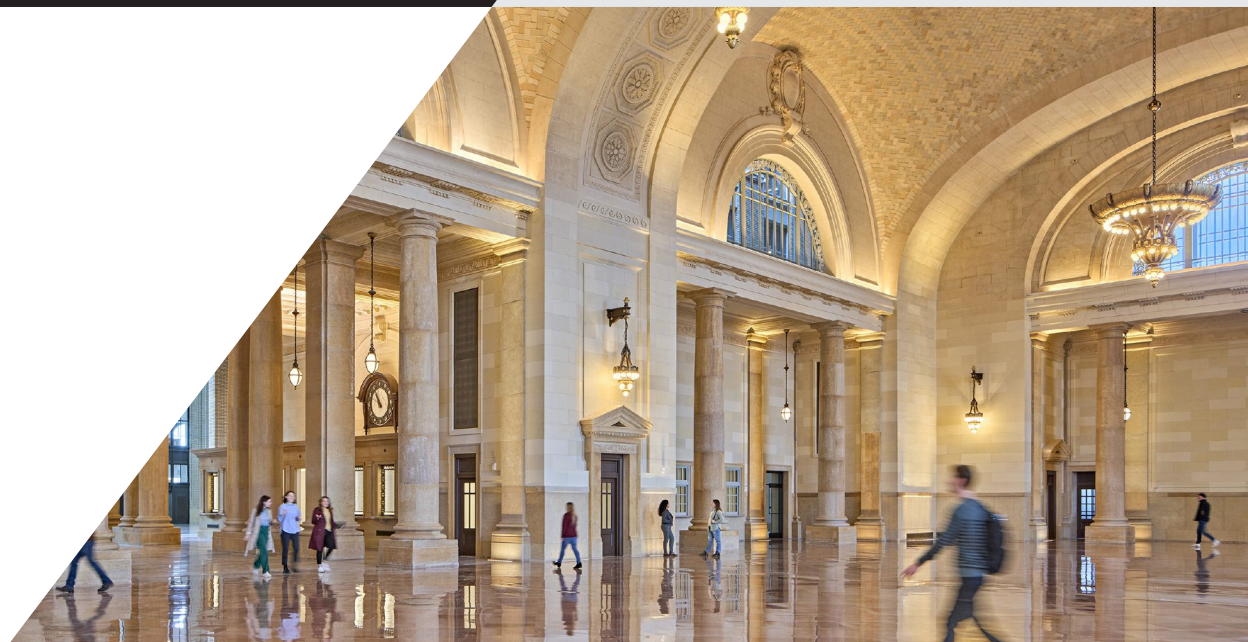
Embodied Carbon Action Plan

TYLin



2025 — EMBODIED CARBON ACTION PLAN

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UIUC SIEBEL CENTER FOR DESIGN | CHAMPAIGN, IL

EXECUTIVE SUMMARY

Silman, now the TYLin Buildings Sector, have been leaders in sustainable structural engineering for more than 40 years. With the advent of identifying and tracking embodied carbon as a key component to Global Warming Potential, we saw a renewed opportunity to play a more active role in sustainable design. In 2019, the Silman Green Initiative (SGI) was founded by engineers of the firm passionate about ensuring that the structural systems we design have a positive impact on the planet. Shortly following the creation of the group, Silman became a signatory of the SE 2050 Commitment Program, which commits firms to achieving zero carbon buildings by 2050. By signing onto this initiative, Silman has agreed to help educate the structural engineering profession, engage in an embodied carbon tracking program for our projects, and report embodied carbon impacts and trends.

In 2023, the Silman Green Initiative (SGI) transitioned to the Sustainability Community of Practice (SCoP). Now fully integrated as part of TYLin, SCoP consists of TYLin Building Sector engineers and computational designers who are passionate about integrating sustainability into structural engineering. This group works to:

- Meet the requirements of the SE 2050 Commitment
- Educate the firm and provide resources on sustainability
- Promote and assist in sustainability integration in projects
- Provide internal tools and databases to assist in sustainability related calculations
- Update specifications and track newly emerging sustainable materials for project integration

The following outlines our progress in past goals from previous years' Embodied Carbon Action Plans (ECAP), as well as our goals for 2025.

