

responses and was proud of the work I put into it. I am now working on implementing the next iteration focused on user-friendly editing and maintenance capabilities to account for prolonged use at the CCED, anticipating that the data will need to be updated with each annual report produced by EGLE.

In all, the conference had the largest turnout that they had seen in the history of the program (300 over expected capacity). I was able to attend great trainings and side room showcases of impactful research that Campus Compact members were working on, and gather ideas and strategies for community engagement, partnerships, and outreach.

## **MAP RESOURCE**

If you would like to explore the map resource I created, please visit this link

<https://grggit.github.io/TestforAVCC/> or scan the QR code on any attached view of my poster. IF you might have any additional questions, feel free to reach out at [grg7576@rit.edu](mailto:grg7576@rit.edu)

# **Domicology Traveling Display**

## ***AVAILABLE TO HOST AT NO COST FOR PERIODS OF 2–6 WEEKS.***

The MSU Center for Community and Economic Development (CCED) has developed a traveling educational display exploring the challenges and opportunities related to structural abandonment and the transition toward a more sustainable, circular built environment.

Originally created as part of a Domicology exhibit at the MSU Museum, the display consists of seven roll-down, collapsible banner panels. Each banner stands approximately 82 inches tall, with a base measuring 37.25 inches wide by 7.5 inches deep.

The panels are designed to engage public audiences in understanding:

- The lifecycle of buildings and materials
- The social, economic, and environmental impacts of structural abandonment
- Policy and practice approaches for creating more just and sustainable communities

**CCED is currently seeking additional host locations interested in providing educational programming or public engagement opportunities around sustainability, community development, or the built environment.**

For additional background materials, please visit: <https://linktr.ee/domicology> or email [ced@msu.edu](mailto:ced@msu.edu)

See photos of the Domicology Traveling Display panels:

### WHAT IS DOMICOLOGY AND WHY IS IT IMPORTANT

Domicology is the study of the life cycle of our built environment, including our homes, shopping centers, hospitals, schools, manufacturing facilities, roads, and all other structures we have built. Taken together, the weight of our built environment now exceeds the total weight of all living things on the planet.

Currently, we take materials from the earth, process them, construct buildings, use them, and eventually demolish them. The U.S. Environmental Protection Agency (EPA) found that more than 75% of all construction and demolition waste ends up in landfills, and studies estimate that construction and demolition waste is expected to reach 2.2 billion tons generated globally each year by 2025.

There is an alternative model for our built environment. Structures have an "end of life." We should plan, design, build, repair, and deconstruct our built environment to maximize the salvage of valuable limited materials, stop structural abandonment, and create a more sustainable and just society.

This 21st century approach to building creates a new economic ecosystem of jobs and industries dedicated to material salvage, reuse, and repurposing and seeks to end structural abandonment, if it, reimagines how we build our future communities.

### SOCIAL, ECONOMIC, ENVIRONMENTAL IMPACTS OF STRUCTURAL ABANDONMENT AND THE LINEAR BUILT ENVIRONMENT MODEL

Property values go down because of surrounding vacant structures, meaning people have a harder time selling their homes or getting home improvements loans. At the same time, insurance prices often rise for nearby properties.

Additionally, studies conducted in the urban center of Austin, Texas, show that crime rates on blocks with open abandoned buildings have been twice as high as those on blocks without them.

DEMOLITION ALSO PRODUCES LARGE AMOUNTS OF DUST THAT MAY CONTAIN LEAD AND OTHER METALS.

Demolishing an average single-family home generates six times the EPA regulation limit of lead dust. Yes, it is less only ingesting the equivalent of three granules of lead dust to cause permanent damage to a child, including major behavioral and learning problems, slowed growth, anemia, and in some cases, seizures, coma, and even death.

Demolition also creates perpetual harm to the environment by putting loads of materials in landfills and requiring manufacturing of new construction materials.

The EPA estimates that U.S. companies generate 156 million tons of building-related construction and demolition waste every year. Of that amount, 92% is generated by renovation and demolition.

Additionally, the construction and building sector accounts for around 3% of global carbon emissions, including all aspects of building a structure and considering the embodied carbon within a built structure.

DEMOLISHED MATERIALS ENDING UP IN LANDFILLS EMIT LARGE AMOUNTS OF CARBON.

When a house is demolished and its materials are buried in a landfill, the carbon emitted amounts to over 41 equivalent tons of energy per average single-family house.

That means that demolishing 1 single house emits the same amount of carbon as if you were to drive your car 93,000 miles. That would be like driving around the world 4 times.

Manufacturing new construction materials has the largest carbon impact in the entire construction and building sector and accounts for a total of 11% of all global carbon emissions.

### THE IMPACT OF STRUCTURAL MATERIAL WASTE ON CLIMATE

To break the cycle of cumulative waste generation and carbon emissions, we need an effective alternative to demolition, which perpetuates it.

A solution to transforming the built environment to benefit communities and the Earth considers structures' life cycles and rethinks their end of life. It aims to capture the full value of a structure through a circular model, rather than thinking of "end of life" as "end of use." This means "deconstructing" a structure at its "end-of-life," then salvaging and reusing its materials.

Much material in our landfills comes from buildings, emitting carbon while taking up space. Much of this material is salvagable.

### THE DOMICOLOGY SUPPLY CHAIN: FROM COLLECTION TO REUSE/RESALE

Large-scale projects and real communities showcase designing for deconstruction and nurturing a circular building model through deconstruction and material re-use.

