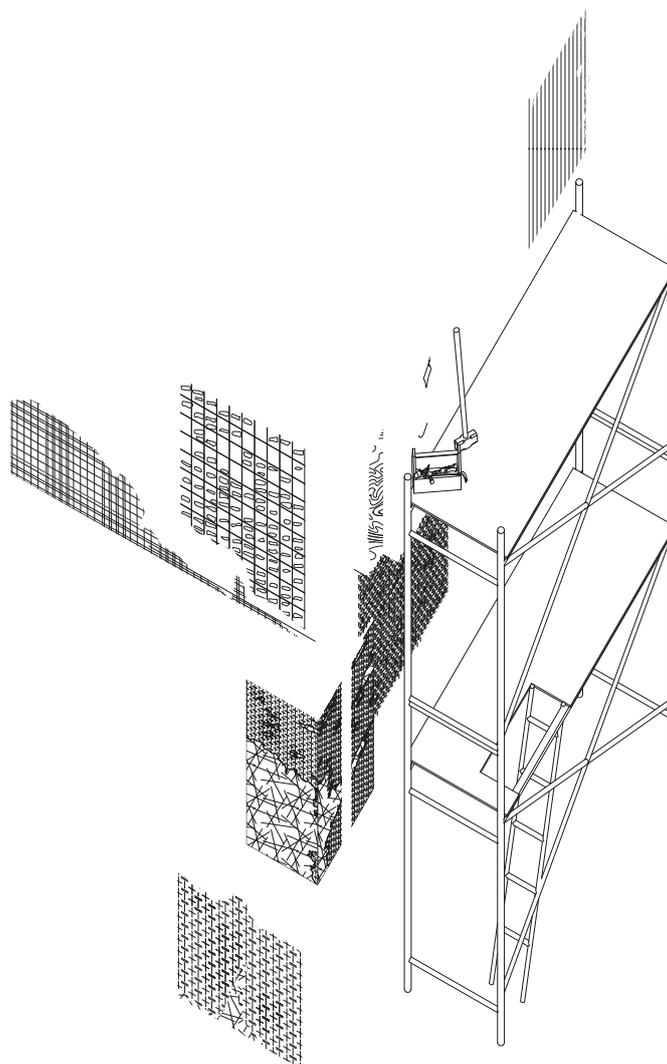


BETWEEN RESOURCE AND WASTE

ON 'CLOSING THE LOOP' IN ARCHITECTURE



ELLEN HÄLLEBRAND / MASTER'S THESIS 2023

CHALMERS SCHOOL OF ARCHITECTURE / DEPARTMENT OF ARCHITECTURE AND CIVIL ENGINEERING

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ARCHITECTURE AND URBAN DESIGN
MATTER SPACE STRUCTURE

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ABSTRACT

Waste has been defined as that which is irrelevant, obsolete, or that which has no value. As a category of materials, it is interesting because it reveals the normative order of the world, but also because its ambiguous nature allows for reinterpretation and repurposing.

”Closing the loop” implies that material flows can be made fully circular by regarding used materials and commodities as resources for new production. In such an ideal system the category of waste disappears. This thesis argues that besides looking into how the loop can be closed, architecture should explore the properties of the category of waste in order to investigate the loop itself. Wasted matter is proof of something being wasted – time, labour and resources – and should not be framed as solely a sustainability issue. Rather than attempting to eliminate waste this thesis examines the potential of waste, asking the question: How can that which lacks value and purpose be designed or be designed with, while still critically engaging with its wasted state?

Taking cues from research within the social sciences and humanities, as well as from contemporary practices in art and architecture, varying scales of waste concepts are addressed. Site visits at waste management businesses in

Malmö inform the thesis of the infrastructures of wasting and recycling. The materiality of waste is studied in material studies of discarded objects. The observations made in the case studies are elaborated on in design explorations. By making casts and assemblages, strategies for dealing with waste in design emerge.

The outcome of the thesis is a speculation in how the accidental and non-standard properties of materials marked by a demolition process can be considered and included in design. The qualities that such materials possess become operational by abstracting them through representation. Manifested in the drawings of a building in a borderland between model and reality, the design speculation is contextualized by its discourse rather than a site. By turning to waste, the thesis examines moments where the loop from wasting to extraction starts over. It speculates on what place there is for waste when linearity is tied together to circularity.

Keywords: waste, CDW, reuse, circular economy

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INTRO

BACKGROUND

THESIS QUESTIONS

BACKGROUND

CIRCULAR ECONOMY

Zero waste and circular economy (ZWCE) have been the mainstream reiteration of sustainable development of the recent decades, promoted by actors ranging from academics and NGOs to management consultancies and multinational companies. With goal 12 being “Sustainable consumption and production”, commonly illustrated as an infinity symbol (∞), the adoption of the SDGs in 2015 has meant a worldwide surge of circular initiatives. In March 2020, the European Commission adopted a new circular economy action plan as part of its Green New Deal (European Commission, n.d.).

With theoretical roots in industrial ecology and environmental economics, a large part of the discourse on circular economy is design related (Ghisellini, Cialani & Ulgiati, 2016). “Closing the loop” is a slogan addressing the re forging of linear material flows to circular or spiral processes by regarding discarded or wasted objects, materials, commodities as resource for new production. In such an ideal system the category of waste disappears.

A common criticism of circular economy is to point out the physical, technical and chemical limits of constant recycling. Material decline and losses in performance would account for spills in the economic loop that would shrink for each turn. This critique focuses on the practical implementations and material reality of circular approaches to growth. However, this objection isn't viable for the other to R's of circularity – reuse and reduce.

WASTEFUL GROWTH

Meanwhile, there are actors that contest the *narrative* of circularity. In their Marxist-Lacanian critique of ZWCE discourse, scholars Valenzuela and Böhm discuss it as a frame for continued “wasteful growth” (2017, p 41). Wasteful, in how the discourse's depoliticization of waste constructs it as no longer a sign of unsustainable growth but as a controllable aspect of a productive sustainability. Waste management – re-cycling, -using, -covering – is perceived as a heroic act; it has become another commodity to fetishize. At the core of their critique lies the mainstream sustainable discourse's naturalisation of growth-driven capitalism (Valenzuela & Böhm, 2017).

The authors suggest that a way forward for the post-growth project would be to re-politicize waste. Their argument points to “re-invent the construal of the reality of waste” (p 42). That is, to acknowledge waste outside its construct as a valuable resource (for the production of commodities and identities of sustainability-wary consumers). Instead, it could be recognized as wasted labour and spoilage of material (Valenzuela & Böhm, 2017).

BEYOND 'CLOSING THE LOOP'

In architectural discourse, another perspective on circularity has emerged. In their 2014 “survey of the perverse sides of architecture” (p 5) authors Cairns & Jacob argue for a sustained contemplation of the ends of buildings. Rather than to deny their ‘death’ (ie. to aim for closed loops of circular materials in forever new beginnings) or marvel over ruins in the dramatic and dulling aesthetics of so called ruin porn, Cairns & Jacob suggest an architecture that can “be with the inevitable fate of its creations” (2014, p 5). That is, acknowledge its ends as well as its beginnings.

In the last couple of years, *extraction* has been a word used (with the prefix non- for ideal imaginaries) to describe what needs to change in architecture beyond carbon modernity. Architecture is traditionally preoccupied with the assembly of materials into “buildings” – or landscapes, furnitures, elements, etc. – that make up space. This non-extractive, somewhat post sustainable, discourse emphasizes other roles and arenas for architects and architecture (eg. Malterre-Barthes & Dzierżawska, 2021). Often, it lands in an attitude of the sustained contemplation Cairns & Jacob (2014) were asking for.

A recent work that deals with the perverse sides of architecture is the anthology *Non-extractive Architecture: On Designing without Depletion* (Space Caviar, 2021). In his contribution, Mark Wigley imagines an architect’s contribution to a non-extractive architecture. He proclaims that architects could use their tools – from surveying to synthesizing – to unveil the inherent extractions of building. Wigley puts it as running architecture in reverse. Instead of concealing the complexity of the built environment and its externalities architects could, as a profession, aim towards exposing it and in that contribute to change (2021).

Charlotte Malterre-Barthes’ contribution to the same anthology includes an exploded axonometric, or parts drawing, accounting for materials and resources used in a typical balloon frame building (fig 1.). In a mission to “politiciz[e] architectural details” (2021, p 92) Malterre-Barthes shows how design is linked to extraction through its components and the way their materials are sourced (2021). Far from being papers with lines on them, or vectors in a euclidean space, architectural drawings are an instruction of what to mine, harvest or, in the case of recycling and reuse, salvage.

THESIS QUESTIONS

How might Cairns & Jacobs', Wigley's and Malterre-Barthes' positions be considered in design? When discussing Domenico Fontana's 1585-86 move of the Vatican obelisk, Tim Anstey provides cues for how representation is linked to what he describes as relevant for the making society more sustainable: "to redefine the architectural work as something process based" (2012, p 55). To represent architecture as a way to move materials is for Anstey of significance to understand it as such (2012). Then, could representation of the ends of buildings, their unbuilding, be a way to understand architecture as more than beginnings?

Circular approaches want to link consumption to production. In the knot of that loop lies waste, as concept and as matter. Understanding 'the loop' as an extension of the extractions a growth-based economy and waste as the material proof of its spoiled labour and resources, one could argue

that besides looking into how it can be closed, architects should explore the properties of the category of waste. Rather than attempting to eliminate it, this thesis is concerned with examining the potential of waste. As a whole, it intends to explore:

How can waste, or that which lacks value and purpose, be designed or be designed with, while remaining in its wasted state? Where wasted state refers to its critical and creative potential.

With focus on the following sub-questions:

- i. *How can the accidental and non-standard properties of materials marked by a demolition process be considered and included in design?*
- ii. *How can the qualities of such materials and process be drawn and become operational through architectural representation?*

METHOD

METHOD

PROCESS

METHOD

In order to answer the thesis questions (p 5), the research is divided into four parts that co-exist and inform each other (although with varying intensity) throughout the process.

CONTEXT

This part explores the concept of waste by studying theory within the humanities as well as analysing a selection of works by contemporary artists and architects. By singling out potentials of waste in relation to design, the reference studies aim to outline the creative and critical agency of the wasted state as well as provide a context for design studies.

CASE STUDIES

In order to investigate the properties of waste materials and the processes they come from, and lead to, this part considers specificities of *systems of waste* and *discarded objects*. The former by doing site visits at waste management businesses in Malmö, while performing informal interviews with their representatives and mappings of infrastructure and systems on a diagrammatic level. The latter by doing material studies to be systematized in a taxonomy. Representation of the case studies, through its as abstraction, aim to spawn observations.

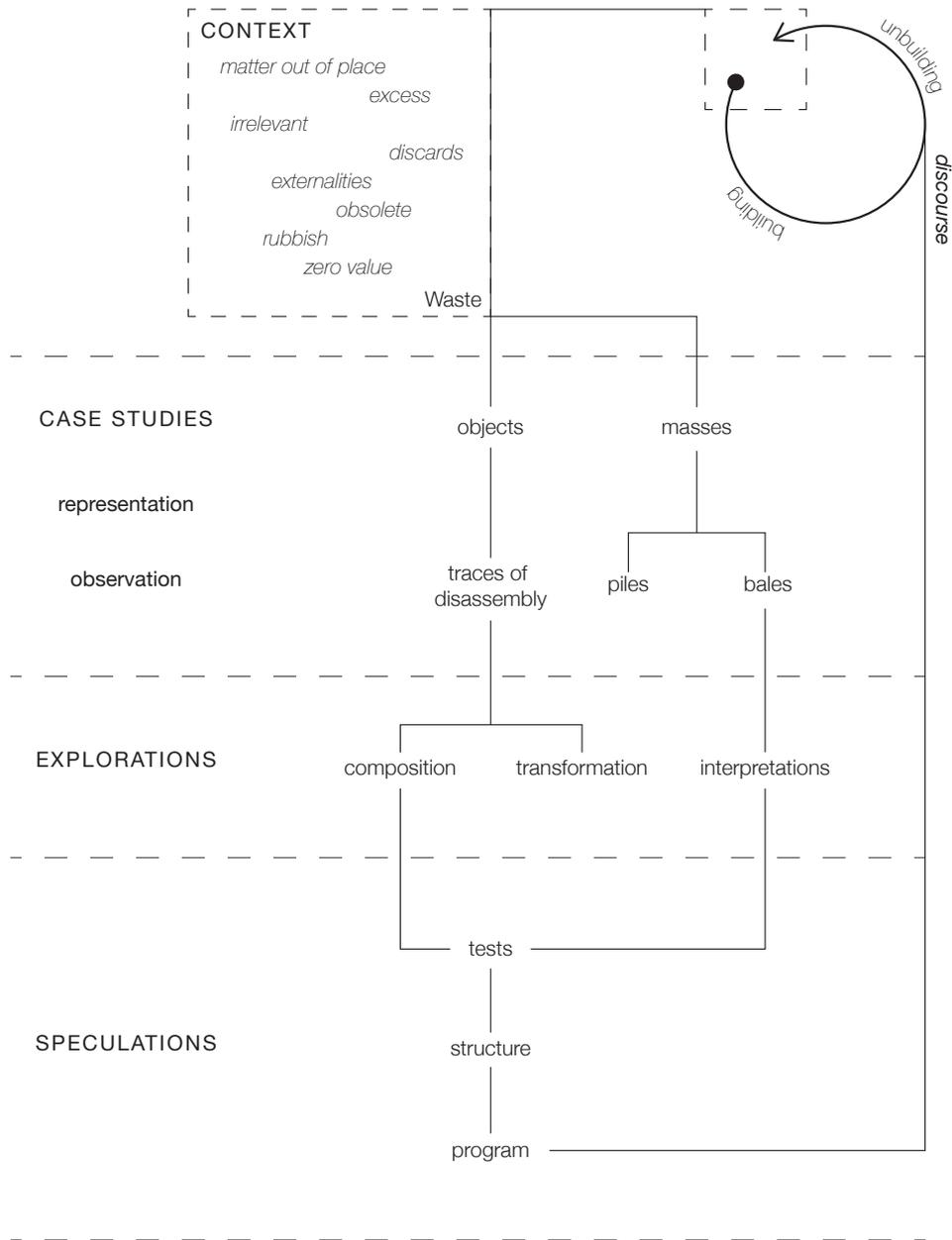
EXPLORATIONS

Through iterative design explorations, the thesis investigates ways to consider waste materials in design processes. Observations from the case studies are transferred to design via small scale design tests in composition, transformation and interpretation. By producing drawings and casts, the thesis explores representational techniques that brings waste into design processes.

SPECULATIONS

Design methods and other outcomes from explorations are synthesized in design speculations on how the accidental and non-standard properties of materials marked by a demolition process can be considered and included in design. First, by testing the material against architectural tropes. Second, by introducing complexity in amount of parts and detailing. Finally, program and motif makes the speculation grow from conceptual assemblages to more contextual speculations.

PROCESS



CONTEXT

THEORIES OF WASTE

WASTE IN PRACTICE

THE POTENTIAL OF WASTE

THEORIES OF WASTE

DEFINING WASTE

The EU defines waste as “any substance or object which the holder discards or intends or is required to discard” (Directive 2008/98). In daily language, *waste* has two somewhat similar connotations. Used as ‘a waste of time, labour, energy...’, it implies an unnecessary or *irrational* use of resources at hand. Waste is what is excessive to an implied optimal amount. The second nuance is that waste is *unwanted* matter. It is that which is redundant and rejected. Both interpretations suggest a subjective assessment or valuation in relation to an other – the optimal amount or the wanted.

The ‘online hub’ Discard Studies, edited by various scholars in the field, claims that:

... “waste [is] not produced by individuals and is not automatically disgusting, harmful, or morally offensive, but [...] both the materials of discards and their meanings are part of wider sociocultural-economic systems.” (Discard Studies, n.y.).

Waste is here defined as an unstable category, understood of as a phenomenon of a situated and contextual nature. Still, not everything is waste – neither is nothing. It is that which is discarded. The studies of it must, therefore, consider systems behind wasting. These can be abstract – eg. cultural norms and value systems – or more concrete as in the case of infrastructure or actual waste management organizations and processes (Liborion & Lepawsky, 2022).

RUBBISH THEORY

Anthropologist Michael Thompson’s Rubbish Theory (2017: original work published 1979) builds upon value theories of transient and durable goods. For consumer goods, the former is the norm. The transient category is characterized by decreasing values and finite lifespans, eg. cars, mattresses. The latter, durables, are defined by increasing value and an infinite expected lifespan, eg. antiques and highbrow art. Thompson adds a third category: rubbish. A state of “valueless and timeless limbo” between the others (2017).

The covert rubbish category allows transient objects to decrease maximally in value, and later on move from rubbish to durable (Thompson, 2017). It is important to note is that the move from transient to rubbish to durable isn’t due to material changes of the goods themselves. The shift is one of perception – controlled by status and class – and limited to a small amount of all transient goods out there. Thompson exemplifies with the first wave gentrification (Smith, 2014) in London, where working class homes ‘suddenly’ became sought after investments (Thompson, 2017).

The diagram Consumptive production and productive consumption is open ended through the black boxes production and consumption. Consumption is to be understood in the economic sense. It is when something ceases to exist within the circulation. For Thompson, transient goods with both fast and slow transfers (food and houses) can get “used up” until they leave

WASTE MATTER

How then, can the tangible aspects of waste be described? What are the material outcomes of shifts from transients to rubbish, and of the consumption of them both?

Geographer Tim Edensor have explored industrial ruins and what he identifies as waste inside them. Waste matter, he argues, causes tension to the ‘proper order of things’. Objects labelled *waste* is for Edensor the material proof of how space is ordered by the power of some (2005).

Edensor’s waste matter is tightly connected to decay and disintegration. As objects decay, he argues, they lose their place in the order of things. Decay is described as hybridization – between object and environment, between culture and nature (Edensor, 2005). The hybridization of waste matter alludes to the concept of the abject. It was originally coined by Julia Kristeva as a trait that evokes disgust or terror because of the loss of distinction between subject and object. As an extended concept, it can describe “anything that muddles normative borders and divisions and thus threatens a breakdown in conventional or dichotomous ways of making meaning of the world.” (Rafi Arefin, 2015). In the contemporary sense of the word then, waste is abject.

In the ambiguity that hybridization is lies part of the potential of waste as matter – it “contains rich potential for reinterpretation and reuse because it is underdetermined” (Edensor, 2005, p 311). Edensor’s *underdetermination* alludes to the concepts of estrangement and defamiliarization. Johnathan Metzger, a professor with a background in urban planning at KTH, describes them as:

“Through the recontextualization of a phenomenon in a new setting, the observer becomes estranged and defamiliarized from a phenomenon previously considered as self-evident and well known, which forces the observer to a reconsideration of the phenomenon at hand” (Metzger, 2011, p 220).

