

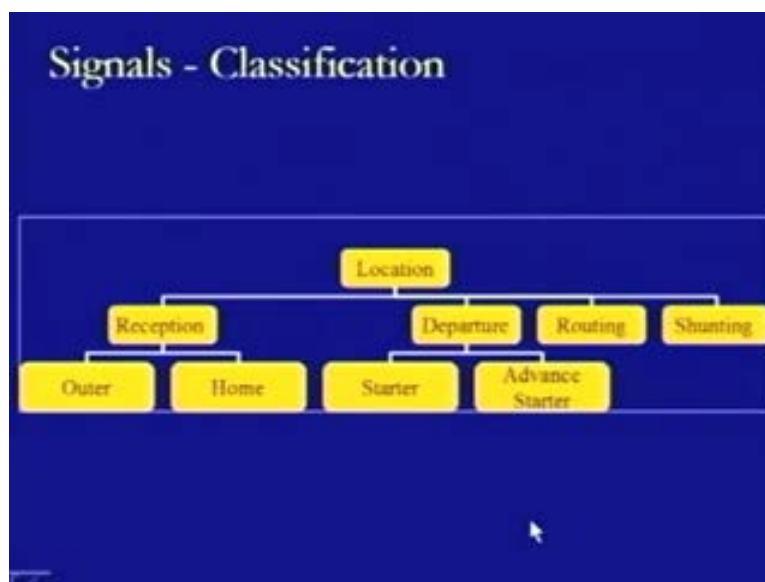
**Transportation Engineering - II**  
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**Lecture - 23**  
**Signals Part – 2**

Dear students, now I welcome you back to the lecture series of course material on Transportation Engineering - II. In the previous lecture, we started with the new aspect that is the controlling device of the movement of trains on the railway tracks and that is what is signals. We are continuing with the signals in this lecture also. In the previous lecture, we have already seen that the signals can be classified on the basis of four types of characteristics and then out of those four types of characteristics and classification systems, we have already discussed signals under operational characteristics and functional characteristics.

Now, in today's lecture, we will be looking at the rest of the two types of characteristics which has been left. That is locational characteristics and special characteristics and the different types of signals which fall under those characteristics.

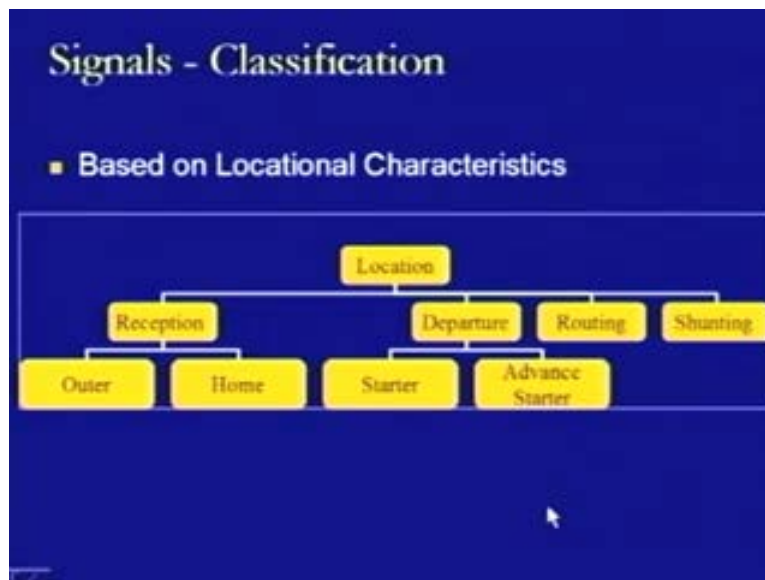
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So, with this, this lecture has been outlined for the different types of the signals and these signals on the basis of the locational characteristics can be defined as being shown in this particular chart. What we see is that the locational characters define it in the form of reception signals, in the form of the departure signals, routing signals and the shunting signals. Within the reception and the departure signals, then they are further classified as outer signals or home signals or starter signals and advance starter signals in the case of departure type of classification. But then, they can also be attributed to the specific location due to which they attain the name as outer, home, starter or advance starter.

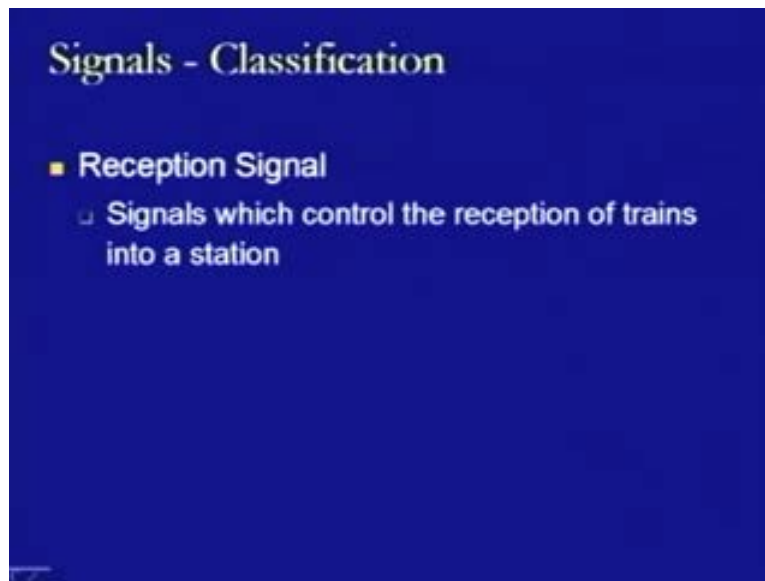
So, in the very first classification, we will be trying to define them in terms of their location and then, we will be going to define them in terms of their special characteristics.

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So, here this is what is being shown.

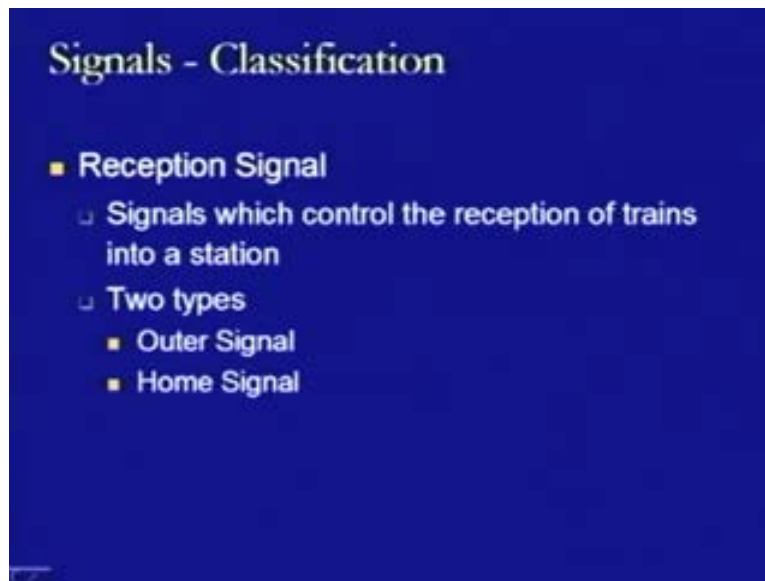
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Now, we come to reception type of signals under the category or categorization based on locational characteristics. These reception signals are the signals which control the reception of trains into a station. In the case of a railway track, the whole of the track is divided into two sections. One is the station section, another one is the block section. The station section is the section which comes under the control, direct control of that station and it is this particular section, in which the trains are remaining stationed on the platform, whereas the block section is that section which is just after the station section and between two station sections whatever is the total section being provided that section is known as block section.

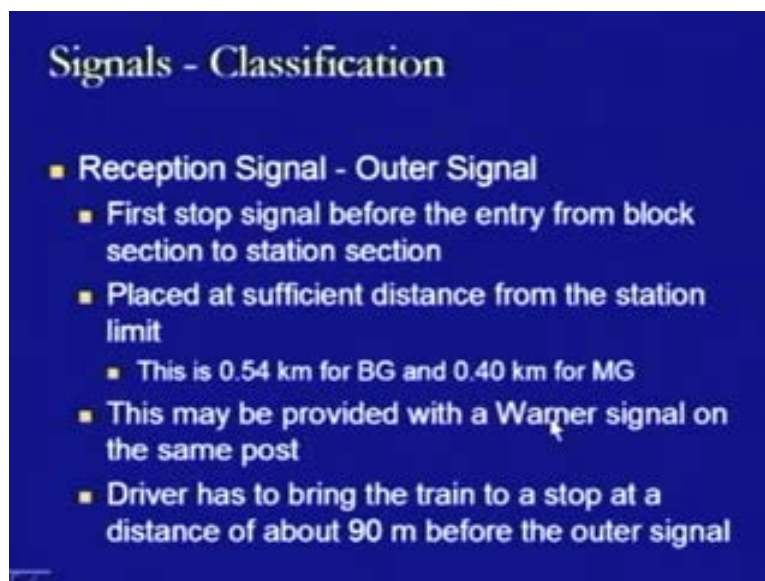
So, here we are interested in looking at the reception signals and those reception signals are the signals which try to control the reception of trains when they come to any of the station and they have to be taken to any of the platform. So, the previous two categories of signals, which we have discussed so far in the previous lectures, can be attributed to the block sections, whereas now we are looking at those signals which are very much related towards the station section or area.

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Here in this case, we have two types of signals. The first category of signal is termed as outer signal and another category is termed as home signal. Again, this home or outer words, they are coming due to their locational aspects and we will look at why, what are the reasons due to which they come in this form and how these signals can be provided and what is their specific job.

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Now, in the case of this reception signal, if we look at the outer signal then outer signal is the first stop signal before the train enters from the block section to the station section. Now, so far the train was in the block section, it was controlled by the stop semaphore signal and Warner signal. But, as soon as it starts coming into the station section that at that point of time a signal is provided and this signal, because it is at just outer periphery of the station section, is termed as outer signal and this you must have heard lot many number of times when you are traveling by train that the train is being stopped at outer.

It is being stopped at outer means the locomotive is just in front of the outer signal which is not allowing the train to move into the station area, because it is already occupied by some other train and there is no place where this train can be accommodated. So, this is the outer signal and this is placed at a sufficient distance from the station limit. That is another requirement that it has to be at some distance. In terms of the broad gauge, this distance is 0.54 kilometer or 540 meters from the station limit, whereas in the case of meter gauge this is located at a distance of 400 meters or 0.4 kilometers and this may be provided with a Warner signal on the same post. So, it means it may be working in combination or in individuality on the same post on which it is being provided with another type of signal or caution signal.

So, in that sense, it will be trying to define that you are moving with caution and still you are provided with proceed condition and Warner signal is horizontal, then you will see that you have to move with a restricted speed. But, if both are down then it means you can move with a higher speed that is the speed with which the train is coming on this station section. Then, the driver has to bring the train to a stop at a distance of about 90 meters before the outer signal. This is the requirement that if the outer signal is not allowing the movement within the station area then the driver has to stop the train 90 meters ahead of the outer signal. So, this is some specification or some standards which are associated with the provision and providing the outer signals within the track system.

