Byzantine and “Barbarian” Historic Structures in Romania - Past, Present and Future

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1. GLOBAL APPROACH TO THE BUILT ENVIRONMENT [1]

An unified built environment presupposes an unified terminology, subordinated in its turn to unified technical, legal and economic regulations. We shall review the terminology by summarising types of interventions into the built heritage and their control, the cultural heritage-values of the built environment, and the control of interventions into these values.

1.1 INTERVENTIONS INTO THE BUILT ENVIRONMENT

Interventions into the built environment fall into several **categories**, such as maintenance, rehabilitation/conservation and extension – according to the proportions of new spiritual or material values integrated:

- **continuous maintenance** means interventions into the built environment in use (and the real estate that forms it), aimed at maintaining original values with a minimal use of new spiritual or material ones;
- **rehabilitation/conservation** presumes interventions of different complexity, eliminating – to a higher or lower degree – the consequences of the physical and moral degradation of the real estate; the quantity of the new material introduced depends on functional conversions, financial possibilities and protection requirements;
- **extension** of the built environment – creation of new buildings – is the category which supposes the maximum quantity of new spiritual and material values introduced, therefore it is absolutely necessary to conform to the requirements of the natural and built environment preservation.

Interventions into the built environment are continuous: maintenance, rehabilitation and extension are permanent processes. **Buildings making up** the built environment suffer interventions of different **types**. These can be **continuous** (permanent maintenance), **periodical** (rehabilitation/conservation) and **occasional** (construction of new buildings).

- **Interventions into the built environment** suppose multiple **phases**: research, planning, execution and maintenance while in use.
- **research** precedes any intervention, and presupposes the full co-operation of all professions. During this phase some interventions are already necessary (archaeological excavations, archaeological -upper structure- survey or partial demolition, provisional constructions, propping systems, scaffolding etc.), to which the legislation on construction-execution works applies. The result of this phase is a **planning program,** for which the researched building is "discharged of its heritage-character";
- **planning** represents the conception phase of interventions, based on the results of the research; it is materialised in the **execution and usage/maintenance program**, which includes the technical documentation and schedule of execution works and care, as well as the identification of financial sources and cost estimates;

- **execution** is the interventions-phase proper, being more emphatic when rehabilitating and extending (completing) the built environment;
- **maintenance during usage** also supposes explicit interventions (execution), though less emphatic ones, appertaining to continuous maintenance.

1.2 CONTROLLING INTERVENTIONS INTO THE BUILT ENVIRONMENT

The means of **control over interventions into the built environment** are provided by the juridical, technical and financial **legislation:**

- on **international level** this means charters, recommendations, communications, bilateral agreements etc., endorsed by different governments;
- on **national level** it means laws, decrees, executive orders, ministerial acts, regulations issued by authorised institutions.

The **control over interventions into the built environment** supposes a legal, technical and financial **framework**. Activities are launched based on **suppositions and estimations** (which match only accidentally the reality revealed during the different intervention phases and categories, even when there exists a proper legal, technical and financial framework). Therefore **corrections** in content and finances **are necessary** during or after execution. Corrections depend on the categories of intervention: they are minimal for extensions of built environment (execution of new works), and their importance increases the less researched the building is, and the more thorough the rehabilitation works are.

The legislation controlling the interventions presupposes legal, technical and economic prescriptions that can satisfy together and simultaneously, if possible, the needs of all three categories: maintenance, rehabilitation/conservation and extension. The juridical systems of the countries from the former socialist block, especially that of Romania, present **serious deficiencies** in the field of continuous maintenance and rehabilitation of the built environment. More exactly, the above mentioned categories of intervention into the built environment have not yet regained their proper position in the legal, technical and economic conscience of these countries.

1.3 CULTURAL HERITAGE VALUES OF THE BUILT ENVIRONMENT – THE BUILT HERITAGE

Speaking of the **cultural heritage values** of the built environment – **the built heritage** – , we need to remember that the cultural heritage presumes by definition a significant built element (known by mankind as built heritage), and that the built environment represents a heritage in its totality (although a significant part of it is not considered worthy of protection, moreover is regarded as polluting the environment and good taste, and thus condemned to demolition.)

The built heritage can possess **cultural heritage values recognised on international, national or local levels.** These values can belong to the **world heritage** (listed by UNESCO), to the **national heritage** (listed by central governmental organisations) or to **local heritages** (listed by local governments).

The built environment also has important **potential** heritage-values, which have not been identified and are thus not protected, but the destruction of which could mean irretrievable losses for the nation, or even for humanity. Therefore all built environment interventions presume a **'previous discharge of its heritage character'**.

1.4 CONTROLLING INTERVENTIONS INTO THE BUILT ENVIRONMENT POSSESSING HERITAGE VALUES

When discussing the **control of interventions into the built environment possessing heritage values,** we must remember that there are potential heritage values as well, therefore we must **distinguish** between the possible situations: a). continuous maintenance or rehabilitation/conservation of listed parts of the built environment, b). continuous maintenance of elements with potential heritage values, c) rehabilitation/conservation of the latter, d) extension of the built environment.

- **continuous maintenance or rehabilitation/conservation** of **listed** parts of the built environment takes place in the framework of legal, technical and financial regulations in force, but consideration must also be given to the special demands of historic buildings;
- the **continuous maintenance** of parts of the built environment with **potential** heritage values is subject to the legal, technical and financial regulations in force that apply to built environment interventions in general, with no extra demands;
- the **rehabilitation/conservation** of elements with potential heritage values is subject to the legal, technical and financial regulations in force that apply to built environment interventions in general, **the building in question being discharged of its heritage character.**
- the **extension of the built environment** – construction of new buildings, infrastructure, parks – is subject to the legal, technical and financial regulations in force that apply to built environment interventions in general, **the area affected by the intervention being discharged of its heritage character** (especially the above and under-ground parts of the intervention's site that are to be demolished.)

The legal, technical and financial **regulations** ensuring the control of interventions into the built environment are **consistent,** that is they unanimously and, if possible, simultaneously apply to all intervention categories (maintenance, rehabilitation/conservation and extension). At the same time they are supposed to meet the special requirements set by the heritage values present. The legislation of the countries from the former socialist block in general, and that of Romania in particular, presents serious deficiencies in this respect.

2. HISTORIC STRUCTURES AND THE CULTURAL MESSAGES THEY CONVEY [2]

2.1 HISTORIC STRUCTURES AND CULTURAL HERITAGE

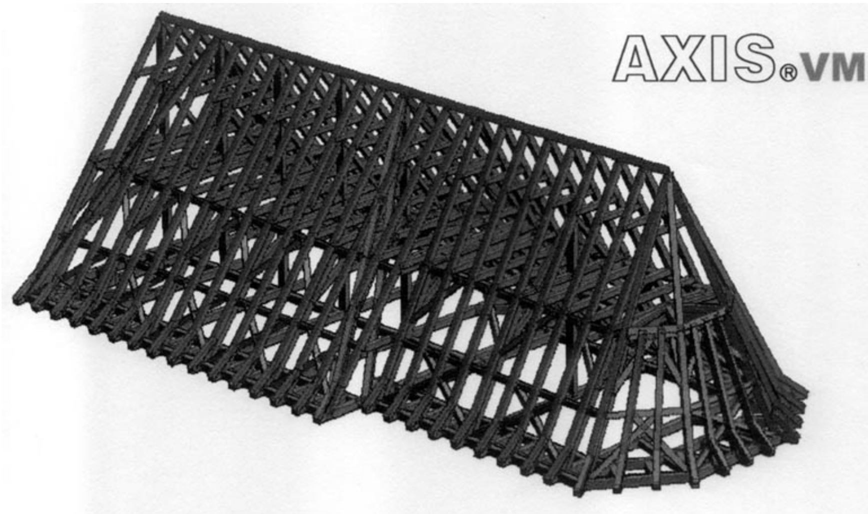
The discourse on the complexity of the cultural heritage has been going on for centuries. Smaller or larger groups have been promoting the "true" heritage, always basing their value judgements on their own criteria. Consensus regarding the cultural character of the built heritage is quite recent, and reached by specialists rather then society.

The built heritage is mostly made up of historic buildings. The most valuable of these are listed on national level as historic buildings. The most significant buildings of the national lists are lately declared by the UNESCO as parts of the world heritage (based on rather subjective criteria).

