



OCTOBER 2019

SPECIFICS

THE MONTHLY NEWSLETTER OF THE
CSI MINNEAPOLIS-St. PAUL CHAPTER

INSIDE THIS ISSUE

- Pg. 2
President's Message
- Pg. 3
Platinum, Gold, and Silver Sponsors
- Pg. 4
Ghost Writer – September Meeting Recap
- PG. 10
October Chapter Meeting/Program
- Pg. 13
New Member Spotlight – Andrew Zabowski
- Pg. 14
Buch Notes
- Pg. 16
GOOGLE Wants More Speed
- Pg. 17
The Ghost of Building Codes Past:
- Pg. 21
Upcoming Events of Local Associations
- Pg. 22
Institute News
- Pg. 23
Certification Quiz
- Pg. 24
Chapter Leadership

Ask yourself, "How can I help?"

Their support enables high-quality programs

Ghost Writer makes brief return: there's no place like home -Allianz Field

Air/Moisture Barrier Advancements and Coming Industry Change

Welcome to another new member!

Structural and mathematical equations revisited

Hey, who doesn't

50 Years of Code Evolution

Keep your self busy and informed !

The "CSI STORE" Returns!

Check your knowledge

Our new chapter board and committee chairs for 2019



*IMPROVING THE
COMMUNICATION
OF CONSTRUCTION
INFORMATION*

From the President...

I want to thank our Programs Committee for an amazing start to the 2019-2020 CSI season with an on-site presentation and tour of the Minnesota United Allianz Field Stadium. Hosted in partnership with the BEC MN Chapter; it was an example of how CSI continues to play an important role in offering the Twin Cities construction community a look at Construction Documents working on a large scale and lessons learned. For those who did not attend some of my take aways included the following points. First, the speakers focused on the importance of communication between the teams and the importance of “mock-ups”. Second, they also identified looking beyond the test data of a given product, or assembly, to understand if the systems will work together as designed. Third, they highlighted the practice of managing scope into personal, product, and process as a function of quality. And finally, they spoke about the importance of coordination of construction documents and maintaining archives; as one speaker joked “Someone might ask you about the project later”. All the above are firmly in the wheel house of CSI. It is this group that drives the instruments of effective communication with all the stake holders.



My first ask is that each of us, at least once this year, will invite one other person that would otherwise not attend a CSI Program. This person could be a colleague or client; someone not thought of as a spec writer but would gain value from a specific program. I believe that all of us in the construction industry are consumers of Construction Documents, but few have been invited into the benefits of executing them well. Be that mentor or friend by buying them lunch at a future CSI program instead of the local bar & grill.

My second ask is to look at your own practice and challenge yourself to become certified by CSI as a CDT (Construction Document Technologist). This course will provide you with more than a credential to put on your business card, it will provide you with knowledge of roles and responsibilities of each team member within the project delivery process. As for myself I can say “I did not know what I did not know”. And because of it I have more to offer those I work with.

My final ask is to get involved. Like many volunteer organizations we need the support of each other to make this organization great and the committees always need help. Please take the time to look at an activity you would like to be involved with and offer your expertise. It could be a future program, becoming a mentor, or helping with our Expo? It could be helping to educate the next CDT or writing up a nomination for an award? It could be finding a new ringer for Golf? I am not asking for a lifetime commitment, just a helping hand.

With that I want to thank each of you who have given, and continue to give, of their time and resources to support this great Chapter.

