Silesian University of Technology Faculty of Architecture Gliwice, Poland

Nina JUZWA
Krystian STANGEL

Towards a Balance Between Design and Technique in Teaching of Architecture

At the moment Poland is going through various stages of discussion mostly due to our integration into European Union. It is also related to academic teaching and the improvement of standards of teaching.

In the recent years centres for architectural education in Poland undergo the process of accreditation in order to raise the level of teaching standards as well as specify the basis for educational programmes. National Council appointed by the Ministry of Education carries out process of accreditation. It consists of eminent academic teachers from different Faculties of Architecture in Poland and representatives of Association of Polish Architects representing employers.

Many Faculties of Architecture have been modifying their curricula recently adjusting them to the 'European Classification Transfer System' [ECTS]. The Faculty of Architecture like other Faculties at the Silesian University of Technology is deeply involved in improving and modifying its curriculum.

It is essential to state that the genesis of the Faculty of Architecture at the Silesian University of Technology in Gliwice is strictly associated with the Faculty of Civil Engineering where architects were educated (initially in the years 1949-1954 in the course for engineers and then since 1962-1976 in the Master of Science five-year course. Independent Faculty of Architecture was established in 1977 with the Master of Science five-year-course. In the initial period construction subjects[1] constituted the major part of the course content. Later, with growing independence of the Faculty the number of these subjects was gradually limited.

The year 2000 marked the beginning for the new curriculum. Its main goal apart from the reduction of teaching hours, which follows the policy of the University of Technology is to introduce the balance between teaching of architectural design understood as teaching design of form and function of the building and the elements of technical knowledge, which enables architects to realise architectural conception.

At the moment that is in 2002 full course lasts ten semesters and the graduates are given a Master of Science degree in engineering architecture Course of study finishes with submission of dissertation[2] consisting of a practical part that is either architectural or urban project and the description of the project-dissertation. The total number of teaching hours is **3675.** They include fifteen weeks and are divided into lectures (L), seminars (S), and project tutorials (PT). The teaching process in the Faculty

[1] What is meant here are subjects dealing with construction only as well as those discussing technical equipment of buildings

[2] Part-time course follows the same curriculum, however, it is divided into a-7-semestr-course for engineers (students who graduate at this stage submit dissertation in engineering) and additional 3-semester undergraduate course finishing with dissertation

of Architecture Silesian University of Technology is based on architectural design and urban planning. According to the topic of the ENHSA workshop in 2002 this analysis includes teaching of construction in the context of teaching of architectural design on undergraduate course.

In the 1990s we took part in a teaching programme for the Faculty of Civil Engineering in which teaching of architectural design was part of an 'integrated project'. Its main principle was to teach architectural design by academic teachers from the Faculty of Architecture together with teachers from the Faculty of Civil Engineering representing branch subjects such as: construction technology, structures and others. The actual project became a good reason for teaching technical problems. This system of teaching was introduced in first semester. Similar principles were brought about in the Faculty of Architecture on engineering course in sixth semester.

In both cases teaching results were not satisfactory. On the one hand too simple project tasks were not sufficient enough for solving technical problems. On the other hand there were problems of management which are always present in case of big numbers of students. It is also essential that academic teachers teaching branch subjects are not willing to introduce non-conventional methods thus leaving science and technology on the periphery.

Therefore the authors of this new curriculum admit that such integrated design projects should be taught on higher levels of the course. Taking into consideration such problems as: architectural design versus building structures they specified the strategy according to which:

1. Teaching architectural design on a five-year-undergraduate course takes place during three stages: I (semesters 1-4), II-semesters 5-7, III-semester 8-10 (poster 1). This division is based on increasing the level of difficulty of design project tasks and problems concerning structure and technology.
2. Teaching construction and engineering subjects supplementing teaching architectural design takes place in two groups of subjects: 1st -Building Technology and 2nd -Structures.
3. Teaching construction and its related subjects in the first two stages takes place independently on architectural design. It becomes integrated in the third stage.

Building Technology Group includes the following subjects during two stages:

Stage I

- **Building elements** all construction elements are discussed using the so-called traditional technology starting with fundamentals and finishing with roof structures as well as various construction materials properly used to erect the building. The course lasts from 2-4 semesters and both seminars (S) and lectures (L) cover 180 hours.

