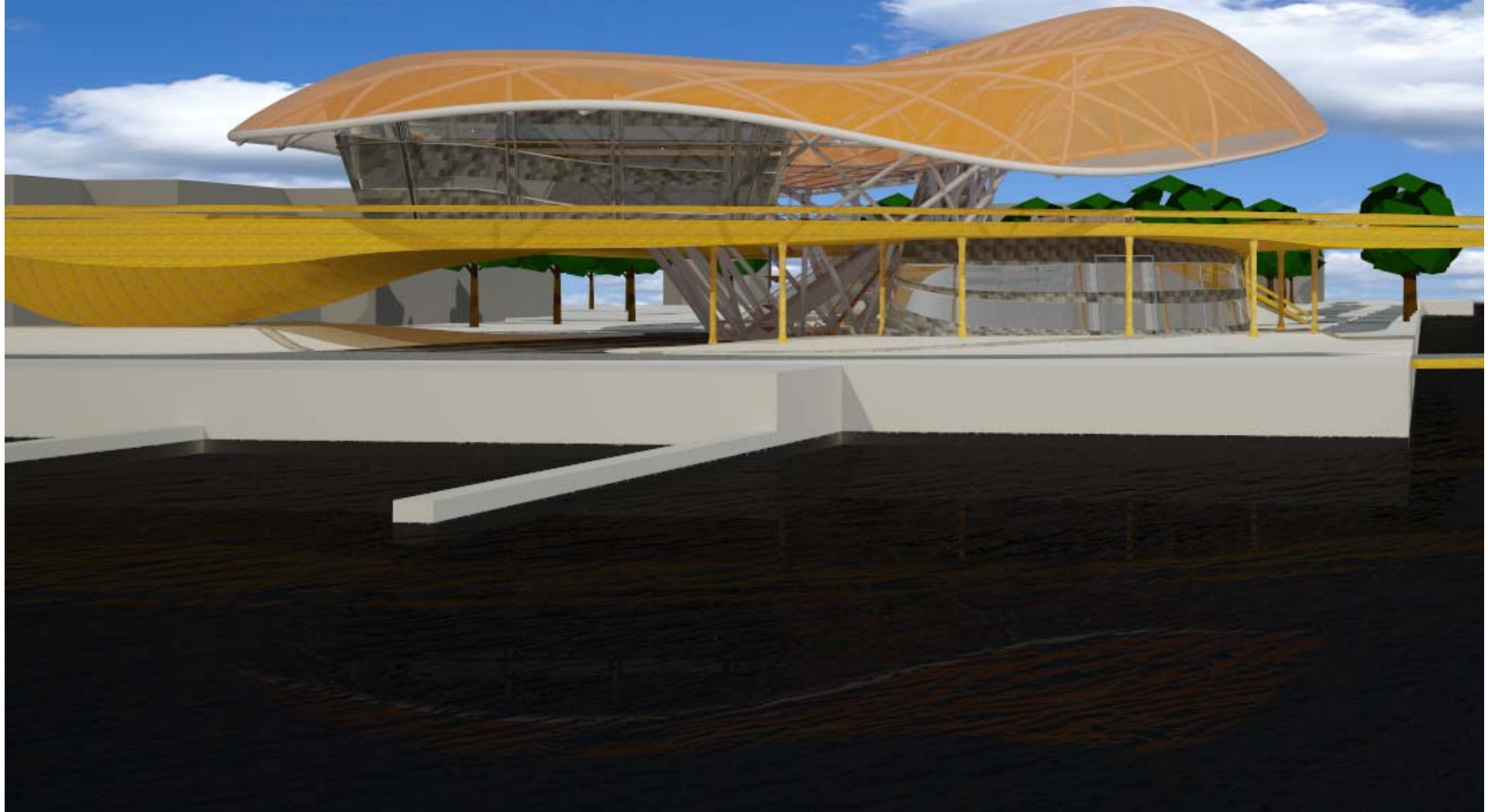


TRANSFERIUM AMSTERDAM NOORD

Mirre Veerman



AMSTERDAM NOORD



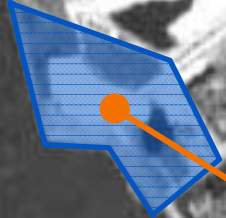
Locatie

AMSTERDAM NOORD



Locatie

AMSTERDAM NOORD



Locatie

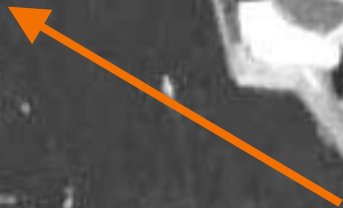


AMSTERDAM NOORD



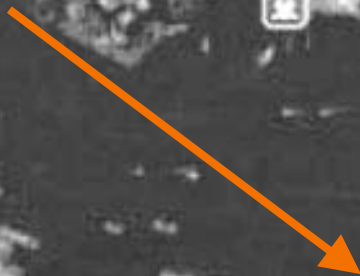
Locatie

AMSTERDAM NOORD



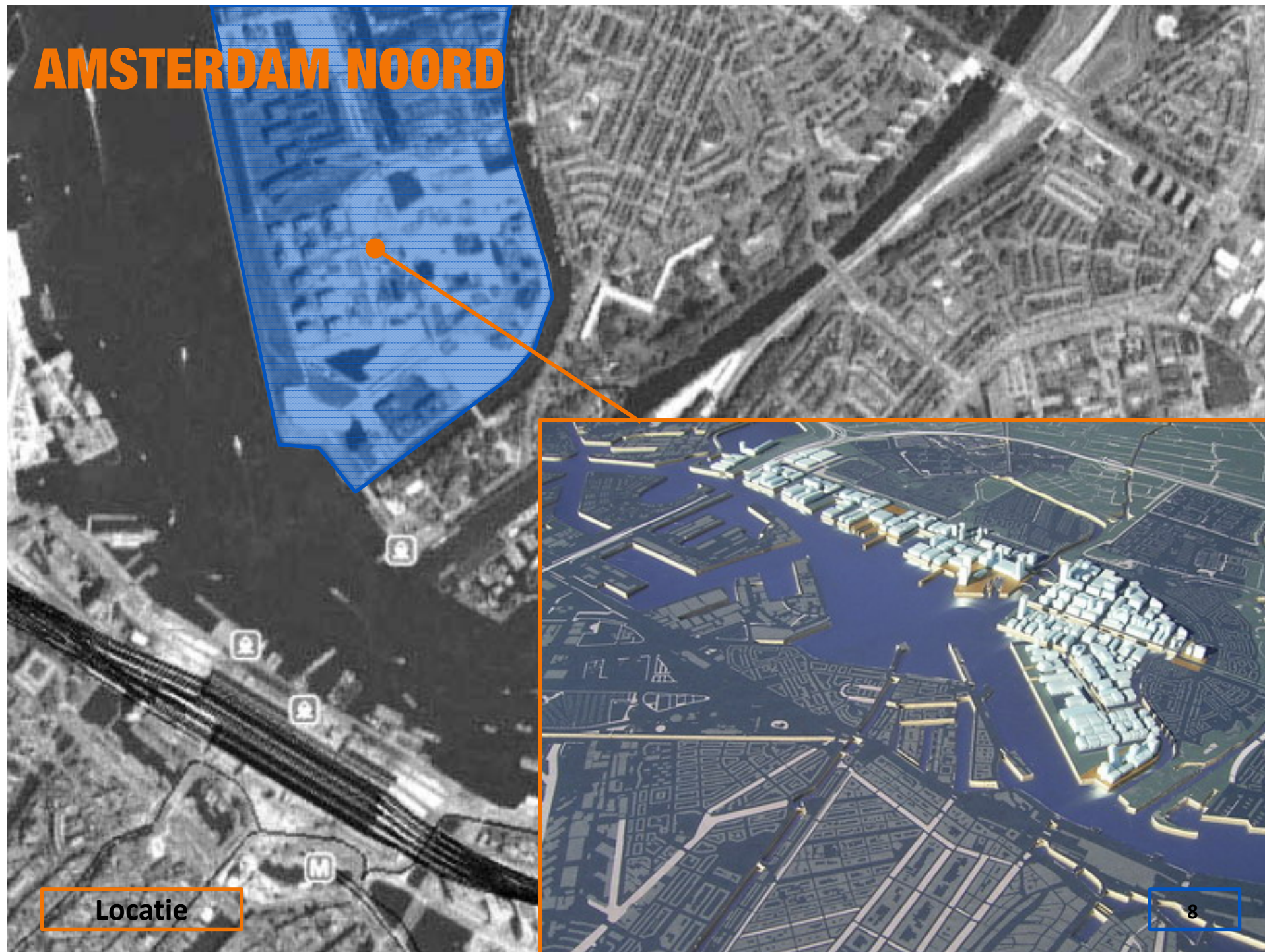
Locatie

AMSTERDAM NOORD



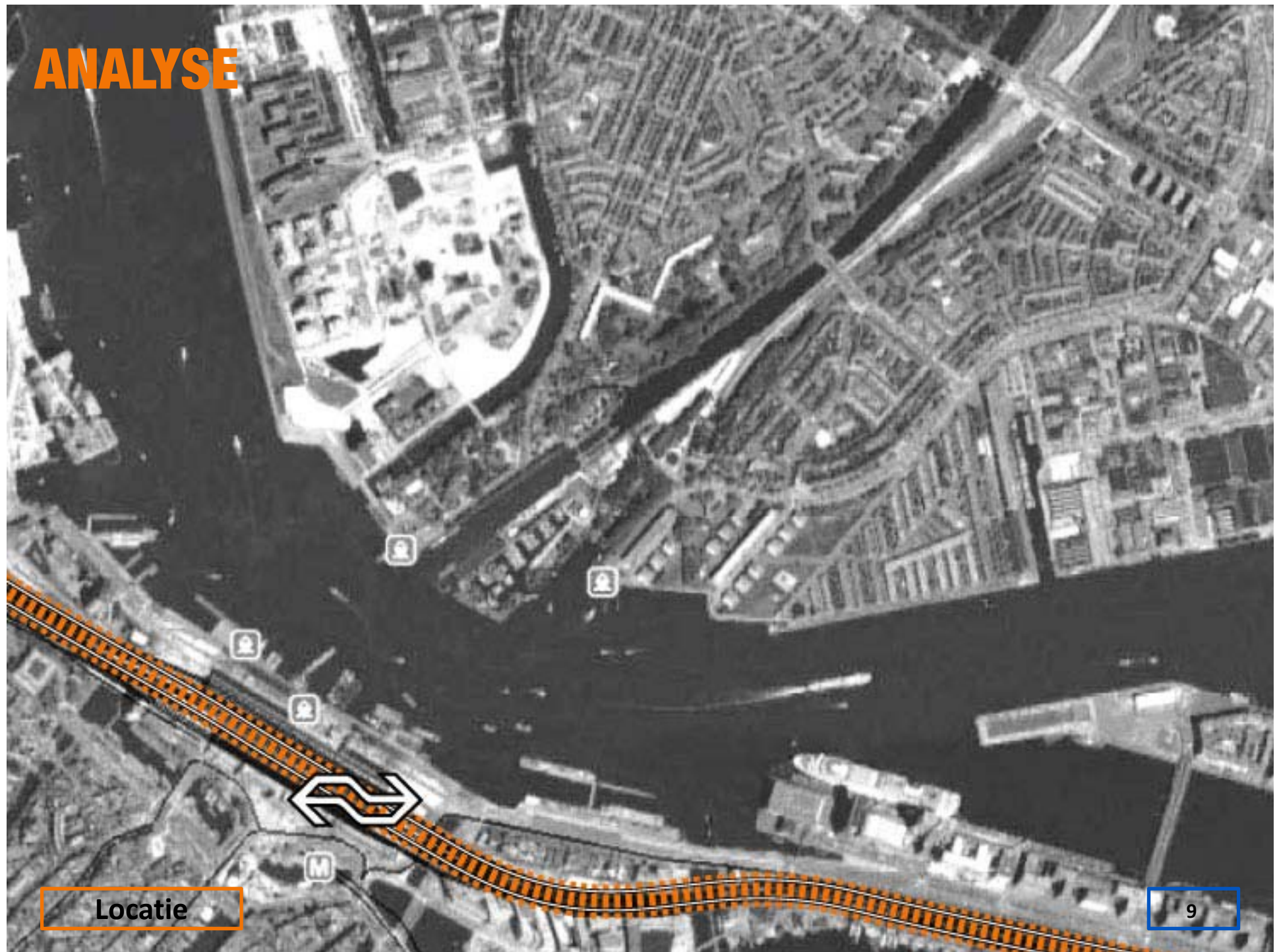
Locatie

AMSTERDAM NOORD



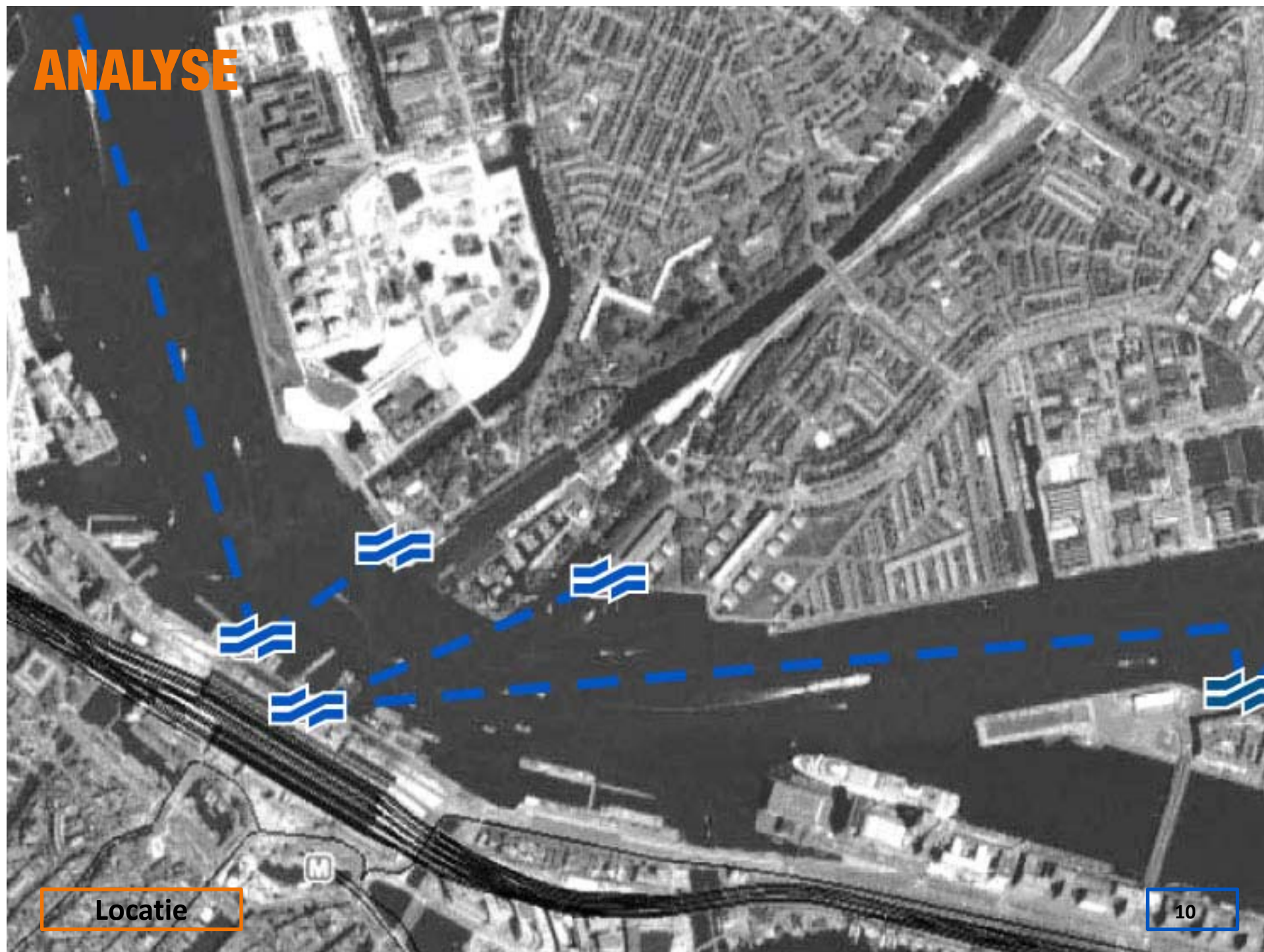
Locatie

ANALYSE



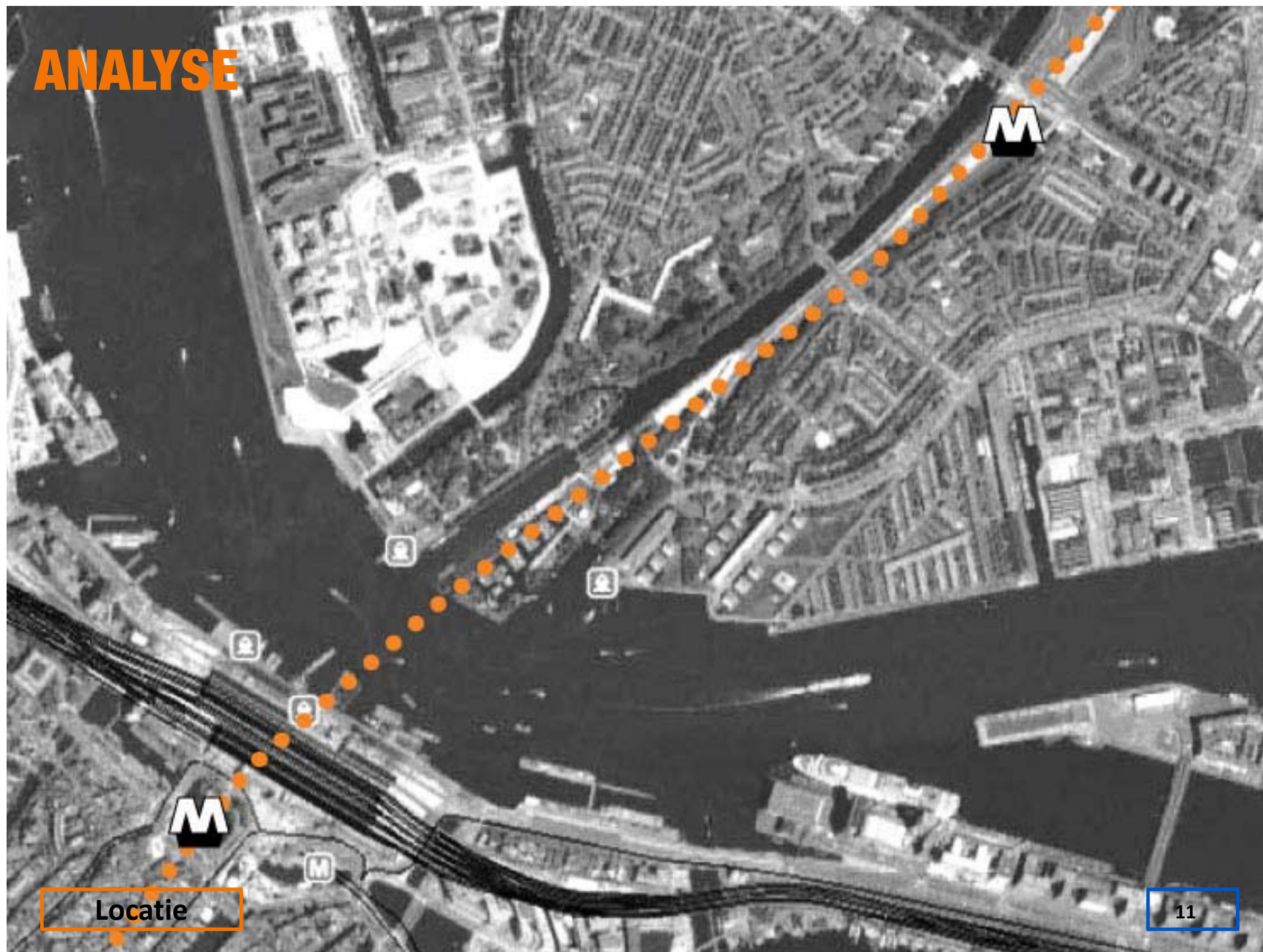
Locatie

ANALYSE



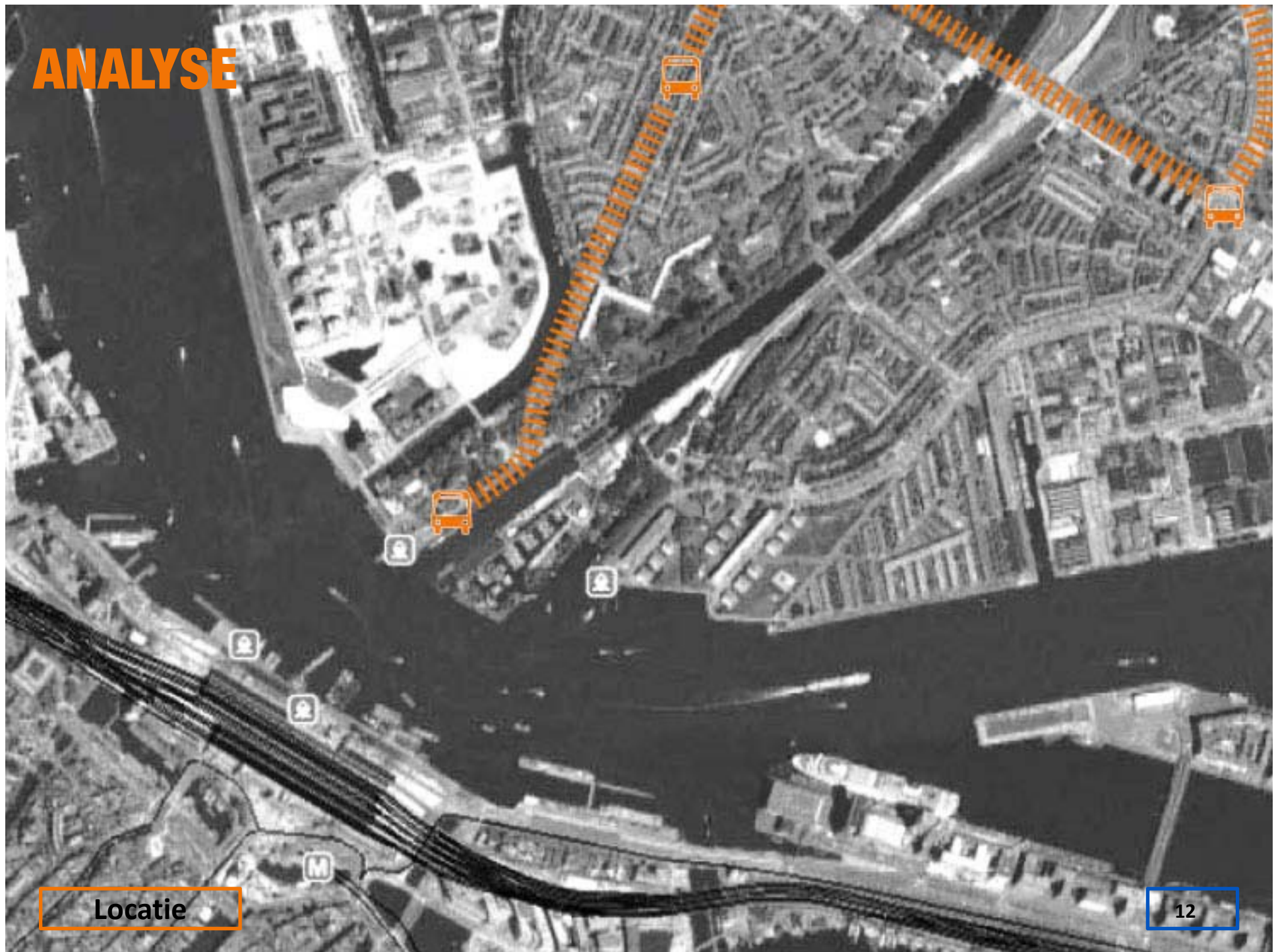
Locatie

ANALYSE



Locatie

ANALYSE



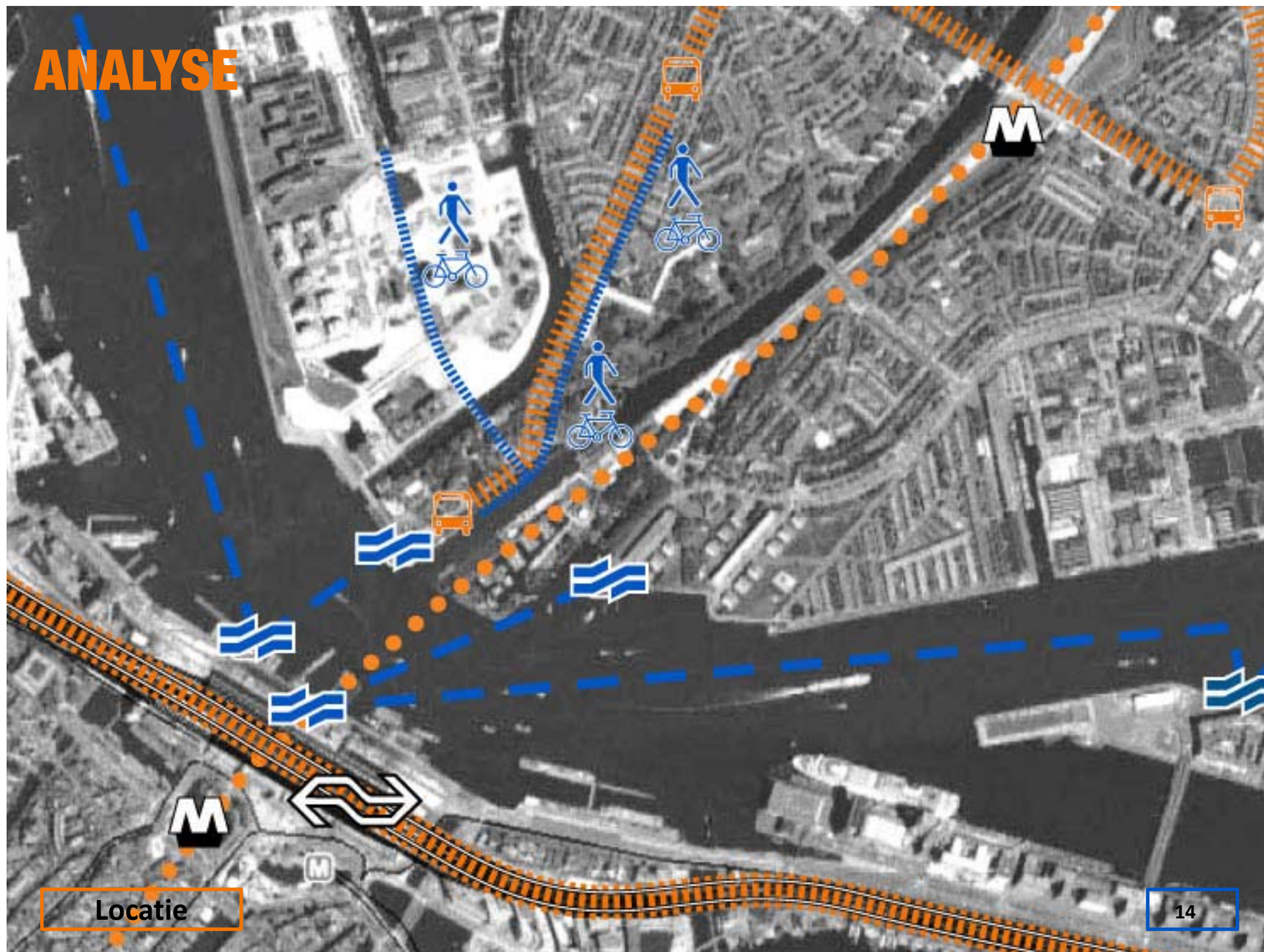
Locatie

ANALYSE



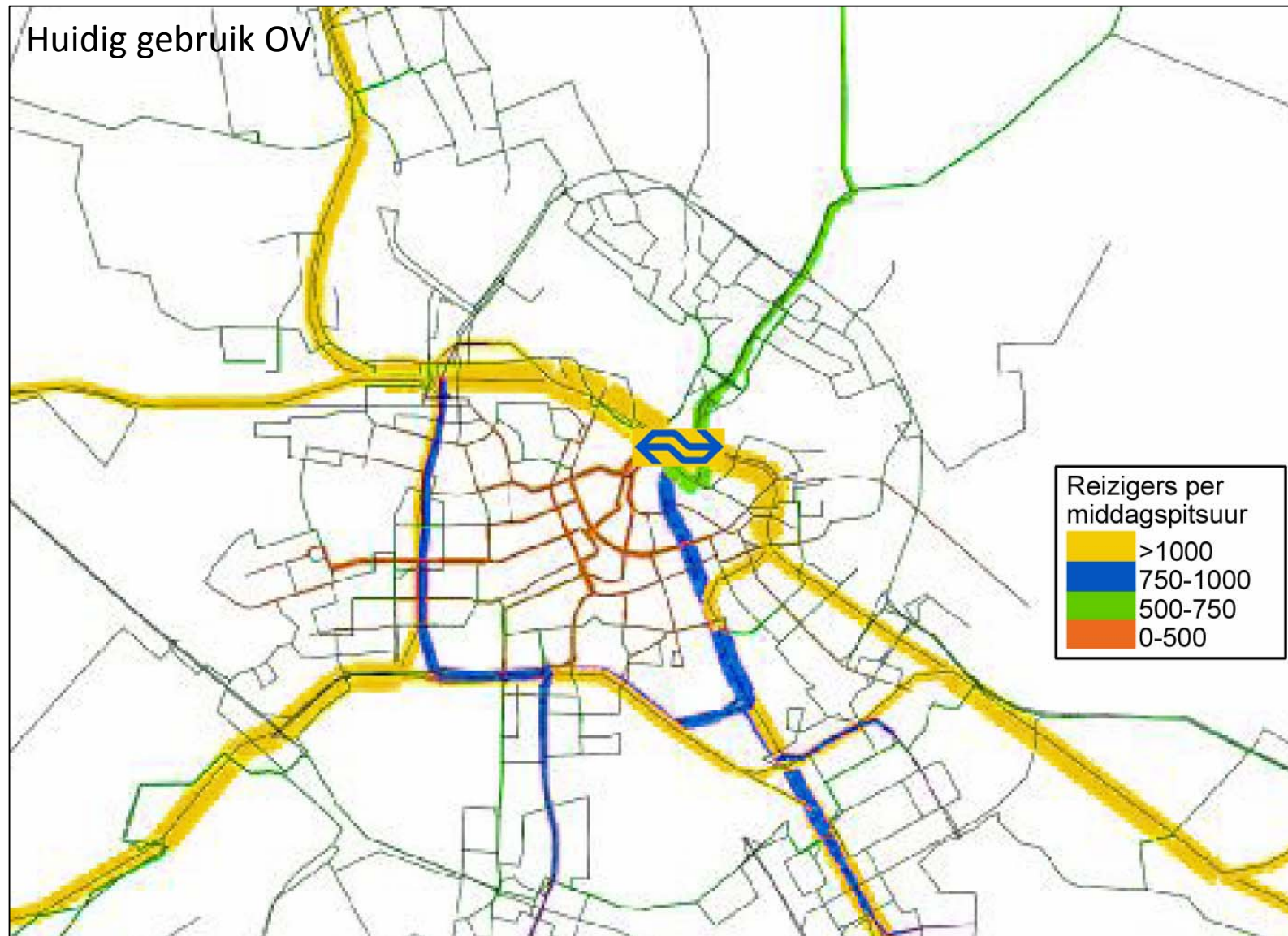
