**Physical Modelling for Electronics Enclosures Using Rapid Prototyping**
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Lecture - 10
Integration of Components 1

Hello. Let me continue with small attempt which I had made last time. The think what I wanted to start at that time was; this; what I call a battery holder.

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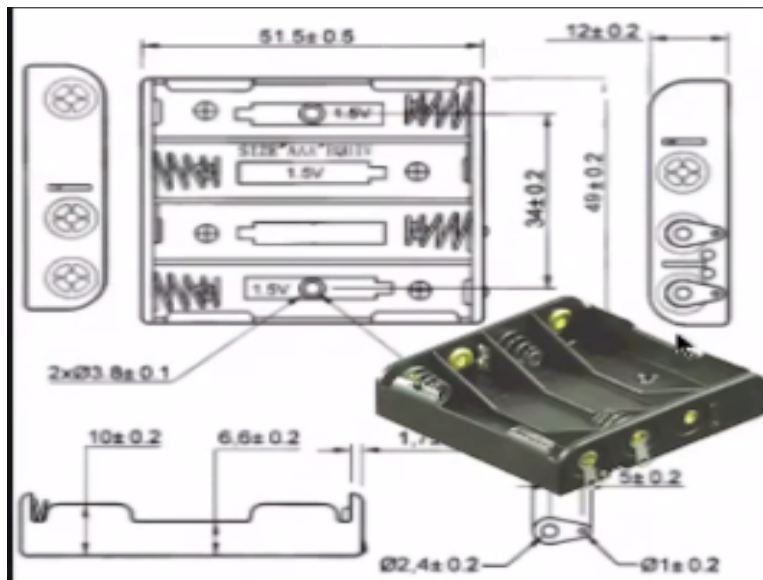
You see here, does it look a little like what I have shown you here. Please have a look at this, yeah. You have seen this. This is exactly the same item which has been shown there. So one of the thing you will notice about it is that there was an attempt to bring all the what you call the; for us to put it onto a printed circuit board or inside a part separately.

Now if you go back to this drawing, you see this drawing; there is an attempt here; can you see here? There is a small slot here and then something here and the most important is two lugs have been brought here. This is where probably 3D printing makes advantage over simple conventional, old way of making things, because incorporating all these details into another part and modifying it slightly is relatively easily.

Sometimes once in your life time probably you need to just what you call access all these dimensions, make all these detailing, leave it there and whenever you want you are able to access them as you like.
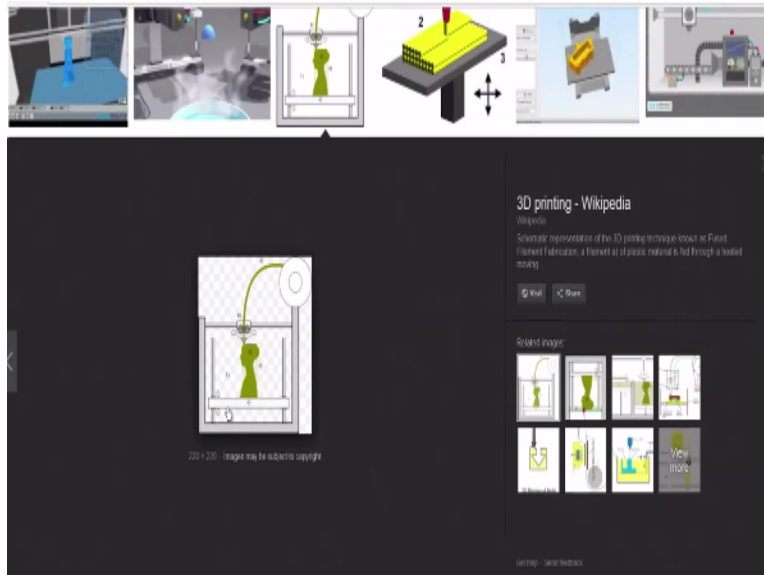
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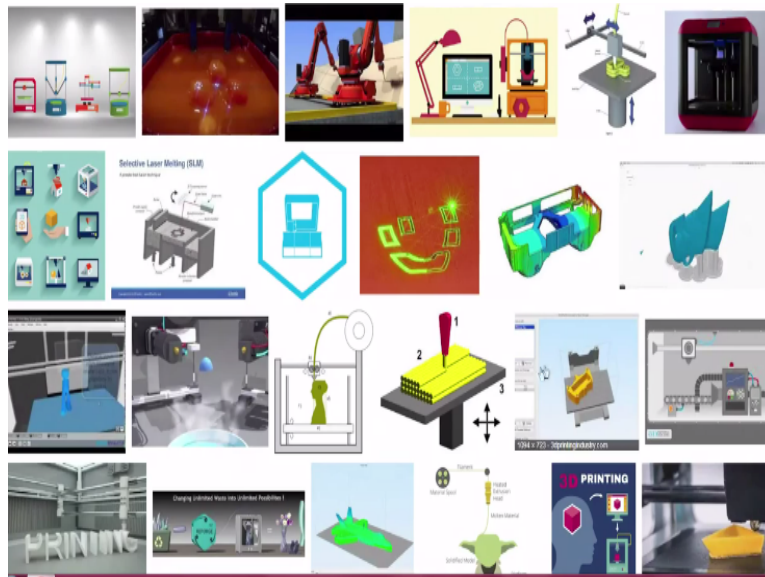
If you go to the usual what you call the place where look for everything. One of the first thing you will notice is often there are many, many, many, many more non-technical something which attracts everybody's attention type of object that are shown here. I think you know what it is. And then you know, lot of it you know, is probably fantasy objects. You see here how a human face can be printed or how a;

