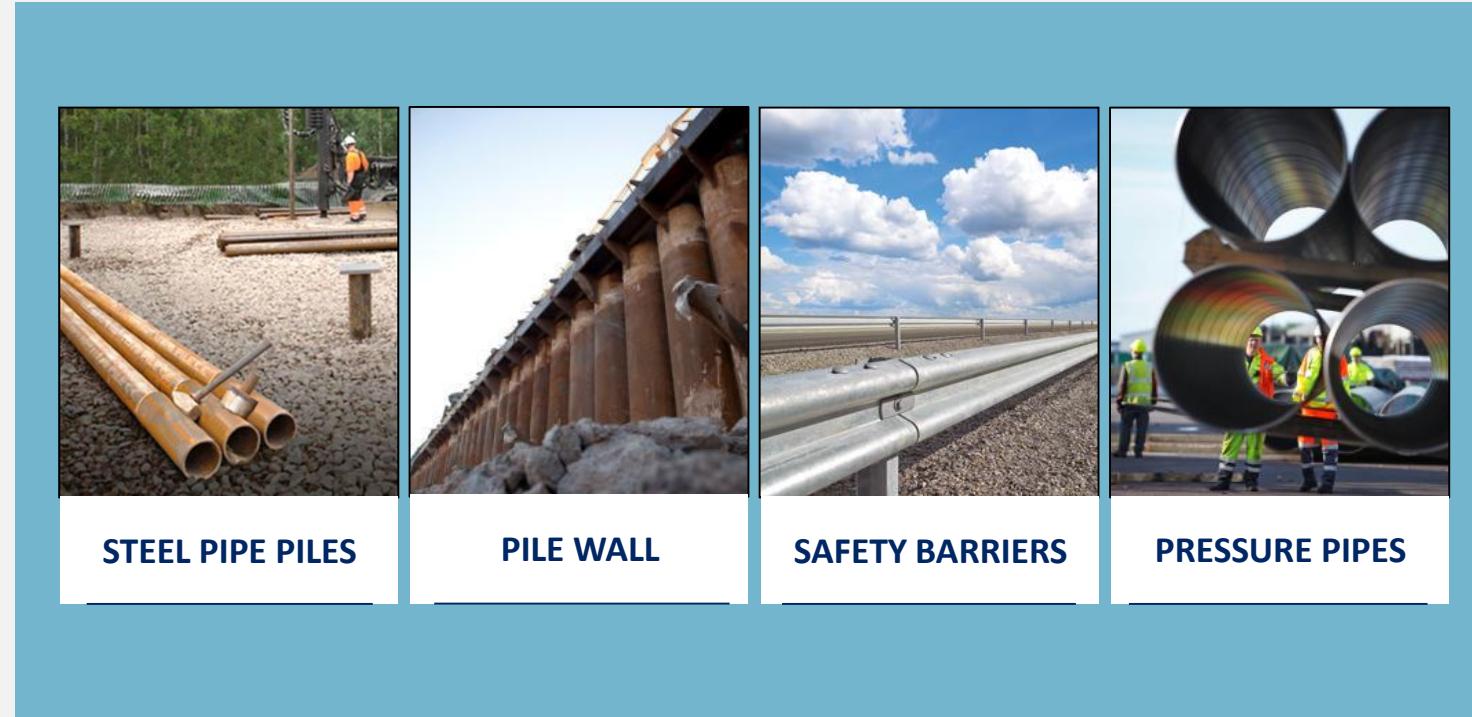


# SSAB



*A stronger,  
lighter and more  
sustainable world*

# SSAB – INFRA products



# History of the "steel pipe piles"

## Marked numbers 2017

Concrete piles:	1 735 623m	(52%)
Rammed steel pipe piles:	940 090m	(28%)
Drilled steel pipe piles:	411 413m	(12%)
Drilled steel core piles:	12 168m	(>1%)
Wooden piles:	217 186m	(7%)
<b>Sum:</b>	<b>3 304 312m</b>	<b>(100%)</b>

## Steel piles

2017	1 352 000 m
2016	956 000 m
2015	633 000 m
2014	766 000 m
2013	710 000 m
2012	689 000 m
2011	687 000 m
2010	634 000 m
2009	540 000 m
2008	724 000 m
2007	328 000 m
2006	351 000 m
2005	587 000 m
2004	589 000 m
2003	401 000 m
2002	431 000 m
2001	386 000 m
2000	334 000 m
1999	310 000 m
1998	258 000 m
1997	241 000 m
1996	238 000 m
1995	167 000 m

800%

# RR® and RD® micro piles

- ▶ Named after the installation method
  - RR® Rammed pile
  - RD® Drilled pile
- ▶ Dimensions
  - RR75 – RR/RD320
  - Wall thickness 6.3 – 12.5 mm
- ▶ Steel quality
  - RR®/RD® pile S460MH
  - RR®/RD® pile S550J2H
- ▶ Splices
  - Conical
  - Threaded
  - By welding



# RR<sup>®</sup> and RD<sup>®</sup> large diameter piles

- ▶ Named after the installation method
  - RR<sup>®</sup> Rammed pile
  - RD<sup>®</sup> Drilled pile
- ▶ Dimensions
  - RR400 – RR/RD1200
  - Wall thickness 8 – 23 mm
- ▶ Steel quality
  - RR<sup>®</sup>/RD<sup>®</sup> pile S355J2H, S440J2H and S460MH
  - RR<sup>®</sup>/RD<sup>®</sup> pile S550J2H
- ▶ Accessories
  - Up to 39 m long
  - Delivered with rock shoes from SSAB
  - Option for coating as corrosion protection



**SSAB**





**Longyearbyen, Svalbard – RD micro piles (S550J2H)**



**Karenlyst Allé, Oslo – RD micro piles (underpinning)**





Borg Havn, Fredrikstad – RR micro piles (S550J2H)





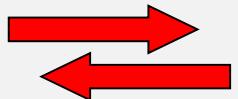
**Grillstad Marina, Trondheim – Pipe in pile with PE-coating**



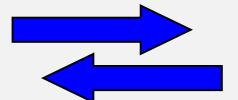
Åstfjorden, Trøndelag – LDP, RR piles

# Energy Piles

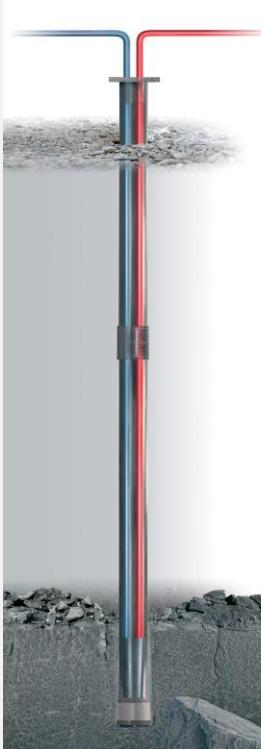
- ▶ Steel pipe piles makes it possible to combined both fundation structure and energy harwest



