Doctoral Dissertation
Doctoral Program in Architecture. History and Project (33th Cycle)

The Icelandic Concrete *Saga*

Architecture and Construction (1847–1958)

Sofia Nannini

* * * * * *

Supervisors

Prof. Sergio Pace, Supervisor, Politecnico di Torino
Prof. Atli Magnus Seelow, Co-Supervisor, Friedrich-Alexander-Universität Erlangen-Nürnberg
Prof. Alberto Bologna, Co-Supervisor, Politecnico di Milano

Doctoral Examination Committee:

Prof. Mario Carlo Alberto Bevilacqua, Referee, Università degli Studi di Firenze
Prof. Guðmundur Hálfdanarson, Referee, University of Iceland
Prof. Antonello Alici, Università Politecnica delle Marche
Prof. Michael Asgaard Andersen, Aarhus School of Architecture
Prof. Thomas Leslie, Iowa State University

Politecnico di Torino
February 22, 2021

I hereby declare that, the contents and organisation of this dissertation constitute my own original work and does not compromise in any way the rights of third parties, including those relating to the security of personal data.

Sofia Nannini

Sofia Nannini
Turin, February 22, 2021

Summary

When inaugurating the first and only Icelandic cement plant in 1958 in the village of Akranes, the Minister of Industry Gylfi Þorsteinsson Gíslason (1917–2004) claimed that “many people would say that a land without building materials is uninhabitable”. By 1958, not only had Iceland become inhabitable enough, but the country had also acquired its political independence from Denmark and a material independence from the rest of the world. Concrete had already become the most popular building material on the island and Iceland was now going to produce its own cement. More than one century before, in 1847 cement was first employed as plaster on the walls of the cathedral of Reykjavík. However, until the turn of the century the majority of rural and urban dwellings were still being built out of local turf or expensively imported timber. There were only a handful of public buildings in stone and lime; their construction was overseen by Danish architects and builders. After a few decades, Icelandic engineers, architects and mastermasons were building their country exclusively in concrete. How did this technique become so popular to the point that the first decades of the twentieth century are referred to as “the age of concrete” by Icelandic historiography? This research traces the presence of cement and concrete in a very peculiar architectural and construction history at the edges of the European continent: the story of an architecture in constant struggle with material shortage and the natural elements; its outcomes intertwined with Icelandic politics, culture and society.

Acknowledgments

This research could not have been possible without the vital help of those who have supported me along the way. First of all, I would like to thank professor Sergio Pace, who has welcomed me with open arms into Politecnico di Torino. The completion of this thesis is largely indebted to Atli Magnus Seelow, who has enthusiastically accepted to oversee my work when I contacted him out of the blue and I knew almost nothing about Icelandic history. He has guided me for three years and given me precious support and knowledge, for which I am infinitely grateful. I am thankful to Alberto Bologna for his constant advice on our shared interests and for his enthusiasm regarding my work. My gratitude goes to those at Politecnico di Torino who followed my progress each year, especially professors Edoardo Piccoli and Marco Trisciuoglio. I am grateful for their support and for having involved me in many exciting side projects. A heartfelt thanks to professors Francesca Frassoldati, Filippo De Pieri, Matteo Robiglio, for having read the draft of my work and for their valuable comments. This thesis is the result of a research conducted in many archives located in Reykjavík. I would like to thank the staff at the National Archives of Iceland, namely Benedikt Eyþórsson, Helga Hlín Bjarnadóttir, Kristjana Vigdís Ingvadóttir and Kristinn Valdimarsson. I could not have gotten far without their patience and constant help. I would like to thank the staff at the National and University Library of Iceland, especially those working at the Icelandic National Collection and at the Manuscripts and Private Archives. I would also like to thank the staff at the Reykjavík City Archives, namely Andrés Erlingsson and Margrét Hildur Þrastardóttir. I am grateful to Sigríður Melrós Ólafsdóttir, former director of the Einar Jónsson museum, for her help during my research on Einar Jónssons's papers. A warm thanks to the staff at the National Museum of Iceland, especially Kristín Halla Baldvinsdóttir of the Photographic Collection and Gróa Finnsdóttir of the National Museum Library. I would also like to thank Unnur Lárusdóttir and Guðrún Þóra Garðarsdóttir at The Icelandic Road and Coastal Administration for their kind help in finding important archival records. This research was also conducted in many institutions far from Reykjavík: I am grateful to the staff of the British Library and the RIBA Library in London; to the staff of the Danish National Art Library and the Royal Library in Copenhagen; to the staff of the Kunsthistorisches Institut in Florence and of the Bibliotheca Hertziana in Rome. I am especially grateful for the virtual help of those who kept working tirelessly despite the hardship of the current Covid-19 pandemic, especially the staff of the Biblioteca Centrale d'Architettura and of the Biblioteca di Storia ed Analisi dell'Architettura at Politecnico di Torino, of the Biblioteca di Studi Umanistici at the University of Pavia and of the Biblioteca di Architettura at the University of Florence. I am also indebted to Laila Zwilser and Louise Karlskov Skyggebjerg from the Technical University of Denmark: unfortunately the current pandemic did not let us meet, but I can't forget their generous help. This work is also the result of many conversations I shared with friends and colleagues between Iceland and Italy. I would like to thank Gunnar Óskarsson and his wife Guðfinna for our talks and dinners; Pétur H. Ármannsson for having shared his knowledge on Icelandic architecture and the work of Guðjón Samúelsson; professor Már Jónsson for his assistance during my Erasmus+ stay at the University of Iceland; engineer Guðmundur Guðmundsson for his help in regards to concrete production in Iceland; professor Massimo Santanicchia from the Iceland Academy of the Arts for the time he has devoted to me during my first research stay in Reykjavík; urban experts Bjarni Reynarsson and Haraldur Sigurðsson for their time and suggestions. I am especially grateful to Erla Dóris Halldórsdóttir, my guardian angel at the archives, who supported me despite my broken Icelandic and always cheered me up. I would like to thank Icelandic-Italian translator Silvia Cosimini for her support since the very beginning and her precious reading suggestions, and professor Mario Bevilacqua from the University of Florence for his interest towards my work. I am extremely thankful to my colleagues and friends in Bologna, particularly to Micaela Antonucci, Luigi Bartolomei, Luca Gullì, Elena Pirazzoli, Enrica Sangiovanni and Gianluca Guidotti. I would like to thank Alberto Colella, ambassador of Italy in Norway and Iceland, for the kind words he has written about my research. My endless gratitude goes to my Icelandic teachers, who made the most difficult language easy and accessible: Ólafur Guðsteinn Kristjánsson and Gísli Hvanndal Ólafsson. *Takk kærlega*. I would like thank Eygló Harðardóttir for her amazing hospitality in Reykjavík. Thanks to all those who hosted me in Torino throughout the years: Patrizia Dante and Renato Correggia, Luca Gibello and Adele Muscolino, and most of all Federica and Valentina Aresu and their amazing mother Gabriella Fazio, gone way too soon. You made me feel at home. Iceland has given me many friends: I would like to thank Arlène Lucianaz for our great time exploring Reykjavík together and for the time she spent taking precious photographs for me; Jakob Maríasson for his help as expert *múrari*; all the friends met while studying the Icelandic language – Ivan Pelegrin, Nico Borbély, Carolina Weps, Louise De Vries, Maarit Intke, Sonja Greiner. We had a lovely time and I have learned from you more than I could imagine. I will be forever grateful to my dear friend Suzanna Reiss-Koncar, who has proofread this work, and also many other articles, and supported me since day one. My PhD years would not have been rich and intense without my colleagues at Politecnico di Torino: one above all, Marianna Gaetani, who has taught me the importance of hard work and the beauty of details. Thank you to all my friends who have encouraged me over the years, especially to those who travelled around Iceland with me, visiting farmhouses, old concrete bridges and museums: let's travel again when we can. The joys and struggles of this research were shared daily with Lorenzo Fecchio, whose *Lebenskünstler* attitude to life is a continuous source of inspiration. I can't wait to share more adventures with you in the future. Lastly, my warmest gratitude goes to my family: to Margherita Nannini, Luigi, Simone and Serena Manfrini; to my grandmother, who has followed all my travels pointing her fingers on an old map of Europe; and to my parents Maria Cristina Masarà and Roberto Nannini, who have always believed wholeheartedly in what I was doing.

Notes on Icelandic pronunciation:

Á/á [au] – as in "all**ow**"
Ð/ð (eð/eth) – "**th**" as in "**th**e", "wea**th**er"
Þ/þ (þorn/thorn) – "**th**" as in "**th**in", "**th**ick"
Æ/æ [ai] – "**i**" as in "**I**" or "H**i**"

Note: Icelandic names are always referred to with full names, the last name being usually a patronymic [*–son, –dóttir*]; when not specified, all translations in the document are by the author.

Abbreviations

BR = Borgarskjalasafn Reykjavíkur [Reykjavík City Archives]
Lbs = Landsbókasafn Íslands [National and University Library of Iceland]
LEJ = Listasafn Einars Jónssonar [Einar Jónsson Museum]
ÞÍ = Þjóðskjalasafn Íslands [National Archives of Iceland]

Contents

Introduction 1

1. From Turf to Concrete: Construction in Iceland in the Second Half of the Nineteenth Century (1847–95) 23

1.1 Inhabiting and Exploring Iceland: Between Turf and Minerals 26
1.1.1 One thousand years of Icelandic turf houses 26
1.1.2. Icelandic pozzolana: Geological surveys in Iceland (1820–42) 36

1.2 A Building Education: Learning from Denmark (1847–95) 39
1.2.1 A bigger cathedral for Reykavík: The first application of Portland cement (1847) 40
1.2.2 Lava, lime mortars and concrete: Education and production (1859–81) 45
1.2.3 The Icelandic invention of concrete (1876–95) 57

2**. *Steinsteypuöldin*: The Age of Concrete (1899–1915)** 73

2.1 A Generation of Pioneers: The First Icelandic Engineers 73
2.1.1 Sigurður Pétursson's survey on building techniques (1899–1901) 76
2.1.2 An engineer's business: Knud Zimsen's trading adventures (1903–13) 89
2.1.3 Jón Þorláksson's scientific concrete 106
2.1.4 Icelandic adventures in reinforced concrete 121
2.1.5 The foundation of the Icelandic Engineers' Society (1912) 149

2.2 New Rules and Public Buildings in Reykjavík 154
2.2.1 The last Danish buildings (1899–1909) 154
2.2.2 The sanatorium in Vífilsstaðir (1908–10) 172
2.2.3 The first building code for Reykjavík (1903–15) 181

3. Into the Icelandic Landscape: Concrete and Farmhouses 193

3.1 Projects for the Countryside (1790–1898) 194

3.2 Towards Concrete Farmhouses 203
3.2.1 Guðmundur Hannesson: The hygiene of concrete 205

3.3 Between Tradition and Modernity 209

3.4 The Design of Concrete Farms on a National Scale 219

4. Icelandic State Architecture: How Concrete Built a Nation (1916–50) 245

4.1 Urban Concrete: Architecture in Reykjavík 246
4.1.1 Concrete classicism 248
4.1.2 Reinforced concrete in Iceland: A slow development 252

4.2 Eclectic Concrete by State Architect Guðjón Samúelsson (1915–50) 257
4.2.1 Traditional architecture in concrete 265
4.2.2 Concrete to mould the Icelandic landscape 279

4.3 Geology and the Surface of Concrete 306
4.3.1 The other side of concrete:
Excursus on formworks in Iceland (1876–1944) 306
4.3.2 Winter is coming: The origins and decline of *steining* (1930–50) 313

4.4 The End of an Era: Architecture and Construction After 1944 329
4.4.1 Epilogue: When Iceland became inhabitable 342

Conclusions 347

References 367

Introduction

I first visited Iceland in winter 2016, taking part in a ten-day photographic journey with talented photographers and enthusiastic travelers from Italy. My trip was prompted by Jorge Luis Borges's poems on Iceland and the Icelandic language, which I had read since I was in high school, and by an almost legendary idea of the island as the *Ultima Thule*. In my mind, Iceland was a land yet to be discovered in the remote North Atlantic Ocean, full of monsters and wonder as in Abraham Ortelius's *Theatrum Orbis Terrarum*. Back then, Icelandic architecture was not in my mind – all I sought were snow-capped mountains, endless horizons and the possibility to practice my basic Icelandic. If I had to imagine Icelandic buildings, however, I would have envisioned some red wooden cottages, like the ones I had seen in Norway's Lofoten archipelago or on the island of Gotland; or perhaps low, grass-covered turf houses like those populating the Shire in the world of J. R. R. Tolkien.

We spent the first days in the West, between the Snæfellsnes peninsula and the national park of Þingvellir; we visited neither towns nor villages. Architecture was scant, and we slept in squared, modern cottages, covered with corrugated iron. We ate in restaurants near gas-stations. For a while I had the impression of being in North America. However, while traveling along the southern coast of the island, I started noticing an increasing number of farmhouses along the road, either inhabited or in ruins and sharing a common trait – they were all in concrete. My eyes were drawn to these buildings drowned in the snow, rather than by the surrounding mountains and glacier lagoons. As a result, while my travel companions were taking photographs of waterfalls and cliffs, I usually turned to the other way, picturing farms, stables and lighthouses. **Figg. 1–4.** When the journey ended I spent a weekend in Reykjavík, where I found evidence of my impressions about local building traditions: except for a few timber houses in the city center, covered with colored corrugated iron and resembling my memories of Scandinavia, Icelandic architecture was wholly in concrete. This was evident in both public and residential buildings, in the center and on the outskirts of the city. **Figg. 5–8.**

Fig. 1 – A concrete farm in Austur-Skaftafellssýsla, southern Iceland. Photo by Sofia Nannini, 2016.

Fig. 2 – Viðborðsel farmhouse, built in 1928 and abandoned in 1960, Sveitarfélagið Hornafjörður. Photo by Sofia Nannini, 2016.

Fig. 3 – House on the cliffs at Dyrhólaey, southern Iceland. Photo by Sofia Nannini, 2016.

Fig. 4 – Dyrhólaey Lighthouse, designed by engineers Thorvald Krabbe and Benedikt Jónsson and architect Guðjón Samúelsson, 1927. Photo by Sofia Nannini, 2016.

Fig. 5 – Residential area in Norðurmýri, Reykjavík. Photo by Sofia Nannini, 2016.

Fig. 6 – Eíriksgata, Reykjavík. Photo by Sofia Nannini, 2016.

Fig. 7 – Church of Hallgrímur [*Hallgrímskirkja*], detail, Reykjavík. Photo by Sofia Nannini, 2016.

Fig. 8 – The Einar Jónsson Museum, Reykjavík. Photo by Sofia Nannini, 2016.

I came back to Iceland six months later to attend a course in Icelandic at *Háskólasetur Vestfjarða*, the University Centre of the Westfjords. The course took place in the former school of Núpur, along the coast of the Dýrafjörð fjord, which I now know was one of the first concrete "district schools" built in the late 1920s. Back then my attention was focused on learning the language. However, before going home, I remember visiting the imposing church of *Hallgrímskirkja* in Reykjavík and thinking that I wished to know more about its bizarre concrete architecture: I googled it in search for quick information, and found almost nothing. I was disappointed and I said to myself that it would be fascinating to start a research project on Icelandic concrete architecture. **Figg. 9–10.** I knew nothing about Icelandic history and my first readings were the novels by Nobel laureate Halldór Laxness (1902–98). As I was reading about the modernization of the Icelandic countryside in Laxness's *Independent People*, I grasped the importance of concrete in Iceland in the first half of the twentieth century.

Three years later, during my research stay in Iceland in 2019, I visited the beautifully preserved farm of Burstafell, near the Vöpnafjörður fjord, in North Iceland. It is a typical turf farm, with wooden gables and soft, green grass that covers the roof. Its rooms are full of objects that belong to another era – photographs of its inhabitants, farming tools, buckets full of toys made of sheep bones and dirty wool. The timber floors creak as the visitors walk by, and although everything is now clean and in good order, it is not hard to imagine those same rooms full of people working and bending below the thick smoke coming from the burnt peat. After a tour around the sleeping rooms and the stables, our guide showed us what used to be the old kitchen and laundry room: a humid, dark, and cold room with the floor made of wet soil, and walls made of – as are all the other walls in the farm – several layers of turf blocks, one stacked on top of the other. Before moving forward in our visit, the guide stopped at the entrance of this room and said that this was the very spot of the house where one could grasp the clash of the times that had occurred in Icelandic history. She used, if I remember correctly, the Icelandic word *árekstur*, meaning collision. She was standing in the threshold of a doorway, and that doorway was halfway between a thick, wet wall of turf blocks, and a thinner, but damp concrete wall. Among all the objects that she could have picked to explain the drastic modernization process that took place in Iceland in the first decades of the twentieth century – she could have chosen the children's toys, the pieces of peat that were used as fuel, an old photograph of a young woman emigrating to America – she chose those two walls, one standing next to the other, one representing the long past of weak and vulnerable housing, the other symbolizing a promise for a better and more durable future. Turf and concrete were still standing together, and that was possible thanks to the fact that the farm had been protected by the National Museum of Iceland since the 1940s. **Figg. 11–13.**

Fig. 9 – District school in Núpur, Dýrafjörður, Westfjords. Photo by Sofia Nannini, 2016.

Fig. 10 – View of *Hallgrímskirkja* from the street of Skólavörðurstígur. Photo by Sofia Nannini, 2016.

Fig. 11 – Farmhouse (now museum) at Bustarféll, Vopnafjörður. Photo by Sofia Nannini, 2019.

Fig. 12a– Farmhouse (now museum) at Bustarféll, Vopnafjörður. Photo by Sofia Nannini, 2019.

Fig. 12b – Farmhouse (now museum) at Bustarféll, Vopnafjörður. Photo by Sofia Nannini, 2019.

Fig. 13 – Farmhouse (now museum) at Bustarféll, Vopnafjörður. The turf and concrete walls in the former kitchen and laundry room. Photo by Sofia Nannini, 2019.

Turf farms needed restoration works at every generation. A turf wall, in an abandoned turf house, would have lasted only a few years. This almost unnatural comparison between turf and concrete was the silent explanation of the century-long struggle that Icelanders faced in order to improve their housing conditions and, not less importantly, to create a twentieth-century Icelandic architecture. In opposition to the intrinsic weakness of turf and grass, the durability of concrete in the harsh Icelandic landscape made it possible to create something that had never existed before – a lasting architecture for its inhabitants. Turf houses make no ruins: if unused, they collapse, and are soon swallowed by the green landscape that surrounds them. This research seeks to be a historical narration of the people and events that changed the Icelandic building tradition between the mid-nineteenth and the mid-twentieth century; their wish to modernize the country, and the result of their efforts towards the construction of a local architecture in the middle of the North Atlantic Ocean.

Focus and scope

It is commonly known that the history of modern concrete, since its first trials in the mid-nineteenth century, has been a history shaped by a vast and eclectic group of professional builders and laymen alike, experts and amateurs, who all contributed to the rapid growth of the technique. The first discoverers of reinforced concrete, years before the rise of scientific calculation methods or patents, were a blended group of gardeners, doctors, enterpreneurs and engineers. Despite the inner modernity related to concrete and to the buildings it generated, its history of trial-and-error was also "wholly non-modern", as stated by architectural historian Adrian Forty.[1] The fascinating role that concrete played at the turn of the century, swinging from its unskilled applications to the birth of daring and complex structures, can be comprehensively described in the small case-study of Icelandic architecture and construction. Iceland's centuries-long physical and political isolation, paired with its harsh climate, is mirrored in a very peculiar architectural history. Since the mid-nineteenth century the Icelandic society experienced a slow and non-violent political struggle for autonomy and independence from the kingdom of Denmark, together with abrupt processes of modernization and urbanization. An essential debate was introduced into the country: how and what to build in order to overcome the backwardness of traditional turf architecture, and to represent Iceland as a new political entity. The difficulties in obtaining timber, due to a general lack of forests, the risks caused by fire, and the hardness of Icelandic rocks which hindered the development of stonemasonry techniques, indicated that a new material should be used to build a renovated Icelandic architecture – and that material, or process, was concrete.[2]

[1] Adrian Forty, *Concrete and Culture. A Material History* (London: Reaktion Books, 2012), 16.

[2] I acknowledge Forty's definition that concrete could be better described as a process rather than as a building material. However, throughout this dissertation, the term "material" is often used for the sake of clarity. See: Adrian Forty, "A Material without a History," in *Liquid Stone: New Architecture in Concrete*, edited by Jean Louis Cohen, and G. Martin Moeller Jr (Basel: Birkhäuser, 2006), 35.

This dissertation focuses on more than a century of Icelandic history of construction, architecture, and technology. In particular, it deals with the reception, development and praise of concrete as a building method, as well as its role in the evolution of Icelandic architecture. The extended timeframe of the research can be explained in relation to the slow advancement of building techniques in Iceland, which was hampered by the island's remoteness. This is a history made up of several, limited events; however, the spread of technical novelties and their impacts on Icelandic society and culture can only be perceived and analyzed in a long-term timeframe.

This text is divided into four chapters, ordered chronologically from 1847, when Portland cement was first used in the country, to 1958, the year when the first and only cement plant of the country was inaugurated. The first chapter traces the early development of stone and concrete architecture in Iceland throughout the nineteenth century, and lays the foundations for understanding how and when cement and concrete started spreading as available building materials and techniques in the country. The second chapter focuses on the first two decades of the twentieth century, and on the first generation of Icelandic building engineers. It discusses their pioneering work in research, trade and design, which was at the core of a new age for Icelandic construction history. In those years, turf as a construction material was swiftly being abandoned, resulting in dramatic changes in the building tradition of the island. The third chapter is centered on a crucial topic of Icelandic architectural and construction history, which was the planning and building of modern farmhouses. Until after the Second World War Icelandic society was chiefly rural and farmhouses were at the core of both political debates and building programs. The fourth chapter focuses on a key moment of Icelandic construction history, dealing with the architectural outcomes of Iceland's first State architect, Guðjón Samúelsson (1887–1950), and his peculiar approach to concrete as a technical means to reach aesthetic and symbolic results. The epilogue of this dissertation is marked by the inauguration of Iceland's cement plant in 1958, which was praised as the symbol of the country's fully-reached material independence.

The small Icelandic population and its isolated geographical context, thus the small number of protagonists and relevant buildings, allowed this study to aim for a comprehensive quality. The focus is on Icelandic architectural, construction and cultural history, and yet the boundaries of this study are not limited to the manifest geographical isolation of the island. On the one hand, the study highlights economic and commercial connections which link Iceland to the rest of Europe and place the island in closer contact with the continent. On the other hand, the dissertation is concerned with issues of tradition and modernization: the underlying thesis is embodied in the idea that anonymous or amateurish concrete construction could be seen as one of the driving forces of architectural and social development. History of construction is also a social history, its development shaped by the key role of anonymous actors.[3] Furthermore, as stated by architectural historian Antoine Picon, the study of construction history may be a bridge between the history of technology and "the material dimension of culture".[4] The hypothesis of this study could be well applied to other geographical contexts, in order to understand not only the key role that concrete had in twentieth-century architectural histories, but also its influence on societies and cultures. Tackling the peripheral case study of Iceland, this dissertation aims at adding another geographical and cultural piece to the global history of construction and architecture, and its ever-changing relations to social communities throughout the centuries.

State of the art

The most comprehensive study on Icelandic architectural history to date was published in 2011 by architectural historian Atli Magnus Seelow: *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts. Transferprozesse zwischen Adaption und Eigenständigkeit.* Seelow was able to piece together a variety of scattered topics and define the key issues of twentieth-century Icelandic architecture. Also, for the first time Icelandic architectural history was systematically connected to international historiography. The book focuses particularly on the works of Iceland's first generation of architects and on the reception of functionalism in the Icelandic building tradition until the postwar period.[5] Seelow's work is the main point of reference when dealing with issues related to Icelandic architecture, construction, and urbanism. However, a greater variety of studies was also taken into consideration for the purpose of this research. The small dimensions of the country and subsequently of its architectural production have not acted as obstacles for the development of an extensive local historiography on these topics. Conversely, apart from a few cases, until the early 2010s Icelandic architectural and construction histories have been often ignored by international scholars.

Some of the earliest scholarly publications on Icelandic architectural traditions were the studies of Danish archaeologist Daniel Bruun (1856–1931), who at the turn of the century researched the archeological remains of Medieval Icelandic settlements. In 1938 German engineer Edwin Sacher (1906–?) published the results of

[3] As Robert Carvais wrote, "comme pour l'historie des sciences et des techniques, il faut s'intéresser aux petites gens, aux inventeurs anonymes, aux découvreurs d'astuces, aux personnages relais de trouvailles." Robert Carvais, "Plaidoyer pour une histoire humaine et sociale de la construction," in *Édifice & Artifice. Histories constructives*, edited by Robert Carvais, André Guillerme, Valérie Nègre, and Joël Sakarovitch (Paris: Picard, 2008), 38.

[4] Antoine Picon, "Construction History: Between Technological and Cultural History," *Construction History* 21 (2005–2006): 17.

[5] Atli Magnus Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts. Transferprozesse zwischen Adaption und Eigenständigkeit* (Nürnberg: Verlag für moderne Kunst, 2001). The volume is based on Seelow's PhD dissertation at Technische Universität München (2008).

his dissertation on traditional farmhouses in Iceland.[6] In the 1930s, for first time, the modernization of Icelandic infrastructures and construction was commented at an international level. Contemporary Icelandic architecture was briefly taken into consideration by a few articles on the local use of concrete. English architecture critic Philip Morton Shand (1888–1960) was the name behind these texts published in *The Concrete Way* journal in 1933 and 1935.[7]

Apart from a few technical booklets and a variety of journal articles, the first monographic investigation on the development of Icelandic construction was published in 1942 by medical doctor and construction expert Guðmundur Hannesson (1866–1946). The text gathered detailed information on both traditional and modern building techniques, drawing from printed and oral sources.[8] In accord with the material categorization of early twentieth-century construction handbooks, the author subdivided local construction history into chapters defined by the building materials adopted – turf, timber, stone, and concrete. This approach to history of construction by building materials became very popular and later influenced many local studies specifically focused on single techniques. Guðmundur Hannesson's work emerged in a very peculiar moment of Icelandic history, when Iceland was about to obtain its political independence, declared in 1944, and therefore a shared discourse on the country's built heritage was needed. Guðmundur Hannesson's pivotal role in the analysis and also in the development of Icelandic construction will be highlighted several times throughout this dissertation (see chapters one and three in particular).

The first monograph on Iceland's first State architect Guðjón Samúelsson was published in 1957. The work was co-edited by politicians Jónas Jónsson (1885–1968) and Benedikt Gröndal (1924–2010). The former, a close friend and supporter of the architect, had been entrusted with the editorial task according to the architect's will.[9] The book, titled *Íslenzk bygging. Brautryðjandastarf Guðjóns Samúelssonar* [Icelandic Architecture. The Pioneering Work of Guðjón Samúelsson] attempted to celebrate the State architect's career through a review of his works, a few years after his death. This publication highlighted the cultural importance which Guðjón Samúelsson had throughout the first half of the twentieth century, as one of the key figures active in shaping the Icelandic urban and rural landscape.

In the following decades, however, such celebratory approach was disregarded in favour of a different research method, which loosely leans towards a *Bauforschung*

[6] Daniel Bruun, *Fortidsminder og Nutidshjem paa Island* (Copenhagen: Nordiske Forlag, 1897); Daniel Bruun, *Gammel Bygningsskik paa de islandske Gaarde. Arkæologiske Undersøgelser* (Kristiania: Grøndahl & Søns Bogtrykkeri, 1908); Edwin Sacher, *Die aus Grassoden und Holz gebauten Höfe und Kirchen in Island* (Würzburg: Konrad Triltsch Verlag, 1938). See paragraph 1.1.1. for more details on these publications.

[7] Philip Morton Shand, "In Concrete. Third Series–IV," *The Concrete Way*, incorporating *The Road Maker* 5, no. 4 (January 1933): 195–208; Philip Morton Shand, "Concrete's Furthest North," *The Concrete Way*, incorporating *The Road Maker* 7, no. 6 (May/June 1935): 330–35.

[8] Guðmundur Hannesson, *Húsagerð á Íslandi* (Reykjavík: Prentsmiðjan Edda, 1942).

[9] Jónas Jónsson, and Benedikt Gröndal, eds., *Íslenzk bygging. Brautryðjandastarf Guðjóns Samúelssonar* (Reykjavík: Norðri, 1957).

analysis of the built heritage. This methodology is rooted in the study of building techniques and in the almost archeological examination of the material aspects of architecture.[10] The approach can be found in many studies published since the mid-1970s by the Árbæjar Museum in Reykjavík and by *Torfusamtökin*, a society for the conservation of Icelandic architectural heritage founded in 1972.[11] These studies focused on specific urban areas, such as neighborhoods of Reykjavík or other towns, and usually employed Guðmundur Hannesson's subdivision of architecture by building materials, classifying buildings according to their material structure. One main example is archaeologist Guðný Gerður Gunnarsdóttir's and architect Hjörleifur Stefánsson's volume on Kvosin, the central area of Reykjavík, published in 1987. The volume broadly tackles the urban development of the capital, and analyzes the built heritage of its city center by creating a sort of catalogue of its architecture and construction techniques street by street, building by building.[12] Many inventories of the country's built heritage were compiled since the late 1960s and are still being written today. They are now collected online by the Cultural Agency of Iceland.[13]

Considering the popularity of Guðmundur Hannesson's 1942 volume on construction history, Icelandic historiography frequently subdivided the research on architectural heritage into building materials. Since the late 1970s, many studies have dealt with specific building materials and techniques, such as stonemasonry, corrugated iron, timber, and concrete. The main reason behind this research methodology was surely the need of understanding construction materials for conservation purposes.[14] However, a volume like Icelandic historian Lýður Björnsson's *Steypa lögð og steinsmíð rís. Sagt frá mannvirkjum úr steini og steypu* [Concrete Laid and Stonemasonry Rising. History of Stone and Concrete Structures],

[10] *Bauforschung* is a research method consisting in the direct analysis of buildings and their phases of construction. It is particularly popular in the German-speaking countries. On this methodology and its applications, see: Uta Hassler, ed., *Bauforschung. Zur Rekonstruktion des Wissens* (Zürich: vdf Hochschulverlag, 2010).

[11] *Árbæjarsafn*, or Árbær Museum, is an open-air museum on the outskirts of Reykjavík. Founded in 1957, its main goal is to preserve and protect the built heritage of the country. It hosts many turf farms and timber houses moved from their original locations and reconstructed in the museum's premises. Since 2007 it has hosted the Building Preservation Center.

[12] Guðný Gerður Gunnarsdóttir, and Hjörleifur Stefánsson, *Kvosin. Byggingarsaga miðbæjar Reykjavíkur* (Reykjavík: Torfusamtökin, 1987). For a similar approach to architectural and urban history, see also: Nanna Hermansson, ed., *Grjótaþorp 1976. Könnun á sögu og ástandi húsanna* (Reykjavík: Árbæjarsafn, 1977); Hjörleifur Stefánsson, *Akureyri: fjaran og innbærinn: byggingarsaga* (Reykjavík: Torfusamtökin, 1986); Þóra Guðmundsdóttir, *Húsasaga Seyðisfjarðarkaupstaðar* (Seyðisfjörður: Safnastofnun Austurlands, 1995).

[13] The website opens with a quote: "Allir Íslendingar kunna að lesa bækur. En hversu margir kunna að lesa hús?" [All Icelanders can read books. But how many can read houses?]. See the complete list of the inventories at: http://www.minjastofnun.is/gagnasafn-/husakannanir/, last accessed 09/10/2020.

[14] See for example the study on stone buildings in Iceland by Danish architects and authors Helge Finsen and Esbjørn Hiort, *Gamle Stenhuse i Island fra 1700-tallet* (Copenhagen: Arkitektens Forlag, 1977); reprinted in Icelandic as *Steinhúsin gömlu á Íslandi,* translated by Kristján Eldjárn (Reykjavík: Iðunn, 1978). See also the studies on corrugated iron and Icelandic timber architecture: *Bárujárn. Verkmenning og saga*, edited by Hjörleifur Stefánsson (Reykjavík: Minjavernd, 1995); Hjörleifur Stefánsson, Kjell H. Halvorsen, and Magnús Skúlason, eds., *Af norskum rótum: gömul timburhús á Íslandi* (Reykjavík: Mál og menning, 2003).

published in 1990, was less defined by conservation needs and more focused on the local history of concrete technology in use until the late 1980s.[15] Particularly important buildings have also been researched as single case studies. These works were usually based on thorough archival research, yet mainly focused on local history rather than on connections with the international architectural historiography.[16]

In the 1990s a new focus emerged, not only on Icelandic construction techniques, but also on architectural history. In 1992 American architectural and art historian Marian C. Donnelly briefly mentioned Icelandic architecture within her volume *Architecture in the Scandinavian Countries.* In particular, she referred to a few Icelandic turf houses, the House of Parliament and the church of Hallgrímur in Reykjavík. She was perhaps the first international scholar who included examples of Icelandic buildings into a wider context.[17] In 1992 Icelandic architect Páll V. Bjarnason gave a short lecture at the *Nordisk Betonkongres* in Reykjavík, titled *Icelandic Architecture in the Concrete Era*, where he first summarized Iceland's architectural achievements in concrete between the late nineteenth century and the 1960s.[18] In 1994 an exhibition titled *Íslensk byggingarlist* [Icelandic Architecture] was held at the Aarhus School of Architecture, with the participation of many Icelandic authors and scholars.[19]

Artist and researcher Hörður Ágústsson (1922–2005) published in 1998–2000 the first comprehensive research on Icelandic construction and architectural histories in two volumes, spanning from the mid-eighteenth century until 1940. He had been one of the founders of the Cultural Heritage Agency of Iceland and was a very active member of history and conservation institutions in the country. Based on extensive archival research, the author's interests were chiefly related to the development of

[15] The volume was largely based on Guðmundur Hannesson's 1942 monographic research on Icelandic construction history. Lýður Björnsson, *Steypa lögð og steinsmíð rís. Sagt frá mannvirkjum úr steini og steypu* (Reykjavík: Hið íslenska bókmenntafélag, 1990).

[16] See for example the publications on the House of Parliament, the main building of the University of Iceland, the Cathedral of Reykjavík, the residence and church at Viðey, and the former national library and museum. Bergsteinn Jónsson, *Bygging Alþingishússins 1880–1881* (Reykjavík: Bókaútgáfa menningarsjóðs og þjóðvinafélagsins, 1972); Páll Sigurðsson, *Úr húsnæðis- og byggingarsögu Háskóla Íslands* (Reykjavík: Háskóli Íslands, 1986-1991); Þórir Stephensen, *Dómkirkjan í Reykjavík. Byggingarsagan. Vol. 1* (Reykjavík: Hið íslenska bókmenntafélag, 1996); Þorsteinn Gunnarsson, *Viðeyjarstofa og kirkja* (Reykjavík: Reykjavíkurborg, 1997); Eggert Þór Bernharðsson, ed., *Safnahúsið 1909–2009: Þjóðmenningarhúsið*, (Reykjavík: Þjóðmenningarhúsið, 2009). See also the important work in 31 volumes on Iceland's churches, *Kirkjur Íslands*, published between 2001 and 2018 by the National Museum and the Cultural Heritage Agency of Iceland.

[17] Marian C. Donnelly, *Architecture in the Scandinavian Countries* (Cambridge/London: The MIT Press, 1992).

[18] Páll V. Bjarnason, "Icelandic Architecture in the Concrete Era," in *XIV. Nordic Concrete Congress & Nordic Concrete Industry Meeting, 6–8 August 1992* (Reykjavík: Icelandic Concrete Association, 1992), 251–58.

[19] Guðmundur Gunnarsson, ed., *Icelandic Architecture* (Aarhus: Arkitektskolen i Aarhus, 1996). That same year, art and architectural historian Júlíana Gottskálksdóttir published a short essay on Icelandic architecture in a collective work on Icelandic art between 1930 and 1944: Júlíana Gottskálksdóttir, "Byggingarlist," in *Í deiglunni 1930–1944. Frá Alþingishátið til lýðveldisstofnunar* (Reykjavík: Mal og Menning, 1994), 155–64.

construction techniques, as the main scope was the conservation of the local built heritage.[20] At the end of the 1990s, a particularly important moment for Icelandic architectural historiography was marked by the work of Icelandic architect and researcher Pétur H. Ármannsson. By gathering documents from existing collections and also from private owners, he published two monographs on key Icelandic architects active since the mid-1920s – Einar Sveinsson (1906–1973) and Sigurður Guðmundsson (1885–1958) – and he also prompted the foundation of the first architectural archive in Iceland.[21]

It is interesting to note that the presence of Icelandic architecture in the international debate has been scarce until the late 2010s. A few English essays were published by Pétur H. Ármannsson in various books and journals, some of them related to the work of the *Docomomo* organization in the Nordic countries.[22] When approaching Icelandic history, international scholars have chiefly focused on the Medieval period and the literature of the sagas. Conversely, modern history, and thus architectural history, has mainly been the focus of Icelandic scholars. From an international perspective, Iceland has been a very popular topic of travel literature since the early nineteenth century. One interesting example are the travel journals by British author and artist William Morris (1834–96), who visited Iceland in the 1870s.[23] However, the overall attention of foreign travellers to the island's architectural history could be condensed in a comment by British poet Wystan Hugh

[20] The first volume deals with Icelandic construction history between 1750 and 1940; the second is a catalogue of buildings to be protected as national cultural heritage. Hörður Ágústsson, *Íslensk byggingararfleifð I: Ágrip af húsagerðarsögu 1750-1940* (Reykjavík: Húsafriðunarnefnd ríkisins, 1998); *Íslensk byggingararfleið II: Varðveisluannáll 1863–1990. Verndunaróskir* (Reykjavík: Húsafriðunarnefnd ríkisins, 2000). On Hörður Ágústsson as artist and researcher, see the catalogue of the exhibition *Endurreisnarmaður íslenskra sjónmennta*, edited by Pétur H. Ármannsson (Reykjavík: Listasafn Reykjavíkur, 2005) and in particular a selected bibliography and list of works at the pages 95–102.

[21] The architectural archive, part of the Reykjavík Art Museum, was founded in 2000 and yet closed in 2011. The monographs were published as a result of two exhibitions supported by the Architecture Department of the Reykjavík Art Museum: Pétur H. Ármannsson, ed., *Einar Sveinsson: arkitekt og húsameistari Reykjavíkur* (Reykjavík: Kjarvalsstaðir, 1995); Pétur H. Ármannsson, ed., *Sigurður Guðmundsson Arkitekt* (Reykjavík: Listasafn Reykjavíkur, 1997). Another outcome of the renovated debate on Icelandic architecture and its archives is the concise guide by Birgit Abrecht, *Arkitektúr á Íslandi. Leiðarvísir* (Reykjavík: Mál og menning, 2000).

[22] Pétur H. Ármannsson, "The Development of Reykjavík in the 1920s and 1930s and the Impact of Functionalism," in *Nordisk Funksjonalisme*, edited by Wenche Findal (Oslo: Ad Notam Gyldendal, 1995), 45–62; Pétur H. Ármannsson, "Reconstruction in Prosperity. An Introduction to Modern Architecture in Iceland," *Docomomo Journal: Nordic Countries* 19 (1998): 46–48; Pétur H. Ármannsson, "Social Aspects and Modern Architecture in Iceland," in *Modern Movement Scandinavia: Vision and Reality*, edited by Ola Wedebrunn (Copenhagen: Fonden til udgivelse af arkitekturtidskrift, 1998), 99–108; Pétur H Ármannsson, "Concrete's Furthest North," *Docomomo Journal: Bridges and Infrastructures* 45 (2011): 87–89.

[23] The journals were published in: William Morris, *The Collected Works by William Morris. Volume VIII. Journals of Travel in Iceland, 1871–1873* (London: Longmans Green and Company, 1911).

Auden (1907–73) written as he visited Reykjavík in 1927: "There is no architecture here".[24]

There could be many reasons why international scholars have not been particularly interested in Icelandic architecture throughout the decades. One could be the geographical isolation of the country, broadly considered as part of Nordic Europe, but usually overshadowed by the architectural production of Sweden, Norway, Finland, and Denmark. A second obstacle is the understanding of the Icelandic language, whose complex grammar could hamper the reading of many sources. It is interesting to notice that these obstacles were partially overcome after the economic crisis of 2008 and the eruption of the Eyjafjallajökull volcano in 2010: more tourists entered the country and were exposed not only to its natural landscape, but also to its architecture. While Iceland was becoming an accessible tourist destination, an increasing number of international scholars encountered its architectural heritage and culture.[25] One direct result was a collection of interviews of Icelandic architects and scholars edited by German architect and museum curator Peter Cachola Schmal, titled in a way that echoes Auden's previously quoted comment – *Iceland and Architecture?* (2011). A second outcome was an issue of the online magazine *uncube* published in 2015 and dedicated to Iceland.[26]

This unprecedented interest shown by international scholars was also mirrored in many local publications that emerged after 2010. In 2013, architect and researcher Hjörleifur Stefánsson published an important volume on Icelandic turf construction, titled *Af jörðu* [the title is deliberately ambiguous, it can be translated either as *Made of Mud*, either as *From Earth*].[27] In 2014 historian Anna Dröfn Ágústsdóttir and

---

[24] Wystan Hugh Auden, and Louis MacNeice, *Letters from Iceland* (London: Faber and Faber, 1937), 109. For an overview of Iceland as portrayed by foreign travel literature, see: Haraldur Sigurðsson, *Ísland í skrifum erlendra manna um þjóðlíf og náttúru landsins. Ritaskrá* (Reykjavík: Landsbókasafn Íslands, 1991). On how Iceland (and Greenland) were represented and perceived by foreign eyes, see: Sumarliði R. Ísleifsson, *Deux îles aux confins du monde. Islande et Groenland. Les représentations de l'Islande et du Groenland du Moyen Âge au milieu di XIX^e siècle* (Québec: Presses de l'Unversité di Québec, 2018).

[25] On the tourist rediscovery of Iceland, see: Kimiko de Freytas-Tamura, "Secret to Iceland's Tourism Boom? A Financial Crash and a Volcanic Eruption," *New York Times,* 16/11/2016, https://www.nytimes.com/2016/11/17/world/europe/reykjavik-iceland-tourism.html, last accessed 05/10/2020.

[26] Peter Cachola Schmal, ed., *Iceland and Architecture?* (Berlin: Jovis, 2011). The publication was followed by an exhibition in Berlin, hosted by the Felleshus of the Nordic Embassies, 23 November 2012 – 6 January 2013.

"Iceland," *uncube magazine* no. 40 (2015). http://www.uncubemagazine.com/magazine-40-16339141.html#!/page1, last accessed 06/10/2020.

[27] Hjörleifur Stefánsson, *Af jörðu* (Reykjavík: Crymogea, 2013). The volume was quoted in recent essays presented at the Construction History Society conference 2019 and 2020. See: Lukas Stampfer, "From Plant to Turf: Determining Qualities at the Intersection Between Pedology, Botany and Building Construction," in *Water, Doors and Buildings: Proceedings of the Sixth Conference of the Construction History Society,* edited by James W. P. Campbell et al. (Cambridge: The Construction History Society, 2019), 330–39; Lukas Stampfer, "Do as the Romans Do: Possible Roman Influences on the Construction of Nordic Settlers," in *Iron, Steel and Buildings: the Proceedings of the Seventh Conference of the Construction History Society*, edited by James W. P. Campbell et al. (Cambridge: The Construction History Society, 2020), 433–42.

architect Guðni Valberg blended urban and architectural histories together in order to focus on the history of Reykjavík through its unbuilt projects.[28] Further works examined the careers of Icelandic professionals. Two examples are Pétur H. Ármannsson's monograph on Icelandic architect Gunnlaugur Halldórsson (1909–86), and the biography of Iceland's first architect, Rögnvaldur Ólafsson (1874–1917), published by Björn G. Björnsson in 2016.[29] In winter 2019 Pétur H. Ármannsson curated an exhibition on Guðjón Samúelsson, celebrating the hundredth anniversary of the State architect's graduation.[30] The exhibition was recently followed by the publication of a comprehensive monograph on the State architect, based on many archival records located in Iceland and Denmark.[31]

Despite the large number of studies available on Icelandic architecture, architectural history has rarely been tackled by Icelandic historians. The eleventh volume of *Saga Íslands* [The History of Iceland], an important series in eleven volumes on Icelandic history, mentions some of Guðjón Samúelsson's works only briefly. A few projects by the State architect were also taken into consideration by Icelandic historian Ólafur Rastrick in his recent cultural and political history of early twentieth-century Iceland.[32] On the contrary, the great revolution in local building materials of the early twentieth century, that is the progressive abandonment of turf construction and adoption of concrete technology, is often mentioned in many histories of Iceland.[33] Although some scholars refer to Icelandic architecture and construction only in passing, at times they add some key information. It was thus important to take into consideration the role played by many Icelandic studies on technological, political, and cultural history. Some examples are the volumes by or the biographies on Iceland's most prominent engineers and politicians, such as Knud Zimsen (1875–1953), Jón Þorláksson (1877–1935) and Thorvald Haraldsen Krabbe (1876–1953). Important sources are also the monographic studies on Icelandic

---

[28] Anna D. Ágústsdóttir, and Guðni Valberg, *Reykjavík sem ekki varð* (Reykjavík: Crymogea, 2014). Urban history is a prominent field of studies in Icelandic historiography and contributed greatly to the development of architectural history. See for example the two-volume work by Guðjón Friðriksson, *Saga Reykjavíkur. Bærinn vaknar (1870-1940).* Vol.1 and 2 (Reykjavík: Iðunn, 1991–94). On the urban history of Reykjavík see also the following works: *Reykjavík í 1100 ár*, edited by Helgi Þorláksson (Reykjavík: Sögufélag, 1974); *Reykjavík miðstöð þjóðlífs*, edited by Kristín Ástgeirsdóttir (Reykjavík: Sögufélag, 1978); See the volumes by Páll Líndal: *Bæirnir byggjast* (Reykjavík: Skipulagsstjóri ríkisins og sögufélag, 1982); *Reykjavík 200 ára: saga höfuðborgar í myndum og máli* (Reykjavík: Hagall, 1986); *Reykjavík: sögustaður við Sund.* Vol. 1–3 (Rekjavík: Örn og Örlygur, 1986–1991). See also the volume by Trausti Valsson, *Planning in Iceland. From the Settlement to Present Times* (Reykjavík: University of Iceland Press, 2003).

[29] Björn Björnsson, *Fyrsti arkitektinn. Rögnvaldur Águst Ólafsson og verk hans* (Reykjavík: Hið íslenska bókmenntafélag, 2016).

[30] *Guðjón Samúelsson húsameistari* (Hafnarborg, Hafnarfjörður, 2 November 2019–12 January 2020). https://hafnarborg.is/exhibition/gudjon-samuelsson-husameistari/, last accessed 06/10/2020.

[31] Pétur H. Ármannsson, *Guðjón Samúelsson húsameistari* (Reykjavík: Hið íslenska bókmenntafélag, 2020).

[32] Pétur Hrafn Árnason, and Sigurður Líndal, eds., *Saga Íslands XI* (Reykjavík: Hið íslenska bókmenntafélag/Sögufélag, 2016), 36–37. Ólafur Rastrick, *Háborgin. Menning, fagurfræði og pólitik í upphafi tuttugustu aldar* (Reykjavík: Háskólaútgfáfan, 2013).

[33] Pétur Hrafn Árnason, and Sigurður Líndal, eds., *Saga Íslands XI*, 22; Gunnar Karlsson, *The History of Iceland* (Minneapolis: University of Minnesota Press, 2000), 292–94.

infrastructures and industries, and particularly a research on the history of cement production in the country.[34] Essential sources which cannot be ignored are the copious references to the modernization of local construction traditions in Icelandic literature. Many novels by Nobel laureate Halldór Laxness were set during the very decades of Iceland's urbanization, while the short story *Legjandinn* [The Lodger] by writer Svava Jakobsdóttir (1930–2004) portrayed the domestic life in a modern apartment of postwar Iceland.[35] Although literary sources bear witness to many social and material changes that happened in the country, they have only rarely been adopted by Icelandic architectural historiography so far.

This dissertation intertwines the aforementioned Icelandic literature on history, architecture, culture, and technology with international sources on architectural and construction history in Europe between the mid-nineteenth century and mid-twentieth century, with a particular attention to concrete. Studies on the history of concrete construction in specific countries are copious and tackle different geographies and timeframes. However, in regard to Nordic Europe, studies on construction history, and specifically on concrete, are not particularly widespread. Some of the reasons behind this absence were recently explained by Swedish architectural historian Claes Caldenby. Referring to architectural historiography in the Nordic countries, he highlighted the architects' lack of interest in construction matters as isolated objects of study; at the same time, he referred to a "loss of historical and humanistic perspective" on engineering topics.[36] A recent work on Nordic concrete architecture was limited to the use of concrete in Norway's capital city: the collective volume

[34] On the industrial and technical development of Iceland in the first half of the twentieth century, see: Thorvald H. Krabbe, *Island og dets tekniske udvikling gennem tiderne* (Copenhagen: Danks-islandsk samfund, 1946). There are also many biographies of Icelandic engineers: Lúðvik Kristjánsson, ed., *Við fjörð og vík. Brot úr endurminningum Knud Zimsens fyrrverandi borgarstjóra* (Reykjavík: Helgafell, 1948); Lúðvík Kristjánsson, ed., *Úr bæ í borg: nokkrar endurminningar Knud Zimsens fyrrverandi borgarstjóra um þróun Reykjavíkur* (Reykjavík: Helgafell, 1952); Hannes Hólmsteinn Gissurarson, *Jón Þorláksson. Forsætisráðherra* (Kópavogur: Almenna Bókafélagið, 1992); Sveinn Þórðarson, *Frumherjar í verkfræði á Íslandi* (Reykjavík: Verkfræðingafélag Íslands, 2002); Jakob F. Ásgeirsson, *Jón Gunnarsson: ævisaga* (Reykjavík: Ugla, 2018). Studies on specific topics, such as the construction of bridges and local cement production can be found in: Sveinn Þórðarson, *Brýr að baki. Brýr á Íslandi í 1100 ár* (Reykjavík: Verkfræðingafélag Íslands, 2006); Guðmundur Guðmundsson, *Sementsiðnaður á Íslandi í 50 ár* (Reykjavík: VFÍ, 2008).

[35] Many of Laxness's novels will be quoted throughout this dissertation. See for example: Halldór Kiljan Laxness, *The Fish Can Sing*, trans. Magnus Magnusson (London: Vintage Digital, 2010). [*Brekkukotsannál*]. First published in 1957; Halldór Kiljan Laxness, *Independent People*, trans. J. A. Thompson (New York: Alfred A. Knopf, 1946). [*Sjálfstætt Fólk*]. First published in 1933–35. See also: Svava Jakobsdóttir, *The Lodger and Other Stories*, trans. Julian Meldon D'Arcy, Dennis Auburn Hill, and Alan Boucher (Reykjavík: JPV, 2006). First edition: Svava Jakobsdóttir, *Legjandinn* (Reykjavík: Helgafell, 1969). Contemporary authors who have written on the modernization of cities and the countryside are Einar Már Guðmundsson and Bergsveinn Birgisson. See: Einar Már Guðmundsson, *Fótspor á himnum* (Reykjavík: Mál og menning, 1997); Bergsveinn Birgisson, *Svar við bréfi Helgu* (Reykjavík: Bjartur, 2010).

[36] Claes Caldenby, "Construction History in Scandinavia," in *L'histoire de la construction. Un méridien européen. Construction History: A European Meridian*, edited by Antonio Becchi, Robert Carvais, and Joël Sakarovitch (Paris: Association francophone d'histoire de la construction, 2015), 263–72. Available online at: https://issuu.com/emchateau/docs/chreport2015/267, last accessed 07/11/2020.

Concrete Oslo (2018).[37] Other recent publications are photographic works portraying concrete projects in specific countries, such as *Concrete Architecture in Finland* (2008) or *Dansk betonarchitektur* (2018).[38] Exceptions are *Tehdään betonista. Concrete in Finnish Architecture* (1989), published by the Association of the Concrete Industry of Finland, which offers an interesting overview on the use of concrete in Finnish architecture since the early twentieth century, and the recent PhD dissertation by Bengt J. O. Johansson's *Betong i arkitekturen: Gestaltning och teknik 1930-1980* [Concrete in Architecture: Design and Technology, 1930–1960].[39] Recently, ArkDes, Sweden's National Centre for Architecture and Design, hosted an exhibition on concrete panels for prefabricated housing, *Flying Panels – How Concrete Panels Changed the World*, with a focus on their use in Sweden since the postwar years.[40] Last year, the Danish concrete association *Dansk Beton* organized the series of lectures *Historisk Beton. Hvorfor og hvordan bevarer vi den?* [Historic Concrete. Why and How Do We Preserve It?]. The lectures covered more than 150 years of concrete history in Denmark, from the first unreinforced experiments before the 1890s until the brutalist projects of the 1970s, and they were given by experts in building preservation, technology historians and architects.[41]

The key goal of this research is to understand the development of concrete construction in Iceland as it was perceived by local inhabitants and building experts, and how concrete acted as a key agent of change for the country's modernization process. The scope of this dissertation is neither to deal with Icelandic concrete history from a merely technical point of view, neither it is to create a photographic catalogue of Icelandic concrete buildings. Icelandic economic development and its quick urbanization in the first half of the twentieth century are usually mentioned in relation to the industrialization of the country's fishing industry. This dissertation aims to add one different perspective to the same process, highlighting the pivotal role played by construction techniques.[42] By framing this study within the branch of

[37] The Oslo School of Architecture and Design recently prompted a research on Oslo's concrete architecture, thus publishing a sort of guidebook which also includes essays, drawings, historical reports on specific buildings. See: Erik Fenstad Langdalen, Andrea Pinochet, and Léa-Catherine Szacka, *Concrete Oslo* (Oslo: Torpedo Books, 2018).

[38] The work published by Finnish photographer Jussi Tiainen is a photographic report of Finnish concrete buildings: *Concrete Architecture in Finland* (Helsinki: Rakennustieto, 2008); *Dansk betonarchitektur* was published by Danish architectural historian Jørgen Hegner Christiansen and offers an overview of important concrete buildings and infrastructures in Denmark: Jørgen Hegner Christiansen, *Dansk betonarchitektur* (Copenhagen: Vandkusten, 2018).

[39] Association of the Concrete Industry of Finland, *Tehdään betonista: Concrete in Finnish Architecture* (Helsinki: Garamond, 1989); Bengt J. O. Johansson, "Betong i arkitekturen: Gestaltning och teknik 1930-1980," PhD dissertation, Chalmers tekniska högskola, 2008, https://research.chalmers.se/publication/63547, last accessed 07/11/2020.

[40] ArkDes, 18/10/2019 – 1/03/2020. The exhibition was curated by Pedro Ignacio Alonso and Hugo Palmarola.

[41] See the full program and the lecture videos at: *Historisk Beton*, https://www.danskbeton.dk/arkitektur/historisk-beton/, last accessed 20/11/2020.

[42] On the industrial and agricultural revolution which took place in Iceland in the first decades of the twentieth century see: Ólafur Ásgeirsson, *Iðnbylting hugarfarsins* (Reykjavík: Bókaútgáfa

European construction and architectural histories, the focus is on the material aspects of Iceland's path to modernity, on the collective struggle against the natural elements, and on the materials of architecture behind the building of an independent nation. More than architects, designers or town planners, the real protagonists of this study are builders, farmers, engineers and tradesmen, acting as the first vehicles of technical knowledge within and towards the island.

Sources and methods

Each of the dissertation's four chapters focuses on different aspects of Icelandic concrete construction. Since the development of each topic took place in different areas of the Icelandic society, I have investigated a variety of sources: archival documents such as letters, reports, handwritten notes and architectural drawings, building codes and regulations, cultural and political discussions printed in Icelandic and Danish newspapers, photos of building sites, patents. While quoting from Icelandic or Danish, an English translation was always provided. Original terms and quotes can be found in the footnotes or, for words of specific importance and book titles, in square brackets in the main text. When needed, particular attention was devoted to the physical proof of architectural artifacts: in line with the *Bauforschung* approach employed by many Icelandic authors, on-site research of some buildings has been useful to gather information from their material evidence. The sources used during the research derive from a number of archival collections, held at the following archives: *Þjóðskjalasafn Íslands* [The National Archives of Iceland], *Landsbókasafn Íslands* [National and University Library of Iceland], *Borgarskjalasafn Reykjavíkur* [Reykjavík City Archives], *Þjóðminjasafn Íslands* [National Museum of Iceland], *Ljósmyndasafn Reykjavíkur* [Reykjavík Museum of Photography], *Listasafn Einars Jónssonar* [The Einar Jónsson Museum], *Vegagerðin* [Icelandic Road and Coastal Administration], *Det Kongelige Bibliotek* [The Royal Library of Denmark], the *DTU's Historie* Archives and *Danmarks Kunstbibliotek* [The Danish National Art Library]. Particularly useful were the online resources of *Sarpur*, online collection of photographs and artworks, and *Tímarit*, digital collection of Icelandic newspapers and journals promoted by the National Library of Iceland.[43]

It is worth mentioning some of the peculiarities of these sources. First, despite the common equation between vernacular architecture and lack of written sources, the high level of literacy in Iceland allowed the creation of a dense network of written reports – such as newspaper articles, letters, and personal notes – which gave voice even to anonymous farmers and builders in late nineteenth- and early twentieth-century Iceland. Second, the events happening in the country were usually portrayed in great detail within the pages of its newspapers, whose availability has been very

menningarsjóðs, 1988). See also the collective work *Iðnbylting á Íslandi. Umsköpun atvinnulífs um 1880 til 1940*, edited by Jón Guðnason (Reykjavík: Sagnfræðistofnun Háskóla Íslands, 1987).

[43] *Sarpur*, https://www.sarpur.is/, last accessed 19/12/2020; *Tímarit*, https://timarit.is/, last accessed 19/12/2020.

widespread since the mid-nineteenth century. Thanks to the almost daily chronicle of major and minor events, it was possible to retrace even the smallest news regarding people, ideas, and techniques moving from the continent to the island, or within the island itself. Third, due to the presence of many self-taught builders, early twentieth-century Icelandic architects and engineers rarely employed technical drawings for their projects, even when adopting reinforced concrete structures. This absence could also be explained by the close personal connections between Icelandic professionals, who usually exchanged ideas and knowledge by word of mouth or letters. On the one hand, this resulted in a general lack of detailed drawings [*sérteikningar*], whose absence nevertheless does give information on early twentieth-century construction habits in the country. On the other hand, the great number of reports, contracts and descriptions of those very designs convey other kinds of information and were very helpful in filling the gaps left by the absence of detailed drawings. Thanks to this variety of documents, this research on Icelandic architectural history was enriched by the influence of social history and history of technology. The dissertation follows the process of modernization which characterized Icelandic concrete construction, and it focuses on the intersection betweeen the country's technological development and its social and political changes. From the perspective of an increasingly popular building technology, the research explores Iceland's struggle for better living conditions, which included the contributions of professionals and common people alike.

Chapter 1

From Turf to Concrete: Construction in Iceland in the Second Half of the Nineteenth Century (1847–95)

> Haec itaque Thyle nunc Island appellatur, a glacie quae occanum astringit. De qua etiam hoc memorabile ferunt, quod eadem glacies ita nigra et arida videatur propter antiquitatem, ut incensa ardeat. Est autem insula permaxima, ita ut populos infra se multos contineat, qui solo pecorum fetu vivunt eorumque vellere teguntur; nullae ibi fruges, minima lignorum copia, propterea in subterraneis habitant speluncis, communi tecto [...] Nam et montes suos habent pro oppidis et fontes pro deliciis.
>
> Adam of Bremen, *Gesta Hammaburgensis ecclesiae pontificum*, late eleventh century[1]

> A farm house looks more like a village than a single habitation. Sometimes several families live enclosed within the same mass of turf. The cottages of the lowest order of people are wretched hovels; so very wretched, that it is wonderful how any thing in the human form can breathe in them.
>
> George Steuart Mackenzie, *Travels in the Islands of Iceland*, 1811[2]

[1] Adam of Bremen, *Gesta Hammaburgensis ecclesiae pontificum*, edited by Johann Martin Lappenberg. Second edition (Hannover: Impensis Bibliopolii Hahniani, 1876), 184. English translation by B. Wallace: "The said Thule is the island called Iceland because of its ice which makes the sea solid. About this island people tell among other things the following remarkable fact: the ice is so black and dry because of its high age that it will burn if one sets it afire. However the island is so big that it is the home for many people. They live exclusively from livestock farming and dress in animal skins. There is no cereal there and only sparse lumber. They live in subterranean pits and enjoy sharing house, food and company with their animals. [...] The mountains are their cities and the springs their happiness." *Beskrivelse af øerne i Nordern* (Copenhagen: Wormianum, 1978), 59–60.

[2] George Steuart Mackenzie, *Travels in the Island of Iceland* (Edinburgh: Thomas Allan and

More than 700 years divide the descriptions of Icelandic living conditions by German chronicler Adam of Bremen (before 1050–1081/85) and Scottish geologist George Steuart Mackenzie (1780–1848). Evidently, Iceland's harsh environment had not led to almost any changes in local construction habits for more than seven centuries. Cold winters and the almost complete absence of forests had allowed the inhabitants to use only what was available – turf, driftwood, and quite a lot of patient resilience towards an almost uninhabitable territory. When Mackenzie visited Iceland in the early 1810s, he was negatively impressed by the poor living standards in the countryside, and yet he admired the human strength behind an architecture made of earth. Although the permanence of Icelandic turf construction would be the standard until the early twentieth century, the first steps towards a change in Icelandic construction history were indeed taken in the decades after Mackenzie's travel.

After centuries of economic and social hardship, mainly caused by the island's intrinsic isolation and many natural disasters, the nineteenth century was a high moment resounding with debates of Icelandic nationalism and political autonomy. Under the kingdom of Denmark since the Kalmar Union, established in the late fourteenth century, the status of Iceland within the Danish kingdom was often blurred. At times the island was referred to as a province, dependency [*biland* in Danish, *hjálenda* in Icelandic] or colony.[3] The island had been economically limited through a trade monopoly which was active since the early seventeenth century and was officially lifted in the mid-nineteenth century.[4] Furthemore, in 1783–84 Iceland was tragically hit by a series of volcanic eruptions in the craters of Laki, in the southern part of the country. The event caused the death of approximately a quarter of its population, due to poisoning and the resulting famine.[5] The news of this eruption and of Iceland's severe living conditions reached all over the world; it is not a coincidence that Italian poet Giacomo Leopardi (1798–1837) included an Icelander as the protagonist of the difficult dialogue between mankind and nature.[6]

Since the early nineteeth century there had been an increasing interest in Icelandic language and culture, which resulted in the foundation of the Icelandic Literary Society (1816) and the *Fjölnir* journal (1835–47), published in Copenhagen by

---

Company, 1811), 115.

[3] On the different political and social perceptions of Iceland and its inhabitants by Denmark and Europe, see: Guðmundur Hálfdanarson, "Iceland Perceived: Nordic, European or a Colonial Other?," in *The Postcolonial North Atlantic. Iceland, Greenland and the Faroe Islands*, edited by Lill-Ann Körber, and Ebbe Volquardsen (Berlin: Nordeuropa-Institut der Humboldt-Universität, 2014), 39–66.

[4] On the Danish monopoly trade in Iceland, see: Gísli Gunnarsson, *Monopoly Trade and Economic Stagnation: Studies in the Foreign Trade of Iceland, 1602–1787* (Lund: Ekonomisk-historiska föreningen, 1983).

[5] The Laki eruption is also known as *skaftáreldar* [fires of the Skaftá river]. On the several epidemics and volcanic eruptions occurred in the eighteenth century, including the Laki eruption, see: Gunnar Karlsson, *The History of Iceland*, 177–81.

[6] "Dialogue of Nature and an Icelander" [*Dialogo della Natura e di un islandese*], written in 1824, was included in Leopardi's work *Operette Morali*, first published in 1827.

Icelandic scholars.[7] From this cultural movement stemmed a quest for more political autonomy, whose leader was Icelandic scholar Jón Sigurðsson (1811–79). A key change in Iceland's politics soon unfolded: in 1843 the Danish kingdom established the Icelandic consultative assembly, named *Alþingi* after the assembly founded in the tenth century by the first generations of Icelandic settlers. The assembly originally met in the fields of Þingvellir, in south-west Iceland.[8] When restored in the nineteenth century, it was relocated in Reykjavík. In the wake of the 1848 European revolutions, the Danish kingdom adopted a constitution in 1849, thus ending its status as an absolute monarchy. Following these recent changes, in 1851 was held a national assembly in Reykjavík: while Danish authorities invited Iceland to accept the recent Danish constitution, Icelandic representatives demanded Iceland's full autonomy in union with Denmark. The meeting ended with a collective protest from the Icelandic side, yet it was dissolved with no further results. Iceland was granted its first constitution only in 1874, according to which the Parliament had legislative power on internal affairs.[9]

Icelandic history is usually marked by some important dates, which act as key watersheds for the political history of the country – the national assembly in 1851, the first constitution in 1874, the beginning of the home rule in 1904, the act of union in 1918, the declaration of independence in 1944.[10] As a result, many underlying processes are overshadowed by a shared political narrative. As Icelandic historian Guðmundur Hálfdanarson argues, while economic and social developments in Iceland are usually regarded as factors depending on political changes, this correlation should be analyzed conversely.[11] It was the increasingly economic and social development, occurred since the mid-nineteenth century, which convinced both Icelandic

---

[7] On the development of a national debate regarding Icelandic cultural and political autonomy, see: Gunnar Karlsson, *The History of Iceland*, 200–04. On the Icelandic language as a cultural cornerstone for Iceland, see: Guðmundur Hálfdanarson, "From Linguistic Patriotism to Cultural Nationalism: Language and Identity in Iceland," in *Language and Identities in Historical Perspective*, edited by Ann Katherine Isaacs (Pisa: Pisa University Press, 2005): 55–67. On the Icelandic Literary Society [*Hið íslenska bókmenntafélag*] see: Sigurður Líndal, *Hið íslenska bókmenntafélag 1816–2016: Söguágrip* (Reykjavík: Hið íslenska bókmenntafélag, 2016). For a cultural and social history of modern Iceland, see: Sigurður Gylfi Magnússon, *Wasteland With Words: A Societal History of Iceland* (London: Reaktion, 2010).

[8] Since it was the location of the historical national assembly of Iceland, today *Þingvellir* is a national park and it is considered as a "lieu de mémoire" by Icelandic scholars. On *Þingvellir*, see: Guðmundur Hálfdanarson, *Íslenska þjóðríkið*: *uppruni og endimörk* (Reykjavík: Hið íslenska bókmenntafélag, 2001), 173–90; Guðmundur Hálfdanarson, "Þingvellir: An Icelandic 'Lieu de Memoire'," *History and Memory* 12, no. 1 (2000).

[9] On the Icelandic independence movement and its origins, see: Gunnar Karlsson, *The History of Iceland*, 200–23; Gunnar Karlsson, "Upphafsskeið þjóðríkismyndunar 1830–1874," in *Saga Íslands* IX, edited by Sígurður Lindal and Pétur Hrafn Arnason (Reykjavík: Hið íslenska bókmenntafélag, 2008), 167–376. See also: Guðmundur Hálfdanarson, "Social Distinctions and National Unity: On Politics of Nationalism in Nineteenth-Century Iceland," *History of European Ideas* 21, no. 6 (1995): 763–79; Guðmundur Hálfdanarson, *Íslenska þjóðríkið*, 45–96.

[10] Not to mention the almost mythical year 874, which for a long time was considered the exact date of the first settlement of Iceland.

[11] Guðmundur Hálfdanarson, "Severing the Ties – Iceland's Journey from a Union with Denmark to a Nation-State," *Scandinavian Journal of History* 31, no. 3–4 (2006): 246–47.

representatives and Danish authorities that Iceland could become a fully independent state. This change of perspective gives a great historical importance to technical progress in Iceland, which allowed the establishment of a modern country with up-to-date infrastructures and available professional knowledge on technical matters.

When it comes to construction and building traditions, the roots of this material development can be found in the very decades when the independence movement emerged. On the one hand, at the core of the growing nationalist movement was the idea that the Danish kingdom was liable for Iceland's poverty and backwardness, and that only a greater political autonomy would eventually free Iceland from its impoverished status.[12] At the same time, as it will be highlighted in the course of the following chapters, the actors of Iceland's progress in building matters were rarely imbued with nationalist visions. On the contrary, they were eager to strengthen their connections with Denmark and other European countries, in order to learn as much as possible on the improvement of local building techniques and living conditions. The nineteenth century thus became the stage for a slow, yet steady material progress. However, throughout the century only a few built projects proved that Iceland was finally improving its seemingly unalterable building traditions, and moving towards what Icelandic historiography would later call "the age of concrete".[13] Besides the construction of certain buildings, a number of geological explorations, local mastermasons, construction techniques and amateurish productions performed as true actors that enabled a deep change in Icelandic construction history. This chapter will deal with the main stages of this development; its discoveries, its results and its failures, in order to understand how an architectural tradition of scattered turf farms was able to renovate itself and embrace the advantageous materials of modernity.

1.1 Inhabiting and Exploring Iceland: Between Turf and Minerals

1.1.1 One thousand years of Icelandic turf houses

Traditional Icelandic construction combined the few building materials which the island offered: turf, gravel and driftwood. Turf farms and churches represented the majority of Icelandic buildings since the time of the first settlement that occurred in the last decades of the ninth century. Turf had been the dominant building material for almost a thousand years: in the eyes of nineteenth-century foreign visitors, Icelandic construction seemed to have been frozen in time; its inhabitants condemned to early-medieval living conditions. This seemingly eternal tradition was suddenly eradicated at the beginning of the twentieth century. In 1903 the first building code for

[12] Guðmundur Hálfdanarson, "Severing the Ties – Iceland's Journey from a Union with Denmark to a Nation-State," 242.

[13] *Steinsteypuöldin*. On the historiographic origin of the term, see chapter two.

Reykjavík entirely banned turf constructions within the city. Quickly the number of turf houses diminished in the whole country, until the few remaining either became ruins, or were listed as national heritage sites by the National Museum of Iceland.[14] **Figg. 1a–1d.**

Despite their bad sanitary reputation and the state of neglect in which traditional Icelandic houses had been kept for decades, turf construction is one of the most researched topics when it comes to Icelandic architectural history. Its academic success may be explained by several reasons: early archaeological studies,[15] a widespread interest in Nordic culture among German scholars until the first decades of the twentieth century,[16] recent scientific studies on traditional building materials.[17] Icelandic turf houses have been extensively studied by many local scholars such as architects, architectural historians and conservation experts, with a recent focus on the classification of heritage sites and their restoration.[18] One of the first detailed

[14] The Historic Building Collection of the National Museum of Iceland [*Húsasafn Þjóðminjasafns Íslands*] records, renovates and promotes several turf farms around the country.

[15] The first modern studies on Icelandic turf architecture date back to the last decades of the nineteenth century, particularly to the studies of Danish archaeologist Daniel Bruun, who researched extensively Icelandic turf houses at the turn of the century: Daniel Bruun, *Fortidsminder og Nutidshjem paa Island*; Daniel Bruun, *Gammel Bygningsskik paa de islandske Gaarde. Arkæologiske Undersøgelser*.

[16] See: Edwin Sacher, *Die aus Grassoden und Holz gebauten Höfe und Kirchen in Island* (1938). Sacher's work was the result of a dissertation at the *Technische Hochschule* in Berlin, hence the presence of technical details of traditional building techniques. However, from his references it is possible to detect that his background was not only linked to construction history. On the contrary, Sacher's work stemmed from several contemporary German studies on Icelandic sagas, Norse mythology, and travels to Iceland, all connected to the general interest on Nordic culture that had been on the rise in the German speaking world since the early nineteenth century. One example is the book by Karl Gustav Stephani, *Der älteste deutsche Wohnbau und seine Einrichtung* (Leipzig: Baumgärtner's Buchhandlung, 1902), which refers to traditional Scandinavian and Icelandic architeture at the pages 341–87. On the Nordic and Scandinavian influence on German culture between the early nineteenth until the early twentieth century, see the exhibition catalogue *Wahlverwandtschaft: Skandinavien und Deutschland, 1800–1914*, edited by Bernd Henningsen and Janine Klein (Berlin: Jovis-Verlagsbüro, 1997). See also: Julia Zernack, "Old Norse–Icelandic Literature and German Culture," in *Iceland and Images of the North*, edited by Sumarliði R. Ísleifsson with the collaboration of Daniel Chartier (Québec: Presses de l'Université du Québec, 2011), 157–86. During the Third Reich, the fascination for the North reached its peak; as for architecture, Nordic rural buildings were seen as the "true form of the North". See: Despina Stratigakos, *Hitler's Northern Utopia: Building the New Order in Occupied Norway* (Princeton/Oxford: Princeton University Press, 2020), 24.

[17] A number of authors have researched turf construction with scientific aims, spanning from the analysis of inner environment and comfort to the chemistry and botany of turf layers. See: Joost Van Hoof, and Froukje van Dijken, "The Historical Turf Farms of Iceland: Architecture, Building Technology and the Indoor Environment," *Building and Environment* 43 (2008): 1023–30; Stampfer, "From Plant to Turf: Determining Qualities at the Intersection Between Pedology, Botany and Building Construction," 330–39. It is also important to keep in mind that turf architecture was not limited only to Iceland, but it was also very common in other Northern European contexts such as Scotland. See: Bruce Walker, *Scottish Turf Construction* (Edinburgh: Historic Scotland, 2006); Brian Wilkinson, "A Study of Turf: Historic Rural Settlements in Scotland and Iceland," *Architectural Heritage* 20 (2009): 15–31.

[18] Parallel to the work of the National Museum are several individual projects and local publications. As an example, see: Sigurjón Baldur Hafsteinsson, "Museum Politics and Turf-House Heritage," in *Þjóðarspegillinn. Rannsóknir í félagsvísindum XI*, edited by Ingjaldur Hannibalsson (Reykjavík: Félagsvísindastofnun Háskóla Íslands, 2010), 267–74; Sigríður Sigurðardóttir, "Traditional Building Methods," *Skagafjörður Heritage Museum Booklet* 16 (2012). Also, in 2011 "The Turf House

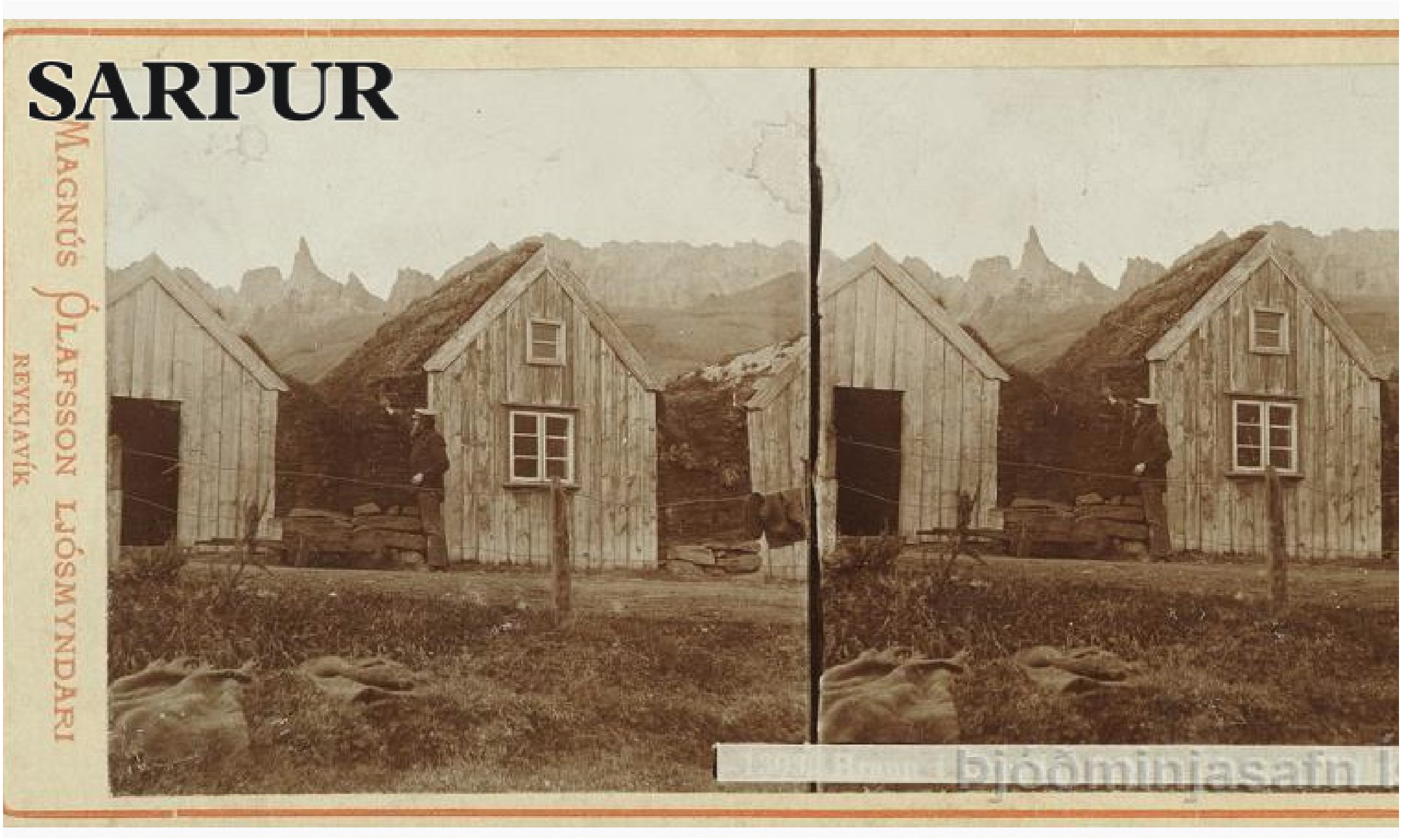


Fig. 1a – A turf farm in Reykholt, ca. 1925–30. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 1b – Abandoned houses in Núpsstaður, southern Iceland. Photo by Regína Hrönn. https://guidetoiceland.is/, last accessed 15/11/2020.

Fig. 1c – Reconstruction of a turf house at the Árbær Museum, Reykjavík. Photo by Sofia Nannini, 2019.

Fig. 1d – Reconstruction of a turf church at the Árbær Museum, Reykjavík. Photo by Sofia Nannini, 2019.

Icelandic accounts on turf buildings was written by doctor and building expert Guðmundur Hannesson, as a chapter in his comprehensive volume on Icelandic construction history published in 1942.[19] A second source of information is the thorough study of Icelandic architectural history between 1750 and 1940, published in 1998–2000 by Hörður Ágústsson, that provided an overview of the subtle developments in turf farms and churches until the early twentieth century.[20] To date, the most comprehensive study on Icelandic turf construction was published in 2013 by architect Hjörleifur Stefánsson.[21]

Building with the earth

The focus of this research will be the very material that substituted turf in Icelandic building traditions, i.e. concrete. It is however important to briefly mention a few characteristics of Icelandic turf architecture in order to understand the pivotal role that this traditional method had in Icelandic architecture until the first half of the twentieth century. First, this research will mostly use the word "turf" to describe the common material of Icelandic architecture, without taking into account the various details that geologically differentiate one kind of turf from another.[22] According to Hjörleifur Stefánsson's definition, a turf house is a structure whose walls are mainly made of turf blocks, sometimes mixed with gravel and coarse stones. The roof structure is usually made of timber pillars and rafters, then topped with a final layer of grass-covered turf. There are several tools which throughout time have been used for cutting turf layers from the ground, resulting in blocks with different shapes to build walls and rooftops. Generally speaking, the walls of a turf house usually rest on a lower level of gravel or coarse stones, alternating with flat turf pieces. On top of this first level, the turf structure itself is double, with two outer layers of turf blocks containing a core of earth and rubble.[23] **Figg. 2a–2b.**

Turf construction had some positive characteristics. It provided cheap and available building material to almost all inhabitants of the country and, most

Tradition" was listed in one "Tentative List" of the Unesco World Heritage Centre. https://whc.unesco.org/en/tentativelists/5589/, last accessed 02/05/2020.

[19] The first part of the text tackles both archaeological remains and building techniques of contemporary turf farms. Guðmundur Hannesson, *Húsagerð á Íslandi*, 1–167.

[20] Hörður Ágústsson, *Íslensk byggingararfleifð I,* 31–94.

[21] Hjörleifur Stefánsson, *Af jörðu.*

[22] Sometimes the terms "peat" and "sod" are used to describe soil materials made of decomposed vegetation. See: Stampfer, "From Plant to Turf: Determining Qualities at the Intersection Between Pedology, Botany and Building Construction," 330. In Icelandic, the term *torf* is the most common. However, there are many categories, depending on the vegetation that covers the ground layers. See: Hjörleifur Stefánsson, *Af jörðu*, 17. The characteristics of turf vary greatly according to each location within the Icelandic territory. See: Sigurjón Baldur Hafsteinsson, "Museum Politics and Turf-House Heritage," 272.

[23] See: Hjörleifur Stefánsson, *Af jörðu*, 18–31. See also: Sacher, *Die aus Grassoden und Holz gebauten Höfe und Kirchen in Island*, 4–5 and Table II. According to Lukas Stampfer, the similarities between Scottish and Icelandic turf construction and Roman conglomerate may highlight some mutual influences dating back to the times of the Roman presence in Britain. See: Stampfer, "Do as the Romans Do: Possible Roman Influences on the Construction of Nordic Settlers," 438–40.

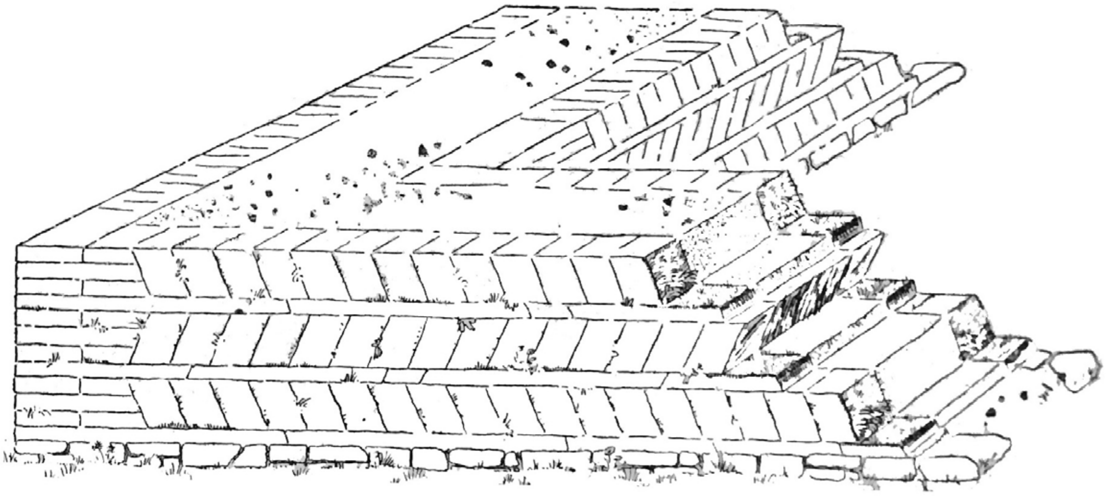


Fig. 2a – Section of turf wall. Coarse stones as foundations, double turf layer with an inner core of earth. Edwin Sacher, *Die aus Grassoden und Holz gebauten Höfe und Kirchen in Island*, Table II.

Fig. 2b – Detail of an outer turf wall, Bustarfell, Vopnafjörður. Photo by Sofia Nannini, 2019.

importantly, it acted as an insulating layer against the harsh climate. However, the absence of heating systems was tolerable only thanks to thick walls and to the almost complete lack of windows, which resulted in rather unhealthy environments. Heating was usually provided by burning dried manure and it caused respiratory difficulties due to the low ventilation. Also, the technique behind turf was common and easily imitated by almost anyone with a little building experience. Yet, as it will be seen at the beginning of chapter two, poorly-built turf constructions were in constant need of renovation every few decades, forcing their inhabitants to refurbish or even rebuild their own dwellings each generation.[24]

The turf farm

According to Iceland's renowned novelist Halldór Laxness, the architectural development of a turf farm cluster "is a little like the propagation of coral, or cactuses".[25] By observing the plans of Iceland's existing or reconstructed turf farms, one is tempted to think that their disposition is entirely random, or generated by an incomprehensible organic law. Despite the great variety, the architectural evolution of the Icelandic farm can be traced back as an increasingly complex form in its planimetric disposition. The "longhouse" [*skáli*], the one-room dwelling typical of the settlement period, was progressively enlarged with transversal or separated areas within the same cluster. The added rooms could be the kitchen [*eldhús*] and the simultanously living room and bedroom usually called *baðstofa*. Later and until today, the term *baðstofa* began to represent the whole complex of a turf farm, usually revolving around one central hall for most activities, including sleeping. By the nineteenth century the most common turf farm typology consisted of a central corridor that connected all rooms together. As Hjörleifur Stefánsson pointed out, the majority of today's existing Icelandic turf farms derive from the late nineteenth-century typology of the "gabled house" that shows a more or less homogeneous façade of gabled timber entrances in front of the turf cluster.[26] As it will be seen in chapters three and four, this specific typology was at the core of an early twentieth-century architectural fascination for turf houses, during the very decades when traditional farms were abandoned in favor of timber or concrete dwellings. **Figg. 3a–4b.**

A country without trees

The main reason why Icelandic construction developed around turf and gravel was that, progressively since the times of settlement, the presence of forests on the

---

[24] Hjörleifur Stefánsson, *Af jörðu*, 32–36.

[25] Halldór Laxness, *Under the Glacier*, trans. Magnus Magnusson (New York: Vintage International, 2004), 17. Original title: *Kristnihald undir Jökli*, published in 1968.

[26] *Burstabær*. For an overview of the planimetric evolution, see: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 40; Hjörleifur Stefánsson, *Af jörðu*, 53–55.

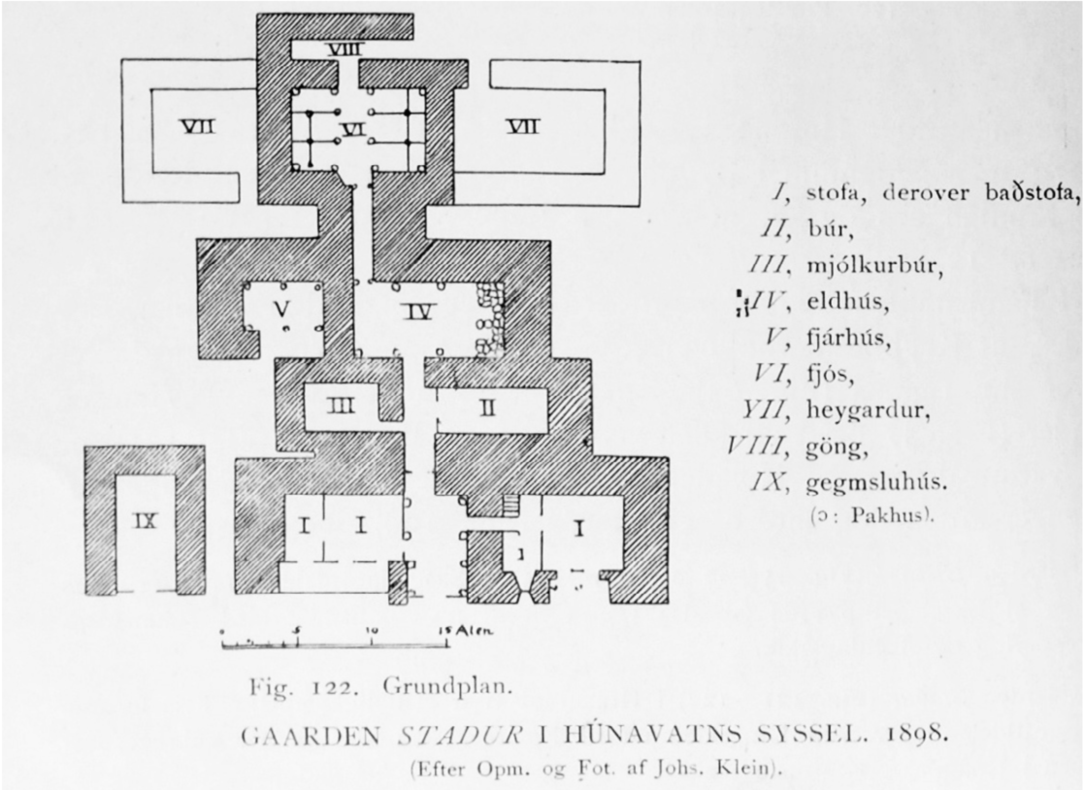


Fig. 3a – Plan of a turf farm in Húnavatnssýsla, 1898.
Bruun, *Gammel Bygningsskik paa de islandske Gaarde,* 100.

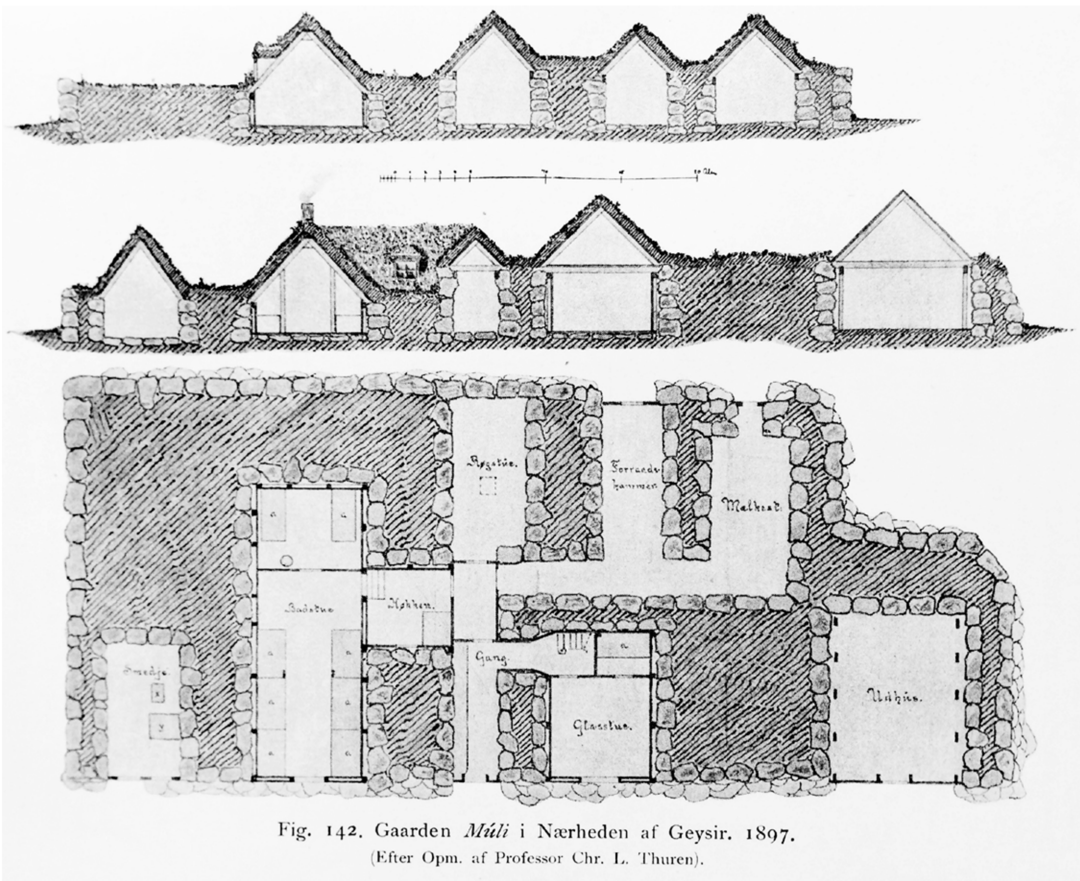


Fig. 3b – Plan and sections of a turf farm near Geysir, 1897.
Bruun, *Gammel Bygningsskik paa de islandske Gaarde,* 113.

Figg. 4a–4b – “Gabled house” or *burstabær* in Bustarféll, Vopnafjörður. Originally built in the late eighteenth century, it was inhabited until 1966. Now it is preserved by the National Museum of Iceland. Photos by Sofia Nannini, 2019.

island decreased until the first half of the twentieth century.[27] With the exception of sporadic timber churches, throughout the centuries Icelanders had to rely less on wood and more on turf and gravel.[28] The timber structures that characterized the roofing system of turf houses were mainly composed by driftwood, which was usually found on the seashore carried by currents on the Atlantic Ocean. Continental timber architecture appeared no earlier than in the sixteenth and seventeenth centuries, mostly as headquarters for European merchants on a few coastal outposts.[29] The presence of trade centers increased rapidly when in 1602 the Danish kingdom issued a decree that imposed a Danish trade monopoly on all Icelandic commerce. Trade was coordinated by Danish citizens in specifically designated commercial harbours along the Icelandic coast: until the mid-nineteenth century timber houses were thus a prerogative of the Danish trading class.[30] However, final abolition of the Danish monopoly in 1855 and the growing number of Icelandic carpenters and builders resulted in an increase of wooden constructions in Icelandic villages. They were not limited to Danish citizens anymore, but became available to some Icelandic families and also used for a few public buildings.[31] In the late nineteenth century entirely prefabricated timber houses became available: they were produced in Norway and exported to the Icelandic centers.[32] **Figg. 5a–5b.** The main drawback of timber construction in Iceland was its high cost, due to constant reliance on imported wood

---

[27] Many might have been the causes behind the progressive decline of Icelandic forests: extensive use of timber by the first settlers, colder temperatures after the fourteenth century, and the widespread grazing of livestock, especially sheep. For a brief outline on Icelandic forestry, see: Michael J. Kissane, "Seeing the Forest for the Trees: Land Reclamation in Iceland," *Scandinavian Review* 86, no. 1 (1998): 4–7.

[28] The most prominent examples of medieval timber buildings in Iceland were the churches of Skálholt and Hólar, the two main sites of the Icelandic Church. See: Gunnar Karlsson, *The History of Iceland*, 38–43. On the churches and their archaeological remains, see: Kristján Eldjárn, Hakon Christie, and Jón Steffensen, *Skálholt: fornleifarannsóknir 1954–58* (Reykjavík: Lögberg, 1988); Hörður Ágústsson, *Skálholt: kirkjur* (Reykjavík: Hið íslenska bókmenntafélag, 1990); Hjörleifur Stefánsson, Kjell H. Halvorsen, and Magnús Skúlason, eds., *Af norskum rótum*, 16–19. On traditional timber architecture in Northern Europe, see: Evgeny Khodakovsky, and Siri Skjold Lexau, *Historic Wooden Architecture in Europe and Russia* (Basel: Birkhäuser, 2015); see also: Jerri Holan, *Norwegian Wood. A Tradition of Building* (New York: Rizzoli International, 1990).

[29] For an outline on Icelandic timber architecture, see: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 45–49. Among Icelandic sources, see: Guðmundur Hannesson, *Húsagerð á Íslandi*, 175–81; Hörður Ágústsson, *Íslensk byggingararfleifð I,* 95–132; Hjörleifur Stefánsson, Kjell H. Halvorsen, and Magnús Skúlason, eds., *Af norskum rótum*, 8–43.

[30] Until the late nineteenth century, the Danish origins of merchants active in Iceland implied differences not only in their dwellings and furniture, but also in their language and culture. See: Auður Hauksdóttir, "Language and the Development of National Identity: Icelanders' Attitudes to Danish in Turbulent Times," *Made in Denmark: Investigations of the dispersion of 'Danishness'. KULT* 11 (2013): 71–72.

[31] One example is the Latin School in Reykjavík, built in 1843–46. In Icelandic *Latínuskólinn*, since 1937 known as *Menntaskólinn í Reykjavík*. It is Iceland's oldest and most renowned high school. See: Heimir Þorleifsson, ed., *Saga Reykjavíkurskóla: Historia Scholæ Reykjavicensis* (Reykjavík: Menningarsjóður, 1975–84). On the construction of the school, see: Guðný Gerður Gunnarsdóttir, and Hjörleifur Stefánsson, *Kvosin*, 238–40.

[32] These houses are known as "catalogue houses", *katalóghús*. See: Kjell H. Halvorsen, "Forsmíðuð hús – norskt handverk, iðnaður og útflutningur," in *Af norskum rótum*, 68–89.

for structures and on corrugated iron for cladding.[33] The need of a highly skilled labour force was also expensive. Although timber houses did play an important role within Icelandic construction and still today characterize some of Iceland's quaint city centers, timber was not only expensive, but it was also constantly threatened by fires. As will be seen at the end of chapter two, by 1915 new timber buildings were entirely banned from the city center of Reykjavík, thus stopping the development of Icelandic timber architecture for the decades to come.

1.1.2 Icelandic pozzolana: Geological surveys in Iceland (1820–42)

Icelandic concrete history dates back to the 1840s. However, debate on Iceland's geological resources and their exploitation for building purposes had already started in the late eighteenth century. The first modern reference to lime production from Icelandic sources was an essay written by Icelandic scientist and medical doctor Sveinn Pálsson (1762–1840), published in the journal of the Icelandic Society for Learned Arts in 1788.[34] The essay can be considered as a brief treatise on limestone and lime production written in Icelandic. In the first two paragraphs Sveinn Pálsson mentions the chemistry and geology of limestone deposits; then he highlights the methods for burning lime and using it for stonemasonry. Acknowledging that limestone deposits have not been discovered in Iceland, he refers to the possibility of obtaining lime from seashells as raw material.[35] Interestingly, Sveinn Pálsson also refers to the existence of hydraulic binders, such as Roman cement and hydraulic lime, and claims that deposits of "clay or red earth" could be found in many places in Iceland.[36]

---

[33] Named as "our most practical building material", corrugated iron was very popular in Iceland between the 1870s and the early twentieth century. Valgarður Ó. Breiðfjörð, "Handhægasta byggingarefnið okkar," *Reykvíkingur* 7, no. 7 (1897): 25. This tradition had roots in Britain, from where the material was usually imported. As a cheap replacement for wood, corrugated iron plates were used for cladding walls and roofs of timber and turf houses, in trading centres and in the countryside. See also: Valgarður Ó. Breiðfjörð, "Bárótta þakjárnið," *Reykvíkingur* 4, no. 9 (1894): 33, and the booklet *Bárujárn. Verkmenning og saga*, edited by Hjörleifur Stefánsson. Sometimes corrugated iron was used as a replacement for the stone layers within turf walls, althought this habit was considered as aesthetically "barbarian" [*barbarisk*] by some inhabitants of Reykjavík. Valgarður Ó. Breiðfjörð, "Handhægasta byggingarefnið okkar," 25.

[34] S.P. [Sveinn Pálsson], "Um kalkverkun af jørdu og steinum með litlum viðbæti um tilbúning skelia-kalks; samanlesit úr dønskum, þýðskum og ødrum ritum," *Rit þess (konunglega) íslenzka Lærdómslistafélags* 9 (1788): 91–143. The Icelandic Society for Learned Arts [*Hið íslenzka Lærdómslistafélag*] was founded in 1779 by Icelandic scholars in Copenhagen, and its journal was published between 1781 and 1798. The society was one of the actors that fostered the development of Enlightenment ideals in the Icelandic context: its effects were to be seen throughout the whole nineteenth century. See: Ingi Sigurðsson, "The Icelandic Enlightenment as an Extended Phenomenon," *Scandinavian Journal of History* 35, no. 4 (December 2010): 371–90.

[35] In particular, he referred to two different methods employed in Bremen and in Holland. Lýður Björnsson discussed both in: *Steypa lögð og steinsmíð rís*, 38–41. On lime production from seashells by Dutch manufacturers, see also: Roberto Gargiani, *Concrete from Archeology to Invention: 1700-1769. The Renaissance of Pozzolana and Roman Construction Techniques* (Lausanne: EPFL Press, 2013), 78–80.

[36] "[...] at í vatnskalk skuli brúka járnleir eða rauða þann, nóg er af víða í leirholltum á Íslandi." S.P. [Sveinn Pálsson], "Um kalkverkun af jørdu og steinum með litlum viðbæti um tilbúning skelia-kalks; samanlesit úr dønskum, þýðskum og ødrum ritum," 131. Sveinn Pálsson also commented on the

Fig. 5a – *Menntaskólinn*, Reykjavík, 1843–46. Photo by Sofia Nannini, 2019.

Fig. 5b – House in Þingholtsstræti 29, Reykjavík, “catalogue house” prefabricated in Norway and built in 1899. Photo by Sofia Nannini, 2019.

Between the lines, Sveinn Pálsson might have been suggesting that Iceland could offer deposits of pozzolana, indeed one of the most coveted earth products in modern construction history. Throughout the eighteenth century, Italian pozzolana deposits were largely exploited, until new deposits were discovered outside the historical boundaries of the Gulf of Neaples and the Roman countryside.[37] This prompted a rush for pozzolanic materials among the European states, in order to sustain the increasing demand for hydraulic infrastructures like harbours and bridges. In line with such geological explorations and material needs, although with considerable delay if compared to France or Spain, in the early nineteenth century also Denmark started promoting the geological analysis of its territory, both in Europe and overseas. The main actor behind these explorations was Johan Georg Forchhammer (1794–1865), student of renowned physicist Hans Christian Ørsted (1777–1851) and a pioneer in Danish geological studies. As a result of his research, Forchhammer published several essays on the geology of the island of Bornholm, of the Faroe Islands, and of the whole Danish territory.[38] Although these printed sources do not directly refer to geological surveys in Iceland, there are archival references to Forchhammer's focus on Icelandic geology and, specifically, concerning the presence of pozzolana deposits.[39] The presence of Icelandic pozzolana had already been mentioned in the 1820s and by the early 1830s Forchhammer resumed research, appointing his colleague Ögmundur Sigurðsson (1799–1845, usually referred to as Ögmundur Sivertsen) to lead geological explorations in the Snæfellsnes peninsula.[40]

Given the fact that there were no further mentions of pozzolana deposits in Iceland until local cement production started in the late 1950s and the debate emerged again in contemporary terms, these investigations seemed to have resulted in a failure. No matter how unsuccessful Forchhammer's survey might have been, it was

---

experiments on Roman conglomerate and hydraulic lime carried out by Antoine-Joseph Loriot (1716–82). On Loriot, see: Gargiani, *Concrete from Archeology to Invention*, 342–51.

[37] In particular, Jean-Baptiste Labat (1663–1738) discovered pozzolana, named also as "red earth", in the volcanic islands and French colonies of Guadalupe and Martinique. On the trade of pozzolana during the eighteenth century, see: Gargiani, *Concrete from Archeology to Invention*, 41–61.

[38] See: Johann Georg Forchhammer, *Om Færöernes geognostiske Beskaffenhed* (Copenhagen: Martv. Frid. Popps Bogtrykkerie, 1824); Johann Georg Forchhammer, *Danmarks geognostiske Forhold* (Copenhagen: Schultz, 1835); Johann Georg Forchhammer, *Om de bornholmske Kulformationer* (Copenhagen: Videnskabernes Selskab, 1837); Johann Georg Forchhammer, *Skandinaviens geognostiske Natur* (Copenhagen: C. A. Reitzel, 1843).

[39] ÞÍ, 1928 – B24/0005. *Bréfadagbók* 20 (*Islands Journal* 20). 1841–1842. Örk. 18. The documents span from 1806 to 1842. They are papers related to *Rentekammeret*, the board of the Danish kingdom in charge of economic matters (documents of *Rentekammeret* regarding Icelandic issues were transferred to Iceland in 1928). The first set of documents is composed by letters and reports regarding the nature of pozzolana, written by scholars such as Gregers Wad (1755–1832) and Gottfried Becker (1767–1845), in relation to some geological inquiries on Icelandic soil and pozzolana carried by Charles Teilmann (?) in 1820. The correspondence was resumed by Forchhammer in 1833, when a discovery of coal in the Skagafjörður area prompted new scientific inquiries on Iceland's geology.

[40] Sivertsen researched in the areas of Búðir and Ingjaldshóll, at the slopes of the volcano Snæfellsjökull on the western coast, and the area of the Skagafjörður on the northern coast. ÞÍ, 1928 – B24/0005. *Bréfadagbók* 20 (*Islands Journal* 20). 1841–1842. Örk. 18. See the expense sheet signed by Sivertsen, 20 October 1835.

nevertheless a sign of the geological importance of Iceland during Denmark's golden age of scientific inquiry. Since the late seventeenth century Iceland had already become particularly famous for its deposits of Iceland spar, or Iceland crystal (see further in this chapter). However, during the first decades of the nineteenth century Iceland's geological curiosities were still in the hands of European scientists and explorers, who did not consider them elements for improving the poor living conditions of the Icelanders. These two worlds collided only after the 1840s, when Icelandic nationalism started rising in the shape of an independence movement. It was then acknowledged that the underdeveloped world of turf farms could be modernized only through the exploration of the geologically rich country. These were, in fact, the premises on which the Icelandic concrete *saga* began.

1.2 A Building Education: Learning from Denmark (1847–95)

Icelandic stonemasonry and concrete construction largely developed throughout the second half of the nineteenth century. The timeframe of 1847–95 is marked by two distinct events, respectively: the first application of Portland cement in the country and the first Icelandic construction in concrete cast walls. During these decades Iceland experienced a new wave of nationalism that eventually set the political agenda towards an increasing autonomy from the kingdom of Denmark. In spite of the growing movement that argued for Iceland's full independence from Denmark, the development of Icelandic construction was very much dependent on Danish technical knowledge. This interdependence could be seen as a bridge connecting Iceland to the continent with a twofold consequence. On the one hand, it tightened the economic and social connections to Denmark, in the very moment when Danish authorities were loosening their grip on the island. On the other hand, it also allowed more commercial and scientific relations with other countries, such as Germany and the United Kingdom, resulting in the importation of new technical expertise to Iceland.[41]

[41] Throughout this dissertation the term Germany will be used to refer to the variety of political systems which followed one another until the Second World War: from the German Second Empire (1871–1918), to the Weimar Republic (1919–33), until Nazi Germany (1933–45). To understand the peculiar "political, religious, cultural, and regional diversity" of the Second Empire, or Prusso-Germany, specifically from an architectural point of view, see: John V. Maciuika, *Before the Bauhaus. Architecture, Politics and the German State, 1890–1920* (Cambridge: Cambridge University Press, 2005), 11–12.

1.2.1 A bigger cathedral for Reykjavík: The first application of Portland cement (1847)

According to Icelandic historiography, cement was first used in Iceland in 1847 to plaster the outer walls of Reykjavík's recently enlarged cathedral. This information has been reported many times by historians throughout the twentieth century, and its origins can be linked to the comprehensive volume on Icelandic construction history written Guðmundur Hannesson.[42] Claiming that "the history of concrete is like a fairytale", Guðmundur Hannesson wrote a very short outline of the discovery of Portland cement.[43] He proudly asserted that the Icelanders "soon paid attention to cement and concrete", and he marked 1847 as the year when cement was first used on the walls of Reykjavík's cathedral.[44] By 1847, the whole country hosted only a handful of stone buildings, all commissioned by Danish authorities and designed by Danish architects. First was the *Viðeyarstofa*, designed by Nicolai Eigtved (1701–1754) and built between 1753–55, as the residence of Skúli Magnússon (1711–1794).[45] The *Viðeyarfstofa* was soon followed by a number of small churches and residences in the South-West part of the country. Some of these buildings had representative goals, other were purely functional – such as the prison of Reykjavík, built in 1765–70.[46] Among them was the cathedral of Reykjavík.[47] **Figg. 6a–6b.**

Despite its small dimensions, the history of Reykjavík's cathedral was long and troublesome.[48] The presence of a cathedral in Rekjavík is, in fact, rather recent. Until

[42] Guðmundur Hannesson, *Húsagerð á Íslandi*, 241; Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 42; Hörður Ágústsson, *Íslensk byggingararfleifð I*, 291; Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 70.

[43] "Sagan um steinsteypuna er æfintýri líkust". Guðmundur Hannesson, *Húsagerð á Íslandi*, 240.

[44] "Það verður ekki annað sagt en að Íslendingar færu snemma að gefa sementi og steinsteypu gætur." Guðmundur Hannesson, *Húsagerð á Íslandi*, 241.

[45] Eigtved was a royal architect of the Danish kingdom and among the founders of the Royal Danish Academy of Art. See: Knud Voss, *Arkitekten Nicolai Eigtved 1701–1754* (Copenhagen: Busck, 1971). Skúli Magnússon was Iceland's *landfógeti* between 1749 and 1793. The *landfógeti* (*Landfoged* in Danish) was the representative of the Danish king regarding the finances of Iceland. On the residence at Viðey, see: Þorsteinn Gunnarsson, *Viðeyjarstofa og kirkja*.

[46] Now the building hosts the headquarters of the cabinet of Iceland [*Stjórnarráð Íslands*].

[47] Among the early stone buildings were the cathedral in Hólar (1757–63), the church of Viðey (1766–74), the prison of Reykjavík, now headquarters of the Cabinet of Iceland (1765–70), the church in Heimaey on the Westman Islands (1773–78), the church in Bessastaðir (1777–78), the Amtmann's residence at Bessastaðir (1761–67), and the Nesstofa residence in Seltjarnarnes (1761–63). For a brief synthesis, see: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 50; see also: Helge Finsen, and Esbjørn Hiort, *Steinhúsin gömlu á Íslandi* (Reykjavík: Bókaútgáfan Iðunn, 1978); Hörður Ágústsson, *Íslensk byggingararfleifð I*, 271–83. Lýður Björnsson claimed that Reykjavík's first stone dwelling was built in 1848: Lýður Björnsson, *Steypa lögð og steinsmíð rís,* 42.

[48] Danish architectural historian Esbjørn Hiort wrote about the late eighteenth century construction of the cathedral in Reykjavík and Andreas Kirkerup's project: Esbjørn Hiort, "Andreas Kirkerup's islandske kirke. Af Reykjavík Domkirkes bygningshistorie," *Architectura. Arkitekturhistorisk Årsskrift* 2 (1980): 126–41; see also the Icelandic version: Esbjørn Hiort, and Hjörleifur Stefánsson, "Úr byggingarsögu dómkirkjunnar í Reykjavík," *Árbók Hins íslenzka fornleifagélags* 81 (1984): 27–48. Danish architectural historian Ida Haugsted wrote about Winstrup's travel to Iceland and his renovation project of 1846–48: Ida Haugsted, "L.A. Winstrups rejse til Island," *Architectura* 20 (1998): 67–93; see

Fig. 6a – Nicolai Eigtved, residence of Skúli Magnússon *Viðeyarstofa* and church. Viðey Island, 1753–55. Photo by Sofia Nannini, 2019.

Fig. 6b – Nicolai Eigtved, residence of Skúli Magnússon *Viðeyarstofa* and church. Viðey Island, 1753–55. Photo by Sofia Nannini, 2019.

the late eighteenth century, Reykjavík did not host the bishop's seat. Since the Middle Ages, Icelandic bishops had resided in Skálholt, in South-West Iceland. After the great earthquakes in 1784–85 that destroyed most of the settlements in Árnessýsla and Rángarvallasýsla counties, the Danish kingdom prompted the transfer of the parish church to Reykjavík, which had already become Iceland's main trading centre.[49] The new cathedral was designed by Danish carpenter and architect Andreas Kirkerup (1749–1810). The final outcome was a small church, with one single hall and no apse, located in the area of Austurvöllur between the harbour and the pond *Tjörnin*, south of the city center. The main structure was in local stones bound together with lime, covered by a timber roof. The works started in 1787 and they were carried out by Danish mastermasons; the cathedral was inaugurated almost ten years later, in 1796.[50] **Fig. 7.**

A few decades later, Kirkerup's cathedral had become too small for the increasing population of Reykjavík.[51] This is why in 1846 the Danish *Rentekammeret* invited the young Danish architect Laurits Albert Winstrup (1815–1889) to travel to Iceland and draw a proposal for the renovation of the cathedral: this invitation made Winstrup the first Danish architect who had ever visited the country.[52] Winstrup's proposal resulted in some essential transformations of the church's layout. A brickwork level was added on top of the original stone walls, a second row of windows was opened, and so were added the choir, the sacristy, and a projecting entrance. The main technical novelties were two: flagstones were used for the roof, and all outer walls were covered by a cement render.[53] Bricks, lime, and cement were imported from Denmark.[54] The works proceeded quickly, and the renovated cathedral was inaugurated in 1848. Soon,

---

also the Icelandic version: Ida Haugsted, and Mjöll Snæsdóttir, "Íslandsferð L.A. Winstrups 1846," *Árbók Hins íslenzka fornleifafélags* 94 (1998): 47–84. Icelandic priest and historian Þórir Stephensen wrote a comprehensive volume on the cathedral's history with detailed archival research: Þórir Stephensen, *Dómkirkjan í Reykjavík. Byggingarsagan. Vol. I.* The history of the cathedral was also published in one of the volumes of the series *Kirkjur Íslands*. See the section written by Þorsteinn Gunnarsson in: "Dómkirkja," *Fornar kirkjur í Reykjavík. Dómkirkjan, Fríkirkjan, Kristkirkja* (Reykjavík: Þjóðminjasafn Íslands, 2012), 30–82.

[49] Esbjørn Hiort, "Andreas Kirkerup's islandske kirke," 126–28.

[50] Esbjørn Hiort, "Andreas Kirkerup's islandske kirke," 139–43; Þórir Stephensen, *Dómkirkjan í Reykjavík*, 56–80.

[51] Þórir Stephensen, *Dómkirkjan í Reykjavík*, 131.

[52] *Rentekammeret* was the department of the Danish Kingdom that managed its economies and taxation. It may be compared to the British Exchequer. It was abolished in 1848, and substituted by the ministerial system. Winstrup had trained as an architect and mastermason, and was mainly active in Denmark. See: Þórir Stephensen, *Dómkirkjan í Reykjavík*, 134–35. Winstrup left notes and sketches of his Icelandic voyage: Ida Haugsted, "L.A. Winstrups rejse til Island," 71–85.

[53] *Hellusteinn* in Icelandic. Stone roofs were regarded as an absolute novelty in Iceland. See: "Helluþökin í Reykjavík," *Þjóðólfur* 1, no. 5 (13 January 1849): 23–24. On the cement render: Þórir Stephensen, *Dómkirkjan í Reykjavík*, 153.

[54] In particular, cement was imported from Flensborg (now Flensburg), which by 1847 was still under the Danish rule. The town became part of the Kingdom of Prussia in 1864 as a result of the Second Schleswig War. See: Þórir Stephensen, *Dómkirkjan í Reykjavík*, 146. During the 1840s and 1850s, traces of cement production in Flensborg could be found in many Danish newspapers. See for example the letter mentioning cement production in Flensborg: "Til Directionen for den mercantile Industriforening," *Følgeblad til "Fædrelandet"* 1, no. 182 (7 June 1840); see also the advertisement in: "Cement," *Svendborg Amtstidende* 5, no. 83 (19 July 1856).

however, Winstrup's renovation raised a number of criticisms by local inhabitants and mastermasons. On the one hand, it was evident that plastered masonry structures were not suitable for the cold and humid Icelandic climate. On the other, for the first time Icelandic masons raised their voices for more autonomy regarding the construction of public buildings.[55] Since Winstrup's renovation of Reykjavík's cathedral and the debate it generated, political aims of autonomy and technical innovations in construction were often intertwined. **Fig. 8.**

Although it is nearly impossibile to validate, the assumption that cement was first used while renovating Reykjavík's cathedral is rather likely. Before 1847, no Icelandic article mentioned Portland cement or its derivatives.[56] In fact, the first remarks on the use of modern cement in Icelandic printed sources are dated a few years after the inauguraton of the enlarged cathedral, which most likely served as an example for construction techniques. Apart from a few technical suggestions, cement soon came to embody social meanings for a country that was seeking better living conditions.[57] During the National Assembly of 1851, the candidate Björn Jónsson (1802–86) stated that within Iceland there was "everything needed to build a house, there is cement, gravel, flagstones and lime".[58] Thanks to a few reports on imported goods, it is possible to conclude that cement was increasingly used by the population since the 1860s.[59] However, it was only in the 1870s that a public debate on cement, lime, and concrete started and echoed in Icelandic newspapers and journals. For a decade, however, most Icelandic builders devoted their attention to lime and, in line with the national struggle towards economic and material independency, they tried to promote local production near the city of Reykjavík.

---

[55] An article, signed by "Some workers in Reykjavík" [Nokkrir iðnaðarmenn í Reykjavík], was published on *Þjóðólfur* in 1867 and is worth mentioning. They criticized most of the cathedral's renovation project, such as the absence of foundations under the new sacristy and the use of seawater within the lime, which severely damaged the masonry walls. The article was soaked in Icelandic national rhetoric, as its authors claimed that the low construction quality of the cathedral was due to a lack of knowledge of Danish builders regarding the Icelandic context. It is important to highlight that this article could be considered as one of the few episodes when Icelandic mastermasons emerged as a unanimous voice in the national debate. See: "Það væri lengi...," *Þjóðólfur* 19, no. 14–15 (8 February 1867): 58–61. The cathedral underwent major renovations already in 1879. See: Þórir Stephensen, *Dómkirkjan í Reykjavík*, 190–99.

[56] This claim derives from a research on the online database *Tímarit*, that includes the majority of journal and newspaper articles published in Iceland between the eighteenth and the twentieth century.

[57] The already mentioned article on flagstone roofs refers to the use of cement to fill the joints of the roof: "Helluþökin í Reykjavík," *Þjóðólfur* 1, no. 5 (13 January 1849): 23. In 1851, an article in the newspaper *Bóndi* referred to lime and cement as "expensive", thus being the main drawback of stone buildings: "[...] þá eru það einna helztu annmarkarnir á því að byggja hjer úr grjóti, hvað kalk og sement er hjer dýrkeypt". "Tilraunir og uppástungur ýmsra manna um bæjabyggingar," *Bóndi* 1, no. 3 (28 February 1851): 42–44.

[58] "Ég vildi nefnilega bæta inn í geinina öllu því, sem ég áleit nauðsynlegt fyrir búandi mann, og það, sem ég hafði í húga, að helzt væri nauðsynlegt til húsabygginga, var cement, múrgrjót, hella og kalk". Statement by Björn Jónsson, in *Tíðindi frá þjóðfundi íslendinga árið 1851*, edited by Pétur Pétursson, Jens Sigurðsson, and Gísli Magnússon (Reykjavík: Prentsmiðja landsins, 1851), 374.

[59] In 1864 at least one barrel of cement was imported: "Vöruskrá," *Norðanfari* 3, no. 30–31 (1864): 62; in 1870, cement was listed among the imported goods coming from Denmark and other countries, under the name of *múrlím*: "Verzlan á Íslandi árið 1866," *Skýrslur um landshagi á Íslandi* 4 (1870): 334. For a comprehensive analysis on the quantity of imported cement in the last decades of the nineteenth century, see "Table IV" in: Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 49.

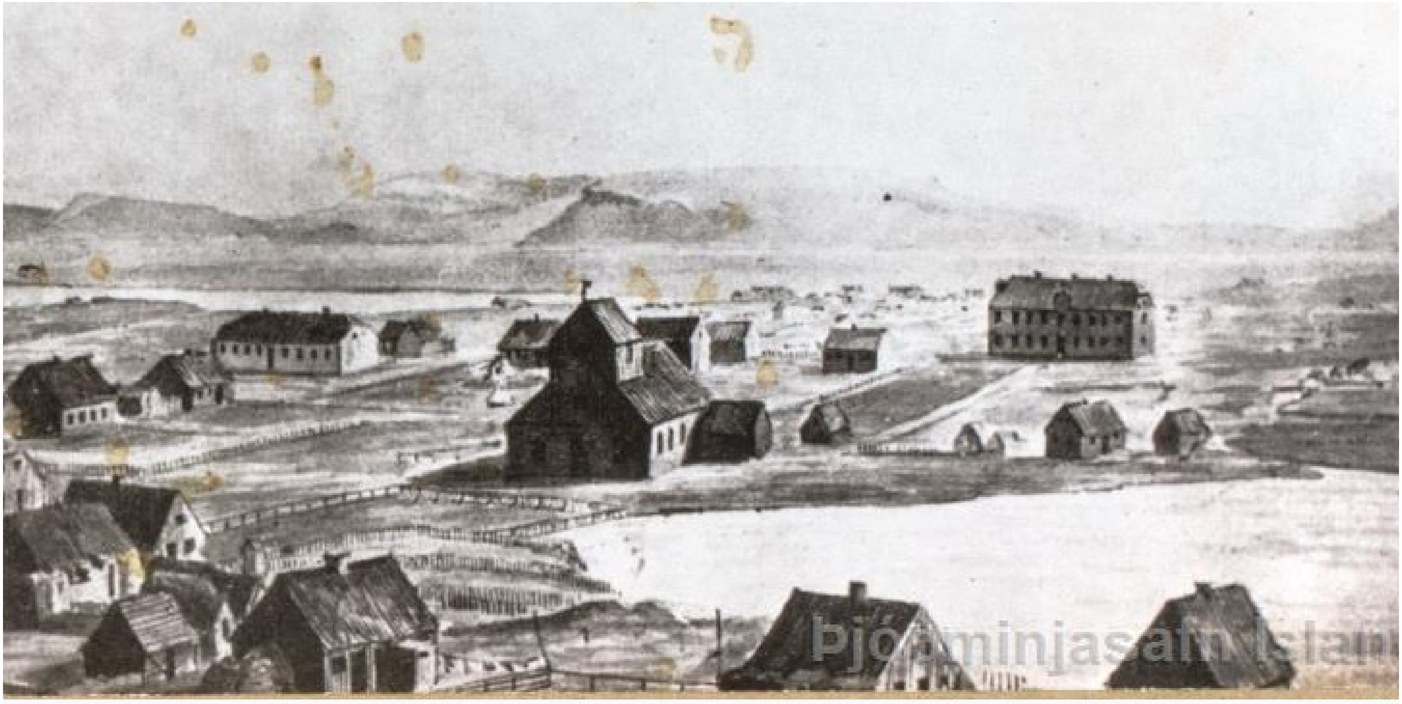


Fig. 7 – Reykjavík in the first half of the nineteenth century. The cathedral is at the very center of the village. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 8 – The cathedral of Reykjavík at the beginning of the twentieth century.
Þjóðminjasafn Íslands/National Museum of Iceland.

1.2.2 Lava, lime mortars and concrete: Education and production (1859–81)

> Where are those who can teach people how to cut stone, and build a house out of it? [...] Is there anyone who can produce lime? No, absolutely no-one in the whole country: people learn Danish, Latin, Greek, Hebrew, German, French and English, but there is no-one here that knows how to make lime [...].[60]

Published in the journal *Ný Félagsrit* in 1852, these words by medical doctor Jón Hjaltalín (1807–82) underscored one of the greatest challenges of the Icelandic independence movement: the desire for better housing conditions and greater autonomy in construction matters.[61] This paragraph deals with a very particular moment in Icelandic construction history: the three decades that span from the end of the 1840s and the first applications of cement to the construction of Iceland's grandest nineteenth-century building – Ferdinand Meldahl's House of Parliament – in 1881. These decades were pivotal because they prompted the establishment of a working class of educated mastermasons and the local production of building materials.[62] This process highlighted a growing cultural transfer in building issues from the continent to Iceland, with a preeminent Danish influence. In fact, until the beginning of the twentieth century, Denmark was still Iceland's chief model for both political and economic paradigms, acting as a bottleneck for the transmission of information and skills.[63] What follows is a brief outline of the main protagonists, moments, and events of the period, with a particular attention to transfers of knowledge from the continent to Iceland.

A building education in Bornholm

One of the main actors in Iceland's building education was Sverrir Runólfsson (1831–79), among the first Icelanders ever to get a formal education as a stonemason.[64] Most information about his life can be found in an autobiography

---

[60] "Hvar eru þeir, sem geta kennt manni að höggva steina, og byggja hús úr þeim? [...] Er þá enginn, sem kann að brenna kalk? – nei, alls enginn á öllu landinu; dönsku, latínu, grísku, hebresku, þýzku, frakknesku og ensku læra menn, en hér er enginn sem kann að brenna kalk [...]." Jón Hjaltalín, "Fjórða bréf," *Ný félagsrit* 12 (1852): 66.

[61] The journal was published in Copenhagen between 1841 and 1873, according to an idea of Jón Sigurðsson, who wanted to prompt a debate about all aspects of Iceland's progress.

[62] Mason or mastermason is a recurring term in this research. The word is often used to translate the Icelandic term *smíður*, which generally represents a craftsman. The combination with other terms adds more meanings to the word: *trésmíður* [carpenter], *húsasmíður* [builder], *húsgagnasmíður* [cabinet-maker].

[63] This key moment in Icelandic construction history was presented with particular attention in: Guðmundur Hannesson, *Húsagerð á Íslandi*, 231–43; Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 35–64; Hörður Ágústsson, *Íslensk byggingararfleifð I*, 271–307.

[64] Most sources assert that Iceland's first trained stonemason was Þorgrímur Þorláksson (1732–1805), who trained in Denmark and worked at the building sites of *Bessastaðastofa*, *Nesstofa* and of the churches at Viðey and Bessastaðir. See: Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 43; Gunnar Bollason, "Ágrip af sögu minningarmarka og steinsmíði á Íslandi frá öndverðu fram á 20. öld," *Árbók hins Íslenzka fornleifafélags* 100 (2009): 22.

written during the 1870s and published only in 1909, and his name is mentioned in most histories on Icelandic construction and architecture.[65] Sverrir Runólfsson acted as an important link between Danish and Icelandic industrial activities, that eventually resulted in great technical progress regarding the country's building industry. **Fig. 9.** Sverrir Runólfsson moved to Denmark in 1856. First he trained as a stonemason in Copenhagen, learning ordinary brickmasonry techniques. Later he moved to the island of Bornholm, where he "learned how to produce lime, cement and bricks".[66] In particular, his accounts indicate that he both worked in the villages of Rønne, Bornholm's largest harbour, and Allinge. His work in Bornholm is significant, although historiography has not yet given this detail sufficient consideration. **Fig. 10.**

Located in the Baltic Sea, at the end of Sweden's southernmost end, Bornholm is characterized by a complex and unique geology. Two features are particularly striking: the island's northern granite formations and a number of limestone deposits along the southern coast.[67] Both features transformed Bornholm into a mining and production site for Denmark. At the beginning of the nineeteenth century Bornholm's geological peculiarity was researched by Danish scientists; by the 1850s Bornholm became the country's center for lime and cement production.[68] It is also reported that a cement plant named *Schors fabrik* was opened in Limensgade in 1741, and that it produced an early version of cement out of argillaceous limestone.[69] A number of limestone quarries were opened on Bornholm, that prompted the construction of almost a dozen cement factories between the 1840s and the 1920s.[70] These plants were producing a kind of cement known as Roman or natural cement, either red or

---

[65] Sverrir Runólfsson, *Æfiágrip Sverris Runólfssonar steinhöggvara* (Reykjavík: Prentsmiðjan Gutenberg, 1909). Guðmundur Hannesson, *Húsagerð á Íslandi*, 231–34; Kjartan Bergmann Guðjónsson, "Sverrir steinhöggvari," *Tíminn* 2, no. 22 (9 June 1963): 518; Guðný Gerður Gunnarsdóttir, and Hjörleifur Stefánsson, *Kvosin*, 284–85; Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 54; Hörður Ágústsson, *Íslensk byggingararfleifð I*, 292–98; Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 54.

[66] "[...] fór hann til Borgundarhólms að læra að brenna kalk, sement og múrstein (tígulstein)." Sverrir Runólfsson, *Æfiágrip Sverris Runólfssonar steinhöggvara*, 7.

[67] This peculiarity is due to the island's location: Bornholm is placed between the Fenno-scandian shield and the continental sedimentary basin. See: Helge Gry, *Geology of Bornholm* (Copenhagen: Theodor Sorgenfrei, 1960), 3–4.

[68] See for example the work by the already mentioned author Johann Georg Forchhammer, *Danmarks geognostiske Forhold* (Copenhagen: Schultz, 1835). Forchhammer had also researched the geology of Bornholm under the assistance of his professor Ørsted in the late 1810s and early 1820s.

[69] See the presentation by Torben Seir Hansen, "Bornholm Cement. A Danish Example of Roman Cement," Seminar Lecture (2008), http://www.romanportland.net/files/doc/seminar2008/torben_seir_seminar2008s.pdf, last accessed 17/11/2020. According to Bent Ole Borup (Aalborg Portland Cement), the production by *Schors Fabrik* is the proof that modern cement could be considered as a Danish invention. See: Bent Ole Borup, "Fra Bornholm til Jylland. Om udviklingen af Dansk cement før 1900," *Historisk Beton*, lecture series. Available online at: https://www.youtube.com/watch?v=MdaRkycxiV8&feature=emb_title, 37'26'', last accessed 17/11/2020.

[70] By 1855 already six plants were active. Gunnar M. Idorn, *Concrete Progress: From Antiquity to the Third Millennium* (London: Thomas Telford, 1997), 24. For a complete list of Bornholm's cement plants, see: Torben Seir Hansen, "Bornholm Cement. A Danish Example of Roman Cement."

Fig. 9 – Sverrir Runólfsson. Þjóðminjasafn Íslands/National Museum of Iceland.

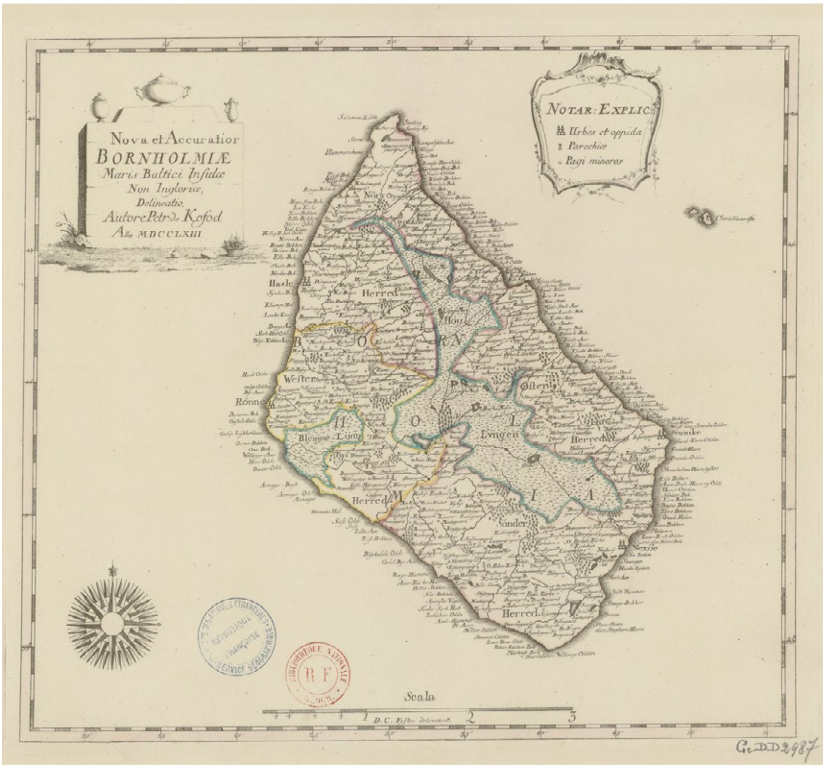


Fig. 10 – Map of Bornholm. Petr. de Kofod, D.C. Fester, *Nova et Accuratior Bornholmiae Maris Baltici Insulae Non Ingloriae*, 1763. Gallica, BNF.

grey in relation to the presence or absence of burned ironstone.[71] Alongside natural cement production, Bornholm's granite and sandstone deposits were also exploited, and a good number of former quarries can still be found on the island.[72] Such ubiquitous availability of stones had been a feature of the island's architecture since way before the beginning of the modern mining season: several historic buildings made with stone ashlars have been part of the local landscape for centuries, as exemplified in the Romanesque churches of Østermarie and Aa.[73]

Far from Denmark's traditional brickmasonry architecture, in Bornholm Sverrir Runólfsson experienced a completely different approach to construction. It is not possible to know exactly what kind of activity Sverrir Runólfsson was involved in while in Bornholm. However, he must have been exposed to both the island's natural cement production and its peculiar stone architecture. One experience was of particular importance: he visited the village of Allinge-Sandvig while the construction of the harbour was taking place.[74] The harbour's piers were entirely made of coarse, flat stones, most likely held together by thick layers of lime mortar. Similarly, several rural houses and farms were made with coarse granite or sandstone ashlars, usually bound together with lime. It was a technique that Sverrir Runólfsson nor any expert visitor could not have missed. **Figg. 11a–11d.** Once back to Iceland in 1860, the influence of his experience in Bornholm started emerging in his works. Not only did he come back as a trained builder, but he also engaged in a number of activities directly connected to the Baltic island: he experimented with coarse stone structures, and he was one of the active protagonists of Iceland's first lime production.

Walls of lava and lime

As a builder, Sverrir Runólfsson is known in his home country especially in relation to two important structures: the church at Þingeyrar in northern Iceland

---

[71] Roman (or natural) cement is a particular kind of cement produced by burning marls at temperatures between 800–1200°C. It was originally patented in 1796 by British clergyman James Parker. Although less resistant than Portland cement, patented in 1824, natural cements were widely produced and used in Europe throughout the nineteenth century. See: María José Varas, Monica Alvarez de Buergo, and Rafael Fort, "Natural Cement as the Precursor of Portland Cement: Methodology for Its Identification," *Cement and Concrete Research* 35 (2005): 2055–65; David Hughes, Simon Swann, and Alan Gardner, "Roman Cement. Part One: Its Origins and Properties," *Journal of Architectural Conservation* 13, no. (2007): 21–36. See also: Cédric Avenier, "Ciment naturel, la matière des moulages d'architecture au XIX[e] siècle," in *Édifice & Artifice. Histories constructives*, 577–86. Ironstone quarries were also present in Bornholm. Torben Seir Hansen, "Bornholm Cement. A Danish Example of Roman Cement."

[72] See for example the Vang Granitbrud on the north-west coast. Granite from Bornholm was massively exported between late nineteenth and to late twentieth century. See: https://bornholm.info/vang-granitbrud/, last accessed 26/11/2020.

[73] The walls of the church Østermariekirke, now in ruins, were made of granite ashlars, the vaults in limestone ashlars. The church Aa kirke, instead, was mainly made out of sandstones and limestone ashlars. See: R. G. Bromley, "Field Meeting: Bornholm, Denmark, 28 August to 4 September 2000," *Proceedings of the Geologists' Association* 111, Part 1 (2002): 80 and 84.

[74] Sverrir Runólfsson, *Æfiágrip Sverris Runólfssonar steinhöggvara*, 7–8.

Fig. 11a– The cement plant *Phønix* near Rønne, ca. 1900. Bornholms Museum.
https://bornholmskcement.weebly.com/cementfabrikkerne.html, last accessed 10/12/2020.

Fig. 11b– The ruins of the Østermarie church, Bornholm.
http://krogenborg.dk/2019/08/03/oestermarie-kirkeruin/, last accessed 09/12/2020.

Fig. 11c – Kay Fisker, sketch of a stone house made with coarse ashlars in Christiansø, north-east of Bornholm.
Danish National Art Library, inv. number 56456.

Fig. 11b– Stone houses in Allinge, Bornholm, 1905.
Photo by Ann Vibeke Knudsen, fotohistorie.com, last accessed 03/10/2020.

(1864–77) and the former prison on Skólavörðurstígur in Reykjavík (1871–73).[75] Like many of his minor works, these projects shared the same building technique.[76] The double walls are made of coarse basalt or volcanic ashlars, of different dimensions, bound together with lime mortar and without any surface render. [77] **Figg. 12a–13b.**

Considering the state of Icelandic construction in the 1870s, still mostly characterized by turf farms, both the church and the prison must have seemed like outstanding architectural wonders. [78] Also, Sverrir Runólfsson's particular stonemasonry technique could take advantage of Iceland's natural resources, yet added almost no extra costs related to stone cutting – which would have been particularly expensive due to the hardness of Icelandic volcanic rocks and the lack of specialized labour force. The mastermason was soon praised for his original building technique, and mentions of his "invention" are still to be found in contemporary historiography.[79] Surely, Sverrir Runólfsson innovated the Icelandic construction like no-one before him, to the point that he was even considered as "Iceland's first architect".[80] However, connecting his Icelandic career to his education in Bornholm, it is clear how much influence the Baltic island had on his works. Although reliable stonemasonry was rather uncommon in Iceland in Sverrir Runólfsson's active years, it is necessary to remember that coarse rocks and gravel were largely used for the lower portions of the walls in turf farms. The real difference in the mastermason's works was not mere the use of stone within the main structures, but the key ingredient that

[75] As for the church at Þingeyrar, Sverrir Runólfsson was the designer and builder of the project. The prison in Reykjavík was instead designed by Danish architect Gotfred Christian Vilhelm Klentz (1826–85), although the adopted building technique was directly influenced by Sverrir Runólfsson, who had just rebuilt the nearby tower of Skólavarða in 1868. Jón Guðmundsson, "Tugthúsbyggingin," *Þjóðólfur* 24, no. 27–28 (24 May 1872): 112–14; Hörður Ágústsson, *Íslensk byggingararfleifð I*, 298. On the construction of the prison, see: Hjörleifur Stefánsson, *Hegningarhúsið við Skólavörðustíg* (Reykjavík: Árbæjarsafn, 1984).

[76] It is also said that in 1871 Sverrir Runólfsson built the first stone house ever commissioned by a farmer, in Stóru-Vogar, near Reykjanes. As reported in the local press, the walls were "all made of Icelandic lava" [Allt byggð úr íslenzku hraun-grjóti]. The building was renovated in 1912. See: J. M. Waage, Sverrir Runólfsson, "Hérmeð leyfum vér...," *Þjóðólfur* 24, no. 13–14 (8 February 1872): 52; Árni Óla, *Strönd og Vogar* (Reykjavík: Menningarsjóður, 1961), 157–58; Guðmundur Björgvin Jónsson, *Mannlíf og mannvirki í Vatnsleysustrandarhreppi* (Hafnarfjörð: Prentsmiðja Hafnarfjarðar, 1987), 64–65.

[77] Icelandic sources usually refer to these stones as *hraun*, a general term for lava and various volcanic products.

[78] The church at Þingeyrar was commissioned by Ásgeir Einarsson (1809–85), farmer and member of the Parliament. The basalt ashlars were quarried on the western side of the Hóp lake, and carried to the building site on the frozen waters during winter. Once completed, the church was welcomed as the "hin traustasta, prýðilegasta og yfirhöfuð einhver hin vandaðasta kirkja, sem byggð hefur verið á þessu landi" [the most solid, beautiful and best church that has ever been built in this country]. Þór Magnússon, "Þingeyrakirkja. Byggingarlist kirkjunnar," in *Kirkjur Íslands* Vol. 8 (Reykjavík: Hið íslenska bókmenntafélag, 2006), 270–72; Þorsteinn Gunnarsson, "Steinhlaðnar kirkjur á Íslandi," in *Kirkjur Íslands* Vol. 31 (Reykjavík: Hið íslenska bókmenntafélag, 2018), 52–58. The prison is commonly known as *Hegnigarhúsið við Skólavörðurstíg*. The walls are mainly made of coarse lavic ashlars, and only the quoins were properly cut. On the construction of the prison, see: Hjörleifur Stefánsson, *Hegningarhúsið við Skólavörðustíg*, 44–51.

[79] Guðný Gerður Gunnarsdóttir, and Hjörleifur Stefánsson, *Kvosin*, 285; Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 54.

[80] "[...] sem kalla mætti fyrsta arkitekt á Íslandi". Páll V. G. Kolka, "Þingeyrakirkja," *Lesbók Morgunblaðsins* 32, no. 45 (24 December 1957): 687.

Fig. 12a – Church at Þingeyrar. Photo by Sofia Nannini, 2019.

Fig. 12b – Detail of the basalt ashlars. Photo by Sofia Nannini, 2019.

Fig. 13a – Former prison in Skólavörðurstígur, Reykjavík. Photo by Sofia Nannini, 2019.

Fig. 13b – Detail of the volcanic ashlars. Photo by Sofia Nannini, 2019.

could bind them all together, despite the lack of smoothly-cut edges: lime mortar. Sverrir Runólfsson must have learned quite a lot about lime and natural cement while in Bornholm: this key piece of information became one of the most debated topics in Reykjavík throughout the 1870s.[81]

Lime production in Reykjavík (1863–79)

Lime mortar was not a complete novelty in the Icelandic context, as it had already been employed for the construction of the few Danish residences and public buildings since the mid-eighteenth century. Thanks to the work of masons like Sverrir Runólfsson, the demand for lime increased considerably in the 1870s, while several new stone buildings were erected around the country. As Sverrir Runólfsson had noted while working at the church in Þingeyrar, lime was the most difficult building material to order and obtain, and to safely carry to remote building sites.[82] In some cases, the absence of lime was compensated by use of other earth products. This is the case of *smiðjumór*, a binding material based on wet clay.[83] It might have already been in use for turf constructions, and since the 1850s it had also been employed for stone buildings.[84] One example is the small warehouse built in 1875 at Sómastaðir, along the eastern fjord of Reyðarfjörður: the walls were made with coarse dolerite ashlars, bound together with clay.[85] **Fig. 14.**

Ordinary lime was mainly imported from abroad, most likely from Denmark. However, as noticed by historian Lýður Björnsson, the amount of imported lime decreased in the years between 1873 and 1877.[86] This trend highlighted a very peculiar chapter of Icelandic construction history, that is, the short-lived yet much discussed adventure of lime production in Reykjavík.[87] The pioneer of Icelandic lime production was Jón Hjaltalín, medical doctor and member of the Parliament. He was particularly concerned with sanitary and health issues, and most of his battles were fought in the *Heilbrigðistíðindi* journal, which he founded and edited in 1870–80. As

---

[81] One short article, signed by Sverrir Runólfsson and published in 1878, refers to his knowledge both on lime and cement. Indeed, under the term "cement" he could have meant the kind of natural cement that was produced in Bornholm. Sverrir Runólfsson, "Kalk og sement," *Ísafold* 5, no. 19 (5 August 1878): 76.

[82] Þór Magnússon, "Þingeyrakirkja. Byggingarlist kirkjunnar," 271.

[83] *Smiðjumór* is also a synonim for *mergill*, translated as a mixture of limestone and clay. It may thus be considered as a marl, although it did not undergo any burning process.

[84] "Tilraunir og uppástungur ýmsra manna um bæjabyggingar," *Bóndi* 1, no. 3 (1851): 42.

[85] The building is protected by the Cultural Heritage Agency of Iceland and it was restored during the 1990s by the National Museum of Iceland. "Sómastaðir við Reyðarfjörð," *Morgunblaðið* (5 April 2004): 28.

[86] See the table V with the amount of imported lime in 1865–1901 in Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 53.

[87] The issue of nineteenth-century Icelandic lime production was tackled by a number of authors. An extensive article was published in 1949: Á. Ó. [Árni Óla], "Kalknám í Esjunni og kalkbrennsla í Reykjavík," *Lesbók Morgunblaðsins* 24, no. 39 (23 October 1949): 461–64; historian Lýður Björnsson provided an extensive outline of Iceland's lime production in late nineteenth century, see: Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 53–64; see also: Guðjón Friðriksson, *Saga Reykjavíkur. Bærinn vaknar (1870–1940). First volume*, 33–34.

early as 1863 the doctor claimed to have found a limestone deposit on Esja, the main mountain range north of Reykjavík.[88] The issue was soon studied by a number of local experts, including Sverrir Runólfsson, and by 1874 a lime production company was founded.[89] First the company opened a small lime kiln near the Rauðará river, in the outskirts of the city; then another kiln was opened in the area of Árnarhóll.[90] The production did not last long: limestone mining stopped in 1879, and so did the lime kiln. It has been suggested that the reasons behind this failure were related to the high costs of the product, and its relatively low quality. However small, the whole process faced a number of obstacles that undermined its amateurish production – from limestone quarrying with gunpowder to the difficult transportation of the goods on horses.[91] **Fig. 15.**

Despite its short history, Reykjavík's lime adventure did leave some traces both on local printed sources and on the architecture of the city. As a matter of fact, this local production prompted some of the first systematic self-reflections on Icelandic construction and its improvement. Throughout the 1870s, in fact, Jón Hjaltalín wrote extensively on the necessity to change Iceland's building traditions. In his articles, he used to refer to traditional turf farms as "the worst cancer for Iceland".[92] He prompted the construction of stone houses with local sources, claiming that suitable housing conditions were directly linked to an improvement of the people's health.[93] According to Jón Hjaltalín, newborn babies were at a higher risk of an early death if living in turf farms, rather than in modern timber or stone dwellings.[94] In order to promote stonemasonry, Icelanders needed to get easier access to binding materials such as lime. On the one hand, Jón Hjaltalín often mentioned his own discovery of limestone deposits on mount Esja and the production that followed.[95] On the other, he even went

[88] This date was suggested both by Árni Óla and Lýður Björnsson while analyzing the report titled "En Kalkbrænderie i Island" [A Lime Kiln in Iceland]. The document is undated and it is collected at the National Library of Iceland. Lbs, Handrit. JS 133 Fol., Örk 6. The date seems likely, as in 1851 Jón Hjaltalín moved back to Iceland after his studies in Denmark and Germany. See: "Merkir Íslendingar. Jón Hjaltalín," *Morgunblaðið* 100, no. 98 (27 April 2012): 39.