Respectfully Submitted,

James R. Bergevin, CSI, CCPR, CDT
President
2019-2020

Chapter's Sponsors

Platinum Partnerships

 **COMMERCIAL**
www.pella.com
952.462.5359

W. L. HALL CO. *Builders Specialties*
530 15th Avenue South Hopkins, MN 55343-7834
www.wlhall.com
763.592.8640

 **HUF COR**[®]
www.hufcorminnesota.com
763.544.0365

 **ARCHCON**
CARLISLE
www.carlisesyntec.com
612.867.5173



MG McGrath
mgmcgrath.com
651.704.0300

 **Rose-Fleischaker**
ASSOCIATES, INC.
<http://rfassociatesinc.com>
612.349.9885

 **KLINE · JOHNSON**
BUILDING ENVELOPE CHOICES
kline-johnson.com
952.854.8723

 **SHERWIN WILLIAMS**
www.sherwin-williams.com
800.321.8194

 **MAJOR INDUSTRIES**
majorskylights.com
888.759.2678

Gold Partnerships

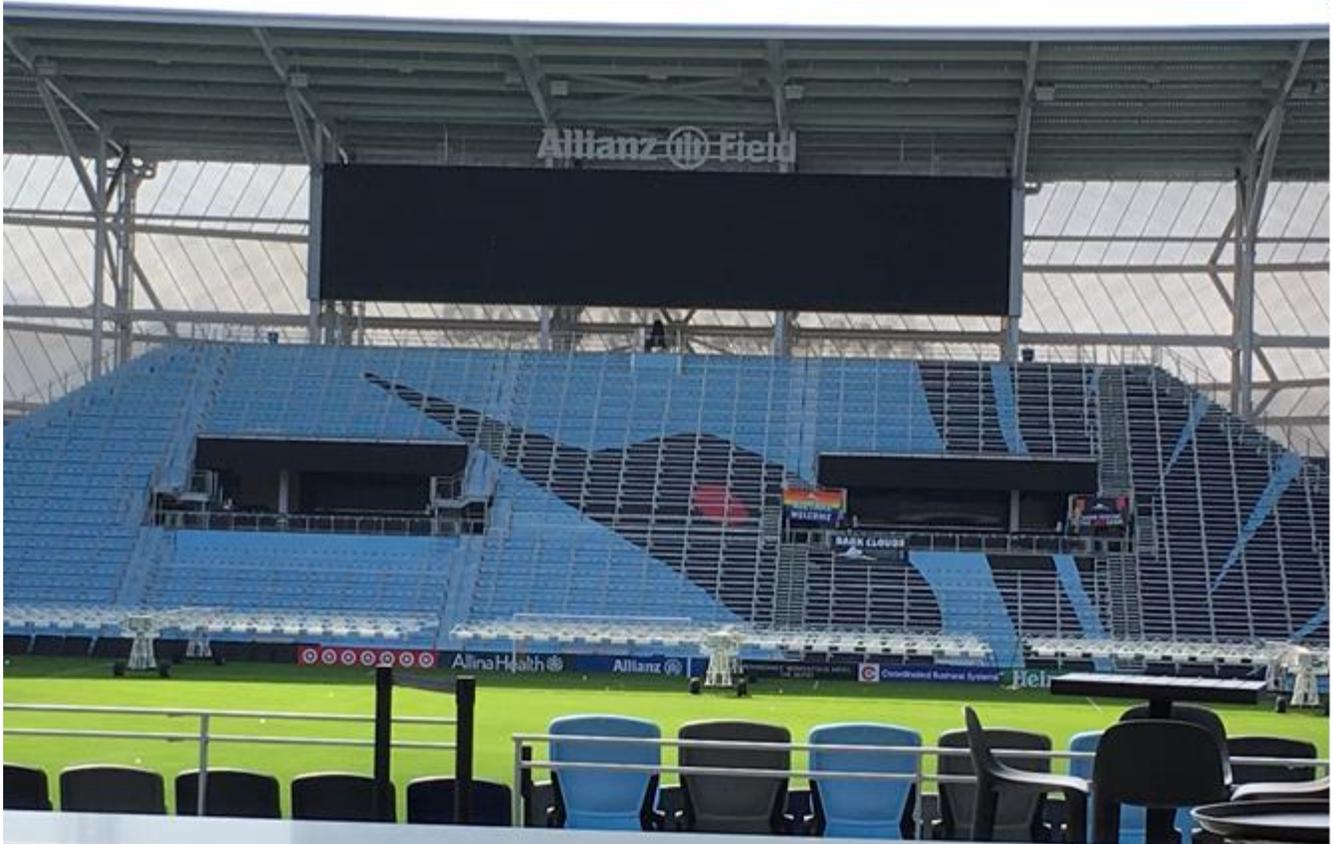
 **INSPEC**
www.inspec.com
763.546.3434

 **intertek** www.architecturaltesting.com

Silver Partnership

 **Hirshfield's**
PAINTS • WALLCOVERINGS • WINDOW FASHIONS
www.hirshfields.com

The Ghost Writer



Allianz Field

Pay no attention to the man behind the curtain: The Skin behind the Canopy

September Chapter Program

September 10, 2019

The new Allianz Field, Saint Paul's home of Major League Soccer's Minnesota United, is a landmark along Interstate 94. The curving PTFE enclosure system is iconic. However, we are not talking about that today. Instead of addressing the canopy, we are addressing the actual weathertight skin, the wizard behind the curtain.

Winds of Change

Moving the home of soccer from Blaine to Saint Paul was a change embraced by the design and owner team, resulting in an iconic exterior canopy skin. However, the true weather barrier is behind this curtain. In addition to the poured-in-place tinted concrete exterior wall at the entrance level, there are two main systems above, which protect the enclosed spaces. These are a stucco wall assembly system and a metal panel wall assembly system. Both wall assembly systems employ metal studs and gypsum board, insulation and air barriers. Both closed cell spray polyurethane inside and foil face polyisocyanurate on the exterior of the studs complied with energy code, but created critical air barrier connections. Challenges arise at the transition details.



Cowardly Lion

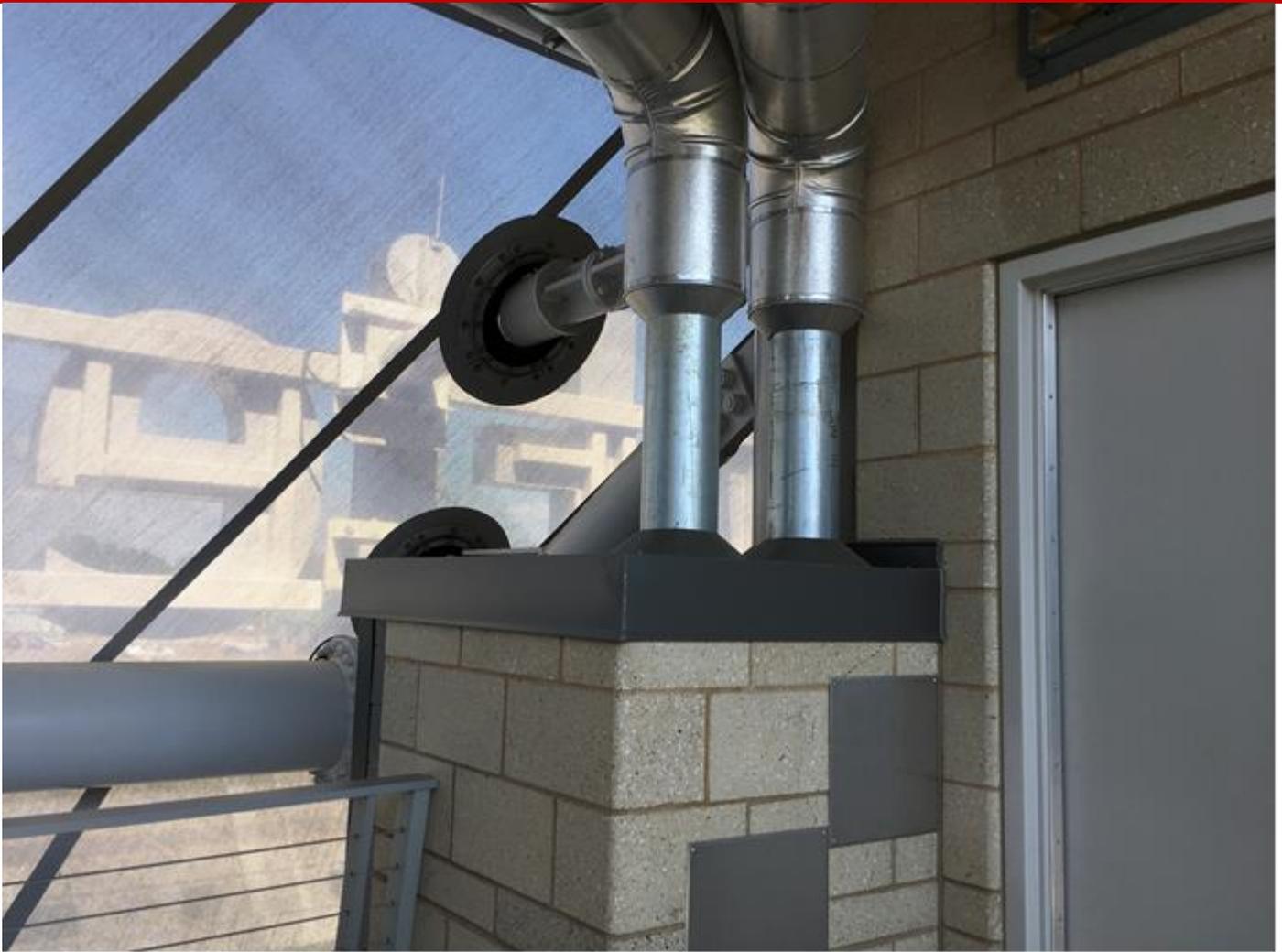
Transitions can be scary. Following the air barrier around and ensuring it remains continuous is a bit like acrobatics. The corners and changes from stucco system to metal panel system start this complexity. But as part of the building is open and part enclosed, and some spaces are heated and others are not, the air barrier transitions also run under the seating where the floor becomes the roof in a “Bermuda Triangle”. The thickness of spray foam also had to be closely monitored, so that it was not applied too thick where it was not intended to be the air barrier.

