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Examination of Interventions and Defects on Façades: The Case of Selamsız Low-Cost Mass Housing in Istanbul, Türkiye

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Abstract

Conservation of 20th century mass housing is discussed considering their heritage value. On the other hand, intervention might be required since they do not meet the today's requirements and defect might have occurred. In that case, primary objective should be the managing of changes to sustain existing building stock. Within the study, the current situation of one of the modern period mass housing projects in Istanbul/Türkiye Selamsız Low-Cost Mass Housing was documented for interventions and defects on the front façade. Besides, determining the frequency of intervention and defects, examining relations between them and external factors, and identifying reasons for the interventions were also aimed. Data collected about 108 existing buildings and photographic research was made through literature review/archive search/site visits. Collected data were evaluated with a systematic order. As a result, almost half of the defects are caused by interventions on building/element/component scale to fulfil spatial and performance requirements.

Keywords: *Mass housing, façade, intervention, defect, building element/component.*

Cephelerde Müdahale ve Hasarların İncelenmesi: Selamsız Ucuz Evler Örneği İstanbul, Türkiye

Öz

20. yüzyılda inşa edilen toplu konutların miras değerleri; sosyal, ekonomik ve teknolojik sebepler nedeniyle tartışılmaktadır. Diğer taraftan; günümüz mekânsal, performans ve teknolojik gereksinimlerini sağlayamamaları ve süreç içerisinde çeşitli hasarların meydana gelmesi sebebiyle bu yapılara müdahale etmek gerekebilir. Mevcut yapı stokunu ve bunların miras değerini sürdürmek için yapılacak müdahaleyi planlamak temel amaç olmalıdır. Bu doğrultuda çalışma kapsamında; İstanbul/Türkiye'deki 20. yüzyıl toplu konutlarından biri olan Selamsız Ucuz Evlerinin ön cephelerinde yer alan müdahaleler ve hasarların incelenmesi amaçlanmıştır. Bunun yanında; müdahaleler ve hasarların sıklığı ile bunların dış etmenlerle (cephe yönelimi, daire/kat sayısı, yol seviyesine göre konum) arasındaki ilişkinin tespit edilmesi hedeflenmiştir. Mevcut 108 yapı, alan gezileri sırasında fotoğraflanarak belgelenmiş, yapılara ait bilgiler literatür ve arşiv taramaları doğrultusunda derlenmiştir. Müdahale ve hasarlar ile ilgili elde edilen veriler yapı, eleman ve bileşen ölçeğinde, hiyerarşik bir düzen içerisinde incelenmiştir. Sonuç olarak; hasarların neredeyse yarısının mekân/performans gereksinimlerini iyileştirmek için bina/eleman/bileşen ölçeğinde uygulanan müdahaleler kaynaklı olduğu tespit edilmiştir.

Anahtar kelimeler: *Toplu konut, cephe, müdahale, yapı elemanı/bileşeni.*

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1. Introduction

In the 18th century, in England, the developments in the production process, which is called the Industrial Revolution caused changes in construction technology, and social, cultural, and economic fields (Albrecht, 2012). On the contrary to the developments, increasing immigration to the industrial city centres caused insufficient working and living conditions with lack of health care, education, and social and infrastructural services (Albrecht, 2012; Henket, 1998). In the 20th century, the housing problem had increased exponentially with the post-war demolition (Henket, 1998; ICOMOS, 2017; MacDonald, Burke, Lardinois, & McCoy, 2018). For this problem, a solution was found in line with the reason i.e., Industrial Revolution. Through construction and production techniques brought by the developing technology and material's potential, mass housing was built by considering health conditions, mass production, affordability, function, and simplicity (Henket, 1998; ICOMOS, 2017; MacDonald et al., 2018; Tostões, 2018; Vos & Storgaard, 2018).

Housing problem started to emerge within the current borders of Türkiye due to population exchanges in the last periods of the Ottoman Empire and the first years of the Republican Period. At the beginning of the 1930's, this problem has been tried to be solved with the workers' houses within the factory premises established with government support, however, these attempts were interrupted because of Great Depression and World War II (Sey, 2007). Although Türkiye remained out of the war and did not suffer any destruction, it was still affected (Hasol, 2017; Sey, 2007; Tapan, 2007; Tekeli, 2007). At the end of the 1940's, the political changes and mechanization in agriculture accelerated the migration to the cities such as Ankara, Istanbul, Izmir, etc. from the rural areas (Hasol, 2017). The population of the cities, which increased by 3% per year in the 1920's, started to increase by 9% after the 1950's (Cem, 2021). As a result of this rapid and uncontrolled urbanization, the existing housing stock became insufficient and squatter zones almost have become to contain 40-50% of the urban population (Tapan, 2007). In the architectural magazines of the period, e.g., in Arkitekt, the housing problem was discussed especially for Istanbul and the reason of the housing problem was attributed to the lack of cooperatives similar to those that provide rapid housing production in Europe, the cost of construction materials, the lack of production of building materials, and the rapidly increasing number of squatter houses (Kessler, 1949; Sayar, 1946). To solve the housing problem, Emlak Kredi Bankası (Emlak Kredi Bank) was established in 1946, Bina Yapım Teşvik Kanunu (Building Construction Incentive Law) and İmar Kanunu (Building Law) were published in 1948 and 1956, respectively. Apart from these, Ucuz Evler Yarışması (Low-Cost Houses Competition) was organized by Istanbul Municipality and İstanbul Belediyesi Tarafından Taksitle Satılacak Ucuz Evler Yönetmeliği (Regulation on Low-Cost Houses to be Sold by Istanbul Municipality in Instalments) was published in 1950. The scope of these attempts was facilitating the loans to be used for house construction, land, and materials, and specifying minimum dimensions and requirements for the houses (Bina Yapım Teşvik Kanunu, 1948; İmar Kanunu, 1956; Istanbul Belediyesi Tarafından Taksitle Satılacak Ucuz Evler Yönetmeliği, 1950; Özdoğan, Feridun; Balkan, Aydemir & Arpat, 1950).

Conservation of these buildings constructed in the 20th century started to be discussed in the world in the early 1990's, and in Türkiye in the 2000's (Polat & Can, 2008) since they are the evidence of that period's historical, social, economic, and scientific characteristics, and construction technology even if they are not monumental (Henket, 1998; ICOMOS, 2017; Macdonald, 1996; Vos & Storgaard, 2018). However, modern period mass housing was designed solution with specifically to its function, its materials and technology are not long-lasting, and there are lack of spatial and technological performances expected today; thus, interventions are made to upgrade their performance or to reuse with a different function, and even might be demolished (de Jonge, 2017; Henket, 1998; Macdonald, 1996; Vos & Storgaard, 2018). In other words, interventions might be required and inevitable to sustain modern period building stock. This situation is taken into consideration in the New Delhi Document as managing changes in Articles 5, 6, 7, and 9, and it is highlighted that in the case where intervention is necessary, it must be considered within the integrity and authenticity of the building (ICOMOS, 2017). In short, it is important to understand and document modern period building stock as soon as possible, to manage the conservation process considering the cultural significance of their original design, and also later additions (Henket, 1998; ICOMOS, 2017; Vos & Storgaard, 2018).

To plan a proper conservation process, it is important to understand the current situation of the building, user needs, and requirements and restrictions defined by law, regulation, and conservation board. Within the scope of the study, it is aimed to document the current situation of one of the modern period mass housing projects constructed with the initiative of the Municipality in 1950's in Istanbul, Türkiye. Selamsız Low-Cost Mass Housing in Uskudar, which is a district in Istanbul, is one of the great examples of its period with its construction techniques, materials, plan types, façades, etc., and also, it has particular importance since most of the buildings still preserve their original function. In that context, the main objective of the study is documenting the interventions and defects of that mass housing. Documentation is made over the façade, where interventions and defects are seen more since it is part of the envelope that separates the external and internal environments. Besides the main objective, there are some additional objectives intended to be achieved as a result of the examination of the documented data, and these are:

- Determining the frequency of interventions and defects
- Identifying reasons for interventions and thus assessing user needs
- Determining the relations between interventions, defects, and external factors such as direction, number of living units, height according to road level, etc.

