Femern Sund Bælt

25 November 2010

Planning status

Fehmarnbelt coast-to-coast

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N.B. It has not yet been decided whether the Fehmarnbelt link's coast-to-coast facility will be built as a bridge or a tunnel. The content of this report does not favour one project above the other nor does it determine the construction methods to be used or how the conceptual designconceptual designs will impact on the environment. The descriptions of possible alignment corridors do not express Femern A/S' preference as the final decision remains to be made.

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The Fixed Link across Fehmarnbelt

On 3 September, 2008, Denmark and Germany signed a treaty for the establishment of a fixed link across the Fehmarnbelt. The two countries agree that a fixed link across the Fehmarnbelt will improve the European and regional transportation of goods and people and thus create the necessary conditions for stronger cultural and economic co-operation. The treaty was ratified through the adoption of a Planning Act in Denmark on 26 March, 2009 while the act ratifying the treaty in Germany was adopted in the German Bundestag on 18 June, 2009 and the Federal Council on 10 July, 2009.

Femern A/S is owned by Sund & Bælt Holding a 100 per cent state-owned Danish company. Femern A/S has been appointed by the Danish Minister of Transport to conduct preparation, investigations and plan for a coast-to-coast link across the Fehmarnbelt.

The company is headquartered in Copenhagen with local offices in Rødbyhavn on Lolland, in Burg on Fehmarn and in Berlin. In total, there are 64 employees in the client organisation while more than 200 people are currently involved with the project through the consultancy and contractor organisations.

A Fehmarnbelt Fixed Link realises the dream of a fixed, close and direct connection between Scandinavia and continental Europe. By uniting the populations in areas such as science, business and culture, it will promote the continuous integration of Europe.

The fixed link will considerably reduce the travel time between Scandinavia and continental Europe: Whilst the current ferry transit takes 45 minutes (plus waiting time), train passengers will require only 7 minutes, car drivers no more than 10. The duration of a train journey between Hamburg and Copenhagen will be cut short from about 4.5 to merely 3 hours.

The fixed link closes a gap between the Scandinavian and European rail networks and is supported by the EU as part of one of the top priority rail corridors for Europe. In the future, freight trains will be able to avoid the 160 km longer detour via the Great Belt. This will create a strong transport corridor between the Øresund region in Denmark/Sweden and Hamburg in Germany, allowing a new greater and more competitive region – the Fehmarnbelt region – to emerge.

Employment levels will rise, both during the construction and after the opening of the fixed link, and consumers will furthermore benefit from lower expenses due to stronger competition. The better accessibility will also strengthen tourism in the region. Science and culture, too, will profit from the faster connection: Cross-border research clusters can be established, further improving the competitiveness of the region. Closer cultural exchange between German, Danish and Swedish inhabitants of the Fehmarnbelt region will make it an even more attractive area to live in.

The fixed link will not only benefit the centres of Hamburg and Copenhagen/Malmø but also offer opportunities for the regions situated in between both metropolises. In the long run, both increased prosperity and a higher standard of living can be achieved.

Content

PREFACE **5**

BRIDGE OR TUNNEL **6**

CONCEPTUAL DESIGN FOR AN IMMERSED TUNNEL **10**

CONCEPTUAL DESIGN FOR A CABLE-STAYED BRIDGE **16**

ALIGNMENT CORRIDOR **20**

THE FEHMARNBELT LINK AND THE ENVIRONMENT **21**

OTHER INVESTIGATIONS **23**

ON LAND IN DENMARK **25**

ON LAND IN GERMANY **27**

LOOKING AHEAD **29**

Preface

Femern A/S has reached an important milestone in the planning and design of a fixed link across the Fehmarnbelt between Denmark and Germany. The company now has the conceptual designs for an immersed tunnel and a cable-stayed bridge in place as the basis for the next stage. At the same time, the collection of data from the environmental, navigational and geotechnical surveys are largely complete.

Femern A/S has carefully considered the two conceptual designs from the tunnel and bridge consultants and will now decide whether to proceed with a bridge or tunnel solution.

The choice will be based on an overall evaluation of the technical, environmental, safety, timing, financial and transport-related aspects. The company will deliver its assessment of these aspects to the Danish Minister of Transport who, in conjunction with the political parties behind the agreement for a fixed link across the Fehmarnbelt, will pinpoint which of the two projects to proceed with.

The Danish Folketing will approve the final project in the form of a Planning Act. In Germany, the project will be subject to an official process in accordance with German legislation.

The fixed link across the Fehmarnbelt will be designed, constructed and operated so as to avoid negative impact on the environment and on people. Consequently, since 2009, a wide range of surveys relating to the flora, fauna, landscape and physical conditions have been undertaken as part of a two-year environmental investigation programme, which will end at the start of 2011. The consultants will then finalise the many thousands of pages of basic reports and, in the spring of 2011, begin the environmental consequence assessment of the immersed tunnel and cable-stayed bridge solutions. As soil conditions in the Fehmarnbelt have a considerable impact on the technical solutions, a range of geotechnical investigations in the Fehmarnbelt and on the islands of Lolland and Fehmarn have been carried out since July 2008. The geotechnical investigations will continue until 2012. A thorough insight into soil conditions is an integral part of the conceptual design preparations and will form the basis for the tender documents for the contractors in due course.

This status report presents the two conceptual designs, the environmental programme, geotechnology and navigational safety as well as the process leading up to final approval. Profitability factors, traffic forecasts or operations have, therefore, not been included.

Bridge or tunnel

On 6 April, 2009, Femern A/S signed a contract with two consulting consortia with regard to the preparation of conceptual designs for a tunnel and a bridge. The two consultants have worked independently of each other albeit from the same starting point.

The treaty between Denmark and Germany is based on a preliminary project, the feasibility studies, which were completed in 1999 and comprise a range of possible technical solutions. Based on technical, environmental, safety and financial considerations, it was decided that the preferred solution was a cable-stayed bridge and the preferred alternative an immersed tunnel. The 1999 study is described in detail at www.femern.com

As ten years have passed since the preliminary study was implemented, Femern A/S' two consultancy consortia are also carrying out a technical evaluation of other solutions, e.g. a suspension bridge and a bored tunnel. The feasibility study from 1999 has shown that a bored tunnel and a suspension bridge will hold a number of technical and environmental problems. Therefore, these two solutions were considered less favourable than a cable-stayed bridge and an immersed tunnel.