Education Plan

Education is the basis on which our Sustainability Community of Practice has developed and grown. Through sharing resources and educating the broader firm, we have been able to integrate sustainability and embodied carbon awareness into projects on a more regular basis, with an emphasis on decarbonizing our designs. Over the next year, we plan to grow these resources to continue to increase the sustainability IQ of all of our engineers. Some of these educational tools are outlined below.

PRACTICE GUIDE

The practice guide was developed to be a quick reference guide to help answer any sustainability questions one may have. This resource, which is integrated into our firm's internal website, provides terminology, quick summaries, and links to the various resources available both internally and externally.

TEKIS

Technical Knowledge Items, or, as they are more commonly known at our firm, TeKIs, are "Wikipedia"-style articles that have become our firm's widely used crowd-sourcing guide to various technical topics. The Sustainability Community Practice has used these as a tool to widely share information about sustainable materials, certifications, and embodied carbon reduction strategies. These are living resources which are routinely updated as sustainability and sustainability requirements evolve.

INTERNAL ROUNDTABLES AND OFFICE HOURS

Every month, our Sustainability Community of Practice hosts a meeting open to the entire office. Two times each quarter, the SCoP leaders host open office hours. In these office hours, anyone is invited to join and ask questions related to sustainability and embodied carbon, whether they came up in the context of a project, are a result of certification or jurisdictional requirements, or otherwise. In the other month of the quarter, a different roundtable topic will be chosen. Experts of that topic will present, and a discussion will follow to share knowledge and perspectives across offices and experience levels.

FIRM ENGAGEMENT

This year, we hope to grow the firm's engagement with the Sustainability Community of Practice and the resources it creates. Some of this engagement is outlined in the sections above. In addition, we are integrating embodied carbon and sustainability into our new employee on-boarding process. Our team is also working to engage each office and studio to share the resources available and encourage those interested to join us. We also actively utilize our Community of Practice internal website, which provides updates to the firm via our internal website's homepage. Finally, we are beginning to track active opportunities and projects with sustainability goals and checking in to provide information, verification, and accountability.

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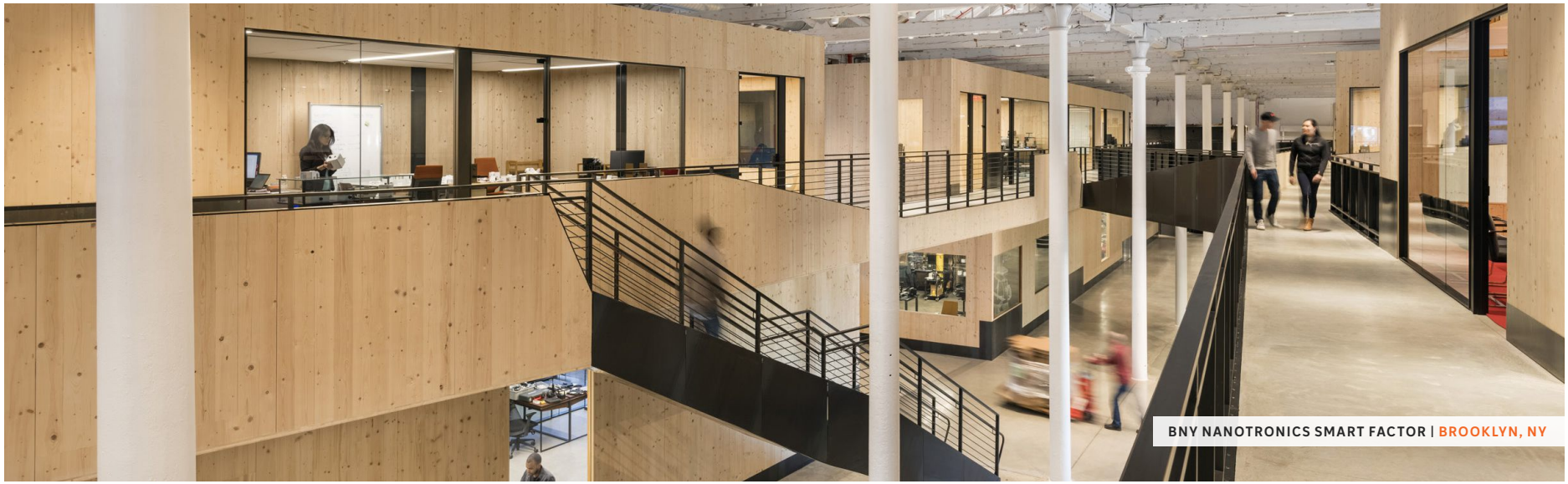
Knowledge Sharing Narrative