[89] Limestone resources mainly derived from the area of Mógilsá, on the southern slope of mount Esja. Á. Ó. [Árni Óla], "Kalknám í Esjunni og kalkbrennsla í Reykjavík," 462.

[90] The street was then called *Kalkofnsvegur*, the lime kiln's street. Guðjón Friðriksson, *Saga Reykjavíkur. Bærinn vaknar (1870–1940). Fyrri hluti*, 34.

[91] Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 59; Á. Ó. [Árni Óla], "Kalknám í Esjunni og kalkbrennsla í Reykjavík," 462.

[92] "Hið versta krabbamein fyrir Ísland". Jón Hjaltalín, "Um híbýli manna," *Heilbrigðis-tíðindi* 2, no. 11–12 (November/December 1872): 32. See also: Jón Hjaltalín, "Kalkbrennsla," *Heilbrigðis-tíðindi* 3, no. 7–8 (July 1873): 61; Jón Hjaltalín, "Um steinlím og ýmislegt, er þar að lýtur," *Þjóðólfur* 29, no. 1 (17 November 1876): 3.

[93] Jón Hjaltalín was not alone in writing about local living conditions. In 1875 district administrative officer [*hreppstjóri*] Jónas Símonarson (1836–93) signed an article with considerations on how to improve Iceland's building traditions, promoting a wider use of timber and stone constructions. Rather harshly, he also acknowledged the miserable natural conditions of Iceland, "this huge, difficult and mountainous snowland" [þetta risavaxna, grítta og klettótta snæland]. Jónas Símonarson, "Fáein orð um húsagjörð," *Norðanfari* 14, no. 43–44 (13 November 1875): 91.

[94] Jón Hjaltalín, "Um steinlím og ýmislegt, er þar að lýtur," 4.

[95] Jón Hjaltalín, "Um híbýli manna," *Heilbrigðis-tíðindi* 2, no. 7–8 (July 1872): 49–50; Jón Hjaltalín, "Kalkbrennsla," 60–61; Jón Hjaltalín, "Um byggingar, kalkbrennslu og steinsmíði," *Heilbrigðis-tíðindi* 4, no. 1 (January 1879): 5–6.

Fig. 14 – The small warehouse at Sómastaðir, Reyðarfjörður. Photo by Sofia Nannini, 2019.

Fig. 15 – Reykjavík in 1876: the lime kiln is on the background to the right.
Þjóðminjasafn Íslands/National Museum of Iceland.

so far to propose to the Parliament a bill to ban the export of Iceland's most valuable product: Iceland spar.

Also known as Iceland crystal or *silfurberg*, pure pieces of Iceland spar are mainly composed by crystallized calcium carbonate: in theory, it could be the perfect ingredient for producing lime. Since the late seventeenth century Iceland spar had been largely studied in relation to the fields of optics and crystallography, and until the first decades of the twentieth century the Icelandic quarry at Helgustaðir, in Reyðarfjörður, was the single mining site for this particular crystal. Iceland spar had become one of Iceland's rare exported goods, supporting the whole continental industry of optical lens and an infinite number of scientific studies.[96] **Figg. 16a–16c.** In 1875, Jón Hjaltalín suggested the export of crystals cease, so that all Icelandic calcium carbonate resources could be used for producing lime for building purposes.[97] Quite interestingly, he also claimed that Iceland – a volcanic island "just like Sicily" – could have offered the necessary earth products to make "hydraulic cement", and consequently concrete.[98] Despite an extensive debate among parliamentarians, this proposal must have sounded absurd in economic terms and it was soon discarded. However, the very presence of this bill in the parliamentary records highlighted the desperate measures that some Icelandic politicians were willing to accept with the only aim of improving the Icelanders' living conditions – especially in a moment of intense emigration to North America triggered by economic needs, cold winters, and the eruption of the Askja volcano in 1875.[99]

1.2.3 The Icelandic invention of concrete (1876–95)

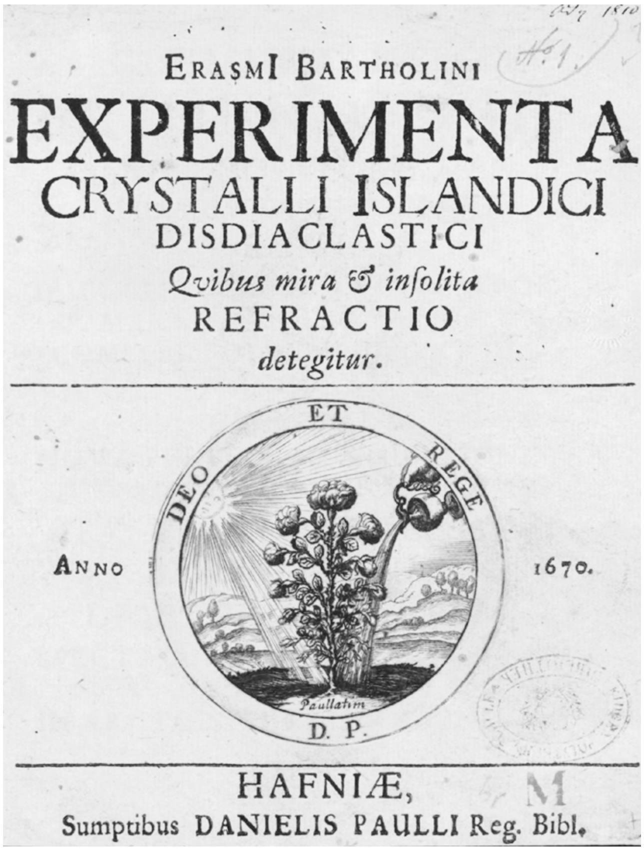
Sverrir Runólfsson's specific knowledge and Jón Hjaltalín's political battle did leave their marks on the future development of Icelandic construction. It may even be said that Iceland's "age of concrete" had its roots in these very years, and stemmed from several construction experiments that followed the stonemason's and the doctor's efforts. From an architectural point of view, an increased availability in lime mortar prompted the construction of a number of stone buildings in the village of

[96] Iceland spar was first studied by Danish physician Rasmus Bartholin (1625–98) in 1670. On the history and the properties of Iceland spar, see: Sveinn Þórðarson, "Saga silfurbergsins," *Náttúrufræðingurinn* 15, no. 2 (1945): 96–107; Leó Kristjánsson, "Úr sögu íslenska silfurbergsins," *Náttúrufræðingurinn* 76, no. 1–2 (2008): 37–48; Leó Kristjánsson, *Iceland Spar and Its Influence on the Development of Science and Technology in the Period 1780–1930: Notes and References* (Reykjavík: Institute of Earth Sciences, University of Iceland, 2015).

[97] "Frumvarp til laga um forboð gegn útflutningi á öllum kalksteinum, silfurbergi og cementsteinum, samt beinum, út úr Íslandi," *Alþingistíðindi. Umræður* (1875), 296–310.

[98] "Frumvarp til laga um forboð gegn útflutningi á öllum kalksteinum, silfurbergi og cementsteinum, samt beinum, út úr Íslandi," 298.

[99] The emigration of Icelanders towards North America, especially Canada, started around the 1870s and decreased slowly until the mid-1910s. Most Western Icelanders [*Vestur-Íslendingar*], as Icelandic emigrants were called, moved to the province of Manitoba. See: Gunnar Karlsson, *The History of Iceland*, 234–38; Gunnar Karlsson, "Vesturheimsferðir," in *Saga Íslands X*, edited by Sigurður Líndal, and Pétur Hrafn Árnason, 20–33.


ERASMI BARTHOLINI
EXPERIMENTA
CRYSTALLI ISLANDICI
DISDIACLASTICI
Qvibus mira & insolita
REFRACTIO
detegitur.

DEO ET REGE
Paullatim
D. P.

ANNO 1670.

HAFNIÆ,
Sumptibus DANIELIS PAULLI Reg. Bibl.

Fig. 16a – Rasmus Bartholin, *Experimenta Crystalli Islandici Disdiaclastici*, 1670. e-rara.ch.

Fig. 16b – Fragment of Iceland spar. Photo by Sofia Nannini, 2020.

Fig. 16c– The former Iceland spar mine at Helgustaðir, Reyðarfjörður. Photo by Sofia Nannini, 2019.

Reykjavík and on its outskirts. As claimed by historian Lýður Björnsson, the lime produced in town was mainly sold in small quantities to several masons. The smaller the quantity, the greater the likelihood that lime had been used only to paint the walls.[100] However, lime mortar was progressively employed as a binding agent for stone structures. An example is the house on Lækjargata 10 in Reykjavík, built in 1877.[101] Yet one building was by far the most interesting technical accomplishment of this decade, combining together personal and technical knowledge, and a bit of rural adaptation.

Built between 1876 and 1881, the little house at Garðar, near Akranes, was considered by Guðmundur Hannesson "the first concrete house in Iceland and possibly in the Nordic countries".[102] The construction was supervised by mason Sigurður Hannsson, who had previously worked with Sverrir Runólfsson.[103] Perhaps because the building site lacked suitable stone ashlars, Sigurður Hannsson decided not to build the house as his teacher would have done. On the contrary, he took advantage of the materials available in the area: sand, gravel, and ground rocks. He built the structure with cast stones produced on site, while the small gable was cast within formworks.[104] Sigurður Hannsson was a client of Reykjavík's lime kiln: his concrete mixture was mainly composed of lime, with a very small quantity of cement. Due to the vast presence of lime in the casting mix, this method is usually referred to as *kalksteypa* in Icelandic, translated as lime conglomerate.[105] It must have been the large quantity of lime within the mix that delayed the hardening phase, thus explaining the long construction timeframe for such a tiny building.[106] **Figg. 17a–17b.**

Despite the important role played in the Icelandic context by the small house in lime conglomerate at Garðar, Guðmundur Hannesson's assumption that the building could be the first concrete house "in the Nordic countries" seems to be too far-fetched. Although concrete was not particularly popular in northern Europe until the first decades of the twentieth century, at the time of Iceland's first experimentations several other countries had employed the method for infrastructural and architectural works. By the early 1870s cement was largely produced in Denmark. Cement factories were located in Bornholm, Sjælland, Fyn and northern Jutland.[107] As a result, cement was used in fortification works in the harbour of Copenhagen – such as

[100] Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 59–60.

[101] Guðný Gerður Gunnarsdóttir, and Hjörleifur Stefánsson, *Kvosin,* 190.

[102] "Þetta var fyrsta steypuhúsið hér á landi og líklega á Norðurlöndum". Guðmundur Hannesson, *Húsagerð á Íslandi*, 242.

[103] Despite several mentions in a number of sources, no biographical information is available on Sigurður Hannsson.

[104] Guðmundur Hannesson, *Húsagerð á Íslandi*, 242–44; Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 61–64.

[105] Guðmundur Hannesson, *Húsagerð á Íslandi*, 243.

[106] The building is approximately 10x7 metres. Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 63.

[107] Orup, "Fra Bornholm til Jylland," *Historisk Beton,* lecture series, https://www.youtube.com/watch?v=MdaRkycxiV8&feature=emb_title, 43'34'', last accessed 17/11/2020. See also: John Cederberg, "De første bygninger og bygværker af beton og jernbeton i Danmark," *Fabrik og Bolig* 2 (1999): 8.

Fig. 17a – House in Garðar, Akranes. Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 61.

Fig. 17b – House in Garðar, Akranes. Akranes Folk Museum, http://museum.is/, last accessed 09/09/2020.

the Prøvestenen Fortress (1859–63) and in the expansion of Trekroner Fortress (1865–68) – in façade decorations and also in a few residential buildings in 1866–67. By the early 1890s, reinforced concrete was already in use (see further in chapter two).[108] On the other side of the Baltic sea, Portland cement had been available in Finland since the mid-1850s; by the end of the century concrete had been used for many infrastructures such as harbours and lighthouses.[109] Cement was available in Sweden at least since the early 1870s, when the first cement plant was founded. Although there is very little information on the first uses of concrete in Sweden, in the 1870s a few concrete bridges were built in Skåne county. The construction of the Bergsbron concrete bridge in Norrköping in 1901–02 implied that the material might have been popular all over the country even before the turn of the century.[110] As for Norway, Portland cement was known and in use since the 1870s, and in 1888 the first Portland cement factory was established at Slemmestad, near Oslo. Reinforced concrete structures became widely accepted since the early twentieth century; the first was the Leir bridge in Grong, built in 1905.[111] It is therefore clear that concrete as a building method was already quite widespread in the Nordic countries even in the last decades of the nineteenth century, and reached Iceland as a direct consequence of what was happening in the continent – especially Denmark. A short mention to the house at Garðar, published as early as 1883, described it as a "concrete" building, and it used two terms simultaneously – the Icelandic *steypusteinn,* meaning "cast stone", and the German/French *beton*.[112] This linguistic hint shows, undoubtedtly, that all local experiments with concrete did originate overseas, most likely in continental Europe, and reached Iceland in a timeframe spanning from the late 1840s to the early 1880s.

Iceland builds its parliament (1880–81)

The house at Garðar may not have been the first concrete house in the Nordic countries. However, it is true that throughout the 1880s cast conglomerate became progressively embedded in Icelandic building traditions, and it subsequently spread

[108] Sanne Spile, "Hvad ved vi om Portland-cement og beton fra før 1890'erne?," *Historisk Beton*, lecture series, https://www.youtube.com/watch?v=MdaRkycxiV8&feature=emb_title, 22'12'', last accessed 17/11/2020. Cederberg, "De første bygninger og bygværker af beton og jernbeton i Danmark," 11.

[109] Lauri Putkonen, "The Early Years of Concrete Construction in Finland," in *Tehdään betonista: Concrete in Finnish Architecture*, 9.

[110] On the early concrete bridges in Skåne County, southern Sweden, see: Mats Areskoug, "Sveriges äldsta betongbro," Oskyltat, https://www.oskyltat.se/2017/10/15/sveriges-aldsta-betongbro-6/#:~:text=Den%20som%20strosar%20runt%20i%20sk%C3%A5nska%20Jordberga%20kan%20njuta%20av,och%20rivna%20sockerbruket%20%C3%A4r%20vacker, last accessed 17/11/2020. On the Bergsbron bridge see: https://digitaltmuseum.se/021016415171/bergsbron-norrkoping-1957, last accessed 17/11/2020.

[111] On the first uses of concrete and reinforced concrete in Norway, see: Per Jahren and Tongbo Sui, *History of Concrete: A Very Old and Modern Material* (Singapore: World Scientific Publishing, 2017), 50–56, 113–29, 130–43; in the same volume there is a short account on the first uses of concrete in the Nordic countries, at pages 167–72.

[112] "Innlendar fréttir," *Þjóðólfur* 35 no. 3 (20 January 1883): 7.

all over the country. In the last two decades of the century, three key plot lines emerged: the importance of the house of parliament as an open-air building school for Icelandic mastermasons, the progressive popularization of European cement and concrete knowledge in the Icelandic press, and the debated acceptance of these building materials by farmers and city dwellers alike.

Since the early 1840s, Reykjavík had hosted the meetings of the restored Icelandic parliament, commonly known as *Alþingi*. However, the parliament was not architecturally represented: the debates were held in the Latin School. By the end of the 1870s this temporary location was finally replaced with the project of a new parliament house, to build next to the cathedral on the Austurvöllur square in downtown Reykjavík. The architectural design was entrusted to Ferdinand Meldahl (1827–1908), one of Denmark's most prominent architects and professor at the Royal Danish Academy of Fine Arts.[113] His proposal was impressive if compared to Icelandic standards: despite the later growth of Reykjavík, the building is still one of the city's main landmarks. Meldahl drafted a two-storey construction, with a double row of rounded windows on a rusticated façade. He envisaged Iceland's new *Alþingi* as a Neo-Renaissance *palazzo*, with evident references to Florentine models.[114] Being Iceland's most important nineteeth-century building, its architectural features had been widely described by local historiography in the past decades, and the project's early uncertainties have also been researched in recent years.[115] However, as many of these sources confirm, the house of parliament was more of a technical turning point than a stylistic one, and it was a key moment for the future of Icelandic construction. **Figg. 18a–18b.** The building works were carried out between 1880 and 1881, and supervised by Danish mastermason Fredrik Anton Bald (1845–1909), who acted as Meldahl's delegate. Since 1866, Bald had worked on many Danish public projects in Iceland, such as the library of the Latin School[116] and the prison on Skólavörðurstígur, both designed by the Danish carpenter Klentz.[117] Thanks to his expertise in the Icelandic context, Bald was the first choice for the supervision of the building site,

[113] On Meldahl's life and career, see: Helga Stemann**,** *F. Meldahl og hans Venner* (Copenhagen: H. Hagerups Forlag, 1926–32); Tobias Faber, *Dansk Architektur* (Copenhagen: Arkitektens Forlag, 1977), 129–31.

[114] Thanks to an increasing spread of prints and engravings, from Joseph Furrtenbach's *Architectura civilis* (1628) to Pierre Clochar's *Palais, maisons et vues d'Italie* (1809), Mario Bevilacqua has pointed out how palazzo Pitti in Florence had become a widely-known model for nineteenth-century European architecture. In particular, this reference might have also affected Meldahl's project in Reykjavík. Mario Bevilacqua, "Prima di Grandjean: rilievi e incisioni di architettura a Firenze tra Cinquecento e Settecento," in *Tra Firenze e Rio. Auguste Grandjean de Montiguy (1776–1850) e la riscoperta dell'architettura del Rinascimento toscano*, edited by Mario Bevilacqua (Firenze: Didapress, 2019), 34.

[115] Guðmundur Hannesson, *Húsagerð á Íslandi*, 234–37; Jónsson Bergsteinn**,** *Bygging Alþingishússins 1880–1881*; Guðný Gerður Gunnarsdóttir, and Hjörleifur Stefánsson, *Kvosin*, 214–26; Hörður Ágústsson, *Íslensk byggingararfleifð I*, 299–308; Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 55. See the chapter on the house of parliament and the debate around where to locate it: Anna D. Ágústsdóttir, and Guðni Valberg, *Reykjavík sem ekki varð*, 14–27.

[116] Known as *Íþaka*, built in 1866–67. See: Guðný Gerður Gunnarsdóttir, and Hjörleifur Stefánsson, *Kvosin,* 241–43.

[117] Throughout his career, Bald work extensively in Iceland and in the Faroe Islands, and so did his son Valdemar (1872–1921). Ida Haugsted, "Tømrer- og bygmester Bald & Søn på Island og Færøerne," *Architectura* 36 (2014): 26–53.

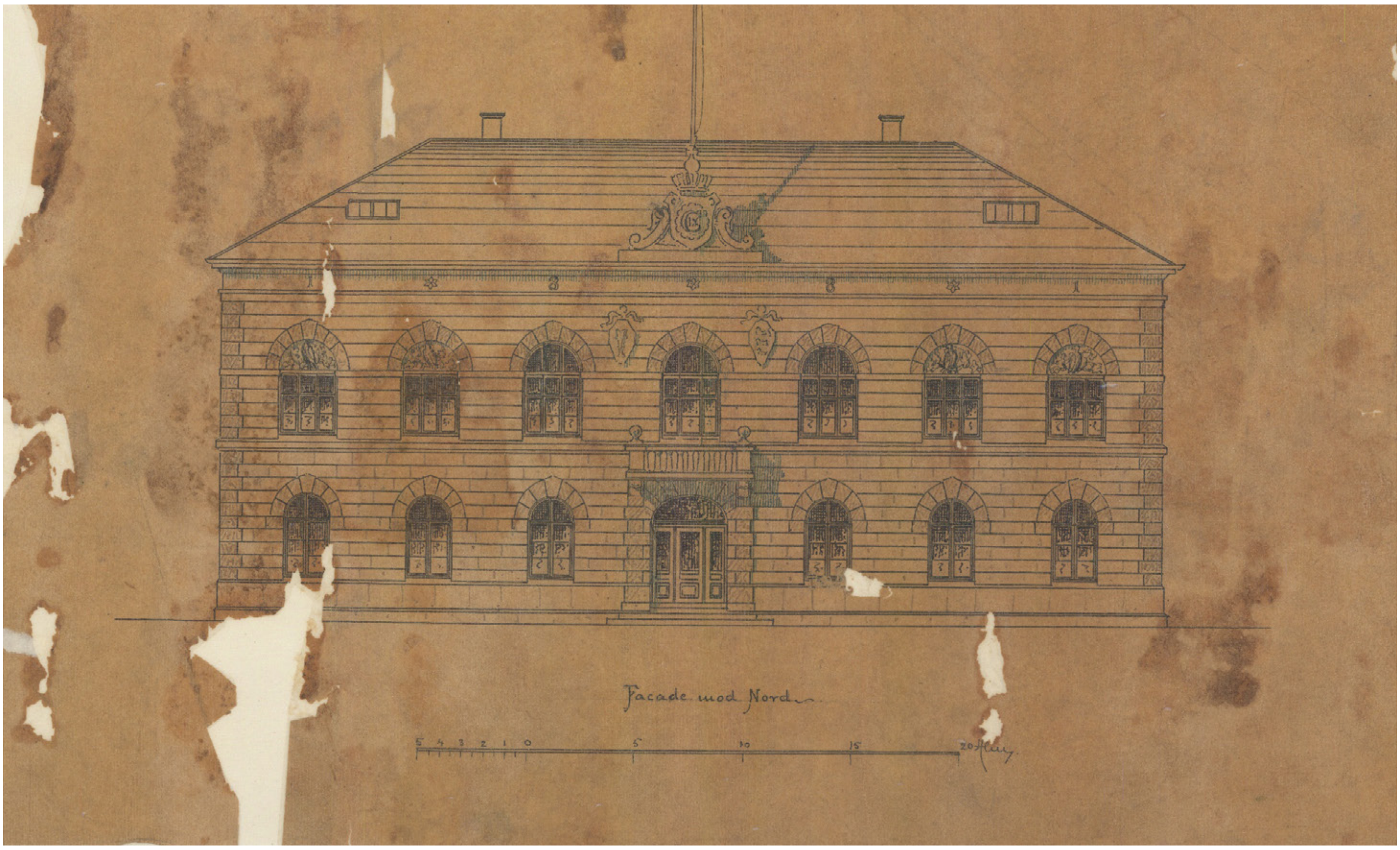


Fig. 18a – Ferdinand Meldahl, Project for Reykjavík’s parliament house, 1878.
Danish National Art Library, inv. number 12115 a-i.

Fig. 18b – The house of parliament next to the cathedral in Austurvöllur, Reykjavík, ca. 1905–10.
Þjóðminjasafn Íslands/National Museum of Iceland.

and he acted as a bridge between Meldahl, located in Copenhagen, and a blend of Danish and Icelandic masons at work in Reykjavík. **Fig. 19.**

Two are the reasons that made the construction of the parliament house so important: the building techniques that were employed, and its sheer size, that required a good number of active workers. Despite the outlook of its rusticated façade, the building's structure was not entirely made of ashlars. The walls were composed by a double layer of dolerite ashlars, made with a sequence of two pieces placed longitudinally and one transversally as a connecting element; the inside core was filled with a concrete mixture of sand, lime, and cement.[118] Apart from the small experiment at Garðar, this was undoubtedly the first time that concrete was used at such a vast scale in Iceland. And this very scale was pivotal for the spread of the technique around the country: Bald's building site became a two-year crash course in stonemasonry and concrete construction for all Icelandic workers that contributed to the task.[119] **Figg. 20a–20b.**

Guðmundur Hannesson pointed out that all building tools were sold after the end of the works, and this meant that "Icelanders, that had learned to work and cut stones, then received proper tools in their hands, and could start building stone houses by themselves", to the point that this process "later repaid all building costs".[120] This development may not have occurred by chance. Contemporary sources point out that this was a more or less intended consequence of the building works. In November 1880, the *Þjóðólfur* journal claimed that the works of the Parliament house were Iceland's "best technical school".[121] A few months later, in January 1881, the same journal asserted that Icelandic masons were going to learn much more under Bald's supervision, than in technical schools abroad, at a much lower cost.[122] If general attention was focused on Icelandic workers learning about stonemasonry and how to exploit Icelandic resources of dolerite and basalt, after the inauguration of the Parliament house the spread of stone constructions was however rather scarce. In Reykjavík, for example, the direct architectural influence of the parliament can be found in a few buildings such as a new elementary school in Pósthússtræti, built in 1883, and in a printing house in Bankastræti, built in 1885.[123] **Figg. 20c–20d.** It is likely that plain stonemasonry did not take root in the country due to its high costs of

[118] Guðmundur Hannesson, *Húsagerð á Íslandi*, 236.

[119] The exact number of Icelandic masons working at the house of parliament is unknown. Hörður Ágústsson mentioned the names of a few of them, and traced their later works all around the country. Hörður Ágústsson, *Íslensk byggingararfleifð I*, 307.

[120] "Fáa mun hafa grunað, hve þýðingarmikið þetta var. Íslendingarnir, sem höfðu lært að kljúfa grjót og höggva, fengu nú góð áhöld í sínar hendur og gátu farið að byggja sjálfir hús úr steini. Fjöldi manna fékk nú atvinnu að vetrinum við að kljúfa grjót og flytja það. Þetta eitt hefur sennilega margborgað allan byggingarkostnað þinghússins." Guðmundur Hannesson, *Húsagerð á Íslandi*, 236.

[121] "[...] hinn bezti iðnaðarskóli." "Þinghúsið," *Þjóðólfur* 32, no. 29 (17 November 1880): 114.

[122] "Alþingishúsið," *Þjóðólfur* 33, no. 3 (29 January 1881): 9.

[123] Both projects shared the same building techniques of the parliament house. The works of the elementary school were supervised by Bald. See: Guðmundur Hannesson, *Húsagerð á Íslandi*, 237; Hörður Ágústsson, *Íslensk byggingararfleifð I*, 307.

Fig. 19 – Fredrik Anton Bald and his family, ca. 1880s/1890s?.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 20a – The house of parliament, Reykjavík. Photo by Sofia Nannini, 2019.

Fig. 20b – Detail of the rusticated ashlars. Photo by Sofia Nannini, 2019.

Fig. 20c – F. A. Bald, Elementary school, Pósthússtræti, Reykjavík, 1883. Photo by Sofia Nannini, 2019.

Fig. 20d – Printing house, Bankastræti, Reykjavík, 1885. Photo by Sofia Nannini, 2019.

construction. Nevertheless, another technique applied by Bald was transferred with much greater success to all corners of the island: ever since the early 1880s, concrete became the solution with which Icelandic mastermasons most experimented, thanks to its flexibility, affordability, and to its growing presence in the local press.

When *beton* became *steinsteypa*: Early newspaper accounts

It was only a few years after the inauguration of the house of parliament that concrete became a matter of discussion in Icelandic journals. The progressively wider acceptance of this technique was mirrored in the terms used to name it: the first remarks on concrete referred to the building method usually by providing the word *beton* in brackets, but soon the Icelandic translation as *steinsteypa* emerged as the most common and recognizable term – from the noun *steinn* [stone] and the verb *að steypa* [to cast]. Icelandic historiography considers two articles as the founding elements of a local scientific debate on concrete: Helgi Helgason's *Um steinsteypu* (1883) and Georg Ahrens' *Um sementsteypu* (1885).[124] Helgi Helgason (1848–1922) was a tradesman and carpenter from Reykjavík.[125] In his article he described the procedure in very simple words, suggesting a mixing ratio of 1 : 3 : 6. He strongly advised against the use of sea sand and particularly suggested the casting of concrete stones for building purposes. An interesting detail to point out is that Helgi Helgason was located in Reykjavík, yet his article was published in the northern village of Akureyri. Especially when building experts were still lacking, printed sources played a key role in the spread of technical information all around the island. Georg Daníel Edward Ahrens (1852–1911) was an Icelandic carpenter of German origins.[126] According to his writings on concrete construction published in the *Þjóðólfur* journal, he had visited Germany and England, and collected technical details on how concrete was used there. Throughout the 1870s both countries were experimenting with above-ground concrete constructions, which the Icelandic author might have seen during his travels.[127] If compared to Helgi Helgason's article, Georg Ahrens' suggestions on the use of concrete for building purposes were more scientific: in particular, in his article

[124] Helgi Helgason, "Um steinsteypu," *Fróði* 4, no. 113 (1883): 265–67; Georg Ahrens, "Um sementsteypu," *Þjóðólfur* 37, no. 3 (17 January 1885): 9–10.

[125] A few biographic information on Helgi Helgason can be found in: Páll Eggert Ólason, ed., *Íslenzkar æviskrár frá landnámstímum til ársloka 1940*, Vol. 2 (Reykjavík: Hið Íslenska bókmenntafélag, 1949): 337.

[126] Not much is known about this author. The birth and death dates were assumed from the obituary written by his sister Jóhanna in Winnipeg: *Heimskringla* 26, no. 9 (30 November 1911): 8. Between 1884 and 1886 he offered lessons on drawing and building technology in Reykjavík, and afterwards he moved to Copenhagen to study architectural drawing, thanks to national grant. Georg Ahrens, "Fyrsta nóvember hefi ég...," *Þjóðólfur* 36, no. 38 (6 October 1884): 152; "Styrkur úr landssjóði," *Suðri* 4, no. 9 (30 March 1886): 36.

[127] The author mentioned, in particular, the settlment of Victoriastadt in Berlin, the cities of Gotha and Hamburg. Georg Ahrens, "Um sementsteypu," 9–10. On German experiments regarding above-ground constructions, see: Salvatore Aprea, *German Concrete. The Science of Cement from Trass to Portland, 1819-1877* (Lausanne: EPFL Press, 2016), 212–23.

concrete formworks were described to the Icelandic audience for the first time.[128] Despite their differences, the two articles represented an important step for Icelandic construction: building techniques entered into the realm of printed sources and, however inaccurately, the spread of information could now surpass the limitations of single individuals and move faster through the national press. However, it is important to keep in mind that neither Helgi Helgason nor Georg Ahrens were trained engineers nor architects. Scientificity in concrete construction was still to come, and only the first Icelandic engineers were to bring more detailed and precise knowledge on this issue.

The farmhouse at Sveinatunga

Cement was first used in the late 1840s, and conglomerates of all sorts had been largely used since the 1870s. The building that opened Iceland's "concrete age" was erected only at the very end of the nineteenth century. In 1895, Sigurður Hannsson – the same builder of the small house at Garðar – built the farmhouse at Sveinatunga in the valley of Norðurárdalur, together with its owner Jóhann Eyjólfsson (1862–1951). In Icelandic historiography, this farm has always been described as the first Icelandic construction made with cast concrete walls, whose mixing ratio was 1 : 2 : 3.[129] The farmhouse is the proof that such literature had made an impact on local building traditions; however amateurish and imprecise, the reference to concrete in Icelandic journals made it possible for builders to experiment more and more with a building method which was soon to change Icelandic living conditions. **Figg. 21–22.** The novelty of the Sveinatunga farmhouse was its fully cast walls, accomplished with the help of moveable timber formworks.[130] The peculiarity of this system was that only three timber planks were used at a time, fastened onto the outer supports with timber wedges, and then moved upwards as soon as the concrete below had set. This undoubtedtly reduced the amount of timber needed on site, which had to be spared considering the scarcity of wood on the island.[131] **Fig. 23.**

Through Guðmundur Hannesson's 1942 volume on Icelandic construction, the farmhouse at Sveinatunga became the symbol of a founding myth for Icelandic construction history: that unexpectedly and without any foreign influence, concrete was "invented" there.[132] The author claimed that Iceland's first concrete experiment did not originate from "educated men, who could read foreign languages", and neither

---

[128] Furthermore, Georg Ahrens pointed out a very precise setting time of 7 to 28 days, instead of the general advice of "two days" proposed by Helgi Helgason. He also mentioned the use of concrete for building arches, or even for underwater infrastructures, and made a clear distinction between Portland cement and other kinds of cement. Guðmundur Hannesson, *Húsagerð á Íslandi*, 246; Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 49.

[129] Guðmundur Hannesson, *Húsagerð á Íslandi*, 249.

[130] Guðmundur Hannesson, *Húsagerð á Íslandi*, 248.

[131] See a focus on formworks in Iceland in chapter four.

[132] This topic was already presented by the author in: Sofia Nannini, "From Reception to Invention: The Arrival of Concrete to Iceland and the Rhetoric of Guðmundur Hannesson," *Arts* 7, no. 68 (2018): 1–13.

Fig. 21 – The Sveinatunga farm in 1929. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 22 – Detail of the cast concrete inside the farm. Photo by Sofia Nannini, 2019.

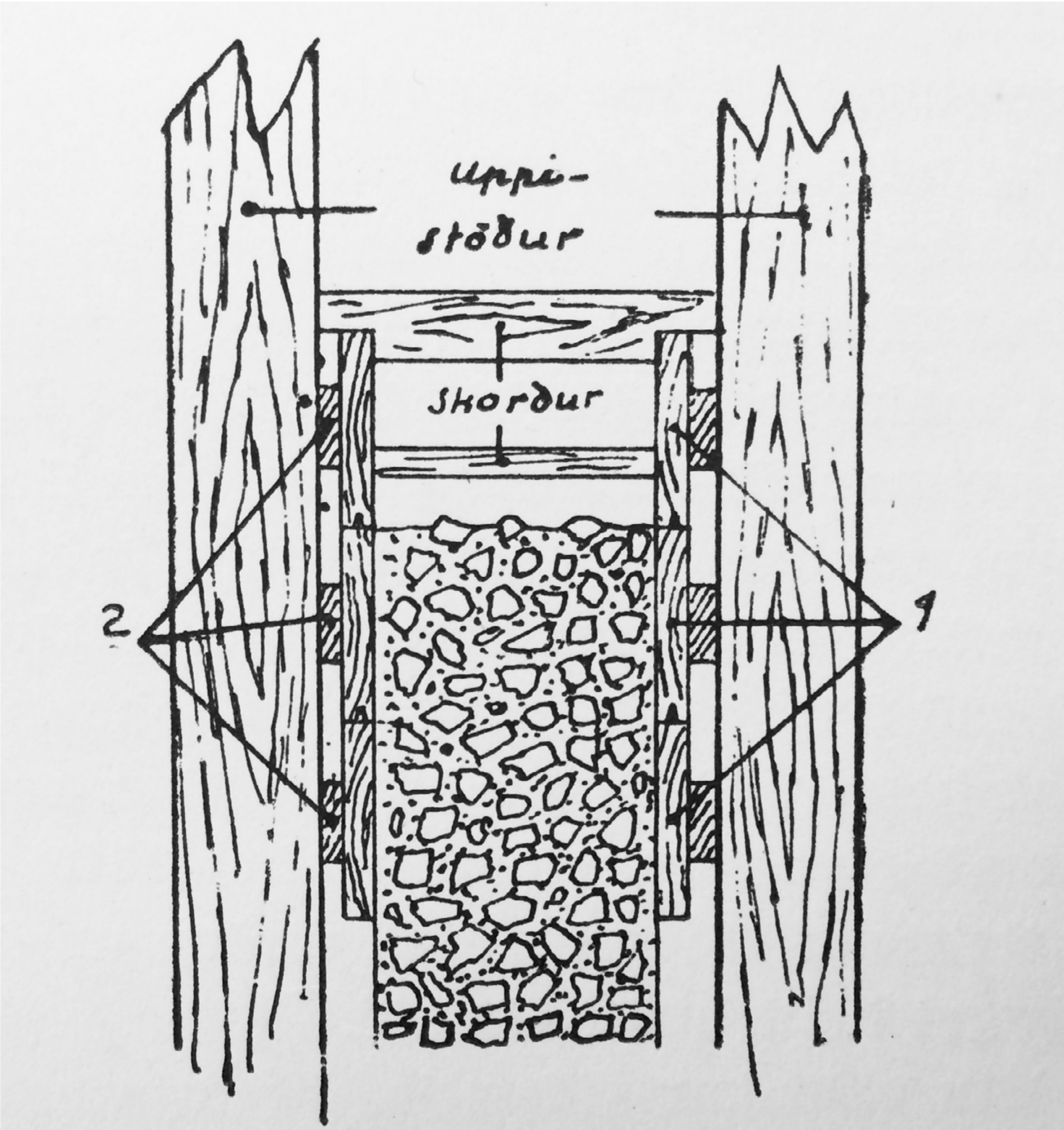


Fig. 23 – Section of the formworks used at Sveinatunga. Guðmundur Hannesson, *Húsagerð á Íslandi*, 248.

from “those who had traveled and seen foreign models”. On the contrary, Guðmundur Hannesson wrote that “there were an Icelandic farmer and a builder, who were making some attempts on their own and they *discovered concrete*!”.[133]

The history of concrete is indeed made up of “many, small, consecutive or even temporally parallel inventions”.[134] As Adrian Forty points out, “the early development of reinforced concrete in the nineteenth century was not attached to a particular time or place; rather it was invented several times, in slightly different ways and in different places.”[135] According to Guðmundur Hannesson, Iceland might have been one of these “different places”, although so far this chapter has highlighted the sheer number of foreign influences and transfers of knowledge from other geographies.[136] His opinion regarding the Icelandic invention of concrete and the country’s record in building the first concrete house in northern Europe was influenced by a sort of nationalistic attitude that re-read and re-imagined Icelandic social and technological accomplishments. Guðmundur Hannesson’s book was published on the verge of Iceland’s declaration of independence, and it contains some myths that aimed at underpinning Iceland’s autonomous role in technical matters.

The construction of the Sveinatunga farm leads up to two key topics that will be discussed in the following chapters. On the one hand, the farm was soon followed by a number of concrete buildings erected all across the country, and particularly in Reykjavík. Their presence, together with the emergence of Iceland’s professional class of trained engineers, greatly influenced the development of Icelandic construction, and inaugurated the country’s “concrete age” (see chapter two). Simultaneously, the farmhouse at Sveinatunga became the first of many trials on how to build modern dwellings in the countryside: a challenge that engaged Icelandic builders and politicians for decades to come (see chapter three).

---

[133] “Hér voru þá íslenzkur sveitabóndi og steinsmiður að gera tilraunir eftir sínu höfði og *uppgötvuðu sementssteypu*!”. Guðmundur Hannesson, *Húsagerð á Íslandi*, 247.

[134] “[...] vieler kleiner, aufeinanderfolgender oder auch zeitlich paralleler Erfindungen”. Alexander Kierdorf, and Hubert K. Hilsdorf, “Zur Geschichte des Bauens mit Beton,” in *Was der Architekt vom Stahlbeton Wissen Sollte: Ein Leitfaden für Denkmalpfleger und Architekten*, edited by Uta Hassler (Zürich: Gta Verlag), 11.

[135] Forty, *Concrete and Culture*, 15.

[136] See also note 3 in: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 69.

Chapter 2

Steinsteypuöldin: The Age of Concrete (1899–1915)

2.1 A Generation of Pioneers: The First Icelandic Engineers

In 1886–87, the French natural scientist and explorer Henry Labonne (1855–1944) sailed to Iceland and the Faroe Islands on a scientific mission promoted by the French Ministry of Education.[1] Labonne described Iceland's nature, culture, and society, and he also highlighted the almost complete lack of technical knowledge among its inhabitants. With words that sound quite patronizing, the author suggested one solution for the inhabitants who aimed to build a modern country:

> Some thoughts on what the Icelanders have to do, if they want to develop as much as possible the natural resources of their dear country. First of all, they have to give up emigrating: Iceland is lacking hands; to cultivate their fields better than they are currently doing, which they are ignoring, and draining them; build some roads; build shelters for the sheep; trade for some compressed hay, which will feed the cows and horses during the winter, the fish which fills up the coasts in great schools, and which the Icelanders have just started fishing; they have to change their national education system and, instead of contemplating the ancient sagas, as the fakirs do with their belly-buttons, study the applied sciences. Could we believe that there is not a single engineer in the whole island! that physics, chemistry, etc., are absolutely ignored, and that, in order to trace a simple path, as I have seen, some surveyors come here from the continent at great expense![2]

[1] Henry Mamy, "L'Islande," *Le Génie Civil: revue générale des industries françaises et étrangères* 10, no. 19 (12 March 1887), 301–03. Labonne published the memories of his voyage in the essay: Henry Labonne, *L'Islande et l'archipel des Færoeer* (Paris: Libraire Hachette, 1888).

[2] "Quelques réflexions sur ce qu'ont à faire les Islandais, s'ils veulent développer autant qu'il est possible les resources naturelles de leur chère patrie. Ils doivent tout d'abord renoncer à l'émigration:

Almost sixty years later, in 1946 the Danish civil engineer Thorvald Krabbe published a book titled *Island og dets tekniske udvikling gennem tiderne* [Iceland and Its Technical Development Over Time]. He claimed that whoever had visited Iceland at the turn of the century, by returning in the 1940s one would have seen a "completely different country". Its natural landmarks were still the same: the snow-capped dome of the Snæfellsjökull in the Faxaflói bay, the mount Esja – "the intimate friend" of all the inhabitants of Reykjavík" – and "the silence of the lava fields". Below the grandness of nature, however, one would have encountered endless telephone wires, growing suburbs, racing cars, wide roads, and noisy harbours. All those infrastructures were the modern body of a "new Iceland", and it was this "new Iceland" that Krabbe's book dealt with.[3]

How was Iceland transformed from "the most deprived point of the globe"[4] into "quite another country"?[5] Who promoted, planned, and physically executed this abrupt change? The answers to these questions have to be found in the lives and works of the true pioneers of early twentieth-century Iceland: its engineers. Emerging later than in the other Nordic countries,[6] the history of Icelandic engineering started as the scattered history of a few individuals, who graduated from the Polytechnic School of Denmark between 1891 and 1903.[7] When moving back to the island, they were entrusted with a great number of tasks, both public and private, therefore swinging

---

l'Islande manque de bras; cultiver mieux qu'ils ne le font leurs prairies, qu'ils négligent, et les drainer; construire des routes; abriter les moutons; échanger contre du foin comprimé, qui nourrira vaches ou poneys durant l'hiver, le poisson qui fréquente les côtes en bancs incroyables et qu'ils commencent à savoir pêcher; ils doivent changer tout leur système d'éducation national et, au lieu de s'absorber dans la contemplation des antiques sagas, comme de fakirs qui se regardent le nombril, étudier les sciences appliquées. Croirait-on qu'il n'y a pas un seul ingénieur dans tout l'île! que physique, chimie, etc., sont absolument ignorées, et que, pour tracer un simple chemin, ils ont recours, comme je l'ai vu, à des géomètres qu'ils font venir à grands frais du continent!". Henry Labonne, *L'Islande et l'archipel des Færoeer*, 298–99.

[3] Krabbe, *Island og dets tekniske udvikling gennem tiderne*, 10–11.

[4] "[...] le point le plus déshérité du globe". Labonne, *L'Islande et l'archipel des Færoeer*, xvii.

[5] "[...] et ganske andet Land". Krabbe, *Island og dets tekniske udvikling gennem tiderne*, 10.

[6] Sweden had established the first engineering schools already in 1827 and 1829, with the opening of the Royal Institute of Technology in Stockholm and the Chalmers University of Technology in Gothenburg. See: Sven Olving, "Education of Graduate Engineers in Sweden," *European Journal of Engineering Education* 2, no. 1 (1977): 110. The first Norwegian engineering school was related to the mining industry, the Bergseminaret in Kongsberg (1757): in 1811 it was moved to the University of Christiania (now Oslo). In 1870 and 1875 new courses were opened in Trondheim and Bergen respectively. See: Trygve Karlsen, "Engineering Education in Norway," *European Journal of Engineering Education* 2, no. 1 (1977): 105. In Finland, the first technical schools were founded in 1849. Only in 1872 was the Technical School of Helsinki transformed into a Polytechnic School. See: Pasi Tulkki, "The Birth of Engineer Education in Finland," *European Journal of Engineering Education* 24, no. 1 (1999): 87.

[7] *Den Polytekniske Læreanstalt*, now the Technical University of Demark (DTU), was founded in 1829. See: J. T. Lundbye, *Den polytekniske Læreanstalt 1829–1929* (Copenhagen: Gad, 1929). The school was later moved to Kongens Lyngby, north of Copenhagen. On the foundation of the school, see also: Michael F. Wagner, "Danish Polytechnical Education Between Handicraft and Science," in *European Historiography of Technology. Proceedings from the TISC-Conference in Roskilde*, edited by Dan Ch. Christensen (Odense: Odense University Press, 1993), 146–63.

between a formal technical profession and political commitments.[8] This chapter will deal with some of these figures, who played a particular role in the development of the construction practices of the country, and prompted what Icelandic historiography still refers to as *steinsteypuöldin* [the age of concrete].[9]

"Obviously he has to be a foreigner": Towards the first Icelandic engineer

As described by Labonne, in the late 1880s there was not a single Icelandic engineer. Nevertheless, this does not mean that there weren't any engineers at all: Iceland was often visited by technicians who graduated from the Polytechnic School of Denmark or from the Norwegian Institute of Technology in Trondheim (formerly the *Trondhjems Tekniske Læreanstalt*), and were generally employed in the construction of lighthouses, harbours, and bridges.[10] As claimed by an anonymous Icelandic student in Copenhagen, the country was lacking local experts to manage the streets and buildings of Reykjavík. Thus that expert "of course has to be a foreigner, because we still don't have an Icelandic engineer in our country".[11] The island's road network lay in a critical state, which was unsuitable for a growing country, and inviting experts from abroad resulted in high yearly expenses. Mixing economical motivations with a good dose of national pride, since the early 1880s some voices had started asking for public scholarships for Icelandic students, in order to allow them to study engineering abroad.[12]

---

[8] A biographical study regarding the most important Icelandic engineers can be found in: Sveinn Þórðarson, *Frumherjar í verkfræði á Íslandi*. A brief mention on the first generation of Icelandic engineers is also in: Guðmundur Magnússon, *Tækni fleygir fram. Tæknifræði á Íslandi og saga Tæknifræðingafélags Íslands* (Reykjavík: Iðnsaga Íslendinga og hið íslenska bókmenntafélag, 2010), 26–34.

[9] The term was first used by engineer Jón Þorláksson in: Jón Þorláksson, "Hvernig reynast steinsteypuhúsin?," *Búnaðarrit* 25, no. 1 (1911): 207. It was then employed by historian Lýður Björnsson in: Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 65. More recently, "the age of concrete" was the subject of a 5-episode documentary series for RUV [The Icelandic National Broadcasting Service], edited by Egill Helgason and Pétur H. Ármannsson: "Steinsteypuöldin" (2016).

[10] Among them, Icelandic newspapers mention: Ib Windfeld–Hansen (1845–1926), Alexander Rothe (?–1914), Udo von Ripperda (1859–1949), and also several unspecified "Norwegian engineers". See: "Brúagjörð yfir Þjórsá og Ölfusá," *Vikverji* 1, no. 20 (1873): 77–78; "Landstjórn," *Fréttir frá Íslandi* 7, no. 1 (1878): 5; "Ölfursárbrúin," *Ísafold* 18, no. 47 (1891): 187.

[11] "Auðvitað yrði það að vera útlendingur, því engan íslenzkan verkfræðing eigum við enn á landi voru." "Götur og byggingar o. fl. í Reykjavík," *Reykvíkingur* 2, no. 4 (1892): 14–15.

[12] A promoter for the improvement of Icelandic technical knowledge was Sigvatur Árnason (1823–1911), member of the Parliament several times between the 1860s and the 1900s. In the pages of the *Þjóðólfur* newspaper, he stressed the importance of a modern road network to improve communication and exchanges, and the education of experts in this matter: "Það er orðið lýðum ljóst að framfaraþjóðirnar leggja langmest kapp á það að geta haft sem allra fljótust og best samskipti hverjar við aðrar [...]. Að eins þá menn ætti því hér eftir að ráða til vegagjörða, sem hafa staðið fyrir vorum beztu vegagjörðum; og í öðru lagi að styrkja nokkra menn sem fyrst til þess, að kynna sér erlendis þá verkfræði, sem að vegagjörðum og brúagjörðum lýtr". [It is clear that growing societies put most of their energy into the establishment of the quickest and best connections among each other [...]. First of all we should hire experts to take care of the construction of roads, those very men who have been responsible for our best roads; secondly, we should financially allow some people to be educated abroad on engineering, and regarding the construction of roads and bridges]. Sighvatur Árnason, "Um samgöngur og vegagjörðir," *Þjóðólfur* 35, no. 25 (1883): 75.

Ten years later, after several grants offered by the Parliament and one academic failure,[13] Sigurður Thoroddsen (1863–1955) graduated in Copenhagen and became Iceland's first engineer.[14] Before sailing home, he spent one year in Norway, specializing in road and bridge construction, and once back in Iceland he was entrusted with many works concerning the planning and building of an effcient road network for the country. Sigurður Thoroddsen played a prominent role in the spread of technical knowledge in Iceland, yet his activity was mainly devoted to infrastructural projects such as several steel suspension bridges. State engineer between 1893 and 1905, he later became a teacher at the Junior College of Reykjavík.[15] Together with the improvement of roads across mountain ridges and through lava fields, and the building of bridges over its powerful rivers, Iceland's greatest challenge was the improvement of its housing conditions. The first efforts in this direction were made by Sigurður Thoroddsen's first, and mostly unknown, colleague.

2.1.1 Sigurður Pétursson's survey on building techniques (1899–1901)

A very short life, and the bad luck of being second to someone did not contribute to the fame of Sigurður Pétursson (1870–1900), second Icelander ever graduating as an engineer.[16] Despite his short career, Sigurður Pétursson played an important role in the development of Icelandic construction because he carried out the country's first scientific research on building techniques. After he finished his studies at the Polytechnic School of Denmark in 1899, he was awarded a national grant to do "research on the building materials of Iceland and provide guidelines for the construction".[17] This research programme was requested by The Agricultural Society

---

[13] In 1883 a carpenter, Gísli Guðmundsson, was granted a scholarship to study engineering in Copenhagen. In 1887 another scholarship was issued to allow him to continue his studies in Trondheim, under the supervision of Norwegian engineer Nils Olaf Hovdenak (1854–1942). As reported in the Parliament documents, Hovdenak stated that "að á því ríði mjög, að einhver íslenskur maður nemi ingeníörlistina og verji kröptum sínum til þess að bæta vegi landsins" [it was very important that an Icelandic man studied the art of engineering and devoted his energy to improve the roads of the country]. Yet, already in 1887 the Parliament committee halted the grant and there are no further records of Gísli Guðmundsson's academic accomplishments. Records of these early scholarships can be found in: "Alþing II," *Þjóðólfur* 39, no. 29 (8 July 1887): 114; "Þingskjöl," *Alþingistíðindi* (1887): 42–43. See also: Sveinn Þórðarson, *Frumherjar í verkfræði á Íslandi*, 15–16.

[14] "Íslenzkur verkfræðingur," *Ísafold* 20, no. 39 (1893): 155.

[15] For a biographical account of Sigurður Thoroddsen, see: Sveinn Þórðarson, *Frumherjar í verkfræði á Íslandi*, 19–27. See also the obituary: Geir G. Zoëga, "Sigurður Thoroddsen, fyrrverandi landsverkfræðingur og yfirkennari," *Tímarit Verkfræðingafélags Íslands* 40, no. 6 (December 1955): 89–90.

[16] Local sources rarely refer to Sigurður Pétursson. With the exception of Sveinn Þórðarson's biographic volume on Icelandic engineers, the majority of the information that follows has been drawn from local newspapers. Sveinn Þórðarson, *Frumherjar í verkfræði á Íslandi*, 29–34.

[17] "[...] til rannsóknar á byggingarefnum landsins og leiðbeiningar í húsabyggingum". See: Sigurður Pétursson, "Um vegi og brýr á aðalleiðinni frá Reykjavík austur í Holt," *Ísafold* 27, no. 18 (4 April 1900): 69. The possibility to fund this research was debated at the Parliament in 1899. See: "Umræður í efri deild og sameinuðu þingi," *Alþingistíðindi* (1899): 390.

of Iceland[18] and promoted by Iceland's governor-general.[19] Sigurður Pétursson worked on this task between winter and summer 1900, doing fieldwork in Iceland and visiting some countries abroad. He visited the Paris World Exhibition and, in particular, he was reported to have travelled to Denmark and Norway in order to research the production of bricks and lime.[20]

European building technique slowly reaching Iceland: Patents and handbooks

In Norway Sigurður Pétursson met with Edvard Kolderup (1847–1911), building and military engineer who taught at The Norwegian Military Academy.[21] Kolderup was also the author of several books on construction techniques, one which was particularly known for his endorsement regarding reinforced concrete structures. Kolderup's text *Haandbog i husbygningskunst* [Handbook on Architecture], published in 1891, was part of the collection of the National Library in Reykjavík.[22] A few years later the book was mentioned in an article of the Agricultural Society's journal *Búnaðarrit*.[23] **Figg. 1a–1b.** The article highlighted the properties of a German patent that had been presented in Kolderup's handbook.[24] What is interesting in this network

[18] *Búnaðarfélag Íslands*. The earliest agricultural society was *Suðaramtsins húss- og bústjórnarfélags*, which published its journal between 1839 and 1846. The society later merged in the *Búnaðarfélag Suðuramtsins*, and the *Búnaðarrit* journal was founded in 1887. Eventually, the Icelandic Agricultural Society *Búnaðarfélag Íslands* was founded in 1899.

[19] The *landhöfðingi* was the official representative of the kingdom of Denmark in Iceland. The position was established in 1872 as the highest governative official on the island. It was eventually replaced in 1904 by the *Stjórnarráð Íslands*, the Ministry of Iceland. Magnús Stephensen (1863–1917) was in charge between 1886 and 1904, and he was the governor-general who signed the research on building materials.

[20] "Mannalát," *Þjóðviljinn* 14, no. 38 (30 October 1900): 151. Limestone from mount Esja, north of Reykjavík, and clay from Laxárvogur í Kjós, in Hvalfjörður. "Kalkstein," *Fjallkonan* 17, no. 33 (25 August 1900): 4. Unfortunately, although the engineer's notes and letters are mentioned in an article on *Búnaðarrit*, no documents regarding this portion of the research have been found. Nevertheless, it is likely that Sigurður Pétursson's tests might have been linked to earlier experimentations on the Icelandic production of limestone, such as the late nineteenth-century attempts by Jón Hjaltalín (see chapter 1). See: Þ. B., "Sigurður Pjetursson og byggingarannsóknirnar," *Búnaðarrit* 15, no. 1 (1901): 10

[21] *Den Militære Høiskole*, now Krigsskolen, located in Oslo. The school was founded in 1750. See: Hans P. Hosar, *Kunnskap, dannelse og krigens krav. Krigsskolen 1750–2000* (Oslo: Krigsskolen Elanders, 2000).

[22] Several books by Edvard Kolderup can be found in the collection of the National Library of Iceland: *Haandbog i husbygningskunst*, published in 1891 and part of the library collection since 1894; *Monierkonstruktionerne. Den nye byggemethodes epokegjørende betydning og anvendelse*, published in 1893 and part of the library collection since 1912; *Grundundersøgelser og fundamenteringsarbeider paa land og under vand for alle slags byggearbeider*, published in 1894 and part of the library collection since 1905. *Monierkonstruktionerne* (1893) and his author are mentioned in the volume by Per Jahren and Tongbo Sui, *History of Concrete: A Very Old and Modern Material*, 82–84.

[23] Björn Bjarnarson, "Um þök," *Búnaðarrit* 8, no. 1 (1894): 154–71.

[24] The author of the article praised the properties of what Kolderup defines *Træcement* (translated into Icelandic as *trjelím*). This technique derived from the 1839 *Holzzement* method, which had been patented by German enterpreneur Carl Samuel Häusler (1787–1853). The *Holz-zement-dach* was a forerunner of modern flat roofs, made of timber formworks covered with layers of wax paper and tar and topped with a layer of gravel and sand. It became quite widespread in the second half of the nineteenth century, and was later at the basis of the so-called "Naturdächer von vulkanischem Cement"

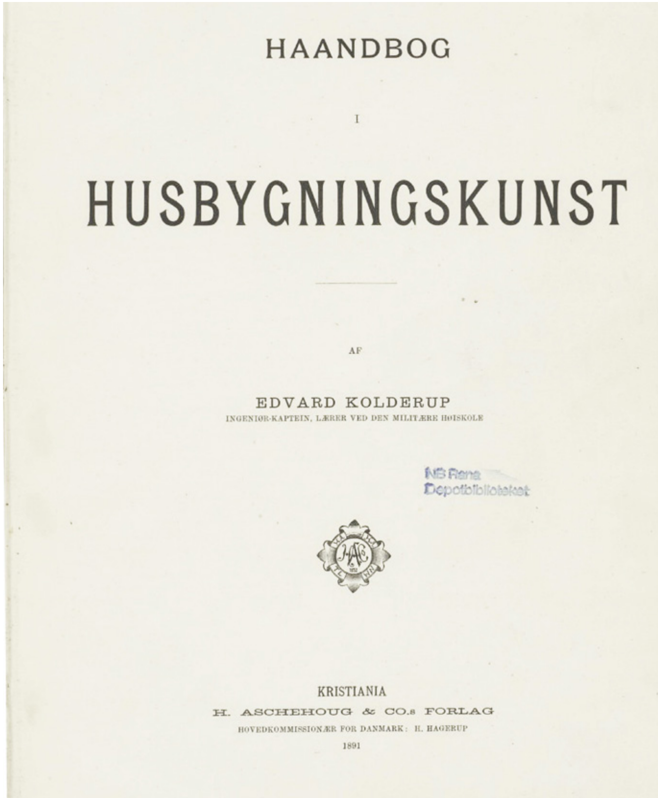
of references and patents is the way this continental knowledge slowly reached Iceland. From Germany, one of Europe's engineering cradles, patents dating back to the first or early second half of the nineteenth century entered the Icelandic countryside only at the beginning of the twentieth century, and through mediation of a Norwegian text. Stemming from a tradition that had its roots in the early nineteenth century, at the turn of the century the genre of the so-called *Bauführung*, meaning handbooks regarding architecture and construction, had already evolved from publications used by self-taught builders into handbooks for engineering and architecture university students.[25] However, because of the absence of engineers, Iceland had no-one except farmers reading those handbooks, thus limiting the use of such texts to the domain of the self-teaching. Although no biographical information is available on Björn Bjarnason, author of the article on *Búnaðarrít*, it should not come as a surprise if he were a man of agriculture: the early Icelandic technical knowledge was still in the realm of an unskilled, yet not uneducated, labour force. It was this very audience that eventually left a mixed expertise in the hands of the new engineers; one made from sources filtered through the books collected in the National library or simply by word of mouth.[26] For isolated Iceland, the handbook by Kolderup must have been a guiding light for whomever was involved in one of the island's greatest challenges: the issue of the improvement of housing conditions.[27] This obsession was felt on a national scale, as it highlighted an intrinsic need that, more than ever before, became one of the most urgent matters at the turn of the twentieth century. While Iceland was slowly gaining more political autonomy, the attentions of its political class were increasingly devoted to the improvement of the inhabitants' living conditions, hence the research assigned to the young engineer.

[Volcanic Cement Roofs], developed by Carl Rabitz (1823–91). Decades later, the Icelandic contributor stated both techniques could have been a good option for Iceland, especially if such roofs had been covered with turf. On the *Holz-zement-dach*, see: G. Bædeker, *Das Holz-Zement-Dach* (Leipzig: Karl Scholtze, 1877); see also: Klaus Sedlbauer, Eberhard Schunck, Rainer Barthel, and Hartwig M. Künzel, *Flachdach Atlas. Werkstoffe, Konstruktionen, Nutzungen* (München: Institut für internationale Architektur-Dokumentation, 2010), 12–13. On Rabitz, see: Carl Rabitz, *Naturdächer von vulkanischem Cement* (Berlin: Verlag von Theophil Bittkow, 1867). This patent opened to the possibility of green, flat roofs, similarly to François Coignet's "béton aggloméré" slabs. Roberto Gargiani, "Vers le toit-jardin en béton, de Soufflot à Coignet", in *L'architrave, le plancher, la plate-forme. Nouvelle historie de la construction*, edited by Roberto Gargiani (Lausanne: EPFL Press, 2012), 490.

[25] Christoph Rauhut, "'Zum Selbstunterricht'. Das Aufkommen der Bücher zur Bauführung im 19. Jahrhundert", in *Der Lehrbuchdiskurs über Bauen*, edited by Uta Hassler (Zürich: Hochschulverlag, 2015), 170.

[26] Given the small dimensions of Iceland, it is possible to trace the growth of the catalogue of the National Library of Iceland, between 1880 and 1920. This allows us to understand not only which books were acquired by the library, but also when they first entered the country. See: Lbs, *Ritaukaskrá Landsbókasafnsins* (1887–1943).

[27] This issue is always referred to as *húsabót* in the Icelandic context, meaning "improvement of houses". In this chapter the Icelandic term *húsabót* will be mainly translated as "renovation" or "refurbishment".



HAANDBOG

I

HUSBYGNINGSKUNST

AF

EDVARD KOLDERUP

INGENIØR-KAPTEIN, LÆRER VED DEN MILITÆRE HØISKOLE

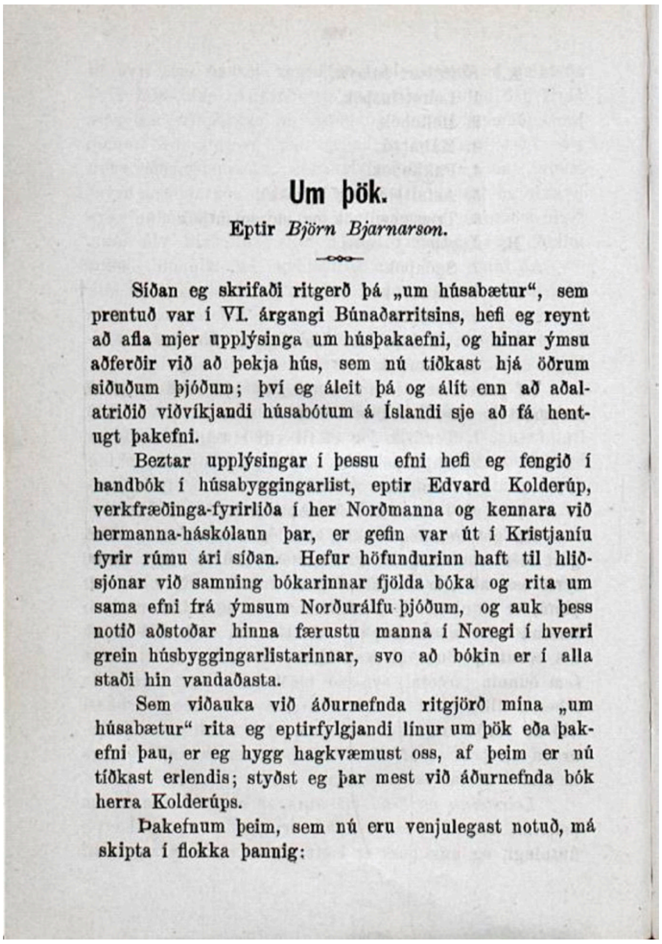
KRISTIANIA

H. ASCHEHOUG & CO.s FORLAG

HOVEDKOMMISSIONÆR FOR DANMARK: H. HAGERUP

1891

Fig. 1a – Kolderup, *Haandbog i husbygningskunst*, 1891. Title page.



Um þök.

Eptir *Björn Bjarnarson.*

Síðan eg skrifaði ritgerð þá „um húsabætur", sem prentuð var í VI. árgangi Búnaðarritsins, hefi eg reynt að afla mjer upplýsinga um húsþakaefni, og hinar ýmsu aðferðir við að þekja hús, sem nú tíðkast hjá öðrum siðuðum þjóðum; því eg áleit þá og álít enn að aðalatriðið viðvíkjandi húsabótum á Íslandi sje að fá hentugt þakefni.

Beztar upplýsingar í þessu efni hefi eg fengið í handbók í húsabyggingarlist, eptir Edvard Kolderúp, verkfræðinga-fyrirliða í her Norðmanna og kennara við hermanna-háskólann þar, er gefin var út í Kristjaníu fyrir rúmu ári síðan. Hefur höfundurinn haft til hliðsjónar við samning bókarinnar fjölda bóka og rita um sama efni frá ýmsum Norðurálfu-þjóðum, og auk þess notið aðstoðar hinna færustu manna í Noregi í hverri grein húsbyggingarlistarinnar, svo að bókin er í alla staði hin vandaðasta.

Sem viðauka við áðurnefnda ritgjörð mína „um húsabætur" rita eg eptirfylgjandi línur um þök eða þakefni þau, er eg hygg hagkvæmust oss, af þeim er nú tíðkast erlendis; styðst eg þar mest við áðurnefnda bók herra Kolderúps.

Þakefnum þeim, sem nú eru venjulegast notuð, má skipta í flokka þannig:

Fig. 1b – Björn Bjarnarson, "Um þök," *Búnaðarrit* 8, no. 1 (1894): 154–71.

Iceland's first research on building techniques

The great part of Sigurður Pétursson's research was fieldwork investigation on the state of Icelandic construction, with a particular attention to the most commonly used materials and their behaviour in the harsh Icelandic environment. The engineer conducted a survey in Þingeyrasýsla county in North-East Iceland by sending a printed form with ten questions to some of its municipalities.[28] The choice of Þingeyrasýsla as the county where reliable information on the state of Icelandic construction could be found may be linked to the special cultural status of area itself. Being an important trading and agricoltural region, throughout the nineteenth century this county had already become a pivotal area for social, cultural and economical development.[29] The ten questions provided by Sigurður Pétursson to each delegate of the county board concerned a variety of issues on construction techniques and Icelandic building traditions. **Fig. 2.**

The engineer was interested in the main and most common building materials and housing projects available in each municipality; in the new methods and recent experiments. He was also interested in the traditional construction techniques that survived the passage of time; in the age and durability of the buildings; in the presence of humidity within the houses and the techniques adopted to limit its spread; in the materials employed for heating; in the names of those who were considered experts in building matters. Nine set of answers were written by the delegates of nine different municipalities. One was signed instead by Jakob Hálfdanarson (1836–1919), farmer at Grímsstaðir near the Mývatn lake and founder of the *Þingeyinga* Cooperative.[30] Jakob Hálfdanarson, who was considered as an expert in building matters, provided an extremely detailed answer to the engineer's questions, composing a handwritten document of 78 pages.[31]

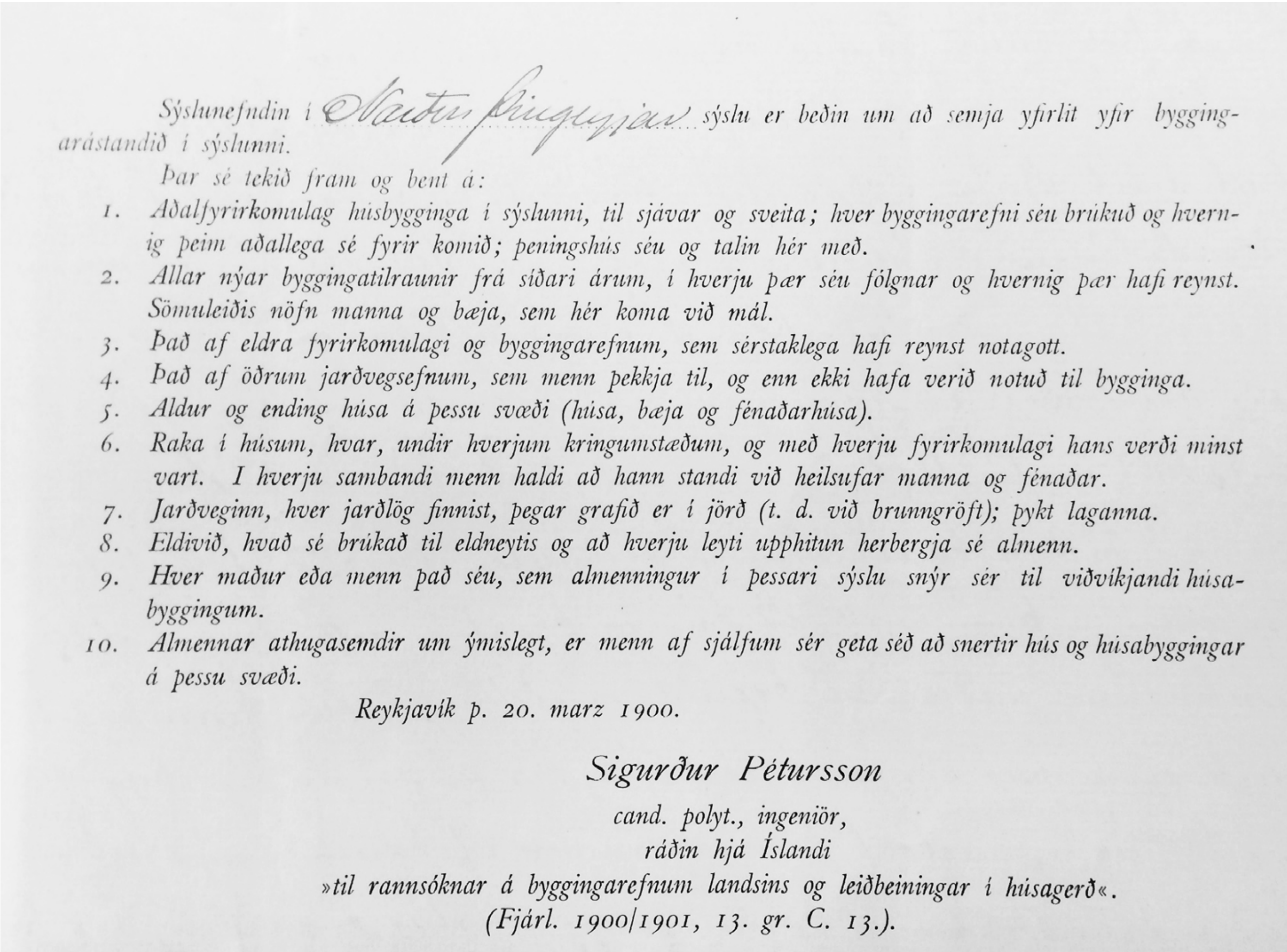
The picture emerging from the survey and its answers can be considered as a mirror of Iceland at the turn of the century: a harsh and remote place, where living conditions had not changed much since the middle ages, yet a country populated by

[28] The municipalites to which the forms were sent to, and were answered by, were: Sauðaneshreppi; Svalbarðshreppi; Axarfjarðarhreppi; Kelduhverfi; Fjallahreppi; Mývatnssveit; Reykdælahreppi; Aðaldælahreppi; Grýtubakkahreppi. The Manuscript Department of the National Library of Iceland holds some of the handwritten answers to the survey. They are collected in: Lbs 767 Fol., Örk 8.

[29] Aðalsteinn Eiríksson, and Maurizio Tani, "Skrúður, la scuola di Núpur, Sigtryggur Guðlaugsson e la pedagogia di Grundtvig nella storia dell'educazione islandese," in *Skrúður, Núpur. Premio Internazionale Carlo Scarpa per il Giardino, XXIV edizione*, edited by Patrizia Boschiero, Luigi Latini, and Domenico Luciani (Treviso: Fondazione Benetton Studi Ricerche, 2013), 82.

[30] *Þingeyinga Kaupfélag*. The Cooperative was founded in 1882. See: Andrés Kristjánsson, *Aldarsaga Kaupfélags Þingeyinga* (Húsavík: Kaupfélag Þingeyinga, 1982); Pétur Sumarliðason, and Einar Laxness, eds., *Sjálfsævisaga: bernskúar Kaupfélags Þingeyinga: úr fórum Jakobs Hálfdanarsonar* (Reykjavík: Ísafold, 1982).

[31] Lbs 4 NF. Jakob Hálfdanarson (1836–1919). *Bréfa- og handritasafn* 1865–1940, Askja 18, Örk 6. "Um húsabyggingar". The document was digitized and it is available at: https://issuu.com/heradsskjalasafnthingeyinga/docs/um_h__sabyggingar, last accessed 02/09/2019.



Sýslunefndin í Norður Þingeyjar sýslu er beðin um að semja yfirlit yfir byggingarástandið í sýslunni.

Þar sé tekið fram og bent á:

1. Aðalfyrirkomulag húsbygginga í sýslunni, til sjávar og sveita; hver byggingarefni séu brúkuð og hvernig þeim aðallega sé fyrir komið; peningshús séu og talin hér með.
2. Allar nýar byggingatilraunir frá síðari árum, í hverju þær séu fólgnar og hvernig þær hafi reynst. Sömuleiðis nöfn manna og bæja, sem hér koma við mál.
3. Það af eldra fyrirkomulagi og byggingarefnum, sem sérstaklega hafi reynst notagott.
4. Það af öðrum jarðvegsefnum, sem menn þekkja til, og enn ekki hafa verið notuð til bygginga.
5. Aldur og ending húsa á þessu svæði (húsa, bæja og fénaðarhúsa).
6. Raka í húsum, hvar, undir hverjum kringumstæðum, og með hverju fyrirkomulagi hans verði minst vart. Í hverju sambandi menn haldi að hann standi við heilsufar manna og fénaðar.
7. Jarðveginn, hver jarðlög finnist, þegar grafið er í jörð (t. d. við brunngröft); þykt laganna.
8. Eldivið, hvað sé brúkað til eldneytis og að hverju leyti upphitun herbergja sé almenn.
9. Hver maður eða menn það séu, sem almenningur í þessari sýslu snýr sér til viðvíkjandi húsabyggingum.
10. Almennar athugasemdir um ýmislegt, er menn af sjálfum sér geta séð að snertir hús og húsabyggingar á þessu svæði.

Reykjavík þ. 20. marz 1900.

Sigurður Pétursson

cand. polyt., ingeniör,
ráðin hjá Íslandi
»til rannsóknar á byggingarefnum landsins og leiðbeiningar í húsagerð«.
(Fjárl. 1900/1901, 13. gr. C. 13.).

Fig. 2 – Survey by Sigurður Pétursson, 1900. Lbs 767 Fol., Örk 8.

inhabitants whose high level of literacy allowed them to comment about the current situation. What emerged from the representatives' answers was that the most common building materials were, without a doubt, gravel, turf and driftwood, employed in order to build and repair the traditional turf farm, commonly referred to as *baðstofa*. **Fig. 3.** These farms did not usually last more than forty or fifty years, depending on the quality of the materials and on natural events such as earthquakes or strong winds.[32] Some delegates stated that no other building materials were known and used.[33] Nevertheless, other municipalities had seen an increase in timber houses, whose main novelties were the outer cladding made of corrugated iron and the presence of a stone and lime cellar below the main floor.

In some cases stone buildings were mentioned.[34] These stone constructions represented an anomaly in the almost complete monopoly of turf farms; however they did not provide suitable living conditions according to their inhabitants. Sandstone was considered too weak and it was prone to swelling over time, with the result that the walls fell apart.[35] In the case of a basalt and tuff structure, the house apparently "did not prove well for residential purposes", as it was too cold during winter and too warm during summer.[36] From these reports it is also possible to trace some of the first applications of concrete in rural Iceland, which was often employed for the construction of chimneys. Some representatives mentioned a mixture of gravel, sand, and cement, in order to build chimneys, especially for the newly-built houses with a timber structure and a lime-rendered stone cellar, as the body of the chimney rested on the floor of the cellar itself.[37] Only one representative mentioned the presence of a concrete house in the municipality.[38] At the same time, Jakob Hálfdanarson provided

[32] According to the answers of the survey, the lowest estimate sets the maximum timespan of a *baðstofa* at 30–35 years; the most positive estimate is instead at 70–90 years. Most answers claim that 40–50 is the ordinary timespan for turf farms.

[33] For example, in the area of Kelduhverfi, between the Tjörnes peninsula and the Jökulsá river, there was not a single house in timber: "Timburhús er ekkert í sveitinni". Answer by the municipality of Kelduhverfi, Lbs 767 Fol., Örk 8.

[34] In Kelduhverfi, it was reported that a house had been built out of sandstone. Its walls were formed by large pieces of carved sandstone and layers of turf. In particular, the writer referred to *ljátorf*, meaning turf that had been cut with a scythe. In Reykdælahreppi, the representative Benedikt Jónsson mentioned the construction of a stone house built around 1882–86, built out of basalt and tuff, boasting a cellar with walls covered by a cement-based mortar.

[35] "Sandsteinn þessi er þó lélegt byggingarefni þvó hann blæs upp með tímanum að utanverðu í veggjum". [This sandstone is yet a weak building material, because it tends to blow up towards the exterior part of the walls"]. Answer by the municipality of Kelduhverfi, Lbs 767 Fol., Örk 8.

[36] "Hús þetta hefir ekki reynst vel til íbúðar". Answer by the municipality of Reykdælahreppi (Benedikt Jónsson), Lbs 767 Fol., Örk 8.

[37] Chimneys could be built also with bricks [*tígulsteinn*], but they had to be imported from the continent. In addition, the presence of heating systems in the farmhouses was relatively recent. "Þar sem baðstofur eru með lofti, eru eldstórnar oftast á gólfinu undir loftinu og gera menn þá reykháfa frá þeim upp í gegnum baðstofuna, eru þeir [...] gerðir úr sementsteypu (betong), sem er algeng aðferð við reykháfagerð hér í sýslu". [If the baðstofa is built with an attic, the stove is placed on the floor below the attic, and people build the chimneys from the stove through the baðstofa, and the chimneys have been lately made out of concrete, which is a common building method for chimneys here in the county]. Answer by the municipality of Reykdælahreppi (Benedikt Jónsson), Lbs 767 Fol., Örk 8.

[38] "Undanfarið 10 ára skeið hafa hér í hreppi verið byggð 10 timburhús og 1 steinsteypuhús (í Nesi)." [In the previous ten years, ten timber houses and one concrete house have been built in the municipality]. Answer by the municipality of Grýtubakkahreppi (Árni Jóhansson), Lbs 767 Fol., Örk 8.

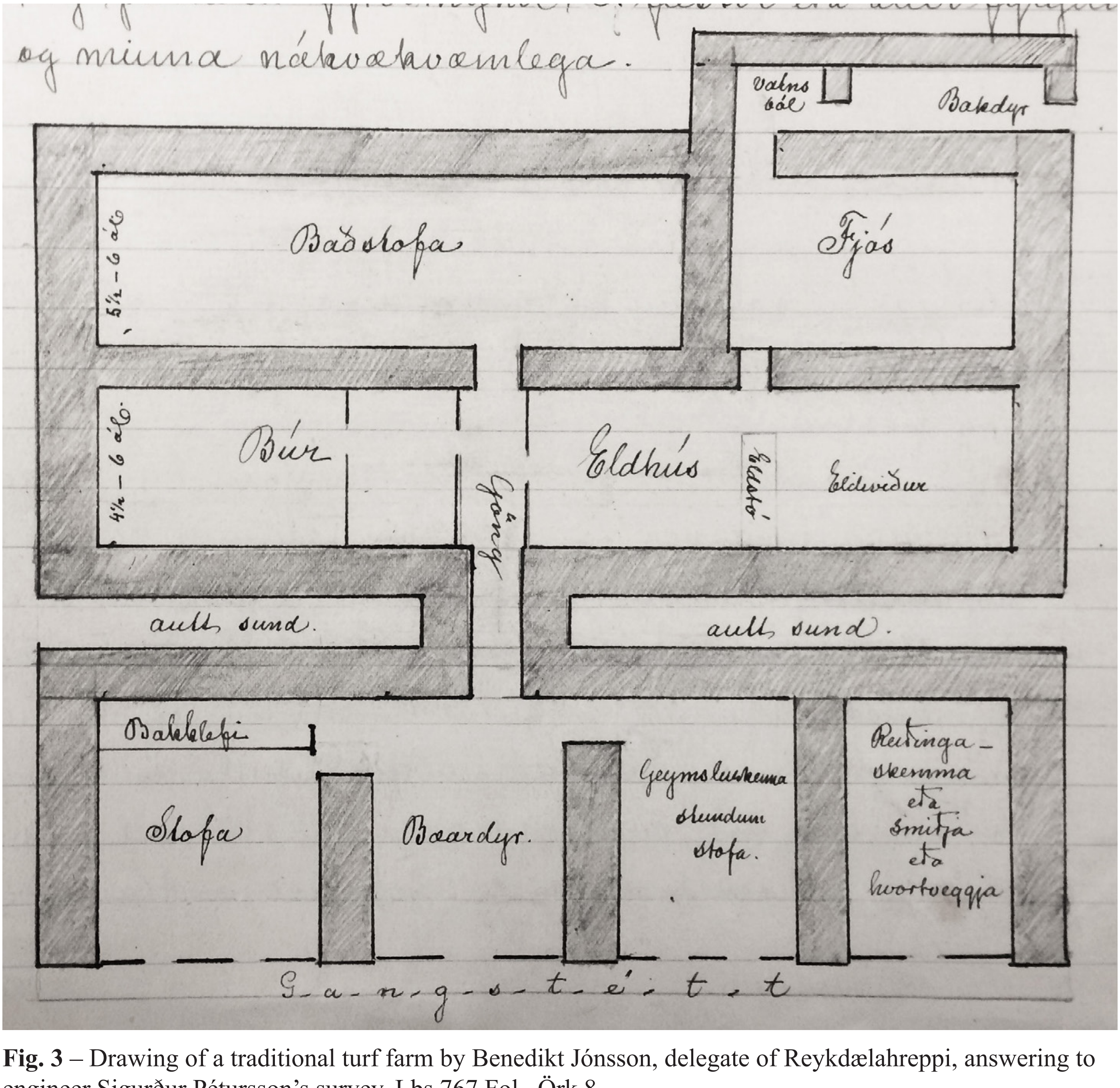


Fig. 3 – Drawing of a traditional turf farm by Benedikt Jónsson, delegate of Reykdælahreppi, answering to engineer Sigurður Pétursson's survey. Lbs 767 Fol., Örk 8.

a very interesting detail: in 1875, a prison had been built in Þingeyrasýsla, most likely in the village of Akureyri, following the recent regulations that ordered the construction of prisons all around the country.[39] Danish mastermason Bald was in charge with the design and construction of these prisons and this is what Jakob Hálfdanarson reported:

> A new material and method was employed by a Danish mastermason, Bald, which consisted in casting the whole wall between pillars and a framework – both the outer and the inner walls.[40]

It is easy to find direct connections between the building method described by Jakob Hálfdanarson and how the mastermason Bald coordinated the works of the house of parliament in Reykjavík between 1880 and 1881. This brief mention confirms the hypothesis that most of the first Icelandic experiments on concrete stemmed from Bald's practical education, which later scattered all around the countryside.

Among the questions provided by Sigurður Pétursson, a particular focus was on the level of humidity within turf farms. Damp walls and a great amount of humidity in the farms were one of the main drawbacks of turf construction.[41] According to their answers, the delegates seemed to be aware of the links between humidity and diseases.[42] However, the methods adoped to limit its spreading were very few – and they merely referred to the building quality.[43] Yet, the issue of humidity could not be fully solved without addressing the heating of the rooms: the use of stoves, and subsequently a thorough warming up of the living places, was still very uncommon,

---

[39] "Byggt og búið í gamla daga," *Tíminn* 63, no. 151 (7 July 1979): 8. The regulation had been accepted with much criticism. "Fangelsi," *Víkverji* 2, no. 1 (16 June 1874): 117–18.

[40] "Þá var af dönskum byggingameistara, Bald, viðhaft nýtt efni og aðferð, sem sé að steypa upp alla veggina milli stöpla og bindinga í grindina – bæði útveggi alla og milli veggi." Lbs 4 NF. *Jakob Hálfdanarson (1836–1919). Bréfa- og handritasafn 1865–1940*, Askja 18. Örk 6. "Um húsabyggingar," 10. The construction of the prison is also mentioned in: "Póstskipið," *Víkverji* 2, no. 1 (16 June 1874): 118.

[41] "Raki er hér allmikill í flestum eða öllum húsum sem er eðlileg afleiðing þess að þau eru svo mikið gjörð af torfi [...]." [There is a lot of humidity in some or almost all houses, which is a natural consequence, as they are mainly made of turf ...]. Answer by the municipality of Svalbartshreppi (Hjörfur Þorklesson), Lbs 767 Fol., Örk. 8.

[42] "Almennt álíta menn að rakinn hafi ill áhrif að heilsu manna". [In general many think that humidity has a negative influence on people's health]. Answer by the municipality of Sauðaneshreppi, Lbs 767 Fol., Örk. 8. "[...] að hann sé háskalegur fyrir heilsufarið yfir höfuð, og fyrir útbreiðslu næmra sjúkdóma, sem fremur virðast verða illkynyaðir [...] í rökum en þurrum húsum, þykjast menn einkum hafa veitt þessu eftirtekst um taugaveiki og um difterítis." [... that it is generally dangerous for health, for the propagation of contagious diseases, which may become lethal ... in damp rather than in dry houses; it is regarded that people had paid attention on typhus fever and on diphtheria]. Answer by the municipality of Reykdælahreppi (Benedikt Jónsson), Lbs 767 Fol., Örk 8.

[43] In fact, one of the answers claimed that a properly-built turf farm could have been almost without dampness or leaking. Also, one county representative claimed that the absence of cattle below the living area – which was quite common in the countryside – could lower the dampness within the farm. "Á 3 bæjum í sveitinni eru kýr ekki hafðar undir baðstofulofti og ber það mest á raka." [In three farms in the territory there are no cows under the pavement, and that fights humidity well]. Answer by the municipality of Kelduhverfi, Lbs 767 Fol., Örk 8.

thus the ordinary farm was generally very cold. They were usually heated by burning dried manure, the most common fuel in the countryside. The answers to Sigurður Pétursson's ninth question – whether there were and who were the building experts in the municipality – clearly highlighted the almost complete lack of skilled mastermasons who pursued a career in the building industry.[44]

Sigurður Pétursson was gone too early to write anything official about his research: he died in October 1900 at the age of thirty.[45] Most of the county representatives' answers were written months after the engineer's death. Because his task was of national importance, new names were soon brought up as possible substitutes for the engineer. The first was that of Knud Zimsen's who, despite his promising expertise, appeared to be much more interested in and occupied with his enterpreneurial adventures (see paragraph 2.1.2).[46] Although not mentioned in the newspapers, another emerging figure was very interested in Sigurður Pétursson's research and legacy – the future architect Rögnvaldur Ólafsson, who was in fact going to become a true protagonist of the Icelandic architectural scene. In fall 1900 he was still a student at the Reykjavík Seminary, but had already showed a keen interest in architecture since a few years prior, when he asked for advice from Guðmundur Finnbogason (1873–1944), at that time philosophy student in the Danish capital.[47] Rögnvaldur Ólafsosn was seeking information about the architectural programme at the Academy of Fine Arts in Copenhagen. A few weeks after Sigurður Pétursson's death, Rögnvaldur Ólafsson wrote another letter to Guðmundur Finnbogason: not only did he stress his interest in architecture and his willingness to ask for a scholarship in order to study in Copenhagen, but he also mentioned the death of Sigurður Pétursson with these words:

> You say that the engineer Sigurður Pétursson has died, and this is a great loss. There is nobody now that can continue his work on the issue concerning the improvement of housing conditions. This may turn out to be good for me: "the death of somebody is the life of another".[48]

[44] The answers to this question are all quite similar. "Hér enginn sérstakur maður sem menn snúi sér til með húsabyggingar" [There isn't a particular man to whom people turn to regarding construction matters]. Answer by the municipality of Sauðaneshreppi, Lbs 767 Fol., Örk. 8.

[45] News of his death was given also in Denmark, in the pages of the journal *Ingeniøren*: "Dødsfald," *Ingeniøren* 9, no. 42 (27 October 1900): 338. The short career of the engineer was also mentioned in the book of biographic information regarding the students and professors at *Den Polytekniske Læreanstalt*: J. J. Voigt, *Statistike Oplysninger angaaende den polytekniske Læreanstalts Kandidater samt Fortegnelse over dens Direktører og Lærere (1829–1902)* (Copenhagen: Schultz, 1903), 224.

[46] "Húsabótarannsóknirnar," *Ísafold* 27, no. 65 (20 October 1900): 259.

[47] Björn Björnsson, *Fyrsti arkitektinn,* 8. Guðmundur Finnbogason later became one of the most important intellectuals in the country. Rögnvaldur Ólafsson's letters to Guðmundur Finnbogason are collected in Lbs 12 NF. *Guðmundur Finnbogason. Skjalasafn. Bréfasafn. Bréf til Guðmundar Finnbogasonar*. Askja 21. They have partly been reprinted in Finnbogi Guðmundsson, ed. "Þrjú bréf Rögnvalds Ág. Ólafssonar til Guðmundar Finnbogasonar," *Árbók Landsbókasafn Íslands* 10 (1984): 53–60.

[48] "Þú fréttir nú lát Sigurðar Péturssonar ingeniörs, og var skaði að honum. Er nú enginn til að takast starfa hans á hendur í húsabótamálinu. Vera má, að það gæti greitt fyrir mér – "eins dauði er

Eventually, Sigurður Pétursson's task was appointed neither to Knud Zimsen, nor to Rögnvaldur Ólafsson, but to engineer Jón Þorláksson (see paragraph 2.1.3).

"A public and national issue": The endless renovation of turf houses

The survey organized by Sigurður Pétursson underscored a critical concern for Iceland and its economy: the endless process of construction and refurbishment of the traditional farmhouse, and the great amount of money required. As the survey indicated, the average age of a turf farm was around 40–50 years, requiring that after each half a century every house in the country had to be wholly restored. If the specific farm was built on public land, it also meant that the farmer could ask for a grant in order to support the works. This particular subsidy for the improvement of houses was very much debated in Parliament at the turn of the century, and in 1900 the first structured law concerning low-interest loans for agricultural and building purposes was issued.[49] As claimed in the pages of the *Búnaðarrít* journal:

> It was self-evident to recognize that our houses are generally poor, vulnerable, and yet unbearably expensive, and the majority was aware that a lack of knowledge was responsible for all the renovations. The improvement [of houses] became a public and national issue [...].[50]

The Ministry of Iceland received dozens of requests for national grants to be devoted to the renovation of farmhouses and farmsteads. Today, these documents are collected at the National Archives of Iceland, and they are an outstanding tool for understanding the modernization of Iceland's construction habits. Between 1904 and 1927 up to 47 requests for housing grants were issued.[51] The documents include farmers' letters, accounts by building experts, expense estimates, governmental papers, and even some simple drawings. Mirroring the answers of Sigurður

---

annars líf". Lbs 12 NF. *Guðmundur Finnbogason. Skjalasafn. Bréfasafn. Bréf til Guðmundar Finnbogasonar*. Askja 21. Letter from Rögnvaldur Ólafsson to Guðmundur Finnbogason, Reykjavik, 25 October 1900.

[49] In 1899 it was decided that a subsidy could be granted to a farmer, if the inhabitant was able to guarantee at least one third of the total costs. See: "191. Breytingartillaga," *Alþingiskjöl* (1899): 313. While debating the financial report of the year 1906, the Parliament documents reported that "Á reikningsárinu hefir verið veittur styrkur til húsabóta á nokkrum þjóðjorðum" [During the financial year we have granted subsidies for the improvement of houses to several public landholdings]. See in: "Afgjöld af jarðeignum landssjóð," *Alþingiskjöl* (1909): 498. The law no. 1 issued on 12th January 1900 declared the opening of a specific department of the National Bank [*Landsbanki*] which would offer low-interest and long-term loans for acquiring agricultural land and/or renovating one's dwellings. See: Steingrímur Steinþórsson, "Byggingarmál alþýðu," in *Félagsmál á Íslandi* (Reykjavík: Félagsmálaráðuneytið, 1942), 262–63.

[50] "Það var sjálfgefið, að kannast við það, að hús vor eru yfirleitt slæm, endingarlítil og því óbærilega dýr, og meiri hlutinn kannaðist og við það, að þekkingarskorturinn stæði fyrir öllum bótum. Húsabótin varð þingmál og landsmál." Þ. B., "Sigurður Pjetursson og byggingarannsóknirnar," 5.

[51] Traces of the copious requests for public funds – specifically addressed to the renovation of farm houses – are now collected in the *Stjórnarrað Íslands* II collection [Ministry Offices of Iceland II] of the National Archives of Iceland. See the complete list in the references.

Pétursson's survey, these documents paint an interesting picture of what was the state of Icelandic construction in the first decades of the twentieth century; its inner problems, the recent technological changes, and the way in which a rural society dealt with a national-scale emergency. The inner structure of each request was quite repetitive. Generally, the farmer in need for a house renovation – or one who had just renovated one's farm – wrote to the county attorney, describing the state of the old farmhouse and the renovation project.[52] Usually one would also attach an economic evaluation of the forthcoming works. Then, the attorney wrote to either the local county representative or the territorial Amtmann.[53] Finally, the request was brought to the attention of the Ministry of Iceland. All demands were related to the refurbishment of farmhouses and the surrounding buildings, and the majority regarded traditional structures. Sometimes the farmer would only request the replacement of an old timber or turf roof with one made of corrugated iron.

The farmers often called for financial support towards the reconstruction of the whole farmhouse, as these dwellings were usually damaged and damp, or had been destroyed by fire.[54] The outcome of such projects was usually another structure made out of turf and gravel. Only in a few cases the new dwelling was in timber, clad with corrugated iron.[55] Although it may seem surprising that an owner would want to rebuild one's farm again with damp and weak turf walls, these documents show the unimaginable complexity and the exceptional costs behind the construction of timber structures in the countryside. In a 1905 request for a new timber house in the southern region of Hörgslandshreppi, the carpenter attached its schedule and quote for the task. The great variety of beams, rafters, and planks, topped with the transportation costs, notably increased the price, and thus rendered timber a material affordable only for a small élite.[56] **Figg. 4a–4b.**

In this context only a few houses were planned to be rebuilt in stone, lime, or concrete. As the survey by Sigurður Pétursson had already underscored, stone houses were usually considered to be unsuitable for living. Only one case describes the construction of a cowshed with cut stones and some bricks, in order to have the

---

[52] The local attorney was referred as *umbóðsmaður* in Icelandic.

[53] The county representative was referred as *sýslumaður* in Icelandic. The Amtmann [*amtmaður*] was a legal figure active until 1904.

[54] The latter is the case for a request issued in 1919 in the southern county of Rangarvallasýsla. See: ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/25, Örk. 8 (1919). In one case an old farm was without windows, making it extremely unsuitable for living.When requesting financial support for this project, the farmer attached a drawing of the new house, boasting three windows in a row, and the receipt regarding the three windowpanes bought in Akureyri. ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/25, Örk. 1 (1906).

[55] An example is the request issued in 1904 in the area of Hafnarfjörður. ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/2, Örk. 2 (1904).

[56] In this particular case, the total cost of a timber house was 2265,64 kr., making it at least three to five times more expensive than a renovation of an ordinary turf farm. ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/7, Örk. 2 (1905)

Fig. 4a – Icelandic turf farms, 1895. Byggðasafnið Skógum.

Fig. 4b – Icelandic turf farms, 1895. Byggðasafnið Skógum.

structure resist “for eternity”.[57] Cement was sometimes employed in the construction of cellars, and only one case documents the extensive application of concrete for the casting of the walls in a stable.[58] Although the first experiments with lime and concrete had originated in Iceland’s countryside, traditional farmhouses were very resilient. In order to see a systematic construction of concrete farms all around the country, the Icelandic society had to wait until the establishment of the technical office of the Agricultural Agency (see chapter three). At the turn of the century, with the exception of a few technicians, usually carpenters and mastermasons, farmhouses were built by their very inhabitants. Specialized building experts were still very few, and they were rarely consulted when a farm had to be renovated.[59]

2.1.2 An engineer’s business: Knud Zimsen’s trading adventures (1903–13)

Knud Zimsen was the son of a Danish merchant whose family had moved to Iceland in 1855. Information on his life and career mainly derives from his autobiographical memories collected in two volumes edited by Lúðvík Kristjánsson in 1948 and 1952.[60] In 1889 he entered the Junior College in Reykjavík, and then moved to Copenhagen to study engineering. Between 1894 and 1897, he studied engineering at the Polytechnic School of Denmark, together with fellows who were about to become Denmark’s most notable engineers: Ivar Jantzen (1875–1961), Poul Sörensen (1873–1964) and Rudolf Christiani (1877–1960).[61] After graduating, Knud Zimsen worked for some years in the office of the Copenhagen city engineer, where he had

[57] “Um ældur og ævi”. ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/1, Örk. 6 (1904). The peculiar richness of this refurbishment project – including also a detailed drawing – is perhaps due to the fact that the farmer’s request was mediated by Jón A. Hjaltalín (1840–1908), school director at Möðruvöllum í Hörgárdal and Akureyri, and member of the Parliament.

[58] Cement was employed as binder for stones and bricks to make walls around 1 ell thick [1 Danish *alin* = 1 ell, ca. 0,63m]. Moreover, concrete was also used to make the floors of a stable. Sometimes it would be mixed with turf layers in the same walls. See again: ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/1, Örk. 6 (1904).

[59] Suggestions on how to build farmhouses and warehouses were often printed in local journals, such as the journal of the Agricultural Society. See for example the texts by farmer Sigurður Guðmundsson, “Um húsabyggingar,” *Búnaðarrit*, 12, no. 1 (1898): 1–65 and by reverend Sigurður Stefánsson, “Nokkur orð um fjárhúsabyggingar o. fl.,” *Búnaðarrit* 16, no. 1 (1902): 216–50.

[60] Knud Zimsen grew up in Hafnarfjörður, south-west of Reykjavík: thanks to his family’s well-off status, he received a good education. Besides Icelandic and Danish, he was taught English and German. Personal information on his life are in: Lúðvík Kristjánsson, ed., *Við fjörð og vík. Brot úr endurminningum Knud Zimsens fyrrverandi borgarstjóra* (Reykjavík: Helgafell, 1948). Memories on his years as mayor of Reykjavík are collected in: Lúðvík Kristjánsson, ed., *Úr bæ í borg: nokkrar endurminningar Knud Zimsens fyrrverandi borgarstjóra um þróun Reykjavíkur* (Reykjavík: Helgafell, 1952).

[61] Jantzen became head of the mint at the Bank of Denmark between 1918 and 1946, and worked in the microeconomics field; Sörensen specialized in hydraulic engineering, and was the director of the Copenhagen groundwater service between 1922 and 1943; Christiani founded in 1904 the worldwide-known building firm *Christiani & Nielsen*, together with his partner Aage Nielsen. See further in this chapter for more details on this firm.

his first experiences with important infrastructural works, before sailing back to Iceland in 1902.[62] **Fig. 5.**

Among the reasons for going back to Iceland, Knud Zimsen knew that the country was fast approaching its "first age of progress", and it had to "nourish its engineers". Aware that Sigurður Pétursson had recently died, he felt that he "had to help Iceland's first engineer to improve the country's technical skills".[63] This age of progress matched with the political changes that were structurally transforming the governmental system of Iceland. By 1902, the Home Rule Party had the majority at the *Alþingi*: in 1904 the office of the *landshöfðingi* was abolished, and Iceland entered the years of its Home Rule. This implied the establishment of the Ministry of Iceland as the country's political representative in the Danish Cabinet.[64] Mixing technology and business, Knud had many enterpreneurial ambitions for his growing country, and he devoted his whole life to countless business ventures. Between success and failure, his activity within Iceland's economy and his influence in Reykjavík's growing infrastructure led him to obtain several administrative roles later on: he was city engineer between 1904 and 1907, member of the city council between 1908 and 1914, and mayor of Reykjavík between 1914 and 1932.

When in Denmark, Knud Zimsen was awarded a national grant for the development of a wool factory in Iceland, which was a part of a bigger plan to develop the country's industries. He took the opportunity to travel between Denmark, Norway, and Germany, in order to acquire some knowledge on the machines and visit similar plants.[65] In 1903 the Company *Iðunn* was established, and the factory was built on the eastern outskirts of Reykjavík.[66] **Fig. 6.** Knud Zimsen's first enterpreneurial adventure is worth highlighting for two reasons. Firstly, the construction of the factory was a matter of national attention: as the engineer started writing about the project in several Icelandic newspapers, this spiked the interest of many municipalities, that proposed the factory to be built in their areas, especially if

[62] Together with Charles Ambt (1947–1919) and Ove Kruse Nobel (1868–1916), Knud Zimsen worked at the construction of a sewerage system around the harbour of Copenhagen. His apprenticeship years were so important that he later wrote: "Ég tel, að þjónusta mín hjá Ambt gamla hafi orðið mér meira virði en nokkur skólaganga" [I believe that my employment at Ambt's office had more value than much school attendance]. Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 94.

[63] Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 95.

[64] The Home Rule [*heimastjórn*] started officially on 1st February 1904, when Hannes Hafstein (1861–1922) was appointed Minister of Iceland in the Danish Cabinet. He was the first Icelander ever to be named for this position. In 1903 the Parliament agreed that the Minister of Iceland should write and speak Icelandic, and reside in Reykjavík, therefore implying that he had to be an Icelander. See: Gunnar Karlsson, *The History of Iceland*, 267–72; Helgi Skúli Kjartansson, *Ísland á 20. öld* (Reykjavík: Sögufélag, 2002), 20–26; Gunnar Karlsson, "Atvinnubylting og rýkismyndun 1874–1918," in *Saga Íslands X*, edited by Sigurður Líndal, and Pétur Hrafn Árnason, 263–68.

[65] The first results of his research were published in: Knud Zimsen, *Skýrsla um rannsóknir stjórnarinnar til undirbúnings klæðaverksmiðju á Íslandi* (Copenhagen: J. H. Schultz, 1901).

[66] As most of Knud Zimsen's enterprises, the company was named after a protagonist of Norse mythology. In this case, *Iðunn* is the name of a goddess that appears both in the Poetic and in the Prose Edda.

Fig. 5 – Knud Zimsen at a young age.
Þjóðskjalasafn Íslands/Byggðasafn Hafnarfjarðar.

Fig. 6 – The wool factory *Iðunn* before 1906. Þjóðminjasafn Íslands/National Museum of Iceland.

close to waterfalls that could provide power for the machines.[67] This mirrored the increasing economic and technological awareness of early twentieth-century Icelanders, who were growing more and more conscious about the potentials of the country and its industrial development. Subsequently, the setting up of the factory revealed a dense network of business connections not only between Iceland and Denmark, but also stretching to Germany. In order to provide machines for *Iðunn,* Knud Zimsen engaged in a series of letters asking for materials and components, and he ordered directly from firms like the *H. Behnisch Maschinen-Fabrik* in Luckenwalde, and the renowned *Sächsische Maschinenfabrik* in Chemnitz. Thanks to the intrinsic internationality of his upbringing, he was already able to define a complex and international geography in which he could relentlessy move in order to buy, sell, and allow his country to develop further into industrialization.[68] On the infrastructural side, the engineer's experience in Copenhagen turned out to be very useful as Reykjavík was growing in size and population. In the first decade of the century, Knud Zimsen worked on several urban projects, such as sewerage systems, the supplying of asphalt, lightning for the streets, and services like the *þvottalaugar*, the washing pools in the area of Laugarnes, east of Reykjavík. As one of Knud Zimsen's autobiographies is titled, Reykjavík was transforming itself "from a village to a city", and the harbingers of this change were its engineers.[69]

In order to analyze Knud Zimsen's role in the Icelandic *saga* of concrete, this paragraph will refer to the many letters sent by the engineer between 1901 and 1913. The copies of those letters are now collected at the Reykjavík City Archives, and they add some key information regarding Knud Zimsen's activity in the Icelandic concrete industry.[70] Despite the fact that Knud Zimsen's role in the creation of an Icelandic concrete industry was more enterpreneurial than related to engineering matters, he was very proud of his title. Knud Zimsen´s network of personal and commercial relations was strengthened by his enrollment to the Danish Engineers' Society.[71] The pride he showed for his still elitarian profession could be seen in his telegraphic address: almost the one and only, *ingeniör*.[72] Not only did Knud Zimsen's technical knowledge have a great influence on the growth of Reykjavík, but it also played a crucial role in the development of its building tradition. In May 1903, he submitted

[67] The proposed municipalities stretched from Húsavík to Akureyri, from Borgarfjörður to Seyðisfjörður. The proposals sent to the engineer are collected in: BR, E25, KZ, Askja 2.

[68] A call for tender for the supply of machines to be installed in the factory was also published in the Danish journal *Ingeniøren*: "Licitation," *Ingeniøren* 12, no. 14 (4 April 1903): 103.

[69] See the book: *Úr bæ í borg*, edited by Lúðvík Kristjánsson. See also: Sveinn Þorðarson, *Frumherjar í verkfræði á Íslandi*, 39–41.

[70] The letters are in: BR, E25, KZ, Askja 1 and 2.

[71] BR, E25 KZ, Askja 1, *Bréfabók* 1903–1905, 458. 15 February 1907.

[72] Knud Zimsen started using the telegraph in early 1908: he had been promoting the opening of a telephone line to Reykjavík since 1904. Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 139–46. The fact that Knud Zimsen used the Danish term for engineer, instead of the Icelandic term *verkfræðingur*, should not come as a surprise. Despite Iceland's growing autonomy, the Danish language was still a recognizable sign of higher education and, more importantly, a link to Northern Europe's scientific debate. On the role of the Danish language in Iceland, see: Auður Hauksdóttir, "Language and the Development of National Identity: Icelanders' Attitudes to Danish in Turbulent Times," 93–94.

the final version of the first building code for Reykjavík, which remained in effect until 1945 (see further on in this chapter). The code assigned great importance to concrete as a building material. This prominent role stemmed from two of Knud Zimsen's enterpreneurial interests: gravel and cement. If the former was at the core of Knud's building firm *Mjölnir*, the latter was the heart of a decade-long trade with the *Aalborg Portland-Cement Fabrik* in Denmark.

Cast stones and modern dwellings: Hopes and failures of the building company *Mjölnir*

Among the treasures of the Icelandic language, there is the common saying *á mölinni*, whose literal meaning could be translated as "on the gravel" and yet it means "in a town". It has been popular since the last decades of the nineteenth century.[73] As the word *möl* means "gravel", this may be directly linked to the material employed for road construction, which made the town of Reykjavík resemble a huge gravel pile in the first decades of the twentieth century. Knud Zimsen was aware of the poor state of the roads in the capital city, usually made with unsuitable dirt soil. **Figg. 7–8.**

In December 1903 he founded and became the director of the *Mjölnir* construction company. Its members acquired the rights to excavate stones and produce gravel in the area of the Rauðará river, in the eastern part of the town.[74] As observed by the director of the *Reykjavík* newspaper, *mjölnir* means "something that grinds". However, the word also bears a mythological memory: in Norse mythology, *Mjölnir* was the hammer used by Thor. In Iceland's twentieth-century *saga* of progress and modernization, the gods' greatest weapon was now embodied by a small factory and its gravel production. The modern version of Thor's *Mjölnir* were the firm's grinding machines, which the engineer bought from Europe. By the time of its inauguration the company was a complete novelty for the Icelandic environment, starting with its headquarters: one of *Mjölnir*'s buildings boasted a shed roof for better natural lightning.[75] **Fig. 9.** However, the firm's scope was not only that of producing gravel to improve the road conditions. In fact, the company soon specialized in the production of concrete cast stones. Iceland had a history of cast stones, which had been first used by the stonemason Sigurður Hannsson in Garðar between 1876 and 1881, as building blocks made of lime conglomerate. Now, thanks to the factory's machines and a precise cement mixture, it was possible to make a greater number of such pieces, which would have been much easier and quicker to use in building works than natural stone.

In Knud Zimsen's mind, the production of concrete cast stones could put an end to Iceland's centuries-long dependency on Danish-imported bricks, which were

[73] Jón G. Friðjónsson, *Mergur málsins. Íslensk orðatiltæki: uppruni, saga og notkun* (Reykjavík: Mál og menning, 2006), 450.

[74] "Mjölnir," *Reykjavík* 5, no. 12 (1904): 45.

[75] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 74–75.

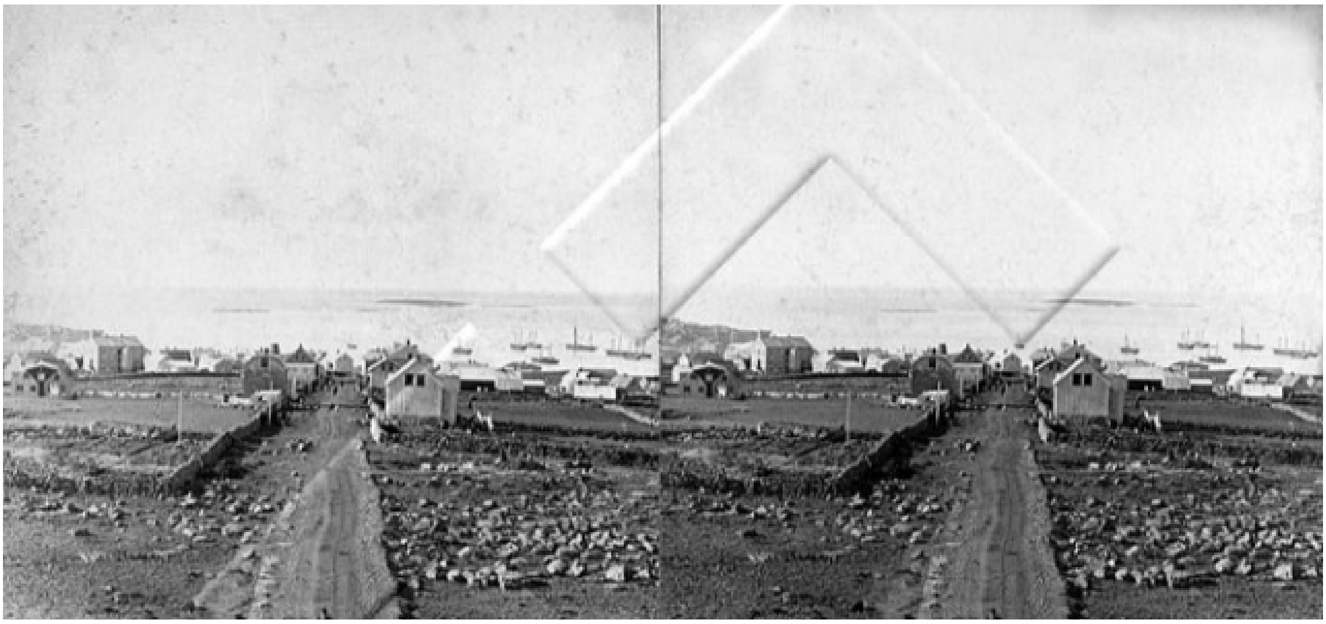


Fig. 7– Reykjavík seen from the top of the hill Skólavörðuholt, 1898–1900.
Ljósmyndasafn Reykjavíkur/Reykjavík Museum of Photography.

Fig. 8 – Austurstræti and Bankastræti, 1898–1900.
Ljósmyndasafn Reykjavíkur/ Reykjavík Museum of Photography.

expensive and not particularly suitable in Iceland's extreme climate. When he founded *Mjölnir*, lime and concrete cast stones had become particularly popular in Sweden, and afterwards in Norway. Despite the shared timeframe, early twentieth-century Icelandic experiments seem to be detached from the Swedish and Norwegian production, as no advertisement of Scandinavian cast stones appeared in Icelandic journals.[76] Yet, the engineer might have read articles and advertisements in the journal edited by the Danish Society of Engineers, as one of Knud Zimsen's letters to a German formwork producer attests.[77] Cast stones were also mentioned in one of the volumes of the German series *Handbuch der Architektur* (1900), which was available in the National Library of Iceland at that time.[78] Some descriptions of elaborate kinds of hollow concrete cast stones were also published in the pages of *Beton und Eisen* in 1906.[79] Regardless of the distance between the Icelandic construction tradition and the Scandinavian trend of employing natural stone, the production of concrete cast stones marked a turning point in the island's history.[80] Icelanders were thus able to produce their own building materials from scratch, with a small percentage of imported goods.[81]

The production was welcomed both with approvals and criticism, as the newspapers published several articles on the factory. Some claimed that the firm embodied a great progress, and that the use of concrete would help eliminate the expensive trade of timber from Norway.[82] Others wrote that *Mjölnir* was a "most needed enterprise", and all public buildings should from then onwards be built only in concrete.[83] Yet, some mastermasons were skeptical, claiming that the use of local dolerite would have been more suitable for the Icelandic environment.[84]

---

[76] Lime cast stones [in Swedish *kalksandstenen*] were first produced in Sweden by *Ragnhildsborgs kalksandstensfabrik* since 1902. In 1916 the Norwegian newspaper *Bergens Tidende* claimed that a Norwegian engineer had researched Swedish concrete cast stones [*betonstein*] in order to start the production in Norway. "Billigere bygninger," *Bergens Tidende* 49, no. 107 (1916): 5.

[77] BR, E25 KZ, Askja 1, *Bréfabók* 1903–1905, 433. 30 September 1906.

[78] The particular volume is the one by Erwin Marx, *Wände und Wandöffnungen* (Stuttgart: Arnold Bergsträsser Verlagsbuchhandlung, 1900), 122–24.

[79] Engineer Albrecht, "Der Betonhohlstein, ein neues Baumaterial," *Beton und Eisen* 5, no. 7 (1906): 166–68.

[80] On the use of natural stones in Nordic architecture, see: Sixten Ringbom *Stone, Style and Truth: The Vogue for Natural Stone in Nordic Architecture 1880-1910* (Helsinki: Suomen muinaismuistoyhdistyksen aikakauskirja, 1987); Atli Magnus Seelow, "Exploring Natural Stone and Building a National Identity: The Geological Exploration of Natural Stone Deposits in the Nordic Countries and the Development of a National-Romantic Architecture," *Arts* 6, no. 6 (2017).

[81] *Mjölnir* produced several kinds of stones, with different dimensions, all cast in timber formworks and with a mixing ratio of 1 : 4 : 7 (cement : sand : gravel). Most probably, the firm produced solid stones (see Fig. 10 in this chapter). The highest price was that of the wooden molds: compared to the price of one cast stone, timber formworks were exceptionally expensive: one formwork costed 3kr, and one medium stone costed 1,30kr. Guðmundur Hannesson, *Húsagerð á Íslandi,* 251. "Mjölnir," *Reykjavík* 5, no. 12 (1904): 45.

[82] "Verksmiðjan 'Mjölnir'," *Þjóðólfur* 56, no. 3 (15 January 1904): 9.

[83] "Mjölnir", *Reykjavík* 5, no. 12 (18 March 1904): 45.

[84] Páll Ólafsson, "Um grástein og steypustein," *Reykjavík* 5, no. 15 (8 April 1904): 59. See also the answer by the newspaper director to the article, *Reykjavík* 5, no. 17 (21 April 1904): 66–67. At the same time, others were even researching the possibility of producing masonry from Icelandic clay

Knud Zimsen did have a “blind faith” in this enterprise, hoping that it would become his “main occupation” in the years to come.[85] His letters show continuous mentions of the firm, as the engineer offered his products to some of the most important figures in Iceland, in an endless writing and receiving of correspondence from his office. In May 1904, he wrote to Tryggvi Gunnarsson (1835–1917), director of the National Bank, offering a purchase of cast stones and also drawing one of the shapes.[86] **Fig. 10.** Later in December 1905, he wrote to Thor Jensen (1863–1947), a prominent businessman and trading partner in Reykjavík, giving him information about the economy and the structure of the firm.[87] This network of Icelandic relations highlights the engineer’s knowledge of the society’s most influential characters, particularly those who could have sway over the building industry.

In spite of his high hopes, Knud Zimsen’s expectations had to match a quite different reality: as he acknowledged decades later, “sales went bad”, and “people did not have confidence in this building material”, as they thought that “the houses would wobble and become cold”.[88] In order to show the inhabitants of Reykjavík that concrete cast stones were solid and safe, Knud Zimsen engaged in a very ambitious form of advertising: he built himself a house made entirely of cast stones, located in the very city centre. The house was built between 1905 and 1906, it was “all made by *Mjölnir*’s stones”, and named *Gimli*.[89] **Figg. 11a–11b.** Although Knud Zimsen did not explain the name’s choice, it is easy to find another mythological connection: in Norse mythology and as described by Snorri Sturluson in his *Prose Edda*, *Gimli* is a beautiful and bright shelter placed in the third heaven of the Norse cosmology, and inhabited by those who survive the destruction of *Ragnarök*. With its almost three-storey high tower and plastered white walls, *Gimli* dominated the urban core of Reykjavík. It differentiated itself from all the other residential dwellings, being more similar in monumentality to administrative buildings such as the Ministry Offices. Although far from common standards of heavenly, *Gimli* was designed and built as a surprising advertising machine in Reykjavík’s urban landscape.

15-inch stones were used in the cellar, 12-inch for the house and 10-inch for its extension.[90] The structure boasted a crenellated tower, which gave the building the

---

resources. Preben Lange, “Tigulsteinsgerð og móhnoð,” *Reykjavík* 5, no. 8 (1904): 30, and *Reykjavík* 5, no. 15 (8 April 1904): 58.

[85] “[...] því ég hafði svo mikla tröllatrú á þessu fyrirtæki, að ég helt mig geta haft við það aðalatvinnu í framtíðinni”. Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 120.

[86] BR, E25 KZ, Askja 1, *Bréfabók* 1903–1905, 60. 27 May 1904. In January 1905, he wrote to a “good friend” in Ísafjörður, in order to sell one of *Mjölnir*’s grinding machines to help with the construction of a concrete building in the area. The recipient of the letter is not known, although he might have been the architect Rögnvaldur Ólafsson, who had just come back to Ísafjörður from Copenhagen. BR, E25 KZ, Askja 1, *Bréfabók* 1903–1905, 177.

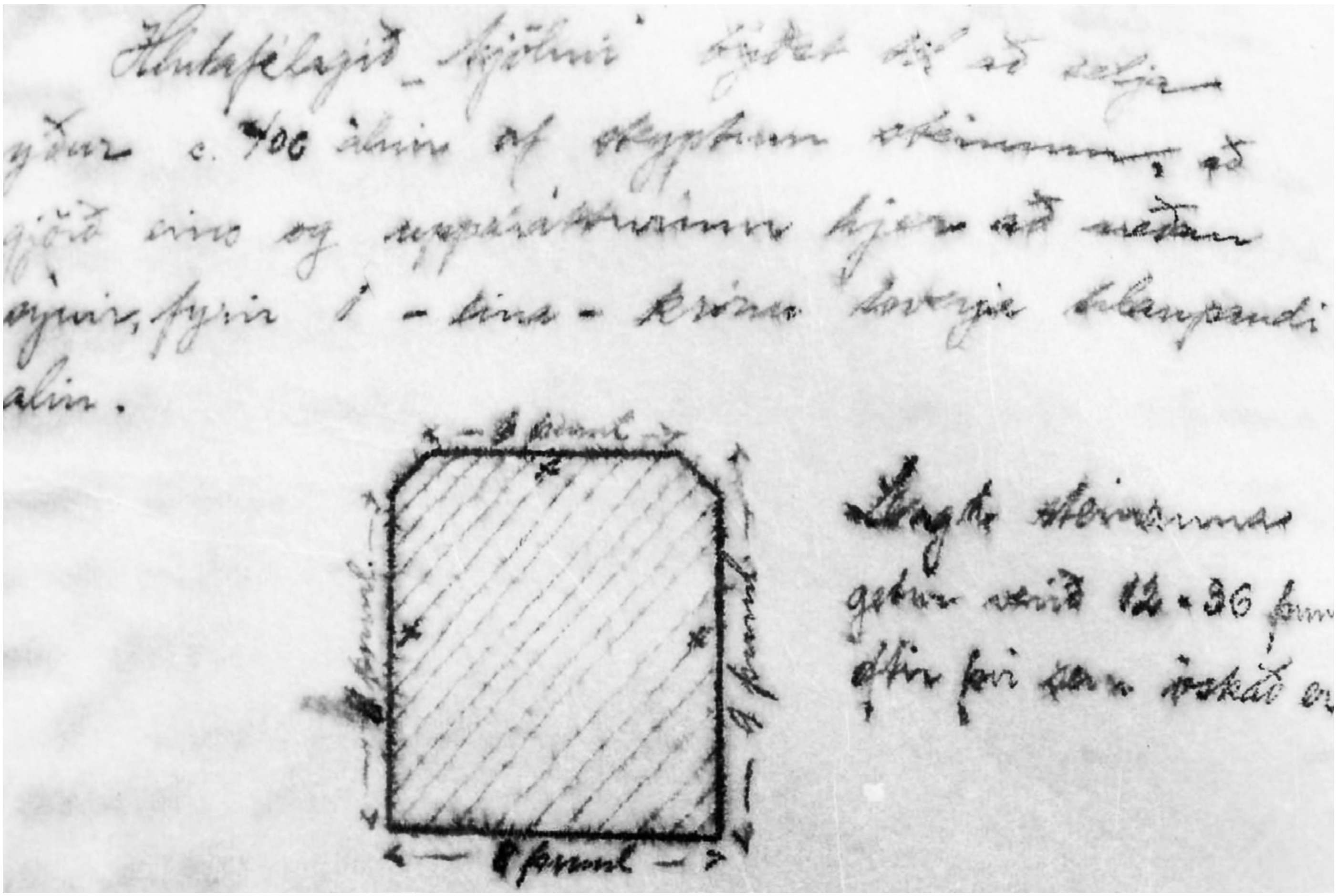
[87] BR, E25 KZ, Askja 1, *Bréfabók* 1903–1905, 440.

[88] “En salan á steininum gekk illa, menn höfðu ekki trú á þessu efni til húsagerðar. Var því einkum fundið það til foráttu, að húsin myndu slaga og verða köld.” Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 121.

[89] “Húsið Gimli var allt hlaðið úr Mjölnissteini”. Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 122.

[90] 1 inch – *þumlungur* – is equivalent to approximately 2,4 cm.

Fig. 9 – The factory *Mjölnir*. Þjóðskjalasafn Íslands.



Hlutafélagið „Mjölnir" býðst til að selja yður c. 400 álnir af steyptum steinum, að gjörð eins og uppdrátturinn hjer að neðan sýnir, fyrir 1 - eina - krónu hverja hlaupandi alin.

Lengd steinanna getur verið 12-36 þum eftir því sem óskað er

Fig. 10 – Drawing of a cast stone produced by *Mjölnir* in a letter by Knud Zimsen to Tryggvi Gunnarsson. BR, E25 KZ, Askja 1, Bréfabók 1903–1905, 60. 27 May 1904

Fig. 11a – Gimli, ca. 1915–25. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 11b – Gimli. Photo by Sofia Nannini, 2019.

outlook of a small urban castle. Probably influenced by *Gimli*, crenellation on top of buildings became common in the 1920s as part the local fashion named "concrete classicism" (see in chapter four).[91] Its roof was all in concrete and some authors even suggested that the engineer experimented with the first reinforced concrete slabs in the whole country.[92] In the kitchen and on the stairs, the engineer had the floors covered by a layer of *terrazzo*.[93] Regardless of the perfect location for such an advertisement and the promises for a bright and safe dwelling as the one described in Snorri's *Edda*, *Gimli* did not bring the hoped-for luck to *Mjölnir*. The house was soon ignored, and so was the hope for a heavenly concrete house on earth, or at least in Reykjavík. In fact, the company scraped along by making concrete fences for some years, and then closed down in 1910.

What Knud Zimsen considered to be the main cause of *Mjölnir*'s unsuccessful business was the rise of a similar company. Owned by a talented colleague, Jón Þorláksson's *Steinar* was also producing concrete cast stones (see further on in this chapter).[94] Yet, other reasons can also explain the decline of this business. First, timber was still the citizens' first choice, especially of those that could afford it – in 1907, for example, the rich merchant Thor Jensen chose timber to build his extravagant villa with carved Ionic columns and colorful decorations on the shores of the pond *Tjörnin*.[95] **Figg. 12a–12b.** Second, the people's initial skepticism about concrete was real, as its outcomes were usually cold and damp structures. The inhabitants of Reykjavík might have considered concrete stones as more vulnerable to earthquakes and weather damage. Most probably, the damages to the Danish bricks employed for the construction of the Cathedral in Reykajvík were still lingering in the people's minds (see note 55 in chapter one), as was the recent earthquake that destroyed many farms in Southern Iceland in 1896. Third, these solid and heavy stones must have been quite difficult to transport to the construction sites, especially considering Iceland's poor road network.[96]

---

[91] See, for example, the house "Galtafell" in Laufásvegur 46 (built by Einar Erlendsson in 1916) and the house in Skálholtsstígur 2 (built in 1927).

[92] Guðmundur Hannesson, *Húsagerð á Íslandi*, 252; Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 73.

[93] *Terrazzo* layers on stairs and floors became quite popular in Iceland between the 1920s and 1950s, echoing the popularity of the *steining* techinique for the outer walls (see chapter 4). On the origins of this "artificial marble", see: Roberto Gargiani, *Concrete from Archeology to Invention 1700–1769*, 30–31.

[94] Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 124.

[95] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts,* 91–92.

[96] It is no surprise if in 1908 the *Reykjavík* newspaper published an article translated from English, written by an Icelander emigrated to Winnipeg, on a true American novelty: Thomas Edison's concrete houses. As the writer claimed, a fully-cast concrete house had survived the great earthquake of San Francisco in 1906, thus proving to be safer than masonry or timber housing. All *Mjölnir* could do was grinding stones into gravel, and the remaining efforts had to be directed towards buying cement from abroad – or, even better, producing it directly in Iceland. A. J. Johnson, "Framtíðar húsagjörð. Er hún ekki framkvæmanleg á Íslandi?," *Reykjavík* 9, no. 27 (1908): 105–06.

Fig. 12a – Thor Jensen's villa in Fríkirkjuvegur, ca. 1912–18.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 12b – Thor Jensen's villa in Fríkirkjuvegur. Photo by Sofia Nannini, 2019.

Cement was at the core of the production of cast stones. In 1903 Knud Zimsen conducted research on the production of *Trass-sement*, which he named weak cement, from clay sources in a gravel bed south of Reykjavík, but the study did not produce results.[97] However, when it came to importing it, Knud Zimsen found himself in charge of a trade which proved to be quite successful for some years.

Buying and selling cement from *Aalborg Portland-Cement Fabrik*

Knud Zimsen's most lasting business and strongest legacy was not an infrastructural project, nor an industrial product. However, the engineer proved to be one of the most far-sighted tradesmen of the country when in January 1903 he established a commercial connection with the *Aalborg Portland-Cement Fabrik* in Denmark, opening an importation trade of cement to Iceland which resulted in almost a decade-long monopoly controlled by the engineer. In his memories, he wrote about a widespread "thirst for cement":

> Cement! – Cement! There is a deep and heavy sound in this word, a word that all people know and understand. They know that, in this expression, behind this very word stand all the greatest and most reliable structures of the world.[98]

The imported quantity of cement had been already growing since the last decades of the nineteenth century: between 1876 and 1903, it had shifted from 54 to 5051 barrels a year.[99] Between 1896 and 1898, the majority of cement was imported from Denmark; a smaller quantity from the UK, Norway, and Sweden, and from other unspecified countries.[100] Until 1903, cement was only sold by merchants in Reykjavík, who were importing very small quantities from the continent. Yet, as Knud Zimsen put it in his memories:

> Had I not come home to work for the improvement of the infrastructures in Iceland? And what could one do without cement? Had I not got to see how some inhabitants of Reykjavík tried to use all their available means in order to acquire some barrels or even only some buckets of this gray powder?[101]

---

[97] In Icelandic, *veikt sement*. Knud Zimsen apparently started this research together with a Danish colleague and a friend, Regnar Gad (1872–1939), who soon claimed that their task was "useless" and left Iceland. Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 85.

[98] "Sement! – Sement! Það er djúpstæður og þungur hljómur í þessu orði, sem allar menningarþjóðir þekkja og skilja. Þær vita, að í tjáningu þess, að á baksviði við það sjálft standa mestu og traustustu mannvirki heimsins." Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 128.

[99] The gross weight of one barrel was approximately 360pd [*pund*, meaning pounds]. Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 49.

[100] The data on imported goods [*aðfluttar vörur*] are collected in: Lbs, *Stjórnartíðindi fyrir Ísland: C-deild* (1882–1907).

[101] "Var ég ekki kominn heim til þess að starfa að umbótum í mannvirkjagerð á Íslandi? Og hvað var hægt að gera í þeim efnum án sements? Hafði ég ekki kynnzt því, hvernig sumir Reykvíkingar reyndu að hafa úti allar klær til þess að eignast nokkrar tunnur eða jafnvel aðeins nokkrar fötur af þessu grámyglulega dufti?" Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 128.

Understanding that the inhabitants of Reykjavík "wanted to buy cement, a lot of cement, if that had not been sold at an exorbitant price",[102] Knud Zimsen established a copious correspondence with the *Aalborg Cement Fabrik*, of which he became Iceland's only buyer and reseller, in order to guarantee a solid flow of good quality, affordable cement into the country.[103] As Knud Zimsen claimed, the cost of one barrel of cement in Iceland was around 13–16kr before 1903.[104] Strategically buying in bulk, the engineer's first order to Aalborg was of 500–1000 barrels of cement, acquired at 5kr. per barrel, and delivered by summer 1903.[105] Once in Iceland, the cement was sold only in certain stores chosen by the engineer: the main ones being Thor Jensen's shop *Godthaab* – his "biggest client"[106] – and the one owned by Knud Zimsen's brother, Jes Zimsen (1877–1938). **Figg. 13a–13d.** Buying from the other side of the Atlantic obviously had its difficulties and drawbacks: the deliveries sometimes went wrong, as the cement barrels were under the constant threat of damages during the shipping.[107] Yet, his bulk strategy paid off: the import of larger quantities, and the continuos shipping via specific cargo boats, led to a decrease in the overall cost of cement on the island and resulted in an increase of its use throughout the country. The engineer also stated that the cost of *Aalborg* cement was at times even lower in Iceland than in Denmark.[108]

Not only did Knud Zimsen resell the cement to some specific stores in Reykjavík, but he also put together a network of clients all around the country. He sold his product to clients in Hafnarfjörður, Westman Islands, Akureyri, Ísafjörður, Dýrafjörður, and other locations of Iceland, either at his selling price – around 8.20kr in 1903 –, or directly having the cement sent from Copenhagen to each harbor at around 5.35kr per barrel.[109] Knud Zimsen was particularly keen on the cement's

[102] Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 127.

[103] Founded in 1889, *Aalborg Portland-Cement Fabrik* was already one of the most active cement factories of Denmark, perhaps even of whole northern Europe. Behind the opening of the plant there was the Danish company *F. L. Smidth & Co*., founded by engineers Frederik Læssøe Smidth (1850–99), Poul Larsens (1859–1935), and Alexander Foss (1858–1925). The same company founded the Swedish *AB Skånska Cementgjuteriet* in Malmö (1887) and the Norwegian *Christiania Portland Cementfabrik* in Slemmestad, near Oslo (1888). By 1913, the city of Aalborg hosted five cement plants, which exploited Denmark's geological resources, naturally rich in limestone and clay. The plants were: *Aalborg Portland* (1889), *Danmark* (1899), *Norden* (1901), *Nørresundby* (1908), and *Dansk Andels Cementfabrik* (1913). See: Henning Bender, and Morten Pedersen, *Aalborg og cementen* (Aalborg: Aalborgbogen, 2006); Morten Pedersen, *Cementen* (Aarhus: Aarhus Universitetsforlag, 2019). On the early stages of the production of Danish cement, see: Alex Foss, "Nyere Metodere i Cementfabrikationen, særlig Aalborg Portland-Cementfabrik," *Den Tekniske Forenings Tidsskrift* 15 (1892): 178–82.

[104] Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 129.

[105] BR, E25 KZ, Askja 1, *Bréfabók* 1901–1903, 235. 21 January 1903.

[106] "Forretningen *Godthaab*; h. Th. Jensen, der en min störste Kunde her [...]". BR, E25 KZ, Askja 1, *Bréfabók* 1903–1905, 206. 17 March 1905.

[107] BR, E25 KZ, Askja 1, *Bréfabók* 1901–1903, 253. 20 March 1903; BR, E25 KZ, Askja 1, *Bréfabók* 1903–1905, 225–26. 26 March 1905.

[108] Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 129.

[109] BR, E25 KZ, Askja 1, *Bréfabók* 1903–1905, 18–19. 23 February 1904; 20. 4 March 1904; 49. 29 April 1904; 459. 16 February 1907. In order to plan the shipments to several parts of Iceland, Knud Zimsen hired an agent to keep the due correspondence with the plant. BR, E25 KZ, Askja 1, *Bréfabók* 1903–1905, 222. 26 March 1905.

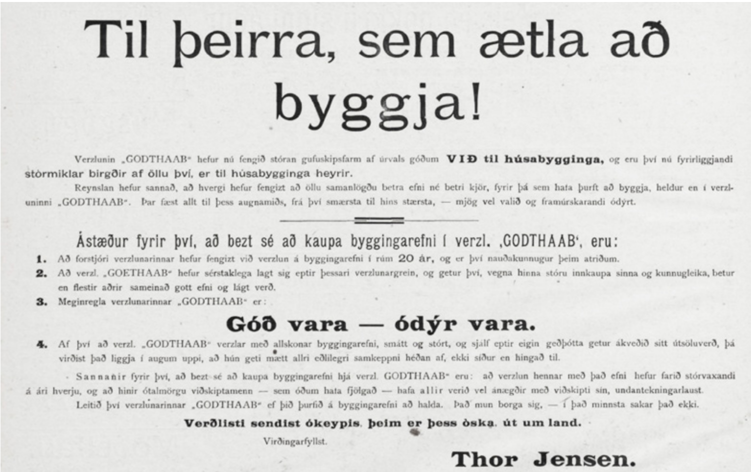


Fig. 13a – Thor Jensen's advertisement for building materials, 1904. *Þjóðólfur* 56, no. 15 (8 April 1904): 60.

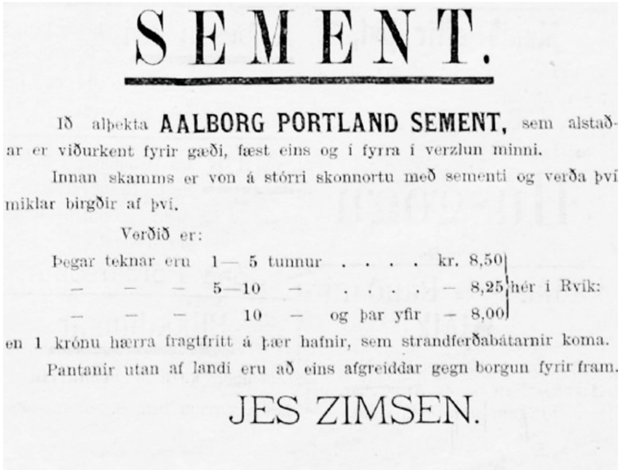
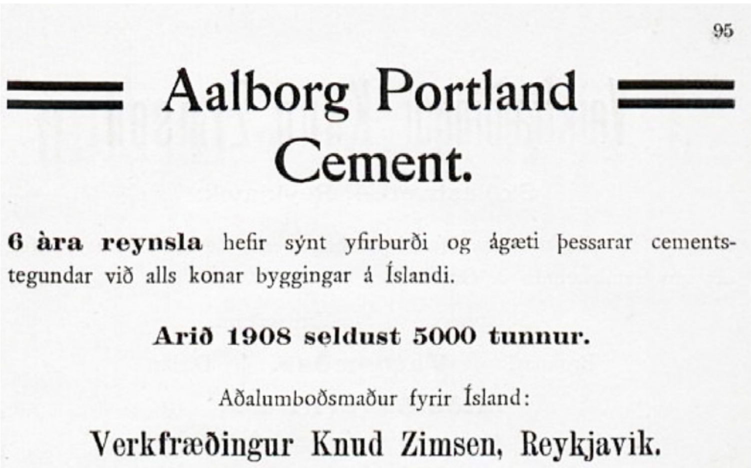
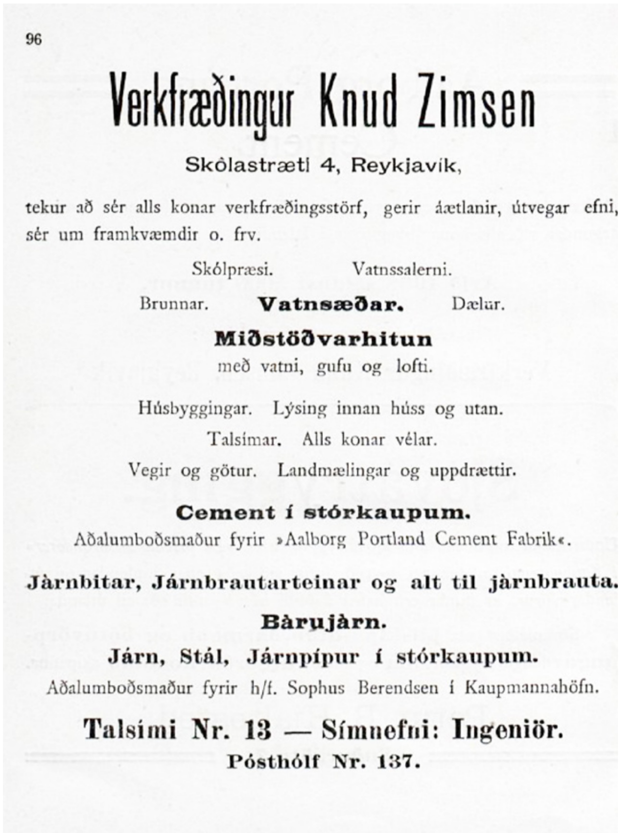


Fig. 13b – Jes Zimsen's advertisement for *Aalborg Portland Cement*, 1904. *Reykjavík* 5, no. 16 (14 April 1904): 63.





Figg. 13c–13d – Knud Zimsen's advertisement for *Aalborg Portland Cement* and for his engineering office, 1909. *Bæjarskrá Reykjavíkur* (1909): 95–96.

quality. Already in the summer of 1903, he asked to the *Aalborg Portland* plant whether they could provide him with the results of stress tests on their cement.[110] In his instructions he also made specific references to the kind of cement to buy: he would mention the "L" cement several times, meaning that he only ordered the variety marked with the *Aalborg Portland* logo, a lion holding a Danish shield. **Fig. 14.** Knud Zimsen soon became the factory's insider in Icelandic cement commerce, providing information on the quality, the acceptance of the product, and its competitors: already in June 1903, he was reporting that *Aalborg Portland*'s cement had been very much welcomed by the inhabitants of Reykjavík.[111] Knud Zimsen's letters do not only refer to his buying and selling, but also to the amount of cement deriving from *Aalborg Portland*'s competitors, and their economic strategies on the island.

Aalborg Portland's first competitors were its neighboring factories, *Norden* and *Danmark*. Exactly when the engineer was securing his monopoly of *Aalborg Portland* in Iceland, the Danish plant was fighting a price war against the factories located in the same town.[112] In November 1904 Knud Zimsen informed *Aalborg Portland* of the possibility that *Norden* would open a trading connection to Iceland, and cleverly used this information in order to lower the price from his partner's side. All the engineer fought for was lower prices to buy the material of modernity and allow the Icelandic building industry to grow. Within an economic battle that greatly outsized the small boundaries of Iceland, Knud Zimsen seemed to be quite sure of his trading skills, and confindently stated to the Danish firm:

> During the last two years I have dealt with cement, I have conquered, so to speak, the whole market here with many connections, personal influence, a good product and cheap prices, and I would have all the advantages by my side in a potential price war, if I stood with a cheaper offer in my hands.[113]

The war between the two plants soon ended. The majority of *Norden*'s shares was acquired by *Aalborg Portland* in 1904; at the same time, Knud Zimsen claimed that *Norden*'s cement was never really appreciated in Iceland, as it was not compatible with the Icelandic climate and it hardened too slowly.[114] Some competitors to Knud Zimsen's Danish cement came also from other geographies. In June 1909, he referred to *Aalborg Portland* about the quantity of cement imported in Iceland in the previous years. In 1906, Iceland imported 16,605 barrels of cement from Denmark, and 408

---

[110] BR, E25 KZ, Askja 1, *Bréfabók* 1901–1903, 369–70. 24 July 1903.

[111] BR, E25 KZ, Askja 1, *Bréfabók* 1901–1903, 333–34. 15 June 1903.

[112] F. L. Smidth-Koncernen, *Cementbranchens konkurrenceforhold* (Copenhagen: S. L. Møllers Bogtrykkeri, 1959), 14.

[113] "I Löbet af de 2 Aar, jeg har forhandlet Cement, har jeg erobret saa at sige hele Markedet her ved gerde Forbindelser, personlig Indflydelsen, god Vare og billige Priser og jer har um alle Fordelene paa min Side i en eventuel Priskamp, naar jeg staar med et billigt Tilbud i Hænder". BR, E25 KZ, Askja 1, *Bréfabók* 1903–1905, 126–29. 10 November 1904.

[114] Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 130. See also: BR, E25 KZ, Askja 1, *Bréfabók* 1903–1905, 252. 29 April 1905.

Aalborg:

Aalborg Portland Cementfabrik. Akts. ☎ 73 og 199, Stats ☎ 10

Aalborg Portland-Cement Fabrik,
største Cementfabrik i Skandinavien,
aarlig Produktion ca. 600,000 Tdr.,
saavel langsombindende som hurtigbindende Cement. Fabrikkens specielle Mærke **„L“** *er særlig egnet til Fabrikation af Rør og lign. og finder derfor ogsaa i stedse stigende Grad Anvendelse i Cementvarefabrikationen.*
Enestaaende Eksportbetingelser og derfor ogsaa betydelig Eksport saavel til europæiske som til oversøiske Lande.
Forhandler i Kjøbenhavn: A. Rindom. Kristiansborgg. 2 ☎ *3786.*
Forhandlere i saa godt som alle Byer og Handelspladser i Danmark.

Bendtzen Brødrene ☎ 15, 30 og Stats ☎ 13
Eneforhdl. f. „Norden“ f. d. nordl. Jylland.

Fig. 14 – Advertisement of *Aalborg Portland Cement*.
Krak Kjøbenhavn Vejviser. Danmarks Handelsspejl (1907): 1232.

from other countries; in 1907, respectively 15,190 and 3,976 barrels had been imported from Denmark and abroad. Since 1903, the quantity of cement in Iceland had increased at least three times. Among the "other countries" from which cement was bought, Knud Zimsen mentioned England and Belgium, sold by the Scottish firm Copland & Berrie.[115] Apparently, the popularity of the *Aalborg Portland* cement was being jeopardized by other companies wanting to sell their own products. In July 1909, Knud Zimsen reported that a shipment of Belgian cement had arrived, yet it was labelled under the popular name of "Lövecement".[116] In a strong business connection with his Danish partner, he even proposed to *Aalborg Portland* that he might buy a small amount of that Belgian cement and send it to them, for the Danish plant to test it.[117]

The engineer's letters and memories rarely referred to the buildings that his cement importation enabled. In connection with the widespread availability of cement that his trade made possible, the use of this material increased astonishingly, and the engineer's commerce did have a massive influence on the development of modern Iceland. When Knud Zimsen's monopoly came to an end – in 1914 he became mayor of Reykjavík and handed over his licence to other traders –, cement had indeed turned into the:

> [...] magic cure, that had changed many theories of civil engineering. With it in one's hands, it was possible to make such things, which the wisest engineers had never let themselves dream of, before this important powder appeared on the scenes.[118]

After ten years of restless trades and countless letters, by 1913 Knud Zimsen had transformed cement from an exclusive commodity to a daily one, ready to be employed in all aspects of the Icelandic building industry, and to give Iceland a key chance towards the creation of a local architectural language.

2.1.3 Jón Þorláksson's scientific concrete

The third protagonist of the Icelandic construction *saga* was engineer Jón Þorláksson, son of farmers from Vesturhópshólar in northern Iceland. Following a trajectory similar to that of Knud Zimsen's, Jón Þorláksson was trained as an engineer and worked as such for a couple of decades, before undertaking a career in politics. He was elected in the *Alþingi* in 1921, and by 1926 was nominated Prime Minister. In

---

[115] BR, E25 KZ, Askja 2, *Bréfabók* 1909–1913, 157. 26 June 1909.

[116] BR, E25 KZ, Askja 2, *Bréfabók* 1909–1913, 188–91. 13 July 1909. *Löve* in Danish means "lion", as was the logo of the *Aalborg Portland* brand.

[117] BR, E25 KZ, Askja 2, *Bréfabók* 1909–1913, 266–70. 20 August 1909.

[118] "Sementið var töfralyf, sem hafði gerbreytt ýmsum kennisetningum mannvirkjafræðinnar. Með það í höndum var hægt að gera þá hluti, sem vísustu verkfræðingar höfðu ekki látið sig dreyma um að nokkurn tíma yrði framkvæmdir, áður en þetta mikilvæga duft kom til sögunnar". Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 128.

