Seismic vulnerability assessment of historical urban centres

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Seismic vulnerability of historical centres

Teze de doctorat ale UPT, Seria X, Nr. YY, Editura Politehnica, 200Z, 168 pagini, 39 figuri, 27 tabele.

Keywords:
Vulnerability, earthquake, historical buildings, masonry, architecture, cultural value, multidisciplinarity, nonlinear analysis, empirical analysis

Summary,
Heritage, understood by the sum of its tangible and intangible elements, is the basis of authenticity, integrity and the 'spirit of the place', giving meaning, value, individuality and emotion.
The doctoral dissertation investigates the earthquake vulnerability of the historic masonry buildings in the Iosefin and Fabric neighborhoods of Timișoara. The vulnerability investigation is based on the existing methodologies and validated at European level, and the thesis aims at customizing these methodologies for the type of earthquakes existing in the Banat area. Based on a detailed nonlinear analysis performed on 25 representative buildings, it is proposed to adapt the existing methodology, and the results are validated by associating with the damage observed in situ after the 1991 earthquake in the Banloc area. This outlines a new methodology for quickly assessing the seismic vulnerability of historic buildings in areas with surface earthquakes.
In addition, the originality and individuality of a community is ensured by the cultural pillar, as part of a sustainable development. In this context, the paper comes with an important cultural characteristic, proposing that the level of vulnerability be influenced by the risk of irrecoverable loss of architectural-artistic, urban or socio-economic values.
The proposed new methodology is validated by applying it to a number of 105 historic buildings in Timisoara.
In conclusion, the doctoral thesis starts from scientific data widely used in Europe, but makes important personal contributions by customizing existing methodologies for surface earthquakes and by developing these methodologies so as to take into account the cultural value of historic buildings.
Such research lays the foundations of an integrated policy of conservation and restoration of historical heritage, putting Timisoara on the map of cities of interest with definite concerns in this direction.

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Cuvinte cheie:
vulnerabilitate, seism, cladiri istorice, zidarie, arhitectura, valoare culturala, multidisciplinaritate, analiza neliniara, analiza empirica

Rezumat,
Patrimoniul, inteles prin suma elementelor sale tangibile si intangibile, reprezinta baza autenticitatii, integritatii si 'spiritului locului', conferind semnificatie, valoare, individualitate si emotie.
Lucrarea de doctorat cercetează vulnerabilitatea la seism a clădirilor istorice din zidărie din cartierele Iosefin și Fabric ale orașului Timișoara. Investigarea vulnerabilității se bazează pe metodologiile existente și validate la nivel european, iar teza urmărește particularizarea acestor metodologii pentru tipologia de cutremure existente în zona Banat. Pe baza unei analize neliniare detaliate realizată asupra a 25 de clădiri reprezentative, se propune adaptarea metodologiei existente, iar rezultatele sunt validate prin asocierea cu avariile observate in situ dupa cutremurul din anul 1991, din zona Banloc. Astfel se conturează o nouă metodologie de evaluare rapidă a vulnerabilității seismice a clădirilor istorice din zone cu cutremure de suprafață.
În plus, originalitatea și individualitatea unei comunități este asigurată de către pilonul cultural, ca parte a unei dezvoltări sustenabile. În acest context, lucrarea vine cu o importantă caracteristică culturală, propunând ca nivelul de vulnerabilitate să fie influențat de riscul pierderii irecuperabile a unor valori de ordin arhitectural-artistic, urbanistic sau social-economic.
Noua metodologie propusă este validată prin aplicarea acesteia asupra unui numar de 105 clădiri istorice din Timișoara.
În concluzie, teza de doctorat pornește de la date științifice utilizate la scară largă la nivel european, însă aduce importante contribuții personale prin particularizarea metodologiilor existente pentru cutremure de suprafață și prin dezvoltarea acestor metodologii astfel încât să țină cont si de valoarea culturală a clădirilor istorice.
O astfel de cercetare pune bazele unei politici integrate de conservare și restaurare a patrimoniului istoric, punând Timișoara pe harta orașelor de interes cu preocupări certe în această direcție.

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1 INTRODUCTION

1.1 Introduction

Natural disasters represent an important aspect of the life of people who live in exposed areas. One of the most important natural disasters that can occur in many places in the world is the earthquake.

Although there were made significant steps in the process of understanding the tectonic moves, through continual development of the seismology and design codes with the indication of specific antiseismic measures, lately there were registered a large number of seismic events in the entire world which led to important losses. Last researches in the field of seismic engineering are holistic studies which need a multidisciplinary approach for the causes, effects and measures that should be taken to reduce the losses.

The results of the multidisciplinary researches and the conclusions that can be drown after past earthquakes must be connected and integrated into a civil protection strategic programme coordinated by the government authorities through intervention measures. This measure has the aim of preparing the population and the responsible authorities to have the best possible answer and so, to reduce the effects of the seismic events. The reduction of the negative effects can be obtained by following effective protection policies that must be implemented before an earthquake occurs, immediately after the event and in the long-term after the earthquake (approximately ten years). This aspect indicates the necessity of developing prevention and intervention strategies for pre and post-event measures.

The prevention and intervention policies should be drawn up for various seismic scenarios, in dependence of the magnitude, epicentral distance and focal depth, foundation soil type and other particularities of the area. The possible scenarios and the civil protection measures must also consider the secondary effects of earthquakes, such as landslides [1], a tsunami [2], or a fire [3].

The seismic scenarios, in general, try to identify the possible direct losses, such as local or global damages to buildings or human life and possible indirect losses, such as economic, social, cultural, and historical ones.

History offers us a lot of examples of seismic events with a significant negative impact on various cities in the world. There are some historical earthquakes that changed the entire appearance of the historical cities on every continent, such as Catania [4], Lisbon [5], San Francisco [6], Messina [7], Cusco [8] and others. Also, another recent series of strong earthquakes hit various cities, such as Mexico City [9], Chile [10], Sumatra [11], Aquila [12], Amatrice [13], Skopje [14], Tangshan [15], Tehran [16], Bucharest [17], Christchurch [18], Bam [19], Bhuj [20], Gorkha [21] and others. These earthquakes caused severe damages to both modern and historical old buildings.

Special attention must be given to the protection of the historical urban centers, which represent an important cultural value and that are located in many cases, in the seismic area of the Mediterranean basin. In the past 20 years, countries like Italy, Greece and Turkey have experienced strong earthquakes that highly affected the architectural assets [22]. Unfortunately, there was noticed the fact that even relatively small magnitude earthquakes caused severe damages to the built heritage. For example, in Italy, a not very strong earthquake that occurred in 2009 led to damages to many historical buildings in the Abruzzo region. Despite the relatively small magnitude of only M_W=6.3, the earthquake provoked more than 300 deaths, let almost 30000 people without houses, and damaged a vast number of buildings, from which many had historical and cultural value [23].

The losses that were provoked highlighted the need for awareness and knowledge. Even in our days, there is a serious danger for the historical urban areas, which are exposed due to lack of seismic design rules or lack of proper consolidation work in the last years. A specific level of total losses, both social and economic, can represent a specific level of risk for a certain area [24], [25].

Seismic risk can also be understood as a sum of three different factors, such as hazard, vulnerability, and exposure [26], [27], [28]. In this equation, hazard represents the actual probability of occurrence of a seismic event of a specific intensity in a particular geographic area. This parameter cannot be influenced by human activity and is very hard to predict. The vulnerability can be explained as the most probable potential of investigated buildings to reach a certain damage state in case of an earthquake with a specific intensity [29]. It can be influenced by the conservation state of the buildings, building materials and techniques, location and other factors. Finally, the exposure can be defined as the proprieties of the area that might get influenced by the seismic event [29]. It can be influenced by risk reduction policies.

The reduction of seismic risk can only be obtained by reducing the vulnerability and the exposure level through protection strategies. There is therefore highlighted the opportunity for risk reduction policies and urban planning multidisciplinary strategies to be able to protect both architectural heritage and local communities. To reduce the seismic risk in historical urban centres, many European countries developed various quick and easy to apply seismic vulnerability assessment methodologies for historical buildings.

Moreover, there is a high need for historical urban centres for optimised models for seismic vulnerability assessment and loss estimation. These tools not only can offer the necessary level of knowledge to predict the future effects of possible earthquakes but also can represent the base for preparing and implementing risk mitigation policies [30].

Not least, it stands out the necessity to protect the cultural value of the historical buildings, which are the most likely to be damaged, through seismic vulnerability assessment methodologies that consider the cultural value.

This simplified seismic vulnerability assessment methodologies must indicate to the local authorities the priorities in the consolidation process of the historical buildings, before any earthquake and immediately after a seismic event. Based on the investigation results, there can be predicted the cities' answer to various seismic scenarios.

1.2 The opportunity of the study subject

Historical buildings were made based on intuition and a great understanding of the action of several forces on the structure but without any mathematical or analytical modeling. Historical structural masonry is considered nowadays, due to the appearance of more resistant materials, as fragile at the seismic forces. Because of their ductility and reduced bearing capacity, historical structures are considered vulnerable to seismic events. Because the built historical heritage is very consistent, there is an attempt to preliminary identify the seismic vulnerability of the historical buildings through simplified empirical methods that follow the answer of the buildings to past earthquakes.

Nowadays, there are several seismic vulnerability assessment methodologies of historical structures that are widely used, but also another ones in progress, globally, that are strongly influenced by the earthquake characteristics and buildings particularities of each region. That is why, the development and improvement of the methodologies, by multidisciplinary teams, for the seismic vulnerability assessment for masonry buildings is necessary and opportune.

Globally, there are used three types of simplified assessment methodologies, such as empirical, numerical and hybrid techniques. A possibility of developing the seismic vulnerability assessment methodologies is to combine empirical with numerical assessment procedures and to adapt the results to the specific characteristics of an urban area. Thereby, the method can be applied later on at a large scale, with minimum time and money resources.

Moreover, the research papers regarding the cultural value of the historical masonry buildings are contemporary subjects, highlighting the necessity of investigating this aspect. Because many historical cities are located in seismic areas, there is opportune to propose a simplified seismic vulnerability assessment methodology that also considers the cultural value of the masonry buildings.

The assessment of the seismic vulnerability is investigated in the entire world, for historical sites [31], historical buildings and urban centres in Portugal [32], Italy [33], Peru [34], Algeria [35], Nepal [36], Morocco [37], New Zealand [38] and others.

The subject of the thesis continues and harness the results related with many research contracts and multidisciplinary projects in the field, such as PERPETUATE [39], NIKER [40], RESIN [41], RISK-UE [42] and others. However, there are several researches and investigations worldwide in this field, since there aren't clarified yet all the aspects and variables that lead to a proper seismic behavior evaluation of a historical building.

At the moment many multidisciplinary teams in the entire world investigate the structural behavior of historical masonry structures, representing the Italian school through Lagomarsino et al. [43], Mazzolani et al. [44], Modena et al. [45], Dina D'Ayala et al. [22], the Portuguese school through Lourenco et.al.[46], the French school through Mouroux et al. [47], the New Zeeland school through Ingham et al. [48], the Greek school through Tassios et al. [49] and Kappos et al. [50], the US school through Mahoney et al. [51] and others.

The subject of the thesis is debated at large scale in important international peer-reviewed journals with impact factor and several internationally renowned conferences, such as SAHC, PROHITECH, IB2MAC, ICSA, ICEFA, and others illustrating the importance and actuality of the theme.

Therefore, the present thesis subject is of high interest both nationally and internationally because it continues the work of recognized international multidisciplinary teams in the field of seismic vulnerability assessment of historical masonry buildings at the urban scale and propose an original simplified seismic vulnerability assessment methodology that can be applied in the areas characterized by shallow earthquakes of moderate intensity.

The thesis is divided into six chapters and three appendices.

The first chapter represents an introduction to the theme, describes the main idea, and presents the main objectives. There is also highlighted the opportunity of the investigated subject and the basis in which the subject was developed.

Chapter 2 presents in the first part the general context of the investigated subject together with the "state of the art" in the field of seismic vulnerability assessment and loss estimation of historic urban areas. The second part of the chapter brings a detailed presentation of the seismic vulnerability assessment methodologies that were chosen to be used and applied to the investigated buildings. There are described the empirical methodologies, which are the easiest, quick to apply and appropriate for urban scale, the mechanical methodologies which necessitate a more detailed investigation and data access, and also the hybrid methodologies which represent a combination of the previous two. The third part of the chapter is about the existing cultural assessment policies, while the last part relates the urban risk reduction strategies that are used at a global level.

The third chapter is divided into two major parts. The first part of the chapter describes the selected zone to be investigated and presents a preliminary analysis of the area. The historical evolution of Timisoara city and especially of the two historical districts that represent the case study areas, Iosefin and Fabric, helps the reader to understand the context better. Following a multidisciplinary study made on-site, there are also presented urbanistic and social analysis, to be able to provide a tool for further loss estimation procedure. At the same urban scale, there is also presented an analysis of the seismicity of the area, past earthquakes, and their effects and also past registered magnitudes. Based on this information, there is also proposed the most probable seismic scenario for the investigated areas, and there is defined the expected macroseismic intensity in case of an earthquake of crustal type in the proximity of the Timisoara city. A novelty that is brought by this chapter is the definition and presentation of the particular failure mechanism of masonry buildings in the near- field areas, obtained after real damage observed on nearby sites affected by the past shallow earthquake, such as Banloc city. Moreover, the scale of the investigation is reduced, and the buildings from the case study historical districts are investigated in detail. Following the on-site investigation and visual inspection for more than 100 historical masonry buildings and a complete survey for 25 of them, there are presented the typical structural typological classes in the area. There are established the mechanical characteristics of the masonry that are going to be used in the further nonlinear analysis and also, as a personal contribution, there are presented the most valuable architectural-artistic assets of the area.

The second part of the chapter already presents the results of the seismic vulnerability assessment of the investigated buildings, following the methodologies that were presented in the second chapter. This part illustrates the results of the empirical investigation of more than 100 historical masonry buildings and the detailed mechanical investigation of 25 of the most representative ones. Moreover, there is also made a comparison between the results of the methodologies and the real damages observed on nearby sites after past earthquakes. Because the results indicate a tendency of the empirical methodology of underestimating the expected damage, there is concluded that the methodology needs to be adapted for the shallow earthquakes in areas with reduced seismicity, such as Banat seismic region. Following this observation, there is proposed a new damage estimation formula that considers the real damage state that might occur, also representing the main personal contribution in this part of the chapter. There are redesigned the empirical seismic vulnerability curves for all 105 investigated buildings following the new proposed damage estimation formula adapted for the near-field earthquake effects. A comparison between the original and the proposed methodologies results is also presented.

Chapter 4 comes in the first part with one of the most important personal contributions in the thesis. It highlights the importance of the cultural value of the historical buildings for the local community and the history of the city. There is proposed a development of the existing empirical methodology to consider also the architectural-artistic, urbanistic, and social-economic value of each investigated buildings. Following the same damage estimation formula that was previously proposed, this chapter presents the application of the new proposed seismic vulnerability assessment influenced by the cultural value results. This proposed methodology also considers the importance of the case study area and can adapt the results to the particularities of the site. The new vulnerability curves are compared with the previous empirical curves, indicating a good correlation and an increase of the vulnerability for the most representative historical buildings of Timisoara city. The results are helpful for the local authorities as they can be used to design a list of priority for rehabilitation work.

In the second part of the chapter, there is also defined a loss scenario based on the losses assessment methodology results of the investigated area, for the considered seismic scenario. There are evaluated the possible losses in terms of buildings, human life, jobs, money and artistic assets. This loss scenario is convenient for understanding the expected effects of a possible shallow earthquake in the proximity of Timisoara city. Following the obtained results, there is also proposed a preliminary risk reduction plan that investigates the existing situation to identify the possible places for refugees and temporary shelters.

The fifth chapter presents original information about the particular failure mechanisms developed by historical buildings in Banat seismic area. There are illustrated original results regarding the capacity curves of the investigated buildings, interstorey drift ranges, cracks distribution, top horizontal displacements, base shear forces, ductility and behaviour factor. The results confirm the conclusions of the nonlinear analysis and the necessity of adapting the empirical seismic vulnerability assessment methodology. Moreover, the chapter presents an interesting comparison between the capacity and the demand of historical masonry structures and also proposes fragility curves for each typological class. There is investigating also the effect of the wooden framework for the bearing capacity, ductility and behaviour factor of the historical masonry buildings and there are proposed FRP quick solutions for reducing the seismic vulnerability.

The last chapter is a conclusion chapter that discusses the results of the empirical, mechanical, and cultural seismic vulnerability assessment methodologies and also the losses scenario estimations. There are highlighted the personal contributions of the author and their opportunity. Moreover, there are presented published papers related to the thesis subject and also future research direction to develop the existing analysis.

Appendix A presents the complete survey of the 25 detailed investigation buildings. The second appendix illustrates the empirical investigation forms that were obtained for all the 103 investigated historic masonry buildings, while appendix C comes with the synthesis of the seismic vulnerability assessment results in terms of numbers and graphics.

There are presented a number of 290 figures and 51 tables.

Overall, the presented thesis, starting from the existing seismic vulnerability assessment methodologies from the entire world, proposes an original new methodology, which is also applied on a large number of historical masonry buildings in Timisoara city, characterised by shallow earthquakes. Based on a correlation between different methodologies results and real failure mechanisms observed after past earthquakes, the damage estimation formula is adapted for the near-field earthquake. The new proposed methodology considers for the first time the influence of the cultural value of the historical buildings. A classification of the specific failure mechanism, ductility and behaviour factor for the historical masonry buildings in this investigated area is proposed. The entire multidisciplinary seismic vulnerability assessment methodology together with the risk reduction proposal plan defines the research direction and opportunity of the thesis.

1.3 **Objectives**

The scientific research has sought to achieve the following objectives:

i) Realizing state of the art for the most common seismic vulnerability assessment methodologies

ii) Proposing a quick and simplified seismic vulnerability assessment methodology for historical masonry buildings located in areas characterized by shallow earthquakes and reduced seismicity, such as Banat seismic region

iii) Identifying typical failure mechanisms characteristic for historical masonry buildings in Banat seismic region

iv) Classifying the historical masonry buildings in Timisoara following typological classes and proposing a database with the characteristic structural systems

v) Assessing the seismic vulnerability of historical masonry buildings in the Banat seismic area

vi) Critically analysing the results obtained following different methodologies

vii) Defining the seismic vulnerability curves of the main historical areas of Timisoara city

viii) Proposing an empirical vulnerability assessment methodology that also considers the cultural value

ix) Defining the vulnerability curves influenced by the cultural value for the historical areas of Timisoara

x) Defining the most probable seismic scenario following the seismicity of the area and building typologies

xi) Proposing seismic vulnerability maps for the two historical districts of Timisoara city

xii) Evaluating the possible losses considering the most probable seismic scenario

xiii) Synthetizing the results of the numerical assessment and defining the general capacity curves for each typological class

xiv) Proposing the average ductility for each typological class that was previously classified, following a specific seismic scenario

xv) Proposing behaviour factor values for each typological class that was previously classified, based on the expected seismic scenario

xvi) Proposing fragility curves for each typological class

xvii) Defining of the expected damage states for each typological class, according to a specific seismic scenario

xviii) Investigating of the effect of the timber framework roof to the ductility of masonry structures

xix) Proposing of quick, easy to apply, modern and not expensive consolidation solutions for historical masonry buildings in Timisoara

2 EXISTING SEISMIC VULNERABILITY ASSESSMENT METHODOLOGIES FOR HISTORICAL BUILDINGS AND HISTORICAL URBAN AREAS

2.1 General context

The seismic hazard can be understand as a measure tool for the most probable destructive potential of an earthquake, in a specific area. In the scientific literature, the measure for the severity of a seismic event is obtained by using macro-seismic or instrumental scale. There are two possibilities, by using parameters related to ground motion, not related with past seismic events, or by using estimation of mean intensity based directly on real damage state observed after past earthquakes. The first category can be expressed in terms of peak ground acceleration, local magnitude or Richter magnitude, while the second category can be related with the macro-seismic intensity [25].

In the process of seismic hazard estimation, there are used both: deterministic and probabilistic methods. First one reconstruct the damage scenario following studies of the observed damage of past seismic events in a specific area and estimates the frequency of repetition in time. The second method uses the information from seismic history of an area and determines the probability of occurring an earthquake of certain intensity or magnitude at a specific interval of time. Following the probabilistic hazard estimation, there was designed the global seismic hazard map, as presented in Figure 2.1 [52].

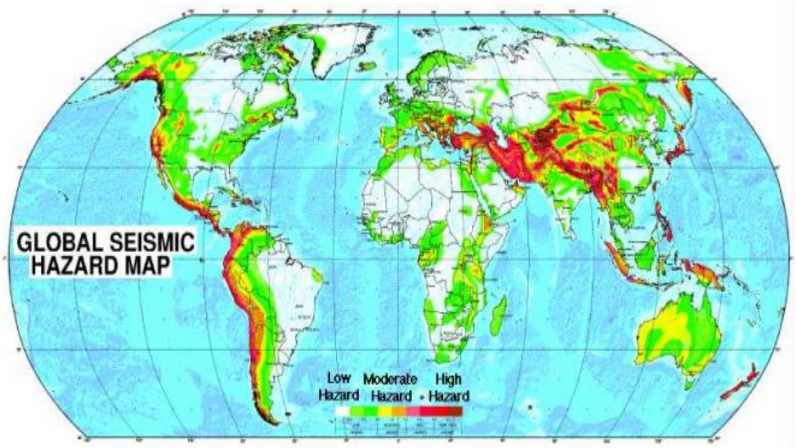


Figure 2.1. Global seismic hazard map [52]

For the exposure of an area, the literature defines it as the sum of quality and quantity of exposed elements to the risk. There can be consider buildings, persons, activities, cultural values, traditions, spirit of place and any other element that might be affected by a seismic event. In the process of exposure estimation level, there should be consider also the capacity of the area to react to an earthquake [25]. The level of exposure in the world is illustrated in Figure 2.2 [53].

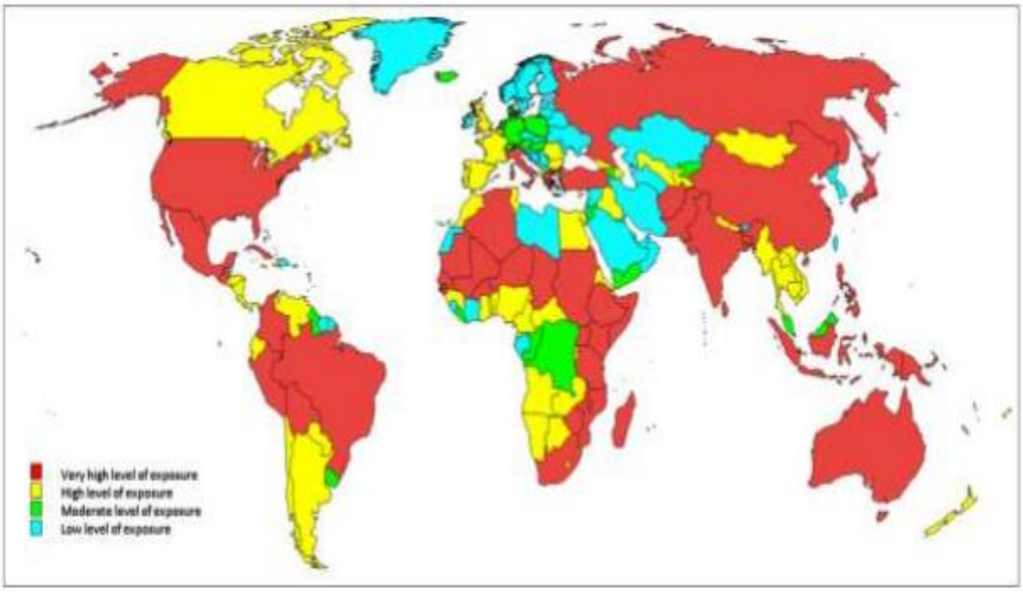


Figure 2.2. Global exposure map [53]

The vulnerability is defined as the measurement of the possibility to be subjected to a specific damage state due to a given earthquake condition or the predisposition to suffer a specific damage state [54]. A convenient parameter for the earthquake condition is the macro-seismic intensity, as a direct correlation between intensity scale and damage [25]. For the determination of the vulnerability of the buildings from an area, which represents the risk parameter that is the most possible to be influenced and reduced, there are many methods used in the entire world, which will be further presented.

Considering the large number of procedures for assessing the seismic vulnerability, there is highlighted the need for a consensual classification. There are two main opinions regarding procedures classification. First, developed by Pellegrini [55], concludes that risk mitigation methodologies can be divided into three main groups, as following:

i) Empirical techniques

ii) Analytical or mechanical techniques

iii) Hybrid methods, as presented in Figure 2.3 [30].

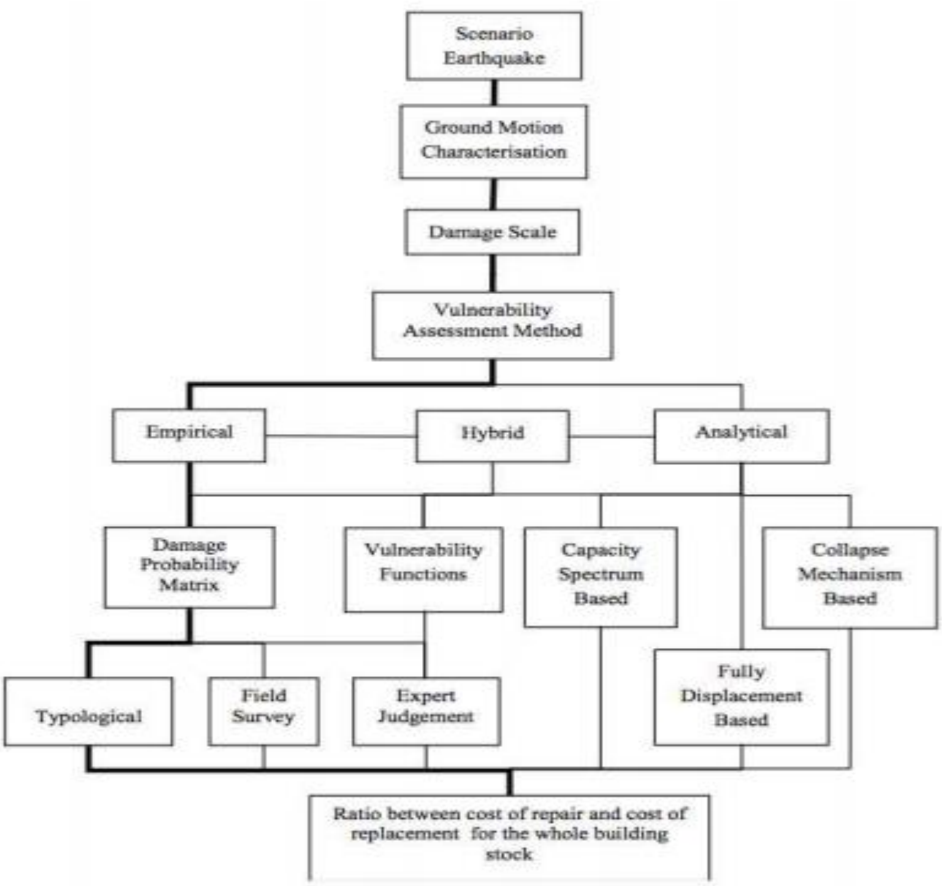


Figure 2.3. First classification of the seismic vulnerability assessment methodologies [30]

Second, there is the classification proposed by Petrini and Corsanego [56], which consider four main categories instead of three, as following:

i. Direct vulnerability assessment method (or analytical)
ii. Indirect vulnerability assessment method (or empirical)
iii. Conventional vulnerability assessment technique
iiii. Hybrid vulnerability assessment technique.

The direct vulnerability assessment techniques follows a typological classification by assigning to each investigated structure type a specific typological class. The evaluation of the most probable damage state for each typological class is obtained following damage observation data from past earthquakes and designing damage probability matrices. The matrices are obtained by considering data for specific region and different seismic intensities. This technique usually is based on both typological and mechanical methods, representing the structure typology through simplified or detailed models [57].

The indirect vulnerability assessment techniques are based on a relationship between the mean damage grade and the expected seismic intensity, by estimating a specific vulnerability index. The data are obtained through vulnerability curves that indicate the expected damage state for each seismic intensity. Each investigated building is classified and according to its class is assigned a particular vulnerability index that can be related to a most probable damage state. The techniques is appropriate for assessment of seismic vulnerability at urban scale or large number of buildings [57]. The most common methodologies that uses the indirect technique is the GNDT-SSN, that estimates the seismic vulnerability of large stocks of buildings by correlation with collected data from past earthquakes in various historical urban centres from Italy [58].

Conventional seismic vulnerability assessment methods are based also on a specific vulnerability index, but in this case the vulnerability is characterised independently from the damage estimation. The method can be also used to compare the seismic vulnerability of different buildings or different groups of buildings within same typology. For each structural typology and design requirements, there are defined capacity curves related to each damage state or even spectral displacements [57]. The performances of each structural typology are calibrated by experts [59]. Following calibration, the most common methodology that uses conventional technique is HAZUS [60], which classifies the damage in 36 structural systems and uses four damage states [60].

The hybrid vulnerability assessment technique is actually a combination of procedures from direct, indirect or conventional methodologies. One of the most-known hybrid methodology is the macroseismic methodology, developed by Lagomarsino and Giovinazzi [61]. This procedure is based on the potential of both direct and indirect techniques. It uses the same vulnerability assessment classification and method that is indicated in the European Macroseismic Scale EMS-98 by Grunthal [62], but in the same type it improves the results by an indirect technique.

The proper use of each individual technique is presented in Figure 2.4 [63].

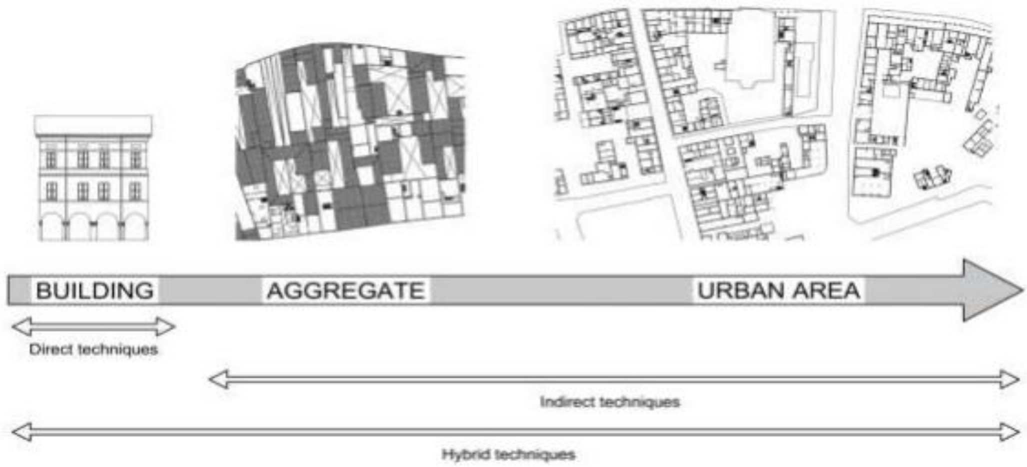


Figure 2.4. Different urban scale appropriate use for seismic vulnerability assessment methodologies [63]

2.2 Classification of seismic vulnerability assesssment procedures

One of the most difficult task in the process of the seismic vulnerability assessment is represented by the data collection and methodology definition. In order to adapt the situation for the multiple possible cases, there were defined the main types of investigation methodologies based on the scale that they are appropriate for. This categories consider the level of detail in the investigation process, the scale of the case study object and the way that the collected data is used, defining first, second and third level approaches.

The first level approaches involves the smallest level of detail in the investigation process, following mostly qualitative information. That is why, are most appropriate for the large-scale vulnerability assessment analysis. The second level approaches involves already some geometrical and mechanical information, being appropriate for aggregate assessment or small building stocks. The third level approach is based on a detailed complete survey and mechanical characteristics of the building. It involves numerical modelling techniques and is appropriate for single building scale, as presented in Figure 2.5 [64].

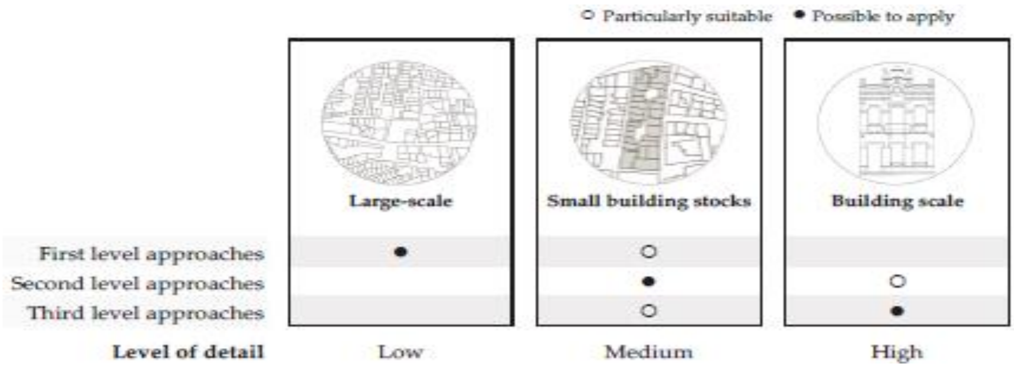


Figure 2.5. Possible seismic vulnerability assessment approaches for various scale [64]

2.2.1 Empirical methodologies

Empirical methodologies represent the first level approach in the process of the seismic vulnerability assessment of existing buildings. In the early 70's, hazard maps were defined following damage scales. Later on, there was started a tentative of assessing the seismic vulnerability of historical buildings at large scale. At first, the evaluation was made only through empirical methods that were obtained as functions of macroseismic intensities [30]. There are several empirical methodologies used nowadays, but in the next pages will be detailed some of them, that are considered to be most appropriate for Timisoara city.

2.2.1.1 Damage probability matrix

First one is the damage probability matrices. This techniques was first proposed by Whitman [65], for the estimation of damage in a probabilistic way. The main idea of this method is that each building that belongs to a particular structural typology has the same chances of achieving a specific damage state for a given macroseismic intensity. After the earthquake from 1971 in San Fernando, the methodology of Whitman [65] was designed for various structural typologies following a damage ratio that represents the ratio between the actual cost of repair work and the cost of replacing the affected building. Based on a function of the seismic intensity, the format of the damage probability matrix proposed by Whitman et. al. is presented in Table 2.1 [30].

Table 2.1. The matrix of the damage probability proposed by Whitman et. al. [30]

Damage state	Damage to structural elements	Damage to non-structural elements	Damage (%)	Seismic intensity				
				V	VI	VII	VIII	IX
0	No damage	No damage	0.00 ÷ 0.05	10.40	-	-	-	-
1	No damage	Minor	0.05 ÷ 0.30	16.40	0.50	-	-	-
2	No damage	Local damage	0.30 ÷ 1.25	40.00	22.50	-	-	-
3	Not noticeable	Global damage	1.25 ÷ 3.50	20.00	30.00	2.70	-	-
4	Minor	Substantial	3.50 ÷ 4.50	13.20	47.10	92.30	58.80	14.70
5	Substantial	Heavy	7.50 ÷ 20	-	0.20	5.00	41.20	83.00
6	Major	Nearly total	20 ÷ 65	-	-	-	-	2.30
7	Building condemned		100	-	-	-	-	-
8	Collapse		100	-	-	-	-	-

In Europe, one of the first damage probability matrix was designed after the earthquake from Irpinia, Italy in 1980, by Braga et. al. [66]. The novelty of this format is that the damage distribution of each structural typology for various seismic intensities was made following a binominal distribution. This binominal distribution is based on only one parameter that varies between 0 and 1, but this aspect brings also the disadvantage of having the standard deviations in dependence to this only one parameter. This method was considered to be a direct procedure [67] due to the possibility of creating direct relationships between structural typology and damage level. The procedure uses three possible vulnerability classes from A to C and is based on the MSK scale [30]. Nowadays, the damage probability matrix is a procedure that is still very used in Italy, but several improvement proposals were made in the past years. For example, the seismic scale was changed from MSK to MCS scale by di Pasquale et. al. [68] in order to adapt the procedure to the Italian seismic catalogue. Later on, a fourth vulnerability class D was introduced by Dolce et. al. [69] and the seismic scale was changed from MCS scale to EMS-98 scale [62]. The new vulnerability class was assigned for buildings edified since 1980 that are more likely to be built following seismic design codes or to be retrofitted [30].

One of the most recent damage probability matrix that is based on the EMS-98 macroseismic scale is the macroseismic method proposed by Bernardini et.al. [70], [61]. The procedure considers five possible damage grades for macroseismic intensities ranging from V to XII EMS-98. For each class of decreasing vulnerability from A to F, there are described quantitative scales of damage levels and qualitative description of the dimension of damages in the buildings. For example, for the vulnerability class C, that is considered to be the medium vulnerability class, the damage distribution for each macroseismic intensity is presented in Table 2.2 [30]. Also, the European macroseismic scale EMS-98 assigns a vulnerability class to each building by considering only the structural typology of the building, as presented in Figure 2.6 [25].

Table 2.2. Damage probability matrix for vulnerability class C following Giovinazzi and Lagomarsino macroseismic methodology [70], [30]

Intensity	Damage grade				
	1	2	3	4	5
V					
VI	Few				
VII		Few			
VIII		Many	Few		
IX			Many	Few	
X				Many	Few
XI					Many
XII					Most

The methodology was improved in 2004 [61] by assuming a beta damage distribution and following a Fuzzy Set theory. Moreover, the matrices for each vulnerability class have been designed in correlation with each group of buildings by using an empirical vulnerability index. The vulnerability index depends on structural and geometrical characteristics of the building or group of buildings. This new improved procedure was already applied on many building stocks from several European cities [71], such as Barcelona [72], [73], Lisbon [74], Faro [75], Sulmona [76] and others.

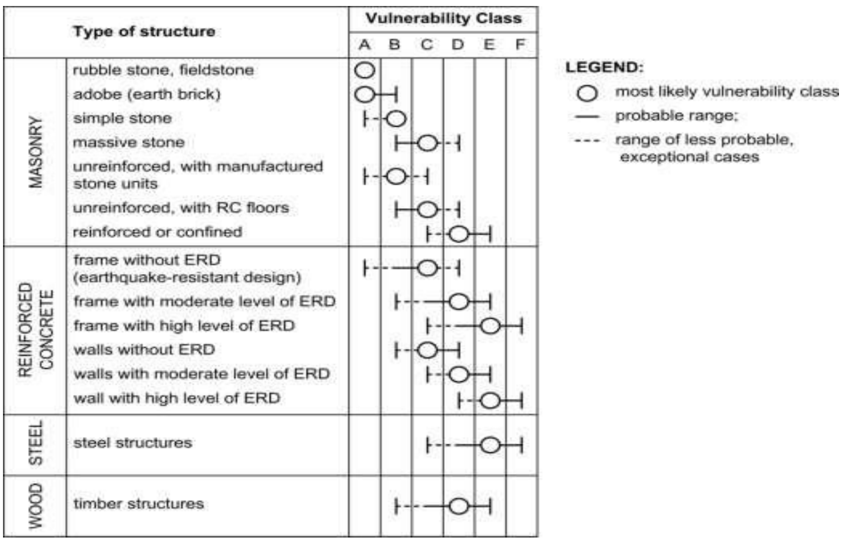


Figure 2.6. Seismic vulnerability classification for structural typologies following EMS-98 [25]

On large scale, the damage probability matrix based on intensity procedure is very effective due to the fact that there are a lot of areas with seismic hazard maps designed based on macroseismic intensity. The advantage of predicting possible future damage grade by using observed damaged from past earthquakes is big, because this procedure can be used in simplified manner for areas with similar characteristics. The main disadvantages are that the macroseismic intensity scale is designed just by observing past damages to building stocks. This aspect needs the existence and collection of many and accurate post-earthquake information and damage statistics, aspect that is not possible in all the areas. The simulation of vulnerability reduction by applying retrofitting solutions is difficult because there are no past information related to this aspect. Nowadays, many seismic hazard maps are designed based on the peak ground acceleration, so there is a need for correlation with the macroseismic intensity. Also, if the peak ground acceleration is used in the derivation of the empirical vulnerability assessment, there can be taken into consideration the relation between the period of vibration of each building and the ground motions frequency [30].

The data of damaged collected after past earthquakes led to a statistically interpretation and a damage distribution was defined for masonry structures, as presented in Figure 2.7 [25]. In Figure 2.8 [77] there is presented the quantitative appreciation of the damage from the previous figure.

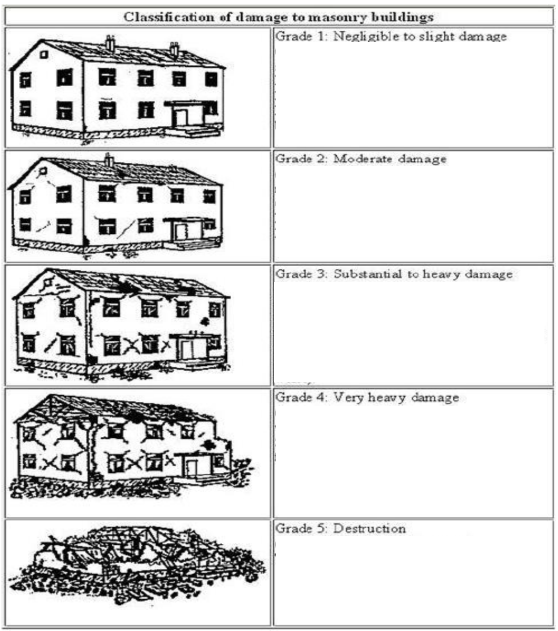


Figure 2.7. Damage distribution for masonry buildings after EMS-98 scale [25]

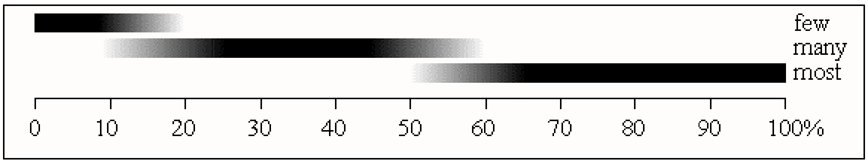


Figure 2.8. Quantitative appreciation of the damage level [77]

2.2.1.2 The vulnerability index method

The vulnerability index method represents also an empirical procedure, called indirect because the relationship between the seismic demand and the response of the building is defined following a vulnerability index [30]. At first, the methodology was proposed by Benedetti and Petrini [78] for buildings considered as isolated structural units and was applied in Italy [79]. The procedure is based on field survey form that associates a specific vulnerability class to each investigated parameter for each building. Each parameter can receive one of four vulnerability class based on the quality conditions and it has also a specific assigned weight. The class A represents the optimal situation, while the class D is considered to be the most unfavourable. The weight for each parameter is related to the importance of it and was determined based on large amount of damage survey data. The first investigation form contained 10 parameters that considered the structural and geometrical aspects of each individual structural unit, such as symmetry, plan and elevation regularity, distribution of structural elements, foundation type, quality of materials, actual level of decay ant others. The first application in Italy [79] developed the original methodology to eleven parameters, as presented in Figure 2.9 [25].

#	PARAMETERS	CLASSES $C_{v,i}$				WEIGHT
		A	B	C	D	p_i
1	Type and organization of resisting system	0	5	20	45	1.00
2	Quality of resisting system	0	5	25	45	0.25
3	Conventional strength	0	5	25	45	1.50
4	Building position and foundations	0	5	15	45	0.75
5	Horizontal diaphragms	0	5	25	45	variable
6	Plan configuration	0	5	25	45	0.50
7	In height configuration	0	5	25	45	variable
8	Maximum distance between walls	0	5	25	45	0.25
9	Roof	0	15	25	45	variable
10	Non structural elements	0	0	25	45	0.25
11	General maintenance conditions	0	5	25	45	1.00

Figure 2.9. Seismic vulnerability assessment investigation form used in Italy before 2000 [79]

The vulnerability index ranged between 0÷382.5, but it was later normalized between 0÷100, for a simplified comparison. The zero value represented the ideal situation or the minimum vulnerability, while the value of 100 represented a maximum vulnerability and a very high risk for the investigated building. For each vulnerability function, there is associated a damage factor from 0 to 1, value 1 meaning collapse of the investigated building [25]. Following past earthquakes data, the vulnerability functions were calibrated in dependence of the peak ground acceleration, as presented in Figure 2.10, for Coimbra, Portugal [80].

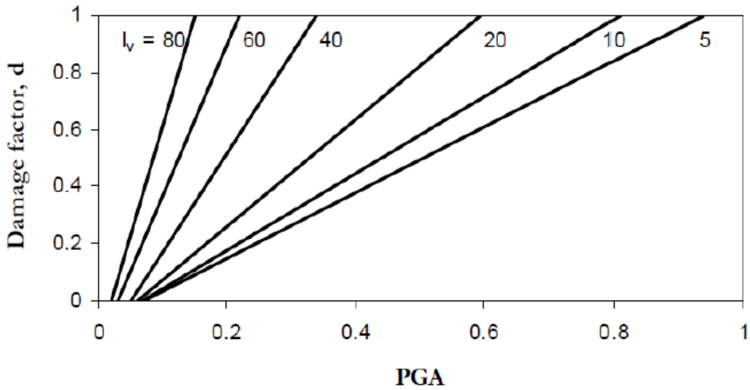


Figure 2.10. Vulnerability functions in terms of peak ground acceleration for different vulnerability indexes [80]

Later on, a new development of the vulnerability index method was proposed for the buildings considered in aggregate by Formisano and Mazzolani [81], by considering 15 parameters instead of 10. The new 5 parameters extends the evaluation of the investigated building by considering also the possible effects of the adjacent buildings and eventually interaction between them (as presented in Figure 2.11 [82]).

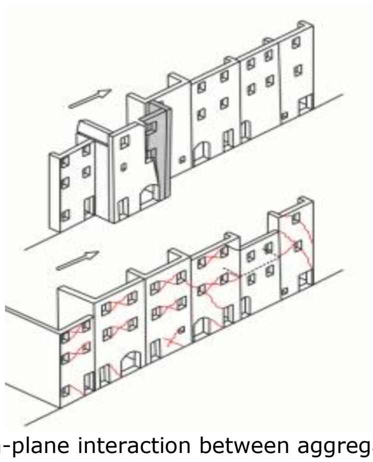


Figure 2.11. In-plane interaction between aggregate's units [82]

The estimation of the vulnerability index follows the same path as previously. Each parameter can be assigned to one of the four vulnerability class from A to D. The scores for the vulnerability classes ranges from 0 to 45 for the first 10 parameters, that are based on Benedetti and Petrini form [78] and for each parameters, there is assigned a weight factor. For the additional 5 parameters, the class scores can be also negative, so they can actually reduce the seismic vulnerability. This new parameters are related with the similarity of structural typology, difference between opening percentages, staggered floors or different adjacent heights. The class scores were assigned after calibration based on numerical analysis [83] and technical Italian code [84]. The final version of the vulnerability investigation form is presented in Figure 2.12 [81].

The final vulnerability index is actually the sum of the assigned class scores multiplied by the weight factor, as presented in Equation 1 [85].

$$I_V = \sum_{i=1}^{15} s_i \, x \, w_i \tag{1}$$

The vulnerability index method was applied and developed on several European cities [86], such as Barcelona, Catania, Thessaloniki and other in the research project RISK_UE [42].

Factors	Class score (s)				Weight (w)
	A	B	C	D	
1. Organization of vertical structures	0	5	20	45	1
2. Nature of vertical structures	0	5	25	45	0.25
3. Location of the building and type of foundation	0	5	25	45	0.75
4. Distribution of plan resisting elements	0	5	25	45	1.5
5. Plan regularity	0	5	25	45	0.5
6. Height regularity	0	5	25	45	0.5÷1
7. Type of floor	0	5	15	45	0.75÷1
8. Roofing	0	15	25	45	0.75
9. Details	0	0	25	45	0.25
10. Physical conditions	0	5	25	45	1
11. Presence of adjacent buildings with different height	-20	0	15	45	1
12. Position of the building in the aggregate	-45	-25	-15	0	1,5
13. Presence and number of staggered floors	0	15	25	45	0,5
14. Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1,2
15. Percentage difference of opening areas among adjacent facade	-20	0	25	45	1

Figure 2.12. Final form of the seismic vulnerability assessment investigation form proposed by Formisano [81]

A correlation between the vulnerability indexes I_V and the vulnerability scale was provided by the GNDT-II method [79]. The analytical expression illustrated in Equation 2 correlates the expected damage grade μ_D with the vulnerability index of each investigated building [87].

$$\mu_D = 2.5[1 + \tanh\left(\frac{I+6.25\ x\ V-13.1}{Q}\right)] \quad (2)$$

Where I represents the seismic risk in terms of macroseismic intensity EMS-98, V is considered to be the normalized vulnerability index in the range of 0÷1 [57] and Q is a ductility factor related with the building typology [88].

Another analytical expression between the vulnerability index and the expected damage state is illustrate in Equations 3-4 [25], [79], [89].

$$\mu_D = \left[2.5 + 3\ x \tanh\left(\frac{I+6.25\ x\ V-13.1}{Q}\right)\right] x\ f(V,I) \quad (3)$$

$$f(V,I) = \begin{cases} e^{\frac{V\ (I-7)}{2}} & I\ EMS-98 \leq 7 \\ 1 & I\ EMS-98 > 7 \end{cases} \quad (4)$$

Where I EMS-98 is considered to be the seismic risk represented by the macroseismic intensity, V represents the index of vulnerability following the GNDT-II method [79], Q is a factor of ductility related with the building typology [25] and f(V,I) represents a function of the intensity and vulnerability index [25], as expressed in Equation 4.

A particular adaptation of the procedure can be seen in the "Catania Project" [90], [91], were the vulnerability index resulted both from direct field observation and a range of values that were assigned to construction practices from the area. This procedure led to a minimum and a maximum value of the vulnerability index for each investigated building, but for the old buildings, the values were calibrated after the real damages observed after the earthquake from Friuli in 1976 [92], [93] and Abruzzo in 1984 [94]. The adapted methodology was used for assessing the seismic vulnerability of both masonry and reinforced concrete buildings, as a quick approach, based on the guidelines of the ATC-21 report [95]. The methodology was applied also on the historical centre of Cusco, Peru [34].

The advantages of the vulnerability index procedure, as an indirect technique, are multiple, as the method allows to define the vulnerability of a building or of a group of buildings with their particularities, not just the vulnerability of a structural typology. In this case, is more particular that the previous one. The main disadvantage is that the parameters and weights need an expert judgment and also present a certain level of uncertainties. When the methodology tends to be applied on very large scale, there is the need of defining the most representative buildings for the investigated area and to correlate the results with the census data [96], if available. In the cases of the case study areas where such database is not available, the procedure is very time consuming [30].

2.2.1.3 The continuous vulnerability curves

The continuous vulnerability curves procedure is based on the real observed damage after past earthquakes in different geographical areas. As the macroseismic intensity is not a constant parameter, but a variable, there was the need of adapting the derivation of the vulnerability functions to the MSK damage scale and also to the Parameterless scale of intensity PSI [97]. This adaptation was made by Spence et. al. [98] and Orsini [99] as is presented in Figure 2.13 [30].

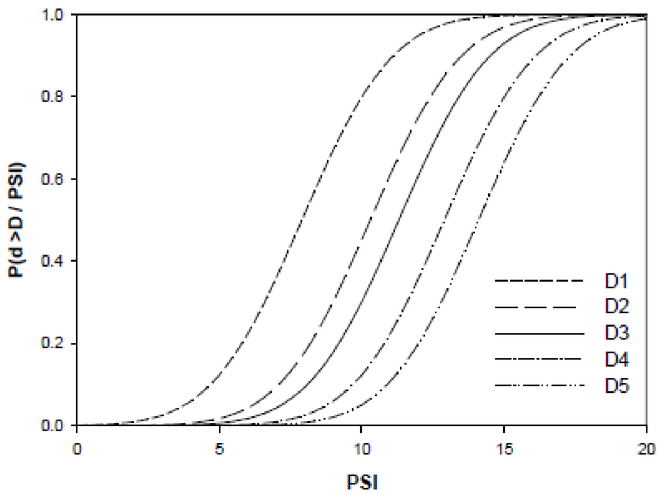


Figure 2.13. Vulnerability curves following continuous vulnerability curves procedure [98]

The procedure was improved by Sabetta et. al. [94] following the survey made after earthquake on almost 50000 buildings in Italy, damaged by severe earthquakes. According to the MSK macroseismic scale, the buildings were classified into 3 structural typologies and 6 damage levels. The average frequency of each damage level was defined as a mean damage index and was obtained for each structural typology. Following a function of peak ground acceleration, there were defined empirical fragility curves for typical structural typologies [100]. The peak ground acceleration was determined following the registered magnitudes of past earthquakes and the site-source distance, based on the attenuation law defined by Sabetta and Pugliese [101].

Simplified empirical vulnerability functions that don't use the macroseismic intensity or the peak ground acceleration were also proposed, but they are based on spectral displacement or spectral acceleration at the elastic period of vibration [102]. This kind of procedure illustrates an improved correlation between the damage level and the ground motion input. Designing the vulnerability curves following spectral ordinates instead of peak ground acceleration or macroseismic intensity had appeared due to the more and more use of attenuation equations [30].

2.2.2 Mechanical methodologies

The mechanical methodologies represent the second and third level approach, involving a more detailed level of knowledge. If the empirical methods are based on macroseismic intensity or peak ground acceleration, the mechanical ones are related more to spectral ordinates and seismic hazard maps. This aspect tend to offer a more detailed analysis and a vulnerability assessment related with direct physical meaning. Moreover, it offers the possibility of calibrating the results to different characteristics of the site or of the building stock [30].

2.2.2.1 The analytically-derived vulnerability curves

The traditionally damage probability matrices are derived from observed data, but more recent methodologies uses also computational analysis for more clear results. This contribution of the mechanical investigation has the aim to overcome the major drawbacks of the empirical methodologies previously presented. The analytically-derived vulnerability curves are obtained following a specific process that is described in Figure 2.14 [103].

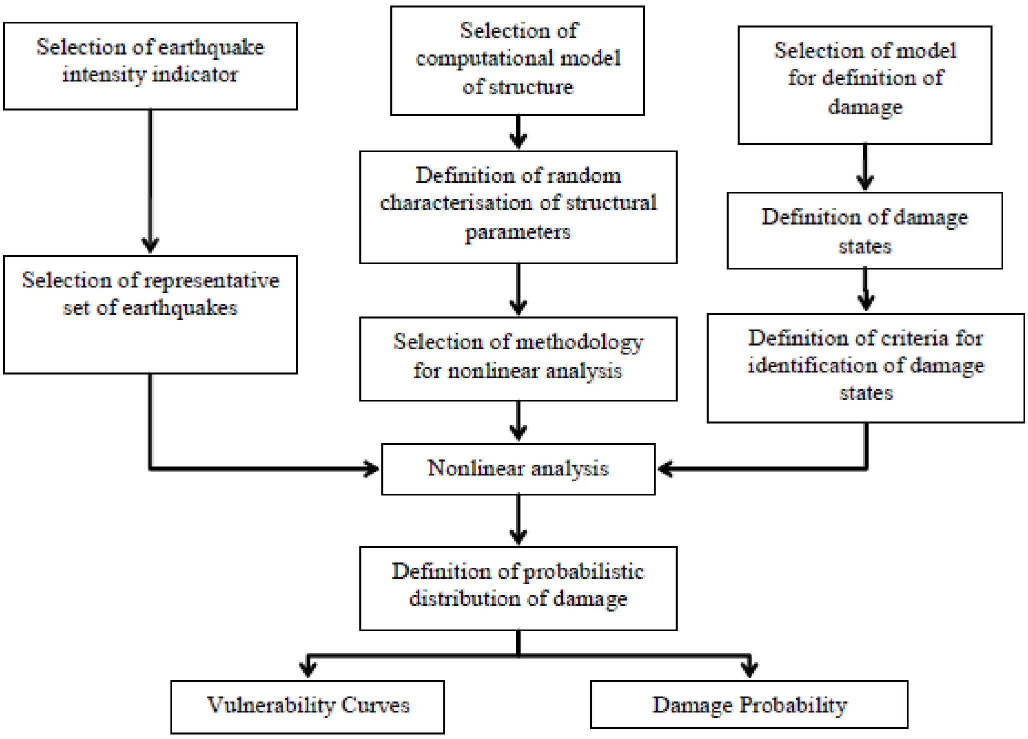


Figure 2.14. Analytical vulnerability curves and damage probability matrix obtaining process [103]

The first vulnerability curves and damage probability matrices following this procedure were obtained using Monte Carlo simulation for three categories of reinforced concrete frame structures [104]. The probabilistic results were obtained following a nonlinear dynamic analysis and considering also the specific ground motion. For the definition of the damage probability matrices there was used the Modified Mercalli Intensity scale. First, the structure was characterised when subjected to dynamic loads. Second, there were defined the potential ground motions. Thirs, there was defined the structural response of the investigated typology. The dynamic analysis considered also a time-histories data based on a specific level of ground motion for a large number of buildings with random structural characteristics. Each nonlinear analysis was able to provide a global damage index that was related to an expected damage state, as presented in Figure 2.15 [30]. The vulnerability curves were later updated following observational data after a survey of 84 buildings affected by the 1994 Northridge earthquake [105].

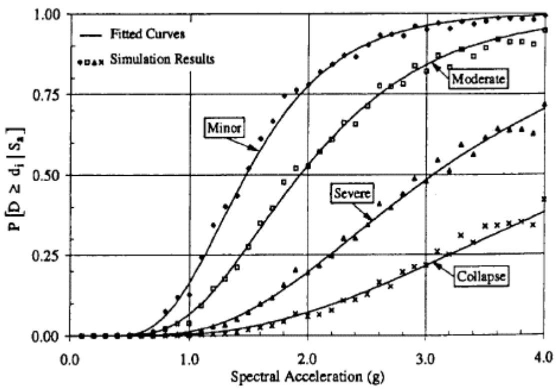


Figure 2.15. Vulnerability curves following the procedure [103]

Adapted pushover curves were defined for several European buildings and the performance point was used to correlate the curves with the expected damage state [106].

One of the most used large-scale projects that follows the presented principles is the RISK-UE project, which follows a building classification matrix based on representative structural typologies for countries such as Bulgaria, France, Greece, Italy, Romania, Spain and FYRoM [107]. The building matrix contains a total number of 65 building classes, divided into three main categories:

(i) Low- rise, meaning maximum 2 storey for wooden or masonry buildings and 1÷3 storey for steel and reinforced concrete structures

(ii) Mid-rise, consisting in 3÷5 storey masonry or wooden buildings and maximum 7 storey steel or reinforced concrete buildings

(iii) High-rise, represented by more than 6 storey masonry or wooden buildings and more than 8 storey steel or reinforced concrete structures [108]

Considering both vertical and horizontal type of structure and also the height range, there was defined the Risk-UE building typology matrix, as presented in Figure 2.16, for masonry structures, as the most common types in Europe [108]. The frequency of the building typologies is illustrated in Figure 2.17 for the most important cities involved in the Risk-UE project [108].

No.	Label	Description	Name	No. of Stories	Height Range (m)
1	M11L	Rubble stone, fieldstone	Low-Rise	1 – 2	≤ 6
2	M11M		Mid-Rise	3 – 5	6 – 15
3	M12L	Simple stone	Low-Rise	1 – 2	≤ 6
4	M12M		Mid-Rise	3 – 5	6 – 15
5	M12H		High-Rise	6+	> 15
6	M13L	Massive stone	Low-Rise	1 – 2	≤ 6
7	M13M		Mid-Rise	3 – 5	6 – 15
8	M13H		High-Rise	6+	> 15
9	M2L	Adobe	Low-Rise	1 – 2	≤ 6
10	M31L	Wooden slabs URM	Low-Rise	1 – 2	≤ 6
11	M31M		Mid-Rise	3 – 5	6 – 15
12	M31H		High-Rise	6+	> 15
13	M32L	Masonry vaults URM	Low-Rise	1 – 2	≤ 6
14	M32M		Mid-Rise	3 – 5	6 – 15
15	M32H		High-Rise	6+	> 15
16	M33L	Composite slabs URM	Low-Rise	1 – 2	≤ 6
17	M33M		Mid-Rise	3 – 5	6 – 15
18	M33H		High-Rise	6+	> 15
19	M34L	RC slabs URM	Low-Rise	1 – 2	≤ 6
20	M34M		Mid-Rise	3 – 5	6 – 15
21	M34H		High-Rise	6+	> 15
22	M4L	Reinforced or confined masonry	Low-Rise	1 – 2	≤ 6
23	M4M		Mid-Rise	3 – 5	6 – 15
24	M4H		High-Rise	6+	> 15

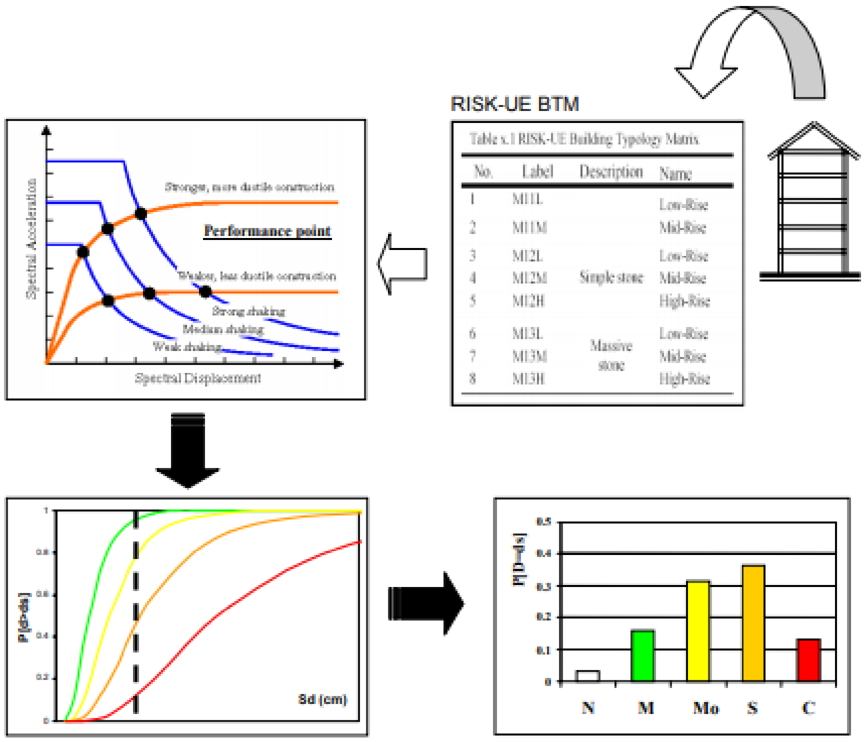
Figure 2.16. Risk-UE building typology matrix [108]

Building typology		RISK-UE Cities						
		Barcelona	Bitola	Bucharest	Catania	Nice	Sofia	Thessaloniki
MASONRY (M)	M1.1	■				■		■
	M1.2	■	■		■	■		■
	M1.3	■			■	■		■
	M2		■			■		
	M3.1	■	■	■	■	■	■	■
	M3.2	■		■	■	■	■	■
	M3.3	■		■	■	■	■	■
	M3.4	■	■	■		■	■	■
	M4			■		■	■	
	M5		■	■		■	■	■

Figure 2.17. Frequency of building topologies for the most important Risk-UE cities [108]

The expected seismic behaviour of the investigated buildings is divided in vulnerability classes. This means that specific building typologies are expected to behave in similar way in earthquake conditions. This approach is a probabilistic one, following a most likely vulnerability class and a specific possible and less possible vulnerability range. For an easier classification, there is allocated a vulnerability index in the range of 0÷1 for each building type. The value close to 1 indicate a most vulnerable condition, while a value close to 0 is appropriate for high-code designed buildings [108].

Considering the macroseismic intensities EMS-98 and the five mean damage grades previously defined, there was obtained the most probable seismic behaviour for each building typology, as presented in Figure 2.19. This represents semi-empirical vulnerability functions, expressing the most likely, possible and less possible vulnerability classes. The results follows data given by all the cities and countries involved in the Risk-UE project. The process of damage estimation for each building typology is illustrated in Figure 2.18 [108].



Damage States
N = None; **Mi** = Minor; **Mo** = Moderate; **S** = Severe; **C** = Collapse

Figure 2.18. Damage estimation process in the Risk-UE project [108]

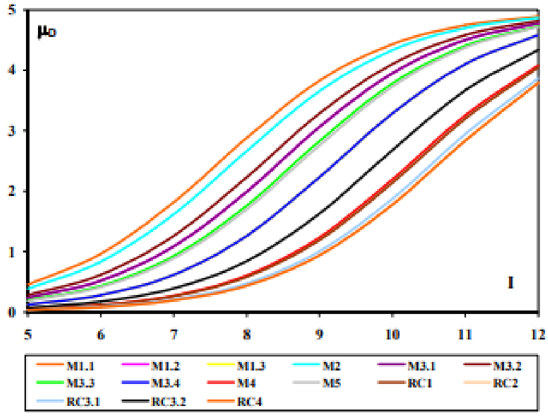


Figure 2.19. Hybrid vulnerability curves for the masonry and reinforced concrete building typologies in the Risk-UE project

In order to be able to adapt the methodology to each particular site, there were defined some new factors that are expected to modify the structural behaviour of the building, based on an expert judgment. The modifying scores are presented in Figure 2.20 for masonry structures and in Figure 2.21 for reinforced concrete ones [108]. The final vulnerability index in defined following Equation 5 [108].

$$\Delta V_m = \sum V_m \tag{5}$$

Vulnerability Factors	*Parameters*	
State of preservation	Good maintenance Bad maintenance	-0,04 +0.04
Number of floors	Low (1 or 2) Medium (3, 4 or 5) High (6 or more)	-0.02 +0.02 +0.06
Structural system	Wall thickness Distance between walls Connection between walls (tie-rods, angle bracket) Connection horizontal structures-walls	-0,04 ÷ +0,04
Soft-story	Demolition/ Transparency	+0.04
Plan Irregularity	...	+0.04
Vertical Irregularity	...	+0.02
Superimposed floors		+0.04
Roof	Roof weight + Roof Thrust Roof Connections	+0.04
Retrofitting interventions		-0,08 ÷ +0,08
Aseismic Devices	Barbican, Foil arches, Buttresses	
Aggregate building: position	Middle Corner Header	-0.04 +0.04 +0.06
Aggregate building: elevation	Staggered floors Buildings of different height	+0.02 -0,04 ÷ +0,04
Foundation	Different level foundation	+0.04
Soil Morphology	Slope Cliff	+0.02 +0.04

Figure 2.20. Modifying scores for the mean vulnerability index associated with masonry buildings in the Risk-UE project

Vulnerability Factors		*ERD level*		
		Pre or Low Code	*Medium Code*	*High Code*
Code Level		+0,16	0	-0,16
Bad Maintenance		+0.04	+0.02	0
Number of floors	Low (1 or 2)	-0,04	-0,04	-0,04
	Medium (3, 4 or 5)	0	0	0
	High (6 or more)	+0,08	+0,06	+0,04
Plan Irregularity	Shape	+0.04	+0.02	0
	Torsion	+0.02	+0.01	0
Vertical Irregularity		+0.04	+0.02	0
Short-column		+0.02	+0.01	0
Bow windows		+0.04	+0.02	0
Aggregate buildings (insufficient aseismic joint)		+0,04	0	0
Foundation	Beams	-0,04	0	0
	Connected Beans	0	0	0
	Isolated Footing	+0,04	0	0
Soil Morphology	Slope	+0.02	+0.02	+0.02
	Cliff	+0.04	+0.04	+0.04

Figure 2.21. Modifying scores for the mean vulnerability index associated with reinforced concrete buildings in the Risk-UE project

The main disadvantage of the analytically-derived procedure is the necessity of high computational data and the necessary time to perform it. That is why, the development of the vulnerability curves is a difficult task, especially in the areas where characteristics of buildings are very different between each other [30].

However, a hybrid methodology could provide the best of the combination of the empirical and analytical methodologies.

2.2.2.2 The collapse mechanism-based methods

The concept of the collapse mechanism-based methods is simple and is based on the evaluation of the average horizontal acceleration at a critical level applied to a specific building masses that leads to the activation of failure mechanism [109].

One of the most used procedures that follows this method is Vulnus, proposed by Modena et al. from the University of Padua [110] for the seismic vulnerability assessment of masonry buildings [88]. Vulnus uses a fuzzy-set theory and several collapse multipliers [111], both for in-plane and out-of-plane behaviour.

First, the collapse multiplier for the in-plane condition, defined as I_1 is considered the ration between the in-plane shear strength of entire system and the total weight, as presented in Equation 6 [30].

$$I_1 = \frac{\min(V_X,V_X)}{W} \tag{6}$$

Where V_x and V_y are considered to be the strength at the middle of the ground floor height in the longitudinal x and transversal y directions. It can be determined based on the tensile strength of the masonry and the entire area of the masonry walls.

Second, the collapse multiplier for the out-of-plane condition, defined as I_2, represents the ratio between out-of-plane flexural strength and the total height, following Equation 7. The flexural strength is measured in the most critical external wall [30].

$$I_2 = min\,(I_2' + I_2'')_i \tag{7}$$

Where I_2' represents the resistance of the vertical strips, while I_2'' is considered to be the resistance of the horizontal strips.

Finally, a third index I_3 is considered, as the weighted sum of different vulnerability parameters, according to the second level GNDT form. The value of I_3 is normalized between 0 and 1. This index can be considered an empirical parameter that follows qualitative aspects and defines the vulnerability index based on Benedetti and Petrini methodology [78].

The necessary data that must be collected follows a specific investigation form. The form follows three main categories. In the first part, there must be defined the geometry of the building and each node, wall and septa must be associated with an index. Second part is related with general building characteristics, while third part considered the characteristics of each wall [109].

The parameters that are considered for the definition of I_3 are:

- The constituent material, as presented in Figure 2.22
- The building conservation state, as presented in Figure 2.23
- The number of storey
- The type of the horizontal structure, as presented in Figure 2.24
- The regularity in place
- The height of the building
- The building area
- The warping of horizontal structures
- The floor regularity, as presented in Figure 2.25
- The wall restraint

In order to be able to apply the procedure, the investigated aggregates must be homogenous in terms of:

- Foundation type and characteristics of the soil
- Construction technologies
- Height and volume
- Age of construction
- Materials and conservation state

MATERIAL	RESISTANCE [MPa]		SPECIFIC DENSITY [kg/m³]
	COMPRESSION	TRACTION	
1) not identified	1.5	0.08	2100
2) stone	2.6	0.14	2100
3) bricks	4.0	0.22	1800
4) RC blocks	4.0	0.36	1200
5) tuff block	3.2	0.20	1800

Figure 2.22. Wall constituent material and relative mechanical proprieties [109]

CONSERVATION STATE	
1) not identified	Mechanical characteristics multiplied by 0.75
2) good	Mechanical characteristics multiplied by 1.00
3) mediocre	Mechanical characteristics multiplied by 0.75
4) bad	Mechanical characteristics multiplied by 0.50

Figure 2.23. Building conservation state [109]

PERMANENT LOADS		
1) not identified		$G+Q=3.7\ kN/m^2$
2) very light	wood (even stiffened), iron beams and little brick vaults	$G+Q=2.2\ kN/m^2$
3) light		$G+Q=3.7\ kN/m^2$
4) medium	Concrete	$G+Q=5.2\ kN/m^2$
5) heavy		$G+Q=6.7\ kN/m^2$
6) very heavy		$G+Q=8.2\ kN/m^2$

Figure 2.24. Type of horizontal structural elements [109]

FLOOR REGULARITY
1) not identified
2) regular
3) inactive at ( ) floor on the walls parallel to X direction
4) inactive at ( ) floor on the walls parallel to Y direction
5) inactive at ( ) floor on the walls parallel to X andY direction
6) overweight at floor ( )

Figure 2.25. Floor regularity [109]

The possible failure mechanism are related with the type of nodes that form between structural walls, as presented in Figure 2.26 [109].

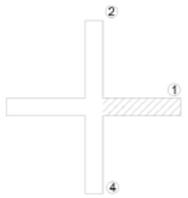
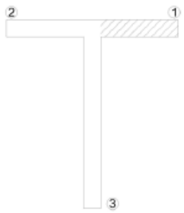
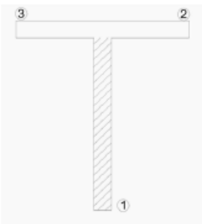
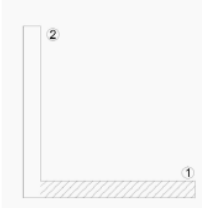
NODE TYPE	
CROSS NODE Possible breaking mechanisms: • Bending failure • Failure of the arch Mechanisms that cannot be activated: • Separation of the wall perpendicular to the septum • Local overturning due to the thrust of the arch	
INTERMEDIATE "T" NODE Possible breaking mechanisms: • Bending failure • Compression breaking of the arch • Separation of the wall perpendicular to the septum Mechanisms that cannot be activated: • Overturning of the wall shoulder perpendicular to the septum due to the thrust of the arch	
ENDING "T" NODE Possible breaking mechanisms: • Bending failure • Compressive failure of the arch • Local overturning due to the thrust of the arch Mechanisms that cannot be activated: • Separation of the wall perpendicular to the septum	
"L" NODE Possible breaking mechanisms: • Bending failure • Compressive failure of the arch • Local overturning due to the thrust of the arch • Separation of the wall perpendicular to the septum	

Figure 2.26. Effects of different type of nodes [109]

The out-of-plane failure mechanism analysis are performed following the equilibrium limit analysis, based on a kinematic approach. The overturning of façade wall is presented in Figure 2.27, while the overturning of the corner is presented in Figure 2.28. The vertical and horizontal overturning failure mechanisms are presented in Figure 2.29 and Figure 2.30 [112].

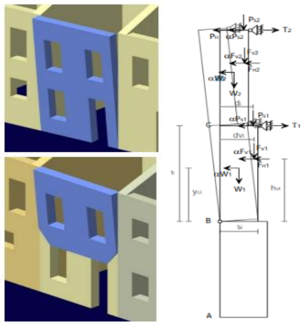


Figure 2.27. Overturning out-of-plane failure mechanism [112]

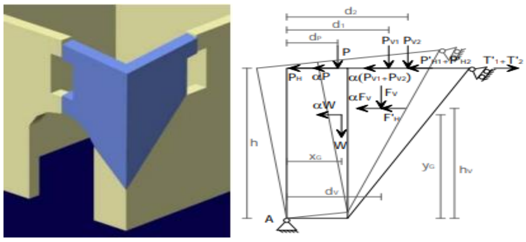


Figure 2.28. Corner overturning out-of-plane failure mechanism [112]

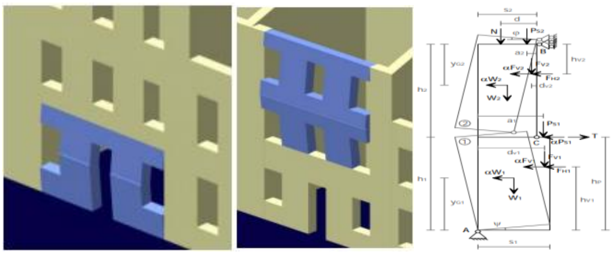


Figure 2.29. Vertical wall out-of-plane failure mechanism [112]

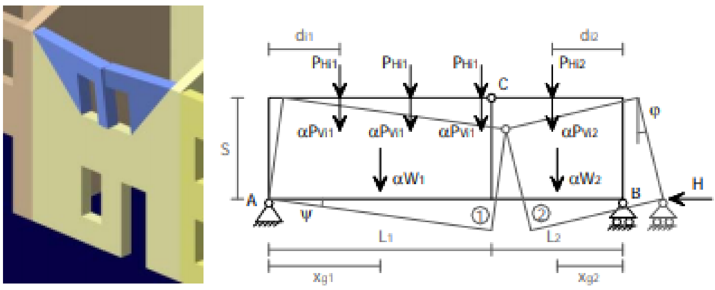


Figure 2.30. Horizontal wall flexion out-of-plane failure mechanism [112]

In conclusion, the collapse mechanism-based methods are based on collapse multipliers that result from mechanical analysis and estimates whether a mechanism will form and what kind of damage will determine.

2.2.2.3 The capacity spectrum-based methods

The capacity spectrum of a structure is defined as the capacity curve, named also the pushover curve, which is a function of the lateral load resistance of the building and its specific lateral displacement. The capacity model can be understand as the idealisation of the capacity curve, in which there can be found two important control points, such as the yield capacity and the ultimate capacity, as shown in Figure 2.31 [108].

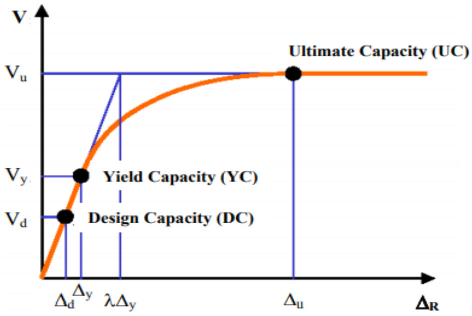


Figure 2.31. The capacity model of a structure [108]

The yield capacity can be understand as the resistance strength of the building to the lateral load before the point in which the system develops nonlinear response. The ultimate capacity is represented by the maximum strength of the structure at the moment in which the system has reached the plastic state [108].

The capacity spectrum-based method is based on the acceleration-displacement spectrum, obtained under a specific ground-shaking scenario. The intersection between the spectrum representing the ground motion and the pushover curve representing the horizontal displacement of the investigated building under increasing lateral load is called the performance point of the structure [113], as presented in Figure 2.32 [108].

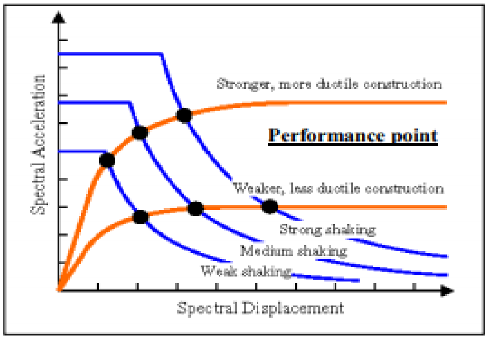


Figure 2.32. Definition of the performance point of a structure [108]

One of the most representative methodologies that follows the capacity spectrum-based procedure is Hazus or Hazard US, which represents a national project with the aim of promoting an applicable methodology for the assessment of the possible losses after specific earthquakes in the entire region [60], [114]. The major axis of the Hazus project are:

- The estimation of the potential hazards in the investigated region
- The inventory and classification of the buildings and other facilities
- The estimation of the direct physical damage to each building class
- The estimation of the indirect damages from secondary effects of earthquakes
- The estimation of the losses in terms of human life, losses of homes and jobs, direct economic losses
- The estimation of the indirect economic losses due to the necessary recovery time [30].

The entire damage estimation process (Figure 2.33) is based on the capacity curve of the representative building classes. For each building class there were chosen model buildings for various design practice in the investigated region. The definition of the performance point for each of the studied building models allows to define the probability of being in a specific damage state. The vulnerability curve is designed as a lognormal curve with a logarithmic standard deviation β_{Sds} which combines the uncertainties in the damage state and variability of the response of the structure, as illustrated in Equation 8 [30].

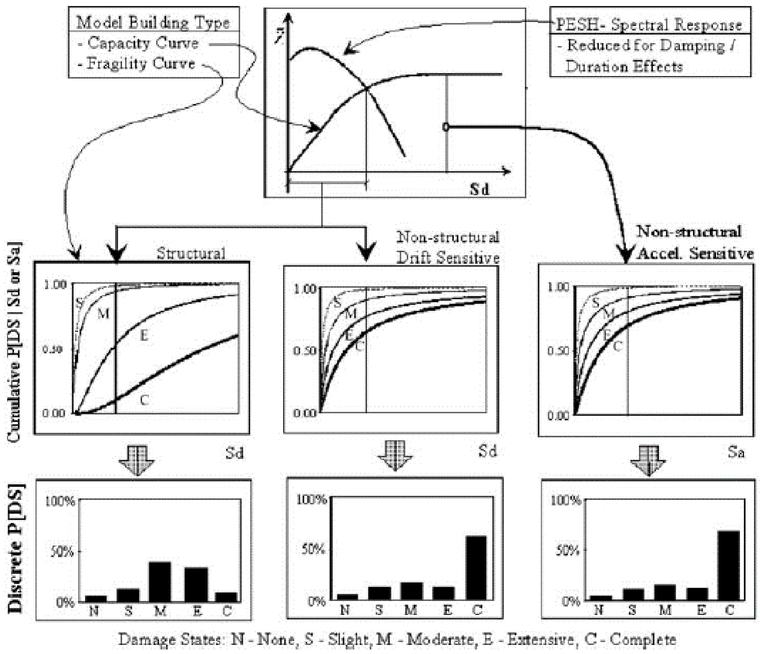


Figure 2.33. Damage estimation procedure for Hazus project [30]

$$\beta_{Sds} = \sqrt{(CONV[\beta_C \beta_D \overline{S}_{d,Sds}])^2 + (\beta_{M(Sds)})^2} \quad (8)$$

Where β_C represents the variability that can appear in the capacity of the model, β_D represents the possible uncertainty in the response because of the variability of the ground-motion demand, while $\overline{S}_{d,Sds}$ is considered to be the median spectral displacement for a given damage state ds [30].

A building model can also consist in a complexity of fragility curves which defines the probability P[D] of being or exceeding a specific damage state ds. The procedure considers five major damage states, such as none, minor, moderate, extensive and collapse. Each of them is characterised by the lognormal standard deviation previously defined, spectral displacement S_d and median value, as presented in Equation 9 [108].

$$P[ds|S_d] = \Phi[\frac{1}{\beta_{ds}} \ln\left(\frac{S_d}{\overline{S}_{d,ds}}\right)] \quad (9)$$

Where S_d is the spectral displacement and Φ represents the standard cumulative distribution function [108].

After the definition of the proportion of each damage state for the building model, there can be determined a composite measure of damage by summing each proportion by 0% for no damage, 2% for slight, 10% for moderate damage, 50% for extensive and 100% for collapse damage state [30], defining the fragility curves as presented in Figure 2.34 [108].

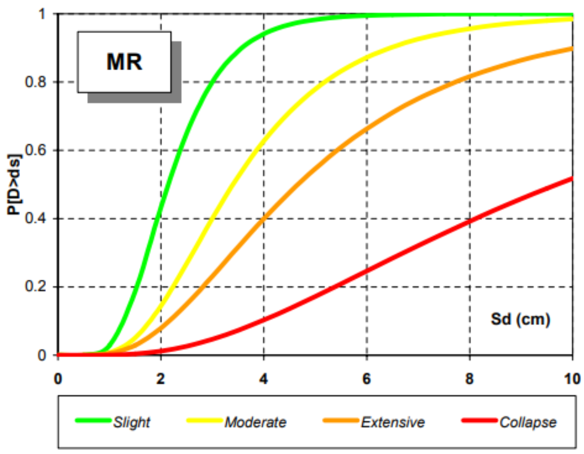


Figure 2.34 Example of fragility curves [108]

Later on, Giovinazzi [115] proposed a modified mechanical procedure, based also on the capacity spectrum for the seismic risk assessment of both masonry buildings and reinforced concrete frame structures. The procedure is based on simplified bilinear capacity curve derived following parameters from the design codes.

From the codes is obtained the function of the seismic zone, representing the base shear coefficient. The yield spectral displacement can be understand as the function of the yield spectral acceleration and the yield period of vibration. The ultimate spectral displacement, that can be understand as a function of yield displacement and structure ductility capacity is also obtained from the codes. As previously defined, the performance point can be obtained from the capacity spectrum. After the point is obtained, it is introduced into the vulnerability curve in order to define the possibility of being or exceeding a specific damage state. The difference from the Hazus procedure is represented by the definition of the mean values for the displacement S_d, as function of yield and ultimate displacement (Equations 10-13). There are considered only four damage states, respectively minor, moderate, severe and complete [30].

$$S_{d,1} = 0.7\ x\ d_y \tag{10}$$
$$S_{d,2} = 1.5\ x\ d_y \tag{11}$$
$$S_{d,3} = 0.5\ x\ (d_y + d_u) \tag{12}$$
$$S_{d,4} = d_u \tag{13}$$

Where d_y represents the yielding displacement, while d_u is considered to be the top horizontal displacement.