In these examples, you will see successes and understand the potential of the deconstruction approach in building and managing the built environment.

The STEM building on Michigan State University's campus, which is a hub for teaching and innovation built in 2021, is an excellent example of "mass timber construction." This is a method of designing for deconstruction by using large pre-manufactured, multi-layered, solid wood panels.

The STEM building is also an example of preservation and reuse. Structural components of the historic MSU Shaw Lane Power Plant were used in its construction.

The STEM building is the first and largest of its kind in the State of Michigan. Other mass timber projects, like the "Ascend" residential building in Milwaukee, Wisconsin, have seen construction of buildings up to 21 stories tall!

In many places, community partners have taken advantage of new re-use markets created by salvaging and reusing construction materials. People have created storefronts and organizations, usually non-profit, that inspire community engagement and promote community development.

The Chicago Rebuild Exchange is an example of a re-use organization whose work promotes building material reuse and construction waste reduction, while also investing in its community. It offers 100 training classes a year, ranging from woodworking, to repair and reuse methods. 89% of its students were placed into building trades jobs earning an average wage of \$18 per hour upon graduation.

### NEARLY 100 TONS OF WASTE PER HOUSEHOLD COULD BE DIVERTED IF THE SALVAGEABLE MATERIALS ARE KEPT.

This would also prevent nearly 8.0 metric tons of carbon dioxide (MTCO2E) from being emitted from landfills.

The amount of potential for diversion is reflected in the large amounts of salvageable materials existing in an average single family home. For example, framing lumber alone, makes up 6,300 kg of a house's total mass, with over 9,000 ft of boards per house, and if salvaged would prevent 6.5 MTCO2E of emissions. Some other quantities that are shockingly large and completely salvageable, if a house were be deconstructed rather than demolished include:

<b>STANDARD BRICK</b> 10,000 kg & 5,000 bricks per house 0.22 MTCO2E emitted if landfilled	<b>ASPHALT SHINGLES</b> 600 kg & 600 sq ft per house 0.02 MTCO2E emitted if landfilled
<b>FLOORING</b> 1,200 kg & 135 sq ft per house 0.02 MTCO2E emitted if landfilled	<b>CONCRETE</b> 34,000 kg & 37 cubic yards per house 0.76 MTCO2E emitted if landfilled
<b>DRYWALL</b> 1,100 kg & 1,445 sq ft 0.07 MTCO2E emitted if landfilled	<b>ROOFING</b> 15,000 kg & 1,620 sq ft 0.35 MTCO2E emitted if landfilled

### THERE IS NOT JUST ONE SOLUTION TO THESE PROBLEMS.

We have other ways to fight and manage abandonment, including preserving historic structures. These buildings can be reused for their original purposes or for new ones through adaptive reuse.

**PRESERVATION**  
Building Reuse Alliance

**"The greenest building is one that is already built."**

### BENEFITS OF STRUCTURAL MATERIAL SALVAGE AND REUSE

Wide-scale benefits from salvaging and reusing materials will transform the built environment to develop more sustainably over time.

Each material in a residential structure has its own potential when salvaged.

For example, lumber salvaged from older homes has several properties that make it more attractive for reuse

- It is more dense, which means it is stronger.
- It has more heart wood than sap wood. Heart wood is more rot resistant. This is because the wood grows more slowly, over longer periods of time.
- As you can see in the image, wood that was harvested and milled into lumber in 1918 had 20-25 growth rings per inch and is all heart wood; that same piece of lumber 100 years later only had 7 growth rings per inch and is mostly sap wood. This current condition results from the use of faster-growing species that are harvested at younger ages.

In addition to preventing the harms of demolition, deconstruction also inspires community revitalization by producing revenue and creating market opportunities.

For deconstruction to be economically beneficial and competitive with demolition, the savings from not needing to pay for disposal and revenue from material resale must be more than the higher labor costs.

Despite its higher labor and overall initial costs, deconstruction can be cost-effective and generate revenues compared to demolition, thanks to the resale value of the salvaged materials.

With just a **50% salvage rate**, deconstruction comes out on top when calculating costs with resale considered,

costing an average of **\$4.83** per square foot **VERSUS** **\$5.36** for demolition

### TIPS ON DECONSTRUCTION

Optimizing the benefits of deconstruction means salvaging the greatest amount of material and making the process of disassembly easier, more cost effective, and energy efficient.

Domicology recognizes that we must consider the end of building life when we are designing and constructing it and design with deconstruction in mind.

### TECHNIQUES

Various techniques have been developed to help to design for deconstruction. All of them emphasize simplifying building constructions. If a building can be constructed simply, it probably can be deconstructed simply.

### METHODS

Designing prefabricated units for construction makes buildings easier to deconstruct at the end of their lives. For example, pre-cast concrete floor panels can be disassembled easily in large sections. This makes them more useful once salvaged and easier to deconstruct.

Transporting larger, pre assembled units can reduce construction costs and minimize the environmental effects of transportation by moving fewer pieces to the worksite.

Wood flooring, steel members, brick, concrete blocks, and carpet tile can be easily and directly reused, refurbished or recycled.

When designing structures, plan for future renovations and adaptations in order to reduce construction waste in the future. Innovate and create adaptable structures.

To make things easier to take apart and reuse, use fasteners like screws, bolts, and connectors rather than glues, caulks, and foams. This requires more time in construction but causes less environmental impact and cost later.