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## Signals - Classification

- Reception Signal - Home Signal
  - Placed just at the door of station
  - Provided with multiple brackets depending up on number of lines available at the station
  - Thus it protects the already occupied sidings
  - Not located at a distance more than 180 m from the start of points and switches

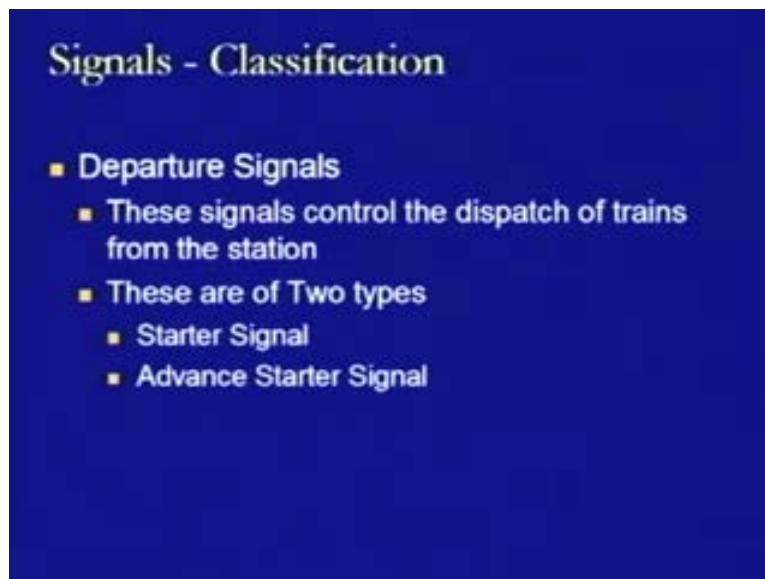
Now, another category of reception signal is home signal. In the case of home signal this is a signal which is just provided at the door of the station that is which we have seen that if there is a single line single track which is going up to the platform, then just before reaching the platform there may be a signal and that signal is what is known as the home signal. That is it is the last point which can stop the train before coming to the platform. So, that is why it is termed as home signal. This is provided, this may be provided, may not be provided depending on the number of lines which are available, number of tracks which are available on that station.

If there is only a single track available on the station, so as to accommodate a train from one direction and then there can be one signal with a single arm on that and which will define the movement of a train on this track. Whereas if there are multiple tracks on which the trains can be taken up, then in that case the signal post will be provided with multiple brackets or multiple arms and depending on in which track we have to move the train, that particular signal or home signal will be made activated. So, that is what it says that it is multiple brackets depending on the number of lines which are available at a station or provided on the signal post. Thus, it protects the already occupied sidings

means if already a track is being occupied, then that signal will never go down and will not allow the coming train to move on this track.

Therefore, we are eliminating the hazardous condition or the chances of any accidents taking place between the approaching train and the train which is already taken its siding. So, this is how it protects the movements and it is not located at a distance more than 180 meters from the start of points and switches. That is the condition that if this signal is being provided just after crossing the signal, the train will start taking a turn and will occupy that siding or track for which the signal is being given. So, therefore there is a provision of points and switches so as to make this turning from the main track and the signal is to be provided at a distance not more than 180 meters from the location of points and switches.

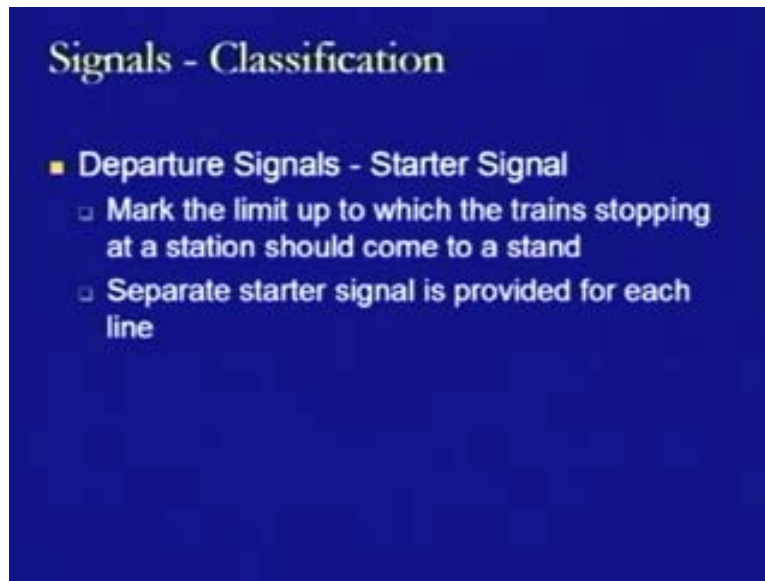
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Now, we look at another category of signals that is departure signals. We have already seen the reception signals where two categories were there and that is how, the train is allowed to move into a station and occupy a platform. Now, we are talking about a condition when the train is standing on the platform and now it has to depart. So, at that location, at that condition whatever the signals are provided so as to dispatch the train

from the station are known as departure signals. So, we will be looking at these departure signals and the category of these departure signals again are two; we have two types. One is known as starter signal, another one is known as advance starter signal. Again, these are on the basis of the same sort of condition as we have seen for the home signal and the outer signal. The home signal we have observed at just at the door step of stations.

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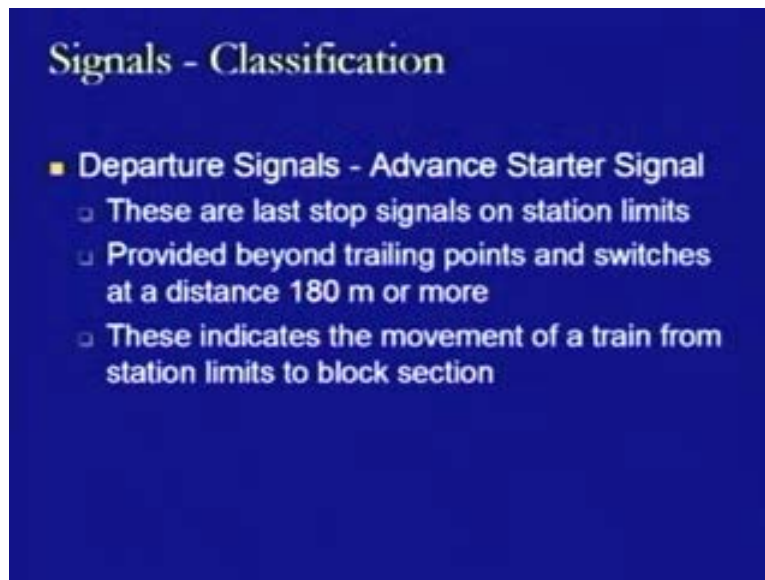
Similarly, here we will be looking at the starter and advance starter signal. Starter signals and the categorization of departure signals, is provided as just ahead of the locomotive from where it is going to start and this marks the limit up to which a train is stopping at the station should come to a stand. That is the location, because if the locomotive is crossing the starter signal, then the driver will not be in a position to look at the signal and understand what the signal is seen, because he will be at the back of that signal. That is why it is important that train is stopping just ahead of the starter signal. The locomotive takes its position short of the starter signal.

So, this is one of the signal which is trying to limitise the length up to which the station, which the train will be stopping and the length of the platform itself and this we can understand in this form also that, in the direction of the departure this is the signal which



is provided on the track adjacent to the platform in the very starting where the locomotive is standing and if we have large number of lines or tracks, then for all those lines or tracks a separate starter signal has to be provided. Then only the trains which are standing on those tracks can understand and the operations of those tracks can be maintained.

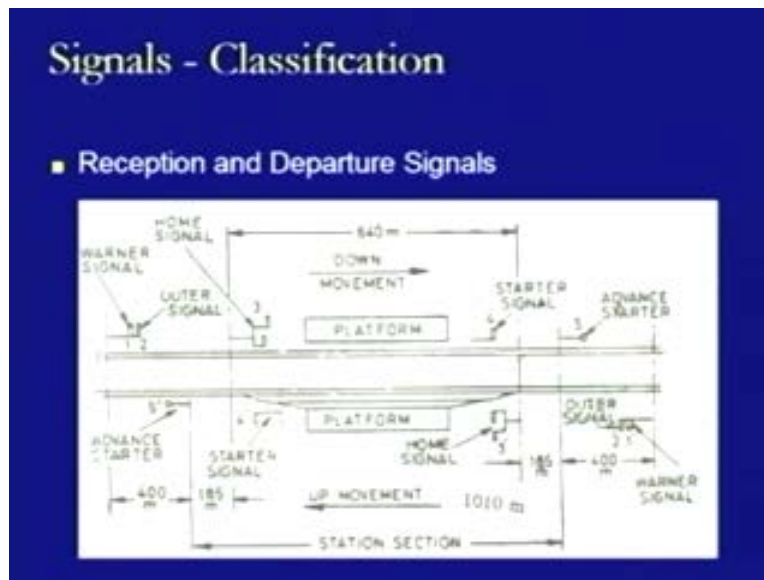
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Another category of departure signal is advance starter signal and ..... of advance starter signal, it is synonymous to the condition which we have seen in the reception signal where the outer signal has been provided. In that sense, this is the last stop signal which is provided within the station limits. The station limit means the points after which there will be a block section. So, at that particular location, whatever signal is provided that is advance starter signal and this is the last location after which the train can be stopped before it moves into the block section. Generally, this type of a signal is provided beyond trailing points and switches. The facing points and switches are the ones which has already been taken while the train has been received in the station area and now we are talking about the trailing points and switches which are provided at the time when the train is departing or it is being dispersed from the station area.

So, in this case, the advance starter signals has to be provided beyond trailing points and switches at a distance 180 meters or more. So, whatever points and switches are there, just the train crosses that one and after a distance of 180 meter or so, we can provide a signal which is termed as advance starter signal. These indicate, these types of signals, they basically indicate the movement of train from station limit to block section as I have already defined that this is how it works.

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Here, all the four categories of signals on the basis of their location or what we can say the basis of locational aspect as we have defined the two categories, the reception signals and the departure signals, have been shown. Here in this case, what we can observe is that there are two main tracks. One is this track, another one is this track. We can take it in the form that there can be a up line track or a down line track and then we have the station area, where this is the station area which is provided here that is being defined like this up to, from this point to this point. We will look at how this point or this point is being decided and then, within this station area we have the platforms.

So, there is one platform on this side and there is another platform on this side for a up train, up linking condition, for a down linking condition. Sometimes, we also observe that

there are, we try to leave the main track and we have some link lines which are provided, which comes this way and finally the platform is provided. So, here the platform is provided on the main track, whereas on this side the platform is provided on a loop line track. So, this is the loop line track. So, this is up movement in this direction and down movement in this direction as being shown.

