COLOUR DESIGN OF BUDA CASTLE DISTRICT

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Summary

Buildings in the monumental town core of Buda Castle district represent the historical past and at the same time are expected to meet colour demands of people of today. Building colours have been planned — rather than piecewise — to match each other and the townscape. Designers have attempted to coordinate a wide range of the both aesthetic and functional importance of well selected colours.

This design has been a representative test of colour dynamic research going on for two decades at the Technical University, Budapest, embracing theoretical and practical problems of the colour design of historical cities.

Actually, a significant part of mankind are town dwellers, striving to have a built environment possibly meeting physical and psychological demands. Actually arising town fabrics, townscapes are accessible to interventions aimed at meeting demands. But a part of towns are not only living places but at the same time they are rooting in the past, imposing to be considered as monumental complexes to be preserved, at rather high expenses. This is the point where the visual quality of colour emerges. Designers are increasingly aware of the suitability of colour to functionally and aesthetically improve the built environment.

This endeavour is parallelled by the development of a new science — so-called colour dynamics — attempting to exactly define colour-man-built environment relations, its results being of use for architects, artists, and everybody interested in colour design. At the Technical University, Budapest, nearly two decades have been spent on these research works and on practical implementation of achievements. A representative test of research results has been made on commission by the Budapest Municipal Council to make a study plan for the complete reconstruction of the Buda Castle district, a monumental complex nearly 800 years old, topologically distinct from other parts of the capital. On the other hand, many of its buildings are living houses, hence it is integrated in the life of the city surrounding it. In the following, subject and train of thought of the design will be presented, pointing out relations likely of use in colour design of similar monumental complexes of town size.

The design subject

Colour dynamic design of the Buda Castle district comprises three phases, of colour designs for 90 to 100 houses each. Each phase took one year, engaging a design work team comprising, in addition to architects and painters, other specialists such as physicists, mathematicians, psychologists, sociologists, physicians, art historians, historians, chemists, reconstructors, electrical engineers, mechanical engineers, colorometrists, industrial designers, etc. Colour selection of the plan has been decided partly by the historical past of the monumental complex, and partly by its actual function.

Past of the Buda Castle district

The Buda Castle district is sited in about the middle of Budapest, a hilltop settlement surrounded by ancient fortifications. After the Mongol invasion in 1241—42, king Béla IV built new fortified towns throughout the country, this is when the Castle Hill got populated to become the actual Castle district. Documents of the date testify a new town to exist on the hill already by 1243.

First town dwellers, mainly the Hungarian population of Óbuda, settled around the actual Vienna Gate. 1240 to 1260 the then single-nave Mary Magdalene parish church had been built in the middle of the Hungarian settlement. In 1247, frightened by the rumor of another Mongolian attack, German citizens of Pest moved up, to settle to the south from the Hungarian settlement, and named their settlement Castrum Novi Montis Pestiensis. Early in the 1300s, the royal residence moved to the southernmost part of the Castle Hill. The church of Our Lady, originally a royal chapel, was given the German population as parish church, to subsist actually — though with transformations. The Mary Magdalene church had been garrison church up to the end of World War II. Now only its spire subsists. The still existing street system of the Castle district started to develop around these two churches, in the second half of the 13th century.

Between 1250 and 1275, Dominicans and Franciscans built an extensive convent and church each. Andrew III, the last king from the House of the Arpads, was buried in the Franciscan church in 1301. In 1302, the citizens of Buda closed gates before the Angevin Charles Robert, who, after being crowned in 1308, started important constructions in the south part of Castle Hill, continued by his son, Lewis I to resettle the royal court from Visegrád in 1355. Completion of the constructions brought about the final mediaeval town fabric that still subsists in its main features. During the reign of king Sigismund (1387—1437) the royal palace and the Castle district underwent further development. In the 14th century, Buda is enriched with two- and three-storey houses and with donjons. Houses of this period are built of stone, with decorated facades, sediled

gateways, shop in the ground floor, and fine arcades in the yards. Houses were built with eaves lining the street, in the Italian way.

