

waterloopkundig laboratorium delft hydraulics laboratory

stormvloedkering Oosterschelde

stroomsnelheden en -richtingen
in het cunet en het kale sluitgat
in de Roompot

verslag modelonderzoek

M 1001-16

juli 1986

Overzicht verslagen M 1001 in ringband

1. Eindsituatie pijlerdam, $\mu A = 11.500 \text{ m}^2$ en $\mu A = 20.000 \text{ m}^2$.
Stroombeeld- en ontgrondingsonderzoek.
2. Nauwkeurighedsanalyse van het ontgrondingsonderzoek.
3. Toetsing berekeningsmethode aanvangsdiepte.
4. Relatie lengte bodembescherming - toegestane maximale ontgrondingsdiepte.
5. Invloed van stroombalken op de ontgrondingen.
6. Waterspiegelfluctuaties tussen de pijlers.
7. Pijlersplaatsingen in de Schaar en Hammen vanuit het zuiden.
8. Onderzoek naar de evenwichtsdiepte van ontgrondingen.
9. Oriënterend onderzoek naar de lengte van het vaste stortebed in verband met weigerende schuif.
10. Toetsing van het ontgrondingsonderzoek.
11. Eindsituatie pijlerdam, $\mu A = 20.000 \text{ m}^2$.
Gewijzigde dorpelliging in Roompot
Stroombeeld- en ontgrondingsonderzoek.
12. Aanzethellingen.
13. Reduktie van de ontgrondingen tengevolge van aanvoer van bodemmateriaal in de Roompot.
14. Ontgrondingsonderzoek ten behoeve van plaatsing van de dorpels in de Roompot.

15. Invloed van morfologische ontwikkelingen op de ontgrondingen in de Schaar van Roggenplaat.
16. Stroomsnelheden en richtingen in het cunet en het kale sluitgat in de Roompot.
17. Eindsituatie pijlerdam, $\mu A = 15.000 \text{ m}^2$.
Stroomgatversmalling in de Hammen
Stroombeeld- en ontgrondingsonderzoek.
18. Eindsituatie pijlerdam, $\mu A = 17.500 \text{ m}^2$.
Stroombeeldonderzoek.
19. Eindsituatie pijlerdam, $\mu A = 17.500 \text{ m}^2$
Gedeeltelijk gesloten schuiven in Roompot.
Stroombeeld- en ontgrondingsonderzoek
20. Eindsituatie pijlerdam, $\mu A = 16.500 \text{ m}^2$
Stroombeeld- en ontgrondingsonderzoek
21. Eindsituatie pijlerdam, variant $\mu A = 16.500 \text{ m}^2$
Ontgrondingsonderzoek in de Hammen.
22. Onderzoek naar de stabiliteit van de stortebedden bij weigerende schuif.
23. Stroombeeldonderzoek bij weigerende schuif.
24. Overzicht verslagen met betrekking tot het detailmodel van de stroomgeulen.

INHOUD

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FIGUREN

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FIGUREN

- 1 Overzicht van de modelbodem
- 2 Overzicht meetraaien en meetpunten
- 3 Lengteprofiel cunet met meetraaien en enkele dwarsprofielen

- 4 Stroomsnelheidsverdelingen in het tracé met en zonder cunet
- 5 Stroomsnelheidsverdelingen in cunet, vergelijking M 1000-M 1001

Stroomsnelheidsvectoren:

- 6 Zonder cunet, eb
- 7 Met cunet, eb
- 8 Zonder cunet, vloed
- 9 Met cunet, vloed

Stroombeelden:

- 10 Vergelijking met en zonder cunet, eb
- 11 Vergelijking met en zonder cunet, vloed
- 12 Vergelijking M 1000-M 1001, met cunet, eb
- 13 Vergelijking M 1000-M 1001, met cunet, vloed

Snelheidsvertikalen:

- 14 Vergelijking M 1000-M 1001, eb
- 15 Vergelijking M 1000-M 1001, vloed

- 16a,b,c Raai A, eb
- 17a,b,c Raai B, eb
- 18a,b Raai C, eb
- 19a,b,c Raai D, eb
- 20a,b,c Raai E, eb
- 21a,b,c Raai F, eb
- 22a,b,c Raai G, eb
- 23a,b,c Raai H, eb
- 24a,b,c Raai I, eb
- 25a,b,c Raai J, eb

- 26a,b,c Raai A, vloed
- 27a,b,c Raai B, vloed
- 28a,b Raai C, vloed

FIGUREN (vervolg)

29a,b,c Raai D, vloed

30a,b,c Raai E, vloed

31a,b,c Raai F, vloed

32a,b,c Raai G, vloed

33a,b,c Raai H, vloed

34a,b,c Raai I, vloed

35a,b,c Raai J, vloed

FOTO'S

- 1 Roompot eb, kaal sluitgat zonder cunet
- 2 Roompot vloed, kaal sluitgat zonder cunet
- 3 Roompot eb, kaal sluitgat met cunet
- 4 Roompot vloed, kaal sluitgat met cunet

STORMVLOEDKERING OOSTERSCHELDE

Stroomsnelheden en -richtingen in het cunet en het kale sluitgat in de Roompot

1. Inleiding

In het kader van het onderzoek naar de stormvloedkering in de Oosterschelde is besloten in het detailmodel van de sluitgaten van de Oosterschelde een serie metingen uit te voeren met betrekking tot de stroomsnelheden en -richtingen in het te baggeren cunet in de Roompot. Tevens zijn in dezelfde punten de stroomsnelheden en -richtingen in het kale sluitgat (zonder cunet) gemeten.

De uitgevoerde metingen hadden tot doel inzicht te verschaffen in het mogelijk gevaar voor aanzanding van het cunet, vooral nabij de oevers. Tevens werd van de gelegenheid gebruik gemaakt om een vergelijking te maken met de metingen verricht in het (samengetrokken) overzichtsmodel M 1000.

Tenslotte wordt verwacht dat deze metingen van belang zullen kunnen zijn voor het ijken van een in ontwikkeling zijnd mathematisch stromingsmodel.

Het onderzoek werd geleid door ir. A.F.F. de Graauw, die tevens dit verslag heeft samengesteld. De eindredactie werd verzorgd door ir. T. v.d. Meulen.

2. Onderzochte situaties

Een overzicht van de modelbodem van het detailmodel is gegeven in figuur 1. Onderzocht zijn de situaties met en zonder cunet in het tracé van de pijlerdam in de Roompot.

De bodembreedte van het cunet bedroeg 100 m en de taludhelling aan weerszijden was 1:7.

In het sluitgat zijn een tiental raaien in stroomrichting gekozen (raaien A...J, figuren 2 en 3).

Op iedere raai lagen 5 meetpunten (punt 1...5) in het diepste deel van het cunet. Op die plaatsen waar het cunet vrij diep is (nabij de oevers) is een meetpunt halverwege het talud gekozen (zeezijde: Zt, meerzijde: Mt). Tevens is steeds het punt op de rand van het talud gekozen (zeezijde: ZR, meerzijde: MR). Tenslotte is aan weerszijden een punt gekozen op 100 m uit de rand van het cunet (punten 6 en 7).

Het een en ander is in figuren 2 en 3 terug te vinden.

Het cunet werd, evenals in het overzichtsmodel M 1000, volgens RWS-tekening nr. 77.4.219 ingebouwd. De vormgeving van de damkoppen en havens van Noordland en Noord-Beveland was overeenkomstig de toestand in het prototype omstreeks februari 1978.

3. Instellen van het model

De ingestelde debieten en waterstanden zijn afgeleid uit de gegevens van het overzichtsmodel (T183 in M 1000):

$$Q_{\max \text{ eb}} = 54.443 \text{ m}^3/\text{s}, \text{ benedenwaterstand NAP } -0,20 \text{ m}$$

$$Q_{\max \text{ vloed}} = 61.260 \text{ m}^3/\text{s}, \text{ benedenwaterstand NAP } +1,40 \text{ m}$$

behorend bij het getij van 11 september 1968. In het detailmodel is voor de snelheidsschaal $n_v = 9$ aangehouden (schaalwet van Froude).

De instelling van het model is voor beide onderzochte situaties gelijk geweest.

De metingen zijn per vertikaal, voor een aantal punten in de vertikaal uitgevoerd met behulp van micromolens. Bij gebrek aan tijd voor het opstellen van meer geavanceerde apparatuur zijn de stroomrichtingen bepaald met behulp van een draadje dat aan de micromolen was bevestigd. De nauwkeurigheid van de in dit onderzoek gemeten stroomrichtingen is daarom beperkt tot $\pm 2,5^\circ$.

4. Resultaten

In figuur 4 zijn de stroomsnelheden in het tracé (3 punten) met en zonder cunet aangegeven. Zoals te verwachten was, zijn de stroomsnelheden in de situatie met cunet kleiner dan in de situatie zonder cunet.

Figuur 5 levert een vergelijking tussen de gemeten stroomsnelheden in het (niet-samengetrokken) detailmodel M 1001 en het (samengetrokken) overzichtsmodel M 1000. In het overzichtsmodel werden de metingen bij 2 verschillende taludhellingen uitgevoerd: helling 1:7 en 1:3.

De overeenstemming is bij vloed goed te noemen. Bij eb is dit minder het geval. Het verschil tussen de situaties met taludhelling 1:7 en 1:3 in het overzichtsmodel is in deze figuur overigens te klein om een voorkeur uit te kunnen spreken.

De figuren 6...9 geven de in het detailmodel gemeten snelheidsvectoren. Zowel de richting als de grootte van de stroomsnelheid werden hierbij over de hoogte gemiddeld.

Hieruit blijkt dat uitsluitend bij de oevers enige afbuiging van de stroming optreedt. Enig verschil tussen de situaties met en zonder cunet is vooral bij vloed nabij Noordland waarneembaar (figuren 8 en 9): de stroomsnelheden nabij Noordland (raai J) zijn in de situatie met cunet duidelijk kleiner dan in die zonder cunet. Ook de stroomrichtingen verschillen in beide situaties, er is sprake van stroomrefractie in de situatie met cunet.

Ook aan het oppervlak is afbuiging van de stroom ten gevolge van het cunet bij de damkop van Noordland waarneembaar (figuren 10 en 11, foto's 1...4).

In figuren 12 en 13 zijn de stroombeelden voor de situatie met cunet in M 1000 en M 1001 weergegeven. Hieruit blijkt dat vooral bij de damkop van Noordland enig verschil in stroomrichting is: het stroombeeld in M 1001 volgt meer de kromming van de damkop, met name aan de meerzijde.

In raai I werden enkele vertikalen in beide modellen doorgemeten. De gemeten snelheidsvertikalen zijn in figuren 14 en 15 weergegeven. Hieruit blijkt dat, vooral bij eb, de stroomsnelheden in M 1001 kleiner zijn dan in M 1000. Er kan op grond van deze figuren een voorkeur worden uitgesproken voor een taludhel-

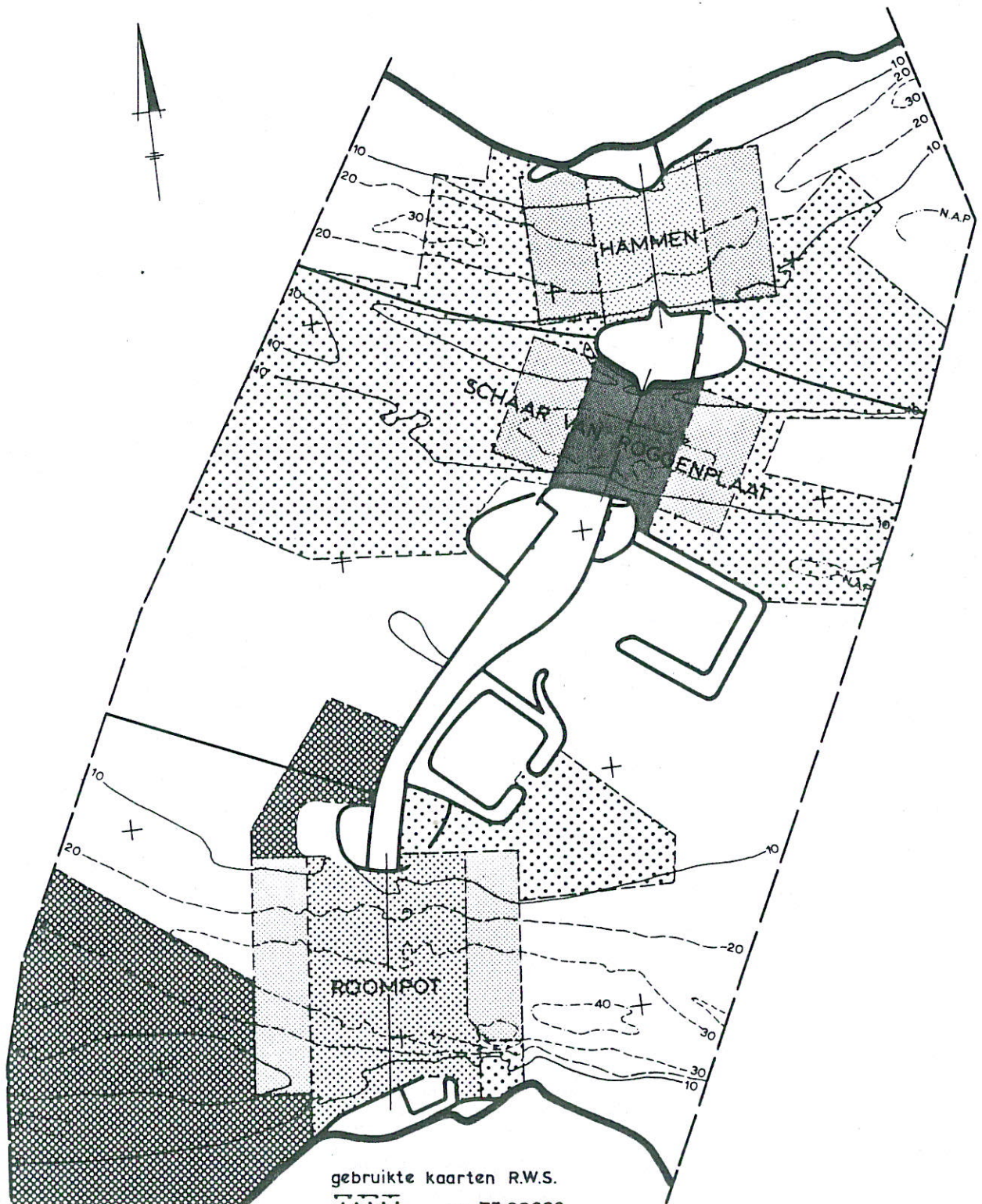
ling van 1:7 in het samengetrokken overzichtsmoedel omdat daarbij de snelheidsgradiënten in de verticaal kleiner zijn ("voller" snelheidsprofiel) zoals dit ook het geval is in het niet-samengetrokken moedel.








Tenslotte worden in figuren 16...35 alle in het detailmoedel gemeten snelheidsvertikalen weergegeven. De bijgeschreven waarden betreffen de gemiddelde stroomsnelheid met (\bar{V}_m) en zonder (\bar{V}_z) cunet en de gemiddelde stroomrichting met ($\bar{\alpha}_m$) en zonder ($\bar{\alpha}_z$) cunet ten opzichte van de meetraai loodrecht op de as van van de pijlerdam (in die gevallen waarin de lokale waarden van α meer dan 5° over de verticaal variëren zijn deze waarden tevens in de figuren aangegeven).

5. Konklusies

Uit de uitgebreide metingen van stroomsnelheden en -richtingen in het detailmodel van de sluitgaten kunnen de volgende konklusies worden getrokken:

1. Over het algemeen zijn de stroomsnelheden ter plaatse van het cunet in de situatie met cunet kleiner dan in de situatie zonder cunet. Enige afbuiging van de stroom treedt uitsluitend bij de oevers op. Vooral nabij Noordland is bij vloed verschil tussen de situaties met en zonder cunet waarneembaar (figuren 8 en 9).
2. Vergelijking van de metingen verricht in het (samengetrokken) overzichtsmodel M 1000 en het (niet-samengetrokken) detailmodel M 1001 toont aan dat bij vloed een redelijke overeenstemming bestaat. Dit is echter niet het geval bij eb, vanwege verschillen in de aanstroming, met name bij Noordland. Over het algemeen kan worden gesteld dat dergelijke zeer lokale snelheidsmetingen in een niet-samengetrokken model betrouwbaarder zijn.
3. De verrichte metingen in het detailmodel kunnen zich lenen voor het iken van een mathematisch stromingsmodel van de Oosterschelde, mits er rekening mee wordt gehouden dat de nauwkeurigheid van de gemeten stroomrichtingen beperkt is tot $\pm 2,5^\circ$.