I do not know which character it is or anything which was earlier know not possible easily. However, in reality we end up with having to build real life technical products. So typically, I will probably start with one of these technical things. See, here it is looks like maybe something which is taken from comic and same thing here and then you have a totes then you have anything. As I just keep going, a lot of seems to be only about how to create interesting objects.

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You see here, it is about how to create; I do not know. Some figure and so on which was not so easy; just about 20 or 30 years back. Now, if you please look back at; kindly look it;

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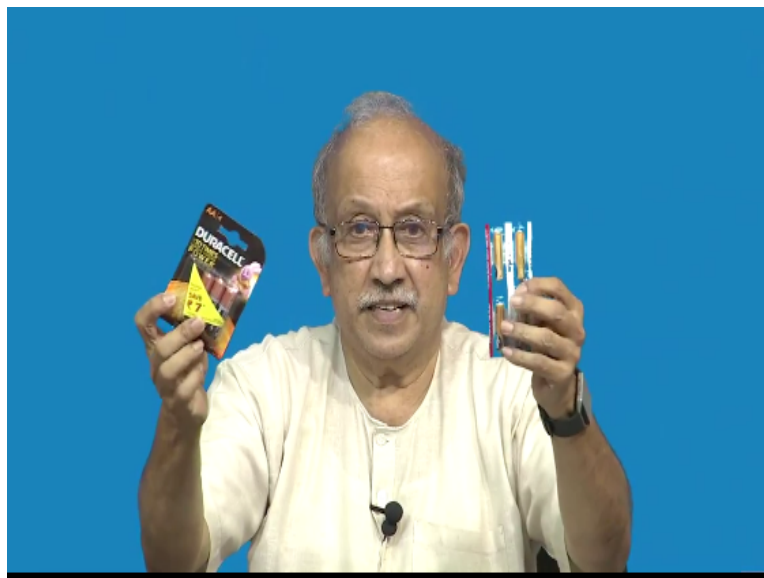
Two cells I have here. The starting point of everything, luckily for us saying look out for all the parts you want. I think all of you know what it is know. I am not promoting saying you must buy only the Duracell Bunny and how it keeps going and so on; it is nothing to be; yeah Duracell Bunny is there. All I just wanted to say is this one represents one type of a technology were;

If you see the top; it is slightly different meaning there is a depression here; there is something here at the back which is a lot related to the technology. And then if you see one of these

commercial (()) (04:10), zinc chloride cells. Zinc chloride cells have the way the top is made, the top projects a little and the way the back is made is slightly different. You have seen this? So it depends a lot on the technology.