BNY NANOTRONICS SMART FACTOR | BROOKLYN, NY

Over the last year, our firm has begun focusing on how we can work with our clients and fellow design professionals to expand embodied carbon knowledge and foster an integrated design approach on more projects. In the upcoming year, we hope to expand this outreach further. Some of our efforts are outlined below.

COLLABORATION WITH PARTNERS

We believe collaboration with partners is key to moving from a baseline embodied carbon reduction to the goal of zero embodied carbon by 2050. In the past, we have worked with architects to brainstorm creative solutions during projects and design charrettes. We've also collaborated with non-profit organizations, such as the Rocky Mountain Institute, to provide industry insight into initiatives. We've also worked with concrete suppliers and wood carpenters to reduce the embodied carbon in their materials or assemblies. Because of our extensive experience & reputation in preservation engineering & adaptive reuse projects, we are industry leaders in cultivating a 'reuse first' policy.

PRESENTATIONS AND LUNCH & LEARNS

Our team has made an effort to promote embodied carbon reduction and share lessons learned through a variety of presentations. This includes presentations at conferences, such as GreenBuild, Net Zero, Structures Congress, and the Mass Timber Conference, where we have shared project and study examples. We have also developed a series of lunch and learn presentations for architects to share ideas on how our two disciplines can collaborate to find a reduction in embodied carbon on projects.

EXTERNAL INVOLVEMENT

Many of our staff are involved in external sustainability groups in their local areas. This includes local chapters of Carbon Leadership Forum, United States Green Building Council, International Living Futures Institute, and National Council of Structural Engineers Associations. Members of our Sustainability Community of Practice have also attended sustainability-focused building conference, including GreenBuild, Net Zero, Design for Freedom at Grace Farms, and Living Future Conference. Each team member attending a presentation or conference related to sustainability is expected to compile notes and lessons learned and share that back to the SCoP.

Reduction Strategy

As we progress to firm-wide understanding of the basics of embodied carbon and sustainable structural systems, our new focus has been to integrate sustainability into all projects, no matter the sustainability goals of the project. This will allow us to hit our target reduction this year of 10% across projects over the next year and 20% across projects over the next 5 years. Some of these methods to achieving this goal are outlined below.

INTEGRATION INTO EXISTING PROCESSES

Working with other knowledge leaders of our firm, we have been working to integrate embodied carbon into our firm's existing processes. This includes updating templates, such as our basis of design narrative, to include sustainability as a baseline. We have also formatted our work to match our typical workflow, easing the ability for sustainability initiatives to integrate into project work.

SPECIFICATIONS

Over the last year, we right sized our firm's concrete specification to remove prescriptive clashes and prioritize performance outcomes. This ensures that all projects have a better baseline for concrete sustainability. We are working on completing a similar process for our other specifications, including structural steel, timber, and concrete masonry units (CMU). We have learned that adjusting our specifications has pushed the contractors we work with to think about their products differently and find creative solutions to meet the project needs while providing a more sustainable option.

