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An Evaluation of Large-Scale Commercial Buildings Architectural Space Indicators with an Approach to Urban Threats and Risks

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Abstract: Achieving to technical criteria that by applying them in architectural design stage of large commercial buildings, considered as one of the most important uses in urban planning, can increase the level of citizens' security against all kinds of natural hazards and threats, and reduce vulnerability and it can provide continuation of the services and activities of these buildings. The present study has a developmental-applied nature. By descriptive-survey method, the issue is investigated in large-scale commercial buildings. In this research, to assess the architectural space of large-scale commercial buildings, five criteria including continuity of activities in emergencies, costs, facilitating emergency exit, reducing the impact of explosions and earthquakes are considered. In this research, using Swara and Smart methods, the subject matter and the proposed model for evaluating the vulnerability of the architectural space are discussed. The results of the evaluation of the criteria and indicators of the architectural space indicate that the criteria for reducing the effect of the explosion, facilitating emergency exit, the continuity of activities in crisis, earthquake and cost with the weights of 0.3056, 0.2778, 0.2315, 1852.0 and 0.1543 are ranked first to fifth. Using the proposed model, the architecture of large-scale commercial buildings can be evaluated against urban threats and vulnerabilities, as well as the vulnerability and weaknesses of these buildings in each indicator and criterion.

Keywords: Architectural space, threats, compatibility, vulnerability, passive defense, large-scale commercial building
JEL Classification: L15, L74, F13, R12

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1- Introduction

Human communication plays a vital role in the formation of the living environment. By interfering with the environment, humans prepare it for their communications. On the other hand, the artifact environment also plays a role in the formation of human identity and personality as well as the coordination of human activities (Diba & Ansari, 1994). Architectural space is born of relationships between identifiers or boundaries, as well as surfaces that do not include identifier properties, but define boundaries. One of the criteria for the desirability of space is the valuation of individuals over it, which is attributed to it at the final stages of growth by users. Architecture adjusts space. Parts of human interpersonal interaction with space returns to his experiences and memories, but the physical elements are responsible for organizing and structuring it. For this reason, the concept of an event is related to the current events of space with respect to the component of time that the presence or absence of persons in space changes the perception of space in the mind of the audience (Loveson, 2012).

Throughout human history, less time can be found when a war does not occur at a point in the world. This trend has also risen as humanity flourishes and progresses. Meanwhile, large-scale commercial buildings in cities are damaged in various ways by attacks and damages. In such a situation, often buildings lose their uses, and people die either due to burial under the rubble or due to a wave of explosion or collision of non-body objects (JalaliFadahani & Araghizadeh, 2012. Large-scale commercial buildings in critical situations can provide continuity and crisis management facilitators with regard to their sustainability and vulnerability to a variety of threats. The sustainability of large-scale commercial buildings depends on a variety of threats to the architecture of this type of building, and the architectural environment can play a significant role in reducing the vulnerability of these buildings to urban threats. In emergencies and natural crises, providing continuous services, including effective ones, in facilitating crisis management, prevents disturbing the functioning of the urban economy, increasing the threshold of endurance of people and national sustainability, which is a non-operational defense goal. In this regard, it is necessary to examine the dimensions and vulnerabilities of large-scale business buildings against urban threats and risks as a metropolitan element in order to determine the vulnerability of these types of buildings and the ways to reduce them.

2- Literature Review

a) Foreign Researches

Barakat & Hetherington (1998) examined various forms of building, such as cubic, cylindrical and circular. The researchers concluded that the elements of building materials and architectural space had a significant role in reducing the effects of explosions in buildings.

Koccaz (2004) conducted research on how to design explosion-resistant buildings, and, along with the influencers on the building, considered architectural features in the design of these buildings. One of these factors is the degree of independency of architectural spaces.

Sinha & Goyal presented a general way to assess the seismic vulnerability of buildings. In this research, the national vulnerability assessment method of India has been considered as a part of the earthquake risk management framework. In this study, after reviewing important indicators for building evaluation, a checklist of criteria was presented to determine the vulnerability of the building quickly.