- gebruikte kaarten R.W.S.
-  nr. 75.90232
 -  75.90230
 -  75.90349
 -  76.9074
 -  76.9065
 -  interpolaties
 -  bodem 1967

 scheidingsmuren

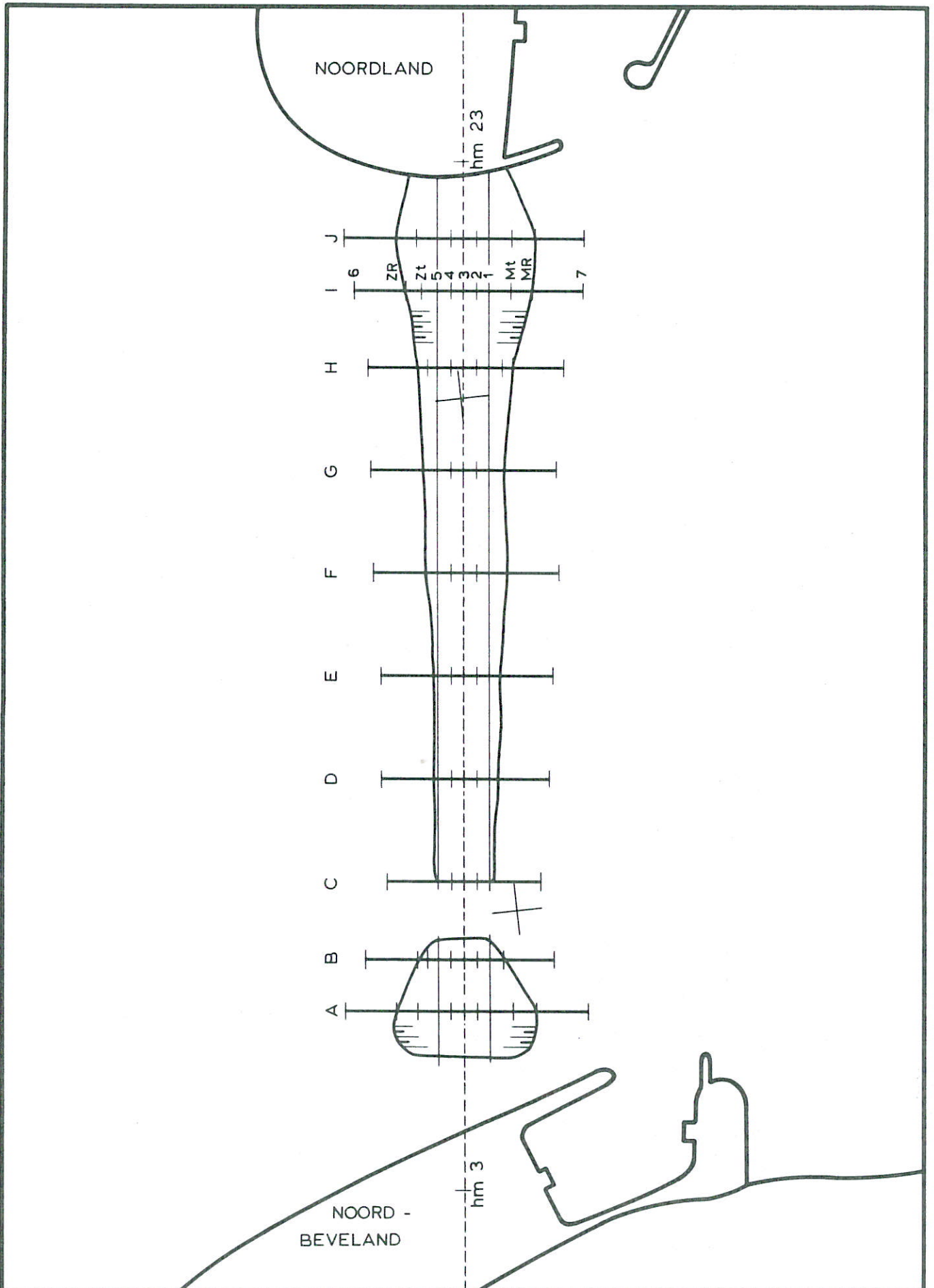
OVERZICHT VAN DE MODELBODEM

SCHAAL 1: 50.000

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M 1001

FIG. 1



OVERZICHT MEETRAAIEN EN MEETPUNTEN

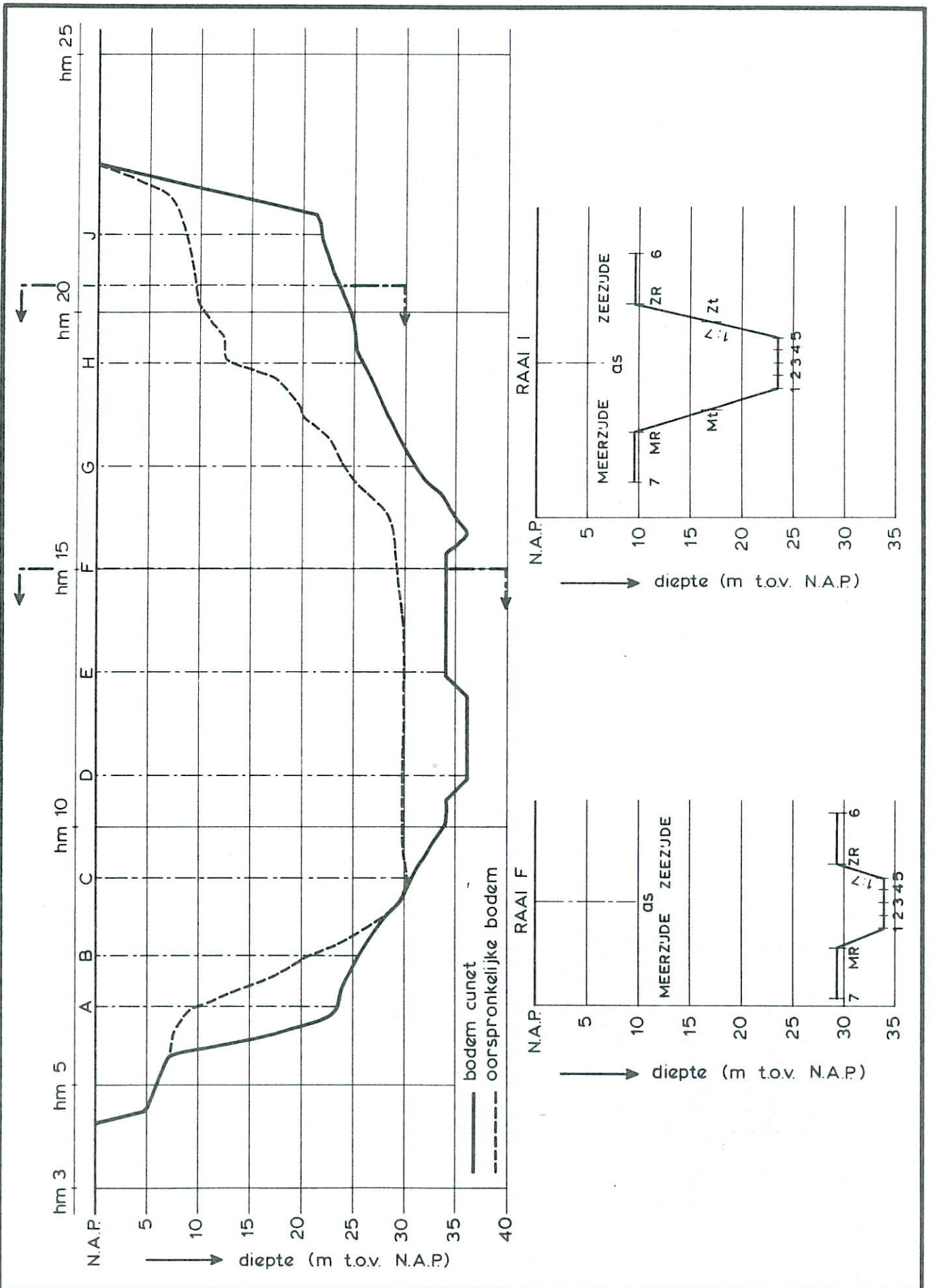
ROOMPOT

SCHAAL 1:10.000

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FIG. 2



LENGTEPROFIEL CUNET MET
ENKELE DWARSPROFIELEN

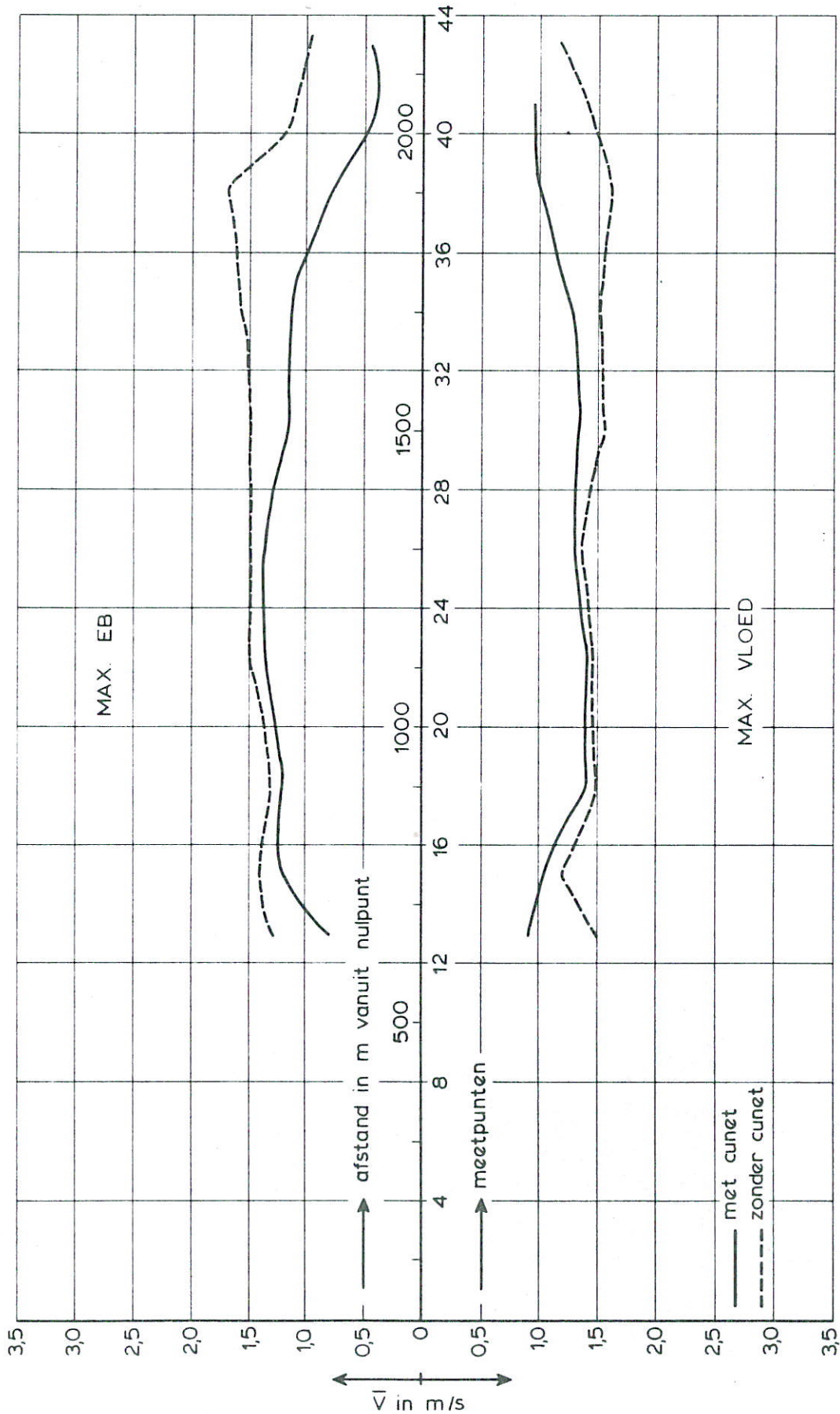
ROOMPOT

SCHAAL HÖR. 1:10.000
VERT. 1:500

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FIG. 3



$Q_{\text{max. eb}} = 54.443 \text{ m}^3/\text{s}$ benedenwaterstand N.A.P. - 0,20 m
 $Q_{\text{max. vloed}} = 61.260 \text{ m}^3/\text{s}$ benedenwaterstand N.A.P. + 1,40 m

SNELHEIDSVERDELINGEN
 MET EN ZONDER CUNET

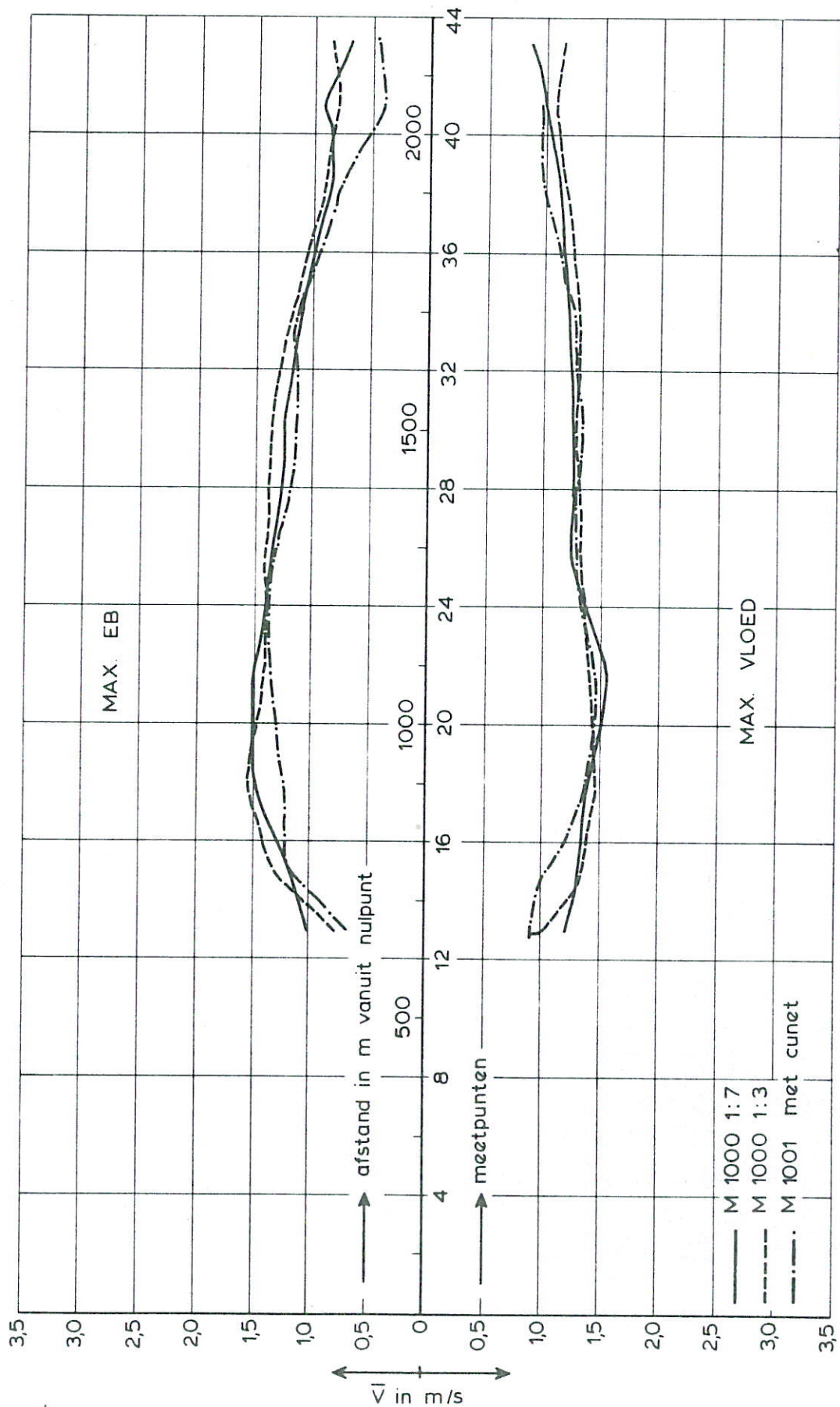
ROOMPOT

TRACÉ

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FIG. 4



$Q_{\text{max. eb}} = 54.443 \text{ m}^3/\text{s}$ benedenwaterstand N.A.P. - 0,20 m
 $Q_{\text{max. vloed}} = 61.260 \text{ m}^3/\text{s}$ benedenwaterstand N.A.P. + 1,40 m

