Works of Art, Produced from Concrete, Installed in Public Spaces from the 1950's to the 1980's in the former Czechoslovakia – Technologies and Surveys

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Abstract

The article discusses techniques applied to artworks created from concrete in the period from 1950 until 1989. The aim of submitted text is to broaden view on the surveyed objects as to their future repairs and restoration. In addition, the paper wishes to draw attention to topical issues of heritage preservation. The introduction highlights technological questions related to terminology. Surveys, characterizing a specific type of use of concrete material, including detected damage indicators, are introduced on examples of the selected concrete objects. The article follows topographic and archive survey of the mentioned artwork fund.

Keywords: works of art, concrete, Czechoslovakia

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Introduction

The issue of care for sculptural compositions made of concrete, created in the second half of the 20th century, is more and more topical. The question is closely related to the increasing interest of art historians in architecture and art installations of this epoch. Art in public spaces is closely tied to architecture by the law, allocating an obligatory share (expressed in percentage) reserved from the building investment for the artistic decoration. In addition to rising professional attention, certain art and civil activities promote art works in public spaces (2). However, heritage preservation keeps ignoring such pieces of art in spite of the fact that - besides average and marginal works – also top-quality works, representing artistic as well as technological level of the artistic creations in the monitored period, are included. Little heritage protection attention, paid to these objects, can be attributed to their low age, and maybe a certain bitterness felt towards the period of their birth and, above all, little reflection of the art history. To effectively protect these works, not only art-historical analysis is necessary but also research on composition and properties of used materials. Restoration of objects, created during this epoch, has been rather unique; most usually only craftsmanship repairs, in many cases deforming artistic expression of the installation. Art conservation schools emphasize restoration of sculptures made of classical materials, concrete materials are paid far less attention. Another reason for extensive protection is the fact that most of the artworks are authentic, never changed since their creation; they wait for their first repair or restoration. In the worse-case scenario, their removal out of the context, for which they have been created, is considered, or even their complete liquidation.

Concrete

Under the term "objects in concrete", as used in the submitted text describing survey on the public space art objects created in the second half of the 20th century, composite materials bonded by cement, including – per construction engineering terminology also cement concretes and cementitious adhesives – are recognized. Concrete is a composite construction material with the feature of artificial stone. In the building material terminology, concrete is seen as a composite substance coming to life by hardening of mixture of its basic components: cement (as the most frequently used binding agent), rock fine and course aggregate, and water. Alongside cement-based binding agents, other substances can also be used to produce concrete, such as asphalt, sulfur, and polymers; however, these materials are not the subject of our survey (3). Due to wide-ranging possibilities of modifications, concretes represent a large group of substances with considerable variety of various properties (4). Most commonly, Portland and mix type cements were used to create artworks in the monitored period (5). In a number of cases, pieces of art were created or coated with cement and/or cement-lime mortar; these materials differ from concrete mainly by the fine aggregate, usually up to 8 mm (6) and higher plasticity, enabling coating application. Terrazzo and so-called artificial stone can be grouped into this category (7). Most usually, a mixture of cement and chip stones with surface dressed in a manner to stress visual presentation of color and shape of the aggregate. Terrazzo technique comes out from the floor installation technology, made up from lime screed floor cover with poured lime chips, with the origin in the ancient Rome floors, with the heyday in the 15th century in Venice (8). This technique slightly changed in the second half

Biological damage - higher vegetation
Fig. 1. Alois Šutera, Hudebník (A Musician),1971, green-engrained concrete filled with basalt aggregate. Photograph Josef Červinka

Biological damage - moss and lichen
Fig. 2. Alois Šutera, Hudebník (A Musician),1971, survey of younger additional segments in UV light. Photograph Josef Červinka

Dark deposits on concrete surface
Fig. 3. Alois Šutera, Hudebník (A Musician),1971, radiograms showing leg reinforcement. Photograph Ondřej Anton

Humus deposit contamination
Fig. 4. Alois Šutera, Hudebník (A Musician),1971, anticipated reinforcement in the sculpture. Red – square cross-section 10 x 10 mm, green – circular cross-section Ø 6 mm, blue – reinforcement with unidentified cross-section with the thickness (cross-section) min. 15 mm. Reinforcement of mandolin and legs by reinforcement Ø 6 mm not shown in the picture. Photograph Ondřej Anton

Graffiti
Fig. 5. Jánuš Kubíček, decorative wall, Halasovo náměstí Brno, 1967, example of the object from raw concrete with imprints of wooden boarding. Photograph Josef Červinka

Overlaying of authentic surface with repair
Fig. 6. Detail of wooden boarding imprint including joints between individual boards. Photograph Josef Červinka

of the 19th century thanks to development in hydraulic binding agent, in particular cements, and was popular in stone-cutting and sculptural production as decoration of facades and building interiors in the first two thirds of the 20th century.

