Perceptions and Reuse of Concrete Building Structures

UNIVERSITÀ DEGLI STUDI FIRENZE
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The 8th International Conference on:

Urban Planning & Architectural Design for Sustainable Development (UPADSD)

24 - 26 OCT 2023 | Florence, Italy

Proceedings in ASTI series (Scopus)

POLYTECHNIC UNIVERSITY OF THE PHILIPPINES 1904

Title– **Perceptions and Reuse of Concrete Building Structures**

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Introduction

Concrete has gone through significant changes in popularity over the past few decades. These changes are particularly evident in the United Kingdom.

This presentation explores factors associated with shifts in **perception of concrete buildings** by the British public and how these changes have influenced the use of concrete in Architecture and Design.

1. Architectural Use of Concrete
   - Disguising and covering concrete
   - Rendering and painting concrete
   - Exposing Concrete
2. Negative perceptions of Concrete
3. The rise of Minimalism and Sustainable Chic
   - Design aesthetics
   - Sustainability
4. Conclusion

Architectural use of Concrete

- Concrete is a **versatile** material that has been used in Construction for thousands of years. However, until the twentieth century it was considered to have **no aesthetic qualities** and was used mainly in utilitarian structures, such as water reservoirs and foundations
- **Reinforcing** concrete helped make the material more widely used in the construction of buildings and structures.
- A key person in the development of reinforced concrete was **Francois Hennebique**. His system introduced steel rods within concrete thus giving the material tensile strength. The 'Hennebique' system became very successful all-around Europe at the start of the 20th century.

Figure 1: La Maison Hennebique 1901-1903 (Historic England 2022)

Figure 2: Hennebique building in England; Weaver Company 1898 (Historic England 2022)

Disguising and covering concrete

- Widespread use of concrete increased in the early **20th century**. Initially it was used in houses, factories, and churches.
- The expressive potential of the material was demonstrated but the concrete structures were **disguised and covered** to look like other materials such as stone or brick or covered using other materials.
- August Perret's **rue Franklin** apartment block was clad with terracotta tiles so the concrete structure was not exposed. The tiles were there to cover the concrete surfaces which Perret believed were more susceptible to **damage** and **decay.** *(Figure 3)*

Figure 3 Perret's Rue Franklin reinforced concrete building clad with terracotta tiles (Invisible Paris 2013)

Rendering and painting concrete

- New ideas about architecture started to emerge in Europe after the First World War, arising from a desire for the creation of an architectural movement not based on styles of the past.

- The ‘New’ world required a ‘New’ Architecture. Concrete provided the tool for the creation of an architectural language which tried to demonstrate the superiority of the future to the past. (*Figures 4, 5 and 6*)

- After the Second World War ended further new architectural ideas developed in Europe and the UK due to the need for fast and economical re-construction of war- affected zones (System building).

Figure 4 Le Corbusier's Villa Savoye 1931 (Archdaily 2023)

Figure 5 De la Warr Pavilion designed by Mendelsohn & Chermayeff 1935 (Sussex Modern 2023)

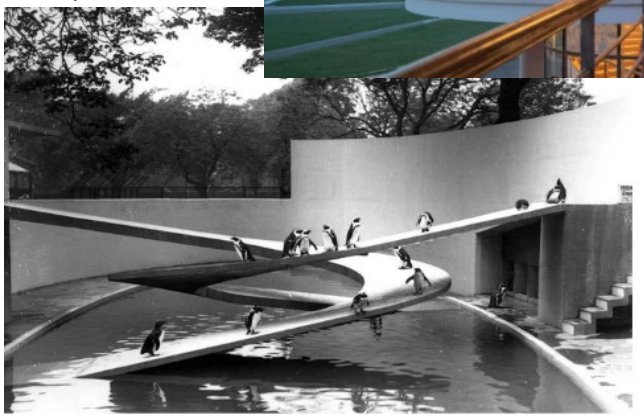


Figure 6 Penguin pool, London by Lubetkin / Tecton 1934

Exposing concrete

- Concrete in the 1950's to 70's began to be used in the plainest state, untreated and unrendered **(Brutalism)**

- The term 'Brutalism' derived from the French term 'Beton Brut' which refers to concrete that is not smoothed down after casting and is left showing the patterns of the formwork and often blemishes and imperfections.

