World SB08 Melbourne

Faculty of Environmental Engineering, Warsaw

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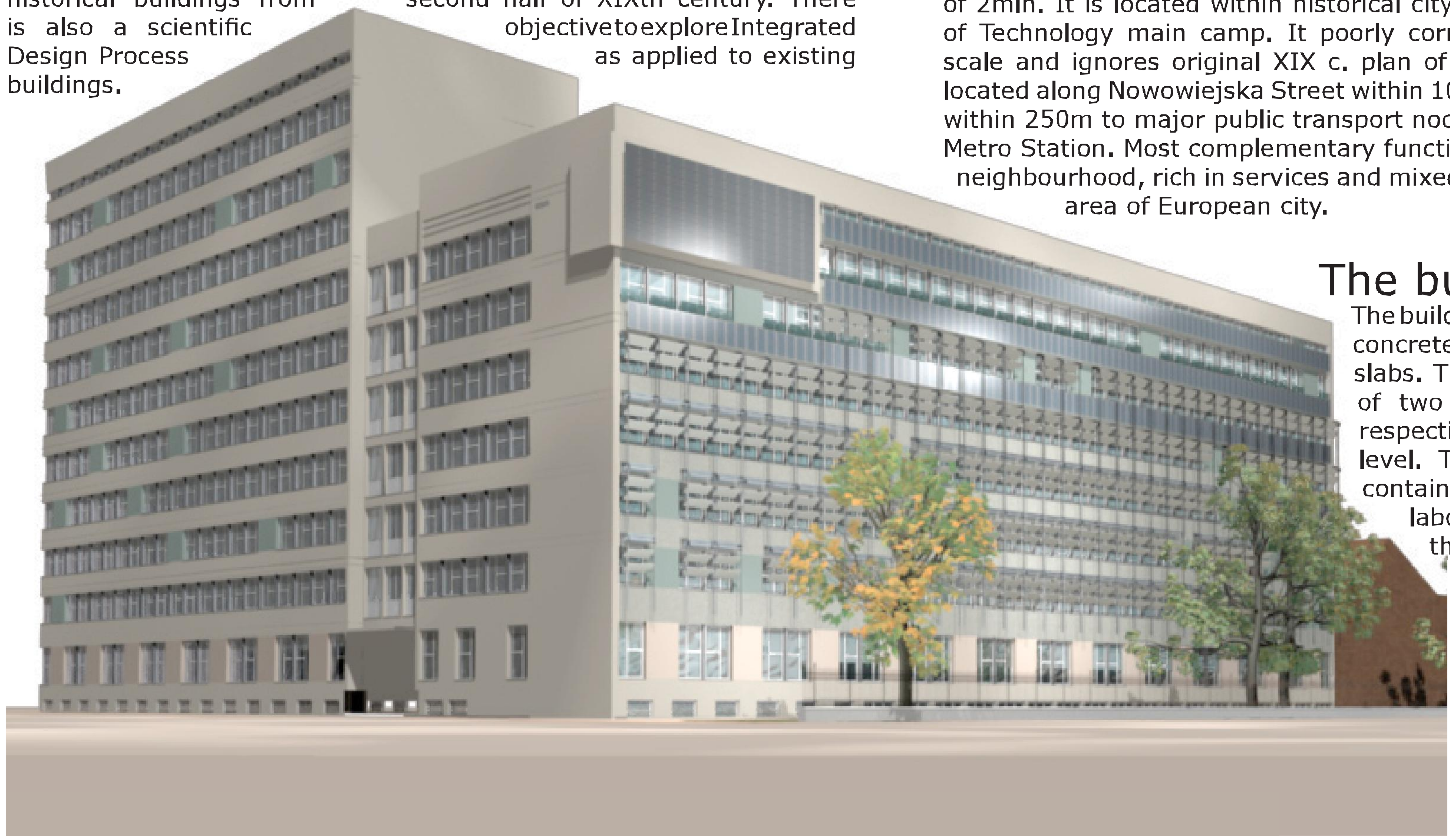
Building Type	- Education, University
Originally built	- 1969
Project Type	- Modernisation
Country	- Poland
City	- Warsaw
Client	- Warsaw University of Technology - EEA STEP*
Architect	- AID
Phase	- Project

Project description

The practical project aim is to improve energy performance of the existing Faculty building, which was originally built in 1965 and to revitalize the outdoor area located between the Faculty building and historical buildings from second half of XIXth century. There is also a scientific objective to explore Integrated Design Process as applied to existing buildings.



Integrated Design Process

One of the objectives of STEP programme is to explore possibility of Integrated Design Process application in modernisation of the building. It proved difficult to integrate systems and planned construction works into single synergetic design in case of existing University building, mainly due to the pattern of building operation in an annual cycle and due to the fragmented mode of financing any modernisations, which, because of legal requirements and financial constraints cannot be easily overcome.

Any interference with the building tissue and any construction work must not collide with the building's operation and are mainly limited to the university vacation period. Therefore the design solutions must be independent from one another in such a way that every construction phase is a separate task allowing operation permission immediately after completion.

