

The evolution of the precast concrete façade in the police headquarters in The Hague.

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Abstract.

Our knowledge of precast concrete facades is becoming more relevant each day. Buildings with precast concrete façades are relatively new in relation to monument listing, due to architectural and constructive innovations being related to these facades. However, these buildings are also next in line for demolition due to their age and Brutalist architectural expression. These precast concrete façades were commonly used after World War II due to their quick and easy assembly, together with the material being easy to obtain. From the 1960s and onwards, advancements in technology resulted in a combination of aesthetics, structure and function for these façades. This research aims to create a better understanding as to why precast buildings of the post-WWII period are in many cases physical evidence of a construction history that was innovative and revolutionary, by showing the development of building and material technology in case-studies with precast concrete façades. The results reveal that Schokbeton played an important transformational and transitional factor in the history of precast concrete, which led to advancements in technology, such as the creation of the loadbearing precast concrete façade. These results lead to a stronger determination of the values connected to precast concrete façades, which are essential in order to come up with a good redesign strategy. The main case-study for this research is the police headquarters in The Hague, due to the presence of two different types of precast concrete façades: a Schokbeton façade and a later built loadbearing precast concrete façade. Historic research together with case-study research was used to collect information on these different types of façades.

Keywords: precast, concrete, Schokbeton, façade, post-WWII

1. INTRODUCTION

The police headquarters in The Hague host a wide variety of precast concrete elements from different time periods. These elements do not only define the character of the building, but also visualize a part of our recent building history.

Precast elements made of concrete date back to the invention of modern reinforced concrete, which was introduced in the 19th century. These first elements were used as building ornaments, sewage pipes and system floors (Heinemann & Quist, 2017). The beginning of the 20th century introduced a wider exploration of the fields of application precast concrete could be used for, leading to concrete tiles and structural blocks (van de Voorde et al., 2015). However, the type of precast elements discussed in this paper: the precast concrete façade, which consists of repeating façade elements made out of concrete and poured in a mold off-site, was not yet widely introduced as a building material in the first half of the 20th century. This new building technique that entered the architectural scene was considered unworthy and aesthetically inferior to brickwork (Heinemann, 2013), due to the lack of craftsmanship and simple shapes, caused by the limited options of precasting at that time.

During the Interbellum, the acceptance of concrete as a building material increased. The number of companies producing precast concrete steadily increased, implying that expertise on precast concrete was growing, resulting in a better control achieved over the material. The consistency in finish could now compete with other building products. This was enforced by ideologies of the time, because the repetition and the systematic approach achieved by using precast, formed a natural match with the principles of Modernism. One of these modernist architects was W.S. van de Erve (1914 – 1994). He designed the police headquarters in The Hague: the case study on which this research focuses. The first part of the building was constructed in 1959 and required a character that envisioned the role of the police at the time: strong, strict and admonishing. Van de Erve designed a façade, produced by Schokbeton N.V, to fulfil that role, while matching his beliefs of Modernism as seen in Figure 1.

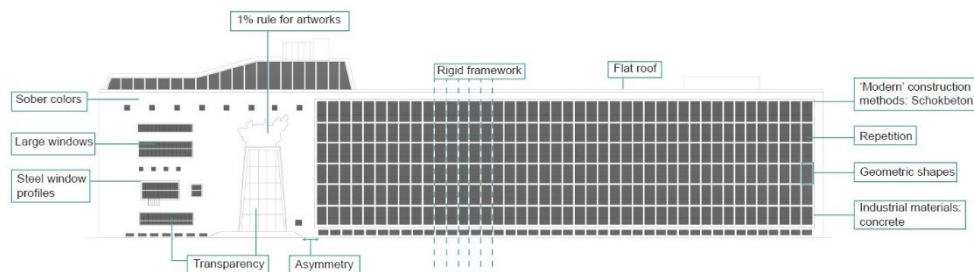


Figure 1. Overview of the characteristics of Modernism in the 1959 part of the police headquarters in The Hague. Authors own image, 2022.