Historic value is a variable changing with space and time. While in the early 19th century only antique constructions were considered as possessing it, at present most countries have social realist listed buildings. The range of historic structural elements acknowledged as valuable also expanded continuously. Along with artistic accessories (wall paintings, painted wood, stone carvings) almost every structural category has been assigned this value, at first their formal, then material and conceptual qualities being acknowledged.

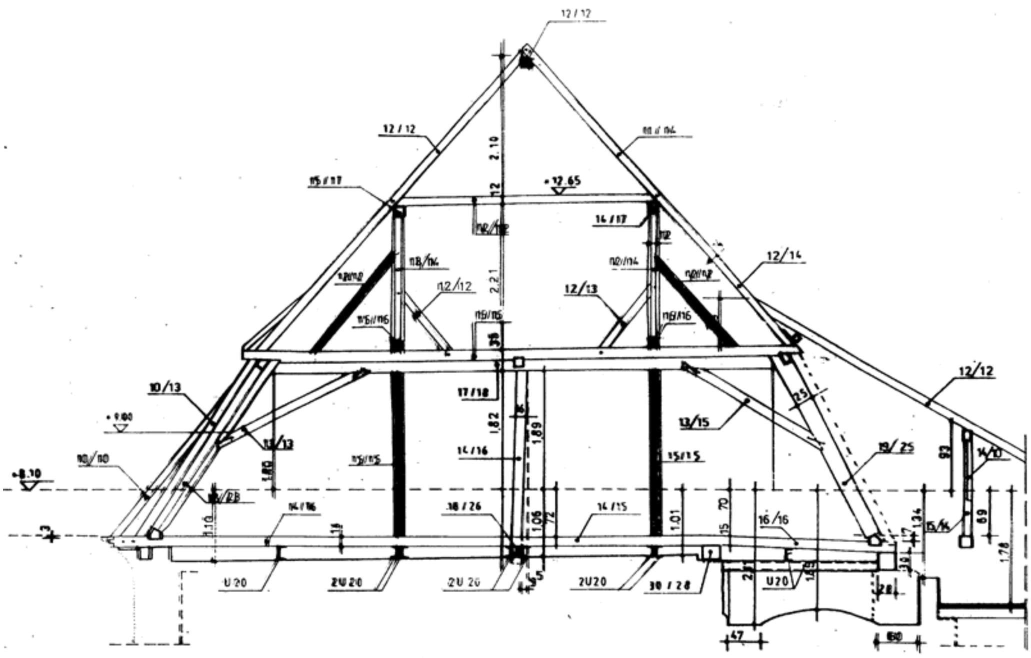
2.2 THE MESSAGE OF HISTORIC STRUCTURES

Due to their structural importance, several elements of structures have been declared values to be protected. Building structure as a whole was probably the last element assigned a historic value because we can speak of calculated structural conceptions only from the 19th century. In the case of most historic buildings we protect intuitive structural conceptions (as compared to the intentionally created artistic, functional and layout values). Apart from structural conceptions, traditional materials, processing and structure-building technologies are also to be protected.



Roof structure from Aluniş – Axonometry

Regardless of their intuitive character (or rather due to it), conceptual elements are highly valuable and always to be protected. Structural rehabilitation's like the ones transforming posts into pillars by introducing internal bracing's damage the conceptual authenticity of the structure, and they are offences as big as replacing Baroque window-frames of an elevation with modern, triple widows.



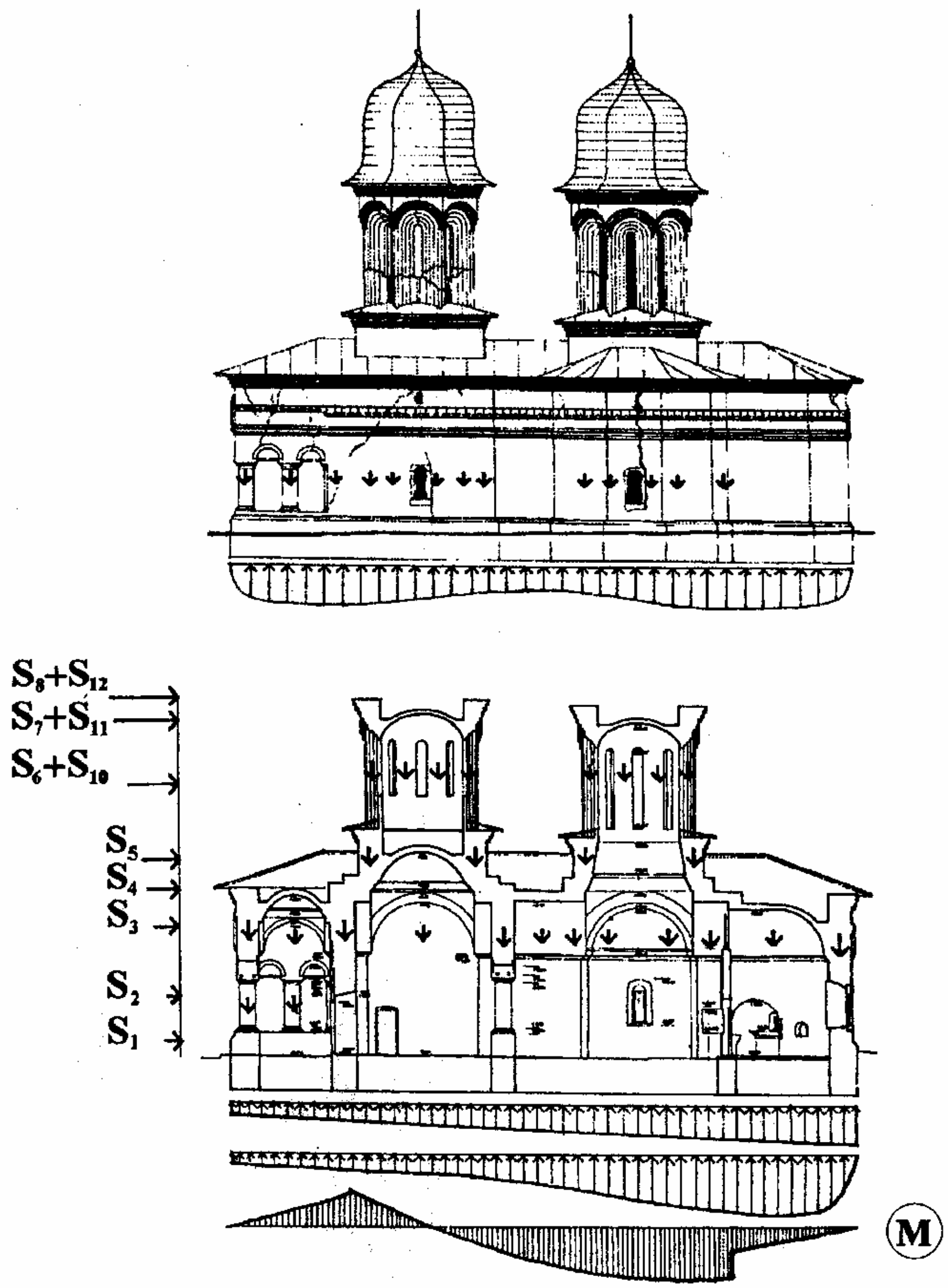
Conversion of Baroque roof structure - transforming posts in pillars

2.3 ON THE THEORY OF HISTORIC STRUCTURES

It is the task of specialists to present the message of historic structures and preserve their conception, material and technology.

We can only preserve historic structural conceptions if we understand them. There is an urgent need therefore for a comprehensive theory of historic structures.

As far as we know, though some segments of this theory do exist, there is no comprehensive one. This is probably due to the fact that when modern structural theory came into being as a scientific discipline, most historic structures were already history.



Fraction-theory in case of Byzantine structures

It is true that the distribution of forces in geometrically constructed structures and sub-ensembles (roof structures, arches, and vaults) started to be studied in the late 19th century, using the graphic static method widely accepted at the time.

It is also true that though in some cases 20th century computer programmes have been used – to mention only the study of the Coliseum in Rome, lead by professor Croci [3] -, as far as we know no comprehensive research project based on modern computerised technology has been initiated yet. The reason for this may be not only lack of finances, but also could be the lack of interest.

We also know about professor Cismigiu's fraction-theory [4], developed in detail for Byzantine architecture, and successfully used by professionals at the structural expertises of historic structures in seismic areas.

If the comprehensive theory of historic structures does not exist, it needs to be developed, of course by a large, surely international group of specialists.