SNELHEIDSVERDELINGEN IN CUNET
 VERGELIJKING M 1000 - M 1001

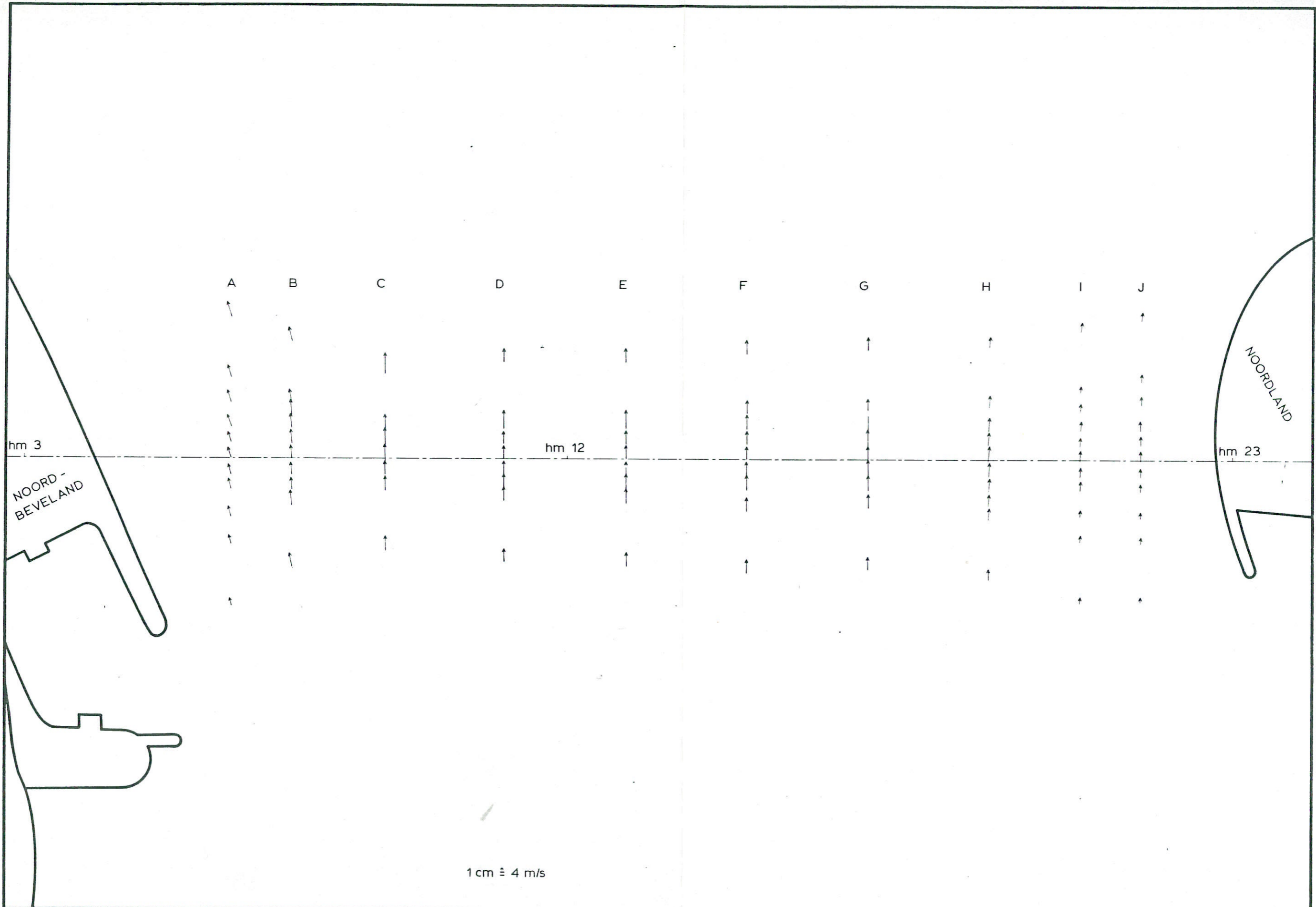
ROOMPOT

TRACÉ

WATERLOOPKUNDIG LABORATORIUM

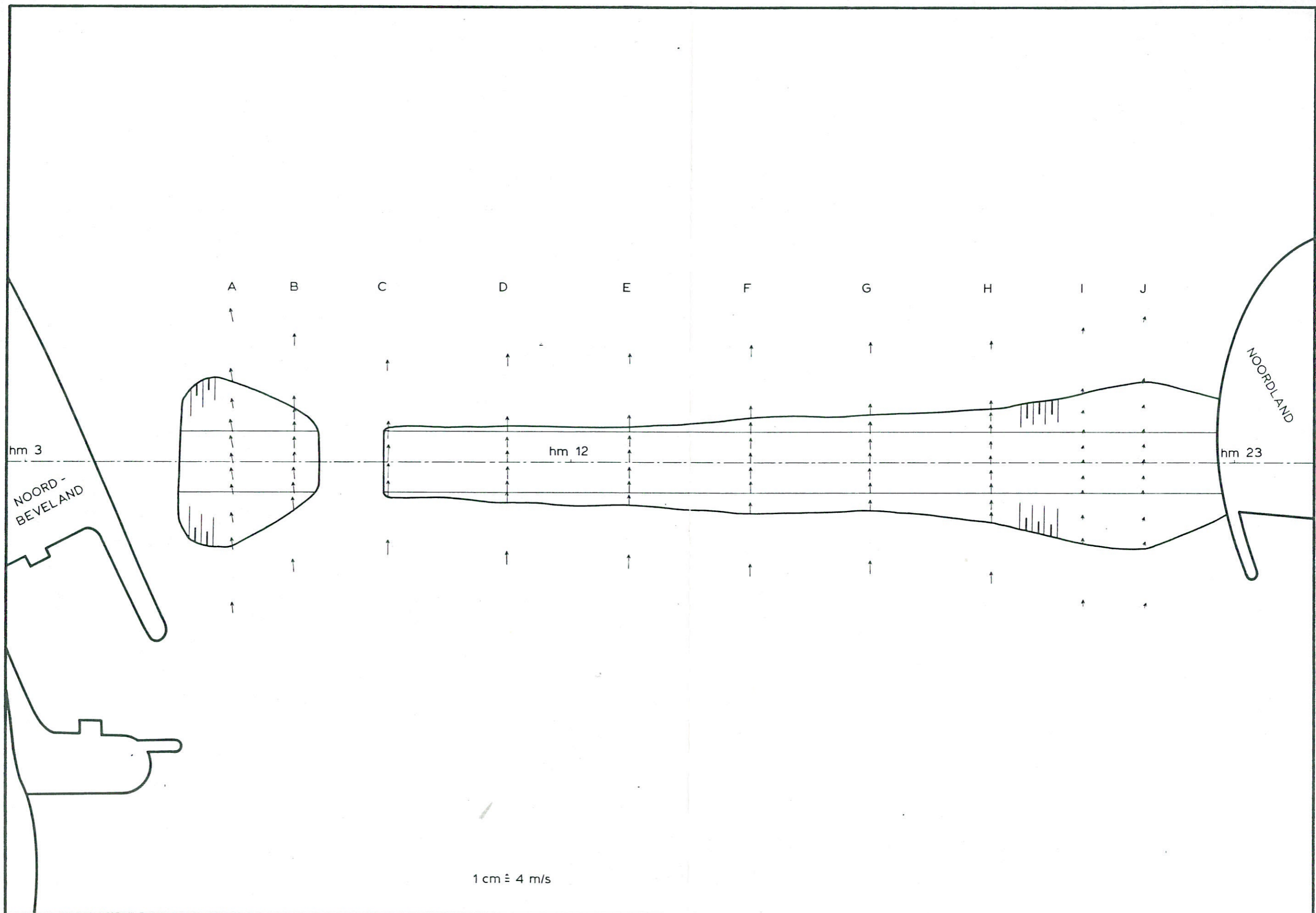
M 1001

FIG. 5

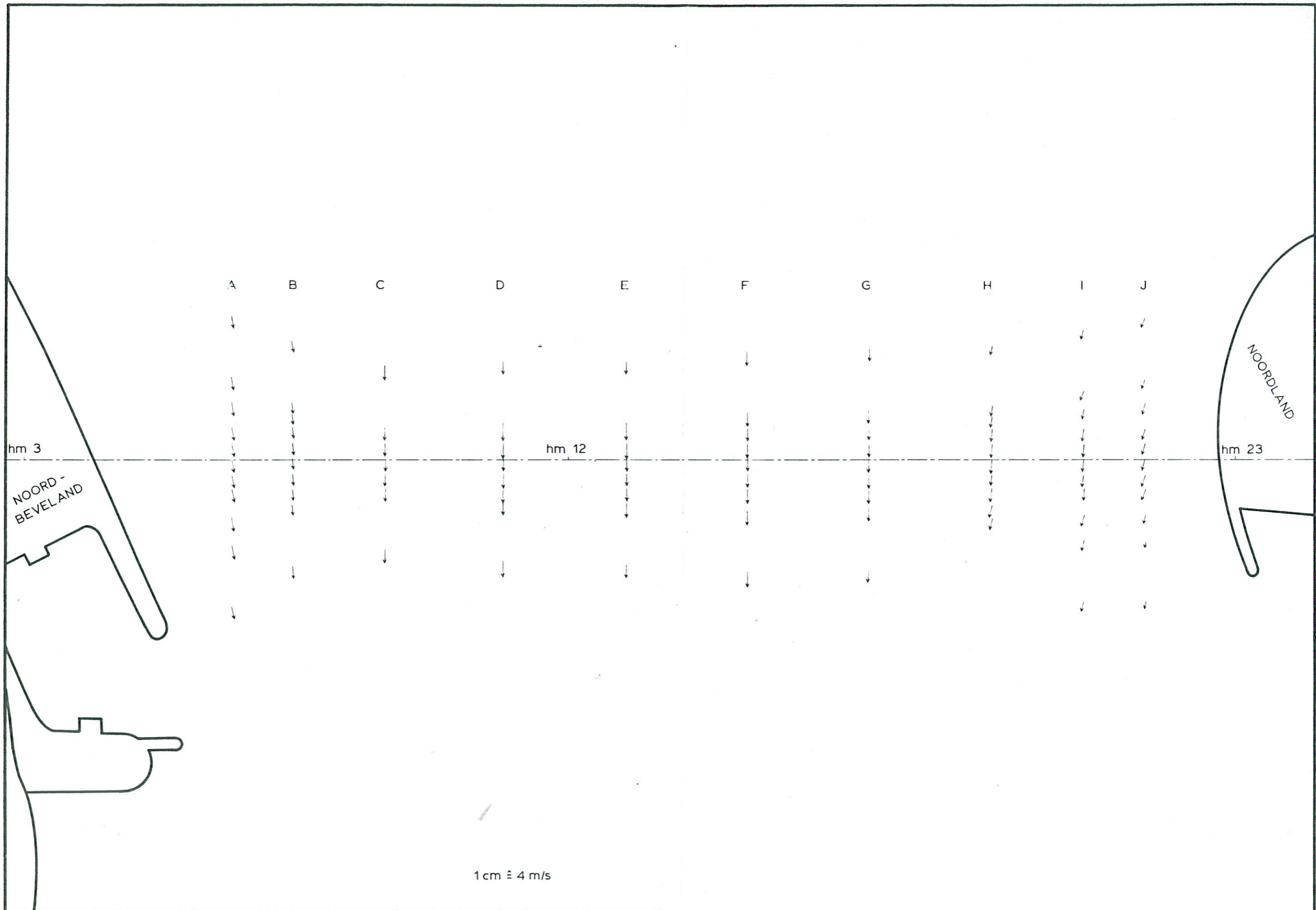


1 cm $\hat{=}$ 4 m/s

STROOMSNELHEIDSVECTOREN ZONDER CUNET	ROOMPOT	EB
	SCHAAL 1:6.000	
WATERLOOPKUNDIG LABORATORIUM	M 1001	FIG. 6

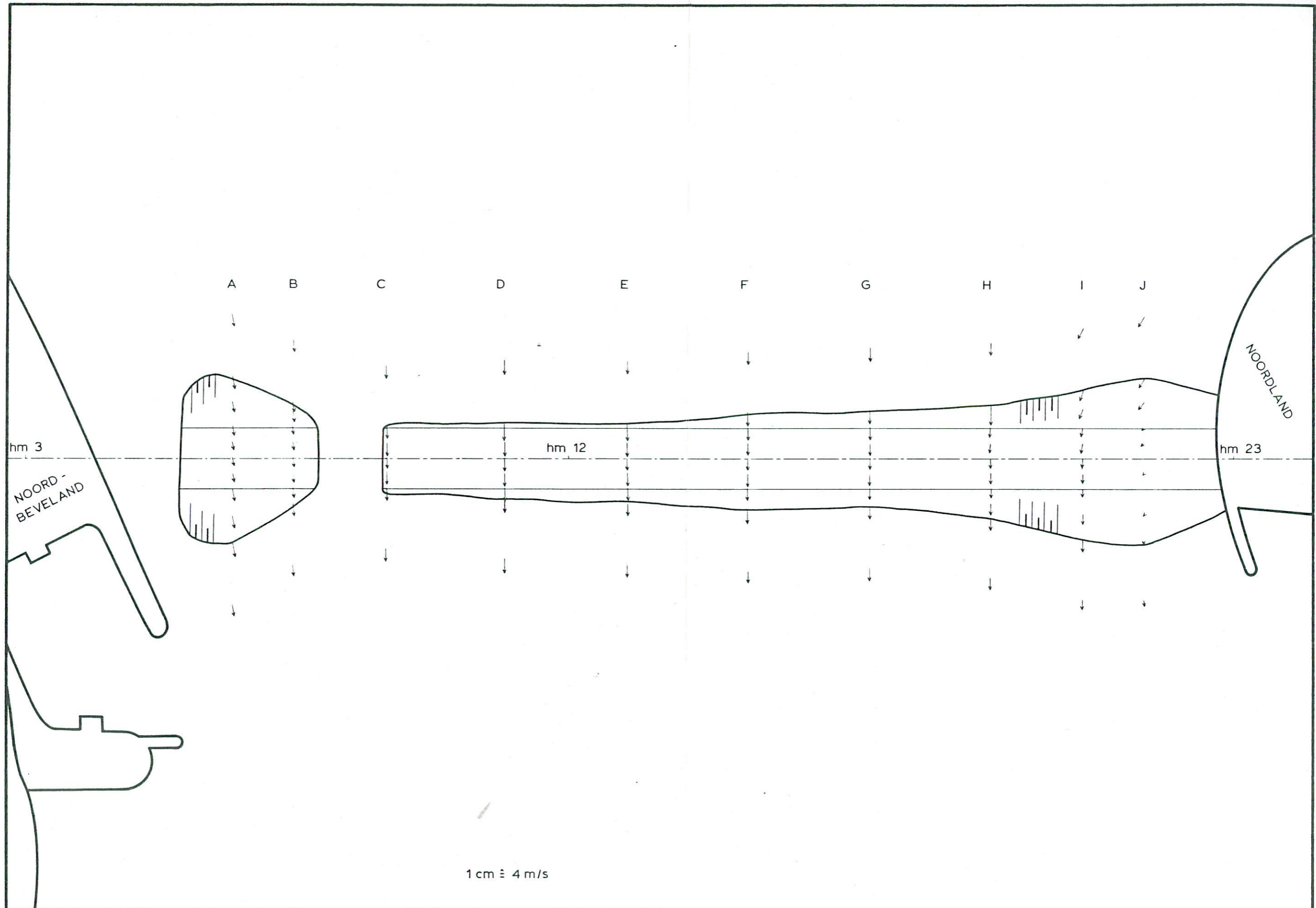


STROOMSNELHEIDSVECTOREN MET CUNET	ROOMPOT	EB
	SCHAAL 1:6.000	
WATERLOOPKUNDIG LABORATORIUM	M 1001	FIG. 7



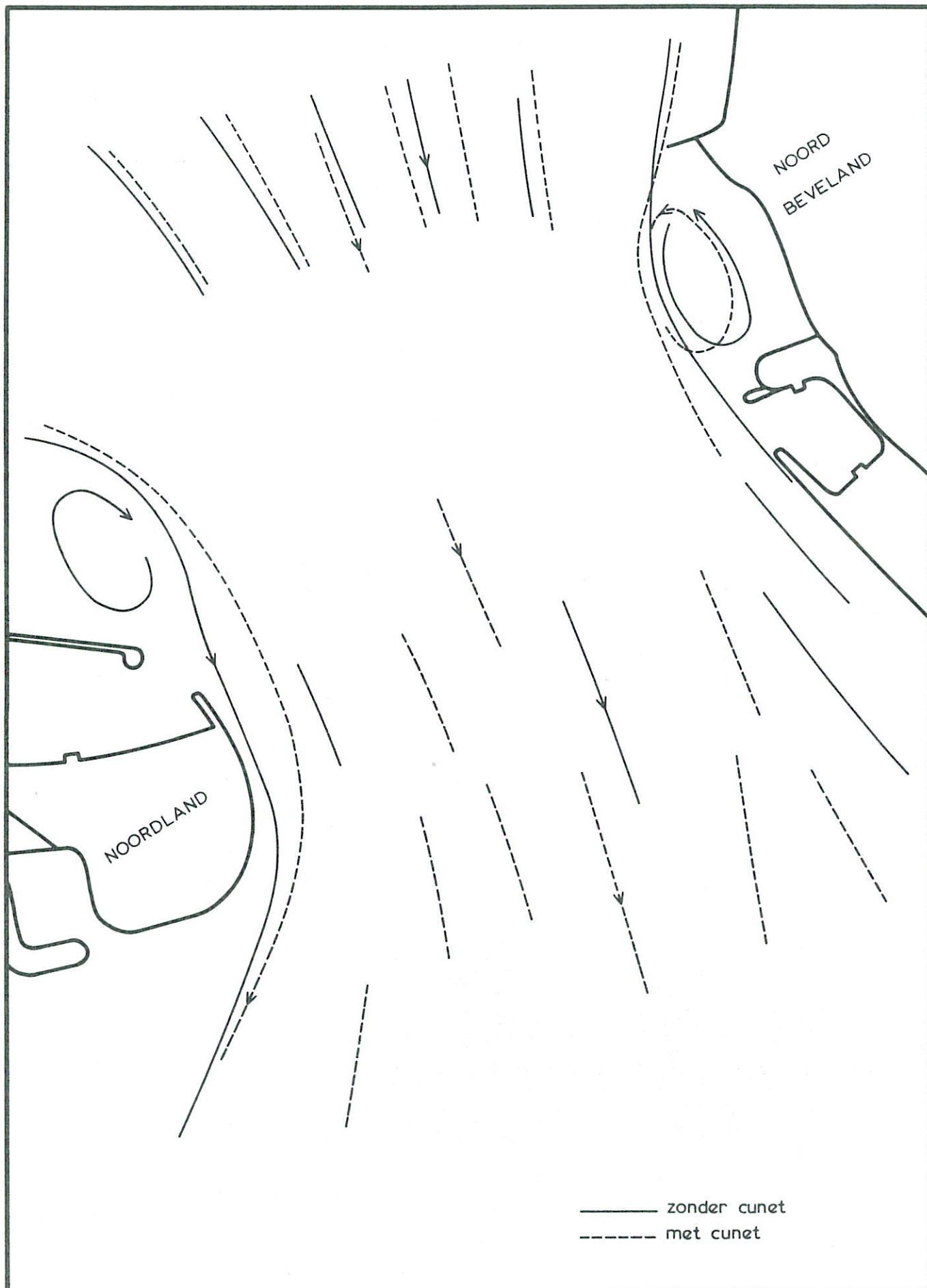
1 cm $\hat{=}$ 4 m/s

STROOMSNELHEIDSVECTOREN ZONDER CUNET	ROOMPOT	VLOED
	SCHAAL 1:6.000	
WATERLOOPKUNDIG LABORATORIUM	M 1001	FIG. 8



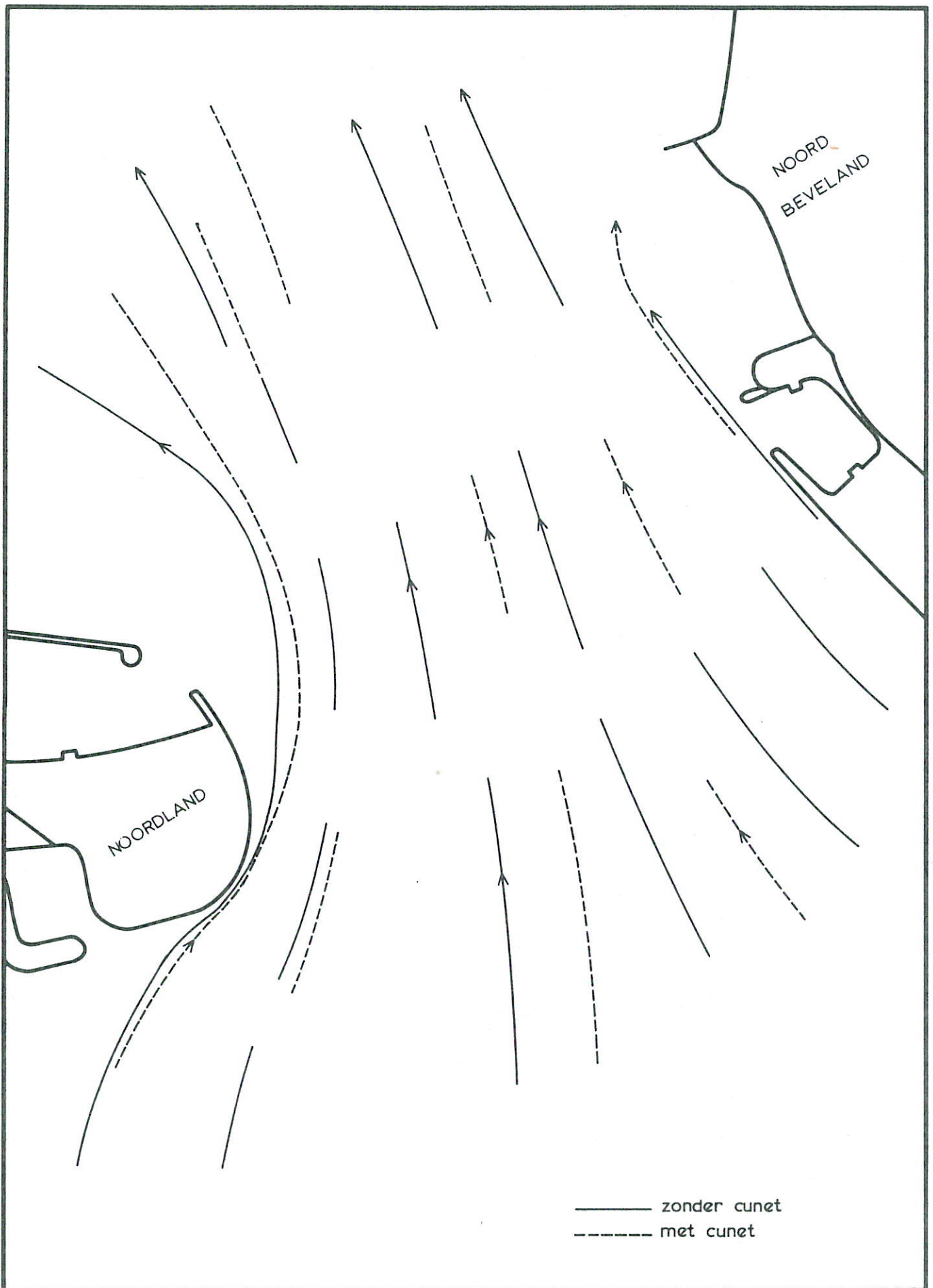
1 cm ≐ 4 m/s