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And then here ingenuity in when you were to make some device which is fitting like this; your ingenuity on how well you can make this object. But what I am going to say is a little generic about in general how to use a Computer Aided Drafting. In this case of a Computer Aided drafting is; if you have the source everything else follows naturally. Battery hole drive shown you.

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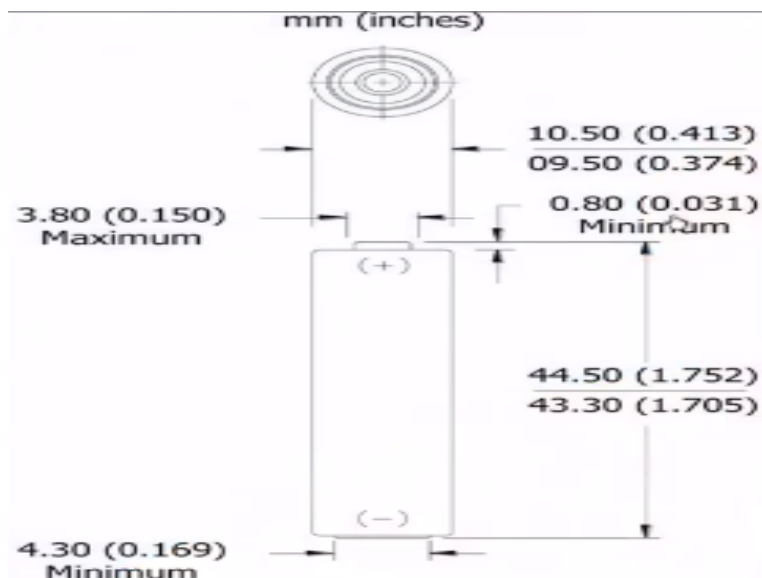
Then, please have a look at this; what you call a picture which is taken from Energizer AAA. You are seeing this here. Everything what you want is defined in ready, so that it is easy for us to start from here and then try to make what are you wanted to make. You have seen here; there is something called Minimum that is given here saying; the height of this positive terminal will be a minimum of 0.80 millimetres.

Similarly, the contact available at the back is 4.3 millimetres and the maximum diameter and so on is given here.

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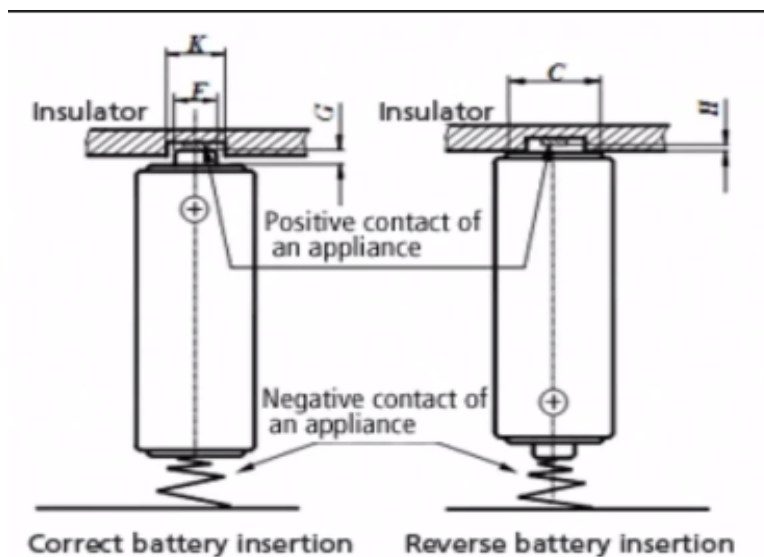
Now you may be wondering why this is required. Why this is required is; when you need this type of a detailing. You have seen this? In case, you need to make certain guarantee that your product does not get destroyed by wrong insertion; it is the point to start unless you have the original information.