It seems certain that this general theory of historic structures needs to be formulated based on structural theories of different ages: thus the Byzantine building culture, the Gothic or Baroque architecture, the Inca or Japanese built heritage may have their own theory of building structures.

In the process of developing this theory we might reach the conclusion that structural theory is general, that there are no separate, historic and modern structural theories. In this case we need to study, understand and present the history of these structures, their development in space and time, paying attention to all cultures and to all theoretical principles of structures guiding constructions anywhere in the world.

2.4 REHABILITATION THEORY OF HISTORIC STRUCTURES

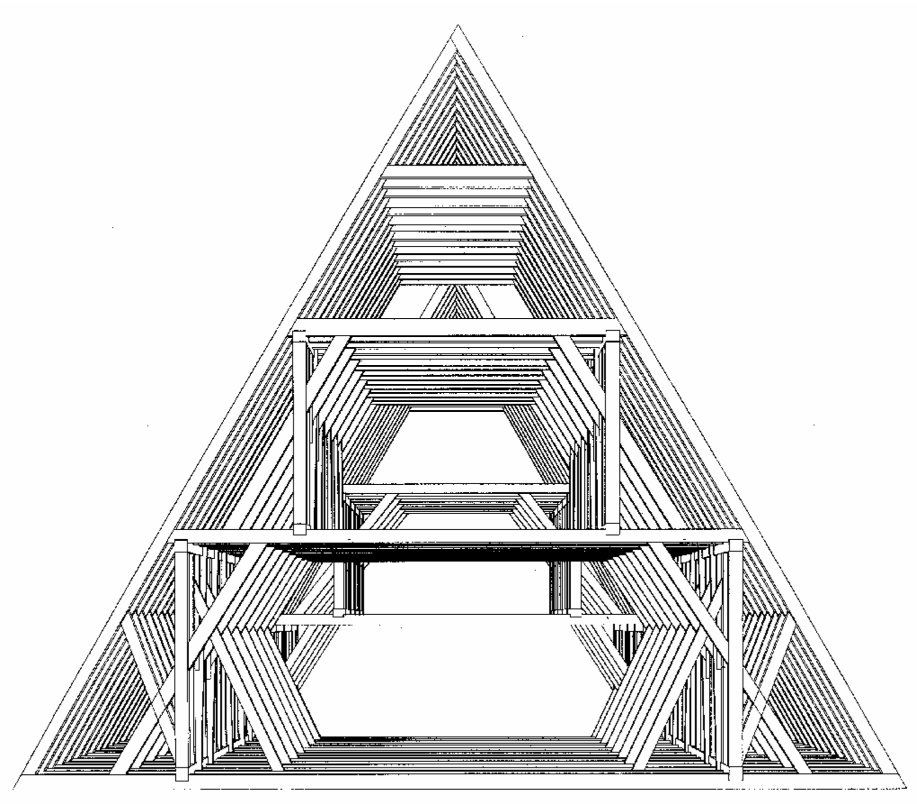
We often compare “sick” buildings to sick people, borrowing a great number of terms from medical science. We say that we rehabilitate structures, that we identify structural deficiencies and their causes by (structural) diagnostics, and that we bring structures up to the expectations and maintain them there by (structural) therapeutics. The former formulates, the latter solves the structural problems of rehabilitation.

Curing sick people has its science; so should curing sick buildings have. Postponing the failure of structures, keeping them “eternally young” surely has its theory (this is the task of structure engineers); while their rehabilitation, their integration into the society of modern buildings is the science practised by architects. The comprehensive name of their discipline could be the "rehabilitation theory of historic structures".

Rehabilitation theory of historic structures should be based on the theory of historic structures. The need for rehabilitation theory of historic structures is created by the fact that buildings need continuous maintenance, functioning, and rehabilitation. Unless based on scientific principles, their appropriate execution can only be based on luck.

Historic structures will always exist, because conservation of built heritage will also exist. However, al least in Central and Eastern Europe, their rehabilitation will continue to be a problem for a long time.

Both parts of the theory and practice of historic structure rehabilitation, structural diagnostics and therapeutics – radically different in our view – illustrate the complexity of built heritage conservation, as well as the fact that almost everything the rehabilitation of historic structures involves can be generalised and classified, though they seem at first glance to be shaped according to unique needs [5].



Gothic roof structure from Daia (Reformed Church) – general view

2.5 HISTORIC ROOF STRUCTURES – STRUCTURAL SUB-ENSEMBLES TO BE UNDERSTOOD AND CONTROLLED

Roof structures are organic parts of the structural unit. As complex sub-unit they illustrate the conceptional and technical skills of the creators of built heritage. The construction and rehabilitation of historic roof structures, being centuries-old practices, are accompanied by disturbing factors that render the scientific approach to these questions even more difficult.

First of all we need to elucidate the terminology. Basic concepts should be clarified so that they are correct from the perspective of art history, structural history, mechanics and technology as well.

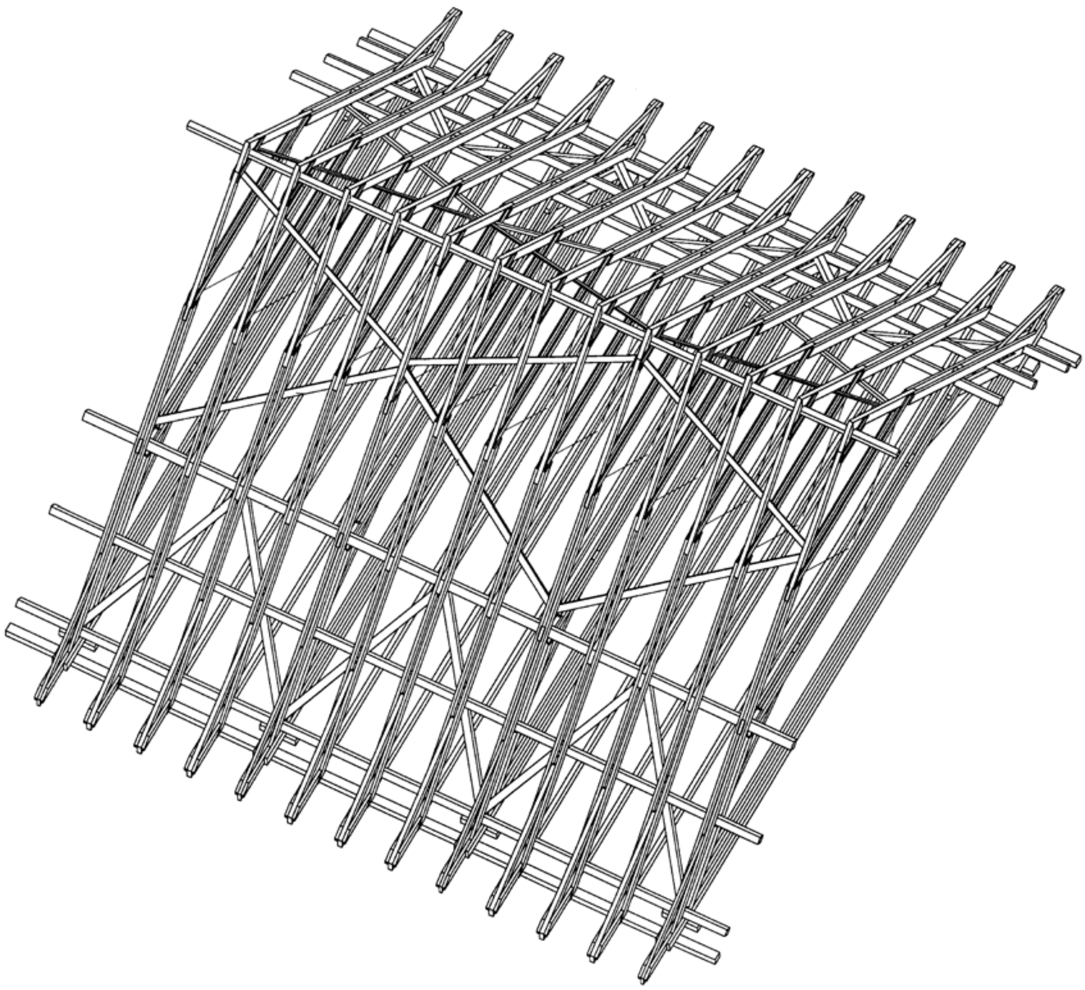
Theoretical mechanics still hasn't solved the problems regarding scientific mechanical modelling, hypothesis-formulation and their test-based correction. Failures or their phases can well be simulated on computers – provided that models properly mastered are available –, with obvious practical consequences.

