

H. P. Berlage and Amsterdam Stock Exchange, a reflection on the meaning of Construction

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The appearance of new building materials and methods at the end of the 19th century brought about a profound change in Architecture which, together with other factors, crystallised into the Modern Movement at the beginning of the 20th century. During this transition period, in which traditional and new systems coexisted, an eclectic architecture with uneven results was produced. It was a time of searching when a generation of masters, Otto Wagner (1841–1918) in Austria, Peter Behrens (1868–1940) in Germany, August Perret (1873–1954) in France, or H.P. Berlage (1856–1934) in Holland, among others, faced a new situation. As compared to the past, the architect had to determine and define the use of materials and their relation to new systems of construction, choosing from among a wider array of possibilities than had ever been seen before.

The work of Hendrik Petrus Berlage (Amsterdam 1856–The Hague 1934) is a constant search. Starting with the principle of constructive sincerity and clarity, it marks the beginning of a renovation in Dutch architecture, and by extension a prelude to subsequent vanguards. Berlage became a fundamental figure, not just as the author and builder of magnificent architecture, but also as an element of transition between the 19th and 20th centuries, who drew on the essence of tradition and yet extolled an architecture stripped of superfluous ornamentation.

From among the diverse contributions of Berlage, I will study, through the Amsterdam Stock Exchange building, the construction options employed and the way of using materials, as compared to the traditional

way of building, and which will become a precedent for subsequent methods.

Because of its apparently medieval aspect, in some cases, the Stock Exchange has been undervalued for being old-fashioned, though at the time it was controversial for just the opposite reason. It provoked a strong reaction in society because of its supposedly industrial or harsh appearance at the same time that it ended up influencing subsequent generations of architects. In many ways, it is a modern building built with traditional materials. It was not built by wrote. Rather it was the result of a profound reflection and investigation into the meaning of building, arriving at formal solutions based on fostering the building's constructive and structural aspects. It became a manifesto of a certain attitude to uphold in Architecture, which has influenced architects since Mies Van der Rohe and continues in force today.

THE AMSTERDAM STOCK EXCHANGE IN THE PERIOD 1898–1903. ANALYSIS OF THE CONSTRUCTION PROCESS BASED ON THE PHOTOGRAPHS OF THE BERLAGE ARCHIVE IN THE NAI

Subject and scope of the study

This study focuses on the period between the years 1898 and 1903. It is a specific and delimited period that begins with the presentation of the third project in 1898, on which the construction was based, and ends in 1903 with the completion of the building.

The information consulted in the NAI dates up until this year. The information from the following period between the years 1093 and 1911 was found in the Municipal Archive of Amsterdam.

The initial approach of this study was to analyse the photographic and graphic documentation from this period. However, the handling of this documentation, its classification and the crossing of data proved to be a much more laborious process than was expected at first glance.

For this reason, and although the plans and the images were viewed in parallel, in order to achieve a homogenous result within the reasonable scope of this study and not render a partial or incomplete vision of the series of plans from 1898, which were essential to the development process of the building, this study focuses on the photographic documentation.

In this case, the decision to work from the images instead of the plans is based on various motives.

Although some of the images have on occasion been published in isolation, in general they are a source of information that is less well known than the plans, which have been circulated more. At the same time they are interesting in that treated as a whole they provide a novel vision and constitute a document which by itself explains the constructive process.

Of the publications that exist on the building, there are a significant number of photographs of the Stock Exchange. However, up until a few years ago, the images of the construction phase tended to be limited to the publication of one or two given images. Since the end of the nineteen nineties, the books published on the building have begun to include different photographs of the construction. Upon seeing the potential of these images and in looking at them more closely, their quality and preparation stands out. This fact, together with the meticulousness of Berlage's work, leads one to believe, almost with certainty, in the existence of more photographs of the building under construction. These photographs would allow for a direct approach to the issue and, in a way, through the eyes of the architect.

Sources consulted. Original documentation in the Berlage Archive of the NAI

The Dutch Institute of Architecture in Rotterdam, known as the NAI (Netherlands Architectural

Institute), houses one of the most important museums of collections and archives on architecture in the world, especially for the period 1880 to 1940.