Rashed et al., (2007) examined the role of GIS and remote sensing in modeling and predicting vulnerabilities, and concluded that the GIS with a comprehensive database could play a major role in vulnerability modeling.

Gebbeken & Döge (2010) evaluated building form and environmental effect on reducing the explosion waves in the building. The researchers concluded that the maximum pressure applied to the building had the greatest impact, at a distance from the explosion center, the angle of reflection of the explosion wave and the building resistance against the explosion waves. In addition, building elements play a significant role in reducing the bursts of explosions.

Walker (2011) examined types of vulnerability assessment models against wind. By examining a variety of models, it has been concluded that most models investigate the behavior of structures and do not address the use of buildings that have a significant role to play against all kinds of hazards.

Nakhaei et al., (2016) presented a model for assessing the vulnerability of the building architecture to the explosion for Swiss Re Skyscraper as a case study. In this research, indicators of the ability to reduce the effects of explosions, economic factors, simplicity of implementation, the relationship between spaces in crises and the creation of the least space unusable. In this paper, the SMART method was used to assess quickly the vulnerability of office buildings to explosions. According to the findings, Swiss Re skyscraper was ranked at an average level of 62.11 points.

a) Iranian Researches

Bitarafan et al., (2013) using the AHP and IHWP methods, have studied the optimal combination of building architectural forms. The researchers concluded in their study that the center-oriented construction form had a better performance than non-passive defense than other forms.

Hosseini (2010) has done research in the field of passive defense measures in urban architectural design. In this research, a proper classification of the types of buildings has been made and in each user, the importance of subsets first is based on the degree of threat and the possibility of invasion and the necessity of continuity wartime activities have been set and then considerations for designing each one of them have been introduced.

Poormoosavi et al., evaluated the vulnerability of urban buildings using the AHP Fuzzy model. After assessing the vulnerability of the building, it was concluded that low-impact materials in construction, high life span of buildings, location of construction on unsustainable land, non-compliance with building standards, concentration and high population density with weak studies are some of the most important factors in the vulnerability of urban buildings.

Ebrahimiyan-Ghajari et al., (2014) modeled urban buildings vulnerability using Delphi methods and hierarchical analysis in GIS environment. The results of studies have shown that in the study area (District 6 of Tehran), about 38% of buildings have low vulnerability, 60% of buildings have a moderate vulnerability and about 2% of buildings are vulnerable, indicating the need for high-level basic measures with a passive defense approach to reduce vulnerability.

Aliakbari & SadatMiri (2014) examined vulnerability of roads in seismic cities based on IHWP model. They concluded that the high degree of enclosure, increased traffic levels, population density, and land-use system as the focus of business, leisure and trans-boundary use are the main causes of roadside vulnerability.

Soltanifard et al., (2015) studied spatial analysis of the effects of transitional network on vulnerability of urban neighborhoods against earthquake. To identify vulnerabilities, 7 criteria and 25 sub-criteria were used.

Nakhjaei & Piri (2015) assess the risk of office building and introduce BMS in various architectural, electrical and mechanical parts of the building. With the prioritization of the substructures of the intelligent building system, the importance of the architectural part of the office buildings has been pointed out. The results showed that more than 58 percent of the Amiriyeh neighborhood is in a high vulnerability zone. In addition, spatially, the inner parts of the neighborhood have the highest density of critical points and axes. These points are the most vulnerable in the event of an earthquake due to the short length and width, which will disrupt the relief process.

Karami & Karami (2015) evaluated the vulnerability of office buildings from the perspective of urban crisis management. By presenting five groups of indicators, it was concluded that the importance of planning and implementing the principled strategies to reduce potential damages and risks and increase the level of proper management and principles of crisis and solutions to reduce and adjust them is inevitable.

Hosseini & Zeytooni (2016) using 11 criteria, optimized the location of business complexes using AHP in the GIS environment. The results of the studies showed that the distribution pattern of commercial complexes was not proportional to the population size of the city and location standards in the study area and did not have a proper distribution.

