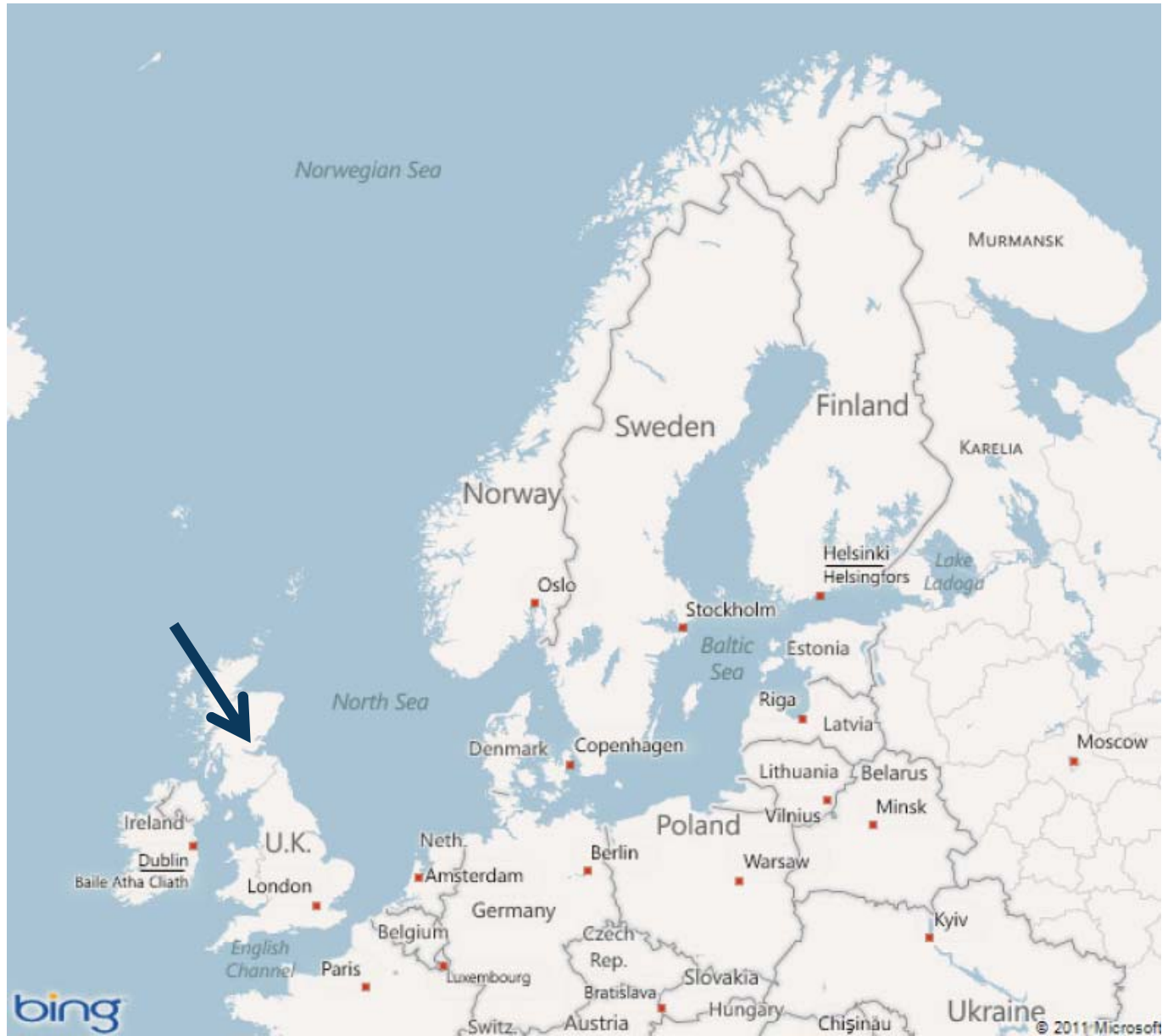


FORTH REPLACEMENT CROSSING

9 APRIL 2013, SØREN BRØNDUM













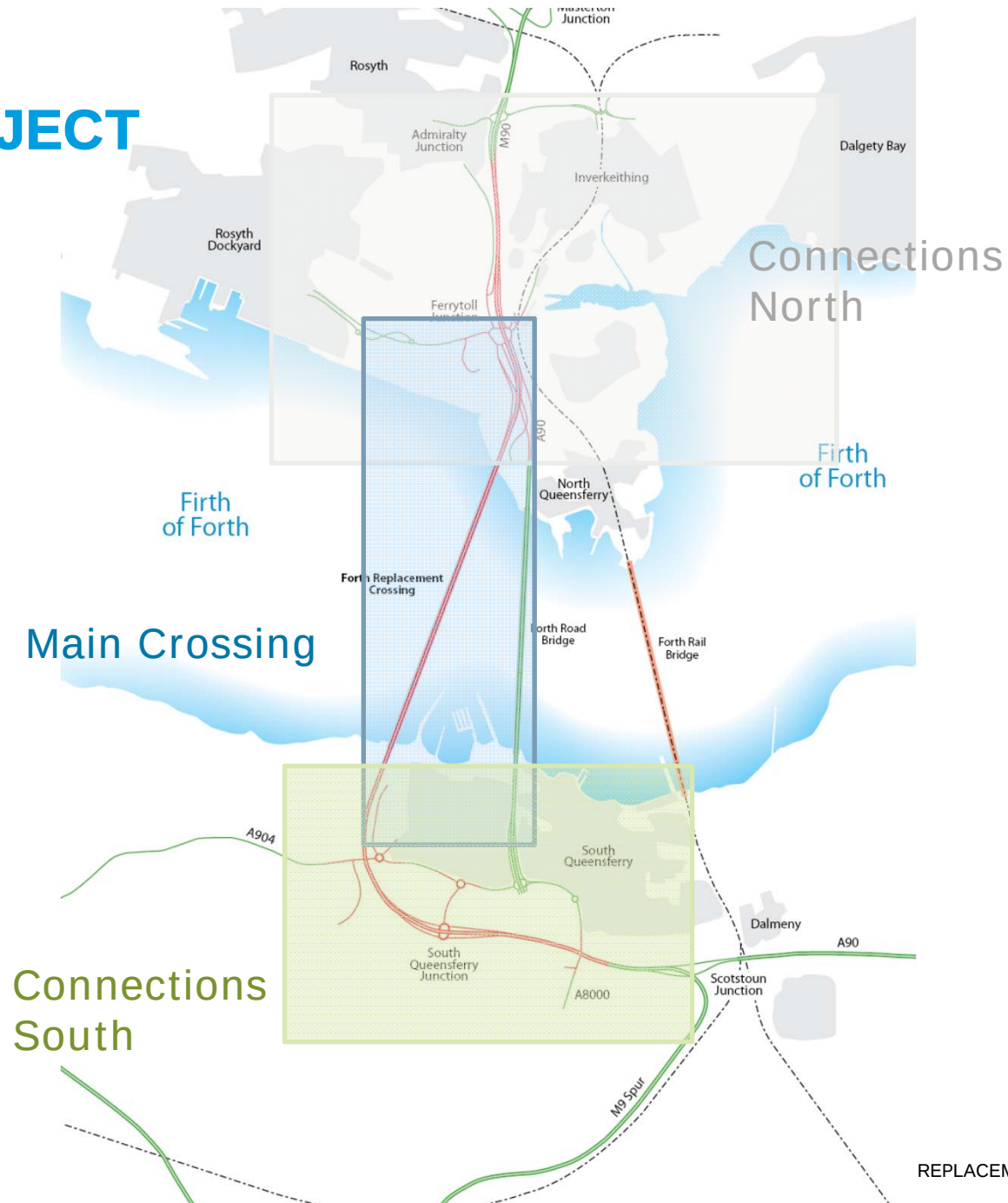
Set fra vest mod øst med alle tre broer



Ny Forth bro set Nord

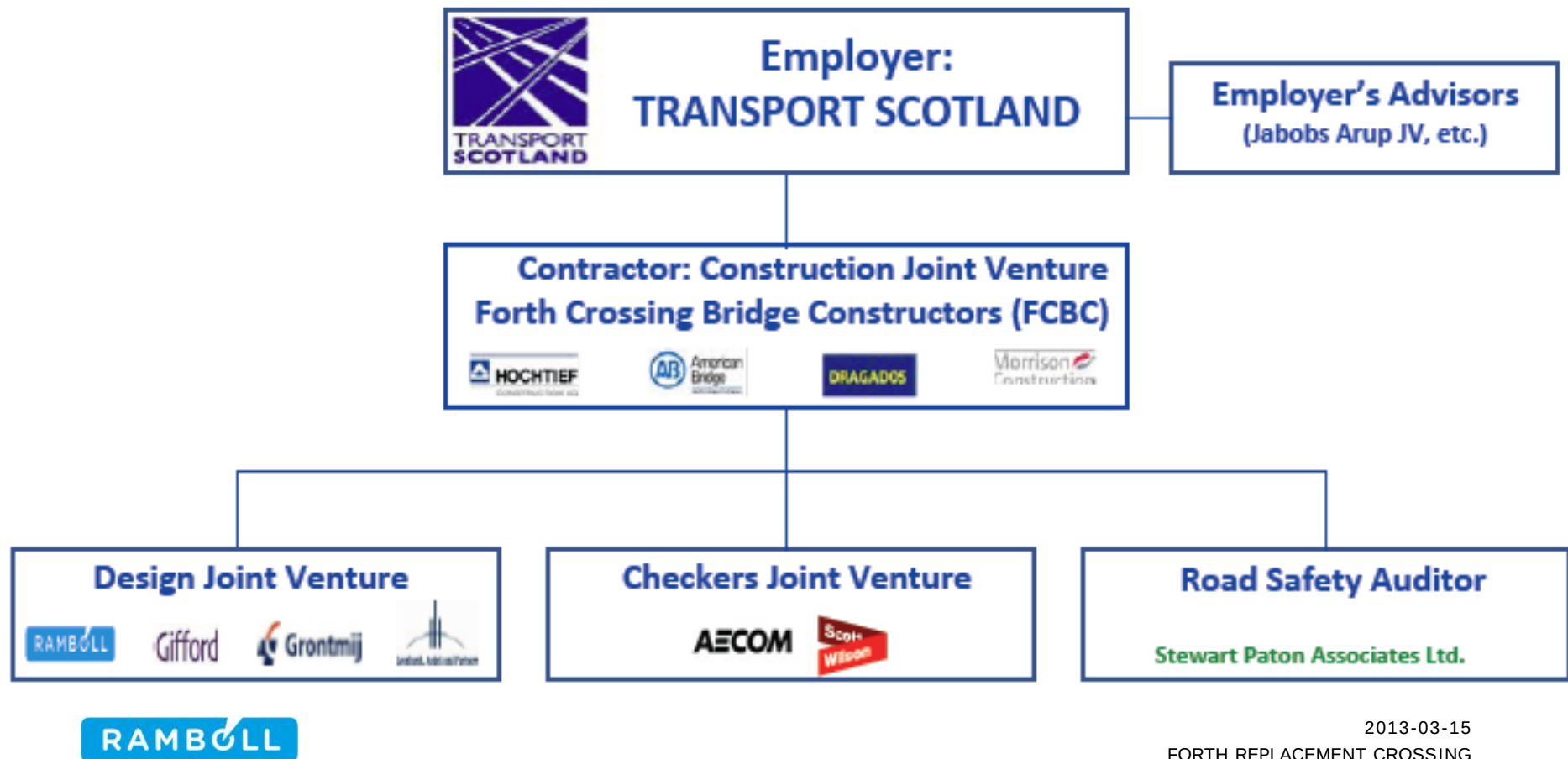


THE PROJECT

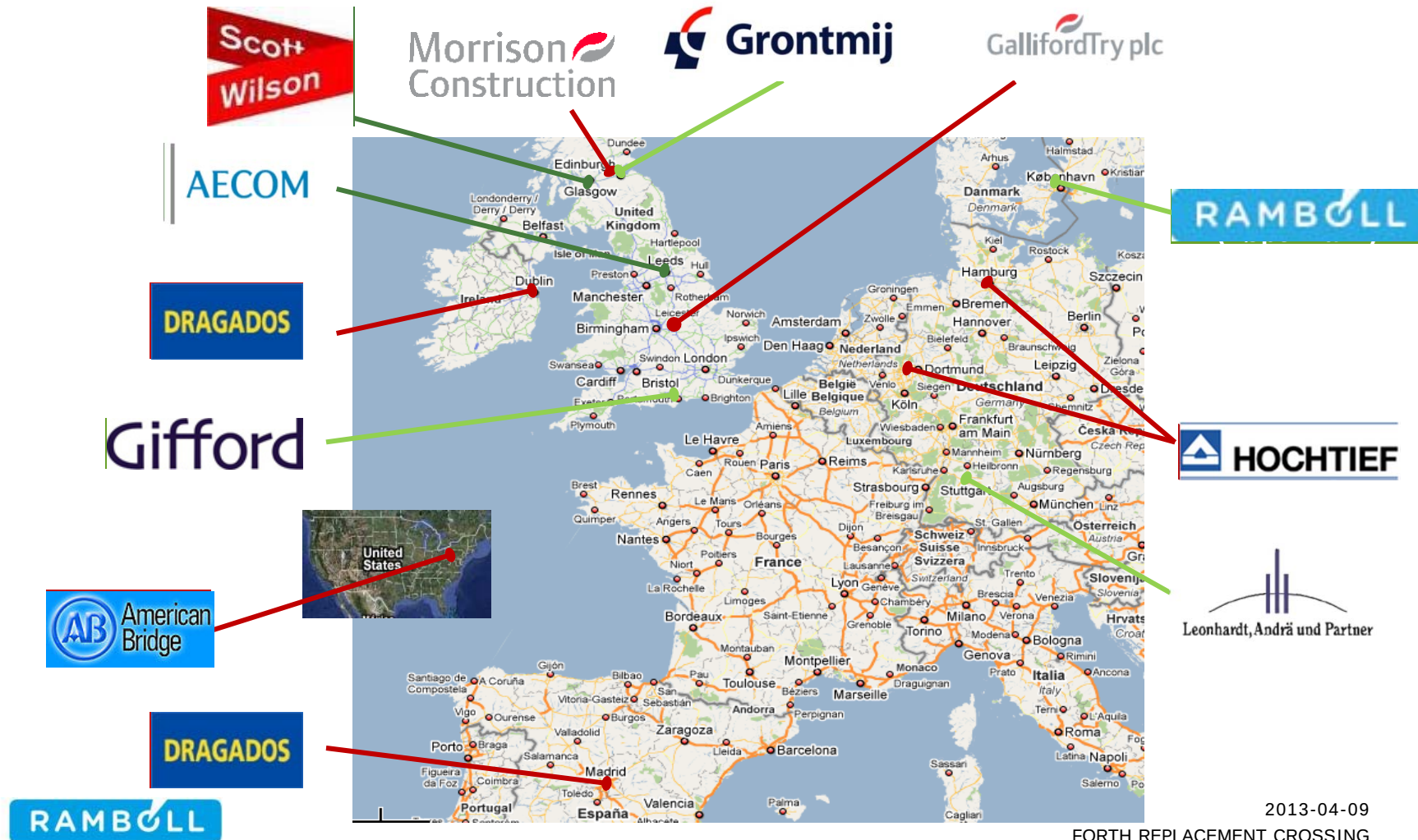


ORGANISATION

