

AESS COMES OF AGE

BY JACINDA COLLINS

Taking the fear out of selecting the appropriate architecturally exposed structural steel category.

SINCE THE LATE 1980s when Helmut Jahn boldly and controversially exposed the steel frame of his amazing United Airlines Terminal at O'Hare Airport, the use of architecturally exposed structural steel (AESS) has exploded.

Getting the most out of AESS means specifying it correctly, however.

More than a decade ago, the Rocky Mountain Steel Construction Association developed initial guidelines for specifying AESS, which the Canadian Institute of Steel Construction subsequently improved. Now, AISC has adopted a new nomenclature for describing AESS featuring new categories and clearer definitions. In addition, the steel industry has produced an AESS sample specification and an updated AESS cost matrix.

Below is a list of steps on how to use these resources successfully to get the most out of your AESS experience!

Step 1: Review the new categories.

Prior to 2016, the general approach to AESS could be described as “one size fits all.” Structural steel was either AESS or it wasn't. And even the requirements included within the AESS definition weren't enough for some projects. To make AESS more attainable for various project types—and also easier to specify for project requirements—five AESS levels or categories have been introduced in the 2016 *Code of Standard Practice for Steel Buildings and Bridges* (ANSI/AISC 303, available at www.aisc.org/specifications):

- AESS 1: Basic elements
- AESS 2: Feature elements at a distance > 20 ft (6 m)
- AESS 3: Feature elements at a distance < 20 ft (6 m)
- AESS 4: Showcase elements
- AESS C: Custom elements

Each category is described in detail in the *Code*, and the included AESS Matrix provides a visual guide as to what is and what is not included in each category. The various categories allow project teams to determine the level of craftsmanship necessary for their project, thus creating a scenario where AESS can be applicable in projects of all shapes, sizes and locations.

Step 2: Review the conceptual cost premium for each of the AESS categories.

In 2017, the Steel Liaison Committee of the Structural Engineers Association of Colorado and the Rocky Mountain Steel Construction Association, with input from national structural

steel fabricators and erectors, updated the popular AESS Cost Matrix for the new AESS category system.

As with the previous version, the updated AESS Cost Matrix is designed to inform design teams about the cost premium associated with specifying AESS. Naturally, the actual cost of craftsmanship varies greatly from fabricator to fabricator across the country. Thus, the idea is to allow project teams to balance a project budget with the desired scope. Here are the conceptual cost premiums for AESS 1, AESS 2, AESS 3 and AESS 4 as compared to standard domestically fabricated and erected structural steel that isn't specified as AESS:

- AESS 1: 10% to 20%
- AESS 2: 25% to 35%
- AESS 3: 40% to 75%
- AESS 4: 100% to 150%

As you can see, there is a marked increase between the four categories. If none of these categories fit a project's scope or budget, teams are encouraged to use the AESS C (Custom) category to create a project scope specific to their steel fabrication and erection needs. And as mentioned, project teams should not be afraid to use multiple AESS categories for different steel across a project to balance vision and cost.

Step 3: Determine if you really, really, really, really, really need to use AESS.

There is a lot of beauty in using exposed standard structural steel (SSS). If the exposed steel is out of view of the day-to-day user, blocked by screens or signage or located where the focal point is not the framing system (e.g., museums or performance spaces), then project teams can opt to use SSS rather than AESS.

Jacinda Collins (collins@aisc.org)

is AISC's structural steel specialist for New York City.





◀ The Stanley Marketplace in Denver uses unfinished standard structural steel (SSS) for a rustic interior.



Cassandra Michel

▲ An example of exposed steel, at Palomar College in San Marcos, Calif., that did not require AESS.



Jeremy Bitterman

They can then pay added attention to the final steel finishes instead of dealing with the added cost and inspections required for any of the AESS categories.

The architect, structural engineer and steel connection designer can work together to take advantage of the various steel shapes, long spans and configurations to create a dynamic framing system that is functional, aesthetically pleasing and budget-friendly. Bottom line, if, after reviewing the five AESS categories, you determine that none of them are feasible but you still want to incorporate exposed structural steel, good news: You can still incorporate exposed structural steel.

Step 4: Map your project out visually.

When you've determined that AESS is the right choice for a project, grab your drawings and map out which categories you would like to use in the various areas. If only maintenance crews or an occasional bird will see the craftsmanship at higher distances, you may want to use a lower or custom AESS category. And for steel close to the touch or near eye level, go with a higher or custom AESS category.

You can even use more than one category on singular tall or long elements. For example, for a three-story column, you can start out with SSS at the top, AESS 1 near the middle and AESS 4 at the bottom. Using multiple categories ensures that added craftsmanship is only applied where needed.

