Celebrating Concrete History: A Tribute to Luke and Billie Snell

by F. Michael Bartlett, Karin T. O'Brien, W. James Wilde, Anne Werner, Jacob L. Borgerson, Kelsey E. Sheridan, Kimberly Waggle Kramer, and Lance Heiliger

On October 27, 2025, at the ACI Concrete Convention – Fall 2025 in Baltimore, MD, USA, ACI Committee 120, History of Concrete, held a special session titled, "Documenting Concrete History: A Tribute to Luke and Billie Snell," commemorating their contributions to the Committee's success. Six members of ACI Committee 120 gave presentations based on papers previously authored by the Snells, which are briefly described in this article.

Luke and Billie Snell (Fig. 1) have been active with ACI Committee 120 for decades. Luke, an Honorary Member of ACI, served two 6-year terms as Chair from the early 2000s to 2018 and was succeeded first by Joe Amon and again by Rick Yelton. Billie, an ACI Fellow, served as Secretary of ACI Committee 120 during this period. During this time, they wrote articles, made presentations, and fostered a welcoming environment at committee meetings. Many members of ACI Committee 120 were (and are) active on other ACI committees, but made sure to attend the Committee 120 meeting because it was the most fun. As a part of meeting introductions, Luke started a tradition of asking those present to state what they had been researching in concrete history recently.

Luke M. Snell, a Concrete Consultant and Emeritus Professor at Southern Illinois University Edwardsville, Edwardsville, IL, USA, has conducted extensive consulting work on construction and concrete-related issues throughout the United States and internationally. He has also authored over 400 articles on concrete, construction materials, construction education, and the history of concrete. He has worked with China, India, Singapore, Taiwan, Tunisia, and Saudi Arabia to start concrete certification programs. He is also a past Chair of the Chapter Activities Committee; International Advisory Committee (discharged); the Educational Activities Committee; ACI Committees E702, Designing Concrete Structures, and 517, Accelerated Curing of Concrete (discharged); and served on the ACI Board of Direction.

Billie G. Snell, a retired teacher who graduated with honors from Southern Illinois University Edwardsville, is a member of Phi Kappa Phi and Kappa Delta Pi (Lambda Theta Chapter) and has served as Treasurer, Vice President, and President of the Chapter. During her time teaching grades 5 through 8, she was honored with World's Who's Who of Women, Outstanding 2000 American Women, Kappa Delta Pi Teacher Honor Society, Dean's College Scholarship, Dr. Ruth Richardson Education Award, Dean's College Honors Program, and National Dean's Honor Roll. Billie and Luke have co-authored over 20 publications to educate school children about concrete, and on concrete history.

We are pleased to share these presentation snippets from the ACI Committee 120 Technical Session in Baltimore, MD.

Fig. 1: Luke and Billie Snell sitting in a Roman amphitheater in El Jem, Tunisia, built Circa 230 AD/CE *(photo courtesy of Luke Snell)*

First Concrete Street in America—W. James Wilde

George Bartholomew (Fig. 2) built America's oldest concrete street in Bellefontaine, OH, USA, in 1891.[1] The use of concrete as the pavement wearing surface was, at the time, unprecedented. Bartholomew convinced the skeptical city council of the merit and durability of this construction by building wide concrete gutters on the city's main street. "After several years of exceptionally hard usage [they] showed so little wear and gave such splendid satisfaction that the city engineer decided to try this form of construction for street pavements."[2]

The roadway slabs, formed in 5 ft (1.5 m) squares with tar paper at the joints, consisted of a two-layer portland cement concrete pavement—a 4 in. (100 mm) concrete "base" with a maximum aggregate size of 1-1/2 in. (40 mm) and a 2 in. (50 mm) wearing layer with a maximum aggregate size of 1/2 in. (13 mm). The sand, stone, and cement were mixed with hand-powered screw mixers and tamped into the forms, entrapping 8% air in the process. The Snells credit James C. Wonders, the Logan County Engineer, with designing the pavement and directing the construction.

