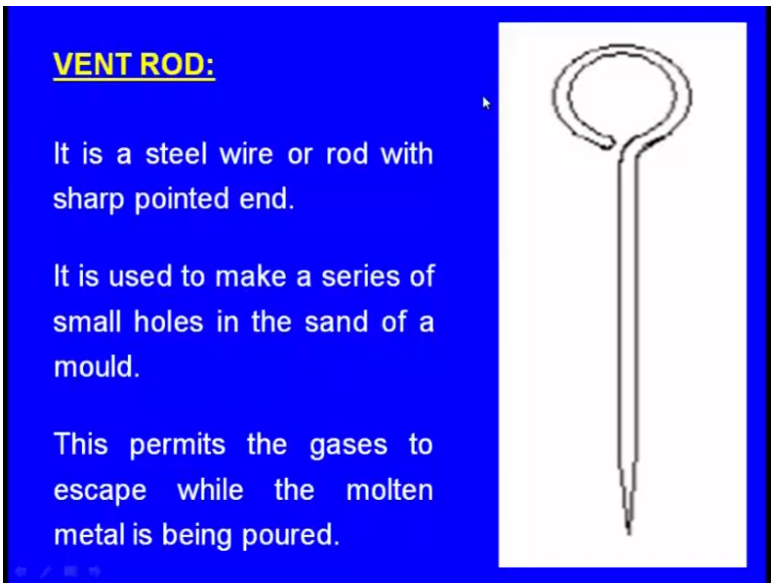

What is the purpose of the vent hole? Vent hole enables hot gases to escape from the mould. So, how to create these so what say small holes or narrow holes; using the vent rod. So, this is the vent rod. It is a steel wire or rod with a sharp pointed end. There is a sharp pointed end is the it is used to make series of small holes in the sand of a mould. This permits the gases to escape while the molten metal is poured into the cavity.

Next one the sprue pin.

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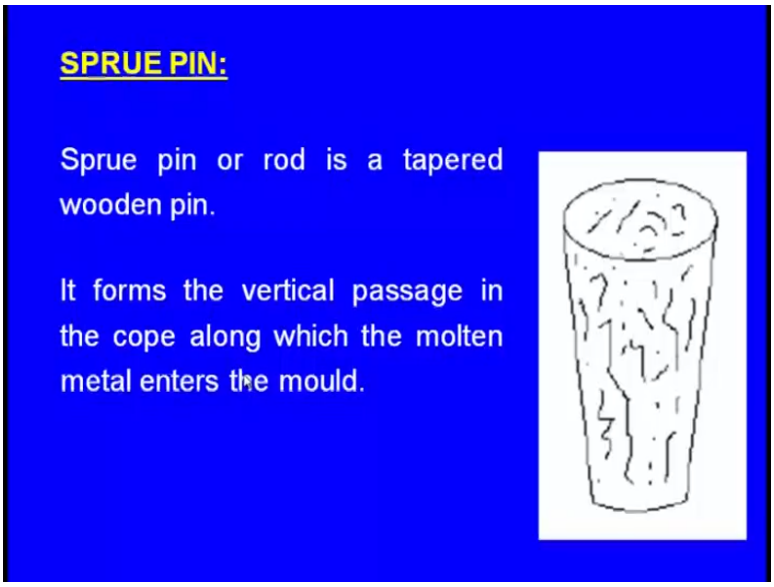

Sprue pin are rod sprue rod is a tapered wooden pin. You can see it is tapered here. What is the purpose of this sprue pin? Some time back you we have seen that the molten metal is poured into the what is say sprue cup or sprue basin. Then it passes through the vertical passage known as the sprue. We have to create this vertical passage by using the sprue pin right. So, it forms the vertical passage in the cope along which the molten metal enters the mould.

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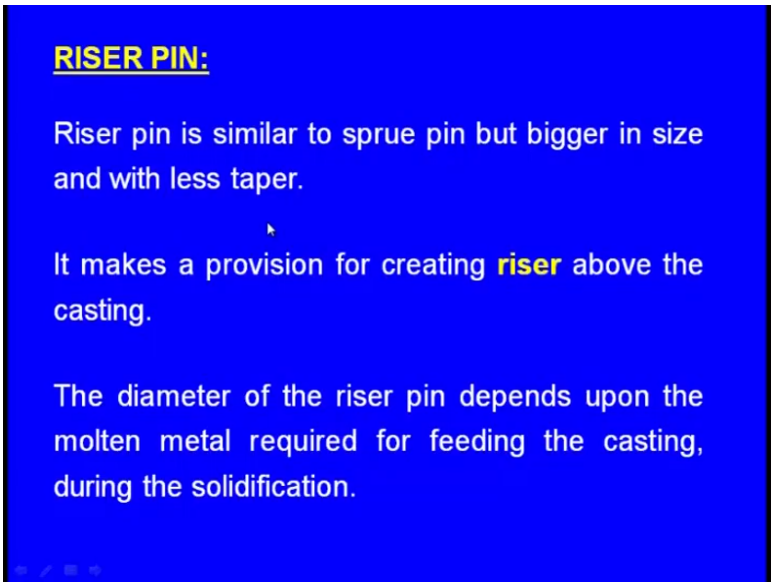

