Re-Tagging

BRITTANY UTTING
Rice University

DANIEL JACOBS
University of Michigan

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The finish schedule specifies a material product, condition, and treatment for each surface in a building, creating a tagged data set that ties aesthetic intent to the material economies, commodity markets, and labor pools of the built environment. However in doing so, the informational interface of the finish schedule simultaneously abstracts the building material from its processes of production and circulation. By divorcing the architect's visual intent from the profoundly resource-heavy transactions inherent in the making of architecture, the data set conceals the complex chain of financial, ecological, and geopolitical exchange. As Building Information Modeling (BIM) softwares and systems layer an increasingly deep cache of product information into the digital architectural mode, we argue that the finish schedule could more explicitly reveal the true material conditions of architectural production.

This paper will unpack the critical frames and practical applications of our recent research and design project entitled RE-TAGGING. The proposal deploys a series of site-specific notations that are tied to an open-source and live-updating material schedule, seeking to make visible the ecosystems of architectural sourcing within the built environment. For the project, we produced a series of tags and stickers that could be placed on any architectural surface or component. Each tag contains a simple annotation, such as CC-01 or ST-02, like in a typical finish schedule, locating the material onto an open access commodity spreadsheet online. For the exhibition, people were invited to place the tags throughout their built environment, creating site-specific notations that would literalize the finish schedule, making visible the ecosystems of architectural sourcing. Part performance and part pedagogical project, RE-TAGGING embodies a strategy of post-occupancy literacy, reconnecting new constituencies to material usage in the built environment. The project works toward a strategy for carbon awareness that aims to provide tools of increased ecological literacy for both the public and architects.

INSUFFICIENT SCHEDULES

The finish schedule specifies a material product, condition, and treatment for each surface in a building, creating a tagged data set that ties aesthetic intent to the material economies, commodity markets, and labor pools of the built environment. However, the interface of the finish schedule, usually in the form of a dense matrix of information and annotation, abstracts the building material from its processes of production and circulation, reducing the material into a coded specification. By divorcing the architect's visual intent from the profoundly resource-heavy transactions and processes of production inherent in the making of architecture, the data set hides the physical extractions, logistical supply movements, and working conditions along a complex chain of financial, ecological, and geopolitical exchange. As Linda Clarke and Jörn Janssen argue:

"Once buildings, the built product, are looked at only as objects of market exchange and distribution, the social relations that they incorporate are no longer apparent. This is because through exchange, buildings in some sense become ideal forms, their value appearing to be embedded in them rather than referring to the human labor involved in their production."[1]

However, as Building Information Modeling (BIM) design processes layer an increasingly deep cache of product information into the digital model, the finish schedule could instead trace more closely these material relations. Already, the scope of the BIM model has expanded beyond an object's 3D geometry to include product information, technical specifications, and even direct links to manufacturers. If the architectural model already integrates the smart BIM object within the global flows of material resources, corporate specifications, and production lines in order to ease the professional collaborations between architect and contractor, how can we ensure that this data stays inscribed into the built environment? As a tactic that bridges the gap between design and occupancy, a physicalization of the schedule could begin to unsmooth these abstractions, re-embedding architecture into its hidden infrastructures of capital, land, and labor.

Figure 1. *RE-TAGGING* by HOME-OFFICE. *Fulfilled* Exhibition Unboxing Photograph. Image credit: Outpost Office.

For the project, included in the 2020 *Fulfilled* exhibition at the Knowlton School of Architecture Banvard Gallery curated by Ashley Bigham, we produced a series of tags and stickers that could be placed on any architectural surface or component. Each tag contains a simple annotation, such as CC-01 or ST-02, like in a typical finish schedule, locating the material onto an open access commodity spreadsheet online. For the exhibition, people were invited to place the tags throughout their built environment, creating site-specific notations that would literalize the finish schedule, making visible the ecosystems of architectural sourcing. Part performance and part pedagogical project, RE-TAGGING embodies a strategy of post-occupancy literacy, reconnecting new constituencies to material usage in the built environment. The project works toward a strategy for carbon awareness that aims to provide tools of increased ecological literacy for both the public and architects.