Location

Building is located in the central district of Warsaw - the city with metropolitan population of 2mln. It is located within historical city block of Warsaw University of Technology main camp. It poorly corresponds with the historical scale and ignores original XIX c. plan of the site. The lower wing is located along Nowowiejska Street within 100m from tramway stops and within 250m to major public transport node in the area of Politechnika Metro Station. Most complementary functions are found in the nearest neighbourhood, rich in services and mixed functions typical for central area of European city.

The building

The building structure is prefabricated concrete frame with prefabricated slabs. The whole building comprises of two wings - 11 and 8 floors respectively plus underground level. Top and underground floors contain technical rooms and some laboratories. Main functions of the rest of the building are laboratories/learning rooms and office type rooms. The building's depth and glazing allows good daylighting.

*STEP programme

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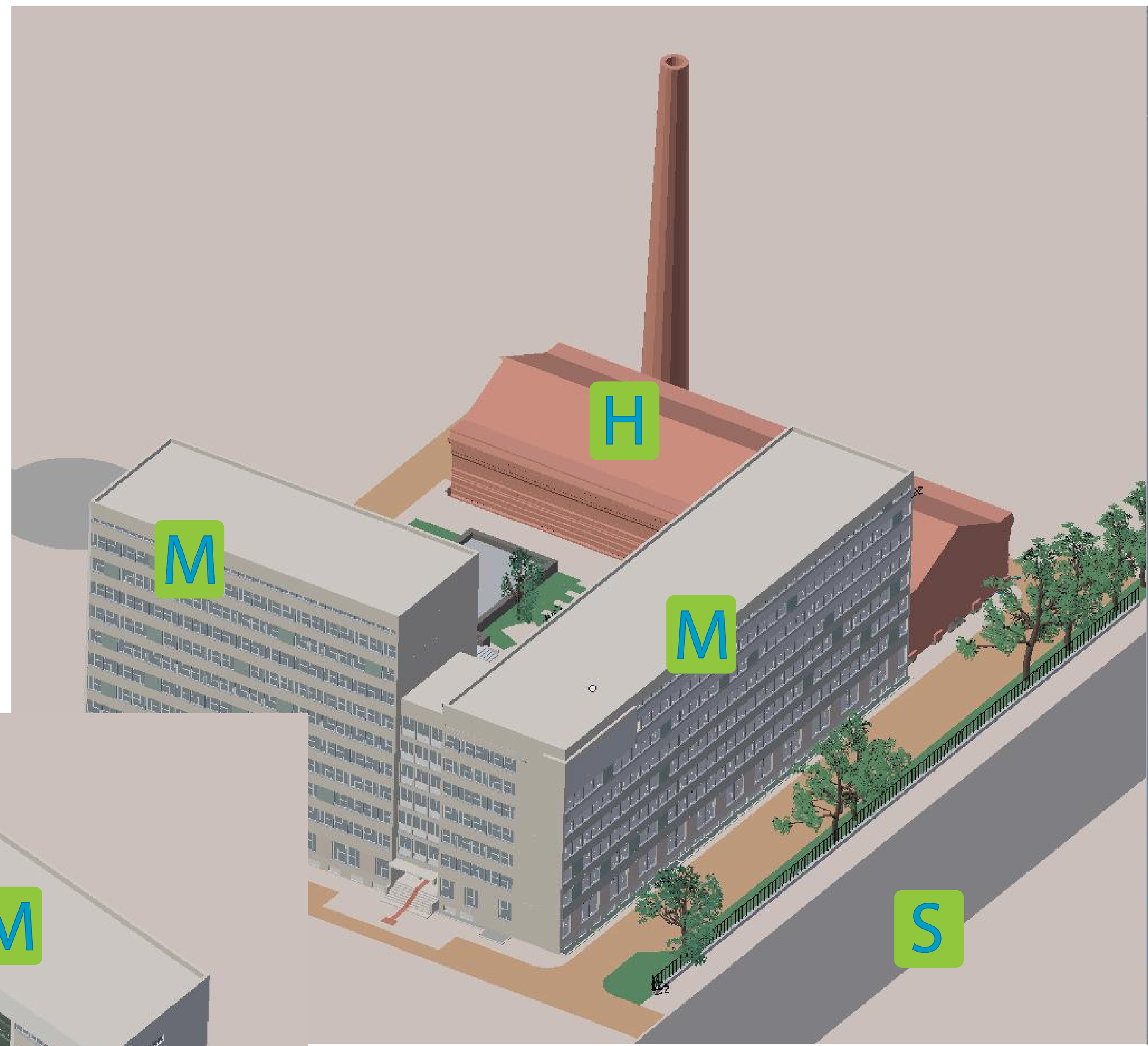
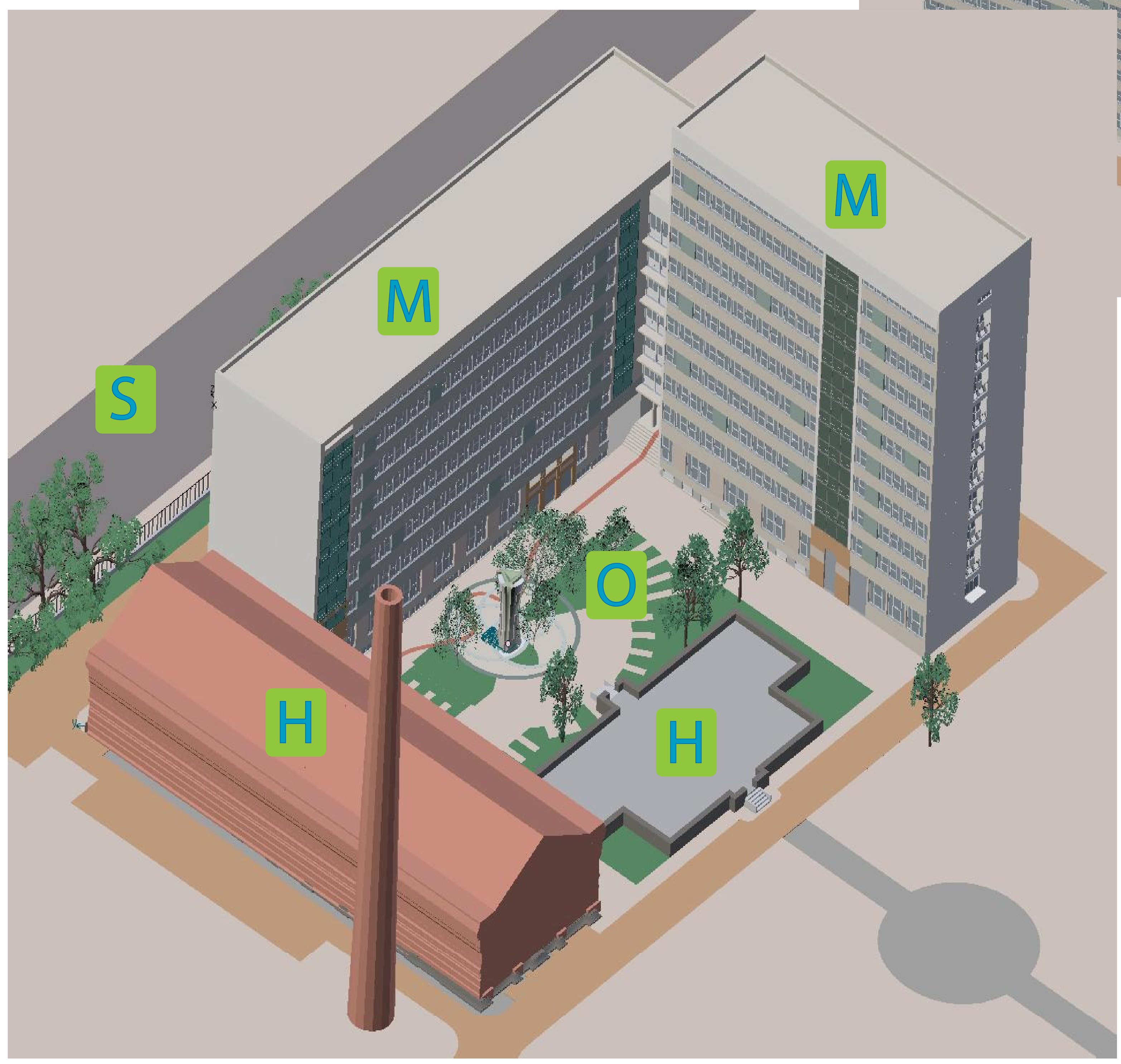
Project data