1929 he became the first secretary of the Independence Party, and from 1932 until his death he was mayor of Reykjavík.[119] Jón Þorláksson's key activities as a politician of the Independence Party can be retraced through a rather laudatory biography written by Icelandic political science professor Hannes Hólmsteinn Gissurarsson.[120] Despite the prominent role played by Jón Þorláksson in politics, this paragraph will focus on his first years as practicing engineer and on his influence in the modernization of Icelandic building traditions. Some of his early contributions can be found in many of his published articles and also in a few letters collected at the National Archives and at the National Library of Iceland. **Fig. 15.** Like his colleague Knud Zimsen, Jón Þorláksson graduated from the Junior College in Reykjavík, and in 1897 he moved to Copenhagen to study engineering at the Polytechnic School of Denmark. He was able to live and study in Denmark thanks to a scholarship named *Garðstyrkur*, which enabled Icelandic students to reside in Copenhagen and enroll to higher education courses. **Fig. 16.** After the graduation in 1903, Jón Þorláksson could have stayed in Denmark or even moved to the United States to start his own profession, thus escaping the harsh working conditions of the engineers in his country. As writes Hannes Hólmsteinn Gissurarsson in his biography, Jón Þorláksson seemed to have other goals in mind:

> He redirected back to Iceland, with its white waterfalls and boiling springs, without ports and roads, where poor people were waiting with impatience for technology to rescue the country from a thousand years of slavery and troubles caused by old and unwelcome guests, cold, humidity, and darkness.[121]

The traveling engineer

Back in Iceland, Jón Þorláksson became the heir of Sigurður Pétursson's research on the production and use of building materials on the island. As soon as 1903, the *Alþingi* entrusted the newly graduated engineer with the research, offering him a yearly grant. The project was coordinated by Jón Þorláksson together with the Agricultural Society of Iceland. The grant had an official start in October 1903, and by the end of the month Jón Þorláksson travelled to Scotland, residing there for a month. Then, he visited some unspecified locations in Denmark, Sweden, and Norway.[122] Between January and March 1904, the engineer lived in Copenhagen and Berlin, and researched clay and brick production. Although it is not possible to detect precisely which plants he visited, in all likelihood Jón Þorláksson might have stopped

[119] *Sjálfstæðisflokkurinn*. The party was founded in 1929.

[120] Hannes Hólmsteinn Gissurarson, *Jón Þorláksson. Forsætisráðherra* (Kópavogur: Almenna Bókafélagið, 1992).

[121] "Han tók stefnuna heim til Íslands með hvítfyssandi fossa sína og vellandi hveri, hafnleysur og vegleysur, þar sem fátækt fólk beið þess með óþreyju, að tæknin leysti það úr þusund ára þrældómi og bægði burt gömlum vágestum, kulda, raka og myrkri." Hannes Hólmsteinn Gissurarson, *Jón Þorláksson*, 77.

[122] "Framhaldsreikningar yfir kostnað við rannsókn á byggingarefnum landsins og leiðbeining í húsagerð árið 1903" [Expenses regarding the research on building materials and guidelines for construction, year 1903] , 11 May 1904. ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/1, Örk. 4 (1906).

Fig. 15 –Jón Þorláksson at a young age, Copenhagen, ca. 1900. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 16 – The Polytechnic School in Copenhagen, ca. 1904–06. Danmarks Tekniske Højskoles Billedsamling/DTU Photographic Archives.

by Denmark's largest brickworks (*Cathrinesminde Teglværk* near Flensburg), and by several brick factories active in the Brandenburg area. Not far from there, the city of Szczecin, then Stettin, hosted Germany's first cement plant, built in 1855. In May the engineer returned to Iceland, engaging in a five-month relentless voyage around the island.[123] From Seyðisfjörður, to Akureyri, from Sauðárkrókur to Akranes, Jón Þorláksson visited villages and farmsteads, and continued traveling in the following years as well. The population was encouraged to send him letters in order to ask questions and receive specific answers.[124] Thanks to a continuous dissemination of work with the people he met and in the journal of the Agricultural Society, his voyage left an important mark on the Icelandic society and its building traditions.

A new building method: Concrete walls and concrete cast stones

Differently than Knud Zimsen, who was apparently more interested in the personal relations growing from his daily correspondence, Jón Þorláksson engaged in a communication task anchored in the journal of the Agricultural Society. The engineer published two long and detailed articles between 1903 and 1904, the first dealing with the technique behind concrete construction, and the second regarding what he considered Iceland's greatest enemies: the cold and the humidity.[125] The first essay, titled "A New Building Method", resulted in a down-to-earth explanation of what concrete is, how to use it best, and how to prevent cold and damp dwellings. Knowing that his audience was chiefly composed of farmers and untrained builders, the engineer started from the very beginning, delineating the composition of concrete and its outcomes. He described the inner structure of cement, and consequently of concrete; he gave suggestions on which sand and aggregates to use, and highlighted the perils of salt within the structures – foreseeing that many could have employed seawater to make concrete. With easy words and an almost patronizing prose, his aim was to make this "new building method" accessible to anyone, helping each Icelander become independent when it came to build a house.[126] Because Iceland was still lacking national regulations on concrete, Jón Þorláksson made reference to the mixing ratios adopted in Germany, probably referring to what he learned while traveling the same year. The engineer highlighted two characteristics of concrete to be aware of: its density and its ability to conduct heat. If more density was due to a higher percentage of cement, and led to waterproof walls, it also meant higher costs and structures that

[123] "Reikningur fyrir ferðakostnaði, rannsóknum og áhaldakaupum við rannsókn á byggingarefnum landsins og leiðbeining í húsagerð, árið 1904" [Expenses for travels, research and purchases regarding the research on building materials and guidelines for construction]. 18 January 1905. ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/1, Örk. 4 (1906).

[124] "Jon Þorláksson," *Norðurland* 2, no. 48 (1903): 191.

[125] Jón Þorláksson, "Nýtt byggingarlag. Steyptir steinar, tvöfaldir veggir," *Búnaðarrít* 17, no. 1 (1903): 277–302; Jón Þorláksson, "Kuldinn og rakinn," *Búnaðarrít* 18, no. 1 (1904): 99–131.

[126] Jón Þorláksson's task mirrors the words of Adrian Forty: "Concrete offered a chance to bypass the traditional trades altogether, and to break their monopoly over construction, by making it possible to build without any need for them at all". Forty, *Concrete and Culture*, 226. Also, the engineer's articles might be considered as a scientific addition to the late nineteenth-century texts which had first presented cement and concrete to the Icelandic audience, as seen in chapter one.

were more prone to conduct heat outside the house. On the contrary, a weaker concrete was cheaper and less prone to heat loss, but dangerously apt to absorb water.[127]

The engineer described the two methods to build a house in concrete: casting its walls in full, or building the same walls with cast stones. As for the first approach, he suggested the use of two timber or iron formworks, around 1 ½ ell in height (ca. 90cm) connected by iron binders. Interestingly, he also suggested placing iron bars within the walls if one wanted to continue casting the inner walls in the following days – thus making this one of the first Icelandic references to reinforced concrete. However, the engineer claimed that casting the walls in full had several drawbacks in the Icelandic context: it took too much time to prepare the formworks, it was too expensive, and it was limited to the very short timeframe of late springtime and summer – when concrete was able to dry properly. He also added that all these disadvantages were particularly severe when the workers were unskilled, as it was especially the case in the countryside.[128] Furthermore, a fully cast wall would need to be extremely thick in order to preserve enough heat inside the rooms and prevent the dampness from forming on the inner surfaces, but again this resulted in higher prices. The engineer's suggestion for building concrete walls that were able to resist the cold and the humidity was the construction of double walls, enclosing an empty layer inside where the air could act as a shield against colder temperatures. This was the opening to a building technique that was already on the minds and proposed by his colleague Knud Zimsen: concrete cast stones.

Jón Þorláksson's proposed use of cast stones was that of building double walls with two rows of 4 ½ inch-thick cast stones and an equivalent 4 ½-inch thick empty layer inside. In order to have the two walls collaborate in carrying the weight, and also to make the house stronger against earthquakes, the engineer recommended the use of cross stones connecting the two edges of the wall. Double walls could also be a heritage of traditional turf buildings, whose vertical structures were usually composed by a double layer of turf blocks enclosing a rubble core. Jón Þorláksson also mentioned the production method of these stones: cast in timber frames, covered with an iron layer inside and on its corners. The stones were to be left still for approximately ten days, before they were ready. In case of window sills and architraves, they could also be reinforced with iron bars. When building the walls, a layer of cement mortar had to be set between each stone.

What were the advantages of concrete cast stones in Iceland? Why invest a whole essay on this method? Why teach it to the general public? The engineer offered a few reasons. First, they would make walls able to stand "for eternity", and to withstand the common Icelandic earthquakes. Second, they would be much cheaper than concrete

[127] Jón Þorláksson, "Nýtt byggingarlag. Steyptir steinar, tvöfaldir veggir," 287.
[128] Jón Þorláksson, "Nýtt byggingarlag. Steyptir steinar, tvöfaldir veggir," 290.

cast walls or cut-stone. Sand and gravel could have been gathered during the winter, and even the stones could have been made during wintertime, maybe in a cattleshed or a stable. Regarding the shipping of cement, the engineer recommended that cement would be bought in small amounts, year by year, in order to avoid the damages caused by humidity and water while stored. Third, and quite surprisingly, Jón Þorláksson also highlighted the "nicer look" of cast stone walls, if compared to fully cast structures – he suggested the use of different kinds of sand in the stones, producing differently-colored elements to place around windows, doors or corners. Although only a hint, this will be the start of a decade-long search for a decoration of the concrete surface that culminated in Guðjón Samúelsson's patent for *steining* (see fourth chapter), binding together the material need for adequate housing and the aesthetic demands for better looking architecture.[129] **Fig. 17.**

Linking building methods and industrial production, the suggested use of concrete cast stones matched the opening of Jón Þorláksson's firm *Steinar*, which produced concrete cast stones for housing and pipes as a competitor of Knud Zimsen's *Mjölnir*. *Steinar* was much more successful than *Mjölnir*, and by 1908 it had already been used in the outer walls of the bank *Íslandsbanki* and of the National Library (see further in this chapter). As reported by the *Þjóðólfur* newspaper, Jón Þorláksson had acquired the patent to produce such cast stones by the Danish Peter Jørgensen (1852–1933) from the Schleswig-Holstein region, who had been filing patents since the late nineteenth century on the production of concrete stones, especially for roofs.[130] In 1907 Jón Þorláksson also founded the company *Pípuverksmiðjan*, producing sewers made of cement and sand, to replace the usual clay sewers bought from Denmark.[131]

The Icelandic war: The battle against cold and the humidity

Jón Þorláksson's second essay in the journal *Búnaðarrít* was titled "On Cold and Humidity". Besides being a general scientific explanation of what is physically defined as "cold" and what are the phenomena related to dampness, the article stood as a call for action addressed to the readers and to the whole of Icelandic society. Since the time of the settlement, Iceland had always been far away from wars or European conflicts. According to the author, however, a constant battle had been fought silently since the first ship landed on the Icelandic shores – the daily war against the natural elements. In this "battle against nature", "the delivery boys" of Iceland's "harsh nature" were the cold and the dampness, like actors following the plot of a play, or subjects of a terrible king. **Fig. 18.** In order to fight these unwelcome guests, the engineer stressed the importance of studying the laws of nature, meaning the laws of science and of scientific research: only by knowing how a physical

[129] Jón Þorláksson, "Nýtt byggingarlag. Steyptir steinar, tvöfaldir veggir," 301.

[130] "Nýt hlutafélag," *Þjóðólfur* 57, no. 6 (3 February 1905): 21. On Peter Jørgensen, see: Eberhard Schunck, Hans Jochen Oster, Rainer Barthel, and Kurt Kießl, *Dach Atlas* (München: Institut für internationale Architektur-Dokumentation, 2002), 13.

[131] Hannes Hólmsteinn Gissurarson, *Jón Þorláksson. Forsætisráðherra*, 151–52.

Fig. 17 – Farmhouse made with concrete cast stones, possibly produced by *Steinar*, ca. 1905–15. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 18 – Snow-covered turf houses on Reykjavík's bay, ca. 1907–14. Þjóðminjasafn Íslands/National Museum of Iceland.

phenomenon occurs and behaves one could hope to mitigate it. Research, science, nature: in a country without scientists nor engineers, these were almost mysterious words. Yet, with stubborness and dedication, Jón Þorláksson kept on widen this knowledge beyond the pages of the journal, meeting people, designing houses, and even trying to change the education of the country towards a deeper knowledge of mathematics, physics, and material technology.

Advice to the people

In August 1906, Jón Þorláksson visited the county of Þingeyjarsýsla and the rural area of Mývatnssveit, where he met Jakob Hálfdanarson, who had already taken part in Sigurður Pétursson's survey on building techniques.[132] They spoke about concrete, and the engineer gave Jakob Hálfdanarson what was believed to be the correct recipe for building both concrete walls and roads. The composition provided by the engineer was of 1 : 5 : 10 (cement : sand : gravel), shifting to 1 : 3 : 5 in case of underwater constructions. This ratio had been already suggested by Knud Zimsen in the building code for Reykjavík, as shown further in this chapter. Because cement was still quite an exclusive resource, at the beginning of the century the most popular mixing ratios were still poor and characterized by an extensive use of sand and gravel.[133] **Fig. 19.**

The visit of this traveling engineer might have been welcomed like that of a prophet, bearer of knowledge and hopes for a better living.[134] He met, however, obstacles similar to those faced by his colleague Knud Zimsen. Jón Þorláksson strived for the general acceptance of his profession within the country, especially regarding his role in the process of the publicly financed renovation of farmhouses. Despite the large scale of the issue, the presence of engineers was still quite uncommon in the countryside. Among several requests for housing grants, only two showed the active presence of Jón Þorláksson, still scarcely recognized as leader of the national research on building materials and advice on construction. In 1904 he was asked to give his opinion on a carpenter's project for a new house to be built at the farmstead of Valdastaðir í Kjós.[135] What emerges from the documents attached to the request is Jón Þorláksson's life mission of teaching the Icelanders how to build. The importance of his task is especially highlighted by a letter written in 1904 and sent to the Ministry of Iceland.[136] Possibly because of the young age of the Icelandic engineering profession, people still did not refer regularly to the engineers when it came to the refurbishment

[132] Meeting the engineer must have felt a very important occasion. Jakob Hálfdanarson wrote a note about their encounter, praising the opportunity to have spoken with a building expert and opening note with an underlined "To remember" [*Til minnis*]. Lbs 4 NF. Askja 18. Örk 6.

[133] Erwin Marx's *Wände und Wandöffnungen* suggested slightly stronger ratios up to 1 : 6 : 6 (cement : sand : gravel). For more examples, see: Erwin Marx, *Wände und Wandöffnungen*, 115–16. The book was available in the National Library.

[134] An article published in 1906 in Akureyri mentioned Jón Þorláksson's research and stated that people had "faith" in his task and knowledge. "Mesti húsbruni á Íslandi 1906," *Norðurland* 6, no. 8 (20 October 1906): 27.

[135] ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/6, Örk 2 (1904). See letter of 22 July 1904.

[136] ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/6, Örk 2 (1904). See letter of 22 July 1904.

of houses, and engineers were well aware of the general lack of building experts in the countryside. As Jón Þorláksson suggested, his task was to give instructions to the inhabitants, and these instructions should be given before the farmers applied for a national subsidy. Jón Þorláksson's plea to the Ministry of Iceland for better involvement of the engineers did not only underline a struggle for the recognition of their profession and their building expertise, but also the difficulty to spread information outside the boundaries of the trading centers.

Jón Þorláksson also complained about the poor educational offer regarding the natural sciences. He referred to this specific issue in a letter sent to the philosophy graduate Guðmundur Finnbogason in 1904, concerning the educational changes of the Junior College of Iceland. Due to the lack of adequate courses of mathematics and physics, an Icelandic student who wanted to pursue a degree at the Polytechnic School of Copenhagen was forced to take some extra courses and exams. Therefore, the educational path towards an engineering graduation was harder and consequently longer, adding an extra year to the regular four and a half years. On top of that, Jón Þorláksson also mentioned the need to learn French before entering the Polytechnic School. The improvement of the high school's educational curricula would benefit the Icelandic students enrolling in technical faculties, and also the whole Icelandic society. By so doing, young engineering graduates could have had more time for practice and experience abroad, before sailing back to Iceland and engaging in what Jón Þorláksson defined a "complicated job".[137] **Fig. 20.**

How to build a house in the countryside

In 1905 Jón Þorláksson forwarded to Ministry of Iceland a project for the construction of a small stone house in Leirvogstunga, in the Mosfellsbær area.[138] The documents mention some drawings which were presumably lost. However, despite the lack of drawings, the project was described step by step by the engineer, and it represents an unique example of how a house could have been built at the turn of the century, and with the advice of a trained expert.[139] The presence of this written description together with the drawings should not be a surprise: the lack of trained builders had to be overcome by a verbal explanation of each step required by the building site. The structure had to be built with concrete cast stones, and following more or less the same suggestions as Jón Þorláksson had published on his *Búnaðarrít* article one year before. It is clear that the final outcome of this proposal would have been a well built house, but also a very expensive one. The engineer also attached the costs for the material and the construction: the total cost would have been of 1830kr, where at least 810kr were related to stone works. Among the latter, more than 200kr

---

[137] Lbs, *Guðmundur Finnbogason Skjalasafn*. BA, Askja 18.
[138] ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/7, Örk 2 (1908).
[139] Jón Þorláksson, "Lýsing á steinhúsi á hálflendu þjóðjarðarinnar Leirvogstungu" [Description of the stone house on public half-farmed land at Leirvogstunga]. 3 February 1905. ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/7, Örk 2 (1908).

Fig. 19 – Turf house in the region of Mývatnssveit, ca. 1905.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 20 – *Menntaskólinn* or Junior College in Reykjavík, 1905.
Þjóðminjasafn Íslands/National Museum of Iceland.

had to be spent on 27 barrels of cement, making it the single most expensive material on the whole building site.[140] In the same years in which Knud Zimsen was popularizing the cost of cement thanks to his massive import trade from Denmark, Jón Þorláksson began to widen his range of influence regarding building issues. If at first he timidly suggested that the Ministry of Iceland have engineers consulted before sending a request for the renovation of a house, he was also the first true promoter of a comprehensive scientific education regarding construction matters.

Teaching material technology in Iceland (1904–09)

Jón Þorláksson´s teaching mission was not limited to newspapers or personal relations. The engineer worked systematically towards an improvement of the technical skills of his fellow citizens, with a special attention to younger generations. In October 1904, as member of Reykjavík's Craftmen Society, Jón Þorláksson prompted the foundation of the first Technical School of Iceland, located in Reykjavík.[141] The school was supported by a 4000kr yearly grant from the Parliament.[142] With the engineer as its director, the school offered evening courses of drawing, calculation, Icelandic and Danish languages, but also day classes on construction techniques, maths, physics, technical drawing and English.[143] **Fig. 21.**

The aim of the school was to offer courses for to those who wanted to become skilled professionals on construction issues, such as carpenters and stonemasons. It also served to render the students competent in the languages they would need to know in order to benefit from the pool of building information available abroad, specifically in Denmark. With this educational offer, Jón Þorláksson wanted to fill the gap of the missing "building experts" highlighted by Sigurður Pétursson in his survey. Already during its first winter, the school had fifty students – mainly carpenters.[144] By 1906, the classes were transferred to its newly built headquarters on the banks of *Tjörnin*. In 1908 the students had increased to sixty, and their number grew bigger and bigger each year. **Fig. 22.**

It is hard to image the endless difficulties of starting a school programme focusing on technical matters from scratch in early twentieth-century Iceland. Gathering books in order to build an extensive library, buying the suitable tools for the students to draw, and creating a group of all-Icelandic teachers educated on the

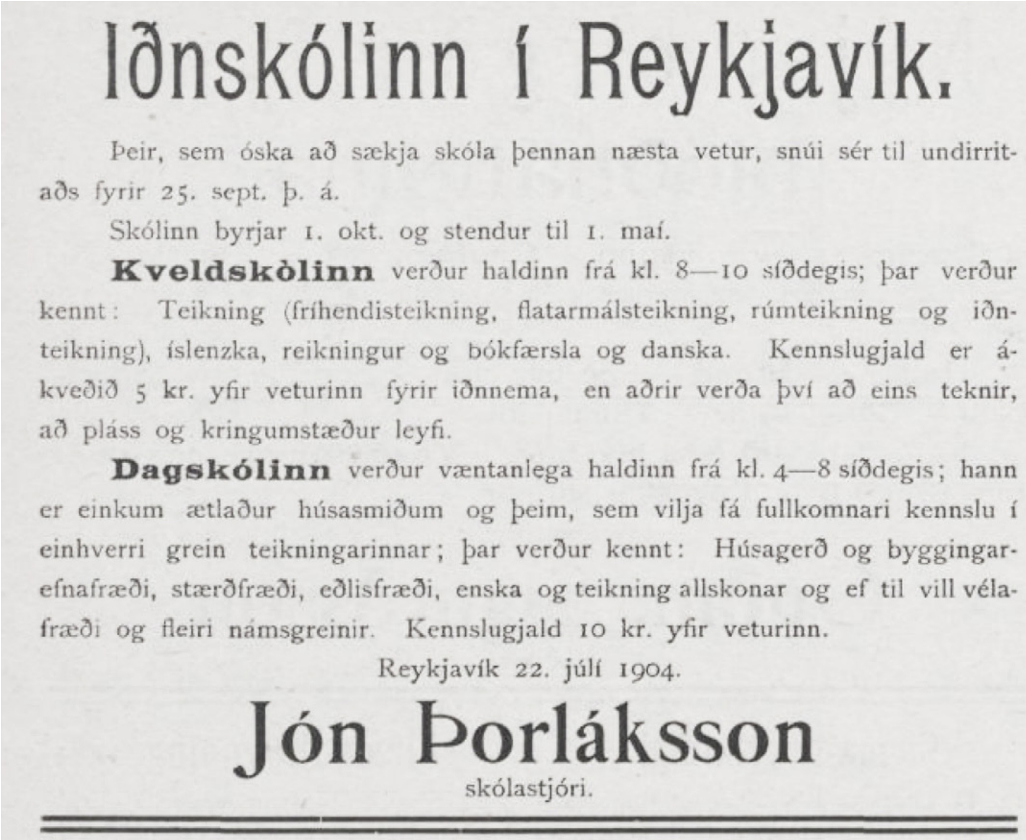
[140] Jón Þorláksson, "Áætlun um kostnað við að byggja 10x10al. steinhús á þjóðjörðinni Leirvogstungu" [Plan of the cost for the construction of a 10x10ell stone house on the public land at Leirvogstunga]. ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/7, Örk 2 (1908).

[141] *Iðnaðarmannafélagið*. The society had been active since 1867, and by 1904 his president was Knud Zimsen. On the history of the society, see: Gísli Jónsson, *Saga Iðnaðarmannafélagsins í Reykjavík* (Reykjavík: Iðnaðarmannafélagið í Reykjavík, 1967).

[142] "Iðnskóli Reykjavíkur," *Bæjarskrá Reykjavíkur* (1905): 140.

[143] Jón Þorláksson, "Iðnskólinn í Reykjavík," *Þjóðólfur* 56, no. 33 (1904): 132. On the history of the Technical School, see: Jón Ólafur Ísberg, ed., *Iðnskóli í eina öld: Iðnskólinn in Reykjavík 1904–2004* (Reykjavík: Hólar, 2004).

[144] "Iðnskólinn," *Reykjavík* 6, no. 15 (1905): 59.



Iðnskólinn í Reykjavík.

Þeir, sem óska að sækja skóla þennan næsta vetur, snúi sér til undirritaðs fyrir 25. sept. þ. á.

Skólinn byrjar 1. okt. og stendur til 1. maí.

Kveldskólinn verður haldinn frá kl. 8—10 síðdegis; þar verður kennt: Teikning (fríhendisteikning, flatarmálsteikning, rúmteikning og iðnteikning), íslenzka, reikningur og bókfærsla og danska. Kennslugjald er ákveðið 5 kr. yfir veturinn fyrir iðnnema, en aðrir verða því að eins teknir, að pláss og kringumstæður leyfi.

Dagskólinn verður væntanlega haldinn frá kl. 4—8 síðdegis; hann er einkum ætlaður húsasmiðum og þeim, sem vilja fá fullkomnari kennslu í einhverri grein teikningarinnar; þar verður kennt: Húsagerð og byggingarefnafræði, stærðfræði, eðlisfræði, enska og teikning allskonar og ef til vill vélafræði og fleiri námsgreinir. Kennslugjald 10 kr. yfir veturinn.

Reykjavík 22. júlí 1904.

Jón Þorláksson

skólastjóri.

Fig. 21 – Advertisement of *Iðnskólinn* [The Technical School]. *Þjóðólfur* 56, no. 33 (29 July 1904):132.

Fig. 22 – *Iðnskólinn*, 1906. Þjóðminjasafn Íslands/National Museum of Iceland.

subjects – this must have been only a small fraction of the concerns. One of the most challenging tasks was to expose the Icelandic pupils to topics which had never been taught in Iceland before, inventing a new vocabulary and adapting these topics to the Icelandic environment and language. Beyond drawing and maths, within the wider context of construction, one of these subjects was material technology. To help his students while teaching construction matters, in 1909 Jón Þorláksson published a short handbook titled *Burðarþolfræði: Ágrip*, which could be translated as *Material Technology: An Outline*, where *burðarþol* means "weight resistance", and the suffix -*fræði* means "studies". The term is also comparable to the German word *Tragwerkslehre*.[145] **Fig. 23.**

Instead of using already available texts, the engineer and school director decided to print his own handbook. Which handbooks were available in Reykjavík in those years? Why would Jón Þorláksson's text have been different from them? Between 1887 and 1908, only a few books concerning architecture and construction matters had been acquired by the National Library. Some of these texts regarded the history of architecture and architectural styles, such as Franz Kugler's *Geschichte der Baukunst* (1856–59) or Eduard Sacken's *Katechismus der Baustile* (1894).[146] Two sets of publications were the most technical among the collection: the already mentioned *Haandbog i husbygningskunst* (1891) by Norwegian engineer Edvard Kolderup, which included a detailed overview of several building techniques and some practical advice, and some volumes of the well-known German series *Handbuch der Architektur*.[147] Jón Þorláksson's scientific knowledge was not only limited within the boundaries of the local library; his years at the Polytechnic School of Denmark had exposed him to the peaks of Denmark's scientific research, especially concerning statics and its application in the construction field. The school of Copenhagen was shaped by professors and scholars such as prominent mathematician Julius Pedersen (1839–1910), author of *Statik* (1881), and pioneering engineer Asger Skovgaard Ostenfeld (1866–1931), author of *Teknisk Statik* (1900) and several books on steel and reinforced concrete structures.[148] **Figg. 24a–24b.**

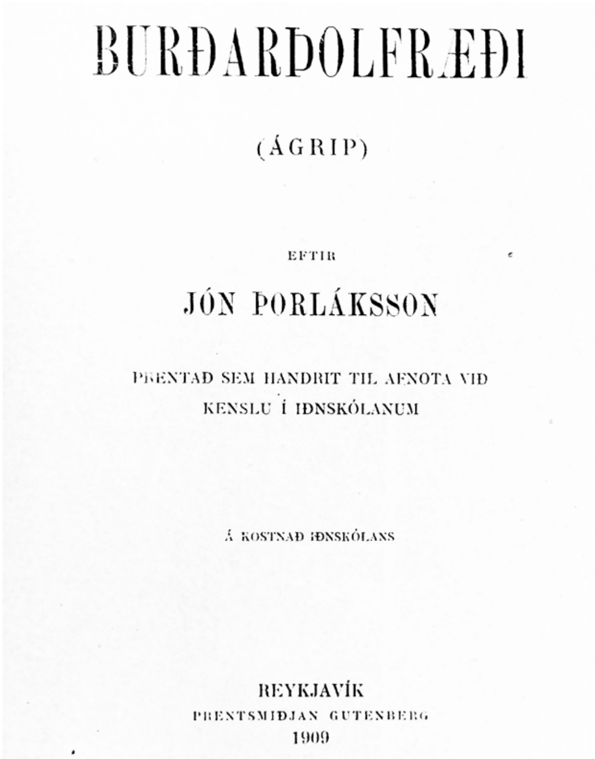
---

[145] Jón Þorláksson, *Burðarþolfræði: Ágrip* (Reykjavík: Iðnskólinn, 1909). Perhaps the Icelandic term *burðarþolfræði* is a direct translation from *Tragwerkslehre* or analogous German terms which were present in the literature available to Jón Þorláksson in his study years in Copenhagen.

[146] Franz Kugler, *Geschichte der Baukunst. Vol. 1–3* (Stuttgart: Verlag von Ebner & Seubert, 1856–59); Eduard Sacken, *Katechismus der Baustile* (Leipzig: J. J. Weber, 1894).

[147] The series, edited by Josef Durm, Hermann Ende, Heinrich Wagner, and Eduard Schmitt, comprised more than a hundred of titles and was published between 1880 and 1943. On the specific volumes held by the National Library of Iceland, see: *Ritaukaskrá Landsbókasafnsins* (1887–1943).

[148] Julius Pedersen, *Statik* (Copenhagen: Høst, 1881); also translated in German as *Lehrbuch der Statik fester Körper* (Copenhagen: Høst, 1882). Asger Skovgaard Ostenfeld, *Teknisk Statik* (Copenhagen: Gjellerup, 1900); also translated in German as *Technische Statik. Vorlesungen über die Theorie der Tragkonstruktionen* (Leipzig: Druck und Verlag Von B. G. Teubner, 1904). Ostenfeld was one of the corresponding authors of the journal *Beton und Eisen*, founded by Fritz von Emperger in 1902. See: Karl-Eugen Kurrer, *Geschichte der Baustatik* (Berlin: Ernst, 2003), 363, and p. 484 for a short biographical note of Ostenfeld.



BURÐARÞOLFRÆÐI

(ÁGRIP)

EFTIR

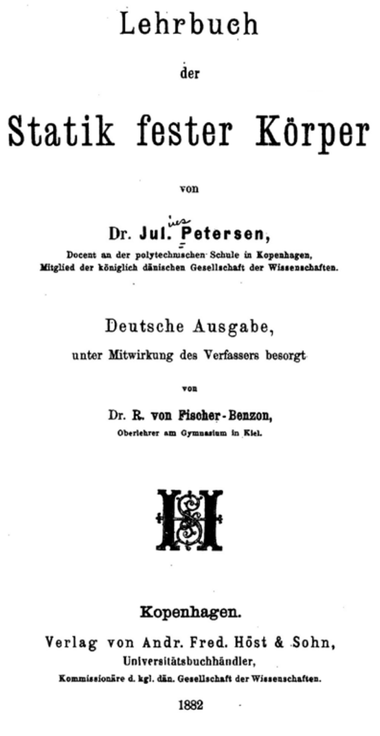
JÓN ÞORLÁKSSON

PRENTAÐ SEM HANDRIT TIL AFNOTA VIÐ
KENSLU Í IÐNSKÓLANUM

Á KOSTNAÐ IÐNSKÓLANS

REYKJAVÍK
PRENTSMIÐJAN GUTENBERG
1909

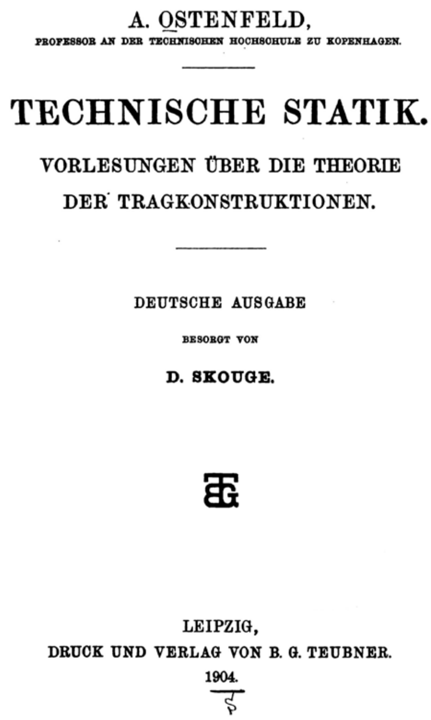
Fig. 23 – Jón Þorláksson, *Burðarþolfræði*, 1909. Lbs, Íslandssafn.



Lehrbuch
der
Statik fester Körper
von
Dr. Jul. Petersen,
Docent an der polytechnischen Schule in Kopenhagen,
Mitglied der königlich dänischen Gesellschaft der Wissenschaften.

Deutsche Ausgabe,
unter Mitwirkung des Verfassers besorgt
von
Dr. R. von Fischer-Benzon,
Oberlehrer am Gymnasium in Kiel.

Kopenhagen.
Verlag von Andr. Fred. Höst & Sohn,
Universitätsbuchhändler,
Kommissionäre d. kgl. dän. Gesellschaft der Wissenschaften.
1882



A. OSTENFELD,
PROFESSOR AN DER TECHNISCHEN HOCHSCHULE ZU KOPENHAGEN.

TECHNISCHE STATIK.
VORLESUNGEN ÜBER DIE THEORIE
DER TRAGKONSTRUKTIONEN.

DEUTSCHE AUSGABE
BESORGT VON
D. SKOUGE.

LEIPZIG,
DRUCK UND VERLAG VON B. G. TEUBNER.
1904.

Fig. 24a – Julius Pedersen, *Statik*, German edition, 1882.

Fig. 24b – Asger Ostenfeld, *Teknisk Statik*, German edition, 1904.

Jón Þorláksson was therefore enriched by two opposite poles of knowledge: that of experience and practical advice, and that of abstract theories and precise calculations. However, could a complete separation of these skills and their related corresponding individuals – the mastermasons on one side, the scientific engineers on the other – be acceptable in the small Icelandic context? Jón Þorláksson acknowledged that the future Icelandic builders whom he was educating had to be able to work without engineers – because the engineers were still very few, and too busy for the many tasks which they were assigned. In Jón Þorláksson's mind, if necessary, a mastermason would have to be independent, and fully able of calculating the height of a beam or to find its flexural strength. In other words, a builder-of-all-trades. Publishing his *Burðarþolfræði*, Jón Þorláksson engaged in a very interesting endeavor: he did not print a construction handbook comparable to late nineteenth-century publications available in Iceland. His text did not include axonometric sections of walls, nor instructions on how to use concrete nor lime. He might have thought that such information would have been provided in the field, through the experience at the building sites. At the same time, he did not indulge in a detailed explanation of the laws of statics, knowing that his students were not sufficiently educated to actually appreciate the sophistication of a mathematical argument.

The handbook had to be very practical: in less than fifty pages, the engineer explained how to understand an element's load-carrying capacity. Elasticity, stress, bending moment, moment of inertia, factor of safety: Jón Þorláksson introduced the Icelandic audience to a whole new universe of physical definitions and theories. His attitude was pragmatic and direct: the important message to convey was how to find the desired height for a beam in a roof, or the desired thickness for a concrete plinth. However, Icelandic students were also lacking the vocabulary to describe this newly discovered world of statics. Alongside definitions and calculations, Jón Þorláksson offered a translation of each term which he might have learned during his studies at the Polytechnic School of Denmark. He followed a true Icelandic tradition, which since late eighteenth century had been very keen in translating loan words into their own, Norse version.[149] From then onwards the Icelandic language could boast the translation of concepts like moment of inertia, factor of safety, bending moment, and so on.[150]

In the last ten pages of the handbook were printed some tables with useful numbers and values, such as the moments of inertia for square or round sections. He also added measures and values for peculiar steel beams (I-, C-, and T-sections), most likely according to the German standards.[151] The most interesting table is the one

[149] Since the late eighteenth century, the purity of the Icelandic language had been one of the cultural battles in the political struggle for independence from the Danish kingdom. See: Guðmundur Hálfdanarson, "Severing the Ties – Iceland's Journey from a Union with Denmark to a Nation-State," 239–41.

[150] *Þverflatartregvægi*, *traustatala*, *beygjuátakið*.

[151] The measures and values of each beam provided by Jón Þorláksson are similar, at times identical, to the German standards published by Friedrich Heinzerling and Otto Intze, *Deutsches*

highlighting certain materials and their strenght resistance – such as strain concentration factor, tensile, compressive, and flexural strenght. Having to adapt to the Icelandic construction tradition and environment, the engineer did not limit his list to common continental materials such as steel, certain kinds of timber (oak, pine), glass or concrete – but he also included local materials such as granite, dolerite, basalt, and even hardened soil, i.e. turf. In another table, which listed the weight per square meter of several construction systems such as timber slabs, he also included the weight of a turf roof, and the medium load of snow and wind on the structures. Two final tables helped the students translate a Danish or an English unit of measure to metres.

Despite the limited audience that this handbook might have had, and being only part of the school's technical education, Jón Þorláksson's publication was epoch-making. For the first time, statics and material technology were available to the local public, readable in Icelandic, and even adaptable to the specificity of Icelandic conditions. Not only had Icelanders been importing foreign building materials for decades, but they had also been buying foreign construction handbooks, thus reading in different languages and always trying to accommodate such readings to their own peculiar environment. Thanks to his polytechnic education, Jón Þorláksson silently changed this habit, moving these topics closer to the Icelandic needs and starting to change the Icelandic construction from within. It was indeed an accomplishment of technical, cultural and sociolinguistic value. While the engineer was establishing a new form of education for the Icelandic builders, it was his very polytechnic background the key to the opening of Iceland to the highest possible degree of scientificity in concrete construction – reinforced concrete built accordingly to the Hennebique patent.

2.1.4 Icelandic adventures in reinforced concrete

So far Icelandic concrete history had been a history of lime, amateurish cast stones, and a harsh trade of cement on the turbulent waves of the Atlantic ocean. When in 1903 Jón Þorláksson suggested the use of iron bars while casting concrete walls, reinforcement in concrete had never been employed in the country, and rarely discussed. Since 1855 reinforced concrete had entered the spotlight of worldwide fame, thanks to the pioneering experiments by Joseph-Louis Lambot (1814–87) and François Coignet (1814–88). Its recognition expanded through a series of patents filed by Joseph Monier (1823–1906) between 1868 and 1880s.[152] However, these novelties

---

Normalprofil-Buch für Walzeisen zu Bau- und Schiffbau-Zwecken (Aachen: Verlag Von Jos. La Ruelle, 1897). The volume was reprinted in 1904, and a 1904 copy is held at the DTU library today. Perhaps it might be the copy avaiable to Jón Þorláksson in his study years.

[152] The literature on the history and development of reinforced concrete is quite copious and cannot be compressed into a single footnote. For an overview on the first reinforced concrete patents, see: Cyrille Simonnet, *Le béton: historie d'un matériau: économie, technique, architecture* (Marseille: Parenthèses, 2005), 39–55. On early reinforced concrete systems and patents, see the essays in: Frank

remained largely unknown in the Icelandic context until the turn of the century. On the one hand, Iceland's surprising modernity in the acceptance and employment of concrete was embodied by the construction of the houses at Garðar and Sveinatunga. At the same time, however, the growing use of concrete, first in the countryside and then in Reykjavík did not necessarily include the use of reinforcement bars. This clearly depended on the difficulty in purchasing and importing iron bars in sufficient quantities, on top of the basic need for timber formworks and barrels of cement. While cement made its praised entrance into the Icelandic countryside in the form of plaster or as a key ingredient for cast stones, Europe was experiencing its hectic era of reinforced concrete patents and methods for calculating new, daring structures. In this dynamic moment, the patents that mostly influenced the European construction in reinforced concrete were those filed by the French enterpreneur François Hennebique (1842–1921) in 1892 and 1898,[153] and the German version of Monier's patent, published in 1887 by the German engineer Gustav Adolf Wayss (1851–1917) in a very successful pamphlet.[154] On top of Hennebique's and Monier's patents, dozens of patents were filed in Europe and the United States. By 1903, as documented by the German engineer and reinforced concrete pioneer Emil Mörsch (1872–1950), each week a new method was added to the countless number of those already active.[155]

At the beginning of the twentieth century, the understanding of the behaviour of reinforced concrete was breaching the boundaries of private patents and companies, thanks to the publication of internationally distributed handbooks such as *Les béton armé et ses applications* by Paul Cristophe (1902) and *Der Betoneisenbau: seine Anwendung und Theorie* by Emil Mörsch (1903).[156] At the same time, new international journals were being printed, with the aim of collecting as many opinions

---

Newby, ed., *Early Reinforced Concrete* (Aldershot: Ashgate, 2001). On the influence of reinforced concrete on the development of structural engineering, see: Hans Straub, *Die Geschichte der Bauingenieurkunst* (Basel: Birkhauser, 1975), 254–66; Karl-Eugen Kurrer, *Geschichte der Baustatik* (Berlin: Ernst, 2002), 336–73. See also: Alexander Kierdorf, and Hubert K. Hilsdorf, "Zur Geschichte des Bauens mit Beton," in *Was der Architekt vom Stahlbeton Wissen Sollte: Ein Leitfaden für Denkmalpfleger und Architekten*, edited by Uta Hassler (Zürich: Gta Verlag), 11–54. Studies on reinforced concrete have also been tackled from a national perspective. See for example: Tullia Iori, *Il cemento armato in Italia. Dalle origini alla Seconda Guerra Mondiale* (Roma: Edilstampa, 2001); Amy Slaton, *Reinforced Concrete and the Modernization of American Building, 1900–1930* (Baltimore: The Johns Hopkins University Press, 2001).

[153] On the history of Hennebique's entreprise and its archives, see: Gwenaël Delhumeau, *L'invention du béton armé: Hennebique, 1890–1914* (Paris: Norma, 1999). The Hennebique patent has frequently been studied from a geographical point of view. On the use of Hennebique's method in UK and in Italy, see respectively: Patricia Cusack, "Agents of Change: Hennebique, Mouchel and Ferroconcrete in Britain," *Construction History* 3 (January 1987): 61–74; Riccardo Nelva, and Bruno Signorelli, *Avvento ed evoluzione del calcestruzzo armato in Italia: il Sistema Hennebique* (Milano: Edizioni di Scienza e Tecnica, 1990).

[154] The pamphlet edited by Wayss, *Das System Monier in seiner Anwendung auf das gesamte Bauwesen* (Berlin: Seydel, 1887) soon became the "classical text" on reinforced concrete until the turn of the century, particularly thanks to the calculation theories developed by engineer Matthias Koenen (1849–1924). Kurrer, *Geschichte der Baustatik*, 344–45.

[155] Kurrer, "La dalle dans le système Monier," in *L'architrave, le plancher, la plate-forme: nouvelle historie de la construction*, edited by Roberto Gargiani. (Lausanne: Presses polytechniques et universitaires romandes, 2012), 552.

[156] Iori, *Il cemento armato in Italia*, 60–61.

and experiences on this building method as possible. In the German-speaking world, and generally in Nordic Europe, the most influential journal was *Beton und Eisen*, published since 1902 in Vienna by Austrian engineer Fritz von Emperger (1862–1942).[157] Despite the fortunate and quick success of some of these patents – in particular the worlwide monopoly of Hennebique's complex network of agents and concessionaires – their continental fame abruptily came to an end when each country started framing the use of reinforced concrete within its national regulations. First in Switzerland and the German Empire (1904), then in France (1906), Italy (1907), and the UK (1911), reinforced concrete slowly became a matter of national policies.[158] Once privately pioneered innovations ruled by patents, reinforced concrete building techniques slowly became regulated by national committees.[159]

Ironically, Icelandic building history embraced the European reinforced concrete patents – especially Hennebique's – only at the end of the patent era, when some European countries had already drafted their own regulations. Two episodes show the employment of such patents in Iceland: one was the bridge over the Fnjóská river, designed and built by the Danish firm Christiani and Nielsen (1906–08), and second were the slabs of the new wool factory *Iðunn*, rebuilt in Reykjavík after a fire destroyed its first headquarters (1907). Both projects were built according to the Hennebique patent. However delayed, the surge of reinforced concrete patents in the country was a clear consequence of the working presence of its engineers, their international connections with continental building firms and their knowledge of a scientific literature on construction topics. The trigger of these two building adventures, traceable in archival documents and in newspapers, were two State engineers active in the Icelandic context: Jón Þorláksson and Thorvald Krabbe. Behind these two names, especially behind the latter, was the great expertise on reinforced concrete that had developed in Denmark since the last decade of the nineteenth century.

---

[157] Kurrer, *Geschichte der Baustatik*, 358–66.

[158] The first draft of the Swiss regulations on reinforced concrete was published in 1904, then enlarged and republished in 1909; the French *Instructions* were published in 1906 by the *Ministère des Travaux Publics, des Postes et des Télégraphes*; the German regulations were first published in 1904, then enlarged and printed in Emil Mörsch's third edition of *Der Eisenbetonbau: seine Theorie und Andwendung* (Neustadt: Wayss & Freytag, 1908), 351–72; on the Italian journey towards a national regulation on reinforced concrete, see: Iori, *Il cemento armato in Italia*, 66–70; the first UK guidelines on reinforced concrete were the result of a joint committee coordinated by the Royal Institute of British Architects in 1911. A comparative study on these regulations can be found in: Stephanie Van de Voorde, Sabine Kuban, and David Yeomans, "Early Regulations and Guidelines on Reinforced Concrete in Europe (1900–1950). Towards an International Comparison," in *Building Histories. The Proceedings of the Fourth Conference of the Construction History Society*, edited by James Campbell et al. (Cambridge: The Construction History Society 2017), 345–56. On the first Danish regulations regarding reinforced concrete, see: Ervin Poulsen, *Betonkrav og –praksis. Normen, forskrifter, dokumenter og faglitteratur 1888–1988 i uddrag til brug i skadesager vedr. betonkonstruktioner* (Hørsholm: Statens Byggeforskninsinstitut, 1989), 28–29.

[159] Sabine Kuban, "Konstruieren in einer regellosen Zeit. Eisenbetonbemessung zwischen Monier-Broschüre und den ersten behördlichen Vorschriften (1887–1904)," in *Alltag und Veränderung. Praktiken des Bauens und Konstruierens*, edited by Werner Lorenz et al. (Dresden: Thelem, 2017), 205–20.

The Danish school: A brief excursion on history of reinforced concrete in Denmark (1891–1910)

Located at the northern edge of central Europe, Denmark was not included in the fertile network of relations which united France to Germany and prompted the development of reinforced concrete in the second half of the nineteenth century. Since the early twentieth century, however, Denmark played an important role in the technical progress of reinforced concrete, which evolved from being an amateurish and still mysterious technique, to a precise, scientifically-calculated building method. Two may be the reasons behind Denmark's growing importance in the debate. First was the presence of its cement plants, such as those in Aalborg, which exploited the country's great reserves of chalk and limestone. Second, the active academic environment of the Polytechnic School in Copenhagen became a key center for debating and experimenting on reinforced concrete. It is no coincidence if the first issue of the *Beton und Eisen* journal (1902) boasted two corresponding authors from Copenhagen; this number grew bigger in the following years.[160] The vitality of the Danish engineering debate may also be detected in the pages of some national technical journals, such as *Den tekniske Forenings Tidsskrift* (1847–1941) and *Ingeniøren* (1892–2006), the latter being the journal of the Danish Engineers' Society, founded in 1892.[161] Despite its central role in the international debate, a part from a few contributions a comprehensive history of reinforced concrete in Denmark is still missing. What follows is but a brief summary of some key information collected from journal articles and specific handbooks published in the first decade of the twentieth century.[162]

In 1906, in the pages of *Beton und Eisen*, engineer and Polytechnic professor Eduard Suenson (1877–1958) outlined a short history of reinforced concrete in Denmark, showing the journal's readers how quickly the material had developed in his country, and what was the current debate at that time.[163] As Suenson reported,

---

[160] One article is signed by Asger Ostenfeld and the other by J. Lehmann and K. Möller, both located in Copenhagen. Kurrer, *Geschichte der Baustatik*, 363.

[161] *Dansk Ingeniørforening*. The journal can be read in its digitized version at the link: http://ing.dk/danmarkshistorie/browse, last accessed 28/09/2020. On the history of the society's first fifty years, see: Johs Kristensen, *Dansk Ingeniørforening gennem 50 Aar: 1892–1942* (Dansk Ingeniørforening, 1942).

[162] To my knowledge, the only essay on Danish reinforced concrete is John Cederberg's "De første bygninger og bygværker af beton og jernbeton i Danmark," *Fabrik og Bolig* 2 (1999): 3–27. The essay holds a very interesting chronological review of Denmark's first reinforced concrete buildings between 1891 and 1910. For a brief outline on Danish engineering history see: Gunnar M. Idorn, *Concrete Progress: From Antiquity to the Third Millennium*, 24–26. On Danish city engineers at the beginning of the twentieth century, see: Hèléne Vacher, "Construire en mosaïque: les ingénieurs des villes-ports, l'innovation technique et la gestion du territoire municipal au Danemark, 1900–1920," *Édifice & Artifice,* 1063–76. At the moment, historian of technology Louise Karlskov Skyggebjerg (Department of Physics, DTU) is researching the history of Danish concrete.

[163] Eduard Suenson, "Zur Geschichte des Eisenbetons in Dänemark," *Beton und Eisen* 5, no. 6 (June 1906): 137–38. For a very brief chronology of reinforced concrete structures in Denmark, see

reinforced concrete was first used in Denmark in 1891, when the German company *Aktiengesellschaft für Beton- und Monierbau* opened a branch in Copenhagen, directed by architect Emanuel Jensen.[164] The first works were the walls and slabs of a laundry; then the slabs of the Copenhagen Art Museum, and the roof of a glass factory in Hellerup. **Figg. 25a–25b.** Suenson also mentioned the construction of partition walls for a breakwater at the Freeport of Copenhagen, made of hollow concrete blocks. Soon after, the enterprise Schöller & Rothe was founded, which coordinated the construction of the first reinforced concrete bridge – a 19m-gangway located in Copenhagen and engineered by the Polytechnic professor Asger Ostenfeld. This flourishing network of building activities is linked to an interesting coincidence: the founding year of the Danish Engineers' Society (1892) corresponded with the entrance of reinforced concrete into the country. More infrastructures followed: between 1895 and 1897, the railway connecting Copenhagen to Helsingör was designed, requiring six bridges and a gangway in reinforced concrete, on top of several foundation works, tunnels and platforms. At the same time, an in-depth discussion on the physical behaviour of reinforced concrete had begun, thanks to elasticity tests carried on by engineer and military captain Torben Grut (1865–1952), and to the pioneering research by Ostenfeld on calculations of reinforced concrete beams.[165] Ostenfeld's studies on the tensile diagram and on the distribution of the stress within reinforced concrete beams were in tight connections with contemporary experimentations by engineers like Armand Considère (1841–1914), Wilhelm Ritter (1847–1906), and Koenen among others.[166]

Regarding these scientific matters and their international debate, technical journals could be considered mirrors reflecting the countless images of the same topic: from *Le Génie Civil* to *Den tekniske Forenings Tidsskrift*, from *Beton und Eisen* to *Ingeniøren*, new theories and tests could spread at an unbelievable speed, usually even prompted by their very authors and readers. In March 1900, for example, engineer Frederik Johanssen (1855–1934) publicly wrote and asked for a Danish translation of Considère's calculating theory for reinforced concrete structures, published in *Le Génie Civil* a year before.[167] Beyond the scientific debate on structural calculation, the building industry was populated by a countless number of

also: Christen Ostenfeld**,** *Christiani & Nielsen: jernbetonens danske pionerer* (Lyngby: Polyteknisk Forlag, 1976), 13–14.

[164] Jensen was also the author of an article on the Monier patent published in 1892. Emanuel Jensen, "Om Monierkonstruktioner," *Den Tekniske Forenings Tidsskrift* (1891): 140–48.

[165] Torben Grut, "Om Beregningen af Monierkostrukioner," *Ingeniøren* 5, no. 9 (29 February 1896): 39–40. Asger Ostenfeld, "Om Bøjning ved Brudgrænsen," *Ingeniøren* 5, no. 13 (26 March 1896): 71; Asger Ostenfeld, "Om Beregning af Monierkonstruktioner," *Ingeniøren* 6, no. 1 (2 January 1897): 1–4.

[166] Kurrer, *Geschichte der Baustatik*, 357.

[167] Fr. [Frederik] Johanssen, "Beregning af armeret Beton," *Ingeniøren* 9, no. 12 (24 March 1900): 111.

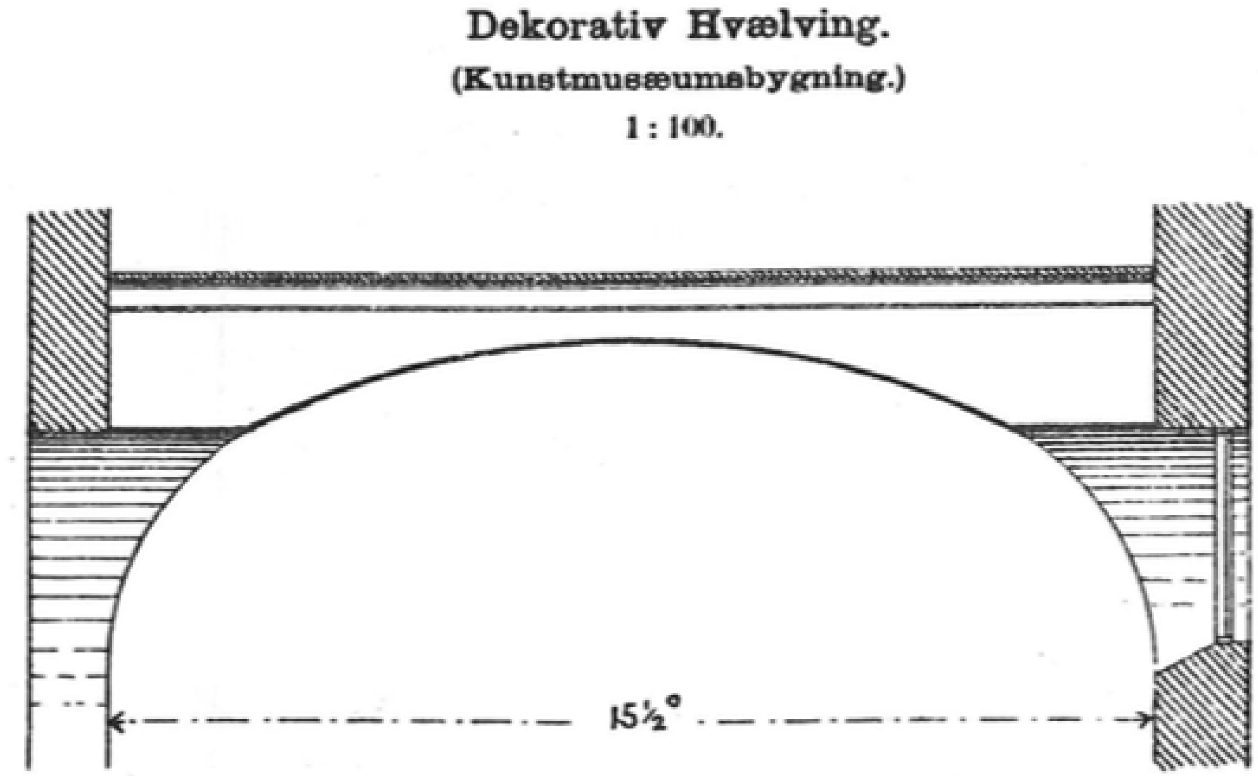


Fig. 25a – Slabs of the Copenhagen Art Museum.
Emanuel Jensen, “Om Monierkonstruktioner,” *Den Tekniske Forenings Tidsskrift* (1891): 140–48.

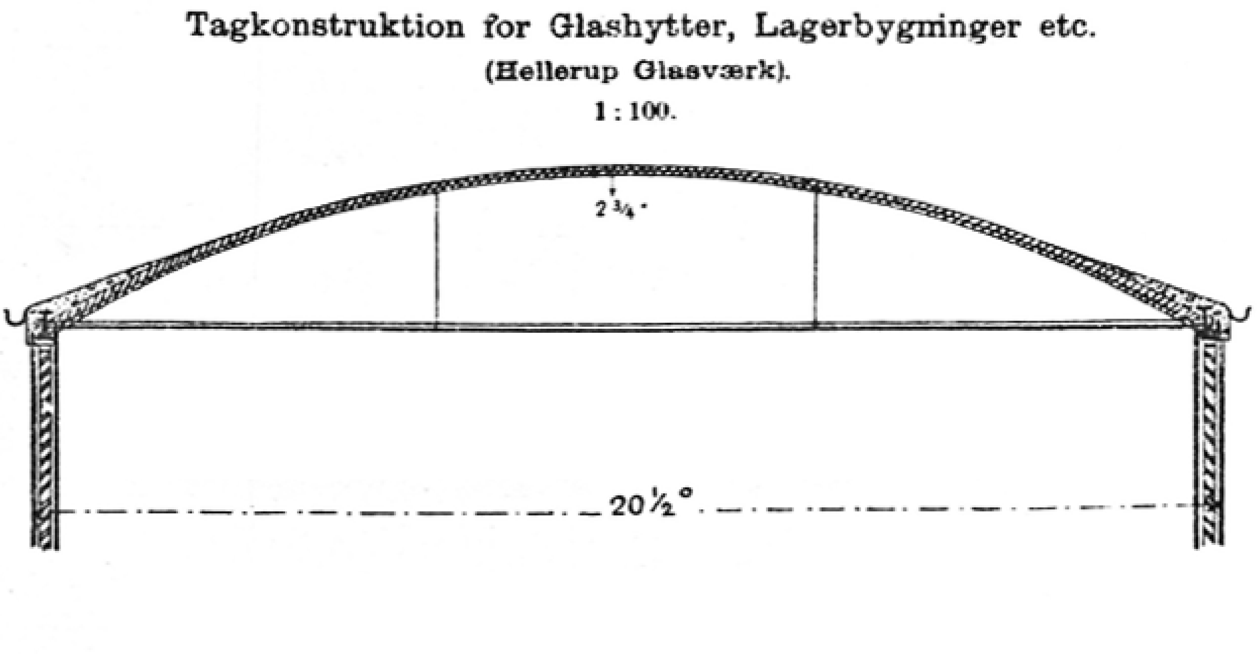


Fig. 25b – Slabs of the glass factory in Hellerup.
Emanuel Jensen, “Om Monierkonstruktioner,” *Den Tekniske Forenings Tidsskrift* (1891): 140–48.

patents, among which the Monier was the most successful and undoubtedly the most discussed until the 1900s.[168] **Fig. 26.**

The Hennebique patent in Denmark

In 1900 another fortunate reinforced concrete patent entered the Danish construction environment. With engineer Grut as agent, and mastermason Carl Schiötz as concessionaire, the worldwide famous Hennebique method had made its way to Copenhagen.[169] Its results were soon published in Hennebique's journal *Le Beton Armé*, which in October 1900 already listed a project for the slabs of the Copenhagen Telephone Society under the heading "Bureau de Copenhague".[170] **Fig. 27.** The Hennebique patent was triumphantly welcomed in Denmark thanks to an article signed by agent Grut and published in *Ingeniøren*.[171] The first agent of Hennebique in the country was very keen on presenting the patent and its applications. He was particularly proud of Hennebique's slabs, which usually resulted in flat ceilings, in contrast to Monier's vaulted ones; furthermore, he described in great details the position of the reinforcement bars within the concrete beams, which was one of the characteristics that helped towards the renowned monolithic properties of the Hennebique's structural skeleton. Between Paris and Copenhagen, both *Le Beton Armé* and *Ingeniøren* highlighted the growing popularity of the Hennebique's patent among Danish engineers and builders. In its editorial tradition, *Le Beton Armé* published an updated monthly list of Hennebique projects produced by each *bureau*, and the number of the Copenhagen-based works increased very rapidly between early 1900 and the last years of the decade. At the same time, the *Ingeniøren* journal published an increasing number of advertisement regarding building firms which acted, or pretended to act, as Hennebique's concessionaires. The growing number of fake concessionaires even prompted François Hennebique himself to write a short note in the front page of *Ingeniøren* in April 1906, listing the only Danish firms that acted as concessionaires of the patent. **Fig. 28.**

The success of Christiani & Nielsen

During the first years of Hennebique's presence in Denmark, the patents were mainly applied in the construction of slabs for industrial or public buildings, all signed by the concessionaire Carl Schiötz. In early 1904, however, a new Hennebique concessionaire appeared on the Danish scene: the firm Christiani and Nielsen. The history of Christiani and Nielsen's worldwide success is well known: it was published in several celebratory publications over the years and the firm's reinforced concrete

---

[168] Sigurd Wessel, "Brandsikre Gulvkonstruktioner," *Arkitekten. Tidsskrift for Bygningsvæsen og Byggeindustri* 5, no. 230 (17 Februar 1899): 147–52.

[169] Suenson, "Zur Geschichte des Eisenbetons in Dänemark," 138.

[170] *Le Beton Armé* 13, no. 29 (October 1900): 16.

[171] Torben Grut, "Om Konstruktioner af armeret Beton (Hennebique-Konstruktioner)," *Ingeniøren* 9, no. 22 (2 June 1900): 179–83.

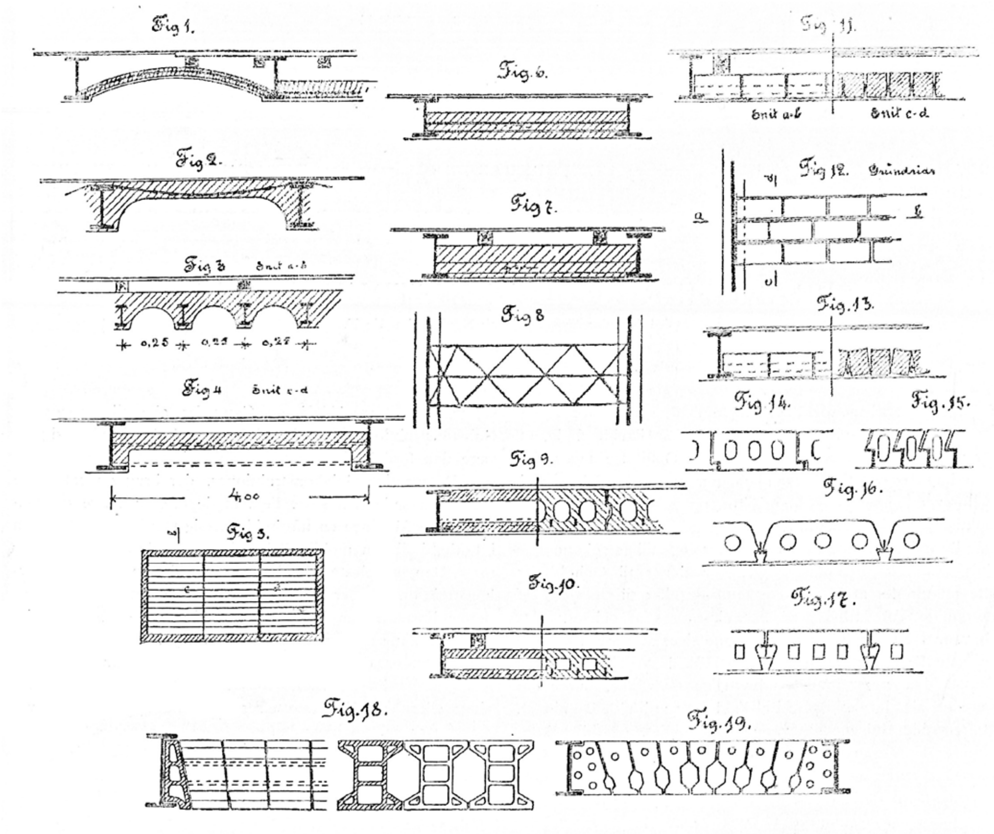


Fig. 26 – Several types of slabs. The *Monier* patent is represented in the first figure. Sigurd Wessel, "Brandsikre Gulvkonstruktioner," *Arkitekten. Tidsskrift for Bygningsvæsen og Byggeindustri* 5, no. 230 (17 Februar 1899): 147–52.

Bureau de Madrid

9872. — **Toiture-Terrasse** à Calalrara. — Concess., M. Cano.

10070. — **Pont de 6 mètres** à Mières. — Concess., M. Ribéra.

10281. — **Réservoir de 70 mc.** à Léon. — Concess., M. Ribéra.

Bureau de Copenhague

7402. — **Planchers** pour la Société des Téléphones de Copenhague. — Concess., M. Schiotz.

Le Gérant : J. Crépin-Leblond.

Rennes. — *Imp. des Arts et Manufactures, 3, place de la Halle-aux-Blés.*

Fig. 27 – First project issued by Hennebique's *Bureau de Copenhague*. *Le Beton Armé* 13, no. 29 (October 1900): 16.

INGENIØREN

UDGIVET AF DANSK INGENIØRFORENING

UDGAAR ONSDAG OG LØRDAG

Nr. 16 A. København, Onsdag den 18. April 1906. 15. Aarg.

Bonnesen & Danstrup.
Maskinfabrik & Jernstøberi.
Specialitet:
Opvarmning & Ventilation.
Nr. 21 Stefansgade Nr. 21,
7380 København. L.

Hennebique

Da herværende Entreprenører tilbyde Udførelsen af Hennebique-Konstruktioner uden at staa i Forbindelse med mig, finder jeg mig foranlediget til at meddele, at de eneste Repræsentanter i Danmark for Firmaet F. Hennebique ere: 8230
Hr. Murmester *Carl Schiøtz.*
d'Hrr. *Christiani & Nielsen.*
Hr. Entreprenør *N. Pedersen,* Ordrup pr. Ringsted.
F. Hennebique.

Dansk Ingeniørforenings
Oplysningsbureau.

Plads søges af:
Ingeniører:
16 Cand. polyt., Bygningsingeniører.
1 Cand. polyt., Bygningsingeniør (Aftenarbejde).
1 Cand. polyt., Fabriksingeniør.
6 Cand. polyt., Maskiningeniører.

Andre tekniske Stillinger:
1 Bogholder og Tegner (Eftermiddagstimer).
3 Konstruktørerer.

Plads tilbydes:
1 Kompagnon til Konsulent- og Agentvirksomheden.
1 ung Ingeniør til Opmaaling og Nivellement.
1 Konduktør ved et større Anlæg (150—180 Kr. mdl.)

Nærmere Oplysninger faas ved Henvendelse til Bureauets Leder, Ingeniør J. T. Lundbye, som træffes paa „Dansk Ingeniørforening"s Kontor, Amaliegade 38 i Reglen Kl. 2—3.
* Angiver at vedkommende Plads er averteret i dette Nummer.

Eneste

Fig. 28 – Hennebique's note in the front page of *Ingeniøren*.
"Hennebique," *Ingeniøren* 15, no. 15 (18 April 1906): 1.

Fig. 29 – Christiani & Nielsen's advertisement in *Ingeniøren* 13, no. 14 (2 April 1904).

projects also feature in many recent architectural history books and essays.[172] The firm was founded in 1904 by the civil engineer Rudolf Christiani (1877–1960) and the captain Aage Nielsen (1873–1945). Their first office was located in Copenhagen; soon they opened branches in Aarhus (1906), Hamburg (1908), St. Petersburg (1910), attaining worldwide expansion with offices in South America, Africa, and Asia by the 1940s.

The origin of the firm's connections to the Hennebique patent was Asger Ostenfeld's advice to Rudolf Christiani. It was perhaps Polytechnic professor Ostenfeld who suggested that Christiani visit Hennebique's headquarters in Paris, and open a business with him.[173] As concessionaire of the Hennebique patent, the firm Christiani & Nielsen entered the Danish construction environment with a pressing advertising campaign, which was published in each issue of *Ingeniøren* between 1904 and 1906. **Fig. 29.** They quickly created a strong business revolving around reinforced concrete structures, particularly specializing in bridges. The number of concrete bridges designed by Christiani and Nielsen under the Hennebique patent increased each year: one causeway in 1904, then five bridges in 1905, up to eight in 1906. By 1908, the total number reached up to 45 projects: the Icelandic bridge over the Fnjóská river was one of them.[174] The greater part of the Danish and European scientific debate over construction issues scarcely reached Iceland, where the majority of its inhabitants were still struggling with the renovation of turf farms and a handful of engineers were trying to modernize the country's architectural traditions. However, those very engineers acted as discreet ambassadors of the continent's building technology, bringing the Hennebique patent to Europe's northernmost geographical limits.

Hennebique moves North: Christiani and Nielsen in Iceland (1907–08)

The construction of the bridge over the river Fnjóská in northern Iceland was only a piece in the monumental task of establishing the country's road network, particularly embodied by the construction of *Þjóðvegur*: the national road connecting

[172] Christen Ostenfeld, *Christiani & Nielsen: jernbetonens danske pionerer*; on the first decades of the firm's production, see: *Christiani & Nielsen. Twenty Five Years of Civil Engineering. 1904–1929* (Copenhagen: Krohns Bogtrykkeri, 1929). Jean-Louis Cohen refers to Christiani and Nielsen's "stunning seaplane hangars" built in 1917 in Tallin, Estonia. Jean-Louis Cohen, *The Future of Architecture. Since 1889* (London/New York: Phaidon, 2016), 53. On Christiani and Nielsen's hangars, see: Maris Mändel, and Oliver Orro, "The Marvellous Reinforced Concrete Shells of Tallinn Seaplane Hangars in the Context of Early Concrete Architecture in Estonia," *Construction History* 27 (2012): 65–85.

[173] Ostenfeld, *Christiani & Nielsen: jernbetonens danske pionerer,* 18.

[174] Ostenfeld, *Christiani & Nielsen: jernbetonens danske pionerer,* 71. Some of their bridges were published in the journal *Beton und Eisen*: Vald Cohen, "Eisenbetonbogenbrücke auf Moorboden," *Beton und Eisen* 6, no. 1 (1907): 7–8; "Die neue 'Südbrücke' in Randers (Jütland)," *Beton und Eisen* 7, no. 13 (1908): 311–13. The increasing amount of works by Christiani & Nielsen can be seen in the pages of *Le Beton Armé.*

the whole island in one, continuous ring.[175] **Figg. 30a–30b.** The daunting project of building and maintening a proper road system had been a key priority of the Icelandic Parliament since the last decades of the nineteenth century, and by the beginning of the twentieth century a suitable transportation network was thought to be at the core of the country's future development. In 1887 the Parliament issued a law which divided the roads into different categories, with different characteristics.[176] In 1893 a new law was issued, with updated guidelines and a general plan regarding areas of the country in need of new road connections.[177] By that time, the task of planning the construction of roads was assigned to Iceland's first engineer, Sigurður Thoroddsen, who was then substituted in 1905 by Jón Þorláksson.[178] The building of Iceland's road network was a true national and collective enterprise, which went hand in hand with Jón Þorláksson's research on building materials: adequate roads meant adequate transportation, thus easier distribution of construction supplies around the country. If Iceland was in need of roads, its roads needed bridges over the copious and powerful rivers that divided the valleys. The presence of dynamic glacial rivers had always interfered with the movement of people and goods, especially during the summer months, when waterways carry the highest volume. The construction and maintainance of the country's bridges was a source of pride and a promise for a better and quicker economic development. It probably represented the biggest chapter in the Icelanders' history of struggle against the natural elements.[179] **Figg. 31a–31c.**

Steel structures became the first option for modernizing the country's bridge construction. The first steel suspension bridge was that over the Öfulsá river at Selfoss (1891), its final design was signed by engineers Vauchan & Dymond from Newcastle. In 1894, the same engineers built the bridge over the Þjórsá river. Following these examples, Sigurður Thoroddsen worked on a good number of steel suspension bridges around the country.[180] **Fig. 32.** Beginning in 1905, Jón Þorláksson started simultaneously researching building materials and the road network. Therefore, it should not come as a surprise if by 1907 he supervised the construction of the first concrete bridge. The bridge over the Bláskeggsá river was only 7,2 metres long, with stone abutments and a vaulted concrete arch. **Fig. 33.** If this small bridge was connected to Jón Þorláksson's first experiments with concrete and his research on local building materials, then the bridge over the Fnjóská river became the built proof of the engineer's ongoing relations with Denmark and the Danish reinforced concrete engineering school. **Figg. 34a–34b.**

---

[175] The ring road [*hringvegur*] was completed only in 1974 with the construction of the last sector in Skeiðarársandur, in southern Iceland. See: "Nú stækkar landið," *Morgunblaðið* 61, no. 121 (12 July 1974): 14–15.

[176] "Alþingi," *Ísafold* 14, no. 40 (24 August 1887): 158.

[177] "Alþingi," *Ísafold* 20, no. 59 (30 August 1893): 235.

[178] For a brief overview of Iceland's road network and its construction, see: Krabbe, *Island og dets tekniske udvikling gennem tiderne,* 13–34.

[179] On the history of Icelandic bridge construction, see: Sveinn Þórðarson, *Brýr að baki*; see also: Krabbe, *Island og dets tekniske udvikling gennem tiderne*, 35–66.

[180] Sveinn Þórðarson, *Brýr að baki. Brýr á Íslandi í 1100 ár*, 75–108.

Fig. 30a – Gravel road in Húnavatnshreppur, ca. 1900–15.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 30b – Road in Kaldidalur, ca. 1905–20. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 31a – Crossing rivers without bridges. Horses crossing the Þjórsá river, ca.1900–07. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 31b – Crossing rivers without bridges. Crossing the Hvítá river, ca. 1925–30. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 31c – Ropeway over the Jökulsá á Brú river, 1924.
Þjóðminjasafn Íslands/National Museum of Iceland.

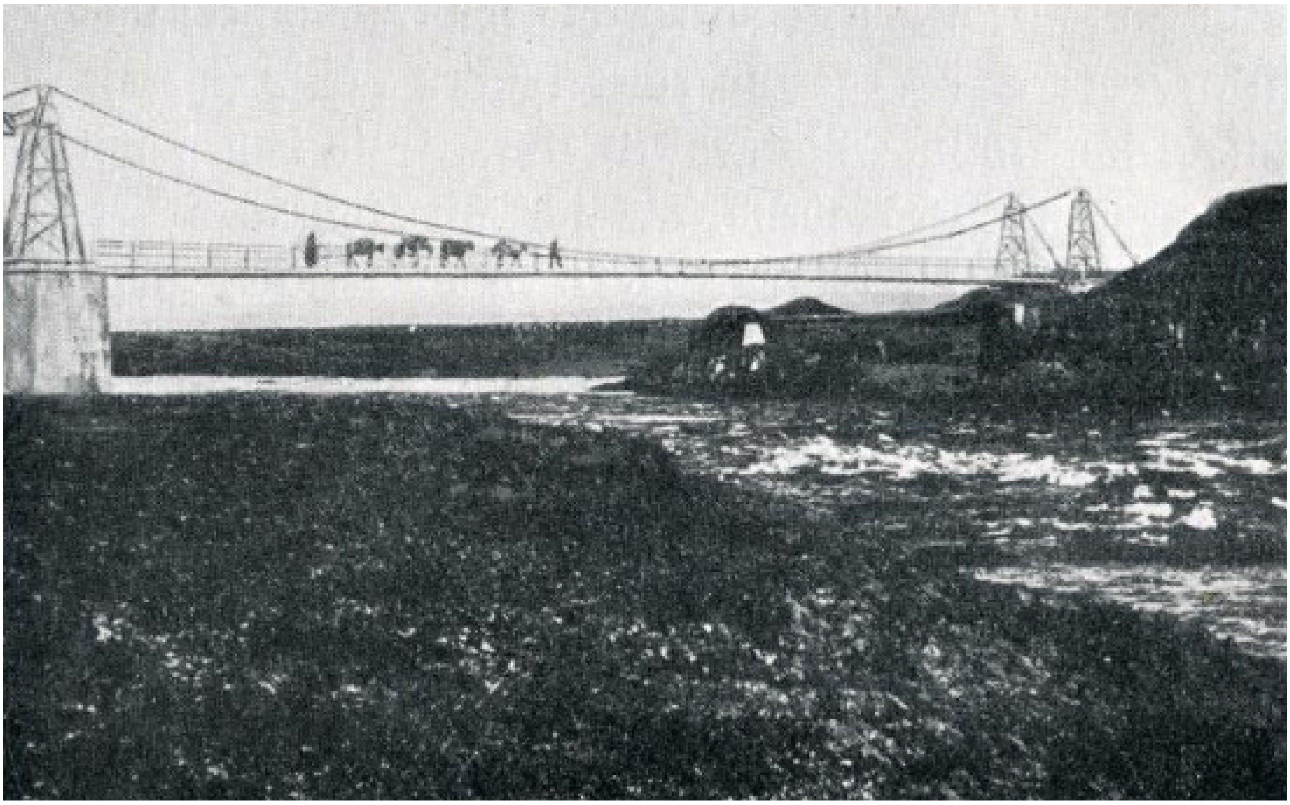


Fig. 32 – The suspension steel bridge over the Öfulsá river, built 1891. Picture taken in 1908.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 33 – Bridge over the Bláskeggsá river, built 1907.
Þjóðminjasafn Íslands/National Museum of Iceland.

A bridge connecting the east and the west bank of the Fnjóská river, near a forest known as Skógar, had been a pressing need for years, and since the late nineteenth century some possibilities had been debated. This bridge was pivotal to allow a direct link between the village of Akureyri and the Mývatn lake, both populated farming areas in northern Iceland. Eventually, this project became Iceland's first reinforced concrete bridge, designed by Christiani & Nielsen. The bridge was completed in 1908, and despite having been followed by a number of other daring reinforced concrete bridges built all over the country, it still represents the beginning of the Icelandic "age of concrete" for bridge construction. This small but elegant piece of infrastructural engineering was described in detailed in the local newspapers, and the bridge has also been internationally published several times.[181] One year after the works, the project was published in the journal *Beton und Eisen*, which did not hide the difficulties experienced by the Danish workers during the construction.[182] In 1933, a picture of the bridge was included by British architectural critic Philip Morton Shand in the pages of the British journal *The Concrete Way*.[183] This "very elegant" bridge was mentioned in later publications by the Danish firm, remembered as one of the first results of the building enterprise.[184] Recently Icelandic author Sveinn Þórðarson has retraced the bridge's construction history thanks to extensive archival research.[185] Here a few arguments will be added to stress the importance of this project, not only within Iceland's epic of road construction, but also in the wider picture of the modernization of the country's building tradition.

As Jón Þorláksson took control over planning of the road and bridge network, he strongly insisted to the Ministry of Iceland that the bridge had to be made of reinforced concrete, and suggested the names of his Danish colleagues Christiani & Nielsen. The engineer stressed this opinion even against his own evaluation regarding the final price: according to his documentation, he attested that a suspended steel bridge would have costed 30'000kr., while a reinforced concrete one at least 33´000kr.[186] A few sentences written by Jón Þorláksson to the Ministry of Iceland are

---

[181] The local press followed the construction of the bridge with great attention. See: "Fnjóskárbrúin," *Norðri* 3, no. 22 (2 June 1908): 88; "Fnjóskárbrúin," *Norðri* 3, no. 26 (30 June 1908): 103; "Fnjóskárbrúin hrunin!," *Austri* 18, no. 25 (9 July 1908): 88; "Fnjóskárbrúin," *Óðinn* 5, no. 2 (1 May 1909): 12.

[182] Because of a late river flood, in June 1908, part of the timber formwork was destroyed and it caused some delay in the construction. Moreover, the remoteness of the building site forced the workers to use horses for the transportation of building materials such as timber planks, reinforcement bars, and cement. Ludwig Hess, "Fnjóská-Brücke auf Island – Landungssteg im Hafen von Hundested," *Beton und Eisen* 8, no. 8 (1909): 188–89.

[183] Philip Morton Shand, "In Concrete. Third Series-IV," *The Concrete Way* 5, no. 4 (January 1933): 200.

[184] Ostenfeld, *Christiani & Nielsen: jernbetonens danske pionerer,* 71–72. Recently, the bridge was mentioned as the starting point for a number of reinforced concrete arch bridges built around Iceland. See: Pétur H Ármannsson, "Concrete's Furthest North," *Docomomo Journal: Bridges and Infrastructures* 45, no. 2 (2011): 87–89.

[185] Sveinn Þórðarson, *Brýr að baki. Brýr á Íslandi í 1100 ár*, 173–78.

[186] ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/63, Db. 2, nr. 698 (1909). Jón Þorláksson, "Áætlun um kostnað við brúargerð á Fnjóská hjá Vothamri" [Cost evaluation for the construction of a bridge over the river Fnjóská in the area of Vothamri], 26 January 1907.

Fig. 34a – Bridge over the Fnjóská river, photo by Sofia Nannini, 2019. The bridge was restored in 1993.

Fig. 34b – Bridge over the Fnjóská river, photo by Sofia Nannini, 2019.

striking for their clarity and they explain perfectly why the Icelandic government had to build such an avant-garde bridge in a remote area of the country. First, he claimed that the chosen spot for the bridge offered enough aggregates for the making of concrete. By so doing, Jón Þorláksson highlighted the strong link between natural resources and man-made construction, which he had been researching for years. Second, he admitted that a reinforced concrete structure would have been more expensive. He added, however, that the only way of having cheaper reinforced concrete bridges around the island was to train the local builders on how to build them. This knowledge necessarily had to come from abroad, and specifically from Denmark.[187] **Figg. 35a–35b.**

The engineer's suggestions to the Icelandic government did play a pivotal role. After a call for tender, published in the Danish journal *Ingeniøren*, in January 1908 the task was assigned to Christiani & Nielsen.[188] Jón Þorláksson had received their project one year earlier, and those drawings attest that the firm was still proudly boasting its status as Hennebique concessionaire. **Figg. 36a–36b.** Yet, by 1908 the name of Christiani & Nielsen did not appear in the pages of *Le Beton Armé* anymore, thus the construction was not even mentioned as a Hennebique product. Although it was not possible to understand who the Danish workers employed at the construction site were, one name emerges from the narration of a local clergyman, reported in an Icelandic newspaper decades later.[189] The director of the works was engineer Knud Reffstrup, employed by Christiani and Nielsen – of whom, however, no archival records can be found, with the exception of a photograph of the bridge on which the workers' names were added. **Fig. 37.** In 1908, in a remote corner of the Icelandic landscape, over a powerful river and between wild mountains, the already mature European tradition of reinforced concrete patents was embraced for the first time in the history of the country. The building of the bridge was a turning point for the Icelandic construction, and emerged as the crossroad where Icelandic infrastructural needs met with European engineering tradition. The bridge over the Fnjóská river served as a stage where Icelandic engineers and builders could face the continental construction experience. **Fig. 38.**

Rebuilding *Iðunn* (1907)

In 1906, the headquarters of the wool factory *Iðunn* burned down. Open in December 1903 thanks to the strong will of Knud Zimsen, production took place in a

[187] ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/63, Db. 2, nr. 698 (1909). Letter by Jón Þorláksson to the Cabinet of Iceland, 26 January 1907. The engineer's opinion was also included in the Parliament debate. See: "Frumvarp til fjárlaga fyrir árin 1908 og 1909," *Alþingiskjöl* (1907): 45.

[188] The call for tender was published twice in the journal *Ingeniøren*, on 13th and 15th November 1907. The contract was signed by Christiani & Nielsen in January 1908. See: ÞÍ, *Stjórnarráð Íslands* II. *Skrifstofa* B/63, Db. 2, nr. 698 (1909). Letter by the Copenhagen office of the Cabinet of Iceland, 18 January 1908.

[189] Pétur Ingólfsson, "Bogabrúin á Fnjóská," *Lesbók Morgunblaðsins* (3 July 1993): 6–7.

Fig. 35a – The bridge in construction, 1908. DTU Historie- og samlingsdatabase.

Fig. 35b – The bridge in construction, 1908. DTU Historie- og samlingsdatabase.

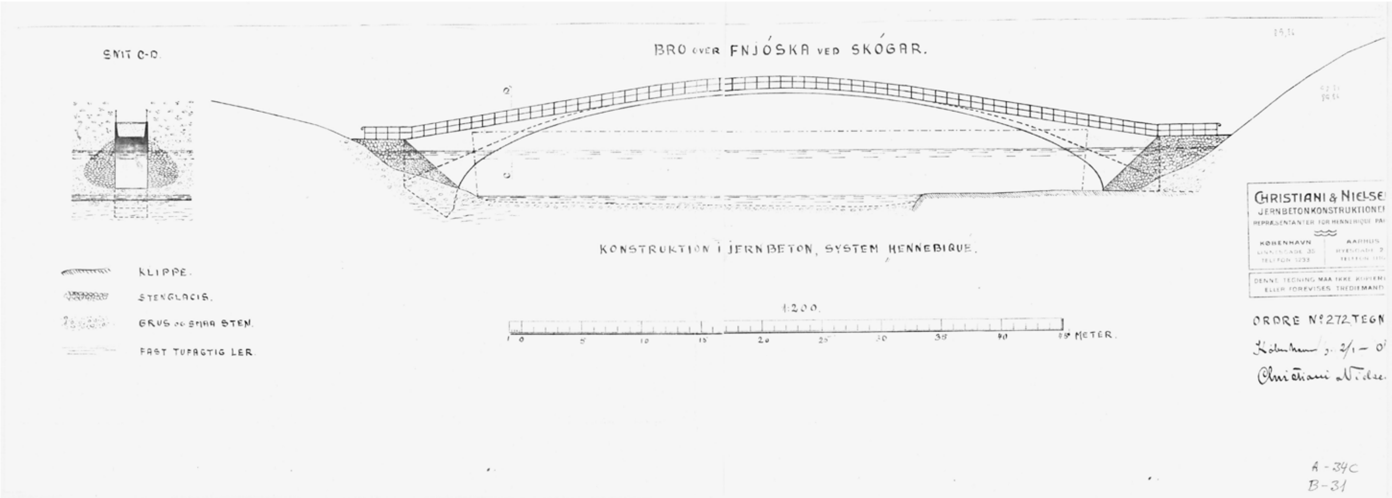


Fig. 36a – Drawing of the bridge over the Fnjóska river. *Bro over Fnjóska ved Skógar.* 1907. Icelandic Road and Coastal Administration. Teikningar A-34C/B-31; 33.

Fig. 36b – Drawing of the bridge over the Fnjóska river. *Bro over Fnjóska ved Skógar.* 1907. Icelandic Road and Coastal Administration. Teikningar A-34C/B-31; 33.

Fig. 37 – Group photo of the workers after the bridge was completed. The man marked with the number 3 is Knud Reffstrup, director of the works. 1908.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 38 – The bridge over the Fnjóská river. Photo by Sofia Nannini, 2019.

large timber building on the eastern outskirts of Reykjavík and close to the sea.[190] Soon after the fire, local newspapers wrote about a forthcoming building in concrete.[191] The factory had to be rebuilt quickly, and with a guarantee of better resistance to fire. Reinforced concrete patents had already conquered Europe with their gospel of fireproof qualities and enduring resistance to earthquakes: the reconstruction of *Iðunn* was also the perfect opportunity to demonstrate these properties to the Icelandic audience.

The new factory was built on the same spot as the old one, in what is today's Skúlagata 42. Wool production stopped in 1914, and the building was transformed into a paint and varnish factory.[192] The structure was destroyed later in 1989, and absence of the original drawings makes it difficult to analyze and evaluate the actual contribution of the Hennebique patent. Two visual proofs attest, however, the presence of what could have been a Hennebique system of pillars, beams, and ribbed slabs. **Figg. 39a–39b.** In addition to these two images, the news of the reconstruction of *Iðunn* spread through the Icelandic newspapers. A short article published in June 1907 mentioned a "novelty in architecture", and claimed that the new factory was going to be rebuilt in reinforced concrete, following the "Hennebique method". The article asserted the fireproof qualities and the resistance to eartquakes of such structures. Moreover, the text declared that "the construction will be handled by Danish experts", and this will be a chance for the Icelanders who will take part in the process "to learn from them, and bring this knowledge into the country". Eventually, it claimed that the "moving spirit" of this method was engineer Thorvald Krabbe.[193] **Fig. 40.**

By summer 1907, Danish-Icelandic engineer Krabbe, graduated at the Polytechnic School of Denmark, had already moved to Reykjavík and was active as State engineer.[194] During his career, Krabbe travelled extensively around the country, and took an astounding number of photographs depicting the very "technical development" which he would later describe in his book in 1946. His tasks were mainly related to infrastructures: he supervised the construction of several harbours, lighthouses, electricity stations, and he also spent years working on a proposal for a

---

[190] "Mikill húsbruni enn," *Ísafold* 33, no. 50 (4 August 1906): 199. "Klæðaverksmiðjan 'Iðunn'," *Óðinn* 1, no. 1 (1 April 1905): 4–6.

[191] "Klæðaverksmiðjan 'Iðunn'," *Þjóðólfur* 58, no. 49 (9 November 1906): 188.

[192] *Málningarverksmiðjan Harpa*. Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 73.

[193] "Félagið reisir nú á ný verksmiðjuna úr rústum og ríður á vaðið með það að nota nýja húsagerð úr járni og steinsteypu, eftir aðferð *Hennebiques*. [...] Fyrir smíðinni standa danskir sérfræðingar, vanir þessu byggingarlagi, en svo mun til ætlast að nokkurir Íslendingar, sem taka þátt í vinnunni, læri af þeim og flytji með því þessa þekkingu inn í landið. [...] Potturinn og pannan í þessari góðu nýung í húsagerð er Krabbe verkfræðingur [...]". "Nýung in húsagerð," *Norðurlandi* 6, no. 48 (8 June 1907): 168.

[194] Thorvald Krabbe had both Icelandic and Danish origins. His father was a Danish medical doctor and professor. His mother was Icelandic. Despite having worked for three decades in Iceland, apparently Krabbe never spoke good Icelandic, and he moved back to Denmark after his retirement. On Krabbe's work as engineer in Iceland, see: Sveinn Þórðarson, *Frumherjar í verkfræði á Íslandi*, 71–80.

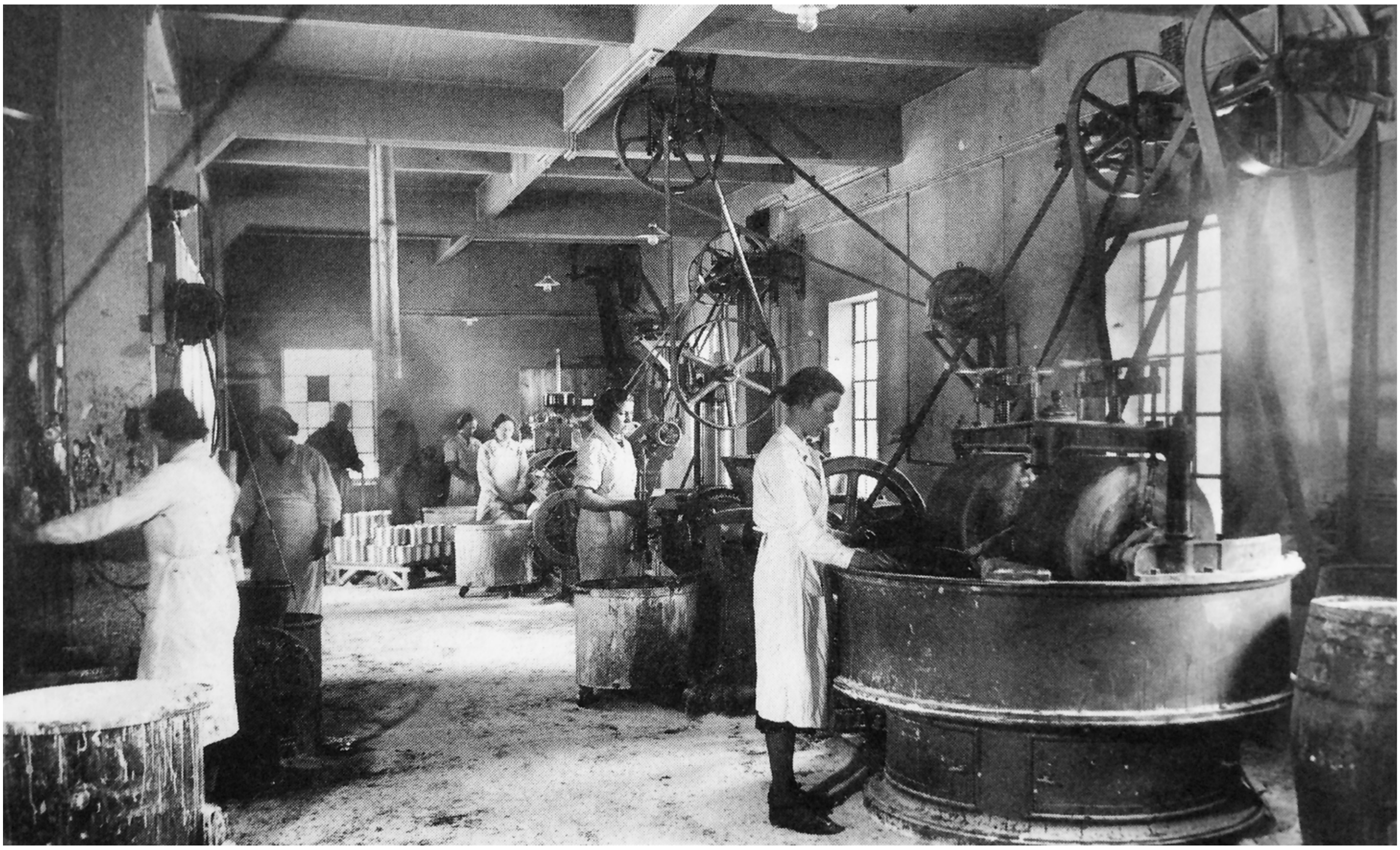


Fig. 39a – Paint factory Harpa, ca. 1950s. The ribbed slabs and the typical Hennebique continuity between the pillar and the beam are evident. Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 75.

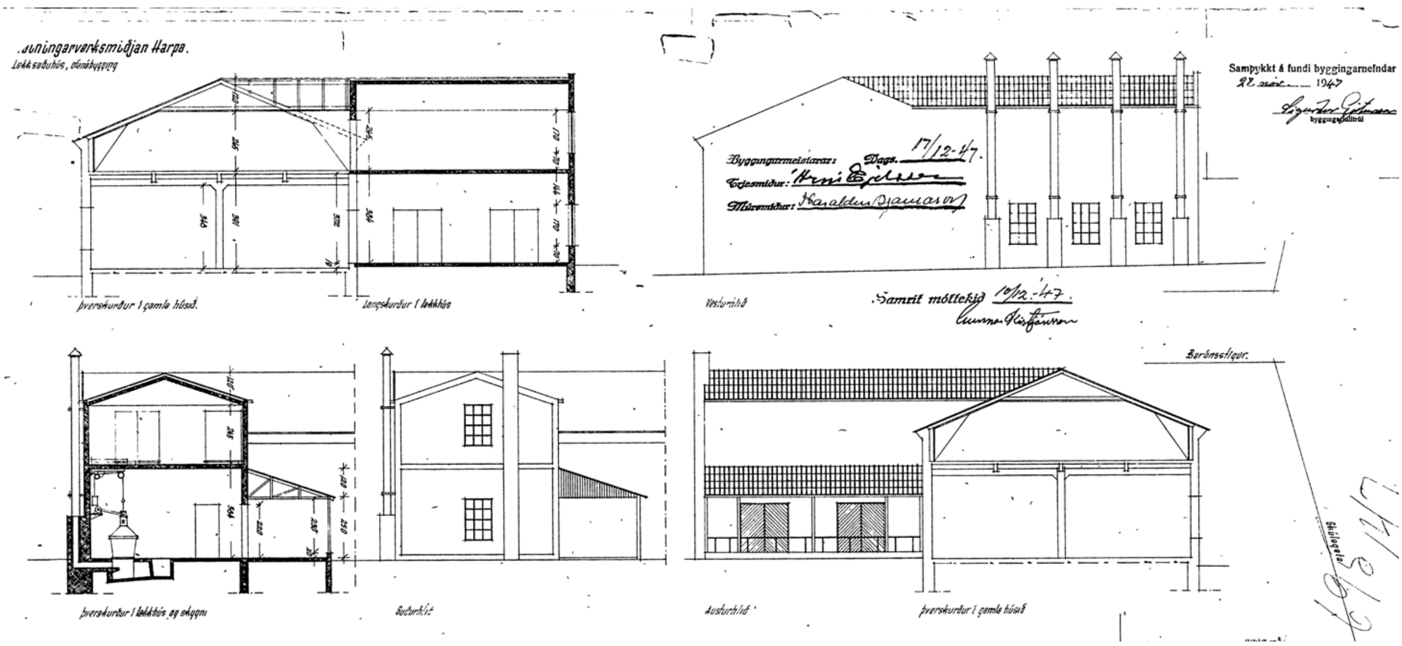


Fig. 39b – Drawings of the paint and varnish factory Harpa. Section of the “old bulding”. 27 November 1947. Teikningavefur Reykjavíkurborgar.

railway connection between Reykjavík and Selfoss.[195] **Figg. 41a–41d.** Krabbe's vast network of professional relations emerges from the copies of his letters, collected in a book covering the years 1906–1909.[196] His connections to Denmark's reinforced concrete construction might have stemmed from his use of concrete in building of piers and breakwaters for Icelandic harbours. In those years, in fact, Krabbe's letters attest that he was working on the harbours of Ísafjörður, Akureyri, and the Westman Islands, among others. Moreover, Krabbe was also consulted by Iceland's Ministry Office regarding the issues of earthquakes and structural improvements. Interestingly, in February 1909 he mentioned a request made by the Ministry of Iceland for him to comment on the news of the tragic earthquake that struck southern Italy on 28th December 1908.[197]

What may truly attest to Krabbe's role as the "moving spirit" behind the use of the Hennebique method at *Iðunn* are two copies of letters sent by the engineer. The first, dated 10th November 1906 and sent to an atelier in Copenhagen, mentions a drawing to be reproduced in two copies, then sent to Christiani & Nielsen, and to the mastermason Carl Schiötz – who, as we have seen, were both Hennebique concessionaires in Denmark.[198] It is therefore likely that Krabbe provided his project for the reconstruction of the wool factory, and then asked the Hennebique firms to produce the authorized version of the structural design.[199] The second letter is dated 17th April 1907, when probably the "Danish experts" were already working on the reconstruction of the factory in Reykjavík. Krabbe wrote to the commission in charge of the construction of the National Library in Reykjavík and on behalf of the *Iðunn* factory. The engineer suggested that the commission hire two "workers" who had already been employed by *Iðunn* to build the library's reinforced concrete slabs.

---

[195] Eventually, Iceland never built a railway network, with the exception of a small rail used during the construction of the Reykjavík harbour in 1917. Krabbe mentioned the issue in his book: Krabbe, *Island og dets tekniske udvikling*, 66–71. For an overview of Iceland's railway proposals between 1894 and 1930, see: Þórður Atli Þórðarson, "Land án járnbrauta. Tilraunir Íslendinga til járnbrautvæðingar," Bachelor Thesis in History, University of Iceland, September 2011. See also: Þorleifur Þorleifsson, "Járnbrautin í Reykjavík 1913–1928," *Saga* 11, no. 1 (1973): 116–61. On Krabbe's work in the construction of lighthouses, see: Thorvald Krabbe, *A Few Remarks on Icelandic Lighthouse Practise* (Reykjavík: Iceland Lighthouse Service, 1932).

[196] ÞÍ. VHS. B-BDA 1. *Bréfabók landsverkfræðings* 1906–1909. See also in: ÞÍ, Stjórnarráð Íslands II, *Skrifstofa* 0000 B/59. Örk. 8. Db. 2, nr. 570. *Beiðnir um aðstoðarverkfræðing (fjárlög 1908/1909, 16 grein 10).* 1636/1910.

[197] ÞÍ. VHS. B-BDA 1. *Bréfabók landsverkfræðings* 1906–1909, 932. 27 February 1909. From Messina to Reykavík, the 1908 earthquake was at the same a truly tragic and exceptional event that opened to a continental debate on construction matters, and led to a number of improvements on reinforced concrete methods, particularly regarding the Hennebique patent. See: Ornella Fiandaca, *Le béton armé "système Hennebique" a Messina fra XIX e XX secolo: dalle sperimentazioni pre-terremoto del brevetto alle sue declinazioni antisismiche* (Ariccia: Aracne, 2014).

[198] ÞÍ. VHS. B-BDA 1. *Bréfabók landsverkfræðings* 1906–1909, 102. 10 November 1906.

[199] Since the name of the project is not mentioned in the letter, one may suggest that Krabbe was dealing with the drawings for the Fnjóská bridge. Although this is a plausible option, the active presence of Krabbe is, however, more certain regarding the reconstruction of *Iðunn*, while it was Jón Þorláksson who played a prominent role in the coordination of the works at the Fnjóská bridge. What is sure is that Christiani & Nielsen signed the project for the bridge, while instead the project for the factory might have been designed by Krabbe and proposed to both concessionaires before accepting the best deal.

Fig. 40 – Thorvald Krabbe, Ísafjörður, July 1922. Þjóðminjasafn Íslands/National Museum of Iceland.

Some of Thorvald Krabbe's photographs taken around the country.
Fig. 41a – The lighthouse Rifstangaviti, 1911; **Fig. 41b** – A telephone station in Siglufjörður, 1916; **Fig. 41c** – A pier in the Westman Islands, 1922; **Fig. 41d** – Concrete bridge in Stykkishólmur, ca. 1920s. Þjóðminjasafn Íslands/National Museum of Iceland.

These workers should not have been paid more than the regular price for a mastermason in Reykjavík; Krabbe attested that for their work at *Iðunn* they had been paid 500kr.[200] If the former letter confirms some direct connections between Krabbe and Hennebique concessionaires in Denmark, the latter highlights an interesting fact: the Hennebique patent was used, or at least proposed, for the construction of Iceland's "finest building"[201] and also the last structure designed by a Danish architect – the National Library and Museum in Reykjavík (see further in this chapter). Furthermore, it is also important to consider that in the same year – 1907 – reinforced concrete was first taught in a series of lectures at the Polytechnic School of Copenhagen by Danish engineer Edouard Suenson. The developments of the technique in Denmark were soon mirrored in its first uses in the remote Icelandic context.[202]

Despite evidence derived from Icelandic sources, the Hennebique archives hold no mention of the rebuilding of *Iðunn*, nor of the bridge over the Fnjóská river.[203] When it comes to the bridge, the drawings attest that Christiani & Nielsen were operating as concessionaires of the Hennebique patent. The same cannot be said, however, for the rebuilding of *Iðunn*, as it was not possible to find the original drawings. Although it is impossible to be entirely sure of an official use of the Hennebique patent in the factory, in July 1907 the journal *Le Beton Armé* mentioned a project for a "plancher de filature", under the direction of the concessionaire C. Schiötz in the "bureau de Copenhague". Perhaps it was the factory *Iðunn*, for the first time pulling Iceland closer to the centre of the European building technology. Perhaps, however, the project was never considered by the Hennebique offices, as it was far too humble compared to what the enterprise had been doing in the continent. However, no matter how small the building was, it represented a huge step ahead for the country's "technical development", as positively photographed by Thorvald Krabbe during his travels around the country. **Fig. 42.**

---

[200] ÞÍ. VHS. B-BDA 1. *Bréfabók landsverkfræðings* 1906–1909, 387. 17 April 1907.

[201] "Veglegasta og vandaðasta steinhús þessa lands" [The finest and best concrete building of this country]. The words are by Jón Jakobsson, "Landsbókasafnið," *Lögrétta* 4, no. 16 (31 March 1909): 61–62. See also: Pétur H. Ármannsson, "'Veglegasta og vandaðasta steinhús þessa lands'. Safnahúsið frá sjónarhóli íslenskrar húsagerðarsögu," in *Safnahúsið 1909–2009: Þjóðmenningarhúsið*, edited by Eggert Þór Bernharðsson (Reykjavík: Þjóðmenningarhúsið, 2009), 20–35.

[202] See the lecture by Louise Karlskov Skyggebjerg, "E. Suenson og tidlig materialelære i Danmark," *Historisk Beton* lecture series, https://www.youtube.com/watch?v=WTT8Rbf7U_g, 1:06:41, last accessed 20/11/2020.

[203] As this chapter is being written, the Hennebique Archives at *La Cité de l'architecture et du patrimoine* in Paris are being reordered, thus the online inventory is only partial. There seems to be no mention to any of the discussed projects, not even in the archival section listing the unidentified projects. Also Guðmundur Hannesson, however, refers to the Hennebique patent when describing the project of *Iðunn*. See: Guðmundur Hannesson, *Húsagerð á Íslandi*, 252.

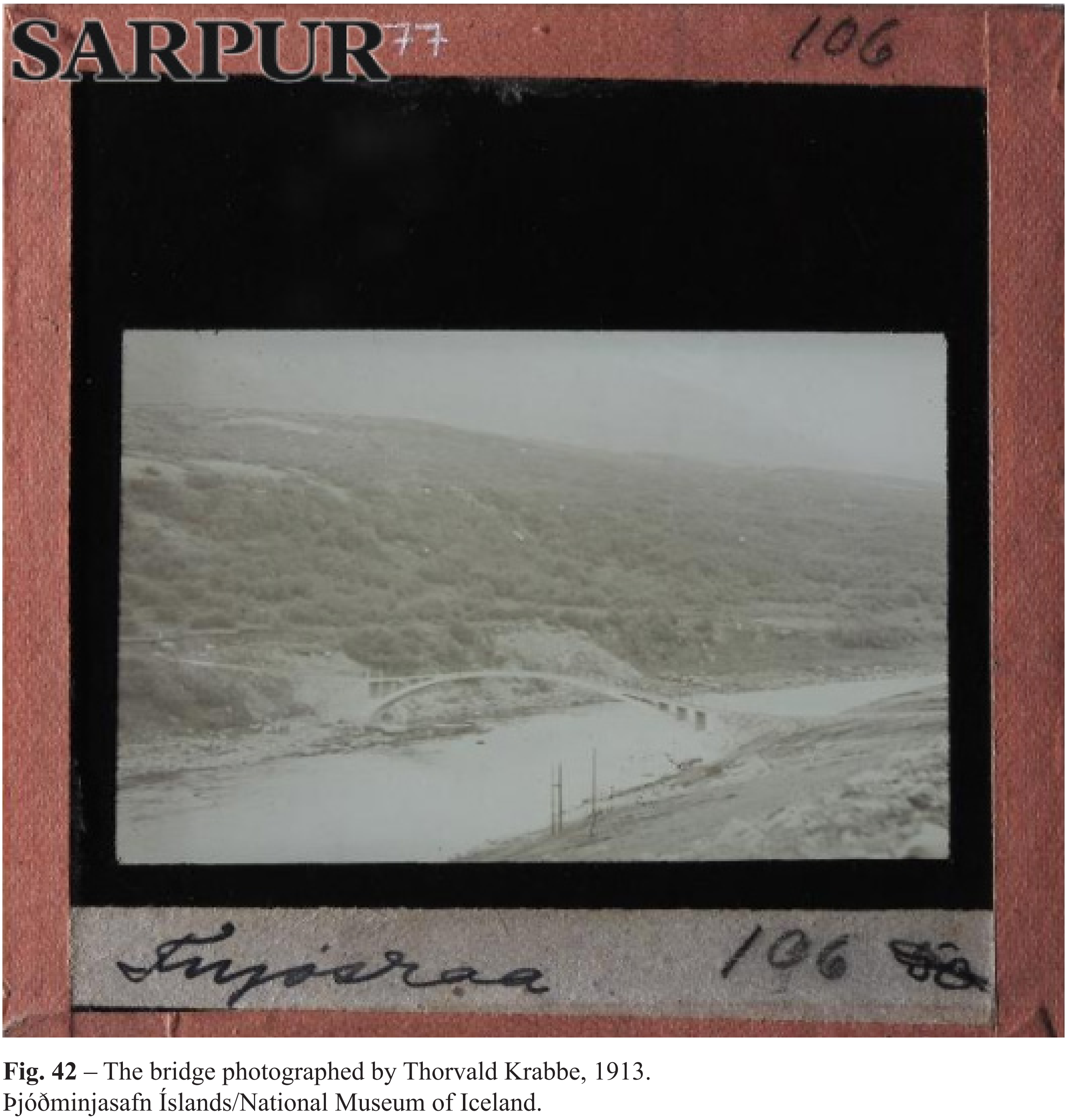


Fig. 42 – The bridge photographed by Thorvald Krabbe, 1913.
Þjóðminjasafn Íslands/National Museum of Iceland.

2.1.5 The foundation of the Icelandic Engineers' Society (1912)

This chapter has presented the specific contribution of single engineers working more or less independently from one another. The focus has been on the professional activity of those who were involved in the modernization process of Icelandic concrete construction. The aim of this paragraph is to briefly explain the state of the engineering profession in Iceland by the early 1910s, approximately ten years after the beginning of the "concrete age". Despite the differences, Sigurður Pétursson, Knud Zimsen, Jón Þorláksson, and Thorvald Krabbe were civil engineers who specifically devoted their careers to the construction of infrastructures and the improvement of Iceland's building traditions, but clearly they were not the only Icelandic engineers working in the country. While they were researching local building materials or importing Danish cement, the number of engineers around them had rapidly increased. By the early 1910s, Iceland's youngest profession was finally represented by a sufficient number of members, who required specific regulation as well as a debating platform for their work and discoveries. What they did was follow the example of their Danish colleagues – in 1912, twelve engineers and one architect founded the Icelandic Engineers' Society.[204] **Fig. 43.** The first members of the Society were a mixed group of individuals, representing the different specializations of the profession. Among its members were Sigurður Thoroddsen, Knud Zimsen, Jón Þorláksson, and Thorvald Krabbe, together with other civil engineers, but the list also included one chemical engineer, one mechanical engineer, and two experts in telegraph communication.

It is also worth mentioning that architect Rögnvaldur Ólafsson was one of the Society's founding members. Already presented as an aspiring architect at the beginning of this chapter, he trained as an architect at *Det Tekniske Selskabs Skole* in Copenhagen. He did not graduate due to health problems, but by 1912 he had already designed a number of buildings all over Iceland, as the country's consultant for public buildings. His presence among the members of the Engineers' Society explains a lot about the small Icelandic community in the 1910s, and about the strong connections between each of its educated experts. Rögnvaldur Ólafsson's importance in the Icelandic "concrete age" was a consequence of his personal relations with Icelandic engineers, who regarded the architect as one of them. Just like the engineers, Rögnvaldur Ólafsson was playing a pivotal role in the modernization of the country, which was the Society's foremost goal. As claimed by the Society's charter, the main aim was to "strengthen the partnership between engineering experts in Iceland".[205]

[204] *Verkfræðingafélag Íslands*. The first president of the Society was Jón Þorláksson. On the first fifty years of the Society, see: Jón Guðnason, *Verkfræðingafélag Íslands: 1912–1962* (Reykjavík: Verkfræðingafélag Íslands, 1962).

[205] "Tilgangur fjelagsins er að efla fjelagslyndi meðal verkfróðra manna á Íslandi". "Lög fjelagsins," *Ársrit Verkfræðingafélags Íslands 1912/1913* 1 (1914): 3.

Following this trend, in 1919 the Society also included the young architecture graduate and future State architect Guðjón Samúelsson as one of its members.[206]

Beyond the diverse education of its affiliates, the open-minded approach of the Icelandic Engineers' Society can also be seen in the pages of its journal. The engineers first published a short yearly report, then in 1916 they launched the fully established *Journal of the Engineers' Society of Iceland*, which became the printed tool for debating on Icelandic infrastructural needs.[207] Since its first issues, the journal was edited similarly to the Danish journal *Ingeniøren*, from which it was clearly influenced. The background of the Icelandic engineers was their Danish Polytechnic education, and the majority of the Icelandic Society's members were also affiliated with the Danish Society. The Icelandic journal published reports from the Society's meetings, lectures held by prominent members or foreign engineers, articles, book reviews and continuous updates about Icelandic infrastructural progress. **Figg. 44a–44b.** From the very beginning, the journal had an international stance, publishing articles in Icelandic and Danish, often providing translations to English, French, and German, thus opening the local debate to the world. As reported on the first issue of the journal, the Icelandic Society was in connection with several engineering and architecture societies in various countries, such as Denmark, Norway, Sweden, Finland, Germany, and Austria. This open-minded internationality is the same characteristic which emerged from Knud Zimsen's or Thorvald Krabbe's letters, written in several languages and sent from Iceland to Europe and the United States. Another example of the engineers' international approach can be found in the texts collected at the National Library, such as Frank B. Gilbreth's *Concrete System* (1908).[208] This cosmopolitan approach was surely at the core of the building of a country that longed for faster connections and better trade. **Fig. 45.**

Given the growing importance which concrete had in Icelandic construction since the beginning of the twentieth century, it is not surprising to see an impressive number of articles dedicated to cement, reinforced concrete, and concrete aggregates, published in the Society's journal since the very first issues. The journal encouraged a truly scientific dialogue regarding building materials, which apparently outdistanced the rural experiments taking place in the countryside. Already in its first meetings, the Society invited a few Danish engineers to give some lectures on the use of reinforced concrete for underwater constructions, in relation to the project for the harbour of

206 "Nýr fjelagsmaður," *Tímarit Verkfræðingafélags Íslands* 4, no. 3 (1919): 32.

207 Respectively: *Ársrit Verkfræðingafélag Íslands* (1912/1913–1914), and *Tímarit Verkfræðingafélags Íslands* (1916–).

208 Frank B. Gilbreth, *Concrete System* (New York: The Engineering News Publishing Company, 1908). The book deals with concrete construction from both technical and economical points of view. According to the loan tag still present in the copy of the book at the National Library of Iceland, the book was borrowed by Jón Þorláksson in 1915.

I. Stofnun Verkfræðingafjelags Íslands og störf þess.

1. Stofnun.

Verkfræðingafjelag Íslands var stofnað á fundi sem haldinn var á Hótel Reykjavík föstudaginn 19. apríl 1912. Voru þar 13 verkfræðingar og aðrir verkfróðir menn saman komnir. Voru þeir:

Ásgeir Torfason,
Benedikt Jónasson,
O. Forberg,
M. E. Jessen,
Jón Ísleifsson,
Jón Þorláksson,
Th. Krabbe,
Rögnvaldur Ólafsson,
P. Smith,
Sig. Thoroddsen,
K. Zimsen,
G. Zoëga,
Þórarinn Kristjánsson.

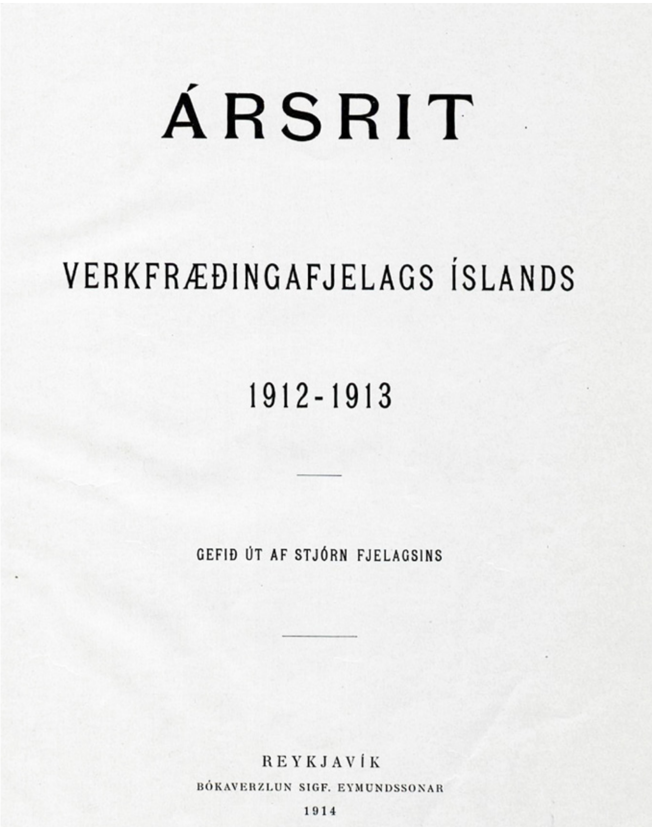
Fundarstjóri var K. Zimsen, ritari Rögnvaldur Ólafsson. Lagafrumvarp lá fyrir, er samið höfðu Jón Þorláksson, Th. Krabbe og P. Smith. Var það samþykkt með nokkrum smábreytingum, og var með því fjelagið stofnað. Gengu allir fundarmenn í fjelagið.

Formaður fjelagsins var kosinn Jón Þorláksson, í stjórn þess: Th. Krabbe, Rögnvaldur Ólafsson og P. Smith. Endurskoðendur voru kosnir: Sig. Thoroddsen og G. Zoëga.

Á fyrsta stjórnarfundi skifti stjórnin verkum þannig, að varaformaður var Th. Krabbe, ritari Rögnvaldur Ólafsson, fjehirðir P. Smith.

Stofnun fjelagsins var þegar tilkynnt ýmsum útlendum fjelögum.

Fig. 43 – List of the Society's founding members; *Ársrit Verkfræðingafélags Íslands* 1912/1913, 3.



ÁRSRIT

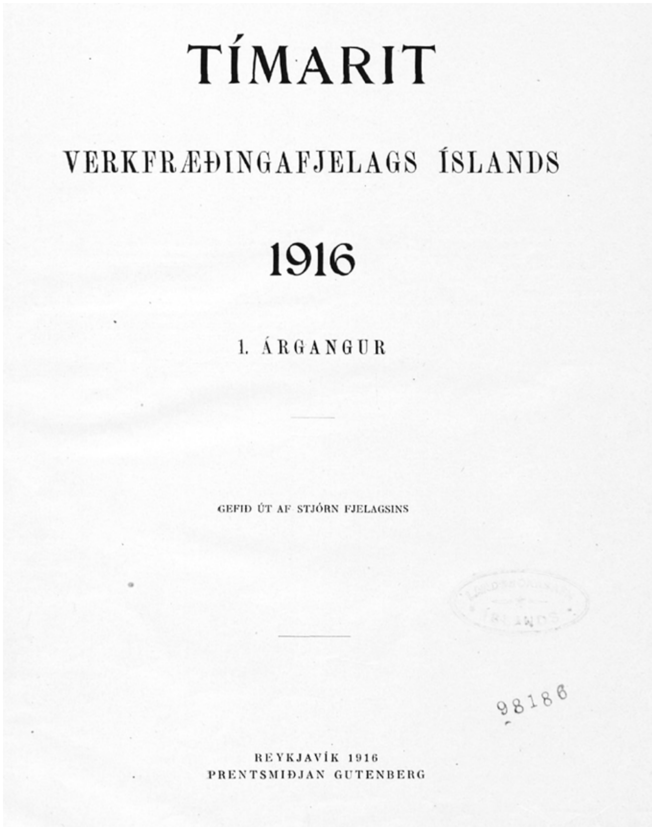
VERKFRÆÐINGAFJELAGS ÍSLANDS

1912-1913

GEFIÐ ÚT AF STJÓRN FJELAGSINS

REYKJAVÍK
BÓKAVERZLUN SIGF. EYMUNDSSONAR
1914

Fig. 44a – Cover of *Ársrit Verkfræðingafélags Íslands* 1912/1913.



TÍMARIT

VERKFRÆÐINGAFJELAGS ÍSLANDS

1916

I. ÁRGANGUR

GEFIÐ ÚT AF STJÓRN FJELAGSINS

98186

REYKJAVÍK 1916
PRENTSMIÐJAN GUTENBERG

Fig. 44b – Cover of the first issue of the Society's journal. *Tímarit Verkfræðingafélags Íslands*.

Reykjavík – one of the biggest infrastructural projects of the town at the beginning of the century.[209]

In 1916 the Society published the "Standard Specification for the Sale and Testing of Portland Cement", written by the Society's Cement Commission, at the suggestion of Knud Zimsen.[210] The short text, available in Icelandic, Danish, German, and English, was divided into five articles that defined the properties of cement to be sold and employed for building in Iceland. As ordinary as it may seem, this standard specification highlighted a huge gap between the engineers' progressive attitude towards the modernization process of architecture, and a building tradition which was still extremely poor and rural.[211] **Fig. 46.** The same issue also contained an article titled "Icelandic Aggregates", whose aim was to present the results of a few tests run on Icelandic sand and gravel samples.[212] The tests were conducted in Copenhagen by engineer Niels Christensen Monberg (1856–1930), with samples collected on the Skólavörðurholt hill in Reykjavík, and in the Westman Islands. This short text marked the beginning of a four-decades long series of trials, tests, and research on Icelandic natural resources towards the fully independent production of concrete. If cement had just become a matter of regulations and tests, the journal was going to become the stage for the most heated debate of the Icelandic concrete *saga*: the building of Iceland's first cement plant (see the epilogue in chapter four).

What can be observed, from the pages of the journal's first issues, is a small group of experts and technicians who had been educated abroad, had been exposed to an international network of studies and research, and who would now use their knowledge to create a better future for their own country. Unsurprisingly, some of these people would become prominent political figures, such as Knud Zimsen and Jón Þorláksson. Already by 1916, Icelandic engineers were far ahead of the times and far better connected to the continent than many of their fellow citizens. Thanks to the small dimensions of the Icelandic context, it was possible to briefly retrace the history of the engineering profession, and to single out some individuals and their particular roles in the development of a body of technical knowledge around concrete and cement. Their accomplishments and failures characterized the first fifteen years of the century, at the dawn of the Icelandic "concrete age". The Society's journal published

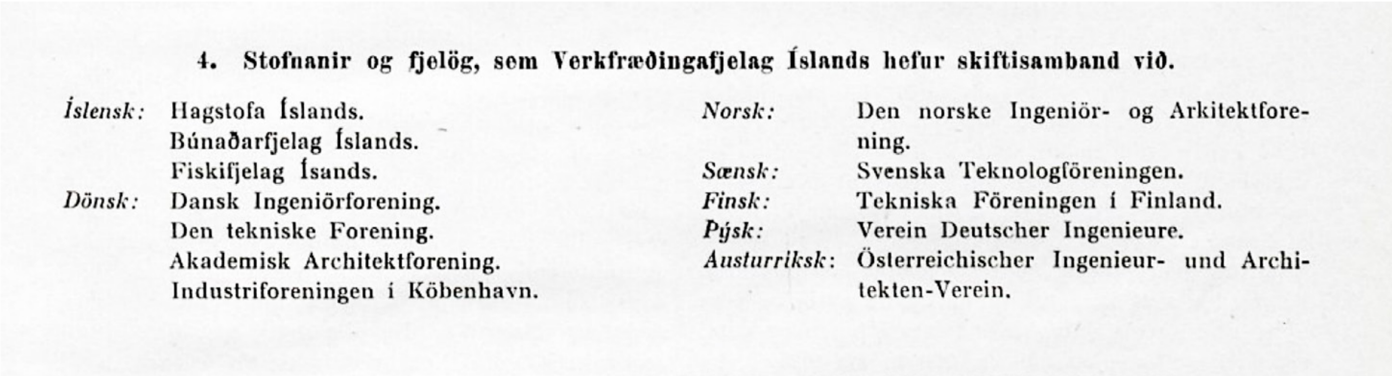
---

[209] In 1912 and 1913, both Danish engineer C. Bech and his colleague Chr. Petersen visited Reykjavík and discussed about the issue. C. Bech, "Jærnbeton, særlig dets Anvendelse ved Vandbygningsarbejder," *Ársrit Verkfræðingafélags Íslands 1912/1913*, 6–7; see also the list of the Society's activities: "Fundarhöld" [Meetings], *Ársrit Verkfræðingafélags Íslands 1912/1913,* 4. The first works related to the harbour in Reykjavík took place in 1912–17, then the harbour was continuously enlarged until the postwar years. See: Krabbe, *Island og dets tekniske Udvikling*, 161–69. On the construction of the harbour in Reykjavík and other harbours in the Faxaflói bay, see: Guðjón Friðriksson, *Hér heilsast skipin: saga Faxaflóahafna* (Akranes: Uppheimar, 2013).

[210] The nomination of a cement commission was proposed by Knud Zimsen, as reported in: "Önnur störf," *Ársrit Verkfræðingafélags Íslands 1912/1913*, 5.

[211] "Reglur Verkfræðingafélags Íslands um sölu og prófun Portland-sements," *Tímarit Verkfræðingafélags Íslands* 1, no. 1 (1916): 3–7.

[212] Mayntz Petersen, "Íslenzkt steypuefni," *Tímarit Verkfræðingafélags Íslands* 1, no. 1 (1916): 13–16.



4. Stofnanir og fjelög, sem Verkfræðingafjelag Íslands hefur skiftisamband við.

Íslensk: Hagstofa Íslands.
Búnaðarfjelag Íslands.
Fiskifjelag Ísands.

Dönsk: Dansk Ingeniörforening.
Den tekniske Forening.
Akademisk Architektforening.
Industriforeningen i København.

Norsk: Den norske Ingeniör- og Arkitektforening.

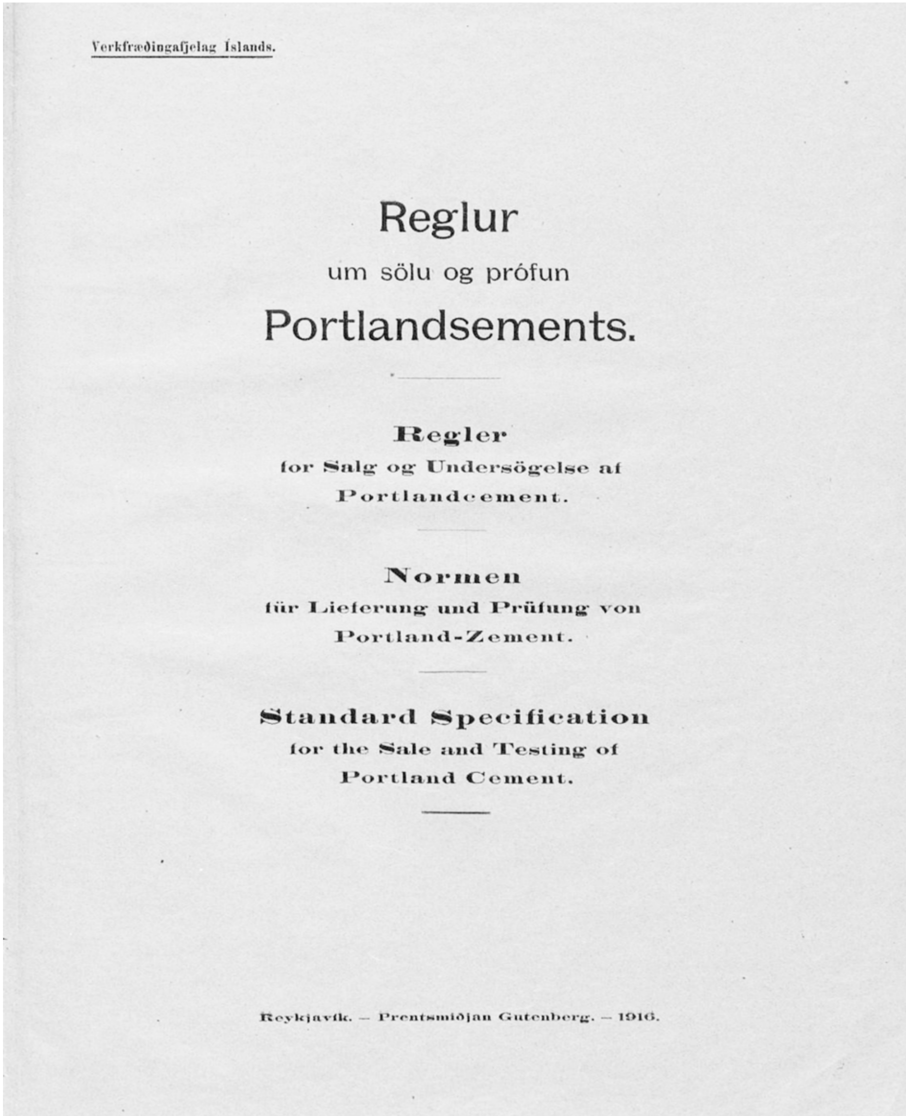
Sænsk: Svenska Teknologföreningen.

Finsk: Tekniska Föreningen i Finland.

Þýsk: Verein Deutscher Ingenieure.

Austurríksk: Österreichischer Ingenieur- und Architekten-Verein.

Fig. 45 – Icelandic and foreign societies in connection with the Engineers' Society of Iceland. *Tímarit Verkfræðingafélag Íslands* 1, no. 1 (1916): 7.



Verkfræðingafjelag Íslands.

Reglur
um sölu og prófun
Portlandsements.

Regler
for Salg og Undersögelse af
Portlandcement.

Normen
für Lieferung und Prüfung von
Portland-Zement.

Standard Specification
for the Sale and Testing of
Portland Cement.

Reykjavík. — Prentsmiðjan Gutenberg. — 1916.

Fig. 46– *Standard Specification for the Sale and Testing of Portland Cement*, Reykjavík, 1916.

an obituary for every deceased member, remembering his activities and milestones. One word was repeatedly used in many obituaries dedicated to the engineers of this history: *brautryðjandi*, literally a "trailblazer", a pioneer.[213]

2.2 New Rules and Public Buildings for Reykjavík

The first years of Iceland's "concrete age" were not only future-oriented years of technical development and engineering experimentations. For what concerned architecture, the first decade of the twentieth century was a turning point that merged late nineteenth-century influences, recent industrial progress, and a growing political autonomy. It was the moment when the last public buildings designed and supervised by Danish professionals were built in Reykjavík. At the same time, with the establishment of the Icelandic Home Rule, Iceland's departure from Denmark's political sphere matched with the opening of a new position, the consultant for public buildings. The country's first architecture student Rögnvaldur Ólafsson was appointed to this role in 1906.[214] As a result, the emergence of both architectural and engineering professions allowed the construction of buildings that were locally designed and proudly built by Icelandic workers. Furthermore, the "age of concrete" had legislative outcomes, which resulted in the first building code for Reykjavík published in 1903. Supervised by Knud Zimsen, the code was the starting point for all future construction rules of the country. Its future modifications triggered a widespread use of concrete both in Reykjavík and in the countryside, especially after the great fire that destroyed the capital's centre in 1915.

2.2.1 The last Danish buildings (1899–1909)

Between 1899 and 1909, three major public buildings appeared in Reykjavík: the banks *Landsbanki* (1896–99) and *Íslandsbanki* (1904–06), and the National Museum and Library known as *Safnahúsið* (1906–09). They were the heritage of Iceland's dependency from Danish architects, mastermasons, and building knowledge in general. However, these three projects characterized the end of an era and at the same time marked some very important steps in the process of creating an Icelandic working class within the construction industry. Before describing their role in the development of Icelandic architecture, it is important to explain why these buildings are referred to as "Danish". As a matter of fact, only recent historiography has highlighted the architects' nationality when researching these projects.[215] This is the

[213] See the following obituaries: Geir Zoëga, "Jón Þorláksson," *Tímarit Verkfræðingafélags Íslands* 20, no. 1 (1935): 1–2; Steingrímur Jónsson, "Knud Zimsen," *Tímarit Verkfræðingafélags Íslands* 38, no. 4 (1953): 95–96; Emil Jónsson, "Thorvald Krabbe," *Tímarit Verkfræðingafélags Íslands* 38, no. 5 (1953); Geir Zoëga, "Sigurður Thoroddsen," *Tímarit Verkfræðingafélags Íslands* 40, no. 6 (1955): 89–90.

[214] Björn G. Björnsson, *Fyrsti arkitektinn*, 18.

[215] See for example: Guðný Gerður Gunnarsdóttir, and Hjörleifur Stefánsson, *Kvosin*, 288; Hörður Ágústsson, *Íslensk byggingararfleifð I,* 307; Seelow, *Die moderne Architektur in Island in der ersten*

case of early stone buildings from the late eighteenth century, and also that of the Cathedral of Reykjavík. Usually such projects were signed by architects who had never visited the country, and sketched low-profile versions of traditional Danish or eclectic European architecture.[216] Despite some contrasts in the reception of the Danish materials for the construction of the cathedral in Reykjavík, the nationality of a project was less an issue of debate in the local newspapers than it is today a label for historians. Today the "Danish" or "Icelandic" tag on a building only serves the purpose of locating the design in a very precise timeframe, that is the first decade of the twentieth century – exactly when an Icelandic professional group of architects, engineers and building experts emerged.

The national boundaries of architecture had become slightly blurred already since the construction of the house of parliament. Although the project was a creation of Danish architect Ferdinand Meldahl, overseen by Danish mastermason Bald, the building site was full of local builders and, as seen in chapter one, it became a practical school for the Icelanders active in the construction field. Almost twenty years after the inauguration of the Parliament, by the late 1890s Iceland was becoming politically and technically more independent. Through the construction of the two banks and of the National Library, it is possible to detect the increasing role of Icelandic manpower in the building phase, and also the greater importance of Icelandic construction experts in the public debate. Although designed and supervised by Danish technicians, each of the three buildings marked one step forward in the development of Icelandic construction industry and its decisional autonomy.

Reykjavík's banks: *Landsbanki* and *Íslandsbanki*

Between 1899 and 1906, two banks were built in the heart of Reykjavík's city center, as headquarters of Iceland's oldest bank institutions: The National Bank [*Landsbanki*] (1896–99) and the private bank *Íslandsbanki* (1904–06).[217] The two buildings rose on the same street, Austurstræti, not far from the house of parliament and the cathedral. Their close locations constituted a financial core in the small city centre. **Fig. 47.** Although the two were independent institutions, both architectural projects were signed by the same Danish architect, Christian Laurits Thuren (1846–1926). Thuren's work was largely influenced by his historicist and eclectic education;

Hälfte des 20. Jahrhunderts, 56–57; Pétur H. Ármannsson, "'Veglegasta og vandaðasta steinhús þessa lands'. Safnahúsið frá sjónarhóli íslenskrar húsagerðarsögu", 20–25.

[216] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 50. The only exception to the physical absence of Danish architects in Iceland was Laurits Albert Winstrup, who travelled to Reykjavík before the restoration and expansion of the cathedral in 1846. See: Ida Haugsted, "L. A. Winstrups rejse til Island," *Architectura* 20 (1998): 67–93.

[217] The National bank was founded in 1885 as the first banking institution of Iceland. *Íslandsbanki* followed in 1903 as a private institution. See: Pétur Hrafn Árnason, and Sigurður Líndal, eds., *Saga Íslands X*, 58–60.

Fig. 47 – View on the street Austurstræti, ca.1905–25. The first building on the right is *Íslandsbankinn*; further and still on the right is the National Bank. Þjóðminjasafn Íslands/National Museum of Iceland.

this was also reflected in his banks in Reykjavík.[218] These tiny bank institutes were designed according to the widespread "convenient eclecticism" – as defined by architectural historian Sergio Pace – that suited most of nineteenth-century European banks.[219] In particular, the most common reference was that of the Florentine *palazzo*, designated the highest symbol of banking reliability and solidity.[220] In this peripheral case, Thuren's projects did not refer directly to Italian models, but most probably had been first inspired by their Danish versions. As suggested by Seelow, Thuren might have been inspired by the building of the Denmark's National Bank designed by Johan Daniel Herholdt (1818–1902) in 1865–70, and also by Meldahl's house of parliament in Reykjavík. For the scope of this research, these buildings will not be considered for their architectural features, but for their being a true catalogue of technical solutions that were almost novelties in Iceland. Both institutes were quite small: the National Bank was two-stories high, while *Íslandsbanki* was limited to one ground floor. Both buildings were expanded in the following decades.[221] **Figg. 48a–49b.**

The construction of the National Bank was overseen by Frederik Bald's son Valdemar (1872–1921).[222] By the early 1900s, the Bald family had established a building firm active both in Iceland and in the Faroe Islands, specialized in public buildings such as schools, lighthouses, hospitals, prisons, and banks.[223] As for the structure of the building, the walls were mainly composed of Dolerite ashlars. These ashlars only emerged as rusticated quoins, yet the rest of the façade was covered by a thick layer of plaster with carvings that imitated the position of the stone blocks. This resulted in an overall rusticated façade, a choice that was undoubtedly linked to the need to represent the institution's firmness through its architecture.[224] As an absolute novelty in the Icelandic context, the slabs were made in steel girders covered by a layer of concrete, and a central heating system was installed.[225] The final outcome was a sober and elegant building, not so different from its references in the continent.

---

[218] Thuren had been a student of architect and Royal Academy of Arts teacher Johan Henrik Nebelong (1817–1871). Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 56.

[219] Sergio Pace, *Un eclettismo conveniente. L'architettura delle banche in Europa e in Italia, 1788–1925* (Milano: FrancoAngeli, 1999), 17.

[220] Pace, *Un eclettismo conveniente*, 68.

[221] The National Bank was largely damaged by the great fire of 1915. In 1923 the building was restored by State architect Guðjón Samúelsson, who added an extra storey and also enlarged the planimetric layout. A further modernist extension was added by Gunnlaugur Halldórsson in 1934–38. See: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 340–41; Guðný Gerður Gunnarsdóttir, and Hjörleifur Stefánsson, *Kvosin*, 111. *Íslandsbanki* was instead almost completely transformed in 1962 when four storeys were added on top of the original building. See: Guðný Gerður Gunnarsdóttir, and Hjörleifur Stefánsson, *Kvosin*, 127.

[222] "Bankastjóri," *Ísafold* 25, no. 6 (2 February 1898): 21.

[223] Ida Haugsted, "Tømrer- og bygmester Bald & Søn på Island og Færøerne," *Architectura* 36 (2014): 26–53.

[224] Pace, *Un eclettismo conveniente*, 69.

[225] "Myndirnar," *Sunnanfari* 8, no. 3 (1 June 1900): 22; Guðný Gerður Gunnarsdóttir, and Hjörleifur Stefánsson, *Kvosin*, 110–11; Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 56.

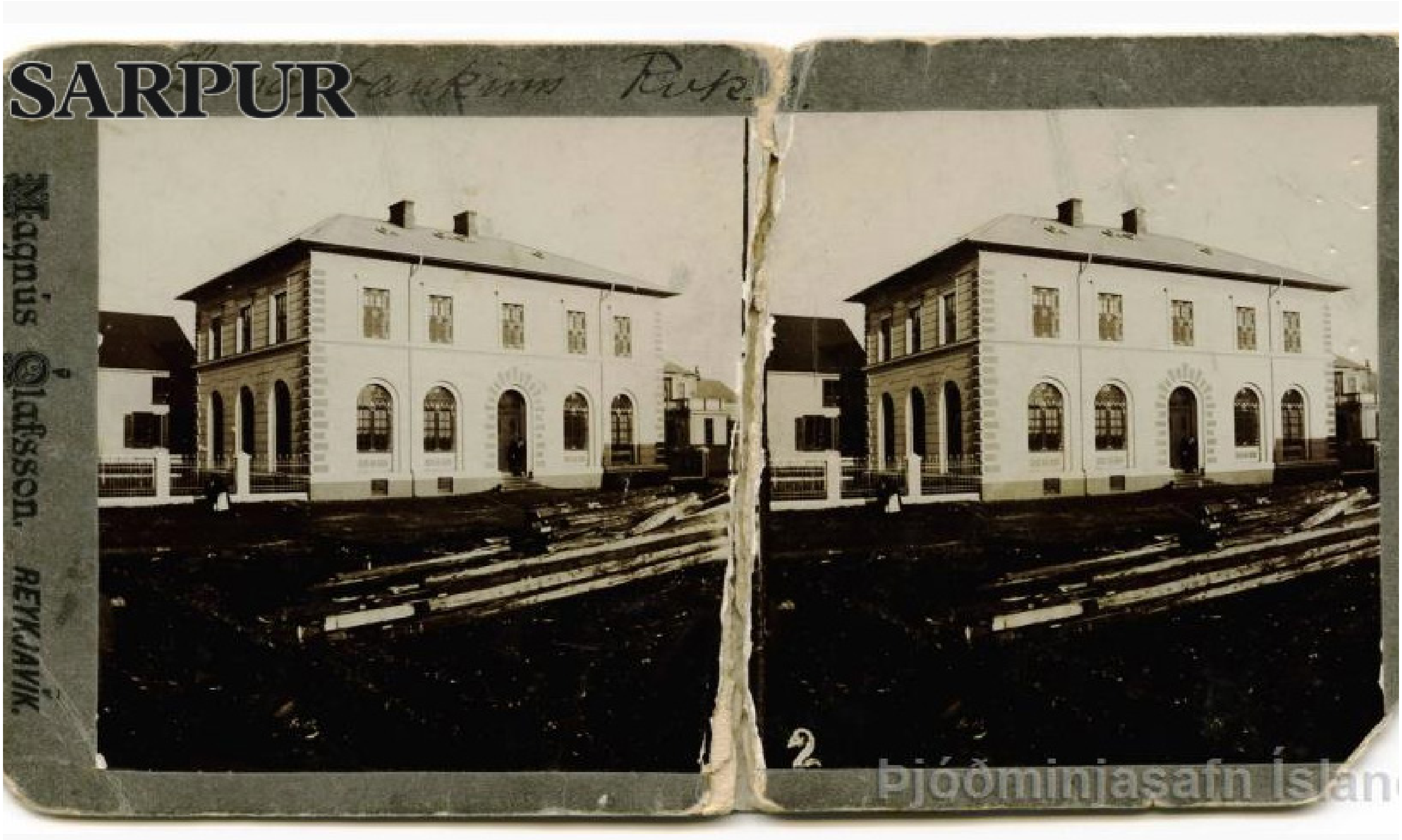


Fig. 48a – The National Bank, ca. 1899–1910. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 48b – *Íslandsbankinn*, ca. 1905–20. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 49a – The National Bank today with the extension by Gunnlaugur Halldórsson. Photo by Sofia Nannini, 2019.

Fig. 49b – *Íslandsbankinn* today. Photo by Sofia Nannini, 2019.

Yet, if European banks were characterized by architectural understatement and austerity, that should have matched with the ethical qualities of banking institutions, the building of the National Bank generated much awe among the inhabitants of Reykjavík. When the works came to an end, the building was welcomed as one of the "beauties in town",[226] and also as "the finest and best building of the country".[227] **Figg. 50a–50b.**

A few years later, Thuren was commissioned another project, this time for the private bank *Íslandsbanki*. The original project, dated January 1905, comprised an elegant, two-storey building with a double entrance. Both entrances were marked by Doric columns supporting pediments, and the façade was all covered by roughly rusticated stone ashlars. Quite interestingly, the building's execution turned out to be quite different than expected, and this was mainly because of local decision-making that interfered with Thuren's preliminary proposal. First, it was perhaps considered too big and too expensive: by February 1905, Thuren sent a smaller version of the original project, only one-storey high. **Figg. 51a–51b.** Evidently the architect did not supervise the construction, which was directed by a Danish mastermason named Halvorsen. Thuren's drawings do not mention the materials to be employed in the project, with the exception of steel girders for the ground and the first floors, and timber beams for the top floor and the roof. At first, local newspapers reported that the foundations were to be in concrete, and the upper walls in Dolerite.[228] **Figg. 52a–52b.** The construction was entrusted to the local building firm *Völundur*, that took care of the building process.[229] Eventually, the firm opted for a double-wall structure, with an outer layer in rough Dolerite ashlars and an inner layer in concrete cast stone produced by Jón Þorláksson's building company *Steinar*. This was the first large-scale application of Icelandic cast stones. A couple of years later, the same technique and the same building firm contributed to the construction of one of Reykjavík's most renowned landmarks: the national library. **Fig. 53.**

The house of culture: The national library (1906–09)

Ironically, the last building designed by a Danish architect was the country's most representative institution, possibly even more important than the house of parliament – the National Library and Museum. Throughout the journey towards independence, the Icelandic language played a great role in asserting the cultural and political autonomy of the country in relation to Denmark. A particular source of pride was Norse history and the literature of the sagas, thus it is easy to imagine the value

[226] "Bankahúsið er til hinnar mestu prýði í bænum [...]". *Dagskrá* 3, no. 10 (24 September 1898): 39.

[227] "Bankahús þetta er sjálfsagt hið vandaðasta og veglegasta hús á landinu". "Myndirnar," *Sunnanfari* 8, no. 3 (1 June 1900): 22.

[228] "Bankahúsið nýja," *Ísafold* 32, no. 27 (13 May 1905): 106.

[229] *Völundur* was a very active building firm founded in 1904 and specialized in timber constructions. See: "Völundur," *Óðinn* 2, no. 12 (1 March 1907): 92; Leifur Sveinsson, "Þættir úr sögu Timburverzlunarinnar Völundar h.f.," *Morgunblaðið* (25 February 1979): 36–37.

Fig. 50a – The National Bank in construction, 1898.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 50b – The National Bank in construction, 1898.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 51a – Thuren's original project, January 1905. Danish National Art Library, 53767 a-f a.