Locatie

ANALYSE



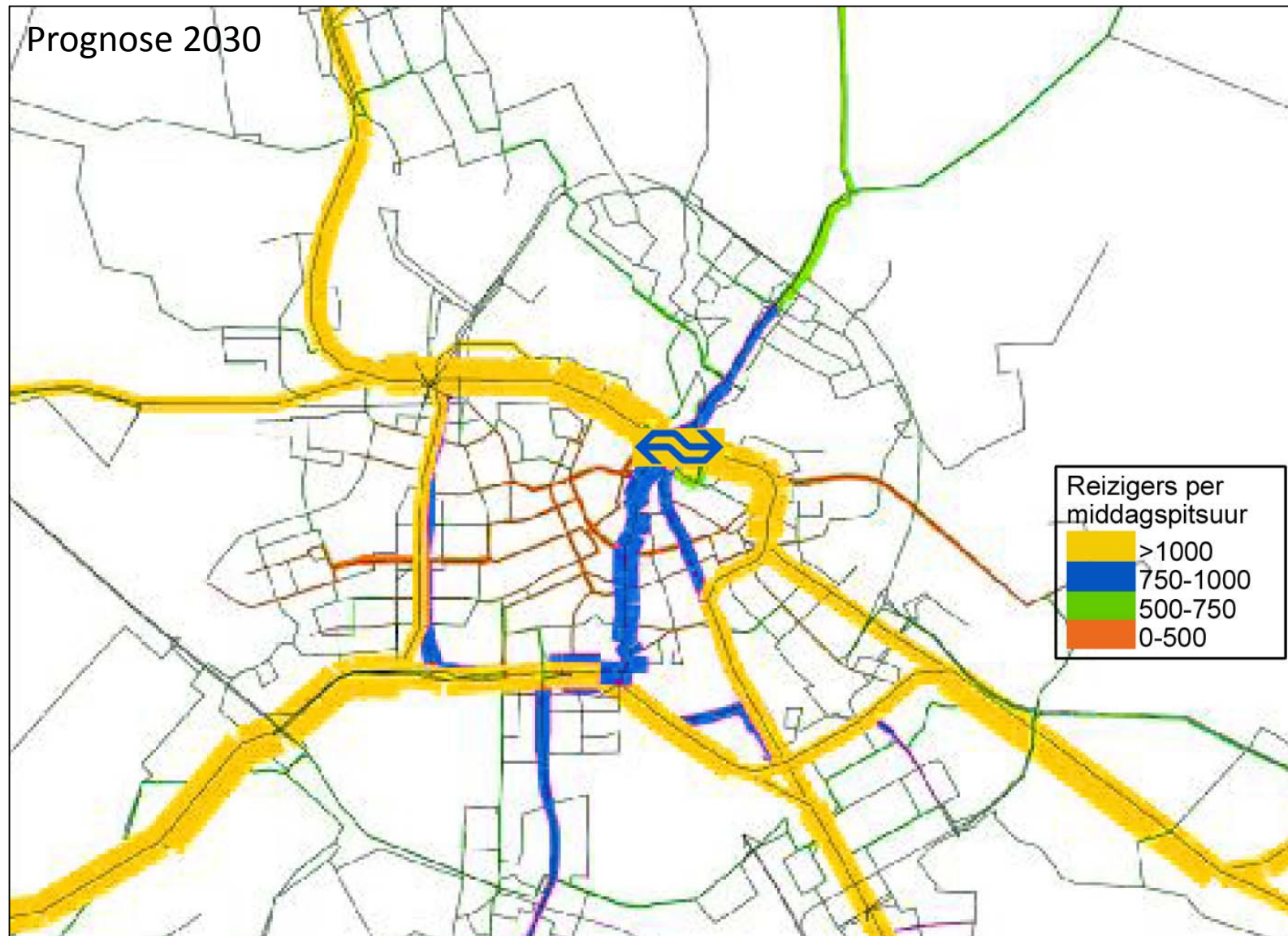
Locatie

ANALYSE



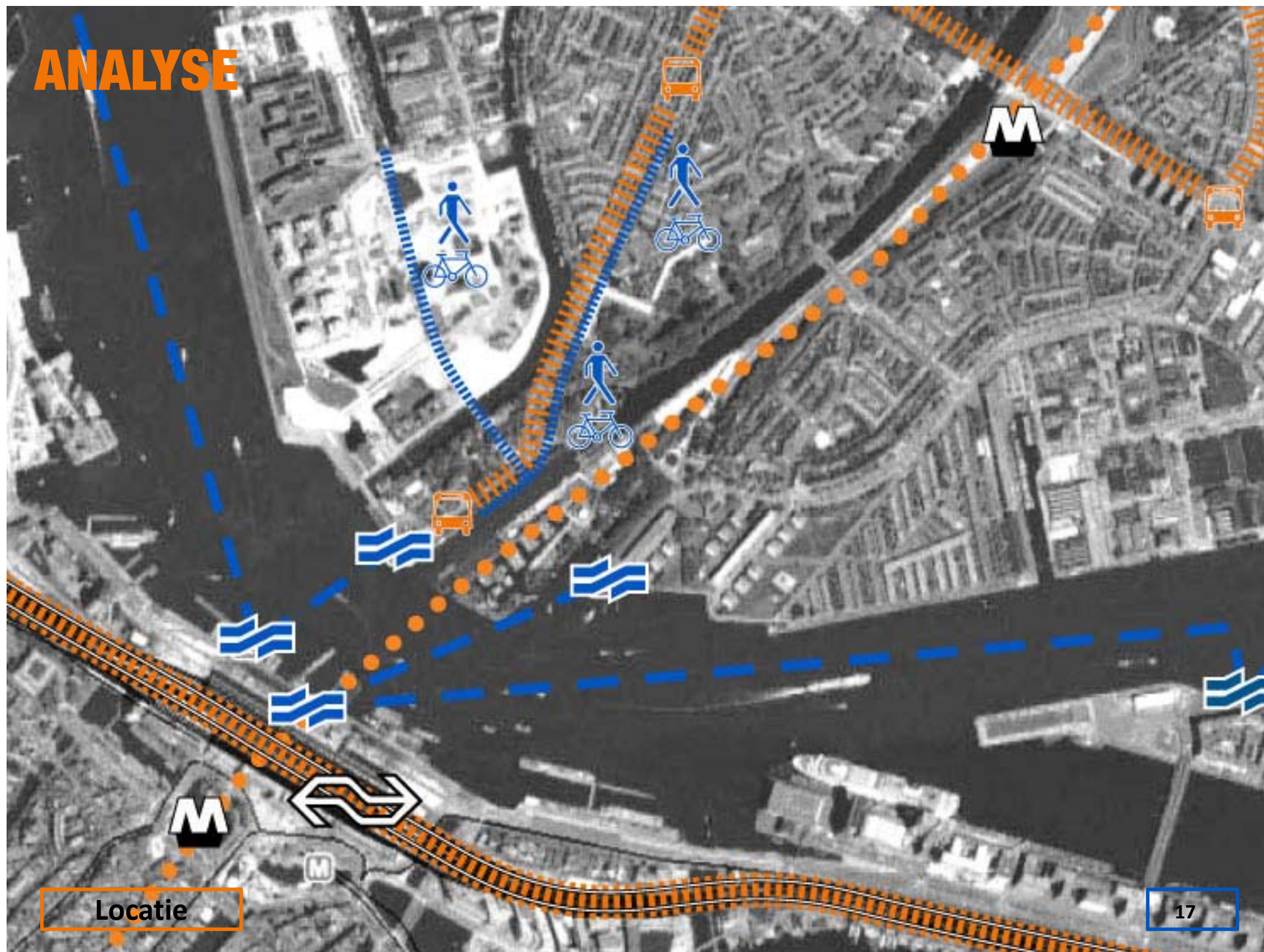
Locatie

ANALYSE



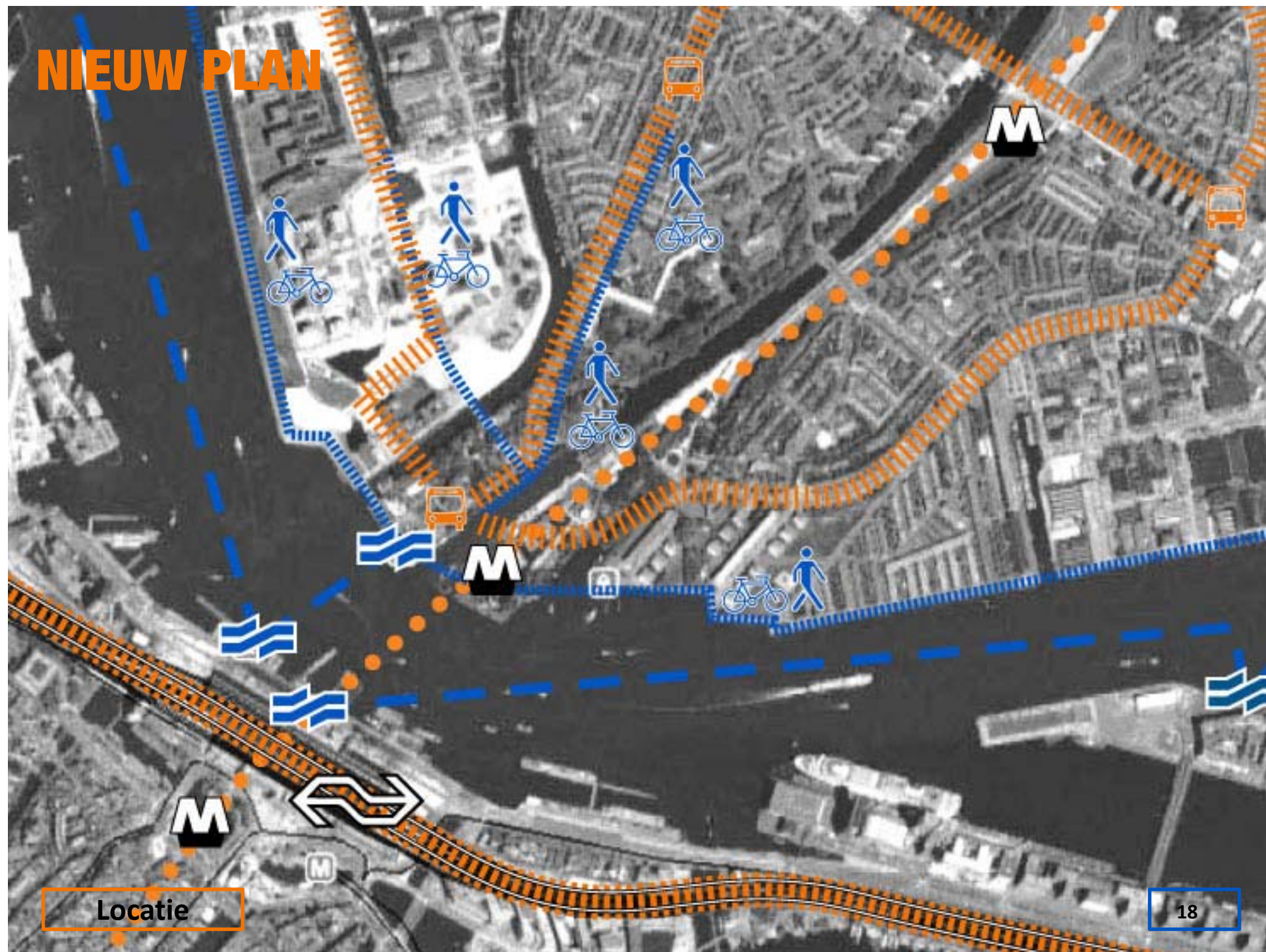
Locatie

ANALYSE



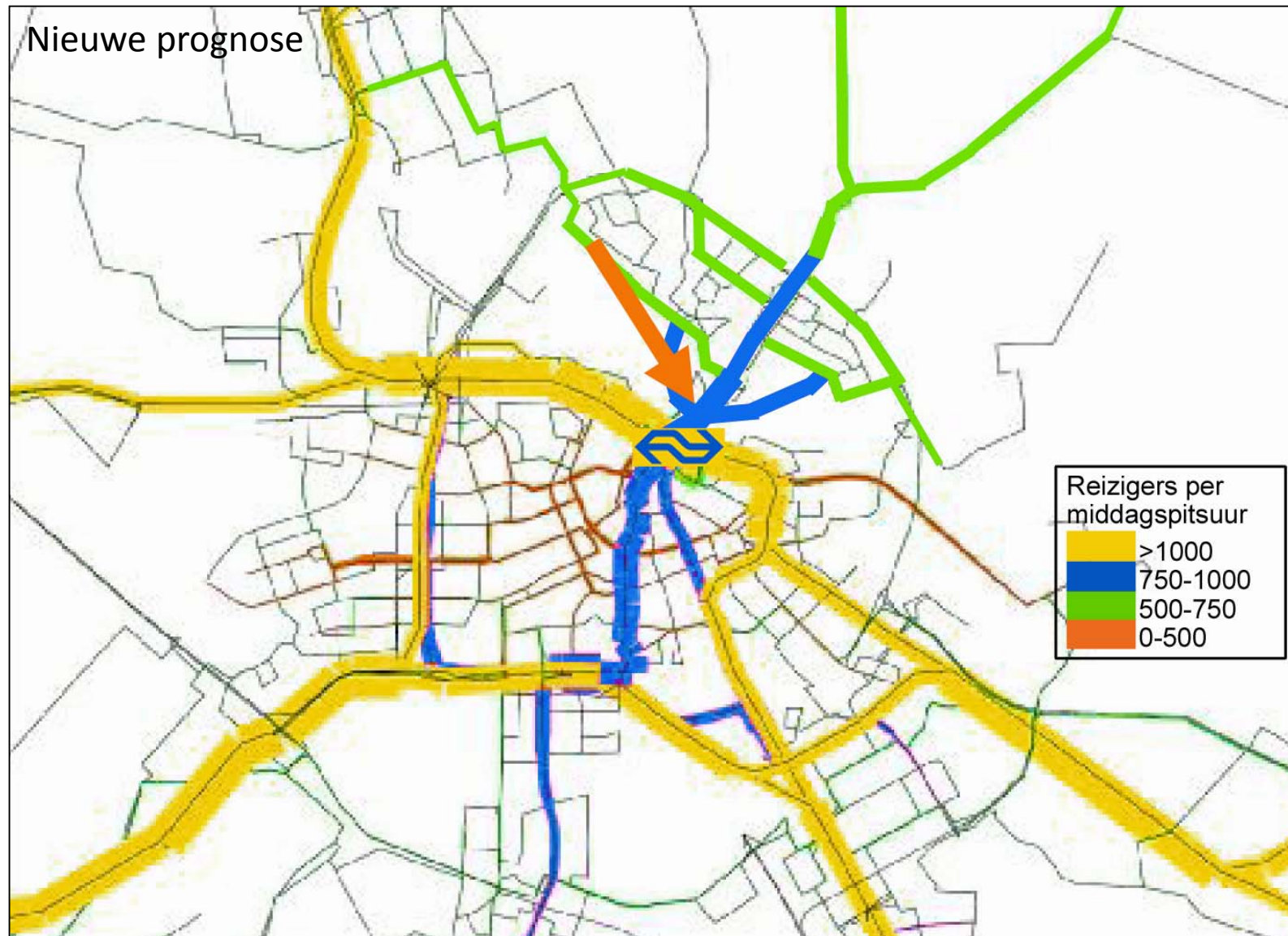
Locatie

NIEUW PLAN



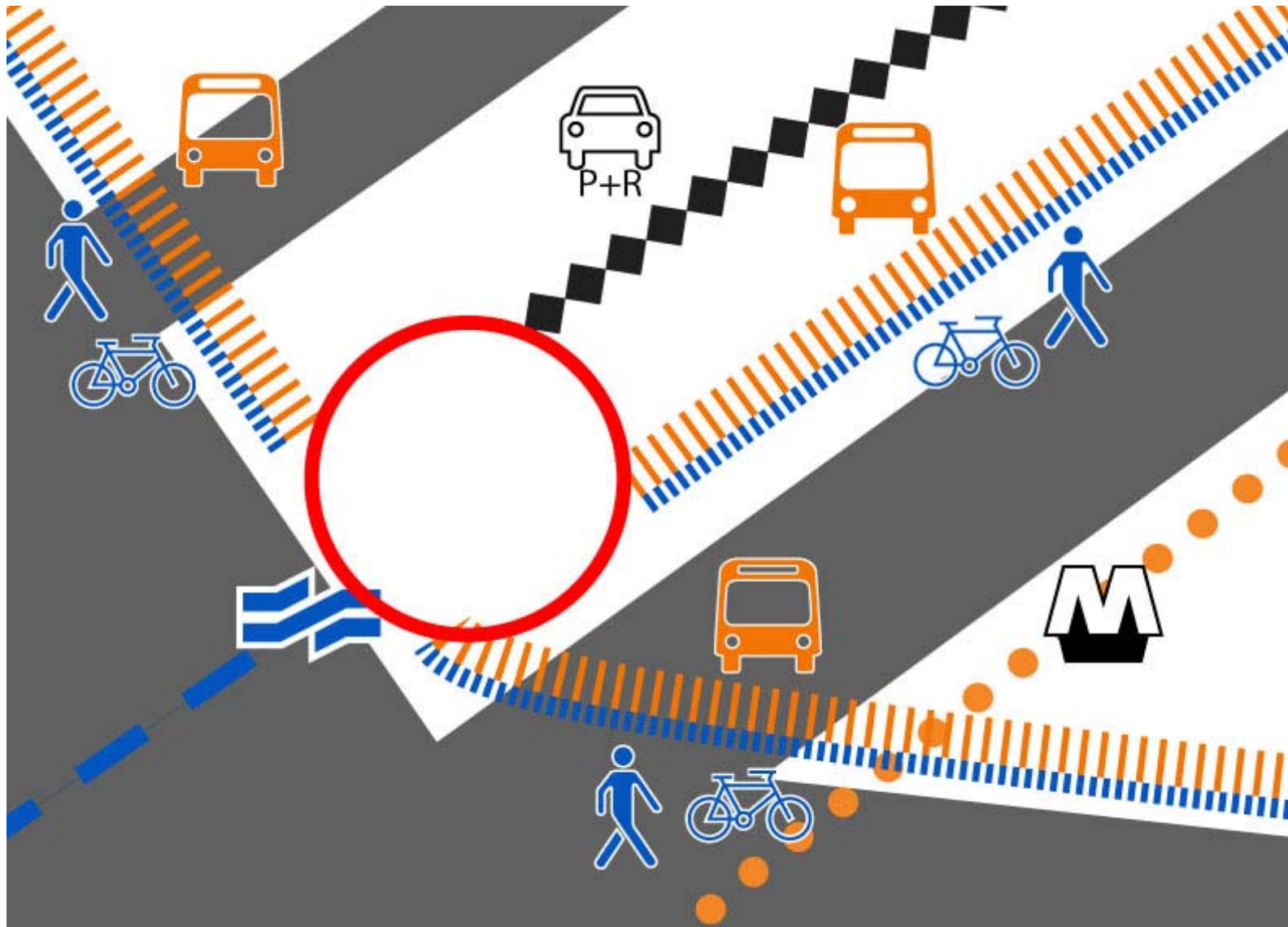
Locatie

NIEUW PLAN



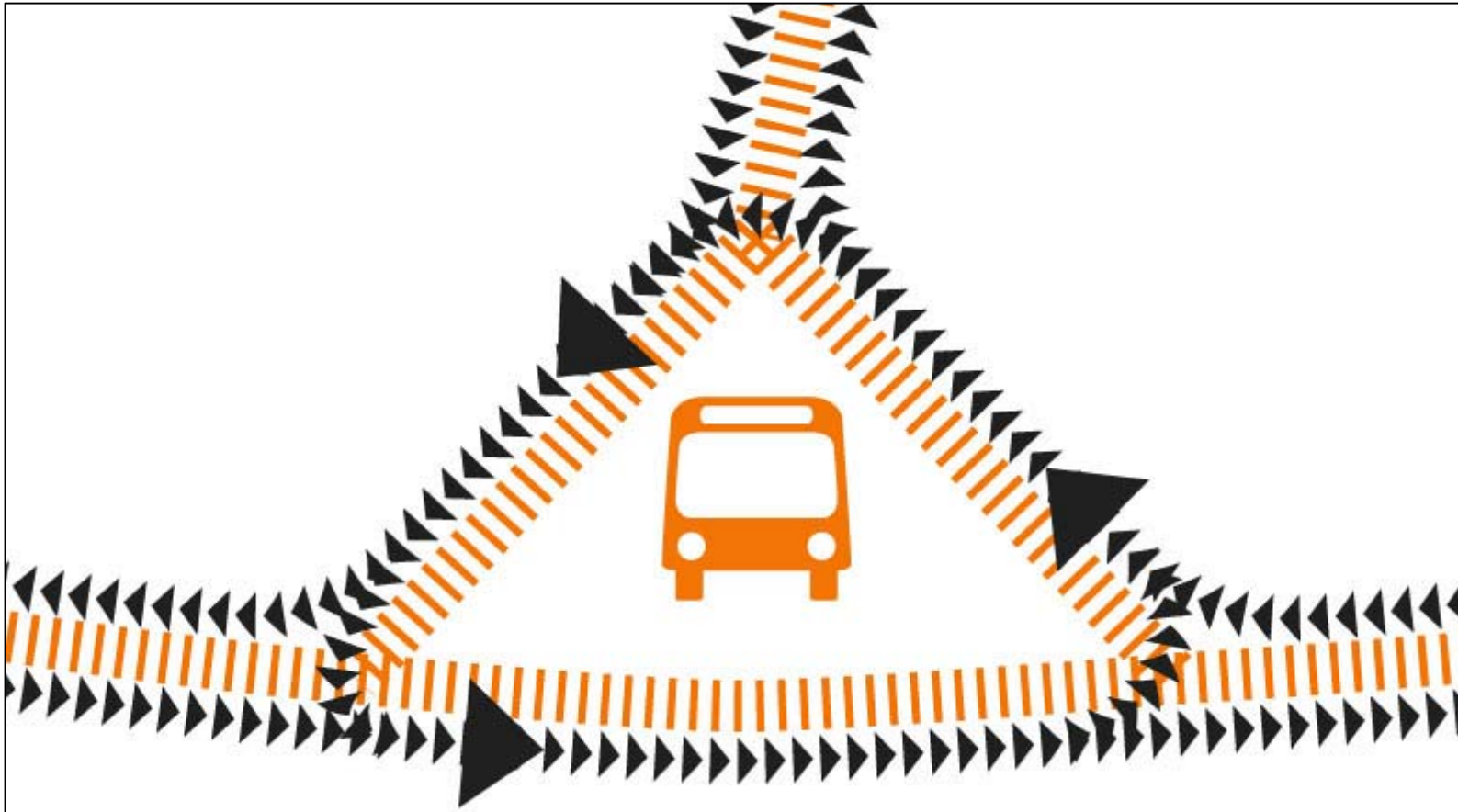
Locatie

VERKEERSTROMEN LOCATIE



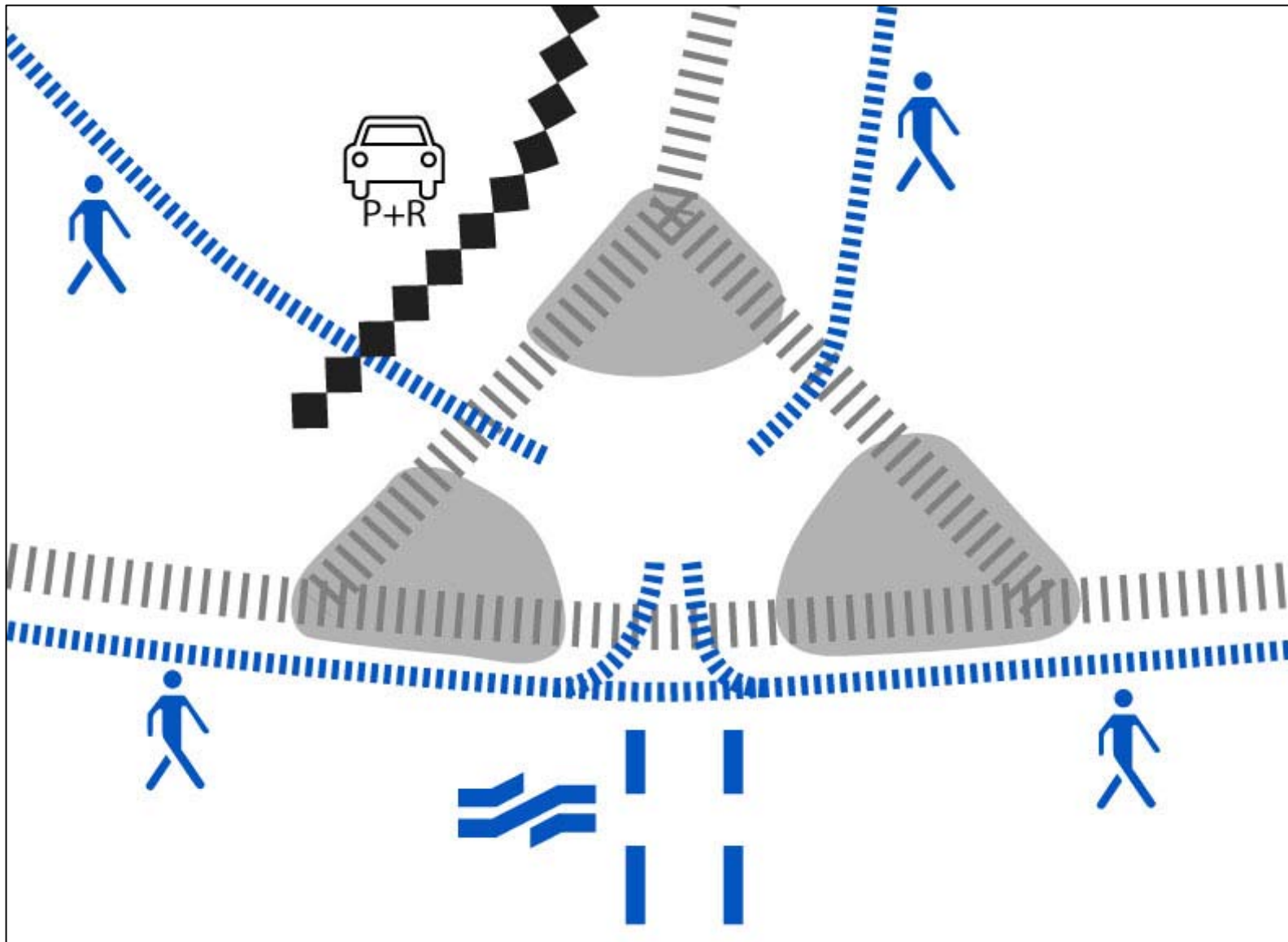
Locatie

VERKEERSTROMEN



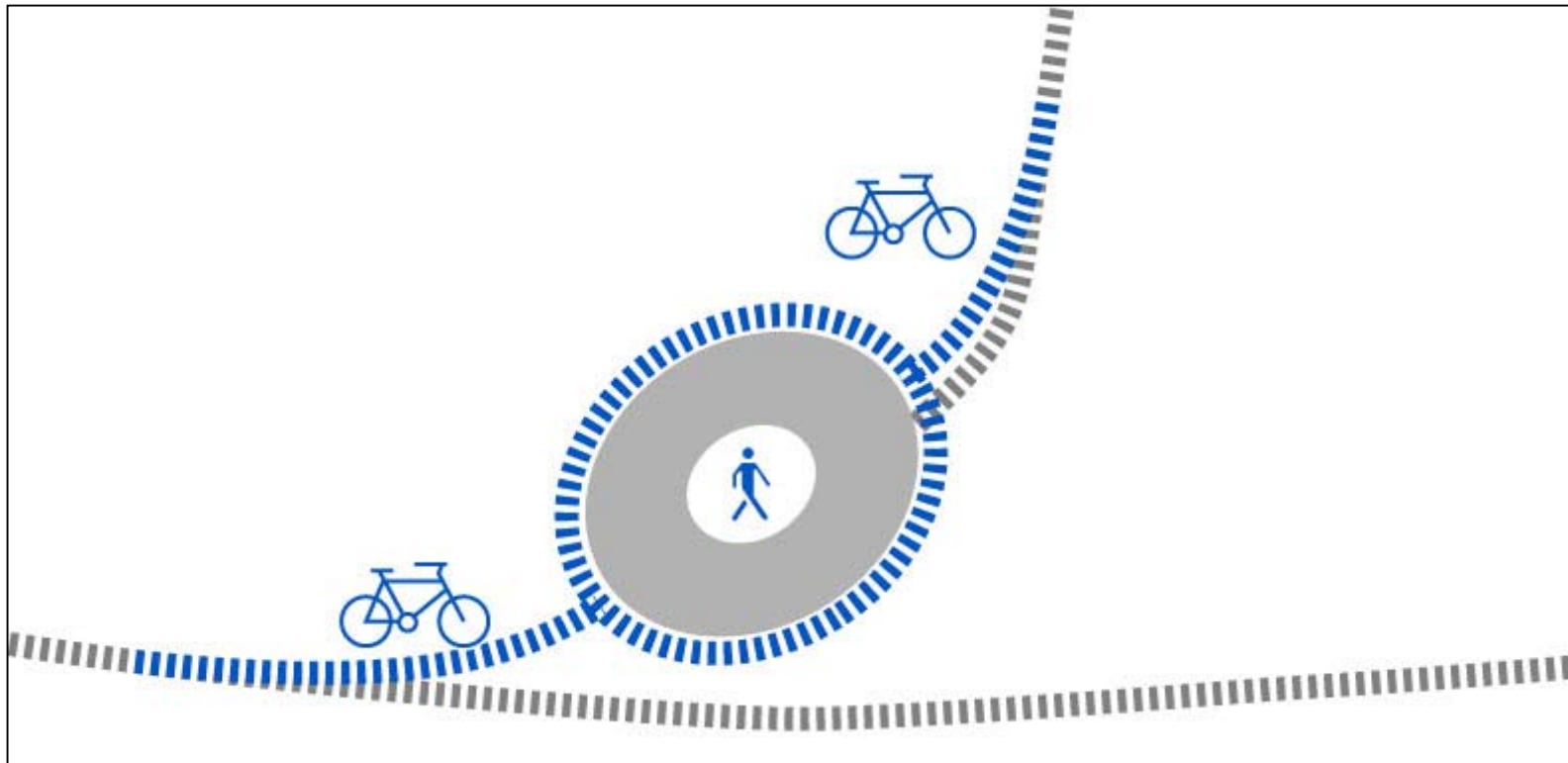
Locatie

VERKEERSTROMEN



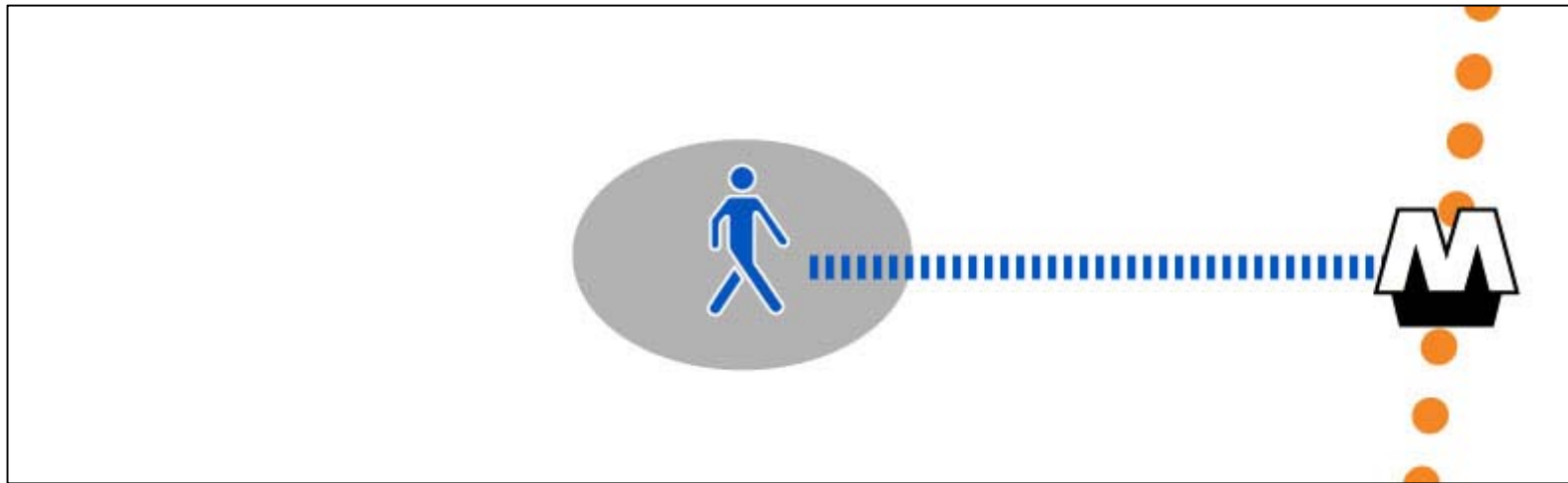
Locatie

VERKEERSTROMEN



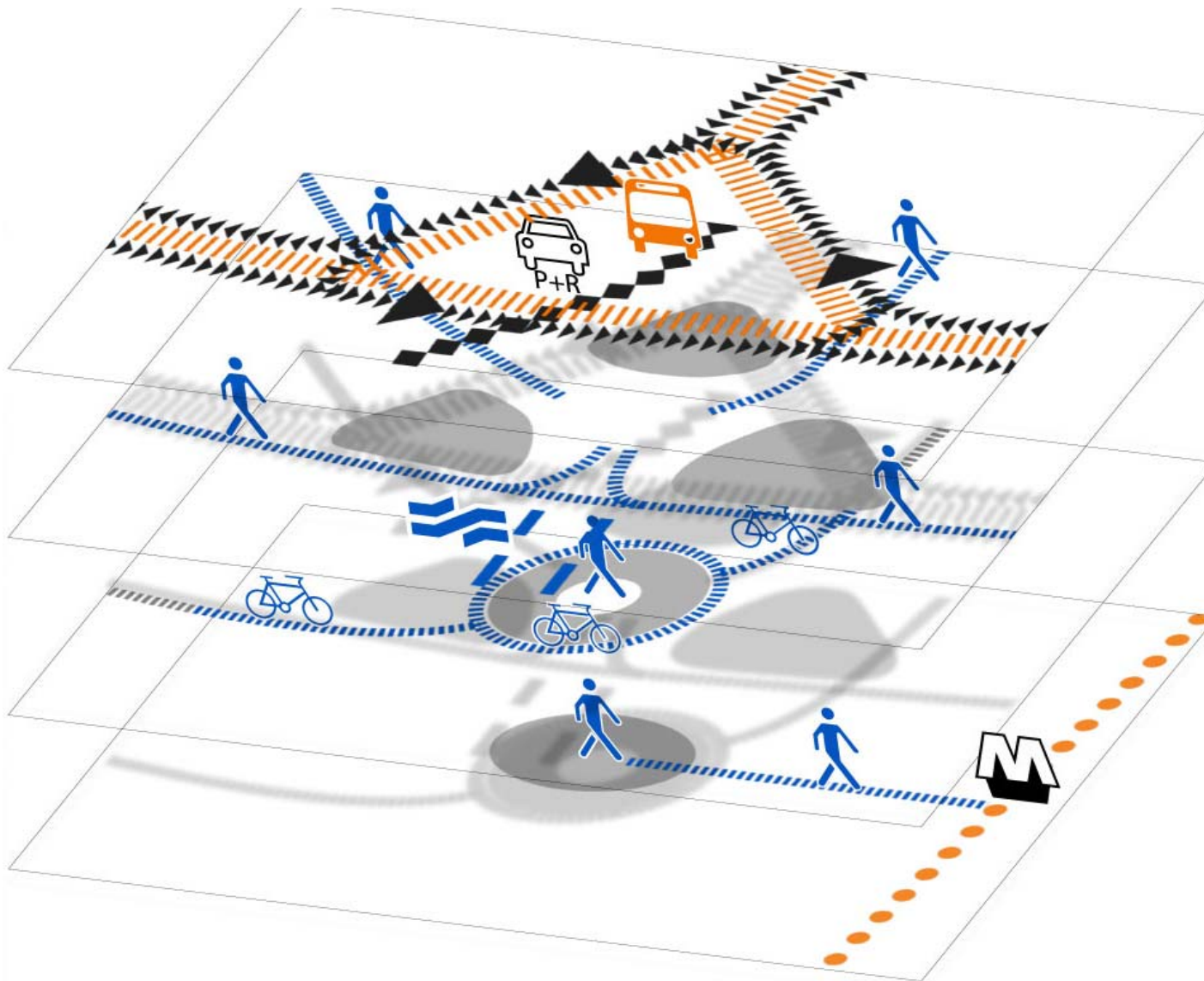
Locatie

VERKEERSTROMEN



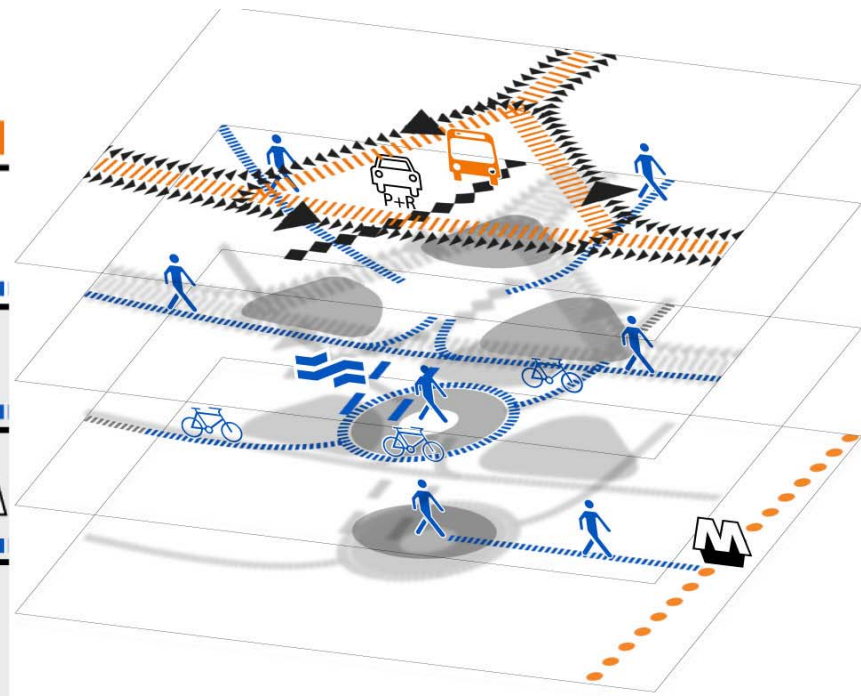
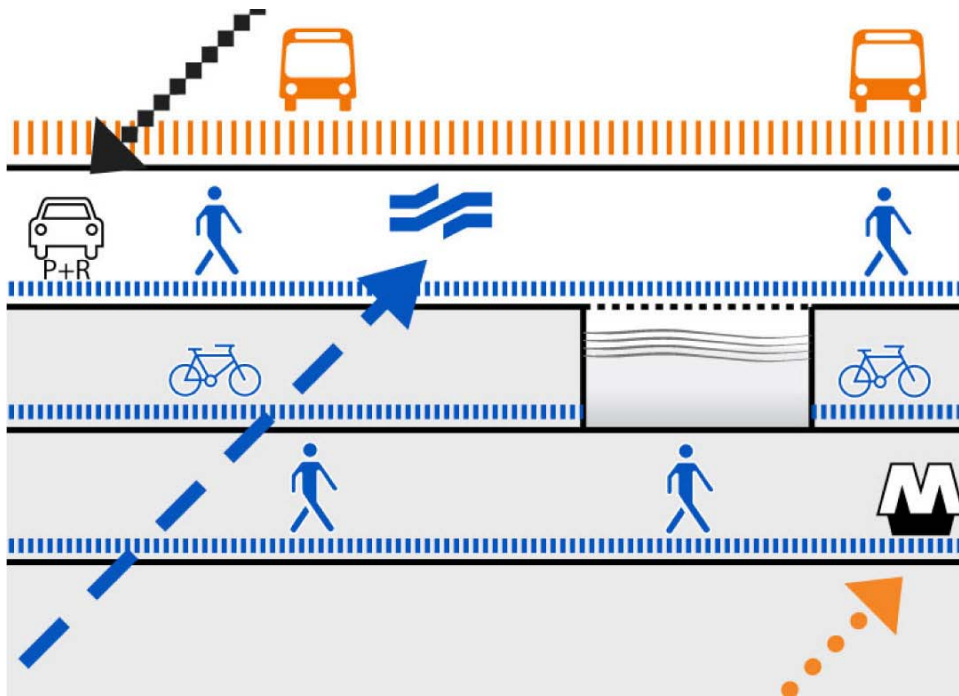
Locatie