STROOMSNELHEIDSVECTOREN MET CUNET	ROOMPOT	VLOED
	SCHAAL 1:6.000	
WATERLOOPKUNDIG LABORATORIUM	M 1001	FIG. 9



— zonder cunet
 - - - met cunet

VERGEL'JKING STROOMBEELD	ROOMPOT	EB
	SCHAAL 1:15.000	
WATERLOOPKUNDIG LABORATORIUM	M 1001	FIG. 10



VERGELIJKING STROOMBEELD

ROOMPOT VLOED

SCHAAL 1:15.000

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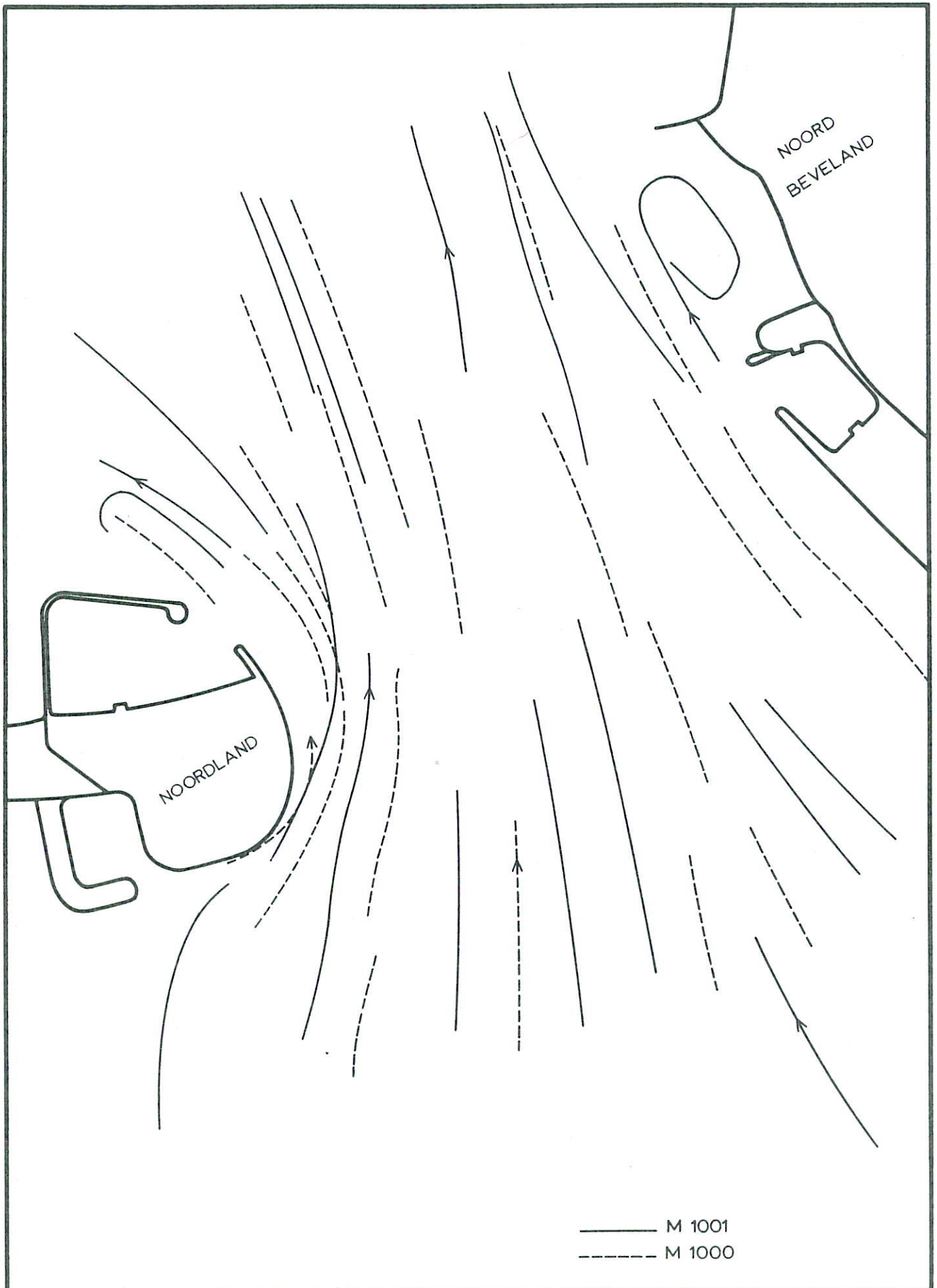
M 1001

FIG. 11



— M 1001
 - - - M 1000

VERGELIJING STROOMBEELD MET CUNET	ROOMPOT	EB
	SCHAAL 1:16.000	
WATERLOOPKUNDIG LABORATORIUM	M 1001	FIG. 12



— M 1001
 - - - M 1000

VERGEL'JKING STROOMBEELD
 MET CUNET

ROOMPOT

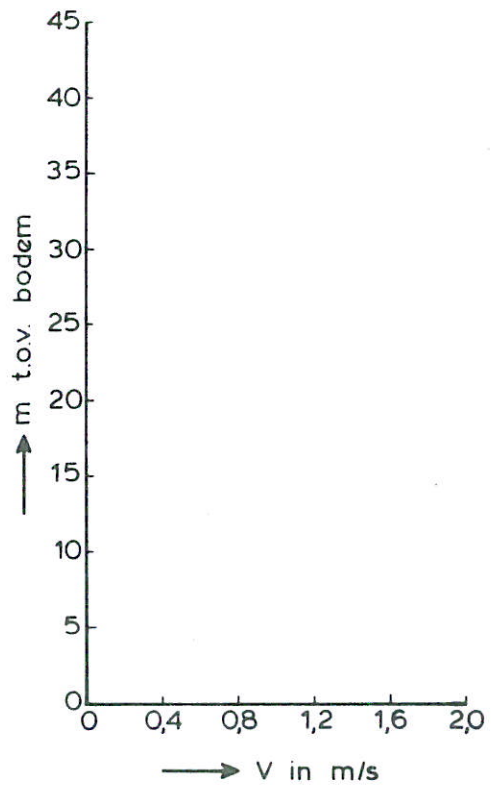
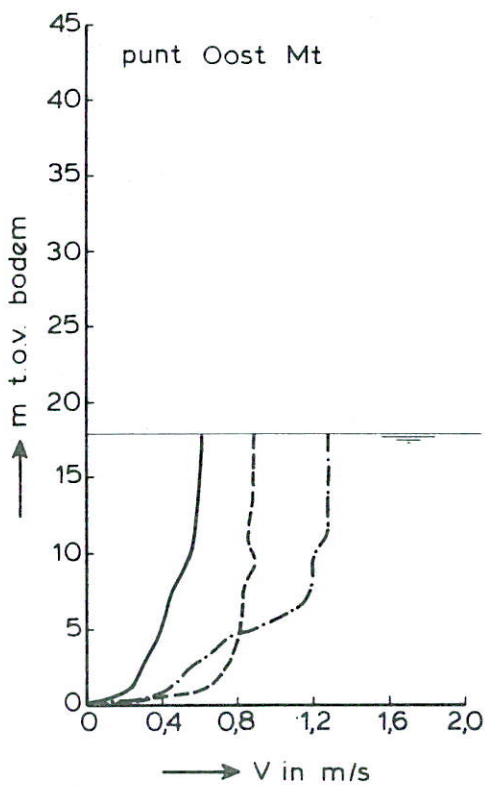
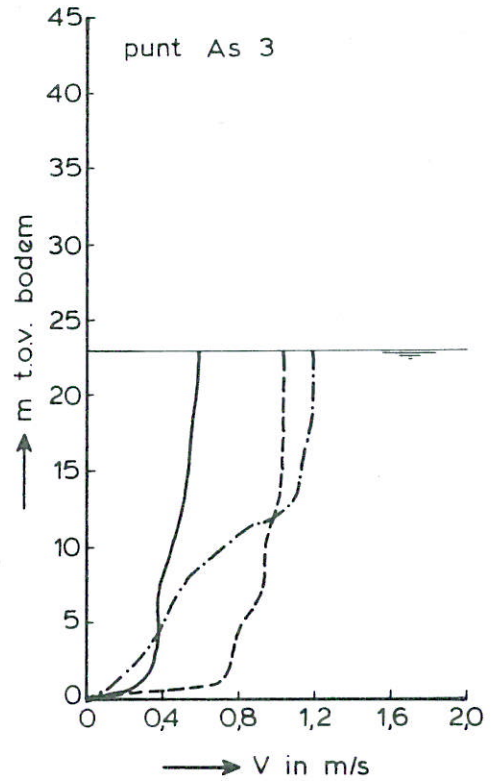
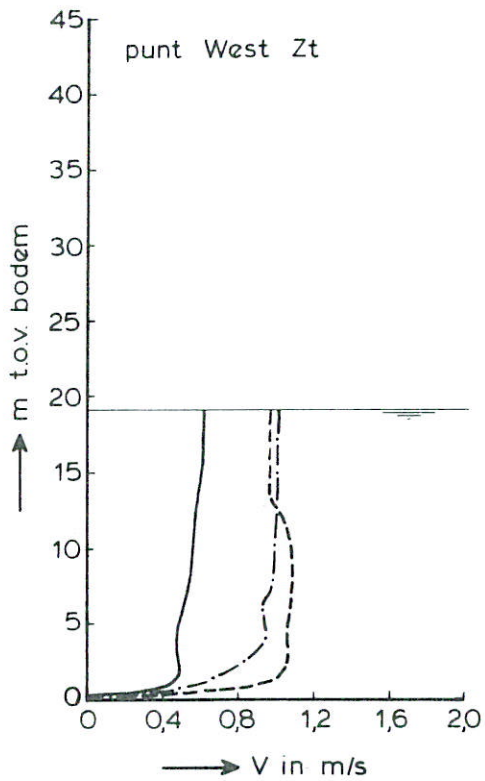
VLOED