In the following sections, a brief literature review is presented. The analysis method, which was developed in line with the literature research, is explained with the information about Selamsız Low-Cost Mass Housing. Afterward, with the proposed methodology, the interventions, and defects on the front façade of the buildings were presented and analysed in a systematic order. Results of the analysis are then presented to understand the additional objectives mentioned above. Finally, the results are discussed in line with the literature review.

2. Literature Review

In BS EN 15978 (2011), the building lifecycle is divided into four phases as (i) the product (row material supply, transport, and manufacturing), (ii) construction process (transport and construction-installation process), (iii) use (use, maintenance, repair, replacement, and refurbishment), and (iv) end of life (de-construction, transport, waste processing, and disposal). Douglas (2006), on the other hand, added maintenance/adaptation, irreversible building obsolescence, and building fully obsolescence phases between usage and demolition phases. As mentioned in Section 1, interventions might be made to modern period buildings to upgrade and extend their service life, and these are divided into two as maintenance and adaptation by Douglas (2006). While the maintenance interventions are made to protect the building in its current situation, to prevent and/or repair simple defects; adaptation means either to improve the building with its current function or to reuse it with a different function (Douglas, 2006). In line with the objective of the study, literature related to defects and their repair methods, interventions made on different scales, and documentation/analysis of the defects/interventions on mass housing is reviewed.

There are studies on the defects that are either generally observed in the buildings (Abbott, McDuling, Parsons, & Schoeman, 2007; Faqih, Zayed, & Soliman, 2020; Guo, Wang, & Li, 2021; Macarulla et al., 2013; Richardson, 2002) or specifically on the façade (Amaro, Saraiva, de Brito, & Flores-Colen, 2013; Çelik, Ergin, Dal, & Ay, 2023; Ertemir & Edis, 2022; Pereira, Silva, Brito, & Silvestre, 2020), and some of them consider heritage value too. Amaro et al. (2013) and Pereira et al. (2020) offer methods for inspection and diagnosis of defects on the wall covered with thermal insulation composite system and rendered façade, respectively. On the other hand, Ertemir & Edis (2022) develops an inspection approach, especially for the rendered-painted façade defects in modern period mass housing.

Defects and repair of the façade are discussed together in some of the research. Sá et al. (2015) work on inspection, diagnosis, and repair techniques (e.g., full/partial replacement, cleaning, application of new finishing, etc.) of rendered wall. Madureira et al. (2017) examine defects and repair techniques similarly and offer repair techniques according to the priority level of defects. Apart from these, Okumuş (2020) and Okumuş & Eren (2020) focuses on one part of the façade i.e., windows, and develops inspection, diagnosis, and repair methods considering components of the window (frame and infill i.e., glass, insulation, and complementary parts).

Some of the studies examined interventions made to improve and reuse buildings (Çakır & Edis, 2022; Douglas, 2006; Engin, 2009). Douglas (2006) classifies interventions for the maintenance/adaptation of the building as extensions (i.e., vertical/horizontal additions), structural alterations (e.g., changes in façade opening, form of the roof, etc.), and refurbishment (e.g., spatial arrangement, change/addition of finishing/insulation layer, etc.). In other words, while the extensions affect the mass, structural alterations, and refurbishments are related to elements, and parts of the elements respectively. Engin (2009) and Çakır & Edis (2022) develop an approach to examine existing reused industrial facilities, and they both evaluate interventions in element scale as additions and removals considering the original situation. Besides, Yaman & Arpacıoğlu (2021), attract attentions on adaptive façade system which enhance performance parameters. Considering existing building, this technology can be implanted on the existing building façade, too.

There are studies that examine the current situation of mass housing considering its heritage value. Öztürk (2020) examines the Selamsız Low-Cost Mass Housing's current situation and its authenticity according to the alterations on the façade, mostly from a conservation perspective. Similarly, Erdal et al. (2020) study another mass housing project i.e., Koşuyolu Neighbourhood, and discuss the buildings' current situation under layout and architectural character. Havinga et al. (2020a, 2020b) aim to manage changes during refurbishment considering heritage value under four scale levels; area, ensembles, building, and building element. Besides, Koman (2021), examines innovation in building technology during modernism period in the context of Walter Gropious's works and also mentions on "housing industry".

In short, although the interventions are briefly mentioned in the studies examining the current situation of modern period housing, the damages and interventions seen in the buildings have not been examined in detail.

3. Methodology

The study to document the current situation of the modern period mass housing's interventions and defects on the front façades, and to examine the frequency of interventions/defects, their relations to each other and with external factors through an example of 131 buildings of Selamsız Low-Cost Mass Housing, consists of three phases. These are (i) data collection, (ii) analysis of interventions and defects on the front façade, and (iii) comparative evaluations of findings.

3.1. Data Collection

In the first phase, information about Selamsız Low-Cost Mass Housing was collected from the literature, the archive of Üsküdar Belediyesi İmar ve Şehircilik Müdürlüğü (Uskudar Municipality Directorate of Construction and Urban Planning), and the photographic record made through site visits in November 2021. Although the original project could not be obtained directly, the renovation projects of some of the buildings with small additions were attained, and their original situations were determined through them.

The construction process of 131 buildings was started in 1950 and completed in three stages as shown in Table 1 (Öztürk, 2020). All of the buildings were constructed with almost similar construction techniques and materials, such as rendered brick masonry walls, strip foundations, gable roofs, timber windows and doors (Uskudar Municipality Directorate of Construction and Urban Planning Archive, n.d.). On the contrary, there are differences in typologies in terms of the number of stories/dwellings (single/multi-family house), façade organization (e.g., with/without balcony), and position to the road level (at the same level as the road, below or above the road). To facilitate and systematize the study, the codes are given to the buildings (B) according to their stages (S) and typologies (T) (e.g., S1_T1_B01 to refer to stage 1, type 1, building 1).

Table 1. General information about buildings according to construction stage

General Information	Examples (close to original version) (Çakır, 2021)
Construction Stage: 1st stage **Construction Year:** 1950-1952 **Contractor Institution:** Istanbul Municipality **Number of Building:** 50 T1 – 24 T2 – 26	 a) **T1** – Two-story/single-family house, at road level, without balcony (S1_T1_B01-B24) b) **T2** – Two-story/single-family house, at road level, with balcony, entrance door located inside of the façade (S1_T2_B25-B50)
Construction Stage: 2nd stage **Construction Year:** 1957-1959 **Contractor Institution:** Electricity, Gas, and Motor Vehicle Workers Union Construction Cooperative **Number of Building:** 25 T3 – 7 T4 – 5 T5 – 13	 a) **T3** – Two-story/multi-family house, below the road (S2_T3_B01-B07) b) **T4** – Two-story/multi-family house, at road level (S2_T4_B08-B12) c) **T5** – One-story/single-family house, at road level (S2_T5_B13-B25)
Construction Stage: 3rd stage **Construction Year:** 1958-1962 **Contractor Institution:** Istanbul Union of Workers Construction Cooperative **Number of Building:** 56 T4 – 2 T6 – 36 T3 – 18	 a) **T4** – Two-story/multi-family house, at road level (S3_T4_B1, S3_T4_B6) b) **T6** – Two-story/multi-family house, above the road (S3_T6_B2-B5, S3_T6_B7-B20, S3_T6_B30-B47) c) **T3** – Two-story/multi-family house, below the road (S3_T3_B21-B29, S3_T3_B48-56)

Although the example buildings are close to original version, various interventions and defects were observed while the photographs were taken during site visit. Prefix S, T, and B refers to stage, type and building respectively. Building codes are shown in the Figure 1.