However, with regard to a complete documentation in the plan approval documents, Femern´s consultants analyse a bored tunnel and a suspension bridge again. In the first half-year 2011, Femern is going to publish background information with the argumentation and calculations, which lead to the deselection of the two solutions.

Common basis for a bridge and tunnel solution

Following 18 months' work, the consultants' conceptual designs are ready to be presented and evaluated. The conceptual designs share a number of aspects of a technical nature in common:

- The fixed link across the Fehmarnbelt will be constructed as a four-lane motorway and a two-track, electrified railway
- Both the bridge and the tunnel will be designed for a technical lifetime of at least 120 years
- The design speed for the road link is 130 km/hour equivalent to Danish motorway standards. The permitted maximum speed, as determined by the authorities, is expected to be 110 km/hour.
- The design speed for the railway is 200 km/hour for passenger trains and 140 km/hour for freight trains, which is the European standard for new build railways.
- The safety of users must be at least as high as on equivalent motorways or rail sections on land in Denmark and Germany. This means that the conceptual designs will include an emergency lane on the road section for the bridge and tunnel solution.
- European norms and standards for the design will be used wherever possible, the so-called Eurocodes.

- The starting point for the conceptual design is that navigational safety in the Fehmarnbelt must be at least as high as it would be without a fixed link. Consequently, the bridge proposal puts forward radar-based ship monitoring in the form of a VTS (Vessel Traffic Service) system which will monitor and guide shipping and therefore maintain navigational safety in the Fehmarnbelt. A VTS system will be established for both a bridge and tunnel solution during the construction phase.

For illustration purposes, the alignment corridor for the conceptual designs has been placed east of Puttgarden and Rødbyhavn. As a result, the two projects can be compared on an equal basis. It should be emphasised, however, that the alignment corridor has not yet been determined.

The process

The fixed link across the Fehmarnbelt must be approved in the form of a Construction Act in Denmark and an official approval process in keeping with German legislation.

The project will be described more specifically as regards the choice of technical solution, alignment, execution methods, environmental consequences, safety and finance. This means that a large number of possible technical solutions, variations and alignments will be considered in order to gradually produce fewer and more specific projects. In this way, the final solution will be continually optimised and improved, also in line with the environmental impact assessment of the possible variations and execution methods.

Once the process is concluded, full documentation of the advantages and disadvantages of the various alternatives will be made available.

Femern A/S expects that the choice of a solution – a bridge or tunnel – will take place at the end of 2010/2011. The preferred alignment corridor will also be selected.

Subsequent to this, the project will be planned in detail and optimised, not least from an environmental perspective. The full EIA study is expected to be submitted for consultation in the spring of 2012.

Other factors

The cost of the project and the final time schedule will be based on the studies currently in progress.

Regardless of whether a cable-stayed bridge or an immersed tunnel is selected, the cost will largely be the same. This is borne out by the consolidated construction estimate published by Femern A/S on 1 November, 2010. In this, the bridge is estimated to cost EUR 5.2 billion and the tunnel EUR 5.1 billion (2008 prices). The estimate has been drawn up on the basis of the

conceptual designs from the consulting engineers, COWI-Obermeyer, who have prepared the conceptual design for a cable-stayed bridge, and Rambøll-Arup-TFC, who have prepared the conceptual design for an immersed tunnel.

Compared to the construction estimate upon which the Planning Act from 2009 is based, the bridge will be more expensive while the tunnel solution will be cheaper. The project, however, remains financially sound and profitable. The investment in the coast-coast link can be repaid by its users within a 30-year period.

Calculations relating to the repayment period have been made on the basis of the same overall assumptions that were used in the calculations for the planning legislation. Although these applied to assumptions for real interest, inflation, toll charges, traffic, operations and maintenance costs and EU subsidies, the calculations are obviously based on the new consolidated construction estimate.

The construction estimate is the best possible assumption based on the information currently available. It cannot be excluded that new information, official requirements, political requirements or delays arising from complaints etc. could result in modifications to the project, the timetable and, consequently, to the price estimate. The final construction budget will be determined during the passing of the Construction Act by the Danish Parliament.

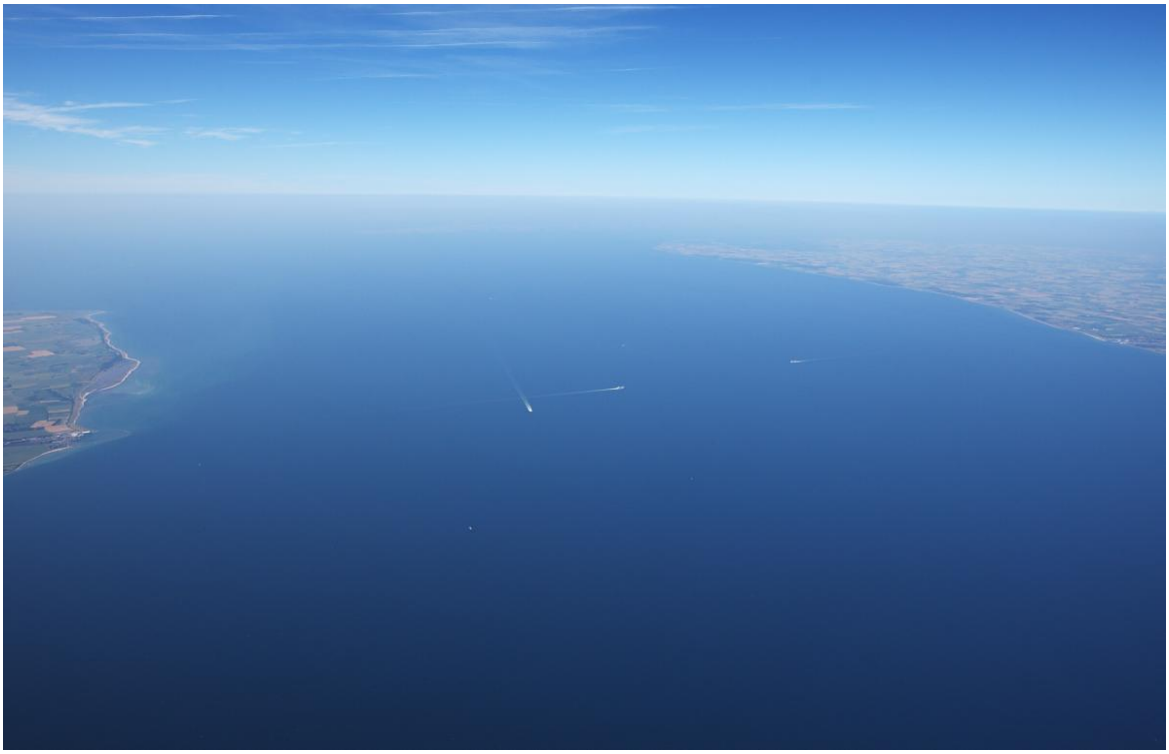
Further details on the consolidated construction estimate are available at www.femern.com.

