The prospect of an accident. When construction fails...
Thematic dossier coordinated by Robert Carvais and Guy Lambert

The collapse of a building after several decades of use, or shortly after it has been put into service, or even during its construction, the failure of a structure under load, the disabling of a building due to damage to its networks, the dispersion or even explosion of its fluids,[1] a devastating fire,[2] the overturning of installations or site machinery, etc. Accidents are an invariable feature of the built environment and construction operations over the long term, as a number of recent examples tragically demonstrate:

- On 14 June 2017, following the explosion of a refrigerator, the Grenfell Tower block of flats in London caught fire, killing 72 people. Expert reports point to the presence of combustible materials in the facade panels and insulation, poor design of the cladding, and in short, to a record of disastrously inadequate maintenance.
- Reflecting the callous state of disrepair of social housing in the area, on 5 November 2018, the collapse of two buildings in the Rue d'Aubagne in Marseille caused the death of 8 people and the evacuation of thousands of local residents. The unhealthy conditions of social housing raise the question of adherence to the principle of human dignity in France.
- On 5 November 2015, in Mariana, in the state of Minas Gerais, Brazil, two mining dams collapsed one after the other, releasing 60,000 cubic metres of sludge containing a mixture of products including heavy metals (lead, mercury...) into the Rio Doce. On 28 January 2019 another dam burst in Brumadinho causing the deaths of more than 300 people. The mining group Vale is on trial for multiple failures and negligence in maintenance.
- On 14 August 2018, the partial collapse of the bridge crossing the city of Genoa killed at least 42 people. However, as Tullia Iori points out, we are entitled to question the sources available for our investigations as construction historians.[3]

Accidents in the construction industry vary greatly in nature and scope. Although the most spectacular or most deadly accidents attract attention because of their striking character, if they are to be studied as opportunities to understand "why buildings fall down" (to borrow an expression from the title of a book by Mario Salvadori),[4] these episodes deserve to be explored in a historical perspective in a more systematic way than they generally have been.

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[1] Roland Recht, "L'effondrement d'une cathédrale au Moyen-Age: calamités et progress", in *L'homme face aux calamités naturelles dans l'Antiquité et au Moyen Age*, Paris, Académie des Inscriptions et Belles-Lettres, 2006, p. 135-163; Odile Jurbert, "L'effondrement des Archives de Cologne: bilan et perspectives (mars 2009-mai 2011)", *La Gazette des archives*, n° 223, 2011-3, p. 5-35; Joachim Scheer, *Failed Bridges: Case Studies, Causes and Consequences*, Berlin, Ernst & Sohn, 2010; Martina Russo, "The collapse of the Tucker's Gym: Research Impulses in the USA at the End of Hypar Shells Era", in João Mascarenhas-Mateus and Ana Paula Pires (eds), *History of Construction Cultures*, Leiden, CRC Press/Balkena, 2021, vol. 1, p. 392-399.

[2] Alkatarina M. Chalvatzi, "Transition from Wood to Iron in French Theatre Structures: A New Construction System", in João Mascarenhas-Mateus and Ana Paula Pires (eds), *op. cit.*, vol. 1, p. 669-676; Boris Hamzeian, "The '3-dimensional wall' of the Centre Pompidou in Paris: Invention and Evolution of a Polyvalent Device", in João Mascarenhas-Mateus and Ana Paula Pires (eds), *op. cit.*, vol. 1, p. 632-639 (fire regulations). On the burning of places of worship, see issue 11 of *Ædificare* (forthcoming).

[3] Tullia Iori, "Problems of sources and bridges", in João Mascarenhas-Mateus and Ana Paula Pires (eds), *op. cit.*, vol. 1, p. 424-429.

[4] Mario Salvadori and Matthys Levy, *Why Buildings Fall Down: How Structures Fail*, New York, W.W. Norton & Company inc., 1992; expanded edition 2002.