Buda has its brightest period during the reign of king Matthias (1458—1490) who married the Italian princess Beatrice in 1476 in a newly built wing of the Palace. This event made the Castle the Mid-European citadel of Renaissance. The townscape due to the grandious constructions inspired one to say to what became a common saying in Italy: "In tota Europa tres omnium pulcherrimae esse urbes, Venetia in aquis, Buda in monte et Florentia in planitie". In the 15th century, Buda was one of the biggest cities in Europe, also by the number of its inhabitants.

After the Turkish occupation in 1541, crosses dropped from spires to be replaced by the Turkish crescent for one and a half centuries. All churches but the Mary Magdalene church were transformed to çamis. During this period, nothing but walls and bastions were repaired, anything else went crumbling.

Destruction of the Castle district under Turkish rule was surpassed by that due to the great siege in 1686. Buda battered to ruins had completely to be reconstructed. The reconstruction in Baroque style went ahead slowly, under guidance first of Italian, then of Austrian architects, respecting earlier possessions, at most some minor plots had been united. Kapisztrán square, of large dimensions, arising in Baroque reconstructions, does not fit the mediaeval town fabric. By the end of the 18th century, characteristic, individual houses were built in a Hungarian variety of late Baroque Louis XVI style. Little construction took place in the 19th century, the few new buildings were too big, unfitting the townscape, disuniting balanced streetscapes of small units.

In World War II, Castle Hill got again ruined. Reconstruction eraded later constructions disagreeing with the townscape. The reconstructed Castle district exhibits continuity of the historical development of this complex of superimposed, interwoven buildings. Spatial proportions of streets and houses of this monumental complex of Buda create intimacy, matching mediaeval origins. Houses are mostly not more than two storeyed — principal cornices are 10—12 m, roof crests 14—16 m high, enhancing the mediaeval skyline; three vertical accents of spires of Our Lady, Dominican and Mary Magdalene churches protrude from the horizontal expanse of smoothly undulating roof lines.

The Buda Castle District now

The actual street fabric of the Castle District has developed in the 13th century. Its eminent point, center is Szentháromság tér (Trinity square) around Our Lady's (Matthias) church behind Fishers' Bastion. Blocks of houses to the north line four N-S streets matching the widened hilltop. The tapering plateau to the south of Szentháromság tér, down to the Royal Palace, accommodates merely two, parallel N-S streets.

Ninety percent of buildings in the Castle District are living houses, the others accommodate museums, offices, restaurants. Communication with other town parts is on foot or by bus, or by private cars. At any time of the day, visitors are roaming around, making glances at arcaded, flowered courtyards. Not only buildings, but all the town part keeping its mediaeval street fabric is under Monuments Act, nevertheless Castle District is not only a museum but an actual city sharing the life-blood of Budapest.

Two great ages of the town: Middle Ages and Baroque, prevail in her streetscapes, intermingled with Louis XVI and Classicist forms. Roof crests of all but two houses lining the streets are parallel to street axes. The blue sky above the smoothly undulating roof lines occupies much of the field of sight of pedestrians. As hours pass, shadow effects quickly change over façades lining N-S streets. Shadows of door and window casings, cornices, pilasters daily increase-decrease on the wall surface, tracing playful ornaments. What is shadowed in the morning gets sunshine in the afternoon. Streetscapes are sometimes dominated by colour, other times by moulding. Lengthwise streets are connected by narrow passages with hardly any sunshine.

Walking out to the bastion promenades, horizon widens out far away. Looking down from any side of the Castle Hill, roofs of Budapest come into sight, either framed by the Buda mountains or underlined by the Danube river. Colours in the sky and the environment expect to be echoed by the façades. They have the function to point out the use of the building, the historical mood. to enhance architectural details, town fabric, all in all, to create a fine human environment hence a visual sensation. All this has been expected of our colour design. (Fig. 1.)