Construction estimate as at 1 November 2010

2008 prices	Immersed tunnel	Cable-stayed bridge
Construction costs	EUR 3.5 billion	EUR 3.5 billion
Other works	EUR 0.3 billion	EUR 0.3 billion
Total construction costs*	**EUR 3.8 billion**	**EUR 3.8 billion**
Project management, operational preparations etc.	EUR 0.7 billion	EUR 0.7 billion
Reserves	EUR 0.6 billion	EUR 0.7 billion
Total gross costs*	**EUR 5.1 billion**	**EUR 5.2 billion**
Expected EU subsidy	EUR 0.6 - 1.1 billion	EUR 0.6 – 1.1 billion
Total net costs*	**EUR 4.0 – 4.5 billion**	**EUR 4.1 – 4.6 billion**

* The total can differ from individual items as a consequence of rounding up.

The political objective contained in the treaty between Denmark and Germany was for the link to open in 2018. Work on the preliminary investigations and the procedures for official approval show that the timetable for approval has to be extended by approx. two years. This is primarily due to the environmental investigations extending over two years and not one year as previously envisaged. In addition, the official approval process is expected to take one year more than anticipated.



The Fehmarnbelt link will be constructed between Rødbyhavn in Denmark (right) and Puttgarden in German. The section is almost 20 km long.

Conceptual design for an immersed tunnel

A tunnel is almost invisible in the landscape. Apart from the portal buildings and the land reclamation at the portals, it will not impact on the marine environment when completed. The total length of the tunnel in the conceptual design will be 17.6 km from tunnel mouth to tunnel mouth. At a speed of 110 km per hour, this would offer motorists a journey time of approx. 10 minutes through the tunnel. The coast-to-coast rail journey would take seven minutes.

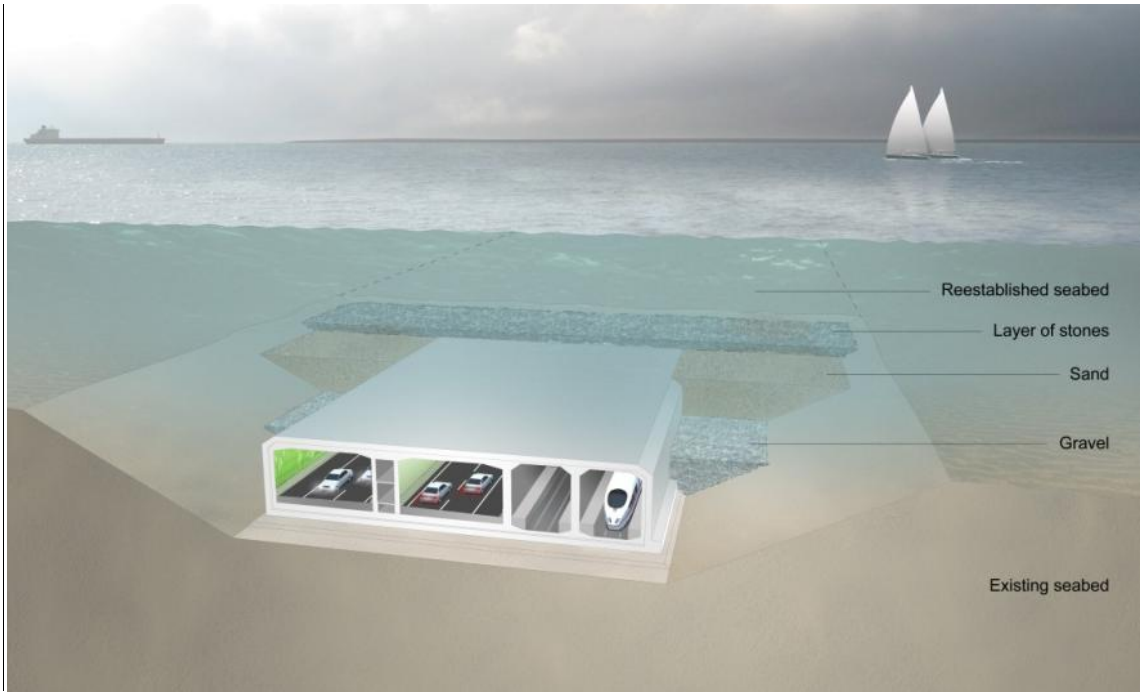
It is proposed that the tunnel be constructed almost as a straight line from coast-to-coast. On the German side, motorists would drive over a small hill and then downwards into a green valley before arriving at the tunnel mouth. After a gradual transition to artificial lighting, they would continue into a tunnel with light walls. Because of the emergency lane, the tunnel would provide a wide and spacious impression.

To ensure that motorists have a sense of diversity during their journey, the section is divided into zones with varied lighting. There are also three approx. 1.5 km long areas of LED lighting which depict images in slow movement on the tunnel walls. Good visibility and a varied experience are designed to counteract tunnel anxiety and keep motorists alert.