building footprint: 2.024 sq.m
gross area above ground : 18.622 sq.m
gross area: 20.128 sq.m
net area: 15.296 sq.m
modernized outdoor area: 2.128 sq.m
building height: 11 stories

climate zone: moderate, semi-continental,
temperatures: winter: -20°C summer 22-24°C
Heating degree-days: 3885 K*day
Cooling degree-days: zero
Building population: 700





	Absolute Performance Results			
	These data are based on the Self-Assessment values	By area	By area & occupancy	
1	Total net consumption of primary embodied energy for structure and envelope, GJ/m2	4	1	GJ/m²*maph
2	Net annualized consumption of embodied energy for envelope and structure, MJ/m2*yr.	77	16	MJ/m²*maph
3	Net annual consumption of delivered energy for building operations, MJ/m2*year	459	96	MJ/m²*maph
4	Net annual consumption of primary non-renewable energy for building operations, MJ/m2*yr.	0	0	MJ/m²*maph
5	Net annual consumption of primary non-renewable energy per dwelling unit in project, MJ/m2*yr.	N.A.	N.A.	MJ/m²*maph
6	Net annual consumption of primary non-renewable energy per dwelling unit in residential element, MJ/m2*yr.	N.A.	N.A.	MJ/m²*maph
7	Net annualized primary embodied energy and annual operating primary energy, MJ/m2*yr.	77	16	MJ/m²*maph
8	Total on-site renewable energy used for operations, MJ/m2*yr.	0	0	MJ/m²*maph
9	Net annual consumption of potable water for building operations, m3 / m2 * year	2.0	0.4	m³/m²*maph
10	Annual use of grey water and rainwater for building operations, m3 / m2 * year	0	0	m³/m²*maph
11	Net annual GHG emissions from building operations, kg. CO2 equivalent per year	64	13	kg/m²*maph
12	Total present value of 25-year life-cycle cost fot total project, EUR per m2.	2,111		
13	Proportion of gross area of existing structure(s) re-used in the new project, percent	73%		
14	Proportion of gross area of project provided by re-use of existing structure(s), percent	91%		

