NEW PARADIGMS, NEW TOOLS  A Research Report: Developing digital tools utilizing heritage waste

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INTRODUCTION

In her ongoing research on urban waste and heritage values, Carleton University’s professor Susan Ross has begun to explore the ways in which the values and practices of heritage conservation simultaneously overlap with and challenge broader sustainability objectives (Ross, 2016). While Canada’s *Standards and Guidelines for the Conservation of Historic Places* advocates for a heritage value-based conservation approach (Parks Canada, 2010), this process also requires that a hierarchy of value be established through the identification of a set of character-defining features. It is this hierarchy which Ross challenges, by questioning whether a focus on conserving character-defining elements contributes to a neglect in considering broader physical and associated values related to the total structure and its materials’ (Ross, 2016). Connecting these principles with those of sustainability, this line of questioning draws into focus parallel yet divergent conversations on value embedded in conversations on heritage and sustainability (Ross, 2016). And while the need to integrate sustainability practices within the realm of heritage conservation has been acknowledged by key heritage institutions such as ICOMOS Canada (ICOMOS, 2017), the Getty Conservation Institute (Avrami, 2011) and the U.S National Trust for Historic Preservation (Elefante, 2007, 2012), the strategies they propose often fail to acknowledge the degree to which rehabilitation projects also generate significant amounts of waste.

Recent statistics charting the volumes of Construction, Renovation and Demolition (CRD) waste generated in Canada note that of the 4 million tonnes per year, material from existing buildings accounts for over 86% of the total CRD waste generated nationally (Vanderpol and Perry, 2014). These statistics have not been lost on environmentalists, for whom the mitigation of CRD waste has been identified as a key strategy in addressing sustainable goals (Yeheyis et al, 2013). While early strategies to address this issue include the implementation of recycling programs, more recent approaches have manifested in the development of research, policies and incentives aimed at encouraging the salvage and reuse of deconstructed building materials on municipal (i.e. City of Halifax and Vancouver), provincial (i.e. Alberta) and institutional levels (i.e. University of British Columbia and Dalhousie University). However, largely motivated by the ecological imperative concerned with growing landfills and unsustainable extraction processes, the dialogue about CRD waste, deconstruction and material reuse often excludes a consideration of the social and cultural legacies of this discarded material.

Highlighting divergent approaches to conservation, this gap in

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1. As part of a research-practice based internship set within an exploration of new paradigms of architectural conservation, the ideas of ‘heritage value’ in this report challenge the sometimes-limited values and attributes currently defined in legislative framework and defended in project assessments. The report recognizes however that each project provides unique perspectives and opportunities for considering how related heritage values and attributes could be expanded beyond the limits of those that are officially recognized in systems of designation.
thinking about heritage and waste values of building materials opens up an opportunity to engage in a nuanced dialogue about role of demolition and deconstruction processes in sustainable heritage conservation practices. Originally positioning ‘salvage’ and ‘discard’ on opposite sides of a spectrum, a review of various projects has revealed the degree to which these two processes are entwined. Despite principles in heritage conservation which advocate for minimal intervention, the following research revealed the degree to which the practice(s) of demolition and/or deconstruction play a role in moderating between diverging development and conservation objectives and are indicative of broader economic, cultural and urban contexts. Understanding that the quantity of demolition/deconstruction waste generated in conservation projects reflects not only the current climate of development within the city, but also a set of broader political, economic and geographic issues, this research explored where these activities occur, and investigates the factors which enable and impede them².

What follows is a report which summarizes research conducted at ERA Architects in Toronto from May-August, 2017. Supervised by professor Ross, this research was conducted through the Social Sciences and Humanities Research Council of Canada (SSHRC) funded New Paradigms / New Tools grant at Carleton University. Complimenting the grant objectives, which explore the use of emerging digital tools within the heritage conservation field, the initial question leading the research was:

- How can digital heritage inventories help make conservation practices more sustainable?

Based on a review of potential related literature compiled by professor Ross³, the connection between heritage inventories in the use of Building Information Models (BIM) had been established as a potential avenue through which to pursue this research. However, while this correlation is established within academic realms, BIM remains an emerging technology in Architectural practices in Canada, including at ERA Architects at the time of this internship. As a result, the research evolved from a review of the issues associated with the question presented above and expanded into a broader investigation of the role and capacities for digital inventories to facilitate material salvage and re-use solutions. Following these adjustments, I redefined the objectives for the research to include:

- Developing an understanding of the current scope of demolition and/or deconstruction occurring within the heritage conservation sector.
- Identifying barriers to deconstruction salvage and reuse, in urban Canadian context.

². The implied critique of development is specifically related to projects being developed on the premise that they will occupy the vacated sites of existing buildings whose value is reduced in reverse proportion to the development potential of the empty site. While this is not the case in every instance, the discounting of the buildings could include more reflection both on the potential reuse values of their embedded materials and the possibility of their associated heritage values being addressed.
³. Annotated Bibliography by Ross, S., see Appendix 7
• Exploring a more nuanced dialogue around cultural and environmental legacy of deconstruction/salvage/reuse/waste and their potential contribution to heritage conservation.

Beginning in May 2017, research at ERA Architects commenced with a process of identifying relevant case studies from the firm’s list of over 600 past and current projects. With the assistance of technician Deion Greene, I surveyed the ERA database Ajera, which had only recently begun to include keywords as project descriptors. A draft list of fifty-one projects were selected involving the following strategies:

• Whole building moving
• Demolition / Disassembly
• Reconstruction / Reassembly
• Salvage of building components, either to be used in the same site, or on another.

For any of the above, the available data of construction/deconstruction waste management, and related recording systems, policies, frameworks, record of off-site locations, would be criteria for inclusion in further study.

I then contacted ERA project managers and reviewed support material via the firm’s server to further refine the list. In addition to reviewing related materials, I engaged colleagues in a series of interviews, conducted site visits, as well as a of related policy and industry examples. In addition, professor Ross travelled to Toronto to co-host two workshops which served to introduce and develop the research at ERA Architects in February and August of 2017. What emerged from this research period was a wealth of resources, which include a poster, a set of aggregated questions from practitioners at ERA, a draft for a typological waste/heritage matrix, a set of practical tools for waste tracking, audits and workflows, a glossary of related terms and a proposed methodology for integrating deconstruction, salvage and reuse in conservation projects. Finally, an annotated bibliography of academic articles relating to digital data, heritage and waste systems was generated. In addition to this report, the poster “Digital Tools for Utilizing Heritage Waste” was presented at CIPA: 26th International Symposium: Digital Workflows for Heritage Conservation in Ottawa, August 2017. An expanded presentation was then

4 I am indebted to everyone at ERA Architects, but in particular: Michael McClelland, Scott Weir, Douglas DeGannes, Edwin Rowe, Victoria Angel, Alexis Cohen, Nicky Bruun-Meyer, Hallie Church, Dan Eylon, Rui Felix, Zak Fish, Angela Garvey, Amanda Ghantous, Deion Green, Gillian Haley, Kurt Kraler, Daniel Lewis, Ryan Love, Noah McGillivray, Morgan O’Reilly, Pegah Rahimian, Catherine Riddell, Sanford Riley, Diana Roldan, Carolina Streber, Mikael Sydor, Tatum Taylor, Sonya Tytgor, Annabel Vaughan, and Max Yuristy for their generous engagement in this project.
5 See Appendix 1: POSTER: Digital Tools for Utilizing Heritage Waste
6 These conversations generated a set of questions which highlight gaps in understanding within the field. These questions were informed the direction of research and were also used to facilitate a workshop at the ERA on August 2, 2017. These questions are included in Appendix 2: QUESTIONS: Demolition Waste in Heritage Conservation
7 See Appendix 3: TYPOLOGIES
8 See Appendix 4: TOOLS: Guides and Manuals for Deconstruction, Waste Audits and Workflows
9 See Appendix 5: TERMINOLOGY
10 See Appendix 6: METHODOLOGIES
11 See http://www.cipaottawa.org. CIPA is the International Committee on Architectural Photogrammetry. The 2017 conference was chaired by Carleton University’s Dr. Mario Santana.
offered at the Building Materials Reuse Association’s annual conference: DeCon & Reuse in Portland, Oregon in September 2017. While each of these segments represent a realm of research unto itself, they are organized in appendixes as reference to future investigations.

As a multifaceted issue with a complex set of challenges, this study revealed a need for a set of both conceptual and digital tools which can assist architects and planners through deconstruction, salvage and reuse processes in heritage conservation projects. In keeping with the premise of the grant, this report is organized in two sections. The first, New Paradigms, introduces six case studies which are representative of a contemporary heritage conservation practice, is complemented by a New Tools section which proposes an innovative technological approach to addressing barriers in material salvage and reuse. Geared at architects, planners and heritage consultants like those at ERA Architects, the proposed technology seeks to integrate existing practices and data sets using dynamic software that improves communication across disciplines. Ultimately, as a preliminary proposal, these tools reflect an emerging awareness of possible issues and solutions to the salvage and re-use of materials within heritage conservation projects.

NEW PARADIGMS

The following section contains a profile of six project sites, all located in the Greater Toronto Area (GTA). Chosen not only for their relevance to the research at hand, these examples provide insight into the complex conditions of urban development which influence both heritage conservation and the generation of demolition waste. Considered thematically, first two sites (21 Grenville St. and 76 Howard St) are examples of two approaches to more conventional heritage typologies – Victorian houses. While the third example, (Mirvish village) also considers the adaptive reuse of Victorian houses, it does so on a district scale and considers the 1960s conversion to commercial use a heritage attribute. Drawing into question ideas of authenticity, the fourth example (MacDonald Block) similarly examines the ‘reconstruction’ of a modernist architectural icon.12 The two final examples carry on the theme of Modern heritage, by examining mid-century high density housing projects. This final pairing reveals evolving notions of ‘heritage’ and contrasting approaches (Redevelopment versus Renewal) to material reuse.

