Building in Existing Contexts – Densification

Paul FLOERKE[a]

[a] *Department of Architectural Science, Ryerson University, Canada, paul.floerke@ryerson.ca*

ABSTRACT

An important theme of applied research is the realization of climate adapted, energy efficient, and soundly constructed environments unfolding to an innovative architectural concept.

Existing buildings, especially certain building typologies are increasingly emphasized as themes. Quality criteria of buildings are much more difficult to capture and must be descriptive. Deciding on these will become a future challenge.

Research clearly shows, that dealing with buildings in existing contexts is considered a main focus. The densification of cities is an ongoing topic, which can be achieved without dissolving the embodied energy, which exists through the built environment. This is one major aspect. Another aspect at the same time being respected when activating existing structures is the reduction of necessary new energy – site management, used resources/ materials, actual construction etc.- for new buildings in identical locations, which often do not achieve higher quality architecture or comparably extended life cycles. Beyond this, the social culture value of existing structures has not been fully assessed. This is an underlying momentum for reconsidering architecture of the sixties and seventies. Roof-top extensions to existing structures is one way of adding to the densification using the potentials of the buildings while simultaneously refurbishing the envelope and considering reuse, recycling.

The approach is to work on areas that have been highly neglected. Architects often prefer to focus on the „new building object“ and less on existing structures, especially those of eras, which are deemed unattractive but will be of high importance to the future architectural profession.

Keywords: *densification, building typologies, potentials of existing buildings, modernity*

1. INTRODUCTION

The Catalogue of Typologies – Rooftop Extensions has been developed in the context of the research project „P845 Building in existing structures – potentials of lightweight steel constructions“.

A total number of 108 out of 154 worldwide selected projects are presented in this catalogue, focusing on existing buildings in urban situations considering densification through extensions and additions.

Similarities between the 154 projects have been analyzed by implementing an abstract graphical method.

The further uniqueness of this publication is the interdisciplinary combination of architectural and engineering documents for precedents studies.

The comparison of schematic sketches led to 6 typologies to which all projects can be related:

- A Roof
- B Cube
- C Inserted
- D Free Form
- E Add On
- F Gap

Within the typology-categories A to F, the Catalogue of Typologies – Rooftop Extensions is structured as follows:

- Chapter 4 Introduction of project related Typologies
- Chapter 5 Project-related overview

- Chapter 6 Detailed presentation of selected projects

The objective of this catalogue is to identify general conditions according to the given information of every typology. This catalogue is to be understood as a manual for clients, planners and the building industry. The presented solutions can be transferred into different contexts and provide assistance to the decision-making process. The variety of solutions, specifically considering the urban context, show how existing potentials can be used for roof-top extensions, which contribute to the densification of cities.

(Please follow the link in references for a free download of the full English/ German version)

2. CASE STUDIES

2.1 Former IBM Building, hanover, lower saxony, Germany

Figure 1: Model photography, IBM-Building Hannover, 2012. Detlef Podehl, Fotografenmeister, Technische Universität Dortmund.

Building in existing contexts has long been one of the most important architectural challenges in Germany. The building inventory is in a phase of over saturation in Germany.

We can only operate to preserve resources if we learn to appropriately and sensibly deal with the existing ones. In this context, post-war modernism raises one of the most increasingly important challenges - buildings constructed in the 1960's and '70's.

Whereas buildings completed in the 1950's are generally well accepted, an aversion exists towards modernist buildings. It appears that the contemporary generation of protagonists of architecture in Germany, whose fathers were the planners and builders of this period, are the opponents of the typical post war architectural canon.

These buildings are demolished without investigating their potential for utilization in planning and economics; if they are demolished, both the embodied gray energy and energy for demolition as well as the historical social-cultural value are all lost. Certainly, not all buildings of this period are significant, but many are. Structures that appear, on first glance, to be almost unsolvable offer, on second glance, the potential for new solutions, especially in the context of the densification of urban areas. In this context, avoiding construction and demolition waste is a priority. Only after considering this should waste management or possible rebuilding on the same site follow.