VERKEERSTROMEN IN LAGEN



Locatie

VERKEERSTROMEN IN LAGEN

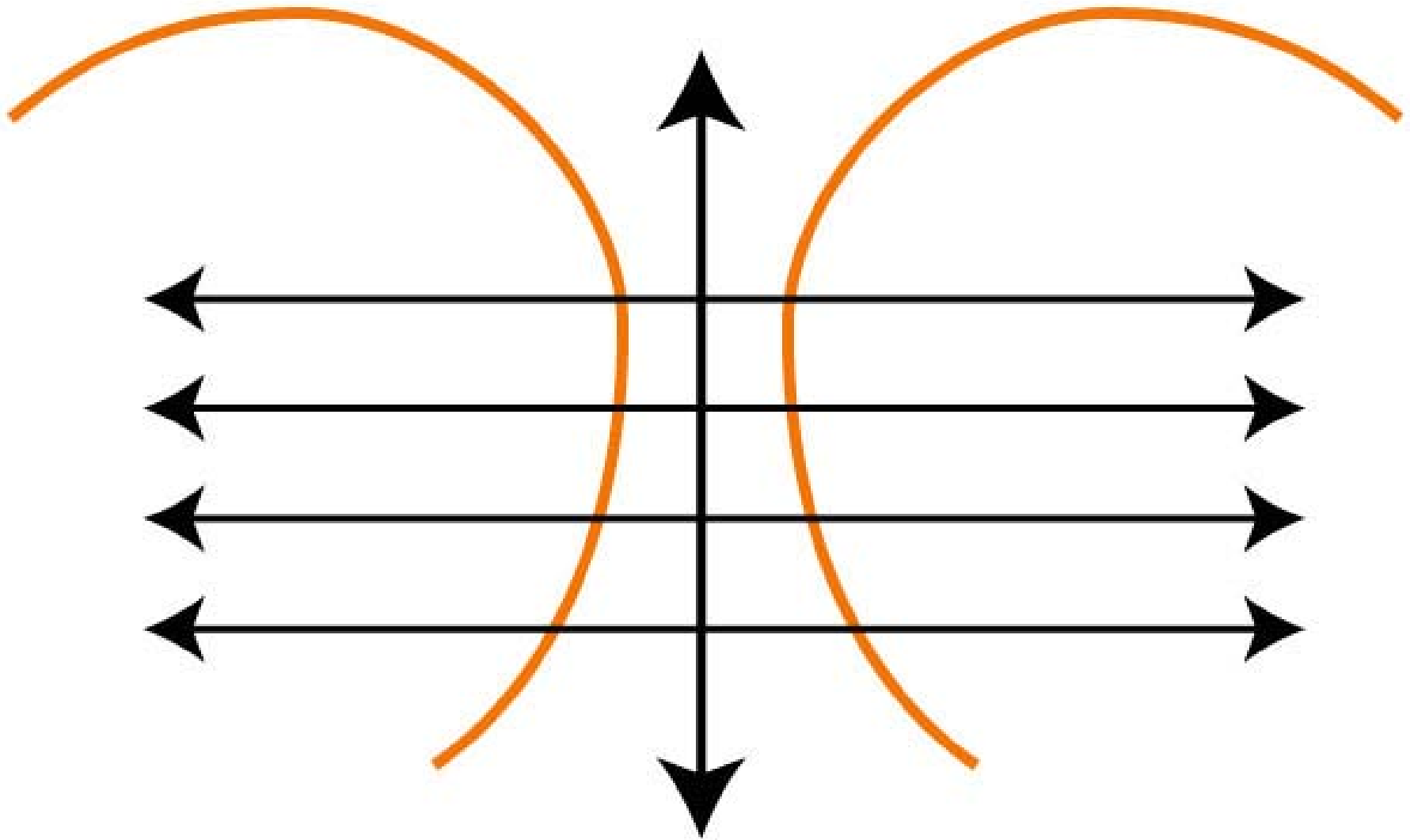


Locatie

UITGANGSPUNT ARCHITECTUUR



UITGANGSPUNT CONSTRUCTIE



UITGANGSPUNT CONSTRUCTIE



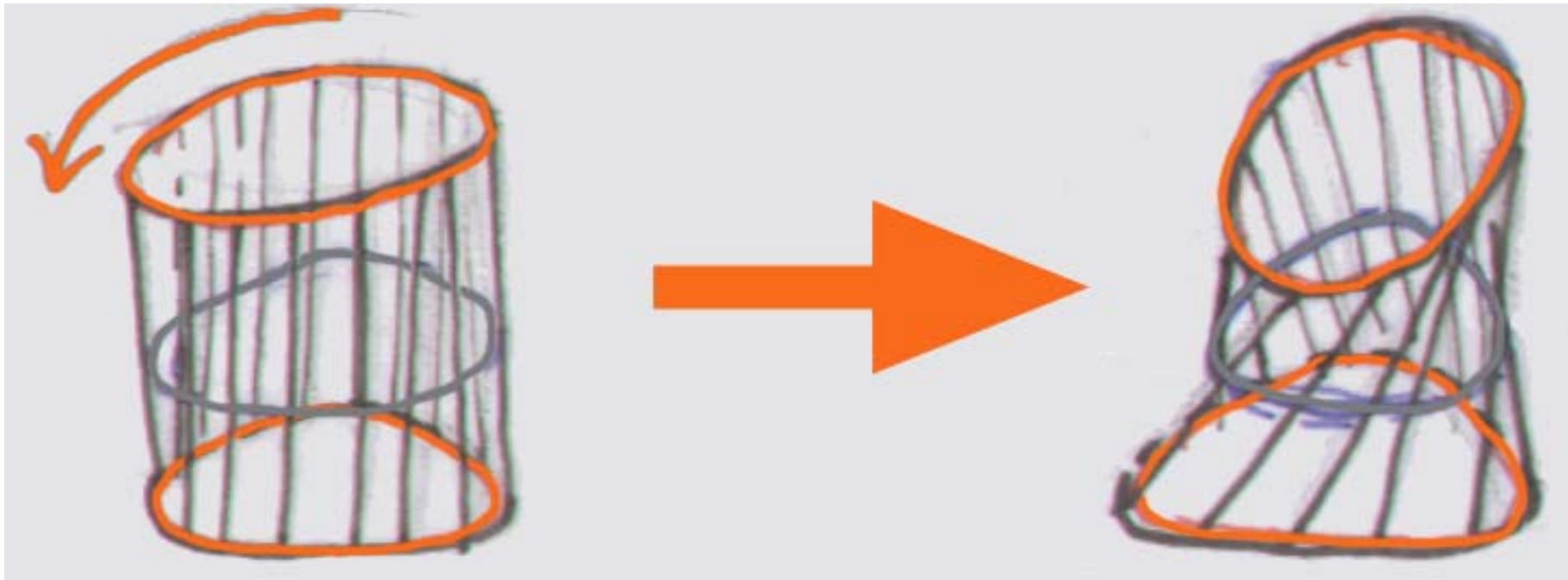
Expo Axis (2010), SBA Design, Shanghai

UITGANGSPUNT CONSTRUCTIE

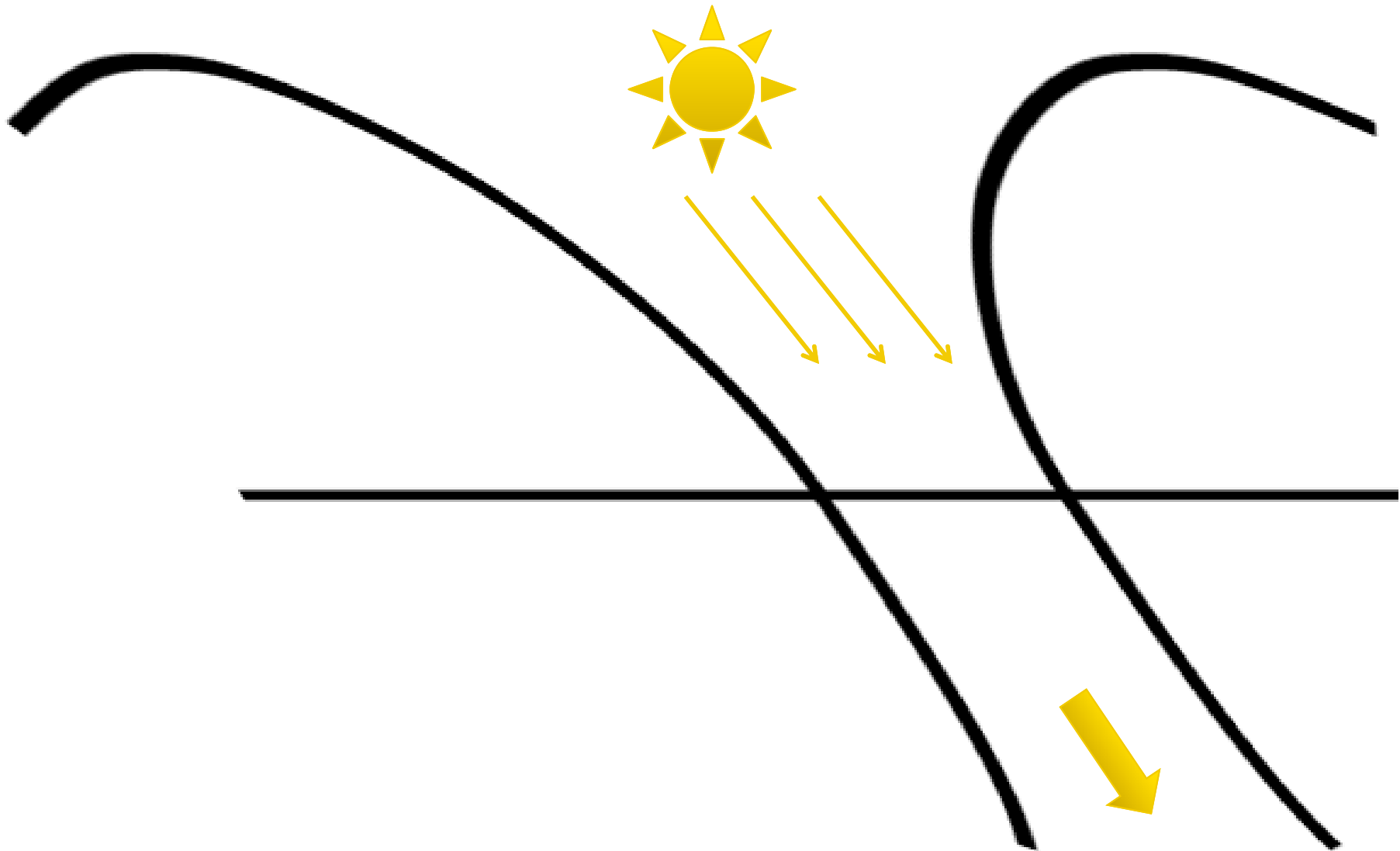


King's Cross Station (2012), John McAslan, Londen

UITGANGSPUNT CONSTRUCTIE

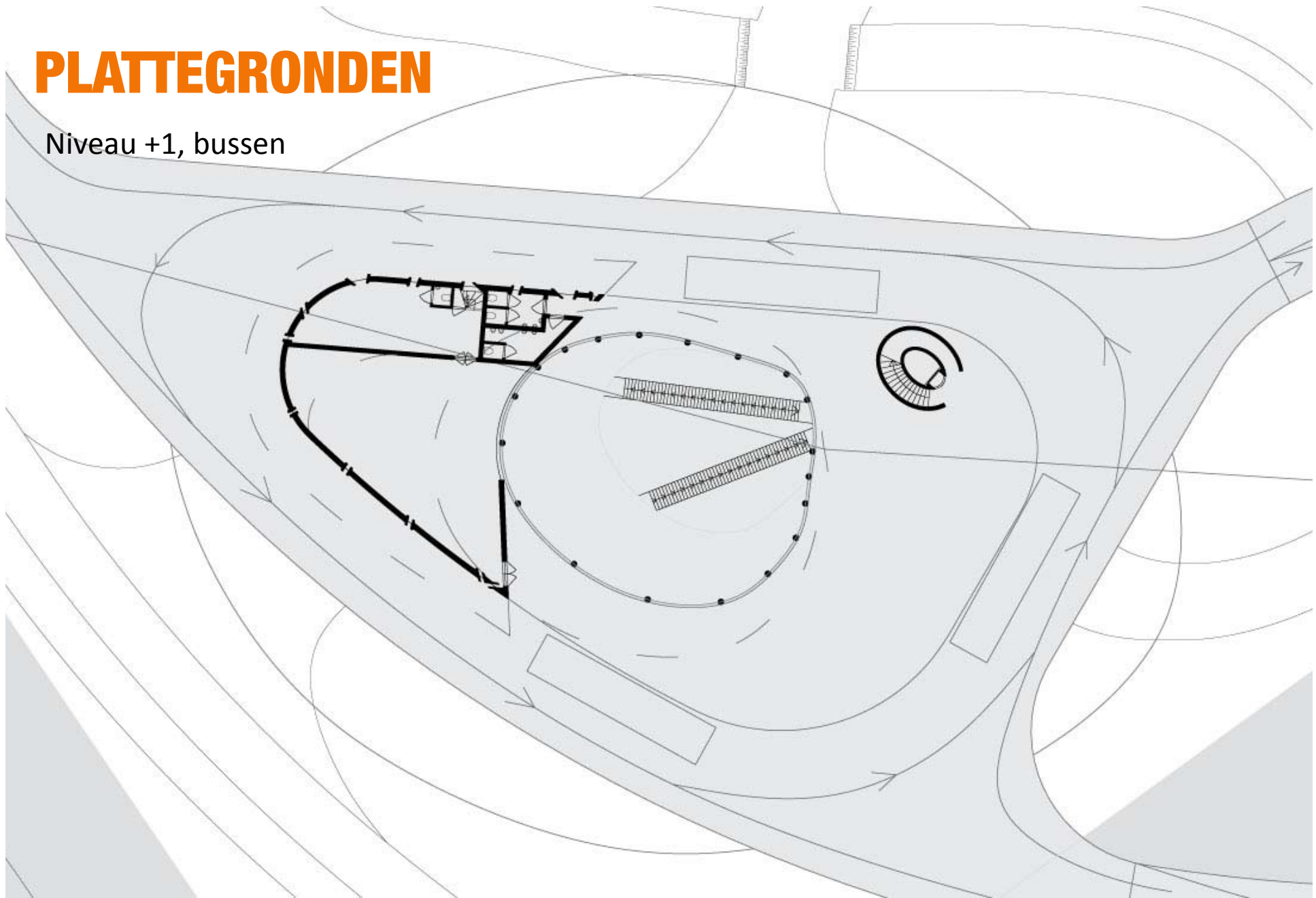


UITGANGSPUNT CONSTRUCTIE



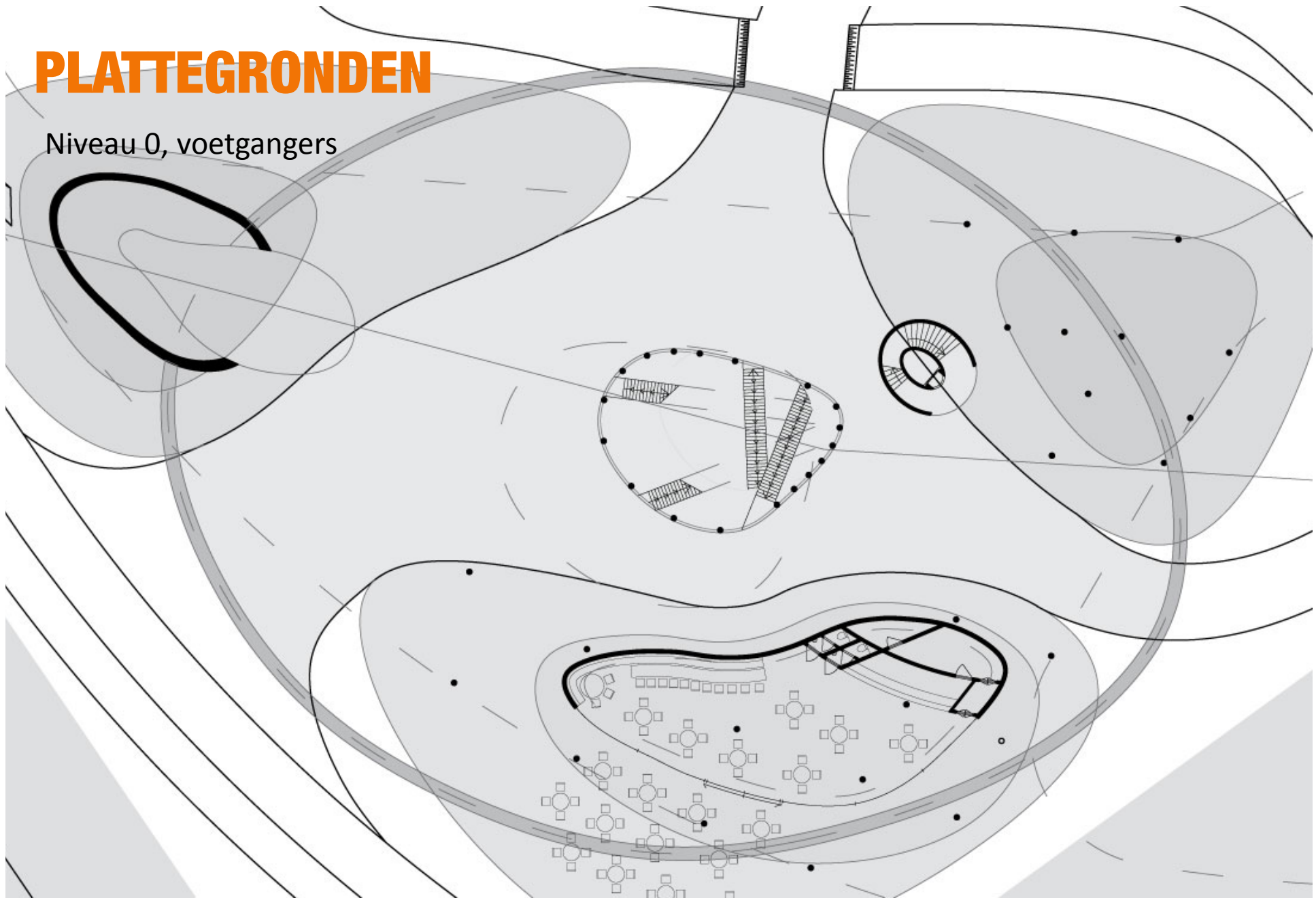
PLATTEGRONDEN

Niveau +1, bussen



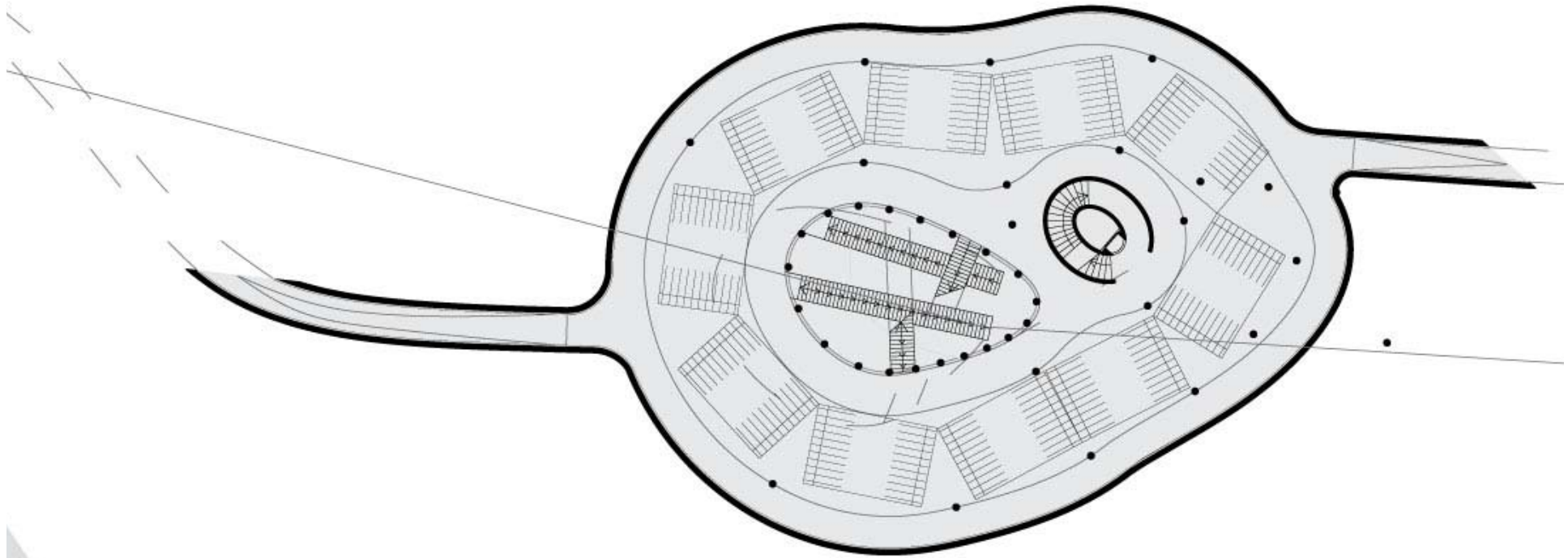
PLATTEGRONDEN

Niveau 0, voetgangers



PLATTEGRONDEN

Niveau -1, fietsenstalling

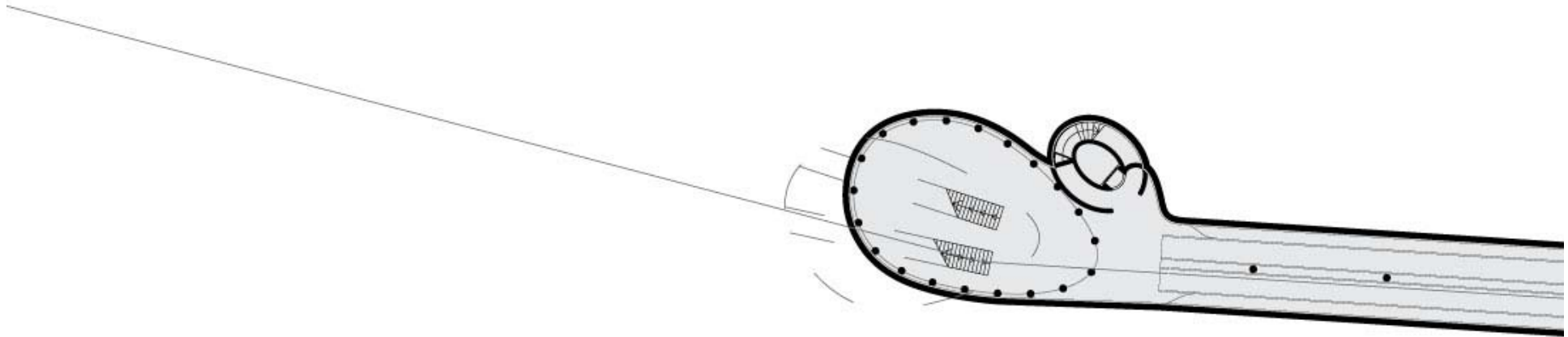


Ontwerp

35

PLATTEGRONDEN

Niveau -2, tunnel naar metro

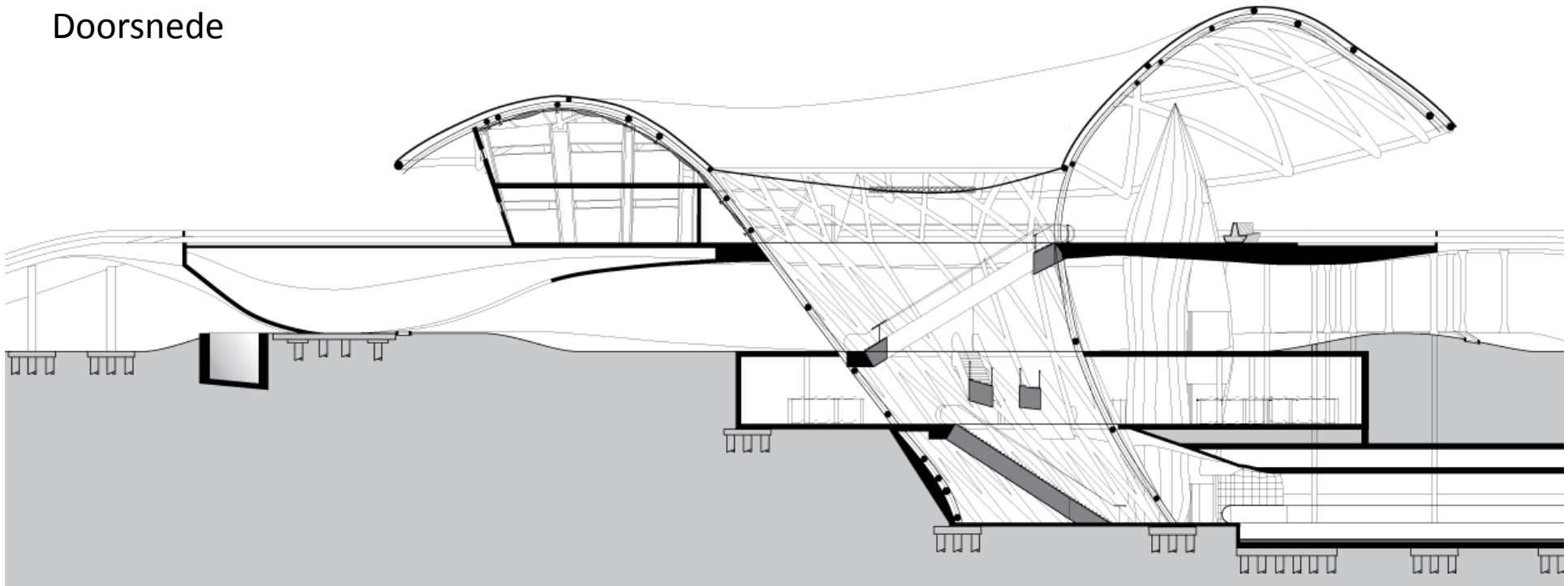


Ontwerp

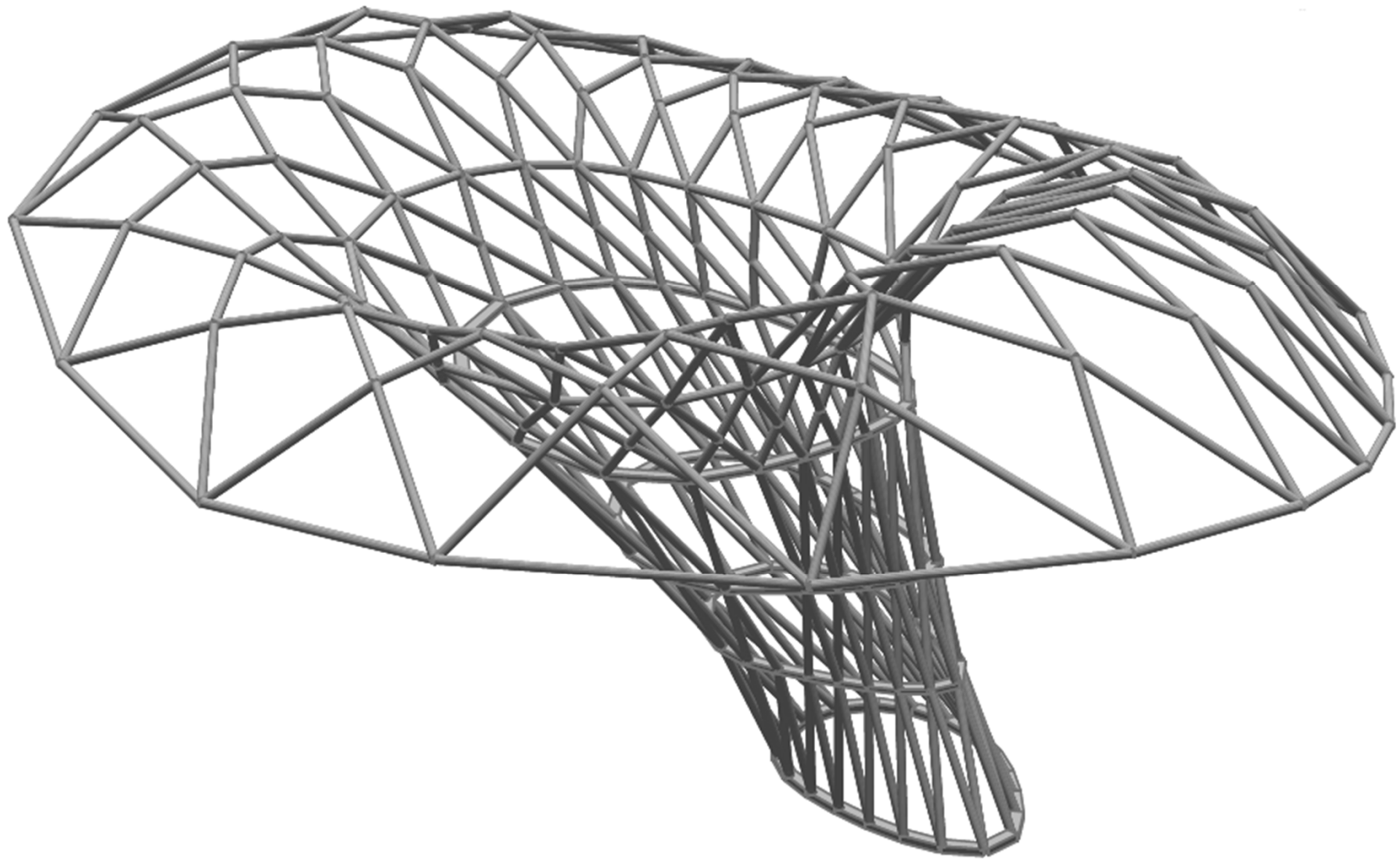
36

DOORSNEDE

Doorsnede

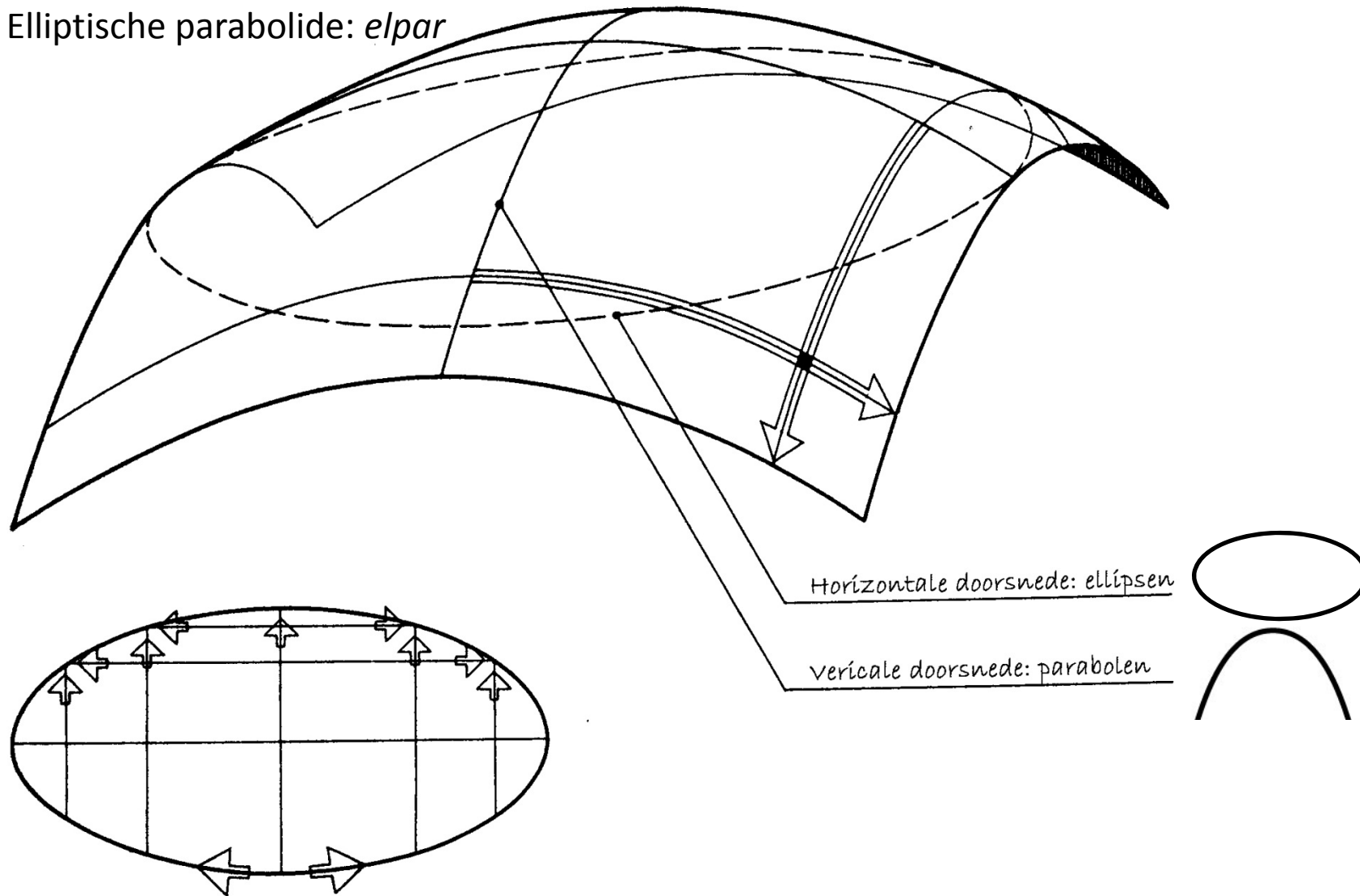


UITGANGSPUNT CONSTRUCTIE



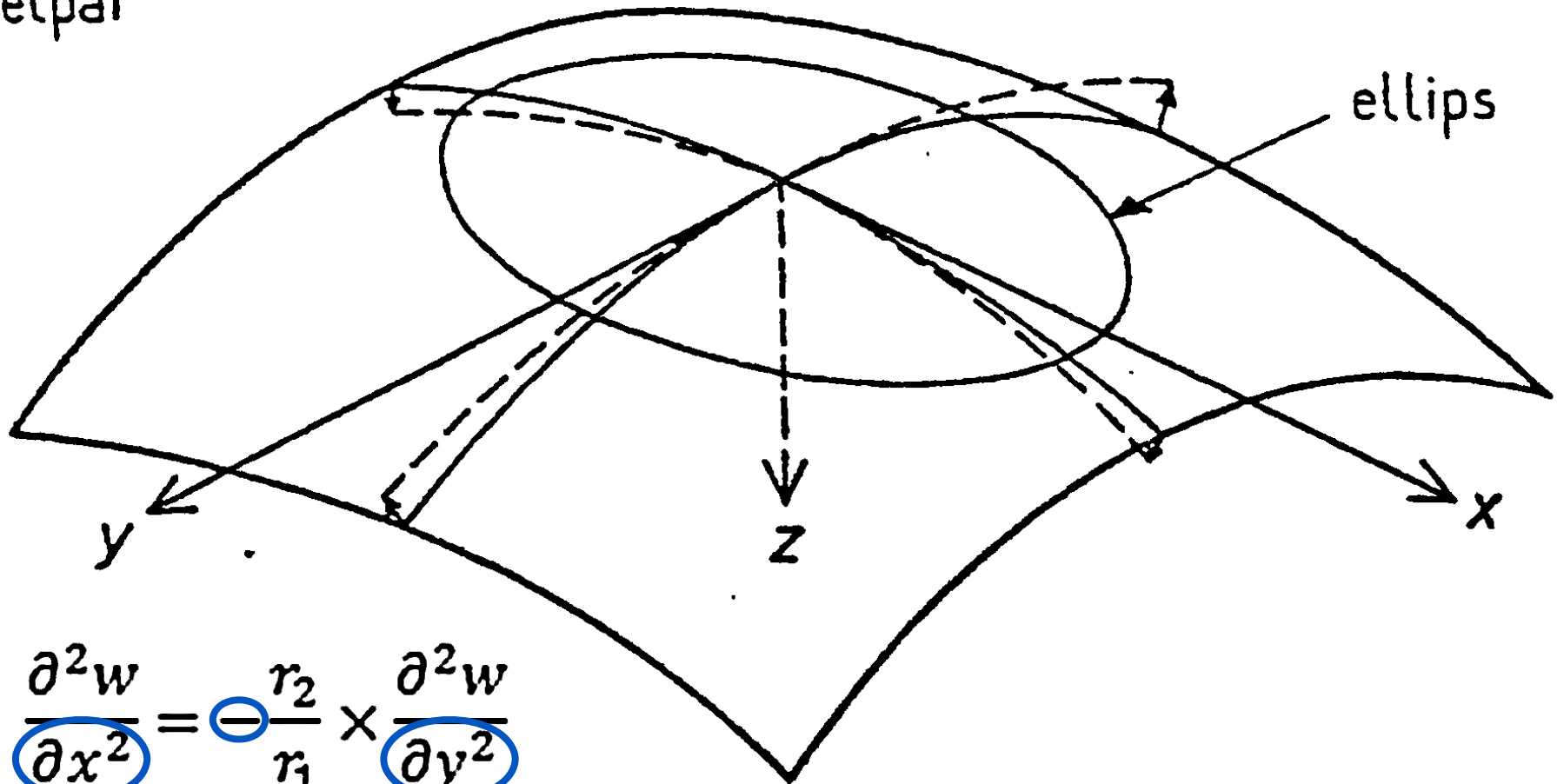
EIGENSCHAPPEN CONSTRUCTIE

Elliptische parabolide: *elpar*



EIGENSCHAPPEN CONSTRUCTIE

Vervorming *el*par
*el*par



$$\frac{\partial^2 w}{\partial x^2} = -\frac{r_2}{r_1} \times \frac{\partial^2 w}{\partial y^2}$$