Energy stored in the soil during the summer



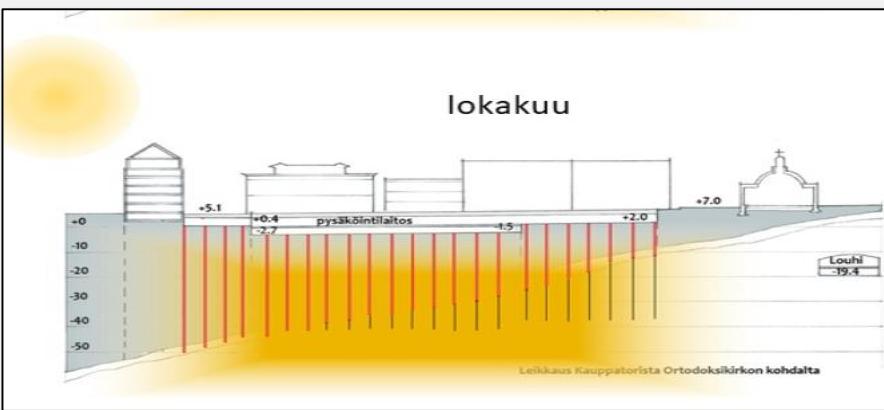
The low temperature in the soil is used as cooling



- ▶ Dimensions for energy piles:
  - RR-piles (RR90-RR1200)
  - RD-piles (RD90-RD1200)
- ▶ Only small alterations is needed for the foundation work

## Eksample: TURKU MARKET SQUARE

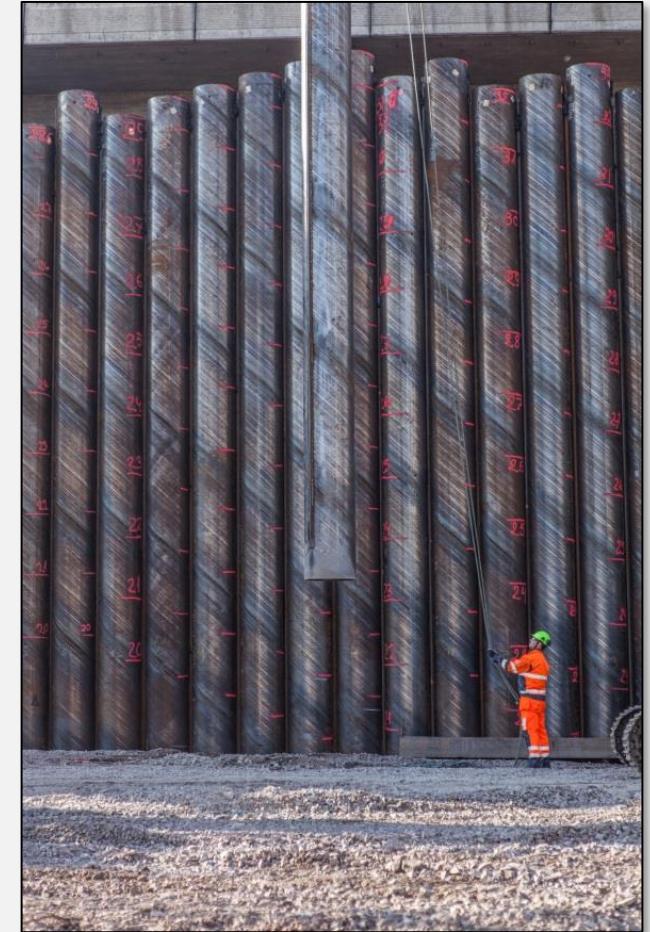
- ▶ RR140x10 -> 17,0 km
- ▶ RR170x10 -> 4,0 km
- ▶ Pile length ~30 m
  
- ▶ More cost effective compared to concrete piles due to the energy harwest



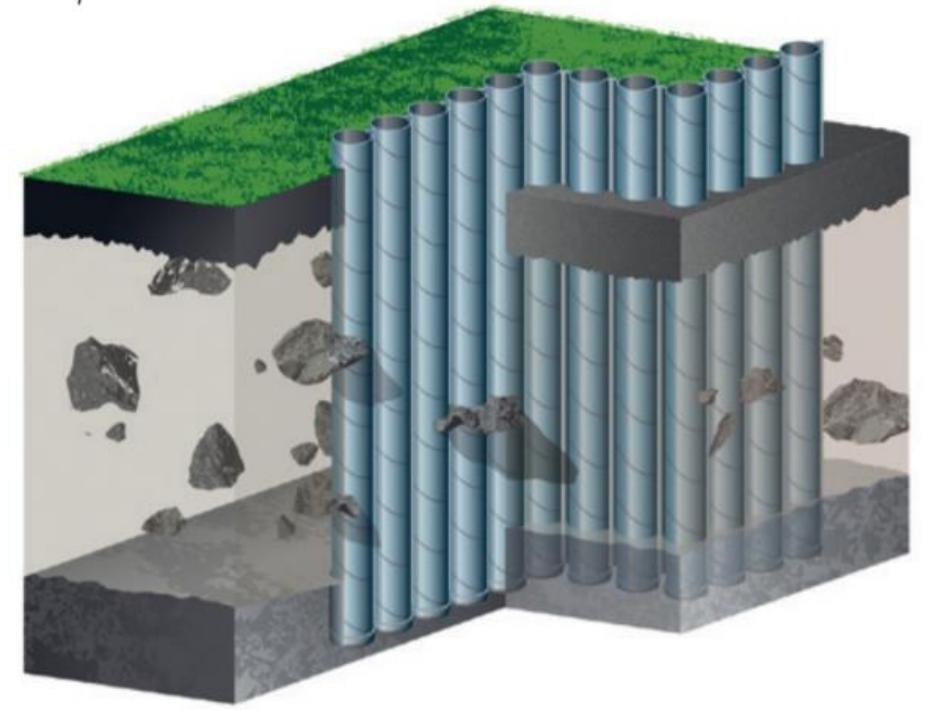
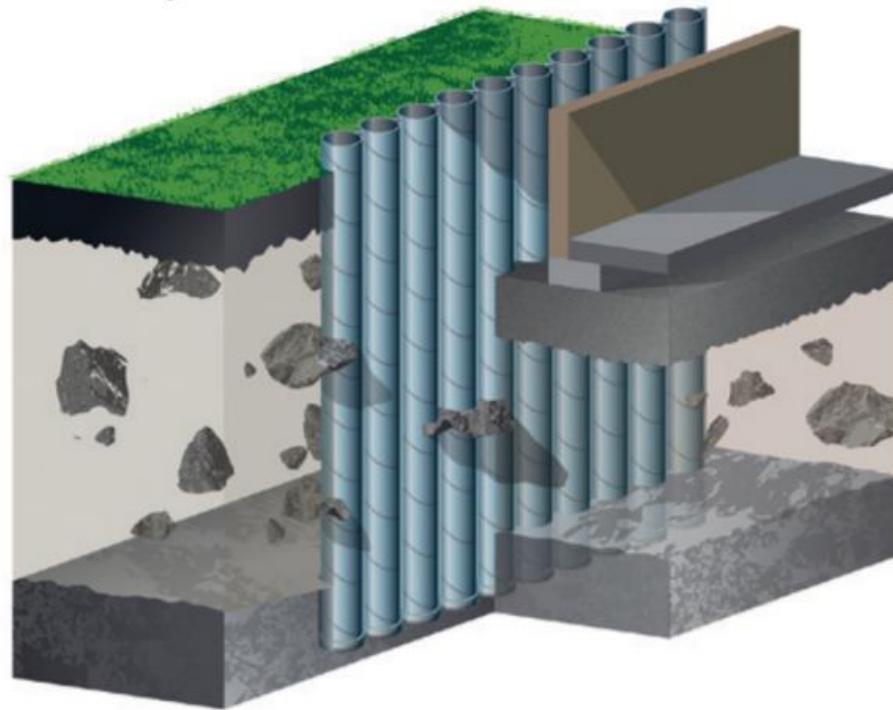
- ▶ Europe's first 0-energy shopping center. Sun energy is stores in the soil through RR-piles
- ▶ Worlds largest sun energy storage on 11,2 GWh
  - Same consumption as 560 single residences