Far from being exceptional events, they are in fact a regular occurrence in the life of constructions.[5]

In this field, the accident can be defined as the unexpected and unfortunate irruption of events that damage all or part of a building and/or the operations linked to its construction.[6] Distinct from a catastrophe[7] – which has a completely different scale of causes and effects – but much larger than a degradation or malfunction, the accident stands out because of the extent of the damage and its disruptive character affecting a specific place or operation. Whether it is more or less serious with regard to the extent of the damage, and whether or not it causes victims (injured or killed) among workers, users or local residents does not alter its essential nature, which is that it is always sudden and fortuitous, and often felt to be violent. But from another perspective, can we not consider that the mechanics of the accident are already in motion as soon as the first warning signs appear (cracks, creaks, rust, etc.)? It should also be recalled that accidents can arise from the vicissitudes of practices, from routines that have not been re-evaluated, from maintenance that has not been carried out or that has been carried out incorrectly or incompletely.

Owing to their unexpected, unwelcome and even sometimes intolerable nature, these events lead to a documentary production proportional to their importance, including of a media, technical and legal nature, thus providing a wealth of sources for considering the history of construction from a different angle. The search for causes and responsibilities reveals, in retrospect, the multitude of material and human realities: design errors or errors in evaluating the conditions of execution, hazardous manoeuvres, technical failures, lax supervision or maintenance, climatic events, earth movements, etc. However, it would be a mistake to try to distinguish too clearly between external and internal causes, since the accidental is so intrinsic to the very act of building, to the materiality of objects and practices. It is clear that the number of possible accidents is increasing globally as the technical requirements and complexity of industrialised societies increase.[8]

Accidents and, by extension, the awareness of risk that they bring to light have a different impact on the practices and production cultures of the various actors – the building and public works sector is still viewed as one of the sectors most seriously affected by accidents at

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[5] The topic of accidents seems to have recently acquired a new momentum, on the evidence of discussions at the national and international construction history congresses, which reflect the state of current research in the world, and which have brought together numerous works that address this theme. Looking only at the 7th and most recent international congress, which took place last July in Lisbon, the proceedings (running to more than 1600 pages) contain 89 occurrences of the word “accident”, but also 259 mentions of “collapse” and 357 occurrences of the word “fire”. About 20 articles are concerned with the topic, the majority of which are case studies, but others undertake a more fundamental reassessment of the issue of accidents in construction.

[6] Etymologically, since as early as the 12th century, the word “accident” has referred to a situation that occurs suddenly and by chance and leads to damage. The association of the word with an unfortunate aspect might not seem to have been self-evident, yet whereas an event can be happy or unhappy, the accident always seems to be negative.

[7] François Walter, *Catastrophes: une histoire culturelle (XVIe-XXIe siècle)*, Paris, Éditions du Seuil, 2008.

[8] Paul Virilio, *Ce qui arrive*, Paris, Édition Fondation Cartier pour l’art contemporain, 2002; Jean Richer, “Paul Virillo, l’accident comme ressource immatérielle”, [online] *Les Cahiers de la recherche architecturale urbaine et paysagère*, n° 11, 2021; Guy Lambert and Olivier Raveux (eds), *Pannes et accidents (XIXe-XXIe siècle). Au cœur de l’économie, des techniques et de la société, Artefact*, n° 11, 2019.

work.[9] To what extent does this disparity reflect the essentially transitory and momentary nature of construction activities? If, as in any productive activity, it results in tensions, or even conflict, which involve civil society and the public authorities either as protagonists or arbitrators,[10] how are these tensions expressed in the construction field?

Three lines of questioning are proposed for this issue of the journal *Aedificare*:

- **The accident as a revelation of an phenomenon that would remain invisible without this disruptive episode**. The mass of archives generated by **the search for causes and responsibilities** tends to shed light on the interrelationships between actors and the workings of processes that usually remain in the shadows of daily practices.[11] What is the role of the experts called upon to perform this task? What sources do they have beyond the ruins of the damaged or even destroyed building? These sources can include the traces of the original construction site, from contracts to iconographic representations (plans, photographs, films), including the activities of the building expert *ex ante* or *a posteriori*.[12] In which directions should research be undertaken: should inquiries lead from the technical domain to the political domain, which is often closely connected to the economic aspects of the project?