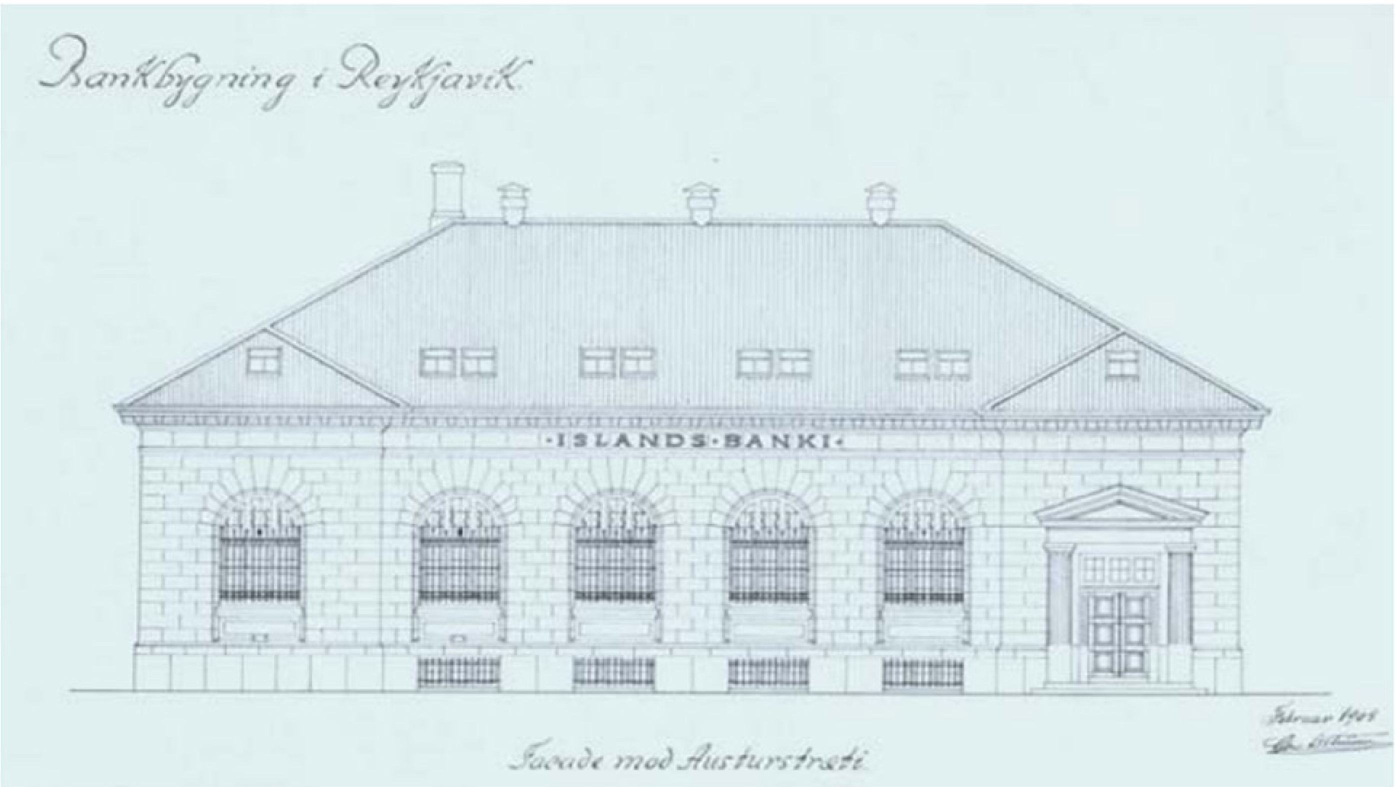


Fig. 51b – Thuren's second proposal, February 1905. Helga Maureen Gylfadóttir, Guðný Gerður Gunnarsdóttir, "Húsakönnun. Austurstræti – Pósthússtræti – Hafnarstræti – Lækjargata" (Reykjavík: Minjasafn Reykjavíkur, 2006), 8.

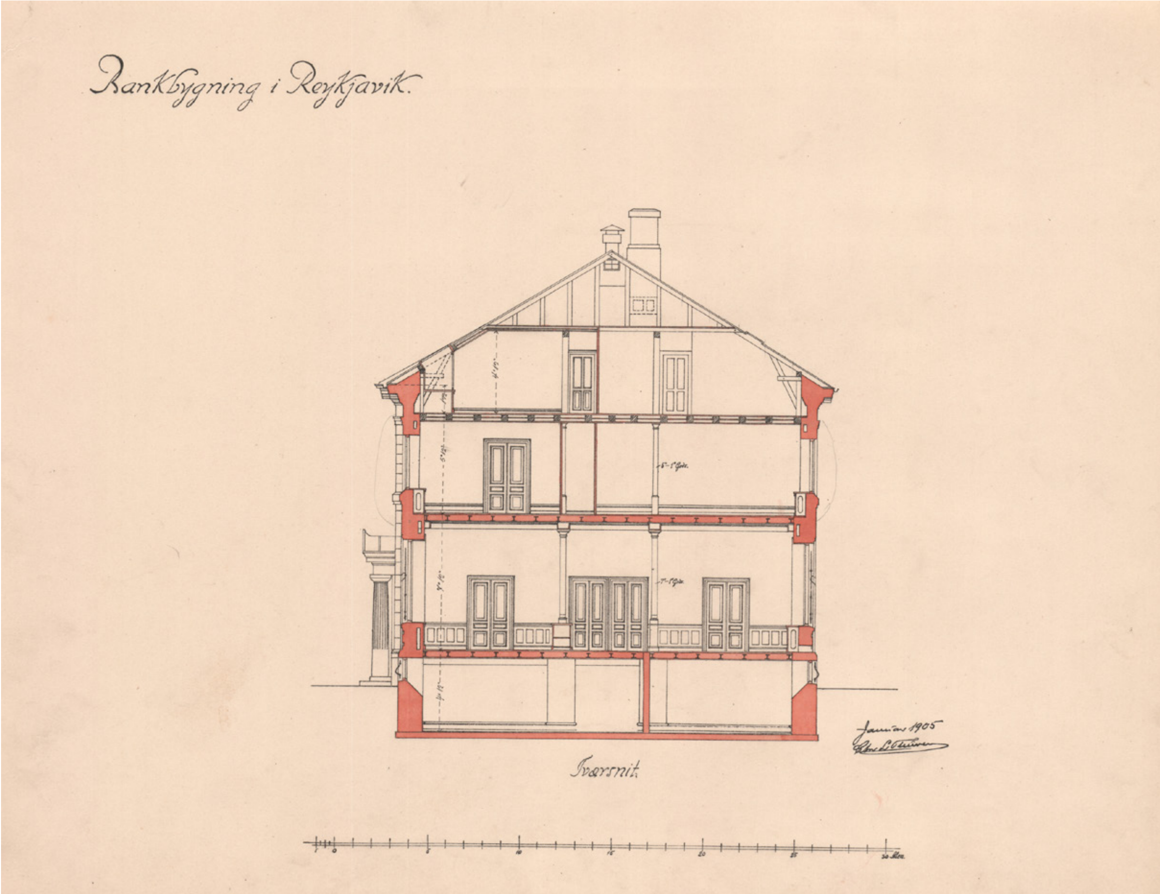


Fig. 52a – Cross section of the first project, January 1905.
Danish National Art Library, 53767 a-f b/d.

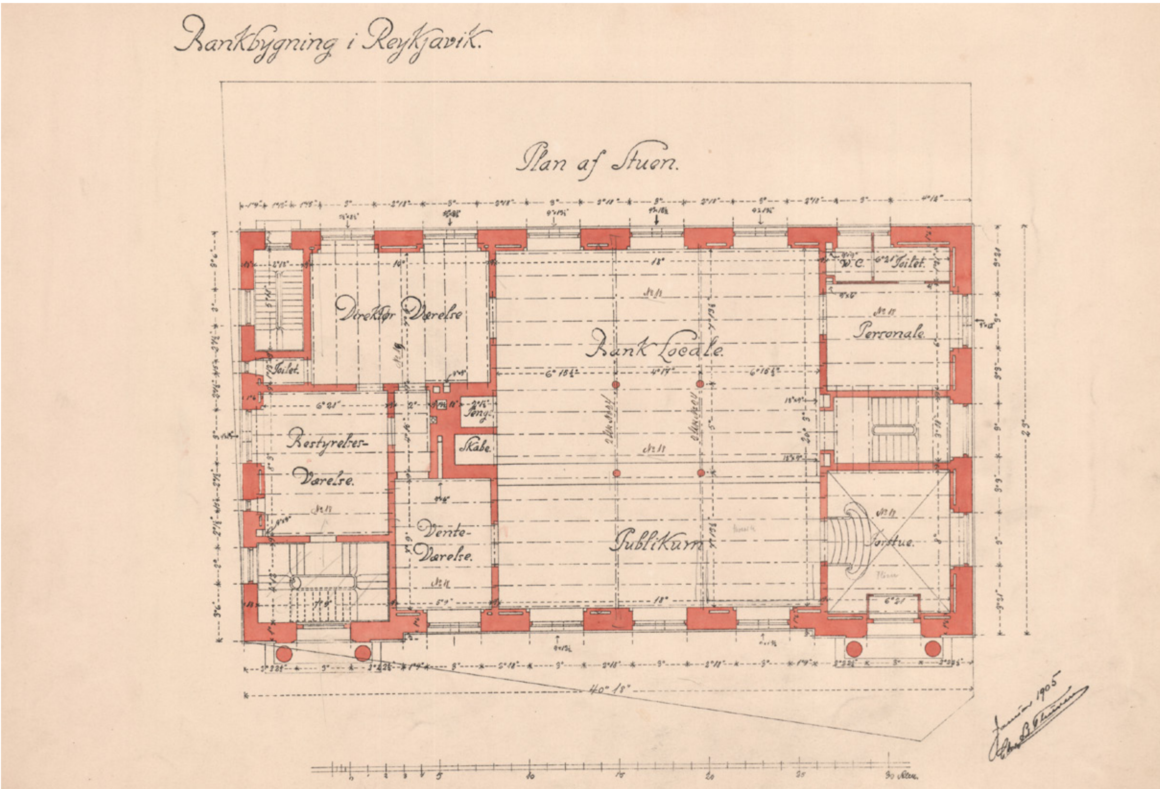


Fig. 52b – Ground floor plan, January 1905.
Danish National Art Library, 53767 a-f b/d.

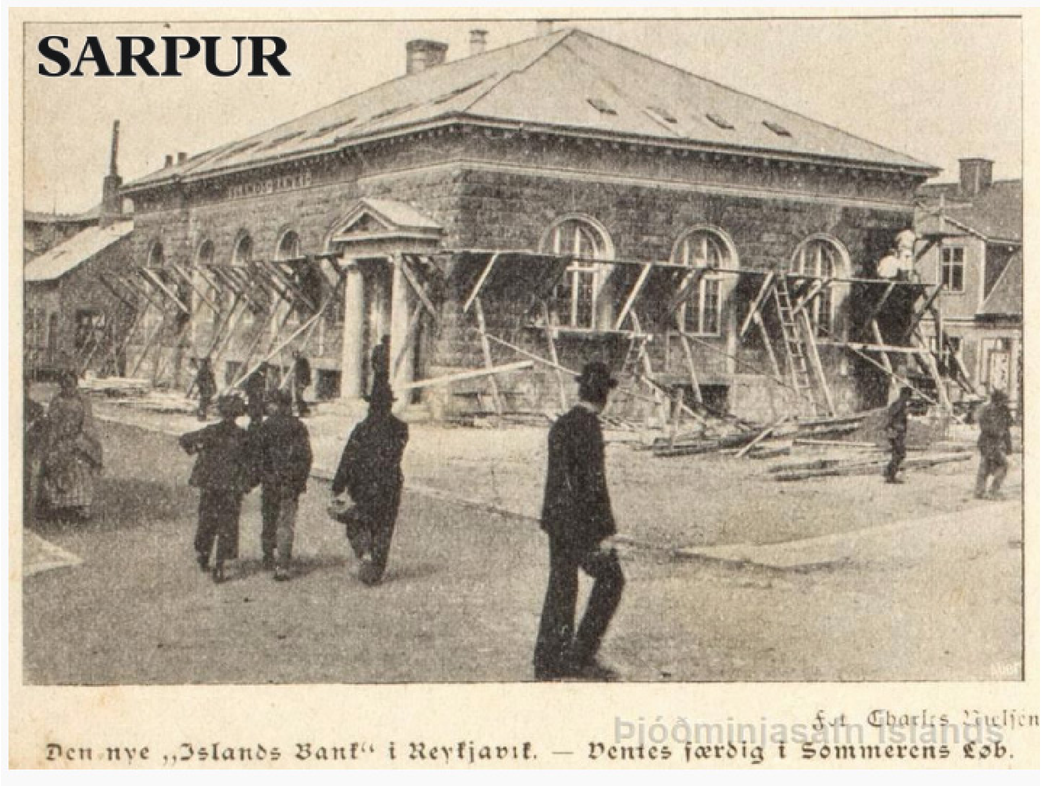


Fig. 53 – *Íslandsbankinn* in construction, ca. 1906.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 54 – *Safnahúsið*, former National Library, Reykjavík. Photo by Sofia Nannini, 2019.

ascribed to Iceland's archival and librarian collections. The national library and museum in Reykjavík was built after most Scandinavian national museums, which had acquired particular importance in Nordic capital cities since the last decades of the nineteenth century.[230] Despite the changes in the collections that have occured during the twentieth century, the building is still an icon of Icelandic cultural knowledge.[231] Its history has been told many times, especially from an architectural point of view. As with the aforementioned bank institutes, the construction of the library will be outlined only as a means to highlight its central role in the development of local architectural and building practices.[232] **Fig. 54.**

Until the turn of the century, the Icelandic library and its archeological and natural collections had been hosted in various, unpractical places around Reykjavík, such as the attic of the parliament, the cathedral, and the building of *Íslandsbanki*. By the early 1900s a suitable location for the collections was needed and the building process was supported by the recently established Ministry for Iceland. From the beginning, the national library was not only a matter of architecture and construction. As stated by Icelandic historian Guðmundur Hálfdanarson:

> The library was not only a building, but also a sort of statement of the Icelanders in relation to the recently-acquired Home Rule government; Icelanders were a cultural people among cultural peoples, fully able to erect its own buildings.[233]

Although the final outcome was a fully-Danish architectural product, it is important to underline the moments in which local decision making took the lead, and contributed to some substantial changes in the architecture and materials. First of all, the library's earliest design was not sketched in Copenhagen, but in Reykjavík. As a newly-nominated consultant for public buildings, Rögnvaldur Ólafsson reported to the Parliament his ideas regarding the architecture of the library.[234] Although in the end the Parliament refused his proposal, Rögnvaldur Ólafsson's design became a

---

[230] For an overview of Scandinavian national museums built at the turn of the century, see: Barbara Miller Lane, *National Romanticism and Modern Architecture in Germany and the Scandinavian Countries* (Cambridge: Cambridge University Press, 2000), 207–13.

[231] Although the core of the Icelandic National Museum collections were moved to a new location in 1950 and a new National Library opened in 1994, the former national library and museum is still a symbol for Icelandic culture and a venue for events and exhibitions. In 2000, the original name, *Safnahúsið* (from the words "*að safna*", to collect, and "*hús*", house) was changed into *Þjóðmenningarhúsið* (The House of National Culture).

[232] The most important accounts on the architectural history of the building are: Finnbogi Guðmundsson, *Úr sögu Safnahússins við Hverfisgötu* (Reykjavík: Árbók Landsbókasafns, 1982); Hörður Ágústsson, *Íslensk byggingararfleifð I,* 307–18; Eggert þór Bernharðsson, ed., *Safnahúsið 1909–2009: Þjóðmenningarhúsið*. See also a brief summary in: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 57.

[233] "Húsið var því ekki aðeins bygging, heldur jafnframt eins konar stefnuyfirlýsing Íslendinga í tilefni nýfenginnar heimastjórnar; Íslendingar voru menningarþjóð með menningarþjóðum sem var fyllilega fær um að reisa sín hús upp á eigin spýtur." Guðmundur Hálfdanarson, "Safnahúsið – Varðkastali og forðabúr íslenskrar þjóðernistilfinningar?", in *Safnahúsið 1909–2009*, edited by Eggert Þór Bernharðsson, 51.

[234] Pétur H. Ármannsson, "'Veglegasta og vandaðasta steinhús þessa lands'. Safnahúsið frá sjónarhóli íslenskrar húsagerðarsögu", 20.

model for the development of the project.[235] The Icelandic government was perhaps looking for a competently trained and mature professional, who could give Iceland a suitable symbol of both cultural and political independence. Eventually, the project was signed by Danish architect Johannes Magdahl Nielsen (1862–1941), particularly known for being the assistant of Jørgen Holm (1835–1916) in the construction of the Royal Library at Slotsholmen in Copenhagen.[236] Following a rather common tradition for Danish architects designing buildings in Iceland, Nielsen never visited the island and evidence of his contribution is more or less limited to a few pencil drawings collected at the National Archives.[237] However, the construction was supervised by his delegate Frederik Kiørboe (1878–1952), who moved to Iceland to work at the building site and in the meantime also supervised a few constructions, such as the school at Landakot and the Reykjanes Lighthouse, together with engineer Thorvald Krabbe.[238] **Figg. 55a–55b.**

The final project envisaged a three-storey building with a prominent gabled entrance and a large reading room facing the rear façade. Originally, the structure would have been in Dolerite ashlars with a copper roof. But this is where Icelandic autonomy emerged: the choice of the building materials was eventually all in the hands of the building firm *Völundur*, that had won a call for tenders for the construction in 1906. The firm opted for a solution that resembled the bank *Íslandsbanki*: the double walls had an external 40cm thick layer of Dolerite blocks, and an inner 12cm layer in *Steinar* concrete cast stones.[239] Clearly the firm's decision was economical: concrete and concrete stones were much cheaper than cut stones.[240] It is also likely that the firm *Völundur* was specialized in timber constructions, and concrete could provide more work in relation to the production of formworks. Furthermore, the rooftop structure was eventually made in iron, as a cheaper alternative to copper. **Fig. 56.** Iceland's growing technical independence was not only visible in the contractor's choices of building materials, but also in connection to local engineering knowledge. As mentioned previously, most probably the Hennebique patent – employed for the slabs of the library's reading room – was suggested by the

[235] On the project by Rögnvaldur Ólafsson, see: Anna D. Ágústsdóttir, and Guðni Valberg, *Reykjavík sem ekki varð*, 33–36. See the original project in: ÞÍ, Teikningasafn, C. VII. 1. a, b, c, d, e. Skúffa 8, Númer 5.

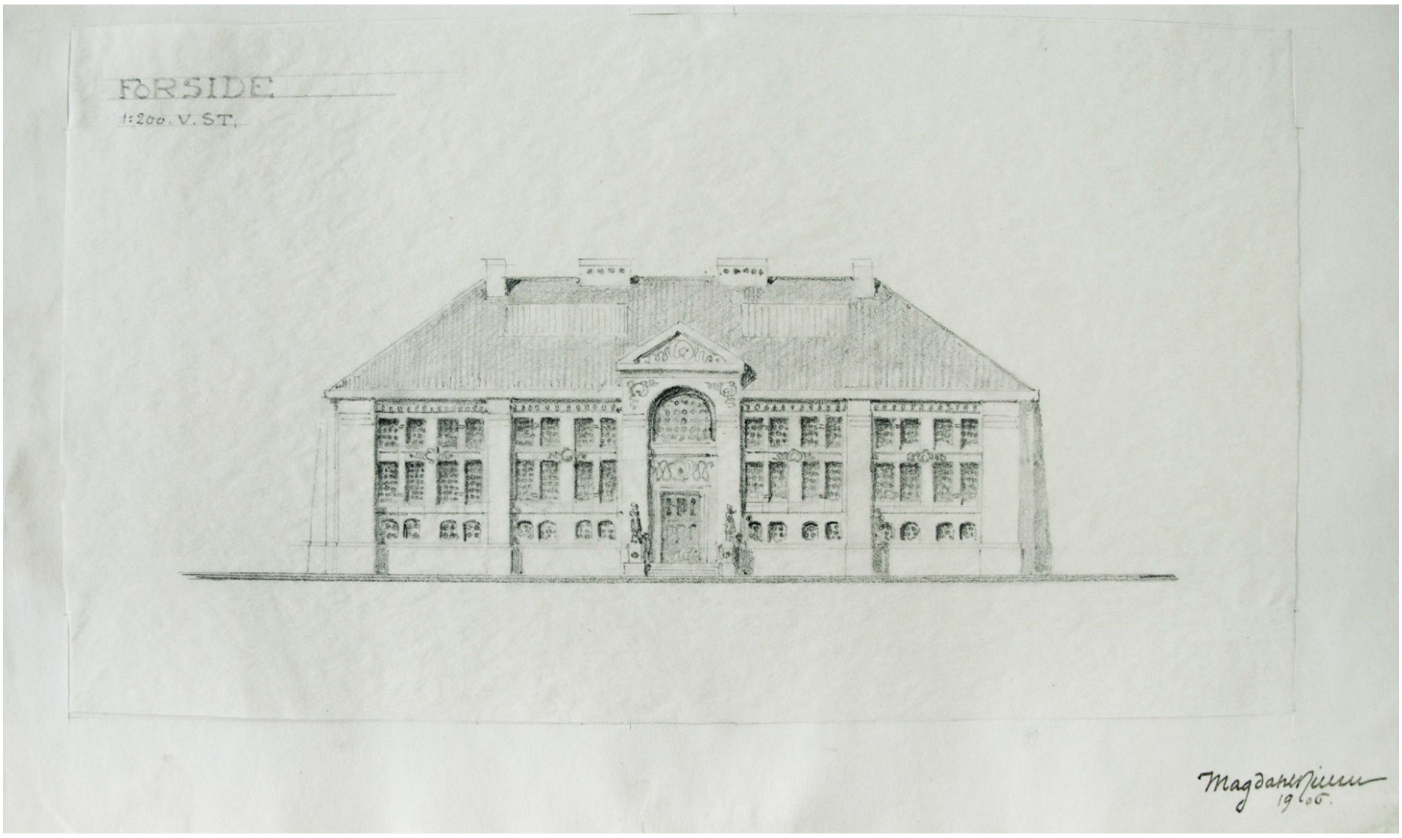
[236] Pétur H. Ármannsson, "'Veglegasta og vandaðasta steinhús þessa lands'. Safnahúsið frá sjónarhóli íslenskrar húsagerðarsögu", 21–23.

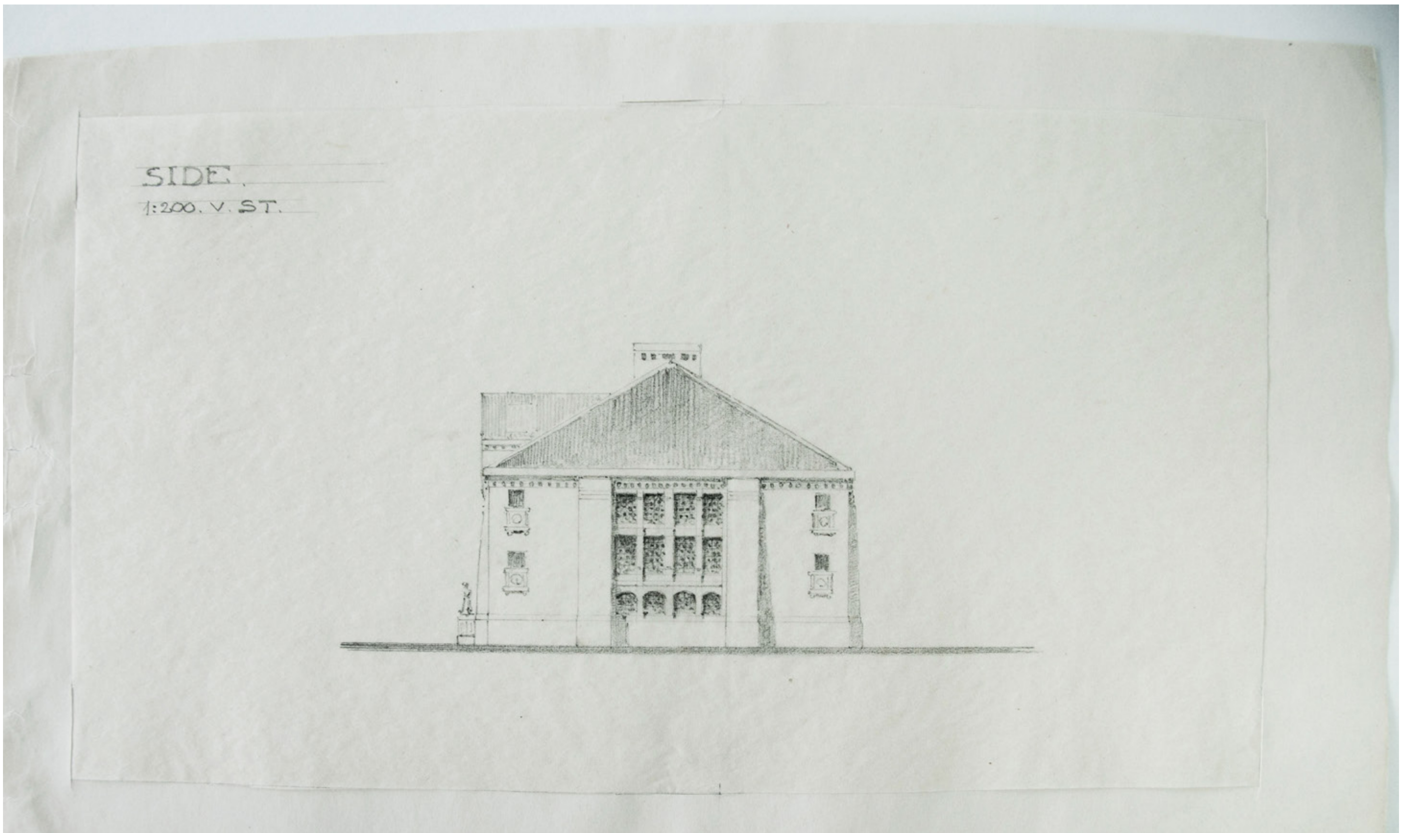
[237] Johannes Magdahl Nielsen did engage in a correspondence with Icelandic librarians and curators, asking questions on the building's future users and capacity. Traces of this dialogue are in the National Archives of Iceland: ÞÍ, *Stjórnarráð Íslands* I. *Skrifstofa* B/18, Örk. 14 (1908). See also: Pétur H. Ármannsson, "'Veglegasta og vandaðasta steinhús þessa lands'. Safnahúsið frá sjónarhóli íslenskrar húsagerðarsögu," 24–25.

[238] Hörður Ágústsson, *Íslensk byggingararfleifð I*, 330.

[239] Pétur H. Ármannsson, "'Veglegasta og vandaðasta steinhús þessa lands'. Safnahúsið frá sjónarhóli íslenskrar húsagerðarsögu", 30.

[240] "Landsbókasafnið nýja," *Ísafold* 33, no. 46 (14 July 1906): 182.





Figg. 55a–55b – Drawings of the National Library by Johannes Magdahl Nielsen, 1906. Þjóðskjalasafn Íslands, Skúffa 22. Örk 27–28–29.

engineer Krabbe after it had been used in the reconstruction of the wool factory.[241] **Fig. 57.**

One final note is worth highlighting in regards to the construction of the library. What really made the difference was not that it was the last building ever designed by a Danish architect – clearly this information was not available to the contemporaries – but that for the first time the entire construction was in the hands of Icelandic builders. Such awareness quickly became part of the national rhetoric about the building: as soon as the library was inaugurated, the librarian boasted that "everything inside has been made in Iceland".[242] Although this was not entirely true, the majority of the architectural elements were local products.[243] For example, two granite columns located in the reading room were quarried in the vicinity of Reykjavík and carved by Icelandic stonemasons. Two characteristics increased the "Icelandicness" of the building, although they do not pertain to the realm of construction. First, the library is located in a very special spot of Reykjavík, that is the hill of Arnarhóll, east of the city centre and close to the sea. Arnarhóll was historically considered the farmstead where Ingólfur Arnarson lived, Iceland's first Viking settler, and thus it always had a mythical significance for the inhabitants. Second, perhaps to underline that it was a symbol of national culture, the building commission later decided to decorate the façades with the names of eight famous Icelandic writers and intellectuals, from Snorri Sturluson (1179–1241) to Hallgrímur Pétursson (1614–74).[244]

The fame of the project also went beyond the Icelandic boundaries: in 1910, Kiørboe published an article in the Danish journal *Architekten*, with special attention to its construction and technological features.[245] **Figg. 58a–58c.** The construction of

[241] In the description of the building attached to the construction files was reported that the coffered ceiling over the reading room was built according to the Hennebique system. Therefore we do not know if the adoption of the patent was a suggestion by Krabbe or if it derived from Nielsen's or Kiørboe's technical knowledge. A short article published in 1909 did refer to "Hennebique-gerðin", meaning that the Hennebique system was adopted for the slabs. Like in the case of the wool factory *Iðunn*, mentions of the Hennebique patent in Iceland's library have not been recorded nor found in the Hennebique archives, thus it is for now impossible to ensure the adoption of this particular patent within these buildings. See: ÞÍ, *Stjórnarráð Íslands* I. *Skrifstofa* B/18, Örk. 14 (1908), "Landsbibliothek og Landsarkiv i Reykjavik. Beskrivelse af Bygningen," 4. See also the article: "Landsbókasafnið," *Lögrétta* 4, no. 16 (31 March 1909): 61.

[242] "Mentasafnið," *Ísafold* 36, no. 24 (1 May 1909): 93. Also reprinted in: "Fjögur söfn undir sama þaki. Á hraðferð um húsið árið 1909," in *Safnahúsið 1909–2009*, 14.

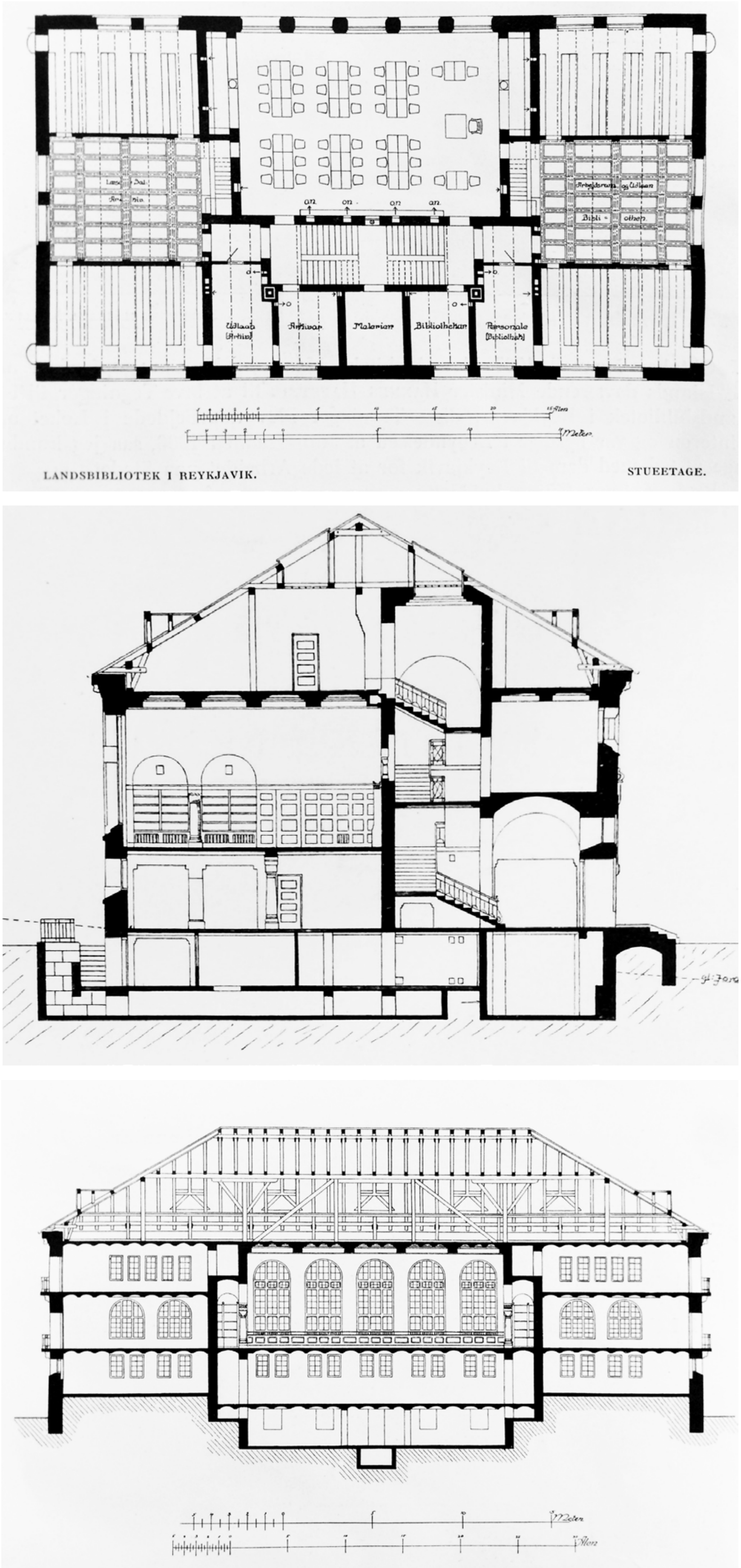
[243] The main entrance, carved in granite, was imported from Denmark. Pétur H. Ármannsson, "'Veglegasta og vandaðasta steinhús þessa lands'. Safnahúsið frá sjónarhóli íslenskrar húsagerðarsögu," 31.

[244] Þórunn Sigurðardóttir, "Nafnasveigur á Safnahúsi," in *Safnahúsið 1909–2009*, 36–45. Nevertheless, the design of the inscription might have been made by architect Nielsen: a drawing of the library's main façade, with the names carved under each window, is collected at the Danish National Art Library and registered under the name of Johannes Magdahl Nielsen. See: Danish National Art Library, inventory number 53323 a-b a, *facade hovedingang*.

[245] Fredrik Kiørboe, "Landsbibliotek i Reykjavik," *Architekten* 12, no. 16 (15 January 1910): 169–74. See also: Pétur H. Ármannsson, "'Veglegasta og vandaðasta steinhús þessa lands'. Safnahúsið frá sjónarhóli íslenskrar húsagerðarsögu," 32.

Fig. 56 – The National Library in construction, ca. 1907.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 57 – The reading room covered by a coffered reinforced concrete slab.
Photo by Sofia Nannini, 2018.



Figg. 58a–58b–58c – Plans and sections of the National Library. Frederik Kiørboe, "Landsbibliotek i Reykjavik," *Architekten* 12, no. 16 (15 January 1910): 169–74.

Fig. 59 – The National Library, ca. 1909–15. Þjóðminjasafn Íslands/National Museum of Iceland.

the library was indeed a turning point for Icelandic architectural history. On the one hand, this public building mirrored the recent establishment of the Home Rule. On the other, the increasing presence of Icelandic contractors, and specifically their freedom in decision-making, reflected the country's slow but imminent industrial development. Eventually, that very same development was the motor behind Iceland's ultimate goal of a full political independence in the decades to come.[246] As if condensed into a single architectural piece, all the elements of the puzzle – culture, industry, politics – were already to be found as early as 1909 in the building site of the national library. **Fig. 59.**

2.2.2 The sanatorium at Vífilsstaðir (1908–10)

The last building to be designed and supervised by a Danish architect was the elegant and central national library. Instead, Iceland's first locally-designed public building was much less classy and much more peripheral: a sanatorium in Vífilsstaðir, south of Reykjavík. The strongest promoter of the sanatorium was Guðmundur Björnsson (1864–1937), medical doctor and director of public health between 1906 and 1931. He complained about the country's lack of facilities for the cure of tubercolisis, as its widespread presence in Europe also affected Iceland. In 1909, Guðmundur Björnsson claimed that all countries had already built sanatoriums to cure the disease, "even the Faroese people, the smallest nation [...]. We Icelanders are the only ones left behind".[247] It might not be a coincidence if Iceland's first public building wholly in concrete was also a tuberculosis sanatorium. As suggested by architectural historian Beatriz Colomina, early twentieth-century architects largely experimented on projects for sanatorium buildings, which became "the testing ground of new materials and techniques of construction and often involved experimental collaborations between architects, engineers, and doctors."[248] One of the key examples is the case of Switzerland: the country's first building in reinforced concrete was the Schatzalp Sanatorium in Davos, built in 1907 under the structural supervision of engineer Robert Maillart (1872–1940).[249]

The location of the sanatorium was a site known as Vífilsstaðir, south of Reykjavík, between the capital and the fishing village of Hafnarfjörður. Rögnvaldur Ólafsson was appointed to the project. Since 1904 he had been the consultant for public buildings, yet he still hadn't had the chance to actually design any of the country's new public services. Until 1909, Rögnvaldur Ólafsson's professional

[246] Guðmundur Hálfdanarson, "Severing the Ties – Iceland's Journey from a Union with Denmark to a Nation-State", 247.

[247] "Allar frændþjóðir okkar hafa reist heilsuhæli handa brjóstveikum mönnum, meira að segja Færeyingar fámennasta þjóðin – [...]. Við Íslendingar erum einir eftir." Guðmundur Björnsson, "Ræða landlæknis," *Ársrit Heilsuhælisfélagsins* 1 (1909): 24.

[248] Beatriz Colomina, *X-Ray Architecture* (Zürich: Lars Müller Publishers, 2019), 74.

[249] The Schatzalp Sanatorium was designed by Otto Pfleghard (1869–1958) and Max Haefeli (1869–1941), together with Robert Maillart, between 1899 and 1900. See: Beatriz Colomina, *X-Ray Architecture*, 88–90.

activity had been limited to a few proposals and small projects. Among them, he suggested some renovation works for the cathedral in Reykjavík in 1904 and he enlarged the nearby Free Church in 1905.[250] In particular, Rögnvaldur Ólafsson's church design became an experimental field for shifting from timber to concrete structures all over the country: he designed and built the first concrete church of Iceland, Bíldudalskirkja (1905–06), that was later on followed by a number of other churches.[251]

For Rögnvaldur Ólafsson, designing a sanatorium was a very special task: he was affected by tubercolosis, and he had resided for some months at the Boserup sanatorium near Roskilde.[252] As suggested by the architect's biographer Björn Björnsson, the influence of the Danish sanatorium on Rögnvaldur Ólafsson's project is striking, in terms of planimetric layout and overall design.[253] The original layout consisted of a longitudinal body intersected by three transversal wings. The building is three stories above ground, with a basement level. Differently from many sanatorium buildings of that age, the sanatorium at Vífilsstaðir did not have balconies, neither on top of the building nor located at each room. The absence of balconies might have been due to the strong winds and generally cold climate typical of Iceland. Heliotherapy was thus practiced in a covered portico at the ground floor, connected to the building's main body, where the patients could lay outside facing south.[254] The decoration was kept at a minimum: the façade was only marked by horizontal low relief bands, defining each storey. However, this should not be seen as an early sign of Icelandic functionalism: Rögnvaldur Ólafsson's contemporary projects were much more eclectic. Surely, the reason behind the sanatorium's sober appearance can be found in its scope as a healing center. At the same time, it may also be linked to the great number of engineers intervening at the building site, bearers of a more technical and less ornamental approach to architecture. **Figg. 60a–62b.**

Evidently, what was important about the sanatorium in Vífilsstaðir was its building process. The construction was very quick: between 1909 and 1910, this single building reunited all of Iceland's architecture and engineering professionals. From the pioneers of reinforced concrete and cast stones – Knud Zimsen, Thorvald Krabbe, Jón Þorláksson – to the workers of Reykjavík's active building firm

[250] Björn G Björnsson, *Fyrsti arkitektinn*, 22–25.

[251] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 86–90; Björn G Björnsson, *Fyrsti arkitektinn*, 132.

[252] In the early twentieth century being affected of tubercolosis was a rather common condition: the designers of sanatoria were often patients. See, for example, Josef Hoffmann (1870–1956), who frequently checked in the Purkerdsorf sanatorium which he designed in 1903, and also Alvar Aalto (1898–1976), who claimed to have been inspired by a period of illness at the hospital before designing his sanatorium in Paimo (1929–33). On the architecture of the sanatorium and its architects, see: Beatriz Colomina, *X-Ray Architecture*, 61–116. On the construction of sanatoria in Europe after the First World War, see: Paul Overy, *Light, Air & Openness. Modern Architecture Between the Wars* (London: Thames & Hudson, 2007), 21–28.

[253] Björn G Björnsson, *Fyrsti arkitektinn*, 14–15.

[254] The building is still in use as a nursing home, although most of its premises have undergone substantial changes. The portico is now in ruins. See: Björn G Björnsson, *Fyrsti arkitektinn*, 184.

Fig. 60a – The sanatorium at Vífilsstaðir in 1910, north façade.
Rögnvaldur Ólafsson, "Lýsing á hælinu," *Ársrit Heilsuhælisfélagsins* (1912).

Fig. 60b – The sanatorium today, south façade. Photo by Sofia Nannini, 2019.

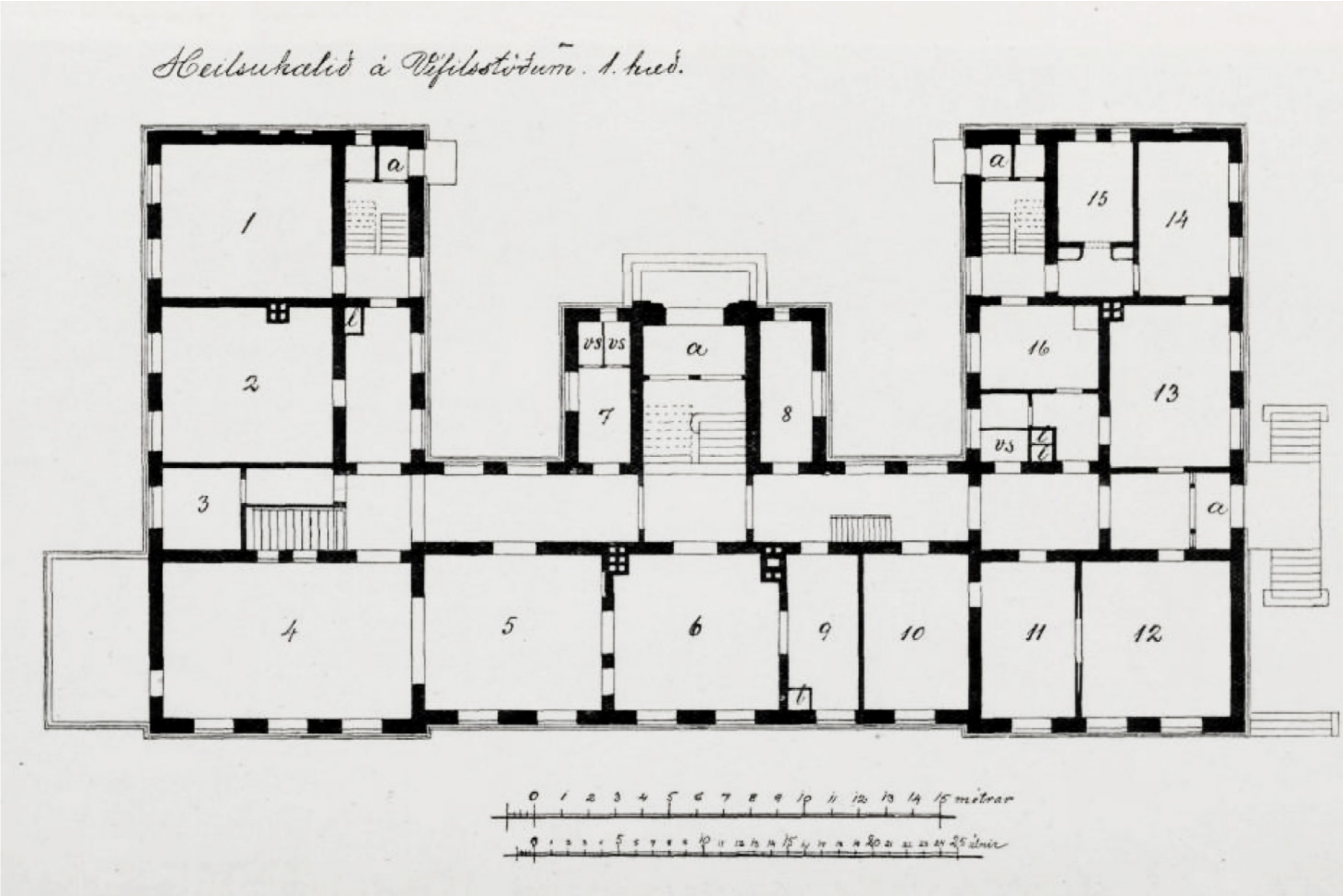


Fig. 61 – Plan of the first floor. Rögnvaldur Ólafsson, “Lýsing á hælinu,” *Ársrit Heilsuhælisfélagsins* (1912).

Fig. 62a – The colonnade, 1910.
Rögnvaldur Ólafsson, "Lýsing á hælinu," *Ársrit Heilsuhælisfélagsins* (1912).

Fig. 62b – The colonnade today, photo by Sofia Nannini, 2019.

Völundur, Rögnvaldur Ólafsson directed the works by grouping together the country's leading technicians.[255] The result was "the first all-Icelandic large building"[256] and Rögnvaldur Ólafsson's "main work".[257] The sanatorium was the first, large-scale architectural outcome of Iceland's "age of concrete", with concrete outer walls and reinforced concrete slabs at the first, second, and third floors.[258] Jón Þorláksson's *Steinar* concrete cast stones were employed for air ducts. Knud Zimsen officially supervised the design of the sanatorium's heating system, but his letters also show that his contribution went far beyond that. **Fig. 63.**

Knud Zimsen played an important role in selling *Aalborg* cement to Rögnvaldur Ólafsson and the sanatorium's building committe. Throughout 1909, Knud Zimsen made several offers to the architect regarding the price of cement, and consequently organized a number of deliveries to the building site.[259] Knud Zimsen saw the project of a sanatorium as an opportunity to strengthen his business connections to the *Aalborg Portland-Cement Fabrik*: from his perspective, the sanatorium was mainly seen as a "large delivery" of cement, and he mentioned the building to his Danish partners.[260] Furthermore, Knud Zimsen was a key connection for the purchase of other building materials: corrugated iron sold to Rögnvaldur Ólafsson,[261] concrete pipes to Jón Þorláksson,[262] and most importantly "Monier iron" – meaning reinforcement bars – to Thorvald Krabbe.[263] The fact that Knud Zimsen sold reinforcement bars to Thorvald Krabbe is relevant: in fact, engineer Krabbe was in charge of the structural calculations of reinforced concrete slabs.[264] Once again, after the *Iðunn* wool factory and the national library, Krabbe turned out to be the link

[255] When describing the project, Rögnvaldur Ólafsson proudly listed all the names of those who worked at the building site, from engineers to masons. See: Rögnvaldur Ólafsson, "Lýsing á hælinu," *Ársrit Heilsuhælisfélagsins* 2 (1912): 19.

[256] "Þetta er fyrsta alíslenzka stórhýsið". "Heilsuhælið," *Ísafold* 36, no. 75 (17 November 1909): 297.

[257] "En aðalverk hans er Vífilstaðahælið". Thorvald Krabbe, "Rögnvaldur Ólafsson," *Tímarit Verkfræðingafélags Íslands* 2, no. 1 (1 March 1917): 2.

[258] Although the building's transversal section by Rögnvaldur Ólafsson suggests that also the last floor should be in concrete, cast in continuity with the vertical structures, the architect claimed that "the building's upper slab is in timber", and so was the timber roofing structure, covered by corrugated iron. Rögnvaldur Ólafsson, "Lýsing á hælinu," 8.

[259] BR, E25 KZ, Askja 2, *Bréfabók* 1906–1909, 448 and 450. 25 January 1909; BR, E25 KZ, Askja 2, *Bréfabók* 1909–1913, 39. 24 March 1909; 71. 20 April 1909; 161. 3 May 1909; 1 July 1909; 310. 17 September 1909; 344. 25 October 1909.

[260] BR, E25 KZ, Askja 2, *Bréfabók* 1906–1909, 475–76. 5 February 1909; BR, E25 KZ, Askja 2, *Bréfabók* 1909–1913, 53–54. 3 April 1909. By July 1909, some troubles arose between Knud Zimsen and the building commitee, concerning their agreements. The engineer was extremely motivated in securing this economic opportunity. BR, E25 KZ, Askja 2, *Bréfabók* 1909–1913, 181–84

[261] BR, E25 KZ, Askja 2, *Bréfabók* 1909–1913, 217–18. 29 July 1909.

[262] BR, E25 KZ, Askja 2, *Bréfabók* 1909–1913, 299–300. 19 September 1909.

[263] Especially in the German-speaking and Nordic countries, where the Monier patent most influenced the building industry, reinforcement bars were often called "Monier iron". In Icelandic, *Monier-járn*. BR, E25 KZ, Askja 2, *Bréfabók* 1909–1913, 102. 4 June 1909.

[264] Rögnvaldur Ólafsson, "Lýsing á hælinu," 19.

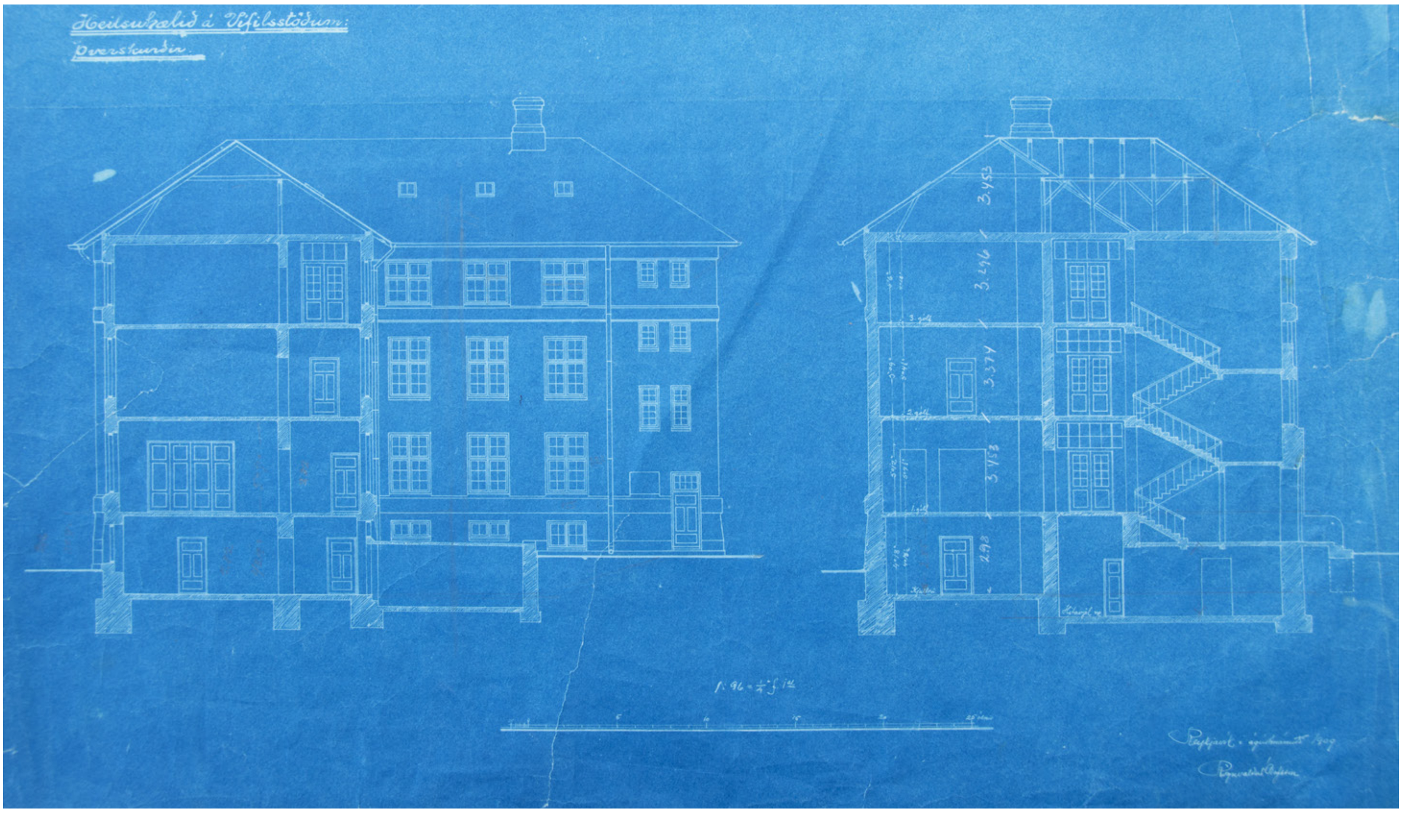


Fig. 63 – Transversal section of the sanatorium. Þjóðskjalasafn Íslands, Teikningasafn. Skúffa 15, Örk 5–6.

between Iceland's building sites and Denmark's scientific approach to concrete.[265] Reinforced concrete elements represented Iceland's highest technical peak in building issues until that moment; however, the presence of a fully-reinforced concrete skeleton wasn't yet a reality, and for now iron bars were only located within the slabs and the stairs. No proofs of Krabbe's structural calculations have been found, but in 1916 the engineer and the architect worked together again, on a much smaller construction. The project was that of a cowshed close to the sanatorium. Rögnvaldur Ólafsson envisaged a reinforced concrete structure, for which the engineer provided all the calculations, and in this case the reinforcement was also present in the vertical pillars.[266] **Figg. 64a–64b.**

When the sanatorium was inaugurated, it was welcomed as the "safest" construction of the country, "located on a rock and itself a whole rock" – a building that could last a thousand years.[267] It was, in short, the symbol of a new, technically independent Iceland: a country that could build itself from within, thanks to its own means, knowledge, and people. Concrete and everything that revolved around it played a huge role during the building process and in the rhetoric that surrounded the project. An interesting suggestion put forth is that the transition from the natural stone of the national library to the concrete of the sanatorium mirrored the increasing autonomy of Iceland, and that this shift from one building material to another might have marked a "liberation from the Danish building technique and architecture".[268] While to some extent this may be true – especially according to the local and contemporary rhetoric of an independent Iceland that would also be autonomous in the supply of building materials – what occured during the Icelandic Home Rule years should not be seen as a "liberation", neither politically nor materially speaking. When it comes to architecture and construction, although Iceland finally formed its own élite of professionals, these experts were largely indebted to and saturated with Danish and continental scientific building knowledge. What might have occured was not a sharp break between two cultures, but a slow appropriation of technical tools to be used in a different context. It should also be highlighted that Rögnvaldur Ólafsson's sanatorium represented Iceland's recent autonomy in construction matters, but it was still far way from an independent architectural consciousness and a more or less autonomous approach to architecture.

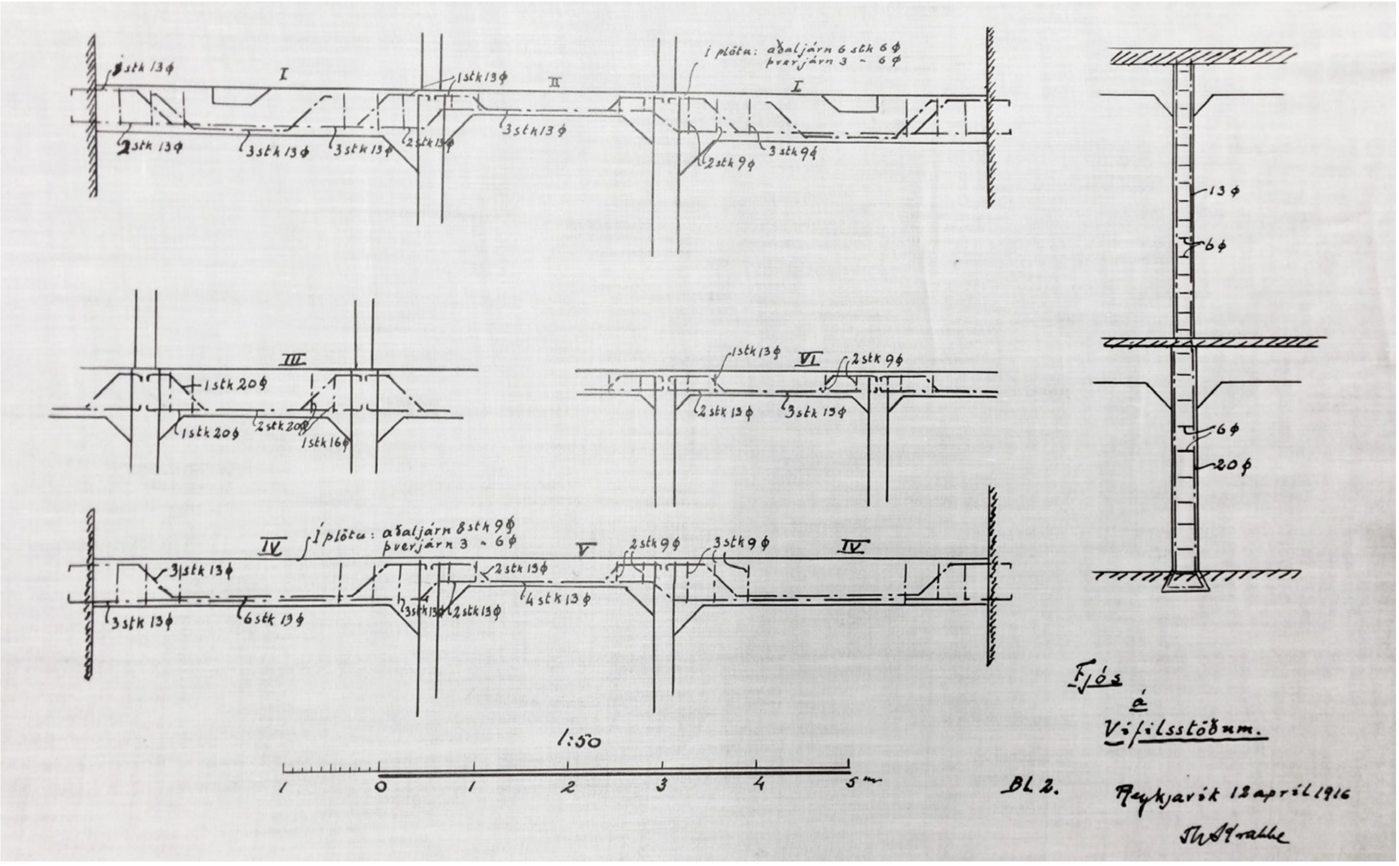
Rögnvaldur Ólafsson's career as Iceland's first designer of public buildings commenced only after his project of the sanatorium. From 1910 until his early death

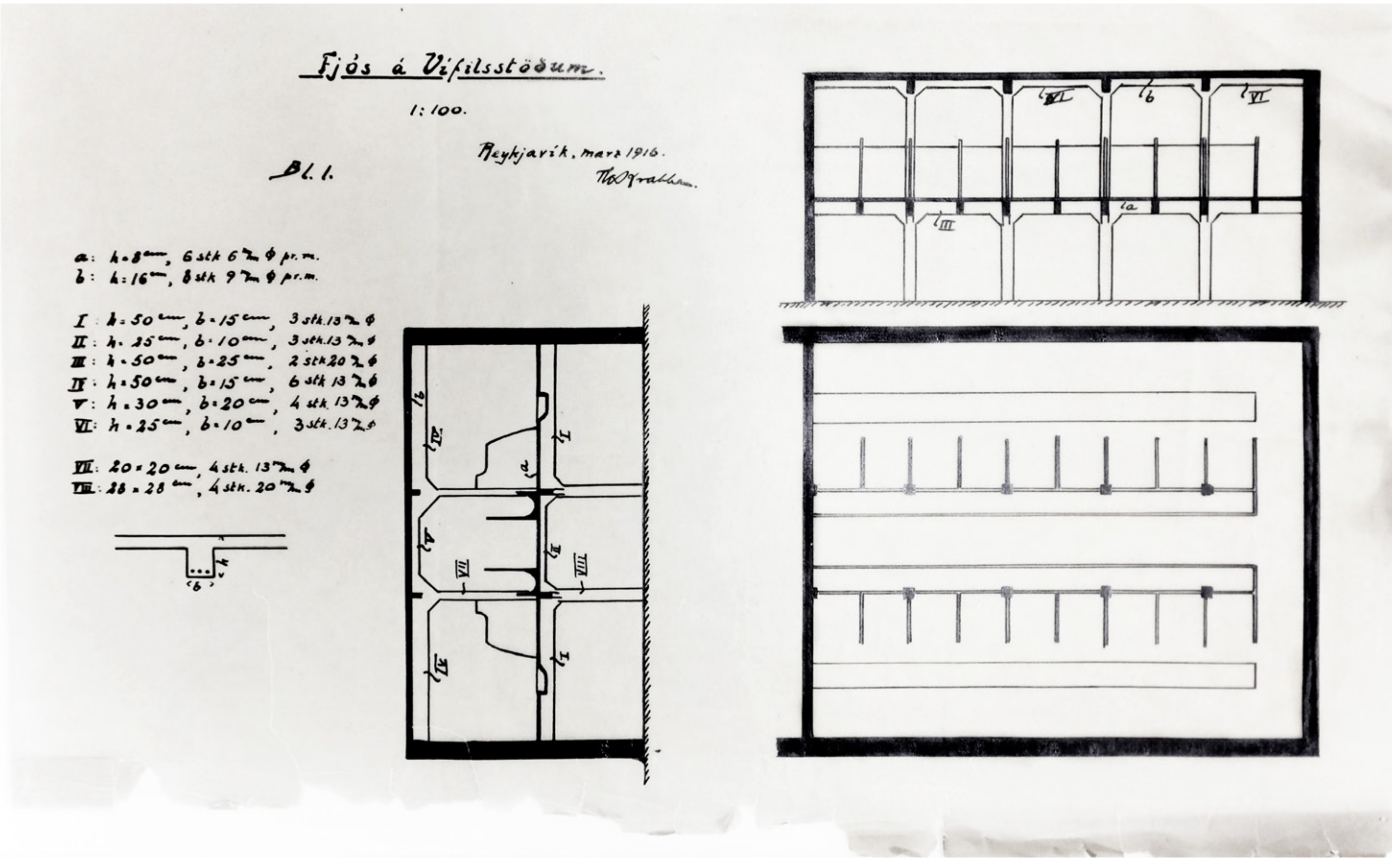
[265] One newspaper article suggested that the Hennebique patent had been adopted to design the slabs of the sanatorium. Also in this case, it has not been possible to prove this information. See: "Heilsuhælið," *Ísafold* 36, no. 75 (17 November 1909): 297.

[266] ÞÍ, *Vita- og hafnarmálastofnun*, *Bréfasafn*. B-BDB/2. Örk 1. *Fjós á Vífilsstöðum*, March–April 1916.

[267] "Jafntraust hús hefur aldrei verið reist hjer á landi; það stendur á klöpp og er alt ein klöpp". "Vífilsstöðum," *Lögrétta* 4, no. 53 (17 November 1909): 210.

[268] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 73.





Figg. 64a–64b – Structural drawings by Thorvald Krabbe for a cowshed in Vífilsstaðir, 1916. Þjóðskjalasafn Íslands, Vita- og hafnarmálastofnun, Bréfasafn. B-BDB/2. Örk 1. Fjós á Vífilsstöðum, March–April 1916.

in 1917, he designed and built residential houses in the city centre of Reykjavík,[269] all three Agricultural Schools of the country,[270] and also Reykjavík's post office.[271] His last project is thought to be the aforementioned cowshed at Vífilsstaðir. In 1916, Rögnvaldur Ólafsson was living in the sanatorium as a patient, and there he died one year later.[272] Despite his early death, the architect also contributed to another chapter of Icelandic construction history. He wrote and gave a lecture on the building code of Reykjavík, published at the beginning of the century, which was already being questioned in the 1910s.

2.2.3 The first building code for Reykjavík (1903–15)

So far, this chapter has dealt with Iceland's "age of concrete" by exploring its protagonists and their individual roles in modernizing local building traditions. The urban scale of this process has not yet been tackled. This final paragraph will deal with an overarching question characterizing the first fifteen years of the twentieth century: how to control the urban growth of Icelandic settlements, and how to regulate the transition from turf to timber and concrete? The growing popularity of concrete in Iceland was soon framed within Reykjavík's first building code, published in 1903 under the supervision of Knud Zimsen. The code soon became a model for every other urban settlement, and it opened a debate on suitable building materials, urban density, and the abandonment of traditions.

A "Capital en bois": Reykjavík at the turn of the century

> On est en Hyperborée. Cette côte, c'est la terre d'Islande, et cette ville en est la capitale: Reykjavík. [...] Elle est entièrement construite en bois, – à part quatre édifices publics: la cathédrale, le palais de l'Assemblée (Althing), la banque et la prison.[273]

When foreign travelers arrived in Reykjavík at the turn of the century, they would walk through a tiny village, made by low timber houses surrounding an unsheltered harbour, and turf farms hidden among the surrounding grass fields.[274] Since its colonization and until the first decades of the nineteenth century, Icelandic

---

[269] Björn G Björnsson, *Fyrsti arkitektinn*, 186–90.

[270] Björn G Björnsson, *Fyrsti arkitektinn*, 176–78.

[271] Björn G Björnsson, *Fyrsti arkitektinn*, 192–93.

[272] A memorial plate to Rögnvaldur Ólafsson stands today on the walls of the nursing home at Vífilsstaðir.

[273] "We are in Hyperborea. That shore is Iceland, and this town is its capital: Reykjavík. [...] It is wholly built out of timber, with the exception of four public buildings: the cathedral, the Parliament House (Althing), the bank, and the prison." Pierre Piobb, "Une Capitale en bois: Reykjavík," *Lecture Modernes* 2, no. 22 (1902): 1353.

[274] This paragraph is an extended version of a research published in: Sofia Nannini, "The City as a Gravel Pile: Building Codes, Concrete, and Urban Dwellings in Reykjavík (1903–45)," in *La città globale. La condizione urbana come fenomeno pervasivo / The Global City. The Urban Condition as a Pervasive Phenomenon*, edited by Marco Pretelli, Rosa Tamborrio, Ines Tolic (Torino: AISU, 2020), publication underway.

settlements had not developed as villages or cities: on the contrary, the island was largely settled by means of scattered turf farms, present in almost all its regions, with the exception of the central, barren highlands. Interestingly, even today one of the Icelandic terms for city, *bær*, also means "farm". **Figg. 65a–65b.**

In 1786, the settlement of Reykjavík, together with other five coastal outposts around the country, acquired the status of trading centre thanks to a Royal decree.[275] This happened in the same years that followed the abolition of the Danish-Icelandic trade monopoly: at first, Reykjavík was only a trading spot for Danish and Icelandic merchants, but it slowly started acquiring social and political functions.[276] The first attempt towards a building regulation for the village is held in the so-called "open letter" issued on 29th May 1839, that established a building commission for Reykjavík.[277] In 1894, some additional clauses were issued: among them, one represented the beginning of a forthcoming revolution in the island's almost one-thousand-year old construction habits: while still accepted on the outskirts of Reykjavík, turf houses were banned in the centre of the village.[278] In order to have a governing building code, however, the town had to wait for the turn of the century. At that time, Reykjavík was still a small settlement compared to the European standards, but it had already expanded incredibly in comparison to other Icelandic trading centers. Moreover, Reykjavík had been gaining a considerable political and cultural importance. Above all, it was the location of the restored Icelandic Parliament and of the Junior College. **Fig. 66.**

This increasingly growing town – both in size and in population – required guidelines for its development. At first, the rules did not refer to a general planning of the city: the first planning commission for Reykjavík was established only in the 1920s.[279] The building rules for Reykjavík were limited to the obtaining of a building permit, to where, when and if to build a house, and – most importantly, in a country that lacked educated architects and engineers – they also had to teach the landowners *how* to build.[280] It is no coincidence if the building code was written with the help of Knud Zimsen, soon after his return to Iceland from his educational years in Copenhagen, and who later became one of the strongest advocates of concrete construction. By 1903, only a handful of concrete buildings had risen in the small

[275] *Kaupstaður* in Icelandic.

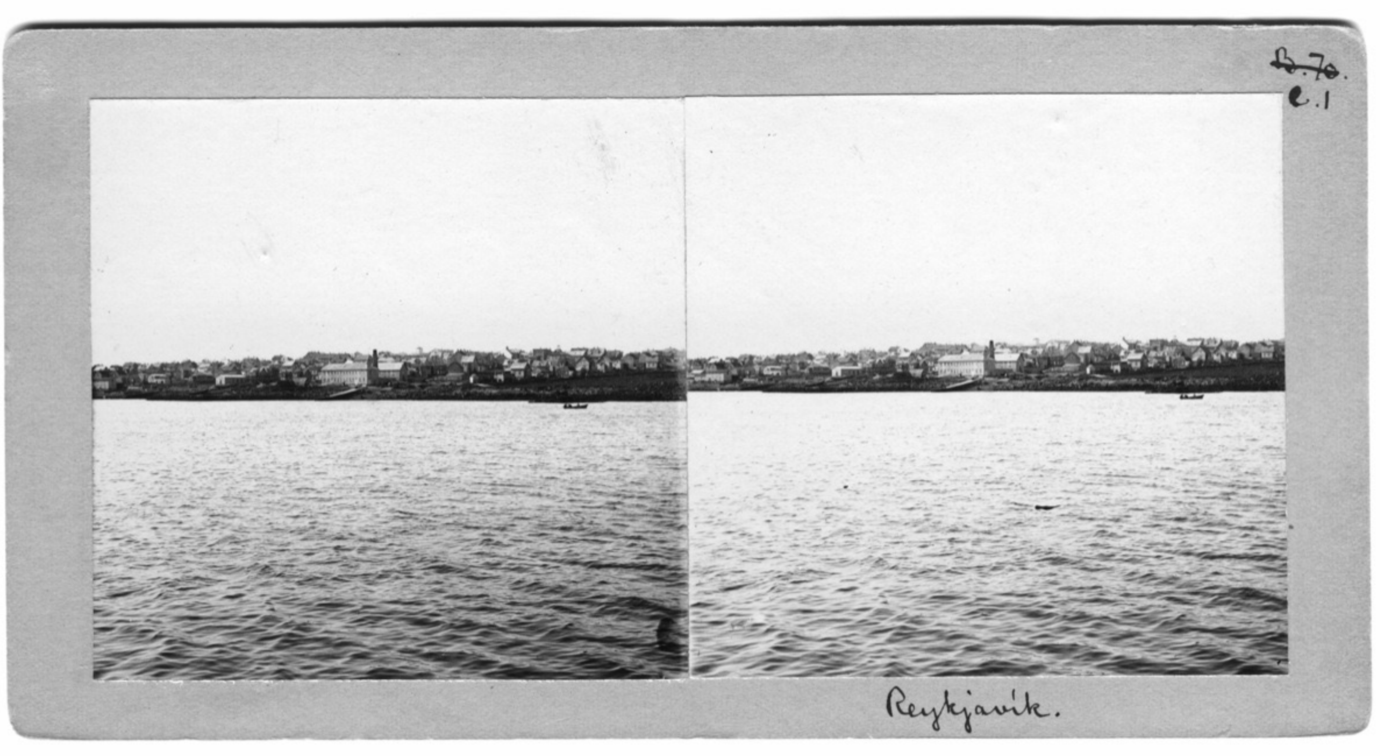
[276] Gunnar Karlsson, *Iceland's 1100 Years. The History of a Marginal Society* (London: Hurst & Company, 2000), 182–85; Guðjón Friðriksson, *Saga Reykjavíkur. Bærinn vaknar. 1870–1940. Fyrri hluti* (Reykjavík: Prentsmiðjan Oddi, 1991), 69–84.

[277] *Opið bréf* in Icelandic. See: Páll Líndal, *Bæirnir byggjast*, 104.

[278] "Það skal hjer eptir bannað, að gjöra hús eða bæi af torfi, nema í úthverfum kaupstaðarins, og þó því að eins að byggingarnefndin veiti til þess samþykki". Lbs, Íslandssafn. *Stjórnartíðindi fyrir Ísland* 1894. A-deild. *Lög um breytingu á opnu brjefi 29. maí 1839, um byggingarnefnd í Reykjavík* [Change of the Open Letter of 29 May 1839, on the Building Commission of Reykjavík], 36–39.

[279] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 162–63.

[280] For a comparison, the first building regulations for urban settlements in Norway were emanated in 1896 and published in 1900: Arne Carlsen, *Den almindelige Bygningslovgivnng* (Kristiania: H. Aschehoug & Co., 1900).



Figg. 65a–65b – Reykjavík at the turn of the century. Photographs taken from the sea and at the harbour, ca. 1907. Landmælingar Íslands, ljósmyndir danskra landmælingamanna, https://www.lmi.is/.

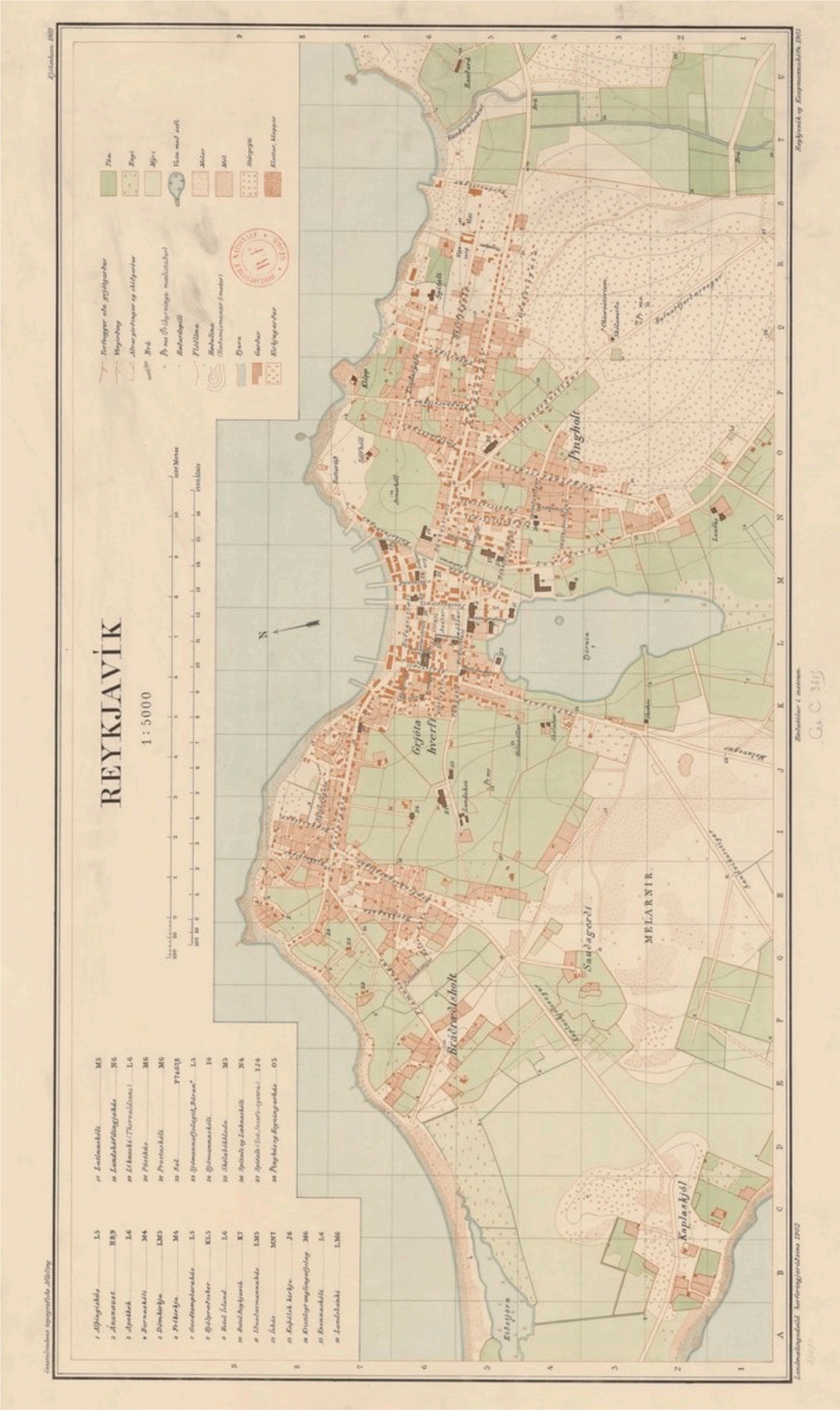


Fig. 66 – Map of Reykjavík, 1903; Copenhagen: Generalstabens topografiske Afdeling. Bibliothèque nationale de France, département Cartes et plans, GE C-3615. gallica.bnf.fr

town: the first being a stable in Barónsstígur (1897–8), then followed by the houses at Bankastræti 4 and Ingólfsstræti 21 (1903). Knud Zimsen responded to the growing demand of concrete by opening its commercial trade with *Aalborg Portland-Cement Fabrik* while simultaneously his building code set some basic rules regarding concrete use for architectural purposes. **Figg. 67a–67b.**

Considering all this, it should not come as a surprise if the building code of 1903 assigned quite a large role to cement and concrete as building materials, and also devoted a lot of attention to explanations regarding construction techniques. As claimed in a local newspaper, the building code had "three aims": reaching proper hygienic conditions, avoiding the risk of fires, building stronger and durable housing.[281] The building code predated Iceland's Home Rule: it was published on 7th September 1903, signed by Iceland's governor-general Magnús Stephensen, and it was divided into thirty-three articles.[282] The first fifteen articles pertained to the duties of the city's building commission and the relations between a new construction and the city – such as street width, a new house's distance from the street and from other buildings, and its height. In particular, timber houses were limited to a height of 14 *álnir* (ca. 9m, being one Danish *alin* – an ell – ca. 0,63m), while stone and concrete houses could be as high as 25 *álnir* (ca. 16m). In general, houses could not be higher than the street width. The still low technical skills regarding concrete did not usually allow the building of higher structures. [283]

The following articles referred to construction topics, such as foundations, materials, and building techniques. For all two-storey or higher buildings, foundations had to be made of stone or gravel, bound together with lime or cement. In order to avoid damp within the walls, a layer of tar or cement was mandatory and it had to be located right above the ground floor.[284] A precise mix ratio for load-bearing concrete walls was given, as concrete could not be weaker than 1 : 5 : 10 (cement : sand : gravel); and it was also stated that it was forbidden to cast concrete walls if the temperature was 2°C or below.[285] The code very briefly mentioned the possibility of reinforced concrete walls, although reinforcement bars were not largely in use at that time. The code's relatively high degree of precision regarding concrete construction techniques aimed at one single scope, as stated by Knud Zimsen in one of his autobiographies:

[281] "Byggingarsamþyktin," *Reykjavík* 4, no. 32 (25 June 1903): 4.

[282] Magnús Stephensen was Iceland's last governor-general between 1886 and 1904. See note 19 in this chapter. Lbs, Íslandssafn. *Stjórnartíðindi fyrir Ísland* 1903. B-deild. *Byggingarsamþykkt fyrir Reykjavík* [Building Code for Reykjavík], 135–44.

[283] *Byggingarsamþykkt fyrir Reykjavík*, Article 13, 137.

[284] *Byggingarsamþykkt fyrir Reykjavík*, Article 16, 138.

[285] *Byggingarsamþykkt fyrir Reykjavík*, Article 17, 138–39.

Fig. 67a – Reykjavík's first concrete buildings: the stable Barónsfjósið in Barónsstígur, built by Guðmundur Jakobsson in 1897–98. Photo by Sofia Nannini, 2019.

Fig. 67b – The house in Bankastræti 6, built by Helgi Magnússon in 1903. Þjóðminjasafn Íslands/National Museum of Iceland.

> I set out very strong rules regarding the construction of stone/concrete houses, as I believed that with such material it was possible to build for the future, and a great effort was made in order to have houses of the best quality.[286]

In early twentieth-century Iceland, building for the future meant both building enduring houses and building towards modernity: this might be the reason why, by the end of the code, its writers included one clause that became a turning point for Icelandic history: turf houses were entirely banned, both in the city centre and on its outskirts.[287] The ban on turf houses in the city did not have instant effects, and for decades turf farms cohabited next to modern constructions. The transition from tradition to modernity also had deep social consequences, as it radically changed the living conditions of most inhabitants. **Figg. 68–69.** This "vanishing world"[288] was poetically narrated by Halldór Laxness in his novel *The Fish Can Sing*, set in one of Reykjavík's last turf farms.[289] In the novel, the farm at Brekkukot is a house "which was to be razed to the ground tomorrow".[290] Referring to the urban growth of Reykjavík, Laxness highlighted with irony the people's optimism on the relations between modern housing and life improvement:

> 'I want to buy this cottage,' said Gúðmúnsen in all seriousness. 'They will soon be building palaces in Iceland. What do you say, Björn? I shall let you have a first-class basement up in Laugavegur. And gold in your hand like dirt, to last you the rest of your life'.[291]

Against fire

Despite the technical progress embodied by Reykjavík's first building code, a good part of its articles were devoted to carpentry. Nevertheless, timber construction had two main drawbacks: it was expensive and it was under the constant threat of fire. This risk was at the centre of the building code's attentions, and it was the reason why Reykjavík first developed as town of low houses surrounded by small plots of land. Houses had to be isolated by means of unbuilt areas with dimensions comparable to

---

[286] "Ég hafði sett mjög strangar reglur um smíði steinhúsa, því að ég taldi, að með því væri verið að byggja fyrir framtíðina og því mikils um vert, að til þeirra væri sem bezt vandað". *Úr bæ í borg: nokkrar endurminningar Knud Zimsens fyrrverandi borgarstjóra um þróun Reykjavíkur*, edited by Lúðvík Kristjánsson (Reykjavík: Helgafell, 1952), 31.

[287] "Torfbæi og torfhús má ekki byggja". *Byggingarsamþykkt fyrir Reykjavík*, Article 29, 143.

[288] Peter Hallberg, *Halldór Laxness* (New York: Twayne Publishers, 1971), 192. On Halldór Laxness see also the recent biography: Halldór Guðmundsson, *The Islander. A Biography of Halldór Laxness* (London: Maclehose Press, 2008).

[289] Halldór Kiljan Laxness, *The Fish Can Sing*, trans. M. Magnusson (London: Vintage Digital, 2010). [*Brekkukotsannál*]. First published in 1957.

[290] Laxness, *The Fish Can Sing*, 246.

[291] Laxness, *The Fish Can Sing*, 75.

Fig. 68– The city centre of Reykjavík at the turn of the century: a turf cottage can be seen on the right. Þjóðminjasafn Íslands/National Museum of Iceland.

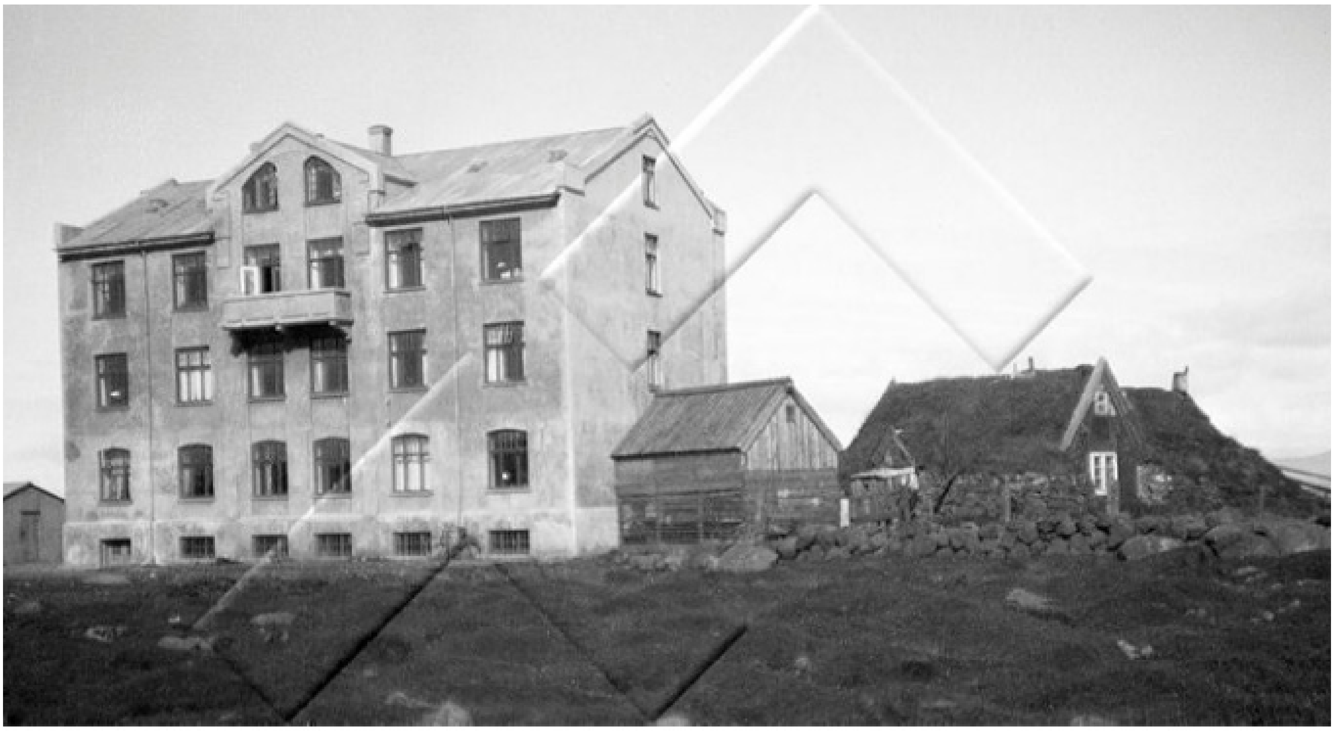


Fig. 69 – The Union's House [Sambandshúsið] by Knud Zimsen, built in 1919, next to an old turf cottage. Photo by Eggert P. Briem, ca. 1925–30.
Ljósmyndasafn Reykjavíkur/Reykjavík Museum of Photography.

those of the house,[292] or – in case of constructions closer than 5 *álnir* (ca. 3m) – divided by a fire-proof wall, usually built in stone or concrete.[293]

In October 1906, a fire destroyed some timber houses in the village of Akureyri, and soon after the local newspaper stated that "the building of timber houses has to stop", so that the reconstruction would only be "out of cement and sand".[294] Some years later, in 1912, this wish was echoed by the newly-founded Engineers' Society of Iceland. Rögnvaldur Ólafsson gave a lecture on the need for an upgrade of the building code of 1903. Timber construction had to be more strictly limited, especially in the city centre, and greater details had to be provided on the use of concrete and its reinforcement. As a builder, Rögnvaldur Ólafsson was very interested in technical issues, such as the resistance of concrete structures against earthquakes and fires. Also, as an architect and urban planning enthusiast, he also understood that the materials with which they were building Reykjavík would have changed the outlook and the organization of the city:

> An alteration which seems to me absolutely necessary is an improved arrangement of the town. On the whole it should be more densely populated. It may seeem going the wrong way to make population denser, when there in other countries is a strong movement rising, tending towards its scattering. I mean the Garden Cities. [...] As far as I can see, the wide expanse of this town renders it very difficult to keep it decently clean, to take care of the make and the repair of streets and pavements and to procure lighting, sewerage and other things [...]. In my opinion, some parts of the town must be built more densely, and then it will be necessary to build from a material more fireresisting and more durable than wood is known to be.[295]

In short, houses of concrete meant more density – less unbuilt plots of land between each building, therefore a denser urban tissue that could finally give Reykjavík the look of a city. Rögnvaldur Ólafsson's plea for a revision of the code did not arrive as expected and more detailed rules on reinforced concrete will only be featured in the new building code for Reykjavík issued in 1945. The architect was especially worried about the large presence of timber houses in the city centre of Reykjavík, and he suggested imposing a restriction on them. Three years later, his words sounded almost prophetic. **Fig. 70.**

During the night of 25th April 1915, a tragic fire burst in Reykjavík: the event destroyed most of the houses in Kvosin, the area corresponding to the city centre,

---

[292] "Hverju íbúðarhúsi skal fylgja óbyggð lóð, er ekki sje minni en hússtæðið". *Byggingarsamþykkt fyrir Reykjavík,* Article 17, 138–39.

[293] "Við hús, sem reist er nær lóðarmörkum en 5 áln., skal gjöra eldvarnarvegg út að nágrannalóð. [...] Eldarnarveggi skal gjöra úr steini [...]". *Byggingarsamþykkt fyrir Reykjavík*, Article 20, 140.

[294] "Timburbyggingar þurfa að hætta [...] reisa aftur sambyggingar og þá líklega úr cementi og sandi". "Mesti húsbruni á Íslandi 1906," *Norðurland* 6, no. 8 (20 October 1906): 27.

[295] Rögnvaldur Ólafsson, "Um byggingarsamþykkt handa Reykjavíkurkaupstað," 31. English translation published after the original text.

between the pond *Tjörnin* and the harbour.[296] A few weeks after the fire, the local newspaper *Morgunblaðið* ran a front-page article with the headline "*Steinbær*", indicating a wish for the Reykjavík of the future to become a "city of stone".[297] *Steinbær* was not only a wish, but a mandatory rule that changed the current building code: in the future, with a few exceptions, all houses of Reykjavík would have to be built out of fireproof materials, such as stone or concrete. This break in local building traditions is similar to the events that occurred in 1904 in Ålesund, Norway, after a fire had destroyed most of its city center.[298] Rögnvaldur Ólafsson's idea of getting rid of timber houses did not seem absurd anymore. Less than two months after the great fire, an additional clause was added to the code: "From now on, all new houses in Reykjavík will have to be built out of stone or concrete, or other reliable and fire-proof materials". The only exception was for isolated buildings standing at least 3,15m away from a neighboring plot and 2m from the street border.[299] After a decade of experiments and tryouts, Reykjavík was truly entering its age of concrete, and so were all the other villages in the country: from Borgarnes (1914) to Ísafjörður (1943), all Icelandic urban settlements slowly adopted a building code, generally modelled after that of Reykjavík. Without a doubt, the revision of the building code marked the heyday of Icelandic concrete architecture both in urban and rural contexts.

---

[296] The event was usually referred to as "the great fire", *bruninn mikli*.

[297] "Steinbær," *Morgunblaðið* 2, no. 212 (7 June 1915): 1.

[298] After the distruction cause by the fire, the new building code of Ålesund forbade all timber structures and promoted the use of masonry following a specific law called *Murtvangloven*. On the 1904 fire of Ålesund and the subsequent reconstruction, see: Helga Stave Tvinnereim, *Arkitektur i Ålesund 1904–1907: Oppattbygginga av byen efter brannen 23 januar 1904* (Ålesund: Aalsunds Museum, 1981).

[299] "Framvegis má ekki byggja neitt hús í Reykjavíkurbæ úr öðru efni en steini eða steinsteypu, eða öðru efni, ekki ótraustara eða óeldtryggara, að dómi byggingarnefndar og bæjarstjórnar, nema þar sem opin bygging er, þ. e. þar sem hús eru ekki sett nær lóðarmörkum en 3,15 metrar, og minst 2 metrar frá götujaðri". Lbs, Íslandssafn. *Stjórnartíðindi fyrir Ísland* 1915. B-deild. *Samþykt um viðauka við byggingarsamþykkt fyrir Reykjavík* [Addition to the Building Code for Reykjavík], 152.

Fig. 70 – Reykjavík's great fire, photo by Magnús Ólafsson, 1915.
Þjóðminjasafn Íslands/National Museum of Iceland.

Chapter 3

Into the Icelandic Landscape: Concrete and Farmhouses

The rural nature of the Icelandic society characterized the island's economy since the Medieval times until the mid-twentieth century. Not only were traditional farmhouses considered symbols of the country's history and culture, but they also became an important backdrop for debating the modernization of local building techniques. As seen in the previous chapters, the innate flaws of turf construction were the cause of an almost constant renovation of local farmhouses: it was indeed a necessity which had severe economic drawbacks for the inhabitants. Reflections concerning the improvement of turf farms date back as early as the late eighteenth century. However, only by the late nineteenth century new architectural and structural proposals emerged. Their aim was to finally replace turf as the main building material, and suggest different ways for building in the Icelandic countryside.

The first part of the chapter will retrace some publications regarding the architectural improvement of Icelandic farmhouses, analyzing their contexts and scopes. The majority of such sources were sporadic in nature, and circulated by means of pamphlets, usually printed in Reykjavík, and by means of brief articles in newspapers or specialized journals. They were usually addressed to a varied audience of farmers and rural inhabitants, but were also read by engineers, Iceland's rare architects, and builders. On the one hand, these texts were meant to foster some political debates among members of the Parliament in order to promote specific laws which might improve the farmers' living conditions. On the other, the issue of farmhouses opened up a discussion on traditionalism in Icelandic architecture, merging national-romantic stances, nationalistic feelings towards vernacular construction and a desperate need for modernization. Since the late 1920s the issue of rural dwellings was going to be tackled centrally, with the opening of a technical office for the planning of farmhouses at a national scale. By this time, the challenge was to draw as many projects as needed for the remotest corners of Iceland's countryside, and also to provide the builders with the necessary information related to the construction of concrete farms. The vast influence of that central office can be retraced thanks to the consistent body of drawings collected at the National Archives of Iceland.

3.1 Projects for the Countryside (1790–1898)

One of the earliest essays on the improvement of Icelandic farmhouses was written in 1790 by Icelandic priest Guðlaugur Sveinsson (1731–1807), and published in the pages of the journal of the Icelandic Society for Learned Arts.[1] The text highlighted some efficient ways for building vertical structures with turf and gravel, and also suggested three different layouts for smaller and larger "gabled" farms.[2] The intrinsic spontaneity of turf houses did not match well with these kinds of resolutions: not only were farmhouses built and rebuilt several times over the course of one generation, but they were also usually constructed by their own inhabitants, and not by skilled technicians. Common practices and word-of-mouth pieces of advice were the basis of construction techniques which had been repeated for centuries and were rarely, slowly modified. Despite the growing national debate concerning the state of Icelandic farms, it is hard to find examples of turf houses which became models of renovated construction techniques throughout the nineteenth century.[3] **Figg. 1– 3**.

A full revision of the building techniques adopted in farmhouses timidly emerged at the very end of the nineteenth century, after one tragic event: a series of earthquakes which occurred in 1896 in southern Iceland, and destroyed the majority of its farm clusters.[4] The destruction caused by the earthquake soon prompted some reflections on the poor state of Icelandic rural buildings and the reconstruction of southern farms. As early as September 1896, a committee for the "collection of

[1] Guðlaugur Sveinsson, "Um húsa- edr bæabyggingar á Íslandi, sérdeilis smá- edr kot-bæa," *Rit þess konunglega íslenzka Lærdómlistafélags* 11 (1790): 242–78.

[2] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 40; Hjörleifur Stefánsson, *Af jörðu*, 82–83.

[3] An exception might be a farm designed and built by Sverrir Runólfsson at the beginning of the 1860s, on the shores of the Ellíðavatn lake near Reykjavík. Due to his training in stonemasonry, he opted for walls made with stone ashlars, adopting the layout of the Icelandic gabled farm. The project is mentioned in: Páll Líndal, *Reykjavík. Sögustaður við Sund.* Volume 1 (Rekjavík: Örn og Örlygur, 1986), 126. This case was an isolated example within the Icelandic countryside, where the predominance of turf construction was not questioned until the early twentieth century. See, for example, the survey by Sigurður Pétursson analyzed in chapter 2.

[4] On the eartquakes which took place between August and September 1896, see: Sveinbjörn Björnsson, "Jarðskjálftar á Íslandi," *Náttúrufræðingurinn* 45, no. 2 (1975/76): 118–21. Among the first reports of the events see: "Jarðskjálftar," *Ísafold* 23, no. 59 (29 August 1896): 235; Skúli Skúlason, "Jarðskjálftarnir i Rangárvallahreppi," *Þjóðólfur* 48, no. 42 (4 September 1896): 167.

Figg. 1–2–3 – Turf farms destroyed after the earthquakes in Southern Iceland, 1896. Þjóðminjasafn Íslands/National Museum of Iceland.

contributions" for the earthquake-striken areas was founded.[5] In February 1897 a thorough discussion was published in the pages of the *Ísafold* journal, specifically regarding the "improvement of farmhouses in the earthquake areas".[6] The journal published four texts which tackled the issue of reconstruction and structural improvement of Icelandic farmhouses. From this debate, two autonomous proposals emerged as opposite ways for addressing the problem: one was submitted by Danish mastermason Bald, and one by Icelandic carpenter Jón Sveinsson (1852–1936). These sources differed in nature: Bald submitted a handwritten text from Copenhagen, whereas Jón Sveinsson printed pamphlet in 1898. Such differences and the almost opposite projects they suggested were signs that a renewed debate on Icelandic farmhouses was taking place, and it was also available for the general public.

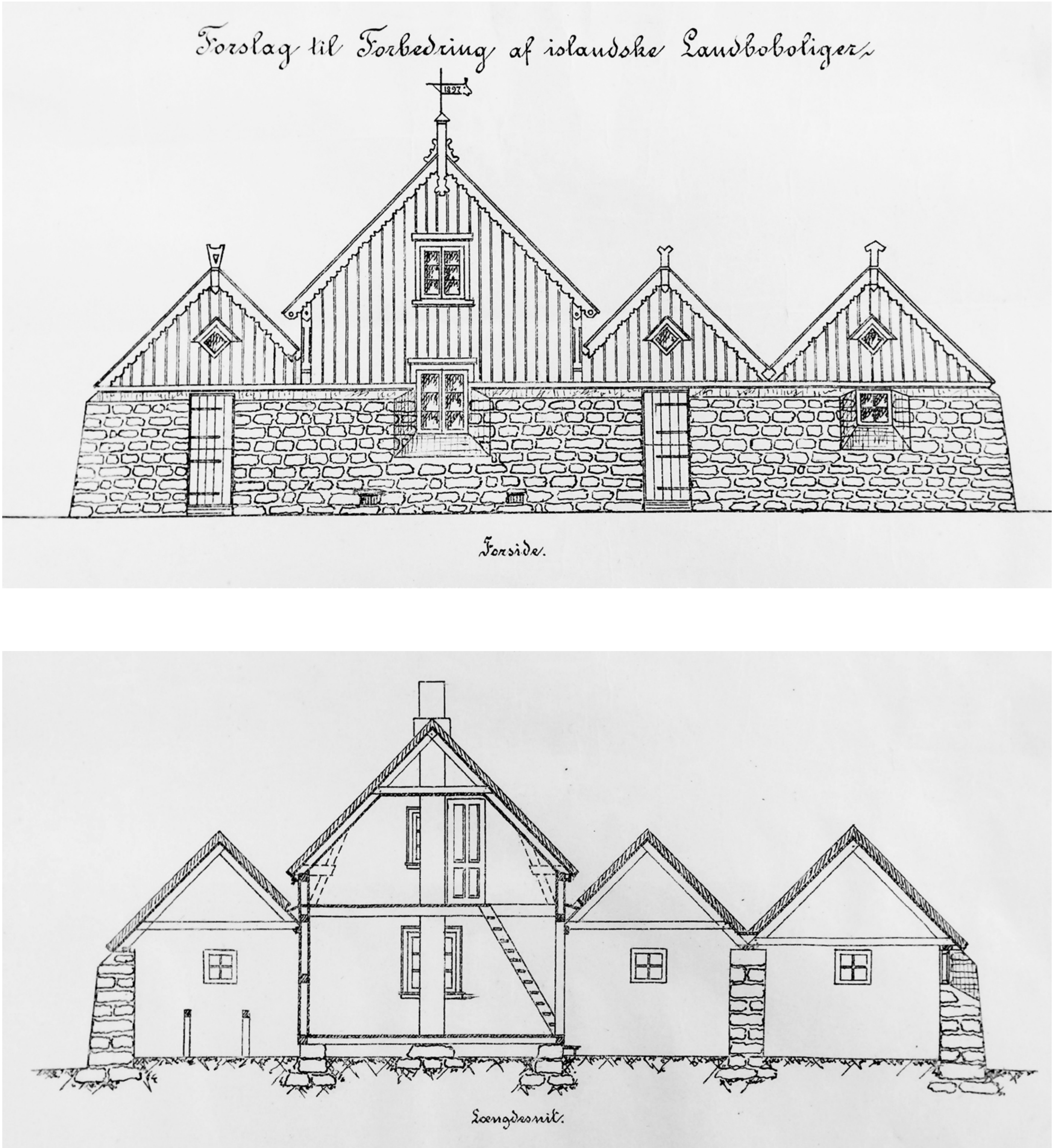
Bald's contribution consisted of a five page handwritten text titled *Proposal for the Improvement of Icelandic Farmhouses*, written in Danish and followed by a drawing of an ideal Icelandic turf farm. The same text was translated into Icelandic and published with a few comments in the pages of the *Ísafold* journal in 1897.[7] The proposal mixed Icelandic traditional elements with some novelties, both in the layout and in the building technique. Bald's reconstruction of a farm was ideally made with stone ashlars alternating with regular turf blocks, resulting in thick vertical structures quite similar to those envisaged by Guðlaugur Sveinsson in the late eighteenth century. The general layout bore a strong resemblance to ordinary gabled turf farms: however, Bald proposed an extended use of timber, in the front gables and in the roofing system, made with timber planks and covered by a turf layer. He also underscored the distinction between the living and sleeping rooms and the farm's service areas: the latter were enclosed by the thick walls of stone and turf, while the former was protected by an extra timber structure. This central portion spanned two levels and hosted a central chimney for heating purposes; its structure in bricks bound in lime, with concrete smoke pipes. Aware of the recent eartquakes, Bald suggested placing iron chains within the stone and turf walls, and also using them to connect the inner timber structures to the outer walls. **Figg. 4a–4d.**

A good amount of timber, a masonry chimney, and some iron rods: despite the traditional appearance, the design included a number of technical improvements which were absolute novelties in late nineteenth-century Iceland. As seen in Sigurður

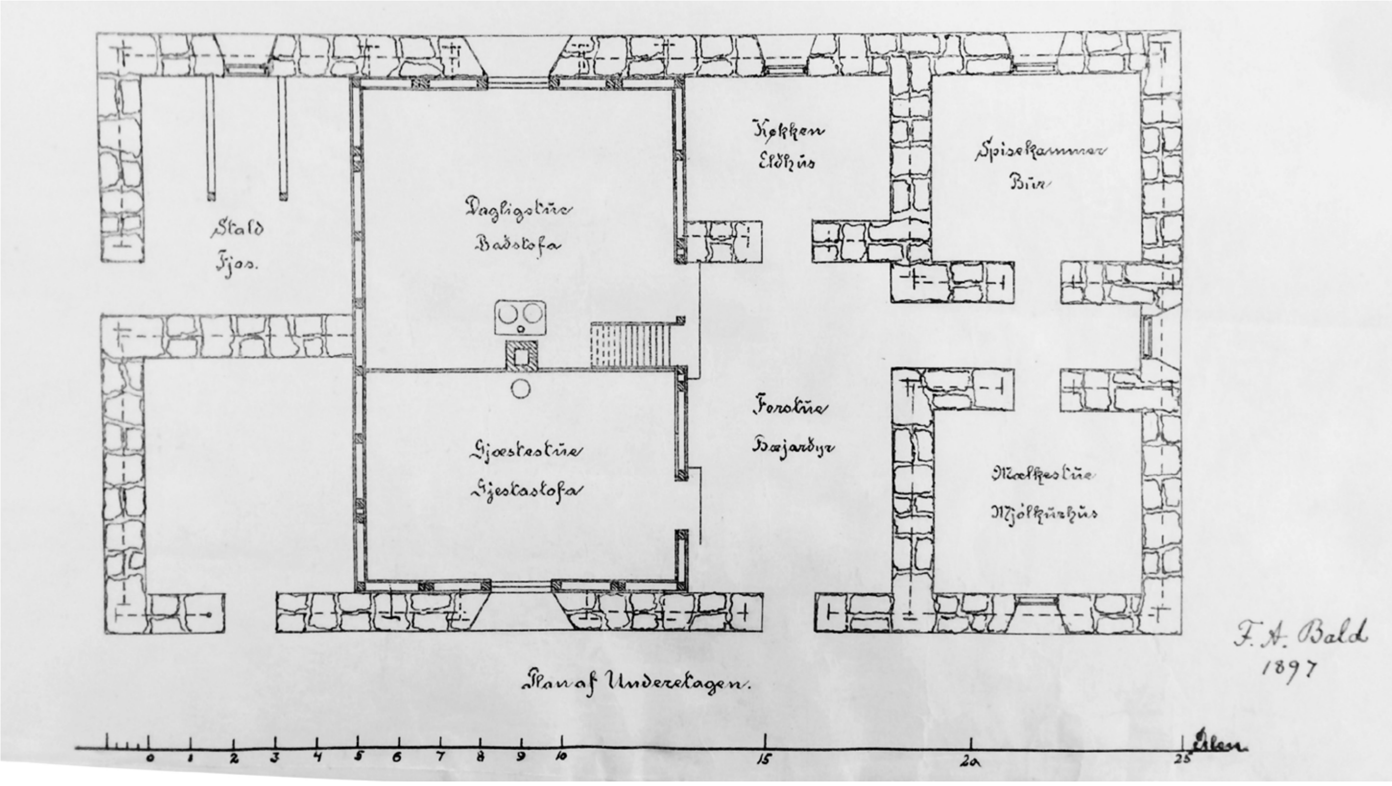
[5] The committee was named *Landskjálftasamskotanefndin* [The Committee for the Collection of Contributions Related to the Earthquake]. Mentions of the foundation of the commitee can be found in the pages of the *Ísafold* newspaper on 16th September 1896. A group of twenty workers was formed and coordinated by politician and bank director Tryggvi Gunnarsson. See: "Landskjálftasamskotanefndin," *Ísafold* 23, no. 64 (16 September 1896): 256. No further mention of the committee has been retrieved in the years after 1896.

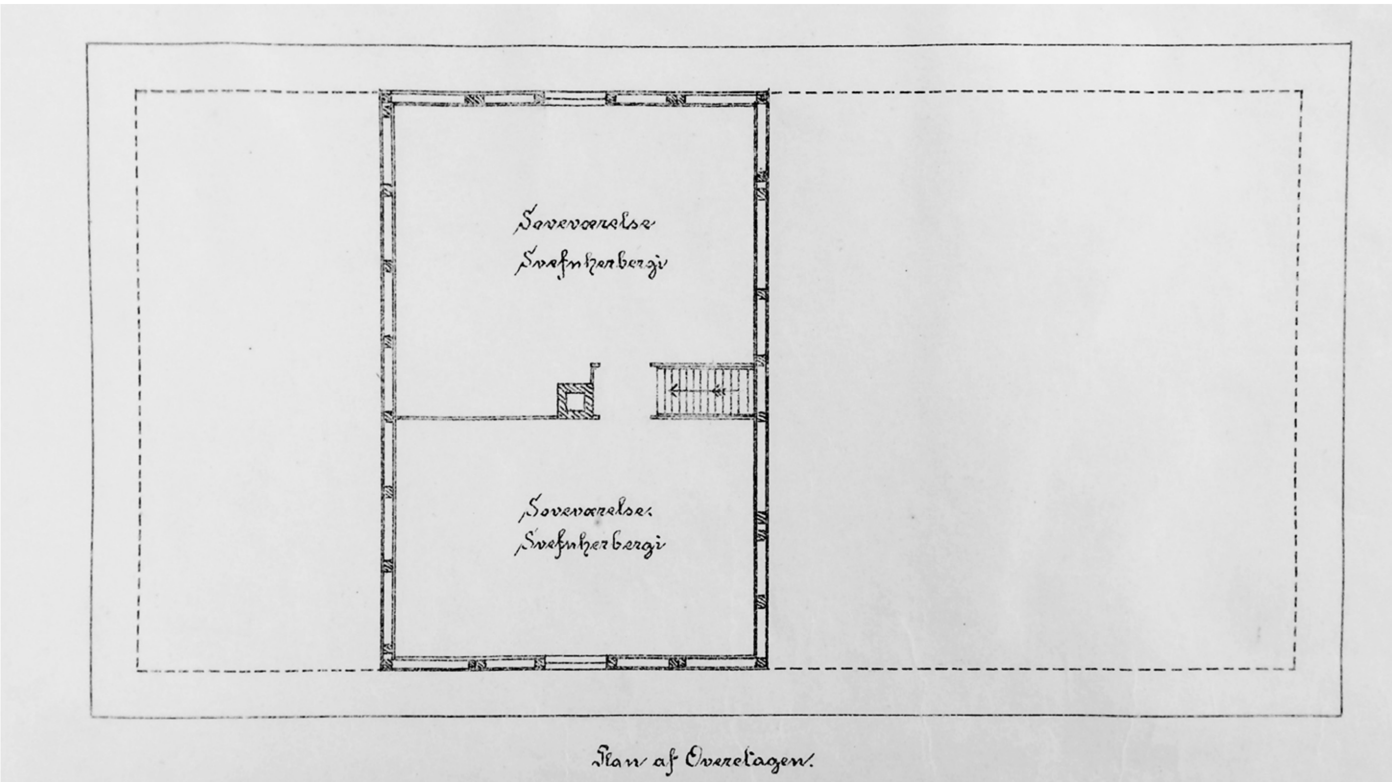
[6] The debate was announced in: "Um húsabætur á landskjálftasvæðinu m. m.," *Ísafold* 24, no. 8 (10 February 1897): 31.

[7] *Forslag til Forbedring af islandske Landboboliger*, copy of a handwritten document and one drawing by F. A. Bald, 1897. Lbs, Íslandssafn. As a note on the last page suggests, the copy was given to the National Library by librarian and archivist Jón Jakobsson (1860–1925) on 24 March 1908. The translated and commented version of Bald's text can be found in: Fredrik Anton Bald, "Um húsabætur á landskjálftasvæðinu og víðar," *Ísafold* 24, no. 10 (17 February 1897): 37–38.



Figg. 4a–4b – Frederik Anton Bald's proposal for the improvement of Icelandic farmhouses. *Forslag til Forbedring af islandske Landboboliger*, copy of a handwritten document and drawings by F. A. Bald, 1897. Lbs, Íslandssafn.





Figg. 4c–4d – Frederik Anton Bald's proposal for the improvement of Icelandic farmhouses. *Forslag til Forbedring af islandske Landboboliger*, copy of a handwritten document and drawings by F. A. Bald, 1897. Lbs, Íslandssafn.

Pétursson's survey discussed in chapter two, the presence of turf farms with a central stove was quite a rarity at the turn of the century, not to mention the use of iron chains for structural purposes. However, despite its quick appearance in the press, the fact that such a proposal was delivered only in handwritten form clearly attests to its limited spread around the country. Despite the precise description and drawings, Bald's contribution was a rather sporadic attempt of dealing with the task of intensive reconstruction of farmhouses especially in the southern part of the island.

One year later, a more structured proposal was published: thanks to its print form it undoubtedly reached a wider public and its proposals had practical outcomes. Titled *Improvement of Farmhouses*, with descriptions and drawings by Icelandic carpenter Jón Sveinsson, the text was published with the support of the commitee founded in 1896.[8] The specificity of this pamphlet stood in the projects it suggested. Differently from Bald's proposal for an ideal turf farm, Jón Sveinsson published plans for timber houses which could replace the turf buildings destroyed by the earthquakes. The author suggested six different layouts for what he called house [*hús*] and three bigger layouts for a modern version of the Icelandic *baðstofa*, meaning the core dwelling of the Icelandic farm, where the inhabitants would both work and sleep in a common hall surrounded by service rooms.[9] To each layout the author attached a drawing and a precise list of the building material needed, together with the price of each element. This choice could be linked to Jón Sveinsson's technical skills: he was a trained carpenter who had studied in Reykjavík, and also worked abroad between Europe and the United States.[10] His international expertise might have also been linked to the ongoing trend of importing Norwegian timber "catalogue houses", a very common business in Reykjavík in the last decades of the nineteenth century.[11] For the first time the modern and expensive "catalogue" timber houses of the capital were proposed for the rural countryside. Despite the high costs of the material and the difficulties of transport, timber structures were nevertheless proposed as the ultimate solution to reconstruct Icelandic farms and reach decent living standards. All projects had a timber structure, surrounding a central masonry chimney, and roofs cladded with corrugated iron sheets. As the drawings show, each building was envisaged without a basement, directly resting on stone foundations. However, Jón Sveinsson wrote some final remarks on the construction of a storage basement located under the first floor: in particular, he suggested casting a layer of concrete and tar on the basement floors, to prevent the spread of humidity rising from the ground.[12] **Figg. 5a–5c.**

The pamphlet aimed at widening knowledge on these structures, listing the building material needed and offering construction models. However, the fact that

[8] Jón Sveinsson, *Húsabætur á sveitabæjum* (Reykjavík: Ísafoldarprentsmiðja, 1898).

[9] On the origins of the *baðstofa*, see: Hjörleifur Stefánsson, *Af jörðu*, 53–55.

[10] Jón Sveinsson had worked in Copenhagen, Hamburg and Chicago. See: Páll Eggert Ólason, ed., *Íslenzkar æviskrár frá landnámstímum til ársloka 1940. Vol. 3, J-N* (Reykjavík: Hið Íslenska bókmenntafélag, 1950), 285.

[11] See note 32 in chapter one.

[12] Jón Sveinsson, *Húsabætur á sveitabæjum*, 25–26.

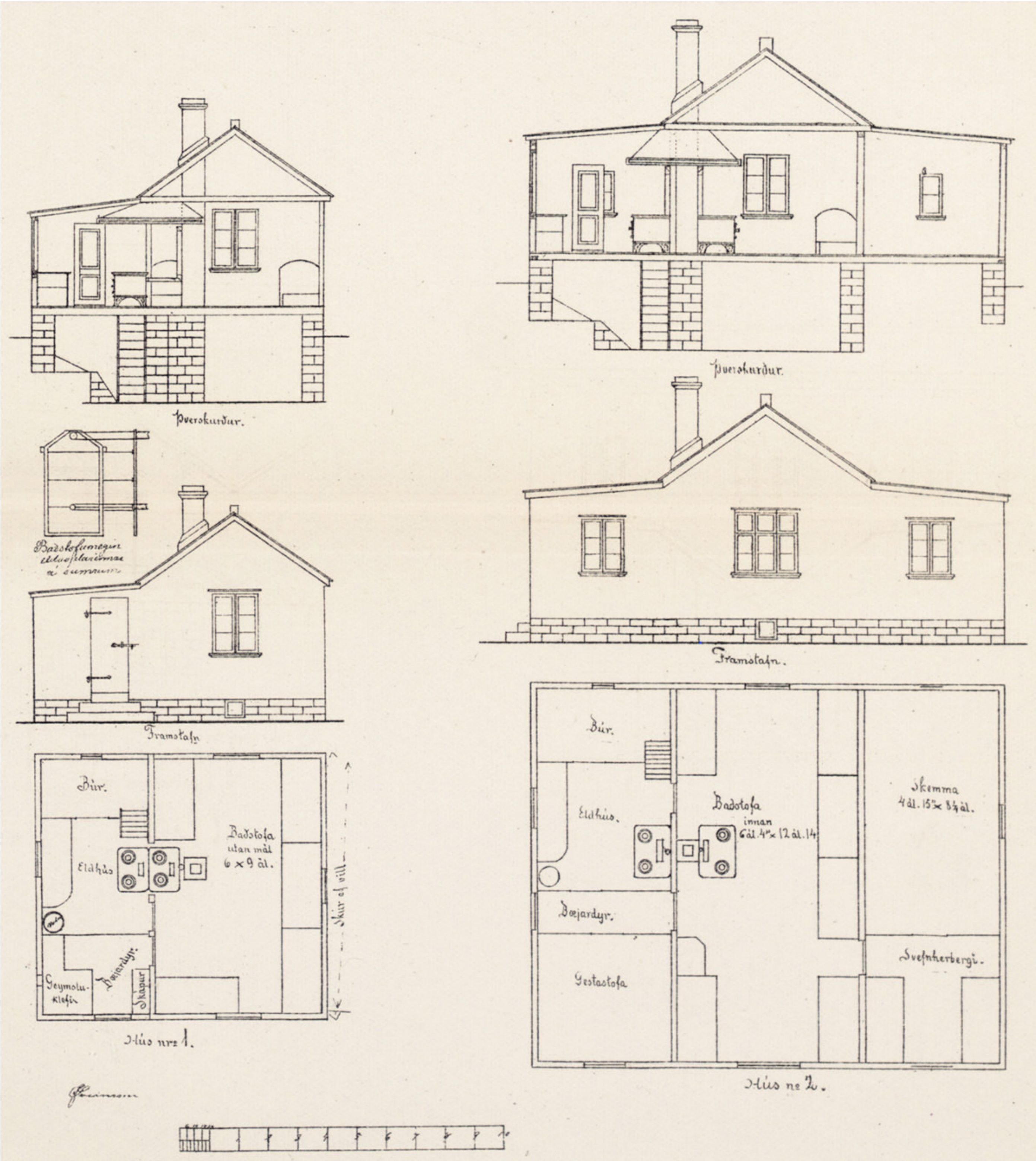


Fig. 5a – Model for a farmhouse. Jón Sveinsson, *Húsabætur á sveitabæjum*, 1898.

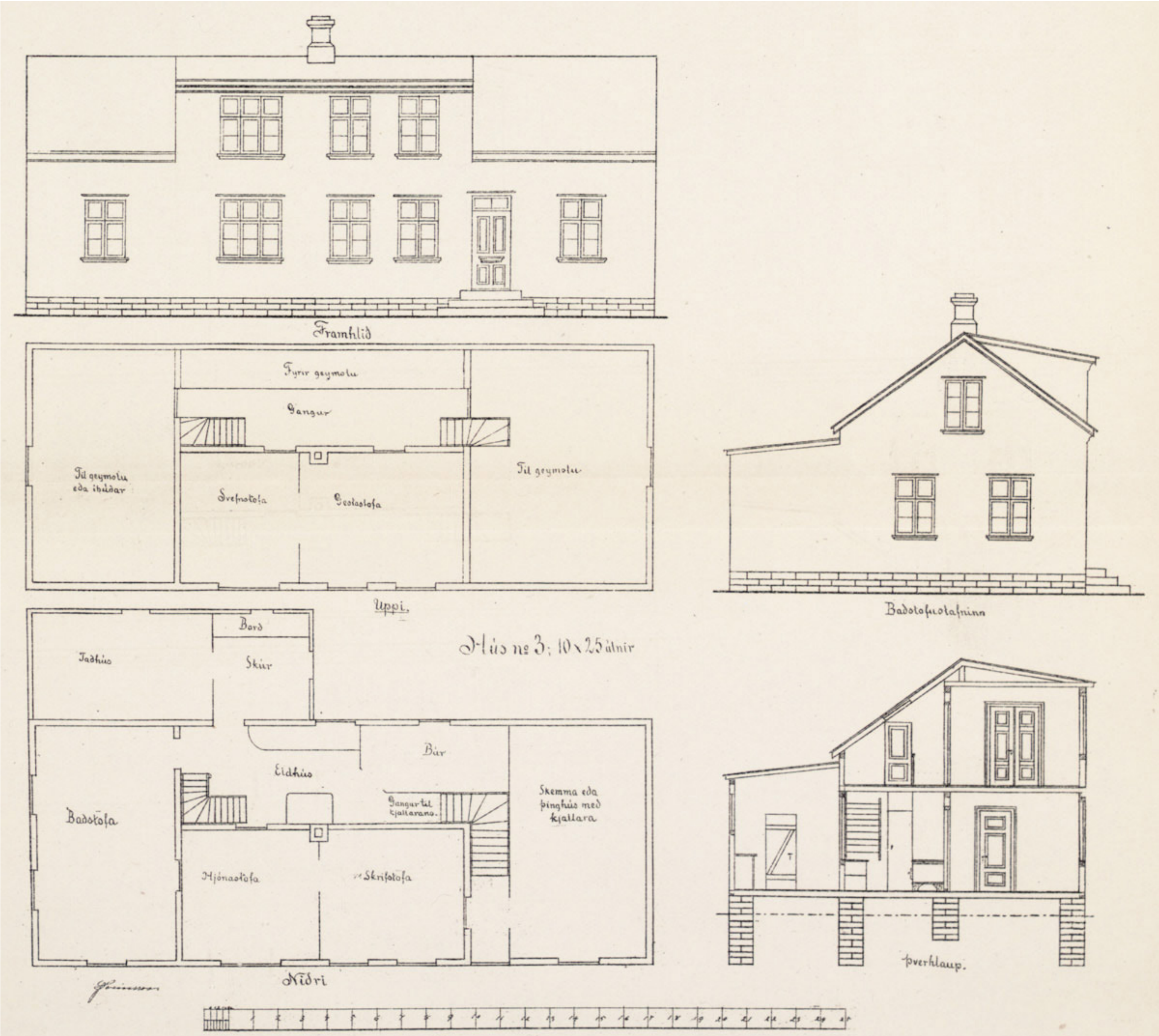


Fig. 5b – Model for a farmhouse. Jón Sveinsson, *Húsabætur á sveitabæjum*, 1898.

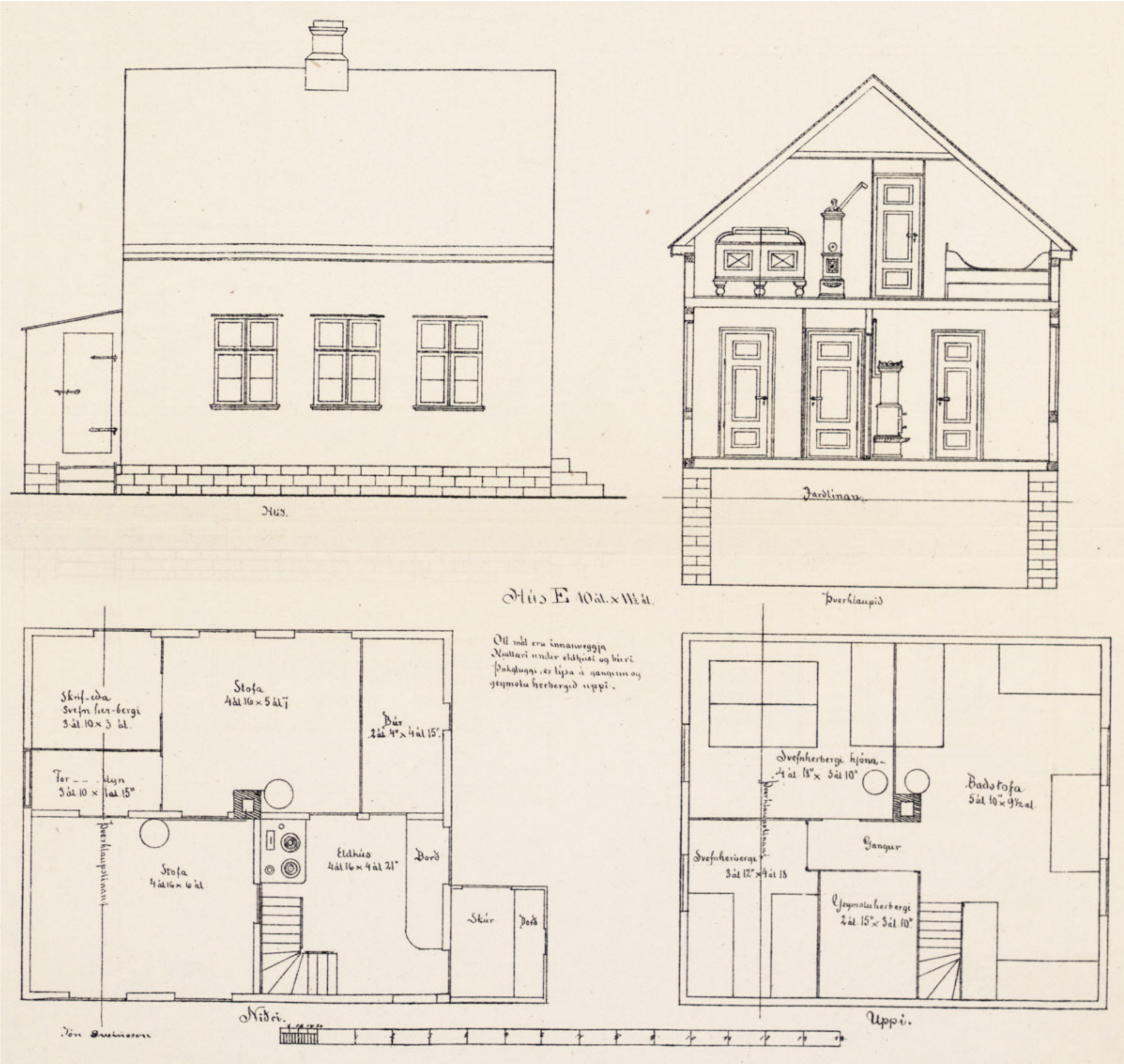


Fig. 5c – Model for a farmhouse. Jón Sveinsson, *Húsabætur á sveitabæjum*, 1898.

high carpentry skills were required might have hampered the approval of this proposal among rural inhabitants. The text did not properly circulate at a national level, and its projects were not taken up as efficient models for the improvement of farmhouses. As seen in chapter two, the majority of the national funds granted for farmhouses was still designated for the reconstruction of turf buildings. Only a few houses were built according to the carpenter's suggestions in the earthquake areas.[13]

3.2 Towards Concrete Farmhouses

The real shift within the debate on farmhouses was fostered by the increasing knowledge of concrete construction brought to the country by its first engineers. This process implied major changes in how farms were built in the countryside, and promoted a collection of data concerning the values and drawbacks of new concrete farms. The first coordinated attempt to track the reception of concrete farms built in the countryside took, once again, the shape of a survey, organized by engineer Jón Þorláksson and medical doctor Guðmundur Hannesson. The results were published in 1911 in the journal of the Agricultural Society, in an article signed by the engineer and titled "How Do Concrete Houses Prove to Be?".[14] The text included one of the earliest acknowledgments of the fast changes taking place in Icelandic construction: less than ten years after his homecoming as an engineering graduate, Jón Þorláksson claimed that "there is no longer any doubt that the country's building traditions are changing. The age of timber construction, which has been going on for a while, is about to end, yet the age of concrete is rising".[15] These words are particularly important for historiographic reasons: it appears to be one of the earliest mentions – if not the earliest – of the term *steinsteypuöldin*, "age of concrete", with regards to Icelandic construction history. The proclamation of the beginning of a new age for Icelandic construction was linked to the increasing number of concrete houses being built in the capital and in the countryside. In particular, the engineer reported that in 1910 Reykjavík had seen more new houses built in concrete rather than in timber.

Ten years after Sigurður Pétursson's survey on rural building techniques in Northern Iceland, the new survey was much more specific on one topic: recent uses of concrete in the countryside.[16] As it was the very beginning of the Icelandic concrete

[13] In particular, the timber house in Teigur í Fljótslhlíð is mentioned as one of the structures built according to Jón Sveinsson's proposals. Sigurður Jónsson, "Timburhúsin risu eftir jarðskjálftana," *Sunnudagsblað* (25 August 1996). https://www.mbl.is/greinasafn/grein/283233/, last accessed 28/11/2020.

[14] Jón Þorláksson, "Hvernig reynast steinsteypuhúsin?," *Búnaðarrit* 25, no. 1 (1911): 207–27.

[15] "Það er nú ekki lengur neinum efa undirorpið, að húsgerðarlagið í landinu er að breytast. Timburhúsaöld sú, sem hér hefir gengið yfir um hríð, er að enda, en steinsteypuöldin upp runnin". Jón Þorláksson, "Hvernig reynast steinsteypuhúsin?," 207.

[16] The recurring use of surveys to gather information on a specific topic could be linked to the small population of Iceland, allowing a number of statistic studies which would be harder to obtain in more populated countries. Iceland's first population census dates back to 1703. In 1913 the office

age, even the term "concrete" was adopted to describe a wide range of construction techniques, including cast walls, concrete cast stones, and stonemasonry. The survey forms were sent out to eighteen farmers who had recently built or renovated their dwellings in concrete, between 1888 and 1909.[17] Twenty-eight in total, the questions were addressed to the understanding of how these farmhouses had been built, both in terms of building materials and layout, and most importantly how they tolerated the Icelandic climate. In line with Jón Þorláksson's didactic scopes, the survey's aim was to gather as much information as possible on how concrete was used, in order to paint a clear picture on local experimentations and outcomes. To understand the early influence of the pioneering work of Iceland's first engineers, most interesting are the answers to the questions 17 and 18, which were focused on the structure of the walls, the mixing ratio, and its aggregates.[18] Particular attention was devoted to the treatment of outer surfaces, in relation to cold temperatures and waterproof dwellings: it turned out that all eighteen buildings were covered by a layer of cement mortar, at times mixed with *Testalin*.[19]

As seen previously, according to Jón Þorláksson the "battle" of Icelandic builders was mainly fought against cold climate and humidity which rapidly spread inside the structures. Thanks to this survey he could draw some conclusions from the practical data gathered from the countryside. Undeniably, the majority of recently built concrete houses were very damp, especially in the winter months, and sometimes even colder than traditional turf farms. There was, however, one truly positive exception: a small hospital had not experienced troubles even in colder temperatures, thanks to its double walls of concrete cast stones and a hollow core between the two layers.[20] This particular feedback became a trigger for a series of future essays on the construction of warmer concrete farmhouses, written by one of the promoters of the survey. He was a protagonist of the country's concrete *saga* and he would also play a key role in writing the first construction history of Iceland: not an engineer, but medical doctor Guðmundur Hannesson.

Hagstofa, currently translated as Statistic Iceland, was founded. In more recent years censuses were conducted also on the built heritage [*Húsakannanir*], in different towns and villages of the country. See the complete list at: http://www.minjastofnun.is/gagnasafn-/husakannanir/, last accessed 20/11/2020.

[17] Both the small house at Garðar and the Sveinatunga farmhouse were included in this list.

[18] See these questions in: Jón Þorláksson, "Hvernig reynast steinsteypuhúsin?," 209. The majority of those early concrete farmhouses were built with single cast walls, approximately 9 to 15 inches thick (ca. 20–36cm). The mixing ratio varied greatly, from stronger blends of 1 : 2 : 3 until weaker proportions of 1 : 4 : 8. Other examples included a farmhouse with double walls in concrete cast stones, most likely linked to the production located in Reykjavík and discussed in chapter two, and other buildings in coarse lava stones, basalt, or dolerite, held together by lime or cement mortar.

[19] *Testalin* was produced in Germany by the company Hartmann & Hauers. It was a chemical alchool-based solution which was mixed with cement to make it waterproof. It was quite popular among the German-speaking countries at the turn of the century, see for example: "Testalin," *Illustrierte schweizerische Handwerker-Zeitung: unabhängiges Geschäftsblat der gesamten Meisterschaft aller Handwerke und Gewerbe* 16, no. 14 (7 July 1900): 282.

[20] See the answer number eight: Jón Þorláksson, "Hvernig reynast steinsteypuhúsin?," 218. The house is described as a hospital [*sjúkrahús*].

3.2.1 Guðmundur Hannesson: The hygiene of concrete

So far in the previous chapters, Guðmundur Hannesson has mainly appeared as the author of the pivotal text *Húsagerð á Íslandi*, published in 1942 and whose legacy greatly influenced nearly all later Icelandic construction histories. However, Guðmundur Hannesson was not a mere collector of information on the evolution of Icelandic architecture: on the contrary, he was an active protagonist of such changes, and played a central role in spreading the technical knowledge promoted by local engineers.[21] Trained in Copenhagen as a doctor specialized in medical hygiene between 1887 and 1894, Guðmundur Hannesson was active as a medical doctor in the northern area of Skagafjörður (1894–96) and in the village of Akureyri (1896–1907). From 1907 onwards he settled in Reykjavík, working as teacher of medicine. In 1911 he was one of the co-founders of the University of Iceland.[22] The difficult living conditions in Iceland became one of Guðmundur Hannesson's obsessions, as he dreamt of offering more suitable and hygienic living standards to all Icelanders. As suggested by architect Pétur H. Ármannsson, the medical doctor might have visited the social housing project of Brumleby in Østerbro, Copenhagen, designed by Michael Gottlieb Bindesbøll (1800–56) and built by the Danish Medical Association between 1854 and 1872.[23] Such an example of communal housing might have spiked a twofold interest in Guðmundur Hannesson: urban planning and modern construction techniques.

The doctor's career as the first pioneer of Icelandic urban planning has been retraced elsewhere.[24] Conversely, his role in the development of local building traditions is worth highlighting as a key moment in Iceland's history of concrete, especially concerning its use in rural buildings. Despite having no formal architectural nor engineering education, once back in Iceland Guðmundur Hannesson started experimenting with building materials, seeking for ways to facilitate higher hygienic living standards, first in timber, then in concrete.[25] Consciously or not, he inserted

[21] This paragraph draws some of its arguments from a research published in: Sofia Nannini, "From Reception to Invention: The Arrival of Concrete to Iceland and the Rhetoric of Guðmundur Hannesson," *Arts* 7, no. 68 (2018).

[22] A detailed biography of Guðmundur Hannesson can be found in: Páll Pétursson, and Sigrún Magnúsdóttir, "Athöfn var helguð hver ævinnar stund," in *Aldarspegill. Samtal við Guðmund Hannesson*, edited by Ásdis Hlökk Theodórsdóttir, and Sigurður Svavarsson (Reykjavík: Hið Íslenska Bókmenntafélag, 2016), 28–49. A brief biographical note is also in: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 423.

[23] Pétur H. Ármannsson, "Húsakostur og heilsufræði," in *Aldarspegill. Samtal við Guðmund Hannesson*, 29.

[24] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 156–61. Guðmundur Hannesson's key text on urban planning is *Um Skipulag Bœja* [On Town Planning], published in 1916. On the influence of this text within Icelandic urban studies, see the aforementioned volume: *Aldarspegill. Samtal við Guðmund Hannesson*, edited by Ásdis Hlökk Theodórsdóttir, and Sigurður Svavarsson.

[25] Already in September 1902 the *Stefnir* newspaper, printed in Akureyri, mentioned the doctor's work in overseeing the construction of a small hospital for the village and of his own family house.

himself into what architectural historian Peter Collins defined the "important line of propaganda which was to constitute the most effective argument of partisans of concrete construction", dealing with the "fireproof", "sanitary", and "hygienic" qualities of concrete.[26] His first attempt at building with concrete dates back to 1910, when he was already in Reykjavík. There, he designed and built his own house at Hverfisgata 12, on one of the city's most central streets and right in front of the newly built national library. The doctor's house followed most of the advice promoted by engineer Jón Þorláksson: it was built on a stone basement, made of dolerite ashlars, and the outer walls consisted of double walls of cast concrete filled with a padding of sawdust, wood panelling and cardboard for insulating purposes.[27] It was this particular insulation layer which defined Guðmundur Hannesson's design signature. **Fig. 6.** In fact, it became the doctor's leading battle in teaching how to build "Warm and dry concrete houses" – this was the title of an article he published two years after Jón Þorláksson's survey among concrete farms.[28] Like many other articles by the same author, the text was published in the journal of the Agricultural Society, thus presumably addressed to farmers, masons and rural workers.[29] Guðmundur Hannesson acknowledged the growing popularity of building with concrete even "outside the earthquake areas".[30] He also recognized the many "drawbacks" of Icelandic concrete construction which was still in its "infancy", both in terms of living standards and, no less important, of aesthetic qualities. What were, then, the disadvantages of concrete according to Guðmundur Hannesson?

From a structural point of view, the main problem was related to the difficulty of producing fully waterproof cast concrete walls. This was due to two specific factors: the almost constant rainfall that did not allow much time for the concrete to dry, and the absence of properly trained workers, resulting in flawed structures prone to damages.[31] Single concrete walls were "way too cold" for rural conditions, therefore the author suggested building double concrete walls, divided by a layer of insulating

Both buildings were made with a timber structure, praised for the presence of a cardboard insulating layer [*pappi*]. "Húsabyggingar á Akureyri," *Stefnir* 10, no. 31 (4 September 1902): 37.

[26] Peter Collins, *Concrete*: *The Vision of a New Architecture* (London: Faber and Faber, 1959), 43. On the influence of hygienic issues and the spread of diseases on the development of modern architecture and materials, see also: Colomina, *X-Ray Architecture*, 16–36. Guðmundur Hannesson's concern with the hygienic standards of Icelandic dwellings was also published in German: Guðmundur Hannesson, "Einige Worte über Bevölkerungszuwachs und Sterblichkeit auf Island," *Mitteilungen der Islandfreunde* 8, no. 1 (July 1920): 1–6.

[27] Pétur H. Ármannsson, "Húsakostur og heilsufræði," in *Aldarspegill. Samtal við Guðmund Hannesson*, 33–34.

[28] Guðmundur Hannesson, "Hlý og rakalaus steinhús. Tillögur og leiðbeiningar," *Búnaðarrit* 27, no. 1 (1913): 1–26.

[29] Guðmundur Hannesson addressed the topic of concrete construction also in later articles such as: "Kringum bæinn," *Búnaðarriti* 29, no. 3 (1915): 215–26; "Nýju steinsteypuhúsin og nokkur orð um húsagerð í sveitum," *Búnaðarrit* 32, no. 2 (1918): 129–47; "Útveggir íbúðarhúsa. Framfarir og afturfarir," *Búnaðarrit* 33, no. 4 (1919): 255–61; "Um torfbyggingar og endurbætur á þeim," *Búnaðarrit* 36, no. 2 (1922): 103–17.

[30] "Utan jarðskjálftasvæðanna vilja nú flestir byggja alt úr steinsteypu, sem vel skal vanda og lengi á að standa." Guðmundur Hannesson, "Hlý og rakalaus steinhús. Tillögur og leiðbeiningar," 1.

[31] Guðmundur Hannesson, "Hlý og rakalaus steinhús. Tillögur og leiðbeiningar," 2–3.

materials.[32] The padding could be of timber and cardboard panels, sawdust, peat chunks, dry turf, pumice or volcanic ashes.[33] Thanks to some elementary drawings – one of the first cases of semi-technical drawings attached to an Icelandic essay on building matters – he also suggested different ways of connecting the outer and the inner walls in order to provide more resistance to earthquakes. Guðmundur Hannesson highlighted two key issues which would characterize local concrete construction in the decades to come. **Fig. 7.** First, although surprising for an article dealing with technical problems such as dampness and insulation, the author complained about the aesthetic problems of concrete: "the appeareance of the buildings is far from being beautiful, and it has nothing national nor peculiar".[34] In this matter, he claimed that concrete houses were "inferior" if compared to traditional Icelandic farmhouses, which instead "could be very beautiful"; new houses were influenced by the "tasteless" architecture of urban settlements. By comparing rural and urban architecture, Guðmundur Hannesson was drawing a line which would influence future Icelandic architectural debates: was a national architecture to be sought in the forms of rural farmhouses or within urban residential projects?

The second issue introduced by the author was the need to involve experts when dealing with new construction methods, in order to avoid mistakes and inaccuracies at the building site. The readers were encouraged both to ask for advice from professionals like architect Rögnvaldur Ólafsson, mentioned as the "only expert in architecture" of Icelandic origin in the country, and also to employ at least one mason with good knowledge of concrete structures.[35] This was a piece of advice to the individuals, yet Guðmundur Hannesson also addressed the Parliament directly. He suggested that the government finance expert builders to be hired in the countryside to supervise the construction of new concrete farmhouses. By so doing, he intended to fill the gap between the few building experts and the majority of farmers who had no connections with the professional world. Just as the aesthetic issues concerning the colour of concrete preceded later debates, the plea for better support from governmental structures would eventually lead to the establishment of the first technical office for the planning of farmhouses in the late 1920s.

[32] Guðmundur Hannesson, "Hlý og rakalaus steinhús. Tillögur og leiðbeiningar," 3–4. Not only was a farmhouse way more exposed to the harsh Icelandic climate than a building in Reykjavík or in a sheltered village, but there were also greater obstacles in the supply of fuel for heating, such as coal, peat, dried manure, and more rarely timber. See also: Jón Þorláksson, "Hvernig reynast steinsteypuhúsin?," 211.

[33] Guðmundur Hannesson, "Hlý og rakalaus steinhús. Tillögur og leiðbeiningar," 6–7 and 12–13. Following a tradition already present in turf houses, the inner walls were usually also covered with timber panels, enhancing the insulating effect.

[34] "Útlit húsanna er viðast fjarri því að vera fagurt, og þaðan af síður neitt þjóðlegt eða einkennilegt." Guðmundur Hannesson, "Hlý og rakalaus steinhús. Tillögur og leiðbeiningar," 1.

[35] Guðmundur Hannesson, "Hlý og rakalaus steinhús. Tillögur og leiðbeiningar," 24–25.

Fig. 6 – Guðmundur Hannesson's house in Hverfisgata 12, Reykjavík, 1910.
Photo by Arlène Lucianaz, 2018.

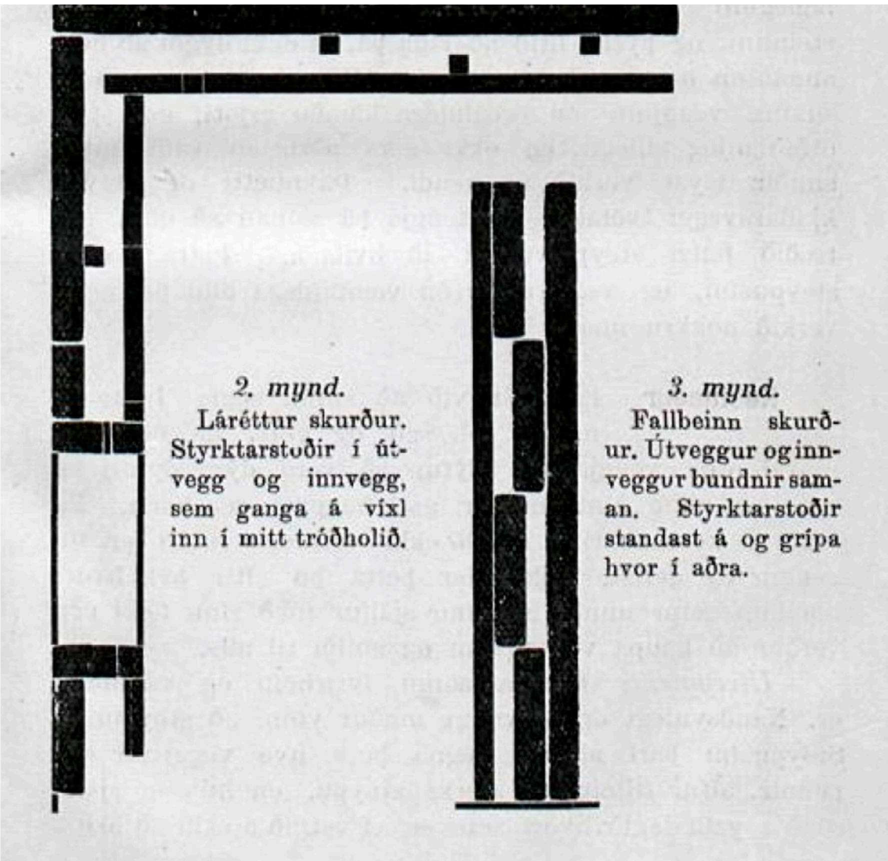


Fig. 7 – Schematic sections of concrete double walls.
Guðmundur Hannesson, "Hlý og rakalaus steinhús. Tillögur og leiðbeiningar," 1913.

3.3 Between Tradition and Modernity

In the late 1910s the debate on Icelandic farmhouses was encouraged by two essays published one after the other: *Íslensk húsgerðarlist* [Icelandic Architecture] printed in 1918 and written by Danish architect Alfred Råvad (1848–1933) and Guðmundur Hannesson's *Skipulag sveitabæja* [Planning of Farmhouses] in 1919.[36] The opposite views expressed by the two texts have been extensively outlined by Seelow: however, for the scope of this research it is important to synthesize this debate once again, in order to understand its influence on Icelandic rural architecture and its development.[37]

Råvad was the brother of Thor Jensen, one of Reykjavík's most prominent businessmen (see chapter two), and published his essay after a short stay in Iceland.[38] *Icelandic Architecture* was conceived as an ode to traditional turf houses, which inspired the author to design modern-day versions of a gabled farm and a rural church. Compared to Bald's 1898 proposal for an Icelandic farmhouse, Råvad's project is definitely poorer in precision and less interested in the technical improvement of this kind of construction. Almost no attention is given to building materials and on how to make earthquake-proof structures. In fact, the point of Råvad's design proposals was mainly to prompt Icelandic architects to maintain and celebrate the external appearance of traditional farmhouses, that is the wooden pointed gables and the thick walls of coarse stones and turf.[39] **Fig. 8.** Råvad fostered a "national romantic enthusiasm for traditional rural buildings in Iceland" and yet, as a foreigner, he perhaps ignored "the primitive and unhealthy living conditions in traditional turf houses".[40] In Råvad's words, he wanted to celebrate the "Gothic origins" of traditional architecture, which were "in harmony with the landscape".[41]

---

[36] Alfred J. Råvad, *Íslenzk húsgerðarlist. Islandsk Architektur* (Copenhagen: Andr. Fred. Høst & Son, 1918). The text is both in Icelandic and Danish, and the booklet is the first of the "Smaaskrifter" series of the *Dansk-Islandsk Samfunds*, The Danish-Icelandic Society founded in 1916. Guðmundur Hannesson, *Skipulag sveitabæja* (Reykjavík: Þorsteinn Gíslason, 1919).

[37] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 102–05.

[38] On Alfred Råvad see: Hans Helge Madsen, *Chicago – København. Alfred Råvads univers* (Copenhagen: Gyldendal, 1990). On Råvad in Iceland, see: Birgir Sigurðsson, *Korpúlfsstaðir. Saga glæsilegasta stórbýlis á Íslandi* (Reykjavík: Forlagið Reykjavíkurborg, 1994), 40–42.

[39] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 103.

[40] "[...] die nationalromantische Begeisterung für das traditionelle rurale Bauen nach Island trägt. [...] er ignoriert sowohl die primitiven und gesundheitsschädlichen Lebensbedingungen in den traditionelle Torfhäusern". Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 102.

