

# INDESTRUCTIBLE HOLLAND

A tribute to a culture of delta experiments



## Introduction

Never Again! This was the credo after the big North Sea flood of 1953 in the Dutch delta, an enormous natural disaster right after WWII. The response of the nation was not one of depression, but instead heralded a new culture: optimism about master planning at the scale of the entire delta, a 'grand project'. The goal was to close off the streams of the Delta from the sea, in order to reclaim the land and keep it safe in the future. A series of enormous engineering works would guarantee an indestructible Delta — works preventing a catastrophic coastal storm flood that appears just once in 10,000 years. It led to what some have since called the 8th Wonder of the World: the Delta Works.

In stark contrast to this famous feat of a Dutch culture of engineering grand delta experiments, stands the virtually unknown former hydrodynamic laboratory in The Waterloopbos, a unique open air testing ground that led to the Delta works. In 2018, one of these monstrous testing models from the past, the Delta flume, will be turned into a monument as a tribute to the Delta works and its characteristic culture of experimentation. This huge monument for the Delta experiments will open up new horizons for dealing with cultural heritage in general.

## **The Delta Plan – a grand project**

For centuries the Dutch struggle against the water has brought together engineers of all kinds. This resulted in a series of ground-breaking experiments and inventions. The most exceptional example of this history are the Delta Works, realized between 1954 and 1997. In 1986 the Dutch Queen Beatrix spoke the legendary words: “The Storm Surge Barrier has been shut, the Delta Works are completed, the Low Lands are safe again.”

The Delta Works are a chain of thirteen major flood protection structures, consisting of an intricate network of dams, barriers, sluices, locks, dikes and levees, designed to reduce the size of the Dutch coastline and protect the areas within and around the Rhine-Meuse-Scheldt delta from North Sea floods. The Delta Plan was the great integral vision behind the whole reconstruction of the Dutch delta. The main decision in the Delta Plan for the future of Holland was to close off the delta streams from the sea. The Delta Plan was a ‘grand project’ combining the different claims of agriculture, mobility, nature, recreation and cultural program. This integral approach to planning shaped Dutch spatial planning and with it the profession of architecture for the coming decades.

## **Shaping a culture of Dutch planning**

The Dutch culture of planning originates in the struggle against the water. This struggle has resulted in a tradition of reclaiming land with grand designs that dates as far back as the 17th century, when Jan Adriaanszoon Leeghwater created the renaissance polder “De Beemster”. The Delta Works are an ultimate expression of this tradition. It articulates an attitude of multidisciplinary and integral planning and design that dares to take on projects at a national scale. In recent decades, this spirit is represented by national projects like “Space for the River”: large urban extensions are purposefully designed in order to help solve bottlenecks along the Dutch rivers, like the waterfront of Nijmegen. In the 1990s, the Belevedere program put cultural heritage on the national planning agenda. The New Dutch Waterline is an example of this. The historic military defense line of 80 km long has been appointed to become a landscape park of the 21st century just east of the Randstad: the Netherlands’ four most populous cities (Amsterdam, Rotterdam, the Hague and Utrecht). Water security is integrated in city extensions, nature conservation and the redesigned new use for numerous fortresses and bunkers, like Bunker 599.

## **The concrete delta – the power of resistance**

Very typical of the modernist period during which the Delta works were conceived was the application of hard and uncompromising materials on a just as uncompromising scale: gigantic concrete pylons, monstrous steel constructions, colossal asphalt dikes, and mountains of Irish basalt. For over 40 years, the delta served as a construction site of utopian experiences. An indestructible Holland needed to be constructed.

This challenged engineers to invent new tools, vehicles and materials, such as cable cars to transport extremely heavy concrete blocks, mesh boats handling city-sized steel foundation meshes filled with stones to be laid on the bottom of the sea, enormous pylons transporting complete ships, drilling machines that would work underwater, and so forth.

Not only engineering evolved due to these new delta landscapes, but it gave rise to a whole new recreational culture as well. The ideal way to explore the Delta works is by turning to the quintessential vehicle of the modern age: the automobile. Enjoying their newfound mobility, people visited the man-made asphalt beaches on giant dams like the Brouwersdam.

Paradoxically, this materialized attitude of make-ability (in Dutch “maakbaarheid”) which is so characteristic of the Dutch struggle against water, is currently considered to be outdated. Climate change, rising sea levels and societal attention to nature have forced engineers in recent decades

to update the “hard” Delta Works. The Dutch are now looking for more ‘natural’ methods of coastal protection — “building with nature” — like employing sand suppletion along the Dutch coast. An example of this is the “Sand engine”, an enormous manmade sand plateau in the waters just north of the port of Rotterdam. The North Sea currents will redistribute the sand, thus reinforcing the eroding beaches and dunes.

Even though the focus has shifted from civil architecture to engineering natural processes, the Delta Plan is still the most revolutionary and exciting episode in our country’s long history of water management; it provided Dutch culture with an element that to this day incites an air of absolute pride. We can follow this shift in the engineers’ ways of thinking over the four decades it took to build the Delta works.

### **A new type of flood barrier for a changing society**

The Dutch were the only nation in the world that had dealt with open sea waterworks at such a scale as the Delta works. The typical Dutch attitude during the decades following the Second World War had been: if something doesn’t exist, we’ll just have to invent it. The Dutch engineers started their gigantic enterprise with the Veerse dam and the Zandkreek dam, the smallest sea arms in the delta, so they would have a chance to fully comprehend what working at open sea with high tide and low tide really meant. The architecture and comprehension of the Delta works further evolved with the completion of every new site-specific waterworks.