Types of Application of Concrete in the Works of Art Installed in Public Spaces

Concrete, used to create artworks installed in public spaces, can be classified into several groups depending on the type of treatment processing. Each group is characterized by visual properties, reflecting techniques and technologies of their origin. Method of treatment usually determines suffered damages. Proposed division is not a strict system. Some works can not be classified in one group only as their treatment or damage can mingle with another group.

Natural stone imitation, employing so-called artificial stone, ranks among traditional use of concrete. Most commonly, these are concretes filled with chip stones or selected sands to gain visual perspective and/or evoke natural stone, most frequently granites. Composites called terrazzo can be included in this category, based on the antique and especially Renaissance Italian floors, later modified by highly hydraulic binding agents introduced in the 19th century. Statues are concrete-casted or tamped down to the mold; subsequently, their surface is stone-cut by grinding, cutting or by washing-out to visually expose used aggregate. These sculptures may be casted as materially homogenous or with different core and precious surface layer. Very often, these objects are reinforced with steel reinforcing bars.

The sculpture Cimbalista (A Cimbalom Player) by Miroslav Hudeček, situated in Strážnice, and Hudebník (A Musician) by Alois Šutera are examples of this category. The sculpture Hudebník by Alois Šutera was created in 1965 (10), now is located in the Přerov cemetery memorial park, where was most probably fixed in 1971 (11). The work depicts a stylized figure of a seated musician, playing the mandolin. The statue is made as a monolithic casting piece with metal reinforcement with the height 125 cm, width 50 cm, and depth 61 cm. Sculptural mass consists of green-engrained concrete filled with basalt aggregate. Aggregate, size 0–4 mm with high density 2,700 kg/m³ and content of magnetic particles, corresponds with the locality Bílčice (12). The sculpture is reinforced with three types of reinforcing bars. The first bar has a square cross-section with 10 mm sides and is located in the axis head – pedestal, then in hands and legs. A round cross-section reinforcement (6 mm) reinforces mandolin, fingers, and pedestal ledge. Third type of reinforcement (unidentified cross-section) with minimum dimension 15 mm, is in the trunk and pedesta (l3). Sculpture surface is biologically-attacked, mainly by mosses. As to the mechanical damages, destruction of concrete caused by the steel reinforcement corrosion is dominant. Concrete mass is cracked, some parts of modeling fell away; moreover, some parts are loosed and separated from the steel reinforcement. In the past, three types of repairing mortars were used to repair the sculpture. The roughest type is used on the sculpture knee; light, from grey cement not engrained in the mass to the green shadow as in case of the authentic mass, but containing the same basalt aggregate. Other two types of mortar are very fine-grained. The first looks like the binding agent of the authentic mass without basalt chip stones and the second one is without engrained cement binding agent, containing small green chip stones. Both types of fine repairing mortars can be clearly seen in UV light.

Art objects, using concrete as the artistic material, constitute the dominant group of the period under consideration. The origins of this movement can probably be traced to the brutalist architecture of Le Corbusier. These are objects consisting of homogenous concrete mixture, sometimes with steel reinforcement, done by casting to the boarding directly in situ, or created as workshop pieces seated on the place of final adjustment. This group includes objects made from prefabricated modular segments. Decorative walls in Halasovo náměstí and street Blažkova in Brno (neighborhood Lesná) by Jánuš Kubíček or monumental sculpture Rovnováha (Equilibrium) by Josef Klimeš on the Barrandov bridge in Prague from 1989 are examples of the works from raw treated concrete. The sculpture Směrník (A Guidepost) by Václav Uruba, set up in

Darkened gypsum crust
Fig. 7. Miroslav Jirava, Torzo ženy (A Female Torso), Prague Jarov, 1965, example of the object from concrete applied on the steel reinforcement covered with ceramic mesh. Photograph Josef Červinka