High Level Organisation Chart



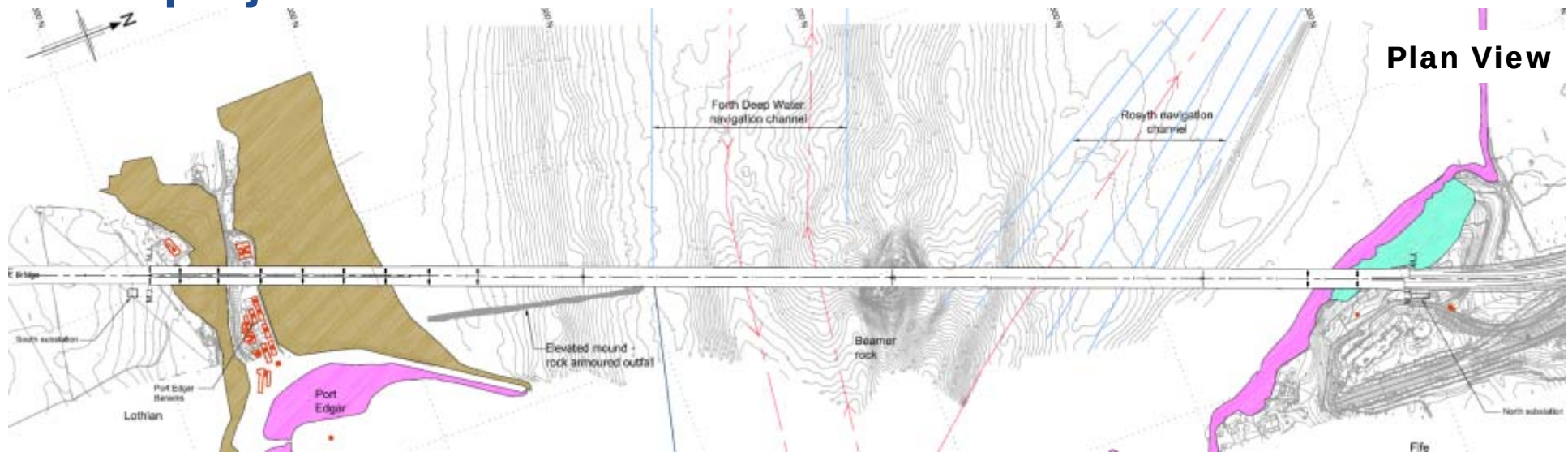
LOCATION



2013-04-09

FORTH REPLACEMENT CROSSING

Bro projektet

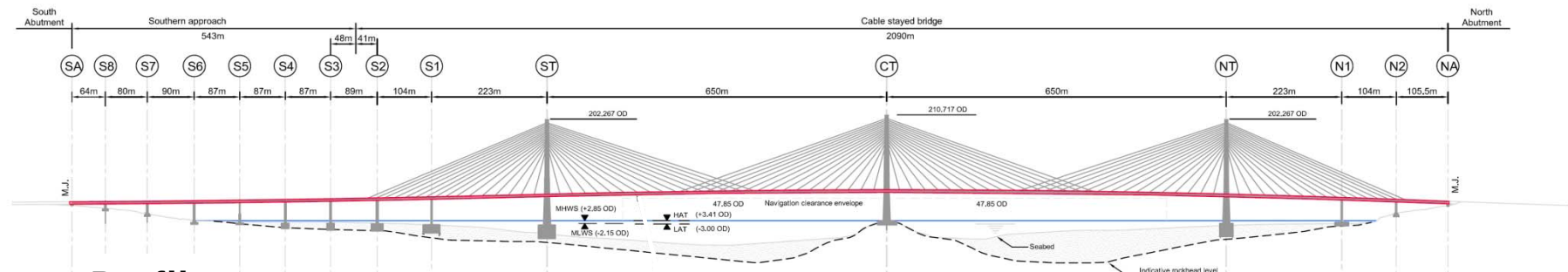


Plan View

Sydlig viadukt

Skrå stags broen

Nordlig viadukt

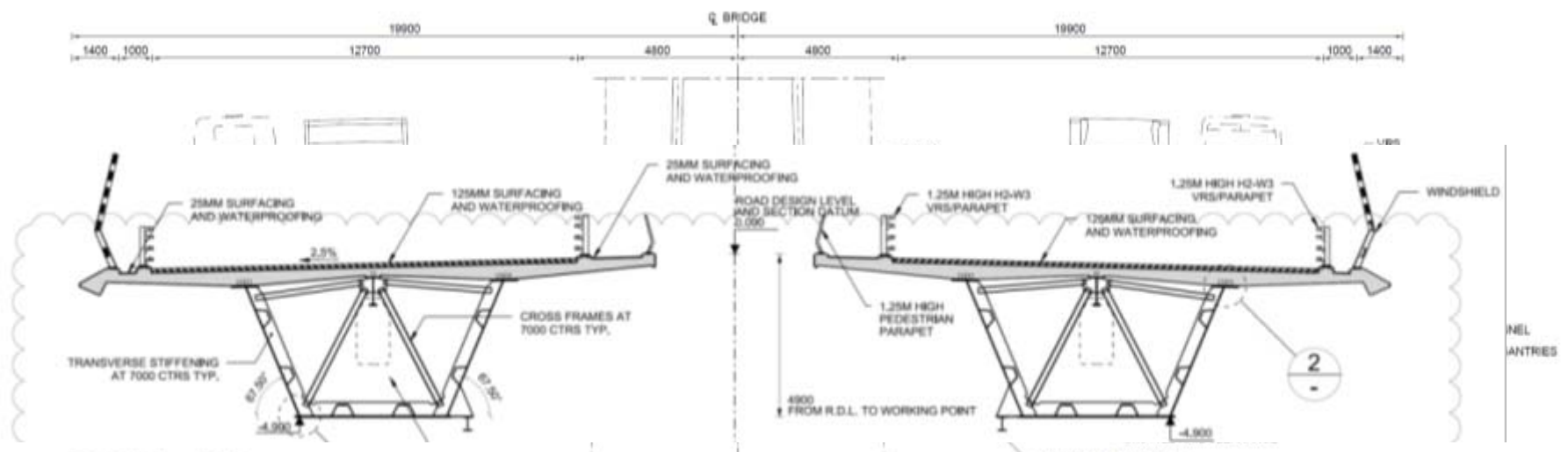
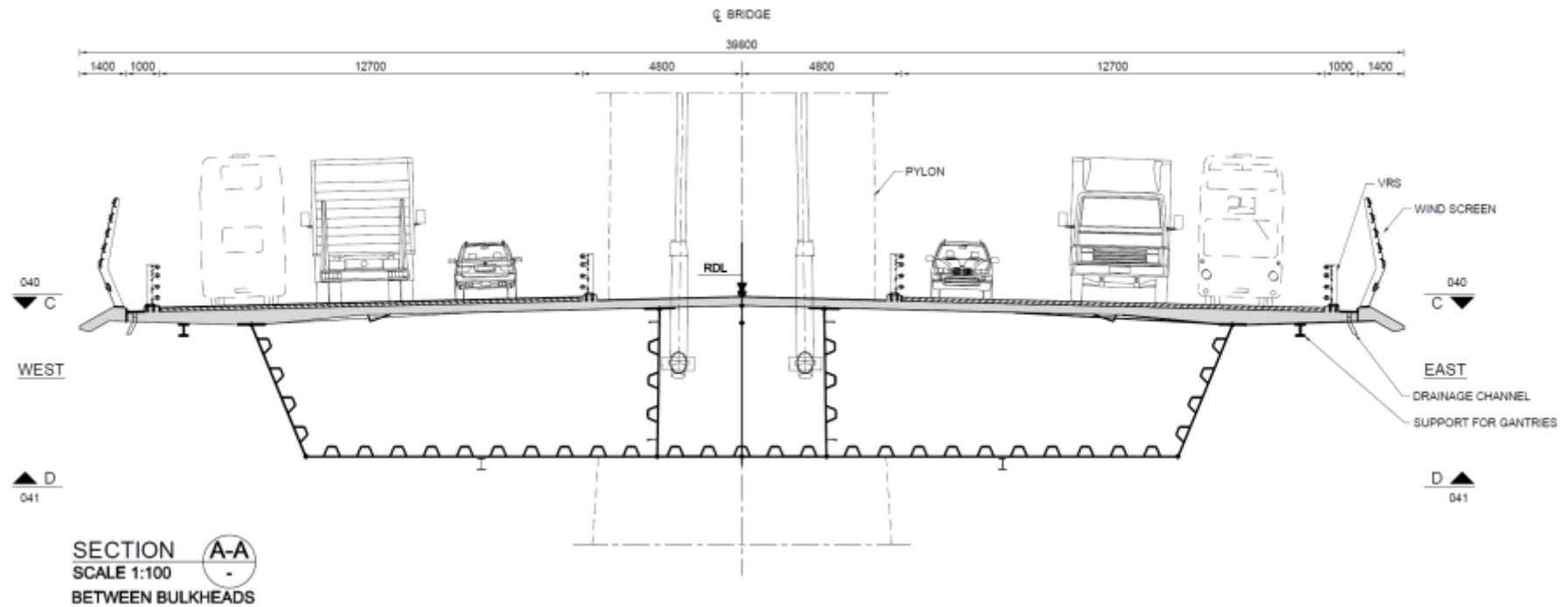


Profil