Hosseini et al., (2016) examined requirements and architectural considerations of urban administrative buildings from the perspective of passive defense. The researchers presented indicators for architectural design of urban office buildings and its requirements.

Shahivandi (2017) investigates the extent of vulnerability of urban neighborhoods in accordance with the principles of passive defense. The researcher in his study of the study area (Shahrekord city) has classified six classes of vulnerability (very high, high, moderate, relatively low, low and very low).

In studies conducted to assess the vulnerability of buildings, generally, quality models such as AHP, ANP, IHWP, etc. have been used. In this study, while evaluating the criteria and indicators of architectural space using new Swara and Smart methods, it presents a model for evaluating the architectural space vulnerabilities in buildings large-scale commercialization.

3- Theoretical Background

The city has a body that has many activities. The set of activities makes up and empowers urban spaces. Commercial spaces have long been the cornerstones of any biological community, and in fact, they have played the heartbeat for them (Abazari et al, 2005). As some scholars have searched the foundations of the primary cities in their commercial realm, they progress to the point where human civilization is considered the birth of human commercial instinct (Shokooyi, 2003). Economic theories are based on the idea that the city is the product of trade links and market functions. In the transformation of rural society into urban society, the increase in production in some primary societies increased trade exchanges (Potter et al., 2006). One of the major economic and commercial indicators of each region is its business centers.

Today, in discussing land use planning, determining the type of land use, the spatial organization of the city, determining the structures and how they are adapted to each other and with urban systems are considered (Ziari, 1998). Commercial centers are also among the uses that affect urban economic activity.

Urban large-scale commercial centers are one of urban uses that have an affiliated population that is heavily influenced by a crisis. The identification of the risk of possible damage plays an important role in preventing and preparing for exposure and dealing with the effects of hazardous effects on urban areas. If the recognition of the dimensions of the risk of threats and risks to the urban areas and the possible damage resulting from it is properly achieved, then the extent and type of measures to deal with these injuries can be defined and extended largely by individuals. To this end, an understanding of the effective factors on the attraction of cities must be obtained.

Architectural space is one of the important axes in commercial buildings, which has a significant role in the vulnerability of these types of buildings.

Space has a disproportionate nature. By its form and its physical elements, its boundaries are defined, and limited. Architecture can be identified by the form and physical elements, and it is perceived with the presence of man in space and through the experience of the momentary momentum on time. Physical form and elements, in coordination with each other, which are referred to as the objectified element in the explanation of the transcendental qualities of architectural space, while forming the structural pillars on the space board, also lead to the cohesion of the spatial system (Falahat et al., 2015).

Architectural space, in general, refers to the intervals between construction materials whose purpose is to create a mission for human activities, such that sometimes this space finds special qualities and artwork is known.

One of the architectural axes consistent with the principles and objectives of passive defense is the architectural environment. According to the architectural styles, the indicators affecting the architectural space include adaptation of adjacent spaces, safe space, how architectural spaces function at different times, the level of humanism (ergonomics) of the building space, the location of vital and sensitive spaces, the independence of building spaces and the density of spaces of the building.

Table1. Indicators related to the architecture of the building

Row	Indicators related to the architecture of the building
١	Adjacent space compatibility
٢	Safe space
٣	Performance of architectural spaces at different times
٤	The level of humanity (ergonomics) of the building's space
٥	Locating vital building spaces
٦	Independence of building spaces
٧	The density of building spaces
٨	Furniture

4- Research Methodology

The method used in this research is descriptive-survey (Delphi) and the basic criteria for location assessment are derived from the study of library resources. In order to investigate and evaluate the indicators and location criteria, a questionnaire was designed, using Delphi technique and random method of 150 elite and expert opinions (managers and experts from Passive Defense Organization, Ministry of Roads and Urban Development, Tehran Municipality, Iranian Scientific Passive Defense Association, and professors from University of Tehran, Iran University of Science and Technology, and Shahid Beheshti University) that can be used to assess all aspects of the vulnerability of the building architecture is used as Table 2. In the following, the SMART method is used to determine the vulnerability assessment of large-scale commercial buildings against threats that, SWARA method has been used in this method to determine the weight of each criterion and indicator, which is one of the threat identification methods provided by the US Department of Defense. This method is based on identifying the key assets of an infrastructure, which, while emphasizing on risk analysis, is numerically looking to detect potential damage in a system. In the following, SWARA and SMART techniques are explained.