So if you look back at a drawing; if you see we have an insulator here; you have seen this; we have an insulator; they have made a small hole; the dimension of E and F and then similarly the dimension here; and then how much of gap you have gave, and make sure that Reverse battery insertion does not damage the product. So I just wanted to tell you that all information that is regarding all the components need to be collected in advance.
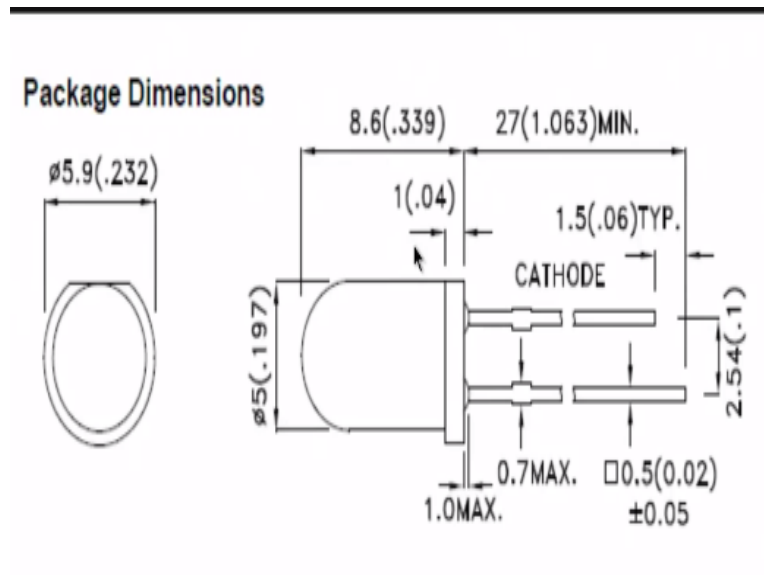
Now I will go for the, what you call next one here and look for something else which; so very routine common thing, is it not?

We see this; so called 5 millimetre LED; I mean whatever you can call it. And then now the right side bottom if you see several things regarding; how to use this items in our project are given here. So typically if you go to any of those things here;

If you see this picture; one of the first things you will notice is; all the dimensions you need are already given here. Something else is also given here saying; what about the orientation; how to keep it place in one place. The idea why I am showing you this is which is generic to most of the

CADD this thing is as; your designs progress you need to gather all these information; make into a library and keep it somewhere.

The thing being these are all contracted dimensions which are given by the manufacturer. And usually they share it across everything; most of them are interchangeable. Now let us say you are to make a torch; if you remember last time I showed that small torch. So how do I go about that torch? We now need to; what you call look for; I will see whether I still have it; lucky, we do not have it.

If I have to know to start with making a small thing saying I need a small circular I mean what you call device which I need to print it. This is where know; it is not purely technical as you would find let us say a four bar linkage or a compass or things like this; I thing you have seen that know. It is a watch for dump fellow who cannot even count there steps. So this is of course I think you know what it is; it is one of the you know, Fitbit challenge watches; so it will keep track of it. I need to wear it because of some other thing.

So if you look at my computer thing; I will try to start there and show you, how best. Now get back to this know; what I started last time. I will flush everything start with a new object.

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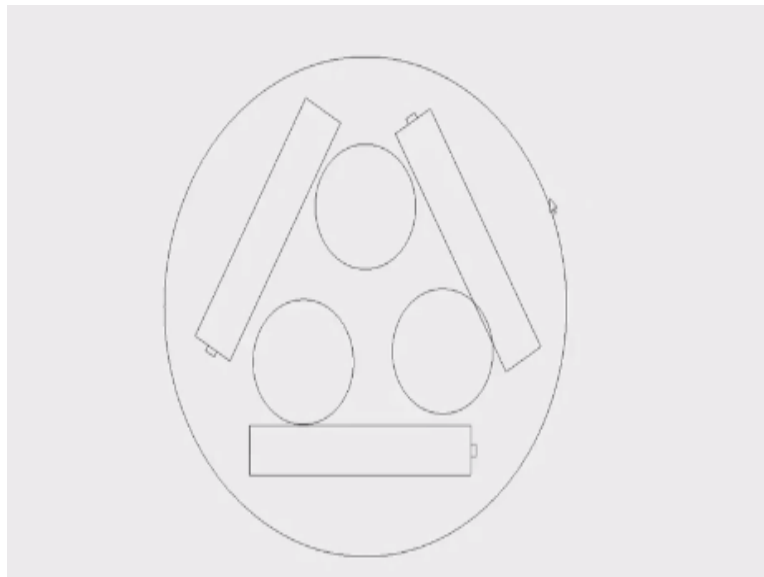
I hope you remember this, this where we have started earlier. I want to make a small torch which typically lights up a white LED. If you go ahead white LED specification one of the thing it says is most vital it is required at least 3.7 volts to be run in the capacity; I mean in the forward current; to drive forward current, you require 3.7. And typically rechargeable or anything probably requires around 1.2 to 1.3 volts it can safely give.