The Berlage Archive contains the largest portion of the documentation that exists on the work of H.P. Berlage (graphic and photographic documentation, writings, letters, participation in conventions, etc.)

In the case of the Stock Exchange, it contains the graphic documentation from the period of its inauguration in 1903. This documentation includes representative drawings of the Stock Exchange of Berlage and other architects, sketches drawn in different sizes and on different types of paper, plans developing the work, detail and construction plans, and complete series of plans of the different phases of development of the project.

The enormous amount of information that exists explains the constant search and work of Berlage during the complex development process of the building, from its beginnings until its completion. In addition to the drawings from the competition and the projects, there are complete series of perfectly drawn plans of floors, elevations and cross-sections. These plans reflect the variations to the building which in some cases, such as the tower, were further developed during the construction process.

In all cases, the different types of plans express the meticulousness as well as the purposefulness in the drafting the documents. The graphic documentation, which is well organised in the archive, allows one to see the differences in approach, graphics, scale, ways of delimiting and representing between the general plans developing the project and the detail and construction plans.

Surprisingly, in contrast to the ordering of the graphic documentation, the photographs apparently do not have a clear order of classification within the archive. In fact, the original photographs related to the construction of the Stock Exchange are dispersed and mixed together with others in the different boxes containing photographic documentation.

Once the investigation and recompilation work was completed, the hypothesis was confirmed, that like the rest of the documentation, the photographs were taken with a vision of the whole which would explain the different construction phases, although they were not later reproduced as whole.

Method used in analysing the images

The method used in analysing the images consisted in

- Establishing a first hypothesis regarding the chronological order of the images.
- Situating them on the building, over the floors corresponding to the 1898 plans.
- Analysing each image individually.
- Comparing the set of images.
- Establishing some general conclusions.
- Analysing the established order again and reordering.

Carrying out the process of analysing the images allowed me not only to obtain information about the construction of the building, but also to reach some conclusions about the analytical process itself.

The result proved more complex than expected. Just ordering the photographs and situating them on the building was a job that I had to revise and modify several times, and which depended a great deal on the image. Thus, the most simple images were those taken at the beginning or the end of the construction, while the ones taken in between provided more information and were more difficult to understand.

The chronological order cannot be strictly followed. Because of the size of the building and its construction process, photographs taken on the same day may show images of different phases of the process. At the same time, respecting the chronological order, one can obtain different results depending on whether the photographs are ordered by parts or according to the building as a whole.

The images provide information at different levels.

- a) Individually and as a whole.
- b) From the description of the information about the construction.
 - of the general process of construction and the order of the different works.
 - of the means and systems used at the time.
- c) From the interpretation of other types of information.
 - Deliberateness of the image, composition, framing, etc.

Analysis of the images.

The images reveal a clear and planned organisation of the works.

The Stock Exchange was built floor by floor at a roughly even pace although the works began at Dam street and there was a slight longitudinal progression in the erection of the building, starting at Dam street and advancing toward Beursplein street. This permitted work to be carried out at the same time on different sites. This was the system used to raise the main bricklaying and masonry work, place the metallic beams and ties of the flooring. This structure was held without beam filling until the end when the building was covered with the assembly of the roof. The foundations, even though they began at Dam, could have advanced more cross-wise from the street behind toward Damrak.

In Image 4, the works advance from the Dam in the background where we can already see the wooden structures for erecting the pillars of the ground floor on the first shared base with a temporary scaffolding for working. In the middle ground, they are about to finish laying the metallic beam of the floor. In the foreground, we see the area without flooring where they are laying bricks and placing framing for creating the arches. This order is verified in Image 8 where the work advances from the back. We can see the temporary planking for working on the flooring at the same height as the flooring in the foreground. This shows an isolated planking for crossing rather than a continuous work surface. It is also confirmed in Image 10 where from the main hall, we can see the assembly of the exterior structure of the roof of The Passage.

The initial phase on the works began with the driving of wooden piles for the foundations, the bricklaying for the basement and the laying of metallic tie-beams in the flooring of the ground level.