The technological advancements in the precast concrete façade really started to be explored after the 1960s. This period shows the exploitation of design potential in precast concrete, as the boundaries of Modernism were further explored by architects (Pyburn, 2018). As a result, precast concrete architecture set itself free from the brick tradition of the centuries up and until the 19th century, which resulted in a concrete architecture that didn't need to disguise the structure, but instead would integrate its aesthetics with its structure. This is visible in the 1980 extension of the police headquarters in The Hague, which was also designed by the same architect as the first part, W.S. van de Erve. The precast concrete façade of this part is designed with much more plasticity in comparison to the façade of the 1958 wing, while also bearing the load of the façade itself and the floors.

By the end of 2023, the police headquarters will be relocated to the Binckhorst, leaving the large complex of 50.000m² vacant. The 1959-part of the complex is listed as a municipal monument (Monumentenzorg Den Haag, 2018), in contrary to the extension from 1980, which is not under the protection of monument listing. In the case of the 1959-part, mainly the tangible objects such as the artworks inside the building are named to state the art-

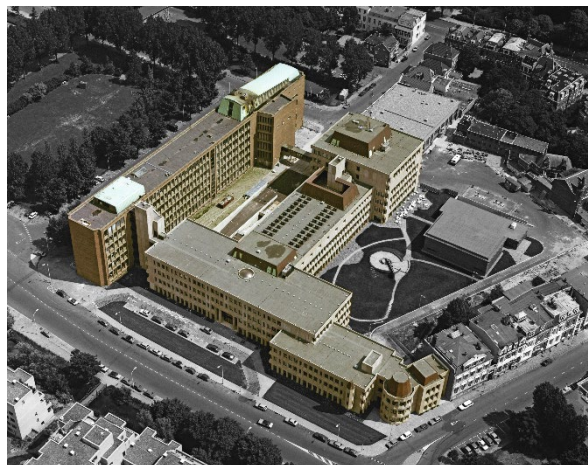


Figure 2. Aerial photo of the police headquarters in The Hague, highlighting the buildings with a precast concrete facade, Haags Gemeentearchief, Delta-Phot, 1980.

historical value of the monument. These statements bring no attention to the presence of the precast concrete elements throughout the building. However, it is necessary for this redesign to research into the historic, architectural and structural aspects of these precast concrete elements, as this is the complex's most notable feature.

This research helps better describe, value and recognize the precast concrete façade in the police headquarters in The Hague and gives answer to the main research question, which is supported by two sub questions:

How does the precast concrete facades present in the police headquarters in The Hague relate to our construction history and the development of building and material technology?

1. *What is the role of Schokbeton in the post-war precast concrete façade?*
2. *What is the contribution of the precast concrete façade to Modernist architecture?*

The heritage values that are provided through this research will support and strengthen the design decisions when redesigning. In case of demolition, this research aims to add to an increased awareness for buildings constructed with precast concrete façades.

2. METHODOLOGY

In order to answer the research question, a combination of research methods is used. A method to combine two research strategies in distinct phases is the Two-Phase Design strategy (Groat & Wang, 2016). It can provide appropriate checks against the weak points in each, while enabling the benefits to complement each other. The first method used is a historic research on Schokbeton, ranging from 1945 until the 1960s, to answer the first sub question. This research will be relevant for the façade of the 1959 part in the police headquarters in The Hague. Information is gathered from the book *Historic Concrete* by Heinemann (2013) and is further supported by the DOCOMOMO dossiers *Import-Export: Postwar Modernism in an Expanding World* (2008), *Concrete and Modernism: Technology and Conservation* (2018) and the paper 'From imitation to acceptance to worldwide production of Schokbeton' by Quist (2021). Besides, archival drawings and photos gathered from the municipality of The Hague and Het Nieuwe Instituut (HNI) provide insight on the materiality and construction methods of the Schokbeton façade.

Research on the 1980 extension of the police headquarters in The Hague is conducted through case studies that range from 1960 until 1980. This time frame is chosen as the 1960s mark the start of a wide design exploration of precast concrete, and 1980 is the year that the extension in the police headquarters in The Hague was finished. The case studies have

a loadbearing façade in common. Although the façade of the 1980 extension was not manufactured by Schokbeton, the case studies were also selected on the presence of a Schokbeton façade. The selection of case-studies was picked to show the transition in the types of façades that Schokbeton produced, while showing the transformation that was happening in precast concrete. The technological advancements of the Dutch company can really be seen in the Philadelphia police headquarters and the US embassy in Dublin. This case study research aims to answer the second sub question, while providing more knowledge on the type of façade used in the police headquarters in The Hague through analysis of similar façades.