PROJECT ASSISTANCE

Since the initiation of our internal sustainability group, our firm's sustainability leaders have been assisting in project work. Over the last year, we've more broadly promoted assistance on projects across all offices. This includes assisting with specifications and embodied carbon calculations, as well as joining sustainability focused project meetings and providing QAQC reviews for drawing sets and calculations. This has also included participating in LEED and Living Future project design charrettes, where we are able to collaborate with the design team to find avenues to reduce carbon. This process has allowed our leaders to share their knowledge and assist in the reduction in embodied carbon on projects.

EARLY AND OFTEN CONVERSATIONS

We have found that the earlier sustainability and embodied carbon are brought into a project, the more likely they are to stick. We have developed a sustainability memo that can be used as a basis for initiating a conversation about embodied carbon during concept or schematic phases. Along with our addition of a sustainability section into our basis of design narrative, we have begun to create graphic standards and examples for how to communicate embodied carbon and sustainability aspects of a project to include during concept and schematic submissions. These help initiate conversations during the early phases of a project to help guide the project towards a more sustainable design. Discussing embodied carbon early has also led to more continuous conversations throughout a project to ensure those goals established are maintained.

Achieving Firm-wide Sustainability Integration

Reporting Plan

Since becoming a signatory of SE2050 in 2020, our firm has been calculating embodied carbon on projects. Since 2020, we have been expanding the number of projects and phases where we calculate embodied carbon. We've also been developing new and simpler ways to integrate these calculations into projects. This year, we will expand our firm's abilities beyond product stage to take a more holistic look at the impact of structural systems on the planet. Some of these methods to achieving these goals are outlined below.

EMBODIED CARBON CALCULATOR

In 2020, we launched our internal embodied carbon calculator, which calculates the product stage embodied carbon of a project by utilizing Environmental Product Declarations (EPDs). Typically, industry wide EPDs are referenced, but the tool allows for customization if a particular EPD will be implemented. This tool has allowed our firm to run quick embodied carbon calculations on any project and has frequently been utilized during early phases of a project, such as concept and schematic design, often being used as in decision making. Material quantities at these early phases are typically estimates, but when utilized during later stages, these quantities are replaced with material takeoffs extracted from our Revit models. All final embodied carbon calculator results are collected in our firm's database and submitted to SE2050.

REVIT PLUG-IN

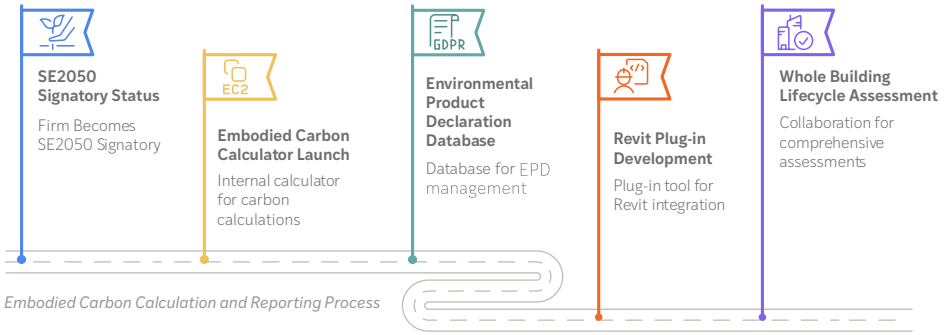
Over the last year, our Sustainability Community of Practice has been developing a Revit plug-in tool. This tool is currently undergoing beta testing, which has been used to generate embodied carbon outputs on multiple projects in the past year. This tool will help project teams quickly calculate the product stage embodied carbon on a project. The tool uses a similar process as the embodied carbon calculator, but with its integration into Revit, it should allow for more continuous feedback on where the project is at compared to its goals and past calculations. Similarly to the embodied carbon calculator, industry wide EPDs are referenced, but there is also the ability to customize if a particular EPD will be implemented. Since this tool is integrated into our Revit models, we hope this will allow for more projects to calculate embodied carbon and track throughout multiple phases. All final embodied carbon calculations are collected in our firm's database and submitted to SE2050.