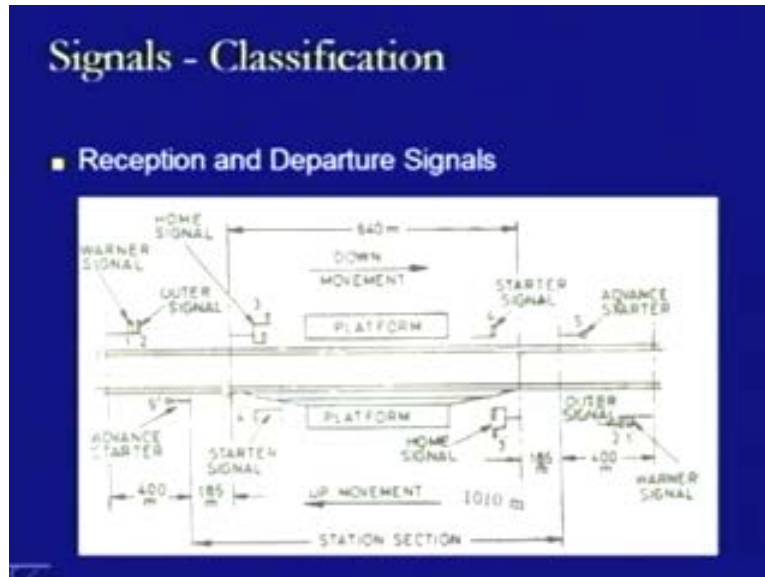
Now, when a train is coming from this direction that is from the left hand side as we are looking on this diagram, then there will be a one signal which will be provided at the location from where the train is moving from the block section to the station section. That is the location. So, from block section to station section when the train is coming, then a signal is provided here and this signal is known as outer signal and this outer signal, as we see in this case there are two signals which have been provided on the same signal post. So, there is an outer signal which is of the nature of a semaphore signal and that is why it is provided at a higher side of this post, whereas there is another signal which is Warner signal and which is located below the semaphore type of outer signal and these are the two signals and combinations which are provided at this location.

Then, when we move in the forward direction that is down movement is there on this line, then as soon as we reach the station limit section, then at that particular location we are having another signal and that signal is termed as home signal. Now, in this case if we have a single line, then we will be having a single home signal at this location and if we are having more of those, then we will be having more of the signals as being shown here. Now, if we assume that this line is also being used for the down movement, then what we found is that there is a possibility of stopping the signal on this section or at this section.

So, if this is a possibility, then we have two lines and in that sense we can have the two arms like this segregated by the two bases. So, we have two base systems like this and then, on each base system one signal is being provided. So, if this goes down then it defines that the train is supposed to take this loop line section, whereas if this goes down it defines that it is to take the main line section or similarly on this side. So, that is what is

the home signal which is provided just before the platform starts and at the same time, as we have discussed in the standards that it has to be something around 180 meters before this forward direction of points and switches, so this is how they are located.

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Now, if we continue with our section in this direction and the train has occupied the platform and then it is to be dispatched, then the train locomotive can take its location, may be up to this point and just ahead of this, one signal is provided which defines the, which restricts or controls the movement of the train on this section and away from it. So, that is why this is a one signal system, which will be provided for this track and as soon as this becomes green then we are allowed to move on this track. But, if it is not green, if it is red, then we are not allowed to move further. We have to keep maintaining our position on the platform and that is why this first signal is termed as the starter signal, because the train is starting from this location.

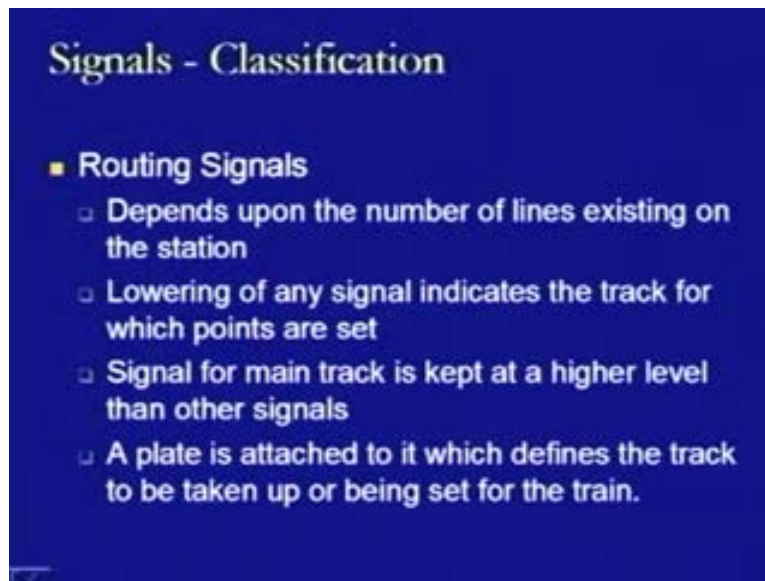
Then, another signal which is provided is the advance starter signal and this advance starter signal is located ahead of the trailing points and switches. Now, here this is the loop line, which comes back to the main track and therefore, this is the location where the points and switches are there and with respect to these points and switches if we go a

distance of 180 meters or so, then at that location the advance starter can be located. So, this is the advance starter located at 180 meters or 185 meters away from this point and crossings or switches.

So, in this case if we look at the station section, then the station section will start from this advance starter condition to this advance starter condition or this outer condition towards the other side of outer condition. That is what we can have and these outer signals, if we have the station section between this advance starter and this advance starter, as we have seen in the definition of outer signal, then these have to be provided at a distance of 400 meters in the case of meter gauge from the station section limit and 540 meters in the case of broad gauge from the station section limit. Therefore, the distance between this advance starter and this Warner signal on the other side should be minimum 400 meters or in the case of broad gauge should be minimum 540 meters. So, the same thing has to be there on this side. So, this is how all the signals are located and that is how it is defined.

Here, again in this case of home signal this is being provided on two different arms, because we have number of lines on which the trains can be taken up and I understand that it is now clear to you that how the trains are received on a platform or in a station area or how the trains depart from a station area using certain types of signals and what are the names of those signals. So, now next time whenever you are visiting the station or using the train modes so as to reach your home you can look upon all these aspects and try to locate all these types of signals.

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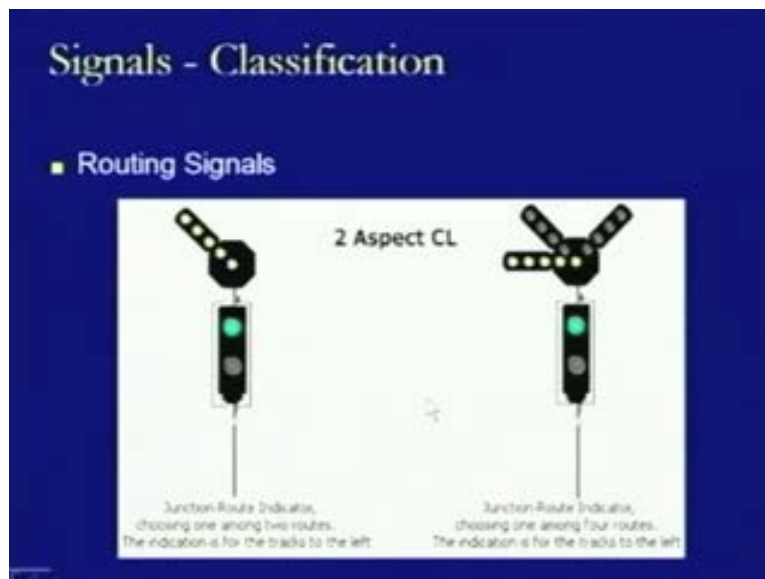


Now, in this classification of signals, another category of signals is routing signals. This is again on the basis of the locational aspect and in this case, it depends upon the number of lines which are existing on the station, because we are trying to route the train on certain lines. So, whatever are the number of lines, on the basis of those number of lines which are available, we will be having number of routes and therefore, we have that much number of movable arms which will be defining which route is to be taken by a train and that is what is a routing signal.

Lowering of any signal indicates that the tracks for which the points are being set and the train can move accordingly on that particular track. This is what has already been seen in the case of the home signal being provided just before the points and switches, so that the driver knows that which particular track his train is going to take. So, that is the similar condition here that when we are having number of lines and routes have to be taken, then lowering of the signal indicates that which particular point is being set and accordingly the driver will be taking that track. The signal for main track is kept at a higher level than other signals.

Now, if all the signals of a routing condition have been placed on the same one post, then in that case the signals which are associated or which are related to the main track will be kept at a higher level, whereas the rest of the signals which are trying to route the train on the rest of the loop lines which are being provided will remain at lower level. This helps driver to basically understand whether they are taking, moving on the main track or they are moving on the other loop line tracks. At times a plate is attached to this type of a signal which defines the track to be taken up or being set for the train. That is another thing which is sometimes provided and if that can be understood, that can be read, this also helps the driver in just finding out which track is being set for them.

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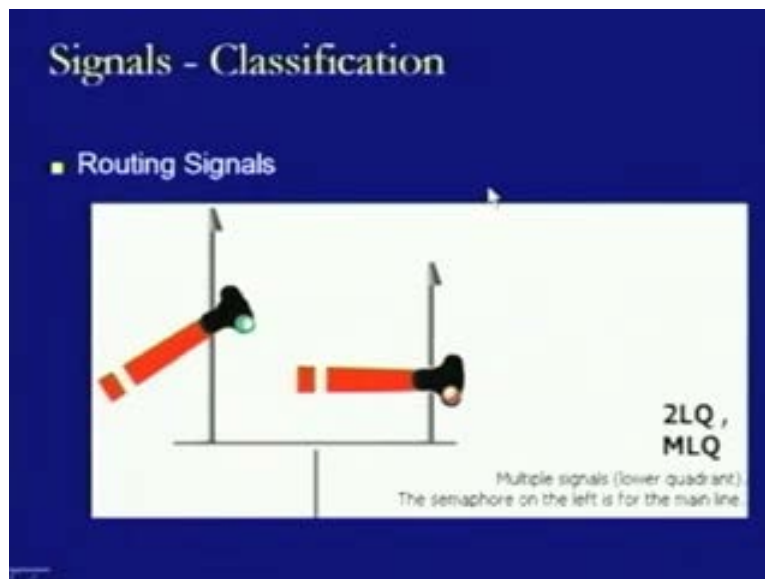


This is one route signal which is being shown here. This may be of different types as we have. Understand, if there are two routes only that is one main route and another route which is provided, then this is how it is defined. We have a colour aspect signal being shown here, with .... colour aspect signal and a movable arm. If we are providing in this form, then it is trying to take it that the track which is to be taken is on the left hand side and this particular track is to be taken by the train and the green light indicates that you are allowed to move further and take that track, whereas in another case, it may happen

that there are four tracks in this case. There are three routing tracks, 1, 2 and 3 and one another track, main track.

So, in this case this indication shows that we are allowed to take this particular track which is on the left hand side, most left hand side, because there is another track also which is on the left hand side, so the most left hand side track is to be taken and you are allowed to move the ..., therefore the green light being shown here. So, this is how out of the four – 1, 2, 3 and 4, the track or the route will be selected within this routing signal condition.

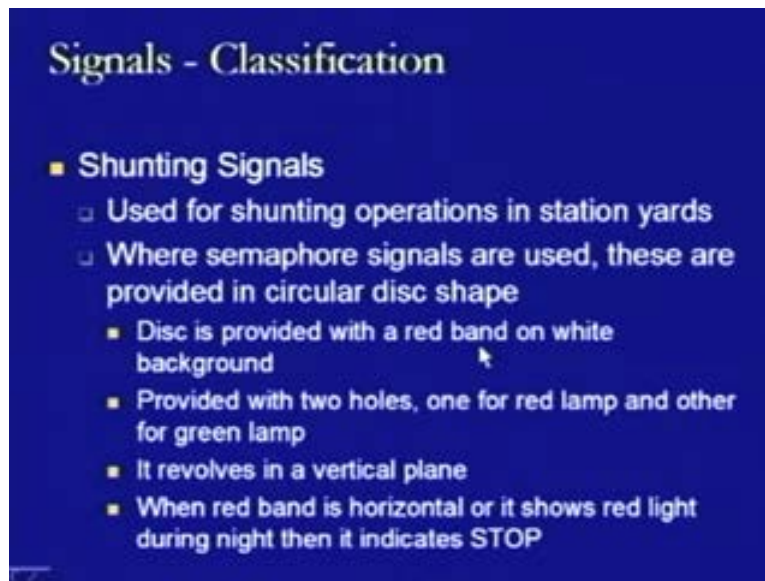
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This is another routing signal condition where the movable arm is being used, so as to indicate that and here what we see is this is the signal post and then at the top of the signal post this is divided into two parts and then, on this one, this particular part we have one signal arm and this is another signal arm. Because, this left hand side signal are **mistaking** downwards, it means, it says that with respect to the main line the left side of track is to be taken by the train, whereas this particular track is not to be taken by the train. So, that is how the routing signals in the case of movable arm system also works and the previous one was the condition where the lights were used.