[41] "Menn halda ef til vill, að ekki sje til á Íslandi fortíðarfræ, er þjóðleg byggingarlist geti gróið upp af, en svo er það þó. Bæði í grunnmynd og hinu ytra sníði torfkirkjunnar og hins gamla ísl. bæjar eru fyrirmyndir, gotnesks uppruna og eðlis, er sem bezt má nota við ætlunarverk og byggingar í framtíðinni. Hinir þykku, traustu hliðveggir og sundurgreindu gaflar með hvössum þökum eru ágætur grundvöllur til að reisa á fyrirmyndir til bygginga með þjóðlegu sníði og í samræmi við landslagið." [People may bellieve that in Iceland there is no past origin from where a national architecture could grow, and yet there is. Both the layout and the outer shape of turf churches and of old Icelandic farms are models of Gothic origins and nature, which can be well used for projects and buildings in the future. The thick, solid side walls and the gables with pointed roofs are a proper starting point for

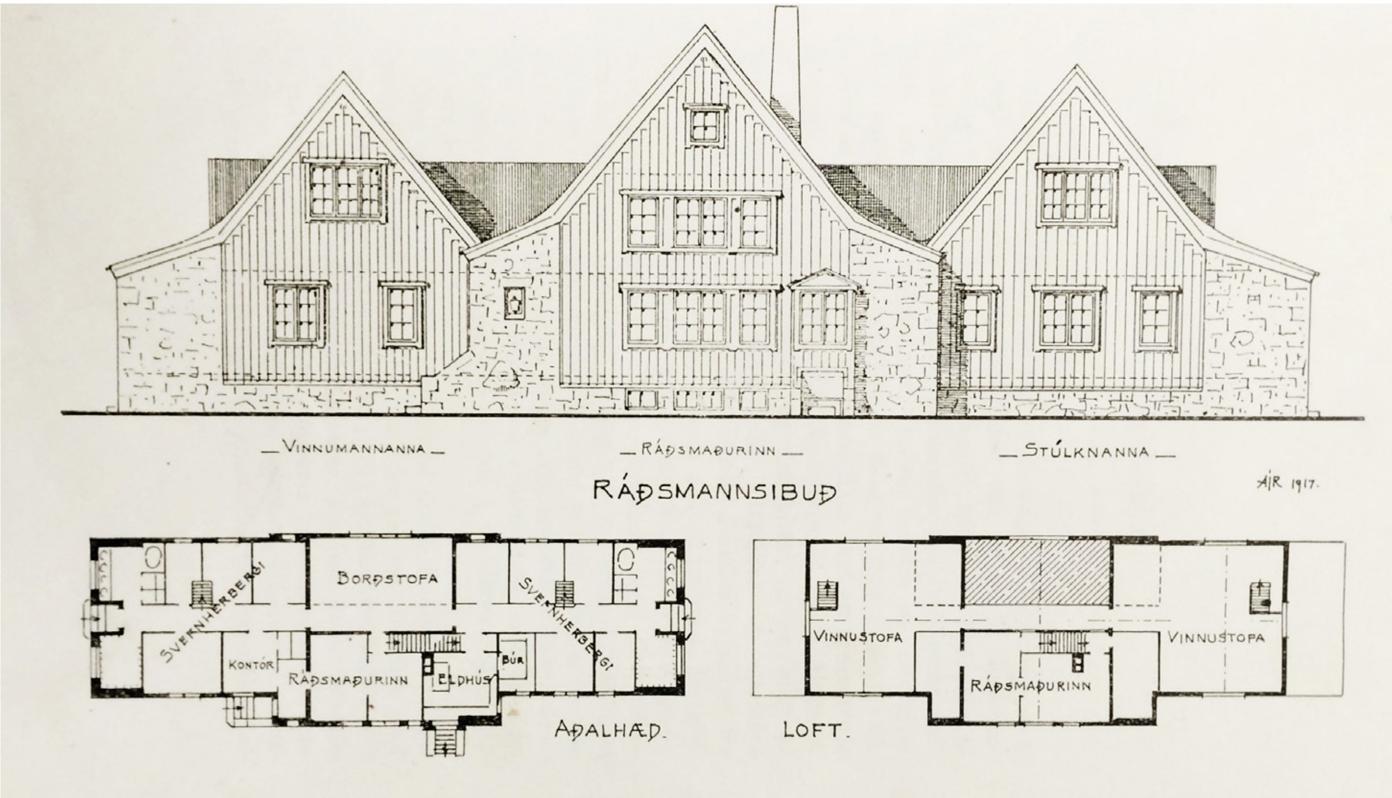


Fig. 8 – Råvad's drawing for a country house. *Íslenzk húsgerðarlist. Islandsk Architektur,* 1918.

Such "national" forms of architecture were compared to the recent "international buildings" of Reykjavík, such as the house of parliament and the national library. If the former was acceptable because it was at least made of "the country's own stone", the latter was labelled as "too Italian", unable to educate future Icelandic architects.[42]

It is interesting to see that a Dane, and not an Icelander, was the main promoter of national pride for the supposed gothic features of traditional Icelandic architecture. Iceland, in fact, had been left out of the developments related to national romanticism and the myth of a common and primogenial gothic culture which, instead, had influenced Germany and Scandinavia throughout the nineteenth century.[43] Those ideals went hand in hand with a growing sense of nationalism among northern regions and were deeply connected to an increase in the study of Germanic languages, Nordic archaeology and literature, and they also prompted studies on Nordic vernacular architecture.[44] In Råvad's view, the Icelandic turf house, rooted in the earth, was seen as a natural element of the Icelandic soil itself, stemming from the ground, echoing similar stances in debates on both Swiss[45] and German traditionalist architecture.[46]

---

erecting models for buildings with national forms and in harmony with the landscape]. Råvad, *Íslenzk húsgerðarlist. Islandsk Architektur*, 3.

[42] "Alþjóðarbyggingar í Reykjavík, þær er reistar hafa verið af húsasmiðum frá Khöfn, geta ekki stutt neitt að ráði að þróun innlends byggingarsniðs. Alþingishúsið hefir að vísu nokkura þýðingu, af því að til þess er notað landsins eigið grjót, en það gefur enga leiðbeiningu, sem notandi sje, um byggingar-listfengi. Landsbókasafnið er mjög snotur bygging og það fer mjög vel á því, eins og því er komið fyrir í bænum, en stíll þess er víst of ítalskur, til þess að það geti haft nein góð áhrif." [International buildings in Reykjavík, which have been built by mastermasons from Copenhagen, cannot support the development of national building forms. The house of parliament is meaningful, because the country's own stone was used, but it doesn't give any useful suggestions regarding architecture. The national library is a very beautiful building and it suits well with the town, but its style is way too Italian so that it cannot have a good influence]. Råvad, *Íslenzk húsgerðarlist. Islandsk Architektur*, 5.

[43] The term "Gothic" may imply many different meanings which cannot be summarized into a single footnote. According to Råvad, it is likely that the term "Gothic" could be linked to a fascination for the Middle Ages as the moment in history where Iceland was experiencing its supposed golden age. On medievalism and Iceland, see further in chapter four. On the construction of historicist, neo-Gothic buildings in the ninteenth century, see: Uta Hassler, Christoph Rauhut, eds., *Bautechnik des Historismus. Von den Theorien über gotische Konstruktionen bis zu den Baustellen des 19. Jahrhunderts* (München: Hirmer, 2012). See the already mentioned exhibition catalogue *Wahlverwandtschaft: Skandinavien und Deutschland, 1800–1914*, edited by Bernd Henningsen and Janine Klein. In particular see the essay by Uffe Østergaard, "Ursprünge und Entwicklungen: Deutschland, der Norden, Skandinavien," 29–38; on the relations between Germany and Scandinavia with their Medieval past, see the short essay in the same volume by Gerd Wolfgang Weber, "'Das nordische Erbe'. Die Konstruktion 'nationaler' Identität aus Vorzeitmythos und Geschichte in Skandinavien und Deutschland,"44–48.

[44] On the evolution of national romantic ideals in Northern Europe, see the volume: Lane, *National Romanticism and Modern Architecture in Germany and the Scandinavian Countries*.

[45] A fascination for Swiss vernacular architecture was popular throughout nineteenth-century Europe. Swiss architects Karl-Adolf von Graffenried (1801–59) and Ludwig von Stürler (1805–91) compared alpine chalets to the "plants of the Alps, born on their own soil". See: Jacques Gubler, *Nazionalismo e internazionalismo nell'architettura moderna in Svizzera* (Mendrisio: Accademia di Architettura, 2012), 34–35. Original edition: *Nationalisme et internationalisme dans l'architecture moderne de la Suisse* (Lausanne: Éditions L'Âge d'Homme, 1975). On the debates regarding traditional Swiss architecture, see: Elisabeth Crettaz-Stürzel, "Nichts Internationaleres als Nationalromantik? Heimatstil in der Schweiz als Reformkultur um 1900," in *Nation, Style, Modernism. CIHA Conference Papers,* edited by Jacek Purchla and Wolf Tegethoff (Cracow/Munich, 2006), 57–

Iceland was considered as one of the cradles, if not *the* cradle, of Nordic language and culture. Icelandic sagas had been elevated as a source of national pride since the early nineteenth century and even generated much interest among British scholars.[47] However, as stated by Icelandic historian Gunnar Karlsson, the fascination for rural life which was a common factor among Nordic national romantic movements could not be fully appreciated in nineteenth- and early twentieth-century Iceland. Its poor living conditions were far too similar to those of the Middle Ages to be celebrated.[48] At the turn of the century, many studies on Finnish, Norwegian, and Swedish farmhouses had already influenced some contemporary projects in the Scandinavian countries.[49] On the contrary, although Icelandic turf houses had been extensively studied by Danish archaeologist Daniel Bruun, such studies did not result in any kind of imitation of rural dwellings by Icelandic upperclass families or artists. Since the mid-nineteenth century national romanticism in the Nordic countries and in Germany had prompted a number of revival movements in architecture: however, Iceland was not part of this picture.[50] As seen in the former chapters, all public buildings recently erected in Reykjavík by Danish architects and mastermasons – from the house of parliament to the banks and the national library – owed more to Neo-Renaissance motifs than national romantic influences.

Thanks to his viewpoint as an outsider, Råvad was therefore the first to promote traditionalist ideals into the country and to praise Icelandic rural architecture. At the opposite side of Råvad's opinions was Guðmundur Hannesson's position as a

73. On Swiss chalets and the Alpine landscape, see also: Annemarie Bucher, "Alpengärten und Schweizerhäuser als Symbole der 'wahren' Natur," in *Felsengärten, Gartengrotten, Kunstberge. Motive der Natur in Architektur und Garten*, edited by Uta Hassler (München: Hirmer, 2014), 62–79.

[46] Supporters of German traditionalist architecture and its *Wohnkultur*, such as architect Paul Schultze-Naumburg (1869–1949), underscored the strong link between German architecture and the earth on which it stood, or from which it generated. See: Giorgio Pigafetta, Ilaria Abbondandolo, and Marco Trisciuoglio, *Architettura tradizionalista. Architetti, opere, teorie.* (Milano: Jaca Book, 2002), 270. On German *Reformarchitektur* at the beginning of the twentieth century, see: Sigrid Hofer, *Reformarchitektur* (Stuttgart: A. Menges, 2005); Nils Aschenbeck, *Reformarchitektur: die Konstituierung der Ästhetik der Moderne* (Basel: Birkhäuser, 2016). On traditionalism in German architecture, see the catalogue edited by Vittorio Magnago Lampugnani, and Romana Schneider, *Moderne Architektur in Deutschland 1900 bis 1950. Reform und Tradition* (Stuttgart: Verlag Gerd Hatje, 1992).

[47] On the role of Norse sagas in Icelandic nationalism, see: Jesse L. Byock, "Modern Nationalism and the Medieval Sagas," in *Northern Antiquity: The Post-Medieval Reception of Edda and Saga*, edited by Andrew Wawn (London: Hisarlik Press, 1994): 163–87. See also: Guðmundur Hálfdanarson, "Interpreting the Nordic Past: Icelandic Medieval Manuscripts and the Construction of a Modern Nation," in *The Uses of the Middle Ages in Modern European States. History, Nationhood and the Search for Origins*, edited by Robert Evans, and Guy P. Marchal (Basingstoke: Palgrave Macmillan, 2011), 52–71. On the reception of Norse culture in the Victorian era: Andrew Wawn, *The Vikings and the Victorians: Inventing the Old North in Nineteenth-Century Britain* (Cambridge: D.S. Brewer, 2000).

[48] "Frumstætt sveitalíf var allt of nálægur veruleiki á Íslandi á 19. öld til þess að nokkurt rúm væri til dýrkunar á því." Gunnar Karlsson, "Spjall um rómantík og þjóðernisstefnu," *Tímarit Máls og menningar* 46, no. 4 (November 1985): 452; see also: Byock, "Modern Nationalism and the Medieval Sagas," 163–64.

[49] On the presence of rural models for Scandinavian modern dwellings, see: Lane, *National Romanticism and Modern Architecture*, 79–120.

[50] Lane, *National Romanticism and Modern Architecture*, 58–73.

determined promoter of twentieth-century models, up-to-date materials and higher hygienic standards. His 1919 essay *Planning of Farmhouses* can be in fact seen as a prompt reply to Råvad's national romantic suggestions. Drawing from his interest in building materials and his mission of improving the living conditions in rural Iceland, Guðmundur Hannesson merged a number of different topics into what has been rightly considered a sort of "textbook" addressed to a variety of readers, from farmers to the growing number of engineers, builders, and architects.[51] Different from the aforementioned proposal of timber farms by Jón Sveinsson, Guðmundur Hannesson suggested only three projects of farmhouses, and yet he went into great detail describing each planimetric or structural choice.[52] What he proposed was a full renovation of Icelandic farmhouses according to hygienic considerations: functional planimetric layouts shaped on the inhabitants' occupations, proper sun orientation, a good number of services such as an inner toilet, a separate kitchen, and storage rooms. The author also gave recommendations regarding which construction techniques to adopt, more or less arriving at a synthesis of all the suggestions on concrete construction gathered throughout the years.[53]

By reading Guðmundur Hannesson's book it is clear that Iceland was not aligned with other Nordic countries when it came to rural architecture and its improvement. Since the mid-nineteenth century, Nordic farmhouses were at the centre of many renovation plans related to their architecture, function, and even ornament.[54] Despite the existence of Iceland's Agricultural Society and of its journal *Búnaðarrit*, the improvement of Icelandic farmhouses had not been tackled systematically throughout the nineteenth century. Therefore, the backwardness of Icelandic farmsteads and the general lack of timber isolated Iceland from Nordic national romantic developments in architecture and crafts, and instead increased the gap between turf houses and early twentieth-century experiments in concrete. It should not come as a surprise if *Planning of farmhouses* was not at all concerned with furniture, architectural ornament, or style: Guðmundur Hannesson wrote his text after Råvad's essay, and

[51] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 105.

[52] Two projects were designed by Guðmundur Hannesson; one by the mastermason Finnur Thorlacius (1883–74). The latter had a more rustic outlook, due to the application of large stone slabs onto the corners of the concrete walls and on the window frames. Guðmundur Hannesson, *Skipulag sveitabæja*, 47–48. Finnur Ó. Thorlacius was a mastermason active in Reykjavík in the early twentieth century. He had trained at *Det Tekniske Selskabs Skole* in Copenhagen and also practiced in Germany and Switerzerland before moving back to Iceland. Most information on his life can be found in his autobiography: Finnur Ó. Thorlacius, *Smiður í fjórum löndum* (Reykjavík: Alþýðuprentsmiðjan, 1961). See also a short biography in: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 420.

[53] According to the author, concrete walls should be double, approximately 10–15cm wide, with a 30cm layer of turf padding, and connected horizontally with "reinforcement pillars" made with cast stones. The suggested concrete mixing ratio was 1 : 2 ½ : 4. Reinforced concrete was suggested for the horizontal slabs. Guðmundur Hannesson, *Skipulag sveitabæja*, 23–26.

[54] Besides the mentioned book by Barbara Miller Lane, see also: Anna Ripatti, "Modernizing Architecture and Ornament on Mid-Nineteenth Century Scandinavian Farms," *Journal of the Society of Architectural Historians* 78, no. 1 (March 2019): 68–89. On the improvement of farmhouses in late nineteenth-century Denmark, see: Peter Brogaard, Halon Lund, and Hans Edvard Nørregård-Nielsen, *Landbrugets huse* (Copenhagen: Gyldendal, 1985), 58–67.

made a clear point in detaching his position from any kind of historicist revival of turf houses. On the contrary, *Planning of Farmhouses* was greatly influenced by British literature, in particular by the works of English architect Mackay Hugh Baillie-Scott (1865–1945), whose essay "The Cheap Cottage" was the only text directly quoted by Guðmundur Hannesson.[55] A number of key issues – such as the costs of a farmhouse, the concept of a "minimum cubic space" for the inhabitants, and the harmony between the cottage and the landscape – had been tackled by Baillie-Scott and were thus part of Guðmundur Hannesson's arguments.[56] **Figg. 9a–9c.**

Reduced costs, functionality, lack of ornament: the formal results were farmhouses with no specific peculiarites in terms of architectural design. However, Guðmundur Hannesson understood that farmhouses had become a starting point to debate nationalism and architecture: the supposed lack of national characteristics in his projects was a source of concern. Nevertheless, he was convinced that following proper hygienic standards and obtaining good living conditions were necessary steps towards a wholly Icelandic, yet renovated way of building. Despite admitting that his farmhouses might resemble "foreign architecture", this exterior detail should not have mattered as long as they were built "with good taste, well suited to the countryside, comfortable to live in, and as cheap as possible".[57] Contrary to Råvad, Guðmundur Hannesson asserted that the shape of a building followed its materials, and not the other way around: it was "natural and unavoidable" that the form of a building changed according to the materials and techniques adopted. The use of concrete or stone, instead of turf, had obvious architectural consequences.[58]

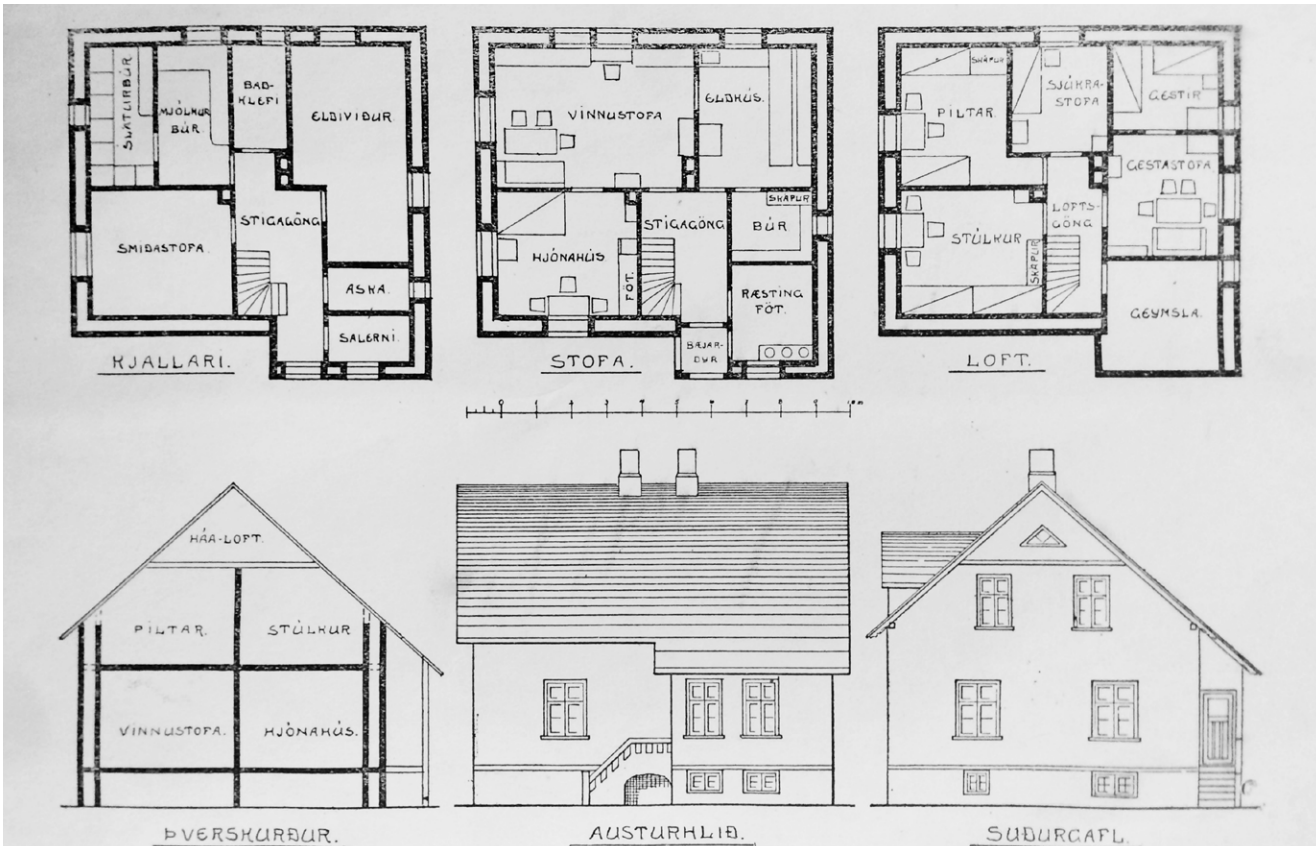
---

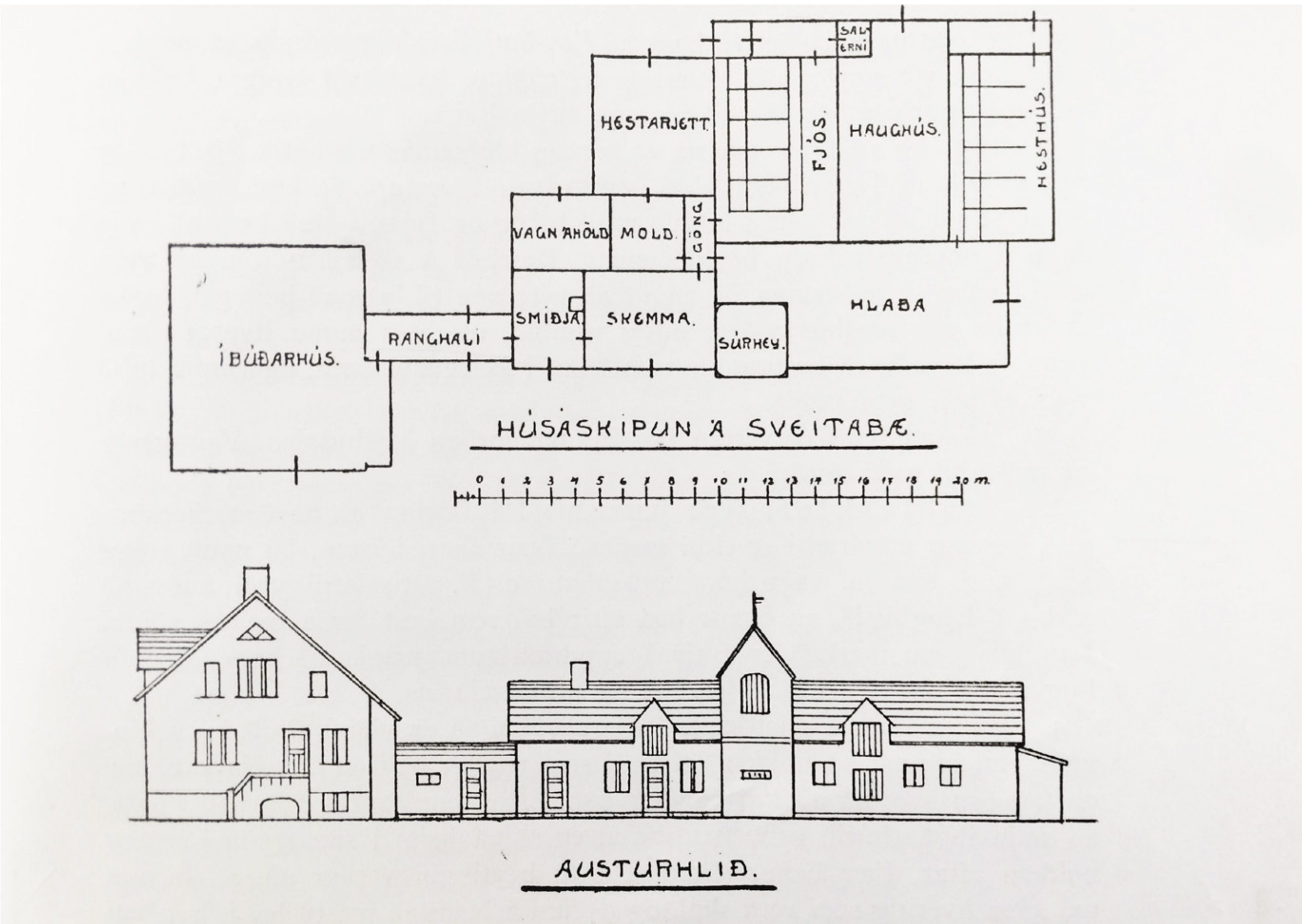
[55] Guðmundur Hannesson, *Skipulag sveitabæja*, 5–6. The original source is: M. H. Baillie-Scott, "The Cheap Cottage," *The International Studio* 52, no. 206 (April 1914): 133–39. Baillie-Scott was also the author of a catalogue of plans for houses and cottages titled *Houses and Gardens* (London: George Newnes Limited, 1906).

[56] M. H. Baillie-Scott, "The Cheap Cottage," 135. Guðmundur Hannesson mentioned the issue of minimum space in the paragraph "Herbergjaþörfin" [The Necessity of Rooms]. His affinity to British literature was also evident in his previous book *On Town Planning*, published earlier in 1916 and vastly influenced by the Garden City Movement – as indicated by the bibliography selected by the author.

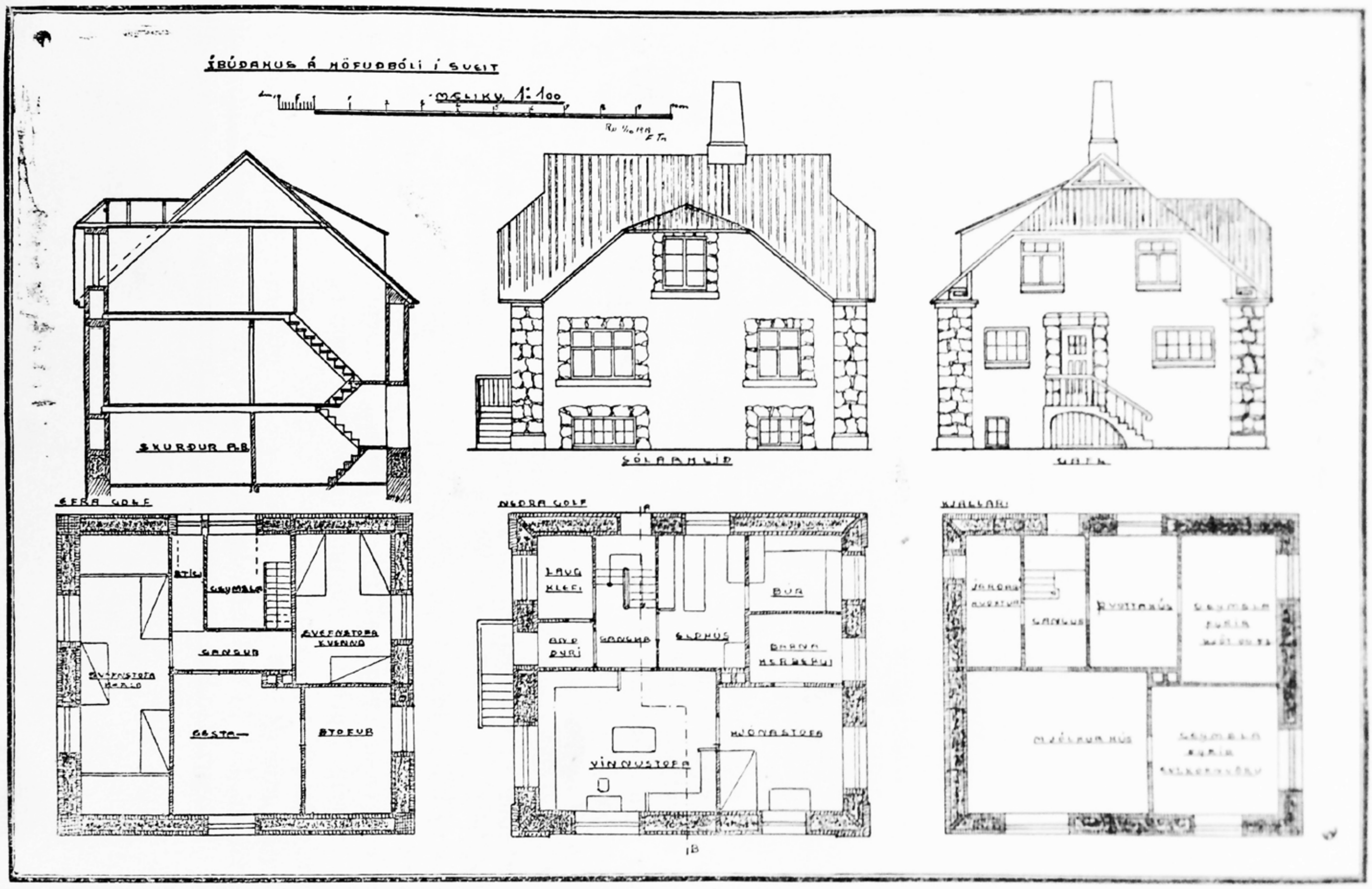
[57] "Það má ef til vill segja, að byggingunum svipi til kaupstaðarhúsa eða útlendrar húsagerðar, en það skiftir í raun og veru ekki mjög miklu máli, ef húsin eru smekkleg, fara vel í sveit, eru hentug að búa í, og svo ódýr sem kostur er á." [It might be said that the buildings are similar to city houses or to foreign constructions, but that doesn't really matter much, if the houses are beautiful, if they match well with the countryside, are comfortable to inhabit, and are as cheap as possible]. Guðmundur Hannesson, *Skipulag sveitabæja*, 40.

[58] "Það er í raun og veru bæði eðlilegt og óhjákvæmilegt, að byggingasniðið breytist til mikilla muna, ef alt annað byggingarefni kemur í stað torfsins og gersamlega ólíkt því. Hjer er alt miðað við að byggingarefnið sje steypa eða steinn. Ef tilætlunin hefði verið sú að byggja torfveggi, hefði alt byggingalagið gerbeytst, alt fengið annan svip." [It is both natural and inevitable that the shape of buildings changes to a great extent, if a completely different building material replaces turf. Everything here implies that the building material is concrete or stone. If the idea had been to build out of turf, the whole structure would have changed, and everything would have had a different shape]. Guðmundur Hannesson, *Skipulag sveitabæja*, 40. Guðmundur Hannesson's opinions seem to underline the importance of the truth to materials in architecture, which was fairly widespread in late nineteenth-century Scandinavia. Some authors and architects, in fact, refused the use of plasters and instead fostered the adoption of natural stones. See: Sixten Ringbom, *Stone, Style and Truth,* 16–17.





Figg. 9a–9b – Drawings of farmhouses by Guðmundur Hannesson.
Guðmundur Hannesson, *Skipulag sveitabæja*, 1919.



8. mynd.

Fig. 9c – Proposal of a farmhouse by Finnur Thorlacius.
Guðmundur Hannesson, *Skipulag sveitabæja*, 1919.

This brought the author to reflect on the meaning of traditions in architecture: Guðmundur Hannesson fully accepted the economic and social changes which were transforming Iceland in the first decades of the twentieth century.[59] Something becomes "Icelandic", he argued, only "after a long time", after experiments and improvements, as it had occurred with traditional turf farms.[60] Beyond all debates on how to build in the countryside, Guðmundur Hannesson summed up the issue by bringing about his practical and down-to-earth point of view:

> We should build according to what best suits us, according to our climate, landscape, building materials, living conditions, and finances. And we have to gradually improve such building methods, so that they become beautiful and complete.[61]

Guðmundur Hannesson kept his role as main advocate and teacher of concrete construction among the general public throughout all the 1920s. A comprehensive collection of his construction advice on concrete structures was published by The Icelandic Technical Society as a handbook in 1921, titled *Concrete. A Guidebook for Common People and Beginners*.[62] In a little more than one hundred pages, he explained with an easy vocabulary the composition of the material, its mechanical strength and also offered brief descriptions of its use in the building field. He included notes on the use of reinforcement bars, and also detailed descriptions of timber formworks, along with axonometrical drawings. Most of this information was later incorporated in his history of Icelandic construction. **Fig. 10.** Eventually, Guðmundur Hannesson's pragmatic stance reflected his core ambition, which was to improve the general living conditions of a population mostly living in unsuitable dwellings. This quest undoubtedly originated from his education as a medical doctor, and became such a lifetime commitment that he asked for the following epitaph, later inscribed on his tombstone in Hólavallagarður cemetery in Reykjavík: "He taught the Icelanders how to build warm houses".[63] **Fig.11.**

Two different outcomes stemmed from Råvad's and Guðmundur Hannesson's positions. On the one hand, the Danish architect prompted a few short-lived

---

[59] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 104.

[60] "Alíslensk getur það fyrsti orðið með löngum tíma, þegar innlend reynsla og smekkur og hugsunarháttur hefur lagt á það smiðshöggið, breytt því svo og bætt, að hver hlutur verði jafnsjálfsagður og hann var orðinn í gömlu bæjunum." [Something becomes Icelandic only after a long time, when the local experience, taste and way of thinking have given its touch, changed it and improved it, so that each part becomes natural, as happened in old farmhouses.] Guðmundur Hannesson, *Skipulag sveitabæja*, 43.

[61] "Vér eigum að byggja svo sem oss hentar best, eftir voru tíðarfari, landslagi, byggingarefnum, lifnaðarháttum og fjárhag. Og vér eigum smámsaman að þroska það byggingalag, svo að það verði fagurt og fullkomið." Guðmundur Hannesson, *Skipulag sveitabæja*, 41.

[62] Guðmundur Hannesson, *Steinsteypa. Leiðarvísir fyrir alþýðu og viðvaninga* (Reykjavík: Iðnfræðafjelag Íslands, 1921). The booklet was published by *Iðnfræðafélag Íslands*.

[63] "Hann kenndi Íslendingum að byggja hlý hús". Anna Guðmundsdóttir, "Dr. Guðmundur Hannesson prófessor," In *Faðir Minn Læknirinn* (Hafnarfjörður: Skuggsjá, 1974), 107.

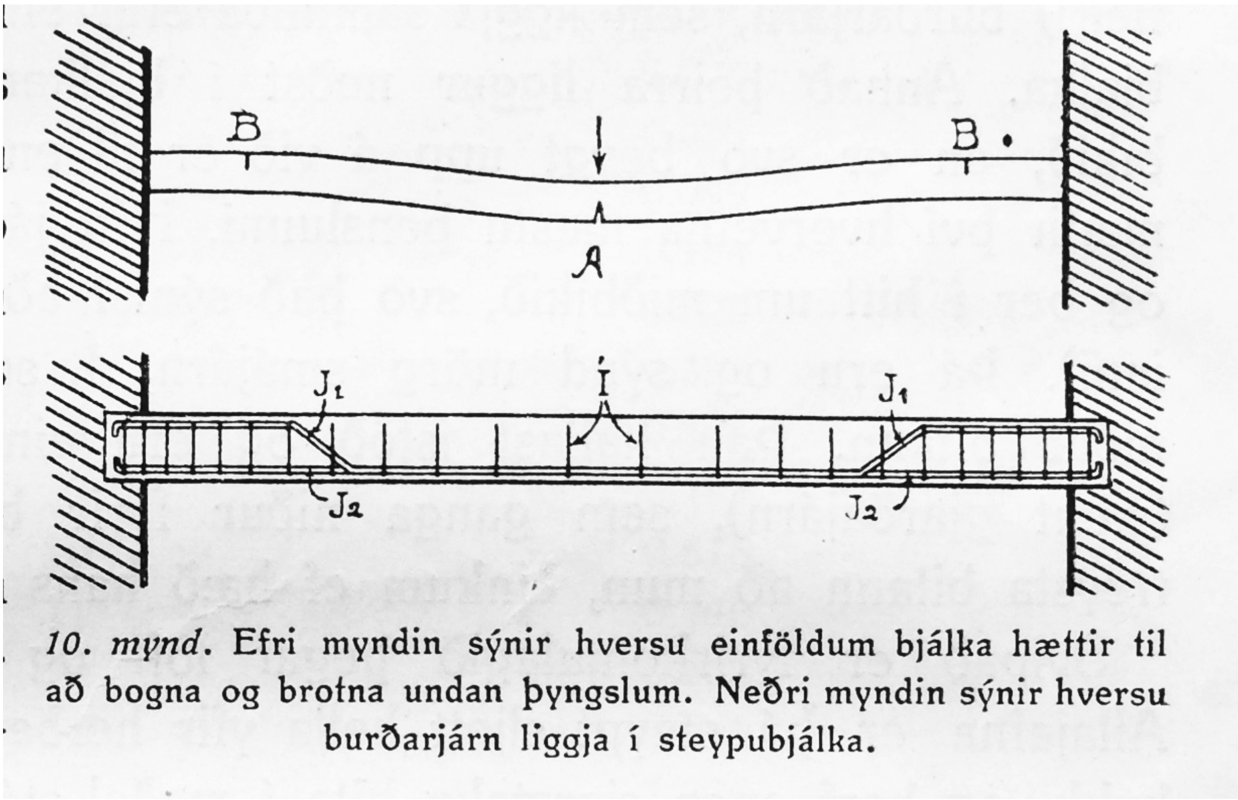


Fig. 10 – Explanation of the position of iron bars in a horizontal beam.
Guðmundur Hannesson, *Steinsteypa. Leiðarvísir fyrir alþýðu og viðvaninga*, 1921.

Fig. 11 – Guðmundur Hannesson's tombstone and epitaph in Hólavallagarður cemetery, Reykjavík. Photo by Sofia Nannini, 2018.

experiments of what can be labelled as a late-national romantic influence in Icelandic architecture (see next chapter). On the other hand, Guðmundur Hannesson's studies fostered a systematic planning and construction of concrete farmhouses all over the country, coordinated by a centralized office, which had lasting effects on the Icelandic rural landscape.

3.4 The Design of Concrete Farms on a National Scale

> The Bank of Iceland opened a department for providing loans for rural house-building. Here the farmers could obtain long-term loans at a low rate of interest, and with small capital repayments, but only on condition that good substantial houses were built, the regulations requiring double walls of reinforced concrete [...] Only really first-class houses could be considered [...].
>
> Halldór Laxness, *Independent People,* English translation, 1946[64]

Until the late 1920s, Icelandic rural buildings were either the target of scarce financial loans by the Ministry of Iceland, which provided farmers with intermittent help and usually no guidelines regarding construction, or they were a much debated topic among architects, engineers, and building experts, whose technical advice did not fully reach the countryside. The challenges posed by rural farmhouses had two main objectives: to find an architecture which could fit well into the Icelandic landscape, and to establish a combination of building techniques which could suit Iceland's amateur craftsmanship, sustain the harsh weather, and be compatible with its poor economic conditions. As seen earlier, these topics had been tackled by engineers, architects and construction experts. Despite the ongoing debate in the journals, their suggestions were not directly applicable to rural Iceland: an intermediate step for the transfer of knowledge was needed.

Rural policies started changing in the mid-1920s when new laws began to establish more structured and convenient loans for agricultural purposes, including the reconstruction of farmhouses and the construction of new buildings. In 1925 the already existing "Agricultural subsidy" was expanded and was soon followed by the "Building and Settlement Subsidy" in 1928, specifically published to target the renovation of farmhouse construction.[65] In particular, projects for new buildings were better sustained financially, as they benefitted from longer-term loans and lower interest rates. The loans were granted by a specific department of the Agricultural Bank of Iceland, founded in 1929.[66] These laws reflected the growing political power

---

[64] Halldór Kiljan Laxness, *Independent People*, trans. J. A. Thompson (New York: Alfred A. Knopf, 1946), 445.

[65] *Ræktunarsjóður Íslands* and *Byggingar- og landnámssjóður*. See: Steingrímur Steinþórsson, "Byggingarmál alþýðu," 262–64.

[66] *Búnaðarbankin Íslands*. Steingrímur Steinþórsson, "Byggingarmál alþýðu," 265 and 274.

of the agrarian and liberal Progressive Party, which would lead all governments between 1927 and 1942, thanks to the vast support of rural voters.[67] Between the two wars, Iceland's "most influential and controversial political leader" was Jónas Jónsson, known as Jónas Jónsson frá Hriflu, representative of the Progressive Party and minister of Justice between 1927 and 1932.[68] Jónas Jónsson influenced the whole country in several ways, often showing very conservative views about culture, art and society.[69] He devoted particular attention to the rural areas; he supported the Icelandic cooperative movement, originated in the early 1880s in Northern Iceland and represented by the Federation of Icelandic Cooperative Societies.[70] Furthermore, he promoted the construction of several secondary schools in the countryside, known as "district schools".[71]

Jónas Jónsson also contributed to many Icelandic journals, and as the director of the *Samvinnan* journal he wrote extensively on cooperative societies and school buildings.[72] Moreover, one of his major goals was to promote the search for a rural architecture which could fit well into the Icelandic landscape as much as the old turf farms did, and yet improve the living conditions of the countryside.[73] At the core of

---

[67] *Framsóknarflokkurinn*, officially founded in 1916. The Progressive party was one of the four main parties which characterized Icelandic politics since the act of union in 1918 – the others being the Independence Party, the Communist Party, and the Labour Party. On the system of parties in Iceland, see: Gunnar Karlsson, *History of Iceland*, 302–08. According to historian Gunnar Karlsson, "although the party did not usually enjoy more than 25–30% of the total vote, and always less than the Independence Party, it was usually the largest parliamentary party, with around 40–50% of members. The reason for this was that the Progressive Party was strongest in rural constituencies, which were in the process of relative depopulation and hence highly overrepresented in the Althing." Gunnar Karlsson, *History of Iceland*, 307. On the Progressive Party, see also: Helgi Skúli Kjartanson, *Ísland á 20. öld*, 124–30.

[68] "Jónas Jónsson frá Hriflu var áhrifaríkasti og umdeildasti stjórnmálaleiðtogi landsins áratugina milli heimsstyrjalda." Helgi Skúli Kjartansson, *Ísland á 20. öld*, 126.

[69] On Jónas Jónsson and his conservative opinions on art and literature, see: Ólafur Rastrick, *Háborgin*, 185–91. In 1942 Jónas Jónsson organized "one of the most controversial art exhibitions in Icelandic history", displaying what he believed was "degenerate art". The event was compared to the exhibition format of the Third Reich. See: Ólafur Rastrick, Benedikt Hjartarson, "Cleansing the Domestic Evil – On the Degenerate Art Exhibition in Reykjavík, 1942," in *A Cultural History of the Avant-Garde in the Nordic Countries*, edited by Benedikt Hjartarson (Leiden: Brill, 2019), 879–902.

[70] *Samband Íslenskra Samvinnufélaga*. See: Gunnar Karlsson, *History of Iceland*, 246–47. Iceland's first cooperative was the *Kaupfélag Þingeyinga*, founded in 1882. One of its founders was Jakob Hálfdanarson (see chapter 2).

[71] *Héraðsskólar*. See: Gunnar Karlsson, *History of Iceland*, 307; Pétur Hrafn Árnason, and Sigurður Líndal, eds., *Saga Íslands XI*, 36. Such schools were designed by the office of the State architect, at times following the "farmhouse style" – such as the school in Laugarvatn, designed by Guðjón Samúelsson and built in 1928–32 (see further in chapter four). At times instead they boasted flat roofs and a heated swimming pool at the basement level – such as the school at Núpur, designed by master builder and architect Einar Erlendsson in 1929. The school at Núpur in the West Fjords is the oldest among the districts schools built throughout the late 1920s and early 1930s. See: Jónas Jónsson, "Byggingar X," *Samvinnan* 27, no.1 (February 1933): 81–82. Next to the school stands the botanical garden Skrúður, winner of the 24th edition of the International Carlo Scarpa Prize for Gardens. See: Patrizia Bocchero, Luigi Latini, and Domenico Luciani, eds., *Skrúður, Núpur. Premio Internazionale Carlo Scarpa per il Giardino, XXIV edizione.* (Treviso: Fondazione Benetton Studi Ricerche, 2013).

[72] *Samvinnan* means "cooperation". The journal was founded in 1926, and Jónas Jónsson directed it until 1946.

[73] "Við Íslendingar höfum þannig fram á síðustu ár lifað okkar eigin lífi utan við meginstrauma byggingarlistarinnar. Við höfum að vísu líka í þeim efnum haft okkar eigin sögu, þótt fábrotin sé. Við

his efforts was one of the greatest tasks which Icelandic politicians had been facing since the late 1910s – the increasing growth of the fishing industry and of urban settlements in general, which led the majority of the rural Icelandic population to flee from the countryside to the coast.[74] Jónas Jónsson's focus on rural Iceland was surely a bearer of conservative views, which aimed at supporting the countryside rather than the growing towns. At the same time, however, his attention to the development of the rural areas fostered a widespread circulation of technical knowledge throughout the island. For example, he suggested that young students learn about concrete construction in rural schools, so that concrete cast stones could be used for the building of farmhouses.[75] Most importantly, Jónas Jónsson was one of the main voices behind the parliamentary bills related to agricultural and building subsidies.

Despite the presence of affordable loans for farmers, the major problem was to make sure that this financial help was actually spent in the construction of enduring farmhouses, in order to avoid the recurring need to reconstruct farming estates each generation. As seen in chapter two, building experts were scarce in the countryside, and technical expertise travelled slowly and with difficulties. In order to overcome this obstacle, the Agricultural Bank established a technical office, with the task of providing guidelines and help to the grantees.[76] The effects of the technical office and the bank's subsidies on the Icelandic countryside were immediate and outstanding. Between 1929 and 1931 alone, approximately 200 concrete farms were built around the country, a quarter of the total concrete houses built between 1910 and 1931. In 1941, the number of concrete farmhouses had increased by more than one thousand.[77] **Fig. 12.**

---

höfum meira að segja eignast fyrir Ísland sérkennilegan byggingarstíl, sem var í samræmi við legu landsins, loftslag, byggingarefni og þann blæ, sem er yfir náttúru landsins. Ég á þar við sveitabæina gömlu, hlaðna úr torfi og grjóti, með mörgum timburþilum fram á hlaðið og langri baðstofu á bak við mörgu burstinar. Gömlu torfbærirnir voru að ytri sýn í fullkomnasta samræmi við fjallanáttúru landsins." [In the past years we Icelanders have lived our own lives outside the main trends of architecture. We did have our own history in this matter, although modest. We had even acquired a peculiar architectural style, which was in harmony with the country's location, climate, building material, and with that breeze above the land's nature. I mean the old farmhouses, made of turf and stones, with timber cladding on the courtyard, and behind a long *baðstofa* with many gables. On the outside, old turfhouses were in perfect harmony with the mountainous nature of the country]. Jónas Jónsson, "Byggingamál," *Samvinnan* 25, no. 3 (July 1931): 196.

[74] For a brief account on the mechanization of Icelandic fishing industry, see: Gunnar Karlsson, *The History of Iceland*, 287–91. For a short account on Icelandic industrial history, see also: David Gordon Tucker, "The History of Industries and Crafts in Iceland," *Industrial Archaeology* 9, no. 1 (February 1972): 5–27.

[75] Jónas Jónsson, "Byggingamál," *Samvinnan* 25, no. 3 (July 1931): 204.

[76] First known as *Teiknistofa Búnaðarbankans* [Technical Office of the Agricultural Bank] and *Teiknistofa Bygginga- og landnámssjóðs* [Technical Office of the Building and Settlement Subsidy], it was later called *Teiknistofa landbúnaðarins*, here translated as "Technical Office of the Agricultural Agency".

[77] These numbers derive from three reports on Icelandic rural buildings carried out in 1910, 1931, and 1941. The report of 1910 was developed by parliamentarian Páll Zóphóníasson (1886–1964). Real estate evaluations followed in 1931 and 1941. When it came to building materials, the percentages were approximately: 74% turf, 24 % timber, 2% stone and concrete (1910); 56,5% turf, 27,5% timber, 16% concrete (1931); 34,2% turf, 32% timber, 33,8% concrete (1941). See: Steingrímur Steinþórsson, "Byggingarmál alþýðu," 267–73.

Fig. 12 – Advertisement of *Teiknistofa Bygginga- og landnámssjóðs*, Technical Office of the Building and Settlement Subsidy; *Tíminn* 13, no. 15 (16 March 1929): 58. tímarit.is.

The years between the office's establishment in 1929 and the mid 1940s were not only remarkable for the sheer number of concrete farmhouses which started appearing in the rural landscape: the way in which the farmhouses were designed and built was also a matter of debate, and it evolved throughout the years. The first building expert to lead the office was Jóhann Franklin Kristjánsson (1885–1952), trained as a carpenter in Akureyri and then as mastermason in Norway.[78] He knew and admired Guðmundur Hannesson's expertise on concrete construction: evidence can be found in a 1908 letter he sent to the doctor asking for advice on how to cast the concrete structures for a community hall.[79] In 1914 Jóhann Kristjánsson was entrusted with the task of giving advice and guidelines on rural construction, and was the director of the technical office between 1929 and 1937. For almost a decade, he was the main source of construction advice for the building of concrete farmhouses. He published several articles on concrete construction, with explanations referred to the building sites where he had directly worked.[80] In parallel, he produced drawings of farmhouses at the office: most of them were applied to different projects in several parts of the country, and usually underwent many transformations as they were built.[81] **Figg. 13a–13b.**

To some extent Jóhann Kristjánsson's designs embraced Guðmundur Hannesson's farmhouse proposals and expanded on them at a national level; at times he also followed some traditionalist examples deriving from the continent. This first generation of farmhouses was characterized by a number of recurring elements: they were two- or three-stories high, with pitched roofs and sometimes a prominent entrance with a staircase, a high cellar under the first floor. In some cases, the farmhouse would mirror the image of the "gabled" turf farm with a row of two or three pointed gables on the main, usually southern, façade.[82] Possible models could have been Baillie-Scott's Blackwell house in Bowness, England (1898–1900) and the villa in Frankenhousen am Kyffhäuser built in 1912 by Hermann Muthesius (1861–

[78] Jóhann Kristjánsson studied in Voss and at *Den kongelige norske Kunst- og Håndverksskole* in Oslo, Norway. For a short biography, see: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 428. In Norway he trained for a year on concrete construction: "20 ára starfsafmæli," *Nýja dagblaðið* 2, no. 44 (20 February 1934): 1–2.

[79] Lbs. 2209, 4to. *Bréf til Guðmundar prófessors Hannessonar (1907–1908)*, Letter from Jóhann Fr. Kristjánsson (Litlu Hámundarstaðir, 28th January 1908).

[80] Jóhann Fr. Kristjánsson, "Leiðbeining í húsagerð. Úr skýrslu um árið 1914," *Búnaðarrit* 29, no. 2 (1915): 148–51; Jóhann Fr. Kristjánsson, "Um byggingarefni," *Tíminn* 1, no. 27 (14 September 1917): 106 and *Tíminn* 1, no. 29 (29 September 1917): 115.

[81] Nearly all drawings issued by the technical office are now held at the National Archives of Iceland: ÞÍ, *Byggingastofnun landbúnaðarins*, *Teikningar*, BB/1 and following. A notebook dated 1929–38 shows the list of recipients of the "delivered projects" designed by the technical office. Each recipient would receive one or more project proposals for a farmhouse. See: ÞÍ, *Byggingastofnun landbúnaðarins*, BA/002 – *Teikningaskrár* (1929–90).

[82] Some of his projects were published in: Jónas Jónsson, "Byggingar III," *Samvinnan* 19, no. 3 (September 1926): 252–53; Jónas Jónsson, "Byggingar- og landnámssjóður," *Samvinnan* 20, no.1 (March 1927): 40–41.

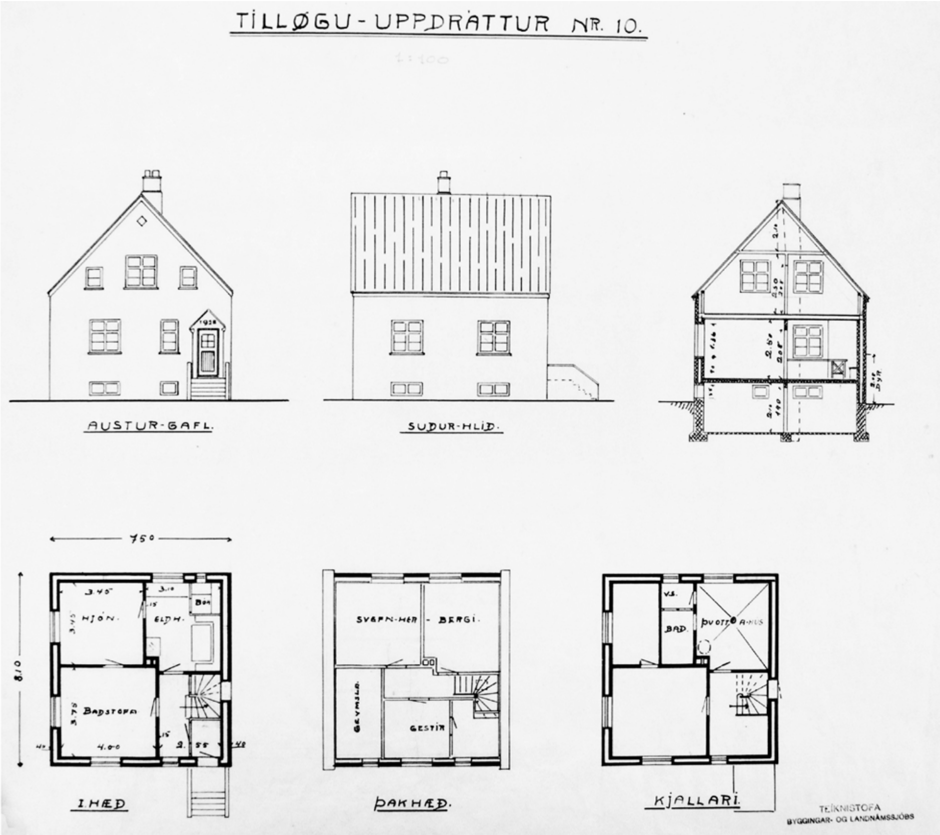


Fig. 13a – Design proposal number 10. Þjóðskjalasafn Íslands, Byggingastofnun landbúnaðarins. Teikningar, BB/1,Teiknistofa bygginga- og landnámsjóðs, Drawing no. 10, 1929–30.

Fig. 13b – Farmhouse in Arnarstapi, Snæfellsnes peninsula. Photo by Sofia Nannini, 2019.

1927)[83] – both boasting a row of three pointed gables (on the influence of the German traditionalist debate in Icelandic architecture, see next chapter). **Figg. 13c–13d.**

Although most drawings were only produced at a 1:100 scale, without specific details and sections, it is evident that the projects included a great variety of materials: all vertical structures were in concrete, conceived as double walls filled by a layer of turf padding; slabs at the first floor were in concrete, presumably slightly reinforced; the slab at the second or last floor and the roofs were instead built in timber, usually protected by a layer of corrugated iron or cardboard, and at times covered by a turf layer so that grass could grow on the outside. An example of such a roof, grass-covered on top of concrete, can be still seen on a building in downtown Reykjavík, in what was the house of Jóhann Kristjánsson himself.[84] **Figg. 14a–14c.** Despite the widespread circulation of these projects in all corners of Iceland, they had several drawbacks which resulted in a general state of dissatisfaction among their inhabitants. Most farmers considered such projects as too big and expensive, thus many farmhouses were left unfinished and with rough concrete surfaces.[85] On top of that, the application of the guidelines promoted by the technical office was not mandatory: as a result, most projects were distorted according to amateurish building practices.[86]

The growing presence of such flawed concrete constructions left a mark on their first inhabitants, to the point that they became a recurring topic in Halldór Laxness's most popular novel *Independent People*. According to Laxness's characters, the arrival of modernity in rural Iceland, with its noisy building sites full of cement mixers and timber formworks, was not necessarily a promise of a better life.[87] On the

[83] On Hermann Muthesius, see: Julius Posener, *From Schinkel to Bauhaus: Five Lectures on the Growth of Modern German Architecture* (London: Lund Humphries/Architectural Association, 1972), 17–23; Julius Posener, "Le architetture di Muthesius," in *Muthesius*, edited by Silvano Custoza, and Maurizio Vogliazzo (Milano: Electa, 1981), 15–21; Laurent Stadler, *Hermann Muthesius (1861–1927): Das Landhaus als kulturgeschichtlicher Entwurf* (Zürich: gta Verlag, 2004). On Muthesius's role in the traditionalist debate, see: Fedor Roth, *Hermann Muthesius und die Idee der harmonischen Kultur* (Berlin: Gebr. Mann Verlag, 2001), 190–96; Lane, *National Romanticism and Modern Architecture*, 148–50; Pigafetta, Abbondandolo, and Trisciuoglio, *Architettura tradizionalista*, 254–56; Maciuika, *Before the Bauhaus*, 16–19. See also: Erik Martin Ghenoiu, *'Tradition' as Modernism in German Architecture and Urban Design, 1888–1918*, PhD Dissertation at Harvard University, Graduate School of Arts and Sciences (May 2008).

[84] Jónas Jónsson, "Byggingar II," *Samvinnan* 19, no. 2 (June 1926): 156; Hörður Ágústsson, *Íslensk byggingararfleið I*, 366 and 371.

[85] A farmhouse would cost approximately 17–20'000kr. Steingrímur Steinþórsson, "Byggingarmál alþýðu," 275.

[86] "20 ára starfsafmæli," 2; Ágúst Steingrímsson, "Umgengni á sveitabæjum," *Tíminn* 22, no. 69 (22 November 1938): 274; Steingrímur Steinþórsson, "Byggingarmál alþýðu," 273.

[87] [...] for there was a great excitement and much afoot on the croft these days, the smell of wood and cement, the tapping of the hammers and the churning rattle of the mixer, workmen by the score, carts and horses, sand and gravel. [...] So Bjartur's house stood in the moulds all that summer, a most depressing object to meet the eye, travellers passing that way missed the friendly old grass-grown turf cottage, for it lay out of sight behind this formless, gaping monstrosity, which reminded one of nothing so much as the havoc and devastation left in the trail of a hurricane." Laxness continues: "Bjartur was now spending his second winter in the house he had built. It was the worst house in the world and unbelievably cold. [...] The walls of the room sweated with damp and were covered with a veneer of ice during frosty weather. The windows never thawed, the wind blew straight through the house,

Fig. 13c – Baillie-Scott, Blackwell house, Bowness, 1898–1900. Wikimedia Commons.

Fig. 13d – Muthesius, Villa in Frankenhousen am Kyffhäuser, 1912. Silvano Custoza, and Maurizio Vogliazzo, ed. *Muthesius* (Milano: Electa, 1981), 73.

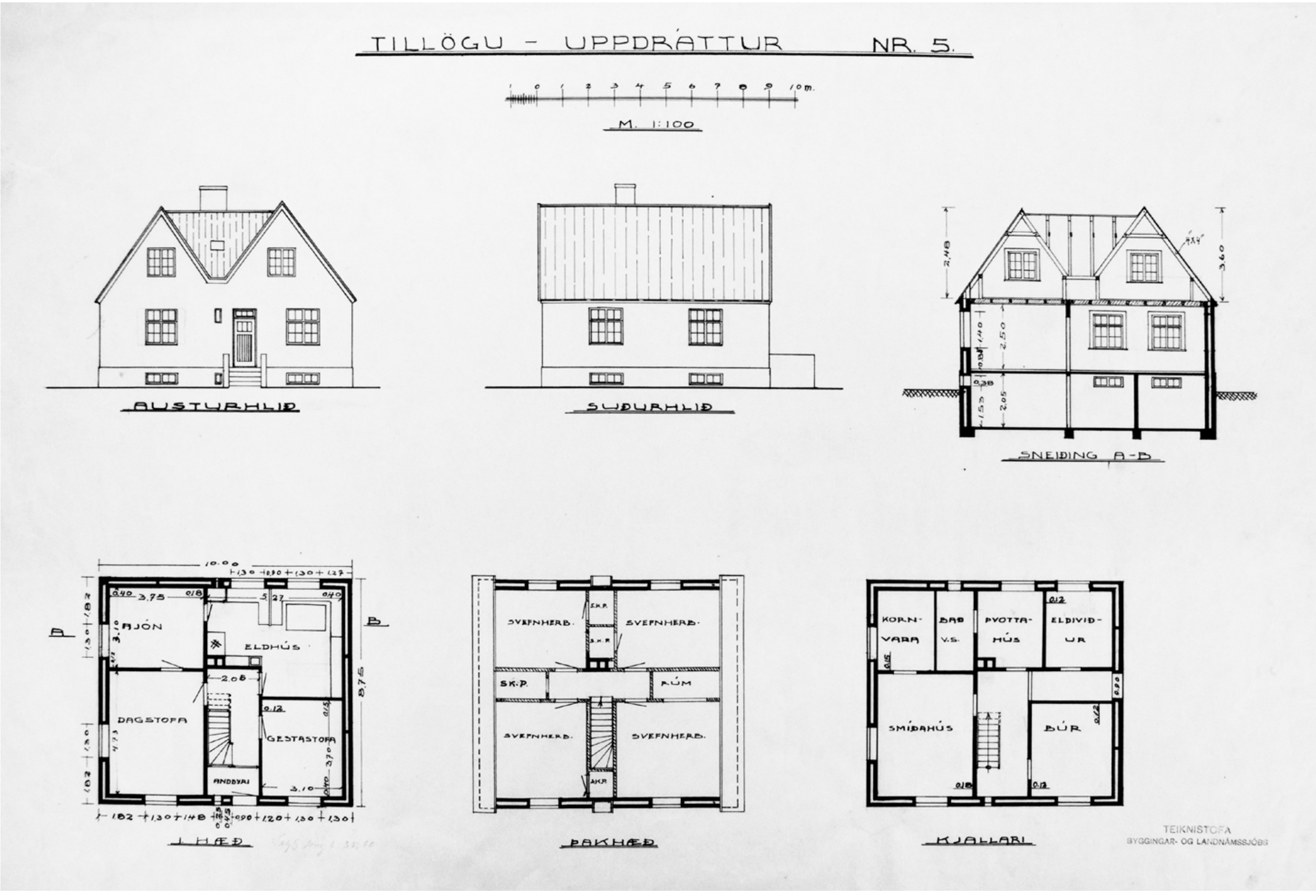


Fig. 14a – Þjóðskjalasafn Íslands, Byggingastofnun landbúnaðarins. Teikningar, BB/1, Teiknistofa bygginga- og landnámsjóðs, Drawings no. 5, 1930.

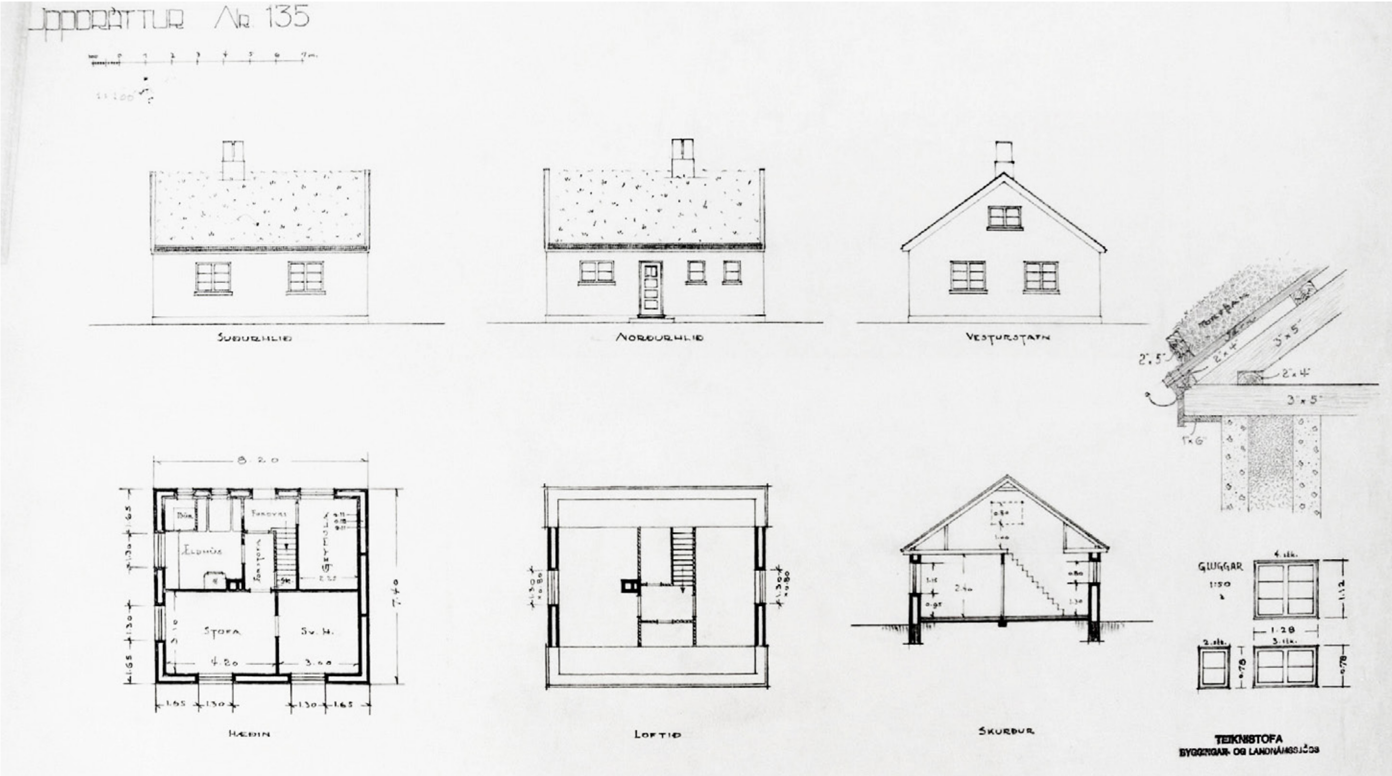


Fig. 14b – Þjóðskjalasafn Íslands, Byggingastofnun landbúnaðarins. Teikningar, BB/4, Teiknistofa bygginga- og landnámsjóðs, drawing no. 135, 1930.

Fig. 14c – Jóhann Fr. Kristjánsson's house in Fjólugata 25, Reykjavík, 1923. Photo by Sofia Nannini, 2019.

contrary, it generally left behind ugly and cold buildings which did not live up to the people's expectations:

> In the evening Ásta took her children down to the brook and stood staring in wonder at this ugly house with the sharp corners, the impressions left on the concrete by the boards in the moulds, the dabs of cement on some of the windows, the broken panes of others, and the holes that had been dug in the earth all around. New though it was, it reminded one of the ruins of a building shelled in the war.[88]

The growing number of farms built halfway, thus prone to quick decay, redefined the duties of the office in 1938: not only would it provide farmers with drawings of farmhouses, stables, and related spaces, but a grantee could not receive a loan unless the drawings were followed properly, or unless the office approved an external project.[89] A slow development of the projects filed by the office began during the 1930s, thanks to the contribution of a new collaborator: Þórir Baldvinsson (1901–86), trained as an architect in 1924–26 in San Francisco at the School of Architecture of the University of California.[90] First as assistant, then as leader of the technical office since 1937, he worked with a twofold scope: exerting more control on the building works carried in rural areas, and reducing the construction costs as much as possible.

Since 1938 the office's projects had become mandatory, and yet it was still extremely difficult to closely follow all building works in the country's remotest areas.[91] In order to offer the greatest amount of technical expertise to those building in the countryside, in 1938 the technical office published a sixteen-page booklet on concrete construction, titled *Concrete Houses. Some Rules for Building Concrete Houses in the Countryside*.[92] The text contained advice on the choice of the building site, the collection and preparation of building materials, building the foundations and

---

upstairs there was snow lying on the floors and swirling about in the air." *Independent People*, 448 and 454.

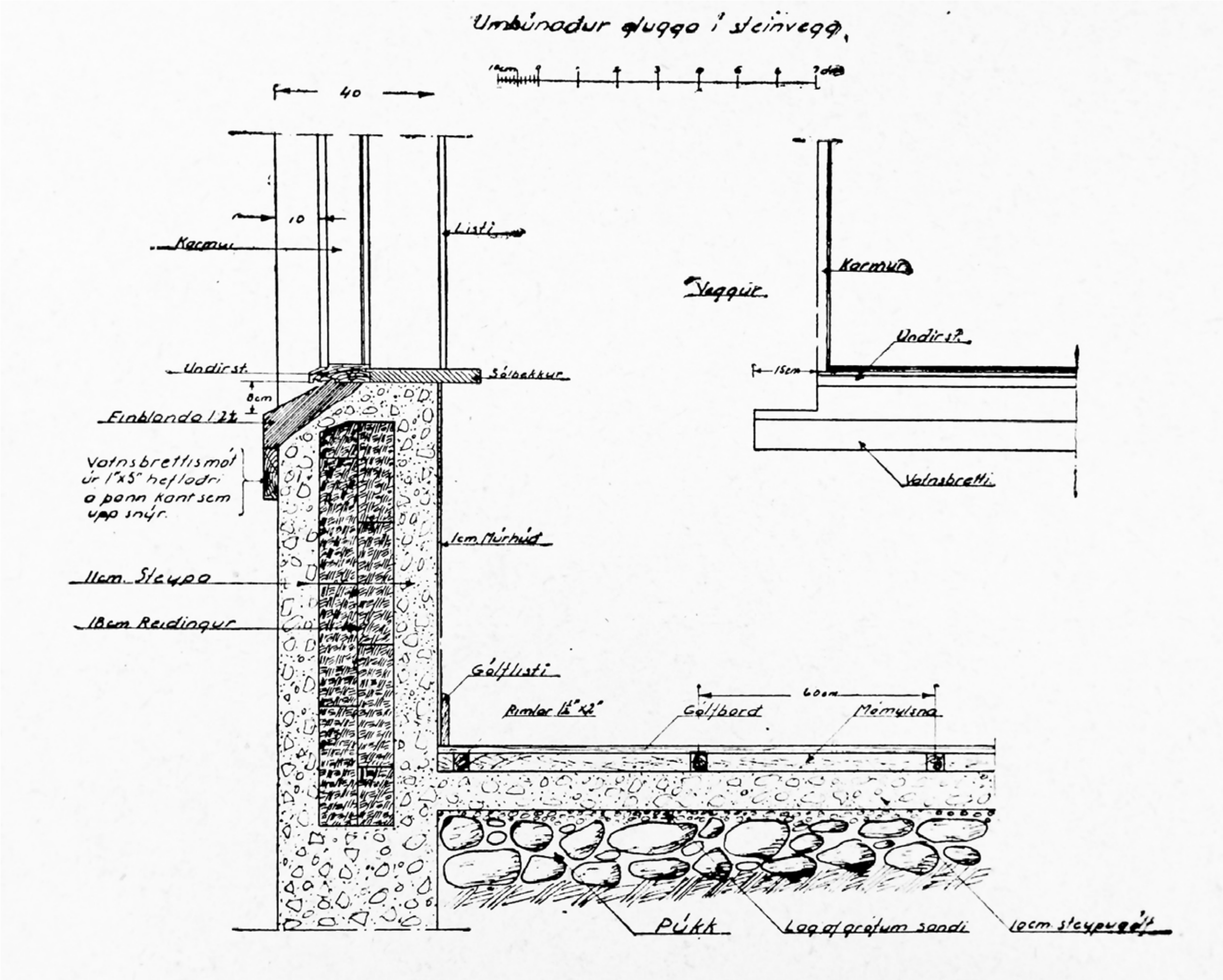
[88] Laxness, *Independent People*, 468. Laxness wrote in details about the frenzy generated by the great variety of subsidies addressed at modernizing Icelandic agriculture. Laxness, *Independent People*, 475–76.

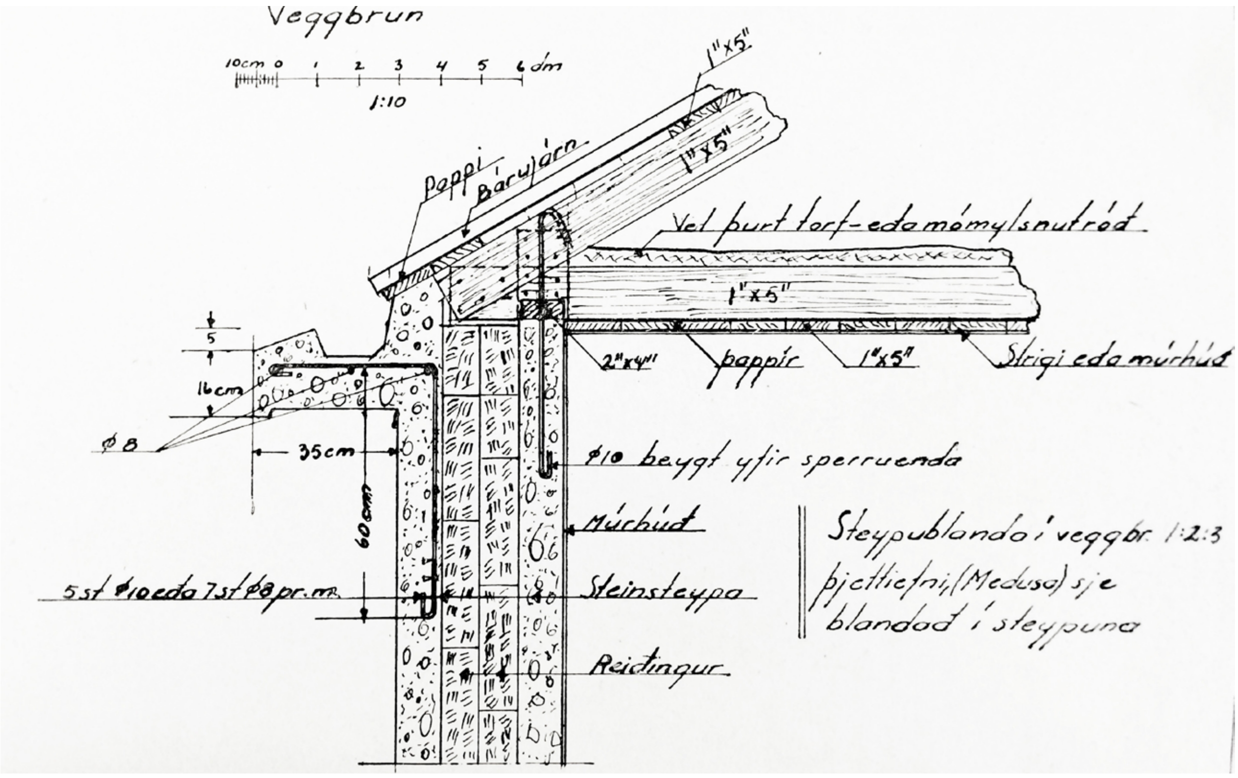
[89] Steingrímur Steinþórsson, "Byggingarmál alþýðu," 274. See the full description of the office's tasks in: "42 Frumvarp til laga um teiknistofu landbúnaðarins," Flm. Steingrímur Steinþórsson, Bjarni Ásgeirsson, *Alþingistíðindi* (1937), 216–25. See also: Þórir Baldvinsson, "Byggið eftir uppdrætti!," *Tíminn* 21, no. 4 (27 January 1937): 14.

[90] Þórir Baldvinsson was one of the many Icelanders who left Iceland for North America. He decided to return to Iceland after the economic crash in 1929. "Eins og fjarlægur draumur...," *Morgunblaðið* 67, no. 27 (3 February 1980): 14–15.

[91] Steingrímur Steinþórsson, "Byggingarmál alþýðu," 274.

[92] Teiknistofa Landbúnaðarins, *Steinhús. Nokkrar reglur um gerð steinhúsa í sveitum* (Reykjavík: Ríkisprentsmiðjan Gutenberg, 1938). Some of its content had already been published by Þórir Baldvinsson as articles in the *Tíminn* journal: Þórir Baldvinsson, "Byggið eftir uppdrætti!," 14. Þórir Baldvinsson, "Undirbúningur sveitabygginga," *Tíminn* 21, no. 42 (29 September 1937): 134. At that time, *Tíminn* was the newspaper giving voice to the Progressive Party. Gunnar Karlsson, *History of Iceland*, 306.





Figg. 15a–15b – Section of a double concrete wall and section of a timber roof. Teiknistofa Landbúnaðarins, *Steinhús*, 1938.

the vertical structures, the timber slabs and the roofing system, etc.[93] The booklet was directly addressed to builders, as the cover rhetorically asks: "Has the craftsman read this text?".[94] For perhaps first time in Icelandic architectural literature, construction advice was followed by precise technical drawings representing sections of concrete and timber structures. Drawings and texts fully described the double concrete walls suggested by Jón Þorláksson and Guðmundur Hannesson at the beginning of the century.[95] In order to lower the building costs, it was also recommended that the concrete be cast with care, so that its outer surface was smooth enough so as to not require an additional finishing.[96] **Figg. 15a–15b.**

The decrease in building costs was the second goal of the technical office during the 1930s and until the mid-1940s. The crash of 1929 and the worldwide depression which followed had a severe impact on Icelandic economy, halting most of its fishing and agricultural exports. The economic downturn lasted until the early 1940s, when a new flow of exports to Britain was prompted by the ongoing war.[97] The general state of depression had harsh effects on Icelandic building industry, and it greatly influenced the works of the office and its projects. Apparently against the ongoing modernization of building techniques, the sudden scarcity of foreign materials – primarily, cement and timber – generated a renewed interest in turf construction, which started appearing in some projects issued by Þórir Baldvinsson and his assistants. For a few years, turf was rediscovered as a potential means for building in the countryside: not only was it integrated within concrete walls as an insulating layer, but it was also applied to whole structures, farmhouses and warehouses alike. At times the old turf farm was kept standing next to the new one as a separated warehouse or stable; at times thick turf walls were located on the northern façade for insulating purposes. **Figg. 16a–16g.**

Þórir Baldvinsson claimed that in order to build long lasting turf farms it was necessary to change the traditional layout: instead of the traditional, nineteenth-century "gabled" house with parallel roofs and gables, the new turf house would be more similar to the medieval "longhouse", with two perpendicular roofs so that snow and rain would not pool in the valleys of the roof and ruin the structure.[98] A number of the technical office's projects employed turf in different ways, usually placing

[93] In order to use turf as an insulating layer, it had to be cut one year before, left drying during the summer, stacked in winter and employed as building material the following spring. See: Teiknistofa Landbúnaðarins, *Steinhús*, 4.

[94] "Hefir smiðurinn lesið þetta rit?". Teiknistofa Landbúnaðarins, *Steinhús*, cover page.

[95] The concrete was cast between the outer formworks and the inner turf layer, and the two sides were held together by 8mm iron rods. A concrete mix ratio of 1 : 3 : 5 was suggested for the lower walls; a stronger ratio of 1 : 2 : 3 was instead suggested for the cornices and the walls above corner windows. Teiknistofa Landbúnaðarins, *Steinhús*, 5–7 and 9.

[96] Two concrete sections of 11cm enclosed a 18cm layer of turf padding. The concrete walls were connected to the timber beams through 10mm iron rods, and the roof was covered by a layer of cardboard and one of corrugated iron. Teiknistofa Landbúnaðarins, *Steinhús*, 13.

[97] For a short summary on the economic depression in Iceland, see: Gunnar Karlsson, *History of Iceland*, 308–12.

[98] Þórir Baldvinsson, "Getum við byggt úr torfi?," *Tíminn* 23, no. 129 (7 November 1939): 514.

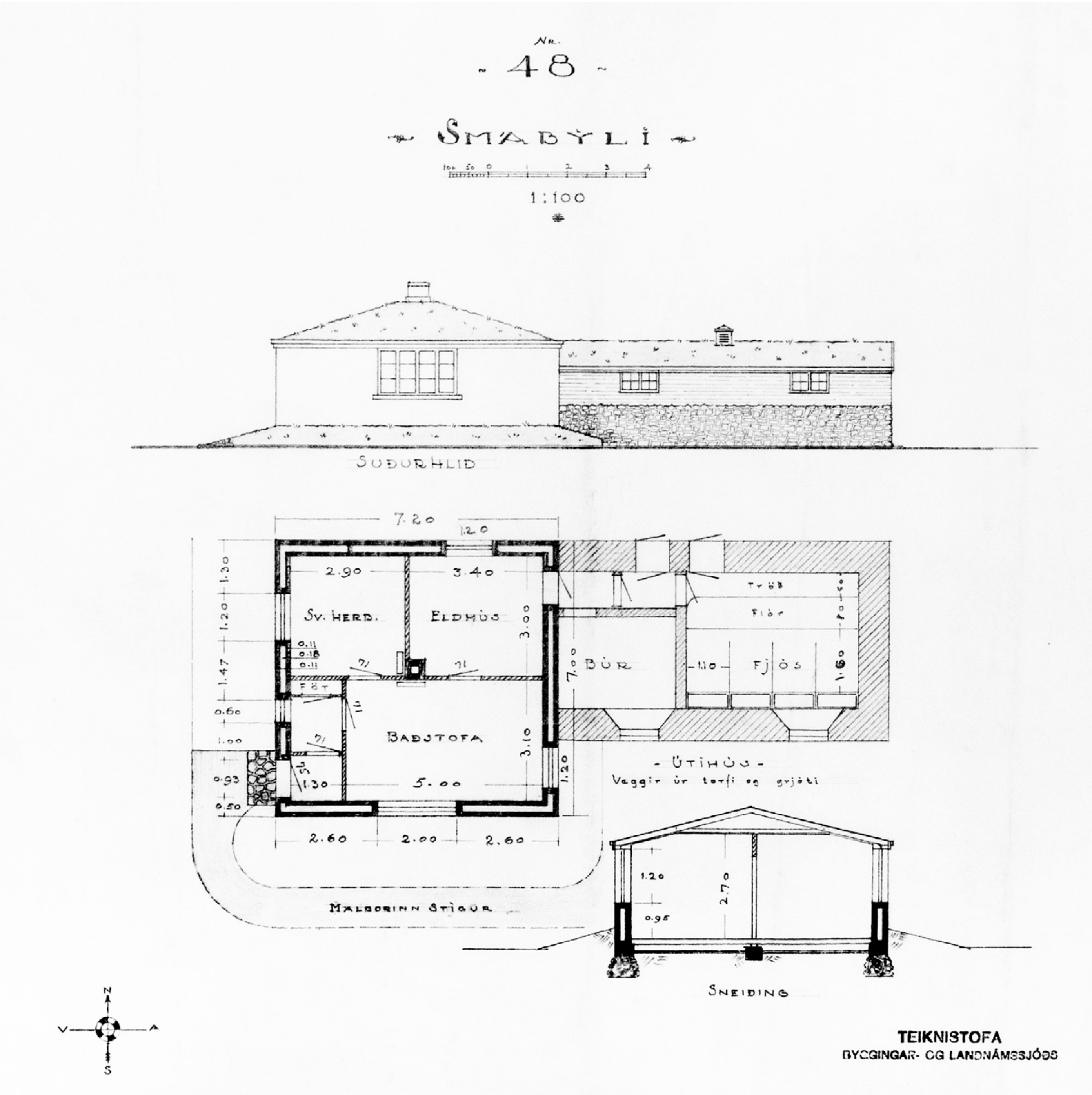


Fig. 16a – Þjóðskjalasafn Íslands, Byggingastofnun landbúnaðarins. Teikningar, BB/2, Teiknistofa bygginga- og landnámsjóðs, BB/2, Drawing no. 48.

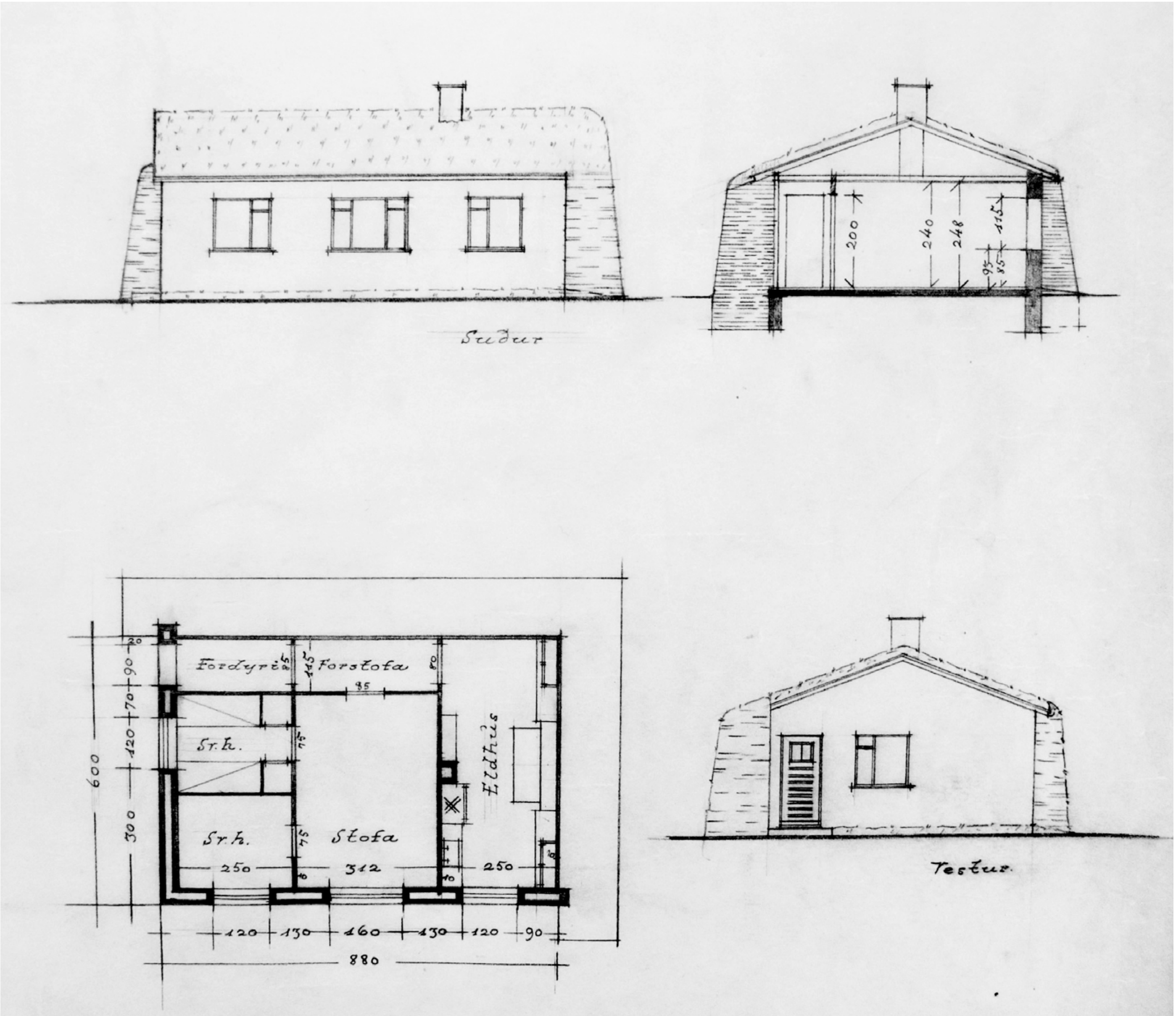


Fig. 16b – Þjóðskjalasafn Íslands, Byggingastofnun landbúnaðarins. Teikningar, BB/2, Teiknistofa bygginga- og landnámsjóðs, unnumbered drawing.

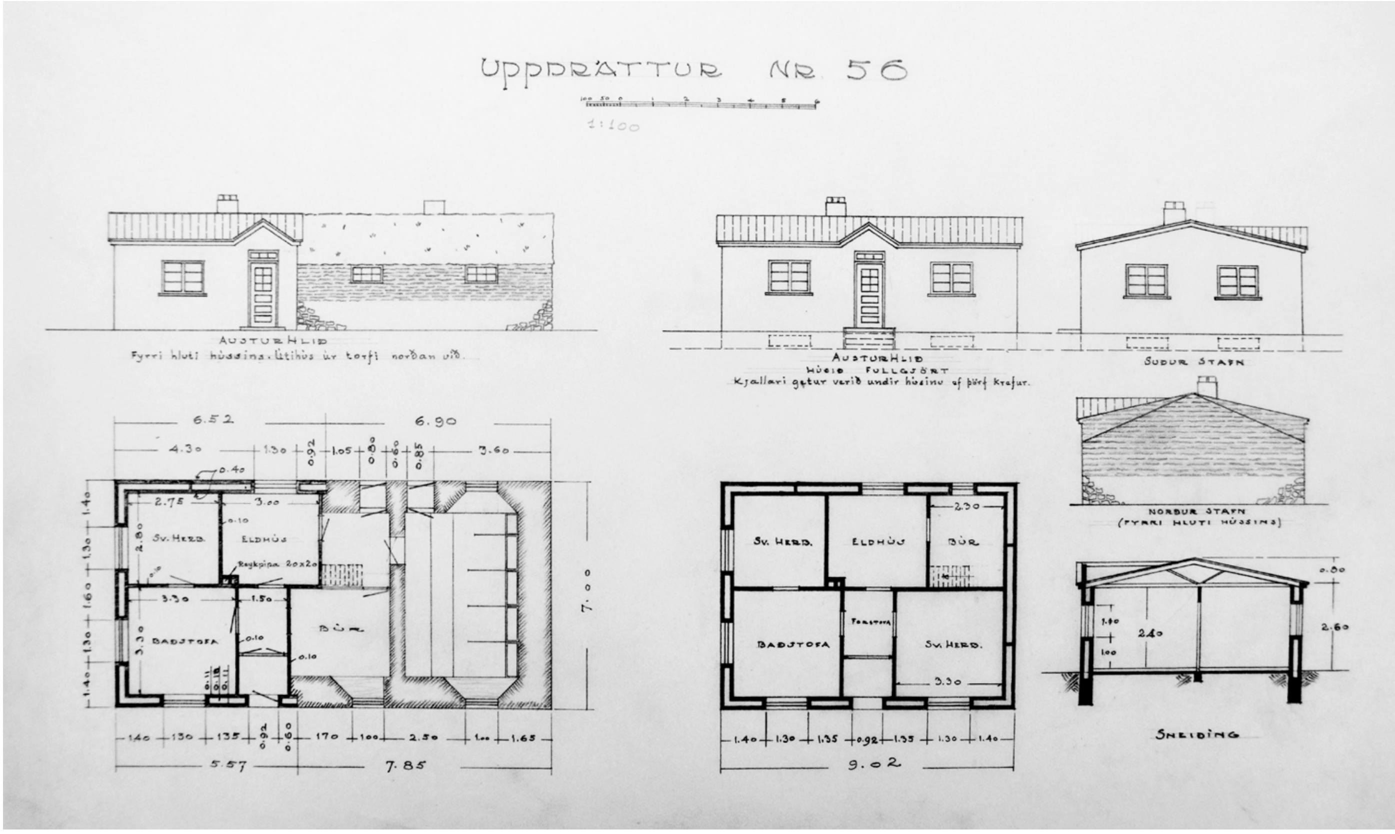


Fig. 16c – Þjóðskjalasafn Íslands, Byggingastofnun landbúnaðarins. Teikningar, BB/3, Teiknistofa bygginga- og landnámsjóðs, BB/3, no. 56.

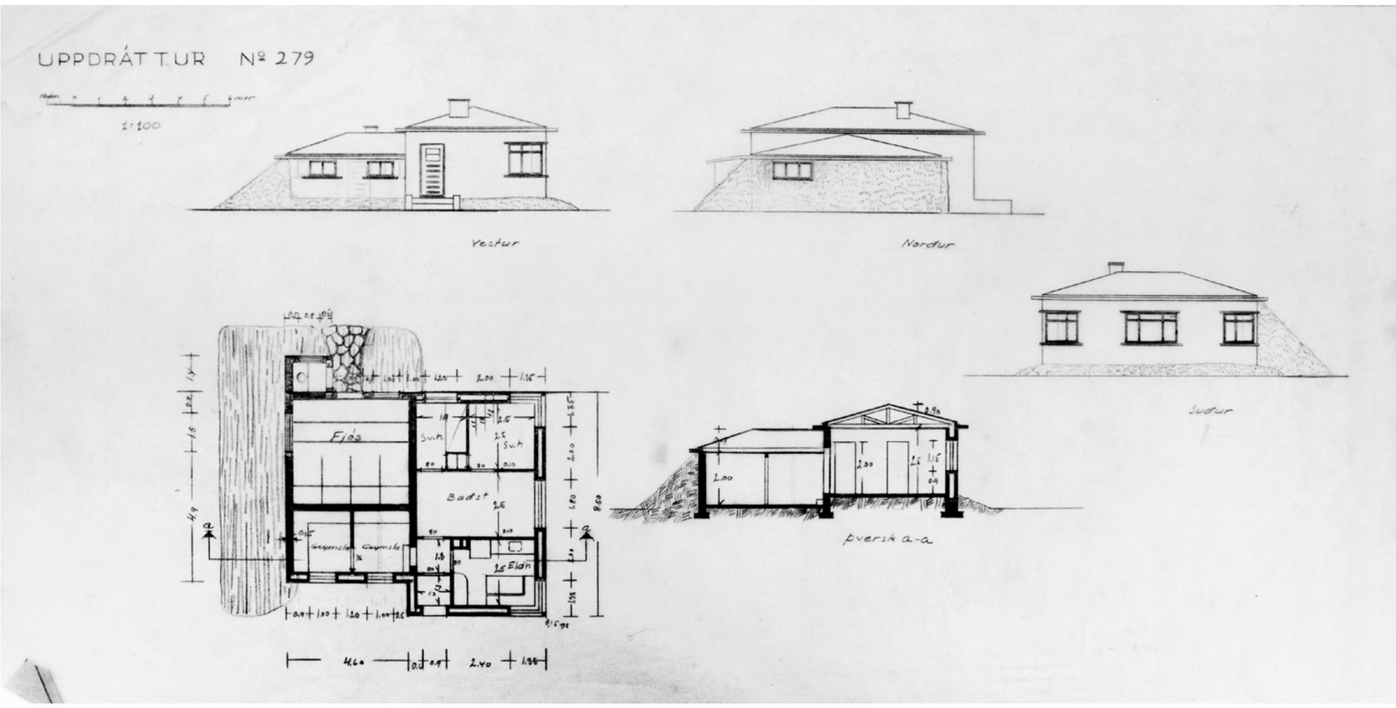


Fig. 16d – Þjóðskjalasafn Íslands, Byggingastofnun landbúnaðarins. Teikningar, BB/1, Teiknistofa bygginga- og landnámsjóðs, BB/7, no. 279.

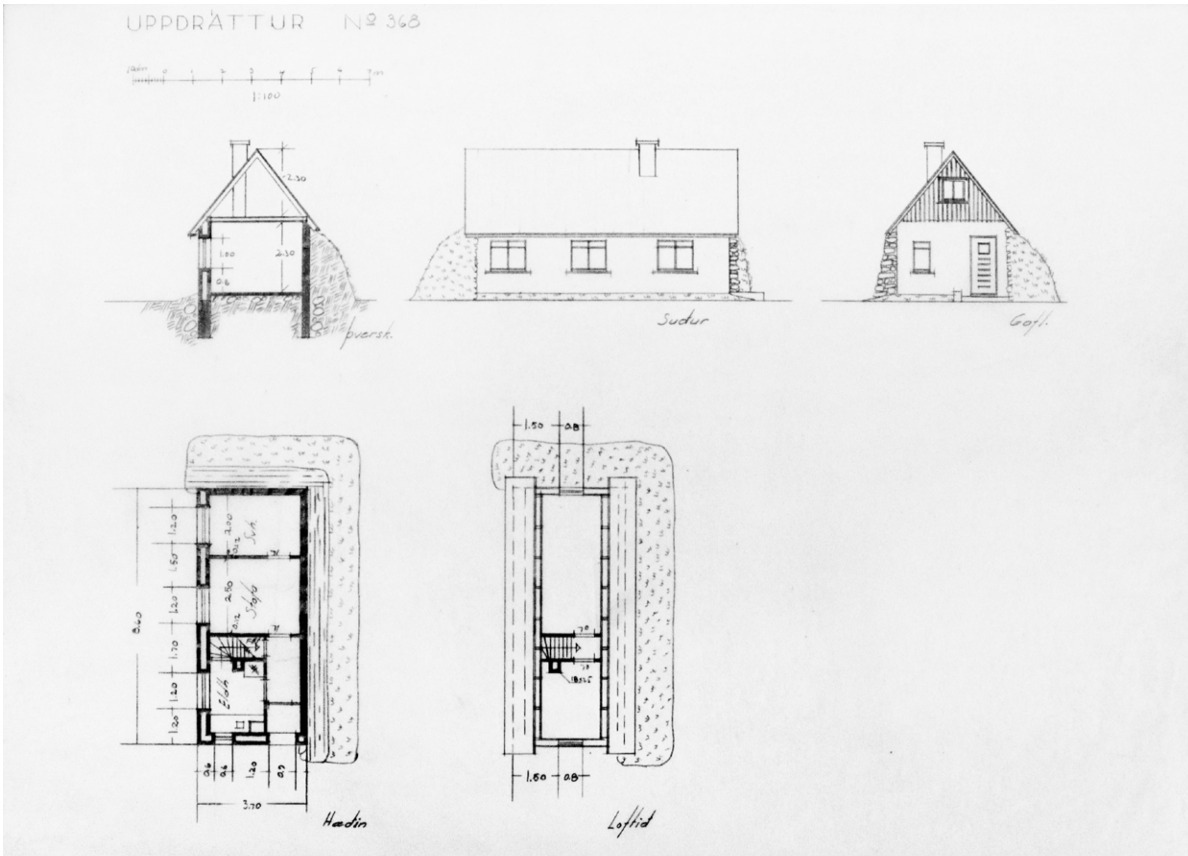


Fig. 16e – Þjóðskjalasafn Íslands, Byggingastofnun landbúnaðarins. Teikningar, BB/9, Teiknistofa bygginga- og landnámsjóðs, no. 368.

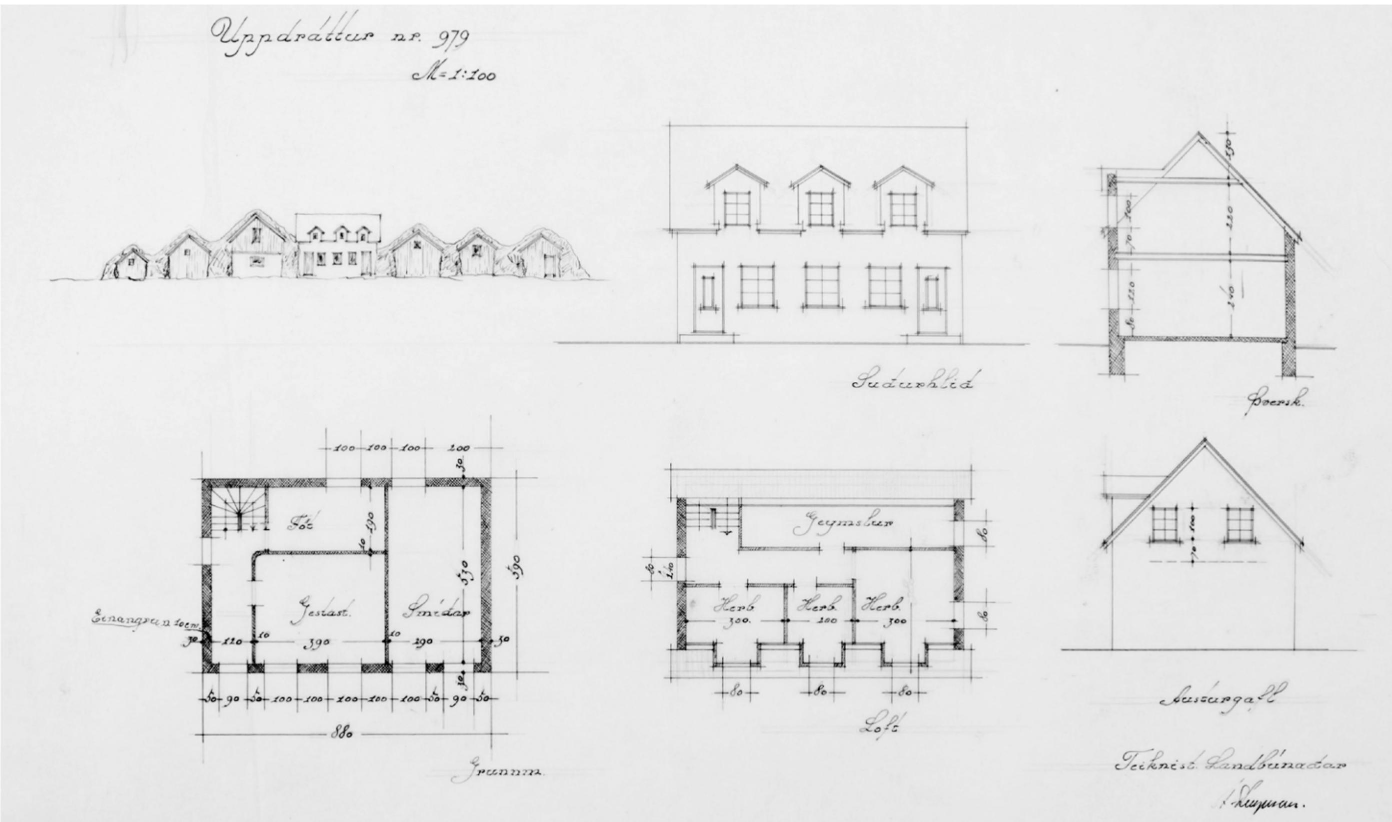


Fig. 16f – Þjóðskjalasafn Íslands, Byggingastofnun landbúnaðarins. Teikningar, BB/21, Teiknistofa bygginga- og landnámsjóðs, no. 979.

Fig. 16g – Concrete farm with side turf wall at Skógar, South Iceland. Photo by Sofia Nannini, 2019.

concrete structures side by side with turf and gravel walls, as experiments of an impossible hybridization between the vernacular and the modern.[99] For the first time in history, turf farms were designed and drawn in details before being built, not treated as spontaneous processes anymore, but with the dignity of any other kind of construction. These experiments were born out of necessity, due to the scarcity caused by the economic depression: this is why they soon faded away when Icelandic economy started improving. By the mid-1940s Icelandic exports had increased once again, and Iceland was entering a new age of economic growth together with a full political independence. Turf fell back into the realm of the forgotten burdens of the past: turf houses decreased in number until they became ruins, or were on occasion saved as historical museums. **Figg. 17a–17c.**

Turf experiments did not last too long, yet a new kind of concrete farmhouse emerged from the 1930s and became a building standard for decades to come. Under the supervision of Þórir Baldvinsson the average farmhouse was transformed: the new projects envisaged low buildings, usually without a cellar and only one-storey high, far from the traditionalist models praised throughout the 1920s. By so doing, the overall costs decreased by a quarter the cost of Jóhann Kristjánsson's former projects.[100] As Þórir Baldvinsson wrote in a essay published in 1939, echoing Guðmundur Hannesson's opinion: "With the disappearance of turf farms, the ancient building culture came to an end. [...]. New building materials resulted in new building forms."[101] **Figg. 18a–18b.**

The aforementioned Icelandic rural projects could be compared to a number of similar experiences which took place throughout Central and Northern Europe in the first half of the twentieth century. Contemporary rural projects subsidized by loan programs also emerged in the Nordic countries and in the Baltic States, such as Finland and Estonia.[102] However, in the case of rural housing the main model for Iceland was obviously Denmark. In 1899 the Danish government issued a law for

[99] In particular see drawing no. 105, ÞÍ, *Byggingastofnun landbúnaðarins*. *Teikningar*, BB/4 1930–39: a long, horizontal window is supported by a concrete wall, whereas the rest of the farmhouse shows thick walls of turf and coarse stones (see Fig. 17a).

[100] Between 1936–38 the average cost had been reduced to approximately 8500kr for each dwelling. Steingrímur Steinþórsson, "Byggingarmál alþýðu," 276. For a description of Þórir Baldvinsson's project for a modern farmhouse, see: Þórir Baldvinsson, "Hýsing sveitabýla," *Andvari* 56, no. 1 (January 1931): 111–20; Jónas Jónsson, "Byggingar X," *Samvinnan* 27, no. 1 (February 1933): 85–90; Jónas Jónsson, "Byggingar XI," *Samvinnan* 27, no. 2 (June 1933): 216–17.

[101] Þórir Baldvinsson, "Heimili sveitanna," in *Húsakostur og híbýlaprýði*, edited by Hörður Bjarnarson et al. (Reykjavík: Mál og menning, 1939), 30.

[102] An example of standardized rural dwellings in Finland between the late 1930s and the 1960s can be found in: Mia Åkerflet, "Type-planning a Fenno-Swedish Identity. The Housing Association for the Swedish Speaking Areas of Finland and the Ideal Rural Home Between 1938 and 1969," *Modernism, Modernisation and the Rural Landscape. Proceedings of the Modscapes Conference 2018. SH Web of Conferences* 53 (2019): 1–10. The Estonian case is strikingly similar to the Icelandic one: once Estonia declared its independence in 1918, the newly established government promoted subsidies for building in rural areas. A bureau was established for the developmenf of standardized projects. See: Marie-Alice L'Heureux, "Modernizing the Estonian Farmhouse, Redefining the Family, 1880s–1930s," *Journal of Baltic Studies* 41, no. 4 (2010): 473–506.

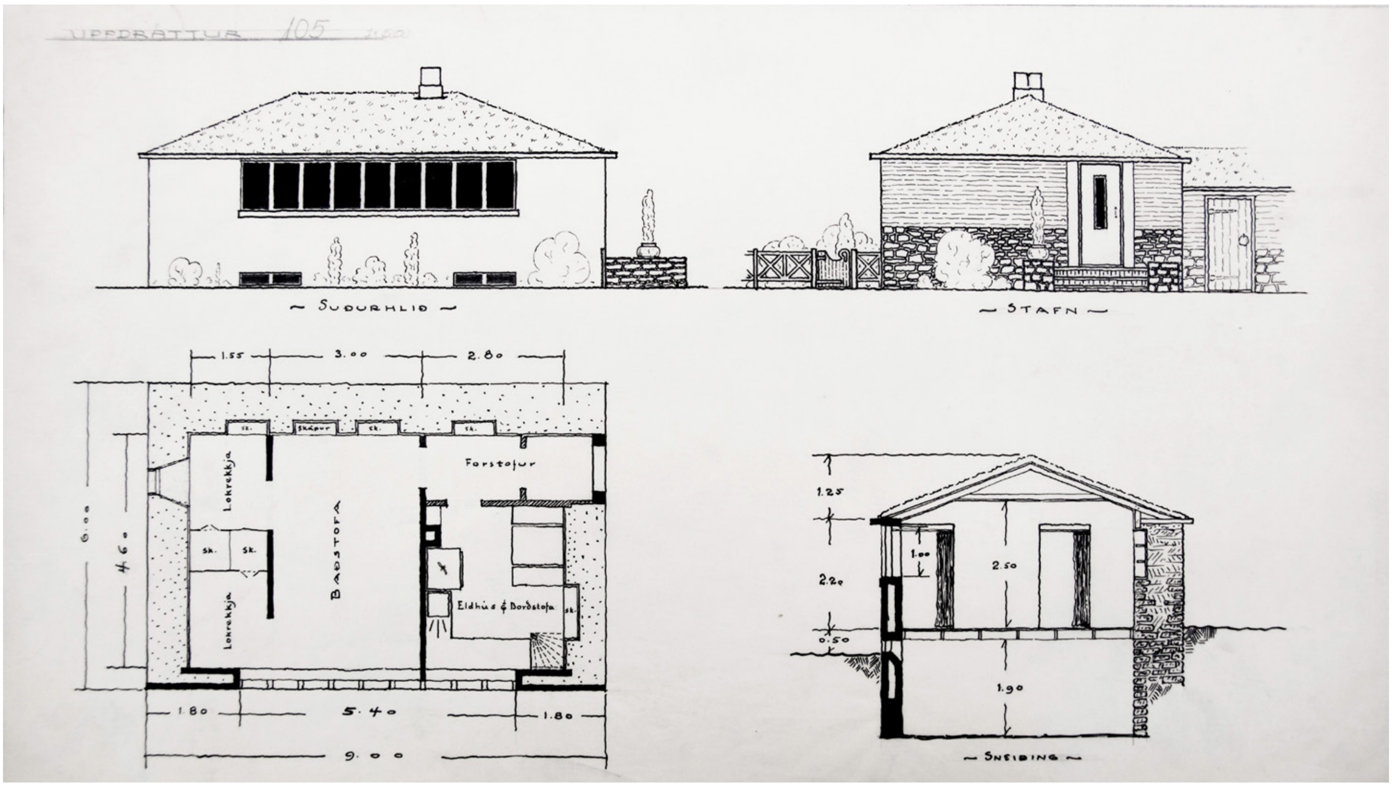


Fig. 17a – Þjóðskjalasafn Íslands, Byggingastofnun landbúnaðarins. Teikningar, BB/4, Teiknistofa bygginga- og landnámsjóðs, drawing no. 105, 1930–39.

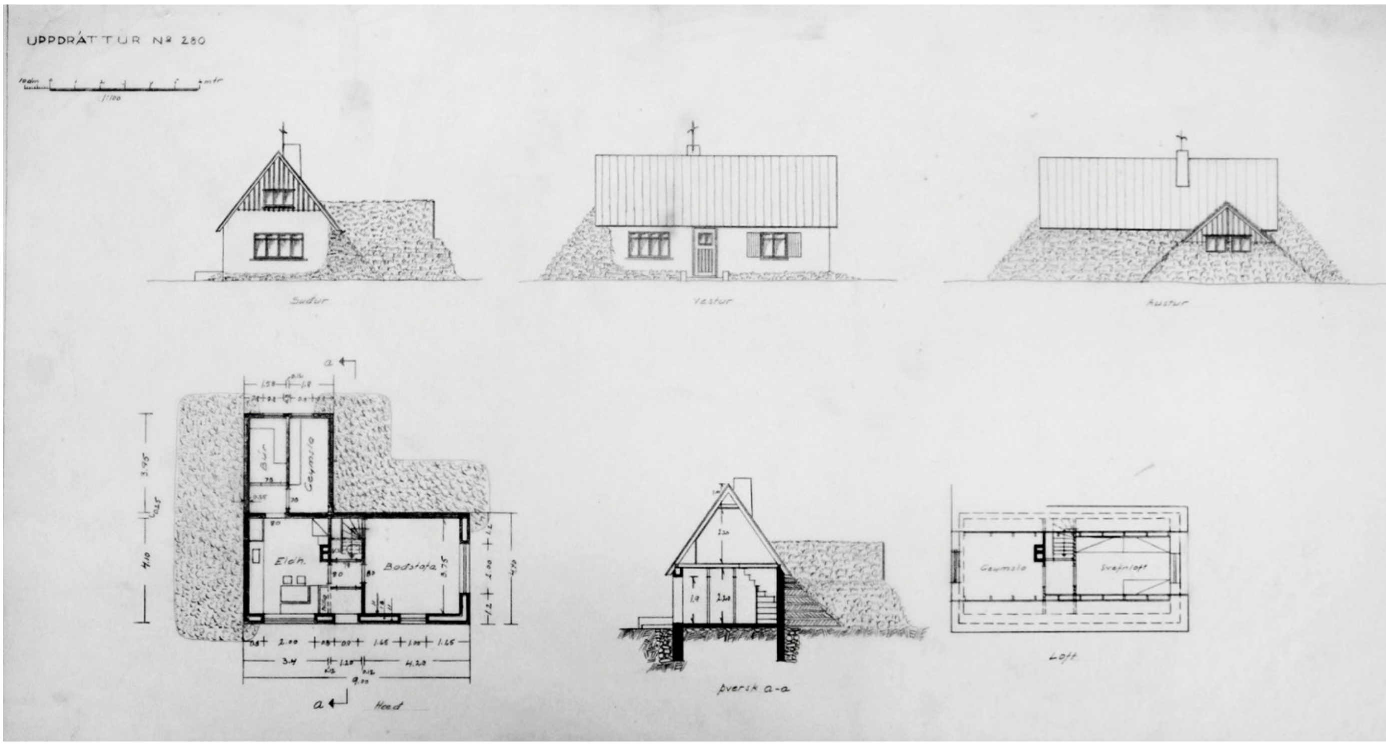


Fig. 17b – Þjóðskjalasafn Íslands, Byggingastofnun landbúnaðarins. Teikningar, BB/7, Teiknistofa bygginga- og landnámsjóðs, drawing no. 280, 1930–39.

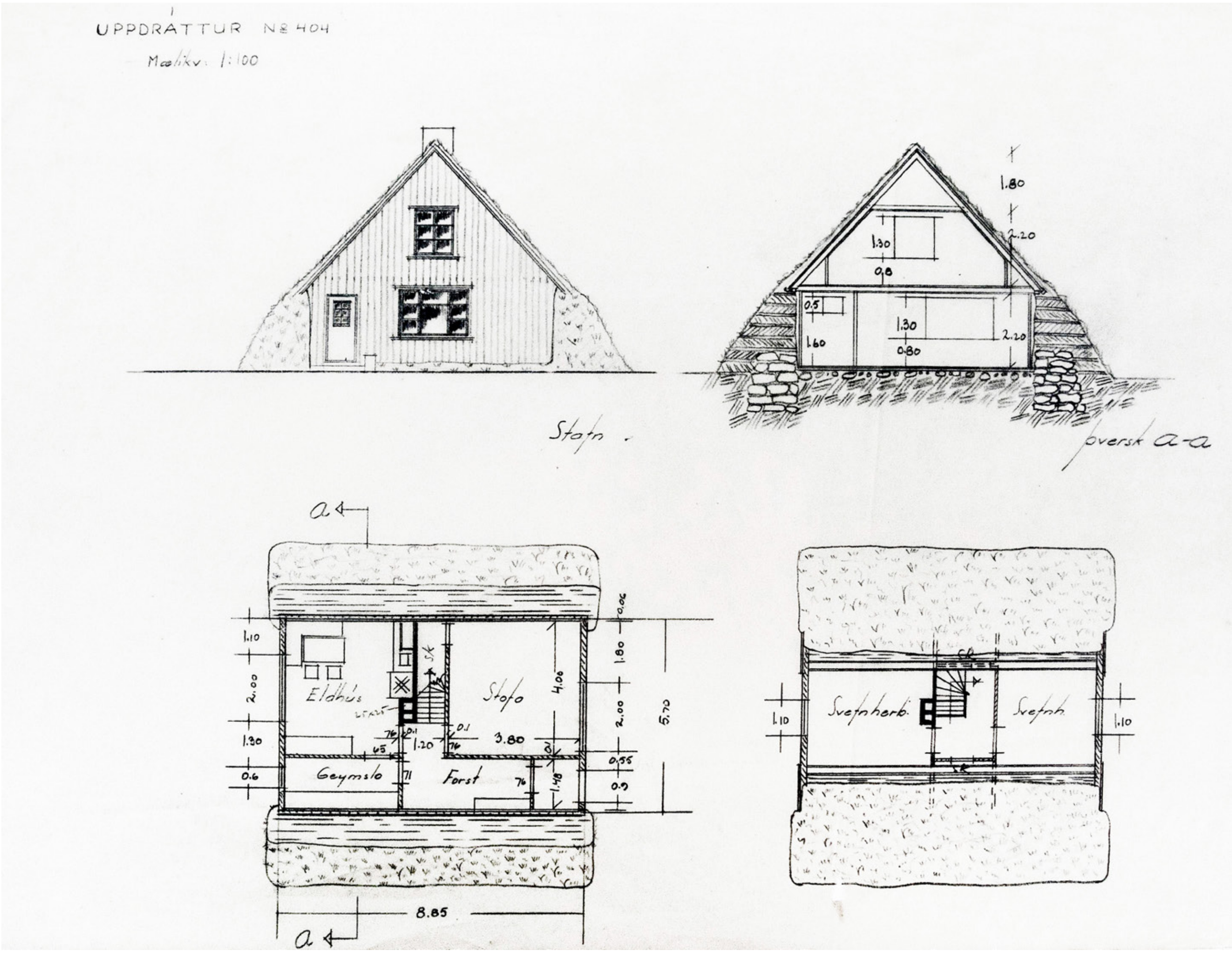


Fig. 17c – Þjóðskjalasafn Íslands, Byggingastofnun landbúnaðarins. Teikningar, BB/10, Teiknistofa bygginga- og landnámsjóðs, drawing no. 404, 1930–39.

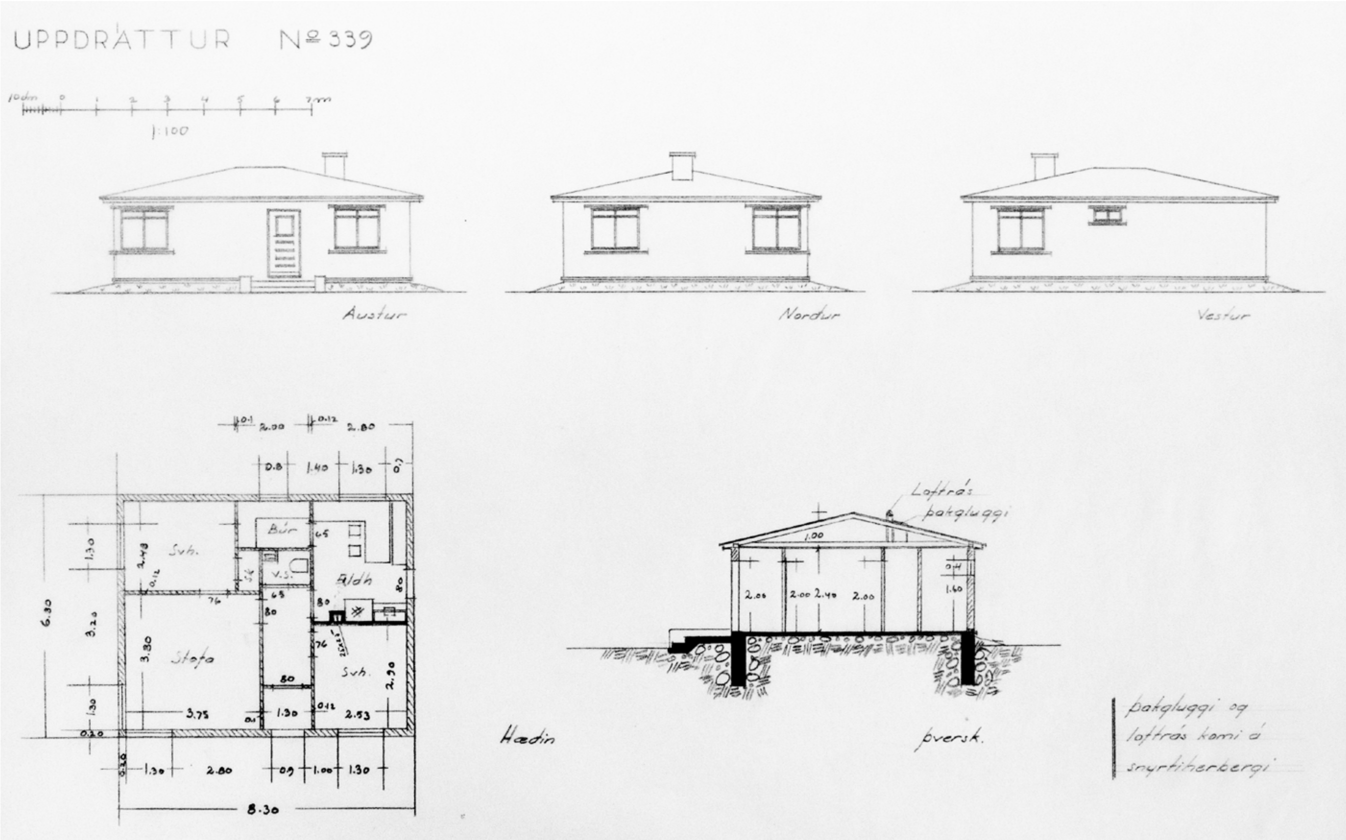


Fig. 18a – Þjóðskjalasafn Íslands, Byggingastofnun landbúnaðarins. Teikningar, BB/19, Teiknistofa bygginga- og landnámsjóðs, drawing no. 339, 1930–39.

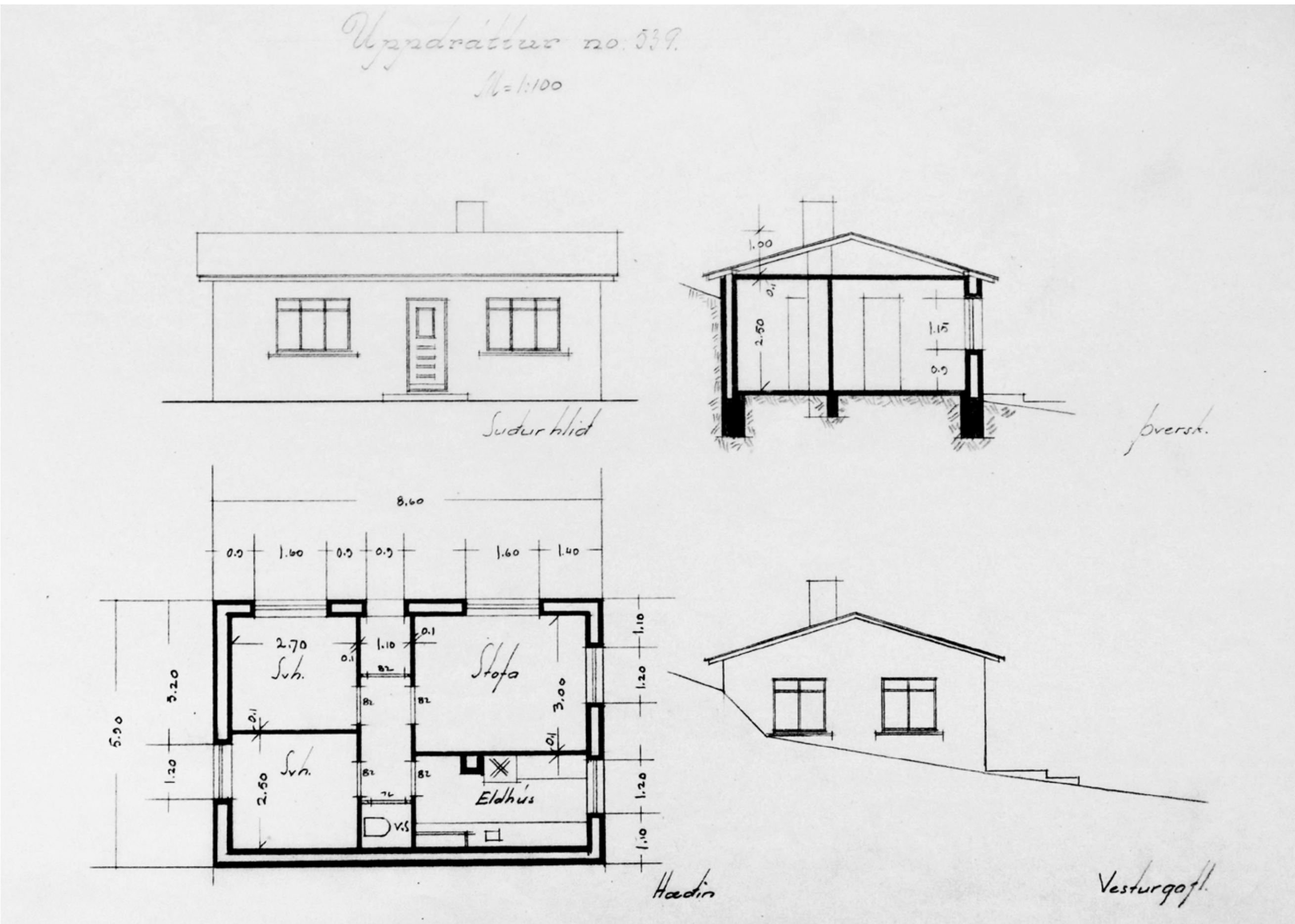


Fig. 18b – Þjóðskjalasafn Íslands, Byggingastofnun landbúnaðarins. Teikningar, BB/12, Teiknistofa bygginga- og landnámsjóðs, drawing no. 539, 1930–39.

establishing small state farms, supported by long-term loans to be used for rural buildings, machineries, and farming.[103] In the same years architectural contests were held to find the best layouts and style to build in the countryside. Many publications were devoted to drawings and designs of farmhouses.[104] In 1919 it was decided that each building project had to be approved by a commission. The architects in charge of evaluating and offering standardized drawings were part of *Landsforeningen Bedre Byggeskik*, a national architectural society officially founded 1915 with the aim of improving Danish building traditions. Among the architects active in the Society was Peder Vilhelm Jensen-Klint (1853–1930).[105] The goals of *Bedre Byggeskik* could be compared to those of the *Heimatschutzbewegung* founded in Germany in 1904, a movement for the protection of German traditions, and specifically concerning rural architecture.[106] A few traces help us understand to what extent Icelandic rural policies had been influenced by Danish models. On the one hand, the Danish Society *Bedre Byggeskik* must have been well known among building experts and architects. In 1915, Guðjón Samúelsson drew a project for an Icelandic farmhouse, greatly infuenced by Danish rural architecture.[107] In 1924, Guðmundur Hannesson explicitly mentioned the *Bedre Byggeskik* Society in one of his articles. A Danish collection of drawings for single houses was part of the National Library collection.[108]

---

[103] Law 24/3/1899 on Provision of Land for Farmers. [*Lov om Tilvejebringelse af Jordlodder til Landarbejdere*]. Those state farmsteads are usually referred to as *Statshusmandsbrug*. Lisbeth Brorsen, Kenneth Johansen, and Eske Møller, *Landbrugets Bygninger 1850–1940* (Copenhagen: Kulturarvsstyrelsen/Kulturministeriet, 2002), 16–17.

[104] *Byggeplaner til Bøndergaarde og til Huse med og uden Jord* (Copenhagen: Kgl. danske Landhusholdningsselskab, 1895); Vilh. Lorenzen, *Tegninger til Husmandsboliger* (Odense: Det Miloske Forlag, 1909); Sjællands og Fyns Stifts Udstykningsforening, *Tegninger til Husmandshuse* (Copenhagen: Erslev & Hasselbalch), 1914.

[105] On Jensen-Klint: Thomas Bo Jensen, *P.V. Jensen-Klint: The Headstrong Master Builder* (London: Routledge, 2009), 61–67. Among the architects active as rural commissioners were Ejnar Mindedal Rasmussen (1892–1975) and Marius Pedersen (1888–1965). The latter was a consultant for *Statens Jordlovsudvalg* between 1922 and 1959. On his contribution to Danish rural construction, see: Pernille Henriette Wiil, *Den rette stemning. Stoflige virkninger i Landsforeningen Bedre Byggeskiks arkitektur*, PhD Dissertation at Museum Vestsjælland, Roskilde Universitet (July 2016), 173–79. On *Bedre Byggeskik* see also: Faber, *A History of Danish Architecture,* 16; Jeanne Brüel, *Bevaringsguide for bedre byggeskik-huse* (Bygningskultur Danmark, 2011). On the standardized houses offered by *Bedre Byggeskik* architects and their role as forerunners of standard Danish detached houses [*typehus*] after the Second World War, see: Jørgen Hegner Christiansen, "Typehuset – Velfærdsstatens foretrukne boform," *Architectura* 35 (2013): 99–100. As an example of the Society's publications, see: Landsforeningen Bedre Byggeskik, *Danske landbrugsbygninger* (Copenhagen: Hassing, 1920).

[106] On *Heimatschutz* architecture, see: Christian F. Otto, "Modern Environment and Historical Continuity: The *Heimatschutz* Discourse in Germany," *Art Journal* 43, no. 2 (1983): 148–57; Verena Jakobi, "Heimatschutz und Bauerndorf. Zum planmäßigen Dorfbau im Deutschen Reich zu Beginn des 20. Jahrhunderts," *PhD Dissertation* in Architektur, Umwelt und Gesellschaft, Technischen Universität Berlin, 2003.

[107] Guðjón Samúelsson's farmhouse design was criticized by Guðmundur Hannesson because too similar to Danish traditional buildings and not suitable for the Icelandic countryside. Guðmundur Hannesson, "Kringum bæinn," *Búnaðarrit* 29, no. 2 (1915): 215–26. See also the project for a "Summer house on the Kattegat", designed by Guðjón Samúelsson during his school years. Pétur H. Ármannsson, *Guðjón Samúelsson húsameistari*, 36.

[108] Harald Nielsen, *Boligbogen. Tegninger og beskrivelser til smaa enfamiliehuse* (Copenhagen, 1926).

Furthermore, in the 1930s it was also evident how the Icelandic Progressive Party was interested in Denmark's law for rural areas.[109] **Figg. 19a–19b.**

By the mid-1940s the Icelandic technical office had issued more than a thousand drawings, and in 1947 it opened a branch in Akureyri.[110] By far and large, it was the single most influential architectural office of the country, releasing more projects than the State architect's office and affecting the lives of thousands of citizens throughout the island.[111] The majority of its outcomes are still visible today, either as active farmhouses or countryside dwellings, or as ruins in the landscape.[112] **Figg. 20a–20b.** Decades of planned farmhouses fulfilled the dreams of Guðmundur Hannesson and of Iceland's first engineers, who longed for a radical transformation of Icelandic construction techniques. Thanks to the subsidies of the Agricultural Bank and to the projects of its technical office, the age of concrete could finally bloom in rural Iceland, and it was able to bring modern living standards to all corners of the island. It is interesting to notice that, despite its slow development, it was especially in the Icelandic countryside that experiments on building materials took place most fruitfully.[113]

---

[109] Guðmundur Hannesson, "Dönsk skipulagslög," *Morgunblaðið* 12, no. 48 (31 December 1924): 2. In 1936 Icelandic member of Parliament Bjarni Bjarnason (1889–1970) claimed he was interested in the work by the Danish commission for rural buildings [*Statens Jordlovsudvalg*]. See: "Frá norræna þingmannafundinum. Viðtal við Bjarna Bjarnason alþm.," *Tíminn* 20, no. 26 (24 June 1936): 102.

[110] "Teiknistofa landbúnaðarins," *Dagur* 30, no. 14 (10 April 1947): 5. The office kept on working under the name of *Byggingastofnun landbúnaðarins* until the early 1990s, when it was closed.

[111] A 1963 publication on the Rural Society of the Suður-Þingeyingur county shows dozens of pictures of farmsteads with their inhabitants: most farmhouses are very recognizable projects by the technical office of the Agricultural Agency. See: Haukur Ingjaldsson, Jón Sigurðsson, and Steingrímur Baldvinsson, *Byggðir og bú. Aldarminning Búnaðarsamtaka Suður-Þingeyinga í máli og myndum* (Búnaðarsamband Suður Þingeyinga, 1963).

[112] The research project *Eyðibýli á Íslandi* (2011–14) conducted a census of all abandoned rural buildings of Iceland. The majority of such constructions were built according to the technical office's drawings. Photographs and data of each building can be found in: Gísli Sverrir Árnason, and Sigbjörn Kjartansson, eds. *Eyðibýli á Íslandi,* Vol.1–5 (Reykjavík: Eyðibýli-áhúgamannafélag, 2011–2014). See also the website: "Eyðibýli á Íslandi," http://www.eydibyli.is/, last accessed 03/09/2020.

[113] Since the late 1920s, laws and projects for urban housing had also been promoted. Workers' houses [*verkamannabústaðir*] were extensively built throughout the suburbs of Reykjavík until the early 1940s. The main contractors were local building societies [*Byggingafélögin*], which obtained special loans for the construction of housing projects. Such laws aimed at solving the great shortage of housing which characterized Reykjavík in the 1920s and 1930s, when a good part of its population lived in flats located in dark and cold cellars. Despite the fact that this process was led by more or less the same protagonists – such as Jónas Jónsson, Guðjón Samúelsson, Þórir Baldvinsson –, the debate around urban housing was less characterized by the same nationalistic traits and material experiments which instead defined the projects for rural construction. On the laws issued for solving the problem of urban housing, see: Steingrímur Steinþórsson, "Byggingarmál alþýðu," 282–90; on the projects for communal housing in Reykjavík, see: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts,* 265–98; see also the extensive text by Jón Rúnar Sveinsson, *Society, urbanity and housing in Iceland* (Gävle: Meyer Information & Publishing Ltd., 2000).

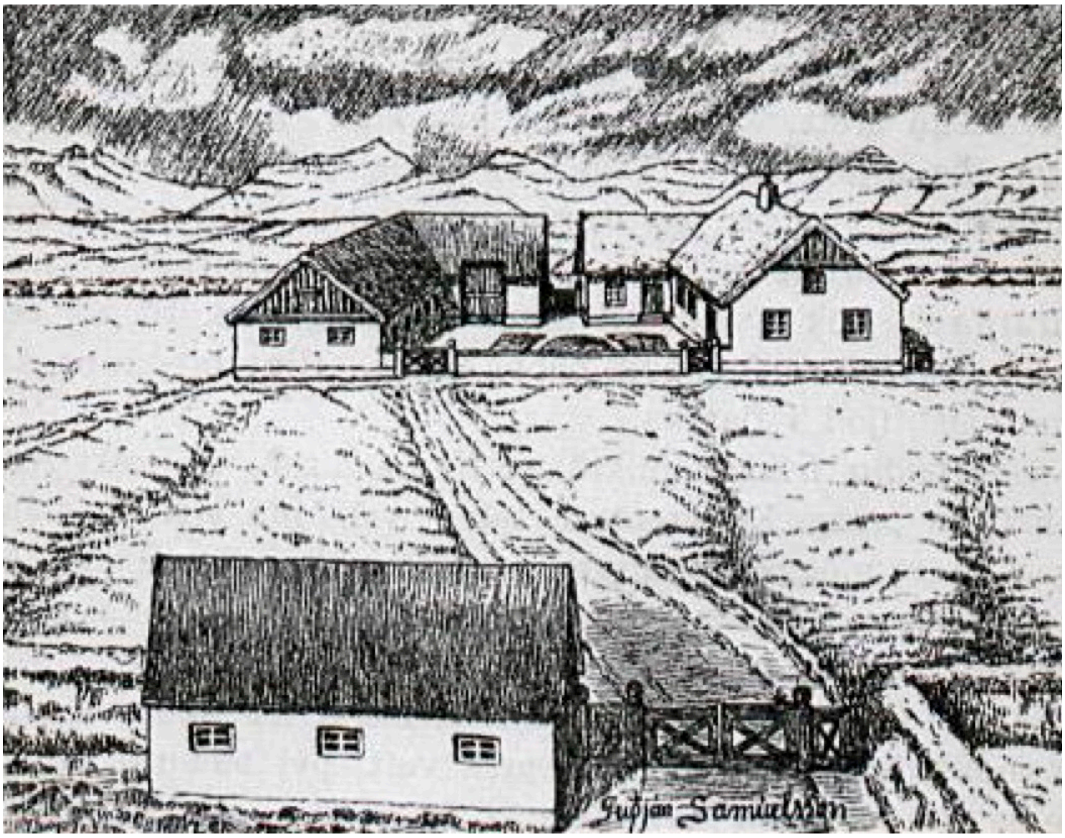


Fig. 19a – Guðjón Samúelsson, Project for an Icelandic farmhouse.
Guðmundur Hannesson, “Kringum bæinn,” *Búnaðarrit* 29, no. 2 (1915): 215–26.

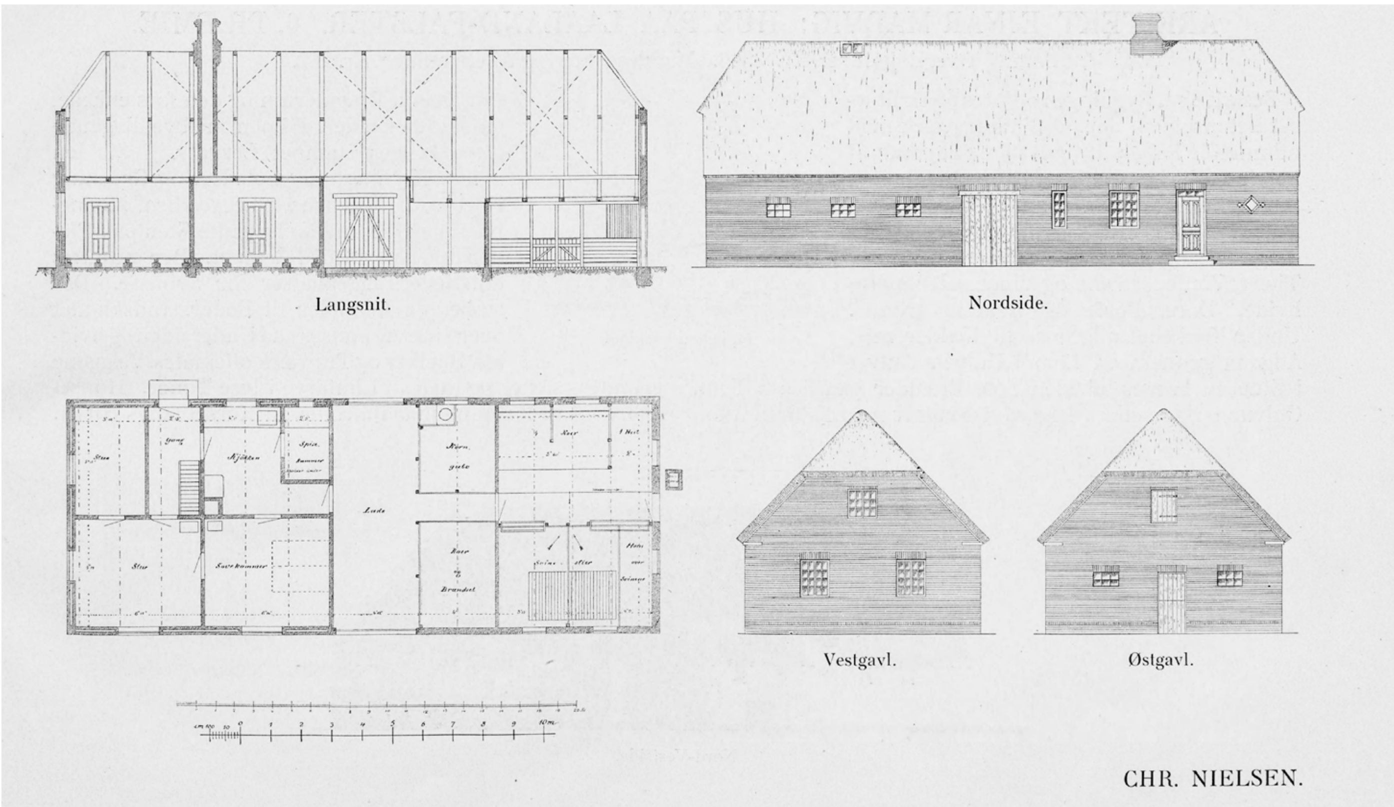


Fig. 19b – Chr. Nielsen, Project for a Farmhouse, fifth place in the 1907 competition for the selection of farmhouse projects. Vilh. Lorenzen, *Tegninger til Husmandsboliger* (Odense: Det Miloske Forlag, 1909), 34–35.

Fig. 20a – Viðborðsel farmhouse, built in 1928 and abandoned in 1960, Sveitarfélagið Hornafjörður. Photo by Sofia Nannini, 2016.

Fig. 20b – Ásbrandsstaðir farmhouse, Vöpnafjörður, built after 1920. Photo by Sofia Nannini, 2019.

Chapter 4

Icelandic State Architecture: How Concrete Built a Nation (1916–50)

The architectural history narrated in the previous chapters has been a history of mastermasons, engineers, farmers, and a very few architects. As seen in the first chapter, Danish architects in charge of Icelandic public buildings rarely visited the country. At the beginning of Iceland's concrete age and until the mid-1910s the only practicing architect on the island was Rögnvaldur Ólafsson, whose contribution was highlighted in the second chapter. The Icelandic rural adventure for the planning and construction of farmhouses was first overseen by engineers and building experts, and only in 1937 was architect Þórir Baldvinsson entrusted with the coordination of the technical office of the Agricultural Agency. One might even wonder if in the first half of the twentieth century Icelandic architectural history was shaped by architects at all, due to the overall absence of architects and architecture graduates active as professionals on the island. The first Icelandic engineering graduate came home from Copenhagen in 1893; however, the Icelandic society had to wait until 1919 to boast an Icelandic architecture graduate. On the one hand, this 25-year gap slowed the development of the architectural profession in Iceland. The same chronological difference, however, had given enough time to the country's building industry to experience a technological revolution: by 1919 the Icelandic concrete age had fully and drastically changed local building traditions.

This chapter will mainly focus on a key issue spanning on the whole first half of the century: how concrete was used for the definition of a national architecture, specifically in the works designed by the office of the State architect, Guðjón

Samúelsson, both as a technique and as a means for attaining cultural significance. In conclusion the chapter will reflect on the decline of Guðjón Samúelsson's architecture and the transformation of Icelandic building traditions after the Second World War and the declaration of independence in 1944.

4.1 Urban Concrete: Architecture in Reykjavík

Like its history of construction and building materials, Icelandic architectural history has always been a history of imported ideas and references. Throughout the nineteenth century and until the early twentieth century such architectural eclecticism derived from the contrast between public buildings – designed by a blended group of academically trained Danish architects – and timber residential dwellings, inspired by Scandinavian models and built by local carpenters. However, as the first generation of Icelandic architects emerged, this inner divergence did not disappear. On the contrary, between the mid-1910s until the early 1950s Icelandic architecture included a varied set of influences which coexisted with one another. Those very decades were a pivotal moment for Icelandic political history: since December 1918 the country had become an independent sovereign state in personal union with the kingdom of Denmark. This implied a substantial separation between Iceland and Denmark: Iceland's neutrality was declared and in 1920 the High Court of Reykjavík acquired the position of Supreme Court.[1] Because of this political change, for a while architecture developed representative and nationalistic values, acting as one of the cultural elements which could provide a tangible image to the kingdom of Iceland.[2]

In contrast with contemporary nationalistic turns in the architecture of recently established countries, Icelandic national architecture did not settle on a single historicist image.[3] Conversely it adopted a mixed range of languages to pursue the

[1] On the Act of Union, see: Gunnar Karlsson, *The History of Iceland*, 280–84; Guðmundur Hálfdanarson, *Íslenska þjóðríkið*, 135–38. Helgi Skúli Kjartansson, *Ísland á 20. öld*, 71–77.

[2] *Konungsríkið Ísland* was the official name of Iceland after the act of union in 1918, until the establishment of the Republic of Iceland in 1944.

[3] Far from the Icelandic context, an interesting case of the creation of an architectural national style based on historical models was that of Serbia. See: Bratislav Pantelić, "Nationalism and Architecture: The Creation of a National Style in Serbian Architecture and Its Political Implications," *Journal of the Society of Architectural Historians* 56, no. 1 (March 1997): 16–41. On nationalism and architecture in the Nordic countries, see: Fabienne Chevallier, and Anja Kervanto Nevanlinna, "La nation finlandaise, entre mémoire et projet," in *Idée nationale et architecture en Europe, 1860–1919: Finlande, Hongrie, Roumanie, Catalogne* edited by Jean-Yves Andrieux, Fabienne Chevallier, Anja Kervanto Nevanlinna (Rennes: Presses universitaires de Rennes, 2006), 207–19; Charlotte Ashby, "The Pohjola Building: Reconciling Contradictions in Finnish Architecture," in *Nationalism and Architecture*, edited by Raymond Quek and Darren Deane, with Sarah Butler (Farnham: Ashgate, 2012), 135–46: from the same volume see: Victor Edman, "How National is a National Canon? Questions of Heritage Construction in Swedish Architecture," 233–44. On the role of traditions in Finnish national architecture, see: Ritva Tuomi, "On the Search for a National Style," *Abacus* 1 (Helsinki: Museum of Finnish Architecture, 1979), 57–96; Malcolm Quantrill, *Finnish Architecture and the Modernist Tradition* (London: E. & F.N. Spon, 1995), 1–27; see also the essay by Charlotte Ashby, "Fennomane Building: A Finnish National Style in Commercial Architecture? A Discussion With Particular Reference to the Designs of Vilho Penttilä and Onni Törnqvist," in *Nation, Style,*

realization of nationalistic meanings through its built heritage: historicists villas with a simplified classical language were built next to neogothic cathedrals, and traditionalist projects emerged beside the first experiments with functionalist design.[4] The connecting element among all architectural outcomes which populated the Icelandic towns and the countryside was the use of concrete, the importance of which is worth highlighting not only as the most widely available building material, but also as the target of technical experiments and a conveyor of cultural meanings. In order to retrace the technological developments and the pivotal significance of concrete within Icelandic architecture before the Second World War, this chapter will mainly focus on the career of Guðjón Samúelsson, State architect between 1919 and 1950, and one of the most influential actors in Icelandic architectural history. The choice of presenting Guðjón Samúelsson's career as the chief case study derives from his importance in the role of Iceland's leading professional. This choice is also justified by the multi-faceted and experimental ways in which he adopted concrete both for structures and ornament.

It is however important to remember that Guðjón Samúelsson was not the only practicing architect in the decades before independence: in addition to a great number of mastermasons very active as designers and builders, he was also surrounded by colleagues who by the 1930s became interested in the emerging *Neues Bauen* and acted as vehicles of the Modern Movement in Iceland. However, the Icelandic reception of functionalism will not be tackled by this dissertation.[5] As a matter of fact, the use of concrete was much more experimental throughout the eclectic career of Guðjón Samúelsson, compared to the contemporary functionalist projects of his peers such as Sigurður Guðmundsson[6] and Þorleifur Eyjólfsson (1896–1968).[7] Their architecture, and in particular that of Sigurður Guðmundsson's, was not exempt from the all-pervading use of concrete, to the extent that this characteristic was even noticed and appreciated by Philip Morton Shand in a series of articles published on

Modernism. CIHA Conference Papers, edited by Jacek Purchla and Wolf Tegethoff (Cracow/Munich, 2006), 107–23.