Assessment data

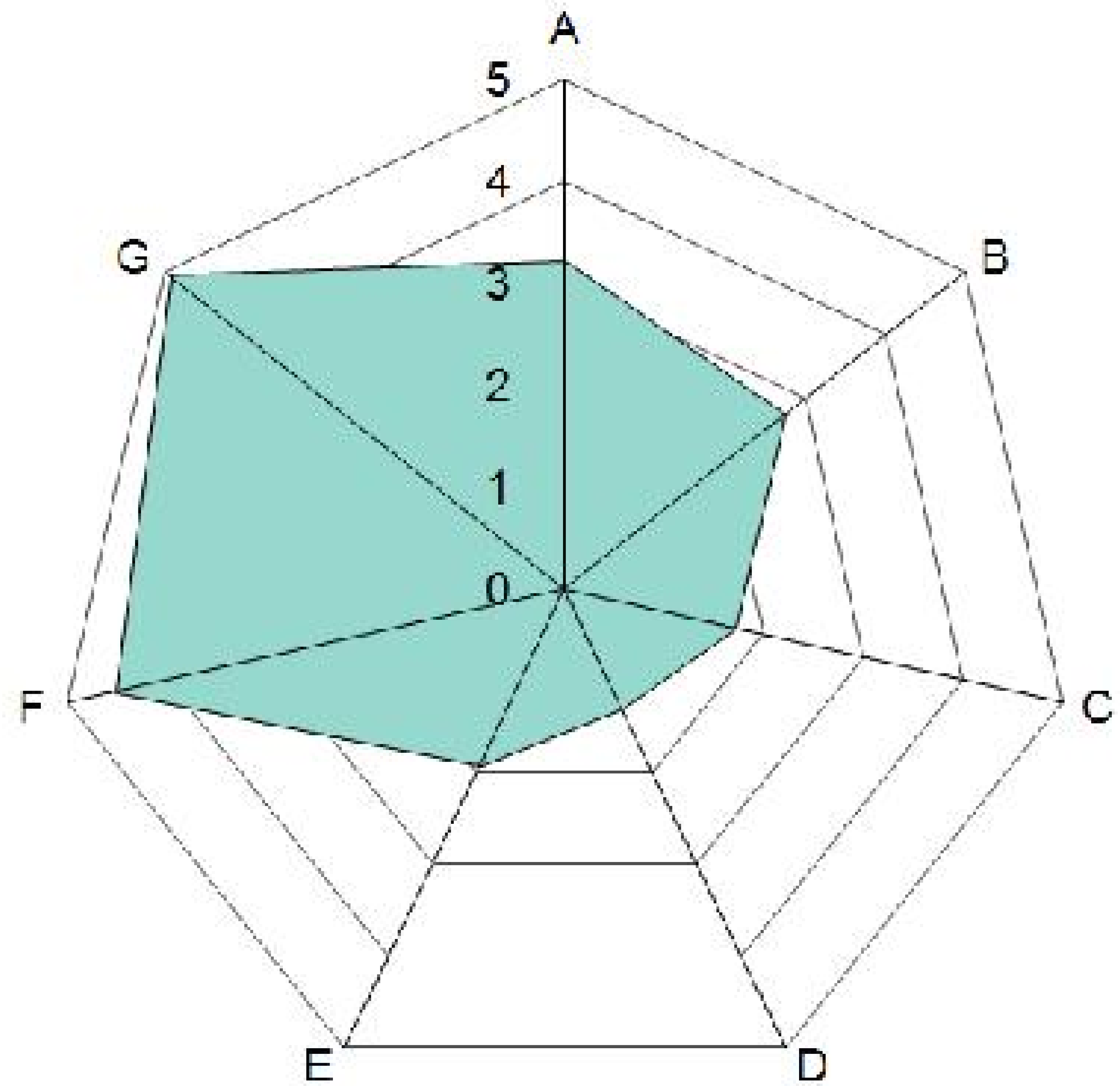
Distance from public transport stop: less than 100m
Predicted travel mileage of personal cars as allowed: 35 000 km/year
Predicted travel mileage of personal cars
[including off-site parking lots]: 70 000 km/year
Development density as a ratio of surrounding area: 1 (no change in intensity is designed)
Predicted net operating energy consumption: 127.5 kWh/sq.m*year
GHG emissions: 64 kg CO2 equivalent /sq.m*year
Embodied energy of materials aggregated: 4GJ/sq.m
New materials mass: 6.5 kg/sq.m

