

## AMFORA Amsterdam

### **Alternative Multifunctional Subterranean Development Amsterdam** *Solving spatial, infrastructural and environmental problems in the city*

#### **Introduction: ambitions of Amsterdam**

In its 'Action plan Healthy City 2008 - 2014', the city of Amsterdam published a list of points of special attention with regard to the environmental and economic development of the city. Concentrations of particulate matter (PM 10) and nitrogen dioxide (NO<sub>2</sub>) are well above European standards. These standards have to be met in 2010. Otherwise, not only the health of the Amsterdam citizens will suffer, but also the economy and development of the city. Permits for building projects may not be granted. The city published a set of measures accompanied by the following statement: „If anyone can make it plausible that the objective can also be achieved in any other manner, their idea will certainly be investigated."



*AMFORA, multi-storey tunnel system (source: Zwarts & Jansma)*

#### **AMFORA**

Dutch engineering company Strukton and Amsterdam based architecture office Zwarts & Jansma have proposed an ambitious plan to solve the spatial, infrastructural and environmental problems of Amsterdam: AMFORA, short for 'Alternatieve Multifunctionele Ondergrondse Ruimte Amsterdam' (Alternative Multifunctional Subterranean Development Amsterdam). Close to 50 km of tunnels will be built underneath the famous canals in the heart of the city. Spread-out over the multi-storey tunnel system one finds facilities that can do without daylight: cinemas, supermarkets, swimming pools, sports facilities and parking space, keeping the underground city alive. Right after leaving the Amsterdam ring road A10, car traffic will be directed below canal level. Logistics, residents and visitors can reach the city centre underground. The Amsterdam air will improve: Particulate matter and other harmful substances no longer reach the atmosphere and exhaust fumes are

filtered using state-of-the-art technology. The most sustainable city is a compact, multi-level city.



*Buildings alongside the Herengracht: 2001 versus 1771 (source: Zwarts & Jansma)*

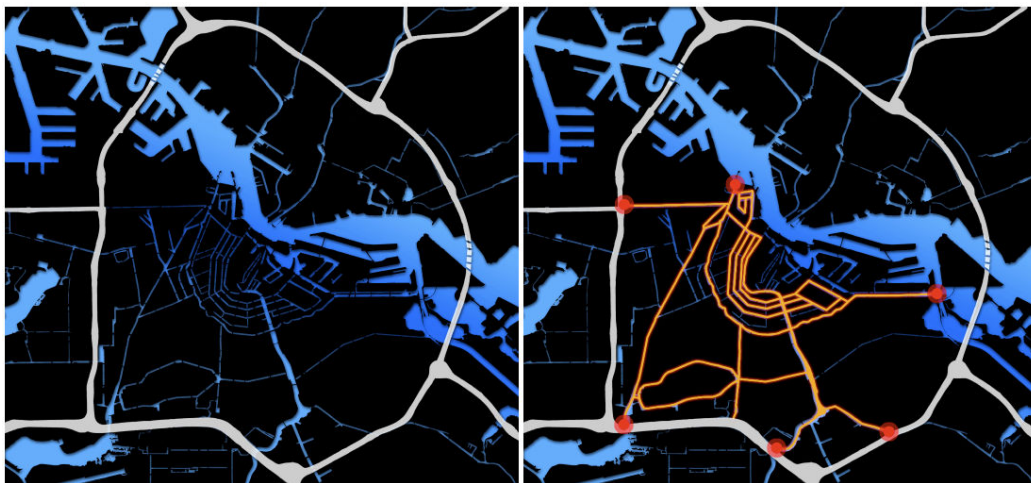
### **The canals of Amsterdam: continually under construction**

Some say Amsterdam was more attractive and a better place to live in the pre-war era. Was it really? Amsterdam used to be a city with stinking canals, where pedestrians were crushed between other people, horses and handcarts. Even if one was in the privileged position to be able to take a walk along the canals on a sunny Sunday afternoon, there was a great chance of slipping over horse manure and landing between the fish bones of the Saturday market.

Another misconception is the thought that the historical city centre of Amsterdam is a well-preserved city, with canal side houses still stemming from the Golden Age. By comparing drawings of the Herengracht in the year 1771 versus 2001, it becomes clear that almost all of the buildings alongside the canal have at some moment in time been demolished and replaced or at least thoroughly renovated. Behind the facades, changes have been even bigger: in the layout, the use, et cetera.