Elution of loose particles
Fig. 8. Miroslav Jirava, Torzo ženy (A Female Torso), 1965, detail of exposed ceramic mesh. Photograph Josef Červinka

Surface cracks
Fig. 9. Jan Koblasa, relief wall of the former offices of Československé aerolinie in Ostrava, 1965, concrete casted pieces with paint. Photograph Josef Červinka

Crack above corroding reinforcement
Fig. 10. Decorative wall in front of the primary school Labská in Brno, example of concrete casted pieces, engrained with used aggregate. Photograph Josef Červinka

Massive loss of mass above reinforcement level
Fig. 11. Decorative wall in front of the primary school Labská in Brno, detail of combination of concrete casted pieces, engrained with used aggregate. Photograph Josef Červinka

front of the railway station in Havířov, belongs to similar, in greater depth surveyed works (14). The sculpture was created at the very end of the construction of the railway station building towards the end of 1969, as proved by date signature in the upper part of the central pillar. The work shows 520 cm high abstract guidepost, with horizontal beams giving directions to different sides, attached to the central pillar in various heights. The part of the monolith is a cubic pedestal, which is connected with the object by a tiny neck. It is a monolithic reinforced-concrete object created by casting into the wooden boarding, with visible grid of joints and undressed timber used for boarding. Concrete mixture consists of grey cement with crushed aggregate (granularity 0.5–30 mm) reinforced with welded steel structure from ribbed concrete steel with diameter 20 mm, 10 mm, and smooth steel (diameter 5 mm). Welding as well as joints created by bonding wire are used in the structure. In the few places, steel has been seated too close to the surface. Over time, these shallow-seated reinforcements have been uncovered by the pressure of products of corrosion (15).

Objects, created by application of concrete to the steel structure thickened with various types of mesh, represent a specific phenomenon. They belong into the group of objects, most commonly created in situ. The artworks "Lovec sobů" (A Reindeer Hunter) by Antonín Širůček in front of the pavilion Anthropos in Brno, slide "Slepička" (A Little Hen) in the premises of the kindergarten in the housing estate Invalidovna (after 1964) and climbing frame "Kyčelní kloub mamuta" (A Hip Joint of Mammoth) by Miloš Zet and Jaroslav Vacek also in the housing estate Invalidovna were created employing this method (16). Miroslav Jirava often used the method of backed concrete (17). "Torzo ženy" (A Female Torso) by Miroslav Jirava in Prague district Jarov (from 1965) represents this group. The torso is situated in front of the department store on the sloping grass surface next to the access stairs. An abstracted female torso (height 120 cm, width 105, depth 90 cm) is mounted on the pedestal with the following dimensions: height 30 cm, width 105 cm, depth 105 cm, combining concrete and sandstone. The statue is a hollow object created by application of cement plaster to the steel supporting structure, covered with ceramic wire lath, defining the shape of the object. Reinforcement cement is applied in two layers. Both layers are constituted by round aggregate (fraction 0–8 mm). The lower lighter layer is softer, strongly degraded on the bare points. The main manifestation of degradation is loess of surface and scaling. Plaster layers on the top summits of the statue are degraded to the ceramic wire and supporting reinforcement. The whole profile of the reinforcement is not completely exposed in any point; however, it is obvious that the cross-section is a smooth prism without ribs. On the sides, defects can be traced, manifested as holes into the statue cavity, filled with municipal waste. There are several cracks in the statue and in the rain shadows is dark, most probably gypsum crust. Rarely, a white efflorescence can be seen on the statue surface. Moreover, the surface is polluted by dust deposits and by biological attack to a small extent.

Coloring of concrete pieces is an independent chapter of the survey. Concrete objects were colored applying several methods. Most commonly, natural color of surface was preserved, i.e., usually grey cement with used aggregate, defined either by technological specification or availability of aggregate in the particular locality. In the period of their birth, objects were grey in the tone of used cement; by protruding exposure of the aggregate (by surface weathering), pieces partially adapted to its coloring. Partial or complete application of the paint system was another possibility of the surface color treatment. Concrete object coloring was also achieved by the color throughout of the concrete mixture in the mass; either by pigments resistant to alkali or specially selected color chip stones. Miroslav Jirava used concrete colored in mass to build a climbing frame "Kohout" (A Rooster), installed in the playground in Krnov (1961). Paint, applied on the concrete surface, used (for instance) Alva Hajn to construct a decorative wall in the housing estate Dubina in Pardubice (1973; in cooperation with the architect J. Třeštík. Jan Koblasa applied paint, most probably imitating bronze, to the relief wall of the building of the former offices of the Československé aerolinie (Czechoslovak Airlines) in Ostrava (1965). A relief concrete wall made from concrete casted pieces, using light grey aggregate and red aggregate setting the color tone, can be found in front of the primary school Labská in Brno.

