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Material Density: A Radical Approach to Adaptive Reuse

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Material Density
A Radical Approach to Adaptive Reuse

a thesis by Madeline Laberge
A Special Thanks...

to my advisors: Jean Francois Bedard, Prof. Junho Chun, & Prof. Roger Hubeli for the steadfast guidance this past year. Also to each and everyone of my Slocum family, with special thanks to the ladies of 787.
Through disassembly and reconfiguration, this thesis proposes to create new relationships between existing materials and their typical forms, using a material-focused densification specific to the site. This radical approach to adaptive reuse contrasts the current over-designed and over-theorized architectural projects, aiming to use a pragmatic approach in how materials on historical sites can be reclaimed.

Situated on a site with forgotten architecture, the building’s “ruins provide the incentive for restoration”\(^1\) where one can re-immerser themselves with the grand, sublime space. But sites like these are typically demolished for new construction due to costly rehabilitation, with new designs ignoring or not using enough of the existing context. But this raises the question why so many people praise the deliberate re-building of historical environments, even if they recognize the artificiality of them.\(^2\)

This thesis opposes this “fake preservation” of buildings and instead aims to conserve, but not preserve, the sublimity of the existing ruins, by densifying the materials within the site to engage the user in their physicality, learning from Burke’s ideas\(^3\) as well as Piranesi’s printing process to darken images. The new materials create dense intersections with the awe of the grand spaces, guiding viewers through the material masses which take on an architectural form, allowing you to walk around, through, over or under.

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2. Ibid.
The relationship between materials, forms and spatial experiences should manifest from the investigations of the old and show how it could reshape or renew a building. Engaging juxtapositions of material and form, with the introduction of interstitial spaces, such as the S(ch)austall by Naumann Architektur, creates peculiar instances that could only originate from designing an adaptive reuse project. Alvaro Siza’s interventions are at the same scale of S(ch)austall, yet use more effort to blend with their context, while restoring the usability of the town’s walkways. Current architecture that is being designed should harken back to the historical or formal context it is situated within in order to keep and perpetuate its ties within a historical timeline.

With an overabundance of adaptive reuse projects today, there is no structured order for how much of the context’s history should be discernible in the new design. If too much of the host building and its history is lost in the new design, a disconnect is created between the new design intervention and the context. The new design could just be seen as an entirely new project. Viollet-le-Duc’s question of true authenticity, asking what time period to restore a building to, shouldn’t be the question designers must ask. Instead, a building’s true authenticity should come from a back and forth exchange between the old and the new, neither restoring to an exact historical moment nor building non-contextual interventions. This material density within a building should be considered ‘authentic’, and therefore relevant, when designing within an existing structure, especially within a material focus.

But as neither land art nor a pristine white walled art museum, this thesis combines the new piles of materials with the existing building form - in turn creating an entirely new spatial experience on the site. To quote Ben Tufnell, “the work is not in the place, it is the place.” Looking at this as a user-guided experience rather than an over-designed building, circulation is changed to fit around the materials, further changing the existing space, although not always through typical architectural forms.

Adaptive Reuse Projects

The initial study of adaptive reuse projects provided a seemingly unordered range of typologies. Through deeper investigations, projects were grouped by their interactions with the host structure.\(^5\) With projects shown on the opposite page, each has its own specific interactions with the existing structure, some treading carefully while others add a large addition. While there still isn’t a “handbook” for designing adaptive reuse projects, the organization of famous buildings and their designs has helped indicate missing aspects of architectural adaptive reuse designs, mainly related to the identity of the original materials on site. Adaptive reuse studies, as well as historic preservation research, pointed out gaps in what architectural material conservation can achieve.

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RESTORATION

a property at a particular period of time in its history, while removing evidence of other periods.

When the property’s historical significance during a particular period of time outweighs the potential loss of extant materials, finishes, etc. that characterize other historical periods; when there is substantial physical and documentary evidence for the work; and when contemporaneous alterations and additions are not planned, Restoration may be considered as a treatment.

