Independent Committee in relation to the fire at Wang Fuk Court in Tai Po

Evidential Hearing

The Honourable Mr Justice David Lok
The Honourable Mr Chan Kin-por, GBS, JP
Dr Rex Auyeung Pak-kuen, GBS, JP

On:
Day 26
Wednesday, 24 June 2026

Mr Victor Dawes SC, Mr Jason Yu, Mr SW Lee, Mr Jonathan Fung and Mr Brian Lee appeared on behalf of the Independent Committee

Mr Calvin Cheuk SC, Mr Jenkin Suen SC, Mr Michael Lok, Mr Charlie Liu and Ms Vivian Woo appeared on behalf of the Government

Mr Ross Yuen appeared on behalf of the Urban Renewal Authority

Representatives of Department of Justice

Representatives of Competition Commission

Mr Richard Khaw SC appeared on behalf of ISS EastPoint Properties Ltd.

Mr Jeffrey Tam appeared on behalf of residents of Wang Fuk Court

Mr Jonathan Kwan and Mr Aaron Chan appeared on behalf of Leung Ping Kay

Page 1

Wednesday, 24 June 2026

(10.00 am)

THE HON MR JUSTICE DAVID LOK: Mr Yu.

MR JASON YU: Chairman, members. Our first witness of today is Prof Richard Yuen Kwok Kit.

Good morning. Prof Yuen, before you is a declaration. Please read it out just like other witnesses.

(10.01 am)

IR PROF YEUNG YAN KIN, RICHARD (affirmed)

Examination by MR JASON YU

MR JASON YU: You are a chair professor of architectural engineering of the City University of Hong Kong. Your area of research is fire safety, CFD and research on fire-retardant materials.

IR PROF YUEN KWOK KIT: Right.

MR JASON YU: You are a registered engineer and you're also a member of the Institute of Fire Engineers and a fellow of the Hong Kong Institution of Engineers.

IR PROF YUEN KWOK KIT: Right.

MR JASON YU: In addition to the investigation of this matter, you were also involved in the investigation of the fire in the mini storage in 2016.

IR PROF YUEN KWOK KIT: Right.

MR JASON YU: What role do you play in this task force?

Page 2

IR PROF YUEN KWOK KIT: In the task force I provide assistance in terms of experiment as well as analysis in terms of fire science.

MR JASON YU: You have an independent role to play?

IR PROF YUEN KWOK KIT: Yes.

MR JASON YU: I understand that in May you have published your final report.

IR PROF YUEN KWOK KIT: Right.

MR JASON YU: You are going to explain to us about some scientific analysis in chapters 7 and 8 of the report today; right?

IR PROF YUEN KWOK KIT: Yes.

MR JASON YU: Please go ahead.

IR PROF YUEN KWOK KIT: Good morning, everyone. In relation to the fire investigation of Wang Fuk Court I will share with you my insight on scientific analysis and validation of hypothesis.

We can see clearly in the Wang Fuk fire there is a rapid vertical fire spread in terms of a jet flame, especially in the first block, Wang Cheong House, where the fire started. We also saw that after the fire had started the fire spread from the outside to the inside, triggering a series of incidents.

In addition, because of the renovation work, there was a large amount of combustible materials. In this

Page 3

picture you see scaffolding nets. We want to see the contribution of the net to the fire, the fire performance, as well as whether there is any effect in terms of ignition.

In my presentation I'm going to focus on key observations. They cover fire development, polystyrene window covers, safety nets and canvas. The material of the canvas is actually plastic. We also have conducted analysis on the staircase openings. They are access openings covered in previous days of hearings. We looked at their contribution and fire performance of the access openings.

In Hong Kong we have conducted basic tests on the materials. These tests provide valid scientific data which forms the basis of our further research. The task force has also made a decision to reconstruct a large-scale model that is close to Wang Fuk Court, in particular the light well and the surrounding area. We have invited the professor and head of Sichuan University of Science and Engineering to construct the model. We would conduct experiment that involved large and fierce fire, so we have to ensure that everything is safe, as well as accurate calculation of parameters and data of the fire. We have constructed a mega-scale cone calorimeter. It was large enough to house a

Page 4

three-storey model of Wang Cheong House, including the re-entrant, that is the light well, as well as the walls/windows of surrounding units. This gave us comprehensive insight for us and enabled us to conduct a large-scale analysis.

This is a full-scale test. Given the fact that there are 31 storeys in each building, it's impossible to do it in full scale. You can see that we have constructed a three-storey model of Wang Cheong House, including the re-entrant.

During the initial test we have put combustibles in that area. The windows replicated are to scale. We call this a full-scale three-storey fire test of the re-entrant, that is the light well.

This is the area of the model according to the layout plan of Wang Cheong House. The model is the three floors closest to the seat of fire. The first time we have constructed four storeys of panels including bamboo sticks, toe-boards, wooden panels to simulate the working platform on the scaffolding.

You can see in this picture that there is an indent. You may not be able to clearly see it, but in that area, that is the re-entrant, we have simulated the miscellaneous items at the seat of fire, showing the combustion and the subsequent spread.

Page 5

When we conduct the experiment, we put scaffolding nets on it because we want to see the fire performance of the net. It looks like it envelops the structure before they were banned.

So during the first experiment we have used the four layers of scaffolding, safety nets, wooden planks, toe-boards, and we have started a large-scale fire of about 2.5 megawatts.

Once lit, it would spread. Before we did that, actually we had done some tests. Without scaffolding, without anything, we conducted a test of the fire. We found that if a fire started at the re-entrant, the severity of the fire was different. The maximum height was about 1 megawatt, that is outside the re-entrant, but with the same materials placed at the re-entrant, the height would reach about 2.5 to 3 megawatts. That means that the heat release rate, the HRR, the peak was higher.

We constructed a model for the full-scale test. This clip shows that once a fire was lit how the fire developed. I'll just show you the clip first.

(Video played)

I will give you information while you watch the clip.

The fire was about 2-point-something megawatts in

Page 6

size, but normally it would not grow into such a large scale in an instant. It would take time. I would describe it in a way that it will have to grow to generate sufficient heat to ignite other materials. You see that the staff members were waiting for the fire to grow.

I don't want to do anything to the clip. Please be patient. The clip takes some time.

After some time, at the re-entrant, combustibles started to burn. You see the glow is quite bright and the fire has grown. We use a cone calorimeter to take measurement of the heat release rate, HRR, in terms of megawatts at different times. We have measured in the end about 29 megawatts, which is a very high figure. You can imagine for a structure of three storeys, reaching 29 megawatts is quite high.

We have done some arithmetic simulations to project the measurement of a building that is 31 storeys. The figure reaches about 700 or 800 megawatts. 29 megawatts alone is high.

You see the fire rapidly developed. At the top you see flames. It's obvious that the combustible materials therein were readily combustible and there were also combustible gases being released. The combustible materials with oxygen would burn more fiercely.

Page 7

At the initial stage of development, you couldn't really see the fire, but later you could see a jet flame throughout the three storeys. At the site we could feel the severity of the fire.

Towards the end of the experiment, all scaffoldings, wooden planks, toe-boards and nets were consumed. So this is what it looks like for a fire of three storeys. You can imagine, and also you could see from different clips how shocking it is with a fire that reaches 31 storeys. We can also see flames coming out from different places. It took time for the fire to develop from the re-entrant. You can now see that the fire developed and reached other areas. The scaffolding and the toe-boards were alight. The development was random. It may go towards one direction and other directions as well, reaching to other combustible materials. You can see a glow here. There are two reasons. Windows have broken. In the experiment we have put a lot of combustibles within the unit to simulate furniture and other materials in the kitchen and in the living room. In the end, all these materials within the unit were consumed. So you can tell that the fire was indeed fierce.

In addition to bamboo sticks falling, there are also flying embers. The amount was huge as well. This is

Page 8

a semi-enclosed site. The wind was not strong on that day so the fire embers did not travel far, but if the wind was strong, the flying embers could travel quite some distance, just like what we saw at Wang Fuk Court. You see the flying embers dropped and left the site because there was no strong wind.

We did not want the fire to damage our equipment, so the firefighters from the site put the fire out for us. It shows that the development and the size of the fire was astonishing.

We also had other observations. At the back of the wall in the setup there was no staircase, but this was simulating the area at the back of the staircase. So on the front you have the scaffolding, the bamboo. At the back we don't have the stairs but we put the openings there. There was a window and also a wooden board for those levels. You could see the fire and smoke penetrating the wooden board after a while.

Before the fire and smoke burned through the boards, the fire and smoke were already coming in. After the boards were burnt out, the fire and smoke came in. So this should be the area of the means of escape, so up there you see the wooden board.

We can imagine here you have the staircase, and when this happens, that undermines the function of the means

Page 9

of escape in case of a real fire. You can see the smoke coming in continuously and the fire burning. So the wooden board is burned. Eventually it's consumed. This is in line with the evidence gathered on site by experts.

At the same experiment we also noticed that in the beginning it took a while for the fire to grow big. It was almost 30 minutes before the slow fire turned into an intense fire, and then within a few minutes it reached 29 megawatts. The temperature was at 200 degrees Celsius when the fire was small. Eventually, it exceeded 1,000 degrees Celsius, so it became an intense blaze.

We also noticed at the scene of the experiment the glass was all broken. That's because of the high temperature and the intense heat. Once the windows were broken, there was a huge amount of radiant heat. The heat and the fire entered the units. Shortly after, the glass broke. There was a huge amount of radiant heat inside the unit. The heat was enough to ignite the combustible items inside the unit, so all the combustible items were also burned.

This experiment showed us the development and the scale of the fire and how the fires entered the unit and then ignited the items inside the flat. This is what

Page 10

the experiment clearly showed us.

Now I want to turn to the safety nets and the combustibles and how these items affected the fire's development.

At the experiment we had different mixes of safety nets and combustible items. So we have sample 1, the first kind of safety net involving uncertified safety net, so safety nets without any certification.

We started off by buying the safety net in the mainland. The experiment was run in Sichuan. Nobody would go around asking for non-fire-retardant net. We also asked the supplier for certified safety nets with proven fire retardancy properties, and then after the experiment, safety nets would make a difference. In some cases, some safety nets turned out to lack fire retardancy.

For uncertified safety nets, not all of them lacked fire retardancy properties. So we tried to thermally deteriorate the sample and then they became non-fire-retardant nets. We took those nets to the mainland labs and it was proved that those nets lacked fire retardancy properties, so we ran the fire experiments with those nets. We also got assistance from the police and the Fire Services Department by getting the specimen we got at the scene at Wang Fuk

Page 11

Court; we sent the samples to the mainland. So we ran a test with the net from Wang Chi House in Sichuan.

At the same time, we also wanted to see how the different safety nets compared with each other, so we had this setup. For this frame, we could mount two safety nets. In this image, we put on a safety net from Wang Chi House, meaning sample 4. On the other side we put on a fire-retardant net to compare and contrast, and we ran a few such studies. I can show you in a moment.

Let's have a look at this clip.

(Video played)

So it's working now. The cameras were placed on both sides. On one side you have the fire-retardant net, and then on the other side we got the net from Wang Chi House. For the net from Wang Chi House -- the ignition started at the same time for both nets, but the fire development was completely different. For the net from Wang Chi House, you can look at the speed of burning and the reaction. The fire burned much faster on the Wang Chi House net.

After a while, there was a distance between the source of the fire and the net itself. For the fire-retardant net, the fire extinguished itself. But this is not a net with the national standards, or Guobiao, but the fire simply went out. Then you can see

Page 12

the glow at the back. That's because the fire is going at the back, on the other side. That's because, as I said, the cameras were put on opposite sides. You see the glow on the left, not because of the fire burning on the fire-retardant net, that's because the fire was burning on the net from Wang Chi House. Therefore, the net from Wang Chi House, the fire has reached the top.