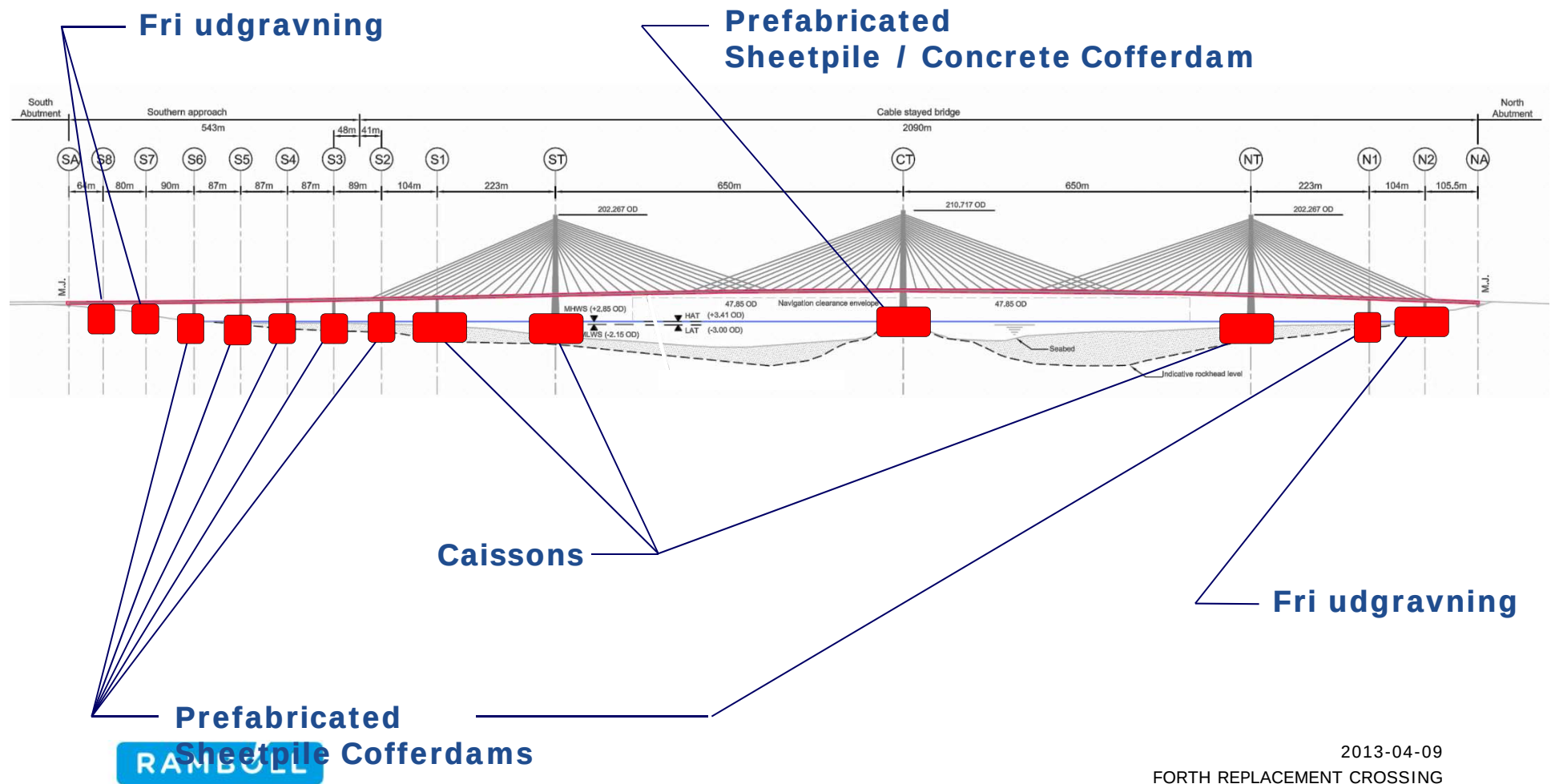
RAMBOLL

2013-04-09
FORTH REPLACEMENT CROSSING

VALGT TVÆRSNITS PROFIL



Bro fundamenter



Caisson Fundering (S1, ST, NT) Udførelse

Stål caisson I Polen

Udgravning indenfor caisson

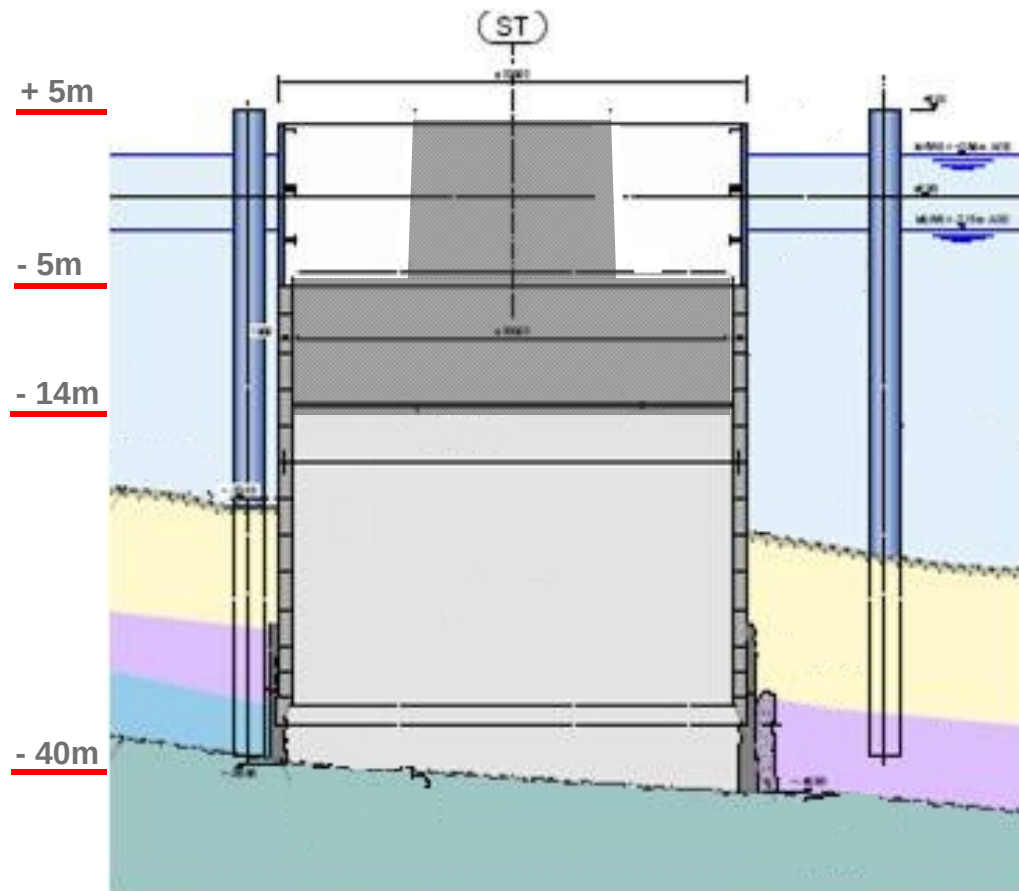
Injicering for at forsegle mellemrum
mellem caisson og klippe