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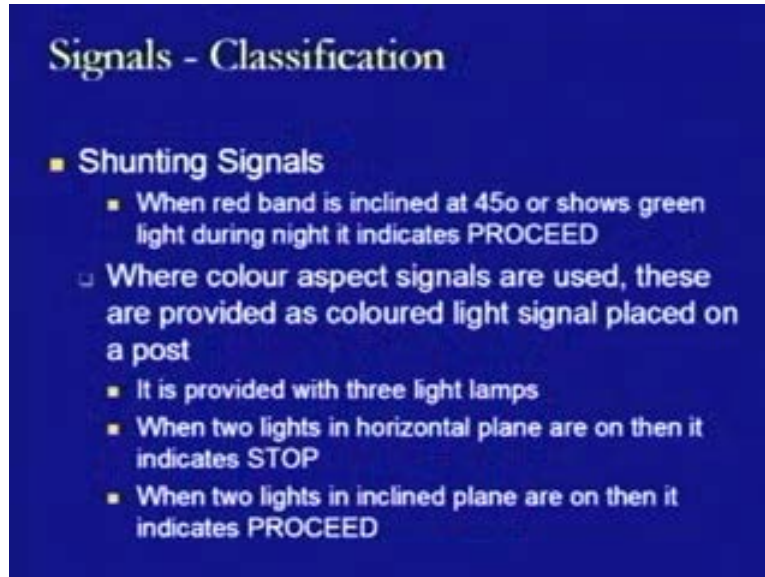


The last signal in the case, category of locational characteristics is the shunting signal. Now, this shunting signal is used for shunting operations in station yards. In most of the station yards, there are the slow operations which are taking place and for those slow operations we provide specific type of signal, which is known as shunting signal. Where semaphore signals are used, then in those conditions, the shunting signals are provided in the form of a circular disc shape and within this circular disc shape, the disc is provided with a red band on white background. This is one thing that the disc is provided with a red band on a white background and it is provided with two holes, one for red lamp and another one is provided for the green lamp. Within, on this circular sheet it is being done in this form and this disc can revolve in the vertical plane and when it revolves in the vertical plane, then this red band will also move. Similarly, the holes which are provided for the light will also move.

Now, when the red band is horizontal or when it shows the red light during night, then it indicates that it is a stop condition. That is the same sort of a condition which we have used when we have taken the semaphore signals or the Warner signals. So, here we have seen that if it is horizontal, then it shows the stopping condition whereas it is not

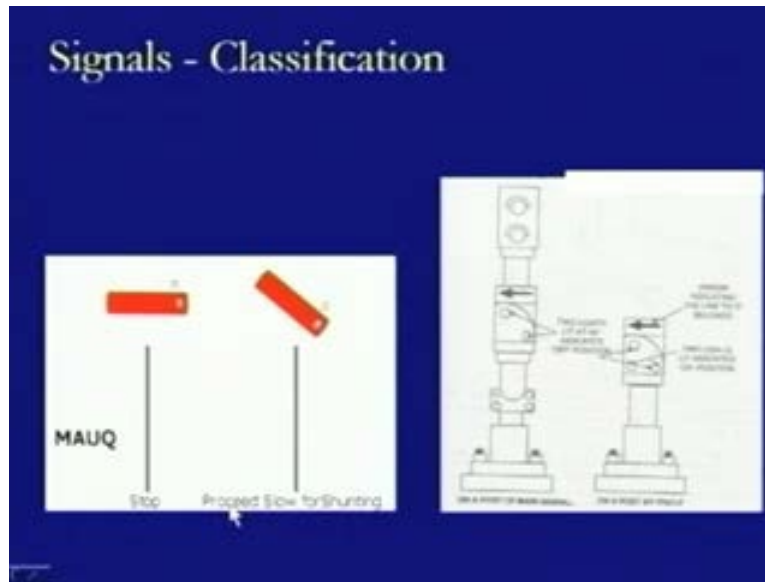
horizontal, then it indicates the movement condition. But then, that movement may be in the cautious condition or it may be with the full speed condition.

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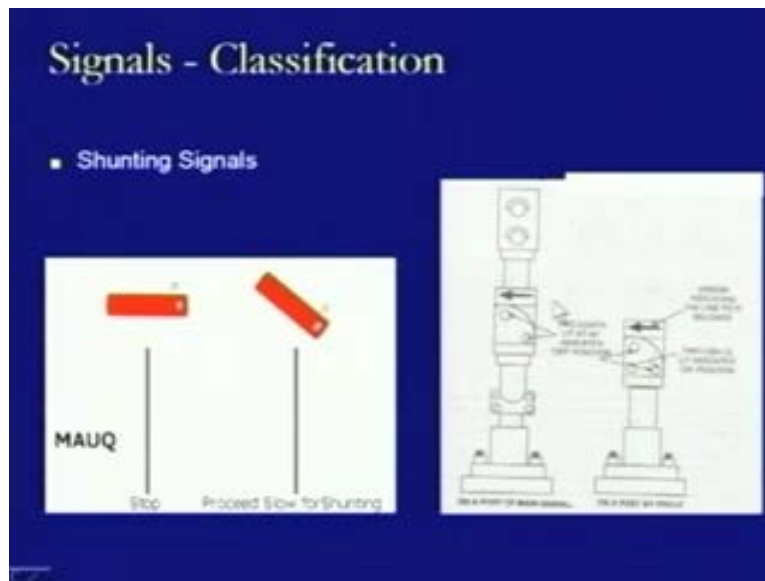
Now, when red band is inclined at 45 degrees, then it shows the green light. During night, it indicates proceed. So, that is the thing. If it is inclined at 45 degrees means we can proceed. In the case of the colour aspect signals which are used for these shunting signals, then these are provided with colour light signal and these colour light signals are placed on the post and generally it is provided with three light lamps. When the two lights in horizontal plane are ON, then it, then it indicates stop. That is here when it is in ON condition, capital ON condition and that means it is indicating stop, because the lights are horizontal. Whereas, if the lights are in the inclined plane, then it will be indicating the proceed condition. So, we have to look at the ON and OFF conditions, which are provided based on the light.

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Now, here we are looking at the signal and this is a circular disc signal and in this circular disc, this circular section is not visible enough in this one. But, this is horizontal, this band is horizontal, then it is defining the stop. Whereas, if this band becomes inclined, then it says that you can proceed slowly for shunting. That is one type of signal which you will find when your train reaches a junction and at that junction we have the yards being provided. Then, you can easily observe the small size of the signals which are provided on the side of the track where there is a post, a small post and at the top of that small post that circular disc is being provided. We can also see the holes. These holes define the colour which also defines whether the train has to stop or move slowly.

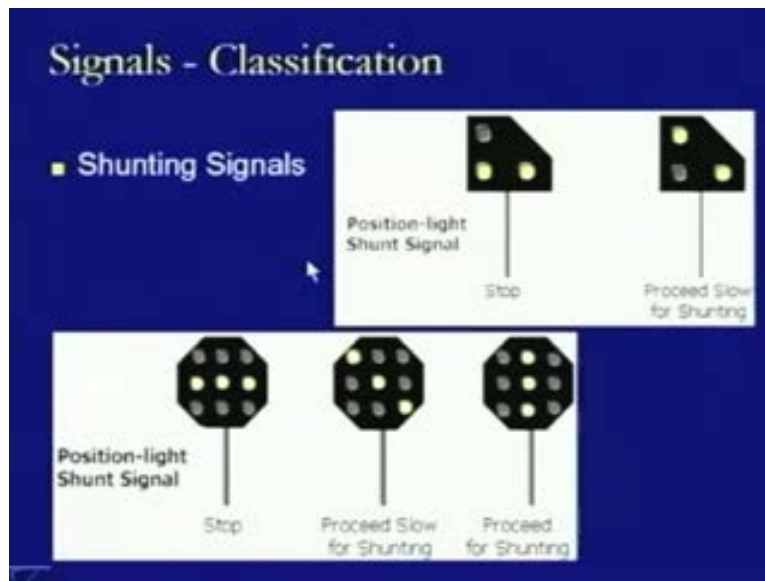
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This is another type of shunting signal, whereas in this case what we have is that there is a base like this, a column sort of a base. This may be a smaller base as being shown here or it may be a bigger base as being shown here and then at top of that one, we have the ... system. This is lamp system where three holes are being provided. So, this is one hole, this is second hole and this is the third hole. So, we have the three holes being provided and depending on whether we are operating these two lights or we are operating these two lights, we define whether it is a horizontal condition or it is an inclined condition.

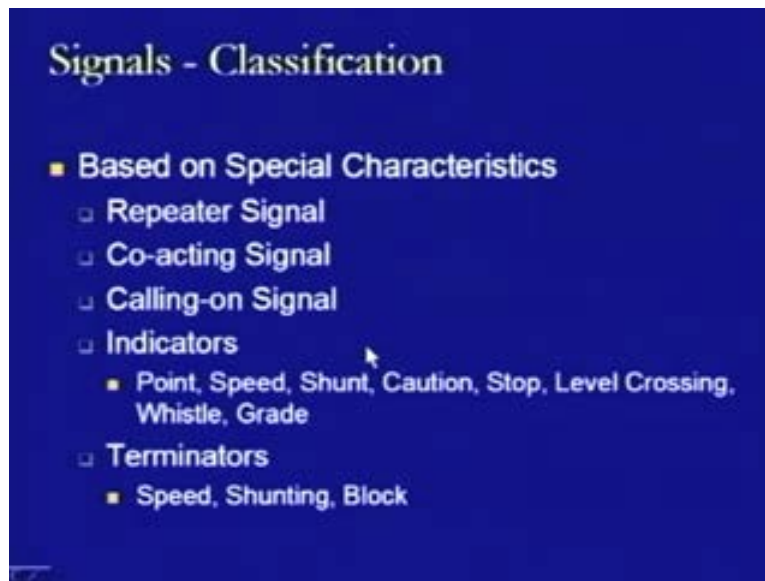
So, if these two lights are in operation, then this is horizontal and it indicates the ON position and it means now the train has to stop. Whereas, if this light and this light are in operation, then it indicates the OFF condition and it means the train is allowed to move with slower speed. The arrow which is being provided at the top here, it indicates the line to which the shunting belongs. So, this is how it defines, whereas in this case we are having the post being increased in further height and it is provided with the colour aspect signal at the top. So, we are using the same signal as a main signal as well as a shunting signal. So, both the things are being provided on the same post. That is a combination of the two signals.