1. Relocation, Demolition and Development: Considering conservation in a Toronto Context at 21 Grenville Street

21 Grenville Street, Toronto, ON

The case of the John Irwin House exemplifies the current development-driven climate of demolition, construction and conservation that is typical in Toronto today. The two and a half storey house was constructed

12. In this report, terminology reflects that of the projects, e.g. the term reconstruction is used in the Macdonald Block to mean a substantial replacement of materials as part of a rehabilitation.
on Grenville street between 1872-73, and expanded in the early 1890s with a large rear addition. At the time of its construction, it was surrounded by houses of similar form. However by 2010, when ERA Architects became involved in the site, it was the last surviving structure from the era and style. Having served both residential and commercial purposes over the course of its life, in 2007 the building received heritage designation under Part IV of the Ontario Heritage Act, in recognition of its associated historic and architectural values. However, confronted by new development proposals for high-rise condominium development on the site, the house owners entered into an Easement Agreement in 2011, allowing for alterations to both the structure and site (Toronto Preservation Board, 2011). In 2016, as per the conservation strategy outlined by ERA Architects, the rear portion of the house was demolished and the remainder was relocated just a few hundred meters east. In its new location, the exterior façade was restored by Hunt Heritage masons while the remaining interior walls and floors were removed completely in order to facilitate new commercial uses. This complicated choreography was orchestrated to allow for the symbolic retention of the structure, which now serves as partial podium for a 50 storey condominium tower. This example of the John Irwin house at 21 Grenville is indicative of the extreme lengths taken to conserve heritage attributes, and the role of demolition, deconstruction and relocation in moderating between heritage conservation and new construction in Toronto.

Images of the now nearly complete project on Grenville street reveal the stark juxtaposition of new and old: from the street, the red and buff brick speaks to a hyper-local material lineage connected to regional geology, extraction and manufacturing processes. In contrast, its towering neighbour expresses an amplified economy and international market of material and cultural resources. Similarly, we may compare the environmental impact of the conservation project against that of the new construction. From this standpoint, we may measure the amount of waste generated in the partial demolition, relocation and renovation involved in the conservation of the John Irwin house against the extraction and consumption of virgin material required in the construction of the new tower. Despite the relatively large amount of material removed from the structure in its conservation treatment, this comparison demonstrates the relative environmental impact of new construction against even the most destructive conservation approaches. Nevertheless, this example also highlights the potential for data on demolition waste to inform opportunities for material salvage and re-use. Working with the available documents at ERA Architects, I was not able to locate formal information regarding the volumes of material removed from 21 Grenville. Although one may be able to retroactively track the amounts and location of this material through the demolition contractors hired to do the work, the absence of this data suggests a lack of concern by the city, the developers, consultants and contractors for these aspects of the original structure and the social and environmental impact of such remnants. Finally, in addition to illustrating
a scarcity of industry interest in the material removed, the lack of data on volumes and content of material removed from heritage structures also speaks to a lack of available tools with which to measure it. Ultimately, this gap demonstrates the potential for building materials to contribute to larger conversations on the ecological impacts of heritage conservation and building construction in Toronto, and to illuminate undocumented streams of material recycling and reuse across multiple sites in the city.

2. **Material Flow, Migration and Heritage Conservation: Relocation, Deconstruction, Salvage and Reuse on Howard Street.**

76 Howard St. Toronto ON

The case of the William Whitehead Mansion, formerly located at 76 Howard Street, offers an interesting counter-point to conservation approaches employed in the face of growing development pressures in Toronto. A story of relocation and reclamation, the conservation of the large brick house on Howard Street reveals much about the dynamic value of ‘heritage brick’ in Toronto and the challenges and opportunities therein. Embedded in this story is also an account of the site itself; uniquely positioned in a long-overlooked wedge of land in the heart of the city, Howard Street and the properties thereon are emblematic of a larger narrative of urban migration and development. In this way, the project represents a shift in conservation approaches which conventionally advocate for the protection of structures and their material *in situ* and instead allows us to conceptualize the flow of materials to and from a site as indicative of a larger contextual continuity.

Discretely located south of Bloor Street, where the downtown core transitions toward the lower-lying east end of the city, on its west-side Howard Street is characterized by a cluster of brick houses and small commercial enterprises. In contrast, the eastern portion of the street is largely vacant. All houses in this area, save for the William Whitehead mansion, were demolished through the years. Originally constructed in 1887, for many years the house stood alone in an overgrown field. Intensifying the isolation of the structure, to the north a high-speed portion of Bloor Street separates the lot from the Rosedale ravine. To the south, a series of 1950s and 60s high-rises densely tower above it. These variables all contribute to the rationale for the high-density development of the site. Negotiating between the heritage status of the structure, which was added to the City’s list of Heritage Properties in 1973 and development proposals and zoning restrictions for the mostly vacant sliver of land, in 2014 ERA Architects proposed the relocation of the house (ERA, 2013 and 2014). Presented as a reunion of sorts, the relocation of the Howard Street house, enabled both a more comprehensive retention and restoration of the structure, as well as the development of the remaining portion of land. Indicative of the intensity of development pressures in Toronto, the relocation of the house on Howard street reveals a set of ambitious measures undertaken within heritage conservation to not only avoid demolition but also strengthen a weakened cluster of similarly scaled buildings through new small-scale infill.
Following its highly-publicized move in November of 2016, the structure began a process of masonry restoration involving the deconstruction and reconstruction of extensive portions of deteriorated and damaged brick and stone. Also carried out by the masons at Hunt Heritage, this work continued throughout the course of my four-month internship at ERA, from May-August 2017. With professional and personal connections at both ERA and Hunt Heritage, I was able to spend considerable time on site observing and at times, even participating in some of the restoration work. This proximity to the slow and laborious deconstruction and reconstruction work, revealed more subtle challenges and opportunities indicative of salvage and reuse of brick and stone. Cutting along mortar lines with specialized tools, the heritage masons evaluated the condition of each brick as sections were strategically removed from the structure. Resulting piles of salvageable brick were stacked and stored on various levels of the scaffolding surrounding the structure, near to where they had been extracted and would be subsequently reinstalled. These piles however, account for a very small portion of the brick used in the reconstruction efforts. Most brick was brittle and unsalvageable due to weathering, unapologetic repair work and carbon build-up on the two chimneys (both of which were completely rebuilt). As a result, new brick of a similar size, colour and porosity was imported from the UK to replace those that had been removed. Heritage mason Daniel Arellano estimates that a dozen 7-yard masonry refuse bins were filled and emptied from the site. Of this number, four contained discarded slate from the roof, and the remaining eight contained general waste from demolition and building activities. Arellano suggests that waste is higher on this job due to the destructive effect of the previously applied cement parging used in repairs throughout. Further, Arellano suggests that by the time of completion, a combination of 3,000 reclaimed and roughly 13,000 -14,000 new bricks will have been used in the project, or about 25% reclams versus 75% new. Demonstrating what appears to be an obvious demand for older reclaimed brick, this case highlights the potential need for data collection on available salvaged brick to inform deconstruction strategies, material...
During one site visit, I noticed a ‘digger’ excavating brick foundations of a neighbouring property. The irony of the situation struck me: in one case, new brick was being imported at great cost for use in the restoration of a heritage structure, and just a few steps away, heritage brick was being unearthed and discarded\textsuperscript{13}. Weeks after discussing this disparity in sources and value of brick, I learned that Arellano had later investigated the trove of buried brick and even salvaged a few units for use in the structure\textsuperscript{14}. While representing a negligible amount of salvage and reuse, this unexpected episode reinforces the value of city-wide inventories in establishing an understanding of local, historical and ecological material use. Indeed, this concept of city-wide inventories is not only increasingly valuable with heritage conservation practices but emerges later in this report as a key tool in addressing material reuse.

Brick plays a central role in the physical and cultural identity of Toronto. Used extensively in residential, industrial and institutional structures, the use of brick not only represents a diverse typology in regional building vernacular, but a local geological configuration (Bateman, 2012). Significant to this character is the Don Valley Brickworks (now Evergreen Brickworks) a former clay quarry and production center that manufactured bricks in Toronto for over 100 years. Located less than 4 km away from the Brickworks, the material identity of Howard Street tells a story of local origins. As suggested above, the relocation of the structure and integration of new, international brick speaks to a shift in this identity. Perhaps more closely resembling the physical and social nature of its southerly neighbours in St. James Town, the conservation of the house on Howard Street finds parallels with the more personal stories of migration for many of the roughly 17,000 people who live in the towers nearby (Canada Census, 2011, wikipedia.org).

In this way, the conservation project on Howard Street engages in a concern both for the materials and materiality of the site, and subsequently prompts several questions relevant to the research at hand. Specifically we may ask: With an understanding of the demand for local brick in conservation strategies, how can the existing condition of the structure inform waste management strategies for building materials? Within this, what opportunities does this data offer deconstruction, salvage and reuse processes? What infrastructure exists to support recycling building materials such as brick, stone and cement? Further, could city-wide inventories of existing building stock be coupled with building, renovation and

\textsuperscript{13} Conversation with the operator of the digger and subsequent research suggested that the discarded bricks were likely transported to the soil remediation site located at the GFL Environmental site in Toronto’s Port Lands

\textsuperscript{14} Admittedly, while an interesting resource, having been underground for a century, this stash would likely have been rendered unusable because of years exposure and absorption of the soil’s moisture. Nevertheless, to maximize the potential for reuse of all materials salvaged during partial or complete demolition/deconstruction, e.g. found brick of unknown provenance, there is a need for careful assessment of these reclaimed materials in terms of their condition, capacity and compatibility in order to identify the most appropriate type of reuse, on the site or off.
demolition permits to indicate material abundances? What additional processes are required to remediate and/or certify materials for reuse? If so, how? Who should be responsible for collecting this information? While some of these questions have been explored through the research of Ergun and Gorgolewski on the brick to be reclaimed from residential demolitions in Toronto (2015), more generally, this case provokes a dialogue about the relationship between the site, its users, owners and its stewardship. Given that conservation strategies often reflect larger social, economic and ecological conditions, the case ultimately challenges us to further consider the possibility of a more nuanced conservation approach which also considers sustainability.

3. **Life in Death: The role of deconstruction in the continued life of Mirvish Village**

    Bathurst – Lennox – Markham – Bloor Streets, Toronto, ON

Located centrally at the intersection of Bathurst and Bloor Streets, Mirvish Village makes up a significant portion of a larger site bounded by Markham Street to the west, and Lennox Street to the south. Comprised of a large department store (Honest Ed’s) as well as a series of residential structures adapted to commercial use in the 1960s (Mirvish Village), the site contains 27 buildings listed on the City of Toronto’s Heritage Register, 24 of which are retained in the approved redevelopment. The site also features a series of connected open spaces; “Honest Ed’s Alley” is a pedestrian thoroughfare often used for outdoor events, which is connected to parking and loading areas. While Honest Ed’s exterior was visually distinguished by four large signs lit by thousands of coloured light bulbs, its interior was regarded as a fun-house, characterized by mirrors and hand-painted signs. Culturally significant to many, the store was notable for its immigrant-derived customer base, for whom it served as a first-stop for procuring essential housewares (Michael, 2015). Similarly, the adjacent Mirvish Village organically evolved as a creative enclave, and has been celebrated for its lively provision of public-space (ERA, 2016). After more than six decades of commercial operations, in 2013 the site was sold to developers Westbank Projects Corp., who are redeveloping the site as mixed residential, commercial and community spaces through integrated construction, demolition and deconstruction strategies. Characterizing its approach as encompassing heritage conservation and sustainability, Westbank Projects Corp have promoted the retention and salvage of existing fabric as key features of the re-design. Unique in this way, the Mirvish Village project reinforces the importance and potential for deconstruction in moderating between conservation and development.

