American Journal of Industrial Medicine

WILEY

AMERICAN JOURNAL OF INDUSTRIAL MEDICINE

HISTORICAL PERSPECTIVE

Foreword: Progress in Construction Safety and Health

Knut Ringen[1,2] | Karl-Heinz Noetel[2] | Krishna N. Sen[3] | Miles Fisher[1]

[1]The Center for Construction Research and Training, Silver Spring, Maryland, USA | [2]Section on Prevention in the Construction Industry, Special Commission on Prevention, International Social Security Association, Geneva, Switzerland | [3]Scientific Committee on Occupational Health in the Construction Industry, International Commission on Occupational and Environmental Health, Rome, Italy

Correspondence: Knut Ringen (knutringen@msn.com)

Received: 13 January 2025 | **Accepted:** 16 January 2025

Funding: Funded by National Institute for Occupational Safety and Health through cooperative agreement number UH60 009762 and U.S. Department of Health and Human Services.

ABSTRACT

The construction industry has always been a large economic sector that is very hazardous to work in. Over the past 40 years there have been major improvements in safety and health practices driven by increased research and more rapid adoption of best practices, not just in the developed countries but also in emerging economies. This special issue aims to showcase a spectrum of perspectives from research to practice, about the current state of construction safety and health.

1 | Background

From at least Biblical times, construction work has been recognized as being very hazardous. Moses enjoined the Israelites to construct a parapet for the roof when building a new house "that thou bring not blood upon thine house, if any man fall from thence." (Deuteronomy, 22:8).

Beginning with the early construction craft guilds—first founded in the 1100s in parts of what is now Germany and the low countries of Europe to promote skills (through apprenticeship) and better working conditions—efforts have been made to reduce hazards in construction and indemnify the injured [1]. Nearly 150 years ago, Germany established the first compensation system for occupational injuries, including coverage for construction industry workers [2, 3]. In 1947, France established the first national organization dedicated to construction safety, the Professional Organization for Prevention in Building and Public Works or OPPBTP. However, only recently, since the mid-1960s, there has been a growing effort to engage science as a (critical) means to make construction work safer and healthier, much of this movement owing to the contemporary awareness of health risks posed by asbestos [4].

In the 1960s, the International Social Security Association established a Special Commission on Prevention and, within it, a Section on Prevention in the Construction Industry (ISSA-C) to combat occupational disabilities that were forcing workers into early retirement. At the same time, the International Commission on Occupational Health established a Scientific Committee on Occupational Health in the Construction Industry (ICOH-C). These organizations' missions complement each other, the ICOH-C promoting research into improving best-known practices and the ISSA-C promoting the adoption of such research.

By the 1970s, construction safety organizations had been established in many countries, especially in Europe, but also in Japan and Ontario, Canada. One in particular, in Sweden, known as Bygghalsan, functioned from 1968 to 1993, and a recent evaluation has reinforced the significance of its industry-wide approach [5] that sought to integrate safety and health research and practice. Bygghalsan's operations resulted in the first robust epidemiological studies focused on construction workers, and relied upon data from annual health examinations tied to national morbidity and mortality registries, which were used to establish outcomes [6]. These studies were presented during seminal conferences focused on occupational health [7, 8], organized in New York by Professor Irving Selikoff, the founder of this journal.

In 1979, Bygghalsan, in cooperation with the ISSA-C and ICOH-C, organized the first international scientific conference dedicated to health risks in construction in Stockholm. The conference focused on the health hazards of solvents used primarily by the paints and finishing trades, and contributed to the widespread adoption of water-based paints for most common applications [9]. This was the first instance in which science-based occupational health evidence resulted in a global change in best practices in the construction industry. The ban on asbestos in construction would come next [10].

Until very recently, the focus on construction safety and health has been limited to conditions in highly developed countries, with the United States lagging significantly behind Europe [11]. Drawing on the scientific expertise developed within ICOH-C and best practices expertise of ISSA-C, in 1990 the United States' building trades unions, major construction industry employers, and the National Institute for Occupational Safety and Health (NIOSH) reached an agreement to seek Congressional authorization for funding dedicated to construction safety and health research. This authorization was granted in 1990 and led to the establishment of CPWR—The Center for Construction Research and Training (until 2006, known as The Center to Protect Workers Rights) (cpwr.com).