So I need to make a torch which uses 3 cells. So what I do here is as before which I have explained it earlier; I start with a solid; oh or even anything given better I will just start with a simple curve and start a layout which will make things easier for me. See if I draw here now typically; from the catalogue I have noticed the length of that cell is 45mm and then the width is probably around 8mm, okay.

Slowly this is; this is my starting point. I just check using this; my command here, wrong line that I have taken, delete. Once again I will try to try this line. This is what I wanted to try. This a 40mm line which I wanted. I will delete it at this moment; I have no interest for the dimensions.

See, this is the starting point of one of my cells. So here I will just finish this a little faster. I have put a; it looks a little like a torch cell. Now coming back to the old what I called concept saying, I want to make a torch with 3 cells because typically a vital need, so I have several options here, one of them I will group the whole lot into one item and then see what I can do with it; easier thing will be – looks it easy I it is not easy.

But it looks to me a little dull saying some might do not know. I wanted to look, make it look a little interesting I will just see if I can make instead something else which has small elements of novelty. See what I will do is I will try to now arrange these things in a different way. Something slowly, it is possible for me to make triangular something which is easy for me and advantage of it is.

Right now what I do instead is I try to start with a circle. See whether these three objects, I will push them into this circle; looks neat. So depending on the way I can manage things I will be able to probably make something which is little unique which is very different from what already

access. And then why did I choose this; I said it is a matter of convenience and so on. So I had randomly chosen these things here.

Now you will notice that this particular what you call thing, may not be very convenient for me because you see that it is, there is no way of putting a contact here and putting a contact there, so is there something else I can do? Yes, what I do is I will move this outer little like this and see if I can array the same triangular whether it will make sense. See I have got a little more gap compare to what I have done earlier, little more gap is there.

Now it is possible for me to now build on this and say what best I can do. And for the LED is if you remember that was a 5mm LED. So by the same what I call using a similar logic, I just see whether I can provide three, say I have got the place for three what does say LEDs here. Now I start building up on the small object or type. This is only a flat 2D structure. Now as I keep building I will try to, you know try to see as much as I can to try to keep on.

