Two Brutalist University Buildings

A comparison between The Aula of The TU Delft and The Roger Stevens Building of Leeds University

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Chapter 1 - Introduction

"Brutalism has had a remarkably long life. It has not only managed to propagate worldwide for seventy years when it first appeared, but also, despite a fall from favour following the initial honeymoon period, when the term took a dystopian turn during the 1980s and 1990s, it has now become more robust than ever (…) *Brutalism's longevity has been matched by its nebulousness, in other words by the capacity of its meaning to mutate in response to different, even contradictory agendas"* (Lefaivre, 2017, p.77).

Brutalism is described as a fluid term with different interpretations and ideas, making it an interesting research topic. Research about Brutalism includes literature specifically about Brutalist universities (Harwood, 2017; Whyte, 2008). Both researchers conducted research on British Brutalist university buildings.

There have also been several Brutalist universities built in The Netherlands, these include designs by Maaskant and Van den Broek en Bakema (Haas, 2022). However, in comparison to the British Brutalist universities, there does not seem to be extensive research done on Dutch Brutalist university buildings. So, with Brutalism being more robust than ever and the presence of university buildings in The Netherlands, this seems to be a relevant research topic. Because there is literature available on British Brutalist university buildings, this thesis will use this literature to compare Dutch and British Brutalist university buildings. For the scope of this paper one Dutch and one British building are compared.

The Dutch building, finished in 1966, is The Aula of The TU Delft designed by Van den Broek en Bakema. This building has been chosen because it is seen as the Brutalist Masterpiece of Van den Broek en Bakema (Lefaivre, 2017 p.84). Haan (2022), who describes all brutalist buildings in The Netherlands, calls it the most Brutalistic building in The Netherlands. Moreover, it is a Rijksmonument (De Gram, 2018).

The British building that is analysed, is the extension of Leeds University, named The Roger Stevens Building. Designed by Chamberlin, Powell and Bon, famous for the design of the Barbican (Frearson, 2014). Whyte (2008) has completed a case study about the Leeds university extension, making it relevant for comparison. So, the research question of this thesis will be:

What are the similarities and differences between The Aula of The TU Delft and The Roger Stevens Building of Leeds university?

Firstly, some general information about Brutalism and Brutalist university buildings will be given. Then the architects of the two specific buildings will be analysed. Then, the two buildings will be compared which will lead to a conclusion on similarities and differences of the buildings.

This order will result in the following chapters: chapter 2: Brutalism as A Movement; chapter 3: The Architects; chapter 4: Comparing the Roger Stevens Building with The Aula from The TU Delft and lastly chapter 5: Conclusion and discussion. The intention of this thesis is that by comparing the two individual buildings there can be reflected on Brutalism in The Netherlands in comparison to Brutalism in Great Britain.

1.2 Methodology

This research is done in the form of a literature review. This includes secondary literature resources about the movement Brutalism, both architecture firms and the two university buildings. Next to the literature review, primary resources, such as floorplans and sections, are analysed. The secondary resources are combined with the primary resources to create a clearer view of both university buildings. Moreover, an image analysis is included to back the statements and conclusions.

To create a complete overview a table with comparisons of both buildings is included. This table gives an overview of the comparison and enables the reader to see what the key points are of this comparison. The different categories of this table can overlap. The reasoning behind this is that different aspects of the building are integrated and cannot be solely seen as separate aspects.

Chapter 2 - Brutalism as A Movement

In this chapter a description of the history and characteristics of Brutalism is given. This puts the comparison at hand in a broader context of the Brutalist movement. The aim of this paper is not to give a conclusive definition of Brutalism as a whole. This chapter only contextualises the research question.

Firstly, Brutalism as a movement is explained. Secondly, one looks at British and Dutch Brutalism. Thirdly, one looks specifically at university buildings within the Brutalist movement.

2.2 Brutalism

As Martin Filler (2016) has noted in a recent review of seven books on the topic, Brutalism today has become so open to interpretation, that it can accommodate everything and its opposite. The lowest common denominator is that its buildings must be made of exposed concrete (Lefaivre, 2017, p.77). This makes it difficult to define Brutalism as such. However, Lefaivre and Martin Fuller ground their statements in architectural history by basing them on Le Corbusier, The Smithsons and Reyner Banham.

Brutalism has always been a contested concept. While Le Corbusier came up with the term *Béton Brut* as an architectural concept in 1952, visible in figure 1 (Brusse, 2017, p. 33). The Smithsons claimed the term *New Brutalism* in 1953 based on the term Béton Brut, Banham tried to take the term out of its architectural context in 1955 (Lefaivre, 2017, p. 77). .

Figure 1: Béton Brut in the design of Unite d'Habitation by Le Corbusier (Glasgowfoodie, 2008).

Despite this debate their several known Brutalist characteristics (Haan, 2021). The first one relates to *Béton Brut*. This means leaving materials like concrete unfished to showcase the rough material. Moreover, Brutalist buildings tend to have an unfinished construction. It is a kind of honesty in showing the raw materials and construction The second characteristic is heavy, large, and imposing shapes, materials and structures. Unusual shapes are used such as geometrical shapes or sculptural shapes or a combination of the two. The third characteristic is a focus on textures, patterns and repetition. There are little to no decorative elements. Relatively small windows is a fourth possible characteristic. A fifth characteristic is leaving functions like airshafts and pipes in sight. A sixth characteristic is found in the use of material. Materials that are used often include concrete, steel, wood, glass, rough stones, and brick (Haan, 2021). The characteristics named until now are all visual aspects.

However, Brutalism also had a set of social ideals. These can be social, political or cultural (Haan, 2021). For this paper the choice was made to leave these out of the research. So, the researcher can focus on the comparison at hand. The list of Brutalist characteristics is not a complete or conclusive list, but it can help to define and compare Brutalist buildings. These characteristics are elaborated upon in chapter 3.

2.3 British Brutalism

The British architecture before World War II was dominated by architects with strong traditionalist ideas (Calder, 2017, p. 27). However, after World War II there was an enormous need for housing and public buildings. Architects such as The Smithsons tried to create a new kind of archicture adjusting to these needs. An example is the school building in Norfolk designed by the Smithsons. This design took inspiration from the modernists in the 1920s. They coined this way of designing *New Brutalism*.

In 1955 the journalist Reyner Banham published an essay in which he tried to define the theoretical foundations of Brutalism. The Smithsons as well as Banham are seen as key figures in the British Brutalist movement (Calder, 2017, p. 31).

With post-war innovations such as building techniques and new materials architects were able create expressive designs which used materials like concrete. These architects referred to Le Corbusier and his term *Béton Brut* (Brusse, 2017, p 33). Moreover, the scale of the design increased. It became possible to build big complexes of concrete and steel in a fast way (Calder, 2017, p. 28).

At the same time new socially engaged ideas arose surrounding these buildings. For example, Brutalist complexes included theaters and all-other kinds of social services. This resulted in big Brutalist complexes in the city of London with all kinds of facilities, with The Barbican as its prime example (Calder, 2017, p. 28).

Modern ways of building declined in popularity because of the disaster of Ronan Point in 1968 as seen in figure 2. This was the partial collapse of a concrete tower, because of a construction fault. This made the public anxious for some of concrete towers (Cook, 2018). Another cause seemed to be *The Tower of Terror.* This was a brutalist tower which had a lot of criminality that appeared to some people to be related to the design of the tower (The Modern House, 2020). Lastly Prince Charles said in 1987 that architects did more damage to London then the Luftwaffe. He mostly meant the concrete Brutalist buildings which had been built all over London (Eliason, 1987).