This clearly shows that the fire has stopped for the fire-retardant net. On the right, the fire reaches the top. The entire net from Wang Chi House was consumed. So this is a stark contrast.

Let's give the clip a bit of time. The fire is almost done.

We can see for the net from Wang Chi House the entire net is consumed, the vertical part is gone. So we can compare the outcome.

In the red box, the entire area is supposed to be the net from Wang Chi House. After the burning, it's consumed. For the fire-retardant net, most of the net remains. The bottom of it is burned, but that's it.

We had sample 3, a thermally deteriorated net. That net ends up like the net from Wang Chi House. Much of it is consumed. Very little of it was left.

So this is our observation. For sample 4, meaning the net from Wang Chi House, in terms of the speed and

Page 13

scale of the burning, the speed and scale were both greater than the flame-retardant net. So we can say that for the sample from Wang Chi House, this net is likely to lack fire retardancy properties.

We also looked at the canvas. There were two kinds. First, the fire-retardant canvas; the other, the non-fire-retardant canvas. The non-fire-retardant kind was similar to the kind used at Wang Fuk Court, the blue and white canvas. A couple of days ago the Government chemist commented on this.

We used the same frame. We mounted the two kinds of canvas. For the flame-retardant canvas, the fire burned for a little while and then the fire went out. For the non-flame-retardant canvas, the burning continued, the fire spread until very little of the non-flame-retardant was left. So you can see the huge difference between the flame-retardant and the non-flame-retardant varieties. So the non-flame-retardant canvas comes with a greater risk of fire propagation.

In the following I want to talk about the 13 full-scale fire tests. We looked at the four-storey scaffolding. The fire was so intense that we had to get the firefighter to put the fire out. We did not want to put out the fire every time because we wanted to watch the entire burning process. So later on we decided to

Page 14

set up only two scaffolding setups. But we kept the size of the building, the re-entrant and everything else. We simply kept fewer combustibles so that we could watch the entire process.

For subsequent tests, there were 13 such tests. For one group of tests, we used a smaller fire. When the fire started at Wang Fuk Court, the source of the fire may involve a small fire. But we also ran tests involving larger fires to see the contrast. So in one test we used uncertified nets. In another, we used flame-retardant nets. In subsequent tests we also used non-flame-retardant nets that were thermally deteriorated. We also ran a test involving the net from Wang Chi House. So we used different kinds of nets to compare and contrast the outcomes.

In some experiments we put polystyrene covers on windows. In some tests, especially for the last few tests, we also put up canvas. We wanted to compare the performance of flame-retardant and non-flame-retardant canvas.

For the tests we ran, we could not tell the performance of the foam boards covering the windows, that's because those boards were in the re-entrant. So we ran some smaller-scale tests. We just burned the foam boards. The ignition started quickly and then the

Page 15

flame droplets would ignite the carton. So in a large-scale fire, the same performance can be expected: droplets occurred and then it ignited the cardboard.

We also noticed the falling of the foam boards. When it falls, it's burning, so whether it's smaller droplets or if the foam board falls as a whole by burning, it can ignite other combustible items. So that's our observation about the foam boards.

Now, let's come back to the safety nets and canvas. We ran so many tests. We want to share some findings.

In test 2 we used non-fire-retardant safety nets. The burning wasn't so bad, so the fire was limited. One would compare that to the use of uncertified safety nets. The flame-retardant nets were doing fine but uncertified safety nets were not all non-flame-retardant.

Now let's turn to the non-flame-retardant safety nets. These were thermally deteriorated nets. They lacked flame-retardant properties, so the fire spread and moved around.

Now, in the smaller fire scenario in the re-entrant. For a very small fire, the safety nets were part of the burning and then the fire spread. In a case of smaller fire we observed flaming droplets and that went on for a longer time. Under large fire conditions, for the

Page 16

uncertified and non-flame-retardant nets, fire was spreading in many places on the net and then there were droplets. Those droplets ignited other part of the net. That's why we say there was secondary ignition. Such ignition was fairly consistent when such nets were used.

For larger sources of fire, many items here were consumed, especially those in the re-entrant. When nets were involved, flame-retardant or not, were quickly consumed. For non-flame-retardant nets, there were many instances of secondary ignition.

When the source of the fire was bigger, the damage would be greater. In other experiments we noticed that for the access openings, when wooden boards were used, aluminium composite panels were used and fire-rated windows were used, there were differences. That experiment showed us that the wooden board caught fire, it was fully burned. This area is supposed to be where the fire escape is supposed to be. Even for aluminium composite panels, it was also burnt through. For aluminium panels it took longer, by just a few minutes, to burn through the board but the fire-rated glass window did much better. It wasn't burned through, it wasn't broken, you simply see a layer on the glass window that looked white.

We also put a device there to measure the

Page 17

temperature. Up there for the window it was only 56 degrees Celsius us, but for the burnt-through part, it was over 600 degrees Celsius. So this shows fire-rated glass did well. Wooden boards and aluminium panels could not protect the means of escape.

Here we have yet clearer proof. I will talk about the fire in a moment.

For the re-entrant, the fire was intense. When fire-rated glass was used, the fire did not reach all the way up, it did not break the windows. The temperature was only at 30 to 30 degrees Celsius so the windows offered better protection.

As regards secondary ignition, we've seen that many tests, mainly when we use the uncertified nets or the non-FR nets or Wang Chi nets, we have seen the secondary ignition. There was a likelihood that the fire would spread on the net and there were flaming droplets igniting the toe-board or the wooden planks or there was a possibility of igniting the wooden stakes. The wooden stake or bamboo sticks would take longer time to ignite but in some cases in the secondary ignition, the bamboo sticks were also ignited.

(Video played)

There is a video here. For the secondary ignition, it would ignite some bamboo sticks and it would cause

Page 18

further flaming droplets.

Let's go back. Bear with me. Let's have a look at this again. Do bear with me. Let me try again.

(Video played)

As you can see here, secondary ignition would ignite the bamboo sticks and potentially the wooden boards, the toe-boards and so on, and there is propagation of the fire. This is sufficiently clear.

In our Hong Kong team's lab we look at the critical combustibles and we look at the TTI, the time to ignition: everything being equal, how long does it take for them to be ignited. I will spare you the details except to say that there are three parts or three areas. The red ones are the easily ignitable materials. The other one is 40 seconds to 75 seconds, moderately ignitable materials. The longest would be the delayed ignitable materials, 75 seconds. This is by no means a scientific definition but this is how we broadly categorise them. This should be moderately ignitable.

For the non-FR nets, it will take longer. I mean for the uncertified ones, moderately ignitable -- sorry, this is FR. Even for the non-FR, it is moderately ignitable. So for the safety nets it may not be instantly ignitable, but compared with the bamboo sticks, it would take a shorter time. Wooden planks,

Page 19

similar to bamboo, it would take longer. Polystyrene, it varies. I mean the foam boards, they have varied speed.

For the Wang Chi nets, they are moderately ignitable but they are more easily ignitable. Wang Yan House also. So we have reason to believe that for the nets collected on site, they are more easily ignitable.

For the TTI of these materials, we can see the small fires for non-FR nets or uncertified nets or Wang Chi nets, they would spread because they are more easily ignitable, moderately ignitable. Once ignited, there are flaming droplets and they would be igniting the combustibles. In particular, the nylon strips, these would cause further propagation of the fire to other areas.

Here, obviously we can see that -- test 11 is for the small fire. Test 11, the small fire, it would cause the spread to certain extent that it would ignite the materials. For test 12 we used Wang Chi nets. And the FR canvas, there was some spread, some development of the fire, but the bamboo scaffolding is still there. Wooden planks, toe-boards, most of them are still there, and the fire wasn't really large. But the nets were all consumed, that's the Wang Chi nets. Test 11, we used the FR canvas and FR nets.

Page 20

Test 13, that's the last test, we used non-FR canvas and also the Wang Chi nets. With this combination, the first fire was really large and it spread to the entire scaffolding which was consumed and some of the bamboo sticks fell and didn't burn. Most of them were completely consumed.

From this angle, it may be a small fire, but if we use non-FR canvas and also Wang Chi nets, with this combination, it spread pretty drastically. It's far more serious than the FR nets being used.

We also tried to compare the situation with the fire plume in Wang Cheong House. These are very comparable. Test 13, we used the Wang Chi nets and also non-FR nets. We did not use any foam, any polystyrene there.

At Wang Cheong House, it is not easily visible, but the fire has already developed. It is similar to our test and some of the nets remain intact. But subsequently, as we can see, after certain period of time, it spread at high speed, there is a high HRR rate. We don't have these kind of data from Wang Cheong. This is only from the test, three-storey high. It's 12 MW.

We should notice it started off being a very small fire, it lasted for a pretty long time but then it ignited very rapidly and spread very rapidly and then it died down because everything is consumed.

Page 21

We have some recordings, Wang Cheong recordings here. By comparison, this is our test. By the 61st second, a whole series of phenomena happened. The fire turned more drastic and number 2 here, it spread to the 3rd floor, similar to our test. Thereafter, the 31st floor, we cannot really extrapolate further from our test but the fire plume is clearly visible in the test and also in Wang Cheong.

We may have only three storeys, but this is very much a vertical plume of fire. And at Wang Cheong, it is even more serious. So our test compares favorably with what happened on the scene in terms of timing and in terms of the scale, nine minutes on the scene. In our test, almost nine minutes as well.

Of course we could not get to the end of the development because we have only three storeys.

Now, with this test, we could not really see the phenomenon for a block of 31 storeys, so we used the CFD and this enabled us to see the wind effect. We also saw how the combustibles were involved in the burning in the re-entrant area, how it turned from a small fire to a large fire.

Now let's turn to the wind condition. Wang Fuk Court, the wind situation, you can see from the Observatory it was an east-to-southeast direction,

Page 22

14 kilometres per hour. It is not a small wind speed. We used the same data into our model.

Now, there is no fire here. It is only there to look at the movement of the wind. The whole purpose is to see what the situation would be like when the wind moves through this building and how the embers would be moving and the direction of the embers.

If you notice that this is Wang Cheong House, and you have the other blocks there as well, this is low level, medium level, and the rooftop, and the wind direction there. There is some difference there. At the ground level there is friction so the wind speed would be lower, at the lower level. Despite that, there is also movement. At a higher level, the flow would be higher.

It is not difficult to see that if there are embers at a high level or mid level, they would be lifted by the draught and be taken to the neighbouring blocks. And the place they drop would be between two blocks.

These embers do carry some weight. They will be lifted by the draught, but they will still be dropping. If it there is a fire plume and the embers would be drifting, they would be taken by the wind to some areas and fall to lower areas. At lower wind speed they would be settling in the area and they would be getting in

Page 23

contact with the combustibles. We find on the scene that there are so many embers drifting in the wind. So there is a phenomenon that the embers would be hitting the scaffolding nets and other combustibles there and they would be dropping onto the platform. If there are debris there that are combustible, that would cause a secondary ignition. So from this diagram you would get to see this more clearly.

If you look at Wang Cheong House, there is smoke there and the smoke would tell us the airflow. It is drifting. There is wind passing through here and the wind would be -- if there are embers drifting here and the wind speed is slow, they would be dropping there.

104/105, over here, they would be drifting over there and there are secondary ignitions over there.

Over at Wang Chi House, there is no wind taking the embers and you have the wind from outside and the chances of the embers drifting over there were smaller. Other than looking at the wind dynamics, we also looked at the fire dynamics. From that CFD we see that with FR nets the fire couldn't develop. There was some burning and the fire would be burning a bit. We cannot see the fire, but there are some materials and they were burning, but there was no spreading. But if the non-FR nets are involved, the spread would be very fast and

Page 24

there would be upward spread, causing a fire plume in the re-entrant area.