The method used for each of the following floors up to the roof was the following:

- Erection of wooden structures on the perimeter for scaffolding and preparation of the wooden auxiliary means necessary to erect the pillars or other stone elements and guide the brickwork.
- Placement of the freestanding stone elements such as pillars with their bases and capitals.
- Bricklaying with the stonework embedded in

the different levels of the brickwork. The stretches of coloured glazed brickwork are laid at this point as can be seen in Image 8. It is treated not as decoration added afterward, but as an integral part of the brickwork. (In the foreground of this image to the right, we see a wall with a surface of glazed ceramic that will hold a stone corbel which is in turn embedded into the wall).

- Placement of metallic tie-beams in the flooring, waiting to fill in the beams until the end, as can be seen in various photographs, at least in the big halls.
- Laying of the bricks for the vaults and arches.

In the final phase, the beams of the flooring are filled in after finishing some of the decorative brickwork such as the spaced brickwork of balustrades of the upper galleries, the putlogs are closed and other finishing brickwork is done as is the placement of decorative elements, ceramic friezes, and stone bas-reliefs by artists such as Jan Toorop or Roland Holst, in niches made for this purpose in the brickwork.

The auxiliary structures are generally made of wood, except for a few machines and special pieces. They are remarkable because of their extraordinary austerity and simplicity for a work of this size and importance. They are interesting not so much in and of themselves but in the way that they were used to rationally prepare the work sites. In addition to a certain degree of systemisation, they sought to execute the works well. This was particularly important in an architecture without finishing work. Thus, in the areas with groups of pillars or buttresses, before erecting one of them, they prepared the totality of the structures necessary for working on each pillar. In the case of the wooden framework for the repeated arches under a certain size, judging by the quality of their construction and the information provided by Image 4 in which the framework in the foreground is marked with 15M., they appear to have been built in the shop and reused during the work.

CONCLUSIONS

The Stock Exchange is a modern building that was constructed with traditional materials and auxiliary means.

The images of its construction reveal a certain sense of prefabrication, or *clean* work, where traditional bricklaying brought together different types of elements on the site. These elements, such as metallic beams and tie-beams for the flooring or numbered and classified pieces of stone, came finished from the shop.

Bricklaying was the only process that entailed on site *manufacture*, the rest of the elements required *assembly*.

This idea can be seen more clearly in the panoramic images of the work, while the partial views or close-ups show the auxiliary means and works more related to traditional construction.

This sense of prefabrication, which is somewhat different than current prefabrication, was closely linked to the treatment of stone.

Holland is a country without stone. The traditional importance of masonry in construction took on a special relevance in the Stock Exchange because of its prominence in the building and its significance in this country. Images 6 and 7 tell us of Berlage's emphasis on the treatment of this material.

This interest is reflected in the special care taken in its treatment and placement in the work.

The conscientious stonework is simpler in the smaller and repetitive pieces and more complex in the especially important pieces, normally the large ones, such as the big capitals in the series of arches in the main hall, which were finished and prepared to bear the base of up to three different arches on the same piece.

For the construction process, there are a series of construction plans in which the pieces are drawn in their proper location and numbered with alphanumeric codes. This suggests that except for special cases, the pieces were repeated a certain number of times.

The photographs reveal that the pieces arrived at the site after being finished in the shop. The finishing work was different on the visible parts than on the hidden parts although they respect the geometry of the planes and edges. This is because the dimensions anticipate their being fit into the brickwork. Thus in the areas where they come into contact with the brickwork, they came in whole kop and laag measurements. The photographs also show the ordering of the stockpiles, and in some cases we can see the designation of pieces, Image 10.

It is an architecture without finishing work, built according to a philosophy that directly expresses the

essence of the materials. This totally dictated the process of construction and signified a continuous reflection on and investigation of the process itself.

The questions posed and the process of searching for the appropriate solutions, which crystallised in a given formal solution such as the construction of a building, is the essence of the architect's work. It takes on special meaning at a historical time when the conditions and means of construction changed. In this case, the architect finds himself in an unknown situation in which he must search for new solutions.

In the case of Berlage, the search for a new path in Architecture began with how the new and traditional materials were used and their meaning in the final result.

The process began with the Stock Exchange and other buildings from the same period. However, it continued over the course of his entire work, especially with the employment of concrete which he used according to different approaches as shown by the office building of the insurance company De Nederlanden van 1845 and the Municipal Museum of the Hague, his last work.