The approach on the Danish side will be characterised by Lolland's manmade landscape and will be marked by a portal containing the control and monitoring centre. In this way, the portal building on the Danish side is conceived as a landmark for travellers on route to Germany.

The tunnel in the conceptual design will be executed as a one level immersed tunnel cast in watertight concrete like the Øresund tunnel. The cross-section is designed with two motorway tubes on the west side and two rail tubes on the east side. Between the road tunnel tubes there will be a central corridor for installations and an escape passage.

The immersed tunnel will be sited in an excavated trench under the seabed and protected by an approx. 1.2 m thick stone layer against collisions from sinking ships or anchors.



A trench is first excavated in the seabed. The tunnel elements are lowered into the trench one by one and linked together. Once the tunnel is complete, it will be covered with stone. Over the years, the natural seabed will regenerate itself.

Three coloured zones and illustrations on the walls of road tunnel will help to give motorists a varied journey during their 10 minute drive through the Fehmarnbelt tunnel.

Planning status

Safety

The immersed tunnel will be safer than equivalent motorways or rail sections on land. There will be no oncoming traffic and no approaches and exits. In addition, the tunnel will always be dry, free from wind and well lit.

There will be extensive communication systems, including dynamic signs, loudspeakers and radio to keep motorists informed during their journey or in the event of an accident. The environment in the tunnel will be measured on an ongoing basis and automatic ventilation systems will ensure air quality and visibility in the tunnel. In addition, the tunnel will be monitored 24 hours per day, 365 days per year.

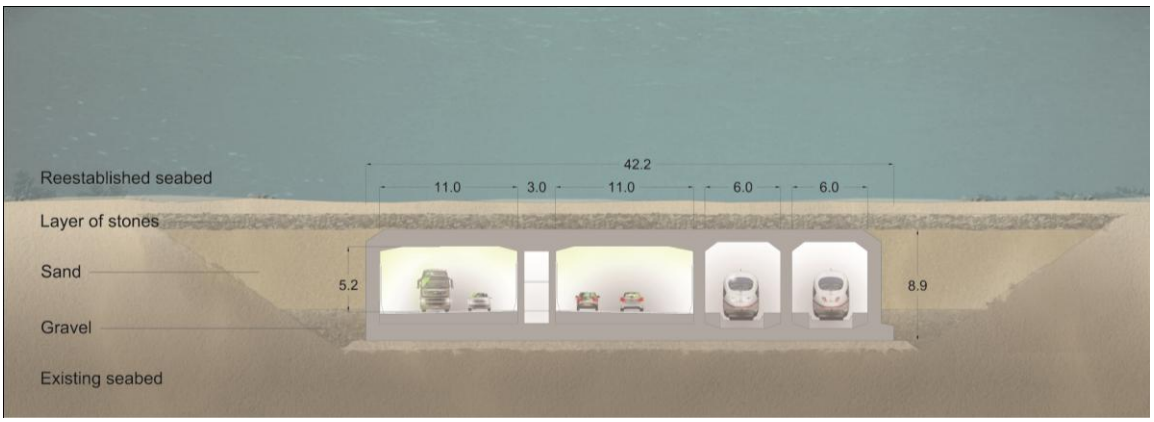
Emergency exits to the rescue corridor or to a safe adjacent tube are, in the conceptual design, located every 108 m with emergency stations containing fire-fighting equipment and direct telephones to the control centre every 54 m.

The tunnel is protected against fire. A sprinkling system will contain a fire until the rescue teams arrive and the roof and walls of the tunnel are fire insulated.

During normal operations, the speed of drivers' own vehicles will ensure that fresh air is drawn into the tunnel, creating good air quality. In the event of a fire, however, large ventilators in the roof will provide ventilation.

Once the tunnel is completed below the seabed, it will not impact on the aquatic environment except for the land reclamations and there is no risk of ship collisions.

Standard element



The Fehmarnbelt tunnel will run along a trench in the seabed and be protected by a stone layer. The tunnel will be the longest of its type in the world. All dimensions in meters.

Construction phase

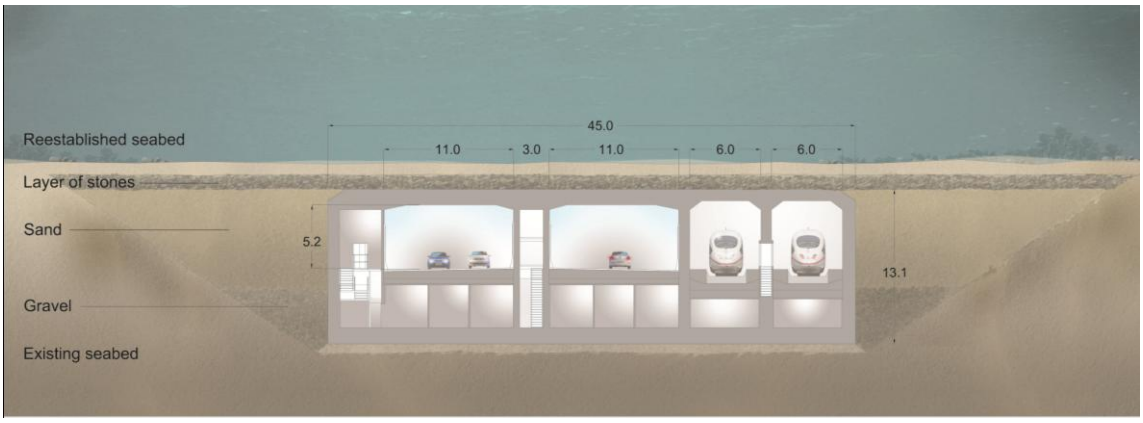
An immersed tunnel under the Fehmarnbelt will be the longest in the world. The design and building methods are already established, but the scale of the project and the depth of the belt will present technical challenges.

The tunnel will be constructed from 79 approx. 200 m long standard elements and approx. 10 special elements to be located every 1.8 km. The tunnel elements will be manufactured at large production facilities on land under controlled conditions. The elements weigh approx. 70,000 tonnes, which means that they can just about float. They will be towed to the tunnel alignment where they will be immersed one by one into the tunnel trench and linked together. When the elements are in place, they will be covered by stone and sand.