SCHAAL 1:16.000

WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 13



- M 1001 met cunet
- - - M 1000 met cunet 1:7 T 221 A'
- · - · M 1000 met cunet 1:3 T 221 B'

SNELHEIDSVERTIKALEN
VERGELIJKING M 1000 - M 1001-

ROOMPOT

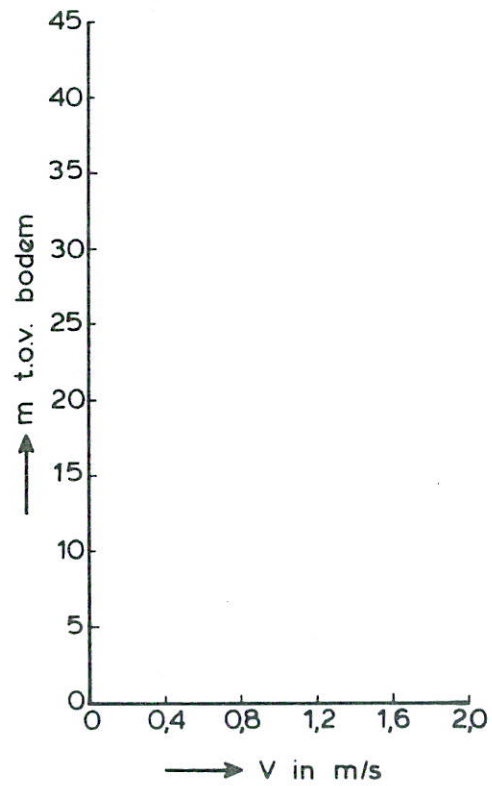
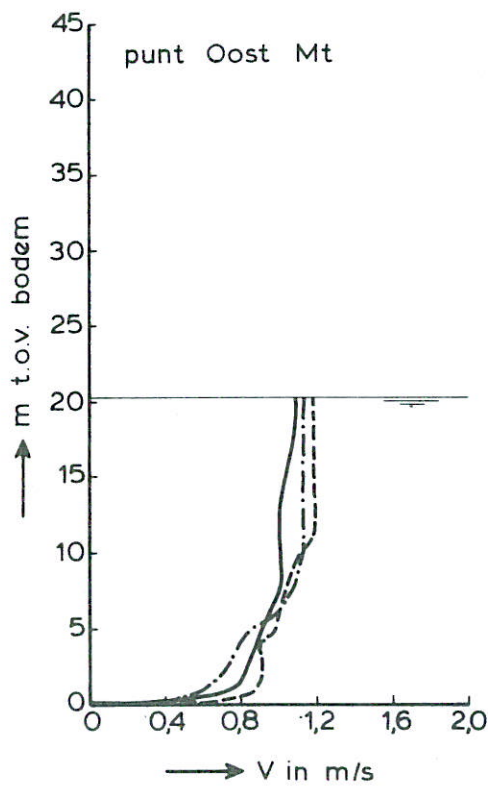
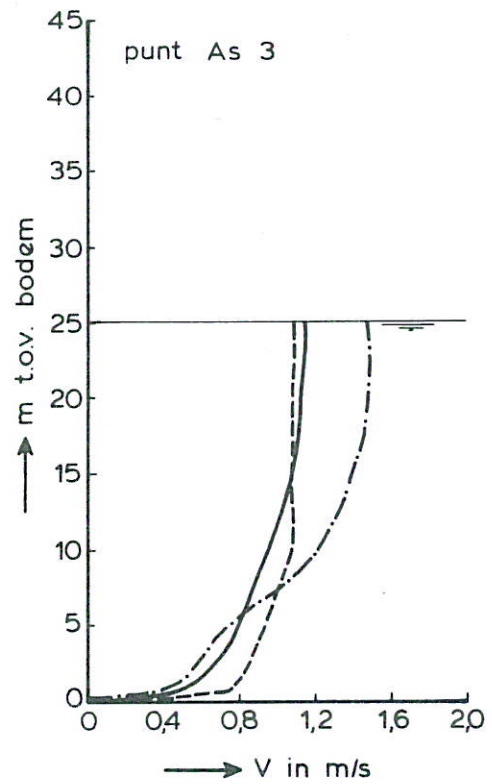
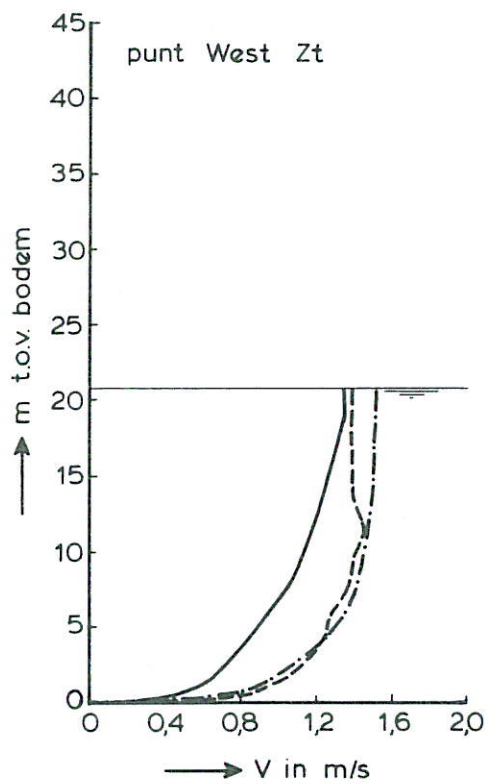
EB

RAAI I

WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 14



— M 1001 met cunet
 - - - M 1000 met cunet 1:7 T 221 A'
 - · - M 1000 met cunet 1:3 T 221 B'

SNELHEIDSVERTIKALEN
 VERGELJKING M 1000 - M 1001

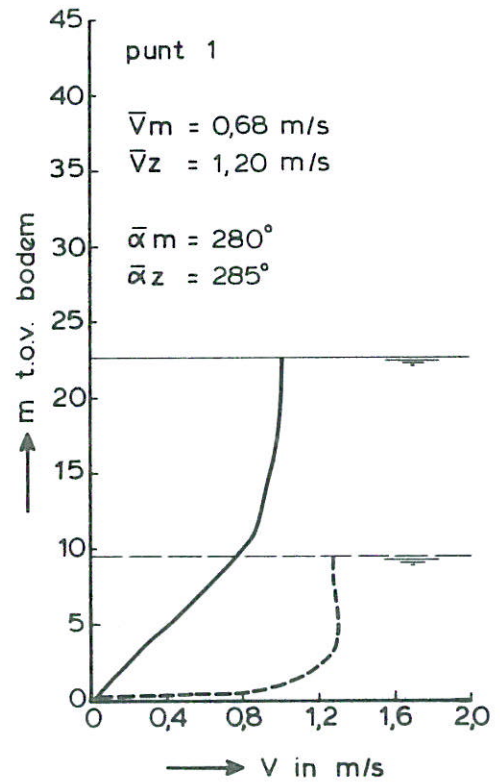
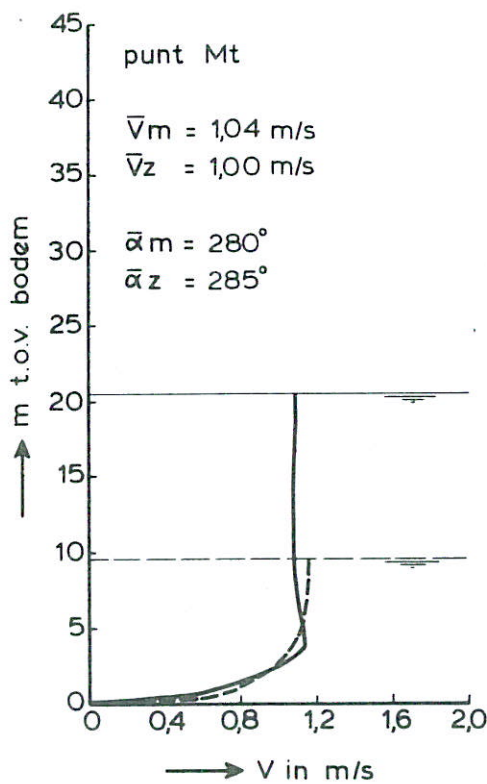
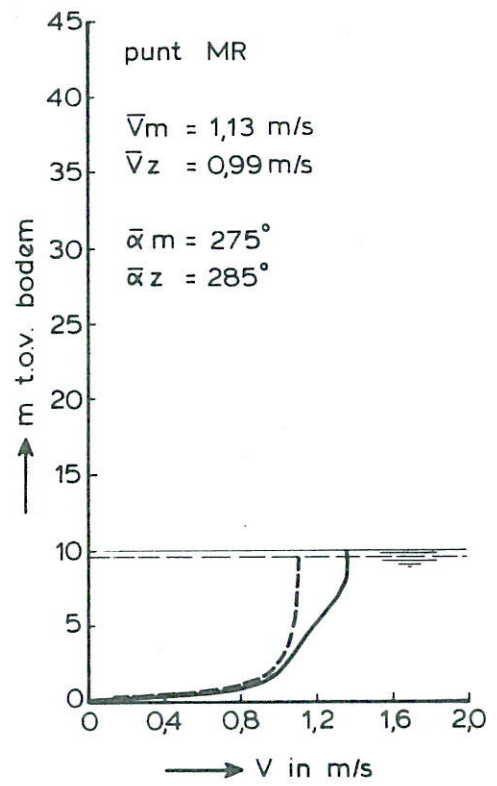
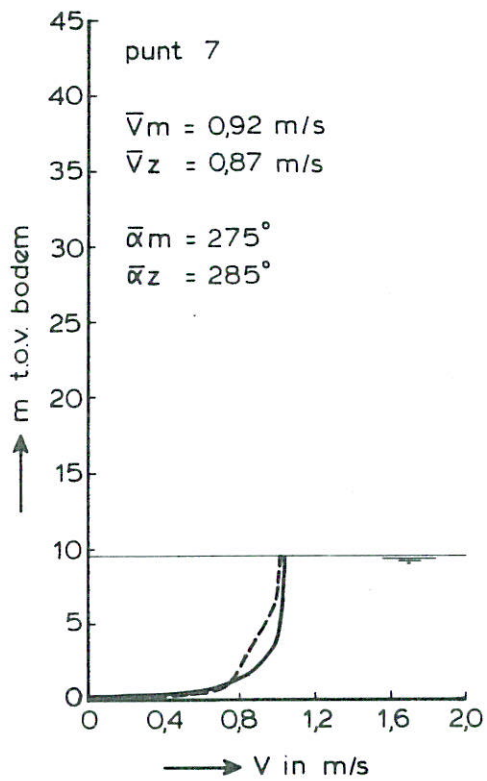
ROOMPOT VLOED

RAAI I

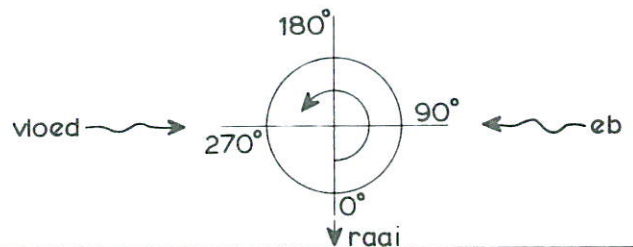
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 15



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

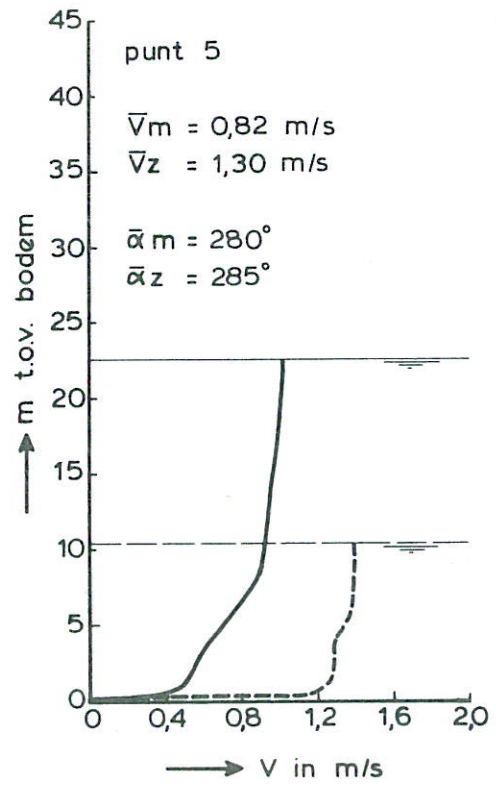
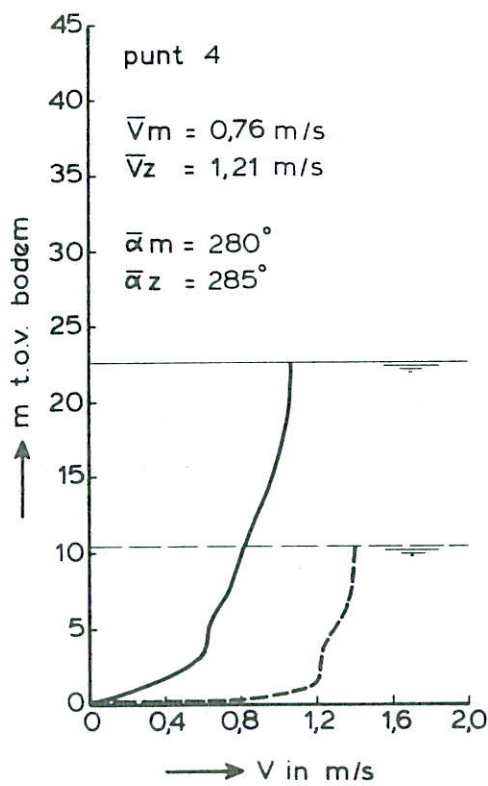
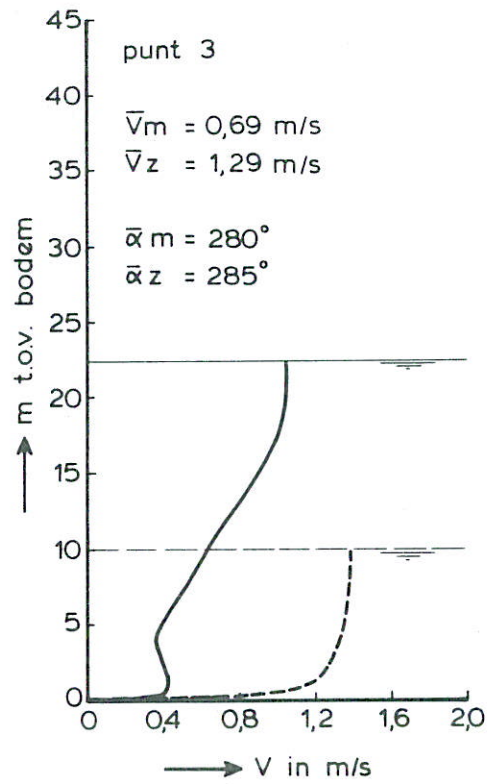
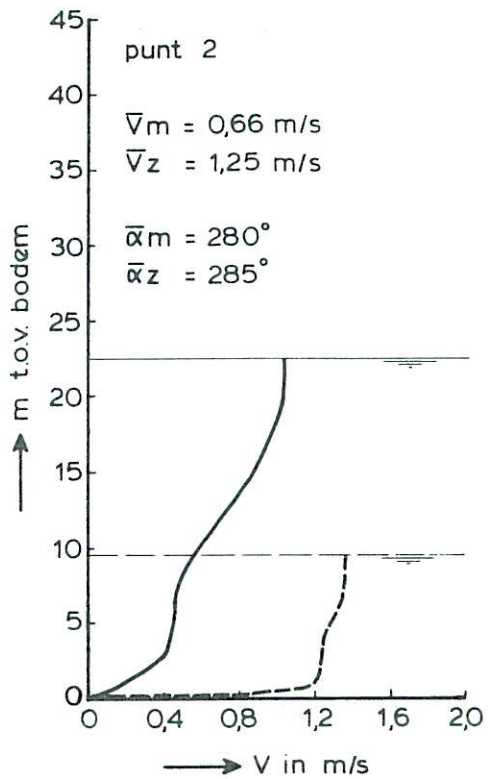
EB

