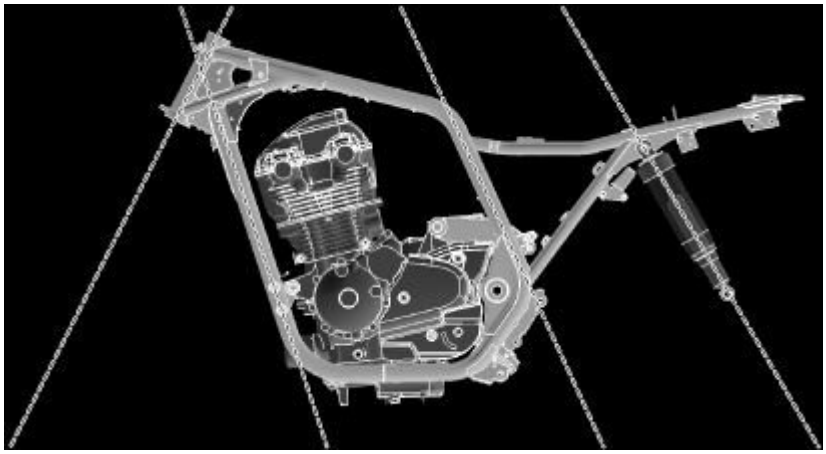
Passion shows through the frame's weld beads

Sekiya:
The CB1100 has an orthodox steel pipe double cradle frame, but was there anything special you did to attain the right rigidity for the ride 'feel' or to create a desired appearance?

Imada:
We focused on the head pipe configuration and frame size reduction. We tried to reduce as much as possible the size of the frame, which was based on the CB1300SF, and attain a flexible and 'calm' rigidity. We adjusted the rigidity of the head pipe area by replacing pipes with pressed components. The head pipe is usually configured predominantly with pipes, but with too much rigidity, the machine would lean over too fast, and we wouldn't get the relaxed feel we wanted.
We had manufacturing problems as well. The end of the head pipe connecting to the main and down tubes was difficult to weld, because of the complexity of the neighboring components. It was also clearly visible in front of the fuel tank, when the rider turned the

handlebar, so we needed to make sure the weld beads were uniformly thick to look the way we wanted it to, and stable and contiguous, to avoid warping and stress concentration due to heat.



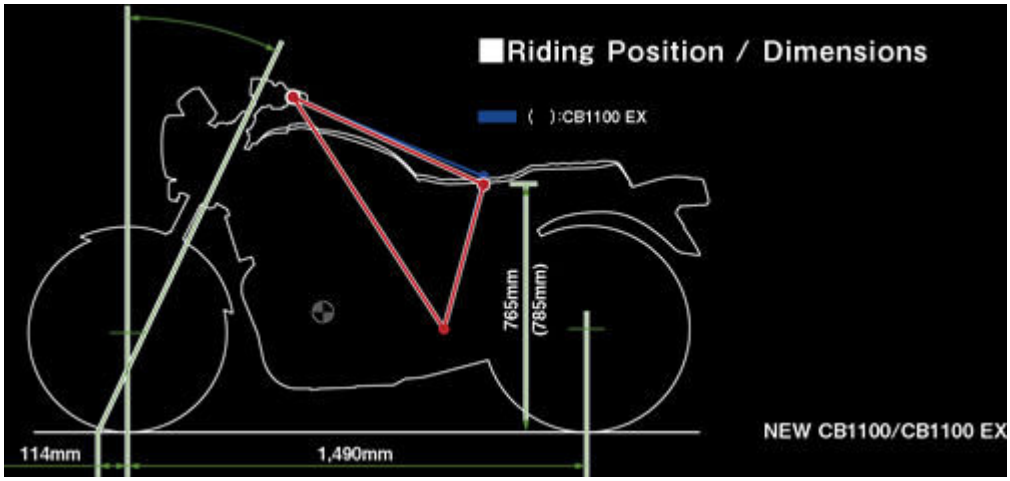
Sekiya:
That means it was in a position accessible by human hand, but not by the welding robot's arm which could only weld certain amounts in certain positions.
Imada:
That's right. A person could weld it by making delicate adjustments, but it would be difficult for a robot to do the same. But it had to be done, to realize the 'ride' we aimed for. We had to find a way to construct what we were told was 'impossible,' as close as possible to our specifications, because we can't expect the customer to ride a bike which we cut corners with.
I made a deal with the factory, that if they did everything they could, we would do the same, to ensure the bike is built with the highest performance and quality, without compromises. We developed processes to realize the bike's performance we wanted, such as redesigning neighboring components to allow access by the welding torch, or enlarging or reshaping the reinforcement plates, or finding a better way to cover components with the reinforcement plates. The factory also helped by configuring the best jigs, finding the best welding methods and sequences, and maximizing component management efficiency.
The seat rail was also difficult, as it is comprised of many components such as the helmet holder, and has a complex structure. A lot of intricate weld spots are near each other, so we had to consider the effects of heat, such as stress dispersion. After a lot of to-and-fro with the factory, such as modifying the shape to avoid the effects, or leaving a sufficient gap, we managed within the finest of limits to build the component as we wanted.
The heat effects of welding can't be forecast completely, so to make sure problems don't arise the factory has more work to do, such as planning what parts will be used for the sub-components, reworking the jig shapes, and fine-tuning the robot's program. I think it was a complex task to tune the production line to realize our specifications.
As a result, we were able to realize most of the important aspects we had marked out in the plans. There were, of course, some difficulties. Each component was within the right tolerances, but when assembled, even if the angle of the step holder was off by a fraction, it would affect how the muffler was attached.
Sekiya:
Korogi (Handling and Stability Researcher) told me there were problems with muffler assembly precision.