THE OPERATIVE TAG

Instrumentalizing a long history of tagging, from botanical specimens to sticker activist campaigns to contemporary branding trends, the tag indexes the position of a commodity in the global flows of product manufacturing, distribution, and exchange. For example, ecological management softwares use botanical tags to geo-locate tree specimens, connecting each tree to a cloud-based GIS inventory in order to manage large tracts of forests. Activists also deploy notational tactics as part of mobilization campaigns. Many organizations distribute QR codes via sticker campaigns as a cheap and highly-visible way to connect people to a website or application, connecting constituencies and directing them towards solidarity resources and collective political events.

Contemporary fashion culture has translated these notational markers into a set of aesthetic signifiers, critically positioning the tag in the design world through a critique of how the market assigns value to products and their brands. For example, Virgil Abloh's "Red Zip Tie" series incorporates large plastic security tags on OFF-WHITE brand sneakers, displaying the product's trademark, brand, date, and item name in order to signal the product's position in a highly-visible consumer culture.[2] By fetishing a notation that is typically discarded (the price tag), the "Red Zip Tie" places in tension the discrepancies between the use-value and exchange-value of a commodity, securing the branded provenance of the commodity to the product itself. Through this notational system, Abloh has captured the tag as a contemporary aesthetic item that ties a product explicitly to its own abstract (and oftentimes extreme) market economy, making visible the mechanisms of value and branding.