- Examples of Brutalism include the **Unite D'Habitation** in Marseille by Le-Corbusier (1947-1952) and in the UK the **National Theatre on South Bank by** Sir Denys Lasdun (1964-68). Architects Allison and Peter Smithson were creating 'Brutalist' buildings in the 50's and 60's that have now been recognised as important buildings (Harwood 2022) (*Figures 7, 8, 9)*

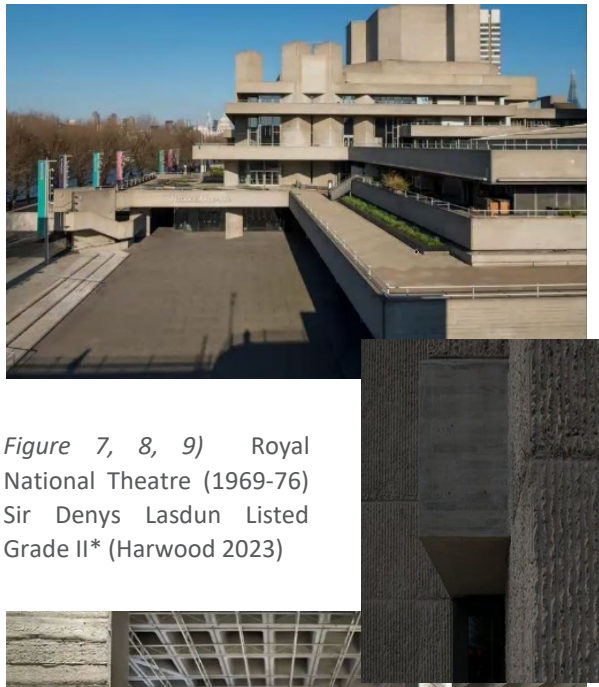


Figure 7, 8, 9) Royal National Theatre (1969-76) Sir Denys Lasdun Listed Grade II* (Harwood 2023)

Negative perception of Concrete Building Structures – ‘Concrete jungle’

Social pressures in Britain for re-housing that took priority after the war associated concrete with council estates and mass housing. Especially in Britain, those living in **high rise buildings** and estates were those who **had no choice**.

Figure 10 A Clockwork Orange. Building, Lecture theatre at Brunel University 1966 by Heywood. Now Grade II listed (Historic England 2023)

The phrase **‘concrete jungle’** was widely used to describe an urban context which included concrete in tower blocks, council estates, deck access or **‘sky roads’** and the absence of any colour.

Figure 11 Park Hill Estate, Sheffield – Roads in the sky (Moustaka 2023)

The strong dislike people had for these environments and the various social problems that seemed to stem from them in a way **condemned concrete**, although in most cases problems were due to the mismanagement and planning of these buildings and complexes.

Figure 12 Barbican centre Chamberlin, Powell and Bon – Grade II listed (Barbican 2023)

Concrete:
Design and Aesthetics – New buildings

- In recent years, there has been a renewed interest in concrete as a building material.
- Contemporary architects such as Tadao Ando, Frank Gehry, Zaha Hadid, Daniel Liebeskind have used the structural potential of concrete to create unique, and highly expressive forms and spaces.
- Concrete is also increasingly used in **interior design** to provide a minimal and industrial aesthetic in the form of polished concrete floors, countertops and walls or exposed ceilings

Figure 13 Vitra Fire Station – Zaha Hadid 1993

Figure 14 Jewish Museum – Berlin, Daniel Liebeskind 2001

Figure 15 House in Oasaka, Espacio 18 2023

Appreciation of the past / Listing, protecting, and improving existing Concrete buildings

There is a growing appreciation for the history and cultural significance of concrete and specifically 'Brutalist' architecture. Although these buildings were previously despised, they are now recognised as part of the UK's **architectural heritage** and efforts are made to preserve them for future generations [Harwood and Davies 2015, Hopkins 2017]. *(Figures 18, 19)*

Buildings and complexes, which were once run-down urban environments, i.e. council estates, are now revamped into more desirable housing complexes and even 'high-end' apartments, often leading to drastic social changes in the area. Good examples of such transformation are Park Hill in Shefield, and Erno Goldfinger's Trellick Tower in Kensington *(Figures 16, 17)*