When a site is rebuilt, there is no guarantee of equal or higher architectural quality especially considering the calculation that an amortisation based on thirty years is necessary to maximize the investment return.

The less an existing building has to be modified, the less the energy that has to be implemented and the more the social and cultural value is raised.

The degree of intervention, specifically the degree of modification, constitutes the critical factor concerning the utilization of the existing building and the method of identifying and using the building's full existing capacity.

Embedded in this method lies a process of selection, which can be either a controlled or uncontrolled sequence of events. In addition to this, it is often vague as to who decides which value is to be sustained, which criteria are to be followed, and which particular criteria are to be emphasized. This is a complex process that eventually constitutes a decision over the existing building.

The above-mentioned context raises aspects for an approach towards a "theory of disappearance", which involves processes which make it impossible to reconstruct, and in which artefacts of historical movements disappear forever, especially when they are not leading the list of architectural favourites.

Figure 2: IBM-Building, Hannover, 2011. Detlef Podehl, Fotografenmeister, Technische Universität Dortmund.

Prof. Dieter Oesterlen's IBM-building in Hannover, Germany, built in the late 1960's, is representative of the 'Braunschweiger Schule' (Braunschweiger School of Architecture). Oesterlen, a renowned post-war architect, sensitively intervened in existing buildings and contexts of what had heavily destroyed Germany, and, specifically, what Hannover was confronted with.

It could be said that in the process of disappearance, there is an underlying form of catharsis in the destruction of things we prefer to forget. Often, reconstruction or preservation of buildings is done with the intention of remembering and reminiscing. Oesterlen's approach, as illustrated by the historical site development in Hannover, shows a not very well-recognized strategy of reconstructing the urban context of a pre-war situation. A school built in 1890 in the same location was so substantially damaged that had to be demolished even after several attempts to provisionally repair it. The school was located in the urban context among several multi-storey apartment buildings and could be read as an explicit differently designed volume. Oesterlen has a similar interpretation of the situation, while following a modernistic architectural expression (see historic maps below).

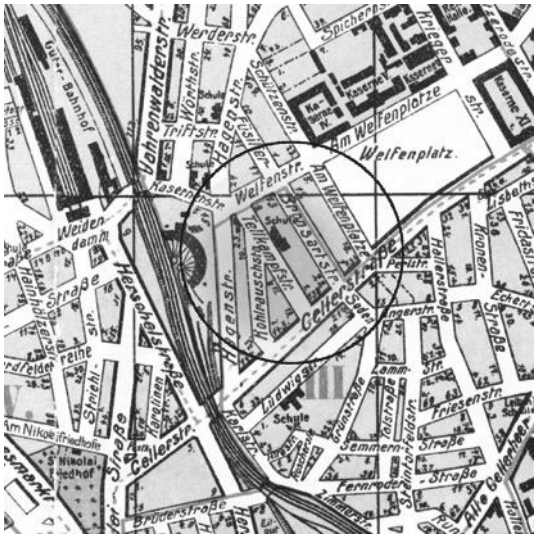

Figure 3: Historic maps, IBM-Building site, Hannover, 1914. Stadtarchiv Hannover, kpr Nr. 0966 Stadtplan Hannover, 1914 Mitte 00001.

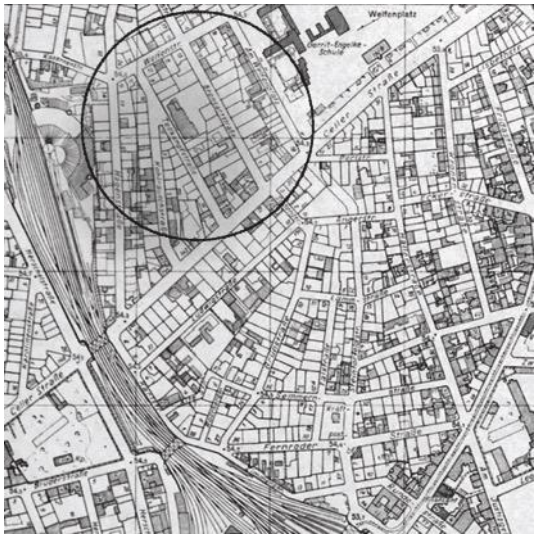

Figure 4: Historic maps, IBM-Building site, Hannover, 1954. Stadtarchiv Hannover, Dt. Grundkarte 1:5000 Blatt, Hannover 1954.