WHOLE BUILDING LIFECYCLE ASSESSMENT

We've been fortunate to work on multiple projects that have required a whole building lifecycle assessment (WBLCA). Oftentimes, these assessments are conducted by the project's sustainability consultant in collaboration with our team. Our team has provided material takeoffs at various phases from our Revit models to the sustainability consultant. We've then worked together to meet the embodied carbon and sustainability goals of the project. These embodied carbon calculations have thus far not been submitted to SE2050, but our team is aiming to begin collecting these and reporting them if the sustainability consultant team has not already. This year, our team is also training in OneClick LCA to provide the structural portion of WBLCA for projects with embodied carbon targets when there is not a sustainability consultant part of the project team.

ENVIRONMENTAL PRODUCT DECLARATION DATABASE

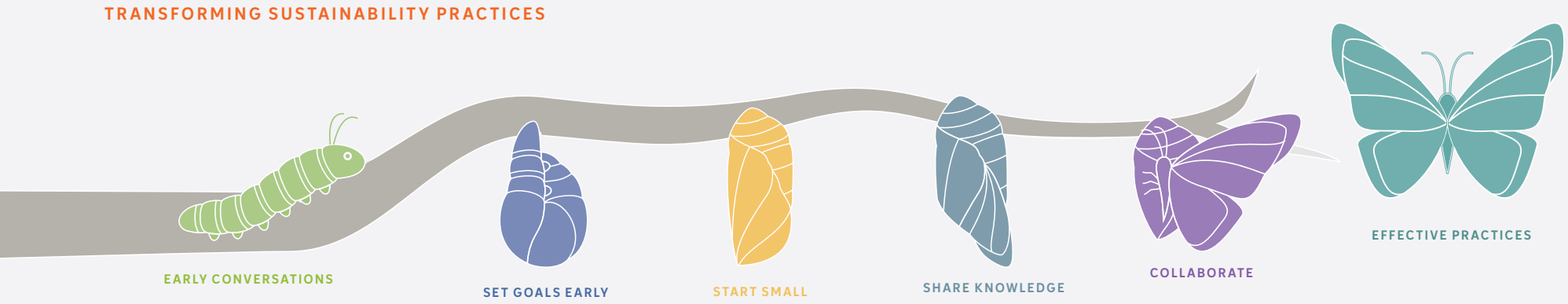
Our Sustainability Community of Practice maintains our internal Environmental Product Declaration (EPD) database. This database includes both industry wide and manufacturer EPDs. The industry wide EPDs are the default EPDs referenced in our embodied carbon calculations. All projects that receive an EPD as part of the submittal process are to save and log the EPD in our internal database. While many manufacturer EPDs are available online, not all manufacturers publish these to open-source databases or easily accessible sites. The collection of all received EPDs allows staff to review EPDs based on material, area, or manufacturer. These EPDs can help refine embodied carbon calculations, provide contractors with manufacturers who could be brought onto a project, or serve as an example for suppliers on projects who have not yet created EPDs for their products.