Amsterdam is not a static city, but a city that is continually under construction. Why should we look back in nostalgia at a city that has never existed? Amsterdam has always adjusted to modern times.

However, not every progress meant improvement: Wouldn't everybody be happy to see the parked cars, cable boxes and waste containers of today disappear? Who would not rather see a quay over which it is pleasant to walk and cycle. Canals that now feature only houses and lawyers' offices will become real shopping streets full of activity again. Like Barcelona and London have world-famous shopping streets such as the Ramblas and Regent Street, Amsterdam could develop a characteristic shopping area along the canals.



*Amsterdam: ringroad A10 and the AMFORA tunnel system (source: Zwarts & Jansma)*

### **Traffic and environment**

Traffic seems to be the opposite of environment and livability. The quays of Amsterdam are crowded with parked cars, particulate matter pollutes the air. AMFORA is a plan for the improvement of the living environment, without this improvement being at the expense of accessibility: a system of spaces below the existing canals. A plan that renders environmental zones superfluous and turns traffic versus environment and livability into a win-win situation. Moreover, the underground spaces create space aboveground for economic activities and enlivenment of the street scene.

The scale of this plan pre-eminently includes the territory within the ring. The underground spaces and the supply roads to those spaces can best be realized below the existing waterways: the canals and the Amstel. From the ring A10 motorists can immediately turn into the system of underground spaces. The city centre remains screened from much traffic and transport while accessibility will only increase. The system of underground spaces is connected to the aboveground city through a fine-meshed network of ramps.



*Rozengracht: present and future (source: Zwarts & Jansma)*

### **Amsterdam re-connected to river IJ**

Bringing access roads and all kinds of logistic connections underground has impressive consequences for the city as a whole. Once Amsterdam was a city by the river IJ. Since the construction of the railway embankment and the Central Station Amsterdam no longer lies by the river IJ but only by the water of the Oosterdok. This water can nowadays hardly be experienced, due to the heavy traffic on the Prins Hendrikkade. If this is no longer a busy main road, Amsterdam will become re-connected to the Oosterdok and the river IJ.

The network of underground roads and access roads in AMFORA lends Amsterdam an efficient traffic structure: a number of inner rings with radials to the ring A10. This creates more space in the inner city for squares and public green in places that are now still dominated by car traffic. The bridges across the canals would become pleasant places to inhabit. The Rozengracht, for example, would become a real shopping street. Cars that now stand on the quays are taken underground. The connection between above and below, the connection between AMFORA and the street can be realized via existing buildings, via pavilions on the quay and shafts that rise through the water. Via this fine-meshed network of entrances a series of functions is accessible that enhance the standard of living in the city. Functions that cannot find a place in the closely built-up Amsterdam city centre and have been banished to the periphery, such as sports provisions. Bringing back those functions stimulates the social interaction between inhabitants.

### Social safety and orientation

People are used to living aboveground. Underground space misses two important qualities of the aboveground: orientation and light. The orientation in this plan is simple: the streets of AMFORA follow the known canals. The existing bridges form points of reference, in combination with lighting and projection of aboveground images. In AMFORA another important condition for atmosphere has also been met: Variation in lighting. Additionally, the various activities between the parking areas are allocated and positioned in such a manner that one is never very far from other people. This is beneficial for social safety.

