Difficult fire in a museum

1 Introduction

Museums come in different forms and shapes. Some are big, some are small. Some museums are housed in brand new buildings. Others are housed in ancient buildings. And everything in between. Each of these buildings represent great value. It is not always easy to put a price on it. *What is the value of an (art) collection? What is the value of an architectural building?*

January 18th, 2021, the Brussels fire department was confronted with a very complex fire in the Palace for Fine Arts, popularly known as "Bozar", located at Ravensteinstraat 33 in Brussels. What started as a roof fire eventually turned into a long battle against the fire both from the top of the roof as from under the roof. The cold weather does not make the job any easier. Below you will find the story of this fire.

2 Bozar

Bozar is located between two major traffic axes in Brussels: Koningsstraat and Ravensteinstraat

It is important to know that there is a height difference of 13 meters between both streets.

In the Ravensteinstraat a short dead-end street, the Terarkenstraat, runs past Bozar. Another dead end street, the villa Hermosastraat, runs past the musical instrument museum to Bozar. At the end of that street there is a view of a side of Bozar.

Image 1 Bozar and its surrounding streets. *(Image: Google maps)*

The building dates from 1928, is 33 000 m² in size and has 8 different levels. It houses, among other things, a concert hall with 2 200 seats. The annual Queen Elisabeth Competition takes place in this hall. The room also houses an organ with 4 200 pipes. The building and its contents are therefore of inestimable value.