These problems ended the popularity of the Brutalist movement in Britain. The public started seeing Brutalism as dystopian instead of the utopian way it was first presented.

Figure 2: The partial collapse of Ronan Point (Daily Telegrapgh, n.d.)

The movement saw a revival in the last years. The public started like the remaining Brutalist buildings. For example, *The Tower of Terror* became a monument and was completely restored (The Modern House, 2020).

2.4 Dutch Brutalism

The Brutalist movement was a lot smaller in The Netherlands compared to Britain. Reasons for this could be that Dutch architects who designed brutalist buildings would not call themselves Brutalists. For example, Van Broek en Bakema identified themselves with the idea of *architecture-urbanism* rather than Brutalism. Other well-known Brutalist architects such as Hertzberger and Aldo van Eyck emphasized other aspects of their designs as well (Lefaivre, 2017, p. 80).

Aldo van Eyck, Jaap Bakema and later Hertzberger were part of Team X. This was a modern architectural organization that was the successor of CIAM (Lefaivre, 2017, p. 83). Allison – and Peter Smithson were also part of this group. Being part of the same group the Smithsons probably had a Brutalist influence on the Dutch architects (Lefaivre, 2017, p. 83; De Wit, 2000, p.80)

Brutalism ended when these architects stopped with their architectural careers (Lefaivre, 2017, p. 83). It did not have an abrupt ending like the British Brutalism. Nowadays some Brutalist buildings are recognized as rijksmonumenten while others are being taken down (Monumenten.nl, 2021; Omroep Flevoland, 2021).

2.5 Brutalist University Buildings

Universities grew rapidly after World War II. More people studied and they spent more time at university. This resulted in a need for more and bigger university buildings. Universities got large amounts of government funding for this. The available funding did not only allow for bigger buildings. It allowed for architectural experimentation as well. The social character of this government involvement coincided with the social character of Brutalism. This resulted in all sorts of Brutalist designs for university as well as Brutalist expansions (Harwood, 2017, p.47).

In The Netherlands there was a similar process. Even though the Brutalist movement was relatively small Brutalist university buildings were built all over The Netherlands. Examples are The Aula of The TU Delft by Van Broek en Bakema, the main building of the VU in Amsterdam designed by architectengroep 69 and The Bunker in Eindhoven designed by Hugh Maaskant (Haan, 2022).

Chapter 3 - The Architects

In this chapter both the architecture firms of The Aula and The Roger Stevens Building will be described. This is done to give extra context to the comparison in chapter 3. The architects are described in general as well as their experience designing university buildings is described. This is, firstly done for the architects of The Roger Stevens Building, Chamberlin, Powell, and Bon. Then, it is done for the architects Van den Broek en Bakema, who designed The Aula.

3.2 Chamberlin, Powell and Bon

Although famous for several Brutalist buildings, including The Barbican, little of Chamberlin, Powell and Bon archive survived (Harwood, 2011). This had an influence on finding information about them and their designs. Chamberlin, Powell and Bon joined forces in 1952 when Powell won the competition to design The Golden Lane Estate in London. They agreed to start an architecture firm together if one of the three won this competition. The Golden Lane Estate is a social housing complex (Branscome, 2017, p. 419). The design is light and uses bright colours. Designed later The Barbican, which adjoins The Golden Lane Estate, is monumental as seen in figure 3.

Figure 3: View on a part of the Barbican Estate (Architectural Review, n.d.).

In the period between the designing of these two buildings, the architecture firm designed a range of building using all different kinds of technology revolving around concrete. These buildings mainly included schools and housing (Harwood, 2011). The Barbican and The Leeds University are seen as their most mature projects. Queen Elizabeth described The Barbican as one of the modern world wonders (Frearson, 2014). The Barbican and Leeds University are

large scale brutalist projects and are significant for British architectural history. Earlier projects are on a smaller scale and more experimental (Historic England, 2010).

Leeds University, including The Roger Stevens Building, is a large brutalist masterplan for The University of Leeds (Historic England, 2010). This building will be discussed more extensively in the comparison in chapter 3.

Before designing Leeds University Chamberlin, Powell and Bon designed The New Hall, now named Murray Edwards College, as seen in figure 4. This was a womens college in Cambridge which opened in 1954 (Murray Edwards College, 2018). The construction of the new Brutalist design started in 1962. Since 1993, parts of the buildings are recognized as monuments (Murray Edwards College, 2018).

Figure 4: Murray Edwards College designed by Chamberlin, Powell and Bon (Historic England, 2018).

3.3 Van den Broek en Bakema

The architecture firm Van den Broek en Bakema was started in 1910 by Michiel Brinkman (Broekbakema, 2021). Van den Broek joined in 1937 and Bakema in 1948. In 1951 the firm was called Van den Broek en Bakema (Hooykaas, 2000, p. 20). Van den broek en Bakema was nationally and internationally known as one of the most important architecture firms of The Netherlands in the 1950s and 1960s. The architecture firm produced projects on different scales as well as having new ideas on architecture, urbanism and the society (Ibelings, 2000, p. 15).

Between 1963 and 1975 the architecture firm Van den Broek en Bakema worked on ideas

formulated with CIAM and Team X (Bakema, 1976, p. 6). Bakema was a member of CIAM and co-founder of Team X, which was the successor of CIAM. Both organizations were discussing modern architecture (Ibelings, 2000, p. 18). Some important ideas that were discussed within the firm Van den Broek en Bakema, CIAM and Team X were: the repeatable housing unit and different types of housing, architectural-urbanism – the idea of unity of townplanning and architecture (Bakema, 1976, p. 6).

In the 1970s and 1980s the vitality of the work declined. The architecture firm could not reach the quality of work of what they produced in the 1950s and 1960s. Reason for this was the huge increase in projects and the deaths of Van den Broek in 1978 and Bakema in 1981 (Iblings, 2000, p. 18).

When analysing the 1950s and 1960s designs of Van den Broek en Bakema from and international point of view, they can be seen as Brutalist designs (Ibelings, 2000, p. 18). The international Brutalist influence of Van den Broek en Bakema is not very big, but they had a big impact on other Dutch architects. Stylistic design methods like the use of expressive concrete, combinations of concrete with brick, bunker-like buildings with small, long windows, heavy masses on light under-constructions and expressive staircases, can be traced back to the Brutalist designs of Van den Broek en Bakema (Ibelings, 2000, p. 18).

Van den Broek en Bakema was the first architecture firm in The Netherlands to design monumental Brutalist-like buildings. Examples, that use the idea of B*éton Brut*, are: the town hall of Terneuzen, the architecture faculty of The TU Delft - destroyed by fire in 2008 - and their Brutalist masterpiece The Aula of The TU Delft (Lefaivre, 2017, p.84). These are all independent buildings instead of large complexes. It is interesting to note that Van den Broek en Bakema also have designed a lot of buildings which cannot be defined as Brutalist.