Once again, the AESS Category Matrix can come in handy when mapping things out. While reviewing the location, context and design style of the steel, teams can check off which category best fits their needs. Or they can start to fill in AESS C desires, which is mandatory for projects using that category. (The C category will be discussed in more detail during the corresponding NASCC: The Steel Conference presentation.)

Step 5: Map out your budget visually.

Now that you have mapped out your project visually, it's time to map it out from a budget perspective as well, and your project team can use a blank AESS Cost Matrix to conceptually map out what the projected AESS premium will be.

The informal (not actual) cost premiums noted in the AESS Cost Matrix apply to the total fabricated and erected weight of AESS for that particular line item or category.

◀ The geometric variation and arrangement of steel at the National Radio Astronomy Observatory (NRAO) Very Large Array provides an attractive look to a functional structure.



steelwise

Bill Baxley

As an example, let's say handling X amount of SSS (we'll call it one ton) is \$100. Now let's say the fabricator must remove all mill marks from the steel (an item that starts in AESS 3). For one ton of steel, this added step will have an added cost range of 5% to 15%, and teams can anticipate adding \$5 to \$15 per ton to the budget. If one ton of steel has few visible mill marks that need removal, then the theoretical budgeted line item would be \$105—but if there are numerous mill marks, then the conceptual budgeted line item would be closer to or exceed the higher end of the range, \$115.

Once the budget is mapped out, then the project team can go back to the visual map and make necessary changes in the categories. Understand that for structural steel projects, the labor component—and not the material component—is where you want to look for project savings. Therefore, when fine-tuning visual and budget desires, think less about changing the steel shapes and more about using SSS or a lower AESS category, or creating a budget- and scope-friendly AESS C to reduce labor and subsequent premiums on a project.

Step 6: Put yourself in the ironworker's shoes.

After a few iterations with the two mapping processes, here's the next thing to do: Switch perspectives and try to visualize the project from an ironworker's view. This is especially helpful as the AESS Cost Matrix does not provide informational premiums for erecting/installing AESS. And as previously mentioned, discovering labor-saving processes (whether using AESS or not) will help reduce your budget.

If you've never performed an overhead weld, just imagine spending hours with your body angled upward and molten material flying toward you. And while this process is routinely performed safely and with excellent results, understand that something as simple as ergonomics can add extra labor time and cost to your project.

When looking for labor savings, design teams may want to consider off-site assembly for AESS installation savings. If sections of a project can be assembled at the fabrication shop and transported as panels or "modules" to the site, this will help control quality and cost for complicated projects and

- ▲ Exposed steel, including a weathering steel "monolith," defines the Minnesota Fallen Firefighters Memorial Statue.
- ▼ The Shrem Museum of Art at UC Davis uses two custom AESS categories for the expressive steel canopy.



Rutherford + Chekene

also create a safer site. While this may appear to shift the labor from the erector to the fabricator, keep in mind that you are taking advantage of the assembly occurring at ground level under the roof of the fabrication shop in a controlled environment that isn't impeded by inclement weather. And your ironworkers in the field will thank you for no longer having to complete complicated crane gymnastics to put your AESS together.

Step 7: Don't forget your connections!

Connections are just as important as shape selection for your AESS projects. So don't forget to think about not only the appearance of your AESS connections but also how they will come together in the field.



▲ BCE Place in Toronto (which predates any AESS standard) successfully used the principal of reducing levels of finish at the higher, less visible levels.



▲ Various elements of the Biblioteca Vasconcelos in Mexico City make it a perfect candidate for SSS or AESS C.



▲ Arthur Ashe Stadium in New York uses large cast connections to create a uniform look at the eight transfers.

There are various connection savings opportunities available that project teams can benefit from. For example, if you're using bolted connections and want all of the bolt heads to look similar, consider using button-head bolts instead of having ironworkers adjust hex-head bolts to match. Consider using castings as a means to keeping connections consistent and unique. And consider using filler material to make intermittent welds look like continuous welds. Simple strategies like these can create stunning connections at half the cost.

Step 8: Finalize finishes.

Think about the type and maintenance of your AESS finishes. The two most important keys to lasting steel finishes are choosing the right one(s) and employing proper surface preparation. Not giving enough attention to either of these factors can result in an unwanted look—which would nullify your decision to use AESS in the first place and leave you wondering why you paid a premium for it. Double-check that the selected AESS finish will protect the steel from its environment. For example, with exterior applications, weathering or galvanized steel may reduce life-cycle costs when compared to repainting steel at the end of the finish's service life.