3. RESULTS

3.1. Historic research

3.1.1. Precast concrete façades entering the architectural scene

One of the companies that played a key factor in the way we built after the war, is Schokbeton. The outbreak of the worldwide economic crisis of 1930 came with economic challenges where building materials like cement, the most expensive fraction of concrete, became scarce. This stimulated the quest for new and cheaper building materials. In order to reduce the amount of cement, a lower water to cement ratio was sought after. This became Schokbeton's unique feature: a shock table that was motorized to raise and lower a mold filled with a concrete mixture of 60mm for two hundred fifty times a minute (Pyburn, 2018). The water to cement factor achieved here was lowered to 0.3 (Scharroo, 1946), resulting in a lower porosity and as a result reducing the infiltration of CO₂. This technological advancement was 1.7 times stronger in comparison to non-shocked concrete and yielded much more durable, stiff, slender and thus cheaper façade elements. Because these elements were precast, meaning they were created in an enclosed plant instead of at the job site, better control and quality was achieved as the environmental conditions played no role anymore.

The end of World War II meant the breakthrough for precast concrete. The war left many buildings in ruins, and the demand for a fast reconstruction was very high. Precast was chosen for its quick and easy assembly, together with the abundance of river rock over the scarcity of brick and wood (Pyburn, 2008). However, precast concrete could only become economically competitive when the building elements were repeated enough. Besides, architectural precast concrete required a batch design and mixing, a mold design with its own fabrication, placement of reinforcing steel, casting, curing, finishing, and transportation from the factory to the job site and finally erection (Pyburn, 2008).



Figure 3. Mounting of the Schokbeton façade panels, The Hague municipal archives, 1958.



Figure 4. Connection of the Schokbeton façade to the concrete skeleton, The Hague municipal archives, 1958.

This process required many complex and challenging steps, with high risks involved. Because this expertise was not yet fully available, especially in the first few years following the war, Schokbeton used their knowledge and expertise on precast concrete to create honeycomb structures and window frames for houses. These frame-based façade elements were a typical product of Schokbeton and were being used commonly in the post-WWII period up until the early 1960's.

3.1.2. *Schokbeton in the police headquarters in The Hague*

The police headquarters in The Hague show the exploration and transition that was happening in frame-based façade elements manufactured by Schokbeton N.V (figure 5). The 1959 part consists of non-loadbearing Schokbeton elements that were mounted on the concrete skeleton in a checkboard pattern (figure 3 & 4). Steel reinforcement bars were used to connect the façade elements on the supporting beams as seen in

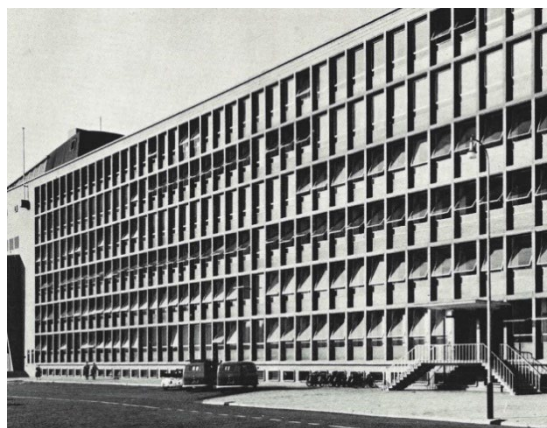


Figure 5. Flyer of Schokbeton N.V showing the facade, Schokbeton archives, 1958.

figure 6. Afterwards, concrete was poured in to fix the elements in place. The U-shape of the Schokbeton element was used to reduce material and weight. Although the Schokbeton elements were non-loadbearing, they did reflect the structure. They followed the structural grid perfectly, showing the repetition in Van de Erve's designs.

The finish chosen in these elements was washed concrete, like most architects of that time opted for. The colour of the cement mixture is of a beige, grey tone and the aggregate consists of a colourful mixture of pebbles. This finish was achieved by filling the moulds with a layer of sand before concrete was poured in and then brushing it after it was removed from the mould. When doing so, the aggregates used in the concrete would become exposed, providing resistance against water infiltration, pollution, and mechanical damage (van de Voorde et al., 2015).