TAG	MATERIAL	ASSEMBLY	LIVE COMMODITY VALUE	MARKET FUTURES INDEX	EMBODIED ENERGY	EMBODIED CARBON	RECYCLED CONTENT	COMPONENT MAT
CC-01	PRECAST CONCRETE	Structural (Panels)	$113/Cubic Yard [15]	$174.5 [23]	0.95 MJ/KG [4]	0.152 KGCO2e/KG [4]	N/A	Cement, Sand, Wat
CC-02	IN SITU CONCRETE	Structural (CIP)	$113/Cubic Yard [15]	$174.5 [23]	1.9 MJ/KG [4]	0.103 KGCO2e/KG [4]	N/A	Cement, Sand, Wat
CC-03	CMU (CONCRETE)	Modular Unit	$113/Cubic Yard [15]	$272 [23]	1.5 MJ/KG [7]	0.152 KGCO2e/KG	N/A	Cement, Sand, Wat
ST-01	STEEL (HOT-ROLLED)	Wide-flange beams, Extrusions	$3691/Cubic Ton [16]	$582 [3]	21.5 MJ/KG	1.55 KGCO2e/KG	93%	Iron, Carbon .23%,
ST-02	STEEL SHEETS	Decking	$3691/Cubic Ton [16]	$206 [23]	31.5 MJ/KG	2.89 KGCO2e/KG [4]	85% [4]	Iron, Chromium, Nic
ST-03	STAINLESS STEEL	Panels, Fixtures, Hardware	$3691/Cubic Ton [16]	$206 [23]	85 MJ/KG [5]	4.407 KGCO2e/KG [4]	85% [4]	Iron, Chromium, Nic
MT-01	ALUMINUM	Panels, Fixtures, Hardware	$1765/Cubic Ton [2]	$76.22 [2]	170 MJ/KG [8]	6.6687 KGCO2e/KG [4]	N/A	N/A
MT-02	ZINC	Panels, Fixtures, Hardware	$2255/Cubic Ton [3]	$76.22 [2]	46.2 MJ/KG [8]	3.3 KGCO2e/KG [8]	N/A	N/A
MT-03	NICKEL	Panels, Fixtures, Hardware	$12573/Cubic Ton [3]	$76.22 [2]	182 MJ/KG [8]	11.5 KGCO2e/KG [8]	N/A	N/A
GL-01	GLASS (SINGLE LAYER)	Interior Partition	N/A	$137.40 [23]	12.7 MJ/KG	1.437 KGCO2e/KG [4]	N/A	Silica sand, soda as
GL-02	GLASS (MULTI LAYER)	Facade Curtain Wall	N/A	$137.40 [23]	12.7 MJ/KG	1.437 KGCO2e/KG [4]	N/A	Silica sand, soda as
RB-01	RUBBER SHEETS	Rubber Product	¢77/KG [2]	$164 [3]	110 MJ/KG [7]	6.6 KGCO2e/KG [8]	N/A	(Butyl rubber) Crude
RB-02	RUBBER SEALANT	Rubber Product	¢77/KG [2]	$164 [3]	110 MJ/KG [7]	6.6 KGCO2e/KG [8]	N/A	(Butyl rubber) Crude
RB-03	RUBBER ADHESIVES	Rubber Product	¢77/KG [2]	$267 [1]	110 MJ/KG [7]	6.6 KGCO2e/KG [8]	N/A	(Butyl rubber) Crude
MU-01	BRICKS (CLAY)	Modular Unit	N/A	$202.10 [23]	2.5 MJ/KG [7]	0.24 KGCO2e/KG [4]	N/A	Clay
MU-02	CERAMICS (TILES)	Modular Unit	N/A	$161.30 [23]	12 MJ/KG [10]	1.25 KGCO2e/KG [8]	7-85% [26]	Clay, Sand, Water [
AS-01	ASPHALT	Bituminous Pitch	$3110/Ton [16]	$106.50 [23]	3 MJ/KG [9]	50.09 KGCO2e/KG [9]	N/A	Bitumen/Petroleum
GB-01	GYPSUM WALL BOARD	Interior Stud Wall	$7.80/Metric Ton [20]	$294.20 [23]	2.9 MJ/KG [4]	-	25-50% [30]	Alabaster
IN-01	FIBERGLASS (MINERAL WOOL)	Insulation	N/A	$172.80 [23]	112.5 MJ/KG [8]	7.865 KGCO2e/KG [8]	40-60% [18]	Silica sand, soda as
IN-02	FOAM (EXPANDED)	Insulation	$16,060/Cubic Ton [21]	$174.50 [23]	109 MJ/KG [8]	4.5 KGCO2e/KG [8]	N/A	Polystyrene [10]
IN-03	FOAM (BOARD)	Insulation	$8795/Ton [21]	$174.50 [23]	101.5 MJ/KG [8]	3.9 KGCO2e/KG [8]	65% [27]	Polyeurathane [10]
PT-01	PAINT	Vinyl-based	N/A	$267.50 [23]	59 MJ/KG [10]	N/A	N/A	Water, Latex (PVA),
PT-02	PAINT	Water-based	N/A	$267.50 [23]	59 MJ/KG [10]	N/A	N/A	Water, Resins, Alco
PL-01	POLYCARBONATE	Panels, Fixtures	$5980/Cubic Ton [21]	$151.50 [23]	108.5 MJ/KG [8]	6 KGCO2e/KG [8]	N/A	N/A
PL-02	PVC	Panels, Fixtures	$1940/Cubic Ton [21]	-	80 MJ/KG [8]	2.5 KGCO2e/KG [8]	N/A	N/A (polyvinyl chlori
PL-03	POLYSTYRENE	Panels, Fixtures	$16,060/Cubic Ton [21]	$134.60 [23]	97 MJ/KG [8]	3.8 KGCO2e/KG [8]	12% [28]	N/A
PL-04	POLYURETHANE	Panels, Fixtures	$8795/Ton [21]	$154.30 [23]	87.1 MJ/KG [8]	3.705 KGCO2e/KG [8]	70% [29]	N/A
TX-01	TEXTILES	Carpet	N/A	$92.40 [23]	N/A	N/A	N/A	Wool, Silk, Cotton,
WD-01	TIMBER	Structural Member	$430/1000 Board Ft. [16]	$237.40 [23]	8.5 MJ/KG [10]	0.4928 KGCO2e/KG [8]	N/A	Wood
WD-02	WOOD FINISH	Finish Material	N/A	-	N/A	N/A	N/A	Water, Alcohol, Petr
VN-01	VINYL	Sheet Material	N/A	$106.40 [23]	65.64 MJ/KG [10]	2.5 KGCO2e/KG [8]	N/A	PVC [21]
PT-01	PETROLEUM	Oil Byproducts	$60.40/Barrel [2]	$177.60 [23]	43 MJ/KG [8]	2.9 KGCO2e/KG [8]	N/A	N/A
MN-01	SAND (FINE AGGREGATE)	Mineral Admixture	$8.94/Metric Ton [20]	$354.00 [23]	0.06 MJ/KG [8]	0.004 KGCO2e/KG [4]	27.5% [8]	N/A
MN-02	GRAVEL (LARGE AGGREGATE)	Mineral Admixture	$8.94/Metric Ton [20]	$354.00 [23]	0.16 MJ/KG [8]	0.01 KGCO2e/KG [8]	N/A	Sand, Gravel, Crush
MN-03	LIMESTONE	Mineral Admixture	$150/Ton [13]	$176.20 [23]	0.64 MJ/KG [11]	-	N/A	N/A
BA-01	CEMENT	Binding Agent	$1.67/Barrel [23]	$174.5 [23]	5.6 MJ/KG [7]	0.795 KGCO2e/KG [4]	N/A	Clinker 86.1%, Fly a
BA-02	MORTAR	Binding Agent	N/A	$119.30 [23]	1.33 MJ/KG [10]	0.727 KGCO2e/KG [4]	N/A	Cement, Lime, Sand
CU-01	COPPER	Alloy Additive	$6268.75/Cubic Ton [3]	$76.22 [2]	100 MJ/KG [8]	3.7 KGCO2e/KG [8]	N/A	N/A