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15. This case evolved into the subject of my current Major Research Project tentatively titled: **ON-SITE: Examining Heritage Values at the Deconstruction Site, the case of Mirvish Village and Honest Ed’s in Toronto**

16. “Instead of the token retention of façades, we will conserve most of the Victorian homes on Markham Street, renewing them as key portions of a vital and diverse residential/retail community. Similarly, rather than superficial nods towards sustainability, we have collaborated with Creative Energy, our recently acquired district energy business, on a strategy that will see Mirvish Village exceed the highest building performance targets and increase the resiliency of Toronto’s electrical grid by incorporating a district energy node with on-site electricity generation”. From http://mirvish-village.
Acting as heritage consultants for the project, ERA developed a conservation plan which also includes a demolition and salvage strategy. While the two large Honest Ed’s structures are slated for demolition, the high volume of built fabric retained by conserving Mirvish Village has been promoted by the developers. With exception of select ornamental features, most interior walls and floors will be removed to accommodate new grading, accessibility and spatial programming, and it is primarily the exterior walls which will be conserved. While the removal of later additions is indicative of a popular bias which privileges the original structure, of note in the conservation strategy is the intention to deconstruct and salvage specific portions of brick using material salvaged through the deconstruction of rear additions. Using historic photos and fire insurance plans to establish a timeline for these additions, ERA’s drawings specify the salvage of sections of brick dating from the 1890s. Here, the salvage of this brick is intended to serve as a resource for repairs and alterations to the remaining buildings.

Totalling 1.8 hectares, an important aspect of this project is the scale of the site on which it is situated. In addition to a large parking lot, the demolition of the two large Honest Ed’s structures opens up space for the sorting and processing of components for recycling and reuse. As an asset in promoting salvage and reuse, the salvage of generic material for re-use on site may be enabled by the large amount of brick required by conservation masons, while the site itself offers ample interior and exterior space for the interim storage and cleaning of material. While not currently within the scope of salvage in this project, such conditions would also make it possible to consider the possibility for the salvage of valuable materials (such as floorboards, baseboards, interior finishes, etc.) for use off site.

Despite the large size of the site, there are many challenges to com/ourapproach/

17. The language of demolition used on site at this time reflects the prevailing approaches, but with the development of a better understanding of more nuanced approaches that include forms of deconstruction, dismantling or disassembly, it will be helpful to develop a discussion of the specific trade requirements associated with these actions. The Building Materials Reuse Association has developed a Deconstruction Handbook and related training, which are helping create a contractor and trades context for engagement with these ideas.
successful salvage in this project. One particular issue is the incorrect use of terminology associated with deconstruction, salvage and reuse processes. Important to communicating objectives and procedures, items to be salvaged are indicated in drawings using the notation “to be demolished by a heritage mason” (ERA, 2017). Revealing an assumption that heritage contractors will use approaches that differ from other contractors, the misuse of the term ‘demolition’, as opposed to ‘deconstruction’ or ‘disassembly’ demonstrates a lack of understanding on the specific skills and trades involved in salvaging building materials. CRD waste management and materials reuse are tracked as components of the project’s LEED certification process. However this lack of clarity creates challenges in determining the quantities of material retained, demolished and salvaged. Also demonstrating limitations within the LEED process, this issue indicates a need not only for more effective tools in quantifying and qualifying existing material, but for communicating objectives and opportunities in deconstruction and salvage. With this, we might ask: how could a greater understanding of the deconstruction process could strengthen the potential for a more resilient conservation and salvage strategy?

Of additional interest in this case, we may consider the cultural value of deconstruction and material reuse in the transformation of this iconic site. Significant in many ways, the conservation of Mirvish Village serves to appease what for some is tragic news; the complete demolition of the two principal Honest Ed’s structures. While the conservation strategy for the area specifically targets the commercial adaptation of the Victorian homes of Mirvish Village by retaining modern frontal additions, painted brick and altered facades, the contrast between this typology and that of the Honest Ed’s structures reinforces the association of ‘heritage’ with a specific material quality and aesthetic character. Additionally, as a structure characterized by different eras of renovation and expansion, the Honest Ed’s building presents many physical challenges to adaptive reuse. However, the buildings also represent a unique tension within the values attributed to heritage; Honest Ed’s is a highly valued cultural landmark in contrast whose physical structure has long been regarded as trash. Moderating in this way between disparate material and cultural values, this case offers several examples of the transformation of heritage values through the salvage and reuse of several items. The functional reuse of brick in façade restoration is held in contrast to the retention of other more ornamental pieces such as stained glass windows and mantel pieces retained as interior features. Salvaged items from the Honest Ed’s structures such as the large-exterior sign, punch-clock machines and conveyor belts from the cashier stations may be regarded as more historic museum pieces (ERA, 2017). Demonstrative of multiple forms of value transformation, the case illuminates how materials gain significance for their potential symbolic reuse as ‘spolia’, maintain value by retaining their structural/functional capacities, loose value through down-cycling recyclable materials such as steel and copper or are considered waste, as in the case of mixed and hazardous materials such as asbestos. Ultimately offering a range of

18. In fact, throughout its history, Honest Ed’s often advertised as such. Take for example, one of the first ads in the paper read: “Our building is a dump! Our Service is Rotten! Our fixtures are Orange Crates! BUT!!! Our prices are the lowest in town! Save yourself and save a lot of money!” (Mirvish, E, 1993, p. 52)
conservation strategies including demolition, deconstruction, whole building relocation as well as salvage and reuse, the case of Mirvish Village also provides an example of a multi-faceted approach to a complex understanding of value transformation, through both the retention and disposal of culturally significant materials.

4. The Role of Demolition, Deconstruction, Salvage and Reuse in the Sustainability of Modern Heritage: The Macdonald Block Reconstruction Project

900 Bay St. Toronto ON

Although in its initial phases, the deconstruction and reconstruction of elements of the Macdonald Block provides an example of the unique tension found in negotiating between the cultural and ecological sustainability of modernist architecture. Built between 1964 and 1971 to serve as the headquarters of several provincial government ministries, like many projects in the modernist era, construction of the Macdonald Block was enabled by the wholesale demolition of several city blocks of commercial and residential structures. A testament to the ideals of the time, the Macdonald Block now stands as a landmark building which holds provincial heritage value for its history, urban design, architecture, landscape and public art (Ministry of Infrastructure (MOI) Heritage Committee (October 2016). In 2016, a plan for the comprehensive retrofit of the Macdonald Block was announced by Infrastructure Ontario. ERA Architects were contracted to provide ongoing heritage consulting services for the proposed interventions. The rehabilitation project, which addresses a series of governmental spatial and environmental objectives, including energy and security upgrades, accessibility requirements, hazardous materials abatement and space planning efficiencies, also represents an occasion to develop a tandem approach towards the sustainable conservation of this celebrated piece of modernist architecture (Infrastructure Ontario, n.d). In pursuit of LEED certification this reconstruction project is an example of the role of demolition, salvage and reuse in achieving both environmental and heritage objectives. While re-use of materials in situ is a preferred option for both intents, this is in some cases in conflict with the rehabilitation objectives. For example, the relatively invasive processes of hazardous material abatement, energy optimization and upgrades to HVAC in the parking levels, all involve extensive excavation which must be conducted subtly so as not to distort design intent which is intrinsically minimalist. In these cases, a careful choreography of deconstruction and reconstruction using both salvaged and new materials are considered conservation tactics.

Of interest in this case are the ways in which the site's modernist status plays in to the evaluation of the simultaneously conflicting and complementary goals of cultural heritage and environmental conservation. One particular tension resides in the question of certification. Current standards require that all repairs and upgrades must withstand a 40-year lifespan. While the structure is on a whole, in good condition, the longevity of certain components is by no means a guaranteed. For example,
whereas the condition of the stone is a known entity to conservators, the
durability of early curtain-wall and window assemblies of 50 years ago is
not. This differential durability of materials is a common barrier facing
building repair and therefore reuse and contributes to the inclination
to discard. However, it is its status as a modernist structure which also
prompts an approach to heritage conservation which anticipates demoli-
tion. If modernist architecture was in part characterized by an economy of
obsolescence, where design intent trumps material composition, the con-
servation of this architecture also promotes further cycles of new material
use, by allowing for the replacement of material components, so long as
their surrogates honour the original design intent (Abramson, 2016).

As heritage consultants for a large-scale mid-century structure,
ERA Architects were required to develop a new rubric by which to mea-
sure the value of existing components and the contextual intent of mod-
ern architecture. Here, it is important to note that prioritization of the
site’s design intent was not arbitrary but drew from analysis of the intrinsic
nature of design at that time - the spirit of Modern Movement/Internation-
al style design philosophy. Subsequently, the decision to salvage or
discard is weighed primarily against this original design intent in addition
to its material condition. As an example of this, while this approach to
heritage conservation allows for the replacement of windows with energy
efficient equivalents of the same dimension and material finishes, in doing
so, it also consumes resources and creates waste. While this approach
allows conservators to retains the original spatial qualities which distin-
guish the structure, one possible criticism of this approach is the relative
subtlety of the intervention. Appearing very similar to the previous form,
this approach intentionally conserves the minimalist design intent by
conducting very refined changes which in some senses obscures a sense
of the economic and social values of the newly invested material as well as
that which it replaced.

In this case, as the project develops, so too does a re-articulation
of heritage value which considers the physical and associative values of
the materials added, retained and discarded throughout. As well, it is
worth noting that the interpretation program for the Macdonald Block is
encouraged to include content related to the “Reconstruction Project”,
which will hopefully provide an improved sense of the values connected to
the new work. As a multi-phased project, this case challenges us to con-
sider not only how the principles of authenticity and integrity manifest in
ecological upgrades to modern heritage but the central role of large-scale
demolition in the history of modern heritage buildings.

