

A Journey along the Norwegian Coast: Warehouses and Historical Wooden Structures

Eine Reise entlang der Küste Norwegens:
Speicherhäuser und historische Holzkonstruktionen

En longeant les côtes de la Norvège :
greniers et autres bâtisses historiques en bois

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1. Introduction

The built environment of Norway is developed through a close interaction with the landscape, the climate conditions, the nature resources, and the traditional communication system. With its 325 000 km², Norway has a land area comparable to many European countries, but with a population of 5 million the average density is only 14 persons per km² – hundred years ago it was half this number. With a combination of few people and a scattered population pattern, transport and communication has always been of highest importance. Being a coastal nation with altogether 103 000 km shoreline including millions of islands (the World's second longest shoreline), the sea has through the history been the major communication system. This is clearly reflected in the demographic pattern even today. The mountainous inland was for centuries a barrier for communication, while the coastline and the fjords penetrating the inland served as the most important road system.



The sea and the fjords of Norway: The main road system through history

Despite of the location in the northern fringe of Europe, Norway has always been an active partner in the international trade. Since the Viking era, Norwegians developed advanced ship building technology and were famous sailors, - regretfully most famous as warriors, but more important for extensive trading on the international market. Fishery has been, and still is, a major industry in Norway, and since medieval times production and export of fish products as salted herring, stockfish and klippfish (salted and dried cod) has been a major basis for the economy. From the 1500s, lumber export to Europe created another gold era in Norway which also led to intensive international trade.



Figure 1: The stockfish – the gold of Norway since medieval times. Drying racks for the codfish (stockfish) in Lofoten islands

The role as a sea-faring nation, both for local communication and internationally, has made a distinct footprint on the Norwegian built heritage. The majority of our historic built structures are related to the sea.

Wood has been the far most important construction material in Norway since Viking times. In the medieval time, wood building technology was developed to a very sophisticated level, enabling the best buildings to survive up to our time. Different construction systems and principles have later been developed in different regions, adapting to the availability of materials and other local conditions.



Figure 2: The viking ships and the stave churches – testimonies of high developed timber building technology since medieval times.

For sea-related buildings, adaptation to the harsh coastal climate – strong winds, rain, high humidity – had to be solved. Timber structures have proved to be very suitable for these climate conditions and for the functional needs of a fishing/trading society in constant adaptation to fishing seasons and resources. Wood was cheap, easily available, and easily processed and handled for construction and for the frequent repair and rebuilding needs for this type of utility structures.

2. Warehouses – the largest building at the seashore

A big variety of utility buildings and structures were necessary to serve the extensive production and transport connected to the fisheries. The boat houses, different types of storage houses for fishing gear, drying houses for nets, and buildings for processing and storing a variety of fish products were all to be found at the seashore. The salting of fish had its own buildings, while the drying of fish in the north was made at open air timber racks. But not only the fishing industry; all types of business, communication, travel and trade used the sea roads and needed built structures. In addition to buildings, various timber structures for loading ships and enabling access to the sea (quais, jetties) were integrated parts of this maritime built environment.

The largest of all were the warehouses. These open storage/production buildings served multiple purposes. Storage of goods was necessary both for the fish production industry, for various export and import products, and for domestic commerce and trading which also happened at sea.

Warehouses were found wherever people lived, traded and travelled. Today large warehouses can be seen in areas that seem to be remote with our contemporary glance. In order to understand what we see, it is important to remember the transport revolution that happened during the 1900s, when the water-based transport system was replaced by a land-based system during a few decades.



Figure 3: Warehouse at the „main road“

3. The log-built warehouse

Almost every medieval urban development in Norway was related to the seashore. A safe port was an obvious location for urban settlements. Many towns and settlements were based on trade of Norway's most important export article, the stockfish (dry codfish) for the markets in Southern Europe.

Bergen at the west coast is a typical example, with a 1000 year old tradition as Norway's most important trading port. The town had the monopoly of trade of stockfish (dry codfish), caught and dried in Lofoten islands in Northern Norway. Stockfish were transported by sailing ships down to Bergen and stored in the warehouses at Bryggen (the Wharf) before the export transit. For several hundred years, Bryggen was one of The German Hanseatic League's overseas posts together with Novogorod, Brugge and London. The league dominated the trade with stockfish in Bergen and had their headquarters in Bryggen. Through the history and several great fires, the built structures have been replaced, but have been continuously rebuilt within the same urban pattern. The present structures are erected after a fire in 1702.