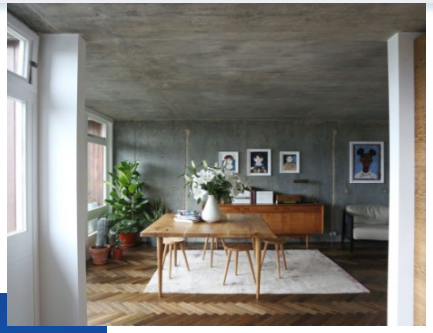
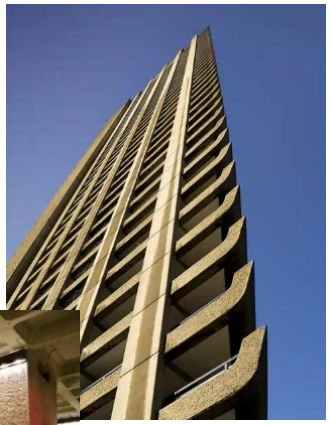


Figure 16, 17 Trellick Tower, Kensington Erno Goldfinger (1968-73) (Harwood 2023)



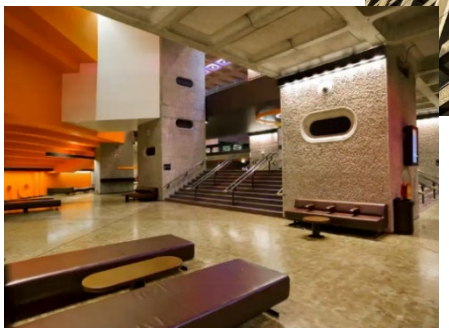


Figure 18,19 Barbican centre I grade 2 listed 2001 (Harwood 2023)

Sustainability of Concrete Building Structures

- Concrete has been generally seen as a material that has significant environmental impact, especially in terms of **carbon emissions** (Shaaban et al., 2020). However, it is now recognised that it can be used in more **sustainable ways**, i.e. made of **recycled materials** or mixed with materials that reduce its **carbon footprint**.

- Changing the function of concrete structures may need **retrofitting** and repair of such buildings. Strengthening using advanced composites or fibre reinforced polymers (FRP) is a promising approach to improve or regain the load-bearing capacity of structures to extend their serviceability (Shaaban and Seoud, 2018).

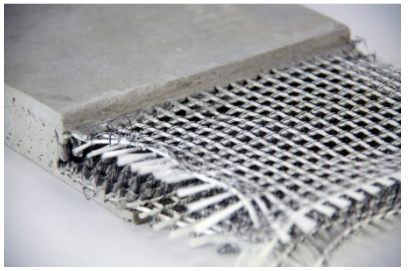


Figure 20 Fabric reinforced polymers

- Sustainable Civil and Structural Engineering research group at **University of West London** (UWL) is currently active in research towards producing **durable** and **sustainable** concrete buildings. Several studies were carried out looking at using waste materials in concrete mixes, replacement of cement with environmentally friendly materials, and producing **self-healing concrete** (Shaaban et al., 2020; Rizzuto et al., 2020)

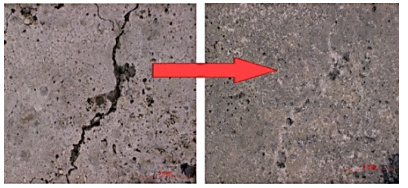


Figure 21 Self Healing Concrete

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Conclusion

The popularity of concrete has fluctuated over the past few decades. This is driven by a combination of **cultural**, **aesthetic**, and **environmental** factors.

- The recent positioning of concrete as a **sustainable**, **energy efficient** building material that can also have an **aesthetic appeal** when used fairfaced, combined with its **versatility** and **durability**, make concrete once again a popular choice for contemporary architecture and Interior design.
- **Re-using** existing concrete structures also presents a sustainable option utilising the existing **embodied energy** of the material.
- Changes in how concrete buildings are perceived can be reflected in the recent growing **appreciation** of existing concrete buildings which are now seen as an important part of the **UK's Architectural Heritage**.

Figure 22 The University College London's new student centre 'Outstanding' BREEAM rating. Ground granulated blast-furnace slag (GGBS) and recycled aggregates within its concrete mix, exposed concrete for thermal mass. Nicholas Hare Architects © Alan Williams Photograph

Figure 23 Post War listed Buildings

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Thank you!

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Thank you to my colleagues and co-authors

Professor Rizzuto and Dr Shabaan who contributed to this presentation and to UWL for all the support.