Table2. Statistics of experts

proficiency	Education	Number
Experts in the field of geography and urban planning	Ph.D.	٣٠
	Master	٤٨
Passive Defense	Master	٢٦
Construction	Master	٢٠
Architecture	Master	٢٦

SMART Technique

The SMART[1] method has been used to implement a rapid assessment model for vulnerability vulnerabilities in large commercial buildings against threats. In this method, a combination of qualitative and quantitative indicators can be used to rank the options. First, in order to calculate the weight and level the indices for each option, the selected range is defined for each of the indices and is ranked by the defined formulas of the indices for each option. In the next step, the weight and importance of each index are measured

[1]- Simple Multi Attribute Ranking Technique

relative to each other and at the end of the weight and the final priority of the options; the combination of the above weights is obtained (Asgharpoor, 2008).

First, the indicators and sub-indicators should be ranked according to importance, priority and weight, respectively. In this research, SWARA method has been used. If i is the index number of the main index and j is the sub-index, using the SWARA method, the weight of wi is obtained for each index and wij weight for each of the sub-indicators. If the score that each of the options received by the community of experts is uij, the i-th index is determined using equation (1) by using the rational mean of options rating in the sub-indices for that index. It is clear that this numerical value will be between 1 and 9 (Asgharpoor, 2008).

$$U_i = \frac{\sum_j w_i u_{ij}}{\sum_j w_{ij=1}} \quad (1)$$

The total score (U) is also determined according to the rating of each indicator and its weight according to (2).

$$U = \frac{\sum_i U_i W_i}{\sum_i W_{i=1}} \quad (2)$$

The value of U is also a number between 1 and 9, indicating the desirability of locating the large commercial building for the threats. In short, the utility level of a large-scale commercial building will be determined based on this model. If we show this level with parameter L, we use equation (3) to calculate its percentage.

$$L = \frac{U}{9} \times 100 \quad (3)$$

Table3. Different levels of evaluation model

Degree	Level
Weak	L<40
Average	40<=L<70
Good	70<=L<90
Excellent	L>=90

Source: (Asgharpoor, 2008)

SWARA[1] Technique

In this way, an expert plays an important role in the assessment and calculation of weights. In addition, each expert chooses the importance of each criterion. Then, it measures all criteria from the first to the last criterion and uses its implied information and experiences. According to this method, the most important criterion is in rank 1 and the least important ranked the last. The team of experts determines the overall rank based on the average score.

The ability to estimate experts' opinions about the relative importance of criteria in their weight determination process is the most important element in this method. It is also suitable for coordinating and collecting data from experts. In addition, the SWARA method is not complicated and the expert can easily use it. The main advantage of this method in deciding is that, on some issues, priorities are defined according to the policies of companies or countries, and there is no need for an evaluation to rank the criteria.

5- Results

Prioritization of Architectural Space Criteria

According to the experts in the discussion of architectural space, the criterion of reducing the effect of explosion is known as a priority. The next rank is facilitating

1- The new step-wise weight assessment ratio analysis method emergency exit. In the following, the sustainability criteria for activities in crisis, earthquake and costs are ranked third, fourth and fifth respectively, as shown in Table 1.