Next one riser pin. Riser pin is similar to the sprue, but larger in size and with less taper. Why we have to use the riser pin? Sometime back we have seen that again there will be vertical column will be there into which there will be a reservoir of the liquid metal will be there, and this reservoir of the liquid metal compensate the shrinkage during the solidification.

So, we have to create a again another vertical column inside the mould cavity for the that is known as the riser. So, to create this riser hole we have to use the riser pin during the moulding process, right? The diameter of the riser pin depends upon the molten metal required for feeding the casting during the solidification. It all depends upon the size of the casting. So, as the size increases even the diameter or the height of the this riser pin will be increasing. Next one swab.

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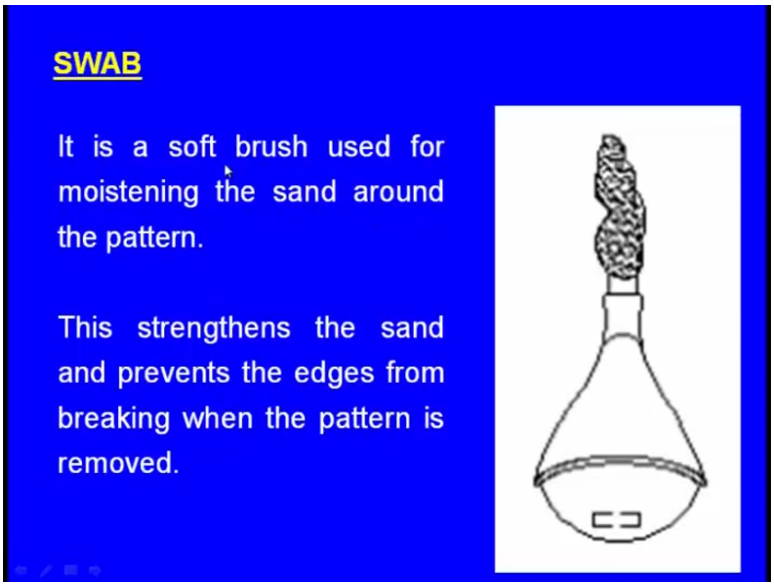

It is a soft brush used for moistening the sand around the pattern. This strengthens the sand and prevents the edges from breaking when the pattern is width drawn or removed. So, when the pattern is the withdrawn or they removed from the compacted sand medium it is possible that the what say edges of the mould may break. To prevent that we take this swab, and moisture the sand around the pattern. Then if you withdraw the pattern the edges will not break. That is the purpose of the swab.

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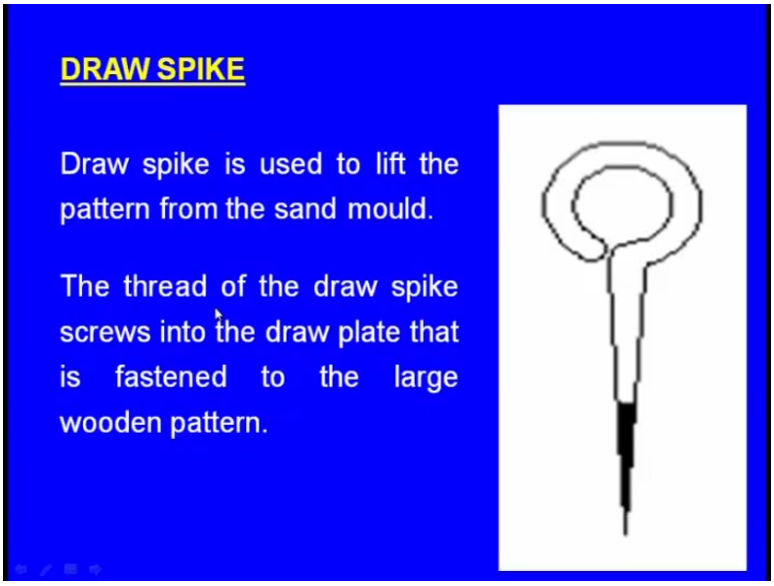