EIGENSCHAPPEN CONSTRUCTIE

Halve bol



EIGENSCHAPPEN CONSTRUCTIE

Halve bol, doorbuiging

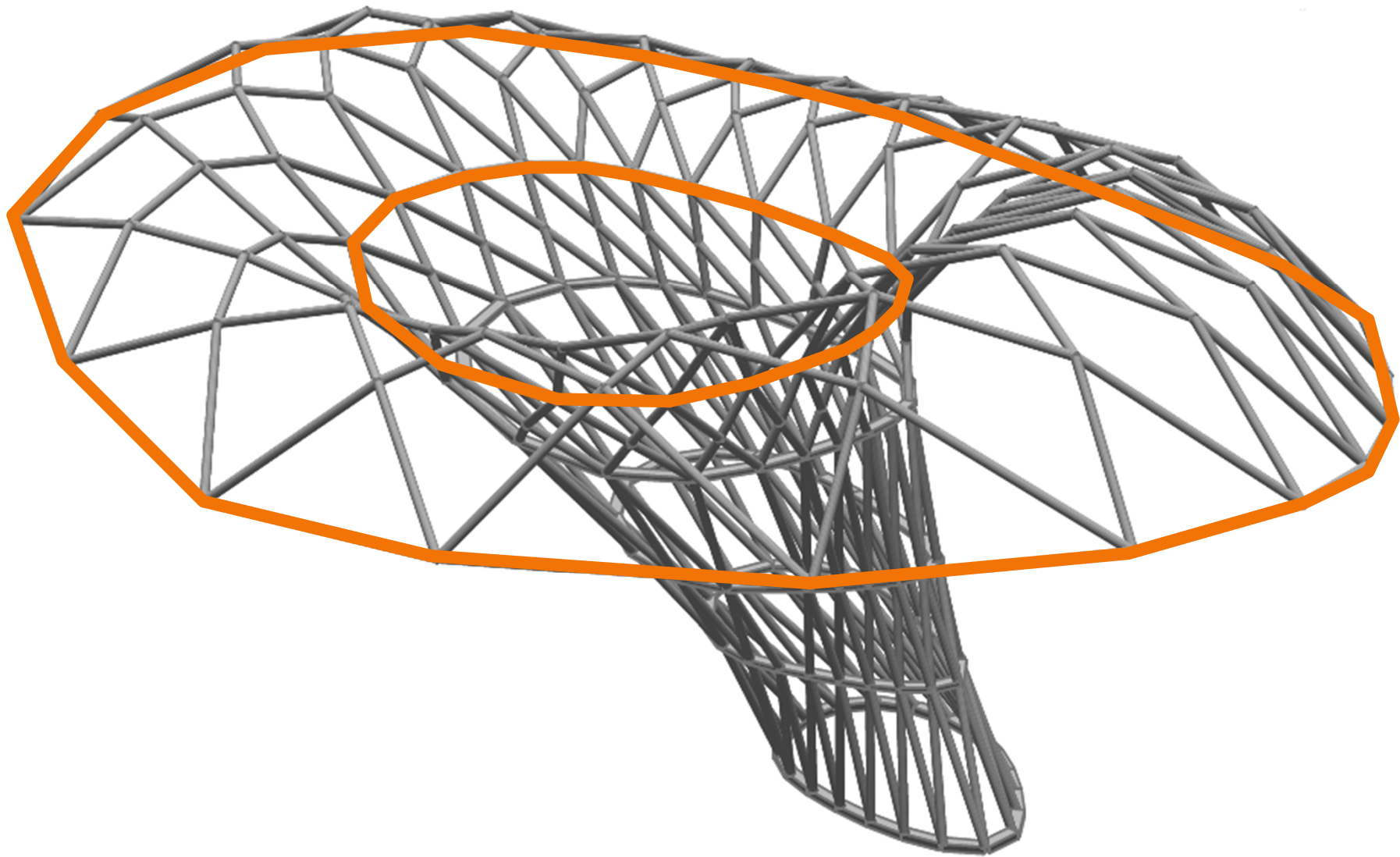


EIGENSCHAPPEN CONSTRUCTIE

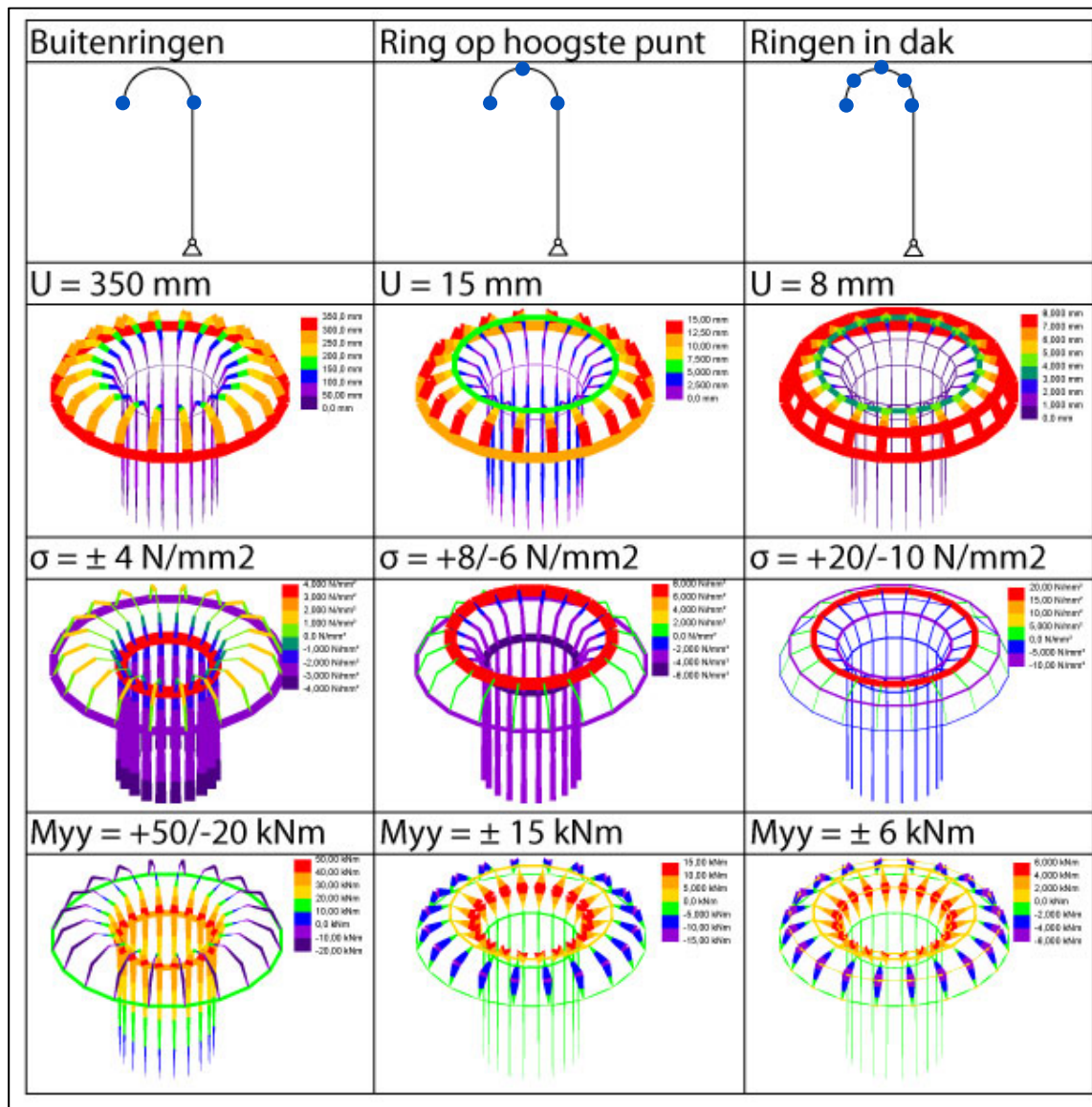
Halve bol, trekkingen



EIGENSCHAPPEN CONCEPT CONSTRUCTIE



OPTIMALISATIE: TREKRINGEN ALS SCHAAAL



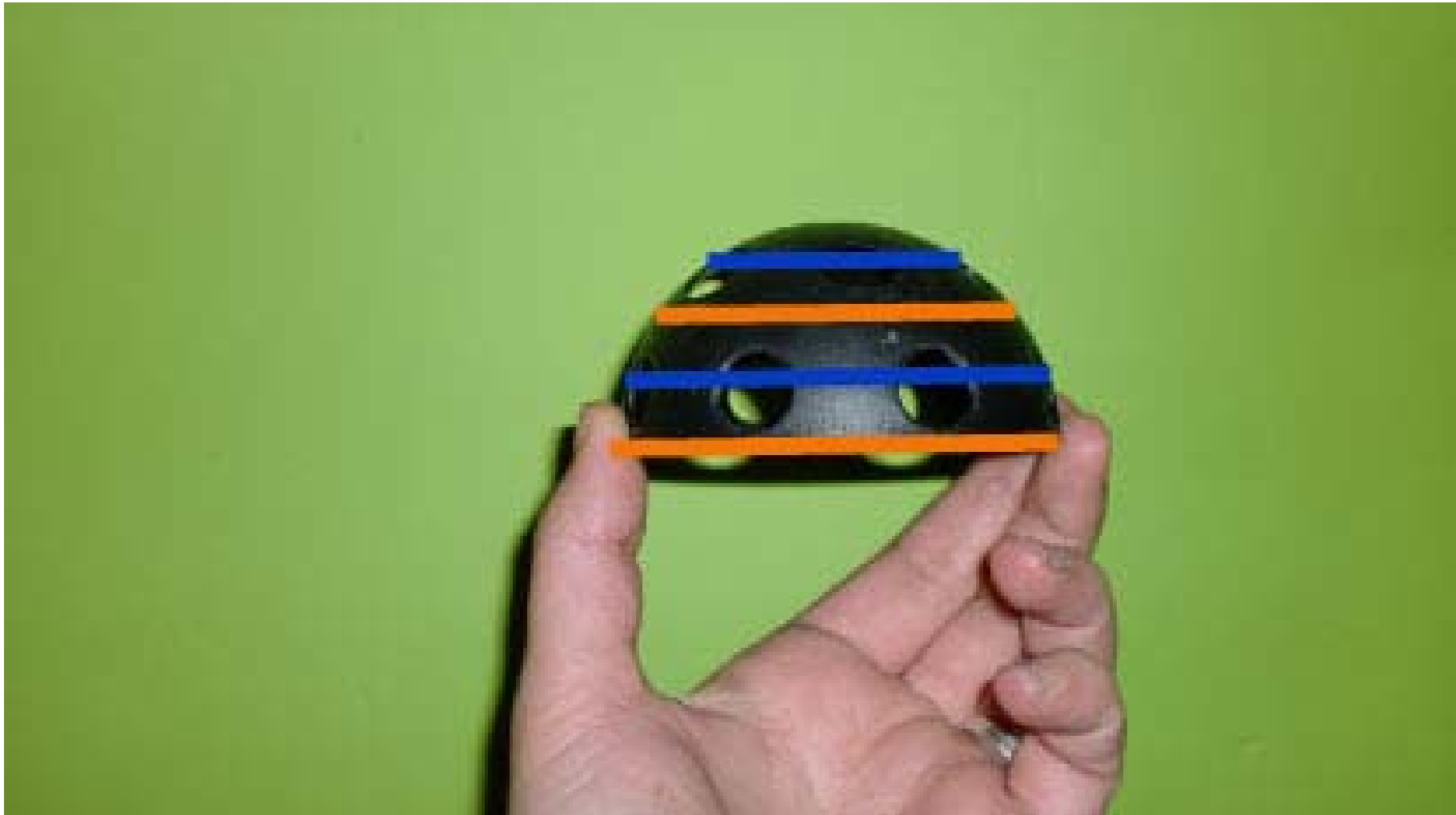
Doorbuiging

Spanning

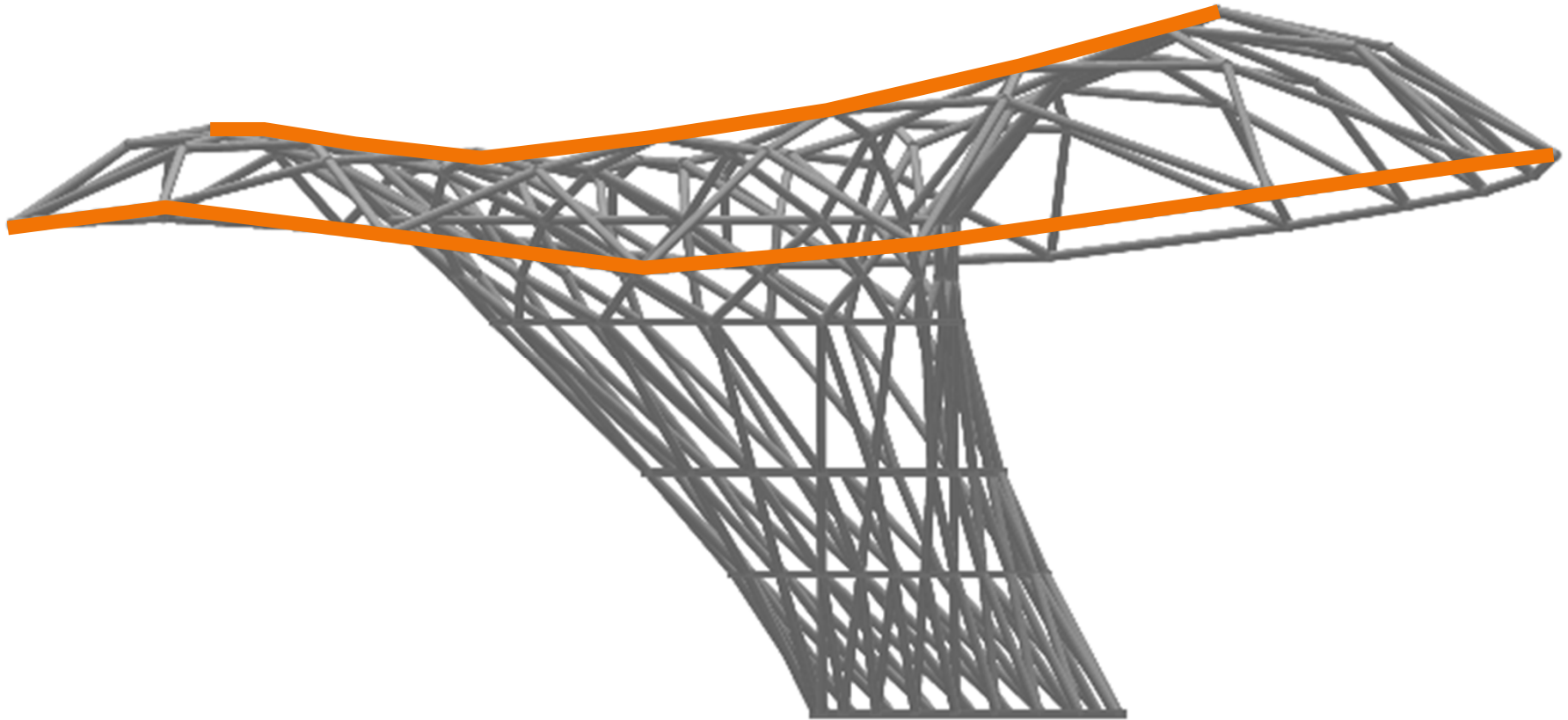
Moment

EIGENSCHAPPEN CONCEPT CONSTRUCTIE

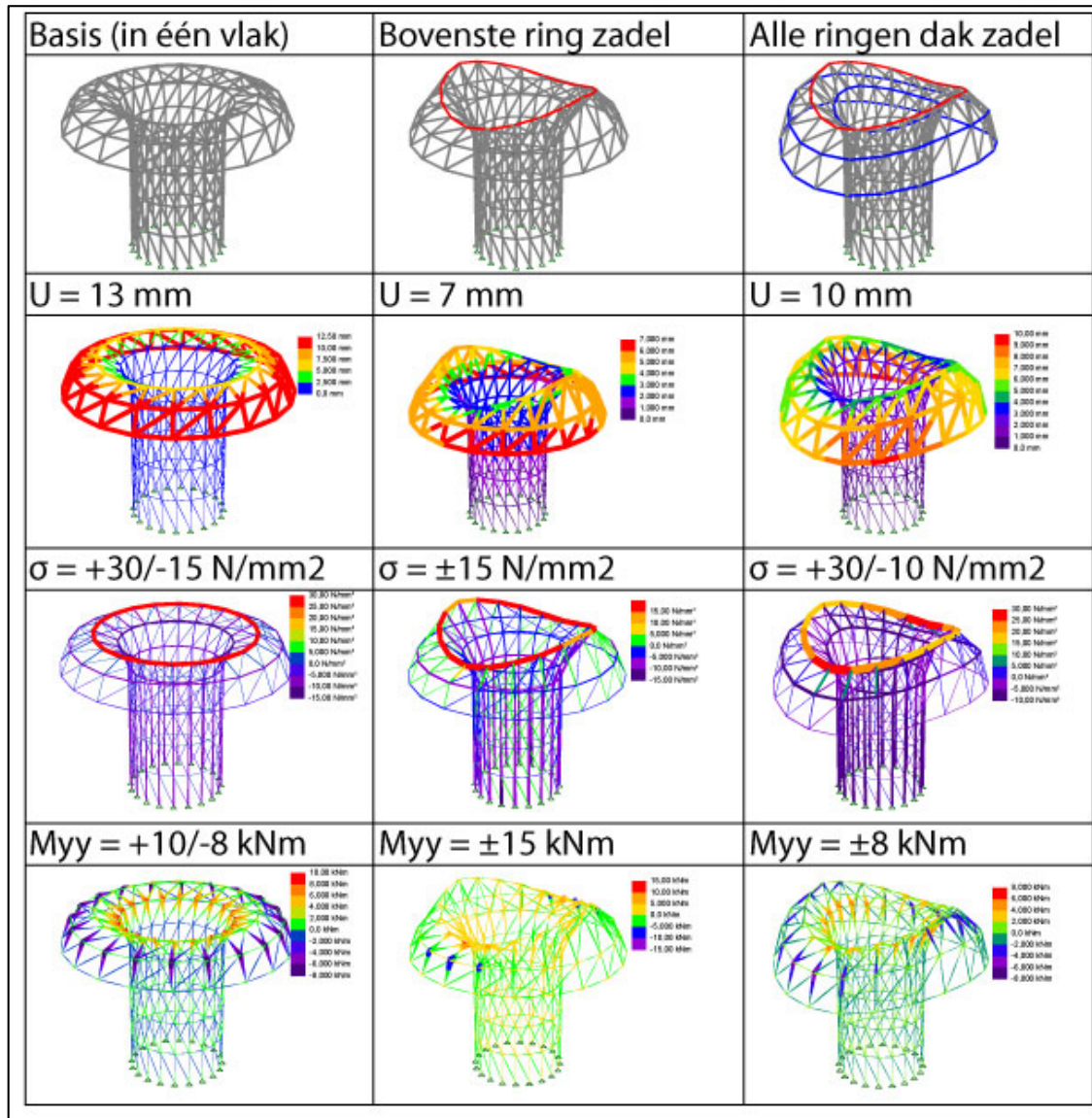
Halve bol, trekkingen in één horizontaal vlak



