

2018 Fire and Evacuation Modeling Technical Conference

Abstract

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Topic : Redevelopment and Retrofit

Performance-based design of the Lausanne University library, the « Unithèque »

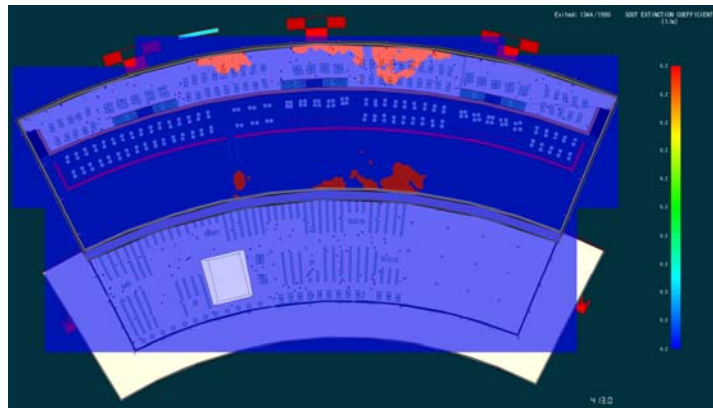
Commissioned in 1983, the Unithèque building - nicknamed the Banana - cause of its circular shape, was conceived as a "Learning Center before time" to accommodate the 6000 Lausanne University students of a year. With the significant increase in the number of students at UNIL, in connection with the demographic boom that the history and attractiveness of UNIL is experiencing, the UNIL library is no longer able to provide surfaces needed for the optimal running of the library.

Therefore, it is planned to build a major extension of the existing building to meet the users needs. The project that has been selected allows to fully relate the extension with the current Unithèque building. Architects have therefore thought the Unithèque as a single large building, offering generous public spaces keeping its initial circular geometry.



Our challenge is to adapt the fire strategy to the building's extension and the new architectural constraints.

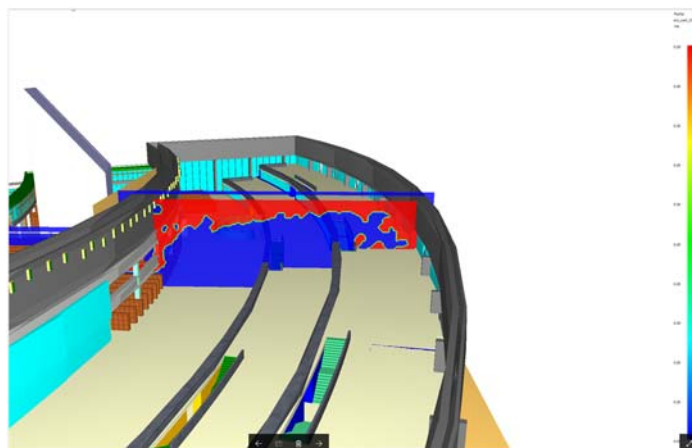
The fire protection systems in place must allow the people evacuation from any place of the building according to quantitative criteria of evacuation conditions.



With a fire safety concept initially designed to extract smoke from the entire building via the large reading space, the choice was made for zone-specific cutting with a fire safety system specific to each zone. In the end, the architect concept and fire protection concept are diametrically opposed.

Everyone knows that one of the main objectives aimed at by fire engineering is also to limit the spread of fire between different areas of a building, but in this case, and from a fire safety point of view, the fact that the different levels of the existing building open radially on the new extension brings new major problems.

Indeed, in the event of a high power fire in the existing part, we can see that a spill plume radially distributed and discharging into the new library space.



It's then obvious that establishing a strategy to manage this circular spill plume, or to avoid its creation, while respecting as much as possible architectural constraints is a real challenge.

The main difficulty is to manage the spill plume. The calculations shows that the difference in mass flow for two fires, discharged or not, are significantly different. Several constraints in the concerned level, not allowing the addition of a drop-beam or the installation of sheath, drive to accept this spill, but also to limit it by extracting a part of it upstream. Indeed, the Harrison and Spearpoint spill plume equation shows that the spill plume mass flow depends on the initial smoke mass flow.

Other constraints complexify this study, especially the concept of assets safeguarding. It is imperative to ensure a good smoke stratification at a reasonable height, in order to protect the books from the smoke.

In our case, the zone-specific cutting has proved to be efficient. The results show that in the context of a fire engineering study, it could be essential to take action upstream the smoke spreading.