Stage II

- **Physics of Construction** which deals with physical properties of construction materials and their use in buildings according to certain rules (sem. 5 seminars (S) and lectures (L) 30 hours).
- **Acoustics,** which is concerned with principles of building design

according to requirements for, sound penetration and dynamic vibrations (sem. 5 seminars (S) and lectures (L) 15 hours).

- **Surveying** dealing with principles of setting out buildings, methods of building inventory and ledges used (sem. 5 seminars (S) 15 hours)
- **Technical Equipment of Buildings** concerned with building technology like plumbing, wiring, etc. (sem. 6 (L & S)- 30 hours)

In general Building Technology Group covers **270** hours in the curriculum and finishes on Stage II.

Building Structures Group lasts six semesters and covers the following stages and subjects:

Stage I

- **Introduction to Structure Systems in Architecture** - with model seminars (L &S, sem 1 45 hours). The aim is to present general knowledge on types of construction applied in architectural objects. A student constructs simple models of supporting structures and roof structures.
- **Statics** (L & S sem 2-3, 90 hours). It focuses on teaching suitable choice and calculation of static schemes of constructions with elements of their calculation.

Stage II

- **Brick, Wooden, Concrete and Metal Structures** (sem. 5,6,7-135 hours). The main goal is to teach various structures used in architecture and elements of static and strength calculation.

Stage III

- **Specialist Consultations in Structures** in the course of architectural design (sem. 8, 9,10- 75 hours). They aim in choosing the best structures in designing objects.

Architectural design on higher semesters leads towards **integrated teaching.** Seminars are run by architects and constructors who hold consultations if necessary. Since students already possess theoretical basis in construction, their dialogue with 'branch assistants' becomes realistic. Similar rules are applied to the diploma project (10th semester).

Advanced Construction in Architecture (sem. 10 – 30 hours) is devoted to summing up the knowledge on modern structures and increased participation of **technology** in modern architecture. During the course of study significant realisations designed by outstanding architects are being analysed.

Total number of hours in Structures group subjects is 375. In general - groups of Building Technology and Building Structure cover 645 hours in the five-year curriculum in the Faculty of Architecture, which is approximately 18% of the teaching programme.

Construction is taught:

- In Stage I. By architects, academic teachers from the Faculty of Architecture with experience in designing who are able to present and justify the need of knowledge of construction in architectural design[3] and with regard to statics –specialists from the Faculty of Civil Engineering.

Group of subjects	Number of Hours	Percentage of hours in the curriculum	
- Architectural Design	990	27	
- Urban Planning	600	16.5	1755 - 48%
	165	4.5	
- Building Technology	270	7.5	
- Structures	375	10.5	645 - 18%
- Other subjects	1275	34	1275 - 34%
Total	3675	100	3675 - 100%

Percentage of construction hours in the curriculum.

- In Stages II and III, construction subjects are run by specialists constructors from the Faculty of Civil Engineering of our University as well as specialists from other Faculties.

The Faculty of Architecture also employs experienced architects from who do not belong to academic staff of Silesian University of Technology. It is the main intention of the authors of this new curriculum to invite outstanding architects and constructors to lecture and consult diploma projects.

Therefore in the new curriculum in the Faculty of Architecture teaching architectural design in Stage I. (sem. 1-4) and in Stage II. (sem. 5-7) is run independently on teaching construction. In Stage III (sem. 8-10), however, teaching construction should be integrated with architectural design. That means that the course of study should be enriched with consultations or seminars related to construction run by specialists constructors and others.