Table4. Priorities for Architectural Criteria

Criteria	Index	Average priority (experts)	Priorities
Ability to reduce the effect of the explosion	C_1	۱	۱
Facilitating Emergency Exit	C_2	2.13	۲
Cost	C_3	4.37	٥
Continuous activity in crisis situations	C_4	2.94	۳
Earthquake	C_5	3.51	٤

Table 2 describes the priorities and the final weight of architectural space criteria. In the Weight column of this table, the weight of each of the main indicators derived from the SWARA method is given. According to this table, the criterion of reducing the impact of the explosion with the weight of 0.3056 was ranked first. Emergency exit easiness, continuity of activity in the conditions of crisis and earthquake, with the weights of 0.2778, 0.2315, and 0.1852 ranked in the second, third, respectively. Moreover, the cost criterion with a weight of 0.1852 is in the final rank.

Table5. Priorities and Final Weight of Architectural Space Criteria

Index	Criterion	The average rate of comparable importance S_j	Initial integration $k_j = s_j + 1$	Comparative weight $w_j = \frac{x_{j-1}}{k_j}$	The final weight $q_j = \frac{w_j}{\sum w_j}$
Ability to reduce the effect of the explosion	C1		1	1.0000	0.3056
Facilitating Emergency Exit	C2	0.100	1.100	0.9091	0.2778
Continuous activity in crisis situations	C4	0.200	1.200	0.7576	0.2315
Earthquake	C5	0.250	1.250	0.6061	0.1852
Cost	C3	0.250	1.250	0.5051	0.1543

Prioritization of Architectural Space Indices

Based on experts' opinion, in the discussion of the criterion of reducing the effect of explosion, facilitating emergency exit, cost, continuity of activities in crisis and earthquake situations, the prioritization of indicators was made and presented in Table 3.

Table6. Prioritization of architectural space indices

Criterion	Indices	Index	Average priority (experts)	Priorities
Ability to reduce the effect of the explosion	Adjacent space compatibility	C_{1-1}	3.88	٤
	Safe space	C_{1-2}	1.1	١
	Performance of architectural spaces at different times	C_{1-3}	٦	٦
	The level of humanity (ergonomics) of the building's space	C_{1-4}	4.91	٥
	Locating vital building spaces	C_{1-5}	1.19	١
	Independence of building spaces	C_{1-6}	2.31	٢
	The density of building spaces	C_{1-7}	1.93	٢
	Furniture	C_{1-8}	2.89	٣
Facilitating Emergency Exit	Adjacent space compatibility	C_{2-1}	3.24	٣
	Safe space	C_{2-2}	٥	٥
	Performance of architectural spaces at different times	C_{2-3}	5.93	٦
	The level of humanity (ergonomics) of the building's space	C_{2-4}	1.89	٢
	Locating vital building spaces	C_{2-5}	4.14	٤
	Independence of building spaces	C_{2-6}	3.39	٣
	The density of building spaces	C_{2-7}	1.33	١
	Furniture	C_{2-8}	2.27	٢
Cost	Adjacent space compatibility	C_{3-2}	7.85	٨
	Safe space	C_{3-2}	٣	٣
	Performance of architectural spaces at different times	C_{3-3}	1.25	١
	The level of humanity (ergonomics) of the building's space	C_{3-4}	6.84	٧
	Locating vital building spaces	C_{3-5}	4.24	٤
	Independence of building spaces	C_{3-6}	5.32	٥
	The density of building spaces	C_{3-7}	5.79	٦
	Furniture	C_{3-8}	1.88	٢
Continuous activity in crisis situations	Adjacent space compatibility	C_{4-1}	4.19	٤
	Safe space	C_{4-2}	1.86	٢
	Performance of architectural spaces at different times	C_{4-3}	4.92	٥
	The level of humanity (ergonomics) of the building's space	C_{4-4}	6.97	٧
	Locating vital building spaces	C_{4-5}	1.22	١
	Independence of building spaces	C_{4-6}	3.33	٣
	The density of building spaces	C_{4-7}	8.29	٨
	Furniture	C_{4-8}	5.77	٦
Earthquake	Adjacent space compatibility	C_{5-1}	3.57	٤
	Safe space	C_{5-2}	1.98	٢
	Performance of architectural spaces at different times	C_{5-3}	2.46	٣
	The level of humanity (ergonomics) of the building's space	C_{5-4}	5.39	٦
	Locating vital building spaces	C_{5-5}	1.23	١
	Independence of building spaces	C_{5-6}	4.64	٥
	The density of building spaces	C_{5-7}	7.89	٨
	Furniture	C_{5-8}	6.87	٧