Preparations to the design

Environmental use of colours must not be made at random. The designer has to be aware of correlations between colour sensations, of reactions of man on colour effects in his environment, of the impact of colour effects on space sensation, and of a lot of other factors of importance or design. This knowledge is needed — beyond of intuitive colour design — to create a built environment of purposeful design, pleasant, and functional to the highest degree. To this aim, purposeful research work has been made at the Technical University, Budapest, on colour-man interactions in a built environment, involving hundreds of tests, simulating spatial situations, constructing purposeful test arrangements, questioning thousands of — at an instance even 50 thousand — test subjects. The obtained millions of data have been computer processed, possibly mathematically formulated, expounded in research reports, essentials reported of in publications. Research work relied on a colour system called COLOROID developed especially for environment colour design submitted to discussion at Hun-

Fig. 1. **Layout plan of Buda Castle district, subject of colour design. The mediaeval street fabric is typically longitudinal, of N—S direction, of importance for coloration, façades being half-and-half east and west oriented at no restriction for colour delimitation**

garian and international meetings, adopted as Hungarian Standard Specification MI 17063-81 in 1982.

The actual design problem involved delimiting colour ranges best fitting design, issuing from a set of preliminary actions.

Data collection survey of demands

The first step was to collect data on the former coloration of each building. The Castle District, divided into ten regions, has been processed in dating topographies. For some houses, paint layers superimposed in centuries offered reliable hint on earlier colours. Each building was investigated, encountered paint layer colours were instrumentally determined. Other buildings, several times reconstructed, hardly kept any paint layer. In such instances, paintings, coloured etchings were consulted. Even old Castle-District-dwellers were addressed to for visual remembrances.

Making use of our former research results, colour preference data of different historical periods have been collected, recorded with a view on each of the three colour sensation parameters, and relationship plotted in handy diagrams. These relationships covered definite members of the realm of colours, but also yielded general conclusions such as: in Middle-Ages saturated, contrasted colours, in Baroque, medium saturated colours with sharp brightness contrast, in Classicism unsaturated colours contrasted at most by saturation, were preferred. Castle district being a living city, colour preference of its actual inhabitants was another contribution to colour delimination. (Fig. 2.)

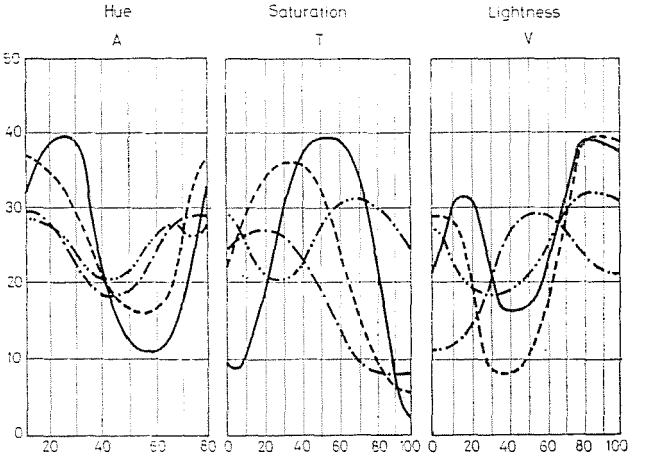

Fig. 2. Colour preference diagrams. Abscissae of the tripartite graph bear Coloroid hue A, Coloroid saturation T and Coloroid brightness V, in this order. Preference percentages are seen in ordinate.

Colour preferences: ———— mediaeval; — — — — baroque; —·—·—·— classicist; ··—··—··— modern

Each building was investigated for townscape significance, defined by its size, architecture, position in the streetscape. Each façade was surveyed and photographed from different aspects. Street width to building height ratios were determined, and so were insolation data for each building. Utilizations of other than living houses were recorded, indicating colour demands for the given specific case.

Analysis of data and requirements

The Castle district got divided into visually perceptible units of squares and shorter streets as a rule, longer streets comprised two or three visual units, confined by houses considered as nodes. Nodal houses between two visual units of characters differing e.g. by building heights, façade ages, functions constituted transitions between characters. Often nodal houses were of outstanding townscape significance. Façade dimensions were averaged for each visual unit, and individual differences plotted. (Figs 3, 4.)

Consideration of differences between architectural moods raised by houses in each visual unit lets conclude e.g. that mediaeval origins of several houses, at least in ground storeys, are manifest in as few as 15 percent, rather differing between visual units. Most of the façades, about 75 percent, keep exteriors of 16th and 18th centuries. Ten percent have been newly built. All these have contributed to the choice of building colours prevalent in the 17th and 18th centuries, for most visual units, including contrasted shades of medium saturated, somewhat lighter than medium warm yellow, green, scumbled red.