In our calculation, within a matter of three minutes, the fire plume would be hitting the top. If we use the Wang Chi nets and if you use the data there, that's the data that we get from the lab using the Wang Chi nets, basically we add the data into our calculation to look at the combustion.

THE HON MR JUSTICE DAVID LOK: Professor, with this CFD, you are merely looking at the nets. In sample 2 there was no burning.

IR PROF YUEN KWOK KIT: Right.

THE HON MR JUSTICE DAVID LOK: In actual fact, there may be some debris there. So in your tests, are you merely looking at the scaffold nets to the exclusion of other factors?

IR PROF YUEN KWOK KIT: No. We had some wooden planks and other combustibles there as well. It's just that we didn't have any foam boards.

THE HON MR JUSTICE DAVID LOK: So if we have compliant nets, they wouldn't catch fire, would they?

IR PROF YUEN KWOK KIT: Well, in our calculation, the situation is like this.

THE HON MR JUSTICE DAVID LOK: Understood. Please.

IR PROF YUEN KWOK KIT: We see that for other nets, non-FR

Page 25

and Wang Chi nets, they will be burning all the way to the top. You see the fire plume appearing there. It would be hard to calculate how it spread. But as you can see, the HRR is well over 700 MW, close to 800 MW. So if you use the non-FR nets, according to our calculation, it would cause more serious spread, a more ferocious spread.

Lastly, I'd like to touch on this point. It's a matter of concern to us. The reason why there was a rapid vertical fire spread along the re-entrant as well as secondary ignitions and the final result of the fire, there are some comparisons. At Wang Fuk Court we could see the fire plume developing into a vertical fire plume rapidly at the re-entrant. It was uncontrollable. During our experiment we could reach the same result, that is, at the re-entrant, with combustible materials, the fire developed into a severe one.

In the Sichuan experiment, we found that the size of the initial fire source mattered. If it is a large fire, it would involve a lot of combustibles. But if the fire size was small, the FR features of the materials would stop the materials from burning. However, if the fire size was large enough, in the end the FR materials would catch fire as well. Of course, it also depends on the fuel load. Comparing the size of

Page 26

the fire, if there is a higher fire load, then the fire would develop more fiercely and surrounding combustible materials would be ignited.

We can also see from our research that in relation to safety nets and canvas, they play a significant role in the fire's development as well as the risk of the propagation involved. If FR nets and canvas were used, the development and spread of the fire could be prevented. We could see it from my experiment as well as from the CFD calculations.

The last test, test 13, we used non-FR canvas and nets from Wang Chi House. The fire consumed everything, including the bamboo scaffolding.

This highlights a number of points. Despite the fact that the size of the fire started as small, but because of the fuel load, it grew into a large one. In addition, there are other factors escalating the development of the fire. First, the availability of combustible materials and the non-FR features. Materials with non-FR features accumulating at the re-entrants or being mounted along the facade, it would increase the risk of development and spread. In the end, it might become uncontrollable, just like what we saw at Wang Fuk Court.

We could see the same situation regarding the fire

Page 27

plume at 11 occasions. We learned from the Observatory that on that day it was quite dry and there was strong wind, causing combustibles to be ignited easily and enabling flying embers as well as flaming droplets to cause ignition to other combustible materials.

I've already covered strong wind. Strong wind carried flying embers and miscellaneous items to a further distance, causing secondary ignition.

That's my presentation. Thank you.

MR JASON YU: Prof Yuen, thank you very much for your detailed presentation. I have some questions for clarification and I also would like to ask you to provide further explanation on certain matters.

IR PROF YUEN KWOK KIT: Okay.

MR JASON YU: Would there be any difference between the experiment at Sichuan and the fire at Wang Fuk?

IR PROF YUEN KWOK KIT: Yes. Strictly speaking, there is a difference.

MR JASON YU: Of course, as you explained, in the model at Sichuan, it's only three storeys and at Wang Fuk the buildings are 31 storeys high. If you compare the Sichuan experiment and the CFD simulation, you said that at Sichuan the peak is 29 megawatts. Using the CFD simulation for 31 storeys, the peak reaches about 700 megawatts. That's because of the chimney effect.

Page 28

The higher the chimney, the airflow as well as the severity of the fire would be different?

IR PROF YUEN KWOK KIT: That's one of the factors. I don't usually use the term "chimney effect" but I know that is commonly used. We can understand that is a vertical tunnel or shaft. If there is a large amount of combustible materials, if they are paralysed, there will be heat generated drawing air from the surrounding area in. When the fire is fully developed, the HRR will be much higher; you can understand it this way.

MR JASON YU: So when you talk about the fire being fully developed, that means when the fire is really severe you will see a difference; is that right?

IR PROF YUEN KWOK KIT: Yes. Well, with 31 storeys, there will be a lot more combustible materials.

MR JASON YU: This fire started as a small fire. If that is the case, will it make such a big difference or the chimney effect and the end will be similar?

IR PROF YUEN KWOK KIT: We can talk about it at different stages. If it is a small fire, if we assume that the combustibles have caught fire, at the incipient stage the situation would be similar because the fire started at a lower level. Even with a long shaft, the development has yet to take place. So at the initial stage it's comparable.

Page 29

MR JASON YU: I understand.
IR PROF YUEN KWOK KIT: However, when the fire reaches higher floors -- we can't see from our experiment, and we have to bear in mind that there is a large amount of combustible material, say, for example, nets, canvas, wooden planks as well as toe-boards. The combustibles would be paralysed by heat within a very short time. We might not see the end result of the fire from the experiment, but we can see from the clips of the site. This is not a linear development, it's a non-linear one. So you can say that is --
MR JASON YU: The English is "exponential".
IR PROF YUEN KWOK KIT: Yes, exponential and geometrical, within a very short time.
MR JASON YU: So the peak at the Sichuan experiment was 29 megawatts and the CFD shows 700 megawatts. A lot more combustibles were included in the CFD; is that right?
IR PROF YUEN KWOK KIT: Yes. Well, using bamboo sticks as an example, it might not be easily combustible, but with sufficient heat, it would alight. We're talking about more or less 10 times more bamboo sticks in addition to other materials.
MR JASON YU: So the 700 megawatts is the peak from the simulation.

Page 30

IR PROF YUEN KWOK KIT: 700 or so.
MR JASON YU: That would be the peak?
IR PROF YUEN KWOK KIT: Yes.
MR JASON YU: Another difference is the weather. The wind was not as strong and the humidity was not as low at the Sichuan experiment.
IR PROF YUEN KWOK KIT: The wind was not as strong, but we did the experiment on a number of days. On certain days the humidity level was similar, but on other days it was slightly higher because our experiment spanned over a few months.
MR JASON YU: There was a set of tests done in January, February, and another in March, April, so the relative humidity ranges from 45 to 91 per cent but most of the time it's about 50 per cent at Sichuan?
IR PROF YUEN KWOK KIT: Right.
MR JASON YU: The difference in weather condition, do you think it would affect how you can apply the result of the Sichuan experiment to Wang Fuk Court?
IR PROF YUEN KWOK KIT: Given the condition of our experiment, we don't think the relative humidity would make a difference. In the last few days of our experiment, the humidity was higher, but at the beginning it was about 50 to 60. It was similar to the humidity of the Wang Fuk fire. Yes, the tests done

Page 31

later had a higher humidity but I don't see much of an impact.
MR JASON YU: So the differences, namely the height of the building, the weather and the amount of fuel load, given that, you still think that the conclusion of the Sichuan experiment can be applied to Wang Fuk Court?
IR PROF YUEN KWOK KIT: Right.
MR JASON YU: Let me now take you to some combinations of actual tests. Please look at ER2-2/1197. You can see it on the projection. ER2-2/1197. We saw this table from your PowerPoint presentation.
IR PROF YUEN KWOK KIT: Right.
MR JASON YU: There is a column called "Fire size". This means the size of the fire; right?
IR PROF YUEN KWOK KIT: Yes.
MR JASON YU: It says here "MW", megawatt. It's a unit used for heat release rate, HRR?
IR PROF YUEN KWOK KIT: Yes.
MR JASON YU: For tests with a small fire, that is under 1.5 megawatts, for a large fire it's 2.5 megawatts, when did you take the measurement of the HRR during the experiment?
IR PROF YUEN KWOK KIT: That's the peak. We used little wooden sticks to start the fire. That's the peak value.
MR JASON YU: So that is the peak of the fire measured at

Page 32

the source of the fire?
IR PROF YUEN KWOK KIT: Once lit, the fire would develop to this size. Without other combustibles, the fire source would extinguish on its own because the fuel load is limited. So that's the peak.
MR JASON YU: I wanted to clarify this, because in your official report, that is ER2-2/1308, paragraph 4.8, we see a different version. It says that at the incipient stage the HRR is 0.5 and 1 megawatt. The reason for the difference in figure is the peak. But here it talks about the incipient stage.
IR PROF YUEN KWOK KIT: That was the initial report. We were rushed for time. So at a later stage, when we had more time, the figures would be clearer.
MR JASON YU: So we should use the figures 2.5 --
IR PROF YUEN KWOK KIT: And 1.5.
MR JASON YU: 1.5 and 2.5. Back to page 1197. You talk about the wooden sticks, you use 10 for a small fire and 200 for a larger fire.
IR PROF YUEN KWOK KIT: A smaller fire -- let me refer to how I worded it.
MR JASON YU: It's page 1423. It talks about fire load, explaining the difference in sizes.
IR PROF YUEN KWOK KIT: Right.
MR JASON YU: So that applies to all the 13 tests?

Page 33

IR PROF YUEN KWOK KIT: I think so because that's our record.
MR JASON YU: That's just for clarification.
Let's look at your initial report. There may be some difference. Let's go to page 1311 of the same bundle. We looked at this one.
Paragraph 4.17, please read it. What I'd like you to do is to explain what you think at that time, whether it's different from what you think now and why.
IR PROF YUEN KWOK KIT: We reported what we saw for the tests. I remember that for tests 3 to 6 it was a larger fire. The combustibles were burning within a short time. We could not differentiate how the characteristics contributed to the development of the fire. It doesn't contradict our final report because it was a large fire. From my experiment, we found that given the size of the fire we could not differentiate the performance of the individual materials.
MR JASON YU: In short, with a smaller fire you could see the fire performance of different materials and their contribution.
IR PROF YUEN KWOK KIT: Right.
MR JASON YU: That's why in test 7 you used a small fire. After that, you used large fire in some tests. And still, with large fire, you can see some differences.