In Table 4, the prioritization and final weight of indicators are expressed in the criterion of the potential for reducing the effect of explosions, which is presented in the weight column of each indicator. According to this table, the secure space of C1-2 with the final weight of 0.1617 has the highest value and it is shown in yellow. Subsequently, the vital and sensitive spaces of the C1-5 building with a weight of 0.1586 and the independence of the building spaces C1-6 with a weight of 0.1321 were placed in the second and third positions, respectively. The lowest index is the performance of architectural spaces functions at different times of C1-3 with a weight of 0.0747.

Table7. Prioritization and final weight of indices in the criterion of reducing the effect of explosion

Criterion	Criterion	The average rate of comparable importance S_j	Initial integration $k_j = s_j + 1$	Comparative weight $w_j = \frac{x_{j-1}}{k_j}$	The final weight $q_j = \frac{w_j}{\sum w_j}$
Safe space	C1-2		1	1.0000	0.1617
Locating vital building spaces	C1-5	0.020	1.020	0.9804	0.1586
Independence of building spaces	C1-6	0.200	1.200	0.8170	0.1321
The density of building spaces	C1-7	0.010	1.010	0.8089	0.1308
Furniture	C1-8	0.020	1.020	0.7930	0.1283
Adjacent space compatibility	C1-1	0.100	1.100	0.7209	0.1166
The level of humanity (ergonomics) of the building's space	C1-4	0.200	1.200	0.6008	0.0972
Performance of architectural spaces at different times	C1-3	0.300	1.300	0.4621	0.0747

Table 5 shows the priority and final weight of indicators in the measure of emergency exit facilitation, which is presented in the weight column of each indicator. According to this table, the density of building spaces C2-7 with a final weight of 0.1993 has the highest value and is shown in yellow. After that, the level of humanity of C2-4 building space with a weight of 0.1661 and C2-8 furniture with a weight of 0.1628 were ranked second and third respectively. The lowest index of the performance of architectural spaces function at different times of C2-3 had a weight of 0.0525.

Table8. Prioritization and final weight of indicators in the criteria for facilitating emergency exit

Criterion	Criterion	The average rate of comparable importance S_j	Initial integration $k_j = s_j + 1$	Comparative weight $w_j = \frac{x_{j-1}}{k_j}$	The final weight $q_j = \frac{w_j}{\sum w_j}$
The density of building spaces	C2-7		1	1.0000	0.1993
The level of humanity (ergonomics) of the building's space	C2-4	0.200	1.200	0.8333	0.1661
Furniture	C2-8	0.020	1.020	0.8170	0.1628
Adjacent space compatibility	C2-1	0.300	1.300	0.6285	0.1252
Independence of building spaces	C2-6	0.010	1.010	0.6222	0.1240
Locating vital building spaces	C2-5	0.250	1.250	0.4978	0.0992
Safe space	C2-2	0.400	1.400	0.3556	0.0709
Performance of architectural spaces at different times	C2-3	0.350	1.350	0.2634	0.0525

In Table 6, the prioritization and final weight of the indicators are expressed in the cost criterion, which is presented in the weight column of each indicator. According to this table, how architectural spaces function at different times C3-3 with a final weight of 0.2627 has the highest value and is shown in yellow. After that, the C3-8 furniture with a weight of 0.1876 and a secure space of C3-2 with a weight of 0.1443 were ranked second and third respectively. The lowest compatibility criterion was for adjacent C3-1 space with a weight of 0.0426.