The theoretical and practical definition of structural conceptions makes the correct approach to development issues possible. The conversion of the attic structure could contribute not only to the understanding of historic roof structures, but also to elucidating problems regarding the insertion of trusses into modern roof structures.

Studying English "historic" roof structures also leads to interesting conclusions. I use quotation marks because hundreds of years ago these structures were built by ship carpenters with much intuition, according to the latest structural principles. “Ship carpenters” were forced by sea storms representing dynamic loads to eliminate all structural solutions but the best ones. Dynamic loads (sea storms, earthquakes) and their role in shaping builders' intuition would be worth discussing.

Problems regarding the history of these structures should also be elucidated. The history of roof structures should be studied (and completed, if necessary) by regions. Such fields of study could be represented by Central and Eastern Europe (with its Gothic, Baroque and eclectic roof structures), the British Isles, the Mediterranean, or any other region, providing sufficient material for a comprehensive, synthetic study.

Numerous theoretical issues of historic building conservation could also be elucidated. An example to be followed is the English one: in England they present roof structures in museums, or even construct buildings for (under) them. We should also discuss whether the recently designed roof structure of the main building of the Bánffy castle in Bontida is appropriate or not. (The roof structure that burned down in 1944 was replaced in 1962 with a new one, hardly taking into consideration the original. After this was also destroyed, a new roof was designed, based on old photos and analogies, its distribution of forces being the same as of Baroque roofs.)



Baroque roof structure using modern technologies – Bánffy castle Bonțida

2.6 REMARKS

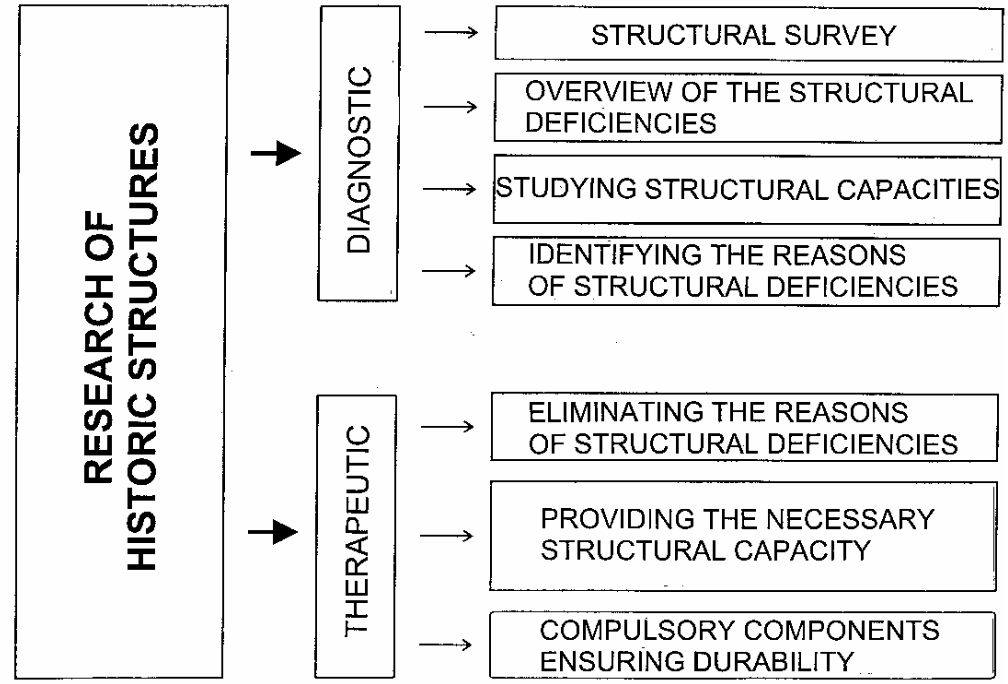
Structures should also transmit the authentic historic message. All craftsmen and specialists executing the interventions must approach the structural unity, the details, materials and traditional technologies of the building humbly and with respect. This way the time will come when not only structure engineers will treat the wall paintings or painted wooden furniture respectfully, but architects and art historians will also acknowledge the aesthetics of structural conceptions.

The history of structures is the history of mankind's intuitive creations. It should be protected and transmitted just like folklore, because, like ancient incantations, they reveal the spirit of our ancestors, their spiritual culture determined by natural laws.

3. RESEARCH OF HISTORIC STRUCTURES.

The Minimal Contents of Structural Documentation [6]

The research of historic structures involves two components, structural diagnostics and therapeutics. These in their turn are completed in four, respectively three steps. In the following the advised minimal contents of structural documentation's in Romania will be presented, structured according to the two above-mentioned categories.



The phases of structural research

3.1 STRUCTURAL DESCRIPTION – STRUCTURAL SURVEY AND PRESENTATION

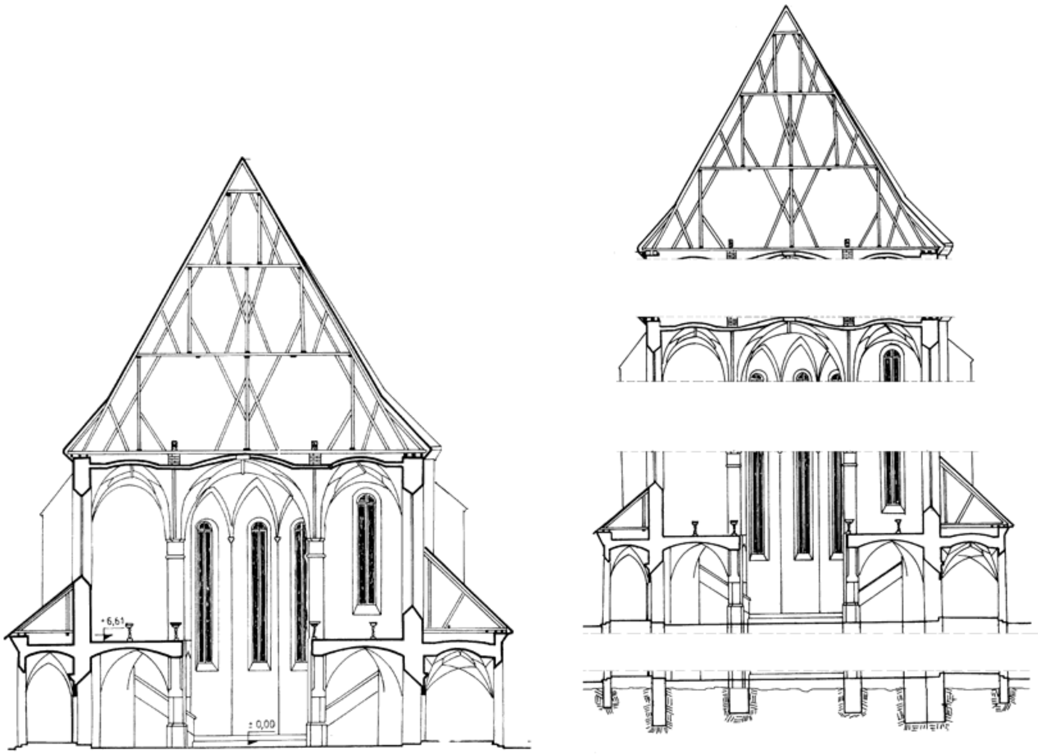
3.1.1 Structural survey and description:

- structural analysis
- structural synthesis

3.1.2 Structural environment (excerpts from accompanying studies and expertise):

- built environment –building construction study
- soil-mechanic environment – issues of foundation, stability, basic qualities, earlier foundations;
- conditions of building physics (hydro-thermal and acoustic);
- conditions of building biology;
- artistic values (mural paintings, painted wooden covers etc.);

- conditions of function and use;
- external and internal building services and their conditions;
- other effects of the protected environment (buildings, gardens, parks).



Structural analysis – Lutheran Church from Bistrita

3.2 OVERVIEW OF THE STRUCTURAL DEFICIENCIES

3.2.1 Structural failures

- geometrical deformations, form change:
  a) – displacement of rigid body;
  b) – deformations presupposing continuities of the building material;
  c) – deformations presupposing lacks of continuity in the building material;

- mechanical changes:
  a) diminished load-bearing capacity
  b) diminished rigidity
  c) diminished ductility

3.2.2 Incompatibility with the new functional needs:

- increase of loads;
- structural elements or sub-units situated improperly from the functional point of view.