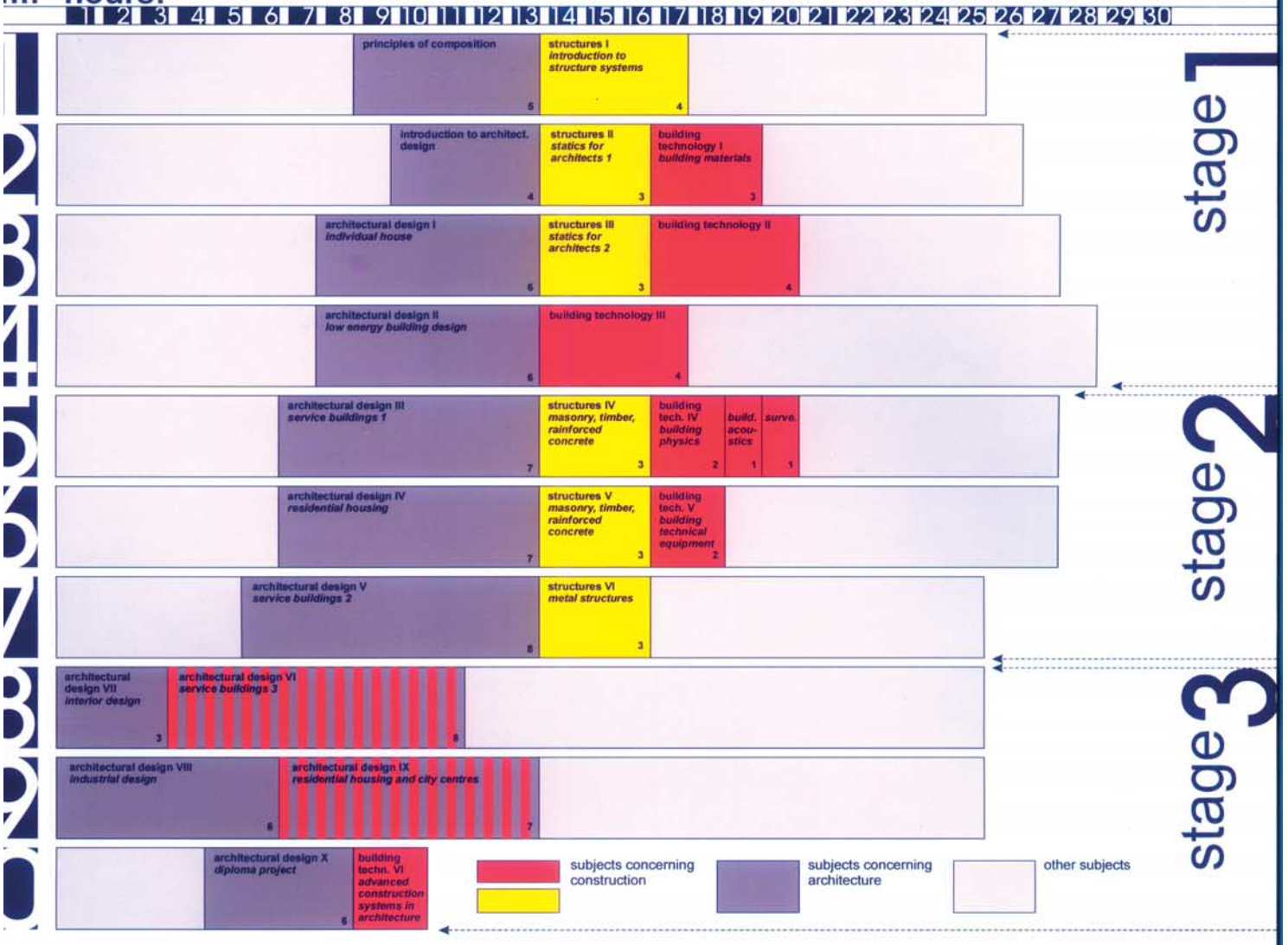
Conclusion

1. Teaching construction in the Faculty of Architecture at the Silesian University of Technology should be independent on architectural design in the initial period, whereas in the final one it should be integrated with design and based on co-operation with constructors.
2. In the initial period of teaching construction teachers should be chosen among architects with experience both in teaching and designing. More developed stages should be run by constructors with teaching and designing experience.
3. Teachers meaning constructors should be encouraged to limit the number of time devoted strictly to calculation, but extend the analysis of modern structures, which would allow to teach students to choose suitable modern structures and evaluation of sections required for architectural objects.
4. Teaching construction should be based on visual effects appealing to imagination; films of disaster caused by mistakes in building structure as well as analysis of destruction following natural disasters.
5. Teaching construction should be based on the analysis of solutions used in well known avant garde realisations designed by famous architects in co-operation with outstanding constructors.