RAAI A

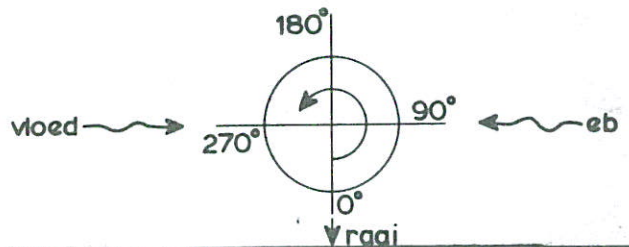
WATERLOOPKUNDIG LABORATORIUM

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FIG. 16 a



— met cunet
 - - - zonder cunet



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ROOMPOT

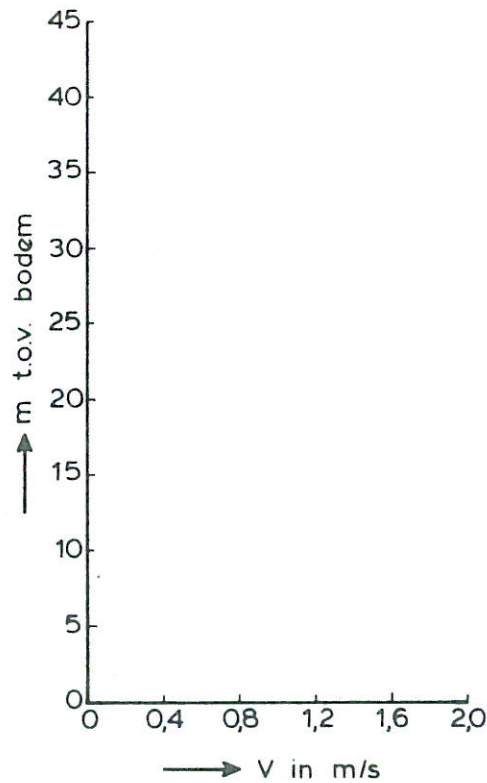
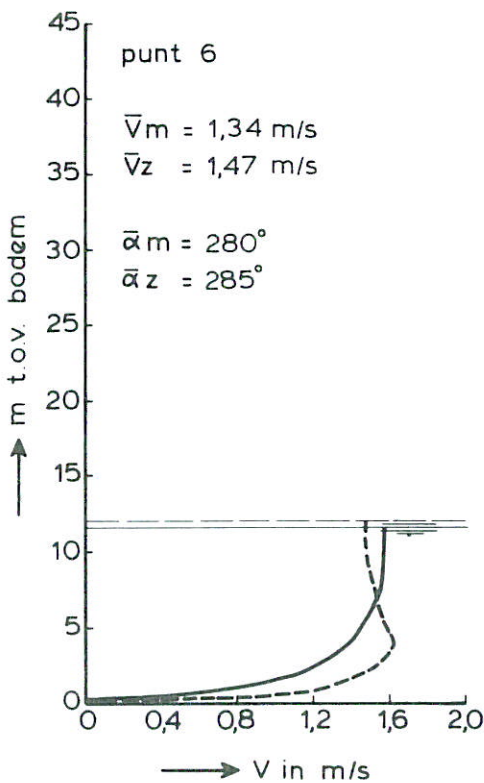
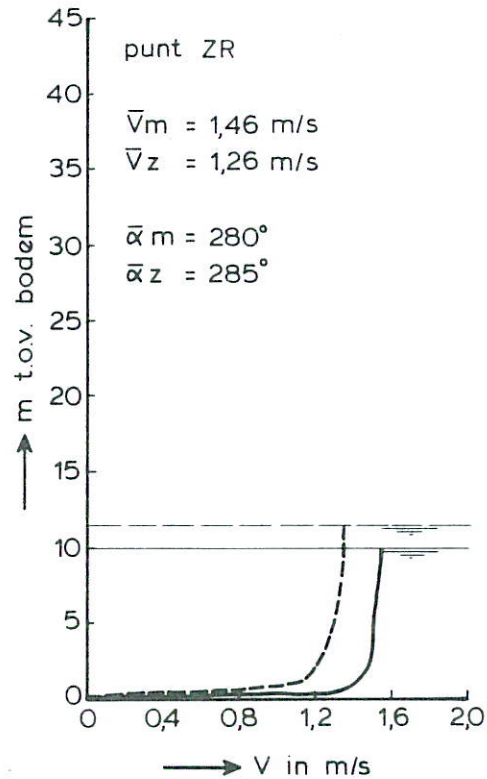
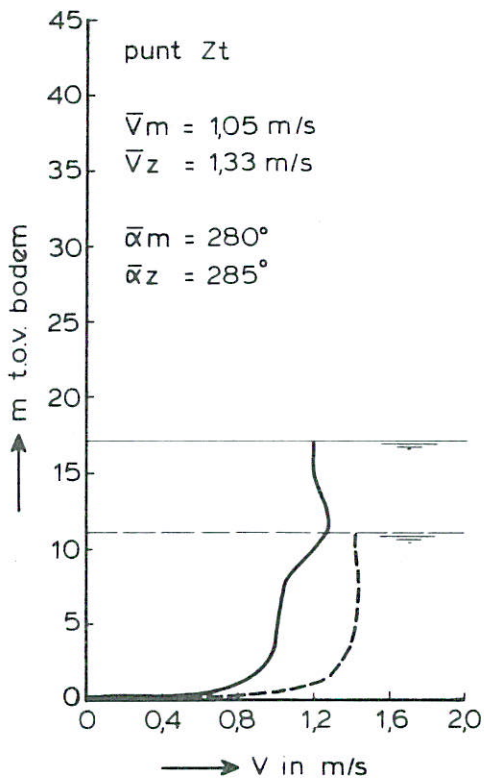
EB

RAAI A

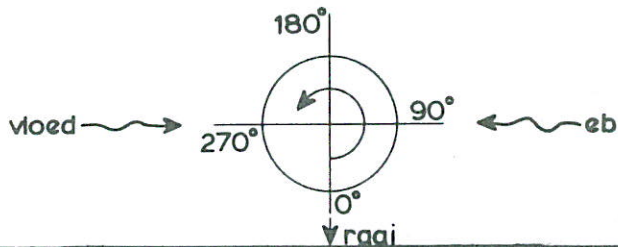
WATERLOOPKUNDIG LABORATORIUM

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FIG. 16 b



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

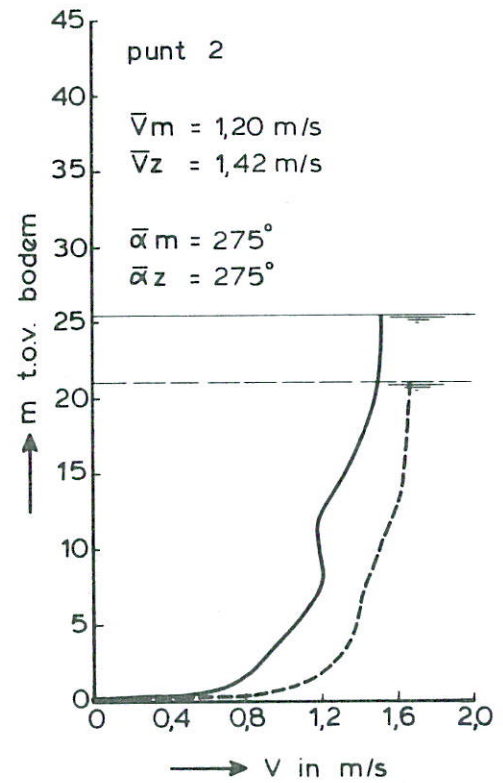
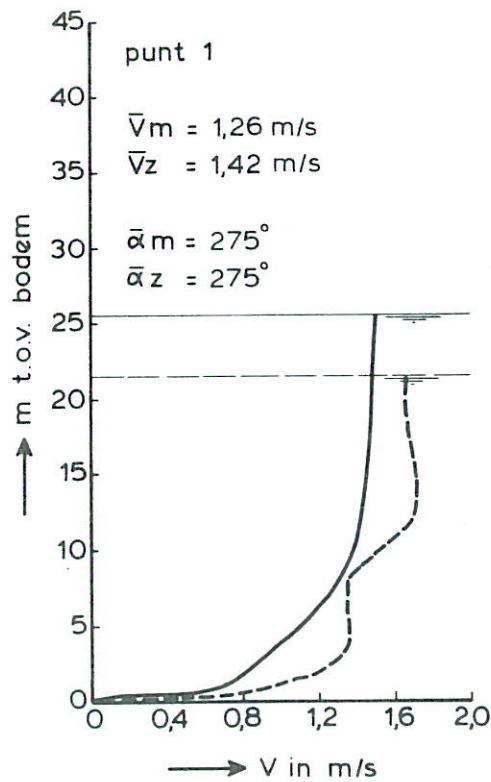
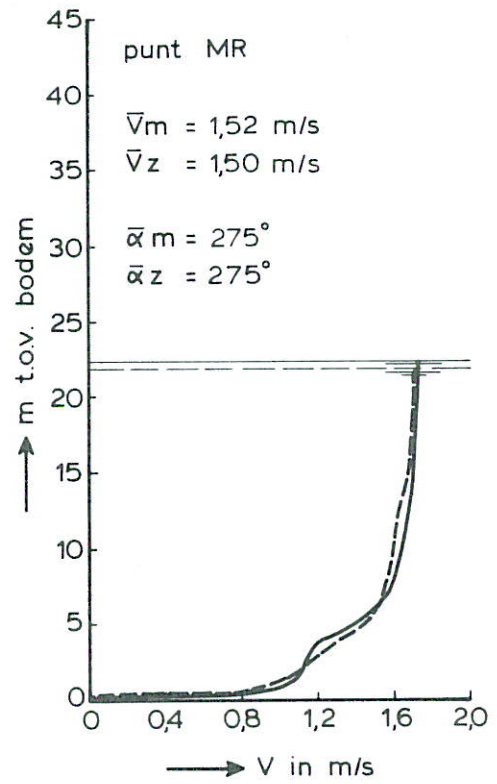
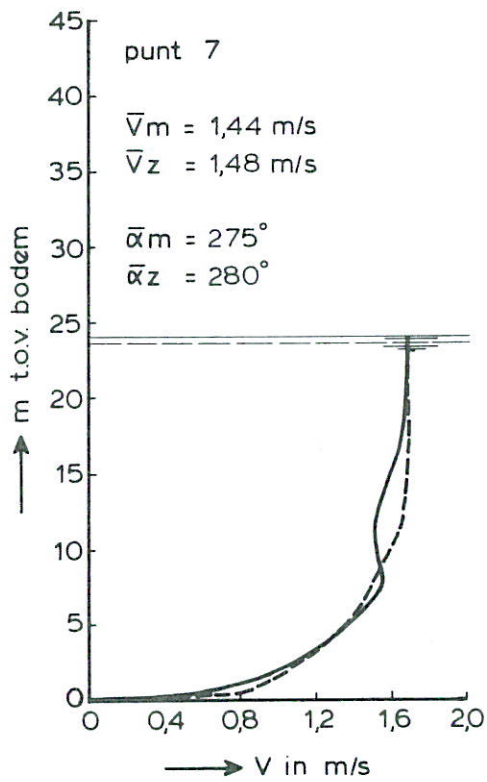
EB

RAAI A

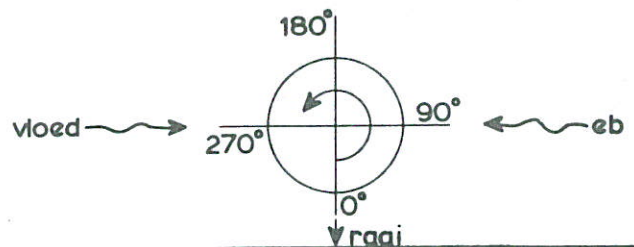
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 16 c



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

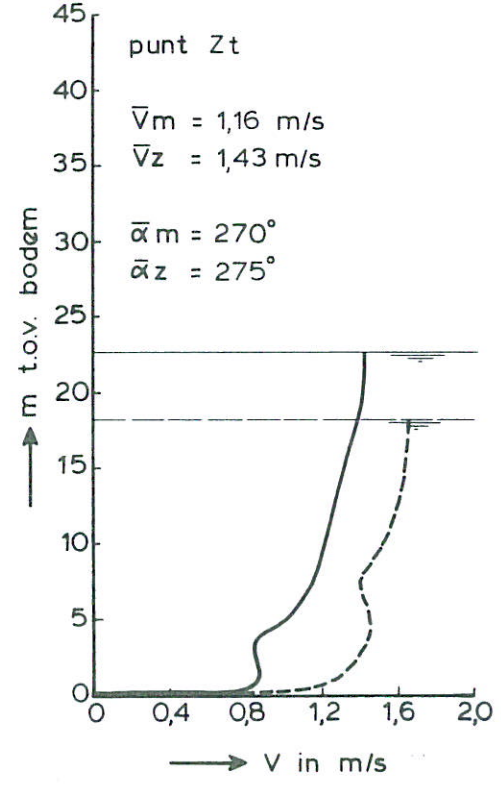
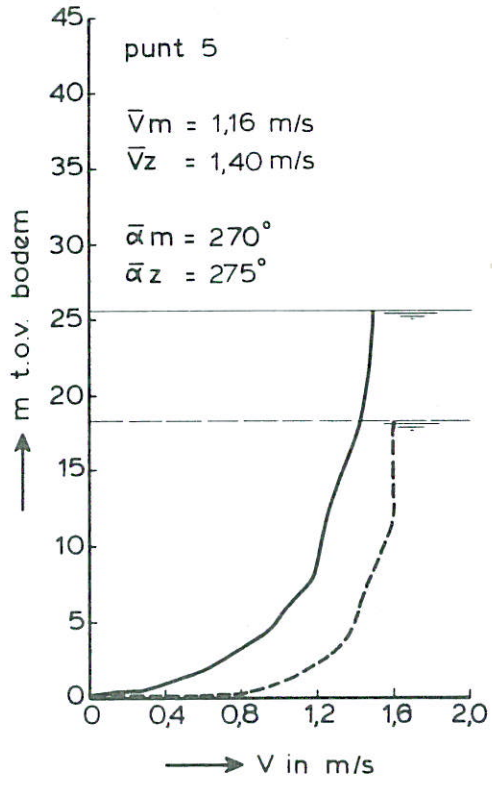
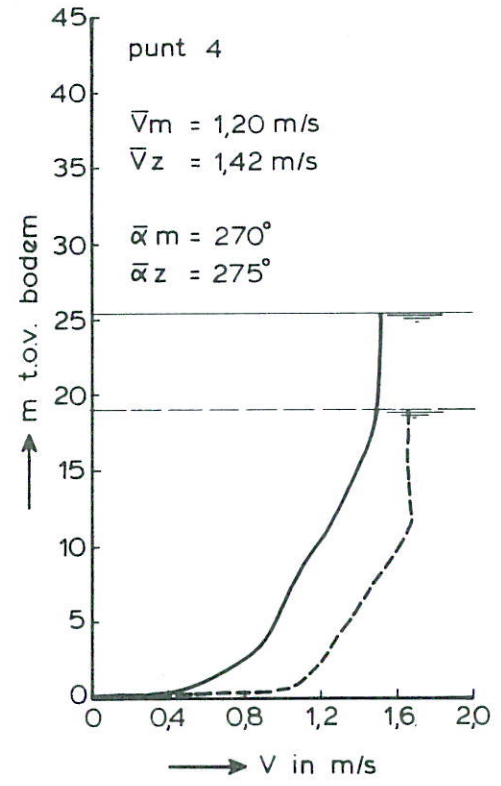
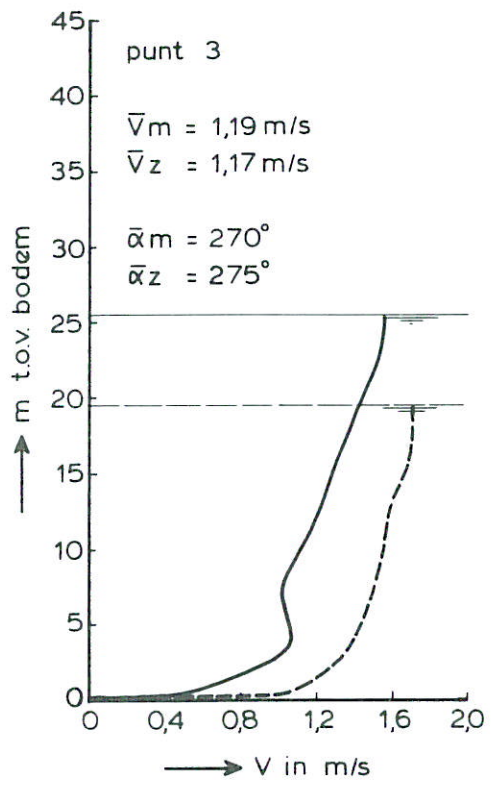
EB