Prior to undertaking work, a particular period of time, i.e., the restoration period, should be selected and justified, and a documentation plan for Restoration developed.

RECONSTRUCTION

recreates vanished or non-surviving portions of a property for interpretive purposes.

When a contemporary depiction is required to understand and interpret a property’s historic value (including the re-creation of missing components in a historic district or site); when no other property with the same associative value has survived; and when sufficient historical documentation exists to ensure an accurate reproduction, Reconstruction may be considered as a treatment.

Historic Preservation

Previous research of historic preservation guidelines indicates there is a very prescribed way the projects must be handled, in terms of matching or replicating the original. The four major project groups include: restoration, reconstruction, preservation and rehabilitation. All have slightly different requirements, but each end product aims to complete the historical to what it was originally. There is no official rules for how to historically preserve architecture through new arrangements or adaptations for new uses.

This thesis comments on the fact that typical historical preservation projects ignore authenticity of an architecture’s timeline by replicating, matching or repairing. Rehabilitation may be a fine way to preserve, but restoring, reconstructing and preserving might not be.
Landschaftspark

An abandoned coal and steel production plant turned public park in Germany, Latz + Partner aims to heal and understand the industrial past, rather than trying to reject it. On a previously heavily polluted ground, the project mediates both the ground and built landscape to create various environments for people to experience as they circulate through.

With such great power and vastness, this site was the closest in scale, in regards to circulation and sublimity, to what this thesis needed to achieve.

Up close, the different parts and connections become even more powerful, with the materials becoming weathered, rusted or simply falling apart. With much intention from the architect, the project is then left to the weather conditions as the final product of the design.
Lara Almarcegui

The large scale industrial site of this thesis is able to be scaled down in terms of the materiality in relation to Lara’s work. She objectively discusses the undefined future of abandoned sites and how viewers can experience these states of an area in transition. She deconstructs to uncover the typically invisible aspects of sites, including structure, materials, ground, etcetera, and often asks, ‘what can i learn from this place?’, instead of what to improve. This thesis uses her blunt approach to showing materials at full scale.

Lara is a Spanish artist who carries out interventions and artistic installations, recognized for her series of demolitions, self-construction and vacant lots. In the images shown, she showcases the actual materials needed to build the buildings themselves.
Robert Smithson

Land Art designed by Smithson, and all earthwork artists, is typically:

larger than the human scale
always site specific
never fully visible from one angle

It is always about the experience of the viewer as they navigate through, around, or over their art. These art pieces reject the traditional museum-type spaces, in turn creating an experience that one must be present at the site to understand. There is also the inevitable intrusion of nature on the pieces, as seen to the right, where tides shift and create a new piece of art. Each experience is to be their own moment and can change if visited at different times.
Material Piles

Looking at piles in general, each material has an inherent stacking property, which can change if the material is acted upon (snapped, crushed, broken, etc.). Studies of how piles could either be orderly or chaotic became a way to architecturalize the material forms in this thesis, and would change the material density of the spaces themselves.

Below: Brick
(on opposite page)
Top Left: Gypsum Board
Top Right: Plastic
Bottom Right: Reinforced Concrete
Bottom Left: Metal
Overview

The next steps of reconfigurations look closely at the Glenwood Power Plant in Yonkers. Explorations of different interventions were pursued through formal analysis strategies, learning from classifications of materials and their elements in the previous stages. Further examinations of the site included: material connections and the site’s potential for the present and future uses as it is situated on the edge of downtown Yonkers. But in this process, Viollet-le-Duc’s argument for the ‘temporality of restoration’ must not be put aside. The design was to delineate the old from the new to enhance the building’s timeline, starting from small details, such as a column or window, to then juxtaposing those with the current building.

The specifics of the iterative process led to findings of material potentials in various forms, such as a column, threshold or corner condition, both formally and technically. After finding the threshold of which the original structure would no longer be structurally sound, that became the point at which the reconfigurations began.