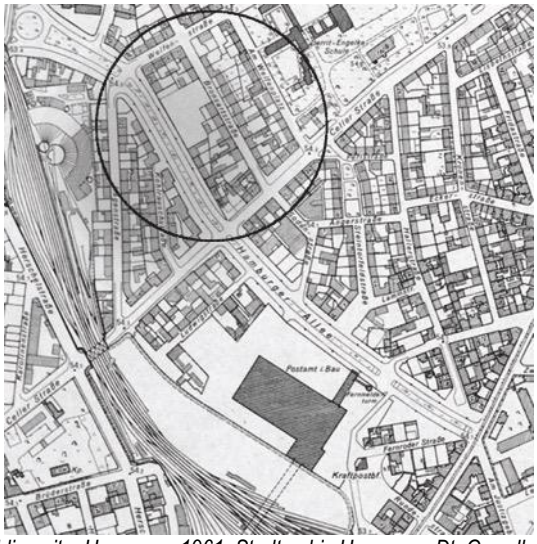

Figure 5: Historic maps, IBM-Building site, Hannover, 1961. Stadtarchiv Hannover, Dt. Grundkarte 1:5000 Blatt, Hannover 1961.

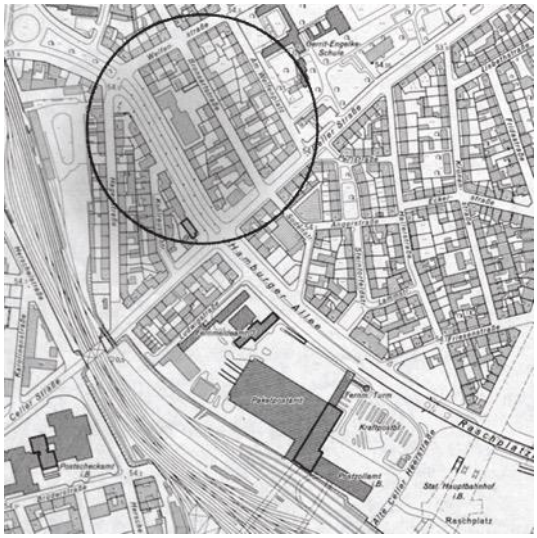

Figure 6: Historic maps, IBM-Building site, Hannover, 1971. Stadtarchiv Hannover, Dt. Grundkarte 1:5000 Blatt, Hannover 1971.

The IBM building cannot be seen as a disruptive building in an ensemble of residential buildings. As a modern office building of its time, it offers deep floor plans with multilayered grid structures, which coincided with the spatial program.

Even by today's standards, daylight simulations for the building clearly show a functional structure. The fixed sun louvers, after investigations of sunlight positioning, prove to be a sophisticated sun-screening device and cannot merely be regarded as a design-oriented application. This fixed sun-screening device is functional while simultaneously reflecting the building's expression.

Analysis of the floor plan types has shown the utilizable grids for different office typologies. Grid drawings and utilization are in accordance with the German government's criteria of building in existing contexts.

The actual measured existing potential of the primary steel reinforced concrete structure of the building would allow a 1 to 2-storey addition, provided it is executed in a light weight steel structure. However, the envelope design is not consistent with contemporary or future standards and would have to be in steel in order to maintain the narrow window framing profiles.

This building is a reflection of the context of the preservation of social and cultural values. The approach or process suggests a strategy for examining buildings of a similar type.