## RD® pile wall

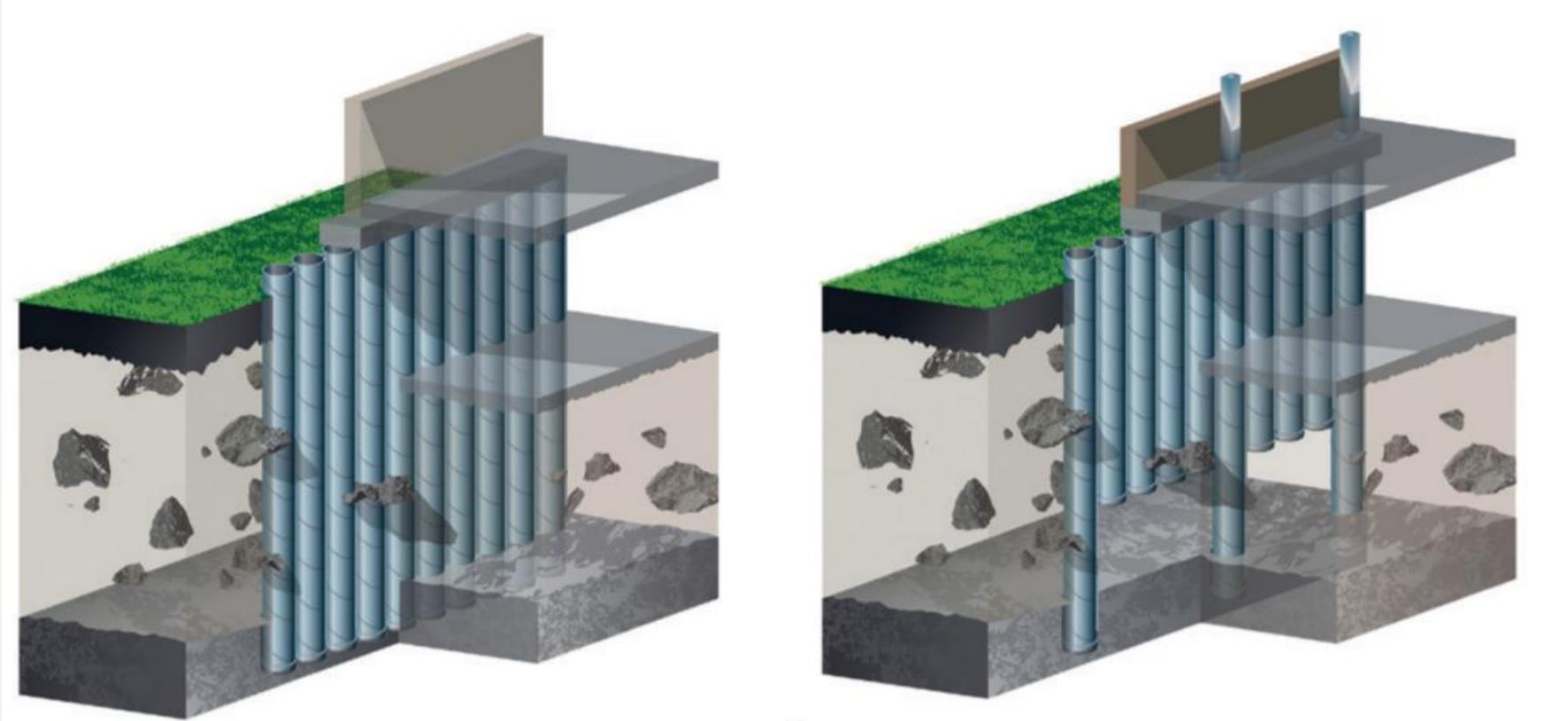
- ▶ Reliable retaining wall and foundation solution based on drilled RD piles
- ▶ Especially for demanding conditions
- ▶ A foundation solution which combines separate horizontally loaded and vertically loaded structures to one entity
- ▶ SSAB has proven track record of over 250 RD pile walls installed since 2009
- ▶ Withstands large bending moment



