economics

UNINTENDED CONSEQUENCES

BY JOHN CROSS, PE

The strange case of fabricator-specific environmental product declarations.

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THE CONSTANTLY CHANGING LANDSCAPE OF REPORTING requirements for the environmental impacts of construction products is creating significant challenges for affected industries—including fabricated structural steel.

In fact, LEED V4 is rewarding, and the State of California is actually mandating, facility-specific environmental product declarations (EPDs) and attempting to use them to direct procurement decisions. Other states and programs are considering similar requirements. While such a process may appear to enhance the sustainability of the built environment, it may in actuality result in the unintended consequence of increasing environmental impacts, limiting competition and raising product costs.

Structural steel is a wise choice for projects seeking to minimize the environmental impacts associated with construction materials. Steel's low global warming potential, limited land use, minimal impacts on biodiversity, closed-loop water systems (which minimize consumption), 98% material recovery rate, 93% recycled content, inherent resilience and transparent reporting of environmental impacts make it an ideal material for high-performance construction projects.

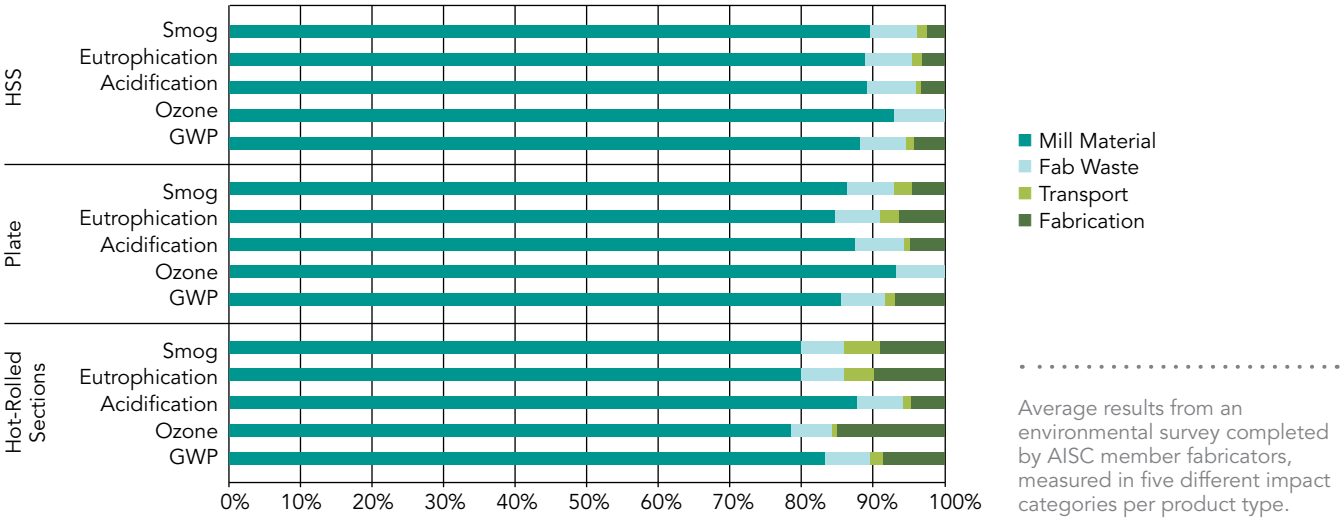
As a demonstration of that transparency, structural steel fabricators are prepared to provide EPDs for fabricated structural steel for building and bridge projects. These EPDs report several of the environmental impacts associated with the fabrication of one ton of structural steel, such as global warming potential, eutrophication, acidification, depletion of stratospheric ozone and smog. Rating programs that recognize sustainable buildings (LEED and Green Globes), standards for high-performance buildings (ASHRAE 189.1) and green codes (*International Green Construction Code*—IgCC) either encourage or require a certain number of products used in a project to provide EPDs.

The goal of these requirements is to increase the level of transparency of a product's environmental impacts as a means of allowing project architects and engineers to make informed product choices. Yet relying on the information included in a fabricator-specific EPD may result in the unintended consequence of selecting the wrong product or material, particularly for fabricated structural steel.

Industry Average or Producer-Specific?

EPDs can reflect either an industry average for the provided products or the impacts associated with a specific product manufacturer. In late 2015 and early 2016, AISC worked with our full members (mills and fabricators), the Steel Tube Institute and the Steel Recycling Institute to produce industry average EPDs for fabricated hot-rolled structural sections, fabricated steel plate and fabricated hollow structural sections (HSS). These EPDs can be submitted by AISC member firms to satisfy the requirements of the various programs and are available at **www.aisc.org/epd**. The LEED EPD-related credit requires EPDs for 20 products, with products using an industry average EPD counting as one-half of a product.

The industry average EPDs for fabricated products were developed based on the impacts associated with the mill products purchased for fabrication, the consumables used in the fabrication process and the energy consumed during fabrication. The mill impact data was collected on a confidential basis from a minimum of three mills based on a detailed



Average results from an environmental survey completed by AISC member fabricators, measured in five different impact categories per product type.

model of the steel production process, with all inputs related to materials, water, consumables and energy included for each type of steel product (hot-rolled sections, plate and HSS).

To determine the average environmental impact of fabrication, AISC conducted a member survey to determine the average transportation distances, energy usage, consumables (welding rods and gas) consumption, waste generation and material purchases for fabrication.

The results were most revealing in that they showed that the vast majority of the environmental impacts associated with all types of structural steel on a per-ton basis occur at the mill, not at the fabrication facility. In fact, the fabrication process represents less than 15% of the overall environmental impact in each category and in most categories, including global warming potential, less than 10% of the impact.