The main disadvantage of the procedure is the use of this kind of damage distribution prevent a useful variation of the mean damage state. Moreover, there was demonstrated that at least for reinforced concrete frame structures, the actual damage distribution has a more complex behaviour [116], but it is considered suitable for masonry buildings. The issue that can lead to not very precise damage estimations is the intention to force the damage pattern to present a binomial distribution [30].

The limit states are determined based on the yielding displacement and the ultimate displacement, by two different analysis: micro modelling or macro modelling. The main difference is that in the macro modelling, the material elements such as bricks, mortar and contact surface between them are modelled together as a composite material [117].

Regarding the modelling strategies, there are three main categories, such as:

- The finite element method
- The distinct element method
- The equivalent frame method [118].

The finite element method is based on the discretisation of the continuous domain by a mesh that is formed by elements connected between each other by nodes. The distinct element method is more appropriate for discontinuous materials, such as masonry, but it necessitate a considerable computational effort, suitable only for small models. Finally, in the equivalent frame method, the global model is divided into macroelements connected by rigid nodes [118]. This last method is the most suitable for relatively quick numerical assessment of the seismic vulnerability of existing masonry buildings. The analysis can be performed with Tremuri software, which is able to provide a complete tridimensional model for an unreinforced masonry structure by considering marcoelements, representing the non-linear seismic behaviour of the building, with limited computational loads [119].

The main advantage of this method is that performing the analysis is considerable faster that the analysis from previous methods, because it involves a lower number of degree of freedom. Also, the use of Tremuri software allows the consideration of other structural elements, such as floors from different materials. Examples of application of the equivalent frame method can be seen in case studies over existing masonry buildings in Europe area [120], [121], [122].

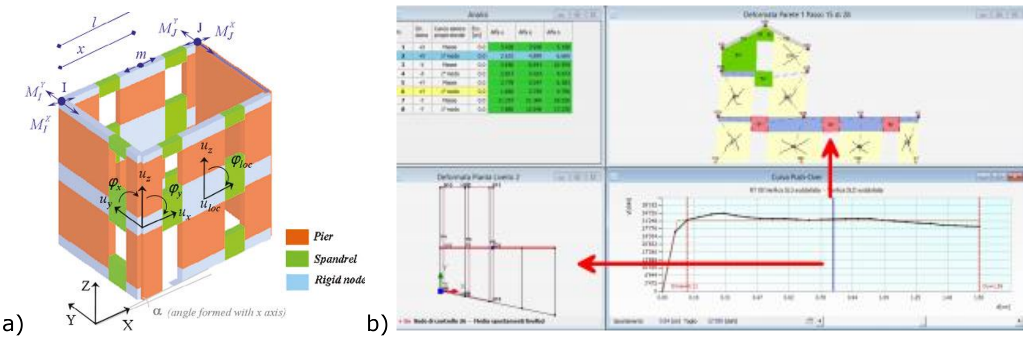
In most of the cases, when it comes to the global analysis of existing masonry building, there is considered only the in-plane failure mechanism, because the out-of-plane failure mechanism usually involves elements of the structural that might not affect the entire seismic response of the building [123], [124]. For the definition of the seismic behaviour of the entire structure, the global elements are divided into macroelements consisting in two different types of panels, connected through rigid nodes:

- The piers, which represent the main vertical structural elements
- The spandrels, which are considered to be the horizontal structural elements, which has the aim to couple the piers in case of seismic loads [125].

The spandrels can present three different kind of behaviour, influencing the response of the adjacent piers, as following:

- The spandrels that have not tension resistant elements, can act as cantilever for the piers
- The spandrels that present at least one tensile resistant element, can partially couple the piers
- The spandrels that present reinforcement both at the top and bottom part, can determine a shear type response of the piers [126].

The equivalent frame model considers that the spandrels are deformable and they can move horizontally or even rotate. Piers and spandrels can present elastic-plastic behaviour, through a deformation limit. Usually, the elastic domain is considered until the activation of the first plastic hinge. Only the joints are considered to be rigid and cannot suffer any deformation. The illustration of the macroelement division of the considered structural model is presented in Figure 2.35, together with the capacity curve characteristic to Tremuri software [119].



a) b)

Figure 2.35. Tremuri software: a) equivalent frame of the simplified model; b) the specific capacity curve [119]

2.2.3 Hybrid methodologies

Seismic fragility curves represent binomial, lognormal or other distributions curves, constructed on sufficient available data [50]. The necessary information can be obtained from expert judgments [127], statistical databased designed after past seismic events [128] or analytical investigation of mechanical models [129]. Application of an empirical methodology by itself can be difficult because of the limited statistical information for several seismic intensities. Analytical methodologies on the other hand comes with the necessity of high computational data and they might overestimate the damage costs sometimes. The purely expert judgments tend to over predict damage states for some structural typologies. To overcome this issues, Kappos et. al [130] developed the hybrid methodology, an approach that uses empirical statistical data, but estimates the expected damage by nonlinear analysis of each structural typology, for various seismic intensities, following two approaches:

i) Level I approach is based on the expected macroseismic intensity for a given area, defining the fragility curves for a relatively low number of structural typologies

ii) Level II approach is based on the capacity curves of a structural typology and the demand spectrum for a given area, defining the fragility curves for each structural typology in terms of spectral displacement [50].

Either level I or level II approaches involves nonlinear analysis for each structural typology considered to be representative for the existing building classes. Results of the pushover analysis are then combined with statistical data and there are designed the fragility curves, in terms of macroseismic intensity or spectral displacement [50]. So, hybrid methodologies represent a combination of two or more procedures, with the aim of improving the results of each other. They present the major advantage of offering the possibility to calibrate one analytical methodology after observational data. The basis of this approach is the combination of analytically determined expected damage based on computational investigation and real observational data related to damages observed after past earthquakes. In case of low level of information about post-earthquake damage in a specific region, hybrid methodology can combine analytically and empirical results, reducing this way the necessary computational effort [30].

One of the first damage probability matrices following a hybrid methodology, combining damage probability matrices for various intensities with registered information from empirical vulnerability index procedure was proposed by Kappos [130], [131], [132]. There was used also a model to simulate the behaviour of each building typology of the damage probability matrices through nonlinear analysis. The investigation was carried out on 6 different structures from Greece that are representative for the buildings designed following 1959 code. The registered data regarding damages to building were used after the 1978 Thessaloniki earthquake. Based on the dynamic analysis results, there was determined a general vulnerability index [30]. The investigation was performed for about 6000 buildings in Thessaloniki city, which represented about a half of the total building number in the area. At first, there was the intention of performing nonlinear analysis based on the M_W=7.0 design earthquake for the area. Because of the limitations of the numerical analysis, there was decided to combine this type of investigation with the damage statistics obtained after the M_W=6.5 earthquake from 1978. Following Equation 14, the future damage estimation was determined [130].

$$C_a(7.0) = C_a(6.5)x\frac{C_c(7.0)}{C_c(6.5)} \tag{14}$$

Where C_a represents the statistical repair cost and C_c is considered the calculated repair cost obtained based on nonlinear analysis made for the most representative buildings.

The database collected after 1978 earthquake covers the largest number of data collected and the largest area in Greece, being more comprehensive than the newer attempts, such as the databases designed after the 1999 Athens seismic event [133].

The most comprehensive application of the methodology was obtained for Thessaloniki and Aegion city, Greece. In Aegion, there were considered 2014 buildings, from which 42.5% were unreinforced masonry buildings. In the first level approach, a seismic intensity of 7 was considered for Thessaloniki and 8 for Aegion. Statistical data for building stocks in the investigated cities were available for various intensities, so an empirical approach was appropriate at first. The database presented information regarding material, type of structure, construction period, damage estimation after earthquake and cost of repair. The database didn't contain information about the specific type of masonry, so there was assumed that buildings built before 1940 were made in stone masonry, while the rest in brick masonry. The damage states distribution for the masonry buildings is presented in Table 2.3. The fragility curves of the first level are illustrated in Figure 2.36 [50].

Table 2.3. Damage states distribution for unreinforced masonry buildings after 1978 Thessaloniki earthquake

Damage state	Stone masonry	Brick masonry
D1	74.42	77.23
D2	13.79	12.87
D3	5.53	4.89
D4	4.33	3.83
D5	1.92	1.17

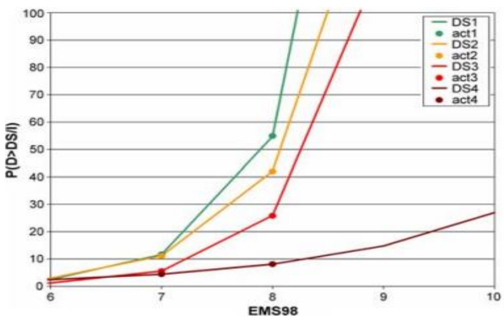


Figure 2.36. First level fragility curves for the unreinforced masonry buildings with 2 storey [50]

The second level approach was based on nonlinear analysis and capacity curves, which represents a provocative task due to the difficulty of modelling the masonry material. The work referred to masonry structures with stiff floors such as masonry vaults or reinforce concrete slabs, as those types are the most common in Thessaloniki and Aegion city. The analysis was performed for three building types, such as single-storey, two-storey and three-storey structures, based on a generic layout (Figure 2.37). The mechanical characteristic of the masonry is illustrated in Table 2.4. Considering the possible number of storeys, the type of masonry material and the possible geometries (such as small or large openings), there were determined 36 building types, all of them investigated with numerical analysis. The nonlinear analysis was an equivalent frame model, in order to simplify the procedure. The representative capacity curves for each building type are presented in Figure 2.38 [50].

Table 2.4. Mechanical characteristics of masonry material considered in the nonlinear analysis of second level approach

Material	Compressive strength f_{wm} [MPa]	Young's Modulus E
Masonry type A	1.5	$550f_{wm}$
Masonry type B	3.0	$550f_{wm}$

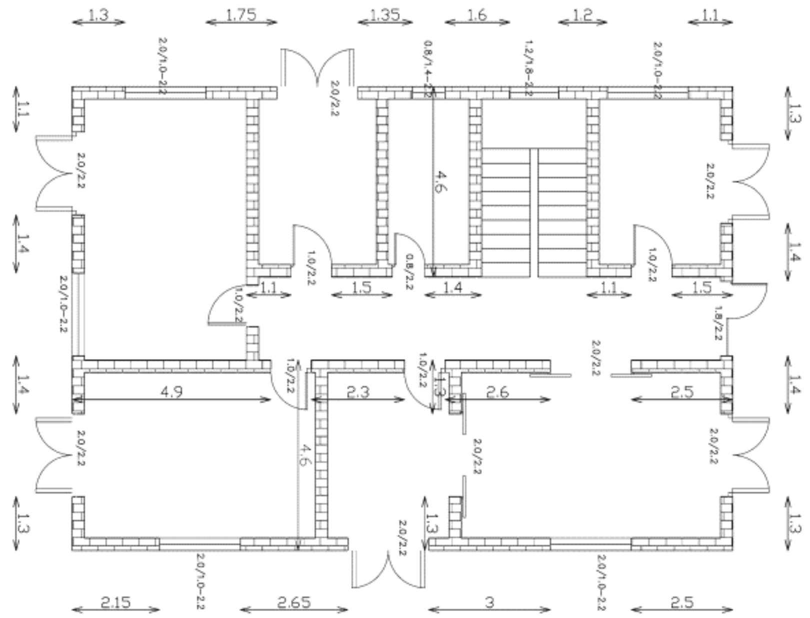


Figure 2.37. Building layout considered for single-storey, two-storey and three-storey representative masonry buildings in Thessaloniki and Aegion [50]

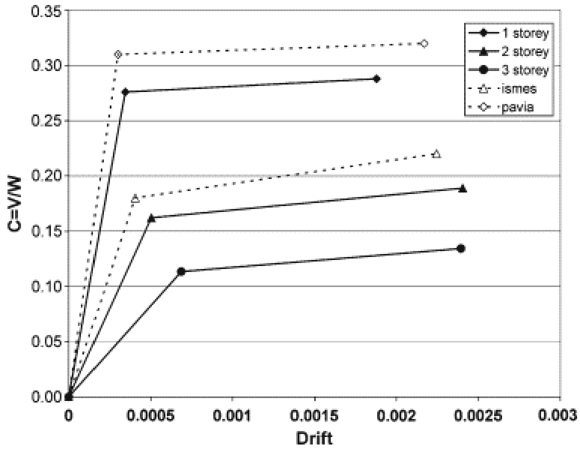


Figure 2.38. Capacity curves for one-storey, two-storey and three-storey masonry buildings, together with experimental curves from Pavia and Ismes tests [50]

Using the hybrid procedure, there were designed damage histograms and vulnerability curves for the building classes that were investigated (Figure 2.39). As expected, the buildings made in stone masonry proved to be more vulnerable than the ones made in brick masonry [50].

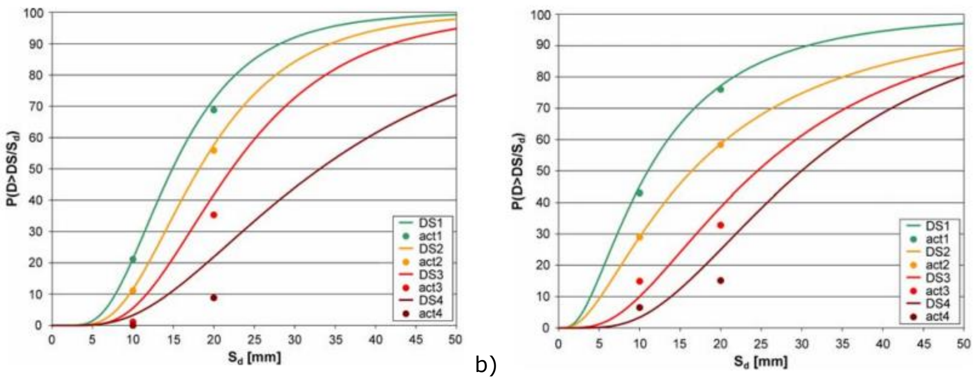


Figure 2.39. Vulnerability curves for: a) brick masonry buildings; b) stone masonry buildings [50]

So, the hybrid procedure proposed by Kappos et.al. combines the statistical empirical data registered after past earthquakes with numerical analysis results of the most representative building types in the area, leading to the definition of the expected damage states at territorial level.

Another investigation based on hybrid methodology was followed by Barbat et.al. [134] and was based on the vulnerability index methodology combined with Monte Carlo computational simulation. There were investigated typical buildings from Spanish region and there were determined the vulnerability functions based on statistical analysis. The aim was to simulate the behaviour of an entire urban area through a large number of hypothetical buildings that were proposed based on observational data from the entire area. After performing the mechanical analysis, the results were calibrated based on data observed during site investigation. Final results after several calibrations are presented in Figure 2.40 [30].

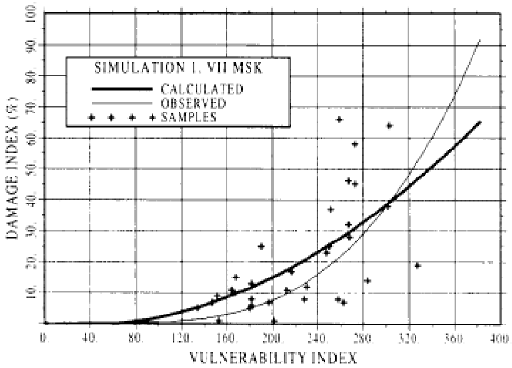


Figure 2.40. Seismic vulnerability function after Barbat hybrid methodology [30]

Because of the different level of uncertainties that the empirical and analytical analysis involve, there is highlighted the difficulty of correlating the results and find the most compatible procedures. There is recommended to follow the median values in order to adapt the analytical results to the empirical one [30].

An example of the hybrid technique can be considered the macroseismic procedure of Faccioli [90], that was applied on several European cities, such as Barcelona [135], Annaba [35] and Faro [32]. Another representative example is the procedure proposed by Ferreira [136], where a simplified vulnerability index is followed in order to observe the possible effect of several different retrofitting solutions, mapped on a base of GIS software, as presented in Figure 2.41 [30].

Figure 2.41. Example of hybrid procedure applied by Ferreira: a) before applying the retrofitting solutions; b) after applying the retrofitting solutions [30]

2.3 **Cultural value assessment procedures**

Seismic vulnerability assessment of historical masonry buildings is usually focused on the structural global behaviour of the investigated unit. In the last year, there was highlighted the need to assess also the possible effect of an earthquake to the non-structural elements of an historical buildings, that might be very valuable and almost impossible to replace in case of lost. There were developed several European projects that focus on the possible losses of the cultural heritage, such as PERPETUATE Project [39], or NIKER Project [40].

The project that is well-know is PERPETUATE Project that follows three major axis, such as:

i) developing a vulnerability assessment methodology for the cultural assets and possible strengthening proposals

ii) definition of the appropriate safety levels for the cultural values

iii) increasing the level of knowledge and reducing the necessary retrofitting measures [137].

The strategic plan of the project is presented in Figure 2.42 [138].

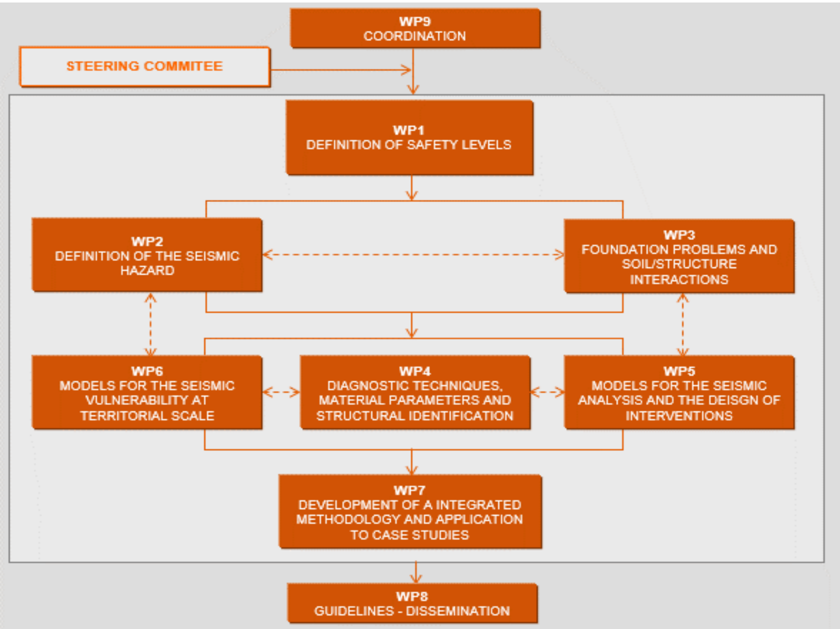


Figure 2.42. PERPETUATE Project structure [138]

The vulnerability assessment procedure is based on a displacement-based methodology, where the safety levels are defined in dependence of the displacement. This way, the eventually retrofitting solutions can be suggested in order to ensure the collaboration through structural and artistic elements. The performance-based design concept is recognized by several international design codes and technical reports, such as Eurocode 8 [139], FEMA [140], Italian Technical Code [141] and others [142].

This concept defines a risk estimation through a probabilistic approach based on various seismic scenarios, allowing to determine the most probable performance levels for historical masonry buildings [137].

There is encouraged the use of the pushover analysis, due to the possibility of the force-displacement curve to define the elastic and inelastic response of the investigated unit. Following the nonlinear curve, there were defined the performance levels or limit states, both for structural and artistic elements, as presented in Figure 2.43 [137].

The project defines four limit states for structural elements of the investigated building, as following:

i) no damage
ii) damage
iii) life safety
iiii) collapse

For the artistic assets, the limit states are defined as presented:

i) no damage
ii) near integrity
iii) damage
iiii) loss [137].

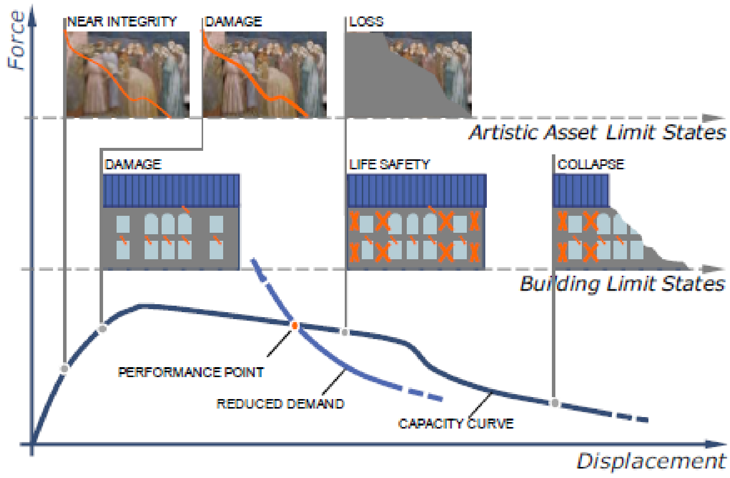


Figure 2.43. Performance levels or limit states defined for both structural and artistic elements in PERPETUATE Project [137]

The definition of the limit states for the artistic assets follows the preservation requirements, such as conserving the aesthetics of the element or ensuring the serviceability of reparability of the affected artistic asset. The comparison between the nonlinear analysis results and the seismic demand is obtained through probabilistic methods. There is defined a Demand Spectra for various categories of soil or hazards, because the seismic demand is determined by more than just one parameter. Because the subject of the project is related with historical buildings, the lifetime is expected to be higher and implicitly the return periods will be defined as longer than in case of new building design, as presented in Figure 2.44 [137].

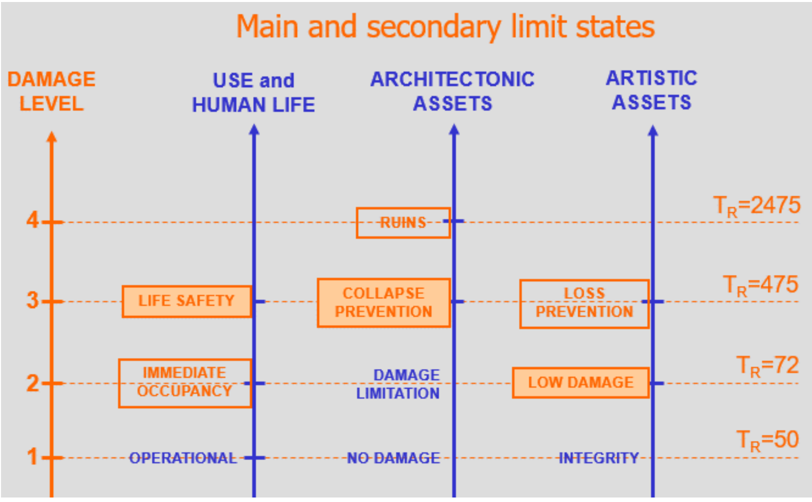


Figure 2.44. Return periods associated with various limit states [138]

One of the most important steps in the process of the seismic vulnerability assessment is the knowledge phase. As long as the level of knowledge is high, the level of uncertainties is low, leading to more credible results. When the information level about existing building is not satisfying, there appears the need of introducing several safety factors and implicitly assuming the lowest conventional parameters. In terms of results and recommendations, this might lead to extensive retrofitting solutions without being actually necessary which could also cost a bad ration between intervention cost and real effects [137].

When it comes to artistic assets, there is recommended to apply the minimum intervention possible for conserving or restoring the element, in order to ensure the preservation of the authenticity. The most suitable procedures for modelling units that are part of the cultural heritage and assess both structural and artistic elements require the pushover analysis methodologies, in order to be able to define the performance point of the entire unit. Following specific building typologies and artistic assets classifications, PERPETUATE Project evaluates their seismic behaviour until collapse, through different modelling strategies [137].

Also, the project evaluates the effect of various retrofitting solutions, traditional or innovative, also through performance-based procedures. This can help to avoid applying extreme consolidation solutions that might come from following the design codes for new buildings. Also, there is investigated in particular the effect of such solutions for the safety and integrity of the artistic assets. In the end, the project aims to define the most suitable methodology for assessing the vulnerability of cultural heritage at urban scale [137].

With the contribution of ICOMOS International Scientific Committee [143] and ISCARSAH Committee [144], there is promoted the importance of the conservation of cultural heritage [145].

2.4 **Seismic risk reduction strategies**

In most of the cases, the strategies for reducing the seismic risk are full of uncertainties, because are influenced by a large number of variables [146]. There is highlighted the need to perform a multidisciplinary study, with implications from different fields of knowledge, such as structural analysis [147], earthquake engineering [148], geotechnical sciences [149], seismic sciences [150], urban sciences [151] and architectural building design.

Because of the accentuated tendency of urbanisation, there is expected that by 2050, more than 60% of the total number of people will live in the urban areas and especially in the biggest cities of the world [152], named megacities [153]. This tendency will lead to a very large number of people exposed to the seismic risk. Nowadays and future cities need a strategy than can assure for them three major aspects:

i) capability of adapting to the climate change situation
ii) being resilient
iii) reduction of the hazard risk or vulnerability [41].

At first, there was considered that one part of the entire vulnerability of the city is the exposure. Later, the literature separated the exposure from the vulnerability, as two different aspects that can be separately influenced, proposing a risk impact framework, as presented in Figure 2.45 [41], [154].

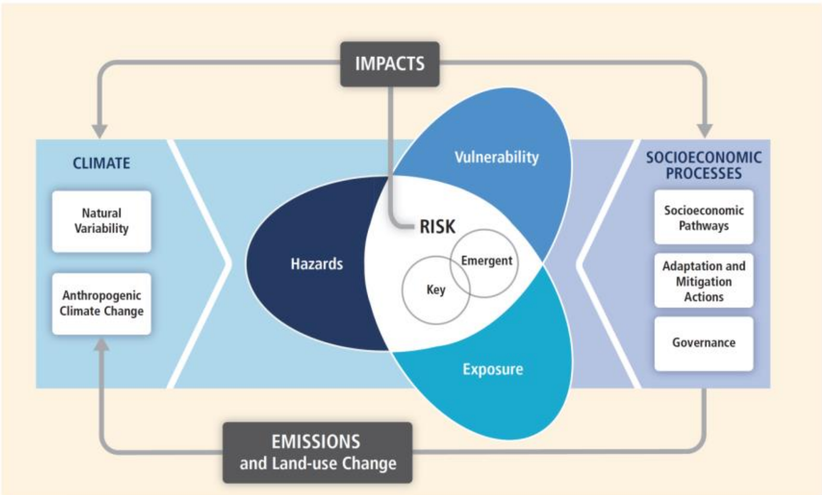


Figure 2.45. Risk impact framework [154]

Exposure can be understand as total amount of the ecosystems, people and livelihoods, infrastructure and economic system, social-cultural values and spirit of the place, that are susceptible to be affected by a possible earthquake [41].

The hazard instead represents the possibility of happening an earthquake or a natural disaster that might put in risk human life, buildings, infrastructure, economy, cultural values and others [41].

Vulnerability can be expressed as the level of decay that a complex system might experience after a seismic event [41]. Sharifi et. al. [155] considers that vulnerability can be understand as the sum of all features that influence the susceptibility of a system to suffer from damages. Later on, Kelly et. al. [156] describes vulnerability as the ability of a system to recover and adapt.

Risk can be defined as the potential for damage to a specific value, at an uncertain outcome [41]. Lavell et. al. [157] considers risk as a perturbation of the social equilibrium, while Birkmann et. al. [158] describes it as probability of occurring alterations of high importance to the normal functioning of a system over a period of time.

The seismic risk can be divided into two major directions [41]:

i) key risk, which is the risk with severe potential negative effect for people and social-economic system, such as highly dangerous natural hazards

ii) emergent risk is the risk that appears from the interaction of several aspects in a complex system, such as the risk related with the climate change dynamic [41].

Oppenheimer et. al. [159] offers a risk classification in dependence of the expected hazard effect over the affected system, as presented in Figure 2.46 [41].

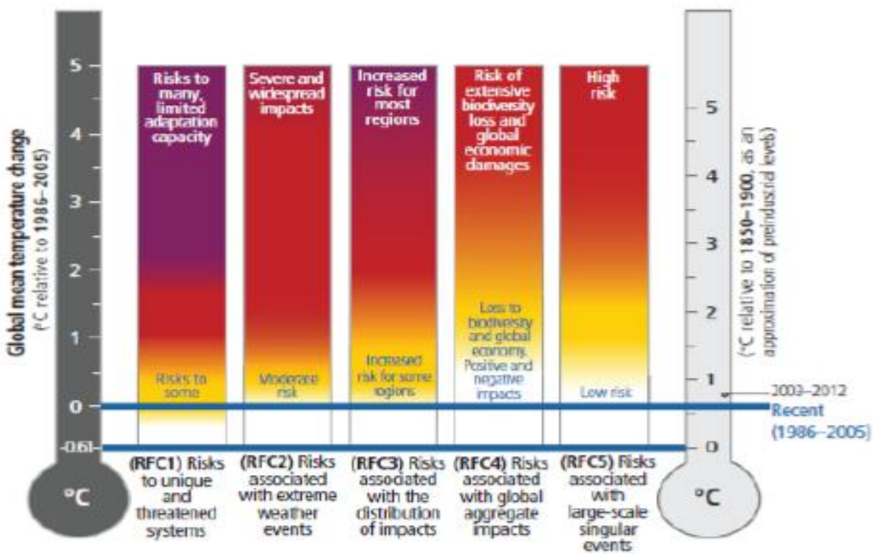


Figure 2.46. Risk classification [159]

Resilience represents an important characteristic for an urban area, understand as the capacity of the city to respond and adapt to seismic events or other hazards, in order to keep its essential functions and identity, as presented in Figure 2.47 [41].

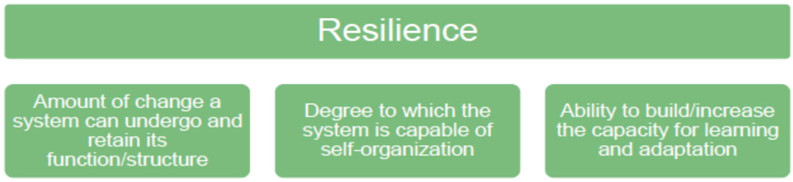


Figure 2.47. The structure of the resilience attribute [41]

A resilient city must function, survive and recover from an earthquake, through sustainability policies permanently adapted to the new conditions [41], as presented in Figure 2.48 [25].

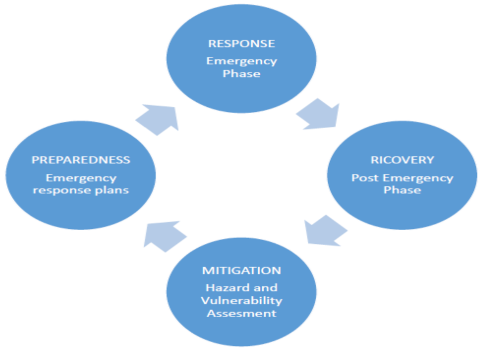


Figure 2.48. The aspects that a city must fulfil in order to be resilient [25]

At urban scale, a city can be compared with a living organism or a mechanical model influenced by different urban standards. In case of damage, there might occur a diminution of the performance levels [41].

The main ideas that are related with the term of resilience are the sustainability and the vulnerability of a city. First one represents a well-known concept in the past years that is used in many fields of interest, in continuous change and adaptation [160]. The second concept can be considered as the opposite of the resilience term [161], but the idea is not widely accepted [162].

Assessing the urban resilience and implicitly, the capacity to recover from an earthquake represents a difficult process, more likely being in the past year to assess the sustainability of a city instead, at various scales [163]. A considerable number of indicators to estimate the resilience level of an urban area were introduced by Fleischhauer [164] highlighting the importance of a proper urban spatial planning, while Frazier et. al. [165] followed a study in Sarasota County, Florida on a similar set of indicators, but differently weighted. A disaster resilience index was proposed by Joerin et. al. [166], following five different aspects, such as:

i) physical
ii) social
iii) economic
iv) natural
v) institutional, as presented in Figure 2.49 [167].

	Dimensions				
	Physical	Social	Economic	Institutional	Natural
Parameters	Electricity	Population	Employment	Mainstreaming of DRR and CCA	Ecosystem services
	Water	Health	Finance and savings	Effectiveness of zone's crisis management framework	Land-use in natural terms
	Sanitation and solid waste disposal	Education and awareness	Budget and subsidy	Knowledge dissemination and management	Environmental policies
	Accessibility of roads	Social capital		Institutional collaboration with other organisations and stakeholders	
				Good governance	
	Housing and land-use	Community preparedness during disaster			
Remaining parameters not considered in AoRA			Income		Intensity/ severity of natural hazards
			Household assets		Frequency of natural hazards

Figure 2.49 Disaster resilience index parameters [167]

A resilient city must present some major proprieties, such as:

i) capacity of ensuring that the failure of one component of the system will not lead to the global failure

ii) presenting diversity

iii) presenting a degree of independence thought its components

iv) ensuring an integrated system that sustains its mechanisms

v) strength

vi) having resources for responding and recovering from disturbing events

vii) adaptability

viii) efficiency [155].

The advanced and integrated urban planning policies might ensure the preservation of the performance levels for a city and its buildings. The problem appears especially in the historical urban areas, where such policies could affect the authenticity of the place or could cost very much. In this situations, there is suitable a certain level of risk, considered as acceptable risk, but with the condition of ensuring the safety of the vital elements [25]. Expect from the human life, the minimum urban components that must be protected are:

i) infrastructure

ii) open spaces

iii) vital urban functions

iv) strategic buildings [168].

The preservation of previous components represent critical aspects in the process of responding in the immediate phase after an earthquake and also guarantee the recovery of the affected urban area [25].

Finally, the framework for assessing the resilience of an urban area is presented in Figure 2.50 [167].

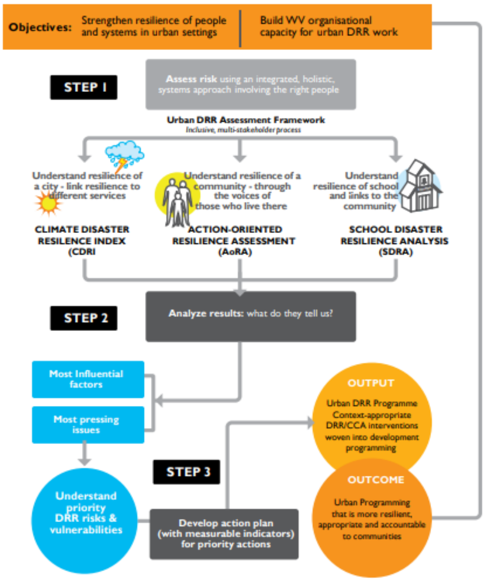


Figure 2.50. Urban resilience and seismic risk reduction assessment [167]

The thesis aims to improve the knowledge level regarding the seismic vulnerability of the Timisoara city and to increase its level of resilience. Also, based on the model obtained for Timisoara, the research work can be used for a better resilience of any other city, with similar characteristics.

3 MULTICRITERIAL VULNERABILITY ASSESSMENT

3.1 Timisoara historical and urban investigation

3.1.1 Historic evolution

Timisoara is the biggest city located in the western part of Romania, in Banat region and was an important commercial pole even from the past.

The first recognition of the city is from 1177, but there are various sign that suggest that the city existed even before the XIIth Century. At that moment, it was named "The fortress of Timis", after the name of the most important nearby river, Timis River. The fortress was defended by a palisade wall made of earth and Bega River on three sides, as presented in Figure 3.1 [169].

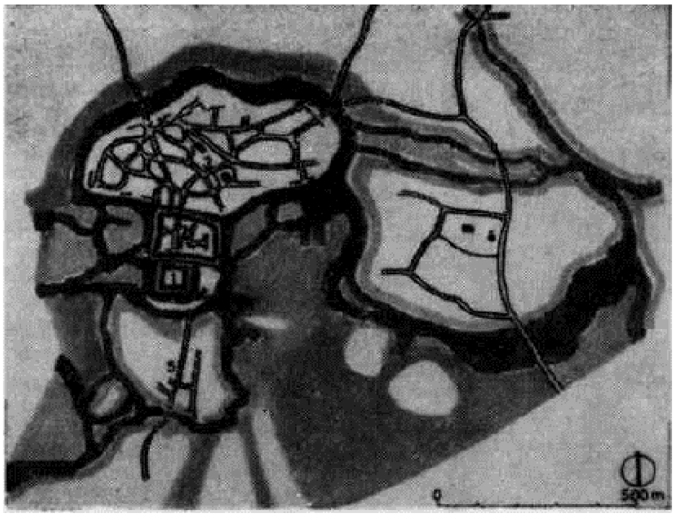


Figure 3.1. Timisoara fortress in the XIVth Century [169]

Later, the street path becomes rectangular (Figure 3.2), with two important streets, along N-S direction, respectively E-W direction. In the XIVth Century, King Carol Robert of Anjou settles here, so the fortress is starting to develop. In the year of 1342, the fortress gets the recognition of a city or "civitas", with military and administrative function [169].

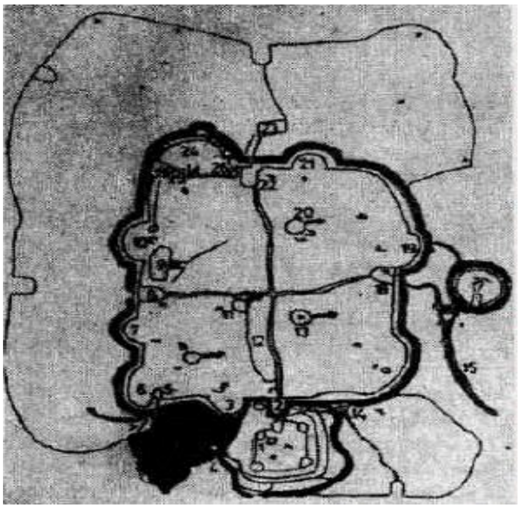


Figure 3.2. Timisoara city in the year of 1650 [169]

During the Ottoman administration, the city is divided into districts and suburbs. The major part of the fortification system is made from earth and wood. A very detailed plan of the city was made in 1716 by Eng. Perette, as presented in Figure 3.3. Outside the city fortress, there were built vacation houses, surrounded by important gardens [169].

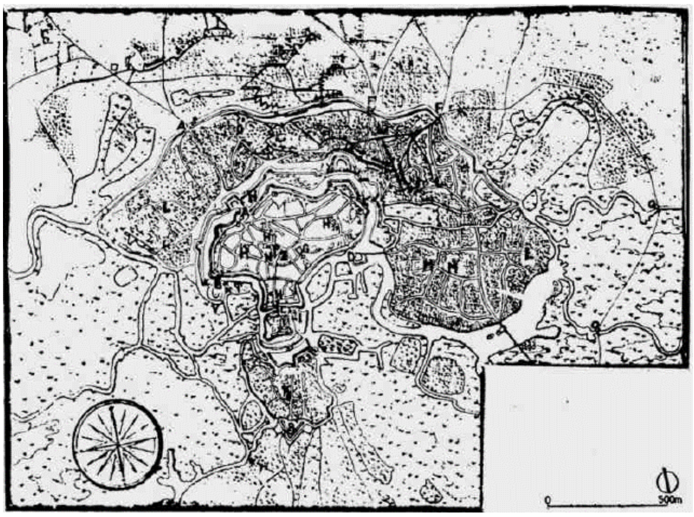


Figure 3.3. The plan of Timisoara city, made in 1716 by Eng. Perette [169]

At the beginning of the XVIIIth Century, Timisoara becomes part of the Habsburgic Administration, and a colonization process with German people begins. Even if the most important urban function remains the military one, the commercial activities are developed and the educational system is improved. Due to political and economic reasons, the Conte Mercy proposed the first systematization and organization strategy for Timisoara city and its surroundings. The most difficult part of the development strategy is represented by the hydro technical work, which involves the regulation of rivers and the rehabilitation of swamp. Because of the fact that the existing fortress doesn't satisfy anymore the military standards, there is studied the possibility of realising a new bastionary fortification system. There are indications that in the year 1719 started the construction of the new fortification, in Vauban style (Figure 3.4). In the year of 1751, the civil construction department is separated from the military construction department [169].

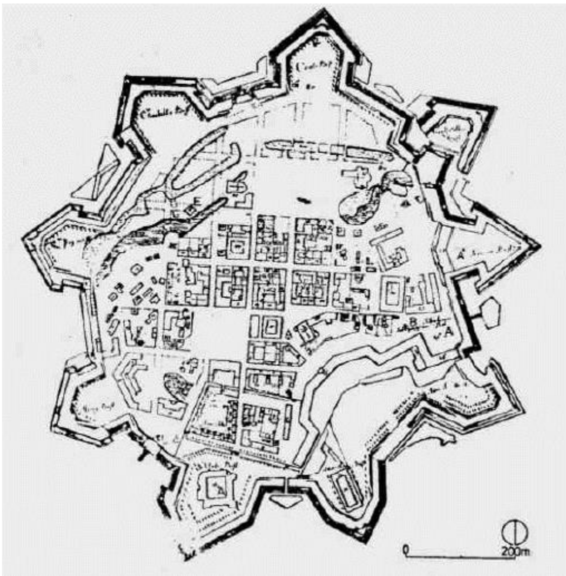


Figure 3.4. The plan of the new fortress for Timisoara city, year 1746-1747 [169]

Starting with year 1727, there is registered an intense activity of construction. In 1728, there are adopted the first construction regulations for Timisoara city and its surroundings. During this time, there are demolished all the old buildings made in burnt clay and wood. A new street path, rectangular, there are constructed new buildings made in masonry. The new constructions follow the street line, forming continuous street fronts and closed contours with interior courtyards. New public squares are designed, usually very symmetric. When the fortress walls are finished, the buildings inside the wall forms the city centre, or Cetate district as it is named nowadays. Because of strategic reasons, there is kept a distance of 949 meters from the fortress walls in which is not allowed to construct anything. Starting with year 1744, there are designed new suburbs outside the "nonedificabile" area. The new main suburbs are Iosefin (named like this from year 1773), in the western part of the city and Fabric, in the eastern part of the city. The most important public functions remain in Cetate district. The image of the main district in presented in Figure 3.5 [169].

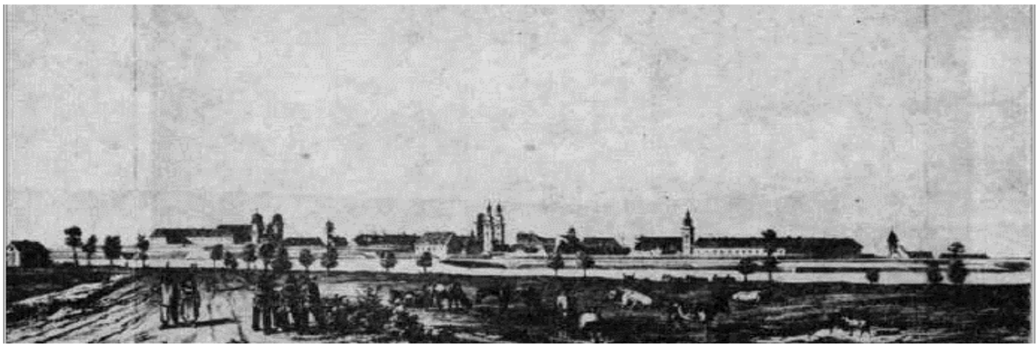


Figure 3.5. View above Cetate district in year 1853 [169]

Usually, the streets in Cetate district present a width between 10 and 13 meters, in few cases even 15 meters. At the beginning, the buildings were built in I or L shape, but later, they were extended, forming U or even O shapes. Most of the buildings presented two or more levels, but the buildings located very close to the fortress walls present only one level. The construction typology follows massive masonry perimetral walls, masonry vaults above basement and ground floor and wooden floor for the other storey. The horizontal and vertical displacement of the structural elements is regular and balanced. In Cetate district, most of the buildings are made in Baroque architectural style, while in Iosefin and Fabric districts, in Secession, Art Nouveau and Eclectic architectural style. The new buildings in Cetate are more decorated and are usually for three families/unit, while in the suburbs, the buildings are designated to just one family. The image of the city from the end of the XVIIIth Century is presented in Figure 3.6 [169].

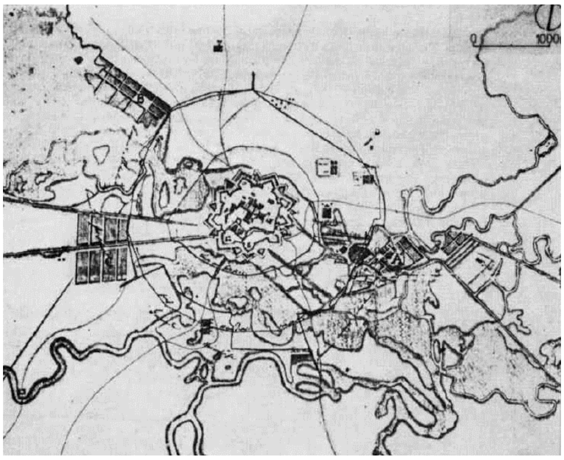


Figure 3.6. Plan of Timisoara fortress and suburbs [169]

Fabric district appeared as a settlement for merchants and craftsman. The population of this suburb is bigger than the population of Cetate. The street path is usually rectangular, but there are some sinuous streets due to the form of the swamps. The construction lots are under 500 square meters and the width of the streets is between 10.50 and 16 meters. The buildings are smaller than in Cetate, made also in masonry. In the south-western part of the suburb, the gipsy community built a small irregular area, with the smallest houses from the city. At the middle of the XIXth Century, more than 50% of the total population of the city lives in Fabric district. A representative image of the Fabric district is presented in Figure 3.7 [169].

Figure 3.7. Representative image (1901) for Fabric district [169]

Iosefin district was named at the beginning the German suburb. The district was developed on both sides of Bega River. The lots are rectangular and significantly bigger, with more than 1900 square meters. The street path is also rectangular, with widths of 38, even 41 meters for the main streets. The buildings are also made in masonry, but are bigger and taller than in Fabric district, with important gardens [169].

In the year of 1868, the area that can't be built around the fortress walls is reduced from 949 to 569 meters, so the suburbs of Iosefin and Traian starts their development through the city centre. Despite this modification, the existence of the massive defence walls obstruct the development of Cetate district and also the construction of modern sewerage and water supply network. That is why, in year 1892, there is made an important decision for Timisoara, the defortification of the city. Due to this decision, there is generated a significant surface of land for new construction, considering the surface of the defence walls and of the protection area around the fortress. In few years, there is built also this space, so Iosefin and Fabric districts merge together with Cetate district, becoming part of the same continuous city, as presented in Figure 3.8.

Figure 3.8. Systematization plan for Timisoara city in year 1901-1903 [169]

Until year 1966, the entire defence area that was initially kept around the fortress walls is built. The city develops also to the northern and southern part, as presented in Figure 3.9 [169].

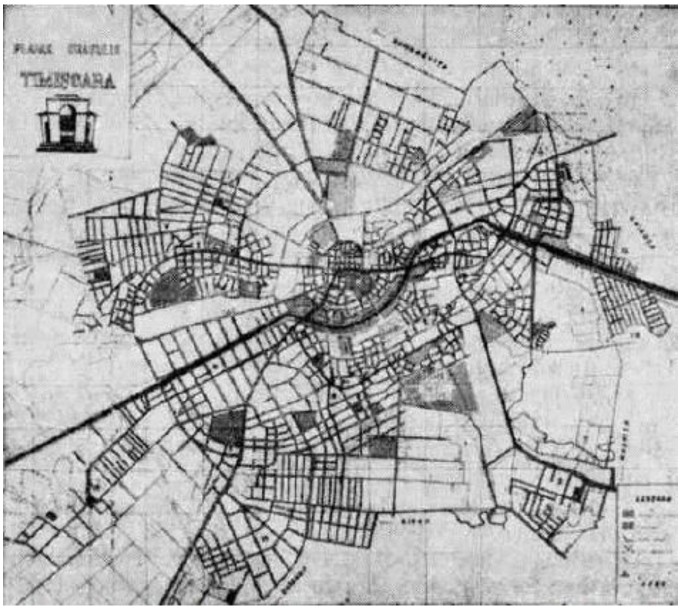


Figure 3.9. The plan of Timisoara in year 1966 [169]

3.1.2 Urban analysis

The form of the nowadays Timisoara city resulted from all the urban development decision that were made in the past. In the present, there are still three main historical districts. The most important one is Cetate district, followed by Iosefin and Traian. All three historical areas merged together during the evolution of Timisoara city, as presented in Figure 3.10 [170]. One of the most important aspects is that Cetate district is not that homogenous today, because of the high number of new construction, rehabilitation work or extension of existing building. That is why, the investigated areas are Iosefin and Fabric, which kept very much their authenticity.

Figure 3.10. Actual position of the historical areas of Timisoara [170]

For the urban analysis, there were investigated the buildings along the main streets in Iosefin and Fabric districts. There was studied the height regime, occupancy of plots, decay state of existing buildings and main functions. The selected buildings are located along the proposed cultural promenade (Figure 3.13). The proposed promenade resulted from overlapping the map of historical buildings (Figure 3.10) with the map of main attraction points (Figure 3.12) and possible outdoor spaces for cultural events (Figure 3.11). This route is expected to be highly visited during Timisoara European Capital of Culture 2021 [171].

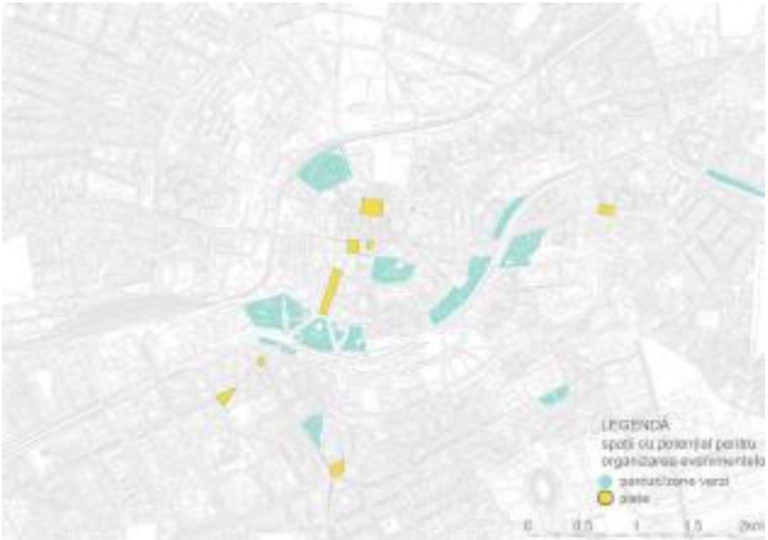


Figure 3.11. The map with the urban outdoor spaces that could accommodate cultural events [171]

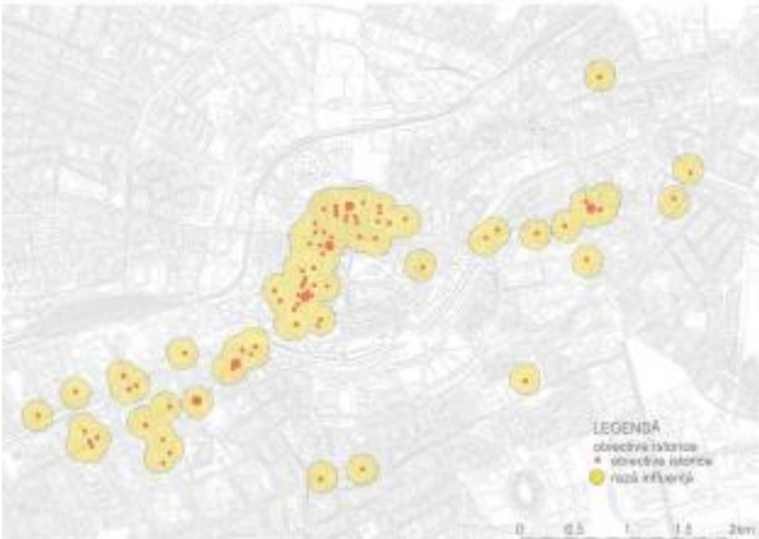


Figure 3.12. Map of main attraction points of Timisoara and area of influence [171]

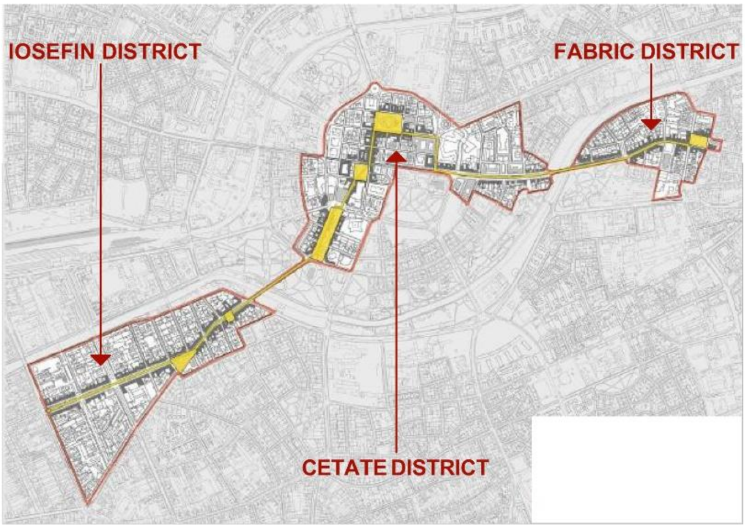


Figure 3.13. Actual position of the historical districts of Timisoara [170]

There were chosen for investigation the most representative historical buildings, as presented in Figure 3.14 for Iosefin district and in Figure 3.15 for Fabric district. The total number of the buildings is 105, from which 68 are located in Iosefin and 37 in Fabric.

Figure 3.14. The investigated historical masonry buildings from Iosefin district

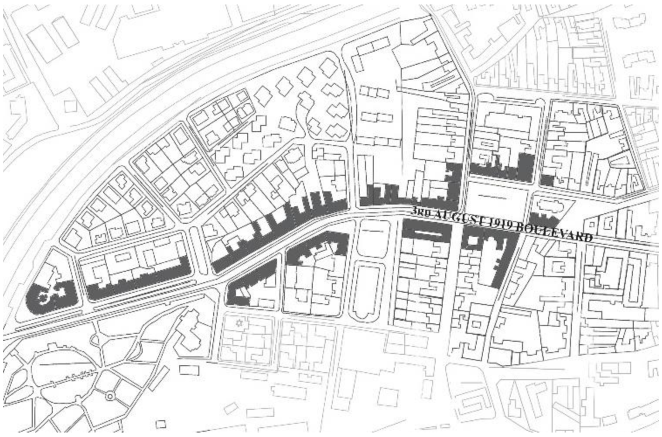


Figure 3.15. The investigated historical masonry buildings from Fabric district

The first aspect that was noticed is the fact that historical masonry buildings in Timisoara are built in closed contours, following the street path and forming interior yards, as presented in Figure 3.16 [172]. Each individual structural unit works together with the other units, creating an aggregate condition with a special structural behaviour in case of an earthquake [173].

Figure 3.16. Group of building characteristic for historical buildings in Timisoara [172]

Regarding the height regime, most of the investigated buildings in Iosefin area present 2 levels, while almost 30% present 3 levels. Only few buildings have 4 or more than 4 levels, while more than 25% of the buildings present only ground floor (Figure 3.17). In Fabric historical area, more than half of the buildings present 3 levels, while almost 35% present 2 levels. Less buildings, almost 10% present only ground floor, while 5% are built with 4 or even more levels (Figure 3.18) [174].

Almost all buildings present also a basement, in both historical areas. The precise situation is presented in Table 3.1 [174].

Figure 3.17. Height regime for the investigated historical masonry buildings in Iosefin district [174]

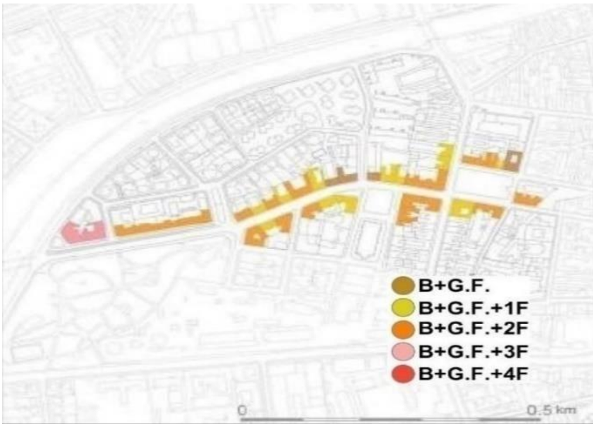


Figure 3.18. Height regime for the investigated historical masonry buildings in Fabric district [174]

Table 3.1. Height regime of investigated buildings from Iosefin and Fabric historical areas [174]

Historical district	Basement + ground floor	Basement + ground floor + one level	Basement + ground floor + 2 levels or more
Iosefin	27 %	37 %	36 %
Fabric	10 %	35 %	55 %

Most of the investigated buildings from both areas are built in L or U shape. The majority of the buildings form continues street front, only 3% being built in a random position inside the plot. The plots occupancy pattern is presented in Figure 3.19 for Iosefin district and in Figure 3.20 for Fabric one [171].

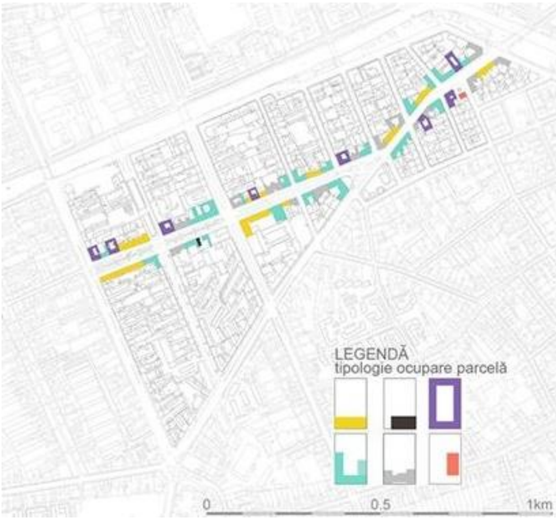


Figure 3.19. Site occupancy pattern for the investigated buildings in Iosefin district [171]

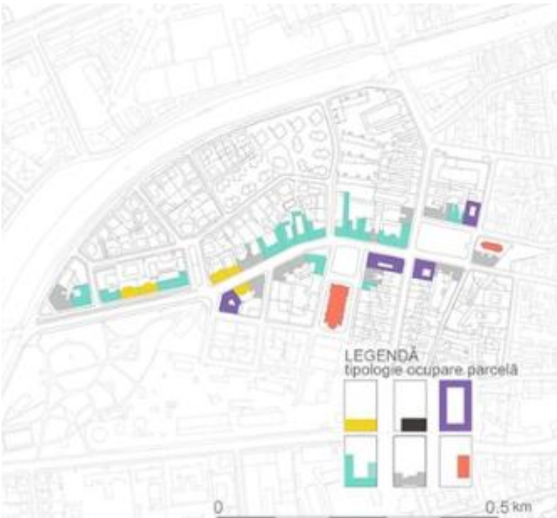


Figure 3.20. Site occupancy pattern for the investigated buildings in Fabric district [171]

Another characteristic of the investigated buildings is the presence of the commercial spaces at the ground floor. The other floors are usually residential, representing also the dominant function, or sometimes accommodate small offices. Moreover, few buildings present a dominant commercial activity, a cultural or a religious one. The dominant function for each building is presented in Figure 3.21 for Iosefin district and in Figure 3.22 for Fabric historical area. Table 3.2 illustrates the percentages of each function for the two historical areas [171].

Figure 3.21. Activities in the investigated historical masonry buildings from Iosefin area [171]

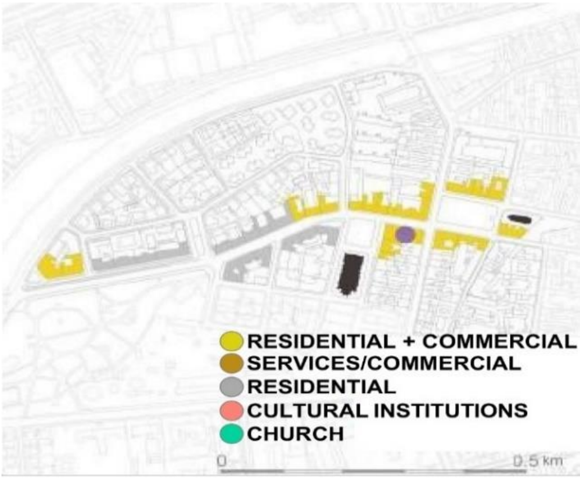


Figure 3.22. Activities in the investigated historical masonry buildings from Fabric area [171]

Table 3.2. Height regime of investigated buildings from Iosefin and Fabric historical areas [174]

Historical district	Residential + commercial	Only residential	Cultural/educational activities	Religious activities	Other
Iosefin	85 %	3 %	3 %	1 %	8 %
Fabric	55 %	35 %	2 %	5 %	3 %

A very important aspect is the actual decay state of the investigated buildings. There was noticed a medium to low overall conservation state for the historical masonry structural units. In both districts, the majority of the buildings haven't been consolidated or rehabilitated in the last 20 years, while few are partially or fully restored. The exact situation is presented in Figure 3.23 for Iosefin district and in Figure 3.24 for Fabric area, while a situation in percentages in illustrated in Table 3.3 [174].

Figure 3.23. The conservation state for the investigated buildings in Iosefin district [174]

Figure 3.24. The conservation state for the investigated buildings in Fabric district [174]

Table 3.3. Conservation state situation for investigated masonry buildings in Iosefin and Fabric historical areas [174]

Historical district	Without rehabilitation	Partially restored	Fully restored
Iosefin	75 %	10 %	15 %
Fabric	82 %	8 %	10 %

3.1.3 Nowadays socio-economic analysis

Earthquakes can affect seriously people life, so being aware of the actual socio-economic state of a community is very important.

An analysis was made based on site investigation, highlighting the existence of 504 apartments in the studied buildings from Iosefin district. Considering an average number of 2.5 members/family, there can be considered a number of 1260 inhabitants. In the commercial spaces, there were identified 196 companies with a total amount of 539 employees. A detailed situation is presented in Figure 3.25Figure 3.25. Number of inhabitants distribution for the investigated buildings, Iosefin district [175]. In Fabric district, there were numbered 385 apartments in the investigated buildings, leading to a number of 963 inhabitants. The number of companies is smaller, only 69, with a total number of 258 employees. A detailed situation is illustrated in Figure 3.26 [175].

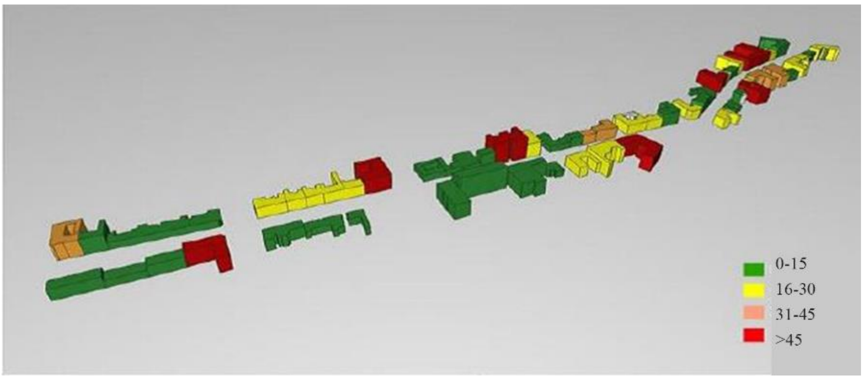


Figure 3.25. Number of inhabitants distribution for the investigated buildings, Iosefin district [175]

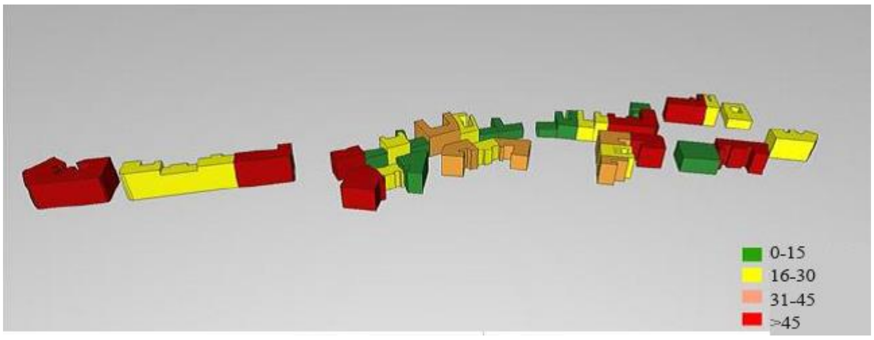


Figure 3.26. Number of inhabitants distribution for the investigated buildings, Fabric district [175]

The main commercial pole in Iosefin district is represented by the local market, with an agro-alimentary profile. At the present moment, this market is unorganized, being chaotically used. The social and educational services are considered to be less that needed. The existence of a significant number of commercial abandoned spaces highlights the poor economic situation of the local community. From culturally point of view, in the area there are a municipal cultural house, a cinema, theatre and clubs with specific activities. There are some public spaces, squares, sport fields that could be used for increasing the quality of life for the people in Iosefin district. Also, the proximity of Bega River with its green promenade represents a positive aspect for the social life in the area [176].

The character of Fabric historical district is an industrial one, with a very interesting succession of public squares. The majority of the inhabitants have a poor economic situation, which led to various social issues in the area. This lack of finances ca be seen also through the aspect of the historical buildings and commercial spaces, less maintained than in the other two historical districts. There is a lack of cultural and educational spaces. However, the proximity of the river bank, a large park and two important public squares highlights a big potential of the social life in Fabric area [176]. The atmosphere in Fabric area can be observed in Figure 3.27 [177].

Figure 3.27. Atmosphere on a normal day in Fabric historical district [177]

3.2 **Typical failure mechanism for Banat region**

3.2.1 Seismicity of Romania

Romania represents an east-European country, located in a seismic area, form by the pre-alpine platforms and alpine orogeny units. In the country, there are two major seismic areas. The most important one is Vrancea seismic zone, with a moderate crustal seismicity. In Vrancea, there were registered some intermediate depth strong earthquakes with magnitudes more than M_W = 7.0, causing damages and casualties. The second most important seismic area is Banat region, with earthquakes of crustal type and maximum registered magnitudes M_W = 5.6. The distribution of the main seismic faults and past earhquakes in Romania and especially the central and western part of the country is illustrated in Figure 3.28 [178].

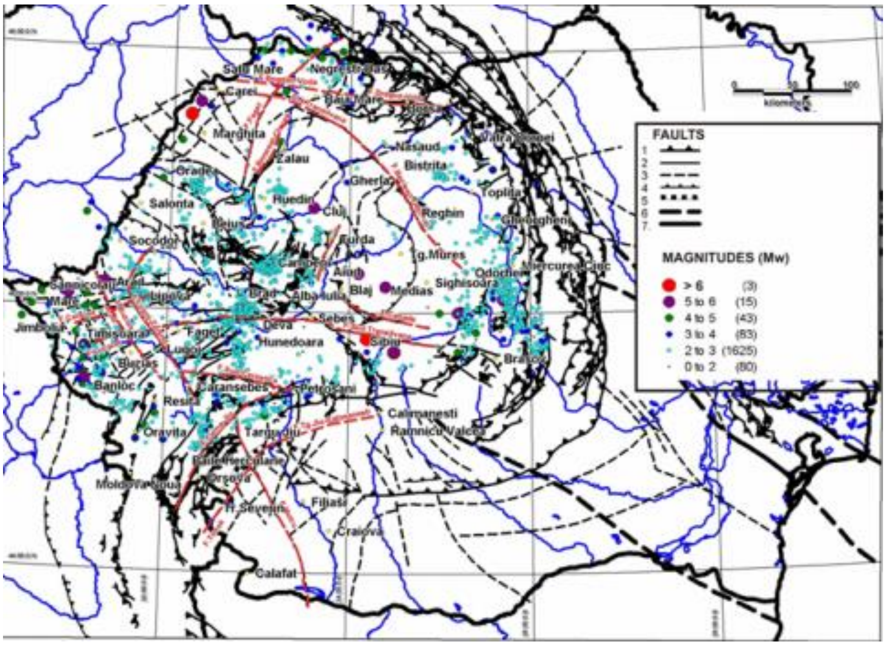


Figure 3.28. Location of faults and seismic events in the central and western part of Romania [178]

The seismicity of the country is different in various areas, depending on the considered seismic hazard. A hazard map is presented in Figure 3.29 [109]. One of the important aspects is considered the design peak ground acceleration for the regions of Romania, as presented in Figure 3.30. The values are considered for an average recurrence interval of 225 years and 20% probability of exceedance in 50 years. In Figure 3.31, there can be seen the corner period T_C for Romania, which describe the field local conditions [179].

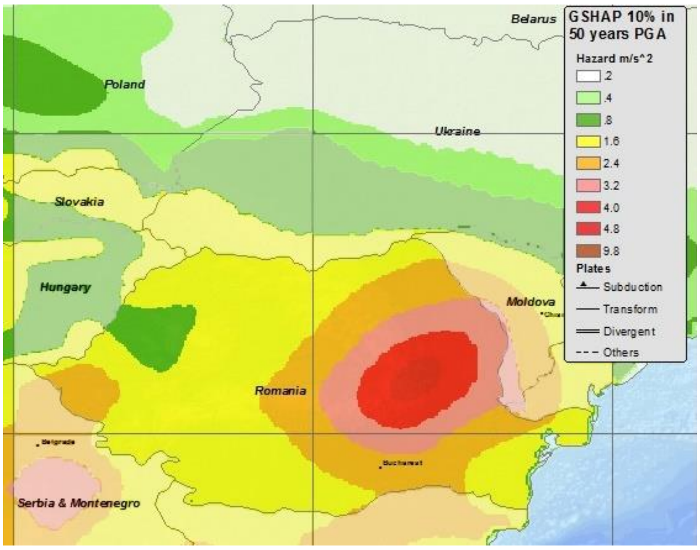


Figure 3.29. Seismic hazard map for Romania following the peak ground acceleration [109]

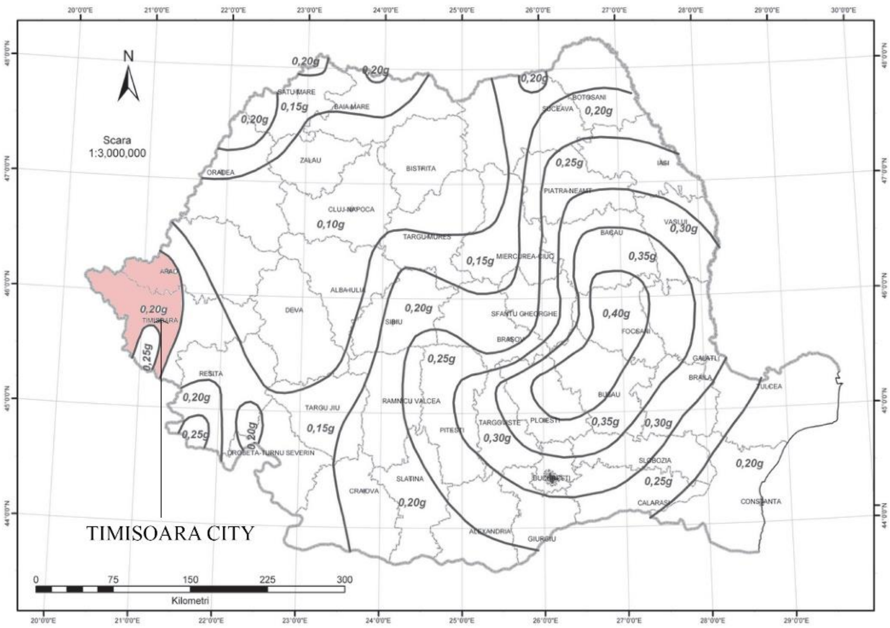


Figure 3.30. Design peak ground acceleration for the regions of Romania [179]

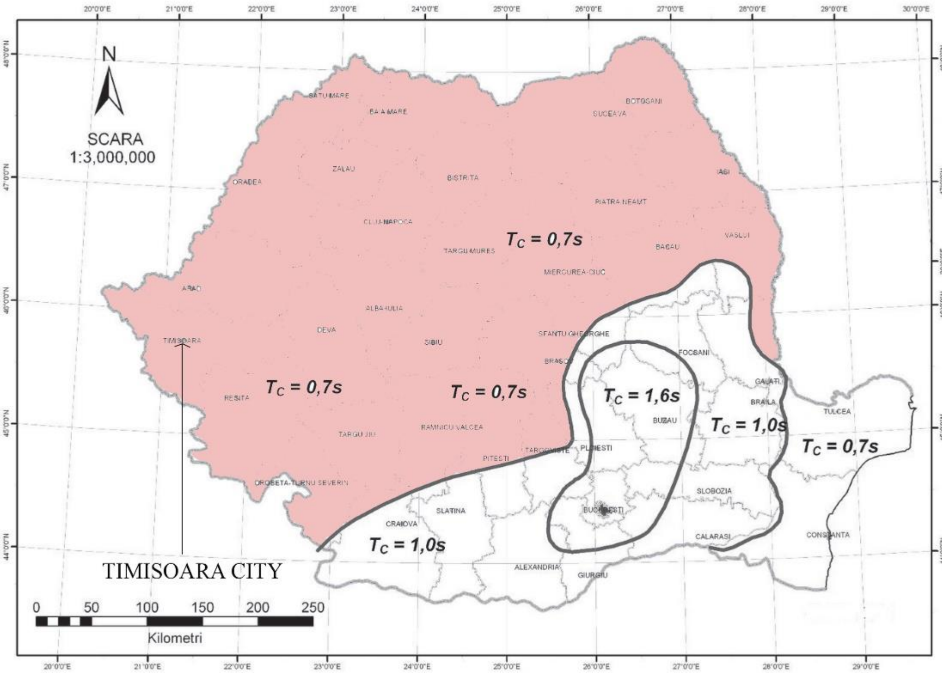


Figure 3.31. Corner period for the regions of Romania [179]

Following the information from Figure 3.30 and Figure 3.31 and considering a 5% dumping, there can be considered a normalized response spectra for Banat region of Romania, as illustrated in Figure 3.32 [179].

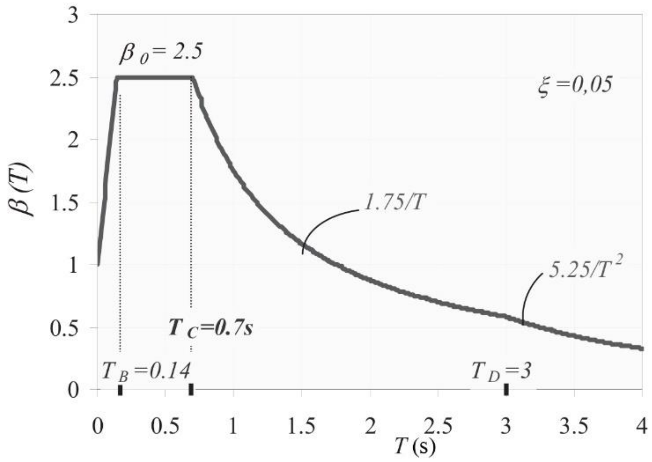


Figure 3.32. Normalized response spectra considered for Banat region with T_c=0.7s [179]

3.2.2 Seismicity of Banat region

Banat seismic area represents the second most important seismic region in Romania. The seismicity of the area is particular due to the crustal earthquakes sources. The focal depth are usually between 1 and 35 km [180]. This type of earthquake can be found only in Banat seismic region (Figure 3.33), where the biggest city is Timisoara.

From Figure 3.30 and Figure 3.31 there can be noticed that Timisoara city has assigned a peak ground acceleration a_g = 0.20 g and a corner period T_C = 0.70 s. Following this information and considering a 5% dumping, there can be considered a normalized response spectra for Banat region, as illustrated in Figure 3.34a. Original proposal for elastic response spectra in Banat was proposed by Gioncu and Mazzolani and presented in Figure 3.34b [181].

The behaviour factor is considered to be q=1, as suggested in the Romanian Code for evaluation of the buildings with cultural value [182].

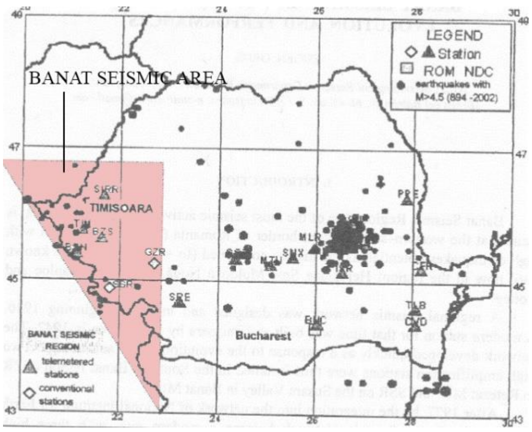
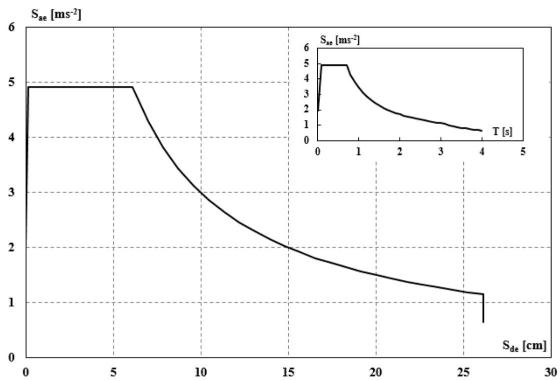
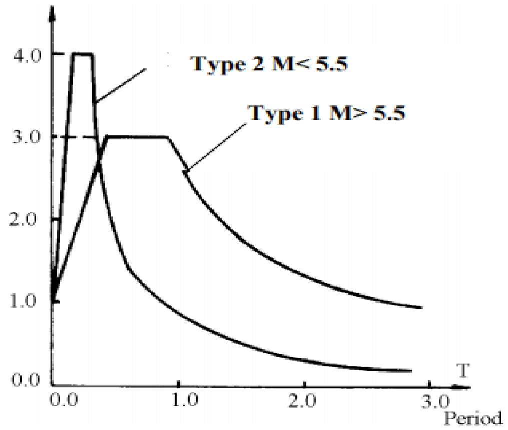


Figure 3.33. Location of Banat seismic area on the territory of Romania [183]



a)



b)

Figure 3.34. Elastic response spectra considered for Banat seismic region: a) according to the Romanian code P100-1/2013 [184]; b) original proposal by Gioncu and Mazzolani [181]

Regarding Timisoara city, there can be noticed the existence of the two active seismic faults in the western part of the city (Figure 3.35). Both faults are located within 5-10 km from the city centre and represent a risk factor for the historical areas of Timisoara [170].

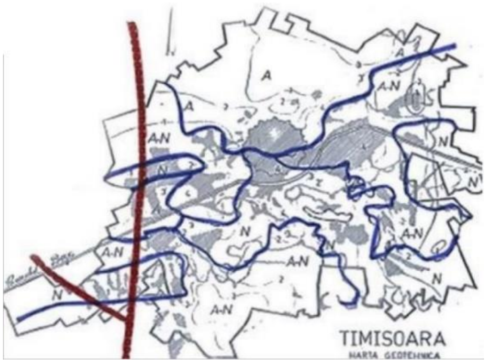


Figure 3.35. The two seismic faults located in Timisoara city [170]

The first seismograph was installed in Timisoara in year 1942 [185], but the entire region was monitored instrumentally by a local network that was called Banat Seismic Micro network, for a long time. But the network became modern only after 1977, having installed three stations [183].

The seismic region is located in the western and southwestern part of the country, with five distinctive area of high seismic potential, such as Banloc, Herculane, Moldova Noua, Voiteg and Sag-Parta [183]. The registrations illustrate earthquakes with magnitudes ranging between 0.2 M_W and 5.6 M_W [186]. A detailed map, with the surroundings of Timisoara is illustrated in Figure 3.36. Some of the most important seismic events are presented in Table 3.4 [187].

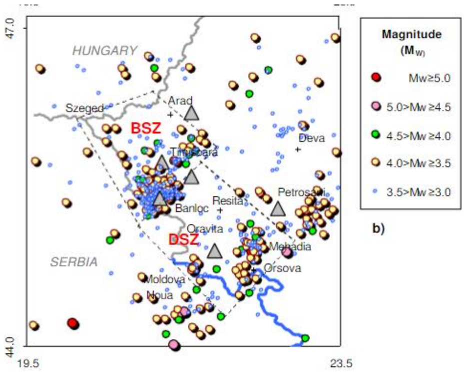


Figure 3.36. Registered magnitudes in Banat seismic region [187]

Table 3.4. Some of the most important earthquakes in Banat seismic region [187], [180], [188]

Date	Focal depth [km]	Magnitude [M_W]
1879	10.0	5.3
1915	8.6	5.4
1936	13.4	5.2
1941	6.0	4.8
1959	7.5	5.0
1960	6.0	4.2
1991	11.0	5.6

There can be noticed a pattern, marked by three important periods of high seismic activity. Each period correspond to a major earthquake and its seismic sequence registered on a few years after the main shock. First period can be considered the Moldova Noua sequence, registered between 1879 and 1880 with a maximum magnitude of 5.3 M_W. The second important sequence is considered Banloc – Romania – Serbia border, registered in the period 1901-1915, with a maximum magnitude of 5.0 M_W. The third period corresponds to the Banloc – Voiteg sequence, which occurred between 1991 and 1996, with a maximum registered magnitude of 5.6 M_W [187].

The conclusion that can be drawn are that considerable events tend to repeat once at 37 years in the area and that the shallower focal depths could cause the most damaging effects event in case of events with smaller magnitude [187]. Generally, depending on the magnitude, there can be considered specific return periods for the seismic events, as presented in Table 3.5 [188].

Table 3.5. Returning period for different earthquakes, depending on magnitude [188]

Magnitude [M_W]	Time [years]	Banloc-Timisoara seismic area	
		50%	40%
4.0	1.6	3.2	4
4.5	4	8	10
5.0	10	20	25
5.5	25	50	62
5.75	44	88	110
6.0	112	224	280

3.2.3 Typical failure mechanism in the epicentre

The strongest seismic sequence that occurred in Banat seismic region is the earthquake from 1991, in Banloc city, at approximately 40 km away from Timisoara, measured in straight line. The seismic sequence of the earthquake is presented in Figure 3.37, marked by two main events occurred within five months in a very small epicentre area, around 10 km. Another series of aftershocks, but of smaller magnitude occurred until March 1992 [187].

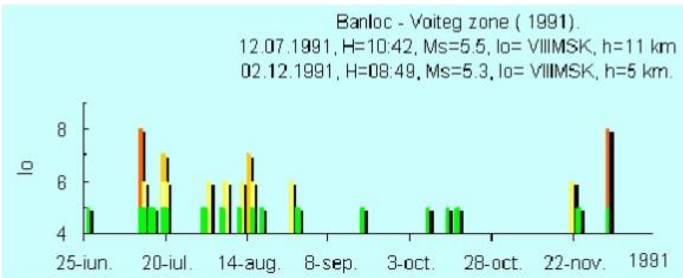


Figure 3.37. The seismic sequence of Banloc earthquake, 1991 [187]

Most of the buildings located in the epicentre area are made in brick or adobe. The specific in-plane failure mechanism for masonry buildings are the flexural-rocking, the shear-sliding and the diagonal shear [189], [190]. The most common damages after earthquakes are the in-plane failure mechanisms due to shear forces, illustrated in Figure 3.38 [191]. But because masonry buildings are irregular and very complex, sometimes is more difficult to appreciate their behaviour under seismic action [192]. Also, the out-of-plane failure mechanisms (Figure 3.39) and the combined failure mechanisms (Figure 3.40) are very common [191].