[3] Many of them graduated from the Faculty of Architecture when it was integrated to Faculty of Building Structure and consisted of more construction subjects

FACULTY OF ARCHITECTURE
SILESIAN TECHNICAL UNIVERSITY IN GLIWICE, POLAND
POLAND, 44-100 GLIWICE, ul. Akademicka 7, tel. +48.32.237.12.10, fax. +48.32.237.24.91, e-mail: archidz@zeus.polsl.gliwice.pl

The Teaching of Construction in Architectural Education



What and Why

The new curriculum has been introduced in 2000. Its main goal is to implement balance between teaching:
- architectural design understood as form and functioning
- elements of engineering knowledge, which allow to realise architectural ideas.

Growing degree of difficulty of designing tasks and technical problems are following subjects in teaching process:

In four initial semesters:
Architectural design:
- principles of composition,
- simple architectural forms,
- design of one-family house.

Construction:
- Building Technology; elements of building structure (foundations, roofs, ceilings, walls, stairs, windows, doors etc.), construction materials, management of designing process.
- Statics,
- introduction to construction; lectures concentrate on general introduction to building structures (L), tutorials focus on constructing simple models of supporting structures as well as roof structures.

In the next stage (5,6,7 semester):
Architectural design:
- small service buildings, work places and residential housing.

Construction:
- Building structures. Lectures concentrate on theoretical basis for wooden, masonry (sem 5), concrete (sem.6), and metal (sem.7) structures. Tutorials deal with simple elements in building structures.
- Subjects supplementing Building Technology; surveying, physics of construction, acoustics, technical equipment of buildings with heating, electrical and plumbing and drain systems.

In the last stage (8,9,10 semester):
- Architectural design:
- Buildings requiring more complex technology and structure such as: city centres, R&D buildings, working places as well as residential housing.
- Construction:

Advanced construction. Modern building structures versus architecture.

How

The group implementing the new curriculum has the following experiences. Since the middle of 1960s there has been a tendency to reduce the number of technology subjects in the curriculum of the Faculty of Architecture (what we mean here are subjects dealing with both construction and technical equipment of buildings). In 1990s we took part in the programme for civil engineers focusing on so called 'integrated project'. Its principle was based on teaching architectural design together with branch subjects (since 1st semester). Similar principle was implemented on engineering course in the Faculty of Architecture in 1999 in 6th semester. In both cases teaching results were not satisfactory due to the following reasons:

- too simple project tasks (initial semesters) couldn't be the basis for technical problems.

- problems with management, (a) occur mainly in groups with big number of students, (b) assistants especially those from faculties other than architecture are usually not willing to introduce non-conventional teaching methods and thus bring about more order into the class than in case of conventional methods.

Taking into consideration all data presented so far we have based the new curriculum on the following strategy:

- In semesters 1-7 subjects dealing with construction as well as those concerning architectural design are taught separately. The goal of construction is to present theoretical basis as well as understanding and studying of simple constructive solutions. Stage I., Stage II.

- In semesters 8-10 consultations or additional seminars focusing on building structures are run by specialists-constructors (from Civil Engineering Faculty). Classes in architectural design should lead to integrated, interdisciplinary teaching. Stage III.

Who

Building Technology Group:

-Elements of building - tutorials run by architects.
-Subjects supplementing technology; (Building Physics, Acoustics, Surveying, Technical Equipment of Buildings) - tutorials run by experts from other Faculties of our University.

- Building structure Group:

- **Introduction to structure systems** - run by architects.
- **Statics** - run by experts in building mechanics.
- **Building structures** (Brick, Wooden, Concrete, and Metal) - tutorials run by constructors and research workers of the Faculty of Civil Engineering.
- **Structure Consultations** - run by experts in teaching construction during architectural design tutorials and during preparation of the diploma project in the last semester of study.
- **Advanced Construction in Architecture** - run both by architects and construction engineers.

When and to What Extend

Teaching process in Poland is based on semesters. One semester has 15 weeks of classes (tutorials).
The new curriculum in Faculty of Architecture in Silesian University in Gliwice lasts 10 semesters that is 3 675 hours. Teaching design (including architectural, urban and conservation) covers 1755 hours (the architectural design takes 990 hours).
The construction subjects are accumulated in two groups, at the following three stages of teaching:

Stage I - (semesters 1, 2, 3 and 4th):
Building Technology Group:
- Elements of Building (including building materials) - semesters 2, 3 and 4th sem., lectures and project tutorials 180 hours.