Concrete can also be used for such objects, where the concrete structure forms the bearing core structure for glass or ceramic cladding, visually perceived minimally or not at all. These substrate structures were formed as casted pieced made to boarding or as prefabricated segments. Casted pieces of supporting structures to the boarding were used for the "Geometrický objekt" (A Geometric Object) formed with glass mosaic tiles in the premises of the glassworks Preciosa (1972–1973) by Karel Malich or the object "Labe" (the Elbe) by Karel Kornych (1973) in Ústí nad Labem in front of the department store Labe. Prefabricated concrete substrate to receive the mosaic installation was used in Brno-Líšeň in the street Štefáčkova for a decorative wall with glass mosaic according to the design of Bohumír Matal. The wall was erected at the end of the 1980's in cooperation with the architect Radko Květ. The wall consists of three prefabricated panels covered with glass mosaic. Dimensions of the individual panels: height 230 cm, width 240 cm, thickness 18 cm (with the mosaic), separated by the expansion joint in

Surface peeling

Fig. 12. Bohumír Matal, decorative wall with glass-mosaic cladding, Brno-Líšeň. Photograph Josef Červinka

Massive loss of mass under reinforcement level

Fig. 13. Bohumír Matal, decorative wall with glass-mosaic cladding, Brno-Líšeň. Wall composition. Photograph Josef Červinka

Surface degradation

Fig. 14. Antonín Širůček, Lovec sobů (A Reindeer Hunter), Brno, concrete applied in three layers on the steel structure with wire lath. Last layer engrained with pigment and black aggregate additive.

Technological indiscipline - concreting

Visually inhomogeneous younger addition

Object displacement

Blisters

the distance ca. 1 cm. Near this wall, another wall is situated with identical dimensions, without mosaic, but presented as concrete surface with pebblestone pouring on one side; it can be expected that the same wall was used to install the mosaic. Ribbed steel reinforcement with diameters 20 mm, 14 mm, 6 mm was detected inside the defects and opened segments discovered during the restoration. (Mosaic restoration with the partial transfer was carried-out in 2017–2018). Used concrete is formed by rounded and sharp-cornered aggregate (fraction 0–30 mm), bonded with grey cement. Mosaic cubes from sintered and cast glass (18) are fastened to the fine reinforced cement mortar. On the southern side, the upper edge of the mosaic panel is supported with the wire lath, folded under the cement rounded roof of the decorative wall. The southern side is enriched with mosaic decoration, aforeplaced for approximately 25 mm in front of the face of the panel, visible in the pedestal part not fitted with the mosaic. Dimensions of glass cubes oscillate from 17 to 21 mm. Sintered glass cubes were produced by the national enterprise Skleněná bižuterie in Jablonec nad Nisou. Poured glass cubes were produced in Jablonecké sklárny in Desná. Production ceased completely in the 1990's. Atmospheric deposits strongly contaminated the mosaic wall. Moreover, bed mortar of glass mosaic cubes was loosened; finally, some cubes have fallen off. Mosaic with bed mortar, separated from the concrete panel surface, have been lost in some parts. On the northern side, this phenomenon was so strong that the bed mortar and mosaic cubes were transferred. On the southern side, mosaic has been separated from its substrate for approximately 20%. Part of cubes, strongly fixed to the bed mortar, are either broken or cracked. Concrete panels are slightly dislocated to each other, on the western side for more than 10 mm. The extent of damage to concrete surface of panels is in the depth 0–10 mm (2% of the surface), in the depth 10–30 mm (1% of the surface), and in the depth 30–50 mm (0.5% of the surface). Exposed steel reinforcement (length 2 m) occurs on the panels. Exposed steel reinforcement demonstrates surface corrosion. Non-destructive strength measurement of the panel concrete in the pressure, adopting NDT method, with unguaranteed exactness, showed the values 26–38 MPa, i.e., the average value 33 MPa. Concrete carbonization depth was determined to the average of 4 mm (eight measurements). Covering layer of the concrete above the steel reinforcement is 36 mm in average. Tensile strength of concrete surface layers reaches 2.6 MPa. Adhesion strength of the mosaic to the concrete foundation is 2.3 MPa.