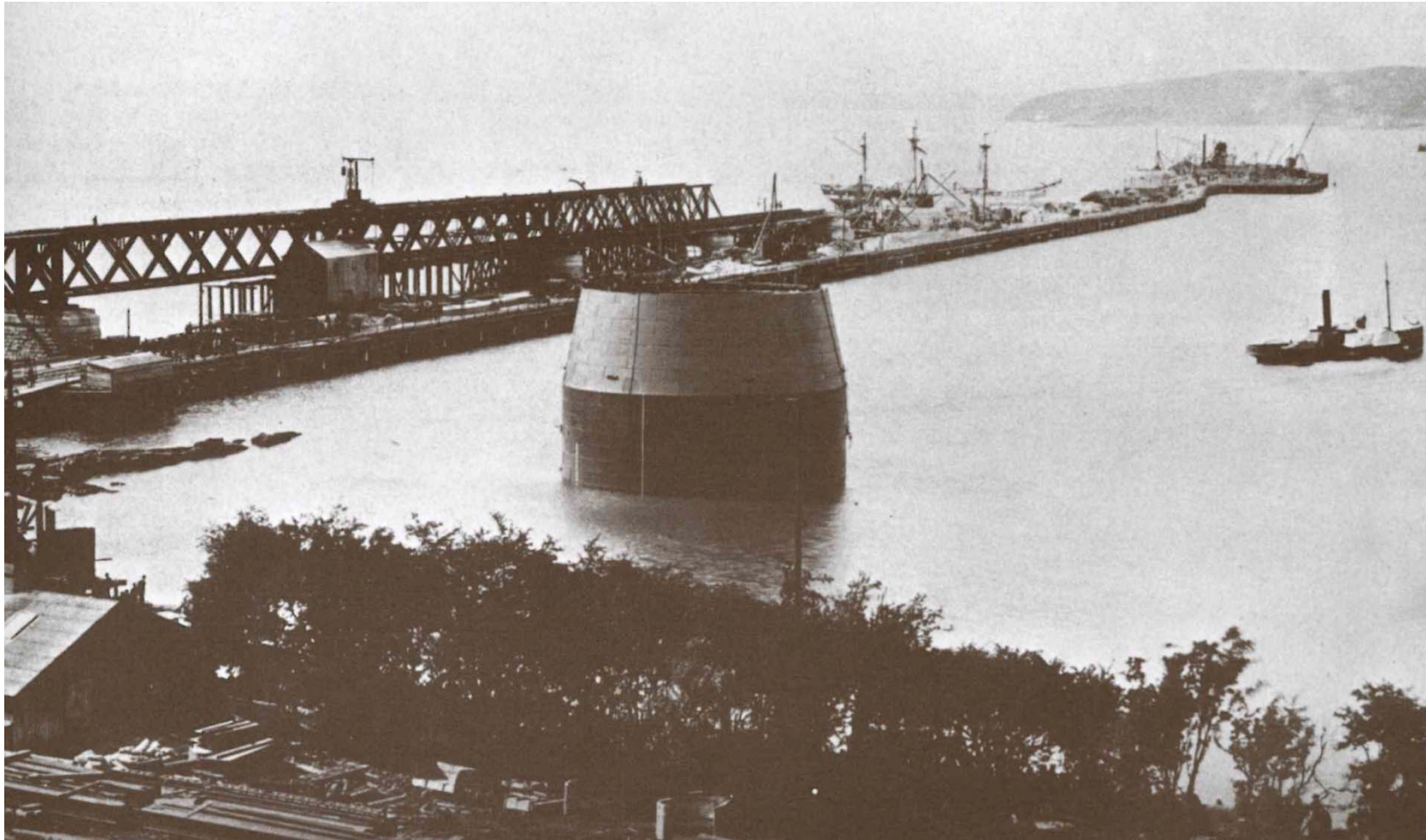
Undervandsbeton til forsegling
Til kote -14m

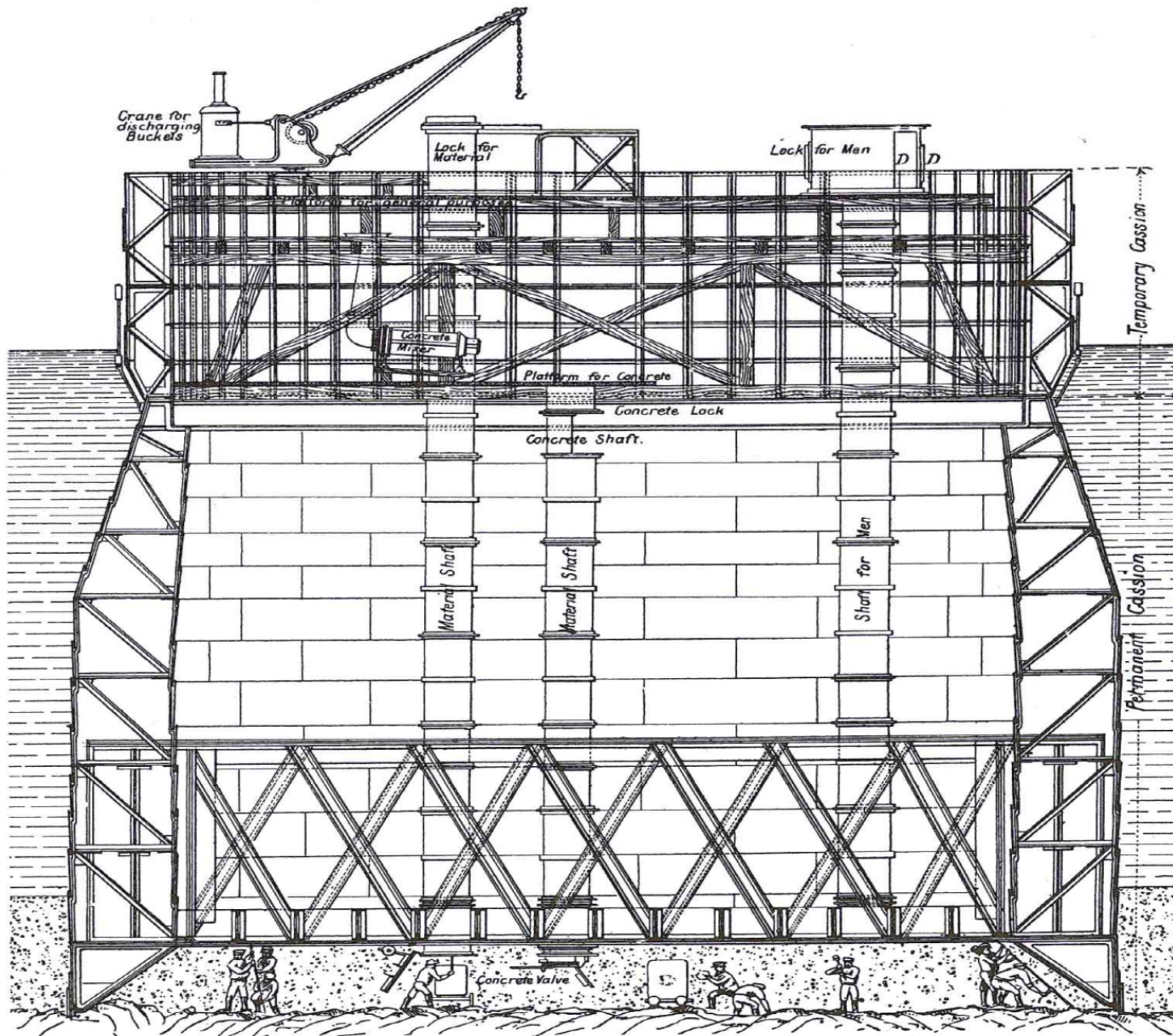
Bortumpning af vand

Beton fundamenter fra
Kote -14m to -5m

Tårn base, Kotel -5m to +5m







RAM

2013-03-15
NT CROSSING



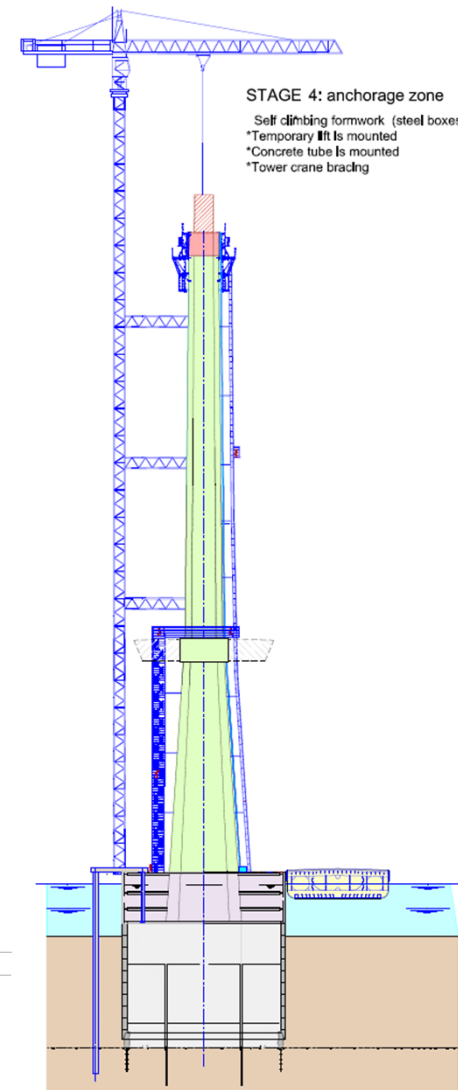
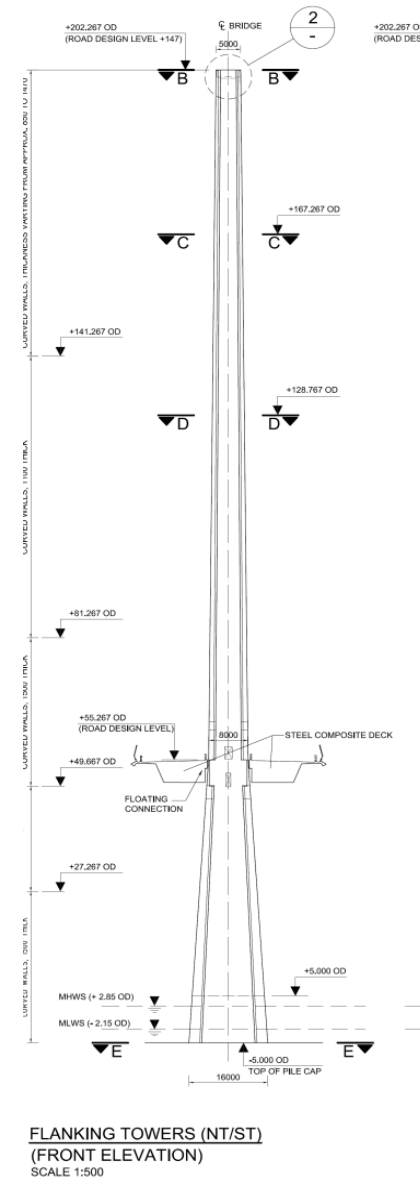
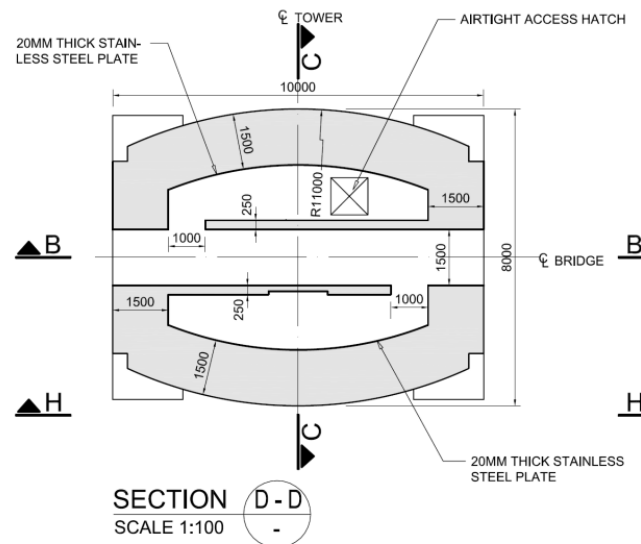