Total Weighted Score: 2.3

SBTool Assessment Score polar graph representation

A - Site selection, Project Planning and Development
B - Energy and Resource Consumption
C - Environmental Loadings
D - Indoor Environmental Quality
E - Service Quality
F - Social and Economic Aspects
G - Cultural and Perceptual Aspects

Where:
0 = Acceptable Practice
3 = Good Practice
5 = Best Practice



M *Modernized existing Faculty Building (there are no extensions)*
O *Revitalized Outdoor Area*
H *existing Historical buildings*
S *Nowowiejska Street*

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Integrated Design Objectives

An Integrated design scheme has been approved for the project. From the very inception if IDP, several distinct features, both explicit and tacit, of the project were demanded by the client:
Explicit:
- to reduce energy and media consumption for building's operations
- to improve indoor comfort, especially to reduce heat in rooms facing sun in summer
- to improve quality of public space by separating vehicle parking from amenities
- to provide more private vehicle parking space to meet demand
- to maintain and enhance historical character of the University Camp
- to meet demands of up to date technical by-laws including mobility of disabled persons, fire-protection measures, indoor air-quality, acoustic performance, - among others
- highly demanded feature is a visible and recognizable expression of the project sustainability to the public.

Environmental Engineering Faculty at the start of IDP process.

Occupants complain the exposed southern facade produce too much heat in summer. Individual initiative to meet the problem is expressed by visible cooling split-units. However in the course of thermomodernisation project thermal insulation and performance glazing were applied, occupants do resist to be deprived of individual cooling devices, partially for the lack of individual air-condition control, and partially for the strong feeling of them improving their living conditions by individual initiative. Integrated design team has to find an elegant and satisfying solution not only to improve indoor physical comfort, but also to maintain users' feeling of belonging to the place they actively occupy and improve.

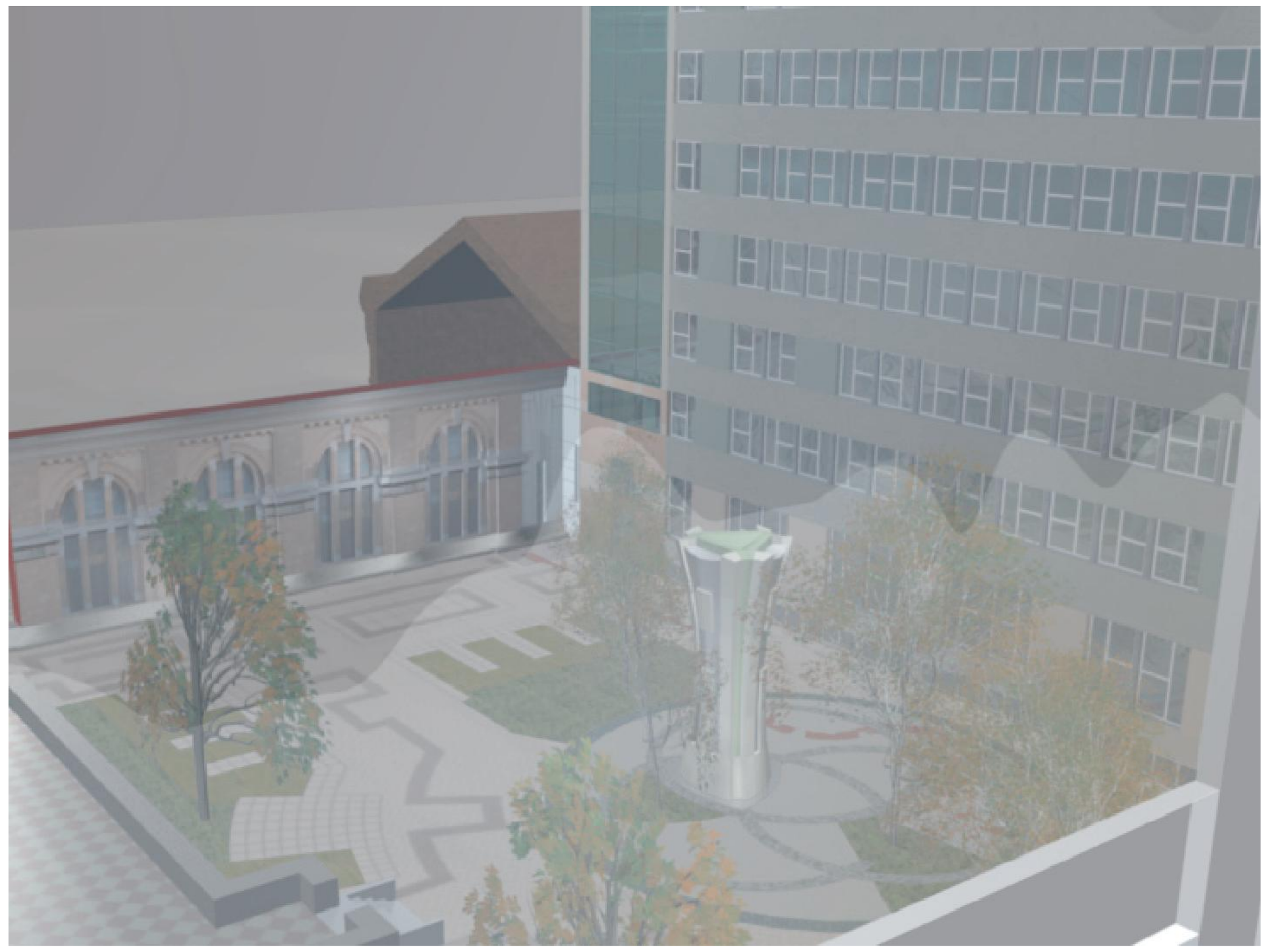
Existing outdoor area use poorly corresponds with primary function.