It is necessary to understand the material in order to be able to achieve artistic form.

It is probable that reinforced concrete will be the cause of a total evolution in Architecture. It is absolutely necessary for architects to start to study artistic forms if they want to remain masters of their art.

From the speech of Berlage in the International Convention of Architects held in Madrid in 1904, in

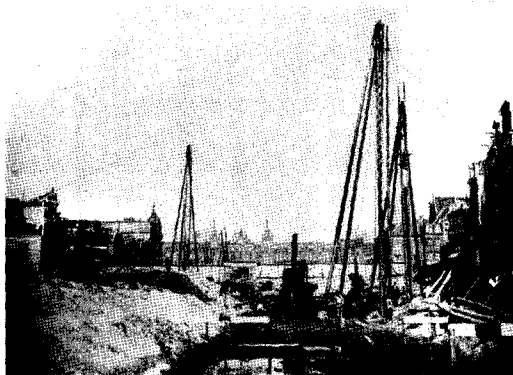


Figure 1

the section *«The Influence of modern construction processes on artistic form»*.

Looking toward Dam street. In the background we see the Central Station building, built in 1886.

Phase of driving the piles of the foundation. Images 1, 2 and 3. The image shows a level at the top of the piles before their heads are joined together below street level.

Earth moving, excavations, and auxiliary elements for on site ranging such as crossbars with levels, 3 the guides without the pile driver, and the second, to the right, wooden structures for driving the piles. Looking at the piles, the one at the rear to the left appears to have been installed recently, the pile driver and the pile are suspended. In the foreground, some workers to the right appear to be plumbing the guides. 2 auxiliary machines, possibly for vertical lifting and pounding of piles with combustion engines.

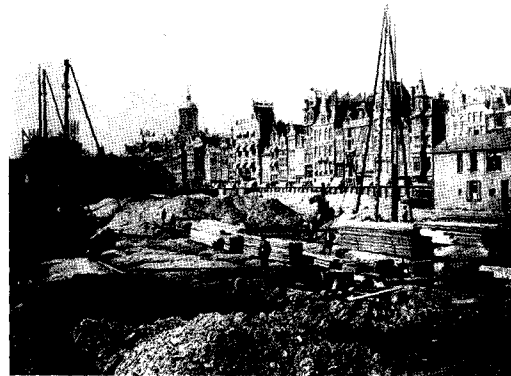


Figure 2

Looking toward Damrak. To the right, we see the Algemeene building, built in 1886, destroyed in a fire in 1960, the department store of C&A currently stands in its place

Perspective is a continuation of Image 3.

Phase of driving the piles of the foundation. Images 1, 2 and 3. The image shows a level at the top of the piles before their heads are joined together below street level, similar to Image 1.

Earth moving and excavations. 3 wooden structures installed for driving piles, the one to the right with guiding tracks, pile-driver and a half driven

pile. 2 auxiliary machines for lifting and driving the pile-driver. In the background and to the right there are warehouse-like buildings that surely existed beforehand and which remain during the works.

With regard to Image 1, there are stockpiles of different types of wood, planks piled for the top level of the foundation, ribbing for this same level and large boards to join transversally various piles. Row of piles and in the foreground an area of piles with water on the surface.

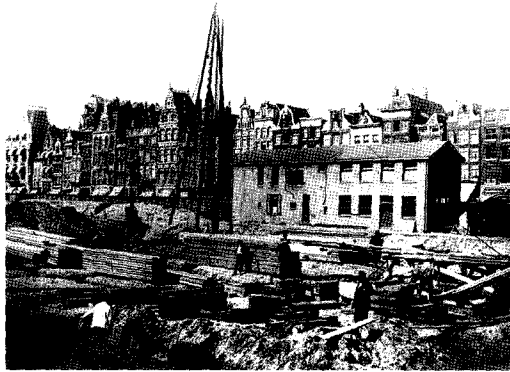


Figure 3

Looking toward Damrak. To the left we see the De Algemeene building, also by Berlage, built in 1886, burned in a fire in 1960, the department store of C&A currently stands in its place.

Perspective is a continuation of Image 2, more to the right. Warehouse-like building that could have existed beforehand and which remains during the works.