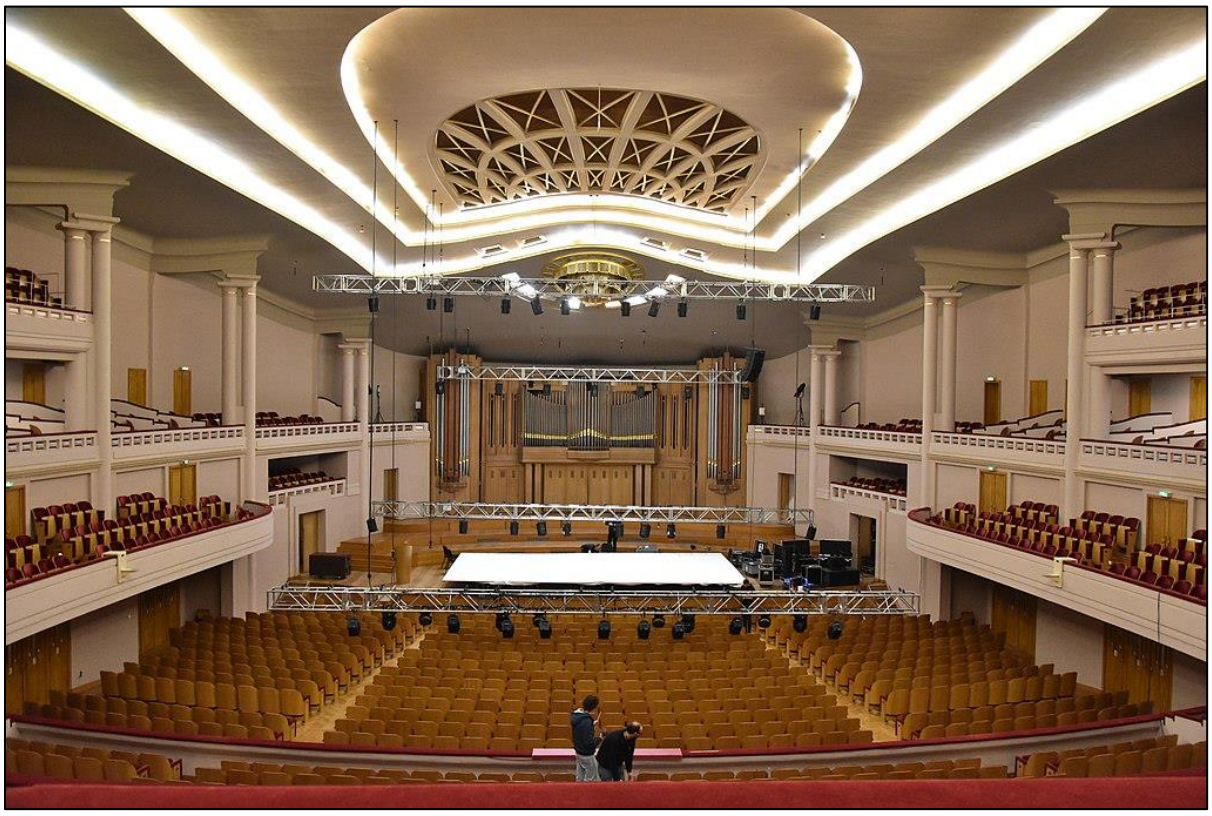

Image 2 Bozar's Henry Leboeuf main hall with 2 200 seats and an organ with 4 200 pipes. *(Picture: www.Bozar.be)*

The roof consists of different parts that are not all on the same level. Almost the entire roof is made of zinc on a wooden underroof. Here and there, sections of glass valleys are installed through which light is drawn in. The beautiful ceiling finish will then hang considerably lower. This creates a large false space between the ceiling and the roof.

Series of valves are also incorporated in various places in the roof. These also serve to transmit light to the exhibition spaces below. When no light is needed, these valves are closed. If the flaps are in the open position, the relevant part of the roof is not accessible. The cold outside temperatures, in combination with the fire extinguishing water (with A-foam), cause very slippery places on the roof.

Cooling groups are housed in various places on the roof. These are housed in wooden structures that are also completely covered in zinc. One of these superstructures is located on the roof approximately above the organ. A second structure stands approximately above the beginning of the room, where the photographer stood to take image 2.

3 Start of the intervention

The Brussels fire department sends a command vehicle, two engines, two ladder trucks and an ambulance to Koningstraat at 16h12. While driving, the chief officer, Captain Davy Platteau, calls for the salvage vehicle from the fire station in Anderlecht. This vehicle has all kinds of equipment on board to avoid consequential damage in the event of fire.

Protecting the contents of the building is thus taken into account from the start of the intervention.