Table9. Prioritization and final weight of indicators in the cost criterion

Criterion	**Criterion**	**The average rate of comparable importance S_j**	**Initial integration** $k_j = s_j + 1$	**Comparative weight** $w_j = \frac{x_{j-1}}{k_j}$	**The final weight** $q_j = \frac{w_j}{\sum w_j}$
Performance of architectural spaces at different times	C3-3		1	1.0000	0.2627
Furniture	C3-8	0.400	1.400	0.7143	0.1876
Safe space	C3-2	0.300	1.300	0.5495	0.1443
Locating vital building spaces	C3-5	0.150	1.150	0.4778	0.1255
Independence of building spaces	C3-6	0.200	1.200	0.3982	0.1046
The density of building spaces	C3-7	0.350	1.350	0.2949	0.0775
The level of humanity (ergonomics) of the building's space	C3-4	0.400	1.400	0.2107	0.0553
Adjacent space compatibility	C3-1	0.300	1.300	0.1620	0.0426

In Table 7, prioritization and final weight of indicators are expressed in the criterion of continuity of activity in crises, which is presented in the weight column of each indicator in the column. According to this table, the critical and sensitive spaces of the C4-5 building with the final weight of 0.2198 have the highest value and are shown in yellow, after which the secure space C4-2 with a weight of 0.1998 and the independence of the building spaces C4-6 weighing 0.1537 were ranked second and third respectively. The lowest density index of building spaces C4-7 was obtained with a weight of 0.0455.

Table10. Prioritization and final weight of indicators in the criterion of continuity of activity in crises

Criterion	Criterion	The average rate of comparable importance S_j	Initial integration $k_j = s_j + 1$	Comparative weight $w_j = \frac{x_{j-1}}{k_j}$	The final weight $q_j = \frac{w_j}{\sum w_j}$
Locating vital building spaces	C4-5		1	1.0000	0.2198
Safe space	C4-2	0.100	1.100	0.9091	0.1998
Independence of building spaces	C4-6	0.300	1.300	0.6993	0.1537
Adjacent space compatibility	C4-1	0.250	1.250	0.5594	0.1230
Performance of architectural spaces at different times	C4-3	0.100	1.100	0.5086	0.1118
Furniture	C4-8	0.350	1.350	0.3767	0.0828
The level of humanity (ergonomics) of the building's space	C4-4	0.300	1.300	0.2898	0.0637
The density of building spaces	C4-7	0.400	1.400	0.2070	0.0455

In Table 8, the priority and the final weight of the indices are expressed in the earthquake criterion, which is presented in the weight column of each indicator. According to this table, the layout of the critical C5-5 building spaces with a final weight of 0.2094 is the highest and is shown in yellow. After that, the secure space of C5-2 with a weight of 0.1903 and the performance of architectural spaces at different times of C5-3 with a weight of 0.1586 were ranked second and third respectively. The lowest density index of building spaces C5-7 was obtained with a weight of 0.0544.

Table11. Prioritization and final weight of indicators in the earthquake criterion

Criterion	Criterion	The average rate of comparable importance S_j	Initial integration $k_j = s_j + 1$	Comparative weight $w_j = \frac{x_{j-1}}{k_j}$	The final weight $q_j = \frac{w_j}{\sum w_j}$
Locating vital building spaces	C5-5		1	1.0000	0.2094
Safe space	C5-2	0.100	1.100	0.9091	0.1903
Performance of architectural spaces at different times	C5-3	0.200	1.200	0.7576	0.1586
Adjacent space compatibility	C5-1	0.300	1.300	0.5828	0.1220
Independence of building spaces	C5-6	0.150	1.150	0.5067	0.1061
The level of humanity (ergonomics) of the building's space	C5-4	0.200	1.200	0.4223	0.0884
Furniture	C5-8	0.250	1.250	0.3378	0.0707
The density of building spaces	C5-7	0.300	1.300	0.2599	0.0544

The results of the SMART method for scoring each architectural space option

According to the experts' opinion from the questionnaires, the score of each of the parameters of the architectural standard indexes is calculated using the Smart method and is presented in Table 9.