The Chicago International Exposition of 1893 awarded Bartholomew first place for Engineering Technology Advancement in Paving Materials for his revolutionary achievement. Thus began a long history of celebrating the "First Concrete Street in America" through nationwide observances, a Golden Jubilee, parades, selling postcards and commemorative plates, and crowning a Miss Concrete Pavement. Bellefontaine celebrated the 100th anniversary of the construction in 1991—and the original concrete pavement still carries light traffic.

The presentation also highlighted Luke Snell's contributions to documenting and preserving this history, emphasizing the evolution of concrete technology, concurrent with the span of his career in the concrete industry.

Fig. 2: Statue and plaque commemorating George Bartholomew at Court Street, Bellefontaine, OH, USA *(photo courtesy of W. James Wilde)*

The Erie Canal—America's First Concrete Classroom—Anne Werner

In 1800, the western boundary of the United States was the Mississippi River. With the Louisiana Purchase in 1803, the country more than doubled in size. Western expansion had begun, creating the need for transportation infrastructure to accommodate the growing nation. At the time, the most efficient mode of transportation was by water. Throughout Europe (particularly in England), waterways, including canals, were the preferred mode.[3]

The Erie Canal (Fig. 3) was built between 1817 and 1825, spanning 363 miles (584 km) between the Hudson River at Albany, NY, USA, and Lake Erie at Buffalo, NY. It was the first major man-made navigational waterway in the United States. The design and construction of the canal marked the beginning of civil engineering as a profession in the United States and the development of domestic hydraulic cement manufacturing.[4] Canvass White, an assistant to Benjamin Wright, who was Chief Engineer for construction of the canal, was sent to England in 1817 by the Governor of New York to study the canal systems and their construction materials and methods.[5] He saw how hydraulic cement was manufactured, and when he returned to the United States, he experimented with local materials to try to produce a natural hydraulic cement. At that time, hydraulic cement had to be imported because it was unavailable domestically. White eventually patented his own hydraulic cement in 1820 that was cheaper and of better quality than that used in England.[6] This cement was used on the Erie Canal and several others for masonry joints and pointing.

The Erie Canal was widened several times to accommodate larger vessels. Despite the introduction of railroads in the mid-1800s, a more effective mode of transportation than canals, the Erie Canal continued to operate and is still open to traffic today.[7] The hard work of White and his fellow engineers facilitated the development of hydraulic cement manufacturing in the United States, as well as the promotion of civil engineering as a profession.

Fig. 3: Lock on the Erie Canal *(photo courtesy of Judy Snell, sister-in-law of Luke and Billie Snell)*

Hoover Dam—Jacob L. Borgerson

Completed in 1936, the 3.25 million yd^3 (2.5 million m^3) of concrete in the Hoover Dam (Fig. 4) made it the first man-made structure to exceed the masonry mass of the Great Pyramid of Giza in Giza, Egypt. The material in this presentation is based on original research by Luke and Billie Snell[8] that was presented at World of Concrete for over 15 years.

Considered to be one of the greatest engineering feats of the twentieth century, the construction of this massive concrete arch-gravity dam in the Black Canyon of the Colorado River required innovative concrete techniques. Congress approved funds for construction in 1930, and the 100 pages of specifications with 76 drawings went to tender at 5 USD per set. The bids were opened on March 4, 1931, and Six Companies Inc., of California was awarded the contract. The workers, who earned between 60 and 75 cents per hour, experienced horrible working conditions with temperatures often exceeding 100°F (38°C)—the 24-hour construction schedule made it a pleasure to work the night shift. Batch plants became operational on site in 1932, and the first concrete was placed on June 6, 1933. The batch plants could produce 24 yd^3 (18 m^3) of concrete every 3 minutes, and the record total daily placement exceeded 10,000 yd^3 (7645 m^3). Type IV cement, with reduced C_3A and increased C_2S, was used to reduce the heat of hydration. The concrete had a compressive strength of 3030 psi (21 MPa) at 28 days and 4290 psi (30 MPa) at 1 year. Four and 8 yd^3 (3 and 6 m^3) buckets suspended from aerial cableways moved the concrete to the jobsite. The dam was cured with water: during the summer, it was the sole job of 20 men to spray water on the surface of the dam. One-inch (25 mm) pipes carrying river and refrigerated water were installed in the concrete to provide cooling; these were cut off and pressure-grouted when the cooling in a section was completed.