In the second half of the 20th century, a group of art pieces made from asbestos cement was created. This material was specifically used for imprints to molds, further assembled into the final shape. Composition of this material is contained already in its name, and consists of the binding agent of cement and aggregate, comprising of mineral fibers from certain asbestos (19). Firstly, asbestos was dipped into the water; after softening, further mixed with cement and/or acrylate dispersion until dense plastic mixture was generated (20). Material fibers work not only as aggregate, but also as an internal reinforcement of the composite at the same time. This property was advantageous to produce extrudates of the objects, with good strength with rather thin wall. The object "Sloup" (A Column) by Věra Janoušková in the housing estate Novodvorská in Prague (1969) is a good example of the asbestos cement application. This material is most significantly represented in the sculptural artworks of Olbram Zoubek.

Surveys of the Concrete Structures

With regards to popularity of concrete as the building material, we have many constructions both from the second half of the 19th century and, particularly, 20th century, which have been already reconstructed. Taking into account use of concrete for technically advanced constructions, such as bridges, dams and skyscrapers, where frequent monitoring of defects and their subsequent rehabilitation are essential, a complex standardized system of surveys and remediation methods of concrete structures have been formulated9). The part of them is mass-destructive. Such procedure can be accepted for technical structures; only exceptionally for construction monuments waiting for repair carried-out as removal of damaged parts of the object to the healthy core and their substitution with new material with the emphasis on technical standards of the repair at the expense of aesthetical and historical values. These interventions, both surveying to collect large samples or corrective anticipating removal of damaged parts of the concrete structure, are inadmissible for works of art or monuments. For the reasons set up above, it is necessary to combine building engineering methods with methods employed in the related industries, such as restoration of stone sculptural works. The optimum strategy for preservation of concrete structures is continuous monitoring of their technical condition. Visual inspection is the basic surveying method. After thorough evaluation, other specialized instrument and laboratory surveys are proposed. Chemical and physical principles of concrete corrosion, their causes and implications have already been extensively surveyed and published (21). Mostly, in relation to building structures and their rehabilitation, but knowledge can be applied also to the art pieces from concrete (22). In addition, visual manifestations of damage are important for preservation and restoration. On the basis of their recognition and assessment, follow-up surveys can be claimed or restoration intervention concept formulated.

Submitted table tries to introduce basic manifestations of damages to concrete objects.

Conclusion

A wide range of materials and techniques, not applied to date, was used to make outdoor sculptural works of art between 1950–1989. Silicate based composites, called concretes, are one of the most widely used materials. Carried-out surveys highlight various types of concrete used for sculptures installed in public spaces with specific corresponding types of their damage. In consideration of the on-going surveying and art-historical research on these so-far little monitored works of art, heritage protection of the most important objects, collected in the relevant fund, can be expected. As minimum, methods of destructive, but ideally not-destructive, testing should be sought for and verified to ensure efficient protection of these works. Based on the results achieved, an effective protection of the artefacts will be formulated to prevent their further damage, deformation, and losses.

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Dzieła sztuki produkowane z betonu, instalowane w przestrzeniach publicznych od lat 1950-1980 w byłej Czechosłowacji – technologie i badania

W artykule omówiono techniki stosowane do dzieł stworzonych z betonu w okresie od 1950 do 1989 roku. Celem artykułu jest poszerzenie analizy obiektów o ich przyszłe remonty i renowacje. Ponadto, praca pragnie zwrócić uwagę na aktualne problemy ochrony dziedzictwa. Wprowadzenie zwraca uwagę na kwestie technologiczne związane z terminologią. Ankiety, charakteryzujące określony rodzaj wykorzystania materiału betonowego, w tym wykryte wskaźniki uszkodzeń, są wprowadzane na przykładach wybranych obiektów betonowych. Artykuł zawiera analizę topograficzną i archiwalną wspomnianego funduszu graficznego.

Słowa kluczowe: dzieła sztuki, beton, Czechosłowacja