RAAI B

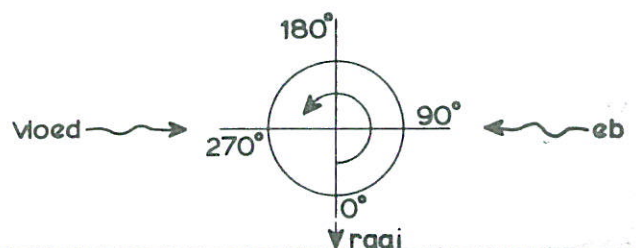
WATERLOOPKUNDIG LABORATORIUM

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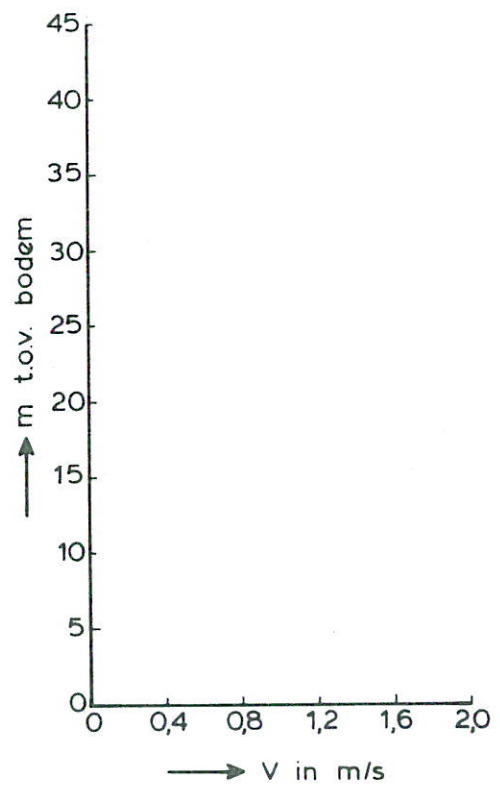
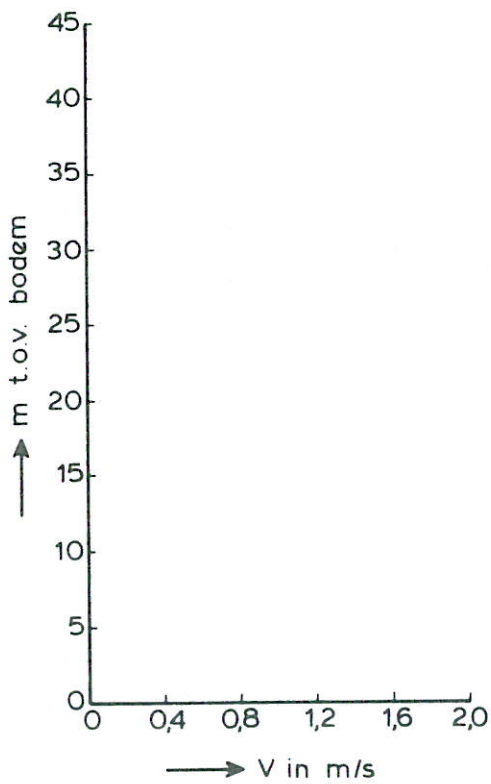
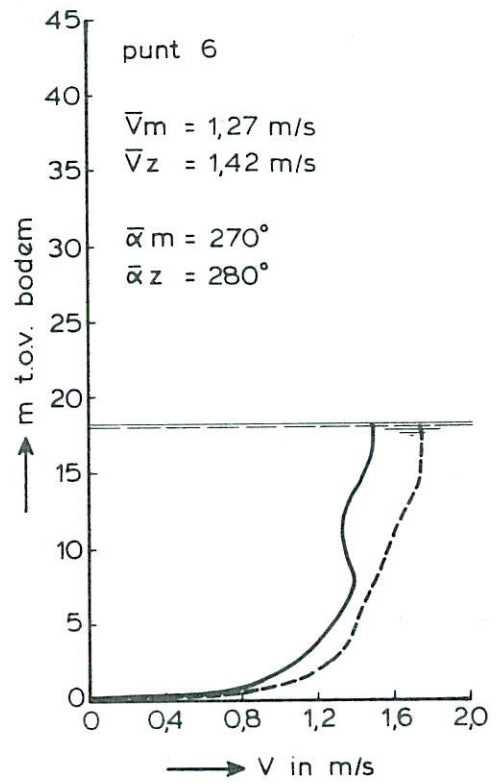
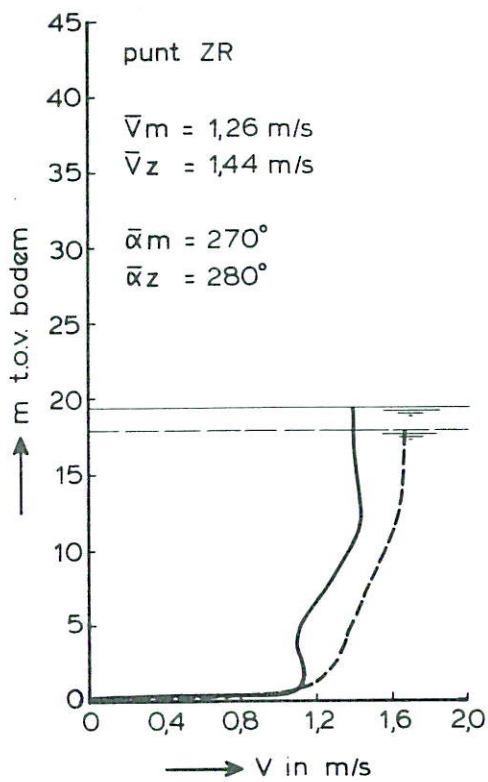
FIG. 17a



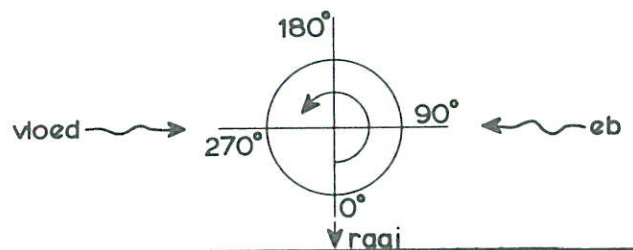
— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN	ROOMPOT	EB
	RAAI B	
WATERLOOPKUNDIG LABORATORIUM	M 1001	FIG. 17 b



— met cunet
 - - - zonder cunet



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ROOMPOT

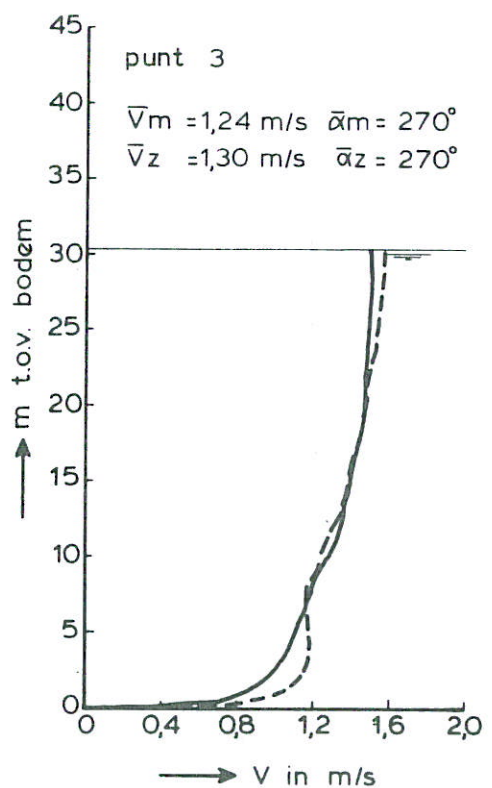
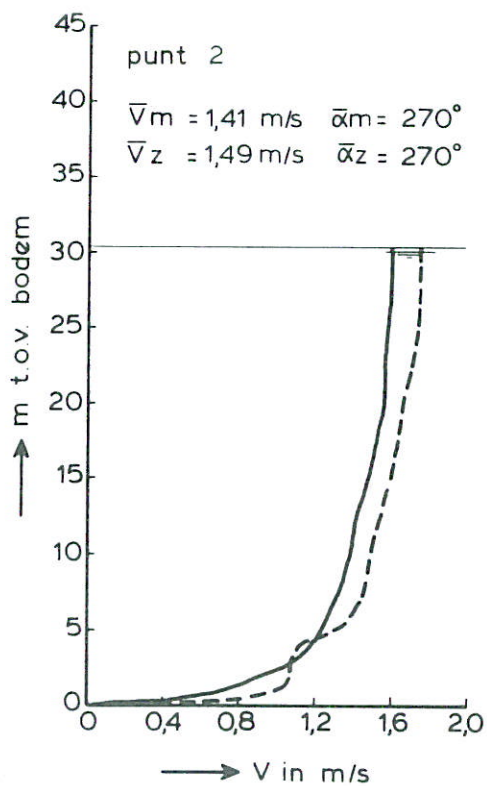
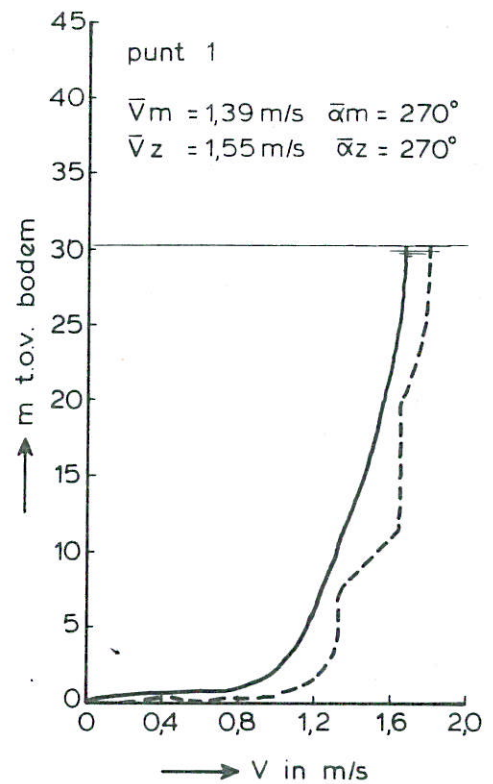
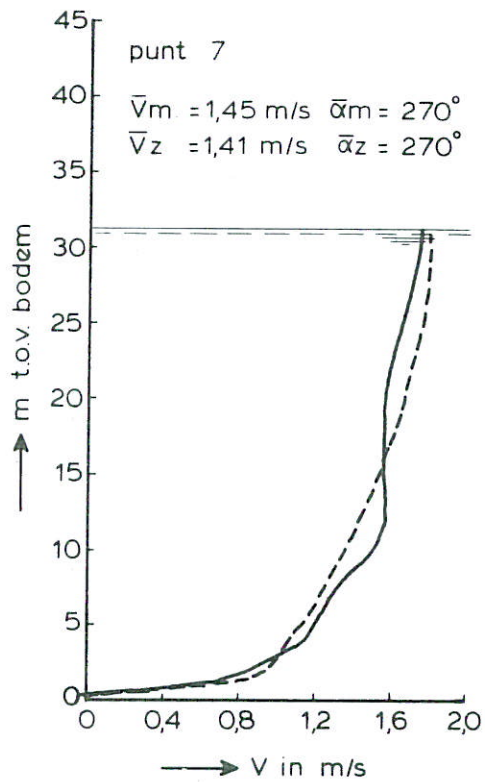
EB

RAAI B

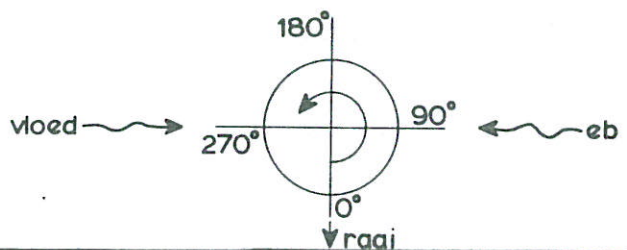
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FIG. 17c



— met cunet
 - - - zonder cunet



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ROOMPOT

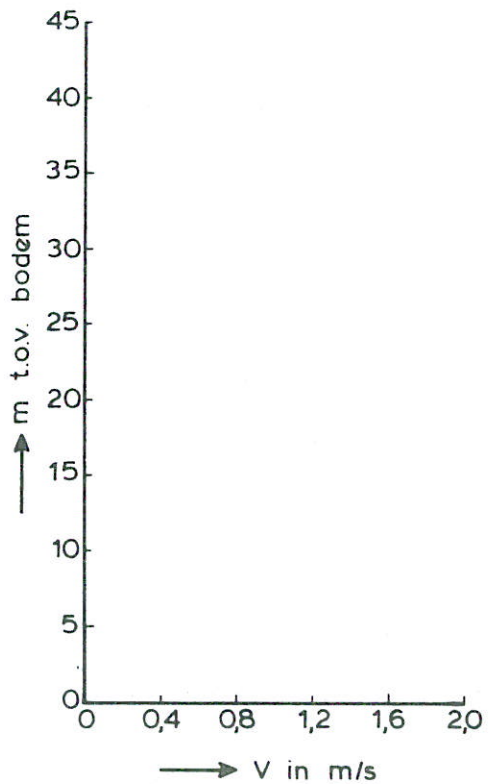
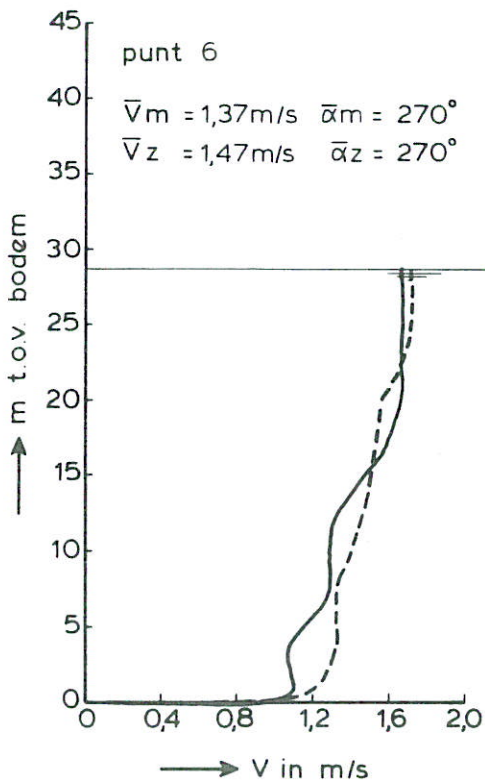
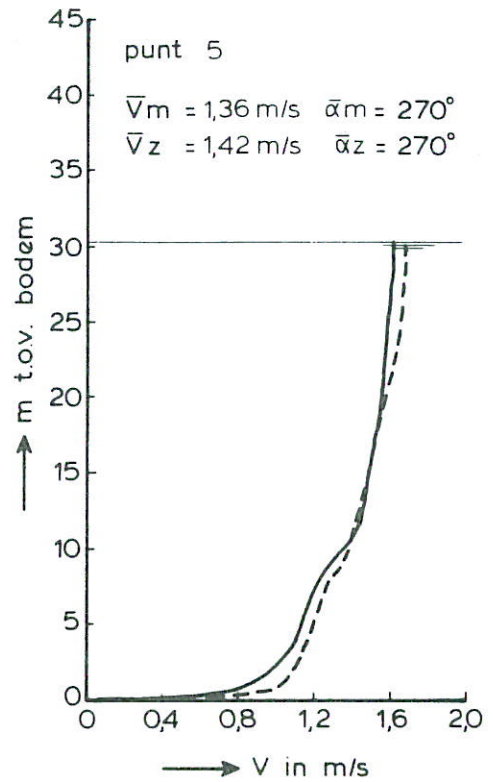
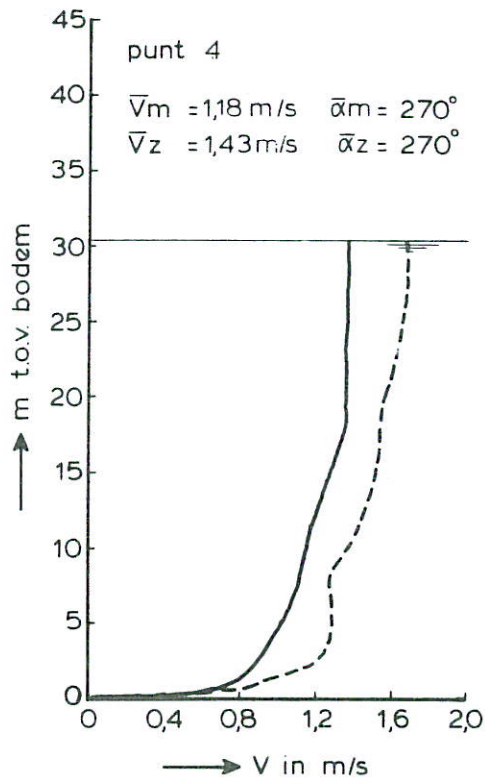
EB