The concept of special elements for an immersed tunnel is new and has several benefits. As all mechanical and electrical equipment requiring space and maintenance will be gathered in these special elements, this means that the standard elements can be made technically simpler and homogenous and, therefore, better suited for batch production.

The special elements are wider than the standard elements and provide space for recesses beyond the emergency lane where service and rescue vehicles can park without disrupting road traffic.

The Special element



The special elements will also ensure that ongoing operations and maintenance can be carried out without disrupting traffic. Beneath the road lanes and the rail track, there will be access to all technical rooms. Personnel, therefore, do not have to cross the traffic. All dimensions in meters.

The soil conditions across the Fehmarnbelt vary significantly. This will present a challenge for excavating the tunnel trench because different equipment will be needed for the different soil types. Large amounts of soil will have to be excavated to accommodate the tunnel. Initial calculations show that approx. 15.5 million cubic metres will need to be excavated. The exca-

vated material can be incorporated into the facility and used, for example, for the construction of the artificial peninsulas or dykes.

The dredging is expected to be carried out by mechanical dredgers which will load the dredged material on to barges for transportation to the appropriate site for offloading and backfilling.

In general, the soil base of the Fehmarnbelt is well suited for the safe siting of an immersed tunnel.

Preliminary calculations have shown that it will take six and a half years to build an immersed tunnel.

Facts

	1999 project	Conceptual design 2010
Total length *)	18.5 km	17.6 km
Length of tunnel elements	150 – 175 m	217 m
Maximum weight of element	68.000 t	73.500 t
Tunnel cross section – height	9.95 m	8.9 m **)
Tunnel cross-section – width	43.0 m	42.2 m **)
Dredging quantities	> 20 million m^3	15.5 million m^3

*) The total length of the tunnel has been changed partly as a result of the chosen alignment and partly because of the design of the peninsulas at the bridge abutment.

**) Measurements apply to the standard elements.

The approach ramp and portal structure on the Danish side of a Fehmarnbelt tunnel with the control and monitoring facilities seen from the north towards the south.

Conceptual design for a cable-stayed bridge

The conceptual design envisages a bridge across the Fehmarnbelt to be 17.6 km from coast-to-coast. With an expected permitted speed of 110 km per hour, it will take motorists approx. 10 minutes to travel across it. For train passengers, the journey will take seven minutes.

The S-shaped bridge will offer travellers panoramic views during their journey. From the approaches, motorists will have a view of the 272 m high pylons, which will stand approx. 7 km from the German coast and approx. 10 km from the Danish coast.

In the conceptual design, the bridge is designed as a cable-stayed bridge on two levels like the Øresund Bridge between Denmark and Sweden. There will be four lanes and two emergency lanes on the upper deck and two electrified rail lines on the lower deck. In the conceptual design, transparent windscreens will be installed along the entire length of the bridge for the comfort of motorists.

Moveable central barriers will allow rescue personnel etc. to cross the motorway in order to achieve maximum freedom of movement in the event of accidents or during maintenance work. With regard to the railway, points will be established on the bridge to achieve maximum capacity during maintenance.

The bridge is a so-called composite solution with the bridge girders made of steel and the road deck of concrete. On the high bridge, the bridge girders and the road deck are expected to be made of steel in order to reduce the weight.

In the conceptual design, the high bridge has a free span of 724 m for each of the two main spans. These will be the longest spans ever built for a cable-stayed bridge for both cars and trains. The large spans are necessary for reasons of navigational safety. The free passage height will be 66.2 metres. The starting point is the Storebælt bridge whose free height is 65 m. The additional 1.2 m will take account of the expected rise in sea level as a result of climate change.

Perspective of a high bridge across the Fehmarnbelt with two free spans of 724 m each.

Safety

According to the conceptual design, the bridge will be safer than equivalent sections of motorway and railway on land. This is owing to the fact that there are no approach and exit roads on the road section and no sidings on the railway coupled with the fact that there is constant video monitoring of the traffic facility, which will reduce the risk of consequential accidents. Experience from the Storebælt and Øresund links in Denmark also show that there are fewer accidents on these sections than equivalent sections on land.

The greatest risk to shipping in connection with a bridge is collisions. The preliminary calculations show that a free span of two times 724 m will provide adequate safety. The three pylons (bridge towers) can withstand the greatest impact from a ship collision because of its great weight. The two nearest bridge piers on each side of the shipping lane will be protected against collisions. A bridge with two passage spans of 724 m each will, together with the VTS system and the marking of the shipping lane, make it just as safe for ships to sail in the Fehmarnbelt as it would be without a bridge.

For the motorist, the Fehmarnbelt bridge's bridge towers (the pylons), as shown in the outline proposal, stand as a clear landmark during the 10-minute journey from coast-to-coast.

Construction phase

A cable-stayed bridge, as described in the conceptual design, will be a technical challenge. The bridge type and methods are well known from other projects, but have never been applied on such a large scale. Only a few cranes in the world have the capacity to lift more than 6,000 tonnes, which will be needed during the construction phase.

Apart from the pylons, all components for the bridge are expected to be built on land at large element factories. The caissons and bridge piers will be executed in reinforced concrete while the bridge girders will be welded together and joined into long sections on land where the road deck will be cast on top of the bridge girders. The components will then be towed to the alignment for assembly. Most of the transportation – including the large quantities of materials for the element factories – will take place by sea.

In general, soil conditions in the Fehmarnbelt are good in terms of the foundations for the bridge piers. However, in a section close to the German coast reinforcement will be required. Femern A/S is, therefore, currently investigating a number of foundation methods such as piling. With steel piling, the quantity of seabed to be excavated for the entire bridge project will amount to approximately 1 million cubic metres.

The current calculations show that it will take approximately six years to build a bridge.