The structure for hanging the curtain canopy penetrates the wall assembly and thus the critical air barrier. And as one design team member said, “Oh, by the way, those things are going to move every which way.” Not just one penetration of the air barrier, but thousands and thousands of penetrations that need to be weather tight. This needed to be figured out BEFORE the exterior skin was applied, due to conflict between the structure and scaffold to get access. They needed not just courage to take on the challenging conditions, but brains to work out the details.

Scarecrow

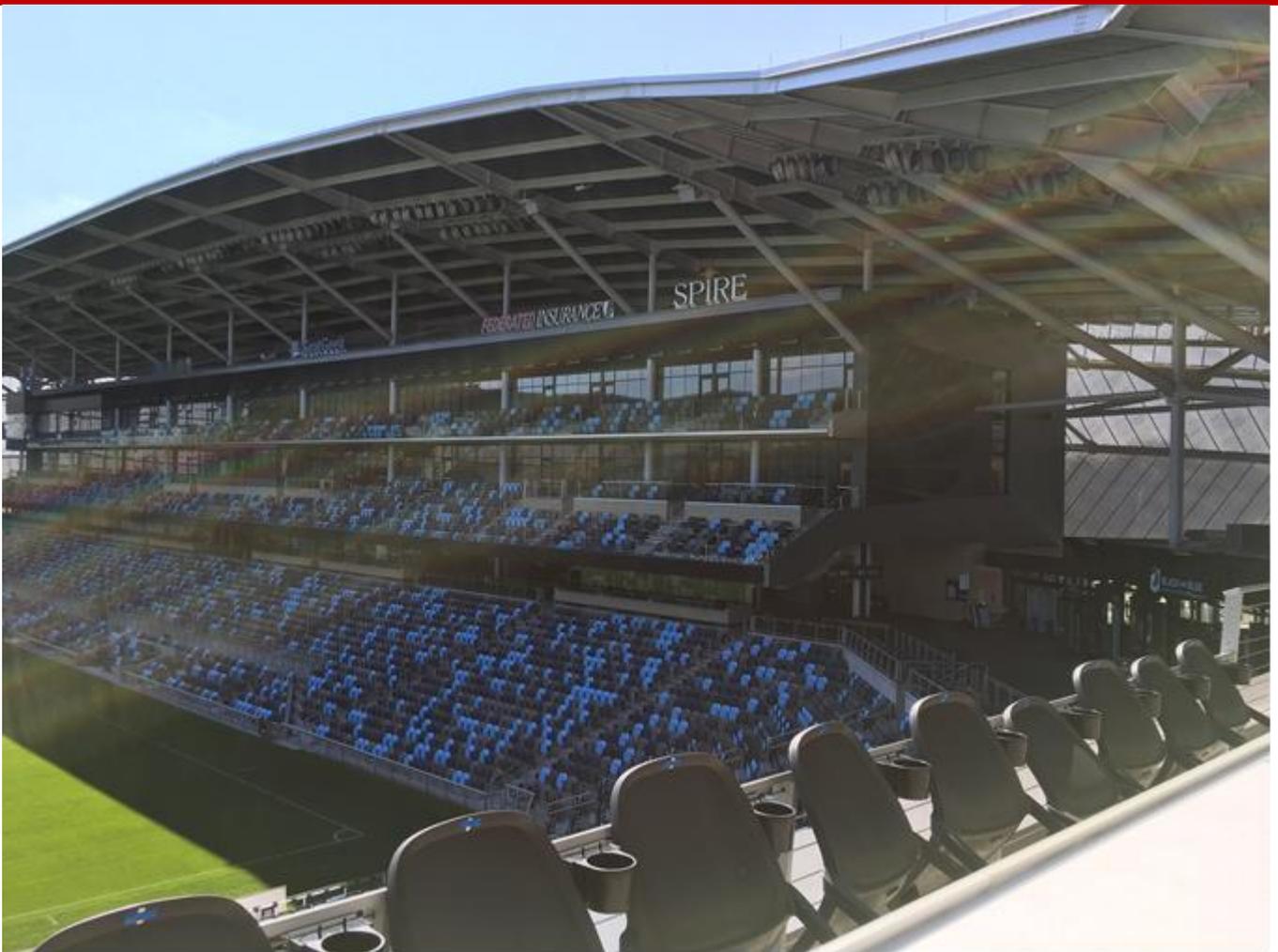
Credit needs to be given to the entire team of designers and trades persons who were the brains behind the successful resolution of the many unique details. Quality control during each of the multiple layers of construction was critical. Team coordination meetings included trade partner and design team participation. Valuable input from an enclosure consultant included reviewing the shop drawings and submittals, early looks on site, and providing initial inspections and performance testing.

A lot of modeling and mock ups tested proposed solutions, as once the condition was fully enclosed and hidden, it would be almost impossible to access later for fixing. Mock ups earned their weight in gold. Since this was the first time PTFE was installed in this application anywhere in the world, how to deal with where the steel structure penetrated the envelope was of utmost concern. Not only does the steel canopy move with wind and temperature, the building structure and exterior has expansion joints which move differently from the canopy. The steel frame is half in and half out of the envelope in places and this needed modeling. Due to this study, there is a big need for joint sealant with flexibility and “dog houses” or penetration enclosures to go around columns without bolts or nuts so that it can seal tight to the roof. Testing to failure produced eye-opening results.