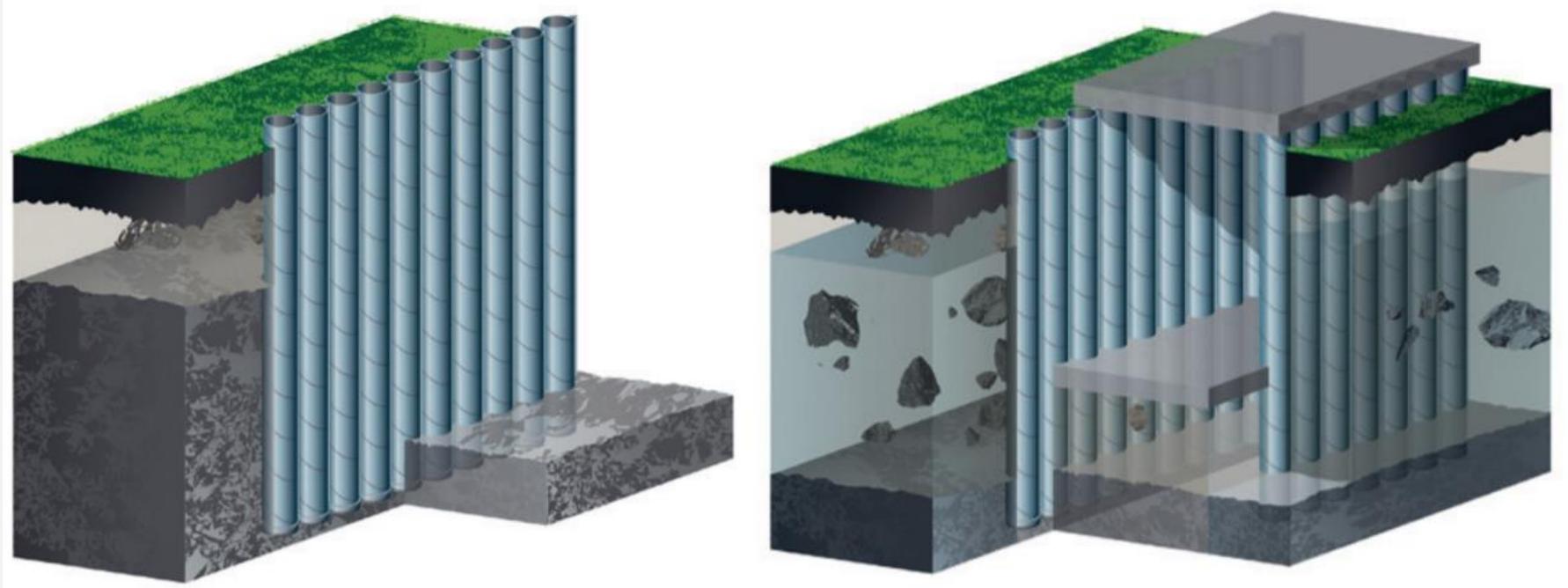
# RD® pile wall as support structure



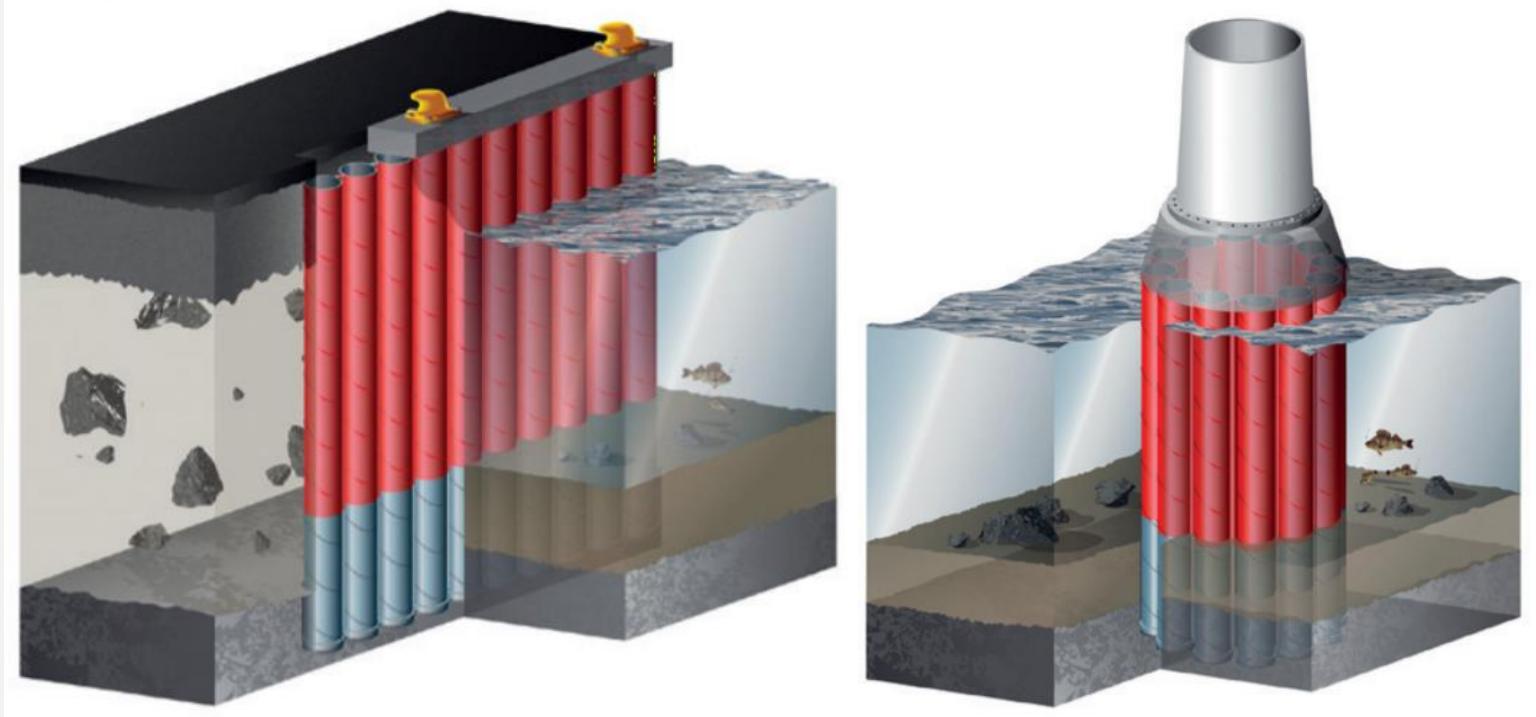
# RD<sup>®</sup> pile wall as support and vertical loaded structure