It is always important to review your coating manufacturer's specifications for the proper prepping the surface so that the coating adheres to the steel. With the new AESS category system, all AESS has a default surface preparation of SSPC SP6, Commercial Blast Cleaning. This surface prep level may make the steel too smooth for your particular coating to adhere to the steel, or the surface may blemish the desired final set of the coat-

ing. Thus, reviewing and including the proper level of surface preparation is vital to ensuring the success of the selected finish.

Once again, think like an ironworker when it comes to applying finishes. Choosing whether to apply a coating at the fabrication shop or in the field should be discussed to determine the best and most efficient path. Keep in mind that not all fabrication shops have the ability to apply coatings, so a subcontractor may need to be brought in. Another consideration: Touching up a coating in the field may not match the coating applied off-site.

Beyond the selecting the proper coating, corrosion protection is also important for AESS. Eliminate or provide drainage to keep water and debris from collecting on or adjacent to the steel. Doing so will also keep the finish from potentially failing.

Step 9: Make sure it's all in the contract documents.

The contract documents are your communication vehicle with the steel fabricator and erector. Make sure that you update your specifications to reflect the new AESS category system. This is where the new AESS Sample Specification comes in handy. It's a generic specification that includes the potential specification language for the new categories, and commentary is also included that provides an in-depth explanation of fabrication and erection techniques commonly used with AESS.

When using AESS C, make sure to include your customized AESS Cost Matrix. And provide clear information for your mock-up panel requirements. Note that sometimes, it's best to see the mock-up at the final viewing distance for the steel, so feel free to ask the fabricator to place the steel on a crane, say, 20 ft in the air to get a true feel of what the final product will be.

TABLE 10.1: AESS Category Matrix

CATEGORY		AESS C	AESS 4	AESS 3	AESS 2	AESS 1	SSS
I.D.	CHARACTERISTICS	CUSTOM ELEMENTS	SHOWCASE ELEMENTS	FEATURE ELEMENTS IN CLOSE VIEW	FEATURE ELEMENTS NOT IN CLOSE VIEW	BASIC ELEMENTS	STANDARD STRUCTURAL STEEL
1.1	Surface preparation to SSPC-SP 6		×	×	×	×	
1.2	Sharp edges ground smooth		×	×	×	×	
1.3	Continuous weld appearance		×	×	×	×	
1.4	Standard structural bolts		×	×	×	×	
1.5	Weld spatters removed		×	×	×	×	
2.1	Visual Samples		×	×	optional		
2.2	One-half standard fabrication tolerances		×	×	×		
2.3	Fabrication marks not apparent		×	×	×		
2.4	Welds uniform and smooth		×	×	×		
3.1	Mill marks removed		×	×			
3.2	Butt and plug welds ground smooth and filled		×	×			
3.3	HSS weld seam oriented for reduced visibility		×	×			
3.4	Cross-sectional abutting surface aligned		×	×			
3.5	Joint gap tolerances minimized		×	×			
3.6	All welded connections		optional	optional			
4.1	HSS seam not apparent		×				
4.2	Welds contoured and blended		×				
4.3	Surfaces filled and sanded		×				
4.4	Weld show-through minimized		×				
C.1							

Step 10: Chat with the steel industry.

As you can see, there are multiple options for using AESS on projects of all sizes and budgets. And AISC staff and our member steel fabricators and erectors are happy to assist you with understanding the new AESS category system and directing your project team to the right resources that will provide guidance and answer all of your

questions before you embark on your first project using the new approach. And AISC member fabricators and erectors can provide preliminary cost information that can help you fine-tune your budget, as well as provide local craftsmanship processes that can save money and help you achieve the desired look for your steel.

You can also contact an AISC structural steel specialist or the AISC Steel Solutions Center for resources, questions or getting connected to a local fabricator or erector. We're here to help! ■

This article is a preview of Session N11 “Buyer Beware: Choosing the Right Architecturally Exposed Structural Steel Category” at NASCC: The Steel Conference, taking place April 11-13 in Baltimore. Learn more about the conference at www.aisc.org/nascc.

And for more on AESS, see our related page, www.aisc.org/aess, as well as “Maximum Exposure” in the November 2017 issue (www.modernsteel.com), which includes complete descriptions of the various categories, a sample specification, the AESS Cost Matrix, the AESS Category Matrix, as list of AESS resources, sample AESS projects and photos illustrating what each category looks like using a sample model.

- ▲ A matrix is provided in Section 10 of the AISC Code, outlining which fabrication processes are present within each category. And for exposed steel goals that don't fit into categories AESS 1 through 4, a Custom category (C) and blank matrix space are available for teams to discuss and create their own unique guidelines.



- ◀ The AESS for the Grand Canopy at UC Davis' Shrem Museum of Art was primed off-site, with the final coating applied on-site.