Table12. Index scores for each architectural space criterion

Index	Dimensions	Ability to reduce the effect of the explosion	Facilitating Emergency Exit	Cost	Continuous activity in crisis situations	Earthquake
Adjacent space compatibility	Compatible	8.11	8.90	7.11	8.88	7.78
	Incompatible	3.12	2.08	3.19	1.89	2.36
Safe space	All people in the building	8.89	8.81	2.11	8.79	8.89
	Space exploiters	7.12	6.32	3.89	6.78	7.42
	Special people	5.23	4.69	7.22	5.43	6.33
	Without a secure space	2.15	2.22	7.23	2.41	3.28
Performance of architectural spaces at different times	Flexible spaces	7.78	8.86	2.06	8.68	8.42
	Adaptable spaces	7.32	5.85	5.18	6.07	5.69
	Single-Functional Spaces	3.34	2.11	7.89	2.67	2.41
The level of humanity (ergonomics) of the building's space	Humanitarian level (ergonomics) Physical factors of building space	6.41	8.90	6.32	7.80	8.32
	Humanitarian level (ergonomics) Psychological factors of building space	4.23	4.17	4.23	6.32	6.54
Locating vital building spaces	Use of sensitive parts in the underground of the building	8.34	4.18	5.11	8.23	2.2
	Use sensitive sections within the building floor plan	6.45	7.78	6.23	7.18	6.24
	Placing in the plan wall	1.22	1.85	5.42	2.09	8.64
Independence of building spaces	Relatively closed spaces and separated from other spaces	7.68	2.12	3.32	8.07	3.72
	Relatively open spaces with other spaces	2.88	8.12	8.12	3.45	8.61
The density of building spaces	Space with low density	3.05	8.89	8.13	8.29	8.65
	High density space	8.33	2.09	3.37	2.67	2.98

Identifying, evaluating and prioritizing the criteria and indicators in an architectural environment can be effective in making a decision for designers to reduce the vulnerability of large-scale business buildings. In assessing the architectural standards of large-scale commercial buildings, the criteria for reducing the impact of explosions, facilitating emergency exit, operating continuity under crisis, earthquake and cost with weights 0.3056, 0.2778, 0.2315, 0.1852, and 0.1543, were obtained as criteria for assessing the compatibility of architectural space of these buildings. Using this model, which includes the set of criteria and indicators provided with the weights, we can estimate large-scale commercial buildings in terms of vulnerability to urban threats and risks, as well as the degree of vulnerability and weaknesses in each indicator and benchmark, can be evaluated.

6- Conclusion and Discussion

Commercial places have a vital role and function in urban and metropolitan areas at the regional level. Disruptions in them make important damage to the economy of a city. Achieving technical criteria that could increase the level of citizen's security in the event of a possible event of urban threats by using them in the design phase of architectural design of commercial buildings, promotes defense capability, national security, and reduces vulnerability to threats from the peripheral environment. The volume of many of the country's annual construction is related to large-scale commercial buildings and they are subject to various hazards, but there are no requirements for architectural space. In this research, the goal is to provide a model for rapidly assessing the vulnerability of large-scale commercial buildings to threats with a crisis management and passive defense approach. To do this, by providing indicators and appropriate measures for evaluating such buildings using Swara and Smart methods, the significance of the architectural space benchmark was obtained and finally, by providing a checklist of them, the degree of compatibility of the building architecture index was investigated and calculated. In the studies on the architectural space, the criteria for reducing the impact of explosions, facilitating emergency exit, continuity of activity in crisis, earthquake and cost with the weights 0.3056, 0.2778, 0.2315, 0.1852 and 0.1543 were ranked first to fifth, respectively.

By using the proposed model, architectural space of large commercial buildings to urban threats and vulnerabilities can be assessed, as well as the degree of vulnerability and weaknesses in each indicator and criterion in the architecture of the space.

Based on the research done in this article, the suggestions below are recommended:

• The vital and sensitive spaces of the buildings to be located in the central part and in the lower floors, and spaces of less importance to be placed in the outer wall of the building.

• Designing cell spaces reduces the vulnerability of buildings.

Multipurpose spaces to be considered in building design

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