NT & ST CAISSON DELIVERY

FORTH REPLACEMENT CROSSING

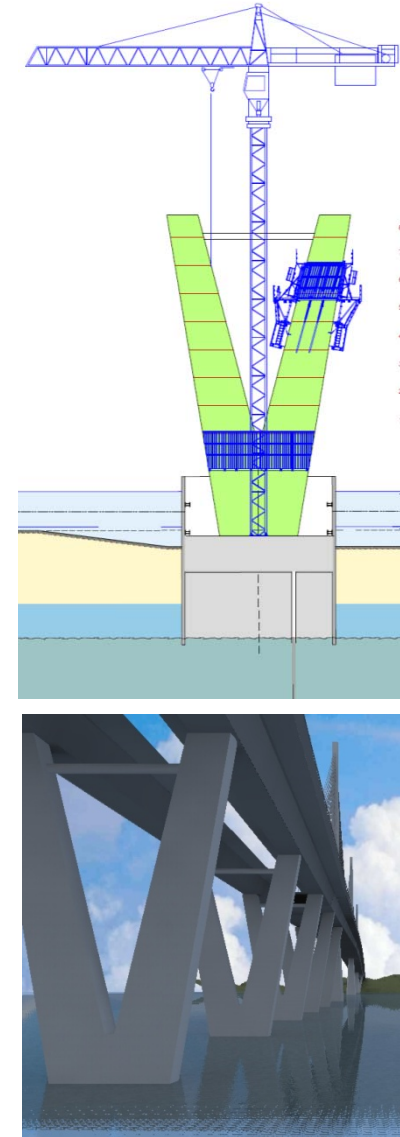
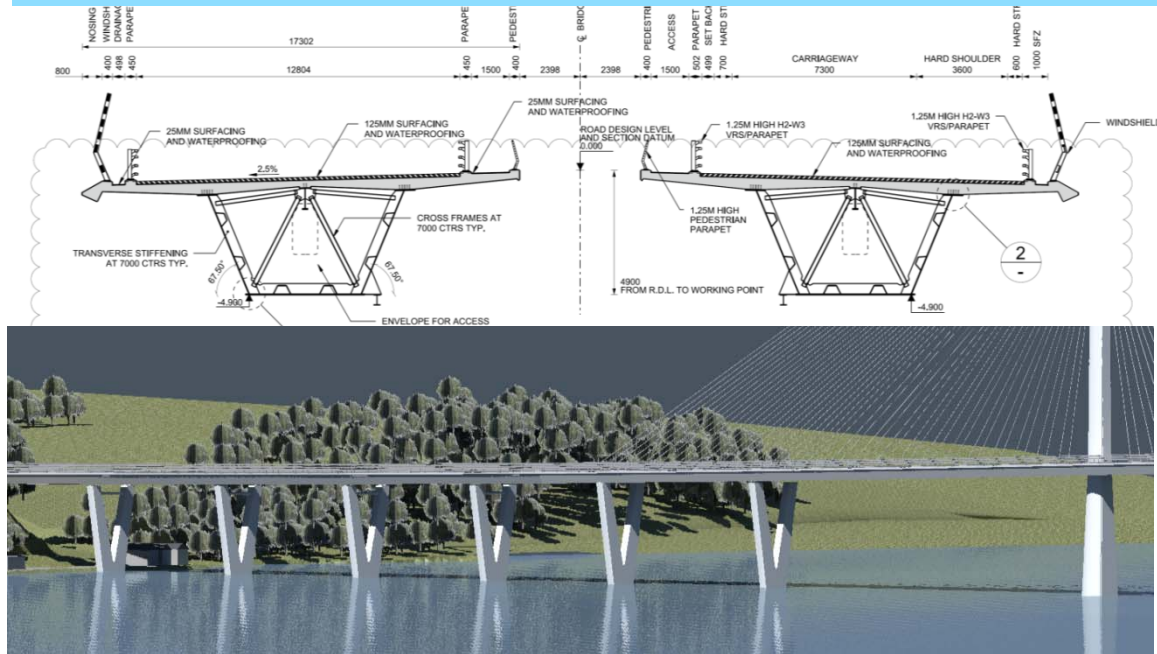
DESIGN: PYLONER

- 3 tårne 200-210m høje
- steelboks I kabel forankrings zonen
- Beton 26,000m³
- Armering 5,200tons

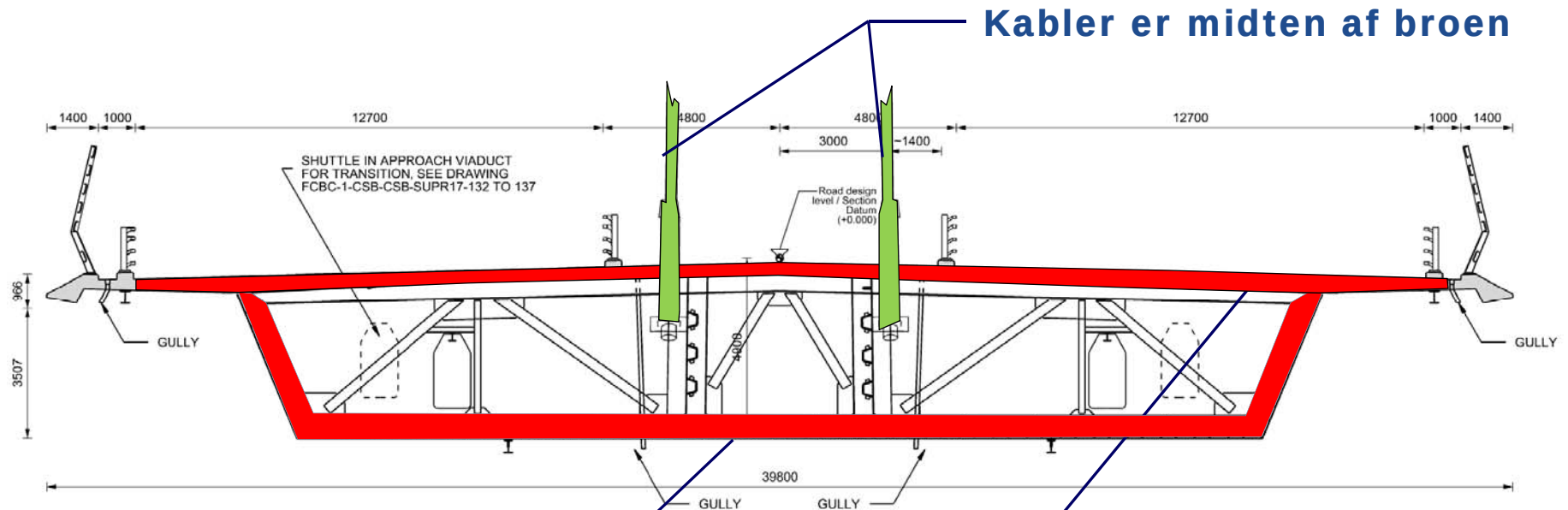


South Approach (543m)

- ca. 87m typisk spæn
- Slap armeret beton V søjler, højde 10 – 50m
- Komposit tværsnit (4,200tons stål)
- Udskubning fra land med



Skråstagsbroen – Dæk konstruktion



Stålboks

Betondæk (Forspændt på tværs)