In summary, through its embedded stories of refusal, waste matter puts up a mirror against the order of things. Edensor argues that it reveals the powers that make up space and through hybridization becomes “charged with alternative aesthetic properties” (Edensor, 2005, p 311). It “provoke[s] speculation about how space and materiality might be interpreted, experienced and imagined otherwise.” (Edensor, 2005, p 330).



Fig 4. Waste matter.

WASTE IN PRACTICE

Artistic installations presenting household waste are a popular method to make public the abundance of goods that are produced, consumed and wasted. Drawing on Marcuse's aesthetic theory, scholar of waste Sarah Surak argues that these displays of garbage can differ in their disciplinary and disruptive qualities (2016). In short, disciplinary displays depict garbage as an individual problem and encourages the viewer to reflect on their daily practice. They are disciplinary because they go along with the neoliberal depiction of waste as an individual problem. Disruptive displays focus on why we waste, rather on what, and makes the audience uneasy by "making visible what we are quick to ignore" (Surak, 2016, p 545). They are disruptive because they reject the hegemonic narrative about the individual and offer other perspectives of the phenomena (Surak, 2016).

It could be argued that the same challenge would apply to architecture. For Surak, art's power to open imaginative doors depends on it's disruption of everyday life (2016). When it comes to architecture, the everyday life aspect is a feature, not a bug. Architecture surrounds us, and this is what critical design is about. "It [critical design] suggests that the everyday as we know it could be different, that things could change." (Dunne, A. & Raby, F. 2021). In these types of practices, features of design – it's embeddedness in mundane day-to-day life through spatiality and realness – are appropriated for other reasons than the design itself.

Surak reviews works that deal with day-to-day household waste. As Liborion & Lepawsky describes, the scalar mismatch of equating waste with this kind of consumer garbage ignores other relationships that matter (2022) – such as modes of production, formal regulations or valuing systems. The subject of household waste itself could be part of why Surak struggles to find disruptive displays.

An example of approaching building waste in architectural representation is how Lenschow & Pihlmann's series of models (fig 5) are doing what Wigley (2021) is asking for. They literally unveil a building of its 12.5 mm skin – eg. gypsum boards, wood panels, flooring. As a model version of Malterre-Barthes' exploded axonometric (fig 1, p 4), it reveals the complexity of the built environment. Set in an ambiguous moment (is it before 'completion' or after the beginning of dismantling?), the scenes can be interpreted as a representation of waste, or at least of what is between building and unbuilding. By referring to design classics and the familiar NETTO-yellow colour, the representation becomes real and recognizable. By appropriating an everyday environment, the home, the models attain a disruptive quality.

The following pages examine three works from practices in art and architecture that can be described as critical design. As collections of odd things, wasted things, they inform the thesis in approaches to assemblage.



Fig 5. Lenschow, K. & Pihlmann, S. (2020). *Home minus 12.5 mm* [three 1:6 scale models] [photos by Hampus Berndtson]. In: Krogh, M. (ed.). *Connectedness – An Incomplete Encyclopedia of the Anthropocene*. Strandberg Publishing.

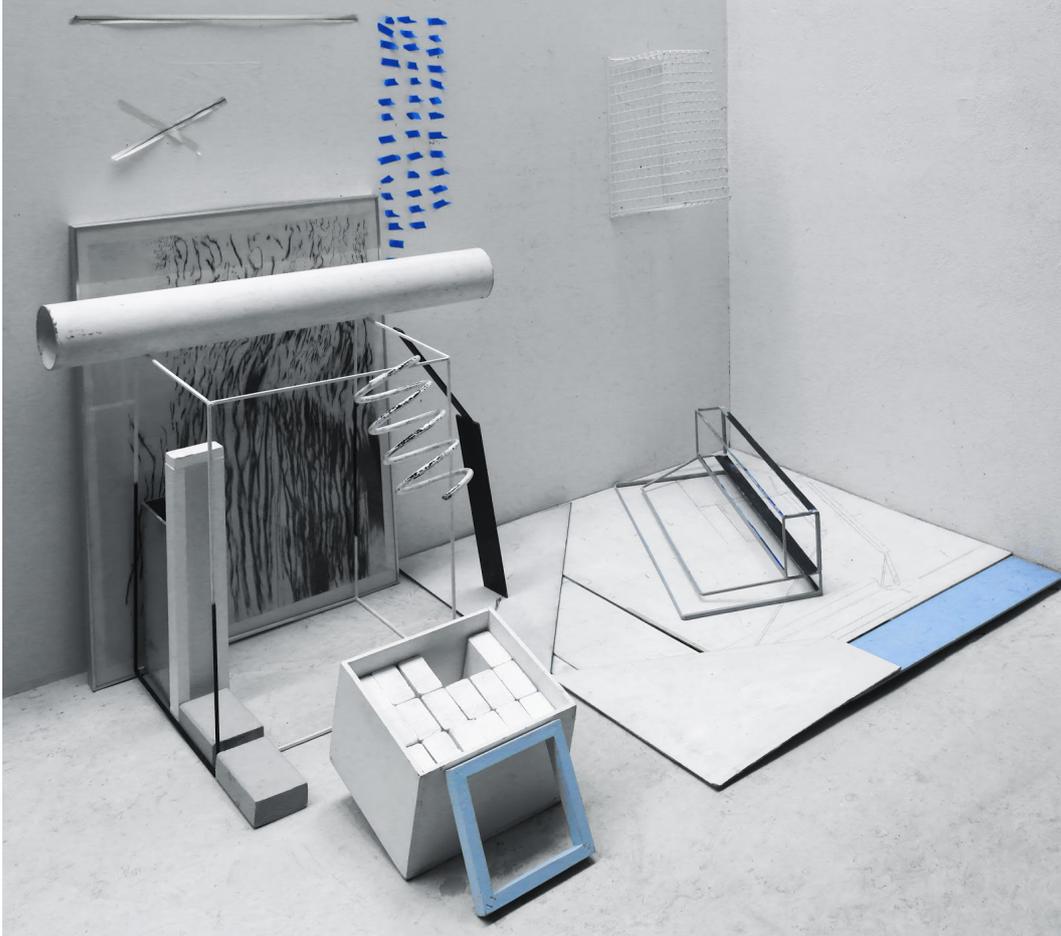


Fig 6. Varvin, K. (2014). *USTABILE VARIABLEL [UNSTABLE VARIABLES] 20141103a* [installations]. Høvik, Norway. <http://varvinart.blogspot.com/>. Reproduced with permission from the artist.

Norwegian artist Kjell Varvin has been creating his *USTABILE VARIABLEL (UNSTABLE VARIABLES, fig 6)* for more than a decade now. As an antithesis of permanence, his website constantly updates with new variations on the installation format. Sometimes with only slight adjustments from the day before, other times more different with objects added or removed. Every once in a while, something reminiscent of an architecture emerges.

Though not explicitly made of waste – even though some of the objects could certainly be classified as that by another – Varvin’s work is

relevant to this thesis because of how his work exemplifies three trajectories of approaching waste and wasted objects circulating within artistic practices. First, his installations capture the fluidity and transient aspects of it. The ever-changing configurations of stuff (or variables) echoes waste management practices – sorting, moving, sorting again. Second, the objects themselves and their *becoming* variables exemplifies one way of approaching decontextualization and estrangement. Through being put in new contexts and/or configurations, an object becomes another. Third, *USTABILE VARIABLEL* are very much *assembled*



Fig 7. Ahlgren, F. (2020). *Alla de där oönskade sakerna* [All those unwanted things] [installation] [photos by Mathilda Werngren]. Södersjukhuset, Stockholm, Sweden. <https://www.finnahlgren.com/>. Reproduced with permission from the artist.

assemblages. Rather than focusing on form or massing, they are about joints and the relations between objects. Out of that, familiar and unfamiliar shapes and compositions can emerge.

Finn Ahlgren's work for Södersjukhuset is, on the other hand, is of a more uniform and cohesive character. The wall mounted installation *Alla de där oönskade sakerna* (All those unwanted things, fig 7) blends in with the white colour of the hospital walls, but its irregularities stemming from the repurposed scrap timber and furniture it is made of makes it clear that this is no usual wall. The artist describes the work as "a celebration of the worn and torn that no one wants" (Ahlgren, n.y. Authors' translation.). The installation is an assemblage that, unlike Varvin's compositions, becomes a united mass – partly because of its homogeneous colour but maybe more because of its flatness, right-angledness and massiveness. The lack of space between singular pieces of timber makes their diversity merge.

New Affiliates' performance *Drywall is Forever* (fig 8) can be seen as a portrayal of moving between Varvin's and Ahlgren's ways of assembling objects. The work is about the simple and brilliant process of gathering scrap gypsum boards and assembling them to a new version of what they once were. As a tale of homogeneity and heterogeneity, it enacts a transformation from individual units to a whole mass by erasing the space between objects. Through plaster, traces of previous use are visible in the new configuration. The wall seems to be captured in a borderland between 'waste' and some kind of 'newness'.

Like the models by Lenschow & Pihlmann (2020, fig 5), New Affiliates' performance captures an ambiguous moment – but here between 'old' waste and 'new' resource. It blurs the lines of the categories in the first place. Their work is an example of critical design because it is just mundane enough to be labelled 'wall', and just special enough to suggest difference.

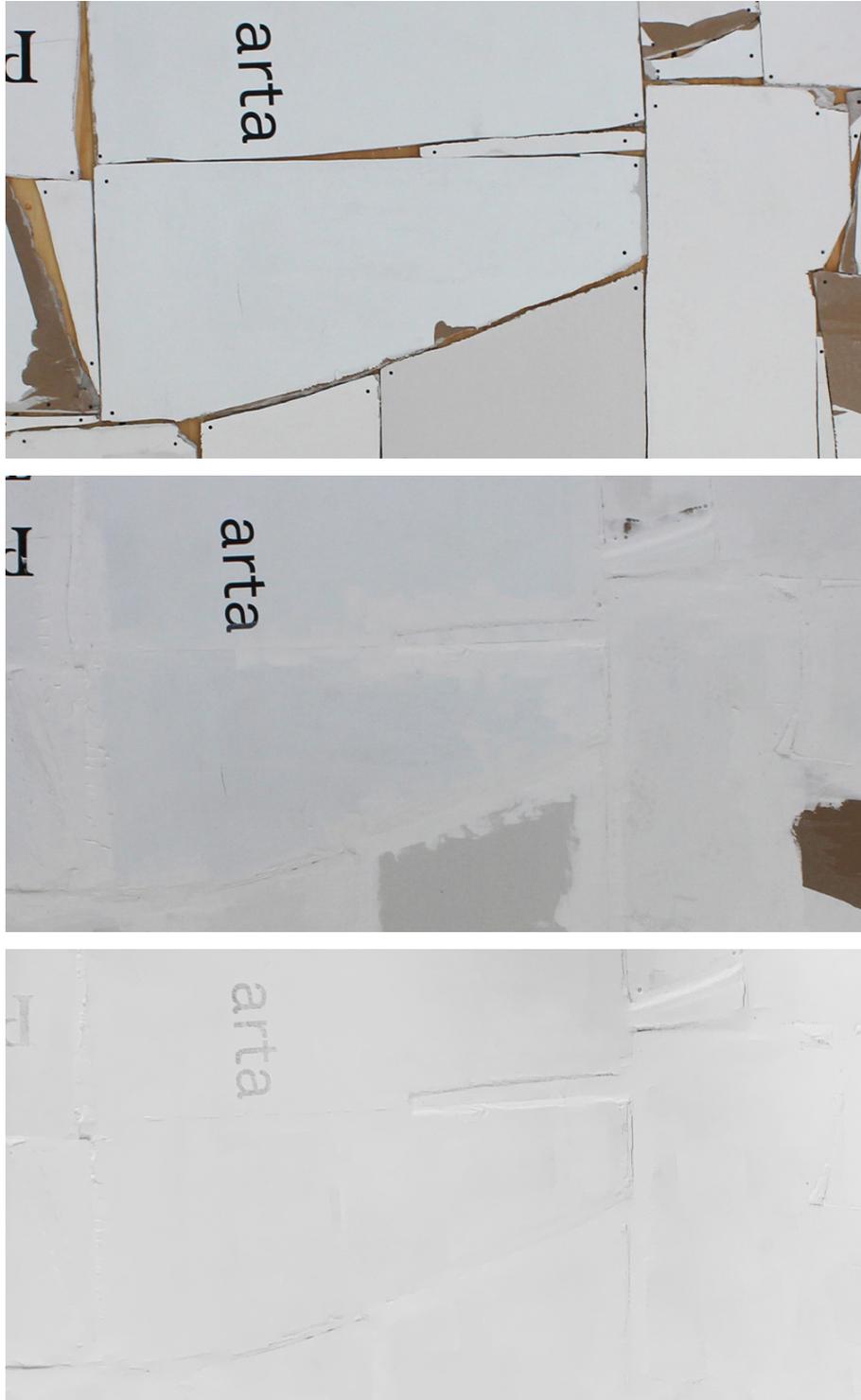


Fig 8. New Affiliates. (2019). *Drywall is Forever* [stills from performance]. Performa 19, New York City.
<https://new-affiliates.us/Drywall-is-Forever>

THE POTENTIAL OF WASTE

As Liborion & Lepawsky informs, the systems and motives behind actions of refusal are multiscalar – different relations matter (2022). Much literature on construction- and demolition waste conceptualise it as masses in streams. Abstract diagrams of waste flows can inform of quantities in relative space. They are capable of visualising relations and larger scales. Conceptualising waste as discarded objects, however, is of interest for design.

Rubbish theory explains on a conceptual level how goods in circulation can shift between value categories. Rubbish is of zero value. Waste, on the other hand, has gone through consumption. It is defined by the act of discarding or wasting it. However, rubbish theory is valuable for the thesis in providing a model for understanding valuing systems. As it is socially and culturally construed what is considered rubbish, waste or object – these things are a mirror of the society that expels it. It relates to those who have the power to define what or who is waste, and what power that is.

While changing cultural norms about what's fashionable is certainly an important part of waste, it is also thinking about tangible features waste matter it can be addressed through design. Edensor's waste matter has been transformed physically. Disintegration, fragmentation and decay disorders the boundaries between objects and their surroundings, making them hybrid (Edensor, 2005). The origin of processes of decay can both be 'natural' – by factors such

as time and environment – or as more often, 'artificial', by human intervention and action (or rather lack of, due to systems of valuation such as the one described by Thompson (2021)).

Waste matter is "irrelevant, dirty and disorderly" (Edensor, 2005, p 315). It embodies some kind of anti-order. That is also its potential. "Stripped of their use and exchange values and the magic of the commodity" he writes, "they can be reinterpreted anew" (Edensor, 2005, p 330). This agency of waste has been picked up by numerous artists both before and since Arman's *Poubelles*. Understood of in relation to Surak's (2016) disciplinary or disruptive displays, the narratives of an installation or the way it depicts waste is part of what becomes of the waste agency. In critical design, the mundane is always a backdrop. Labelled 'design' or 'architecture', these works have the ability to relate to the everyday in other ways than fine art.

In conclusion, for design, the potential of waste as a conceptual matter lies mainly in the critical potential of it being a mirror of society, an other to what is main (eg. Edensor, 2005; Liborion & Lepawsky, 2022; Surak, 2016; Valenzuela & Böhm, 2017). As objects, it has creative potential in its underdetermination and hybridity (Edensor 2005; Metzger, 2011). The thesis is interested in wasting as an action that leaves traces on objects. Unlike 'natural' decay these accidental and non-standard properties of materials are embedded with stories of an active refusal that could be unfolded.

WASTE SYSTEMS

SPACES OF WASTE

WASTE INFRASTRUCTURES

Systems of waste and wasting are multiscalar (Liborion & Lepawsky, 2022). The thesis is interested in the valuing systems of buildings and their materials, and the built and invisible infrastructures managing them. These spaces of waste management are, as Ghosn & Jaizary describes, designed to remain “out of sight” (2016, p 98). They are often located in the outskirts of cities, in what has been called the urban fringe. To understand and map what happens to building waste after its disposal the thesis examines two waste management businesses and their facilities at the lot Grundkallen in Malmö.

SPACES OF WASTE

NORRA & ÖSTRA HAMNEN

Since the decline of industrial activity in Malmö following 1990s economic crises, the redevelopment of urban fringes with high city branding potential (or Koolhasian waterfronts) has flagshipped the city's transition from 'harbor town' to 'knowledge city' (Listerborn, 2017). The development started with Bo01 in *Västra hamnen* and has been followed by *Limhamns hamnområde*, *Dragörkajen*, and in the 2020s *Inre hamnen* and *Frihamnen* (renamed *Nyhamnen*).

Today, *Östra hamnen* and its extension into the somewhat recently constructed *Norra hamnen* accommodates many of the city's industrial activities. With businesses like the municipal SYSAV and various private actors located here, a part of the area can be seen as a cluster of waste management entrepreneurs.