House colours have been stated to be little changed in the last century, at most by saturation and lightness. Each house wall in each visual unit was processed in a set of drawings showing colorations related to the four primary colours of the given set of façades in different historical ages.

The ratios of street width to façade height were found to range from 1.5 to 1.8 as an average. Testing variation of optimum looking angles for houses of a visual unit of a street showed visual effect of the colour of protruding mouldings for too acute angles to suppress the visual effect of the coloured façade. For instance, at several spots in Táncsics Mihály street, in Országház and Úri streets, this angle is near the critical value. (Fig. 5.)

40 percent each of house façades were found to face west and east, 10 percent each to face south and north, hence in sunshine, most houses are cyclically insolated and in shadow. There are only 15 percent never insolated, constantly in shadow. Streets are rather wide compared to building heights, hence hardly any façade facing west or east completely lacks sunshine.

Now, sunshine with its shadow effects enhances architectural features but in shadow, enhancing needs colours. Visual unit streetscape drawings were made indicating shadow lengths in spring and in autumn, at 8 h a.m., at noon and at 6 h p.m. (Fig. 6.)

Fig. 3. A detail of Fortuna street as visual unit. So-called accent graphs above façades express rate and positive or negative deviation of façade areas from the average

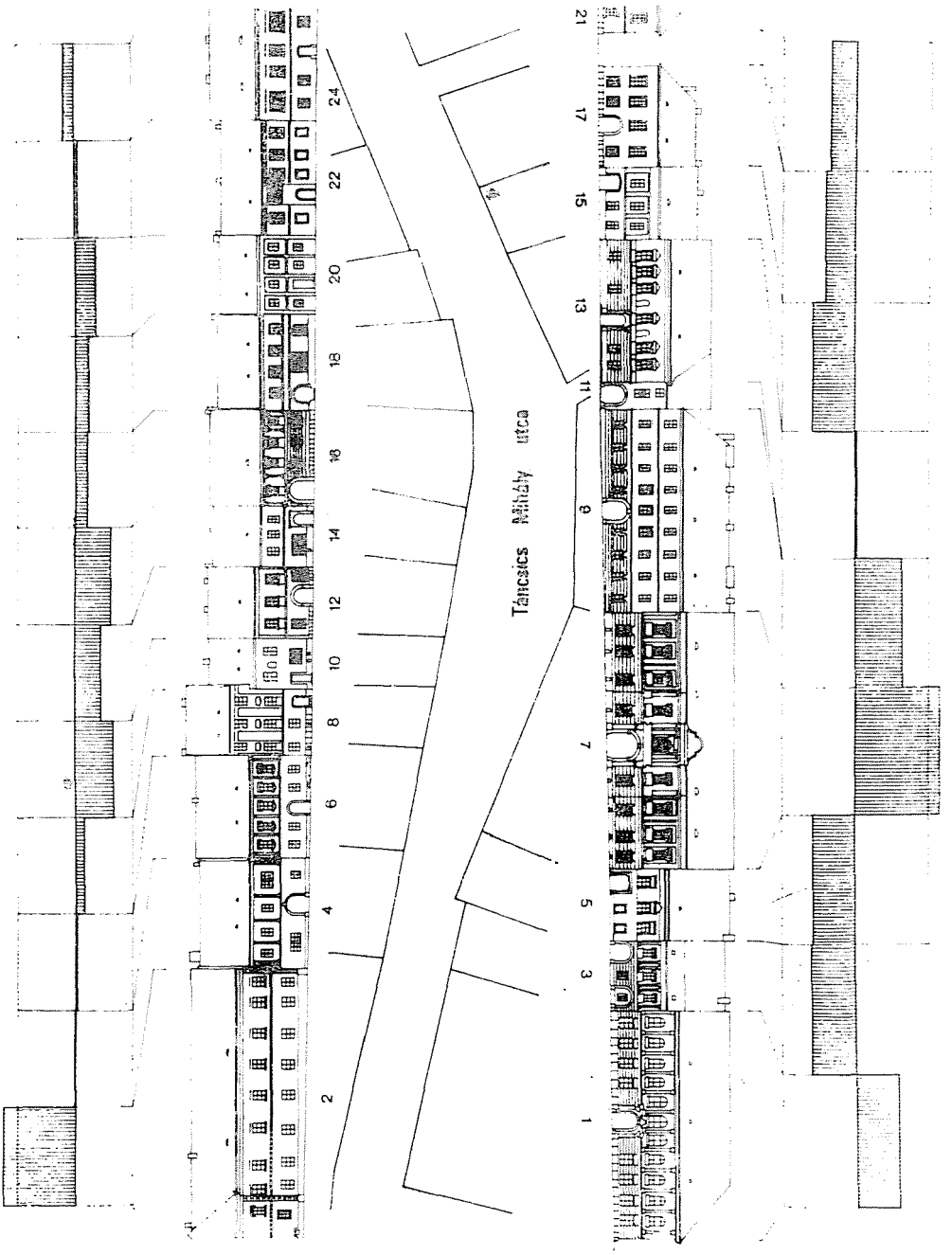

Fig. 4. Part of Táncsics Mihály street with relevant accent graphs

Fig. 5. Construction of optimum looking points to houses of a part of Uri street. Intersections of arc two and half times the façade width with the street line are the nearest points the façade can be overlooked from. To consider the street as narrow or wide compared to the façade dimensions is decided by the looking angle and so is the accent to be borne by walls or courses

The range of colours

Analyses have led to aspects to be followed in design, partly of colour demands, and partly, of prohibitions. For the sake of comprehensibility, a method was needed for a possibly exact definition and recapitulation of colour suggestions from different aspects. This method, named colour delimitation, is aimed at delimiting colour ranges (hues, saturations and brightnesses) of members meeting colour requirements from the actual aspects. The delimited colour range still amply accommodates the designer's phantasy.

Colour delimination started by plotting all three parameters of colours preferential from a given aspect, compared to other members of the colour range. This work relied on design aids, tables from earlier research work, such as those of colour preference index system, of the colour association system,