In the current situation given in Figure 1, which was detected on the site visit, 23 of 131 buildings (18%) were destroyed. Among the existing ones, 93/108 are used for residential purposes, 11/108 are used for commercial purposes, while the rest of them (4/108) are neither used nor there is clear information about them. It has been determined that buildings that are adapted to different functions such as cafe, kindergarten, dentist, pharmacies, etc., are generally located on Gazi Main Street and Yeniocak Street, which form the boundary of the region.

The building located on the left side of the S3_T6_B30 (Figure 1), is not seen on the satellite image of 1966, which is the first image of the in which examined mass housing is appeared (Istanbul Metropolitan Municipality, n.d.), and is located in the same parcel with the S3_T6_B30 on the plan (General Directory of Land Registry and Cadastre, n.d.). For all these reasons, it is not included in the scope of the study.

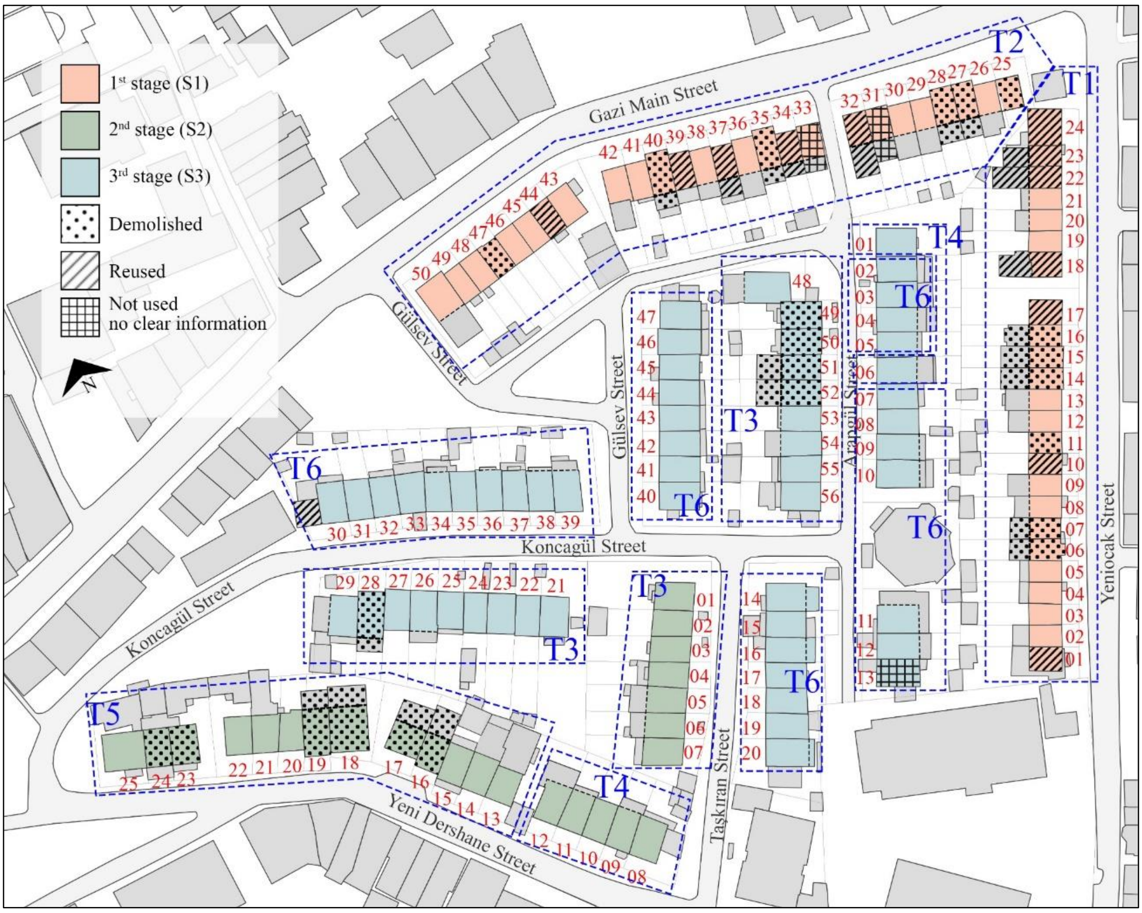

Figure 1. Layout plan (According to site visit in 2021. The original parts of the buildings are coloured, additions to them are given in grey colour - Adapted from plan taken from Uskudar Municipality Directorate of Construction and Urban Planning Archive)

3.2. Analysis of Interventions and Defects

In the second phase of the study, an analysis method has been developed to document the interventions and defects seen on the front façades of the buildings. First of all, the buildings are considered as a system and evaluated in hierarchical order as a subsystem, element, and component (Çakır & Edis, 2022; Douglas, 2006; Havinga et al., 2020a, 2020b). The subsystem and elements are divided into four groups as; (i) the structural system (masonry structural wall, skeletal structural member, foundation, and floor), (ii) envelope (non-structural external wall, wall opening, and roof), (iii) spatial dividers (non-structural internal wall, circulation element), and (iv) mechanical system (ISO 19208:2016; Rush, 1986). The functional components of these elements are accepted to be the core (structural component), protective layer, finishing layer, and complementary component(s).

Considering this hierarchy and literature review, documentation and analysis of the interventions and defects on the front façades of 108 buildings of the Selamsız Low-Cost Mass Housing that still exist today, consist of two stages, which are the analysis of the (i) interventions, and (ii) defects.

3.2.1. Analysis of the interventions

Analysis of the interventions is made in three hierarchical levels as building, element, and component benefiting from the literature review (Çakır & Edis, 2022; Douglas, 2006; Engin, 2009; Havinga et al., 2020a; Öztürk, 2020) given in Section 2.

The first level contains interventions at building scale that affect the whole building which are made to improve or reuse it and are divided according to the type of the area that is created additionally (i.e., open, and close), and the direction of the intervention (i.e., vertical, and horizontal). In the second level, interventions on the external wall and wall openings (i.e., window/door) which are the elements of the façade subsystem made to repair/refurbish/reuse of building are examined. Besides, rare interventions related to other building elements such as the addition of vertical skeletal element, fire escape stair, changes/removal of the roof, etc. are also considered because they affect the façade visually. In short, in the study, interventions in the external masonry wall, window/door, and other elements (i.e., skeletal structural member, circulation element, and roof) are examined. The last level contains interventions at component scale which are related to the functional parts of the elements such as finishing or protective layer. Through these examinations, intervention types identified during site visit, element/component that was intervened, and their codes are given in Table 2.

Table 2. Intervention types at the scale of building/element/component

Scale	Intervention Type	Code
Interventions at Building Scale (BS)	Interventions to create additional open spaces	
	Addition of entrance canopy	**BS1**
	Addition of pergola (connected with the building)	**BS2**
	Changes in the form of the entrance terrace (lengthening, widening, reorientation)	**BS3**
	Interventions to create additional closed spaces	
	In horizontal direction – Expansion of the floor spaces (in single floor/through the whole building)	**BS4**
	In vertical direction – Addition of floor	**BS5**

Scale	Intervention Type	Element that is intervened	Code
Interventions at Element Scale (ES)	Changes in the size/form of the window/door	Masonry wall – window/door	**ES1**
	Changes in the number of window/door (opening a new one or closing the existing one)	Masonry wall – window/door	**ES2**
	Addition of circulation element (e.g., fire escape stair)	Other elements	**ES3**
	Addition of skeletal structural member (e.g., column to support additional floor)	Other elements	**ES4**
	Intervention to the roof (changes of the form or removal of partially/fully)	Other elements	**ES5**