5. Transmitting Heritage Values of Demolition Waste and
Reclaimed Materials:
Examples in the Regent Park redevelopment project

Gerrard St. E – Parliament St. – Shuter St.– River St, Toronto, ON

The redevelopment of Regent Park offers much to this multifaceted
conversation. Emerging from the site’s own legacy of large-scale demoli-
tion that preceded urban-renewal, a review of its current redevelopment offers a unique opportunity to compare two eras’ approaches to demolition waste. An exploration of both the composition and treatment of this material has the capacity to speak of transformations in notions of social progress and environmental stewardship. In 2006, a report exploring the opportunities for reduction and diversion of CRD Waste Materials identified Regent Park as a potential model for sustainable redevelopment (Sonnevera International Corp, 2006).

Uncommon in its scale and scope, the redevelopment of Regent Park is obliged to comply with often ignored provincial regulations\(^{19}\) (Ontario Regulation 102/94 and 103/94) which enforce mandatory demolition waste audits and management plans. The data generated through these audits not only offers quantitative insight into the composition and volume of recent demolition waste, but the management plan allows for a qualitative understanding of how and where such material is treated, both on and off site. This data undoubtedly contains records of the hazardous and non-hazardous components and subsequent abatement processes of demolished structures. As such, it has the potential to speak of the overall health of the site and the environmental impact of the waste generated. This data must necessarily be positioned within a broader understanding of the ways in which a language of cleanliness and health have long been used as a rationale for renewal and redevelopment.

Further, the 2004 *Sustainable Community Design Report* by Dillon Consulting Limited offers some insight into the potential legacy of demolition waste within the redevelopment project; documenting diversion goals and recommended recycling and recovery processes for demolition waste. At the time of the report, it was estimated that 90% of the waste generated would be diverted from the landfill and that further environmental impacts would be reduced through the integration of recycled-content and local materials sourcing (Dillon Consulting Ltd, 2004).

As an essential component to the sustainable design for Regent Park, these processes indicate the degree to which the structure’s remnants contribute to its future identity. In this way, the environmental legacy of former structures plays a role in shaping the reputation of the structures which replace them. An interesting example of this is the integration and “recycled construction materials, including reclaimed wood from Regent Park” within the new Daniels Spectrum facility as a new community cultural hub (Daniels Spectrum, 2017). Championed as an environmental feature within the LEED rating system’s objectives achieved by the structure, the reuse of building materials also represents a shift in the measures of success for (re)development projects. In this case, the re-use of materials is particularly remarkable because in most other instances, building components are not explicitly connected to place. The LEED requirements for materials re-use usually assume off-site provenance. Acknowledged

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\(^{19}\) In his paper “Development of Construction and Demolition Waste Recycling in Ontario” (2007, August), Tomo Saotomoe explore the factors affecting the lack of compliance of provincial regulations. In addition to a lack of enforcement, owners lack a sense of responsibility for the materials they generate. Further, medium and mid-sized sites are commonly overlooked (p.29).
for the environmental legacy embedded in demolished structures, these reclaimed materials may also be probed for their capacity to account for the historic and social legacy of the site. In order to develop a better understanding of this, some possible questions for salvaged material might include: What is its original location? How and why was it selected for integration in the new structure? How, if at all, are stories of its original location, salvage and re-use told in relation to its new context?

As a final component to this case, the Heritage Impact Assessment (HIA) and subsequent Interpretation Plan prepared for 14 Blevins by ERA Architects provides insight into the role(s) of demolition and deconstruction in heritage conservation. As these two documents demonstrate, the process of demolition can serve as an expression of the community’s sentiment and aspirations for the place. Noting the significance of demolition but also reclaimed materials in situ expands on the opportunity to further consider the commemorative potential of recycling and reuse of building materials in contemporary structures. As in LEED certification, the exhibition of salvaged material in new construction presents a unique opportunity to not only take responsibly for a complex set of relationships and contexts which enable development, but to provide a thread of continuity which recognizes the dual social and environmental legacy of the place.

6. Renewal versus Redevelopment – Approaches to Sustainability in Conservation: Examples in the Tower Renewal project

Greater Toronto Area, ON

Providing an interesting contrast to the role of demolition in the Redevelopment of Regent Park, ERA’s work on Tower Renewal considers possible strategies in reusing and upgrading the large stock of high rise housing built between 1945 and 1984 in the Greater Golden Horseshoe (GGH) area surrounding Toronto. Home to one million people in the Greater Toronto Area, these post-war apartment towers are similarly representative of Modernist principles of site planning, building layout and suite design. Having aged significantly, many of the towers require reinvestment. Despite a perceived ubiquity of the tower typology, research conducted at ERA, in partnership with planningAlliance and the Cities Center at the University of Toronto, highlights significant features such as site geography, ownership and location which creates ‘invisible’ variations in the form (Tower Renewal Partnership, 2016, 1). Understanding the issues facing these towers to be both structural and systemic, the goals of the Tower Renewal project - improved energy efficiency, poverty reduction, intensification and urban revitalization – are also key areas of provincial interest in Ontario (ERA Architects et al, 2010).

The Tower Renewal project itself is an important indicator of shifting values within the heritage conservation sector. Recognizing the significance of addressing the structural and cultural conditions of the towers, the Tower Renewal Partnership (TRP) recognizes value in not only the architectural contribution of this building stock, but the communities they
represent. As an indicator of this recognition, during my time at ERA, work was being done to develop a set of criteria with which to identify towers of specific heritage values. In this way, the project is indicative of a larger shift in dialogue in the heritage industry which increasingly recognizes value not only in a series of large-scale structures, but the people who inhabit them.

The strategy for the renewal of these structures includes developing two sets of tools, which on the one hand address varying site geographies, market condition and local policy contexts, and on the other, support owners in facilitating upgrades while maintaining affordability, performance standards and tenant comfort. The Tower Renewal project is also of interest to this research because of use of Building Information Modelling (BIM) technology in the design of structural retrofits. Given the scale and scope of the project, the architectural team working on ‘ReSet’ – the design chapter of Tower Renewal – is the first at the firm to use the program. Chosen for its ability to deal with interconnected and repetitive elements, BIM allows for an integrated design approach which cross references existing layers. With a diverse set of embedded tools, BIM allows the designer to address groups of building components, visualize various stages in the building’s transformation and coordinate diverse procedures. With clear potential to inform a concerted deconstruction process, the Tower Renewal project is an interesting case for that looks at not only what but how materials may be retained and replaced to negotiate between conservation, deconstruction and re-use.

SUMMARY

Representative of the “New Paradigms” of the current heritage conservation discourse, the case studies explored above demonstrate several the themes advancing the field today. In particular, these are: an acceleration of urban development, the expansion of notions of heritage values including recognition of modern heritage, and an understanding of material flows as indicative of cultural and ecological sustainability. Understood broadly, these case studies reveal particular challenges and opportunities to conceptualizing and integrating material re-use in conservation projects within the city of Toronto. While they illustrate a range of conditions affecting urban development projects, they also emphasize the limitations of current legislative frameworks for engaging in a nuanced dialogue her-
itage value. To this end, the critique of development presented in these cases considers the contrasting value judgements which exist simultaneously on a given site. As described above, in addition to case studies, through a series of interviews, site visits and a review of related policy and literature, my research internship at ERA Architects revealed a need for a set of tools which can assist architects and planners through deconstruction, salvage and reuse processes in heritage conservation projects. As conservation is an inherently interdisciplinary process involving trades, services, designers, policy makers and community members, it also became apparent that there exist numerous approaches to address the challenges involved in material reclamation and reuse. The following section will address one possible approach to this question.

NEW TOOLS: Tools for utilizing heritage demolition waste

Effective strategies for better integration of waste management and heritage conservation must reflect the needs and context of their users. The following summary has been prepared to address the needs of architects and planners, like those encountered at ERA Architects. The suggestions below draw on a range of disciplines and strategies which may assist in tracking and representing heritage structures and their materials through processes of deconstruction and restoration, in order to further promote their reuse. Expanding on the role of inventories in heritage resource management, the New Tools offered here are presented through three actions: Collect, Describe and Communicate. Representative of the sites and materials in question, these actions importantly describe the role of the data in facilitating the salvation of heritage resources. For a preliminary review of the available literature on digital tools and processes and how they relate to built heritage and waste management, see Appendix X.

INVENTORIES

A primary issue facing re-use is the challenge of identifying quantities and qualities of available building material. One tool that is useful in addressing this is the heritage inventory. Rooted in urban activist strategies of the 1970s and 80s, heritage inventories are once again considered important tools in heritage conservation. Recently conducted on a city-wide scale in Los Angeles, Hamilton and Ottawa, heritage inventories allow municipalities to identify, record and evaluate their heritage structures within a larger urban context. Providing a valuable portrait of the historic and existing character of the city, the inventory works to inform decisions about community and urban planning, zoning and development, environmental review, cultural tourism and disaster response (City of Los Angeles, n.d). While inventories have been established through the years for many places and institutions, contemporary iterations have often developed using a combination of evaluation criteria, including: regional heritage regulations, existing condition assessments, historical background documents, taxation and property information, public works information and community input.
It is increasingly common for contemporary inventories to also exist as digital databases. In addition to creating greater flexibility in both form and content, the digital format of heritage inventories opens up new opportunities for the integration of related information and initiatives, as well as the innovation of new approaches to data collection. In the case of a recent inventory project conducted for the Durand Neighbourhood in the City of Hamilton, ERA developed a digital application for an iPad which enabled the surveyor to access historical records while conducting an onsite analysis of the structure. Allowing for a preliminary evaluation of each building that references previously recorded information allowed for a dynamic reading of the evolution of the site and neighbourhood as a whole. The result was a dynamic digital heritage inventory which comprehensively documented area and its attributes. Intended as a reference tool which may inform future development proposals, heritage inventories can play a role in identifying opportunities for material salvage and reuse.

COLLECT

The first suggestion towards facilitating recycling and reuse of building materials is the integration of municipal heritage inventories with building demolition permit applications. Initially recommended in a 2006 report on the reuse and recycling of structural steel (Gorgolewski et al, 2006), this strategy harnesses existing information gathered in parallel streams. Linking heritage inventories with the incremental application of construction and demolition permits could help identify the potential character and volume of available salvageable material. Further, in generating an inventory of demolition waste, this tactic makes visible trends in material abundance or scarcity depending on geographic, seasonal or economic conditions. Utilized appropriately, this information has the potential to support greater coordination between relevant deconstruction / construction trades.