Figure 5: The architecture faculty of The TU Delft (Broekbakema, n.d.-b)

Van den Broek en Bakema designed several university buildings including The Aula of The TU Delft, the architecture faculty of The TU Delft visible in figure 5 and the faculty building of civil engineering (Macel et al., 1994). Both Van den Broek and Bakema were at some point professors at the faculty of architecture in Delft (Salamons, 2000, p. 53). The Aula of The TU Delft is called the brutalist masterpiece of Van den Broek en Bakema (Lefaivre, 2017, p.84). This design will be discussed more thorough in chapter 3.

Chapter 4 – Comparing The Roger Stevens Building with The Aula

In this chapter The Aula and The Roger Stevens Building will be compared. This leads to a table with an overview of similarities and differences, as seen in figure 6. The comparison is done in six paragraphs: 1. History, 2. Materials and construction, 3. Function and circulation, 4. Critics review, 5. Brutalist aspects and 6. A photo comparison. Each paragraph first looks at The Aula, then at The Roger Stevens Building, and concludes with a comparison.

Theme	**Aula TU Delft**	**Roger Stevens Building as part of the Leeds University extension**	**Differences and similarities**
History	Designed in 1959. Finished in 1966. Adaptation in 1991. Since 2009 a rijksmonument.	Designed in 1960 Drastically revised in 1963 and 1965. Finished in 1970. Monument since 2010 (grade II*). Part of a larger brutalist masterplan.	Both designs were revised, but the Roger Stevens Building more drastically. Both buildings are monuments
Materials & construction	Built out of prestressed concrete using Bé*ton Brut.* Construction is a very important design aspect, concrete used in multiple ways.	System Built precast concrete. Since the exterior is painted, precast concrete airpipes are the main brutalist feature on the outside.	Buildings both use concrete but a different type, causing a different appearance. Both have expressive a construction visible on the outside
Functions & circulation	The building consists of three parts with central circulation. Auditorium floating above the entrance. Connected with a bridge.	The circulation follows the sloped lecture halls. Lecture halls dictate the exterior of the building. Connected with two bridges.	Both buildings are connected with bridges to other faculties. Functions dictate the outside of the building in both cases.
Critics review	The building is a monument and is seen as a brutalist masterpiece and well-functioning. Views about the design are polarized.	The building is a monument. People think it is confusing and hard to get around. Views about the design are polarized.	Both buildings are monuments. The main difference in critique is about the circulation and wayfinding, which functions better at the Aula. Views about Brutalism are polarized in general.
Brutalist aspects	The brutalist character of the building is strengthened by contrasts within the building. Addition of restaurant influenced Brutalist character.	The brutalist character of the building is strengthened by contrasts within the building. Painting of exterior influenced Brutalist character.	Both buildings were changed later, influencing the Brutalist character of them.

Figure 6: table containing key points comparison (Own work)

4.1.1 History, Aula TU Delft

Firstly, the history of both buildings is compared. The design of The TU Delft auditorium started in 1959. The architecture firm Van den Broek en Bakema was chosen because Van den Broek was at that time one of the appointed architects by the Rijksgebouwendienst (Macel et al., 1994, pp. 115-120). The Rijksgebouwendienst was a governmental structure of architects appointed to design public buildings.

The first design brief was an auditorium, lecture halls and a senate hall. During the design process the central administration and library were added to the design brief, which resulted in a design with a tower on top of the building. However, This new design brief turned out to be too expensive, so they turned back to the original design brief (Macel et al., 1994, pp. 115-120). Both designs are visible in figure 7.

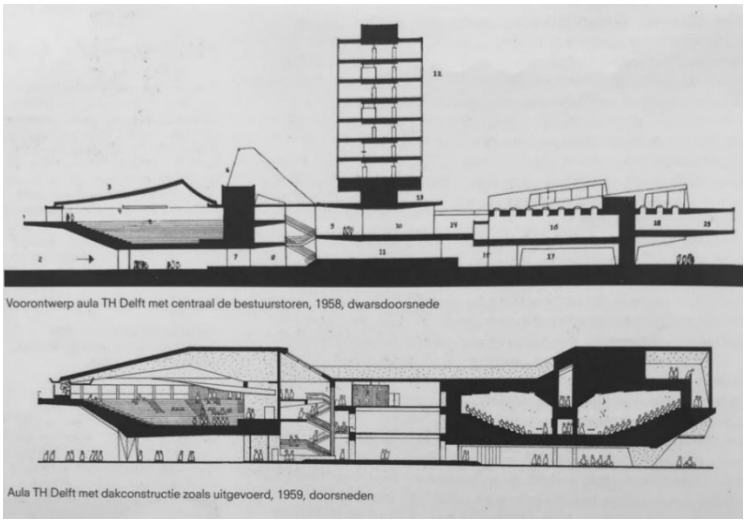

Figure 7: on top the design with the proposed tower, below the final design which was finished in1966 (Dettingmeijer & Oosterman, 2000, p.64).

Further on in the design process, the circulation space for all the functions was centralized to save space and, thus, cut costs. The final design, counting 72.000 square meters, was approved in 1961. The building was finished in 1966 (Macel et al., 1994, pp. 115-120).

In 1983 there was a need for a restaurant, so the decision was made to place this restaurant in The Aula. The Architect chosen for this additional design was Evert Kleijer. Kleijer suggested to place the restaurant under the building at the backside, where the old bike storage used to be. It was finished in 1991. (Macel et al., 1994, pp. 115-120) Since 2009 The Aula is a Rijksmonument. (De Gram, 2018)

4.1.2 History, Roger Stevens Building

In 1958 Leeds University wanted to break with its architectural past. Until then all university buildings were built in classical styles, but now they wanted to modernize and expand. The architects chosen were young, radical, and committed to an aggressively modern approach. They were also pioneers of the British Brutalist movement. This architecture firm was Chamberlin, Powell and Bon (Whyte, 2008)..

Before starting the design process, the firm did two years of research at the university campus. The architecture firm published these results in 1960. It was based on modern research methods like flow charts and motion studies, which exemplified the functional planning of that period. The research resulted in a complete masterplan for The University of Leeds (Whyte, 2008).

The masterplan included a physical education centre, a senior common room, a lecture theatre block, an art gallery, and a library. These common buildings would be surrounded by more standard buildings like offices, laboratories and engineering workshops that would repeat itself in a pattern of similar building units. Flexibility was a leitmotif for this plan. This plan would allow Leeds University to grow and change at will (Whyte, 2008).

However, in practice Leeds University grew much faster than expected. On top of this, the plan was too expensive. This meant that the plan had to be revised in 1963. In the end not the entire plan was completed, the buildings were constructed from 1964 until 1976 (Whyte, 2008).

One of the famous buildings of The Leeds Campus extension is The Roger Stevens Building. This lecture theatre block was a centrepiece of the plan and is connected to other buildings with lifted walkways for pedestrians. It can be found in both the designs of the campus in 1960 and 1963 (Historic England, 2010).

The Roger Stevens Building was drastically altered in 1963 and in 1965. These alterations will be discussed further on in chapter 4.2.2.The building was finished in 1970. In 2010 it became a monument (Historic England, 2010). In 2014 the interior of the building was renovated, leaving in its original state (Fuse & University of Leeds, 2012).

4.1.3 Comparison History

There are similarities and differences between these two buildings' histories. The most relevant similarities and differences will be elaborated upon. A relevant difference is the reason

for acquiring the architects. The architects of The Roger Stevens Building were chosen to break with the classical past of the university. While the architects of The Aula were chosen because they were renowned architects.