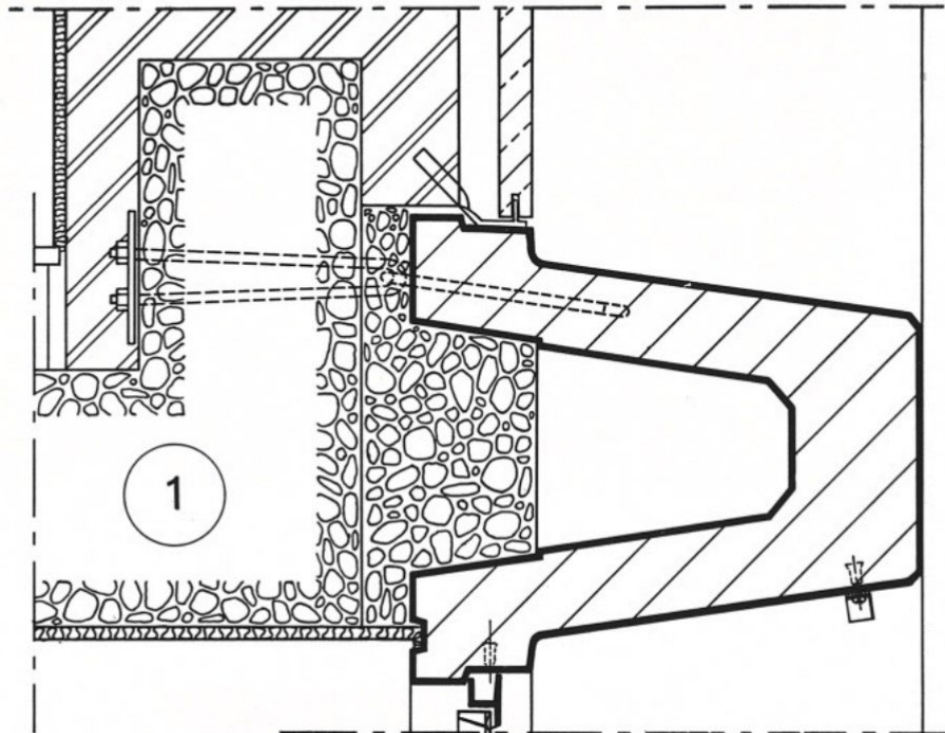


Figure 6. Vertical detail of the connection between the Schokbeton façade to the concrete skeleton, Schokbeton archives, 1958.

3.2. Case study research

From the 1960s and onwards, combining the aesthetic, structural, functional and financial advantages of concrete became very popular. This was due to advancements in technology, such as the introduction of glass-

fibre moulds, which allowed more diversity in the designs of the precast façade elements. This meant that curved forms were now possible to make, while the surfaces of these elements could still be textured. This was also a time period where the façade became integrated in the structure, which was revolutionary, as Modernist architecture tended to free the skin from the structure ever since the introduction of glass and steel at the beginning of the 19th century. The integration happening in the façade is evidenced in three relevant case studies: the Philadelphia police headquarters in the USA, the U.S. Embassy in Dublin and the police headquarters in The Hague. These buildings were all constructed after 1960, and were all offices. This is no coincidence, as office buildings sought for a strict and stately character, which could be achieved with architectural precast concrete.

3.2.1. Philadelphia police headquarters



Figure 7. Robert Geddes, Philadelphia police headquarters, Hidden City Philadelphia, Peter Woodall, 1962.

3.2.1.1. Building shape

The Philadelphia police headquarters was constructed in 1962. The character achieved with precast concrete in this project is remarkable, as it is an Expressionist rather than a Brutalist building. The shape of the building resembled handcuffs as a reference to the police and the architects were adamant that the building should not look like a “grim, forbidding fortress, scaring the wits out of the citizen, but rather act as a welcoming addition to the urban landscape of Philadelphia (Circling in the Square, 1963). The circular geometry of the building was used as an opportunity for innovative technology, as the curves that were made out a

precast concrete panel system could only be produced by specialised manufacturers such as Schokbeton N.V. at the time. The rounded shape also reduced the amounts of moulds that had to be to two, making the building more financially feasible.