2 | Advances in Construction Safety and Health Research

Under the auspices of ICOH-C, the acceleration of knowledge generated over the last 40 years has been well documented in three compendia:

- The first, published in 1995 and mainly geared toward a US audience, provided an overview of construction safety and health and noted that "until the late 1980s, safety and health research in the construction sector was limited to a few European countries." [12]
- The second compendium, published in 2005, focused primarily on risk assessment and epidemiology. It concluded that "the characteristics that make the industry hazardous are common to all countries." [13]

Five years later, a third compendium was published in AJIM that focused on work-related injuries, musculoskeletal disorders, and ergonomics, finding that "construction is one of the largest economic sectors… nevertheless [it] has received relatively little focus in terms of safety and health research" [14] (Figure 1).

3 | Adoption of Best Practices

Coupled with research, ISSA-C has advanced the state of best practices in a similar manner through growing outreach and the convening of industry leaders globally. Since 1968 it has organized 31 International Symposiums on Health and Safety in the Construction Industry. Three of these have led to declarations on recommended best practices.

The 29th International Symposium held in Brussels, Belgium in November 2009, focused on the potential for adverse impacts from globalization, both on the progress that had been made in safety and health, but also on the social security arrangements created in individual countries. The resulting *Declaration of Brussels* [15] defined eight essential actions of best practices in construction safety and health:

- OSH policies (conventions, recommendations, codes of practice) throughout the world should be kept up to date.
- OSH strategies to implement the policies should take into account the particularities of the construction industry.
- Social security agencies and preventive bodies play a key role in defining and promoting safety and health.
- All stakeholders have important roles to play in strengthening safety and health.
- OSH programs at company level should be performance-based, and include the participation of workers and their representatives in continuous risk assessment/audit activities and organization of work-site OSH committees.
- Performance-based OSH programs require the adoption of adequate instruments aimed at measuring the efforts made and the progress achieved by all participants in the work process at all levels, based on proactive monitoring.
- Strengthening the labor inspectorates with the appropriate resources (including labor inspectors specific for the construction sector) to ensure the respect of OSH laws and regulations.

Dr. Anders Englund, Medical Director of Bygghalsan from 1968-1993, receives the ICOH-C Lifetime Achievement Award from Drs. KN Sen, chair, and K. Ringen, past chair, Carpi, Italy, October 2024, in recognition of his contribution to the introduction of science-based approaches to construction safety and health. Under his leadership Bygghalsan established occupational risks for numerous exposures including lung diseases and cancers, musculoskeletal disorders, hearing loss, and mental stress, and measured the effectiveness of different prevention measures. Dr. Englund was a contributing editor to AJIM from its inception.

FIGURE 1 | The contribution of Dr. Anders Englund.

- Public clients must check the respect of OSH regulation in order to prevent accidents and to get the best out of public money.

In follow-up, ISSA-C held its 30th International Symposium in Boston in October 2012, which set new and ambitious benchmarks for safety and health performance, and focused on best practices to anticipate and prevent risks as the most important means to achieve them. The resulting *Declaration of Boston* [16] listed the following actions to be of particular importance:

- Active dedication to sustainable work and development by the owner/client.
- Careful attention to safety, health, and environment during the design, planning, procurement, and construction phases, including the life-cycle of the structures.
- Strong integration of safety and health staff in all aspects of the construction process.
- Recognition and accommodation of a diverse and multicultural workforce.
- Mandatory safety and health leadership training for all supervisors, and mandatory safety and health training for all workers.
- Empowerment of all workers to enforce safety and health, including strong support for young and vulnerable workers.
- Involvement of the regulator in all aspects of the planning and construction phases, and the extensive use of a safety case approach to prevent risks.
- Continuous monitoring recordkeeping of safety and health performance measures, including hazardous occurrences, injuries and illnesses, and taking corrective actions immediately when indicated.

Following a period of interruption due to the 2008–2010 international economic collapse and the 2019–2020 Covid pandemic, ISSA-C convened its 31st International Symposium in Berlin, Germany, in June 2022. It focused on achieving the *Vision Zero* objective that had been launched 5 years earlier (more on that below). The resulting *Declaration of Berlin* [17] concluded that vast changes had occurred in the [last] decade, including:

- Much greater recognition that risk is not distributed evenly but rather is concentrated among employers and workers with limited skills, experience, and safety and health resources.
- More attention should be given to gender-specific and multi-cultural needs on construction sites.
- Significant globalization of construction, with continued exploitation of migrant workers.
- Introduction of digitalization and new management practices have created new opportunities and challenges.
- The COVID-19 Pandemic, resulting in opportunities to institutionalize many new practices favorable to workplace safety and wellbeing.
- A significant increase in mental health indicators supports the need for greater awareness of stress and psychological fatigue among construction workers.