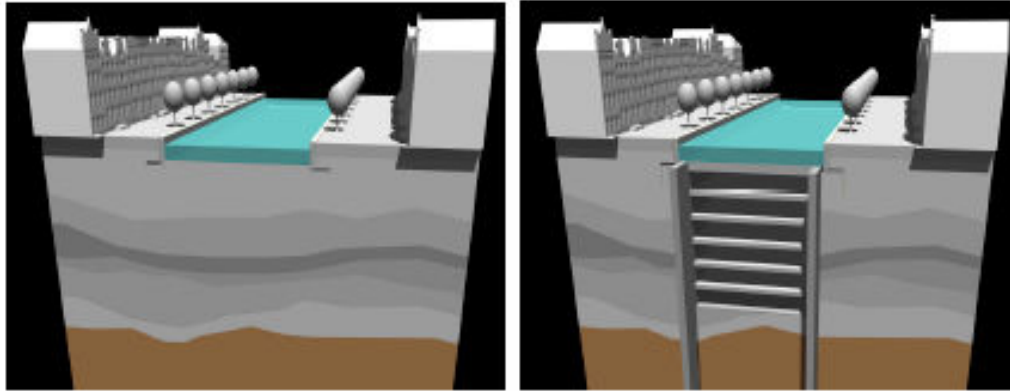


*3d Impression (source: Zwarts & Jansma)*

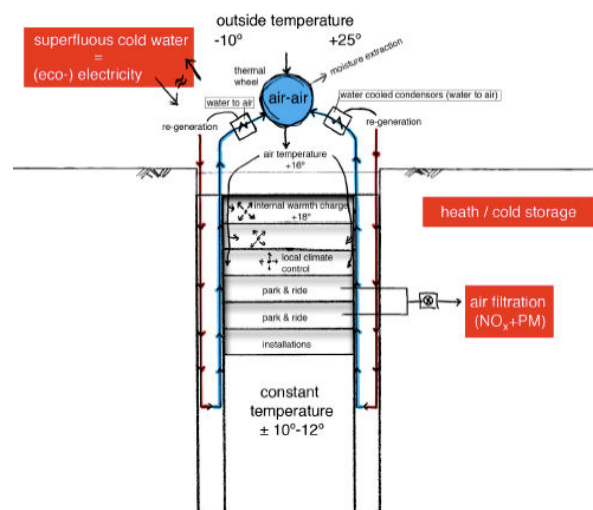
### Construction

AMFORA is a plan based on existing technology in the field of safety and detection, traffic steering, energy- and climate concepts and image projection. The design has been started from a construction that produces the least possible disturbance, the largest possible freedom for the layout and the lowest possible costs: a column-free space with a span of 30 m. If a canal is broader, such as the Amstel, the structure is made out of segments of 30 m. If a canal is less than 30 m wide, the span will be attuned to this width.

The construction of AMFORA is based on manageable, proven technology: the canal is temporarily filled up, after which two diaphragm walls are erected, between which concrete slabs are built. After the top floor has been poured, the water will already return in the canal and the further progress of the activities will be invisible to the inhabitants. In this manner the trouble for the surroundings is kept to a minimum. The supply and removal of equipment and materials will be done underground.



Construction scheme (source: Zwarts & Jansma)



Climate and installations (source: Zwarts & Jansma)

### Sustainable technology

AMFORA will be CO<sub>2</sub>-neutral. By the application of heat/cold-storage, where use is made of water pipes in the diaphragm walls, no additional energy will be required for cooling and heating of the underground space. Heat exchangers see to the transition from water to air and to the dehumidification. In this manner the temperature of the underground space can be maintained in all seasons. In summer there is an abundance of cool water, which can be offered as city cooling, for the replacement of air-conditioning in the buildings aboveground.

Filtering the ventilated air of the park and ride layers produces a considerable profit for the air quality in the city centre of Amsterdam. The traffic can reach the city centre of Amsterdam regularly, without this being at the expense of the air quality. Thanks to the reduction of particulate matter, new building projects aboveground can proceed without any problem.

Also the safety concept of the underground space uses state-of-the-art techniques. The underground space is partitioned between the bridges. In case of calamities, such as fire or flood, the compartments can be closed off. The underground space is designed in such a way that it is accessible for emergency services and can be equipped with a system for transport guidance and vehicle identification systems by which motorists can be directed to empty parking places in the vicinity of their destination.

### **Feasibility**

The plan has proved itself in technical and economic feasibility studies: per underground layer approximately 1 million m<sup>2</sup> of floor surface. The building expenses will quickly decrease as more layers are realized. In the event of six layers, the building expenses per m<sup>2</sup> will drop below 1500 euro: less than 30,000 euro per parking space. AMFORA is therefore decidedly not a utopian plan. In a first stage two nodes on the city ring (S110) can be connected. After this, the plan may be extended by several connections via the other canals. AMFORA is a solution with far-reaching potential: the project is innovative and sustainable, produces a great improvement for the living environment and is also technically and economically feasible. A plan that has proved itself in technical and economic feasibility studies and applies existing technology. The plan has specifically been designed for Amsterdam, but can also be applied in other cities with the same purpose. Two site studies are currently in progress: Groenmarkt and Amstel. These sites will connect the newly opened Hermitage with the Amstel Hotel and Carré Theatre. This connection is to be opened in 2018, ten years prior to the 2028 Olympics, for which Amsterdam has the ambition to apply.

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