

## INTERVIEW WITH RAYMOND PAN

# Building the 12-Day Hospital in China

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*Raymond Pan is the Design Principal and an award-winning architect at the Los Angeles-based HMC Architects, one of America's leading architectural design firms.*

*Mr. Pan designed the Shunde Hospital of Southern Medical University in China, an enormous undertaking, which opened in 2018. It is a 3 million square foot, 2,000-bed hospital. By number of beds, the Shunde Hospital, located in Shunde, near Guangzhou, is the eighth-largest hospital in the world.*

March 13, 2020—As the novel coronavirus advanced in the city of Wuhan, on January 23, the Chinese and the Wuhan governments began building the Huoshenshan hospital, containing an infection isolation capacity in Wuhan, Hubei province's largest city, which was then the epicenter of the COVID-19 outbreak. The government, and the construction companies they directed, conducted an all-out mobilization. They deployed 4,000 workers—which swelled to 7,000—led by 700 project managers, and dozens of engineers, who together employed over 1,000 large-scale pieces of equipment (excavators, cranes, etc.) and transport vehicles to level a 50,000 square meter site, excavating 150,000 cubic meters of earth.

They laid essential infrastructure, on top of that put down a foundation, and then, built a 25,000 square meter, two-storey hospital, holding 1,000 beds. In an incredible accomplishment, on February 5, twelve days after construction started, the hospital opened for use.

Mr. Pan has knowledge of the method by which the Huoshenshan hospital was built.

On March 13, *EIR's* Richard Freeman interviewed Mr. Pan.

**EIR:** The planning for the building of the Huoshenshan hospital was started a few days before, and then on January 23, construction of the hospital began. Who built the prefabricated units, if you know, that were ready for assembly when they began, after the clearing of the ground and the setting of the sites, and things like that?

**Pan:** From what I know, it is a general contractor, one builder. But the prefabricated units, the units you see outside, it's just one of the components of the hospital, because to build this hospital on the ground, it



*Site preparation begins for Huoshenshan Hospital.*

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also involves the utilities, the roofing company, the mechanical system companies, and those things. But the prefabricated units, the steel frame kind of housing that you saw, was manufactured by a company. I don't know the name of the company, but it had to be fabricated by a single company, otherwise it wouldn't work as the parts would not come together very precisely. With the required assembly precision, you don't want them manufactured by different entities.

**EIR:** How was the planning for this done? I know that there was a hospital built in Beijing to treat SARS

in 2003. But is there some conception of what was needed for a 12-day hospital; is this a standby capability that China has developed? How did the Chinese government put together what is an incredible achievement in 12 days?

**Pan:** Obviously, as you know, they had experience with the smaller hospital they built for SARS in 2003. That was the prototype that they developed for this hospital, but on a much smaller scale. So, looking at how the site works, and I have seen the published building blueprint, it was custom fit for the site. That means that the hospital was conceptualized as something that could be scaled and shaped in different ways, based on the modules needed. For example, it can get re-configured in another site, based on how many rooms they need,



*Huoshenshan Hospital about midway into its construction.*

such as isolation rooms—you can also have wards as needed, which are larger rooms with multiple beds for people with less coronavirus acuity. In the more severe acuity cases, you would isolate them in a single room by themselves.

**EIR:** I would imagine there is a scaling methodology.

**Pan:** There is one commonality that is crucial to Chinese infection control hospitals. You will see there is always a central spine, a central corridor, what they call a clean corridor and they keep it uncontaminated. And that corridor can extend longitudinally or the other way, but the thing just replicates, based on the desired shape. Then that corridor connects to individual treatment wings on its sides, so this corridor can extend indefi-

nately and connect as many wings and rooms as it could.

**EIR:** So, this clean corridor could be expanded longitudinally or latitudinally and could go in either direction for as long as needed?

**Pan:** Yeah, yeah. The blueprint shows that it is a pretty traditional Chinese infection control building type. In terms of how the plans are laid out, it is not groundbreaking. The innovation is really in the technology to “modulate” it. To do it, offsite pre-fabricated modules are produced, and you bring them on-site assembled, at a speed that you saw [in Wuhan], we all see today. But this is based on the traditional Chinese model for infection control.

**EIR:** Would this be the case in some of the hospitals that are built elsewhere in China? I mean, they would not look like the Huoshenshan, because it is a two-story and some of the hospitals are many stories. But in terms of the infection control plan, would it be that which you would see in a Chinese hospital or in the infection ward section of the hospital?

**Pan:** Yes. I designed one large hospital in Shunde, the Shunde Hospital of Southern Medical University in China that has an infection control building. In fact, that replaces the original hospital there, the old hospital, where SARS got started.