[4] Similar contrasts can be found in many European urban contexts at the beginning of the century. On the differences and contrasts between functionalism and what has been broadly defined as "traditionalism", see the volume by Pigafetta, Abbondandolo, and Trisciuoglio, *Architettura tradizionalista. Architetti, opere, teorie*.

[5] The reception and development of functionalism in Iceland was thoroughly presented by Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 175–236 and 265–311. See also the brief essay by Hörður Ágústsson on Icelandic functionalism in the volume *Nordisk Funktionalism*, edited by Gunilla Lundahl (Stockholm: Arkitektur Forlag AB, 1980), 76–79; Pétur H. Ármannsson, "Social Aspects and Modern Architecture in Iceland," in *Modern Movement Scandinavia: Vision and Reality*, edited by Ola Wedebrunn (Copenhagen: Fonden til udgivelse af arkitekturtidskrift, 1998): 99–105.

[6] On Sigurður Guðmundsson's career, see: Pétur H. Ármannsson, ed. *Sigurður Guðmundsson Arkitekt*; Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts,* 175–95 and 230–31. Trained at the Royal Danish Academy of Fine Arts in Copenhagen, Sigurður Guðmundsson had to adapt to concrete construction; he claimed that, while studying in Denmark, he had never had the chance to learn about concrete. Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 181 (note 21).

[7] On Þorleifur Eyjólfsson, see: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 196–99.

The Concrete Way journal. Furthermore, a concrete villa by Sigurður Guðmundsson was included in the third edition of *Gli elementi dell'architettura funzionale* by Italian architect Alberto Sartoris (1901–98).[8] Setting the reception of functionalism aside, this chapter will instead focus on the eclectic and experimental ways in which concrete – reinforced and unreinforced, cast or prefabricated, structural or decorative – was used for the construction of a national architectural language, which left many examples still visible today, and yet lost its energy soon after the end of the war and the establishment of the Icelandic Republic.

4.1.1 Concrete classicism

As seen at the end of chapter two, the 1915 great fire of Reykjavík gave a new direction to the building traditions of the town and all Icelandic settlements. Until then, concrete had been rarely used for urban residences or commercial buildings: most recent houses had timber structures, built according to the guidelines of the 1903 building code.[9] However, the decade-long efforts of Iceland's first engineers to promote the use of concrete and the import of cement had already had its architectural consequences, such as the sanatorium in Vífilsstaðir and the growing number of concrete farms in the countryside. This process soon took over timber structures in the city as well. In 1912 there were only 19 concrete houses in Reykjavík; after the fire of 1915 all new houses of the capital were either built or rebuilt in concrete.[10]

Since the early 1910s a new architecture was to be seen in the expanding suburbs of the capital, later known as "concrete classicism" – a term first coined by architectural historian and artist Hörður Ágústsson.[11] Concrete classicism was not the product of a single architect nor a well-established trend, rather it was a common

---

[8] Philip Morton Shand, "Concrete's Furthest North," *The Concrete Way*, incorporating *The Road Maker* 7, no. 6 (May/June 1935): 330–35. Other concrete projects by Sigurður Guðmundsson are in: Sigurður Guðmundsson, "Three New Concrete Buildings in Iceland," in "In Concrete. Third Series–XXVI," *The Concrete Way*, incorporating *The Road Maker* 9, no. 2 (September/October 1936): 100–3. See also: "A Concrete Sheepfold at Réttir, Iceland", in "In Concrete. Third Series–XX," *The Concrete Way*, incorporating *The Road Maker* 8, no. 2 (September/October 1935): 98. Shand might have been the reason behind the presence of Sigurður Guðmundsson's villa for Haukur Thors (1930–31) in the third edition of *Gli elementi dell'architettura funzionale* by Alberto Sartoris (1941). Ten photographs of Icelandic buildings are held at Sartoris' archive and were annotated by Shand himself. See: Antoine Baudin, ed., *Photography, Modern Architecture and Design. The Alberto Sartoris Collection. Objects from the Vitra Design Museum* (Lausanne: EPFL Press, 2005), 84. On Sartoris and the publication of his renowned book, see the recent volume: Cinzia Gavello, *Alberto Sartoris attraverso "Gli elementi dell'architettura funzionale". Genesi e fortuna critica di un libro* (Milano: FrancoAngeli, 2020).

[9] As an example, see the timber house in Grettisgata 26, built in 1904 a few months after the publication of the town's first building code. Hrefna Róbertsdóttir, *Gamli austurbærinn. Timburhúsabyggð í norðanverður Skólavörðuholti frá byrjun 20. aldar* (Reykjavík: Árbæjarsafn, 1989), 21. In 1912, there were 19 concrete and 963 timber buildings in Reykjavík. Guðmundur Hannesson, *Um skipulag bæja*, 13.

[10] See the table in: Guðmundur Hannesson, *Um skipulag bæja*, 13. See also: Guðný Gerður Gunnarsdóttir, and Hjörleifur Stefánsson, *Kvosin*, 295.

[11] *Steinsteypuklassík.* Hörður Ágústsson, *Íslensk byggingararfleið I,* 322. See also: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts,* 82–85.

approach shared by the first Icelandic architects who were looking for a suitable architecture to represent the wealthiest families and trading companies in town. Merging eclectic decorations, Danish neo-baroque historicism and a distorted classical language, the outcomes of "concrete classicism" were very popular until the establishment of functionalism in the early 1930s, and still today characterize some residential neighborhoods in Reykjavík. However, it is important to underline that Icelandic "concrete classicism" owes its nature to Danish historicist and eclectic architecture, built in concrete for practical reasons, and therefore it had nothing to do either with what is defined as Nordic classicism, nor with the rigorous search of a concrete classical architecture by a reinforced concrete enthusiast such as Auguste Perret (1874–1954).[12] **Figg. 1a–1d.**

The stylistic peculiarity of Icelandic concrete classicism has already been analyzed elsewhere, yet for the purpose of this research one key aspect is worth highlighting.[13] The first generation of trained Icelandic architects followed the suggestions of their engineering colleagues, and adopted concrete as their preferred building technology while giving shape to the demands of the increasing number of urban dwellers.[14] From a structural point of view, concrete was used in the same way as in the rural areas – in single or double walls, rarely and lightly reinforced, at times with cast concrete stones.[15] More interestingly, however, was the rather sophisticated

[12] On Nordic classicism, see: Simo Paavilainen, *Nordisk klassicism 1910–1930* (Helsinki: Finlands Arkitekturmuseum, 1982); John Stewart, *Nordic Classicism: Scandinavian Architecture 1910–30* (London: Bloomsbury, 2018); Harry Charrington, "Nordic Visions of a Classical World," in *The Routledge Handbook on the Reception of Classical Architecture,* edited by Nicholas Temple, Andrzej Piotrowski, and Juan Manuel Heredia (Abingdon: Routledge, 2020), 356–69. On neo-classicism in Denmark, see: Faber, *A History of Danish Architecture,* 150–64; Lisbet Balslev Jørgensen, "Classicism and the Functional Tradition in Denmark," in *Nordisk klassicism*, 51–78. On Auguste Perret and his classicist concrete construction, see: Collins, *The Vision of a New Architecture*, 194–223; Karla Britton, "The Poetic Economy of the Frame: The Critical Stance of Auguste Perret," *Journal of Architectural Education* 54, no. 3 (February 2001), 176–84; Roberto Gargiani, "Il classicismo modernista nell'architettura del *Musée des Travaux Publics* di Auguste Perret," in *Classicismo, classicismi*, edited by Giorgio Ciucci (Milano: Electa, 1995), 56–67.

[13] Icelandic "concrete classicism" was largely influenced by Danish neo-baroque historicism, such as the projects by Ulrik Plesner (1861–1933), Carl Brummer (1864–1953), and Andreas Clemmensen (1852–1928). Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 91–94; Hörður Ágústsson, *Íslensk byggingararfleifð I*, 319–22 and 355–64. On Danish historicist and eclectic architecture in the second half of the nineteenth century see: Faber, *A History of Danish Architecture*, 120–37; on Danish early twentieth-century neo-baroque see: Knud Millech, *Danske Arkitekturstrømninger* (Aarhuus: Aarhuus Stiftsbogtrykkerie, 1977), 253–84. See also some of the residential projects by P.V. Jensen-Klint, part of the larger *Bedre Byggeskik* movement already discussed in chapter three: Jensen, *P.V. Jensen-Klint*, 126–65.

[14] With the exception of Rögnvaldur Ólafsson, in the first two decades of the twentieth century the most active Icelandic professionals were Einar Erlendsson, Finnur Thorlacius, and Jens Eyjólfsson (1879–1959). In particular, Einar Erlendsson was a very prolific designer and one of the main promoters of "concrete classicism". Trained at *Det Tekniske Selskabs Skole* in Copenhagen, he was the assistant to Rögnvaldur Ólafsson between 1905 and 1917, and later became assistant to Guðjón Samúelsson. See: Sigríður Björk Jónsdóttir, *Einar Erlendsson og reykvísk steinsteypuklassík* (Dissertation in History, University of Iceland, 1995); Sigríður Björk Jónsóttir, "Íslensk steinsteypuklassík í verkum Einars Erlendssonar," *Lesbók Morgunblaðsins* (26 September 1998): 10–12.

[15] Hörður Ágústsson, *Íslensk byggingararfleifð I*, 325–26.

Fig. 1a – Rögnvaldur Ólafsson, House in Skólabrú 2, Reykjavík, 1912. Photo by Sofia Nannini, 2019.

Fig. 1b – Guðjón Samúelsson, House for Gísli Johnsen in Túngata 18, Reykjavík, 1922. Photo by Sofia Nannini, 2019.

Fig. 1c – Guðjón Samúelsson, House for Helgi Bergs in Skólavörðurstígur 30, Reykjavík, 1923.
Photo by Sofia Nannini, 2019.

Fig. 1d – Einar Erlendsson, House in Þingholtsstræti 29b, former City Library, Reykjavík, 1916.
Photo by Sofia Nannini, 2019.

application of cement plaster for decoration and details, such as simplified classical orders, cornices and crenellations: the plasticity of concrete made it easier for architects and masons to produce architectural details at a higher speed and lower prices.[16] One major example of "concrete classicism" is Einar Erlendsson's *Gamla Bíó*, the movie theatre built in downtown Reykjavík in 1925–26. The structure is in cast concrete, yet the overall balance of the façade, with a tripartite rusticated entrance and a massive pediment resting on four, simplified Composite lesenes, bears strong resemblance to eminent neoclassical models of urban theaters, stemming from the Milanese *Teatro La Scala*.[17] **Figg. 2a–2c.**

The results of "concrete classicism" could be considered an outcome of architectural eclecticism, yet they represented a testing ground for Icelandic builders on the artistic and decorative uses of concrete. If Reykjavík had to be a concrete city, at least its residences and commercial headquarters could elegantly represent the inhabitants' growing wealth, all by using local materials and importing only cement. Concrete classicism firmly established the concrete age in Reykjavík, and it made way for further uses of the material as a means of reproduction of a mythical medieval past, or translation of vernacular architecture and natural landscape.

4.1.2 Reinforced concrete in Iceland: A slow development

Before discussing Guðjón Samúelsson's concrete architecture, it is important to briefly summarize the development of reinforced concrete in Iceland since the early use of the Hennebique patent seen in chapter two. After the first experiments, reinforced concrete slabs and staircases were soon quite widespread in the country. In 1914 the first publication by the Icelandic Engineers' Society included the advertisement of a building company specialized in reinforced concrete, considered as "the oldest" in the country.[18] Guðmundur Hannesson's booklet on concrete (1921) shows several examples of concrete reinforcement, such as slabs, stairs, window frames, and even reinforced concrete fence posts.[19] However, reinforcement bars in vertical structures only appeared in the late 1920s: according to Guðmundur Hannesson, the first application of reinforcement bars in vertical walls occurred in a house built under the supervision of architect Sigurður Guðmundsson in 1927.[20] Although it was not the case of a reinforced concrete frame, thanks to the introduction

[16] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 84. On concrete as a plastic medium see: Amy Slaton, *Reinforced Concrete and the Modernization of American Building,* 71–73; on concrete as a moulded material, opposed to carved stone: Forty, *Concrete and Culture*, 83; on early twentieth-century praise of concrete plasticity, see: Collins, *The Vision of a New Architecture*, 146–49.

[17] *La Scala* was designed in 1776–78 by Giuseppe Piermarini (1734–1808). I would like to thank prof. Mario Bevilacqua for suggesting this comparison. On Einar Erlendsson's *Gamla bíó* see: Hörður Ágústsson, *Íslensk byggingararfleifð I,* 333 and 344.

[18] "Landsins elsta og stærsta járnsteypa." "Hlutafélagið Járnsteypa Reykjavíkur," *Ársrit Verkfræðingafélags Íslands 1912/1913* 1 (1914).

[19] Guðmundur Hannesson, *Steinsteypa*, 79–83, 84–87, 87–89.

[20] The house belonged to Kjartan Thors (1890–1971), son of Thor Jensen. Guðmundur Hannesson, *Húsagerð á Íslandi*, 258.

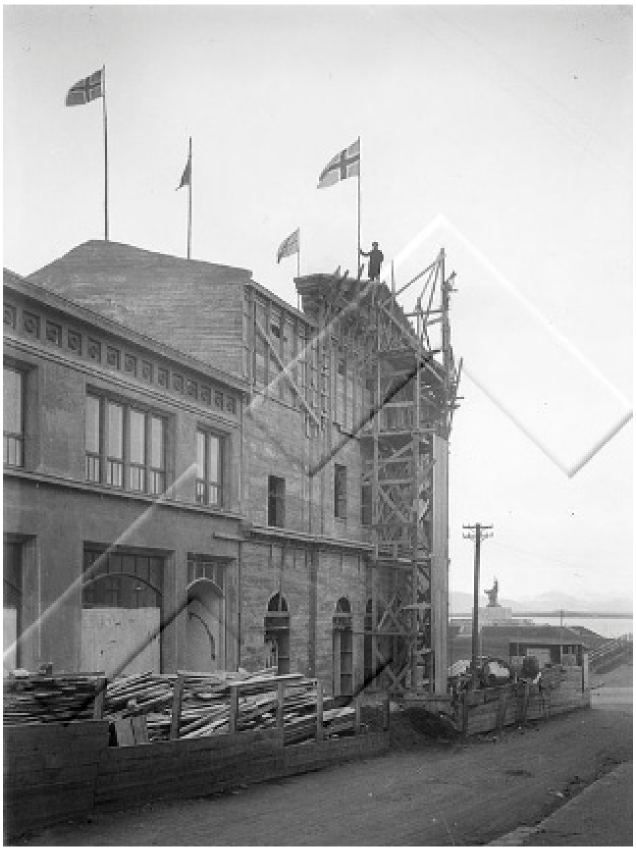


Fig. 2a – Einar Erlendsson, Gamla bíó theatre in construction. Reykjavík, 1925–26. Ljósmyndasafn Reykjavíkur/Reykjavík Museum of Photography.

Fig. 2b – Gamla bíó, Reykjavík. Hörður Ágústsson, *Íslenzk byggingararfleifð I*, 340.

Fig. 2c – Einar Erlendsson, Gamla bíó theatre in Ingólfsstræti, Reykjavík, 1926. Photo by Sofia Nannini, 2019.

of reinforcement bars concrete walls could be much thinner – between 15 and 20cm – and more resistant to earthquakes. Between 1932 and 1933, engineer Jón Þórlaksson wrote a series of four articles for the journal of the Engineers' Society, dealing with concrete construction with a very scientific approach. However, reinforcement was rarely mentioned, and mainly only related to horizontal slabs.[21] Furthermore, as was the case with many construction details, reinforcement bars were rarely included in the architectural drawings, thus it is difficult to estimate the spread of such technology in the years before the Second World War.

The almost complete absence of reinforced concrete frame structures caused some criticism in the local press in the 1930s. Icelandic engineer Jón Gunnarsson (1900–73), who graduated from the Massachussets Institute of Technology in 1931 and thus became the first Icelandic engineer ever to be trained at an American institution, strongly criticized the way the structural works had been carried out during the construction of the National Theatre. In fact, the vertical structure – completed by 1933 – was not built with a reinforced concrete frame, but with massive, unreinforced, 70 centimeter thick concrete walls. Only the horizontal structures were reinforced.[22] Jón Gunnarsson blamed it on the fact that Icelandic concrete buildings were being treated as if they had been made out of turf, therefore in need of massive vertical structures.[23] Jón Gunnarsson spent his first years as a practicing engineer in Reykjavík offering advice on reinforced concrete and writing many articles on the topic. **Fig. 3.** The most notable example of a reinforced concrete frame structure built before the war was Sigurður Guðmundsson's imposing harbour warehouse in Reykjavík, built between 1933 and 1939. Named "the Harbour House", it was one of the few buildings where the whole load was carried by giant octagonal and mushroom-like pillars, proudly described by the architect in the pages of *The Concrete Way* journal. When built, it was one of the biggest structures in Reykjavík, and it was based on contemporary Finnish industrial projects.[24] **Figg. 4a–4c.**

[21] Jón Þórlaksson, "Steinsteypa til íbúðarhúsagerðar I," *Tímarit Verkfræðingafélags Íslands* 17, no. 4 (1932): 34–45. See also the following articles in: *Tímarit Verkfræðingafélags Íslands* 17, no. 5 (1932): 49–53; 18, no. 1 (1933): 12–14; 18, no. 3 (1933): 32.

[22] See the drawings signed by engineer Steinn Steinsen (1891–1981) in: ÞÍ, *Húsameistari ríkisins. Bréfa- og teikningasafn*, Mappa 2, Geymsla 7. Örk 410, drawings of horizontal reinforced concrete structures (1930–33). Reinforced concrete pillars are present only in the foundations.

[23] Jón Gunnarsson, "Veggir steinhúsa," *Alþýðublaðið* 3, no. 193 (21 August 1931): 3–4. Jakob F. Ásgeirsson, *Jón Gunnarsson*, 67–69. See also: Jón Gunnarsson, "Blöndun steinsteypu og meðferð hennar," *Eimreiðin* 37, no. 3 (1931): 255–64.

[24] *Hafnarhúsið.* See: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 304–05. Sigurður Guðmundsson, "Three New Concrete Buildings in Iceland," 102.

Járnbent steinsteypa.

Tek að mjer að gera alla útreikninga á steinhúsum t. d. **járn í gólf, burðarveggi, Frame- og Flat slab construction.**

Einnig tek jeg að mjer útreikning á húsum til að gera þau **traust** gegn **jarðskjálftum.**

Jón Gunnarsson, verkfræðingur.
Grundarstíg 11. Sími 144.

Fig. 3 – Advertisement by engineer Jón Gunnarsson regarding reinforced concrete structures.
Jón Gunnarsson offered drawings of reinforced concrete frame structures, with reinforced concrete slabs and earthquake-proof. “Járbent steinsteypa,” *Morgunblaðið* 19, no. 108 (13 May 1932): 1.

Fig. 4a – Sigurður Guðmundsson, “The Harbour House,” Tryggvagata 17, Reykjavík, 1933–39.
Today the building hosts the Reykjavík Art Museum [Listasafn Reykjavíkur]. Photo by Sofia Nannini, 2019.

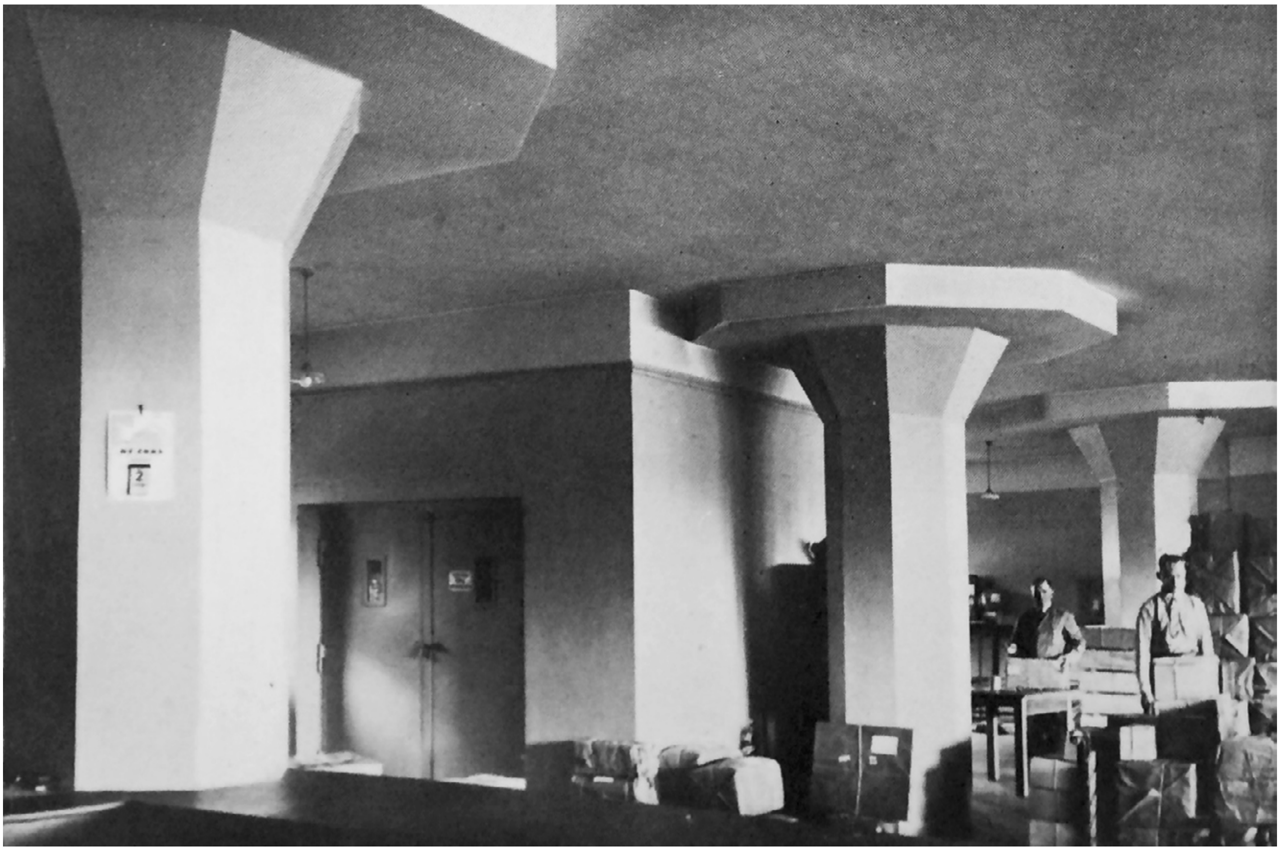


Fig.4b – Concrete pillars of the warehouse. Sigurður Guðmundsson, “Three New Concrete Buildings in Iceland,” 102.

Fig. 4c – The concrete pillars today. The material is damaged and one can often see the presence of very coarse aggregates within the concrete mix. Photo by Sofia Nannini, 2019.

4.2 Eclectic Concrete by State Architect Guðjón Samúelsson (1915–50)

Guðjón Samúelsson was the single most influential protagonist of the Icelandic architectural scene throughout the first half of the twentieth century. His vast influence was made possible thanks to his position as State architect of the kingdom of Iceland, with which he was entrusted in April 1920, more than one year after the ratification of the Act of Union with Denmark in December 1918. Even before that, he had already worked on a few projects in Reykjavík during a pause from his studies at the Royal Danish Academy of Fine Arts in Copenhagen. Active through the declaration of independence and until 1950, the year of this death, Guðjón Samúelsson relentlessy worked on hundreds of public projects of various kinds – housing, churches, hospitals, schools, public buildings – helped by dozens of assistants. Some of these buildings still define the skyline of towns like Reykjavík or Akureyri, and of other historical landmarks such as Reykholt and Þingvellir.[25] Although he was a key figure for Icelandic history and culture, his *oeuvre* was largely criticized in the decades after his death and only in 2020 a thorough monograph was published on his education and career.[26] **Fig. 5.**

Guðjón Samúelsson was in charge of most public buildings erected between the late 1910s and the late 1940s. His approach to architecture was manifold, at the same time experimental and pragmatic. The position as State architect invested his task with political meanings, as he was entrusted with the search for an architecture which could represent Iceland as a social and political entity with cultural characteristics distinct from Denmark. While his first projects were strongly influenced by Danish and Scandinavian national-romantic architecture – in particular by figures such as his professor Martin Nyrop (1849–1921) and Finnish architect Eliel Saarinen (1873–1950) – Guðjón Samúelsson later experimented with neo-vernacular projects, until he settled on his most renowned signature: the sculptural "basaltic" style.[27]

Despite the variety of languages adopted by the State architect throughout the decades, one common thread unites all his projects built around the country: not surprisingly for the events that have been discussed so far, that common thread was concrete. Concrete became the State architect's only means of expression for the creation of Icelandic civic and religious architecture. Most likely he had not learned about concrete construction during his academic education, yet as soon as he came

[25] Reykholt was one of the most important Icelandic settlements during the Middle Ages. In particular it was the residence of famous historian and poet Snorri Sturluson. Today Reykholt hosts the *Snorrastofa*, a research center on Medieval studies. On the history of Reykholt see: Geir Waage, *Reykholt: sagan* (Reykholt: Snorrastofa, 1996).

[26] Pétur H. Ármannsson, *Guðjón Samúelsson húsameistari*. On the State architect's early life and education, see the pages 15–86; on Guðjón Samúelsson's legacy, see the pages: 363–68.

[27] On the different phases in Guðjón Samúelsson's career and the influence of his teacher Martin Nyrop, see: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 107–09.

back to Iceland he inserted himself in the professional world of engineers discussed in chapter two. In line with his predecessor Rögnvaldur Ólafsson, Guðjón Samúelsson immediately became a member of the Engineers' Society of Iceland, used their journal as a preferred stage for his publications, and collaborated shoulder to shoulder with his engineering colleagues in the years to come.[28] His interest in technical matters also emerged from his readings: he enthusiastically reviewed, for example, Guðmundur Hannesson's booklet on concrete construction, published in 1921.[29]

Guðjón Samúelsson's earliest Icelandic projects were carried out while he was taking a break from his studies in architecture.[30] He happened to be in Reykjavík after the fire had destroyed most of the city center, and he was given the chance to design the first structure to emerge from the deserted plots of land near the house of parliament. His project for the Nathan & Olsen office building (1916–17) did bear strong resemblance to some notable Finnish examples, such as the Pohjola Insurance or the Telephone Company buildings in Helsinki,[31] and also to some Jugendstil projects recently built in Ålesund, Norway, after the fire in 1904.[32] However, by choosing to cover the concrete structure with a basic cement plaster Guðjón Samúelsson entirely avoided the debate which most characterized the Finnish and Norwegian models – that is the use of local, natural stone to clad the façades of civic buildings, which imbued them with meanings of national identity.[33] On the contrary, he sought help from the increasingly local knowledge on concrete, so that the construction was overseen by Icelandic mastermasons.[34] Like many of Guðjón Samúelsson's projects throughout the decades, its dimensions and height were

[28] Guðjón Samúelsson published many articles in the Engineers' journal. See for example: Guðjón Samúelsson, "Íslensk húsagerð og skipulag bæja," *Tímarit Verkfræðingafélags Íslands* 15, no. 1 (1930): 1–8; Guðjón Samúelsson, "Íslenzk byggingarlist. Nokkrar opinberar byggingar á árunum 1916–1934," *Tímarit verkfræðingafélags Íslands* 6, no. 18 (1933): 53–82.

[29] Guðjón Samúelsson, "Steinsteypa," *Morgunblaðið* 10, no. 131 (10 April 1923): 4.

[30] When Rögnvaldur Ólafsson died in 1917, Guðjón Samúelsson was invited by Prime Minister Jón Magnússon (1859–1926) to finish his studies, in order to be able to accept the position of State architect. Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 109.

[31] The Pohjola Insurance Building was designed and built by Herman Gesellius (1874–1916), Armas Lindgren (1874–1929) and Eliel Saarinen in 1899–1901; the headquarters of the Telephone Company in Helsinki were instead a project by Lars Sonck (1870–1956), built in 1904–05. For the comparison between these Finnish projects and Guðjón Samúelsson's office building, see: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 113. On the project for the Pohjola building, see: Fabienne Chevallier, *L'œuvre d'Eliel Saarinen en Finlande et la question de l'architecture nationale de 1898 à 1909* (Paris: Publicatios de la Sorbonne, 2001), 141–52. On Gesellius, Lindgren and Saarinen, see also: Quantrill, *Finnish Architecture and the Modern Tradition*, 6–12 and the comprehensive work by Markku Komonen, *Saarinen Suomessa* (Helsinki: Museum of Finnish Architecture, 1984).

[32] See, for example, the *Svane Apoteket* by architect Hagbarth Schytte-Berg (1860–1944), built in 1905–07, or the building in Notenesgate 9 by architect Karl Norum (1852–1911), built in 1906–07.

[33] On the aforementioned Finnish and Norwegian examples and their place in the national-romantic debate concerning the use of natural stone, see: Ringbom, *Stone, Style and Truth*, 159–64 and 169–81.

[34] The mastermasons in charge of the construction were Jens Eyjólfsson and Kristin Sigurðsson (1881–1944). See: Atli Magnus Seelow, "Verslunarhús Nathan & Olsen við Austurstræti. Hornsteinn Guðjóns Samúelssonar að nýjum miðbæ Reykjavíkur," *Saga. Tímarit Sögufélags* 50, no. 1 (2012): 9–21.

Fig. 5– Guðjón Samúelsson at a young age. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 6a – Guðjón Samúelsson, Nathan & Olsen Office Building, Reykjavík, 1916–17. Þjóðminjasafn Íslands/National Museum of Iceland.

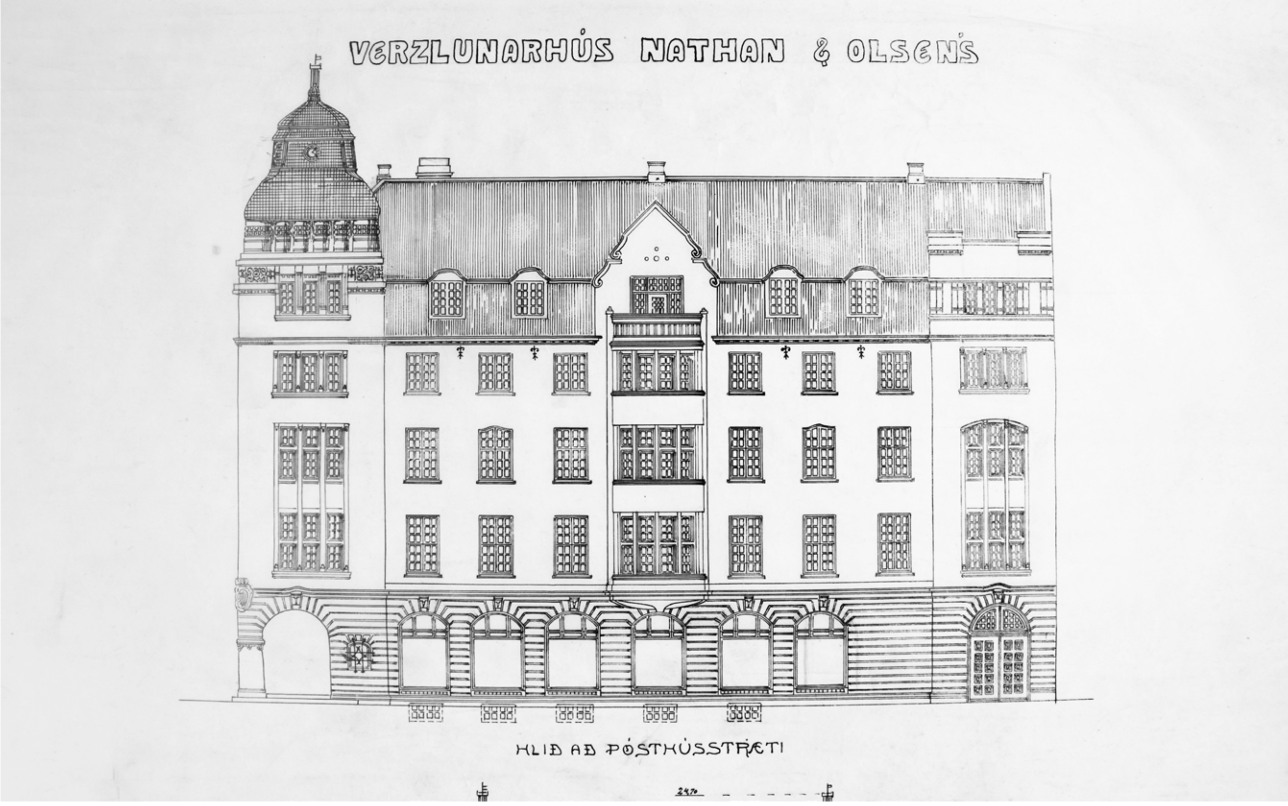


Fig. 6b – Guðjón Samúelsson, Nathan & Olsen Office Building, elevation, 1917. Þjóðskjalasafn Íslands, Húsameistari ríkisins. Teikningasafn, C/276.

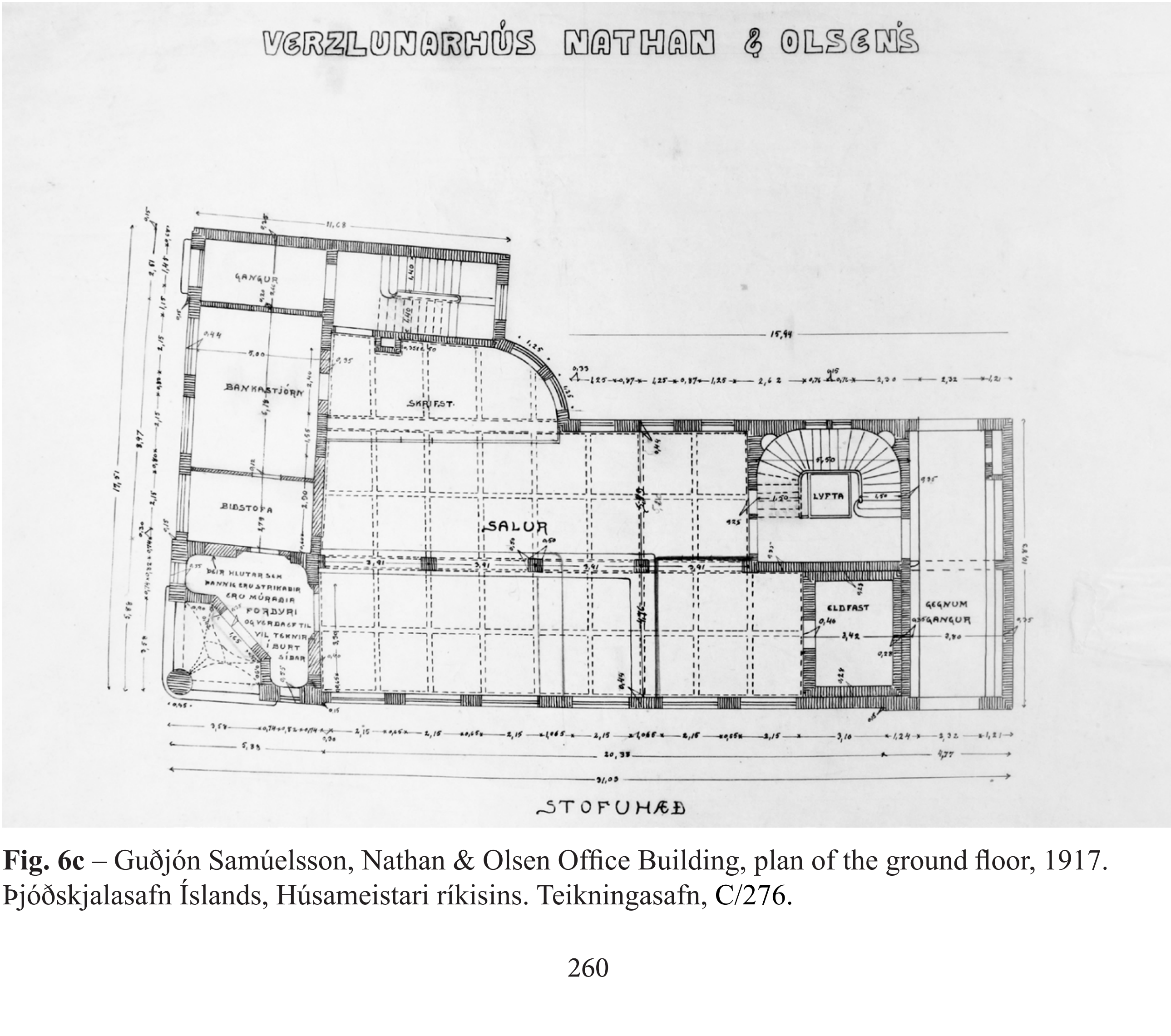


Fig. 6c – Guðjón Samúelsson, Nathan & Olsen Office Building, plan of the ground floor, 1917. Þjóðskjalasafn Íslands, Húsameistari ríkisins. Teikningasafn, C/276.

particularly majestic if compared to local standards. As it can be seen from Guðjón Samúelsson's drawings, most of the structure was made of cast concrete walls: only the underground and ground levels show a combination between a concrete frame and cast walls.[35] **Figg. 6a–6c.**

In 1915–16 Guðjón Samúelsson had also worked on a very peculiar design: the project for the museum and studio of sculptor and painter Einar Jónsson (1874–1954).[36] In his draft, Guðjón Samúelsson envisaged the building as a small yet massive concrete construction; its similarities to Eliel Saarinen's monumental proposal for the Finnish house of parliament have already been highlighted by the historiography.[37] Guðjón Samúelsson's design was later revisited and enlarged by master builder and architect Einar Erlendsson. Furthermore, Einar Jónsson's participation in the design enhanced the building's sculptural outlook, to the point that its final version had many of the plastic qualities already present in the sculptor's handmade clay model. **Figg. 7a–7c.** Located on top of Skólavörðurholt hill in Reykjavík, the museum was inaugurated in June 1923 and soon it was compared to "a sort of basaltic pipe organ in a weird future church".[38] Its heavy presence overlooking the whole town from a rocky hill could not be ignored, and it was a starting point for many future works of the State architect. For the first time in Icelandic architectural history, the sculptural qualities of concrete were made evident, and they were employed to create an architectural monumentality which could be compared with the experiments of German *Zyklopenstil* architecture.[39] Instead of being clad with coarse ashlars and stone slabs, Icelandic monumental architecture matched with a pervading use of concrete. The medium's plasticity even transformed ordinary architectural elements into giant sculptures, such as the spiral staircase towards the rear courtyard. The plastic features of the material made the building similar to a piece of Icelandic landscape, the result of which was completely different from any other architecture present on the island.[40] **Figg. 8a–8c.**

---

[35] The original drawings are in: ÞÍ, *Húsameistari ríkisins. Teikningasafn,* C/276.

[36] On Einar Jónsson's life and career see the recent volume by Ólafur Kvaran, *Einar Jónsson myndhöggvari* (Reykjavík: Hið íslenska bókmenntafélag, 2018).

[37] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 110–11. Saarinen's sway on Guðjón Samúelsson is indisputable: some sketches found in the State architect's books highlight this influence. Guðjón Samúelsson used to copy some projects by Saarinen published in the German journal *Moderne Bauformen*, available in Copenhagen during his study years. Pétur H. Ármannsson, *Guðjón Samúelsson húsameistari*, 40–42; 46–49.

[38] "... eins og stuðlabergs-orgel í einhverja furðulega framtíðarkirkju." Guðmundur Finnbogason, "Listasafn Einars Jónssonar opnað í dag," *Morgunblaðið* 10, no. 1932 (24 June 1923): 2.

[39] On German *Zyklopenstil*, see: Wolfgang Pehnt, *Die Architektur des Expressionismus* (Stuttgart: Verlag Gerd Hatje, 1998), 72–79.

[40] Seelow also underscored the key influence of Eliel Saarinen's monumental works between 1908 and 1927, based on the intersection between "natural forms and the man-made forms". See: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 110. On Saarinen's Parliament building for Finnland and its mountain-like qualities, see: Kurt. W. Forster, "Berg und Tal in Bauten der Neuzeit," in *Felsengärten, Gartengrotten, Kunstberge. Motive der Natur in Architektur und Garten*, 48–49. On the construction of the Einar Jónsson museum, see also: Ólafur Kvaran, *Einar Jónsson myndhöggvari*, 180–83 and 189–91.

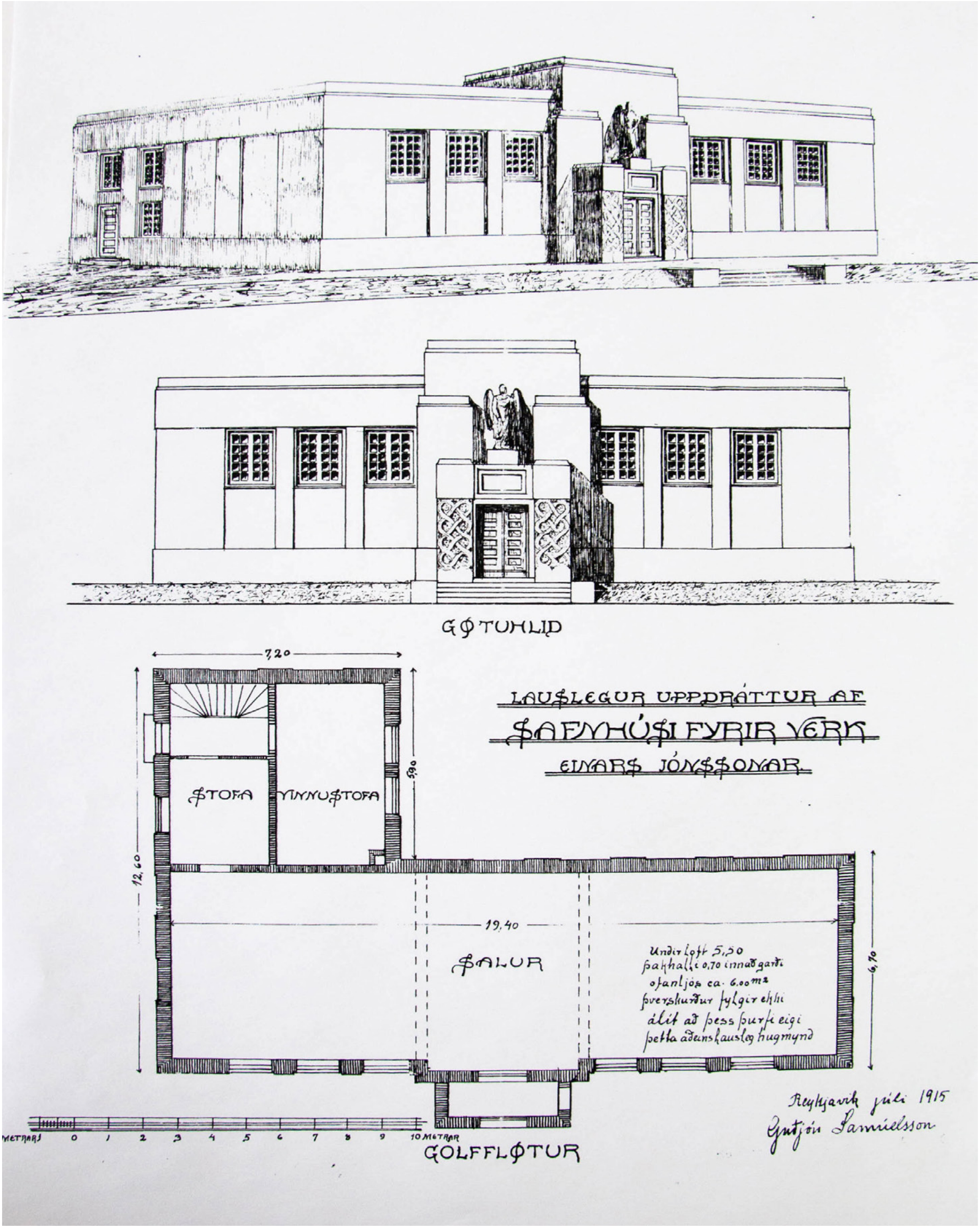


Fig. 7a – Guðjón Samúelsson, Project for Einar Jónsson's museum and studio, 1915. Þjóðskjalasafn Íslands, Húsameistari ríkisins. Teikningasafn, Safn A(D), Flokkur 44.

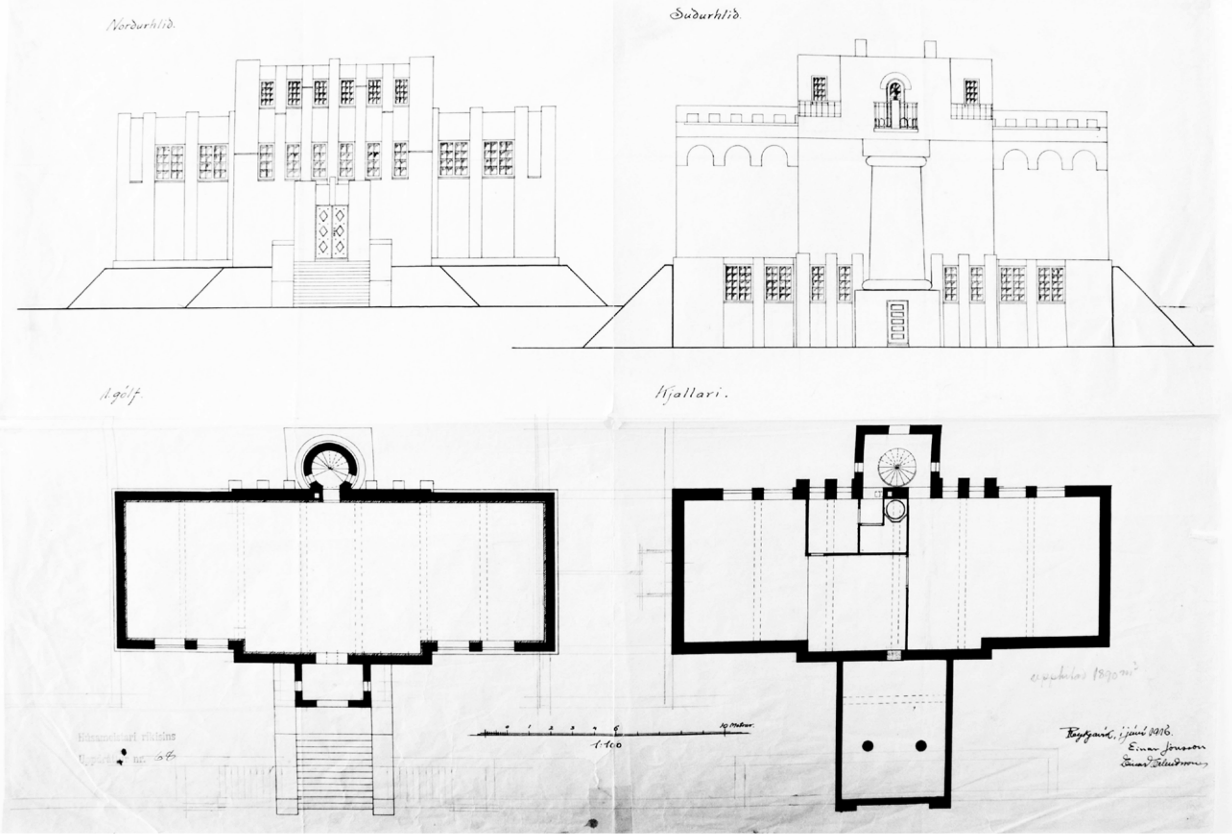


Fig. 7b – Einar Erlendsson, Einar Jónsson, Project for Einar Jónsson's museum and studio, 1916. Þjóðskjalasafn Íslands, Húsameistari ríkisins. Teikningasafn, Safn A(D), Flokkur 44.

Fig. 7c – Einar Jónsson, Model for his museum and studio, ca. 1915–16. Einar Jónsson Museum, Reykjavík. Photo by Sofia Nannini, 2019.

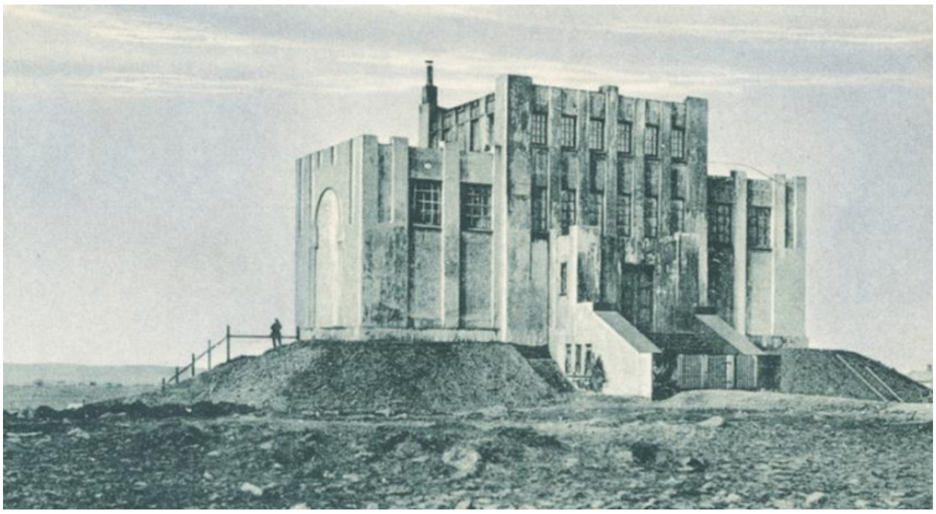


Fig. 8a – Einar Erlendsson, Einar Jónsson, Einar Jónsson's museum and studio, Reykjavík. 1916–23. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 8b – Einar Erlendsson, Einar Jónsson, Einar Jónsson's museum and studio, Reykjavík. 1916–23. Photo by Sofia Nannini, 2019.

Fig. 8c – Wilhelm Kreis, Museum für Vorgeschichte. Halle, 1913–14. Pehnt, *Die Architektur des Expressionismus*, 75.

4.2.1 Traditional architecture in concrete

The third chapter presented the essay *Icelandic Architecture* by Alfred Råvad (1918) as one of the publications through which the debate about Icelandic rural construction emerged. Although the essay was published at the end of the Scandinavian national romantic era, it promoted a late interest for a translation of Icelandic vernacular architecture into concrete.[41] Referred to as "the turf house revival" by Seelow, it comprised several experiments on residential, rural, and public buildings by different architects throughout the 1920s.[42] Guðjón Samúelsson and other professionals engaged in experiments that aimed at translating the shapes of the traditional farm into modern materials, thus implementing Råvad's national romanticism into an architecture of concrete.[43]

The reasons behind these experiments can be related to a number of different factors. The growing political importance of politician Jónas Jónsson addressed the debate towards what he defined as the Icelandic "farmhouse style".[44] Not only did he endorse and promote the rural policies of the Progressive Party (see chapter three), but he was also one of the most prominent supporters of Guðjón Samúelsson's search for a national architectural language.[45] The search for national meanings within architecture might have been one of the causes for such interest: different from historicist elements deriving from a far-away classical culture, traditionalist architecture was in fact much more linked to the social and cultural history of rural Iceland, and therefore better suited for its built image. On the other hand, the emergence of a traditionalist debate in Iceland in the early 1920s was not an isolated phenomenon within the European architectural scene. On the contrary, the Icelandic

[41] "By the 1920s the 'dream of the North' had lost most of its coherence as a theory of history or as a guide to national identity. But it was a powerful ideal for a long time." Lane, *National Romanticism and Modern Architecture*, 22.

[42] "Die Wiederbelebung des Torfhauses." Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 119.

[43] Even before the publication by Råvad, it is important to underline that Rögnvaldur Ólafsson had already drafted a project for the headquarters of the newly founded University of Iceland as early as 1913, to be located on the central hill of Arnarhóll and shaped as a giant gabled farmhouse. The project was soon discarded. See: Hörður Ágústsson, *Íslensk byggingararfleið I*, 335; Anna Dröfn Ágústsdóttir, and Guðni Valberg, *Reykjavík sem ekki varð*, 40–42.

[44] *Sveitabæjastíll*, as in: Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging*, 36–43. Many projects for concrete farmhouses boasting the shapes of traditional turf farms could be found in the pages of Jónas Jónsson's *Samvinnan* journal. See the drawing by architect Guðjón Samúelsson, in: Jónas Jónsson, "Byggingar II," *Samvinnan* 19, no. 2 (June 1926): 152–53; one by mastermason Finnur Thorlacius, in: Jónas Jónsson, "Byggingar III," *Samvinnan* 19, no. 3 (September 1926): 250; and one by painter Ásgrímur Jónsson (1876–1958), in: Jónas Jónsson, "Byggingar I," *Samvinnan* 19, no. 1 (March 1926): 25. Ásgrímur Jónsson was one of Iceland's most prominent painters in the first half of the twentieth century. See: Júlíana Gottskálksdóttir, *Ljósbrigði: Safn Ásgríms Jónssonar* (Reykjavík: Listasafn Íslands, 1996).

[45] Jónas Jónsson's influence on Guðjón Samúelsson's career was pivotal in many ways: the politician fostered the construction of a number public buildings which were seen as symbols of national identity while Iceland was moving towards its independence. On the personal relations between Guðjón Samúelsson and Jónas Jónsson, see: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 107–109; Pétur H. Ármannsson, *Guðjón Samúelsson húsameistari*, 189–93.

case can be related the traditionalist and neo-vernacular movements which had already affected the architecture of England, Germany, and the Nordic countries since the late nineteenth century.[46] The most evident source of influence on the Icelandic traditionalist debate was Råvad's aforementioned text, which for the first time sparked interest in the country's traditional architecture. Furthermore, since the early 1920s print sources from the European traditionalist debate slowly started appearing in the catalogue of the National Library. It is important to mention the presence of four texts by Hermann Muthesius: *Das Englische Haus* (first published in 1904),[47] *Die Bedeutung der Gartenstadtbewegung* (1914),[48] *Kleinhaus und Kleinsiedlung* (1918) and *Kann ich auch jetzt noch mein Haus bauen?* (1920).[49] These texts were most likely read by Guðmundur Hannesson, since traces of Muthesius's works and theorical positions often appeared in his writings.[50] In addition to Muthesius's writings, Guðjón Samúelsson owned a copy of the illustrated book *Hausbau und dergleichen* (1916) by Heinrich Tessenow (1876–1950).[51]

Iceland's material specificity and its corresponding building industry can be seen within its late-1920s and early-1930s traditionalist architecture, especially if

[46] The definition of "traditionalist architecture" is uncertain and often blurred. For the scope of this dissertation, traditionalist architecture will be interpreted through the definition by Martin Steinmann, who describes it as "the effort to provide architecture with a deeper 'reality', stemming from the tradition of a country or a people", which was rooted in nineteenth-century Romanticism and particularly bloomed in Germany and in the Nordic countries. See: Martin Steinmann, "Architettura e Tradizionalismo. Lavoro come scienza e lavoro come immagine: sulla tradizione dell'architettura 'comune'," in *L'avventura delle idee nell'architettura 1750–1980*, edited by Vittorio Magnago Lampugnani (Milano: Electa, 1985), 169. See also: Vittorio Magnago Lampugnani, *Architektur und Städtebau des 20. Jahrhunderts* (Stuttgart: Verlag Gerd Hatje, 1980), 123–43. At times, "traditionalism" is defined as an architectural theory embracing every architectural production which stood against modernism and modernist architecture – thus including historicist and neoclassical experiments. See the introduction to: Pigafetta, Abbondandolo, and Trisciuoglio, *Architettura Tradizionalista*, 11–17.

[47] Hermann Muthesius, *Das englische Haus* (Berlin: Ernst Wasmuth, 1908–11). Acquired by the National Library between 1918 and 1924. *Ritaukaskrá Landbókasafnsins* 31, no. 1 (1918–24): 184.

[48] Hermann Muthesius, *Die Bedeutung der Gartenstadtbewegung: Vier Vorträge in Gegenwart der Frau Kronprinzessin* (Leipzig/Paris: Renaissance Verlag Robert Federn, 1914). Acquired in 1916. *Ritaukaskrá Landbókasafnsins* 30, no. 1 (1916–17): 104.

[49] Hermann Muthesius, *Kleinhaus und Kleinsiedlung* (München: F. Bruckmann, 1918); Hermann Muthesius, *Kann ich auch jetzt noch mein Haus bauen? Richtlinien für den wirklich sparsamen Bau des bürgerlichen Einfamilienhauses unter den wirtschaftlichen Beschränkungen der Gegenwart* (München: F. Bruckmann, 1920). Both acquired in 1926. *Ritaukaskrá Landbókasafnsins* 33, no. 1 (1926): 47.

[50] Guðmundur Hannesson's influential essay *On Town Planning* draws much from the literature regarding the Garden City movement, and also includes a picture of Muthesius's row houses in Hellerau. See: Guðmundur Hannesson, *Um skipulag bæja*, 55. In 1927 an article by Guðmundur Hannesson debated the use of flat or pitched roofs in architecture, explaining Muthesius's endorsement for the latter. See: Guðmundur Hannesson, "Ris eða flatt þak," *Morgunblaðið* 14, no. 118 (25 May 1927): 3–4.

[51] The copy is today held at the library of the Iceland Academy of the Arts [*Listaháskóli Íslands*]: Heinrich Tessenow, *Hausbau und dergleichen. Mit 107 Zeichnungen und Photographien eigener Arbeiten von Heinrich Tessenow* (Berlin: B. Cassier, 1916). The volume belonged to Guðjón Samúelsson according to the description: *Arkítektafélag Íslands: Guðjón Samúelsson*. I would like to thank the staff of the LHÍ Library for their help in answering my queries. According to architectural historian Thomas Bo Jensen, *Hausbau und dergleichen* was very popular in Denmark, where it became "a little bible for young Danish architects". Jensen, *P. V. Jensen-Klint*, 66.

compared with contemporary neo-vernacular projects built in the Nordic countries. While Nordic traditionalist architecture developed around the materials of tradition, such as timber, bricks, or natural stone, Iceland's local technique – turf – was never used within the projects of the so-called "farmhouse style".[52] On the contrary, the shapes of traditions were replicated in concrete, a material and technique which in Iceland, for a short time, allowed both functionalist villas and revivals of rural constructions. The results of this architectural season were diverse in scope and dimensions, yet they all reflected a common nostalgic feeling towards the country's quickly disappearing rural past.

Chapter three has highlighted the experiments that occurred in the countryside, where concrete farms with traditional forms and pointed gables became a trademark of the Agricultural Agency's technical office until the late-1930s. In parallel, a concrete metamorphosis of turf farms was manifest in some residential projects built in Reykjavík soon after Råvad's publication. In 1921 engineer Jón Þorláksson designed and built a couple of twin concrete houses in Baldursgata 19–21, where the reference to the layout of the traditional turf farm is evident due to the pointed front gables and the absence of windows on the lateral walls.[53] **Fig. 9a.** That same year Guðjón Samúelsson designed and built a row of communal houses funded by the State bank, therefore called "Bank Houses".[54] Located at Framnesvegur 20–26a, these houses owed much to Råvad's design, distorting the traditional planimetric layout as they showed pointed transversal gables connected by longitudinal roofs. Later, Guðjón Samúelsson's project was considered as "difficult to inhabit", most likely due to the high pointed roofs which were not easy to build out of concrete and also took up much living space on the second floor.[55] **Figg. 9b–9c.** Rather than by Icelandic

[52] On traditionalism in the Nordic countries, see: Steinmann, "Architettura e tradizionalismo," 173; Lane, *National Romanticism and Modern Architecture*, 28–32 and 164–75; Ringbom, *Stone, Style, and Truth*, 46–51; On Norwegian late-nineteenth and early-twentieth vernacular architecture: Nils Georg Brekke, *Architecture in Norway* (Basel: Birkhäuser, 2019), 338–40, and 360–65. On Finnish vernacular architecture and its revival, see: Tuomi, "On the Search for a National Style," 61–81; Christin Nezik, "The Search for a Contemporary Finnish Architecture. Adaptations of the Vernacular Tupa in the Oeuvre of Herman Gesellius, Armas Lindgren, Eliel Saarinen, and Alvar Aalto," in *Regionalism, Nationalism and Modern Architecture*, edited by Jorge Cunha Pimentel, Alexandra Trevisan, and Alexandra (Cardoso. Porto: CEAA, 2018), 265–80. On the Swedish context, see also: Eva Eriksson, "International Impulses and National Tradition 1900–1915", in *Sweden: 20th Century Archtecture*, edited by Claes Caldenby, Jöran Lindvall, and Wilfried Wang (Munich: Prestel, 1998), 18–45;

[53] Hörður Ágústsson, *Íslensk byggingararfleið I*, 330 and 332. Similar experiments on residential architecture also reached northern Iceland, where the mastermason Sveinbjörn Jónsson (1896–1982) sketched a proposal for a row of workers' houses strongly resembling a rural "gabled" farm. The proposal is undated, yet it was most likely sketched in the early 1920s. Friðrik G. Olgeirsson, Halldór Reynisson, and Magnús Guðmundsson, *Byggingameistari í stein og stál. Saga Sveinbjarnar Jónssonar í Ofnasmiðjunni 1896–1982* (Reykjavík: Ofnasmiðjan og Fjölvaútgáfan, 1996): 85. Sveinbjörn Jónsson trained as mastermason in Norway between 1916 and 1918. Later he developed a particular kind of L-shaped concrete cast stones named "r-steinar", which were largely used in northern Iceland until the 1930s. See pp. 71–74.

[54] *Bankahús*. Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 272–75.

[55] Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging*, 120. See also: Jónas Jónsson, "Byggingar," *Samvinnan* 21, no. 1 (March 1928): 50–51.

Fig. 9a – Jón Þorláksson, Houses in Baldursgata 19–21, Reykjavík., 1921. Ljósmyndasafn Reykjavíkur/Reykjavík Museum of Photography.

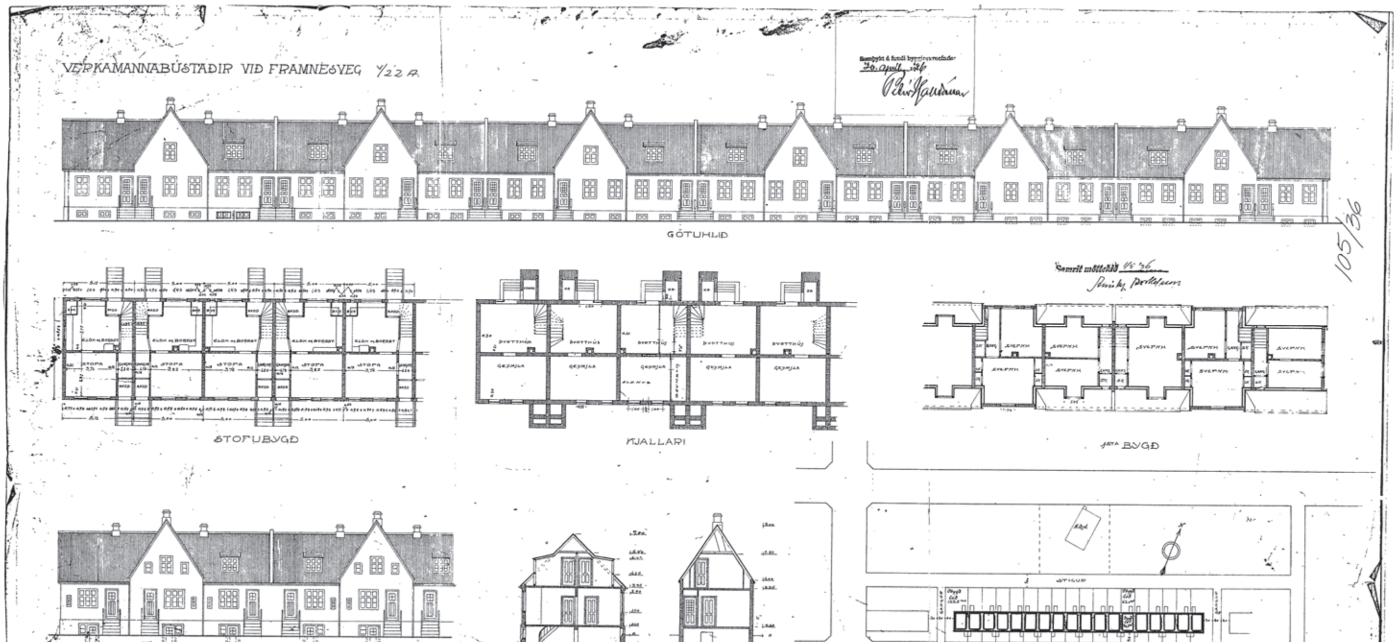


Fig. 9b – Guðjón Samúelsson, Houses in Framnesvegur 20–26A, Reykjavík. 1922–23. Teikningavefur Reykjavíkurborgar.

Fig. 9c – Guðjón Samúelsson, Houses in Framnesvegur 20–26A, Reykjavík. 1922–23.
Photo by Sofia Nannini, 2018.

traditional farmhouses, these houses might have been inspired by a number of traditionalist residential projects which were increasingly common in Germany and northern Europe since the mid-1910s. A particular influence could have derived from the row houses of the Copenhagen Public Housing Association[56] and from some of Muthesius's and Tessenow's housing projects, published in the aforementioned texts.[57] It is also important to consider that Muthesius's *Wie baue ich mein Haus* (1917) – of which *Kann ich auch jetzt noch mein Haus bauen?* was a later reprinted and modified version – was extremely popular even beyond Germany and became a widely-used source of building advice for many European architects throughout the 1920s.[58] **Figg. 10a–10d.**

More projects followed and included ideas of public buildings shaped as massive traditional farms. They echoed some eclectic experiments of Scandinavian national romanticism, such as Martin Nyrop's Fishery Building at the Nordic Exposition of 1888 or Arnstein Arneberg's Eidsvold Folk High School designed in 1906–8, influenced by rural models enlarged at a giant scale.[59] The most daring proposal was Guðjón Samúelsson's project for the swimming pool of Reykjavík, envisaged in 1925 as a huge farmhouse boasting three high front gables and round windows. Its gables seemed to be resting on thick lateral stone walls, yet the bearing structure was a plain concrete frame.[60] **Figg. 11a–11b.** A well known outcome of this trend was Guðjón Samúelsson's small parish seat in Þingvellir, built in 1929–30 at the time of the one-thousand year anniversary of the Icelandic historical assembly *Alþingi*.[61] Celebrated by a great number of citizens and by Danish king Christian X (1870–1947), the 1930 anniversary was a core event for the development of the Icelandic modern state, and it involved a number of celebrations. Its national rhetoric and symbolism was well

---

[56] KAB (*Københavns Almindelige Boligselskab*). See for example the *Bakkehusene* housing project by Ivar Bentsen and Thorkild Henningsen, in Bellahøj, Copenhagen: Faber, *A History of Danish Archtitecture*, 159–60. See also the housing project in Hellerup, built in 1920–24: Frederik Christian Boldsen, *Studiebyens Huse: Fotografi, Tegning og Beskrivelse af 104 Enkelt-, Dobbelt- og Rækkehuse i Hellerup* (Copenhagen: KAB, 1924).

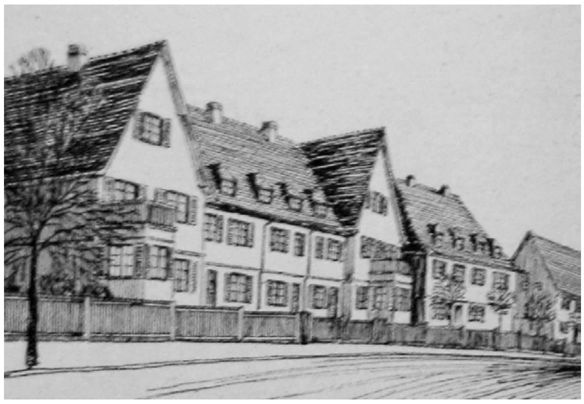
[57] See for example Muthesius's project for *Reihenhäuser in Ackermannschöhe* in Stettin: Muthesius *Kann ich auch jetzt noch mein Haus bauen?,* 163 and 166; see also some of Tessenow's projects for Hellerau, published in: Tessenow, *Hausbau und dergleichen*, 62–67 and the projects with front gables in 72–74. Also Muthesius's *Kleinhaus und Kleinsiedlung* collects many residential designs with plans and elevations. On the garden city of Hellerau, see: Lane, *National Romanticism and Modern Architecture*, 155–61; Maciuika, *Before the Bauhaus,* 225–47; Nils M. Schinker, *Die Gartenstadt Hellerau 1909–1945: Stadtbaukunst, Kleinwohnungsbau, Sozial- und Bodenreform* (Dresden: Sandstein Verlag, 2013). For a recent summary of Muthesius's residential projects, see: Piergiacomo Bucciarelli, *Le ville berlinesi di Hermann Muthesius* (Roma: Gangemi, 2011).

[58] Bucciarelli, *Le ville berlinesi di Hermann Muthesius*, 22–23.

[59] On domestic and rural models in Scandinavian national romantic architecture, see: Lane, *National Romanticism and Modern Architecture in Germany and the Scandinavian Countries*, 164–72.

[60] The swimming pool was built according to a different design in 1929–37. See a full description of the project in: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 119 and 202–05; Pétur H. Ármannsson, *Guðjón Samúelsson húsameistari*, 234–45.

[61] 930 was the year when *Alþingi* was said to have been founded. The date was decided retrospectively in the twentieth century and in 1930 Iceland celebrated *Alþingi*'s one-thousandth anniversary. See: Gunnar Karlsson, *The History of Iceland,* 20. See also the following footnotes.



Figg. 10a–10b – Row houses in Duisburg and row houses in Ackermannshöhe in Stettin. Muthesius, *Kann ich auch jetz noch mein Haus bauen?*,163–66.

Fig. 10c – D. and K. Schulze, Siedlung der Gewerkschaft Viktoria. Muthesius, *Kleinhaus und Kleinsiedlung,* 184.

Fig. 10d – Project for residential row houses. Tessenow, *Hausbau und dergleichen*, 72.

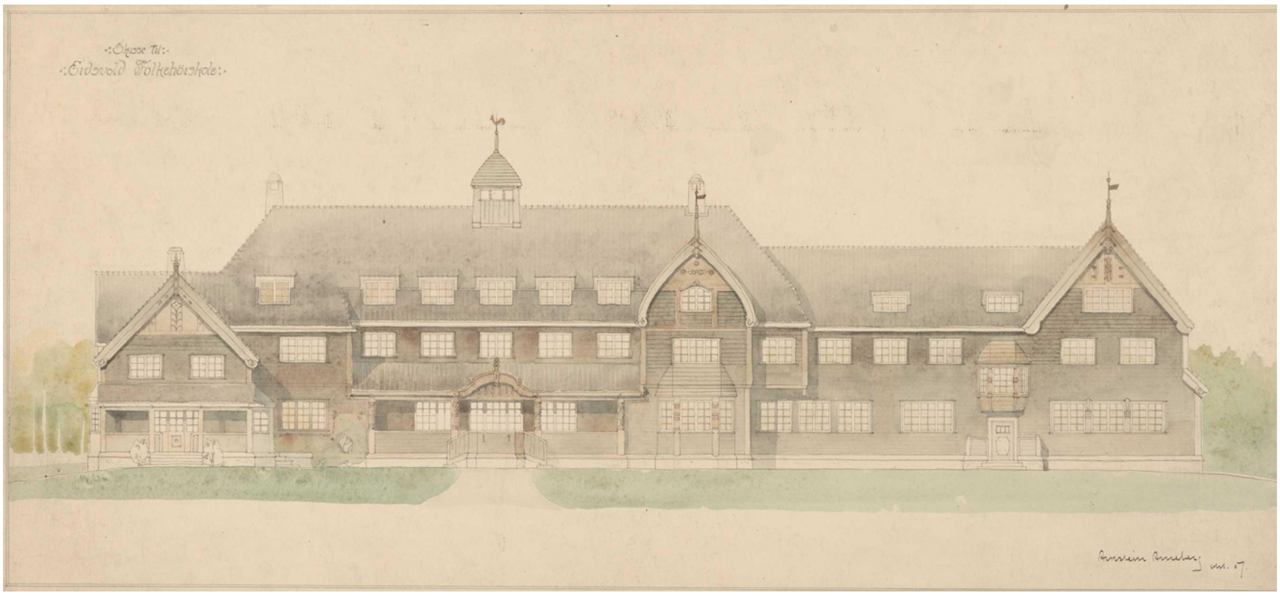


Fig. 11a – Arnstein Arneberg, Design of Eidsvold Folk High School, 1907. Norsk Arkitekturmuseum, NAMT.aar407.001

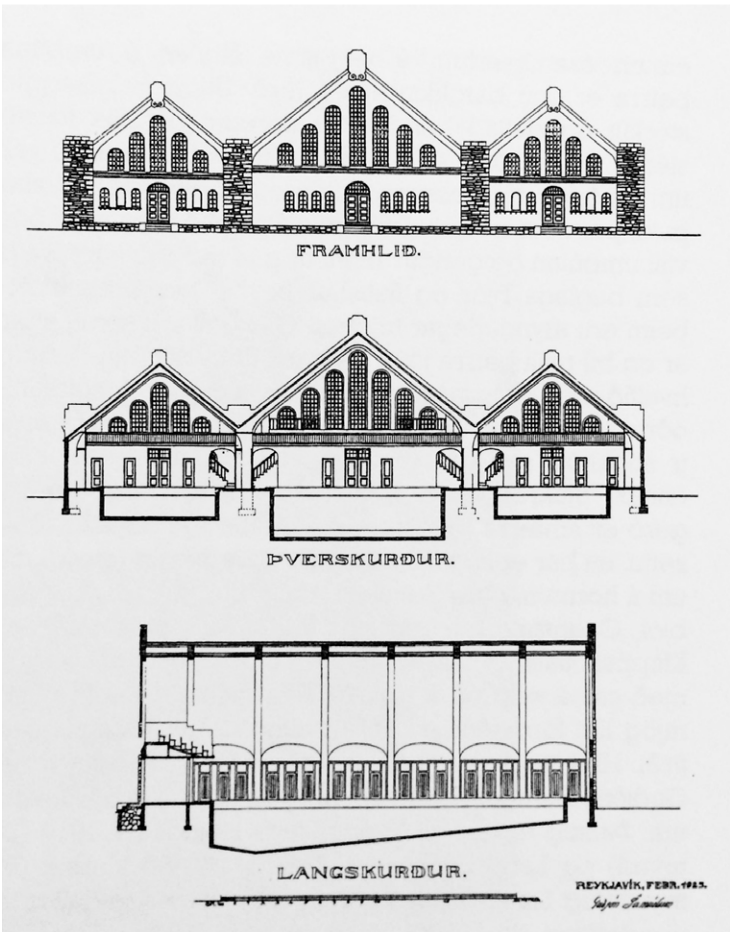


Fig. 11b – Guðjón Samúelsson, Project for the Reykjavík Swimming Pool, 1925. Hörður Ágústsson, *Íslenzk byggingararfleifð I*, 349.

matched with the adoption of the "farmhouse style" in architecture.[62] Another contemporary project by Guðjón Samúelsson was the school in Laugarvatn (1929–32). Its rural appearance with six pointed roofs coexisted with the internal octagonal-shaped reinforced concrete pillars.[63] **Figg. 12a–13b.**

Lesser known and yet peculiar examples of concrete traditionalist buildings were two projects built in 1925 on the outskirts of Reykjavík. One was Thor Jensen's huge milking farm at Korpúlfsstaðir. Its first draft was designed by mastermason Guðmundur Halldór Þórláksson (1887–1958)[64] and then modified and built by architect Sigurður Guðmundsson.[65] Guðmundur H. Þorláksson also designed a warehouse for the headquarters of the fishing company Alliance in Reykjavík's harbour area Grandinn.[66] Both buildings show the extreme contradiction of the Icelandic architectural revival: enormous concrete gabled fronts, with no specific ornaments or decorations, aimed at echoing the idea of a traditional turf farm, yet at the same time they rested on reinforced concrete structures. **Figg. 14a–14b.** Different from other Nordic historicist projects which usually employed reinforced concrete as a structural material to be hidden behind stone or timber cladding, in this case concrete was not hidden by other materials applied on the façade.[67] Conversely, concrete was proudly shown on the outer surfaces, only protected with a layer of cement plaster. This was a statement of its popularity among Icelandic builders – yet it could be also considered as a pragmatic evidence of the still basic means available within the Icelandic construction field. **Figg. 15a–15b.** Despite the interest that emerged at a national scale, the enthusiasm for such experiments was short-lived, largely opposed by intellectuals such as Halldór Laxness and by the emerging

[62] More than a quarter of the whole population took part in the event. Gunnar Karlsson, *History of Iceland*, 308. See also: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 120–21 and note 68 in particular. On the events and celebrations for the one-thousandth anniversary of *Alþingi*, see: Magnús Jónsson, *Alþingishátíðin 1930* (Reykjavík: H. F. Leiftur, 1943); Helgi Skúli Kjartansson, *Ísland á 20. öld*, 81–85; Guðmundur Hálfdanarson, and Ólafur Rastrick, "Culture and the Constitution of the Icelandic in the 19th and 20th Centuries," in *Power and Culture: Hegemony, Interaction and Dissent*, edited by Jonathan Osmond and Ausma Cimdina (Pisa: Pisa University Press, 2006), 92–95.

[63] Guðjón Samúelsson, "Íslenzk bygginarlist," *Tímarit Verkfræðingafélags Íslands* 18, no. 6 (December 1933): 66–69; Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 120. See other traditionalist projects by Guðjón Samúelsson in: Pétur H. Ármannsson, *Guðjón Samúelsson húsameistari*, 107–18; on the school at Laugarvatn see the pages: 193–97.

[64] Guðmundur Þorláksson had trained at *Det Tekniske Selskabs Skole* in Copenhagen. He worked as city architect in Reykjavík between 1921 and 1926 and also collaborated with State architect Guðjón Samúelsson. Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 424.

[65] On the history of the farm, see: Birgir Sigurðsson, *Korpúlfsstaðir: saga glæsilegasta stórbýlis á Íslandi* (Reykjavík: Forlagið Reykjavíkuborg, 1994).

[66] The building is mentioned in the built heritage survey: Drífa Kristín Þrastardóttir, Guðný Gerður Gunnarsdóttir, *Húsakönnun: Örfirisey og Grandinn* (Reykjavík: Minjasafn Reykjavíkur, 2009), 61.

[67] See, for example, Onni Tarjanne's National Theater, built in 1900–02, and Lars Sonck's Telephone Company Building, Helsinki: both reinforced concrete structures were clad in granite. See: Lane, *National Romanticism and Modern Architecture in Germany and the Scandinavian Countries*, 201 and 238.

Fig. 12a - Guðjón Samúelsson, Parish seat in Þingvellir, 1929–30.
Photo by Sofia Nannini, 2018.

Fig. 12b - Guðjón Samúelsson, Parish seat in Þingvellir, 1929–30.
Photo by Sofia Nannini, 2018.

Fig. 13a – Guðjón Samúelsson, School in Laugarvatn, 1929–32. Guðjón Samúelsson, "Íslenzk bygginarlist," *Tímarit Verkfræðingafélags Íslands* 18, no. 6 (December 1933): 66.

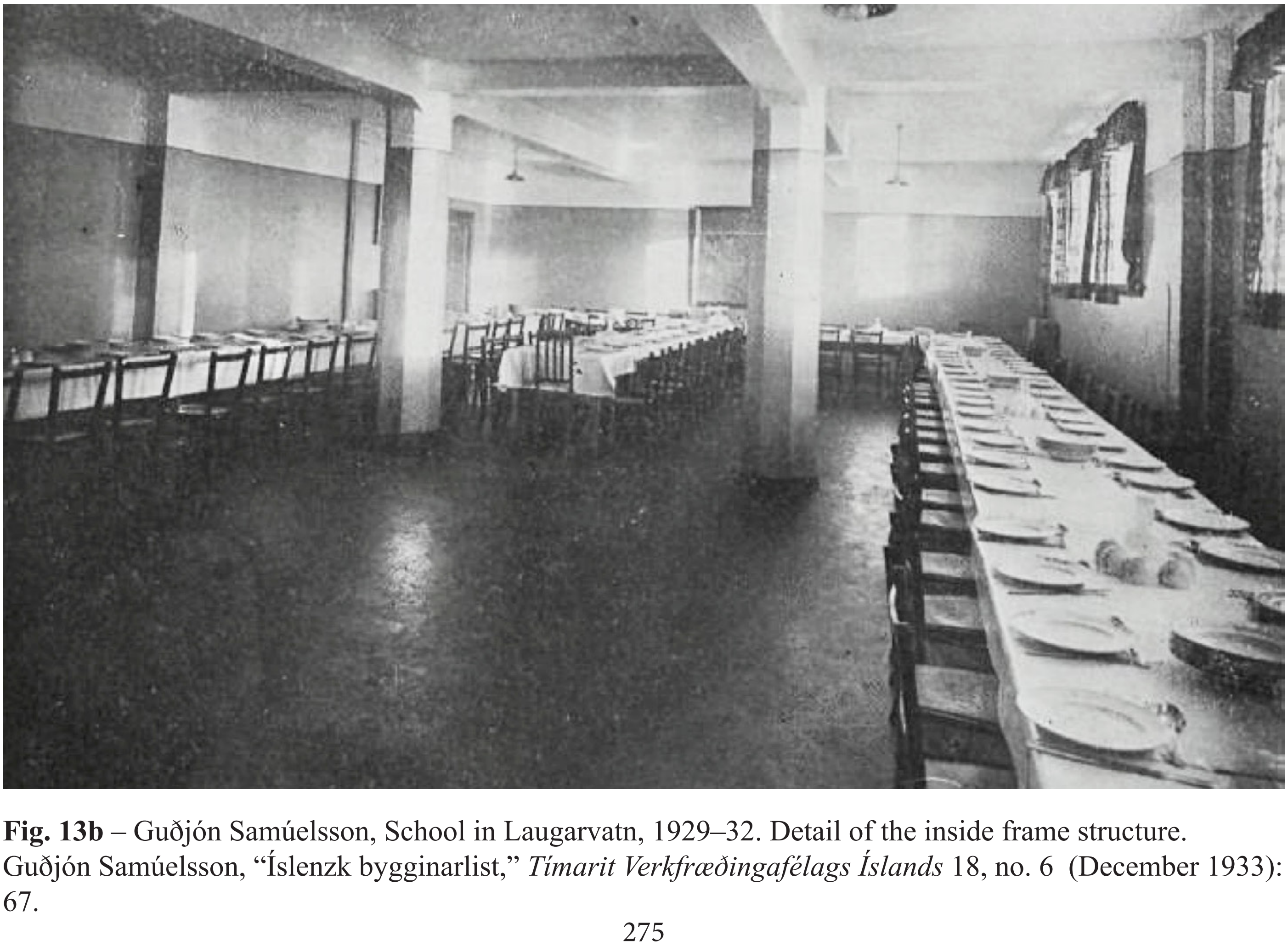


Fig. 13b – Guðjón Samúelsson, School in Laugarvatn, 1929–32. Detail of the inside frame structure. Guðjón Samúelsson, "Íslenzk bygginarlist," *Tímarit Verkfræðingafélags Íslands* 18, no. 6 (December 1933): 67.

generation of modernist architects active in Iceland.[68] Later the whole experience was even labelled as a complete failure by its main supporter, Jónas Jónsson.[69] As seen earlier, similar changes occurred in the design of farmhouses, whose traditionalist design was soon substituted by low and definitely more functional dwellings.

One might wonder why traditional farmhouses were momentarily brought back to life in a time when modern architecture was pointing in a different direction. One answer can be found in what Barbara Miller Lane writes as she tackles the issue of monumentality in Scandinavian architecture and its links to the idea of the nation: "By evoking the northern past, each of the Scandinavian countries laid claim to a period in its history in which it could be viewed as larger and more dominant than it was in the present."[70] Rural turf farms were strongly linked to the idea of a mythical Icelandic past, and to the great literary and cultural accomplishments of the Middle Ages – reinventing an architectural tradition in lasting materials was thus a way of evoking the dream of a "golden age" of Icelandic history.[71] The Icelandic "farmhouse style" was a true case of invention of a tradition, since the concrete translations of turf houses were mostly "gabled" farms, whose origins date back only to the late eighteenth century, and which were extremely different from the dwellings of the first settlers and heroes of the sagas.[72] Furthermore, despite politician Jónas Jónsson's repeated hints to and praises of the country's rural architecture, it is very likely that Icelandic twentieth-century vernacular projects owed much more to contemporary German traditionalist designs and developed less as a direct reference to Icelandic farmhouses. To some extent, it could be argued that Iceland and its traditionalist architectural culture were not as isolated as imagined by its supporters. On the contrary, they were an active part of a continental debate on architecture and regional traditions.

Another reason behind this vernacular turn could be found in what architectural historian Winfried Nerdinger writes to justify the "invention of tradition" within German architecture at the turn of the century. Nerdinger claims that the "turn to regional architectural forms and traditions was also a reaction to the massive distruction of historical built fabric in the course of industrialization and

[68] Harsh criticism on Icelandic historicist and traditionalist architecture came from Halldór Laxness and also from modernist architects such as Sigurður Guðmundsson. See: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 224–5; 234–36. See the essay by Halldór Laxness, "Sálarfegurð í mannabústöðum," *Húsakostur og híbýlaprýði*, 115–21.

[69] Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging,* 39. Jónas Jónsson also wrote that "torfið og steinsteypan áttu ekki samleið" [turf and concrete had nothing in common]. Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging,* 118. While this statement might be true in regards to the reception and criticism of historicist revivals of rural farms, turf and concrete as basic building materials did share some experiments, as seen in the projects by the technical office of the Agricultural Agency.

[70] Lane, *National Romanticism and Modern Architecture in Germany and the Scandinavian Countries*, 244.

[71] On the idea of an Icelandic "golden age", see: Gunnar Karlsson, *The History of Iceland*, 51.

[72] On invented traditions, see the classic work by Eric Hobsbawn, and Terence Ranger, *The Invention of Tradition* (Cambridge: Cambridge University press, 1983).

Fig. 14a - Guðmundur H. Þorláksson, and Sigurður Guðmundsson, Farm at Korpúlfsstaðir, 1925. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 14b – Guðmundur H. Þorláksson, and Sigurður Guðmundsson, Farm at Korpúlfsstaðir, 1925. Photo by Sofia Nannini, 2019.

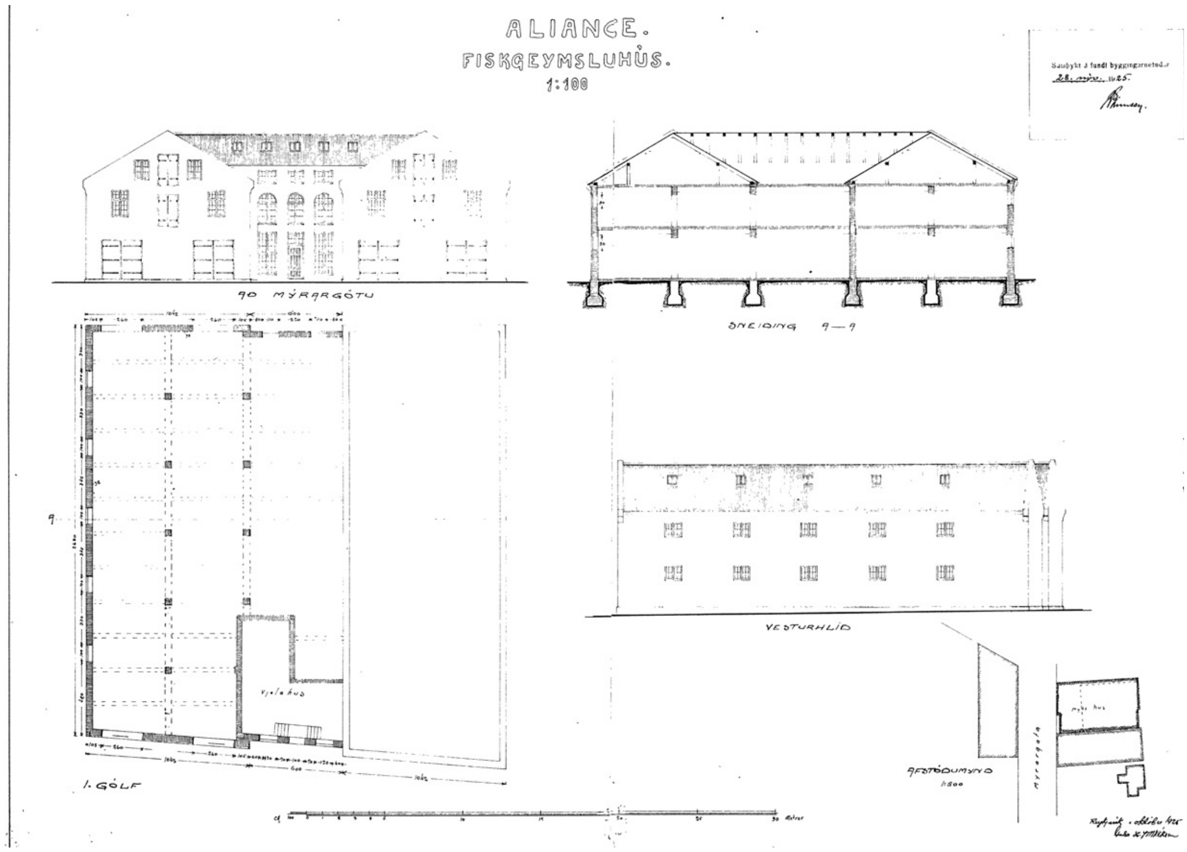


Fig. 15a – Guðmundur H. Þorláksson, Headquarters of the fishing company Alliance in Reykjavík, 1925. Teikningavefur Reykjavíkurborgar.

Fig. 15b – Guðmundur H. Þorláksson, Headquarters of the fishing company Alliance in Reykjavík, 1925. Photo by Sofia Nannini, 2019.

urbanization".[73] The effects of urbanization in the Icelandic landscape might not have been as pervading as in other European countries, and certainly the Icelandic industrialization occurred much later than in the continent. Nevertheless, these rapid processes affected Icelandic society to the point that, for some years, its architects had strongly believed that it was possible to build the shapes of a turf farm – or Nordic farm in general – in concrete, thus eternalizing it as the symbol of a national history.

4.2.2 Concrete to mould the Icelandic landscape

Guðjón Samúelsson's most famous trademark can be found in a series of projects developed since the mid-1920s, and revolving around the ornamental motif usually known as "basaltic style".[74] The term originated from the basalt formations which are common in Iceland, sometimes reaching such massive dimensions as to become true national landmarks.[75] Examples are the formations at Reynisfjara, near Vík í Mýrdal or the Svartifoss waterfall in South Iceland. **Fig. 16.** The association of such basaltic formations with art and architecture first appeared in some Icelandic newspaper articles published in the early 1920s, initially connected to the artworks and the museum of sculptor Einar Jónsson.[76] Many of his sketches and sculptures highlighted the basaltic motif, obsessively repeated as a sort of metaphor of the Icelandic landscape, the idea of a geological primitive hut, or, in the case of the bas relief dedicated to politician Jón Sigurðsson, even as a metaphor of the Icelandic people.[77] **Figg. 17a–17d.**

From the late 1920s onwards Guðjón Samúelsson had systematically adopted and implemented the basaltic ornament into his concrete projects, and it soon became the

[73] "Die Wendung zur regionalen Bauformen und Bautraditionen war auch eine Reaktion auf die enorme Zerstörung von historischer Bausubstanz im Zuge der Industrialisierung und Urbanisierung [...]." Winfried Nerdinger, "Die 'Erfindung der Tradition' in der deutschen Architektur 1870–1914," in *Geschichte Macht Architektur,* edited by Werner Oechslin (München: Prestel Verlag, 2012), 73.

[74] In Icelandic *stuðlabergsstíll* or *hamrastíll,* from *stuðlaberg* meaning "basalt formation" and *hamar* meaning "cliff". The notion of "basaltic style" was explained in detail by Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 123–26. Icelandic scholar Hörður Ágústsson did not mention this term in the first volume of his *Íslensk byggingararfleifð*; Pétur H. Ármannsson mentions it only in passing, when presenting the development of a few specific projects by the State architect, such as the church at Landakot and the church of Hallgrímur. See: Pétur H. Ármannsson, *Guðjón Samúelsson húsameistari*, 181–85, 324–36.

[75] Basalt formations are common in other contexts in the North Atlantic, such as the Scottish island of Staffa in the Inner Hebrides; its massive basaltic formations have been a tourist site since the early nineteenth century and were often likened to manmade architecture. See: Jan Pieper, "Werke der 'Baumeisterin Natur' in Schilderungen der Romantik," in *Felsengärten, Gartengrotten, Kunstberge. Motive der Natur in Architektur und Garten*, 136–53.

[76] Ágúst H. Bjarnason, "Íslenzkir listamenn. Einar Jónsson, myndasmíður," *Íðunn* 8 no. 3–4 (January/April 1922), 214–34; H. [?] Franzson, "Íslenzk húsgerðarlist," *Skólablaðið* 1, no. 4 (17 April 1926): 12–13; Jónas Jónsson, "Byggingar VIII," *Samvinnan* 23, no. 1 (March 1929): 72–76.

[77] The work is titled *Brautryðjandinn* [The Pioneer] and it is part of Einar Jónsson's monument to the politician and leader of the independence movement Jón Sigurðsson. The monument includes a statue, made in 1911, which was moved in front of the house of Parliament in 1931. When moved, a new base by Guðjón Samúelsson was added, together with the bas relief.

Fig. 16 – Basalt formations at Reynisfjara, Southern Iceland.
Photography: courtesy of Marco Bottigelli, 2015.

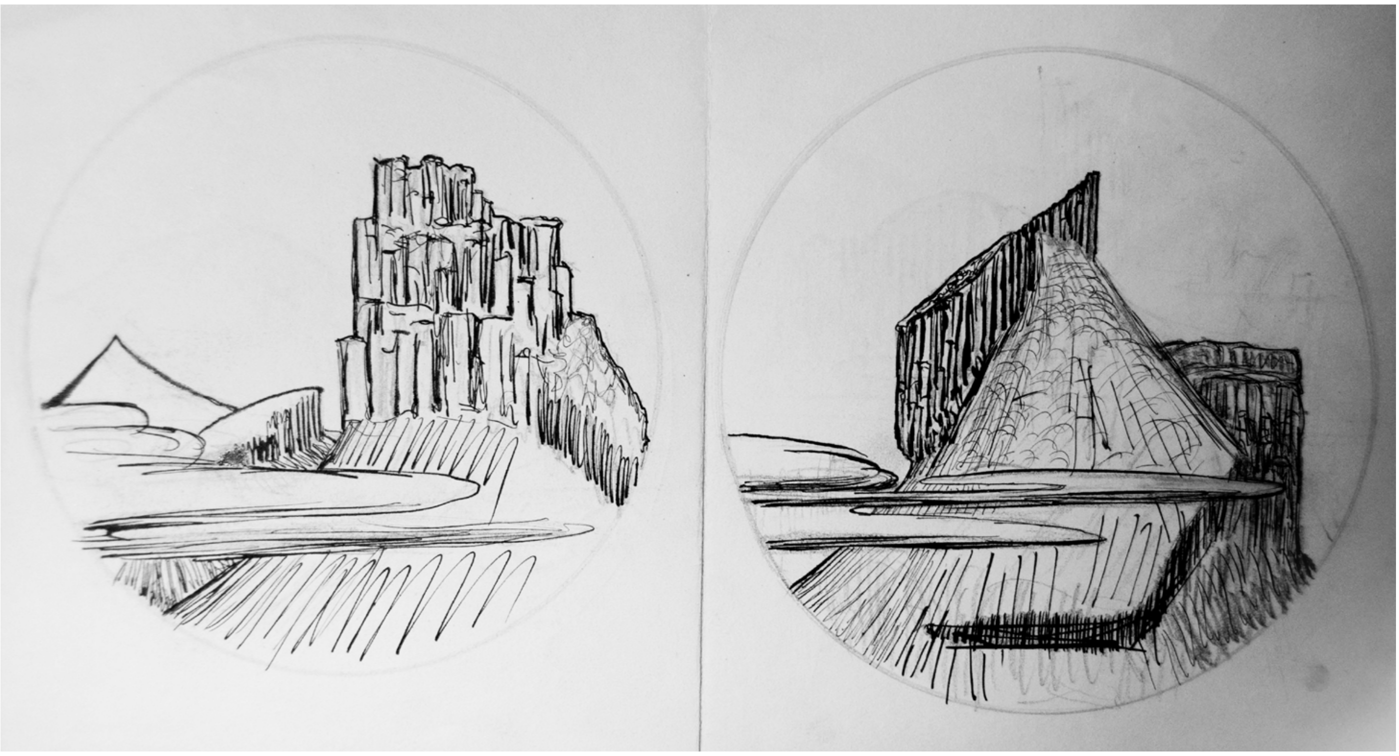


Fig. 17a - Einar Jónsson, Sketches of Icelandic mountains. Undated. LEJ.

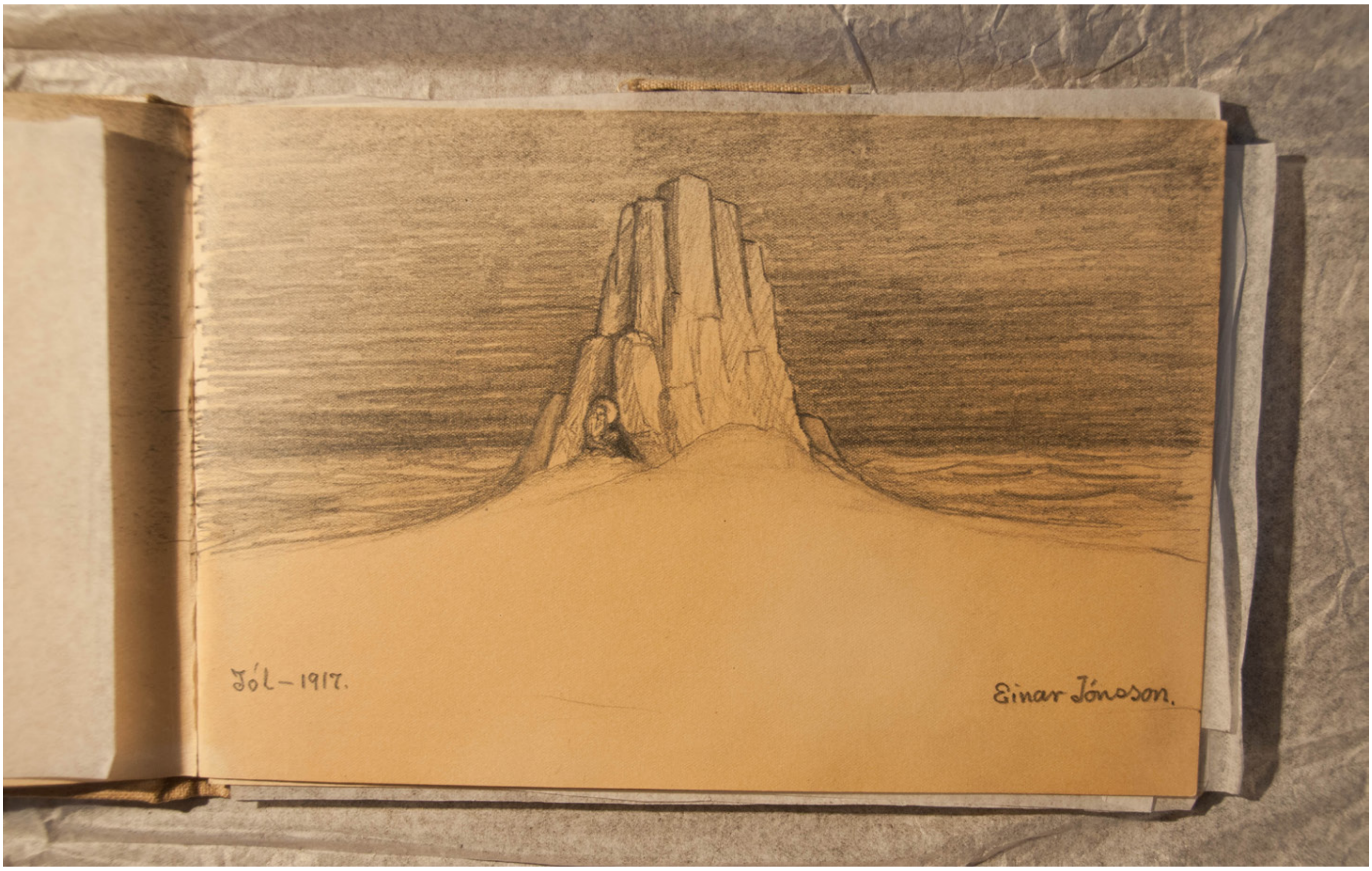


Fig. 17b – Einar Jónsson, Jól [Christmas], 1917. LEJ, sketchbooks.
A basaltic formation is here envisaged as a sort of Icelandic primitive hut.

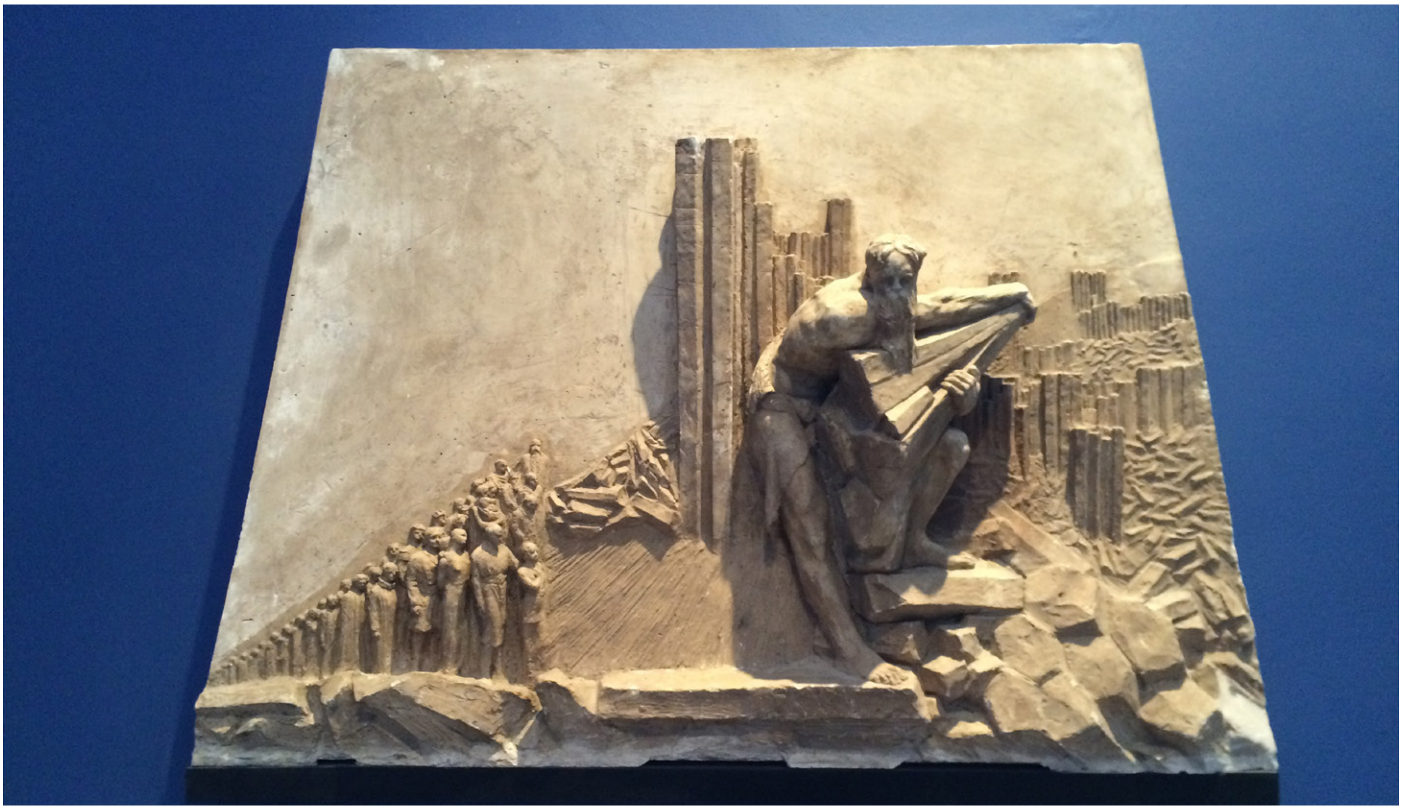


Fig. 17c – Einar Jónsson, *Brautryðjandinn* [The Pioneer], plaster cast model. 1911.
The Einar Jónsson Museum.

Fig. 17d – Einar Jónsson, Statue for Jón Sigurðsson, with the bas relief *Brautryðjandinn* [The Pioneer]. Base by Guðjón Samúelsson, 1931. Photo by Sofia Nannini, 2019.

most popular signature of the new, national architecture. A hint of his fascination for the basaltic formation can be seen in a drawing for the main façade of the State Hospital, designed and built in 1925–31 in Reykjavík.[78] In this elevation, dated January 1926, the main pediment at the center of the elevation encloses a drawing of a typical, pyramid-like Icelandic mountain, with basaltic columns on top. Although the bas relief was not ultimately built according to this specific design, it is interesting to notice the preminent position given to the Icelandic landscape within such a key building for Icelandic society as the national hospital.[79] **Figg. 18a–18b.**

Experiments with basaltic sculptural ornament started with the construction of the Catholic church at Landakot, on a hill overlooking the centre of Reykjavík. The project was designed by Guðjón Samúelsson and built in 1925–29.[80] **Figg. 19a–19d.** The church was envisaged as a massive neo-Gothic concrete building with three naves and a single bell tower located above the entrance.[81] The choice of a neo-gothic model for Guðjón Samúelsson's church mainly derived from the request of the vicariate.[82] However, it may be also seen as an interesting architectural outcome of early twentieth-century medievalism which was typical of the Nordic countries.[83] In a country boasting its own medieval culture and literature with pride, and yet without any stone cathedral as remains of that supposed golden age, Guðjón Samúelsson's neo-gothic church reflected a specific Icelandic medievalism which seemed to be halfway between that of the "found" and that of the "made" Middle Ages.[84] Iceland

---

[78] "Landsspítalinn, framhlið", signed by Guðjón Samúelsson. ÞÍ, *Húsameistari ríkisins*, C/776, *Landsspítali gamli*.

[79] On the construction of the hospital, see: Pétur H. Ármannsson, *Guðjón Samúelsson húsameistari*, 144–52.

[80] Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging,* 54–57; Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 116–18. See the paragraphs "Þættir úr byggingarsögu Kristskirkju" by Gunnar F. Guðmundsson, "Lýsing kirkjunnar" and "Byggingarlist kirkjunnar" by Pétur H. Ármannsson in the chapter "Kristskirkja í Landakoti," in *Fornar kirkjur í Reykjavík. Dómkirkjan, Fríkirkjan, Kirstkirkja. Kirkjur Íslands* (Reykjavík: Hið íslenska bókmenntafélag, 2012), 193–223; Pétur H. Ármannsson, *Guðjón Samúelsson húsameistari*, 180–88.

[81] The bell tower should have been topped by a tall spire which was not eventually built. See the drawings: ÞÍ, *Húsameistari ríkisins. Bréfa- og teikningasafn*. Safn A(D), flokkur 21, verkefni H–L, örk. 30. As highlighted by historian Gunnar Guðmundsson, a model for Guðjón Samúelsson's project was the church of the *Abbaye royale* in Celles-sur-Belles, whose tall central tower, slender inner pillars and pointed groined vaults strongly influenced the final Icelandic design. "Kristskirkja í Landakoti," 202–03. The church at Celles-sur-Belles was rebuilt by French architect François Leduc (1640–1703) in the second half of the seventeenth century.

[82] Guðjón Samúelsson's earliest project envisaged a Romanesque church, with rounded-arch windows and painted in white (1920). See: "Kristskirkja í Landakoti," 195–96.

[83] On medievalism in twentieth-century Finnish architecture, see: Tuomi, "On the Search for a National Style," 81–85. On the "Gothic", "Old Norse, or "Dragon Style" revival in Sweden and Norway, see: Lane, *National Romanticism and Modern Architecture in Germany and the Scandinavian Countries*, 62–69.

[84] As Louise d'Arcens writes, medievalism can be either of the "'found' Middle Ages" or of the "'made' Middle Ages", the former emerging "through contact with, and interpretation of, the 'found' or material remains of the medieval past", and the latter encompassing "texts, objects, performances, and practices that are not only post-medieveal in their provenance but imaginative in their impulse and founded on ideas of 'the medieval' as a conceptual rather than a historical category". Louise D'Arcens, "Introduction. Medievalism: Scope and Complexity," in *The Cambridge Companion to Medievalism*, edited by Louise D'Arcens (Cambridge: Cambridge University Press, 2016), 2.

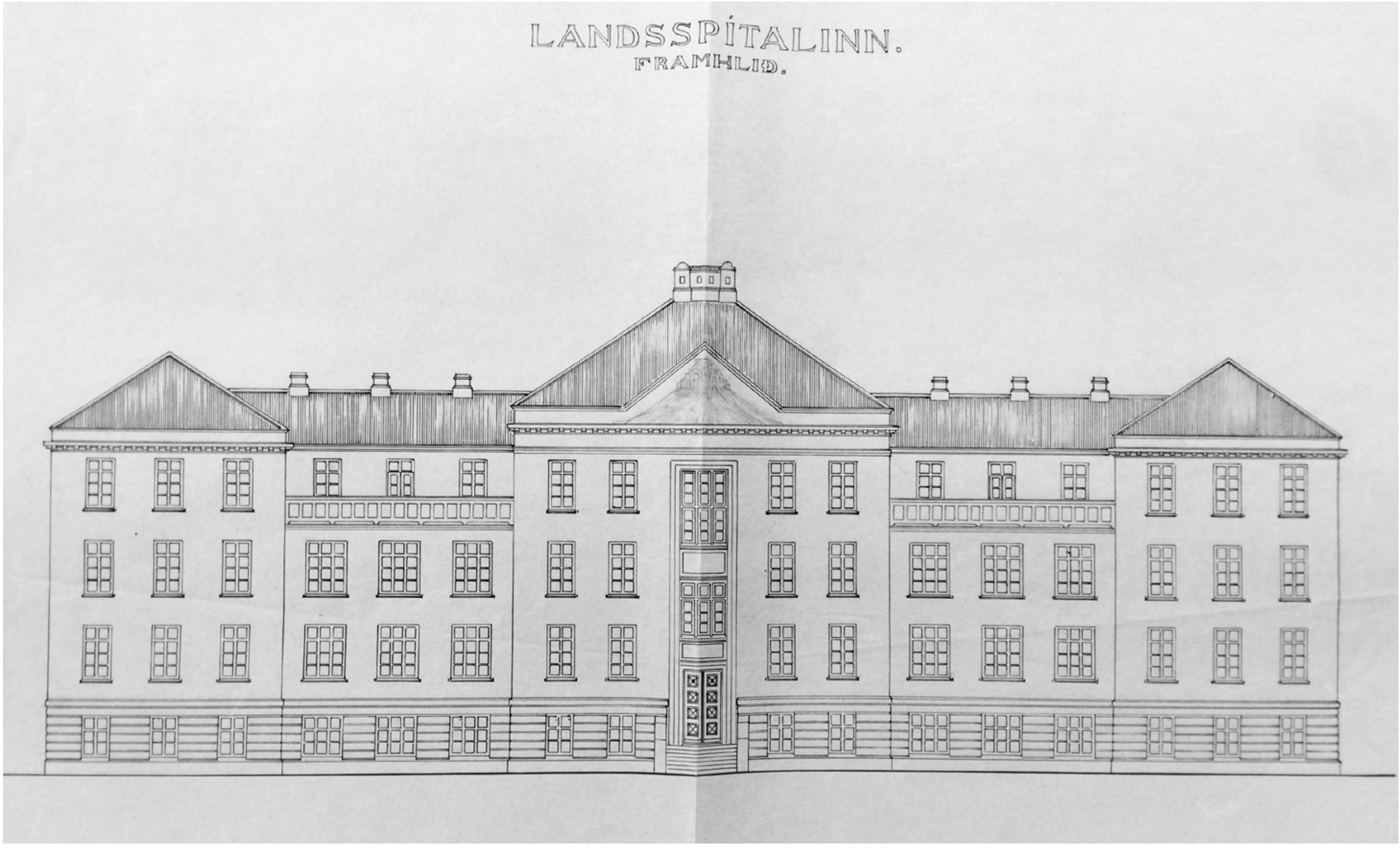


Fig. 18a – Guðjón Samúelsson, Elevation of the National Hospital. See the detail of the pediment.
ÞÍ, Húsameistari ríkisins, C/776, Landsspítali gamli.

Fig. 18b – Guðjón Samúelsson, National Hospital, Reykjavík, 1925–31.
Þjóðminjasafn Íslands/National Museum of Iceland.

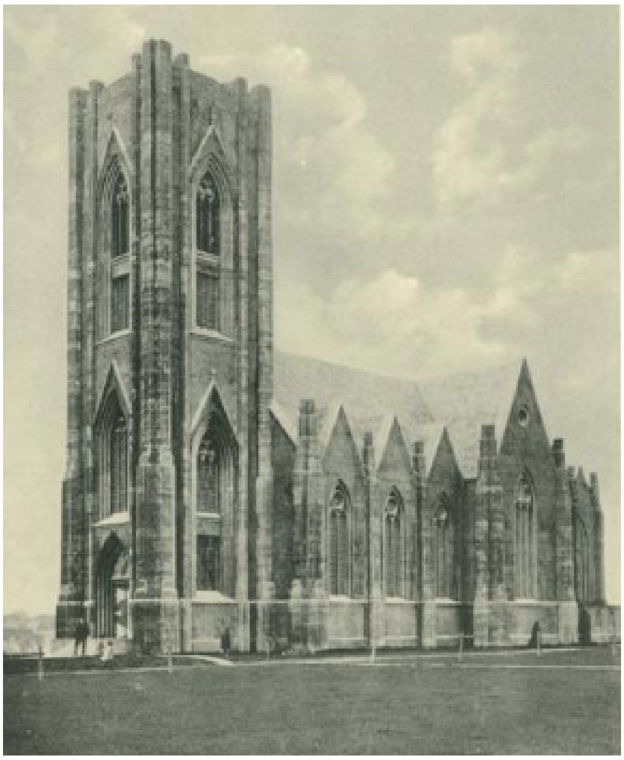


Fig. 19a – Guðjón Samúelsson, Catholic church at Landakot, Reykjavík, 1925–29. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 19b – Guðjón Samúelsson, Catholic church at Landakot, Reykjavík, 1925–29. Photo by Sofia Nannini, 2019.

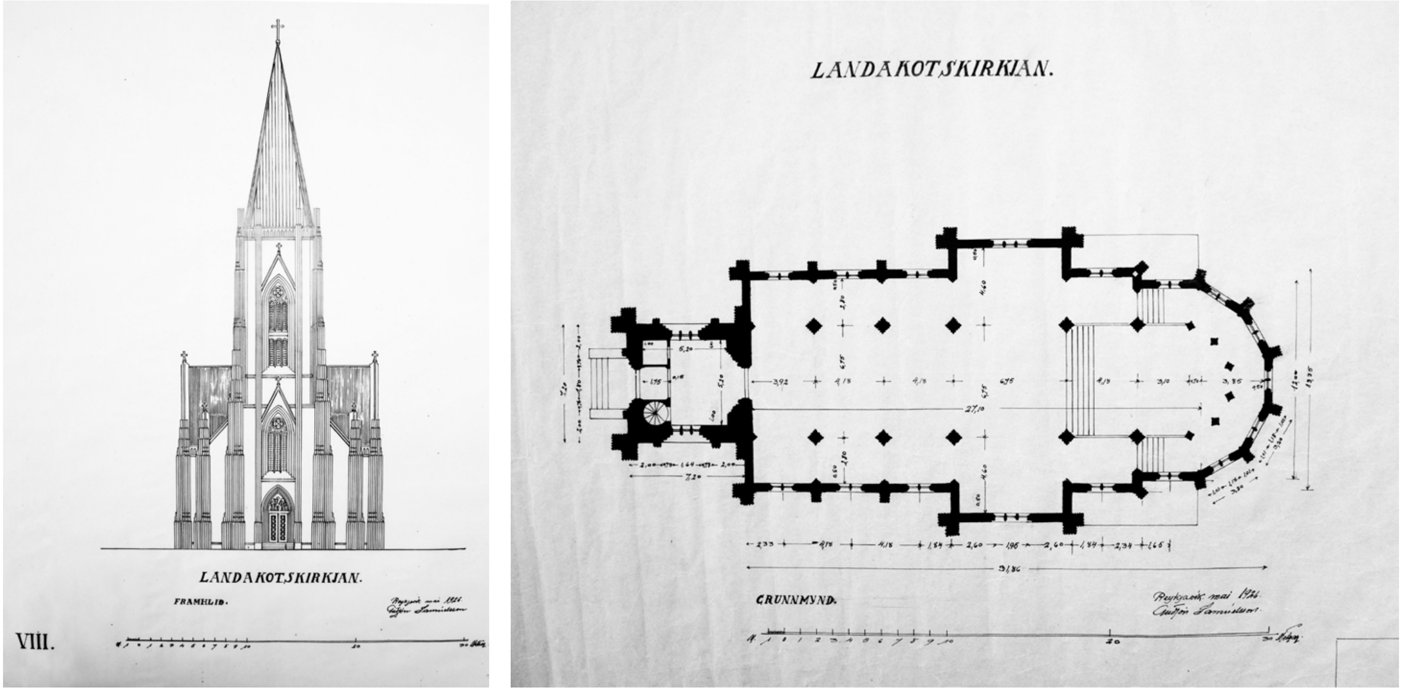


Fig. 19c – Guðjón Samúelsson, Drawings for the Catholic church at Landakot. Elevation and ground floor, May 1926. ÞÍ, Húsameistari ríkisins. Bréfa- og teikningasafn, Safn A(D), Flokkur 21, Verkefni H–L. Örk 30.

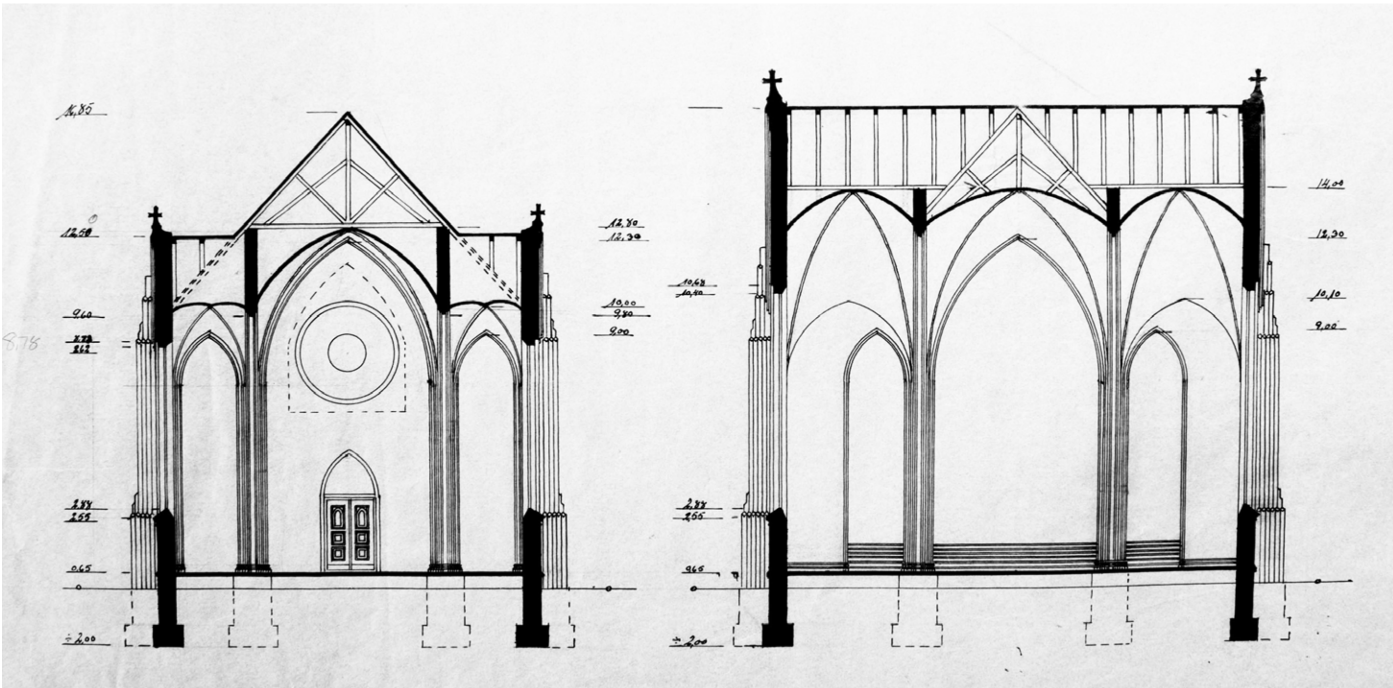


Fig. 19d – Guðjón Samúelsson, Drawings for the Catholic church at Landakot. Sections, May 1926. ÞÍ, Húsameistari ríkisins. Bréfa- og teikningasafn, Safn A(D), Flokkur 21, Verkefni H–L. Örk 30.

had its roots in a medieval past with a distinctive culture, and yet its cathedrals had only been massive timber buildings which did not create lasting ruins.[85] Guðjón Samúelsson's choice of a neo-gothic design could have been a way to praise the Icelandic medieval past and also a way to create a falsely historical image for the urban landscape of Reykjavík – a choice which was not left untouched by harsh criticism. For example, Laxness described "gothic churches in concrete as another example of a misunderstanding in architecture".[86]

Guðjón Samúelsson's church at Landakot was one of the many examples of neo-gothic and eclectic concrete churches built at the beginning of the twentieth century – both in Europe and overseas.[87] Structurally, however, the church is of particular interest, boasting a number of technical developments in the use of concrete in Iceland.[88] The works were overseen by mastermason Jens Eyjólfsson, who had already worked with Guðjón Samúelsson during the construction of the Nathan & Olsen Office Building. First, the inner pillars were made out of cylindrical cast hollow blocks, moulded in iron formworks. The blocks were prefabricated before hand, piled up around an iron reinforcement, and the inner hole filled with concrete. The groined vaults, instead, were made of lightweight concrete with pumice as its main aggregate, stretching out over a wire net. **Figg. 20a–20c.** Anticipating a specific finishing technique which would be discussed later in this chapter, fragments of Iceland spar were embedded in the outer walls of the building, thus allowing particular light reflections.[89]

As mentioned earlier, the church at Landakot was the first architectural project where the "basaltic" ornament was consciously adopted as a design choice. The heavy outer pillars, acting as buttresses for the internal structure, were moulded in such a way to recall the shapes of basaltic formations. As the photographs of the building site

---

[85] As wrote Jónas Jónsson in a contemporary newspaper article, "Ef íslendingar hefðu kunnað að byggja úr steini á blómaöld kaþólskunnar myndu nú standa veglegar dómkirkjur í Skálholti og á Hólum og fagrar gotneskar smákirkjur prýða hverja sveit" [If the Icelanders had learned how to build out of stone during the Catholic golden age, now there would be superb cathedrals in Skálholt and Hólar, and beautiful gothic churches would decorate all regions]. Jónas Jónsson, "Landakotskirkja," *Tíminn* 11, no. 57 (23 December 1927): 216.

[86] Laxness, "Sálarfegurð í mannabústöðum," *Húsakostur og híbýlaprýði*, 118. See also: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 236.

[87] See for example the essay by Stephanie Van de Voorde, and Roony De Meyer, "L'application innovante du béton armé dans la construction d'églises en Belgique. Béton sacré ou usine à prière?," in *Édifice & Artifice*, 587–96. See also the essay on reinforced concrete churches in Canada by Barry Magrill, "Pouring Ecclesiastical Tradition into a Modern Mould," *Journal of the Society for the Study of Architecture in Canada* 37, no. 1 (2012): 3–15. Many eclectic churches in reinforced concrete were also published in the *Beton und Eisen* journal. See for example: Leopold Bauer, "Die katholische Pfarrkirche in Bielitz," *Beton und Eisen* 10, no. 11 (July 1911): 229–32; F. v. Perko, "Die evangelische Kirche in Innsbruck," *Beton und Eisen* 6, no. 2 (1907): 36–38.

[88] As it occured for many Icelandic projects, the technical novelties were reported in newspaper articles or other printed sources, since the drawings only show the overall architectural design. Jónas Jónsson, "Landakotskirkja," 216–17; "Landakotskirkjan nýja," *Morgunblaðið* 15, no. 121 (27 May 1928): 5; Guðjón Samúelsson, "Kaþólska kirkjan," *Morgunblaðið* 15, no. 163 (7 June 1928): 6; Jónas Jónsson, "Byggingar VIII," 72–76.

[89] The surface render was removed by later restorations. See: "Kristskirkja í Landakoti," 212.

Fig. 20a – Guðjón Samúelsson, Catholic church at Landakot, Reykjavík, 1925–29. Inside view. Photo by Sofia Nannini, 2019.

Fig. 20b – The pillars after the construction. In the photo the pillars had not been plastered yet, so the precast blocks are still visible. 1928. Þjóðminjasafn Íslands/National Museum of Iceland.

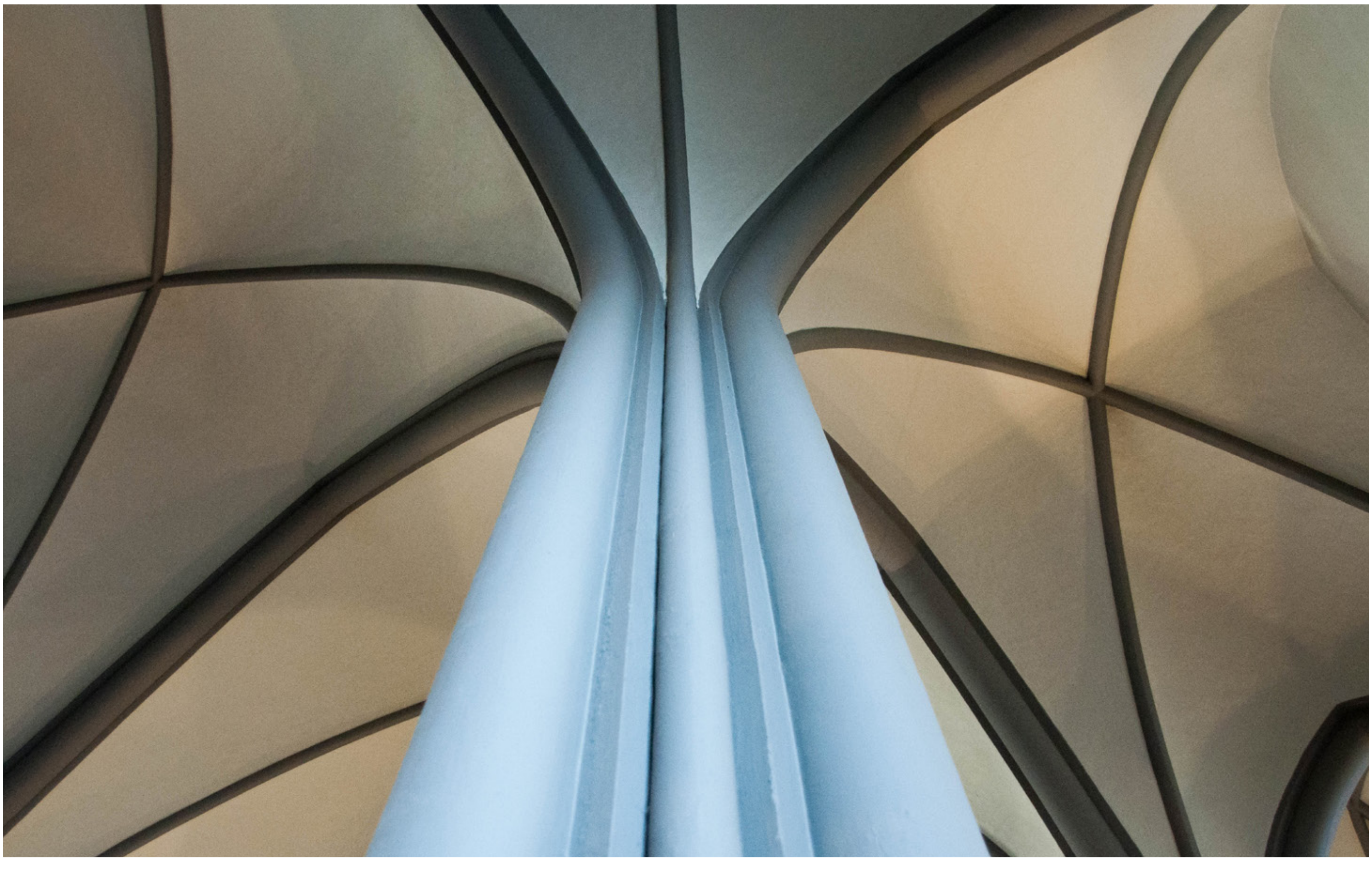


Fig. 20c – The pillars and the vaults today. Photo by Sofia Nannini, 2018.

show, the whole design was the result of an elaborate intertwining of wooden formworks which were used for the vertical walls and the "basaltic" pillars. Some photographs also show the presence of randomly-placed reinforcement bars within the outer buttresses. It is quite interesting to notice the efforts that were put into the design and construction of such concrete "basaltic" ornaments, while in truth Icelandic concrete construction and the related knowledge on concrete reinforcement had not fully developed yet.[90] **Figg. 21a–21b.** As soon as the construction came to an end, a debate started on the origins of this particular architectural decoration. On the one hand, traces of the same sculptural pattern had been seen in Reykjavík before, specifically as a decorative ornament on the façade of the Egill Jacobsen store in Austurstræti 9, Reykjavík, designed by mastermason Jens Eyjólfsson in 1920–21. On the other hand, however, the State architect reclaimed his paternity, asserting that thanks to him a surface decoration had achieved the sculptural look and the necessary dimensions able to transform a building into a piece of the Icelandic landscape.[91] Despite the argument related to its origins, the national meanings behind the "basaltic" ornament surely derived from Guðjón Samúelsson's intense quest for an architecture which could be considered Icelandic, and which could represent the country's cultural and natural richness.[92] **Figg. 22a–22c.** After the construction of the church at Landakot, concrete and basaltic-like decorations became the trademark of several public projects by Guðjón Samúelsson. The most prominent examples are the National Theatre, designed and built over a quarter of a century from 1925–50,[93] and the Lutheran church of Hallgrímur,[94] whose construction took even longer. The first design dates back to 1937, yet the building was eventually finished only in 1986. While in these two cases the basaltic motif emerges with particular intensity, simplified, more geometrical variations of the same ornament can also be found in the

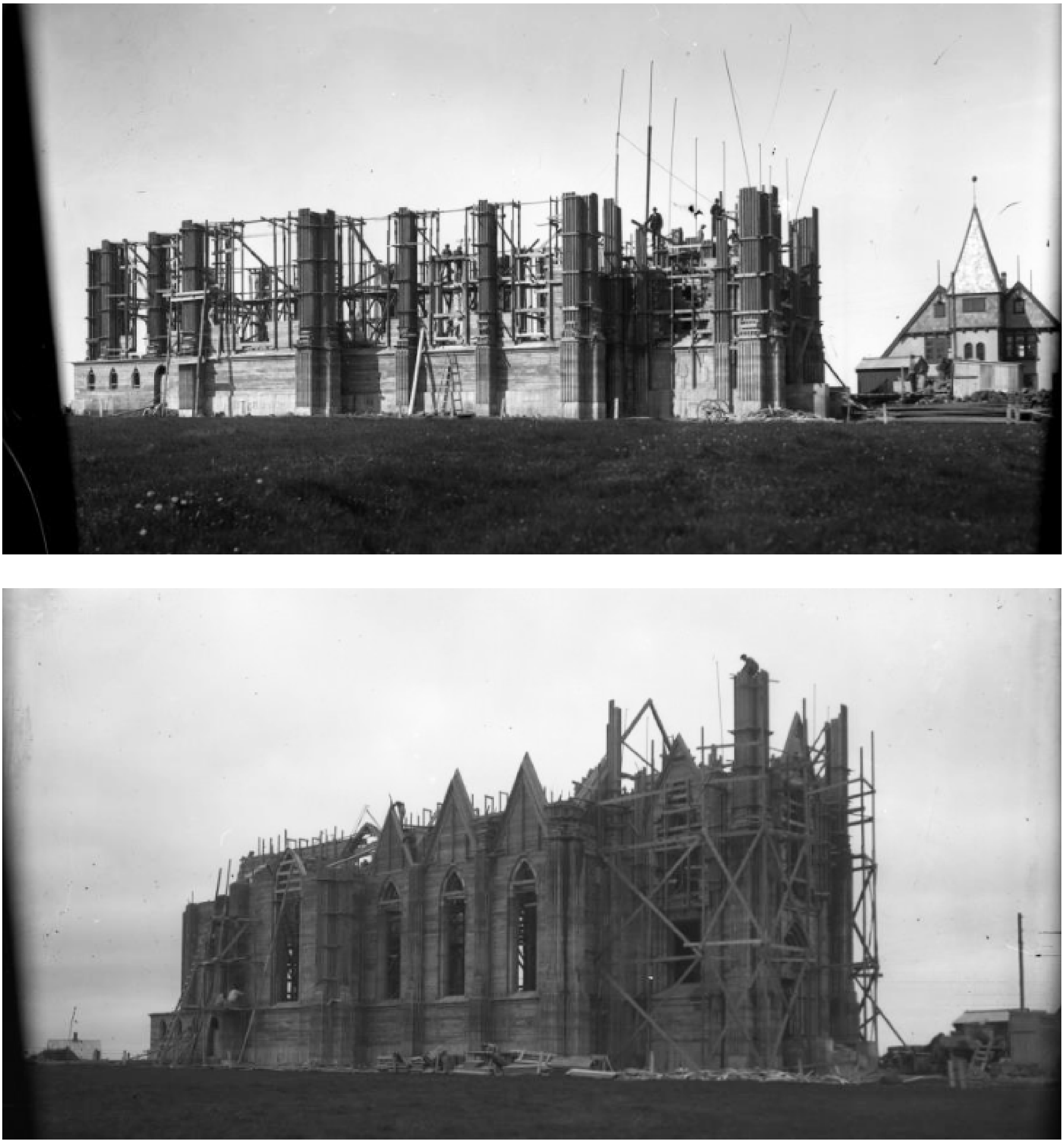
[90] In the report that described the works, Guðjón Samúelsson asserted that the pillars and the arches had to be built in reinforced concrete. However, the detailed drawings related to the reinforcement are not present in the National Archives. See the report in: ÞÍ, *Húsameistari ríkisins. Bréfa- og teikningasafn*, B/210. Örk 1, 1926–1996. *Ýmsar kirkjur*.

[91] The dispute appeared in pages of the *Morgunblaðið* newspaper, as Guðjón Samúelsson responded to an article published on the newly built church: "Landakotskirkjan nýja," *Morgunblaðið* 15, no. 121 (27 May 1928): 5; Guðjón Samúelsson, "Kaþólska kirkjan," *Morgunblaðið* 15, no. 163 (17 July 1928): 6.

[92] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 118.

[93] *Þjóðleikhúsið*. On the National Theatre, see: Jónas Jónsson, *Þjóðleikhúsið: þættir úr byggingarsögu* (Reykjavík: Ísafoldprentsmiðja, 1953), 118; Hörður Ágústsson, *Íslensk byggingararfleið I,* 350–51; Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 127–33; Pétur H. Ármannsson, *Guðjón Samúelsson húsameistari*, 246–59. The project was published in the British journal *The Builder*: Guðjón Samúelsson, "The National Theatre, Reykjavík, Iceland," *The Builder* 180, no. 5650 (June 1951): 784–85.

[94] *Hallgrímskirkja*, dedicated to Icelandic poet and Lutheran minister Hallgrímur Pétursson. On the construction and design of the church, see: Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging*, 62–67; Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 144–51; Sigurður Pálsson, *Mínum drottni til þakklætis: saga Hallgrímskirkju* (Reykjavík: Hallgrímskirkja, 2015); Pétur H. Ármannsson, *Guðjón Samúelsson húsameistari*, 316–36.



Figg. 21a–21b – The church in construction, 1927–28. Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 22a – The basaltic decoration on the outer pillars of the church. Photo by Sofia Nannini, 2019.

Figg. 22b–22c – Jens Eyjólfsson, Egill Jacobsen store in Austurstræti 9, Reykjavík, 1920–21.
Photos by Sofia Nannini, 2019.

church of Akureyri (1934–40) and the church of Laugarnes (1940–49).[95] **Figg. 23a–23d.**

In spite of the long construction process, the church of Hallgrímur eventually became Guðjón Samúelsson's most renowned project and also one of Reykjavík's landmarks thanks to its special position on top of Skólavörðurholt hill. The church is considered a "conclusion of Guðjón Samúelsson's research towards a national Icelandic architecture"[96] and it is Iceland's most recurring architectural project both in scholarly writings and tourist guides.[97] However, it is perhaps in the main hall of the National Theatre that the imitation of the basaltic formations reached its peak. There Guðjón Samúelsson created a tridimensional effect of concrete basaltic columns hanging from the ceiling, resembling the natural geology surrounding the Svartifoss waterfall. **Figg. 24a–24c.**

Jónas Jónsson was one of the main supporters of the "basaltic style" architecture by Guðjón Samúelsson. He created a narrative to guarantee the State architect's authorship over the basaltic ornament, and enthusiastically promoted the link between architecture and the natural landscape.[98] This association was particularly highlighted in Jónas Jónsson's monograph on Guðjón Samúelsson, where he often juxtaposed the images of the State architect's projects and photographs of Icelandic geological formations.[99] His metaphors were numerous: the church of Hallgrímur was "like a basaltic eruption",[100] the National Theatre was "a palace of elves, where the stones could talk and spoke strange languages. They [the inhabitants of Reykjavík] marveled at that dark cliff with the characteristics of Icelandic mountains."[101] Drawing on

---

[95] On the church in Akureyri see: Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging,* 58–59; on the church at Laugarnes, see pages 60–61 of the same text. On both churches, see: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 138–43.

[96] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 144.

[97] *Hallgrímskirkja* is the only project by Guðjón Samúelsson, and also one of the very few Icelandic buildings, appearing in Marian C. Donnelly, *Architecture in the Scandinavian Countries,* 333. See also the recent article on the Lutheran church by Aurél Bernárd, "Hallgrímskirkja, Reykjavík. A Late Example of Expressionist Church Architecture," *Journal of Built Environment* 6, no. 1 (2018): 86–102.

[98] He claimed that Guðjón Samúelsson had been influenced by the basaltic formations in Hofsós, Skagafjörður, which became a model for his buildings. See: Jónas Jónsson, Benedikt Gröndal, *Íslenzk bygging,* 109; Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 123. See also Jónas Jónsson's positive reception of the church at Landakot: Jónas Jónsson, "Landakotskirkja," *Tíminn* 11, no. 57 (23 December 1927): 217–18.

[99] See the title page of *Íslenzk bygging*, and also pages 13 and 44.

[100] Jónas Jónsson, "Hallgrímskirkja í Reykjavík," *Tíminn. Jólablað* (23 December 1942): 9–10.

[101] "Það var álfahöll, þar sem steinarnir höfðu mál og töluðu annarlegar tungur. Þeir undruðust þennan dökka klett með einkennum íslenzkra fjalla." Jónas Jónsson, *Þjóðleikhúsið: þættir úr byggingarsögu*, 118. Guðjón Samúelsson had already mentioned the parallelism between his theatre and "the palace of an elf king", see: Guðjón Samúelsson, "Íslenzk byggingarlist. Nokkrar opinberar byggingar á árunum 1916–1934," 75. The reference to a magical world of elves may be also linked to the first play which inaugurated the theatre opening in 1950: *Nýarsnóttin* [New Year's Eve] written in 1872 by Indriði Einarsson (1885–1939). The protagonist of the play is Áslaug, an elf-woman and representative of the hidden people. According to Icelandic mythology, elves were considered to live in the Icelandic mountains, inhabitants of Iceland since its geological formation. From the figure of Áslaug was created the Icelandic tradition of the *Fjallkona* (mountain-woman) related to the national

Fig. 23a – Guðjón Samúelsson, National Theatre, Reykjavík. 1925–50.
Photo by Sofia Nannini, 2018.

Fig. 23b – Guðjón Samúelsson, Church of Hallgrímur [Hallgrímskirkja], Reykjavík. 1937–86.
Photo by Sofia Nannini, 2019.

Fig. 23c – Guðjón Samúelsson, Church of Akureyri, Akureyri, 1934–40.
Photo by Sofia Nannini, 2019.

Fig. 23d – Guðjón Samúelsson, Church of Laugarnes, Reykjavík, 1940–49.
Photo by Sofia Nannini, 2018.

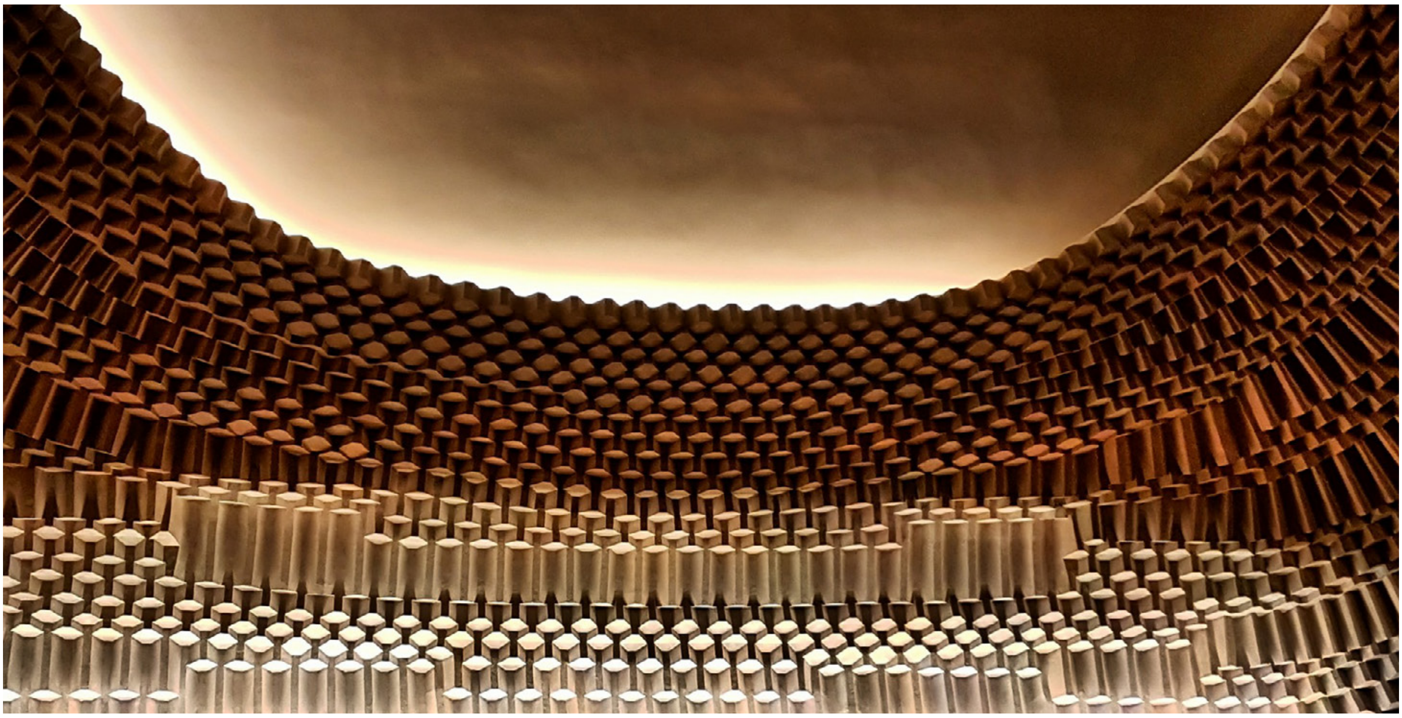


Fig. 24a – Guðjón Samúelsson, National Theatre, 1925–50. View of the main hall. Photo by Arlène Lucianaz, 2018.