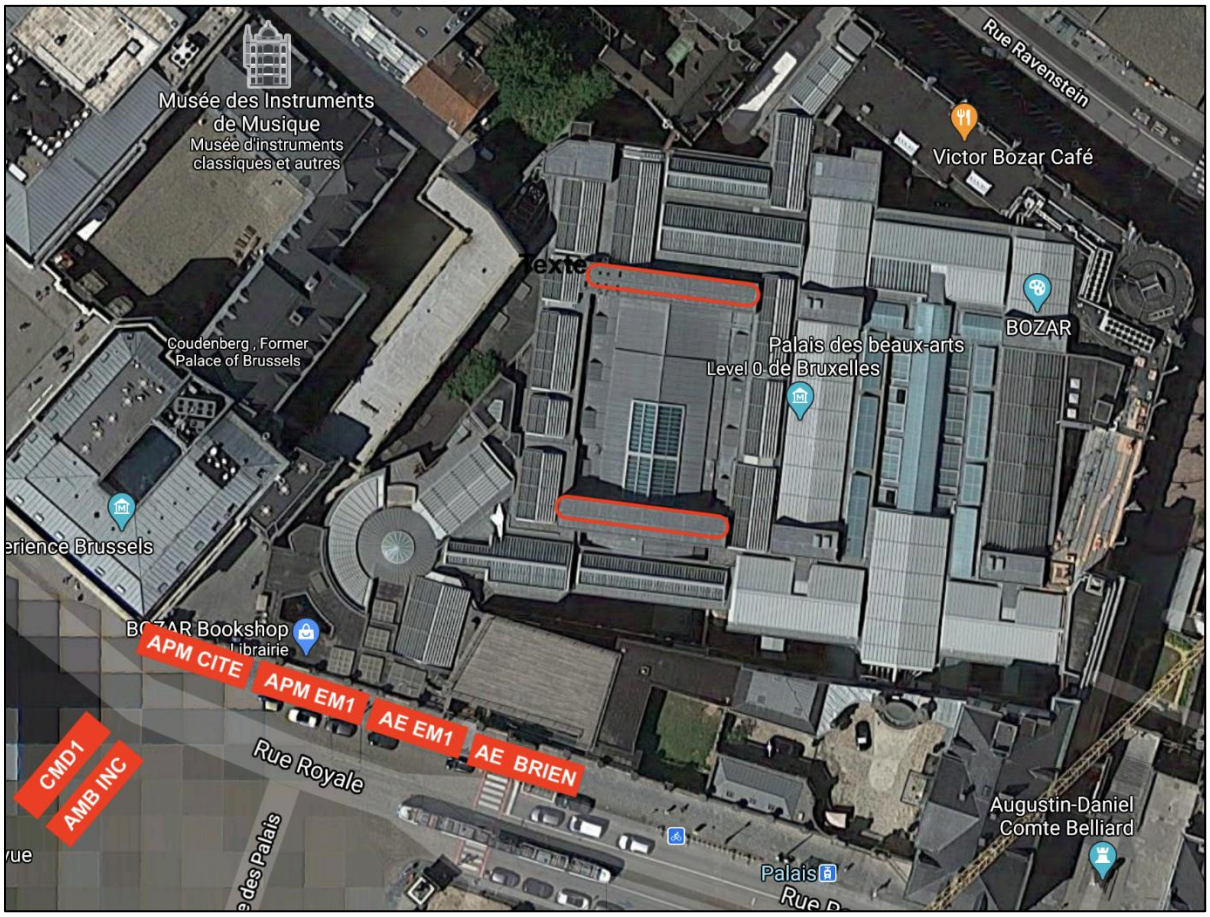

Image 3 Aerial photo of the roof of Bozar. The complex roof structure is clearly visible. The roof consists of many different parts at different heights. The placement of the first six vehicles on scene has been indicated. This image has been rotated 90° clockwise compared to image 1. Two cooling group structures are indicated with a red border. The cooling group closest to Koningsstraat (Rue Royale) was on fire when the teams arrived. (Image: Laurent Ledeghen)

Once the first teams arrive in Koningsstraat, information is exchanged with the museum staff. The smoke development is clearly visible. It is light gray smoke that initially goes straight up. Later, the temperature of the smoke drops due to the extinguishing actions. This causes the smoke to hang on the roof and greatly reduces visibility on the roof.

A reconnaissance is being held on the roof. It is clear that there is a fire in one of the structures that house the cooling units (the lower zone marked in red in Figure 3). The flames rage through the top and side of the structure. The engine "Cité" deploy two 45 mm hoses to fight the fire. They seem to have the situation under control quickly.

4 As the intervention continues

The flames have been put down but the smoke remains consistently hanging above the roof. The limited visibility in combination with the use of A-foam and cold temperatures made the roof dangerously slippery.

Image 4 View at the roof after putting down the flames of the built-up structure. *(Picture: Davy Platteau)*

The situation drastically changes after 5 minutes. The second cooling group structure (the upper zone marked in red on image 3), which is 60 meters away from the first, is now also starting to catch fire. This was a big surprise for the people on site. After all, there was no sign that the fire had spread. Apparently the fire spread rapidly under the zinc roof. There are now three structures on fire: the two built-up structures and the connecting roof.

After this fire spread, the engine "Helihaven" will also deploy two 45 mm hoses to extinguish the second structure. Around 16h30, a third engine (Anderlecht) is requested and the citywide tour commander, Major Laurent Ledeghen, arrives on the scene at 16h40.

Image 5 Two company officers liaise on the roof. The picture allows to estimate the long distances that have to be travelled on the roof. *(Foto: Robert Decock)*

The citywide tour commander does his reconnaissance and the ladder trucks are deployed "in water tower", which means that they deploy a water canon to attack the fire from above. Water is then sprayed onto the fire from a cannon.

At 16h50, two additional engines are requested (one from station "Helihaven" and one from the station "VUB"), as well as an extra ladder truck. This third ladder truck will be used to create an escape route for the firefighters on the roof. If things would go wrong further, they can flee to the Ravensteinstraat side and reach safety via the third ladder truck.