Page 34

Let's look at page 1216, "Key Observation (11)".
IR PROF YUEN KWOK KIT: Yes. There are differences. From the figures we could see differences.
MR JASON YU: Even for a larger fire, take test 4 as an example, 2nd floor in the re-entrant, it was 100 degrees Celsius with FR nets. Test 8 returned 500 degrees Celsius, so that's a five-times difference. Can you explain that difference?
IR PROF YUEN KWOK KIT: For FR and non-FR nets -- I want to backtrack a bit. The paragraph before that is about the total heat release. It has to do with the heat release of an object that is burning. Paragraph 4.17 is about total heat release. The difference is small. For all materials that are burned, much of it came from the bamboo.
Here we look at the peak, the peak HRR. Here we're talking about megawatt, but previously we were talking about megajoules. So here we're talking about the rate. Previously, we were talking about the amount of heat. So the heat release rate focuses on the peak value. So there is a difference.
MR JASON YU: Chairman, I want to complete my questions about this issue before we get to the break, so I will take another 10 minutes or so.
This is for larger fires. If the fire is smaller,

Page 35

the difference will be bigger?
IR PROF YUEN KWOK KIT: Correct.
MR JASON YU: You ran two different tests. We talked about the CFD test in case 4, and that was the subject of the question from the chairman. Basically with the FR net, no ignition happened.
IR PROF YUEN KWOK KIT: Right.
MR JASON YU: For the Sichuan test, for tests 11 to 13 you saw the same thing. With FR canvas and FR net, the fire could not start.
IR PROF YUEN KWOK KIT: Right.
MR JASON YU: So for a smaller fire, you can tell the difference?
IR PROF YUEN KWOK KIT: Correct.
MR JASON YU: So the size of the fire makes a difference for the development of the fire. If we are to apply what we have seen to the case of Wang Fuk Court, first we will have to establish that the fire started small at Wang Cheong House. Do you agree with that?
IR PROF YUEN KWOK KIT: I agree. In my research I could not analyse the amount of combustible items at Wang Cheong House, so we can only run two different tests.
MR JASON YU: Is there a way for us to deduce, when the fire started at Wang Cheong House, that the fire was small rather than it was a big fire? On Monday we heard that

Page 36

a possible cause of fire was a cigarette butt. So after you went through the pictures and you have looked at how the fire developed at the experiment, can we deduce whether the fire started big or small at Wang Cheong House?
IR PROF YUEN KWOK KIT: I want to approach this from a different perspective. When you start a fire, it always starts small. So you always go through the stage when the fire is small. When the fire is small and nothing combustible is nearby or nothing else is ignited, then the risk of the fire growing big is always smaller. But if the materials are there and the ignition continues, it's possible that other items were already ignited. It's like a baton pass, the ignition goes on, the fire moves on to other items. So a small fire, in the case of Wang Cheong House, could happen. So we have reason to think that when the fire was small, it already ignited other combustible items nearby.
We will have fire engineering experts from the Fire Services Department in a moment. When the fire started, barely anyone noticed. There were some droplets. At that point the fire was probably a small fire.
MR JASON YU: Chairman, maybe this is an appropriate time to take a break.
THE HON MR JUSTICE DAVID LOK: So we will take a 15-minute

Page 37

break.
(11.24 am)
(A short adjournment)
(11.40 am)
THE HON MR JUSTICE DAVID LOK: Mr Yu.
IR PROF YUEN KWOK KIT: Chairman, there was a question directed at me about the intensity of the fire I'd like to clarify. May I?
THE HON MR JUSTICE DAVID LOK: Please.
IR PROF YUEN KWOK KIT: 0.5 in the earliest report, the 0.5 was because we didn't put it into the light well for ignition. For the re-entrant area, for the same fire source, the fire would be larger.
MR JASON YU: So the focus is in January and February test and the April test, the source of fire would be the same whether it is big or small?
IR PROF YUEN KWOK KIT: Yes.
MR JASON YU: That's the point to clarify.
Yes. A moment ago we looked at the Sichuan test or the CFD simulation. There are certain limitations like the combustibles amount in the light well and also the height. Assuming that in Wang Fuk Court, all the factors being equal, the only difference is the nets or canvas being used, they are of FR properties.
In your evidence or in your test results, given this

Page 38

assumption, for the light well of Wang Cheong House, would it cause such a severe fire plume?
IR PROF YUEN KWOK KIT: According to my scientific analysis, the answer is no.
MR JASON YU: In your presentation, you said that the light well in Wang Cheong House, the small fire source, given the FR canvas and FR nets, they would self-extinguish. The fire would not spread and there would not be any knock-on effect as we saw in Wang Fuk Court?
IR PROF YUEN KWOK KIT: Simply put, yes. Self-extinguishing, it may take a while, it may burn for a while, and some materials might be ignited. But for the development, it would not be as severe.
THE HON MR JUSTICE DAVID LOK: Let me get this clear. We're no expert on this, but as someone who is non-trained, we understand that it may be the cigarette butt igniting some materials underneath. The first one who took the picture saw that the fire started from the platform.
IR PROF YUEN KWOK KIT: Right.
THE HON MR JUSTICE DAVID LOK: Would you call this small fire or large fire?
IR PROF YUEN KWOK KIT: In that situation it was too far away to be judged.
THE HON MR JUSTICE DAVID LOK: There was also much debris and there was a chimney effect, also the plume of fire.

Page 39

Let's focus on the safety nets. If we use FR nets, there are two things, it may be flying or drifting to other areas. But if we use the FR nets, can you say categorically how the fire plume would be developing?
IR PROF YUEN KWOK KIT: For FR nets, if they are used, they would significantly reduce the risk of spread because in our test, from the data analysis, we can see that there is no spread, it just gets burned. If there are no other factors, the FR nets would reduce the risk of fire plume happening.
THE HON MR JUSTICE DAVID LOK: I'm still none the wiser. There is the chimney effect, there is the wind blowing and there are other materials like bamboo there as well, and on the bamboo scaffolding there may be some debris. So even if the nets are compliant, they might still cause a fire plume?
IR PROF YUEN KWOK KIT: Well, it all depends on the way the nets are mounted. The nets are mounted vertically, it is a vertical screen. It is mounted on other materials, so in those circumstances it would facilitate the vertical spread of fire if this is non-FR materials.
Now, the safety nets are there to envelop the scaffold, so there are no other assumptions, so it is a vertical screen hanging down. Under these circumstances, if it is non-FR, from our test, from our

Page 40

data analysis, we know that it would certainly be spreading upward. So we have reason to believe that it would really cause a spread and cause the fire plume.
DR REX AUYEUNG PAK-KUEN: Professor, let me follow up on the question raised by the chairman. What we would like to ascertain is why the fire could spread or develop so rapidly. In your analysis, we heard it was the net, the foam board, the canvas. In your analysis, of all these materials, what caused the rapid spread of the fire? Can you identify the answer from your analysis?
IR PROF YUEN KWOK KIT: I think we have to be careful in making the distinction. We can see from our tests there are some more easily ignitable materials and they are ignited very easily, but the volume and the location of them would certainly make a difference.
Now, let's say the scaffolding netting, the canvas, they are of a large size, covering the scaffolding, so they would play a bigger role in the vertical spread of the fire. But once it spreads -- your question is why it spread so extensively. Because there are so many combustibles up there. The bamboo sticks, if they are stored in such huge quantity, if they are not ignited, they are no issue at all.
But if we are using the non-FR nets, they would cause spread of the fire and the combustibles would

Page 41

otherwise not be involved, like the bamboo sticks, wooden plants. There are many bamboo sticks and wooden planks. Once they are ignited, the HRR would be very high and the speed of spread would be very fast.

With such intense heat, the materials would be paralysed and with the paralysis it would emit the combustible gas, there would be exponential development as a result. I'm not sure whether I have made myself clear.

THE HON MR JUSTICE DAVID LOK: So from your analysis, non-FR nets, other than secondary ignition, that's an ember drifting, the shift the fire from one block to another block --

IR PROF YUEN KWOK KIT: Droplets as well.

THE HON MR JUSTICE DAVID LOK: Yes. So for non-FR nets, even if there is vertical spread causing a plume of fire, in Wang Cheong House this is a major factor causing the fire plume?

IR PROF YUEN KWOK KIT: Correct.

MR JASON YU: To facilitate the Committee, let's turn to the evidence in the bundle to back up this. Let's take a look at the Sichuan test.

Let me explain a little bit here before we do so. My understanding is that there was such a big fire because it ignited some materials like bamboo sticks.

Page 42

In your initial test, the bamboo sticks constitute 80 per cent of the heat.

IR PROF YUEN KWOK KIT: Yes, agreed.

MR JASON YU: So the question is how can it ignite the less ignitable materials like bamboo sticks; right?

IR PROF YUEN KWOK KIT: Yes.

MR JASON YU: We can see that for a small fire it ignites the bamboo sticks and emit the heat and cause the spread. That's your evidence.

IR PROF YUEN KWOK KIT: Yes.

MR JASON YU: Let's take a look at the test. ER2-2/1243. That's for the Committee's reference.

The key point of this page is about tests 11, 12 and 13.

IR PROF YUEN KWOK KIT: Right.

MR JASON YU: This is not written down here; you might wish to write this down. Test 11 used FR nets, FR canvas.

12, non-FR nets but FR canvas.

13, non-FR nets and non-FR canvas.

So you can see that the intensity of the fire would be different.

IR PROF YUEN KWOK KIT: If I may clarify. If you use the non-FR nets, to be more accurate, 12 and 13, they are the Wang Chi nets.

MR JASON YU: Yes. You would test the Wang Chi nets. There

Page 43

were a lot of droplets.

IR PROF YUEN KWOK KIT: Right. I cannot certify them to be non-FR, but I wouldn't object to you using this term. But I prefer the term "Wang Chi nets". That would be more accurate.

MR JASON YU: Yes. We saw the clip, the Wang Chi nets, in your test they were mounted and they burned really severely and they were completely consumed. We're talking about the Wang Chi nets there; right?

IR PROF YUEN KWOK KIT: Agree.

MR JASON YU: This bamboo, 11, 12 and 13, there is difference. Test 11, bamboo, about 35 megajoules, compared with 12, 291 -- further down, please. Non-FR canvas and nets, 8,720. If you compare 11 and 13, non-FR canvas and nets, the energy released, the extent was about 500 times. That's by way of reference.

They've also conducted a CFD simulation. That's the fourth case. Same bundle, page 1497. This diagram shows you the result of the fourth case. The HRR, they use FR nets. The professor has already explained that there are other combustibles there like bamboo, toe-board and wooden planks. This is FR nets, case 4, orange, nothing much burning. But if you use the Wang Chi net or non-FR net, there is exponential growth. So from this simulation we can verify what you said.

Page 44

IR PROF YUEN KWOK KIT: Yes, indeed.

MR JASON YU: I'm not sure whether the Committee has any other question on this particular subject?

THE HON MR CHAN KIN-POR: The FR nets certainly can prevent a spread from small to big fire. They started off using the FR nets but after one year of them being exposed to the elements, the properties became worse. Do you have any data or any particular advice as to how often they should replace the nets? So there is a decay process, there are many factors, the length they stay up there would make a difference, and typhoon and so on. Are there any recommendations? They may keep them up for the whole time and it would be very dangerous in the process. Any recommendations for replacement?

IR PROF YUEN KWOK KIT: Thank you very much for the question. As a scholar, I would be rather conservative. I don't have the data, I don't pretend to have an answer there, but this is something that should be considered. We cannot rule out the possibility that if they keep them up for some time, they're exposed to the elements and the FR properties might take a turn for the worse.

