March 31, 2016

Administration
University of Virginia
P.O. Box 400222
Charlottesville, VA 22904-4222

To the University of Virginia:

I am writing to address a glaring hole in the education of young architects and engineers today. Having studied as a student in both fields at a number of institutions, I know that the University of Virginia is not alone in this oversight. I am speaking for hot-dip galvanized steel.

For those that are unfamiliar with this process, hot-dip galvanizing is the method of dipping fabricated steel in a vat of molten zinc in order to provide a layer of protection against corrosion. This protection is three-tiered. First, the zinc coating forms a barrier by isolating the base metal from environmental damage. Zinc is tightly-bonded and impervious, forming an excellent barrier from external factors. Second, it offers cathodic protection, essentially providing sacrificial protection to the steel by corroding first due to elemental properties. Third, zinc forms a patina when exposed to the weather, thus creating a layer of protection for itself and slowing the corrosion rate down further.

The benefits of this centuries-old process over other forms of corrosion protection are numerous, from environmental to financial. As future specifiers, students must be made aware of this steel option while they are still in school, so that they can understand the full range of material potential inherent in their projects. Hot-dip galvanizing is a simple and sustainable solution for the longevity of building projects. In this age of environmental concern, knowledge about hot-dip galvanizing is critical to minimizing corrosion and thus saving raw materials and energy spent on replacement.

The reasons to specify hot-dip galvanizing are multifold and are detailed below.

Aesthetics

In architecture, materiality is as integral to a project as structure, space, or light. As renowned architect Peter Zumthor writes, "I am convinced that a good building must be capable of absorbing the traces of human life and taking on a specific richness... I think of the patina of age on materials, of innumerable small scratches on surfaces, of varnish that has grown dull and brittle, and of edges polished by use." In order for a good building to age and exhibit such richness, it must first be protected. Hot-dip galvanizing provides this protection with the additional benefit of aesthetic beauty. The rich zinc patina that develops is not renewed every year of its lifespan like paint must be. On the contrary, the matte-gray patina records the history of the environment. It develops through a natural weathering process and provides the protection, itself corroding slowly and slowing the corrosion rate to about one-thirtieth the rate of steel in the same environment.

El Andaluz
Commercial offices and residences
Santa Barbara, CA

Students of architecture should be introduced to case studies that exemplify the beauty of hot-dip galvanized steel. By studying these successful applications, hot-dip galvanized steel will become part of the colorful library of materials that can help convey the desired architectural atmosphere and principles. In the same way that Cor-Ten steel has been embraced by architects and artists alike, the expressiveness of hot-dip galvanized is ready to be further explored.

Valkyrie Sculpture
Brooklyn, NY

Durability

Another important aspect of aging in a structure is the durability of materials. Hot-dip galvanizing provides a uniquely durable form of protection in harsh environments compared to other forms of protection, such as paint or stainless steel, thanks to the metallurgical bond formed between the zinc and the iron in steel. The coating actually becomes part of the base rather than simply a surface treatment. The durability is achieved through three means. First, the galvanizing process leads to the formation of tightly bonded and highly abrasion-resistant intermetallic layers on a molecular level. Second, the protection is uniform due to the way the iron and zinc interact in the galvanizing kettle. This eliminates weak points and is more reliable than other forms of protection. Finally, due to the total immersion process, coating coverage is complete, including the insides of extruded members. This protects interiors from corrosion that tends to occur due to humidity and condensation buildup, whereas painted structures have no interior protection.

I-35 Mississippi River Observation Park
Minneapolis, MN

Sustainability

Roots of Life
Notre-Dame-de-Lourdes, NB Canada

Green Plains Grain Obion County Ethanol Plant
Obion, TN

The building industry is under historic pressure to enact more ecologically conscious development. According to the US Green Building Council, in the US buildings account for 39 percent of CO2 emissions. The impact of buildings reaches beyond the well-known statistics on energy consumption. Other considerations such as material sourcing and end-of-life use must be considered. The choice of hot-dip galvanizing has a positive contribution to sustainable goals for several reasons. First, no maintenance is required, saving energy and resources in re-application. Second, the coating is made up of 98 percent zinc, which is an abundant natural resource that is not harmful to the environment as it is found almost everywhere naturally. Like steel, zinc is infinitely recyclable without degradation, such that around 30 percent of the zinc supply in the world is actually sourced from a recycled supply. This means that the material used in hot-dip galvanizing can actually find a second life after its use as a coating. This closed loop makes hot-dip galvanizing an environmentally responsible choice over other methods of protection such as paint.