- **Immediate and emergency management of the consequences of an accident**. Devising ways of securing the broken or ruined building, its surroundings or the building site, clearing away rubble without further endangering any victims, and intervening on an unstable site or structure are activities that call for specific skills,[13] whether or not these are specific to actors in the construction world.[14] The Notre-Dame de Paris security and reconstruction site

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[9] Nicolas Jounin, *Chantier interdit au public: enquête parmi les travailleurs du bâtiment*, Paris, Éditions la Découverte, 2008; Catherine Denys, "La mort accidentelle à Lille et Douai au XVIIIe siècle: mesure du risque et apparition d'une politique de prevention", *Histoire urbaine*, n° 2, 2000, p. 95-112; on the field of construction, see p. 105-106; Valérie Nègre, "Quatre accidents saisis sur le vif", in Valérie Nègre (ed), *L'art du chantier: construire et démolir du XIXe au XXIe siècle*, Paris, Cité de l'architecture et du patrimoine, 2018, p. 108-113; see, more generally, François Ewald, "Formation de la notion d'accident du travail", *Sociologie du travail*, vol. 21, n° 1, 1981, p. 3-13, and Rémi Lenoir, "La notion d'accident du travail: un enjeu de lutes", *Actes de la recherches en sciences sociales*, vol. 32-33, April/June 1980, p. 77-88.

[10] Catherine Omnès, "De la perception du risque professionnel aux pratiques de prévention: la construction d'un risque acceptable", *Revue d'histoire moderne & contemporaine*, n° 56, 2009-1, p. 61-82; David Niget and Martin Petitclerc (eds), *Pour une histoire du risque*, Québec, France, Belgique, Rennes, PUR, 2012; Thomas Le Roux (ed), *Risques industriels: savoirs, régulations, politiques d'assistance, fin XVIIe-début XXe siècle*, Rennes, PUR, 2016; Grégory Quenet, *Les tremblements de terre aux XVIIe et XVIIIe siècles: la naissance d'un risque*, Seyssel, Champ Vallon, 2005.

[11] R. Pereira, A.B. Menegaldo and J. Fernandes, "Modernization of Civil Construction in Brazil in the Second Half of the 19th Century: Strategies of a Local Entrepreneur", in João Mascarenhas-Mateus and Ana Paula Pires (eds), *op. cit.*, vol. 1, p. 471-478 (about a contractor who is not responsible for an accident); Daniel Friedman, "Private Responsibility for Public Safety: The Case of Charles Buddensiek", in João Mascarenhas-Mateus and Ana Paula Pires (eds), *op. cit.*, vol. 2, p. 500-506 (on the story of a scapegoat).

[12] Michela Barbot, Robert Carvais, Emmanuel Château-Dutier and Valérie Nègre, "Maintaining/Repairing Paris through Expertise (1690–1790)", in João Mascarenhas-Mateus and Ana Paula Pires (eds), *op. cit.*, vol. 1, p. 166-175.

[13] Anne Dietrich, Jérôme Riberot and Xavier Weppe, "Le dessin opérationnel à la brigade de sapeurs-pompiers de Paris: l'improbable histoire d'une ressource organisationnelle", *Annales des Mines – Gérer et comprendre*, n° 133, 2018-3, p. 3-12.

[14] Although shoring and "reinforcement" work are part of the domain of architects devoted to heritage, the implementation of these devices must also counteract the ruin of the building: Georges Duval, *Restauration et réutilisation des monuments anciens: techniques contemporaines*, Liège, Mardaga, 1990, p. 17-20; Florence

currently provides an illustration of this every day, with the involvement of scaffolding companies, stonecutters, carpenters, researchers, etc. Rescue workers may also have to rehouse survivors, or even build them a temporary home. How has this constraint been addressed historically?

- **Prevention and risk culture.** While the risk of accidents is a reality of which industrialised societies have become increasingly aware, construction professionals are also familiar with it, in the field of both physical and technical damage. Questioning the causes of an accident is often the first step towards preventing other occurrences, through legal, economic and even social means, practical actions of control and surveillance, and the setting up of expert appraisal and recurrent maintenance.[15] Have construction regulations only tended to become stronger, tougher or more effective by rethinking the methods to be applied beyond the imposition of constraints?[16] Should we not also question the foundations of risk, that is to say, the nature of situations of uncertainty?[17]

The accident remains a human tragedy, but the knowledge acquired through these episodes remains fundamental in the framework of engineering studies.[18] In this regard, the history of construction offers a particularly valuable perspective, since it allows a fine appreciation of the mechanisms of the art of building across time in all its scientific and technical but also social dimensions.[19]

Contenay, Benjamin Mouton and Jean-Marie Pérouse de Montclos, *L'École de Chaillot. une aventure des savoirs et des pratiques (Architecture et patrimoine)*, Paris, Éditions des cendres/Cité de l'architecture et du patrimoine, 2012.