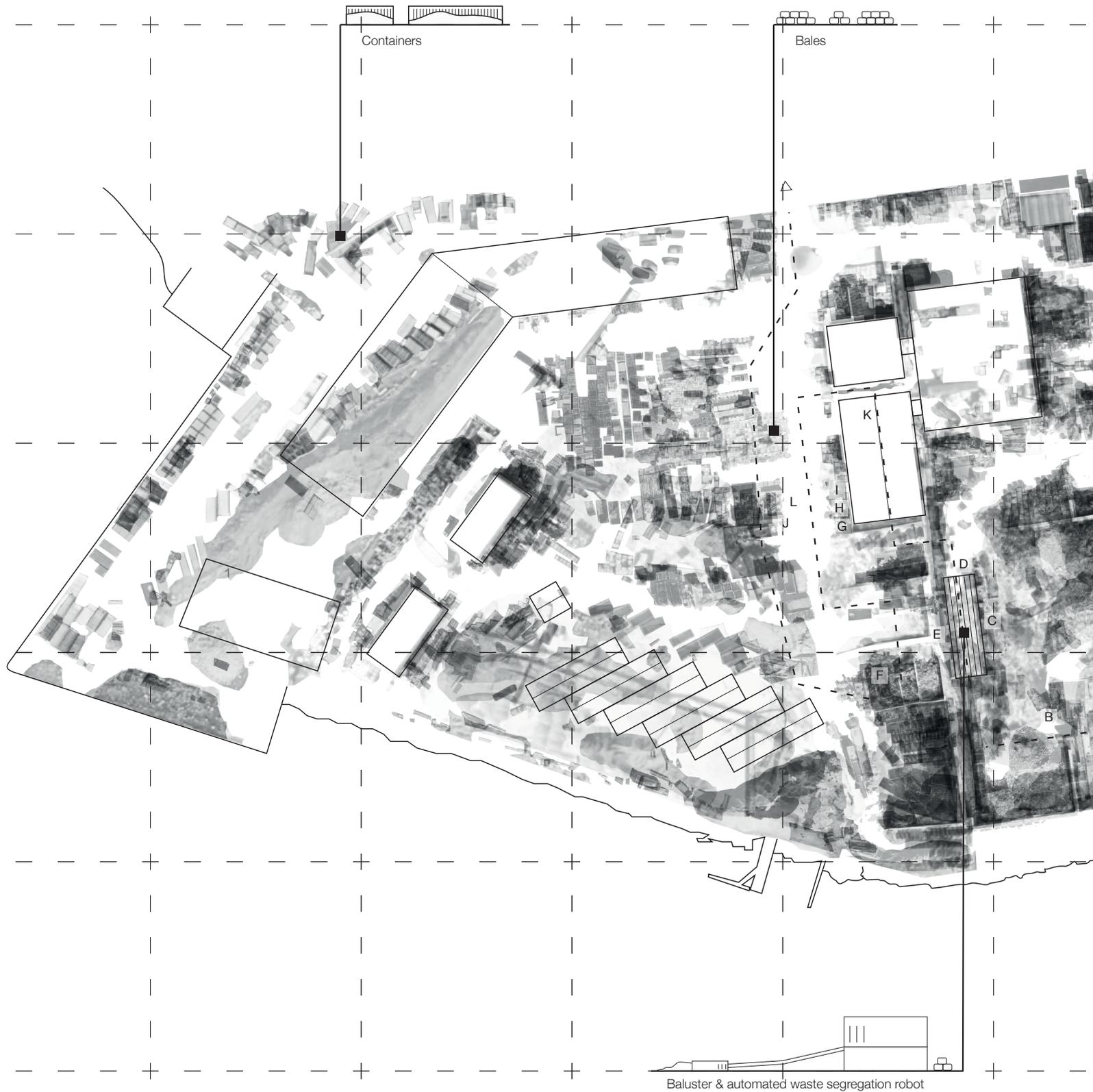
GRUNDKALLEN

The lot Grundkallen serves as a case study for researching spaces of waste management. It is shared by two actors in the industry: local Carl F and a branch of the transnational company Ragn-Sells. Both have broad client registers ranging from industrial producers and construction companies to housing cooperatives (Sw. *bostadsrättsföreningar*), but are not specialized in household waste.

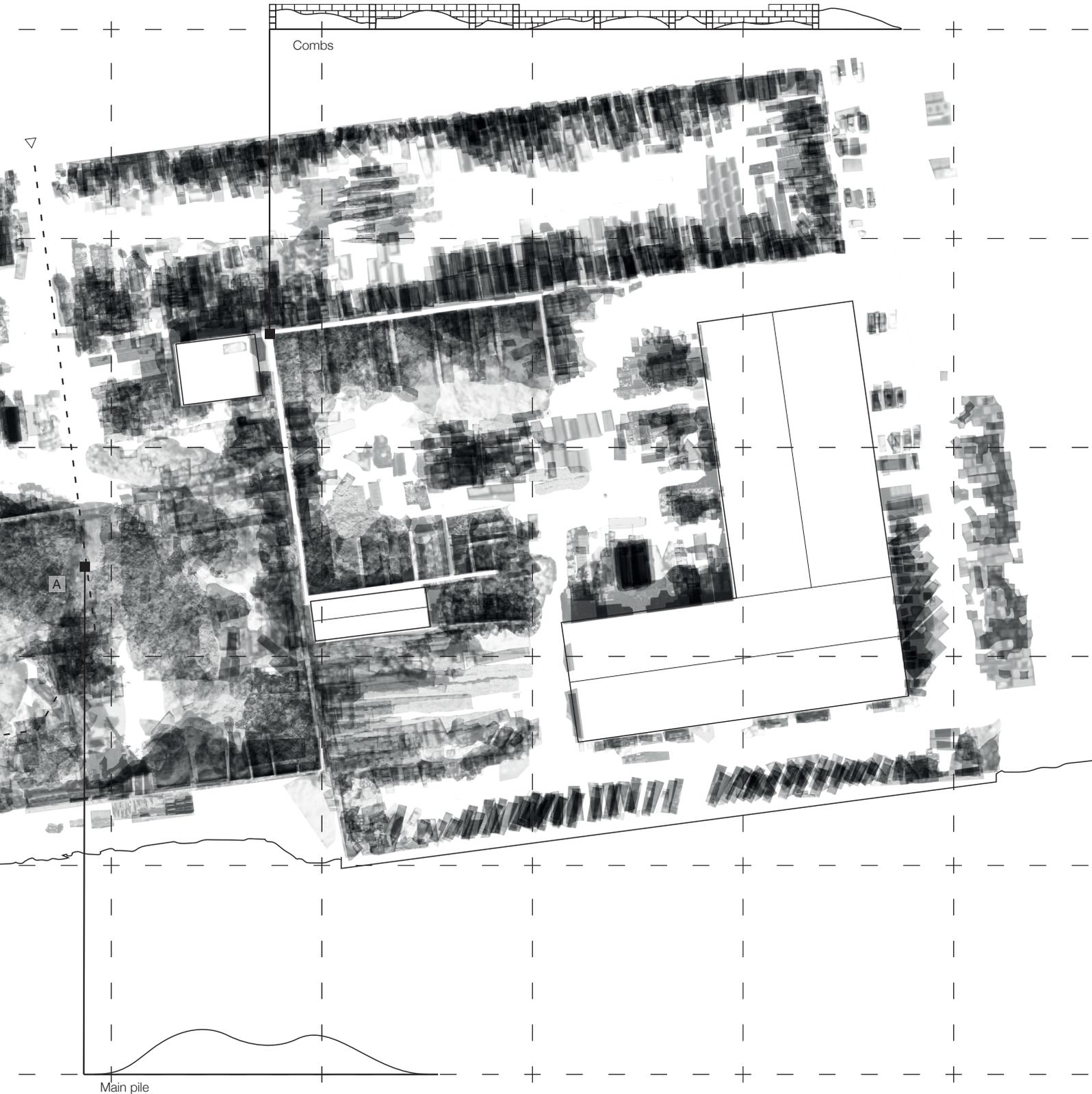
waste management is about logistics. In plan, its spaces can be understood as an urbanism of waste. Typologies include, but is not limited to, piles, buildings, machines, containers, bales. Piles grow, move and change with rates of production (or rather consumption). The organization of the work – where loads come in, gets sorted and processed – is visible and shows that it is structured to transform large, irregular masses to tidy chunks of matter.

Multiplied and masked aerial photos from 2012 to 2022 reveal movements and changes on the site. Rather than a fixed repository, this kind of





Rather than a fixed repository, this kind of waste management is about logistics. In plan, its spaces can be understood as an urbanism of waste. Typologies include, but is not limited to, piles, buildings, machines, containers, bales.



Combs

A

Main pile



A: Easy grabs at main pile



B: Manually sorted materials to enter baluster



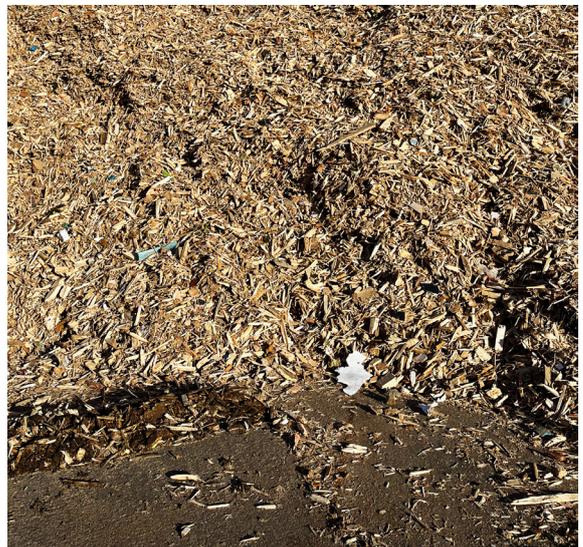
C: Baluster sorted rubble



D: Baluster sorted 2D waste



E: Baluster sorted 3D waste



F: Chipped wood stock



G: high-density polyethylene (HDPE)



H: HDPE



I: polyethylene (PE)



J: assorted wires



K: mineral wool



L: assorted plastics (ex. polyester)

WASTE INFRASTRUCTURES

SORTING AT CARL F

A closer look at Carl F's premises reveal the built and organizational infrastructures of waste management. Studying the time lapse drawing of the business, one can get the impression that it is fluid. Variability is not everything though. Yes, the spaces here can be seen as an urbanism of waste. Piles move around and the spaces get adapted to the labour that takes place. Still, some things are fixed.

The (dis)assembly line at Carl F is built up around their waste segregation robot. Workers in trucks and wheel loaders prepare the loads by manually sorting out what is too large to be

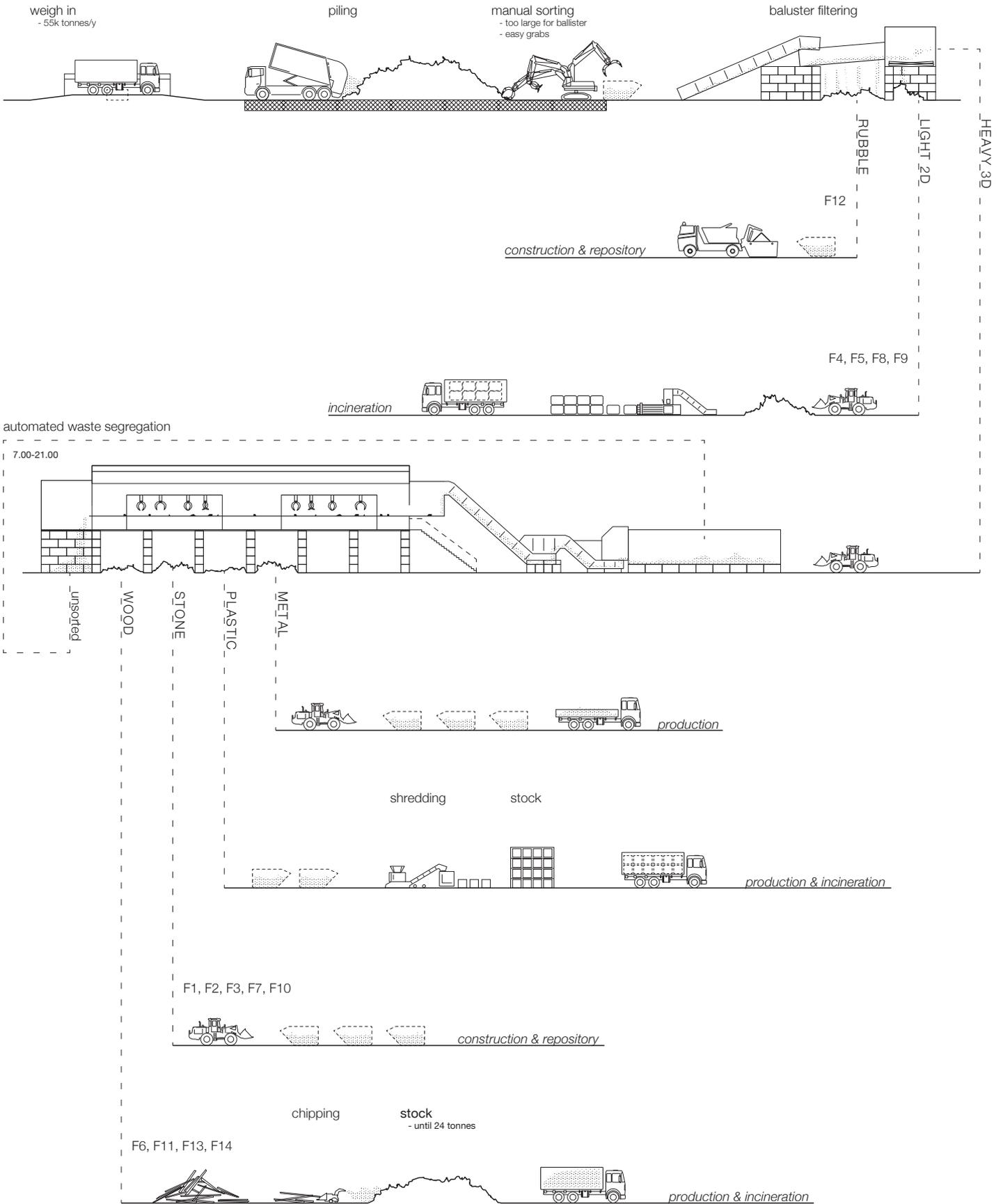
fractionated automatically, as well as easy grabs – large quantities of what can be distinguished as the same. The baluster, a sort of shaking sieve separator, sorts mechanically. It shakes masses to differentiate between rubble, lightweight and slippery materials, and solid objects. The solid waste fraction enters the waste segregation robot on a conveyor belt. There, it is analysed with a laser sensor and the data fed to an artificial intelligence that can distinguish what type of material is approaching and in which fraction, following material composition, it belongs to. Robotic arms follow information from cameras to put the 'matter out of place', in its place.

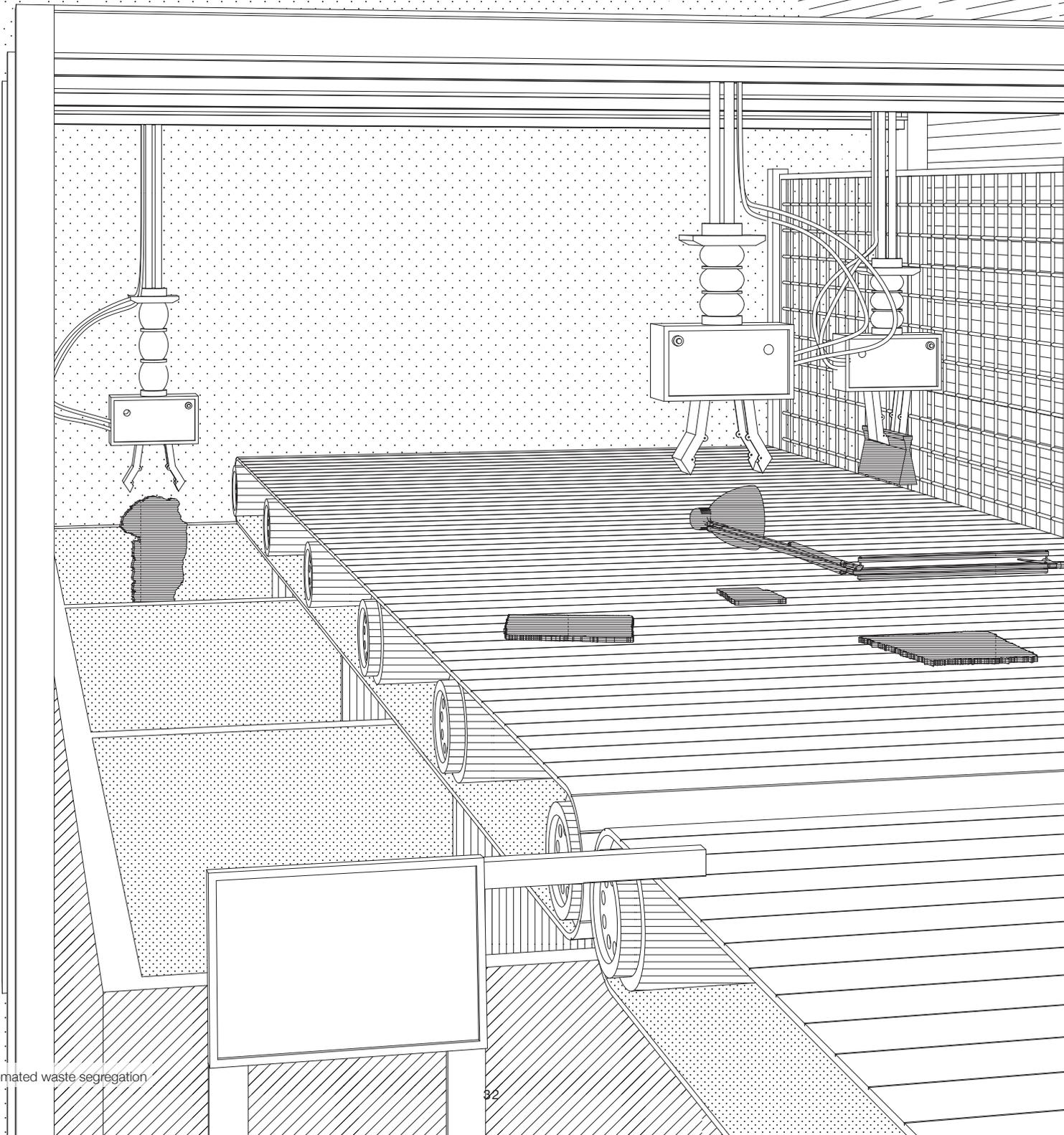
FROM PILES TO BALES

Edensor describes how the power of making order in the world is made visible by looking at waste matter (2005). At Carl F, waste matter is ordered by sorting it into fractions by individual object's material composition. In terms of form, that means transforming it from heterogeneous piles to homogeneous bales.