And then try to switch on more productivity aids which will help me in try to provide some what you call other tools. So one of them is I have a (()) (19:15) tool here. Sorry, I am not able to configure it on the fly. The thing being this is the very, very basic layout. Now again going back to where I had started earlier; instead of just working in 2D I say how well I can work on this 3D point of it, okay. If you see the; I will just get rid of all these things.
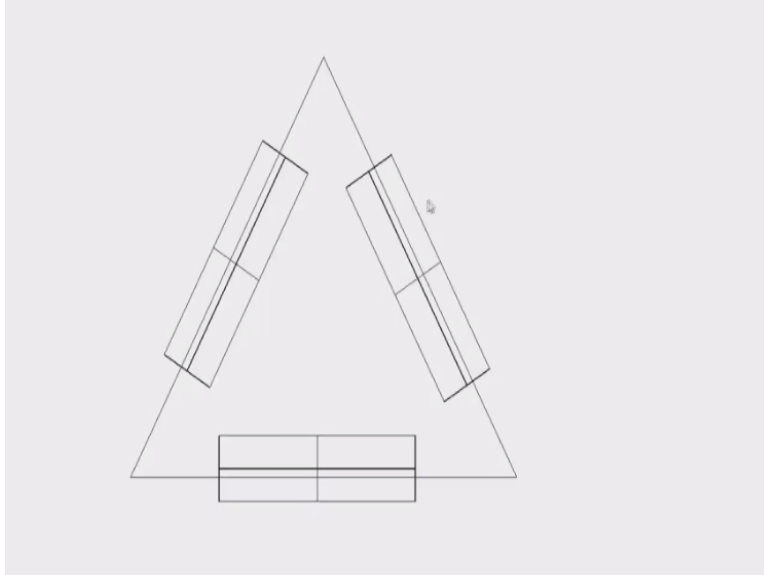
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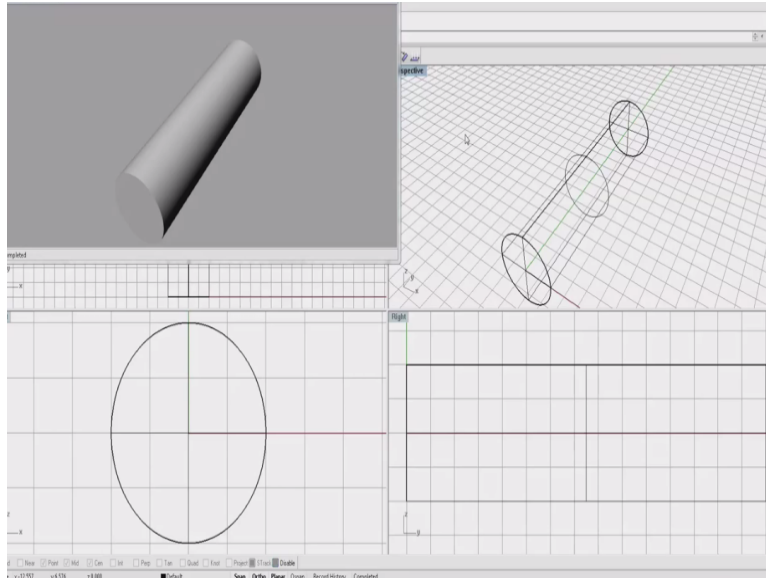
Try to see whether I can create a 3D what you call cell. So this typical is a cylindrical object. You are seeing here? I have a cylindrical object, which can form the; what you call; whatever I am trying to look, and to make it simple so that regeneration is easy.

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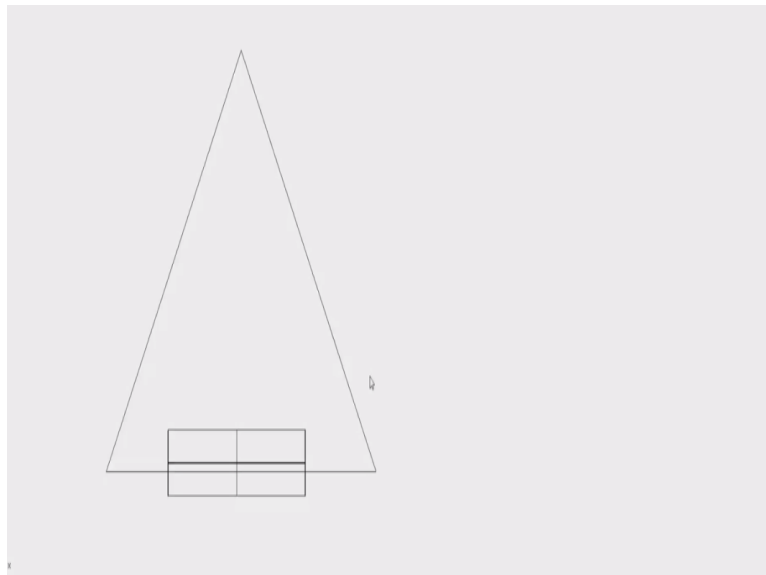
I will try my best not to what do you call make a very complicated object. And now I see whether I can; however as before I try to make a polygon here for the concept of a; I am again getting trying to get back to the layout of having how to arrange all these three in a what you call in a triangular fashion. So I am slightly better off from the point where I have started; so now I will try to Array them.