Tin Man

Communication was at the heart of this project. The project manager and foreman already worked well with each other. Full-team mockups demonstrated assembly problems and proposed solutions using the construction manager, the subcontractor trades and the designers. This team got the ideas out of the room and to the crew on the scaffold putting in fasteners. There was no time to let folks sit in the office to plan; they needed to walk around and get what was learned communicated to the rest of the trades. Breakneck speed required for the construction documents meant conditions were resolved in the field. The architect stayed engaged with the project to make decisions, such as material product substitutions, with enough information for the contractors to build but provide flexibility for site issues.



Toto

The tower presented a dog-of-a-detail. Over 40' in height, the west side "tower" required NFPA 285 compliance. With multiple product manufacturers specified within multiple wall assembly components and multiple contractors responsible for these assemblies, every time the word "multiple" came up they earned another gray hair! NFPA 285 is an assembly test, not an engineering judgement, so a letter would not suffice. So they had to either test every single assembly or rely on a technical evaluation per IBC 2012 Section 703.3 alternate method.

There's No Place like Home

With the successful completion of the soccer stadium and its current active team and fans, the true wizard behind the scenes is the skin behind the canopy and the brains, courage and heart were the team that made it all work.





OCTOBER CHAPTER PROGRAM

Air/Moisture Barrier Advancements and Coming Industry Change

**Opus Hall Great Room (MOH)
University of St. Thomas, Minneapolis, Campus**

Tuesday, October 8, 2019
11:00 AM - 2:00 PM

The October Chapter Lunch Program will be a joint meeting between CSI and BEC (Building Enclosure Council) with a presentation that will provide attendees with an update on current industry trends and research that has been completed for air/moisture management. Many exciting things are taking place in the air barrier industry and many changes are and will be taken place over the next few years. Come learn about things that will impact on how you specify and design air barriers, along with technical and code changes that may impact material choices and performance requirements. Items to be reviewed are:

1. Quantifying Air and Moisture impacts on buildings, including energy and monetary savings and reduction in moisture transport.
2. A sticky subject – how well do air barrier adhere to the wall – results from research
3. Let's punch a bunch of holes in our air barrier and hope it works - Overview of fastener penetration research with Oak Ridge National Laboratories.
4. Updates to Building Codes for Whole Building Airtightness testing performance requirements. Upcoming technical and research projects: What the industry is working on to create standards and guidelines for materials, test methods and technical resources.
5. Quality Assurance in the Field – What are the top field related issues?

COST

Members - \$0.00

Non-Members - \$45.00

Registration ends on Monday, September 30th, 2019

ITINERARY

11:00 AM – 11:15 AM Registration

11:15 AM – 11:30 AM CSI Business

12:00 PM – 12:30 PM Lunch

12:30 PM – 2:00 PM Presentation

PROGRAM LOCATION

University of St. Thomas – Minneapolis Campus
Opus Hall Great Rooms (MOH) Room 201/202
1000 LaSalle Avenue
Minneapolis, Minnesota 55403

PARKING & TRANSPORTATION

Parking Ramp Address:
935 Hennepin Ave
Minneapolis, MN 55403

From this parking ramp, which is underneath Opus Hall, take the elevator to the 2nd floor/Skyway level to get into Opus Hall.

To view all parking and transportation options, click the link below:

[ST. THOMAS PARKING OPTIONS](#)

SPEAKER



Laverne Dalgleish
Principle
Building Professionals

Mr. Laverne Dalgleish is the Executive Director of the Air Barrier Association of America (ABAA). As such, he works to champion energy conservation in buildings while educating the building owners and designers about the benefits of energy conservation such as durability, comfort, reduced maintenance, reduced HVAC equipment costs and the positive impact on the environment.

Mr. Dalgleish travels North America on a weekly basis to educate building owners and designers on the benefits of effective and working air barrier systems in buildings. This education mission includes working with standards development organizations, training and education groups, government policy departments, and quality assurance program developers for the construction industry. Mr. Dalgleish is the Secretariat of two ISO Committees, ISO TC61 SC10 Cellular Plastics and ISO TC163 SC3 Thermal Insulation Products. He is also Chair of the ULC Thermal Performance in the Building Environment Standards Committee.

Mr. Dalgleish was the key developer of the ABAA Quality Assurance Program for the installation of air barrier systems in buildings. This program is based on ISO9000 and ISO 12576-2 but brings the ISO requirements together with practical applications for the air barrier industry.

CONTINUING EDUCATION

This program will be registered with AIA CES for HSW and LU credit. Pending AIA approval, credits may be granted for attendance. Sign in at the meeting with your AIA number in order to receive credit.



Andrew Zabowski

W. L. Hall Co. Builders Specialties

Andrew Zabowski is a Sales Associate for the Interiors Division of W.L. Hall. Co., specializing in space management moveable wall systems. Andrew partners with architects, design professionals, contractors, and builders to provide technical design assistance. Some of the architectural building products Andrew represents are:

Modernfold- Dormakaba Group

Skyfold- Dormakaba Group

LaCantina Doors

DWS-Doorwall Systems

Klein-USA

Andrew graduated from the University of Kansas-Lawrence, KS. - School of Architecture & Design, with a Bachelor of Architecture (B. Arch) 1998. He worked for RSP architects from 1998-2014 with a focus on creative exterior designs. He has worked in the architectural environment or construction sales industry for the last 21 years with a brief layover in selling medical devices (spinal fusion devices 2009-2011).

He is an active member in CSI and 2009 LEED Accredited Professional from the United States Green Building Council.

Andrew enjoys golfing, playing softball and watching his child compete in tennis. He resides in South Minneapolis and has one daughter.



Andrew Zabowski, CSI
W. L. Hall Co. Builders Specialties
azabowski@wlhall.com
Phone: 952-974-7636
Mobile: 612-391-0218

BuchNotes

$$M = wL^2 \div 8$$

Many of you will recognize this equation even if you haven't used it since your last structures class in architecture school. But where did it originate? I'm not sure why I started thinking about this, the formula for the bending moment in a uniformly loaded beam, but at some point I began trying to figure out where it came from and when it and other structural equations were developed. I was surprised to find that, although men have been building structures for over 5,000 years, structural design as we know it today is less than 200 years old. A lot has been built without benefit of this equation and others like it.