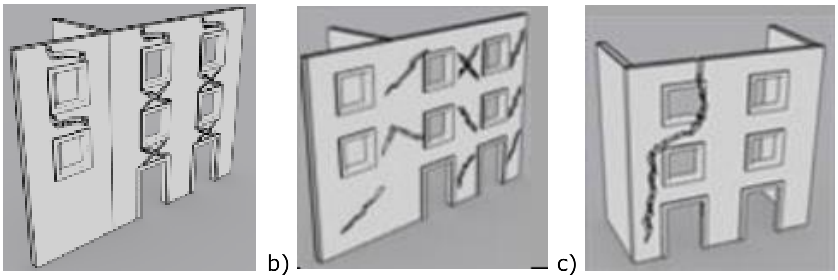

a) b) c)

Figure 3.38. Most common in-plane failure mechanism due to shear forces for masonry buildings: a) damage to spandrels; b) damage to piers; c) global in-plane damage [191]

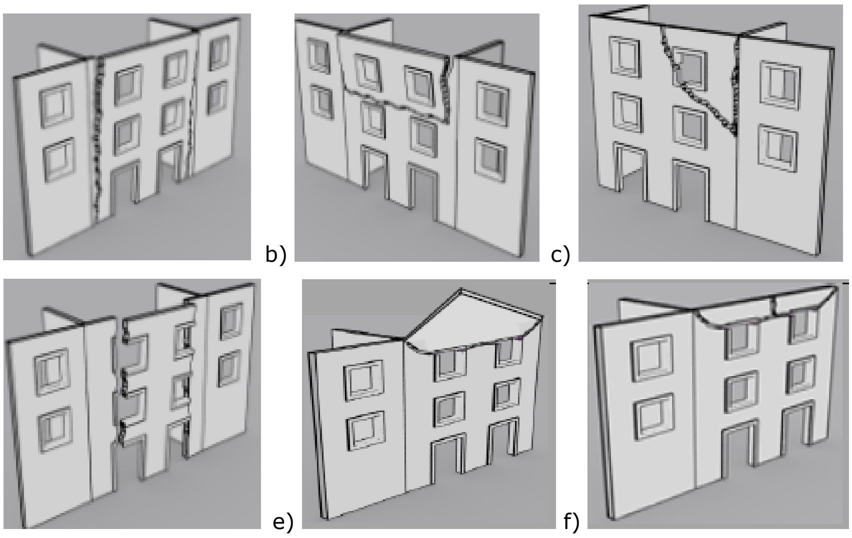

a) b) c)
d) e) f)

Figure 3.39. Typical out-of-plane failure mechanisms for masonry buildings: a),b) overturning because of lack of connection, both sides; c) overturning in correspondence of the piers; d) overturning due to lack of connection, one side; e), f) arch failure; [191]

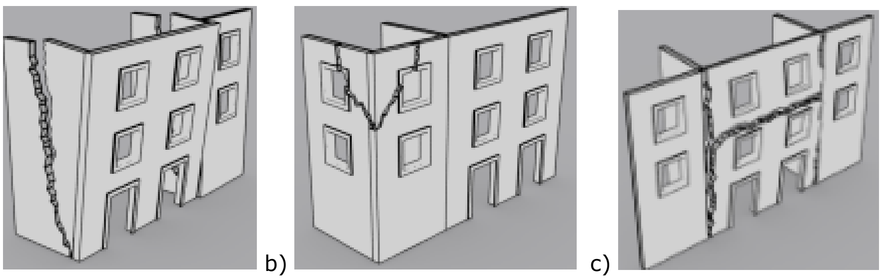
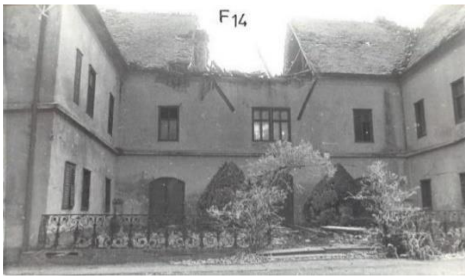

a) b) c)

Figure 3.40. Most common combined failure mechanism for masonry buildings: a) lack of connection between façade and transversal walls; b) corner failure because of flexible horizontal elements; c) failure because of anchors [191]

Also in the case of Banloc earthquake, 1991, the type of damages were especially due to shear forces and vertical forces. At first inspection, there were noticed moderate damages to arches, lintels, attics, chimneys and roofs (Figure 3.41) [170], [193]. From the typical failure mechanism, there was slightly activated the diagonal shear, leading to some cracks especially in the façade masonry walls, as presented in Figure 3.42 [174].

a) 

b) 

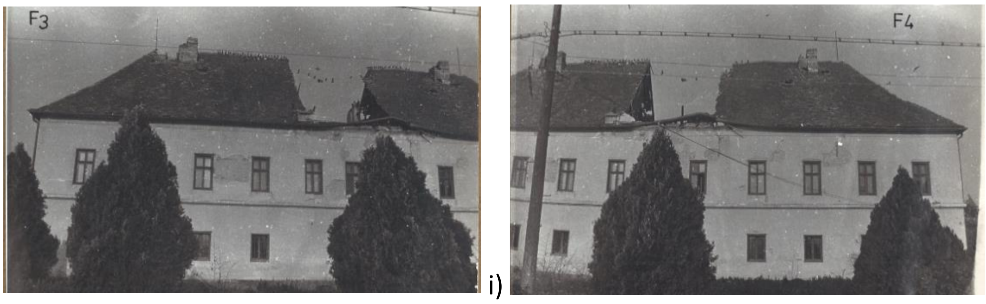
c) 

d) 

e) 

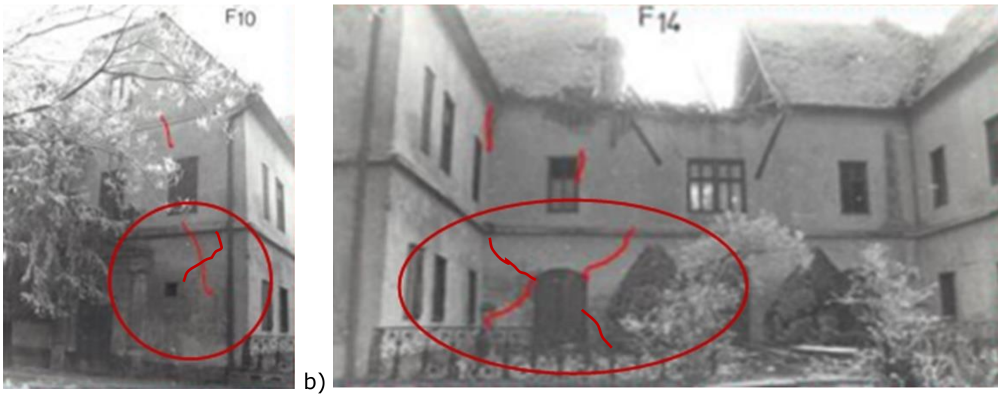
f) 

g) 



h) i)

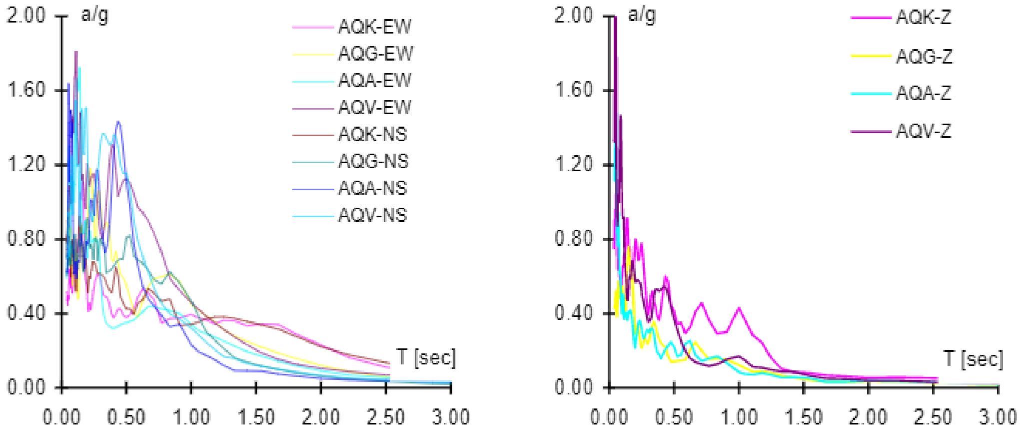
Figure 3.41.Damages to masonry buildings in the epicentre of Banloc earthquake, 1991 [170]



a) b)

Figure 3.42. Diagonal shear cracking at the façade masonry walls of buildings in the epicenter of Banloc earthquake, 1991 [174]

From the investigated pictures, there was noticed also a particular type of decay, respectively the vertical cracks. This type of damage occurs because of the shallow focal depth and very small epicentral distance. In the near-field events, the vertical forces are comparable or even higher than the horizontal ones, as observed also after L'Aquila (Figure 3.43) [194], Amatrice [13] and Christchurch [18] earthquakes. That is why, the vertical cracking in-plane failure mechanism is more likely to occur at the buildings located in the epicentre of the earthquakes [195].



(a) (b)

Figure 3.43. Comparison between: a) horizontal and b) vertical components of L'Aquila earthquake from 6th April 2009 [194]

The patter of the vertical cracks is presented in Figure 3.44 for Christchurch [196], Darfield [38], Plomari [197] and Banloc buildings [174].

a) b)

Figure 3.44. Vertical cracking in-plane failure mechanism observed at masonry buildings in the epicentre of : a) Plomari [197]; b) Banloc earthquake, 1991 [174]

The main reason of the appearance of the vertical cracks is due to the surface waves that are present at the shallow earthquakes and near-field seismic events, as presented in Figure 3.45. This type of waves is very dangerous, carrying the biggest amount of energy [195].

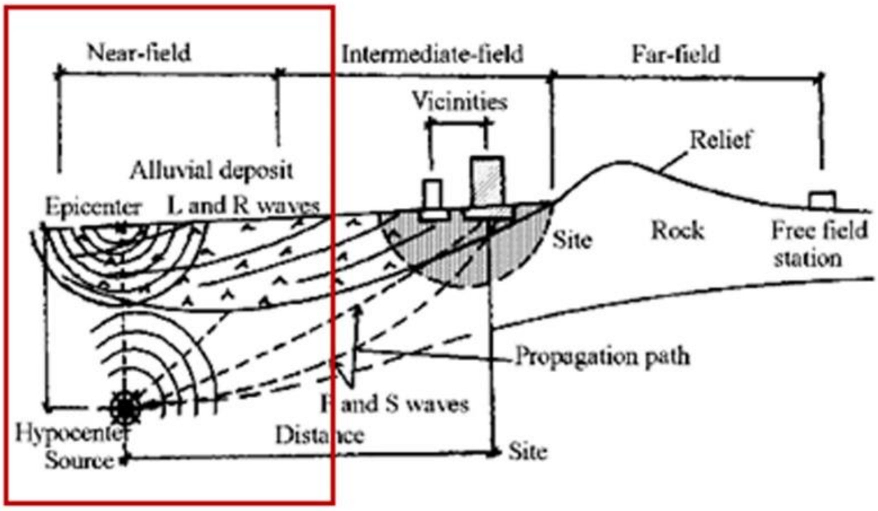


Figure 3.45. Surface-waves characteristic to the near-field earthquakes [195]

The surface waves are called L and R waves and they represent the primary cause of destruction. Their behaviour tends to move the ground up and down or even side-to-side (Figure 3.46), in dependence of the waves direction [195].

In some cases, there can appear also the asynchrony of the vertical movements (Figure 3.47), that could lead to the appearance of breaking lines into the building. This particularity makes the vertical ground motions more dangerous than the horizontal ones. The vertical components represent in reality the dominant parameter for the near-field seismic areas [195]. Unfortunately, in many seismic design projects, this component is neglected [174].

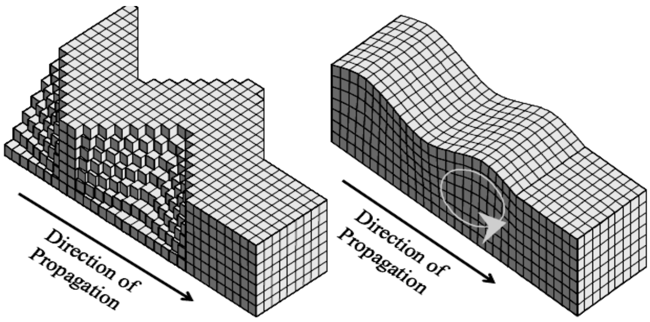


Figure 3.46. The possible propagation direction for the surface L and R waves: side-to-side or up and down [195]

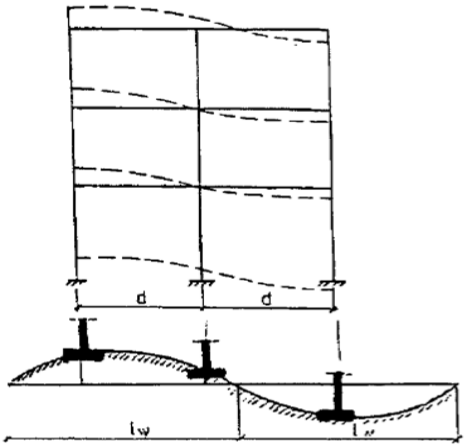
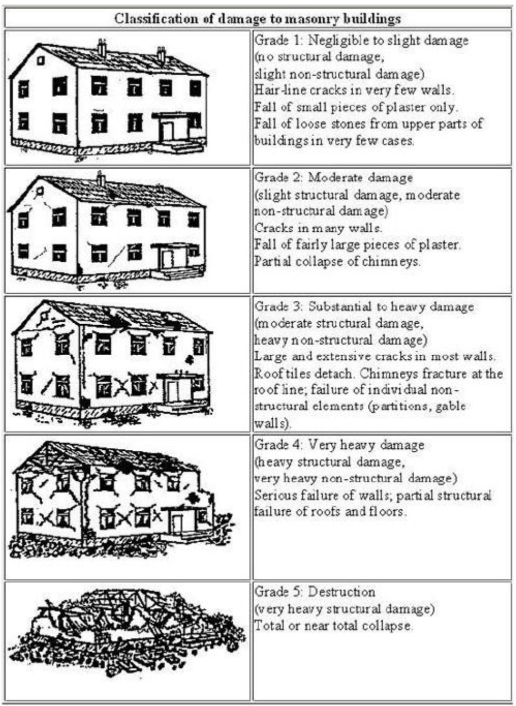


Figure 3.47. The possible asynchrony of the vertical movements [195]

The correlation between expected damage state and the most probable real level of damage is presented in the EMS-98 damage scale for masonry buildings, as shown in Figure 3.48 [198].



Classification of damage to masonry buildings	
	Grade 1: Negligible to slight damage (no structural damage, slight non-structural damage) Hair-line cracks in very few walls. Fall of small pieces of plaster only. Fall of loose stones from upper parts of buildings in very few cases.
	Grade 2: Moderate damage (slight structural damage, moderate non-structural damage) Cracks in many walls. Fall of fairly large pieces of plaster. Partial collapse of chimneys.
	Grade 3: Substantial to heavy damage (moderate structural damage, heavy non-structural damage) Large and extensive cracks in most walls. Roof tiles detach. Chimneys fracture at the roof line; failure of individual non-structural elements (partitions, gable walls).
	Grade 4: Very heavy damage (heavy structural damage, very heavy non-structural damage) Serious failure of walls; partial structural failure of roofs and floors.
	Grade 5: Destruction (very heavy structural damage) Total or near total collapse.

Figure 3.48. EMS-98 damage scale for masonry buildings [198]

As previously presented, the most present in-plane failure mechanism at the masonry buildings located in Banloc, after the earthquake from 1991 is the vertical cracking failure mechanism. The main cause is the activation of the up and down vertical ground movements and also of the asynchrony of the vertical movements.

Moreover, there was noticed also a trend for the out-of-plane local failure mechanism. Because of the high rigidity of the typical complex wooden frameworks that is present at historical masonry buildings in Banat area (Figure 3.49) [199], the top part of the masonry façade walls present an overturning effect. This damage leads also to the partial crash of the roof, usually inside the building, affecting also the slabs and interior walls.

The entire combination of in-plane and out-of-plane failure mechanism that was observed in the epicentre of Banloc earthquake, in 1991 is described in Figure 3.50 [174].

a)  b) 

Figure 3.49. Typical rigid wooden framework on historical masonry buildings in Banat region [199]

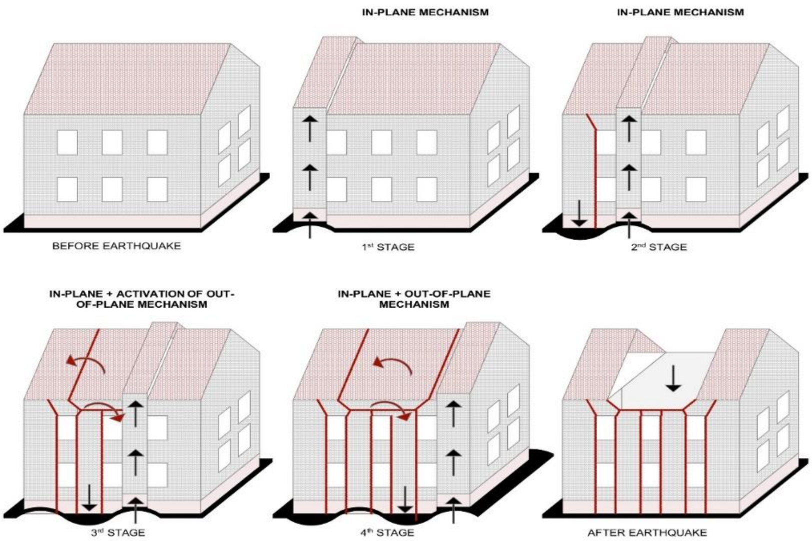


Figure 3.50. Particular combination of in-plane and out-of-plane failure mechanism for masonry building in the epicentre of shallow earthquakes [174]

From the analysis of the failure mechanisms observed on site, in the epicentre, after the seismic event from 1991, there can be say that the real decay level indicates a damage state of D2-D3 (Figure 3.51).

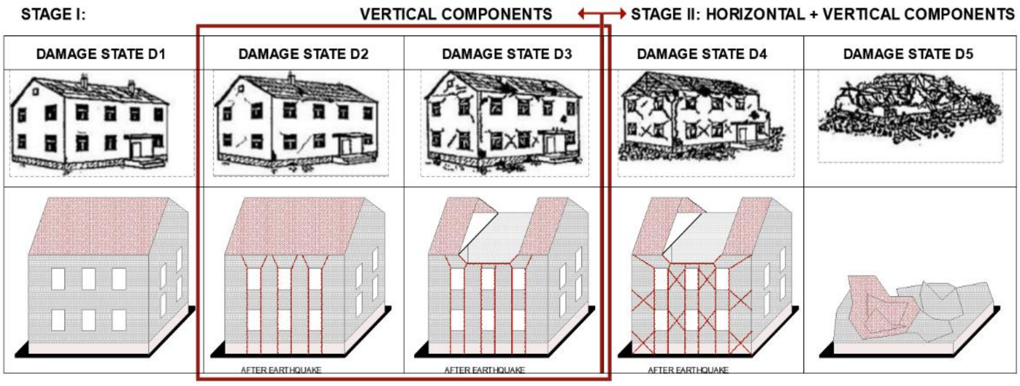


Figure 3.51. Correlation between real damage observed on site and expected damage states for similar masonry buildings in the near-field areas [174]

This level of damage suggest the possibility of reaching significant damages to non-structural elements, but only small or moderate damages to structural elements. The building has very little chances of losing its bearing capacity [174].

3.2.4 Possible seismic scenario

The eventuality of an earthquake is very difficult to predict, but there can be estimated the most probable macroseismic intensity of a future earthquake. This estimation could help on realising the most probable seismic scenario and appreciate the possible damages and losses.

As previously presented, in the area of Timisoara, there were registered earthquakes with magnitudes between M_W = 0.2 ÷5.6 [186] and the peak ground acceleration is considered to be a_g = 0.20g in Timisoara city and a_g = 0.25g in Banloc area, according to the Romanian design code [179].

At first, there was estimated the most probable macroseismic intensity based on a very simple relation, illustrated in Equation 15, in dependence of the peak ground acceleration [200].

$$\ln(PGA) = 0.24 \times I_{EMS-98} - 3.9 \quad (15)$$

The results of the previous formula indicates a macroseismic intensity IX EMS-98, which is considered to be the most probable macroseismic intensity for the region. The same correspondence between peak ground acceleration and macroseismic intensity is illustrated in Figure 3.52 [201]. The correlation between the European macroseismic scale EMS-98 [89] and the expected damage is described in Table 3.6 [62].

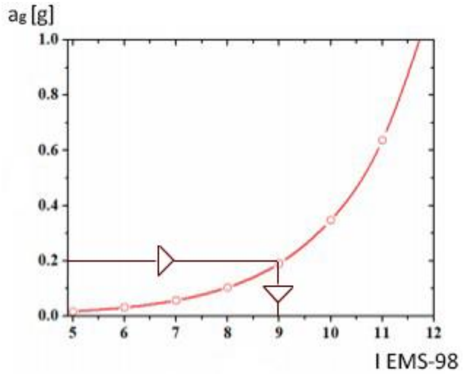


Figure 3.52. Correspondence between ag and EMS-98 [201]

Table 3.6. Correlation between MES-98 scale and real damage [62]

Macroseismic intensity	Definition	Description
I	Not felt	Not felt at all
II	Scarcely felt	Only vibration is felt, by individuals at rest in houses
III	Weak	Vibration felt indoor by few people, light trembling
IV	Largely observed	Felt indoor by many people, not frightening
V	Strong	Felt indoor by most, outdoor by few, hanging objects start to swing and top heavy objects topple over
VI	Slightly damaging	Felt by most indoor and by many outdoor, people frightened and run outdoors, fine cracks in plaster
VII	Damaging	Most people frightened and run outdoors, objects fall from shelves, small cracks in walls, partial collapse of chimneys
VIII	Heavily damaging	Furniture may be overturned, damage to ordinary buildings, chimney fall, large cracks in walls
IX	Destructive	Ordinary buildings partially collapse, considerable damages
X	Very destructive	Ordinary buildings might collapse
XI	Devastating	Most of the ordinary buildings collapse
XII	Completely devastating	All structures might be heavily damaged or even destroyed

A more specific way of determining the most probable macroseismic intensity is the attenuation law described in Equation 16 [202]. This law allows us to appreciate the probable macroseismic intensities for various scenario, depending on magnitude M_W, focal depth h_f and epicentral distance d. A detailed situation of the results is presented in Table 3.7 [203].

$$I_{EMS-98} = 1.45 \times M_W - 2.46 \times \ln(R) + 8.166 \tag{16}$$

, where R represents a correlation between focal depth and epicentral distance, as decribed in Equation 17 [202].

$$R = \sqrt{d^2 + h_f{}^2} \; [km] \tag{17}$$

Table 3.7. Attenuation law results for possible magnitudes in Timisoara city [203]

M_W	d [km]	h_f [km]	I [EMS-98]
4	5	5	**9**
	10	10	7
	15	15	6
	20	20	6
	25	25	5
5	5	5	11
	10	10	**9**
	15	15	8
	20	20	7
	25	25	7

Considering the fact that the correlation between peak ground acceleration and macroseismic intensity illustrates a most probable intensity of IX EMS-98, there can be suggested two seismic scenarios for the same intensity. In case of an earthquake with the epicentre in Timisoara city (5-10 km from the city centre) and a focal depth of maximum 10 km, the most probable macroseismic intensity would be also IX EMS-98.

This probable seismic scenarios will be further considered for the seismic vulnerability assessment of the investigated historical masonry buildings.

3.3 Preliminary analysis of the case study buildings

3.3.1 Location

The study involves a large number of historical buildings located in the two historical areas outside the city centre of Timisoara, which are Iosefin (Figure 3.14) and Fabric (Figure 3.15). There were preliminary investigated a total number of 105 buildings, 68 from Iosefin area and 37 from Fabric historical district. For each of this historical masonry buildings, there were studied aspects such as constructive system, regularity, symmetry, aspects regarding adjacent buildings, possible valuable artistic assets and others, as presented in 3.1.2. For all this buildings, there was performed the empirical seismic vulnerability assessment based on the Vulnerability Index Methodology [81].

For the detailed investigation, there were selected 25 historical masonry buildings, considered as representative for the entire area. For this buildings, there were made complete survey, on-site investigation and experimental tests. The location of the chosen buildings is presented in Figure 3.53 for Iosefin district (19 buildings) and in Figure 3.54 for Fabric district (6 buildings). For all of them, there was performed the mechanical seismic vulnerability assessment with Tremuri software [120].

Figure 3.53. Selected historical masonry buildings from Iosefin district for mechanical analysis

Figure 3.54. Selected historical masonry buildings from Fabric district for mechanical analysis

3.3.2 Structural system description and classification

All the investigated buildings are made in masonry of burnt clay brick and lime. The perimetral walls are massive, with thicknesses ranging between 80 centimetres at the basement and 40 centimetres at the top floor. Usually, the buildings are aligned with the street, with the long façade occupying the street front. The short façade is perpendicular on the street. Another massive structural wall is usually another wall parallel with the street, in the median part of the building, following the main façade. Other massive structural walls are present at the staircase [170], [204].

The transversal walls are much thinner, with thicknesses between 10 and 15 centimetres. Their role is to ensure the rigidity of the building and to clearly define the functional areas. Due to this fact, in many cases, the structural behaviour of historical masonry buildings is more favourable on one direction than the other orthogonal [170], [204].

In many cases, the transversal walls are not connected with the façade walls. That is why, in case of an earthquake, there is a high risk for the activation of the out-of-plane failure mechanism [170], [204].

The horizontal structural elements are made is two different ways. There can be seen masonry vaults, mostly at the basement and sometimes at the ground floor or wooden floors, mostly at the top floors. The masonry vaults present a thickness of a brick layer, between 15 and 20 centimetres. The wooden floors are made either with single or with double layer of wooden beams [170], [204].

The roof is based on a rigid and complex wooden framework, made after German influences. Usually, the height of the attic could easily accommodate another level [170]. The rigidity and complexity of the wooden framework tends to compress the masonry perimetral walls, leading to an improvement of the global bearing capacity of the historical building [205], [206], [207].

The building typology and structural layers are presented in Figure 3.55.

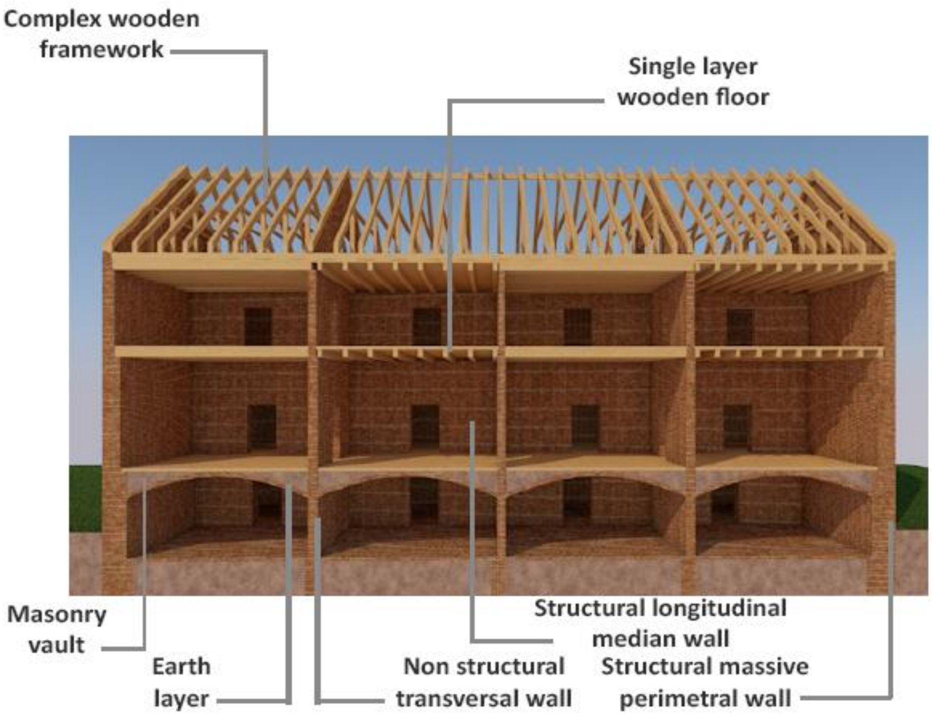


Figure 3.55. Building typology and structural layer characteristic for historical masonry buildings in Timisoara

Following geometrical parameters, a classification was made for the investigated buildings in Iosefin and Fabric historical districts. The buildings with just one storey are classified as buildings from typological class Type I. The buildings with two storey are considered to be buildings from typological class Type II. The buildings with three or more storey are classified as typological class Type III.

A detailed relationship between number of levels and typological class is described in Table 3.8 [170].

Table 3.8. Typological classes considered for Iosefin and Fabric historical districts

Number of levels above basement	Typological class	Percentage of each class in Iosefin district	Percentage of each class in Fabric district
One	Type I	26 %	14 %
Two	Type II	39 %	29 %
Three or more	Type III	35 %	57 %

The distribution of the buildings based on typological classes is illustrated Figure 3.56 in for Iosefin historical area, respectively in Figure 3.57 for Fabric district.

Figure 3.56. Typological class distribution in Iosefin historical district

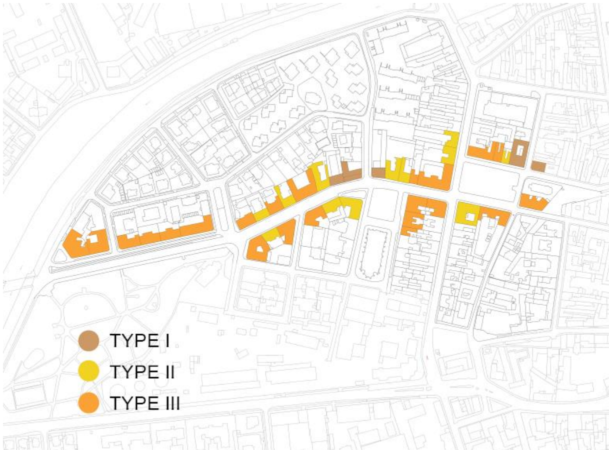


Figure 3.57. Typological class distribution in Fabric historical district

The height of a storey is compress between 3.60÷4.20 meters for the ground floor and 3.20÷3.80 meters for the other levels. In most of the cases, the ground floor is the highest of all storeys [170]. The total height of the investigated buildings is between 4.80 meters for buildings with just one storey and 15.10 meters for buildings with three or more storeys [170]. This height was considered until the starting point of the roof. The height of the roof is from 2.30 meters for smaller buildings till 4.80 meters for tallest buildings, as presented in Figure 3.58 [174].

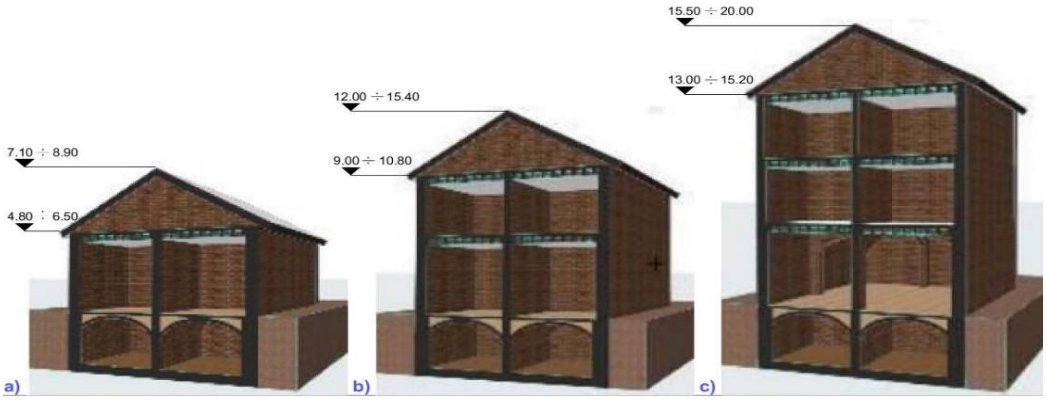


Figure 3.58. Height of the buildings for each typological class: a) type I; b) type II; c) type III [174]

For more detailed information about the bearing capacity of the structural elements of the investigated historical masonry buildings, there were performed small experimental tests on bricks extracted from 4 of the case study buildings. The bricks were extracted both from basement, ground floor, top floor and attic, from three historical masonry buildings from Iosefin district (Figure 3.59) and from one historical masonry building from Fabric area (Figure 3.60).

Figure 3.59. The historical masonry buildings from Iosefin district from where were extracted burnt clay bricks for experimental tests

Figure 3.60. The historical masonry buildings from Fabric district from where were extracted burnt clay bricks for experimental tests

The experimental test were performed following Romanian normative [208], [209], [210], by the authorised testing laboratory of Politehnica University Timisoara. The experimental test were performed by a hydraulic press, as presented in Figure 3.61. Moreover, there were made also tests with an L-type sclerometer, in order to be able to calibrate the results [211].

Figure 3.61. Hydraulic press used in the experimental tests on burnt clay brick extracted from some of the historical investigated buildings in Timisoara [211]

The burnt clay bricks that were tested are presented in Figure 3.62 before any preparation and in Figure 3.63 after the application of a lime topping of high resistance [211].

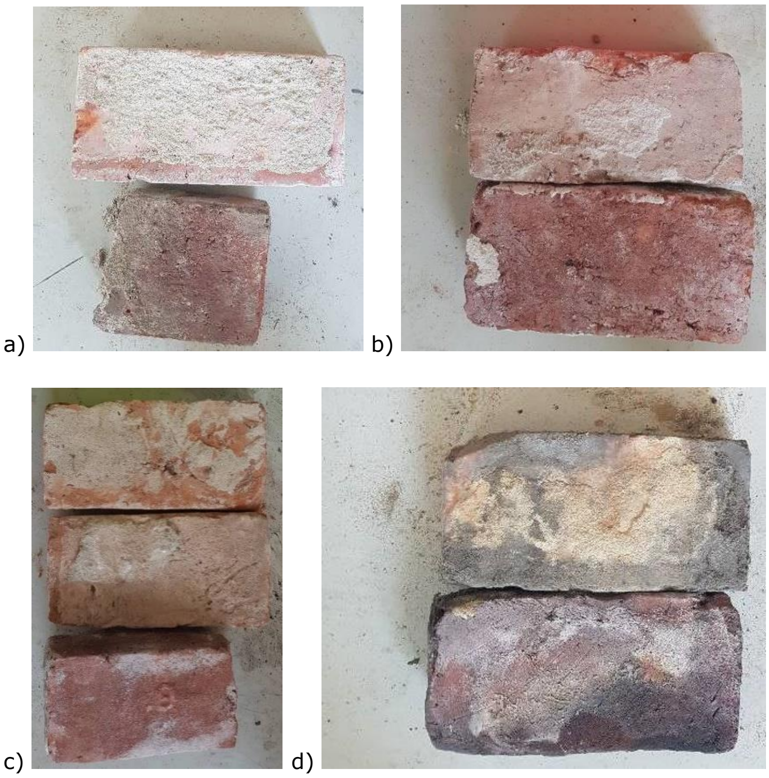


Figure 3.62. The tested burnt clay brick: a) Merlin Theatre, Iosefin; b) Sinaia Palace, Iosefin; c) King Carol the 1st no. 28, Iosefin; d) Mercur Palace, Fabric [211]

Figure 3.63. Some of the tested burnt clay brick after the application of a lime topping [211]

Some pictures obtained during the teste are presented in Figure 3.64. The obtained data is detailed in Table 3.9 [211].

a) b)

Figure 3.64. Photos obtained during the experimental tests performed on bricks from the investigated historical masonry buildings in Timisoara [211]

Table 3.9. Obtained data after performing the experimental tests [211]

Brick number	Maximum area	Compression strength	Medium compression strength	Standardised compression strength
	<mm2>	<N>	<N/mm2>	<N/mm2>
1.1	42624	2000×10^3	32,18	26,07
1.2	23798	415×10^3		
2.1	43218	1220×10^3	29,34	23,77
2.2	42192	1285×10^3	30,46	
3.1	40310	2000×10^3	49,62	32,52
3.2	44100	680×10^3	15,42	
4.1	33221	615×10^3	18,51	13,51
4.2	46512	510×10^3	10,96	
4.3	48360	534×10^3	11,04	

The data that was obtained was compared with the specification from the Romanian Design Code [179] and with other experimental tests performed on similar historical masonry buildings, with related geometrical, structural and typological characteristics [212], [213], [214], [215]. The mechanical proprieties for the masonry structures that were considered representative for the investigated buildings and for further empirical and mechanical analysis are presented in Table 3.10 [170].

Table 3.10. Mechanical proprieties considered to be characteristic for the investigated historical masonry buildings in Timisoara [170]

Mechanical proprieties	fk [N/mm^2]	fvk0 [N/mm^2]	E [N/mm^2]	G [N/mm^2]	Density [kg/m^3]
Masonry without reinforcement	2.35	0.06	2350	940	1800

3.3.3 Architecture and artistic assets

The historical districts of the city were influenced by several cultures, such as Ottoman and Habsburgic, leading to an impressive mixt of architectural styles. The styles that can be seen are mostly Art Nouveau, Eclectic, Seccession and sometimes Baroque.

The buildings illustrate the financial status of their inhabitants, or at least used to do it in the past. The tallest a building was, the more decorated and detailed. The local atmosphere from the past can be seen in Figure 3.65 [216].

Figure 3.65. Historical atmosphere in Timisoara city [216]

Usually, buildings from typological class I are very poor in architectural-artistic details. Also, their roof is not very complex and not very tall, because the height of a roof represented in the past the visual and urban landmark that the buildings was important. Some representative examples of building typology I are illustrated in Figure 3.66 for Iosefin district and in Figure 3.67 for Fabric historical area.

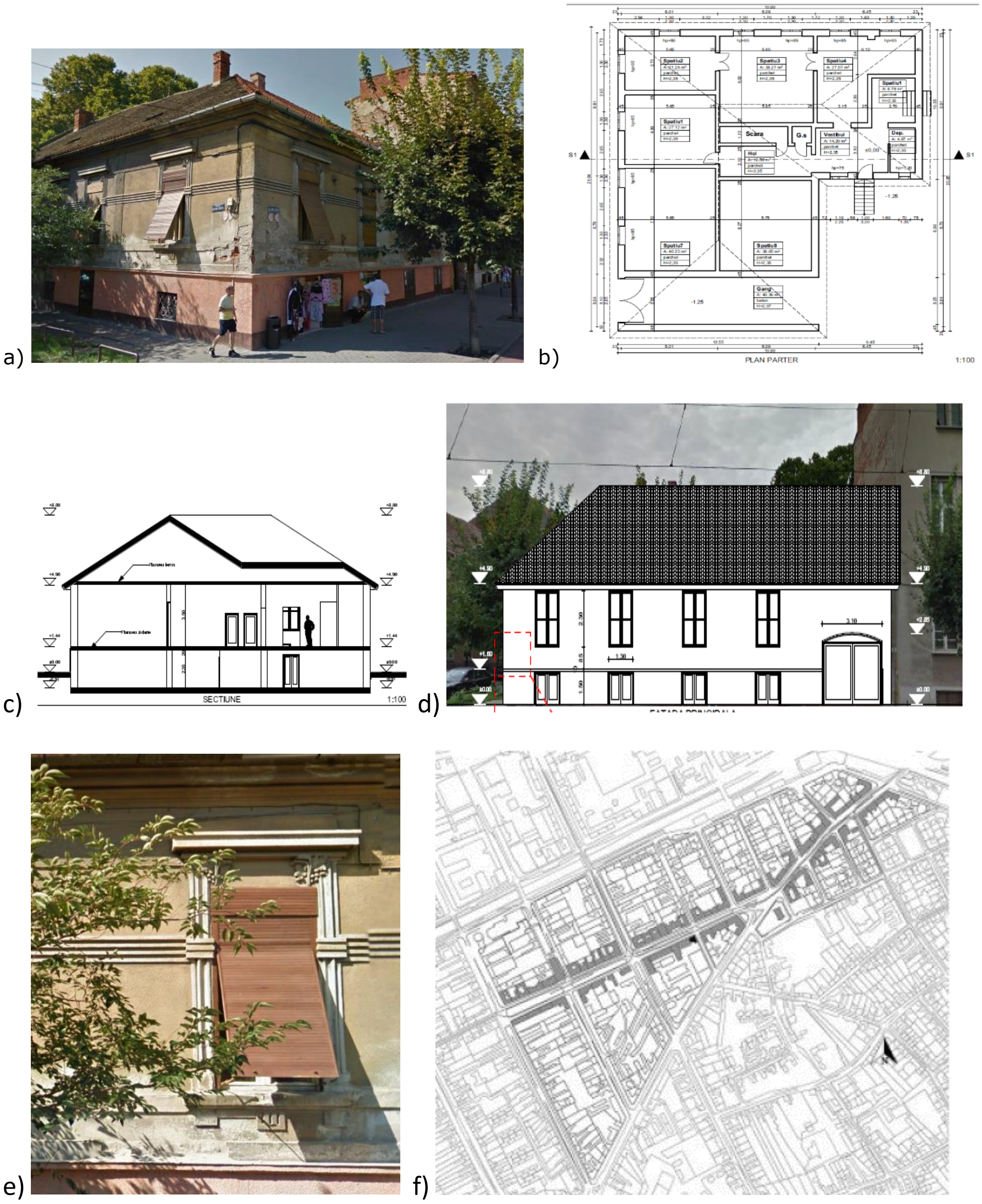


Figure 3.66. Typological class type I historical masonry buildings for Iosefin district: a) image of the buildings in the current state; b) ground floor plan; c) section; d) façade; e) architectural-artistic elements; f) location

Figure 3.67. Typological class type I historical masonry buildings for Fabric district: a) image of the buildings in the current state; b) ground floor plan; c) section; d) façade; e) architectural-artistic elements; f) location

In case of the typological class type II, the decoration are more visible and the buildings tends to become bigger. At many buildings from this typological class, the basement tends to become higher, accommodating commercial functions. There can be seen corner bosses, frontons and balconies with decorated balusters. Some representative examples of building typology II are illustrated in Figure 3.68 for Iosefin district and in Figure 3.69 for Fabric historical area.

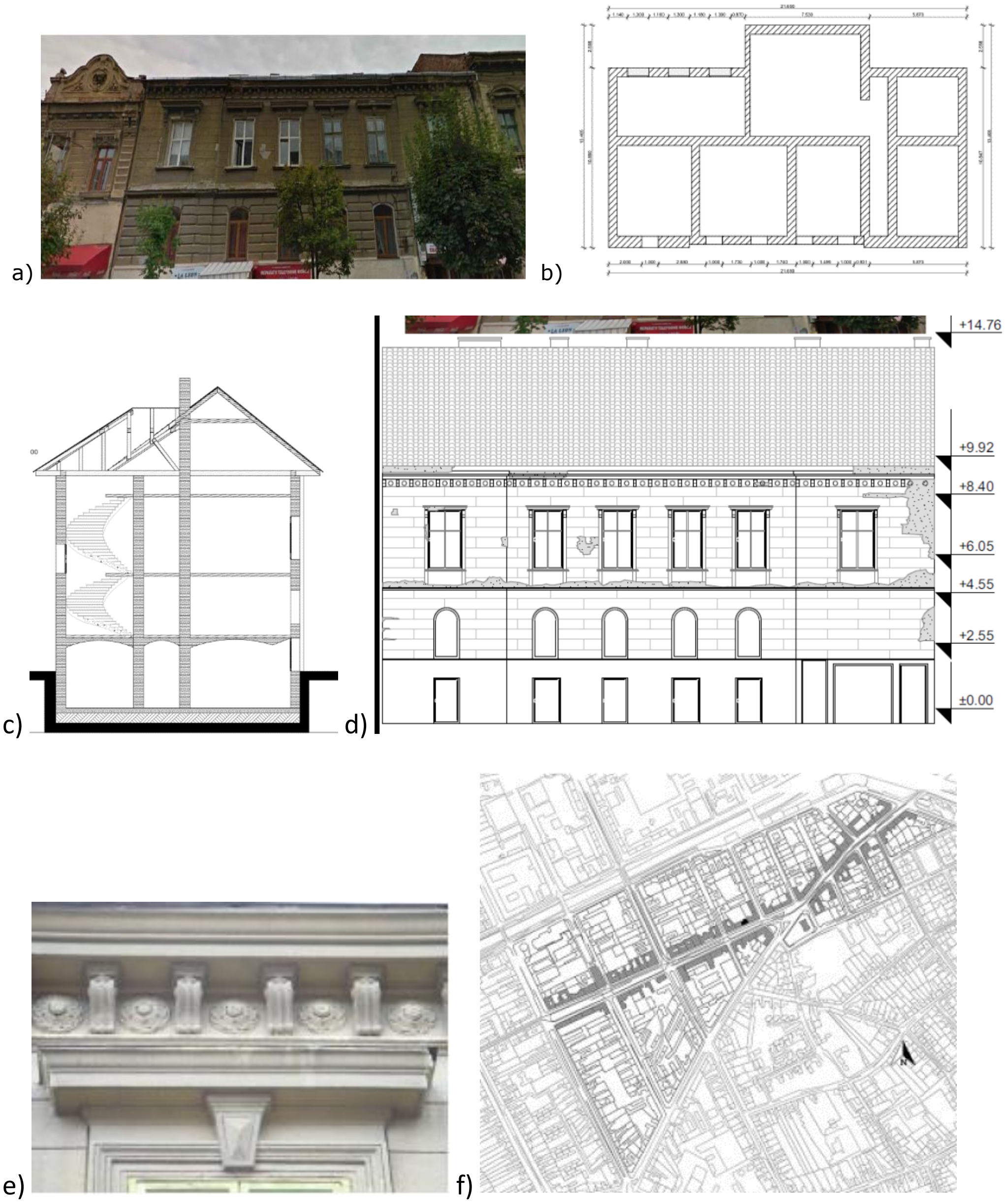
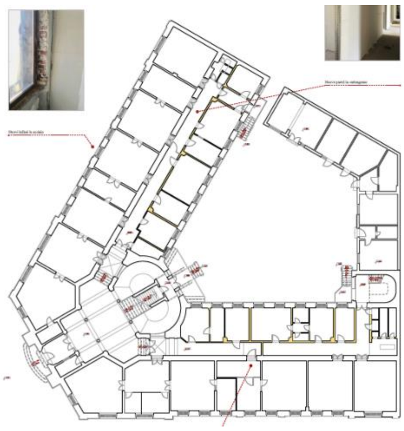


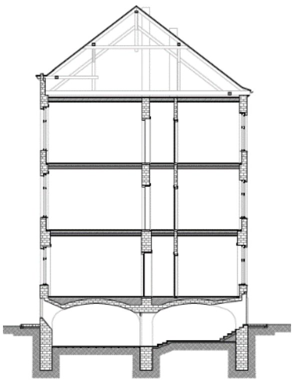
Figure 3.68. Typological class type II historical masonry buildings for Iosefin district: a) image of the buildings in the current state; b) ground floor plan; c) section; d) façade; e) architectural-artistic elements; f) location

Figure 3.69. Typological class type II historical masonry buildings for Fabric district: a) image of the buildings in the current state; b) ground floor plan; c) section; d) façade; e) architectural-artistic elements; f) location

In case of the typological class type III, the decoration becomes very important, as a part of the expression of the building. The architectural-artistic elements tends to become more complex and organic and there can be observed some particular themes, such as aquatic or vegetal decoration theme. Usually, the ground floor presents some different elements or textures, in order to bring the building more at human scale. The roof is decorated and becomes an urban visual landmark. The frontons are much decorated, also. In many cases, the buildings from typological class type III tends to be located in corner positions into the group of the buildings, in order to mark an intersection or an important convergence node. Some representative examples of building typology III are illustrated in Figure 3.70 for Iosefin district and in Figure 3.71 for Fabric historical area.

a) 

b) 

c) 

d) 

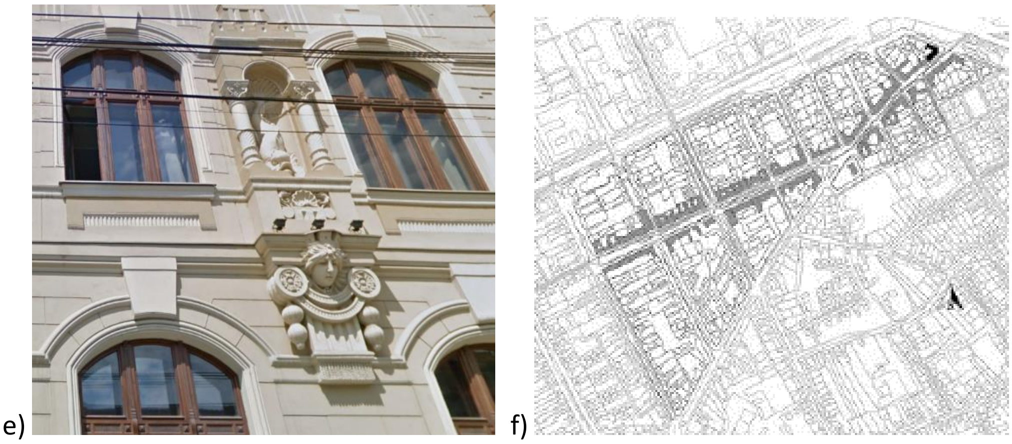
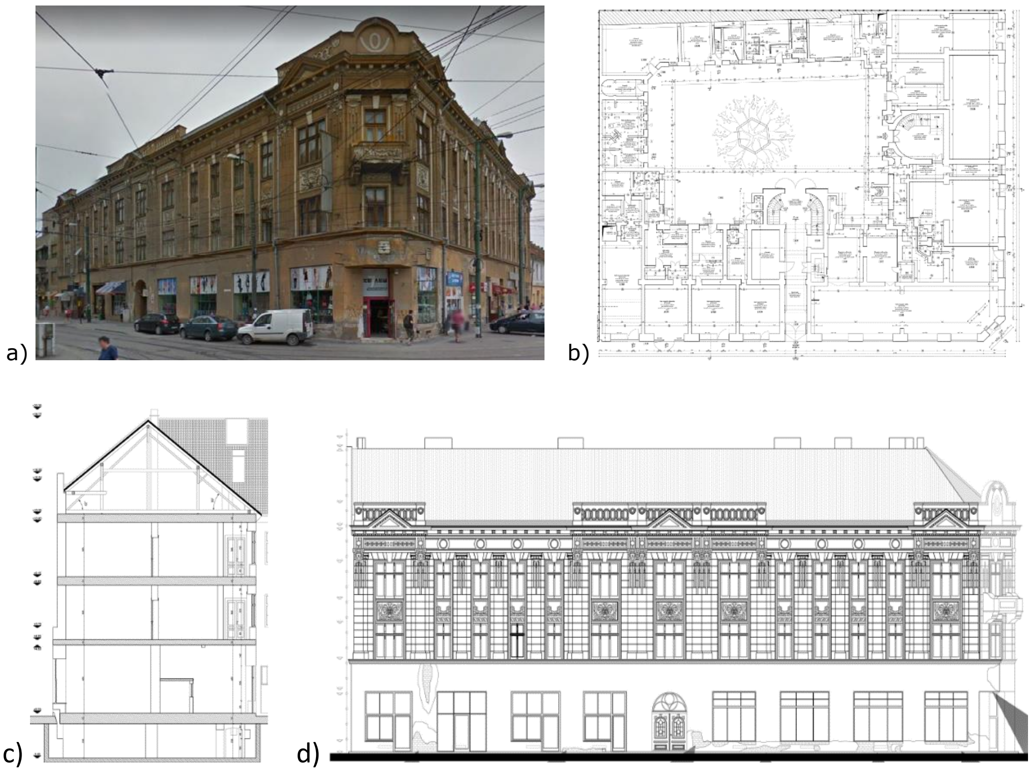


Figure 3.70. Typological class type III historical masonry buildings for Iosefin district: a) image of the buildings in the current state; b) ground floor plan; c) section; d) façade; e) architectural-artistic elements; f) location



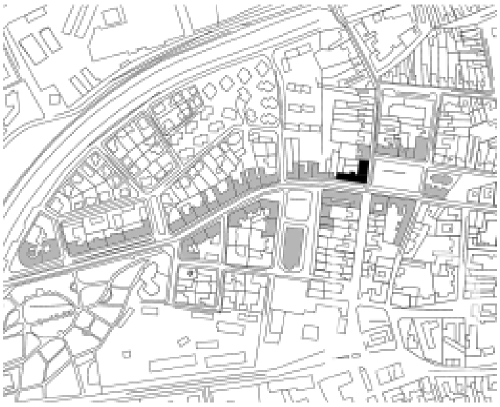
e)  f) 

Figure 3.71. Typological class type III historical masonry buildings for Fabric district: a) image of the buildings in the current state; b) ground floor plan; c) section; d) façade; e) architectural-artistic elements; f) location

Artistic assets represent very valuable elements for historical buildings, showing part of their history [39]. Their preservation is difficult due to their fragility and permanent exposure to climate factors at the exterior part of the buildings or human use at the interior [217], [218]. A synthesis of the architectural-artistic elements that can be present in a historical building from the ones investigated in Timisoara, based on typological classes is presented in Table 3.11. The list of architectural-artistic assets follows the Romanian guideline regarding the classification of the monuments [219] and there must be keeping in mind that exceptions might happen. The table is obtained based on personal observation and generalisation process.

Table 3.11. Architectural-artistic assets that are more likely to be found in the investigated historical buildings from Timisoara

Architectural-artistic asset	Typological class type I	Typological class type II	Typological class type III
Woodwork / joinery	o	o	o
Original stucco	x	o	o
Statues	x	x	o
Bas-reliefs	x	o	o
Gable / frontons	o	o	o
Mosaics	x	o	o
Paintings	x	o	o
Bosses	o	o	o
Balconies	x	o	o
Historical railing	x	o	o
Complex wooden framework	x	x	o
Special details / themes	x	x	o

3.4 **Empirical seismic vulnerability assessment**

3.4.1 Methodology

Empirical methodologies represent quick and simplified procedures for assessing the seismic vulnerability assessment of historical buildings, appropriate for urban investigation areas a large scale [30].

The analysis of complex buildings based on computational modelling represents a very difficult task, due to the absence of drawings, reports and detailed information about the structure. For a first assessment of the vulnerability, there is necessary a simplified method. The simplified analysis aims to evaluate the probability of the investigated buildings to reach a specific damage state at a specific expected seismic intensity [81].

At first, the empirical seismic vulnerability assessment methodology was proposed by Benedetti and Petrini [78] and was focused on assessing the seismic vulnerability of each individual structural unit. The influence of the neighbourhood buildings was not considered, neither the influence of the investigated building on the structural behaviour of the entire aggregate.

Later, there was proposed a development of the existing empirical methodology, by Mazzolani and Formisano [81], that was adapted to the assessment of the seismic vulnerability of structural units within masonry aggregates.

The procedure is based on a vulnerability form, where a score (s) is assigned to each different factor in order to calculate a vulnerability index. The first ten factors are either geometrical or structural, while the last five factors are related to the adjacent buildings. For each factor, there can be assigned one vulnerability class from four available. The classes are named from A to D, A being the lowest vulnerability grade and D the highest. The first ten parameters has class scores ranging from 0 to 45. There are no negative scores, which means that none of the parameters can reduce the vulnerability of the buildings, just to increase it. For the last five parameters, the scores can be also negative, due to the fact that a specific criteria can significantly reduce the vulnerability. The importance of each parameter is highlighted by the weight (w) that is assigned as a specific score multiplier. In the end, the vulnerability index is represented by the sum of each class score multiplied by the assigned weight [81].

The class scores and associated weights for the last five parameters of the vulnerability form were obtained based on numerical calibration. The analysis was performed using Tremuri nonlinear analysis [189], [220], on a masonry structural unit that is representative for Campania region [81].

The final vulnerability form, that was used also for assessing the seismic vulnerability for the historical masonry buildings investigated in Timisoara city is presented in Table 3.12 [174].

Table 3.12. The empirical seismic vulnerability form [174]

No.	Factor	Class A	Class B	Class C	Class D	Weight
1	Vertical structure organisation	0	5	20	45	1
2	Vertical structure`s nature	0	5	25	45	0.25
3	Type of foundation and location/soil	0	5	25	45	0.75
4	Distribution of structural elements in plan	0	5	25	45	1.5
5	Regularity in plan	0	5	25	45	0.5
6	Regularity in elevation	0	5	25	45	1
7	Floors type	0	5	15	45	1
8	Roofing	0	15	25	45	0.75
9	Other details that might influence the seismic behavior	0	0	25	45	0.25
10	Conservation state	0	5	25	45	1
11	Different height between current and adjacent buildings	-20	0	15	45	1
12	Location of the building into the aggregate	-45	-25	-15	0	1.5
13	Staggered floors	0	15	25	45	0.5
14	Structural or typological heterogeneity	-15	-10	0	45	1.2
15	Opening area percentage among adjacent façade	-20	0	25	45	1

The last five parameters are very important, because they consider the structural behaviour of the entire aggregate, not just of the one individual structural unit. Under seismic action, the adjacent buildings could increase or decrease the bearing capacity of the investigated building and this element need to be consider. So, the new five parameters are related with:

- The interaction in elevation
- The interaction in plan
- The influence of the staggered floors
- The influence of the heterogeneity between structural units
- Opening percentage of adjacent facades [220].

For the interaction in elevation, there were considered six possible analysis cases, as presented in Figure 3.72 .The results have shown that a building within two shorter buildings is more vulnerable, as the central building in this case becomes free for lateral displacement at its last levels [220].

Figure 3.72. The study cases of the interaction in elevation effect [220]

For the plan interaction, there were considered four possible analysis cases, isolated building, in line position between at least two other buildings, in corner position into the aggregate or in an ending position (Figure 3.73). The results have shown the fact that the most favourable position is the one in line between at least two other buildings [220].

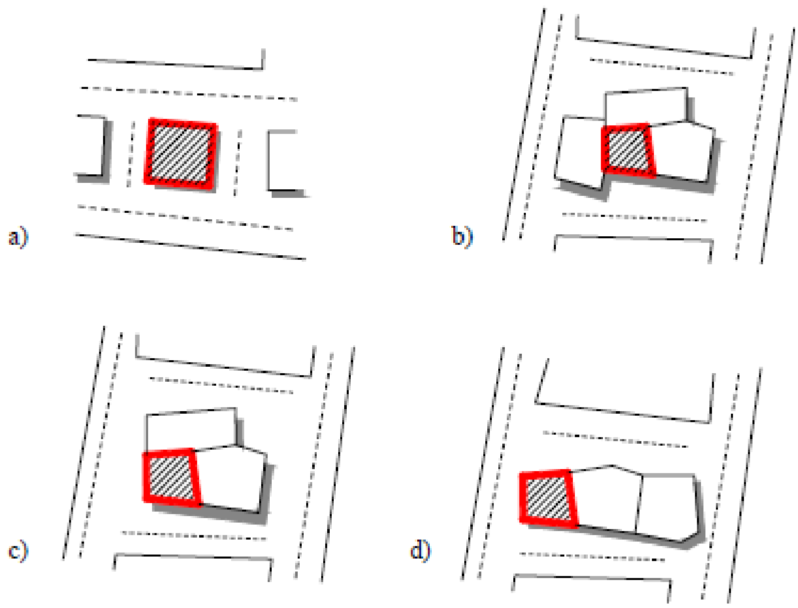


Figure 3.73. The study cases for the plan interaction within the aggregate [220]

For the influence of the staggered floors, five analysis cases were considered, as presented in Figure 3.74. The results have shown the fact that the influence of the staggered floors is very little, but as the number of those floors increases, the vulnerability increases also, even if in a negligible way [220].

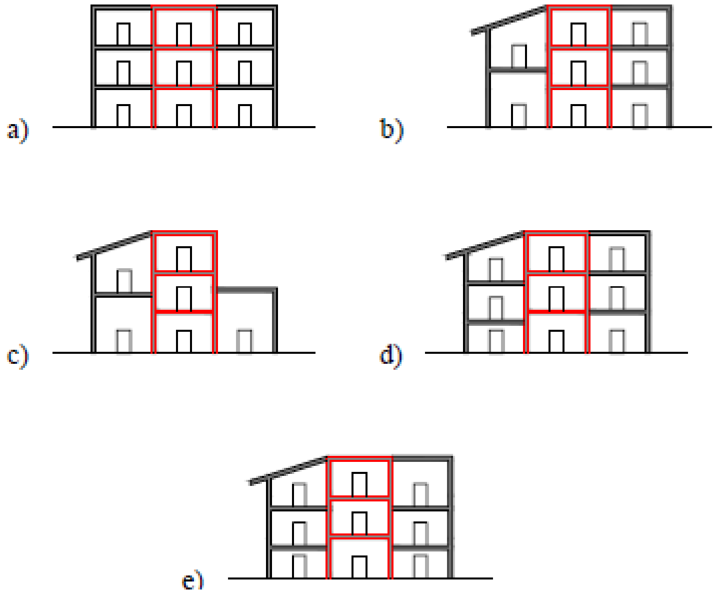


Figure 3.74. Analysis cases for the influence of the staggered floors [220]

For the influence of the typological heterogeneity within the aggregate, there were considered four study cases, with similar characteristic, with adjacent building of same material but worse construction technique, with adjacent building of same material but better construction technique and with adjacent building of a very different structural typology (Figure 3.75). The most vulnerable condition resulted to be for buildings next to units that are made from similar materials, but with greater strength. An interesting observation is that the most favourable condition is when the investigated building is located near a reinforced concrete structure [220].

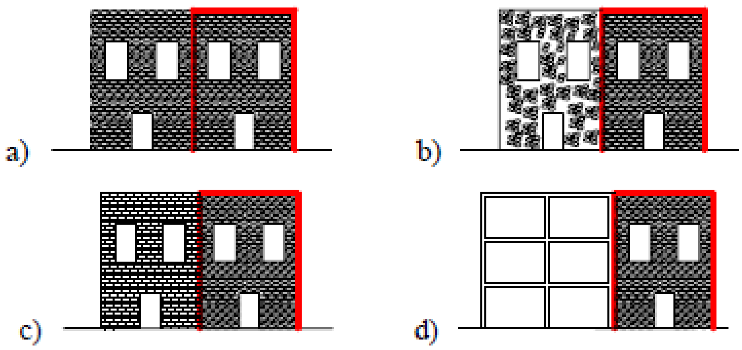


Figure 3.75. Study cases for the typological heterogeneity among the aggregate [220]

For the last parameter that considers the influence of the opening percentage difference between adjacent buildings, there were considered five possible cases. There was considered the possibility of having no difference between opening areas, difference greater than 25% for both or for just one side, difference less than 25% or even the possibility of having adjacent building without any opening (Figure 3.76). The results have shown the fact that the most vulnerable situation is for the case study buildings with a difference of less than 25% of the opening area [220].

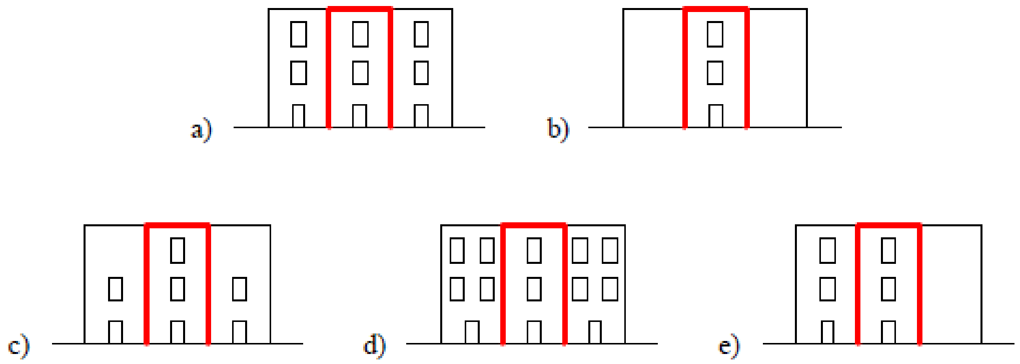
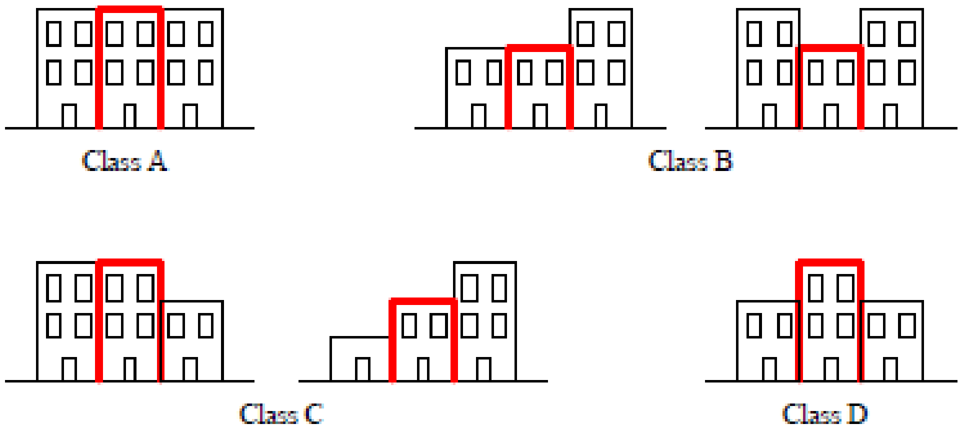


Figure 3.76. Study cases for the influence of the opening area percentage among adjacent buildings [220]

The assignment of the four possible classes (A,B,C or D) in the vulnerability form is presented in [220].



a)

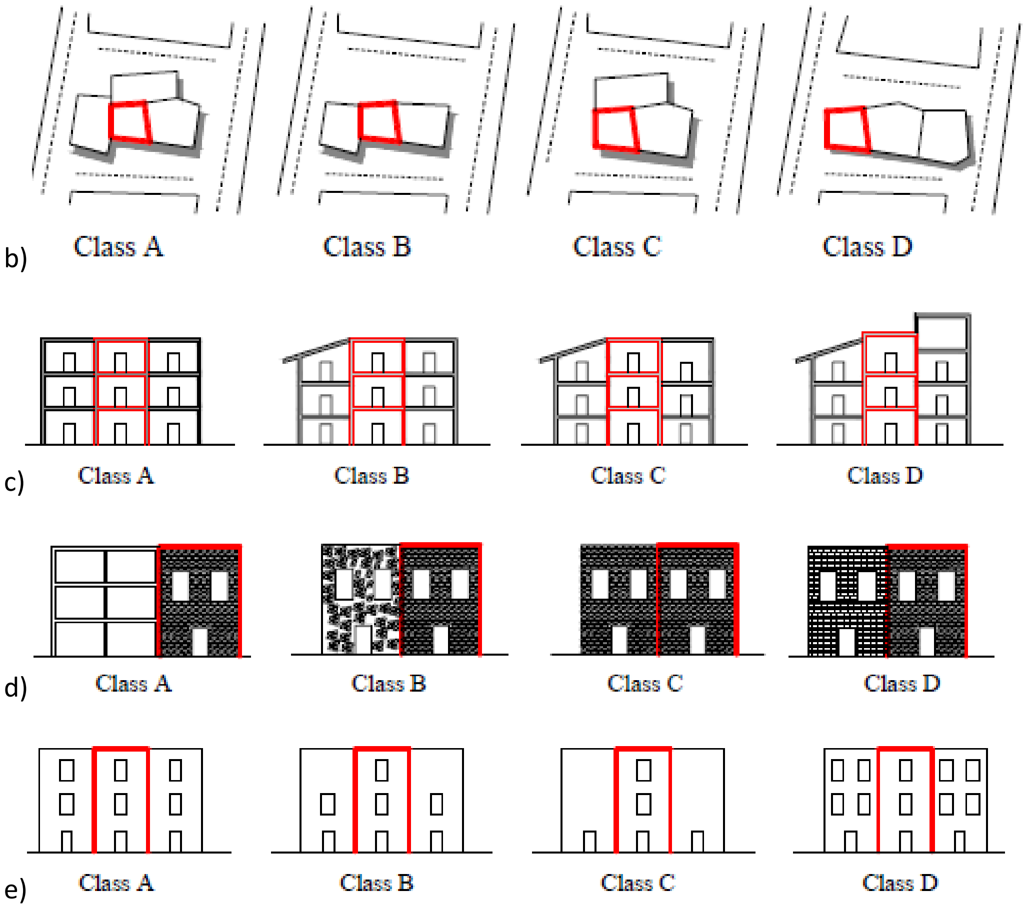


Figure 3.77. The assignment of the possible vulnerability classes for the vulnerability form: a) in elevation interaction; b) in plan interaction; c) staggered floors; d) structural heterogeneity; e) percentage difference among opening areas of adjacent facades [220]

The vulnerability index can be calculated both for first ten parameters, as an isolated structural unit and for all fifteen parameters, considering also the aggregate condition. The vulnerability index formula is presented in Equation 18 for individual structural unit condition and in Equation 19 for aggregate condition. After the index is obtain, it is normalised in the range of 0÷1 following Equation 20 [174].

$$I_{V10} = \sum_{i=1}^{10} s_i \times w_i \tag{18}$$

$$I_{V15} = \sum_{i=1}^{15} s_i \times w_i \tag{19}$$

, where s_i represents the class score and w_i is considers the associated weight factor for each parameter.

$$V = \frac{I_V - I_{V\,MIN}}{I_{V\,MAX} - I_{V\,MIN}} \tag{20}$$

In order to better follow the vulnerability assessment of the investigated historical masonry buildings in Timisoara, there was made a map with numbers, both for all 105 preliminary investigated buildings (Figure 3.78 for Iosefin district district and in Figure 3.79 for Fabric area).

Figure 3.78. Map with numbered investigated historical buildings in Iosefin district

Figure 3.79. Map with numbered investigated historical buildings in Iosefin district

After the definition of the vulnerability index for each investigated building, there was determined also the most probable damage state. The damage state represents a function of the normalized vulnerability index (V), the macroseismic intensity (I) and a factor Φ that influence the curve slope considered to be 2.3 for residential buildings, as represented in Equation 21 [87].

$$\mu_D = 2.5[1 + \tanh\left(\frac{I + 6.25 \times V - 13.1}{\Phi}\right)] \tag{21}$$

The determination of the expected damage provides the most probable damage state that might occur for the investigated building/ group of buildings. The correlation between damage state D_S and real level of expected damage [221] is presented in Table 3.13 [222].

Table 3.13. Correlation between damage grade, damage state and real expected damage [222]

μ_D	Damage state	Most probable degradation level
0.0-1.5	D1	Slight (no structural damage, slight non-structural damage)
1.5-2.5	D2	Moderate (slight structural damage, moderate non-structural damage)
2.5-3.5	D3	Substantial to heavy (moderate structural damage, heavy non-structural damage)
3.5-4.5	D4	Very heavy (heavy structural damage, very heavy non-structural damage)
4.5-5.0	D5	Destruction (very heavy structural damage)

Determining the most probable damage state can provide vulnerability curves and vulnerability maps for the investigated historical areas, highlighting the most vulnerable masonry buildings.

3.4.2 Results

Following the methodology presented above, there were obtained the normalized vulnerability indexes for each investigated building, both for Iosefin and Fabric district. The methodology was applied following the most probable seismic scenario, so a macroseismic intensity IX EMS-98 is considered.

The indexes graphics for the buildings analysed as individual structural units (first 10 parameters) are illustrated in Figure 3.80 for Iosefin historical district and in Figure 3.81 for Fabric area. Brown colour represents the building typology type I, yellow is used for type II, while orange symbolize typology type III. The graphics highlight a low to medium vulnerability index based on the applied methodology (maximum possible value of the normalized vulnerability index being 1).

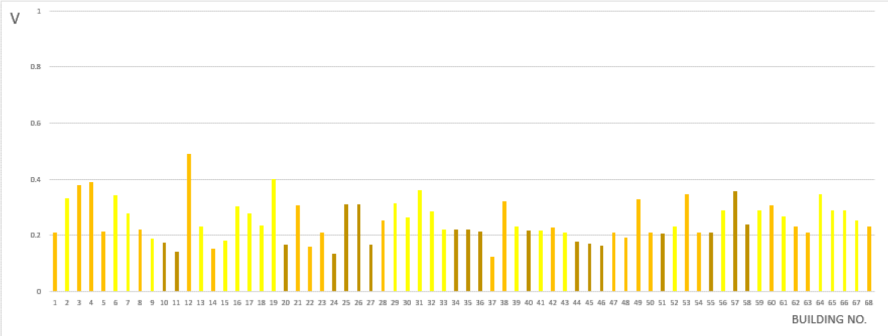


Figure 3.80. Normalized vulnerability indexes (V) for the 68 investigated buildings in Iosefin district, for first 10 parameters on the vulnerability form

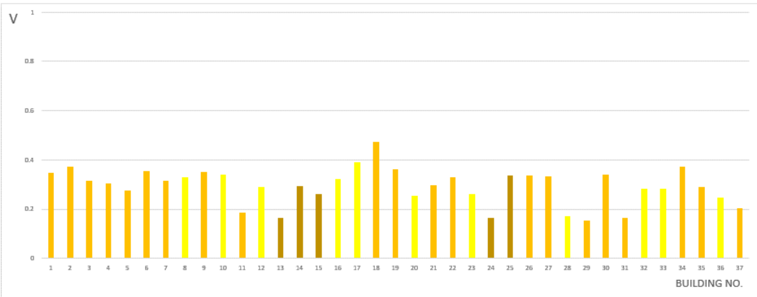


Figure 3.81. Normalized vulnerability indexes (V) for the 37 investigated buildings in Fabric district, for first 10 parameters on the vulnerability form

For a better illustration, there were made also vulnerability curves, presented in Figure 3.82 for all building in Iosefin district and in Figure 3.83 for investigated buildings in Fabric area. The curves indicate a low vulnerability for macroseismic, in the range of damage state D1.

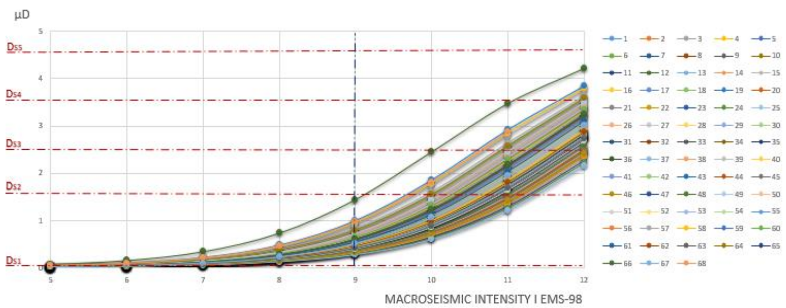


Figure 3.82. Vulnerability curves for the 68 investigated buildings in Iosefin district, for first 10 parameters on the vulnerability form

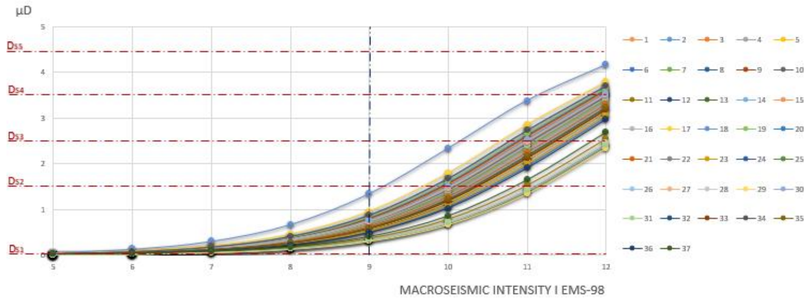


Figure 3.83. Vulnerability curves for the 37 investigated buildings in Fabric district, for first 10 parameters on the vulnerability form

For all 105 case study historical masonry buildings, there was made also an average vulnerability curve, together with a vulnerability range (Figure 3.84). The vulnerability range was determined following the possible variability of damage $V_{MEC\ mean} - 2\sigma$; $V_{MEC\ mean} - \sigma$; $V_{MEC\ mean} + \sigma$; $V_{MEC\ mean} + 2\sigma$ [174], where σ represents the standard deviation of the vulnerability indexes. The vulnerability range indicate also a low vulnerability for macroseismic intensity IX EMS-98, in the same range of damage state D1.

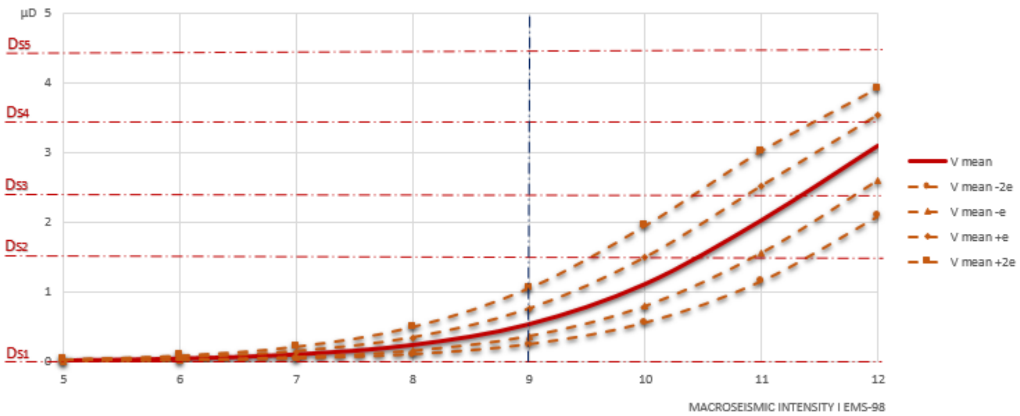
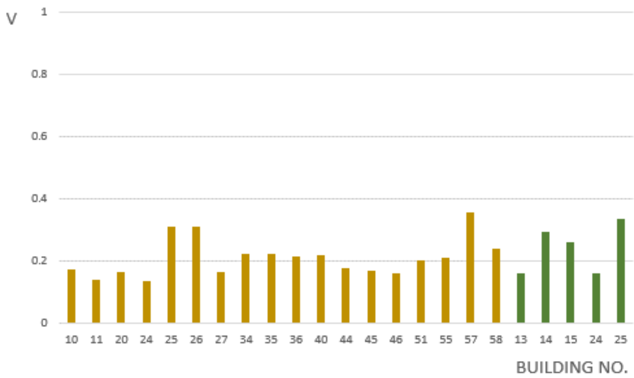


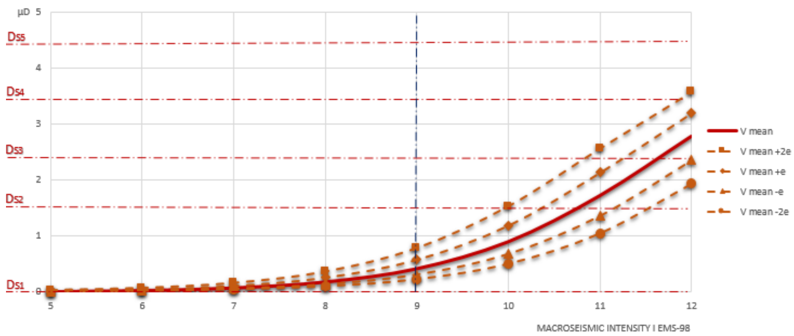
Figure 3.84. Mean vulnerability curve and vulnerability range for all 105 investigated buildings in Iosefin and Fabric district, for first 10 parameters on the vulnerability form

For a better understanding of the seismic vulnerability of the investigated areas, there were obtained also the normalized vulnerability index graphics and vulnerability ranges for each typological class. In Figure 3.85 there is presented the index graphic and curve range for typological class Type I, for buildings located in both investigated areas. Type II normalized vulnerability index graphic and vulnerability curve is illustrated in Figure 3.86, while in Figure 3.87 there is presented the situation for type

III. The medium normalized index is V = 0.21 for typological class type I, V = 0.27 for type II and V = 0.29 for type III. In all figures, the yellow colour symbolize the buildings located in Iosefin historical district, while the green colour represent the buildings from Fabric area.

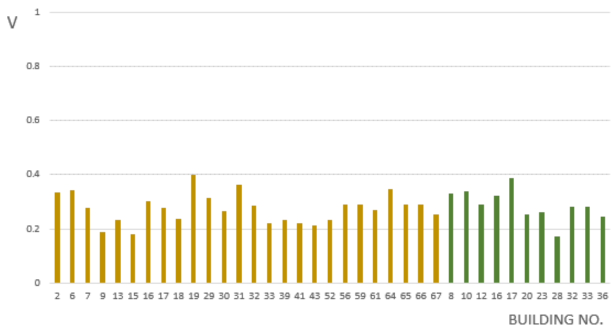


a)

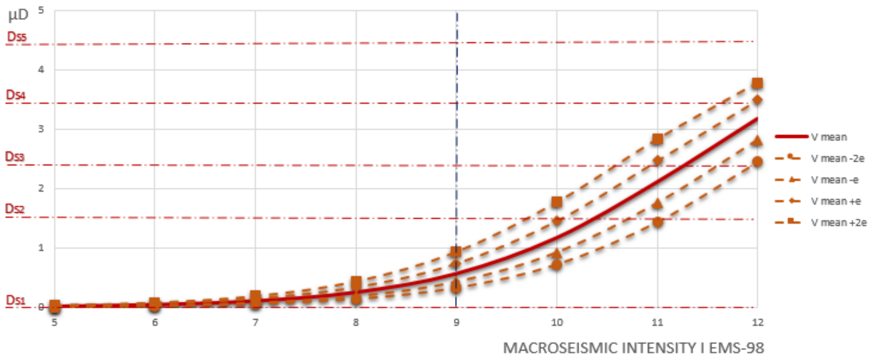


b)

Figure 3.85. Vulnerability for buildings from typological class type I in Iosefin and Fabric district, for first 10 parameters on the vulnerability form: a) normalized vulnerability indexes (V); b) mean vulnerability curve and vulnerability range

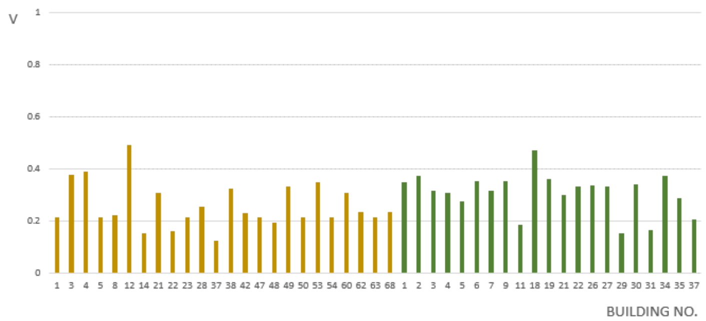


a)

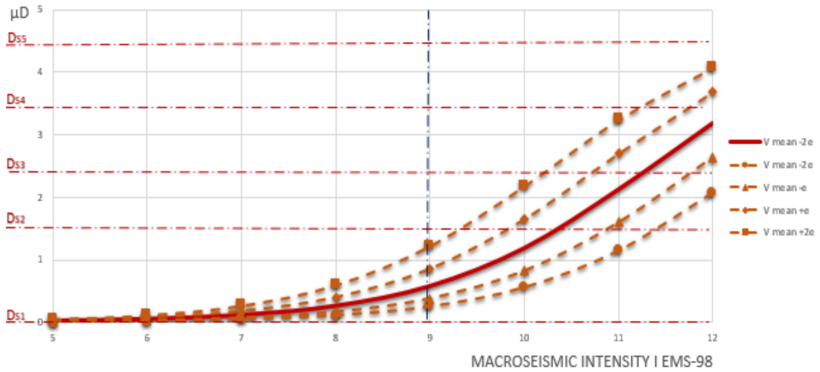


b)

Figure 3.86. Vulnerability for buildings from typological class type II in Iosefin and Fabric district, for first 10 parameters on the vulnerability form: a) normalized vulnerability indexes (V); b) mean vulnerability curve and vulnerability range



a)



b)

Figure 3.87. Vulnerability for buildings from typological class type III in Iosefin and Fabric district, for first 10 parameters on the vulnerability form: a) normalized vulnerability indexes (V); b) mean vulnerability curve and vulnerability range

Even if for all typological classes the most probable damage state is D1, there can be seen a small increasing of the seismic vulnerability from typological class type I to type II and from typological class type II to type III.

A vulnerability map was made for both historical area, illustrating the expected damage state for each investigated building. The seismic vulnerability map for Iosefin district is presented in Figure 3.88, while the map for Fabric historical area is illustrated in Figure 3.89. According to the results, all investigated buildings are expected to reach no more than damage state D1.

