

The more input we receive from our industry,
the more completely we can attempt
to answer that question.

business issues

HOW GREEN ARE WE?

BY JOHN CROSS, P.E., LEED AP

I HAVE OFTEN BEEN ACCUSED of bleeding green because of my fanatical loyalty to the Green Bay Packers. But how green am I, really?

It is one thing to say that I am green but quite another to prove it. My “proof” comes in a variety of ways: season tickets at Lambeau Field; stock in the Packers; jerseys from Favre, Rodgers, Cobb, Driver, Bulaga and Gado; a spotlighted 5-ft-tall combination green “G” and Lombardi Trophy in my front yard, “XLVPACK” license plates, myriad other Packer memorabilia and most importantly the Packer flag that flew in front of the office of Illinois Governor Pat Quinn to pay off a bet with Wisconsin Governor Scott Walker after the Packers beat the Bears in the 2010 NFC Championship game (yes, that was mine). When it comes to being a Packers fan, I can objectively demonstrate how green I am.

Fabricated structural steel is touted as a green construction material. But how green are we?

Just as I can demonstrate my Packer greenness in a variety of ways, we can also demonstrate the greenness of fabricated structural steel. Steel is the most recycled material in the world and structural steel has one of the highest percentages of recycled content of any steel product, often approaching 100%. At the same time it is currently estimated that 98% of all structural steel at the end-of-life is recycled back into new steel products. From an emissions perspective we know that since 1990, energy intensity, per ton, from steel production has been reduced by 28% and carbon emissions have declined by 35%. Studies have been performed that demonstrate that the embodied environmental impacts of steel-framed buildings are equal to or less than buildings constructed in concrete or wood. We can objectively demonstrate how green we are.

Everyone’s Green

But just as nearly every Packers fan can claim to be green in some way, so can nearly every construction material. Structural steel is recycled, concrete is regional and wood is bio-based. These competing claims have created confusion in the marketplace as well as a knee-jerk reaction on the part of members of the green construction community against what they have wrongly labeled as “single-attribute materials.” The problem isn’t single-attribute materials, but rather single-attribute evaluation methodologies. To overcome this concern, the major sustainability codes, standards and rating systems have placed a

higher degree of emphasis on encouraging transparency in the reporting of environmental impacts associated with the production of all construction materials.

LEED V4, which entered the marketplace last November, provides credit to projects that use at least 20 products that have published environmental product declarations (EPDs). The ASHRAE 189.1 committee is in the process of amending that standard (*Standard for the Design of High-Performance, Green Buildings*) to include the provision of 10 EPDs as a compliance path for material selection. And a variety of proposals are working their way through the *International Green Construction Code* process to require the provision of EPDs.

Simply put, structural steel fabricators will soon be asked by general contractors (who in turn would have been asked for these by architects, engineers or project owners) to supply EPDs on projects following LEED, ASHRAE or *IgCC* guidelines and requirements.

At the same time, there is an increasing emphasis on the performance of life-cycle assessments (LCAs) comparing the environmental impacts of products, assemblies or whole buildings as a means of lessening the overall impact of building construction and operation on the environment.

The difference between an EPD and an LCA is that the EPD is a summary statement of the LCA, listing only five or six impact categories—such as global warming potential, ozone depletion, acidification, eutrophication and primary energy consumption—while the LCA will go into much greater detail on individual processes and impacts associated with those processes.

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The data required to either construct an EPD or to conduct an LCA originates in a life-cycle inventory (LCI) of the processes and material required to produce a product. In the case of fabricated structural steel this means collecting data from mills that produce hot-rolled sections, plate or coil regarding their inputs of raw materials and energy and their outputs of steel, byproducts and emissions. In the case of hollow structural sections (HSS) the inputs and outputs of the secondary process of creating HSS from coil are added to the LCI information for coil production itself.

Key Component

But the process does not end there. The product delivered to the job site is not a hot-rolled section, steel plate or HSS. The delivered product is a *fabricated* hot-rolled section, a *fabricated* steel plate or a *fabricated* HSS. This means that inputs and outputs associated with the fabrication process must also be included.

AISC is currently working with an outside consultant and the three AISC member hot-rolled structural mills to develop industry average LCI data for use in producing an LCA for hot-rolled structural steel. We are also discussing the development of similar data for HSS with the three AISC member HSS producers and the Steel Tube Institute. Plate data will be available through AISI.

Again, these are not the products that are delivered to the job site. What is delivered to the job site is *fabricated* product, so the EPD will need to be for *fabricated* structural steel. This means that as an industry we must collect the data necessary to develop industry average fabrication impacts. This was done

internally by AISC a few years ago in the form of a brief survey of our fabricator members, but now must be redone in a more rigorous manner using an outside consultant so the EPDs that are produced can be certified by a third party.