It's easy to find textbooks and websites that explain how structural equations were derived and how to apply them, but I wasn't able to find anything describing their origins until recently when I read an article about a book, "The History of the Theory of Structures, From Arch Analysis to Computational Mechanics" by Karl-Eugen Kurrer. At 848 pages, this is not a book most people would sit down to read cover to cover. But if you happen to have a question about the history of structural design, this would be a good place to begin. Before we get to that, and my equation, it might be helpful to start at the beginning of construction in the western world, in Egypt and Mesopotamia, just to put things in perspective.

Sometime between 6000 and 3000 BC, man began to settle down and grow crops for food. This occurred first in the valley of the Tigris-Euphrates Rivers, in what we know today as Iraq, and in the Nile Valley in Egypt. In addition to building houses, agriculture necessitated the construction of dams and canals for control of irrigation water. Until 3000 BC most knowledge was passed on by word of mouth from one builder to the next. (Paper wasn't in wide use in Europe until the 16th Century.)

Mathematical calculation began as early as 3000 BC although it was used mostly for weighing things for commerce, and for measuring and calculating areas and volumes. The right triangle was understood in Mesopotamia as was the concept of "level".

As villages grew to cities, wealth increased. Tombs, temples, and palaces were "engineered" and constructed, e.g., the pyramids in Egypt from 2700 to 2200 BC. Craftsmen began to emerge for working with clay bricks and stone. Roads, (some paved with stone), and bridges were built for commerce and to transport building materials. The earliest significant bridge, (400 ft. long over 7 piers), was built in the 6th century BC. It was made of mud brick piers with short timber beams supporting the roadway. The Great Wall of China was started in 200 BC, and the Walls of Babylon were constructed in about 600 BC.

Greek architects and engineer/builders learned by doing, and doing it over again. The Greeks took the post and beam, developed first in Egypt, and the Mycenaean corbelled arches and refined their proportions and details. Archimedes (267 – 212 BC), developed the principle of the lever and lever arm, and Euclid developed geometry in 300 BC. Elementary statics was understood by the Greeks and the concept of equilibrium was expressed mathematically. The Greeks were great scientists.

In contrast to the Greeks, the Romans were great engineers but not great scientists. Romans refined the techniques developed by others before them. Roman engineers were precise and understood economy in the use of construction materials. They understood the forces in stone arches and developed pozzuolana from combining lime powder, volcanic ash, and sand for use in making masonry mortar. However, it wasn't until the 15th Century that geometry and trigonometry were used in Italy. Roman aqueducts and buildings still stand today due to their being over designed, or having an extra factor of safety sometimes also known as the “margin of ignorance”.

Both Leonardo da Vinci (1452 – 1519) and Galileo (1564 – 1642) experimented with the tensile strength of wire. This was the beginning of the strength of materials science. There is evidence of structural theory in Leonardo's late 15th Century drawings. Galileo developed equations for bending and published them in 1638 in his *Dialogue Concerning Two New Sciences*. But it wasn't until 200 years later that a theory of bending was fully developed by the French engineer Navier. In the interim, structural design was performed using empirical methods, members were sized on the basis of “custom”, i.e., repeat what had been done before in the same situation. The first evidence of structural analysis was for the repair and retrofitting of the dome at St. Peter's Basilica in Rome in 1742. Here, scientific methods were used for the first time in a structural application.

Claude-Louis-Marie-Henri Navier was born in Lyon, France in 1785. He grew up with his uncle who was a high French government civil engineering official. Navier began work in the government's bridges and roads department. Construction in France at the time used mostly masonry and stone materials unlike England where cast iron was becoming prevalent. Navier travelled to England in the 1820s to study this new material and published his theory of chain suspension bridges in 1823.

In 1826 Navier, now a professor at the Ecole de Ponts et Chaussées, combined statics and strength of materials to form the unified theory of structures that he published in his *Resume des Lecons*. He built on the studies of Galileo, and on the later theoretical work by F. J. von Gerstner, of Bohemia, and the Prussian engineer J. A. Eytelwein. Navier's practical bending theory enabled engineers to reliably predict beam performance. His structural theories were also applied to the design of retaining walls, masonry arches, columns, and elastic slabs. As a result, Navier is considered the father of modern structural theory and the author of the equation at the top of this article.

In addition to the book, “The History of the Theory of Structures, From Arch Analysis to Computational Mechanics” by Karl-Eugen Kurrer, that is the basis for most of this article, I also used the book, “Engineering in History” by Kirby, Withington, Darling, & Kilgour, (published by McGraw Hill in 1956, with 530 pages), for information on ancient construction. There is a new and enlarged edition of “The History of the Theory of Structures, Searching for Equilibrium”, although as you can see it has a slightly revised title. It was published in 2018 by Ernst & Sohn, Berlin, and has 1,212 pages. Both editions trace in great and interesting detail the history of structures and structural design from their beginnings in Galileo's time up to the computational statics used today. Biographies of important engineers are presented along with a history of engineering education in Europe and the USA. The book is enhanced by many photographs, historical drawings, and diagrams.

Google Wants More Speed

- [Are You Already Behind?](#) - July 2019
- [Speed Up - Clean Up Your Files](#) - August 2019

Website performance is about retaining users and better Google referrals.

<https://developers.google.com/web/fundamentals/performance/why-performance-matters/>

Now that Google is ranking websites based on their mobile experience, you need to focus on delivering the fastest friendly experience you can achieve.

<https://www.hobo-web.co.uk/your-website-design-should-load-in-4-seconds/>

Google has long used page speed as a [ranking tool for desktop searches](#).

Google's 2019 shift to focus on [mobile-based search results](#) is the alert to recheck your website speed and eliminate slow spots. There are lots of tools available to understand your page speed performance. One listed in the link above is from Google:

<https://developers.google.com/speed/pagespeed/insights/>

Use this tool to evaluate your home page and several internal pages.

The next few newsletters will focus on changes I would recommend for most websites. I frequently will check an advertiser's performance when talking on the phone. I have a "simple is better" and "make it easy to be selected and specified" philosophy. This is very different than the current design philosophy for ecommerce practiced by many web designers. My focus is on desktop performance for the specifier and architectural staff.

Here is the primary tool I use to understand how their website responds:

<https://www.webpagetest.org/>

Evaluate your home page and several internal pages. Save the link for the future to evaluate changes you make. Use the results to ask your web designer/manager how they suggest improving your website performance.