Figure 3.88. Seismic vulnerability map for Iosefin historical district, for first 10 parameters [174]

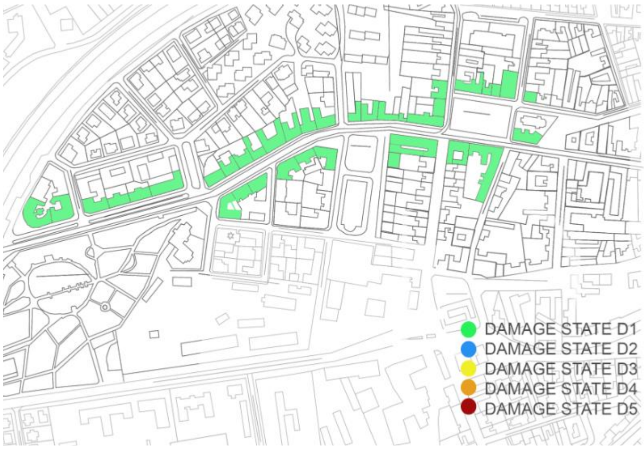


Figure 3.89. Seismic vulnerability map for Fabric historical district, for first 10 parameters [174]

Following the methodology for buildings in aggregate condition, there were obtained the normalized vulnerability indexes for each investigated building from Iosefin and Fabric historical areas. The indexes graphics for the buildings analysed in aggregate condition (all 15 parameters) are illustrated in Figure 3.90 for Iosefin historical district and in Figure 3.91 for Fabric area. As previously, brown colour is used for building typology type I, yellow represents type II, while orange means typology type III. The graphics highlight also a low to medium vulnerability index based on the applied methodology, but a bit higher than for the buildings considered as isolated.

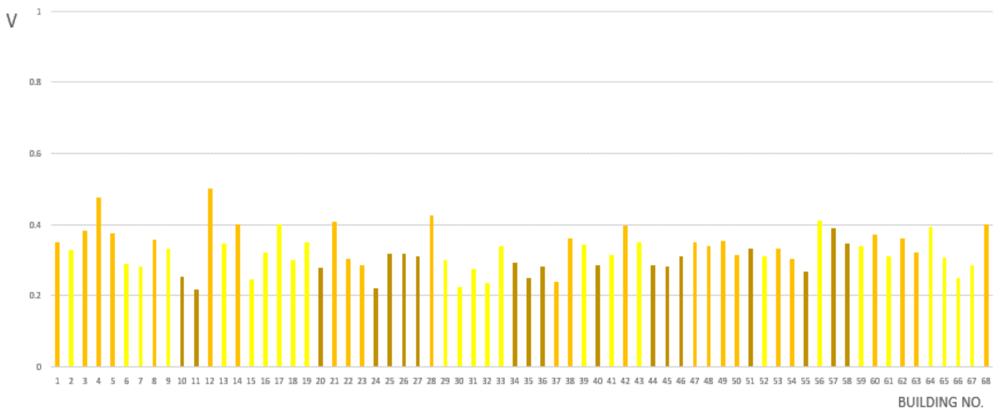


Figure 3.90. Normalized vulnerability indexes (V) for the 68 investigated buildings in Iosefin district, for all 15 parameters on the vulnerability form

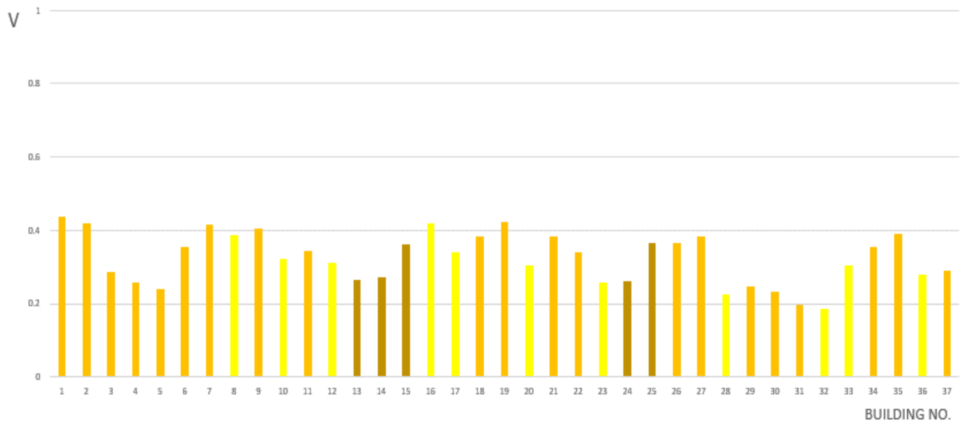


Figure 3.91. Normalized vulnerability indexes (V) for the 37 investigated buildings in Fabric district, for all 15 parameters on the vulnerability form

The vulnerability curves are presented in Figure 3.92 for all investigated building in Iosefin historical area and in Figure 3.93 for the buildings in Fabric district. The curves indicate also for aggregate condition a low vulnerability for macroseismic intensity IX EMS-98, in the range of damage state D1, but with chances of reaching also damage state D2.

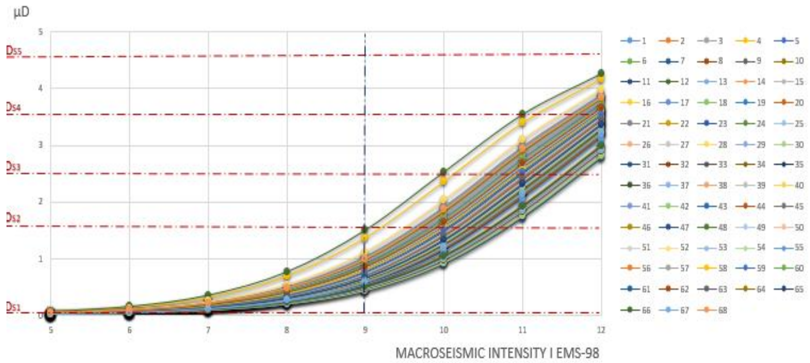


Figure 3.92. Vulnerability curves for the 68 investigated buildings in Iosefin district, for all 15 parameters on the vulnerability form

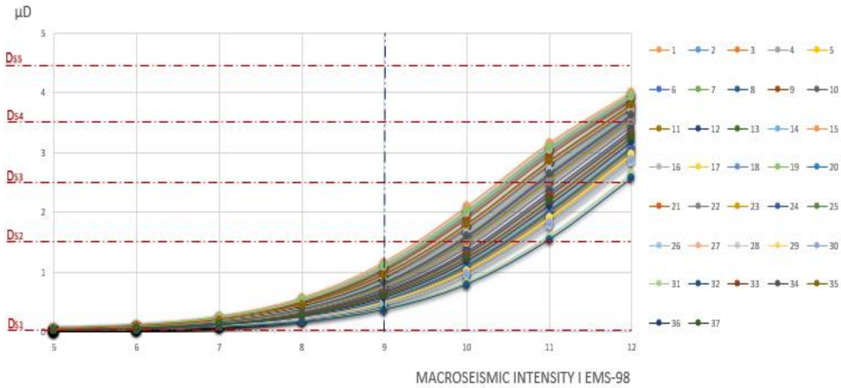


Figure 3.93. Vulnerability curves for the 37 investigated buildings in Fabric district, for all 15 parameters on the vulnerability form

The average vulnerability curve, together with a vulnerability range for all 105 investigated historical masonry buildings is presented in Figure 3.94. The vulnerability range was determined following the possible variability of damage (MEC mean – 2σ; V MEC mean– σ; V MEC mean + σ; V MEC mean + 2σ) [174], where σ represents the standard deviation of the vulnerability indexes. The vulnerability range indicate also a low vulnerability for macroseismic intensity IX EMS-98, in the same range of damage state D1, but with chances of reaching damage state D2.

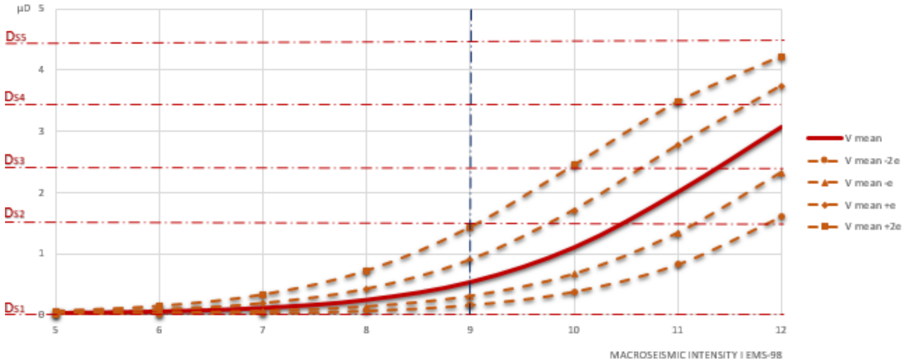
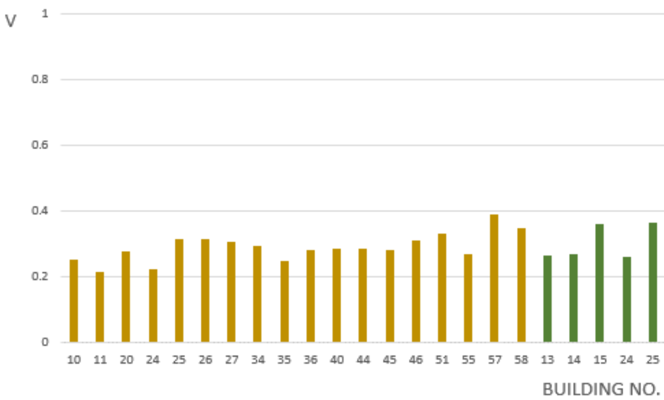
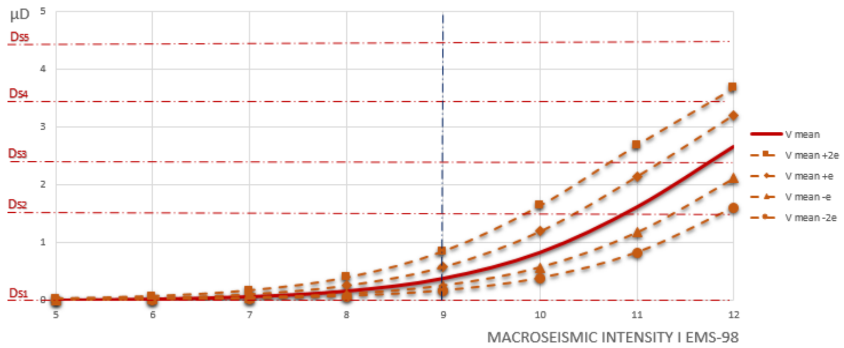


Figure 3.94. Mean vulnerability curve and vulnerability range for all 105 investigated buildings in Iosefin and Fabric district, for all 15 parameters on the vulnerability form

The normalized vulnerability index graphics and vulnerability ranges for each typological class was obtained also for aggregate condition. The index graphic and curve range for typological class Type I, for buildings located in both investigated areas is presented in Figure 3.95. For typological class type II, the normalized vulnerability index graphic and vulnerability curve is illustrated in Figure 3.96, while the situation for type III is presented in Figure 3.97. The medium normalized index is V =0.29 for typological class type I, V =0.31 for type II and V =0.35 for type III. In all figures, the yellow colour symbolize the buildings located in Iosefin historical district, while the green colour represent the buildings from Fabric area.

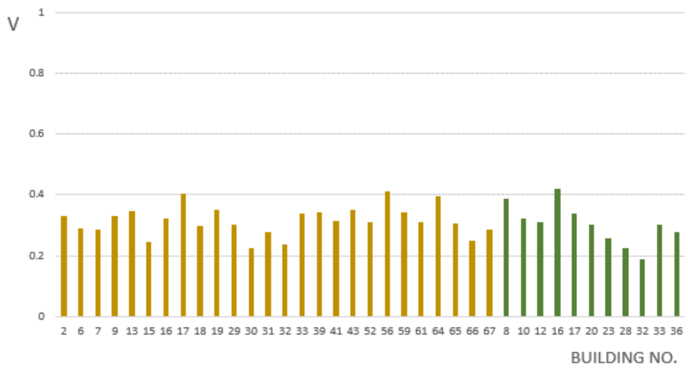


a)

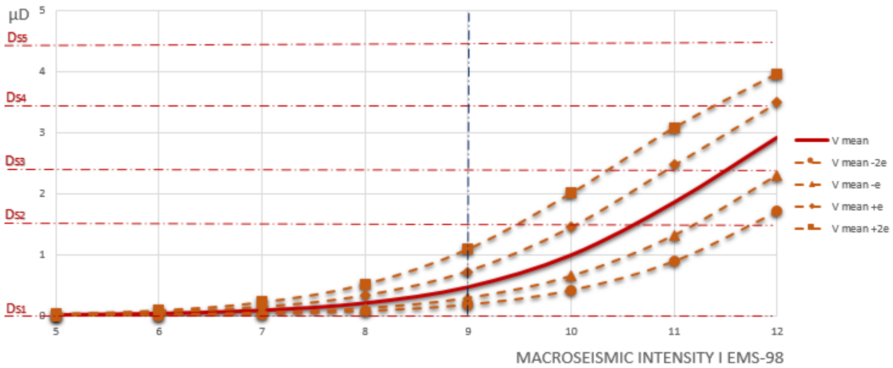


b)

Figure 3.95. Vulnerability for buildings from typological class type I in Iosefin and Fabric district, for all 15 parameters on the vulnerability form: a) normalized vulnerability indexes (V); b) mean vulnerability curve and vulnerability range



a)



b)

Figure 3.96. Vulnerability for buildings from typological class type II in Iosefin and Fabric district, for all 15 parameters on the vulnerability form: a) normalized vulnerability indexes (V); b) mean vulnerability curve and vulnerability range

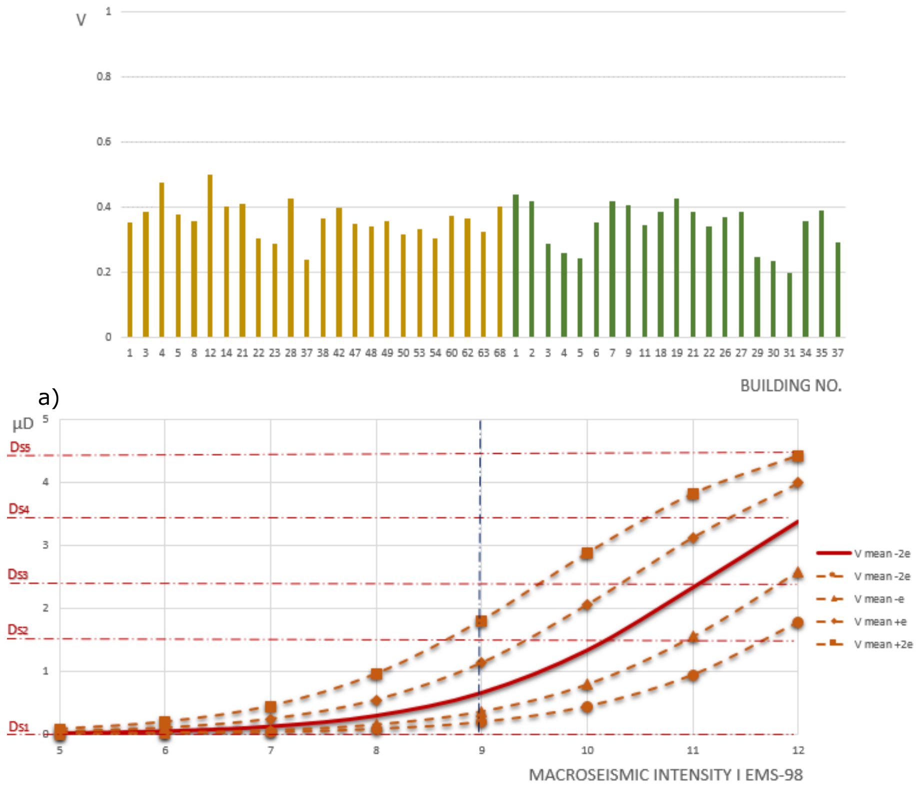


Figure 3.97. Vulnerability for buildings from typological class type III in Iosefin and Fabric district, for first 10 parameters on the vulnerability form: a) normalized vulnerability indexes (V); b) mean vulnerability curve and vulnerability range

As for isolated structural unit condition, also for aggregate condition, for all typological classes the most probable damage state is D1. But there can be seen a clear increasing of the seismic vulnerability from typological class type I to type II and from typological class type II to type III. Also, for typological class type III, there can be observed real chances of reaching damage state D2.

For both historical area there were made vulnerability maps showing the expected damage state for each investigated building. The seismic vulnerability map for Iosefin district is presented in Figure 3.98, while the map for Fabric historical area is illustrated in Figure 3.99. According to the results, almost all investigated buildings are expected to reach no more than damage state D1. Just one building, from Iosefin district, is expected to reach damage state D2.

Figure 3.98. Seismic vulnerability map for Iosefin historical district, for all 15 parameters [174]

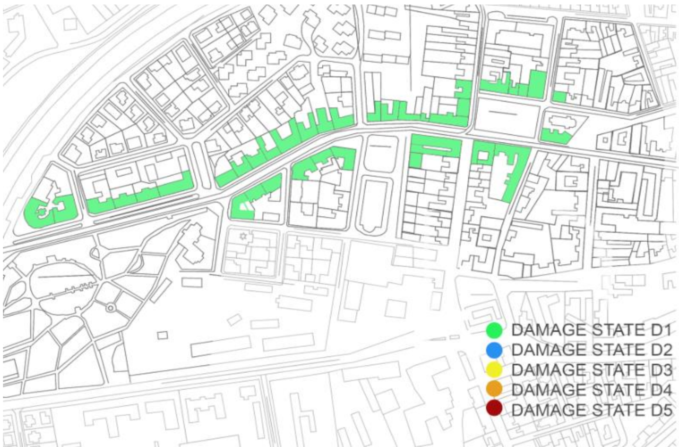


Figure 3.99. Seismic vulnerability map for Fabric historical district, for all 15 parameters [174]

When analysing the results of the empirical seismic vulnerability assessment proposed by Mazzolani and Formisano [81], there can be noticed the fact that a macroseismic intensity of IX EMS-98 wouldn't be dangerous for the historical masonry buildings in Timisoara city, leading to no damages, neither to structural or non-structural elements. But the previous earthquake occurred in Banloc in similar conditions to our seismic scenario, caused significant damages to similar historical masonry buildings [193]. That is why, there is a need for performing a numerical analysis and calibrate the empirical methodology based on its results.

3.5 **Mechanical seismic vulnerability assessment**

3.5.1 Methodology

A more precise seismic vulnerability assessment method is represented by the capacity curves, where the prediction of the damage distribution after seismic action is determined by evaluating the performance point of the structure. The capacity curve represents a force-displacement curve, representing the lateral force resisting capacity. The simplest way to compare the capacity of a structure to the demand of a local earthquake is through the non-linear static analysis. The "non-linear" refers to the behavioural model that is used, while "static" means that the force is applied statically to the structure [57].

Static pushover analysis provides useful tool for assessing the seismic assessment of existing historical buildings, because it illustrates the seismic demands that are imposed to the structural system by the design ground motion [57].

The building response to an earthquake, described as a laterally-applied load, can be determined through the capacity curve, based on the pushover displacement of the entire structure [60]. In order to simulate the real ground shaking action, there is applied to the structure an increasing pattern of lateral forces in the pushover analysis. When the lateral loads are increasing, some of the structural elements tend to start yielding [223]. After the apparition of the plastic hinges, the lateral loads are applied until failure, leading to a non-linear static capacity curve [224], as presented in Figure 3.100.

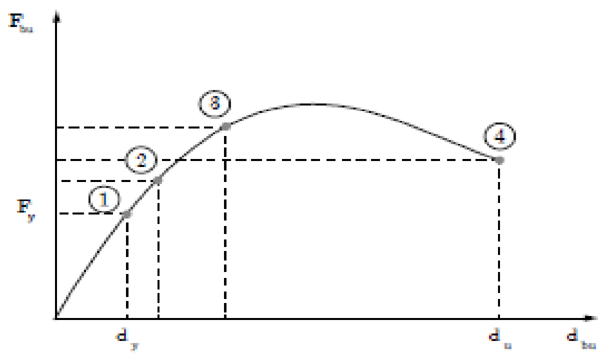


Figure 3.100. Pushover curve example [57]

In the first phase, some of the elements start to develop cracks, while the first signs of yielding appear in the second phase. Plastic hinges and failure of some yielded elements appear in the third phase. Last phase is associated with the ultimate displacement of the entire structure until the global collapse [57].

The structure is considered collapsed after the exceedance of the ultimate displacement. The collapse is considered when the base shear force present a 20%

decay of its original value [57]. The comparison between the base shear forces and the horizontal displacement associated forms the graphical capacity curve, which is characteristic to each structure, independent on the seismic action [189].

The non-linear analysis was made using Tremuri software [189], developed by the team of Lagomarsino, in the University of Genoa [120]. The software is insipired by the equivalent frame method, using macro-elements as a function of global geometry, storey areas and heights, openings dimensions and types [120]. The software is able to reduce the number of degree of freedom, in order to illustrate the seismic response of the analysed building or group of buildings, following the scheme illustrated in Figure 3.101 [189].

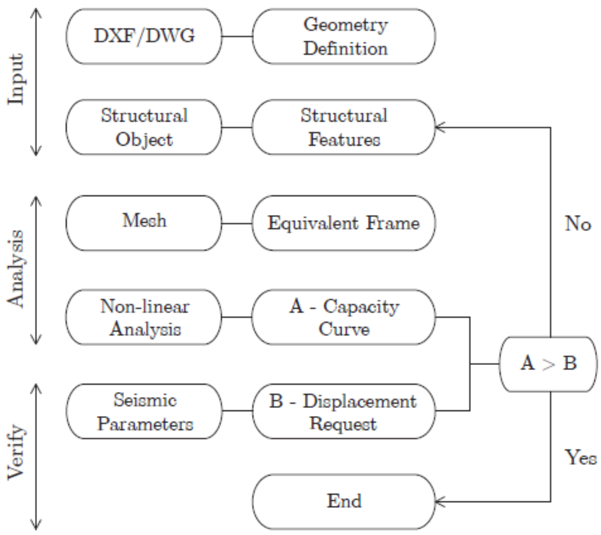


Figure 3.101. Scheme for Tremuri software [57]

The macro-element individualisation of the structures appeared as an observation of the typical failure mechanism after past earthquakes. So, Tremuri divide the structure into a combination of horizontal and vertical individual elements. The masonry vertical panels are transformed into spandrels and piers, the horizontal ones into beams or lintels and the connection is made by rigid nodes (Figure 3.102) [59]. The typical in-plane considered failure mechanism are the bending-rocking, shear-sliding and diagonal shear [57], as presented in Figure 3.38. When each macro-element exceeds its maximum acceptable deformation, named drift, is considered unable to face the horizontal loads. In this case, the element is replaced by specific connection rod, so the normal transmission of forces can happen [189].

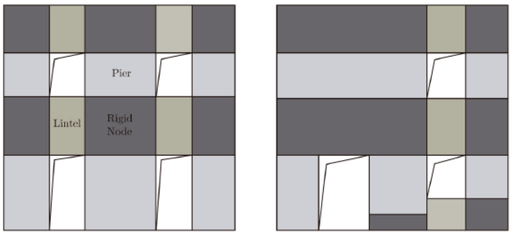


Figure 3.102. Macro-element division of a structure made by Tremuri software [57], [189]

3.5.2 Results

Tremuri software was used for all 25 detailed investigated buildings from Iosefin and Fabric historical districts, as described in Figure 3.53 and Figure 3.54. The analysis was performed on each masonry building, considered as individual structural unit. The purpose was to determine the first type of decay that tends to appear in the structure, the top horizontal displacement and the maximum shear forces. The analysis was performed also based on typological class, so a proper comparison with the empiric methodology could be possible. The detailed survey of all 25 investigated buildings is presented in Appendix B.

For the nonlinear analysis, the behaviour factor for the investigated buildings was considered to be q = 1 [182].

In the first part of the study, there was investigated the in-plane failure mechanism that are activated when the investigated buildings are affected by an earthquake. The situation for the typological class Type I is presented in Figure 3.103, for typological class Type II in Figure 3.104 and for Type III in Figure 3.105.

The legend of the representation colours for each damage and failure type is illustrated in Figure 3.106 [189].

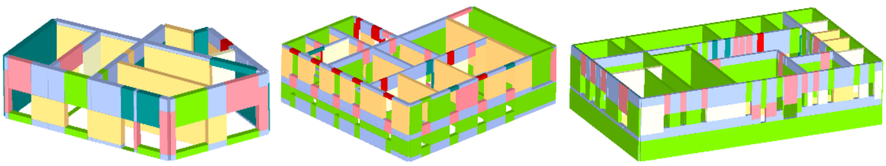


Figure 3.103. In-plane failure mechanism for some buildings from typological class type I, for both historical areas

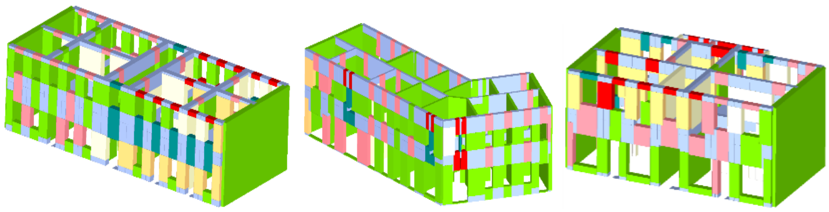


Figure 3.104. In-plane failure mechanism for some buildings from typological class type II, for both historical areas

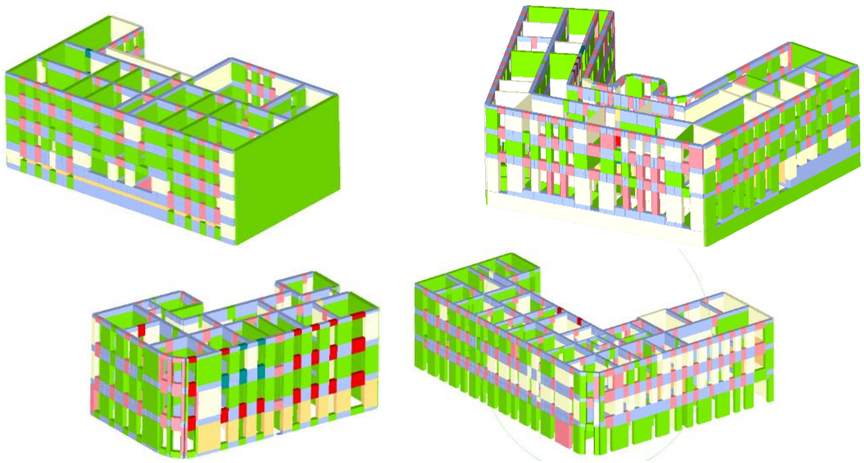


Figure 3.105. In-plane failure mechanism for some buildings from typological class type III, for both historical areas

Figure 3.106. Legend of specific damage and failure in Tremuri software [189]

There can be noticed the fact that more than 40% of the macro-elements are affected, presenting damages or even failure from shear, bending and tension forces.

The next step of the analysis was to determine the base shear force and the top horizontal displacement for two important limit states through the capacity curve of each investigated building, such as serviceability and ultimate limit states. The detailed situation for the longitudinal direction is presented in Table 3.14, while for the transversal direction in Table 3.15.

Table 3.14. Shear forces and horizontal displacements for the investigated buildings, for the longitudinal x-direction

Bld. no.	Typological class	Serviceability limit state	Maximum base shear force	Ultimate limit state
		Δ_Y [cm]	V [kN]	Δ_U [cm]
25	Type I	0.04	1796	0.14
10		0.10	1549	0.39
55		0.12	3248	0.36
51		0.20	2976	0.56
24		0.04	2826	0.12
25		0.18	771	0.56
Average		**0.11**	**2194**	**0.36**
6	Type II	0.20	1942	0.60
56		0.32	3677	1.08
29		0.36	1467	1.08
47		0.18	4232	0.72
13		0.24	5594	0.84
9		0.48	3835	1.68
43		0.26	4231	0.73
41		0.20	3640	0.80
15		0.18	2478	0.66
16		0.36	3178	1.62
39		0.28	2770	0.80
33		0.45	4971	0.96
Average		**0.29**	**3501**	**0.96**
53	Type III	0.80	9075	2.64
54		0.82	12480	2.67
1		0.92	9432	4.07
23		0.58	3209	1.68
7		0.63	3906	2.65
3		0.70	4223	2.16
19		0.60	10846	1.62
Average		**0.72**	**7596**	**2.49**

Following the information from Table 3.14 there were designed the simplified bilinear curves for the investigated buildings, as presented in Figure 3.107 for typological class Type I, in Figure 3.108 for Type II and in Figure 3.109 for class Type III.

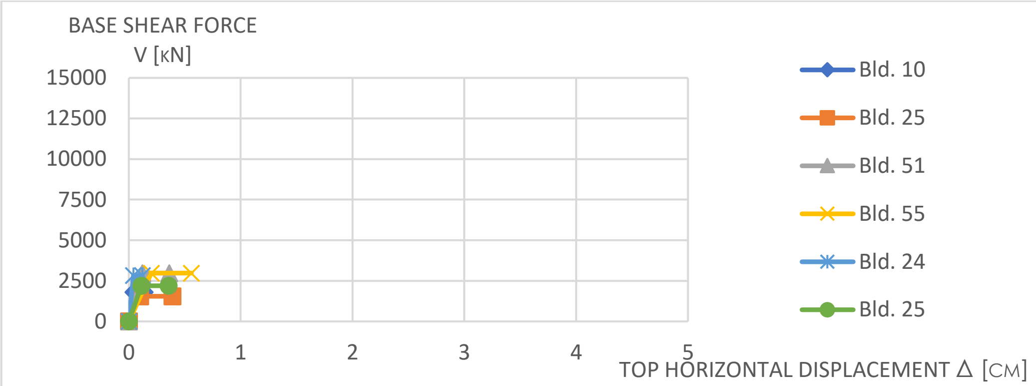


Figure 3.107. Simplified bilinear curves for longitudinal OX-direction, typological class type I

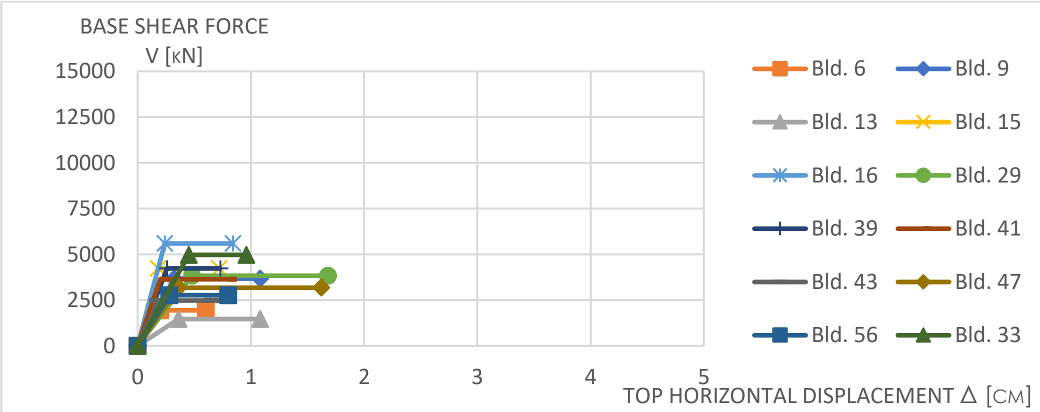


Figure 3.108. Simplified bilinear curves for longitudinal OX-direction, typological class type II

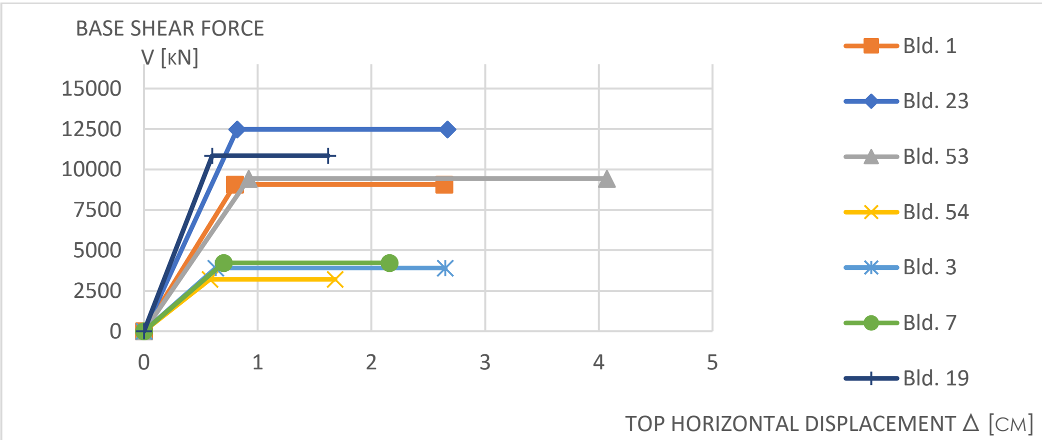


Figure 3.109. Simplified bilinear curves for longitudinal OX-direction, typological class type III

Table 3.15. Shear forces and horizontal displacements for the investigated buildings, for the transversal y-direction

Bld. no.	Typological class	Serviceability limit state	Maximum base shear force	Ultimate limit state
		Δ_Y [cm]	V [kN]	Δ_U [cm]
25	Type I	0.12	2348	0.40
10		0.24	1061	0.82
55		0.16	3326	0.52
51		0.12	2607	0.36
24		0.04	3976	0.12
25		0.06	1512	0.20
Average		**0.12**	**2472**	**0.40**
6	Type II	0.28	2775	1.08
56		1.64	3076	4.03
29		0.30	2812	0.96
47		0.84	3734	2.81
13		0.56	1231	2.04
9		0.30	6247	0.84
43		0.85	3375	2.60
41		0.40	1758	1.68
15		0.20	1933	0.60
16		0.26	2293	0.96
39		0.36	2429	1.32
33		0.14	3426	0.68
Average		**0.51**	**2924**	**1.63**
53	Type III	0.40	9343	1.36
54		0.66	13907	2.15
1		0.96	8083	2.84
23		0.24	1581	1.28
7		0.38	4243	1.39
3		0.48	3092	1.20
19		0.48	8215	1.32
Average		**0.51**	**6923**	**1.65**

Following the information from Table 3.15, there were designed the simplified bilinear curves for the investigated buildings, as presented in Figure 3.110 for typological class Type I, in Figure 3.111 for Type II and in Figure 3.112 for class Type III.

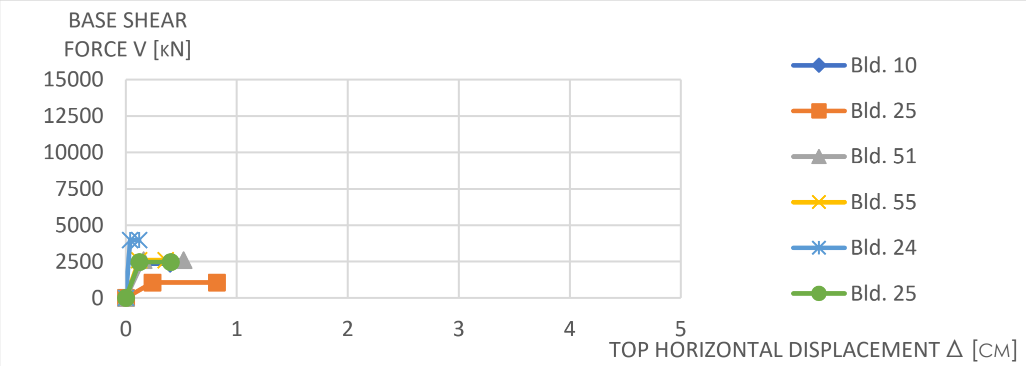


Figure 3.110. Simplified bilinear curves for transversal OY-direction, typological class type I

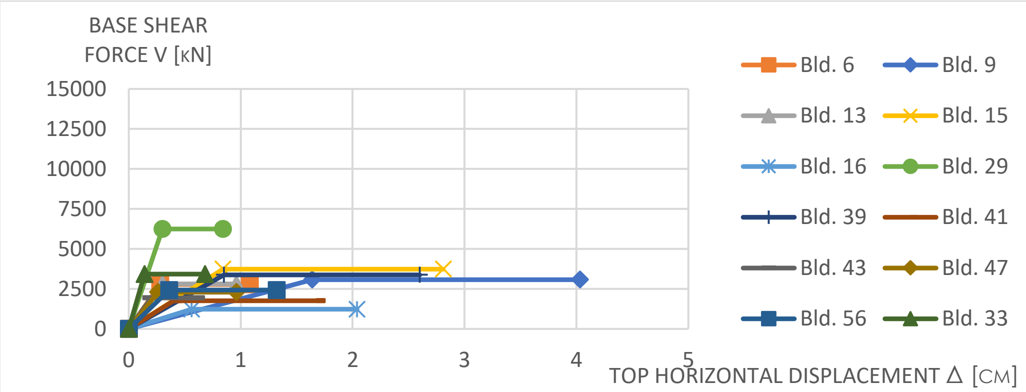


Figure 3.111. Simplified bilinear curves for transversal OY-direction, typological class type II

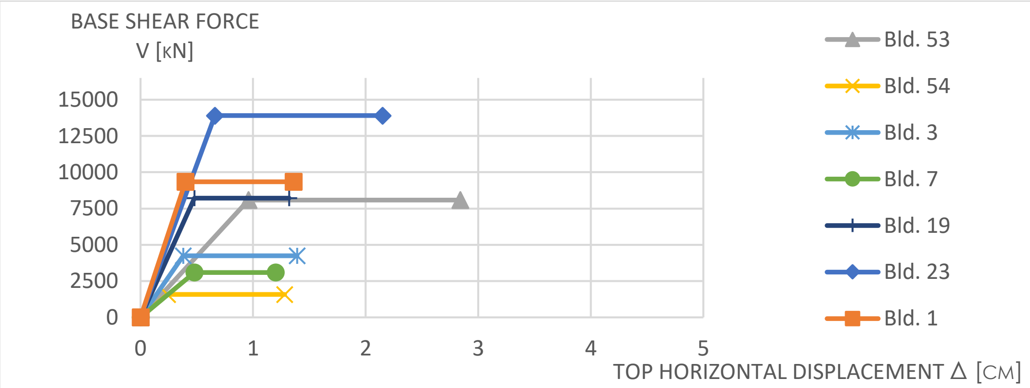


Figure 3.112. Simplified bilinear curves for transversal OY-direction, typological class type III

Following the maximum and the ultimate horizontal displacements for each investigated building, there was determined also a mechanical vulnerability index, as the ratio between the top horizontal displacement required by the seismic design spectra (the demand, Δ_y) and the ultimate horizontal displacement of the building (the capacity, Δ_u). The formula is described in Equation 22 [59]. The detailed situation is presented in Table 3.16, where the final mechanical vulnerability index is considered the maximum from the mechanical vulnerability indexes on the two main directions of each historical masonry building.

The top horizontal displacement required by the seismic design Δ_y is the displacement correspondent to the serviceability limit state while the ultimate horizontal displacement Δ_u is the displacement correspondent to the ultimate limit state.

$$V_{MEC} = \frac{\Delta_y}{\Delta_u} \tag{22}$$

Table 3.16. Maximum and ultimate horizontal displacement and mechanical vulnerability index for all 25 investigated buildings

Bld. no.	Typological class	Longitudinal direction			Transversal direction			$V_{MEC\ MAX}$
		Δ_y [cm]	Δ_u [cm]	V_{MEC}	Δ_y [cm]	Δ_u [cm]	V_{MEC}	
25	**Type I**	0.04	0.14	0.28	0.12	0.40	0.30	0.30
10		0.10	0.39	0.25	0.24	0.82	0.29	0.29
55		0.12	0.36	0.33	0.16	0.52	0.31	0.33
51		0.20	0.56	0.35	0.12	0.36	0.33	0.35
24		0.04	0.12	0.33	0.04	0.12	0.33	0.33
25		0.18	0.56	0.32	0.06	0.20	0.30	0.32
Average		0.11	0.36	0.31	0.12	0.40	0.31	**0.32**
6	**Type II**	0.20	0.60	0.33	0.28	1.08	0.26	0.33
56		0.32	1.08	0.29	1.64	4.03	0.40	0.40
29		0.36	1.08	0.33	0.30	0.96	0.31	0.33
47		0.18	0.72	0.25	0.84	2.81	0.29	0.29
13		0.24	0.84	0.28	0.56	2.04	0.27	0.28
9		0.48	1.68	0.28	0.30	0.84	0.36	0.36
43		0.26	0.73	0.35	0.85	2.60	0.32	0.35
41		0.20	0.80	0.25	0.40	1.68	0.24	0.25
15		0.18	0.66	0.27	0.20	0.60	0.33	0.33
16		0.36	1.62	0.22	0.26	0.96	0.27	0.27
39		0.28	0.80	0.35	0.36	1.32	0.27	0.35
33		0.45	0.96	0.46	0.14	0.68	0.21	0.46

Average		0.29	0.96	0.31	0.51	1.63	0.29	**0.33**
53	**Type III**	0.80	2.64	0.30	0.40	1.36	0.29	0.30
54		0.82	2.67	0.31	0.66	2.15	0.31	0.31
1		0.92	4.07	0.23	0.96	2.84	0.34	0.34
23		0.58	1.68	0.35	0.24	1.28	0.19	0.35
7		0.63	2.65	0.24	0.38	1.39	0.27	0.27
3		0.70	2.16	0.32	0.48	1.20	0.40	0.40
19		0.60	0.14	0.37	0.48	1.32	0.36	0.37
Average		0.72	0.39	0.30	0.51	1.65	0.31	**0.34**

The average mechanical vulnerability index for typological class type I is V_{MEC} = 0.32, for type II the mean V_{MEC} = 0.33, while for type III V_{MEC} = 0.34. This indicated the fact that the investigated buildings are not likely to lose their bearing capacity, but as indicated above through the extended damages on structural elements, they are expected to reach damage states D2, D3 and even D4, because of the observed damages to structural elements. The lower mechanical vulnerability index can be seen at the typological class type I. For typological class type II, there is visible a 3% increase and for typological class type III another 3%.

Another conclusion that can be drawn is that on both longitudinal x direction and transversal y direction, the average mechanical vulnerability index is quite similar for all typological classes (0.31 for type I, 0.31 for type II and 0.30 for type III for x direction and 0.31 for type I, 0.29 for type I and 0.31 for type III for y direction).

In general, the mechanical vulnerability of the investigated buildings is quite similar, due to the similarity of the structural system and mechanical proprieties of the construction materials. There can be seen a small increase in the average vulnerability from typological class type I to type III, due to the increase of height and masses.

The numerical results of the methodology, for all investigated buildings, are presented in Appendix C.

The mechanical vulnerability index is already compressed between 0 and 1, so no normalization method is necessary. The results for the detailed investigated buildings in both historical districts are presented in Figure 3.113 for typological class Type I, in Figure 3.114 for typological class type II and in Figure 3.115 for type III.

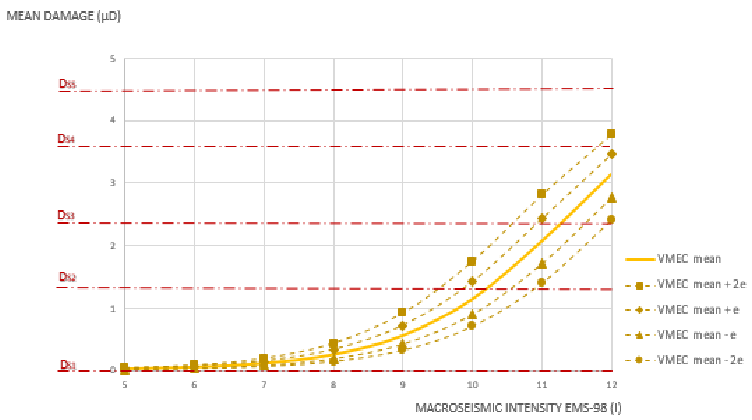


Figure 3.113. Mechanical vulnerability curve and range for typological class type I

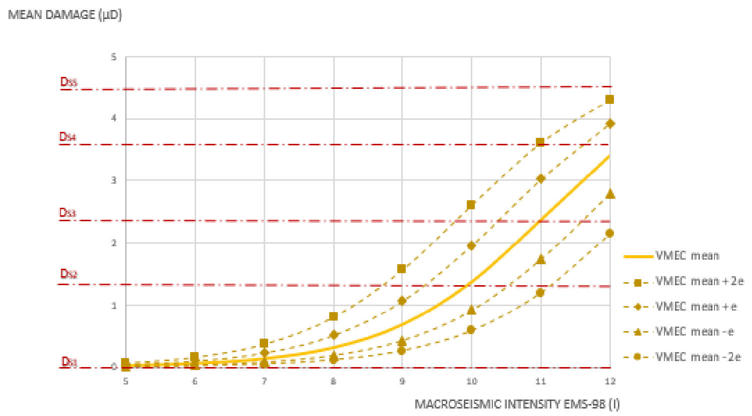


Figure 3.114. Mechanical vulnerability curve and range for typological class type II

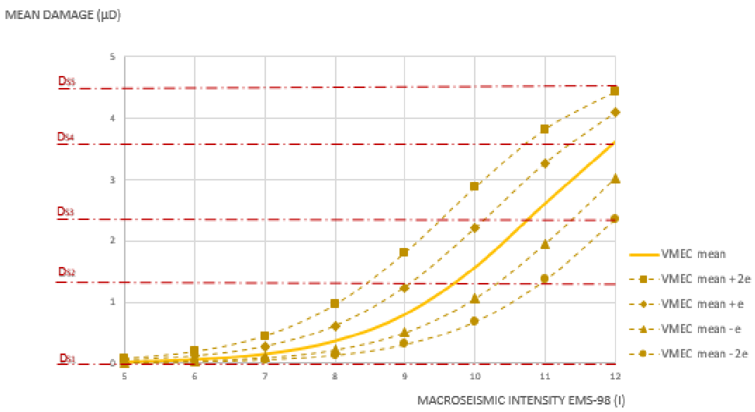


Figure 3.115. Mechanical vulnerability curve and range for typological class type III

The vulnerability mean curves and vulnerability ranges indicate a low seismic vulnerability of the investigated building. The most probable damage state is D1, with possibility of reaching D2. The indicated vulnerability is lower than the one predicted from the damage distribution indicated in the damage distribution obtained with Tremuri software.

There was investigated also the interstorey drift as the ratio between displacement and level height characteristic for each investigated historical masonry building, following Equation 23. The results are presented in Table 3.18. According to FEMA-356, there can be evaluated the most probable expected damage states based on the interstorey drift values [225] (Table 3.17) [226]. Also, Tremuri user manual [189] indicated a 0.6% interstorey drift value for the shear failure.

$$I_D = \frac{\Delta_{u,n} - \Delta_{u,n-1}}{h} x100 \tag{23}$$

, where $\Delta_{u,n}$ represents the ultimate top displacement at level n, $\Delta_{u,n-1}$ represents the ultimate top displacement at the inferior level (n-1) and h represent the height between levels n-1 and n.

Table 3.17. Correlation between expected damage states and interstorey drift values [225], [226]

URM	Damage state D2	Damage state D3	Damage state D4	Damage state D5
	ID < 0.1%	0.1%<ID<0.3%	0.3%<ID<0.6%	0.6%<ID

Table 3.18. Interstorey drift values and expected damage state for the investigated buildings

Bld. no.	Typological class	Interstorey drift (%)	Expected damage state
25	Type I	0.05	D2
10		0.04	D2
55		0.04	D2
51		0.09	D2
24		0.04	D2
25		0.11	D3
6	Type III	0.12	D3
56		0.07	D2
29		0.06	D2
47		0.13	D3
13		0.11	D3
9		0.26	D3
43		0.16	D3
41		0.14	D3

15		0.23	D3
16		0.05	D2
39		0.25	D3
33		0.11	D3
53	Type II	0.13	D3
54		0.21	D3
1		0.13	D3
23		0.28	D3
7		0.32	D4
3		0.16	D3
19		0.22	D3

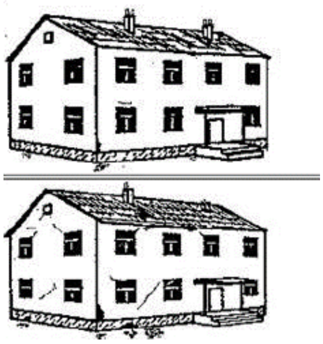
The interstorey drift values for each typological class illustrate the lowest expected vulnerability for typological class type I and the highest for typological class type III. The expected damage state is D2 for type I, D3 for typological class type II and D3-D4 for type III. The indicated vulnerability is significantly higher than the one illustrated in the vulnerability curves after the mechanical analysis.

In conclusion, there is necessary a comparison between the results of the numerical seismic vulnerability assessment and the real excepted damage and a further adaptation of the methodology.

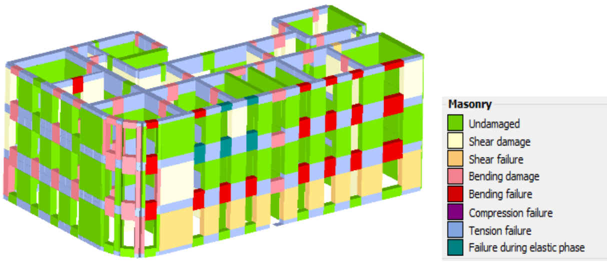
3.5.3 Comparison between mechanical analysis results and past earthquakes real damages

First, there was made a comparison illustrated in Figure 3.116 and Figure 3.117 between damage distribution and the mechanical vulnerability curves and ranges. There was noticed a difference of at least one damage state, the damage estimation formula showing a lower level of vulnerability. The mechanical vulnerability indexes indicate possible damages both to non-structural and structural elements. Also, the damage distribution obtained with Tremuri software indicate not only damages, but also failure of some of the macro-elements that are considered to be structural. A simplified comparison is presented in Figure 3.116. Also, the results presented in Table 3.17 indicate also D2-D4 damage states. So, the most probable damage states of D1-D2 indicated by the vulnerability curves is not credible, indicating the fact that the damage estimation formula (Equation 21) is not adapted to the specific of Banat seismic region.

Second, there was made a comparison between the real damages observed on similar masonry buildings after the earthquake occurred in Banloc, also in Banat seismic region. The type of damages were previously presented in Figure 3.41, Figure 3.42, Figure 3.44 and Figure 3.50, indicating moderate to significant damages to structural elements and an expected damage state of D2-D3, even D4 in particular cases. A simplified comparison is presented in Figure 3.117.

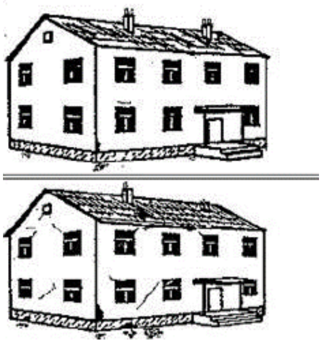


a)



b)

Figure 3.116. Simplified comparison between: a) expected damages indicated by the mechanical vulnerability curves; b) damage distribution indicated by non-linear analysis



a)

b)

Figure 3.117. Simplified comparison between: a) expected damages indicated by the mechanical vulnerability curves; b) real damages observed on site after similar past earthquake

Based on the observations, there was concluded that the damage estimation formula needs to be adapted for the near-field earthquakes, in order to proper illustrate the expected damage states for the historical masonry buildings located in Banat seismic area or other regions with similar characteristics. The real expected damage states for investigated buildings is considered to be D2-D3. This results excludes the partial collapse, such as the local collapse of the roof due to the chimneys fall. The numerical results of the methodology, for all investigated buildings, are presented in Appendix C.

3.5.4 Adaptation of damage estimation formula for near-field earthquakes and new mechanical seismic vulnerability assessment results

The aim was to increase the expected damage state to one level, so for a macroseismic intensity IX EMS-98 to reach damage state D2-D3 as indicated from pushover analysis and on site damages observed after past earthquake.

In order to do so, there was modified only one parameter of the damage estimation formula, the parameter that indicates the curves slope.

So, from a coefficient of 6.25 (in the original methodology), there was proposed a new coefficient of 12.50. The proposed formula for damage estimation in the near-field areas is presented in Equation 24. The other parameters remain unchanged, as in Equation 24 [87].

$$\mu_D = 2.5\left[1 + \tanh\left(\frac{I + 12.50 \times V - 13.1}{\Phi}\right)\right] \quad (24)$$

Considering the new proposed damage estimation formula, there were redesigned the mechanical vulnerability curves and ranges. Figure 3.118 presents the vulnerability curves for buildings from typological class type I, located both in Iosefin and Fabric district. In Figure 3.119 there can be seen the curves for the typological class type II, while for type III the situation is illustrated in Figure 3.120. More on, there were made also the mechanical seismic vulnerability curves for all buildings located in Iosefin district (Figure 3.121) and also an average vulnerability curve and range for the area (Figure 3.122). The same procedure was applied also for Fabric district, presented in Figure 3.123 and in Figure 3.124.

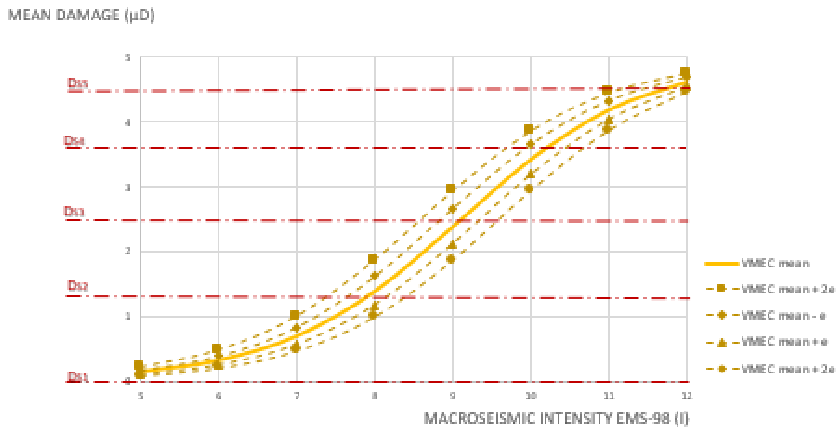


Figure 3.118. Proposed average mechanical vulnerability curve and vulnerability range for typological class type I, adapted for near-field earthquakes

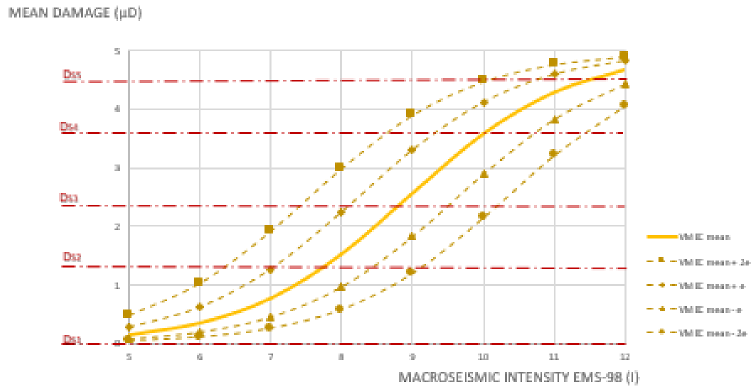


Figure 3.119. Proposed average mechanical vulnerability curve and vulnerability range for typological class type II, adapted for near-field earthquakes

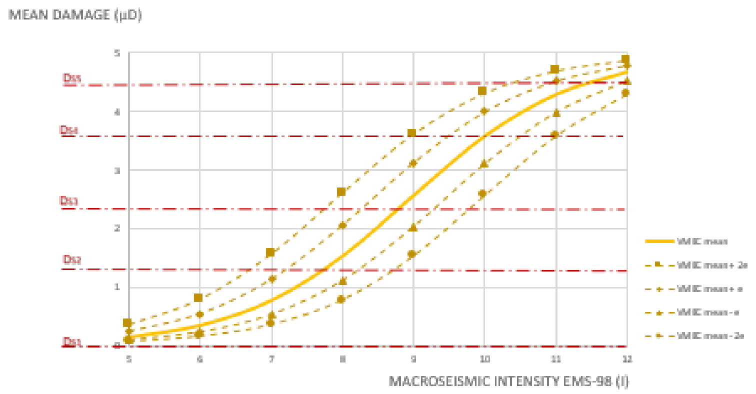


Figure 3.120. Proposed average mechanical vulnerability curve and vulnerability range for typological class type III, adapted for near-field earthquakes

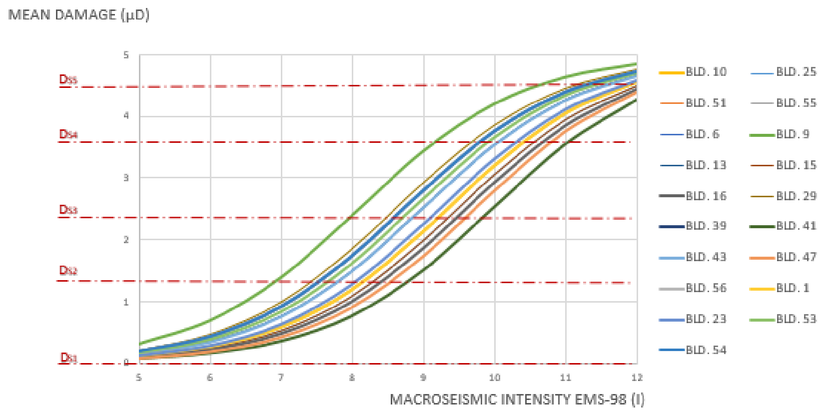


Figure 3.121. Proposed mechanical vulnerability curves for all 19 investigated historical masonry buildings in Iosefin district, adapted for near-field earthquakes

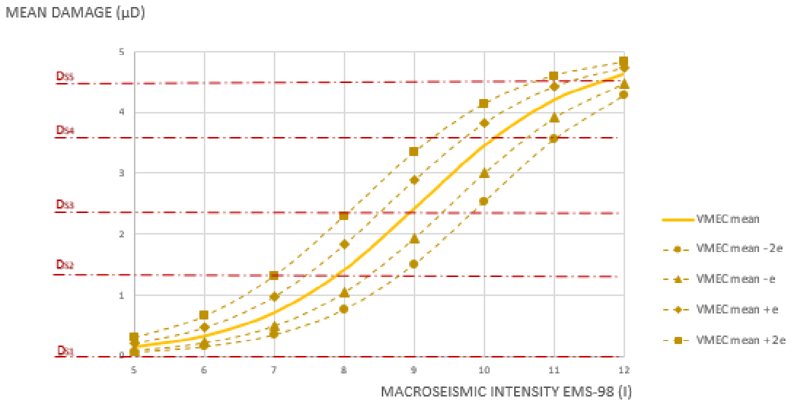


Figure 3.122. Proposed mean mechanical vulnerability curve and range for all 19 investigated historical masonry buildings in Iosefin district, adapted for near-field earthquakes

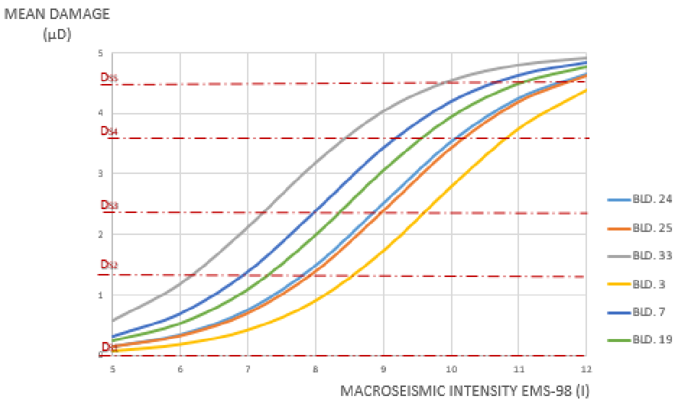


Figure 3.123. Proposed mechanical vulnerability curves for all 6 investigated historical masonry buildings in Fabric district, adapted for near-field earthquakes

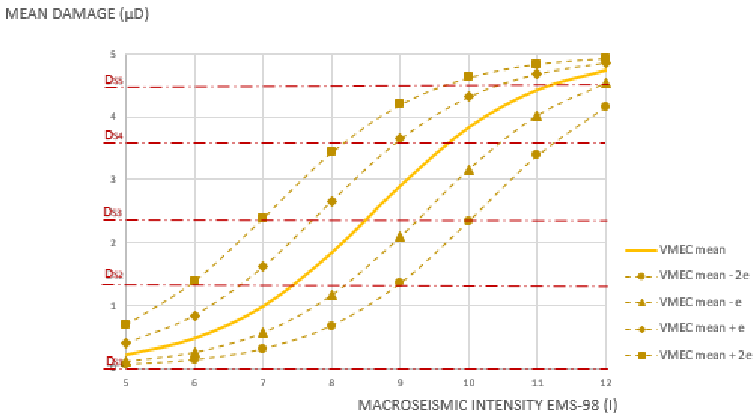


Figure 3.124. Proposed mean mechanical vulnerability curve and range for all 6 investigated historical masonry buildings in Fabric district, adapted for near-field earthquakes

Considering the results based on the new proposed damage estimation formula, there can be noticed that the expected damage states have increased with at least one level. For macroseismic intensity IX EMS-98, for typological class type I, the most probable general damage state would be D2 with chances of reaching D3, while for typological classes type II and type III, the expected general damage state would be D3 with chances of reaching D4. In Iosefin area, the general damage state for all investigated building is D3, the same as in Fabric district. The detailed level of damage for the two historical districts is presented in Table 3.19.

Table 3.19. Percentages of expected damage states for the investigated buildings after mechanical seismic vulnerability assessment, based on proposed damage estimation formula

Historical district	Damage state D1	Damage state D2	Damage state D3	Damage state D4	Damage state D5
Iosefin	5.50%	36.50%	58.00%	0.00%	00.00%
Fabric	0.00%	33.50%	50.00%	16.50%	00.00%
All 25 blds.	4.00%	36.00%	56.00%	4.00%	00.00%

3.6 **Proposed empirical seismic vulnerability assessment methodology after adaptation to near-field earthquakes**

3.6.1 New results following the proposed damage estimation formula

Following the proposed adapted methodology presented above, there were obtained the normalized vulnerability indexes for each of the 105 investigated building. For the buildings analysed as individual structural units (first 10 parameters), the graphics for the normalized vulnerability indexes are illustrated in Figure 3.125 for Iosefin historical district and in Figure 3.126 for Fabric area. For building class type I there is used the brown colour, for type II yellow, while for typological class type III there is used orange colour. The graphics highlight a medium vulnerability index based on the applied proposed adapted methodology. There can be seen that the vulnerability index are identical with those from the original empirical methodology, because the vulnerability form and the scores weren't change. The medium normalized vulnerability index for Iosefin historical district is V= 0.25, while for Fabric area V=0.29. The increased value of the vulnerability index in Fabric area is mainly due to the higher level of decay presented to the investigated buildings.

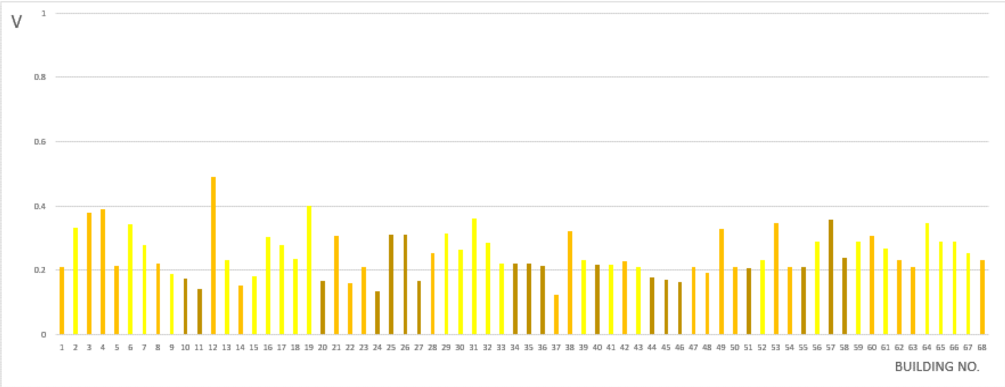


Figure 3.125. Normalized vulnerability indexes (V) for the 68 investigated buildings in Iosefin district, for first 10 parameters, based on proposed adapted methodology

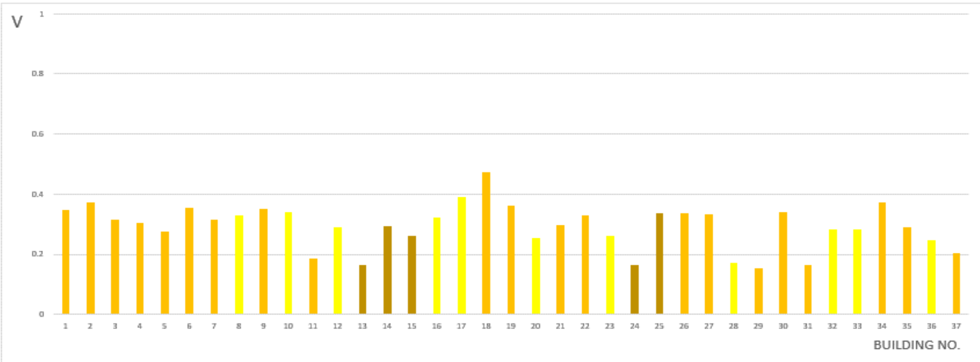


Figure 3.126. Normalized vulnerability indexes (V) for the 37 investigated buildings in Fabric district, for first 10 parameters, based on proposed adapted methodology

The vulnerability curves are presented in Figure 3.127 for all building in Iosefin district and in Figure 3.128 for investigated buildings in Fabric area. The curves indicate a medium vulnerability for macroseismic intensity IX EMS-98, in the range of damage states D1-D4.

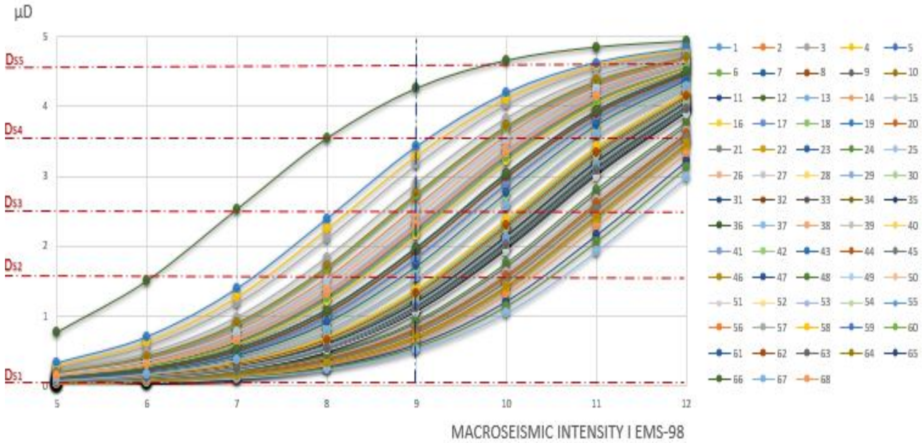


Figure 3.127. Vulnerability curves for the 68 investigated buildings in Iosefin district, for first 10 parameters based on proposed adapted methodology

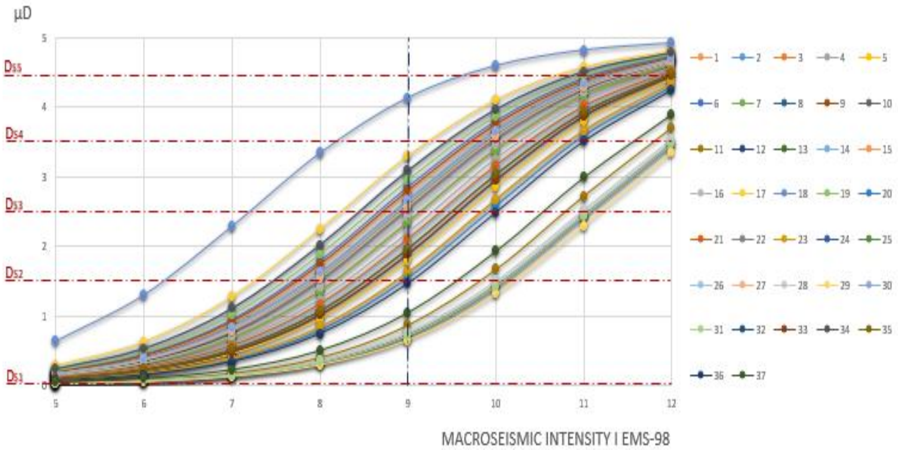


Figure 3.128. Vulnerability curves for the 37 investigated buildings in Fabric district, for first 10 parameters based on proposed adapted methodology

There was made also an average vulnerability curve, together with a vulnerability range for all 105 case study historical masonry buildings, as presented in Figure 3.129. The vulnerability range was determined following the possible variability of damage $V_{MEC\ mean} - 2\sigma$; $V_{MEC\ mean} - \sigma$; $V_{MEC\ mean} + \sigma$; $V_{MEC\ mean} + 2\sigma$ [174], where σ represents the standard deviation of the vulnerability indexes. The vulnerability range indicate a medium vulnerability for macroseismic intensity IX EMS-98, in the range of damage state D1-D4. This damage state is in accordance with the real damages observed on site on similar historical masonry buildings, after earthquakes similar with our seismic scenario.

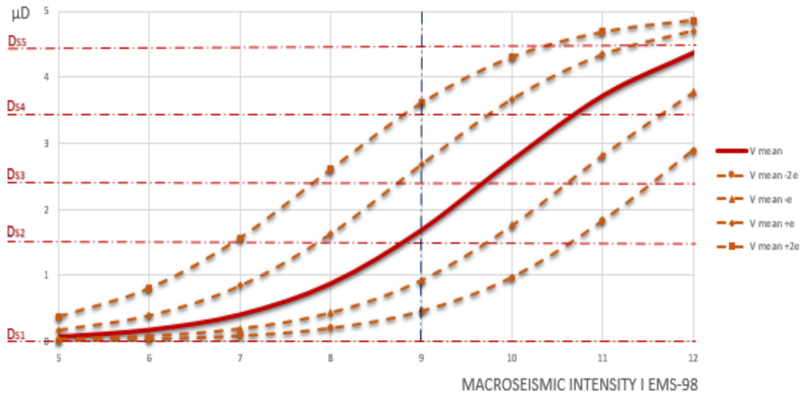


Figure 3.129. Mean vulnerability curve and range for all 105 investigated buildings in Iosefin and Fabric district, for first 10 parameters on the vulnerability form

The vulnerability curves and vulnerability ranges for each typological class after the proposed adapted methodology were obtained also. For buildings located in both investigated areas, there is presented the vulnerability curve range for typological class Type I in Figure 3.130. Type II normalized vulnerability curve is illustrated in Figure 3.131, while in Figure 3.132 there is presented the situation for type III.

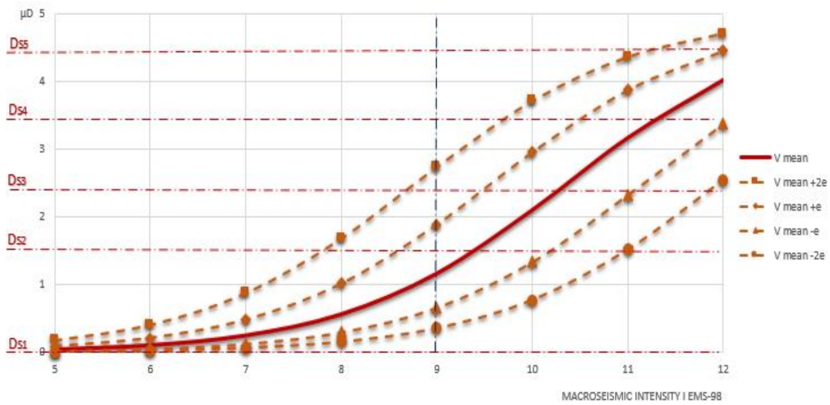


Figure 3.130. Mean vulnerability curve and range for buildings from typological class type I in Iosefin and Fabric district, for first 10 parameters based on proposed adapted methodology

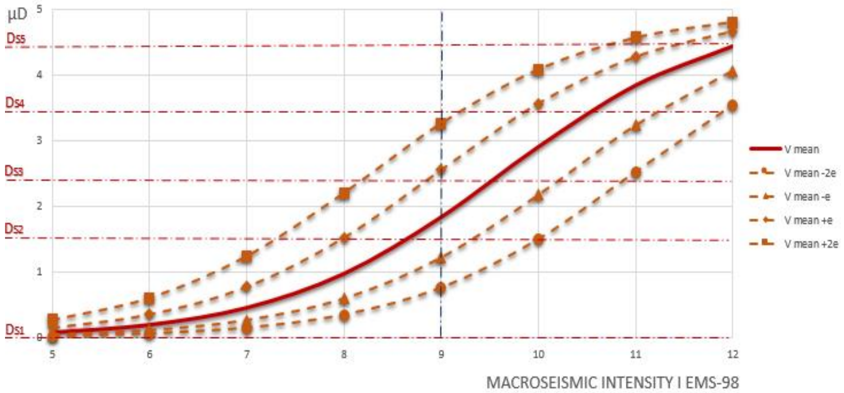


Figure 3.131. Mean vulnerability curve and range for buildings from typological class type II in Iosefin and Fabric district, for first 10 parameters based on proposed adapted methodology

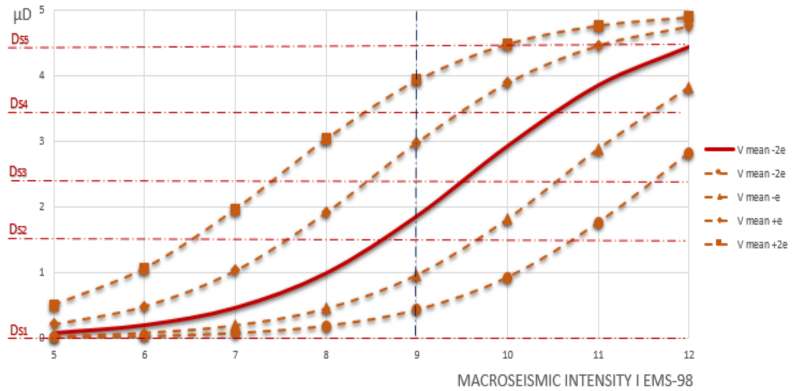


Figure 3.132. Mean vulnerability curve and range for buildings from typological class type III in Iosefin and Fabric district, for first 10 parameters based on proposed adapted methodology

There can be seen an increasing of the seismic vulnerability from typological class type I (damage states D1-D3) until the typological class type III (damage states D1-D4). There were designed also the vulnerability maps with the expected damage state for each investigated building, for both historical districts. The map for Iosefin district is presented in Figure 3.133, while the seismic vulnerability map for Fabric historical area is illustrated in Figure 3.134. The percentage of buildings that are expected to reach each damage state is detailed in Table 3.20.

Figure 3.133. Seismic vulnerability map for Iosefin historical district, for first 10 parameters based on proposed adapted methodology [174]

Figure 3.134. Seismic vulnerability map for Fabric historical district, for first 10 parameters based on proposed adapted methodology [174]

Table 3.20. Percentages of expected damage states for the investigated buildings for 10 parameters based on proposed adapted methodology

Historical district	Damage state D1	Damage state D2	Damage state D3	Damage state D4	Damage state D5
Iosefin	57.50%	26.50%	14.50%	1.50%	0.00%
Fabric	33.00%	27.00%	37.50%	2.50%	0.00%

Also for the aggregate condition, following the proposed adapted methodology, there were obtained the normalized vulnerability indexes for each investigated building from Iosefin and Fabric historical areas. The indexes graphics for the buildings analysed in aggregate condition are presented in Figure 3.135 for Iosefin historical district and in Figure 3.136 for Fabric area. As previously, brown colour is used for building typology type I, yellow represents type II, while orange means typology type III. The graphics highlight also the same vulnerability indexes as in the original empirical methodology, due to the fact that the vulnerability form wasn't modified at all.

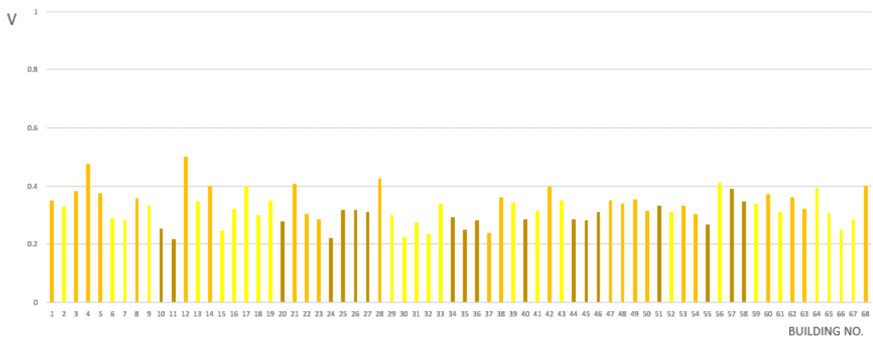


Figure 3.135. Normalized vulnerability indexes (V) for the 68 investigated buildings in Iosefin district, for all 15 parameters based on proposed adapted methodology

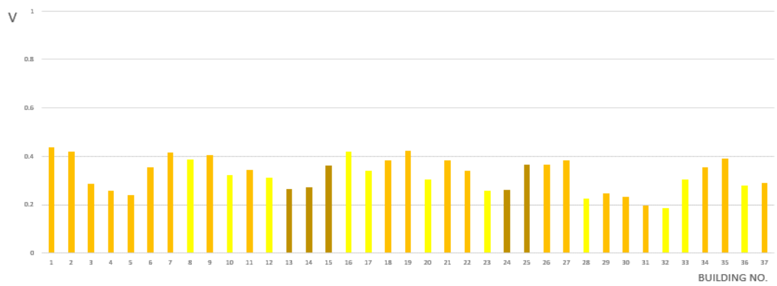


Figure 3.136. Normalized vulnerability indexes (V) for the 37 investigated buildings in Fabric district, for all 15 parameters based on proposed adapted methodology

Following the proposed adapted methodology, the vulnerability curves are presented in Figure 3.137 for all investigated building in Iosefin historical area and in Figure 3.138 for the buildings in Fabric district. The curves indicate also for aggregate condition a medium vulnerability for macroseismic intensity IX EMS-98, in the range of damage states D1-D3, even D4 for few buildings.

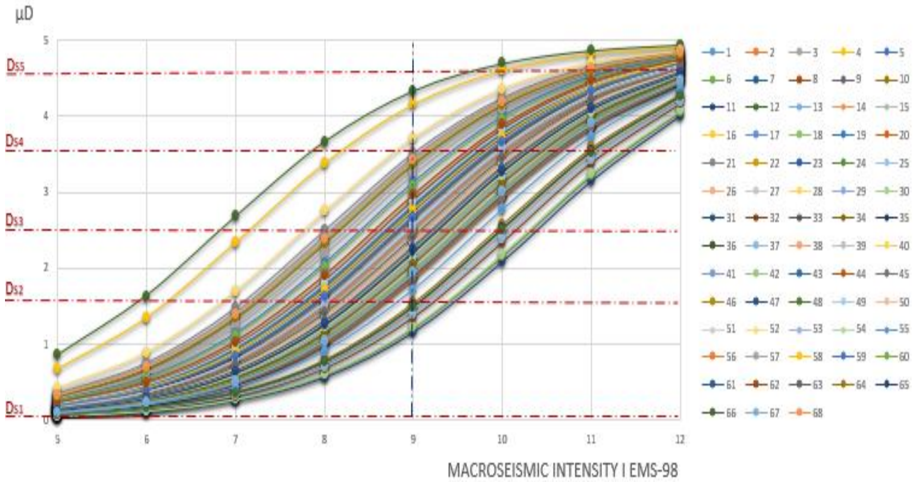


Figure 3.137. Vulnerability curves for the 68 investigated buildings in Iosefin district, for all 15 parameters on the vulnerability form

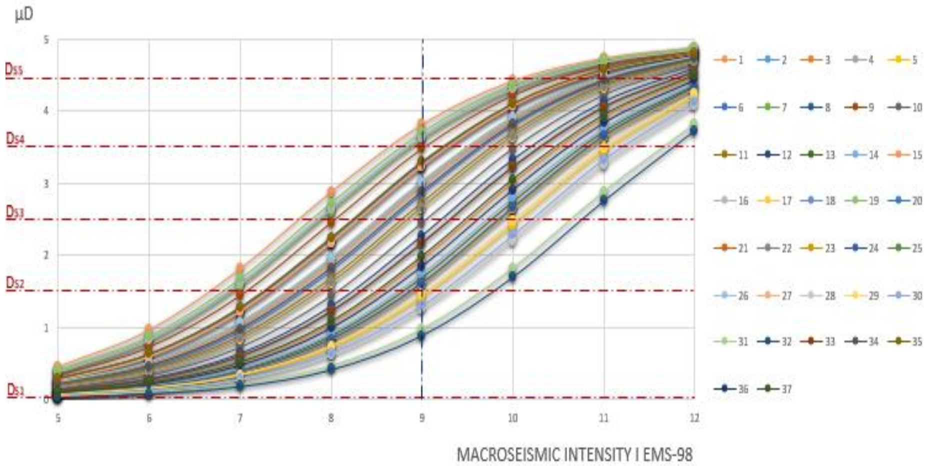


Figure 3.138. Vulnerability curves for the 37 investigated buildings in Fabric district, for all 15 parameters on the vulnerability form

After the adaptation, the average vulnerability curve and vulnerability range for all 105 investigated historical masonry buildings is presented in Figure 3.139. Following the possible variability of damage, the vulnerability range was determined ($V_{MEC\ mean} - 2\sigma$; $V_{MEC\ mean} - \sigma$; $V_{MEC\ mean} + \sigma$; $V_{MEC\ mean} + 2\sigma$) [174], where σ represents the standard deviation of the vulnerability indexes. The vulnerability range indicate also a moderate vulnerability for macroseismic intensity IX EMS-98, in the same range of damage states D1-D4.

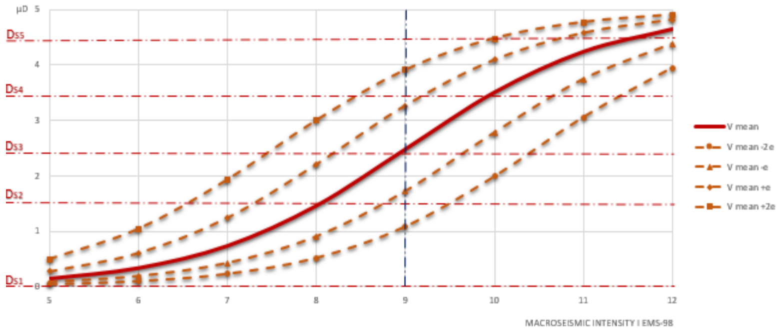


Figure 3.139. Mean vulnerability curve and vulnerability range for all 105 investigated buildings in Iosefin and Fabric district, for all 15 parameters based on proposed adapted methodology

The normalized vulnerability curved and vulnerability ranges after proposed adapted methodology, for each typological class was obtained also for aggregate condition. For typological class Type I, for buildings located in both investigated areas the vulnerability range is presented in Figure 3.140. For typological class type II, the vulnerability curve is shown in Figure 3.141, while the situation for typological class type III is presented in Figure 3.142. The medium normalized index after adaptation is V =0.29 for typological class type I, V =0.31 for type II and V =0.35 for type III. In all figures, the yellow colour symbolize the buildings located in Iosefin historical district, while the green colour represent the buildings from Fabric area.

For typological class type I the seismic vulnerability is moderate to low, with most probable damage state D2 and possible damage states D1-D3. For typological class type II, there can be seen a 10% increase of the vulnerability, the damage states ranging from D1 to even D4. When it comes to typological class type III, the seismic vulnerability increase even more, with another 20%, but without reaching damage state D5. The vulnerability maps illustrating the expected damage state for each investigated building are presented below for both historical districts. The map for Iosefin district is presented in Figure 3.143, while the seismic vulnerability map for Fabric historical area is illustrated in Figure 3.144. The percentage of buildings that are expected to reach each damage state is detailed in Table 3.21.