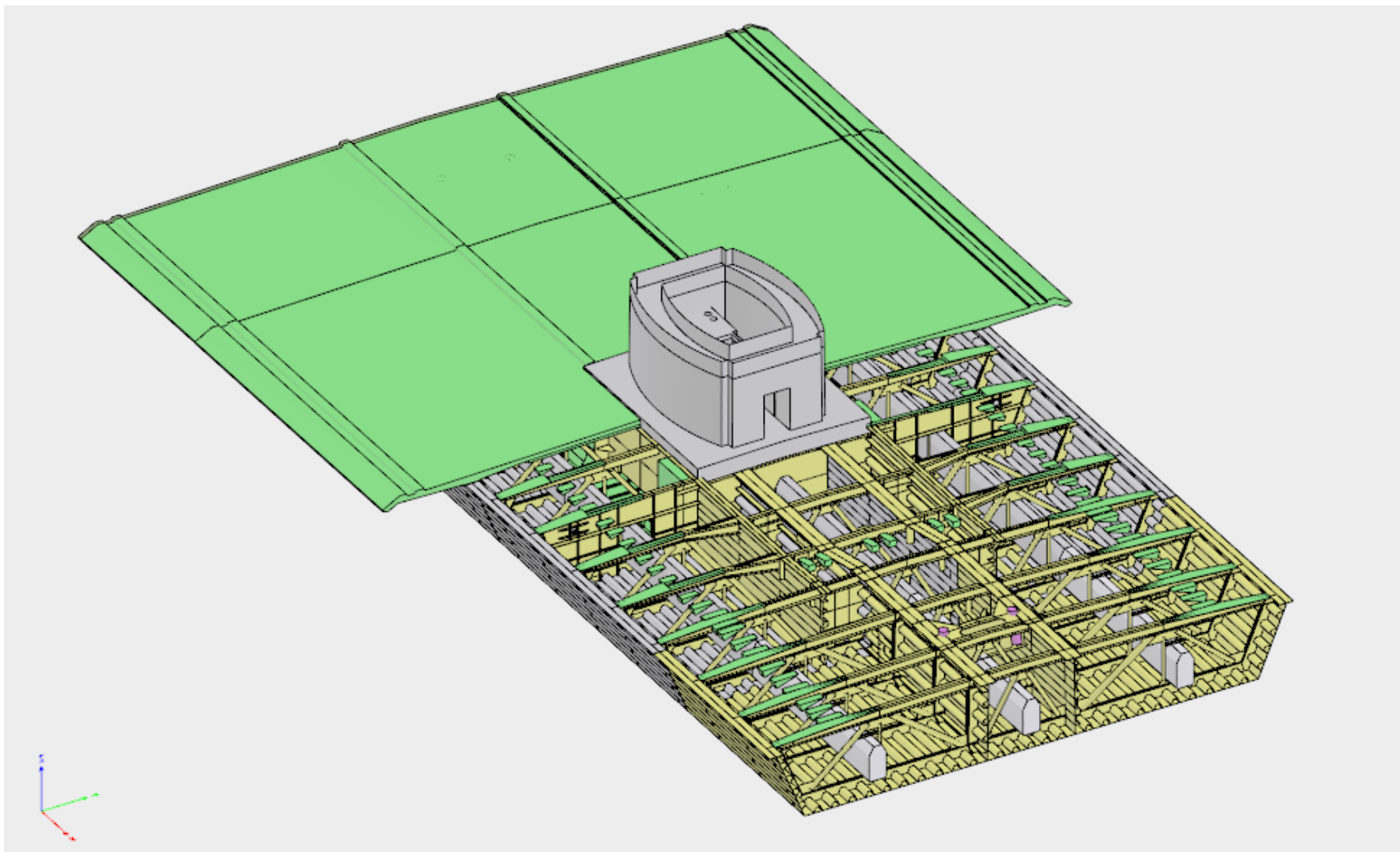
Stål er beskyttet af affugtningsystem inde i boksen

RAMBOLL

2013-04-09

FORTH REPLACEMENT CROSSING

DÆK SEGMENT VED DEN CENTRALE PYLON

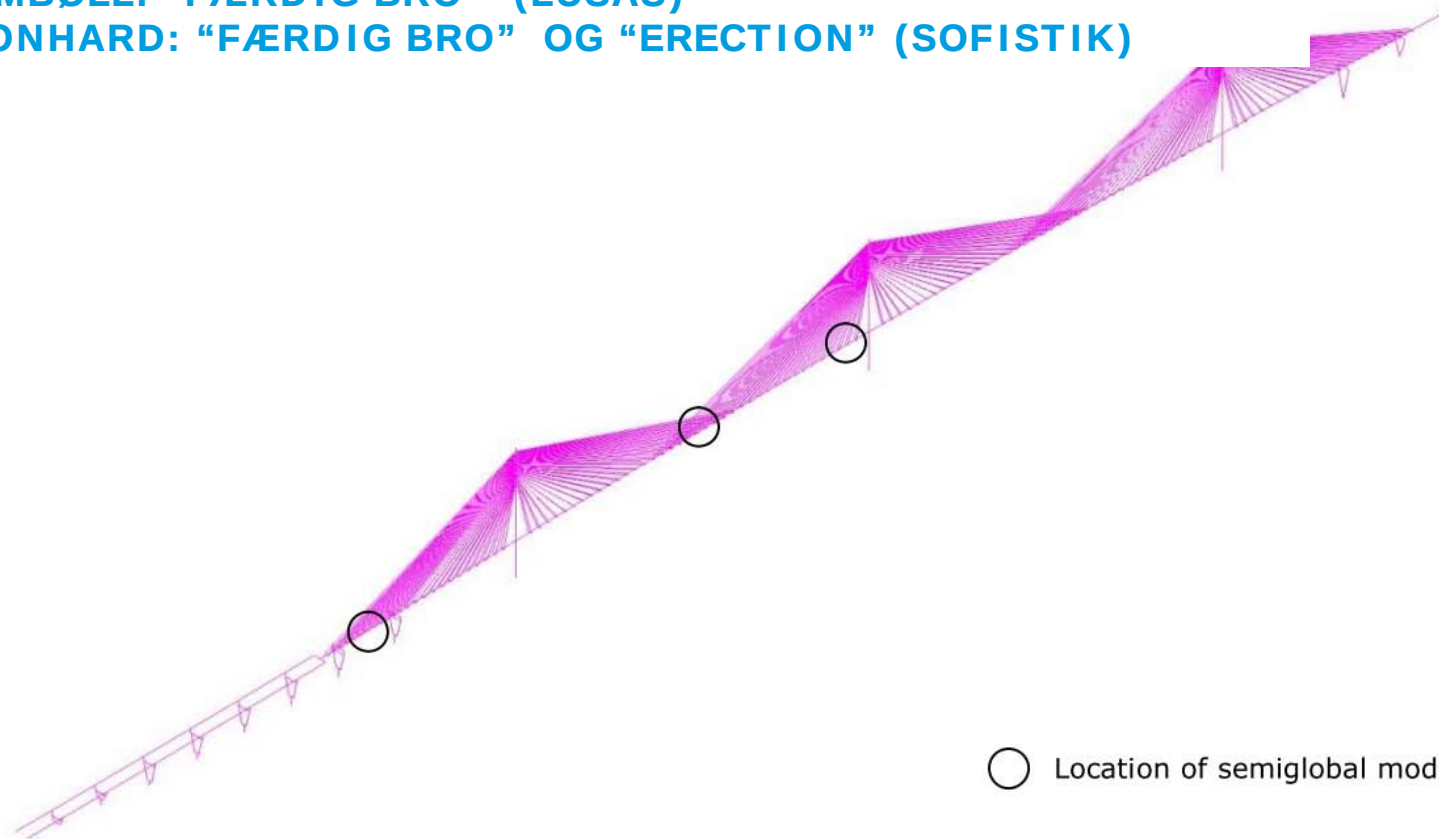


DESIGN PROCES: GLOBALE BJÆLKE MODELLER

3 GLOBALE BJÆLKER MODELLER:

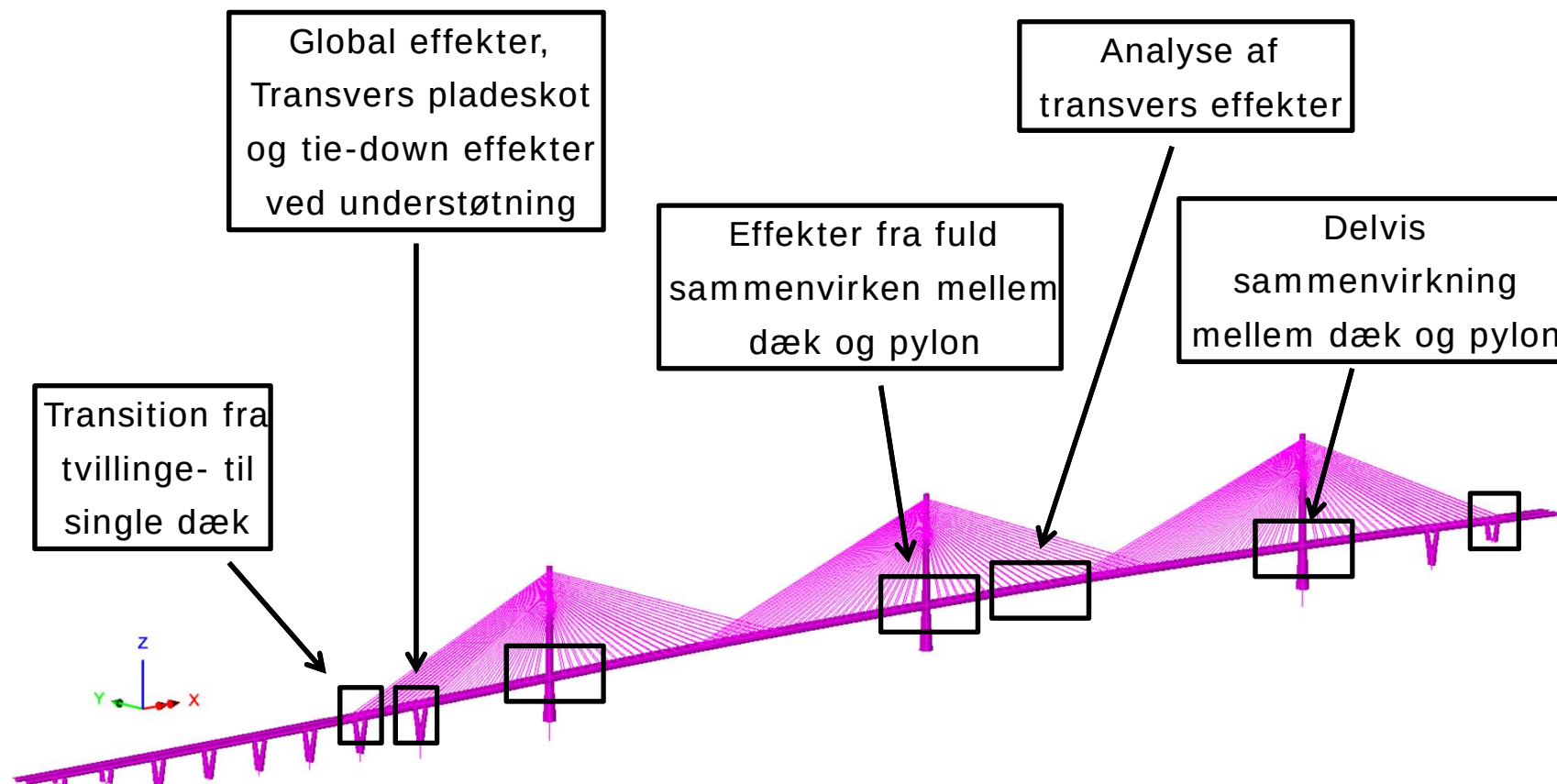
RAMBØLL: "FÆRDIG BRO" (LUSAS)

LEONHARD: "FÆRDIG BRO" OG "ERECTION" (SOFISTIK)