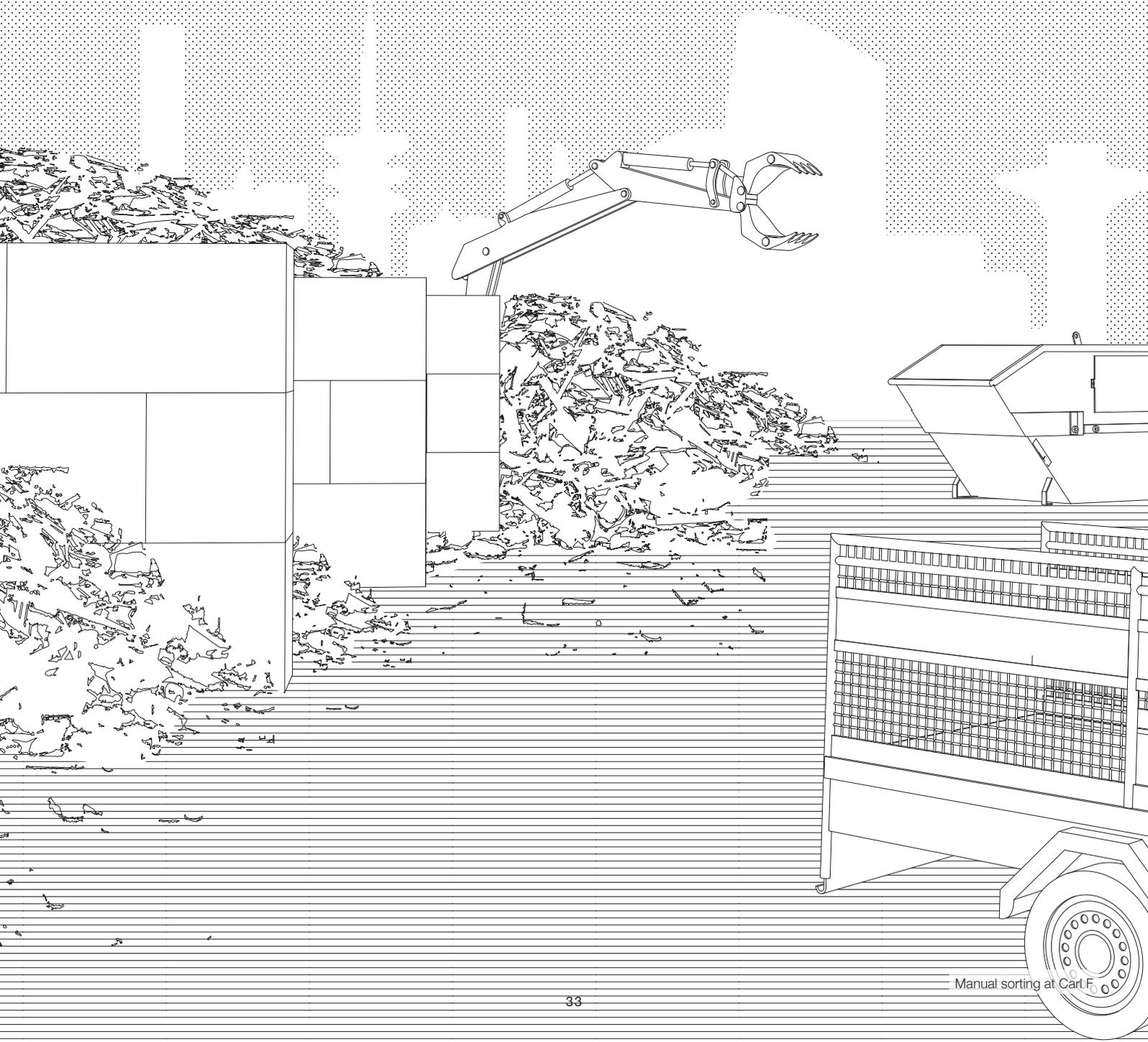
This differentiation is interesting because it offers a middle way between looking at waste as intangible masses (pp 23-33) or as singular objects (pp 38-41). As seen in the diagrammatic section, a pile of stuff is contained by, in its simplest form, the ground. More orderly, it is confined to a container. Bales are containers in themselves, as singular structures.

WASTE SYSTEMS





Automated waste segregation



DISCARDED OBJECTS

RUBBISH SKIN ON A DURABLE SITE

A TAXONOMY OF WASTE

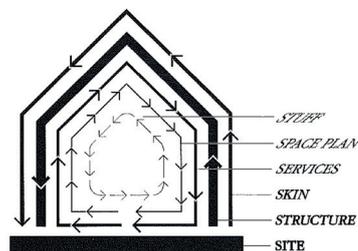
To conceptualise and represent waste as masses in streams is convenient for thinking about and mapping out its systems. However, waste as matter – the tangible stuff that make up those abstract flows – is of interest for the thesis because of its potential for design. To explore the materialities of waste matter, and to understand how consumption alters objects, the thesis investigates a selection of discarded objects and their journey from transient and rubbish matter to waste.

RUBBISH SKIN ON A DURABLE SITE

The consumption of transient and rubbish architecture is examined through a case study of the waste generated in a renovation of a 1960s row house in Oscarshem, Lund. A popular model for understanding change in buildings is Stuart Brand's building *layers*. These different components (except site) last, wear out or get outdated at different rates. Brand compares buildings to ecosystems: buildings are seen as systems of parts that adapt to a natural process of change of society (Brand, 1995).

Looking at the row house at Oscarshem with Brand's eyes, only parts of its *skin* has changed since its building – some added 70s carpeting and veneer panels. Otherwise, only *stuff* is what this building has learnt. Now, however, all but its *structure* and *site* is about to change. Does that mean that those are durable, while the skin, services and stuff are rubbish?

Understanding the house as a whole good in circulation – its built parts, its installations and its plot put together – it could be argued to belong to the durable category. It is located in an urban part of Sweden, where housing costs and prices have risen steadily under the past decade. Of course, values in rubbish theory isn't only about economic value and price. Still, the folkhemsnostalgia and suburban lifestyles encapsulated in and made possible by these row houses are corner stones in conceptions of what makes a good life – making the building valuable by association.

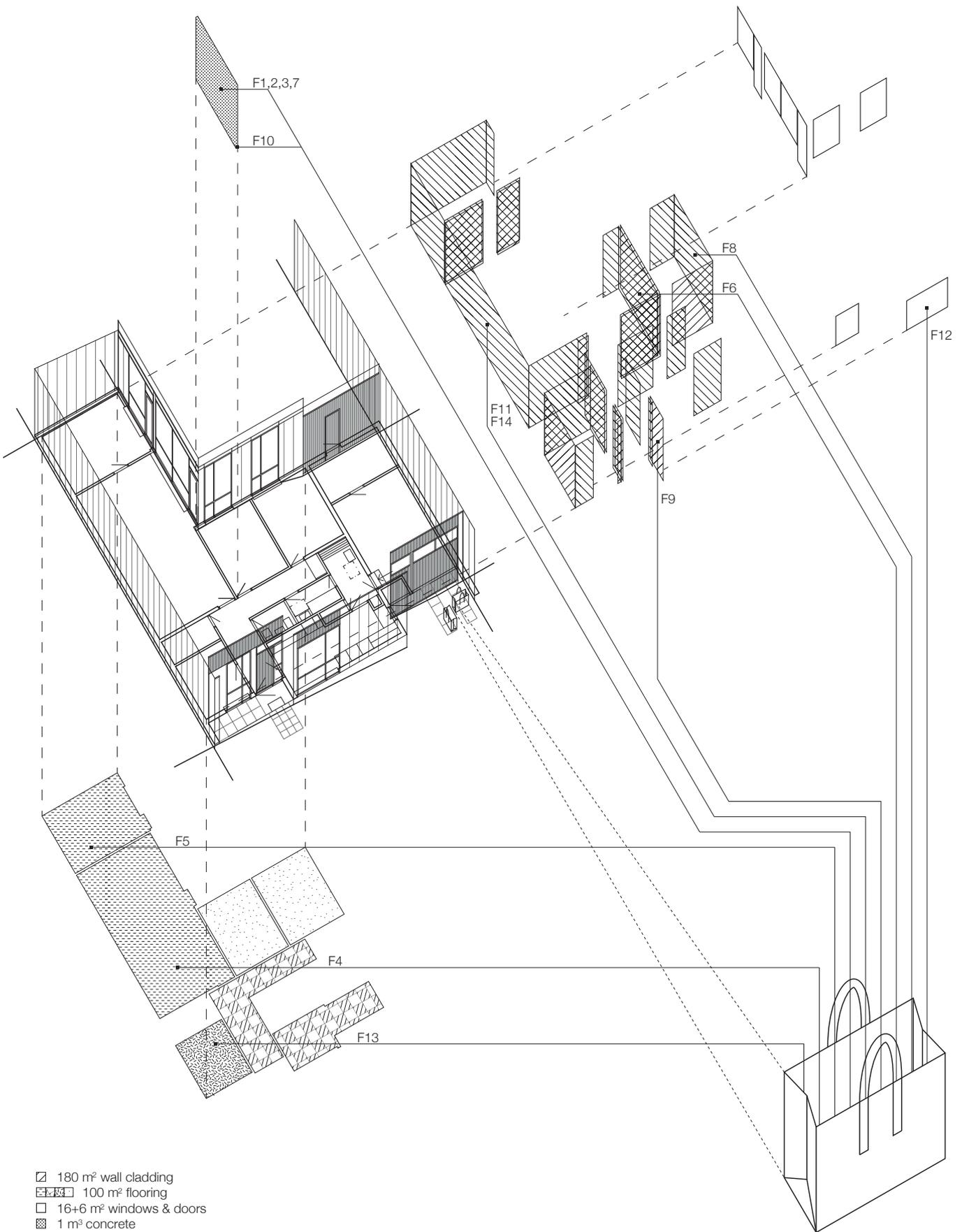


SHEARING LAYERS OF CHANGE. Because of the different rates of change of its components, a building is always tearing itself apart.

Fig 9. "Shearing layers of change" from Brand, S. (1995). *How Building Learn*. Penguin Books.

Brand claims that all buildings change, but only some improve with time (1995). Understanding a building as parts in assembly, and their layers of change in relation to rubbish theory, one could say that they do, because they get rid of what becomes rubbish. Brand's naturalising comparison to evolution isn't enough to explain how something wear out or obsolescence. As seen in the explored axonometric to the right, in the case of the studied row house, the rubbish that is expelled is mainly its skin. It is subject the most visible and tactile parts of a building, the subject of wear and tear but also to notions of what's fashionable. To deem something obsolete, as in 'out of style' and 'actual' deterioration, is to actively clean up space. The change of the components in fig. 8 is more often than wear and tear an active process of eliminating rubbish, of utilizing the power of making order in the world.

DISCARDED OBJECTS



A TAXONOMY OF WASTE

WASTE FRAGMENTS

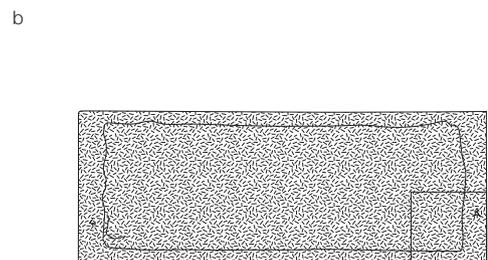
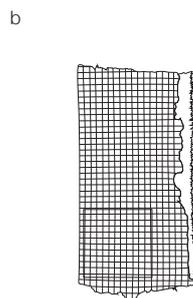
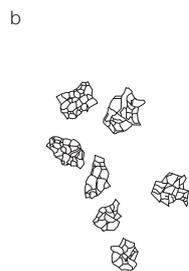
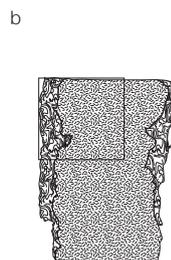
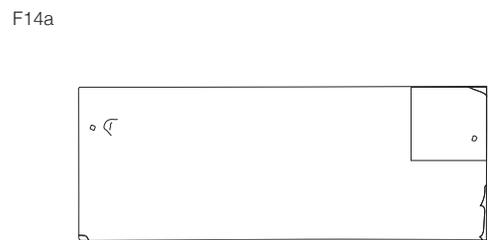
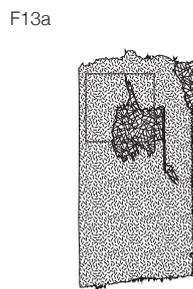
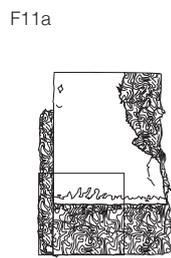
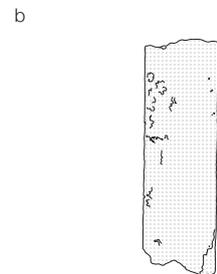
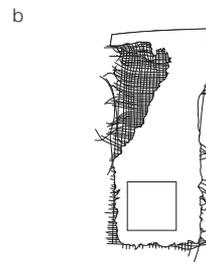
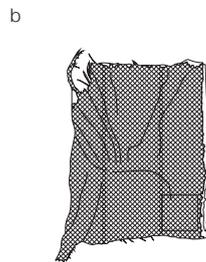
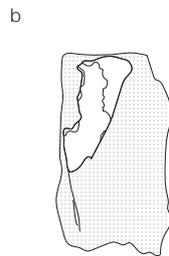
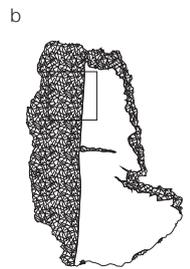
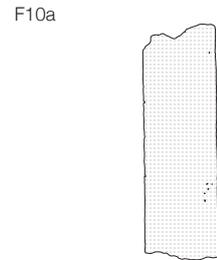
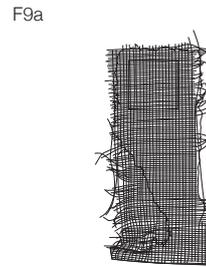
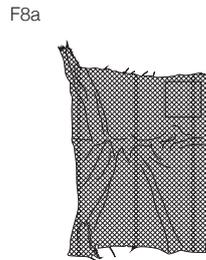
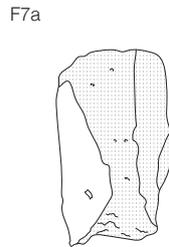
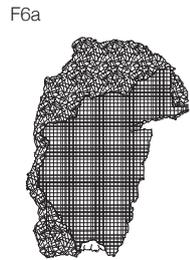
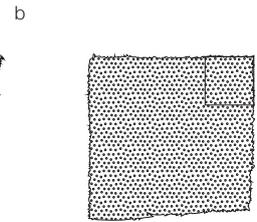
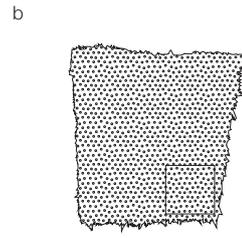
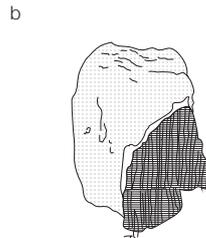
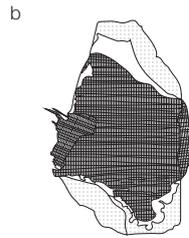
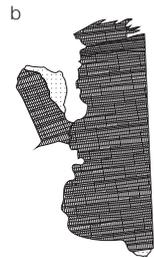
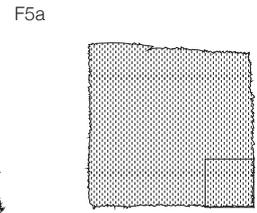
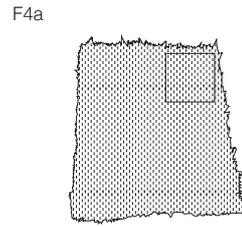
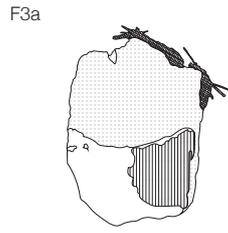
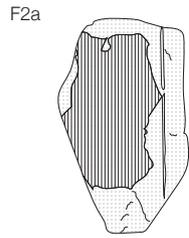
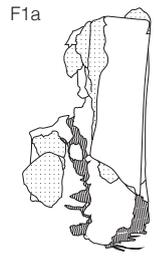
1. Lightweight concrete with woven tissue.
2. Lightweight concrete with woven tissue and wallpaper. Linear trace of reinforcement.
3. Lightweight concrete with woven tissue and wallpaper.
4. Wool rug, dark brown. 7 mm
5. Wool rug, orange. 14 mm.
6. Chipboard with wallpaper and blue paint
7. Lightweight concrete. Glue and paper from wall covering.
8. Woven wool wallpaper, green. Dots of glue on one side.
9. Woven wallpaper with paper back, ragged.
10. Concrete sill.
11. Softboard with white and blue paint.
12. Shattered window glass.
13. Linoleum carpeting. Red woven surface, worn out with holes.
14. Masonite board, painted blue and green. Dents from demounting.

TRACES OF DISASSEMBLY

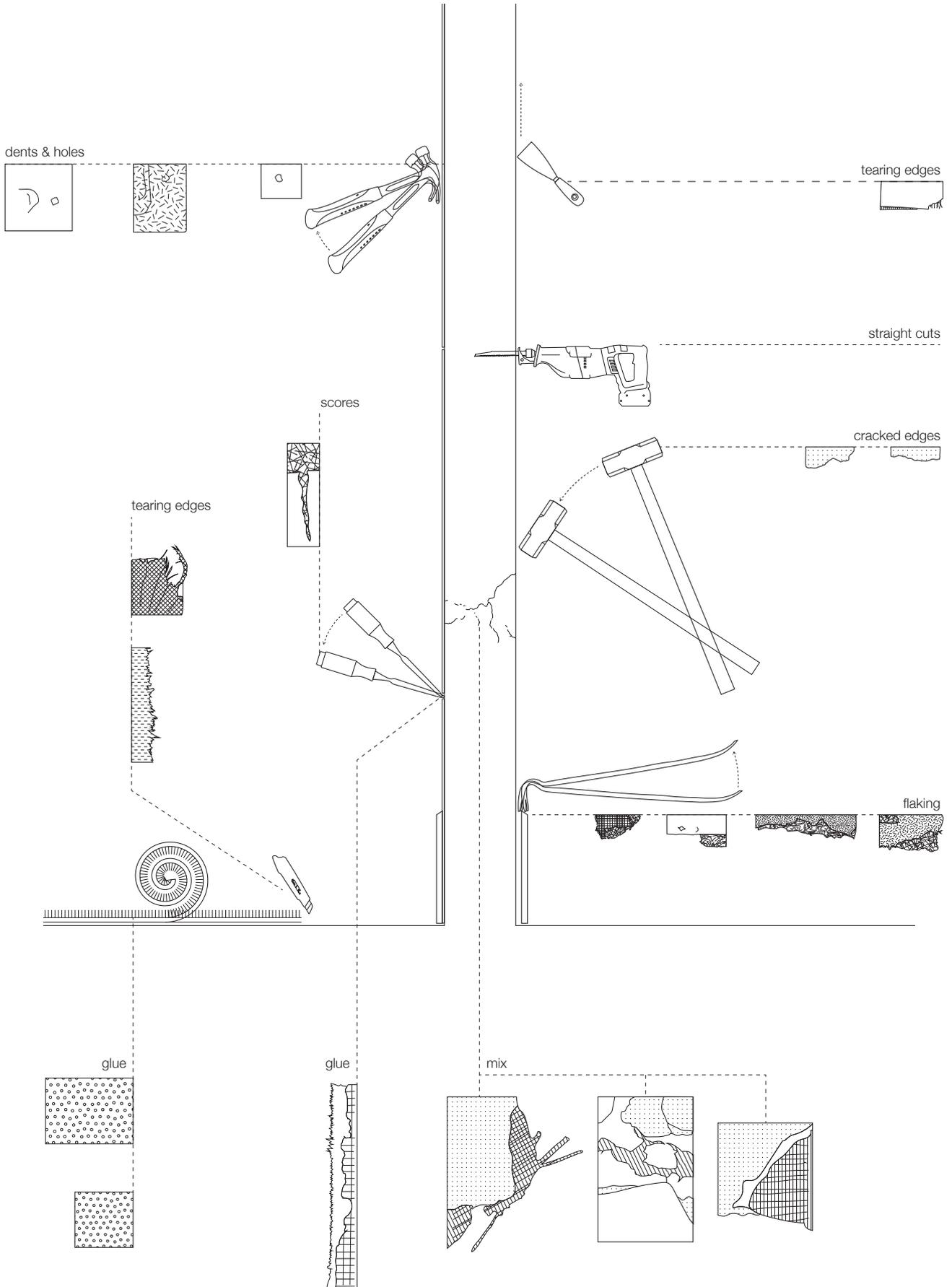
The researched fragments have all been wasted through unbuilding – a renovation of a 1960s row house in Lund. Random acts in this process leave their marks on fragments: traces of disassembly. *Tool interactions* (TIs) – including rough edges from a tiger saw’s blade, cracks from being broken with a sledgehammer, and dents from hammers prising out nails – informs of the disassembly process. As primary elements of form, tool interactions can be seen as points and lines. They are present as singular moments or as edges that follow along a whole fragment.