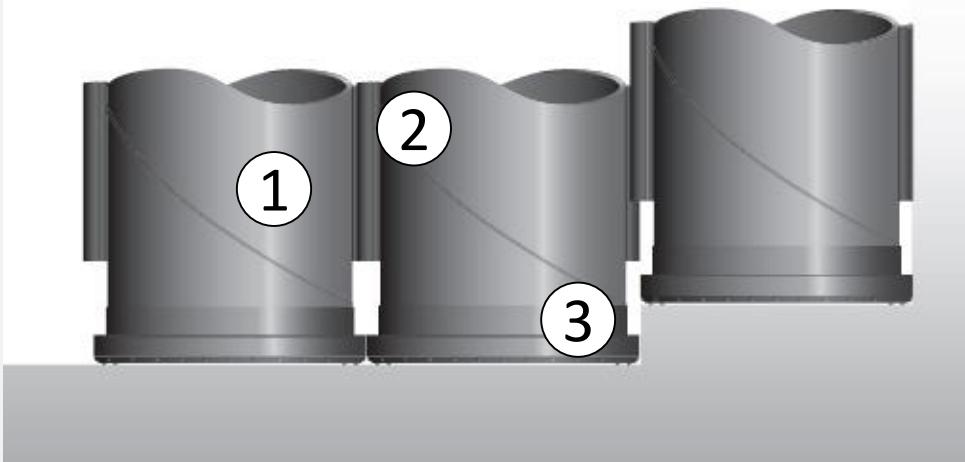
# RD® pile wall as support structure in rock an soil



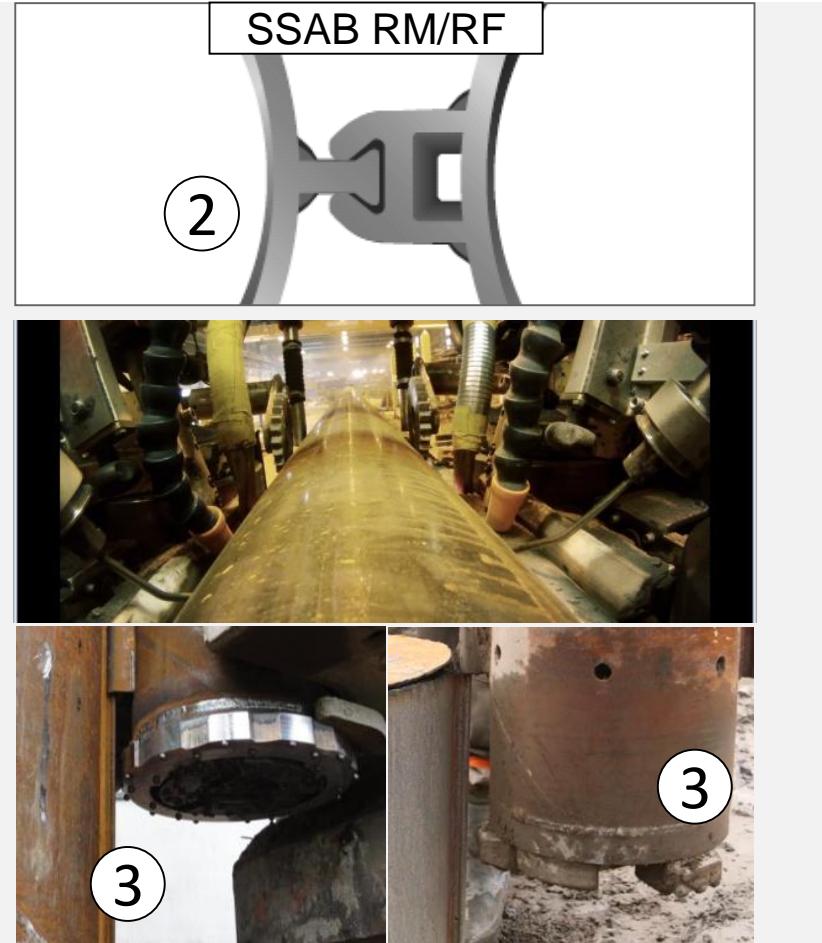
# RD® pile wall as water structures



# RD pile wall: components and principles

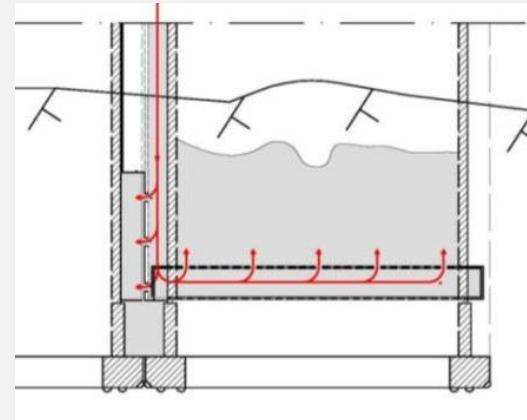


1. SSAB's RD pile
2. Special interlock profiles developed by SSAB attached by welding to the piles
3. Concentric drilling method with oversized ring bits or drilling method with opening wing-reamers and without ring bits



# SSAB RM/RF splice

- ▶ Stiff and resistant interlock structure
- ▶ Integrated injection channel which enables injection/grouting of lower end of the pile
- ▶ Increase stiffness between pile and bedrock and improves water tightness

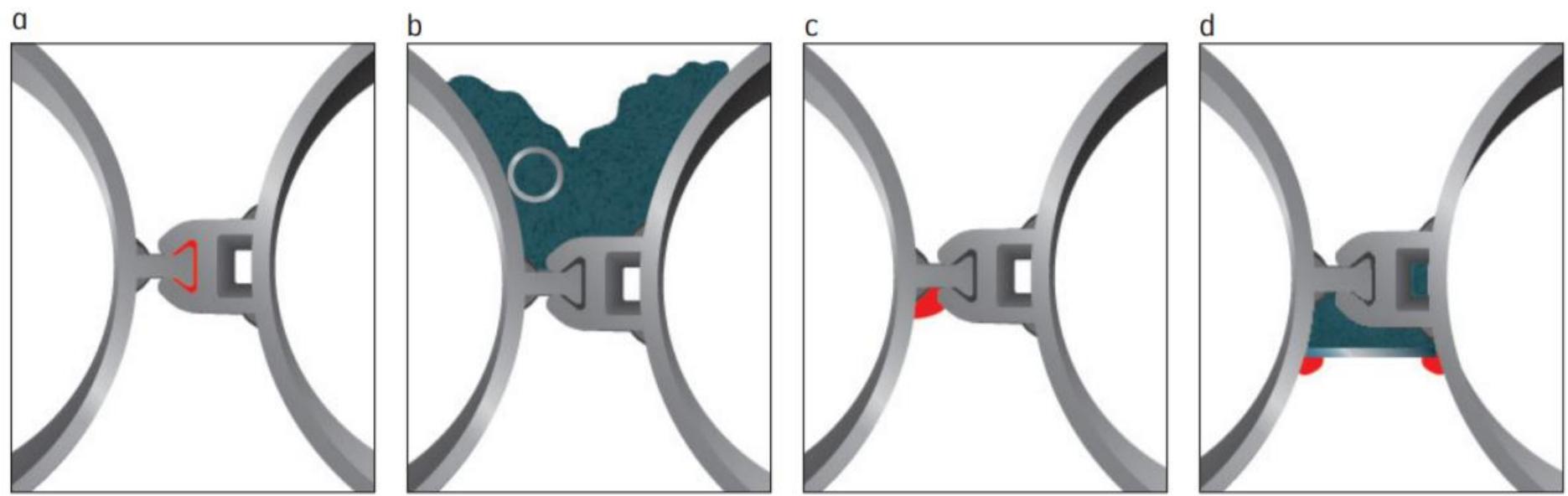


RM/RF splice



## Water tightness solutions

- ▶ a – sealing applicants in the lock
- ▶ b – grouting behind the RM/RF låsene
- ▶ c and d – welding of lock or steel plate in front of lock