[15] Charles Davoine, Maxime L'Héritier and Ambre Péron d'Harcourt (eds), Sarta Tecta*: de l'entretien à la conservation des édifices, Antiquité, Moyen Âge, début de la période moderne*, Aix-en-Provence, Presses universitaires de Provence, Centre Camille Jullian, 2019. See in particular Charles Davoine's study on the rich vocabulary of Roman law for designating the causes of constructive damage. See also Stefania Mornati and Ilaria Giannetti, "The Role of Construction History in Safety Assessments: A Case Study of Reinforced Concrete 'Gerber' Bridges in Italy", in João Mascarenhas-Mateus and Ana Paula Pires (eds), *op. cit.*, vol. 1, p. 416-423.

[16] Sara Wermiel, *The Fireproof Building: Technology and Public Safety in the Nineteenth Century American City*, Baltimore, The Johns Hopkins University Press, 2000; Davide Prati, Giorgia Predari, Angelo Massafra and Bruno Salmi, "A Reinforced Concrete Stage Tower within a 18th-Century Masonry Theater: The Municipal Theater of Bologna", in João Mascarenhas-Mateus and Ana Paula Pires (eds), *op. cit.*, vol. 1, p. 726-733; Rocio Maira Vidal, "Geometry and Construction of the Severies of the Vaults in the Cathedral of Notre Dame de Paris", in João Mascarenhas-Mateus and Ana Paula Pires (eds), *op. cit.*, vol. 2, p. 341-348; Nigel P. Isaacs, "Building Controls in New Zealand: A Brief History, 1870 to the 1930s", in João Mascarenhas-Mateus and Ana Paula Pires (eds), *op. cit.*, vol. 2, p. 493-499; Tom W. Leslie, "'Dry and Ready in Half the Time': Gypsum Wallboard's Uneasy History", in João Mascarenhas-Mateus and Ana Paula Pires (eds), *op. cit.*, vol. 2, p. 682-687.

[17] Robert Carvais and Valérie Nègre, "Présentation du numéro", *Aedificare*, n° 7, 2020-1, p. 16-27 (in English, p. 32-43).

[18] Dermot W. O'Dwyer, "The Potential Roles of Construction History in Engineering Education", in João Mascarenhas-Mateus and Ana Paula Pires (eds), *op. cit.*, vol. 1, p. 403-409.

[19] Lorenzo Grieco and Maria Grazia d'Amelio, "Between Academy and Practice: Adriano Galli and the Prestressed Water Bridge over the Casilina in Mignano Montelungo (1954)", in João Mascarenhas-Mateus and Ana Paula Pires (eds), *op. cit.*, vol. 1, p. 578-585 (written in memory of the author's father, who narrowly escaped an accident and death); Valérie Theis, "Des hommes, des ponts et des drames", *Le Monde*, 8 September 2018, p. 6.

Articles may be written in any of the following languages: French, Italian, English, Spanish, German and Portuguese. As a guideline, they may be between 30,000 and 60,000 characters long (spaces included) / between 5.000 and 10.000 words.

We welcome both case studies and in-depth reflections on any periods and geographical areas from a historical perspective, including immediate history. Proposals for articles should include a title and an abstract of approximately 2,500 characters (spaces included) or 400 words, as well as the author's contact details (surname, first name, position and institutional affiliation, e-mail, postal address). They should be sent before 15 February 2022 to rcarvais@noos.fr and guy.lambert@paris-belleville.archi.fr

The proposals will be examined and selected by the coordinators of the dossier. As for the articles themselves, each will be assessed by two referees appointed by the editorial board of the journal *Aedificare*.

Timetable:

- 15/02/2022: submission of proposals by authors

- 01/03/2022: notification of acceptance of proposals

- 31/08/2022: submission of articles by authors

- 30/09/2022: transmission of peer reviews to authors

- 31/10/2022: submission of the final articles

- early 2023: publication of the dossier