The chief officer on week duty, Colonel Tom Van Gyseghem, has also reached the scene. He divides the scene in sectors:

- Sector Alfa at koningstraat: 3 engines and one ladder truck led by Captain Platteau.
- Sector Bravo at Terarkenstraat/Villa Hermosastraat: one ladder truck and one engine led by Major Ledeghen.
- Sector Charlie/Delta at Ravensteinstraat/Baron Hortastraat: one engine and one ladder truck. This sector is deployed later and is led by Major Moreas.

Colonel Van Gyseghem is responsible for the operational coordination. He manages the sectors and provides a logistics point where decontamination and rehabilitation are provided. Collecting used SCBA and changing air tanks also takes place there. It is proposed to announce the municipal phase of the disaster plan, but the mayor decides not to follow that proposal.

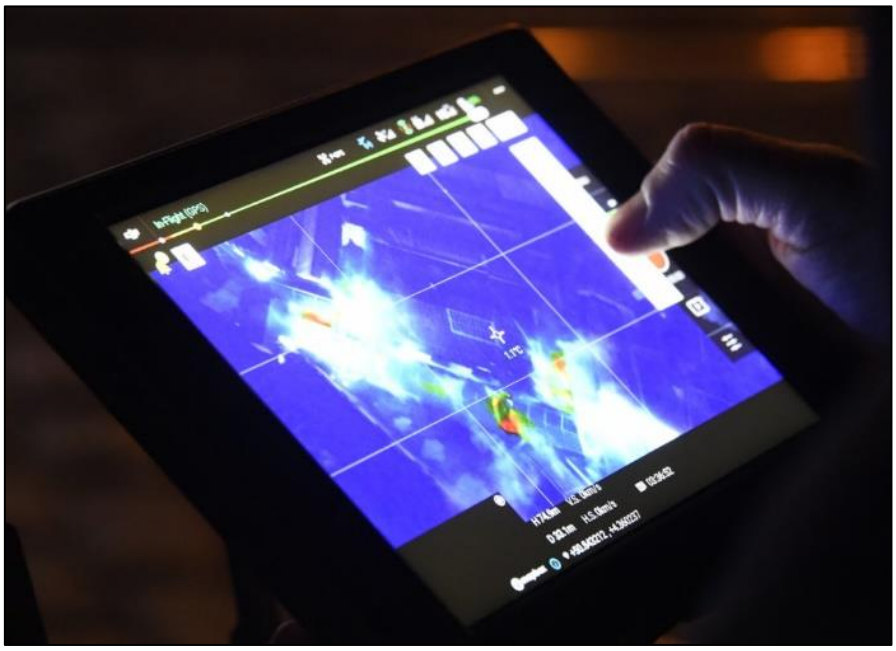

Image 6 The thermal images of the drone are a great support in giving instructions during the intervention. *(Picture: Davy Platteau)*

The police arrives on the scene with a drone team. The images from the drones appear to be of enormous added value for the further ongoing of the intervention. The thermal imaging camera clearly indicates where the remaining hotspots are. Due to the large amounts of low-hanging smoke (refer to image 4), it is difficult to obtain a good image. The drone can provide decent imaging with its thermal imaging camera.

In the meantime, the crew from the engine of Anderlecht is sent inside. Their job is to conduct an interior reconnaissance. After all, the fire has spread about 60 meters under the roof. It is more than likely that there are some fire sources under the roof. They quickly come across the fire that is moving in the false ceiling. On this, they make a stop line with two hoses of 45 mm.

With the help of these hoses, they manage to stop the fire in the false ceiling (see image 7).

Image 7 View at a glass section of the false ceiling. The fire in it is clearly visible. *(Picture: Luc Van Ussel)*

At the same time, firefighters made a setup with two 45mm hoses on the roof in the Villa Hermosastraat.

The crews in the Ravensteinstraat lay two 70 mm hoses along the facade of the building until they reach the roof. There, four hoses of 45 are deployed on the roof. In total there are now eight 45mm hoses on the roof and two 45mm hoses under the roof.