3.2.1.2. Structure overview

Figure 8 gives a structural overview of a repeating part of the building, where the connection between the rounded core to the façade is shown. This structural core, consisting of cast-in-place cylinders containing elevators and stairs, stretches to the façade through post-tensioned pie-shaped floor panels. The most outboard part of the floor edged over the beamline to support three storeys of loadbearing precast concrete panels that carried three floors. These panels did not only provide enclosure, but also accommodated installations such as electricity, piping, heating and windows (Pyburn, 2018).

Schokbeton's expertise provided the opportunity for the architects in the Philadelphia police headquarters to create a consistency in shape, color and finish which allowed them to compete with other building systems to achieve the desired architectural expression. The extensive design process, without help of computer technology, has resulted in a state of the art building.

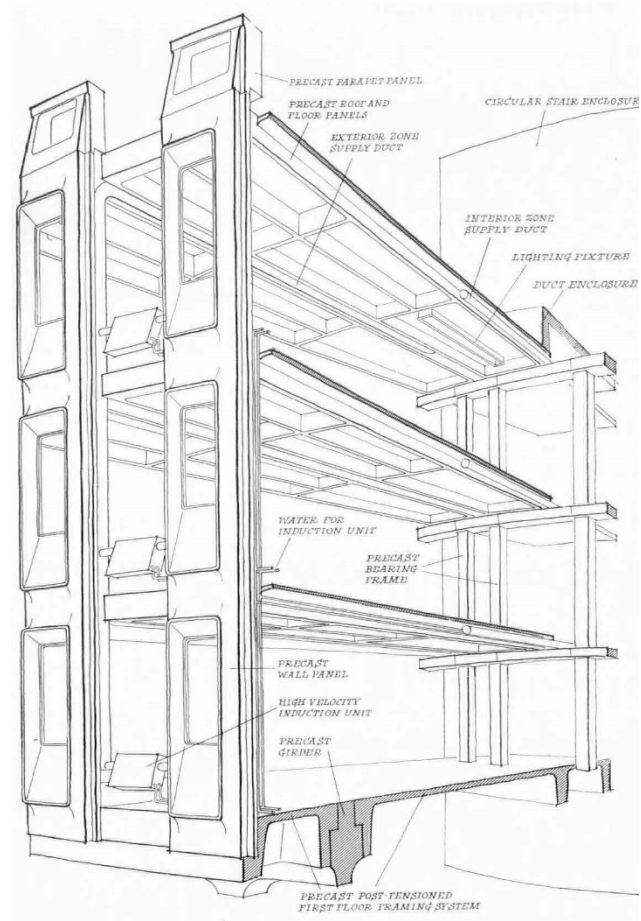


Figure 8. Drawing showing the assembly of the precast concrete panels, Philadelphia police headquarters, USA, Circling in the Square, Architectural Forum 118, 1963.

3.2.2. US Embassy Dublin

3.2.2.1. Building shape

The US Embassy in Dublin was constructed in 1964. Similar to the Philadelphia police headquarters, this project required exhaustive research and study. According to the architect John Johansen, “its five-storey cylindrical shape, on a 33.5m diameter, presents a façade that turns its back on no one.”

American embassy designs were to be “friendly” and “inviting” buildings that also reflected the “foreignness” of faraway places (JohnM.Johansen, 2001). However, due to the Cold War, the world became more threatening and designs shifted towards an increased security. This became visible in this building, as a cylindrical shape is oriented towards the inside, causing an introvert character on the building. In order to recreate a relation to the exterior, the façade had to soften the border between inside and outside. Precast elements serving as structural columns, spandrel panels and balcony railings provided for this.