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So, in the case of these shunting signals, we look at some more type of the shunting signals here and what we see is that the shunting signal may be after ..... in nature where these three lights when in operation shows a stop, when this is inclined like this then it indicates that you can proceed slowly for shunting, but if it is vertically upward like this then it shows that we can proceed for shunting with the normal speed and this is another type of shunting signal which is being used at some of the locations and here again the philosophy or the conception is the same that is whether we are using the horizontal two lights or we are using the lights, which indicates an inclined line. If it is indicating the inclined line, then it shows the, proceed slowly for shunting but otherwise it shows the stop condition. So, these are all about the types of the signals which can be categorized on the basis of locational aspect.

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Now, we will be looking at the signals which can be classified on the basis of special characteristics and in this category, we will be looking at different type of signals like repeater signal, co-acting signal, calling-on signal and indicators related to points, speed, shunt, caution, stop, level crossing, whistle, grade. These are the different indicators which can be used. There are some more indicators, true, but some important indicators have been taken here. It is not possible to take all type of indicators. Similarly, terminators, related to the termination of speed, shunting or termination of a block section.

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## Signals - Classification

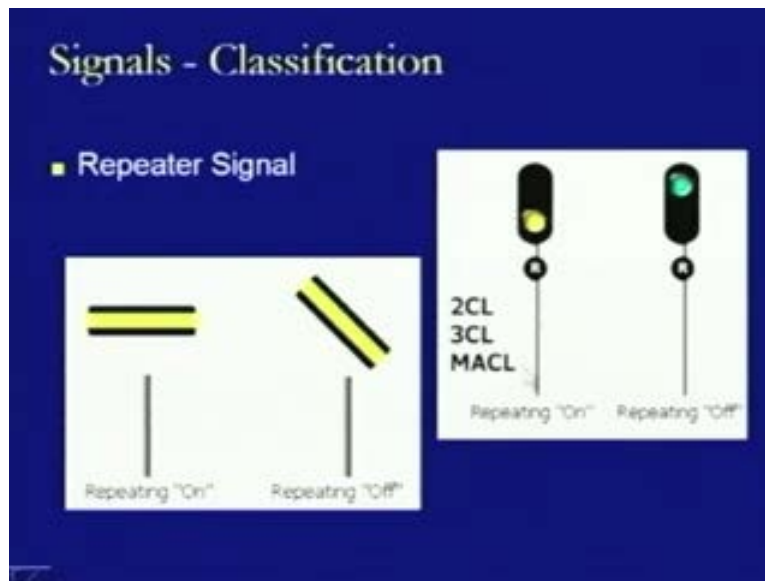
### ■ Repeater Signal

- Provided when a signal is not visible to the driver from adequate distance due to curvature or any other reason or to the guard of the train at the rear end of the platform
- It is located at a suitable position on the platform in rear of main signal
- This may be semaphore type, colour aspect type or rotating disc type
- It is provided with a 'R' marker

Now, we start with first category under the special characteristics signal that is repeater signal. The repeater signal is provided when a signal is not visible to the driver from adequate distance, due to curvature or any other reason or to the guard of the train at the rear end of the platform. That is the problem which is there if a train is standing on a platform and because of the curvature provided within the platform, the driver is not in a position to see the main home, this starter signal, then in that condition another signal is provided which also shows the same type of signaling which is being shown in the case of a starter signal and that is how the driver will be able to see it.

Similarly, sometimes it may happen, because of the curvature the guard is not in a position to see that signal and therefore, repeater signal is provided in between from where the guard can see the signal. It is located at a suitable position on the platform itself, in rear of the main signal that is the starter signal here, which we are talking about. This may be a semaphore type or it may be a colour aspect type or it may be a rotating disc type and generally this signal is provided with a marking 'R', which indicates that this is a repeater signal.

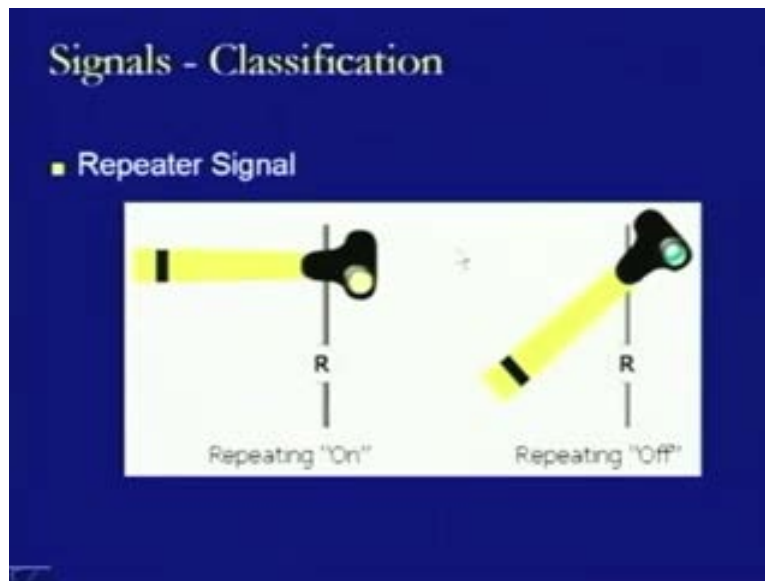
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Like here, we are trying to show the repeater signal. This is disc shape repeater signal, where if it is horizontal marking, there the band is being given by a lining of black on the two sides and this is ON condition means stop, if it is inclined it is OFF condition means proceed. Similarly, it may be in the form of sign post, signal post with one signal particular light which is provided and if this light is yellow in colour, then it is repeating ON condition means cautiously you can move, where it is green it is OFF condition means you can move further and R is provided, so as to indicate that this is a repeater signal. So, this is what we define.

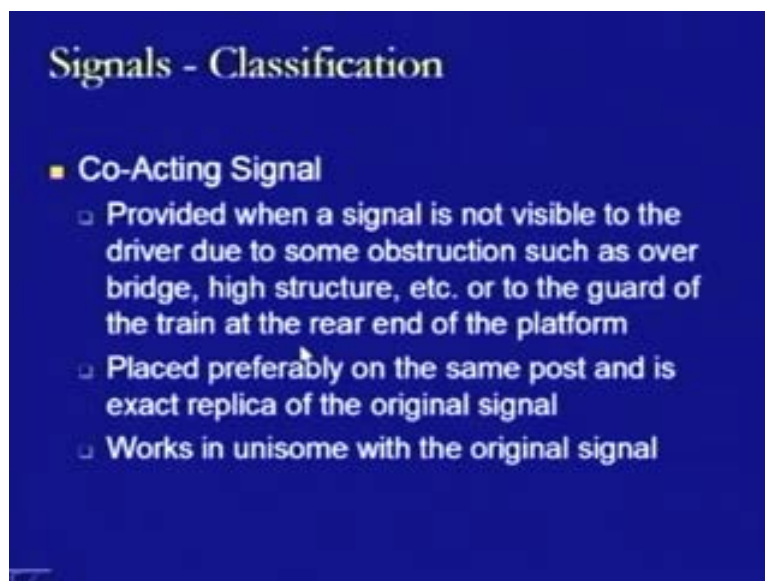


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Then, this is another repeater signal which is provided in the form of movable arm and here it is yellow in colour and though this is semaphore type, but this is yellow with black band and here it is R being shown here and again the condition remains such that if it is ON position then it is horizontal stop condition, if it is inclined position means OFF position and proceed condition

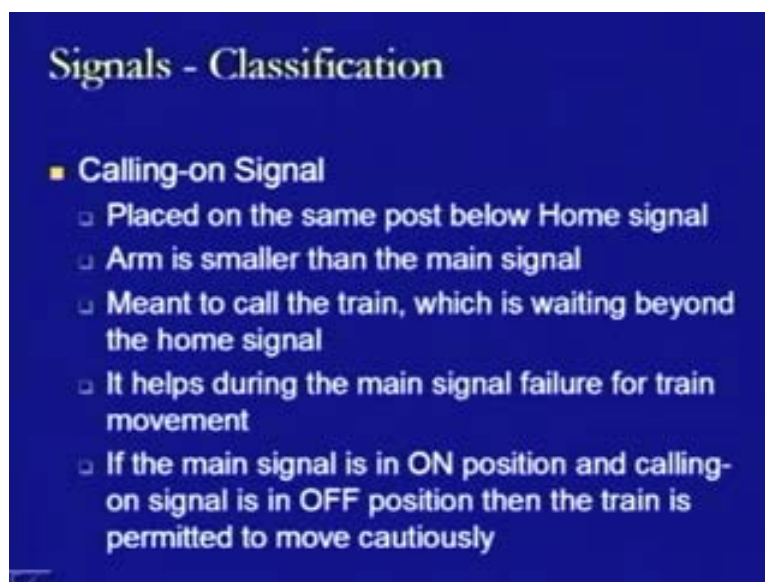
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Now, there is another category of signal which is termed as co-acting signal. In the case of co-acting signal, they are provided when the signal is not visible to the driver due to some obstruction such as over bridge, high structure, etc., or to the guard of the train at the rear end of the platform. In the previous case, what we have seen is that there was a curvature in the platform and due to that curvature in the platform the driver or the guard was not in a position to see the signal. Here, we are talking about another condition where certain structures have been provided on the platform itself like the bridges for the pedestrians to cross and come to the other side of the platform.

In such conditions, sometimes this is being provided in such way that it comes in the line of sight of the driver or the guard and they are not in a position to see the main signal. So, in that case, a co-acting signal is provided and this co-acting signal is placed preferably on the same post and it is exact replica of the original signal. That is how the original signal looks like, in the same way, the co-acting signal also looks like and is provided just above the main original signal on the same post, so that now it is visible to the driver or the guard. So, it is clearing the obstruction. It works in unison with the original signal that is whatever is the indication in the original signal will be the indication of the co-acting signal.

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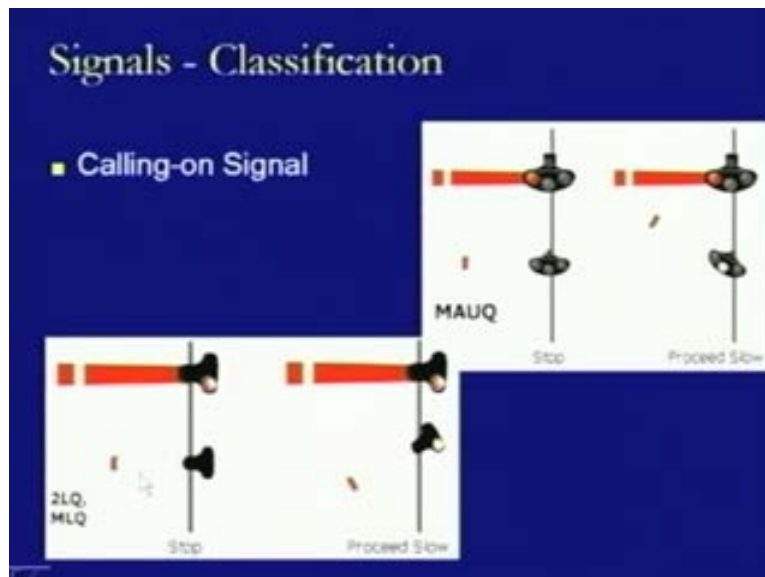
### Signals - Classification

- Calling-on Signal
  - Placed on the same post below Home signal
  - Arm is smaller than the main signal
  - Meant to call the train, which is waiting beyond the home signal
  - It helps during the main signal failure for train movement
  - If the main signal is in ON position and calling-on signal is in OFF position then the train is permitted to move cautiously

Then, the another category of signal here is the calling-on signal and this calling-on signal is placed on the same post below home signal. So, you have the home signal as we have seen in the case of the reception signals and there what we found is that there can be more than one post being provided at the same location on which the movable arms are located. Now, on the same post there is another signal which is a calling-on signal, which defines that you are being called to take one track. So, the arm is smaller than the main signal in this case and it is meant to call the train which is waiting beyond the home signal.