Figure 2. *RE-TAGGING* by HOME-OFFICE. Live Updating Commodity Spreadsheet <www.home-office.co/re-tagging>.

Within architecture, the labeling of a material is typically reserved and coded for the exclusive use of the material manufacturer and has little meaning for the occupants of the building. Can a notational project that leans into this visibility and aesthetic of tag culture begin to texture our built environment, tying our material contexts to the environmental impacts of the construction industry? Recent activist projects in architecture have begun to utilize these tactics of annotation and tagging to reveal concealed histories embedded in the built environment. From acknowledging occupied indigenous lands to revealing the material and labor provenances of architectural production, they seek to expand the public literacy of the built environment and its relationship to territory, materials, and the working conditions along every step of the supply chain. For instance, the *Who Builds Your Architecture?* (WBYA?) advocacy group works to reveal the relationship between architecture and labor, focusing on the vast displacement and exploitation of people with the rise of globalization. Another example can be found in the recent work by the Settler Colonial City Project, "Decolonizing the Chicago Cultural Center" at the 2019 Chicago Architecture Biennial. For the project, the group researched the architectural materials, components, ornaments, and symbols constituting the Chicago Cultural Center, superimposing text outlining the hidden histories of these artifacts and revealing architecture's relationship with processes of colonization in the United States. Critical to these projects is the visibility of each intervention, overturning the passive reception of the built environment and engaging a broader public.

OFF-SITE AND OPEN-SOURCE

Following these threads of design advocacy, acknowledgement, and accountability, these notated tags, explicitly referencing architectural contract documentation standards, tie each material to an online, live-updating resource schedule that correlates materials to the underlying logistical networks and commodity flows associated with the materials of architecture. This approach offers an alternative to the traditional finish schedule, registering detailed information about each building material including point of extraction, live commodity values, constituent raw materials, embodied energy per unit, and labor footprint of production. This resource schedule begins to challenge architecture's material and energy reliance on what Mark Jarzombek refers to as the 'Quadrivium Industrial Complex' of glass, steel, concrete, and rubber. In his recently published essay in e-flux of the same name, he concludes by posing the of questions: "How to communicate differently with the materials that we create and harness? How to extricate

Figure 3. *RE-TAGGING* by HOME-OFFICE. Photograph.

ourselves, as designers, from the by-now-naturalized linkages between rationality, modernity, and coloniality?"[3] While the plastic tags used in the RE-TAGGING project are themselves implicated in these processes—manufactured in Shenzhen of non-recycled polypropylene by the Weixinfu Technology Co., distributed by Xinfu Technologies, and fulfilled by Amazon—the collective performance of tagging the 'Quadrivium' works toward a new sensibility of material culture in architecture. The project imagines a fully tagged and annotated built environment, stubbornly displayed on every discrete material component of architecture. This pervasive and unavoidable labeling system provides a new aesthetic texture for the built surface, indexing the position of these material commodities in the global flows of product manufacturing, distribution, and exchange, making explicit architecture's profound ecological impacts.