4 | Progress and Setbacks

Over the past 35 years, we have seen remarkable development in construction safety and health globally. Less-developed parts of the world, including South Asia and Africa, have exhibited a growing interest in improvements, and ISSA, together with ILO, responded to this by publishing a basic guide to safety and health, which is non-verbal and relies on pictures for illustration of best practices [18]. More women are now engaged in this field, both in research and in practice. And increasingly, a welcome change in research emphasis from epidemiology and outcomes to engineering and prevention is taking place. In addition to this, there has been a growing awareness of mental health risks arising from, or adversely affected by, workplace conditions. These shifts are evident when we compare this compendium to the ones referenced above.

However, we also have witnessed setbacks. The economic collapse in 2008–2010 led to 20%–30% of workers and employers disappearing from the industry in many countries. Then, when the economy recovered, many new and inexperienced companies and workers moved in to fill the gap left behind, which resulted in a spike in injury rates and general reversal in the progress that had been made [19].

To counteract this development, as the global economy recovered, in 2017 the ISSA Special Commission on Prevention adopted a new *Vision Zero* campaign (visionzero.global), noting that occupational injuries and illnesses are preventable. In 2022, ISSA-C published a *Vision Zero* guideline specific to the construction industry, building on the seven rules of the *Vision Zero* movements (see Table 1) and the previous ISSA-C Declarations, "[taking] into account the main features of the construction industry, such as the temporary and unique nature of construction, the multiplicity and diversity of stakeholders, multicultural labor and coactivity issues, outsourcing as well as construction project management and contracting... Preventing professional accidents or diseases during the entire life cycle of a building (design, construction, use, and demolition) is paramount for a guide approaching issues and solutions related to the construction sector. A focus should be set on the role of

TABLE 1 | Seven rules of *Vision Zero* for enterprises and worksites.

1.	Take leadership—Demonstrate commitment
2.	Identify hazards—Control risks
3.	Define targets—Develop programs
4.	Ensure a safe and healthy system—Be well-organized!
5.	Ensure safety and health in machines, equipment and workplaces
6.	Improve qualifications—Develop competence
7.	Invest in people—Motivate by participation

each player, at first on the customer/buyer or developer, who must invest in prevention of occupational risks for all employees on a construction site. The architect or project manager, in charge of a project, should also include the prevention of such risks in the development/design of the product." [20].

5 | The Focus of the Current Issue

Because so much has transpired over the past decade, in 2023, we decided to issue a global invitation to submit articles for inclusion in a new construction safety and health research compendium. The objective was to assess the state of knowledge about the safety and health of construction workers and how well the industry is protecting its workforce, with the aim of documenting:

- How much improvement in construction safety and health there has been over the past 30 years.
- Current developments in construction safety and health.
- The broad range of research internationally.

While we may not have achieved each of these objectives fully, the result is impressive. Having received more than 40 abstracts, we ended up selecting those included based on quality and coverage of the broadest range of topics. The commentaries at the start reflect where we are and aspirations for where we may go. The research articles that follow reinforce the facts that construction remains hazardous in comparison to most other industries, planning for safety and health is too often inadequate, old risks (asbestos) remain in place while others (nanomaterials, mental ill-health) are emerging, new technologies (such as AI) have tremendous potential, and—most importantly—the human factor must always be at the forefront.

Author Contributions

All authors contributed to the conceptualization and preparation of the manuscript and approved its final version.

Acknowledgments

We thank the other members of the board of ISSA-C for their support for this special issue: Marie Diallo, Caisse de Sécurité Sociale, Senegal; Paul Duphil, OPPBTB, France; Roberto Morrison Yonge, Cámara Chilena de la Construcción, Chile; Prof. Pieter van Gelder, Delph Technical University, The Netherlands; Fabrice Meeuw, Constuctiv, Belgium; Jeon Jae Park, Korean Occupational Safety and Health Agency, Republic of Korea; and the following members of the ISSA-C Secretariat: Petra Jackisch, Bernd Merz, and Svenja Birkenfeld. We also thank CPWR—The Center for Construction Research and Training, and Chris Trahan Cain, Rick Rinehart, Sue Dong and Trish Quinn for supporting the preparation of the special issue. Funded by the National Institute for Occupational Safety and Health through cooperative agreement number UH60 009762.