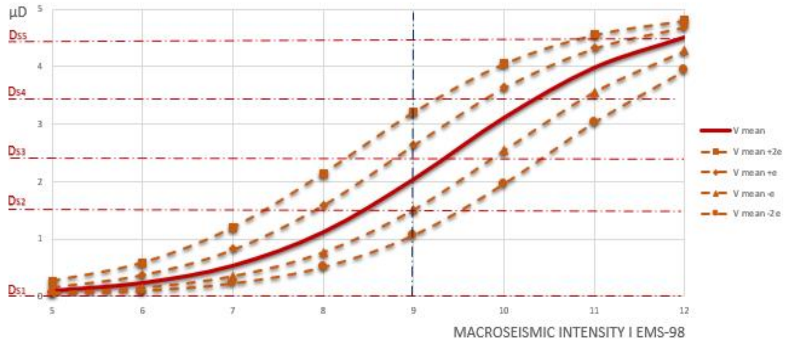


Figure 3.140. Mean vulnerability curve and vulnerability range for buildings from typological class type I in Iosefin and Fabric district, for all 15 parameters on the vulnerability form based on proposed adapted methodology

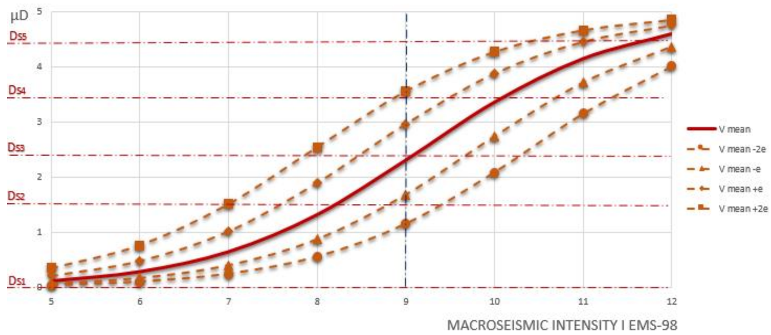


Figure 3.141. Mean vulnerability curve and vulnerability range for buildings from typological class type II in Iosefin and Fabric district, for all 15 parameters on the vulnerability form based on proposed adapted methodology

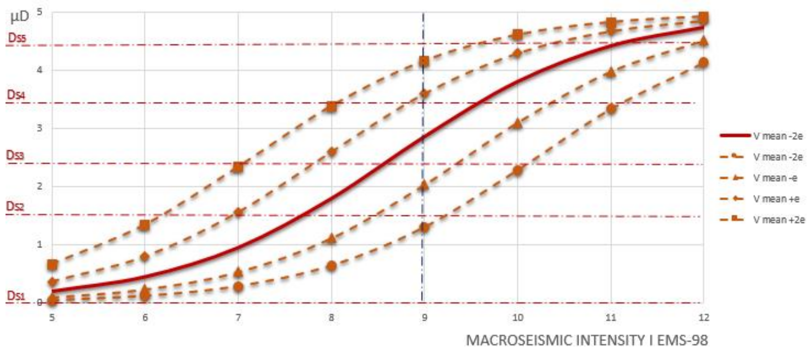


Figure 3.142. Mean vulnerability curve and vulnerability range for buildings from typological class type III in Iosefin and Fabric district, for all 15 parameters on the vulnerability form based on proposed adapted methodology

Figure 3.143. Seismic vulnerability map for Iosefin historical district, for all 15 parameters based on proposed adapted methodology [174]

Figure 3.144. Seismic vulnerability map for Fabric historical district, for all 15 parameters based on proposed adapted methodology [174]

Table 3.21. Percentages of expected damage states for the investigated buildings for 15 parameters based on proposed adapted methodology

Historical district	Damage state D1	Damage state D2	Damage state D3	Damage state D4	Damage state D5
Iosefin	12.00%	41.00%	39.50%	7.50%	0.00%
Fabric	11.00%	38.00%	37.50%	13.50%	0.00%

When analysing the results of the proposed adapted empirical seismic vulnerability assessment, there can be noticed the fact that a macroseismic intensity of IX EMS-98 can be dangerous for the historical masonry buildings in Timisoara city. The most probable damage states are D2 and D3 and in some cases, the expected damage states are D1 or D4. That means that are very likely to occur significant damages to non-structural elements and moderate damages to structural elements, without affecting the bearing capacity of the investigated historical masonry buildings. The numerical results of the methodology, for all investigated buildings, are presented in Appendix C.

3.6.2 Comparison between empirical analysis and mechanical analysis results

Mechanical nonlinear analysis represents a useful tool in the process of seismic vulnerability assessment of historical masonry buildings. The results indicated by the pushover analysis highlighted a medium seismic vulnerability, in accordance with the results indicated by the interstorey drift values and damage distribution indicated by site observation after real earthquakes. In order to be able to provide a proper comparison between empirical and mechanical results, there was applied the empirical seismic vulnerability assessment just for the 25 detailed investigated buildings. The empirical seismic vulnerability curves for both 10 and 15 parameters, compared with the mechanical ones are presented in Figure 3.145 for typological class Type I, in Figure 3.146 for Type II and in Figure 3.147 for class Type III.

For a more detailed comparison, there was made also a situation with the expected damage states for each of the 25 investigated buildings, based on empirical methodology results, mechanical methodology results and also interstorey drift value results (Table 3.22).

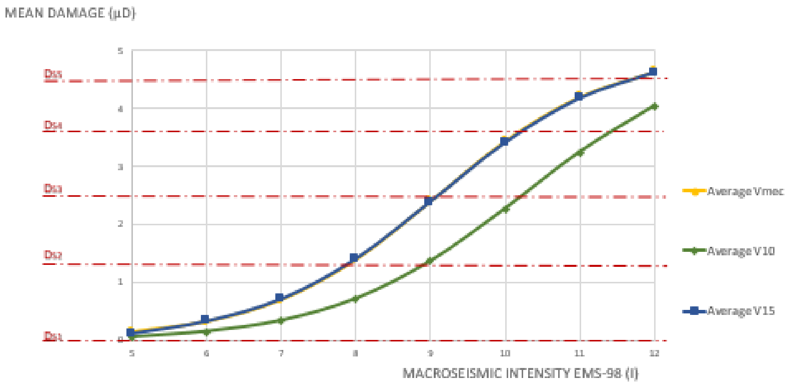


Figure 3.145. Comparison between empirical and mechanical seismic vulnerability curves based on proposed adaptation methodology, for typological class Type I

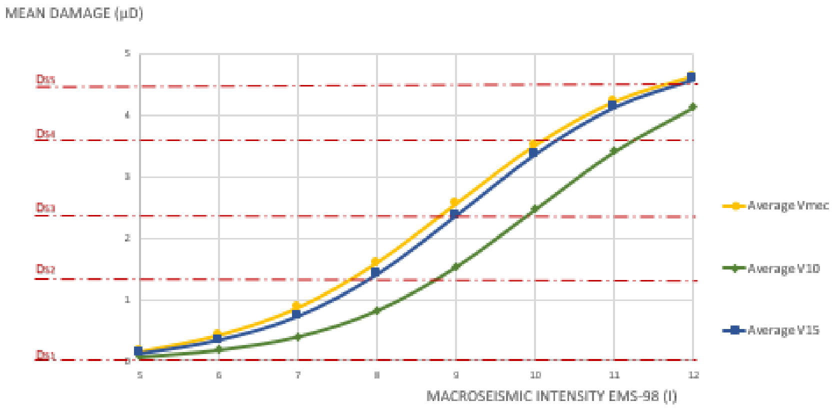


Figure 3.146. Comparison between empirical and mechanical seismic vulnerability curves based on proposed adaptation methodology, for typological class Type II

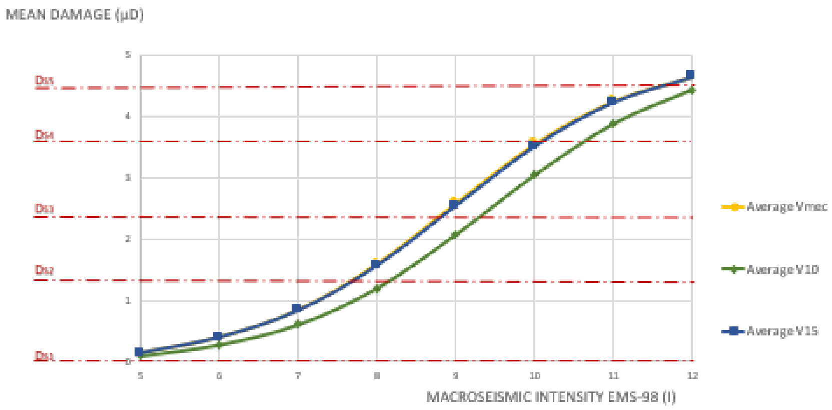


Figure 3.147. Comparison between empirical and mechanical seismic vulnerability curves based on proposed adaptation methodology, for typological class Type III

Table 3.22. Comparative results for the expected damage state for the 25 investigated buildings in Timisoara, following empirical and mechanical proposed methodologies

Bld. no.	Typological class	Expected damage state (based on proposed adaptation)			
		Empirical methodology		Mechanical methodology	Interstorey drift value
		Building as isolate unit	Building in aggregate		
25	Type I	D1	D2	D2	D2
10		D2	D2	D2	D2
55		D1	D3	D3	D2
51		D1	D2	D3	D2
24		D1	D2	D3	D2
25		D3	D3	D2	D3
Average		**D1**	**D2**	**D2**	**D2**
6	Type III	D3	D2	D3	D3
56		D1	D3	D3	D2
29		D1	D3	D3	D2
47		D1	D1	D2	D3
13		D2	D2	D2	D3
9		D2	D2	D3	D3
43		D1	D3	D3	D3
41		D1	D2	D1	D2
15		D1	D3	D3	D3
16		D1	D2	D2	D2
39		D2	D4	D3	D3
33		D2	D2	D4	D3
Average		**D2**	**D3**	**D3**	**D3**
53	Type II	D1	D3	D2	D3
54		D1	D2	D2	D3
1		D3	D3	D3	D3
23		D1	D2	D3	D3
7		D2	D2	D2	D4
3		D2	D4	D3	D3
19		D3	D4	D3	D3
Average		**D2**	**D3**	**D3**	**D3**

The comparison of empirical and mechanical results indicate a very good correlation of the expected damage states when the proposed damage estimation formula adapted for Banat seismic area is use.

The empirical methodology for buildings considered as isolated structural units tends to underestimate the expected damage state with one class. Otherwise, the empirical methodology that considers the building within the aggregate is very similar in results with the mechanical one.

The general expected damage is D2 for typological class Type I, respectively D3 for typological clasess Type II and Type III.

3.7 **Conclusion**

There were determined the following conclusions:

(i) the results of the seismic vulnerability curves and expected damage states indicate a very good correlation for macroseismic intensity IX EMS-98 between empirical and mechanical seismic vulnerability methodologies, after the proposed adaptation formula for the damage estimation. Also, the new results are in accordance with the interstorey drift values and with the real damages observed on site on similar masonry buildings after past earthquakes in Banat seismic region. The differences are at maximum one damage state for the investigated buildings. For the mean seismic vulnerability, the differences between methodologies are less than 20 percent for all typological classes;

(ii) there can be seen a small underestimation of the results based on the empirical seismic vulnerability assessment for building considered as isolated structural unit. For all typological classes, this methodology tends to underestimate the seismic vulnerability of the investigated buildings with 20 percent;

(iii) the empirical seismic methodology for 15 parameters showed to be very similar in results with the mechanical methodology, but still underestimating the seismic vulnerability with 5 percent;

(v) overall, the seismic vulnerability of the 25 investigated buildings is a moderate one, compressed between damage states D2÷D3, showing the possibility of reaching significant damages to non-structural elements and moderate damages to the structural ones. The most vulnerable typological class is type III, which represents the tallest historical masonry buildings in Timisoara city;

(vi) when the new proposed methodology was applied for all 105 historical masonry buildings, the seismic vulnerability showed to be a little smaller, around damage state D2 but with chances of reaching damage states D3 and even D4. This decrease is due to the fact that the 25 buildings that were selected for detailed investigation are the most complex ones, so their vulnerability is higher. In the group of all 105 historical masonry buildings, there are some which are in very good conservation state, influencing the seismic vulnerability of the entire area;

(vii) in this case, the proposed adapted empirical methodology could be used for assessing the seismic vulnerability of other historical masonry buildings in the near-field seismic region with similar characteristics with Banat region. The methodology represents a quick and simplified tool and can be calibrated for any particular region by using also the mechanical methodology;

(viii) the results highlight the possibility of losing some architectural-artistic elements, which are non-structural but very important for the history of the city. In this context, there was considered opportune to develop the proposed empirical seismic vulnerability assessment methodology, considering also the influence of the cultural value of each building;

The content of this chapter was published in the following papers:

1. Chieffo N., Apostol I., Keller A., Mosoarca M., Marzo A., ”Global behavior of historical masonry structures and timber roof framework”, *Prohitech 2017*, Lisabona, Portugalia, 2017

2. Azap B., Apostol I., Mosoarca M., Chieffo N., Formisano A., ”Seismic vulnerability scenarios for historical areas of Timisoara”, *Proceedings of 17th National Technical-Scientific Conference on Modern Technologies for the 3rd Millennium*, Oradea, Romania, pp 149-154, 2018

3. Apostol I., Mosoarca M., Onescu E., ”Seismic vulnerability assessment for historical building as isolate/in aggregate for Timisoara city, Romania”, *Journal of Architecture, Urbanism and Heritage*, Vol. 2, Politehnica Publishing House, 2018

4. N. Chieffo, M. Mosoarca, A. Formisano, I. Apostol, ”Seismic vulnerability assessment and loss estimation of an urban district of Timisoara”, *IOP Conference Series*, Vol. 471, Session 9, 2019

5. Onescu I., Mosoarca M., Azap B., Onescu E., ”Seismic losses scenario for cultural promenade in Timisoara Capital of Culture 2021, Romania”, *IOP Conference Series*, Vol. 471, Session 9, 2019

6. Apostol I., Mosoarca M., Chieffo N., Onescu E., ”Seismic vulnerability scenarios for Timisoara, Romania”, *Structural Analysis of Historical Constructions*, RILEM Bookseries, vol. 18, pp. 1191-1200, 2019

7. M. Mosoarca M, I. Onescu, B. Azap, E. Onescu, N. Chieffo, M. Szitar-Sirbu, ”Seismic vulnerability assessment for the historical areas of the Timisoara city”, *Engineering Failure Analysis* (Impact Factor 2.897 at 13.07.2020), Vol. 101, pp. 86-112, 2019

8. Onescu I., Onescu E., Mosoarca M., ”Multi-criterial vulnerability assessment for Timisoara city, Romania”, *4th International Conference on Structure and Architecture*, Lisabona, Portugalia, 2019, accepted

9. Onescu E., Onescu I., Mosoarca M., ”Seismic vulnerability assessment of historical group of buildings in Timisoara city”, *Proceedings of 18th National Technical-Scientific Conference on Modern Technologies for the 3rd Millennium*, Oradea, Romania, 2019, accepted

10. M. Mosoarca, I. Onescu, E. Onescu, A. Anastasiadis, ”Seismic vulnerability assessment methodology for historic masonry buildings in the near-field areas”, *Engineering Failure Analysis*, Vol. 115, paper ID 104662, September 2020, available online (Impact factor 2.897)

The information was disseminated at the following conferences:

1. 17th National Technical-Scientific Conference on Modern Technologies for the 3rd Millennium, 22-23 march 2018, Oradea, Romania

2. 1st International Conference on Heritage and Sustainable Innovation CoHeSION, 15-17 November 2018, Timisoara, Romania

3. World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium, 18-22 june 2018, Prague, Czech Republic

4. 8th International Conference on Engineering Failure Analysis ICEFA, 8-11 July 2018, Budapest, Hungary

5. 4th International Conference on Structure and Architecture ICSA, 24-26 July 2019, Lisbon, Portugal

The following awards were received based on the presented research:

1. Best poster award, 8th International Conference on Engineering Failure Analysis ICEFA, 8-11 July 2018, Budapest, Hungary

4 SEISMIC VULNERABILITY ASSESSMENT INFLUENCED BY THE CULTURAL VALUE

4.1 Proposed methodology

Urban cultural heritage preservation involves a multidisciplinary strategy, that has to bring together local and professional community, local authorities and future developers [227]. If we look back at the tendency of city development, there can be noticed a visible pattern of urbanisation. If back in the 1950 there were only 30 percent of the population that lived in the city, this number reached to more than 50% in 2014, expecting to reach 66% by 2050 [228]. In this context, there is the need of searching for new revitalisation strategies for the overpopulated historical centres [229].

But there comes the question: what do we understand through urban cultural heritage? What do we need to preserve? We can look at the urban cultural heritage as the sum of elements that give's identity and spirit of place to the city. This involves elements such as architectural-artistic assets, but also intangible elements such as importance for the urban pattern, cultural or social life for the local community, historical meaning.

There are some steps that have to be taken in order to assess the cultural value of a historical building [230], such as on-site investigation, urban investigation and historical investigation of the archives (Figure 4.1) [219]. There must be followed four important criteria, such as structural integrity, architectural value involving rarity and unicity, urban value and memorial-symbolic involving also social-economic value. In addition, there can be considered also the criteria of the estimative age of the buildings, but in case of very homogenous urban areas, with buildings from the same period of time, this criteria can be excluded, up to the investigators. This criteria also is directly influenced by the authenticity and importance of the elements, not only by their age.

For the structural integrity value, there is targeted the integrity and coherency both in plan and elevation, building materials and techniques, symmetry and conservation state of structural elements. For this criteria, there can be used the empirical vulnerability form with 10 or 15 parameters, illustrated in Table 3.12 [78], [81].

The consideration of the structural aspects is important and must consider also the returning period characteristic to the earthquakes from Banat area, as illustrated in Table 4.1 [188].

The first classification can be made following mechanical behaviour, where architectural assets are divided into structural elements by themselves, non-structural elements but connected to structural ones or non-structural elements with own seismic response, as presented in Table 4.2 [24].

Table 4.1. Returning period for earthquakes in Banat seismic area [188]

Magnitude [Mw]	Returning period [years]	Banloc-Timisoara area	
		50%	40%
4.0	1.6	3.2	4
4.5	4	8	10
5.0	10	20	25
5.5	25	50	62
6.0	112	224	280
6.25	1320	2640	3300

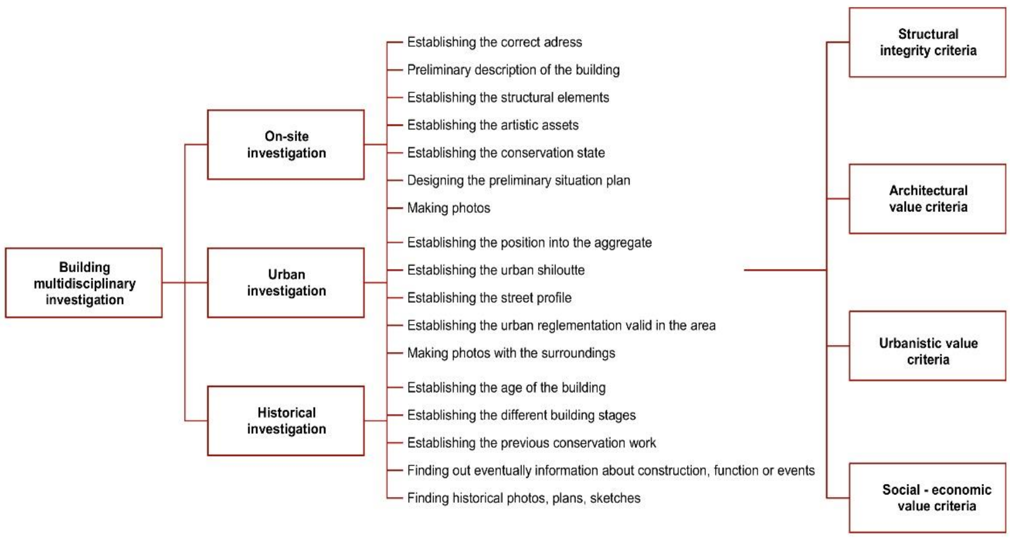


Figure 4.1. Important stages for the building multidisciplinary investigation

Table 4.2. First architectural-artistic elements proposed to be consider for the cultural value [24]

Seismic behaviour	Artistic assets
Structural elements	Columns, stone or brick walls, stone or wooden lintels, wooden beams, masonry arches and vaults, wooden framework
Non-structural elements but connected with structural ones	Frescos, mosaics, stuccoes, decorated ceilings, vaults or arches, decorated floors, tiles, parquets
Non-structural elements	Sculptures, balconies, bas-reliefs, attics, frontons

For the artistic assets, there can be considered the most relevant architectonic elements, following a classification [231]. There was followed the classification proposed by the National methodological code for the classification of historical monuments [219], but also several classification proposed by researchers in this field [39], [24]. For this criteria, there are followed several parameters, such as architectural coherency, importance for a specific architectural style or building period, significance for a specific historical-geographical area, architectural plastics of exterior facades and interior spaces, valuable artistic assets, general character of the building, decay level, percentage of original material, monument status, historical past events or possible intervention works.

For a better understanding of the presence of the artistic assets to the historical masonry buildings investigated in Timisoara, there are presented some representative buildings with cultural value [232] in Iosefin area from each typological class (Figure 4.2), while for Fabric district they are illustrated in Figure 4.3. In Figure 4.4 there are presented several artistic assets that can be found very often to the investigated buildings, such as woodwork, joinery, stucco, statues, balconies, frontons, mosaics, paintings, decorated ceilings, decorated floors, valuable wooden framework and others.

a)


b)

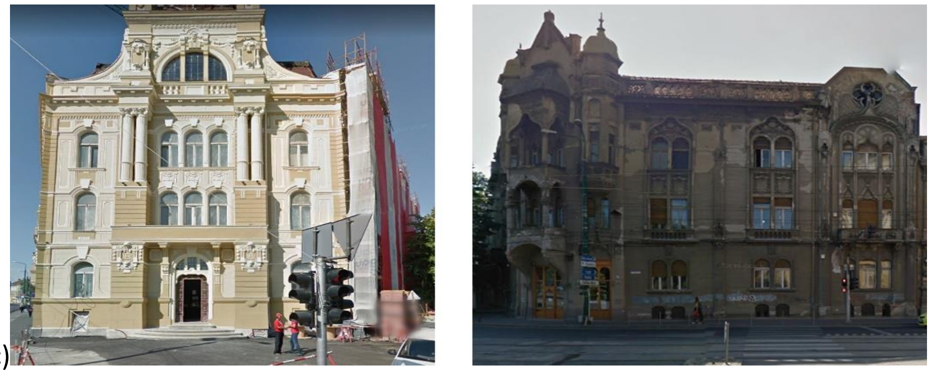

c)


Figure 4.2. Representative historical buildings with cultural value in Iosefin district: a) from typological class type I; b) from typological class type II; c) from typological class type III;

a)
b)
c)


Figure 4.3. Representative historical buildings with cultural value in Fabric district: a) from typological class type I; b) from typological class type II; c) from typological class type III;

b)

Figure 4.4. Representative artistic assets that can be found at many historical masonry buildings in Timisoara:

For the urbanistic value of an historical building, there are followed several parameters, such as its relationship with the urban or natural context, location importance, appurtenance to an important site, importance for a specific urban pattern or typology, importance in contouring the street profile and silhouette, particularities of the roof shape and others (Figure 4.5).

a) b)

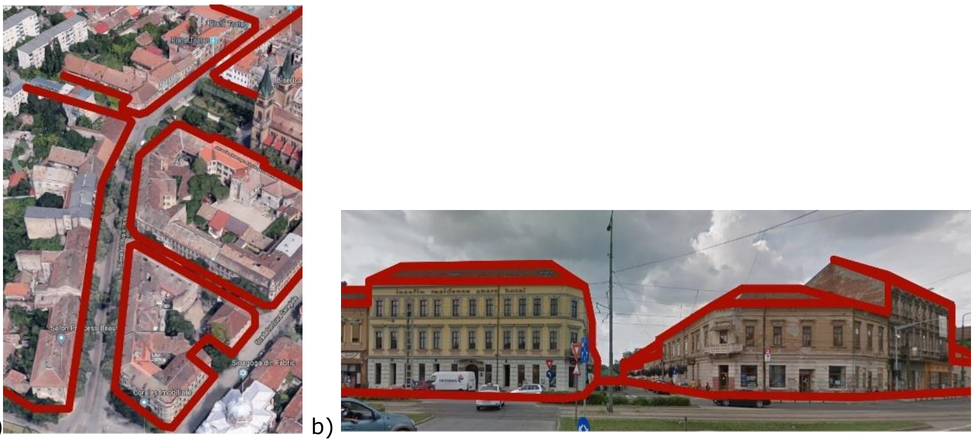


Figure 4.5. Importance of a historical building in defining the urban pattern: a) defining the street profile; b) defining the street silhouette;

When it comes to the social-economic criteria, there can be considered several aspects, such as the correlation of the building with specific representative moments or people, the importance of the building into the local community memory, possible local traditions, public important social or cultural functions and of course economic value of the building.

From all the exposed criteria, for each investigated site there might be eliminated or added few, due to the particularities of each area. A scheme with the general criteria that might be considered in such a study is presented in Figure 4.6

For the investigation of Iosefin and Fabric historical districts, there were considered only the majority of those, as some were inexistent in the area. The final investigation form that is proposed for assessing the seismic vulnerability influenced by the cultural value contains a total number of 42 parameters. The weight associated with each parameter is proposed by the authors following the National methodological code for the classification of historical monuments [219] and personal considerations and can be adapted by the investigators to each site.

In the final approach, there was assigned also a weight for each of the four criteria, such as structural, architectural-artistic, urbanistic and social-cultural. Considering the fact that is still a seismic vulnerability assessment, there was decided to give the most significant weight to the structural parameters (70%), followed by the architectural-artistic criteria with 15%. For the urbanistic parameters there was considered a weight of 10%, while for the social-economic ones, 5 percent. This way, the cultural value can influence the seismic vulnerability with maximum 30%, influencing just the hierarchy of the buildings that need rehabilitation work. Also, this criteria weight can be adapted to each investigated site, in dependence of the most important criteria for the area.

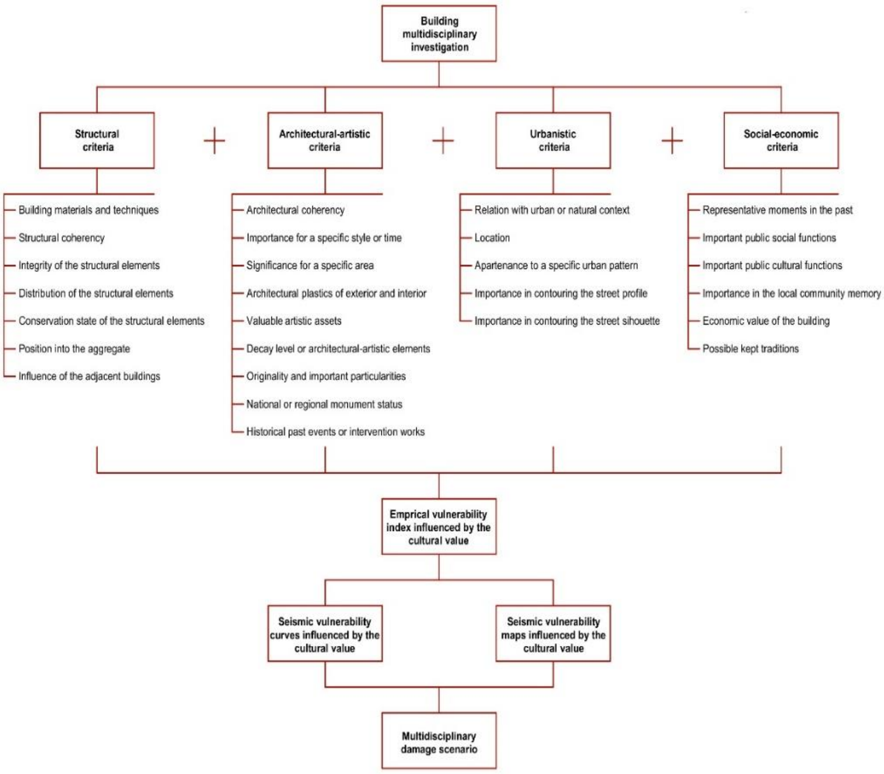


Figure 4.6. Scheme with general parameters that might be considered in the seismic assessment influenced by the cultural value for any historical urban area

Each parameter and its associated weight were assigned based on several experts' opinion and also on the recommendation of the Romanian Methodological Code for the classification of the monuments. The final vulnerability form influenced by the cultural value is presented in Table 4.3.

Table 4.3. Proposed vulnerability form influenced by the cultural value

%	Criteria	No.	Element	Class				Weight
				A	B	C	D	
70 %	STRUCTURAL	1	Vertical structure organisation	0	5	20	45	1.00
		2	Vertical structure nature	0	5	25	45	0.25
		3	Type of foundation and location/soil	0	5	25	45	0.75
		4	Distribution of structural elements in plan	0	5	25	45	1.50
		5	Regularity in plan	0	5	25	45	0.50
		6	Regularity in elevation	0	5	25	45	1.00
		7	Floor type	0	5	15	45	0.75
		8	Roofing	0	15	25	45	0.75
		9	Other details	0	0	25	45	0.25
		10	Conservation state	0	5	25	45	1.00

		11	Different height between current and adjacent buildings	-20	0	15	45	1.00
		12	Location of the building into the aggregate	-45	-25	-15	0	1.50
		13	Staggered floors	0	15	25	45	0.50
		14	Structural or typological heterogeneity	-15	-10	0	45	1.20
		15	Opening area percentage difference	-20	0	25	45	1.00
						$I_{V\ STRUCT}$		
15 %	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.50
		17	Age, importance of the build époque	0	10	15	25	1.20
		18	Original woodwork/joinery	0	10	15	25	1.00
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1.00
		20	Original statues or bass-reliefs	0	10	15	25	1.00
		21	Original gable/fronton	0	10	15	25	1.00
		22	Original balconies and railings	0	10	15	25	1.00
		23	Original mosaics or stone work	0	10	15	25	1.00
		24	Original paintings or frescoes	0	10	15	25	1.00
		25	Conservation state of artistic assets	-5	10	15	25	1.00
		26	Authenticity/ originality (global, elements)	0	10	15	25	1.00
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.50
		28	Particular construction techniques/materials	0	10	15	25	0.50
		29	Conservation state of original materials	-5	10	15	25	0.50
		30	Representative historical events	0	10	15	25	0.50
		31	Archaeological site	0	10	15	25	1.50
		32	Representative/ original wooden framework	0	10	15	25	1.00
		33	Past restoration work	-5	10	15	25	1.00
						$I_{V\ ARCH\text{-}ART}$		
10 %	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.50
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.50
		36	Annexes, relation with the urban pattern	0	10	15	25	1.00
		37	Location (central area, touristic area)	0	10	15	25	1.50
		38	Representative/particular shape of the roof	0	10	15	25	1.00
						$I_{V\ URB}$		
5 %	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.50
		40	Importance for the local community memory	-5	10	15	25	1.00
		41	Economic value	0	10	15	25	1.50
		42	Cultural functions	0	10	15	25	1.50
						$I_{V\ SOC\text{-}EC}$		
						$I_{V\ CULT}$		

In order to determine the vulnerability index influenced by the cultural value, there was followed Equation 25. Moreover, the vulnerability index was normalized in the range 0÷1 following Equation 27.

$$I_{V\,CULT} = 0.70 \times \sum_{i=1}^{15} s_i \times w_i + 0.15 \times \sum_{i=16}^{33} s_i \times w_i + 0.10 \times \sum_{i=34}^{38} s_i \times w_i + 0.05 \times \sum_{i=39}^{42} s_i \times w_i \quad (25)$$

, where s_i represents the class score and w_i is considers the associated weight factor for each parameter. The fulfilled vulnerability form for all the investigated buildings are presented in Appendix A.

Considering the fact that the cultural value is very different in one urban area than in other, there must be introduced an attenuation factor that takes into account the importance of the investigated area. For example, it wouldn't be correct to use the same normalization vulnerability index formula for a small city located in Romania with valuable architecture, but not worldly recognised as for a historical city with UNESCO heritage [233]. The seismic vulnerability of such important sites should be increased more, following an attenuation factor, obtained by fulfilling a very simple proposed form (

Table 4.4). The attenuation factor could increase the seismic vulnerability with up to 50% in exceptional cases, so the value of the parameter is in the range 1÷1.50. The value of the parameter can be easily obtained by simply choosing a situation for each parameter and making the sum of the indicated values, as presented in Equation 26.

$$A_F = \sum_{i=1}^{5} p_i \quad (26)$$

, where A_F represents the attenuation factor in the range of 1÷1.5 and p_i represents the points associated with the selected option.

Table 4.4. Investigation form for determining the attenuation factor for cultural value

Parameter		Options	Points (p_i)
1	Age of the urban area	Ancient period (before year 500)	0.30
		Classical period (500 – 1500)	0.25
		Modern period (1500 - 1945)	0.22
		Contemporary period (1945- present)	0.20
2	Population	Very high populated (> 1 million inhabitants)	0.30
		High populated (< 1 million inhabitants)	0.25

		Moderate populated (< 300000 inhabitants)	0.22
		Low populated (< 100000 inhabitants)	0.20
3	Tourism	Very touristic city	0.25
		Touristic city	0.23
		Little touristic city	0.22
		Not a touristic city	0.20
4	Worldly recognition	UNESCO site	0.35
		Continental importance	0.30
		National importance	0.25
		Regional importance	0.20
5	Conservation state	Poor	0.30
		Moderate	0.25
		Good	0.23
		Very good	0.20
		A_F	

In the case of Timisoara city, the city is dating before year 1500, it has around 300 000 inhabitants, it is a touristic city but not very and the investigated urban site it has regional importance, with a moderate conservation state. So, the situation for Timisoara is presented in Table 4.5, highlighting an attenuation factor equal to 1.14.

Table 4.5. Investigation form for determining the attenuation factor for cultural value in case of Timisoara city

Parameter	Ranges	Points
Age of the urban area	Classical period (500 – 1500)	0.25
Density	Moderate density (< 500000 inhabitants)	0.22
Tourism	Little touristic city	0.22
Worldly recognition	Regional importance	0.20
Conservation state	Moderate	0.25
	Attenuation factor (A_F)	1.14

In order to be able to normalise the vulnerability index in the range of 0÷1, but also consider the attenuation factor regarding the cultural importance of the investigated urban site, there was proposed Equation 27.

$$V_{CULT} = \frac{I_{V\,CULT} - I_{V\,CULT\,MIN}}{I_{V\,CULT\,MAX} - I_{V\,CULT\,MIN}} \times A_F, \text{ if } V_{CULT} < 0.66 \quad (27)$$

$$V_{CULT} = \frac{I_{V\,CULT} - I_{V\,CULT\,MIN}}{I_{V\,CULT\,MAX} + I_{V\,CULT\,MIN}} \times A_F, \text{ if } V_{CULT} >= 0.66$$

Based on the normalized vulnerability index influenced by the cultural value and following Equation 28, there can be determined the most probable damage state influenced by the cultural value for each investigated historical masonry building.

$$\mu_D = 2.5\left[1 + \tanh\left(\frac{I + 12.50 \times V_{CULT} - 13.1}{\Phi}\right)\right] \tag{28}$$

,where V_{CULT} represents the normalized vulnerability index influenced by the cultural value, I represents the macroseismic intensity EMS-98, while Φ is a factor that influence the curve slope considered to be 2.3 for residential buildings [87].

Assessing the seismic vulnerability considering also the artistic assets represents an important aspect in the preservation process of the history, because the architectural-artistic elements can be irremediable damage even in case of little global damage, as presented in Figure 4.7 [24]. Nonlinear analysis provides detailed information about seismic behaviour and bearing capacity, but empirical assessment provide quick and simplified tool, easy to apply at urban scale as a first step in the process of seismic vulnerability assessment.

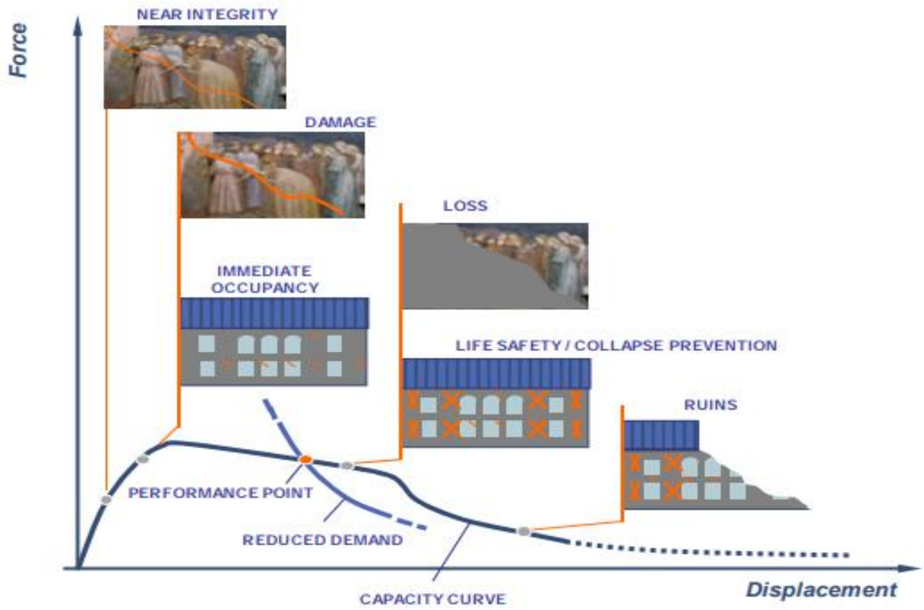


Figure 4.7. Damage curve to non-structural elements [24]

4.2 **Vulnerability scenario influenced by the cultural value**

The proposed empirical seismic vulnerability assessment methodology influenced by the cultural value was applied for all 105 investigated buildings (Figure 4.8), both from Iosefin (Figure 4.9) and Fabric district (Figure 4.10). There were designed the mean seismic vulnerability curves and vulnerability ranges influenced by the cultural value following the standard deviation, for all 42 parameters from the vulnerability form. For a better understanding of the importance of the typological classes, there were designed also the seismic vulnerability curves influenced by the cultural value for each typological class, for all 105 investigated buildings from Iosefin and Fabric historical districts in Timisoara. The curves for typological class type I are illustrated in Figure 4.11, for class II in Figure 4.12, while the curves for class type III are presented in Figure 4.13.

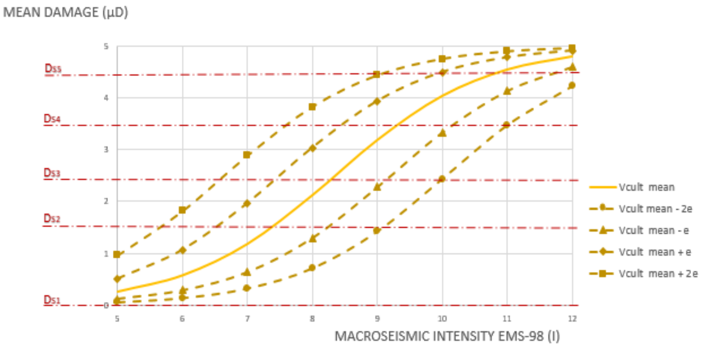


Figure 4.8. Seismic vulnerability curve influenced by the cultural value for all 105 investigated buildings

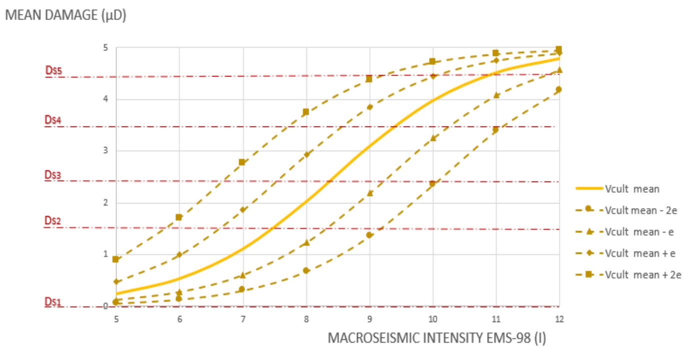


Figure 4.9. Seismic vulnerability curve influenced by the cultural value for Iosefin district, for all 68 investigated buildings

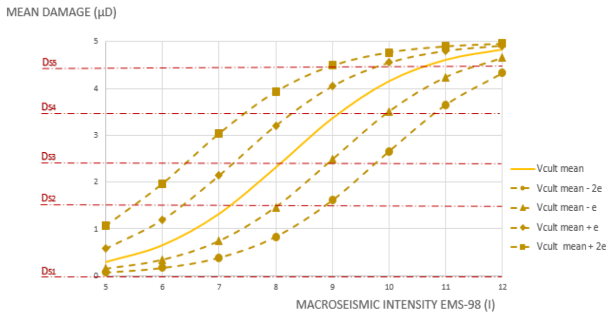


Figure 4.10. Seismic vulnerability curve influenced by the cultural value for Fabric district, for all 37 investigated buildings

The results have shown a medium seismic vulnerability influenced by the cultural value for both historical districts. The expected mean damage state is D3 for both areas, with a range of D1-D4. This means that the chances of having decay to artistic assets is high, even if there is no risk of losing the bearing capacity for the investigated historical masonry buildings.

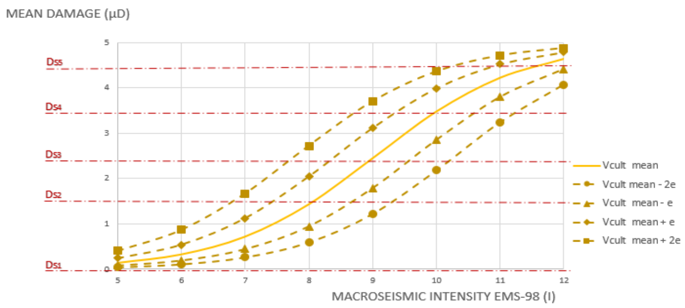


Figure 4.11. Seismic vulnerability curve influenced by the cultural value for typological class type I, for all investigated historical masonry buildings in Iosefin and Fabric district

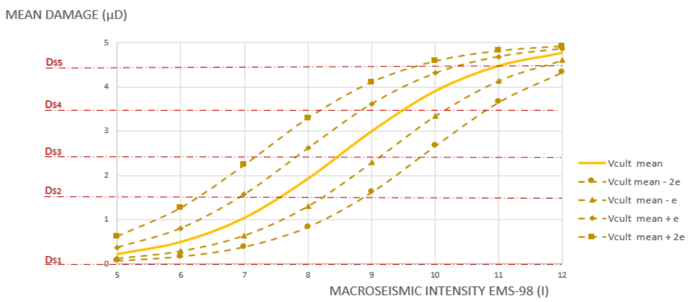


Figure 4.12. Seismic vulnerability curve influenced by the cultural value for typological class type II, for all investigated historical masonry buildings in Iosefin and Fabric district

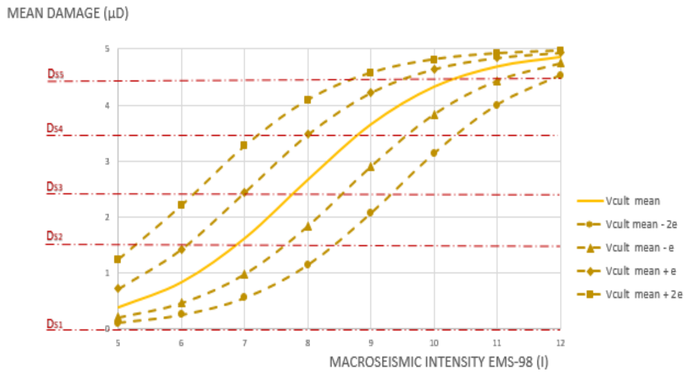


Figure 4.13. Seismic vulnerability curve influenced by the cultural value for typological class type III, for all investigated historical masonry buildings in Iosefin and Fabric district

The results indicate that the buildings from typological class type I remain the less vulnerable when the cultural value is considered, while the buildings from typological class type III are still the most important to keep for the history preservation of the city. For macroseismic intensity IX EMS-98, for typological class type I and type II, the mean damage state is D3, while for type III the mean damage state is D4. Type II presents a 9% increased vulnerability in comparison with type I when the cultural value is considered, while type III presents a vulnerability higher with another 13% than type II in the same condition.

Following the new results, there were determined the percentages of the expected damage states for all 105 investigated historical masonry buildings for the considered seismic scenario, as presented in Table 4.6.

Table 4.6. Percentages of expected damage states influenced by the cultural value for the investigated buildings for all 42 parameters based on proposed adapted methodology

Historical district	Damage state D1	Damage state D2	Damage state D3	Damage state D4	Damage state D5
Iosefin	3.00%	25.00%	42.50%	28.00%	1.50%
Fabric	0.00%	16.00%	43.50%	38.00%	2.50%

A new vulnerability map was designed, considering the new results adapted based on the cultural value, as illustrated in Figure 4.14 for Iosefin district and in Figure 4.16 for Fabric historical area.

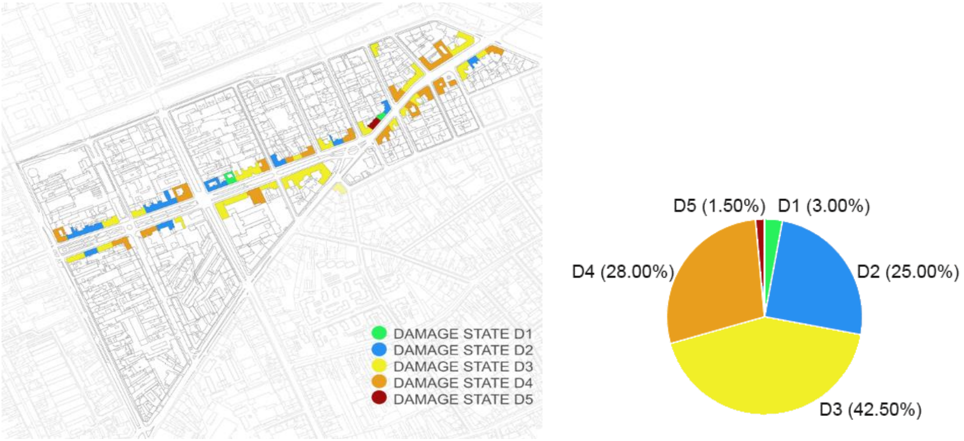


Figure 4.14. Seismic vulnerability map influenced by the cultural value for Iosefin historical district

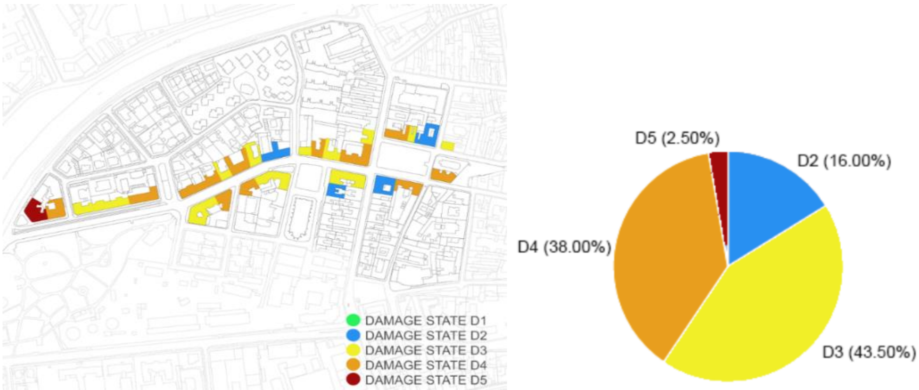


Figure 4.15. Seismic vulnerability map influenced by the cultural value for Fabric historical district

The results highlight that for a macroseismic intensity IX EMS-98 the most probable damage state are generally D2-D3 for both historical districts, representing a dangerous situation for the architectural-artistic, urbanistic and social-economic assets of Timisoara city. In Iosefin district, the chances of reaching even D4 damage state are higher. This situation happens because of two main reasons. First, the percentage of buildings from typological class type III in Fabric is significantly higher than in Iosefin district, increasing the vulnerability influenced by the cultural value of the entire area. Second, the conservation state of the artistic assets and building materials in Fabric area is very poor, leading to an increased vulnerability in comparison with Iosefin district. Overall, the seismic vulnerability influenced by the cultural value in Fabric district is 5% higher than the one from Iosefin historical area.

4.3 Comparison between seismic vulnerability influenced by the cultural value methodology results and adapted empirical methodologies results

A comparison was made between the results of the empirical seismic vulnerability assessment methodology and empirical methodology influenced by the cultural value. The aim is to observe the level of decrease or increase of the seismic vulnerability when the cultural value of the investigated buildings in considered. The comparison was made for each typological class for all 105 investigated buildings. The results are presented in Figure 4.16 for Type I, in Figure 4.17 for Type II and in Figure 4.18 for typological class Type III. All results are based on the proposed adapted formula for damage estimation.

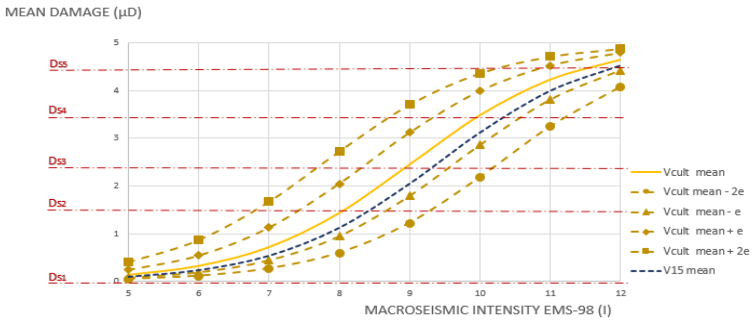


Figure 4.16. Comparison of empirical results for typological class Type I, for all investigated buildings in Iosefin and Fabric district

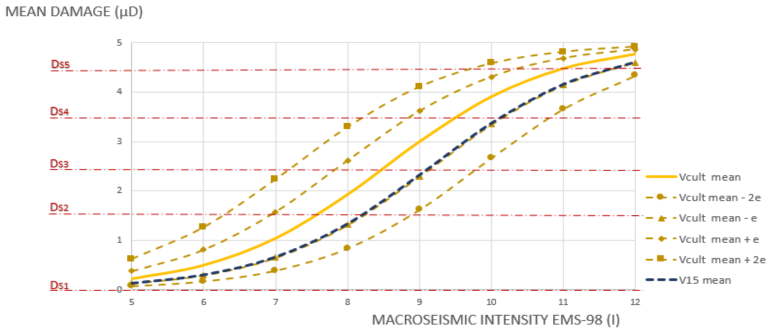


Figure 4.17. Comparison of empirical results for typological class Type II, for all investigated buildings in Iosefin and Fabric district

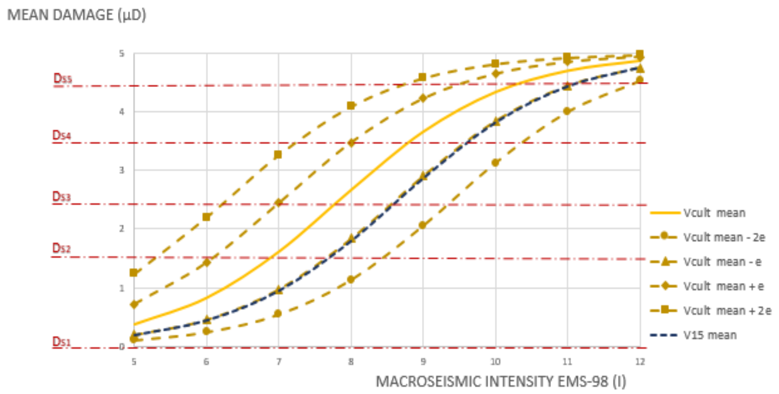


Figure 4.18. Comparison of empirical results for typological class Type III, for all investigated buildings in Iosefin and Fabric district

The results indicate an 8% increase of the seismic vulnerability for typological class Yype I, when the cultural value is considered. Despite the lack of architectural-artistic elements and importance for the urban silhouette of the buildings belonging to this class, there is a moderate cultural value due to their history, position into the city, architectural style and building materials.

For typological class Type II, the vulnerability curves increase with 14 percent. This aspect is related with the moderate cultural value of the buildings belonging to this class. They present important cultural aspects which need to highlight a moderate vulnerability.

In the case of the investigated buildings from typological class Type III, there can be noticed an increase of the seismic vulnerability due to the cultural value with 16 percent. The buildings belonging to this typological class are the most important for the history and culture of the city, so their cultural value is the highest. Their seismic vulnerability increases, so in case of a prioritization list for rehabilitation work, they could come first and ensure the safety of Timisoara's heritage.

A synthesis of the empirical results is presented in Figure 4.19 and Table 4.7, highlighting the soft increase (about 14%) of the seismic vulnerability and percentages of the expected damage states when the influence of the cultural value is considered for all 105 buildings.

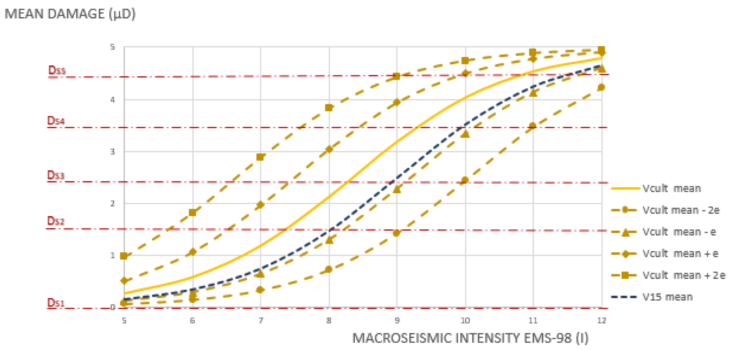


Figure 4.19. Comparison of empirical results for all 105 investigated buildings

Table 4.7. Percentages of expected damage states for the investigated buildings based on empirical methodologies

Methodology	Historical district	Damage state D1	Damage state D2	Damage state D3	Damage state D4	Damage state D5
Empirical	Iosefin	12.00%	41.00%	39.50%	7.50%	0.00%
	Fabric	11.00%	38.00%	37.50%	13.50%	0.00%
Empirical influenced by cultural value	Iosefin	3.00%	25.00%	42.50%	28.00%	1.50%
	Fabric	0.00%	16.00%	43.50%	38.00%	2.50%

The information obtained following the proposed seismic vulnerability assessment methodology influenced by the cultural value represent an important tool for a multidisciplinary prevention plan. In order to provide a strategy for seismic risk reduction, there must be reduced also the seismic vulnerability of the most important building for Timisoara city.

4.4 **Losses assessment methodology**

The unpredictable character of earthquakes led in time to the need of identifying the heritage that is in the highest risk and to develop constantly effective risk reduction strategies. Especially in the situation of historical urban areas, where the buildings that are usually located in the city centre were built without any seismic codes considered, there is highlighted the need of developing possible seismic scenarios and be aware of the possible losses [64]. That way, there can be proposed both prevention and attenuation plans for reducing the negative effects of the seismic events.

In order to be able to assess the possible losses in case of a specific losses scenario, there is necessary a multidisciplinary study in order to determine the most probable macroseismic intensity, damage states, number of victims, effect on urban area, cultural losses, social-economic negative effects and others [146].

Complex urban areas usually host both residents and tourists, which are attracted by the cities historical, architectural and cultural values. Considering such exposure-related aspects for Timisoara city, especially in the context of European Capital of Culture 2021, the damage scenario should consider also the social vulnerability factors, such as population density, crowding conditions, ages, financial and philological effects and others [234]. Based on damage scenarios, there can be reduce the probability of an urban crisis and also there can be reduced the financial and social effects, human life losses and even recovery time, getting from a qualitative emergency plan to a quantitative one [235].

The need of defining the possible financial losses and the financial needs for the recovery phases could offer the possibility to local authorities and local communities to evaluate the report between recovery costs and prevention costs, because usually the post-disaster phases are unpredictable and reactive, so more costly comparing with disaster risk reduction policies [236].

The level of knowledge represents a challenge in this process, so there is proposed a methodology to follow in order to able to provide the best level of details in the losses assessment process. The steps of the methodology are presented in Figure 4.20.

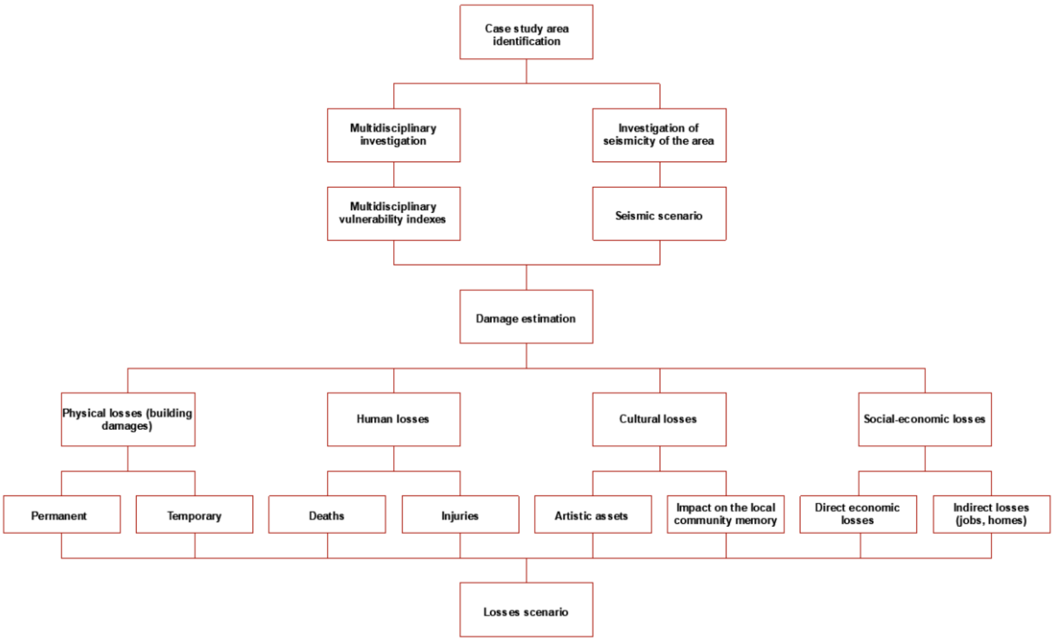


Figure 4.20. Proposed losses scenario methodology steps

The damage estimation was already made in the previous chapter, and in the losses scenario will be considered the results influenced by the cultural value, so the multidisciplinary damage scenario. The next step was to investigate the number of people that live and work in the area, so a losses scenario could be contoured.

After a detailed site inspection, there was noticed a number of 504 apartments and 196 companies that are located in the investigated buildings in Iosefin district, respectively 385 apartments and 69 companies in Fabric area. Based on this information, there was established that the approximate number of inhabitants would be 1260 for Iosefin area and 963 for Fabric district based on a medium number of 2÷3 people/family, while the number of people who work in the area was determined to be 539 for Iosefin and 258 for Fabric, based on information obtained on site [175].

First of all, there was determined the most expected general percentage of damaging based on Equation 29 [175].

$$\%MF = 0.4 \times P[D_3] + 0.6 \times P[D_4] + 0.7 \times P[D_5] \tag{29}$$

,where $P[D_k]$ represents the probability of occurrence of a specific damage state, from D_1 to D_5, determined after empirical seismic vulnerability assessment influenced by cultural value (considering the damage states percentages from Table 4.6).

The probability of having a specific damage state $P[D_k]$ was determined mathematically, as a ratio between the numbers of buildings that are expected to reach damage state D_K for a specific macroseismic intensity and the total number of investigated buildings.

The probability of reaching near collapse or even collapse state for investigated buildings, meaning damage state D_5 was determined following Equation 30, while the expected percentage of buildings that might become unusable for a period of time was determined following Equation 31, defining the possible historical and cultural losses for the analysed districts [80]. The buildings that will become unusable will need implicitly rehabilitation work and relocation of the inhabitants. If in those buildings there is also commercial activity, this will have to be closed until repair.

$$P_{collapse} = P[D_5] \tag{30}$$

$$P_{unusable} = 0.40\ x\ P[D_3] + 0.60\ x\ P[D_4] \tag{31}$$

Regarding the social impact, there were determined on one hand the percentage of people that might lose temporary their home and on the other hand, the percentage of people that might get injured or even lose their life, following Equation 32 and Equation 33 [80].

$$P_{severly\ injured\ or\ dead} = 0.30\ x\ P[D_5] \tag{32}$$

$$P_{temporary\ homeless} = 0.40\ x\ P[D_3] + 0.60\ x\ P[D_4] + \ 0.70\ x\ P[D_5] \tag{33}$$

As for the financial losses, there should be consider both direct and indirect economic losses. Direct losses represents the total amount of money necessary to cover the damages made to the buildings or even to reconstruct the collapsed buildings, while the indirect losses refer to the cost of relocating people and interrupting commercial activities. The total economic losses represents the sum of the direct and indirect financial losses. The direct financial losses are determined following Equation 34 [37].

$$S_{direct\ economic\ losses} = \sum_{k=2}^{5} CS(k) = V_C\ x\ \sum_{k=2}^{5} \sum_{j=1}^{n} [Area(j) x\ P[k,j]\ x\ URM(k,j)] \tag{34}$$

where CS(k) represents the total construction cost for repairing the damages from each damage state from D2 to D5, VC represents a cost associated per square meter (in dependence of the economical market of the city), Area represents the area of the investigated building, P[k,j] represents the probability that the building j reaches a specific damage state k, while URM(k,j) represents an index associated with the most probable damage state for the buildings made in unreinforced masonry [237], for macroseismic intensity IX EMS-98, according to .

Table 4.8 and n represents the total number of investigated buildings.

Table 4.8. URM loss indexes

Damage state	Most probable damage state	Loss Index (URM)
D_1	Slight (no structural damage, slight non-structural damage)	0.00-0.05
D_2	Moderate (slight structural damage, moderate non-structural damage)	0.05-0.10
D_3	Substantial to heavy (moderate structural damage, heavy non-structural damage)	0.10-0.30
D_4	Very heavy (heavy structural damage, very heavy non-structural damage)	0.30-0.60
D_5	Destruction (very heavy structural damage)	0.60-1.00

The cost V_C per square meter is determined following Equation 35 and Equation 36 and it represents the effective cost of constructing a similar building per square meter plus the cost of furniture and appliances [37].

$$V_C = GL_C + (n_{level} - 1)\ x\ F_C + n_{level}\ x\ M_C \quad (35)$$

$$F_C = 0.50\ X\ GL_C \quad (36)$$

, where GL_C represents the cost of reconstructing a new similar ground floor at the price of the local market at the current time per square meter, F_C represents the cost of reconstructing a superior similar level of the building per square meter and is considered half of GL_C, n_{level} is considered to be the number of total levels of the building, while M_C is the cost of furniture and necessary appliances, again in dependence of the local market trend.

The indirect financial losses are influenced by the number of persons who work in the affected buildings and the number of people that become homeless and is determined following Equation 37 [238] and proposed Equation 38. The total amount of indirect losses represents the sum of indirect losses due to the need of relocating homeless people ($IC_{relocation}$) and the indirect losses due to the interruption of the economic and commercial activity in the area ($IC_{inactivity}$).

$$IC_{inactivity} = N_{jobs}\ x\ GDP_{area} \quad (37)$$

, where N_{jobs} represents the number of jobs estimated to be inactive temporary in the area, while GDP_{area} represents the gross domestic product considered per area, after national statistics.

$$IC_{relocation} = N_{temporary\ homelles}\ x\ C_{hotel}\ x\ N_{days} \quad (38)$$

, where $N_{temporary\ homeless}$ represents the total number of the people that remain without shelter (determined as the ratio between Equation 33 and total number of residents) for a shorter or longer period of time, C_{hotel} is considered to be the average price of staying at a medium to low class hotel per night in the affected city or nearby, while N_{days} represents the estimated number of relocation days, obtained following proposed Equation 39, starting from the estimated minimum need of 60 days of relocation for current reparation ($N_{min\ days}$).

$$N_{days} = N_{\min days}\ x\ \frac{(1.00\ x\ P[D_2] + 2.00\ x\ P[D_3] + 3.50\ x\ P[D_4])}{100} \quad (39)$$

4.5 Losses scenario

The application of previous formula led to an interesting result, showing the fact that in Iosefin area, almost 34% of the total investigated building will need rehabilitation work in a slighter or more intense way. In Fabric district, the percentage is a bit higher, around 40%, because of the significant already existing level of decay in the area. Based on the determined number of buildings that will need repair work and implicitly will become unusable for a shorter or longer period of time (Figure 4.21), there was determined also the estimated number of people that will need a temporary new shelter, as presented in Figure 4.22. In Iosefin district, about 35% of the inhabitants will need to be relocated, while in Fabric area, the percentage is around 43%. Moreover, following the same number of affected buildings and considering the number of people that work inside those buildings, there was determined also the impact on the local economy and number of people that will remain without a job for a while (Figure 4.23). In percentages, Iosefin area will probably have around 35% of its workers in this situation, while Fabric area is estimated to have 42%.

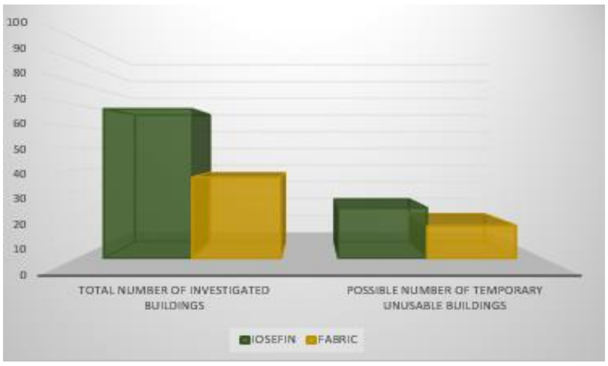


Figure 4.21. Possible number of unusable buildings for a period of time

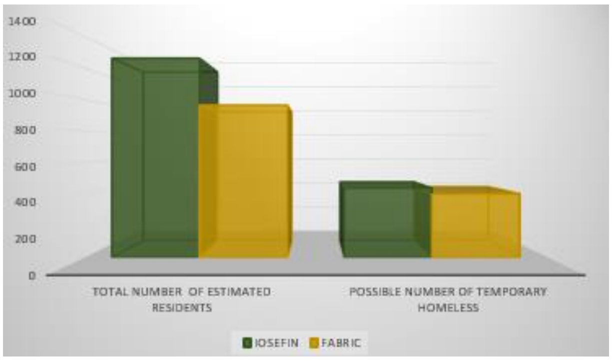


Figure 4.22. Possible number of people without a home for a period of time

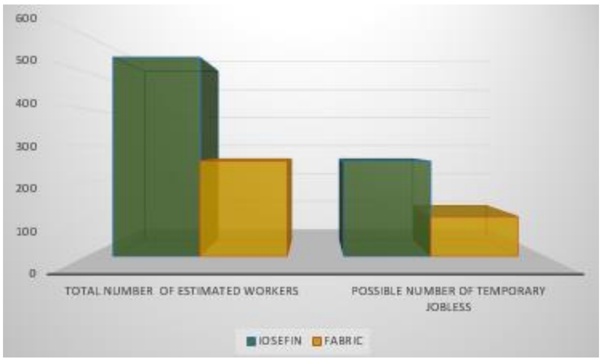


Figure 4.23. Possible number of people without a job for a period of time

An important aspect for a city are the possible financial losses in case of an earthquakes. Local authorities need an estimation so they can be prepared with emergency funds in case of seismic events. For Timisoara city, for the direct financial losses, there was considered a minimum GL_C = 800 EUR/ square meter and a M_C = 75 EUR/ square meter [175]. For the indirect financial losses, there was assumed an average night stay hotel price C_{hotel} = 20 EUR/night. The gross domestic product GDP_{area} of Timisoara is considered to be 5639 EUR/resident [239]. The results are presented in Figure 4.24, Figure 4.25 and Figure 4.26, highlighting a much higher financial vulnerability for Fabric district. This situation happens because in Fabric, the buildings with more than 3 levels are majority, much more than in Iosefin area, so it led to a very large number of usable square meters that will need repair work. Also, the poor conservation state of Fabric's buildings increased the vulnerability of the area and implicitly to more dangerous damage states and more expensive repair works for longer time.

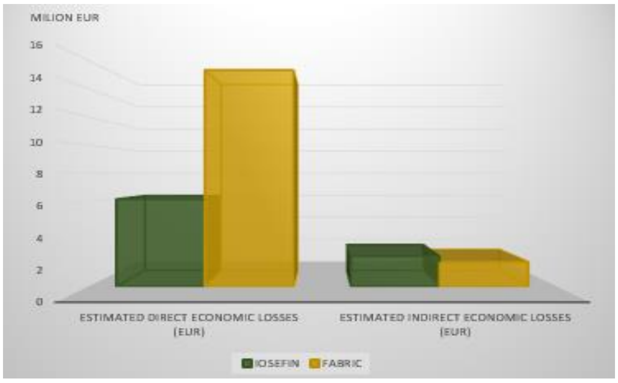


Figure 4.24. Possible direct and indirect total economic losses

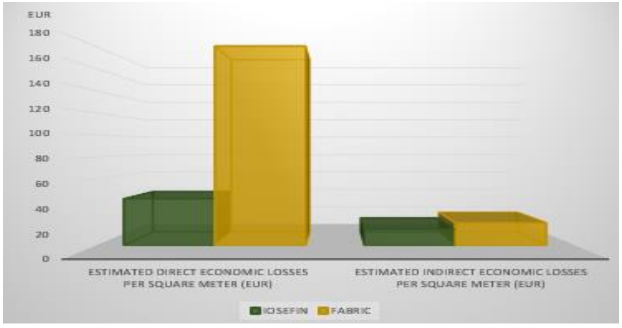


Figure 4.25. Possible direct and indirect economic losses per square meter

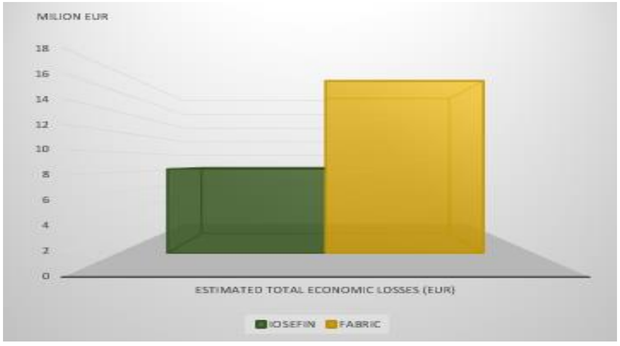


Figure 4.26. Possible total economic losses

So, there can be see that Fabric area is in much more need of rehabilitation work in order to prevent massive financial losses. For a better understanding of the reason of such a large amount of expected financial losses in Fabric area, there is presented in Table 4.9 a situation regarding total number of buildings, number of levels and total area that is considered for rehabilitation work.

Table 4.9. Detailed situation of investigated buildings for financial losses

District	No. of bldgs.	Type I (%)	Type II (%)	Type III (%)	Ground floor area (square meters)	Total area (square meters)	Average square meters / building	Average cost / square meter (EUR)
Iosefin	68	27	37	36	46696	145701	2142	43
Fabric	37	10	35	55	24990	85007	2297	156

Considering the fact that starting from damage state D2 there are big chances of appearing non-structural cracks, the possible damage level to artistic assets is very high. In order to be able to provide an estimation of possible losses, there were considered the three main categories of artistic assets from Table 4.2.

So, for structural architectural-artistic values such as brick walls, stone facades, arches and vaults, columns or wooden framework, there were considered dangerous damage states D3-D5. The estimated structural architectural-artistic assets loss estimation is proposed to be determined following Equation 40.

$$Artistic\ assets\ loss_{structural} = 0.40\ x\ P[D_3] + 0.60\ x\ P[D_4] + 1.00\ x\ P[D_5] \quad (40)$$

For the non-structural architectural-artistic values, but that are connected with structural elements, such as frescoes, mosaics, decorated ceilings and floors, tiles and others, there were considered dangerous also damage states D3-D5. The estimated non-structural architectural-artistic assets connected with structural elements loss estimation is proposed to be determined following Equation 41.

$$Artistic\ assets\ loss_{non-structural\ connected\ with\ structural} = 0.60\ x\ P[D_3] + 0.80\ x\ P[D_4] + 1.00\ x\ P[D_5] \quad (41)$$

Finally, for the non-structural architectural-artistic values, such as sculptures, bass-reliefs, decorated railings, attics and others, there were considered dangerous also damage states D2-D5. The estimated non-structural architectural-artistic assets loss estimation is proposed to be determined following Equation 42.

$$Artistic\ assets\ loss_{non-structural} = 0.40\ x\ P[D_2] + 0.60\ x\ P[D_3] + 0.90\ x\ P[D_4] + 1.00\ x\ P[D_5] \quad (42)$$

Based on the previously determined probable damage state percentages, there were also determined the most probable artistic assets losses for each category, for both historical districts, as presented in Figure 4.27.

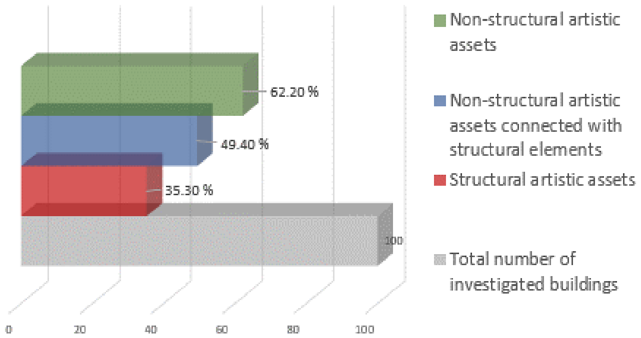


Figure 4.27. Estimated artistic losses percentages for both Iosefin and Fabric districts

When there is considered the fact that all investigated buildings are in protected historical areas, the percentages of possible artistic assets losses highlights the need of a risk reduction plan for Timisoara city, in case of an earthquake.

4.6 **Seismic risk reduction proposal plan**

Preserving historical urban centres represents an important task, due to their outstanding social, economic, environmental and cultural value. For the safeguarding of such a historical centre, there is necessary a good management of the urban area and inhabitants, possible only following a multidisciplinary approach [240].

Especially in the Mediterranean countries, seismic risk represents nowadays one of the most prioritised risk in the authority's strategic plans. There is studied a lot the proper way of developing and implementing risk mitigation strategies and in general, this strategies are focused on identifying the most vulnerable urban areas. Because of age of construction, lack of seismic design rules and proper maintenance, usually this vulnerable areas are identified to be exactly the historical districts of a city [241].

Each strategy should consider at least two phases: pre-event and after event. In case of the after-event phase, there should be considered on one side the intervention plan for the next few hours after earthquake and on the other hand the attenuation and rehabilitation plan for the next months or years after event [241].

The pre-event phase is based on the preventive behaviour, as one of the major targets in preservation of cultural heritage in the entire world [242]. It involves different kind of risk assessment methodologies, access to information, databases, losses scenarios, cost-benefits analysis and of course collaboration through various professions [241].

The post-event phase is focused first of guarding the human life, through efficient rescue and quick intervention plans. A good infrastructure must be prepared to receive and treat all the people that are either injured, either homeless for a period of time. Later on, a quick investigation must be made to estimate the real damage level on the affected site. Based on attenuation plan and after earthquake expertise, there must be provided a quick recovery of the public system and a rehabilitation plan for the affected buildings [241].

A synthesis of the most important steps is presented in Figure 4.28 and Figure 4.29 [241].

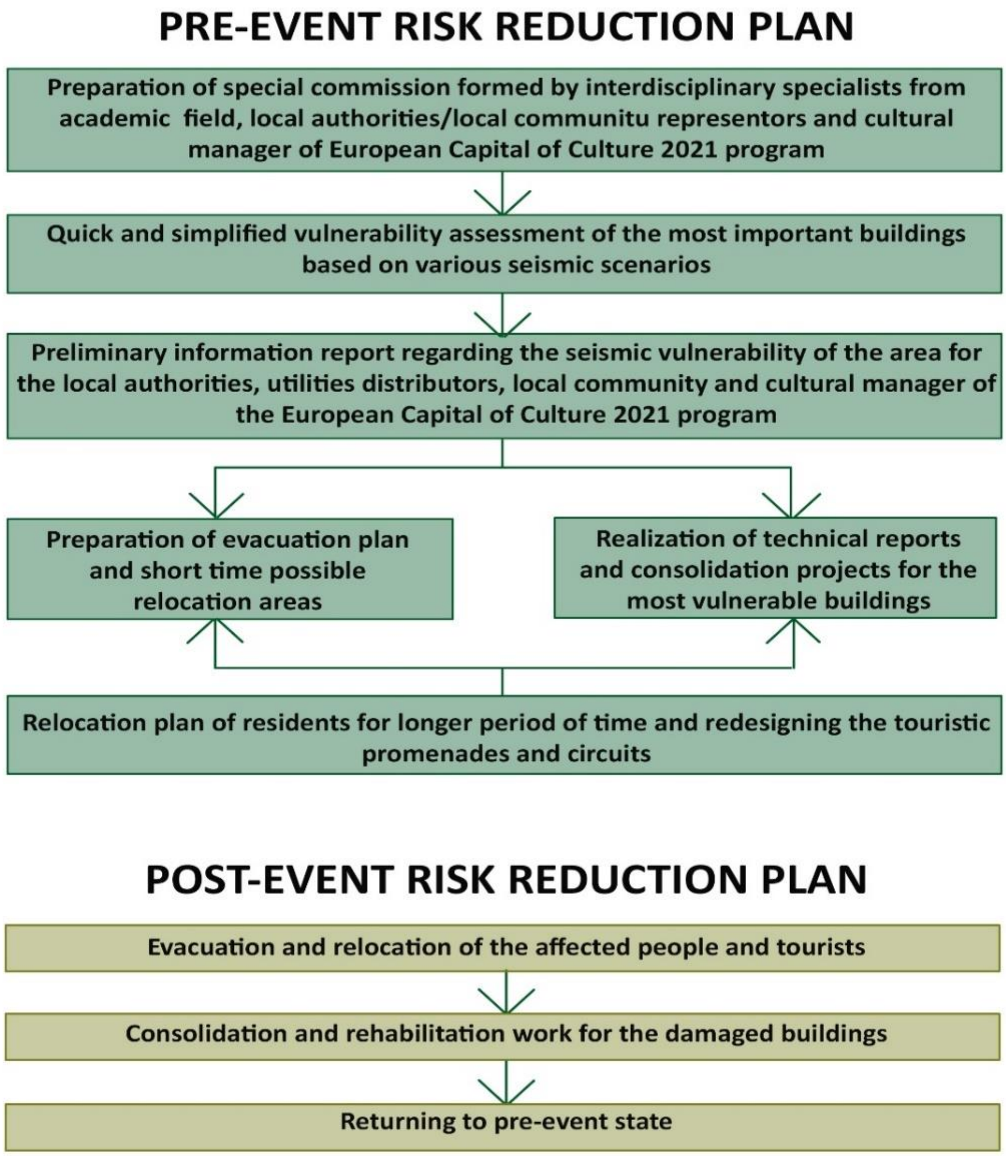


Figure 4.28. Diagram of the pre and post event risk reduction plan phases

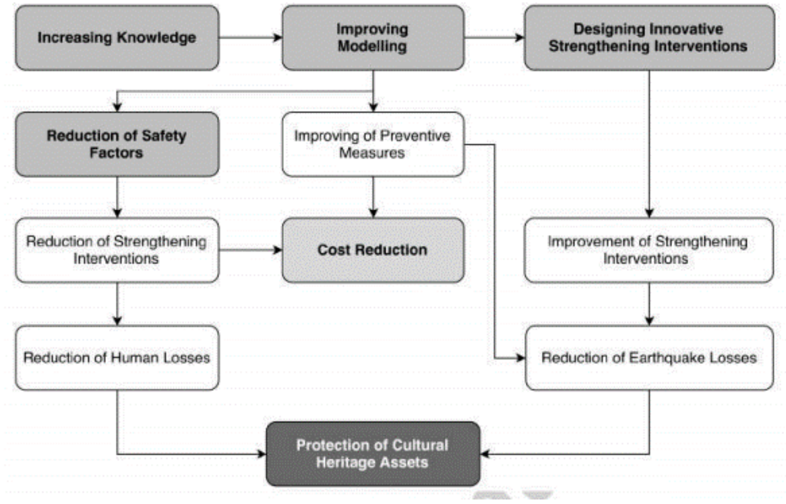


Figure 4.29. Diagram of the main strategic steps proposed in PERPETUATE project [241]

The next two subchapters will present a proposal for a multidisciplinary strategy that considers also the cultural value of the historical buildings and can be applied on any urban centre with similar characteristics or proper adaptation.

Data collection represents one of the most difficult task when it comes to urban scale, so there is the need of applying a strategy that uses more than one methodology. This way, there can be ensured a good compromise between time and costs and reliability of information. In case of the urban scale studies, there is accepted to use a certain level of approximation and to calibrate the methodology following detailed information from just a stock of representative buildings [240].

Based on the significant number of people that might be affected by an earthquake, even if more psychologically and economically than physically, there is highlighted the need of developing emergency plans. The first preliminary step for the evacuation plan is mapping the possible evacuation places that should satisfy some criteria, such as: availability of the area, accessibility, characteristics of the surrounding buildings at a distance shorter than 500 meters [243]. If there are any enclosed structures that could accommodate people, there should be used as shelters. If not, there should be considered the open areas where there could be placed temporary structures such as: tents or mobile units. Each shelter, permanent or temporary, should be accessible to emergency vehicles and teams [243].

When it comes to urban scale measures, there should be involved specialist from many fields, together in a multidisciplinary team. There are some very important steps that should be followed in order to be able to provide the necessary knowledge level for a functional risk reduction strategy, as presented in Figure 4.30.

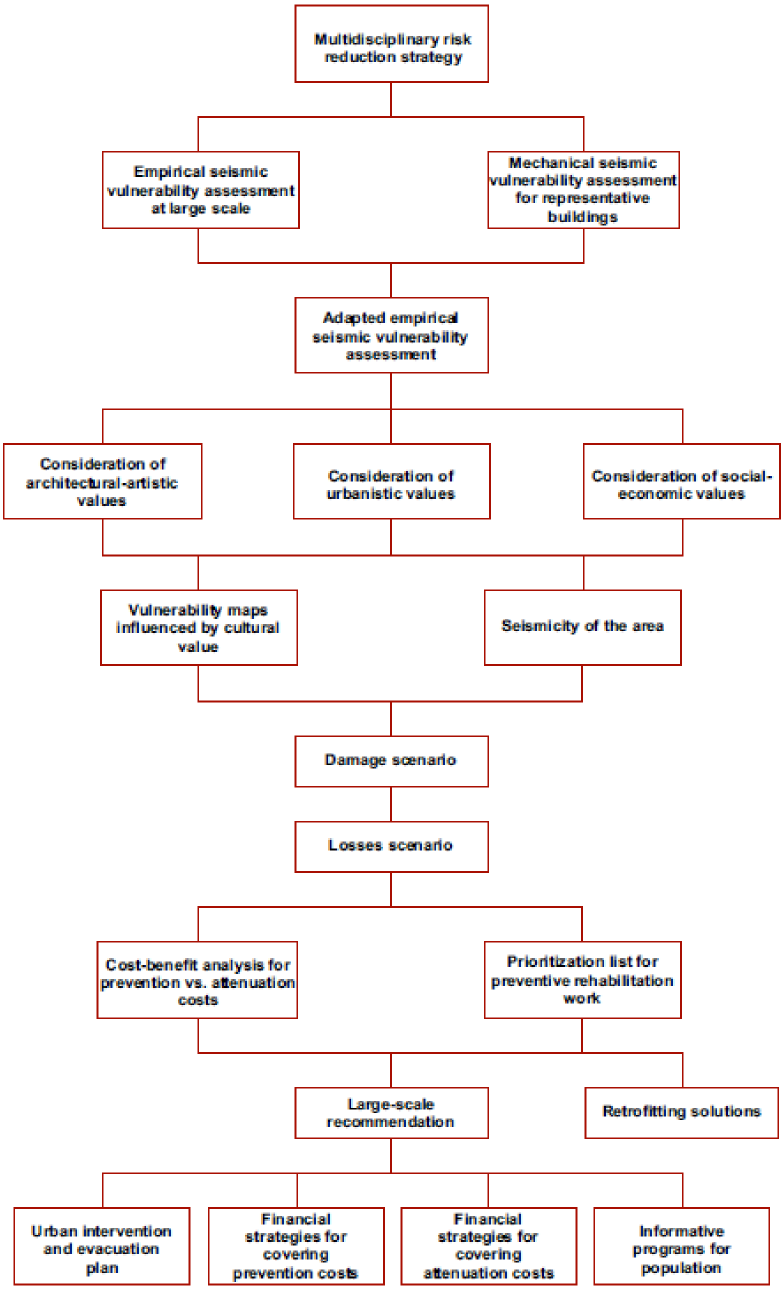


Figure 4.30. Multidisciplinary proposed strategy for seismic risk reduction in historical urban centres

Previous chapters focused on the seismic vulnerability assessment, both empirically and mechanically. Following nonlinear analysis results for the most representative historical buildings, there was adapted the empirical methodology for the near-field earthquake effect. Moreover, there were investigated the architectural-artistic, urbanistic and social-economic values and there was made a second adaptation of the empirical methodology, considering also the cultural value of the investigated buildings. Considering some particular criteria regarding the importance of the investigated site, there were also obtained the most probable damage scenario for the determined most probable macroseismic intensity and the losses scenario.