Outdoor area revitalization

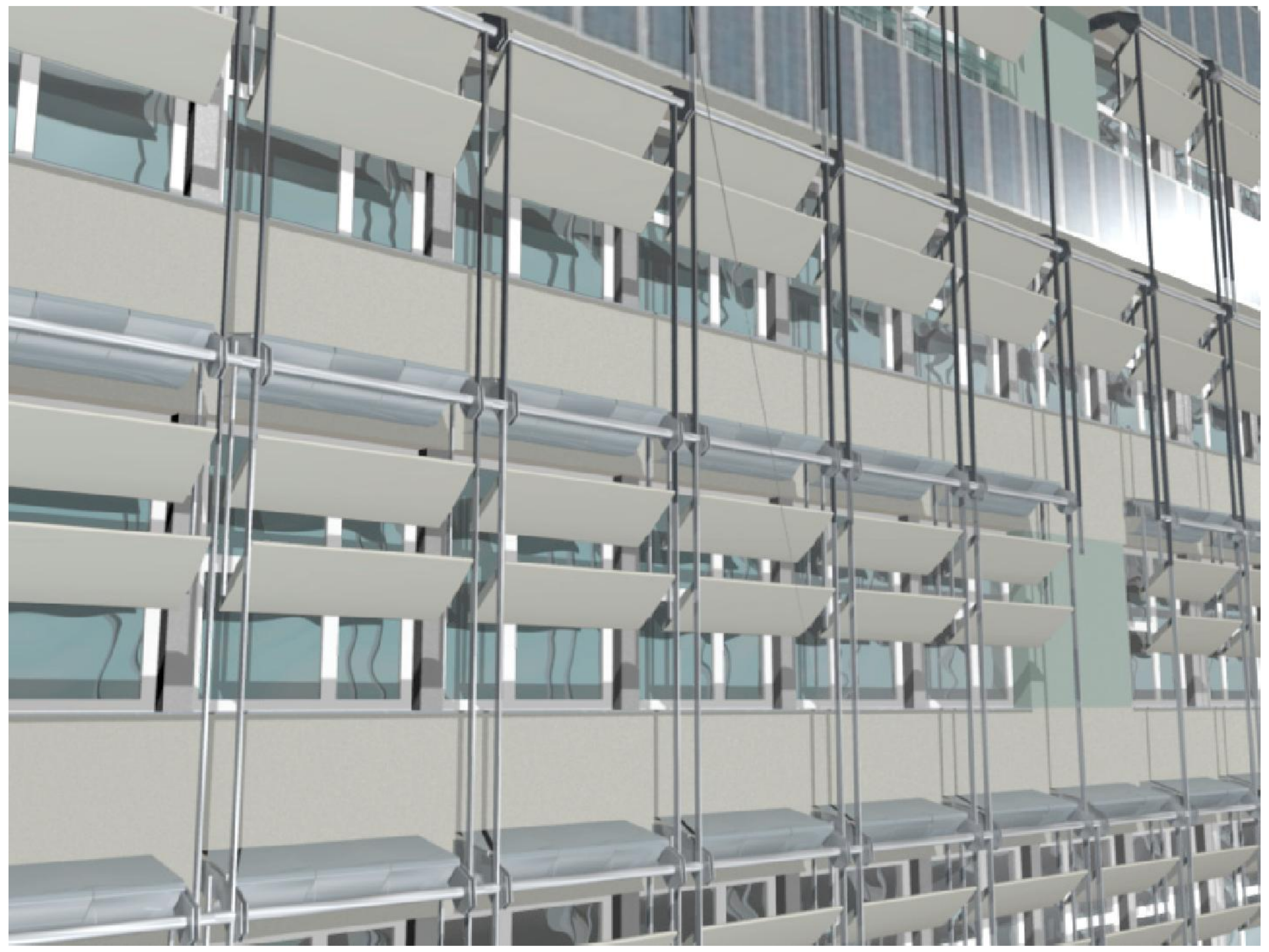
Preferences of students slightly differ from those of university employees in everyday life patterns, but what is common for their aspirations is to maintain social contacts with the help of the virtue of place. As the main demand for the University is to facilitate interpersonal contacts the design attempts to reduce all antisocial patterns of use like vehicle parking and mass solid waste collecting.