Bryggen, Bergen. Seafront

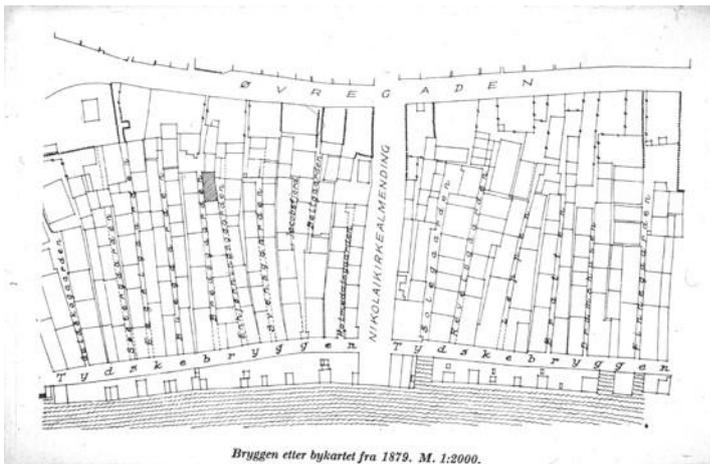


Figure 4: Map from 1879 showing the urban structure with rows of warehouses and internal passageways.

At Bryggen the rows of warehouses were lined along the natural harbour. The lots were deep and narrow in order to give access to the sea for everybody. Each property consisted of an alley with rows of buildings on each side. The warehouses consisted of log-built single buildings in two or three stories, lined up along the internal allies. The access to the upper floors was through galleries in timber frame construction. This combination of heavy and light constructions (main structure in log and galleries/external space in stave or wood frame construction) has origin in Norway back to medieval times.



Figure 5: The construction system of the Bryggen warehouses: log-built cores with galleries carried by nature-grown timber "knees"

4. The timber frame warehouse

Big booms of fishing industries in the 1700s led to rapid urban growth and need for new warehouses for production and storage. This happened in Stavanger due to rich herring fisheries and in Kristiansund in connection with the development of the klippfish industry. *Kristiansund* is the center for production and export of klippfish, salted and dried codfish. This industry developed from the early 1700s and became an important export article especially suitable for transport to the New World (Latin America), and led to the establishment of a town here because of favourable local natural and climatic conditions for the production. The codfish was salted and afterwards dried on naked rocks.



Figure 6: Drying of klippfish in the 1930s. The outdoor drying method was common until the 1950s.

The processed klippfish must be stored cool and airy, and large warehouses especially adapted to salting and storage surrounded the natural harbour basin between Kristiansund's four islands. The warehouses could be organized along or perpendicular to the seashore and Hoisting devices were placed in the ridge of the building or in dormers along the roof.

These industries grew up quickly and created a need for an enormous bulk of buildings for salting and storage in a short time, and the European timber frame construction system was adopted. It is a simple post and beam structure stiffened by bracings and natural grown "knees" in the corners. The structure is clad with boarding. Foundations may also be timber, either poles or log-built boxes filled with stone.

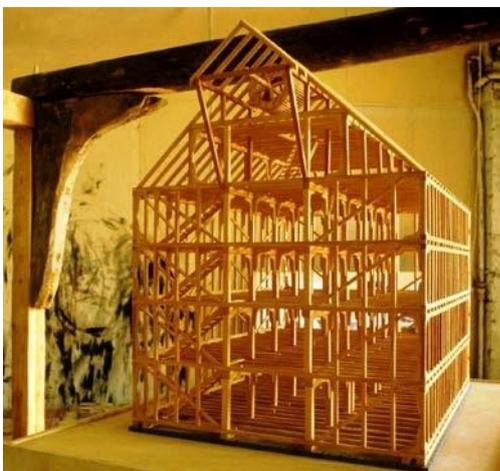


Figure 7: Warehouse in Kristiansund for salting and storage of klippfish. The open timber frame construction was simple and quick to construct.

5. Warehouses in mixed log-timber frame structure

Trondheim is the largest city in Mid-Norway and was since medieval times a trading port for the region. The river harbour offered a safe port and is the reason for the initial location of the urban settlement. Later, warehouses were also built along the seashore. The warehouses of Trondheim were repeatedly destroyed by fires, but were re-erected on the same sites, more or less following the same construction principle. The present warehouses date from the 17., 18. and 19. Century.

The merchants of Trondheim traded with various goods, both export and import goods. Rough products as fish and lumber needed large and airy space, while more precious goods as copper (from the copper mines of Røros mining town and others) and import articles as flour, grain, sugar and fine textiles must be stored more safe and controlled.

The merchant warehouses in Trondheim were therefore usually erected in a combination of wood frame and log constructions. Most warehouses had closed rooms with log walls in the lower floors and large open spaces in the upper floors, but we see a big variety of combinations, partly depending of the age of the warehouse. Timber were used until around 1845 when new building codes for Trondheim (after two great fires which almost destroyed the entire city centre) led to a ban for timber buildings in the central area.



Figure 8: Map of the river harbour of Trondheim 1868, and photo in late 1800s. Note the passageway on the river side of the warehouses. This passage is presently closed on most warehouses.

The warehouses were placed in the river on pole foundations, ships could sail up the river and goods were loaded directly to and from the ships to the warehouse by hoisting devices in the gable. The same hoisting system was found on the street side of the building. Along the seafront a continuous passageways on open galleries was established, making it possible to move on the outside along the row of buildings.



Figure 9: A comparison between warehouses and building types on medieval farms indicates connections between the farming and the merchant building traditions in a long historic span of time.