**EIR:** SARS started in Shunde?

**Pan:** Yes. The first case of SARS was discovered in Shunde in the early 2000s. Patients were housed in the old hospital, which afterwards was demolished and replaced by one that I designed.

An added note, if I may: Given this was the epicenter of the SARS outbreak, we designed the whole hospital with infection control as an overarching strategy. Each of the hospital’s major building components is designed to be able to connect physically and decouple for quarantine instantaneously in case of outbreak within. It’s an innovative design approach for the region that has since been copied in other Chinese hospitals.

**EIR:** That's significant.

**Pan:** Yes, so there, as I worked on this Chinese hospital, the one thing I learned is that the way the Chinese address infection control is different than elsewhere. And what that means is they always build one stand-alone infection control building in the hospital.

**EIR:** Is it a separate building or floor?

**Pan:** It is a separate building. It is very different from our concept of infection control in the West. It is a completely different concept. It is a stand-alone infection control building and the layout in the infection control building of the prefabricated [Huoshenshan] hospital that was built in ten days is based on that tradition.

**EIR:** I imagine from what you are saying that the reason it is a separate stand-alone building is to keep it separate from all other portions of the hospital.

**Pan:** Yes. That is the way the Chinese do it, which is based on how they treat infected people and how they perceive pandemics can be stopped. It really is pure total isolation. There is no question of failure of mechanical systems. Don't touch anything. Just leave it alone; leave it at a distance.

The hospital that I designed in Shunde has six buildings connected by walkways and an arbo-retum. If there is an alarming number of infection cases, the infection control building is shut off from the rest of the hospital.

### Cooperation, Centralization, and Capacity to Intervene

**EIR:** In Wuhan and Hubei province, it is very hard to have 60 million people under quarantine. And yet what struck me is that the population worked with this concept. No one likes to be quarantined, but they worked with the idea, realizing that it was a very important step to take, to save lives.

**Pan:** Yes, under extreme conditions they understood that they had to take extreme measures, probably

the most extreme measure, for controlling an epidemic in shutting down a whole city, in locking down the whole province of 60 million. They took extreme measures for sure.

**EIR:** The *Construction Times* reported that there were about 700 project managers and they had about 4,000 to 7,000 workers for Huoshenshan. This took a high degree of centralization; how did they select the project managers and the workers?

**Pan:** I don't know exactly where these people are from. But I would assume the benefit of China is that a lot of their construction companies are central government-owned. They have the capacity to mobilize unlike anything we've seen elsewhere. For example, the hos-



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*Workers labored around the clock to construct Huoshenshan Hospital in less than two weeks.*

pital that I designed and was built in Shunde, during a time when there was no emergency to get it built, at one point there were 2,000 workers on site, and it was normal. In the U.S., at hospital construction sites, there are normally 400 workers.

The one thing that China is able to do is to mobilize, that's one thing they can do and that is one of the reasons they can build this [Huoshenshan] hospital this fast. It is this capacity to mobilize, not only the people but the necessary construction material itself. You have to have the construction materials in place, concrete, all these pre-fab units. Another advantage is that in China, in the recent twenty years, there's been a construction boom. They have a lot of workers at hand, at their disposal. Having gone through this process of

a massive construction boom, the skill set is there. The company that built this, likely a state-affiliated company, already had pretty significant capacity. They can mobilize.

**EIR:** You seem to marvel at the building of infrastructure.

**Pan:** Yes, and the reason I say that, is that to build hospitals, *it is what you don't see that is most complicated*. It is what I call the infrastructure work, including water supply, electrical, the gas, all those utilities that are all underground. In fact, when we build hospitals, the underground utilities take a major amount of effort just to get the site ready. It is very complicated. But, in



*Huoshenshan Hospital nearing completion on January 31, 2020.*

this case, they did it in such a short span of time. They had to select a site. Not only that, they had to select a site in a way that they could already tap into public utilities because you don't have time to create new utility lines to the site. What I find under-appreciated is the Chinese capacity to identify where the site can be so they can tap into public utilities, and be able to connect to that and bring those lines in and put them in underground, which also involves a large amount of earth excavation. It's what you don't see that was one of the greatest efforts in building this hospital.

**EIR:** When you build a hospital, how long would you take to build the required infrastructure, if you weren't in this 12-day mode, if you were trying to do it as quickly but as competently as possible, within strin-

gent standards, how long would that normally take, as say with the Shunde hospital?