Facts

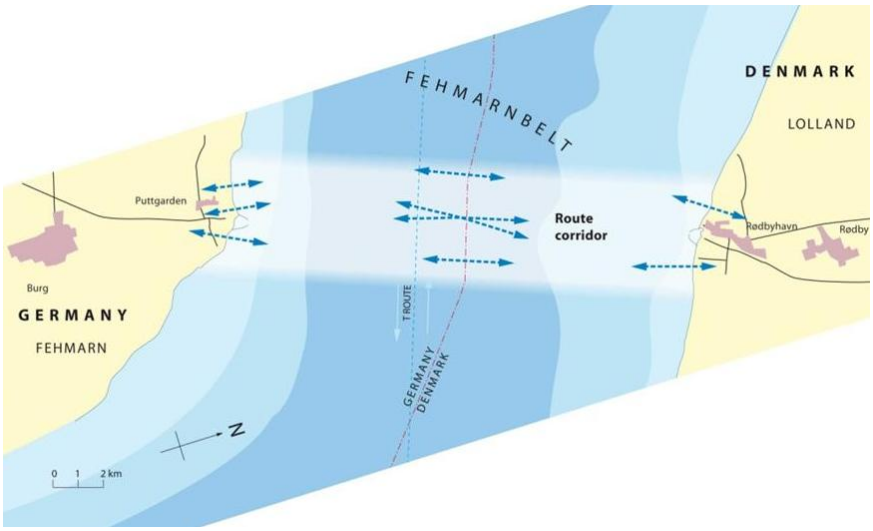
	1999 project	Conceptual design 2010
Total length *)	18.6 km	17.6 km
Height of bridge girder	15.0 m	12.9 m
Cable-stayed bridge	3,208 m	2,414 m
Number of pylons	4	3
Number of bridge piers (approach bridges)	64	76
Length of bridge span (approach bridges)	240 m	200 m
Excavation volumes	>3.0 million m^3	Approx. 1 million m^3

*) The total length of the bridge has been changed partly owing to the chosen alignment and partly owing to the design of the peninsulas at the bridge's abutments.

The Femern Belt link can be designed as a two-level composite bridge in steel and concrete. Trains will run on the lower deck with cars on the upper deck.

Alignment corridor

In the pre-investigations for a fixed link across Fehmarnbelt from 1999, the coast-to-coast link followed an alignment east of Puttgarden and Rødbyhavn. The authorities, however, require that all alternatives be examined and treated on an equal basis in order to identify the most advantageous solution. Femern A/S has, therefore, considered a number of potential alignment corridors both east and west of Rødbyhavn and Puttgarden.



Work aimed at identifying the best alignment corridor will continue until the spring of 2011.

Femern A/S is examining which corridor will have the least impact on the surroundings. The assessment is based on a number of criteria such as environmental sensitivity, navigational safety (especially in relation to ferry operations), existing submarine cables etc, the impact of regional and urban development on buildings and people, technical possibilities, including access to existing infrastructure and finance.

Each possible variant will be developed, evaluated, optimised and re-evaluated until the first, most disadvantageous alignment can be excluded. The remaining variants will then be re-examined in increasing degrees of detail. This documented process will eventually reduce the options to one alignment corridor for each of the technical solutions with the lowest possible impact (Low Impact Corridors). The selection process is expected to be completed in the spring of 2011.

The alignment will be decided as part of the final approval procedure which, in Denmark, will take the form of the Construction Act.

The Fehmarnbelt link and the environment

Largescale infrastructure projects such as a fixed link across the Fehmarnbelt and its approach facilities will inevitably impact on people as well as the environment. This applies during the construction phase where, for instance, dredging works at sea will impact on the marine environment as a result of, for example, sediment spill from the dredging, especially in the case of a tunnel. This also applies to the operational stage when a bridge may impact on the water flow and, therefore, on the environment of the Baltic Sea.

In 1995-1999, a joint German/Danish feasibility study was undertaken, the results of which were used for an initial evaluation of how a bridge or a tunnel is likely to impact on the environment, the landscape and on people. The results are included in the report “Fehmarnbelt Feasibility Study” which can be downloaded at www.femern.com/Publications.

In 2004-2005, further investigations into, e.g., the potential consequences for bird life, were carried out. The results from all these studies are contained in the report “The Fehmarnbelt Link and the Environment, Environmental Consultation Report 2006” which can be downloaded at www.femern.com/Publications.

From the spring of 2009 to the end of 2010, a comprehensive environmental investigation programme will be carried out. The first evaluated results will be available in the spring of 2012. The programme is based on the latest knowledge and most recent scientific methods and builds on the previous investigations. The costs of this very comprehensive investigation programme amount to approximately EUR 67 million.

In accordance with the EIA directive, the following factors shall be assessed:

- People
- Animals
- Plants
- Water
- Soil
- Air
- Climate
- Landscape
- Cultural heritage
- Material assets
- Cumulative effects

The extent, distribution and scientific methods of the environmental programme were the subject of an official consultation between 21 June and 6 September, 2010 in Germany, Denmark and the Baltic countries. Responses have been received from Denmark, Germany, Sweden, Norway, Finland and Poland. The results will be published during the winter of 2010/2011.

Significant environmental factors in the choice and design of the solution

The huge amounts of data from the environmental investigation programme will form the basis of an environmental assessment of a cable-stayed bridge and an immersed tunnel. The alternative solutions of a bored tunnel and a suspension bridge will also be assessed. The environmental assessments will be contained in an Environmental Impact Assessment report which is expected to be submitted for hearing in the spring of 2012.

The assessment of the environmental consequences will also be used for the continuing optimisation of the conceptual designs. This applies, for instance, to the excavation methods during the construction phase when the choice of equipment, location of the dredging works in time and space and the volumes are of great importance as to how and how much the excavation work will impact on the surroundings.

Another example of how the results from the environmental investigations will be used is the optimisation of the design of the bridge piers. The shape of the bridge piers will influence turbulence in the water and, therefore, the mixing of the water masses created. Optimisation is aimed at contributing to limiting this type of impact.

Another important area is the impact on the water, especially its salinity, in both the Fehmarnbelt and the Baltic. As a result, the water flow to and from the Baltic will be analysed in great detail for all possible solutions. The mixing of salty bottom water and fresh surface water caused by the turbulence generated by the bridge piers may potentially result in minor impact. This issue is important should the final choice be a bridge.