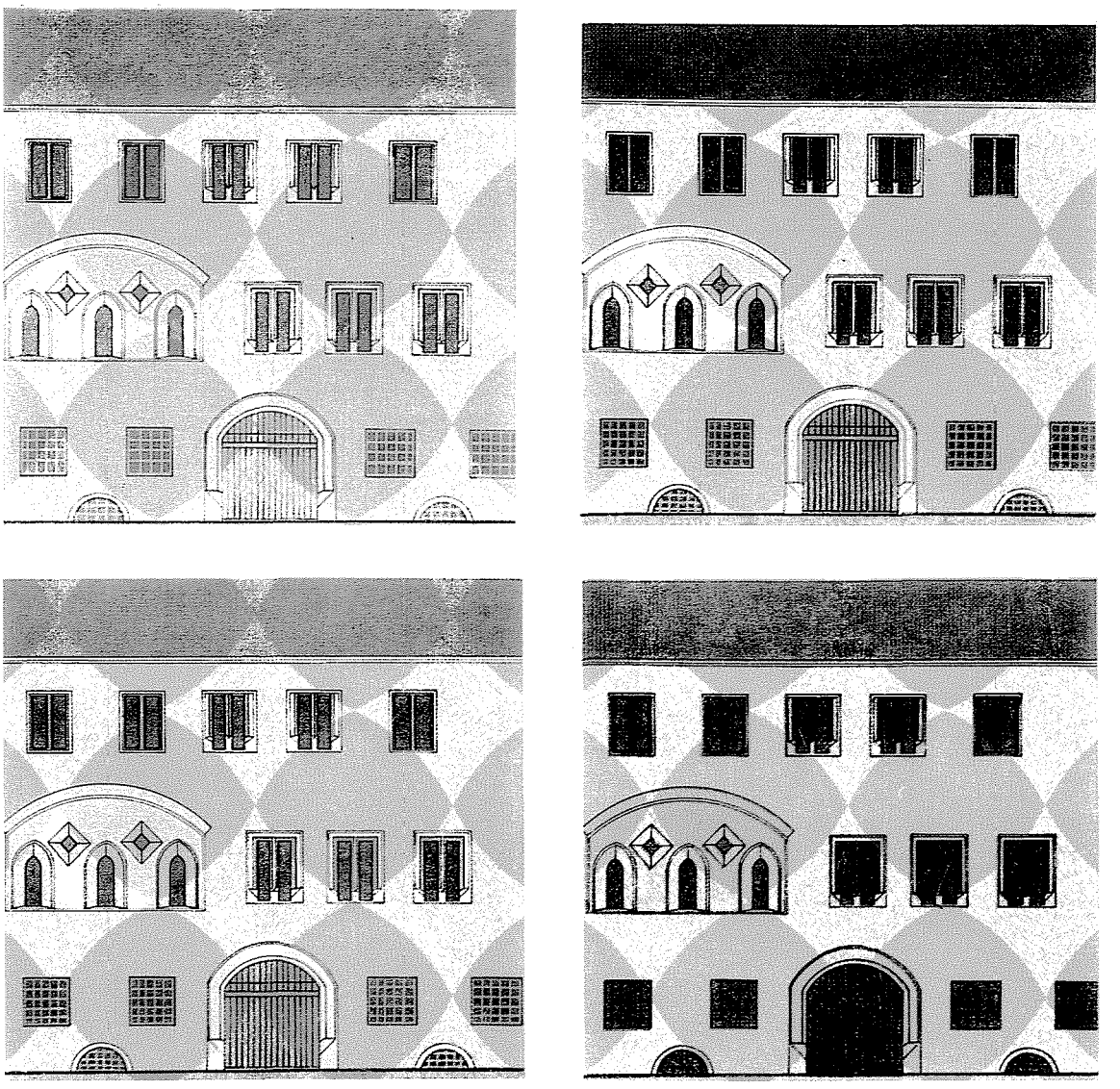

Fig. 6. Six colour varieties of the facade of 31, Uri street, resulting from the exclusive enforcement of various single, are often contradictory aspects in design. Analysis is expected to designate essential aspects to be validated in design