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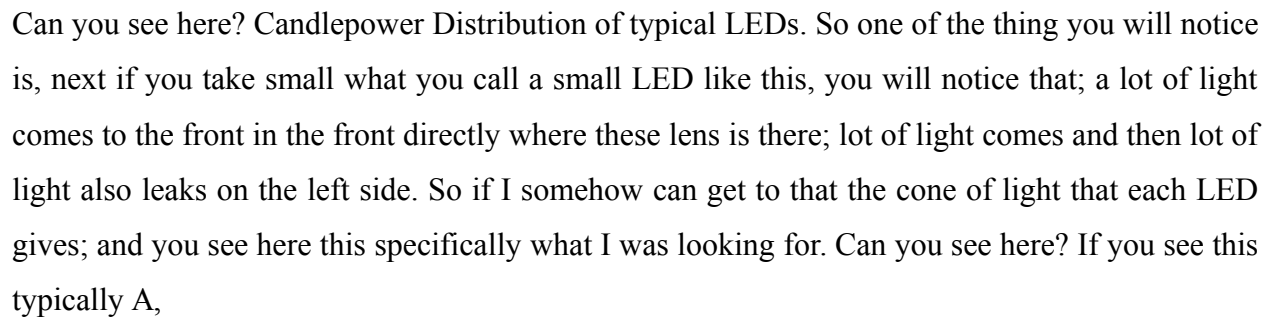Say I have got all these thing mounted quickly on a 3D array.

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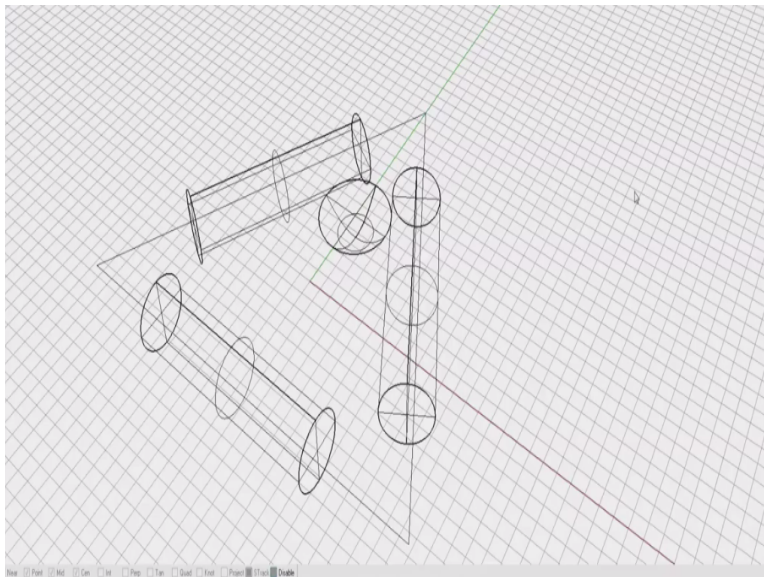
So if I now going and see the side view I will notice that this seem to be quite, you know what you call happily sitting in a triangular fashion. It is easy for me, so write now because of the; for the purposes of; how to tell; to make the thing easy and simple I have not made a detail 100%. Now I will see what else I can add to the thing about the say very quick start thing started here, can you see? That is actually a small reflector. So it is possible for me to put a lamp inside that.

The thing is most of the LED is if you see even the once they pointing up; if you go back to the, the characteristics of it; so; sorry can you can show me this; what you call this other monitor?
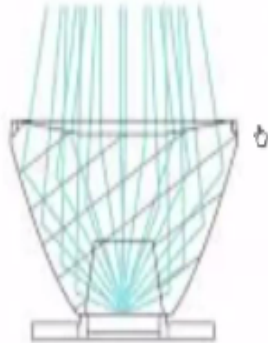
You can show me the other monitor; I will go back here and ask for; if I go and examine these things we see that there is a beautiful this thing and very, very important thing is the spread okay, where all these things can be huge amount of data is available and particularly what I am looking for is the focusing and this type of a data here.