3.3 STUDYING STRUCTURAL CAPACITIES

3.3.1 Modelling:

- strength model
- static model
- dynamic model

3.3.2 Studying the load-bearing capacity by

- calculations;
- load-tests.

3.4 IDENTIFYING THE REASONS OF STRUCTURAL DEFICIENCIES

3.4.1 Reasons originating in planning:

- flawed original structural conception;
- later planning conceptions flawed from the structural point of view.

3.4.2 Reasons originating in execution:

- defective original execution of structure;
- later interventions flawed from the structural point of view.

3.4.3 Reasons originating from the use:

- reasons due to moral erosion;
- reasons due to physical erosion;
- special reasons (earthquakes, explosions, storm etc.)

Note: In case of all these factors, it must be determined whether they are evident or just presupposed reasons, and whether they can be eliminated or not.

3.5 ELIMINATING THE REASONS OF STRUCTURAL DEFICIENCIES

3.5.1 Reasons of structural deficiencies that cannot be eliminated:

- deficiencies in respect to the new function;
- the costs of eliminating these being too high;
- historic values of the parts to be eliminated do not allowing for this;
- state of equilibrium reached after the damage not to be disturbed.

3.5.2 Reasons of structural deficiencies that can be eliminated:

- elimination’s involving structural reinforcement at the same time;

- eliminations neither involving, nor followed by structural reinforcement;
- eliminations not involving, but followed by structural reinforcement.

Note: The reasons of the deficiencies eliminated must be specified in each case.

3.6 PROVIDING THE NECESSARY STRUCTURAL CAPACITY

3.6.1 By preserving the existent structural model:

- strengthening the structural elements;
- replacing the structural elements;
- repairing structural details, solutions;
- changes in the material of the structure.

3.6.2 By changing the existent structural model:

- introducing new structural elements;
- introducing new structural sub-units.

3.7 COMPULSORY COMPONENTS ENSURING DURABILITY

3.7.1 Compatibility of materials

3.7.2 Structural compatibility

3.7.3 Technological compatibility

3.7.4 Compatibility of function, usage

4. ROMANIAN STRUCTURES AND THEIR PROBLEMS

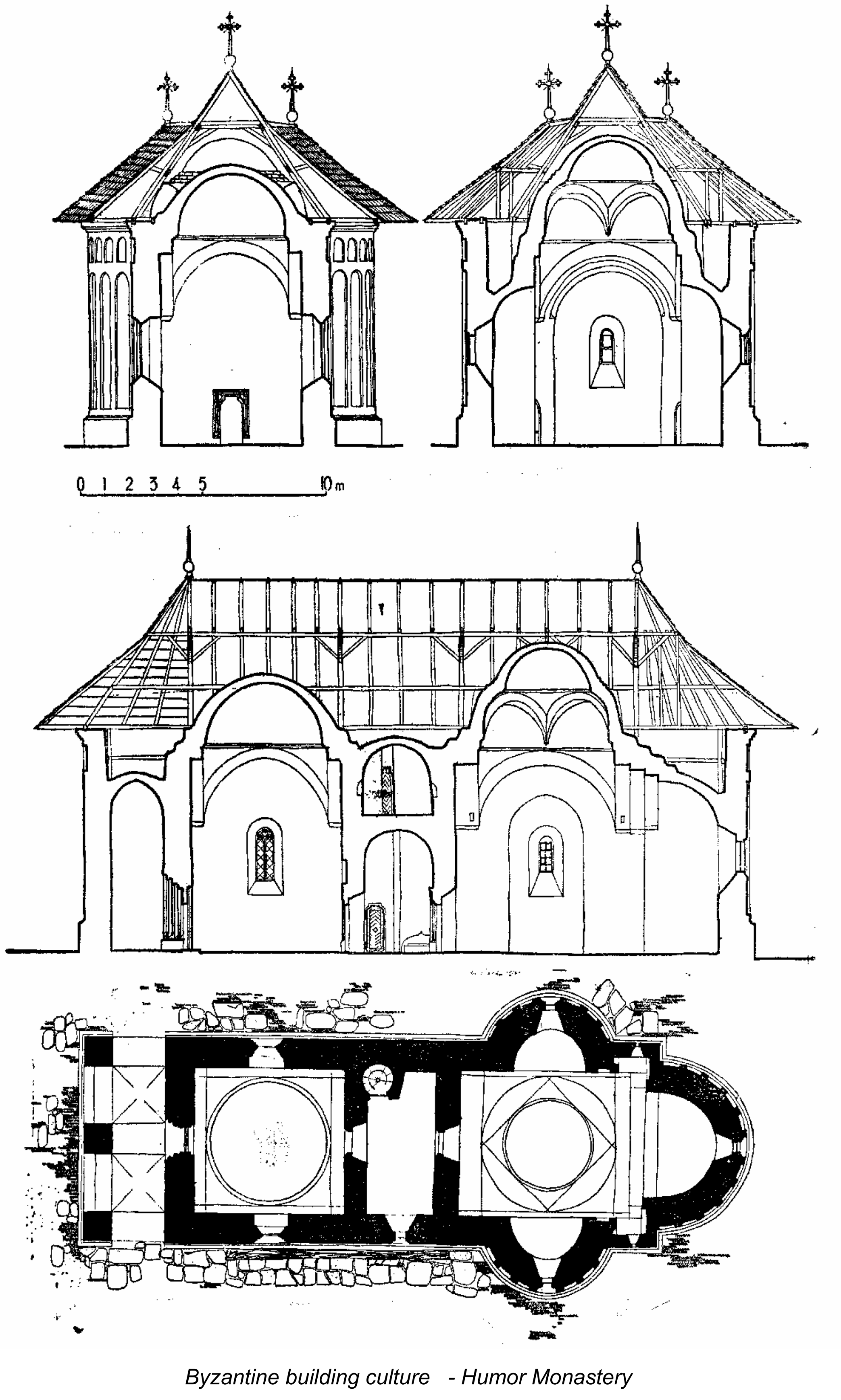
4.1 HISTORIC OVERVIEW

On the territory of Romania two characteristic building cultures can be found, along with their transitional variations: the typical structures of Byzantine building culture, and those of the „Western" (Romanesque, Gothic, Renaissance etc.) architectural styles.

4.1.1 Byzantine character and the „Vrancea"-type earthquakes (intermediate depth earthquakes) outside the Carpathian basin

In the regions outside the Carpathian basin, the dominant structural systems are the ones of the Byzantine building culture, especially until the 19th century. Orthodox churches compulsorily preserve the elements of this style to this day. These building systems have preserved much more from the sophisticated structural ensembles of the Roman Empire than the „Western" architectural styles.