A future fixed link would lie in the so-called “bird flight line”, a migrating route for several million birds every year. In addition, the near area is home to a rich bird life. As a result, it will be examined how a fixed link – bridge or tunnel – will affect bird life during the construction phase as well as during the operational phase.

Regardless of whether a bridge or a tunnel is selected, the alignment will pass through a Natura 2000 area and may even affect other Natura 2000 areas near the alignment. Natura 2000 is the name of a network of protected nature areas in the EU which are intended to preserve and protect nature as well as animal and plant species that are rare, threatened or characteristic for EU countries. Therefore comprehensive consequence surveys are taking place as demanded by the Natura 2000 directive. The results are significant for the decision on the preferred alignment corridor and the preferred technical solution.

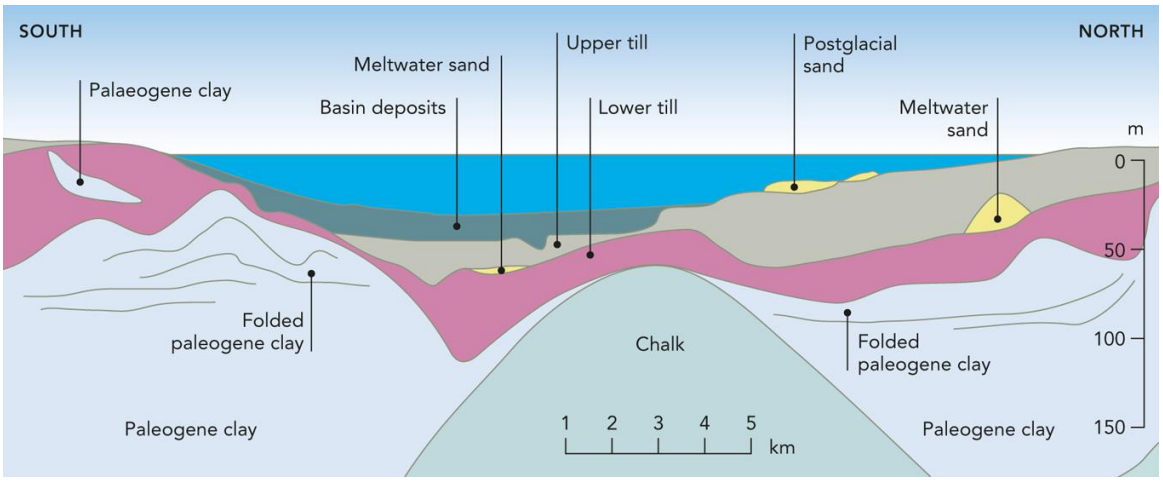
Femern A/S regularly publishes articles and results from the environmental programmes at www.femernenvironment.com. The final environmental consequence assessments will be included in the material for the EIA hearing in the spring of 2012.

Other investigations

The Fehmarnbelt subsoil has been mapped by seismic surveys and test borings. The samples are analysed and laboratory tests carried out. The special soil conditions close to the German coast will also be subject to further examination.

Femern Belt is characterised by four main types of soil:

- Deposits after the last Ice Age. The young deposits of sand, silt and clay appear as an approximately 10 m thick layer in the deepest part of the Fehmarnbelt.
- Glacial deposits in the form of moraine clay can be established immediately under the seabed at Lolland and are found beneath the younger deposits in the deepest sections of the belt. Closest to Lolland, there are many large rocks on the seabed.
- Palaeocene clay, some of the world's most fined-grained and richest clay, is found across the whole area except for the area where the chalk layer in the subsoil has risen to form a dome. Nearest to the coast at Fehmarn there is a thick layer of clay of this type.
- The oldest sediments are chalk similar to the chalk at Møn's Klint in Denmark. The chalk is visible as a dome-shaped formation in the middle of the belt. This is due to movements in the deeper-lying salt deposits. If the phenomenon is still active, the movements amount to 1 mm/year and, therefore, are of no significance to the construction of the fixed link.



The geology in the Fehmarnbelt.

Preliminary analyses show that in the 20 per cent of the link closest to Germany, the soil conditions are of a type where extraordinary measures are necessary to ensure that the bridge piers are well founded. This may be done through concrete or steel piling foundations in the seabed. Largescale tests will take place in the Fehmarnbelt between 2010 and 2012 in order to document how a bridge or a tunnel can be founded safely on the seabed.

Navigational investigations

The conceptual design for a cable-stayed bridge has two free spans of 724 m each. The preliminary surveys from 1999 comprise a cable-stayed bridge with three free spans, one for each direction and a separation span at the centre which divides the shipping.

Since 2006, Femern A/S has been conducting extensive studies and simulations of navigational safety for different bridge solutions and span widths. Although the investigations are ongoing, preliminary analysis shows that a bridge with two free spans of 724 m would be a safe solution when combined with a VTS system and good demarcation of the shipping lanes with buoys etc.

The assumption behind the design is that it must be at least as safe to sail through the Fehmarnbelt with a bridge as it is with the current ferries. The final requirements for maintaining navigational safety under a bridge solution will be determined by the Danish and German maritime authorities.

On land in Denmark

Femern A/S is responsible for the Danish approach facilities between the coastline and up to the existing motorway and railway. Rail Net Denmark and the Danish Road Directorate are responsible for the Danish landworks which begin approx. 4 to 5 km inland.

The toll station will be located on the Danish side. Moreover, facilities will be established for operations and maintenance, personnel and freight checks and emergency facilities. Both a bridge solution and a tunnel solution will have an operations and monitoring centre located at the toll station or, in the case of a tunnel, in the portal building near the coast.

After the abutment, both the motorway and the rail line will be brought down to the level of the existing terrain as quickly as possible and integrated into the landscape.

The new motorway and railway will cross a number of existing roads and pathways. In connection with the design of the approach facilities, contact will be established with the local authorities as to how traffic across the facility both during the construction phase and after completion of the link shall be organised.

The alignment corridors on land for the bridge and tunnel solution are not identical in the conceptual designs. As previously mentioned, the optimum corridor has not yet been determined.

Aimed at ensuring the minimum environmental impact, investigations into alignment corridors for a bridge and tunnel are ongoing. The plan is to decide on the optimum corridor in the spring of 2011.