**Pan:** The utilities itself? Shunde hospital was designed in essentially a new city where the infrastructure had not been laid out. So, I had to go in and suggest to the government how the future adjacent roadways could work, including the subway station, which was completed a year after completion of the hospital. The scale of the project was so big, I see it as an urban project. It is no longer one single building. It is such a big building, and also if you think about city growth, to build a city, you need hospitals, and schools as essential infrastructures.

Most of my projects are in the U.S.; the U.S. takes longer because the regulations are different. The underground utilities for a hospital are a pretty major endeavor that people don't see for hospital design.

But I would say, probably infrastructure is a third of the time.

**EIR:** At the Huoshenshan hospital they were able to put in the underground infrastructure in two to three days. That's quite something?

**Pan:** Yes. The most challenging part of that is coordinating between different trades and types of workers. What I mean is when

somebody is trying to lay out different types and conduits of water supply, and there is also another set of persons who are laying down the concrete floor, and it all has to be coordinated. This is where it is quite amazing. They were able to coordinate it all, with so many workers on site because sometimes the more workers on site, the more complicated it becomes. You now have to manage a big group of people. It's not just the capacity itself, but the quantity, the sophistication of being able to manage so many types of workers at the same time.

**EIR:** Which might explain why there were 700 project managers?

**Pan:** Yes, yes. Each project manager probably

manages one aspect of this. For example, one is managing the electrical lights, another the water supply, another the sewage system, etc., etc. But even for 700 project managers to manage themselves as a team is quite amazing.

Imagine you were working on a project where you had 700 team members, how do you actually manage within yourselves? With seven hundred managers, there is a pretty daunting complexity in this aspect alone.

**EIR:** Are the rooms at the Huoshenshan hospital pretty standard rooms or were there changes made to accommodate the fact that they had to be built with speed?

**Pan:** The concept of the rooms is for quarantine. The rooms themselves, the modular unit is already designed somewhere else before this happens. The two parts to that question are: one is, what is already designed. And those rooms, the technology surrounding the room; how air gets into it, how a person gets into it; how do you supply medication? Those are already designed.

Now the second part of the question, the room is actually not the same as a normal patient room because it is an infection control unit. For example, in a typical patient room, you would have a bed, a bathroom, and a family area. This quarantine unit, the difference is, there is no family area in the room. You have the patient, the doctors and all the technology for treating this patient in an isolated manner. So, it is not a typical patient room that has to be pre-designed.

**EIR:** Is the machinery the same as that which you would have in a normal isolation ward?

**Pan:** Conceptually, yes. What I mean by that is that they're negatively pressured, where air only goes inward, it does not go outward. These rooms are pretty



*A typical patient room in Huoshenshan Hospital.*

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*One of the first coronavirus patients to be admitted at Huoshenshan Hospital.*

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bare bones, because the wall's finish is metal as it comes. Then what we call the head-work, the electrical outlet, the gas lines and all the devices behind the patient's head on the wall, those are pre-fabricated, so it is a lot more utilitarian than what we would see in a normal patient room. However, the room is every bit a hospital room. Its general layout is based on the traditional Chinese infection control model.

### The Shunde Hospital

**EIR:** How long did it take to build the Shunde Hospital of Southern Medical University in China near Guangzhou? It is one of the largest in the world, having 3 million square feet and 2,000 beds.

**Pan:** From design to construction? So, design was about a year, construction was three years. But there were some delays, not because of the construction process. There was some delay primarily in the funding of the project. At one point the Chinese government, since it was a public hospital, the Chinese government was being very cautious on public project funding. That caused delay for six months.

The Chinese government became very cautious about releasing funds. They wanted more documentation, more support documents, to make sure the funds were not being abused. Before, they would have released the funds more freely.

**EIR:** Otherwise the construction phase would have taken two and a half years rather than three?

**Pan:** Yes, two and a half to three years. To put this in perspective, for a hospital of that scale in the U.S., the construction time would probably take five to six years. That is twice the amount of time.

**EIR:** Why?

**Pan:** A lot of it has to do with our U.S. regulations, which is a good thing. We have stronger regulations in terms of the inspection process, and the review of our design by our governing health agency.

But, as I mentioned, it is also the number of workers. On the Shunde hospital project, there were normally, about 2,000 workers building it per day. For the U.S. hospital construction sites, it would normally be about 400 workers.

**EIR:** How much are pre-fabricated modules used?

**Pan:** The technical term is modulated facade system which represents LEGO-like facade assembly systems. So we defined 60 different wall modules for the project, each one is roughly ten feet by fifteen feet. The construction team can pre-fabricate some of these wall systems off site, and then bring them out to the site and assemble them. So that would help speed up the process but also for us it is about quality control. We can control

consistent quality of exterior finishes, of exterior materials, for wall systems throughout the whole campus, throughout the whole hospital.