General assumptions and speculations concerning these building types, their architectural quality, their utilization possibilities, and feasibility studies alone do not go far enough. Only the explicit illumination of historical references, the inherent processes, and what can be evaluated as existing cultural inventory, as well as the explicit investigation of anticipated future uses can provide support in making decisions concerning conservation, modernization, or possible extensions to existing buildings. A modification is at its best when existing buildings in all of their facets and resources have been completely captured and understood.

2.2 University of Hamburg - Campus Von-Melle-Park (VMP), Hamburg (Germany)

The development of university campuses in Germany found its climax in the sixties and seventies. The architecture conceived during this period left its imprint as the architecture of the booming years of economy. This period often created university satellite campuses on the fringe of the cities.

Universities located in the down town core could only be implemented, if post-war vacated lots were made available.

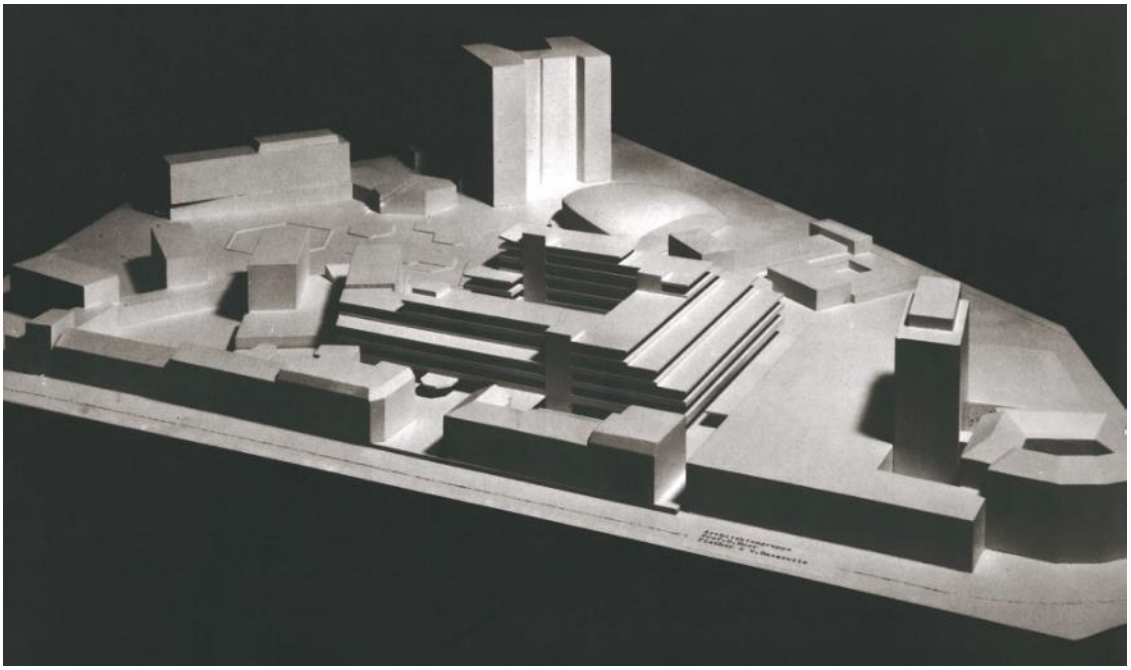

Figure 7: Model, Campus Von-Melle-Park, University of Hamburg, 1971. from: Architektengemeinschaft WIWI II. Hoor, Prof. D., Geelhaar, K., Fischer, C.F., v. Bassew, H. (1971): Erweiterungsgebäude des Fachbereichs Wirtschaftswissenschaften der Universität Hamburg. Planunterlagen als Anlage zur Leistungsbeschreibung, cover.

The development oft the main campus for the University of Hamburg began in the late 1950's according to the plans of the architect and urban planner Paul Seitz, who was the first director of the city planning division for the City of Hamburg from 1953-1963. Paul Seitz planned two of the existing buildings:

The Philosophy tower (Philosophenturm/ VMP6 (1959-91)) and the Paedagogy Institute (Pädagogisches Institut/VMP8 (1957-60)).