As an added component, the information generated through waste audits and management plans can be incorporated with heritage inventories and permitting processes to provide more accurate information about the condition and quantity of salvageable material. However, while waste audits and management plans are currently required under Ontario Regulation 102/94 for demolition projects over 2000 square meters (ontario.ca), this regulation is rarely enforced (Saotomoe, 2007). Instead, voluntary programs such as LEED provide additional incentives for developers and architects to complete demolition waste audits. The LEED rating system is not without flaws, various other templates also exist to assist in quantifying and tracking demolition waste. Generally, accessi-

20. It must be noted here that a network of salvage already exists in informal / semi-formal ways.
21. However, as first and second-hand accounts demonstrate, LEED awards relatively few points to building material re-use. Requiring significant effort and coordination, this attribute is pursued less often by developers seeking LEED certification.
22. UBC offers downloadable Technical Guidelines for Sustainability including Construction
ble as downloadable spreadsheets, the development of interactive waste auditing systems would improve their use.

Taking the digital application developed at ERA for the Durand Neighbourhood Study as an example and combining it with solid waste and recycling applications developed at ReCollect, we may conceptualize an integrated tool that provides background information regarding the historical and legal parameters of the structure while facilitating on-site condition assessments. An added advantage to this hypothetical tool is the opportunity to develop an awareness of relevant terminology and processes integral to deconstruction and salvage.

Additionally, we may consider the use of information generated through Building Information Modelling (BIM) within this system. Increasingly used by architects to facilitate interdisciplinary structural evaluations BIM has also been explored for its potential contribution to Life Cycle Analysis (Soust-Verdaguer, 2017) and heritage conservation practices (Foxe, 2010). Allowing for a dynamic representation of the structure at various phases of its life the information generated in BIM can serve to inform both waste audits and larger inventory projects. See also appendix X on the recent research on the possibilities of BIM for heritage, or H-BIM, for integrated systems.

It should be noted however, that this suggestion must be considered critically with an awareness of the potential issues associated with urban mining. Recognizing that heritage resources, like other natural non-renewable resources, are vulnerable to assertions of power and control, it is necessary to acknowledge the potential for an unmanaged collection and distribution of these materials may result in the unwarranted deconstruction of significant structures.

DESCRIBE

Further, this unified data may also provide a framework for a nuanced approach to the certification and identification of reclaimed materials. Referring to historical data through the inventory enables a more precise structural identification through the establishment of the age, origins and potential defects of the building components (Gorgolewski et al, 2006, 61). Important to designers working to integrate reclaimed materials in new structures, this information may also provide valuable insight into the

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23. In addition to several other services, ReCollect has created an educational waste-sorting game. Developed for the city of Vancouver “VanSort” is an entertaining example of the kinds of interactive applications that could exist for deconstruction training and waste audits (recollect.net). This kind of approach could be used in conjunction with the criteria established through LEED or Green Globes to develop an integrated waste audit system.

24. An understanding of both the language and processes which distinguish demolition from deconstruction are essential to ensuring successful salvage and reuse, see Appendix 5 for more details on terminology.
development of interpretations strategies for both demolished and new structures. An integrated heritage inventory supports the representation of the continuum of buildings and their materials. Using the geographical information embedded in this data, it is possible to represent the spatial and temporal trajectory of buildings and their materials. Extending records of buildings to include the locations of their disassembled components may also help to identify important interim locations for the storage, sorting and repair of this material as well as local resources for the consignment and procurement of salvage materials.

**COMMUNICATE**

To this end, a map containing this amalgamated information has the potential to expose unseen relationships, patterns and process. Revealing trends in material re-use and/or disposal, a geographical account of the flow of building materials also has the capacity to reveal institutional biases, instances of environmental injustice (www.forensic-architecture.org) as well as subtle processes of gentrification, development or neglect. Ultimately, mapping is just one example of the ways the integration of data can reveal the complex relationships through visual materials. In his article on the visualization of energy flow in architecture, Daniel A. Barber demonstrates how charts, systems diagrams and architectural designs have the capacity to animate the intricate associations between materials, their locations and the communities they represent (Barber, 2013).

Finally, expanding on the concepts presented above, we may consider the potential to merge existing digital communication platforms in order to connect existing informal and structural salvage strategies. One example of this technique is PetaJakarta.org. (Holderness, 2015) Created to reflect and respond to flood conditions in Jakarta, Indonesia, the platform uses open source software to amalgamates information from social media platforms with government and NGO systems to create dynamic maps that communicate rapidly changing local environmental conditions. This model provides a framework with which we can imagine a similar strategy for responding to local deconstruction and salvage opportunities. An integrated communication network might be achieved by aggregating information available on through industry websites, consulting services, and existing digital communication platforms. Along with several other studies, a 1997 Report on Building Disassembly and Material Salvage suggests that identifying a market for building materials has been established as a key factor in ensuring the success of material reuse. (US EPA, 1997). Various directories of salvage companies exist, including the online resource Salvoweb.

26. As an extreme example of this, the research agency Forensic Architecture documents instances of erasure in architecture as an act of social and environmental justice. Through mapping, photographic and interviews, Forensic Architecture recognizes buildings as evidence of larger environments and their media representations. (www.forensic-architecture.org)

27. In his article on visualization of energy flow in architecture, Daniel Barber looks at the way complex relationships are represented through maps, charts and architectural design. (Barber, 2013).


29. Other directories for salvage materials can be found in reports such as the one produced by Gorgolewski et al or consulting firms at: http://reclaystewardedge.com/ormd/. Salvo web is another directory dedicated to listing local salvaged building material purveyors, however it lists businesses which have registered under the Salvo directory. (http://www.salvoweb.com/canada/ontario/antique-and-reclaimed-materials/reclamation-yards/directory.html)
or online trading platforms\textsuperscript{30}, and combining them with data available at the municipal level. An interactive map might be generated using open data software\textsuperscript{31} to display information about available material, as well as potential sites for storage, recycling, and reuse.

Ultimately, the suggestions above build on an understanding of the potential for digital tools to bridge existing fields of knowledge and to reveal nuanced connections between them. In combining municipal heritage inventories, demolition permits and waste audits, the proposed tools can work to strengthen existing networks for the salvage and reuse of building materials. In addition to supporting rating system certification and design with reclaimed materials, when mapped, this integrated data can reveal previously unobserved patterns and trends, which can help identify more opportunities for reuse. Expanding on recent innovations in open source software, the proposed tools have the capacity to empower communities to record, organize and interpret the value of buildings and their components in various stages of the life cycle.

\textsuperscript{30} A range of formal and informal online trading platforms exist for building materials. Sites like Kijiji.ca make available a range of salvaged material, but is organized under crude categories and requires constant monitoring in order to get updates. Alternately specialized groups such as Bunz Trading Zone on the social media platform Facebook social media generate “Curb Alerts” indicating free material awaiting disposal.

\textsuperscript{31} The PetaJakarta.org application and website was created using CogniCity, an open source software which considers itself to be an integral infrastructure for climate adaptation. Available with support from the Open Data Institute. To learn more visit: theodi.org/about
REFERENCES

BOOKS & JOURNAL ARTICLES:


REPORTS:


Ministry of Infrastructure (MOI) Heritage Committee. (2016, October). Statement of Cultural Heritage Value: Provincial Heritage Property of Provincial Significance, B10606 Macdonald Block (N00364 Queen’s Park Complex), 900 Bay Street (77 Wellesley Street, 80 Grosvenor Street), Toronto. Heritage Components: Macdonald Block (B10606) Mowat Block (B15658), Hearst Block (B10602), Ferguson Block (B10604), and Hepburn Block (B10605). Cultural Heritage Landscape (Part of P00364). Updated from 2005 SCHV: October 2016


DISSERTATIONS:


POLICIES:


WEB SITES:


City of Vancouver. (n.d.) “VanSort” Retrieved from recollect.net/sorting-game/vancouver


Appendix 1: POSTER: Digital tools for Utilizing Heritage Waste

Poster design: Alison Creba

Appendix 2: QUESTIONS Demolition Waste in
Heritage Conservation

Aggregated and distilled from notes and conversations at ERA Architects, Summer 2017

SCOPE:

- What is the ‘big picture’ of the demolition waste issue: Where does it go? How much is generated? What is the environmental impact?
- Within the heritage conservation realm, how much waste is produced when working to retain a structure?
- What is the relationship between the types of conservation project, the intervention and the kind of waste generated?
- How do the ways we identify and distinguish heritage from not-heritage play into the production of waste?
- How can a heritage conservation perspective relate to demolition processes?
- What are the implications if everything is heritage?

RESPONSIBILITY / REGULATION:

- How is a sense of responsibility and accountability embedded in the way we evaluate and conserve buildings?
- Who is responsible for the demolition waste generated in heritage projects? The architect? The contractor? The city? The owner?
- What are the incentives that actually force people to act/revise their current practices?
- What are international examples of these diversion practices?
- What are Ontario policies around CRD waste diversion?
- What is the roles of the building code in regulating demolition waste? How do these regulations inhibit or promote the compatibility of salvaged materials in new/re-construction?

ACTION:

- What is the narrative of the relationship between demolition and construction from a heritage conservation perspective? How can this be utilized in a commemorative capacity?
- What kind of processes and precedents must be established in order for deconstruction and reuse to occur? How can the site be set up to accommodate these processes?
- What is the language of waste diversion and reuse? How can terminology be imple-
mented in various proposals and/or specifications that will assist this?

- Thinking about LEED, what alternatives exist to regulate CRD waste, acknowledge the relationship between conservation, demolition and construction, and explore the potential for salvage and re-use?
- How to overcome the bureaucratic barriers recycling and reuse?
- What tools are out there to assist architects and engineers for implementing salvaged materials in reconstruction?
**Appendix 3: TYPOLOGIES**

Through conversations with colleagues, I became interested in developing a matrix to demonstrate the relationship between the building type, conservation treatment and level of material retained onsite or diverted elsewhere. Understanding there to be many factors including geographic location and related policies, the following rubric was developed as a possible way to illustrate these dynamics. The below matrix is a tentative proposal for such a model.

**Project Name & Location**

<table>
<thead>
<tr>
<th>Stage of Project</th>
<th>Conservation Typology</th>
<th>Assessments conducted</th>
<th>Waste policies referenced</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(Environmental, Heritage, Engineering, Archeological)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner: Public, Private</th>
<th>Rationale for Demolition</th>
<th>Community intent</th>
<th>Amount of material</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Recycled vs. salvaged for reuse vs. reused on site</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Building Type / Assembly</th>
<th>Heritage Attributes</th>
<th>Development proposal</th>
<th>Proximity to waste transfer / recycling / salvage centres</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Scale / Size of site</th>
<th>Relationship of new elements to the former structure</th>
<th>LEED or other environmental standards applied</th>
<th>Level of material separation conducted on-site or off-site</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Former Use</th>
<th>New Programming</th>
<th>Estimated diversion rates</th>
<th>Possible issues. i.e. contamination (health)</th>
</tr>
</thead>
</table>
Appendix 4: TERMINOLOGY

The following heritage conservation and deconstruction terms and strategies were compiled after being invited to consult on the progress of a project undertaken by ERA Architects involving the deconstruction and reuse of components on a previously covered historic façade, June 2017.