6. The future of warehouses

The change of transport from sea to road, and development of trade and transport in general, has led to loss of function for a big number of warehouses along the Norwegian coast. The challenge is the same for many historic ports in Europe and the question is always: How is it possible to adapt this type of large, unheated utility buildings, bearing the testimony of a past that is vital for the feeling of identity of coastal people – in a way that they may serve their new purpose in an good way but still keep their power as historic evidence?



Figure 10: Trondheim river harbour. Intensively photographed by tourists, but with an acute need for rethinking about the future.

In Trondheim, the row of warehouses on both sides of river Nidelva is today one of the most important cultural environments of Trondheim. It is a testimony over Trondheims history as a trading port and the role as a merchant hub in Mid-Norway. However, the

river harbour has not been in commercial use since the sailing ships was replaced by motor-driven vessels in the early 1900s. The use today is marginal and many warehouses suffer from neglect and are falling into disrepair.

This situation has recently led to an increasing concern both from the local and regional public authorities, the research and educational institutions of Trondheim, and the general public. Great attention is paid on finding solutions for sustainable use of the warehouse rows, without compromising them as historic monuments.

Some of the challenges that have to be solved are,

How to create an acceptable indoor climate and reduce energy consumption in open, uninsulated buildings, without changing their character?

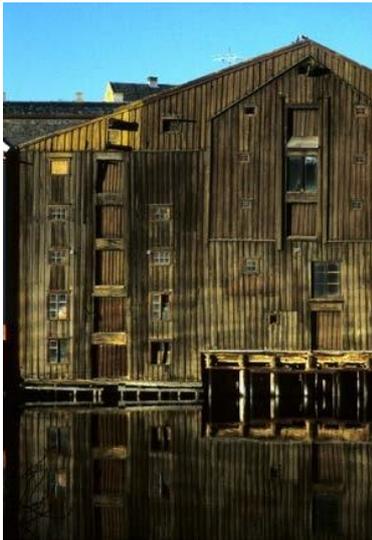
How to solve the need for daylight in deep buildings with windows only in the gables?

How to adapt buildings with maybe five floors to the need for accessibility for disabled?

How to reduce the risk of fire and secure the safety for the users and the buildings?

How to create usable space in buildings with a floor height down to 1.70 m?

These issues were addressed by a group of architect students in the 2012 building conservation course at the faculty of Architecture and Fine Art, NTNU. 18 proposals were designed for new use in 5 warehouses, based on a thorough documentation of the buildings. The projects were exhibited in one of the warehouses and got much attention. The students' work made a starting point for a feasibility project for a building conservation center in Trondheim, focusing especially on challenges for new use in large, uninsulated timber structures – like the warehouses.



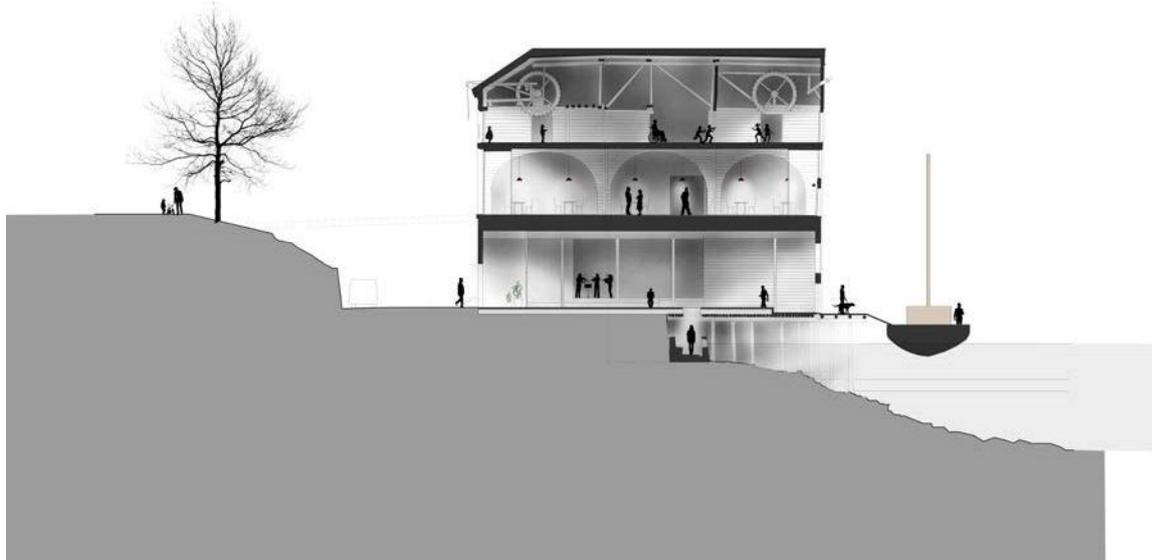


Figure 11: Proposals for new use in Huitfeldt warehouse in Trondheim. Students: Nora Aurora Hallberg (above) and Monica Haugen (below)

7. Literature

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