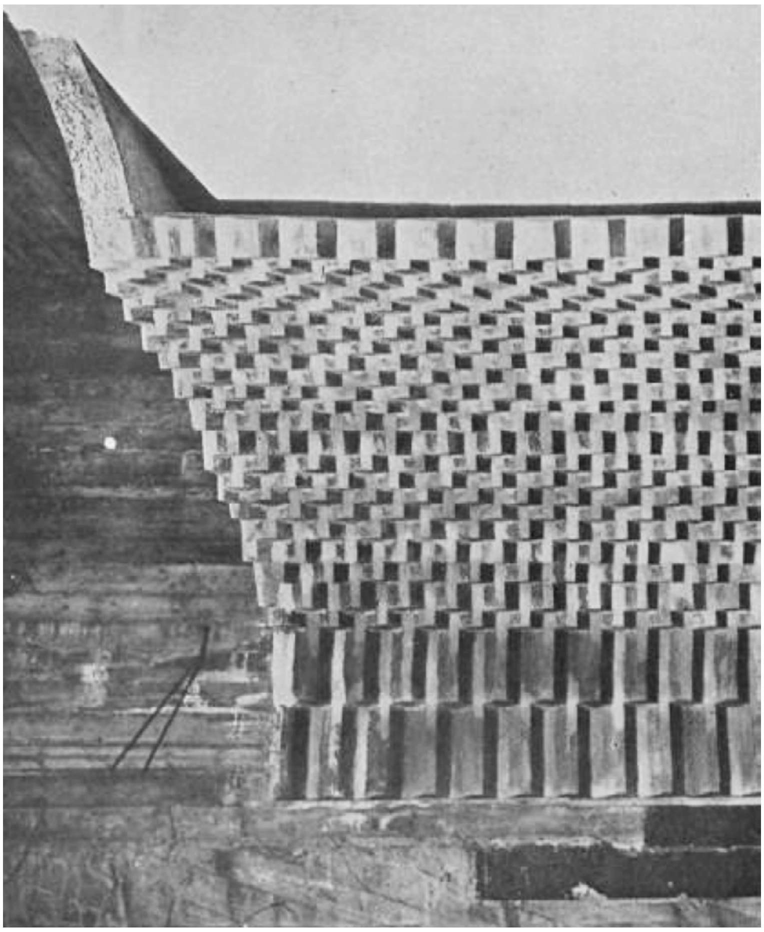


Fig. 24b – Guðjón Samúelsson, National Theatre, 1925–50. The main hall in construction. Guðjón Samúelsson, "Íslenzk bygginarlist," *Tímarit Verkfræðingafélags Íslands* 18, no. 6 (December 1933): 75.

Fig. 24c – Basalt formations at the Svartifoss waterfall, southern Iceland. Photo by Sofia Nannini, 2016.

Icelandic folklore such as the legend of “hidden people”, Jónas Jónsson described the State architect’s buildings in a way that made them look similar to Ásgrímur Jónsson’s imaginary and evocative paintings starring the Icelandic landscape.[102] **Figg. 25a–25b.**

Despite Guðjón Samúelsson’s ambition to create a national architecture based on shared values such as Icelandic nature, the creation of the “basaltic style” was not completely detached from the architectural developments of the continent. On the contrary, the State architect’s experiments had their roots in many European architectural examples, deriving from Denmark, Finland, and Germany. The most influential building was the Grundtivg church in Copenhagen, a gigantic architecture in refined brickwork designed by Danish architect Jensen-Klint in 1913 and built in 1921–40.[103] Not only was this church a prime source of inspiration for Guðjón Samúelsson, but as early as 1916 the Danish project had already been compared to “basaltic formations” by architect Carl Petersen (1873–1923).[104] **Fig. 26.** Another important reference could have been Eliel Saarinen’s monumental projects such as the Finnish Parliament (1908) or the Railway Station in Helsinki (built in 1919). Furthermore, one could also find echoes of the utopian crystalline architecture of German expressionism – such as Hans Poelzig’s (1869–1936) *Grossen Schauspielhaus* in Berlin (1918–19).[105] To this list one may also add some of Poelzig’s designs representing ideal, crystal-like architectures, such as the model for a chapel in Karlsruhe and some sketches for the *Majolikakapelle* in München (both 1921).[106] **Figg. 27a–27b.** A striking representation of an utopian architecture envisaged as a basaltic-like sculpture was sketched around 1920 by Dutch architect

---

celebration. See: Terry Gunnel, “The Development and Role of the *Fjallkona* (Mountain Woman) in Icelandic National Day Celebrations and Other Contexts,” in *Ritual Year 11: Traditions and Transformations*, edited by Guzel Stolyarova, Irina Sedakova, and Nina Vlaskina (Moscow: T8, 2016), 28–29. On the idea of a “supernatural landscape” embedded in Icelandic history and traditions, see: Miriam Mayburd, “The Hills Have Eyes: Post-Mortem Mountain Dwelling and the (Super)Natural Landscape in the *Íslendingasögur*,” *Viking and Medieval Scandinavia* 10 (2014): 129–54.

[102] *Huldufólk*. Elves are a key part of Icelandic folklore, and are present in many folktales. See: Einar Ólafur Sveinsson, *The Folk-stories of Iceland* (London: Viking Society for Northern Research, 2003), 170–82.

[103] On the design and construction of the church, see: Steen Eiler Rasmussen, *Nordische Baukunst* (Berlin: Verlag Ernst Wasmuth, 1940), 62–71; Jensen, *P.V. Jensen-Klint*, 288–391.

[104] Petersen writes about “basaltformationer” [basaltic formations] when describing the model of the church. Carl Petersen, “Grundtvig-Kirken,” *Berlingske Tidende* 168, no. 216 (3 August 1916): 3. The article is also quoted in: Jensen, *P.V. Jensen-Klint*, 290.

[105] Seelow has traced many comparisons between Guðjón Samúelsson’s buildings and projects that might have been influential: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 110, 124, 132, 149.

[106] *Wegkapelle für die Karlsruher Majolika-Fabrik*, 1921. Pehnt, *Die Architektur des Expressionismus,* 85. On Hans Poelzig see pages 81–89 from the same volume. “Majolikakapelle München”, in *Hans Poelzig. Der zeichnerische Nachlass* (Berlin: Galerie Bassenge, 2014), 78. It is however not sure if Guðjón Samúelsson was familiar with Poelzig’s drawings or not. On crystals and their symbolic meanings in expressionist architecture and art, see: Henrik Leschonski, *Der Kristall als expressionistisches Symbol. Studien zur Symbolik des Kristallinen in Lyrik, Kunst und Architektur des Expressionisms (1910–1925)* (Frankfurt: Peter Lang, 2008). Pehnt, *Die Architektur des Expressionismus*, 30–4. Wolfgang Pehnt, *Deutsche Architektur seit 1900* (München: DVA, 2006), 58–64.

Fig. 25a – Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging*, title page.

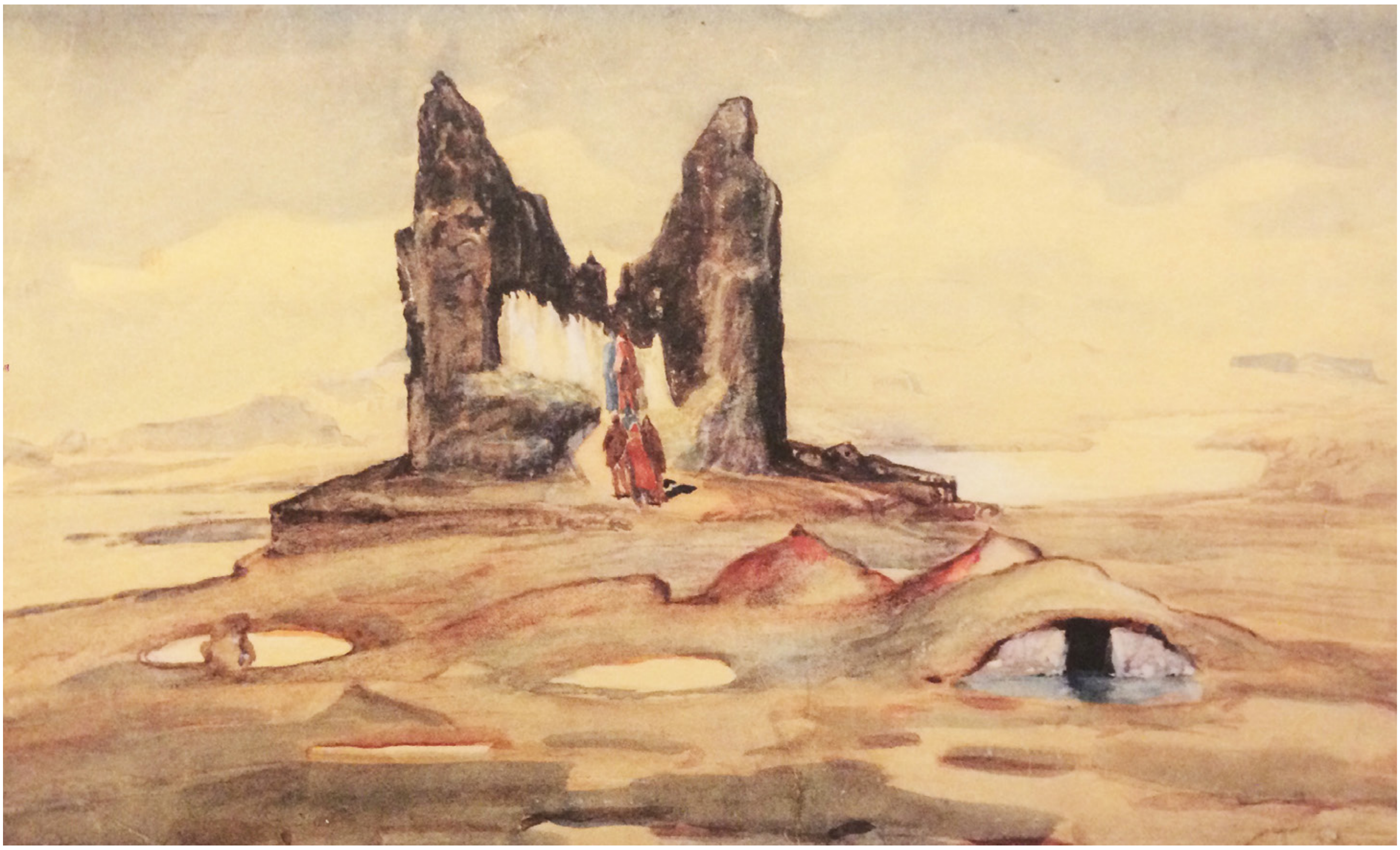


Fig. 25b – Ásgrímur Jónsson, *Álvakirkjan* [The Elf Church], 1905.
Listasafn Íslands/National Gallery of Iceland.

Fig. 26 – P. V. Jensen-Klint, Grundtvig Church, Copenhagen, 1921–40.
Photo by Michele Barale, 2018.

Johannes Christiaan Van Epen (1880–1960).[107] **Fig. 28.** While fantastic dreams of basaltic-like architectures and sculptures were mainly limited to sketches and models, at the edge of the continent Guðjón Samúelsson embraced concrete technology in order to actually produce an architecture with these decorative features. Parallel to the basaltic metaphor, Guðjón Samúelsson's vertical designs could also be compared to massive pipe organs, as Einar Jónsson's previously mentioned studio and museum had been described at its inauguration. Curiously, the image of the pipe organ for the design of a church can also be seen in projects built far away from Iceland in the 1930s: the top of the Chrysler Building in New York City (1930)[108] and the church of Pontinia, built in 1934–35 by Italian architect Oriolo Frezzotti (1888–1965). The church boasts a central concrete bell tower in the shape of a tall pipe organ; its verticality is surprisingly similar to Guðjón Samúelsson's churches.[109] **Figg. 29a–29b.**

Regardless of the intense debate it generated, the actual number of buildings characterized by the "basaltic style" is actually quite low. Almost simultaneously Guðjón Samúelsson transitioned to a slightly different architectural language, defined as "The Republic Style". The term was coined by Jónas Jónsson as a way to refer to many of Guðjón Samúelsson's public projects built between the late 1920s and the mid-1930s, forerunning the establishment of the Icelandic Republic. Less monumental and sculptural, they were characterized by marked vertical lines and usually flat roofs. These projects became very widespread throughout the country as ordinary public buildings like schools and swimming pools.[110] **Figg. 30a–30b.** Similarly to the "farmhouse style" endorsed by Jónas Jónsson, Guðjón Samúelsson's neo-gothic and basaltic design could be seen as an example of national style which was "born as a myth". As art historian Wolf Tegethoff argues:

> As an ostensible historical fact no less unreal than the very notion of pre-modern nations iteself, it nonetheless worked exceedingly well as hypothetical construct within

---

[107] Pehnt, *Die Architektur des Expressionismus*, 31.

[108] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 148; Pétur H. Ármannsson, *Guðjón Samúelsson húsameistari*, 336.

[109] On the construction of Pontinia see: "Italian New Towns as an Experimental Territory for the Modern Movement in Italy. The Case Study of Oriolo Frezzotti and His Architecture for Public Facilities in Littoria, Sabaudia, and Pontinia," in *Regionalism, Nationalism & Modern Architecture. Conference Proceedings. Porto, October 25–27 2018,* https://www.modscapes.eu/conference2018/proceedings/ , last accessed 20/09/2020. The church was heavily criticized by Giuseppe Pagano (1896–1945) in an article titled "Architettura nazionale," *Casabella* 85 (1935): 6–7 and the project was also present in a booklet published by Operazione Nazionale per i Combattenti, *Aprilia 25 aprile anno 14 E.F.: l'Agro Pontino al 29 ottobre anno 16 E.F.* (Roma L'Agro Pontino, 1937). A copy of the booklet is also held at the National Library of Denmark. It is impossible to understand if Guðjón Samúelsson was familiar with this project or, in general, with the architectural production of the Italian fascist regime. In summer 1935 Guðjón Samúelsson travelled to Europe to collect ideas for the construction of the university campus to be built in Reykjavík, visiting Norway, Denmark, Germany, and the UK. During his travel he might have been in contact with several architecture journals and reports on contemporary buildings and architectural projects, including examples from Italy.

[110] *Lýðveldisstíllinn*. See: Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging*, 111. See some examples in: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 209–10.

Fig. 27a – Hans Poelzig, Wegkapelle für die Karlsruher Majolika-Fabrik, 1921. Pehnt, *Die Architektur des Expressionismus*, 85.

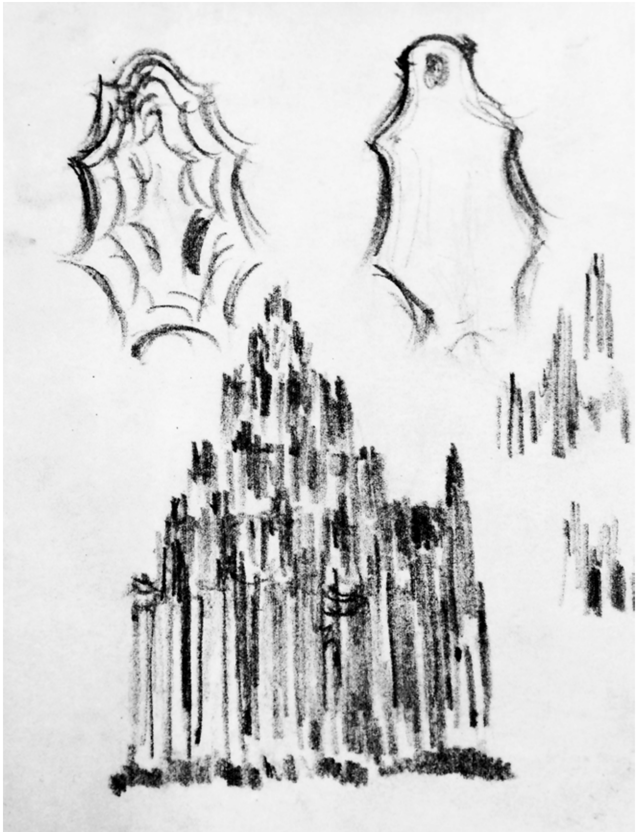


Fig. 27b – Hans Poelzig, Majolikakapelle, München, 1921.
Hans Poelzig. *Der zeichnerische Nachlass* (Berlin: Galerie Bassenge, 2014), 78.

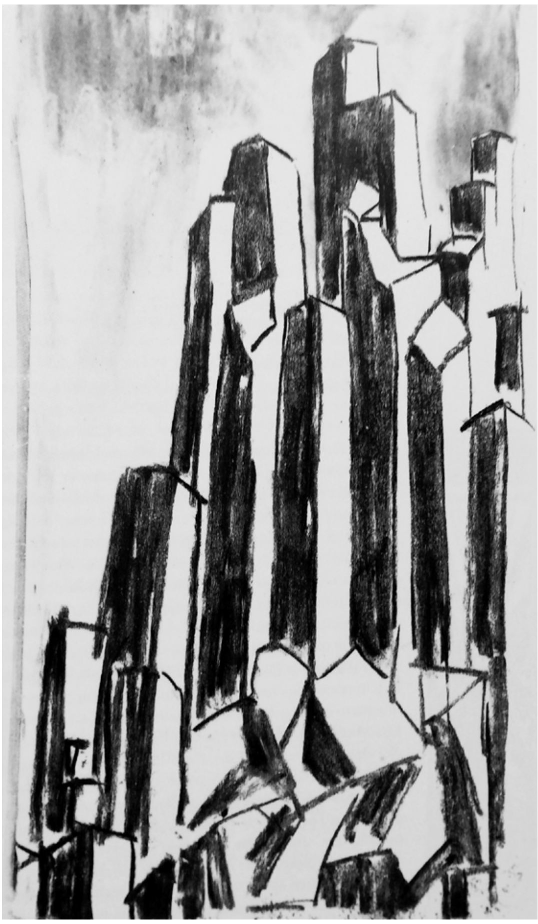


Fig. 28 – Johannes Christiaan Van Epen, *Architektur-fantasie*, 1920. Pehnt, *Die Architektur des Expressionismus*, 31.

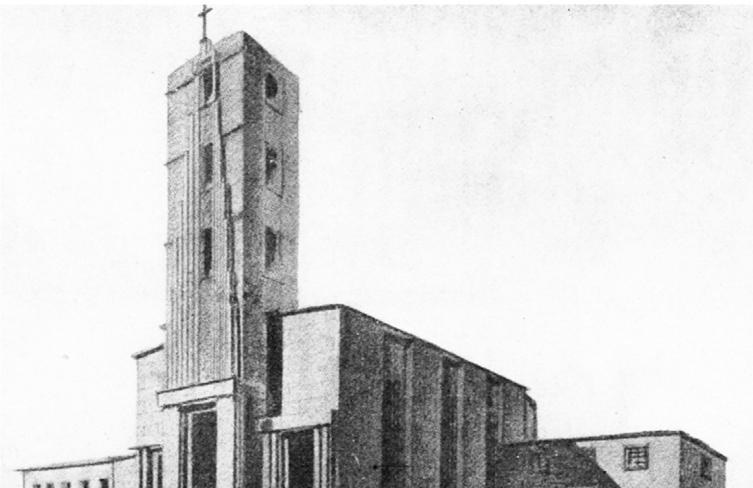


Fig. 29a – Oriolo Frezzotti, Church of Pontinia, 1934–35. Pagano, "Architettura nazionale," 6.

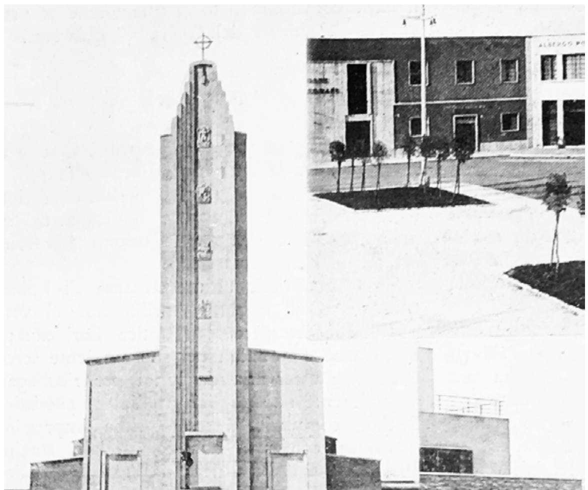


Fig. 29b – Church of Sant'Anna, Pontinia. *Operazione Nazionale per i Combattenti, Aprilia 25 aprile anno 14 E.F.: l'Agro Pontino al 29 ottobre anno 16 E.F.* (Roma L'Agro Pontino, 1937), 47.

> the ideological context of nineteenth- and early twentieth-century nationalism. However, when it came to actually creating an appropriate style expressing national identity, the concept utterly failed or produced quite ridiculous approximations.[111]

Emerging as an independent professional only after Iceland's recognition as a sovereign state in 1918, Guðjón Samúelsson's architecture focused on representing the country with new, fully Icelandic public buildings. By 1918, however, Iceland was *de facto* independent from Denmark; this implied, perhaps, that local experiments with traditionalist or symbolic buildings were not serving a specific political purpose and were soon replaced by more functional projects.[112]

Architectural historian Seelow identified the true peculiarity of the Icelandic "basaltic style" in its late emergence, if compared to the European movements it was inspired from. It is however important to highlight another specificity of Guðjón Samúelsson's basaltic architecture – a technical one, that is the all-encompassing use of concrete for its accomplishment. From a construction point of view, the role of concrete in the development of this sculptural ornament was undeniable: acting as a liquid stone, concrete could be moulded and modelled freely enough to obtain shapes able to imitate Icelandic nature, or even to emulate elaborate brickwork achievements such as the Grundtvig church. As seen in the photographs of the building site for the church at Landakot the complex design behind many "basaltic" ornaments in concrete was the result of an intricate castle of wooden formworks, which helped achieve the casting of the structure and the decoration at the same time. Such an attention given to wood-working could have been linked to the knowledge on timber construction shared by many Icelandic workers, who had worked extensively with timber before the new fashion for concrete rose in the mid-1910s. Although these structures and their decorations were envisaged and built in concrete, up to this point little has been said on the surface of Guðjón Samúelsson's architecture. Obviously, the concrete skin could not be left naked, both for protective and aesthetic purposes. The following paragraph will focus on the technique adopted by the State architect to surmount this issue, and on the large influence it had on Icelandic architecture until the postwar years.

[111] Wolf Tegethoff, "Art and National Identity," in *Nation, Style, Modernism. CIHA Conference Papers*, 17.
[112] Guðmundur Hálfdanarson, "Severing the Ties – Iceland's Journey from a Union with Denmark to a Nation-State", 246–47.

Fig. 30a – Guðjón Samúelsson, School in Reykholt, 1929–31.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 30b – Guðjón Samúelsson, Reykjavík Swimming Pool, 1929–37.
Þjóðminjasafn Íslands/National Museum of Iceland.

4.3 Geology and the Surface of Concrete[113]

Late nineteenth- and early twentieth-century Icelandic architecture was not affected by any specific debate regarding a "new national style focused [...] on the nature and authenticity of materials".[114] Timber, on the one hand, was not as largely available as in the other Nordic countries and it could not sustain the construction of national buildings. On the other hand, natural stones and their use in architecture were not at the center of the attention, whereas the topic had kept many architects and builders occupied in Norway, Sweden, and Finland.[115] Icelandic builders were not indifferent to this issue: as seen in chapter one, Sverrir Runólfsson strived for a construction method employing Icelandic stones, such as rough lava and basalt. However, not only had Icelandic stones always been very hard to quarry and work, thus preventing their steady use as building material, but the material was also historically linked to the buildings erected according to the design of Danish architects. When Guðjón Samúelsson started working in Iceland, concrete was everywhere: it had established itself as the most popular building technique, out of necessity and thanks to the tireless work of many Icelandic engineers and construction experts. Yet there was another step to take: how to transform a common, poor technique into a national material? How to let the richness of the Icelandic lanscape emerge from bare concrete walls? If imitating the basaltic formations was basically a matter of architectural design and proper placement of the formworks, how did Icelandic builders achieve a truthful metamorphosis of cast concrete into Icelandic natural stones? Instead of cladding the concrete structures with stone slabs, as it had already been done in many Finnish and Norwegian buildings, Guðjón Samúelsson, together with many Icelandic architects and builders, was looking for a different solution. The goal was to solve both this and also other practical problems – to hide the flaws and inaccuracies of rough concrete surfaces and protect them from the harsh arctic weather. To tackle these problems, at the beginning of the 1930s he proposed the use of a local, Icelandic version of cement-based pebbledash.

4.3.1 The other side of concrete: Excursus on formworks in Iceland (1876–1944)

Before retracing the development and debates around Guðjón Samúelsson's finishing technique, it is important to synthesize what has been said about formworks in Iceland in the first half of the twentieth century. The importance of formworks in concrete construction is great, encompassing both issues of technique, manufacture,

[113] This paragraph is an extended version of a research published in: Sofia Nannini, "Icelandic Concrete Surfaces: Guðjón Samúelsson's *Steining* (1930–50)," in *Iron, Steel and Buildings: the Proceedings of the Seventh Conference of the Construction History Society*, 541–52.

[114] Lane, *National Romanticism and Modern Architecture in Germany and the Scandinavian Countries*, 174.

[115] See, for example, the claim that granite was a "Nordic" stone with a character matching the inhabitants of the Nordic countries. Ringbom, *Stone, Style, and Truth,* 50.

and design.[116] As seen in the first chapter, the first experiment with cast conglomerate and formworks was the small house built in Garðar, Akranes. In 1885 building expert Georg Ahrens first mentioned the use of formworks in a newspaper article, relying on his experience in Germany.[117] In 1895 the construction of the farm at Sveinatunga not only became an important chapter in Icelandic construction history, but it also led to what was known as "the formwork of Sveinatunga."[118] This kind of moveable, timber formwork became very widespread in concrete construction in Iceland until the late 1940s (see figure 23 in chapter 1). Although many authors mentioned the possibility of both iron and timber formworks, timber mainly established itself as the main source this production.[119]

This development could sound counterintuitive, considering the absence of wood in the country and the high costs related to its import. However, many building companies specialized in timber had been active in Iceland since the late nineteenth century. With the rise of concrete construction they adapted to the necessities of the new technique, thus producing formworks. The company *Völundur*, for example, specialized in timber structures, in the 1920s advertised the production and sale of timber formworks.[120] Furthermore, since the early 1920s timber planks for formworks were increasingly advertised in many journals and newspapers: they were usually sold by those very traders who also offered cement, corrugated iron, and other building materials.[121] **Fig. 31.** Much information on how formworks were conceived in the first decades of the century can be found in Guðmundur Hannesson's handbook on

---

[116] Despite the key importance of formworks in concrete construction, only a few studies focus on their production and application. See a brief mention to formworks in: Forty, *Concrete and Culture*, 235; see also the essay by Stefania Mornati, "Le coffrage comme matrice figurative: du travail du charpentier au produit industriel," in *Édifice & Artifice,* 623–31. Most studies on formworks refer to specific twentieth-century architects and builders, such as Le Corbusier (1887–1965), Pier Luigi Nervi (1891–1979), Louis I. Kahn (1901–74). On how formworks were treated as a pivotal building and artistic element by these figures, see: Roberto Gargiani, and Anna Rosellini, *Le Corbusier: Béton Brut and Ineffable Space 1940–1965* (Lausanne: EPFL, 2011), 158–70; Roberto Gargiani, *Louis I. Kahn: Exposed Concrete and Hollow Stones* (Lausanne: EPFL, 2014), 68–70, 211–14, 238–48; Thomas Leslie, *Beauty's Rigor: Patterns of Production in the Work of Pier Luigi Nervi* (Urbana/Chicago/Springfield: University of Illinois Press, 2017), 70–95. On the use of formworks for shell roofs, see: Ciarán Conlon, "James Hardress de Warenne Waller and His Contribution to Shell Roof Construction, Concrete and Fabrick Formwork Technologies," in *Nuts and Bolts of Construction History. Culture, Technology and Society, Vol.3*, edited by Robert Carvais, André Guillerme, Valérie Nègre, Joël Sakarovitch (Paris: Picard, 2012), 125–32. In line with these studies, Alberto Bologna's recent volume on Chinese contemporary concrete architecture highlighted the imperfect use of formworks as a design goal among many aricitectural studios. Alberto Bologna, *Chinese Brutalism Today: Concrete and Avant-Garde Architecture* (San Francisco: ORO Editions, 2019), 112–46.

[117] Georg Ahrens, "Um sementsteypu," 9–10.

[118] *Sveinatungumót*. Most likely thanks to a direct conversation with one of the builders, Guðmundur Hannesson included a section of the formwork in his book, and named it after the farm. Guðmundur Hannesson, *Húsagerð á Íslandi*, 248.

[119] Georg Ahrens, "Um sementsteypu," 9–10; Jón Þorláksson, "Nýtt byggingarlag. Steyptir steinar, tvöfaldir veggir," 290.

[120] See an example of the company's advertisement in: "Völundur," *Vísir* 12, no. 126 (6 June 1922): 4.

[121] One of them was engineer Jón Þorláksson, who extensively traded building materials in Iceland through his company *J. Þorláksson & Norðmann*. See for example the advertisement in: "Byggingar-efni," *Morgunblaðið* 12, no. 23 (9 August 1925): 1.

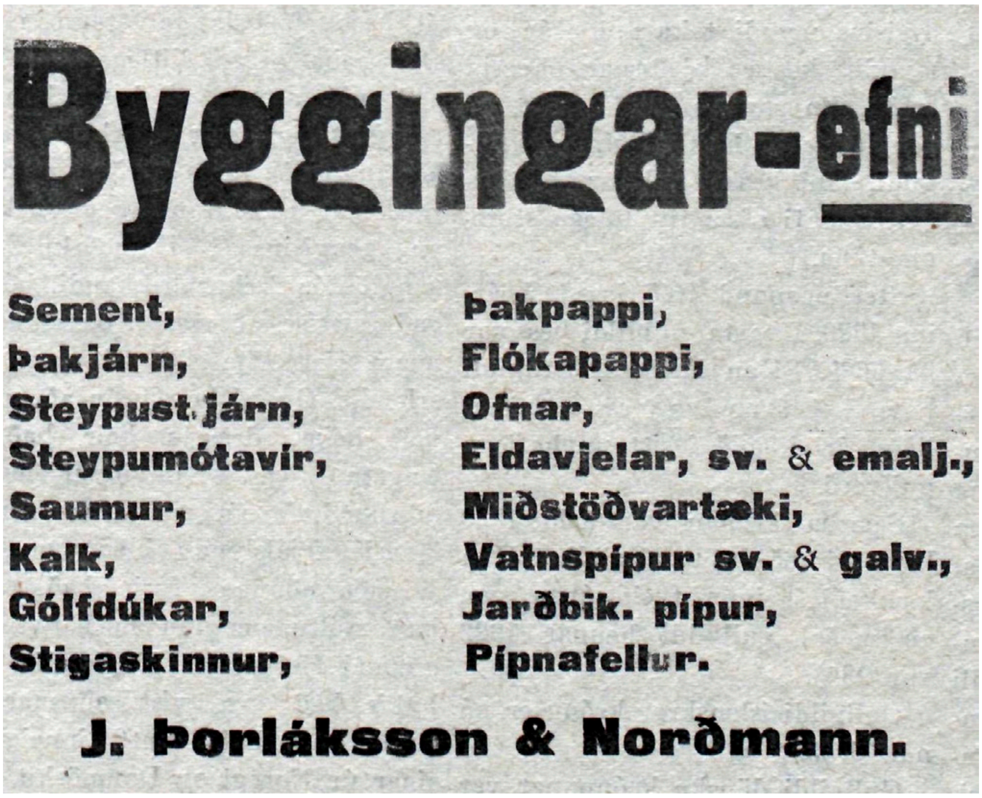


Fig. 31 – Advertisement for building material sold by the company J. Þorláksson & Norðmann. Timber formworks are included in the list [*steypumótavír*]. *Morgunblaðið* 12, no. 231 (9 August 1925): 1.

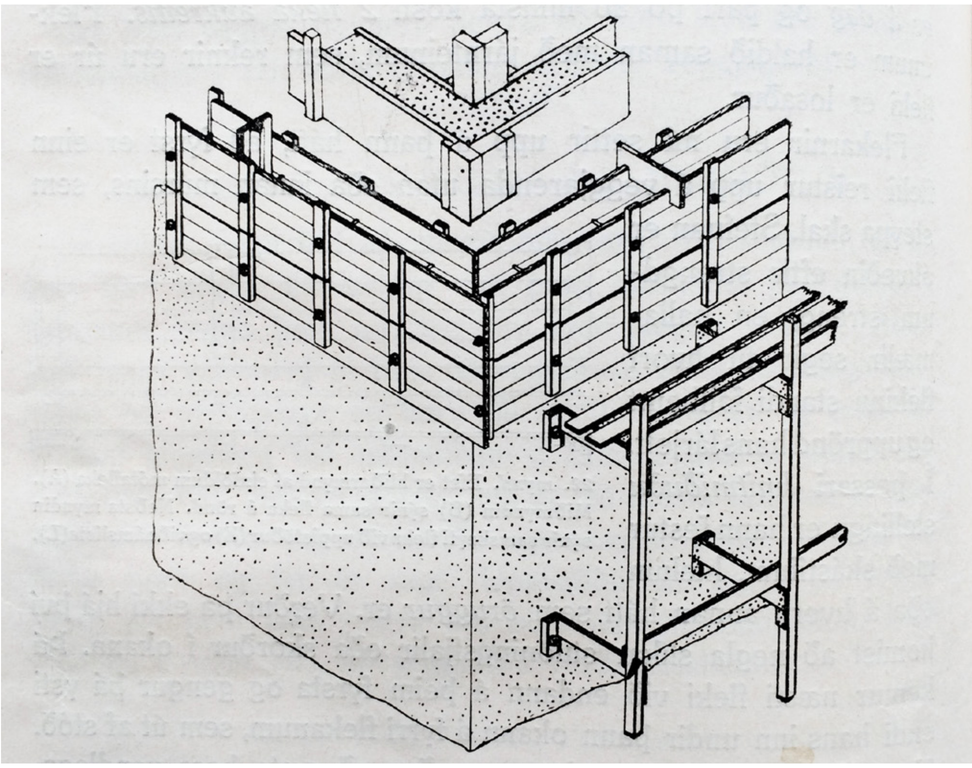


Fig. 32 – Axonometric drawing of moveable timber formworks. Guðmundur Hannesson, *Steinsteypa. Leiðarvísir fyrir alþýðu og viðvaninga*, 1921, 72.

concrete and also in his later book on Icelandic construction history.[122] The author listed four different kinds of formworks in use in Iceland: the moveable formwork named after the Sveinatunga farm; a formwork made of timber planks and without vertical supports; the "formwork of Reykjavík", very popular in the city, with vertical and diagonal supports, and another moveable formwork called "pincers formwork".[123] **Fig. 32.** Eventually the "formwork of Reykavík" became the most popular method for casting concrete: many examples of these formworks can be found in photographs dating back to the 1930s and '40s. The peculiarity of such formworks was based on the presence of metal elements, connecting the two outer vertical supports. If these connections were made of wire, they were left within the concrete walls and hidden while smoothing its surface. At times the connections were instead made of cylindrical iron bars, which were pulled out from the walls creating small holes both on the timber supports and within the concrete. **Figg. 33a–33c.**

Timber was also used to make the formworks for the production of concrete cast stones, like those manufactured by the companies *Mjölnir* and *Steinar.*[124] **Fig. 34.** Since the late 1920s a few brands of hardboard were publicized in Icelandic newspapers, such as the Austrian *Heraklith* and the American *Masonite*, which could be used as formworks as well as insulating panels.[125] After the Second World War most building technology changed, including formworks. A greater variety of materials and tools became available, such as cranes and moveable formworks in metal and steel.[126]

In the years of Guðjón Samúelsson's activity, imperfections on concrete surfaces could derive from many causes related to formworks – maybe they were not properly placed, or were made of reused material.[127] Yet it was not only formworks which caused imperfections on the surface: the cause often was the inacurrate mix ratio of the components, and sometimes also the large amount of water added to the mixture.[128] Until the early 1920s concrete was usually mixed by hand, poured within the formworks through barrels, and levelled with paddles. To ease this task, some builders started adding greater amounts of water in order to produce a less dense

---

[122] Guðmundur Hannesson, *Steinsteypa*, 66–76; Guðmundur Hannesson, *Húsagerð á Íslandi*, 259–61

[123] As called by Guðmundur Hannesson: *Sveinatungumót*; *flekamót; Reykjavíkurmót* (or *þiljamót*); *tangarmót*.

[124] Guðmundur Hannesson, *Steinsteypa*, 44–48.

[125] See the advertisement of *Heraklith* in *Morgunblaðið* 16, no. 81 (10 April 1929): 4. See the advertisement for *Masonite* in: *Morgunblaðið* 21, no. 24 (28 January 1934): 8. On *Masonite* and *Heraklith/Eraclit* see also: Mornati, "Le coffrage comme matrice figurative," 624.

[126] An example is the *skriðmót* formwork, in timber or metal, that is moveable thanks to a hydraulic lifting system. See: Lýður Björnsson, *Steypa lögð* og steinsmíð rís, 145–50. Today the categories of *þiljumót* and *flekamót* still exist: the former is referred to formworks with greased timber planks and timber vertical structures; the latter instead is referred to formworks with a metal structure, supporting greased horizontal timber planks. I would like to thank *múrari* Jakob Maríasson for the precious information and Arlène Lucianaz for her help in the translation.

[127] Advertisement on "old formworks" can be found in many newspapers in the 1930s and 1940s. See for example: "Steypumótaviður," *Morgunblaðið* 14, no. 125 (3 June 1927): 4.

[128] Guðmundur Hannesson, *Húsagerð á Íslandi*, 261–64.

Fig. 33a–33b – The “formwork of Reykjavík” in use, ca. 1933–38.
Borgarsveit (above) and the Westman Islands (below). Þjóðminjasafn Íslands/National Museum of Iceland.

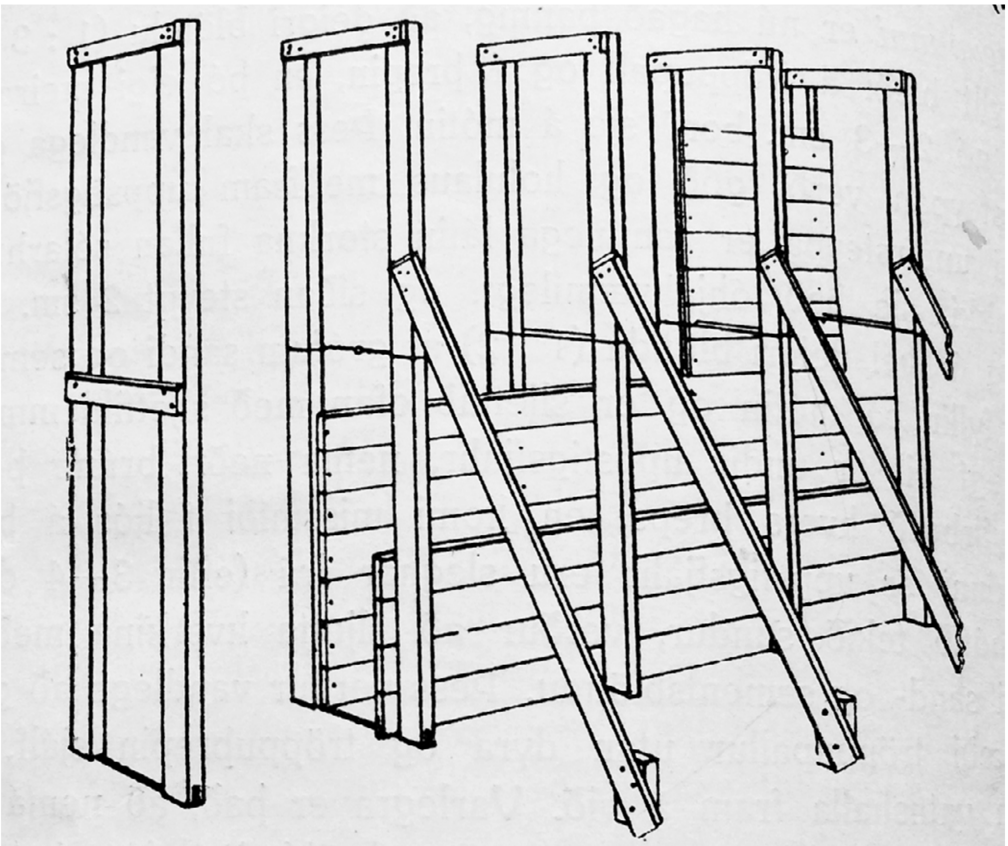


Fig. 33c – Drawing of the “formwork of Reykjavík”.
Guðmundur Hannesson, *Steinsteypa. Leiðarvísir fyrir alþýðu og viðvaninga*, 1921, 66.

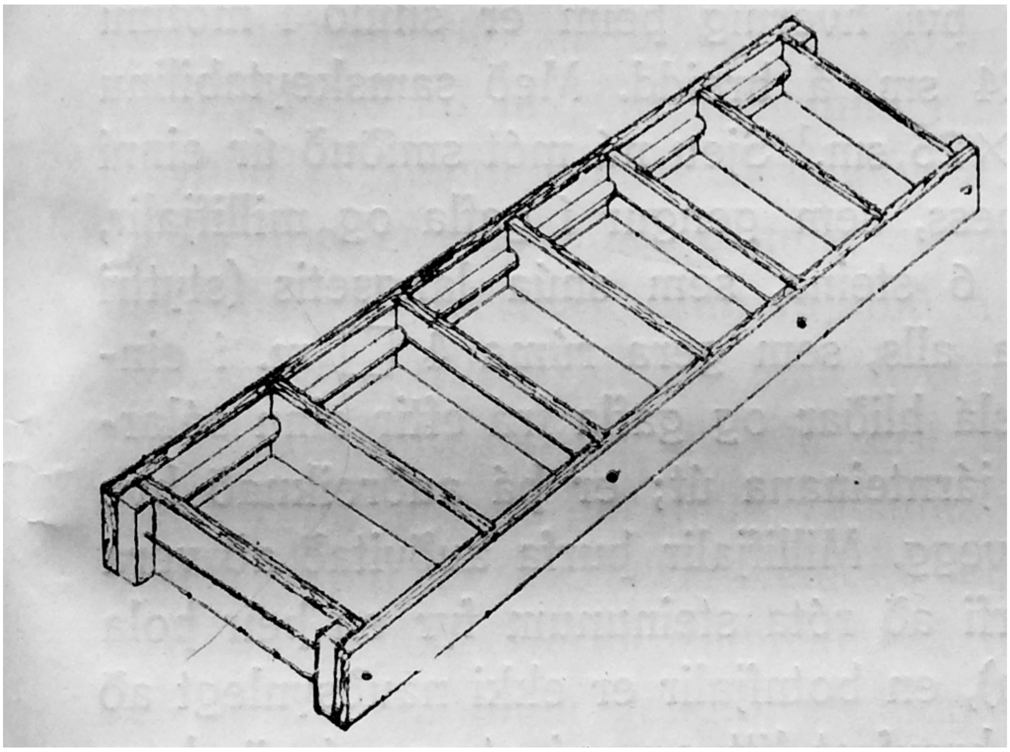


Fig. 34 – Drawing of timber formworks for concrete cast stones.
Guðmundur Hannesson, *Steinsteypa. Leiðarvísir fyrir alþýðu og viðvaninga*, 1921, 49.

Fig. 35a – Concrete mixer in use during the works for a pier in the harbour of Hafnarfjörður. Photo by engineer Thorvald Krabbe, 1912.
Þjóðminjasafn Íslands/National Museum of Iceland

Fig. 35b – Horse-powered concrete mixer in use in the countryside.
Undated photography.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 35c – Rural concrete construction, Bæjarhreppur, ca. 1935–45.
Þjóðminjasafn Íslands/National Museum of Iceland.

mixture, which however resulted in weaker structures.[129] Concrete mixers first appeared in the mid-1910s, yet in the countryside such machines were mostly amateurishly constructed and usually powered by horses. **Figg. 35a–35c.**

Overall, bare concrete surfaces were usually uneven and rough, exposed to the harsh weather conditions of the country and its winters. Cement plasters were normally applied to the outer surfaces, yet with mixed outcomes in terms of waterproof qualities and aesthetic appreciation.[130] By the early 1930s, Guðjón Samúelsson arrived at a solution: turning a common pebbledash render into *steining*, his own patented, all-Icelandic, and largely debated finishing technique.

4.3.2 Winter is coming: The origins and decline of *steining* (1930–50)

The State architect first experimented with his own version of a concrete render in 1930, when he was supervising the works for the National Theatre in Reykjavík.[131] The theatre was one of the most expensive architectural projects ever erected in the country and was majestic for Icelandic standards.[132] As seen previously, the building process mirrored the low-skilled labour that characterized the Icelandic construction industry until the postwar years. Not only were the vertical structures exceedingly thick, but there were also many inacurracies in the placement of the formworks. Cement finishings had already been in use in Iceland since the early 1920s, as the outer surfaces had always been "the greatest trouble" of Icelandic concrete construction.[133] Outer concrete walls were usually coated with a cement plaster made with 1 part cement and 2 parts sand, a few centimeters thick.[134] Due to cold temperatures, however, the cement plaster tended to come off from the concrete walls, which were often subject to cracks.[135] Within this context, the emergence of *steining* was due to two unrelated factors. On the one hand, the worldwide economic downturn had struck Iceland, causing a halt in the construction of the theatre. On the other, the severe climate conditions of the Icelandic winters exposed the concrete surfaces to the rigors of snow and strong winds. By 1933, the theatre was completed, yet it remained empty of furniture and finishing. **Fig. 36.**

Fearing permanent damage, engineer and then mayor of Reykjavík Jón Þorláksson suggested that rough concrete surfaces be protected by cement and gravel

[129] Guðmundur Hannesson, *Húsagerð á Íslandi*, 255–57.
[130] Guðmundur Hannesson, *Húsagerð á Íslandi*, 265.
[131] Jónas Jónsson, *Þjóðleikhúsið: þættir úr byggingarsögu*, 67–70.
[132] For the overall costs of the building, see: Jónas Jónsson, *Þjóðleikhúsið: þættir úr byggingarsögu*, 98–105.
[133] Guðmundur Hannesson, *Húsagerð á Íslandi*, 264.
[134] See for example the description of the coating of the National Hospital, designed by Guðjón Samúelsson. "Alt húsið skal húðað utan úr cementsblöndu 1–2, cement og sands um 20 cm á þykt [...]" [The whole building will be coated with a cement mix 1–2, cement and sand, around 2cm thick...]. ÞÍ, *Húsameistari ríkisins, Bréfa- og teikningasafn*, B/9, *Landspítalinn*. Örk.1.
[135] On top of that, cement coating was considered too expensive. See: Jón Gunnarsson, "Hví er verið að "pússa" steinhúsin?," *Tíminn* (25 July 1931): 4.

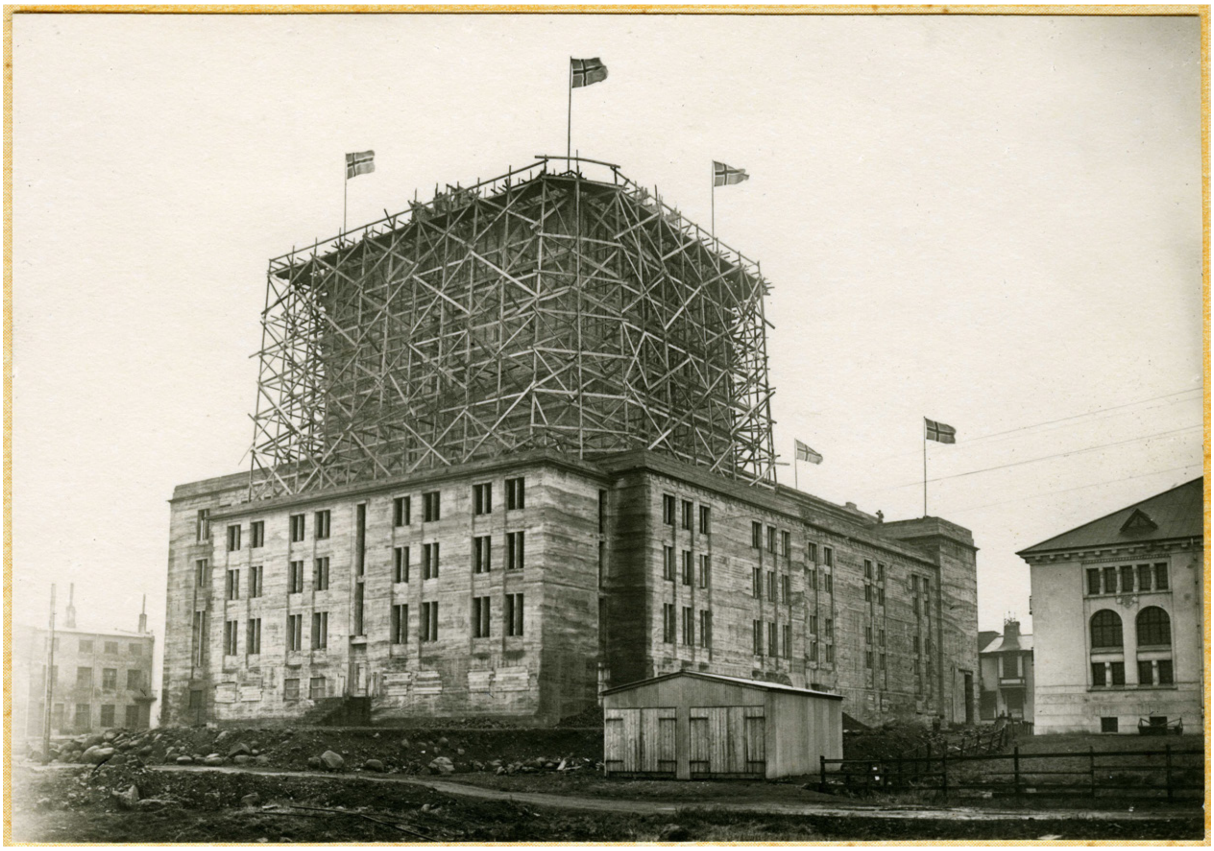


Fig. 36 – The National Theatre in construction, 1932. Photo by Loftur Guðmundsson. Þjóðminjasafn Íslands/National Museum of Iceland.

MINERALIT

er et vakkert og holdbart facadepus- og kunststensmateriale, som anvendes til bygnings- have- og kirkegaardsutstyr. Det ligner natursten, er like saa holdbart, og meget billigere. Se gesimsen paa Creditbankens nye bygning i Prinsensgate, Oslo. De trodde det var granit, ikke sandt? Den er støpt i Mineralit støpemasse, og den hvite facade er pudset med Mineralit facadepudsmateriale Likesaa Christiania Roklubs nye bygning i Frognerkilen, Nitedals Tændstikfabriks nye kontorbygning og mange andre.

Materialet leveres i alle farver og for alle formaal. Mineralit er et norsk produkt og fabrikeres og forhandles kun av

A/S KRISTIANIA MØRTELVÆRK, BESTUM

Fig. 37 – *Mineralit* advertisement in the Norwegian newspaper *Akers-Posten* 20, no. 47 (29 September 1925): 5. Courtesy of the National Library of Norway.

render. However, by the early 1930s another issue had started occupying the minds of Icelandic builders: leaving the concrete surface unfinished, or even coating them with another grey layer of cement, was not considered aesthetically pleasing. In 1903, Jón Þorláksson had already suggested the use of sand "of different colours" to decorate concrete cast stones.[136] In 1926, artist Guðmundur Einarsson (1895–1963) proposed the coating of concrete buildings with white quartz powder, "as if they were made of light grey marble".[137] Later on, in 1942, Guðmundur Hannesson claimed that the colour of concrete was "unusually ugly", therefore the builders had to prevent the "drowned rat effect" deriving from cement plasters.[138] When it came to protecting and decorating the surfaces of the theatre, in order to avoid a bleak grey layer on the whole building Guðjón Samúelsson first proposed using the Norwegian *Mineralit* render, known in Iceland as *Mineralpuss*.[139] Used in Iceland since the early 1930s, *Mineralit* consisted in a mix of ground granite and mortar, applied on the outer walls and cleaned with hydrochloric acid: a version of what is generally known as roughcast.[140] *Mineralit* was well advertised on the Norwegian press, especially for its similarity to real granite ashlars. **Fig. 37.**

Due to the economic downturn, by 1933 importing foreign materials was too expensive, and this additional restriction inspired Guðjón Samúelsson to experiment with local geological resources.[141] The theatre was entirely rendered with a sort of pebbledash boasting a selection of Icelandic rocks, such as obsidian, quartz, rhyolite, and the particularly precious Iceland spar.[142] If, at first, the decision was triggered by economic and structural reasons, the final result pointed in a completely different direction: transforming a cheap, yet necessary finishing technique into an ode to the Icelandic landscape and a precious enrichment of the new Icelandic architecture. **Figg. 38a–38b.**

The architect vs. the mastermasons: A debated patent

Considering its components and application, Guðjón Samúelsson's *steining* bore a strong resemblance to the largely widespread British pebbledash, in use in Iceland since the 1920s.[143] Roughcast and pebbledash are lime- or cement-based renders which were particularly popular in Scotland and England at the end of the nineteenth century and beginning of the twentieth. Thanks to their rustic look, they were largely employed by architects of the Arts and Crafts movement, seeking for traditional and

---

[136] Jón Þorláksson, "Nýtt byggingarlag," 301.

[137] Guðmundur Einarsson, "Háborgin," *Eimreiðin* 32, no. 3 (1926): 244.

[138] Guðmundur Hannesson, *Húsagerð á Íslandi*, 265.

[139] Kornelíus Sigmundsson, "Hrafntinnu-kvartshúðunin," *Tímarit iðnaðarmanna* 12, no. 3 (1939): 33.

[140] Sigurður Guðmundsson had applied *Mineralit* to two villas built in Reykjavík in 1930–31. See: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 242.

[141] Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging*, 68.

[142] Guðjón Samúelsson, "Íslenzk byggingarlist," 76.

[143] Pebbledash in Icelandic was commonly known as *perluákast*. Guðmundur Hannesson reported that the technique was first used by architect Sigurður Guðmundsson in 1927. Guðmundur Hannesson, *Húsagerð á Íslandi*, 265.

Figg. 38a–38b. *Steining* render on the National Theatre. The darker shades are related to the presence of obsidian fragments. Photos by Sofia Nannini, 2018.

vernacular techniques.[144] Applications of roughcast renders can be found at Hill House, built in 1902–04 by Charles Rennie (1868–1928) and Margaret Macdonald Mackintosh (1864–1933) and coated with a Scottish version of roughcast called *harling* and at Baillie Scott's 22 Hampstead Way (1908–09), North London.[145] Both techniques share the use of pebbles and a cement or lime mortar, yet they are slightly different: the roughcast implies that pebbles are directly mixed with the mortar and then applied on the surface. On the contrary, to make pebbledash a thin layer of mortar is first spread on a limited area of the wall, then the ground stones are quickly applied with the help of a trowel.

As early as 1934 Guðjón Samúelsson desperately tried to patent his *steining* coating in Iceland, by sending his documentation to the Ministry of Industry.[146] In particular, he highlighted a few characteristics that would make his *steining* different from common pebbledash and more suitable to cold climates.[147] He insisted that the binding agent for the underlayers should be only cement, in order to make it as resistant as possible against the Icelandic climate. A first layer had to be applied to the whole surface, and its mortar had to be composed of 1 part cement, 2 ½ parts hard sand. The second layer was spread on to one small area at a time, its mixing ratio had to be 1 : 2, and around 4mm thick. Hard stones had to be chosen for the final layer, ground and applied by hand with a trowel. After a few days the whole surface could be washed with normal or slightly acid water. **Fig. 39.**

In May 1935 the Icelandic Ministry refused filing the patent.[148] By 1939, however, the architect managed to file patents in both Denmark (1937) and in the UK (1939), and afterwards he resubmitted the patent documents to Iceland.[149] He was supported by several politicians, such as Jónas Jónsson and Þorsteinn Briem (1885–

---

[144] On roughcast and pebbledash in the Edwardian period, see: Jonathan Taylor, "Edwardian Pebbledash and Roughcast," Building Conservation. https://www.buildingconservation.com/articles/pebbledash/pebbledash.htm, last accessed 2/09/2020. On render and coating techniques in England, see: Alison Henry, and John Stewart, eds., *Practical Building Conservation: Mortars, Renders, and Plasters* (London: Ashgate, 2012). See also the definition of roughcast in: William Millar, *Plastering. Plain and Decorative* (London: B. T. Batsford, 1899), 210–11.

[145] On traditional Scottish *harling*, see: Craig Frew, "Lime Harling," Building Conservation. https://www.buildingconservation.com/articles/lime-harling/lime-harling.htm, last accessed 2/09/2020. Deterioration of the *harling* render on the Hill House has led to a substantial renovation project which was much discussed: the studio Carmody Groarke built a shed around Mackintosh's building for its protection during the works. See: Ike Ijeh, "Shelter from the Storm," *Building* 285, no. 9074 (21 June 2019): 38–42.

[146] See the corrispondence between Guðjón Samúelsson and the Ministry of Industry and Transportation in: "370 Tillaga til Þingsályktunar. Flm. Jónas Jónsson, " *Þingsskjál* A (1941).

[147] "370 Tillaga til Þingsályktunar". Attachment I–II, letter by Guðjón Samúelsson to the Ministry of Industry and Transportation, 16 November 1934.

[148] "370 Tillaga til Þingsályktunar". Attachment III, Letter by Páll Pálmason, representative of the Ministry of Industry and Transportation to Guðjón Samúelsson, 16 May 1935.

[149] Guðjón Samúelsson, "Fremgangsmaade til Behandling af Yderfladerne af Bygninger og andre Bygningsværker, navnlig af Beton," Patent DK 56543, 29 June 1937; Guðjón Samúelsson, "Improvements in or relating to Treating the Surfaces of Buildings and other Structures, particularly of Concrete," Patent GB 516,064, 21 December 1939.

Fig. 39 – The application of *steining* with a trowel.
Ári Trausti Guðmundsson, and Flosi Ólafsson, *Steinuð Hús*, 32.

1949), former minister of Industry and Transport and member of the Parliament.[150] Despite the political support, the State architect's patent proposal was strongly opposed by the Reykjavík Mastermasons' Society.[151] The Society refused to see such a common surface render under a private patent. By the end of the 1930s, *steining* had become very widespread in Reykjavík, and the adoption of a patent would have much increased its price, already at least twice as expensive as an ordinary cement plaster.[152] The architect filed the Icelandic patent in 1941, but the property issue was later brought to court and the patent was revoked by the Icelandic government in 1945.[153] This event was followed by the annulment of the Danish and British versions.[154] The argument was eventually resolved by letting the technique fall again into the realm of the common finishing methods available for Icelandic builders. This issue reflected the complex relationship between a low-skilled, but experienced, working class, and the few educated technicians who were struggling to leave their own mark on the development of local architecture.

From geology to architecture

Regardless of the failure of the patent and its similarities to pebbledash, Guðjón Samúelsson's *steining* did boast a different characteristic if compared to common and unsophisticated finishing techniques. It was "uniquely Icelandic", and this Icelandicness originated from the selection of rocks decorating the buildings' surfaces.[155] These very rocks could transform an ordinarily rendered surface into a rhetorical architecture praising the geological richness of the country. While struggling to file his patent, the State architect claimed that "Iceland seemed to be the poorest among all countries when it comes to building materials". Although the situation had already changed with the arrival of cement, he labelled grey concrete buildings as "unartistic", as they did not match as perfectly with the Icelandic landscape as the traditional turf houses did.[156] Therefore, by coating the surfaces with obsidian, quartz, and several local geological resources, a plain and dull material was transformed into the Icelandic landscape itself.

Dark obsidian was mainly mined near the Törfajökull glacier in the south, or in the Þingeyjarsýsla county in the north-east. It was then transferred to Reykjavík by

---

[150] Attachment IX, letter by Þorsteinn Briem to the Ministry of Industry and Transportation,14 March 1940. "370 Tillaga til Þingsályktunar".

[151] *Múrarafélag Reykjavíkur.* The Society was founded in 1933. On the history of mastermasons in Reykjavík until the early 1950s, see: Björn Sigfússon, *Múrarasaga Reykjavíkur* (Reykjavík: Múrarasamtökunum í Reykjavík, 1951).

[152] Attachment XI, letter by the Direction of the Reykjavík Mastermasons' Society to the Ministry of Industry and Transportation, 3 December 1940, "370 Tillaga til Þingsályktunar".

[153] Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 110–11.

[154] Ári Trausti Guðmundsson, and Flosi Ólafsson, *Steinuð Hús. Varðveisla, viðgerðir, endurbætur og nýsteining* (Reykjavík: Húsafriðunarnefnd ríkisins, 2003), 18.

[155] Ári Trausti Guðmundsson, and Flosi Ólafsson, *Steinuð Hús*, 6.

[156] Attachment VIII, letter by Guðjón Samúelsson to the Ministry of Industry and Transportation, 27 May 1940. "370 Tillaga til Þingsályktunar".

Figg. 40a–40b – *Steining* render of the church of Akureyri. Details of the obsidian splinters in contrast with quartz fragments. Photos by Sofia Nannini, 2019.

Fig. 40c – *Steining* render of the church of Akureyri. Details of the obsidian splinters in contrast with quartz fragments.Photos by Sofia Nannini, 2019.

Fig. 41a – The villa in Eiríksgata 6, Reykjavík, designed by Guttormur Andrésson and commissioned by Trausti Ólafsson. Photo by Sofia Nannini, 2019.

Fig. 41b – Detail of the *steining* render with fragments of Iceland spar. Photo by Sofia Nannini, 2019.

ship.[157] The presence of pointed obsidian fragments in the *steining* mixture resulted in very dark shades on the concrete surface, as it was in the case of the National Theatre. Shiny quartz was mined in the Mosfellsbær area, near Reykjavík. Its presence was discovered mostly in the vicinity of some gold mines which had been active since 1909.[158] An interesting application of both obsidian and quartz can be seen on the façade of the church in Akureyri, northern Iceland. Dark obsidian splinters were used to mark the edges of the structure while pale quartz pieces covered the rest of the surface. **Figg. 40a–40c.** The most precious material to be found in the *steining* render is ground Iceland spar. Usually, however, only the cheapest and most opaque fragments of Iceland spar were used for coating purposes.[159] Today, a few buildings still boast the original *steining* render and pebble mix. One of them is the modern villa commisioned by the chemist Trausti Ólafsson in 1934, whose *steining*-rendered walls include translucent Iceland spar, black obsidian, and other volcanic rocks.[160] **Figg. 41a–41b.** Since 1937, ground seashells also became a part of the *steining* tradition.[161] They were introduced in order to substitute the rocks and produce a shiny, yet cheaper blend.

A stone symphony: The main building of the University of Iceland (1934–40)

The utmost synthesis of this geological variety can be seen in the main building of the University of Iceland, part of the campus designed and built by Guðjón Samúelsson in 1934–40.[162] **Figg. 42a–42c.** "In no other building on Earth can be found a similar decoration" claimed Jónas Jónsson, referring to the diversified application of *steining* both on the outside and inside.[163] The concrete render itself was the main topic of the rector's inauguration speech, proudly asserting that the building was a symbol of Iceland's building materials.[164] Also, the State architect's specific interest in the surface renders was reported in the daily construction report.[165] The decoration of the concrete surface was achieved both with regular *steining* for the outer walls and the ceilings, and by cladding the inner walls with precast slabs.[166] The

---

157 Ári Trausti Guðmundsson, and Flosi Ólafsson, *Steinuð Hús*, 24–25.

158 Ári Trausti Guðmundsson, and Flosi Ólafsson, *Steinuð Hús*, 22–23.

159 Sveinn Þórðarson, "Saga silfurbergsins," 106–07.

160 The villa was designed by mastermason Guttormur Andrésson in 1934. I would like to thank Rúnar and Edda from the Eric The Red Guesthouse in Reykjavík for inviting me to visit the villa and have access to Bergþóra Góa Kvaran's research on the building.

161 *Skjeliamulning* in Icelandic.

162 Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging,* 68–75; Páll Sigurðsson**,** *Úr húsnæðis- og byggingarsögu Háskóla Íslands*; Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 134–37; Pétur H. Ármannsson, *Guðjón Samúelsson húsameistari*, 277–93.

163 "Er þvílíkt skraut ekki til í neinu öðru húsi á jörðinni." Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging*, 128.

164 "Ræða rektors," *Árbók Háskóla Íslands*, Academic Year 1939–40 (Reykjavík: Prentsmiðjan Gutenberg, 1940), 59–60.

165 The construction log was partially reprinted in: Páll Sigurðsson, ed., *Úr húsnæðis- og byggingarsögu Háskóla Íslands*, 326. The original document is held at the private archive of mastermason Þorlákur Ófeigsson and his family.

166 Slabs were cast in glass containers: the front side was polished, the slabs were hooked and cemented upon the walls. Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging*, 128.

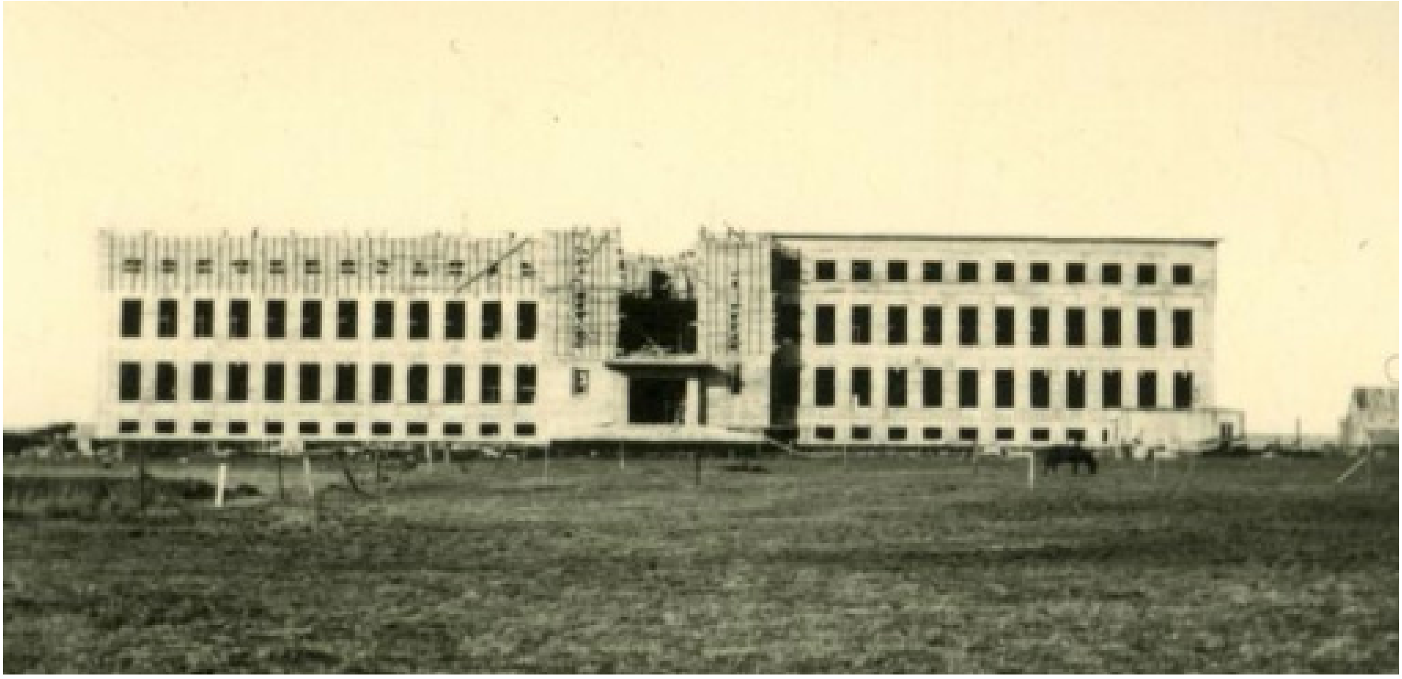


Fig. 42a – The main building of the University of Iceland in construction, 1939.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 42b – The main building of the University of Iceland, ca. 1935–45.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 42c – The main building of the University of Iceland, 1934–40. Photo by Sofia Nannini, 2018.

Fig. 43a – Main entrance and façade of the building. Photo by Sofia Nannini, 2018.

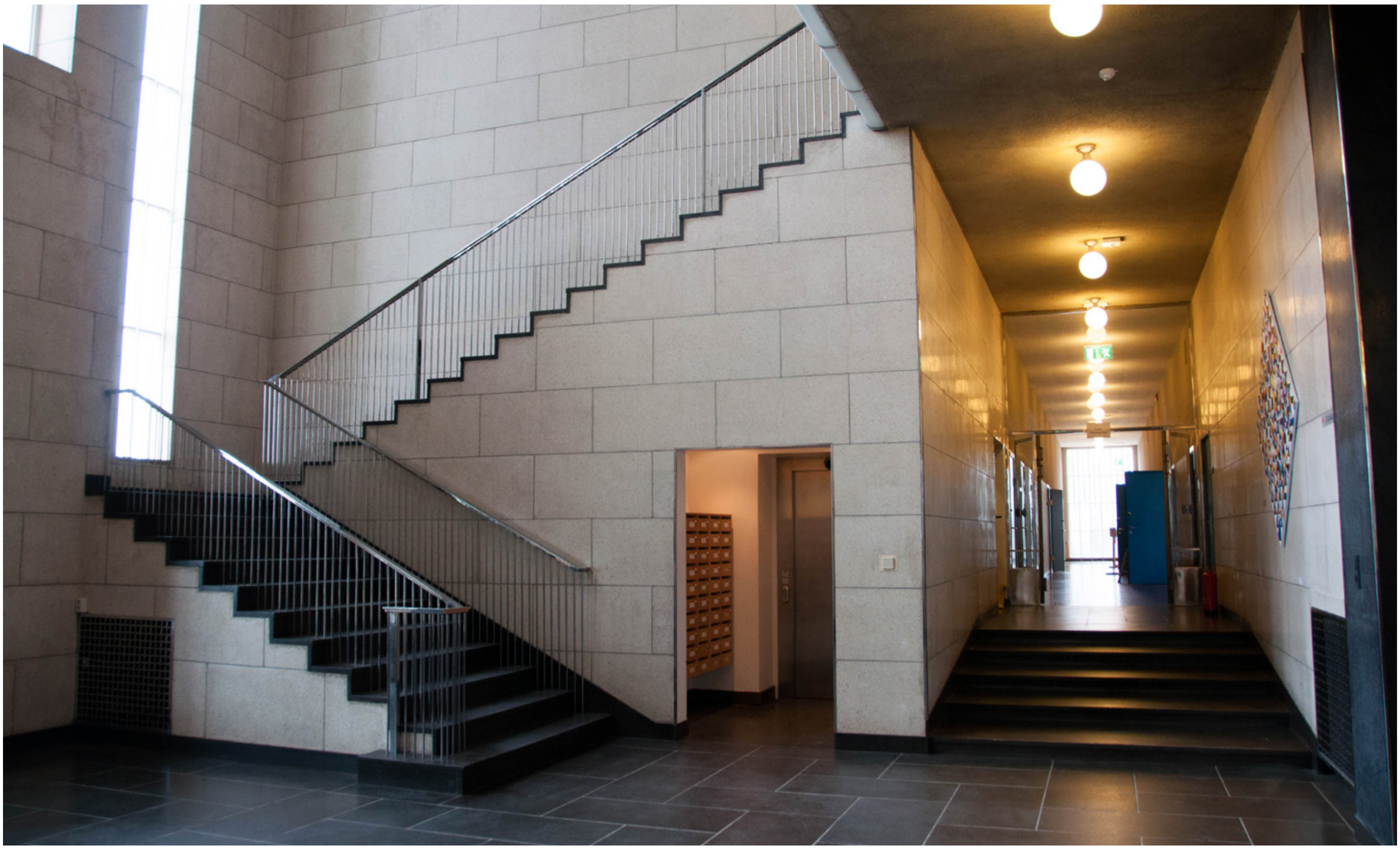


Fig. 43b – The vestibule. Photo by Sofia Nannini, 2018.

Fig .43c – The ceiling above the vestibule. Photo by Sofia Nannini, 2018.

rendering of the whole building took more than one year, and it absorbed much of Guðjón Samúelsson's energy. He personally supervised all trials on the renders, and even located the precise spot on the Reykjanes pensinsula from where to collect seashells for the *steining* blend.[167] While the stones were usually ground with the help of grinders, seashells had to be first separated from shingles, and this process was done by hand by "three girls" on the working site.[168]

The vestibule's walls were covered with seashell-rendered slabs, and the ceiling coated wth ground, shiny Iceland spar. The main doorway was rendered with a mixture of ground obsidian together with greenish rhyolite. The floor was covered with dolerite, whereas the main hall's vestibule was clad with red rhyolite slabs. The altar of the University chapel was decorated with clear Iceland crystals; the whole outer façade was rendered with a quartz-based *steining* blend, for which approximately 7 tons of quartz were employed.[169] **Figg. 43a–43e.** The final result had a very powerful effect. Not only did the local aggregates generate a polychromy able to elegantly decorate a somber and austere building, but this symphony of stone fragments became an architectural mirror of the Icelandic geology and, consequently, a built eulogy to the island's natural landscape. Given the political interest in the technique, emerged in the hectic years moving towards Iceland's declaration of independence, *steining* was ultimately not limited to technical matters, but it also acquired political and rhetorical meanings.

The decline of *steining*

Since its emergence in the early 1930s *steining* had become so popular that overall it covered thousands of buildings.[170] Radical changes occurred in Icelandic building traditions since the end of the Second World War, which altered the country's economy and allowed more imports of foreign goods and materials. At first some builders experimented with imported rocks to be added to the *steining* blend. One example is the Reykjavík Health Center by architect Einar Sveinsson (1906–73), built in 1949–55. The reddish façade is entirely rendered with a *steining* mix of German red marble and Icelandic calcite.[171] **Fig. 44.** By the beginning of the 1960s, however, *steining* was eventually abandoned and replaced by plastered pre-cast structures, or by cast concrete treated with chemical retarders, allowing the concrete aggregates to emerge on the surface.[172] Only during the 1990s was the technique resumed, with the aim of restoring most of the architectural heritage dating back to the 1930s–40s. The main building of the University of Iceland was wholly restored in

[167] Páll Sigurðsson, ed., *Úr húsnæðis- og byggingarsögu Háskóla Íslands*, 326.

[168] Páll Sigurðsson, ed., *Úr húsnæðis- og byggingarsögu Háskóla Íslands*, 327.

[169] Páll Sigurðsson, ed., *Úr húsnæðis- og byggingarsögu Háskóla Íslands*, 324.

[170] Ári Trausti Guðmundsson, and Flosi Ólafsson, *Steinhuð hús*, 4.

[171] *Heilsuverndarstöð Reykjavíkur*. Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts,* 243.

[172] The technique, named *völun*, is explained in: Ári Trausti Guðmundsson, and Flosi Ólafsson, *Steinhuð hús*, 38–39. On similar finishes, see: Henry Langdon Childe, *Concrete Finishes and Decoration* (London: Concrete Publication Limited, 1964), 60–61.

Fig. 43d – The ceiling above the vestibule. Photo by Sofia Nannini, 2018.

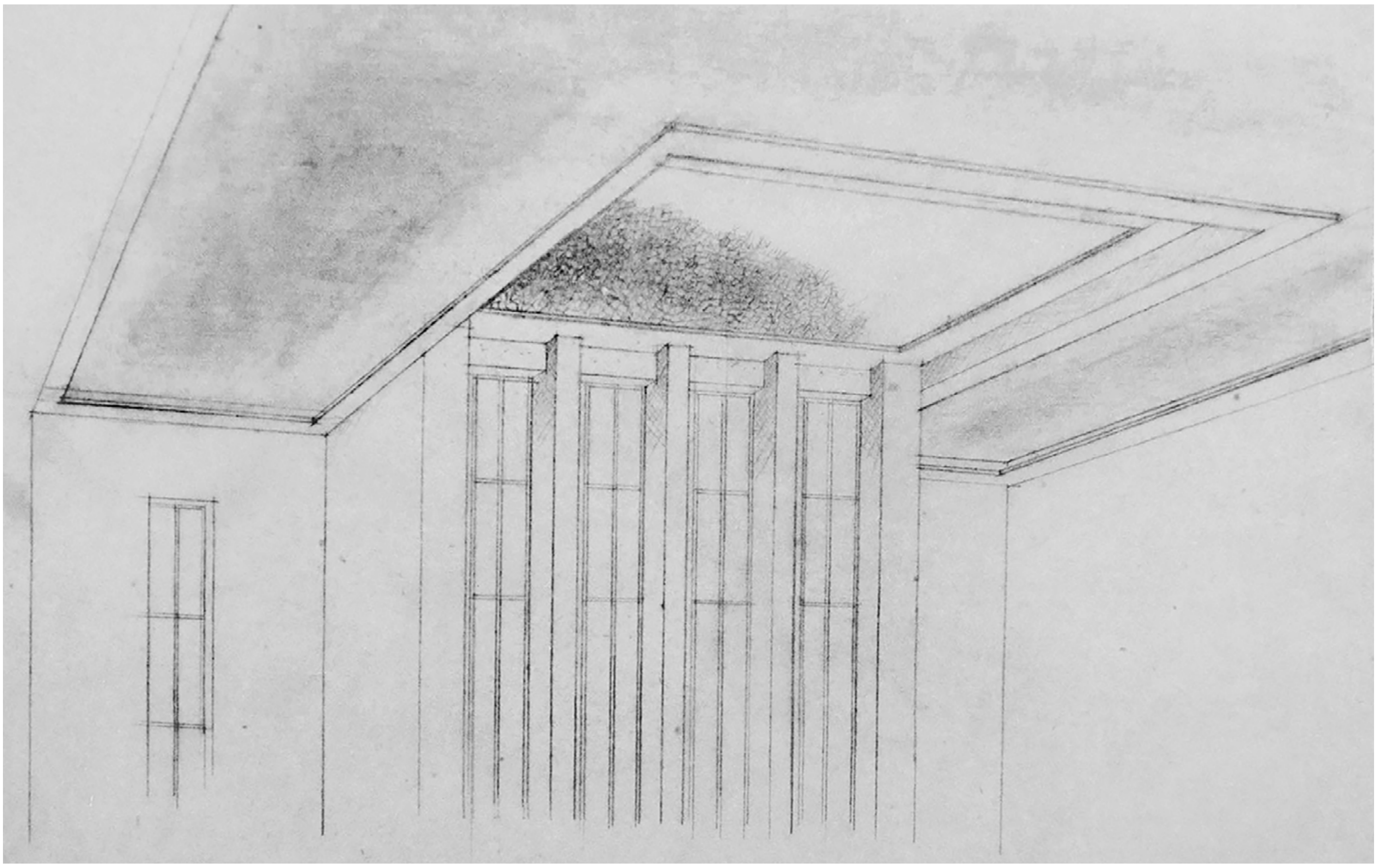


Fig. 43e – Sketch for the *steining* render on the ceiling above the main entrance of the University of Iceland. Þjóðskjalasafn Íslands, Húsameistari ríkisins. Bréfa- og teikningasafn. Safn A(D). Flokkur 42, Örk 181. 1930–1939. Háskóli Íslands. Sérteikningar.

1995, and so was the National Theatre in 2006–08. Both restoration works were carried under the supervision of the National Architectural Heritage Board, and in 2003 the Cultural Heritage Agency of Iceland published a booklet on *steining* and its restoration by geologist Ári Trausti Guðmundsson and mastermason Flosi Ólafsson. For these occasions, some closed mines were re-opened for the collection of quartz and Iceland spar.[173]

As became apparent from Guðjón Samúelsson's failure in obtaining a patent, *steining* and ordinary pebbledash were technically much too similar. Icelandic *steining* had much in common with other contemporary finishing renders, such as ordinary pebbledash common in Great Britain or the Belgian *cimorné* in use in Flanders since the 1930s until the early 1960s.[174] Despite the characteristics it shared with contemporary techniques, *steining* stemmed from a distinct history and was granted a completely different future. When it was first employed in the 1930s, it physically reflected the country's material shortage and the national pride for the development of Icelandic architecture. When it was rediscovered in the 1990s, *steining* was not treated as a burden from the past – as postwar pebbledash is usually considered today in the United Kingdom – but as a key quality of Iceland's twentieth-century built heritage.[175] *Steining* can be placed on the thin line that divides nature and artificiality, once again expressing one of the many dichotomies that characterize concrete – as Adrian Forty writes.[176] Although his invention did not differ enough from other render techniques to be granted a patent, Guðjón Samúelsson was able to project a variety of meanings that could change the way one would look at his concrete surfaces.

4.4 The End of an Era: Architecture and Construction after 1944

The Second World War was a pivotal watershed in Icelandic history. Despite Iceland's neutrality in the conflict, many events changed the country politically and socially. In April 1940 Denmark was occupied by Germany, and one month later Iceland was occupied first by British forces, and subsequently by troops from the

[173] Ári Trausti Guðmundsson, and Flosi Ólafsson, *Steinhuð hús*, 23.
[174] On *cimorné,* see the comprehensive PhD dissertation by Liesbeth Dekeyser, "Cimorné Interwar Decorative Cement Render: A Historical and Technical Approach Towards Restoration Guidelines," PhD Dissertation, Faculty of Engineering, Vrije Universiteit Brussel, 2015. See also: Liesbeth Dekeyser, Ann Verdonck, and Hilde De Clercq, "*Cimorné* Cement Render With Opalescent Glass Granules: A Decorative Façade Finish Developed by Innovative Craftsmanship in the Interwar Period," *Journal of Architectural Conservation* 19, no. 2 (2013): 86–102.
[175] Laura Barnett, "Grey, Lumpy, Impossible to Remove – But Pebbledash Isnt' All Bad," *Guardian* (21 April 2010), https://www.theguardian.com/lifeandstyle/2010/apr/21/pebbledash-homes-nick-clegg, last accessed 26/08/2020.
[176] Forty, *Concrete and Culture*, 43–68.

Fig. 44 – Einar Sveinsson, Reykjavík Health Center [*Heilsuverndarstöð Reykjavíkur*], 1949–55. Photo by Sofia Nannini, 2019.

United States.[177] The military occupation by foreign armies led to many economic and social transformations. On the one hand, it helped overcome the economic downturn which had started in the early 1930s; on the other, it heavily impacted the closed and isolated social environment of the island for many years to come.[178] Furthermore, the German occupation of Denmark further distanced Iceland from the Danish kingdom. After a few intense years, in May 1944 a referendum took place, and on 17th June the new Icelandic Republic was officially celebrated at Þingvellir.[179] Icelandic independence was not born out of a revolution, but it had developed through a slow transformation of the country's institutions since the establishment of the Home Rule in 1904 and the Act of Union in 1918. Nevertheless, the declaration was undoubtedly a much-expected event, and it became a turning point in Iceland's recent history.[180]

Among many proud considerations for such a pivotal achievement, for the sake of the particular history narrated in this dissertation it is interesting to highlight the reaction of Icelandic engineers to the declaration of independence, as published in July 1944 in the journal of the Engineers' Society.[181] In addition the overall satisfaction regarding the new political situation, Icelandic engineers overcame merely nationalistic arguments and instead celebrated independence by pointing out the important contribution of Danish and Nordic engineering within Icelandic technical development. Furthermore, they thanked foreign institutions such as the Polytechnic School of Denmark, a "role model" for the recently opened engineering

---

[177] For a short account of the occupation years of Iceland during the Second World War, see: Gunnar Karlsson, *The History of Iceland*, 313–18. See also: Helgi Skúli Kjartansson, *Ísland á 20. öld*, 213–39; Pétur Hrafn Árnason, and Sigurður Líndal, eds., *Saga Íslands XI*, 68–84.

[178] In 1940 approximately 25,000 British soldiers were stationed in Iceland; since 1941 around 60,000 American soldiers reached the country. These numbers were very high if compared to the small local population: in 1941 Icelandic inhabitants were approximately 120,000. Foreign troops were mostly settled in Reykjavík and the Reykjanes peninsula, near the village of Keflavík. See: Gunnar Karlsson, *The History of Iceland*, 317. In Keflavík the American troops opened a military base and an airport which later became Iceland's international civil airport in 1987. The presence of such a vast miliary force left deep social consequences, which can be found both in historical accounts, documentaries, and novels. See for example a review on the documentary *Hernámsárin* [The Occupation Years] by Reynir Oddsson (1967) by: Guðmundur Hálfdanarson, "The Occupation Years – Documenting a Forgotten War," *Journal of Scandinavian Cinema* 2, no. 3 (November 2012): 249–55. See also: Guðmundur Hálfdanarson, "The Beloved War. The Second World War and the Icelandic National Narrative," in *Nordic Narratives of the Second World War*, edited by Henrik Stenius, Mirja Österberg and Johan Östling (Lund: Nordic Academic Press, 2011), 79–100. On the American military rights on Icelandic soil, see: Valur Ingimundarson, *The Rebellious Ally. Iceland, the United States, and the Politics of Empire 1945–2006* (Dordrecht: Republic of Letters, 2011), 11–28. The social and also urban consequences related to the presence of the military base near Keflavík were at the core of a recent novel by Jón Kalman Stefánsson, *Fish Have No Feet: A Family History*, trans. by Philip Roughton (London: Maclehose Press, 2016). On the representation of Icelandic architecture in Jón Kalman Stefánsson's novels, see: Sofia Nannini, "Narrare senza architettura. L'Islanda nei romanzi di Jón Kalman Stefánsson," in *Architetture. Forma e narrazione tra architettura e letteratura,* edited by Andrea Borsari, Matteo Cassani Simonetti, and Giulio Iacoli (Milano: Mimesis, 2019), 467–78.

[179] The seventeenth of June was chosen because it was Jón Sigurðsson's birthday. On the declaration of independence, see: Gunnar Karlsson, *The History of Iceland*, 319–23.

[180] Guðmundur Hálfdanarson, *Íslenska þjóðríkið*, 138.

[181] Finnbogi R. Þorvaldsson, "Endurreisn lýðveldis á Íslandi," *Tímarit Verkfræðingafélag Íslands* 29, no. 2 (July 1944): 17.

degree course at the University of Iceland.[182] The internationality and openess of Icelandic engineers was not new: as seen in chapter two, it stemmed from their varied academic education and experiences. However their reaction addressed a very important topic: that Iceland was independent from a political point of view, but it was still much dependent on foreign technical knoweldge, materials, machineries. As the epilogue will show, one of the achievements of the postwar years was becoming independent regarding one key imported good: cement.

Architecture and construction were deeply affected by the political and economic changes brought on by the worldwide events of the 1940s. Despite the overall backwardness in construction matters, since the beginning of the decade most amateurish techniques were slowly being replaced by up-to-date building processes. In 1944 the first Icelandic conference and exhibition on building topics was held in Reykjavík, and it addressed all the issues regarding housing, planning and the production of building materials.[183] New building materials were introduced: one example were locally-produced pumice slabs and blocks, usually adopted for insulating purposes.[184] **Fig. 45.** Since the occupation by military troops in 1940, the population of Reykjavík started to increase rapidly and the need for housing exploded. As a result, many locals started living in the barracks built by the British and American soldiers. As highlighted by Icelandic historian Eggert Þór Bernharðsson, this "barrack life" had harsh consequences on the Icelandic population until the late 1960s.[185] For years, a rather high number of inhabitants were registered as homeless.[186] **Fig. 46.**

In order to address such critical conditions, in 1942 the City Council of Reykjavík planned the construction of five-storey apartment buildings first on the eastern outskirts of the town, then replicated in several areas. The project was carried out by a team of architects led by Einar Sveinsson, drawing inspiration from a number of different housing projects built in the Nordic countries in the 1930s.[187] **Figg. 47a–47c.**

---

[182] Engineering has been available as a study field at the University of Iceland since 1940.

[183] The conference took place in Reykjavík and was a meeting point for many of the mastermasons and architects mentioned throughout this dissertation, such as Einar Erlendsson, Jóhann Fr. Kristjánsson, and Guðmundur H. Þorláksson. The proceedings were published in: Arnór Sigurjónsson, ed., *Byggingarmálaráðstefnan 1944. Erindi og umræður* (Reykjavík: Landssamband iðnaðarmanna, 1946).

[184] Resarch on pumice as a building material was prompted by *Vikurfélagið* [The Pumice Society], founded in the mid-1930s. In 1952 the Society published a booklet on the production of pumice slabs and blocks. Vikurfélagið H. F., *Nokkur orð um vikur* (Reykjavík: Vikurfélagið, 1952).

[185] See: Eggert Þór Bernharðsson, *Undir Bárujárnsboga. Braggalíf í Reykjavík 1940–1970* (Reykjavík: JPV Forlag, 2000).

[186] On the housing shortage in Reykjavík in the 1940s, see: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 315–17. See also a contemporary account on housing policies in Iceland in: Björn Björnsson, *Húsnæðismál og byggingarstarfsemi í Reykjavík 1928–1947* (Reykjavík, 1948).

[187] These housing blocks are in: Hringbraut 37–47 (built in 1942–44), Skúlagata 64–80 (built in 1944–48) and Langahlíð 19–25 (built in 1945–49). On the typology and some comparisons with contemporary housing projects in Sweden and Denmark, see: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 319–26. One of the possibile models might have been

Fig. 45 – Exhibition of building materials [*Byggingarmálasýningin*], Reykjavík, 1944.
Arnór Sigurjónsson, ed., *Byggingarmálaráðstefnan 1944. Erindi og umræður*, picture 22.

Fig. 46 – Military barracks in Iceland (Reykjavík?), 1934.
Þjóðminjasafn Íslands/National Museum of Iceland.

Fig. 47a – Einar Sveinsson and Ágúst Pálsson, Apartment buildings in Hringbraut 37–47, Reykjavík, 1942–44. Photo by Sofia Nannini, 2016.

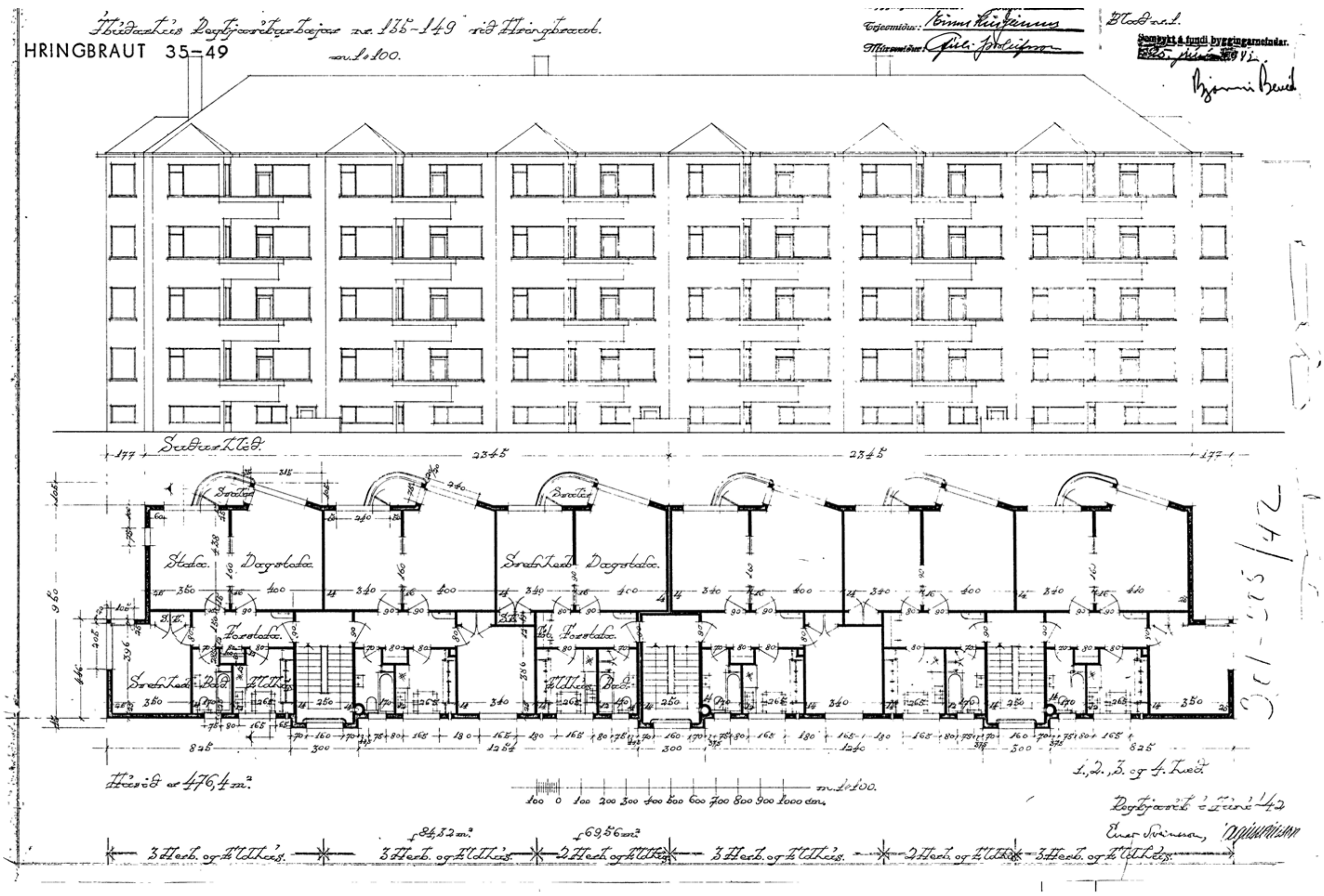


Fig. 47b – Einar Sveinsson and Ágúst Pálsson, Apartment buildings in Hringbraut 37–47, Reykjavík, 1942–44. Teikningavefur Reykjavíkurborgar.

Fig. 47c – Einar Sveinsson and Ágúst Pálsson, Apartment buildings in Miklabraut/Langahlíð 19–25, Reykjavík, 1945–49. Photo by Sofia Nannini, 2019.

Fig. 48a – Einar Sveinsson and Ágúst Pálsson, Apartment buildings in Miklabraut/Langahlíð 19–25, Reykjavík, 1945–49. Ljósmyndasafn Reykjavíkur/Reykjavík Museum of Photography.

The height of these buildings, hosting four floors of apartments, implied that concrete was finally going to be used as suggested by Rögnvaldur Ólafsson almost thirty years before – "to build more densely" – and that the obsolete building code of 1903 had to be fully revised. Due to the presence of concrete pillars in the corners of balconies and of corner windows, it may be suggested that reinforced concrete was adopted throughout the construction at least in these specific areas. As a matter of fact, the application of reinforcement bars within concrete pillars can be seen from photographs of the building sites. These buildings were therefore one of the first examples of reinforced concrete construction applied on a large scale for housing purposes. **Figg. 48a–48c.**

Already presented by architect and mastermason Einar Erlendsson at the conference in 1944, the new building code for Reykjavík was issued in 1945.[188] The code stressed the use of concrete as the only building materials allowed in town – timber and other materials were subjected to a particular permit that could only be granted by the building commission. It made precise mentions to the type of cement, the quality and the storage of the aggregates, the design mix, production and application of concrete, of the formworks and the reinforcement bars, and a whole chapter was devoted to concrete structures. In particular, the very weak design mix required by the building code of 1903 changed greatly: in the new code, reinforced concrete for walls and foundations could not be weaker than 1 : 3 : 3. The code did not mention turf farms anymore: far from its rural past, Reykjavík was moving towards the future faster than ever, and its new code became the written promise for a more reliable and scientific use of the building materials. Construction was now going to be only in the hands of skilled technicians, graduated architects and engineers, established building companies and mastermasons societies, whose contributions led to a full modernization of the building industry. However, this process was by no means fast and without obstacles. In October 1948, architect Einar Sveinsson published a long article in the *Morgunblaðið* newspaper acknowledging the many weaknesses of Icelandic concrete construction.[189] He asked publicly for the direct attention of the government in building matters, and more importantly he promoted some of the ongoing research on concrete aggregates and cement production.

Einar Sveinsson's voice was not unimportant and his key role in the postwar architectural debate was a sign that the times had largely changed since the early 1930s. Graduated at the *Technischen Hochschule* in Darmstadt in 1932, he had been

---

Svein Markelius's *Kollektivhuset* in Stockholm (1935), which had been published in the pages of *The Concrete Way* journal by Philip Morton Shand, shortly before the article "Three New concrete Buildings in Iceland" by Sigurður Guðmundsson.

[188] Einar Erlendsson, "Byggingarsamþykktir," in *Byggingarmálaráðstefnan 1944*, 117–28; Stjórnartíðindi fyrir Ísland 1945. B-deild. *Byggingarsamþykkt fyrir Reykjavík*, 357–75.

[189] Einar Sveinsson, "Húsnæðisvandamálin og íbúðarbyggingar Reykjavíkurbæjar. Byggingarmátinn," *Morgunblaðið* 23, no. 237 (8 October 1948): 6 and 12. The article was followed by two texts on rents and building costs. See: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 327–28.

Fig. 48b – Einar Sveinsson and Ágúst Pálsson, Apartment buildings in Miklabraut/Langahlíð 19–25, Reykjavík, 1945–49. Ljósmyndasafn Reykjavíkur/ Reykjavík Museum of Photography.

Fig. 48c – Einar Sveinsson and Ágúst Pálsson, Apartment buildings in Miklabraut/Langahlíð 19–25, Reykjavík, 1945–49. Ljósmyndasafn Reykjavíkur/ Reykjavík Museum of Photography.

City Architect of Reykjavík since 1934, director of the city planning and member of the building commission.[190] Despite the role as State architect which Guðjón Samúelsson performed until his death in 1950, his position weakened in time as the number of active architects increased, as did their role in city and planning commissions. Furthermore, not only had the State architect office increasingly hosted collaborators and assistants, but in the 1940s there were many private practictioners in the country.[191] In 1936 the Iceland Architects' Society was founded, thus separating, at least formally, the activities and works of architects from those of the engineers.[192]

Icelandic architecture was not in the hands of Guðjón Samúelsson alone anymore. Between the mid-1940s and late 1950s a number of public buildings emerged in the capital, such as schools, churches, and the headquarters of the National Museum, whose somber and functional design had become the face of the "Reykjavík of the future".[193] If it had not been for the shared use of concrete structures and *steining* on the outer surfaces, nothing would have looked more different than Guðjón Samúelsson's eclectic National Theatre or church at Landakot. **Figg. 49a–49b.**

When Guðjón Samúelsson died in 1950, he was remembered through plentiful obituaries which appeared in several newspapers and journals.[194] Furthermore, in 1957 Jónas Jónsson and Beneditk Gröndal published a monograph on the architect, which has often been quoted throughout this dissertation.[195] Despite the extensive praise of Guðjón Samúelsson's career once he passed away in 1950, that year Icelandic architecture closed one of its most debated chapters, that of the search for a

---

[190] For a short biography of Einar Sveinsson and a list of publications, see: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 418–19. See also the catalogue: Pétur H. Ármannsson, ed., *Einar Sveinsson: arkitekt og húsameistari Reykjavíkur* (Reykjavík: Kjarvalsstaðir, 1995).

[191] The collaborators of Guðjón Samúelsson between 1919 and 1950 were 39 in total. Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 107. For biographic information on Icelandic architects during the twentieth century, see: Haraldur Helgason, ed., *Arkitektatal* (Reykjavík: Þjóðsaga, 1997).

[192] Guðjón Samúelsson was nominated president of the Society. The founding members were: Ágúst Pálsson (1893–1967), Sigurður Guðmundsson, Bárður Ísleifsson (1905–2000), Eiríkur Einarsson (1907–69), Einar Sveinsson and Gunnlaugur Halldórsson. See: "Nýtt félag húsagerðameistara," *Þjóðviljinn* 1, no. 19 (21 November 1936): 1.

[193] "Reykjavík framtíðarinnar". The definition was coined by architect Þórir Baldvinsson in 1940. On the many public projects designed outside of the State architect office, see: Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 329–53.

[194] Guðjón Samúelsson's obituaries were largely published in the press. In particular, see: H. Kr., "Guðjón Samúelsson. Húsameistari ríkisins," *Tíminn* 34, no. 95 (3 May 1950): 5 and 7; Geir Zoëga, "Guðjón Samúelsson. Húsameistari ríkisins," *Tímarit verkfræðingafélag Íslands* 35, no. 3 (June 1950): 25–26. Like many of the engineers discussed in chapter two, he was described as a "pioneer" for Icelandic society. After his death, the position of State architect was appointed to his longtime collaborator Einar Erlendsson. "Húsameistari ríkisins settur," *Þjóðviljinn* 15, no. 102 (11 May 1950): 8. The office continued its activity for many decades, until it was revoked in 1996. The position was restored in 2015 with the purpose of managing the real estate properties of the government, such as the Prime Minister's office. "Stéfan Thors settur húsameistari ríkisins," https://www.ruv.is/frett/stefan-thors-settur-husameistari-rikisins, last accessed 15/09/2020.

[195] In this monograph Guðjón Samúelsson was compared to Iceland's most prominent artists of the first half of the twentieth century, such as Einar Jónsson, Þórarinn Þorláksson (1867–1924), Ásgrímur Jónsson, and Jóhannes Kjarval (1885–1972). Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging*, 107.

Fig. 49a – Sigurður Guðmundsson, Nautical School, Reykjavík, 1941–45. Photo by Sofia Nannini, 2019.

Fig. 49b – Sigurður Guðmundsson, National Museum, Reykjavík, 1945–52.
Photo by Sofia Nannini, 2018.

national architectural language. The "basaltic style" was put aside, as it had already been turned into a more geometrical "Republic Style" by Guðjón Samúelsson himself. Its forms oddly and anachronistically reappeared once as a monumental sculpture on Reykjavík's highest point with the construction of the church of Hallgrímur, inaugurated in 1986, much later than the date of its original design. *Steining* and the geological metaphor it embodied also slowly disappeared, only to be rediscovered again in the 1990s.

The American sway left a mark on Iceland during the hectic postwar years. The availability of building materials drastically changed; Icelandic professionals were being educated not only in Europe but also in the United States and Canada.[196] On top of that, the increasing population demanded a greater number of housing projects which saturated Reykjavík and its outskirts, and enlarged many urban settlements throughout the country.[197] Moreover, economic and social influence deriving from the United States became a key factor in Iceland's development since 1940 and lasted throughout the Cold War.[198] The effects of such a pervading process of Americanization were also seen in Icelandic building industry and architectural culture.[199] Examples can be found in many areas: from the diffuse advertisement of American building materials and machines in Icelandic technical journals,[200] to the proposal for the Reykjavík City Hall published in 1964, envisaged as a low-rise skyscraper with a curtain wall system, as if transplanted from an American city.[201] **Fig. 50.** The American influence can mainly be seen on the outskirts of Reykjavík and other settlements: their low-density neighborhoods are easily comparable to the American suburbia. As stated by Icelandic urban planning expert Bjarni Reynarsson, "The Nordic model of suburban apartment buildings as a social unit has never fit the individualistic Icelanders. The American dream of a single family home has been much closer to the hearts of the residents in Reykjavík".[202]

---

[196] The first census of Icelandic engineers was published in 1956. By then, a good number of engineers from the younger generations had already graduated from North American institutions, such as MIT, IIT, McGill, Cornell and others. See: Jón E. Vestdal, *Verkfræðingatal: æviágrip íslenzkra verkfræðinga og annarra félagsmanna Verkfræðingafélags Íslands* (Reykjavík: Sögufélag, 1956).

[197] On the urban development of Reykjavík after the Second World War, see: Bjarni Reynarsson, *Borgir og borgarskipulag* (Reykjavík: Skrudda, 2014), 233–43.

[198] On the relations between Iceland and the United States, see: Valur Ingimundarson, *Í eldlínu kalda stríðsins. Samskipti Íslands og Bandaríkjanna 1945–1960* (Reykjavík: Vaka-Helgafell, 1996); Valur Ingimundarson, *The Struggle for Western Integration. Iceland, the United States, and NATO During the First Cold War* (Oslo: Institut for forsvarsstudier, 1999).

[199] The term Americanization is here used according to the definition provided by Jean Louis Cohen: "the actual transformation of European (and other) societies in the American image [...] Americanization is one of the principal modalities of modernization." Jean Louis Cohen, *Scenes of the World to Come. European Architecture and the American Challenge 1893–1960* (Paris: Flammarion, 1995), 15.

[200] See examples in the pages of the journal of the Engineering Society, *Tímarit verkfræðingafélag Íslands*.

[201] The project was published in 1964 after years of debate in the local newspapers, yet it was never built in this form. See: "Ráðhús Reykjavíkinga við Tjörnina," *Morgunblaðið* 51, no. 8 (11 January 1964): 1, 8 and 17.

[202] Bjarni Reynarsson, "The Planning of Reykjavík, Iceland; Three Ideological Waves – A Historical Overview," *Planning Perspectives* 14 (1999): 65. The fascination for detached houses in

Fig. 50 – Project for the Town Hall, Reykjavík. *Morgunblaðið* 51, no. 8 (11 January 1964): 17.

It is difficult to find any connections between the architectural and construction history narrated so far, and the developments occurred in Icelandic architecture during the second half of the twentieth century. At the same time though, as a robust *fil rouge* which connects late nineteenth-century rural experiments to today's architectural studios, concrete was a legacy which the postwar years did not set aside. Throughout the chronology examined so far cement and concrete were described as a "magic potion",[203] as the "first durable building material of the Icelanders"[204] as a "revolution",[205] and they lived up to the expectations of Icelandic builders. Rooted in a rural past, Icelandic concrete went through a great variety of amateurish trials, academic research, architectural experimentations and national rhetoric, until it established itself as the key element to build a postwar welfare state.[206]

4.4.1 Epilogue: When Iceland became inhabitable

Iceland's intrinsic scarcity of building materials and its unwelcoming environment had been at the core of many of the island's descriptions, from Adam of Bremen's until early twentieth-century travel reports. As shown throughout this dissertation, the lack of sufficient clay and timber resources had not allowed Iceland to be fully independent in terms of building materials since the times of the settlement. If massive imports of materials were avoided by building with turf and gravel, by the late nineteenth century modern living habits and growing urban centers could not host the traditional turf farms anymore. Timber, lime and bricks were being imported in larger and larger quantities. To this list was added cement, which soon became a substance on which the whole Icelandic construction industry became dependent. As seen in chapter two, engineer Knud Zimsen engaged in a ten-year commercial relationship with the *Portland-Cement Fabrik* in Aalborg, Denmark, and he largely contributed to the lowering of cement prices in Iceland and to the democratization of its use throughout the country.

Icelandic postwar society was portrayed by author Svava Jakobsdóttir in her short novel *Legjandinn* [The Lodger], first published in 1969.

[203] In the words of Knud Zimsen, as reported in: Lúðvik Kristjánsson, ed., *Við fjörð og vík*, 128.

[204] "Steinsteypan var fyrsta varanlega byggingarefni Íslendinga." Jónas Jónsson, and Benedikt Gröndal, *Íslenzk bygging*, 108.

[205] "Þessi byggingarmáti var alger bylting í húsagerð hjer á landi [...]" [This way of building was a total revolution in the construction of the country ...]. Einar Sveinsson, "Húsnæðisvandamálin og íbúðarbyggingar Reykjavíkurbæjar. Byggingarmátinn," 6.

[206] The process was slow and not without obstacles. In 1942, some members of the Icelandic Engineers' Society complained about the lack of regulations regarding reinforced concrete structures. Árni Pálsson, "Normur um járnbenta steypu," *Tímarit Verkfræðingafélags Íslands* 27, no. 2 (1942): 15–16. The Society highlighted the absence of detailed regulations again in 1955, see: Sigurður Thoroddsen, "Um steinsteypugerð í Reykjavík," *Tímarit Verkfræðingafélags Íslands* 40, no. 5 (1955): 78–80. The news was echoed by the press: the *Þjóðviljinn* newspaper titled "Icelanders use more concrete than others but they handle it worse". "Íslendingar nota meiri steinsteypu en aðrir en kunna verr með hana að fara," *Þjóðviljinn* 21, no. 25 (31 January 1956): 4.

Since the very beginning of the "concrete age" a new goal became evident: that Iceland would start its own cement production, thus making concrete a whole locally-produced good. However, producing cement in Iceland was not easy: the country has scarce geological sources of calcium carbonite, such as limestone, and clay. Combining technological and political arguments, the debate covered more than three decades and required a thorough study of local sources which could be employed for cement production.[207] At first the argument was mainly limited within the Icelandic Engineers' Society: its members started publishing detailed studies on the possibilities of producing cement in the country.[208] The issue was acknowledged at a political level in 1935, when the Parliament issued a grant to support further research on the topic, inviting foreign and local engineers to contribute. The topic was resumed after the Second World War: in 1949 the company State Cement Works [*Sementsverksmiðja ríkisins*] was founded, and it was decided to erect the new plant in Akranes, north of Reykjavík and on the Faxaflói bay – strategically not far from the capital. The reason behind this choice was that the location was both close to deposits of seashells, which needed dredging from the bottom of the bay and were sources of calcium carbonite, and to deposits of argillaceous rhyolite.[209] Receiving loans from the International Cooperation Administration in Washington D.C., the cement factory was officially inaugurated in June 1958.[210] **Fig. 51.**

The inauguration of the plant was an occasion for rhetoric speeches comparable to those pronounced fourteen years before, on the day of the declaration of

[207] On the history of cement production in Iceland, the construction of the cement plant and its operating years, see: Guðmundur Guðmundsson, *Sementsiðnaður á Íslandi í 50 ár.* On the construction of the cement works see also: Lýður Björnsson, *Steypa lögð og steinsmíð rís*, 133–44.

[208] Helgi H. Eiríksson, "Íslenskar bergtegundir sem byggingarefni," *Tímarit Verkfræðingafélags Íslands* 6, no. 3 (1921): 25–31; see also the research by Danish engineer Poulsen on Pozzolana deposits in Iceland: A. Poulsen, "Om Puzzolan og Portland Cement" *Tímarit Verkfræðingafélags Íslands* 14, no. 1 (1929): 1–6. Research on pozzolanic deposits in Iceland continued in the postwar years. See: Hörður Jónsson, and Haraldur Ásgeirsson, "Móberg Pozzolans." *Tímarit Verkfræðingafélags Íslands* 44, no. 5 (1959): 71–78.

[209] Other locations were taken into considerations, especially Öndunarfjörður and Patreksfjörður in the West Fjords, but were considered too distant from the capital. Guðmundur Guðmundsson, *Sementsiðnaður á Íslandi*, 16–18. If the absence of calcium carbonate and clay was substituted by seashells and a particular kind of rhyolite, gympsum was still imported from abroad. For a description of the Icelandic cement production, see also: Fillmore C. F. Earney, "Seashells and Cement in Iceland," *Marine Mining* 5, no. 3 (1986): 307–20. The research behind the choice for a location and the cement production can be found in: Haraldur Ásgeirsson, "Framleiðsla portlandsements," *Tímarit Verkfræðingafélags Íslands* 31, no. 2 (1946): 23–27; Jón E. Vestdal, "Hráefni til sementsframleiðslu og hagnýting þeirra," *Tímarit Verkfræðingafélags Íslands* 34, no. 5 (1959): 58–76; Haraldur Ásgeirsson, "Staðsetning sementsverksmiðjunnar," *Tímarit Verkfræðingafélags Íslands* 34, no. 6 (1949): 90–92; Jón E. Vestdal, "Sementsverksmiðjan á Akranesi," *Tímarit Verkfræðingafélags Íslands* 42, no. 4 (1957): 46–55.

[210] The political influence of the United States was behind the financing of the State Cement Works. When the World Bank first refused to grant a loan to the Icelandic company in 1954, the Icelandic government replied that Iceland could accept an offer by the Soviet Union for an industrial development loan. In 1955, the International Cooperation Administration, an United States government agency, decided to grant two loans for the construction of the Icelandic plant. On the political debate behind the construction of the plant, see: Valur Ingimundarson, *Í eldlínu kalda stríðsins*, 289–92. See also: Guðmundur Guðmundsson, *Sementsiðnaður á Íslandi*, 21–22.

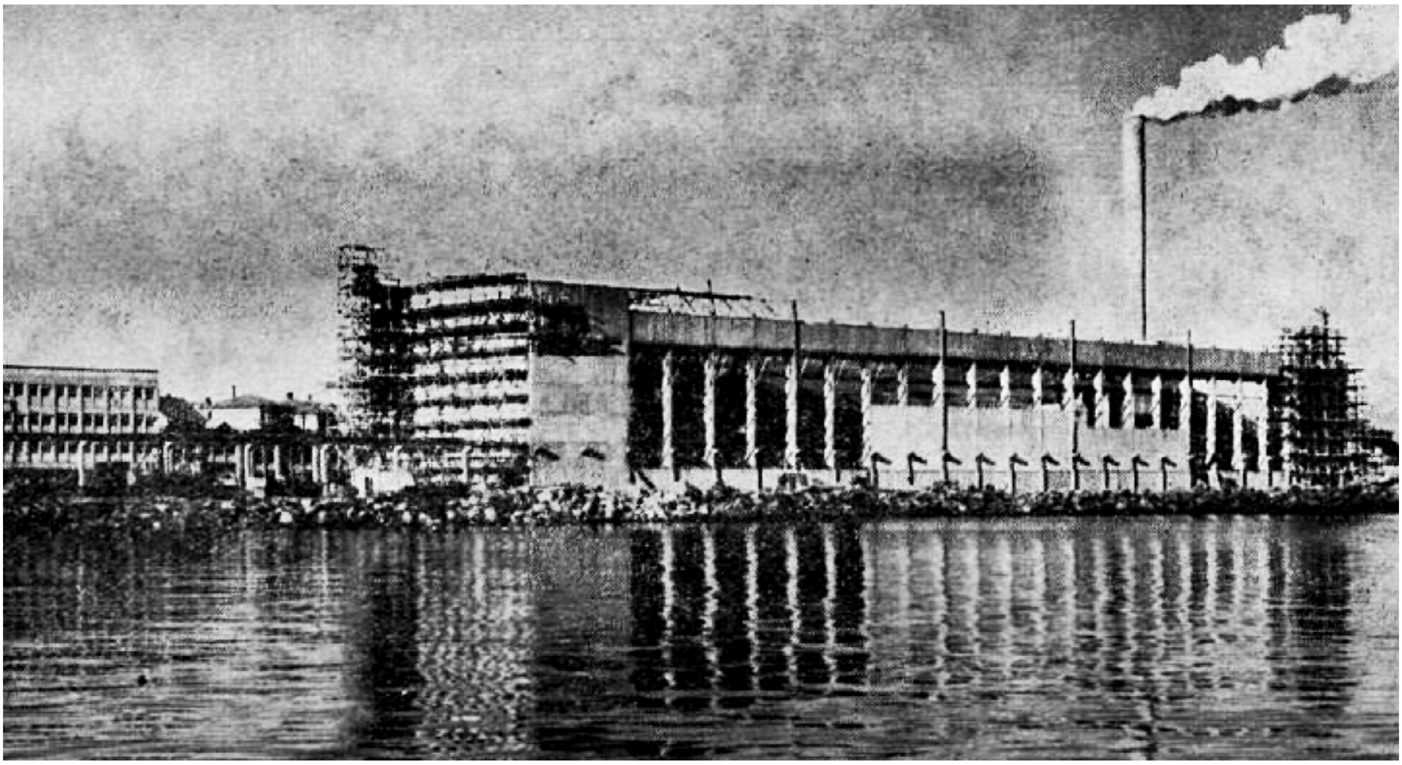


Fig. 51 – State Cement Works in construction, Akranes, 1958.
Tímarit Verkfræðingafélags Íslands 43, no. 4 (1958): 58.

Fig. 52a – The State Cement Works in Akranes before its demolition. Photo by Sofia Nannini, 2018.

Fig. 52b – Cement sack from the State Cement Works in display at the National Museum of Iceland. Photo by Arlène Lucianaz, 2020.

independence. In Akranes the president Ásgeir Ásgeirsson (1894–1972) claimed that "the history of Icelandic construction had mainly been a tragedy" until the end of the nineteenth century, changed only by the discovery of Portland cement. Laying the cornerstone of the cement work also meant laying a cornerstone for the "construction history of the future".[211] Gylfi Þ. Gíslason (1917–2004), minister of Industry, added that "many would consider uninhabitable a country without building materials. Many would consider unbelievable that a culture could develop among people living within earth and gravel. And many would also consider unthinkable that such people could be independent".[212] Both politicians remembered the starting point of Iceland's concrete history: the first concrete house of Iceland, the little farm built at Sveinatunga in 1895, was promoted as a mythic national achievement. Subsequently, they both wished that the cement works would become a key protagonist in the future of the country. As the *Tíminn* journal had titled a few years before, the plant would become "the mother of the future buildings in Iceland."[213]

More than 130 years after the first reports on pozzolana deposits and more than 110 years after the first application of Portland cement in the country, Icelandic politicians and engineers finally considered Iceland as independent in regards to its construction industry. The experience of local cement production was however short-lived. The State Cement Works halted the production in 2012, as local production had become more expensive than importing cement from abroad. Despite the plant is now being dismantled, Iceland's ability to produce its own cement is still considered as a pivotal historical moment in the country's recent history and worth of a national narrative in an official location. Since 2020 a sack of Icelandic cement has been in display at the National Museum in Reykjavík.[214] **Figg. 52a–52b.**

[211] "Þessi hornsteinn, sem geymir sögu verksmiðjunnar, er jafnframt hornsteinn í byggingarsögu framtíðarinnar. Saga húsagerðar á Íslandi er að mestu leyti raunasaga fram í lok síðustu aldar." Ásgeir Ásgeirsson, "Ávarp forseta Íslands," *Verkfræðingafélags Íslands* 43, no. 4 (1958): 49.

[212] "Margir mundu segja það land óbyggilegt, þar sem engin væru byggingarefni. Ýmsir mundu telja það ótrúlegt, að menning gæti þróazt með mönnum, sem búa í mold og grjóti. Og enn mundu margir álíta það óhugsandi, að slíkt fólk gæti verið sjálfstæð þjóð." Gylfi Þ. Gýslason, "Ræða," *Tímarit Verkfræðingafélags Íslands* 43, no. 4 (1958): 50.

[213] "Sementsverkjsmiðjan, móðir framtíðarbygginganna á Íslandi," *Tíminn* 37, no. 140 (26 June 1953): 1.

[214] I would like to thank Arlène Lucianaz for letting me know about this recent addition to the museum's exhibition.

Conclusions

> This place isn't fit for habitation; everything is against it: common sense, the wind, the lava. Still, we've lived here all these years, all these centuries, stubborn as the lava, silent within history as the moss that grows over rock and changes it into soil, someone should stuff us, pin medals on us, write a book about us. Us?
>
> Jón Kalman Stefánsson, *Fish Have No Feet*, 2016[1]

The Icelandic concrete *saga* was not a history of sensational events, it was far less tumultuous than the many volcanic eruptions that often shake the island. On the contrary, it was a slow process, comprised of many small details. In the end, those very details became the mirror of a society experiencing fast-paced transformations. Concrete superseded building traditions which were hundreds of years old. At the same time, some builders tried to immortalize the shapes of those traditions, using concrete as a link between past images and present needs. Most of all, concrete created a new image for modern Iceland, it allowed suitable living conditions and drastically transformed its social habits. The history of concrete is, for Iceland, a history of material and social change. With concrete, not only did builders build differently, but also people started living in a different way. It was also a collective history. No single individual was responsible for its outcomes, and yet this *saga* was shaped by several figures who contributed with their own expertise. Their contributions were not anonymous; however, with a few exceptions, these actors are little known by the general public. This is the peculiar strength of the Icelandic concrete tradition: although prompted by distinct people – mastermasons, farmers, politicians, engineers, architects – it was not represented by a single person nor by a single professional category. On the contrary, it was backed by the whole Icelandic society. The development of Icelandic concrete was made up of countless experiments, knowledge transfers, errors, debates, myths, failures; it was a history of utter backwardness and sheer modernity blended together.

This research has tried to understand some of these experiments, trace a few transfers of knowledge from the continent to the island, and question the founding myths behind Icelandic concrete and its history. Chapter one has researched the material roots behind the twentieth-century development of Icelandic architecture as an architecture in concrete. Shortage of building materials and economic means prompted the first experiments with cement, lime and stonemasonry. At the same time, the study has proved that concrete construction developed later in Iceland than

[1] Jón Kalman Stefánsson, *Fish Have No Feet*, trans. by Philip Roughton (London: MacLehose Press, Kindle Edition, 2016), chapter "Keflavík – present".

in the other Nordic countries. Despite some national narratives, this development was not independent from what was happening in the continent. The chapter underscored the strong connections that linked Icelandic and European building knowledge, with a particular attention to the Danish influence. This interdependence was at the basis of Iceland's growing use of lime and cement since the mid-nineteenth century. Contrary to Guðmundur Hannesson's rhetorical stances, clearly concrete was not invented in Iceland. Instead, what was specifically invented by some Icelandic professionals and politicians were the rhetoric and nationalistic meanings around it.

Chapter two has given particular importance to the work and career of Iceland's first generation of engineers, who acted as key conveyors of practical and technical building knowledge from Europe to the country. They were the actual trailblazers of Icelandic construction history. This was their main legacy: literally and metaphorically creating a road towards better living conditions and the material independence needed to build long-lasting housing. If one single image could be chosen as an allegory for their pivotal role in twentieth-century Icelandic history, that image would be the "pioneer" sketched several times by painter and sculptor Einar Jónsson. What Einar Jónsson depicted was a human figure breaking the hard basaltic rocks of Iceland, making a new road on which to walk on – perhaps the road towards progress and modernity, with all its consequences. **Figg. 1–2.**

Chapter three has focused on rural experiments with concrete and the epoch-making renovation of building traditions concerning Icelandic farmhouses. The chapter has followed the whole process, from the first proposals for the renovation of turf farms, to some articles and booklets published in the 1910s and 1920s, until the establishment of the technical office of the Agricultural Agency and its countless standardized projects. Since the construction of the farmhouse at Sveinatunga in 1895, rural areas had been a testing ground for solving Iceland's most long-lasting hurdle – how to build warm, enduring, modern housing at the lowest prices, with local manpower and materials, able to fit into its harshly beautiful landscape.

Chapter four has linked the material aspects of Icelandic construction with debates related to the definition of a national architectural language. In particular, the research followed the traces of State architect Guðjón Samúelsson and the use of concrete in his works, from neovernacular buildings to the basaltic decorative pattern. The use of concrete was at the core of every single architectural experiment. The original trait of the Icelandic vernacular revival was not its outer forms, that derived from a distorted idea of tradition which expanded from southern Germany to Northern Europe, but the choice of recreating such traditional image through the enduring texture of concrete. Simultaneously, concrete allowed to mold the natural symbols of Iceland as ornaments on its public buildings. Drawing on Sixten Ringbom's study on the use of natural stones in Nordic architecture, Seelow claimed that the adoption of the "basaltic style" helped Icelandic builders achieve the idea that a national architecture could refer to a national material – at least metaphorically.[2] Considering

[2] Seelow, *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts*, 124.

Fig. 1 – Sketch of *Brautryðjandi* [Pioneer] by Einar Jónsson. LEJ, sketchbooks.

Fig. 2 – Sketch of *Brautryðjandi* [Pioneer] by Einar Jónsson. LEJ, sketchbooks.

the importance of concrete in the actual definition and realization of such sculptural trademark, one may even state that at this point the national material of Iceland was not a specific natural stone nor its metaphor, but concrete itself. Icelandic concrete could be well considered as one of the many "national concretes" of twentieth-century architectural history.[3] One of its distinctive features was the application of *steining*, promoted by Guðjón Samúelsson since the beginning of the 1930s. The use of this coating technique was particularly evocative of several elements of Icelandic construction: economic struggle, resource scarcity, geology, nationalism, and architectural experimentations were all condensed into a single, yet expressive, layer of concrete render.

For many reasons highlighted throughout this study, concrete had a larger role in Icelandic construction and architectural histories than it had in the other Nordic countries. Concrete acted as a motor for the country's material development; its transformative power also promoted deep social and cultural changes. It improved local living conditions and allowed the construction of symbolic buildings for the Icelandic society; at the same time, concrete took on new meanings which are evident in various areas of the Icelandic cultural production. Until the first decades of the twentieth century, turf construction was a pivotal element of Icelandic culture. When concrete replaced turf, not only did it open a new chapter in Iceland's construction history, but it also became a part of the country's culture.

Icelandic concrete today: architecture and culture

The development of Icelandic concrete architecture was a slow evolution which began approximately in the 1840s and, despite the chronological limits to which this dissertation is confined, it is still an ongoing process. The fact that the Icelandic concrete age has not ended yet can be appreciated by walking in the suburbs of Reykjavík or by visiting other towns and villages in the country. The history that was told in the previous chapters laid the foundations for nearly all that was built in Iceland since the postwar decades. Already in 1960, more than two thirds of residential houses were in concrete, less than a third in timber, and only one percent of housing units were turf farms.[4] This trend continued in the following decades: by 1982, concrete houses were the 93.9% of the country's residential units. The industrialization of concrete construction changed Icelandic postwar architecture. One example above all was the widespread use of precast concrete panels for many housing projects all around the country, one of its earliest examples being the construction of the residential neighborhood in Breiðholt, Reykjavík.[5] **Figg. 3a–4b.**

Concrete did not only establish itself as the preferred material for construction companies, but it also became the trademark of many Icelandic architects. Notable

[3] On the idea of "national concretes", i.e. specific ways in which concrete was used in specific countries and absorbed national characteristics, see: Forty, *Concrete and Culture,* 119–42.

[4] Lyður Björnsson, *Steypa lögð og steinsmíð rís*, 155.

[5] Lyður Björnsson, *Steypa lögð og steinsmíð rís*, 175.

Fig. 3a – Residential units in construction, Breiðholt, Reykjavík, 1975.
Ljósmyndasafn Reykjavíkur/Reykjavík Museum of Photography.

Fig. 3b – Residential units in construction, Breiðholt, Reykjavík, 1979.
Ljósmyndasafn Reykjavíkur/Reykjavík Museum of Photography.

Fig. 4a – Prefabricated residential units in Höfn, South Iceland. Photo by Sofia Nannini, 2016.

Fig. 4b – Prefabricated residential units in Kópavogur, near Reykjavík. Photo by Sofia Nannini, 2019.

examples are the works by architect Högna Sigurðardóttir (1929–2017), who studied and worked in Paris and was one of the first Icelandic architects who pioneered the use of *béton brut* in the country.[6] In the last three decades, Studio Granda emerged as one of the most active architecture offices of the country and its use of concrete stretches all the way from monumental buildings to smaller experimental works.[7] In 1992 they completed the Reykjavík Town Hall, whose impressive concrete pillars are mirrored by the pond at the center of the city. More recently, the studio built an interesting residential house at Garður, southern Iceland (2014). The house can be seen as a sort of contemporary Icelandic turf house: it was built partially underground, flanked by earth abutments, yet enclosed by cast concrete walls and an arched concrete ceiling. Along the lines of Guðjón Samúelsson's experimentations on *steining*, the terrazzo finish of the floor includes basalt and shell fragments.[8] In 2019, the studio restored a concrete farm and stables dating back to the early 1980s, engaging in a very peculiar restoration project in which the imperfections of rural concrete were kept and elected as a distinctive characteristic for the whole building.[9] **Figg. 5–11.**

The restoration of twentieth-century concrete heritage has been one of the most pressing topics of Icelandic architecture in the past decades, especially in the city of Reykjavík. Between 1998 and 2000 Studio Granda restored Sigurður Guðmundsson's "Harbour House" and transformed it into the Reykjavík Art Museum. In 2009–11, after the demolition caused by a fire, they rebuilt the cinema *Nýja Bíó* according to the original design by Finnur Thorlacius (1919). Between 1997 and 2000, Hornsteinar Architects restored the former National Library, now House of Culture, and in 2004 they completed the expansion of the National Museum.[10] In 2013–14 the studio Arkís Architects renovated the former commercial building of Nathan & Olsen, now known as Apotek Hotel.[11] In 2017, Kurtogpi Architects restored the small concrete studio of Icelandic artist Ásmundur Sveinsson (1893–1982), built in 1933 by architect Sigurður Guðmundsson, and in the same year they also renovated the former concrete factory

[6] On the use of concrete in some of her Icelandic residential projects, see: Guja Dögg Hauksdóttir, "The Search of Meaning Through Concrete: Matter and Mind in the Work of Högna Sigurðardóttir," *The Journal of Architecture* 20, no. 3 (2015): 489–509.

[7] Studio Granda was founded by architects Margrét Harðardóttir and Steve Christer in 1987. On their works, besides many articles in international architecture journals, see: Sheila O'Donnell, and John Tuomey, *Í hlutarins eðli – The Nature of Things: Studio Granda* (Reykjavík: Kjarvalsstaðir, 1995); Annette W. LeCuyer, *Studio Granda: Dreams and Other Realities* (Ann Arbor: University of Michigan, 1998). See also the interview with the studio in: Schmal, ed., *Iceland and Architecture?*, 74–121.

[8] "Garður Landhouse/ Studio Granda", *Archdaily*, 21 February 2017, https://www.archdaily.com/805562/gardur-landhouse-studio-granda?ad_medium=office_landing&ad_name=article, last accessed 9/11/2020.

[9] "Drangar Renovation / Studio Granda," *Archdaily,* 24 September 2019, https://www.archdaily.com/925031/drangar-renovation-studio-granda?ad_medium=office_landing&ad_name=article, last accessed 9/11/2020.

[10] See the official website of Hornsteinar Architects at http://www.hornsteinar.is/, last accessed 30/11/2020.

[11] See the recent volume on Arkís Architects: *Natural Elements*, edited by Tomas Lauri (Stockholm: Arvinius+Orfeus, 2020).

Fig. 5 – Högna Sigurðardóttir, Bakkaflöt House (1965–68), Garðabær, near Reykjavík.
https://www.visir.is/g/2017260072d, last accessed 15/11/2020.

Fig. 6 – Högna Sigurðardóttir, House in Sunnubraut 37 (1963–66), Kópavogur, near Reykjavík.
Photo by Sofia Nannini, 2018.

Fig. 7 – Studio Granda, Reykjavík City Hall (1987–92). Photo by Sofia Nannini, 2016.

Fig. 8 – Studio Granda, Reykjavík City Hall (1987–92). Photo by Sofia Nannini, 2016.

Fig. 9 – Studio Granda, Garður Landhouse (2014). *Archdaily*, https://www.archdaily.com/805562/gardur-landhouse-studio-granda?ad_medium=office_landing&ad_name=article, last accessed 15/11/2020.

Fig. 10 – Studio Granda, Garður Landhouse (2014). *Archdaily*, https://www.archdaily.com/805562/gardur-landhouse-studio-granda?ad_medium=office_landing&ad_name=article, last accessed 15/11/2020.

Fig. 11 – Studio Granda, Drangar Renovation (2019). *Archdaily*, https://www.archdaily.com/925031/drangar-renovation-studio-granda?ad_medium=office_landing&ad_name=article, last accessed 15/11/2020.

Marshall Húsið.[12] As mentioned in paragraph 4.3.2, Guðjón Samúelsson's steining-rendered buildings were restored between the mid-1990s and the late 2010s. In recent years, the concrete structure of the church of Hallgrímur has been in a state of almost constant renovation, to the point that restoration works on the church have been considered as an "eternal task".[13] **Figg. 12–13.** The eminence of concrete in the Icelandic context is also highlighted by the work of the Icelandic Concrete Society [*Steinsteypufélagið*], founded in 1971, which unites companies, individuals and institutions in order to promote scientific research on concrete technology in Iceland. It was the last society dedicated to concrete construction to be founded in the Nordic countries, yet it is exceptionally active given the small dimensions of the country.[14] Every few years, the society awards a "concrete prize" for Iceland's most appreciated architectural or infrastructural projects in concrete.[15]

The impact of concrete on Icelandic national culture cannot be overstated. Beyond architecture, concrete is all-pervading in many other areas of Icelandic culture, from artworks to literature. The material was largely used by Icelandic artists and sculptors such as Ásmundur Sveinsson and Sigurjón Ólafsson (1908–1982). The former also enthusiastically used concrete to build his second house and studio on the outskirts of the city, completed in 1959.[16] As artist Einar Jónsson had done before him in the mid-1910s, Ásmundur Sveinsson modelled his studio as a massive concrete sculpture, flanked by two cones and topped by a spherical dome.[17] **Figg. 14–15.** Icelandic artist Sigurjón Ólafsson also experimented with concrete, with a particular focus on casting bas-reliefs.[18] One example is the sculpture dedicated to the stacking of salted fish, *Saltfiskstöflun* (1934–35), located on Rauðarárholt hill in Reykjavík. He also used concrete to cast wall decorations which could be compared to Le Corbusier's *sculptures moulées*: one example is the austere façade of the Búrfell power station, in south-west Iceland (1966–69). The wall of the dam is covered with

[12] See the official website of Kurtogpi Architets at https://www.kurtogpi.is/, last accessed 27/11/2020.

[13] "Steinsteypuskemmdir eilífðarverkefni," *RÚV*, 12 August 2015, https://www.ruv.is/frett/steypuskemmdir-eilifdarverkefni, last accessed 13/11/2020.

[14] The Swedish Concrete Association [*Svenska Betongföreningen*] was founded in 1912; the Finnish Concrete Association opened in 1925 as *Betongföreningen i Finland*, now *Suomen Betoniyhdistys*; in Denmark, *Dansk Betonforening* was founded in 1947, now merged into *Dansk Beton*; *Norsk Betongforening* was established in Norway in 1955.

[15] *Steinsteypuverðlaun Steinsteypufélagsins*. See the list of the past recipients: http://www.steinsteypufelag.is/steinsteypuverethlaunin.html, last accessed 10/11/2020.

[16] Ásmundur Sveinsson used concrete to create or enlarge some of his statues – such as *Járnsmiðurinn* [The Blacksmith], now located on Snorrabraut boulevard in Reykjavík (1936) or the smaller *Tröllkona* [Giantess] crafted in 1946 and now exhibited at the Ásmundur Sveinsson museum. On the sculpture *The Blacksmith*, see: "Járnsmiðurinn," *Listasafn Reykjavíkur*, https://safneign.listasafnreykjavikur.is/en/verk/H-016, last accessed 09/11/2020.

[17] On Ásmundur Sveinsson's studios in Reykjavík and their construction, see: Pétur H. Ármannsson, "Salir Ásmundar," in *Ásmundur Sveinsson*, edited by Ólöf Kristín Sigurðardóttir (Reykjavík: Listasafn Reykjavíkur – Ásmundarsafn, 2017), 172–83.

[18] On the life and career of Sigurjón Ólafsson, see: Birgitta Spur, ed., *Sigurjón Ólafsson: myndhöggvari* (Reykjavík: Styrktarsjóður Listasafns Sigurjóns Ólafssonar, 1985); Lise Funder and Birgitta Spur, eds., *Sculptor Sigurjón Ólafsson and His Portraits* (Reykjavík: Sigurjón Ólafsson Museum, 2008).

Fig. 12 – Renovation works on the church of Hallgrímur, Reykjavík. Photo by Sofia Nannini, 2016.

Fig. 13 – Renovation works on the church of Hallgrímur, Reykjavík. Photo by Sofia Nannini, 2018.

Fig. 14 – Ásmundur Sveinsson, Model for his house and studio. Ásmundur Sveinsson Museum.
Photo by Sofia Nannini, 2019.

Fig. 15 – Ásmundur Sveinsson Museum (completed in 1959), Reykjavík. Photo by Sofia Nannini, 2019.

Fig. 16 – Sigurjón Ólafsson, *Saltfiskstöflun* (1934–35), Rauðarárholt, Reykjavík.
Photo by Sofia Nannini, 2019.

Fig. 17a – Sigurjón Ólafsson, Wall relief on the Búrfell Power Station (1966–69).
Sigurjón Ólafsson Museum, http://www.lso.is/vefskra/1232.htm, last accessed 15/11/2020.

Fig. 17b – Sigurjón Ólafsson, Wall relief on the Búrfell Power Station (1966–69).
Photo by Ómar Óskarsson, https://www.mbl.is/frettir/innlent/2020/05/02/fimmtiu_ara_saga_burfellsvirkjunar/, last accessed 20/11/2020.

concrete panels, decorated by geometric reliefs dedicated to the relationship between humans and nature.[19] In recent years, concrete is still present in many art museums: contemporary artists such as Ingólfur Arnarsson and Brynhildur Þorgeirsdóttir have exhibited many abstract and sculptural works cast in concrete.[20] **Figg. 16–17b.**

The heritage of the Icelandic concrete age has been frequently portrayed by photographers, film-makers and, most of all, by many Icelandic novelists. The presence of hundreds of concrete ruins all over the island emerges from the landscape photographs collected in *Metamorphosis* by Sigurgeir Sigurjónsson, in which the Icelandic nature is juxtaposed to ruins, buildings and construction sites.[21] Abandoned farmhouses designed by the technical office of the Agricultural Agency, discussed in paragraph 3.4, were photographed and listed by the research project *Eyðibýli á Íslandi* [Abandoned Farmhouses in Iceland].[22] The dramatic story told by the short film *Síðasti bærinn* [The Last Farm], directed by Icelandic director Rúnar Rúnarsson in 2004, revolves around a small concrete farmhouse at the very end of the Dýrafjörður fjord in the Westfjords.[23] **Figg. 18a–18b.** Literature is the field where the revolution in building tradition that occurred in the early twentieth century has emerged most. Decades after Laxness's masterpieces, many Icelandic authors still mention the social changes brought about by modern concrete dwellings. Einar Már Guðmundsson's novel *Fótspor á himnum* [Footprints in Heaven], published in 1997, is a nostalgic and disillusioned hymn to those who lived in the years when Reykjavík was still divided between turf farms and unlivable concrete basements.[24] The destruction of traditional farms and their replacements in concrete are mentioned by Bergsveinn Birgisson in his novel *Svar við bréfi Helgu* [Reply to a Letter from Helga], published in 2010.[25]

---

[19] The reliefs are approximately five meters high and more than sixty meters long. On the bas-relief at the Búrfell Power Station, see the website of the Sigurjón Ólafsson Museum: http://www.lso.is/08_Burfell/Burf_cat_e.pdf, last accessed 14/11/2020. Sigurjón Ólafsson's bas-reliefs can be also found on façades of residential and commercial buildings in Reykjavík, such as on the southern elevation of an apartment building in Espigerði 2 (1973–74) and of the Sundaborg warehouses near the Sundahöfn harbour (1971–74). On both works see the website of the museum: "Lágmynd/Wall Relief," http://www.lso.is/vefskra/1285.htm; "Sundaborg/Wall Relief,"http://www.lso.is/vefskra/1274.htm, last accessed 14/11/2020.

[20] See the recent exhibitions by Ingólfur Arnarsson, *Jarðhæði/Ground Level* (Reykjavík Art Museum, 03/11/2018–10/02/2019) and *Frumefni náttúrunnar*/*Natural Elements* by Brynhildur Þorgeirsdóttir (Ásmundur Sveinsson Museum, 06/04/2019–10/06/2019).

[21] Sigurgeir Sigurjónsson, *Metamorphosis* (Reykjavík: Prentmiðlun, 2017).

[22] See note 112 in chapter three.

[23] Rúnar Rúnarsson, *Síðasti bærinn*, 2004. The short movie can be watched online at: https://www.youtube.com/watch?v=Oh7sQ4hPnyk, last accessed 14/11/2020.

[24] Einar Már Guðmundsson, *Fótspor á himnum* (Reykjavík: Mál og menning, 1997).

[25] "Yet we watched the old turf farmhouses of Hörgár Parish being cleared away by bulldozers upon the arrival of cement. It's one thing to believe in and devote oneself to progress, Helga, and another to start despising the old ways. The old turf farms are all gone now because they reminded people of cold and damp and what people so mercilessly call 'hayseedism'. But what culture do people have who say such things? It's only when folk turn their backs on their own history that they become small". English translation as *Reply to a Letter from Helga*, trans. by Philip Roughton (Las Vegas: AmazonCrossing, 2013), 77. The original text goes: "Við sem sáum burstabæjunum í Hörgárhrepp rutt í burt af jarðrýtum þegar sementið kom. Það er eitt að trúa á og tileinka sér framfarir, Helga mín, annað að byrja að fyrirlíta hið gamla. Gömlu torfbærnir eru allir horfnir núna því þeir minntu fólk á kulda og sagga og það sem menn svo miskunnarlaust kalla molbúahátt. En hvaða menningu eiga þeir sem tala

Fig. 18a – Poster of *Síðasti bærinn* [The Last Farm] by Rúnar Rúnarsson, 2004.

Fig. 18b – The concrete farm where the short movie *Síðasti bærinn* was shot. Dýrafjörður, Westfjords. Photo by Sofia Nannini, 2016.

Jón Kalman Stefánsson's novels often refer to architecture in the Icelandic landscape and to the hardship of inhabitating that landscape. In his book *Fiskarnir hafa enga fætur* [Fish Have No Feet], published in 2013, the author used concrete as a collective metaphor for human relationships and life:

> [...] and somewhere in Keflavík Jakob mixes concrete, he adds a little resin to the mix to bind it, to keep it from separating, to keep it from sliding down after it's been spread on a wall or used to fasten a weatherboard, so that it remains whole and thereby acquires a purpose. Needs just a small amount, hardly more than a capful in the concrete mixture, which is composed of numerous shovelsful of sand and cement, a certain amount of water, yet all it takes is one capful of resin for the mixture to remain bound together rather than slowly separate or crumble off the walls. After tossing the resin into the mixture, Jakob hesitates, watching the raw materials spin and combine, watching the resin disappear into the mixture. Why is it so easy to combine cement, sand and water into one, a whole, a unit, a purpose, all it takes is one capful, it isn't fair, because it seems so difficult to get life to hang together, this human life that you've got to drag around with you wherever you go, wherever you are.[26]

The fact that a contemporary novelist did not consider concrete and its components as parts of a distant technical world, but as a shared historical and social feature to be used for a literary and metaphorical purpose, is undoubtedly one of the results of the concrete *saga* that has characterized Icelandic architecture and society. Today the works of Icelandic artists, historians, directors and novelists all tell the same story from different perspectives: for those inhabiting Iceland, concrete is everywhere and holds a variety of meanings. It is the cornerstone of the country's recent history; its presence is so widespread that it may be taken for granted and its roots may not be even questioned. The history of concrete construction and architecture in Iceland could not be framed by a few years and it did not emerge from a handful of buildings. On the contrary, it was a collective history springing from the nineteenth century and influencing society through the present day, embracing rural and urban areas alike, engaging engineers and farmers, architects and politicians. Concrete acted as a driving force of social and economic development for Iceland; it eventually gave its inhabitants the opportunity to go past the rigors of their former lifestyle and embrace the commodities and contradictions of modernity.

---

svo? Þegar menn snúa baki við sögu sinni, þá fyrst verða þeir litlir." Bergsveinn Birgisson, *Svar við bréfi Helgu*, 66.

[26] Jón Kalman Stefánsson, *Fish Have No Feet*, chapter "Keflavík 1980". The original text goes as follows: "[...] og einhverstaðar í Keflavík hrærir Jakob í steypu, hann skvettir léttblendi út í svo blandan haldist saman, fari ekki í sundur, skríði ekki niður þegar búið er að smyrja henni á vegg, setja í vatnsbretti, til að hún haldist sem eining og öðlist þar með tilgang. Þarf bara smáskvettu, varla meira en tappa út í steypublönduna sem samanstendur þó af allnokkrum skóflum af sandi og sementi, slatta af vatni, en samt þarf ekki meira en tappa af léttblendi til að blandan haldist saman en skríði ekki í sundur, eða molni úr veggnum. Jakob hikar eftir að hafa skvett léttblendinu út í blönduna, horfir á hana snúast í hrærivélinni og blandast saman við steypuna, hverfa inn í hana. Afhverju er svona auðvelt að láta sement, sand og vatn bindast saman, verða eitt, að heild, einingu, tilgangi, það þarf bara einn tappa, það er ekki sanngjart, því það virðist svo erfitt að fá lífið til að hanga saman, þessa ævi manns sem maður þarf að burðast með hvert sem maður fer, hvar sem maður er." Jón Kalman Stefánsson, *Fiskarnir hafa enga fætur* (Reykjavík: Skynjun, 2013), 234–35.

References

Note: Icelandic authors have been listed alphabetically following the order of their first names, the last name usually being a patronymic [*–son, –dóttir*]. The titles of references in Nordic languages have been translated and inserted in brackets.

Archival sources

Glossary
askja = box
örk = folder
bréf = letter
teikning = drawing
skúffa = drawer
mappa = folder
geymsla = storage
flokkur = group
verkefni = project

Þjóðskjalasafn Íslands. National Archives of Iceland [ÞÍ].
The National Archives of Iceland include the majority of documents related to Iceland and its institutions. Most photographs and images of the National Archives have been digitized and are available at the website *sarpur.is*.

Byggingastofnun landbúnaðarins. Teikningar.
[The Building Institute of the Agricultural Agency. Drawings]

- **BA/2. Örk 3**

1937. *Ýmsar afgreiðslur.*
Documents on the work by the technical office of the Agricultural Agency.

- **BB/1 – BB/24**

Standard drawings for farmhouses by the technical office of the Agricultural Agency (drawings 0001–1177, **1930–48**).

Húsameistari ríkisins. Bréfa- og teikningasafn.
[The State Architect. Letters and Drawings]

- **B/9. Örk 1.**

1926–1934. *Landsspítalinn*.
Documents on the construction of the National Hospital.

- **B/167. Örk 1.**

1924–1954. *Þjóðleikhúsið. Bréf, reikningar, faktúrur.*
Documents regarding the construction of the National Theatre in Reykjavík.