The new assemblies then acted both structurally and architecturally. The final design at the end of this project wouldn’t necessarily be the end for the building’s timeline, but would leave space for material potentials, both formally and tectonically.

The building itself is a romanesque revival industrial plant. With its main structure from the steel, minimal materials were used such as brick, concrete and glass, as well as wood and plaster. With basic materials such as these, they can be seen as building blocks that can be used for the new designs.

With the previous precedent projects as the main drivers of the thesis design, the mix of the spatial experience with tactile materials creates a strange connection between the existing site and the new forms. The projected outcome is for the viewer to recognize that all materials come from the site, and have simply been repurposed to create new spaces.
Site

The Glenwood Power Station lies on the bank of the Hudson River in Yonkers, NY between two major bridges (the Tappan Zee and George Washington) that go to new york city. Besides the horizon line of Manhattan, this power plant is one of the most prominent buildings on the riverbank as you travel north on the Hudson. It was one of two major power plants near the city built for the electrification of the railways and were well known sites because of it. But that being said, the site has been in disrepair since the abandonment in the 1960s, having acted as a playground for urban explorers. Until recently, when a development group bought the property to make a convention center, hotel and retail shops.
The building itself has two four-story halls with various platforms for machinery, pipes and equipment. But as of today, all of the machinery has been removed. Specifics of the site include being built with over 700,000 bricks, 32 thousand linear feet of steel, and 15,000 cubic yards of concrete - all robustly designed for the power plant.

With an addition of a water ferry stop, the site offers a further connection to the waterfront - terminating the marina just north of it - and an additional incentive to visit the site. The program has minimal impact on the new design, but allows some architectural elements to form, such as bathrooms, a concession stand and a ticket booth.
TYPICAL SLAB DETAIL

1-1/2" = 1'-0"

TYPICAL COLUMN CONNECTION

1" = 1'-0"

FIELD WELD - 3/8" FILLET WELD

3/4" BOLT

SHOP WELD - 3/8" FILLET WELD

5" SLAB

3/8" RODS

1-1/2" FINISH SLAB

FIELD WELD - 3/8" FILLET WELD

FIELD WELD - 3/8" FILLET WELD

ERECTION BOLTS TO REMAIN IN PLACE

TYPICAL BEAM CONNECTION

1" = 1'-0"
Site Homeostasis

Using a sum-zero approach, one-hundred percent of materials on the site are to be kept on site. Thus keeping both the physical materials and their embodied energies on site, allowing for their past and future timelines to continue.

As this could be one of many designs, this thesis is to be taken as a first step in the reclamation of this site. In the future there would be other programs that start to infiltrate the site, rearranging or further deconstructing the materials, but never removing any matter. Through the future timeline of the site, the building can adapt and change slowly as needed.

Material Reconfigurations

The photographic studies on the following pages indicate possible takeoff points for design. With the reassemblage of materials on the site, joints may not line up, structure may no longer be needed in a specific area and so on. The designs will ultimately lead to strange connection points and juxtapositions through the new connections. After the introduction of program and those specific spatial needs, the structural grid is to be used as the base of design. The rearrangement of the steel as well as the rest of the building will focus on creating these intersection moments and exemplify their qualities.

Images on the following pages (L - plan, R - Section):
1. Steel
2. Brick
3. Concrete
The design methodology of this thesis is not to demolish or remove building materials, but to deconstruct, rearrange and juxtapose. The starting point for the rearrangement is the site stripped down to its structural grid with pieces removed as necessary for the new designs. Each material is piled according to its physical abilities, which were studied. Looking at how they could either be seemingly random or organized piles, different outcomes could be produced from this. For instance, different spatial experiences would be created from neatly stacked as opposed to randomly piled bricks, and would also change the degrees of inhabitation.

Logistically, moving the materials would require extra care and structural attention during the highly scripted and scheduled process. While deconstructing, materials could be placed directly where they will be piled, so that less effort would be required. The rearrangement of those pieces are organized in strange ways, to make them fit back together or pile properly. The final design of this thesis includes both the piles themselves and the structure needed to support them.