The university campus is characterized by a loose accumulation of individually designed buildings for separate institutes. The concept of the campus was to be comparable to the values of a democratic and pluralistic educational system.

Figure 8: Maps of existing situation and new building of VMP5, 1971. from: Architektengemeinschaft WIWI II. Hoor, Prof. D., Geelhaar, K., Fischer, C.F., v. Bassew, H. (1971): Erweiterungsgebäude des Fachbereichs Wirtschaftswissenschaften der Universität Hamburg. Planunterlagen als Anlage zur Leistungsbeschreibung, page 3.

The building ensemble of the university campus was extended in the early seventies. Von-Melle-Park 5 was planned as an extension to the Faculty of Economics and executed ready for occupancy by an architects association for the University of Hamburg.

SIEMENS using prefabricated concrete components completed the building in 1975.

Figure 9: Mapping of listed university buildings, Hamburg, 2016. www.geoportal-hamburg.de/Geoportal/geo-online/index.html (Stand 19.03.2016).

The entire university campus is under ensemble protection (see light-red coloured areas in Figure 3).All buildings are protected historic heritage (see dark-red coloured buildings). Exceptions to this are only the building VMP5 as well as the areas of the university library.

The Hamburg Ministry of Culture Office for the Protection of Historic Buildings will soon be establishing guidelines for the refurbishment process of the existing buildings.

In preliminary discussion with the Culture Office main objectives for the future refurbishment plans were determined. Maintaining materials, building volumes and nuances of colouring are of paramount concern. All interventions or modernizations should respect the principle of identifying the year the building was built this way referencing its cultural context. At the same time the buildings must adhere to the current requirements of energy efficiency.

For every required construction project in the existing context, the decision between conservation of the ensemble and the improvement of the building performance becomes a balancing act.

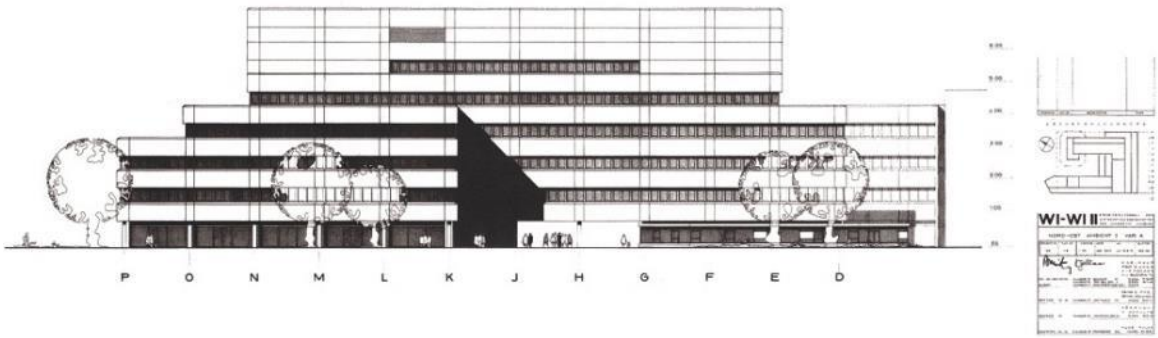

Figure 10: Northeast elevation, Von-Melle-Park 5, 1971. from: Architektengemeinschaft WIWI II. Hoor, Prof. D., Geelhaar, K., Fischer, C.F., v. Bassew, H. (1971): Erweiterungsgebäude des Fachbereichs Wirtschaftswissenschaften der Universität Hamburg. Planunterlagen als Anlage zur Leistungsbeschreibung, page 15.