As an annotational hardware, these physical tags would be a non-proprietary call-out of the material elements of an environment, creating an overlay of information on the architectural or ecological detail. For instance, encountering a building that uses structural steel members, one could note the ST-01 tag on a hot-rolled steel beam and easily access the open-source material schedule from a quick QR code scan. The schedule would indicate at that moment in time the live commodity value of the steel is $3,700 per cubic ton, its market futures index is $447, its embodied energy is 21.5 megajoules per kilogram, its embodied carbon is 1.5 kilograms, and its recycled content is up to 93%.[4] How would such an encounter alter perception of that material? A quick glance up and down the schedule, or at an adjacent material, could reveal the extravagant expense—in resources, labor, and environmental impact—of the structure. If such a system were to be expanded, any wanderer or constituent could correlate the tag with a centralized database of information, quickly checking the commodity value of a material when purchased compared to today, if a material or specimen used forced or prison labor for its production, the estimated carbon footprint per unit of the material compared to various benchmarks, or the raw material sourcing of the material.

Such an overlay of data also serves as a representation of the maintenance and care required of architectural assemblages and ecological specimens, through a sort of material acknowledgement presented alongside the built environment. This echoes landscape architect Jane Hutton's method of tracing key materials and resources of the landscape of New York City through their narratives of extraction, distribution and construction. In her book, *Reciprocal Landscapes,* she argues that "the construction of a landscape in one place is related to transformation elsewhere."[5] Unpacking the origins of materials, mining and refining locations, influential legislation, and regional environmental impact allows us to understand a deeper scope of the material politics and ethics embedded in the built environment. How do we navigate and mobilize architecture, aesthetics, data, ethics, and care to reinscribe stewardship of the Earth's resources into the built environment? How do we use software and emerging technology to analyze, design, and propose architecture within this data-rich environment? This space of research and pedagogy would help to better situate emerging architects to adapt, propose, lobby, and even affect policy for the built environment to better confront the climate crisis.

While current excellent carbon footprint databases (such as the Inventory of Carbon and Energy, or ICE) exist, they often require membership fees and are difficult for non-professionals to interpret. Instead, alternative digital interfaces and non-proprietary informational commons could help publics trace and track architectural production, giving more voice and agency to precarious ecosystems, ecologies, economies, and peoples. While this would require a vast mobilization of data consolidated by a variety of disparate organizations, this performance of RE-TAGGING can be thought of as a rough guerilla tactic for environmental transparency, operating as sharp graphic points disrupting the visual field of the built environment.

Figure 4. *RE-TAGGING by HOME-OFFICE.* Speculative Collage.

ENDNOTES

1. Linda Clarke & Jörn Janssen, “Forum: A historical context for theories underpinning the production of the built environment,” in *Building Research & Information* (36:6), pp. 659-662.
2. In 2018, OFF-WHITE c/o Virgil Abloh applied for trademark status of its now iconic red “Zip Tie,” in which an aestheticized security tag is affixed to clothing and shoes. The application was rejected by the U.S. Patent and Trademark Office citing that the “functional matter cannot be protected as a trademark,” and that the zip tie was “not inherently distinctive.” (source: Victor Deng “Virgil Abloh Is Having Trouble Trademarking His Off-White Zip Ties” in *COMPLEX* (Oct. 14, 2019).
3. Mark Jarzombek, “The Quadrivium Industrial Complex,” *e-flux Architecture*, Overgrowth, 2019, https://www.e-flux.com/architecture/overgrowth/296508/the-quadrivium-industrial-complex/.
4. Information for live-updating open-source schedules are scraped from live commodity tracking sites including https://tradingeconomics.com/, https://www.investing.com/, https://www.indexmundi.com/, and the US Bureau of Labor Statistics (https://www.bls.gov/) among others. Information such as embodied energy, carbon, and recyclability are from public databases such as the Inventory of Carbon and Energy (ICE).
5. Jane Hutton, *Reciprocal Landscapes: Stories of Material Movements* (New York: Routledge, 2019) 8.