# Pile wall; dimensions and steel quality

Pile	Diameter [mm]	Weight [kg/m]								
		10	12.5	14.2	16	18	20	21	22	23
<b>RD220</b>	<b>219.1</b>	51.6	63.7							
<b>RD270</b>	<b>273.0</b>	64.9	80.3							
<b>RD320</b>	<b>323.9</b>	77.4	96.0							
<b>RR400</b>	<b>406.4</b>	97.8	121.4							
<b>RR500</b>	<b>508.0</b>	122.8	152.7	172.9	194.1					
<b>RR600</b>	<b>610.0</b>	148.0	184.2	208.6	234.4	262.8				
<b>RR700</b>	<b>711.0</b>	172.9	215.3	244.0	274.2	307.6	340.8			
<b>RR800</b>	<b>813.0</b>	198.0	246.8	279.7	314.5	352.9	391.1	410.2	429.2	
<b>RR900</b>	<b>914.0</b>	222.9	277.9	315.1	354.3	397.7	440.9	462.5	484.0	
<b>RR1000</b>	<b>1016.0</b>	248.1	309.3	350.8	394.6	443.0	491.3	515.3	539.3	563.2
<b>RR1200</b>	<b>1220.0</b>	298.4	372.2	422.3	475.1	533.6	591.9	621.0	650.0	679.0

 Steel grades S440J2H and S550J2H  
 Steel grades S355J2H, S440J2H and S550J2H  
 Steel grades S355J2H and S440J2H





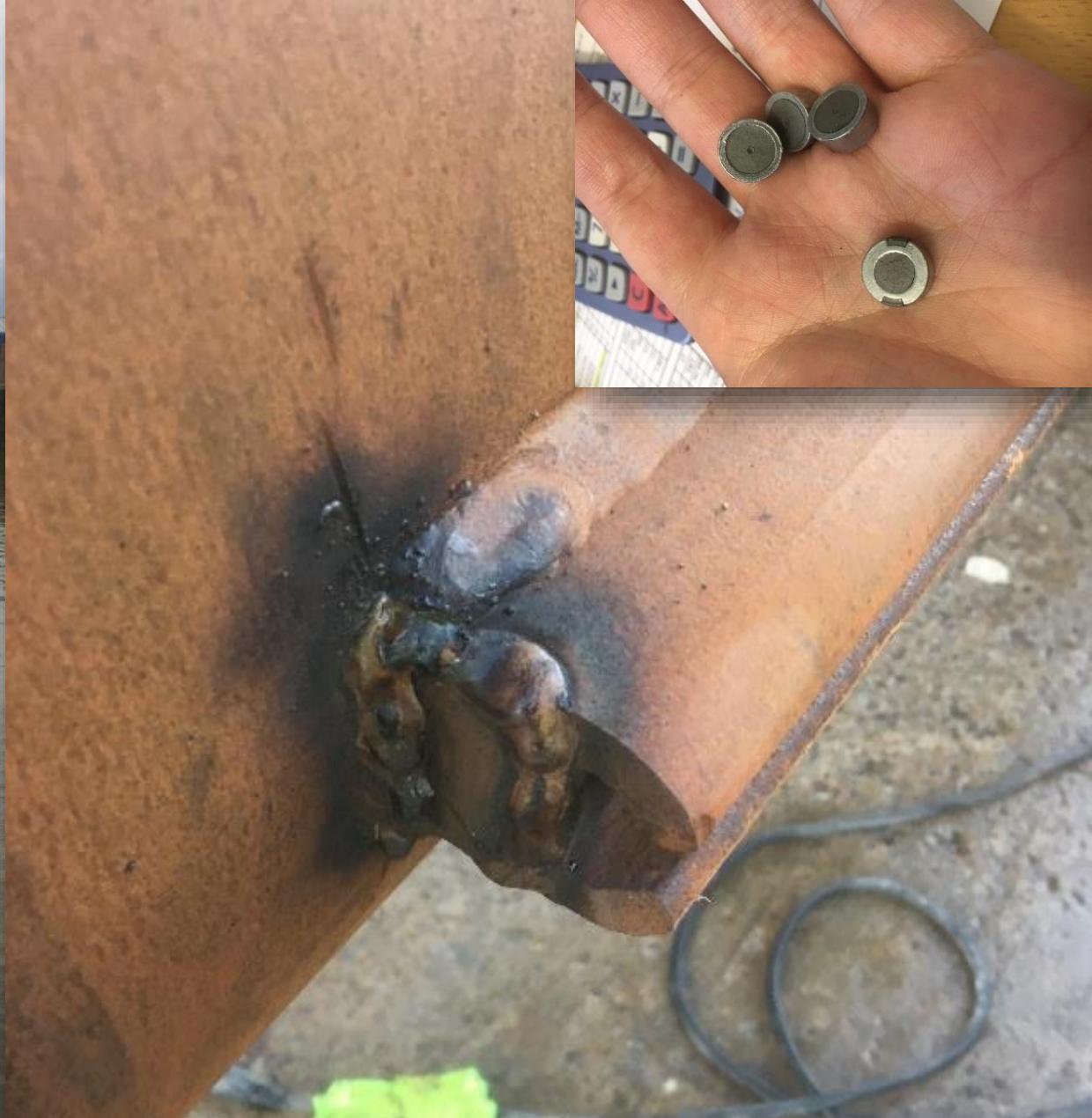
**E18 Bommestad, Larvik – RD Pile wall**



Euro Tank Terminal, Rotterdam, NL – Combi wall RR1220/14



Helsinki, Finland – circular RD pile wall



Peter Head, Scotland – RD Pile Wall, water front





Polluted ground, Bergen Norway – RD Pile Wall



**City Tram, Bergen Norway – RD Pile Wall**



Anchoring, Bergen Norway – RD Pile Wall



Pasila Tripla, Helsinki Finland – RD pile wall



# SSAB HIGH STRENGTH STEEL PILES SUSTAINABLE PRODUCT OFFER

## ENVIRONMENTAL BENEFITS WITH RRs® & RDs® - HIGH STRENGTH PILES

- Even **25% - 55% higher load-bearing capacity** with same pile dimensions. Higher loads with reduced amount of piles and less costs, also in retaining walls.
- Corresponding load-bearing capacity with smaller pile dimensions. **More economical piles and easy installation.**
- The **total energy consumption of the foundation is lower**. Environmental impacts of the manufacturing, handling, **transportation** and installation are reduced.