Before the alignment corridor is announced, the potentially affected property owners will be contacted.

Femern A/S plans to hold public, local information meetings on Lolland and Fehmern on the project’s status and the subsequent steps.

On the lowest bridge deck, the railway runs towards the east while the motorway on the upper deck veers left and is led down into the terrain before reaching the toll station. The illustration shows the approach facility on the Danish side viewed from north towards south.

From the tunnel portal on the Danish side, there will be constant control and monitoring of traffic throughout the tunnel.

On land in Germany

The German approach facilities between the coastline and the approach to the existing motorway and railway will be planned by Femern A/S. The Landesbetrieb Straßenbau und Verkehr (LBV) and Deutsche Bahn (DB) will be responsible for the German landworks which begin a few kilometres inland.

The toll station will be sited on the Danish side while operations and maintenance facilities as well as parking areas for border controls will also be established on the German side.

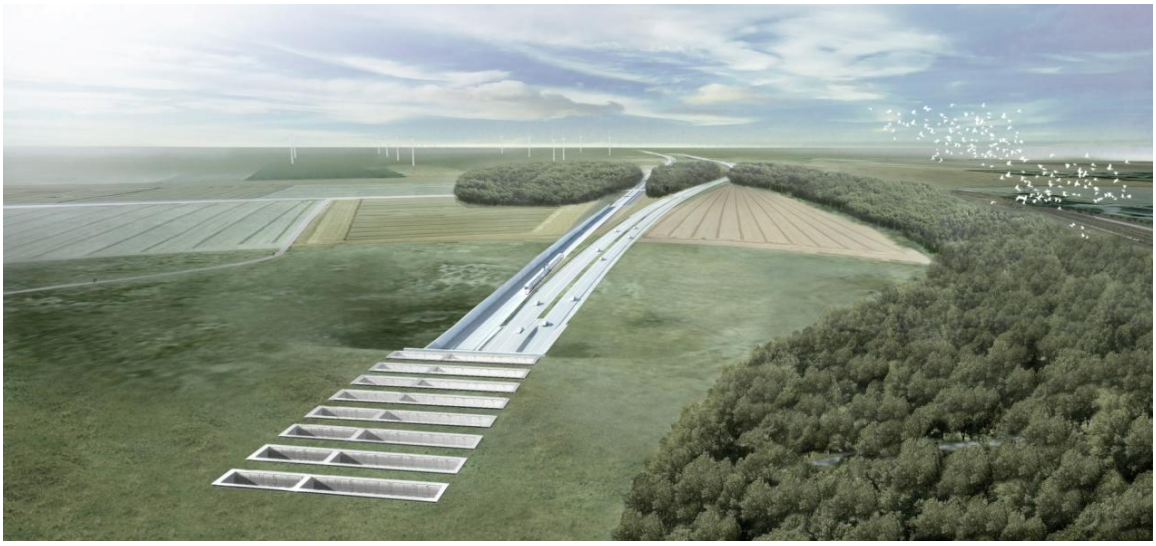
After connecting to land, the motorway and railway will, as soon as possible, be on level with the existing terrain and integrated into the landscape in the best way possible.

The new motorway and railway will cross a number of existing roads and pathways. In connection with the preliminary planning of the approach facilities, there will be meetings with the local authorities etc. to establish how traffic crossing the facility during the construction phase and the subsequence operational phase will be organised.

The alignment corridor is shown immediately east of the existing ferry port but, as mentioned earlier, the optimum corridor has not yet been determined. The selection process is expected to be completed in the spring of 2011.

Before the alignment corridor is announced the potentially affected property owners will be contacted directly.

Femern A/S intends to hold public local information meetings on Lolland and Fehmarn on the status of the project and the next steps.



With a tunnel solution, the proposal is to make the approach as green as possible and thus integrate it into the existing landscape as much as possible. The roof of the portal building is partly open to soften the transition from natural to artificial lighting.

The bridge solution seen from north to south at the existing coastline east of Puttgarden and with the ferry birth in the background. This provides the best possible environmental and aesthetic impression.

Looking ahead

The conceptual designs for a bridge and tunnel solution across the Fehmarnbelt is an important milestone. The preliminary investigations and the conceptual designs form the basis of the environmental consequence assessment.

Femern A/S will carry out its work in line with the Planning Act as approved by the Danish Parliament on 26 March 2009. The first stage of the preliminary investigation work is nearing completion and the next stage will be to decide on the basis for the disposition proposal (the proposal to be applied for) and the content and form of the EIA process, i.e. which project to apply for and how to submit the documentation for the examined options. Afterwards, Femern A/S will prepare the EIA report and begin drafting the application for the German authorities.

Approval in Germany

Permission in Germany for the construction of a fixed link across the Fehmarnbelt will be given on the basis of a lengthy approval process. The approval process is a purely legal– administrative process which will take place on the basis of an overall application. The application material will comprise the EIA investigations and other environmental assessments, landscape plans, alignment investigations, technical project descriptions with accompanying drawings and proposals for compensatory measures.

The approval authority is Landesbetrieb für Verkehr und Strassenbau, Schleswig-Holstein in Kiel (LBV-SH).

The overall environmental assessment is, therefore, an integral part of the application for project approval. The approval process will provide authorities, stakeholder organisations and private individuals with the opportunity to submit proposals and objections. The project applicants will then be able to respond to the submitted arguments. On the backdrop of this, non-public consultations will be organised during which the parties can discuss any objections and the subsequent responses.

The approval authorities will then consider the different expressions of interest and determine the result in an overall project approval (construction permit). In general, no further approval or permission will be required for the project.

Approval in Denmark

In Denmark, the Ministry of Transport, together with the Minister of the Environment, will conduct an EIA process which comprises a public consultation. The Minister of Transport, in co-

operation with the Minister of the Environment, will then present a draft for a Construction Act to be considered and approved by the Danish Parliament.

The feasibility study with resume and background reports, “The Fehmarnbelt link and the Environment “, “The Environmental Consultation Report” from 2006 and other reports and material that have been published up until today are available at:

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