Now, in Sichuan Province we did use the uncertified nets, and after thermal deterioration, the properties worsened. But I dare not use this kind of data to extrapolate that to a work scene and make some

Page 45

recommendations, I beg your pardon.
THE HON MR CHAN KIN-POR: But commonsensically, there are problems. Is this something worth looking at?
IR PROF YUEN KWOK KIT: Yes, indeed.
MR JASON YU: My next question might provide an answer to the member's question.
We're talking about recommendation and how we are going to be dealing with that. We do have the IC expert, ER3/2252, 7.3.1, point (b). FR and non-FR properties, we rely on the test. Like the member said, there may be deterioration, there may be decay. Tomorrow we're going to be having experts testifying here for building maintenance and renovation works. In the re-entrant area, we should stop using the combustible materials.
So on that recommendation, what's your take on this?
IR PROF YUEN KWOK KIT: On this recommendation, I think in principle it is sound, but the question is we have to look into this in greater depth because if you use FR materials, they may deteriorate, so how do we go about monitoring them?
MR JASON YU: Right. Here, combustible materials, this is the wording used here. Even for FR materials, they are combustible so they are suggesting that no combustible materials be used and that's the safest course of

Page 46

action?
IR PROF YUEN KWOK KIT: That's an ideal situation.
THE HON MR CHAN KIN-POR: So no combustible materials, you would be adding to the costs. It may not be feasible.
MR JASON YU: So I should put this to you, Professor.
IR PROF YUEN KWOK KIT: In principle, it is fine by me, but in practice I'm not sure how this can be implemented.
THE HON MR JUSTICE DAVID LOK: I think we can say this. This is a matter of risk management. We are sure that the re-entrant area is pretty risky. It might cause a raging fire, so the building materials, how long should they be there, I think we can make recommendation. But any recommendation would involve the interests of the trade, the construction cost might be a matter -- maybe we use space materials and so on; it may not be practical. So we may recommend certain direction. We have to be alive to the risk and we have to take follow-up action to follow up on this.
MR JASON YU: Maybe I will ask in a different way. Are there materials that are not combustible, ones that can be used to replace the materials used as safety nets on the facade?
IR PROF YUEN KWOK KIT: I think it's a matter of risk management, as the chairman put it. Of course we would like to minimise the risk, but driving it down you all

Page 47

the way to zero comes with a huge cost. I fully agree that is a matter of risk management.
Back to your question. It is also relevant to risk management. If the materials used have FR properties that can be controlled or sustained, of course the risk will be reduced. I think it's something that's worth exploring.
You just asked whether there are materials with higher FR properties. In terms of materials science, technology develops rapidly. We can look into the technological developments and possibly use the products.
MR JASON YU: Now I will explore another area, fire-rated windows as well as access openings. Please go to ER2-2, a different bundle, page 1423. On the rightmost column, it talks about tests 7 to 13 at Sichuan. You have tested different windows at staircases. 9 to 13 says "Fire-resistant glass".
IR PROF YUEN KWOK KIT: Yes.
MR JASON YU: I understand there are different types of fire-resistant glass with different ratings. The glass windows used in the experiment, is it the same, of the same specification as those used in Wang Fuk Court?
IR PROF YUEN KWOK KIT: In short, yes, we procure the fire-resistant glass from the mainland. We follow the

Page 48

same specifications as those that are used to replace the windows at Wang Fuk Court. That means they are fire-resistant compliant.
MR JASON YU: So within the trade, it talks about 60-minute resistance?
IR PROF YUEN KWOK KIT: Yes.
MR JASON YU: In terms of access openings you use wooden panels as well as aluminium composite panels?
IR PROF YUEN KWOK KIT: Right.
MR JASON YU: Just now we heard that the fire at the re-entrant was fierce, reaching 1,000 degrees Celsius. With fire-resistant glass, the temperature is greatly lowered to just about 50 degrees Celsius.
IR PROF YUEN KWOK KIT: Right.
MR JASON YU: If the access openings are replaced with aluminium composite panels and wooden panels, that will render the staircases untenable?
IR PROF YUEN KWOK KIT: Yes. The wooden panels and the aluminium composite panels have been burned through.
MR JASON YU: So smoke will enter?
IR PROF YUEN KWOK KIT: Yes. We followed the same design and installation as Wang Cheong House. There were gaps. At the very initial stage, smoke went in through the gaps. So in addition to that there is also heat, when the materials were burned through there would be a large

Page 49

amount of heat going in.
THE HON MR JUSTICE DAVID LOK: This will affect the severity of the fire as well as evacuation?
IR PROF YUEN KWOK KIT: The temperature will be raised to a point where evacuation via this route is not possible.
MR JASON YU: You said that basically it's as high as 600 degrees Celsius.
IR PROF YUEN KWOK KIT: Yes. With access openings.
MR JASON YU: In your CFD simulation you arrived at a similar conclusion, ER2-2/1499. These are the paragraphs; right?
IR PROF YUEN KWOK KIT: Yes.
MR JASON YU: Let's go all the way to page 1501. There is a detailed analysis on how smoke and fire penetrate the staircase. Let's look at the table here. Table 3 on page 1501, I understand that this is the situation with access openings.
IR PROF YUEN KWOK KIT: Right.
MR JASON YU: So one every five floors. You see the time to 10-metre visibility.
IR PROF YUEN KWOK KIT: Right.
MR JASON YU: This is the tenability, that is, whether it is safe to use the staircase. One of the indicators is temperature, the other is time to visibility; right?
IR PROF YUEN KWOK KIT: Yes.

Page 50

MR JASON YU: In about 60 to 70 seconds, the visibility has greatly dropped to a lower level.
IR PROF YUEN KWOK KIT: Right.
MR JASON YU: With the use of fire-resistant glass, let's go to page 1500. At the bottom; maybe a bit higher up. Here. Paragraph 1. If fire-resistant glass is used, then it will last -- well, up to 200 seconds there is no smoke at the staircase. You just used a simulation and let it run to 200 or it is smoke-free the whole course?
IR PROF YUEN KWOK KIT: I think under the simulation we stop at about 200 or 300 seconds because by that time the fire has reached to the top. The glass was not burned through.
MR JASON YU: So even if you keep running the simulation, windows would still remain intact?
IR PROF YUEN KWOK KIT: Right.
MR JASON YU: So whether it is CFD or the Sichuan experiment, the view of the task force is that creating access openings at staircases is extremely dangerous and it also undermines the tenability of the means of escape. Let's look at ER3/2254 under (h). The recommendation is that when it comes to staircase and lift lobbies, if windows face re-entrants, there should be fire-rated glazing installed. Do you agree with this recommendation?

Page 51

IR PROF YUEN KWOK KIT: Based on our observation and the analysis, I agree with this.
MR JASON YU: Lastly, do you have any other information or any recommendation for the Committee?
IR PROF YUEN KWOK KIT: There's something that I've already replied to. In the design of buildings, fire safety design and work lasting for quite some time, risk assessment is very important. However, when it comes to details, I believe we need more analysis and research. In the area of risk assessment, I think it's something that should be incorporated into monitoring, design and execution of work so that the parties will be alive to the risks in order to prevent incidents. It is something that should be included. As to how, I will leave it to the relevant parties.
MR JASON YU: We heard what you said, but we still would like to see if you can help us, especially when it comes to risk management of nets. You know that there is renovation work going on all over the world. Do you know if there is any other materials that can be used, materials that are less combustible?
IR PROF YUEN KWOK KIT: There is an obvious answer. When it comes to temporary scaffolding for building maintenance and renovation, the use of temporary scaffolding is common. Very often they use metal scaffolding. I have

Page 52

an open mind. But if metal scaffolding used, you will still need to see if there are other risks. Anyway, risk assessment should be incorporated.
MR JASON YU: I was talking about nets, not scaffolding.
IR PROF YUEN KWOK KIT: Oh. Well, yes, there are requirements when it comes to nets. FR materials should be used.
MR JASON YU: I don't have any other questions.
THE HON MR JUSTICE DAVID LOK: Other parties? No other questions.
Mr Suen.
Examination by MR JENKIN SUEN
MR JENKIN SUEN: I have some supplementary questions for clarification.
Professor, just now the chairman talked to you about the CFD. There are different cases. One is case 4. Let me take you to the relevant page, ER2-2/1497. Mr Yu took you to this figure. There are three cases and then in case 4 FR nets is used. The line in orange, we can see that it doesn't really burn and not much heat was released, but there are also other cases. Case 5, non-FR net is used. It's a purplish line. A lot of heat or energy was released.
IR PROF YUEN KWOK KIT: Yes.
MR JENKIN SUEN: There is also case 6, the use of Wang Chi

Page 53

net. The performance is very similar to non-FR nets.
IR PROF YUEN KWOK KIT: Right.
MR JENKIN SUEN: The chairperson also asked a question. In terms of case 4, did you only look at the performance of the nets? You said no. You said there were other materials.
We can see from your report, that is page 1486, paragraph 2.4, material used in the model. We can see that under "Material Properties in the Model" there are nets, foam boards, toe-boards and wooden planks. So you use materials that could be found at Wang Fuk Court to do the simulation?
IR PROF YUEN KWOK KIT: Right.
MR JENKIN SUEN: My last question: fire-resistant glass. Please refer to the final report of the task force, ER1/108. There is a footnote. 7.2.3.21, there is a toe-board, aluminium composite panels and fire-rated glass window. Under note 97, it says:
"Class B fire-rated glass windows with 60 mins fire resistance ..."
This is the one used in the Sichuan experiment?
IR PROF YUEN KWOK KIT: Yes.
MR JENKIN SUEN: The next page, page 109. Let's look at footnote 100. It's in relation to Wang Fuk Court. The information submitted by the authorised person, that is

Page 54

plans and information, when they were submitted to ICU, the newly installed materials also have the same specification, that is 60 minutes, the same as the one used in the Sichuan experiment?
IR PROF YUEN KWOK KIT: Right.
MR JENKIN SUEN: Thank you for the clarification. I don't have any other questions.
THE HON MR JUSTICE DAVID LOK: Any re-examination?
MR JASON YU: No.
THE HON MR JUSTICE DAVID LOK: Thank you, Prof Yuen.
(The witness was released)
(12.15 pm)
MR VICTOR DAWES: Chairman, members, before we call the next witness, to help the public to better understand our discussion, I'd like to clarify a few points.
The recommendation of the legal team is that there will be studies in the future to see what can be done. It's not just an across-the-board requirement of using non-combustible material. The design of the light well, the height of the building all have a part to play. There may be supplement from our experts. That's something I'd like to say. We will have further information from tomorrow.
THE HON MR JUSTICE DAVID LOK: I can say that the recommendation of the Committee should not detach too

Page 55

much from reality. We don't want it to be too ideal, costing projects more than $330 million. We want to draw the attention of everyone to the risks that have been neglected in the past. We want to make use of the open hearing, the public hearing to draw focus on these issues. We will not rigidly make classified recommendations because that would be done at the risk of making unrealistic recommendations.
I can say that the approach of the Committee is something along the same line. Every site is different.
MR VICTOR DAWES: The conditions of every site should be considered.
THE HON MR JUSTICE DAVID LOK: Yes. I think that's the direction of the reform. The hearing has highlighted some issues that have been neglected in the past. The incident has cost many lives. There has been ongoing works, but this time, tragically and unfortunately, it has cost lives and we fully understand that we need to address the risk.
MR VICTOR DAWES: The next witness is Dr To Chi Wing.
Dr To, as with other witnesses, please read out the declaration.
(12.18 pm)
IR DR TO CHI WING (affirmed)
Examination by MR VICTOR DAWES

Page 56

MR VICTOR DAWES: Thank you. Please have a seat.
Dr To, you joined the Fire Services Department in 2004 and then in December 2024 you became the Divisional Commander (Airport).
IR DR TO CHI WING: Correct.
MR VICTOR DAWES: After you joined the FSD you pursued a bachelors, masters and doctorate degree in fire engineering?
IR DR TO CHI WING: Correct.
MR VICTOR DAWES: At the Inter-departmental Fire Investigation Task Force you served as the secretary?
IR TO CHI WING: Correct.
MR VICTOR DAWES: Can you tell us, in the investigation and preparing the report, what your duties are?
IR DR TO CHI WING: For this report I assisted departments with talking to each other, I assisted Prof Yuen in running the tests and also writing the final report.
MR VICTOR DAWES: You also submitted a witness statement to the Committee; that's WS1/19. I believe you will confirm that the content therein is accurate?
IR TO CHI WING: Yes, I do.
MR VICTOR DAWES: You will tell us about the final report with the focus on chapters 6 and 8. Those two chapters have to do with the validation of the hypothesis, how the fire spread to the unit, the secondary ignition and

Page 57

the modelling about the fire development. You have also prepared slides, so now I give the floor to you so you can take us through the material.

IR DR TO CHI WING: Chairman, members, for the spread of the fire at the Wang Fuk Court fire, we looked at three kinds of spread. First, vertical spread along the re-entrant, so that is covered in detail in the report. I want to focus on how the fire went from an external fire to the units and also the secondary ignition.

For the Wang Fuk Court fire, more than 560 units were seriously damaged. More than 90 per cent of such units were on both sides of the fire plume. We believe the spread of the fire had to do with the plume.