Planes and volume belong to another category of traces. Wasted materials are often disassembled by force and in a carefree manner – they are about to be wasted, not saved. The separation of fragments from their built context can leave a second set of signs of wastedness: *material hybridity* (MH). Pieces of wallpaper still stick onto lightweight concrete blocks. Glue covers what was previously the back of a fabric. Reminiscent of Edensor’s (2005) notion of hybridization through decay, these traces are a sign of disassembly through their embedded stories of previous assembly.

WASTE FRAGMENTS



UNBUILDING



TRACES OF DISASSEMBLY

TOOL INTERACTIONS

MATERIAL HYBRIDITY

DENTS



Tld1 [F14b]



Tld2 [F14a]



Tld3 [F14b]



Tld4 [F14a]

SPLIT



Tls1 [F11a]

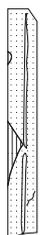
INCISIONS



Tli1 [F6b]



Tli2 [F13a]



Tli3 [F2]

FLAKING



Tf1 [F11a]



Tf2 [F11b]



Tf3 [F13b]



Tf4 [F11a]



Tf5 [F11b]



Tf6 [F6a]

TEARING



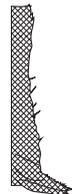
Tlt1 [F9]



Tlt2 [F4a]



Tlt3 [F8b]



Tlt4 [F8ab]

CRACKING



Tlc2 [F10a]



Tlc3 [F10b]

WALLPAPER



MHw1 [F1a]



MHw2 [F3b]



MHw3 [F2b]



MHw4 [F1b]

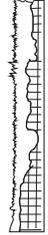


MHw5 [F3a]



MHw6 [F2a]

GLUE



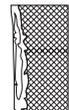
MHg1 [F13b]



MHg2 [F4b]



MHg3 [F5b]



MHg4 [F8b]

PAPER



MHp1 [F9b]



MHp2 [F11a]

EXPLORATIONS

TRANSFORMATION

INTERPRETATIONS

COMPOSITION

As a collection of design explorations carried out in the thesis, this chapter covers three approaches to design and reuse that build upon the analyses of waste systems and discarded objects. *Transformation* builds upon the observation of material hybridity and echoes it. *Interpretations* pick up the primitive form of the bale, and materialise this middle scale conception of waste – between mass and object. *Composition* explores the agency of traces of disassembly as drivers in design.

TRANSFORMATION

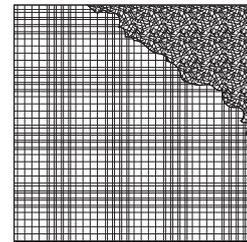
Waste copies echo the act of unbuilding in reenacting processes that force material hybridity. In this thesis, the technique goes under the name of *transformation by representation*. A copy is at once a replica of an original object and an object in itself. The creation of them alter the originals, transforming them by making representations of them.

Flat materials are multiplied in monoprints where they spill onto the paper – the media of a print – which also spills back on materials themselves. The acrylic paint used for the prints becomes a binder that connects the two, the print and the printed. A second representation round materialised the prints back to objects, as laser cut tracings. Their ultimate flatness has erased traces of disassembly.

Waste fragments with higher three dimensional-ity (ie. concrete debris) are multiplied in plaster casts. Without using release agents, fibers and grain from original objects get caught in the latex mold and in turn pass onto the plaster copies. As copies, they are conscious creations of what was previously random externalities of an unbuilding process.



S6a



S6aL



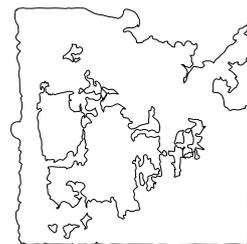
S6aw



S6aP1



S6aP2



S6aP1C

Fragment no 6 (F6), a piece of chipboard partly covered with wallpaper, was documented as a unique object. A sample (S6a) was cut. The sample was drawn and documented with lines (S6aL). The original sample was stained (S6aw) by doing monoprints (S6aP1&2). Prints were basis of creating new matter – waste copies (S6aP1C).



Waste copies (F7C & F3C) in assembly.

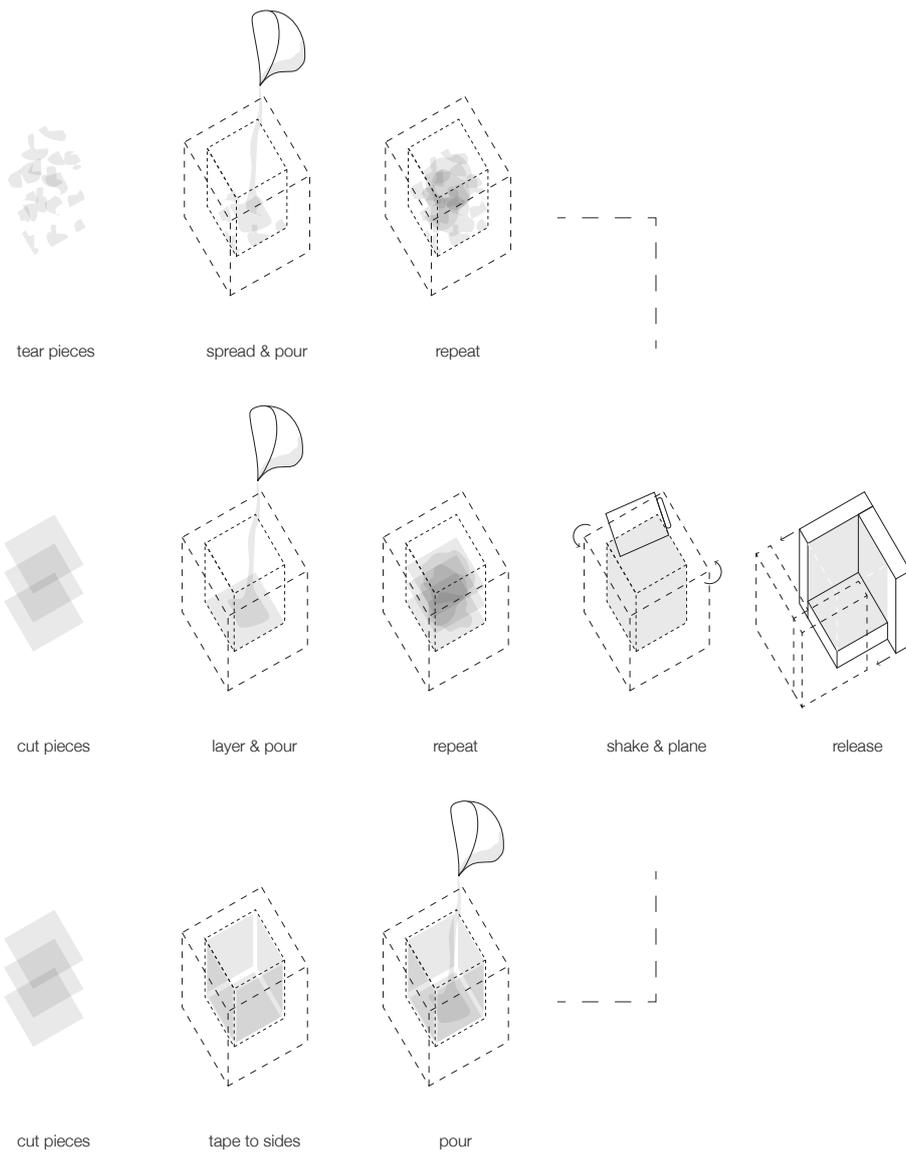
INTERPRETATIONS

The study visits at Carl F and Ragn-Sells informed of the systematic transformation of waste masses from heterogeneous piles to homogeneous bales. By moving, filtering and sorting, cluttered masses is fractioned into tangible units. Intended to facilitate the recycling of materials by their respective recycling method, the change of typology also provides a concept for representing waste. The *bale* as a collection of objects can bridge the conceptualization of waste as masses (as seen on pp 26-27) and as objects (ie. catalogue of fragments, p 39).

“Dirty models” are models that are created in the middle of the design process. Rather than being a manifestation of a design that has already been ‘finished’, they reveal the they are a “design thought in process” through their

dirtyness (Frichot et. al., 2022, p 64). Drawing on the idea of the transformation of a pile to a bale – by change of form and method of stacking – series of models that negotiate the baled state were developed. Bales are represented as cast cubes of rubble, of layers and of textures.

The casting process gives a homogenizing effect to the variety of waste samples they encapsulate. While erasing the traces of disassembly these objects carried with them, the bale interpretations inform of an alternative way of looking at them. Being somewhat ‘stupid’, they are not trying to make sense of the waste or play to its materiality. Instead of singling out irregularities or specific qualities, they capitalise on what is similar about the waste samples.

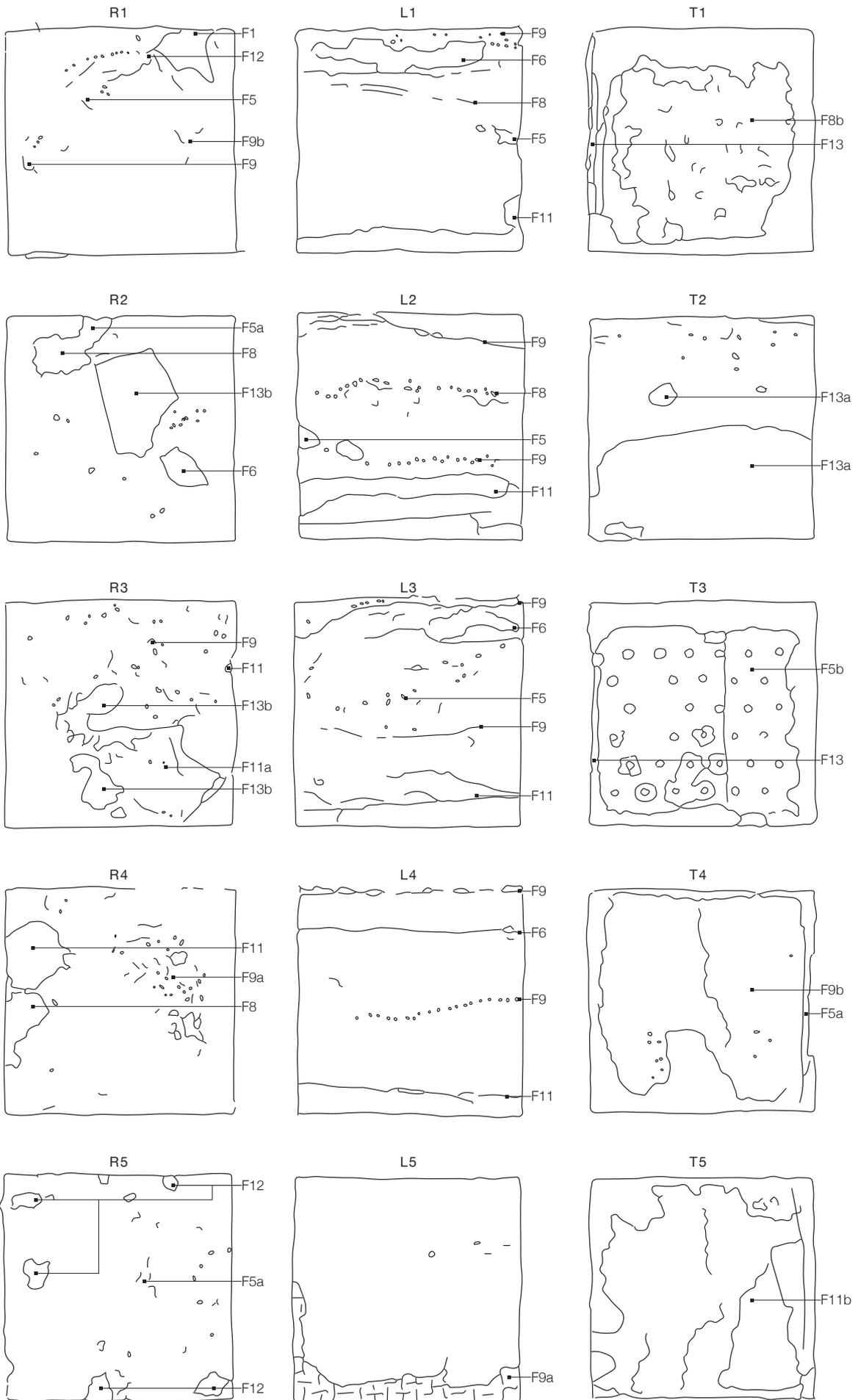




Being somewhat 'stupid', bale interpretations are not trying to make sense of the waste or play to its materiality. Instead of singling out irregularities or specific qualities, they capitalise on what is similar about the waste samples, as rubble, layers and as surface textures.

Bale interpretations
Plaster, cast with waste rubble and samples

EXPLORATIONS

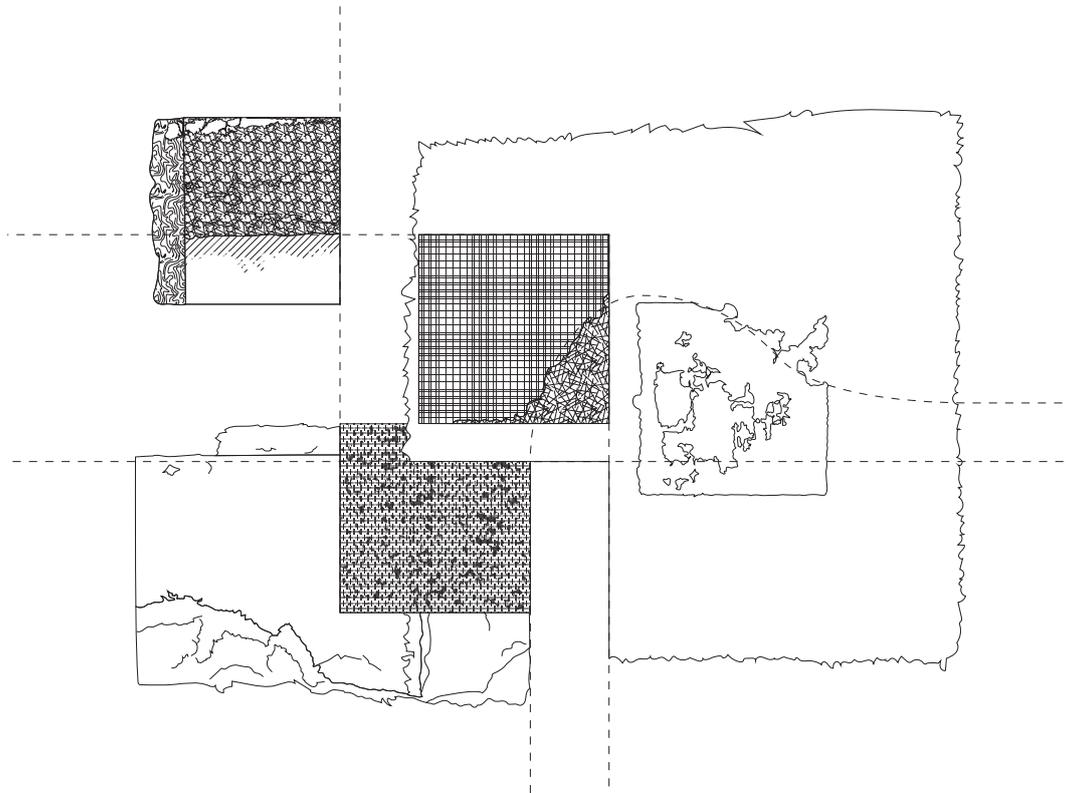


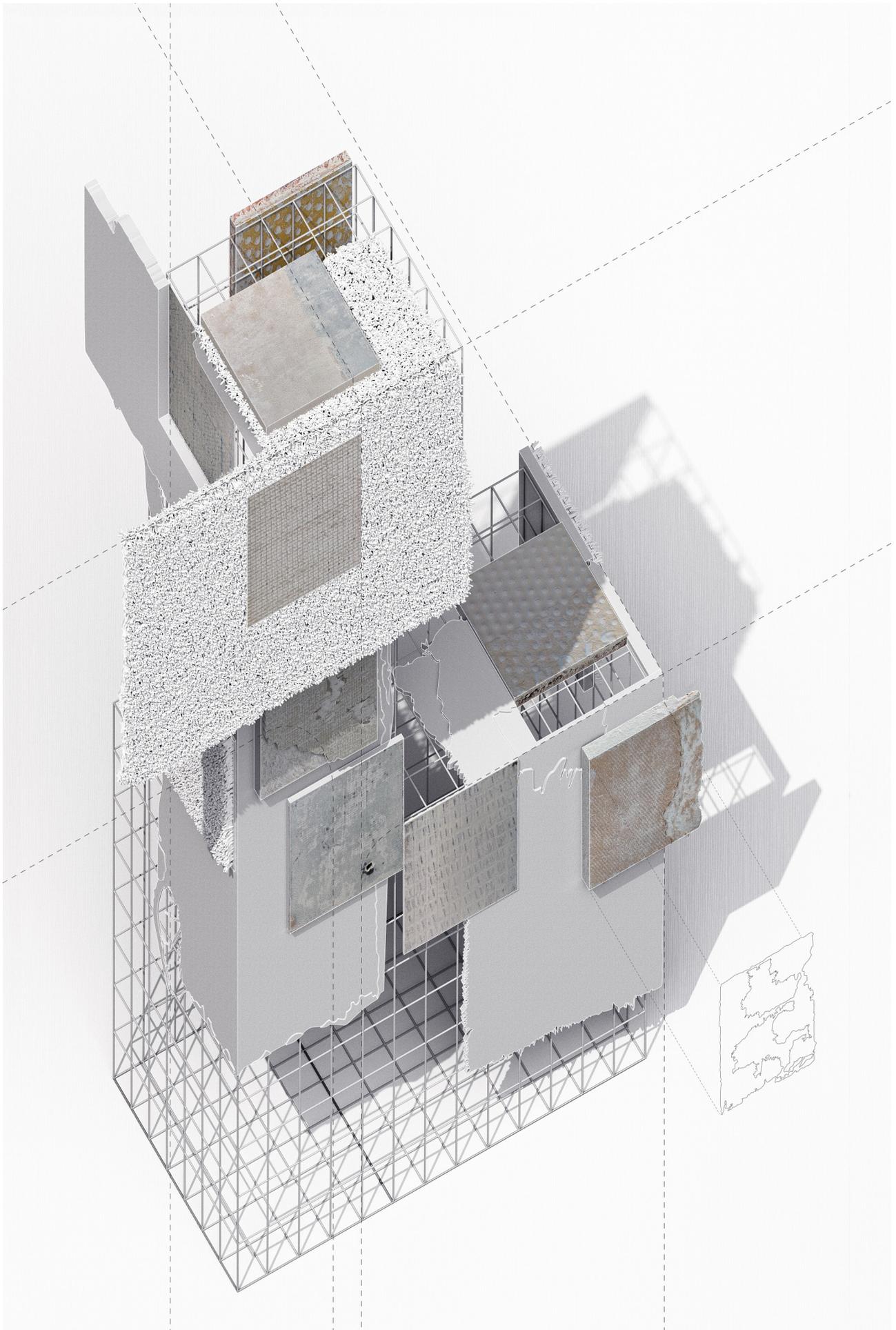
COMPOSITION

With waste fragments, random traces of disassembly are 'the thing' – or at least a unique quality they have. Their form and shape is more often than not irregular, and even if not, it is at least a *fact* – it exists in the real world, and is not invented in the design process.