A similarity is the alterations during the design process. Both designs were altered during the design process because of cost reduction. This altered the final design of both buildings. Although a difference is that The University of Leeds was altered more heavily because the design was not fully realised. The design of The Aula, on the other hand, changed during the design process, but it was fully realised.

Another difference is the scale of the projects. In Delft the design was a single building, while in Leeds it was a complete masterplan. The Aula was much smaller and already finished in 1966. The project in Leeds, on the other hand, was not completely finished. Some buildings were finished in 1976. This meant that there was a different relation to the Brutalist movement. In 1966 Brutalism was seen as modern an innovative, while ten years later disasters like Ronan Point and *The Tower of Terror* had changed the public opinion.

Another concluding similarity and difference are alterations at a later stage. Both buildings were modernized. In Delft this was an addition that could be seen on the outside. The Renovation of The Roger Stevens Building only existed out of interior upgrades.

4.2.1 Construction & Materials, Aula TU Delft

The construction is one of the most important aspects of this design, if not the most important. Sixty percent of the budget was meant for construction. (Macel et al., 1994, p. 117). When it was built, it was the heaviest prestressed concrete building in The Netherlands. Prestressed concrete is stronger than reinforced or normal concrete. Next to this the end of the steel cables of the prestressed concrete are visible at the inside of the building (Macel et al., 1994, p. 117).

"The design of The Aula is a trapezium made from prestressed, reinforced concrete and is carried by sculptural concrete pillars. The roof is shaped like concrete origami" (Ibelings, 2000, p. 149). The concrete, as a material, is used in different construction methods to serve the needs of the project.

The building can constructively be split into four parts (Macel et al., 1994, p. 117). The auditorium in the front, the middle part is the circulation, the third part is the lecture halls and

lastly the roof. The auditorium and the roof are constructively the most interesting parts of the design. The auditorium is shaped like a concrete bucket that is floating above the entrance and is resting on two sculptural pillars. This is characteristic for the building and can be seen in figure 8.

Figure 8: Picture of the front and side of The Aula showing the overhang of the auditorium (CCgrid, 2013).

The backside where the four lecture halls are, is also lifted from the ground. This is to minimize the footprint of the building. The roof combines the three parts underneath with a folded concrete construction, as seen in figure 9. This is characteristic for the building as well (Macel et al., 1994, p. 117).

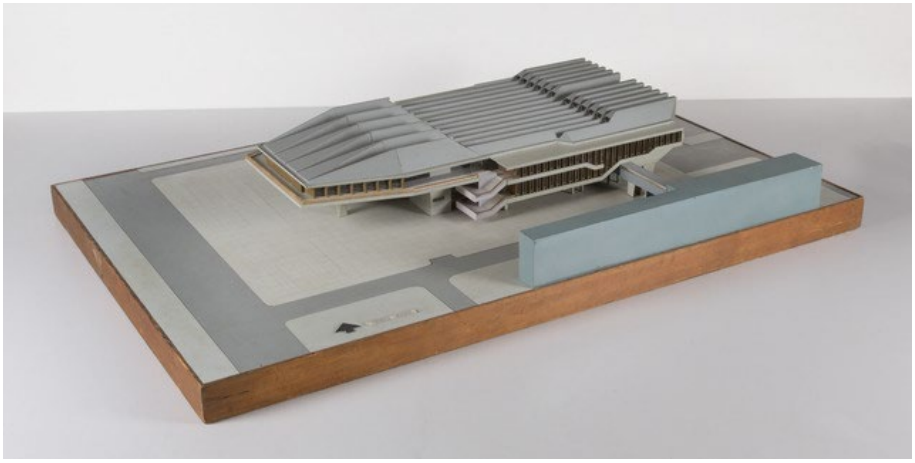

Figure 9: Model of The Aula of The TU Delft showing that the folded roof construction combines the parts underneath (Het Nieuwe Instituut, n.d.)

While the construction is very distinctive, the materials are kept very simple. The concrete is left unpolished and open. This is called *Béton Brut*, as seen earlier in figure 1. The

only additional material is the wood. Together with the concrete this gives the building a harmonious and neutral feel. (Macel et al., 1994, p. 118). However, one could argue that the rough concrete and the varnished wood could be interpreted as contrasting.

4.2.2 Construction & Materials, Roger Stevens Building

As discussed earlier the design of The Roger Stevens Building was drastically altered. The original design had a construction with cantilevered lecture halls. This expressive design was changed because the construction would be too expensive to realise (Steele, 2020). The original design would have been typically Brutalist because of its expressive shapes. Moreover, all the lecture halls would have been visible. This design is visible in figure 10.

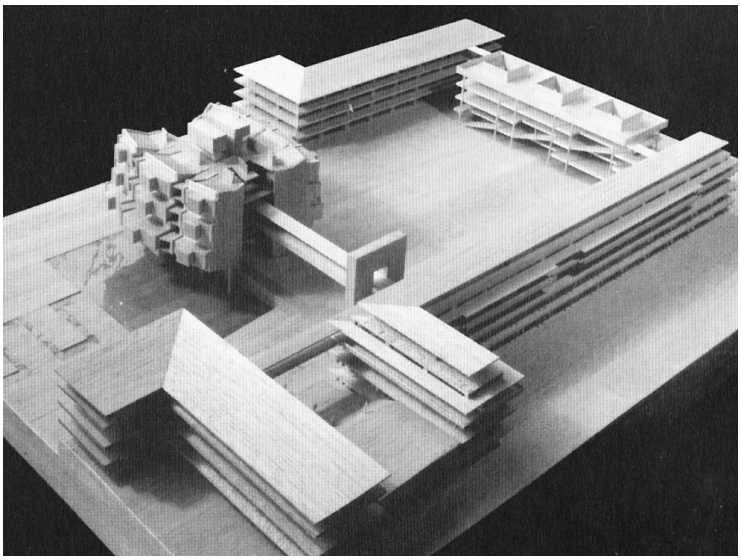

Figure 10: Model showing the original design of the Roger Stevens Building with the cantilevering lecture halls (University of Leeds, 2017)

The solution, as realised in the final building, was a ramped circulation, which made it possible to put the lecture halls on top of each other without them being cantilevered (Steele, 2020). The final design is less expressive than the original one, but it still has some characteristic Brutalist features. For example, the ramped circulation and the lecture halls are visible from the outside as seen in figure 11. Another example is the emphasis on the visibility of the airpipes, which were needed for the lecture halls. The airpipes are made from precast concrete. They are left visible on purpose and probably even exaggerated, these are also visible in figure 11. The precast concrete airpipes are the main remaining Brutalist feature of the building. The buildings exterior was namely painted (Steele, 2020). This opposed Brutalist building methods.

Figure 11: The Roger Stevens Building, on the right are the stacked lecture halls with the airpipes (the Culture Map, n.d.).

The building is system-built out of prefabricated concrete parts. Reason for this were the cutting of costs, speeding up the process and it being seen as a modern way of building (Whyte, 2008). The precast concrete is visible in the in- and outside the building.

4.2.3 Comparison Construction & Materials

In this comparison the construction and materials of the two buildings will be compared. A first and big similarity is the main material, which is concrete. However, the buildings differ in the type of concrete that is used. The Aula is made of prestressed concrete, while The Roger Stevens Building is made of system built precast concrete. Both choices came forth of the function of the material. For The Aula it is important that the concrete can make long span lengths, because of the floating principle. While for The Roger Stevens Building the cost were the most important factor.