Excellent quality control was provided by state-of-the-art testing facilities. To obtain cylinders with a minimum dimension of four times the maximum aggregate size, 36 x 72 in. (914 x 1829 mm) cylinders were tested in a 4 million lb (1.8 million kg) testing machine.

Fig. 4: Hoover Dam *(photo courtesy W. James Wilde)*

Ninety-six workers died during construction, not including heat prostration that killed one worker every other day in the summer of 1931. It was recognized that workers need to drink water.

Many features of the dam construction, including an aggregate washing facility and the gravel plant/railroad, remain visible underwater in the reservoir created by the dam.

Graveyard Concrete—Kelsey E. Sheridan and Kimberly Waggle Kramer

Billie Snell and Debbie Amon presented their research on the durability and historical significance of graveyard concrete in a 2006 article in *Concrete International*.[9] New Orleans' cemeteries, often called "Cities of the Dead," are renowned for their architectural beauty and their resemblance to small cities (Fig. 5). Rows of tombs, built with brick and covered in cement plaster or lime-and-cement stucco, are arranged like city streets, reflecting societal divisions based on wealth, religion, and social status.

The presentation examined the historical practices of burial and tomb maintenance, with a focus on the role of materials such as lime and cement in the construction and preservation of crypts and mausoleums. It traced how the introduction of portland cement opened up new possibilities in construction. This material could be cast into forms, enabling builders to experiment with larger spans, thinner profiles, and architectural styles that fueled the evolution of design. At the same time, its adoption often created challenges when paired with older masonry traditions. The harder nature of cement mortars sometimes caused distress in historic stone and brickwork, revealing both the promise and the unintended consequences of this technological shift. As New Orleans works to preserve and rebuild its heritage, addressing these challenges remains crucial to safeguarding the unique legacy of the "Cities of the Dead."

Fig. 5: View of St. Louis Cemetery No. 3 in New Orleans, LA, USA *(photo courtesy of K.E. Sheridan)*

Start of Certification—Lance Heiliger

Luke Snell was invited to mark the 25th anniversary of the ACI Certification Program by writing an article in *Concrete International* on the origins and evolution of certification in the concrete industry.[10] He quotes then-ACI President John McLaughlin's support of developing a certification program in his January 1980 President's Memo in *Concrete International*, that though barbers must participate in a training and examination program to become qualified to a set of standards, "…I have no such assurance with respect to the qualifications of technicians who are, to a large extent, in day-to-day control of the quality of concrete construction or projects in many parts of the United States."

The article traces the development of standardized testing, quality control measures, and training programs that have shaped modern construction practices (Fig. 6). The discussion highlights key milestones, the role of industry organizations, and the impact of certification on ensuring durable and reliable concrete structures. By reflecting on this history, the presentation underscores the importance of certification in advancing professionalism, safety, and innovation in the concrete industry.

Construction in the Bible—Karin T. O'Brien

Luke Snell authored a series of four articles in *Arizona Contractor and Community* on the use of construction materials in biblical times.[11-14] His research examines ancient construction techniques, including the use of lime-based mortars, natural cements, and early concrete and masonry applications in structures such as the Tower of Babel, Solomon's Temple, and Roman aqueducts. By analyzing historical texts and archaeological evidence, he provides insight into how early civilizations approached estimating, scheduling, and jobsite safety that influenced modern construction technology. This discussion bridges ancient ingenuity with contemporary engineering, revealing the long-standing significance of concrete in human history.

Fig. 6: Luke Snell explaining testing procedures to students in Ethiopia *(photo courtesy of Luke Snell)*

Stay Tuned!

The ACI Committee 120 Technical Session in Baltimore was well-attended and favorably received. We look forward to holding a follow-up session at a future ACI Concrete Convention: there are many more of Luke and Billie's publications to celebrate. A collection of their publications is available at **https://acimissouri.org/LukeBillie_Snell**.

References

1. Snell, L.M., and Snell, B.G., "Oldest Concrete Street in the United States," *Concrete International*, V. 24, No. 3, Mar. 2002, pp. 72-74.