# Eksampel: Norways biggest RR® pile project



*Have not taken into account the  
timeuse and logistics on site*

*Scrap and waste!*

*Steel is 100% recyclable!*

Dimension	Capacity (kN)
RRs170/10	1450
RR170/12,5	1549
P270MA	1532

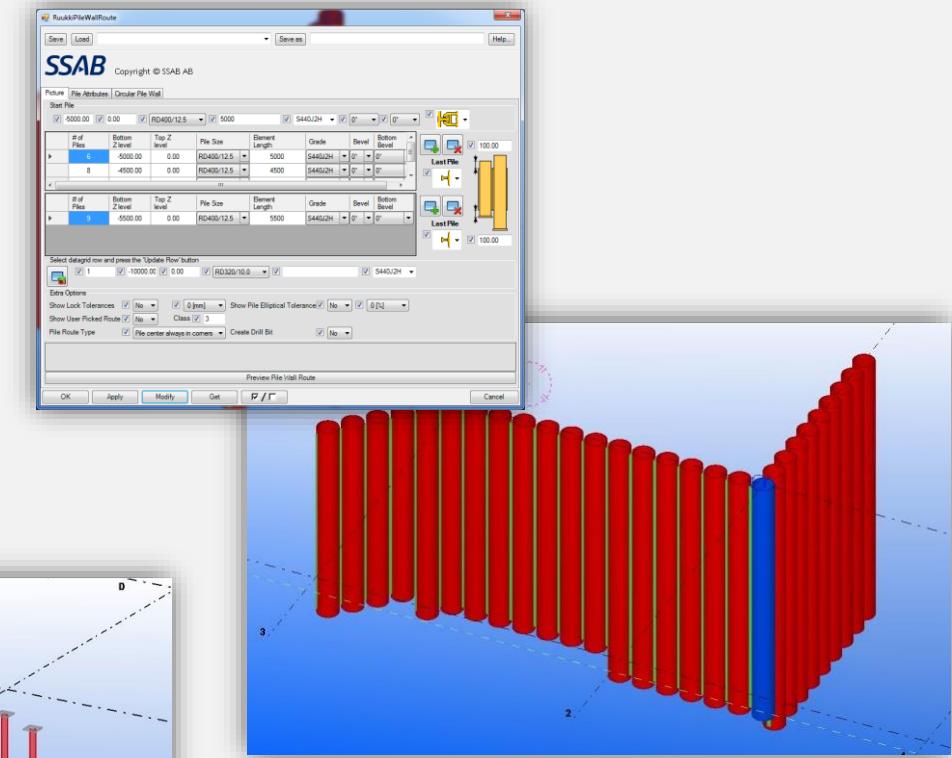
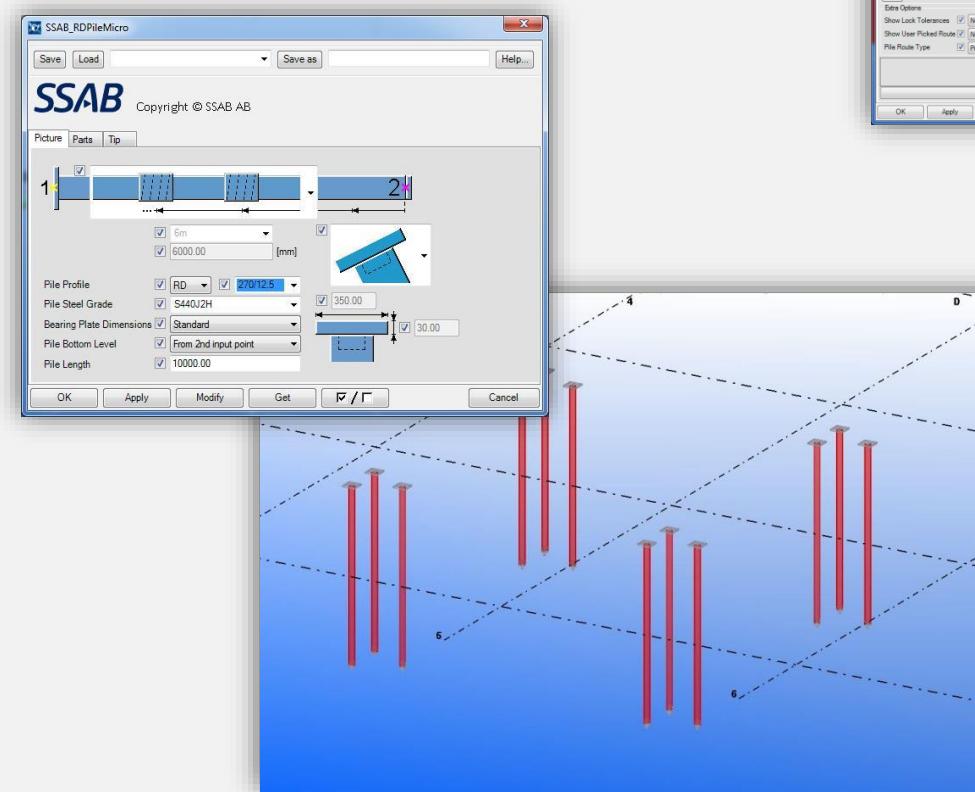
<b>Savings 550 vs. 440</b>	
Steel	320 ton
Trucks	11 pcs.

<b>Savings 550 vs. concrete</b>	
Weight	5375 ton
Trucks	192 pcs.

