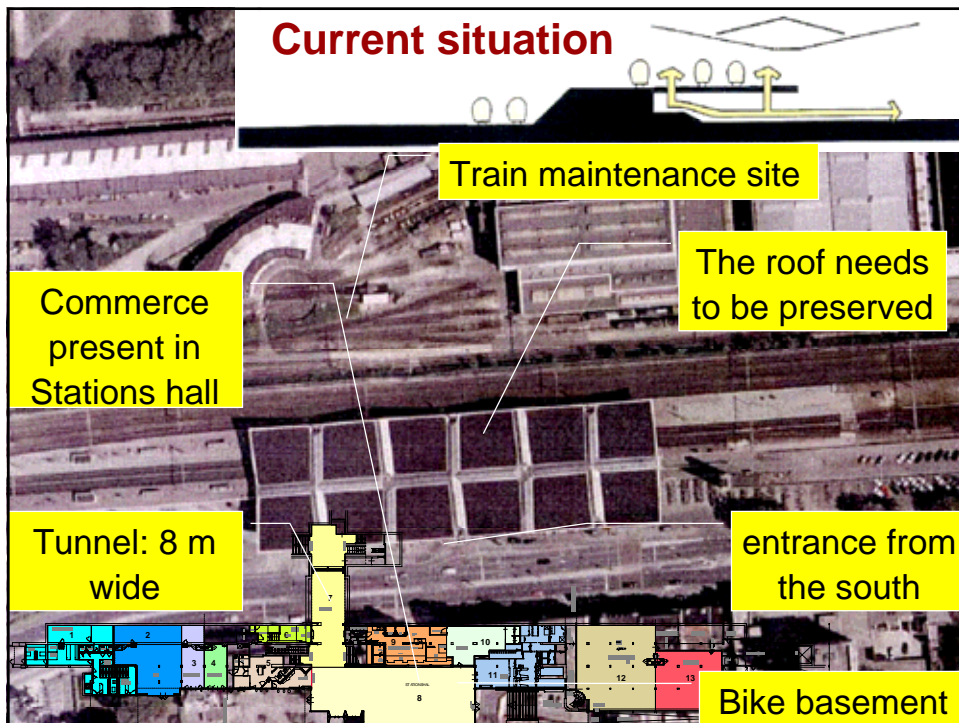


CSVA conference
Toronto, October 24 2006
Timme Hendriksen, CVS



Railway station Tilburg

Case Study ProRail



Project Goals

ProRail

ProRail initiative:

1. Increase transfer capacity of the tunnel and its stairs and elevators
2. Upgrade bike shed and basement (Quantity & Quality)

Additional ambitions of the City of Tilburg:

3. Allow a future passage to the North site (north) due to future development plans there
4. Upgrade the passage to a quality axis which fits in the future environment
5. Link the passage's walking routes with the city centre

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Project history

ProRail

- ProRail has stated that it needs a tunnel of 11,2 m wide to solve the transfer problem
- The local council wished tunnel of 100 m wide!
- Brought back to 24 m
- Despite the fact that Tilburg could hitch hike with the project, they had to pay the largest part



VE study Goals

- Basic assumptions were dated
- Review functions and assumptions
- Find alternatives which provide the necessary functions and performance against lower costs



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VE team

- Representative Railway stations and commerce
- Project leader Engineering firm
- Project manager ProRail
- Local council representatives
(Urban development)
- Cost Engineer
- Designers
(Civil engineer)
- Architect



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VE Study set-up

- design stage: 20%
- 2- day study (till the Development phase)
- Incl. Site visit



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- Meanwhile:
 - Designer finishes the proposals
 - Excursion to other Railway stations
- Half a day Closing session:
 - Present proposals
 - Discuss proposals
 - Evaluate proposals
 - Agree on how to continue
 - Evaluate VE study