Disclosure

The contents of this article are solely the responsibility of the authors and do not necessarily represent the official views of the authors' institutions.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

References

1. M. Kranzenberg and M. T. Hannan, "History of the Organization of Work," Encyclopedia Britannica, 2023, https://www.britannica.com/money/history-of-the-organization-of-work.

2. R. Elling, *The Struggle for Workers' Health: A Study of Six Industrialized Countries* (Baywood Pub. Co, 1986).

3. DGUV, *Die Geschichte der gesetzlichen Unfallversicherung - ein Rückblick*, https://www.dguv.de/de/mediencenter/hintergrund/125_jahre/index.jsp.

4. M. Greenberg, "Biological Effects of Asbestos: New York Academy of Sciences 1964," *American Journal of Industrial Medicine* 43 (2003): 543–552.

5. M. Johansson, M. Nygren, and L. Berglund, "The Changed Relations Between the Construction Industry and Occupational Health Services," *Work* 67 (2020): 903–915, https://doi.org/10.3233/WOR-203341.

6. A. Englund, "Swedish Approach to Industry-Wide Studies: The Construction Industry," *Annals of the New York Academy of Sciences* 653 (1991): 313–315.

7. C. Maltoni, "Occupational Carcinogenesis," *Annals of the New York Academy of Sciences* 271 (1976): 1–513.

8. "Health Hazards of Asbestos Exposure," *Annals of the New York Academy of Sciences* 330 (1979): 1–811.

9. A. Englund, K. Ringen and Mehlman, eds., *Occupational Health Hazards of Solvents* (Princeton Scientific Publishing Co, 1986).

10. B. Järvholm and A. Burdorf, "Emerging Evidence That the Ban on Asbestos Use Is Reducing the Occurrence of Pleural Mesothelioma in Sweden," *Scandinavian Journal of Public Health* 43, no. 8 (2015): 875–881, https://doi.org/10.1177/1403494815596500.

11. G. Rosen, *A History of Public Health* (MD Publications, 1958).

12. K. Ringen, A. Englund, L. Welch, J. L. Weeks, and J. L. Seegal, "Why Construction Is Different," *Occupational Medicine (Philadelphia, PA)* 10, no. 2 (1995): 255–259.

13. C. Van Duivenboden, M. Frings-Dresen, and K. Ringen, "Construction Workers and Occupational Health Care," *Scandinavian Journal of Work, Environment & Health* 31 (2005): 1–116.

14. K. Ringen and J. Melius, "Construction Safety and Health," *American Journal of Industrial Medicine* 53 (2010): 551–653.

15. "ISSA International Section on Safety and Health in the Construction Industry," Declaration of Brussels, 2009, https://www.issa.int/sites/default/files/documents/administration/2Declaration_of_Brussels_en-35925.pdf.

16. "ISSA International Section on Safety and Health in the Construction Industry," Declaration of Boston, 2012, https://www.issa.int/sites/default/files/documents/prevention/2-Declaration-of-Boston_en-36154.pdf.

17. "ISSA International Section on Safety and Health in the Construction Industry," Declaration of Berlin, 2022, https://www.issa.int/sites/default/files/documents/202305/Declaration%20of%20Berlin.pdf.

18. "ISSA International Section on Safety and Health in the Construction Industry," Prevention Through Pictures in Construction, 2015, https://www.issa.int/sites/default/files/documents/prevention/wcms_383797-3-160736.pdf.

19. K. Ringen, X. S. Dong, L. M. Goldenhar, and C. T. Cain, "Construction Safety and Health in the USA: Lessons From a Decade of Turmoil," *Annals of Work Exposures and Health* 62, no. S1 (2018): S25–S33, https://doi.org/10.1093/annweh/wxy069.

20. "ISSA International Section on Safety and Health in the Construction Industry," Seven Golden Rules to Implement the Vision Zero Strategy: Guide for the Construction Industry, 2022, https://www.issa.int/sites/default/files/documents/2022-06/Vision%20Zero%20Guide%20for%20the%20Construction%20Industry.pdf.