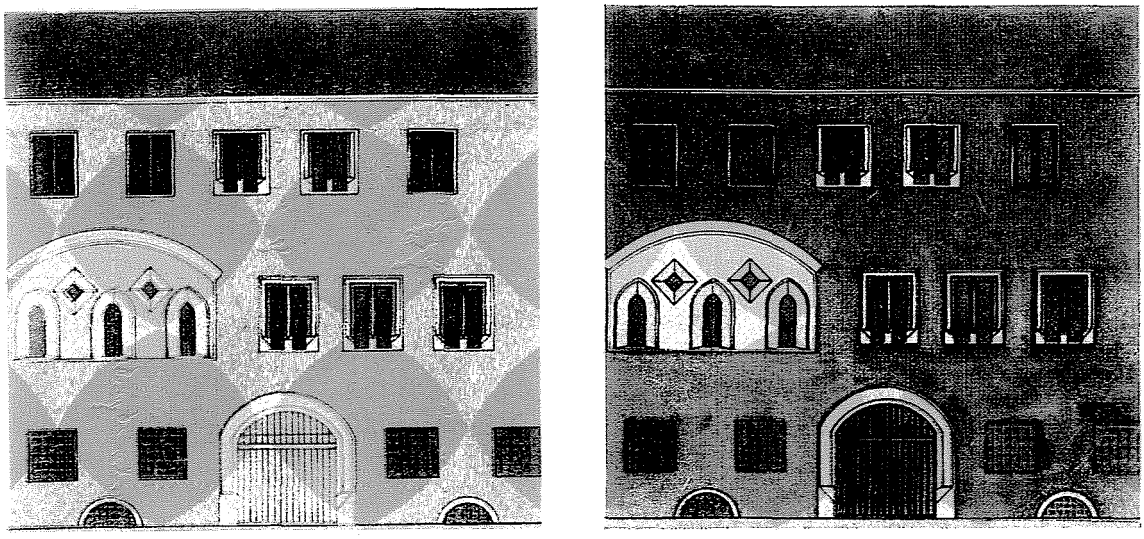

Fig. 6 for caption see over leaf

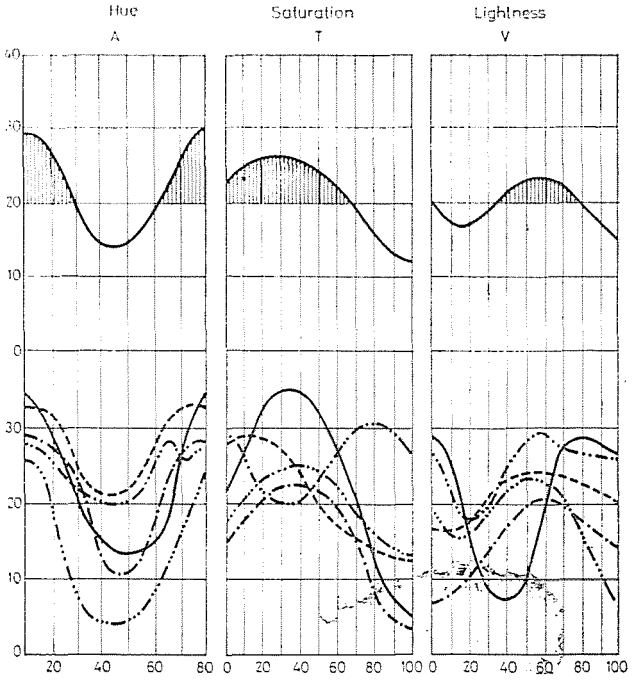

Fig. 7. Colour delimitation diagram for 29, Úri street. Abscissae of the tripartite diagram bear Coloroid saturation T and Coloroid brightness V. Ordinates show preference percentages of single colours from one aspect prevailing over the others.
Aspects: ———— monumental; — — — — architectural; —.—.—.— functional; ..—..—..— building occupants; ...—... illumination.
Curves are enveloped in thick line. The designer advisably may select of colours symbolized a shaded areas

of illumination effects to change colour perception, a set of diagrams on the change of space sensation, etc. Colour delimitation involved separate diagrams from monumental, architectural, functional, human and illumination aspects. Colour delimitation was made for each visual unit, then for each building separately. Colour delimitation curves were superimposed, resulting in a quantity of colours to begin design with. (Fig. 7.)

Design

Buda Castle district is an outstanding monumental complex. Its buildings represent both historical past and present. Not only historical age, style of the buildings but also colour demands of inhabitants had to be reckoned with in colour design, to express historical atmosphere of Buda Castle, capital of Hungary for 800 years, quarters to generations adding in turn, new colours to the townscape. Building colours were defined within the complex of the townscape,

rather than detached. Design coordinated a wide range of aspects and demands in the conviction that well chosen colours — beyond of aesthetic value — improve functionality of the environment. The resulting assortment of colours has been recorded in a plan documentation.

Colour selection

Using the delimited colour range, paintings have been made of visual units, rows of façades seeking shades well fitting the monumentally authentic colour to achieve the desired mood, caring for not to let other aspects prevail over aesthetic pleasantness.

Agreeing in colours of buildings within a visual unit, colours were specified according to COLOROID colour harmony rules. Now, maquettes were made of the streets, painted with these colours. The future visual effect of the street on the pedestrian was tested by a fibre-optic instrument. A displeasing design was replaced by a different one, sometimes even ten to fifteen times. The final colour