Embodied Carbon Calculation and Reporting Process

Lessons Learned

1. **Embodied carbon and sustainability conversations should happen early and often.** We have found that even on projects that start with big sustainability goals, if we haven't set clear embodied goals early, embodied carbon can quickly get pushed to the wayside. This can be due to cost, project schedule, and/or client interests or priorities. Setting embodied carbon goals early and following up on those discussions throughout a project process has led to success in maintaining reductions in embodied carbon on projects. Even on projects where sustainability may not be an openly declared key performance metric, the inclusion of embodied carbon information in our concept and schematic deliverables has led to fruitful conversations that raise awareness and educate owners and other project team members.
2. **Start small.** When looking at embodied carbon implementation on projects, we have found the best way for engineers to begin calculating embodied carbon is to run calculations during concept or schematic design phases. Typically, a project is already completing material takeoffs for cost estimates, so the additional lift to input those takeoffs into an embodied carbon calculation is simple. This has allowed engineers less familiar with the process to become more comfortable and eventually begin to look at embodied carbon during future phases of a project.
3. **Share knowledge in multiple ways**. Over the years, we have discovered that communication in many formats is the best way to spread knowledge throughout all offices and personnel. This may mean providing the same information in an email, a Teki, a blog post, and a presentation. Although it may seem repetitive, it has helped us reach more staff and ensure the resources and critical information is seen by as many as possible.
4. **Collaborate with your design partners.** Much of the work we do as structural engineers revolves around building with the parameters an owner or architect has given us. This means that sometimes we are limited by elements of the building out of our control, such as floor build-up minimums, span lengths, structural grid locations, and building massing. Through collaboration with the entire design team, we can work together to maximize the reductions we are seeing. Alone we can achieve some reduction, but together we can truly make a difference.



Elective Documentation

CATEGORY	REQUIREMENT
Education	✓ Provide a narrative of how the Embodied Carbon Reduction Champion will engage embodied carbon reduction at each office.
	✓ Present at least (1) webinar focused on embodied carbon and make a recording available to employees. This could be created internally, pulled from an external source (with permission), or pulled from a publicly available source such as the Boston Society for Architecture. Include this resource in your orientation and on-boarding program.
	✓ Incorporate embodied carbon education in your on-boarding process for all new employees.
	✓ Initiate an embodied carbon interest group within your firm and outline their goals. This group may more broadly address sustainability, but they must include embodied carbon.
	✓ Create an Embodied Carbon digital resource wiki and/or forum on your firm's internal website for staff to create, share, and discuss Embodied Carbon educational resources.
	✓ Engage with a CLF Regional Hub. This could mean attending presentations or working sessions and reporting back to the firm, or co-chairing a hub.
Reporting	✓ Submit a minimum of (2) projects per U.S. office with structural engineering services to the SE 2050 Database. You are not required to submit more than (5) total projects across your firm, but we encourage you to submit as many as possible! Firms are expected to follow with the spirit of the SE 2050 Program in determining how many total projects your firm must submit. You do not need to consider offices that only offer construction administration services or offices with fewer than (5) full-time employees.
	✓ For multi-office firms, describe how each office is measuring and reporting embodied carbon. For single-office firms, describe how different project teams or managers are measuring and reporting embodied carbon.
	✓ Include all structural material quantities in your submissions to the SE 2050 database.
Reduction	✓ Set clearly stated, firm-wide reduction targets in the short-term (<1 year) and long-term (>5 years).
	✓ Develop and implement a workflow that makes it easier to make early design decisions based on embodied carbon.
	✓ Update your specifications to incorporate embodied carbon performance. Include embodied carbon in your submittal review requirements.
	✓ Communicate the embodied carbon impacts of different design options to clients with creative and effective data visualization. You are welcome to include these visualizations in your Elective Documentation, though it is not required if your firm would prefer to keep marketing materials private.
	✓ Compare different design options with embodied carbon as a performance metric during the project concept phase. Explain what you did and what the results changed (if anything).
	✓ Participate in a LEED, ILFI Zero Carbon, or similar project design charrette and speak to potential design considerations impacting embodied carbon.
Advocacy	✓ Describe the value of SE 2050 to clients and how your design teams can collaborate to reduce embodied carbon. Please attach any associated marketing materials.
	✓ Publicly declare your firm as a member of the SE 2050 Commitment on your website, LinkedIn, or other social media.
	✓ Give an external presentation on embodied carbon that demonstrates a project success or lessons learned. Get connected at a CLF regional hub near you and be sure to post the recording.