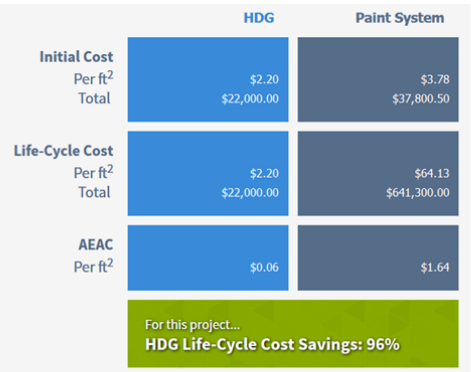
There is no issue more pressing for future builders than environmental impact. It is critical to signal to students that the industry is making sincere efforts to positively impact the environment by educating them about sustainable options like hot-dip galvanizing.

Financial

In practical terms, cost is always a significant consideration. Though students should not feel constantly constrained by cost considerations in their theoretical work, they should be made aware of this reality in preparation for joining the workforce.

A life-cycle analysis exercise is a vital component commonly incorporated into professional practice courses for architects and engineers. In the arena of life-cycle costs, hot-dip galvanizing is the clear frontrunner over other protective systems, including paint and powder coatings. Contrary to the common perception that hot-dip galvanizing is initially cost-prohibitive, hot-dip galvanizing is becoming an increasingly economical choice. Over seventy years or more in most environments, hot-dip galvanizing requires no maintenance, thus far surpassing competing life-cycle costs.

For example, using the American Galvanizers Association online Life-Cycle Cost Calculator, I compared the costs of hot-dip galvanizing to an acrylic paint option. The theoretical project is typical of what a student of architecture or engineering might design, in terms of size and lifespan, with a simple structure and medium member type. Located on the seacoast, where corrosion potential is high, the galvanized coating actually saves 96 percent of the cost over the paint system. Hot-dip galvanizing is clearly the right choice when designing for the long-term future.



Cost of Galvanizing	TODAY'S COST	NET FUTURE VALUE	NET PRESENT VALUE
Original Galvanizing	$2.20	n/a	n/a
Total Price / ft²	**$2.20**	**$2.20**	**$2.20**
Cost of Paint System			
Original Painting	$3.78	$3.78	$3.78
Touch-Up - Year 5	$1.51	$1.67	$1.59
Maint. Repaint - Year 6	$2.65	$3.02	$2.83
Full Repaint - Year 9	$5.10	$6.12	$5.58
Touch-Up - Year 14	$1.51	$2.00	$1.74
Maint. Repaint - Year 15	$2.65	$3.62	$3.09
Full Repaint - Year 18	$5.10	$7.33	$6.11
Touch-Up - Year 23	$1.51	$2.40	$1.90
Maint. Repaint - Year 24	$2.65	$4.34	$3.38
Full Repaint - Year 27	$5.10	$8.79	$6.69
Touch-Up - Year 32	$1.51	$2.87	$2.08
Maint. Repaint - Year 34	$2.65	$5.20	$3.70
Full Repaint - Year 36	$5.10	$10.53	$7.32
Touch-Up - Year 41	$1.51	$3.45	$2.28
Maint. Repaint - Year 43	$2.65	$6.23	$4.05
Full Repaint - Year 45	$5.10	$12.63	$8.01
Total Price / ft²	**$50.09**	**$83.97**	**$64.13**

Cost Comparison
Hot-Dip Galvanized v.
Acrylic Waterborne

Finally, when paired with paint, hot-dip galvanizing becomes even more attractive in terms of all of the above points, from protection to aesthetic possibilities. Increasingly specialists are turning to this method of protection, which also provides a life-cycle economic advantage over simply paint on bare steel. Together the two coatings constitute a duplex system which provides superior corrosion protection and can extend the life of the steel by 1.5 to 2.3 times the combined lifetimes of both systems. The possibilities for structural expression and architectural playfulness are endless with the color palette available for painting.

Big Edge
Las Vegas, NV

LARM Sculpture
Chicago, IL

By multiple measures, including durability, cost, and aesthetics, hot-dip galvanizing is a highly advantageous option for the protection of the structures that architects and engineers dedicate their careers to designing. Hot-dip galvanizing is positive for the ecological and built environments. Since students are future specifiers, it is therefore also beneficial to the industry and society at large for students to be aware of this process before they begin their first constructed projects. Hot-dip galvanizing should be incorporated into the curriculum of architecture and engineering students alike.

Thank you for your attention.

Sincerely,

Jennifer Hsiaw
Candidate for M.Arch ’17

Thank you to the American Galvanizers Association at galvanizeit.org for providing the information and images used in this hypothetical letter.