These industry average EPDs provide an accurate, transparent representation of the environmental impacts associated with selecting a structural steel framing system for a project.

Happy Ending? Not So Fast

This article would have a happy ending if the story ended here, but that is not the case. There is a growing trend to mandate and/or reward the selection of similar products from different producers based on the comparison of producer-specific EPDs against the industry average EPDs. For example, the LEED V4.0 program includes a credit for "Multi-attribute Optimization," which rewards the selection of products that demonstrate impact levels below the industry averages for that product.

A more troubling scenario is playing out in California, where Assembly Bill 262 "Buy Clean California" (AB262) was signed into law this past October. This act requires that when the State of California purchases structural steel, reinforcing bar, flat glass or mineral wool board insulation, the environmental impacts of the selected product must be documented with a facility-specific EPD and that the documented global warming potential (GWP), measured in tons of CO_2eq/ton of steel, be less than the industry average value. These requirements are scheduled to go into effect on July 1, 2019. Beyond the issue of the unfair advantage this law provides to products such as concrete and wood, which are not included in AB262, the question for the structural steel industry becomes whether fabricator facility-specific EPDs provide a transparent, accurate and meaningful measurement of the environmental impacts associated with fabricated structural steel.

The answer is NO.

While a facility-specific EPD may be an accurate reporting of the environmental impacts associated with past fabrication activities over a specific period of time (typically one year), they are not an accurate prediction of future environmental impacts associated with the production and fabrication of one ton of structural steel. They do not provide a meaningful indication of whether the fabrication activities at a specific fabrication facility are above or below the industry average. There are several reasons why this is the case:

1. Unlike other products used in a construction project, fabricated structural steel is not a commodity. Every piece of fabricated structural steel is a uniquely designed product requiring different fabrication operations. On a per-ton basis, the environmental impacts associated with the fabrication of a 4-ft truss member with welded connection plates will be significantly different than the impacts associated with the fabrication of a 60-ft bolted beam assembly. To evaluate all fabricated structural steel on a per-ton basis from an industry average perspective is proper at the macro level of material selection, but not an accurate approach for an individual project.
2. Structural steel fabrication is an off-site activity subject to the peaks and valleys of project scheduling. Project delays resulting from a variety of factors outside the control of the fabricator will create gaps in shop use, while at other times sliding schedules may result in demand exceeding shop capacity during a given period. The structural steel fabrication industry business model addresses these challenges by sharing work between multiple facilities owned by a single fabrication firm or by sharing work between fabricators. It is not unusual for a single project to be fabricated in multiple facilities based on the dynamics of project schedules that would have been unforeseen at the time of bidding. The result is that a facility-specific EPD may not reflect the fabrication facility where a portion of the work may be performed.
3. The project mix for any given fabrication facility will vary greatly year to year. The type of projects and the requisite mix between the use of hot-rolled sections, plate and HSS, the requirements for welding or bolting, the steel intensity (lb/sq. ft), bay sizes and other factors will directly impact the required fabrication operations and the per ton measure of environmental impacts. The result is that the facility-specific environmental impacts for the current year will vary significantly from the environmental impacts measured in a prior year.
4. It is important to note that the fabricator does not control the design of the product. EPDs are developed from life-cycle assessments (LCAs) of the product production cycle. The premise

behind using LCAs is that manufacturers can track reductions in environmental impacts based on improvements in the design and manufacture of the product. A comparison of a producer-specific EPD to an industry average EPD for a similar product assumes that the producer controls the product design and manufacture. The structural steel fabricator does not control the design of the product. The design of the product being manufactured is specified by the structural engineer, and even the manufacturing process—when it comes to the selection of welding or bolting—is often outside the direct control of the fabricator. It would be more appropriate to ask architectural and structural engineering firms to track the environmental impacts associated with their designs and measure each firm against the average for their industry than to measure the environmental performance of a fabricator against an industry average.

A Wide Range of Impacts

The end result is that the per-ton environmental impacts for a fabrication facility can vary greatly between projects. A fabricator with impact levels below average during the study year may well have impact levels well above the industry average in a subsequent year, while a fabricator above the average in the study year may actually have levels below the average on future projects. The end result might be the unintended consequence of increasing rather than decreasing environmental impacts and discriminating against a fabricator that specializes in complex projects.

So are facility-specific fabricator EPDs worthwhile? The simple answer is no, particularly when it is recognized that the fabricator contribution to overall environmental impacts of fabricated structural steel is typically less than 10% of the total impact. This does not mean that collecting environmental impact data associated with fabrication is not worthwhile. Fabricator data still needs to be collected to determine industry averages. The fact is that the industry average data provides a more accurate assessment of the environmental impacts of structural steel than does individual fabricator data.

Does this mean that producer-specific EPDs aren't valuable for structural steel? No, it doesn't, since 90% of the environmental impacts associated with structural steel originate at the producing mill. Legitimate comparisons can be made between individual producers and industry averages. Mills do control the "design" and manufacture of their products, and there are differences between mills for a particular product class. For example, recent studies have shown that the global warming potential for hot-rolled structural steel produced in China is 2.94 tons of CO_2eq/ton of steel, while hot-rolled structural sections produced in the U.S. average only 0.98 tons of CO_2eq/ton of steel (this report can be found at **www.aisc.org/discover**). Clearly, if a comparison is to be made, it should be at the producer, not fabricator, level and a producer-specific EPD for fabricated structural steel should reflect mill-level impacts combined with industry average fabrication impacts. ■