Building Structures Group:
- Introduction to Structure Systems, semester 2, lectures 15, tutorials 30 hours,
- Statics, 2 and 3th on sem. lectures and tutorials total number 90 hours.

Stage II - (sem. 5, 6 and 7th):
Building Technology Group;
Subjects supplementing technology, e.g.:
Physics of Building, sem. 5, 30 hours, Acoustics, sem. 5 - 15 hours, Surveying, sem. 5 - 15 hours and Technical Equipment of Buildings, sem. 6, 30 hours.
Building Structures Group;
- Brick, wooden, and concrete structures, on semesters 5 and 6 - lectures and tutorials (total number of lectures and tutorials - 90 hours).
- Metal structures, on semester 7, lectures and tutorials total number 45 hours.

Stage III, (semesters 8, 9 and 10th):
- Consultations in Construction, during the course of architectural design (sem. 8, 9) and during preparation of the diploma project in the last (10th semester of study).
- Advanced Construction in Architecture (semester 10, lectures, 30 hours).

The group of Building Technology takes 270 hours and Structures make up 375 hours. Both this construction groups cover 645 teaching hours in the architectural course, which constitutes 18% of the teaching programme.

Virtual Reforms

The present curriculum based on ECTS system has been implemented for 3 years and is still being modified and requires further improvement especially regarding content and methods. General principle of introducing the balance between teaching architectural design and technology remains unchanged.

Stage I (semesters1-4)-teaching process starts with general introduction to construction elements of the building, materials (this part is run by an architect), and goes through general review of construction systems, enriched with practical creation of building structures (run by an architect) to the principles in the theory of structural design included in Statics (run by a constructor).

Stage II (semesters 5-7) continuation of the theory of structural design including brick, wooden, concrete and metal, structures (run by a constructor). Construction and architectural design are taught independently.

Stage III (semesters 8-10) architectural design should head towards integrated teaching. Tutorials are run by architects and branch consultations are organised if necessary. Since students already possess some theoretical knowledge in construction, their conversation with branch experts becomes realistic. Similar principles are applied to diploma project (10th semester). The successful teaching process should include architects who are not only good teachers, but also have design and realisation experience.

Construction in Arc

FACULTY OF ARCHITECTURE
SILESIAN TECHNICAL UNIVERSITY IN GLIWICE, POLAND
POLAND, 44-100 GLIWICE, ul. Akademicka 7, tel. +48.32.237.12.10, fax. +48.32.237.24.91, e-mail: archidz@zeus.polsl.gliwice.pl

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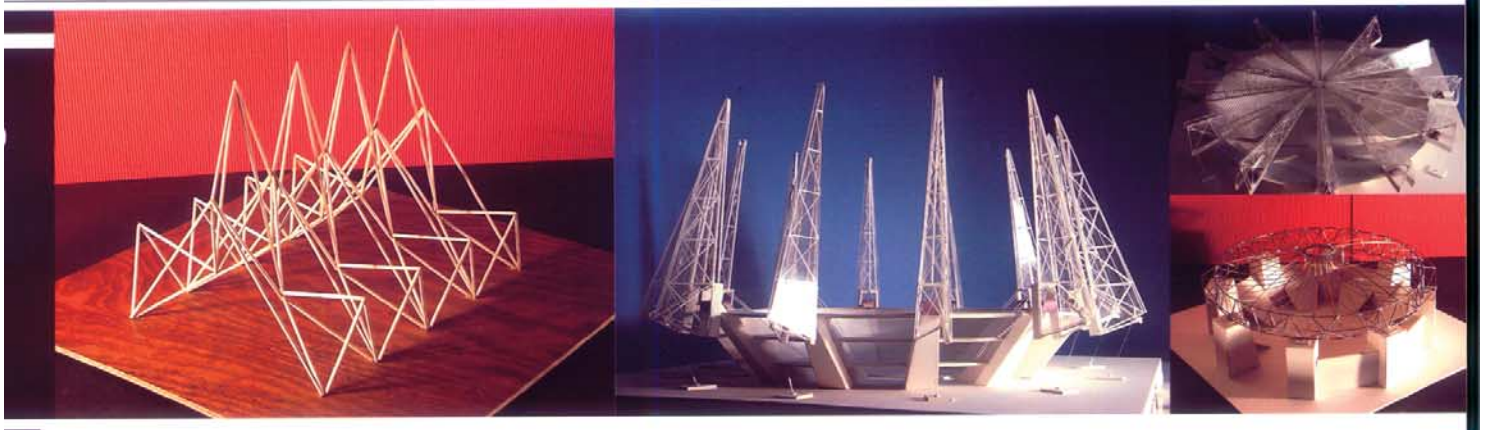