Scale	Intervention Type	Element that is intervened	Component that is intervened	Code
Interventions at Component Scale (CS)	Addition of external thermal insulation	Masonry wall	Protective layer	**CS1**
	Changes in finishing layer (throughout the façade, socle region or skirting level)	Masonry wall	Finishing layer	**CS2**
	Addition of decorative elements to the façade	Masonry wall	Complementary	**CS3**
	Material changes in the window/door frame	Window/door	Core	**CS4**
	Intervention to the sill (Material change or addition of new one)	Window/door	Complementary	**CS5**
	Addition of protective elements in front of the windows (window security bars, shutter)	Window/door	Complementary	**CS6**

3.2.2. Analysis of the defects

The second stage of the methodology is the analysis of the defects seen on the masonry wall and window/door benefiting from the literature given in Section 2 (Amaro et al., 2013; Ertemir & Edis, 2022; Pereira et al., 2020). The defects observed through site visits, the elements that are damaged, the zone of the defects, and their codes are given in Table 3. During site visits, since inspections were visual, the exact components with the defect could not be determined especially for the masonry wall, and all of them were accepted to be on the finishing layer. Although this acceptance has been made, it has also been observed that the defects were concentrated in certain zones. For this reason, contrary to the interventions, in the examination of the defects, it was preferred to give the region instead of the component in which the defect was seen. A masonry wall is divided into parts as the surrounding of the window/door, socle region, additional/adjacent building-related surface, and plumbing-related surface, and entire wall surface except aforementioned parts, while the window/door is classified as frame, infill (i.e., glass), sill, and window security bar. Regarding the window/door, the grouping components and zones are parallel to each other. For instance, frame/glass can be considered as core, and sill/security bar can be taken as a complementary component.

Table 3. Defects on masonry wall and window/door

Type of Defect	Element that is observed	Zone of defect	Code
Biological formation	Masonry wall	Surrounding of the window/door, Socle region, Additional/adjacent building-related surface	**DE1**
Efflorescence	Masonry wall	Surrounding of the window/door, Socle region, Additional/adjacent building-related surface	**DE2**
Corrosion	Window/door	Window security bar	**DE3**
Cracks	Masonry wall	Entire wall surface, Surrounding of the window/door, Socle region, Additional/adjacent building-related surface, Plumbing-related surface	**DE4**
Bubbling-spalling	Masonry wall	Entire wall surface, Surrounding of the window/door, Socle region, Additional/adjacent building-related surface, Plumbing-related surface	**DE5**
	Window/door	Window/door frame, Sill	
Discoloration/colour changes	Masonry wall	Entire wall surface, Socle region, Additional/adjacent building-related surface, Plumbing-related surface	**DE6**
	Window/door	Window/door frame, Sill	
Surface irregularities (roughness, point holes)	Masonry wall	Entire wall surface, Surrounding of the window/door, Socle region, Additional/adjacent building-related surface, Plumbing-related surface	**DE7**
Material loss	Window/door	Window/door frame, Window infill (i.e., glass)	**DE8**

3.3. Comparative Evaluations of Findings

General information (current situation, function, direction), interventions (at the scale of the building/element/component with the codes and where they are observed), and defects (types, element/component location that are observed, codes) on 108 buildings are listed together in a spreadsheet computer program at the end of phase 1 and 2. In the last phase of the study the collected data are evaluated. First, the incidence of the data obtained from each stage of the analyses is taken separately. Considering the frequency of the interventions observed in each building type, it is aimed to identify reasons for interventions and in turn, to determine user needs related to spatial and thermal performance, and against water leakage. Then, the reason and frequency of the defects are examined to find their relation to interventions. On the contrary of interventions analysis, in the evaluation of the defects, building types are neglected, since no significant difference was observed for the building types. Finally, the relation of the intervention and defects with the other factors is discussed.

4. Results and Discussion

As a result of the analyses, the number and frequency of interventions and defects detected on the front façades of 108 buildings of the Selamsız Low-Cost Mass Housing are evaluated separately for each building type.

4.1. Evaluation of the Interventions

The interventions implemented to the buildings at the scale of building/element/component are given in Table 4 for each building type. Regarding incidences, CS – Interventions at Component Scale are found to be the most common intervention and seen in all of the buildings (108/108), followed by BS – Interventions at Building Scale (79/108), and ES – Interventions at Element Scale (35/108), respectively. CS could be completed without requiring relatively much change and budget such as changes of the finishing layer of the façade, changes of window frames, sill, etc. On the other hand, the preference of this intervention, which is related to performance requirements such as thermal insulation, waterproofing, etc., can be interpreted as the buildings do not provide the required performance level of the housing function. BS were generally implemented to customize the entrance areas of the building that are directly related with the exterior. Similarly, it is observed that the ES applied for the spatial requirements, were preferred less since it required changes in both external masonry wall and window/door. In addition, since external masonry walls are load-bearing elements at the same time, the intervention possibilities are limited.

Table 4. Total number and frequency of intervention types at the scales of building/element/component

Int. Scale	Int. Type	Building Type and Number T1 18	T2 20	T3 20	T4 7	T5 7	T6 36	Total[1] 108	Total[2] 108
Interventions at Building Scale (BS)	**BS1**	7 – 38.89%	7 – 35.00%	11 – 55.00%	2 – 28.57%	2 – 28.57%	24 – 66.67%	**53 – 49.07%**	**79**
	BS2	1 – 5.56%	–	–	1 – 14.29%	–	1 – 2.78%	**3 – 2.78%**	
	BS3	–	–	–	–	–	6 – 16.67%	**6 – 5.56%**	
	BS4	10 – 55.56%	15 – 75.00%	2 – 10.00%	–	4 – 57.14%	3 – 8.33%	**34 – 31.48%**	
	BS5	–	5 – 25.00%	4 – 20.00%	–	–	13 – 36.11%	**22 – 20.37%**	
Interventions at Element Scale (ES)	**ES1**	11 – 61.11%	9 – 45.00%	2 – 10.00%	–	-	–	**22 – 20.37%**	**38**
	ES2	3 – 16.67%	15 – 75.00%	–	–	1 – 14.29%	1 – 2.78%	**20 – 18.52%**	
	ES3	1 – 5.56%	–	–	–	–	–	**1 – 0.93%**	
	ES4	–	–	–	–	–	1 – 2.78%	**1 – 0.93%**	
	ES5	–	2 - 10.00%	1 - 5.00%	–	–	–	**6 – 5.56%**	
Interventions at Component Scale (CS)	**CS1**	5 – 27.78%	10 – 50.00%	5 – 25.00%	–	–	11 – 30.56%	**31 – 28.70%**	**108**
	CS2	7 – 38.89%	11 – 55.00%	6 – 30.00%	2 – 28.57%	2 – 22.22%	11 – 30.56%	**39 – 36.11%**	
	CS3	4 – 22.22%	10 – 50.00%	5 – 25.00%	–	–	12 – 33.33%	**31 – 28.70%**	
	CS4	17 – 94.44%	18 – 90.00%	20 – 100.00%	7 – 100.00%	7 – 100.00%	36 – 100.00%	**105 – 97.22%**	
	CS5	13 – 72.22%	17 – 85.00%	19 – 95.00%	6 – 85.71%	5 – 71.43%	36 – 100.00%	**96 – 88.89%**	
	CS6	16 – 88.89%	18 – 90.00%	18 – 90.00%	7 – 100.00%	5 – 71.43%	28 – 77.78%	**92 – 85.19%**	

Int.: Intervention. Building types are given in Table 1. Intervention codes are given in Table 2.
Intervention percentages are calculated per building type in the building type and number columns.
Total [1]: Total number and percentage of the interventions of 108 building for each intervention type.
Total [2]: Total numbers of interventions for each intervention scale.