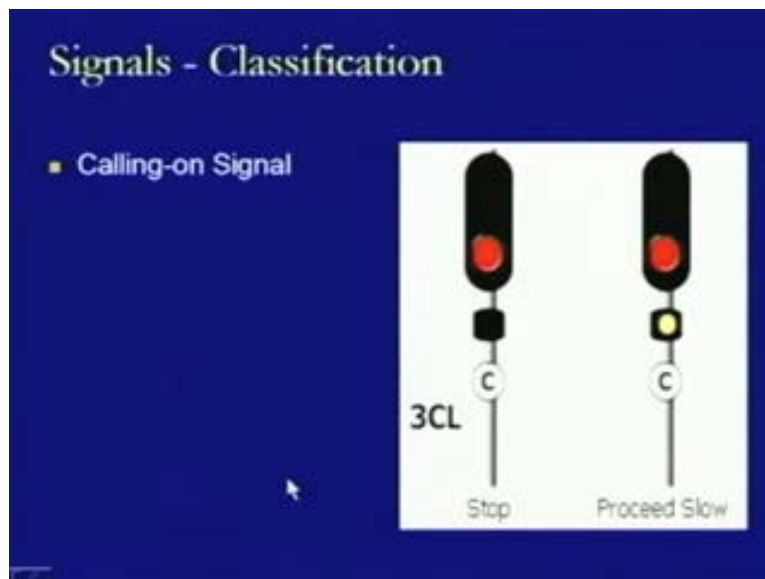
So, if the train is waiting beyond home signal and we lower this smaller arm, then it says that train is being called to occupy this track. It helps during the main signal failure for train movement. If there is a condition where the main signal has gone bad, then it may help in the movement of the trains. If the main signal is in ON position and calling-on signal is in OFF position, then the train is permitted to move cautiously and this is what we have seen number of times, when we have discussed combination of two signals on the same post and one is working in ON condition, position and another is working with the OFF position.

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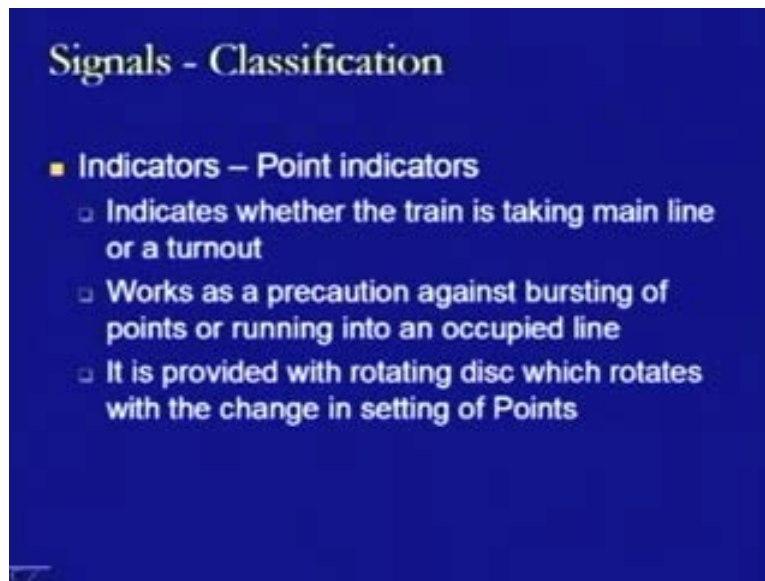
Here, we are showing the calling-on signal and we have the lower quadrant calling-on signal and this is another one where what we observe is that this is the main signal which is being provided. There is another signal being provided here. Because this is white background colour, so that is why it is not coming as visible in this. But, this is a smaller signal post which has a signal, which is being provided along with movable arm. This is white with red band, so if it is horizontal it means we have to stop. But, if this is down, it means we can proceed. But because the main signal is horizontal, then we have to proceed slowly, cautiously and same is the condition when we are talking about the upper quadrant signal means, then this will be working in the upward direction.

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This is another one where this is, C is being written on this circular disc which defines that this is a calling-on signal, similar to the repeater signal where we have used R and this is a colour aspect signal where if nothing is being shown on this one, then it means we are in a stop condition, but here if it is amber means we have to proceed slowly and if it becomes green, then it means we can move with the same speed and this will also become green.

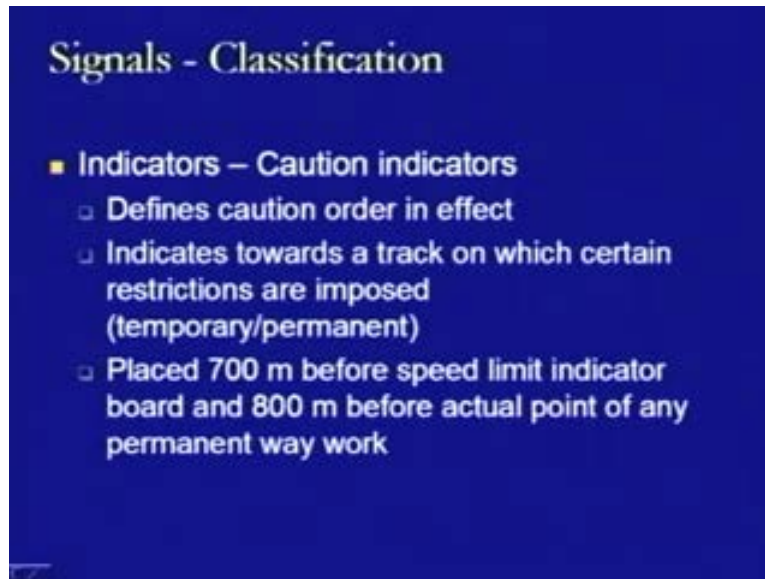
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Now, we come to the different type of indicators. As we have seen, we can provide the indicators on different specific conditions like there are point indicators, wherein they indicate whether the train is taking the main line or it is taking a turnout. So, as soon as the train is crossing the points, he will, the driver will find that there is an indicator just before that which defines that you are going towards the point or towards the main track and it works as a precaution against bursting of the points or running into an occupied line. That is how it helps the driver.

It is provided with rotating disc which rotates with the change in setting of points. It is a combination of the movement of the points or the setting of the points and as soon as the points are being set, the rotating disc will also start moving and it will take its position and if it is allowing the movement on the turnout, then it will be set in that form.

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Then, we have the caution indicators. The caution indicators define caution order in effect that what type of caution order is being given, whether it is a restricted condition or the speed, then we have to restrict it or if it is something else, then we have to look at that type of caution. But, these cautions or these restrictions they may be temporary or they may be permanent in nature. It is not necessary that all the times they are permanent and not necessary that these restrictions which are coming to the track, they are imposed on all the tracks which are laid side by side. Sometimes they are imposed on some of the tracks and the other tracks are not being imposed of any restriction.

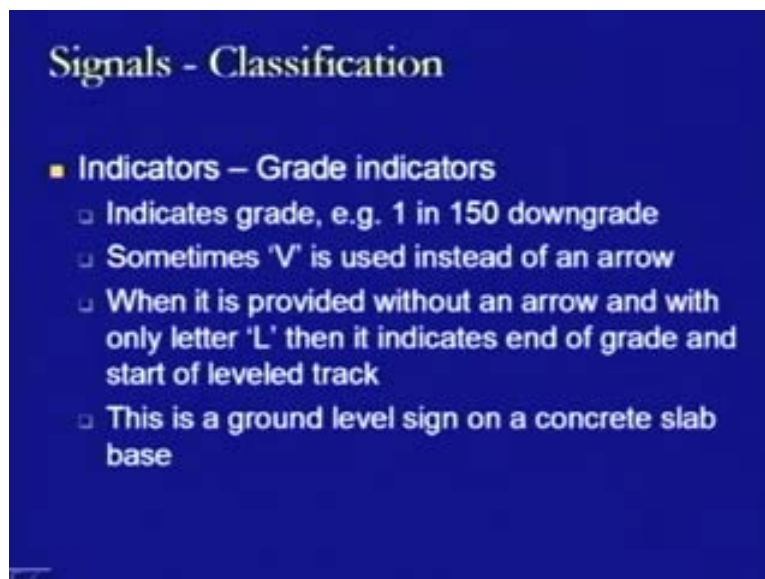
Most of these have to be placed 700 meters before the speed limit indicator board and 800 meters before the actual point of any permanent way work. So, if any permanent way work is going on, then in that case, 800 meters before that this caution indicator is to be provided and you have observed that when we are traveling by train, at times the train speed is reduced, because the work is going on ahead and after sometime we found that, then only we found a work force is working on the site of the track and that is why the speed of the train is being reduced. That is the distance of 800 meters, whereas if the speed is being restricted, then it is provided at a distance of 700 meters.

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This is a caution indicator. This is how it defines that the movement is allowed in this direction, but is restricted.

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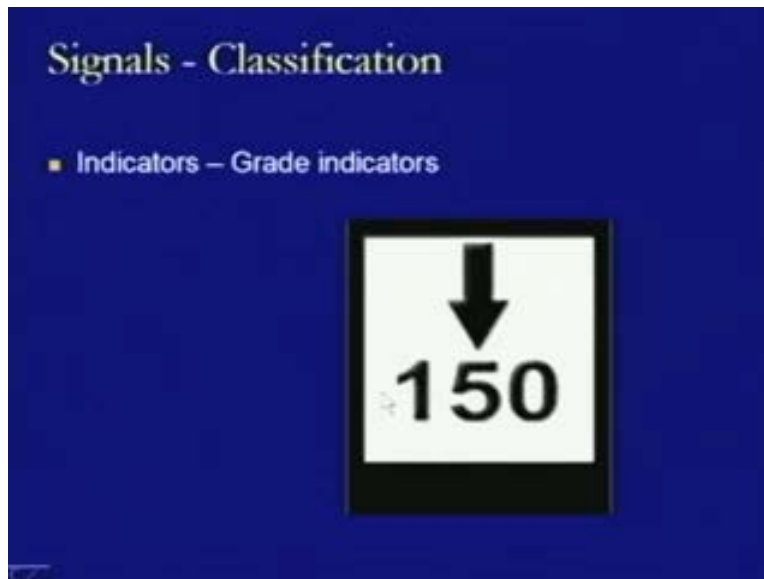


Then, we come to the grade indicator. The grade indicators are defining the grade in terms of like 1 in n value and it may be up grade or it may be a down grade. So, where n values defining that if we moved so much value of horizontal distance, then there is one

unit of rise or one unit of fall. So, 1 in n means here we have taken an example value as 1 in 150 and then if it is a down grade, then we have to show that now the train is moving on 1 in 150 grade, which is going down. Similarly, it may be the upward condition and sometimes we use V instead of an arrow to define that whether it is a down grade or it is an upgrade.