# Tekla and Revit components

## ► Premade components

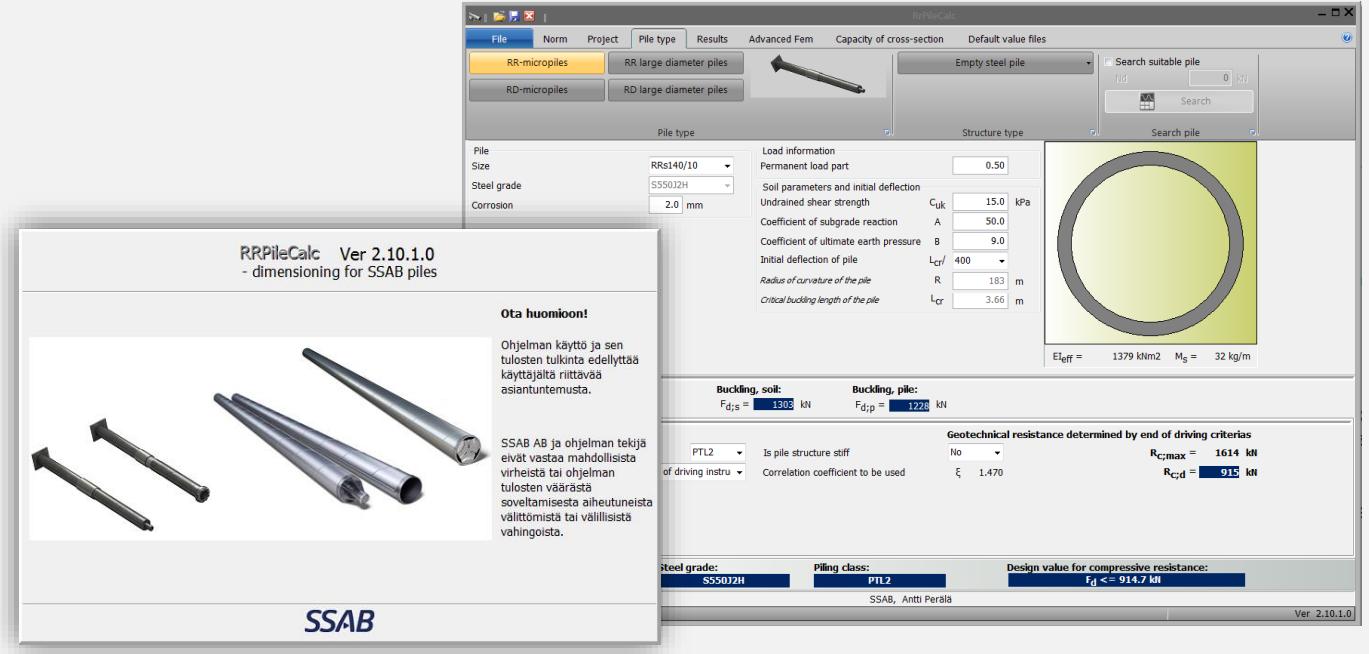
- Micro piles and large diameter piles
- RD pile wall



► Free download at:  
[warehouse.tekla.com](http://warehouse.tekla.com)  
[www.ssab.com/infra](http://www.ssab.com/infra)

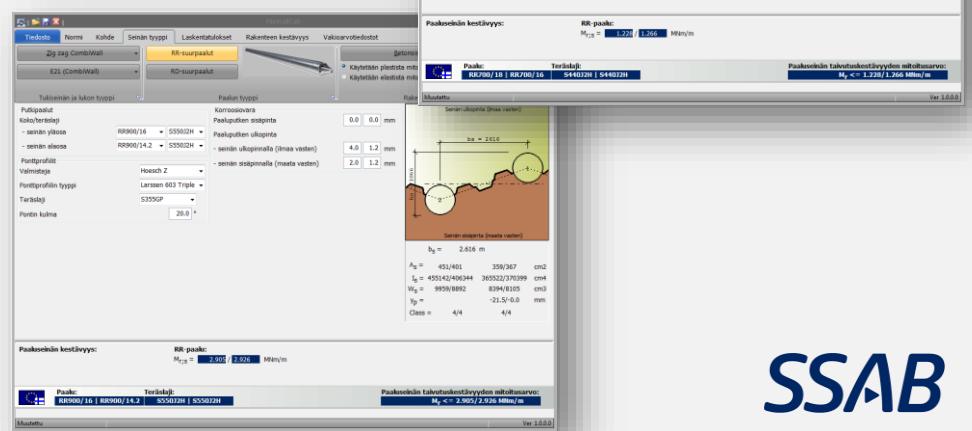
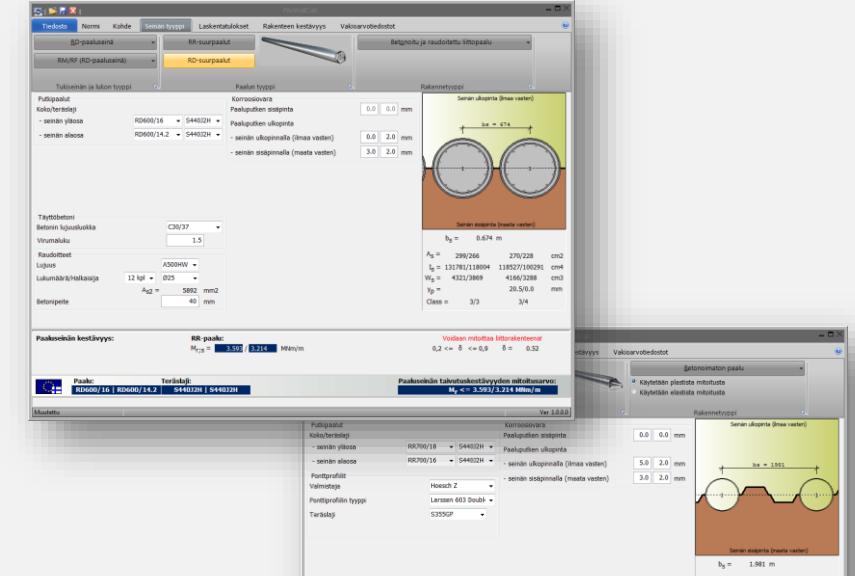
# RRPileCalc

- ▶ Design software for end bearing piles
- ▶ Based on Eurokodes and national annexes and regulations
  - EN 1992
  - EN 1993
  - EN 1994
  - EN 1997
  - PO-2016
  - PV2019
- ▶ Dagens versjon 3.4.1.0



# PileWallCalc

- ▶ Design software
  - RD pile wall
  - Combi wall
  - Zig-Zag combi wall
- ▶ Calculates bending resistance
  - Elastisk / Plastisk
  - Steel structures / Composit structures
  - With reinforcement / Inner pipe
- ▶ According to
  - EN standard and national annexes



## SSAB INFRA technical support

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► [www.ssab.com/infra](http://www.ssab.com/infra)

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