What can be designed is how they are assembled. The agency of traces of disassembly as drivers in design is explored in series of compositions where the irregularities and lines connecting them become operative in design. Directionalities in patterns or form is picked up as compositional lines. Specific moments are utilized for dynamics. Variations in texture gives weight.

As elevations, the assemblages process shapes, proportion and textures. By folding the flat assemblage along compositional lines, they are made as three dimensional. Interpreted as proto-structures, they involve form and balance in euclidian space. Finally, the compositions are manifested as a figurine, brought into the real world through a visual language that handles colour, time and space.





SPECULATIONS

TROPES

STRUCTURE

FACADES

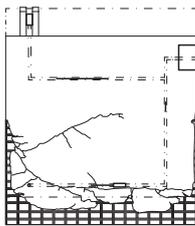
BUILDING

Concluding the thesis, design approaches and methods developed in the design explorations are synthesized in drawings that speculate on how waste can be designed with while still being waste, expressing its wastedness. Influenced by Neyran Turan's and NEMESTUDIO's work (eg. Turan, 2019), assemblages are represented as still lives in a borderland between model and real scale. Their context isn't the 'real world', but the discourse and systems they refer to. By introducing complexity in amount of parts, motif, detailing and entourage, the design develops from conceptual assemblages to more contextual speculations.

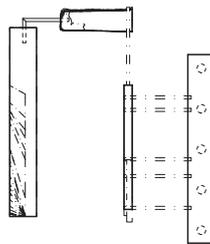
TROPES

Bale interpretations are, together with fragments, samples and isolated traces of disassembly (pp 37-39), re-presented as models of structures, following the intuitive composition strategies established by working with tool interactions as visual cues (pp 50-51). A mark on a surface is picked up in a vertical support. The directionality of a pattern can be elaborated on in joints to another object. Irregular edges – flaking, cracked or tearing – are combined to dynamic visual connections through design.

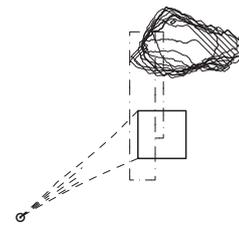
The material is tested against iconic architectural logics – the *slab-heavy* Dom-Ino, the Barcelona pavilion’s *screens* and the straightforward *Stonehenge* – in order to bring free composition back to the ground. Displayed as test together with their contents, these proto architectures inform of assembly strategies for larger compositions. Rather than designing form and function, the tropes are a negotiation between form and texture, of the existing and invented.



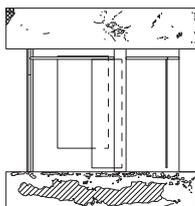
Slabs: plan



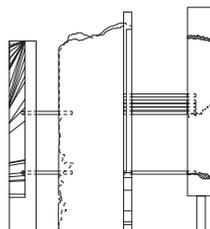
Screens: plan



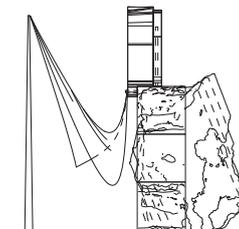
Stonehenge: plan



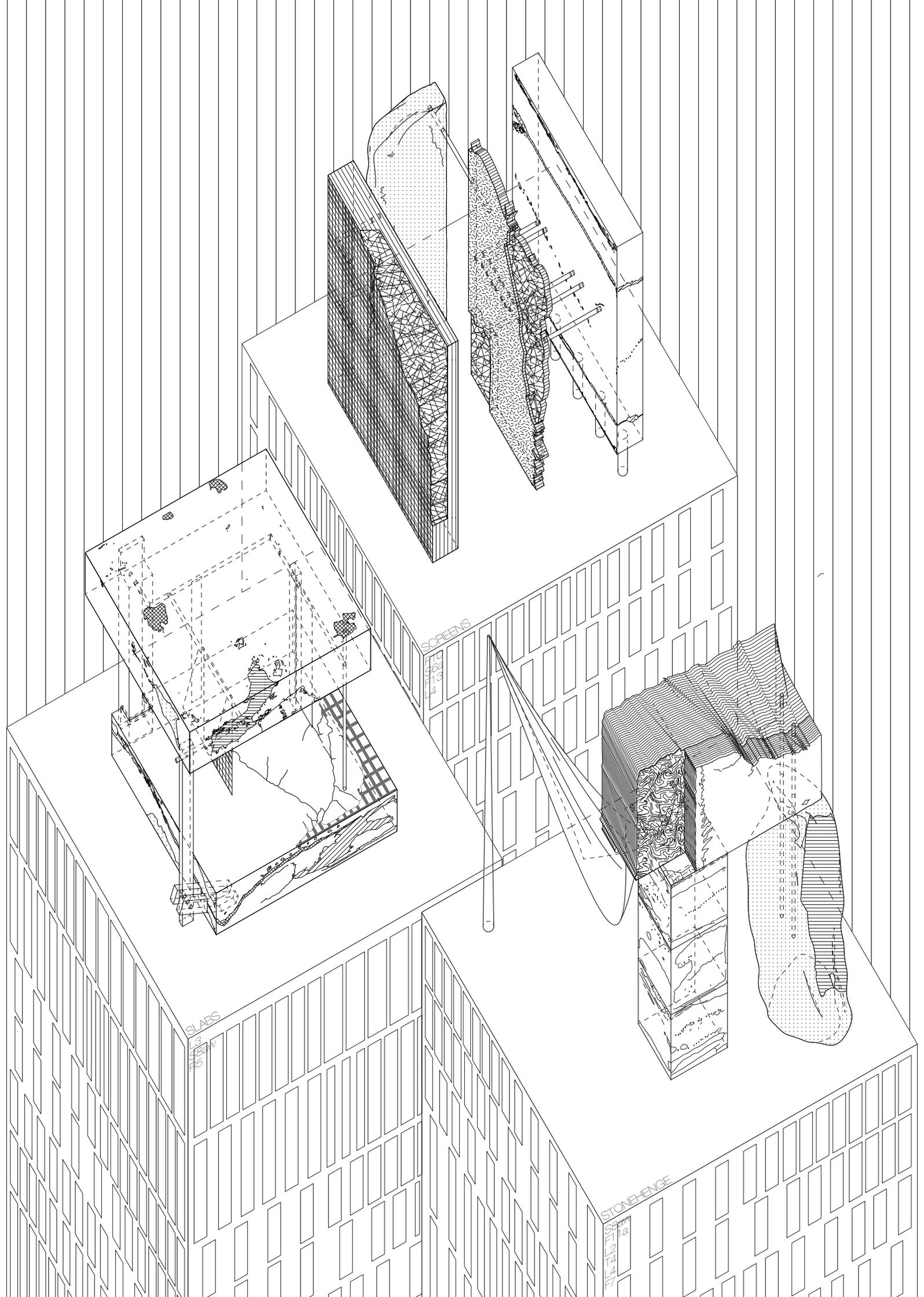
Slabs: elevation



Screens: elevation



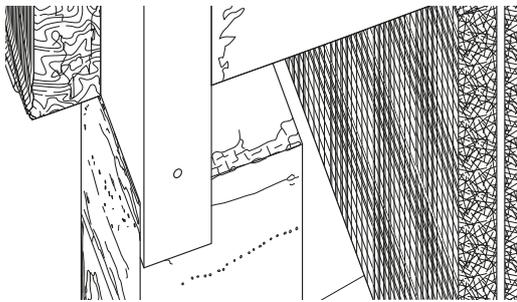
Stonehenge: elevation



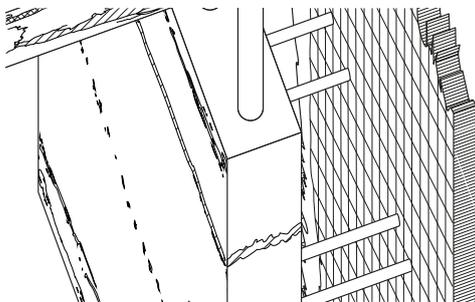
STRUCTURE

The structure is a scaling up of the tropes in how it combines a larger amount of waste fragments and bale interpretations. It increases complexity in both structure and amount of parts. Strategies for joints are repeated, adding one piece at a time. Layering components alternately builds depth while communicating tectonics. Irregular and non-standard properties are appropriated as cues for assembly. Joints are sometimes exaggerated to highlight certain features – directionalities of form or pattern, or specific traces of disassembly.

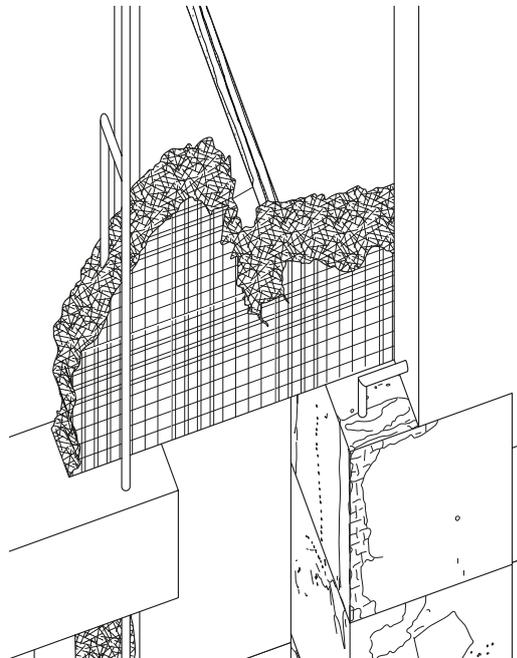
Set against the taxonomy of waste fragments (p 39), the structure communicates its context. Though somewhat reminiscent of a castle, it is without typology, without program, without site. It is nothing but its recipe, a materialisation of tying together waste streams. In that sense, it is but an aesthetised list of contents.



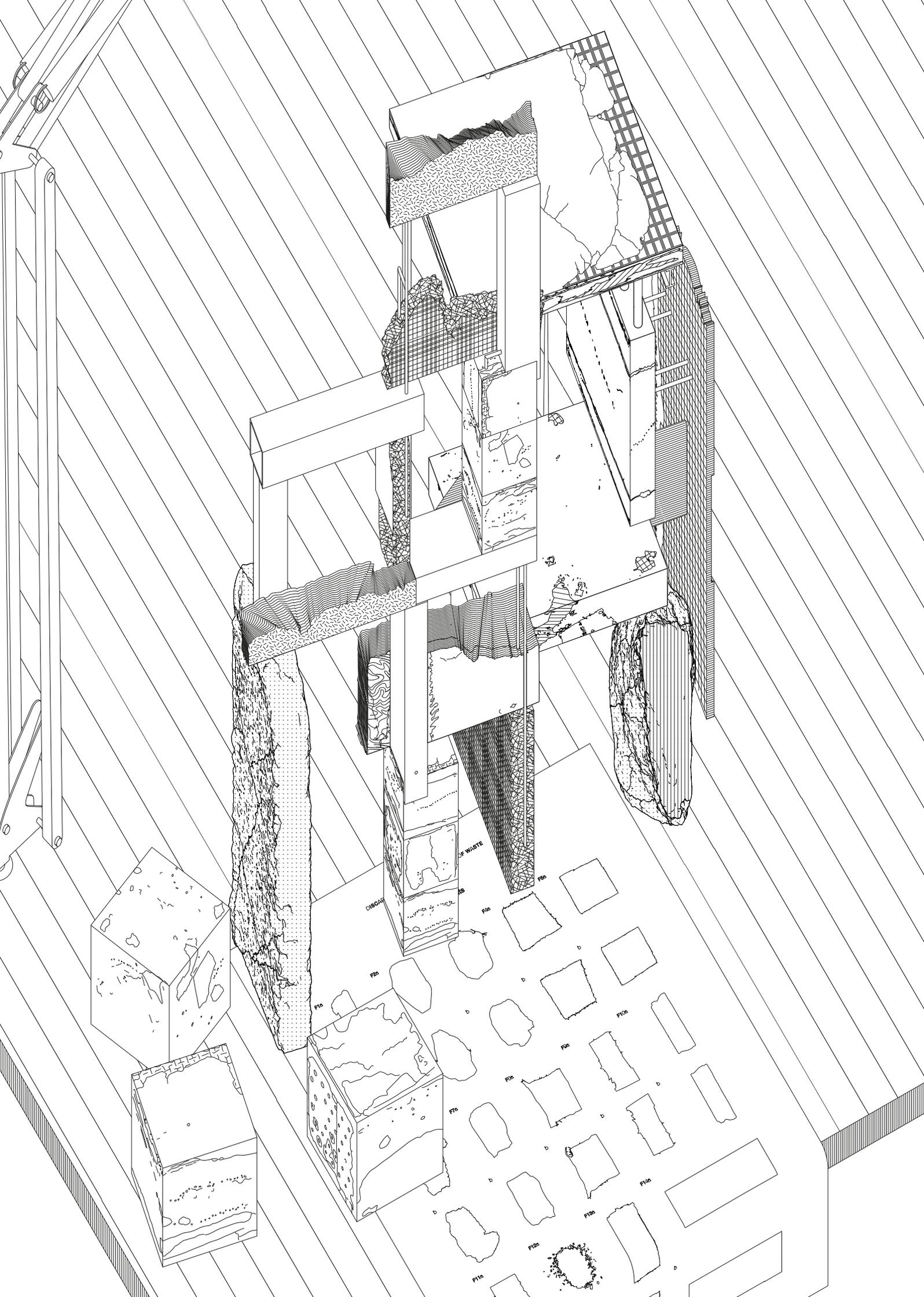
Alternating layering, see Stonehenge



Assembly strategy derived from pattern, see Screens



Exterior joints, see Slabs



FACADES

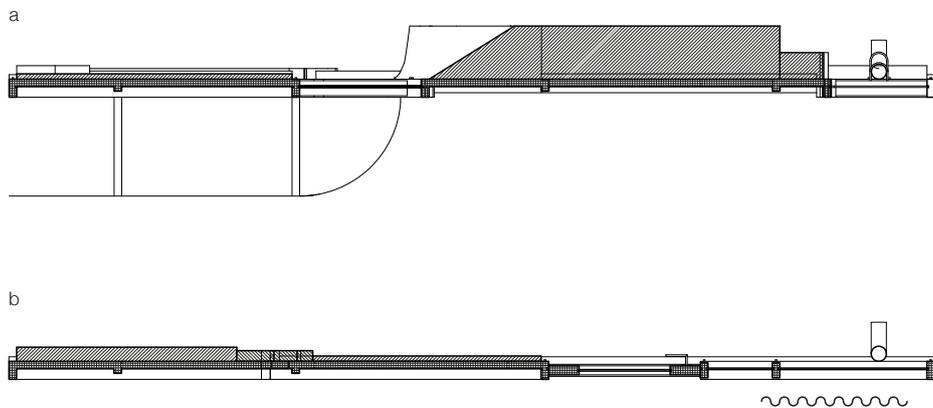
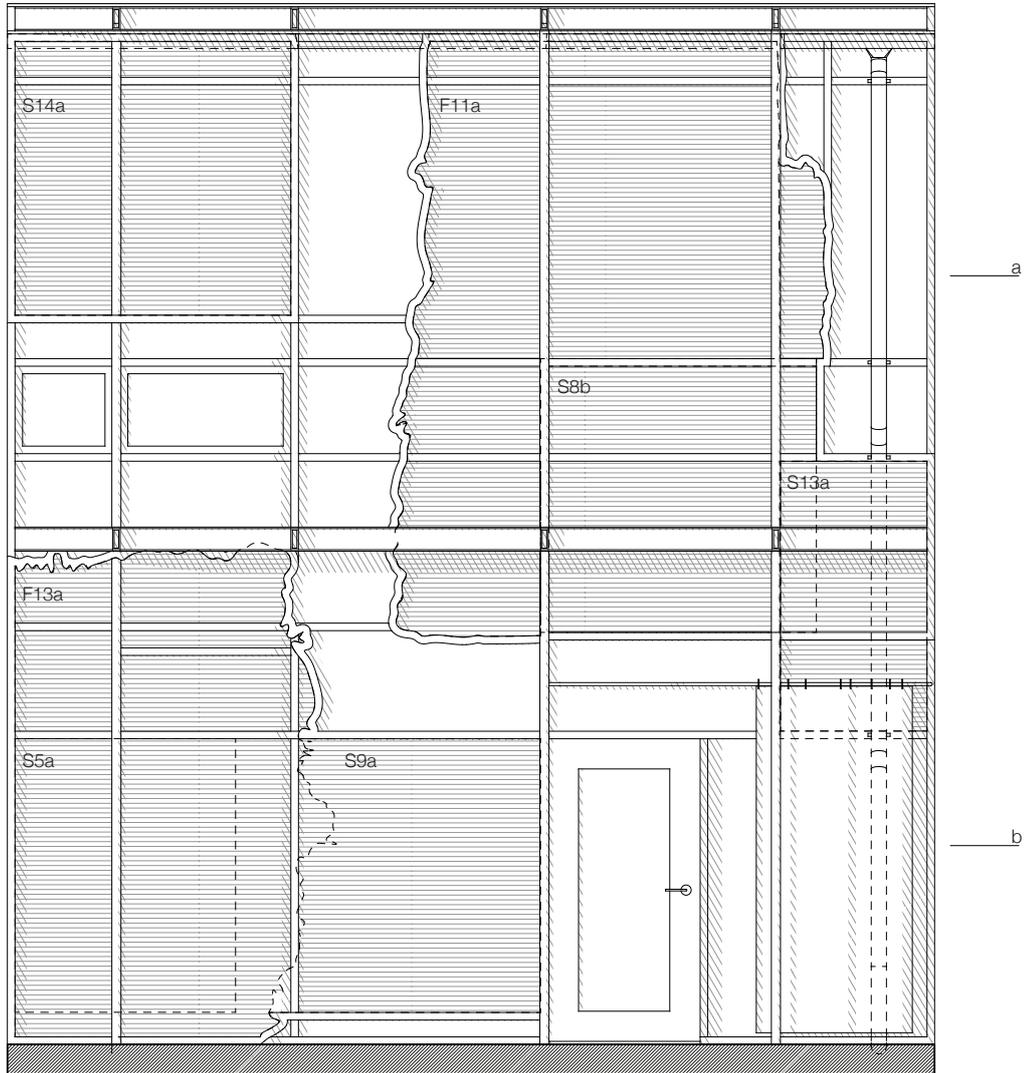
The design is once more scaled up. This time not through overall size and amount of parts, but in detail and recognizability. With the facade of a two storey building as motif, two assemblages investigating composition as surface and as structure are represented at a scale bordering model and real. Entourage gives clues as to how to understand the drawing. Their contexts aren't the tangible reality, but they relate to the mapping of waste streams and valuation systems. A toolbox signals contextualisation somewhere in the end or beginning of building. The cutting mat and a KAPAline model-to-be hints at what other materialities are conveyed in the facades.