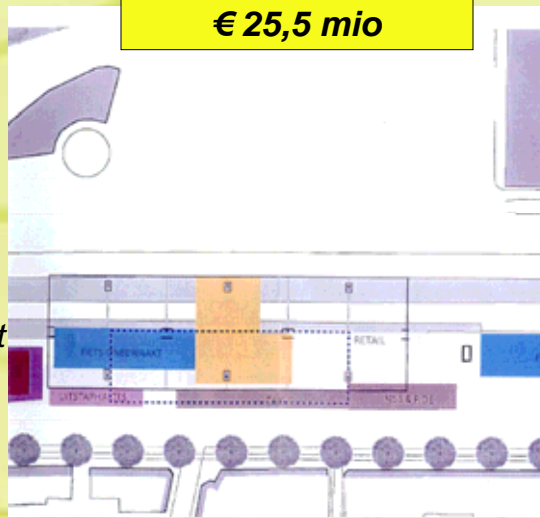
7

Baseline design

- Tunnel constructed in situ from the south
- Temporarily measures during construction for existing commerce
- Right through the supports of the Roof
- 24 m wide with support pillars in the centre
- Height: 3,2 meter.

ProRail

**Construction costs:
€ 25,5 mio**

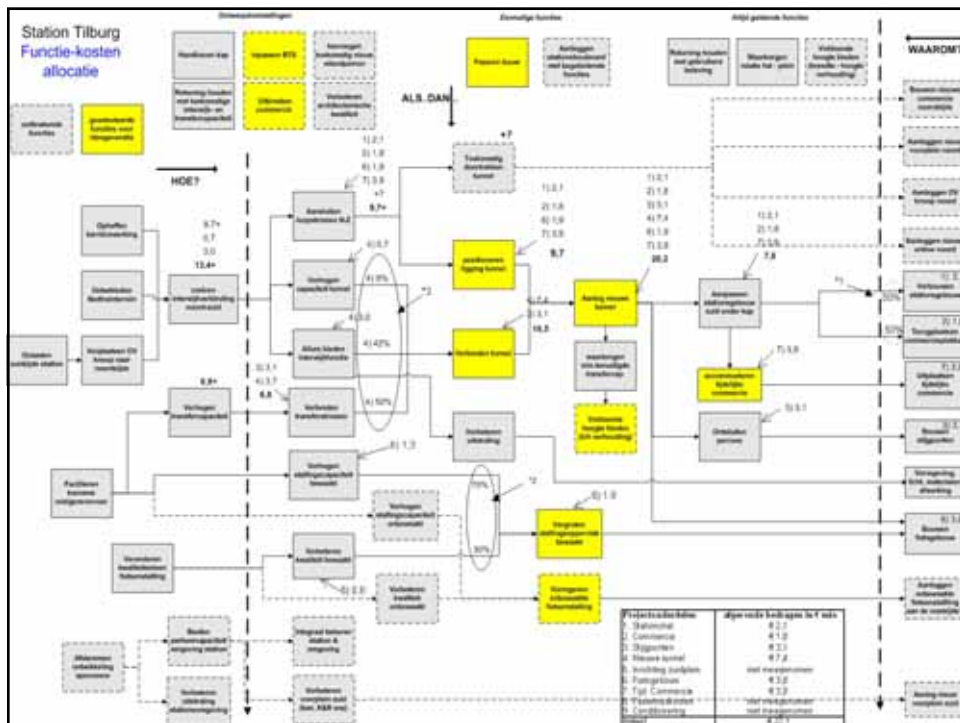
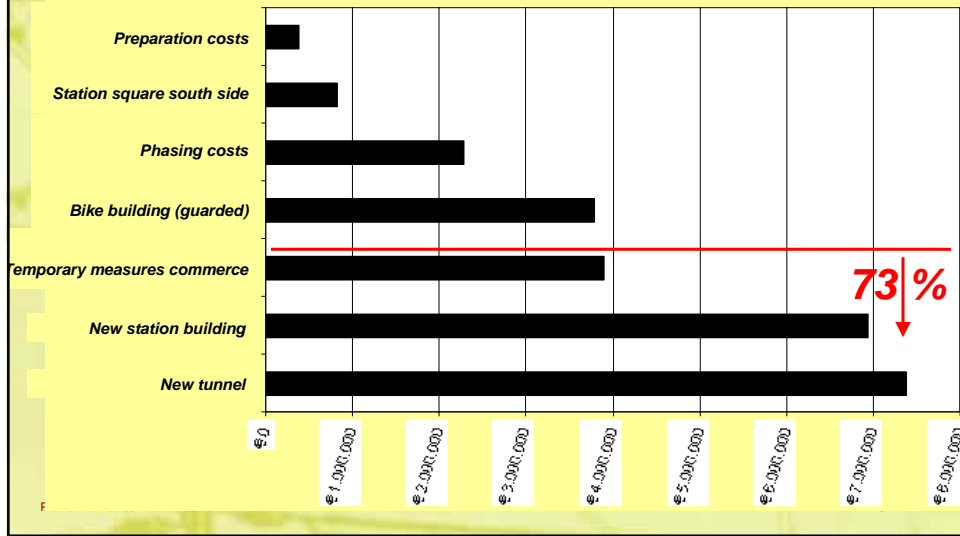