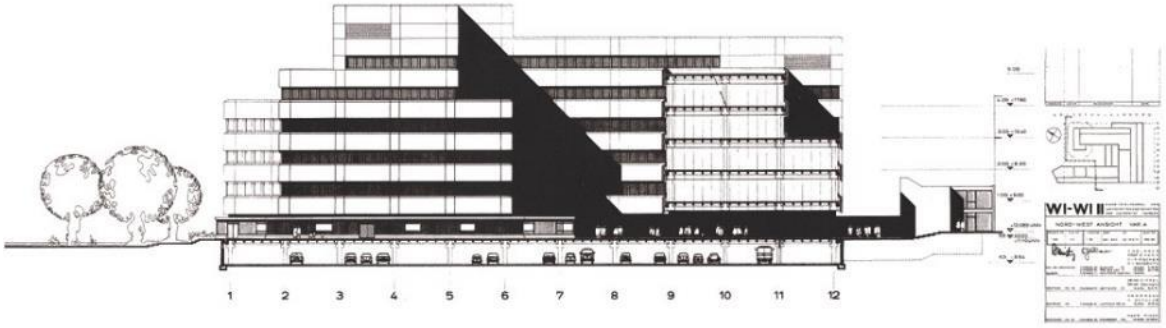

Figure 11: Northwest elevation, Von-Melle-Park 5, 1971. from: Architektengemeinschaft WIWI II. Hoor, Prof. D., Geelhaar, K., Fischer, C.F., v. Bassew, H. (1971): Erweiterungsgebäude des Fachbereichs Wirtschaftswissenschaften der Universität Hamburg. Planunterlagen als Anlage zur Leistungsbeschreibung, page 14.

Refurbishing buildings of the seventies demands, besides renewing the mechanical systems also updating to the existing fire codes, removing contaminated materials as well as improving the building envelope. After 40 years the existing envelope is in need of an upgrade. The facade consists of concrete sandwich panels and framed sliding windows with aluminum profiles. The concrete, or the exterior was exposed to harsh weather conditions and has been subject to heavy corrosion. All windows are leaky and are difficult to operate including the sun shading devices.

A refurbishment concept was developed by the architects PASD-Feldmeier Wrede (Germany), in respect to the architecture of the building as a protected ensemble.

Figure 12: Photography of north façade corner, Von-Melle-Park 5, 2016. PASD Architekten. Feldmeier Wrede. Photography taken by Mariia Tumanovska, 02/2016.