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Can you see here? Candlepower Distribution of typical LEDs. So one of the thing you will notice is, next if you take small what you call a small LED like this, you will notice that; a lot of light comes to the front in the front directly where these lens is there; lot of light comes and then lot of light also leaks on the left side. So if I somehow can get to that the cone of light that each LED gives; and you see here this specifically what I was looking for. Can you see here? If you see this typically A,
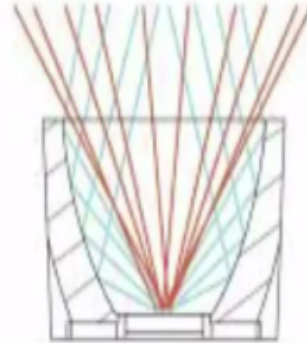
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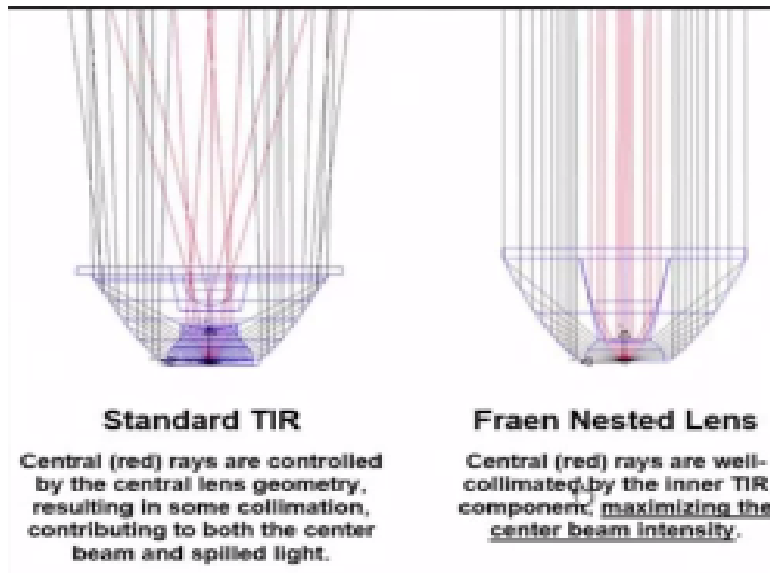
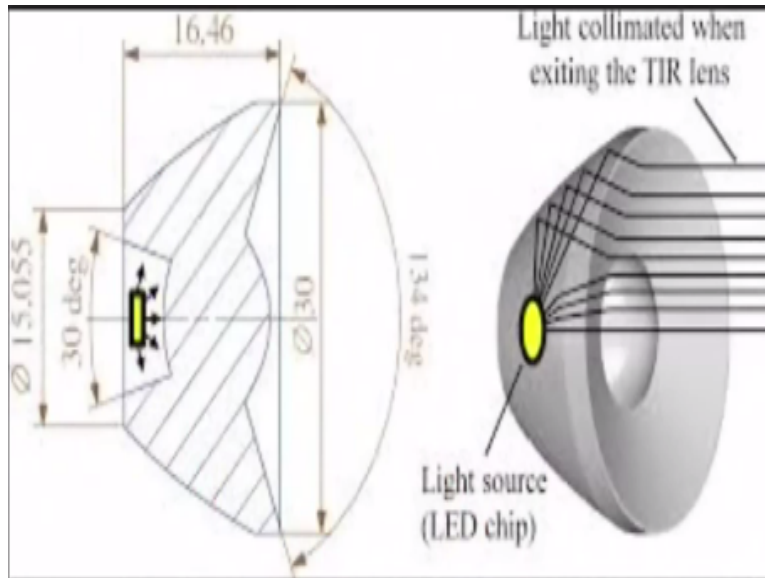**Total internal reflection (TIR) lens**   **Legacy reflector**

See we have; I have a beautiful picture here. So the moment you have understanding Optical Performance of LED is; you have a lot of data about how to what you call; play around with this the reflector that we have and so on. Even in the case of the old standard 5mm LED the; if you look at the; what you call the way the lights spread it changes a lot.

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Standard TIR

Central (red) rays are controlled by the central lens geometry, resulting in some collimation, contributing to both the center beam and spilled light.

Fraen Nested Lens

Central (red) rays are well-collimated by the inner TIR component, maximizing the center beam intensity.

So Standard thing, Fraen Nested lenses and so on and stone know.

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We have a non-stop array of; how this LED can known; See what I am looking for I have come here. In case you have a chip LED you have now end up with having to design things which are a little like this. So we have the; we have the lens here; that lens is also ensure that the light can get collimated.