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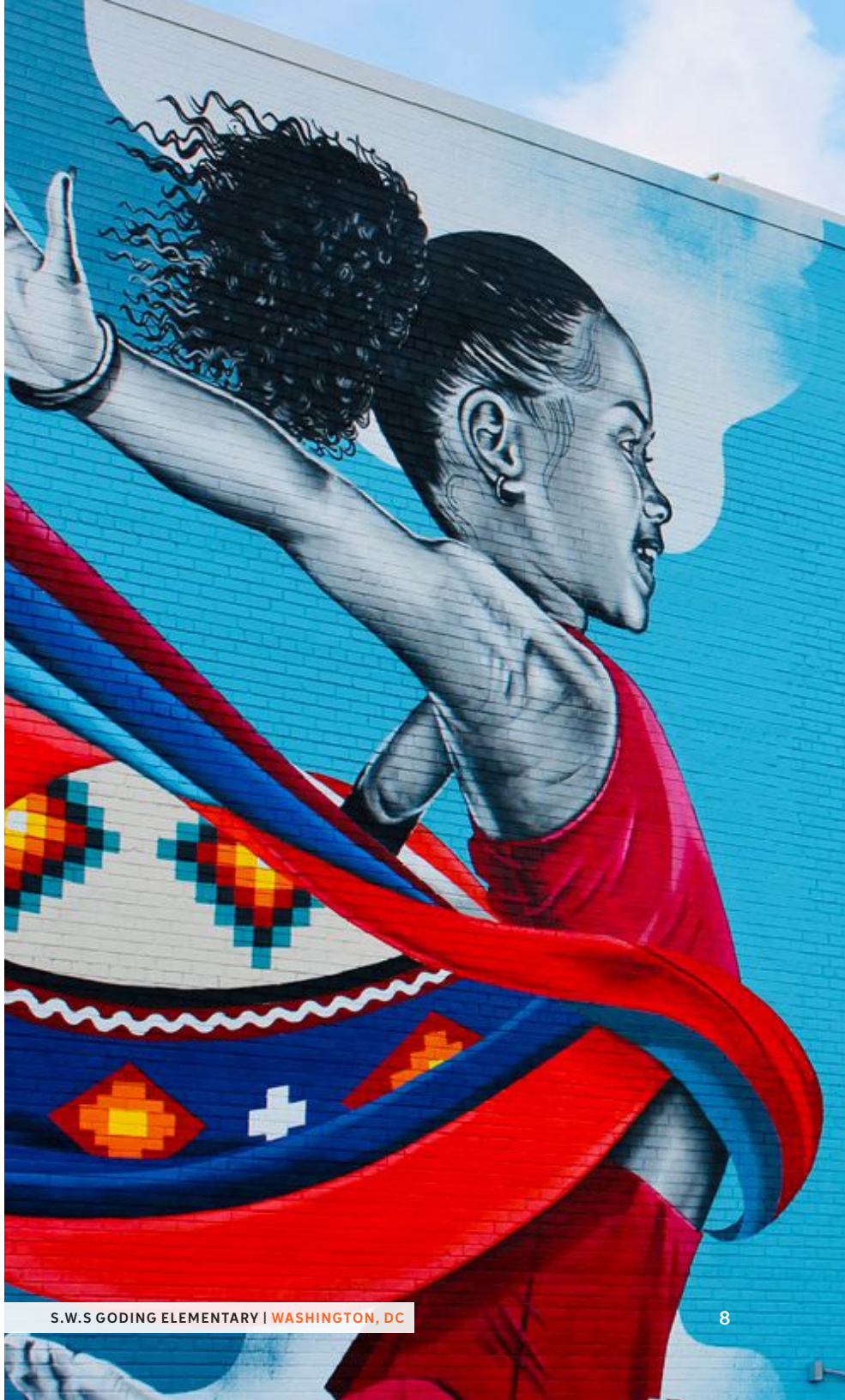

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