- **Disassembly** - taking apart components without damaging, but not necessarily to reuse them.
- **Deconstruction** - Similar to disassembly but with thought towards reusing the components.
- **Demolition** - a term for both the name of the industry and a process of intentional destruction.
- **Refurbishment** - Improving building performance through partial or complete replacement and/or upgrade of components and services.
- **Retrofit** - Change of use or purpose after construction from which a building was designed (term retrofit rarely used in UK, predominantly a US term).
- **Adaptable Building** - A multi-use building which allows for an easy change in its use.
- **Repair**: Where a building element is returned to its former condition, following deterioration or damage, without altering its original appearance or detail.
- **Heritage Fabric**: All salvaged fabric that is described to be reinstalled or otherwise re-used.
- **Intent of Heritage Work**: The intent of the Heritage Work is the reconstruction of part of the original masonry salvaged from the 1928 brick and limestone façade walls, reinstalled as a ventilated masonry veneer, as indicated on the Drawings. From the interior face of the exterior walls, all construction and detailing will be in accordance with the Architectural documents, and will therefore not be part of the scope of Heritage Work. Nonetheless, coordination with the related trades shall be a required component of the scope of work.


Salvage Definitions

**Types of Salvage**: when conducting your inventory, you can distinguish features by:

- **Salvage for re-use on site**: determined based on the heritage value and structural
integrity of the component, as well as the cost/benefit analysis of replacement. If this feature is not used in its exact former location, is it relevant elsewhere in the structure?

- **Salvage for Casting**: If re-use is not an option, using the component as a model for casting is considered. Is the component complete? Are there any elements missing? Can they be recreated during the casting process? Will any modifications need to take place in order to accommodate the feature in the new assembly?

- **Salvage for re-use off site**: If the component cannot be used on site, consider having the contractor specify a salvage yard / group where components with potential re-use value can be deposited.

- **Salvage for recycling**: If the component cannot be reused at all, consider including specification about recycling practices.

- **Landfill**: If re-use and recycling are not feasible, the item is considered waste. Consider tracking volumes of waste generated in this project by volume (truck loads can be tracked through receipts, etc.)

**Salvage Value**: a monetary* evaluation that measures a change in value. You may consider evaluating materials based on whether original materials are worth:

- A **small fraction** of their new counterpart (10-25%)

- A **significant portion** of new counterpart (50-85%): Previous use of materials does not affect the way in which they are re-used. Materials can substitute one-for-one for readily available parts.

- **Equal or greater portion** (100%+) their new counterparts. Their value has increased over time due to rare attributes, current equivalents are exponentially higher and/or changes to the material through (re-milling, etc.) processes which add value.

*consider incorporating heritage values such as authenticity, integrity, etc. into this strategy. This evaluation should likely take place in collaboration with a heritage mason, who will understand the relative value of the stone.”

Appendix 5: TOOLS Guides and Manuals for deconstruction, waste audits and workflows

BMRA Model Guide Specification: Section 02 42 13.13 Deconstruction of Buildings:
The purpose of this Model Guide Specification is to provide the building industry with a consistent set of technical requirements for deconstructing buildings as the Owner's directed method of building removal, based on the best knowledge and practices available within the industry. Retrieved from: www.stopwaste.org/resource/bmra-model-guide-specification-deconstruction-buildings?page=search

BRE Deconstruction and Reuse of Construction Materials (Information Note) This information note provides an overview of the Deconstruction Market Share report which examines waste arising in the construction and demolition (C&D) industries, the legislative, strategic, fiscal and policy issues relating to deconstruction and how the deconstruction process can work effectively within the C&D and recycling industries. Available at: http://projects.bre.co.uk/ConDiv/ deconstruction/default.html. (Summary c/o www.gdrc.org/uem/green-const/toolbox/box_6-1.html)

This report explains the difference between deconstruction and demolition. It looks at the advantages and challenges of deconstruction. The deconstruction process is then described using a case study. Available at: www.ciwmb.ca.gov/Publications/ ConDemo/43301027.pdf. (Summary c/o www.gdrc.org/uem/green-const/toolbox/box_6-1.html)

CIB Deconstruction Task Group TG39 (Task Group) The Task Group focuses on the technical, economic, and policy issues required to foster disassembly rather than demolition of buildings, in order to make salvaged building materials a viable alternative to landfilling. Available at: http://www.cce.ufl.edu/affiliations/cib/index.html. (Summary c/o www.gdrc.org/uem/green-const/toolbox/box_6-1.html)


Hong Kong Polytechnic University: A Guide for Managing and Minimizing Building and Demolition Waste (PDF Document)

Institute for Local Self Reliance Deconstruction (Website) This website provides background information on the benefits of deconstruction. Includes links to relevant publications, articles and case studies. Available at: http://www.ilsr.org/recycling/ indexdeconstruction.html (Summary c/o www.gdrc.org/uem/green-const/toolbox/box_6-1.html)

Powell Center for Construction & Environment at the Rinker School of Construction Management, University of Florida. https://www.cce.ufl.edu/deconstruction/

Recollect: Recollect is an application for portable digital devices to help facilitate municipal recycling.

For more information visit: recollect.net/


UBC provides guidelines for Demolition and Construction waste diversion, management instructions, report templates and unit converters. All this information is available online at: www.technicalguidelines.ubc.ca/technical/sustainability.html

Waste Audits and Waste Reduction Work plans:
Appendix 6: METHODOLOGIES:

“The most important part of assessing the feasibility of deconstruction for a particular structure is a detailed inventory of how and of what the building is made. Every component, its condition, and the manner in which it is secured to the structure can have an impact on the cost-effectiveness of salvage.” (http://www.lifecyclebuilding.org/)

The following is based on: UBC’s Simple Steps to C & D Waste Diversion: This methodology is accompanied by various templates for tracking and reporting on waste quantities.

- **Estimate:** develop an inventory of materials to be salvaged. This can be done in multiple stages, first through early projections, and again once 1980’s cladding is removed through a more detailed investigation. A detailed documentation of the conditions will serve as an inventory and reference for reconstruction, as well as a tool for evaluating salvage-ability of the material.

- **Set Targets:** Based on your estimates, established highest % of salvage targets possible for each type of waste. Specify amounts, criteria and opportunities for salvageable and recyclable materials

- **Plan:** Identify work schedule that includes a consideration of on-site staging and off-site storage locations as well as transportation methods. Establish a marketing plan for all salvaged materials before you start a project. Build deconstruction work crews with a recognition of deconstructions blend of construction and demolition skills

- **Engage:** Designate a contractor/group responsible for setting up well identified and positioned salvage stations. Be sure to clearly communicate amongst contractors and subcontractors the objectives, thresholds/criteria for salvage as well as soliciting feedback from them.

- **Track:** Designate an individual responsible for monitoring and documenting waste management performance, inform all site workers about the process.

- **Evaluate:** Compare performance with targets. Get feedback from contributing stakeholders for future improvements.

**Project Planners should:**

- Identify salvage materials, equipment, assemblies, components
- Identify removal techniques and technical issues
- Apply for regional permits, where applicable
- Contract a salvage specialist
- Identify storage area
Project managers, installation engineers, heritage contractors should consider / specify:

- Layout of collection area
- Collection
- Contract issues for disposal, hauling, etc.
- Material separation and/or preprocessing
- Handling hazardous waste


Ways to leverage waste management services in the early phases of a project:

- Benchmarking and goal setting
- Understand occupant behaviors
- Manufacturer connections
- Understand recycling market
- Emerging recycling re-use opportunities

Appendix 7: BIBLIOGRAPHY Integrating Digital Data in Heritage & Waste Systems

The following annotated bibliography on BIM, built heritage, inventories, waste management, LCA and deconstruction, was initially prepared by Susan Ross, in May 2017, as background for the summer internship at ERA. It is included here to provide additional resources for the New Tools discussion started in this report.


Abstract: “This study discusses the future directions of effective Design for Deconstruction (DfD) using BIM-based approach to design coordination. After a review of extant literatures on existing DfD practices and tools, it became evident that none of the tools is BIM compliant and that BIM implementation has been ignored for end-of-life activities. To understand how BIM could be employed for DfD and to identify essential functionalities for a BIM-based deconstruction tool, Focus Group Interviews (FGIs) were conducted with professionals who have utilised BIM on their projects. The interview transcripts of the FGIs were analysed using descriptive interpretive analysis to identify common themes based on the experiences of the participants. The themes highlight functionalities of BIM in driving effective DfD process, which include improved collaboration among stakeholders, visualisation of deconstruction process, identification of recoverable materials, deconstruction plan development, performance analysis and simulation of end-of-life alternatives, improved building lifecycle management, and interoperability with existing BIM software. The results provide the needed technological support for developing tools for BIM compliant DfD tools.”


Abstract: “The overall aim of this study is to develop a Building Information Modelling based Deconstructability Assessment Score (BIM-DAS) for determining the extent to which a building could be deconstructed right from the design stage. To achieve this, a review of extant literature was carried out to identify critical design principles influencing effactual building deconstruction and key features for assessing the performance of Design for Deconstruction (DfD). Thereafter, these key features were used to develop BIM-DAS using mathematical modelling approach based on efficient material requirement planning. BIMDAS was later tested using case study design and the results show that the major contributing factors to DfD are use of prefabricated assemblies and demountable connections. The results of the evaluation demonstrate the practicality of BIM-DAS as an indicator to measure the deconstructability of building designs. This could provide a design requirement benchmark for effective building deconstruction. This research work will benefit all stakeholders in the construction industry especially those interested in designing for deconstruction.

1. All abstracts, summaries and keywords are taken from the cited texts.
The eventual incorporation of BIM-DAS into existing BIM software will provide a basis for the comparison of deconstructability of building models during design.”


Preface: “This publication on Building Information Modelling (BIM) for heritage offers guidance to owners, end users and professionals in the fields of heritage and construction, aiming to help them successfully implement BIM in heritage projects. It assumes no BIM knowledge (practical, technical, theoretical) on the part of the reader. ... It is hoped that this publication can raise awareness of the potential advantages of a BIM approach for heritage projects and subsequently foster the adoption of BIM by the heritage sector. ... BIM for heritage is, by definition, a multi-disciplinary field that requires input and collaboration of professionals with very different skillsets. This publication addresses issues surrounding the production and use of BIM models for historic buildings, but also points to existing guidance and standards for managing a building’s entire lifecycle effectively using BIM.”