EIGENSCHAPPEN CONCEPT CONSTRUCTIE



OPTIMALISATIE: RINGEN IN ÉÉN VLAK

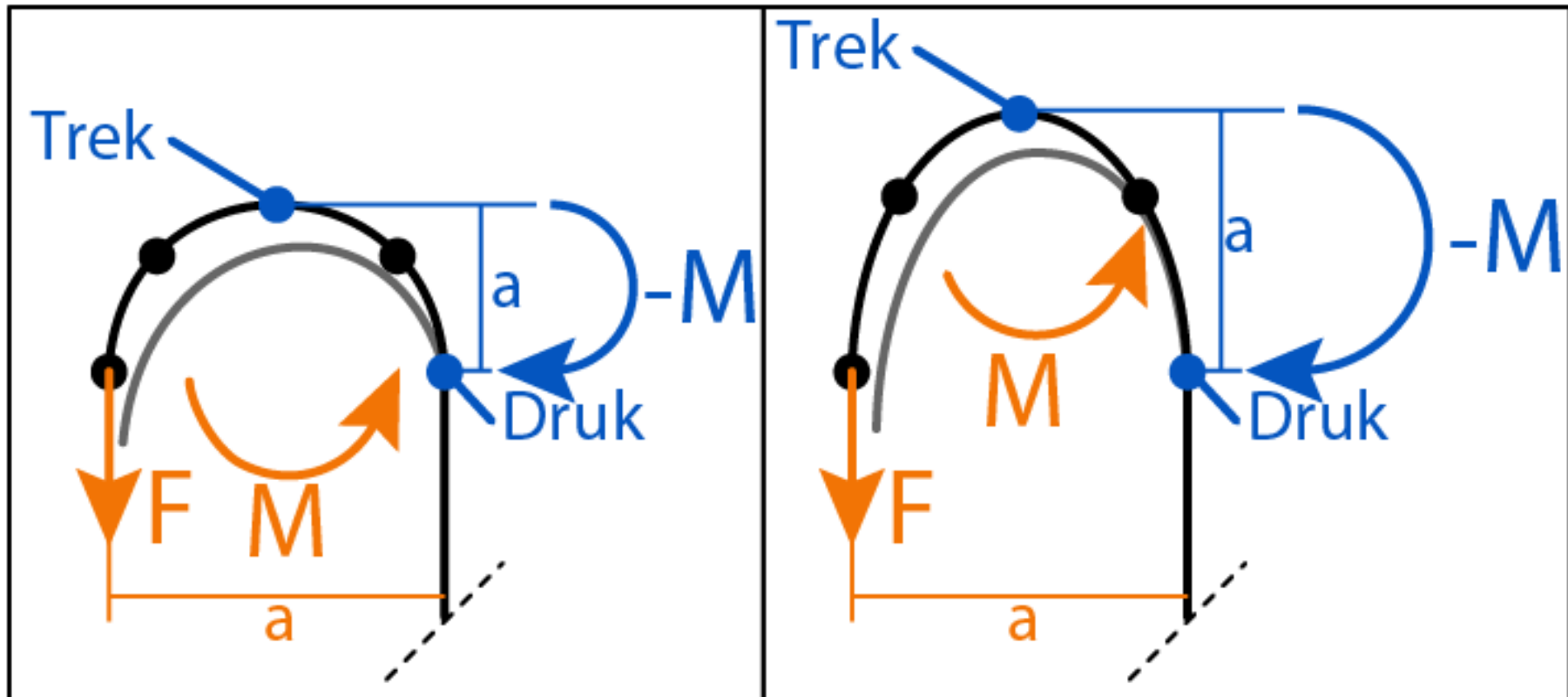


Doorbuiging

Spanning

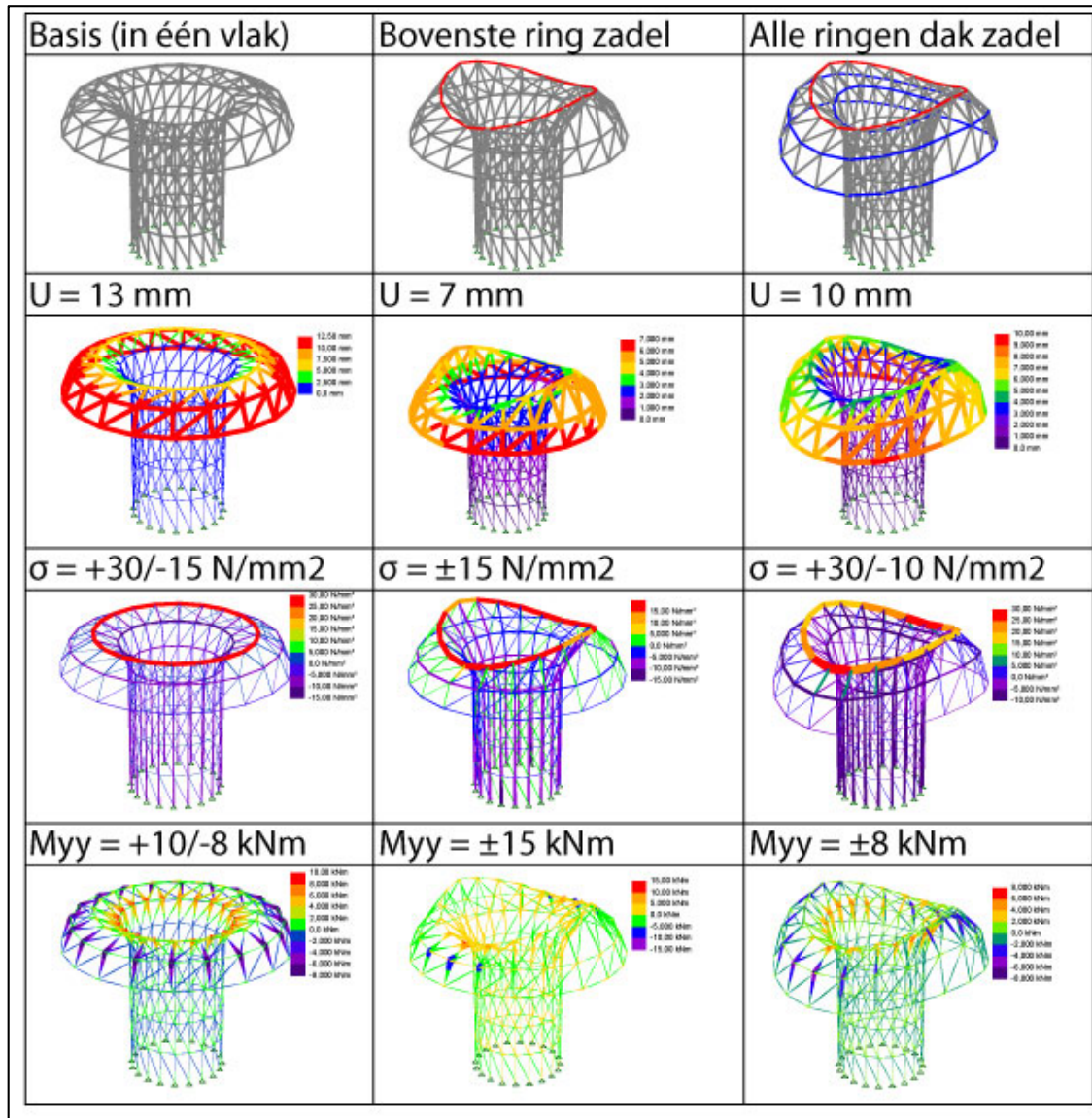
Moment

OPTIMALISATIE: RINGEN IN ÉÉN VLAK



$$M = F \times a, \text{ dus } F \times a = M$$

OPTIMALISATIE: RINGEN IN ÉÉN VLAK



Doorbuiging

Spanning

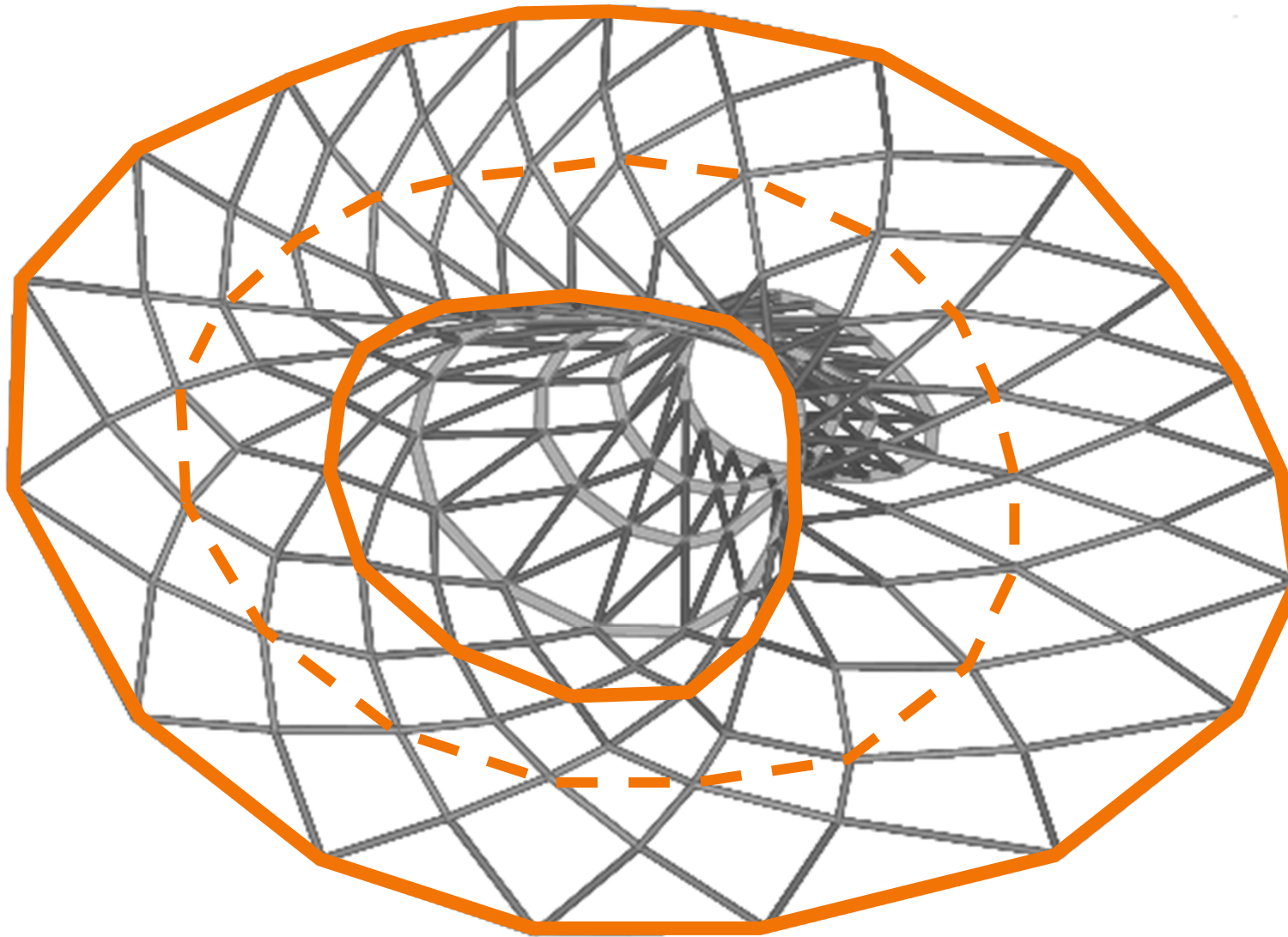
Moment

EIGENSCHAPPEN CONCEPT CONSTRUCTIE

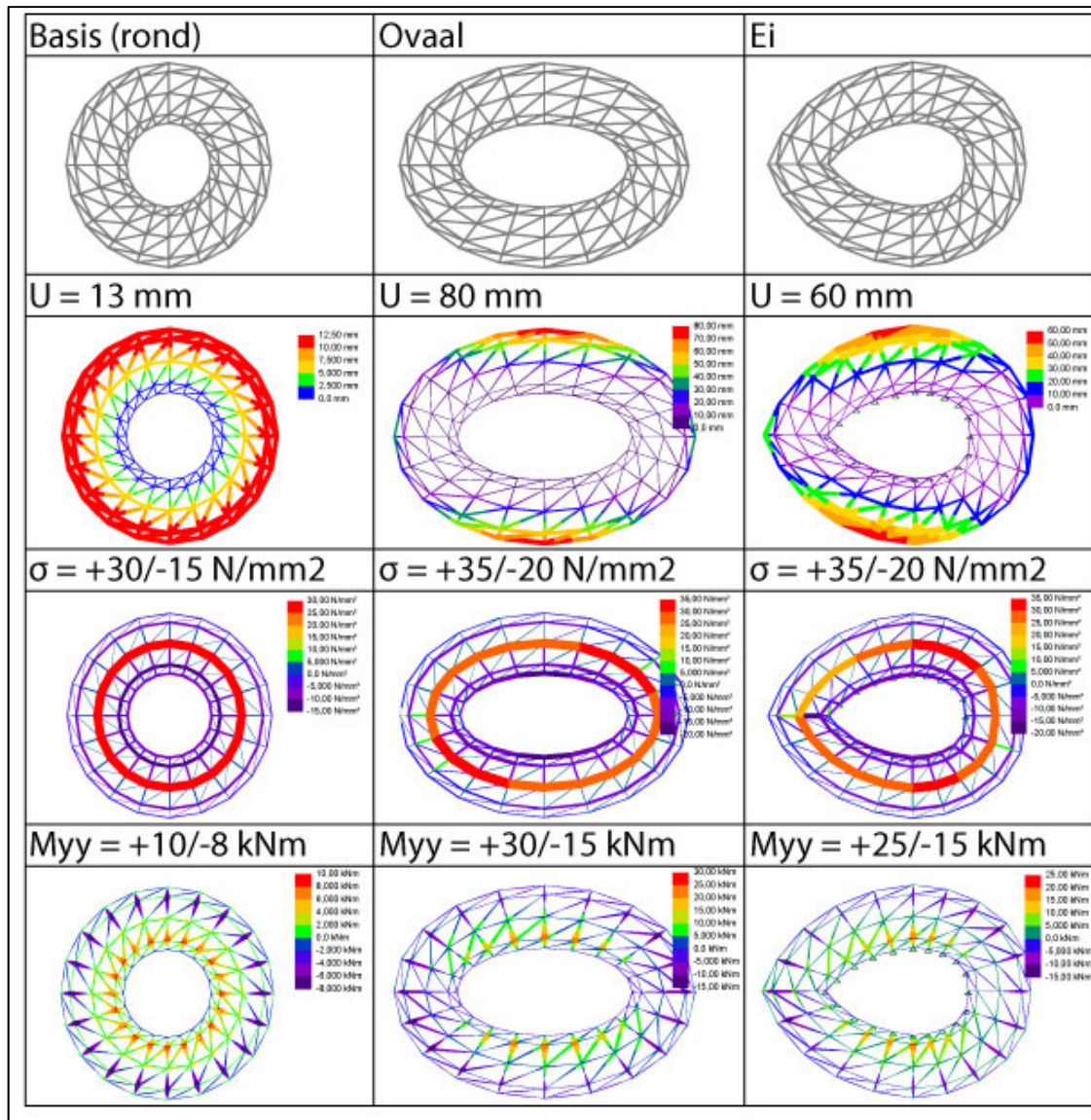
Halve bol, cirkelvormige trekkingen



EIGENSCHAPPEN CONCEPT CONSTRUCTIE



OPTIMALISATIE: VORM CONSTRUCTIE

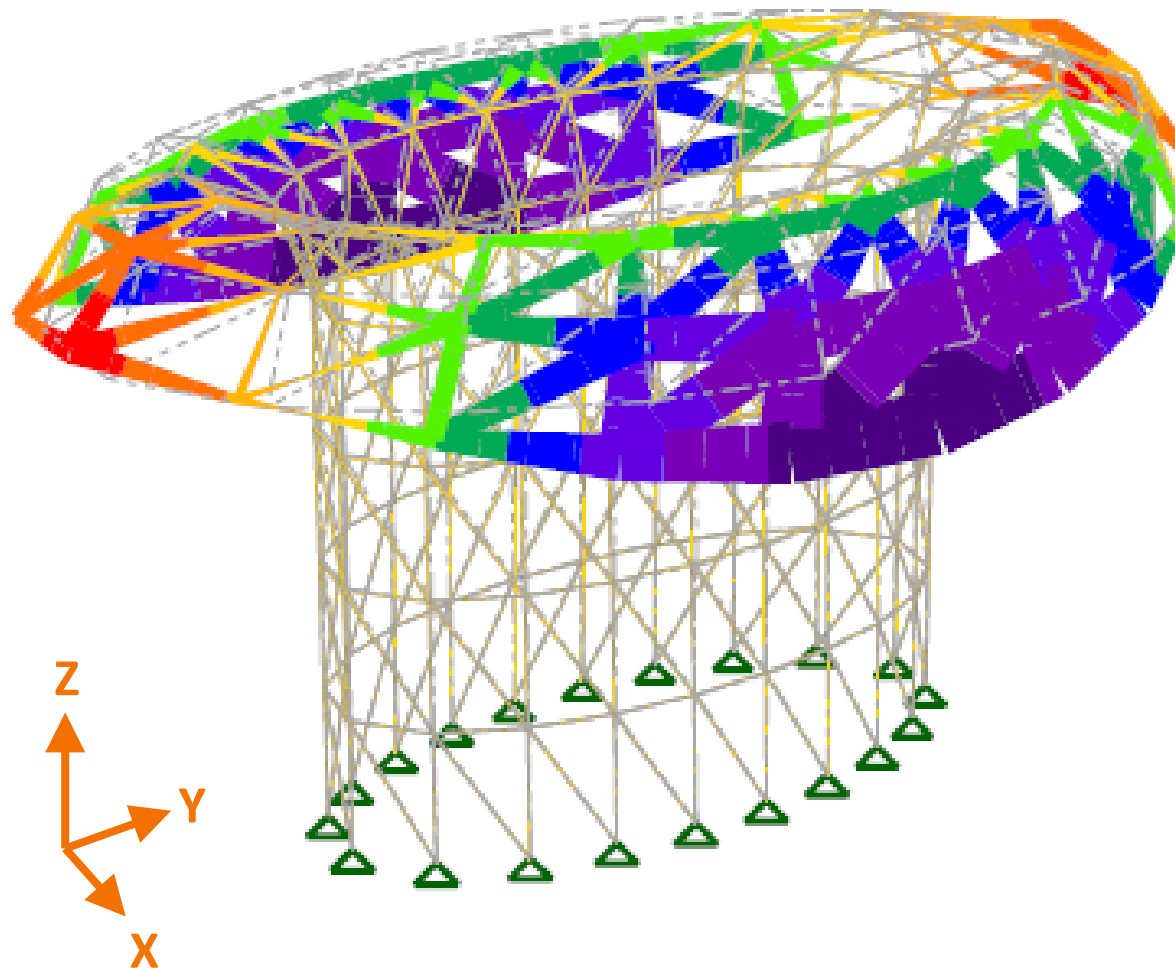


Doorbuiging

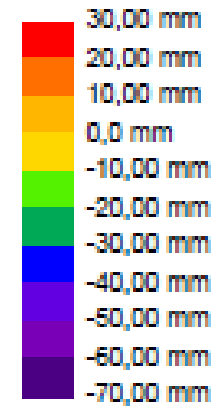
Spanning

Moment

OPTIMALISATIE: VORM CONSTRUCTIE



Doorbuiging Uz

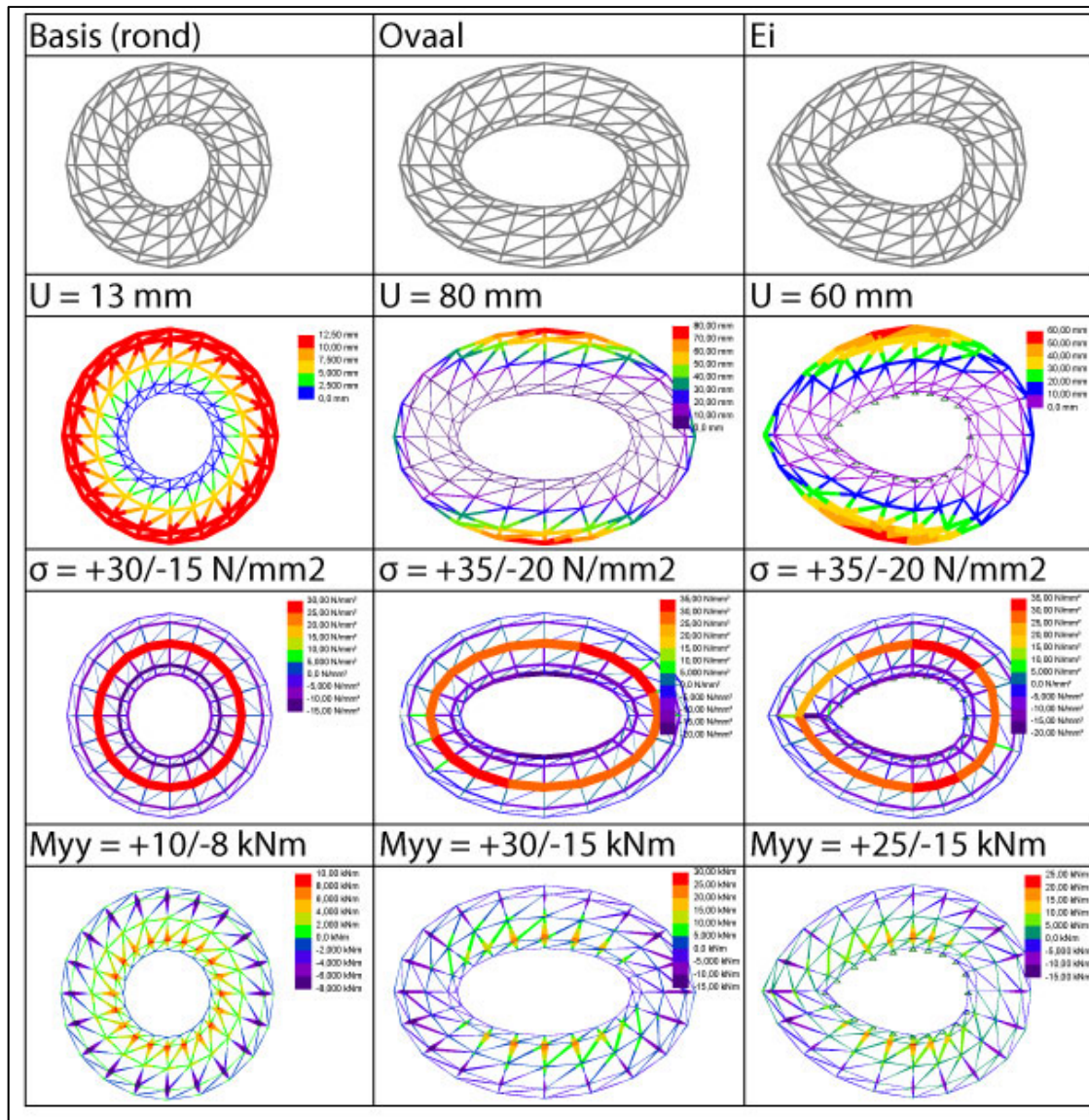


Case: L1 : Dead

Case: A1 : Dead

Contour case

OPTIMALISATIE: VORM CONSTRUCTIE

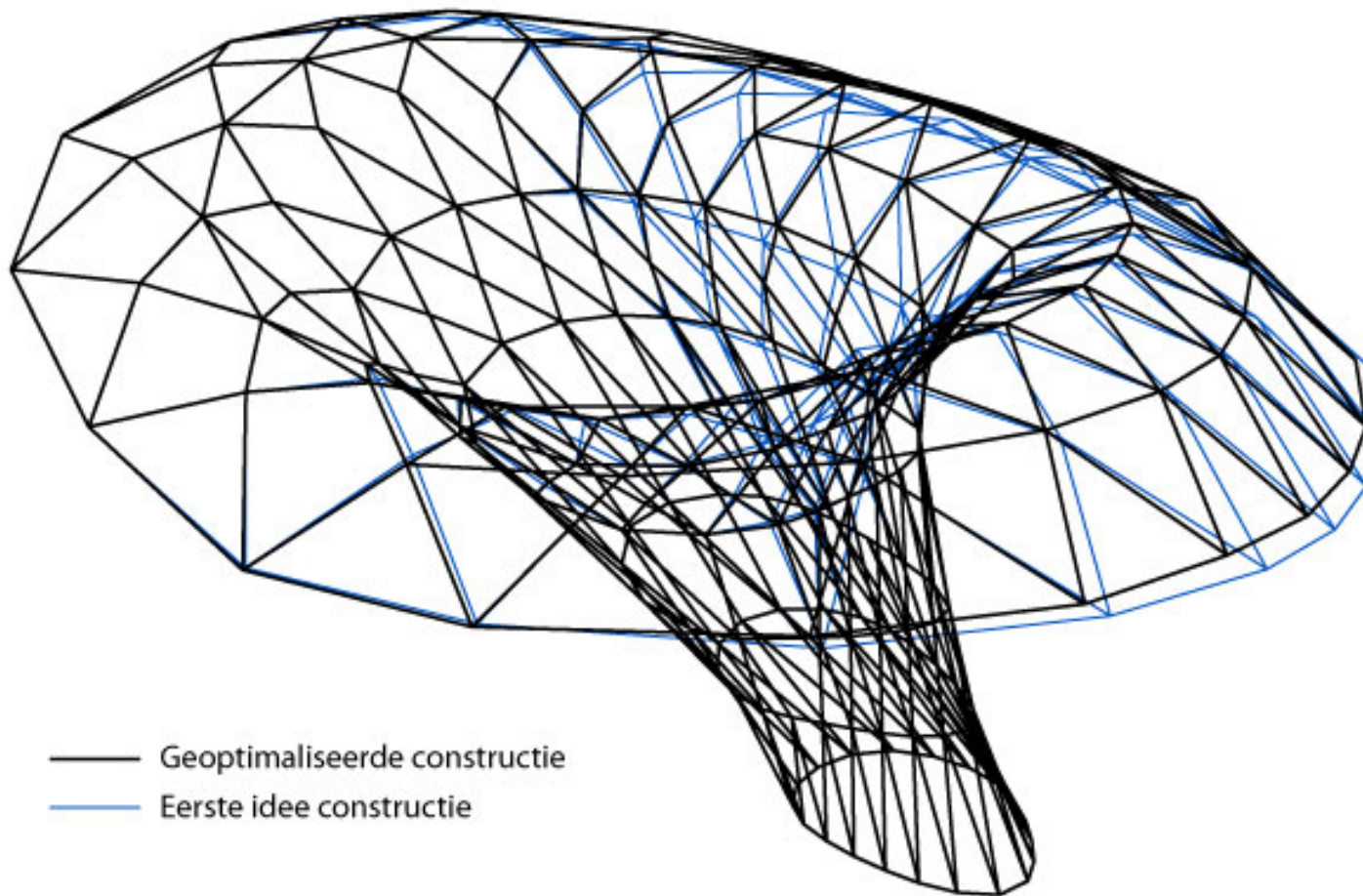


Doorbuiging

Spanning

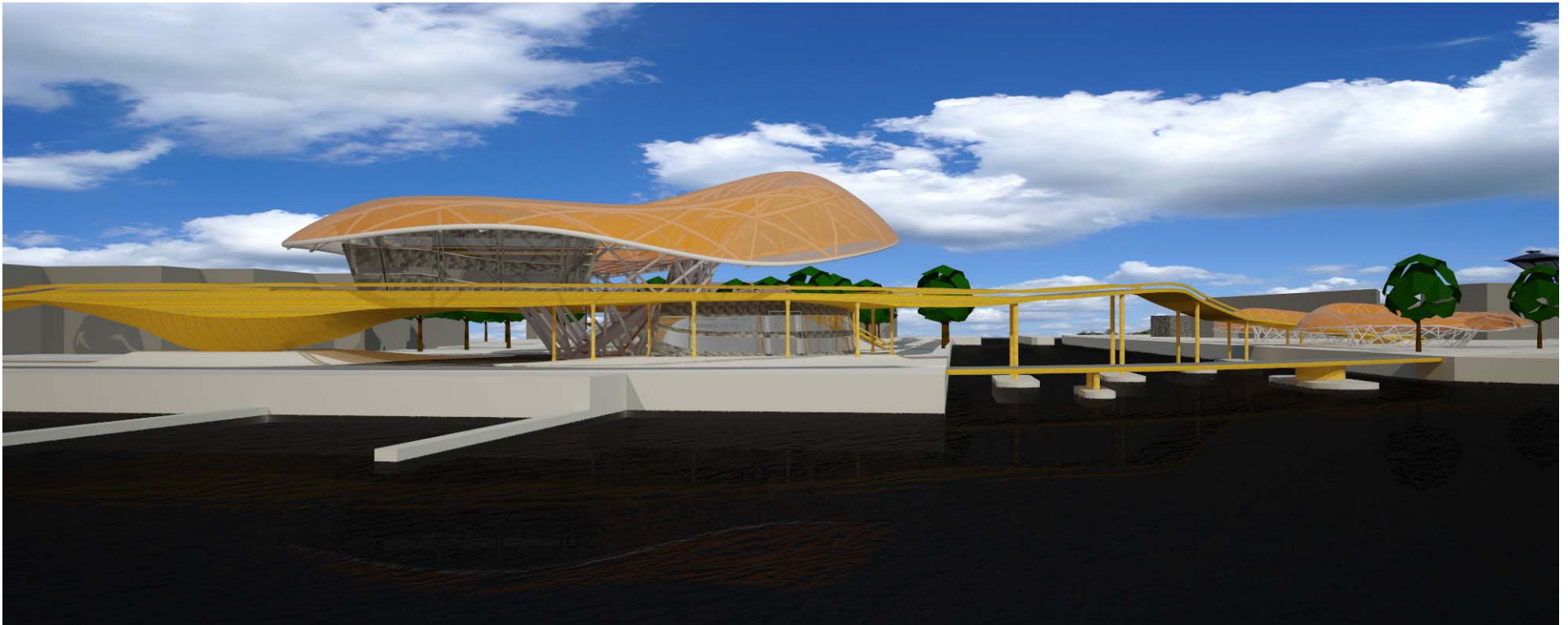
Moment

OPTIMALISATIE NAAR EIGEN GEWICHT

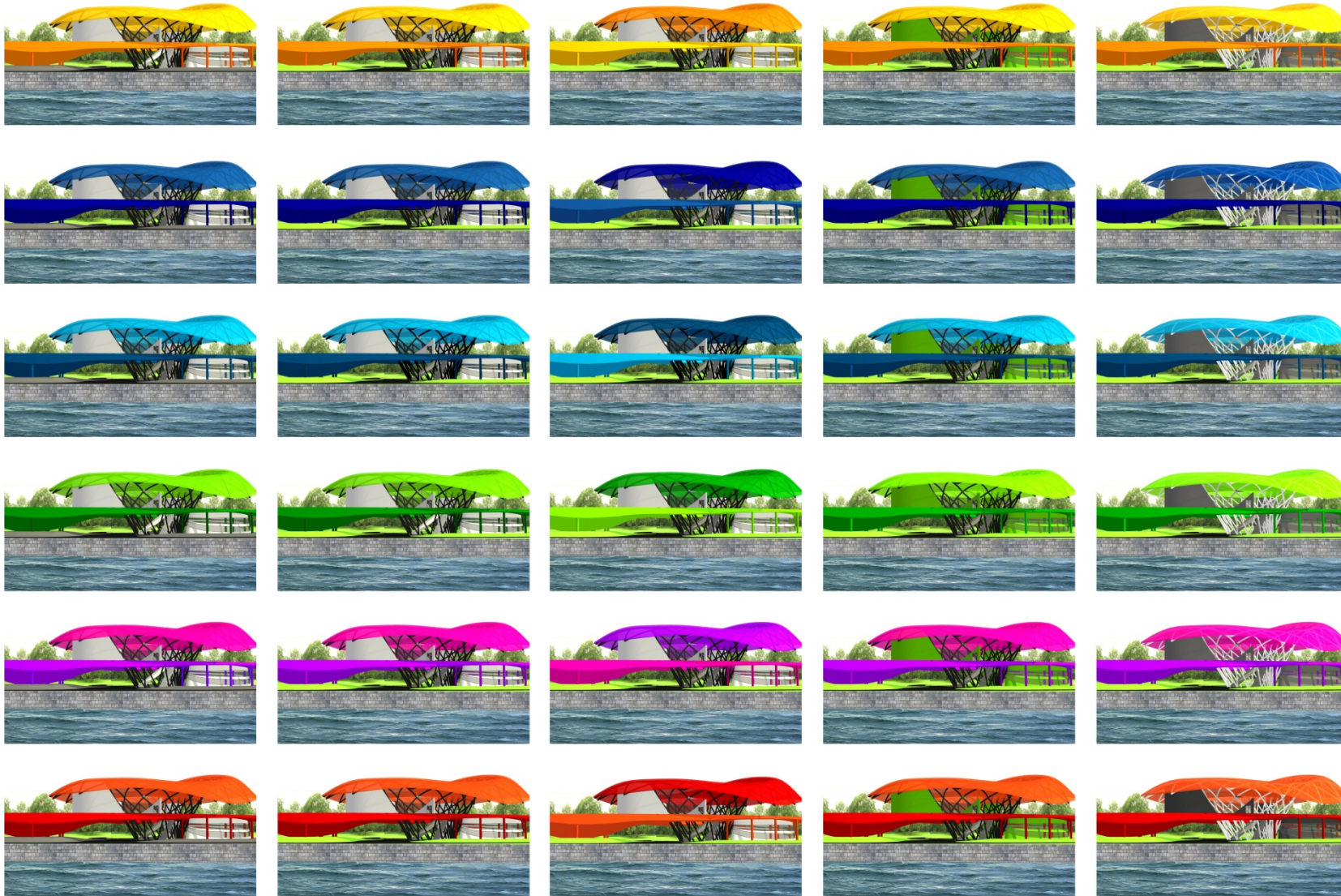


	U [mm]	U [%Δ]	σ [N/mm ²]		σ [%]	M_{yy} [kNm]		M_{yy} [%]
Eerste idee	1250	-	-60	+60	-	-600	+800	-
Resultaat	70	94,4	-70	+80	133,3	-60	-80	90,0

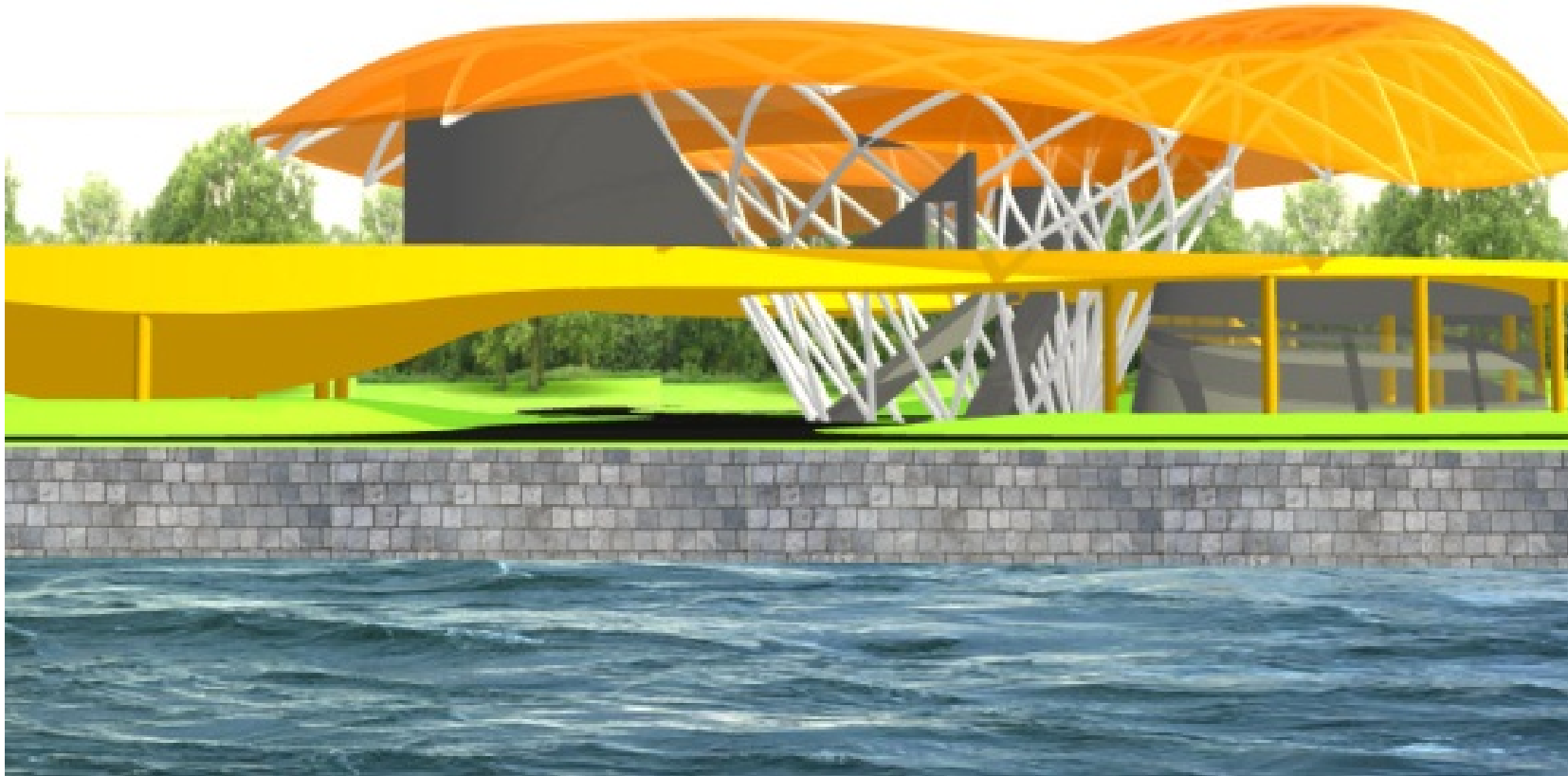
ZUIDGEVEL



KLEURGEBRUIK



KLEURGEBRUIK



ZUIDGEVEL



Ontwerp

60

OOSTGEVEL



Ontwerp

61

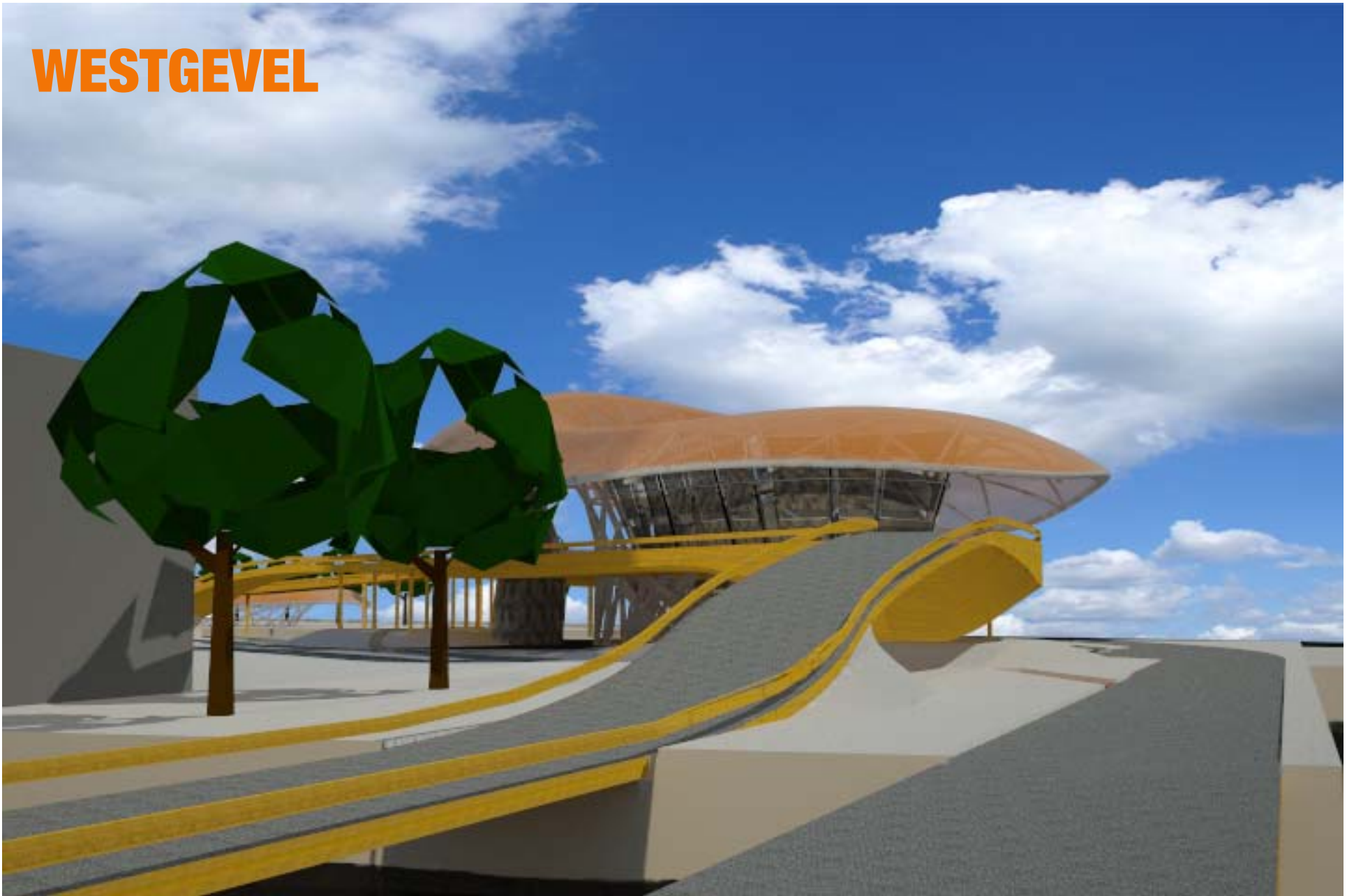
NOORDGEVEL



Ontwerp

62

WESTGEVEL



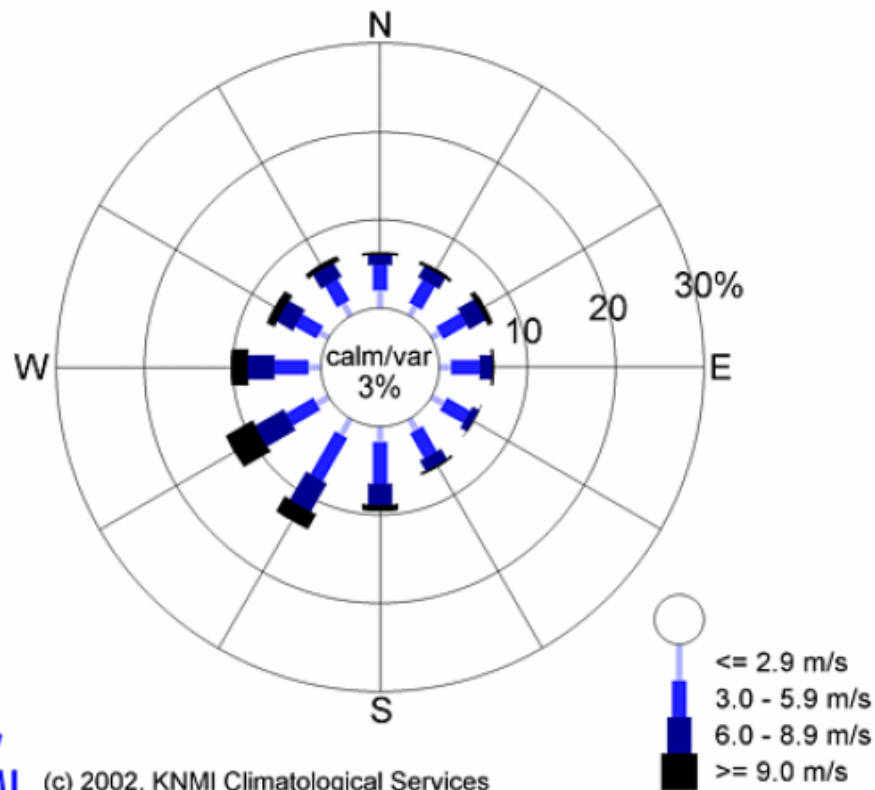
Ontwerp

63

EIGENSCHAPPEN WIND

Maximale doorbuiging: 200 mm

Wind rose Schiphol, Year climatology
1 January to 31 December (time period 1971-2000)



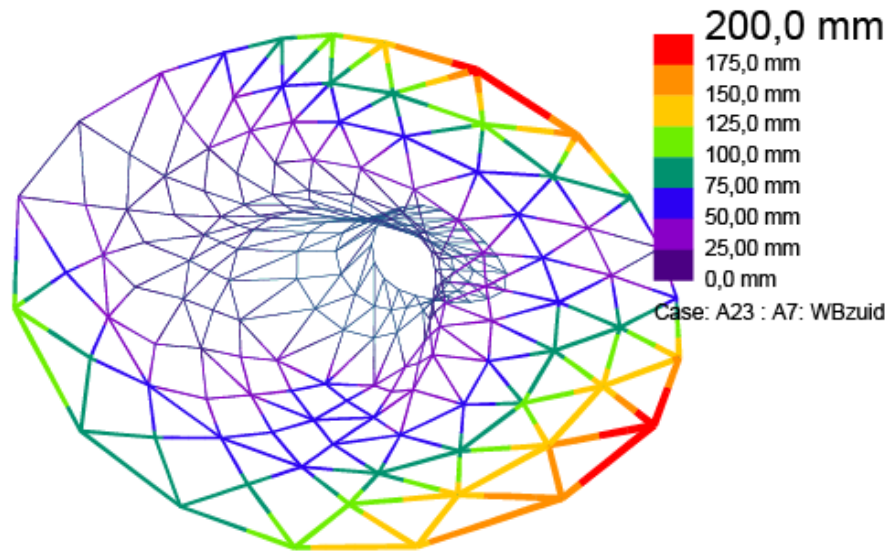
EIGENSCHAPPEN WIND

Maximale doorbuiging: 200 mm

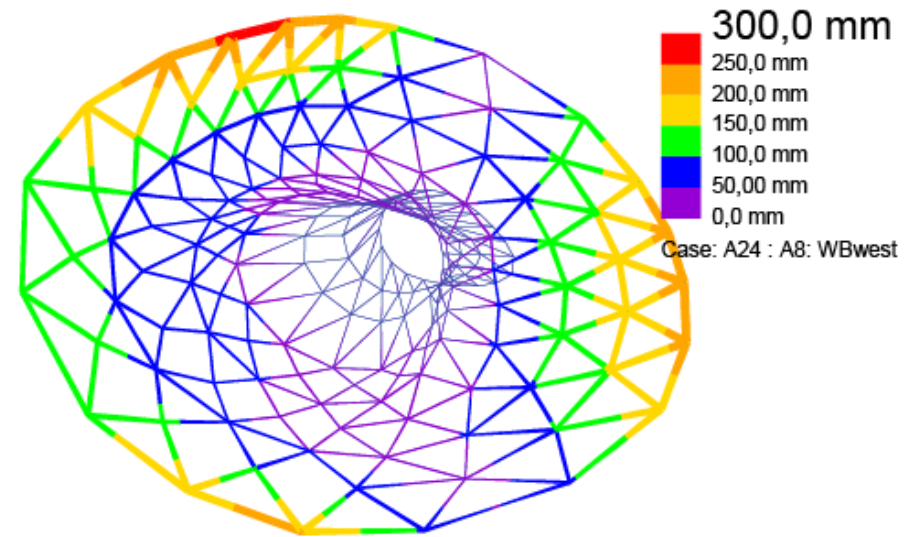


DOORBUIGING DOOR DE WIND

Maximale doorbuiging: 200 mm

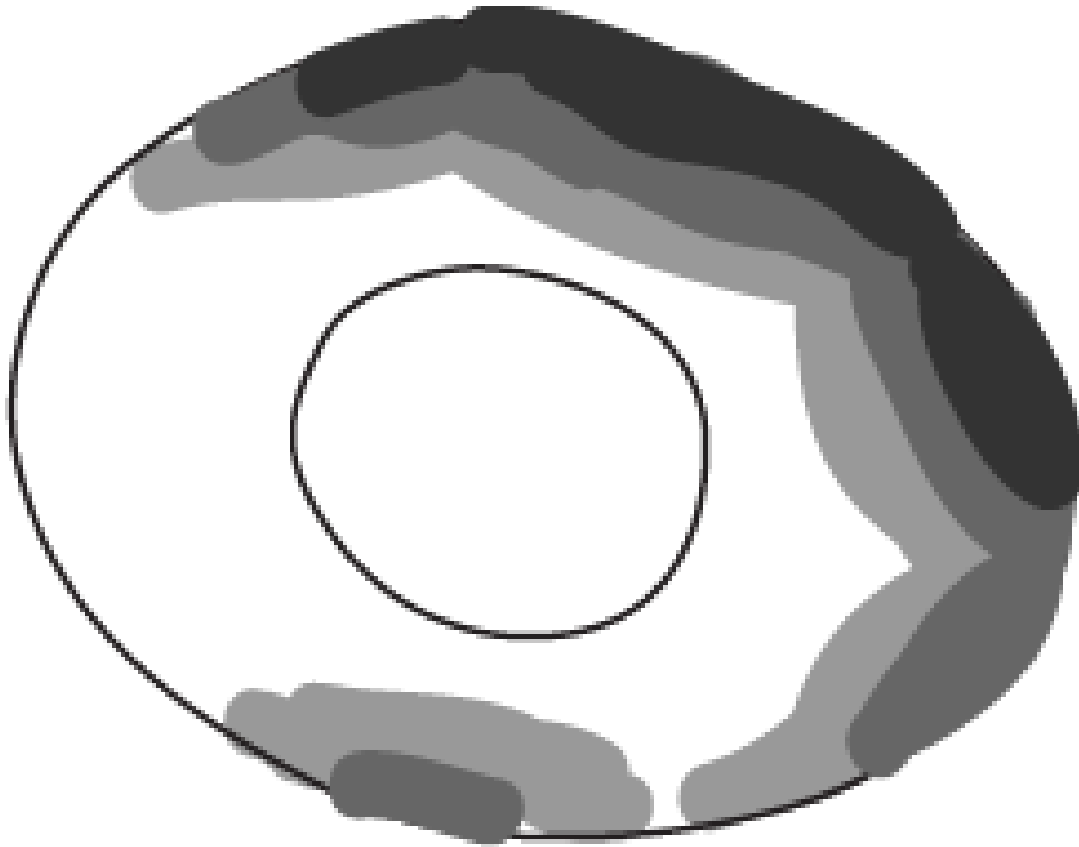


Zuidelijke wind



Westelijke wind

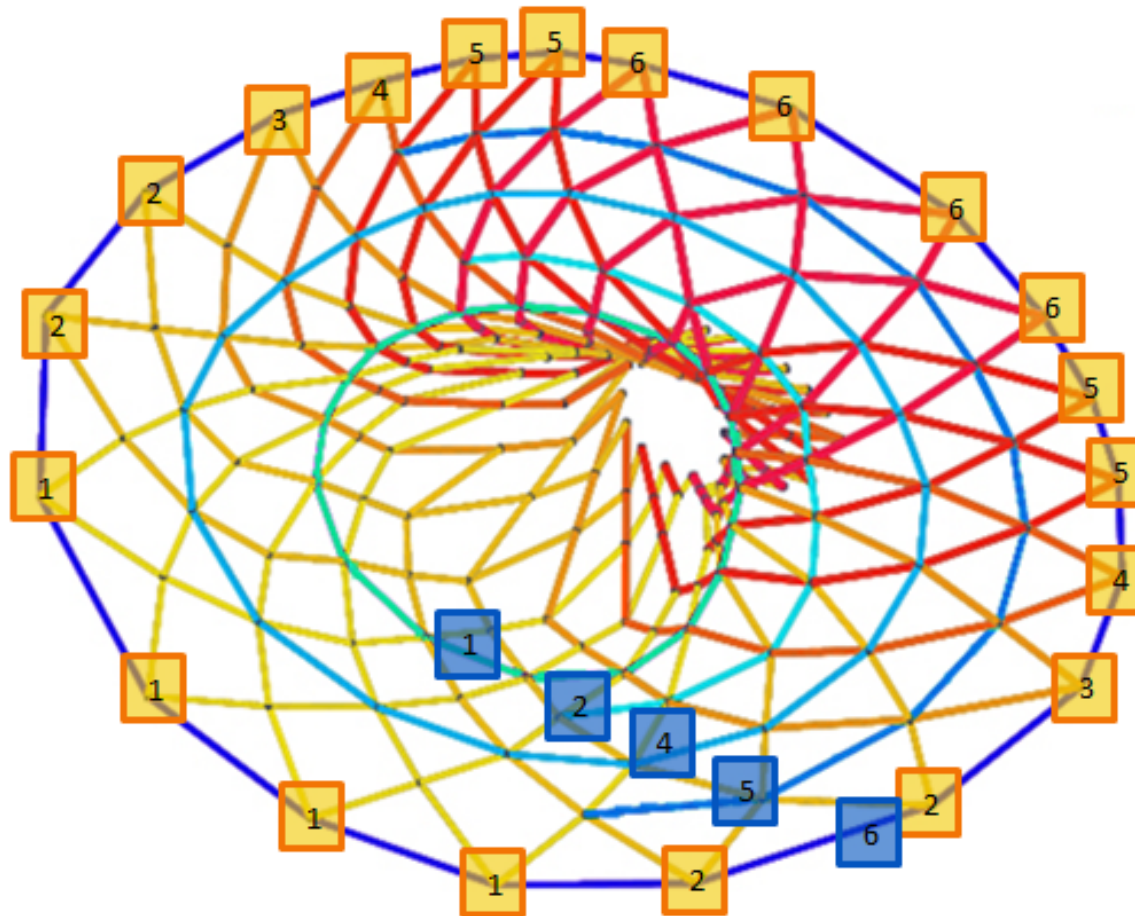
ANALYSE ZWAKKE PLEKKEN



Doel: behalen van de maximale doorbuigingseis met minimale gewichtstoename.