In order to be able to provide a significant urban strategy, the next step is the cost-benefit analysis of the prevention and attenuation cost. Based on this results, there can be further proposed by specialist financial strategies for covering the costs that are the most effective in the risk reduction policy for Timisoara city. Such an analysis must be made by financial specialist, but if we consider only the fact that we eliminate the indirect financial costs, consisting in cost of relocation of affected people and interruption of commercial activity, there is already a great benefit.

Meanwhile, there must be made a prioritization list for retrofitting preventive intervention in order to reduce the negative effect of an earthquake. In this situation, there should be considered two major aspects. First, there should come first the buildings that are the most vulnerable when the cultural value is considered. Second, there should come those that have the largest areas and implicitly the largest possible number of affected people and eventually commercial activity. A detailed scheme is presented in Figure 4.31, while the list with the buildings ordered by priority is illustrated in Table 4.10 for Iosefin district and in Table 4.11 for Fabric area.

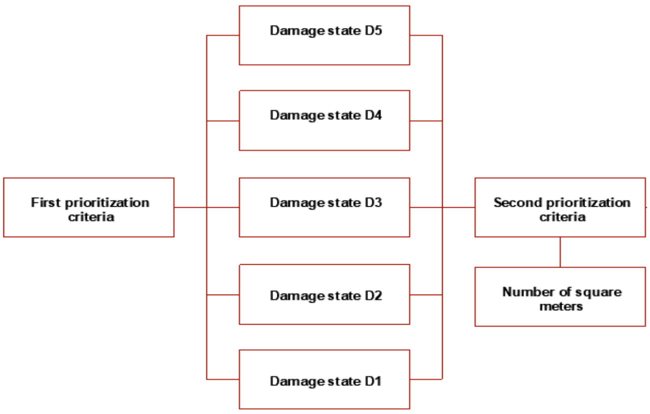


Figure 4.31. Prioritization criteria for investigated buildings

Table 4.10. List of investigated buildings after prioritization for Iosefin historical area

Number in the priority list	Building number	Expected damage state	Total area (square meters)	Typological class
1	12	D5	2228	III
2	49, 3, 28, 4, 60, 63, 8, 62, 38, 42, 68, 14, 21	D4	5868, 5640, 5008, 4908, 4512, 4140, 3948, 3708, 3564, 3456, 3392, 3080, 2704	III
3	43, 17, 56, 19, 64, 57	D4	2259, 1980, 1282, 921, 843, 740	II
4	54, 48, 22, 1, 53, 47, 5, 23, 50	D3	6500, 5400, 5056, 4992, 4424, 4132, 2432, 1196, 1036	III
5	9, 65, 52, 16, 39, 13, 33, 41, 61, 2, 6, 7, 59, 67, 18	D3	2880, 2862, 2409, 2286, 2214, 2211, 1956, 1653, 1476, 1470, 1431, 1137, 897, 794, 789	II
6	55, 34, 58, 51, 46	D3	960, 882, 868, 852, 396	I
7	37, 66, 32, 30, 15, 31, 29	D2	1596, 1641, 1290, 1106, 944, 856, 796	III, II
8	35, 27, 44, 20, 40, 26, 10, 36, 45, 25	D2	1638, 1404, 1198, 775, 613, 550, 534, 458, 410, 401	I
9	24, 11	D1	1662, 313	I

Table 4.11. List of investigated buildings after prioritization for Fabric historical area

Number in the priority list	Building number	Expected damage state	Total area (square meters)	Typological class
1	1	D5	5935	III
2	19, 27, 2, 11, 6, 26, 35, 21, 34, 7, 9, 18	D4	5344, 4864, 4815, 4256, 3948, 3280, 3140, 3056, 2800, 2016, 1964, 968	III
3	16, 8	D4	1881, 1014	II
4	37, 3, 29, 30, 4, 22, 5	D3	4596, 2584, 1959, 1659, 1587, 1496, 1488	III
5	32, 12, 20, 33, 10, 17, 36	D3	2370, 2295, 1602, 1476, 1383, 1263, 1230	II
6	25, 15	D3	785, 710	I
7	28, 31, 23, 24, 14, 13	D2	2442, 774, 651, 1788, 1250, 338	III, II, I

The next step is to look at the investigated area's neighbourhood and to identify the buildings with public character that might be used as indoor shelters in case of disaster and also the open areas that could accommodate temporary shelters, as illustrated in Figure 4.32 for the Iosefin area, and in Figure 4.33 for the Fabric district respectively.

Figure 4.32. Preliminary analysis of possible evacuation spaces and shelters in Iosefin district

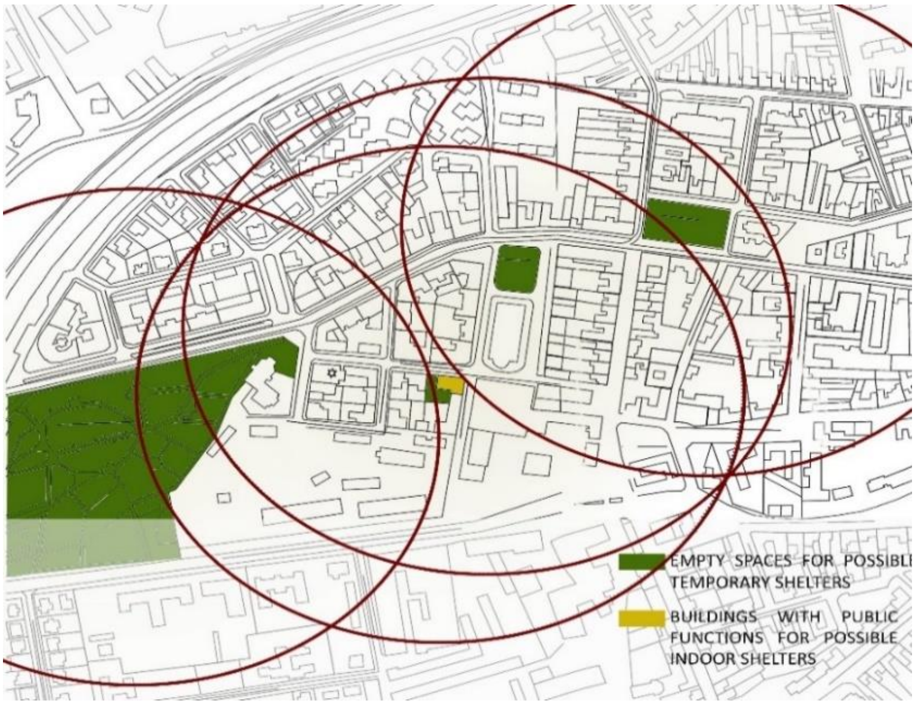


Figure 4.33. Preliminary analysis of possible evacuation spaces and shelters in Fabric district

The mapping of the possible evacuation places has shown that for the both historical districts, there are evacuation points close enough to each investigated building, covering the entire area. Despite these apparent good results, there should be considered the fact that the most vulnerable buildings were determined to be the buildings in a corner position of the aggregate, which highlights the possibility of blocking some evacuation routes. It is recommended to design potential scenarios for evacuation in order to identify the safest way from each point of the investigated areas to the closest evacuation space.

4.7 **Conclusion**

The following conclusion were determined:

(i) the proposed methodology represents only the first step in the process of assessing the cultural value of the historical buildings and will need improvement work;

(ii) there are few information about the seismic vulnerability assessment influenced by the cultural value and the proposed methodology is the first one of its type, at least in Romania;

(iii) the architectural-artistic assets can be damaged even in case of small earthquakes, so the assessment of the historical important buildings is appropriate;

(iv) the proposed methodology represents a quick and easy-to-apply way to determine the most vulnerable historical masonry buildings that present also an important cultural value;

(v) the results of the study indicate a general D2-D3 damage state for Iosefin and Fabric historical districts when the cultural value was considered;

(vi) the seismic vulnerability influenced by the cultural value is 5% higher in Fabric district then in Iosefin area, due to the poor conservation state of the buildings

(vii) in Iosefin district, 34% of the investigated buildings will need rehabilitation work in order to ensure their safety; in Fabric district, the percentage is 40%;

(viii) the determination of the most vulnerable buildings with cultural value represents a valuable tool for the multidisciplinary prevention strategy of a city;

(ix) both historical areas present sufficient evacuation places, close enough to the investigated building; further research work must be done in order to determine the most likely evacuation paths;

(x) preserving the cultural value of the historical buildings represent a mandatory work in the process of a sustainable development of any city;

The content of this chapter was published in the following papers:

1. Azap B., Apostol I., Mosoarca M., Chieffo N., Formisano A., ”Seismic vulnerability scenarios for historical areas of Timisoara”, *Proceedings of 17th National Technical-Scientific Conference on Modern Technologies for the 3rd Millennium*, Oradea, Romania, pp 149-154, 2018

2. N. Chieffo, M. Mosoarca, A. Formisano, I. Apostol, ”Seismic vulnerability assessment and loss estimation of an urban district of Timisoara”, *IOP Conference Series*, Vol. 471, Session 9, 2019

3. Onescu I., Mosoarca M., Azap B., Onescu E., ”Seismic losses scenario for cultural promenade in Timisoara Capital of Culture 2021, Romania”, *IOP Conference Series*, Vol. 471, Session 9, 2019

4. M. Mosoarca, I. Onescu, B. Azap, E. Onescu, N. Chieffo, M. Szitar-Sirbu, ”Seismic vulnerability assessment for the historical areas of the Timisoara city, Romania”, *Engineering Failure Analysis* (Impact Factor 2.897 at 13.07.2020), Vol. 101, pp. 86-112, 2019

5. Onescu I., Onescu E., Mosoarca M., ”Multi-criterial vulnerability assessment for Timisoara city, Romania”, *4th International Conference on Structure and Architecture*, Lisabona, Portugalia, 2019, accepted

6. I. Onescu, E. Onescu, M. Mosoarca, ”The impact of the cultural value to the seismic vulnerability of a historical building”, *IOP Conference Series*, 2019, accepted

The information was disseminated at the following conferences:

1. 17th National Technical-Scientific Conference on Modern Technologies for the 3rd Millennium, 22-23 march 2018, Oradea, Romania

2. World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium, 18-22 june 2018, Prague, Czech Republic

3. 8th International Conference on Engineering Failure Analysis ICEFA, 8-11 July 2018, Budapest, Hungary

4. 4th International Conference on Structure and Architecture ICSA, 24-26 July 2019, Lisbon, Portugal

5. World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium, 17-21 June 2019, Prague, Czech Republic

5 SPECIFIC BEARING CAPACITY AND DAMAGE DISTRIBUTION FOR NEAR-FIELD HISTORICAL MASONRY BUILDINGS

5.1 Interstorey drift range

The expected damage level for an unreinforced masonry building in case of an earthquake can be determined also by the relative displacement between levels. This can be done by determining the interstorey drift, as the horizontal interstorey displacement divided by the story height [245]. In order to reduce the non-structural damages, the interstorey drift should be limited to 0.1% [244], while for the prevention of collapse, the drift should be limited to 0.4% for shear and 0.6% for compression-bending [119] according to the Romanian design code [179] and Eurocode 8 [139].

The interstorey drift was determined for each building following the median longitudinal wall. There was determined a node on this wall that is the closest to the centre of gravity, as illustrated in Figure 5.1.

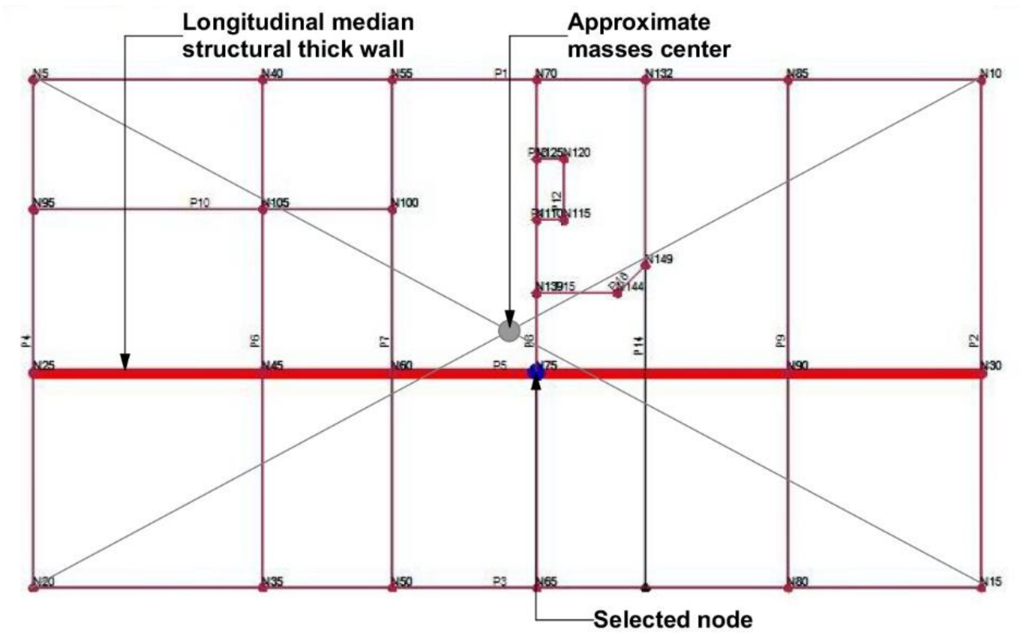


Figure 5.1. The position of the interstorey drift node in plan

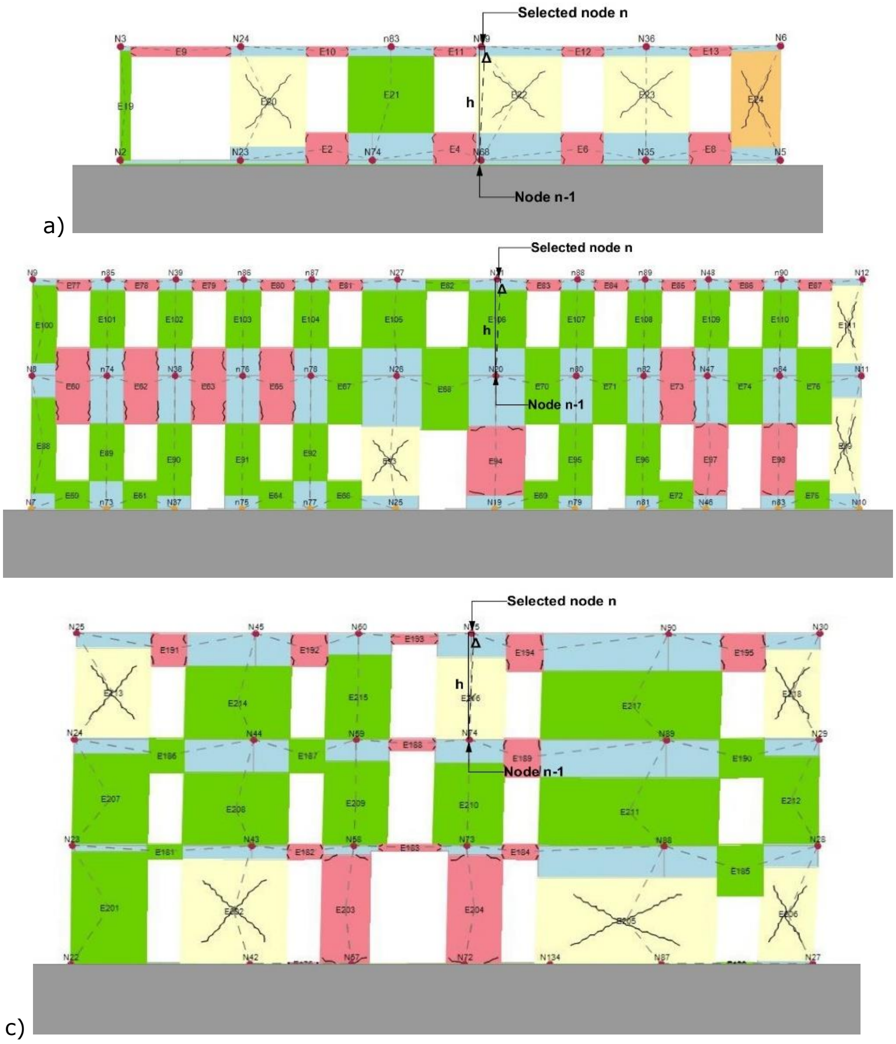
a)
b)
c)


Figure 5.2. The position of the interstorey drift node in elevation for typological class: a) type I; b) type II; c) type III;

The investigation of the interstorey drift characteristic for each analysed historical masonry building revealed an interesting pattern, as presented in Table 5.1. It was followed for two different limit states: the serviceability limit state, respectively the ultimate limit state (Figure 5.3) [246].

The interstorey drift range for each typological class is illustrated in Figure 5.4, Figure 5.5 and Figure 5.6, for both immediate occupancy and ultimate limit states, while a comparison between the average values is presented in Figure 5.7.

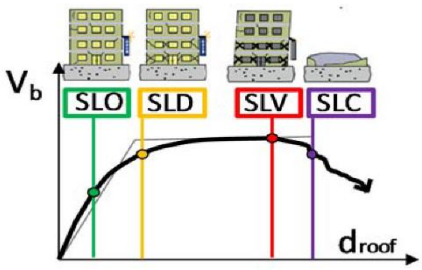


Figure 5.3. Correlation between capacity curve and building limit states [246]

Table 5.1. Interstorey drift values and expected damage state for the investigated buildings

Bld. no.	Typological class	Interstorey drift Serviceability limit state (%)	Interstorey drift Ultimate limit state (%)
25	Type I	0.01	0.05
10		0.01	0.04
55		0.01	0.04
51		0.02	0.09
24		0.01	0.04
25		0.02	0.11
Average		**0.01**	**0.06**
6	Type II	0.02	0.12
56		0.02	0.07
29		0.02	0.06
47		0.01	0.13
13		0.01	0.11
9		0.03	0.26
43		0.01	0.16
41		0.03	0.14
15		0.02	0.23
16		0.02	0.05
39		0.01	0.25
33		0.02	0.11
Average		**0.02**	**0.14**
53	Type III	0.05	0.13
54		0.02	0.21
1		0.02	0.13
23		0.02	0.28
7		0.03	0.32
3		0.04	0.16
19		0.06	0.22
Average		**0.03**	**0.21**

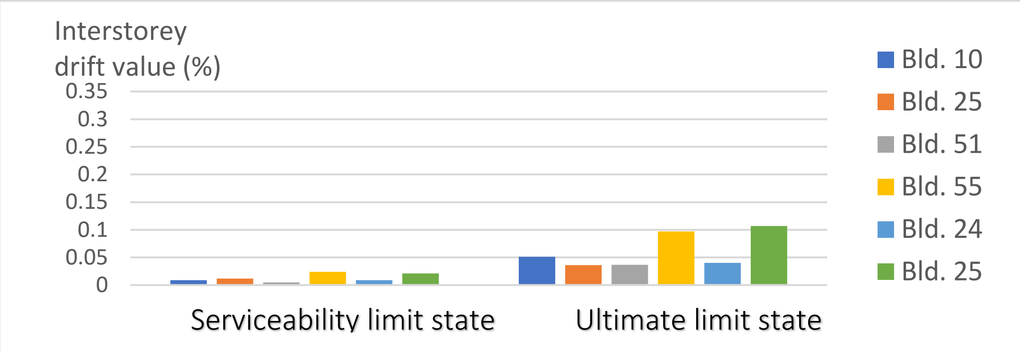


Figure 5.4. Interstorey drift value for buildings from the typological class type I

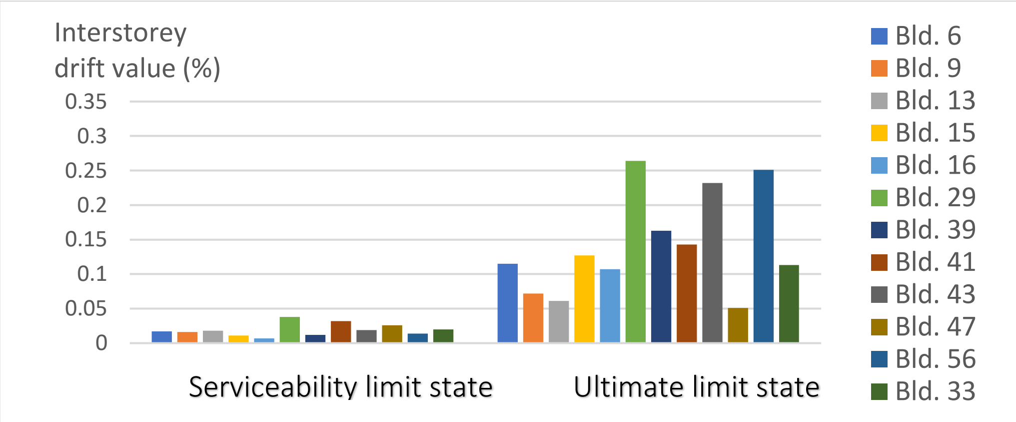


Figure 5.5. Interstorey drift value for buildings from the typological class type II

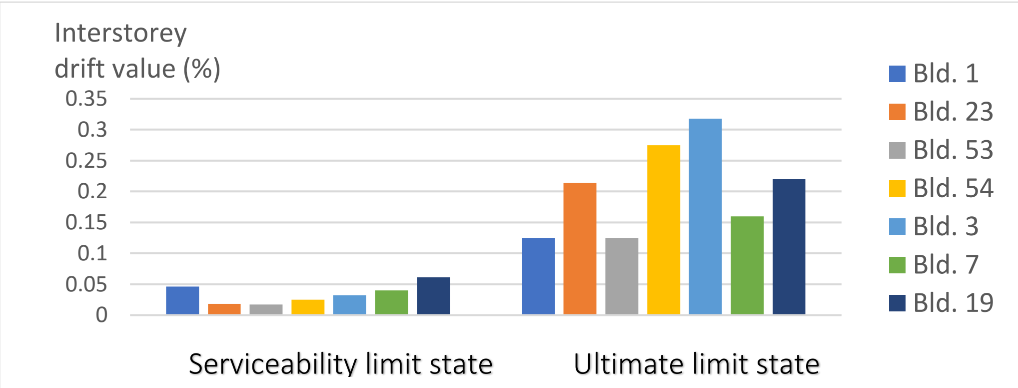


Figure 5.6. Interstorey drift value for buildings from the typological class type III

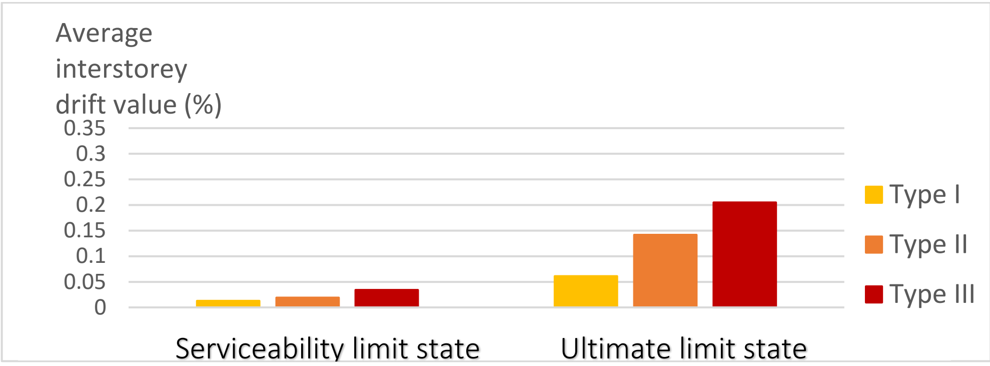


Figure 5.7. Comparison between average interstorey drift values for all typological classes

The interstorey drift values for each typological class illustrates a specific range for each type. The lowest interstorey drift is highlighted for the typological class Type I, ranging between 0.01÷0.02% at serviceability limit state and 0.04÷0.11% in the ultimate limit state. For typological class Type II, the average interstorey drift is higher with 8%, ranging from 0.01÷0.04% for the serviceability limit state and 0.05÷0.26 for the ultimate limit state. Another increase of the average interstorey drift value, with 6% can be noticed for the typological class Type III, where the ranging for the serviceability is of 0.02÷0.06% and for the ultimate limit state is of 0.13÷0.32%.

All investigated buildings present a drift value lower than the limit of 0.4% for shear and 0.6% for compression-bending that are indicated in the specific literature [119].

Based on the determined values, there was also defined the most probable damage state for each investigated buildings, as presented in Table 3.18. For the typological class Type I, the most probable average damage state is D2. For typological class Type II it is D2-D3, while for Type III is expected a D3 damage state. A more detailed classification is presented in the third chapter.

5.2 **Cracks and failure distribution**

In the first part of the study, there was investigated the structural elements where the first crack appears and what efforts cause them. The situation for the typological class Type I is presented in Figure 5.8. There can be noticed the fact that the most common cracks that appear in the buildings with just basement and ground floor is due to the bending forces, mostly appearing in the lintels from the upper part of the buildings.

In case of the typological class Type II, there were observed also cracks mostly from bending forces. In most of the cases, the most affected elements are the lintels, especially at the upper part of the structure, but there were noticed cracks also in the spandrels from the top floor, from shear forces, as presented in Figure 5.9.

The most complex in-plane failure mechanism appear to the historical masonry buildings from typological class Type III. The cracks from bending forces appear not only at the upper part of the building, but also at the medium level. Also, at the top floor of the buildings there can be seen shear damages in the spandrels, as presented in Figure 5.10.

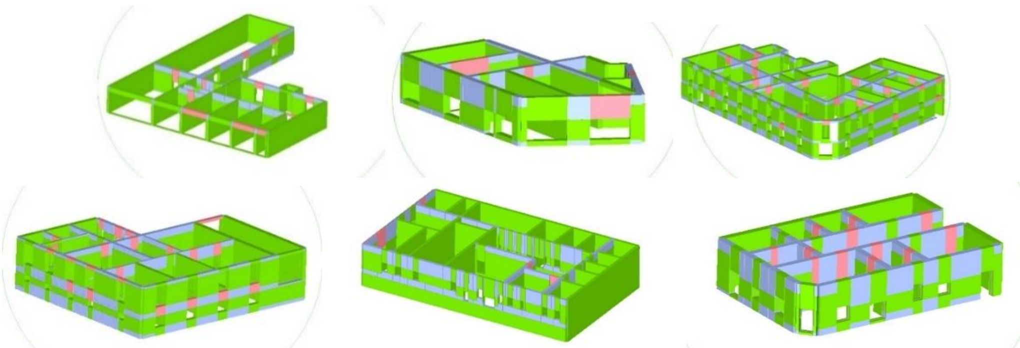


Figure 5.8. First damages registered for typological class Type I, for both historical areas

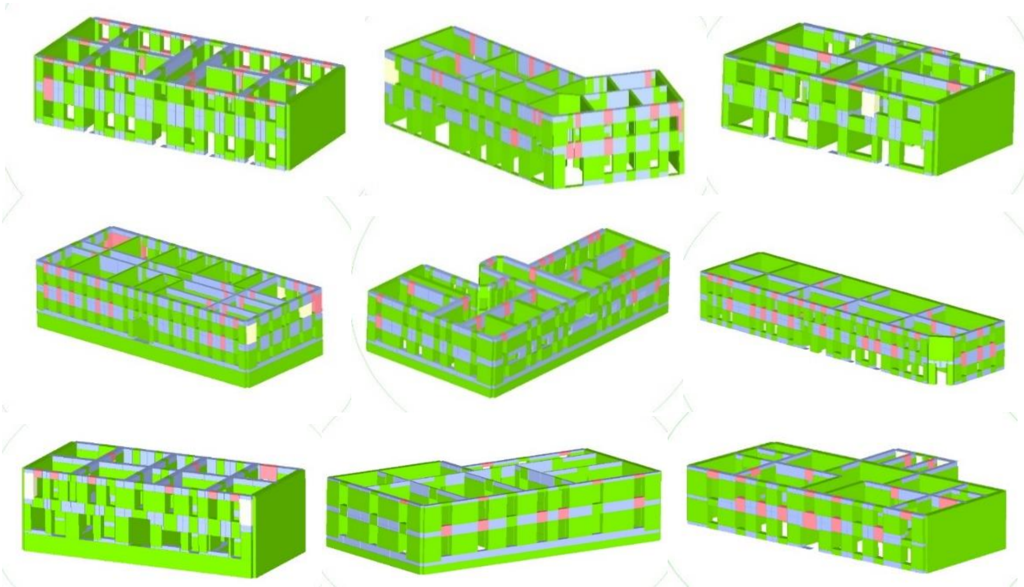


Figure 5.9. First damages registered for some buildings from typological class Type II, for both historical areas

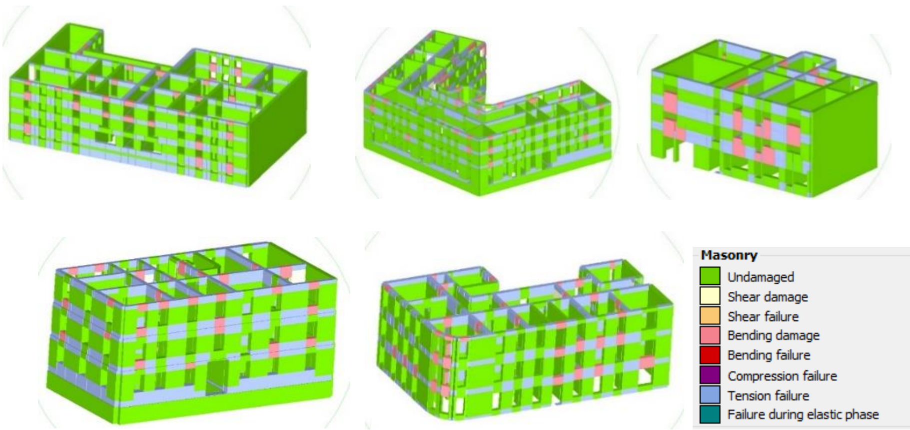


Figure 5.10. First damages registered for some buildings from typological class Type III, for both historical areas

The illustration of the specific cracking types that appear for all typological class is presented in Figure 5.11, while a detailed situation for each investigated building is presented in Table 5.2.

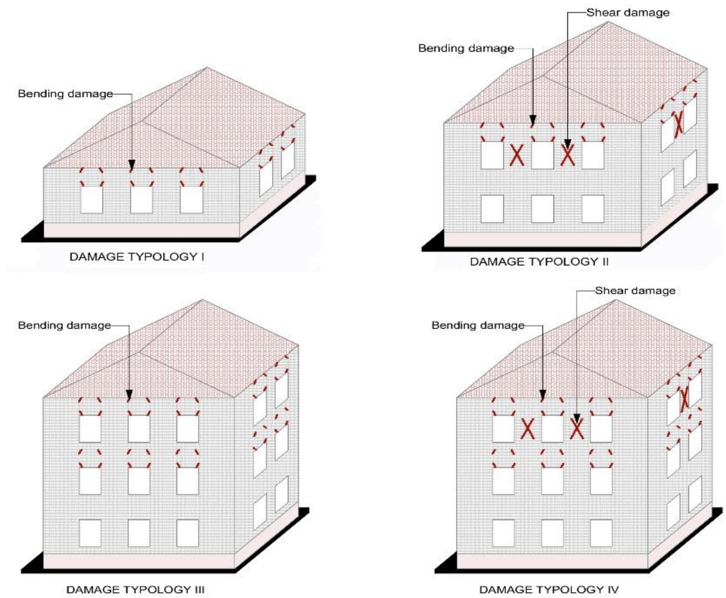
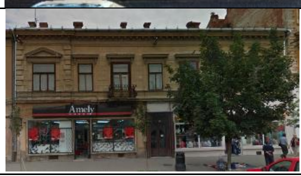
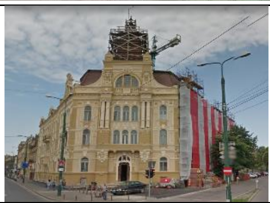
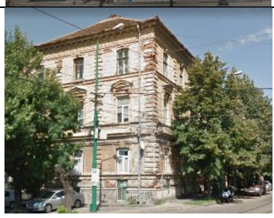


Figure 5.11. Damage typologies that were identified at the investigated historical masonry buildings

Table 5.2. First type of cracks for the 25 historical investigated masonry buildings

Bld. no.	Typ. class	Picture of the building	Forces	Affected macro-elements	Damage typology
25			bending	lintels at the upper part of the building	Typology I
10			bending	lintels at the upper part of the building	Typology I
55	Type I		bending	lintels at the upper part of the building	Typology I
51			bending	lintels at the upper part of the building	Typology I
24			bending	lintels at the upper part of the building	Typology I
25			bending	lintels at the upper part of the building	Typology I
6			bending	lintels at the upper part of the building	Typology I
56			bending shear	lintels and spandrels at the upper part of the building	Typology II
29			bending shear	lintels and spandrels at the upper part of the building	Typology II

47			bending shear	lintels and spandrels at the upper part of the building	Typology II
13	Type II		bending	lintels at the upper and medium part of the building	Typology III
9			bending	lintels at the upper part of the building	Typology I
43			bending	lintels at the upper and medium part, spandrels at the upper part of the building	Typology IV
41			bending	lintels at the upper and medium part of the building	Typology III
15			bending shear	lintels at the upper and medium part, spandrels at the upper part of the building	Typology IV
16			bending	lintels at the upper and medium part of the building	Typology III
39			bending	lintels at the upper part of the building	Typology I

33			bending shear	lintels at the upper and medium part, spandrels at the upper part of the building	Typology IV
53			bending shear	lintels at the upper and medium part, spandrels at the upper part of the building	Typology IV
54			bending shear	lintels and spandrels at the upper part of the building	Typology II
1			bending shear	lintels and spandrels at the upper part of the building	Typology II
23	Type III		bending tension	lintels at the upper and medium part of the building	Typology III
7			bending shear	lintels at the upper and medium part, spandrels at the upper part of the building	Typology IV
3			bending	lintels at the upper and medium part of the building	Typology III

19			bending	lintels at the upper and medium part of the building	Typology III

There can be seen a failure pattern for each typological class. For Type I, the most common cracking type is damage typology I.

For typological class Type II, the most common cracking types dameg typologies II and III.

The typological class Type III is the more complex. The most common cracking types for buildings with three or more levels are damage typologies III and IV.

In general, there can be say that the first affected elements are the lintels due to bending forces, followed by the spandrels due to shear forces but only for the buildings with more than one level.

5.3 Capacity curve of investigated buildings

Following the capacity curves of each investigated historical masonry building, determined previously through the mechanical analysis, there were determined the maximum base shear forces of each investigated building, for both longitudinal and transversal direction, as presented in Table 5.3.

Table 5.3. Base shear forces for the investigated buildings

District	Bld. no.	Typological class	Maximum base shear force OX-direction	Maximum base shear force OY-direction
			V [kN]	V [kN]
Iosefin	25		917	2037
	10		1283	726
	55		2265	2416
	51	**Type I**	2976	2722
Fabric	24		3482	3976
	25		966	1512
Average			**1982**	**2232**
Iosefin	6		1874	2984
	56		1476	2701
	29		1698	3329
	47		3088	6431
	13		5748	3279

	9	**Type II**	4975	6194
	43		6483	7707
	41		4433	2684
	15		2707	3493
	16		2754	2437
	39		2084	3031
Fabric	33		4006	3751
Average			**3444**	**4002**
Iosefin	53	**Type III**	9910	11088
	54		15129	15863
	1		3233	4083
	23		2232	4208
Fabric	7		2735	4243
	3		5309	4896
	19		15096	13749
Average			**7663**	**8304**

The analysis highlighted the fact that in general, the maximum base shear forces are higher on the transversal direction. For both direction, from typological class Type I to typological class Type II there can be seen an increase of the average maximum base shear forces with 42÷44%. From typological class Type II to typological class Type III, the average maximum base shear forces increases with another 51÷55%.

For typological class Type I, the maximum base shear forces on both longitudinal and transversal directions are presented in Figure 5.12, while the same elements are illustrated in Figure 5.13 for typological class Type II and in Figure 5.14 for Type III.

Also, a comparison between the average maximum base shear forces for each typological class is presented in Figure 5.15.

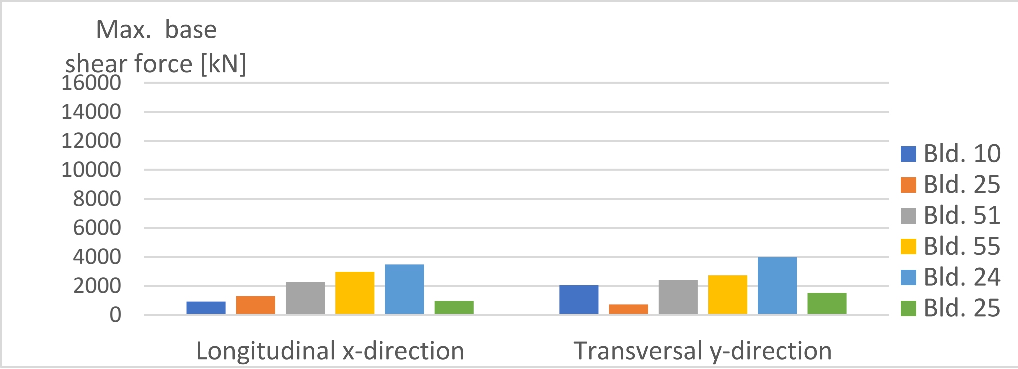


Figure 5.12. Maximum base shear forces for typological class Type I

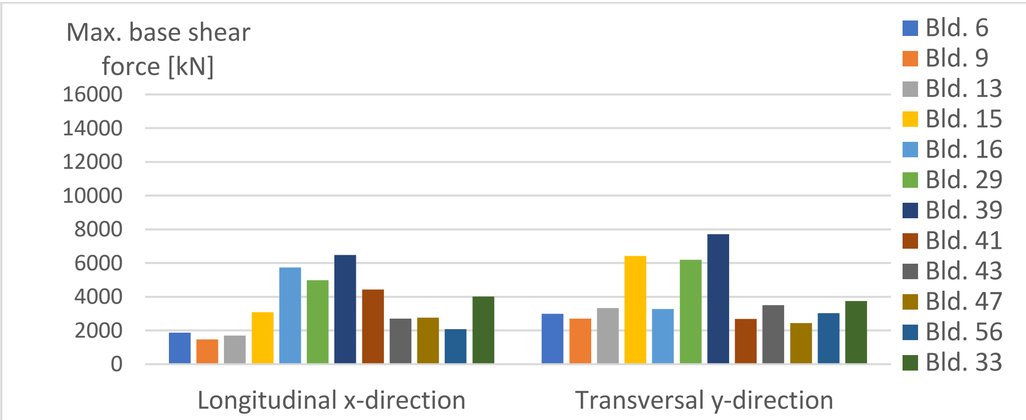


Figure 5.13. Maximum base shear forces for typological class Type II

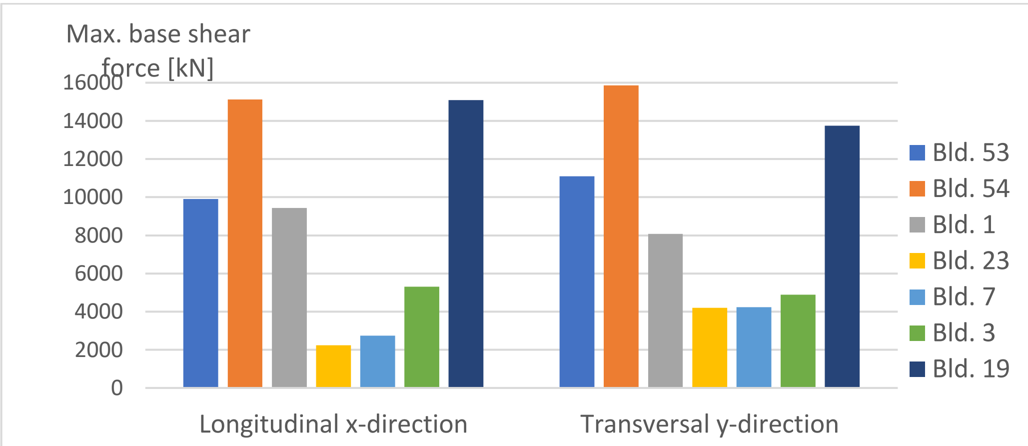


Figure 5.14. Maximum base shear forces for the investigated buildings from typological class Type III

The big differences between the maximum base shear forces of the majority of buildings from typological class Type III and Bldgs. 53, 54 in Iosefin district and 19 in Fabric area is caused by the high difference of the area between the buildings. The average total area of buildings with the lower base shear forces is 650÷700 square meters, while the average ground floor area for the buildings with the higher base shear forces is 1250 ÷1300 square meters. When all the floors are considered, the differences between the masonry masses is considerable. All the mentioned aspects lead to such significant changes in the numerical analysis.

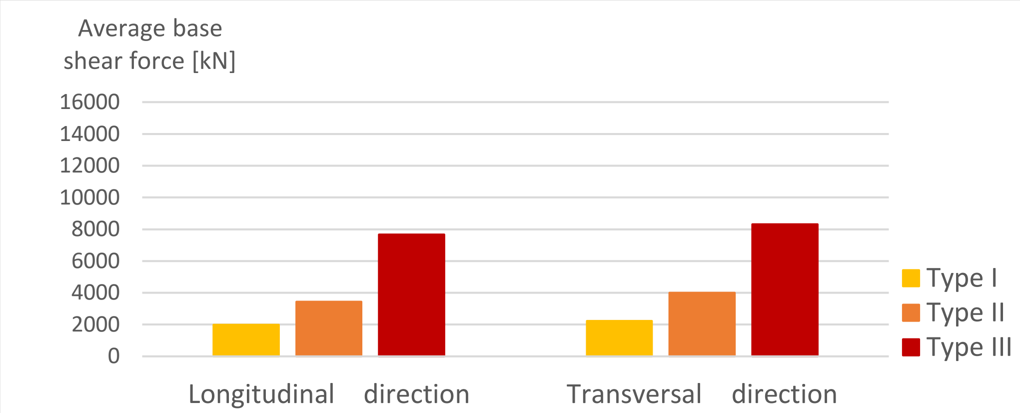


Figure 5.15. Comparison between average base shear forces for each typological class

Moreover, there were investigated also the top horizontal displacements at serviceability and ultimate limit states, for both longitudinal and transversal directions, as presented in Table 5.4.

Table 5.4. Top horizontal displacement values for the investigated buildings

Bld. no.	Typological class	Longitudinal x-direction		Transversal y-direction	
		Serviceability limit state displacement [cm]	Ultimate limit state displacement [cm]	Serviceability limit state displacement [cm]	Ultimate limit state displacement [cm]
25	**Type I**	0.04	0.16	0.06	0.24
10		0.04	0.12	0.18	0.79
55		0.08	0.24	0.04	0.12
51		0.16	0.44	0.04	0.20
24		0.08	0.28	0.08	0.24
25		0.14	0.62	0.08	0.34
Avg.		**0.09**	**0.31**	**0.08**	**0.32**
6		0.16	0.4	0.04	0.16

56	Type II	0.32	1.62	0.04	0.16
29		0.16	0.44	0.20	0.92
47		0.06	0.18	0.30	0.96
13		0.04	0.12	0.04	0.16
9		0.18	0.36	0.18	0.54
43		0.06	0.24	0.05	0.18
41		0.04	0.12	0.16	0.40
15		0.12	0.3	0.06	0.24
16		0.24	1.63	0.30	1.32
39		0.2	0.72	0.04	0.12
33		0.04	0.12	0.12	0.64
Avg.		**0.14**	**0.52**	**0.13**	**0.48**
53	Type III	0.48	1.28	0.32	1.36
54		0.92	3.45	0.78	2.12
1		0.92	4.07	0.96	2.84
23		0.42	1.56	0.59	1.65
7		0.79	2.84	0.70	1.39
3		0.6	1.74	1.26	3.49
19		0.54	1.74	0.48	1.92
Avg.		**0.67**	**2.38**	**0.73**	**2.11**

The investigation revealed the fact that serviceability limit state usually occurs at a top horizontal displacement of 23÷33% from the ultimate horizontal displacement for typological class Type I. For typological class Type II, the yielding displacement represents 15÷50% of the ultimate displacement, while for Type III, the percentage is in the range of 23÷38%.

Also, from typological class Type I to typological class Type II there can be seen a 35÷38% increase of the serviceability top displacement values and 33÷40% of the average ultimate displacement. From typological class Type II to typological class Type III, the average serviceability displacement values increases with another 79÷82%, while the increase for the average ultimate displacement is in the range of 77÷78%.

The serviceability horizontal displacements for each typological class, for both longitudinal and transversal directions are presented in Figure 5.16, Figure 5.17 and Figure 5.18, while the ultimate displacements are illustrated in Figure 5.20, Figure 5.21 and Figure 5.22. A comparison between the average horizontal displacement values for each typological class is shown in Figure 5.19 and Figure 5.23.

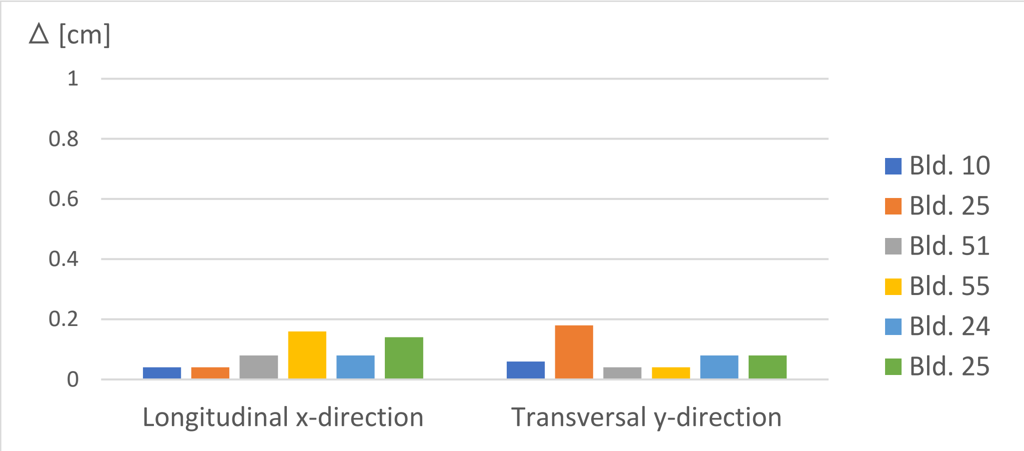


Figure 5.16. Serviceability top horizontal displacement for typological class Type I

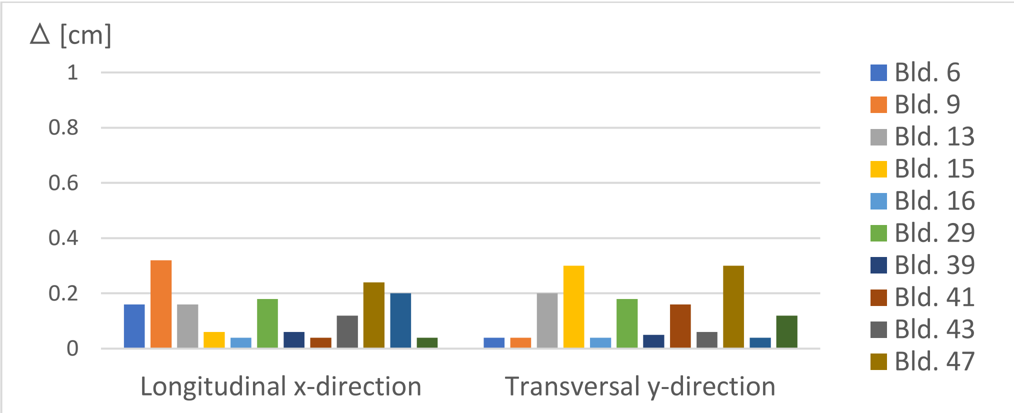


Figure 5.17. Serviceability top horizontal displacement for typological class Type II

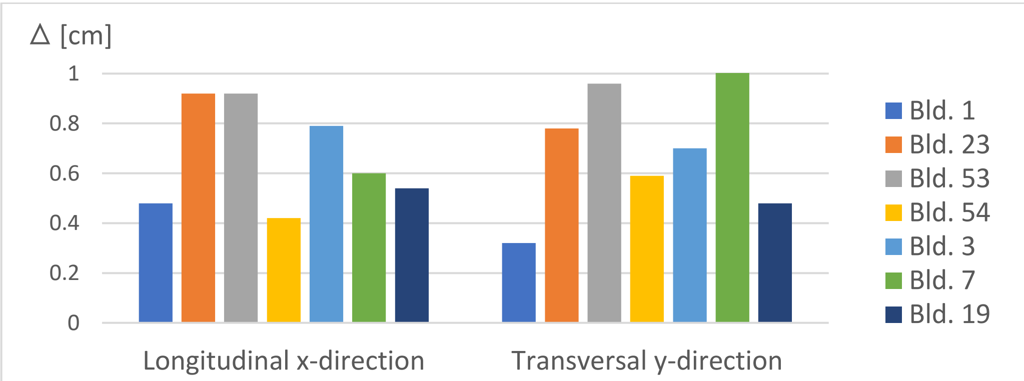


Figure 5.18. Serviceability top horizontal displacement for typological class Type III

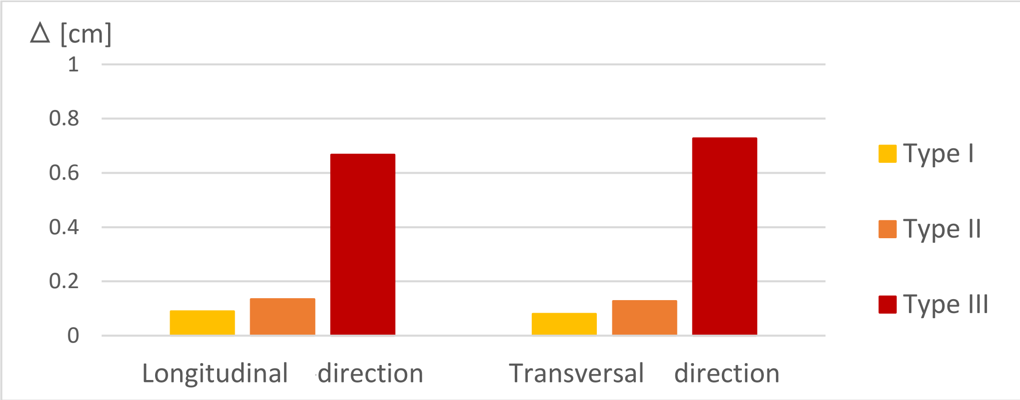


Figure 5.19. Comparison between the average serviceability horizontal displacement values for each typological class

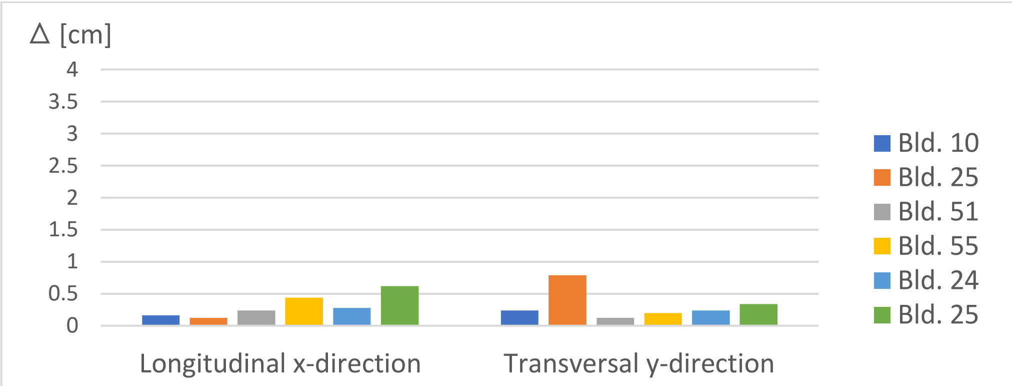


Figure 5.20. Ultimate limit state top horizontal displacement for typological class Type I

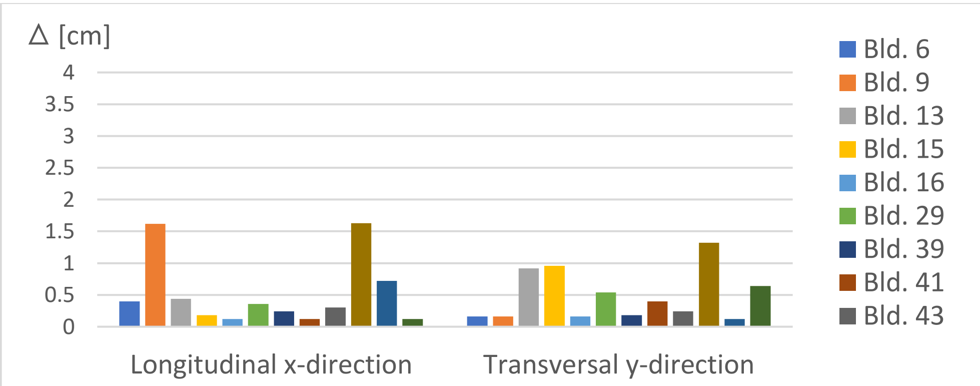


Figure 5.21. Ultimate limit state top horizontal displacement for typological class Type II

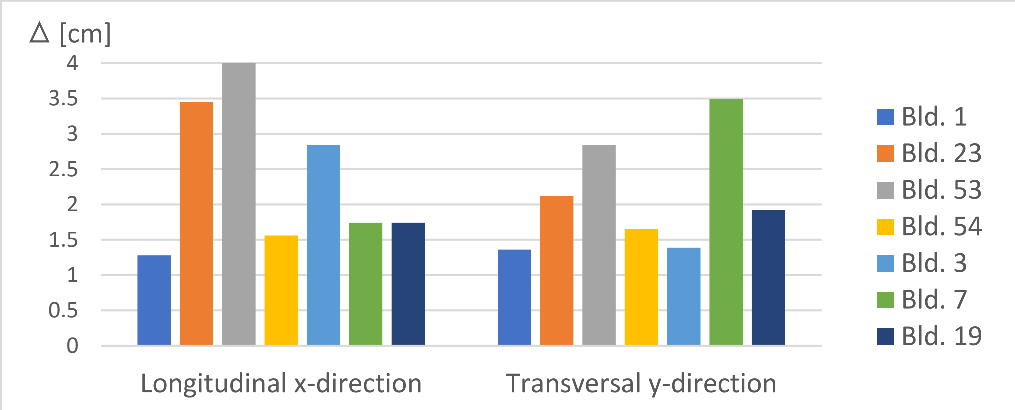


Figure 5.22. Ultimate limit state top horizontal displacement for typological class Type III

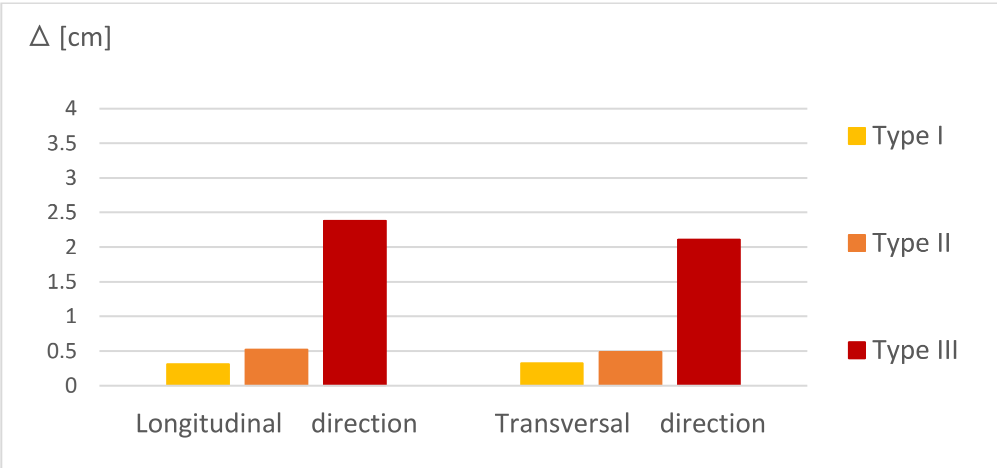


Figure 5.23. Comparison between the average ultimate horizontal displacement values for each typological class

In general, between typological classes Type I and Type II, the differences for both base shear forces and top horizontal displacements are around 30÷40%.

The biggest difference is between typological classes Type II and Type III, where the increase is up to 70%. This aspect is mainly due to the high area and volume difference between the buildings belonging to each typological class. The buildings from typological class Type III are much bigger, with bigger masses and heights, that is why they aloud bigger horizontal displacements.

5.4 **Structure ductility**

One of the last steps in the analysis of the investigated historical masonry buildings is the investigation of the structure ductility of each building. At first, there was obtained a comparison between the average bilinear force-displacement curves for each typological class, on both directions, as illustrated in Figure 5.24 and Figure 5.25.

The average bilinear force-displacement were obtained based on the average values of the base shear forces and average yielding and ultimate displacement values, for each typological class.

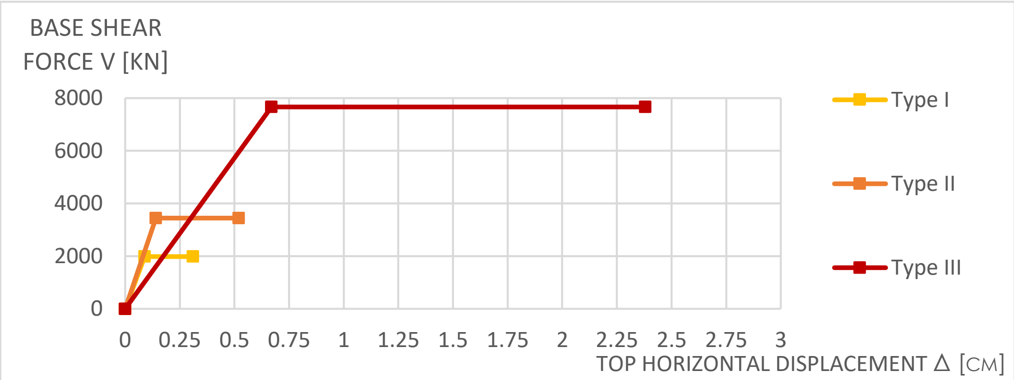


Figure 5.24. Comparison between average bilinear force-displacement curves for each typological class, on longitudinal OX-direction

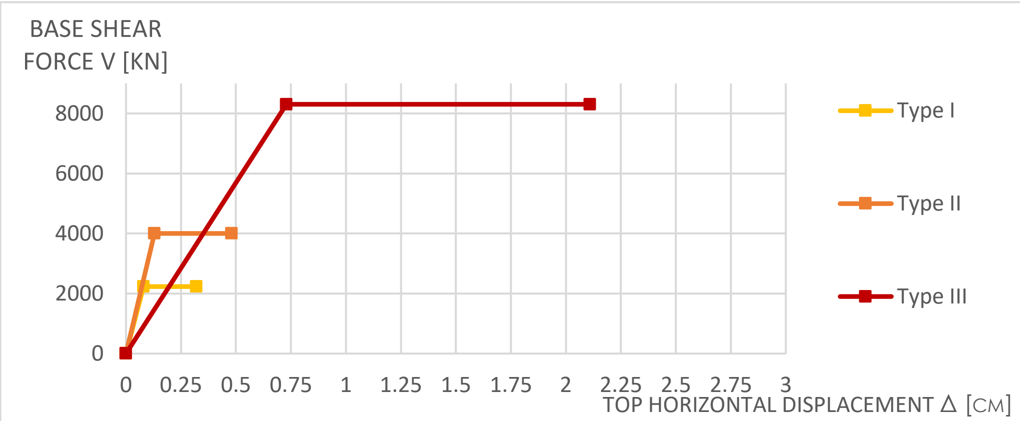


Figure 5.25. Comparison between average bilinear force-displacement curves for each typological class, on transversal OY-direction

There were determined the values of the ductility factor μ_{Δ} [247], as presented in Table 5.5.

Table 5.5. Ductility factor for the investigated masonry buildings, for both directions

Typ. class	Longitudinal direction			Transversal direction		
	Ultimate displacement Δ_U [cm]	Yielding displacement Δ_Y [cm]	Ductility factor $\mu_{\Delta x}$	Ultimate displacement Δ_U [cm]	Yielding displacement Δ_Y [cm]	Ductility factor $\mu_{\Delta y}$
Type I	0.16	0.04	3.00	0.24	0.06	3.00
	0.12	0.04	2.00	0.79	0.18	3.39
	0.24	0.08	2.00	0.12	0.04	2.00
	0.44	0.16	1.75	0.20	0.04	4.00
	0.28	0.08	2.50	0.24	0.08	2.00
	0.62	0.14	3.43	0.34	0.08	3.25
	Average		**2.45**	**Average**		**2.94**
Type II	0.40	0.16	1.50	0.16	0.04	3.00
	1.62	0.32	4.06	0.16	0.04	3.00
	0.44	0.16	1.75	0.92	0.20	3.60
	0.18	0.06	2.00	0.96	0.30	2.20
	0.12	0.04	2.00	0.16	0.04	3.00
	0.36	0.18	1.00	0.54	0.18	2.00
	0.24	0.06	3.00	0.18	0.05	2.60
	0.12	0.04	2.00	0.40	0.16	1.50
	0.30	0.12	1.50	0.24	0.06	3.00
	1.63	0.24	5.79	1.32	0.30	3.40
	0.72	0.20	2.60	0.12	0.04	2.00
	0.12	0.04	2.00	0.64	0.12	4.33
	Average		**2.43**	**Average**		**2.80**
Type III	1.28	0.48	1.67	1.36	0.32	3.25
	3.45	0.92	2.75	2.12	0.78	1.72
	4.07	0.92	3.42	2.84	0.96	1.96
	1.56	0.42	2.71	1.65	0.59	1.80
	2.84	0.79	2.59	1.39	0.70	0.98
	1.74	0.60	1.90	3.49	1.26	1.77
	1.74	0.54	2.22	1.92	0.48	3.00
	Average		**2.47**	**Average**		**2.07**

The results indicate an average ductility factor in the range of 2.43÷2.47 for the longitudinal x-direction, with neglectable differences between the typological classes, respectively 2.07÷2.94 for the transversal y-direction. The lowest credible value of the ductility factor was determined to be 1.50. There should be performed more numerical analysis on similar buildings in Timisoara, to determine a more precise value of the ductility factor.

On longitudinal direction, the smallest average ductility factor is registered for typological class Type II, followed very closely by the typological class Type I, while Type III illustrates the higher average ductility factor.

On transversal direction, the lower average ductility factor is highlighted for buildings from typological class Type III, followed by Type II. The highest average ductility factor is registered for typological class Type I.

A comparison between the average ductility factors for each typological class is illustrated in Figure 5.26 for longitudinal direction and in Figure 5.27 for transversal direction.

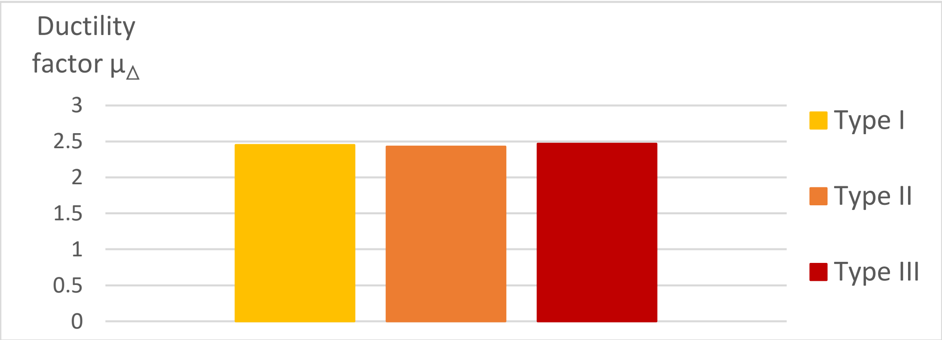


Figure 5.26. Comparison between average ductility factors for all typological classes, for longitudinal OX-direction

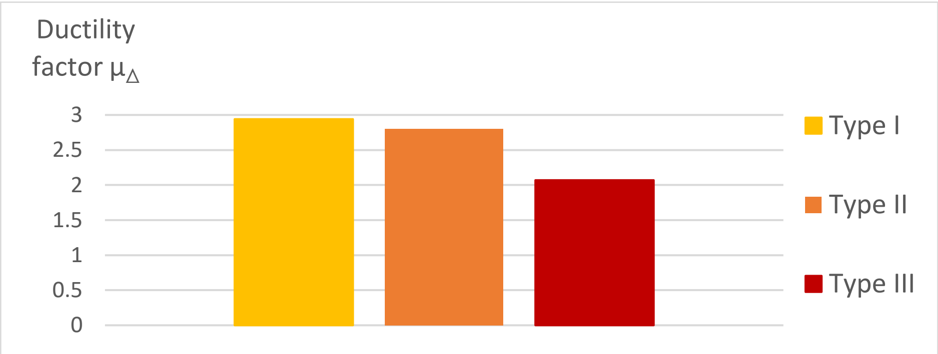


Figure 5.27. Comparison between average ductility factors for all typological classes, for transversal OY-direction

In conclusion, the ductility of each typological class is similar on longitudinal direction and different on transversal direction. Between the typological classes, the differences are in the range of 1÷2 percent for longitudinal direction, respectively in the range of 5÷30 percent for the transversal direction.

5.5 **Behavior factor**

After the calculation of the displacement ductility, there were determined the values of the behavior factor q. The values were determined following the Equation 43 [248] and are presented in Table 5.6.

$$q = (2\mu_{\Delta} - 1)^{1/2} \tag{43}$$

Table 5.6. Behaviour factors for the investigated unreinforced masonry buildings

Typ. class	Longitudinal direction		Transversal direction	
	Ductility factor	Behaviour factor	Ductility factor	Behaviour factor
	μ_{Δ}	q	μ_{Δ}	q
Type I	3.00	2.24	3.00	2.24
	2.00	1.73	3.39	2.40
	2.00	1.73	2.00	1.73
	1.75	1.58	4.00	2.65
	2.50	2.00	2.00	1.73
	3.43	2.42	3.25	2.35
	Average	**1.95**	**Average**	**2.18**
Type II	1.50	1.41	3.00	2.24
	4.06	2.67	3.00	2.24
	1.75	1.58	3.60	2.49
	2.00	1.73	2.20	1.84
	2.00	1.73	3.00	2.24
	1.00	1.00	2.00	1.73
	3.00	2.24	2.60	2.05
	2.00	1.73	1.50	1.41
	1.50	1.41	3.00	2.24
	5.79	3.25	3.40	2.41
	2.60	2.04	2.00	1.73
	2.00	1.73	4.33	2.77
	Average	**1.88**	**Average**	**2.12**
Type III	1.67	1.53	3.25	2.35
	2.75	2.12	1.72	1.56
	3.42	2.41	1.96	1.71
	2.71	2.10	1.80	1.61
	2.59	2.04	0.98	0.99
	1.90	1.67	1.77	1.59
	2.22	1.86	3.00	2.24
	Average	**1.96**	**Average**	**1.72**

The results indicate an average behaviour factor in the range of 1.88÷1.96 for the longitudinal x-direction, with neglectable differences between the typological classes, respectively 1.72÷2.18 for the transversal y-direction. The lowest credible value that was observed is q=1.5. There should be performed more numerical analysis on similar buildings in Timisoara, to determine a more precise value of the behavior factor.

On longitudinal direction, the smallest average behaviour factor is registered for typological class Type II, followed very closely by the typological class Type I, while Type III illustrates the higher average behaviour factor.

On transversal direction, the lower average ductility factor is highlighted for buildings from typological class Type III, followed by Type II. The highest average behaviour factor is registered for typological class Type I.

A comparison between the average behaviour factors for each typological class is illustrated in Figure 5.28 for longitudinal direction and in Figure 5.29 for transversal direction.

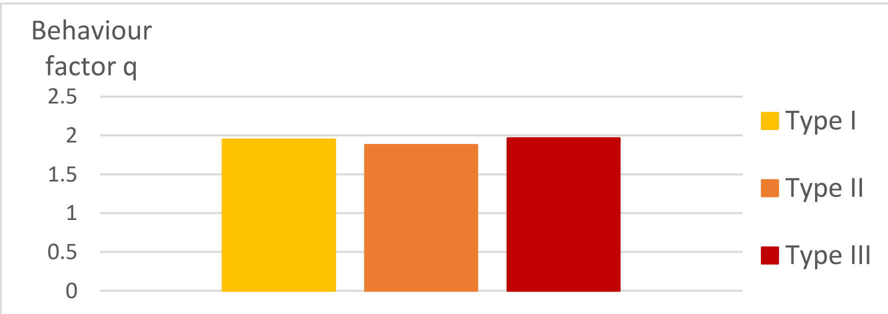


Figure 5.28. Comparison between average behaviour factor q for all typological classes, for longitudinal OX-direction

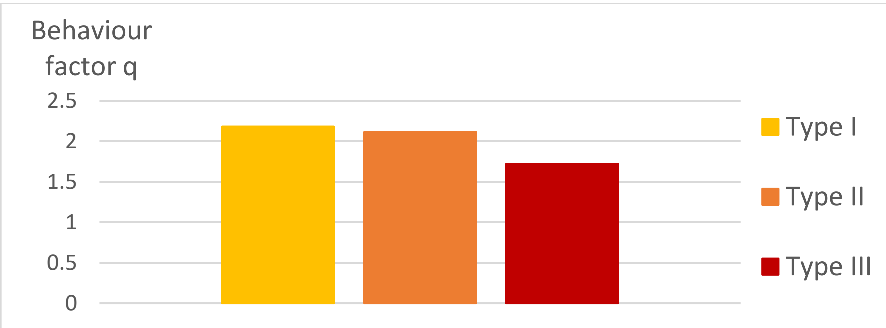


Figure 5.29. Comparison between average behaviour factor q for all typological classes, for transversal OY-direction

Experimental test and various analysis of researchers in the field indicate the fact that the values of the behaviour factor for the unreinforced masonry structures could reach values up to q=2.84, as suggested by Tomazevic. et. al. [248].

The average behaviour factors, for all three typological classes, for both longitudinal and transversal directions are around the value of q=2.

In conclusion, the results indicate a similar behaviour factor for all three typological classes on longitudinal direction, with differences in the range of 1÷4%. For the transversal direction, the differences between typological classes are in the range of 5÷30%. The behaviour factor values are higher on transversal direction for typological classes Type I and Type II and lower for Type III.

5.6 **Target displacement of the equivalent SDOF system**

The comparison between capacity and demand of the structure [249] (Fig. 5.30) is illustrated in Figure 5.31 for typological class Type I, in Figure 5.32 for Type II, respectively in Figure 5.33 for Type III. The displacement demand S_{de} and the acceleration S_{ae} are illustrated in Table 5.7 for all the investigated buildings.

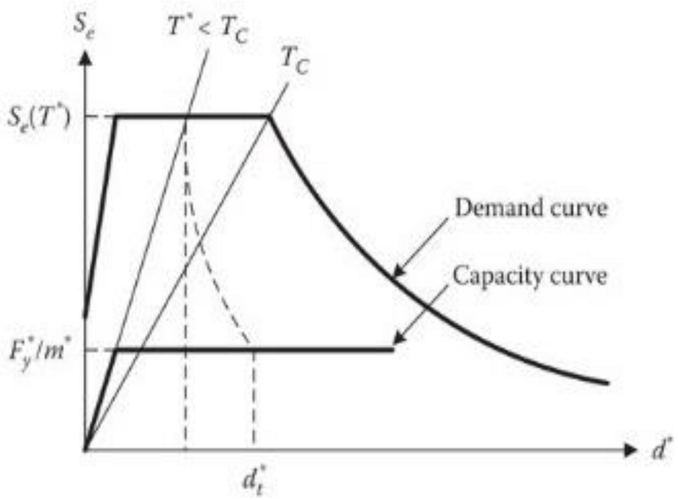
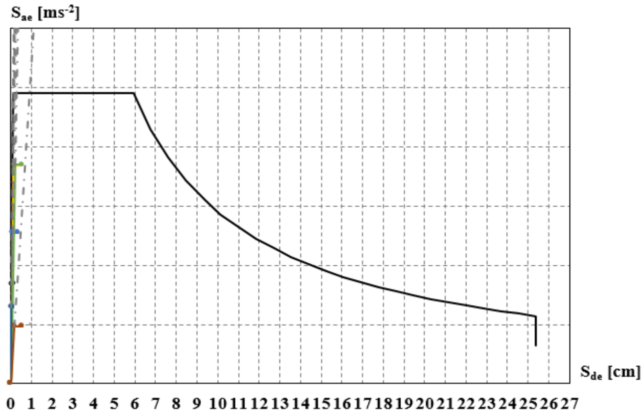


Figure 5.30. Determination of the inelastic displacement demand for short-period structures

a) 

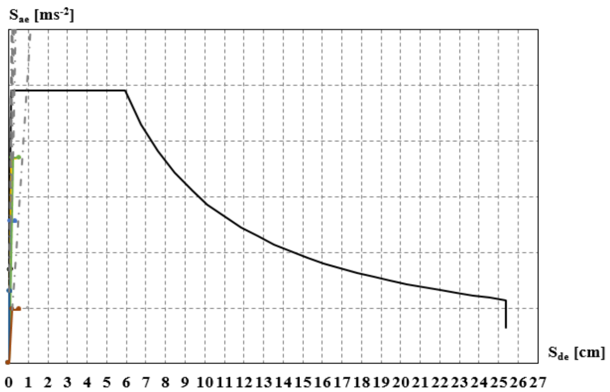
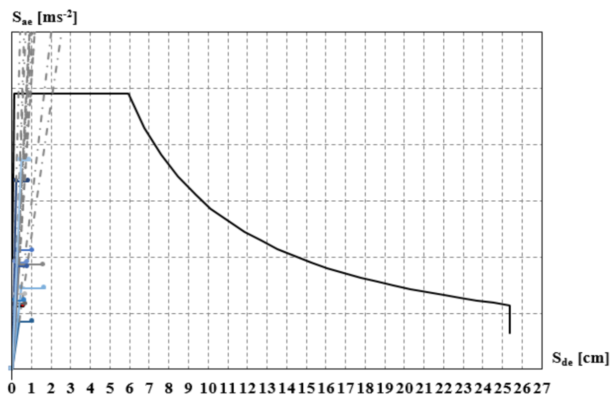
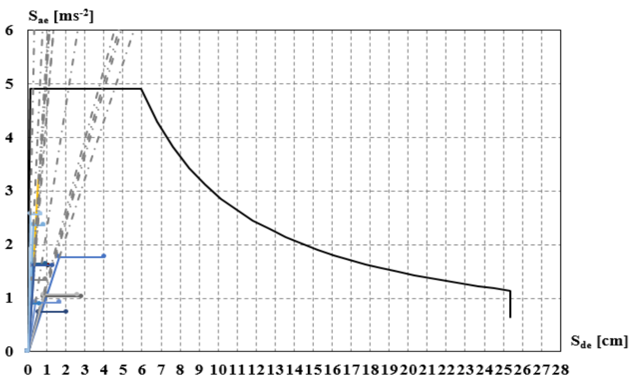
b) 

Figure 5.31. Comparison between capacity and demand for buildings of typological class Type I in Banat seismic area: a) on longitudinal OX direction; b) on transversal OY direction

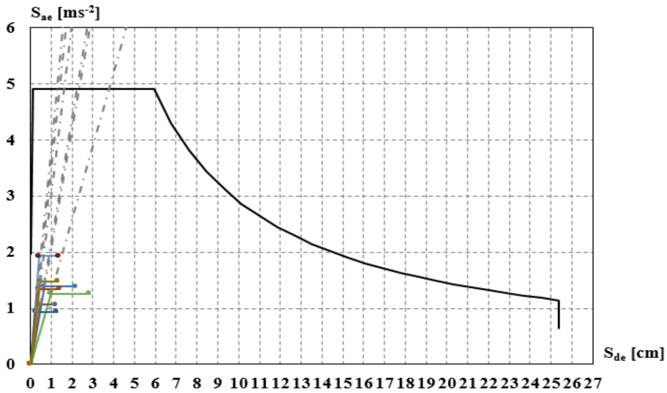
a) 



b)

Figure 5.32. Comparison between capacity and demand for buildings of typological class Type II in Banat seismic area: a) on longitudinal OX direction; b) on transversal OY direction

a)



b)

Figure 5.33. Comparison between capacity and demand for buildings of typological class Type III in Banat seismic area: a) on longitudinal OX direction; b) on transversal OY direction

Table 5.7. Displacement demand and acceleration for the investigated buildings

Typ. class	Longitudinal direction		Transversal y-direction	
	Displacement	Acceleration	Displacement	Acceleration
	[cm]	[ms^{-2}]	[cm]	[ms^{-2}]
Type I	0.10	1.70	0.30	2.20
	0.10	3.60	0.50	2.50
	0.20	2.50	0.30	2.60
	0.20	3.60	0.15	3.20
	0.15	1.30	0.10	1.80
	0.90	1.00	0.10	1.90
Average	**0.28**	**2.28**	**0.24**	**2.36**
Type II	0.90	1.10	0.90	1.60
	0.80	2.10	4.60	1.80
	2.10	0.80	1.00	1.70
	0.90	1.20	4.00	1.00
	0.40	3.30	3.70	0.80
	1.80	1.50	0.80	2.40
	1.00	1.40	4.00	1.10
	0.60	1.90	2.10	0.90
	1.70	1.50	0.90	1.10
	1.00	1.80	1.00	1.30
	0.80	1.80	1.10	1.60
	0.60	3.60	0.30	2.60
Average	**1.05**	**1.83**	**2.03**	**1.49**
Type III	2.10	1.90	1.00	1.90
	3.20	1.30	2.30	1.40
	3.10	1.50	3.80	1.30
	1.60	1.90	1.20	0.90
	2.50	1.30	1.40	1.40
	2.30	1.50	2.20	1.10
	1.60	1.90	1.70	1.50
Average	**2.34**	**1.61**	**1.94**	**1.36**

On longitudinal direction, the average displacement demands increase from 0.24 cm for typological class Type I with 70% to 1.05 cm for Type II. Another 50% increasement from Type II can be seen until the 2.34 cm average displacement for typological class Type III. On transversal direction, from Type I to Type II there is an 80% increasement and from Type II to Type III a 5% decrease. A comparison of the average displacement demand for the three typological classes is illustrated in Figure 5.34.

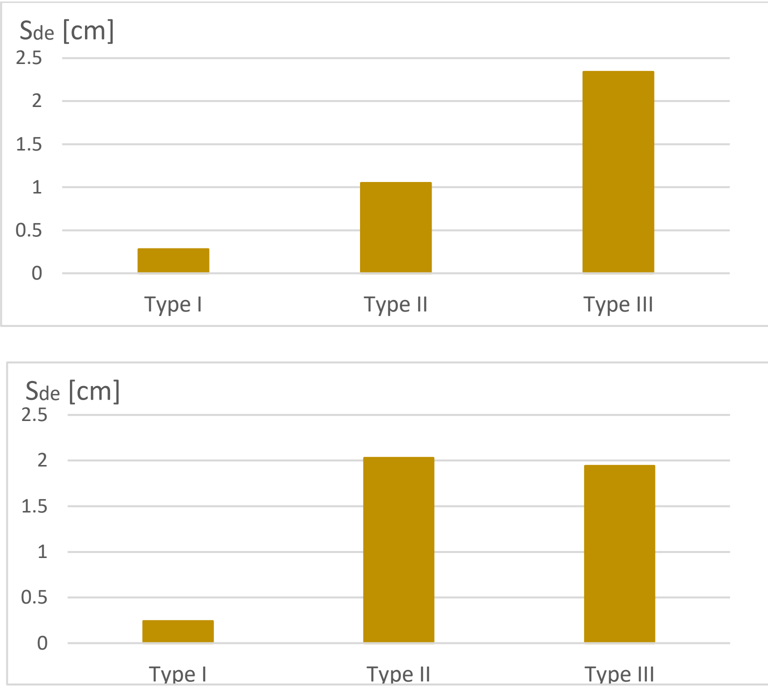
a)
b)


Figure 5.34. Comparison between the average displacements for the three typological classes: a) on longitudinal OX direction; b) on transversal OY direction;

The analysis of the target displacement represent a first step in the process of the assessment of Timisoara historical masonry building's seismic response. The procedure should be further developed through in-situ determination physical-mechanical proprieties of the structural materials.

5.7 **Fragility curves**

The assessment of different damage states suffered by the investigated buildings can be obtained through the fragility curves, for different seismic actions [250]. Fragility curves represent a tool for estimating the damage propensity for the investigated typological classes. In other words, it illustrate the probability for reaching a specific damage state when a specific displacement S_{de} is obtained [251].

The probability of reaching a specific damage state or limit state (LS) under a particular measure of seismic intensity, in this case the PGA represents the fragility function. The function is defined by those two parameters, the displacement demand determined by the seismic intensity for each limit state and the dispersion β for each limit state. The first parameter is obtained by performing numerical analysis based on the design codes that indicate the most probable PGA for a specific region. The second parameter is influenced by the uncertainties in the seismic demand and the variability of the capacity of the investigated buildings. The method to obtain the fragility curves is the discretised method that links the average damage μ_D to the displacement S_{de} [251].

The average damage degree is determined by estimation, for each acceleration step. Actually, there is made the ratio between the seismic demand and the capacity of the structure that were determined in the previous subchapter [251].

The methodology uses damage state D1 as representation for slight damage, D2 for moderate damage, D3 for serious damage and D4 for near collapse or even collapse damage. Each damage state is obtained following Equation 44, as function of yieldind and ultimate displacement (Table 5.5) from the previously obtained bilinear curves [251], [250].

$$\begin{aligned} S_{D1} &= 0.7\ x\ \Delta_y \\ S_{D2} &= 1.5\ x\ \Delta_y \\ S_{D3} &= 0.5\ x\ (\Delta_y + \Delta_u) \\ S_{D4} &= \Delta_u \end{aligned} \quad (44)$$

For the determination of the expected performance level of the investigated structure, there is followed Equation 45, as the mathematical expression of the fragility curves [170].

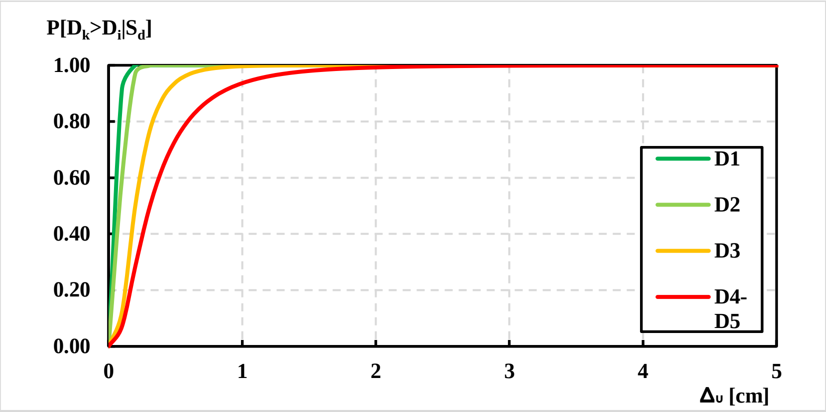
$$P[D_k|S_{de}] = \Phi[\frac{1}{\beta}\ x\ \left(\ln\frac{S_{de}}{S_{de,DS}}\right)] \quad (45)$$

Where Φ represents the cumulative distribution function and $S_{de,Ds}$ is considered to be the average spectral displacement value obtained for each damage state. β is the standard deviation of the lognormal distribution that depends on the uncertainties of the seismic demand and is obtained based on Equation 46 [170].