Image 8 Two firefighters at work at one of the burning structures. *(Picture: Robert Decock)*

Now that all people have been deployed, a sixth engine (UCL) is requested on site. After all, there is a need (for such an intervention) for a strategic reserve that can be deployed quickly if something unexpected happens. These extra crewmembers were eventually also used indoors to open false ceilings.

An extra ladder truck is requested, but in the station the decision is made to send out the 36 m aerial platform. A 4th chief officer is also requested on site. Major Karl Moreas arrives on site and takes care of the coordination of sector Charlie/delta. This upscaling does mean that six of the eleven Brussels engines, four of the seven ladder trucks and three of the four on-duty chief officers were deployed for the same intervention. In dispatching, Capt. Bruno Van Kriekinge ensures that the residual coverage of Brussels remains guaranteed.

By 01h30 most firefighters were relieved. The fire department remained on site as a fire watch until 8 o'clock in the morning. Shift change takes place at 08h00 in the Brussels Fire department. The arriving crew then carried out a further two hours of inspections to ensure that the fire would not flare up again. These inspections were combined with the execution of pumping tasks. As much firefighting water as possible was pumped out of the cellars of the Bozar.

The final setup looked like this:

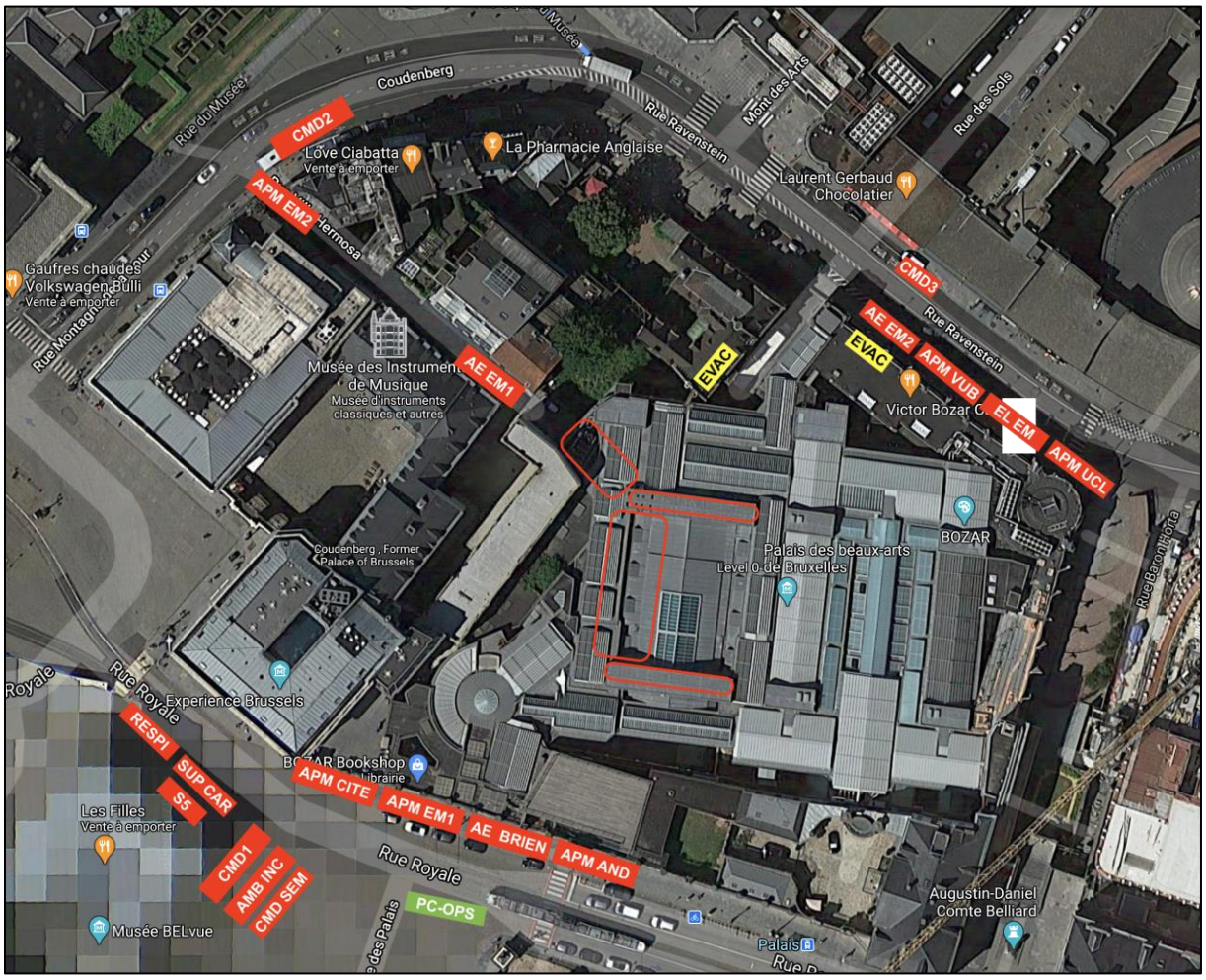

Image 9 Overview of the site with the dedicated vehicles. *(Figure: Laurent Ledeghen)*

A total of 98 firefighters participated in this intervention. One firefighter became ill during the task and was brought to the hospital for further care. Another got slightly injured after tripping on the zinc roof. He was brave enough to continue the intervention.

5 Lessons learned

5.1 Callback of personnel

The Fire Department of Brussels is the largest organization in the country. Throughout the year, between 160 and 175 firefighters are on duty 24 hours a day in the various Brussels fire stations. This allows many interventions to be completed simultaneously. However, it occasionally happens that an intervention consumes a lot of resources. Then the residual coverage of the territory (where 1.2 million people live and 400 000 people work during the day) quickly becomes a challenge.

Moreover, firefighters have to be relieved at a certain time. At the time of relief, the teams that are going to relieve are no longer available for another intervention, while the relieved teams must first shower, eat and put their vehicles back in order before they can go to the