4specs (then specs-online.com) was originally designed in 1996 using a dial-up connection. My focus has been to keep our speed performance maximized. Our focus is on "being specified" on commercial, institutional and industrial construction projects. The 4specs metaphor is the 3-ring binder library used by architects for design and specification information.

Questions and suggestions are always appreciated.

COLIN GILBOY

The Ghost of Building Codes Past: 50 Years of Code Evolution

BY BILL SCHMALZ, CSI, CCCA, FAIA

The other day I was rummaging through a closet looking for something I never found, and instead I discovered something that was, a long time ago while I was in architecture school, one of my most frequently used reference books. It wasn't about architectural history, or design theory, or building technology. It was the 1970 edition of *The BOCA Basic Building Code*. In the mid-1970s, instructors at the Illinois Institute of Technology's College of Architecture had the crazy notion that architecture students should understand building codes and use them when designing their projects. Everyone was required to buy a copy of BOCA. And what, some of you may be asking, is BOCA?

For much of the 20th century, three organizations published model building codes: the Building Officials and Code Administrators published the *BOCA Basic Building Code*, the Southern Building Code Congress International published the *Standard Building Code* (SBC), and the International Conference of Building Officials published the *Uniform Building Code* (UBC). Local jurisdictions adopted these codes on a mostly regional basis: north-central and northeastern jurisdictions tended to adopt BOCA, southeastern jurisdictions preferred the SBC, and western and some north-central jurisdictions went with the UBC.

All that changed in 1994, when the three code organizations joined forces to create the International Code Council and develop a single national model code. The final editions of the three "legacy" codes—the SBC, BOCA, and the UBC—were published in 1994, 1996, and 1997, respectively. They were replaced by the *International Building Code* (IBC), first published in 1997 and revised every three years since [1]. Most states, counties, and cities have adopted the IBC, usually with modifications.

Finding the old BOCA book sent me down memory lane to my college years, but it also made me wonder how obsolete it might be. After all, a lot of stuff has changed over the past 50 years. In 1970, all architectural drawings were made by hand, all models were physical objects, the Empire State Building was still the world's tallest, and you needed to know a programming language such as Fortran to use computers—mainframe computers, that is, not personal ones, which didn't exist yet. Outside of architecture, cigarette smoking was allowed almost everywhere, including airplanes; the Interstate Highway System was still under construction; and push-button telephones were just starting to replace rotary-dial phones.

So I assumed building codes must have changed too. To find out how much, I compared the 1970 BOCA with the 2018 IBC.

The first thing I noticed was BOCA's **size and weight**. BOCA is a compact book, with 493 pages, 9½ inches by 6 inches by 1¼ inches thick and weighing two pounds. The 2018 IBC is a giant in comparison, with 752 pages, 12½ inches by 11½ inches by 3¾ inches thick and weighing more than seven pounds. With more than three times BOCA's weight, the IBC must have a lot more stuff. Right?

Well, of course it does. Many topics covered in the IBC aren't mentioned in BOCA, including atriums, accessibility, delayed egress, carbon monoxide alarms, climate zones, common paths of travel, covered mall buildings, foam plastic insulation, fuel cell power systems, helipads, intumescent fire-resistant coatings, low-energy power-operated doors, photovoltaic panels, and wheelchair spaces.

On the other hand, the 1970 BOCA included things we won't find in the 2018 IBC, such as drive-in movie theaters, cast steel ("All castings shall be free of injurious blow holes." I should hope so.), flammable film (more than three pages devoted to it [2]), and spiral slide fire escapes (sounds like fun!).

Another obvious difference between 1970 and 2018 was BOCA's lack of **metric units of measure**. It wasn't until 1975 that Congress passed the Metric Conversion Act, which effectively changed nothing, but it did create the United States Metric Board, which disbanded in 1982 after having accomplished nothing. Then, suddenly, in 1988, Congress passed the Omnibus Foreign Trade and Competitiveness Act, which required federal agencies to use the metric system by the end of 1992. For architects, the most significant result is that wine is sold in 750 ml bottles. [3]

The IBC labels its **occupancy groups** in a logical, easy-to-remember way ("A" for assembly, "B" for business, "E" for education, etc.). BOCA chose an odd, seemingly random approach: Group A was high hazard, Group B was storage, and Group E was business. For the mercantile, institutional, and residential occupancies, IBC uses Groups M, I, and R, while BOCA used Groups C, H, and L. BOCA lumped educational occupancies into its assembly occupancy (labeled "Group F," of course). Subgroup F-4 includes for "all buildings used as churches, schools, colleges, and for similar educational and religious purposes."

High-rise buildings as we know them had been around for at least a hundred years before 1970, yet the 1970 BOCA had no special requirements for them. The IBC devotes three pages (and as we know, IBC's pages are two and a half times bigger than BOCA's) to requirements for high-rise buildings. These include fire sprinkler systems, emergency systems (such as smoke detection, fire alarm, and standpipes), and fire service access elevators.

To calculate the **number of occupants** in a building, the IBC gives us 38 categories of occupancy loads. People's lives must have been much simpler in 1970, because BOCA had only 12, and three of them were for various types of mercantile uses. All institutional uses were thrown into one category, with 150 square feet per occupant.

The way **stair and door widths** are calculated has changed. The IBC's method is straightforward: Provide 0.2 inches of door width and 0.3 inches of stair width for each occupant. Thus, if 150 people need to exit through a stair enclosure, the door has to be at least 30 inches wide [4] and the stair has to be at least 45 inches wide.

BOCA's method was far less precise. It was based on a "unit of exit width" of 22 inches (supposedly the width of a man's shoulders) and a half unit of 12 inches. Doors and stairs were sized by the number of occupants allowed per unit of exit width, e.g., for business occupancies protected by sprinklers, 112.5 people per unit of exit width for doors and 75 people for stairs. Thus, 150 occupants would need a door of one-and-a-half exit units, or 36 inches, and a stair of two exit units, or 44 inches.