When we gathered evidence on site and when we investigated, on both sides of the fire plume, the areas closer to the plume were more seriously damaged. Take Wang Yan House, between flats 02 and 03, in the re-entrant there was a fire plume. And then kitchen of flat 02 and in the living room, the damage was more serious. For flat 03, in the kitchen and the toilet, the damage was more serious.

Our observation also accords with what people have told us in their statements and the professor's research. The smoke and the heat entered the flat through the open or damaged windows and the exhaust fan.

Page 58

The fire was so serious that it could break the windows and it could ignite the items in the units through radiant heat.

From the news footage we can also see that after the plume was there for Wang Tao House, fire came out from the unit and the fire went to previously unaffected parts of the scaffolding.

Our investigation also revealed other forms of spread in locations other than the re-entrant. So there were other openings, such as the place for the air-conditioner. This is how the fire also spread. But in this case, there were no other combustibles or flammable items nearby, so the fire did not develop further.

Aside from the exterior wall, after the fire plume occurred, the fire entered the unit, the fire grew, it burned down the door of the unit and the door of the unit nearby; the fire entered the unit through different means. Different kinds of spread could co-exist, but most importantly it came down to the plume in the re-entrant.

There were 12 plumes. 11 occurred in the first two hours. Our conservative estimate, more than 470 units were affected. For the first six fire plumes, they were only 30 minutes apart. We estimate that

Page 59

within the 30-minute window, the fire entered more than 300 units.

Now secondary ignition, the professor has explained this. The experiment showed that for the uncertified net and the non-FR net and the net from Wang Chi House, there were instances of secondary ignition. This means the smaller fires spread along the net and there were also flame drops. When the smaller fires and the drops reached, say, something like the bamboo, then the fire spread further to the toe-boards and wooden planks.

In the Wang Fuk Court fire, the secondary ignition was more complex. Apart from drops, there were also flying embers and also falling debris. In terms of the flaming droplets -- so this is the footage from the person reporting the fire. So there were droplets at that point. From what the professor provided, we can also see similar things happening.

(Video played)

You can see there were droplets. In the experiment there were also droplets. The Government chemist's report shows that for net, foam boards, toe-boards and panels, droplets happened. The Sichuan experiment also shows the droplets can ignite combustible items.

On the wind-carried embers, from the CCTV footage of Wang Tai House on the roof, when the fire plume emerged

Page 60

at Wang Cheong House, there were flying embers drifting towards the building. News footage shows the fire plume was intense at Wang Cheong House. Lighter embers could be carried above the rooftops and those embers drifted to somewhere far away, such at Wang Tai House.

The first fire plume went out, and then at around 3.03 pm, the second fire plume emerged.

By 3.05 pm, on the rooftop of Wang Tai House, there were flying embers. We believe the fire plumes helped carry these embers. It was windy at that point, so the embers could drift to somewhere far away.

Embers at height, apart -- at the mid-levels, the professor also performed a computer simulation. The simulation results are in accordance with our frontline observations. When the second fire plume emerged at Wang Cheong House, at the black circle our officers also spotted ignition.

Moving on from flying embers, now I want to talk about the debris. This is Wang Sun House. The fire was intense. Miscellaneous items fell off. Some such objects bounced off to another building and you can see the white smoke.

This is the re-entrant of Wang Cheong House. The fire was intense. Bamboo sticks caught fire and fell off.

Page 61

Next to it, east re-entrant of Wang Cheong House, we saw burned construction materials. This is where the burned bamboo sticks fell off to and blocked the exit. Our hypothesis also accords with the statement from witnesses.

Now, we have covered the source of heat. We now turn to the combustibles. There were a huge amount of combustibles, construction materials on the ground. On the scaffolding there was also construction waste. Workers were putting on the mosaic tiles and there were strips of paper torn off during the process. There was also a scaffolding, there were toe-boards, wooden planks, canvas, nylon strips. For canvas and safety nets, as Dr Lee, from the Government chemist, told us on Monday, the Buildings Department has requirements on the fire retardancy properties. But in Dr Lee's report we also learned that the canvas found on site had poor FR properties.

Tests 12 and 13 from Prof Yuen also show the canvas played a crucial role in the fire. We can find the canvas from the catch fans. Also on the working platform on the 1st floor of each building we could find the canvas. On the scene, canvas was also used to cover the construction materials on ground level.

Now I will turn to the three modes of fire spread

Page 62

and how they interacted with each other.

The fire spread vertically rapidly across 31 storeys. The fire was so serious that it broke windows and it spread into different units. When the units caught fire, other previously unaffected parts of the scaffolding were also affected. The fire also carried embers to great height and then the embers drifted to other parts because of the wind, and that spread the fire.

It was also a windy and dry day. When the fire came into contact with suitable combustibles, secondary ignition happened. When the secondary ignition happened, in the re-entrant a second fire was started.

For this fire, there were 12 fires, the first one at Wang Cheong House. The source of the fire was a cigarette, but for the other fires, we believe there were flame droplets or burning debris. Those were smaller sources of fire, so how did the smaller fires grow big?

There were two factors. First, the presence of suitable combustibles on site. The smaller fires could not ignite everything. If the fire came into contact with a wooden plank or a bamboo stick, the fire could not start. But if there was suitable combustible items, say cardboard or other forms of paper, the fire could

Page 63

grow.

There was a question from the chairman, how do we tell what's a big fire and what's a small fire? To give you an idea of this, during Prof Yuen's experiment, the wooden sticks we used were 184 kilograms. To create a big fire, we would need 184 kilograms of combustibles on the platform to start a big fire. From what we saw on site, on the rooftop there wasn't such a huge amount of combustible items.

So when a small fire comes into contact with the combustibles on the rooftop, what would happen would probably look more like the small fire scenario mentioned by Prof Yuen. If the net had FR properties and if the canvas had FR properties, the fire could have been prevented.

To summarise, there was a red fire warning system and it was a dry day. If a fire started, it could spread quickly. In the re-entrant, when there was an ignition source and it came into contact with suitable combustibles, the fire could grow bigger. On site, when there were non-fire-retardant nets and canvas, the fire could spread further and lead to a bigger fire.

The fire could spread into units and the affect the previously unaffected parts of the scaffolding. When the scaffolding burned embers and burning debris

Page 64

emerged, the fire could carry embers and debris on fire to spread. When the fire came into contact with combustible items, secondary ignition could happen or they could also ignite combustibles on the ground and then we got secondary ignition.

With secondary ignition came further droplets and embers. This becomes a self-reinforcing cycle. We also saw instances of secondary ignition and spreading of fire into the unit. When the sources of fire drifted to the re-entrant and then suitable combustibles were available and the net and canvas lacked FR properties, the fire got out of hand and then the second fire started.

That's my presentation.

MR VICTOR DAWES: Thank you, Dr To, for your presentation. It was very clear.

Can you assist us with a few aspects. First, we touched upon the cause of the fire. All evidence points to smoking, and this accords with your statement. Can you explain the reason behind ruling out other causes? We have ruled out the leakage of liquefied petroleum gas, we looked at some materials, but can you explain to the public, because the public did not have the benefit of being able to read your report, how did you rule out LPG?

Page 65

IR DR TO CHI WING: We got officers from the EMSD on the task force. They looked into the cause of the fire. They looked at the use of LPG. There was no spike in LPG usage before the fire. There was a pipe for LPG. When there is heat, there should be leakage.

At the re-entrant of Wang Cheong House, there was an LPG pipe. The EMSD made an estimate about the LPG level but they realised that the heat released from the LPG was way lower than the fire. And then after the site investigation, they ruled out the leakage of LPG as a cause of fire.

MR VICTOR DAWES: Just to clarify, they looked at the usage level, there was no leakage. When there is leakage, the usage level should go up?

IR DR TO CHI WING: Correct, there should have been a spike.

MR VICTOR DAWES: If there was a leakage of the LPG, the situation would have been different. Can you explain further?

IR DR TO CHI WING: When there's an LPG leak, we have to look at where the leakage happens. LPG is heavier than air. It should stay at a lower level. But in this case, the fire burned from the bottom up and the fire spread rapidly. So the EMSD concluded that LPG leakage was not the cause. We looked at the location of the pipe and where the fire started. There were only three

Page 66

instances of overlapping. For the other nine cases there were no LPG pipes. So we saw no correlation between the fire and LPG.

MR VICTOR DAWES: At the re-entrant, we looked at how the fire spread. The fire spread in a similar way whether there was an LPG pipe or not, so that's why you ruled out LPG leakage?

IR DR TO CHI WING: Correct.

MR VICTOR DAWES: You also ruled out short-circuiting of electrical appliances. We understand that often a fire starts because of short-circuiting of appliances.

IR DR TO CHI WING: Right.

MR VICTOR DAWES: Can you tell us more about this?

IR DR TO CHI WING: The EMSD entered units 104 and 105 for an inspection. They did not find signs of short-circuiting of appliances. The Government chemist's report shows that when they look at the damage on site, the fire started at the re-entrant and then the fire entered the flat. So we believe the fire had nothing to do with the appliances in units 104 and 105.

MR VICTOR DAWES: You also ruled out another factor, and that is welding. On work sites, welding often happens. Your conclusion, based on the site conditions was that you did not find any sign of welding.

IR DR TO CHI WING: Correct.

Page 67

MR VICTOR DAWES: So you ruled that out?

IR DR TO CHI WING: Correct.

MR VICTOR DAWES: You also mentioned spontaneous combustion. Can you explain to us what this is and why we also ruled this out?

IR DR TO CHI WING: Spontaneous ignition happens when you put something in the air and the room temperature is enough to ignite the item. We could not find any such item on scene so we ruled out this cause.

MR VICTOR DAWES: The task force also concluded that it was a weak source of fire so arson was ruled out.

IR DR TO CHI WING: Right.

MR VICTOR DAWES: So the fire was more likely to be accidental. So can you tell us why you ruled out arson?

IR DR TO CHI WING: As the Government chemist explained yesterday, arson would involve accelerant and the liquid would be left on the concrete so there would be a lot of damage on the concrete, but that didn't happen.

MR VICTOR DAWES: Let me turn now to the development of the fire. In your presentation you touched on this briefly. In your report you analysed the seven blocks and the damage to the different units and examined the spread of the fire. In the re-entrant area you analysed the combustibles. For the seven re-entrant areas, the combustibles are pretty similar. Any particular

Page 68

difference?

IR DR TO CHI WING: The combustibles are mainly bamboo scaffolding, wooden plank, toe-board and so on.

MR VICTOR DAWES: Let me clarify. 12 re-entrants in seven blocks and the 12 re-entrant areas, this has to do with the fire, in your evidence, you mentioned 92 per cent of the units that were seriously damaged are actually near the re-entrant areas.

IR DR TO CHI WING: Yes.

MR VICTOR DAWES: Please explain to us, for the fire to move on from the re-entrant to the unit, that is a lateral development?

IR DR TO CHI WING: Yes.

MR VICTOR DAWES: You've also analysed the timing. We can see that for the 11 fire re-entrants, within a matter of two hours they have completely been consumed.

IR DR TO CHI WING: Yes.

MR VICTOR DAWES: Can you explain to us, please, for the fire to move from the re-entrant to the units, they have to burn through the glass and the glass would break and the fire and the smoke would be penetrating into the units. Can you supplement the situation for us, please? You might wish to use one of the PowerPoints there.