- **B/168. Örk 1.**

1924–1952. *Þjóðleikhúsið. Bréf, áætlanir, reikningar.*
Documents regarding the construction of the National Theatre in Reykjavík.

- **B/210. Örk 1.**

1926–1996. *Ýmsar kirkjur*.
Documents on several churches designed by the State architect office.

- **C/276**

1917. *Verzlunarhús Nathan og Olsens.*
Guðjón Samúelsson's drawings for the commercial building for Nathan & Olsen in Reykjavík.

- **C/776**

Landsspítali gamli.
Drawings of the project for the National Hospital in Reykjavík.

- **Mappa 2, Geymsla 7. Örk 410**

1907–1931. *Þjóðleikhúsið. Teikning frá 1907–1931 afrit.*
Drawings of the National Theatre in Reykjavík.

- **Skúffa 22. Örk 27–28–29.**

1908. *Safnahúsið við Hverfisgötu og Arnarhólssvæðið.*
Drawings and projects of the National Library and Museum by Johannes Magdahl Nielsen.

- **Safn A(D), Flokkur 44.**

1916–1946. *Listasafn Einars Jónssonar.*
Drawings of the Einar Jónsson museum and studio.

- **Safn A(D), Flokkur 21, Verkefni H–L. Örk 30**

1925–1926. *Landakotskirkja.*
Drawings of the church at Landakot by Guðjón Samúelsson.

- **Safn A(D), Flokkur 42. Örk 181**

1930–1939. *Háskóli Íslands. Sérteikningar.*
Drawings of the main building and campus of the University of Iceland.

Rentukammer. Bréfasafn.
[Rentukammer. Letters]

- **1928 – B24/0005** / *Bréfadagbók* 20 (*Islands Journal* 20). 1841–1842 / Örk. 18

Documents regarding the early research on pozzolana in Iceland.

Stjórnarráð Íslands I. Skrifstofa. Bréfasafn.
[Ministry Offices of Iceland I. Letters]

- **Skrifstofa B/16. Örk. 9.**

Db.1, nr. 515. *Landsbókasafnið*. 968-969/**1908**.
Documents on the National Library in Reykjavík.

- **Skrifstofa B/18. Örk 14.**

Db. 1, nr. 594. *Opinberar byggingar. Bókasafnsbygging m.m. (Safnahúsið).* 1276/**1908**
Documents regarding the construction of the National Library in Reykjavík.

Stjórnarráð Íslands II. Skrifstofa. Bréfasafn.
[Ministry Offices of Iceland II. Letters]

Documents regarding the requests by farmers for funds in order to renovate their farmsteads located on public lands:

- **Skrifstofa 0000 B/1. Örk 2.**

Db. 1, nr. 4. *Beiðni Ágústs Blöndals um styrk til húsabóta á þjóðjörðinni Hlaðhamri í Bæjarhreppi.* 454/**1908**.

- **Skrifstofa 0000 B/1. Örk 6.**

Db. 1, nr. 18. *Beiðni um styrk til húsabóta á Möðruvöllum í Hörgárdal*. 130/**1904**.

- **Skrifstofa 0000 B/1. Örk 8.**

Db. 1, nr. 20. *Beiðni um styrk til húsabóta á Gröf í Kirkjuhvammssókn í Húnavatnssýslu.* 45/**1904**.

- **Skrifstofa 0000 B/1. Örk 13.**

Db.1, nr. 36. *Beiðni um styrk til húsabóta á þjóðjörðinni Nyrðri-Búastöðum í Vestmannaeyjum.* 528/**1904**.

- **Skrifstofa 0000 B/1. Örk 16.**

Db. 1, nr. 44. *Beiðni um styrk til húsabóta á þjóðjörðinni Vatnsholti í Staðarsveit.* 79/**1904**.

- **Skrifstofa 0000 B/1. Örk 17.**

Db. 1, nr. 45. *Beiðni um styrk til húsabóta á þjóðjörðinni Skarði í Neshreppi utan Ennis.* 80/**1904**.

- **Skrifstofa 0000 B/2. Örk 2.**

Db. 1, nr. 53. *Beiðni um styrk til húsabóta á þjóðjörðinni Ási í Garðahreppi í Gullbringu- og Kjósarsýslu* 229/**1904**.

- **Skrifstofa 0000 B/4. Örk 1.**

Db. 1, nr. 121. *Ábúandinn á þjóðjörðinni Stóra-Kambi í Breiðavíkurhreppi, Þórarinn Þórarinsson, biður um styrk úr umbótasjóði til hlöðubyggingar* 227/**1904**.

- **Skrifstofa 0000 B/4. Örk 2.**

Db. 1, nr. 122. *Ábúandinn á þjóðjörðinni Hagaseli í Staðarsveit, Jóhannes Ó. Gíslason, sækir um styrk úr umbótasjóði til baðstofubyggingar*. 228/**1904**.

- **Skrifstofa 0000 B/4. Örk 3.**

Db. 1, nr. 123. *Ábúandinn á þjóðjörðini Sellóni í Stykkishólmshreppi, Ólafur Thorlacius, sækir um að sér verði, er hann fer frá jörðinni, greiddur úr umbótasjóði mismunur andvirðis húss, sem hann hefir látið byggja og gammalla bæjarhúsa.* 317/**1904**.

- **Skrifstofa 0000 B/4. Örk 18.**

Db. 1, nr. 156. *Ábúandinn á þjóðjörðinni Vaðstakkseyri í Neshreppi utan Ennis, Kristján Jónsson, sækir um styrk til húsabóta á nefndri jörð.* 341/**1904**.

- **Skrifstofa 0000 B/4. Örk 19.**

Db. 1, nr. 157. *Ábúandinn á þjóðjörðinni Setbergi á Skógarströnd, Benedikt Björnsson, sækir um styrk til húsabóta á nefndri jörð*. 342/**1904**.

- **Skrifstofa 0000 B/5. Örk. 5**

Db. 1, nr. 190. *Ábúandinn á þjóðjörðinni Bjarnarstöðum í Bárðardal sækir um styrk til húsabóta á jörðinni* 385 a/**1906**.

- **Skrifstofa 0000 B/5. Örk. 10**

Db. 1, nr. 197. *Ábúandinn á þjóðjörðinni Osi á Skógarströnd, Stefán Guðmundsson, sækir um styrk til húsabóta á nefndri jörð* 939/**1906**.

- **Skrifstofa 0000 B/5. Örk. 11**

Db. 1, nr. 198. *Ábúandinn á þjóðjörðinni Ingjaldshóli í Neshreppi utan Ennis sækir um styrk til húsabóta á nefndri jörð* 501/**1904**.

- **Skrifstofa 0000 B/5. Örk 12.**

Db. 1, nr. 199. *Ábúandinn á þjóðjörðinni Ytri-Knarartungu í Breiðuvíkurhreppi sækir um styrk til húsabóta á nefndri jörð* 502/**1904**.

- **Skrifstofa 0000 B/6. Örk 2.**

Db. 1, nr. 206. *Ábúandinn á þjóðjörðinni Valdastöðum í Kjós sækir um styrk til húsabóta á jörðinni.* 529/**1904**.

- **Skrifstofa 0000 B/7. Örk 2.**

Db. 1, nr. 254. *Ábúandinn á þjóðjörðinni Leirvogstungu sækir um styrk til húsabóta*. 63/**1908**. Evidence of the engineer Jón Þorláksson in the request.

- **Skrifstofa 0000 B/7. Örk 3.**

Db. 1, nr. 256. *Ábúandinn á þjóðjörðinni Hörgsdal í Horgslandshreppi, Bjarni Bjarnason, sækir um að landssjóður kaupi hlöðu sem hann hefir byggt á jörðinni.* 195/**1905**.

- **Skrifstofa 0000 B/7. Örk 6.**

Db. 1, nr. 261. *Ábúandinn á þjóðjörðinni Ögri í Stykkishólmshreppi, Páll Guðmundsson, sækir um styrk til húsabóta*. 1018/**1904**.

- **Skrifstofa 0000 B/8. Örk 13.**

Db. 1, nr. 297. *Ábúandinn á þjóðjörðinni Ási á Skógarströnd, Stefán Guðmundsson, sækir um styrk til húsabóta á nefndri jörð*. 869/**1904**.

- **Skrifstofa 0000 B/12. Örk 4.**

Db. 1, nr. 373. *Ábúandinn á þjóðjörðnni Bergshól (Bergþórsbúð og Brandsbúð) sækir um styrk til húsabóta (greiðsla verðmunar á gömlum og nýjum húsum).* 143/**1905**.

- **Skrifstofa 0000 B/13. Örk. 2.**

Db. 1, nr. 408. *Ábúandinn á þjóðjörðinni Féeggstöðumr sækir um styrk til húsabóta á jörðinni*. 179/**1905**.

- **Skrifstofa 0000 B/13. Örk. 11.**

Db. 1, nr. 424. *Ábúandinn á 1/3 þjóðjarðarinnar Hruna í Hörgslandshreppi sækir um styrk til húsabóta á nefndri jörð.* 194/**1905**.

- **Skrifstofa 0000 B/16. Örk. 12.**

Db. 1, nr. 498. *Ábúandinn á þjóðjörðinni ½ Drápuhlíð sækir um styrk til húsabóta*. 433/**1907**.

- **Skrifstofa 0000 B/16. Örk. 13.**

Db. 1, nr. 499. *Ábúandinn á þjóðjörðinni Hamarsfirði sækir um styrk til húsabóta* 957/**1905**.

- **Skrifstofa 0000 B/19. Örk. 6.**

Db. 1, nr. 532. *Beiðni um styrk til húsabóta á þjóðjörðinni Staðarbakka í Helgafellssveit.* 421/**1905**.

- **Skrifstofa 0000 B/19. Örk. 7.**

Db. 1, nr. 533. *Beiðni um styrk til húsabóta á þjóðjörðinni Lágarkoti í Eyrarsveit.* 422/**1905**.

- **Skrifstofa 0000 B/20. Örk. 9.**

Db. 1, nr. 587. *Beiðni ábúandans á þjóðjörðinni Veðramóti í Skagafirði, Björns Jónssonar, um styrk til húsabóta* 178–179/**1906**.

- **Skrifstofa 0000 B/24. Örk. 1.**

Db. 1, nr. 703. *Ábúandinn á þjóðjörðinni Hólabaki í Þingeyraklaustursumboði sækir um landsskuldarlækkun vegna skemmda á jörðinni og styrk til húsabóta*. 236/**1906**.

- **Skrifstofa 0000 B/25. Örk. 1.**

Db. 1, nr. 720. *Ábúandinn á þjóðjörðinni Skógum á Þelamörk sækir um styrk til húsabóta.* 373/**1906**.

- **Skrifstofa 0000 B/25. Örk. 8.**

Db. 1, nr. 734. *Ábúandinn á hálfri þjóðjörðinni Þjóðólfshaga sækir um styrk til húsabóta.* 2030/**1919.**

- **Skrifstofa 0000 B/27. Örk. 2.**

Db. 1, nr. 777. *Ábúandinn á þjóðjörðinni Kópavogi, Erlendur Zakaríasson, sækir um styrk til húsabóta*. 126/**1908**.

- **Skrifstofa 0000 B/27. Örk. 8.**

Db. 1, nr. 787. *Ábúandinn á þjóðjörðinni Eyrarbúð í Breiðuvíkurhreppi sækir um styrk til húsabóta svo og endurgjald fyrir byggingu á fyrri ábúðarjörð sinni, Öxl, í sama hreppi.* 1188/**1906**.

- **Skrifstofa 0000 B/28. Örk. 18.**

Db. 1, nr. 833. *Ábúandinn á þjóðjörðinni Varmalandi í Skagafirði sækir um styrk til húsabóta á jörðinni*. 379/**1906**.

- **Skrifstofa 0000 B/29. Örk. 1.**

Db. 1, nr. 840. *Ábúandinn á þjóðjörðinni Helgaseli sækir um styrk til húsabóta eftir að hús jarðarinnar hafa fokið. 366*/**1906**.
Documents regarding a farmer's request for funds in order to renovate a farm.

- **Skrifstofa 0000 B/29. Örk. 2.**

Db. 1, nr. 841. *Ábúandinn á þjóðjörðinni Ytra-Gili í Hrafnagilshreppi sækir um styrk til húsabóta á jörðinni.* 372/**1906**.

- **Skrifstofa 0000 B/29. Örk. 3.**

Db. 1, nr. 842. *Ábúandinn á þjóðjörðini Bakka í Svarfarðardal sækir um styrk til húsabóta á jörðinni*. 370/**1906**.
Documents regarding a farmer's request for funds in order to renovate a farm.

- **Skrifstofa 0000 B/29. Örk. 6.**

Db. 1, nr. 845. *Ábúandinn á þjóðjörðinni Norður-Hvammi í Mýrdal sækir um styrk til húsabóta á jörðinni.* 1361/**1907**.

- **Skrifstofa 0000 B/29. Örk. 14.**

Db. 1, nr. 856. *Ábúandinn á þjóðjörðinni Bláfeldi sækir um styrk til hlöðubyggingar.* 387/**1906**.

- **Skrifstofa 0000 B/30. Örk. 16.**

Db. 1, nr. 895. *Ábúandi Múlakirkjujarðarinnar Ness sækir um styrk til húsabóta*. 897/**1906**.

- **Skrifstofa 0000 B/34. Örk. 12.**

Db. 1, nr. 938. *Ábúandinn á þjóðjörðinni Granastöðum í Ljósavatnshreppi sækir um styrk til húsabóta*. 861/**1906**.

- **Skrifstofa 0000 B/34. Örk. 13**

Db. 1, nr. 939. Á*búandinn á þjóðjörðinni Botni í Grýtubakkahreppi sækir um styrk til húsabóta*. 860/**1906**.

- **Skrifstofa 0000 B/47. Örk. 8**

Db. 2, nr. 318. *Landsetinn á þjóðjörðinni Þormóðsstöðum sækir um styrk til húsabóta*. 86/**1908**.

- **Skrifstofa 0000 B/54. Örk. 25.**

Db. 2, nr. 476. *Ábúandinn á Húsanesi sækir um styrk til húsabóta*. 104/**1908**.

- **Skrifstofa 0000 B/58. Örk. 14.**

Db. 2, nr. 556. *Ábúandi Saura í Helgafellssveit beiðist styrks til húsabóta*. 149/**1908**.

- **Skrifstofa 0000 B/59. Örk. 12.**

Db. 2, nr. 578. *Beiðni um styrk til húsabóta á Hamrændum í Breiðavíkurhreppi.* 187/**1908**.

- **Skrifstofa 0000 B/63. Örk. 2.**

Db. 2, nr. 677. *Beiðni um styrk til húsabóta í Enniskoti í Þingeyraklaustursumboði*. 884/**1908**.

- **Skrifstofa 0000 B/334. Örk. 7.**

Db. 8, nr. 483. *Styrkur til húsabóta á Hliðarenda* 382/**1927**.

- **Skrifstofa 0000 B/1. Örk 4.**

Db. 1, nr. 6. *Rannsókn á byggingarefnum og leiðbeiningar í húsagerð sbr. fjárlög f. 1904-1905, 14. grein B. 1. j*. 20/**1906**
Documents regarding Jón Þorláksson's funded research on building materials and guidelines for the construction of houses.

- **Skrifstofa 0000 B/29. Örk. 20.**

Db. 1, nr. 866. *Verkfræðingur landsins sækir um styrk til þess að ferðast til Noregs*. 357/**1906.**
Documents on engineer Jón Þorláksson's requested funds to travel to Norway.

- **Skrifstofa 0000 B/29. Örk. 21.**

Db. 1, nr. 867. *Verkfræðingur landsins sækir um leyfi til þess að ferðast til útlanda*. 301/**1906**.
Documents on engineer Jón Þorláksson's requested funds to travel abroad.

- **Skrifstofa 0000 B/34. Örk. 2.**

Db. 1, nr. 922. *Christiani & Nielsen í Kaupmannahöfn senda veðlista yfir brýr o. fl. úr steinsteypu*. 891/**1906**
Christiani & Nielsen send a warranty list on a bridge to be built in concrete.

- **Skrifstofa 0000 B/35. Örk. 5.**

Db. 1, nr. 979. *Þjóðvegir* 1365/**1906**.
Documents on the construction of the national roads.

- **Skrifstofa 0000 B/44. Örk. 16**

Db. 2, nr. 228. *Leiguliðinn á Horni í Helgafellsveit leitar um styrk til húsabóta*. 105/**1908**
Documents regarding a farmer's request for funds in order to renovate a farm.

- **Skrifstofa 0000 B/52. Örk. 15.**

Þjóðvegir. 151/**1908**.
Documents on the construction of the national roads.

- **Skrifstofa 0000 B/59. Örk. 8.**

Db. 2, nr. 570. *Beiðnir um aðstoðarverkfræðing (fjárlög 1908/1909, 16 grein 10).* 1636/**1910**
Building advice from engineer Thorvald Krabbe.

- **Skrifstofa 0000 B/60. Örk 1**

Db.2, nr. 601. *Brúagerð á Fnjóská milli Pálsgerðis og Miðgerðis í Dalsmynni.* 509-510/**1908**.
On the construction of the bridge over the Fnjóská river.

- **Skrifstofa 0000 B/63. Unnumbered.**

Db. 2, nr. 698. *Brúargjörð á Fnjóská* 1759/**1909**.
Documents and letters regarding the construction of the bridge on the Fnjóská river.

- **Skrifstofa 0000 B/66. Örk. 8.**

Db. 2, nr. 763. *Þjóðvegir*. 430/**1909**.
Documents on the construction of the national roads.

Teikningasafn. [Drawing Collection]

- **C. VII. 1. a, b, c, d, e. Skúffa 8, Númer 5.**

Safnahús. Project by Rögnvaldur Ólafsson for the National Library, ca. 1905.

- **Skúffa 15, Örk. 5–6**

Heilsuhælið á Vífilsstöðum. Project by Rögnvaldur Ólafsson for the sanatorium in Vífilsstaðir, 1909.

Vita- og hafnarmálastofnun. Bréfasafn.
[Institute for Lighthouses and Harbours. Letters]

- **B-BDA 1.**

Bréfabók landsverkfræðings. **1906–1909**.
Book of letters by engineer Thorvald Krabbe.

- **B-BDB/2. Örk 1.**

Byggingamál. **1909–1917.**
Documents and letters with construction advice by engineer Thorvald Krabbe.

- **B-BDB/6. Örk 4.**

Landsverksfræðingur. Fyrirspurnir og svör. **1906–1933**.
Documents and letters with construction advice by engineer Thorvald Krabbe.

Borgarskjalasafn Reykjavíkur. Reykjavík City Archives.
Among their vast collection, the Reykjavík City Archives hold the private archives of some important figures of Icelandic history.

Einkaskjalasafn nr. 25. Knud Zimsen. [Private archive of Knud Zimsen]

- **Askja 1**

Bréfabók Knuds Zimsens. Books of letters by Knud Zimsen: 1901–1903 and 1904–1907.

- **Askja 2**

Bréfabók Knuds Zimsens. Books of letters by Knud Zimsen: 1906–1909 and 1909–1913. Documents regarding the construction and opening of the wool factory Iðunn.

Einkaskjalasafn nr. 191. Jón Þorláksson & Ingibjörg Clæssen Þorláksson. [Private archive of Jón Þorláksson and Ingibjörg Clæssen Þorláksson]

- **Askja 1–4**

Private letters and documents to/from Jón Þorláksson.

Landsbókasafn Íslands / Háskólabókasafn. National and University Library of Iceland [LBS].

The National and University Library of Iceland holds the majority of printed books, booklets and other sources related to the study topic.

Tímarit.

Digital library of Icelandic newspapers and journals. https://timarit.is/.

Handritasafn. [Manuscript Department].

- **LBS 4 NF.** ***Jakob Hálfdanarson (1836–1919). Bréfa- og handritasafn 1865–1940*** **[Jakob Hálfdanarson. Letters and Manuscripts 1865–1940].**

Askja 18. *Handrit XII. Húsabyggingar*; XIII. *Einkaskjöl og skilriki*; XIV. *Vegir*; XV. *Bændatal og íbúar*; XVI. *Ýmislegt*. **Örk 6.** “Um húsabyggingar”. Answer to engineer Sigurður Pétursson's survey on building traditions.

- **LBS 12 NF.** ***Guðmundur Finnbogason. Skjalasafn*** **[Archive].** ***Bréfasafn. Bréf til Guðmundar Finnbogasonar*** **[Letters to Guðmundur Finnbogason].**

Askja 18. Letter from Jón Þorláksson (Reykjavík, 9th May 1904).
Askja 21. Letters from Rögnvaldur Ólafsson (Reykjavík, 4th February 1897; Reykjavík, 25th October 1900; Ísafjörður, 4th July 1905).

- **JS 133 Fol.** ***Skjalaböggull. Ísland á 18. og 19. öld*** **[Documents. Iceland in the 18th and 19th Century].**

Örk. 6. “Et Kalkbrænderie i Islands”. [A Lime Kiln in Iceland].

- **LBS 314 Fol.** ***Reikningar kalkfélagsins (Esjufélagsins) 1875–1888*** [Invoices of the Lime Society–*Esjufélag* 1875–1888].

- **LBS 767 Fol.** ***Margvíslegt brot. Ýmsar hendur. Skr. á 19. og 20. öld.***

Örk 8. *Skýrslur um byggingarástand í Þingeyjarsýslu, gerðar að beiðni Búnaðarfélags Íslands og boði landshöfðingja, sbr. bréf hans til sýslumanns, dags 31. ágúst 1900. Spurningar eru samdar af Sigurði Péturssyni verkfræðingi. Svör eru úr eftirtöldum hreppum: Aðaldæla-, Axarfjarðar-, Fjalla- og Grýtubakkahreppi, Kelduhverfi, Mývatnssveit, Reykdæla-, Sauðanes- og Svalbarðshreppi*. [Surveys on the Building Conditions of the County of Þingeyjarsýsla. The survey was requested by the Agricoltural Society of Iceland and ordered by the *landhöfðingi*, following his letter to the county magistrate, 31 August 1900. The questions of the survey were collected by engineer Sigurður Pétursson. The answers come from the following districts: Aðaldæla-, Axarfjarðar-, Fjalla- og Grýtubakkahreppi, Kelduhverfi, Mývatnssveit, Reykdæla-, Sauðanes- og Svalbarðshreppur.]

- **Lbs. 2209, 4to.** ***Bréf til Guðmundar prófessors Hannessonar (1907–1908)*** [Letters to professor Guðmundur Hannesson, 1907–1908].

Letter from Jóhann Fr. Kristjánsson (Litlu Hámundarstaðir, 28th January 1908).

Íslandssafn. [Icelandic National Collection].

- ***Forslag til Forbedring af islandske Landboboliger.***
  [Proposal for the Improvement of the Icelandic Rural Dwellings].

Copy of a handwritten document and one drawing by F. A. Bald, 1897.
Retro: "Gefið af Jóni Jakobssyni, 24.03.1908".

- **Stjórnartíðindi fyrir Ísland. [Government gazette].**

Stjórnartíðindi fyrir Ísland 1903. B-deild. *Byggingarsamþykkt fyrir Reykjavík* [Building Code for Reykjavík], 135–44.

Stjórnartíðindi fyrir Ísland 1915. B-deild. *Samþykt um viðauka við byggingarsamþykkt fyrir Reykjavík* [Addition to the Building Code for Reykjavík], 152.

Stjórnartíðindi fyrir Ísland 1924. B-deild. *Samþykt um breytingu á byggingarsamþykt fyrir Reykjavík 7. sept. 1903* [Changes of the Building Code for Reykjavík 1903], 80–82.

Stjórnartíðindi fyrir Ísland 1945. B-deild. *Byggingarsamþykkt fyrir Reykjavík* [Building Code for Reykjavík], 357–75.

Stjórnartíðindi fyrir Ísland: C-deild (1882–1907). "Aðfluttar vörur" [Imported Goods].

- **Ritaukaskrá Landsbókasafnsins. [Catalogue of the National Library].**

Vegagerðin. Icelandic Road and Coastal Administration.
Archive of the Icelandic Road and Coastal Administration.

- Teikningar A-34C/B-31; 33. *Bro over Fnjóska ved Skógar*. **1907**.

Drawings of the bridge over the Fnjóská river by Christiani & Nielsen.

Listasafn Einar Jónssonar. Einar Jónsson's Museum [LEJ].
The Museum holds drawings and sketches by Icelandic sculptor Einar Jónsson.

Einar Jónsson Myndhöggvari. Tillögur, uppköst og tilraunir um utlit o. þ. h.
Proposals. Sketches and drafts.

Alþingistíðindi. [Parliament gazette].
Available online at:
https://www.althingi.is/thingstorf/leidbeiningar-og-yfirlit/althingistidindi/1918-1944/.

"Frumvarp til laga um forboð gegn útflutningi á öllum kalksteinum, silfurbergi og cementsteinum, samt beinum, út úr Íslandi" [Bill to ban the export of all limestones, Iceland spar or cement products, including bones]. *Alþingistíðindi. Umrœður* (1875), 296–310.
"Umræður í efri deild og sameinuðu þingi" [Debates in the Upper House and in the united Parliament]. *Alþingistíðindi* (1899), 390.
"191. Breytingartillaga" [Amendment Proposal]. *Alþingiskjöl* (1899), 313
"Frumvarp til fjárlaga fyrir árin 1908 og 1909" [Bill for the National Budget, years 1908 and 1909]. *Alþingiskjöl* (1907), 45.
"Afgjöld af jarðeignum landssjóðs" [Expenses on public landholdings]. *Alþingiskjöl* (1909), 498.
"Flm. Steingrímur Steinþórsson, Bjarni Ásgeirsson" [Motion to improve the technical office of the Agricultural Agency. Supported by Steingrímur Steinþórsson, Bjarni Ásgeirsson]. *Alþingistíðindi* (1937), 216–25.
"370 Tillaga til Þingsályktunar. Flm. Jónas Jónsson" [Parliament proposal by Jónas Jónsson]. *Þingsskjál* A (1941), unnumbered pages.

Teikningavefur Reykjavíkurborgar. City of Reykjavík – Drawings.

Digital collection of drawings related to the city of Reykjavík.
https://teikningar.reykjavik.is/fotoweb/.

Ljósmyndasafn Reykjavíkur. Reykjavík Museum of Photography.

Digital collection of photographs of Reykjavík.
https://reykjavikcitymuseum.is/reykjavik-museum-of-photography.

Danmarks Kunstbibliotek. Danish National Art Library.

1878. Ferdinand Meldahl, Project for the house of parliament in Reykjavík.
Inventory number 12115 a-i.

1905. Christian Laurits Thuren, Project for the bank *Íslandsbanki* in Reykjavík.
Façade, cross section and ground floor plan.
Inventory numbers: 53767 a-f a, 53767 a-f b, 53767 a-f d.

1906–09. Johannes Magdahl Nielsen, Project for the National Library of Iceland.
Façade. Inventory number 53323 a-b a, *facade hovedingang*.

DTU Historie- og samlingsdatabase. DTU Historical Collection.

Due to the Covid-19 pandemic it was not possible to conduct research at the historical collection of Denmark's Technical University. However some of its archival records are digitized at the website: https://historie.dtu.dk/samling.

Journal and newspaper articles (in chronological order, before 1959)

S.P. [Sveinn Pálsson]. "Um kalkverkun af jørdu og steinum með litlum viðbæti um tilbúning skelia-kalks; samanlesit úr dønskum, þýðskum og ødrum ritum" [On the Effects of Lime on Earth and Stones, with an Addition on the Fabrication on Seashell-Lime; From Danish, German and Other Essays]. *Rit þess (konunglega) íslenzka Lærdómslistafélags* 9 (1788): 91–143.

Guðlaugur Sveinsson. "Um húsa- edr bæabyggingar á Íslandi, sérdeilis smá- edr kot-bæa" [On the Construction of Houses and Farms, Especially Cottages]. *Rit þess konunglega íslenzka Lærdómlistafélags* 11 (1790): 242–78.

"Helluþökin í Reykjavík" [Stone Roofs in Reykjavík]. *Þjóðólfur* 1, no. 5 (13 January 1849): 23–24.

"Tilraunir og uppástungur ýmsra manna um bæjabyggingar" [Experiments and Suggestions by Several People on Farmhouses]. *Bóndi* 1, no. 2–6 (1851): 24–27; 42–44; 54–57; 71–78; 81–86.

Jón Hjaltalín "Fjórða bréf" [Fourth Letter]. *Ný félagsrit* 12 (1852): 66.

"Vöruskrá" [List of Goods]. *Norðanfari* 3, no. 30–31 (1864): 62.

"Það væri lengi..." [It would be long...]. *Þjóðólfur* 19, no. 14–15 (8 February 1867): 58–61.

"Verzlan á Íslandi árið 1866" [Trade in Iceland in 1866]. *Skýrslur um landshagi á Íslandi* 4 (1870): 334.

J. M. Waage, and Sverrir Runólfsson. "Hérmeð leyfum vér..." [Letter to the editor of *Þjóðólfur*]. *Þjóðólfur* 24, no. 13–14 (8 February 1872): 52.

Jón Guðmundsson. "Tugthúsbyggingin" [The Prison]. *Þjóðólfur* 24, no. 27–28 (24 May 1872): 112–14.

Jón Hjaltalín. "Um híbýli manna" [On Housing]. *Heilbrigðis-tíðindi* 2, no. 5–6 (May–June 1872): 33–36.

Jón Hjaltalín. "Um híbýli manna" [On Housing]. *Heilbrigðis-tíðindi* 2, no. 7–8 (July–August 1872): 49–53.

Jón Hjaltalín. "Kalkbrennsla" [Lime Production]. *Heilbrigðis-tíðindi* 3, no. 7–8 (July–August 1872): 60–63.

"Brúagjörð yfir Þjórsá og Ölfusá" [Bridges on the Þjórsá and Ölfusá Rivers]. *Vikverji* 1, no. 20 (1873): 77–78.

"Kalk í Esjunni" [Lime on Mt. Esja]. *Víkverji* 1, no. 21 (28 August 1873): 83.

"Póstskipið" [The Mailboat]. *Víkverji* 2, no. 1 (16 June 1874): 118.

"Fangelsi" [Prison]. *Víkverji* 2, no. 1 (16 June 1874): 117–18.

Jónas Símonarson. "Fáein orð um húsagjörð" [A Few Words on Construction]. *Norðanfari* 14, no. 41–42 (5 November 1875): 87–88.

Jónas Símonarson. "Fáein orð um húsagjörð" [A Few Words on Construction]. *Norðanfari* 14, no. 43–44 (13 November 1875): 91.
Jón Hjaltalín. "Um steinlím og ýmsilegt, er þar að lýtur" [On Limestone]. *Þjóðólfur* 29, no. 1 (17 November 1876): 3–4.
Jón Hjaltalín. "Um steinlím og ýmsilegt, er þar að lýtur" [On Limestone]. *Þjóðólfur* 29, no. 7 (18 January 1877): 25–26.
"Steinhús og timburhús" [Stone Houses and Timber Houses]. *Ísafold* 5, no. 2 (31 January 1878): 5–7.
"Landstjórn" [National Government]. *Fréttir frá Íslandi* 7, no. 1 (1878): 5.
Sverrir Runólfsson. "Kalk og sement" [Lime and Cement]. *Ísafold* 5, no. 19 (5 August 1878): 76.
Jón Hjaltalín. "Um byggingar, kalkbrennslu og steinsmíði" [On Buildings, Lime Production and Stonemasonry]. *Heilbrigðis-tíðindi* 4, no. 1 (January 1879): 5–7.
"Þinghúsið" [The House of Parliament]. *Þjóðólfur* 32, no. 29 (17 November 1880): 114.
"Alþingishúsið" [The House of Parliament]. *Þjóðólfur* 33, no. 3 (29 January 1881): 9.
"Innlendar fréttir" [News from Iceland]. *Þjóðólfur* 35 no. 3 (20 January 1883): 7.
Sighvatur Árnason. "Um samgöngur og vegagjörðir" [On Communication and Road Construction]. *Þjóðólfur* 35, no. 25 (1883): 75.
Helgi Helgason. "Um steinsteypu" [On Concrete]. *Fróði* 4, no. 113 (1883): 265–67.
Georg Ahrens. "Fyrsta nóvember hefi ég..." [On November 1st I have...] *Þjóðólfur* 36, no. 38 (6 October 1884): 152.
Georg Ahrens. "Um sementsteypu" [On Concrete]. *Þjóðólfur* 37, no. 3 (17 January 1885): 9–10.
"Mannslát" [Obituary]. *Ísafold* 12, no. 5 (30 January 1885): 17.
"Styrkur úr landssjóði" [National Grant]. *Suðri* 4, no. 9 (30 March 1886): 36.
"Alþing II." [Parliament II]. *Þjóðólfur* 39, no. 29 (8 July 1887): 114.
"Ölfursárbrúin" [The Bridge over the Ölfusá River]. *Ísafold* 18, no. 47 (1891): 187.
"Götur og byggingar o. fl. í Reykjavík" [Streets, Buildings, etc. in Reykjavík]. *Reykvíkingur* 2, no. 4 (1892): 14–15.
"Íslenzkur verkfræðingur." [Icelandic Engineer]. *Ísafold* 20, no. 39 (1893): 155.
Björn Bjarnarson. "Um þök" [On Roofs]. *Búnaðarrit* 8, no. 1 (1894): 154–71.
Valgarður Ó. Breiðfjörð. "Bárótta þakjárnið" [The Corrugated Iron Roof]. *Reykvíkingur* 4, no. 9 (1894): 33–34.
"Jarðskjálftar" [Earthquakes]. *Ísafold* 23, no. 59 (29 August 1896): 235.
Skúli Skúlason. "Jarðskjálftarnir i Rangárvallahreppi" [Earthquakes in the Rangárvellir District]. *Þjóðólfur* 48, no. 42 (4 September 1896): 167.
"Landskjálftasamskotanefndin" [The Committee for the Collection of Contributions Related to the Earthquake]. *Ísafold* 23, no. 64 (16 September 1896): 256.
"Um húsabætur á landskjálftasvæðinu m. m." [On the Improvement of Buildings in the Earthquake Area]. *Ísafold* 24, no. 8 (10 February 1897): 31.
Bald, **Fredrik Anton.** "Um húsabætur á landskjálftasvæðinu og víðar" [On the Improvement of Houses in the Earthquake Area and Elsewhere]. *Ísafold* 24, no. 10 (17 February 1897): 37–38.
"Handhægasta byggingarefnið okkar" [Our Most Convenient Building Material]. *Reykvíkingur* 7, no. 7 (1897): 25–26.
Sigurður Guðmundsson. "Um húsabyggingar" [On the Construction of Houses]. *Búnaðarrit*, 12, no. 1 (1898): 1–65.
"Bankastjóri" [Bank Director]. *Ísafold* 25, no. 6 (2 February 1898): 21.

"Nýr verkfræðingur" [A New Engineer]. *Þjóðviljinn* 8, no. 30 (14 April 1899): 118.
Sigurður Pétursson. "Um vegi og brýr á aðalleiðinni frá Reykjavík austur í Holt" [On Roads and Bridges Between Reykjavík and Holt]. *Ísafold* 27, no. 18 (4 April 1900): 69.
Sigurður Thoroddsen. "Um vegi og brýr o. s. frv." [On Roads and Bridges etc.]. *Ísafold* 27, no. 21 (18 April 1900): 82.
"Myndirnar" [The Images]. *Sunnanfari* 8, no. 3 (1 June 1900): 22.
"Kalkstein" [Limestone]. *Fjallkonan* 17, no. 33 (25 August 1900): 4.
"Mannalát" [Obituary]. *Ísafold* 27, no. 63 (10 October 1900): 251.
"Húsabótarannsóknirnar" [Research on the Improvement of Houses]. *Ísafold* 27, no. 65 (20 October 1900): 259.
"Mannalát" [Obituary]. *Þjóðviljinn* 14, no. 38 (30 October 1900): 151.
Þ. B. "Sigurður Pjetursson og byggingarannsóknirnar" [Sigurður Pétursson and the Building Research]. *Búnaðarrit* 15, no. 1 (1901): 3–14.
Sigurður Stefánsson. "Nokkur orð um fjárhúsabyggingar o. fl." [More on Construction of Stables and Other]. *Búnaðarrit* 16, no. 1 (1902): 216–50.
"Húsabyggingar á Akureyri" [Buildings in Akureyri]. *Stefnir* 10, no. 31 (4 September 1902): 37.
"Byggingarsamþyktin" [The Building Code]. *Reykjavík* 4, no. 32 (25 June 1903): 4.
Jón Þorláksson. "Nýtt byggingarlag. Steyptir steinar, tvöfaldir veggir" [New Building Method. Cast Stones, Double Walls]. *Búnaðarrit* 17, no. 1 (1903): 277–302.
"Jon Þorláksson." *Norðurland* 2, no. 48 (1903): 191.
Jón Þorláksson. "Kuldinn og rakinn. Orsakir þeirra og ráðin við þeim" [Cold and Humidity. Their Causes and How to Deal with Them]. *Búnaðarrit* 18, no. 1 (1904): 98–131.
"Verksmiðjan 'Mjölnir'" [The *Mjölnir* Factory]. *Þjóðólfur* 56, no. 3 (1904): 9.
"Mjölnir" [*Mjölnir*]. *Reykjavík* 5, no. 12 (1904): 45.
Páll Ólafsson. "Um grástein og steypustein". *Reykjavík* 5, no. 15 (8 April 1904): 59.
Jón Þorláksson. "Iðnskólinn í Reykjavík" [Technical School in Reykjavík]. *Þjóðólfur* 56, no. 33 (1904): 132.
Lange, Preben. "Tigulsteinsgerð og móhnoð." [Brick Production and Peat Handling]. *Reykjavík* 5, no. 8 (1904): 30.
"Nýt hlutafélag" [New Company]. *Þjóðólfur* 57, no. 6 (3 February 1905): 21.
"Iðnskóli Reykjavíkur" [Technical School in Reykjavík]. *Bæjarskrá Reykjavíkur* (1905): 140.
"Klæðaverksmiðjan 'Iðunn'" [The Wool Factory *Iðunn*]. *Óðinn* 1, no. 1 (1 April 1905): 4–6.
"Bankahúsið nýja" [The New Bank]. *Ísafold* 32, no. 27 (13 May 1905): 106.
"Iðnskólinn" [The Technical School]. *Reykjavík* 6, no. 15 (1905): 59.
"Landsbókasafnið nýja." [The New National Library]. *Ísafold* 33, no. 46 (14 June 1906): 182–183.
"Mikill húsbruni enn" [Another Great Fire]. *Ísafold* 33, no. 50 (4 August 1906): 199.
"Mesti húsbruni á Íslandi" [The Greatest Fire in Iceland]. *Norðurland* 6, no. 8 (20 October 1906): 27.
"Klæðaverksmiðjan 'Iðunn'" [The Wool Factory Iðunn]. *Þjóðólfur* 58, no. 49 (9 November 1906): 188.
"Völundur." *Óðinn* 2, no. 12 (1 March 1907): 92.
"Nýung í húsagerð" [Innovation in Architecture]. *Norðurlandi* 6, no. 48 (8 June 1907): 168.
A. J. Johnson. "Framtíðar húsagjörð. Er hún ekki framkvæmanleg á Íslandi?" [Construction of the Future. Is it Not Practicable in Iceland?]. *Reykjavík* 9, no. 27 (1908): 105–06.
"Fnjóskárbrúin" [The Bridge over the Fnjóská River]. *Norðri* 3, no. 22 (2 June 1908): 88.
"Fnjóskárbrúin" [The Bridge over the Fnjóská River]. *Norðri* 3, no. 26 (30 June 1908): 103.

"Fnjóskárbrúin hrunin!" [The Bridge over the Fnjóská River Collapses!]. *Austri* 18, no. 25 (9 July 1908): 88.

Jón Jakobsson. "Landsbókasafnið" [The National Library]. *Lögrétta* 4, no. 16 (31 March 1909): 61–62.

"Fnjóskárbrúin" [The Bridge over the Fnjóská River]. *Óðinn* 5, no. 2 (1 May 1909): 12.

"Mentasafnið" [The National Museum]. *Ísafold* 36, no. 24 (1 May 1909): 93.

"Heilsuhælið" [The Sanatorium]. *Ísafold* 36, no. 75 (17 November 1909): 297.

"Vífilsstöðum" [At Vífilsstaðir]. *Lögrétta* 4, no. 53 (17 November 1909): 210.

Guðmundur Björnsson. "Ræða landlæknis" [Speech of the Director of Public Health]. *Ársrit Heilsuhælisfélagsins* 1 (1909): 24–30.

Jón Þorláksson. "Hvernig reynast steinsteypuhúsin?" [How Do Concrete Houses Prove to Be?]. *Búnaðarrit* 25, no. 1 (1911): 207–27.

Rögnvaldur Ólafsson. "Lýsing á hælinu" [Description of the Sanatorium]. *Ársrit Heilsuhælisfélagsins* 2 (1912): 7–19.

Guðmundur Hannesson. "Hlý og rakalaus steinhús. Tillögur og leiðbeiningar" [Warm and Dry Concrete Houses. Suggestions and Guidelines]. *Búnaðarrit* 27, no.1 (1913): 1–26.

Bech, C [?]. "Jærnbeton, særlig dets Anvendelse ved Vandbygningarsbejder" [The Use of Reinforced Concrete in Water Works]. *Ársrit Verkfræðingafjelags Íslands* (1914): 6–7.

"Lög fjelagsins" [Society's Charter]. *Ársrit Verkfræðingafélags Íslands 1912/1913* 1 (1914): 3.

Rögnvaldur Ólafsson. "Um byggingarsamþykkt handa Reykjavíkurkaupstað" [On Building Regulations for Reykjavík]. *Ársrit Verkfræðingafjelags Íslands* (1914): 9–13 (translation into English at pp. 30–34).

Jóhann Fr. Kristjánsson. "Leiðbeining í húsagerð" [Guidelines on Construction]. *Búnaðarrit* 29, no. 1 (1915): 148–51.

Guðmundur Hannesson. "Kringum bæinn" [Around the Town]. *Búnaðarrit* 29, no. 1 (1915): 215–26.

"Steinbær" [A City of Stone]. *Morgunblaðið* 2, no. 212 (7 June 1915): 1.

Björn Guðmundsson. "Hlý og rakalaus steinhús" [Warm and Dry Concrete Houses]. *Búnaðarrit* 30, no.1 (1916): 73–77.

"Reglur Verkfræðingafjelags Íslands um sölu og prófun Portlandsements" [Standard Specification of the Sale and Testing of Portland Cement]. *Tímarit Verkfræðingafélags Íslands* 1, no. 1 (1916): 3–6.

Petersen, Mayntz. "Íslenzkt steypuefni" [Icelandic Aggregates]. *Tímarit Verkfræðingafélags Íslands* 1, no. 1 (1916): 13–16.

Jóhann Fr. Kristjánsson. "Um byggingarefni" [On Building Materials]. *Tíminn* 1, no. 27 (14 September 1917): 106 and *Tíminn* 1, no. 29 (29 September 1917): 115.

Thorvald Krabbe. "Enn um íslenskt steypuefni." [On Icelandic Aggregates]. *Tímarit Verkfræðingafélags Íslands* 2, no. 2 (1917): 27–28.

Guðmundur Hannesson. "Nýju steinsteypuhúsin og nokkur orð um húsagerð í sveitum" [New Concrete Houses and Some Words on Construction in the Countryside]. *Búnaðarrit* 32, no. 2 (1918): 129–47.

"Nýr fjelagsmaður" [New Member]. *Tímarit Verkfræðingafélags Íslands* 4, no. 3 (1919): 32.

Guðmundur Hannesson. "Útveggir íbúðarhúsa. Framfarir og afturfarir" [Walls in Residential Houses. Progress and Decline]. *Búnaðarrit* 33, no. 3 (1919): 255–61.

Helgi H. Eiríksson. "Íslenskar bergtegundir sem byggingarefni" [Icelandic Geological Resources as Building Material]. *Tímarit Verkfræðingafélags Íslands* 6, no. 3 (1921): 25–31 (translation into English at pp. 30–31).

Ágúst H. Bjarnason. “Íslenzkir listamenn. Einar Jónsson, myndasmíður” [Icelandic Artists: Sculptor Einar Jónsson]. *Íðunn* 8 no. 3–4 (January/April 1922), 214–34.
Klitgaard-Nielsen, H. [?]. “Om Jærnbetonnormer for Island” [On Reinforced Concrete Norms for Iceland]. *Tímarit Verkfræðingafélags Íslands* 7, no. 4 (1922): 53–56.
Guðmundur Hannesson. “Um torfbyggingar og endurbætur á þeim” [On Turf Houses and Their Improvement]. *Búnaðarrit* 36, no. 2 (1922): 103–17.
“Völundur” [*Völundur*]. *Vísir* 12, no. 126 (6 June 1922): 4.
Guðjón Samúelsson. “Steinsteypa” [Concrete]. *Morgunblaðið* 10, no. 131 (10 April 1923): 4.
Guðmundur Finnbogason. “Listasafn Einars Jónssonar opnað í dag” [The Einar Jónsson Museum Open Today]. *Morgunblaðið* 10, no. 1932 (24 June 1923): 2.
Guðmundur Hannesson. “Dönsk skipulagslög” [Danish Planning Laws]. *Morgunblaðið* 12, no. 48 (31 December 1924): 2.
“Byggingar-efni” [Building Materials]. *Morgunblaðið* 12, no. 23 (9 August 1925): 1.
Jónas Jónsson. “Byggingar. I.” [Buildings. I.] *Samvinnan* 19, no. 1 (March 1926): 18–26.
H.[?] Franzson. “Íslenzk húsgerðarlist” [Icelandic Architecture]. *Skólablaðið* 1, no. 4 (17 April 1926): 12–13.
Jónas Jónsson. “Byggingar. II.” [Buildings. II]. *Samvinnan* 19, no. 2 (June 1926): 150–56
Jónas Jónsson. “Byggingar. III.” [Buildings. III.] *Samvinnan* 19, no. 3–4 (September 1926): 250–55.
Guðmundur Einarsson. “Háborgin” [The Acropolis]. *Eimreiðin* 32, no. 3 (1926): 244.
Jónas Jónsson. “Byggingar- og landnámssjóður” [Building and Settlement Subsidy]. *Samvinnan* 20, no. 1 (March 1927): 40–41.
Guðmundur Hannesson. “Ris eða flatt þak” [Pointed or Flat Roof]. *Morgunblaðið* 14, no. 118 (25 May 1927): 3–4.
Jónas Jónsson. “Byggingar. IV” [Buildings. IV]. *Samvinnan* 20, no. 2 (June 1927): 158–68.
“Steypumótaviður” [Timber Formworks]. *Morgunblaðið* 14, no. 125 (3 June 1927): 4.
Jónas Jónsson. “Byggingar. V” [Buildings. V]. *Samvinnan* 20, no. 3 (September 1927): 297–302.
Jónas Jónsson. “Landakotskirkja” [The Church at Landakot]. *Tíminn* 11, no. 57 (23 December 1927): 215–16.
Jónas Jónsson. “Byggingar. VI” [Buildings. VI]. *Samvinnan* 21, no. 1 (March 1928): 49–53.
“Landakotskirkjan nýja” [The New Church at Landakot]. *Morgunblaðið* 15, no. 121 (27 May 1928): 5.
Guðjón Samúelsson. “Kaþólska kirkjan” [The Catholic Church]. *Morgunblaðið* 15, no. 163 (7 June 1928).
Jónas Jónsson. “Byggingar. VII” [Buildings. VII]. *Samvinnan* 21, no. 3–4 (September 1928): 260–65.
Jónas Jónsson. “Byggingar. VIII” [Buildings. VIII]. *Samvinnan* 23, no. 1 (March 1929): 72–76.
Poulsen, A [?]. “Om Puzzolan og Portland Cement” [On Pozzolana and Portland Cement]. *Tímarit Verkfræðingafélags Íslands* 14, no. 1 (1929): 1–6.
Jónas Jónsson. “Byggingar. X” [Buildings. X]. *Samvinnan* 27, no. 1 (February 1930): 80–90.
Jónas Jónsson. “Byggingar. IX” [Buildings IX]. *Samvinnan* 24, no. 2 (June 1930): 186–91.
Jónas Jónsson. “Byggingar. XI” [Buildings XI]. *Samvinnan* 27, no. 2 (June 1930): 213–20.
Guðjón Samúelsson. “Íslensk húsagerð og skipulag bæja” [Icelandic Architecture and Urban Planning]. *Tímarit Verkfræðingafélags Íslands* 15, no. 1 (1930): 1–8.

Þórir Baldvinsson. “Hýsing sveitabýla” [On Farmhouses]. *Andvari* 56, no. 1 (January 1931): 111–20.
Jónas Jónsson. “Byggingamál” [The Issue of Construction]. *Samvinnan* 25, no. 3 (July 1931): 196–204.
Jón Gunnarsson. “Hví er verið að “pússa” steinhúsin?” [Why are Concrete Houses Being Plastered?]. *Tíminn* (25 July 1931): 4.
Jón Gunnarsson. “Þjóðleikhúsið” [The National Theatre]. *Tíminn* (8 August 1931): 182.
Jón Gunnarsson. “Veggir steinhúsa” [Walls in Concrete Houses]. *Alþýðublaðið* (21 August 1931): 3–4.
Jón Gunnarsson. “Blöndun steinsteypu og meðferð hennar” [The Mixing of Concrete and Its Application]. *Eimreiðin* 37, no. 3 (1931): 255–64.
Jón Þorláksson. “Steinsteypa til íbúðarhúsargerðar” [Concrete in Residential Buildings]. *Tímarit Verkfræðingafélags Íslands* 17, no. 4 (1932): 33–45.
Jón Þorláksson. “Steinsteypa til íbúðarhúsargerðar” [Concrete in Residential Buildings]. *Tímarit Verkfræðingafélags Íslands* 17, no. 5 (1932): 49–53.
Jón Þorláksson. “Steinsteypa til íbúðarhúsargerðar” [Concrete in Residential Buildings]. *Tímarit Verkfræðingafélags Íslands* 17, no. 6 (1932): 61–73.
Jón Þorláksson. “Steinsteypa til íbúðarhúsargerðar” [Concrete in Residential Buildings]. *Tímarit Verkfræðingafélags Íslands* 18, no. 1 (1933): 12–14.
Jón Þorláksson. “Steinsteypa til íbúðarhúsargerðar” [Concrete in Residential Buildings]. *Tímarit Verkfræðingafélags Íslands* 18, no. 4 (1933): 32.
Jónas Jónsson. “Byggingar X” [Buildings X]. *Samvinnan* 27, no. 1 (February 1933): 85–90.
Jónas Jónsson. “Byggingar XI” [Buildings XI]. *Samvinnan* 27, no. 2 (June 1933): 216–17.
Guðjón Samúelsson. “Íslenzk byggingarlist. Nokkrar opinberar byggingar á árunum 1916–1934” [Icelandic Architecture. Some Public Buildings in the Years 1916–1934]. *Tímarit verkfræðingafélags Íslands* 6, no. 18 (1933): 53–82.
“20 ára starfsafmæli” [20-Years Work Anniversary]. *Nýja dagblaðið* 2, no. 44 (20 February 1934): 1–2.
Geir Zoëga. “Jón Þorláksson”. *Tímarit Verkfræðingafélags Íslands* 20, no. 1 (1935): 1–2.
“Frá norræna þingmannafundinum. Viðtal við Bjarna Bjarnason alþm.” [From the Meeting of Nordic Parliamentarians. Interview with Bjarni Bjarnason]. *Tíminn* 20, no. 26 (24 June 1936): 102.
“Nýtt félag húsagerðameistara” [A New Society of the Architects]. *Þjóðviljinn* 1, no. 19 (21 November 1936): 1.
Þórir Baldvinsson. “Byggið eftir uppdrætti!” [Build According to the Drawing!]. *Tíminn* 21, no. 4 (27 January 1937): 14.
Þórir Baldvinsson. “Undirbúningur sveitabygginga” [Preparation of Farmhouses]. *Tíminn* 21, no. 42 (29 September 1937): 134.
Ágúst Steingrímsson. “Umgengni á sveitabæjum” [Dealing with Farmhouses]. *Tíminn* 22, no. 69 (22 November 1938): 274.
Þórir Baldvinsson. “Getum við byggt úr torfi?” [Can We Build With Turf?]. *Tíminn* 23, no. 129 (7 November 1939): 514.
Kornelíus Sigmundsson. “Hræfntinnu-kvartshúðunin” [Quartz-Obsidian Plaster]. *Tímarit iðnaðarmanna* 12, no. 3 (1939): 33.
Árni Pálsson. “Normur um járnbenta steypu” [Norms on Reinforced Concrete]. *Tímarit Verkfræðingafélags Íslands* 27, no. 2 (1942): 15–16.
Jónas Jónsson. “Hallgrímskirkja í Reykjavík [The Church of Hallgrímur in Reykjavík]. *Tíminn. Jólablað* [Christmas Edition]. (23 December 1942): 9–10.

Finnbogi R. Þorvaldsson. "Endurreisn lýðveldis á Íslandi" [The Renaissance of the Republic in Iceland]. *Tímarit Verkfræðingafélags Íslands* 29, no. 2 (1944): 17.
Sveinn Þórðarson. "Saga silfurbergsins" [The History of Iceland Spar]. *Náttúrufræðingurinn* 15, no. 2 (1945): 96–107.
Haraldur Ásgeirsson. "Framleiðsla portlandsements" [Production of Portland Cement]. *Tímarit Verkfræðingafélags Íslands* 31, no. 2 (1946): 23–27.
Einar Sveinsson. "Húsnæðisvandamálin og íbúðarbyggingar Reykjavíkurbæjar. Byggingarmátinn" [The Issue of Housing and Residential Buildings in Reykjavík. The Building Method.]. *Morgunblaðið* 23, no. 237 (8 October 1948): 6 and 12.
Á. Ó. [Árni Óla]. "Kalknám í Esjunni og kalkbrennsla í Reykjavík" [Lime Production in Reykjavík]. *Lesbók Morgunblaðsins* 24, no. 39 (23 October 1949): 461–64.
Jón E. Vestdal. "Hráefni til sementsframleiðslu og hagnýting þeirra" [Raw Materials for the Production of Cement and Their Use]. *Tímarit Verkfræðingafélags Íslands* 34, no. 5 (1949): 57–76.
Haraldur Ásgeirsson. "Staðsetning sementsverksmiðjunnar" [The Location of the Cement Plant]. *Tímarit Verkfræðingafélags Íslands* 34, no. 6 (1949): 90–92.
Geir Zoëga. "Guðjón Samúelsson" [Guðjón Samúelsson, Obituary]. *Tímarit Verkfræðingafélags Íslands* 35, no. 3 (1950): 25–26.
H. Kr. "Guðjón Samúelsson. Húsameistari ríkisins" [Guðjón Samúelsson: State Architect]. *Tíminn* 34, no. 95 (3 May 1950): 5 and 7.
"Húsameistari ríkisins settur" [The State Architect Nominated]. *Þjóðviljinn* 15, no. 102 (11 May 1950): 8.
"Sementsverkjsmiðjan, móðir framtíðarbygginganna á Íslandi" [The Cement Plant, Mother of the Future Buildings in Iceland]. *Tíminn* 37, no. 140 (26 June 1953): 1.
Steingrímur Jónsson. "Knud Zimsen" [Knud Zimsen, Obituary]. *Tímarit Verkfræðingafélags Íslands* 38, no. 4 (1953): 95–96.
Emil Jónsson. "Thorvald Krabbe" [Thorvald Krabbe, Obituary] *Tímarit Verkfræðingafélags Íslands* 38, no. 5 (1953): 111–112.
Sigurður Thoroddsen. "Um steinsteypugerð í Reykjavík" [On Concrete Construction in Reykjavík]. *Tímarit Verkfræðingafélags Íslands* 40, no. 5 (1955): 78–80.
Geir Zoëga. "Sigurður Thoroddsen" [Sigurður Thorodssen, Obituary]. *Tímarit Verkfræðingafélags Íslands* 40, no. 6 (1955): 89–90.
"Íslendingar nota meiri steinsteypu en aðrir en kunna verr með hana að fara" [Icelanders Use More Concrete Than Others but They Handle It Worse]. *Þjóðviljinn* 21, no. 25 (31 January 1956): 4.
Jón E. Vestdal. "Sementsverksmiðjan á Akranesi" [The Cement Plant in Akranes]. *Tímarit Verkfræðingafélags Íslands* 42, no. 4 (1957): 46–55.
Páll V. G. Kolka. "Þingeyrakirkja" [The Church at Þingeyrar]. *Lesbók Morgunblaðsins* 32, no. 45 (24 December 1957): 684–88.
Ásgeir Ásgeirsson. "Ávarp forseta Íslands" [Speech of the President of Iceland]. *Tímarit Verkfræðingafélags Íslands* 43, no. 4 (1958): 49.
Gylfi Þ. Gíslasson. "Ræða" [Speech]. *Tímarit Verkfræðingafélags Íslands* 43, no. 4 (1958): 50–52.
Jón E. Vestdal. "Vígsla Sementsverksmiðju ríkisins á Akranesi" [Inauguration of the Cement Plant in Akranes]. *Tímarit Verkfræðingafélags Íslands* 43, no. 4 (1958): 52–56.
Hörður Jónsson, and Haraldur Ásgeirsson. "Móberg Pozzolans." *Tímarit Verkfræðingafélags Íslands* 44, no. 5 (1959): 71–78.

Bibliography

"A Concrete Sheepfold at Réttir, Iceland." In "In Concrete. Third Series–XX." *The Concrete Way*, incorporating *The Road Maker* 8, no. 2 (September/October 1935): 98.

Abrecht, Birgit. *Arkitektúr á Íslandi. Leiðarvísir* [A Guide to Icelandic Architecture]. Reykjavík: Mál og menning, 2000.

Adam of Bremen. *Gesta Hammaburgensis ecclesiae pontificum*, edited by Johann Martin Lappenberg. Second edition. Hannover: Impensis Bibliopolii Hahniani, 1876.

Adam of Bremen. *Beskrivelse af øerne i Nordern* [Description of the Islands in the North]. Copenhagen: Wormianum, 1978.

Albrecht, **[?]**. "Der Betonhohlstein, ein neues Baumaterial." *Beton und Eisen* 5, no. 7 (1906): 166–68.

Andrés Kristjánsson. *Aldarsaga Kaupfélags Þingeyinga* [One Century of the *Þingeyinga* Cooperative]. Húsavík: Kaupfélag Þingeyinga, 1982.

Anna D. Ágústsdóttir, and Guðni Valberg. *Reykjavík sem ekki varð* [The Reykjavík That Did Not Take Place]. Reykjavík: Crymogea, 2014.

Anna Guðmundsdóttir. "Dr. Guðmundur Hannesson prófessor" [Professor Guðmundur Hannesson]. In *Faðir Minn Læknirinn*. 83–108. Hafnarfjörður: Skuggsjá, 1974.

Aprea, Salvatore. *German Concrete: The Science of Cement from Trass to Portland*, *1819-1877*. Lausanne: EPFL Press, 2016.

Arnór Sigurjónsson, ed. *Byggingarmálaráðstefnan 1944. Erindi og umræður* [Building Conference 1944. Lectures and Discussions]. Reykjavík: Landssamband Iðnaðarmanna, 1946.

Aschenbeck, Nils. *Reformarchitektur: die Konstituierung der Ästhetik der Moderne.* Basel: Birkhäuser, 2016.

Ashby, Charlotte. "Fennomane Building: A Finnish National Style in Commercial Architecture? A Discussion With Particular Reference to the Designs of Vilho Penttilä and Onni Törnqvist." In *Nation, Style, Modernism. CIHA Conference Papers,* edited by Jacek Purchla and Wolf Tegethoff. 107–23. Cracow/Munich, 2006.

Ashby, Charlotte. "The Pohjola Building: Reconciling Contradictions in Finnish Architecture." In *Nationalism and Architecture*, edited by Raymond Quek and Darren Deane, with Sarah Butler. 135–46. Farnham: Ashgate, 2012.

Association of the Concrete Industry of Finland. *Tehdään betonista: Concrete in Finnish Architecture.* Helsinki: Garamond, 1989.

Auden, Wystan Hugh, and Louis MacNeice. *Letters from Iceland.* London: Faber and Faber, 1937.

Auður Hauksdóttir. "Language and the Development of National Identity: Icelanders' Attitudes to Danish in Turbulent Times." *Made in Denmark: Investigations of the Dispersion of 'Danishness'. KULT* 11 (2013): 65–94.

Árbók Háskóla Íslands [Yearbook of the University of Iceland]. Academic Year 1939–40 Reykjavík: Prentsmiðjan Gutenberg, 1940.

Avenier, Cédric. "Ciment naturel, la matière des moulages d'architecture au XIX[e] siècle." In *Édifice & Artifice. Histories constructives,* edited by Robert Carvais, André Guillerme, Valérie Nègre, and Joël Sakarovitch. 577–86. Paris: Picard, 2012.

Ári Trausti Guðmundsson, and Flosi Ólafsson. *Steinuð Hús. Varðveisla, viðgerðir, endurbætur og nýsteining* [Houses With *Steining*. Conservation, Fixing, Improving and New *Steining*]. Reykjavík: Húsafriðunarnefnd ríkisins, 2003.

Árni Óla. *Strönd og Vogar* [Beaches and Bays]. Reykjavík: Menningarsjóður, 1961.

Ásdís Hlökk Theodórsdóttir, and Sigurður Svavarsson, eds. *Aldarspegill. Samtal við Guðmund Hannesson* [The Mirror of the Century. Dialogue with Guðmundur Hannesson]. Reykjavík: Skipulagsstofnun og Hið íslenska bókmenntafélag, 2016.

Åkerflet, Mia. "Type-planning a Fenno-Swedish Identity. The Housing Association for the Swedish Speaking Areas of Finland and the Ideal Rural Home Between 1938 and 1969." *Modernism, Modernisation and the Rural Landscape. Proceedings of the Modscapes Conference 2018. SH Web of Conferences* 53 (2019): 1–10.

Baillie-Scott, Mackay Hugh. "The Cheap Cottage." *The International Studio* 52, no. 206 (April 1914): 133–39.

Baudin, Antoine, ed. *Photography, Modern Architecture and Design. The Alberto Sartoris Collection. Objects from the Vitra Design Museum.* Lausanne: EPFL Press, 2005.

Bauer, Leopold. "Die katholische Pfarrkirche in Bielitz." *Beton und Eisen* 10, no. 11 (July 1911): 229–32.

Benárd, Aurél. "Hallgrímskirkja, Reykjavík. A Late Example of Expressionist Church Architecture". *YBL Journal of Built Environment* 6, no. 1 (2018): 86–102.

Bender, Henning, and Morten Pedersen. *Aalborg og cementen* [Aalborg and Cement]. Aalborg: Aalborgbogen, 2006.

Bergsteinn Jónsson. *Bygging Alþingishússins 1880–1881* [The Construction of the House of Parliament 1880–1881]. Reykjavík: Bókaútgáfa menningarsjóðs og þjóðvinafélagsins, 1972.

Bergsveinn Birgisson. *Svar við bréfi Helgu*. Reykjavík: Bjartur, 2010. English edition: *Reply to a Letter from Helga*, translated by Philip Roughton. Las Vegas: AmazonCrossing, 2013.

Bevilacqua, Mario. "Prima di Grandjean: rilievi e incisioni di architettura a Firenze tra Cinquecento e Settecento." In *Tra Firenze e Rio. Auguste Grandjean de Montiguy (1776–1850) e la riscoperta dell'architettura del Rinascimento toscano*, edited by Mario Bevilacqua. Firenze: Didapress, 2019.

"Billigere bygninger" [Cheaper Buildings]. *Bergens Tidende* 49, no. 107 (1916): 5.

Birgir Sigurðsson. *Korpúlfsstaðir: saga glæsilegasta stórbýlis á Íslandi* [*Korpúlfsstaðir*: The History of the Greatest Farm in Iceland]. Reykjavík: Forlagið Reykjavíkurborg, 1994.

Bjarni Reynarsson. "The Planning of Reykjavík, Iceland: Three Ideological Waves – A Historical Overview." *Planning Perspectives* 14, no. 1 (1999): 49–67.

Bjarni Reynarsson. *Borgir og borgarskipulag: þróun borga á Vesturlöndum, Kaupmannahöfn og Reykjavík* [Cities and City Planning: Urban Development in the Western Countries, Copenhagen and Reykjavík]. Reykjavík: Skrudda, 2014.

Björn Björnsson. *Húsnæðismál og byggingarstarfsemi í Reykjavík 1928–1947* [Housing and Construction in Reykjavík 1928–1947]. Reykjavík, 1948.

Björn G. Björnsson. *Fyrsti arkitektinn. Rögnvaldur Águst Ólafsson og verk hans* [The First Architect. Rögnvaldur Águst Ólafsson and His Work]. Reykjavík: Hið íslenska Bókmenntafélag, 2016.

Björn Sigfússon. *Múrarasaga Reykjavíkur* [History of Reykjavík's Mastermasons]. Reykjavík: Múrarasamtökunum í Reykjavík, 1951.

Bocchero, Patrizia, Luigi Latini and Domenico Luciani, eds. *Skrúður, Núpur. Premio Internazionale Carlo Scarpa per il Giardino, XXIV edizione.* Treviso: Fondazione Benetton Studi Ricerche, 2013.

Boldsen, Frederik Christian. *Studiebyens Huse: Fotografi, Tegning og Beskrivelse af 104 Enkelt-, Dobbelt- og Rækkehuse i Hellerup* [*Studiebyens* Houses: Photography, Drawing and Description of 104 Single, Double and Row Houses in Hellerup]. Copenhagen: KAB, 1924.

Bologna, Alberto. *Chinese Brutalism Today: Concrete and Avant-Garde Architecture*. San Francisco: ORO Editions, 2019.
Brekke, Nils Georg. *Architecture in Norway.* Basel: Birkhäuser, 2019.
Britton, Karla. "The Poetic Economy of the Frame: The Critical Stance of Auguste Perret." *Journal of Architectural Education* 54, no. 3 (February 2001), 176–84.
Brogaard, Peter Halon Lund, and Hans Edvard Nørregård-Nielsen. *Landbrugets huse* [Farmhouses]. Copenhagen: Gyldendal, 1985.
Bromley, R. G. "Field Meeting: Bornholm, Denmark, 28 August to 4 September 2000". *Proceedings of the Geologists' Association* 111, no. 1 (2002): 77–88.
Brorsen, Lisbeth, Kenneth Johansen, and Eske Møller. *Landbrugets Bygninger 1850-1940* [Agricultural Buildings 1850–1940]. Copenhagen: Kulturarvsstyrelsen/Kulturministeriet, 2002.
Bruun, Daniel. *Fortidsminder og Nutidshjem paa Island: Orienterende Undersøgelser foretagne i 1896* [Ancient Memories and Today's Home in Iceland. Investigations in 1896]. København: Nordiske Forlag, 1897.
Bruun, **Daniel**. *Gammel Bygningsskik paa de islandske Gaarde* [Old Building Traditions in Icelandic Farms]. Kristiania: Grøndahl & Søns Bogtrykkeri, 1908.
Brüel, Jeanne. *Bevaringsguide for bedre byggeskik-huse* [Preservation Guide for *Bedre Byggeskik* Houses]. Bygningskultur Danmark, 2011.
Bucher, Annemarie. "Alpengärten und Schweizerhäuser als Symbole der 'wahren' Natur." In *Felsengärten, Gartengrotten, Kunstberge. Motive der Natur in Architektur und Garten*, edited by Uta Hassler. 62–79. München: Hirmer, 2014.
"Byggt og búið í gamla daga" [Built and Inhabited in the Old Days]. *Tíminn* 63, no. 151 (7 July 1979): 8.
Byock, Jesse. "Modern Nationalism and the Medieval Sagas." In *Northern Antiquity: The Post-Medieval Reception of Edda and Saga*, edited by Andrew Wawn. 163–87. London: Hisarlik Press, 1994.
Byggeplaner til Bøndergaarde og til Huse med og uden Jord [Drawings for Farms and Houses With or Without Land]. Copenhagen: Kgl. danske Landhusholdningsselskab, 1895.
Bædeker, G. [?]. *Das Holz-Zement-Dach***.** Leipzig: Karl Scholtze, 1877.
Caldenby, Claes. "Construction History in Scandinavia." *L'histoire de la construction. Un méridien européen. Construction History: A European Meridian*, edited by Antonio Becchi, Robert Carvais, and Joël Sakarovitch. 263–72. Paris: Association francophone d'histoire de la construction, 2015. Available online at: https://issuu.com/emchateau/docs/chreport2015/267. Accessed 15/11/2020.
Carvais, Robert. "Plaidoyer pour une histoire humaine et sociale de la construction." In *Édifice & Artifice*. *Histories constructives*, edited by Robert Carvais, André Guillerme, Valérie Nègre, and Joël Sakarovitch. 31–43. Paris: Picard, 2008.
Cederberg, John. "De første bygninger og bygværker af beton og jernbeton i Danmark" [The First Buildings and Structures in Concrete and Reinforced Concrete in Denmark]. *Fabrik og Bolig* 2 (1999): 3–37.
"Cement" [Cement]. *Svendborg Amtstidende* 5, no. 83 (19 July 1856).
Charrington, Harry. "Nordic Visions of a Classical World." In *The Routledge Handbook on the Reception of Classical Architecture,* edited by Nicholas Temple, Andrzej Piotrowski, and Juan Manuel Heredia. 356–69. Abingdon: Routledge, 2020.
Chevallier, Fabienne. *L'œuvre d'Eliel Saarinen en Finlande et la question de l'architecture nationale de 1898 à 1909.* Paris: Publications de la Sorbonne, 2001.

Chevallier, Fabienne, and Anja Kervanto Nevanlinna. “La nation finlandaise, entre mémoire et projet.” In *Idée nationale et architecture en Europe, 1860–1919: Finlande, Hongrie, Roumanie, Catalogne* edited by Jean-Yves Andrieux, Fabienne Chevallier, Anja Kervanto Nevanlinna. 207–19. Rennes: Presses universitaires de Rennes, 2006.

Childe, Henry Langdon. *Concrete Finishes and Decoration.* London: Concrete Publication Limited, 1964.

Christiani & Nielsen: Twenty Five Years of Civil Engineering, 1904–1929. Copenhagen: Krohns Bogtrykkeri, 1929.

Christiansen, Jørgen Hegner. “Typehuset – Velfærdsstatens foretrukne boform” [The Standard House. The Welfare State’s Preferred Housing Form]. *Architectura* 35 (2013): 99–137.

Cohen, **Jean Louis.** *Scenes of the World to Come. European Architecture and the American Challenge 1893–1960*. Paris: Flammarion, 1995.

Cohen, Jean Louis, and G. Martin Moeller Jr., eds. *Liquid Stone: New Architecture in Concrete*. Basel: Birkhäuser, 2006.

Cohen, Jean Louis. *The Future of Architecture Since 1889.* London: Phaidon, 2012.

Cohen, Vald. “Eisenbetonbogenbrücke auf Moorboden.” *Beton und Eisen* 6, no. 1 (1907): 7–8.

Collins, Peter. *Concrete: The Vision of a New Architecture. A Study of Auguste Perret and His Precursors*. London: Faber and Faber, 1959.

Conlon, Ciarán. “James Hardress de Warenne Waller and His Contribution to Shell Roof Construction, Concrete and Fabrick Formwork Technologies.” In *Nuts and Bolts of Construction History. Culture, Technology and Society, Vol.3*, edited by Robert Carvais, André Guillerme, Valérie Nègre, Joël Sakarovitch. 125–32. Paris: Picard, 2012.

Crettaz-Stürzel, Elisabeth. “Nichts Internationaleres als Nationalromantik? Heimatstil in der Schweiz als Reformkultur um 1900.” In *Nation, Style, Modernism. CIHA Conference Papers,* edited by Jacek Purchla and Wolf Tegethoff. 57–73. Cracow/Munich, 2006.

Cusack, Patricia. “Agents of Change: Hennebique, Mouchel and Ferroconcrete in Britain.” *Construction History* 3 (January 1987): 61–74.

Custoza, Silvano, and Maurizio Vogliazzo. *Muthesius.* Milano: Electa, 1981.

D’Arcens, Louise, ed. *The Cambridge Companion to Medievalism*. Cambridge: Cambridge University Press, 2016.

Dekeyser, Liesbeth, Ann Verdonck, and Hilde De Clercq. “*Cimorné* Cement Render with Opalescent Glass Granules: A Decorative Façade Finish Developed by Innovative Craftsmanship in the Interwar Period.” *Journal of Architectural Conservation* 19, no. 2 (2013): 86–102.

Dekeyser, Liesbeth. “Cimorné Interwar Decorative Cement Render: A Historical and Technical Approach Towards Restoration Guidelines.” PhD Dissertation, Faculty of Engineering, Vrije Universiteit Brussel, 2015.

Delhumeau, Gwenaël. *L’invention du béton armé: Hennebique, 1890–1914*. Paris: Norma, 1999.

“Die neue ‘Südbrücke’ in Randers (Jütland).” *Beton und Eisen* 7, no. 13 (1908): 311–13.

Donnelly, Marian C. *Architecture in the Scandinavian Countries*. Cambridge, Massachussets: MIT University Press, 1992.

Drífa Kristín Þrastardóttir, and Guðný Gerður Gunnarsdóttir. *Húsakönnun: Örfirisey og Grandinn* [Research on the Built Heritage: Örfirisey and Grandinn]. Reykjavík: Minjasafn Reykjavíkur, 2009.

Earney, Fillmore C. F. "Seashells and Cement in Iceland." *Marine Mining* 5, no. 3 (1986): 307–20.

Eggert Þór Bernharðsson. *Undir Bárujárnsboga. Braggalíf í Reykjavík 1940–1970* [Under a Corrugated Iron Arch. Barrack Life in Reykjavík Between 1940 and 1970]. Reykjavík: JPV Forlag, 2000.

Eggert þór Bernharðsson, ed. *Safnahúsið 1909–2009: Þjóðmenningarhúsið* [*Safnahúsið* 1909–2009: The House of National Culture]. Reykjavík: Þjóðmenningarhúsið, 2009.

Einar Már Guðmundsson. *Fótspor á himnum* [Footprints in Heaven]. Reykjavík: Mál og menning, 1997.

Einar Ólafur Sveinsson. *The Folk-stories of Iceland.* London: Viking Society for Northern Research, 2003.

"Eins og fjarlægur draumur... [Like a Distant Dream...]." *Morgunblaðið* 67, no. 27 (3 February 1980): 14–15.

Eriksson, Eva. "International Impulses and National Tradition 1900–1915." In *Sweden: 20th Century Archtecture*, edited by Claes Caldenby, Jöran Lindvall, and Wilfried Wang. 18–45. Munich: Prestel, 1998.

Faber, Tobias. *Dansk Architektur* [Danish Architecture]. Copenhagen: Arkitektens Forlag, 1977.

Fenstad Langdalen, Erik, Andrea Pinochet, and Léa-Catherine Szacka. *Concrete Oslo.* Oslo: Torpedo Books, 2018.

Fiandaca, Ornella. *Le béton armé "système Hennebique" a Messina fra XIX e XX secolo: dalle sperimentazioni pre-terremoto del brevetto alle sue declinazioni antisismiche.* Ariccia: Aracne, 2014.

Finnbogi Guðmundsson. *Úr sögu Safnahússins við Hverfisgötu* [On the History of the *Safnahús* in Hverfisgata]. Reykjavík: Sérprentun úr Árbók Landsbókasafnið, 1980.

Finnbogi Guðmundsson, ed. "Þrjú bréf Rögnvalds Ág. Ólafssonar til Guðmundar Finnbogasonar." [Three Letters by Rögnvaldur Ólafsson to Guðmundur Finnbogason]. *Árbók Landsbókasafn Íslands* 10 (1984): 53–60.

Finnur Ó. Thorlacius. *Smiður í fjórum löndum. Endurminningar* [Builder in Four Countries. A Memoir]. Reykjavík: Bókaútgáfan Logi, 1961.

Finsen, Helge, and Esbjørn Hiort. *Gamle Stenhuse i Island fra 1700-tallet* [Old Stone Houses in Iceland from the Eighteenth Century]. Copenhagen: Arkitektens Forlag, 1977.

Finsen, Helge, and Hiort, Esbjørn. *Steinhúsin gömlu á Íslandi* [Old Stone Houses in Iceland]. Translated by Kristján Eldjárn. Reykjavík: Bókaútgáfan Iðunn, 1978.

F. L. Smidth-Koncernen. *Cementbranchens konkurrenceforhold* [Competitive Relations in the Cement Business]. Copenhagen: S. L. Møllers Bogtrykkeri, 1959.

Forchhammer, Johann Georg. *Om Færöernes geognostiske Beskaffenhed* [On the Geological Nature of the Faroe Islands]. Copenhagen: Martv. Frid. Popps Bogtrykkerie, 1824.

Forchhammer, Johann Georg. *Danmarks geognostiske Forhold* [The Geological Features of Denmark]. Copenhagen: Schultz, 1835.

Forchhammer, Johann Georg. *Om de bornholmske Kulformationer* [On Coal Formations in Bornholm]. Copenhagen: Videnskabernes Selskab, 1837.

Forchhammer, Johann Georg. *Skandinaviens geognostiske Natur* [Scandinavia's Geological Nature]. Copenhagen: C. A. Reitzel, 1843.

Foss, Alex. "Nyere Metodere i Cementfabrikationen, særlig Aalborg Portland-Cementfabrik" [Recent Methods in the Production of Cement, Particularly the Aalborg Portland Cement Plant]. *Den Tekniske Forenings Tidsskrift* 15 (1892): 178–82.

Friðrik G. Olgeirsson, Halldór Reynisson, and Magnús Guðmundsson. *Byggingameistari í stein og stál. Saga Sveinbjarnar Jónssonar 1896–1982* [Building Expert of Stone and Steel. The History of Sveinbjörn Jónsson 1896–1982]. Reykjavík: Ofnasmiðjan, 1996.

Forster, Kurt. W. "Berg und Tal in Bauten der Neuzeit." In *Felsengärten, Gartengrotten, Kunstberge. Motive der Natur in Architektur und Garten*, edited by Uta Hassler. 46–61. München: Hirmer, 2014.

Forty, Adrian. "A Material Without a History." In *Liquid Stone: New Architecture in Concrete*, edited by Jean Luis Cohen, and G. Martin Moeller Jr. 34–45. Basel: Birkhäuser, 2006.

Forty, Adrian. *Concrete and Culture: A Material History*. London: Reaktion Books, 2012.

Frew, Craig. "Lime Harling." Building Conservation. Accessed 2/09/2020. https://www.buildingconservation.com/articles/lime-harling/lime-harling.htm.

Funder, Lise, and Birgitta Spur, eds. *Sculptor Sigurjón Ólafsson and His Portraits*. Reykjavík: Sigurjón Ólafsson Museum, 2008.

Gargiani, Roberto. "Il classicismo modernista nell'architettura del *Musée des Travaux Publics* di Auguste Perret." In *Classicismo, classicismi*, edited by Giorgio Ciucci. 56–67. Milano: Electa, 1995.

Gargiani, Roberto, and Anna Rosellini. *Le Corbusier: Béton Brut and Ineffable Space 1940–1965.* Lausanne: EPFL, 2011.

Gargiani, Roberto, ed. *L'architrave, le plancher, la plate-forme: nouvelle historie de la construction.* Lausanne: Presses polytechniques et universitaires romandes, 2012.

Gargiani, Roberto. *Concrete from Archeology to Invention: 1700-1769. The Renaissance of Pozzolana and Roman Construction Techniques*. Lausanne: EPFL Press, 2013.

Gargiani, Roberto. *Louis I. Kahn: Exposed Concrete and Hollow Stones.* Lausanne: EPFL, 2014.

Gavello, Cinzia. *Alberto Sartoris attraverso "Gli elementi dell'architettura funzionale". Genesi e fortuna critica di un libro*. Milano: FrancoAngeli, 2020.

Geir Waage. *Reykholt: sagan* [Reykholt: The History]. Reykholt: Snorrastofa, 1996.

Ghenoiu, Erik Martin. "'Tradition' as Modernism in German Architecture and Urban Design, 1888–1918." PhD Dissertation at Harvard University, Graduate School of Arts and Sciences (May 2008).

Gilbreth, Frank Bunker. *Concrete System*. New York: The Engineering News Publishing Company, 1908.

Gísli Gunnarsson. *Monopoly Trade and Economic Stagnation: Studies in the Foreign Trade of Iceland, 1602–1787.* Lund: Ekonomisk-historiska föreningen, 1983.

Gísli Jónsson. *Saga Iðnaðarmannafélagsins í Reykjavík* [The History of the Craftmen Society in Reykjavík]. Reykjavík: Iðnaðarmannafélagið í Reykjavík, 1967.

Gísli Sverrir Árnason, and Sigbjörn Kjartansson, eds. *Eyðibýli á Íslandi* [Abandoned Houses in Iceland] Vol.1–5. Reykjavík: Eyðibýli-áhúgamannafélag, 2011–2014.

Grut, Torben. "Om Beregningen af Monierkostrukioner" [On the Calculation of Monier Constructions]. *Ingeniøren* 5, no. 9 (29 February 1896): 39–40.

Grut, Torben. "Om Konstruktioner af armeret Beton (Hennebique-Konstruktioner)." [On Reinforced Concrete Structures (Hennebique Structures)]. *Ingeniøren* 9, no. 22 (2 June 1900): 179–83.

Gry, Helge. *Geology of Bornholm*. Copenhagen: Theodor Sorgenfrei, 1960.

Gubler, Jacques. *Nationalisme et internationalisme dans l'architecture moderne de la Suisse.* Lausanne: Éditions L'Âge d'Homme, 1975. Italian edition: *Nazionalismo e*

internazionalismo nell'architettura moderna in Svizzera. Mendrisio: Accademia di Architettura, 2012.
Guðjón Friðriksson. *Saga Reykjavíkur. Bærinn vaknar (1870–1940). Fyrri hluti* [History of Reykjavík The City Awakens (1870–1940). First Volume]. Reykjavík: Iðunn, 1991.
Guðjón Friðriksson. *Saga Reykjavíkur. Bærinn vaknar (1870–1940). Síðari hluti* [History of Reykjavík The City Awakens (1870–1940). Second Volume]. Reykjavík: Iðunn, 1994.
Guðjón Friðriksson. *Hér heilsast skipin: saga Faxaflóahafna* [The Ships Greet Here. History of the Harbours in Faxaflói]. Akranes: Uppheimar, 2013.
Guðjón Samúelsson. "Fremgangsmaade til Behandling af Yderfladerne af Bygninger og andre Bygningsværker, navnlig af Beton." Patent DK 56543, 29 June 1937.
Guðjón Samúelsson. "Improvements in or Relating to Treating the Surfaces of Buildings and Other Structures, Particularly of Concrete." Patent GB 516,064, 21 December 1939.
Guðjón Samúelsson. "The National Theatre, Reykjavík, Iceland." *The Builder* 180, no. 5650 (June 1951): 784–85.
Guðmundur Björgvin Jónsson. *Mannlíf og mannvirki í Vatnsleysustrandarhreppi* [Life and Infrastructures in *Vatnsleysustrandarhreppur*]. Hafnarfjörð: Prentsmiðja Hafnarfjarðar, 1987.
Guðmundur Guðmundsson. *Sementsiðnaður á Íslandi í 50 ár* [Fifty Years of Cement Industry in Iceland]. Reykjavík: Verkfræðingafélag Íslands, 2008.
Guðmundur Gunnarsson, ed. *Icelandic Architecture.* Aarhus: Arkitektskolen i Aarhus, 1996.
Guðmundur Hannesson. *Um skipulag bæja* [On Town Planning]. Reykjavík: Háskóli Íslands, 1916.
Guðmundur Hannesson. *Skipulag sveitabæja* [Planning of Farmhouses]. Reykjavík: Þorsteinn Gíslason, 1919.
Guðmundur Hannesson. "Einige Worte über Bevölkerungszuwachs und Sterblichkeit auf Island." *Mitteilungen der Islandfreunde* 8, no. 1 (July 1920): 1–6.
Guðmundur Hannesson. *Steinsteypa. Leiðarvísir fyrir alþýðu og viðvaninga* [Concrete. Guidebook for Common People and Beginners]. Reykjavík: Iðnfræðafjelag Íslands, 1921.
Guðmundur Hannesson. *Húsagerð á Íslandi* [Construction in Iceland]. Reykjavík: Prentsmiðjan Edda H. F., 1942.
Guðmundur Hálfdanarson. "Social Distinctions and National Unity: On Politics of Nationalism in Nineteenth-Century Iceland." *History of European Ideas* 21, no. 6 (1995): 763–79.
Guðmundur Hálfdanarson. "Þingvellir: An Icelandic 'Lieu de Memoire'." *History and Memory* 12, no. 1 (2000).
Guðmundur Hálfdanarson. *Íslenska þjóðríkið: uppruni og endimörk* [Icelandic Nation State: Origins and Limits]. Reykjavík: Hið íslenska bókmenntafélag, 2001.
Guðmundur Hálfdanarson. "From Linguistic Patriotism to Cultural Nationalism: Language and Identity in Iceland." In *Language and Identities in Historical Perspective*, edited by Ann Katherine Isaacs. 55–67. Pisa: Pisa University Press, 2005.
Guðmundur Hálfdanarson. "Severing the Ties – Iceland's Journey from a Union with Denmark to a Nation-State." *Scandinavian Journal of History* 31, no. 3–4 (2006): 239–41.
Guðmundur Hálfdanarson. "Interpreting the Nordic Past: Icelandic Medieval Manuscripts and the Construction of a Modern Nation." In *The Uses of the Middle Ages in Modern European States. History, Nationhood and the Search for Origins*, edited by Robert Evans and Guy P. Marchal. 52–71. Basingstoke: Palgrave Macmillan, 2011.

Guðmundur Hálfdanarson. "The Beloved War. The Second World War and the Icelandic National Narrative." In *Nordic Narratives of the Second World War*, edited by Henrik Stenius, Mirja Österberg and Johan Östling. 79–100. Lund: Nordic Academic Press, 2011.

Guðmundur Hálfdanarson. "The Occupation Years – Documenting a Forgotten War." *Journal of Scandinavian Cinema* 2, no. 3 (November 2012): 249–55.

Guðmudur Hálfdanarson. "Iceland Perceived: Nordic, European or a Colonial Other?." In *The Postcolonial North Atlantic. Iceland, Greenland and the Faroe Islands*, edited by Lill-Ann Körber, and Ebbe Volquardsen. 39–66. Berlin: Nordeuropa-Institut der Humboldt-Universität, 2014.

Guðmundur Hálfdanarson, and Ólafur Rastrick. "Culture and the Constitution of the Icelandic in the 19th and 20th Centuries." In *Power and Culture: Hegemony, Interaction and Dissent*, edited by Jonathan Osmond and Ausma Cimdina. 87–102. Pisa: Pisa University Press, 2006.

Guðmundur Magnússon. *Tækni fleygir fram. Tæknifræði á Íslandi og saga Tæknifræðingafélags Íslands* [Technology Advances. Technical Knowledge in Iceland and the History of the Icelandic Technical Society]. Reykjavík: Iðnsaga Íslendinga og hið íslenska bókmenntafélag, 2010.

Guðný Gerður Gunnarsdóttir, and Hjörleifur Stefánsson. *Kvosin. Byggingarsaga miðbæjar Reykjavíkur* [*Kvosin*. Architectural History of the City Centre of Reykjavík]. Reykjavík: Torfusamtökin, 1987.

Guðrún Harðardóttir. *Þingeyrakirkja* [The Church at Þingeyrar]. In *Kirkjur Íslands.* Vol. 8. 263–315. Reykjavík: Hið íslenska bókmenntafélag, 2006.

Guja Dögg Hauksdóttir. "The Search of Meaning Through Concrete: Matter and Mind in the Work of Högna Sigurðardóttir." *The Journal of Architecture* 20, no. 3 (2015): 489–509.

Gunnar Bollason. "Ágrip af sögu minningarmarka og steinsmíði á Ísland frá önduverðu fram á 20. öld" [Outline of the History of Monuments and Stonemasonry in Iceland until the Twentieth Century]. *Árbók hins íslenszka fornleifafélags* 100 (2009): 5–41.

Gunnar Karlsson. "Spjall um rómantík og þjóðernisstefnu" [On Romanticism and Nationalism]. *Tímarit Máls og menningar* 46, no. 4 (November 1985): 449–57.

Gunnar Karlsson. *The History of Iceland*. Minneapolis: University of Minnesota Press, 2000.

Gunnar Karlsson. *Iceland's 1100 Years. The History of a Marginal Society*. London: Hurst & Company, 2000.

Gunnell, Terry. "The Development and Role of the *Fjallkona* (Mountain Woman) in Icelandic National Day Celebrations and Other Contexts." In *Ritual Year 11: Traditions and Transformations*, edited by Guzel Stolyarova, Irina Sedakova, and Nina Vlaskina, 22–40. Moscow: T8, 2016.

Hallberg, Peter. *Halldór Laxness*. New York: Twayne Publishers, 1971.

Halldór Guðmundsson. *The Islander. A Biography of Halldór Laxness*. London: Maclehose Press, 2008.

Halldór Kiljan Laxness. "Sálarfegurð í mannabústöðum" [The Beauty of Souls in Human Dwellings]. In *Húsakostur og híbýlaprýði*, edited by Hörður Bjarnarson et al. 115–21. Reykjavík: Mál og menning, 1939.

Halldór Kiljan Laxness. *Independent People*. Translated by J. A. Thompson. New York: Alfred A. Knopf, 1946. [*Sjálfstætt Fólk*]. First published in 1934–35.

Halldór Kiljan Laxness. *The Fish Can Sing*. Translated by Magnus Magnusson. London: Vintage Digital, 2010. [*Brekkukotsannál*]. First published in 1957.

Hálldór Kiljan Laxness. *Under the Glacier*. Translated by Magnus Magnusson. New York: Vintage, 2004. [*Kristnihald undir Jökli*]. First published in 1968.

Hannes Hólmsteinn Gissurarson. *Jón Þorláksson. Forsætisráðherra* [Jón Þorláksson. Prime Minister]. Kópavogur: Almenna bókafélagið, 1992.

Hans Poelzig. Der zeichnerische Nachlass. Berlin: Galerie Bassenge, 2014.

Hansen, Torben Seir. "Bornholm Cement. A Danish Example of Roman Cement." Lecture Presentation (2008). Accessed 15/10/2020. http://www.romanportland.net/files/doc/seminar2008/torben_seir_seminar2008s.pdf.

Haraldur Sigurðsson. *Ísland í skrifum erlendra manna um þjóðlíf og náttúru landsins. Ritaskrá* [Iceland in Foreign Writings Regarding Nature and Society. A Bibliography]. Reykjavík: Landsbókasafn Íslands, 1991.

Hassler, Uta, ed. *Was der Architekt von Stahlbeton wissen sollte: ein Leitfaden für Denkmalpfleger und Architekten*. Zürich: GTA, 2010.

Hassler, Uta, ed. *Bauforschung. Zur Rekonstruktion des Wissens.* Zürich: vdf Hochschulverlag, 2010.

Hassler, Uta, and Christoph Rauhut, eds. *Bautechnik des Historismus. Von den Theorien über gotische Konstruktionen bis zu den Baustellen des 19. Jahrhunderts.* München: Hirmer, 2012.

Hassler, Uta, ed. *Der Lehrbuchdiskurs über das Bauen*. Zürich: Hochschulverl, 2015.

Haugsted, Ida. "L. A. Winstrups rejse til Island" [L. A. Winstrup's Journey to Iceland]. *Architectura* 20 (1998): 67–93.

Haugsted, Ida. "Tømrer- og bygmester Bald & Søn på Island og Færøerne [Bald & Son, Master Carpenters and Builders, in Iceland and the Faroe Islands]. *Architectura* 36 (2014): 26–53.

Haukur Ingjaldsson, Jón Sigurðsson, and Steingrímur Baldvinsson. *Byggðir og bú. Aldarminning búnaðarsamtaka Suður-þingeyinga í máli og myndum*. [Buildings and Farms. Memories of the Agricultural Association of Suður-Þingeyinga in Words and Images]. Akureyri: Búnaðarsamband Suður-Þingeyjarsýslu, 1963.

Hausen, Marika, ed. *Eliel Saarinen: Projects 1896–1923*. Helsinki: Museum of Finnish Architecture, 1990.

Hautajärvi, Harri, ed. *The Building of Finland*. Helsinki: Rakennustieto, 2018.

Hegner Christiansen, Jørgen. *Dansk betonarchitektur* [Danish Concrete Architecture]. Copenhagen: Vandkusten, 2018.

Heimir Þorleifsson, ed. *Saga Reykjavíkurskóla: Historia Scholæ Reykjavicensis* [History of the Reykjavík School]. Reykjavík: Menningarsjóður, 1975–84.

Heinzerling, Friedrich, and Otto Intze. *Deutsches Normalprofil-Buch für Walzeisen zu Bau- und Schiffbau-Zwecken.* Aachen: Verlag Von Jos. La Ruelle, 1897.

Helga Maureen Gylfadóttir, Guðný Gerður Gunnarsdóttir. "Húsakönnun. Austurstræti – Pósthússtræti – Hafnarstræti – Lækjargata" [Research on the Built Heritage: Austurstræti – Pósthússtræti – Hafnarstræti – Lækjargata]. Reykjavík. Minjasafn Reykjavíkur, 2006.

Helgi Skúli Kjartansson. *Ísland á 20 öld* [Iceland in the Twentieth Century]. Reykjavík: Sögufélag, 2002.

Helgi Þorláksson, ed. *Reykjavík í 1100 ár* [Reykjavík in 1100 Years]. Reykjavík: Sögufélag, 1974.

Henningesen, Bernd, and Janine Klein, eds. *Wahlverwandtschaft: Skandinavien und Deutschland, 1800–1914*. Berlin: Jovis-Verlagsbüro, 1997.

Henry, Alison, and John Stewart, eds. *Practical Building Conservation: Mortars, Renders, and Plasters.* London: Ashgate, 2012.

Hess, Ludwig. “Fnjóská-Brücke auf Island – Landungssteg im Hafen von Hundested.” *Beton und Eisen* 8, no. 8 (1909): 188–89.

Hiort, Esbjørn. “Andreas Kirkerup’s islandske kirke. Af Reykjavík Domkirkes bygningshistorie.” [Andreas Kirkerup’s Icelandic Church. On the Construction of the Cathedral of Reykjavík]. *Architectura. Arkitekturhistorisk Årsskrift* 2 (1980): 126–41.

Hiort, Esbjørn, and Hjörleifur Stefánsson. “Úr byggingarsögu dómkirkjunnar í Reykjavík.” [On the Costruction of the Cathedral in Reykjavík]. *Árbók Hins íslenzka fornleifagélags* 81 (1984): 27–48.

Hjörleifur Stefánsson. *Hegningarhúsið við Skólavörðustíg* [The Prison in Skólavörðurstígur]. Reykjavík: Árbæjarsafn, 1984.

Hjörleifur Stefánsson. *Akureyri: fjaran og innbærinn: byggingarsaga* [Akureyri: The Coast and the Village. An Architectural History]. Reykjavík: Torfusamtökin, 1986.

Hjörleifur Stefánsson, ed. *Bárujárn: verkmenning og saga* [Corrugated Iron: Technique and History]. Reykjavík: Minjavernd, 1995.

Hjörleifur Stefánsson, Kjell H. Halvorsen, and Magnús Skúlason, **eds**. *Af norskum rótum: gömul timburhús á Íslandi* [From Nordic Roots. Old Timber Houses in Iceland]. Reykjavík: Mál og menning, 2003.

Hjörleifur Stefánsson. *Af jörðu. Íslensk torfhús* [From Earth. Icelandic Turf Houses]. Reykjavík: Crymogea, 2013.

Hobsbawn, Eric J., and Terence Ranger, eds. *The Invention of Tradition*. Cambridge: Cambridge University Press, 1983.

Hofer, Sigrid. *Reformarchitektur.* Stuttgart: A. Menges, 2005.

Holan, Jerri. *Norwegian Wood: A Tradition of Building*. New York: Rizzoli, 1990.

Hosar, Hans P. *Kunnskap, dannelse og krigens krav. Krigsskolen 1750–2000* [Knowledge, Education and the Requirements of War. The Military Academy 1750–2000]. Oslo: Krigsskolen Elanders, 2000.

Hrefna Róbertsdóttir. *Gamli austurbærinn. Timburhúsabyggð í norðanverðu Skólavörðuholti frá byrjun 20. aldar* [The Old *Austurbær*. Timber Buildings North of Skólavörðurholt Hill Since the Beginning of the Twentieth Century]. Reykjavík: Árbæjarsafn, 1989.

Hughes, David, Simon Swann, and Alan Gardner. “Roman Cement. Part One: Its Origins and Properties.” *Journal of Architectural Conservation* 13, no. (2007): 21–36.

Hörður Ágústsson. *Skálholt: kirkjur* [Skálholt: Churches]. Reykjavík: Hið íslenska bókmenntafélag, 1990.

Hörður Ágústsson. *Íslensk byggingararfleifð I: Ágrip af húsagerðarsögu 1750-1940* [Icelandic Architectural Heritage. An Outline of the History of Architecture 1750-1940]. Reykjavík: Húsafriðunarnefnd ríkisins, 2000.

Hörður Ágústsson. *Íslensk byggingararfleifð II: Varðveisluannáll 1863–1990. Verndunaróskir* [Icelandic Architectural Heritage. Annals of Preservation 1863–1990. Conservation Plans]. Reykjavík: Húsafriðunarnefnd ríkisins, 2000.

Hörður Bjarnason et al. *Húsakostur og híbýlaprýði* [Housing and Furniture]. Reykjavík: Mál og menning, 1939.

“Iceland.” *uncube magazine* no. 40 (2015). Accessed 6/10/2020. http://www.uncubemagazine.com/magazine-40-16339141.html#!/page1.

Idorn, Gunnar M. *Concrete Progress: From Antiquity to the Third Millennium*. London: Thomas Telford, 1997.

Ijeh, Ike. “Shelter from the Storm.” *Building* 285, no. 9074 (21 June 2019): 38–42.

"In Concrete. Third Series–XIII". *The Concrete Way*, incorporating *The Road Maker* 7, no. 1 (July-August 1934): 34–50.

Ingi Sigurðsson. "The Icelandic Enlightenment as an Extended Phenomenon." *Scandinavian Journal of History* 35, no. 4 (December 2010): 371–90.

Iori, Tullia. *Il cemento armato in Italia. Dalle origini alla Seconda Guerra Mondiale.* Roma: Edilstampa, 2001.

Jahren, Per, and Tongbo Sui. *History of Concrete: A Very Old and Modern Material*. Singapore: World Scientific Publishing, 2017.

Jakob F. Ásgeirsson. *Jón Gunnarsson: ævisaga* [Jón Gunnarsson: A Biography]. Reykjavík: Ugla, 2018.

Jakobi, Verena. "Heimatschutz und Bauerndorf. Zum planmäßigen Dorfbau im Deutschen Reich zu Beginn des 20. Jahrhunderts." *PhD Dissertation* in Architektur, Umwelt und Gesellschaft, Technischen Universität Berlin, 2003.

Jensen, Emanuel. "Om Monierkonstruktioner" [On Monier Structures]. *Den Tekniske Forenings Tidsskrift* (1891): 140–48.

Jensen, Thomas Bo. *P.V. Jensen-Klint: The Headstrong Master Builder.* London: Routledge, 2009.

Johanssen, Fr. [Frederik]. "Beregning af armeret Beton" [Calculation of Reinforced Concrete]. *Ingeniøren* 9, no. 12 (24 March 1900): 111.

Johansson, Bengt J. O. "Betong i arkitekturen: Gestaltning och teknik 1930–1980" [Concrete in Architecture. Design and Technology 1930–1980]. PhD dissertation, Chalmers tekniska högskola, 2008. Accessed 7/11/2020. https://research.chalmers.se/publication/63547.

Jón G. Friðjónsson. *Mergur málsins. Íslensk orðatiltæki: uppruni, saga og notkun*. [The Core of the Language. Icelandic Idioms: Origin, History and Use]. Reykjavík: Mál og menning, 2006.

Jón Guðnason. *Verkfræðingafélag Íslands: 1912–1962* [Icelandic Engineers' Society: 1912–1962]. Reykjavík: Verkfræðingafélag Íslands, 1962.

Jón Guðnason, ed. *Iðnbylting á Íslandi. Umsköpun atvinnulífs um 1880 til 1940* [Industrial Revolution in Iceland. Changes in the Working Life Between 1880 and 1940]. Reykjavík: Sagnfræðistofnun Háskóla Íslands, 1987.

Jónas Jónsson. *Þjóðleikhúsið: þættir úr byggingarsögu* [The National Theatre. History of the Building]. Reykjavík: Ísafoldprentsmiðja, 1953.

Jónas Jónsson, and Benedikt Gröndal, eds. *Íslenzk Bygging. Brautryðjandastarf Guðjóns Samúelssonar* [Icelandic Architecture. The Pioneering Work of Guðjón Samúelsson]. Reykjavík: Norðri, 1957.

Jón Kalman Stefánsson. *Fish Have No Feet: A Family History*. Translated by Philip Roughton. London: Maclehose Press, 2016.

Jón Rúnar Sveinsson. *Society, Urbanity and Housing in Iceland*. Gävle: Meyer Information & Publishing Ltd., 2000.

Jón Ólafur Ísberg, ed. *Iðnskóli í eina öld: Iðnskólinn in Reykjavík 1904–2004* [A Technical School in One Century: The Tecnical School in Reykjavík 1904–2004]. Reykjavík: Hólar, 2004.

Jón Sveinsson. *Húsabætur á sveitabæjum. Uppdrættir og áætlanir* [Improvement of Farmhouses. Drawings and Plans]. Reykjavík: Ísafoldarprentsmiðja, 1898.

Jón E. Vestdal. *Verkfræðingatal: æviágrip íslenzkra verkfræðinga og annarra félagsmanna Verkfræðingafélags Íslands* [Engineers' Census: Biographies of Icelandic Engineers and Other Members of the Icelandic Engineers' Society]. Reykjavík: Sögufélag, 1956.

Jón Þorláksson. *Burðarþolfræði: ágrip*. Reykjavík: Iðnskólinn, 1909.

Júlíana Gottskálksdóttir. “Byggingarlist” [Architecture]. In *Í deiglunni 1930–1944. Frá Alþingishátið til lýðveldisstofnunar* [In the Crucible. From the 1000th Anniversary of Alþingi to the Establishment of the Republic]. 155–64. Reykjavík: Mal og Menning, 1994.

Júlíana Gottskálksdóttir. *Ljósbrigði: Safn Ásgríms Jónssonar* [The Ásgrímur Jónsson Museum]. Reykjavík: Listasafn Íslands, 1996.

Karlsen, Trygve. “Engineering Education in Norway.” *European Journal of Engineering Education* 2, no. 1 (1977): 105–8.

Kirkjur Íslands. Fornar kirkjur í Reykjavík. Dómkirkjan, Fríkirkjan í Reykjavik, Kristkirkja í Landakoti [Churches of Iceland. The Cathedral of Reykjavík, The Free Church of Reykjavík and the Christian Church in Landakot]. Reykjavík: Hið íslenska bókmenntafélag, 2012.

Kissane, Michael J. “Seeing the Forest for the Trees: Land Reclamation in Iceland.” *Scandinavian Review* 86, no. 1 (1998): 4–7.

Kiørboe, Frederik. “Landsbibliotek i Reykjavik (Landsbókasafn Íslands)” [The National Library of Iceland]. *Architekten* 1, no. 16 (1910): 169–74.

Khodakovsky, Evgeny, and Siri Skjold Lexau. *Historic Wooden Architecture in Europe and Russia.* Basel: Birkhäuser, 2015.

Kjartan Bergmann Guðjónsson. “Sverrir steinhöggvari” [Mastermason Sverrir Runólfsson]. *Tíminn* 2, no. 22 (9 June 1963): 518.

Knud Zimsen. *Skýrsla um rannsóknir stjórnarinnar til undirbúnings klæðaverksmiðju á Íslandi* [Report on the Governmental Research for the Construction of a Wool Factory in Iceland]. Copenhagen: J. H. Schultz, 1901.

Kolderup, Edvard. *Haandbog i husbygningskunst* [Handbook on Architecture]. Kristiania: H. Aschehoug & Co. Forlag, 1891

Kolderup, Edvard. *Monierkonstruktionerne. Den nye byggemethodes epokegjørende betydning og anvendelse*. [Monier Structures. The Epoch-Making Significance and Application of the New Building Method]. Kristiania: H. Aschehoug & Co. Forlag, 1893.

Kolderup, Edvard. *Grundundersøgelser og fundamenteringsarbeider paa land og under vand for alle slags byggearbeider* [Soil Investigation and Foundation Works above Ground and Underwater for all Kinds of Buildings]. Kristiana: H. Aschehoug & Co. Forlag, 1894.

Komonen, Markku. *Saarinen Suomessa* [Saarinen in Finland]. Helsinki: Museum of Finnish Architecture, 1984.

Krabbe, **Thorvald Haraldsen.** *A Few Remarks on Icelandic Lighthouse Practise.* Reykjavík: Iceland Lighthouse Service, 1932.

Krabbe, Thorvald Haraldsen. *Island og dets tekniske udvikling gennem tiderne* [Iceland and Its Technical Development over Time]. Copenhagen: Danks-islandsk samfund, 1946.

Kristensen, Johs. *Dansk Ingeniørforening gennem 50 Aar: 1892–1942* [The Danish Engineers’ Society in 50 Years: 1892–1942]. Dansk Ingeniørforening, 1942.

Kristín Ástgeirsdóttir, ed. *Reykjavík miðstöð þjóðlífs* [Reykjavík as the Centre of National Life]. Reykjavík: Sögufélag, 1978.

Kristján Eldjárn, Hakon Christie, and Jón Steffensen. *Skálholt: fornleifarannsóknir 1954–58* [Skálholt: Archeological Investigatios 1954–58]. Reykjavík: Lögberg, 1988.

Kuban, Sabine. “Konstruieren in einer regellosen Zeit. Eisenbetonbemessung zwischen Monier-Broschüre und den ersten behördlichen Vorschriften (1887–1904).” In *Alltag und Veränderung. Praktiken des Bauens und Konstruierens*, edited by Werner Lorenz et al. 205–20. Dresden: Thelem, 2017.

Kugler, Franz. *Geschichte der Baukunst. Vol. 1–3.* Stuttgart: Verlag von Ebner & Seubert, 1856–59.

Kurrer, Karl-Eugen. *Geschichte der Baustatik*. Berlin: Ernst, 2002.

Kurrer, Karl-Eugen. "La dalle dans le système Monier." In *L'architrave, le plancher, la plate-forme: nouvelle historie de la construction*, edited by Roberto Gargiani. 544–552. Lausanne: Presses polytechniques et universitaires romandes, 2012.

Labonne, Henry. *L'Islande et l'archipel des Færoeer.* Paris: Libraire Hachette, 1888.

Landsforeningen Bedre Byggeskik. *Danske landbrugsbygninger* [Danish Agricultural Buildings]. Copenhagen: Hassing, 1920.

Lane, Barbara Miller. *National Romanticism and Modern Architecture in Germany and the Scandinavian Countries.* Cambridge: Cambridge University Press, 2000.

Lauri, Tomas, ed. *Natural Elements*. *The Architecture of Arkís Architects.* Stockholm: Arvinius+Orfeus, 2020.

LeCuyer, Annette W. *Studio Granda: Dreams and Other Realities.* Ann Arbor: University of Michigan, 1998.

Leifur Sveinsson. "Þættir úr sögu Timburverzlunarinnar Völundar h.f." [History of the Building Firm *Völundur*]. *Morgunblaðið* (25 February 1979): 36–37.

Leó Kristjánsson. "Úr sögu íslenska silfurbergsins" [On the History of Iceland Spar]. *Náttúrufræðingurinn* 76, no. 1–2 (2008): 37–48.

Leó Kristjánsson. *Iceland Spar and Its Influence on the Development of Science and Technology in the Period 1780–1930: Notes and References.* Reykjavík: Institute of Earth Sciences, University of Iceland, 2015.

Leschonski, Henrik. *Der Kristall als expressionistisches Symbol. Studien zur Symbolik des Kristallinen in Lyrik, Kunst und Architektur des Expressionisms (1910–1925).* Frankfurt: Peter Lang, 2008.

Leslie, Thomas. *Beauty's Rigor: Patterns of Production in the Work of Pier Luigi Nervi.* Urbana/Chicago/Springfield: University of Illinois Press, 2017.

L'Heureux, Marie-Alice. "Modernizing the Estonian Farmhouse, Redefining the Family, 1880s–1930s." *Journal of Baltic Studies* 41, no. 4 (2010): 473–506.

Lorenzen, Vilh. *Tegninger til Husmandsboliger* [Drawings of Cottages]. Odense: Det Miloske Forlag, 1909.

Lúðvík Kristjánsson, ed. *Við fjörð og vík. Brot úr endurminningum Knud Zimsens fyrrverandi borgarstjóra* [By the Fjord and the Bay. Some Memories of Former Mayor Knud Zimsen]. Reykjavík: Helgafell, 1948.

Lúðvík Kristjánsson, ed. *Úr bæ í borg: nokkrar endurminningar Knud Zimsens fyrrverandi borgarstjóra um þróun Reykjavíkur* [From Village to Town. Some Memories of Former Mayor Knud Zimsen on the Development of Reykjavík]. Reykjavík: Helgafell, 1952.

Lundahl, Gunilla, ed. *Nordisk Funktionalism* [Nordic Functionalism]. Stockholm: Arkitektur Forlag AB, 1980.

Lýður Björnsson. *Steypa lögð og steinsmíð rís. Sagt frá mannvirkjum úr steini og steypu* [Concrete Laid and Stonemasonry Rising. History of Stone and Concrete Structures]. Reykjavík: Hið íslenska bókmenntafélag, 1990.

Maciuika, John V. *Before the Bauhaus. Architecture, Politics and the German State, 1890–1920.* Cambridge: Cambridge University Press, 2005.

Mackenzie, George Steuart. *Travels in the Island of Iceland*. Edinburgh: Thomas Allan and Company, 1811.

Madsen, Hans Helge. *Chicago – København. Alfred Råvads univers* [Chicago–Copenhagen. The Universe of Alfred Råvad]. Copenhagen: Gyldendal, 1990.

Magnago Lampugnani, Vittorio. *Architektur und Städtebau des 20. Jahrhunderts.* Stuttgart: Verlag Gerd Hatje, 1980.

Magnago Lampugnani, Vittorio, and Romana Schneider, eds. *Moderne Architektur in Deutschland 1900 bis 1950, Reform und Tradition.* Stuttgart: Verlag Gerd Hatje, 1992.

Magrill, Barry. "Pouring Ecclesiastical Tradition into a Modern Mould." *Journal of the Society for the Study of Architecture in Canada* 37, no. 1 (2012): 3–15.

Mamy, Henri. "L'Islande". *Le Génie Civil: revue générale des industries françaises et étrangères* 10, no. 19 (12 March 1887): 301–03.

Marx, Edwin. *Wände und Wandöffnungen*. Stuttgart: Arnold Bergsträsser Verlagsbuchhandlung, 1900.

Mayburd, Miriam. "The Hills Have Eyes: Post-Mortem Mountain Dwelling and the (Super)Natural Landscape in the *Íslendingasögur*." *Viking and Medieval Scandinavia* 10 (2014): 129–54.

Mändel, Maris, and Oliver Orro. "The Marvellous Reinforced Concrete Shells of Tallinn Seaplane Hangars in the Context of Early Concrete Architecture in Estonia." *Construction History* 27 (2012): 65–85.

"Merkir Íslendingar. Jón Hjaltalín" [Important Icelanders: Jón Hjaltalín]. *Morgunblaðið* 100, no. 98 (27 April 2012): 39.

Millech, Knud. *Danske Arkitekturstrømninger* [Danish Architectural Currents]. Aarhus: Aarhus Stiftsbogtrykkerie, 1977.

Millar, William. *Plastering. Plain and Decorative.* London: B. T. Batsford, 1899.

Mornati, Stefania. "Le coffrage comme matrice figurative: du travail du charpentier au produit industriel." In *Édifice & Artifice*. *Histories constructives*, edited by Robert Carvais, André Guillerme, Valérie Nègre, and Joël Sakarovitch. 623–31. Paris: Picard, 2008.

Morris, William. *The Collected Works by William Morris. Volume VIII. Journals of Travel in Iceland, 1871–1873.* London: Longmans Green and Company, 1911.

Mörsch, Emil. *Der Eisenbetonbau: seine Theorie und Andwendung*. Neustadt: Wayss & Freytag, 1908.

Muthesius, Hermann. *Das englische Haus*. Berlin: Ernst Wasmuth, 1908–11.

Muthesius, Hermann. *Die Bedeutung der Gartenstadtbewegung: Vier Vorträge in Gegenwart der Frau Kronprinzessin*. Leipzig/Paris: Renaissance Verlag Robert Federn, 1914.

Muthesius, Hermann. *Kann ich auch jetz noch mein Haus bauen? Richtlinien für den wirklich sparsamen Bau des bürgerlichen Einfamilienhauses unter den wirtschaftlichen Beschränkungen der Gegenwart*. München: F. Bruckmann, 1920.

Nanna Hermansson, ed. *Grjótaþorp 1976: könnun á sögu og ástandi húsanna* [*Grjótaþorp* 1976: Research on the History and the Condition of Houses]. Reykjavík: Árbæjarsafn, 1977.

Nannini, Sofia. "Narrare senza architettura. L'Islanda nei romanzi di Jón Kalman Stefánsson." In *Archiletture. Forma e narrazione tra architettura e letteratura,* edited by Andrea Borsari, Matteo Cassani Simonetti, Giulio Iacoli. 467–78. Milano: Mimesis, 2019.

Nannini, Sofia. "Icelandic Concrete Surfaces. Guðjón Samúelsson's Steining (1930–50)." In *Iron, Steel and Buildings: The Proceedings of the Seventh Conference of the Construction History Society*, edited by James W. P. Campbell, Nina Baker, Karey Draper, Michael Driver, Michael Heaton, Yiting Pan, Natcha Ruamsanitwong and David Yeomans. 541–52. Cambridge: The Construction History Society, 2020.

Nannini, Sofia. "The City as a Gravel Pile: Building Codes, Concrete, and Urban Dwellings in Reykjavík (1903–45)." In *La città globale. La condizione urbana come fenomeno pervasivo / The Global City. The Urban Condition as a Pervasive Phenomenon*, edited by Marco Pretelli, Rosa Tamborrio, Ines Tolic. Torino: AISU, 2020. Publication underway.

Nelva, Riccardo, and Bruno Signorelli. *Avvento ed evoluzione del calcestruzzo armato in Italia: il Sistema Hennebique.* Milano: Edizioni di Scienza e Tecnica, 1990.

Nerdinger, Winfried. "Die 'Erfindung der Tradition' in der deutschen Architektur 1870–1914." In *Geschichte Macht Architektur,* edited by Werner Oechslin. 69–79. München: Prestel Verlag, 2012.
Newby, Frank, ed. *Early Reinforced Concrete.* Aldershot: Ashgate, 2001.
Nezik, Christin. "The Search for a Contemporary Finnish Architecture. Adaptations of the Vernacular Tupa in the Oeuvre of Herman Gesellius, Armas Lindgren, Eliel Saarinen, and Alvar Aalto." In *Regionalism, Nationalism and Modern Architecture*, edited by Jorge Cunha Pimentel, Alexandra Trevisan, and Alexandra Cardoso. 265–80. Porto: CEAA, 2018.
Nielsen, Harald. *Boligbogen. Tegninger og beskrivelser til smaa enfamiliehuse* [The Book of Housing. Drawings and Descriptions of Small Single-Family Houses]. Copenhagen, 1926.
"Nú stækkar landið" [The Country Is Growing Now]. *Morgunblaðið* 61, no. 121 (12 July 1974): 14–15.
O'Donnell, Sheila, and John Tuomey. *Í hlutarins eðli – The Nature of Things: Studio Granda.* Reykjavík: Kjarvalsstaðir, 1995.
Olving, Sven. "Education of Graduate Engineers in Sweden." *European Journal of Engineering Education* 2, no. 1 (1977): 105–14.
Ostenfeld, Asger. "Om Bøjning ved Brudgrænsen" [On the Bending at the Fracture Limit]. *Ingeniøren* 5, no. 13 (26 March 1896): 71.
Ostenfeld, Asger. "Om Beregning af Monierkonstruktioner" [On the Calculation of Monier Structures]. *Ingeniøren* 6, no. 1 (2 January 1897): 1–4.
Ostenfeld, Asger Skovgaard. *Teknisk Statik* [Structural Analysis]. Copenhagen: Gjellerup, 1900. Also translated in German as *Technische Statik. Vorlesungen über die Theorie der Tragkonstruktionen*. Leipzig: Druck und Verlag Von B. G. Teubner, 1904.
Ostenfeld, Christen. *Christiani & Nielsen: jernbetonens danske pionerer* [Christiani & Nielsen: Danish Pioneers of Reinforced Concrete]. Lyngby: Polyteknisk Forlag, 1976.
Otto, Christian F. "Modern Environment and Historical Continuity: The *Heimatschutz* Discourse in Germany." *Art Journal* 43, no. 2 (1983): 148–57.
Overy, Paul. *Light, Air & Openness. Modern Architecture Between the Wars.* London: Thames & Hudson, 2007.
Ólafur Ásgeirsson. *Iðnbylting hugarfarsins*. *Átök um atvinnuþróun á Íslandi 1900–1940* [An Industrial Revolution of the Character. The Battle for the Industrial Development in Iceland 1900–1940]. Reykjavík: Bókaútgáfa menningarsjóðs, 1988.
Ólafur Kvaran. *Einar Jónsson myndhgöggvari. Verk, táknheimur og menningarsögulegt samhengi* [Sculptor Einar Jónsson. Work, Symbolism and Cultural-Historical Context]. Reykjavík: Hið íslenska bókmenntafélag, 2018.
Ólafur Rastrick. *Háborgin: menning, fagurfræði og pólitík í upphafi tuttugustu aldar*. [The Acropolis: Culture, Aesthetics and Politics at the Beginning of the Twentieth Century]. Reykjavík: Háskólaútgafan, Sagnfræðistofnun Háskóla Íslands, 2013.
Ólafur Rastrick, and Benedikt Hjartarson. "Cleansing the Domestic Evil – On the Degenerate Art Exhibition in Reykjavík, 1942." In *A Cultural History of the Avant-Garde in the Nordic Countries*, edited by Benedikt Hjartarson. 879–902. Leiden: Brill, 2019.
Ólöf Kristín Sigurðardóttir, ed. *Ásmundur Sveinsson.* Reykjavík: Listasafn Reykjavíkur-Ásmundarsafn, 2017.
Paavilainen, Simo. *Nordisk klassicism 1910–1930.* Helsinki: Finlands Arkitekturmuseum, 1982.
Pace, Sergio. *Un eclettismo conveniente. L'architettura delle banche in Europa e in Italia, 1788–1925*. Milano: FrancoAngeli, 1999.
Pagano, Giuseppe. "Architettura nazionale." *Casabella* 85 (1935): 2–7.

Pantelić, Bratislav. "Nationalism and Architecture: The Creation of a National Style in Serbian Architecture and Its Political Implications." *Journal of the Society of Architectural Historians* 56, no.1 (March 1997): 16–41.

Páll Eggert Ólason, ed. *Íslenzkar æviskrár frá landnámstímum til ársloka 1940* [Icelandic Biographical Dictionary from the Settlement to 1940]. Vol. 2. Reykjavík: Hið Íslenska bókmenntafélag, 1949.

Páll Eggert Ólason, ed. *Íslenzkar æviskrár frá landnámstímum til ársloka 1940* [Icelandic Biographical Dictionary from the Settlement to 1940]. Vol. 3. Reykjavík: Hið Íslenska bókmenntafélag, 1950.

Páll Líndal. *Bæirnir byggjast* [The Towns Are Built]. Reykjavík: Skipulagsstjóri ríkisins og sögufélag, 1982.

Páll Líndal. *Reykjavík 200 ára: saga höfuðborgar í myndum og máli* [The Story of a Capital: Reykjavík in Words and Pictures]. Reykjavík: Hagall, 1986.

Páll Líndal. *Rekjavík: sögustaður við Sund* [Reykjavík. Historical Places in Sund]. Vol. 1–3. Rekjavík: Örn og Örlygur, 1986–1991.

Páll Sigurðsson. *Úr húsnæðis- og byggingarsögu Háskóla Íslands* [Architectural History of the University of Iceland]. Reykjavík: Háskóli Íslands, 1986–91.

Páll V. Bjarnason. "Icelandic Architecture in the Concrete Era." In *XIV Nordic Concrete Congress & Nordic Concrete Industry Meeting*, 6-8 August 1992. 251–58. Reykjavík: Icelandic Concrete Association, 1992.

Pedersen, Julius. *Statik* [Statics]. Copenhagen: Høst, 1881. Also translated in German as *Lehrbuch der Statik fester Körper*. Copenhagen: Høst, 1882.

Pedersen, Morten. *Cementen.* Aarhus: Aarhus Universitetsforlag, 2019.

Pehnt, Wolfgang. *Die Architektur des Expressionismus.* Stuttgart: Verlag Gerd Hatje, 1998.

Perko, F. V. "Die evangelische Kirche in Innsbruck." *Beton und Eisen* 6, no. 2 (1907): 36–38.

Petersen, Carl. "Grundtvig-Kirken" [Grundtvig's Church]. *Berlingske Tidende* 168, no. 216 (3 August 1916): 3.

Pétur H. Ármannsson. "The Development of Reykjavík in the 1920s and 1930s and the Impact of Functionalism." In *Nordisk Funksjonalisme*, edited by Wenche Findal. 45-62. Oslo: Ad Notam Gyldendal, 1995.

Pétur H. Ármannsson, ed. *Einar Sveinsson: arkitekt og húsameistari Reykjavíkur.* Reykjavík: Kjarvalsstaðir, 1995.

Pétur H. Ármannsson, ed. *Sigurður Guðmundsson Arkitekt* [Architect Sigurður Guðmundsson]. Reykjavík: Listasafn Reykjavíkur, 1997.

Pétur H. Ármannsson. "Reconstruction in Prosperity. An Introduction to Modern Architecture in Iceland." *Docomomo Journal: Nordic Countries* 19 (1998): 46–48.

Pétur H. Ármannsson. "Social Aspects and Modern Architecture in Iceland." In *Modern Movement Scandinavia: Vision and Reality*, edited by Ola Wedebrunn. 99–108. Copenhagen: Fonden til udgivelse af arkitekturtidskrift, 1998.

Pétur H. Ármannsson, ed. *Endurreisnarmaður íslenskra sjónmennta* [The Renaissance Man in Icelandic Visual Art]. Reykjavík: Listasafn Reykjavíkur, 2005.

Pétur H Ármannsson. "Concrete's Furthest North." *Docomomo Journal: Bridges and Infrastructures* 45 (2011): 87–89.

Pétur H. Ármannsson. *Gunnlaugur Halldórsson archiktekt* [Architect Gunnlaugur Halldórsson]. Reykjavík: Hið íslenska Bókmenntafélag, 2014.

Pétur H. Ármannsson. “Salir Ásmundar [Ásmundur’s Studios]”. In *Ásmundur Sveinsson*, edited by Ólöf Kristín Sigurðardóttir. 172–83. Reykjavík: Listasafn Reykjavíkur – Ásmundarsafn, 2017.

Pétur H. Ármannsson. *Guðjón Samúelsson húsameistari* [State Architect Guðjón Samúelsson]. Reykjavík: Hið íslenska bókmenntafélag, 2020.

Pétur Hrafn Árnason, and Sigurður Líndal, eds. *Saga Íslands X* [The History of Iceland, Vol. 10]. Reykjavík: Híð íslenska bókmenntafélag–Sögufélag, 2009.

Pétur Hrafn Árnason, and Sigurður Líndal, eds. *Saga Íslands XI* [The History of Iceland, Vol. 11]. Reykjavík: Híð íslenska bókmenntafélag–Sögufélag, 2016.

Pétur Ingólfsson. “Bogabrúin á Fnjóská” [The Bridge over the River Fnjóská]. *Lesbók Morgunblaðsins* (3 July 1993): 6–7.

Pétur Pétursson, Jens Sigurðsson, and Gísli Magnússon, eds. *Tíðindi frá þjóðfundi íslendinga árið 1851* [Reports from the National Assembly 1851]. Reykjavík: Prentsmiðja landsins, 1851.

Pétur Sumarliðason, and Einar Laxness, eds. *Sjálfsævisaga: bernskúar Kaupfélags Þingeyinga: úr fórum Jakobs Hálfdanarsonar* [An Autobiography: The First Years of the Þingeyinga Cooperative. From the Belongings of Jakob Hálfdanarson]. Reykjavík: Ísafold, 1982.

Picon, Antoine. “Construction History: Between Technological and Cultural History”. *Construction History* 21 (2005–2006): 5–19.

Pieper, Jan. “Werke der ‘Baumeisterin Natur’ in Schilderungen der Romantik.” In *Felsengärten, Gartengrotten, Kunstberge. Motive der Natur in Architektur und Garten*, edited by Uta Hassler. 136–53. München: Hirmer, 2014.

Pigafetta, Giorgio, Ilaria Abbondandolo, and Marco Trisciuoglio. *Architettura tradizionalista. Architetti, opere, teorie.* Milano: Jaca Book, 2002.

Piobb, Pierre. “Une Capitale en bois: Reykjavík.” *Lecture Modernes* 2, no. 22 (10 October 1902): 1353–60.

Posener, Julius. *From Schinkel to Bauhaus: Five Lectures on the Growth of Modern German Architecture*. London: Lund Humphries/Architectural Association, 1972.

Posener, Julius. *Hans Poelzig: Reflections on His Life and Work.* New York: The Architectural History Foundation, 1992.

Poulsen, Ervin. *Betonkrav og –praksis. Normen, forskrifter, dokumenter og faglitteratur 1888–1988 i uddrag til brug i skadesager vedr. betonkonstruktioner* [Concrete Requirements and Practices. Excerpts of Norms, Regulations, Documents and Literature 1888–1988]. Hørsholm: Statens Byggeforskninsinstitut, 1989.

Putkonen, Lauri. “The Early Years of Concrete Construction in Finland.” In *Tehdään betonista: Concrete in Finnish Architecture*, edited by the Association of the Concrete Industry of Finland. 8–19. Helsinki: Garamond, 1989.

Quantrill, Malcolm. *Finnish Architecture and the Modernist Tradition*. London: E. & F.N. Spon, 1995.

Rabitz, Carl. *Naturdächer von vulkanischem Cement*. Berlin: Verlag von Theophil Bittkow, 1867.

Rasmussen, Steen Eiler. *Nordische Baukunst.* Berlin: Verlag Ernst Wasmuth, 1940.

“Ráðhús Reykjavíkinga við Tjörnina” [The Town Hall of Reykjavík near *Tjörnin*]. *Morgunblaðið* 51, no. 8 (11 January 1964): 1, 8 and 17.

Ringbom, Sixten. *Stone, Style and Truth: The Vogue for Natural Stone in Nordic Architecture 1880-1910*. Helsinki: Suomen muinaismuistoyhdistyksen aikakauskirja, 1987.

Ripatti, Anna. “Modernizing Architecture and Ornament on Mid-Nineteenth-Century Scandinavian Farms.” *Journal of the Society of Architectural Historians* 78, no. 1 (March 2019): 68–89.

Roth, Fedor. *Hermann Muthesius und die Idee der harmonischen Kultur.* Berlin: Gebr. Mann Verlag, 2001.

Råvad, Alfred J. *Íslenzk húsgerðarlist. Islandsk Architektur.* Copenhagen: Andr. Fred. Høst & Søn, 1918.

Sacher, Edwin. *Die aus Grassoden und Holz gebauten Höfe und Kirchen in Island*. Würzburg: Konrad Triltsch Verlag, 1938.

Sacken, Eduard. *Katechismus der Baustile*. Leipzig: J. J. Weber, 1894.

Sartoris, Alberto. *Gli elementi dell'architettura funzionale: sintesi panoramica dell'architettura moderna*. Milano: Hoepli, 1941. Third edition.

Schinker, Nils M. *Die Gartenstadt Hellerau 1909–1945: Stadtbaukunst, Kleinwohnungsbau, Sozial- und Bodenreform.* Dresden: Sandstein Verlag, 2013.

Schmal, Peter Cachola, ed. *Iceland and Architecture?*. Berlin: Jovis, 2011.

Schunck, Eberhard, Hans Jochen Oster, Rainer Barthel, and Kurt Kießl. *Dach Atlas*. München: Institut für internationale Architektur-Dokumentation, 2002.

Sedlbauer, Klaus, Eberhard Schunck, Rainer Barthel, and Hartwig M. Künzel. *Flachdach Atlas. Werkstoffe, Konstruktionen, Nutzungen*. München: Institut für internationale Architektur-Dokumentation, 2010.

Seelow, Atli Magnus. *Die moderne Architektur in Island in der ersten Hälfte des 20. Jahrhunderts. Transferprozesse zwischen Adaption und Eigenständigkeit*. Nürnberg: Verlag für moderne Kunst, 2011.

Seelow, Atli Magnus. “Verslunarhús Nathan & Olsen við Austurstræti. Hornsteinn Guðjóns Samúelssonar að nýjum miðbæ Reykjavíkur” [The Building of Nathan & Olsen in Austurstræti. Guðjón Samúelsson's Cornerstone in the New City Centre of Reykjavík]. *Saga. Tímarit Sögufélags* 50, no. 1 (2012): 9–21.

Seelow, Atli Magnus. “Exploring Natural Stone and Building a National Identity: The Geological Exploration of Natural Stone Deposits in the Nordic Countries and the Development of a National-Romantic Architecture.” *Arts* 6, no. 6 (2017).

Shand, Philip Morton. “In Concrete. Third Series–IV”. *The Concrete Way*, incorporating *The Road Maker* 5, no. 4 (January 1933): 195–208.

Shand, Philip Morton. “Concrete's Furthest North.” *The Concrete Way*, incorporating *The Road Maker* 7, no. 6 (May/June 1935): 330–35.

Sigríður Björk Jónsdóttir. *Einar Erlendsson og reykvísk steinsteypuklassík* [Einar Erlendsson and the Concrete Classicism in Reykjavík]. Dissertation in History, University of Iceland, 1995.

Sigurjón Baldur Hafsteinsson. “Museum Politics and Turf-House Heritage.” *Þjóðarspegillinn. Rannsóknir í félagsvísindum XI,* edited by Ingjaldur Hannibalsson. 267–74. Reykjavík: Félagsvísindastofnun Háskóla Íslands, 2010.

Sigurður Guðmundsson. “Three New Concrete Buildings in Iceland.” In “In Concrete. Third Series– XXVI.” *The Concrete Way*, incorporating *The Road Maker* 9, no. 2 (September/October 1936): 100–03.

Sigurður Gylfi Magnússon. *Wasteland With Words: A Societal History of Iceland*. London: Reaktion, 2010.

Sigurður Jónsson. “Timburhúsin risu eftir jarðskjálftana” [Timber Houses Built After the Earthquakes]. *Sunnudagsblað.* (25 August 1996). Accessed 02/09/2020. https://www.mbl.is/greinasafn/grein/283233/.

Sigurður Líndal. *Hið íslenska bókmenntafélag 1816–2016: Söguágrip.* [The Icelandic Literary Society 1816–2016. Historical Outline]. Reykjavík: Hið íslenska bókmenntafélag, 2016.

Sigurður Pálsson. *Mínum drottni til þakklætis: saga Hallgrímskirkju* [To My Lord in Gratitude: The History of Hallgrímskirkja]. Reykjavík: Hallgrímskirkja, 2015.

Simonnet, Cyrille. *Le béton: historie d'un matériau: économie, technique, architecture*. Marseille: Parenthèses, 2005.

Sjællands og Fyns Stifts Udstykningsforening. *Tegninger til Husmandshuse* [Drawings of Farmhouses]. Copenhagen: Erslev & Hasselbalch, 1914.

Slaton, Amy. *Reinforced Concrete and the Modernization of American Building, 1900–1930*. Baltimore: The Johns Hopkins University Press, 2001.

Spur, Birgitta, ed. *Sigurjón Ólafsson: myndhöggvari.* [Sculptor Sigurjón Ólafsson]. Reykjavík: Styrktarsjóður Listasafns Sigurjóns Ólafssonar, 1985.

"Sómastaðir við Reyðarfjörð" [The Warehouse at Sómastaðir in Reyðarfjörður]. *Morgunblaðið* (5 April 2004): 28.

Stadler, Laurent. *Hermann Muthesius (1861–1927): Das Landhaus als kulturgeschichtlicher Entwurf.* Zürich: gta Verlag, 2004.

Stampfer, Lukas. "From Plant to Turf: Determining Qualities at the Intersection Between Pedology, Botany and Building Construction." In *Water, Doors and Buildings: Proceedings of the Sixth Conference of the Construction History Society,* edited by James W. P. Campbell, Nina Baker, Michael Driver, Michael Heaton, Sabine Kuban, Michael Tutton and David Yeomans. 330–39. Cambridge: The Construction History Society, 2019.

Stampfer, Lukas. "Do as the Romans Do: Possible Roman Influences on the Construction of Nordic Settlers." In *Iron, Steel and Buildings: the Proceedings of the Seventh Conference of the Construction History Society*, edited by James W. P. Campbell, Nina Baker, Karey Draper, Michael Driver, Michael Heaton, Yiting Pan, Natcha Ruamsanitwong and David Yeomans. 433–42. Cambridge: The Construction History Society, 2020.

Steingrímur Steinþórsson. "Byggingarmál alþýðu" [Public Building Issues]. In *Félagsmál á Íslandi*. 257–89. Reykjavík: Félagsmálaráðuneytið, 1942.

Stemann, Helga. *F. Meldahl og hans Venner* [F. Meldahl and His Friends]. Copenhagen: H. Hagerups Forlag, 1926–32. [5 Volumes].

Steinmann, Martin. "Architettura e Tradizionalismo. Lavoro come scienza e lavoro come immagine: sulla tradizione dell'architettura 'comune'." In *L'avventura delle idee nell'architettura 1750–1980*, edited by Vittorio Magnago Lampugnani. 169–78. Milano: Electa, 1985.

Stephani, Karl Gustav. *Der älteste deutsche Wohnbau und seine Einrichtung*. Leipzig: Baumgärtner's Buchhandlung, 1902.

Stewart, John. *Nordic Classicism: Scandinavian Architecture 1910–30.* London: Bloomsbury, 2018.

Stratigakos, Despina. *Hitler's Northern Utopia: Building the New Order in Occupied Norway.* Princeton/Oxford: Princeton University Press, 2020.

Straub, Hans. *Die Geschichte der Bauingenieurkunst*. Basel: Birkhauser, 1975.

Suenson, **Eduard.** "Zur Geschichte des Eisenbetons in Dänemark." *Beton und Eisen* 5, no. 6 (June 1906): 137–38.

Sumarliði R. Ísleifsson, ed. *Iceland and Images of the North*. Sainte-Foy: Presses de l'Université du Québec/Reykjavík: The Reykjavík Academy, 2011.

Sumarliði R. Ísleifsson. *Deux îles aux confins du monde. Islande et Groenland. Les représentations de l'Islande et du Groenland du Moyen Âge au milieu di XIX^{e} siècle.* Québec: Presses de l'Unversité di Québec, 2018.

Svava Jakobsdóttir. *Legjandinn.* Reykjavík: Helgafell, 1969. English edition: *The Lodger and Other Stories*. Translated by Julian Meldon D'Arcy, Dennis Auburn Hill, and Alan Boucher. Reykjavík: JPV, 2006.

Sveinbjörn Björnsson. "Jarðskjálftar á Íslandi" [Earthquakes in Iceland]. *Náttúrufræðingurinn* 45, no. 2 (1975/76): 118–21.

Sveinn Þórðarson. *Frumherjar í verkfræði á Íslandi* [Pioneers of Engineering in Iceland]. Reykjavík: Verkfræðingafélag Íslands, 2002.

Sveinn Þórðarson. *Brýr að baki. Brýr á Íslandi í 1100 ár* [Bridges in the Past. 1100 Years of Bridges in Iceland]. Reykjavík: Verkfræðingafélag Íslands, 2006.

Sverrir Runólfsson. *Æfiágrip Sverris Runólfssonar steinhöggvara* [Biography of Stonemason Sverrir Runólfsson]. Reykjavík: Prentsmiðjan Gutenberg, 1909.

Taylor, Jonathan. "Edwardian Pebbledash and Roughcast." Building Conservation. Accessed 02/09/2020.
https://www.buildingconservation.com/articles/pebbledash/pebbledash.htm.

Tegethoff, Wolf. "Art and National Identity." In *Nation, Style, Modernism. CIHA Conference Papers,* edited by Jacek Purchla and Wolf Tegethoff. 11–23. Cracow/Munich, 2006.

Teiknistofa Landbúnaðarins. *Steinhús: nokkrar reglur um gerð steinhúsa í sveitum* [Concrete Houses: Some Rules for Building Concrete Houses in the Countryside]. Reykjavík: Teiknistofa landbúnaðarins, 1938.

Tessenow, Heinrich. *Hausbau und dergleichen. Mit 107 Zeichnungen und Photographien eigener Arbeiten von Heinrich Tessenow.* Berlin: B. Cassier, 1916.

"Testalin." *Illustrierte schweizerische Handwerker-Zeitung: unabhängiges Geschäftsblat der gesamten Meisterschaft aller Handwerke und Gewerbe* 16, no. 14 (7 July 1900): 282.

Tiainen, Jussi. *Concrete Architecture in Finland.* Helsinki: Rakennustieto, 2008.

"Til Directionen for den mercantile Industriførening" [To the Board of the Mercantile Industry Society]. *Følgeblad til "Fædrelandet"* 1, no. 182 (7 June 1840).

Titford, Reginald Maurice, ed. *The Golden Age of Concrete.* London: Published on behalf of Christiani & Nielsen by Dorothy Henry Publications, 1964.

Trausti Valsson. *Planning in Iceland: From the Settlement to Present Times*. Reykjavík: University of Iceland Press, 2003.

Tvinnereim, Helga Stave. *Arkitektur i Ålesund 1904–1907: Oppattbygginga av byen efter brannen 23 januar 1904* [Architecture in Ålesund 1904–1907: The Reconstruction of the City After the Fire on 23 January 1904]. Ålesund: Aalsunds Museum, 1981.

Tucker, David Gordon. "The History of Industries and Crafts in Iceland." *Industrial Archaeology* 9, no. 1 (February 1972): 5–27.

Tulkki, Pasi. "The Birth of Engineer Education in Finland." *European Journal of Engineering Education* 24, no. 1 (1999): 83–94.

Tuomi, Ritva. "On the Search for a National Style." In *Abacus* 1. 57–96. Helsinki: Museum of Finnish Architecture, 1979.

Vacher, Hèléne. "Construire en mosaïque: les ingénieurs des villes-ports, l'innovation technique et la gestion du territoire municipal au Danemark, 1900–1920." *Édifice & Artifice. Histories constructives*, edited by Robert Carvais, André Guillerme, Valérie Nègre, et Joël Sakarovitch. 1063–76. Paris: Picard, 2008.

Valur Ingimundarson. *Í eldlínu kalda stríðsins. Samskipti Íslands og Bandaríkjanna 1945–1960* [On the Fire Line of the Cold War: Relations Between Iceland and the United States]. Reykjavík: Vaka-Helgafell, 1996.

Valur Ingimundarson. *The Struggle for Western Integration. Iceland, the United States, and NATO during the First Cold War*. Oslo: Institut for forsvarsstudier, 1999.

Valur Ingimundarson. *The Rebellious Ally. Iceland, the United States, and the Politics of Empire 1945–2006*. Dordrecht: Republic of Letters, 2011.

Van de Voorde, Stephanie, and Roony De Meyer. "L'application innovante du béton armé dans la construction d'églises en Belgique. Béton sacré ou usine à prière?." In *Édifice & Artifice*. *Histories constructives*, edited by Robert Carvais, André Guillerme, Valérie Nègre, and Joël Sakarovitch. 587–96. Paris: Picard, 2008.

Van de Voorde, Stephanie, Sabine Kuban, and David Yeomans. "Early Regulations and Guidelines on Reinforced Concrete in Europe (1900–1950). Towards an International Comparison." In *Building Histories. The Proceedings of the Fourth Conference of the Construction History Society*, edited by James Campbell, Nina Baker, Michael Driver, Michael Heaton, Yiting Pan, Treve Rosoman, David Yeomans. 345–56. Cambridge: The Construction History Society, 2017.

van Hoof, Joost, and Froukje van Dijken. "The Historical Turf Farms of Iceland: Architecture, Building Technology and the Indoor Environment". *Building and Environment* 43 (2008): 1023–30.

Varas, María José, Monica Alvarez de Buergo, and Rafael Fort. "Natural Cement as the Precursor of Portland Cement: Methodology for Its Identification." *Cement and Concrete Research* 35 (2005): 2055–65.

Vikurfélagið H.F. *Nokkur orð um vikur* [On Pumice]. Reykjavík: Vikurfélagið, 1952.

Voigt, J. J. *Statistike Oplysninger angaaende den polytekniske Læreanstalts Kandidater samt Fortegnelse over dens Direktører og Lærere (1829–1902)* [Statistical Information Regarding the Candidates at the Polytechnic School and a List of Its Directors and Teachers]. Copenhagen: Schultz, 1903.

Von Emperger, Fritz. *Handbuch für Eisenbetonbau*. Berlin: Ernst, 1910.

Voss, Knud. *Arkitekten Nicolai Eigtved 1701–1754* [Architect Nicolai Eigtved 1701–1754]. Copenhagen: Busck, 1971.

Wagner, Michael F. "Danish Polytechnical Education Between Handicraft and Science." In *European Historiography of Technology. Proceedings from the TISC-Conference in Roskilde*, edited by Dan Ch. Christensen. 146–63. Odense: Odense University Press, 1993.

Walker, Bruce. *Scottish Turf Construction.* Edinburgh: Historic Scotland, 2006).

Wawn, Andrew. *The Vikings and the Victorians: Inventing the Old North in Nineteenth-Century Britain*. Cambridge: D.S. Brewer, 2000.

Wiil, Pernille Henriette. *Den rette stemning. Stoflige virkninger i Landsforeningen Bedre Byggeskiks arkitektur* [The Right Atmosphere. Material Effects in the Architecture of the *Bedre Byggeskik* Association]. PhD Dissertation at Museum Vestsjælland, Roskilde Universitet (July 2016).

Wessel, Sigurd. "Brandsikre Gulvkonstruktioner" [Fireproof Slabs]. *Arkitekten. Tidsskrift for Bygningsvæsen og Byggeindustri* 5, no. 230 (17 Februar 1899): 147–52.

Wilkinson, Brian. "A Study of Turf: Historic Rural Settlements in Scotland and Iceland," *Architectural Heritage* 20 (2009): 15–31.

Þorleifur Þorleifsson. "Járnbrautin í Reykjavík 1913–1928" [The Railway in Reykjavík 1913–1928]. *Saga* 11, no. 1 (1973): 116–61.

Þorsteinn Gunnarsson. *Viðeyjarstofa og kirkja* [The Residence and Church at Viðey]. Reykjavík: Reykjavíkurborg, 1997.

Þorsteinn Gunnarsson. "Steinhlaðnar kirkjur á Íslandi" [Stone Churches in Iceland]. In *Kirkjur Íslands.* Vol. 3. 52–58. Reykjavík: Hið íslenska bókmenntafélag, 2018.

Þór Magnússon. "Þingeyrakirkja. Byggingarlist kirkjunnar" [The Church at Þingeyrar. Architectural History of the Church]. *Kirkjur Íslands*. Vol. 8. 270–72. Reykjavík: Hið íslenska bókmenntafélag, 2006.

Þóra Guðmundsdóttir. *Húsasaga Seyðisfjarðarkaupstaðar* [Architectural History of Seyðisfjörður]. Seyðisfjörður: Safnastofnun Austurlands, 1995.

Þórir Baldvinsson. "Heimili sveitanna" [The Country House]. In *Húsakostur og híbýlaprýði*, edited by Hörður Bjarnarson et al. 29–37. Reykjavík: Mál og menning, 1939.

Þórir Stephensen. *Dómkirkjan í Reykjavík*. *Byggingarsagan.* Vol. 1. [The Cathedral in Reykjavík. History of the Building]. Reykjavík: Hið íslenska bókmenntafélag, 1996.

Þórður Atli Þórðarson. *Land án járnbrauta. Tilraunir Íslendinga til járnbrautvæðingar* [A Land Without Railways. Attempts of the Icelanders for a Railway Connection]. Bachelor Thesis in History, University of Iceland. September 2011.

Zernack, Julia. "Old Norse–Icelandic Literature and German Culture." In *Iceland and Images of the North*, edited by Sumarliði R. Ísleifsson with the collaboration of Daniel Chartier. 157–86. Québec: Presses de l'Université du Québec, 2011.