Tread and riser dimensions have also changed. In 1970, you could have 7¾-inch-high risers in business occupancies and 7½-inch-high risers in assembly and institutional occupancies. Today, seven inches is the maximum for all three occupancies. While risers have gotten smaller, treads have grown. Treads could be as small as 10 inches for business, assembly, and institutional occupancies; today, 11 inches is the minimum. Does this mean people's feet are getting bigger? Apparently they are. A recent study [5] shows that average shoe sizes have increased by two sizes over the past four decades. [6]

Guards at stairs used to be much lower and more open. Because BOCA's guards [7] were a minimum of 30 inches above the stair nosings (compared to today's 42 inches), and handrails were from 30 to 33 inches above the nosings, guards and handrails could be the same element. Regarding openness, in 1970 you could have as much as 10 inches between intermediate longitudinal rails and 6 inches between vertical balusters. Today, a sphere larger than four inches in diameter cannot pass between any two intermediate rails or balusters.

Here's something I don't expect to see in codes anymore: In certain fire districts, "all roof coverings shall be of **asbestos**, ... asbestos felt, ... or similar noncombustible ... materials." And "where warm air ducts pass through combustible floors, the surrounding space shall be tightly fitted with asbestos cement." And a list of exterior veneers including "asbestos shingles" and "asbestos cement boards." And "ducts and vents shall be constructed of ... asbestos cement or other approved ... materials." Today's architects are so terrified of the A-word that even typing it makes me uncomfortable. Yet, the 2018 IBC still talks about asbestos-cement boards and asbestos shingles (Table 1404.2) and asbestos in low-hazard storage (Section 311.3), as well as in several other places.

These nine items are hardly a comprehensive study of how building codes have evolved in 50 years; they are just nine significant ones that caught my attention. Smaller ones include the use of escalators as means of egress (BOCA allowed it for some occupancies, while IBC explicitly prohibits it) and the IBC's allowance of longer travel distances to exits.

What are the lessons I've learned from this code comparison? First, that not all code changes result in safer buildings, nor are they intended to. Changing occupant group designations just made the code more rational, and the revised way to calculate door and stair widths makes more sense than using exit units; neither of these improves safety. Many other code changes respond to changing technology, such as photovoltaic panels and intumescent coatings, or to new design challenges, such as atriums and covered malls.

Second, that the code changes that *do* improve safety are often the result of learning from tragedies and catastrophic building failures. For example, most serious high-rise fires have occurred in buildings that either weren't sprinklered or had the sprinkler system temporarily deactivated [8]. As a result, the IBC now requires all high-rise buildings to be sprinklered. Similarly, I suspect that guard heights were increased because people were accidentally falling over the lower guards, and that risers were shortened because people were stumbling on the higher ones.

And third, that a lot of code provisions haven't needed to change. For example, the minimum headroom in stairs remains 6'-8" (or, as BOCA quaintly puts it, "six and two-thirds (6-2/3) feet") and the occupant load for business occupancies is still 100 gross square feet per occupant. Apparently, nothing has happened in the past 50 years to warrant a change. Making these requirements even slightly more stringent, such as increasing stair headroom to, say, 7'-0" (because people have been growing taller) or increasing business occupancy loads to 80 GSF/occupant (because, I don't know, people are getting skinnier?), would affect sizes of stairs and building floor-to-floor heights, and result in costlier buildings without making the buildings safer.

My dear old 1970 BOCA may not be useful in designing buildings anymore, but it is a good reminder that building codes are constantly evolving for many reasons: They are being made easier to use, they are keeping up with changing technology, and they are finding the appropriate balance between life safety and building cost.

Follow the author on Twitter @bill_schmwil.

Footnotes:

[1] The IBC didn't become *the* national building code. The U.S. Constitution leaves things such as building codes (and architects' licenses) to the states, so the federal government hasn't the authority to impose a national building code. Meanwhile, the National Fire Protection Association, which has been around since 1896 and has been publishing its *Life Safety Code* (under a variety of titles) since 1927, began publishing *NFPA 5000*—its own model code—in 2002. This code is as comprehensive as the IBC, but is in many ways different. California briefly considered adopting it as the basis of the *California Building Code*, but in the end went with the IBC.

[2] And for good reason. Nitrate film, or nitrocellulose, was the material used for motion picture film from the industry's beginnings until the early 1950s. It was able to capture great images—*Citizen Kane* and *Gone with the Wind* were shot on it—but it had the annoying tendency to burst into flame when subjected to heat from, say, a projection lamp. In 1948, Eastman Kodak introduced cellulose triacetate, a far more stable film, and by 1951 it had replaced nitrate.

[3] By at least 1993, BOCA was providing metric dimensions in parentheses.

[4] In which case, the minimum allowable door width of 32 inches would apply.

[5] <https://www.independent.co.uk/life-style/health-and-families/features/why-our-feet-are-getting-bigger-9481529.html>

[6] A more likely reason for increased tread widths is that 7½" or 7¾" risers are just not comfortable for most people to use. An old rule-of-thumb formula— $24" \leq 2R+T \leq 25"$ (which was included in some building codes, such as the 1994 SBC)—provides a comfortable relationship between riser height and tread width. The rule of thumb dictates that, to stay within the 24"–25" range, as risers decrease, treads must increase. Thus, shorter risers may have had more to do with wider treads than people's average foot size.

[7] "Guard," not "guardrail," is the right term. Even in 1970, BOCA knew that, but most of us (including me) still habitually say "guardrail."

[8] A notable example happened in 1991 in Philadelphia. One evening, a fire broke out on the 22nd floor of the 38-story One Meridian Plaza, across the street from the historic City Hall. By the time the fire department arrived the fire was already out of control. For 19 hours, the fire kept moving up, one floor at a time. It didn't stop until it reached the 30th floor, which was the first floor protected by sprinklers.