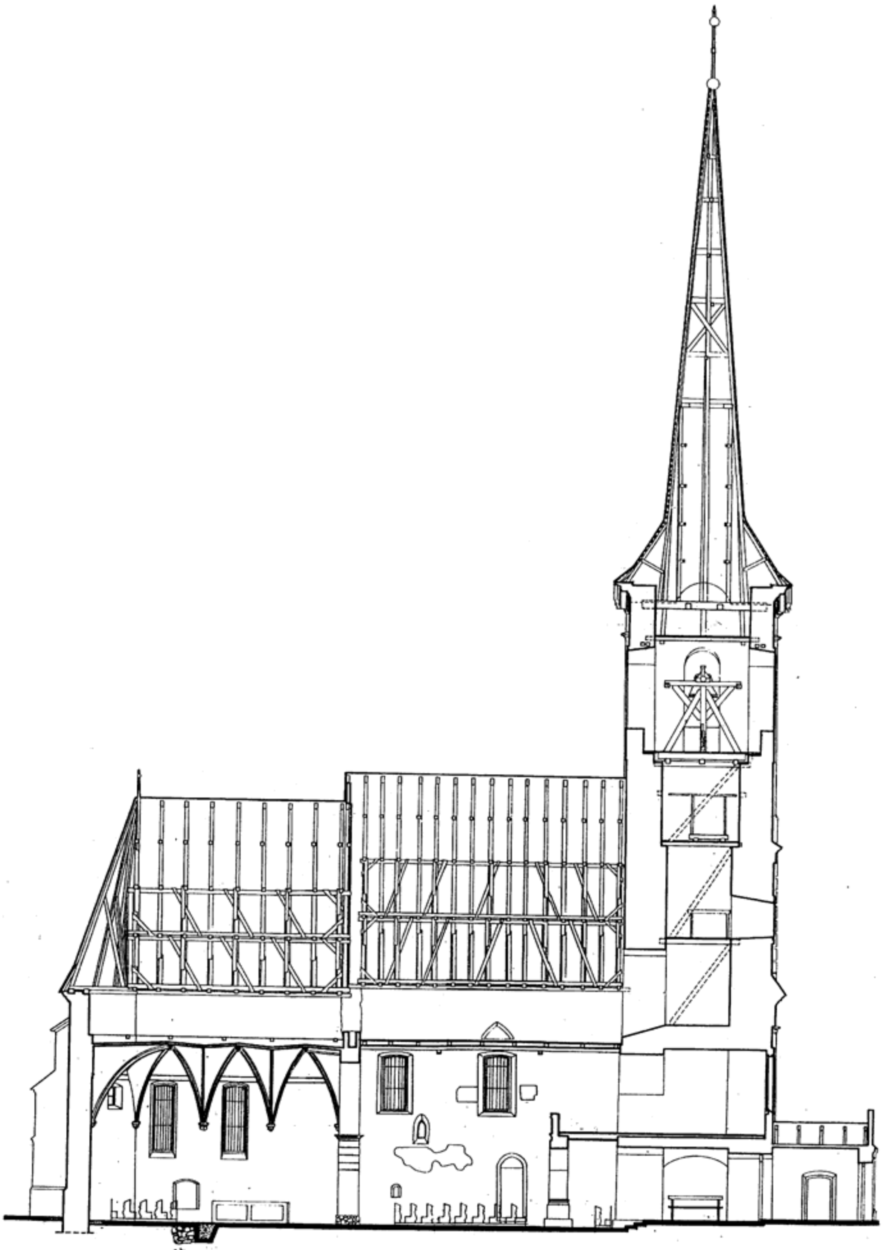
Sophistication however has serious consequences on the durability of the structures facing „Vrancea"-type earthquakes with deep epicentres, as well as on the seismic safety of structures and on the severity of seismic regulations. This is why there are few European countries with technical regulations as severe and as much in contradiction with international historic building conservation as ours.



Byzantine building culture - Humor Monastery

4.1.2 The „barbarian” Western system of structures in the Carpathian basin

In the Carpathian basin the Western system of structures dominates. Earthquakes here represent a problem in the Banat region (with shallow epicentres), as well in the south-eastern part of the basin, where the effects of „Vrancea”-type earthquakes can frequently be strongly felt. These have often decimated the buildings supported by Western-type structures, developed for the other parts of Central Europe, where the dangers of seismic activities are much lower, and proven thus not secure enough.

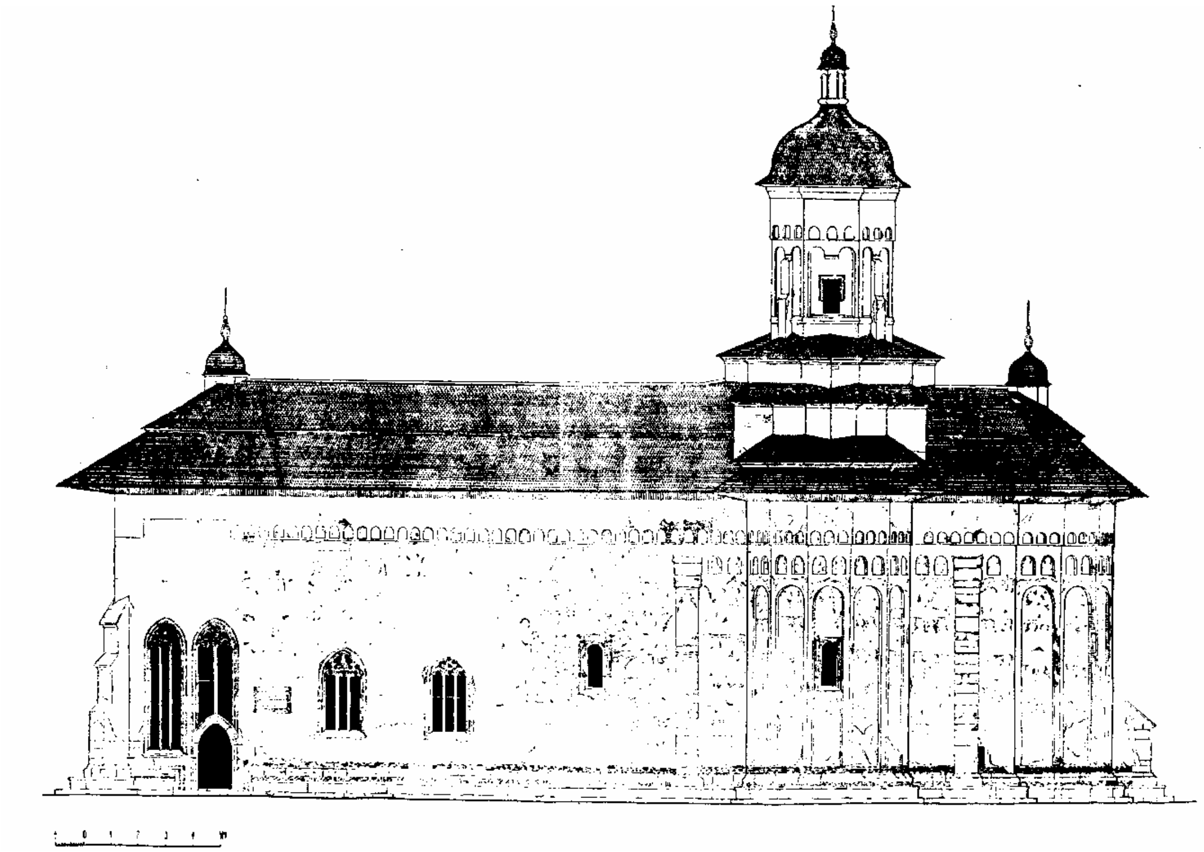


“Barbarian” Western building culture – Reformed Church from Daia

4.1.3 4.1.3. Transitional systems of structures

Transitional systems of building structures, combining elements of both architectural styles, exist in several places. Such is the case of a part of the famous Moldavian monasteries, as well as the Transylvanian region of the Mures river.

These buildings also posit special structural questions.



Transitional system – Western style windows on Byzantine structure (The Monastery from Probota)

4.2 SPECIFIC ENVIRONMENTAL CONDITIONS

4.2.1 Earthquakes with deep (Vrancea) or shallow seismic region (Banat)

The rigidity of our seismic regulations must again be stressed: though the country's seismic map distinguishes six (A-F) regions according to the strength of seismic activities, the technical regulations are very severe even for regions with the lowest intensity of seismic activities (e.g. the compulsory use of cement in masonry, etc.)

4.2.2 Swelling and shrinking clay (especially in Transylvania)

Swelling and shrinking clay is very common countrywide. Modern technical regulations are adequate, but these principles were not known and applied at the construction of historic buildings. The number of constructions in need of interventions for this reason is hopelessly high.

4.2.3 Landslides, slow deformations – problems of slope stability

Problems of slope stability are very difficult to solve, especially in the case of medieval churches built on hill-slopes. In the majority of cases, the costs of reinforcement exceed by far those of building a new church.

The slow deformation of slopes has been degrading many structures for centuries, presupposing continuous – and relatively expensive – maintenance.

4.2.4 The low qualitative and quantitative level of technical regulations concerning historic structures

Due primarily to the high seismic dangers, Romanian technical structural regulations are numerous and mostly effective.

Unfortunately however this is only true of new buildings, not historic ones.

Soil mechanical regulations for centuries-old foundations, differentiated seismic regulations, directions for compatible structural interventions are still lacking.

4.3 SPECIFIC SOCIAL CONDITIONS

4.3.1 Communism's hatred of religion and aristocracy

Communism's hatred of religion and aristocracy made it try to destroy the most valuable elements of the built heritage, the churches and castles: „Vae victis." (see for example the Bontida castle, which has no structural problems, but it can hardly deal with the 25-year-long lack of roof, or the photos of the Ozd manor, also showing a structure decaying because of the lack of roof.)

4.3.2 Consequences of the communist 'no-maintenance' policy

One of the basic communist policies, that of 'no-maintenance', took a heavy toll on the whole stock of buildings. The conditions they are in cannot even be imagined for those who have not been to the socialist block.

4.4 GENERAL ISSUES

Some issues we face here, with both negative and positive consequences, are probably common Europe-wide.

4.4.1 Environmental damages, air pollution, circulatory vibrations

Environmental damages, air pollution, circulatory vibrations have negative effects. Naturally the problems of a country with such low standards of environment protection are in this respect bigger than those of Europe in general.