A difference which comes forth from the use of material is the typically Brutalist character. The Aula of the Delft looks more typically Brutalist because of its rougher concrete and its use of *Béton Brut*. The concrete of the Roger Stevens Building, on the other hand, was painted.

A similarity can be found in the expressiveness of both constructions. The Aula has large

overhangs and a folded concrete roof. The Roger Stevens Building has ramped circulation and an emphasis on the precast concrete airpipes. So, both buildings show their brutalist character on the exterior. However, one could argue that the brutalist character of The Aula is stronger, because of its large dramatic overhangs and expressive roof. While the gesture of the airpipes and ramped circulation at The Roger Stevens Building is less clear.

4.3.1 Functions & Circulation, Aula TU Delft

While the construction of The Aula is divided into four parts, the functions are divided into three parts. The auditorium, the middle part and lastly the lecture halls (Macel et al., 1994, p. 117). This is visible in the floorplans in figure 12. Another thing one can see on the floorplans is the symmetry of the building also visible in figure 12.

In the original design the lecture halls and the auditorium are floating. This was to minimize the footprint of the building. When the restaurant was added, the part under the lecture halls became part of the footprint of the building (Macel et al., 1994, p. 118). This reduced the floating effect of the building, but it added functions

The middle part of the building functions as the central spine for the other two parts. It includes the stairs and circulation of the building. The stairs and, thus the circulation, can be seen on the inside and the outside of the building. Moreover, the middle part is the only part that is not floating in the original design. So, it functions as entrance to the building as seen in the floorplans in figure 12.

Next to the specific functions of the building, one can also note a diverse use of the spaces in between the lecture halls (Macel et al., 1994, p. 119). Bakema called this *inbetween spaces*. These are spaces that are formed of left-over space in between the open roof construction and the functions (Dettingmeijer & Oosterman, 2000, p. 63). Although these spaces are very special and sometimes weirdly shaped because of the roof and the functions inside the building, it has a clear circulation route. This is caused by the centralized circulation of the middle part. The circulation was centralized to cut costs, but it benefited the design in the end (Macel et al., 1994, p. 115). The Aula connects to the faculty of physics with a bridge. This fits in with the modernist architecture principle of divided traffic flows (Dzwierzynska & Prokopska, 2017).

Another thing to note is the relation between function and form. This becomes most visible at the auditorium. The auditorium is shaped like a big concrete bucket that sticks out of the building. So, the function dictates the shape of the building.

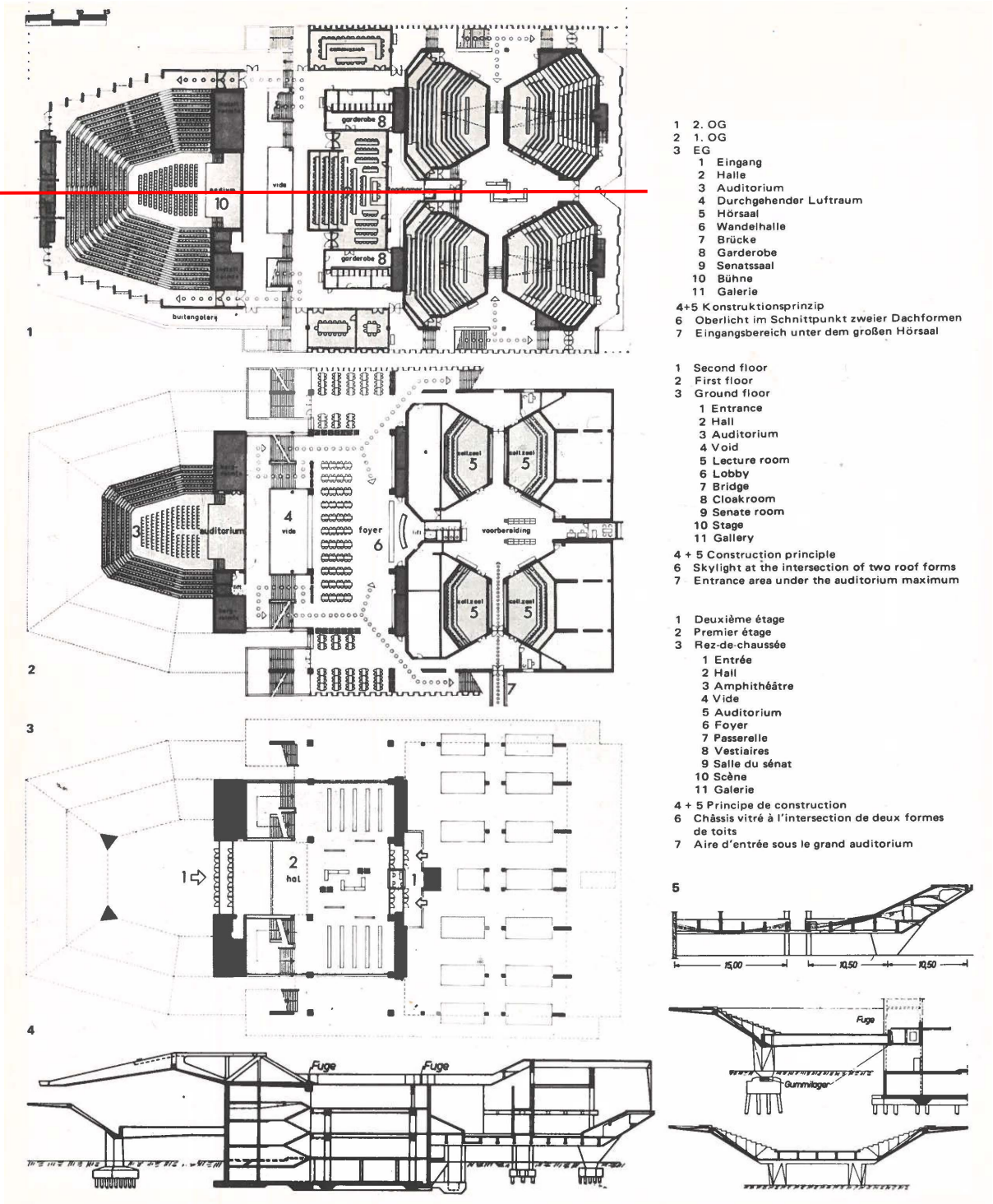

Figure 12: Floorplans of the Aula of the TU Delft in red the symmetry axis(Andreas, 1976, p. 70)

4.3.2 Functions & Circulation, Roger Stevens Building

As mentioned in paragraph 4.2.2, the circulation of The Roger Stevens Building was changed so it would not be necessary to cantilever the lecture halls. Instead the architects decided to turn the lecture halls ninety degrees, so that the lecture halls could be stacked on top of each other. However, this meant that all the circulation had to follow the new sloped shape. This slope created a ramped circulation that follows the lecture halls (Steele, 2020). A result of this ramped circulation are the remarkable entrances to the lecture halls. Namely, every row of chairs has its own entrance door, as seen in figure 13.

Figure 13: interior lecture hall Roger Stevens building (Fuse, 2012).

The building has 25 lecture halls. They range in size from a capacity of 79 people to 308 people (University of Leeds, 2021). The form of the building is dictated by the lecture halls functionality. One can see the ramped circulation and the lecture halls on the exterior of the building as seen in figure 14.

Figure 14: the façade of the roger stevens building shows the lecture halls and the circulation behind it (Historic England, 2010).