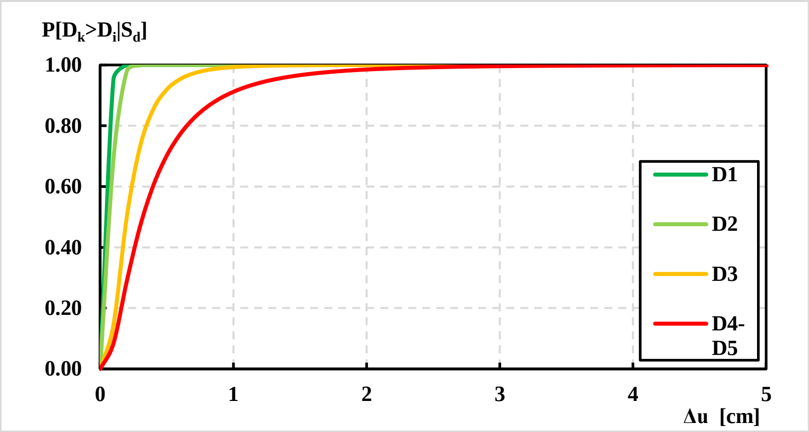
$$\beta = 0.45\ x\ \ln(\mu_\Delta) \quad (46)$$

Where μ_Δ represents the ductility of the structure, previously defined (Table 5.5).

Following the previously expressed methodology, there were determined the average fragility curves for the three investigated typological classes, on both longitudinal and transversal directions, as illustrated in Figure 5.35, Figure 5.36 and Figure 5.37.

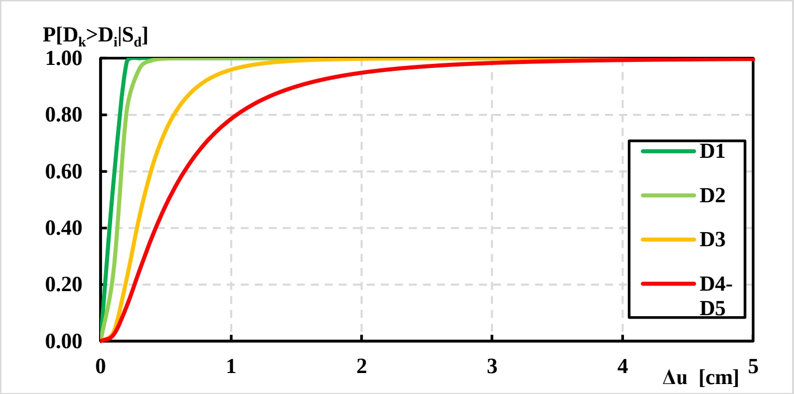


a)

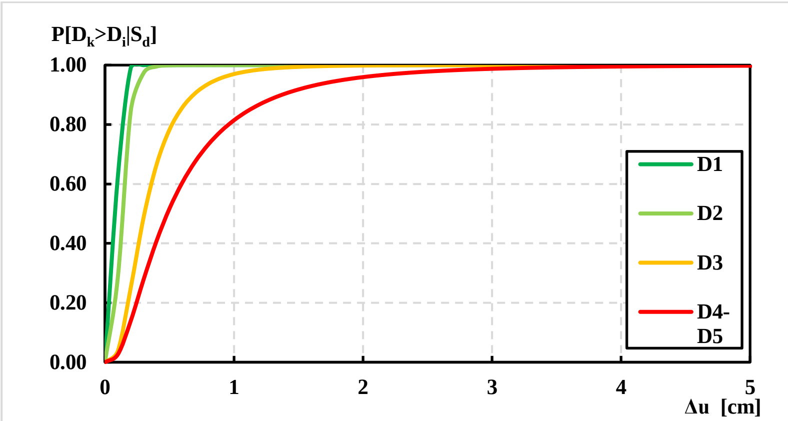


b)

Figure 5.35. Average fragility curves for typological class Type I: a) for longitudinal OX-direction; b) for transversal OY-direction;

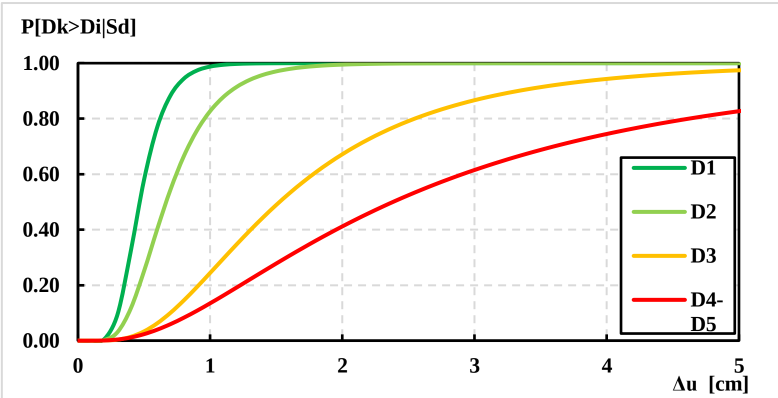


a)

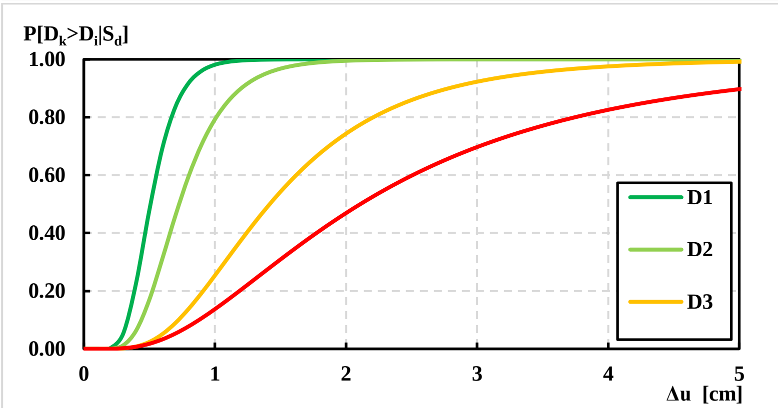


b)

Figure 5.36. Average fragility curves for typological class Type II: a) for longitudinal OX-direction; b) for transversal OY-direction;



a)



b)

Figure 5.37. Average fragility curves for typological class Type III: a) for longitudinal OX-direction; b) for transversal OY-direction;

For typological class Type I, on longitudinal direction the average ultimate displacement was determined to be 0.31 cm, meaning that the changes to reach damage state D4-D5 are under 48%, respectively 75% for damage state D3. On transversal direction, for the average ultimate displacement 0.32 cm, there are 47% chances of reaching damage state D4-D5 and 73% changes for D3.

For typological class Type II, the average ultimate displacement was determined to be 0.52 cm on longitudinal direction and 0.48 cm on transversal one. The chances of reaching damage states D4-D5 are 48%, respectively 52% on the two directions, while for damage state D3 there are 75%, respectively 78%.

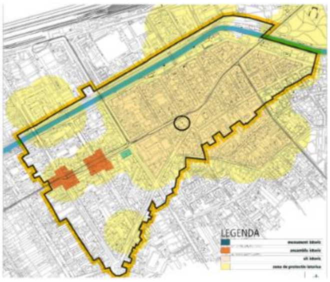
Regarding the typological class Type III, the chances of reaching damage states D4-D5 are 50% for ultimate average ultimate displacement 2.38 cm on longitudinal direction, respectively 2.11 cm on transversal direction. Damage state D3 present 77% chanches of reaching for both directions.

In conclusion, for all the situation, the chanches of reaching near collapse or collapse damage state are under 50%. The most expected damage state is D3, highlighting the good correlation with the empirical and mechanical seismic vulnerability assessment results.

5.8 **Influence of the wooden framework roof on the structural behaviour of historic masonry buildings**

When the mechanical vulnerability assessment is made, there should be considered also the influence of the wooden framework, the roof structure. In many cases, the roof is consider not important for the seismic behaviour of the studied building, but in the next study there will be illustrated how in reality can improve the bearing capacity. This situation is more visible when the wooden framework of the roof is more complex and rigid and less visible when the roof structure is very simple and easy.

The selected building for the investigation of the impact of the timber framework over the global seismic behaviour is located in Iosefin area, at the intersection of two main boulevards, 16^{th} December 1989 and King Carol the 1^{st} and is called also Elite’s Palace. The building is very important in the memory of the local community, as one of the most important palaces in the area, which was also the central office of the economy fund of Timisoara’s municipality. Is built between 1886 and 1888 in Eclectic architectural style and presents a large basement, ground floor and two levels above, being one of the tallest historical buildings in the district. At the ground floor, there was at a moment a famous café shop and nowadays there are still commercial spaces. In the present, the basement isn’t use and at the upper floors there are residential spaces. The location and the historical image of the case study building are presented in Figure 5.38 [252].

a) 

b) 

Figure 5.38. Investigation of Elite's Palace in Iosefin district: a) location into the district; b) historical image with the building [252]

As almost all the buildings in the area, Elite's Palace is made in brick masonry with lime mortar. The longitudinal walls, those that are parallel with the main facades are very massive, presenting thicknesses of 90 cm at the basement, 80 cm at the ground floor and 70 cm at the other floors. There is also another longitudinal median massive wall that is parallel with the main façade and is structural also. The transversal walls instead, are not structural, they present thicknesses of about 15 cm and they only define the interior spaces and increase the rigidity of the building. They are also not connected with the façade walls, leading to a high risk of developing out-of-plane failure mechanisms. The horizontal structural elements are made of brick vaults above the basement with a thickness of 15 cm and wooden floors. The height of the ground floor is almost five meters, while the total height of the building is around 14 meters until the starting point of the roof. The general conservation state is medium [252].

The palace is made from three wings that follow the street path, with a main front length of 38 meters (Figure 5.39). Between the wings, there is contoured an interior courtyard. The ground floor is treated as a first register, at human scale, with bosses-like elements for a specific architectural rhythm. For the other floors, this bosses-like elements can be seen only at the corners of the building, marking the direction change of the façade. The roof is made in wooden framework, in a very complex and rigid way (Figure 5.40), with a height of almost 5 meters and an opening a bit over 14 meters [252].

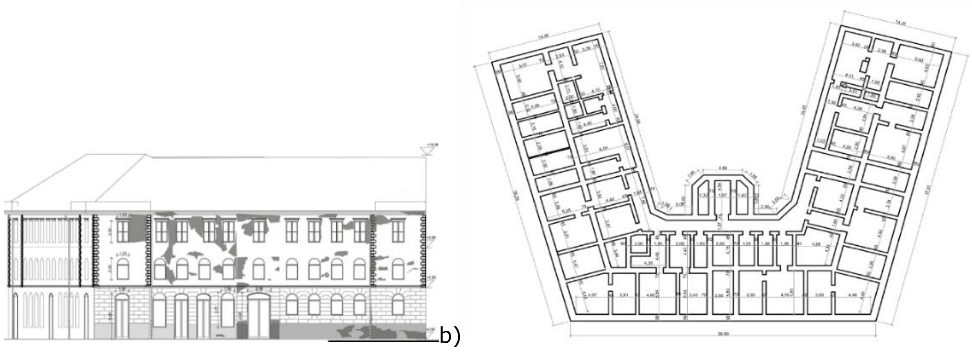

a) b)
Figure 5.39. Survey of Elite's Palace: a) main façade; b) basement plan [252]


Figure 5.40. Wooden framework details from similar building [207]

The comparison of the bearing capacity with and without the roof framework considered was made following pushover analysis with Tremuri software [120], [122]. The investigation was made considering the in-plane failure mechanism, following three important steps, such as appearance of the first damage, maximum shear force and top horizontal displacement on the bilinear force-displacement curve.

The definition of the wooden framework was made in a simplified way in Tremuri software, is illustrated in Figure 5.45. The mechanical prorpieties of the wooden elements are described in Table 5.8.

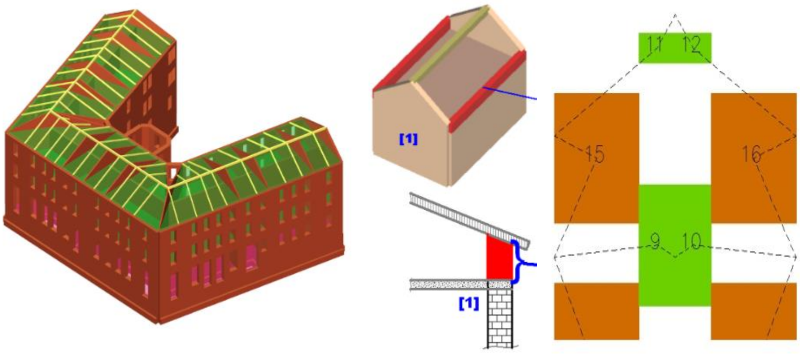


Figure 5.41. Wooden framework conformation in Tremuri

Table 5.8. Mechanical proprieties of the wooden elements

E [N/mm^2]	G [N/mm^2]	w [kN/m^3]	f_{wm} [N/mm^2]	f_{wk} [N/mm^2]	ym	kmod
9500	590	4	29	20	1.30	0.60

The first considered situation was the one of the historical masonry building without the rigid roof. The failure mechanism for the facades are illustrated in Figure 5.42 and Figure 5.43 [252]. The synthesis of the results is illustrated in Table 5.9.

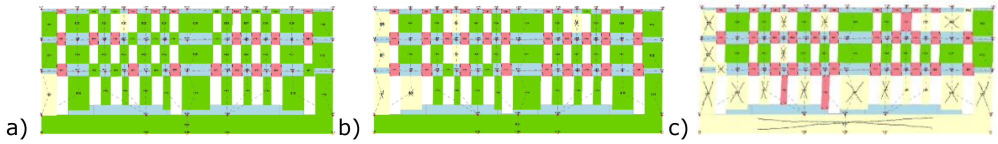


Figure 5.42. In-plane failure mechanism for Elite's Palace, for longitudinal seismic direction: a) appearance of first damage; b) maximum shear force; c) top horizontal displacement; [252]

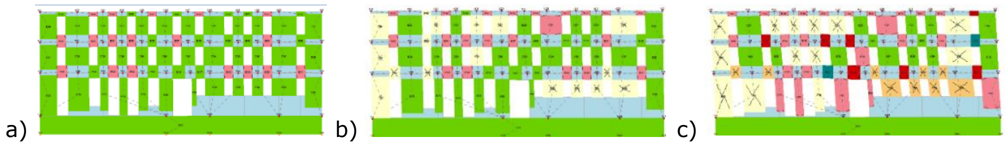


Figure 5.43. In-plane failure mechanism for Elite's Palace, for transversal; seismic direction: a) appearance of first damage; b) maximum shear force; c) top horizontal displacement; [252]

Table 5.9. Synthesis of the pushover analysis for Elite's Palace without roof considered

Elite's Palace without roof		Δ_y [cm]	Δ_u [cm]	V_{MEC}	Ductility μ_Δ	Behaviour factor q
	x-direction	0.92	3.45	0.27	2.75	2.12
	y-direction	0.78	2.12	0.37	1.72	1.56

The second situation was the one of the historical masonry building with the rigid roof framework considered. The failure mechanism for the facades are illustrated in Figure 5.44 and Figure 5.45 [252].

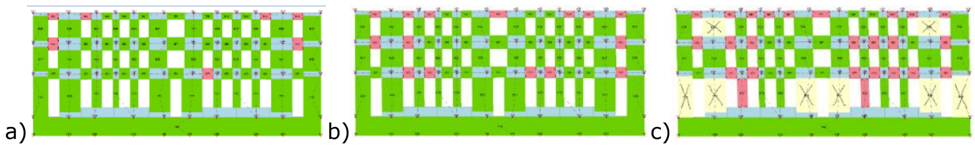
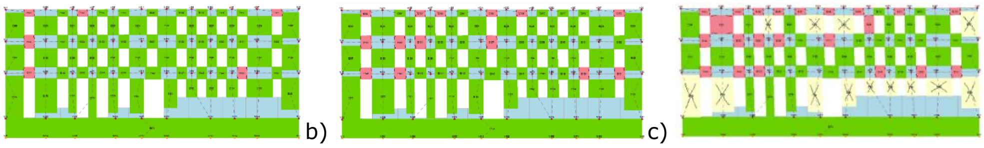


Figure 5.44. In-plane failure mechanism for Elite's Palace, for longitudinal seismic direction: a) appearance of first damage; b) maximum shear force; c) top horizontal displacement; [252]



a) b) c)

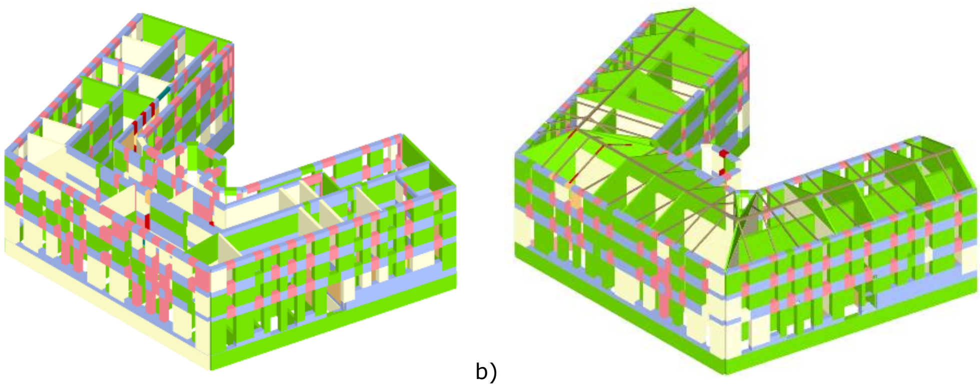
Figure 5.45. In-plane failure mechanism for Elite's Palace, for transversal; seismic direction: a) appearance of first damage; b) maximum shear force; c) top horizontal displacement; [252]

The results illustrate the fact that when the roof structure is considered, there are changes in the damage distribution pattern. The synthesis of the results is illustrated in Table 5.10. There can be observed the fact that the presence of the wooden framework limits the horizontal displacements, leading to lower mechanical vulnerability indexes.

Table 5.10. Synthesis of the pushover analysis for Elite's Palace with the roof considered

Elite's Palace with roof		Δ_y [cm]	Δ_u [cm]	V_{MEC}	Ductility μ_Δ	Behaviour factor q
	x-direction	0.62	2.91	0.21	3.69	2.52
	y-direction	0.53	2.44	0.22	3.60	2.49

A comparison of the tridimensional mechanical model without and with the roof considered is presented in Figure 5.46 [252], while the vulnerability curves for both situations are illustrated in Figure 5.47.



a) b)

Figure 5.46. Mechanical model of Elite's Palace with damages in the limit state: a) without the roof; b) with the roof [252]

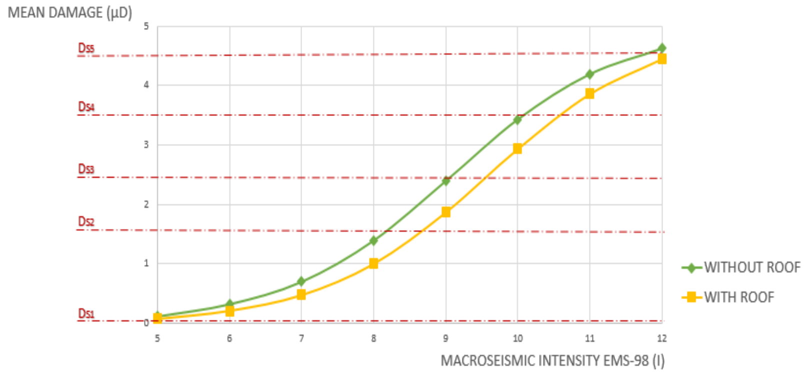


Figure 5.47. Vulnerability curves for Elite's Palace, with and without roof structure considered

The results indicate a good improvement of the seismic behaviour of the building when the masonry walls are compressed under the heavy roof framework. There can be seen that the number of vertical structural elements affected by shear forces is lower in the case of the roof considered. Also, the most vulnerable parts of the buildings aren't anymore the entire façade walls, but only the corners of the building.

Moreover, just by considering the presence of the roof, there can be noticed a decrease of the mechanical seismic vulnerability index values with 10÷15%, showing the fact that in the case of historical masonry building with rigid heavy roof framework, the global behaviour is different if the influence of the roof is considered (Figure 5.50).

Regarding the ductility of the structure, there can be seen that when the heavy roof is considered, the structure's ductility increases with 25% on longitudinal direction and with 50% on transversal direction (Figure 5.49).

The behaviour factor increases with 15% on longitudinal direction and with 35% on transversal direction when the wooden framework is considered (Figure 5.48).

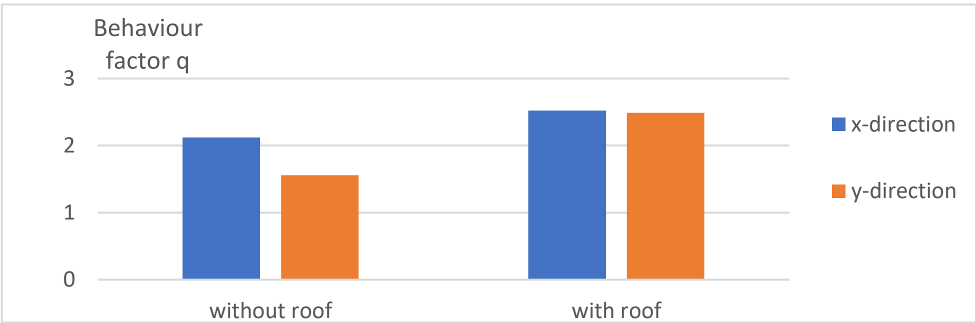


Figure 5.48. Comparison of the behaviour factor with and without considering the wooden framework

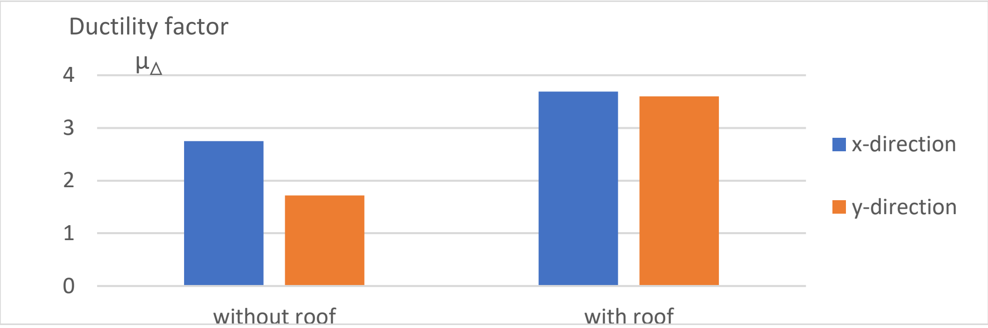


Figure 5.49. Comparison of the structure ductility factor with and without considering the wooden framework

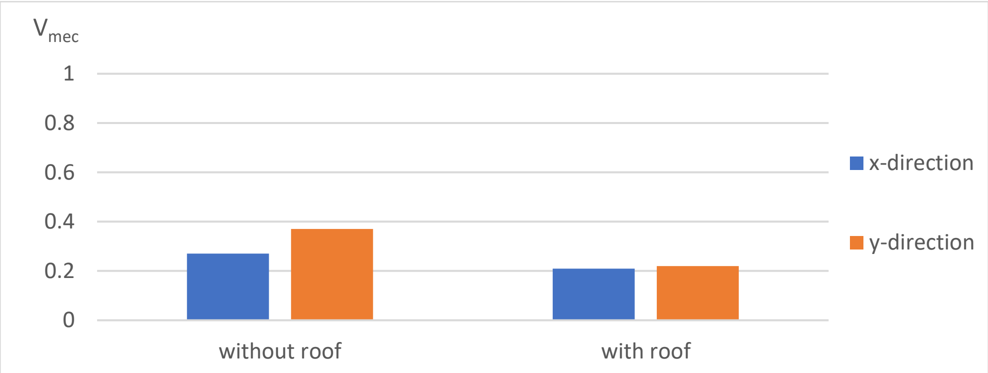


Figure 5.50. Comparison of the mechanical vulnerability index with and without considering the wooden framework

In conclusion, the wooden framework is not only important for its aesthetic, formal or cultural value, but also for its structural role, increasing the bearing capacity of the entire building under seismic forces.

5.9 Simple retrofitting solutions for historic masonry buildings

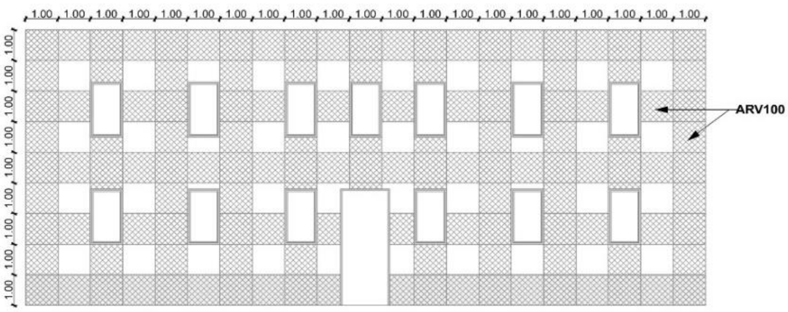
A previous study considered some easy-to-apply innovative retrofitting solutions that could reduce the seismic risk, highlighting that minimum intervention could cause a considerable improvement of the bearing capacity [253], [254], [255]. There will be presented three fibre-based materials that are recommended and a comparison of the bearing capacity without and with retrofitting for the most representative buildings.

The second recommendation is related with possible retrofitting solutions. For a numerical analysis, made also with Tremuri software, there were chosen three buildings from Fabric district, all three from typological class Type III. The buildings are named 3 August no. 11 Palace, Princesses Mirbach Palace and Karl Kunz Palace. Their location is presented in Figure 5.51. Two of them present a corner position and one of them an ending position into the aggregate. All three are dating from 19th century, were made in brick masonry with lime, with similar characteristics with Elite's Palace [204].

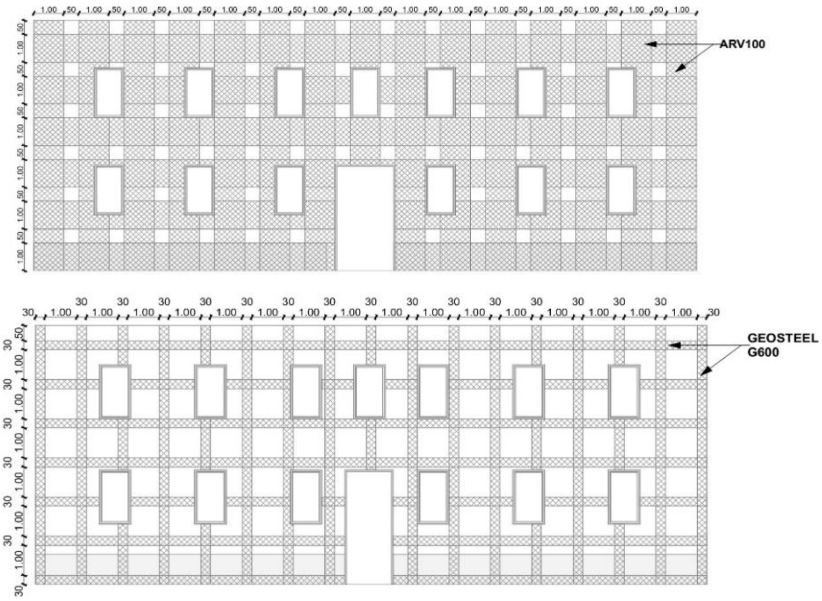
Figure 5.51.Location of the three case study building for the effect of retrofitting solutions [204]

The first scenario was to investigate the bearing capacity of the buildings without any consolidation solution. The pushover analysis indicated the fact that the most vulnerable elements are the spandrel, which are affected by bending forces, followed by the vertical structural elements, affected by shear forces.

The consolidation solutions that were proposed are easy-to-apply and fast in execution. The first material is made with polymeric composite fibre type ARV100 from Kerakoll Company [256]. There were proposed two consolidation solutions with this material: first, with the fibre-based material applied at a step of 100 centimetres (Figure 5.52a) and second, at a step of 50 centimetres (Figure 5.52b). The second material considered is made of galvanized steel composite fibre type Geosteel G600 also from Kerakoll Company [257]. So, the third consolidation solution is based on this new material, applied at a step of 100 centimetres (Figure 5.52c).



a)



b)

c)

Figure 5.52. Layout of the fiber-based materials on the facades: a) first solution; b) second solution; c) third solution

First and second consolidation methods, based on materials type ARV100, represents the application of a bi-axial mesh obtained by resistant aramid and glass fibre. This type of fibre-based material is designed to reinforce the masonry structure and to increase its ductility, presenting also a high durability in an alkaline environment. The material is presented in Figure 5.53, while its mechanical proprieties are illustrated in Table 5.11 [256].

Table 5.11. Mechanical proprieties of fibre-based reinforcement material type ARV100 from Kerakoll Company [256]

Material	Weight of primed mesh [g/m^2]	Equivalent thickness of mesh [mm]	Tensile strength [MPa]	Elastic modulus [GPa]
ARV100 (warp)	250 ± 5%	0,031	1600	80

Figure 5.53 Fibre-based reinforcement material type ARV100 from Kerakoll Company [256]

Third consolidation method, based on materials type GeoSteel G600, represents the application of a unidirectional sheet made of high strength galvanised steel fibre. This type of fibre-based material is designed also to reinforce the masonry structure and to increase its bearing capacity, being easy to manipulate. The material is presented in Figure 5.54, while its mechanical proprieties are illustrated in Table 5.12 [257].

Table 5.12. Mechanical proprieties of fibre-based reinforcement material type GeoSteel G600 from Kerakoll Company [257]

Material	Weight of primed mesh [g/m^2]	Equivalent thickness of mesh [mm]	Tensile strength [MPa]	Elastic modulus [GPa]
GeoSteel G600 (1 layer)	670	0,084	>3000	>190

Figure 5.54 Fibre-based reinforcement material type GeoSteel G600 from Kerakoll Company [257]

The synthesis of the pushover analysis in all the previously presented scenario is illustrated in Table 5.13. There can be noticed an improvement of the yielding and ultimate displacement and also for the maximum shear force. Also, the problem of spandrel failure due to shear forces is solved in almost all situations.

Table 5.13. Synthesis of pushover analysis results for all scenarios

Building	Consolidation method	Δ_y [cm]	Δ_u [cm]	F_{max} [cm]	V_{MEC}
3 August no. 11 Palace	Unconsolidated	0.70	3.22	2529	0.22
	ARV 100 (step 100 cm)	0.88	4.52	3392	0.19
	ARV 100 (step 50 cm)	0.90	5.00	3398	0.18
	GEOSTEEL G600 (step 100 cm)	0.98	7.08	4317	0.14
Princesses Mirbach Palace	Unconsolidated	0.49	2.27	11467	0.22
	ARV 100 (step 100 cm)	0.59	3.72	13681	0.16
	ARV 100 (step 50 cm)	0.61	3.76	14039	0.16
	GEOSTEEL G600 (step 100 cm)	0.71	4.47	17473	0.15
Karl Kunz Palace	Unconsolidated	0.60	1.74	2309	0.34
	ARV 100 (step 100 cm)	0.82	5.66	3495	0.14
	ARV 100 (step 50 cm)	0.84	6.64	3661	0.13
	GEOSTEEL G600 (step 100 cm)	0.92	6.71	4042	0.13

A comparison of the vulnerability curves was also made and is presented in Figure 5.55 for 3 August no. 11 Palace, in Figure 5.56 for Princesses Mirbach Palace and in Figure 5.57 for Karl Kunz Palace. The results indicate that for first consolidation solution, there is a seismic vulnerability reduction between 3÷20 percent. For the second consolidation solution, the seismic reduction comparing with unconsolidated building is of 4÷21 percent, while for the third solution the reduction is 7÷21 percent.

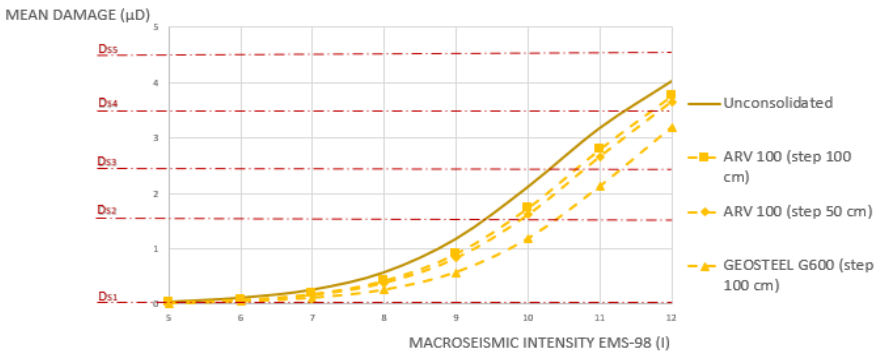


Figure 5.55. Seismic vulnerability curves for 3 August no.11 Palace, for the building unconsolidated and consolidated with the three solutions

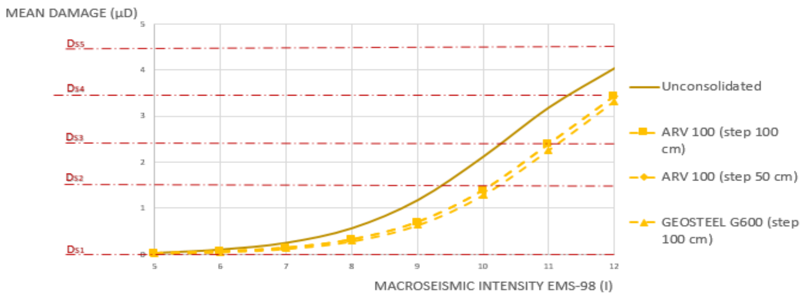


Figure 5.56. Seismic vulnerability curves for Princesses Mirbach Palace, for the building unconsolidated and consolidated with the three solutions

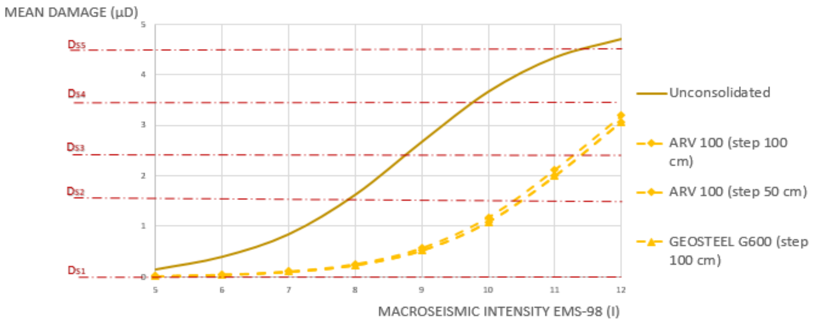


Figure 5.57. Seismic vulnerability curves for Karl Kunz Palace, for the building unconsolidated and consolidated with the three solutions

There was investigated also the structure's ductility μ_Δ and the behaviour factor q for the each of the three investigated buildings, as illustrated in Table 5.14 and Figure 5.58, Figure 5.59 and Figure 5.60.

Table 5.14. Structure's ductility and behaviour factor for all scenarios

Building	Consolidation method	Δ_y [cm]	Δ_u [cm]	Structure ductility μ_Δ	Behaviour factor q
3 August no. 11 Palace	Unconsolidated	0.70	3.22	3.60	2.48
	ARV 100 (step 100 cm)	0.88	4.52	4.13	2.69
	ARV 100 (step 50 cm)	0.90	5.00	4.55	2.84
	GEOSTEEL G600 (step 100 cm)	0.98	7.08	6.22	3.38
Princesses Mirbach Palace	Unconsolidated	0.49	2.27	3.63	2.50
	ARV 100 (step 100 cm)	0.59	3.72	5.30	3.10
	ARV 100 (step 50 cm)	0.61	3.76	5.16	3.05
	GEOSTEEL G600 (step 100 cm)	0.71	4.47	5.29	3.09
Karl Kunz Palace	Unconsolidated	0.60	1.74	1.90	1.67
	ARV 100 (step 100 cm)	0.82	5.66	5.90	3.28
	ARV 100 (step 50 cm)	0.84	6.64	6.90	3.57
	GEOSTEEL G600 (step 100 cm)	0.92	6.71	6.29	3.40

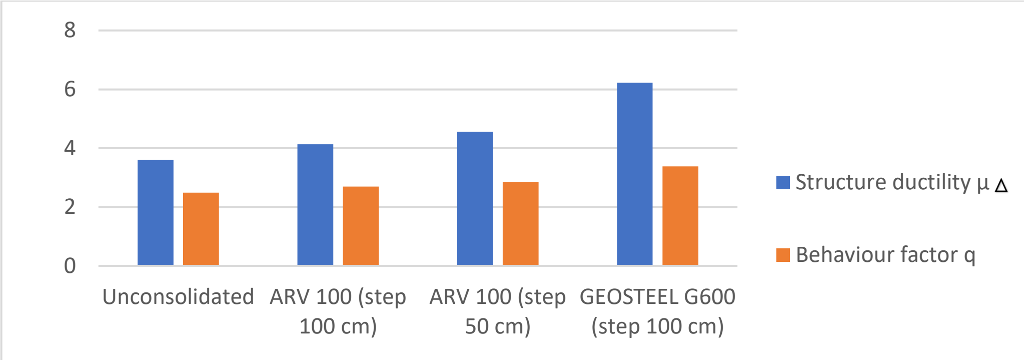


Figure 5.58. Structure ductility and behaviour factor for 3 August no.11 Palace, for the building unconsolidated and consolidated with the three solutions

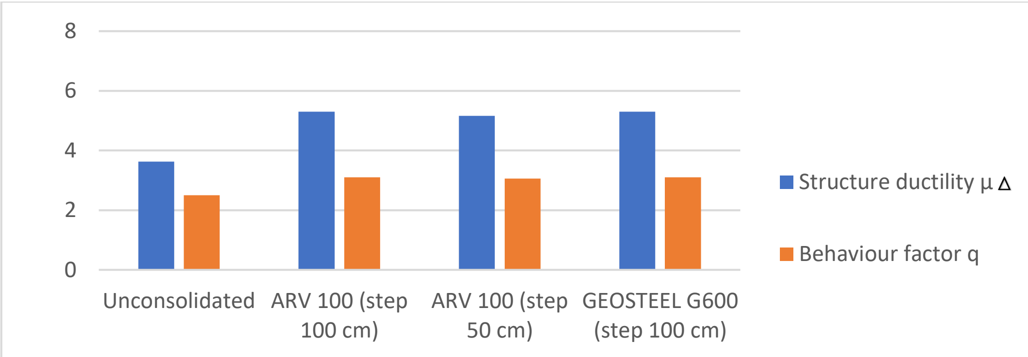


Figure 5.59. Structure ductility and behaviour factor for Princesses Mirbach Palace, for the building unconsolidated and consolidated with the three solutions

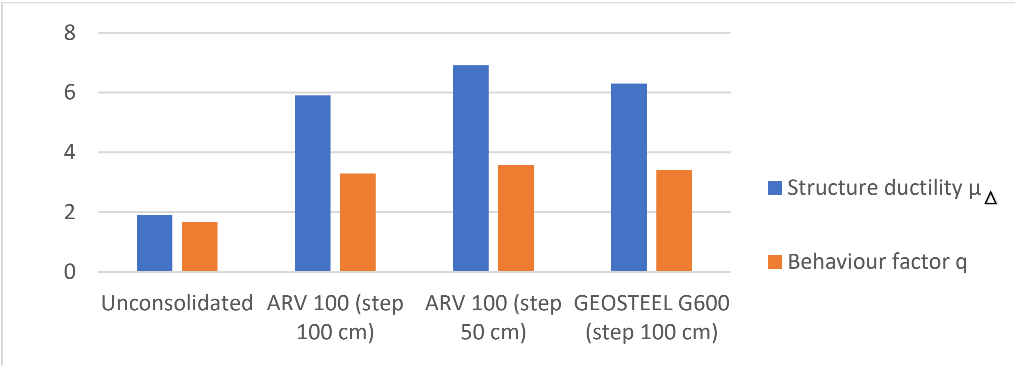


Figure 5.60. Structure ductility and behaviour factor for Karl Kunz Palace, for the building unconsolidated and consolidated with the three solutions

There can be seen an increase of the ductility and of the behaviour factor when the consolidation solutions are considered, for all three buildings in comparison with the unconsolidated structure. Although, the differences between consolidation methods are not very concludent, so further study is needed in order to determine which solution is the best for the unreinforced masonry buildings.

In conclusion, very simple consolidation solutions can be applied on historical masonry buildings in order to increase their bearing capacity. Of course, the subject need further studies and detail, but it represents the first step. Fibre-based material are appropriate for masonry structures because they increase the bearing capacity, but don't change the stiffness, nor the architecture of the building.

5.10 **Conclusion**

The following conclusion were determined:

(i) the interstorey drift range is 0.035÷0.10% for typological class Type I, 0.050÷0.250% for Type II and 0.125÷0.315% for typological class Type III;

(ii) the most vulnerable elements are the lintels, affected by bending, followed by the spandrels due to shear forces, but only at buildings from typological class Type II and Type III;

(iii) in general, the maximum shear forces are higher on transversal direction; from one typological class to another, the maximum shear forces increase with up to 50%;

(iv) the limit of the elastic domain is reached at a top horizontal displacement of 23÷33% of the ultimate horizontal displacement;

(v) the average ductility of the investigated buildings is 2.45÷2.47 for longitudinal direction and 2.07÷2.94 on transversal direction;

(vi) for each typological class, the difference between the ductility on both directions is in the range of 5÷30 %;

(vii) average displacement demand is 0.24 cm for typological class type I, 1.05 cm for type II, respectively 2.34 cm typological class type III

(viii) for all three typological classes, the probability of reaching damage states D4-D5 are under 50%, in accordance with the results of the empirical and numerical seismic vulnerability assessment methodologies;

(ix) the wooden framework increase the bearing capacity of historical masonry buildings;

(x) just by considering the presence of the roof, there can be noticed a decrease of the mechanical seismic vulnerability index values with 10÷15%;

(xi) when the heavy roof is considered, the structure's ductility increases with 25% on longitudinal x-direction and with 50% on transversal y-direction;

(xii) the behaviour factor increases with 15% on longitudinal x-direction and with 35% on transversal y-direction when the wooden framework is considered;

(xiii) FRP consolidation solutions can increase also the bearing capacity of masonry buildings without changing their stiffness nor architectural design;

(xiv) There can be seen an increase of the ductility with minimum 13% and of the behaviour factor with minimum 7% when the consolidation solutions are considered, for all three buildings in comparison with the unconsolidated structure;

The content of this chapter was published in the following papers:

1. Apostol I., Mosoarca M., Stoian V., ”Modern Consolidation Solutions for Buildings with Historical Value. Part I: Reinforced Concrete Structures”, *Proceedings of 16th National Technical-Scientific Conference on Modern Technologies for the 3rd Millennium*, Oradea, Romania, pp 111-116, 2017

2. Mosoarca M., Apostol I., Stoian V., ”Modern Consolidation Solutions for Buildings with Historical Value. Part II: Masonry Structures”, *Proceedings of 16th National Technical-Scientific Conference on Modern Technologies for the 3rd Millennium*, Oradea, Romania, pp 209-214, 2017

3. Apostol I., Bradeanu R., Mosoarca M., ”Case study of consolidation methods with fiber-based composite materials in Romania”, *Key Engineering Materials*, Volume 747 KEM, 2017, Pages 414-419, Proceedings of International Conference on Mechanics of Masonry Structures Strengthened with Composites Materials, 2017

4. Mosoarca M., Apostol I., Keller A., Formisano A., ”Consolidation methods of Romanian historical building with composite materials”, *Key Engineering Materials*, Volume 747 KEM, 2017, Pages 406-413, Proceedings of International Conference on Mechanics of Masonry Structures Strengthened with Composites Materials, 2017

5. Chieffo N., Apostol I., Keller A., Mosoarca M., Marzo A., ”Global behavior of historical masonry structures and timber roof framework”, *Prohitech 2017*, Lisabona, Portugalia, 2017

6. Apostol I., Mosoarca M., Chieffo N., Keller A., Bocan D., Bocan C., Bradeanu R., ”Solutions for improving seismic vulnerability of historic masonry buildings”, *Proceedings of 17th National Technical-Scientific Conference on Modern Technologies for the 3rd Millennium*, Oradea, Romania, pp 131-136, 2018

7. M. Mosoarca, I. Onescu, B. Azap, E. Onescu, N. Chieffo, M. Szitar-Sirbu, ”Seismic vulnerability assessment for the historical areas of the Timisoara city, Romania”, *Engineering Failure Analysis* (Impact Factor 2.897 at 13.07.2020), Vol. 101, pp. 86-112, 2019

8. E. Onescu, I. Onescu, M. Mosoarca, ”The impact of timber roof framework over historical masonry structures”, *IOP Conference Series*, 2019

9. M. Mosoarca, I. Onescu, E. Onescu, A. Anastasiadis, ”Seismic vulnerability assessment methodology for historic masonry buildings in the near-field areas”, *Engineering Failure Analysis*, Vol. 115, paper ID 104662, September 2020, available online (Impact factor 2.897 at 13.07.2020)

The information was disseminated at the following conferences:

1. 16th National Technical-Scientific Conference on Modern Technologies for the 3rd Millennium, 23-24 March 2017, Oradea, Romania
2. International Conference on Mechanics of Masonry Structures Strengthened with Composites Materials, MuRiCo5, 28-30 June 2017, Bologna, Italy
3. 17th National Technical-Scientific Conference on Modern Technologies for the 3rd Millennium, 22-23 march 2018, Oradea, Romania
4. World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium, 18-22 june 2018, Prague, Czech Republic
5. 8th International Conference on Engineering Failure Analysis ICEFA, 8-11 July 2018, Budapest, Hungary
6. World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium, 17-21 June 2019, Prague, Czech Republic

6 CONCLUSION

The present thesis continues the research that the late Prof. eng. Victor Gioncu has started in the field of seismic vulnerability of the load-bearing structures more than 30 years ago. The vulnerability studies that were developed through the Prohitech research contract, for the historical structures, have highlighted the necessity to establish a quick and simplified seismic vulnerability assessment methodology for the Banat seismic area, which is characterized by shallow earthquakes. The need to develop such vulnerability assessment methodology for the historical buildings is underlined by a large number of such structures in the area and by the low financial possibility of the owners to perform detailed expert's reports, so the local authorities could determine a prioritization list for the needed rehabilitation work. This research was started back in 2010 in the Faculty of Architecture and Urban Planning Timisoara. The base of this research was the existing vulnerability assessment methodologies that were proposed by recognized universities such as Federico II University in Naples, University of Padua and University of Genova for the area of Italy, a country with a vast number of historical buildings and many earthquakes, a lot of them quite similar with Banat earthquakes.

In this Ph.D. thesis, the proposal of a new seismic vulnerability assessment methodology is presented, with the primary purpose of its implementation in the seismic risk analysis, damage and loss estimation, and risk reduction policies. The proposed methodology has the main advantage of being a quick and easy-to-apply procedure for assessing the seismic vulnerability of historical masonry buildings at a territorial scale, in the near-field areas. Moreover, it offers the possibility of assessing the possible cultural losses and to determine in a simplified way the seismic vulnerability influenced by the cultural value.

The plus of knowledge that the research thesis brings also follows the world's efforts to reduce the seismic risk and the possible losses in terms of human life, architectural and cultural values, social and economic aspects. It is also related to the ICOMOS permanent activity for saving heritage through prevention policies. Preventing the permanent loss of valuable and irreplaceable assets is easier and more likely to occur than repairing and rehabilitating. The significant amount of data collection and investigation analysis that is presented in the thesis is the result of a multidisciplinary study that was made together with bachelor, master, and Ph.D. students, professionals from various fields, professors, and researchers.

The proposed seismic vulnerability assessment methodology represents a calibration between the numerical nonlinear analysis results and the real response of buildings to past earthquakes, which represent the tremendous natural laboratory of the Banat seismic area.

6.1 **Personal contributions**

Historical masonry buildings represent a valuable part of the heritage of a city and need to be protected through preservation and prevention strategies. The base of any policy is the knowledge that can be improved following seismic vulnerability assessment methodologies.

Existing methodologies need to be adapted to the particularities of each site. The adaptation is possible based on numerical analysis and comparison with past earthquake's effects.

Personal contributions in the field of seismic vulnerability assessment of historical buildings are:

- The proposed methodology can be used for assessing the seismic vulnerability of other historical masonry buildings in the central European seismic area characterized by shallow earthquakes of medium intensity and similar construction techniques of the buildings with the ones in the seismic Banat area. The thesis proposes the first empirical seismic vulnerability assessment methodology adapted for Timisoara city;
- There were investigated the existing historical masonry building typologies in Timisoara city, and there was designed the first database in the area;
- There were proposed seismic vulnerability curves and expected damage states for a specific seismic scenario, indicating an excellent correlation between proposed empirical and mechanical seismic vulnerability methodologies. The vulnerability curves were calibrated to be in accordance with the damage states indicated by the interstorey-drift range. Also, the results are correlated with the real damages observed on-site on similar masonry buildings after past earthquakes in Banat seismic region;
- There was determined for the first time the seismic vulnerability of the masonry buildings in Timisoara city, for different building typologies based on story number;
- There were designed the first vulnerability maps for the historical districts of the city;
- The thesis presents the first information about the expected damage state of historical masonry buildings for a particular seismic scenario. The seismic vulnerability of the investigated buildings is a moderate one, compressed between damage states D2÷D3, showing the possibility of reaching significant damages to non-structural elements and moderate damages to the structural ones. The most vulnerable typological class is type III, which represents the tallest historical masonry buildings in Timisoara city;

- The research brings out the first losses scenario for Timisoara city, under the conditions of the proposed seismic scenario. The first risk reduction plan is presented;
- The results highlight the possibility of losing some architectural-artistic elements, which are non-structural but very important for the history of the city. In this context, there is opportune the development of the empirical seismic vulnerability assessment methodology to consider also the influence of the cultural value of each building. The determination of the most vulnerable buildings with cultural value represents a valuable tool for the multidisciplinary prevention strategy of a city, so the thesis proposes a new and simplified empirical seismic vulnerability assessment methodology influenced by the cultural value of historic buildings. The vulnerability curves influenced by the cultural value highlighted a slight increase in the vulnerability for the most representative buildings in Timisoara's historic districts;
- The research brings out information about the in-plane failure mechanism developed by the historical masonry buildings in Timisoara. The pushover analysis was performed on a large number of buildings;
- The nonlinear analysis indicates that the average displacement ductility of the investigated buildings is 2.40÷2.50 for longitudinal direction and 2.10÷2.90 on the transversal direction;
- The research confirms the results through the average behavior factor for all three typological classes that are in the range of 1.50÷2.50 for both longitudinal and transversal directions;
- The thesis brings out the first comparison between capacity and demand for historical buildings in Timisoara;
- The mechanical analysis results are used to design the first fragility curves for Timisoara. The curves indicate less than 50% chanches of reaching damage states D4-D5, in total accordance with the empirical and numerical seismic vulnerability assessment methodologies results;
- Following the empirical and numerical results, is proposed the first prioritization list for rehabilitation work, for the investigated historical masonry buildings in Timisoara;
- The proposed methodology can be applied at a different scale of investigation because the capacity curves were analyzed in such a way to reflect, on average, the typical behavior of each typological class. That is why it is misleading to consider that the seismic vulnerability assessment and damage and loss estimation of a typological class is representative of the entire structural typology and to the majority of the buildings that belong to that typological class;
- The thesis brings out information regarding the influence of the heavy roof on the structure’s ductility, highlighting an increase in the building’s ductility when the wooden framework is considered;

- Following the nonlinear analysis and the observed decay level of the historical masonry buildings in Timisoara, there is proposed a simplified consolidation method. The proposed solution is reversible and uses FRP modern materials that have proven to increase the bearing capacity of masonry buildings without changing their stiffness nor architectural design. There can be seen an increase of the ductility and of the behavior factor when the consolidation solutions are considered, in comparison with the unconsolidated structure, for specific building typologies with particular horizontal and vertical geometries and seismic scenario. The analysis results can be used to propose in the future effective tools for structural protection measures, retrofitting solutions, strengthening programs for historic masonry buildings;

In conclusion, this research has illustrated that the personal contributions of the thesis represent an innovative approach that promises future improvements and research work to overcome its limitations and challenges. The obtained result can become effective tools in the process of seismic risk reduction and risk mitigation for historical urban centers.

6.2 **Future research directions opened by the present thesis**

The future research is addressed to the development of the proposed seismic vulnerability assessment to provide a more reliable representation of the historic masonry aggregates and not only of individual structural units, as follows:

i) future research direction in the field of seismic vulnerability assessment of masonry buildings in Banat seismic area

ii) future research direction in the field of seismic vulnerability assessment of masonry aggregates

iii) future research direction in the field of out-of-plane failure mechanism for historic masonry buildings

iv) future research direction in the field of application of the mechanical model to a wider range of masonry structures

vi) future research in the field of the ductility and behavior factor of different structural typologies of masonry, for various seismic scenarios

vii) future research in the field of fragility curves for historical masonry buildings and aggregates and further expected damage distribution

viii) future research in the field of the influence of wooden framework on the bearing capacity of masonry structures

ix) future research in the field of complex urban seismic risk reduction studies

x) future research un the field of seismic scenarios for various epicentral distances and focal depths for Timisoara city and other towns in Banat seismic area

6.3 **Published papers**

Articles in ISI journals with impact factor: 2, cited in 9 papers

1. M. Mosoarca, I. Onescu, E. Onescu, B. Azap, N. Chieffo, M. Szitar-Sirbu., "Seismic vulnerability assessment for the historical areas of the Timisoara city, Romania", *Engineering Failure Analysis* (Impact factor 2.897 on 13.07.2020), Vol. 101, pp. 86-112, 2019, WOS:000464960500007, cited by:

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viii) Biglari M., Formisano A., Damage Probability Matrices and Empirical Fragility Curves From Damage Data on Masonry Buildings After Sarpol-e-zahab and Bam Earthquakes of Iran Front, Built Environ., 2020

ix) Keller A.I., Parisi M.A., Tsakanika E., Mosoarca M., Influence of historic roof structures on the seismic behaviour of masonry structures, Proceedings of the Institution of Civil Engineering – Structures and Buildings, ISSN 0965-0911, 2019

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i) Andreescu I., Mosoarca M., Dinu D.R., Reshaping the Villa-Complex intervention in a 1930's structure, Structural Analysis of Historical Constructions, ed. Springer, RILEM Bookseries, vol. 18, pp. 2314-2322, 2019

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viii) Chieffo N., Formisano A., Ferreira T.M., Parametric Estimation of Seismic Impact Scenarios and Expected Losses at Urban Scale, 2018

ix) Chieffo N., Formisano A., Mosoarca M., The Impact of local hazard effects on the vulnerability assessment of an urban area in Timisoara, Journal of Architecture, Urbanism and Heritage, volume 2, 2019

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11. Onescu E., Onescu I., Mosoarca M., ”The impact of timber roof framework over historical masonry structures”, *IOP Conference Series: Materials Science and Engineering*, 2020, in indexation process

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2. Apostol I., Mosoarca M., Chieffo N., Onescu E., "Seismic vulnerability scenarios for Timisoara, Romania", *Structural Analysis of Historical Constructions*, ed. Springer, RILEM Bookseries, vol. 18, pp. 1191-1200, 2019, ISBN: 978-3-319-99440-6, cited by:

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v) Mosoarca M., Stoian V., Florea M., Structural balance of historical aggregates, Structural Analysis of Historical Constructions, ed. Springer, RILEM Bookseries, vol. 18, pp. 2448-2456, 2019

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viii) Mosoarca M., Stoian V., Florea M., Structural balance of historical aggregates, Structural Analysis of Historical Constructions, ed. Springer, RILEM Bookseries, vol. 18, pp. 2448-2456, 2019

Articles in other international Proceedings: 3, cited in 1 paper

1. Apostol I., Keller A., Mosoarca M., ”Climate Change Risk Assessment Methodology for Historic Urban Centers”, *International Journal of Sustainable Agricultural Management and Informatics*, ISSN print: 2054-5819

2. Chieffo N., Apostol I., Keller A., Mosoarca M., Marzo A., ”Global behavior of historical masonry structures and timber roof framework”, *Proceedings of the 3rd International Conference on protection of historical constructions*, Lisabona, Portugalia, cited by:

i) Mosoarca M., Keller A.I., A complex assessment methodology and procedure for historic roof structures, International Journal of Architectural heritage (**Impact factor 1.440** on 13.03.2020), Vol. 12, Issue 4, pp. 578-898, 2018

3. Apostol I., Mosoarca M., Onescu E., ”Seismic vulnerability assessment for historical building as isolate/in aggregate for Timisoara city, Romania”, *Journal of Architecture, Urbanism and Heritage*, Vol. 2, Politehnica Publishing House, 2018, ISSN: 1224-6024

Attended conferences: 9

1. International Conference on Green Development, Infrastructure and Technology GREDIT, 31 March-01 April 2016, Skopje, Macedonia
2. 16th National Technical-Scientific Conference on Modern Technologies for the 3rd Millennium, 23-24 March 2017, Oradea, Romania
3. International Conference on Mechanics of Masonry Structures Strengthened with Composites Materials, MuRiCo5, 28-30 June 2017, Bologna, Italy
4. 17th National Technical-Scientific Conference on Modern Technologies for the 3rd Millennium, 22-23 march 2018, Oradea, Romania
5. 1st International Conference on Heritage and Sustainable Innovation CoHeSION, 15-17 November 2018, Timisoara, Romania
6. World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium, 18-22 june 2018, Prague, Czech Republic
7. 8th International Conference on Engineering Failure Analysis ICEFA, 8-11 July 2018, Budapest, Hungary
8. World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium, 17-21 June 2019, Prague, Czech Republic
9. 4th International Conference on Structure and Architecture ICSA, 24-26 July 2019, Lisbon, Portugal

Rewards received: 1

1. Best poster award, 8th International Conference on Engineering Failure Analysis ICEFA, 8-11 July 2018, Budapest, Hungary

Citations: 42, from which:

i) 13 in ISI journals with Impact Factor

ii) 6 in ISI indexed papers

H-index:
i) 4 in Google Scholar
ii) 3 in Scopus
iii) 2 in Web of Science

APPENDIX A

%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
Bld. No.: 1		DISTRICT: IOSEFIN							
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	0
		8	Roofing	0	15	25	45	0.75	33.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	0
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	12.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 11			76.25
						Iv STRUCT 15			111.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			139.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	15
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			67.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	0
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			10
						Iv CULT			106.05

Foto

Bld. No.: 2		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	45
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 11			120
						Iv STRUCT 15			95.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			149.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			82.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			99.15

Foto

Bld. No.: 3		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	11.25
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	54
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 14			136.25
						Iv STRUCT 15			132.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			139.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	15
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			67.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	0
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			10
						Iv CULT			121.1

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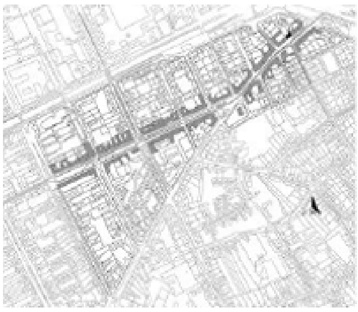

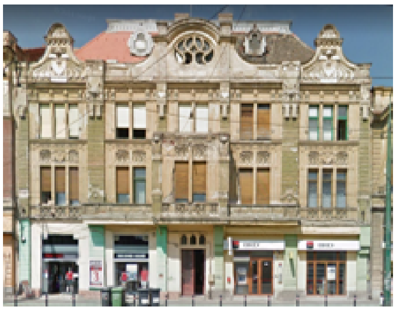

Bld. No.: 4		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	12.5
		6	Regularity in elevation	0	5	25	45	1	25
		7	Type of floors	0	5	15	45	0.75	11.25
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 13			140
						Iv STRUCT 15			195
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	25
						Iv ARCH-ART.			142
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			82.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	0
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			10
						Iv CULT			166.55
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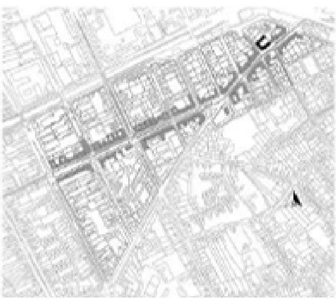

Bld. No.: 5		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	11.25
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-18
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
						$I_{V\ STRUCT\ 10}$			77.5
						$I_{V\ STRUCT\ 15}$			127
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	10
						$I_{V\ ARCH-ART.}$			50
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	22.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						$I_{V\ URBAN.}$			82.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						$I_{V\ SOC-ECON.}$			32.5
						$I_{V\ CULT}$			106.28

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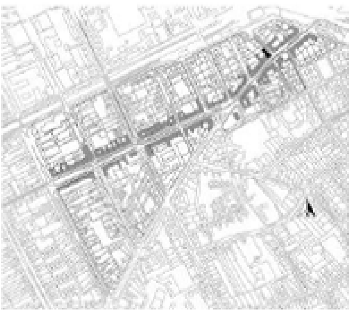
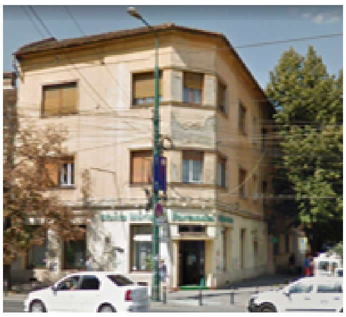
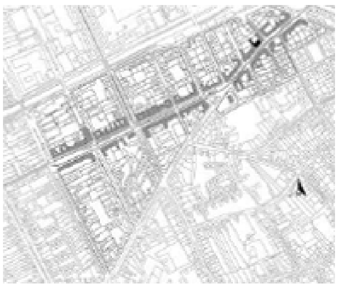
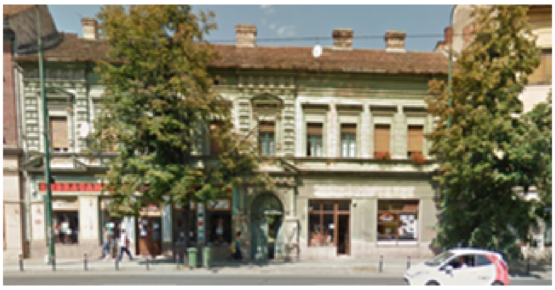




Bld. No.: 6		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-18
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 14			123.75
						Iv STRUCT 15			68.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			97.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			97.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			73.775
Foto	 								

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Bld. No.: 7		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 11			100
						Iv STRUCT 15			65.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			144.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			78.4

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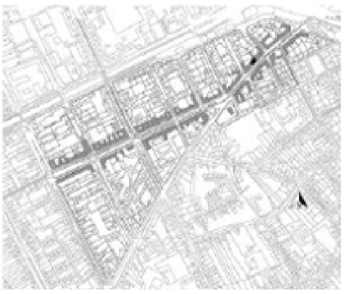

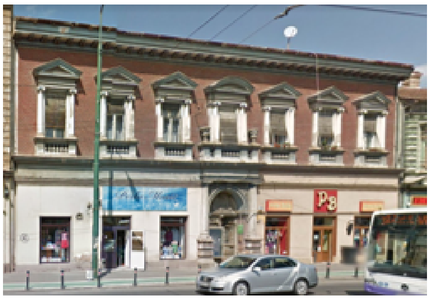

Bld. No.: 8		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	11.25
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	12.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 14			80
						Iv STRUCT 15			115
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			112.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			127.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			112.5

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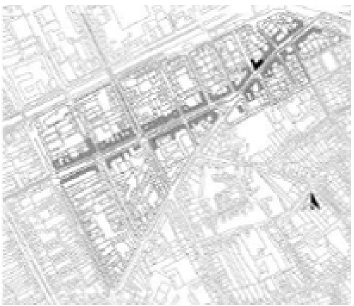

Bld. No.: 9		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	11.25
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 14			67.5
						Iv STRUCT 15			97.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			144.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	22.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			103.05

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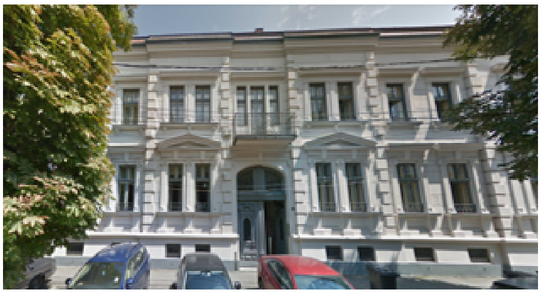

Bld. No.: 10		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 18			62.5
						Iv STRUCT 15			45
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	0
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			12.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			85
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			43.125

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Bld. No.: 11		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	0
		7	Type of floors	0	5	15	45	0.75	0
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	0
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-18
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 18			51.25
						Iv STRUCT 15			20.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	0
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			2.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	15
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			67.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			22.9

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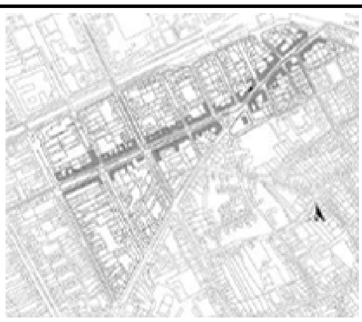

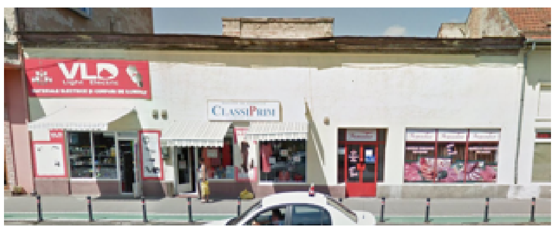

Bld. No.: 12		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	11.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	11.25
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	45
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 14			176.25
						Iv STRUCT 15			211.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			137
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			181.9

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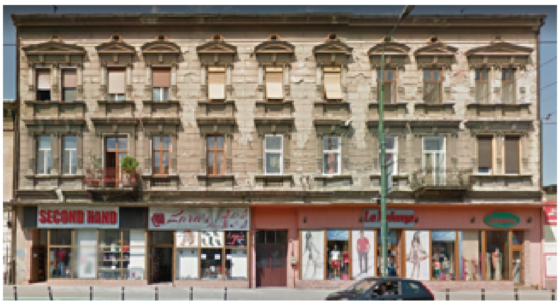

Bld. No.: 13		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 13			83.75
						Iv STRUCT 15			108.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			100
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			103.5

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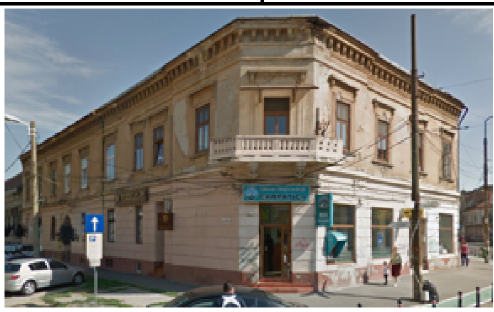

Bld. No.: 14		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	0
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	12.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	54
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 13			55
						Iv STRUCT 15			144
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			80
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			122.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	0
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			126.68

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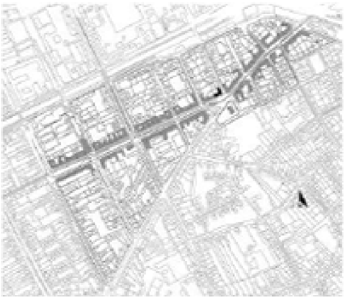

Bld. No.: 15		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	0
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
					$I_{V\,STRUCT\,10}$				65
					$I_{V\,STRUCT\,15}$				40.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
					$I_{V\,ARCH\text{-}ART.}$				70
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
					$I_{V\,URBAN.}$				92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
					$I_{V\,SOC\text{-}ECON.}$				32.5
					$I_{V\,CULT}$				49.725

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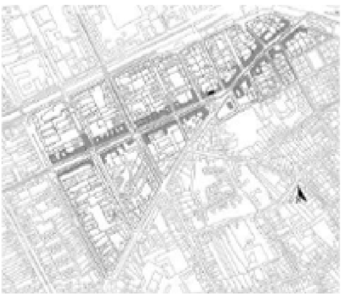

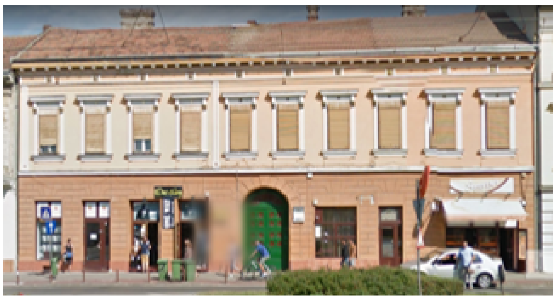

Bld. No.: 16		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	11.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 10			108.75
						Iv STRUCT 15			91.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			105
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			92
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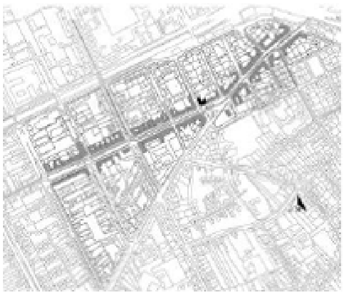

Bld. No.: 17		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	11.25
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	22.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 10			100
						Iv STRUCT 15			145
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			107.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			122.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			132.25

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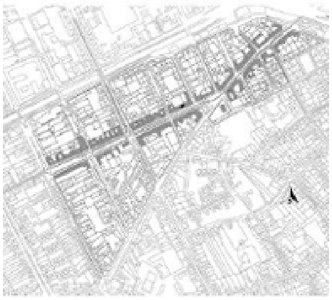
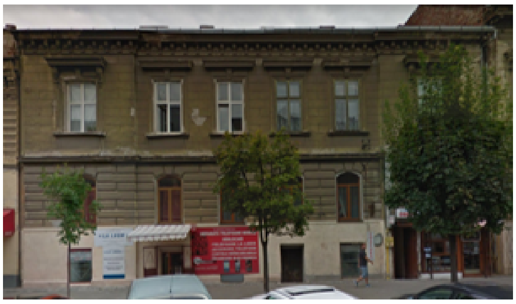
Bld. No.: 18		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 18			85
						Iv STRUCT 15			75.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			82.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			76.1
Foto									

Bld. No.: 19		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 13			143.75
						Iv STRUCT 15			109.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			162
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			111.65

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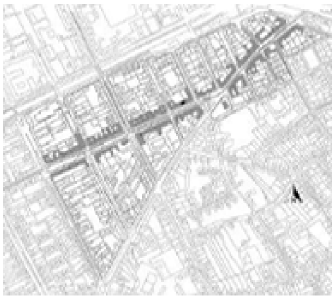

Bld. No.: 20		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	0
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 14			60
						Iv STRUCT 15			62.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	0
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			12.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			85
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			55.375

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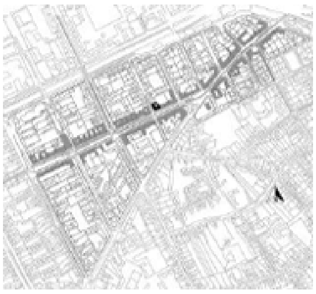
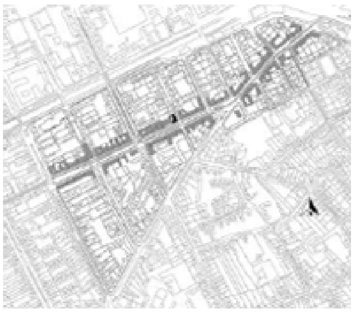
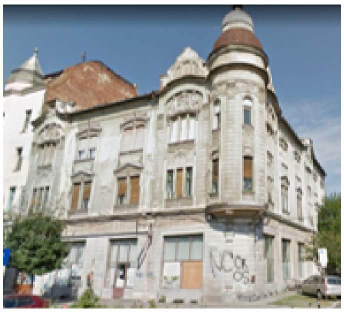


Bld. No.: 21		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	11.25
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	11.25
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
						Iv STRUCT 13			111.25
						Iv STRUCT 15			148.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	18
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	25
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			188
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			122.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			146.95
Foto	 								

Bld. No.: 22		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 14			57.5
						Iv STRUCT 15			78
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			102
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			97.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			81.275
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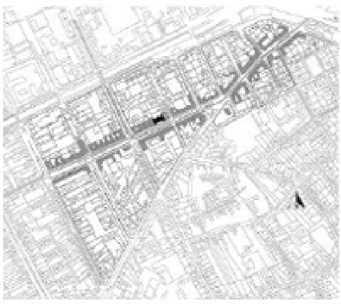

Bld. No.: 23		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 14			76.25
						Iv STRUCT 15			66.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			107
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			73.65
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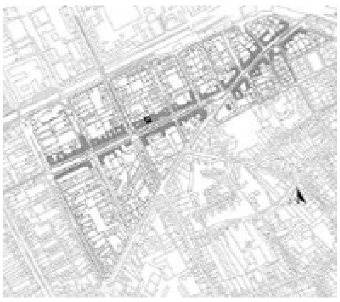
Bld. No.: 24		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	0
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	0
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 11			48.75
						Iv STRUCT 15			24.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	0
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			2.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	15
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			67.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			25.35
Foto									

Bld. No.: 25		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
						Iv STRUCT-II			112.5
						Iv STRUCT-IS			88
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	0
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			2.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	15
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			67.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			69.975
Foto									

Bld. No.: 26		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
						Iv STRUCT 10			112.5
						Iv STRUCT 15			88
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	0
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			2.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	15
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			67.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			69.975
Foto									

Bld. No.: 27		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
						Iv STRUCT 13			60
						Iv STRUCT 15			82.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	0
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			2.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			75
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			66.875

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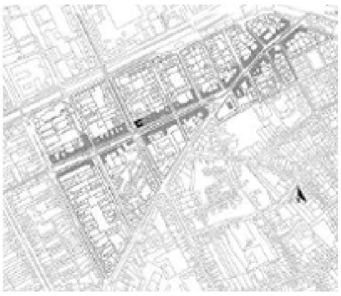
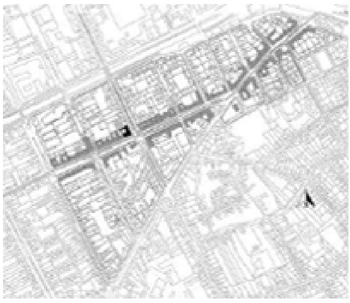


Bld. No.: 28		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	11.25
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	11.25
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	22.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 10			91.25
						Iv STRUCT 15			161.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			169.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			127.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			153.43
Foto									

Bld. No.: 29		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 11			113.75
						Iv STRUCT 15			76.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			45
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			82.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			70

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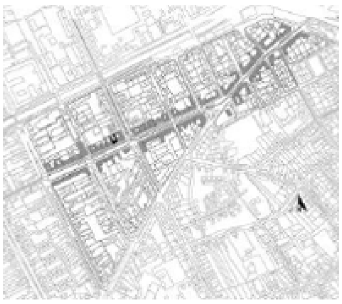

Bld. No.: 30		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	11.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 14			95
						Iv STRUCT 15			25.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			27.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			32.85

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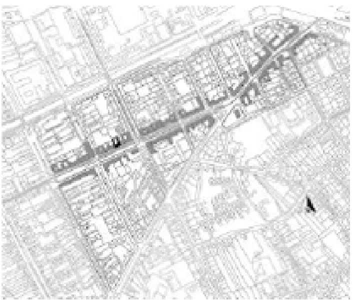

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Bld. No.: 31		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	11.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	45
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 1-8			130
						Iv STRUCT 1-15			60.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			45
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			82.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			58.975

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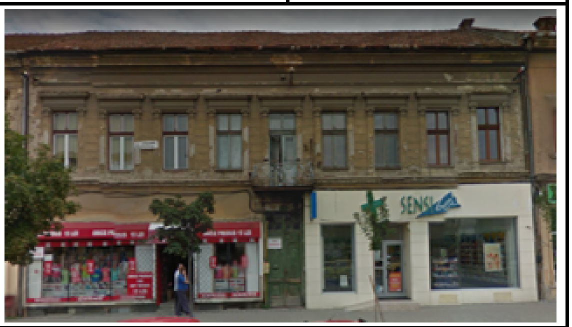

Bld. No.: 32		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	25
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 15			102.5
						Iv STRUCT 15			33
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			45
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			82.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			39.725
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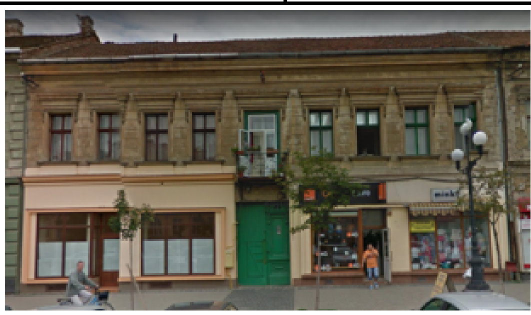

Bld. No.: 33		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	11.25
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	12.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
						Iv STRUCT 10			80
						Iv STRUCT 15			103
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			97.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			99.1

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Bld. No.: 34		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	11.25
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 13			80
						Iv STRUCT 15			72.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			112.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			80

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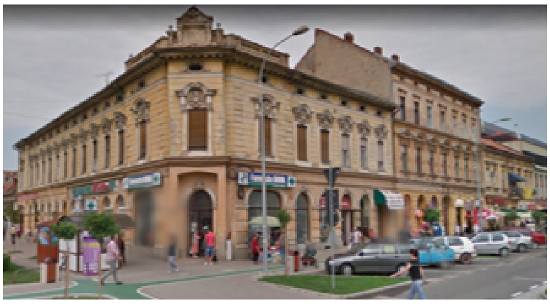

Bld. No.: 35		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 14			80
						Iv STRUCT 15			42.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	0
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			2.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	15
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			67.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			38.125

Foto

Bld. No.: 36		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 18			77.5
						Iv STRUCT 15			65
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	0
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			2.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	15
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			67.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			53.875

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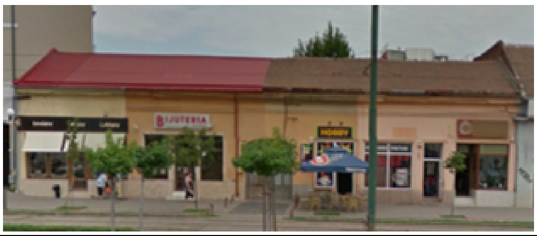

BUPT

Bld. No.: 37		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	0
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	3.75
		8	Roofing	0	15	25	45	0.75	0
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 13			45
						Iv STRUCT 15			35.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	-5
						Iv ARCH-ART.			52.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			43.6

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Bld. No.: 38		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	12.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	0.75	11.25
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
						$I_{V\,STRUCT\,11}$			116.25
						$I_{V\,STRUCT\,15}$			118.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	15
						$I_{V\,ARCH\text{-}ART.}$			172
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						$I_{V\,URBAN.}$			127.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						$I_{V\,SOC\text{-}ECON.}$			47.5
						$I_{V\,CULT}$			124.05

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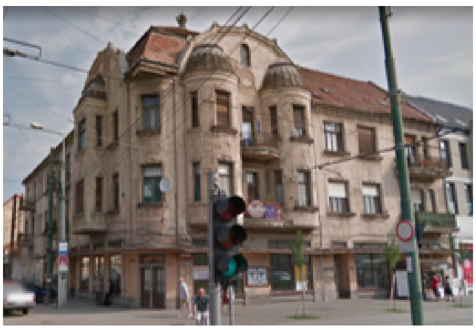

Bld. No.: 39		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 18			83.75
						Iv STRUCT 15			106.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			162
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	22.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			87.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			109.8

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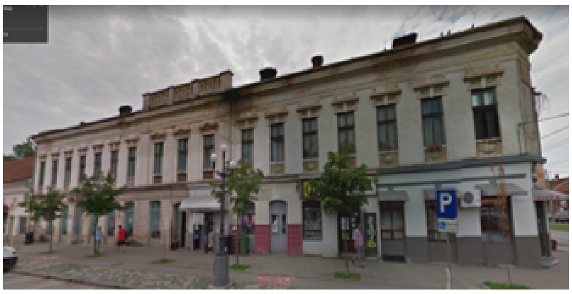

Bld. No.: 40		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	0
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 10			78.75
						Iv STRUCT 15			66.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			80
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	15
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			77.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			67.375

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Bld. No.: 41		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						$Iv_{STRUCT\,13}$			83.75
						$Iv_{STRUCT\,15}$			86.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						$Iv_{ARCH-ART.}$			102
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						$Iv_{URBAN.}$			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						$Iv_{SOC-ECON.}$			32.5
						Iv_{CULT}			86.55

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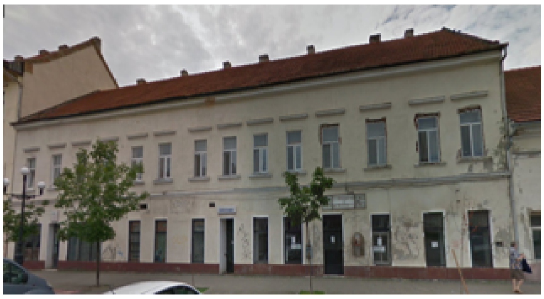

Bld. No.: 42		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	12.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 10			82.5
						Iv STRUCT 15			142.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	25
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			172
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			137.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			141.68

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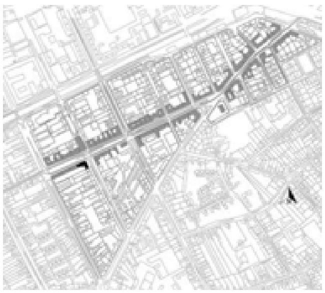

Bld. No.: 43		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	12.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 13			76.25
						Iv STRUCT 15			111.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			159.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	22.5
		40	Importance for the local community memory	-5	10	15	25	1	15
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			60
						Iv CULT			115.55

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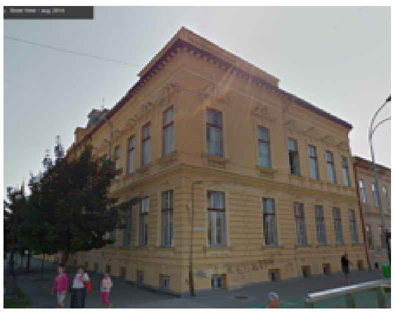

Bld. No.: 44		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 14			63.75
						Iv STRUCT 15			66.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	5	25	45	1.5	37.5
		17	Age, importance of the build époque	0	5	15	25	1.2	0
		18	Original woodwork/joinery	0	5	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	5	25	45	1	5
		20	Original statues or bass-reliefs	0	5	25	45	1	0
		21	Original gable/fronton	0	5	25	45	1	0
		22	Original balconies and railings	0	5	15	25	1	0
		23	Original mosaics or stone work	0	5	15	25	1	0
		24	Original paintings or frescoes	0	5	15	25	1.2	0
		25	Conservation state of artistic assets	-15	0	25	45	0.5	0
		26	Authenticity/ originality (global, elements)	0	5	25	45	1.2	6
		27	Official monument (national, regional, local, protected area) status	0	15	25	45	1.5	22.5
		28	Particular construction techniques/materials	0	5	15	25	0.5	0
		29	Conservation state of original materials	-5	0	15	25	0.5	7.5
		30	Representative historical events	0	5	15	25	0.75	0
		31	Archaeological site	0	5	25	45	1.5	0
		32	Representative/ original wooden framework	0	5	15	25	1	5
		33	Past restoration work	-25	0	25	45	1	0
						Iv ARCH-ART.			98.5
10%	URBANISTIC	34	Importance in contouring the street profile	0	5	15	45	1.5	7.5
		35	Importance in contouring the urban silhouette	0	5	15	45	1.5	7.5
		36	Annexes, relation with the urban pattern	0	5	15	25	1	0
		37	Location (central area, touristic area)	0	5	25	45	1.5	67.5
		38	Representative/particular shape of the roof	0	5	15	25	1	5
						Iv URBAN.			87.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	5	25	45	1.2	6
		40	Importance for the local community memory	0	5	15	25	0.5	0
		41	Economic value	0	5	15	25	1.5	7.5
		42	Cultural functions	0	5	25	45	1.2	0
						Iv SOC-ECON.			13.5
						Iv CULT			70.575