Abstract: “Building construction and demolition waste contribute greatly to the total mass found in landfills. While the traditional linear building model demands new materials for new projects, adopting cyclical models of reclamation and reuse will provide a more resourceful and sustainable future. This thesis proposes designing a building for disassembly by reusing salvaged materials in the Vanier neighbourhood of Ottawa. As the last major area near downtown that has yet to be developed, Vanier is a model that represents places where aging structures provide an opportunity for material evolution among the existing urban fabric, and where land value is beginning to outweigh the value in rehabilitating obsolete buildings situated on it. Utilizing digital workflows, this thesis project will examine deconstructing derelict buildings and structures found on several Vanier properties as the base material palette for designing a new addition to an existing commercial structure with the ability to be methodically disassembled.”


Summary: “This chapter explores the ways that historical Geographic Information Systems (GIS), or HGIS, can be applied to historians’ understanding of the environmental history of Toronto’s Don River Valley. It follows the experiences of a small team of researchers (an historian, a map and GIS librarian and a few research assistants) in navigating the complexities of building a historical mapping project using GIS technology. Through the example of the resulting Don River Historical Mapping Project, we discuss the challenges of accessing and working with historical source materials, the uncertainties inherent to historical GIS, and the difficulties of making resources and research findings publicly accessible. Unlike most HGIS projects, which take their origin from a research problem or question and produce specific datasets with which to address that question, this project aimed from the outset to produce a body of data that would be accessible to a broad range of researchers from different disciplines for use in a variety of different projects. While a research project on the
Don River Valley was the impetus for the project, the outcomes of the project were in the end much broader, shaped by the mandate of the library to promote its collections and provide open access to data to facilitate research. This chapter, as a result, is as much about the changing role of the academic library as a partner in academic research as it is about mapping the history of the Don Valley.” (p. 44)


Abstract: “Since 2010, the state of Rhineland-Palatinate in Germany has developed a cultural landscape information system as a process to secure and further enrich aggregate data about its cultural assets. In an open dialogue between governing authorities and citizens, the intention of the project is an active cooperation of public and private actors. A cultural landscape information system called KuLIS was designed as a web platform, combining semantic wiki software with a geographic information system. Based on data sets from public administrations, the information about cultural assets can be extended and enhanced by interested participants. The developed infrastructure facilitates local information accumulation through a crowdsourcing approach. This capability offers new possibilities for e-governance and open data developments. The collaborative approach allows governing authorities to manage and supervise official data, while public participation enables affordable information acquisition. Gathered cultural heritage information can provide incentives for touristic valorisation of communities or concepts for strengthening regional identification. It can also influence political decisions in defining significant cultural regions worth of protecting from industrial influences. The presented cultural landscape information allows citizens to influence the statewide development of cultural landscapes in a democratic way.”


Summary: “This paper discusses ethical and sociopolitical questions raised for cultural heritage by digital technologies and presents two archaeological case studies from Australia. The paper was first drafted in May 2012 for a scholarly edited book produced in hard copy by the Springer publishing company with the usual processes of review and production. Had I published my work via a blog it would have become public immediately. Readers may have posted comments and started online communication. Our experiences, perceptions and roles as authors, consumers, producers or users of formats, genres and platforms and the actual and perceived qualities of the ‘product’ would be different. How would peer review apply? What about referencing? Who owns the intellectual property of discussion content? Would the blog be archived? … These are just some examples of the transformative nature of digital technologies.” (p.13)

Densley Tingley, Danielle and Buick Davison, “Developing an LCA methodology to account for the environmental benefits of design for deconstruction,” *Building and Environment* 57 (2012) 387-395

Abstract: “The aim of the study was to establish a methodology for life cycle assessment (LCA) studies that are investigating reused materials or products/buildings that
incorporate design for deconstruction within them, thus facilitating future reuse. This methodology was then used as the basis for a tool that has been developed – Sakura, to demonstrate the case for design for deconstruction within specific building design projects. A literature review of work relating to material reuse and recycling was undertaken, from this it has been suggested that the most appropriate way to deal with reused materials is to share the environmental impacts of them between the number of predicted lives. The LCA method for Sakura, boundaries and functional units are also outlined. The methodology was applied to a representative building, in a simplified LCA study; different ways of representing the output are discussed, with a comparative graph decided as the best option to represent the benefits of design for deconstruction. The methodology and graphical representation have been used within the LCA tool Sakura. Sakura has been developed to demonstrate the benefits of design for deconstruction within specific building design projects.”


Abstract: “Deconstruction is the process of disassembling a physical structure to its components in reverse order to that used during construction with minimum damage so that they maintain their original physical properties and structural integrity. In the United States single-family houses are constructed of wood frames. Deconstruction is increasingly considered a viable option to demolition in the removal of such buildings. The study reported herein analysis the reduction in GHG emissions and energy savings of recovering the reusable material for the purpose of resale, as a whole and in increments, to that of terminal disposal (landfilling). The analysis examined the following scenarios: (a) current practice in the US, (b) current practice in the European Union, (c) maximum reuse (all recovered materials will be reused), (d) maximum recycling (all recovered materials will be recycled—no reuse), and (e) soft-stripping reuse (only the material that were collected during soft-stripping will be reused, all else will be recycled), using the Waste Reduction Model. The reduction in greenhouse gas emission in the maximum recycling scenario was the highest observed across all scenarios. Soft-stripped materials saved more energy than recycling and contributed to nearly half of the resale value of salvaged materials.”


Abstract: “This study examines the stocks of clay brick in Toronto’s single detached housing, to provide parameters for city scale material reuse and recycling. Based on consensus from the literature and statistics on Toronto’s single detached housing stocks, city scale reusable and recyclable stocks were estimated to provide an understanding of what volume could be saved from landfill and reintroduced into the urban fabric. On average 2523–4542 m3 of brick was determined to be available annually for reuse, which would account for 20–36% of the volume of virgin brick consumed in new house construction in 2012. A higher volume, 6187 m3 of brick, was determined to be available annually for recycling because more of the prevalence of cement-based mortar, which creates challenges for brick reuse in Toronto. The results demonstrated that older housing containing reusable brick were being mostly landfilled and replaced with housing that contained only recyclable brick.”

Abstract: “Despite the widespread adoption of building information modeling (BIM) for the design and lifecycle management of new buildings, very little research has been undertaken to explore the value of BIM in the management of heritage buildings and cultural landscapes. To that end, we are investigating the construction of BIMs that incorporate both quantitative assets (intelligent objects, performance data) and qualitative assets (historic photographs, oral histories, music). Further, our models leverage the capabilities of BIM software to provide a navigable timeline that chronicles tangible and intangible changes in the past and projections into the future. In this paper, we discuss three projects undertaken by the authors that explore an expanded role for BIM in the documentation and conservation of architectural heritage. The projects range in scale and complexity and include: a cluster of three, 19th century heritage buildings in the urban core of Toronto, Canada; a 600-hectare village in rural, south-eastern Ontario with significant modern heritage value, and a proposed web-centered BIM database for materials and methods of construction specific to heritage conservation.”


Abstract: “In the present climate of financial restrictions, the importance of identifying those buildings that are of greatest value has increased. Identification necessitates knowledge, not only of the architectural and historic worth of a building, but also of its role and contribution to the history and landscape of its location. This paper aims to demonstrate the relevance of Geographical Information Systems (GIS) in aiding historic research and analysis of vernacular architecture. Related work in the development of GIS technology to assist in reconstructing and visualizing historical geography has been described by Southall and the role of GIS in managing and analyzing spatial data in the field of archaeology has also been well documented.

By using a UNIX-based Arc/Info GIS and incorporating geo-referenced spatial and textual data, a more comprehensive and contextual method of recording buildings can be developed. This allows better-informed judgments to be made when evaluating individual buildings or preparing conservation strategies.”


Abstract: “This study examines data, information, and knowledge management in the historic environment sector in the context of broader trends in information technology, and information and knowledge management approaches. The opportunity provided by changes in technology over the career of the author are reviewed, with a caution against focusing purely on technology as a solution. A shift is proposed towards a greater emphasis on socially constructed knowledge of good practice, captured by social media or Web 2.0 systems in online communities of practice. This should complement the recorded data and information about the past that has been the traditional focus of data and information management in the sector.”
The London Charter for the Computer-Based Visualisation of Cultural Heritage, 7 February 2009

Summary: “The London Charter seeks to establish principles for the use of computer-based visualisation methods and outcomes in the research and communication of cultural heritage in order to:

- Provide a benchmark having widespread recognition among stakeholders.
- Promote intellectual and technical rigour in digital heritage visualisation.
- Ensure that computer-based visualisation processes and outcomes can be properly understood and evaluated by users.
- Enable computer-based visualisation authoritatively to contribute to the study, interpretation and management of cultural heritage assets.
- Ensure access and sustainability strategies are determined and applied.
- Offer a robust foundation upon which communities of practice can build detailed London Charter Implementation Guidelines.”


Summary: “Many new innovations have consequences and uses that are unforeseen. The initial benefits typically drive the adoption of a new product or service, but the social and consequences. The emergence of building information modelling (BIM) and may be one example that would benefit from a broader discussion. Most of the research on BIM is how it can be used within the supply side of the construction industry, but there are other significant concerns. The construction industry engagement with BIM has primarily been on the use as a common platform for information exchange between a multitude of professionals, suppliers and constructors. This typically involves a shared model for a proposed design with inputs from various team members. This enhances and accelerates the dialogue about the building design (and the process involving the underlying decisions, rationale and approvals) for the client. Finally, BIM serves as a document of record for the facility managers to assist their understanding, inform their decisions and capture performance data over the entire life cycle of the building.” (p.643)


Executive Summary: “It is increasingly being recognised that the requirements to deal with the existing built heritage and especially that which was traditionally constructed prior to 1919 calls for a different professional expertise and understanding from that which has been more commonly developed for the ‘main steam’ new build construction industry.