Taking the logic from land art, the new materials would intrude and densify the sublime space of the site by allowing multiple viewpoints to popup, large masses to navigate around and each material to be seen in person. Most people may only experience this project on the ground plane, which is why it is mostly focused on that level.
As this obviously can not be done on site, these images emulate the atmosphere of what it would be like to experience this space. A subliminal site with grunge, rust, filled with weathered materials and their textures, is something this thesis portrays. Using a working model to create them, the images are meant to be collages of the elements and conditions that one would experience.
Conclusions

To conclude, the deconstruction and rebuilding of this site is a test for both material reuse as well as creating a more dense, compressed environment. The projected outcomes of this experiences would primarily be the realization of the site’s vastness, while connecting the new designs to the site's material density. With a new sublime-esque space, viewers are drawn in - regardless if it looks dangerous.

And as this could be one of many designs, this thesis is to be taken as a first step in the reclamation of this site. Similar to the introduction of the ferry stop, in the future there would be other programs that start to infiltrate the site, rearranging or further deconstructing the materials. This thesis isn’t in opposition to a “programmed” building, but posits that architectural ruins shouldn’t be over-designed all at once with no regard its repercussions. Through the future timeline of the site, the building can adapt and change slowly as needed.

Further Investigations

1. A more detailed process of the deconstruction of the site:
   - which machines are to be used (bulldozer, wheelbarrow, shovel, etc.)
   - turn radius of machines to inform pile sizes
   - which materials are machine made vs handmade
   - how much material would be able to be reclaimed

2. Further architecturalization of the material piles and necessary structure (even more technical than proposed).

3. Indication of possibilities that weathering, tides, light has on the site, in addition to remediation of the toxic ground.

4. Detailed plans of how to make the site structurally stable for today’s use by the community.

5. Collision of necessary, additional structural materials with the reconfigured materials.
Annotated Bibliography


Bollack believes the best designs occur at the intersections of old and new structures, highlighting in instances that support this claim from projects in the USA, Europe and the Middle East. She argues that buildings are canvases for the continuing evolution of sites and their contexts. Projects are divided into five main intervention types: insertions, parasites, wraps, juxtapositions and weavings.


Material engagement in architecture is separated into five thresholds, with the main themes on how materials can be an ephemeral engagement driven by technological progress, with a need for pragmatic rationality. Through tectonics, ephemerality and the need for material to be the “fountainhead of form”, this book starts to tackle many aspects of material meanings in architecture.


Burke’s philosophical exposition of the Sublime and the Beautiful goes into great lengths detailing the bases of both. Specifically, the Sublime’s formal cause is the passion of fear, particularly the fear of death. Looking at aspects of space through vastness, infinity, magnificence and more, spaces in this thesis were able to be designed through these specific tensions to render them sublime for viewers.


Through the works of Scarpa, Frank Lloyd Wright, Mies van der Rohe, and Louis Kahn, Caldwell explains how strangely designed details shaped their designs. Not trying to put projects into specific categories, Caldwell chose to embrace the idiosyncrasies of each project and shows how small changes in the construction process can create undeniable shifts in the overall scheme.


Five definitions of detail to find the quintessential definition of detail in architecture - a theory based book.


Good architectural details express the material of the architecture.


Focusing on concrete as a medium, rather than a material, categorized evaluations from architects and philosophers offer new insights on the claim of concrete’s inexistent history.


Frampton traces the history of contemporary form as an evolving poetics of structure and construction, by using many architects exemplary studies, from Gothic to Postmodernism.


Explanations for the American need for breaking architectural tradition. He discusses throughout his essays the way we perceive landscape and ruins, explaining how many strive to preserve without regard to authenticity.


“Brings together two lectures given by Rem Koolhaas at Columbia University’s Graduate School of Architecture, Planning and Preservation, along with a response (framed as a supplement to the original lectures) by Jorge Otero-Pailos. In his first essay, Koolhaas describes alternative strategies for preserving Beijing, China.”