Phase of driving the piles of the foundation. Images 1, 2 and 3. The image shows a level at the top of the piles before their heads are joined together below street level, similar to Image 1 and 2.

With regard to Image 1, there are stockpiles of different types of wood, planks piled for the finished level of the foundation, ribbing for this same level and large boards to join transversally various piles.

Row of piles in the foreground to the left where there are two workers.

Looking toward Dam. Perspective similar to Image 1 with the Central Station in the background.



Figure 4

The status of the works corresponds to the basement and the first floor. The works progress from Dam in the background where we see already installed the wooden structures for erecting the stone pillars of the ground floor on top of the first flooring with provisional scaffolding. In the middle ground, the metallic beams of the flooring without an auxiliary floor. In the foreground, an area without flooring where they are laying bricks and placing the framework to form the arches. Stockpiles of bricks under the metallic beams of the flooring. We see also that wooden posts have been installed around the perimeter for the scaffolding.

There are two framework structures prepared for forming arches, and a third one to the left that is on the floor among other materials. Judging by the quality of their construction, they may be reused to form arches in spans of the same width (the first frame is marked 15M). The group in the background is checking the position of the framework, while the worker in the foreground has begun to place the first layer of the arch with bevelled brick. The walls have been built higher on the left where the area has been left free of xxx in order to connect the arch to the wall, which in the upper floors are visually reinforced with a piece of stone which serves as the base for the arches. In the basement, which is for services and installations, stone pieces have not been placed, as we can see from the image.

Looking toward the main entrance on Beursplein street. It corresponds approximately with what we see in the background of Image 4.

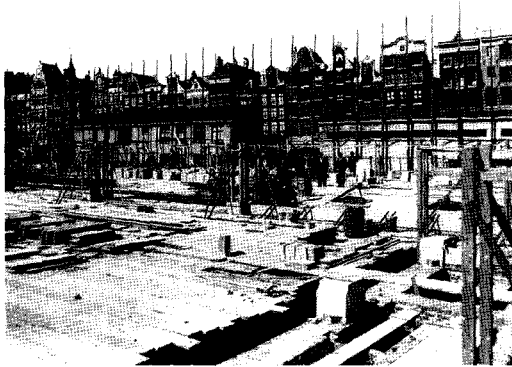


Figure 5

Works on the beginning of the ground floor. First flooring with temporary planking for workmen (in some areas we can see where the metallic beams are embedded in the walls). Preparation of necessary auxiliary measures.

The wooden structures for the buttresses-pilasters of the central wall of the two smaller halls have been prepared. The wooden posts around the perimeter for the scaffolding, and the auxiliary machinery for hauling and lifting have been installed. On this floor, they have begun to place the pieces of stone and we see the first stockpiles.

Importance of the wooden auxiliary means in the placement of stone and in the laying of brick, both visible brick and finishing brick, inside and outside the building.



Figure 6

Looking toward Damrak. To the right we see the Algemeene building, also by Berlage, built in 1886 and destroyed by fire in 1960.

Works on the beginning of the ground floor. First floor with temporary planking for workmen (in some areas we can see where the metallic beams are embedded in the walls). Installation of wooden posts on the perimeter for scaffolding

Stone works and stockpiling of materials.

The main issue of the photograph is the stonework. There are stockpiles of stones and other materials, possibly bricks. They are erecting all elements of the stone pillars-columns (base and capital of softer stone, and shaft of already polished and decorated granite). The stone elements come from the shop totally finished, including the decoration, in which there is a differentiation between the finish of the parts that will be visible and those that will end up embedded in the brickwork. Particularly noteworthy is the stonework on the capitals prepared to support the big longitudinal arches and the smaller transversal arches.

Looking toward Dam, from the perspective of the viewer.

Works on the beginning of the ground floor. First floor with temporary planking for workmen. The wooden posts around the perimeter for scaffolding have been installed. Stone works and stockpiling of material. The image was taken at the same time of the previous one (Images 6 and 7).