After 20 years of experimenting, evaluating and learning from every new Delta work, the engineers thought themselves ready for the masterpiece: the Oosterschelde flood barrier. The first four kilometers were constructed as a closed dam like the Grevelingendam. But in 1974, the construction was halted because of societal resistance to the project. The last period of the realization of the Delta Works was characterized by the resistance of a changing society which started to re-appreciate nature and ecological diversity in the wake of the environmental movement of the 70s, worried by depleting fishing reserves and the gradual disappearance of the unique delta flora. From here on, the challenge for the Delta engineers was not only about managing natural forces, but now also about dealing with a new Dutch attitude that cared about its Delta nature. People demanded the final and largest flood barrier to close only in case of a storm flood. This challenge led to the most innovative Delta work yet. Sixty-five colossal concrete pillars of 18.000 tons a piece were prefabricated in special dry-docks and positioned against the strong tidal currents by the gigantic Ostrea construction ship. Sixty-two steel sliding doors ensured that the storm surge barrier could normally be kept open over a gigantic length of 3 km, and closed in the scenario of a dangerous storm. An architecture of this scale calls for unity, and was therefore painted in a single colour to emphasize the repetition and the scale of the work. The different heights of the hydraulic cylinders emphasize the channel depth, allowing this hidden landscape to be read.

### **Open-air hydrodynamic laboratory - Waterloopbos**

Throughout its entire building process, the construction of the Delta works was supported by scientific experimentation. Parallel to the realization of the Delta works at the coast, a lesser known but unique part of the Dutch history of water management was under construction at the other side of the country: an open-air hydrodynamic laboratory, built in 1951 in a newly created forest through which water naturally flowed, named the Waterloopbos. It was essentially a laboratory as big as an entire landscape, in which the Delta works could be tested on scale. It was primarily used for the Delta works, but later on it also allowed many other international water works to be tested in the form of scale models.

Because computer models did not exist yet, everything had to be built manually at various scales. This even meant that the entirety of the Oosterschelde Delta was erected in a giant hall in order to simulate high and low tides, without having to be concerned about the influence of the strong winds in the polder. A wide variety of possible flood barrier constructions were built and tested on scale. The dynamics of the water could be observed by dropping pieces of paper into it and analysing the flows and currents against a grid of tensioned ropes. Because of the new type of open flood barriers of the Oosterscheldekering that were about to be realised, it became necessary to build and test the new constructions by means of giant waves at scale 1:1. In order to achieve this, a new concrete construction was erected in the Waterloopbos. This so-called Delta flume was the first of its kind and became a masterpiece of Delta experimentation. It was almost a Delta work in itself, and a crucial step in the process of the realization of the Delta works. The simulated life-sized waves had to test the reliability of the constructions and prove that they were virtually indestructible. This eventually led to the realization of the Oosterschelde flood barrier that was opened in 1986.

The Delta experiments in the Waterloopbos, as well as the actual built structures, generated a lot of innovative scientific research projects with results that still form the basis of the Netherlands' strong position in hydrodynamic engineering. The scientific results are still useful inputs for the contemporary computer models that are used to calculate the impact of new interventions and water streams. The necessity of an indestructible Delta led to a culture of physical experimentation and innovation on both the scale of models and at actual scale in the hydrodynamic laboratory. The Netherlands still benefits from these investments in scientific research, as water management remains one of the greatest engineering-based export products.

### **Hardcore Heritage - National monument Deltawerk 1:1**

The hydrodynamic laboratory closed down some years ago. Even though it recently received the status of national monument, the testing models are in decay after years of inactivity. The Delta flume is the most impressive and permanent construction in this landscape of scale models. The Dutch government wants to turn the giant Delta flume into a monument. The Dutch Cultural Heritage Agency and Natuurmonumenten have commissioned RAAAF | Atelier de Lyon to come up with an architectural art installation, due to open in September 2018.

Monuments are typically regarded as immutable and untouchable, and as a result tend to fade from public imagination and memory. Our approach of Hardcore Heritage represents a new way of thinking about monuments and cultural heritage. The cut-through National Monument 'Bunker 599' (which was awarded with the AR Emerging Architecture award 2013) was the starting point of Hardcore Heritage and showed the power of this approach. Like Bunker 599, Deltawerk 1:1 should also be read as a built manifesto. Through deliberate destruction, radical changes in context, and seemingly contradictory additions, a new field of tension arises between present, past and future. It raises questions on how to deal with the some major Deltaworks in the future, which might become obsolete when climate change requires new built structures. Merely preserving these works does not create new meaning. Dealing with obsolete or vacant architecture represents a global challenge in architecture, and demands a site-specific approach of carefully designed interventions.



Our proposal Deltawerk 1:1 is the opposite of simple preservation of built cultural heritage. It is rather an experiment on cultural heritage itself. By excavating the sand plateau around the Delta flume, a gigantic experimental Deltawerk of seven meters high and 250 meters long is unveiled and surrounded by water. Massive concrete slabs are cut out of the 80 cm thick walls, turned 90 degrees around their axis and placed at an angle in the resulting void. This new space offers an intense spatial experience of light, shadows, reflection, and opens up vistas on the Waterloopbos. Over the years the slabs will be colonized by nature. The spatial experience changes throughout the days, the seasons and over the years.

In a radical way this intervention sheds new light on the practice of preserving cultural heritage. The monument Deltawerk 1:1 is a tribute to the majestic architecture of indestructible Holland.

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