When it is provided without an arrow and with only letter L, then it indicates the end of the grade and the start of the leveled track. So, this is how the indication of the completion of the grade is being given to the driver, otherwise the driver will not be knowing at what time the grade is being completed and they are moving on the leveled track and this is a ground level sign on a concrete slab base. It is not a big sign being provided on the high post. It is provided on a ground level.

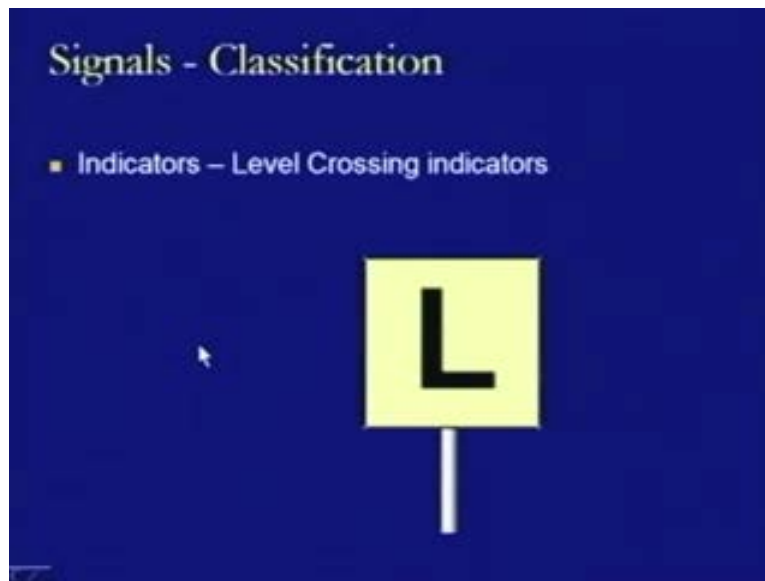
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This is how it looks like. This is grade indicator, where the value of 150 has been given, which says it is 1 in 150 grade and this arrow is moving in the downward direction it means it is a down grade. If the arrow is up, it means it is an upgrade. Sometimes instead of an arrow, only V will be there.

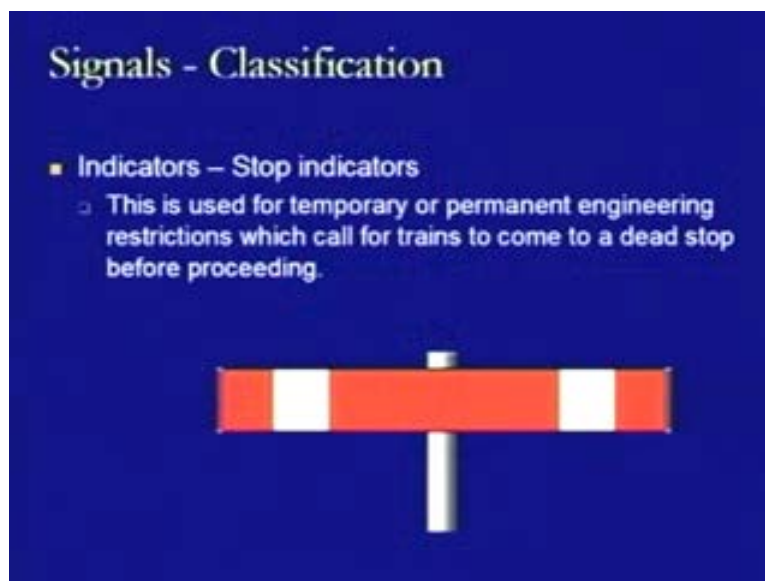


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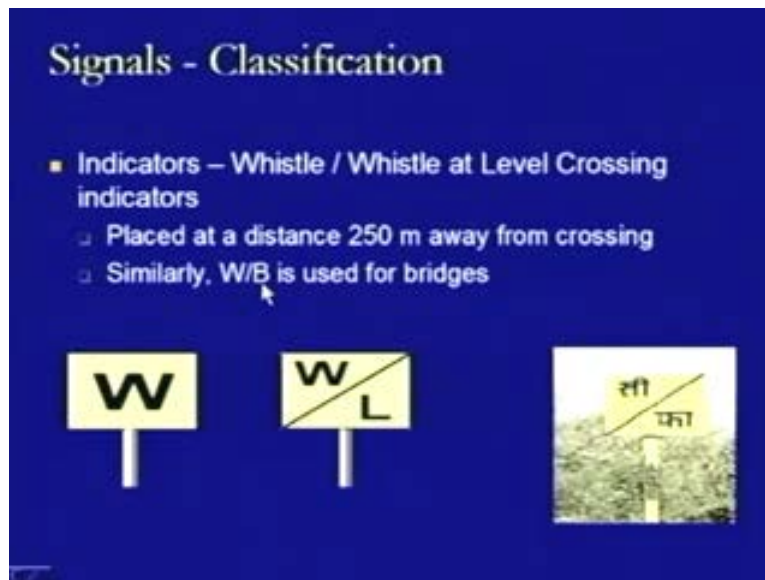
Then, we have the level crossing. The level crossing indicators is in the form of this square sheet on which the L is being placed. So, if on the side of the track if the driver finds that there is an indicator where L is being written, then it means a level crossing is coming ahead and the driver has to be very cautious while crossing that level crossing, where the persons may cross the track from the sides.

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Then there is a stop indicator. This is how it looks like. This is a rectangular sheet and where we have the red background with white band on one side and the other side. This is used for temporary or permanent engineering restrictions which call for trains to come to a dead stop before proceeding further.

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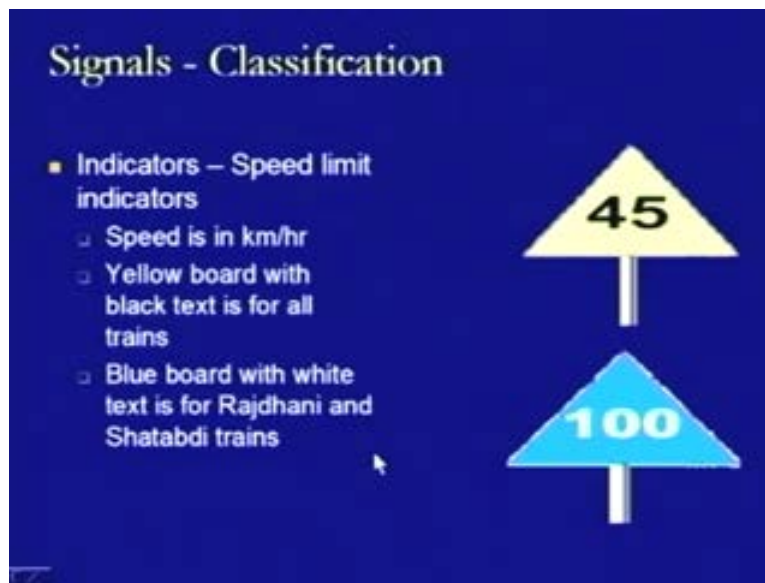


Then we have another type of indicator, which is termed as whistle indicator or whistle at level crossing indicator. This is an indicator which is given to the drivers so as to whistle, blow the whistle of their train. The reason behind is that now probably they are passing through the area where people are staying on both the sides of the track and so as to make a caution, it is better that the train moves while giving a whistle and you must have listened to this at number of locations where even your own train in which you are traveling keeps on going the whistle as soon as it moves through the area where on both the sides people are living.

Similar is the condition when the whistle is to be given if we are approaching the level crossings so as to make the people cautious that the train is coming and they should not cross the track at that point of time. So, in the case only whistle is to be blown in the inhabited area, then only W is written and if it is level crossing, then W with L is written

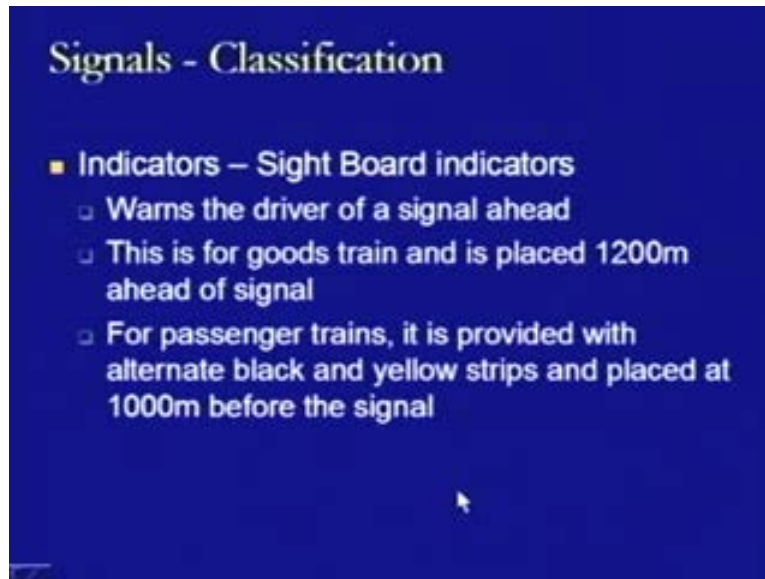
or sometimes in Hindi it is written as se pha means se is for seeti and pha is for phaatak. So, there is a phaatak ahead, so blow the seeti. So, this is blow the level, blow the whistle because the level is ahead. Generally, it is placed at a distance 250 meters away from the crossings and this is how W or like B are also used where it is whistle because you are reaching the bridge. So, B is for bridges.

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Then, we have some other indicators like speed limit indicators. So, if it is 45 means 45 kilometer per hour, if it is 100 means 100 kilometers per hour and yellow board is generally used for all the types of trains with black text, whereas if it is blue board with white text, then it for Rajdhani or Shatabdi trains. So, next time when you are moving, if you see this one, then you can understand this is the restriction for Rajdhani and Shatabdi and this is the restriction for rest of the trains.

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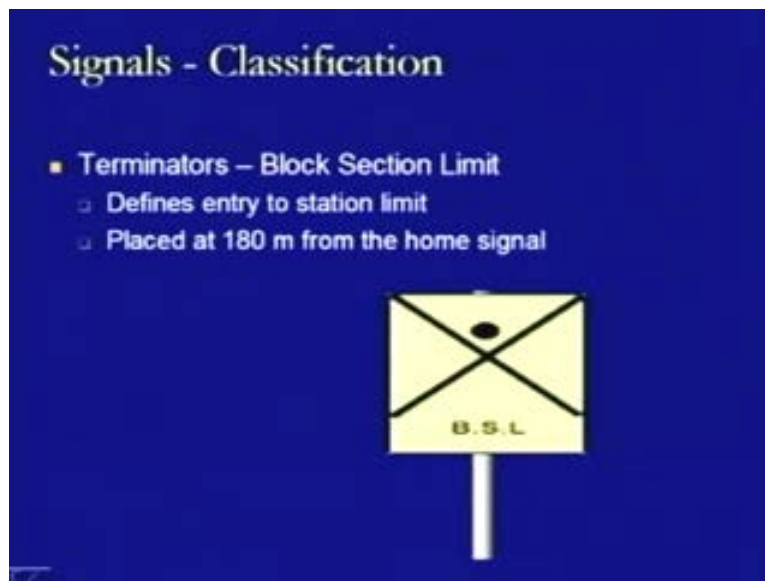
Then, we have the sight board indicators where which warns the driver of a signal ahead and this is for goods train and is placed 1200 meters ahead of the signal, generally and for passenger trains it is provided with alternate black and yellow strips and they are placed at 1000 meters before the signal.