The biggest challenge for Integrated Design is to renegotiate the balance of interests between the private and the public. It is common misconception that if most individuals vote for the same it must be a good thing. Contrary to individual desires, most attractive public spaces are those which satisfy the need of easy social relations. However many users of the outdoor space indicate a private vehicle parking place on top of their wish list, technical functions were reduced in order to promote efficiency of space in cherishing individual mood and maintaining feelings of belonging to the place. Alienation from immediate environment is considered a serious problem of far-reaching consequences.

Outdoor space is redesigned to accommodate new uses, especially socializing activities. Paving texture and pattern attempts to reintegrate space while both private vehicle parking and vital access routes are preserved but modified. The design follows general idea of multipurpose space arrangement and easy conversion from one type of activity into another to extend attractiveness of the place in course of the day and the year and to encourage playfulness.



Sustainable investments are required to express investor's attitude. The design recognizes that by delivering both inner yard which is visible from main vertical and inner communication spaces of the building and the front street facade with recognizable features.



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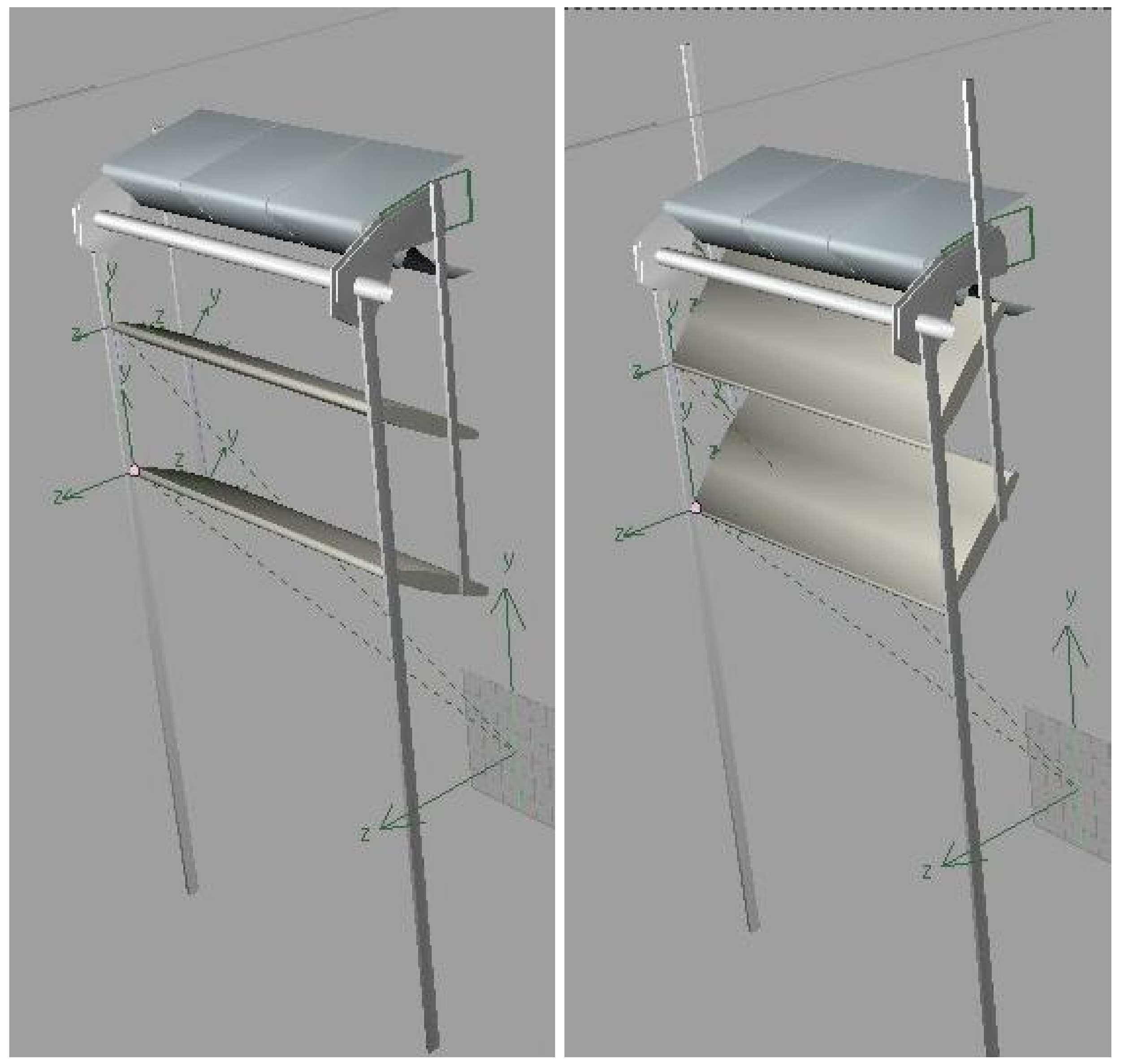
Outdoor area designed to integrate adjacent historical buildings with the Faculty building. Paving is redesigned to accommodate summer leisure events. Representational function in correspondence to conference rooms in Old Boiler House influenced the design as well.