Meaning of stone in the building and the importance of the start of construction on the main

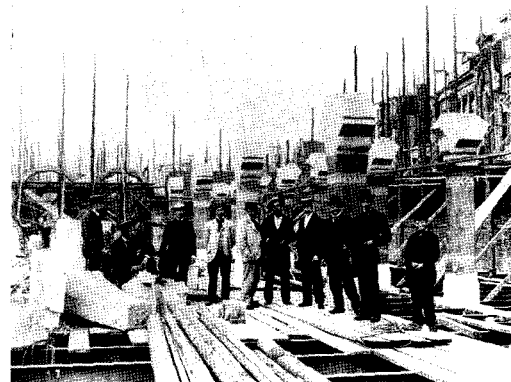


Figure 7

hall. All elements of the stone columns have been erected (base and capital of softer stone, and shaft of already polished and decorated granite). To the left, there stands out in the image a stockpile of stone elements where we see a corbel and we can verify that the pieces arrive finished from the shop, differentiating between the visible and hidden parts.

The presence of Berlage is worth pointing out. He is with a group of people (fifth from the right) who we can assume were close to him. He is slightly in front of the others and is the only person who we see from a profile.

The already explained importance of the stone is linked to the moment and place chosen to take a singular photograph. It is the only one in which Berlage appears in a specially prominent pose. It is the best known photograph from the construction of the Stock Exchange and one of the most published.



Figure 8

Looking toward the area of Dam street with the Damrak building in the background. Of all the photographs analysed, this is the one that is taken from the highest viewpoint.

Works in the upper portion of the ground floor (depending on the hall) and the beginning of the first floor.

Rooms with lower ceilings already covered with the metallic beams and tie-beams of the floor above. The wooden formwork for the brick barrel vault of the main hall of the central body has been prepared. In the big hall at the back, which has higher ceilings,

they continue to erect the walls. Wooden scaffolding.

The works progress from the back where we see temporary planking for workmen on top of the flooring at the same level as in the foreground. The planking is for crossing and does not offer a continuous surface for working. On this floor, the tie-beams are laid in two continuous sections and are supported in the central area by two joined metallic beams, making the floor look like a single piece. In the central body of the floor, which is more subdivided, to the left we see the upper portion of various arches, some with the framework still in place and the formwork prepared for the vault. Brickworks with two groups of people. In the foreground, to the right, we see a wall with a glazed brick face that is going to support a stone corbel which is in turn embedded into the wall.

Panoramic view from an elevated perspective that allows us to see the relative heights and sizes of the big halls and the rooms with lower ceilings, and understand the special complexity of the building. Different constructive systems such as metallic flooring and brick vaults determine the different character of the rooms.

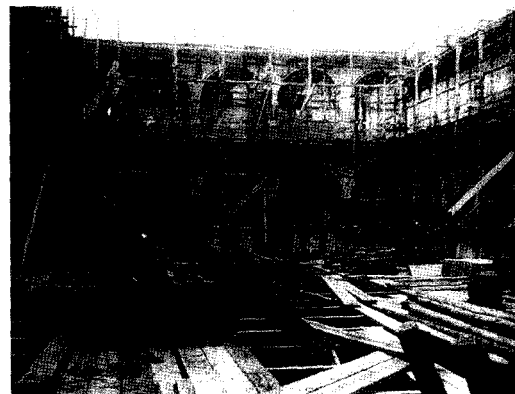


Figure 9

Looking toward the area of Dam street, in the Stock Exchange Hall, now Yakult Hall. This is the first image where although the building has not been covered, we are inside a complete space.

The height of the hall rises up to the level of the first floor, which is the level that supports the metallic

roof trusses. Although it is cut by the cropped in the image, the scaffolding continues higher up, possibly up to the level of the roof, as suggested by the hand ladder.

Wood scaffolding, very high and made of two logs joined end to end, reinforced in some points by diagonal boards. In the upper portion of the wall in the background, the stone columns that bear the arches are still covered by the auxiliary wooden structure used to assemble them.

Stockpiles of stone, brick and different types of wood for auxiliary means (logs, boards, blooms, large boards). The wooden framework for an arch is on the floor.

This is the photograph with the lowest quality and most careless composition.

