

# Car proportions



When we start drawing cars, the first time we do it is because we like them. Maybe we have been looking at a car that we like for hours, and then we think “I want to do something like this”. Even when we do not want, the first draw of our own car has something of that car. Most of the times, it has the gestures or graphics over which our attention falls. But there are a lot of hidden things that escape from our sight.

If we ask people the reason because they like that or that other car, they will not give a convincing answer. They like it, but many times they do not know why. And a big number of cars are still sold around the world because of their look.

One of the most important things is the harmonious proportions of the architecture. As Leonardo da Vinci did with the human body, and his Vitruvian Man, a great number of studios men have done the same thing with the right proportions of the vehicles. Talking about cars, the harmony of lines and volumes must pass unnoticed. Only when one of the rules of the proportions is broken we can view there is something wrong. Obviously the idea of the perfect proportions changes with the years, as happens for instance with the human beauty, because it has a social and cultural face which evolves. It is important too to clarify that in design (as in almost everything) there is nothing absolute. You can find on the streets some cars that do not totally match with the rules we are going to expose. But, of course, if you break a rule, you must know you are doing it. You can decide not to follow some of them, so you know you must work to equilibrate the result. Sometimes the technical features of the vehicle condition the result. Is not the same, for instance, to have the engine in the front that in the rear; to have transverse or longitudinal engine... Designers must, in many cases, to work for disguising ugly but technically needed elements or their disposition.

Since you can find so many types of different bodies, we could make a different analysis for each one of them, and perhaps we will do it in a near future. But, for now, we will take the most representative of them: the four doors saloon.

We can start from the analysis of the today's considered harmonious proportions to know and understand its future changes. Let's take a look over two of the best-proportioned cars of the market:



Both of them, Mercedes E-Class and BMW 5 Series have the lines of a classic three volumes saloon. In other words, they are designed avoiding the radical aesthetic innovations and the showiness. So, if we do not see anything strange in their lines or volumes, that can be useful to make a study of its proportions.

**1st rule:** When we start a new project or car drawing, the first reference point we take are the wheels. Once the wheels are positioned, we can construct line by line the rest of the car. Often you will see drawings of professional designers which have really big wheels and they look great. But we must know that the distance between the wheels in the same side of a car is about three times the diameter of one of them. In our example is around three and a half times:



Is true that big wheels give a better look to any car, but the wheelbase as well as the wheel size, are very important for the car dynamics and for the interior space. An evidence of that is the size of our car's wheels: even if we can use up to 21" or 22" rims, the street cars rarely cross the barrier of 19" (and only if it is a really big car or a super sport coupe!!). The resource used by designers to make the street vehicles look like show cars, is to accentuate the wheel arches.

You can draw a car with bigger wheels than real ones, and so it will have the necessary drama to make it look faster and more powerful; however you must not place them too nearly, because it will look like a toy and later making that car in a 3D model you will be forced to use real size for the wheels. In that case you will lose the drama of the car that you just imagined. The wheelbase must have an adequate length too. Think that the wheelbase length is one of the parameters which have more influence over the chassis rigidity. The longer wheelbase, the more weight needed to reinforce the structure. (And the more money in materials and the more power needed to move the car).

**2nd rule:** The position and the orientation of the A pillar are important. If we draw an extend from the base of the A pillar it will end near the centre of the front wheel:



This rule can be differently applied for the front than for the rear wheel drive cars for technical reasons.

The FWD cars, usually, have transversally placed engines (unless they are ready to mount a 4WD system, as for instance Audi). The front wheels must be placed behind the engine, because of the transmission placed itself behind the engine. You can see this detail in new cars as the Peugeot 407, which has the wheels so close to the front door than the opening line is pulled back. Their designers have done a very good work disguising that detail, but, if you take a look, you will see that is a big part of the car

hanging beyond the front wheel. The RWD cars usually have their engines placed longitudinally and the wheels are placed near the corners.