Whilst BIM is still in its formative state for the UK’s new build sector, an interesting range of digital technologies are beginning to emerge that could result in distinct benefits for practitioners thinking about adopting a Historic Building Information Modelling (HBIM) approach for work on the existing building stock. With conservation, repair and maintenance (CRM) currently amounting to some 42% of all industry
activity, the current emphasis on new build orientated BIM risks leaving related developments in the CRM sector in the shadows. At the heart of an HBIM CRM approach is a fundamental requirement to establish value, significance and accurately surveyed data of the asset that is anticipated being worked upon. In addition to the available ‘high end’ digital survey applications, a number of related techniques offer the prospect of relevant low-cost opportunities for building survey, investigation and recording work. Whilst much still needs to be done to clarify their potential, looking at their various capabilities and advantages should help HBIM practitioners determine a relevant approach to take. But, as case by case needs have to be considered with regard to complexity, applicability and cost, practitioners will inevitably also have to make “horses for courses” decisions based on what information is prevalent at the time. This COTAC Report aims to set out to scope a preliminary understanding of the issues that might be considered and addressed in devising an HBIM approach. It is founded on internal work carried out by COTAC over the past four years and, in particular, the outcomes of the three related annual COTAC Conferences held since 2011.”


Abstract: “Surveys and inventories of the built environment have improved the understanding of the state of existing heritage structures and historic districts and assisted in their preservation by thorough and consistent documentation. Unfortunately, full exploitation of these resources has been impeded by their static, non-interactive nature as printed documents (ie, reports or maps). This article presents recent attempts to improve access of such resources through their web-enablement. Specifically, issues of usability, relevance, contemporaneity, and spatial integration are evaluated. These requirements are considered with respect to a new resource, Historic Ireland’s Built Environment and Road Network Inventories Access (HIBERNIA). This integrated, extendable database and geographic information system (GIS) is featured as an example of how access to these surveys and inventories can be improved to form the basis for future developments to provide a more complete picture of heritage resources and enable innovative resource management strategies.”


Abstract: “Historic Building Information Modelling (HBIM) is a novel prototype library of parametric objects, based on historic architectural data and a system of cross platform programmes for mapping parametric objects onto point cloud and image survey data. The HBIM process begins with remote collection of survey data using a terrestrial laser scanner combined with digital photo modelling. The next stage involves the design and construction of a parametric library of objects, which are based on the manuscripts ranging from Vitruvius to 18th century architectural pattern books. In building parametric objects, the problem of file format and exchange of data has been overcome within the BIM ArchiCAD software platform by using geometric descriptive language (GDL). The plotting of parametric objects onto the laser scan surveys as building components to create or form the entire building is the final stage in the reverse engineering process. The final HBIM product is the creation of full 3D models including detail behind the object’s surface concerning its methods of construction and material make-up. The resultant HBIM can automatically create cut sections, details and schedules in addition to the orthographic projections and
3D models (wire frame or textured) for both the analysis and conservation of historic objects, structures and environments.”


Abstract: “The purpose of this paper is to identify key elements of what makes an inventory program effective for cultural heritage conservation and management. It is hoped that it will spur discussion among heritage professionals about increasing the effectiveness of inventory programs. This paper reflects on more than a decade of experience with the establishment of heritage surveys and inventories at national and citywide scales in the Middle East and North America, and through site-based heritage management projects. In addition, it reflects on engagement with international professionals involved with heritage inventories.

Heritage inventories are permanent, ongoing records that require long-term institutional resource commitments. To be effective for heritage management, inventory programs should be established with links to heritage legislation, built upon data standards, and maintain dedicated personnel, programs of activity, and systems on an ongoing basis. Inventories are fundamentally different than heritage surveys, or other data collection activities, which collect information within a specific timeframe. The findings are based on engagement with real-world, practical applications. It is hoped that the recommendations included will be useful to professionals working in heritage institutions that are establishing inventory programs, or seeking to modernize, invigorate, or increase the effectiveness of their inventory programs. This paper presents insights gained through engagement with a large number and variety of heritage inventory and survey programs and projects from across the world, reflecting on broad trends and patterns.”


Abstract: “Historic Building Information Modelling (HBIM) is limited by the irrelevance of object libraries and the inability of 3D scans to determine structures in buildings of dissimilar age and construction. The potential for energy conscious initiatives to make informed judgments regarding the ‘deep renovation’ of traditional buildings requires development of better noninvasive appraisal methods. Presumptions are dangerous for the majority of forms of historic building construction, yet older buildings benefit from better statutory control against alteration in any event. Here it is proposed that the pre-existing standard methods of nineteenth- and early twentieth-century construction could improve capacity to build data for a significant number of buildings of that era. The matching of images to develop place recognition algorithms has been deployed in a number of contexts. Standards, Patents and Specifications provide the means for developing new object libraries nested and shared from the surface to the structure. The example of decorative finishes, commonly used in public buildings at the turn of the twentieth century, demonstrates a traceable route whereby classifications could be determined using historic specifications and product data. The wider potential for such groundwork to enhance capacity to model energy performance of
these less well-protected buildings is suggested.”

Santana Quintero, Mario and Ona Vileikis “Heritage Recording and Information Management in the Digital Age (SMARTdoc-heritage),” *Change Over Time*, Volume 1, Number 2, Fall 2011, pp. 156-164

Executive Summary: “The international symposium SMARTdoc-heritage, which was held on November 19–20, 2010 at the University of Pennsylvania in Philadelphia (USA), provided a wide crossdisciplinary platform for educators, professionals, heritage institutions, and managers of heritage places to share, exchange, and explore new approaches, best practices, and research results in the area of digital heritage recording, documentation, and information systems.

This event was organized by the Historic Preservation Department at the School of Design (University of Pennsylvania) with the collaboration of the Raymond Lemaire International Centre for Conservation (RLICC, KU-Leuven) and the University College St. Lieven. Supporting institutions included the Kress Foundation, Sardegna fund, UNESCO World Heritage Center, UNESCO Chair for Preventive Maintenance, Monitoring, and Conservation (PRECOMOS), ICOMOS Scientific Committee on Heritage Documentation (CIPA), ICCROM, and the International Society on Virtual Systems and Multimedia (VSMM). This symposium, initially planned by Robin Letellier and Frank Matero, was dedicated to Letellier’s unique vision and tireless effort to promote heritage conservation through research, teaching, and public service.”


Abstract: “Current environmental problems arising from the building sector require tools to help reduce resource consumption and environmental impact. Life Cycle Assessment (LCA) is a widely used tool to quantify the environmental impacts of the building sector. The literature recognizes the need to simplify the method application, especially to reduce and optimize data acquisition. Building Information Modeling (BIM) is defined as a virtual 3D building model, which integrates with a database of their building elements. Several studies recognize that the integration of BIM and LCA can simplify data acquisition of the building as well as provide both tools with feedback. This paper reviews recent studies centered on BIM-based LCA, and also carries out a methodological analysis of their integration, focusing on the way that BIM can contribute to simplifying data input, and optimize output data and results during the LCA application in buildings. The results show the viability to develop methods based on BIM models for organizing building information used to estimate environmental and energy consumption impacts based on LCA, including: templates and plug-ins for BIM software, and the integration of automated processes combining different data and software. Reviewed papers are simplified LCA applications, mostly focused on CO2emissioncalculation during the early stages of design. Finally, methodological challenges and recommendations for BIM and LCA tools are proposed.”

Stulens, Anouk and Veerle Meul, Neža Čebron Lipovec, “Heritage Recording and Information Management as a Tool for Preventive Conservation, Maintenance, and Monitoring: The Approach of Monumentenwacht in the Flemish Region (Belgium),” *Change Over Time*, Volume 2, Number 1, Spring 2012, pp. 58-76
Summary: “It is common knowledge that—with the exception of calamities such as fire, earthquakes, and floods—monuments decay in a gradual process and very often major damage is the result of minor damage that has not been repaired in due time. Regular attention and maintenance can slow down the process of decay or, in specific cases, even partially prevent it. That is why an organization was founded in the Netherlands, in the Flemish Region of Belgium, and elsewhere in Europe with a goal based on the very elementary belief that prevention is better than cure, but in this case applied to cultural heritage. Monumentenwacht offers a systematic inspection system focusing on maintenance and preventive conservation and has developed a database for member, object, and inspection information. After almost twenty years of experience, the organization is now in a phase of professionalization of applied technology to develop an integrated condition-reporting database. The question is whether this new system will reach its goals and generate the necessary benefits for users and stakeholders.”


Abstract: “The development of a simulation tool that can accurately characterize the energy performance of the Canadian housing stock would enable detailed studies to predict the impact of energy saving upgrades and technologies on a national scale. Such a tool requires a detailed database of house descriptions that collectively represent the entire housing stock. Such a database has been assembled by selectively extracting measured and observed data collected by professionals who conducted on-site audits of 200,000 houses. The auditors’ data were extracted to statistically match key parameters (location, house type, vintage, geometry, and heating system) with a broad-based random survey of the Canadian stock. The result is a database comprised of nearly 17,000 detailed records of single detached, double and row houses. Each of these house records represents *500 houses in the Canadian stock and contains sufficient data to enable the accurate characterization of its energy performance through building performance simulation.”


Abstract: “Over the past 20 years, heritage inventories in Flanders (Belgium) have evolved from printed books to digital inventories. It is obvious that a system that publishes a digital inventory needs to adapt to the user requirements. But, after years of working with a digital inventory system, it has become apparent that not only has the system been developed to the users needs, but also that user practice and the resulting data have been shaped by the system. Thinking about domain models and thesauri influenced our thinking about our methodology of surveying. Seeing our data projected on a common base-map led us to realize how intertwined and interdependent different types of heritage can be. The need for structured metadata has impressed upon us the need for good quality data, guaranteed by data entry standards, validation tools, and a strict editing workflow. Just as the researchers have transitioned from seeing their respective inventories as being significantly different to actually seeing the similarities between them, the information specialists have come to the realization that there are synergies that can be achieved with other systems,
both within and outside of our organization. Deploying our inventories on the web has also changed how we communicate with the general public. Newer channels such as email and social media have enabled a more interactive way of communicating. But throughout the years, one constant has remained. While we do not expect the systems to live on, we do want the data in them to be available to future generations.”


Abstract: “While BIM processes are established for new buildings, the majority of existing buildings is not maintained, refurbished or deconstructed with BIM yet. Promising benefits of efficient resource management motivate research to overcome uncertainties of building condition and deficient documentation prevalent in existing buildings. Due to rapid developments in BIM research, involved stakeholders demand a state-of-the-art overview of BIM implementation and research in existing buildings. This paper presents a review of over 180 recent publications on the topic. Results show scarce BIM implementation in existing buildings yet, due to challenges of (1) high modeling/conversion effort from captured building data into semantic BIM objects, (2) updating of information in BIM and (3) handling of uncertain data, objects and relations in BIM occurring in existing buildings. Despite fast developments and spreading standards, challenging research opportunities arise from process automation and BIM adaption to existing buildings’ requirements.”