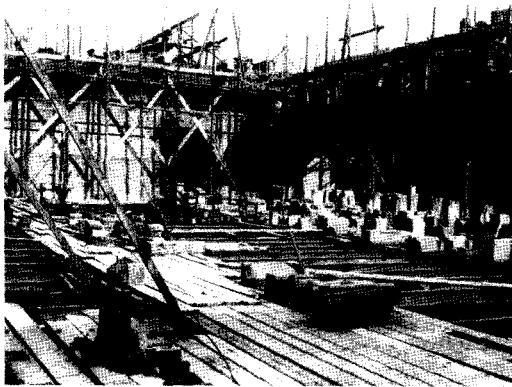


Figure 10

In the main hall of the Stock Exchange looking toward the area of Dam street.

As in the Image 9 before, although the building has not been covered, we are inside a conformed space.

The height of the walls in the biggest hall continues to rise. Beginning of the upper levels. The big lateral arches and the first floor supports have been completed.

The works continue to progress from the area of Dam street. In the background, to the right, we see part of the metallic roofing structure of the Stock Exchange Hall, now Yakult Hall (Image 9). In the wall at the rear, they have begun work on the upper overhanging gallery, with the placement of large

corbels of bevelled and protruding stone. Once embedded in the supporting brickwork, they remain propped up at the end until the suspension is completed with a system of vertical logs and diagonal braces in the form of Saint Andrew's cross, which rest on the ground. At the last level of work, auxiliary lifting constructions and on the ground floor, to the left, a cogged wheel machine with a manual crank. Stockpiling of stone elements, to the right, a piece with carved decoration is marked 91 L*A (the asterisk represents a small illegible sign). Other smaller stockpiles of stone, brick and logs for scaffolding. In the lower left hand corner, the board at the end of the flooring is turned upside down and appears to be equipped with small pieces to fit it over the tie-beams and prevent it from sliding along the floor (however, this does not appear in all of them).

In the wall in the background, in addition to the marks from the putlogs, we can see a slightly sunken horizontal rectangle prepared for a later decorative frieze, which will end up flush with the brickwork.



Figure 11

In The Passege, now The Arke Foyer, looking toward the main hall of the Stock Exchange, which can be seen in the background.

We see a structure of metallic roof trusses that have been placed from the interior, and at least part of the exterior of the saddled roof.

The Passege is a hall with a ceiling of uniform height, although it is lower than the other rooms with this type of roof in the central body of the building. It serves as a transition between the two different areas of the building. In the background we see the scaffolding for the series of arches of the main hall.

The roof structure is comprised of different parts. The interior with the lateral horizontal elements which will be covered and the central curved sections which will be transparent. On top, the exterior made of a saddled roof. We see wood logs and planks for the works. Between them, we see two holes in the wall, possibly for access to the inside for maintenance. On the floor, part of the lineal curved elements of the structure and some pieces of stone.

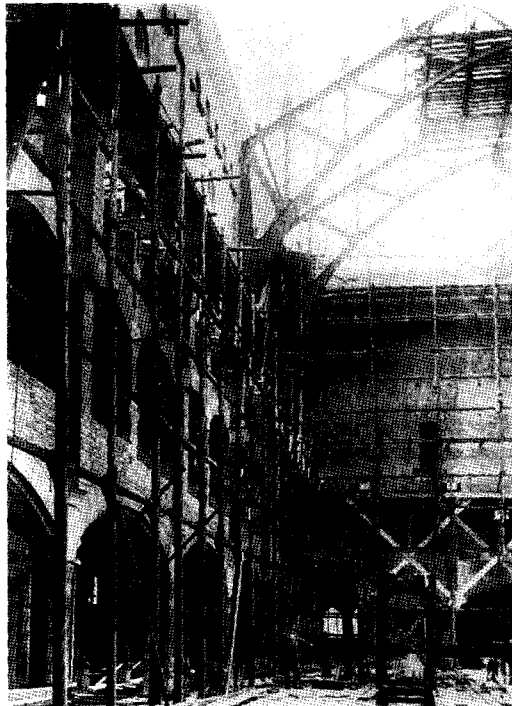


Figure 12

The beams of the floor still have not been filled in.

There remain the marks from the putlogs in the brickwork and some corners have yet to be finished.

The double arch at the end of the barrel vault corresponds to the opposite side described in the formwork phase in Image 7.