Next one the draw spike. It is used to lift the pattern from the sand mould. You can see this is the draw spike and it has a thread here, and your thread here and a point pinpoint here. And after the compaction is over the pattern has to be removed from the mould. How to remove that? Just by holding we can not remove it by using the draw spike. Now what happens is this. Thread of this draw spike is screwed into the what say draw plate that is fastened to the wooden pattern. Then you try to pull the draw spike then the pattern will come out, or prior to that you have to wrap the pattern on different sides both sides, you have to rapid it so that the mould cavity enlarges slightly. And you have a small what is say clearance is created between the mould and the pattern. Then using the draws spite, we remove the pattern.

Next one the mallet.

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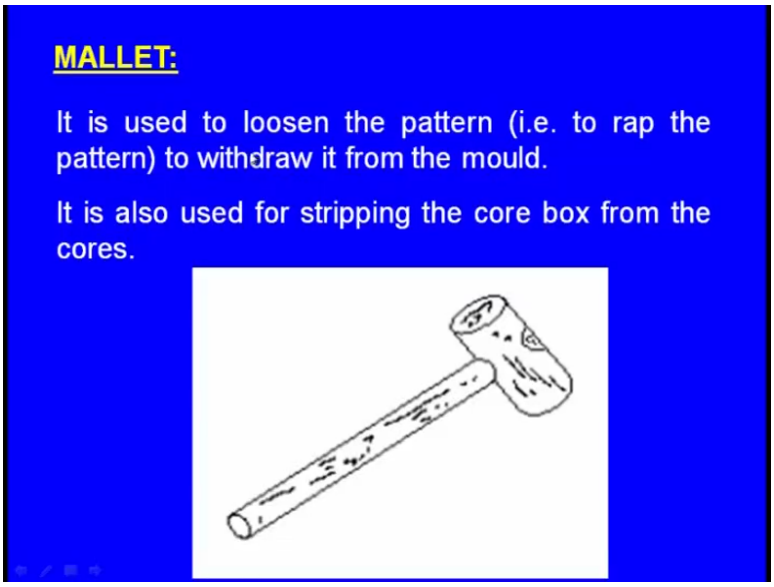

It is used to loosen the pattern, some just now i told we have to wrap the pattern. Means, we have to create a small clearance between the pattern and the mould. So, took do this wrapping, we use this mallet. Means, using the mallet initially we place the draw spike into a above the pattern, and using the mallet we strike it on both the sides. Then a what say mould cavity slightly enlarges a small clearance is created between the pattern, and the cavity are the mould. Then using the draw spike, we can remove the pattern. So, that is the purpose of the mallet.

Next one lifter.

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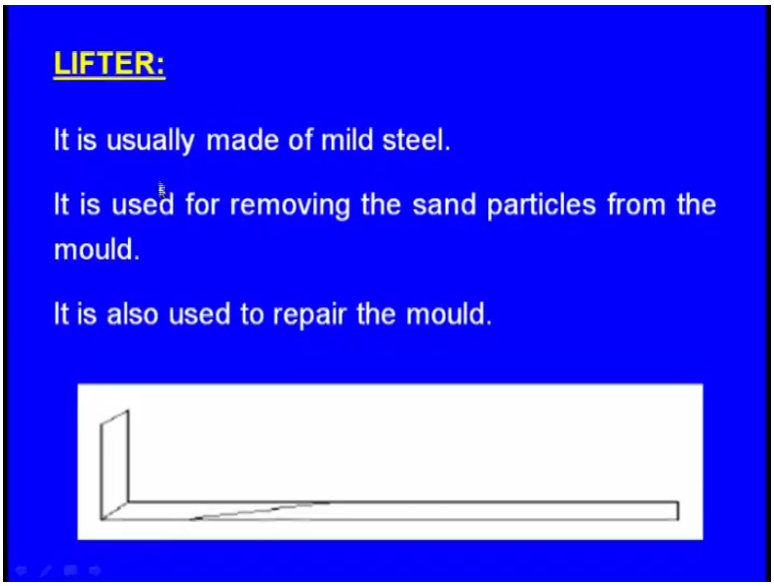

It is usually made up of mild steel. It is used for removing the sand particles from the mould. It is also used to repair the mould. Friends, today we have seen the different moulding terms we have seen. And also, different tools that are used in the sand moulding we have seen. And in the next class we will be learning about the moulding sands and the core sands. So, first we will complete the what say sand moulding then we go on to the other process.

Thank you.