On the floorplan in figure 15 the updated design looks somewhat symmetrical, but several of the facades are not. With the original design being symmetrical, the architects tried to maintain this symmetry. However, the ramped circulation did not allow for a completely symmetrical building.

Because The Roger Stevens Building is part of a larger Brutalist design, it is relevant to look at the building in relation to the surrounding buildings. The building is connected to other Brutalist buildings with bridges (Whyte, 2008). This creates spaces underneath the slanting lecture halls as seen in figure 14, which are used as entrances on several sides of the building.

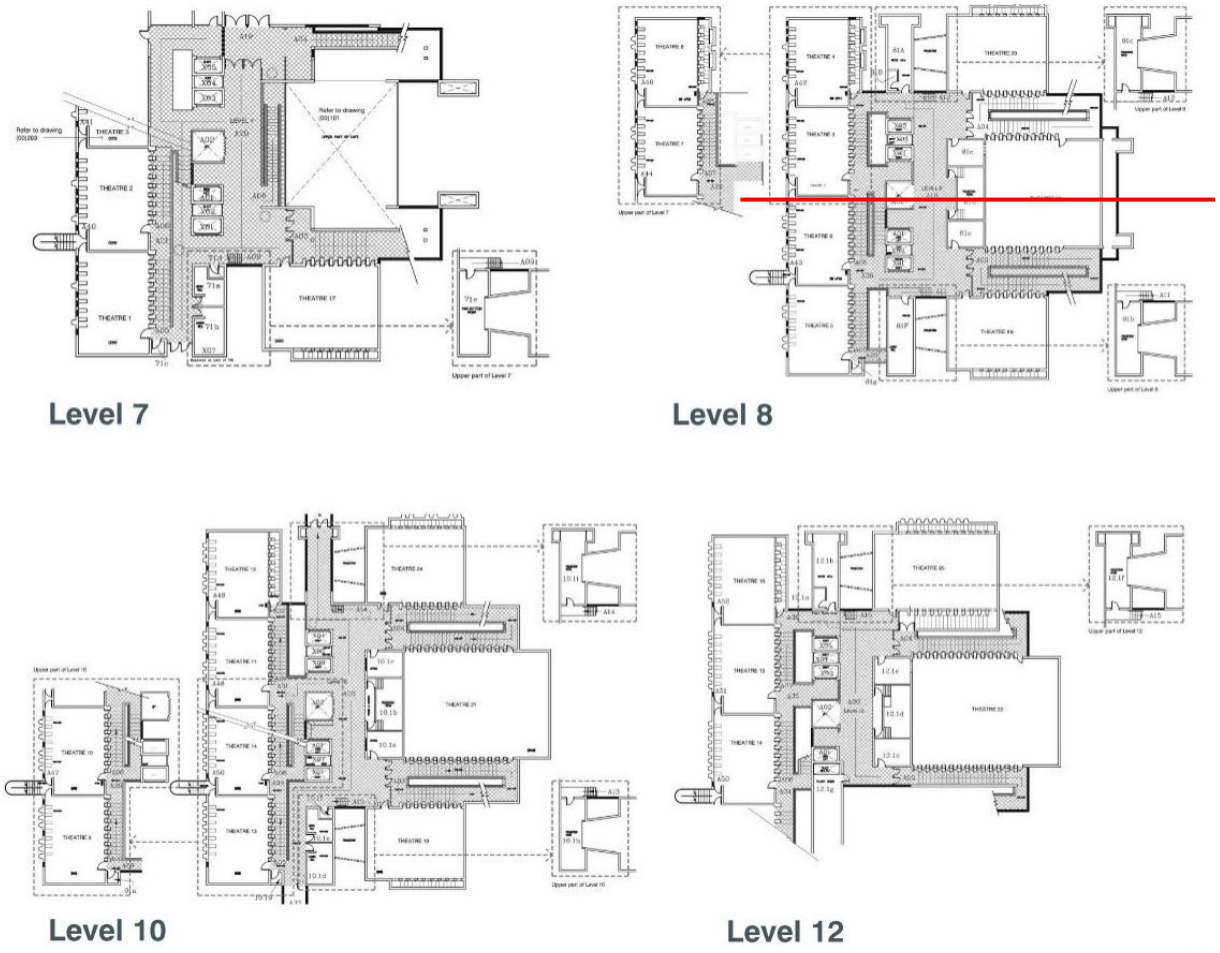

Figure 15: Floorplans of the Roger Stevens building in red the symmetry axis in the floorplan(Fuse & University of Leeds, 2012)

4.3.3 Comparison Functions & Circulation

The circulation within the buildings differs. The Aula's circulation is centralized which allows the user to move freely from one space to another. The circulation in The Roger Stevens Building follows the lecture halls, resulting in ramped circulation that moves into different directions. Because the circulation of The Aula is centralized, it becomes clear in its use. The visibility of the stairs on the exterior of the building adds to this experience. The circulation of The Roger Stevens Building, on the other hand, follows a more scattered pattern.

Another difference can be seen in the division of functions. The Aula is divided into three separate parts with *inbetween spaces,* while The Roger Stevens Building does not have this division. Instead it is shape is dictated by the stack of lecture halls.

A similarity is the connection of the buildings to surrounding buildings. Both buildings are connected to other faculty buildings with bridges. This was a trend at the time of construction.

Another similarity can be found in the relation of form and function. The interior functions can in both cases be seen on the outside. In both cases the interior functions even dictate the exterior shape.

4.4.1 Critics Review, Aula TU Delft

The Aula became a Rijksmonument in 2009. This is the highest monumental rank in The Netherlands and, thus, can be seen as an argument in favour of the importance of the building. A Rijksmonument must be of national importance from a cultural or historical perspective (Monumenten.nl, 2021). In the case of The Aula arguments for recognizing it as a monument are its representativeness for developments after World War II and it being an important Brutalist design by Van den Broek en Bakema because of detailing, quality, composition, and material use (De Backer, 2018).

Next to this, The Aula received funds from The Getty Foundation in 2018. The foundation described the building as an exemplary modern buildings on the international level. It is seen as a primary example of Brutalism. Reasons for this are the sculptural shape, language and exposed concrete (Webredactie Communication TU Delft, 2012). The Architectural Archive of Delft describes the building as functional and spatially interesting (Macel et al., 1994, p. 120). So, different institutions recognise the building as important and culturally relevant.

Another group that critiques buildings are journalists. For example, one journalist

describes The Aula as a weird but functional and beautiful “thing” He also points out that it is an intense building because of it material and size, but that it still has some kind of elegance (Algemeen Handelsblad, 1966).

Another journalist praises the building for its circulation, its interesting spaces, and the spatial philosophy of the architect. He describes it as a brilliant building in the architecture era after World War II, comparing it with brilliant Dutch architecture of before the war like the Van Nelle Fabriek or the Rietveld Schroder huis (Reuling, 1966). It is interesting to note that people already saw the building as special when it was just completed.

On the other hand, another newspaper brings forward that the citizens of Delft called it a monster (Leeuwarder courant, 1966). So, the building was positively reviewed by professionals, such as journalists, and institutions, while citizens were not as positive. This tension can still be seen today.

In current day journalism this is reflected. Delft citizens think of The Aula as a hideous piece of concrete, that could be replaced with a new building. Some citizens do not get why it should be preserved as a monument (Flieger, 2018). This negative public opinion is not surprising because Brutalist buildings are often reviewed in a negative way. The question that remains is if the general public thinks the whole of Brutalism is ugly or just The Aula.