In the main hall of the Stock Exchange, looking toward the main entrance on Beursplein street.

It can be seen from the previous image, number 11.

We see the placement of the structure of metallic roof trusses has begun seen from the inside.

It is the hall with the most light. It has a roof structure also composed of different parts. Two roof trusses have been placed in the interior structure and there is auxiliary planking for the workmen in the area of the ridge board. On the floor, on the ridges, we see part of one of the elements.

The wall at the rear, the partition walls of the hall, has been raised up to the horizontal level where the slanted plane of the roof trussing structure begins. Here they have continued with the propping system of vertical logs and diagonal braces in the form of a Saint Andrew's cross, and the system of imposing corbels made of bevelled and protruding stone to support the overhanging gallery until it is stabilised by the weight of the wall. The gallery is vaulted for the floor between corbels. Also, we see the marks in the brickwork made for joining the perpendicular walls to the volume sticking out from underneath the gallery.

In the top floors of the lateral series of arches, the balustrades made of spaced brickwork with decoration are missing. The stone bases of these are also missing.

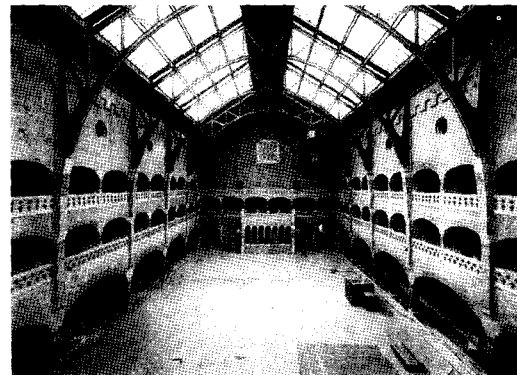


Figure 13

View of the main hall looking toward the main entrance on Beursplein street.

In this hall the works are very advanced.

The roof appears to be finished, even with glass. There is a moving booth suspended from the roof truss at the rear. On the floor there is an area marked off so that the workmen will not walk under the booth.

We cannot see the floor, either because it has not been laid or because it is protected.

Under the series of arches, we see the markings for the installations and on the floor we see rows of stone in the pavement in line with the columns.

There are stockpiles of floorboards and rectangular elements that have been laid down.

The most important panoramic view of the hall in its original configuration. The big arches have not been divided and the trusses do not have braces. These changes were carried out in 1907.

Exterior view of the building with the tower of the main façade toward Beursplein and the western elevation toward Damrak.

We see the building practically finished. They are working on placing the stone bas-relief above the main entrance. Scaffolding and auxiliary work



Figure 14

platform upon which various heavy longitudinal elements have been piled, possibly pieces from the bas-relief as the scaffolding appears to be reinforced. The clock is still missing from the tower.

The perimeter of the work remains fenced off.

Ground floor. Plan from the 1898 series.

Location of the images.

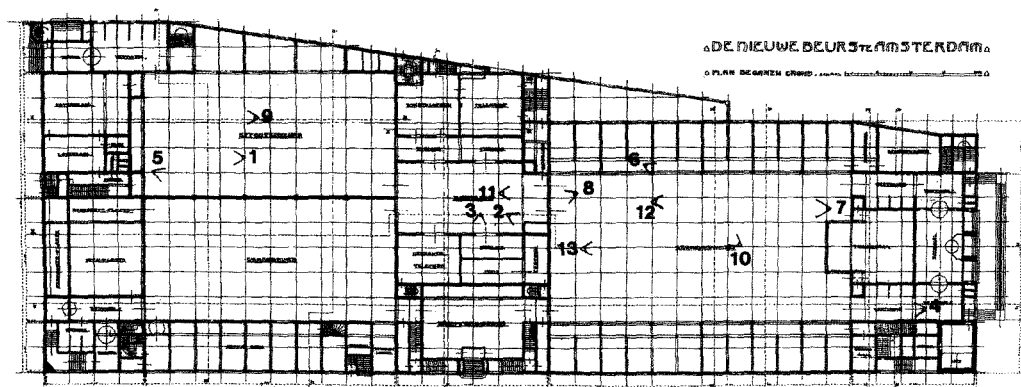


Figure 15