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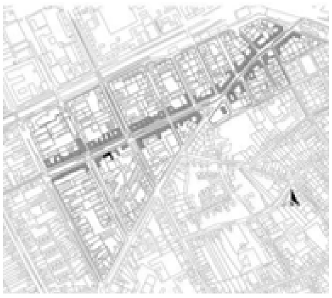

Bld. No.: 45		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 13			61.25
						Iv STRUCT 15			63.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			65
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	15
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			87.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			64.375

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Bld. No.: 46		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	0
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						$I_{v\,STRUCT\,13}$			58.75
						$I_{v\,STRUCT\,15}$			83.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	-2.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						$I_{v\,ARCH\text{-}ART.}$			72.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	15
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						$I_{v\,URBAN.}$			77.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	15
						$I_{v\,SOC\text{-}ECON.}$			55
						$I_{v\,CULT}$			80

Foto

Bld. No.: 47		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	0
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
						Iv STRUCT 14			76.25
						Iv STRUCT 15			109.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	18
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	25
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			150.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	25
						Iv URBAN.			122.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	22.5
		40	Importance for the local community memory	-5	10	15	25	1	15
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			60
						Iv CULT			114.3

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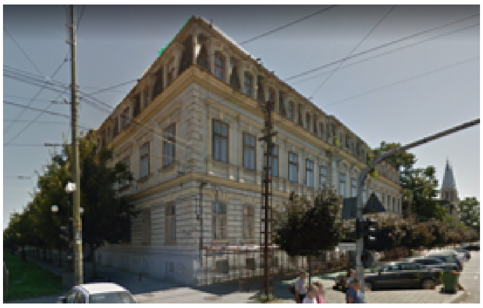


Bld. No.: 48		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	12.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
						$I_{V STRUCT 10}$			68.75
						$I_{V STRUCT 15}$			103.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	0
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	-5
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						$I_{V ARCH-ART.}$			52
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						$I_{V URBAN.}$			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	22.5
		40	Importance for the local community memory	-5	10	15	25	1	15
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						$I_{V SOC-ECON.}$			60
						$I_{V CULT}$			94.175

Foto

Bld. No.: 49		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 18			118.75
						Iv STRUCT 15			113.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	18
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			143
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			82.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	0
		40	Importance for the local community memory	-5	10	15	25	1	15
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	22.5
						Iv SOC-ECON.			60
						Iv CULT			112.33

Foto

Bld. No.: 50		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 14			76.25
						Iv STRUCT 15			86.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	18
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			123
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			82.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	0
		40	Importance for the local community memory	-5	10	15	25	1	15
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	22.5
						Iv SOC-ECON.			60
						Iv CULT			90.075

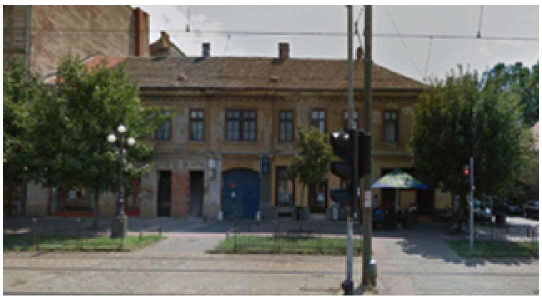
Foto

Bld. No.: 51		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 14			73.75
						Iv STRUCT 15			98.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			115
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			99.5

Foto

Bld. No.: 52		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	22.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 14			83.75
						Iv STRUCT 15			83.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			122
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			90.05

Foto



Bld. No.: 53		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 14			125
						Iv STRUCT 15			98
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	18
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			155.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			112.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	15
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	37.5
						Iv SOC-ECON.			90
						Iv CULT			107.68

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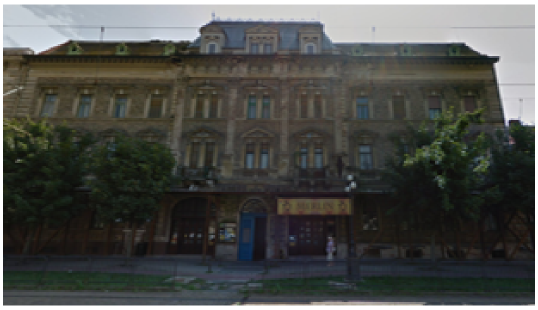

Bld. No.: 54		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
						Iv STRUCT 14			76.25
						Iv STRUCT 15			78.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	25
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	7.5
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			199.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			137.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	22.5
		40	Importance for the local community memory	-5	10	15	25	1	15
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			60
						Iv CULT			101.8

Foto

Bld. No.: 55		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
						Iv STRUCT 10			76.25
						Iv STRUCT 15			78.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	25
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			180
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			132.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	22.5
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			55
						Iv CULT			98.125

Foto

Bld. No.: 56		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 10			103.75
						Iv STRUCT 15			151.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			112.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			135.88

Foto

Bld. No.: 57		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	11.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	45
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
						Iv STRUCT 14			128.75
						Iv STRUCT 15			136.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	25
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			125
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	15
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			77.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			40
						Iv CULT			123.88

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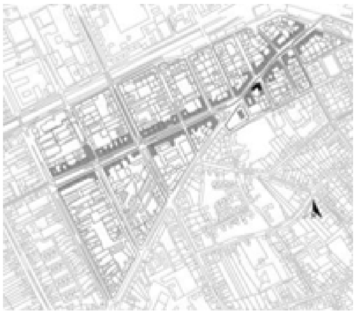

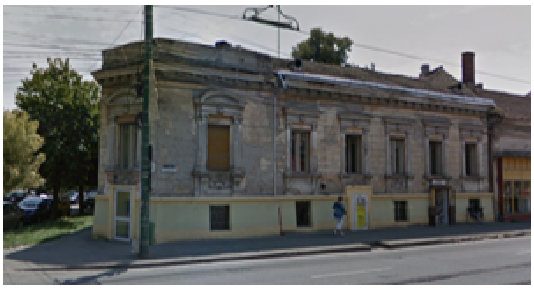

Bld. No.: 58		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
						Iv STRUCT 11			86.25
						Iv STRUCT 15			108.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	12.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			147
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			85
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			40
						Iv CULT			108.68

Foto

Bld. No.: 59		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	0
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 13			103.75
						Iv STRUCT 15			103.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			105
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	0
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			98.875

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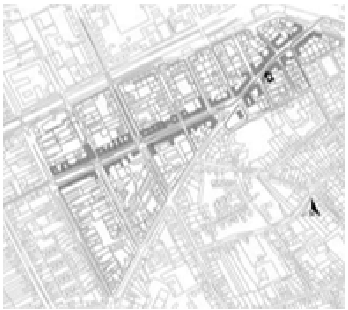

Bld. No.: 60		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 14			110
						Iv STRUCT 15			125
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	30
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	25
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			210
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			132.13

Foto

Bld. No.: 61		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	11.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 10			96.25
						Iv STRUCT 15			83.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	15	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	25
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			117.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			87.875

Foto

Bld. No.: 62		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	12.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						$I_{v\,STRUCT\,11}$			83.75
						$I_{v\,STRUCT\,15}$			118.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	25
		20	Original statues or bass-reliefs	0	10	15	25	1	15
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						$I_{v\,ARCH\text{-}ART.}$			192
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						$I_{v\,URBAN.}$			122.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						$I_{v\,SOC\text{-}ECON.}$			47.5
						$I_{v\,CULT}$			126.55

Foto

Bld. No.: 63		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	0
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 14			76.25
						Iv STRUCT 15			91.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	30
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	15
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	25
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			197.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	25
						Iv URBAN.			137.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	22.5
		40	Importance for the local community memory	-5	10	15	25	1	15
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	15
						Iv SOC-ECON.			75
						Iv CULT			111

Foto

Bld. No.: 64		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	11.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	45
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	0
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 13			125
						Iv STRUCT 15			140
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	15
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			139.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	15
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			82.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			40
						Iv CULT			129.18

Foto

Bld. No.: 65		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 11			103.75
						Iv STRUCT 15			81.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			172
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			112.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			96.3

Foto

Bld. No.: 66		DISTRICT: IOSEFIN								
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 18			103.75
						Iv STRUCT 15			41.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	15
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			174.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	15
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			90
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			66.775
Foto	 								

Bld. No.: 67		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
					$I_{v\,STRUCT\,13}$				91.25
					$I_{v\,STRUCT\,15}$				66.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
					$I_{v\,ARCH\text{-}ART.}$				142
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
					$I_{v\,URBAN.}$				92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
					$I_{v\,SOC\text{-}ECON.}$				47.5
					$I_{v\,CULT}$				79.65

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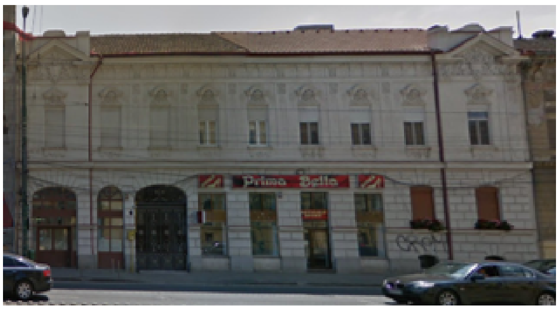

Bld. No.: 68		DISTRICT: IOSEFIN							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	12.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 13			83.75
						Iv STRUCT 15			143.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	30
		18	Original woodwork/joinery	0	10	15	25	1	25
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	25
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	25
		22	Original balconies and railings	0	10	15	25	1	25
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			245
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			127.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	15
		41	Economic value	0	10	15	25	1.5	37.5
		42	Cultural functions	0	10	15	25	1.5	15
						Iv SOC-ECON.			82.5
						Iv CULT			154.25

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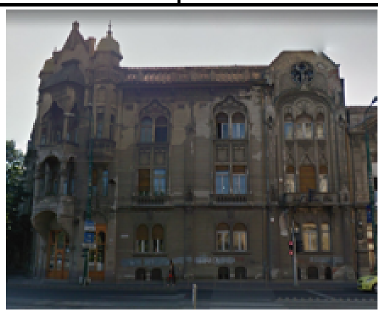

Bld. No.: 1		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	25
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						$I_{V\,STRUCT\,10}$			125
						$I_{V\,STRUCT\,15}$			168
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	18
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	25
		22	Original balconies and railings	0	10	15	25	1	25
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	10
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	7.5
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	25
		33	Past restoration work	-5	10	15	25	1	10
						$I_{V\,ARCH\text{-}ART.}$			245.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	25
						$I_{V\,URBAN.}$			147.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	15
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	15
						$I_{V\,SOC\text{-}ECON.}$			67.5
						$I_{V\,CULT}$			172.55

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Bld. No.: 2		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	11.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	12.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 13			133.75
						Iv STRUCT 15			156.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	12.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			159.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			122.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			147.93

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Bld. No.: 3		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	25
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						$Iv_{STRUCT\ 14}$			113.75
						$Iv_{STRUCT\ 15}$			66.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	18
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	15
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	10
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	5
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						$Iv_{ARCH-ART.}$			223
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						$Iv_{URBAN.}$			132.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	15
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						$Iv_{SOC-ECON.}$			52.5
						Iv_{CULT}			96.05

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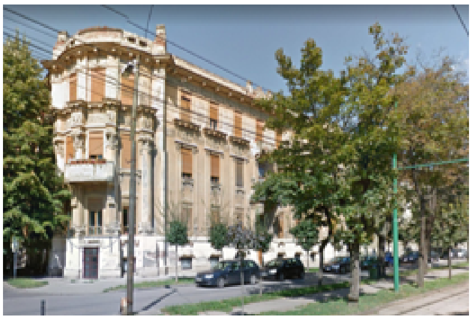

Bld. No.: 4		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						$I_{v\,STRUCT\,10}$			110
						$I_{v\,STRUCT\,15}$			48
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	18
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	15
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	10
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	5
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						$I_{v\,ARCH\text{-}ART.}$			223
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						$I_{v\,URBAN.}$			117.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	15
						$I_{v\,SOC\text{-}ECON.}$			62.5
						$I_{v\,CULT}$			81.925

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Bld. No.: 5		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 10			98.75
						Iv STRUCT 15			36.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	30
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	15
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	5
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			227.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			117.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			73.975

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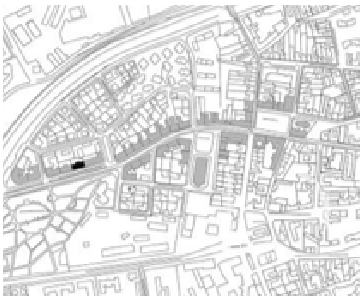

Bld. No.: 6		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	25
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 14			127.5
						Iv STRUCT 15			112.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	18
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	25
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	10
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	5
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			243
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			137.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			131.33

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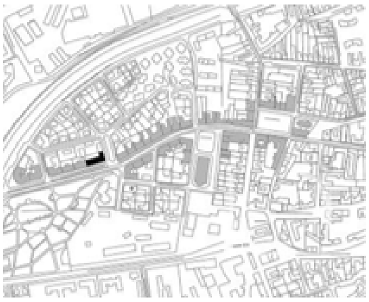

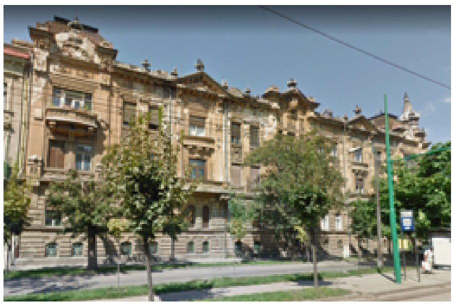

Bld. No.: 7		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	25
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	0
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 11			113.75
						Iv STRUCT 15			154.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	5
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			172
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			132.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	15
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			52.5
						Iv CULT			149.65

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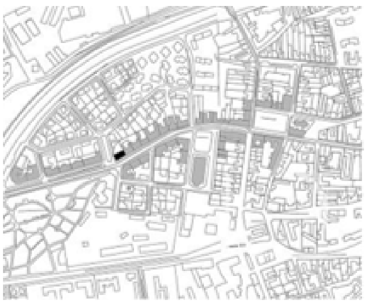
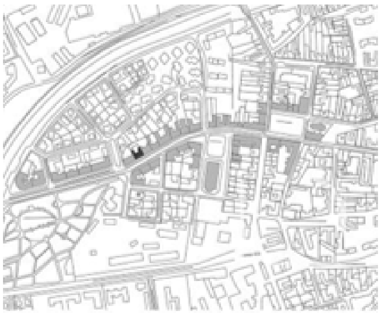


Bld. No.: 8		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	54
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						$Iv_{STRUCT\,13}$			118.75
						$Iv_{STRUCT\,15}$			135.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	15
						$Iv_{ARCH\text{-}ART.}$			182
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						$Iv_{URBAN.}$			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	0
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						$Iv_{SOC\text{-}ECON.}$			32.5
						Iv_{CULT}			132.85
Foto	 								

Bld. No.: 9		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	11.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	45
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 14			126.25
						Iv STRUCT 15			146.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			192
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			144.65

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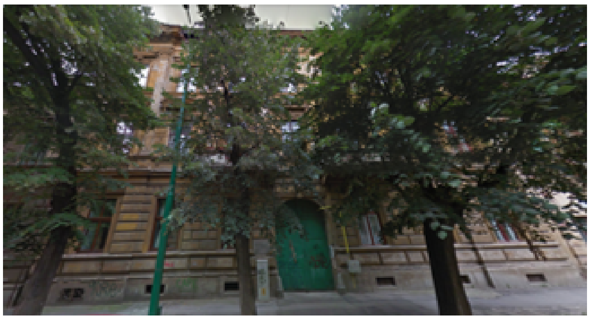

Bld. No.: 10		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 14			122.5
						Iv STRUCT 15			92.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			197
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			102.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			106.93

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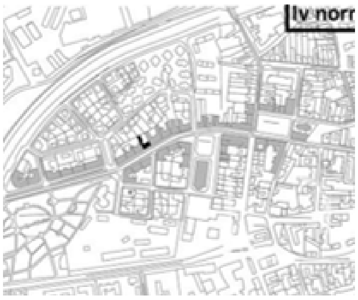

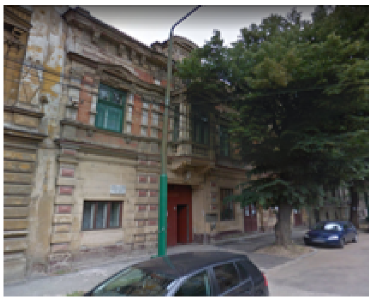

Bld. No.: 11		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 13			66.25
						Iv STRUCT 15			106.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	18
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			190.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			122.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			117.58

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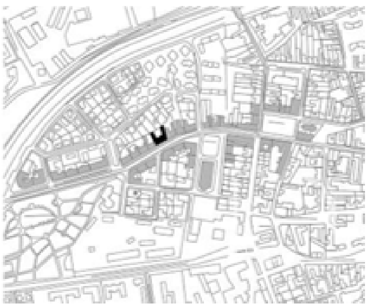

Bld. No.: 12		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-67.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 14			103.75
						Iv STRUCT 15			83.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			167
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			94.55

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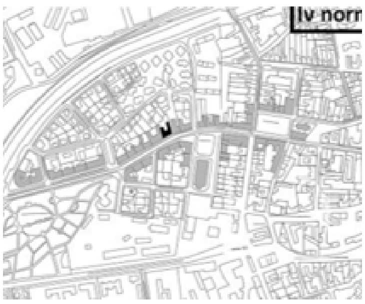

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Bld. No.: 13		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 14			58.75
						Iv STRUCT 15			53.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			80
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			75
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			58.375

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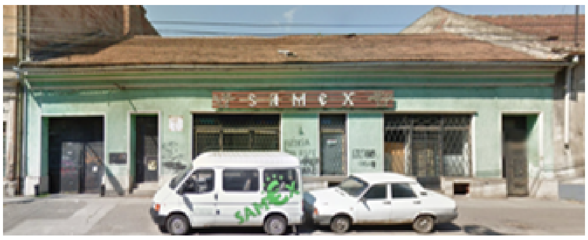

Bld. No.: 14		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	45
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 1-10			106.25
						Iv STRUCT 1-15			56.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			80
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			75
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			60.475
Foto									

Bld. No.: 15		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	0
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						$I_{V\,STRUCT\,10}$			93.75
						$I_{V\,STRUCT\,15}$			118.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	10
						$I_{V\,ARCH\text{-}ART.}$			80
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						$I_{V\,URBAN.}$			75
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						$I_{V\,SOC\text{-}ECON.}$			25
						$I_{V\,CULT}$			103.88
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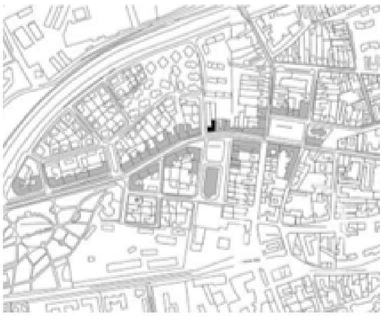

Bld. No.: 16		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	45
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 13			116.25
						Iv STRUCT 15			156.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			137
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			140.8

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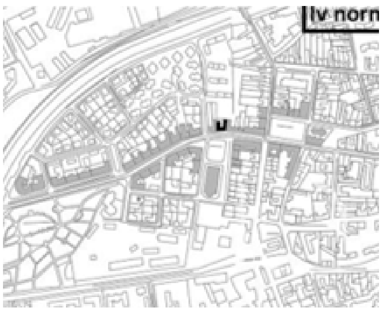

Bld. No.: 17		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	11.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	45
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 18			140
						Iv STRUCT 15			102.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			120
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			100.63

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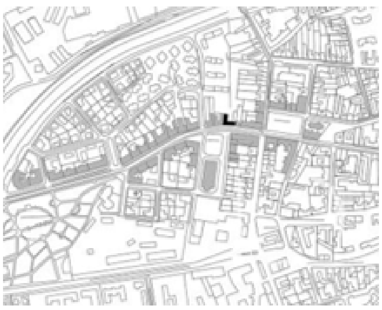

Bld. No.: 18		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	20
		2	Nature of vertical structures	0	5	25	45	0.25	11.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	45
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 18			170
						Iv STRUCT 15			132.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	18
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			120.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			121.7
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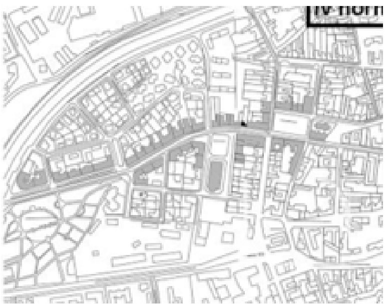

Bld. No.: 19		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	25
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
						Iv STRUCT 13			130
						Iv STRUCT 15			160
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	15
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	10
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	5
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			227
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			137.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			162.18

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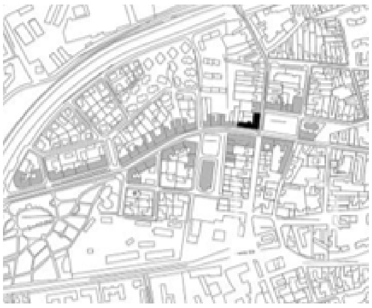

Bld. No.: 20		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 11			91.25
						Iv STRUCT 15			78.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			85
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			102.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			79.375

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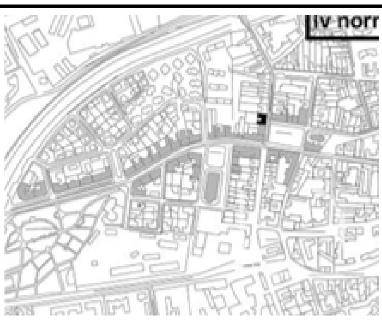

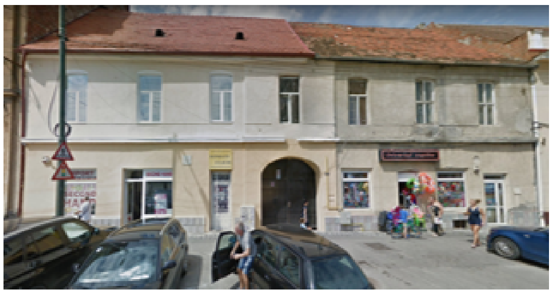

Bld. No.: 21		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	11.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 13			107.5
						Iv STRUCT 15			132.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	15
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	10
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			217
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			137.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			141.43

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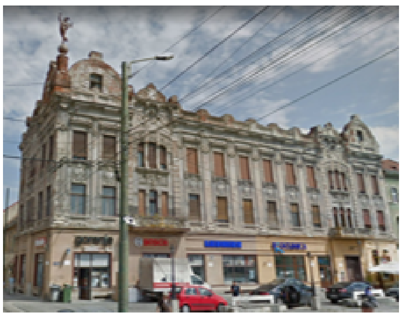

Bld. No.: 22		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	11.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	45
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 14			118.75
						Iv STRUCT 15			103.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			162
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			109.3

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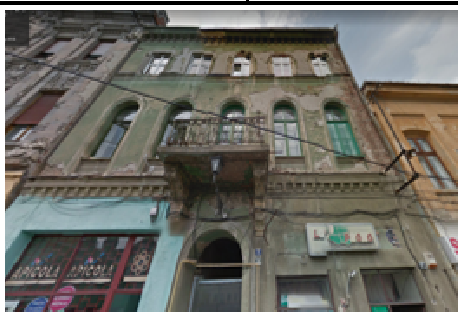
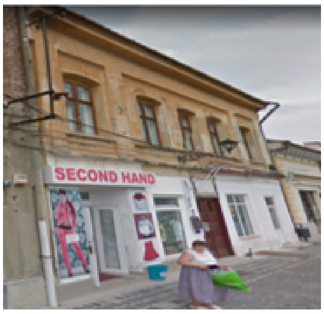


Bld. No.: 23		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-67.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						$I_{V\,STRUCT\,10}$			93.75
						$I_{V\,STRUCT\,15}$			48.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						$I_{V\,ARCH\text{-}ART.}$			87.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						$I_{V\,URBAN.}$			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						$I_{V\,SOC\text{-}ECON.}$			25
						$I_{V\,CULT}$			57.75
Foto	 								

Bld. No.: 24		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 11			58.75
						Iv STRUCT 15			49.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	0
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			114.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			25
						Iv CULT			63.65
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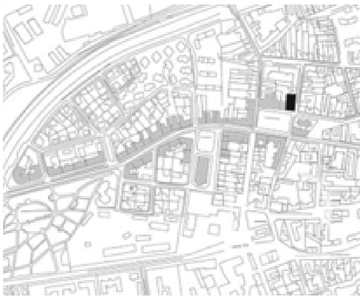

Bld. No.: 25		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 14			78.75
						Iv STRUCT 15			76.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	15
		17	Age, importance of the build époque	0	10	15	25	1.2	0
		18	Original woodwork/joinery	0	10	15	25	1	10
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	0
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	0
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			77.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	15
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	0
						Iv URBAN.			90
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	15
		42	Cultural functions	0	10	15	25	1.5	22.5
						Iv SOC-ECON.			47.5
						Iv CULT			76.725

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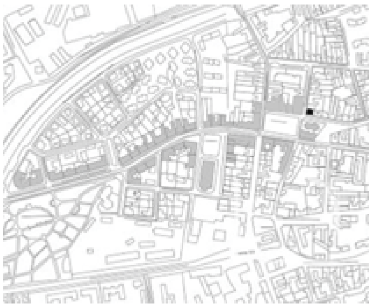

Bld. No.: 26		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	25
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	0
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 10			121.25
						Iv STRUCT 15			121.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	18
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	15
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	10
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			210.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			127.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	15
						Iv SOC-ECON.			62.5
						Iv CULT			132.33

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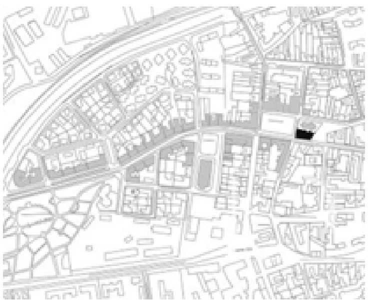

Bld. No.: 27		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	45
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						Iv STRUCT 13			120
						Iv STRUCT 15			133
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	10
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			217
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			137.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			47.5
						Iv CULT			141.78

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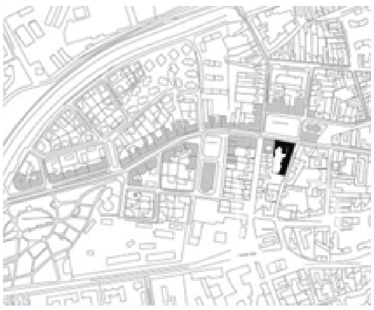

Bld. No.: 28		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						$I_{V\,STRUCT\,10}$			61.25
						$I_{V\,STRUCT\,15}$			26.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	15
						$I_{V\,ARCH\text{-}ART.}$			129.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						$I_{V\,URBAN.}$			112.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						$I_{V\,SOC\text{-}ECON.}$			32.5
						$I_{V\,CULT}$			51.025

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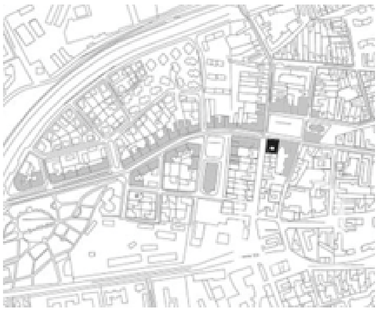

Bld. No.: 29		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	0
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	0
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						$I_{v\,STRUCT\,14}$			55
						$I_{v\,STRUCT\,15}$			40
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	30
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	10
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	5
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	5
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	-5
						$I_{v\,ARCH\text{-}ART.}$			187.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	25
						$I_{v\,URBAN.}$			137.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	22.5
		40	Importance for the local community memory	-5	10	15	25	1	15
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	22.5
						$I_{v\,SOC\text{-}ECON.}$			82.5
						$I_{v\,CULT}$			74

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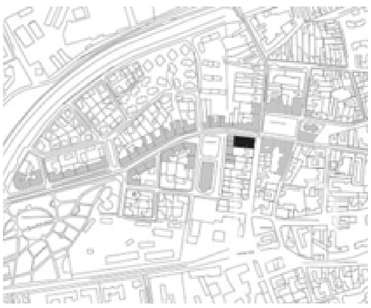

Bld. No.: 30		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	11.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	45
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	-20
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 1B			122.5
						Iv STRUCT 1S			60.5
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	10
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	15
						Iv ARCH-ART.			182
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			82.025

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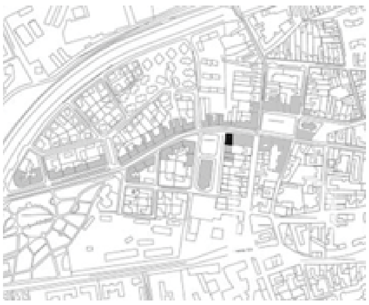

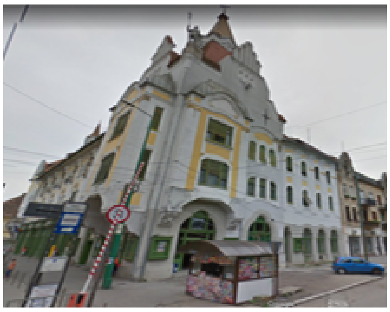

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Bld. No.: 31		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	11.25
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 1[illegible]			58.75
						Iv STRUCT 15			36.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	22.5
		17	Age, importance of the build époque	0	10	15	25	1.2	18
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	0
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	10
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			120.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	0
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			17.5
						Iv CULT			55.075

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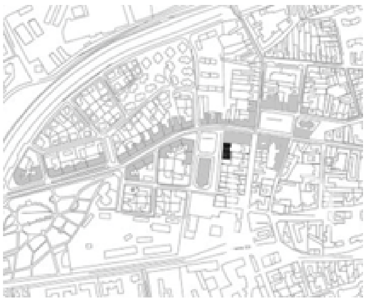


Bld. No.: 32		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 1[illegible]			101.25
						Iv STRUCT 15			78.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			152
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			90.3
Foto									

Bld. No.: 33		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	CLASS B	CLASS C	CLASS D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	0
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 14			101.25
						Iv STRUCT 15			63.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	10
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			152
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			92.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			78.3

Foto

Bld. No.: 34		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	37.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	0
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 1[illegible]			133.75
						Iv STRUCT 15			114.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	15
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	10
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			197
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			127.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			123.9
Foto	 								

Bld. No.: 35		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	0
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	25
						IvSTRUCT14			103.75
						IvSTRUCT15			136.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						IvARCH-ART.			167
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	22.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						IvURBAN.			107.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	0
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						IvSOC-ECON.			17.5
						IvCULT			132.05

Foto

Bld. No.: 36		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	1.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	15
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-37.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 10			88.75
						Iv STRUCT 15			61.75
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	0
		21	Original gable/fronton	0	10	15	25	1	0
		22	Original balconies and railings	0	10	15	25	1	10
		23	Original mosaics or stone work	0	10	15	25	1	0
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			144.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	22.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
						Iv URBAN.			112.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	0
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			17.5
						Iv CULT			77.025

Foto

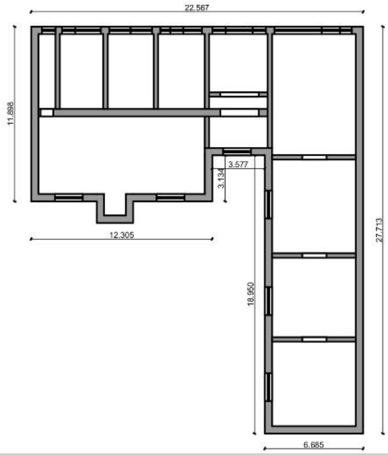
Bld. No.: 37		DISTRICT: FABRIC							
%	CRITERIA	No.	ELEMENT	CLASS A	B	C	D	WEIGHT	VALUE
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	5
		7	Type of floors	0	5	15	45	1	5
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	0
		10	Physical conditions	0	5	25	45	1	5
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	0
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	-12
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	0
						Iv STRUCT 13			73.75
						Iv STRUCT 15			69.25
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	10
		21	Original gable/fronton	0	10	15	25	1	10
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	0
		25	Conservation state of artistic assets	-5	10	15	25	1	10
		26	Authenticity/ originality (global, elements)	0	10	15	25	1	0
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	5
		30	Representative historical events	0	10	15	25	0.5	0
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative/ original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
						Iv ARCH-ART.			179.5
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	0
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	10
						Iv URBAN.			122.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	-5
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
						Iv SOC-ECON.			32.5
						Iv CULT			89.275

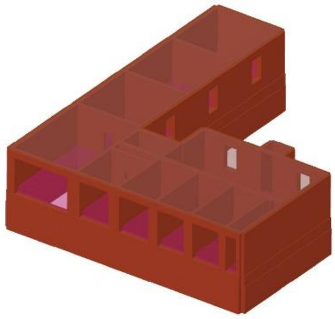
Foto

APPENDIX B

TYPE I

Bld. I.1
(25)

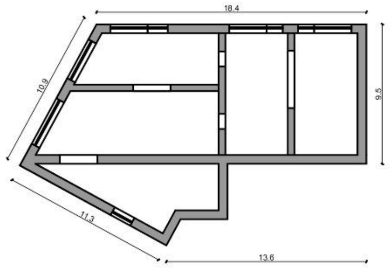


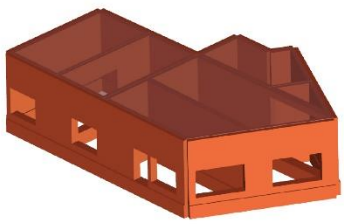


IOSEFIN

TYPE I

Bld. I.2
(10)





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TYPE I

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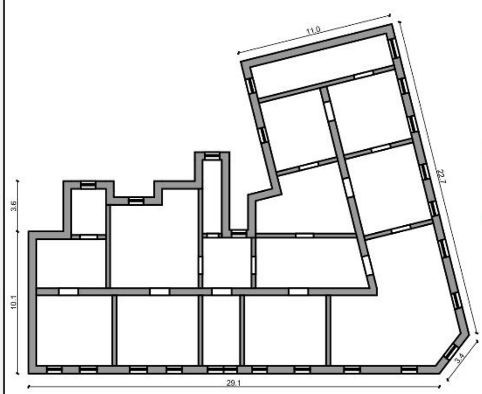
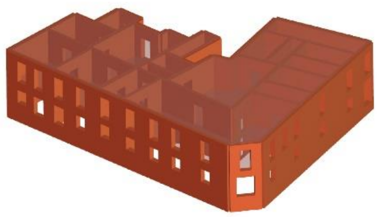
(55)





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TYPE I

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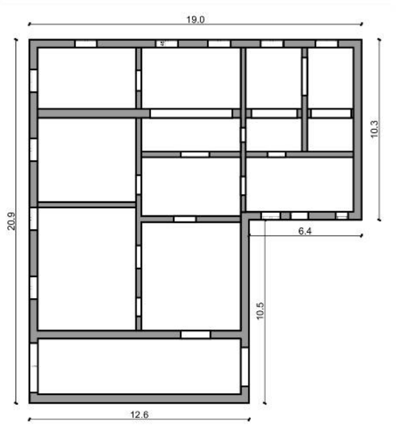
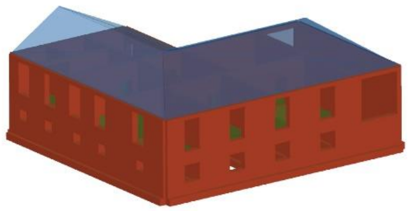
(51)





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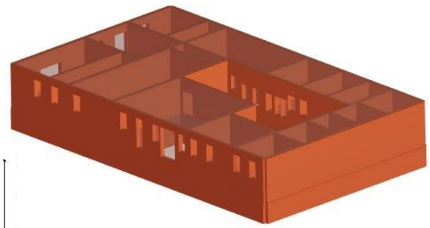
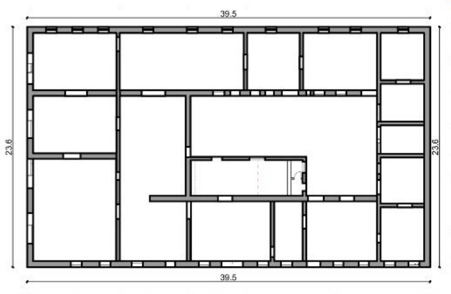
TYPE I

Bld. I.5
(24)

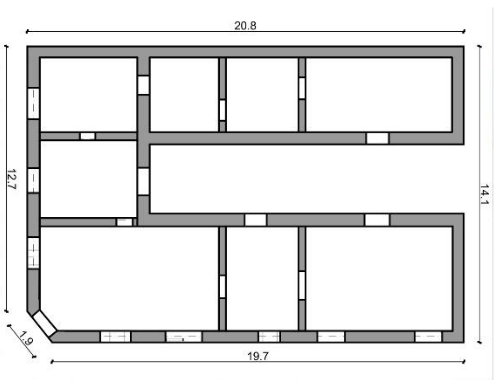




FABRIC

TYPE I

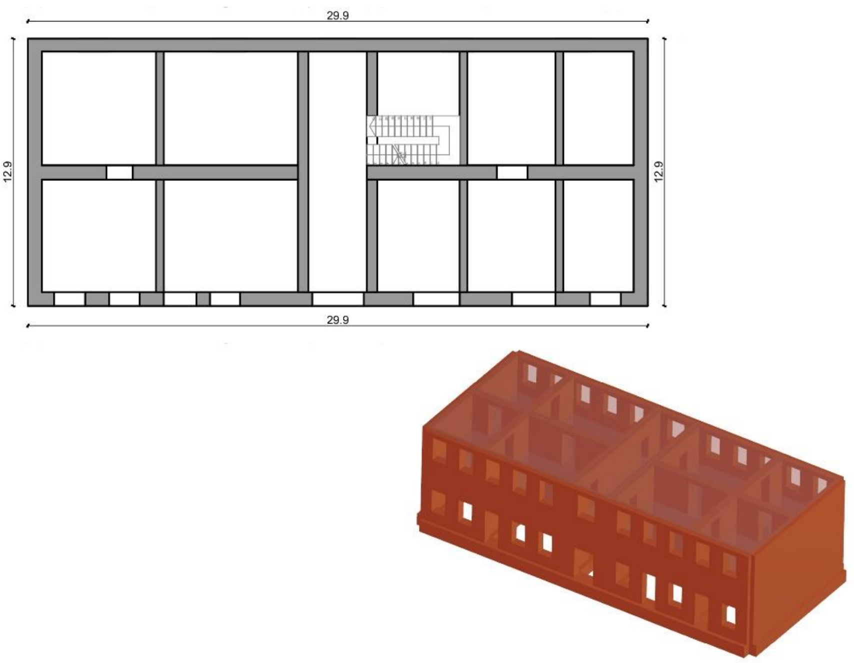
Bld. I.6
(25)



FABRIC

TYPE II

Bld. II.1
(6)



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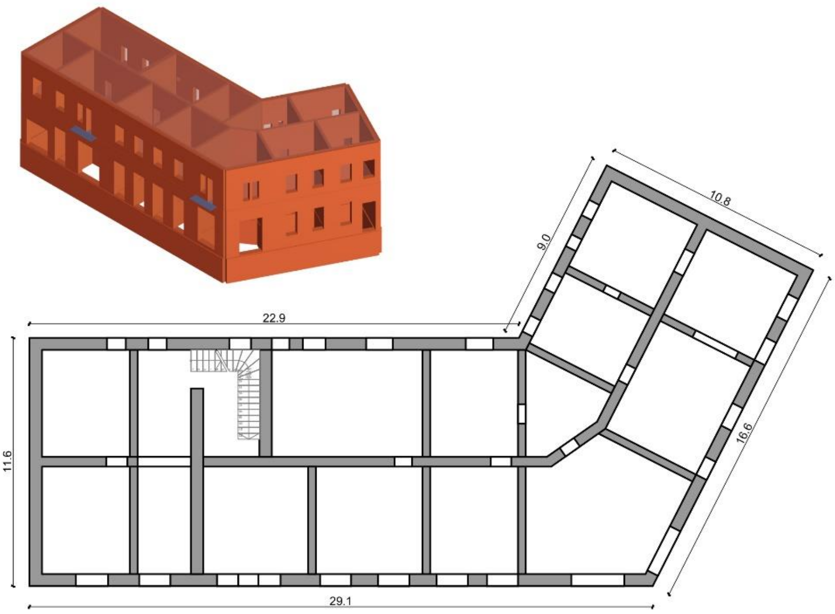
TYPE II

Bld. II.2
(56)



IOSEFIN

TYPE II

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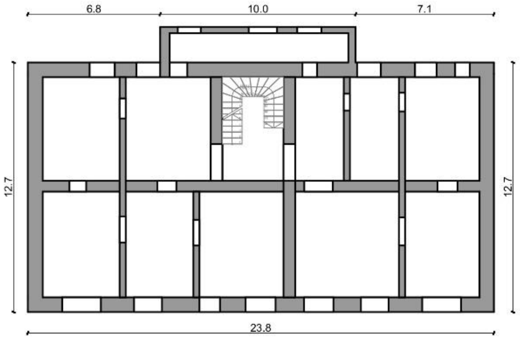
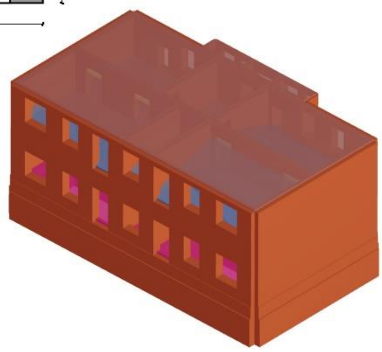
(29)





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TYPE II

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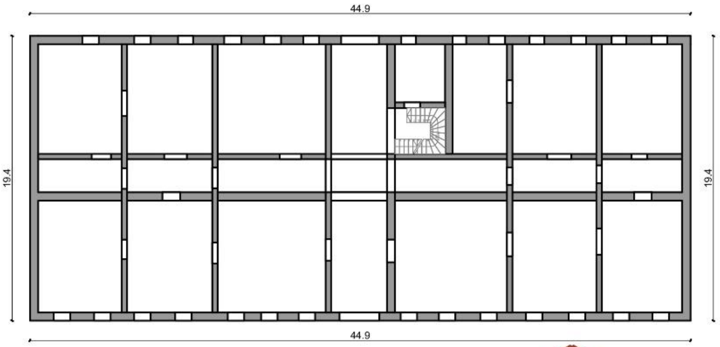
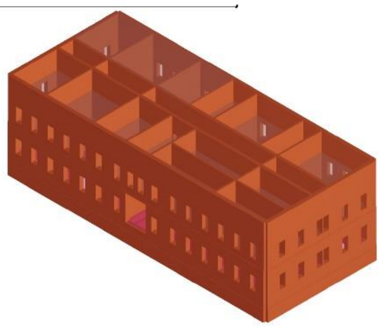
(47)

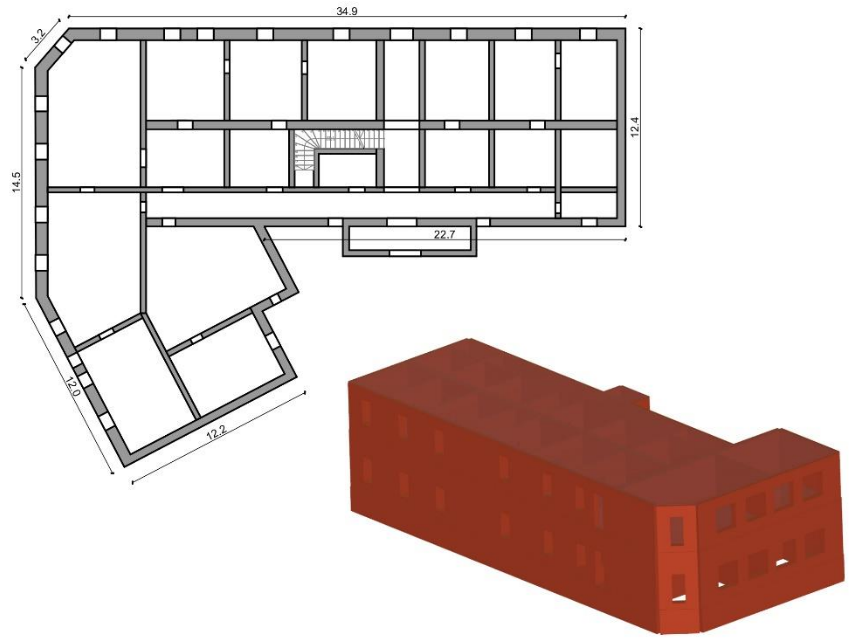




IOSEFIN

TYPE II

Bld. II.5
(13)



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TYPE II

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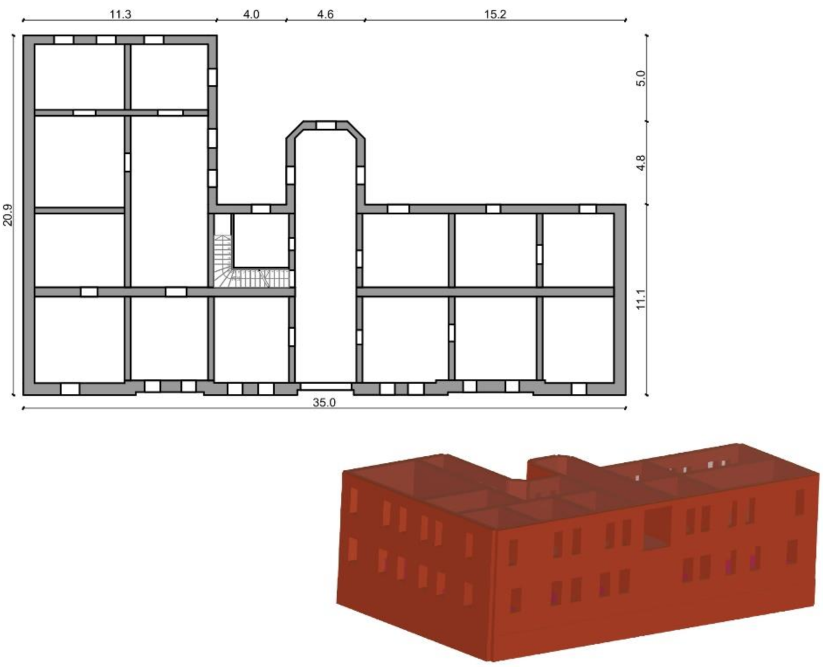
(9)



IOSEFIN

TYPE II

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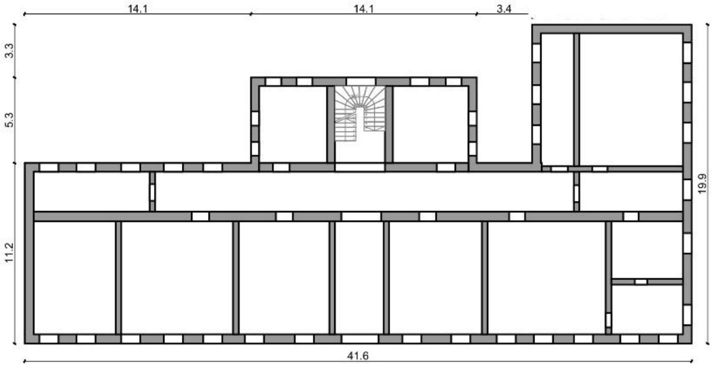
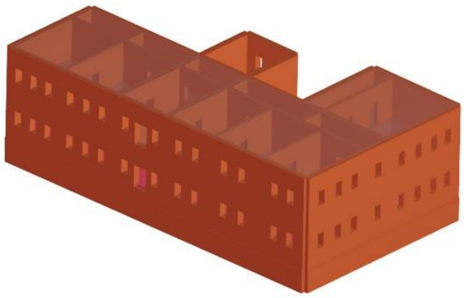
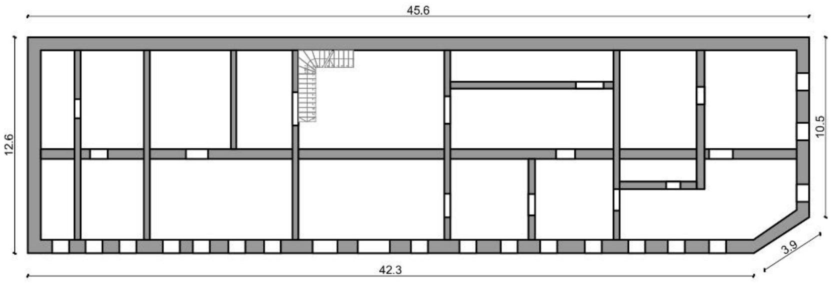


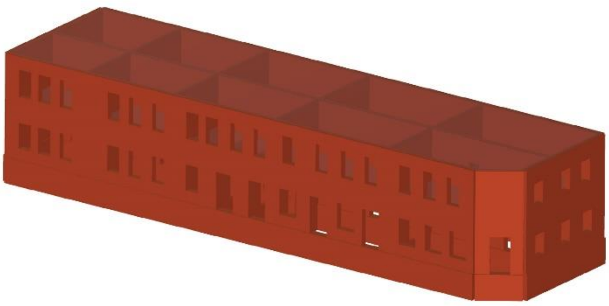


IOSEFIN

TYPE II

Bld. II.8
(41)





IOSEFIN

TYPE II

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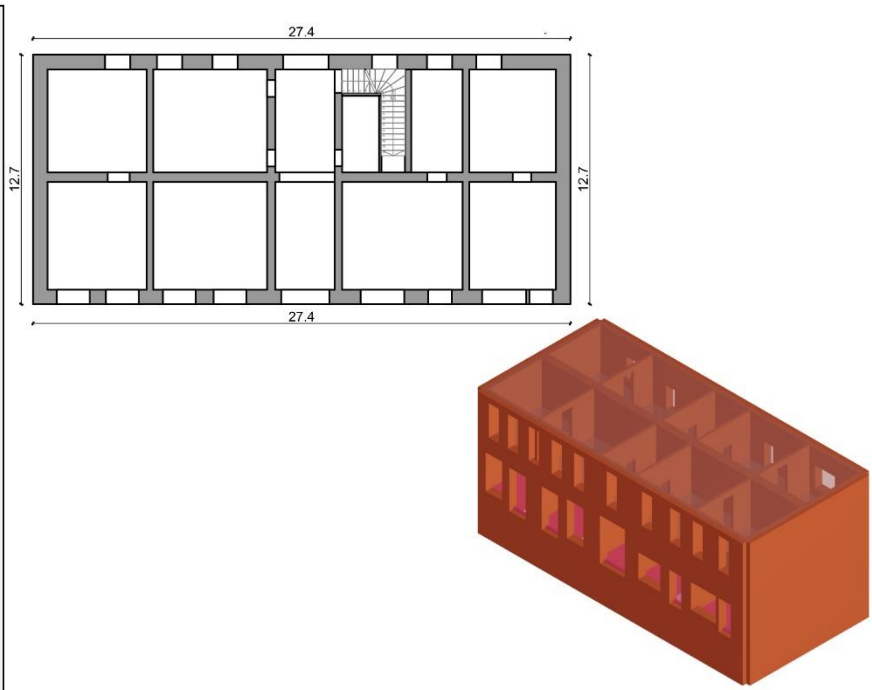
(15)



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TYPE II

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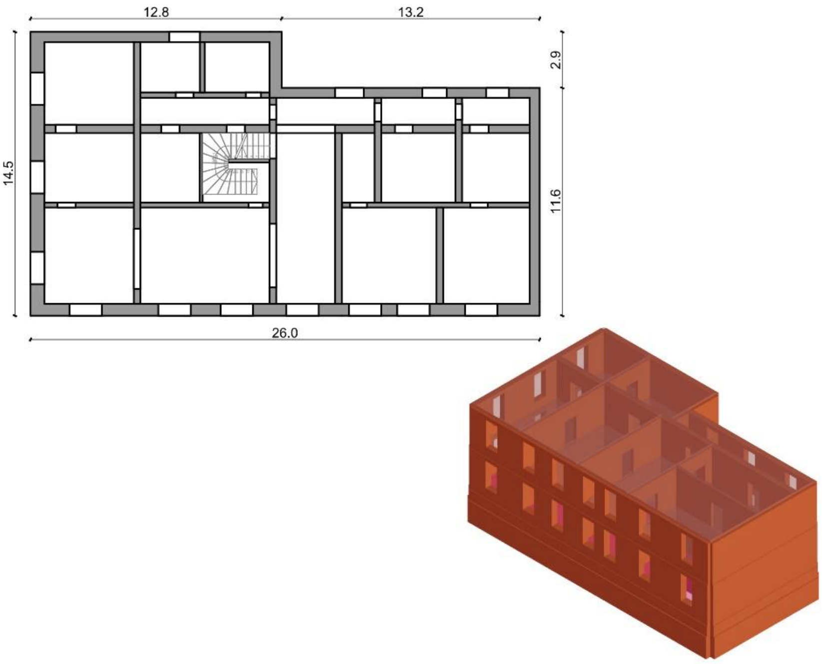

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TYPE II

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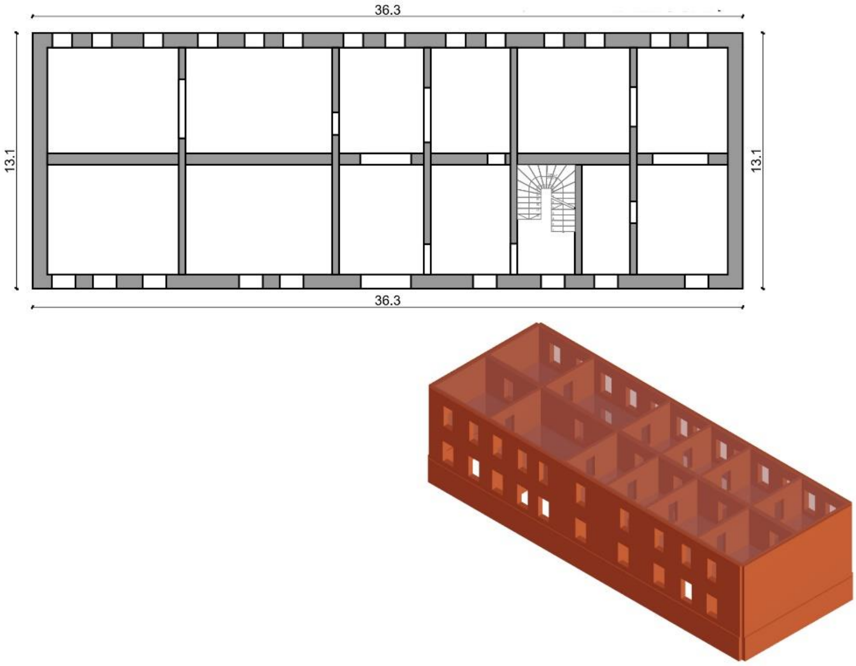
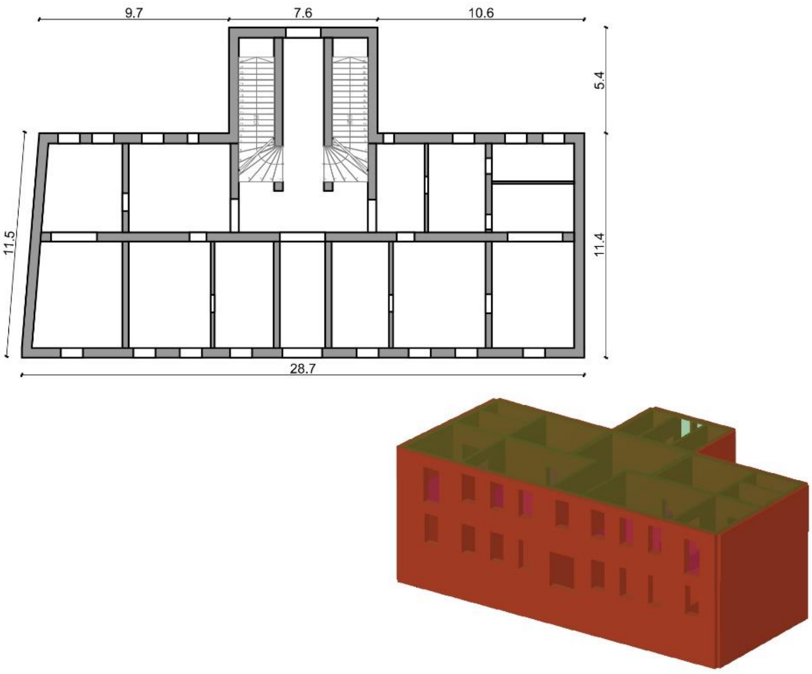


TYPE II

Bld. II.12
(33)

FABRIC



TYPE III

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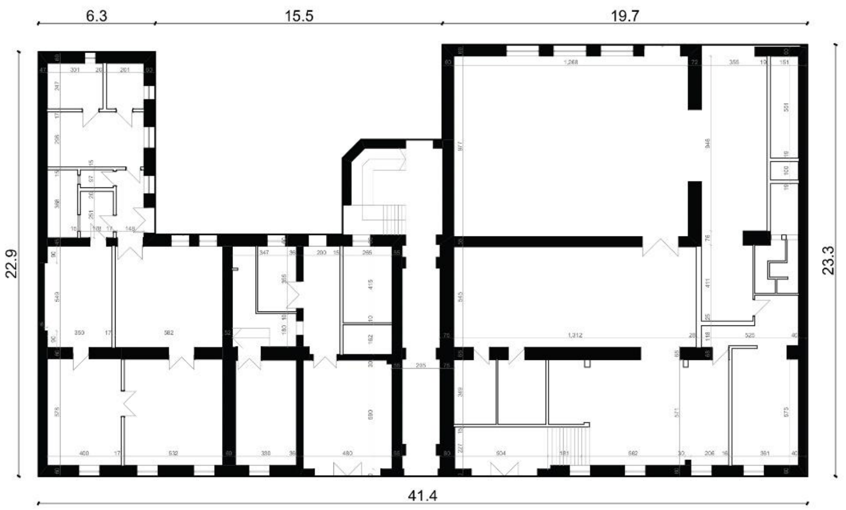
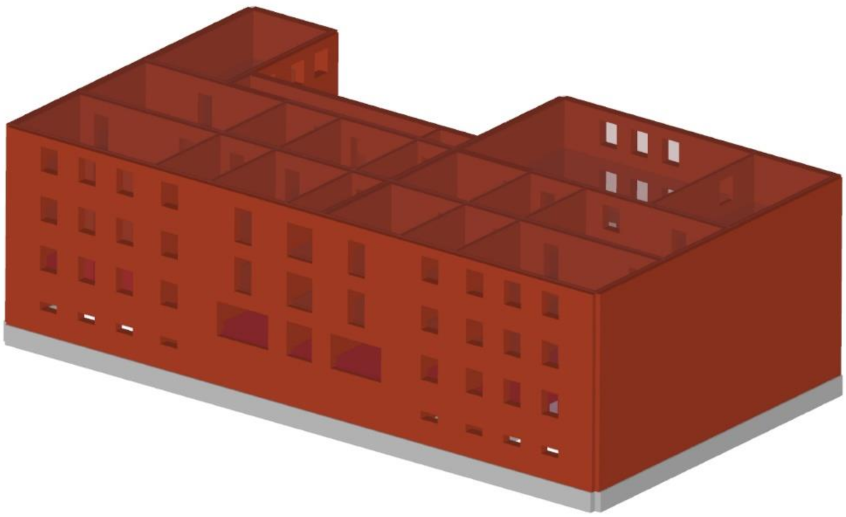
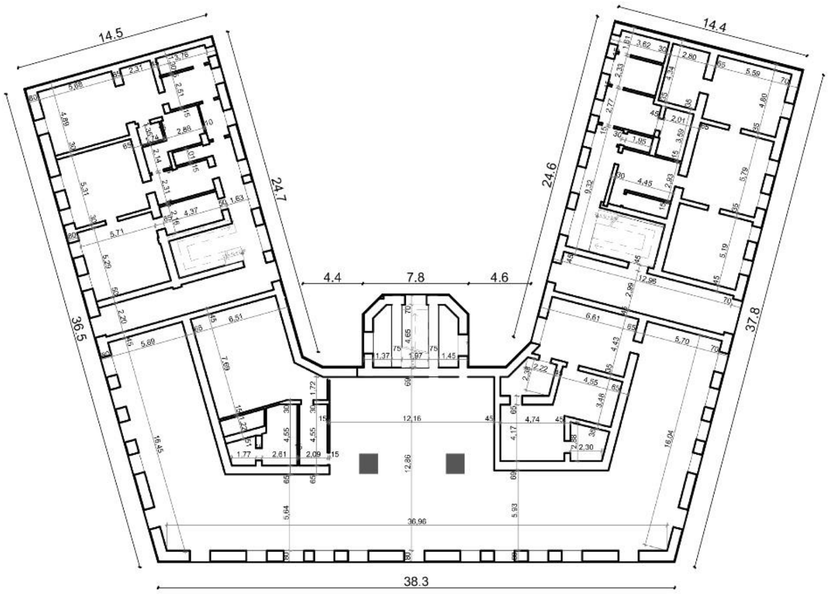


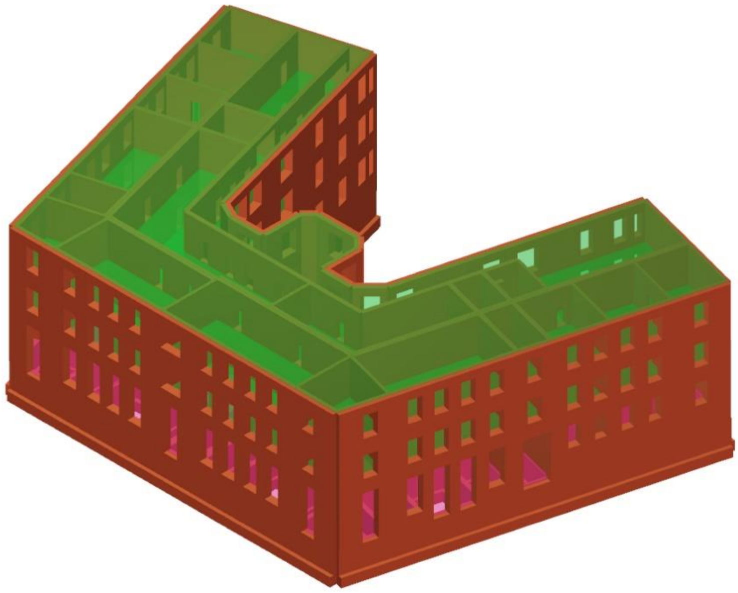


IOSEFIN

TYPE III

Bld. III.2
(54)





IOSEFIN

TYPE III

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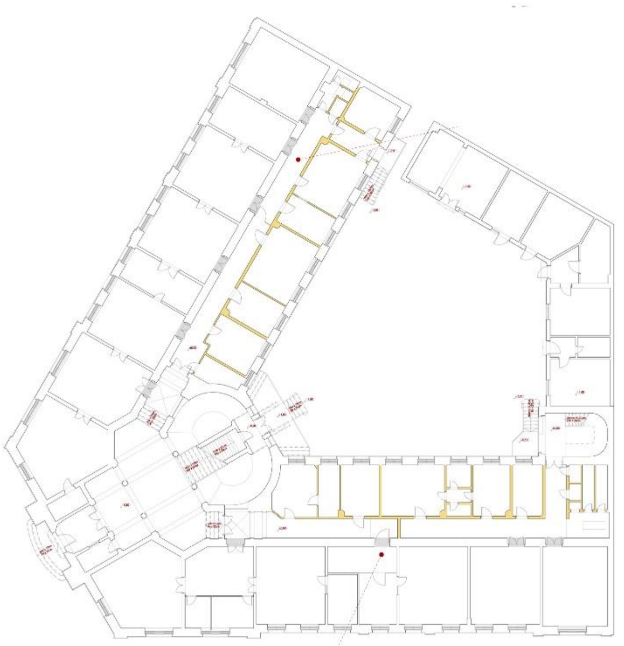

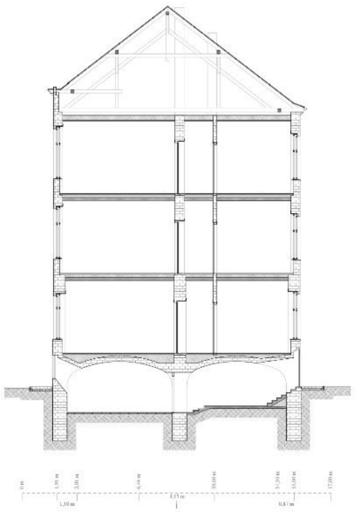

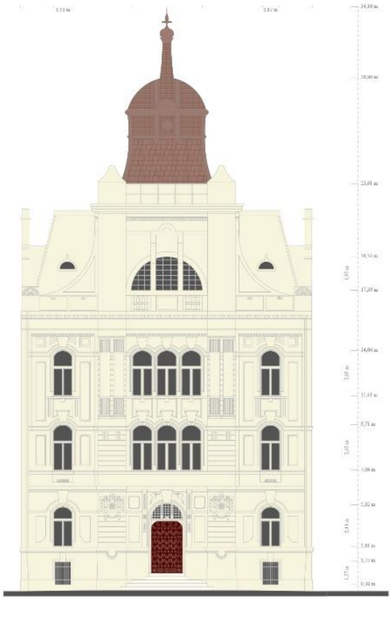

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TYPE III

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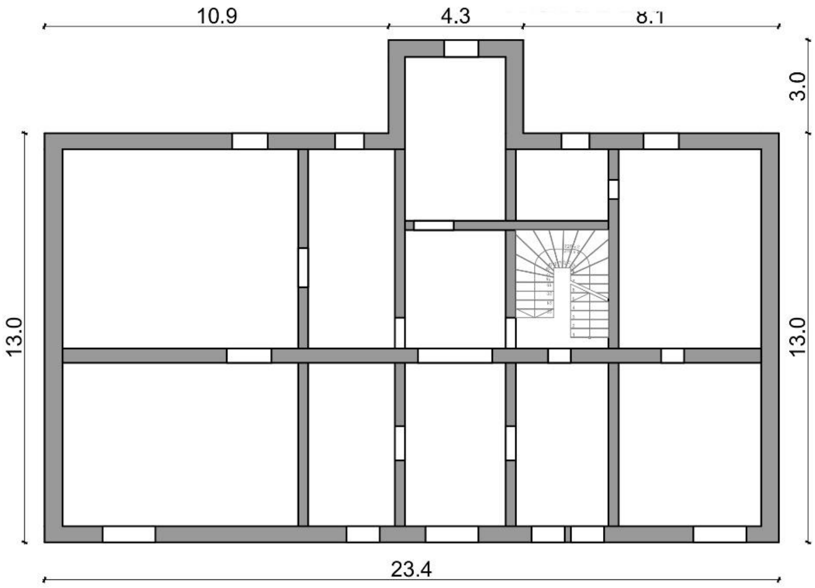

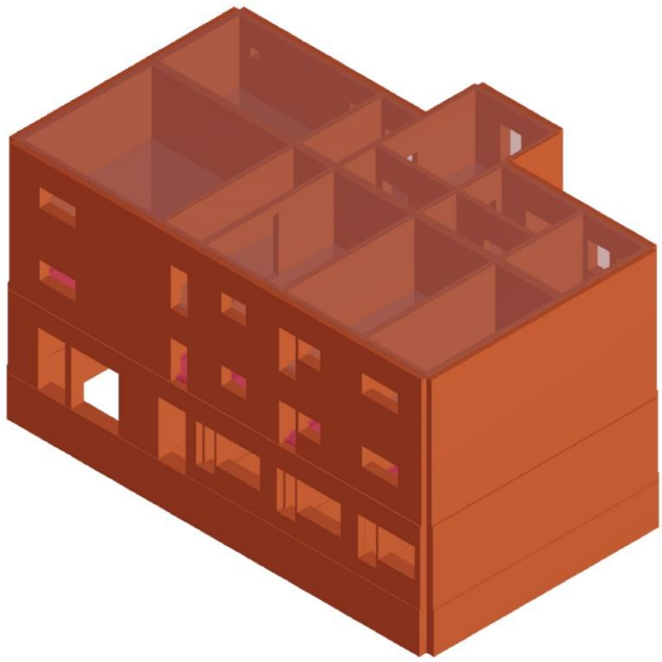

IOSEFIN

TYPE III

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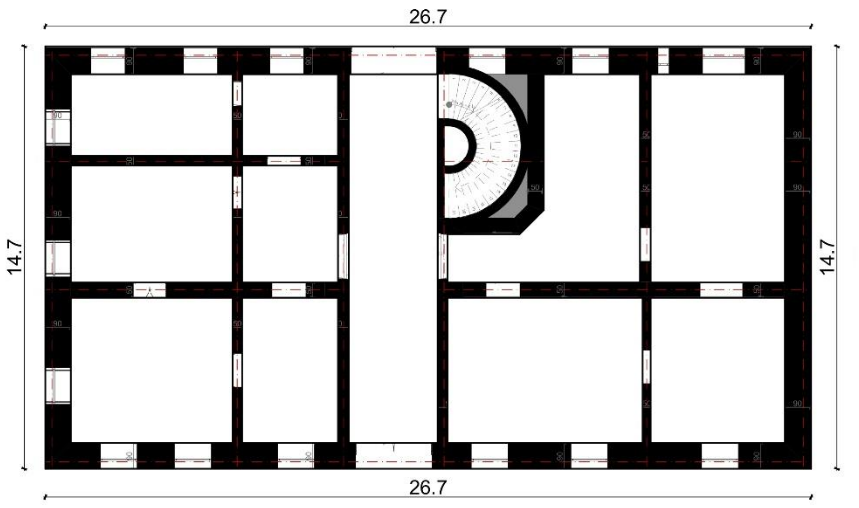
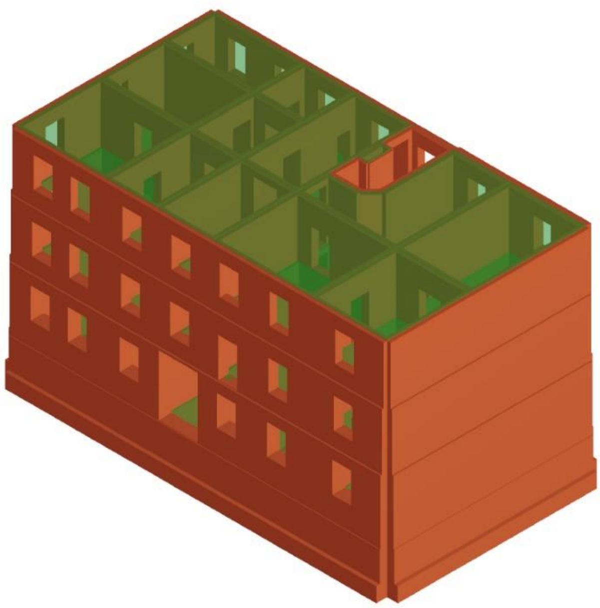
(7)





FABRIC

TYPE III

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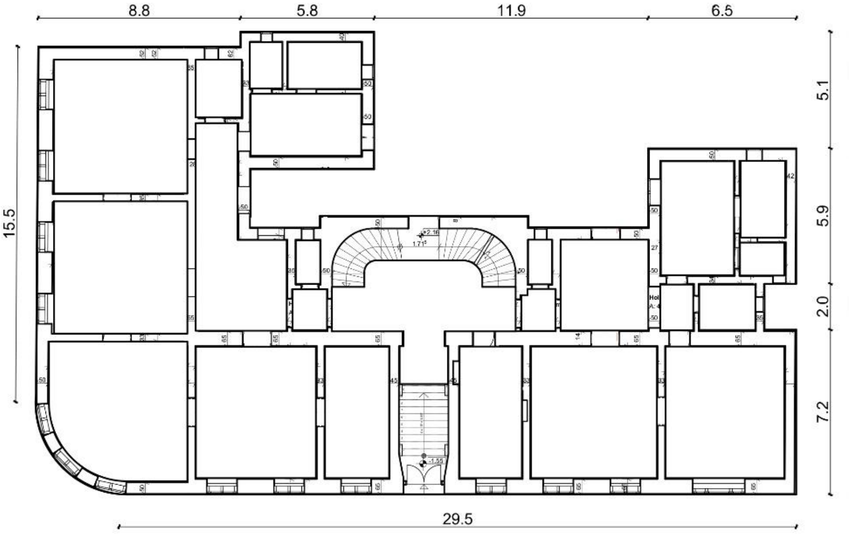
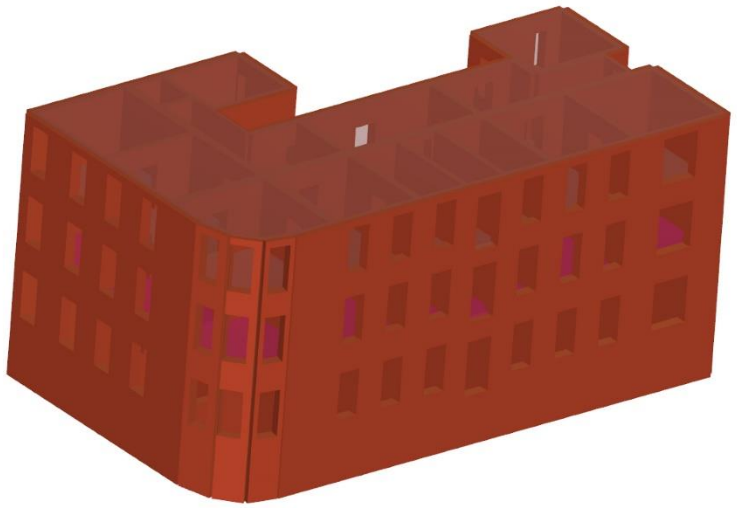
(3)





FABRIC

TYPE III

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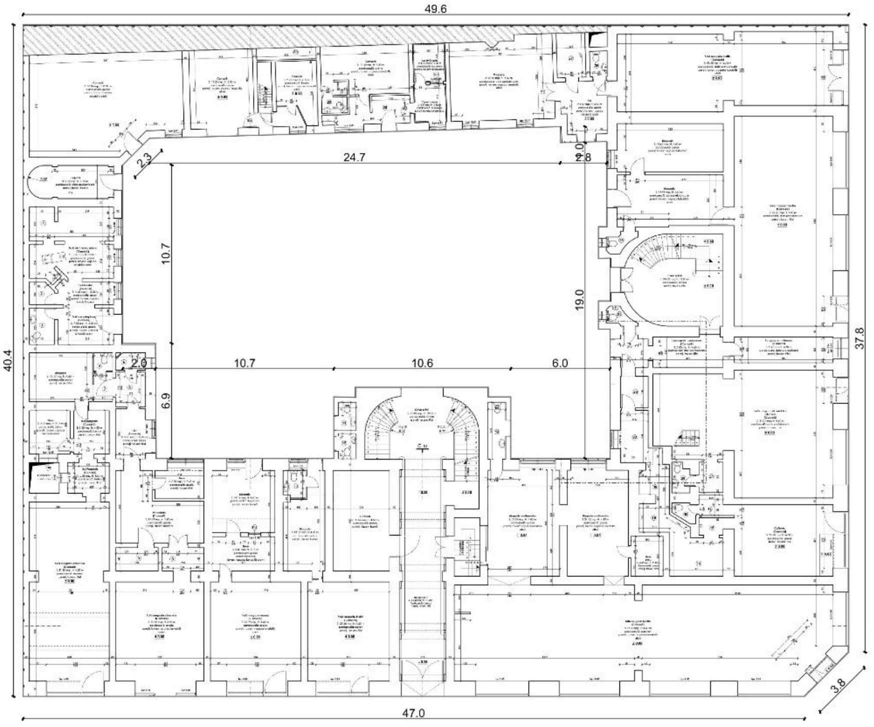

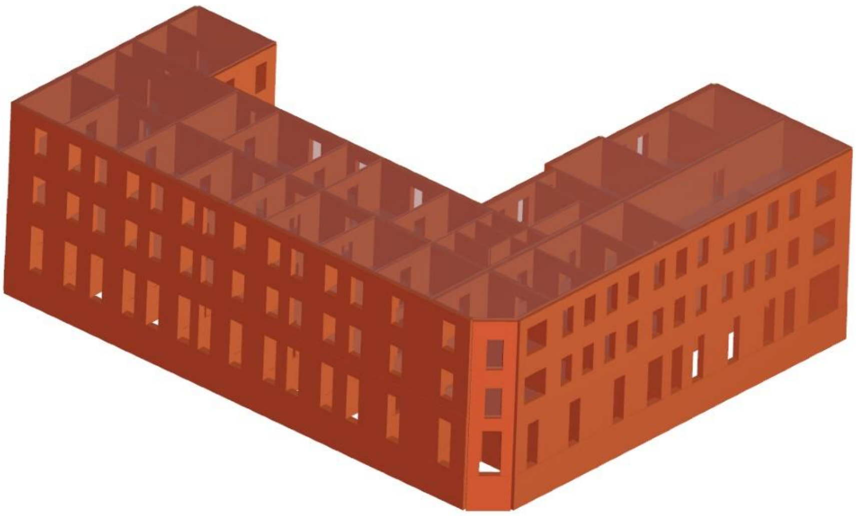

FABRIC

APPENDIX C

District	Type	No.	Building	Adress	Iv10	Iv15	Δy x	Δu x	Fmax x	μΔ	q	Δy y	Δu y	Fmax y	μΔ	q	Vmec x	Vmec y	mec ma	Δu n	Δu n-1	h	Interstorey drift
							cm	cm	Kn			cm	cm	Kn						cm	cm	cm	
IOSEFIN	I.1	25		Iosefin B-dul Regele Carol I nr. 14 (16A)	112.5	88	0.04	0.14	1796	2.5	2	0.12	0.4	2348	2.333	1.915	0.2857	0.3	0	0.21	0	410	0.051219512
	I.2	10		Iosefin B-dul 16 Decembrie 1989 nr. 16 (Zugrav Nedelcu nr. 1A)	63.75	46.25	0.1	0.39	1549	2.9	2.191	0.24	0.82	1061	2.417	1.958	0.2564	0.2927	0.293	0.18	0	490	0.036734694
	I.3	55		Iosefin B-dul 16 Dec. 1989 nr. 17	67.5	97.5	0.12	0.36	3248	2	1.732	0.16	0.52	3326	2.25	1.871	0.3333	0.3077	0.333	0.32	0.19	350	0.037142857
	I.4	51		Iosefin B-dul Regele Carol I nr. 7	73.75	91.25	0.2	0.56	2976	1.8	1.612	0.12	0.36	2607	2	1.732	0.3571	0.3333	0.357	0.43	0.07	370	0.097297297
FABRIC	I.5	24		Fabric Str. Zavoi nr. 1	68.75	98.75	0.04	0.12	2826	2	1.732	0.04	0.12	3976	2	1.732	0.3333	0.3333	0.333	0.28	0.07	520	0.040384615
	I.6	25		Fabric Str. Costache Negruzzi nr. 1	140	138	0.18	0.56	771	2.111	1.795	0.06	0.2	1512	2.333	1.915	0.3214	0.3	0.321	0.6	0	560	0.107142857
AVERAGE	I				87.708	93.2917	0.11333	0.355	2194.33	2.219	1.844	0.12333	0.40333	2471.67	2.222	1.854	0.3146	0.3112	0.273	0.337	0.055	450	0.061653639

	II.1	6		Iosefin B-dul 16 Dec. 1989 nr. 10 (nr.12)	123.75	68.25	0.2	0.6	1942	2	1.732	0.28	1.08	2775	2.857	2.171	0.3333	0.2593	0.333	0.54	0	470	0.114893617
	II.2	56		Iosefin B-dul 16 Dec. 1989 nr. 15	103.75	151.25	0.32	1.08	3677	2.375	1.936	1.64	4.03	3076	1.457	1.384	0.2963	0.4069	0.407	0.35	0	500	0.07
	II.3	29		Iosefin B-dul Regele Carol I nr. 20	113.75	76.25	0.36	1.08	1467	2	1.732	0.3	0.96	2812	2.2	1.844	0.3333	0.3125	0.333	0.27	0	440	0.061363636
	II.4	47		Iosefin B-dul General Ion Dragalina nr. 8	76.25	109.25	0.18	0.72	4232	3	2.236	0.84	2.81	3734	2.345	1.921	0.25	0.2989	0.299	0.65	0.08	450	0.126666667
	II.5	13		Iosefin Str. Ady Endre nr. 2	83.75	108.75	0.24	0.84	5594	2.5	2	0.56	2.04	1231	2.643	2.07	0.2857	0.2745	0.286	0.48	0	450	0.106666667
IOSEFIN	II.6	9		Iosefin Str. Zugrav Nedelcu nr. 12	41.25	63.75	0.48	1.68	3835	2.5	2	0.3	0.84	6247	1.8	1.612	0.2857	0.3571	0.357	1.51	0.4	420	0.264285714
	II.7	43		Iosefin B-dul Regele Carol I nr. 17	76.25	111.25	0.26	0.73	4231	1.808	1.617	0.85	2.6	3375	2.059	1.766	0.3562	0.3269	0.356	0.64	0	410	0.156097561
	II.8	41		Iosefin B-dul Regele Carol I nr. 23	83.75	96.25	0.2	0.8	3640	3	2.236	0.4	1.68	1758	3.2	2.324	0.25	0.2381	0.25	0.89	0.32	400	0.1425

	II.9	15		Iosefin Piata Alexandru Mocioni nr. 7	65	40.5	0.18	0.66	2478	2.667	2.082	0.2	0.6	1933	2	1.732	0.2727	0.3333	0.333	1.16	0.07	470	0.231914894
	II.10	16		Iosefin Strada Emanoil Gojdu nr. 2	108.75	91.25	0.36	1.62	3178	3.5	2.449	0.26	0.96	2293	2.692	2.094	0.2222	0.2708	0.271	0.21	0.02	375	0.050666667
	II.11	39		Iosefin B-dul Regele Carol I nr. 19	83.75	86.25	0.28	0.8	2770	1.857	1.648	0.36	1.32	2429	2.667	2.082	0.35	0.2727	0.35	1.55	0.67	350	0.251428571
FABRIC	II.12	33		Fabric B-dul 3 August 1919 nr. 8	98.75	61.25	0.45	0.96	4971	1.133	1.125	0.14	0.68	3426	3.857	2.591	0.4688	0.2059	0.469	0.45	0	400	0.1125
AVERAGE	II				88.229	88.6875	0.2925	0.96417	3501.25	2.362	1.9	0.51083	1.63333	2924.08	2.481	1.966	0.3087	0.2964	0.337	0.725	0.13	427.9	0.140748666
	III.1	53		Iosefin B-dul Regele Carol I nr. 3	125	98	0.8	2.64	9075	2.3	1.897	0.4	1.36	9343	2.4	1.949	0.303	0.2941	0.303	0.67	0.27	320	0.125
	III.2	54		Iosefin B-dul Regele Carol I nr. 1	76.25	78.75	0.82	2.67	12480	2.256	1.874	0.66	2.15	13907	2.258	1.875	0.3071	0.307	0.307	1.23	0.02	565	0.214159292
IOSEFIN	III.3	1		Iosefin B-dul 16 Decembrie 1989 nr. 2	121.25	96.75	0.92	4.07	9432	3.424	2.418	0.96	2.84	8083	1.958	1.708	0.226	0.338	0.338			400	0

	III.4	23		Iosefin B-dul Regele Carol I nr. 12	76.25	66.75	0.58	1.68	3209	1.897	1.671	0.24	1.28	1581	4.333	2.769	0.3452	0.1875	0.345	1.2	0.1	400	0.275
FABRIC	III.5	7		Fabric B-dul 3 August 1919 nr. 11	93.75	118.75	0.63	2.65	3906	3.206	2.327	0.38	1.39	4243	2.658	2.077	0.2377	0.2734	0.273	0.61	0.03	440	0.131818182
	III.6	3		Fabric B-dul 3 August 1919 nr. 3	113.75	66.75	0.7	2.16	4223	2.086	1.781	0.48	1.2	3092	1.5	1.414	0.3241	0.4	0.4	0.72	0	450	0.16
	III.7	19		Fabric B-dul 3 August 1919 nr. 33	130	160	0.6	1.62	10846	1.7	1.549	0.48	1.32	8215	1.75	1.581	0.3704	0.3636	0.37	1.09	0	495	0.22020202
AVERAGE	III				105.18	97.9643	0.72143	2.49857	7595.86	2.41	1.931	0.51429	1.64857	6923.43	2.408	1.911	0.3019	0.3091	0.334	0.92	0.07	438.6	0.160882785

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