3.2.2.1. Structure overview

The structure consists of two circular, arcaded facades of reconstructed limestone that support a precast concrete floor. This eliminates the need for columns, making the floor space optimal for office use. The vertical supports in the facade twist at angles of 90 degrees, creating an opening for doors with a balcony behind. Gutters were integrated as well. The precast concrete facade elements were made in a very revolutionary way, because instead of using the usual molds constructed from wood, a fiber-glass coating was added and the wooden mold was later removed, leaving only a fiber-glass mold. This way, the double-curved facade elements could be created. As seen in figure 9, the integration of structure and aesthetics was seamless. For this building to be

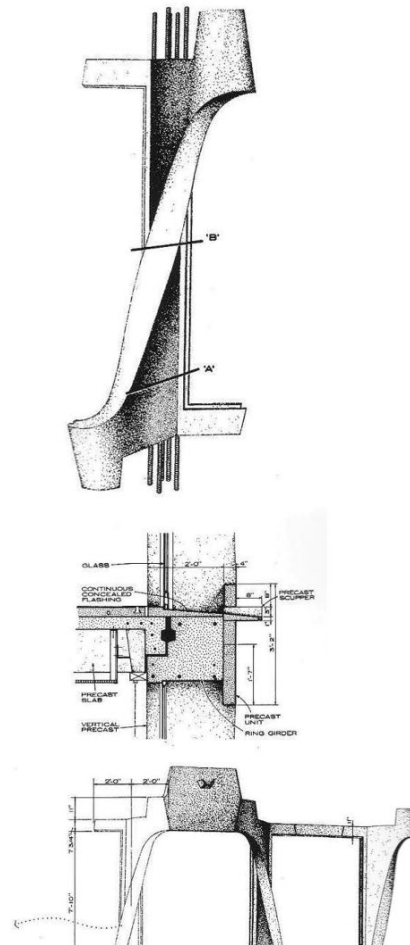


Figure 9. Detail drawings the precast concrete façade elements in the US Embassy in Dublin, Ireland, Modernism on the prairie, DOCOMOMO national symposium, Minnesota, 1963.

only the second precast concrete structural facade ever constructed, this was a huge technological leap already.

3.2.3. Police headquarters The Hague – 1980 extension

3.2.3.1. Building shape

The image that Van de Erve had of the police was a deciding factor in the outcome of the design. The slang name of this building for citizens of The Hague became “The Sandcastle” and proves that the envisioned image of Van de Erve came through: a castle to keep intruders out. This fit the image of the police at that time.

Although the manufacturer of this façade was not Schokbeton, the façade is very similar to the one used in the Philadelphia police headquarters. It is remarkable that the design expression of a similar shape is strict and stately while the Philadelphia building is, or at least tries to be a welcoming building. To emphasize on the castle-like image, two circular elements that remind of a castle tower were added.

The precast elements were finished with washed aggregate in a beige tone as seen in figure 10, giving a warmer feeling to the façade compared to the 1959-part.

3.2.3.2. Structure overview

The precast concrete façade supports hollow-core slabs and double-T floors, spanning ten meters from inverted T-beams. The façade is loadbearing in the vertical direction as it carries the weight of other precast elements, but also distributes the lateral loads in the building through the floor slabs to the structural cores. Because Van de Erve aimed to achieve uniformity in his design, precast elements are placed on every part of the building, meaning that the precast elements parallel to the span direction of the floors are non-loadbearing. The choice to make the whole building precast shows a rich palette of precast elements, as the corners, ground floor panels, towers and the different window sizes all required their own mould.



Figure 10. Façade of the 1980 extension of the police headquarters in The Hague, Authors own image, 2022

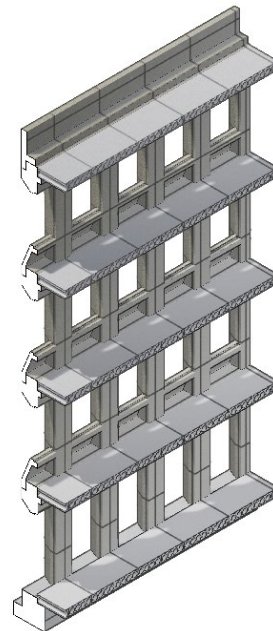


Figure 11. Structural overview of the facade, Authors own image, 2022

4. CONCLUSION

4.1 Discussion

Design decisions in case of a redesign for the 1959 part of the police headquarters in The Hague, as well as the extension from 1980 can be better motivated when the attributes of the building are analysed. This research has analysed precast concrete façades and has linked values to these attributes present in the police headquarters in The Hague.

In the case of the 1959 part, the Schokbeton façade can be seen as a symbol for transition and transformation in the development of the precast concrete façade. This results in a scientific-conceptual value which is important to acknowledge in the redesign. Neglecting the façade, by obscuring or demolishing it, means hiding or destroying a part of our history that explains how we build and how we live.