In the following paragraphs, findings of each intervention scale are discussed and exemplified separately:

- BS – Interventions at Building Scale: Among 79 building that intervened at building scale, in 29/79 buildings, intervention types to create only open spaces (BS1, BS2, BS3), in 23/79, interventions to form closed additional spaces (BS4, BS5), and in 27/79 buildings both were preferred. The most common intervention type is BS1 – Addition of entrance canopy (53/108) and was generally preferred to create a covered area in front of the entrance door, regardless of building type (Figure 2-a). The second line is BS4 – Expansion of the floor spaces (in single floor/through the whole building) horizontally (34/108) and specifically implemented in T2 to include the empty spaces in front of the entrance door to the interior space as an entrance hall (Figure 2-b). In addition, there are examples where the floor area is expanded only on the ground floor or throughout the building side façade, especially in the buildings located at the corner. However, the expansions made on a single floor (32/34) were observed to be preferred more than the expansions made through the whole building (2/34). BS5 – Addition of floor in vertical direction (22/108) is the third in line, and generally was applied in T6, since this type of building is multi-family house, and the usable area is considerably small in comparison to the single-family house (Figure 2-c). Intervention types BS2 - Addition of pergola (connected with the building) (Figure 2-d) and BS3 - Changes in the form of entrance terrace (lengthening, widening, reorientation) were applied relatively less according to others (Figure 2-e). Although many pergolas have been built in the gardens, very few of them are connected to the building which are excluded from the scope of the study.

Figure 2. Examples for BS (Hatice Yasemin Çakır, 2021); **a)** BS1 (S1_T1_B13, S3_T6_B10); **b)** Entrance that close to original version (left) (S1_T2_B46), BS4 (the others) (S1_T2_B45, S1_T2_B39, S1_T1_B02, S3_T6_B12); **c)** BS5 (S3_T6_B39); **d)** BS2 (S3_T4_B06); **e)** entrance terrace that close to original version (left) (S3_T6_B30), BS3 (right) (S3_T6_B42)

- ES – Interventions at Element Scale: Among the intervention types at the element scale, the ones that affect external masonry wall, and window/door were applied mostly (33/38), according to other ones that related to other elements (5/38). ES1 – Changes in the size/form of the window/door (22/108), and ES2 – Changes in the number of window/door (20/108) have been determined relatively high compared to others. These two intervention types were generally preferred in T1 and T2 (Figure 3-a, b), since they are single-family houses which have one decision maker, and also on the first-floor, the number and dimension of the windows are not adequate. These are followed by ES5 – Intervention to the roof (3/108) with relatively less frequency (Figure 3-c). It is thought that to create a usable flat roof, the roof was removed partially/fully. The least common intervention types are ES3 – Addition of circulation element, and ES4 – Addition of skeletal structural member, and both were made in only one building (1/108). In one of the reused buildings as a kindergarten, steel fire escape stair was added to the front façade (Figure 3-d), while in the other one that was still used for housing purposes, the vertical skeletal structural member was added to support an additional floor (Figure 3-e).

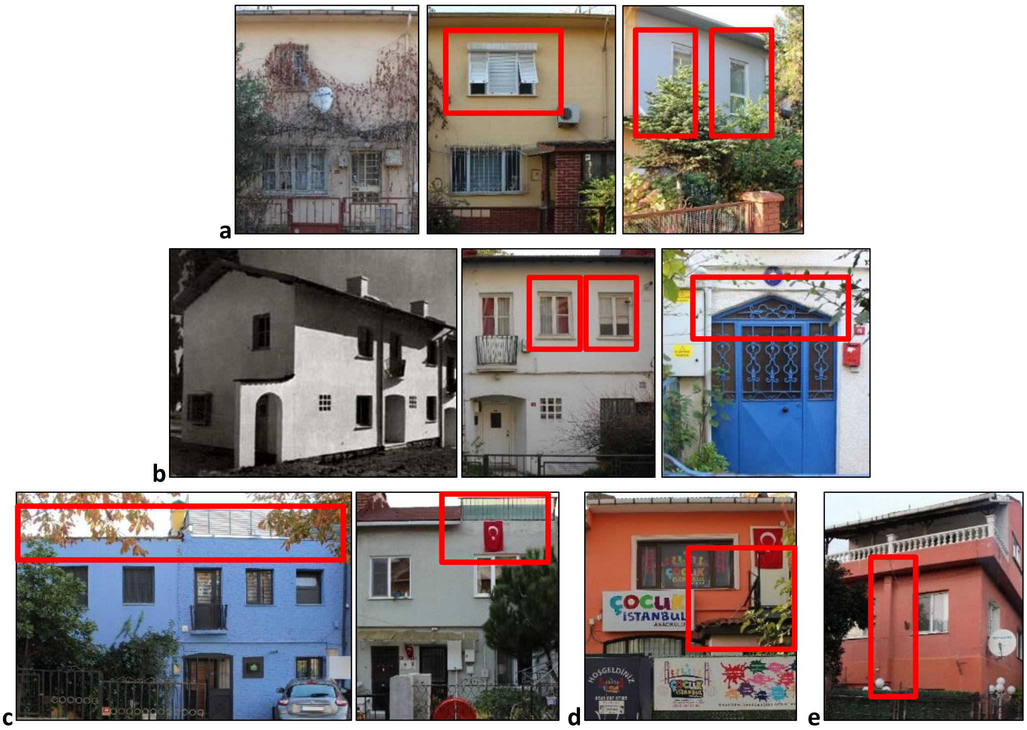

Figure 3. Examples for ES (Hatice Yasemin Çakır, 2021); **a)** façade that close to original version (left) (S1_T1_B03), ES1/ES2 (the others) (S1_T1_B04, S1_T1_B09); **b)** original photographs of T2 (left) (Uskudar Municipality Plan and Project Directorate Archive, n.d., as cited in Öztürk, 2020), ES1/ES2 (the others) (S1_T2_B46, S1_T2_B44); **c)** ES5 (S1_T2_B33_B34, S3_T3_B23); **d)** ES3 (S1_T1_B23); **e)** ES4 (S3_T6_B39)

- CS – Interventions at Component Scale: Interventions at components of both window/door and masonry wall are detected in 57/108 buildings, while in 51/108 of them only interventions on window/door are determined (CS4, CS5, CS6). In short, interventions at component scale were only implemented in the window/door of the buildings. CS4 – Material changes in the window/door frame, which is the core of the window/door, is the most common intervention type, observed in almost all buildings (105/108). The wooden window/door were renewed with PVC in the window, iron/steel in the door, and their original partitions were not preserved (Figure 4-a). The reason of this intervention is probably insufficient thermal insulation, water leakage, and security problems. The second line is CS5 – Intervention to the sill one of the complementary components of the window/door (96/108) and probably was made with similar reasons as the previous one. CS5 is seen in two different ways as changes of the sill with a new one (81/96), and the addition of a new sill on top of the existing one (6/96) (Figure 4-b). The third mostly seen intervention is CS6 – Addition of protective elements in front of the window (92/108), which is the complementary component (Figure 4-c). Due to the security reasons, generally, window security bars were added on the ground floor, and sometimes on both floors. It is followed by, CS2 – Changes of finishing layer which is the intervention to the finishing layer of the masonry wall (39/108). CS2 is seen in three different ways, as changes in the material of the entire wall surface (18/39), socle region (8/39), and skirting (13/39) (Figure 4-d). In 6 of the 11 reused buildings, the façade finishing material observed to be changed with stone, brick, etc. However, it would not be directly associated with the reuse, because it has been determined that PVC cladding is widely preferred in some of the buildings that still maintain residential function. In short, it is thought that material changes in socle region, and skirting is made to protect buildings from water infiltration and splash water. While for the material change in entire surfaces thermal performance could be the important factor, besides water infiltration. The fifth line is CS1 – Addition of thermal insulation and CS3 – Addition of decorative elements to the façade which are related to the protective layer and complementary component of the masonry wall and are the least implemented (31/108). It is estimated that decorative elements located around the window and on wall edges were added during the application of thermal insulation material (Figure 4-e).