A group of current day professionals are architects such as Nathalie De Vries and Erick van Egeraat. Both have studied at The TU Delft and describe the building as a modern spaceship that landed on campus. Both the architects saw The Aula as the only iconic building on campus. They both named The Aula as best Brutalist building, they know (Winstron, 2014).

4.4.2 Critics review, Roger Stevens building

The Roger Stevens Building was recognized as a Grade II* monument in 2010 (Historic England, 2010). Grade II* monuments are the single highest tier of monuments. Just 5,5% of the monuments is a grade II* monument (Historic England, 2015.) The building is seen as one because of its outstanding design with bold shapes and well-designed interiors.

The interior spaces were based on extensive research and were seen as innovative. The building did not change much since its completion. This proves the building to be a success. A case study researching The University of Leeds describes the Brutalist and modern development

plan as innovative. It also shows that the plan was widely praised by architects, critics, and staff of the university (Whyte, 2008).

Whyte (2008) also describes a journalist who described the plan as spacious and beautiful. All these positive reviews of the plan were published around 1960 before the construction started. However, in 1970 the building was already described as crude, unattractive and old fashioned. What once was seen as very modern already seemed old fashioned. What was thought to be super functional did not seem to work (Whyte, 2008). So, the perspective on the design changed a lot when it was built.

One university paper of Leeds University asked students what they thought of the building. The text shows the experience of the circulation as a maze and compares the exterior with that of a prison (Cooney, 2020). Students describe the building as a place where it is difficult to find their way because of all the different stairs and doors.

The way finding is also seen as a problem in the renovation plan of the building in 2014. It is challenging to find the logic of moving around the building and to find one's way. As a solution new sign were added to help visitors and students (Fuse & University of Leeds, 2012).

A blogger described the building as unintuitive. He describes the views on the building as polarized by students as well as academics (*Organ Pipe-Clad Concrete and Lost Students*, 2013). This is confirmed in the comments of the blog. For example, A PhD A.J. Duke worked in The Roger Stevens Building from 1973 to 2001. He describes it as an unpleasant working environment and says the building was unpopular with everyone who worked there. He also thinks the building has a truly bizarre layout and the interior is a complete design mess (*Organ Pipe-Clad Concrete and Lost Students*, 2013).

4.4.3 Comparison Critics Review

Both buildings are recognized as monuments. The Aula is ranked as a Rijksmonument and The Roger Stevens Building as a grade II* monument. These are both high grade monuments and both are selected as a monument because of being an important Brutalist building.

However, both buildings are controversial. In the public eye the Brutalist style tends to be seen as ugly. This group thinks that the buildings should be replaced instead of preserved. This

controversy could be seen as a trend with Brutalism, people hate it or love it. Moreover, this seems to play a role in people's perception of the two building.

A difference can be found in reviews of the building's functionality. The Aula is described as a pleasant and multifunctional. This differs from The Roger Stevens Building. There are a lot of comments on the circulation, hallways, stairs, and doors in the building. It is experienced as weird and hard to find one's way. This resulted from budget cuts. The Aula has been more positively received than The Roger Leeds Building.

4.5.1 Brutalist Aspects, Aula Tu Delft

The design of The Aula plays with different types of contrast. An example of this is the contrast on the exterior between the glass and the concrete. The concrete is finished as *Béton Brut*, while the window frames are thin and the glass itself is very smooth, visible in figure 16. This is a contrast between heavy and light. It makes the concrete seem rougher, making the building arguably more Brutalist.

Figure 16: Side of The Aula of The TU Delft showing the contrast (Architectuur.org, n.d.).

Another contrast, seen in both interior and exterior, is the contrast between wood and concrete. The wood is smooth and a warm colour while the concrete is the direct opposite of this. The contrast creates the illusion of both more materials differing even more. This is further discussed in paragraph 4.6.2.

Another interesting contrast is seen in the original design. The heavy structure that is lifted form the ground. This makes the structure seem even more big and impressive while, at the same time, one can walk right underneath it without a problem. It makes the building almost

seem afloat. However, with the design of the restaurant the building lost this quality for the most part by blocking the views and walkways. This makes the contrast less heavy and the building.

The building is described as one of the most monumental buildings designed by Van den Broek en Bakema (Dettingmeijer & Oosterman, 2000, p. 63). This monumentality is caused by a combination of symmetry and sculptural design. The symmetry is seen at the front façade, where there are symmetrical columns and a symmetrical overhang. The sculptural design is seen in the overhangs and the folded roof. The combination of the symmetry with the sculptural design, make the building typically brutalist. In my opinion the sculptural design combined with the symmetry strengthen each other making it a Brutalist monumental building. This does seem to contrast with the idea of form follows function, but in this design, it does seem to work out well.

4.5.2 Brutalist Aspects, Roger Stevens Building

The contrast, that is visible at The Aula, is also somewhat visible at The Roger Stevens Building. For example, it is seen at the east side of the building. On that side there are large parts of glass with thin window frames combined with precast concrete. Because these are the only two materials used in this façade the contrast is clear. This makes the concrete seem like a stronger gesture in the building.

The contrast between the glass and the concrete at The Roger Stevens Building is less strong on the outside. The exterior concrete was painted in a later stage, which makes the contrast less strong (Steele, 2020). Moreover, the paint makes the building seem a bit dull.

On the inside however the contrast between the glass and the original concrete is clearly visible showing the original quality of it. The combination of concrete finishings with wooden furniture makes the rooms more pleasant on the inside, while maintaining the Brutalist character. This is further discussed in paragraph 4.6.2.

The original design would have been symmetrical with cantilevering lecture halls, making it an expressive Brutalist design. As shown earlier in figure 10. However, in the updated design the shape of the building is dictated by a new simpler configuration of lecture halls, making it less sculptural. At the same time the extra addition of precast concrete airpipes makes the building sculptural in a different way. This is not only a sculptural aspect, it also an example of function dictating form, which is typically Brutalist.

4.5.3 Comparison Brutalist Aspects

A similarity is the adjustments made at a later stage to both buildings. In both cases this reduced the Brutalist contrast effects of the original design. The Aula, on the one hand, uses the symmetry in its advantage by combining it with a sculptural design. This combination makes it a very monumental building.

The character of The Roger Stevens Building, on the other hand, is more derived from showcasing or emphasizing its functions. The airpipes are shown and used in an architectural way. The design of The Aula does not showcase these detailed functions. In this sense it is possible to say that the design of The Aula is more monumental or maybe even classical than the design of The Roger Stevens Building.

4.6.1 Photo Comparison Exterior

Figure 17 & 18: Left: exterior Roger Stevens Building (Brutalist Constructions, 2015). Right: exterior of The Aula of The TU Delft (Architectuul, n.d.)

This paragraph is a visual comparison of the two projects. The photos shown above are showing the backside exterior of the building. On the left The Roger Stevens Building and on the right The Aula of The TU Delft. Based on the pictures several differences will be discussed.

The first difference is the types of shapes chosen for the exteriors. The design of The Aula uses angular, hard, triangular shapes. This makes the building look extra rough. The Roger Stevens Building is a combination of angular and round shapes. The design consists mostly out of squares with added round elements. These round elements include the stairs, airpipes, and the rounded corners of the overhang. This softens the edges of the building making it less harsh.