Facade 1 uses fragments and samples in a curtain wall configuration, letting the frames both twist around their edges as well as highlighting the logics of their assembly. Lines between traces become operational (pp 50-51), and as shown in

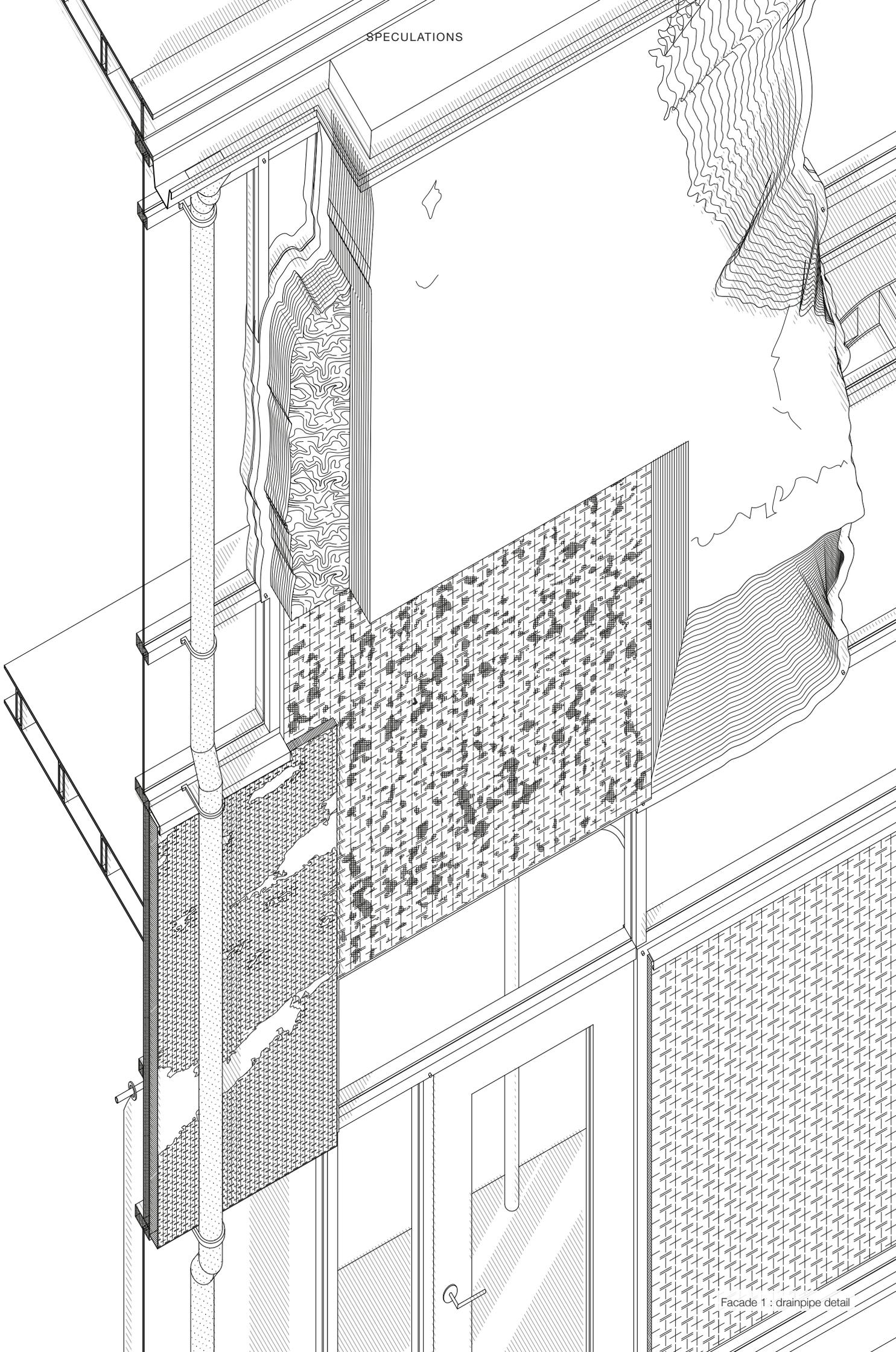
the interior elevation, they are woven together with secondary connections. All but composition of fragments of samples is secondary – window sills follow strange edges and the drain pipe bulges out to follow what is behind it.

Facade 2 picks up on the prominence of irregular edges amongst traces of disassembly. It employs these isolated moments of fragments (p 39) in a tectonic and more traditional composition, picking up cues from the tropes (esp. Stonehenge, pp 54-55). Tearing, flaking and cracked, parts are bound together both by their overall form and by specific details. Also here, window frames highlight certain aspects of the puzzle – they elevate directionalities and bind them together. The interior elevation reveals hierarchy – window frames are, as if glued, simply hung upon the structure to fill up their openings.

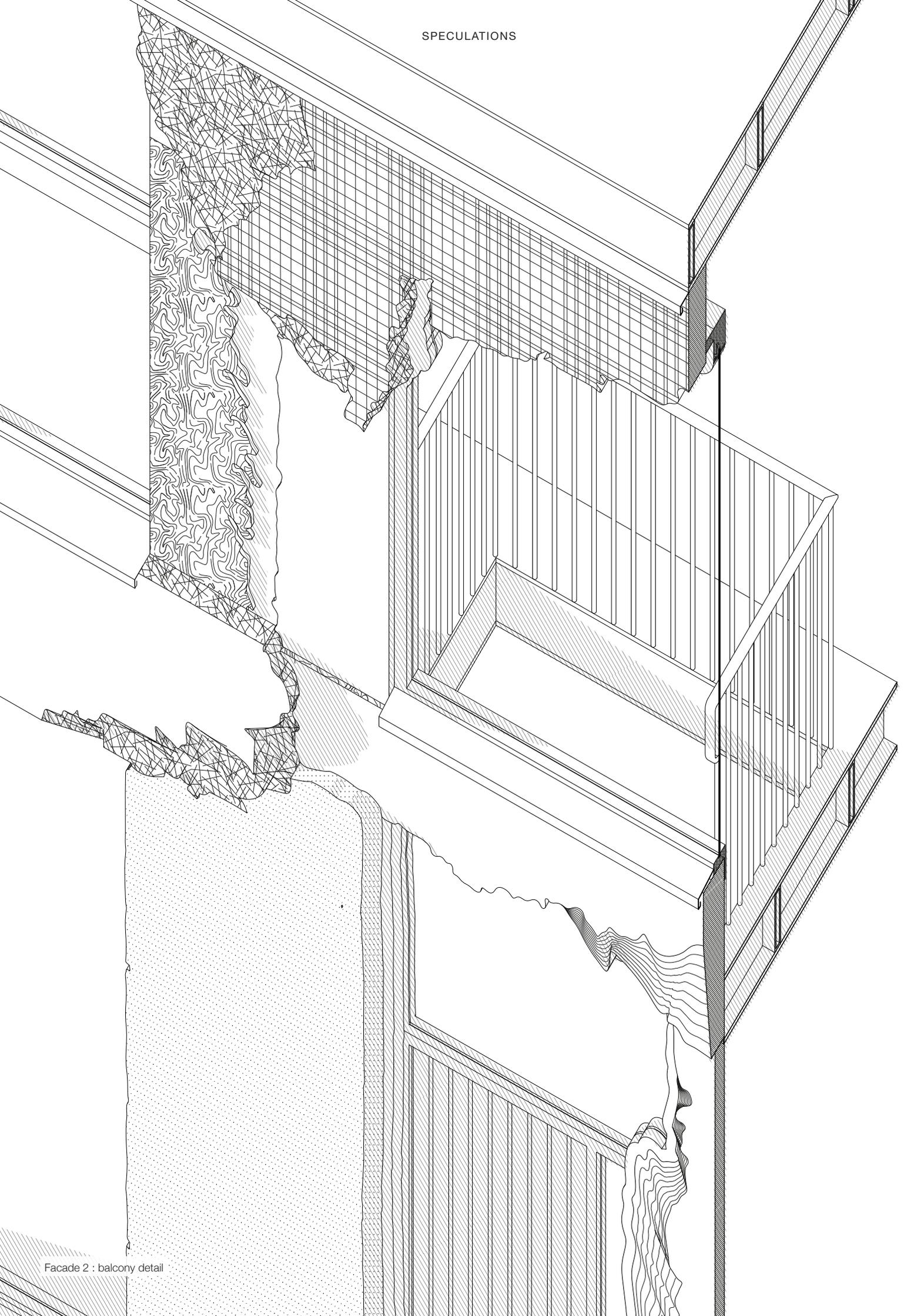




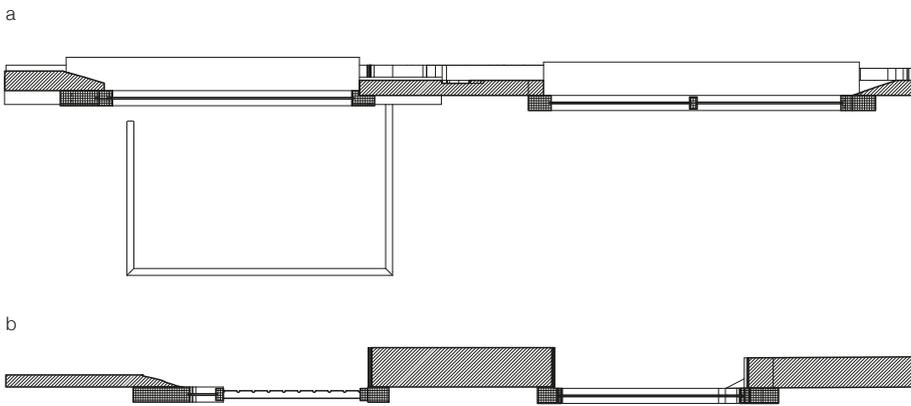
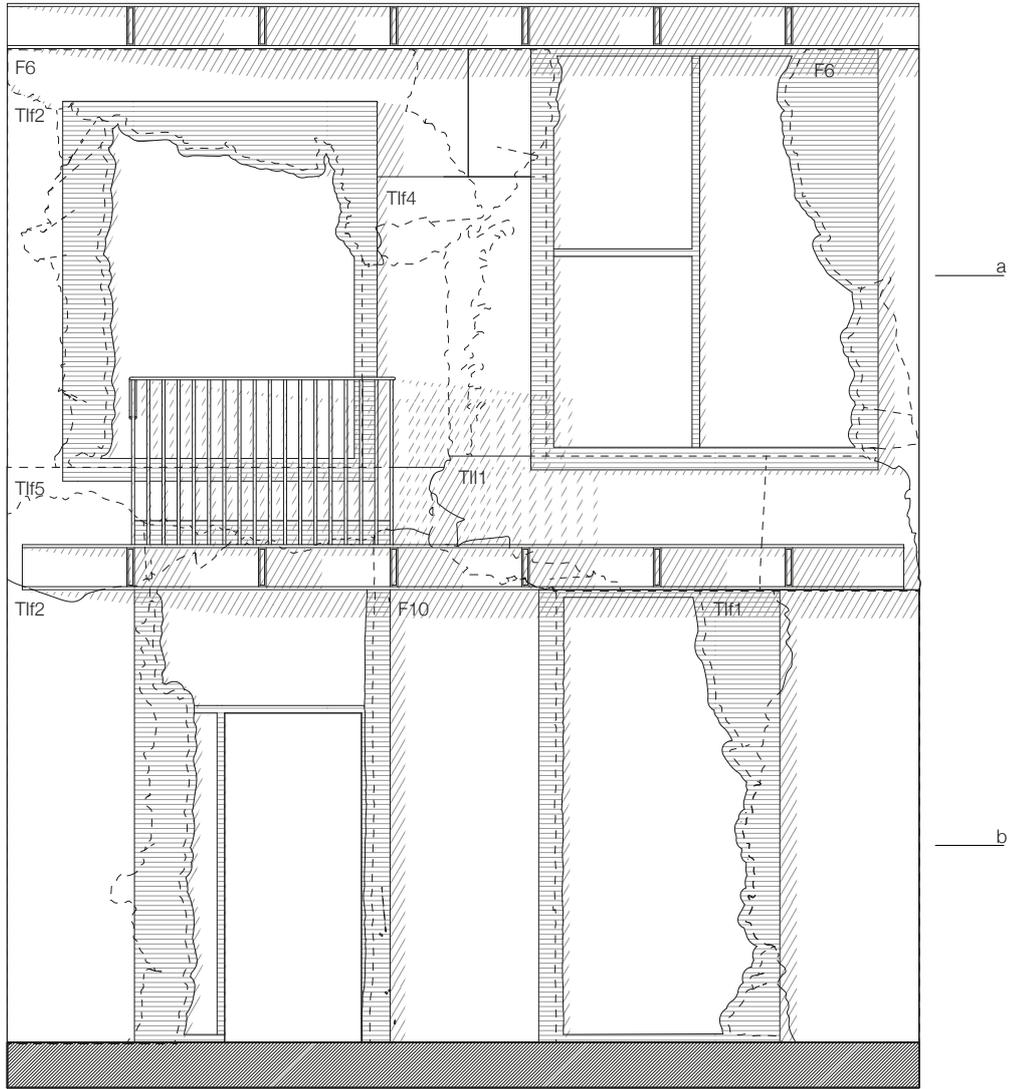
Facade 1 uses fragments and samples in a curtain wall configuration, letting the frames both twist around their edges as well as highlighting the logics of their assembly. Lines between traces become operational, and as shown in the back elevation, they are woven together with secondary connections.



SPECULATIONS



Facade 2 : balcony detail



Facade 2 picks up on the prominence of irregular edges amongst traces of disassembly. It employs them in a tectonic and more traditional composition, picking up cues from the tropes. The back elevation reveals hierarchy – window frames are, as if glued, simply hung upon the structure to fill up their openings.

BUILDING

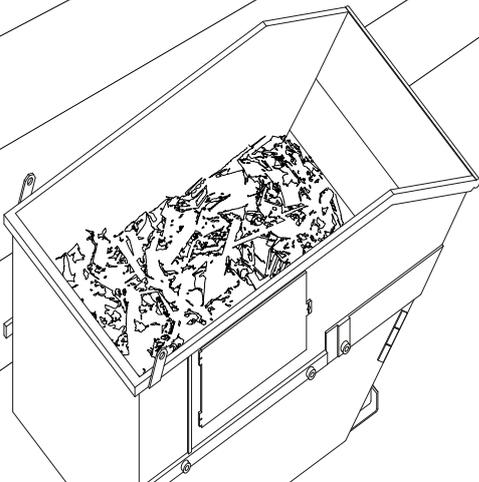
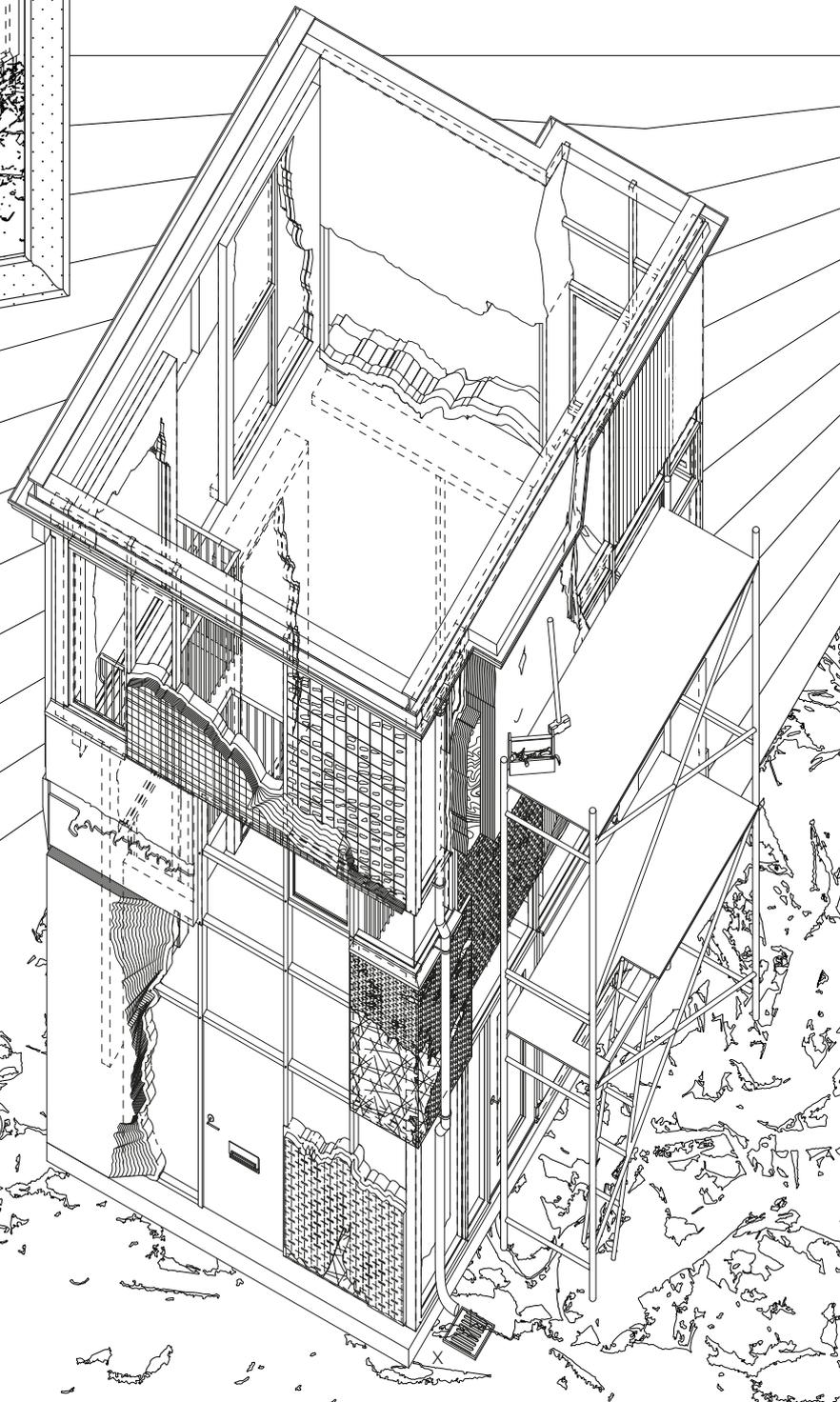
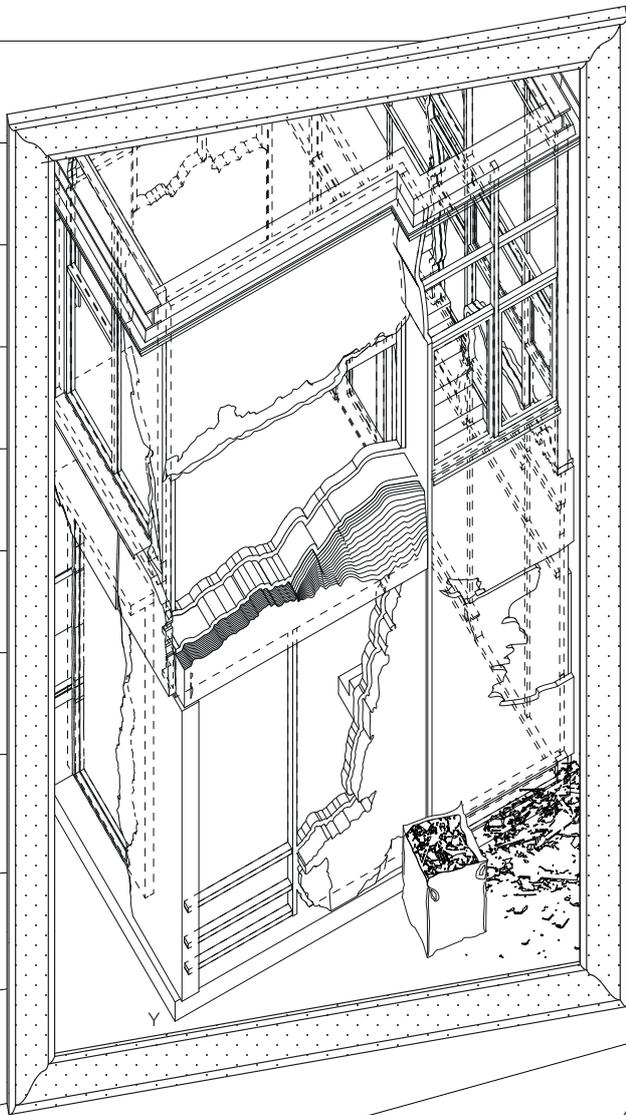
Partly an exploration of corners, *Building* elaborates the differences of the structural systems of the facades further. Corner X inherits its 'stuck on' character from facade 1. Waste fragments are folded along its structure as in figurine (p 51), or assembled by stitching them together as seen in Screens (pp 54-55). Corner Y stacks elements on top of each other, reminiscent of Stonehenge (pp 54-55).