Figure 4. Examples for CS (Hatice Yasemin Çakır, 2021); **a)** window/door that close to original version (left) (S1_T1_B12), CS4 (right) (S1_T1_B05); **b)** CS5 (S1_T2_B43, S1_T2_B45); **c)** CS6 (S2_T3_B05); **d)** CS2 (S2_T3_B05, S1_T1_B04, S1_T2_B37); **e)** CS3 (S3_T3_B56)

In short, these unplanned interventions cause the loss of original details of the buildings. As in the study, Havinga (2020a) presents these type of interventions as "negatively values attribute" which means interventions that have a negative impact on the front and rear façade in different scale. In building scale, addition of the storages of the ground floors are evaluated as negative impact on heritage value since causing changes on the window/door of the façade. While in the element scale, applying thermal insulation to the external side of the façade, loss of fenestration, window frames replaced by PVC, addition of entrance canopy and snoops, etc. are taken as negative interventions. These results are consistent to the results presented above, especially in the case of addition of entrance canopy, changes in the number/form/size of the window, and changes in the material of the window. However, in this study, while the component scale was descended to a lower scale, Havinga (2020a) started to examine the case studies from a broader scale as area, and ensemble. In the study conducted by Erdal et al., (2020), interventions such as addition/expansion of floor, additions to the garden are considered as interventions that affect mass organization and cause the building to lose its originality. These are parallel to the building scale interventions mentioned in this paper, except additions to the garden, since in this study only interventions that related to the front façade are taken consideration.

4.2. Evaluation of the Defects

Analysis on the defects shows that; among the 108 buildings that exist, there are defects in different dimensions in the 83/108 buildings, while the remaining 25/108 buildings do not have any defects as they probably have been repaired recently (Table 5). In the 72 of the 83 buildings, defects are located only on the masonry wall, and both on masonry wall and window/door in the 11 of them. Concerning the incidences (T1-P1, T2-P2), entire wall surface (71/232), surrounding of the window/door (56/232), and socle region (43/232) are the most defected zones, respectively. The most common defect types (T1-P1, T3-P3), their zones, and their relation to the factors (intervention, natural factor) are given below, in detail:

Table 5. Total number and frequency of the defect types according to their zones and factors

Zone	F	Codes of Defect Types								
		DE1	DE2	DE3	DE4	DE5	DE6	DE7	DE8	Total[2] T^2-P^2
Entire Wall Surface	F1	-	-	-	5	2	9	4	-	20
	F2	-	-	-	2	2	29	18	-	51
	T^1-P^1	**-**	**-**	**-**	**7–9.86%**	**4–5.63%**	**38–58.32%**	**22–30.99%**	**-**	**71–30.60%**
Surrounding of the window/door	F1	-	1	-	5	4	13	27	-	50
	F2	1	-	-	1	-	3	1	-	6
	T^1-P^1	**1–1.79%**	**1–1.79%**	**-**	**6–10.71%**	**4–7.14%**	**16–28.57%**	**28–50.00%**	**-**	**56–24.14%**
Socle region	F1	-	1	-	1	1	-	1	-	4
	F2	1	9	-	3	15	11	-	-	39
	T^1-P^1	**1–2.33%**	**10–23.26%**	**-**	**4–9.30%**	**16–37.21%**	**11–25.58%**	**1–2.33%**	**-**	**43–18.53%**
Building-related surface	F1	1	1	-	3	5	3	2	-	15
	F2	-	-	-	-	-	-	-	-	-
	T^1-P^1	**1–6.67%**	**1–6.67%**	**-**	**3–20.00%**	**5–33.33%**	**3–20.00%**	**2–13.33%**	**-**	**15–6.47%**
Plumbing-related surface	F1	-	-	-	8	3	6	7	-	24
	F2	-	-	-	-	-	-	-	-	-
	T^1-P^1	**-**	**-**	**-**	**8–33.33%**	**3–12.50%**	**6–25.00%**	**7–29.17%**	**-**	**24–10.34%**
Window/ door frame	F1	-	-	-	-		-	-	1	1
	F2	-	-	-	-	7	-	-		7
	T^1-P^1	**-**	**-**	**-**	**-**	**7–87.5%**	**-**	**-**	**1–12.5%**	**8–3.45%**
Window infill	F1	-	-	-	-	-	-	-	1	1
	F2	-	-	-	-	-	-	-		-
	T^1-P^1	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1–100.00%**	**1–0.43%**
Sill	F1	-	-	-	-	-	-	-	-	-
	F2	-	-	-	-	2	5	-	-	7
	T^1-P^1	**-**	**-**	**-**	**-**	**2–28.57%**	**5–71.43%**	**-**	**-**	**7–3.2%**
Window security bar	F1	-	-	-	-	-	-	-	-	-
	F2	-	-	7	-	-	-	-	-	7
	T^1-P^1	**-**	**-**	**7–100.00%**	**-**	**-**	**-**	**-**	**-**	**7–3.2%**
Total[3]	F1	1	3	-	22	15	31	41	2	115
	F2	2	9	7	6	26	48	19	-	114
	T^3-P^3	**3–1.29%**	**12–5.17%**	**7–3.02%**	**28–12.07%**	**41–17.67%**	**79–34.05%**	**60–25.86%**	**2–0.86%**	**232**

F: Factor. F1: Factor 1 (Intervention). F2: Factor 2 (Natural factor). Defect types are given in Table 3.
T^1-P^1: Total number of the defects for each zone and defect type, separately. Percentages are calculated per zones.
Total[2]/T^2-P^2: Total number of defects for each zone. Percentages are calculated considering total number of defects (232).
Total[3]/T^3-P^3: Total number of defects for each defect type. Percentages are calculated considering total number of defects (232).

DE6 – Discoloration/colour changes (79/232) is the most common defect, and generally, seen on the entire wall surface (38/79), followed by surrounding of the window/door (16/79), and socle region (11/79) respectively (Figure 5-a). DE6 on the entire wall surface and socle region consist of natural factors, while on the surrounding of the window/door related to intervention to the sill. It is thought that incorrect workmanship, and detail design during CS5 – Intervention to the sill, caused water leakage under the sill, and in turn, DE6 occurred. The second in line is DE7 – Surface irregularities (60/232), and mostly seen on the surrounding of the window/door (28/60), followed by entire wall surface (22/60), and plumbing-related surface (7/60) respectively (Figure 5-b). DE7 on the entire wall surfaces are observed as point holes, generally on the buildings facing south-east, and north-west which are caused by natural factors (hail). The ones that are on the surrounding of the window/door, and plumbing-related surfaces are originated from material (i.e., plaster and paint) applied to cover mistakes made during interventions (e.g., material changes in window frame/sill, assembly of mechanical elements, material applied to cover interventions, etc.). The third in line is DE5 – Bubbling-spalling (41/232), and unlike others, it is located mostly on the socle region (16/41), and followed by window/door frame (7/41), and additional/adjacent building-related surface (5/41) respectively (Figure 5-c). It is thought that the defects on the additional/adjacent building-related surface occurred due to different seismic characteristics of the structural system of existing and additional parts (i.e., masonry and skeletal structural system). DE5 is observed due to groundwater in the buildings where the socle region or skirting is not covered (i.e., CS2 – Changes of finishing layer is not applied) which can be considered as a design fault. In the buildings where the original window/door frame is preserved (i.e., CS4 – Material change in window/door frame is not implemented), defect has occurred in the paint layer of the wooden frames because of natural factors. DE5 on additional/adjacent building-related surface is generally caused by natural factors. These defects are followed by DE4 – Cracks (28/232), DE2 – Efflorescence (12/232), DE3 – Corrosion (7/232), DE1 – Biological formation (3/232 – 1.29%), and DE8 – Material loss (2/232 – 0.86%), respectively (Figure 5-d, e, f, g, h). DE4 occurred due to the mounting of mechanical system elements. DE1/DE2 are related to the water leakage problem in the socle region and can be regarded as an advanced level of DE5. DE3/DE8 are specific to the window/door which is seen on the complementary component (i.e., window security bar), and core (i.e., window frame, infill) respectively, and generally seen on the buildings that are not used, and the material of the window was not changed with PVC.