**3rd rule:** If we draw a vertical line from the lower point of the C pillar, this line has to go straight to the center of the rear wheel. As we have seen before, we may see some differences between FWD y RWD cars:



The car in the image is RWD. As explained in the previous rule, that kind of cars has the front wheels closer to the corners than the FWD. In other words, the entire cockpit is pulled back to make place for the longitudinally placed engine. So, the C pillar, which marks the rear end of the cockpit, begins over the axis of the rear wheels. In the FWD the cockpit is moved a little bit forward, in relation with the RWD car, so the C pillar usually is centred in its base over the rear wheel axle.

**4th rule:** If we draw a line connecting the centres of both wheels of a side, the bottom opening line of the doors should match with it:



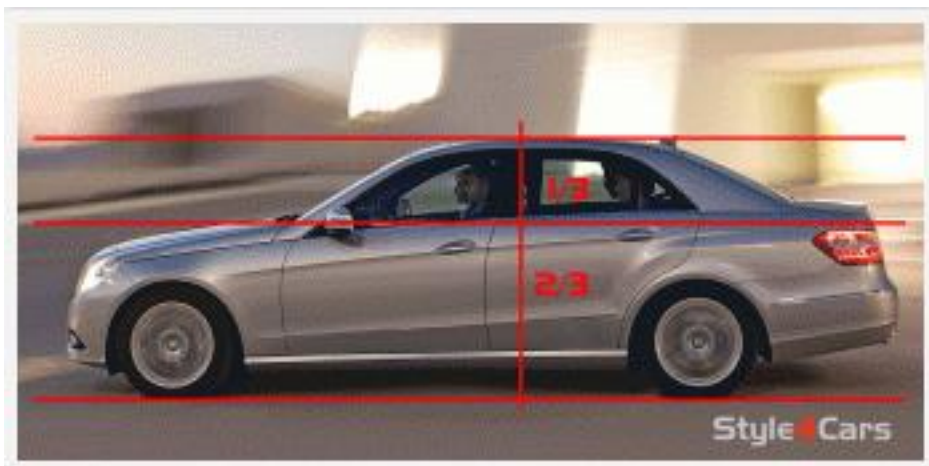
No much more to say about it.

**5th rule:** Usually there is a line defining the height position of the front lamps and bumper. That line starts from the top of the front wheel:



That line can be now found in a lower position than a few years ago. You can see some concept cars which have the front lights even lower than street cars (for instance, the Lexus LF-C Concept). That is not only because the show car wheels are bigger, but because the designers explore the more aggressive look of the car with the front lamps in different positions. You can also find extreme cases like the Rolls-Royce Phantom VII, that had their lights so high that it was necessary to add a couple more (the round ones) in a lower position leaving the originals in order to keep its aesthetic equilibrium.

**6th rule:** One of the most important aspect of the car is given by the proportions between the glass and the body. That most used is up to 1/3 of the total car's height for the glass:



Keeping in mind this proportion, let's take a look at what happen if we alter the glass surface. Less than 1/3 means a sportier and more aggressive looking. But we have to know that the access in the car is harder, and once inside, the passengers can experiment claustrophobic sensation, especially those from the rear seat. Think, for instance, at the differences between our example car, the Mercedes E Class, and the CLS: the latter one

is so more sporty because of these proportions and the potential buyers for one or the other are so different that there are two shapes for the same car.

If we change the proportions by increasing the glass surface, we will obtain more cab-looking cars. The more surface you give to glasses, the more increases the practical aspect of the car. If you want to do so, think always about the way on which the window opens, because if the glass is bigger than the space available in the door you must know that they can not be fully opened.

**7th rule:** At last, the total height of the body should be about two and 1/4 – two and 1/2 times the height of a single wheel:



It is important to remark that all those rules are so universally accepted that they have become themselves a standard in the automotive industry; new cars must agree with them to fit the platform on which they are going to be assembled.