OPTIMALISATIE

‘Bos bloemen’ methode



Profieldoorsneden:

Spanten (oranje)

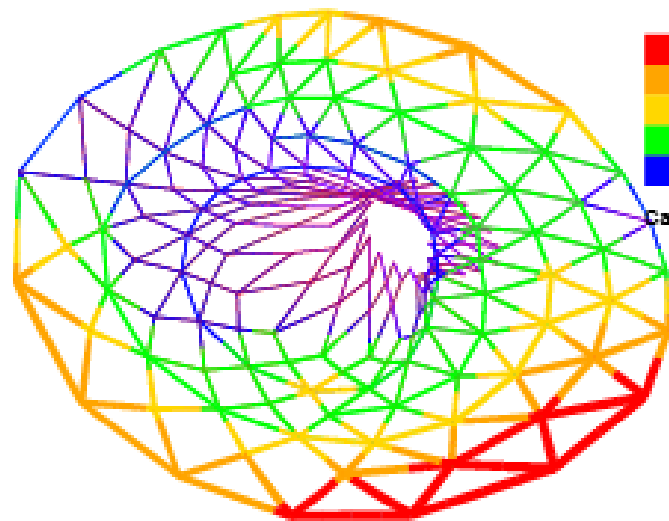
1. $\varnothing = 305$ mm, $t = 16$ mm
2. $\varnothing = 330$ mm, $t = 16$ mm
3. $\varnothing = 386$ mm, $t = 16$ mm
4. $\varnothing = 394$ mm, $t = 16$ mm
5. $\varnothing = 419$ mm, $t = 16$ mm
6. $\varnothing = 445$ mm, $t = 16$ mm

Ringen (blauw)

1. $\varnothing = 305$ mm, $t = 16$ mm
2. $\varnothing = 330$ mm, $t = 16$ mm
3. $\varnothing = 394$ mm, $t = 25$ mm
4. $\varnothing = 419$ mm, $t = 17,5$ mm
5. $\varnothing = 445$ mm, $t = 17,5$ mm

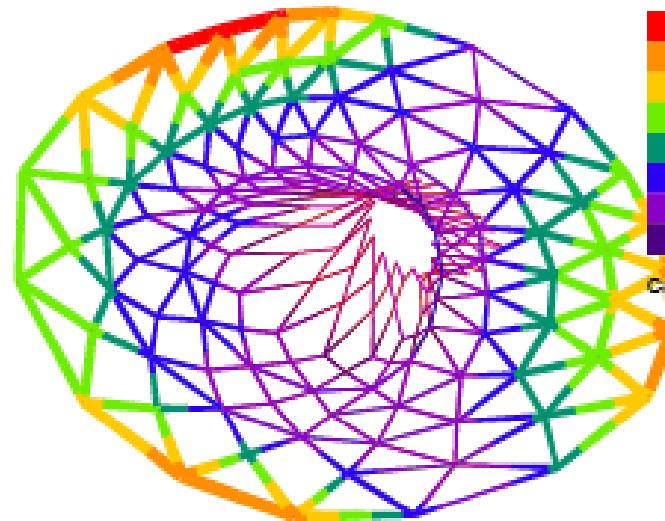
OPTIMALISATIE

Maximale doorbuiging: 200 mm



125,0 mm
100,0 mm
75,00 mm
50,00 mm
25,00 mm
0,0 mm
Case: A23 : A7: WBzuid

Zuidelijke wind

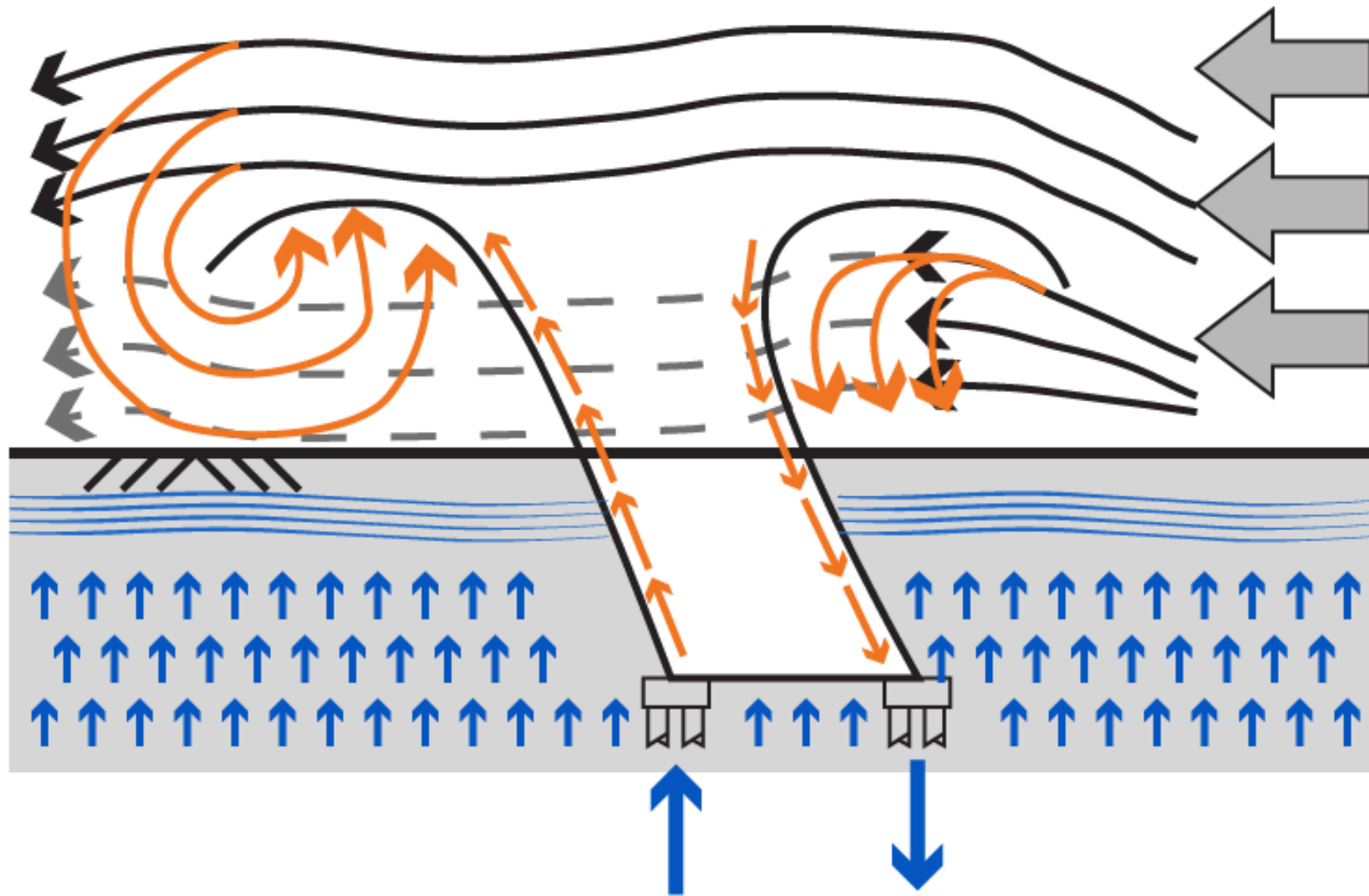


200,0 mm
175,0 mm
150,0 mm
125,0 mm
100,0 mm
75,00 mm
50,00 mm
25,00 mm
0,0 mm
Case: A24 : A8: WBwest

Westelijke wind

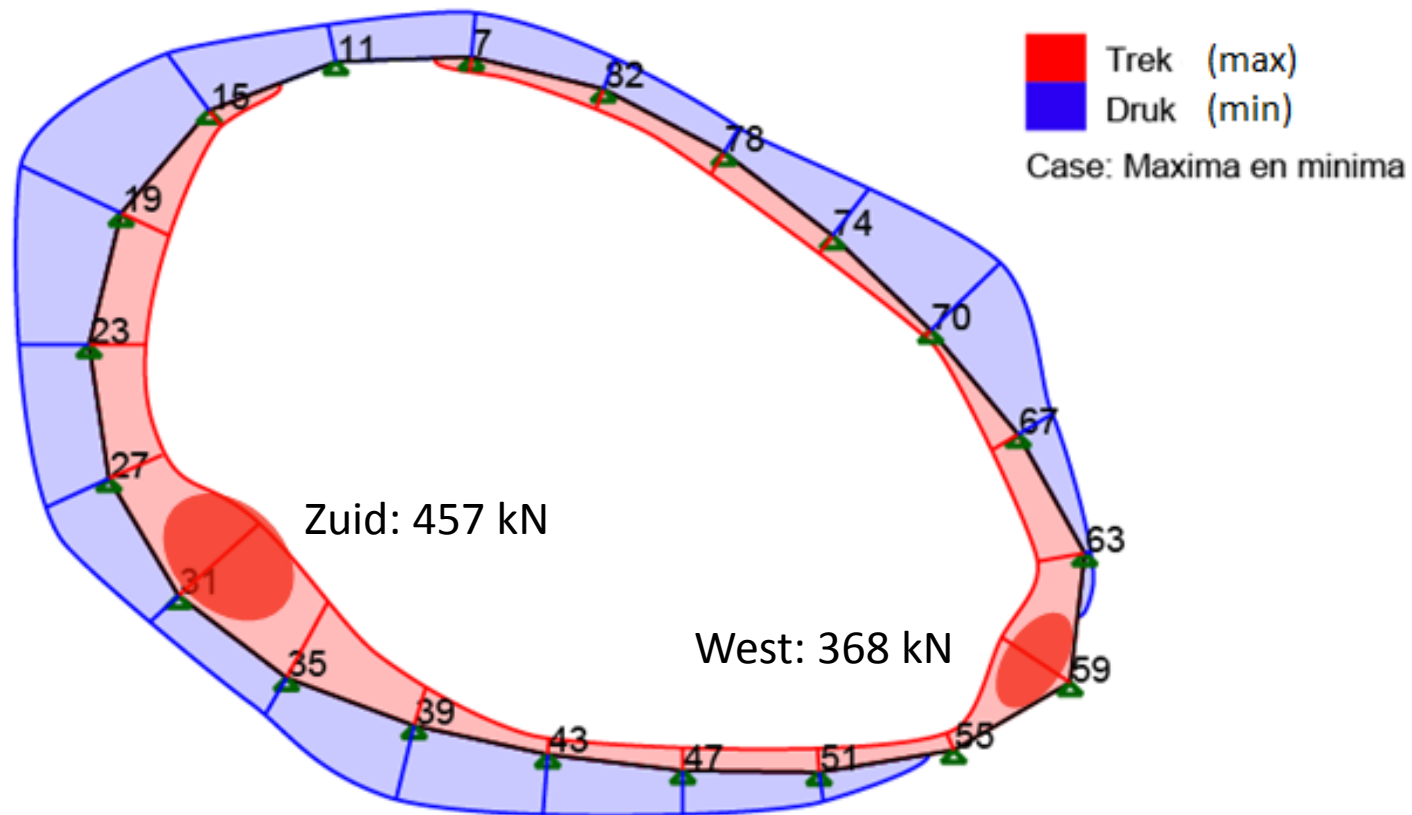
	U [mm]	U [%Δ]	G [ton]	G [%]
Optimalisatie EG	300	-	280,4	-
Resultaat	200	66,7	342,6	122,2

FUNDERING



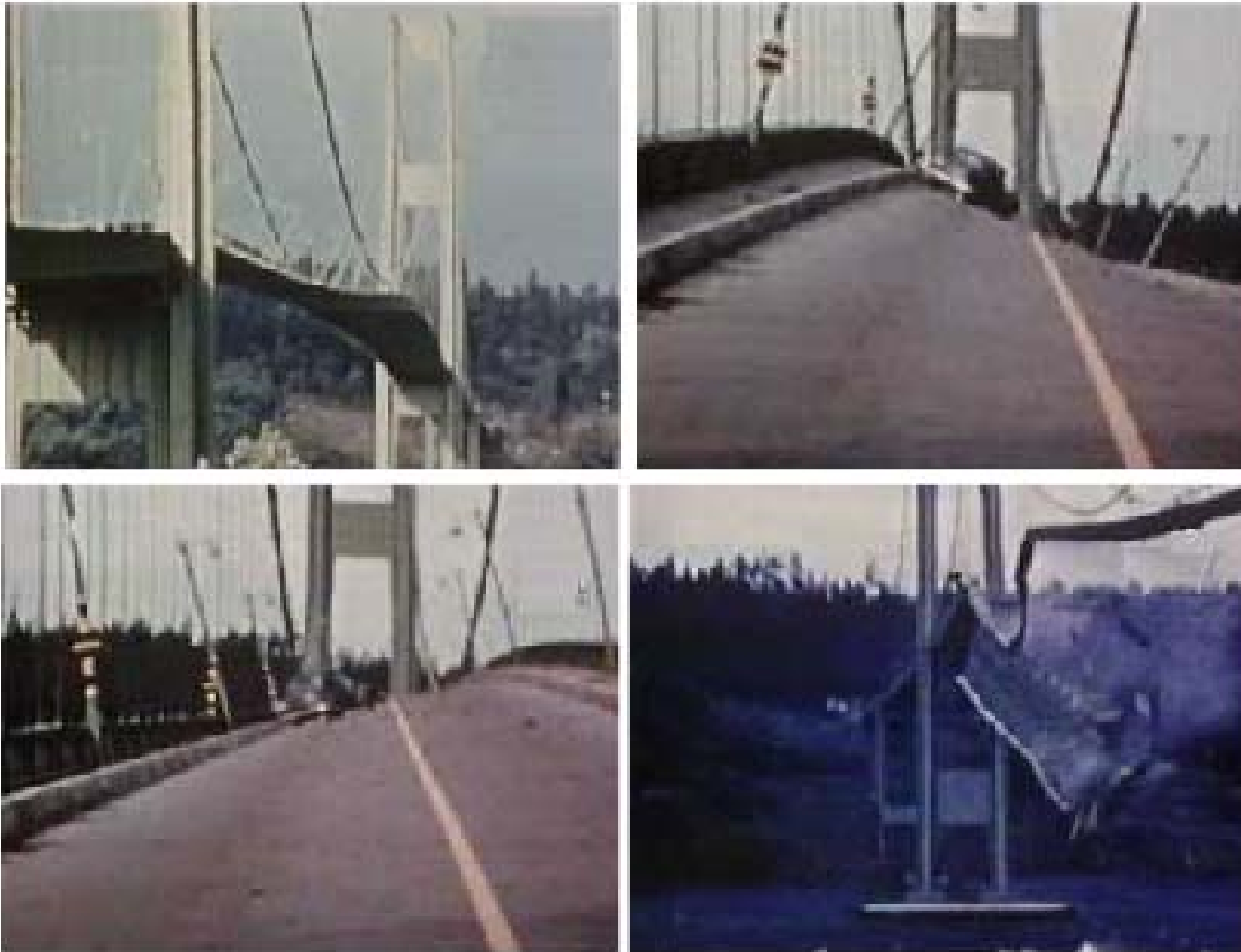
Optimalisatie wind

FUNDERING



Trekkkrachten [kN]		Drukkkrachten [kN]	
Opwaartse druk grondwater	30100	Gewicht vloeren (A = 2850 m ² , d= 450 mm, G=25kN/m ³)	32060
Trek door wind	457		
Totaal	30557	Totaal	32060

RESONANTIE



Tacoma Narrows Bridge, Washington, VS

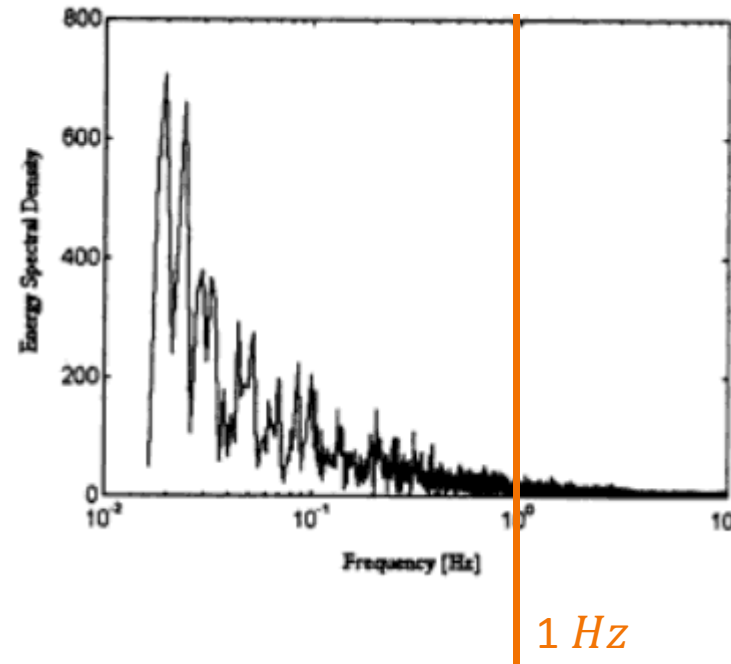
Optimalisatie wind

RESONANNTIE: VLAGERIGHEID WIND

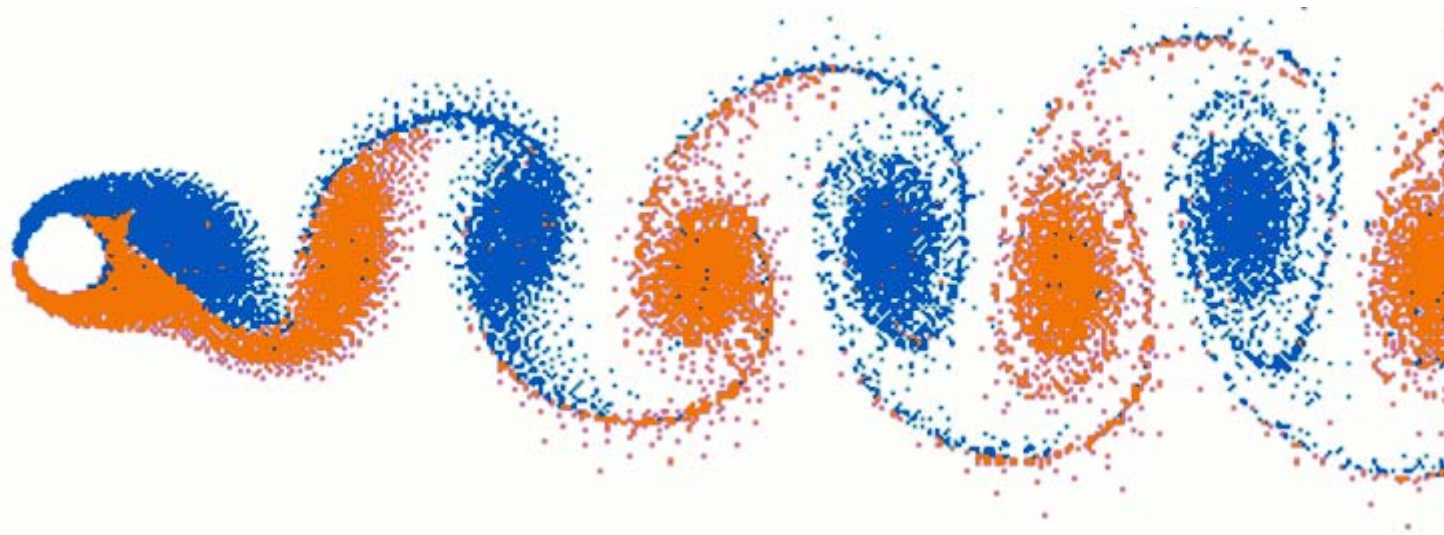
Eigenfrequenties

1. 1,155 *Hz*
2. 1,394 *Hz*
3. 1,641 *Hz*
4. 1,902 *Hz*
5. 2,034 *Hz*
6. 2,165 *Hz*
7. 2,540 *Hz*
8. 2,802 *Hz*
9. 3,003 *Hz*
10. 3,091 *Hz*

Turbulentiespectrum



RESONANTIE: LOSLAATFREQUENTIE



Optimalisatie wind

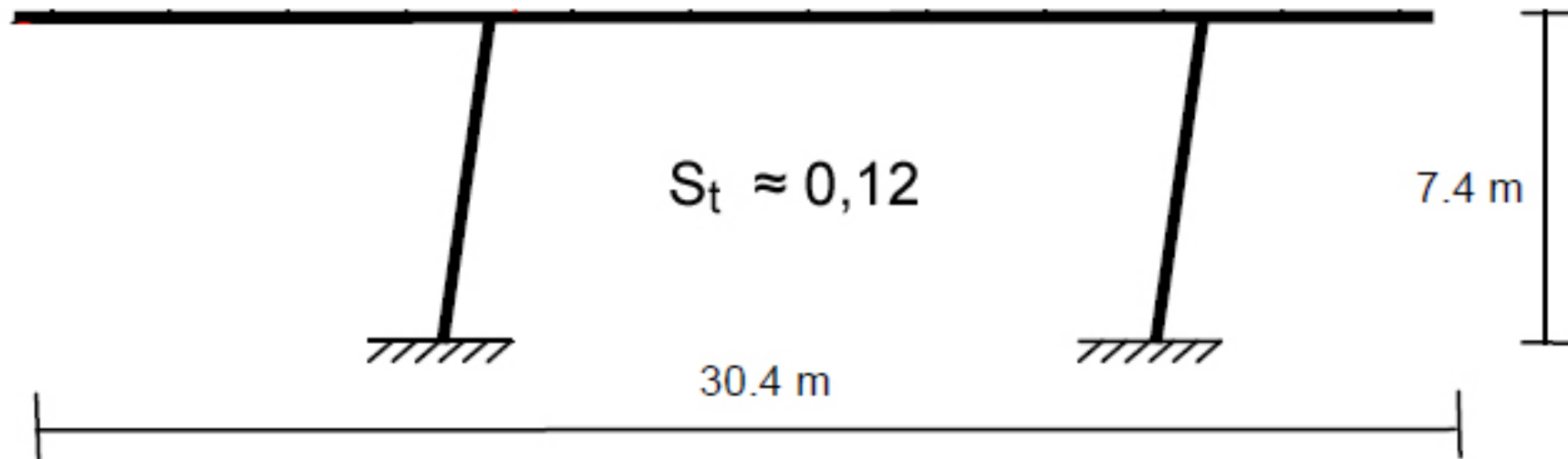
RESONANTIE: LOSLAATFREQUENTIE

$$n_s = \frac{S_t \times \bar{u}}{b} \text{ [Hz]}$$

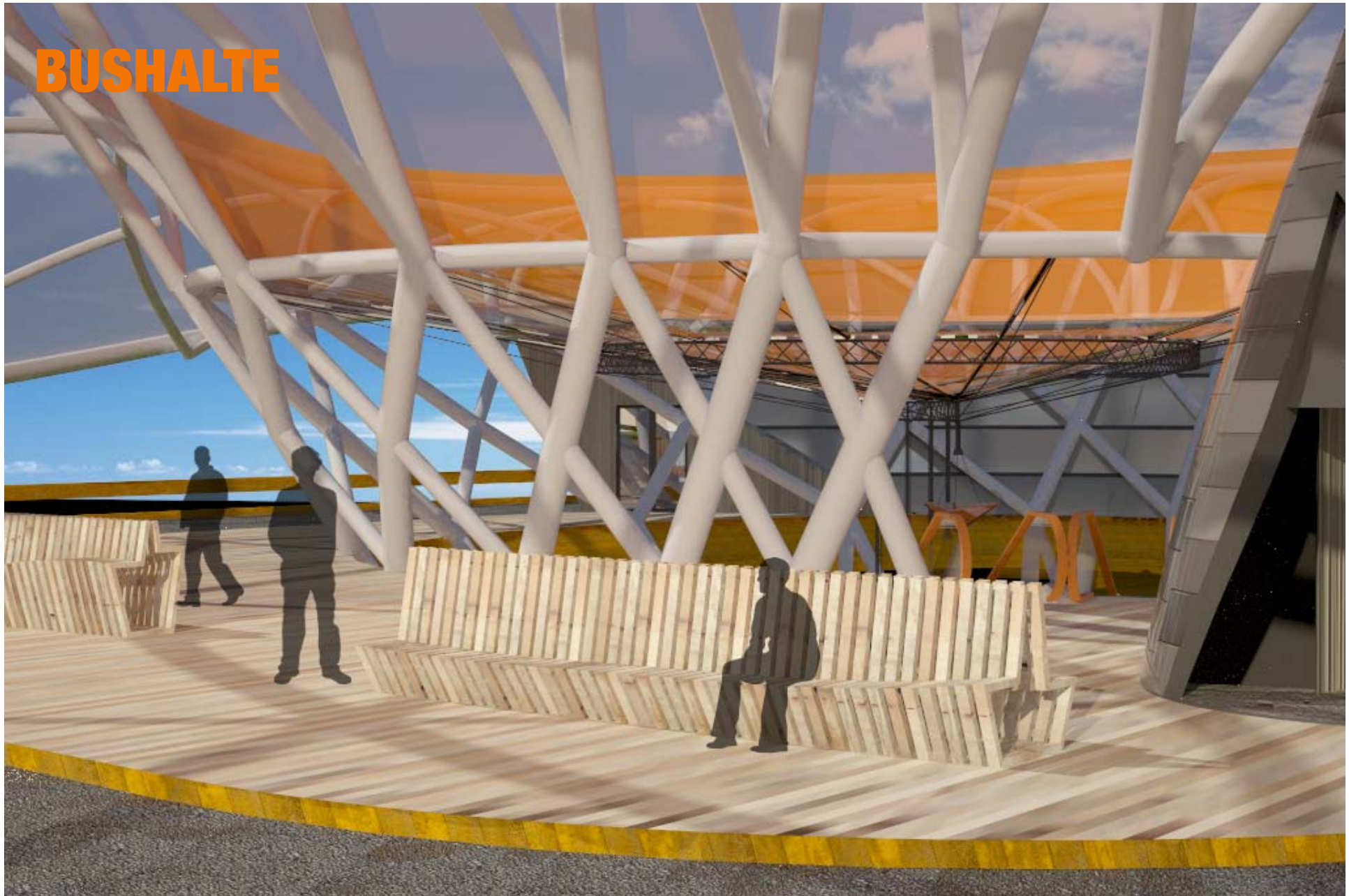
waarbij:

S_t = Strouhalnummer = 0,12
 $\bar{u}$ = nominale windsnelheid [km/h] = 93,6 km/h
 b = breedte van het gebouw [m] = 50 m

$$n_s = 0,22 \text{ Hz}$$



BUSHALTE



FIETSENSTALLING



Ontwerp

77

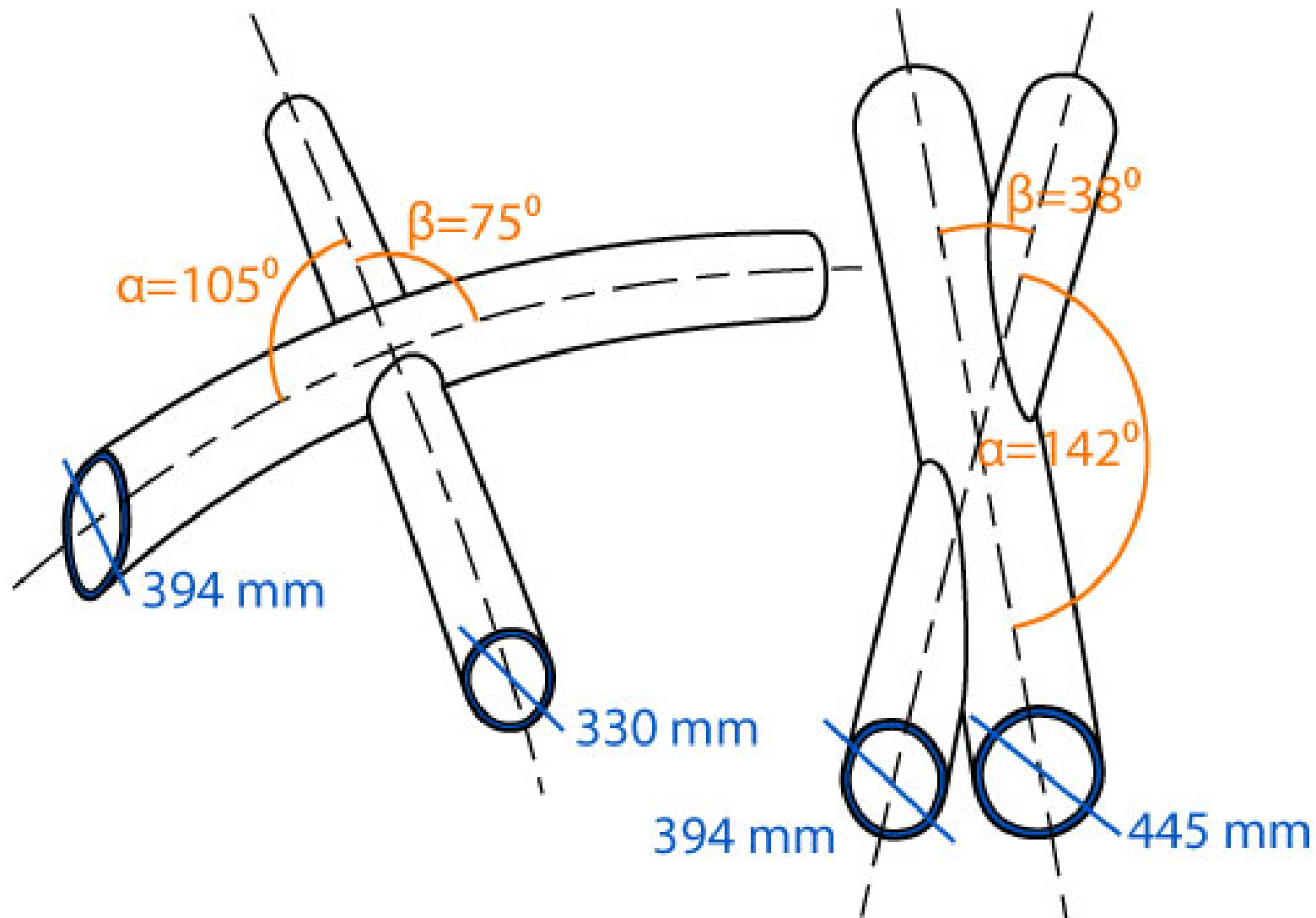
TUNNEL METRO



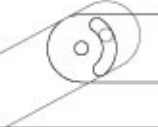
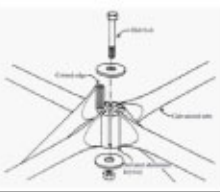
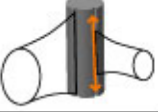
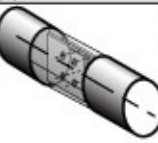
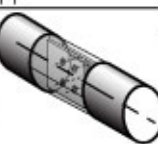
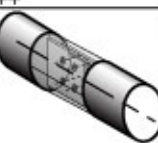
Ontwerp

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LASTIGE PUNTEN DETAILLERING



METHODES

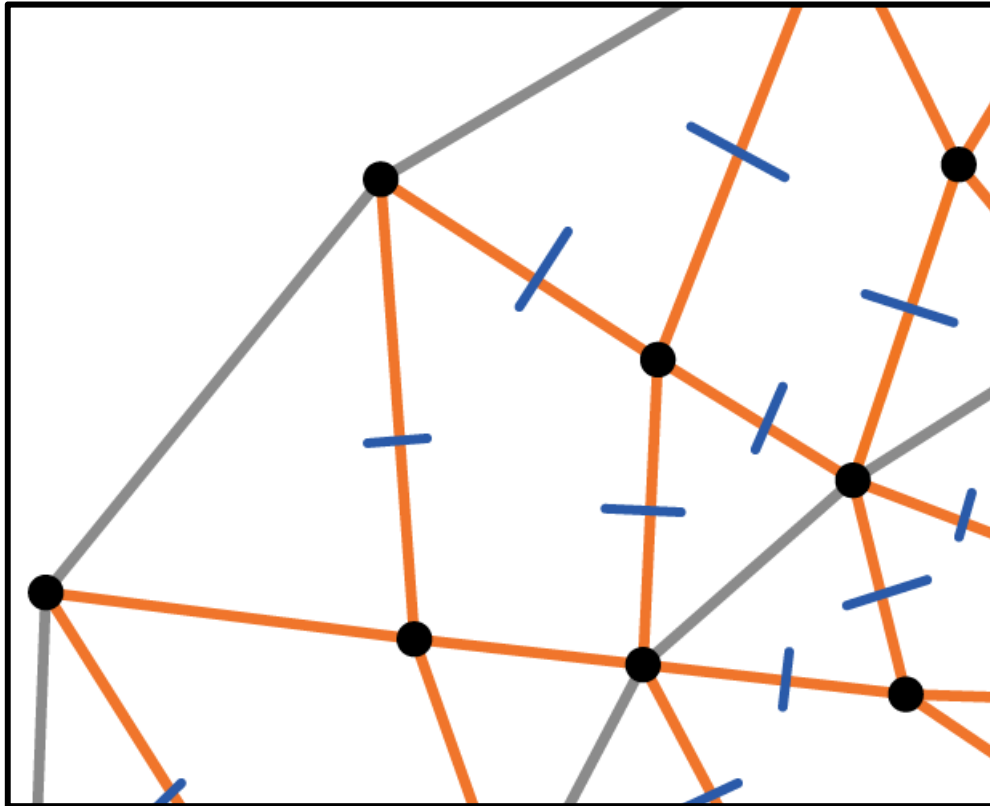
Methodes	Opbouw	Ringen	Geschiktheid	Montage knopen	Architectuur	Architectoisch beeld	Totaal
Bestaande knopen							
splice connector		++	++	++	---	-	+
					Beeld unieke spanten wordt verstoord door knopen.		Goede mogelijkheid, wel verstoord architectonisch beeld.
triodectic		++	0	-	-	0	-
			Knoop wordt even hoog als plat eind hoogste buis.	Probleem vastzetten staven kleine diameter	Beeld wordt redelijk verstoord door knopen en patte uiteinden buizen.	Geen architectonisch beeld beschikbaar. Relatief kleine knoop.	Lastig met verschillende diameters en verstoord architectonisch beeld.
							