Figure 5. Examples for CS (Hatice Yasemin Çakır, 2021); **a)** DE6 (S3_T4_B01, S1_T2_B38); **b)** DE7 (S2_T3_B03, S3_T6_B12, S1_T2_B29); **c)** DE5 (S1_T2_B31, S1_T1_B12, S3_T6_B19); **d)** DE4 (S1_T1_B02); **e)** DE2 (S1_T1_B02); **f)** DE3 (S3_T6_B40); **g)** DE1 (S1_T2_B37); **h)** DE8 (S3_T6_B18)

Shortly, defects are related to both interventions and natural factors. In the study performed by Sá et al. (2015) about defects seen on the rendered façades, the most common defects are listed as dirt/particle deposit, biological colonization, colour change/discoloration, and linear cracking. Although the results obtained in this paper are consistent to result of Sá et al. (2015), the biological formation has not been seen so often, instead, surface defects have been encountered. Okumuş (2020) evaluated defects especially on window system and stated that the rate of defect seen in the wooden frames is greater than that of PVC frames. Parallel to this, in this paper, the defects seen on the windows are observed to be in wooden ones due to neglect and natural effects.

5. Concluding Remarks

A study was performed to document Selamsız Low-Cost Mass Housing in Uskudar, Istanbul/Türkiye, which is an important example of the modern period that still preserves its original function and design as much as possible. The data of 108 buildings that still exist today among the 131 constructed buildings were obtained from the literature, archive search, and site visit and their front façades were evaluated in terms of (i) interventions at the building/element/component scale, and (ii) defects. As a result of that documentation, the frequency of the interventions and defects, their relation to each other and external factors, and user requirements were discussed. The following conclusions were drawn from the comparative evaluations of intervention and defects:

- Considering the current situation of the existing 108 buildings, when the results obtained from this paper and Öztürk (2020)'s research were compared, it was seen that both demolished and obsolete buildings were increased by one.
- To meet spatial requirements (e.g., spatial dimensions, daylight) interventions at building scale (79/108), and element scale (35/108) such as addition/extension of floor, size/form/number change in the window/door were implemented. These unconscious interventions led to the destruction of the original façade layout. In addition, intervention at the component scale such as material change in frame/sill, addition of thermal insulation layer, and decorative elements to meet performance requirements were observed in all buildings (108/108). Although these interventions did not affect the façade on a massive scale, caused the disappearance of original details such as the partition of the window frame.
- Defects are generally located on masonry wall (mostly on the entire wall surface, surrounding of the window/door, socle region), since most of the window/door have been renewed. It has been determined that half of the defects were caused by unconscious interventions as mentioned above. In addition, environmental factors, orientation, and design decisions are also effective.

As a result, buildings of Selamsız Low-Cost Mass Housing, which were built in the 1950's, could not meet the spatial and performance requirements due to various reasons, in turn, interventions were made at different scales or some of them were demolished. In line with the interventions and external factors, defects occurred in different dimensions. It is believed that documentation and registration of these buildings, which are an important part of modern heritage of Türkiye, and creating appropriate solutions in line with the requirements will prevent unplanned interventions, defects, and destruction of original details. In this context, this paper is seen as a preliminary study to determine the frequency of interventions and defects to find proper solutions/precautions for them.

In further studies, maintenance/repair method is planned to be suggested according to the urgency of the intervention, which will be determined by grading the detected defects. Using digital scanning techniques instead of visual inspection and transferring obtained data to the Building Information Modelling (BIM) programs will enable the performance values of the façades to be determined more accurately and enable to propose a more planned intervention method to be followed. The methodology has the potential to be applied into a different region where the number of reused buildings is more, and in such a case, the effects of the selected functions on the interventions can be evaluated.

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References

Abbott, G. R., McDuling, J. J., Parsons, S. A. & Schoeman, J. C. (2007). Building condition assessment: a performance evaluation tool towards sustainable asset management. *CIB World Building Congress*, 649–662.

Albrecht, H. (2012). What does the Industrial Revolution signify. *Industrial Heritage Re-Tooled.* J. Douet (Ed.). *The TICCIH (The International Committee for the Conservation of the Industrial Heritage) Guide to Industrial Heritage Conservation*, 17–23. Lancaster: Carnegie Publishing LTD.

Amaro, B., Saraiva, D., de Brito, J. & Flores-Colen, I. (2013). Inspection and diagnosis system of ETICS on walls. *Construction and Building Materials*, *47*, 1257–1267.

https://doi.org/10.1016/j.conbuildmat.2013.06.024.

Bina Yapım Teşvik Kanunu No: 5228 [Building Construction Incentive Law No: 5228], (1948, 7, 6). Official Gazette (Number: 6950). Access Address (19, 04, 2022): https://www.resmigazete.gov.tr/arsiv/6950.pdf.

Cem, İ. (2021). *Türkiye'de geri kalmışlığın tarihi [History of underdevelopment in Türkiye]* (31. ed). İstanbul: Türkiye İş Bankası Kültür Yayınları.

Çakır, H. Y. & Edis, E. (2022). A database approach to examine the relation between function and interventions in the adaptive reuse of industrial heritage. *Journal of Cultural Heritage*, *58*, 74–90. https://doi.org/10.1016/j.culher.2022.09.015.

Çakır, H. Y. (2021). *Personal Archive*.

Çelik, A. B., Ergin, Ş., Dal, M., & Ay, İ. (2023). Analysis of Stone Deterioration on the Facades of Hatuniye Madrasah. *Journal of Architectural Sciences and Applications*, *8*(1), 355–369. https://doi.org/10.30785/mbud.1302007.

de Jonge, W. (2017). Sustainable renewal of the everyday Modern. *Journal of Architectural Conservation*, *23*(1–2), 62–105. https://doi.org/10.1080/13556207.2017.1326555.

Douglas, J. (2006). *Building adaptation*. Routledge.

Engin, H. E. (2009). *Tarihi yapıların yeniden kullanımında iç mekâna etkilerin incelenmesi için bir yöntem önerisi; İstanbul endüstri yapıları örneği [A proposal method for analysing the effects on re-use of historical buildings: A case study on industrial buildings in Istanbul].* PhD diss., Karadeniz Technical University, Trabzon.

Erdal, Y., Alatlı, H. İ., Kırbaş, A. & Salman, Y. (2020). Kadıköy'ün genişleyen sınırları: Koşuyolu [*Expanding borders of Kadıköy: Koşuyolu*]. *Betonart: Beton, Mimarlık ve Tasarım*, *65*, 6–17.

Ertemir, D. Y. & Edis, E. (2022). Sustaining modern heritage buildings: visual defect categorisation guides for the general condition survey of rendered-painted facades. *International Journal of Building Pathology and Adaptation*, *41*(3), 606-624. https://doi.org/10.1108/IJBPA-03-2022-0041.

Faqih, F., Zayed, T. & Soliman, E. (2020). Factors and defects analysis of physical and environmental condition of buildings. *Journal of Building Pathology and Rehabilitation*, *5*(1), 1–15. https://doi.org/10.1007/s41024-020-00084-0.

Guo, J., Wang, Q. & Li, Y. (2021). Evaluation-oriented façade defects detection using rule-based deep learning method. *Automation in Construction*, *131*, 103910. https://doi.org/10.1016/j.autcon.2021.103910.

Hasol, D. (2017). *20. yüzyıl Türkiye mimarlığı [20th century Türkiye Architecture]* (2.ed). YEM Yayın.

Havinga, L., Colenbrander, B. & Schellen, H. (2020a). Heritage attributes of post-war housing in Amsterdam. *Frontiers of Architectural Research*, *9*(1), 1–19. https://doi.org/https://doi.org/10.1016/j.foar.2019.04.002.