In the U.S., it actually makes a lot more sense to pre-fabricate, because now you can have less workers on site, and then more workers in the factory in a controlled environment.

We're going to see that more and more in the U.S.

**EIR:** Could you name some of the companies in the U.S. that make pre-fabricated modules?

**Pan:** There are companies that manufacture exterior wall systems, modulated wall systems. One com-



Kiwi Information Technology Co Ltd.

*The Shunde Hospital of Southern Medical University in China, designed by Raymond Pan.*

pany is called Digital Building Components. Another company is called Kapture. There are several in the Phoenix, Arizona area.

### **Plan, Plan, and Mobilize**

**EIR:** Let me pose this to you. We've been looking at the situation in the United States, and it used to be we had 4.5 beds per 1,000 population. And now we're down to about 2.3 beds per 1,000 people, so roughly half, since 1975. COVID-19 is getting much worse. What would it take, could America do what was done with the building of the Huoshenshan hospital in twelve days, or if not that time, at least quickly? What could we do if say President Donald Trump, and the Congress, and others, together said, we've got to build 20 of these infection isolation hospitals in selected areas, could America do it? How would that

look? Because, if we could do it, we would develop a capability, a new technology of building, that we could use to build regular hospitals much more quickly, as well.

**Pan:** Let's look at how China is doing this. What it takes is, you have to have the mentality to prepare for it, so you have to think ahead, you've got to plan ahead, because as I mentioned, when the Chinese build this, they did not start in on it on day one of the construction [without preparation]. They planned ahead. They knew that this is something they would have to deal with. You have to have people who plan ahead.

As well, you have to have the experience of doing this. There was a small hospital that you mentioned in Beijing that was built as a prototype during SARS. They had the experience, they planned ahead, and they were able to mobilize a massive amount of resources. So, that's three key components.

So, for the U.S. to do this, we've got to think that way. You've got to be able to plan this as if we are preparing for the pandemic, and to have a strategy to implement that. But also you've got to do it, you've got to do it to gain the experience. Think ahead of time. You can design anything you want, but until the rubber hits the road, and without such preparation, you don't know what you're doing; you don't have time even to test things out. You have ten days to build this hospital. There's not any last minute there that you can say, "Let me try this system out and see if it works."

We've got to think ahead, plan ahead. In advance, we've got to test it out, and have a strategy of how we can mobilize. Because, I think mobilization is one key area that is going to be more challenging in the U.S., because a lot of work forces are privatized. So that means that it's harder to mobilize, compared to China where there's a lot of state-owned construction companies; they can mobilize workers a lot faster.

So, there needs to be a planning phase to do that, to look at all those things. Not just physically building it, but I think it's the work ahead of time in preparing for it, in case anything happens. So I'm afraid we [in America] are a little bit late to this, at this point.

But I wonder, I've always wondered, if there is an entity that should be ready for this type of pandemic, it should be our military and military capacity. You would think that they must have developed some type of military hospitals, battlefield hospitals that they can probably adapt, because they must have some-

thing that can be put together in a very short period of time.

**EIR:** That makes sense to me. Would it make sense to take an area and see if we can replicate this Huoshenshan building process, where it might be needed? In the United States, we have the Army Corps of Engineers, and other branches of the military, and some Governors and parts of the Federal Government have raised the issue of mobilizing them.

Should the United States broaden channels to China on this matter, including military-to-military?

**Pan:** Yes, yes. I think that definitely is one avenue that we can explore. Also, there is the WHO, the World Health Organization. The mission of the WHO is to create a common platform on a global scale between countries to share healthcare policies and activities.

**EIR:** Do you think there are other ways?

**Pan:** Well, the U.S. State Department should contact the Chinese State Department and find the right contact, and I suspect China's Health Department, equivalent to our CDC (Centers for Disease Control and Prevention), here. I think that that's probably the counterpart with CDC.

**EIR:** And would they talk to them about hospital building on this emergency basis, do you think?

**Pan:** I believe so. China is willing to share, I think it's probably willing to share, yes, I think that definitely, on the state level they could find out more details than civilians could.

**EIR:** In the United States, is there sufficient innovation in building hospitals?

**Pan:** There is some degree of limitation. In the U.S., innovation in healthcare, especially in hospital design, is closely coupled with our health insurance policies. The current U.S. push on innovation is based on how to build it faster and better, and cheaper. You know you treat a patient with some sort of normal disease, influenza for example, you may have three days to treat a patient. The goal is to get the patient out of the hospital in three days or as fast as you could, in some cases. In China, it is different.