The second difference is the choice of material. The Roger Stevens Building is made of

precast concrete while The Aula is cast-in-place using prestressed concrete. This has an influence on the look of the material. The Aula has the *Béton Brut* look. This gives depth to the facade instead of looking like one smooth surface. The precast concrete from The Roger Stevens Building causes lines in the façade, making it seem that the building is made from concrete blocks as seen in figure 15. The precast concrete makes the facade almost one-dimensional. This is balanced by adding the three-dimensional looking airpipes they. The one-dimensional look can also be cause by the paint layer as Steele (2020). This can also be a reason for The Aula looking like one massive building, while The Roger Stevens Building seems to miss that quality.

Another difference is found in symmetry. The symmetry of The Aula, visible on the backside, makes the building very imposing, especially in combination with the overhang and the expressive roof. The Roger Stevens Building does not have this symmetry because of the ramped circulation. Both ways of dealing with symmetry fit the Brutalist style.

4.6.2 Photo Comparison Interior I

Figure 19 & 20: Left: Interior Roger Stevens Building (Meet in Leeds, 2017). Right : Interior of The Aula of The TU Delft (Haan, 2020).

In this paragraph the two interiors of the buildings will be compared, with these pictures differences and similarities will be discussed.

A similarity found in the pictures is the combination of wood and concrete. This gives a warm atmosphere to the interior while remaining the Brutalist character. In the case of The Roger Stevens Building, this is done with the wooden furniture. In the case of The Aula, this is done with wooden slats.

Both interiors are shaped by the other functions that surround the space. For example, the sloped roof of The Roger Stevens Building is created by the lecture hall above. In the case of The Aula the shape of the room is created by the lecture halls surrounding it and the folded concrete roof.

In both cases one can see the shapes, visible on the outside, on the inside of the building as well. In the case of The Aula the triangular shapes with hard edges continue in the interior. While at The Roger Stevens Buildings the rounded corners are still visible on the inside. This makes it possible to recognize the Brutalist style on the inside. This makes them different form each other on the inside.

So in a way they are quite comparable on the inside while at the same time being completely different.

4.6.3 Photo Comparison Interior II

Figure 21 & 22: Left: Interior circulation of The Roger Stevens Building (Maltby, 1971). Right: Interior circulation of The Aula of the TU Delft (Broekbakema, n.d.-a)

In this paragraph two other interior will be compared. Both these pictures are photographs of the circulation. These will be elaborated on because they are characteristic for both buildings. On the right side one can see the central circulation space of The Aula of The TU

Delft. On the left side one can see the circulation space of The Roger Stevens Building.

In case of The Aula, the circulation space is in the center of the building. It has a large atrium, making it possible to see all the floors and stairs. The atrium becomes very spacious. The stairs and rooms surrounding the atrium are also spacious. The stairs are wide as well as the hallways. The atrium lets through, making and the surrounding spaces light. The combination of the wide stairs, the atrium, and the light, make it a pleasant place.

The photograph of The Roger Stevens Building shows the, in paragraph 4.3.2 discussed, ramped circulation. This ramped circulation is seen on every floor. So, unlike The Aula one does not have an overview of the circulation in the building. This can make it hard to find one's way. On the left side of the photograph there are doors to enter the lecture halls. The stairs are quite narrow for a public building, which can lead to it feeling cramped. Next to that the space is experienced as disorienting because of it being ramped. This is reflected in the case study on student experience, that was brought forward in paragraph 4.4.2.

The circulation of The Roger Stevens Building lets less light in, in comparison to the circulation of The Aula. A reason for this seems to be that everything is dimensioned very tightly. This was probably done because of the budget cuts. On the other side, the ramped circulation does make for an interesting spatial design with all the height differences.

Chapter 5 – Conclusion and Discussion

5.1 Conclusion

The goal of this research was to add to the literature about Brutalist university buildings. This was done by comparing two Brutalist university buildings. The research question of this paper was:

> *What are the similarities and differences between The Aula of The TU Delft and The Roger Stevens Building of Leeds university?*

This research question was answered in three chapters. The first chapter, chapter 2, introduced Brutalism in general, British Brutalism, Dutch Brutalism and Brutalist University building. This was done to contextualise the research. The chapter shows that Brutalism is a contested idea, but there seem to be several characteristics that can be noted such as: the use of *beton brut* and other raw materials, making use of geometrical- and sculptural shapes, and leaving functions in sight. Another conclusion was Brutalism being bigger in Britain than in The Netherlands. Lastly, it became clear that university buildings lend themselves well for Brutalist designs. This was because of the public character university buildings which worked well with the Brutalist ideology, and at the same time the Brutalist movement coincided with a need for more university buildings.

In the following chapter, chapter 3, the architecture firms that designed the two buildings were to be introduced and compared. These architecture firms were the British Chamberlin, Powell and Bon and the Dutch Van den Broek en Bakema. Chamberlin, Powell and Bon are famous Brutalist architects also known for the design of the Barbican in London. Van den Broek en Bakema are famous Dutch architects who did not identify themselves with Brutalism, but they did design several Brutalist buildings. Another relevant conclusion is that both firms had experience with designing Brutalist university buildings.

The third chapter, chapter 4, was the comparison of the two Brutalist university buildings. The buildings were to be compared based on six different aspects, which were: history, construction & materials, functions & circulation, critics review, brutalist aspects, and lastly a photo comparison. Interesting trends to note from these comparisons were: the different circulation space within the building; the different use of concrete, and the polarized views on Brutalist style seen with both buildings. Next to that, it was possible to see how the shape of the buildings was dictated by the function. This did have a completely different result, but the

principle is similar. The different use of symmetry and asymmetry is also interesting to note. The Aula is completely symmetrical, while The Roger Stevens Building was not. Both seem to work for a Brutalist design. Symmetry can make a design look more monumental, while asymmetry can show a bigger emphasis on form dictated by function.

Both designs made use of the principle of contrast within their design to strengthen the Brutalist aspects. In the visual comparison one notes that The Aula is more expressive and rougher, because of the angular shapes and rough prestressed concrete that was used. The Roger Stevens Building is more careful because of its material choice of precast concrete and its softened edges. Both seem to work for the designs but have a very different look on the outside. So, A main conclusion of this thesis is that, even though Brutalist university buildings use similar design principles the resulting buildings can differ a lot.

Lastly, a social similarity is that both buildings had to deal with budget cuts. In the case of Delft this seemed to work out positively, because of the circulation being centralized. For The Roger Stevens Building this has worked out in a more negative way. The building can feel cramped or disorienting. This begs the question how budget and successful architectural design relate to another. Because only the “cheaper” designs were realized, one can only speculate on this.

5.2 Discussion

Next to more tangible conclusions, one can speculate on the results of a thesis. The scope of this paper was relatively narrow, so remarks on further research and validity of this research are to be done. For example, as one looks at the differences between the two buildings at hand, it stands out that the results are extremely specific to these two buildings. The conclusion that similar design principles lead to different buildings is hard to generalize. More research surrounding this effect can be done. t is not directly possible to use these results for other Brutalist universities. It could however be a possibility to research other Brutalist universities in a similar way.

Another speculation is if one can generalize this research to the two architecture firms at hand. The buildings that were compared are seen as characteristic for the two firms. For this extra research would be necessary. One could, for example, compare more buildings of the two firms.

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