4.4.2 The ageing of materials and structures

4.4.3 The spread of computerisation [7]

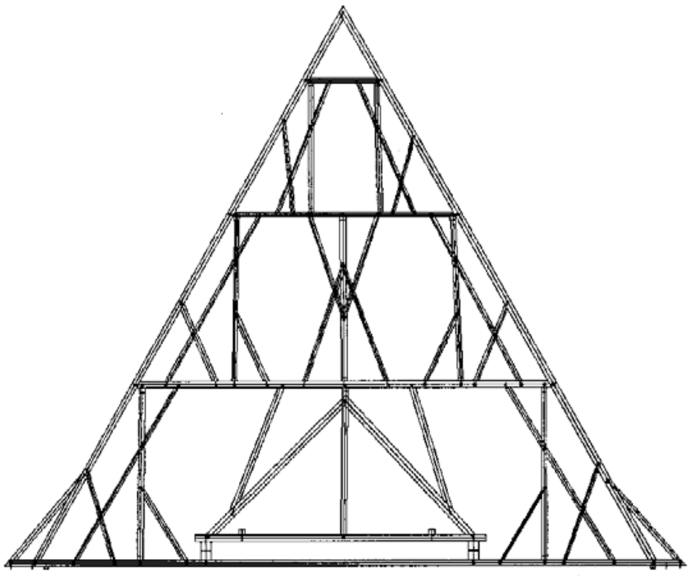
- historic structures and the computerised model

  The intuitive approach to the structures of different ages can take two directions. The craftsman living in the age of eclecticism does not understand the intuitive Gothic (or Renaissance) structural conceptions, and consequently when undertaking repairs, he often damages not only the (Gothic) roof structure, but also the vaulting sheltered by it (see the late 19th century interventions in the Bistrita Lutheran church,_where the suspension trusses were replaced by compressed ones; internal pillars were walled up and transformed into truss-supports,_thus taking on not only gravitational, but also wind-load, while forced to lean on the vaulting and cause it crack.)

  The structural intuition of structure engineers trained in engineering is minimal (it becomes stunted, just like our organs we don't use). Therefore historic structures must be approached scientifically by modern engineers, which is hardly possible without computerised modelling.

  Historic structures are spatial structures, maybe even more so than the engineered spatial structures, which are more emphatically based on plane-systems, probably due to technological conditions (e.g. prefabrication.) The reduction of historic structures to systems of plane structures can only be done by rough approximations. Before computer-based planning, at the eve of engineering, but even after the birth of building structure theories, there was no method of efficiently modelling spatial structures. Therefore interventions were not modelled previously, and were aggressive and groundless.

  „Real" survey of historic structures and their level of intuition only became possible in the immediate past, in the last 8-10 centuries, with computers becoming common. The process is slow, since the rehabilitation of historic structures is not a productive industry.

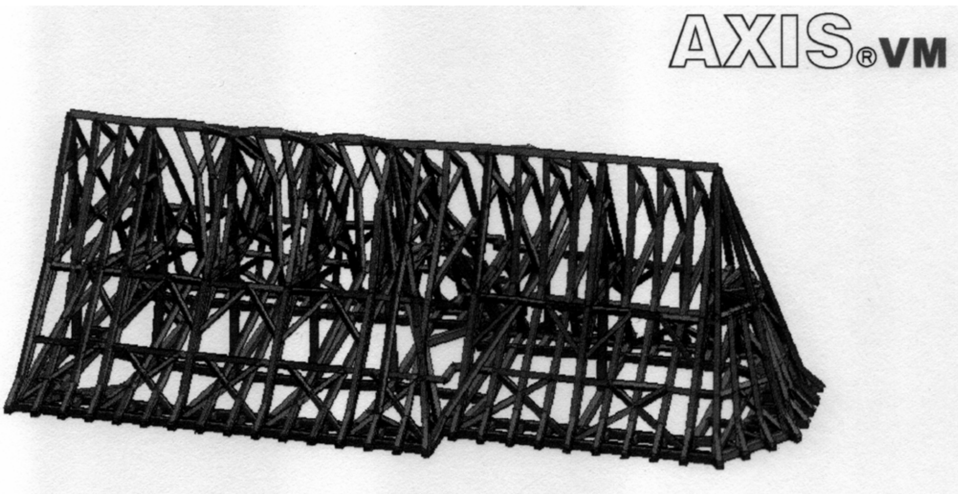


Primary truss from the Bistrita's Lutheran roof structure

- the quality of the computerised model:

  Mechanical models of historic structures rely on many hypotheses formulated by modern structural theory for modern, steel or reinforced concrete building structures, less for modern timber or brick ones. Building mechanics still needs to undertake the possible reinterpretation and extension of these hypotheses, in order to make them approximate better the real behaviour of historic structures.

  The models of historic structures at present provide the researcher of historic timber structures with not only qualitative, but also quantitative data. Timber as a material works flexibly, which makes models easy to handle. Nevertheless the differences of the mechanical characteristics of materials introduced in different ages into the structure need to be taken into consideration in this case as well, and so do the rigidity factors of joints. Models of historic masonry structures only provide qualitative data, since the moment cracks appear flexible models cease to function. Modelling cracked conditions on the other hand requires by far bigger efforts, which are only made in exceptional cases.



Roof structural failure-simulation using computer

- the quality of the (computerised) modeller:

  The professionals (or the groups of professionals) must be aware of modern structural principles, but at the same time they must also be specialists in historic structures endowed with intuition as well. They must also be young enough to possess strong computer skills. These are the somewhat contradictory qualities that one must possess if one wants to undertake this task. One must be aware of the principles and confines within which computerised models are worth and necessary to use.

5. BRIEF OVERVIEW OF TASKS

5.1 THE STRATEGY

Joining the EU is a good opportunity to develop a common rehabilitation strategy for historic structures as well.

When developing this strategy, we must consider the following:

5.1.1 general issues

The ageing (4.4.2.) of historic structures, the environmental damages, the air pollution and circulatory vibrations (4.4.1.) are the common problems of all countries from Europe.

The spread of computerisation (4.4.3.) is also a pan-European challenge; computers, widely accessible for the last 8-10 years, possess a high potential of research, modelling and simulation that we should rely on.

5.1.2 the common problems of Central and Eastern European countries joining the EU

Communism’s hatred of religion and aristocracy (4.3.1.), the consequences of its ‘no-maintenance’ policy (4.3.2.), the low qualitative and quantitative level of technical regulations for historic structures (4.2.4.) are probably problems faced by all countries joining the EU, with the possible differences lying in the level of degradation.

Swelling and shrinking clays (4.2.4.), landslides, slow morphological deformations, problems of slope stability (4.2.4.) may not be the common problem of everybody, and earthquakes (4.2.4.) are even less so.

5.1.3 the specific problems concerning the historic structures of different countries

The fact that two specific building cultures coexist on the territory of Romania (4.1) could assign this country a special place as well as more complex and singular problems to solve.

5.2 DATABASE, DOCUMENTATION, RESEARCH

5.2.1 the common database and documentation regarding historic structures

Though databases do exist in Romania, they are not consistent, and not all of them are computerised. Joining the common EU database would be of course be welcome.

Documentation is similarly continuous, but depends on the financial and theoretical background. The complex systems of structures require more attention, and do not always allow for the development of a single documentation method. Nevertheless, since the importance of preserving structural values is beyond any doubt for us, our database of historic structures is quite significant, and we would welcome any co-operation in the field.