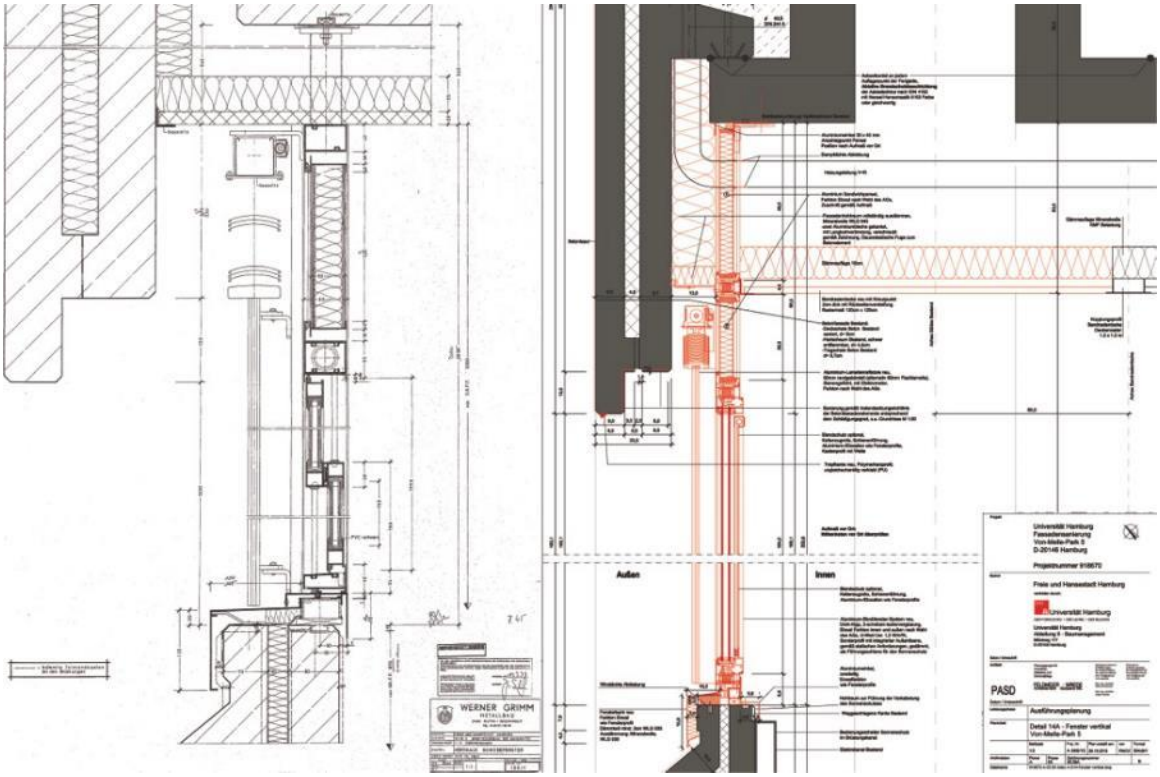

Figure 13: Vertical window section, built situation and refurbishment. Werkplanung 1971: Werner Grimm Metallbau Eutin. Ausschnitt Werkplanung 2016: PASD Architekten. Feldmeier Wrede

The sliding aluminum windows were installed in the early seventies. These windows provide no thermal separation but were assembled with insulated double-glazing.

To bridge the structural height of 2.60 m, hollow section columns were mounted according to the secondary grid of 1.20 m. The hollow columns are used to attach the window elements vertically. All window constructions end at 2.60 m, aligned with the edge of the dropped ceiling, which runs further above the framed windows into the exterior of the facade. This void is also used to accommodate pipes for the heating system, which lead behind the prefabricated panels to the floors above.

Remaining inoperable for years are the sun-shading devices, which was to be centrally monitored and controlled by the South facing elevation.

In the frame of the obligatory analysis of the existing building, the commissioned replacement of the windows evolved into an extensive issue. The refurbishment plans include a vapour tight window construction aligned with the insulation of the exterior wall element. To compensate for the dewpoint at the bottom of the window, the windows will be insulated.

Integrating a structural pilaster strip will strengthen the window frames. These pilasters can also be utilized for the subsequent assembly of the sun-shading device. Window elements will be realized with aluminum framing in an anodised coloured tone modelled after the existing facade.

The dropped ceiling will be reduced according to the depth of the room, replacing the insulation material. Penetrating heating pipes through the sandwich panels will be sealed and taped airtight. To prevent condensation, the voids in the facade will be filled with additional insulation. The envelope facing south will be installed with a sun-shading device, which can be individually controlled by the users.

A dismantling of contaminated building materials will be undertaken during the course of the refurbishment of the windows. Applied asbestos plates as well as batten insulation will be removed. Asbestos cords, which were inserted to the points of support, will be coated with a bonding paint.

To maintain the appearance of the facade, the concrete panels will be cleansed and damaged spots repaired. The drainage line on the panels will be re-profiled. The concrete panels will be coated with a water repellent in the final process. All seals will be substituted with current compression tape along the joints and seams.

Figure 14: Visualisation of north façade corner, Von-Melle-Park 5, 2016. PASD Architekten. Feldmeier • Wrede. Visualisation made by Mariia Tumanovsk

3. CONCLUSION

The three chapters of this paper give a coherent detailed view on the discourse around buildings in existing contexts. Not only giving a view on the hidden potentials in the built environment for densification through extensions, primarily to the roof-top, but also a view on individual buildings. As case studies they deliver important strategies of approaching this area of concern towards renewable existing urban environments, which may be transferred to similar contexts.

Only through initial analysis, which delivers a deep understanding of the building in its object character and assessment of its social cultural and economic value, can appropriate decisions be made.

A detailed focus on the building components is inevitable, if refurbishment aiming at improvement of utilization and performance are to be brought in accordance with the quality of appearance. Comprehensively respecting these aspects signifies adding to the quality of the urban fabric.

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