

Fire risk in relation to BIM

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Abstract. Technological advances in the field of technical coordination and simulation provides a new method in construction (BIM, Building Information Modeling). These methods will enable us to implement a risk occurrence of fire and its spread already in preparation of the building itself.

Next message informs about the possibilities and what procedures can be implemented alone fire safety solutions to building information model. His subsequent use in design practice and streamlining the entire process.

Intorduction

Building Information Modelling (BIM) is a process which is known since the seventies. During that time he became a great tool that allows you to reduce construction costs and speed up construction projects. BIM has the potential to avoid errors, but only under the condition that efforts to avoid errors had all members, of which are involved in the process. BIM can be understood is a tool that will enable us to analyze into detailed virtual construction, we can using it better understand the project, but cannot to decide for us. With proper use of BIM can reduce construction time, cost and requirements. [1]

The procedure for assessing fire protection solutions according to CSN (Czech National Standard)

The actual assessment procedure can be summarized in the following steps, see Table 1

Tab.1 The procedure for assessing fire protection solutions according to CSN [2] [3]

Step	Activity	Data
1	Breakdowns object into fire sections	Floor space S the number of floors z
2	Draft fire safety equipment and measures	EPS, H, SHZ, ZOKT,
3	Determination of fire risk fire sections	p_v, p_{vs} T_N
4	Verifying the size of fire sections: length width area Number of floors in fire section	$l \leq l_{max}$ $\check{s} \leq \check{s}_{max}$ $S \leq S_{max}$ $z \leq z_{max}$
5	Determination of requirements for building construction and products: Degree of fire safety fire section	SPB

	Fire resistance of Reaction to fire class A1 to F Index flame spread on the surface of building materials	$R_i, E_i, I_i, W_i, S_i, M_{i,aj}$ $A1_i$ až F_i i_{si}
6	Calculation of the actual fire properties of building structures and materials: fire resistance Reaction to fire class A1 to F Index flame spread on the surface of building materials	R, E, I, W, S, M_{aj} $A1$ až F i_s
7	Verifying the applicability examined construction and materials, structural modifications, any draft measures	$R \leq R_i$ $A1$ až $F \leq A1_i$ až F_i $i_s \leq i_{si}$
8	Assessment of escape routes (UC): Number of persons Number of UC types of UC length width equipment	E 2 and more, exceptionally 1 $NÚC, CHÚC, (ČCHÚC)$ $l_u \leq l_{umax}$ $u \leq u_{min}$ emergency lighting, etc.
9	Assessment of distances: According to the density of heat flow According to the the impact of burning parts The resulting distance d	d_1 d_2 $d_1 < d > d_2$
10	Assessment of technical equipment	
11	The design of components for fire intervention of	
12	Fire protection solution of the construction (text part and drawings)	ČSN 01 3495

Implementation assessing of fire risks in BIM

Here I describe the procedures which significantly simplifies the manufacturer fire safety solutions. The actual fire risk as such will have to continue to be treated by a competent person. As mentioned earlier BIM tool not only software which evaluates the results. The implementation is tested on a standard projection software (ArchiCAD) but such use is of principled point of view may be used in all design BIM Software.

When processing fire safety solutions BIM process is important to bigger time already in the beginning of the design of the building, when the building was designed according to the standard.

- Breakdowns object into fire sections,

Fire zone is an area of the building, bordered since other parts of the object, or. since neighboring buildings Fire dividing structures. The fire divisive structures include the bearing walls and non-bearing fire walls and fire ceilings. [3]

Fire sections in BIM is functional zone area which demarcate the estimated unit, this area us will then verify if all adjacent structures may be fire separating. Furthermore, the respect of size limits and area of the compartment.

- Draft fire safety equipment and measures

Fire safety equipment and measures are meant following elements:

- EPS - Fire Alarm Systems
- H - Possible action of fire rescue units
- SHZ - sprinkler system
- ZOKT - equipment for smoke and heat

Safety equipment is physically included as an element of an intelligent building model, including its effectiveness according to standards

- Determination of fire risk fire sections ($p_v[\text{kg}\cdot\text{m}^{-2}]$)

In the calculation formula fire risk includes many factors (coefficients) that we generated automatically from the information entered into the model in the previous steps.

Determination of fire risk is also fully automatic.

- Verifying the size of fire sections:

Reducing the size of the fire sections is dictated by efforts to optimize the investment costs for building fire safety and probable damage by fires on objects, enable endangered persons sufficiently fast and safe escape and make available a fire engulfment for fire service units

This step is the solution using BIM secured when you divide an object on fire sections, checking is performed automatically based on the general requirements that are given standard

- Calculation of the actual fire properties of building structures and materials:

When evaluating construction products or materials and structures is necessary to distinguish their fire protection properties. Define a class of reaction to fire and fire-resistant sub-element structure of which reveals to us the fire resistance of the structure.

The requirements for these properties is necessary to determine the application of BIM in the initial design stage. A can also be used for other projects.

- Design and evaluation of escape routes (unprotected and protected)

The actual escape route is essentially a section (of the building) which can replace intelligent BIM zone which brings all the information about the type of ways number of evacuated persons, types of interconnected spaces but also other information necessary to assess the suitability of individual routes.

Of course the plot is risk places.

- Assessment distances

If the object for various reasons and despite all the preventive measures is in fire, there is a real risk of spread to neighboring buildings. Therefore is one of the crucial tasks in ensuring fire safety preventing the spread of fire to other objects.

The BIM is that by adding information about fire danger area each parametric element outer casing. This information is graphically and best shows in 3D imaging where detail is visible if in this zone is any other building, or on how much of a hit. [4]

- Assessment of technical equipment

Building Services are an essential part of the object. The assessment of fire safety that may contribute to the emergence and spread of fire [3].

The project of creating a complex BIM principles are already all lines of technical equipment shown in 3D real position, find a contact routes to the border zone is only a matter of moments as well as the related security measures preventing from spreading through these openings, feedback control is also carried out automatically.

Placing the chimney is of course implemented in the chimney element and a protection zone (area) a safe distance in comparison collisions element us is readily found if not in this band elements that are unacceptable.

- The design of components for fire intervention of

The effective implementation of fire safety intervention and intervening units of the Integrated Rescue System is essential to secure [3]

- access road and entrance area
- Internal and external access routes
- technical equipment

BIM may in these cases apply primarily the technical devices that are implemented in the actual model as the functional elements of the building, enriched more deluxe parameters necessary for the effective construction assessment.

- Fire protection solution of the construction

This solution is in BIM generated automatically assuming proper treatment preceding steps.

Conclusion

The assessment of fire risk using the intelligent building model (BIM) is possible in the future it will probably inevitable. When fair process can prevent many mistakes today commonly arise from imperfect information value of 2D drawing. The final assessment but will always belong to the person duly eligible. BIM is only a tool to facilitate this work. [1]

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