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Pareto analysis

ProRail

Cost Chart



Proposal Evaluation		Proposal description	Evaluation in comparison to the baseline design							
			User perception	Environmental quality	Functional quality	Commercial quality	future fit	Maintainability	Constructability	Estimate cost consequences construction cost (in %)
ProRail - ambitions in railinfra	Plan									
	1	Pre construct and slide from the north, 24 -26 m wide, height 3,2 m, cross tracks with a right angle	Yellow	Yellow	Yellow	Green	Yellow	Yellow	Green	-34%
	2	Pre construct and slide from the north, 24 -26 m wide, height 2,59 m, cross tracks with a right angle	Red	Yellow	Yellow	Green	Yellow	Yellow	Green	-36%
	3	Pre construct and slide from the north, 15 - 17 m wide, height 3,2 m, cross tracks with a right angle	Orange	Yellow	Yellow	Green	Yellow	Yellow	Green	-49%
	4	Pre construct and slide from the north, 18 - 20 m wide, height 3,2 m, cross tracks with an angle in the direction of the Spoorlaan	Yellow	Green	Yellow	Green	Yellow	Yellow	Green	-42%
	5	Pre construct and slide from the north, 18 - 20 m wide, height 2,59 m, cross tracks with an angle in the direction of the Spoorlaan	Red	Yellow	Yellow	Green	Yellow	Yellow	Green	-43%
	6	Pre construct and slide from the south, 15 - 17 m wide, height 3,2 m, cross tracks with a right angle	Orange	Yellow	Yellow	Green	Yellow	Yellow	Green	-33%
	7	Pre construct and slide from the south 18 - 20 m wide, height 3,2 m, cross tracks with an angle in the direction of the Spoorlaan	Red	Yellow	Yellow	Green	Yellow	Yellow	Green	-23%
	8	Pre construct and slide from the north, 15 - 17 m wide, height 2,59 m, cross tracks with a right angle	Red	Yellow	Yellow	Green	Yellow	Yellow	Green	-33%
9	Pre construct and slide from the south 18 - 20 m wide, height 2,59 m, cross tracks with an angle in the direction of towards city centre	Red	Yellow	Yellow	Green	Yellow	Yellow	Green	-23%	

Best proposal: plan 4

- Build and slide from north
- Crosses the tracks with angle
- Width: 18 - 20 m
- Height: 3,2 m
- Good connection City centre
- Outside Roof supports
- €8,6 mio less (- 34%)
- whole tunnel: €5,9 mio less (- 23%) than half the tunnel in baseline design

ProRail