Imada:
That was precisely the case. The rubber mounts would become rigid if the rubber bushing was compressed because of discrepancies in assembly measurements. that would potentially destroy the 'feel' we wanted.

Ride ‘feel’ perfected on delicate balance

Sekiya:
I now understand that the importance in pursuing precision in tolerances is not limited to super sports and racing bikes.

Imada:
The CB1100 looks like a bike that doesn't care much about precision, but in reality, it's built upon layer after layer of high-precision components and techniques.
In fact, there were many instances we were told some aspects were 'impossible to build' within normal manufacturing tolerances, and we had difficulties solving all those problems. A well-built bike is often founded, in part at least, on the fine balancing of a few key components.



Sekiya:
So the movement 'feel' between minimum and maximum is founded on the overcoming of these sorts of problems?

Imada:
The entire process was like that. The shape and thickness of the engine and other components, and managing the torque for the connecting bolts, all affect the ride.
If the engine mount connection is too tight, the ride feels rigid. The same can be said for the head pipe area, which if tightened too much, kills the slight lag that defines the 'relaxed ride.'
When opening the throttle, or leaning into a corner, there has to be a slight lag, which is dissipated throughout the chassis in a well-mannered way, to realize a 'smooth' and 'pleasant' ride. This, I think, is what the CB1100 is all about.

Sekiya:
This may be the new trend in manufacturing motorcycles. From an era of pursuing specs and performance, and the efficiency in manufacturing these machines, to the precision and efficiency in manufacturing bikes that are fun, or have personality. It may be the 21st century way of pursuing technology.

Being particular down to the wheel hub

Sekiya:
What aspects of the suspension and wheels did the development team focus on realize the 'ride' you wanted?
Fukunaga:
We wanted the bike to appear simple, and void of oddities. Our target is the rider in their 40's to 50's, so the feel and stability were our main focus.

Korogi:
The image we wanted is a relaxed ride, and even here, neutrality was important.

Teranishi:
I was at odds with Korogi, who wanted the perfect rigidity balance, and remember many heated arguments we had. For example, each curve radius in the hub's shape was important. We used CAE analysis to optimize the hub's shape and made modifications from there, and we were surprised that a slight change in curve radius had a definite effect on the 'ride.'
Sekiya:
Even small deflections in the various components would add up, and the handling would be affected.
Korogi:
The bike's 'ride' is undoubtedly affected by the shape of the hub, so I asked Teranishi to try it out for herself, in the hope

of her understanding the difference.

Teranishi:
I was convinced. Even as the bike's designer, I could definitely tell the difference in 'ride' by changing the hub shape. That's why we repeated test after test to strike the balance between hub shape and performance. The finished hub's shape and curve radius is the result of our repeated testing.

Sekiya:
Was the process complicated by it being a component that not only affects the 'feel' of the bike, but machining productivity and costs?

Teranishi:
Yes. We took a lot of care in determining the curve radius to have the right rigidity balance, and not cause manufacturing headaches. The EX's hub is hollow, to reduce weight. This is usually difficult, or even impossible to produce, considering manufacturing and processing methods and costs. We had endless discussions with the factory.

Carefully selected wire spokes

Teranishi:
The shape of the rims is the result of thorough discussions and understanding with the manufacturer. The excitement, when each side understood the other's ideas or expectations, was amazing!

Sekiya:
It seems to me that developing the CB1100 was similar to how racing bikes were made. The basic plans are all on paper, but the final bike is the result of looking at, and fine-tuning, the actual components at manufacturing, reminding me of Honda's 'three realities principle.'

Fukunaga:
You may be right. In the days of hand-drawn plans, the designer would write in comments such as 'to be discussed' to be able to convey the finer points to the manufacturing team. What we tried to do was convey 'passion' that cannot be expressed on paper.
I think a successful engineer is one who can convey his intentions, face-to-face. Manufacturing understands, and the final product, say, is buffed, even though he forgot to put it in the plans. That sort of thing.

Korogi:
I learned how important conversations were while developing the CB1100. The countless battles I had with Teranishi were fun.

Teranishi:
The CB1100EX's front rims ended up at about the same weight as cast wheels. We aimed to be able to switch out the cast wheels without disturbing the bike's look, and also give it character. With a bike as big as the CB1100, it isn't easy to realize the rigidity and strength with wire spokes.

Fukunaga:
We initially used the VFR1200X as a base, but it didn't look right. The four-muffler CB400 fit our image perfectly, so we started there and faced huge problems in getting the strength right. We even tried 40 spokes.

Teranishi:
Yes, we did. We tried to reproduce the 40-spoke CB400 look, but had trouble attaining enough rigidity and strength. Angling the spokes, like the VFR1200X, could have made 40-spokes possible, but the CB1100 would then look like an off-road model. We finalized the number and size of the spokes by pursuing a classic look, one that the rider would expect for an air-cooled CB bike. We ended up with 48 spokes.

Sekiya:
A lot of hard work has gone into the details that, unless you go out of your way to appreciate, you'd probably miss. It's true that rigidity in the wheel area affects handling, but I'm surprised that so much thought has gone into the 'feel' more than the bike's performance. That's an area which I'd like to unravel more stories for, and understand the logic involved.