○ Location of semiglobal modes

UNDERSØGELSE AF LOKAL EFFEKTER VIA FE MODELLERING

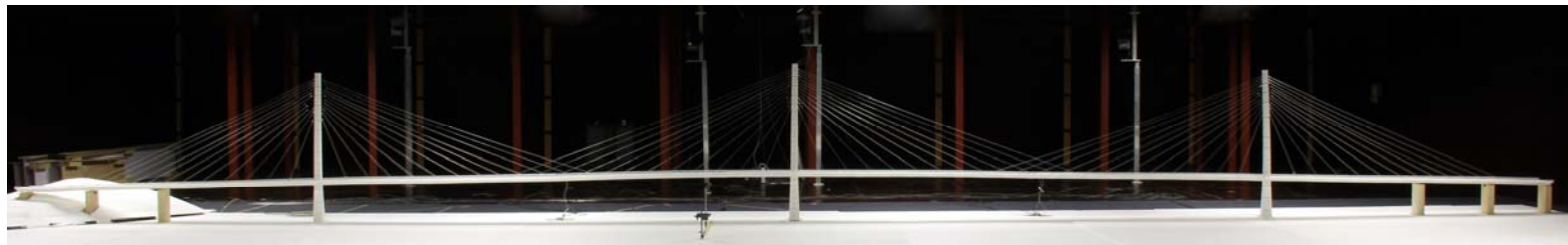
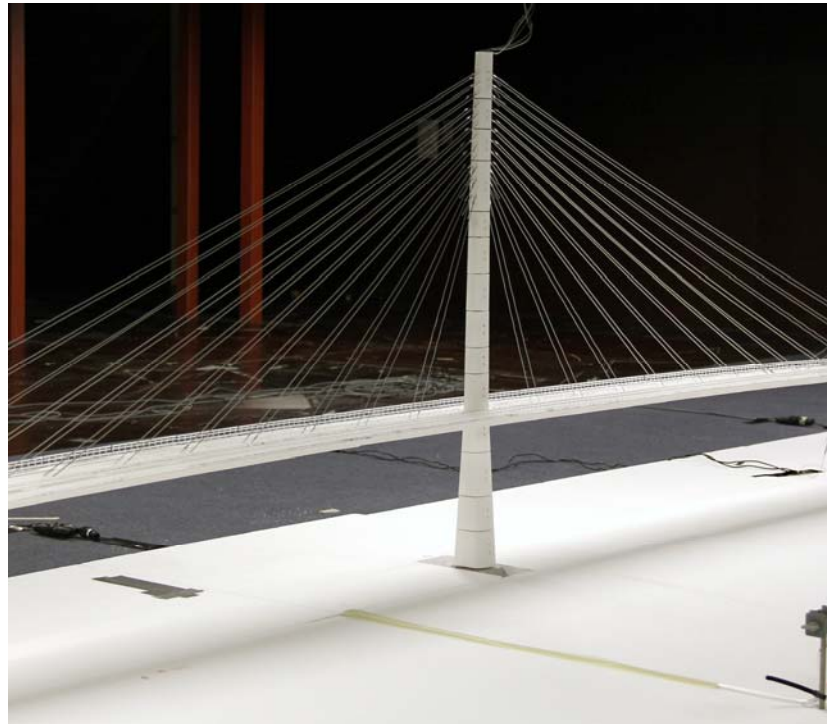


AEROELASTISK SEKTIONSMODELFORSØG VED SVEND OLE HANSEN

- Skala 1:50
- 85m x 39.8m
- Lodret flytning/torsion
- Hvirvelafløsning
- Flutter



AEROELASTISK FULDBROFORSØG – FÆRDIG BRO FORCE TECHNOLOGY



HOVED TIDSPLAN

- 2009 - 2010 – Tilbudsfase
- Forår 2011 – Design begynder
- Sommer 2011 – Udførelse begynder
- Sommer 2013 – Design færdig
- December 2016 – Åbning bro

Udførelse af de 3 brotyper

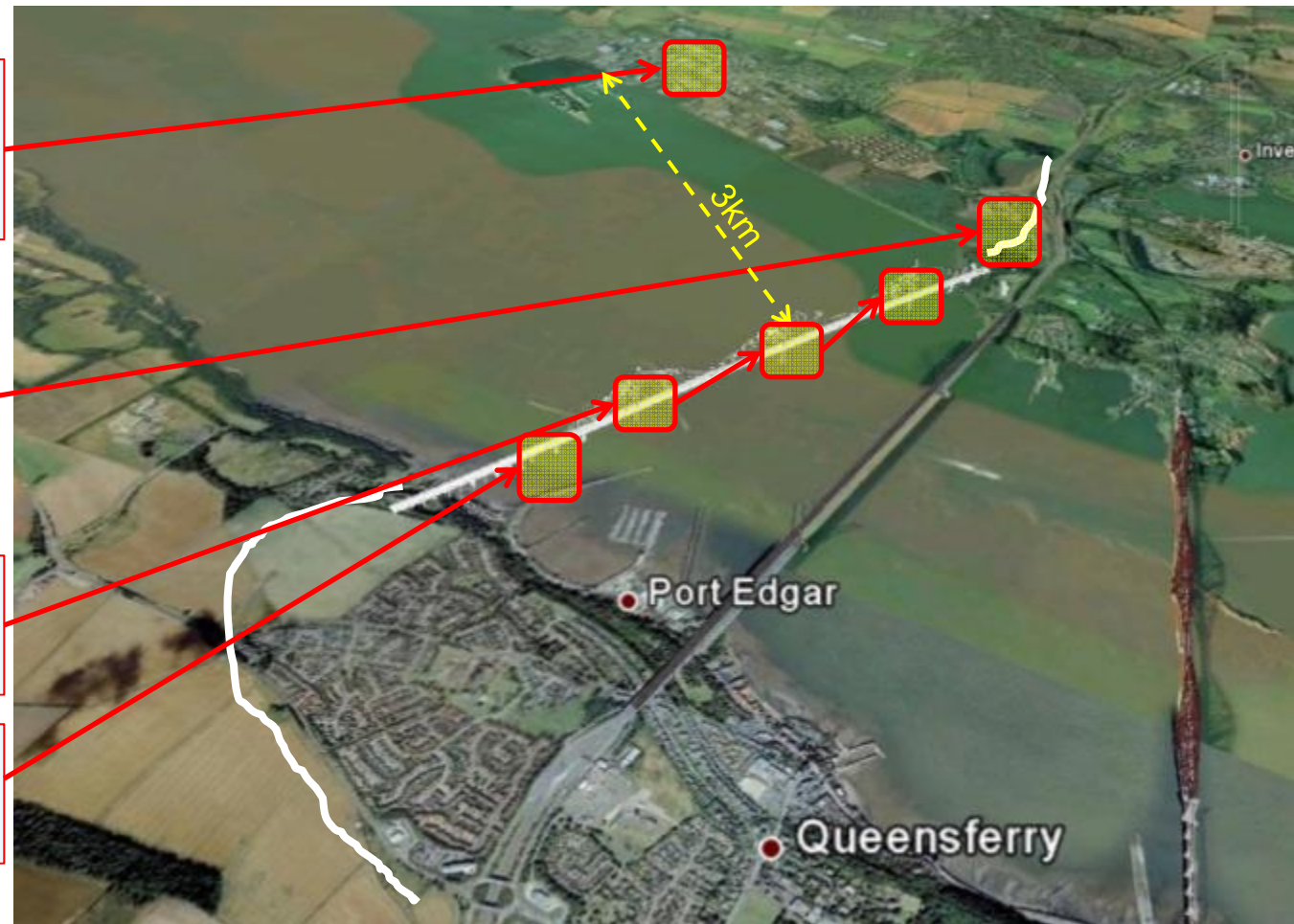
2. CSB Pre-Cast Yard
Segment Production,
Storage & Preparation.
2013 - 2015

3. Nordlig viadukt
NA to N2, in-situ
12/2013 – 12/2014

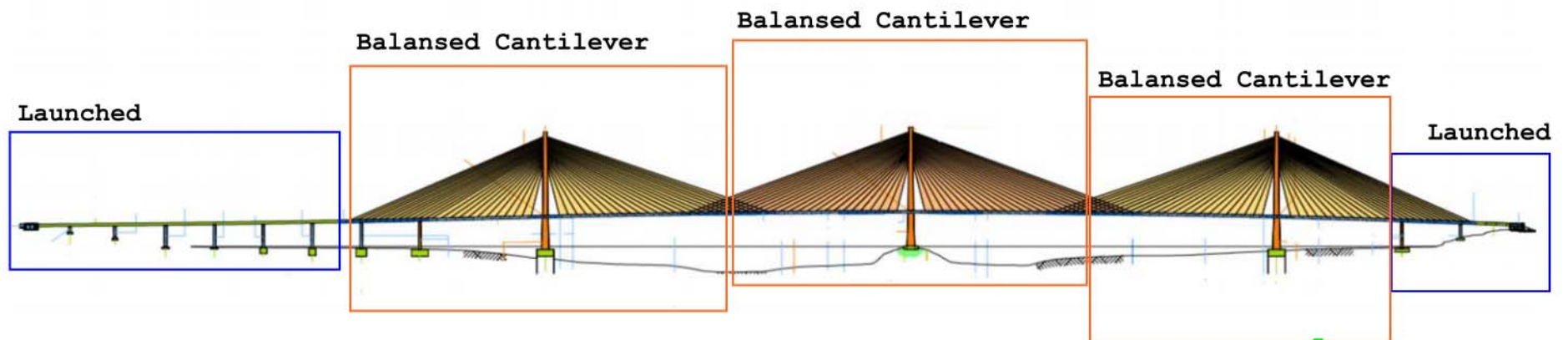
1. Tårne, in-situ
2013 - 2014
Dæk 2014-2015