Unieke knopen							
gieten		-	-	++	++	++	0
			Individuele mallen maakt deze methode erg kostbaar.		Onderscheiding ringen en spanten. Structuur spanten wordt niet verstoord.		Zeer dure methode vanwege mal unieke knopen. Wel gewenst architectonisch beeld.
laser snijden		-	++	++	++	++	++
			Eenvoudige afstelling		Onderscheiding ringen en spanten. Structuur spanten wordt niet verstoord.		Goed mogelijke methode. Gewenst architectonisch beeld. Nadeel: ringen in ander constructief vlak, wel oplosbaar.
drukklassen		++	++	++	---	---	---
			Alleen nog hoeken van 90° mogelijk.		Alleen hoeken van 90° mogelijk waardoor gehele beeld structuur negatief veranderd.	Geen architectonisch beeld beschikbaar. Alleen hoeken van 90° mogelijk.	Gewenste vrijheid knopen niet mogelijk met deze methode, nog te experimenteel.

LASERSNIJDEN

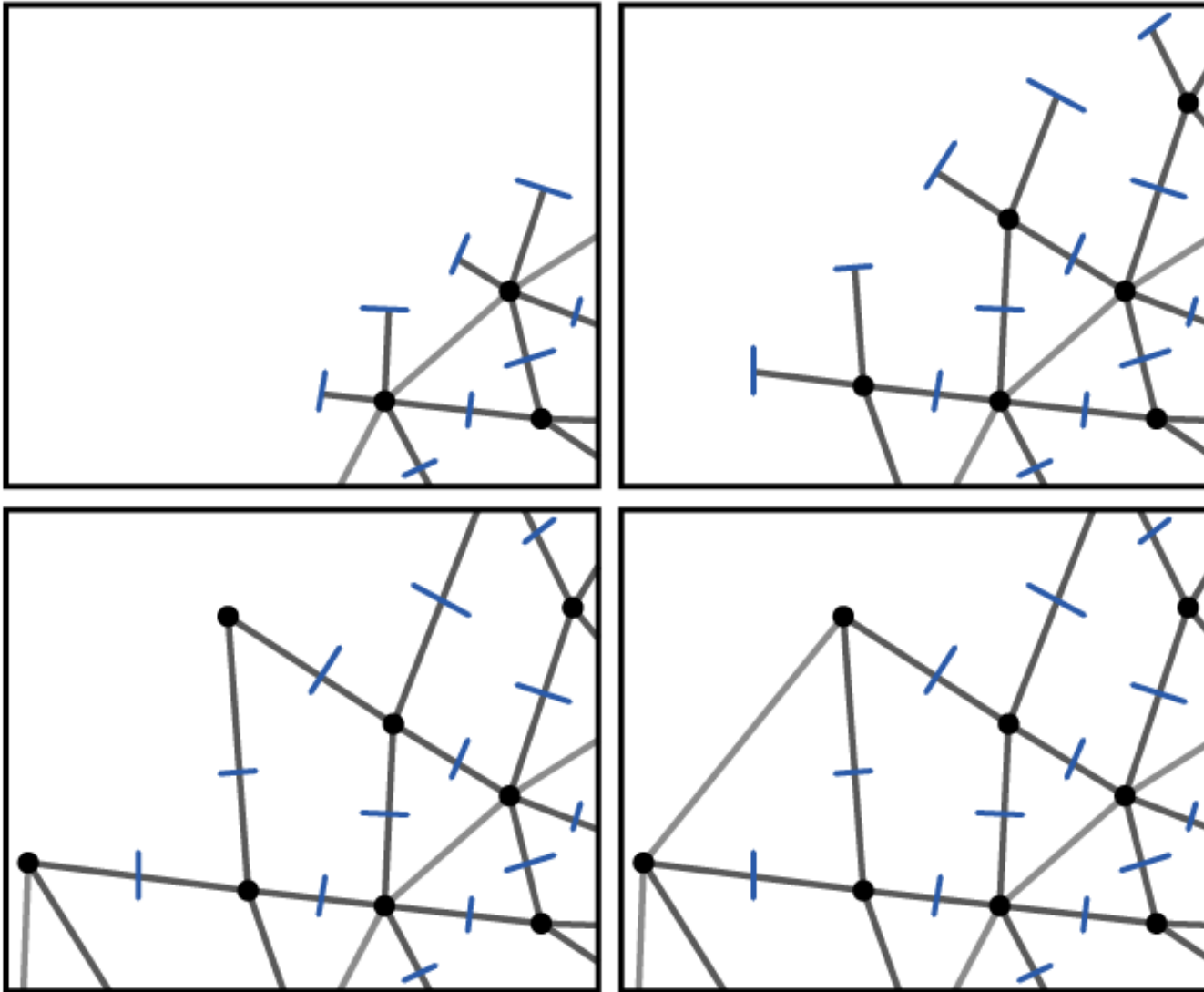


Detaillering

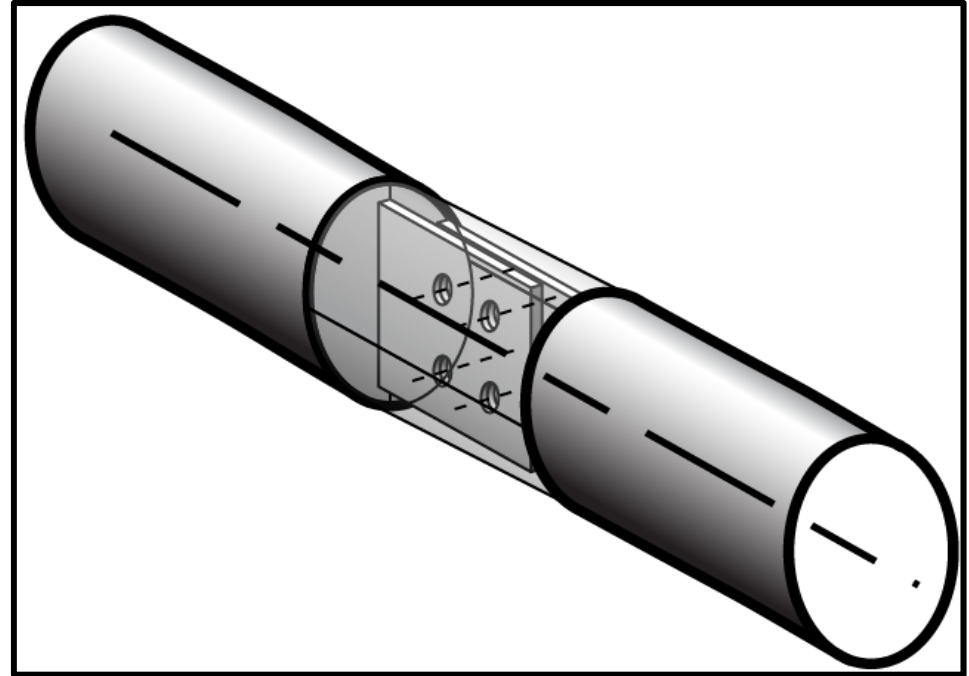
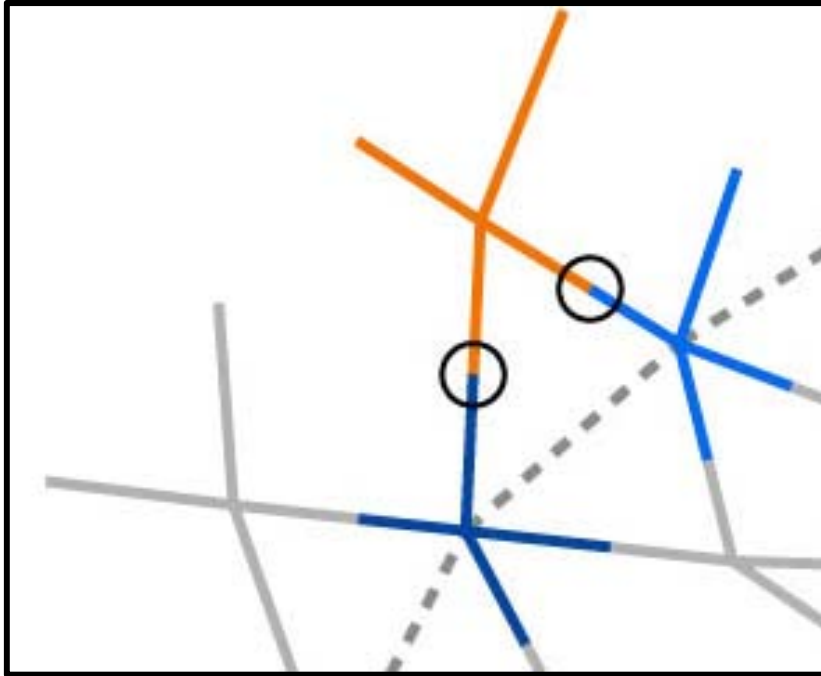
MONTAGE



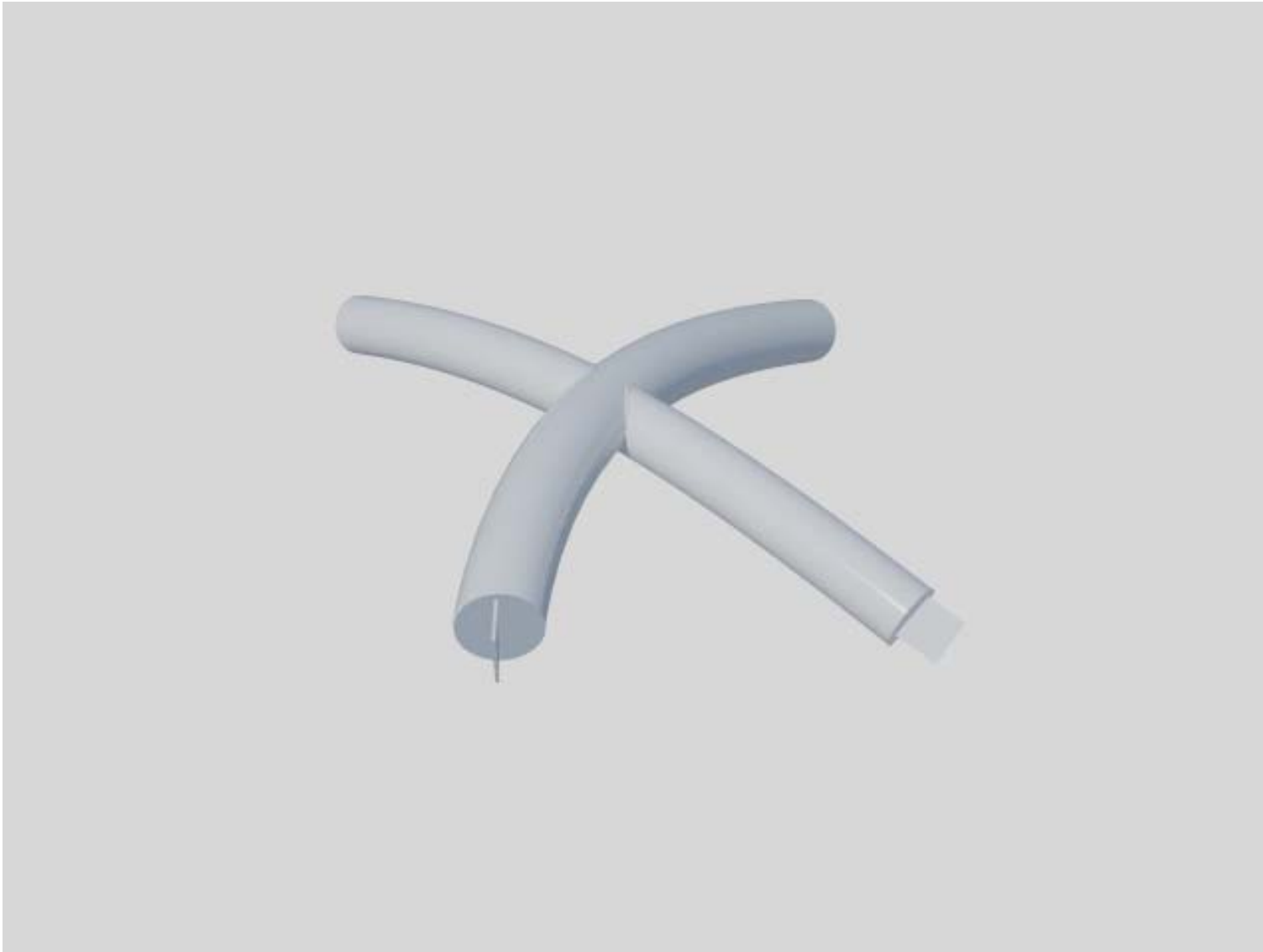
MONTAGE



MONTAGE



MONTAGE



Detaillering

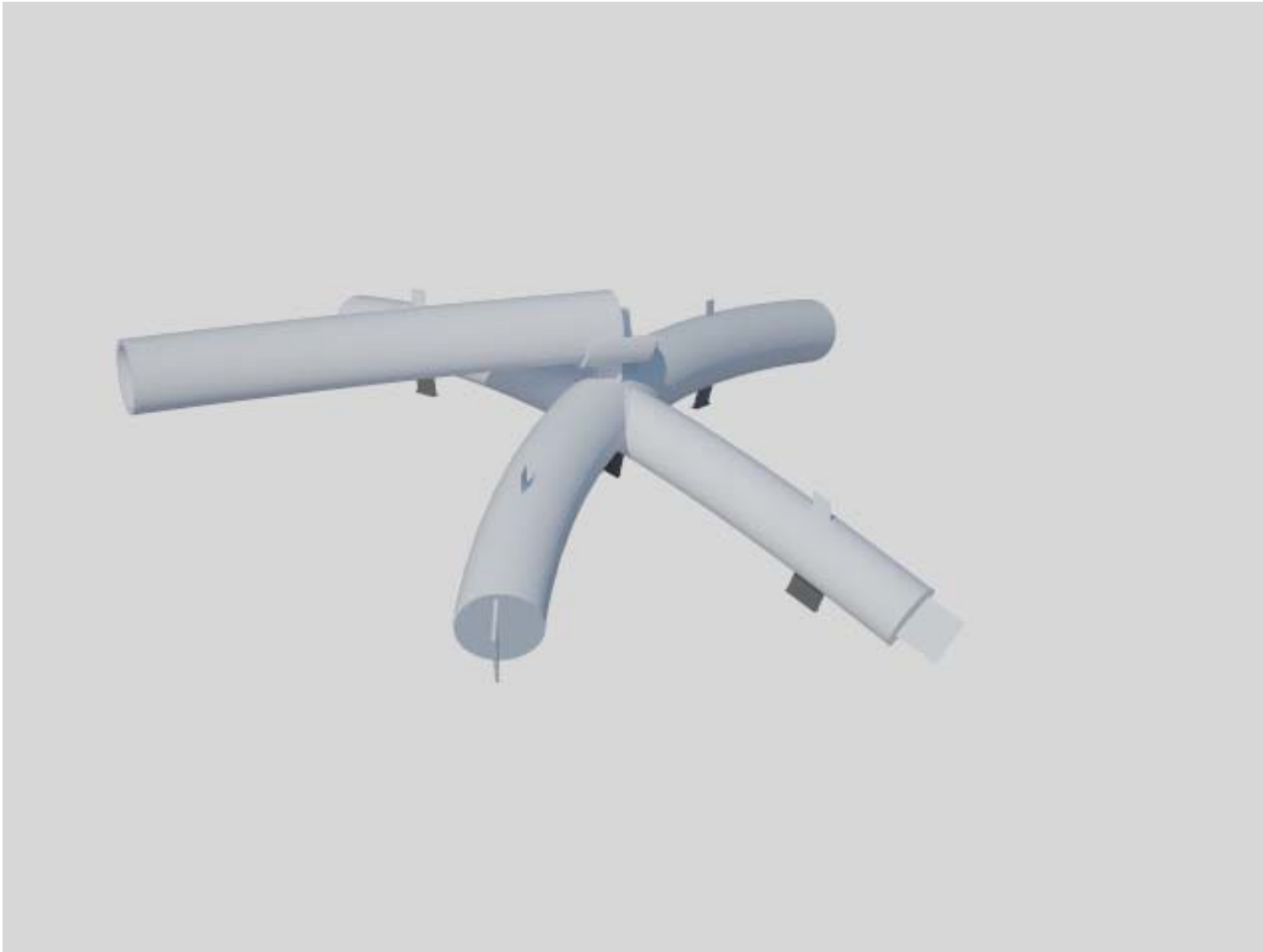
MONTAGE



MONTAGE



MONTAGE



Detaillering

MONTAGE



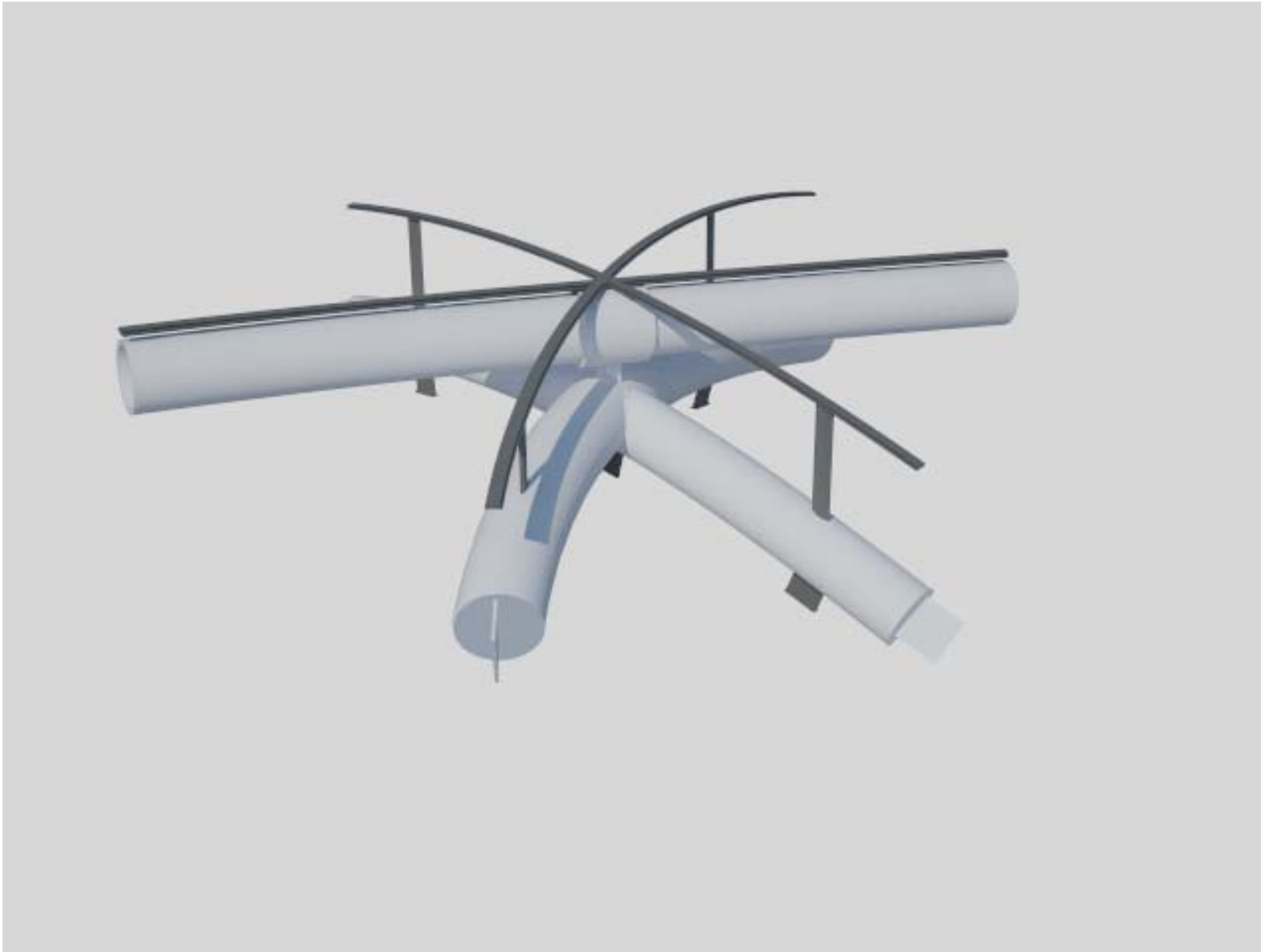
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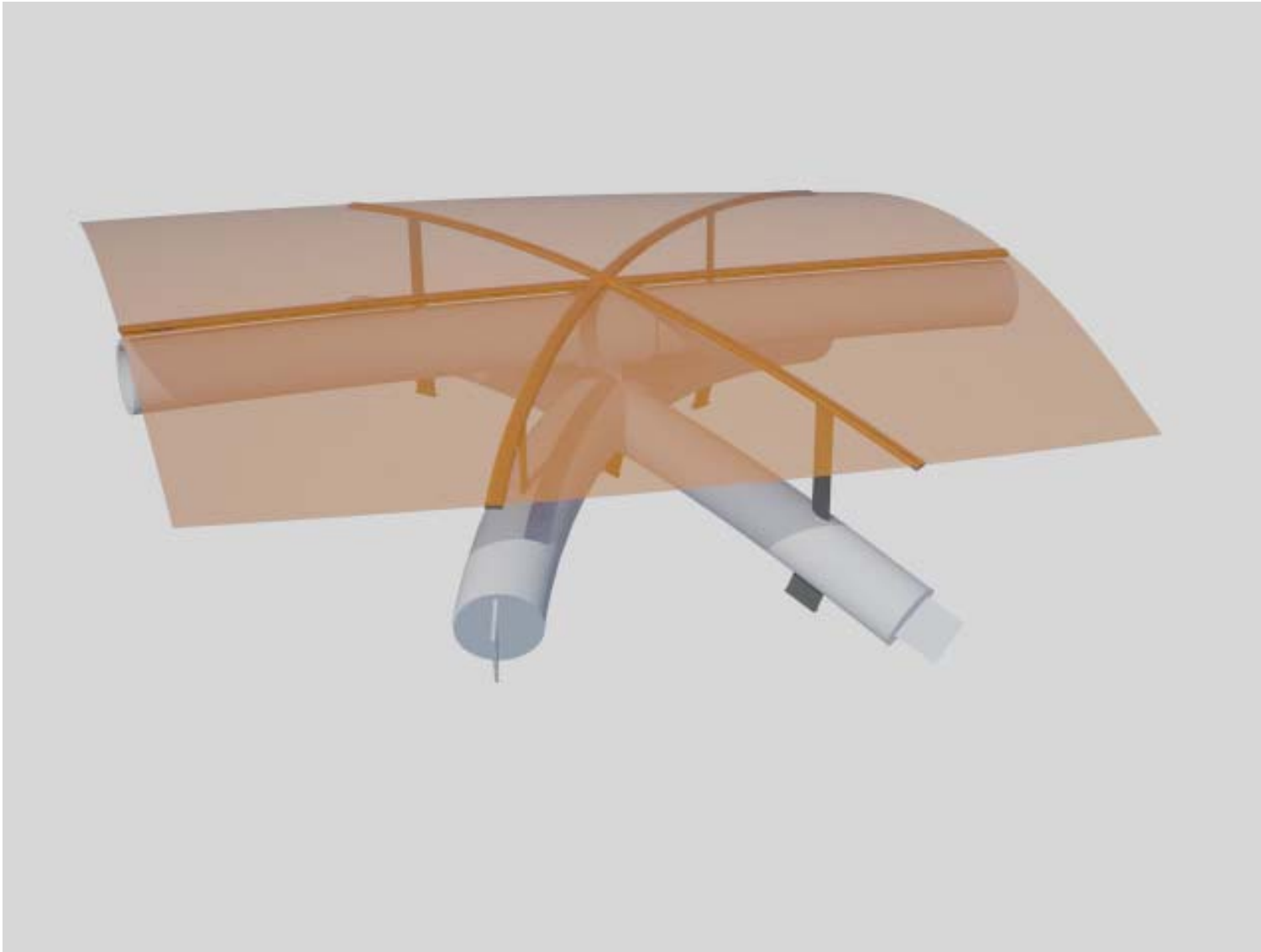
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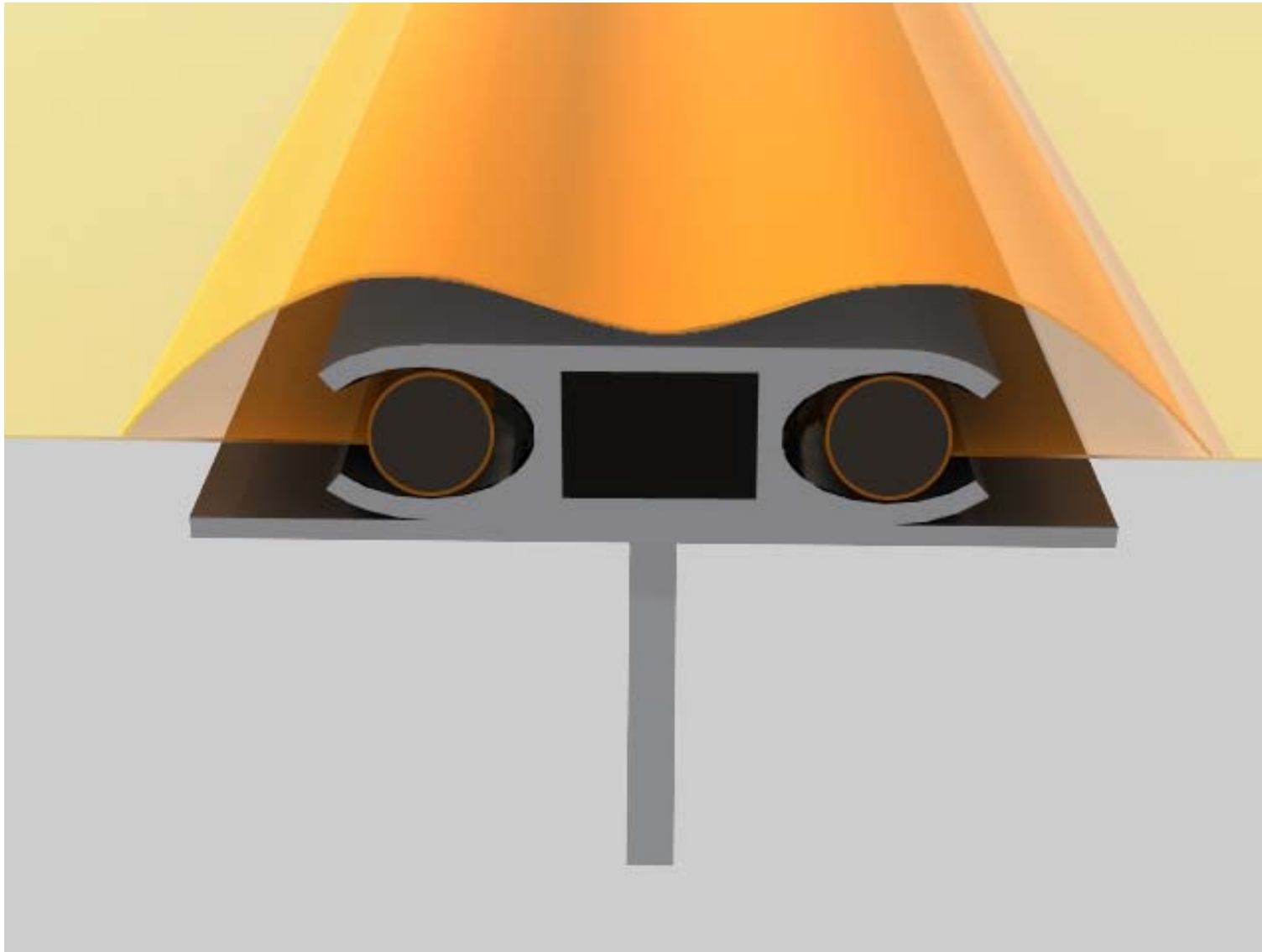
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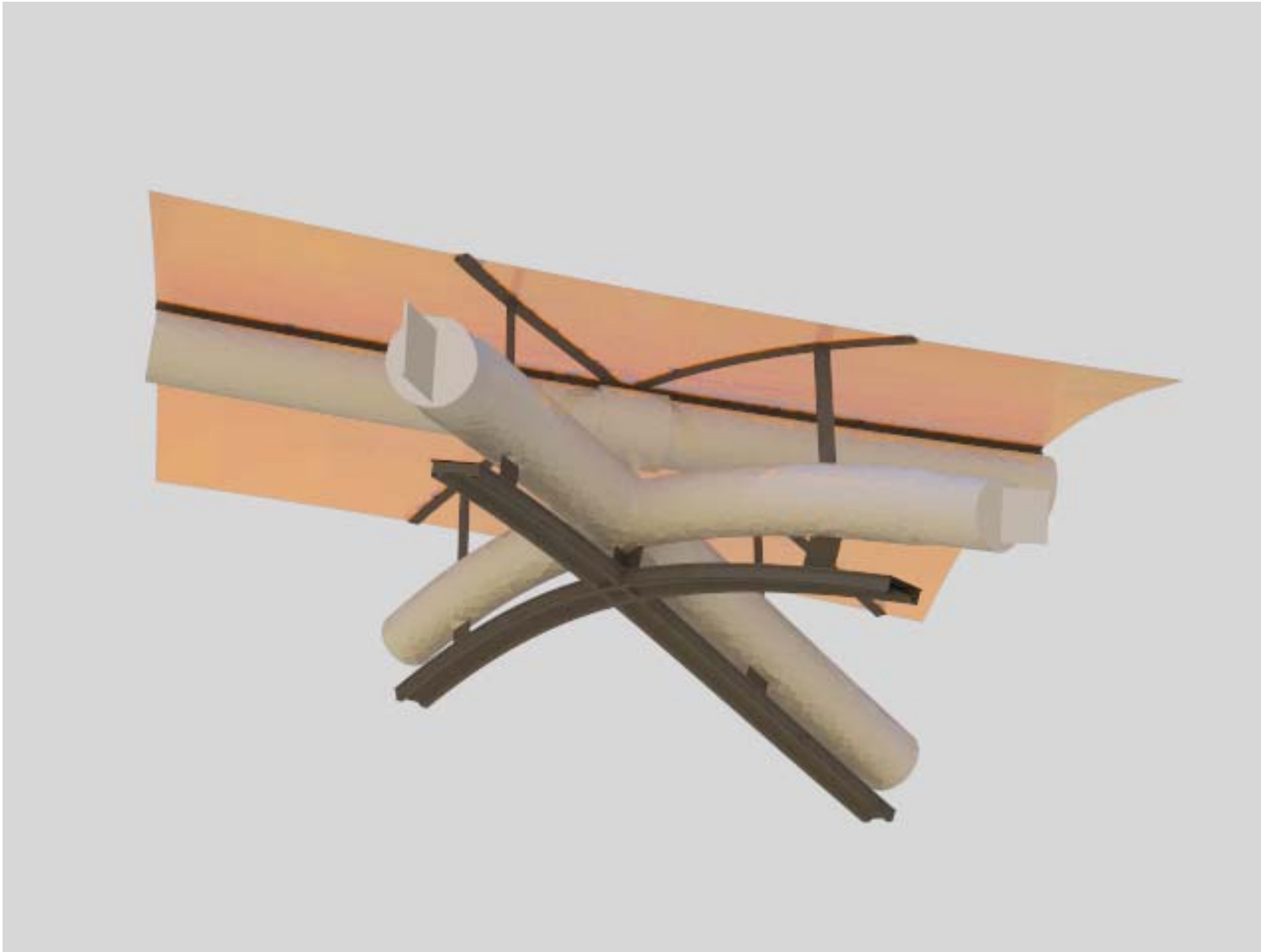
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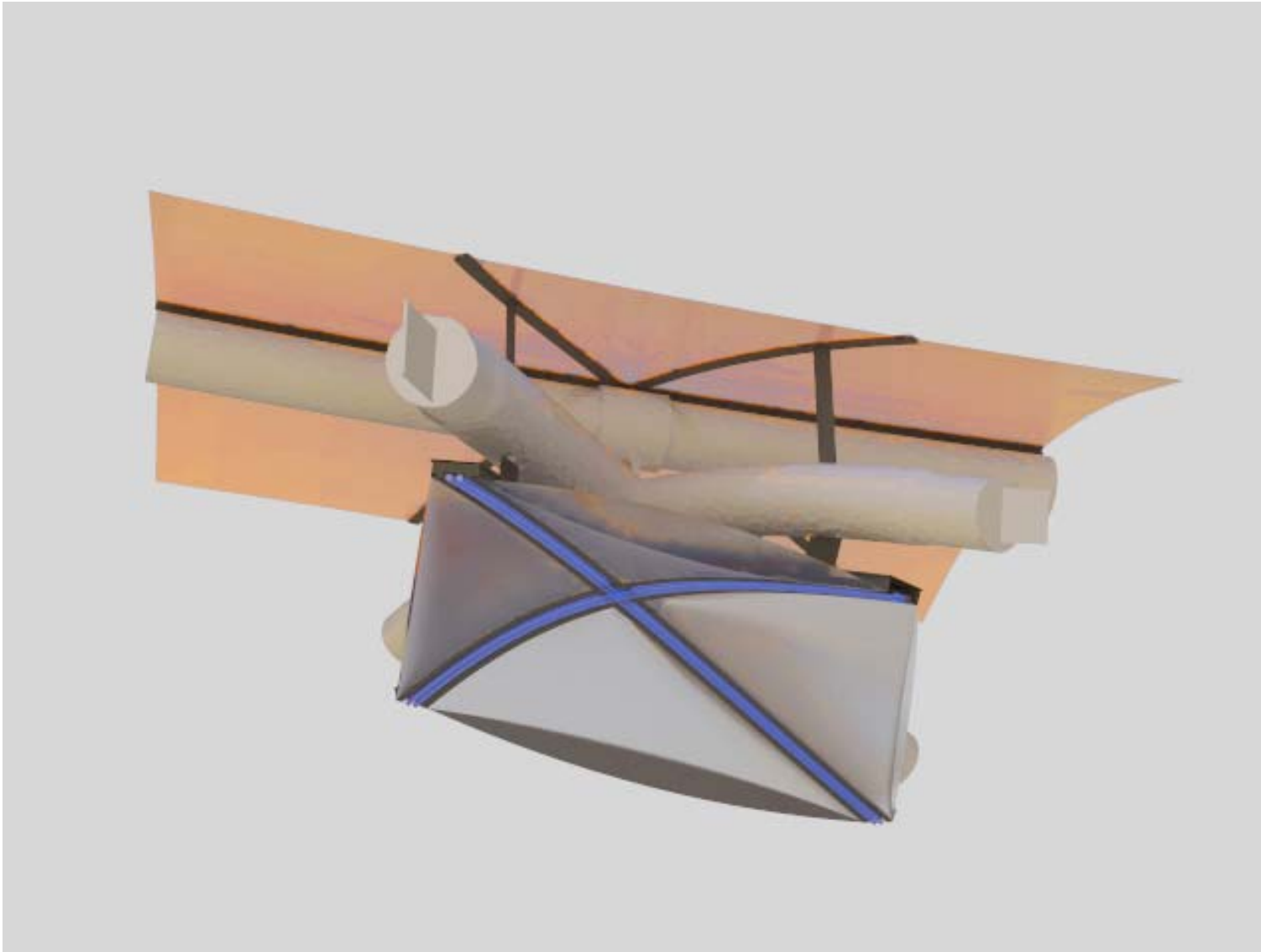
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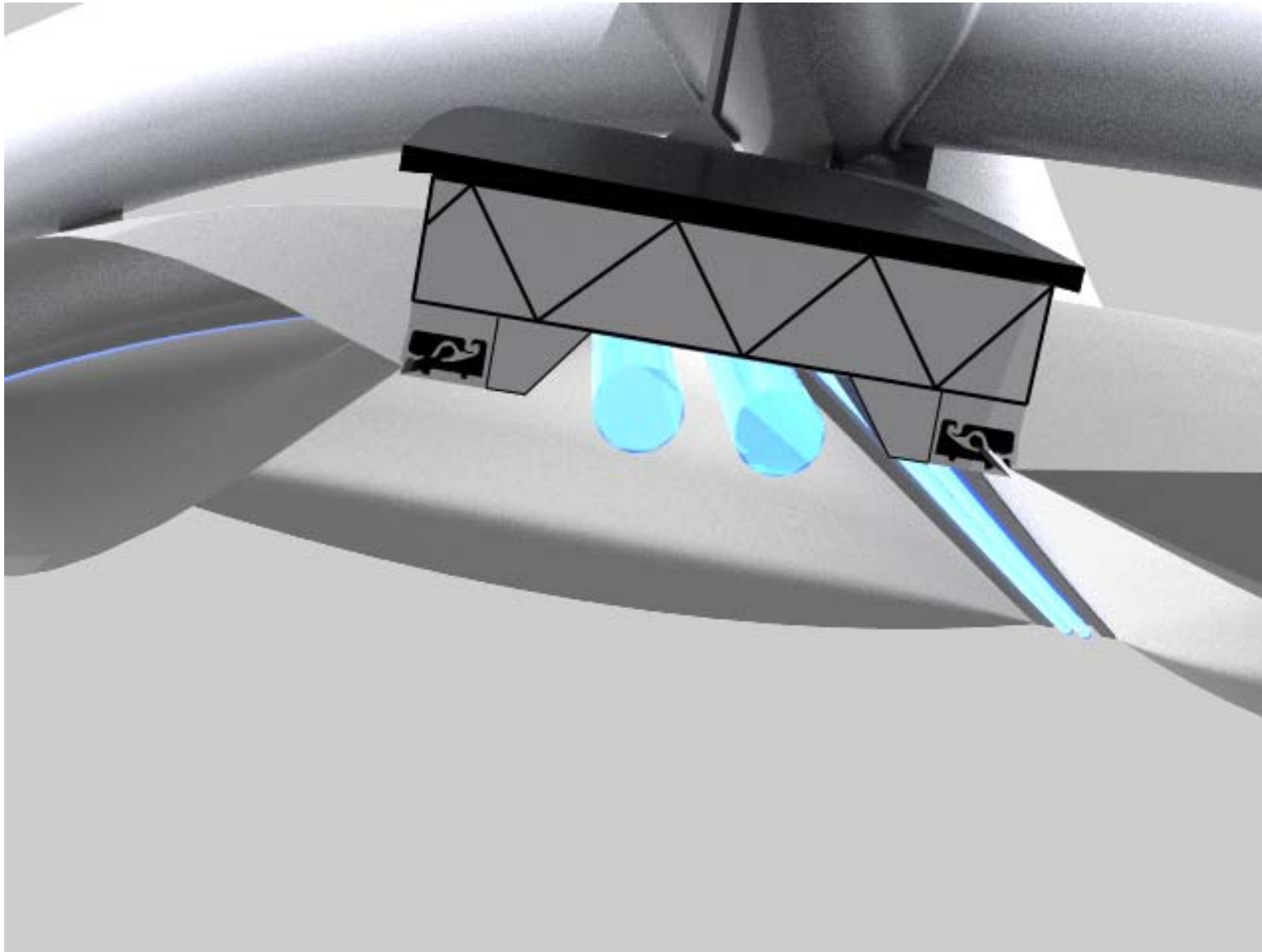
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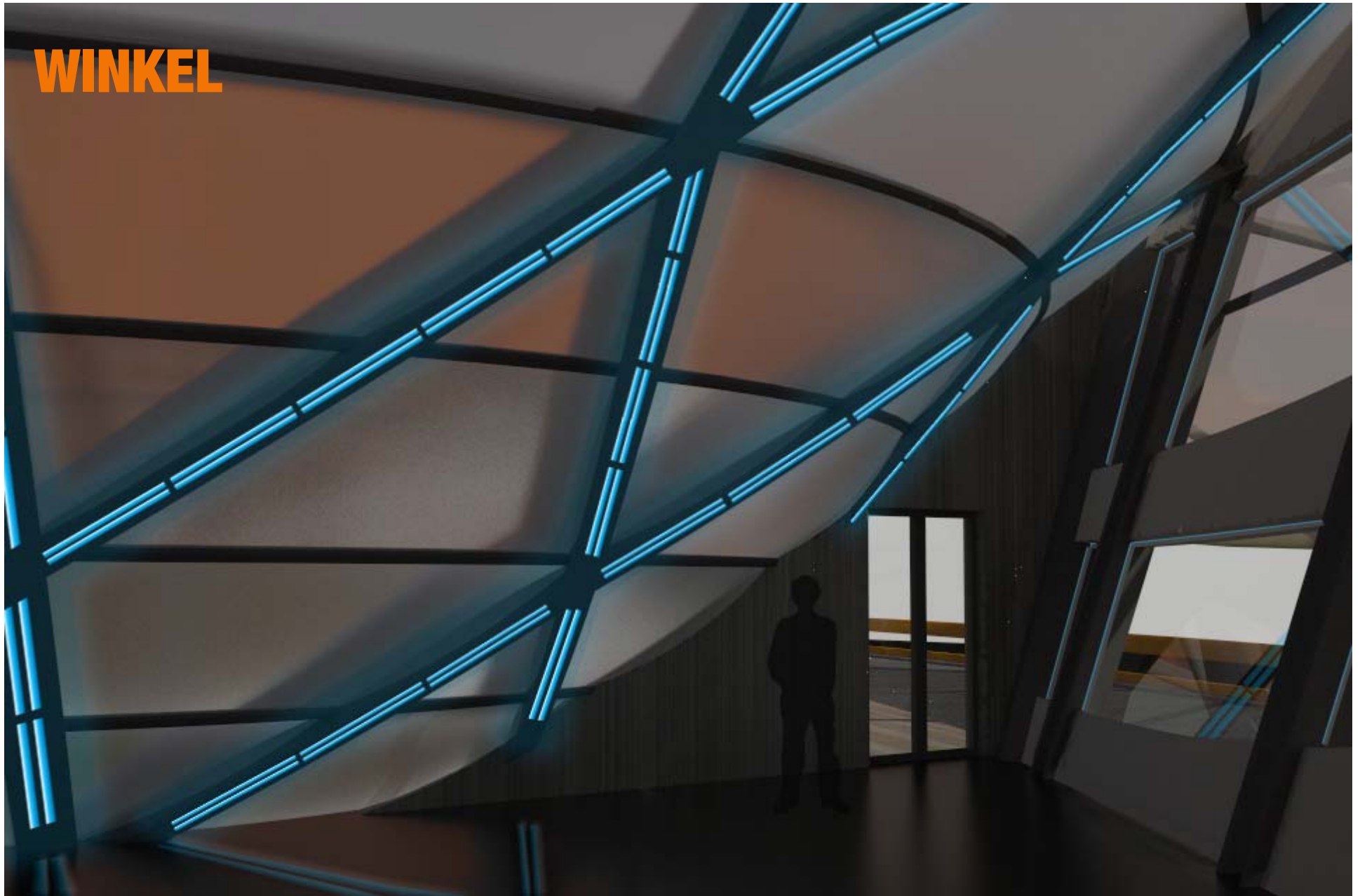
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MONTAGE