Discussions over the grotesque and sublime and the necessity for ruins, notably with examples from Wright and references to Thoreau.


A deeper inquiry of land art in relation to the body and form. With specifics stated about different land artists, such as Robert Smithson and Robert Morris, projects were discussed as to their relation to the viewer and overall mass and form.


An investigation of adaptive reuse is performed to show it can be its own architectural field and aims to answer the most fundamental question: how the past should be included in the design for the future.
Footnotes

Figs. 1-12: Madeline Laberge, Author.


Fig. 15: Michael Latz, Blast Furnace Park, *Raut Rot: Der Landschaftspark Duisburg-Nord*, 2017.

Fig. 16: Michael Latz, Blast Furnace Park, *Raut Rot: Der Landschaftspark Duisburg-Nord*, 2017.

Fig. 17: Michael Latz, Blast Furnace Park, *Raut Rot: Der Landschaftspark Duisburg-Nord*, 2017.

Fig. 18: Job Janssen, Construction Rubble of TENT's Central Space, TENT Rotterdam, 2011.

Fig. 19: Angelo Greco, 2013 Spanish Pavilion, 2013.

Fig. 20: Claudio Franzini, Spanish Pavilion at la Biennale di Venezia, installation views, 2013.

Fig. 21: Lara Almarcegui, FER, LARA ALMARCEGUI, 2015.

Fig. 22: Wolfgang Thaler, Construction Rubble of Secession's Main Hall; Installation View, Austria, 2010.

Fig. 23: Holt-Smithson Foundation, Amarillo Ramp.

Fig. 24: George Steinmetz, Spiral Jetty.

Fig. 25: Utah.com, Spiral Jetty.

Fig. 26: Adobe Stock, “Brick”.

Fig. 27: Bow Valley Waste, Drywall Pile.

Fig. 28: Jan Schenckenhaus, Bundle/cube with plastic garbage on a recycling yard.

Fig. 29: Pryzmat, Junkyard with pile of metal waste and scrap iron staff, stock photo.

Fig. 30: Steven Jones, Construction Site Concrete Rubble with Re Bar.

Fig. 31-34: Lela Goren Group, THE PLANT.

Fig. 35: Madeline Laberge, Site Axonometric, Author.

Fig. 36: Madeline Laberge, Site Plan, Author.

Fig. 37: Madeline Laberge, Site Section, Author.

Fig. 38: Madeline Laberge, Enlarged Site Plan, Author.

Fig. 39: Madeline Laberge, Enlarged Site Section, Author.

Fig. 40-41: Madeline Laberge, Construction Details, Author.

Fig. 42: Madeline Laberge, Exploded Axonometric, Author.

Fig. 43: Madeline Laberge, Site Programming Sketch, Author.

Fig. 44: Madeline Laberge, Section Programming Sketch, Author.

Fig. 45: Madeline Laberge, Plan Programming Sketch, Author.

Fig. 46-51: Madeline Laberge, Material Piling Studies, Author.

Fig. 52: Peter Fieldpeck, Main Turbine Hall Looking East.

Fig. 53: Madeline Laberge, Ground Plan, Author.

Fig. 54-59: Madeline Laberge, Detail Plans, Author.

Fig. 60: Madeline Laberge, Section, Author.

Fig. 61: Madeline Laberge, Entry Ramp / Glenwood Power Station Series, Author, 2019.

Fig. 62: Madeline Laberge, Waterfront / Glenwood Power Station Series, Author, 2019.

Fig. 63: Madeline Laberge, Rubble Pile / Glenwood Power Station Series, Author, 2019.

Fig. 64: Madeline Laberge, Concrete Slab Pile / Glenwood Power Station Series, Author, 2019.

Fig. 65: Madeline Laberge, Leaning Columns / Glenwood Power Station Series, Author, 2019.

Fig. 66: Madeline Laberge, Brick Tunnel / Glenwood Power Station Series, Author, 2019.