Havinga, L., Colenbrander, B. & Schellen, H. (2020b). Heritage significance and the identification of attributes to preserve in a sustainable refurbishment. *Journal of Cultural Heritage*, *43*, 282–293. https://doi.org/10.1016/j.culher.2019.08.011.

Henket, H.-J. (1998). Has the modern movement any meaning for tomorrow? *ICOMOS–Hefte Des Deutschen Nationalkomitees*, *24*, 22–25.

International Council on Monuments and Sites. (ICOMOS). (2017). *Approaches to the conservation of twentieth century cultural heritage–Madrid-New Delhi Document*. ICOMOS Paris, France.

International Organization for Standards. (ISO). (2016). *ISO 19208:2016 Framework for Specifying Performance in Buildings*.

İmar Kanunu No: 6785 [Building Law No: 6785], (1956, 7, 16). Official Gazette (Number: 9359). Access Address (19, 04, 2022): https://www.resmigazete.gov.tr/arsiv/9359.pdf.

İstanbul Belediyesi Tarafından Taksitle Satılacak Ucuz Evler Yönetmeliği [Regulation on Low-Cost Houses to be Sold by Istanbul Municipality in Installments]. (1950). Istanbul: İstanbul Belediye Matbaası.

İstanbul Büyükşehir Belediyesi [Istanbul Metropolitan Municipality]. (n.d.). *İstanbul Şehir Haritası [Istanbul City Map] - 1966.* Access Address (19.04.2022) https://sehirharitasi.ibb.gov.tr/.

Kessler, G. (1949). İstanbul'da mesken darlığı, mesken sefaleti, mesken inşaatı. [Housing shortage, housing misery, housing construction in Istanbul]. *Arkitekt*, (5–6), 131–134.

Koman, İ. (2021). Analysis of the Architect's Role in Creating Innovation Value in the Context of Walter Gropius's Works. *Journal of Architectural Sciences and Applications*, *6*(1), 97–114. https://doi.org/10.30785/mbud.881914.

Macarulla, M., Forcada, N., Casals, M., Gangolells, M., Fuertes, A. & Roca, X. (2013). Standardizing housing defects: Classification, validation, and benefits. *Journal of Construction Engineering and Management*, *139*(8), 968–976. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000669.

Macdonald, S. (1996). Reconciling authenticity and repair in the conservation of modern architecture. *Journal of Architectural Conservation*, *2*(1), 36–54. https://doi.org/10.1080/13556207.1996.10785152

MacDonald, S., Burke, S., Lardinois, S. & McCoy, C. (2018). Recent efforts in conserving 20th-century heritage: The Getty Conservation Institute's Conserving Modern Architecture Initiative. *Built Heritage*, *2*(2), 62–75. https://doi.org/10.1186/BF03545694

Madureira, S., Flores-Colen, I., de Brito, J. & Pereira, C. (2017). Maintenance planning of facades in current buildings. *Construction and Building Materials*, *147*, 790–802. https://doi.org/https://doi.org/10.1016/j.conbuildmat.2017.04.195

Okumuş, E. M. (2020). *Pencere sistemlerindeki bozulmaların teşhis, analiz ve müdahalesine yönelik karar destek modeli [*Decision support model for diagnosis analysis and interventon of the failures in window systems*]*. PhD diss., Mimar Sinan Fine Arts University, Istanbul.

Okumuş, E. M., & Özlem, E. (2020). Konutlardaki Ahşap Pencerelerde Oluşan Hasarların Tespiti ve İyileştirilmesine Yönelik Öneriler: İstanbul'dan Fener ve Balat Örneği. *Engineering Sciences*, *15*(1), 43–68.

Özdoğan, F., Balkan, A. & Arpat, A. (1950). İstanbul Belediyesi'nin "Ucuz evler" müsabakası münasebet ile [On the occasion of Istanbul Municipality's "Cheap houses" competition]. *Arkitekt*, *5–6*, 135–136.

Öztürk, B. (2020). Selamsız ucuz evler yerleşimi [Selamsız low-cost housing settlement]. *Betonart: Beton, Mimarlık ve Tasarım*, *65*, 18–28.

Pereira, C., Silva, A., Brito, J. & Silvestre, J. (2020). Urgency of repair of building elements: Prediction and influencing factors in façade renders. *Construction and Building Materials*, *249*, 118743. https://doi.org/10.1016/j.conbuildmat.2020.118743

Polat, E. E. & Can, C. (2008). The concept of modern architectural heitage: definiton and content. *Megaron / Yıldız Technical University, Faculty of Architecture E-Journal*, *3*(2), 177–186.

Richardson, B. (2002). *Defects and Deterioration in Buildings: A Practical Guide to the Science and Technology of Material Failure*. London: Routledge.

Rush, R. D. (1986). *The Building Systems Integration Handbook*. Washington: American Institute of Architects.

Sá, G., Sá, J., De Brito, J. & Amaro, B. (2015). Statistical survey on inspection, diagnosis and repair of wall renderings. *Journal of Civil Engineering and Management*, *21*(5), 623–636.

https://doi.org/10.3846/13923730.2014.890666.

Sayar, Z. (1946). Mesken Davası [Housing case]. *Arkitekt*, *3–4*, 49–50.

Sey, Y. (2007). Yeni vatandaşların barındırılması: Konut politikaları ve toplu konut [To House the New Citizens: Housing Policies and Mass Housing]. In S. Holod, Renata; Evin, Ahmet; Özkan (Ed.), *Modern Türk Mimarlığı: 1900-1980* (pp. 159–183). Ankara: TMMOB Mimarlar Odası.

Tapan, M. (2007). Uluslararası üslup: Mimarlıkta liberalism [International style: liberalism in architecture]. In S. Holod, Renata; Evin, Ahmet; Özkan (Ed.), *Modern Türk Mimarlığı: 1900-1980* (pp. 111–122). TMMOB Mimarlar Odası.

Tapu ve Kadastro Genel Müdürlüğü [General Directory of Land Registry and Cadastre]. (n.d.). *Parsel Sorgulama Uygulaması [Parcel inquiry application]*. Access Address (19.04.2022) https://parselsorgu.tkgm.gov.tr/#ara/cografi/41.02354059586465/29.03095364570618.

Tekeli, İ. (2007). Türkiye'de mimarlığın gelişiminin toplumsal bağlamı [The social context of the development of architecture in Türkiye]. In S. Holod, Renata; Evin, Ahmet; Özkan (Ed.), *Modern Türk Mimarlığı: 1900-1980* (pp. 15–36). Ankara: TMMOB Mimarlar Odası.

The British Standards Institution (BSI). (2011). *BS EN 15978:2011 Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method*. London.

Tostões, A. (2018). Modern built heritage conservation policies: How to keep authenticity and emotion in the age of digital culture. *Built Heritage*, *2*(2), 17–34. https://doi.org/10.1186/BF03545691

Üsküdar Belediyesi İmar ve Şehircilik Müdürlüğü Arşivi [Uskudar Municipality Directorate of Construction and Urban Planning Archive]. (n.d.). *Selamsız Low-Cost Mass Housing Documents*.

Üsküdar Belediyesi Plan ve Proje Müdürlüğü Arşivi [Uskudar Municipality Plan and Project Directorate Archive]. (n.d.). *Selamsız Low-Cost Mass Housing Documents*.

Vos, E. & Storgaard, E. (2018). Teaching re-use strategies for modernist buildings: a case study handbook for a joint European Master in Architecture. *Joelho: Revista de Cultura Arquitectonica*, *9*, 186–201. https://doi.org/10.14195/1647-8681_9_11.

Yaman, B., & Arpacıoğlu, Ü. (2021). Dynamically Controlled Adaptive Facade and Shading Systems. *Journal of Architectural Sciences and Applications*, *6*(1), 153–164. https://doi.org/10.30785/mbud.798233.