3. Sydlig viadukt
SA to S2/S3, in-situ
2013 – 2014

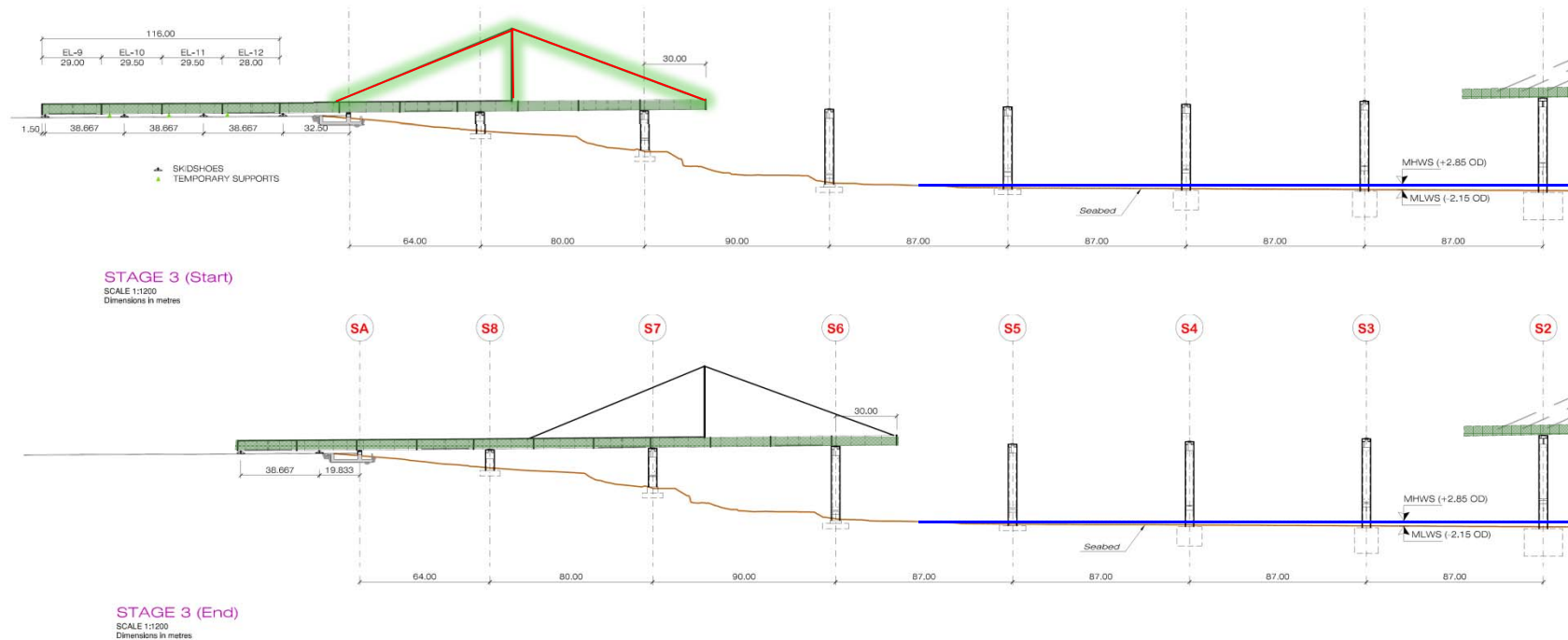
RAMBOLL



CONSTRUCTION



Sydlig Viadukt/Tilslutningsbro - Udskubning



- Udskubning fra sydlig portalbygning
- Søjle til at supportere den frie udkragning
- In-situ beton støbes efter at broen er skubbet ud.

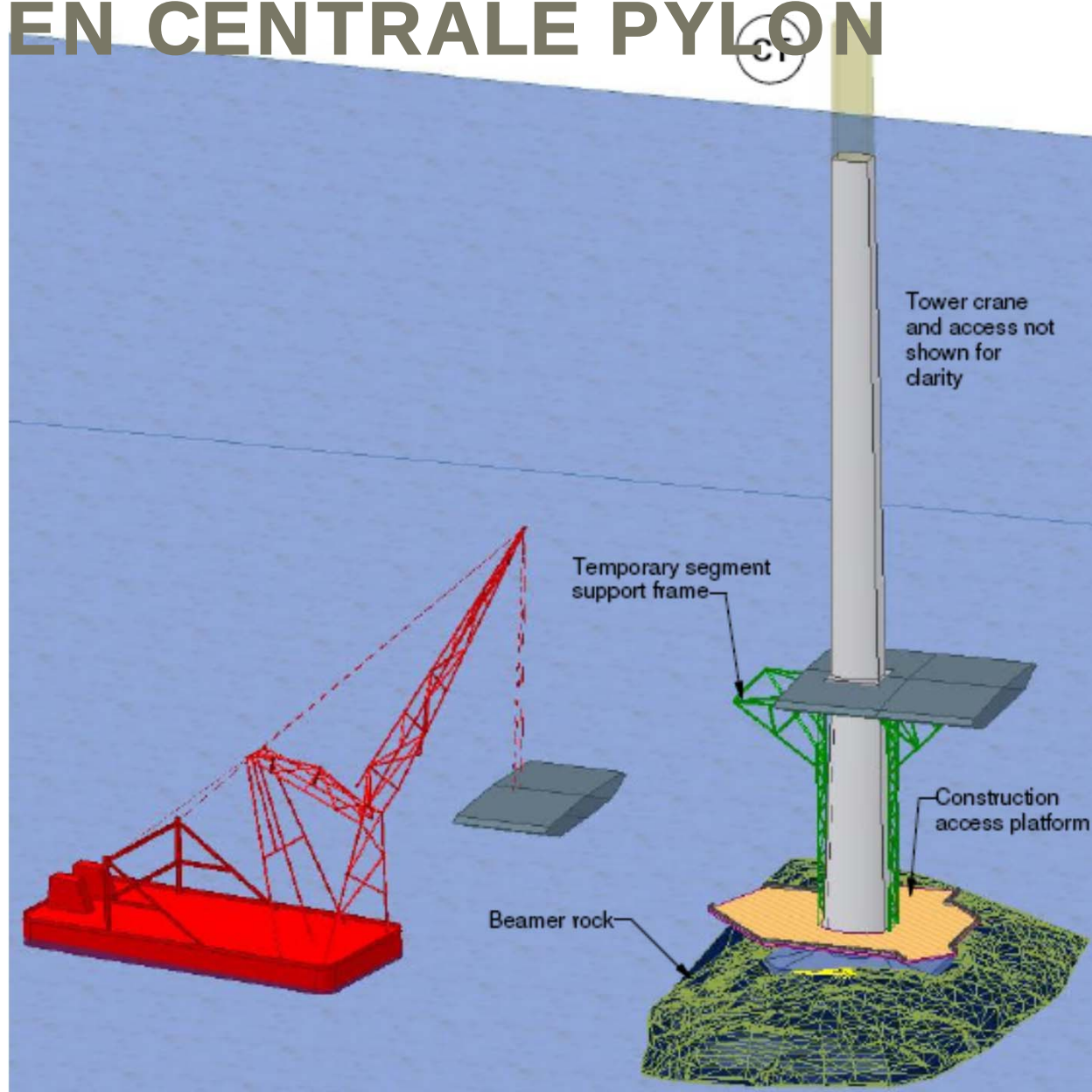
RAMBOLL

2013-04-09
FORTH REPLACEMENT CROSSING

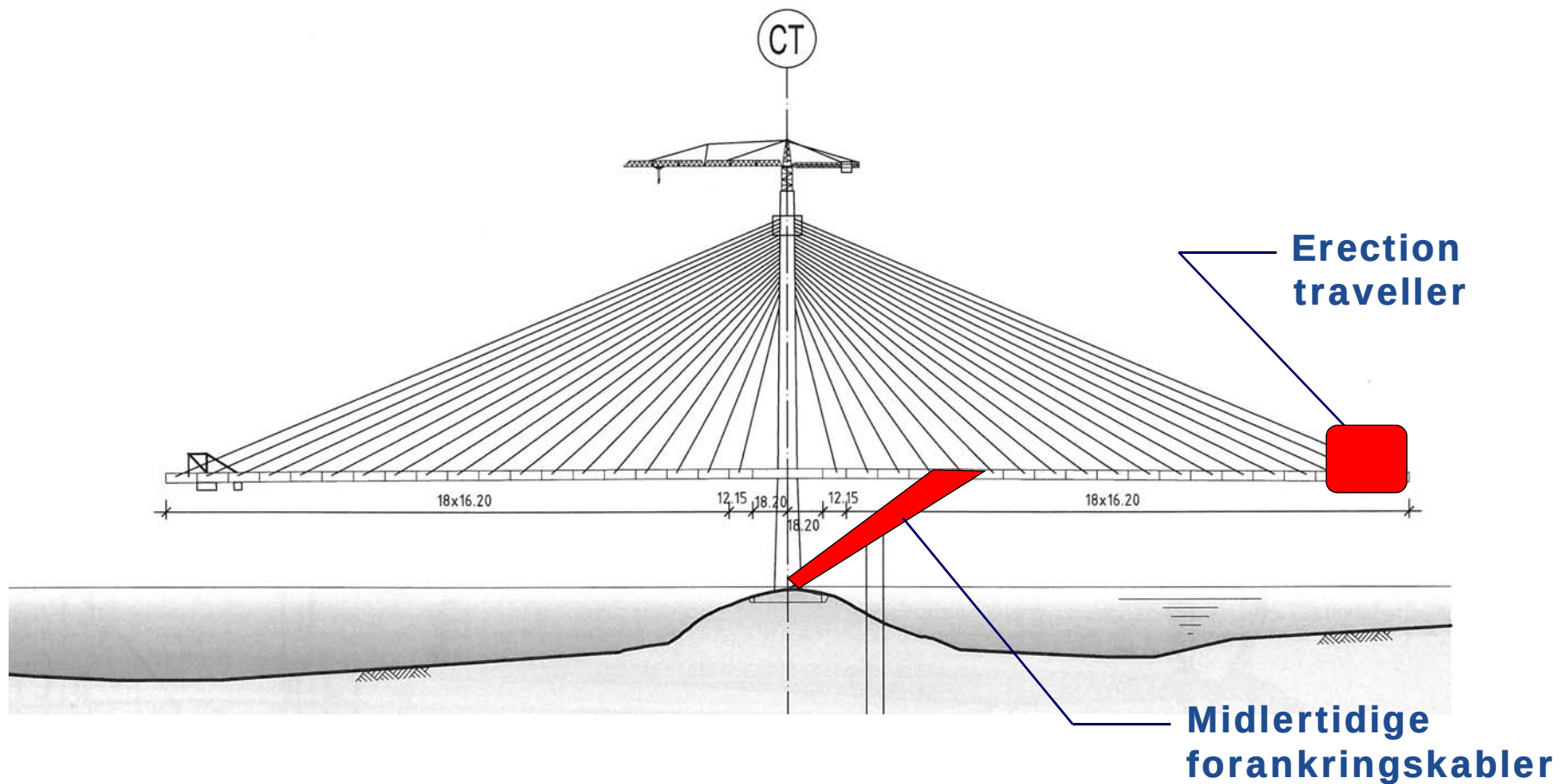
HOVEDBRO



DE FØRSTE 4 DÆKSEGMENTER VED DEN CENTRALE PYLON



Balanceret frembygning – fra den centrale tårn



RAMBOLL

2013-04-09
FORTH REPLACEMENT CROSSING

160m cant; stage 10; 500 year;
20m/s

FOTO SET FRA SYD



FOTO SET FRA NORD



COFFERDAM RUNDT OM FUNDAMENT FOR DEN CENTRAL PYLON



COFFERDAM, FUNDAMENT – CENTRAL PYLON



UDGRAVNINT NORDLIG CAISSON



OPSÆTNING AF MIDLERTIDIG COFFERDAM PÅ CAISSON





3-15
ING

HALF SECTION “MOCK UP” OF CSB STEEL

SPØRGSMÅL