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So, after this sight board indicator which we have seen, we have another type of an indicator which is termed as block section limit indicator that is B S L indicator and this is another type of terminator which defines the entry of the train into the station limit after the block section has completed and it is generally placed at a distance of 180 meters from the home signal.

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Then another one is the shunt limit.

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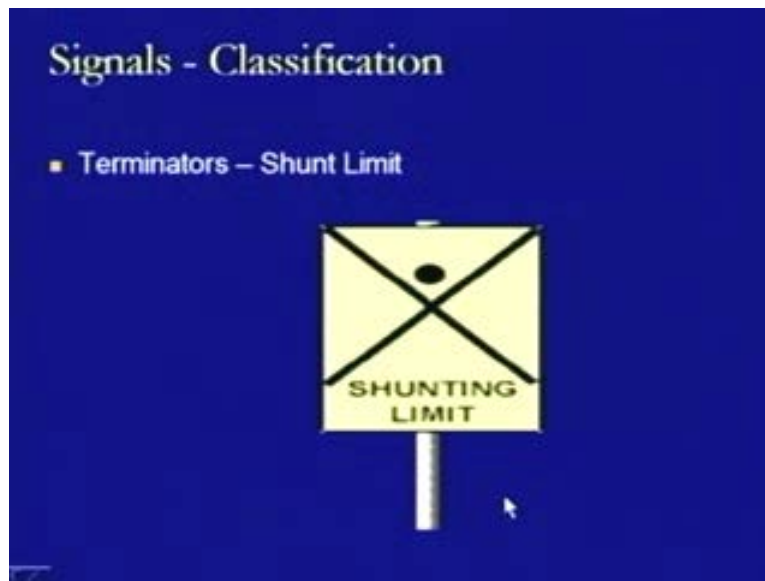
## Signals - Classification

### ■ Terminators – Shunt Limit

- Indicates end of shunting section with lights on both sides
- Sometimes S/L is used instead of 'Shunting Limit'
- Placed at 400 m to the rear of the first stop signal in LQ signaling and at 180 m for UQ / MLQ signaling system

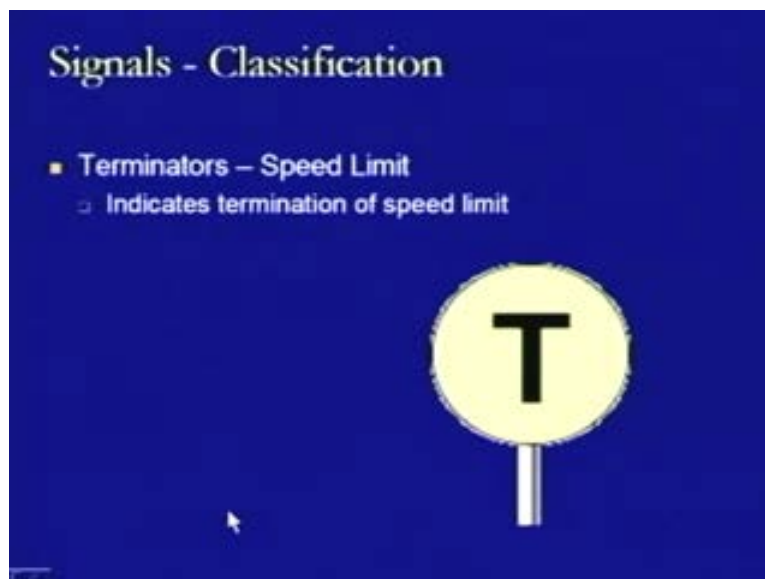
In this case this indicates the end of the shunting section with lights on both the sides and sometimes S of L is used instead of the shunting limit. So, that is how it indicates the termination of shunting area. Generally, it is placed at 400 meters to the rear of the first stop signal in lower quadrant signal system and at 180 meters for upper quadrant or M L Q signaling system, multiple signaling system.

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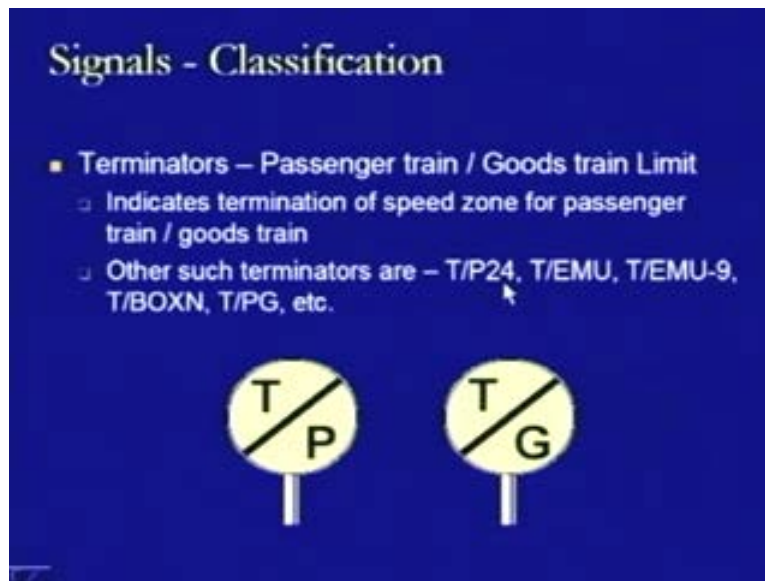
Then, this is a shunting limit terminator, as we have seen the B S L terminator, similarly in that sense this is cross means and this is written here.

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Then, we have another terminator which is speed limit terminator which is circular in section with T inscribed on that with a yellow background and black text. This is what is speed limit terminator. It indicates the termination of the speed limit.

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Then, similarly we have the terminators for say, for the passenger trains, for the goods train limits and they indicate the termination of the speed zone for passenger train or for the goods train. Other such terminators are also available like T oblique P24, T oblique EMU. That is EMU is generally used in the suburban or the urban areas like metros, etc. T oblique BOXN, this is BOXN for goods type of traffic, T oblique PG means passenger and goods and so on.

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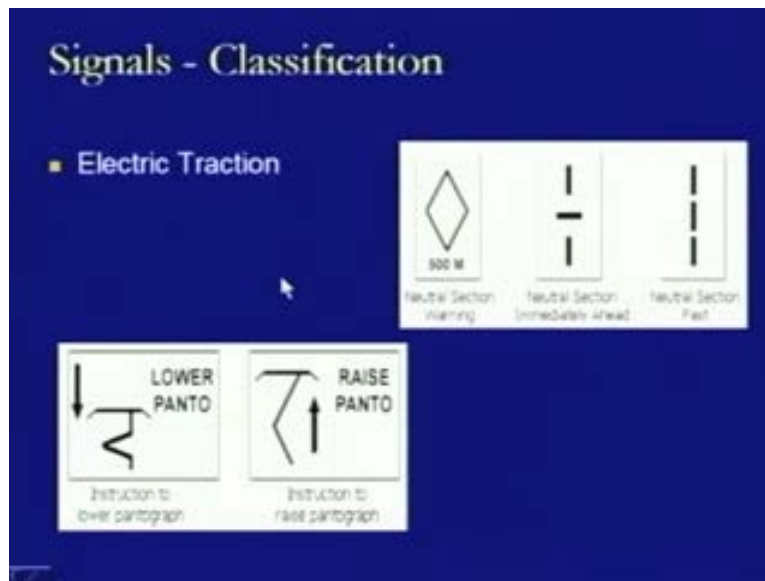


Then we come to another type of indicators which are there. They are related to the electric traction and in this case what we found is that we have the indicators like this - vertical line with a horizontal line and this vertical line. This is one type of an indicator. Then we have an indicator like this one, where we have again this vertical horizontal and vertical and this is one indicator. Then, we have an indicator which is here as this rhombus and which written something and capital A written at this top. Now, what it says is that if there is capital A written on this one means it is AC or A/c? traction being provided. Then, if it is rhombus like this then it means it is neutral section. There is no electric current being provided in this section and the train has to move with the current already available to that.

Similarly, in this case when we are talking, this is the instruction which is given for the pantograph that is the connectivity which is provided between the locomotive and the electrified traction provided at the top in the terms of cable. So, between those connectivity, there is one thing which is lifted from the top of the locomotive that you must have seen in the case of electric locomotives and that is what is known as pantograph. So, lifting the pantograph is the indication that is now you can lift your pantograph. Similarly, here this is for bringing the pantograph down.

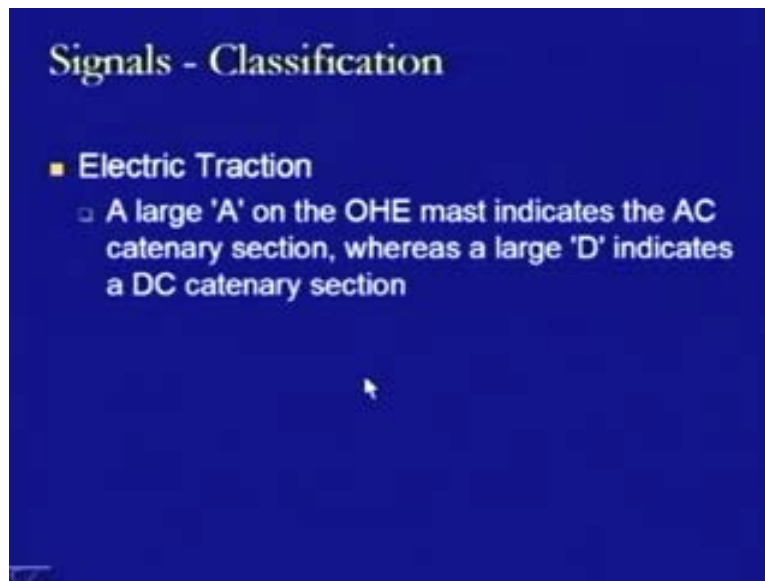
So, this is what it looks like. It is pantograph that is being shown here and the arrow is going downwards.

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It means lower the pantograph, whereas if it is going in the upward direction it is in the stressed position, then it means raise the pantograph, so as to get the electricity. This is neutral section at for a distance of 500 meters. Then, this is neutral section **immediately** ahead that is just you are entering the neutral section and this is the neutral section which is already being crossed and now you are coming in the electrified section. So, it says the neutral section is 500 meters. This is how the electric traction has been defined in this case.

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Then, further if there is a large A on OHE mast it indicates the AC, **whereas** if there is large D, ... it indicates a DC catenary section. So, this is how the electric traction indications are given to the drivers, when they are moving on electrified track. So, in this lecture as well as in the previous lecture, now we have seen regarding different type of signals which can be provided on any track.

In today's lecture, we covered the signals which have been categorized by the locational characteristics or which can be used in specific conditions therefore they have the specific characteristics. What I understand is that I have been able to give you the information regarding the different type of the signals which are used on railway tracks and now whenever you are going to the railway tracks you will be looking towards the signal and you will understand the meaning of those signals. Now, we will be stopping at this location and we will be meeting in the next lecture so as to look at some other aspects of railway engineering.

Till, bye, good bye.