Perhaps let me guide you in detail. One of the sayings is the foam board would also play a role. You

Page 69

might wish to elaborate on this.
IR DR TO CHI WING: For the foam boards, they play a certain role. The foam boards are combustible materials. They are put on the windows. In some cases, in our test we find that after the fire the foam boards might fall on to the scaffolding. When the foam boards are ignited, then that would cause fire and that would cause the breakage of the windows.
Other than these, if the foam boards are ignited, they are lighter, and they would also cause the spread of the fire.
MR VICTOR DAWES: Are there any of the two scenarios -- you said that foam boards are attached to the windows, they are taped onto the windows, they become detached easily. When they are drifting away, they would be getting in touch with other windows and they would break the windows because of the fire. There is some evidence from the residents that the foam boards remained attached and they remained alight and they would contribute to the breaking of the windows and the smoke would be penetrating. There is such a possibility?
IR DR TO CHI WING: Yes. In our report we did mention this as well.
MR VICTOR DAWES: Also, as the fire spread, perhaps you can assist us here, the fire spread to the units, and

Page 70

indoors the fire spread from one place to another, you mentioned briefly. Can you elaborate on this? What's your observation there?
IR DR TO CHI WING: We have examined the exhibits. There are some units where the scaffolding still exists, not burnt, but the units the fire spread into them, the doors were burned down and the smoke doors were also burned down. So in these circumstances, the fire didn't spread from outside in, but the fire actually spread from one unit to another unit by way of the corridor.
MR VICTOR DAWES: On that score, you saw the internal spread. Are there any particular patterns that you can tell us?
IR DR TO CHI WING: It is rather difficult there because, to determine the internal spread, we have to make sure that the scaffolding is intact. The scaffoldings are really seriously affected. We have to find the unit which is alight, and if the scaffolding remains intact, it is difficult. We spent quite a lot of time identifying this.
MR VICTOR DAWES: Our observation, which I'm sure you would agree, is that there are many scaffolding burnt down, and in gathering evidence, some scaffolding fell down because of the fire and that affected your collection of evidence?

Page 71

IR DR TO CHI WING: Yes.
MR VICTOR DAWES: And also, if you may assist here, secondary ignition. We understand that in this fire disaster, we see from clips that because of the combustibles, the fire spread from one block to another. It is like a chain reaction spreading from one block to another. There are so many blocks with scaffolding up at the same time with all the combustibles. Do you think you would agree with this?
IR DR TO CHI WING: If the blocks are not carrying out the work at the same time, the situation might have been better, and I think there is room for further study. For scaffolding nets, for instance, the FR properties are in doubt. If we have FR nets, would it have been better? This is something we should look at.
THE HON MR JUSTICE DAVID LOK: If the nets are compliant, the after-flame would be no more than four seconds. If the source of fire is removed, it would be self-extinguishing. If it drifts to other places, say from Wang Cheong, they used compliant nets, Wang Tai would be safe.
IR DR TO CHI WING: As we said, the embers drifting, they are small sources of fire. If they drift to other places, they lose their heat, they would be self-extinguishing, they would not be igniting anything.

Page 72

THE HON MR JUSTICE DAVID LOK: Yes. Even if they drift elsewhere, they would be self-extinguishing in a couple of seconds.
IR DR TO CHI WING: Right.
THE HON MR JUSTICE DAVID LOK: So if they use compliant nets, Wang Tai would have been safe?
IR DR TO CHI WING: Yes, there is a possibility there.
MR VICTOR DAWES: Chairman, I've got no other questions.
THE HON MR JUSTICE DAVID LOK: Other involved parties, any questions?
Mr Suen.
Examination by MR JENKIN SUEN
MR JENKIN SUEN: Just one question to follow up.
Dr To, let's turn back to the PowerPoint, page 5. Mr Dawes asked about many factors that caused the windows to be breaking. One of the reasons is the foam boards. Other than the foam board here, we're looking at Wang Yan House, in the re-entrant units 2 and 3, between them there is the re-entrant area. The area shaded red show the broken windows.
From your understanding, the windows broke here, kitchen windows, toilet windows. Unit 02, the living room window facing the re-entrant, the windows broke. Even without the foam boards, if there is a plume of fire, would that also cause the breaking of the windows?

Page 73

IR DR TO CHI WING: Yes. In the professor's test, because of intense heat of the fire plume, even without the foam board, the windows are also liable to break.
MR JENKIN SUEN: Thank you very much. I've got no other questions.
MR VICTOR DAWES: One more point for clarification. Can I say this, to facilitate public understanding. So if there is intense heat, as a matter of temperature, the windows will be breaking?
IR DR TO CHI WING: Right.
MR VICTOR DAWES: No other questions.
THE HON MR JUSTICE DAVID LOK: Thank you very much, Dr To.
(The witness was released)
(12.51 pm)
THE HON MR JUSTICE DAVID LOK: We still have one more witness. We continue in the afternoon. We resume at 2.15.
(12.51 pm)
(The luncheon adjournment)
(2.15 pm)
MR VICTOR DAWES: Chairman, the next witness is Mr Yiu Men Yeung.
Good afternoon, Mr Yiu. Just like other witnesses, please read the declaration before you.
(2.15 pm)

Page 74

MR YIU MEN YEUNG (affirmed)
Examination by MR VICTOR DAWES
MR VICTOR DAWES: Thank you. Please be seated. Mr Yiu, we know that you joined the Fire Services Department in 1998. In March last year you became the Assistant Director of New Territories South.
MR YIU MEN YEUNG: Right.
MR VICTOR DAWES: You're also the head of the Inter-departmental Fire Investigation Task Force.
MR YIU MEN YEUNG: Right.
MR VICTOR DAWES: You submitted four witness statements to the Committee. You can confirm the content of the four witness statements to be true and correct?
MR YIU MEN YEUNG: Right.
MR VICTOR DAWES: You are here to take us over chapters 9 and 10 of the task force report, that is in relation to the cause of the mass casualty as well as another issue. I'll give the floor to you.
MR YIU MEN YEUNG: Chairman, members, I'm here to take you through the analysis of the number of fatalities injuries caused by the fire. I will also talk about the reasons leading to heavy casualties of the case as well as conclusions.
First, 168 lives were perished in the fire. 149 of them were residents, seven workers, 10 domestic helpers,

Page 75

one visitor and, tragically, 1 firefighter. Of the 168 casualties, over 90 per cent of them were found in Wang Cheong House and Wang Tai House. There are different locations where the deceased were found. In Wang Cheong House, most of them were found inside the flats. About 24 per cent of them were found in common areas. In Wang Tai House, half of the fatalities were found in common areas.
We have conducted an analysis. The result shows that at Wang Cheong House, the light well where the fire started led directly to two staircases. The access openings opened every five floors were breached at a very early stage by fire and heat or fire. So residents, when they tried to evacuate, entered the staircases, found that they could not use the staircase to evacuate. They would return back to their units to seek shelter.
At Wang Tai House, at the start of the fire, the fire plume was found at the light well adjacent to windows. So when residents came out, even though there was smoke, they could still go through a staircase that was not yet affected. However, when they went a few floors down, they would have to race against time with the fire plume. They also had to evacuate very quickly and make sure that they were able to overcome the

Page 76

obstacles accumulated at the exit, so most of the casualties at Wang Tai House were found in the common area.
Now, for Wang Cheong House, Wang Tai House and Wang Sun House, the damage from the fire was comparable but the casualties were fewer in Wang Sun House. That's because for Wang Cheong and Wang Tai, the fire started in those two blocks first, people there had less time to evacuate.
For Wang Sun House, the fire started at roughly 3.25 pm. When the first fire plume emerged, when the fire spread, that was 4.01 pm. That means the residents at Wang Sun House had an hour or so to learn about the fire. That may be because of the arriving fire engines, the blare was on so the residents were alerted by the arrival of more and more fire engines, and then maybe their family members told them about the fire of their block. So those residents in Wang Sun House had an hour or so to escape.
Now, injuries. There were 79 injuries. 45 people were found inside units. Four were found in staircases, three in the corridor, four on the rooftop. Three were found outside the building. Three were in Kwong Fuk Estate. We believe they inhaled the smoke from the fire. So those Kwong Fuk Estate residents had to be

Page 77

hospitalised. And then 13 firefighters were injured. Four members of the public went to hospital on their own.

So many lives were lost. The task force narrowed down the observations to five points. First, the fire spread rapidly. Second, because of the access openings, the staircases were modified, objects were falling, bamboo sticks are falling, exits were blocked and also the fire alarms were shut down. And then foam boards were used to cover the windows.

This has been said many times: the fire spread rapidly. Just how fast? We can watch the clip.

(Video played)

On the top right-hand corner there's a clock. At roughly 4.11 pm, this is Wang Tao House. We don't see the fire just yet. On the lower floors, maybe 2nd or 3rd floor we see the fire.

Now 4.11 pm, the fire spread rapidly. In 20 seconds' time, the fire spread to the 31st floor.

The next factor, illegal modification in the staircase to create access openings to make it easier for workers to get in and get out. So we see here Wang Cheong House, Wang Tai House and Wang Sun House, we took pictures at these three blocks of the access openings. Let's look at the ceiling and the wall.

Page 78

The smoke rose. There is a common feature to these three blocks. Look at the upper part. Look at the ceiling. It's black. As I said, the smoke rose. So this picture shows when the smoke entered the corridor, it entered via the access opening. When you look at the wall below the access opening, the wall looks white. For Wang Sun House, it's a more extreme case. Even the concrete fell. That means, aside from the smoke, the heat also entered the staircase. Residents living on upper storeys could not take the staircase as a means of escape.

We can now look at other cases where no access openings were created. In these cases, the glass was intact. We just heard from another witness this morning telling us about the fire-rated or fire-resistant glass. You can look at these windows. These windows were broken, they were broken by firefighters. We can tell that's the case because if there was fire and smoke outside and if these windows were damaged by fire, the area around the window would be black.

So when did we break the windows, we could tell the fire was out. There was no fire, no smoke outside. There was smoke trapped inside. We wanted the smoke to dissipate, so firefighters broke the windows. There was no smoke outside coming inside, so there is no charred

Page 79

wall in the area above the window.

Now, blocked exits. The fire went up. When it grew and it spread vertically, first it destroyed the nylon strips such that the other objects such as canvas and bamboo sticks fell and blocked the exit.

(Video played)

This is the front entrance of Wang Tai House so this is the CCTV footage. The last gentleman managed to escape and then the situation worsened quickly.

Let's look at the metal gate. Outside the gate the fire was getting more intense and then the embers were drifting. The smoke was also getting heavier. Bigger embers could be seen. In just over a minute's time the situation worsened dramatically. Bamboo sticks fell, the fire getting more intense. At this moment, even if residents made it to the ground floor at this point, they would no longer be able to leave the building. For this reason, firefighters faced a daunting challenge, trying to enter the building to put out the fire.

Now the shutdown of fire alarms. When the fire started and people learned about the fire, those people could not activate the fire alarm for others to evacuate. Then the covering of windows with foam boards. As we've heard, foam boards accelerated the fire spread. The foam boards also prevented residents

Page 80

from seeing what's going on elsewhere, so people in Wang Tai House couldn't see the fire in Wang Cheong House. They couldn't see the flying embers drifting toward their own building, so that delayed the awareness of fire and that affected their escape.

Now, I want to turn to this RSET and ASET model, RSET being required safe egress time and ASET being available safe egress time.

When Wang Fuk Court was designed, this model was not taken into account. Back then it was about the functional design, the building was designed such that residents would escape. We can look at the bottom first.

If a fire starts, first there is the smouldering that is barely visible, and then the fire grows and then the fire becomes fully developed such that it endangers the occupants. If the person can escape before the fire is fully developed, meaning this person is endangered, we consider that acceptable from a fire safety perspective.

For the occupiers, they may not take notice when the fire starts, so there will be a detection time. When the people learn about the fire, they also have to take the time to determine whether to leave, they have to find out what's going on, and then they start the

Page 81

evacuation.

When do people get to safety? They start the evacuation and then they take a protected corridor or staircase and this corridor or staircase takes the people to a safe place, that's what we mean by a person reaching a place of safety. So we incorporate a safety margin.