Detaillering

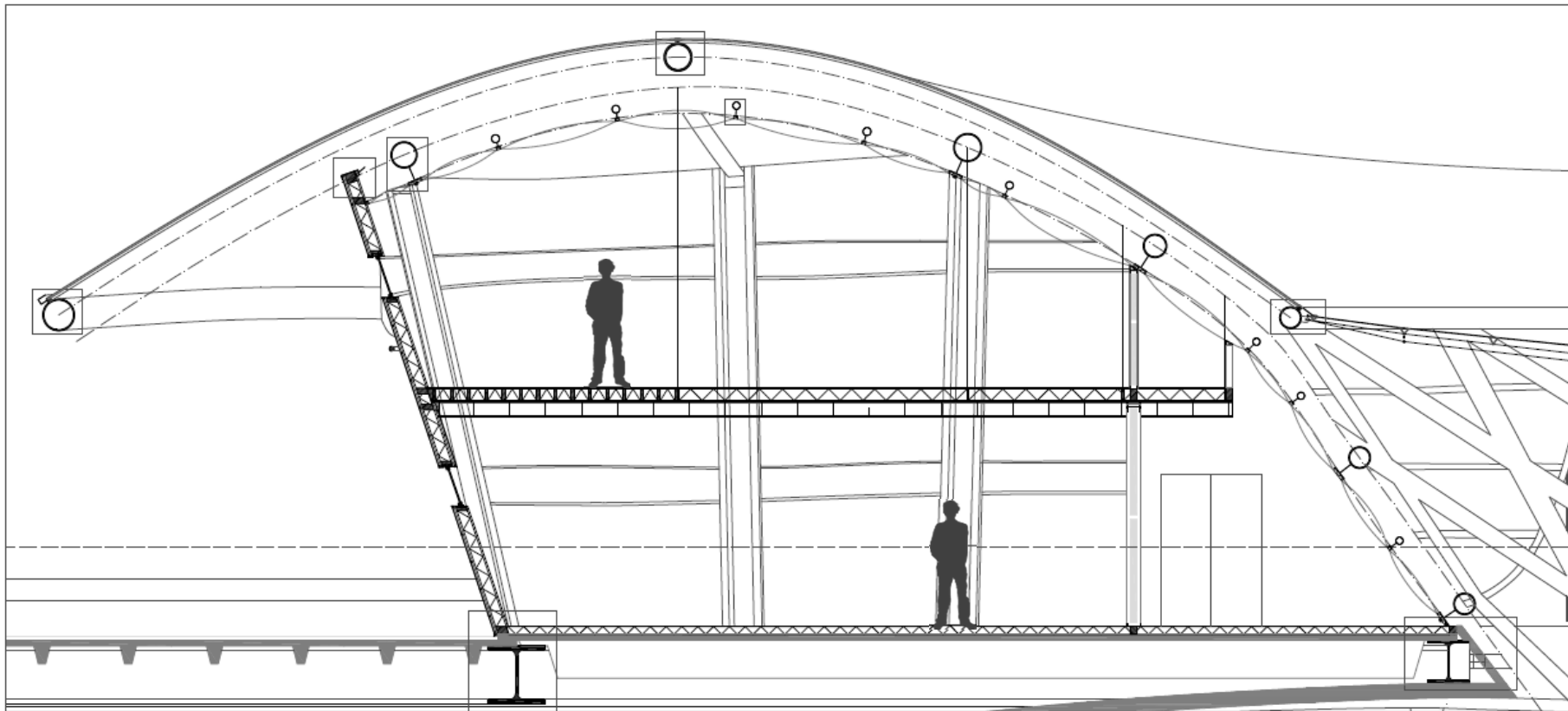
WINKEL



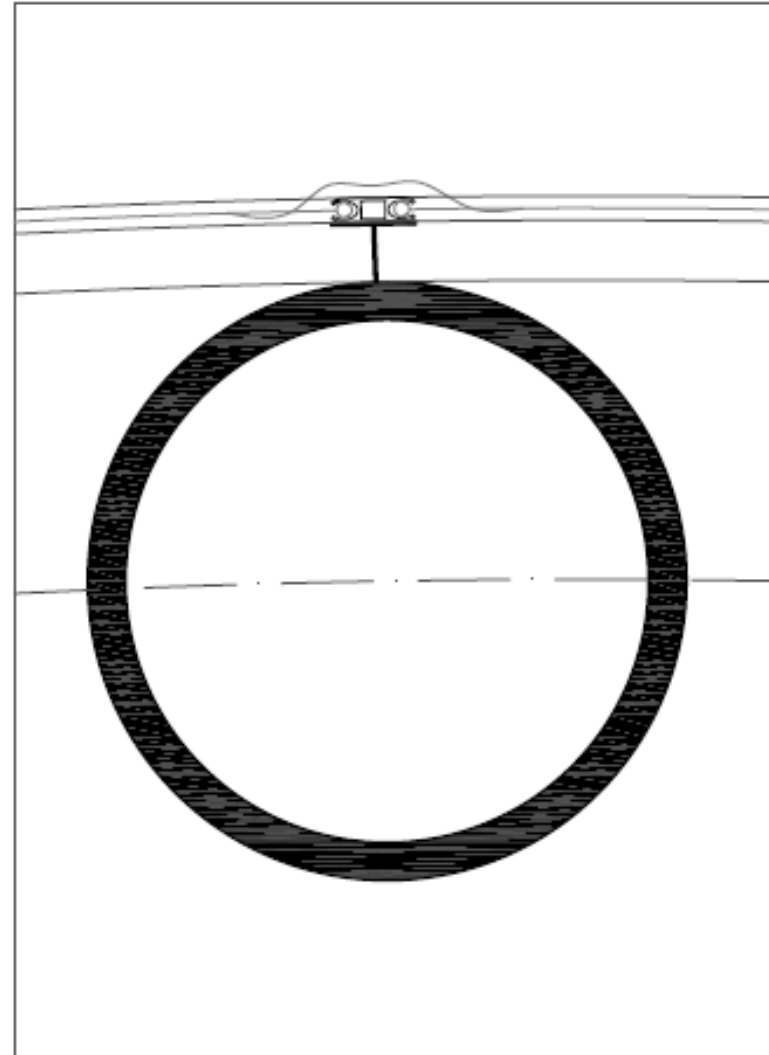
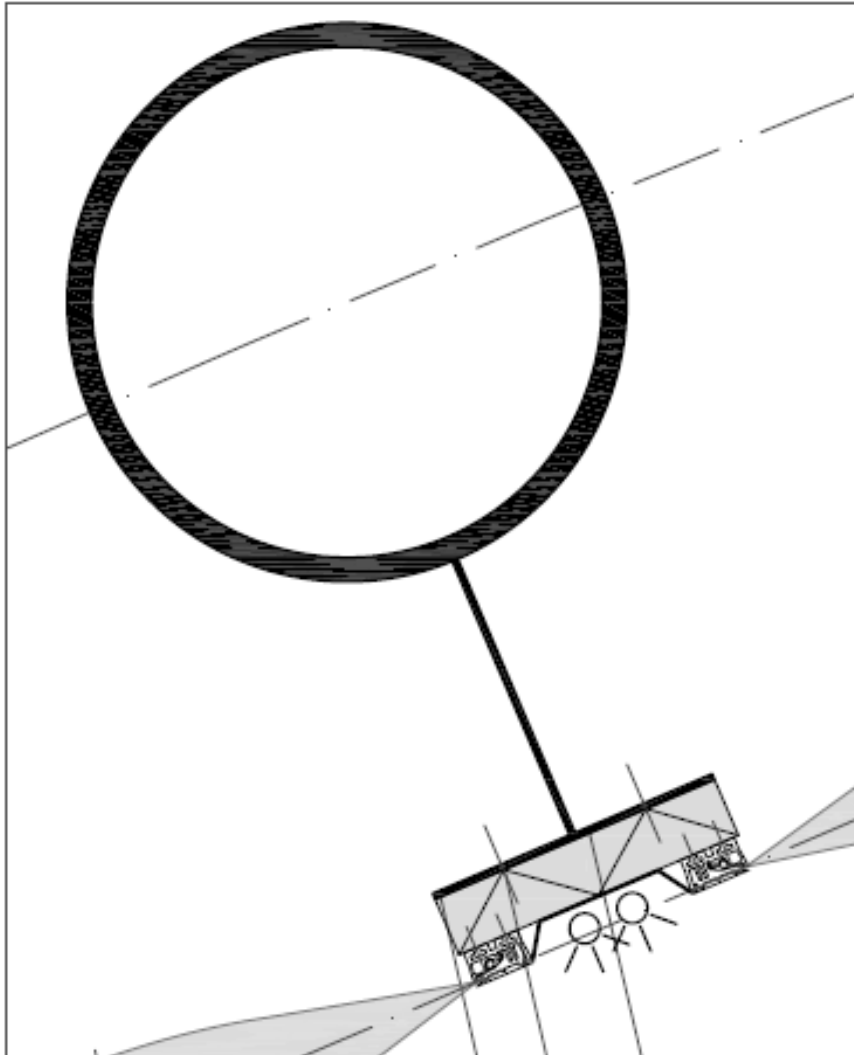
Detallering

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DOORSNEDE



DETAILLERING



STRAATBEELD



BUSPLATFORM



Ontwerp

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ROUTE AUTO-METRO



Ontwerp

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ROUTE AUTO-METRO



ROUTE AUTO-METRO



ROUTE AUTO-METRO



ROUTE AUTO-METRO



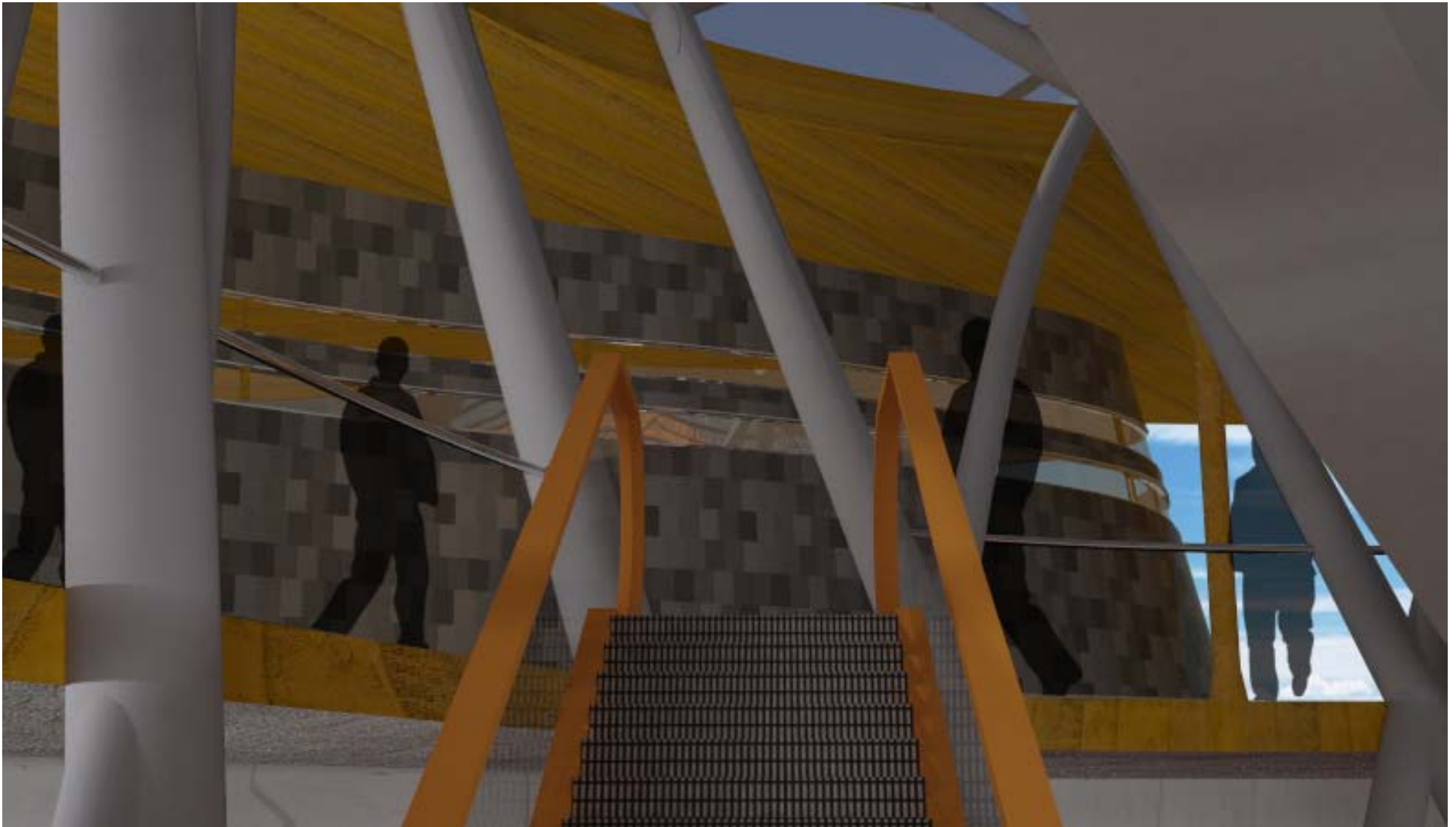
ROUTE METRO-BUS



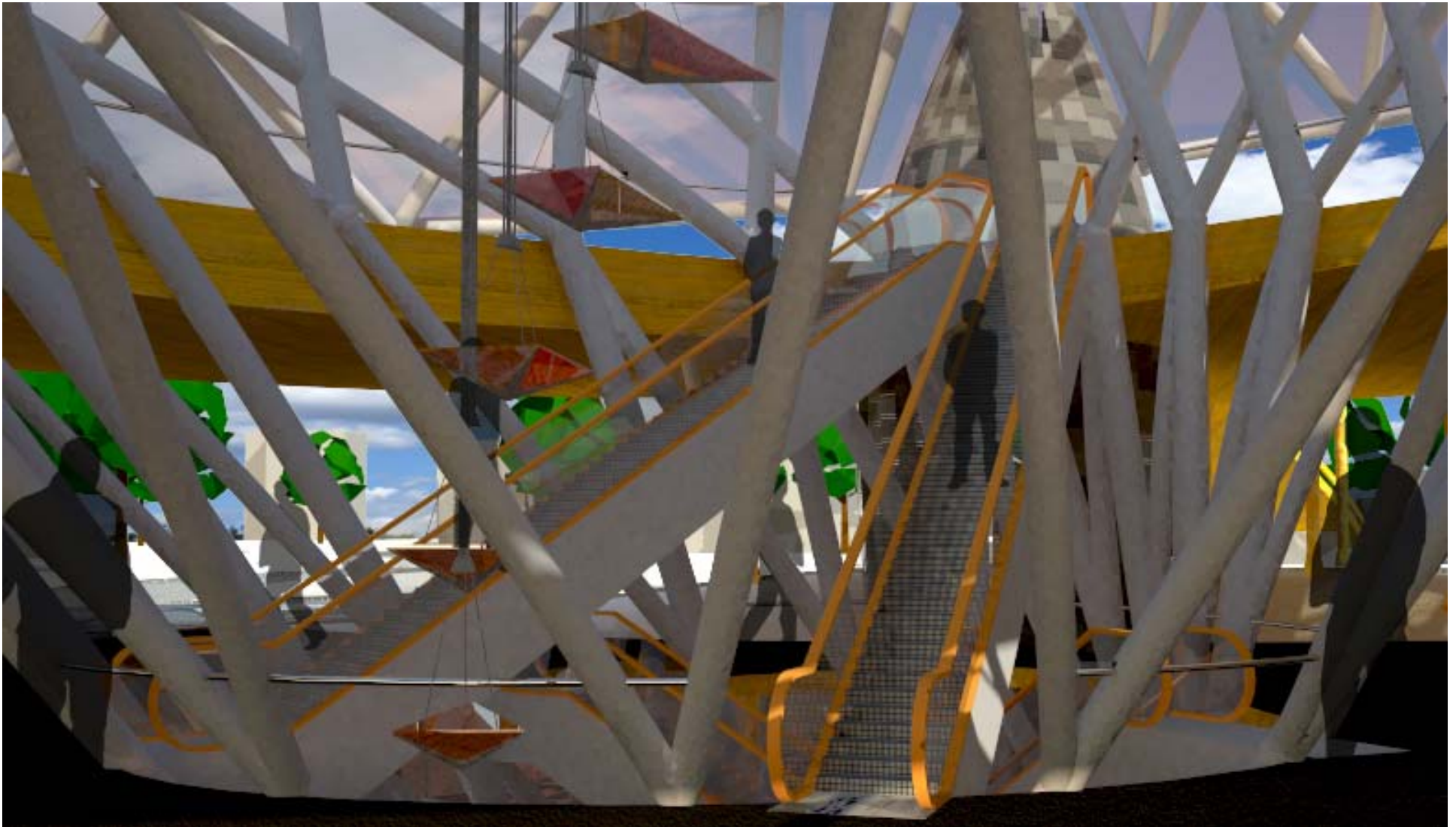
ROUTE METRO-BUS



ROUTE METRO-BUS



ROUTE METRO-BUS



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ROUTE METRO-BUS



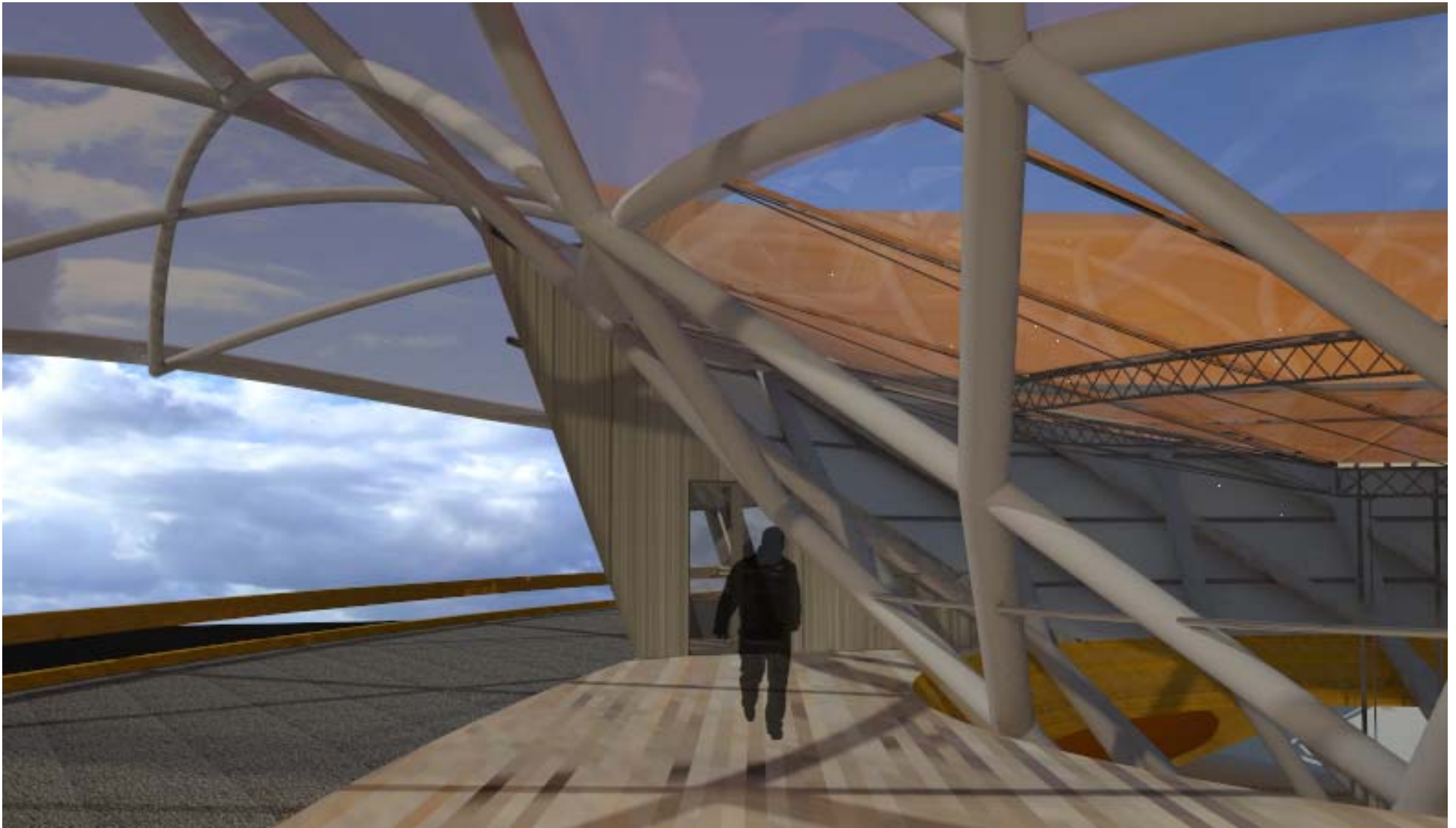
ROUTE METRO-BUS



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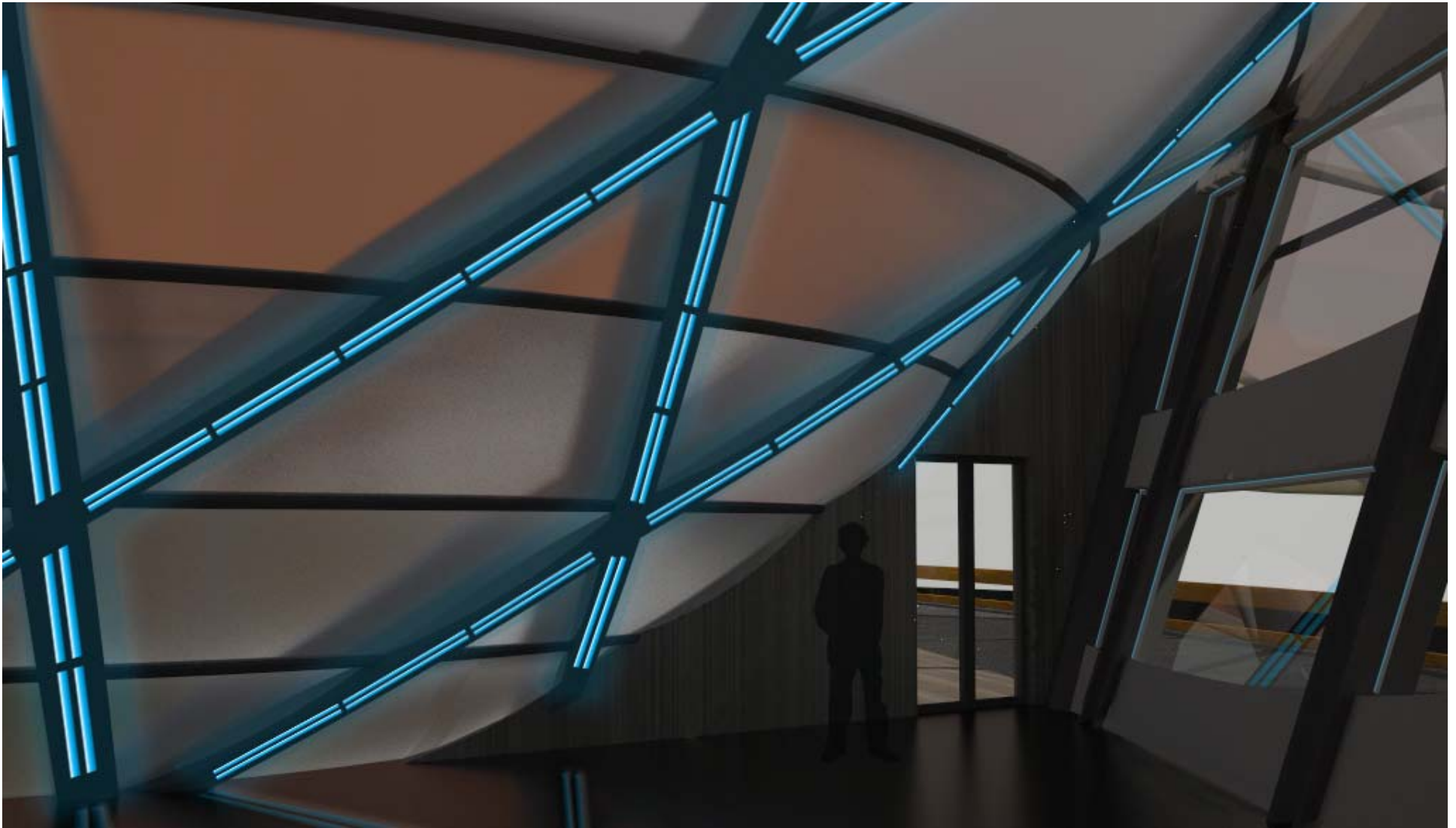
ROUTE METRO-BUS



Ontwerp

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ROUTE METRO-BUS



Ontwerp

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ROUTE METRO-BUS



ROUTE METRO-BUS



BEDANKT VOOR UW AANDACHT



Borrel 17.00 – 19.00

Feest 21.00 – ??.

Soc. Tyche, Oude Delft 123, 2611 BE, Delft