next intervention. In Brussels there is a collaboration with the Red Cross, which then sends up to ten EMT's. In this way, ten firefighters can be taken from the ambulances and deployed as firefighters. However, this is not sufficient at the time of the change of guard.

One of the lessons from this fire is that threshold values must be determined. For example, if 5 engines have been deployed for more than 2 hours and it is clear that the end of the deployment is not yet in sight, a number of people will have to be called in. There is a particular need for truck drivers, company officers and chief officers.

5.2 Spare batteries and spare devices

The fire department is increasingly working with battery-powered equipment: radios, flashlights and thermal imaging cameras. During long-term interventions, the batteries run out and spare batteries or even spare devices have to be brought on site. So there is a need for a decent stock of those items. It is important that they are also accessible outside normal working hours. An additional challenge is that this concerns a stock that will only be used a few times a year. These devices must therefore be included in a circuit. If not, the batteries may not work when they are needed because they have been sitting idle in the closet for several months.

5.3 Operational coordination

In a large-scale intervention, it is very important to structure the intervention. The operational coordination has worked well. There were multidisciplinary consultations at regular intervals. The director of Bozar and the architect of its renovation also participated, as well as the management of the Brussels public buildings. The architect had the most recent plans with her. This was very convenient. The director and the Brussels public building management were able to immediately take the necessary measures to organize rapid repairs to the roof to limit water damage to the building and the collection

Image 10 Colonel Van Gyseghem and Captain Platteau at the command post. *(Picture: Robert Decock)*

Assigning a radio channel per sector has added the necessary ease. CAN-reports were used in a regular base to flow information from the sectors to the command post.

6 Final

All in all, this was a very major intervention that had some surprising twists. The first impression upon arrival gave a completely wrong impression of the challenge the teams faced. The people of the 40th company handled this fire well by systematically scaling up, adjusting and supplementing their image from above and below and ensuring good

coordination of the extinguishing works. There is no doubt that their work saved this monument and its contents.

7 Sources

[1] *www.wikipedia.org, BOZAR, consulted 1th of february '21*

[2] *Ledeghen Laurent (2021) Debriefing Bozar, presentation given to all officers in Brussels.*

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