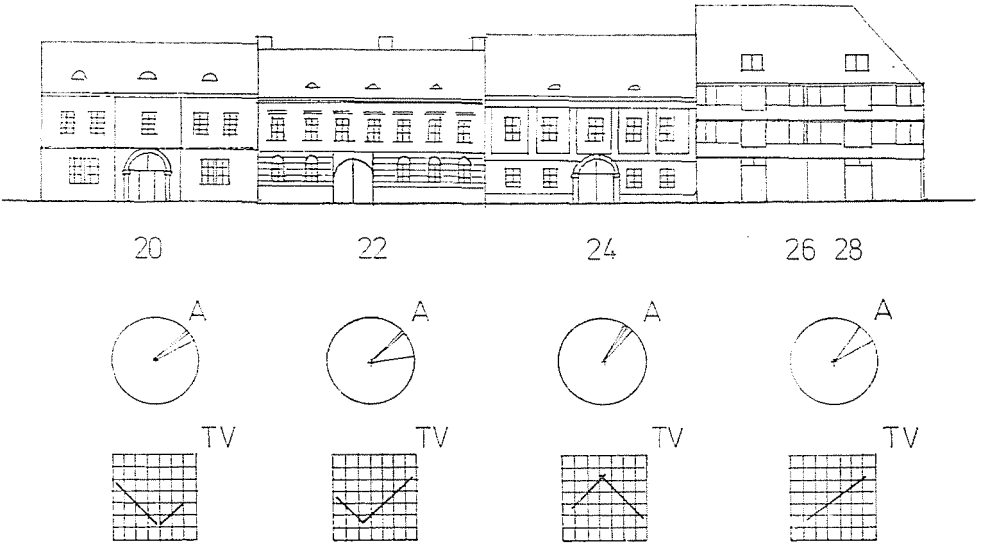

Fig. 8. A part of Szentháromság street with colour harmony diagrams for the buildings

design comprised COLOROID system diagrams for every building. Diagrams below the row of facades permitted to compare theoretical correlations. Circles below façades in Fig. 8 represent the COLOROID colour scale indicating typical hues of the planned house colours. Squares below circles schematize the given COLOROID axial section(s), with lines exhibiting relationships between colour saturations and brightnesses of the given house.

After completion of all (42) of the pictures, it became clear that colours of buildings within a visual unit mostly came from a definite, rather narrow range of the sphere of colours. Namely, group harmonies were applied for most houses. Even for incomplete triadic and complementary harmonies, at least two colours belonged to colour ranges typical of the other buildings. Thereby given emplacements were affected by harmony groups typical of Baroque and Classicist coloration. Fitting of scattered, mediaeval-type harmonies was made to range colour saturations with those of surrounding buildings in scale. Tetrade harmonies, current in Art Nouveau, were completely omitted. The applied harmonies were of some simple scale type. That is, colours of the harmony are of saturations and brightnesses forming simple scales, of proportions similar to those of paints usual in the 17th and 18th centuries.

Painting the design sheets was rather spectacular. The 52 design sheets presented rows of 5 to 10 façades to 1 : 50 scale. The last stage of design decided over the painting technology of each façade. Colour samples were made using the paint corresponding to the suggested technology. For the sake of instrumental colour identification at implementation, colour coordinates in COLOROID and CIE XYZ systems have been determined for each colour.

In course of design, colour suggestions were often decided over in lengthy discussions. Accomplished colour designs were submitted to public discussion organized by the Section of Colour Dynamics of the Scientific Society for Building. The last instance of discussions was before professional juries invited by the Budapest Municipal Council, raising concrete and often theoretical problems concerning a building. The sharpest divergencies concerned monumental authenticity of certain building colours. Some specialists required absolute respect of every subsisting colour sample irrespective of the often centuries of differences between the building and its colour remnant. Others challenged certain aspects in colour selection. Anyhow, some colours had to be modified, entraining to change further, coordinated colours.

Documentation

The complete plan documentation comprised 2950 pages of text and 62 painted design sheets 50 by 100 cm. The text partly described considerations and tests on the colour design of the complex, with diagrams visualizing and explaining colour selection for the customer, and partly designs for each building, complete with collected information, COLOROID and CIE XYZ coordinates of design colours, suggested painting technology, colour consignation picture of the building, and colour samples.

The Municipal Council, authority directing reconstructions, forwarded designs to the investor, Communal Management and Building Office, an organization managing reconstruction of monuments and living houses in Budapest

making a contract of reconstruction with the Budapest Building Enterprise No. 1. Reconstruction of the Castle District has been managed by a special Operative Commission of the Municipal Council.

Last but not least, a compilation made out of the plan documentation has been awarded international first prize at the 2. Internationale Farb-Design Preis in Stuttgart, 1983.

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