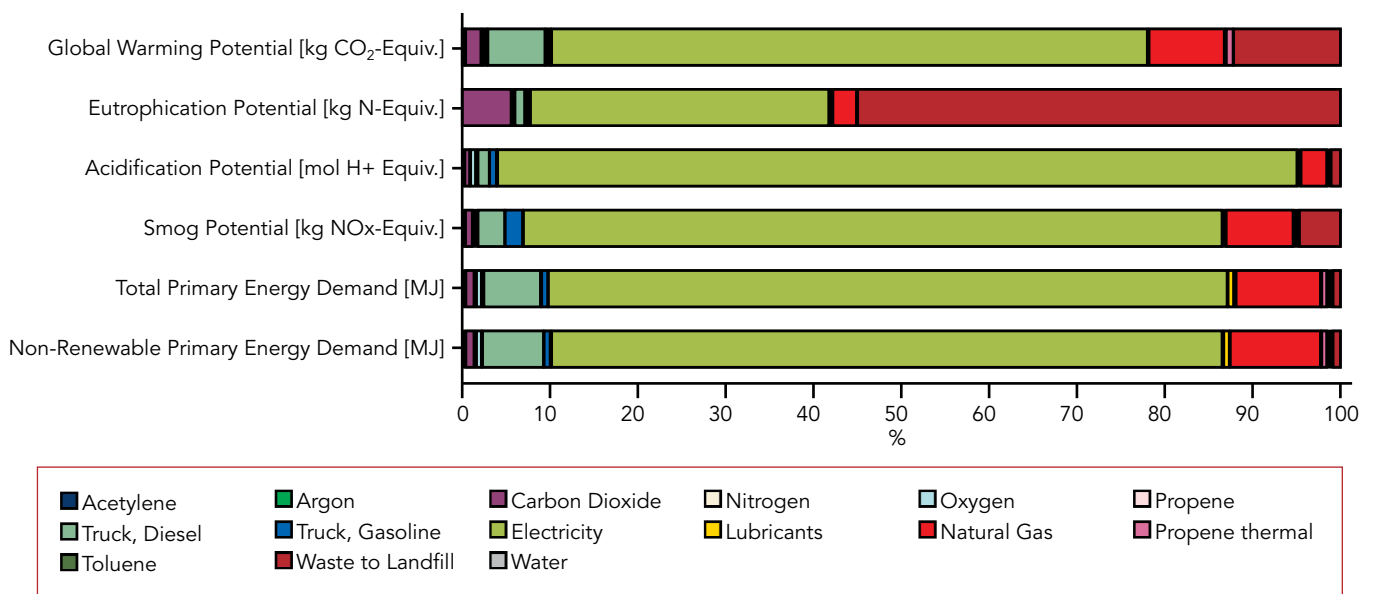
A Clearer Picture

If you are a fabricator member of AISC, later this summer you will be receiving a questionnaire that will include questions regarding your 2013 production tonnage, material purchases, waste, electricity consumption, water consumption and data on a variety of other consumables. In addition, you will be asked to identify your firm and the location of your shop by zip code in order that the consultant can determine the electric power grid mix (renewable, coal, natural gas, nuclear) in your area. Only the consultant will see your individual shop responses, with all data being reported to AISC as anonymous averages. A list of participating firms will be posted on the AISC website.

I'm sure you are already asking yourself, "Is this really necessary?" That's a perfectly valid question.

For all the hype we hear about green buildings, adoption of green codes and standards has been much slower than anticipated. LEED V4 is a quantum leap in complexity beyond LEED 2009 (see "Up To Speed on LEED," 02/2014) and green construction practices have not lived up to their economic promises—i.e., additional construction costs have not been justified by operational savings. This may mean that fewer projects will pursue LEED certification or be required to comply with

Environmental Impacts from Average Steel Fabrication



▲ Fabrication environmental impacts by source (from the 2010 AISC member fabricator survey). Note the dominance of electricity consumption.

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the requirements of the green codes and standards. I doubt you will be asked to provide an EPD for fabricated structural steel on the majority of your projects over the next three to four years. But you will be asked for this information on some of your projects, and architects and engineers will be making decisions relating to the framing systems for projects based on the LCA data available for comparative construction materials.

The More the Merrier

So now you are probably saying to yourself, “If this is industry average data, I’ll let everyone else submit their data and just provide the industry average EPD when asked.” Well, that doesn’t quite work for two reasons.

First, LEED contains some qualifying language of the EPD that says it can only be used by firms “in which the manufacturer is explicitly recognized as a participant by the program operator.” While the interpretation of what this means is under discussion within USGBC, it is clear that if you want to make sure you can use the industry average EPD to meet the requirements of your project you will at a minimum need to be an AISC member and have participated by submitting your shop’s data. (Note: This also means that the industry average EPD data will only apply to mill material supplied from producers that participated in the collection of mill data.)

Second, if everyone took that attitude, we wouldn’t be able to develop an industry average!

On top of that, it is also possible that you may want to develop an EPD that is specific to your shop. A company-specific EPD receives more credit under LEED V4 than an industry average EPD and could be used to demonstrate that the environmental performance of your company exceeds the industry average. That is the theory being promoted by the

green community as a motivation for improving overall environmental performance. However, it is questionable whether company-specific EPDs have any realistic meaning in the structural steel industry.

The environmental impacts of the fabricating process vary greatly by the requirements of each specific project, and the mix of projects being fabricated in a shop will vary year to year. Some will be high-tonnage, low-shop-hour projects while others may require significantly more shop activity on a per-ton basis. For that reason, EPDs on a per-shop basis will not be an accurate estimate of actual environmental impacts for a given project or shop and are therefore not a valid basis for comparison of a specific firm with the industry average.

If you are following all of this, you may have just had a light bulb go on and realized that even the industry average EPD or LCA for fabricated structural steel doesn’t really capture what the actual environmental impacts will be for a specific project. You are absolutely correct! They are only an average of the average shop’s average project. The current process does not allow for any adjustment of the EPD or LCA based on the level of complexity of a given project, thus making it our goal to include language in the EPD that highlights this concern.

Bottom line: There will be an industry average EPD and LCA for fabricated structural steel (hot-rolled, HSS and plate). At a minimum, the EPDs will be available to AISC members that participate in the shop data collection effort to meet the documentation requirements of green rating systems, codes and standards (keep an eye out for the survey later this summer). From there, we will be able to objectively demonstrate how green fabricated structural steel is. ■