2. Chubb, J.H., "Cost and Value of Concrete Pavements," *ACI Journal Proceedings*, V. 5, No. 1, Jan. 1909, pp. 356-357.

3. Spangenburg, R., and Moser, D.K., *The Story of America's Canals*, Facts on File, Inc., New York, NY, 1992, 82 pp.

4. Thompson, L., *The Erie Canal*, Rourke Publishing, Co., Vero Beach, FL, 2005, 48 pp.

5. Snell, L.M., and Snell, B.G., "The Erie Canal – America's First Concrete Classroom," *Concrete International*, V. 18, No. 12, Dec. 1996, pp. 63-64.

6. McKee, H.J., "Canvass White and Natural Cement, 1818-1834," *Concrete International*, V. 1, No. 6, June 1979, pp. 39-42.

7. The Erie Canalway, National Heritage Corridor website, "The Canal System Today," https://eriecanalway.org/learn/history-culture/canal-today. (last accessed Oct. 10, 2025)

8. Snell, L.M., "Hoover Dam 1931-1935," World of Concrete presentation, 2025, https://acimissouri.org/downloads/Articles/hooverdam.pdf. (last accessed Oct. 10, 2025)

9. Snell, B.G., and Amon, D.L., "Graveyard Concrete," *Concrete International*, V. 28, No. 3, Mar. 2006, pp. 66-67.

10. Snell, L.M., "How ACI's First Certification Program Got Its Start," *Concrete International*, V. 27, No. 10, Oct. 2005, pp. 27-31.

11. Snell, L., "Construction in the Bible: Materials," *Arizona Construction & Community*, V. 8, No. 5, Sept.-Oct. 2019.

12. Snell, L.M., "Construction in the Bible: Materials: Part 2," *Arizona Construction & Community*, V. 8, No. 6, Nov.-Dec. 2019.

13. Snell, L., "Construction in the Bible: Techniques," *Arizona Construction & Community*, V. 9, No. 1, Jan.-Feb. 2020.

14. Snell, L., "Construction Techniques in the Bible," *Arizona Construction & Community*, V. 9, No. 6, Nov.-Dec. 2020.

Selected for reader interest by the editors.

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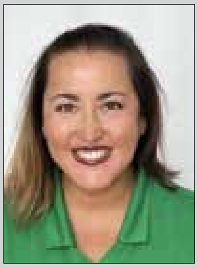

Karin T. O'Brien is Executive Director of the ACI Missouri Chapter. She is Chair of ACI Committee C630, Construction Inspector Certification; Secretary of ACI Committees E702, Designing Concrete Structures, and 120, History of Concrete; and a member of the ACI Chapter Activities Committee and ACI Committee C631, Concrete Transportation Construction Inspector Certification. She resides in Chesterfield, MO, USA.

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ACI member **Kelsey E. Sheridan** is a Senior Engineer at WDP & Associates specializing in forensic investigations of failures, distress, and deterioration in the built environment, with a focus on concrete structures. Her expertise includes condition assessments, material diagnostics, and repair design for both modern and historic structures. She is Secretary of ACI Committee 364, Rehabilitation, and a member of ACI Committee 546, Repair, and ACI Subcommittee 562-C, Loads and Condition Evaluation. She also serves on the Board of Directors for SEA-MW and mentors local students through the ACE Mentor Program.

Kimberly Waggle Kramer, FACI, is a Professor at Kansas State University, Manhattan, KS, USA, and Co-Owner of KDK Engineering, LLC. She has more than 35 years of structural engineering experience and over 20 years of academic experience. She is Chair of the ACI Educational Activities Committee (EAC) and ACI Committee 551, Tilt-Up Concrete Construction; past Chair of ACI Committees E702, Designing of Concrete Structures, and 124, Concrete Aesthetics, and ACI Subcommittee 130-G, Education; and a member of the ACI Board of Direction. Being appointed by the Governor of Kansas on the Kansas State Board of Technical Professionals (KBTP), Kramer, past-Chair of KBTP, promotes her passion of structural engineering.

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