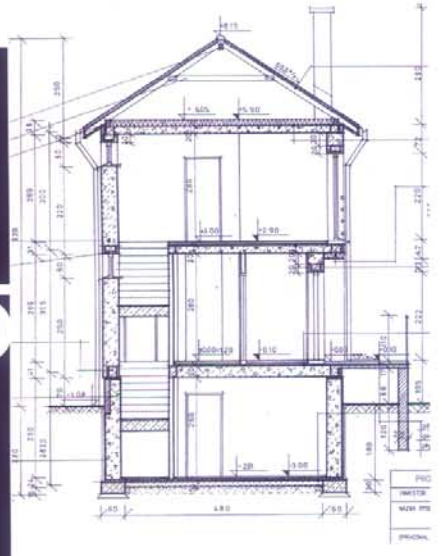

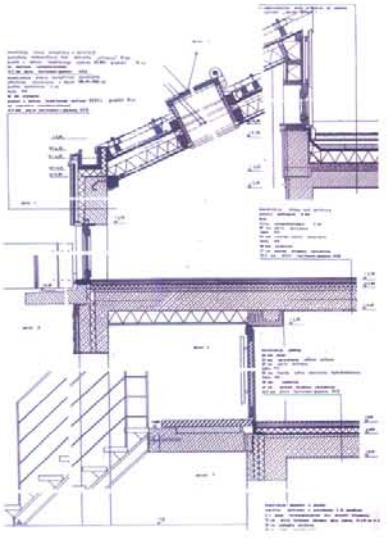

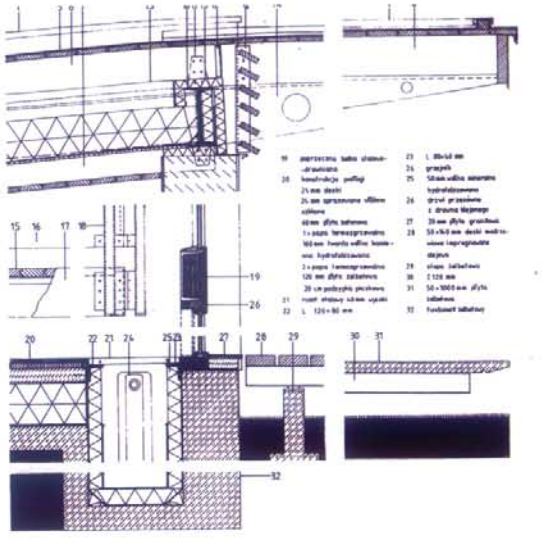

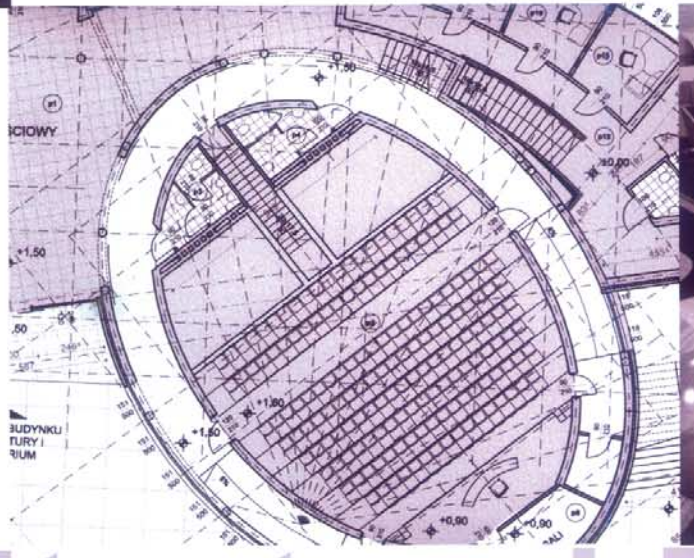

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