UPCOMING EVENTS FROM LOCAL CONSTRUCTION ASSOCIATIONS

Check websites for complete listings

DATE	EVENT	ORGANIZATION	WEBSITE
10/7/2019	AIA Minneapolis Annual Meeting	AIA MN MN Chapter – American	aia-mn.org
10/25/2019	AIA Northern Curling Event	Institute of Architects	
10/31/2019	Health Design Knowledge Community		
10/24/2019	Recognition Evening at St. Paul	AGC of Minnesota	agcmn.org
10/22/2019	Sustainable & Resilient Bldgs. Cmte.	ASHRAE – MN	mnashrae.org
12/3-4/2019	Convention at The Depot Mpls	ARM – Aggregate Ready Mix of MN	armofmn.com
10/30/2019	M'sey & Goodale Mergers/Acquisitions	ACEC - American Council of Eng. Cos.	acecmn.org
10/X/2019	Many Com'te Meetings See Website	American Public Works Association	apwa-mn.org
10/24/2019	General Meeting & Student Reception	BOMA – Bldg Owners & Managers	bomampls.org
10/21/2019	General Meeting	BOMA – Bldg Owners & Managers	bomasaintpaul.org
12/5/2019	U of M 67 th Concrete Conference	Concrete Paving Assoc. of Minnesota	concreteisbetter.com
10/14/2019	Chapter Meeting – See Website	MSP Const.Specification Inst.	csimsp.org
10/17/2019	Visitation Day	Dunwoody Institute	dunwoody.edu
10/18/2019	State of MN Economic Forecast	Minnesota Construction Assoc.	mnconstruction.org
10/ 8/2019	Meeting & Tour of Vikes Training Fac.	IFMA – International Facility Mgmt.	msp-ifma.org
10/4/2018	Fri. 4 Lecture-Transportation Mgmt.	ASLA – Am. Soc. of Landscape Arch.	asla-mn.org
10/24/2019	Happy Hr.-Support of Eng. Education	MN Society of Prof. Engineers	mnspe.org
10/17/2019	Bunch & Learn -Tour of Glass Art Design	ASID - Am. Soc. of Interior Designers	mn.asid.org
10/17/2019	Breakfast Mtg.- Fly Ash Topic	Minnesota Concrete Council	mnconcretecouncil.com
10/17/2019	Networking Social	NAMC-UM - National Association of Minority Contractors – Upper Midwest	namc-um.org
10/X/2019	Contact Office	NAWIC- Nat'l Assoc. of Women Constr.	nawicmsp.org
10/17/2019	Forum: LEED Performance Criteria	USGBC – U. S. Green Bldg. Council	usgbc.org
10/11/2019	Women in Arch.- Alternative Practice	U of MN – College of Design & Arch	arch.design.umn.edu



COMING SOON: THE CSI STORE

You asked, and CSI listened. We are in the process of launching the CSI Store. A one-stop-shop for chapter and region leaders to purchase CSI branded materials in bulk, at discounted prices. As we are working to set up the store, we want to hear from you – what types of unique products would you like to see included in the CSI Store? Pins, pens, pads, polos – we've got the basics covered! We want to hear your ideas for different items you'd like to have available for purchase.

Please email your ideas at Institute Communities “Chapter Leaders Discussion” and we will do our best to source and include them at the CSI Store launch, immediately following CONSTRUCT.

I look forward to hearing your thoughts!



Matt Switzer
Director of Marketing and Communications
Chicago IL

Certification Quiz

By Jack P. Morgan
Indianapolis Chapter Quizmaster



1. What is typically the Contractor's first activity on the Project Site?
 - a. Survey and lay out the new construction.
 - b. Meet with AHJ.
 - c. Install temporary power.
 - d. Mobilization. Which of the following is not a management expertise that Contractors bring to a Project?
2. The responsibility of inspecting Work already performed for proper condition to receive subsequent work lies with the:
 - a. Owner.
 - b. A/E.
 - c. Contractor.
 - d. Subcontractor.
3. Facility Managers should perform a Post-Occupancy Evaluation how long after initial occupancy?
 - a. Three months.
 - b. Three to six months.
 - c. Six to nine months.
 - d. Just before the One-Year Correction Period completion.
4. Green Buildings are designed to reduce overall impact of the Built Environment on human health and the natural environment by:
 - a. Efficiently using manpower resources during construction.
 - b. Protecting occupant health and improving employee productivity.
 - c. Reducing waste, pollution, and environmental degradation during construction.
 - d. Increasing volatile organic compounds in construction materials.
5. Which of the following is a primary characteristic of Integrated Project Delivery?
 - a. Schematic Design is performed by the General Contractor.
 - b. Recognition that intensified planning results in efficiency and savings during execution.
 - c. Can only be used with the Design-Build Delivery Method.
 - d. Reduces efficiency of Project Commissioning.
6. When was the first college founded solely for African American students?

Answers Are Provided On Page 24

Chapter Board (2019-2020)

President	James Bergevin, CSI, CCPR, CDT
Immediate Past President	Cynthia Long, CSI, CDT
President-Elect	David Rasmussen, CSI
Vice President	Kevin Slattery, CSI
Vice President	Andy Marolt, CSI, CCS, LEED AP
Vice President	Mark McPherson, CSI, CDT
Vice President	Rick Nichols, CSI, LEED AP, AIA Allied
Secretary	Tohnya Adams, CSI
Treasurer	Adrienne Rulseh, CSI

Chapter Committees (2019-2020)

Awards Committee	Matt Strand, CSI, CDT, Chair Rick Nichols, CSI, LEED AP, AIA Allied
Certification Committee	Gerhard Guth, CSI, CCS, CDT, AIA, LEED AP Jerrilyn O'Brien, CSI, CDT, EIT, Co-Chair
Communications Committee	Jerry Putnam, FCSI, CCS, CDT, Chair
Expo Committee	Kathrine Barrett, CSI-EP, CDT, LEED GA Noah MacMillan, CSI, Co-Chair
Membership Committee	Susan Lee, CSI, CDT, AIA, CID, NCARB, Chair Gary C. Patrick, CSI, AIA, RRC, Co-Chair
Programs Committee	Brien DuRouche, CSI, Chair
STEP Committee	Hannah Fleischaker, CSI, Chair Adrienne Rulseh, CSI-EP, Co-Chair
Chapter Administrator	Jordan Grote, IntrinXec Management, Inc.
Assistant Chapter Administrator	Madison Silva, IntrinXec Management, Inc.
Website Administrator	Jerry Putnam, FCSI, CCS, CDT

CERTIFICATION QUIZ ANSWERS

1. - d [PDPG 14.8]

2. - c [AIA A201 3.3.3]

3. – b [PDPG 17.8.1]

4. - b [www.epa.gov/greenbuildingpubs/about]

5. - b [PDPG 4.8.3]

6. - Originally established as The Ashman

Institute, Lincoln University received its charter

from the Commonwealth of Pennsylvania on April

29, 1854, making it the nation's first degree-

granting Historically Black College and University.

Copyright 2019, CSI-MSP, all rights reserved.

Newsletter Editor: Jerry Putnam

For more information, contact Jordan Grote, CSI-MSP Assistant Chapter Administrator
P: (952) 564-3044