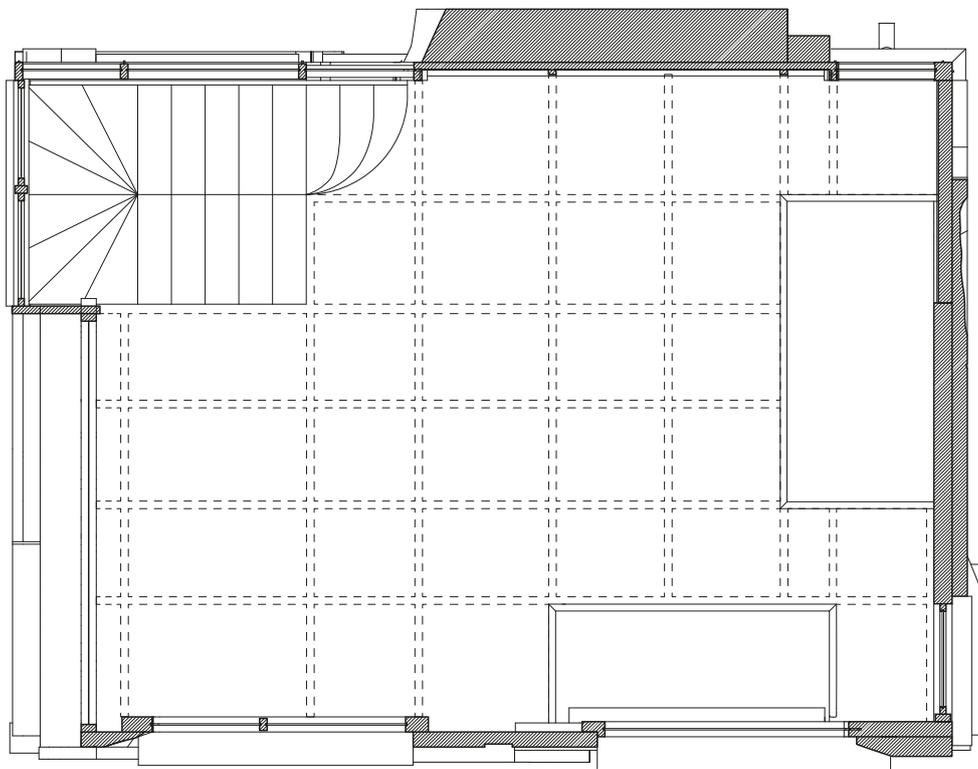
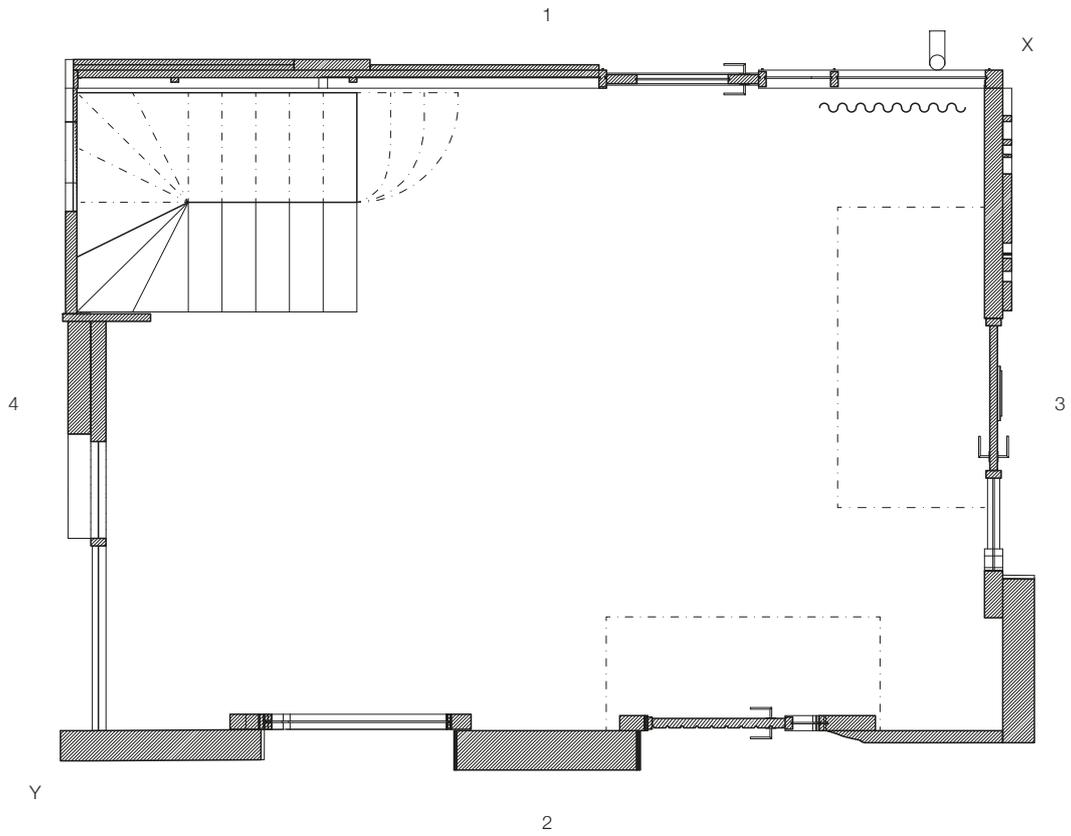
Facade 3&4 are also negotiations of waste fragments 'stuck on' or 'stacked' – or of Ahlgren's unity and Varvin's assembly (pp 18-19). In no 3, the systems blend into each other, clearly visible in the interior elevation. In facade 4, they meet up straight.

Set in an ambiguous moment under assembly or disassembly, the building tries to relate to the discourse on circulation and the ends of buildings rather than to a 'real' site. It is a

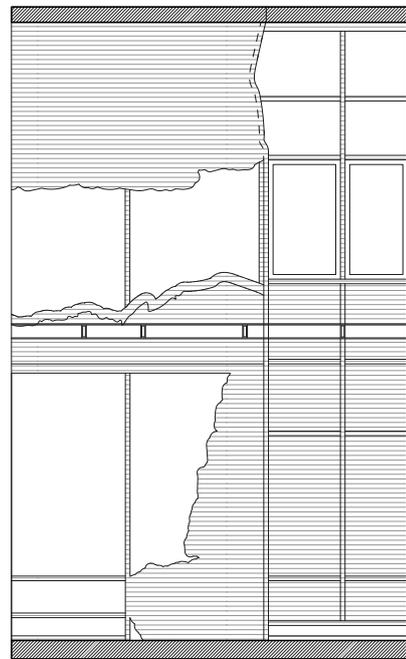
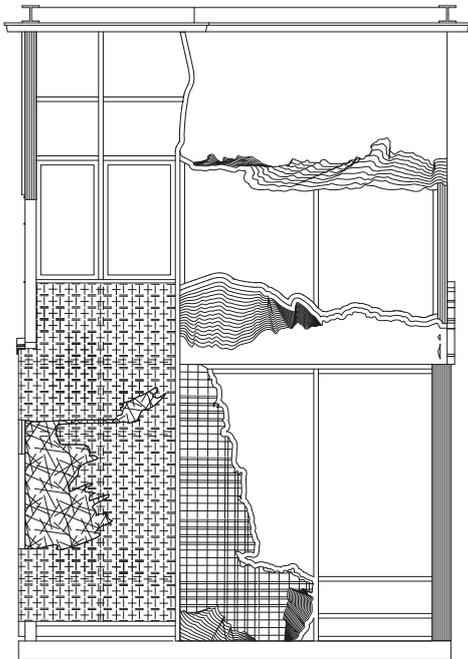
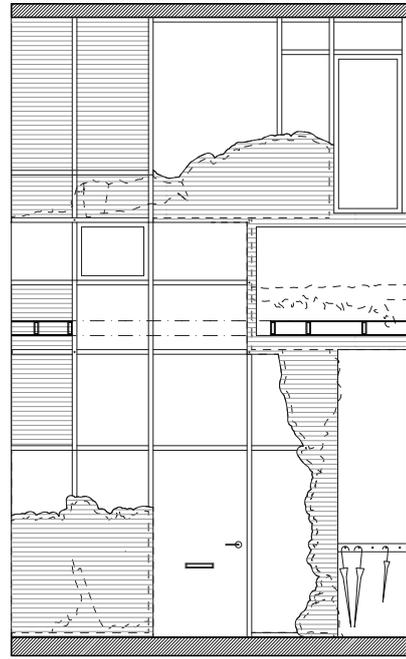
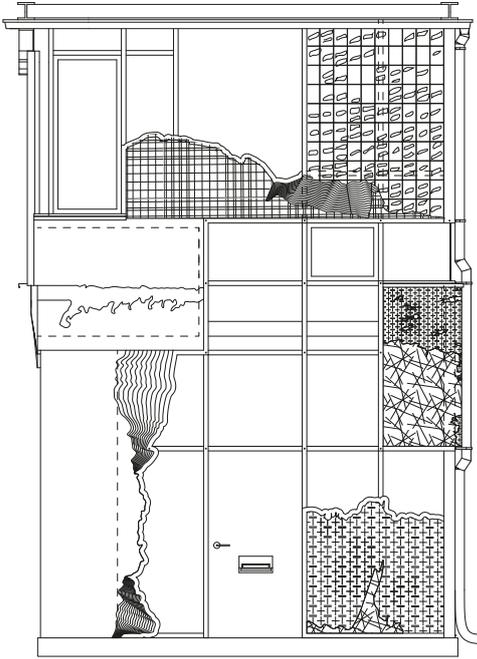
speculation in how competing narratives to the hegemonic circularity might materialize in architecture. If the ends of buildings are of interest for what could be a glimpse of post-sustainable discourse, why not look into their ultimate end?

Finally, a cast model hints back at conceptualisations of waste as systems of waste, or as discarded objects. Designing with waste might have to do with understanding multiple scales of the phenomena. Its intangible masses and abstract systems of valuation – Why are things wasted? Why are buildings unbuilt? – as well as the material stuff and their traces of disassembly that make up those systems. Representing it as such might allow for a sustained contemplation on waste in architecture.





Without programme, the plan drawings of *building* is hinting at what priorities lie behind its design. Directions doesn't matter, it tries to relate to the discourse on circulation and the ends of buildings rather than to a 'real' site.



Facades 3 and 4 negotiate the opposite structural logics of the other two. Sometimes through weaving particularities together with an external structural system. Sometimes by stacking units on top of each other, assuming them to be structural in themselves.

Facade 3 & 4 / 1:100
exterior and interior elevations





To design with waste might have to do with understanding multiple scales of the phenomena. Its intangible masses and abstract systems of valuation – Why are things wasted? Why are buildings unbuilt? – as well as the material stuff and their traces of disassembly that make up those piles.

Building / Model
Plaster cast with mixed waste rubble

OUTRO

DISCUSSION

REFERENCES

IMAGE SOURCES

DISCUSSION

SUMMARY & REFLECTION

Early on, I got my hands on some real building waste. These fragments, that were taken from a dump trailer on its way to the repository and incineration boxes at the recycling station, were vital to the formulation of the thesis. They defined that the work was not going to be about what is already today recycled as matter – metals, glass, plastics or even timber. Consequently, the thesis would approach broken things, ugly things, dusty things and hybrid things trying to make sense of their place in architecture.

The first explorations were simply focused on representing waste. How could that which is most often seen as messy piles of rubble be considered in design? On the other hand, when one object is singled out – does it not leave its place in the waste category by getting valued more than the others? This is where the distinction between rubbish and waste becomes vital. Rubbish is of zero value, but still inside the circulation of goods. Waste, on the other hand, is defined by the act of discarding or wasting it. Representing discarding as unbuilding was important for the observation of traces of disassembly. These are the material proofs of what the waste was before it became waste, and records of its wasting.

Representation was also a reason for exploring waste management. Waste, it seems from the reference studies, is commonly perceived as a whole mass or a singular object. The analysis of the phenomena therefore spans two widely different scales – the diagrammatic mappings of *Waste Systems* (pp 23-33) and the myopic studies of *Discarded Objects* (pp 35-41).

The design *Explorations* (pp 43-51) are experiments in interpreting observations from the studies of waste systems and objects as design cues for new objects and assemblages. Introducing the trial and error parts of a design process, they start to create friction against the concept of waste. A copy of a waste fragment hasn't been wasted – but still it carries with it the traces of disassembly. Bale interpretations homogenize what was previously an odd mix of waste samples. In their new frozen state as part of an art object, do their stories of unbuilding get lost? Compositions appropriate irregularities of waste as cues for design, again making sense of the messiness that characterized it.

As re-presentations, the drawings of a design project in *Speculations* (pp 53-69) are in one sense simply what has already been said, said again. Manifested in tests against tropes, a more complex structure and in the motif of facades, assemblages of traces of disassembly inform of the becoming of, and existence of waste. To be understood in relation to the mappings of waste management, they are a reflection on a paradigm of sustainability, obsolescence and extraction.

The thesis started with the intention of exploring how competing narratives to the hegemonic *sustainability* might materialize in architecture. If the ends of buildings are of interest for what could be a glimpse of post-sustainable discourse, why not look into their ultimate end?

ANSWERS

To remain in its wasted state, that which lacks value and purpose can be designed with thinking of it as fragments of a before, as objects that carries with them embedded information of their discarding.

i. Leaving waste fragments as they are, their traces of disassembly can be a key to include and consider them in design. Appropriated as cues for assembly, these non-standard properties can become operational for design.

ii. The qualities of discarded objects can be discerned through the abstraction of architectural representation. Representations have the ability to re-present a phenomena – with entourage in its motif but also as through the context of the picture plane in itself.

CONTRIBUTIONS

The thesis' answers are to be seen as part of a wider discussion on the paradigms of obsolescence and sustainability (eg. Abramson, 2012, 2016), and of the role of architecture in non-extractive imageries. The contribution of the thesis in that discussion is that it lifts the potential of waste to be a medium that can embody narratives of the ends of building. It attempts to represent what is already there.

A second contribution is the conceptualisation of waste as both masses in systems and as concrete object, and the representation of it as a middle way – bales. Could this help in bringing waste materials into a realm of design – where each single piece of matter won't matter that much?

FURTHER

What could be extended on is an analysis and discussion about value. What could thinking of use value and exchange value, and symbolic values, in relation to objects, and architectures, as commodities bring to the table? In relation to the discussion started in *Rubbish skin on a durable site* (p 36), about buildings as wholes or as assembled parts, one might be able to discern something about the relations between value, space and matter.

In day-to-day Swedish, *konsumtion* (consumption) is near synonymous with shopping. The final use of a product in an economic sense is traditionally seen as its acquisition – at least for transient goods. But as many have pointed out and as this thesis shows, consumption is more than that. For Baudrillard, it was consumption rather than production that was the main driver of capitalist society (1996, original work published 1968). “To become an object of consumption, an object must first become a sign” (Baudrillard, 1996, p 200). Could it be that circular economy is consumer society extended – and understood as postmodern signs, architecture can enter the loop? Moving on, one could study this relationship: architecture – representation – sign. Understood in relation to Lefebvre's perceived, conceived and lived space, architectural representation might have potential to influence them all.

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Waste has been defined as that which is irrelevant, obsolete, or that which has no value. As a category of materials, it is interesting because it reveals the normative order of the world, but also because its ambiguous nature allows for reinterpretation and repurposing.

"Closing the loop" implies that material flows can be made fully circular by regarding used materials and commodities as resources for new production. In such an ideal system the category of waste disappears. This thesis argues that besides looking into how the loop can be closed, architecture should explore the properties of the category of waste in order to investigate the loop itself. Wasted matter is proof of something being wasted – time, labour and resources – and should not be framed as solely a sustainability issue. Rather than attempting to eliminate waste this thesis examines the potential of waste, asking the question: How can that which lacks value and purpose be designed or be designed with, while still critically engaging with its wasted state?