In the case of the 1980 extension, the post-1960 tendency to integrate the structure in the façade is evidence of the technological advancements happening in precast concrete. This results in a scientific-technological value for the loadbearing parts of the façade, that is important to acknowledge as it shows the development in construction history and material technology.

4.2 Conclusion

Precast concrete facades shed light on the potential of the plasticity and aesthetics of concrete, and by doing so paved the way for concrete to become an accepted architectural material and even a defining material of Modernist architecture in the post-war period. Precast concrete contributed to new advancements in the architectural expression of buildings.

Schokbeton had an important role in early post-war facades. Their innovations represented a viable transition from craft to technology in construction, as the economic challenging time made precast concrete favorable over the scarcity of brick. The frame-based elements of Schokbeton in the early post-war period provided a way for precast concrete to become an accepted architectural material.

The advancements in concrete technology by Schokbeton show the transformational role the company played. These advancements enabled the façade to become a structural element next to its aesthetic purpose. The sophistication and integration of architecture with construction was new for the time, as it was different from Modernist beliefs that tended to free the skin from the structure.

5. BIBLIOGRAPHY

"Circling in the Square." Architectural Forum 118, 1963, 120-125, retrieved from <https://usmodernist.org/AF/AF-1963-02.pdf>

Groat L., & Wang, D., "Case studies and combined strategies", *Architectural Research Methods*, Hoboken, Wiley, 2013, 445-448.

Heinemann, H. A., & Quist, W., "Het Schokbetonarchief – voorbeeld van het afstoffen van prefab beton erfgoed", *TNO - NVMz study day historic concrete*, Delft, 2017, Retrieved from <https://www.researchgate.net/project/Pre-cast-concrete>

Heinemann, H.A., *Historic concrete: From concrete repair to concrete conservation*, TU Delft, Delft, 2013, retrieved from <https://repository.tudelft.nl/islandora/object/uuid%3A987fafd0-cd76-4230-be0e-be8843cae08e>

JohnMJohansen, "US Embassy in Dublin", accessed on April 22, 2022, <https://johnmjohansen.com/US-Embassy-Dublin.html>

Macdonald, S., *The preservation of Post-War Heritage*. Shaftesbury, Donhead. 2001.

Monumentenzorg Den Haag, Alexanderveld 125/126, 2018, retrieved from <https://www.monumentenzorgdenhaag.nl/monumenten/alexanderveld-125126>

Pyburn, J., "Schokbeton in the USA", *Concrete and Modernism: Technology and Conservation*, Minnesota, DOCOMOMO, 2018, 16-23, Retrieved from <https://docomomo-us.org/news/concrete-and-modernism-technology-and-conservation-dossier>

Pyburn, J., "The Role of Architectural Precast Concrete Technology in the Internationalization of Postwar Modernism", *Import-Export: Postwar Modernism in an Expanding World*, DOCOMOMO, New York, 2008, 113-120, Retrieved from <https://docomomo-us.org/resource/files%2F5lvjp7okfskf04a.pdf>

Quist, W. J., From imitation to acceptance to worldwide production of Schokbeton, In A. Tostoes, & Y. Yamana (Eds.), *16th International Docomomo Conference Tokyo Japan 2020+1 Proceedings - Inheritable Resilience: Sharing Values of Global Modernities* (pp. 540-545), (Inheritable Resilience: Sharing Values of Global Modernities - 16th International Docomomo Conference Tokyo Japan 2020+1 Proceedings; Vol. 2), 2021, DOCOMOMO.

Scharroo, P. W., *Cement en Beton - Oud en Nieuw*, L.J. Veen's Uitgevers-maatschappij N.V. 1946, Amsterdam, 1946.

Van de Voorde, S., Verswijver, K., & Dardenne, O., "Post-war building materials", Brussels, University of Brussels, 2015, Retrieved from <http://matériauxdeconstructiondapresguerre.be/wp-content/uploads/2015/12/post-war-building-materials.pdf>

Van Zuijlen, L., "Schokbeton is superbeton", DOCOMOMO, 2003, 16-19, retrieved from <https://www.docomomo.nl/nieuwsbrieven--67.html>