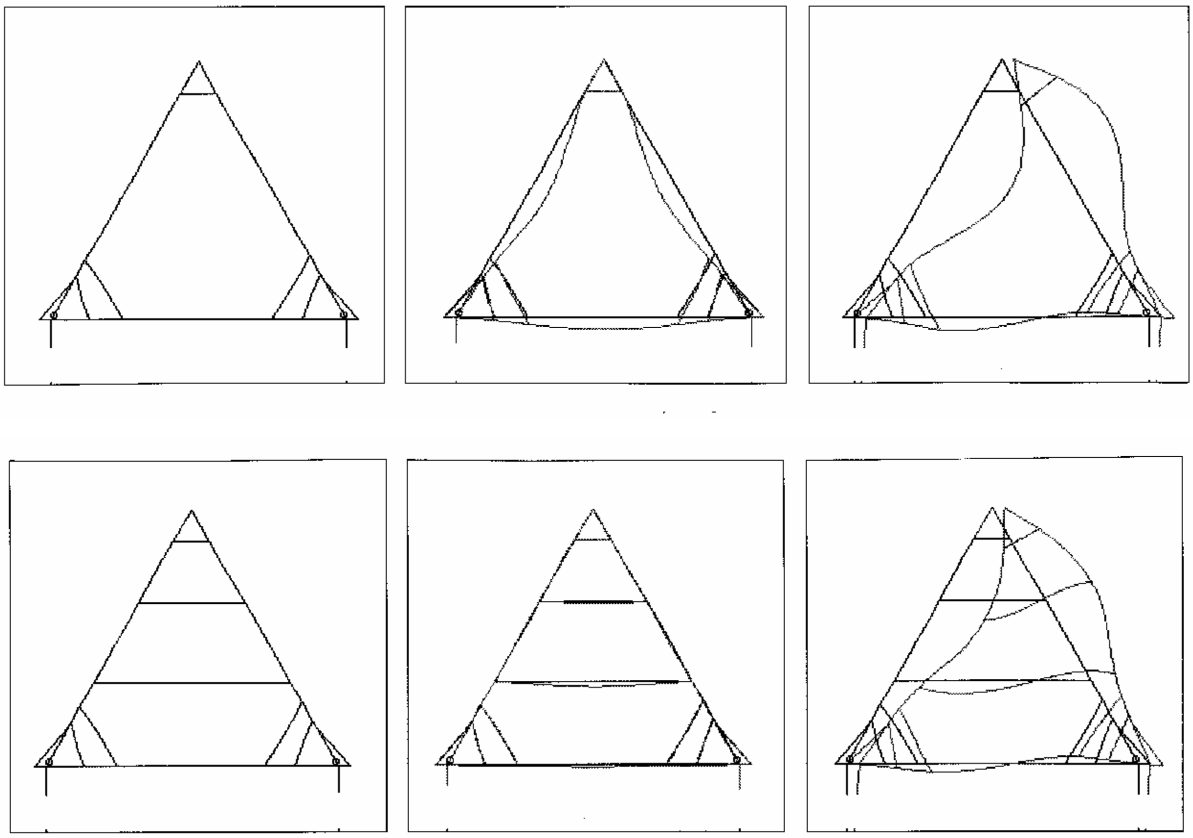
The decaying built heritage holds a special position, its condition being influenced both by social transformations (affecting vernacular architecture, mansions and manor houses), and ethnical changes (especially the emigration of Jews and Saxons.) We know of cases where 800-900 years old buildings are vanishing without thorough documentation.

There are also significant results in the field, like the documentation of the Transylvanian Saxon culture, carried out between 1992-1998 mostly with support from abroad (though the documentation is rather poor on structures.)

5.2.2 joint researches

Research-projects are not common in the field of historic structures. Of course all conservation's presuppose a structural and soil-mechanic assessment, but there are no research programmes funded by the central government.

The already mentioned spread of computerisation made it possible for us to launch a PhD programme in the field, at the Cluj Technical University, Faculty of Civil Engineering. Though it functions in a non-attendance system (and as such with the serious financial support from students), already five doctoral students are working on their theses elucidating different under-studied issues of historic structures. /We hope that in the next years the 12-15 doctoral dissertations overview the main issues of computerised modelling of historic structures will be completed. Examples of titles: (1-2-3) Gothic, Baroque or Eclectic Historic Roof Structures (Reducible To Plane Structures); (4) Historic Roof Structures (Irreducible To Plane Structures); (5-6) Historic Vaulting With Single Or Double Radii Of Curvature; (7-8) Computerised Modelling Of Timber And Masonry Structures, and Experimental Confirmation Of Its Hypotheses; (9-10-11-12-13) Romanesque, Gothic, Renaissance, Baroque Or Classicist Historic Structures And Their Seismic Behaviour; (14) The Dynamic Model of Historic Structures – Traffic Vibrations; (15) Historic Foundation Systems.



"Research" using computer facilities

The range of possibilities for co-operation is of course very wide, both in foundation and applied research projects. Some examples:

- dynamic loads and structural performance (for historic structures: earthquakes and sea-storms; for modern structures: traffic vibrations;
- parallel research of sea (oceanic) and continental roof structures;
- special issues of 19^{th} century structures in the Carpathian basin;
- material model – linear and non-linear one.

5.3 EDUCATION, TRAINING, SENSITISATION TO VALUES

5.3.1 Specialist training and specialisation

The importance of specialist training is beyond any discussion. What should be discussed are the curricula and their harmonisation. In the following we present the Transylvania Trust foundation's Built Heritage Conservation Specialist Training Programme.

a. The object of the Built Heritage Conservation Specialist Training Programme is training the personnel qualified to manage the built heritage (involving research, conservation planning and execution, maintenance) in all fields involved (architecture specialised in historic building conservation, building mechanics, building technology, archaeology, art history, construction physics and biology, geodesy, soil mechanics, conservation of auxiliary pieces of art: murals, painted wooden elements and furniture, stone, metal, glass items as well as historic gardens.)

b. The Specialist Training Programme functions in two systems (in the education system of the National Ministry of Education as well as outside the system), on three levels (basic, intermediate and upper) and three forms (basic training, retraining and specialisation). It is advisable that basic training takes place integrated into the national education-system; retraining and specialisation can be offered outside of it as well.

c. The Specialist Training Programme is co-ordinated by the Central European Built Heritage Conservation Training Centre of the Transylvania Trust. The Centre generally co-ordinates the training forms not integrated into the national education system – though not necessarily only these. It compiles the curriculum of studies, creates the analytical programmes, and works out additions to or changes in the curriculum of studies or the analytical programmes.

d. The final location of the Training Centre is the Bontida Bánffy castle; the training gradually developing outside the education system occupies its final location in phases, in close co-ordination with the schedule of the castle's rehabilitation.

e. The training is offered on three levels: basic, intermediate and upper level training are all necessary.

   On basic level, craftsmen are trained (joiners, carpenters, tinsmiths, building material processing assistants, renderers, coaters, building sculptors, stone-carvers, masons, painters and decorators, furniture-joiners and restorers etc.);

   On intermediate level, assistants are trained (assistants specialised in the general management of historic building conservation, in architecture, engineering, in heritage management, settlement-protection and development);

   On the upper level, training is offered to specialists with university degrees (architects, engineers, building mechanics, soil mechanics, construction physicists, construction biologists, archaeologists, art historians specialised in historic building conservation, garden-planners specialised in historic gardens, murals, painted wood, glass, metal and furniture restorers are trained.)

f. It is the task of the Training Centre to offer basic training (laying more emphasis on issues of built heritage conservation), retraining (for those who completed their training in the existing education-system), and specialisation (for trained professionals) on all three levels.

g. The Transylvania Trust Foundation assumed in the past as well the responsibility of managing the Transylvanian built heritage conservation training.

The Foundation manages the postgraduate course in historic building conservation, offered since 1998 in the framework of the Babes-Bolyai University. The Foundation developed the curriculum, compiled the documentation necessary for registering with the Ministry of National Education a training form functioning in the national education system, recruited the tutors and the students enrolled in Romanian or Hungarian language groups.

The Built Heritage Conservation Training Programme is also managed by the Transylvania Trust Foundation. The professional level of the training is defined by the English co-organisers (the Institute for Historic Building Conservation and the Oxford Brookes University), as well as the Technical University of Cluj, Faculty of Civil Engineering, and the Transylvanian Historic Building Conservationists' Society. The programme was launched in 1998. The 10-week course took place in the summer of 2000 in the Bethlen Gábor College, Aiud, and in 2001 in the Bontida Bánffy castle and the Maiad Unitarian church. The accreditation of this training not integrated in the national education system is in process.

5.3.2 Sensitisation of the public opinion about structural values

This task can include a wide range of actions, especially as concerns the sensitisation towards the historic values of structures, which is a field more or less neglected in the whole Europe.

5.3.3 Exchange of information, mutual briefing

The exchange of information is an issue of primary importance and can be realised in several ways.

We would like to mention here that the series of 8-day spring conferences at Tusnad, Romania have brought together 10 times this far 180-250 specialists from 15-24 countries of the world. Specialists in historic structures and representatives of the other fields involved jointly overview here each year the current topic.

We also find it very important that this year the Cluj International Scientific Conference on Historic Structures will be organised for the 6th time. The event is attended each year by 50-80 specialists representing 4-8 countries. Proceedings of the conferences are published in three languages.

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