I mentioned five factors leading to the heavy casualties. I want to illustrate the five reasons with reference to this framework. Now, we cannot tell how each part, each stage of the process affects the time needed so I can only offer an estimate.

The fire spread rapidly in this case. The fire started on the rooftop outside flats 104 and 105 in a re-entrant. Miscellaneous items piled up in the area, there was non-fire-retardant nets/canvas. The re-entrant faces the east, meaning it's the windward side and that led to the rapid spread of the fire.

When the fire became fully developed, residents had very little time to escape. Now, what do you mean by "safety"? Normally when someone gets into the means of escape, meaning the staircase, they should be safe because the staircase should be protected. It should offer protection and people should be able to leave the block by taking the staircase but sadly, the two

Page 82

staircases saw modifications, meaning there were access openings, and that means the two staircases could no longer protect the residents.

So in that case, by "safety", we mean that the residents would have to get to the ground before the fire entered the staircases. But even then, when the residents did get to the ground, they were not safe yet. That was because of the falling bamboo sticks, non-FR nets, toe-boards, and these objects were burning, so the residents would have to make it out of the building before those burning objects fell to the ground, and that's what we mean by "safety".

And then the shutdown of the fire alarms. This lengthened the detection time so people learned about the fire only later.

Finally, the foam boards. This led to a longer detection time. The foam boards also made it harder for residents to learn what was going on. When you suspect a fire, you look out of your window to check the environment around you, but the foam boards prevented people from doing exactly that. So that delayed the start of the evacuation time.

That's all from me. Thank you.

THE HON MR JUSTICE DAVID LOK: Mr Victor Dawes.

MR VICTOR DAWES: I have a few things where I will need your

Page 83

assistance. In the final report, paragraph 9.3, ER1/195, we looked at the cause of death for the 168 people who lost their lives. Most died of smoke inhalation, 91 of them, the report says inhalation of smoke; and then 65 victims died of adverse effect of fire; 12 died of multiple causes.

Can you explain what is meant by "adverse effect of fire"?

MR YIU MEN YEUNG: Generally in a fire the most common fatal cause is smoke inhalation. As to the adverse effects, these effects can be many things. It can be the smoke, the fire or a case where we could not tell the cause of death simply because the unit is so seriously damaged and the corpse is also damaged.

MR VICTOR DAWES: Got it. Let's look at page 196 for Wang Sun House. The block was damaged to more or less the same extent as Wang Cheong but there were fewer casualties in Wang Sun House. That's because the fire started later and some residents in Wang Sun House may have already learned of the fire. In a survey submitted by residents, most people said they learned about the fire, they were informed by other means. They may have learned from the news footage or they may have received a call from a relative. You also explained that there may have been another reason, and that is the Fire

Page 84

Services Department focused their resources on preventing the fire from spreading so people in Wang Sun House had more time to escape.

Can you explain further the deployment of the FSD in terms of how it managed to let more people from Wang Sun House escape?

MR YIU MEN YEUNG: At an early stage of the fire, the FSD elevated the fire to No. 3 alarm. We deployed vast resources. We also put in extra resources. But it takes time for resources to make a difference, so on the scene we worked with what we had and did what we could. We focused our resources on firefighting for Wang Tai and Wang Cheong House.

We got many requests for help. We saw the bamboo sticks falling, so we had to create an entrance. After opening this entrance we had to keep that access open so that we could bring people out. That's why we put time and resources into that effort.

MR VICTOR DAWES: Paragraph 9.4.3, page 201. You mentioned this dynamic assessment. This also mattered for residents. Could you explain this further?

MR YIU MEN YEUNG: I have been in fire services for 28 years. I do fire talks, I talk to my friends, I got asked most often whether one should escape during a fire. I want to stress that it's always right to try

Page 85

to escape. But should you insist on escaping? This will warrant a dynamic assessment. First, assess your situation and where the fire is.

In the case of the Wang Fuk Court fire, some residents lost their lives in the staircase, some lost their lives in their own home. In some cases, the home of the resident was left intact, but when these residents sought refuge in the flats of others, they lost their lives there instead.

So that's why I say when people spot a fire and they see smoke, they should try to escape or they should go home. So it's hard for us to tell for sure whether they should always escape.

In the case of Wang Fuk Court, some people couldn't escape through the staircase. They took the lift instead and they managed to get out and this is a very special case.

MR VICTOR DAWES: The education done by the FSD goes that you don't take the lift during a fire.

MR YIU MEN YEUNG: Correct.

MR VICTOR DAWES: But some people managed to get out by taking the lift.

MR YIU MEN YEUNG: Some, right.

MR VICTOR DAWES: And this has to do with the smoke entering in the staircase.

Page 86

MR YIU MEN YEUNG: Right.

MR VICTOR DAWES: For some blocks the exits were blocked by fallen objects and that also played a part.

MR YIU MEN YEUNG: Right.

MR VICTOR DAWES: In the works contract for Wang Fuk Court, there was an item for a covered walkway. This work was not performed. An expert of the Committee made a recommendation. For work at the entrance of a building, that has to do with evacuation. If there's a bamboo scaffolding, there should be a cover to keep the escape route clear. I wonder if you have any thoughts on this?

Let me try to elaborate this in this case. If at the entrance there was a metal canopy, would that have delayed the blockage of the entrance?

MR YIU MEN YEUNG: As a fire services officer, I think anything that can reduce the fire load, meaning anything that can reduce the combustibles, we welcome that. In this case, can we use metal structures, it's hard to generalise and we should not -- we don't need to generalise. You can find a middle course on whether that will work. We should leave this up to experts.

MR VICTOR DAWES: Also there is a suggestion we examine the issue of access openings. There are suggestions that the means of escape facing the re-entrant, we become aware of the danger of the re-entrant. It is suggested

Page 87

that fire-rated windows should be installed there at that location. Is that right? Is it correct? Of course you have to bear in mind the costing. But from your point of view, for the windows facing the re-entrant, where there is high risk of fire, we should have the fire-rated window. Would that be considered?

MR YIU MEN YEUNG: Yes, we welcome that suggestion.

MR VICTOR DAWES: The final investigation report, I'd like you to explain a little bit further. Fireman Ho Wai Ho entered the block and got separated. The report said that Mr Ho and the other firemen followed the relevant protocol and there is no evidence to show that there is any negligence or any breach of the protocol. Can you explain or supplement on this point, please?

MR YIU MEN YEUNG: Indeed. At that time they got a job to go to Wang Cheong House, but on the ground floor Mr Ho was assisting an old lady, pushing a wheelchair. She got stuck and he helped her out with that and he got separated from his fellow colleagues. He entered Wang Tai and he followed the protocol and we believe that he mistook that block for Wang Cheong and he entered Wang Tai thinking he was entering Wang Cheong. On the 25th floor, two floors below the fire scene, he left the lift and he followed the protocol precisely.

MR VICTOR DAWES: We feel really saddened by his demise, but

Page 88

in terms of procedures, will you make sure that colleagues in similar situation would not see a repeat of this? I'm sure you will review this. Do you have any information for the Committee?

MR YIU MEN YEUNG: Yes. We are going to review that but I've got nothing to supplement for the time being. But with regard to Mr Ho, he had time to leave. He went to the 25th floor, he had a full tank. If he chose to evacuate, he could, but he chose to save people, rescue people.

MR VICTOR DAWES: Indeed. You stated this because there are some unfavourable comments out there.

I've got no further questions.

THE HON MR JUSTICE DAVID LOK: Any further questions from other involved parties?

Examination by MR RICHARD KHAW

MR RICHARD KHAW: Mr Yiu, about the fire alarm system or the fuse, in the final report there is some mention of that. I've got a couple of questions in this regard to follow up.

Please refer to the final report, ER1/216, 10.4.2. By way of background, after the fire, regarding the fire alarm system fuse the FSD conducted some investigation. If I remember, out of the eight blocks, other than Wang Cheong, all the other seven blocks, they found that

Page 89

the fuse had blown.

In Wang Chi House, it was least affected by the fire but the fuse was found to be blown. So it is because of this that they examined the fuse from Wang Chi.

In 10.4.9, in the last sentence:

"The fuses from Wang Chi were taken to lab for examination and the findings indicated that the fuses had operated normally but were damaged due to an overcurrent."

I didn't see any reason why there was such an overcurrent. My question is why was there such an overcurrent? Why did it cause the overcurrent?

MR YIU MEN YEUNG: We didn't go into that in any great detail but for the fire alarms, they were deactivated, it was turned off.

MR RICHARD KHAW: If you look at the preliminary report, B2/1893, here, the table below is what I described. If you look at the following page, Wang Chi House, we mentioned Wang Chi. If you discount Wang Cheong where the fuse is normal, for the other six blocks, the fuse of the fire alarm system, any lab test report?

MR YIU MEN YEUNG: I didn't follow up on this.

MR RICHARD KHAW: My final question is on WS4/1788, witness statement. Thank you. This is Mr Keung, Assistant Director of the FSD, the third witness statement.

Page 90

If you turn to page 1802, paragraph 6 onwards, it's about the fire alarm system investigation and testing. 6.1 onwards is about the observation and findings. 6.1 is about the electrical circuit and the fire alarm.

6.2, there is intense heat that damaged the circuits.

Let's turn to 6.3. It is about the direction of the investigation. 6.4, after the fire, at the pump room there are some observation. 6.5, they considered the risk and they didn't propose to reactivate the power source for testing. 6.6 is about the situation in Wang Chi House.

Mr Yiu, Mr Keung in his third witness statement gave us these observations. There was the statement given on 16 March. Now that you've completed the investigation and published the final report, in relation to Mr Keung's observation and testing, I haven't done all the tests that you have, you don't have any contra view?

MR YIU MEN YEUNG: No, we don't have any contra view. The task force terms of reference identified the causes of fire and why there was such huge fatalities. We realise that the fire alarm system was turned off. That's a fact. As to why, this falls outside of the terms of reference.

MR RICHARD KHAW: I have no further questions.

THE HON MR JUSTICE DAVID LOK: Any other questions from any other involved parties?

Mr Suen.

Examination by MR JENKIN SUEN

MR JENKIN SUEN: A question for Mr Yiu. You prepared the presentation. In the last page I'd like to refer Mr Yiu to that again. If you will open the PowerPoint again, page 19. Further down.

Let's turn to ER5. There is a new version. There are the smoke stop doors. I wonder whether you've got anything to add there?

MR YIU MEN YEUNG: There are some suggestions out there that the smoke stop doors were open and, as a result, the staircases were filled with smoke. I've got these two photos to let people know that the dark area is the corridor and the smoke doors charred on one side. This is open and it's not congruent with the neighbouring area, so it shows that during the fire the doors were shut.

MR JENKIN SUEN: Thanks very much, Mr Yiu. I've got no further questions.

THE HON MR JUSTICE DAVID LOK: Any re-examination?

MR VICTOR DAWES: No, chairman.

THE HON MR JUSTICE DAVID LOK: Thank you very much, Mr Yiu.

(The witness was released)

(2.54 pm)

Page 92

THE HON MR JUSTICE DAVID LOK: No other witness?

MR VICTOR DAWES: No, chairman. Tomorrow the IC experts will be testifying. Just a reminder that the two experts will be testifying in English.

THE HON MR JUSTICE DAVID LOK: Let me say something about the arrangement for tomorrow. The experts will be speaking in English, so those attending the hearing here, when you register, you may wish to collect your SI device to facilitate the tuning-in of Cantonese interpretation.

At the Central Library, we will be broadcasting the Cantonese channel. So is it all clear; tomorrow when you are turning up here at the City Gallery, when you register, if you see the need for Cantonese interpretation, please collect the headset for this purpose.

Unless you have any further questions, let's resume at 10.00 am tomorrow.

(2.55 pm)

(The hearing adjourned until 10.00 am on Thursday, 25 June 2026)