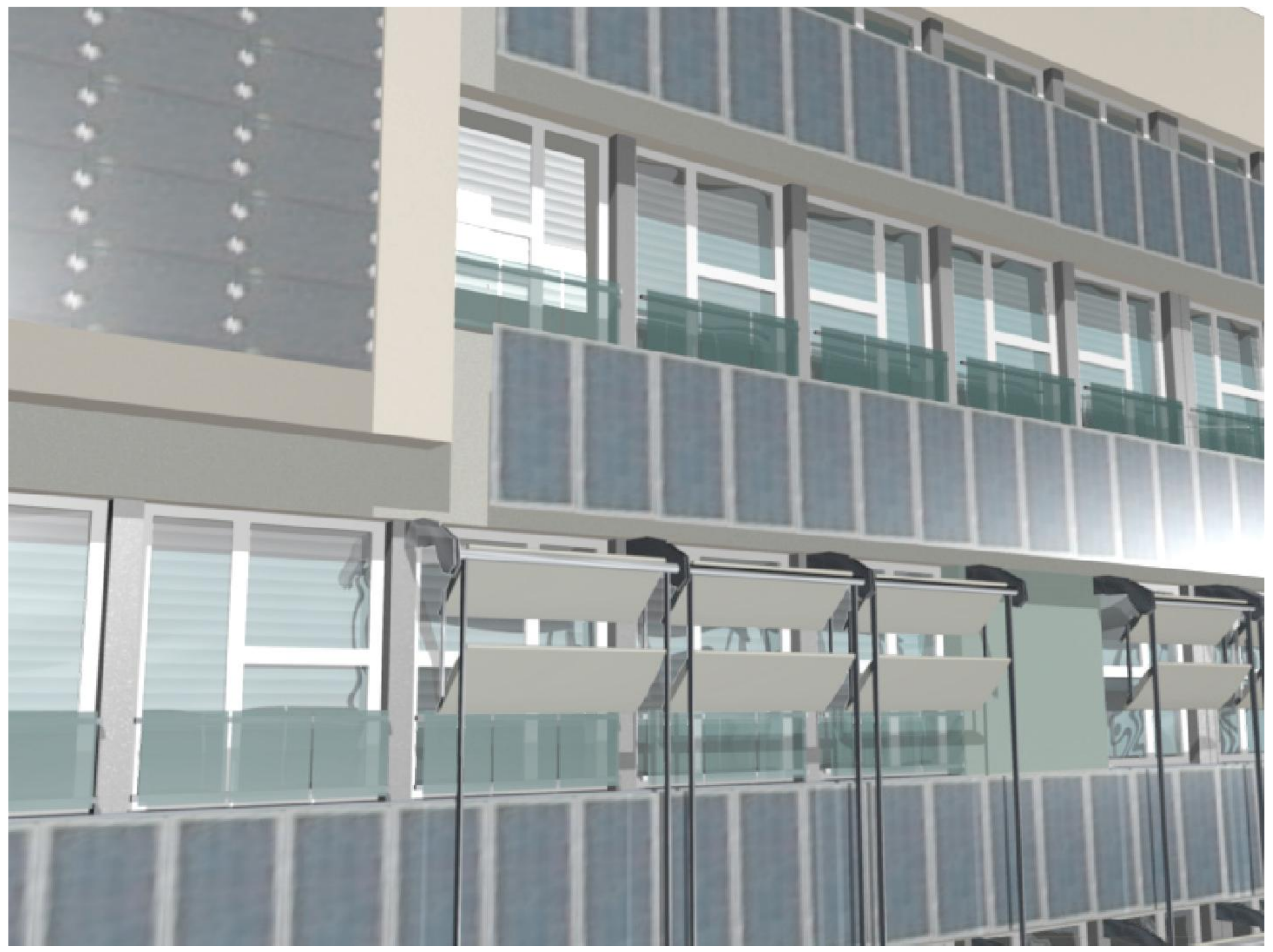
An existing ventilation air inlet is redesigned to new decorative form making a part of semi-public space composition. No existing trees are removed or relocated, and the green and permeable area is effectively enlarged despite visual domination of stone paving.

Existing development the outdoor area. Undefined and non-informative space. The only readable pattern is created by discipline in car parking.

Southern facade is equipped with individually designed movable louvres that serve as both shading and daylight reflecting shelves to control direct solar light penetration and solar heat gains. In closed position the system traps air to limit a cooling effect from air convection in winter. It is individually controlled to satisfy the need of occupants to maintain control of their personal space. It occurred important in the face of fact, that many users managed to install individual cooling units and resisted attempts to be deprived of them.



The facade louvres system takes into consideration integrates PV panels which were commissioned prior to IDP.
Important factor in facade design was an ease of maintenance, therefore louvre system accessible from windows was selected.



The great care has been taken to integrate modernistic and XIX c. architecture into a meaningful whole., while minimal resource usage is both an aesthetic and IDP goal.

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