RAAI C

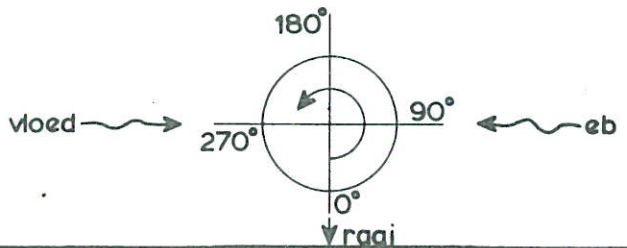
WATERLOOPKUNDIG LABORATORIUM

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FIG. 18 a



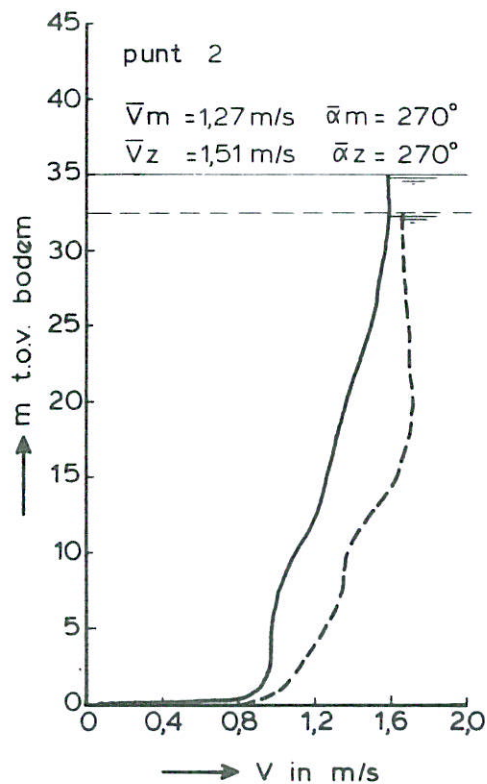
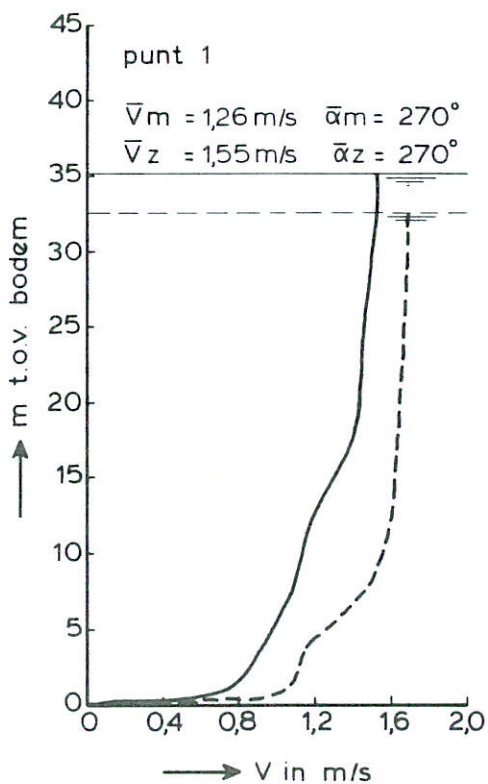
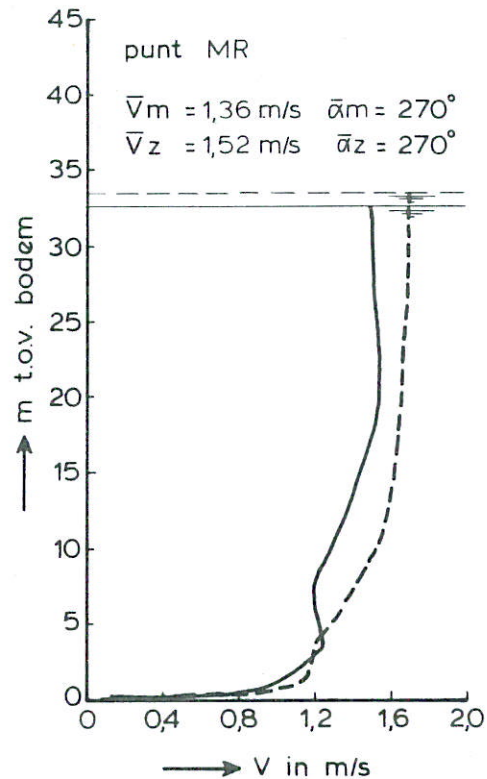
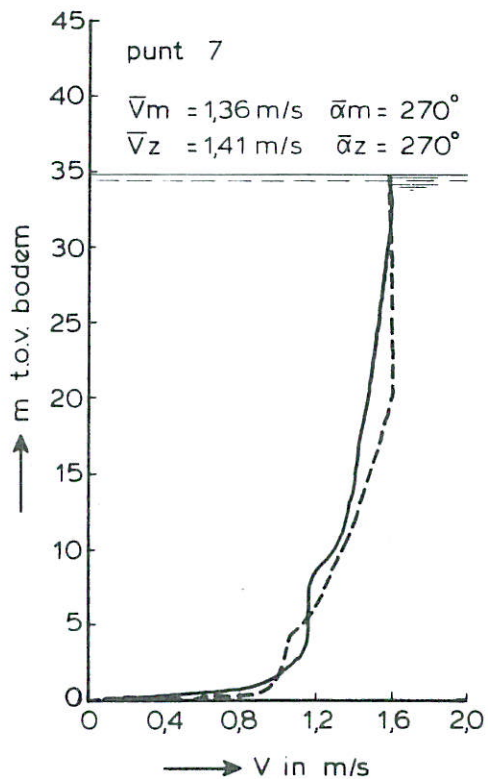
— met cunet
 - - - zonder cunet



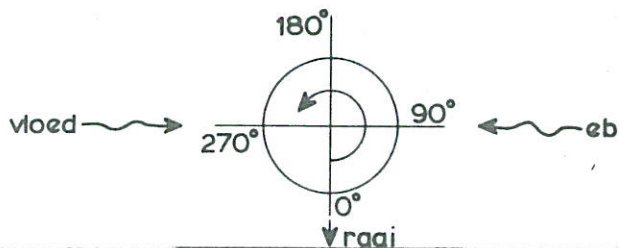
SNELHEIDSVERTIKALEN

ROOMPOT EB

RAAI C



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

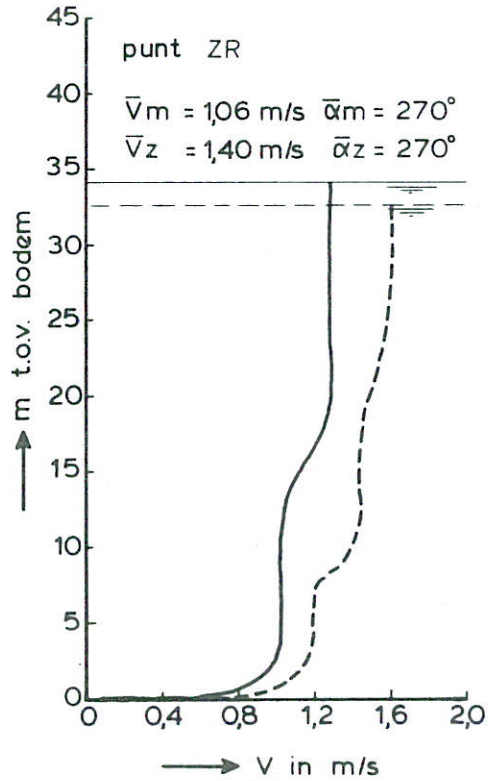
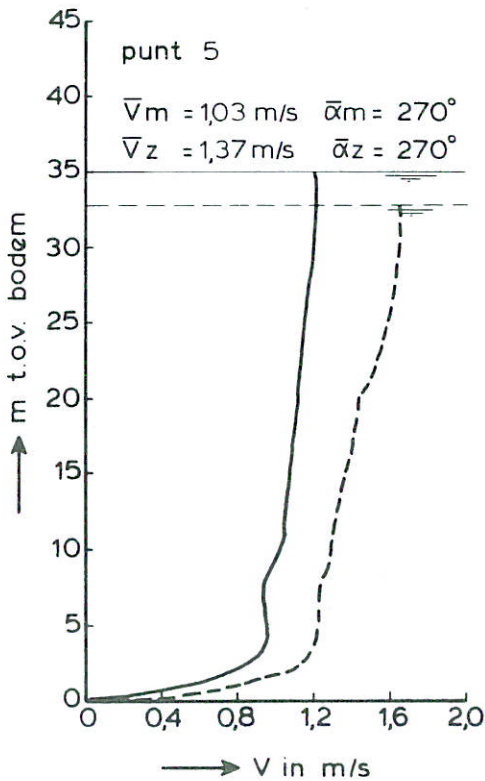
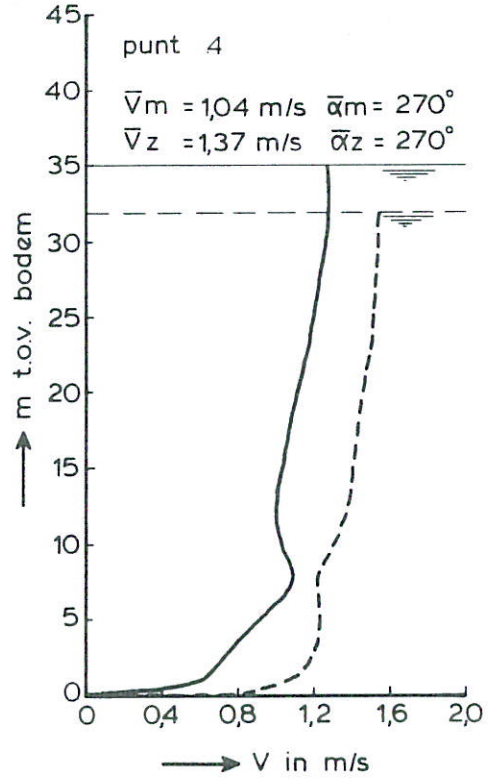
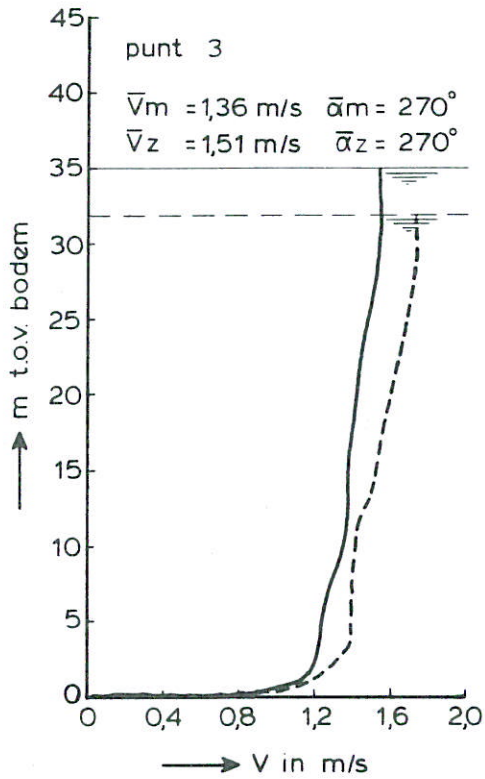
ROOMPOT EB

RAAI D

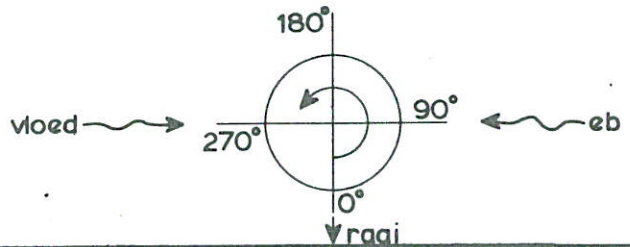
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FIG. 19a



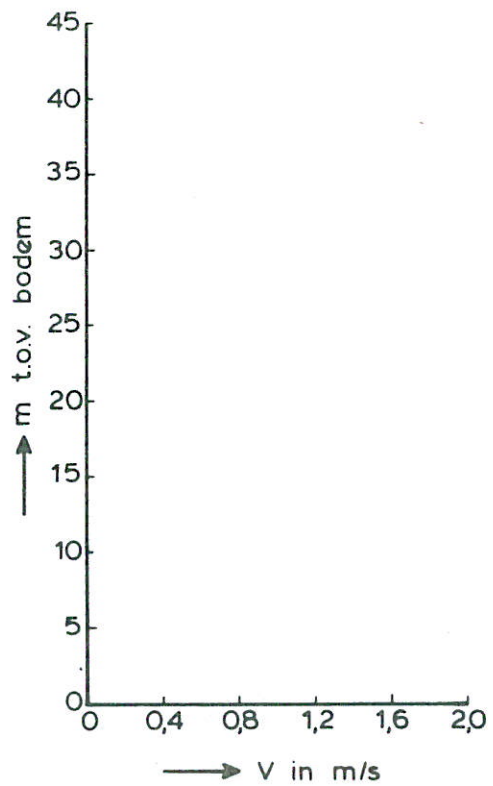
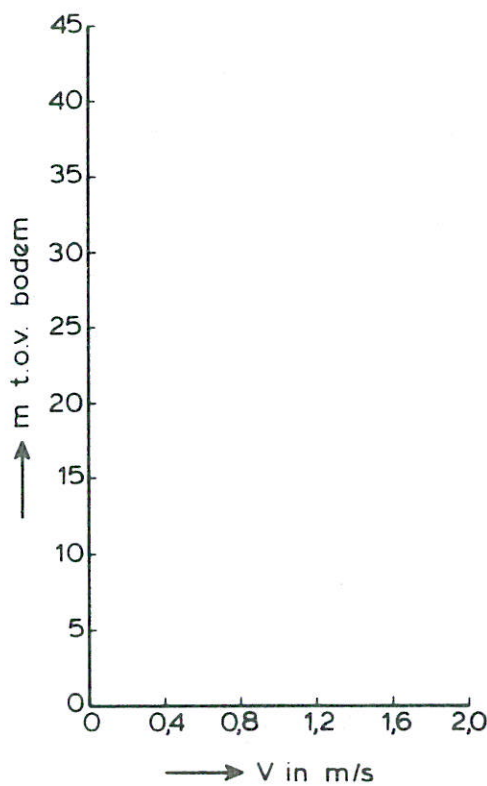
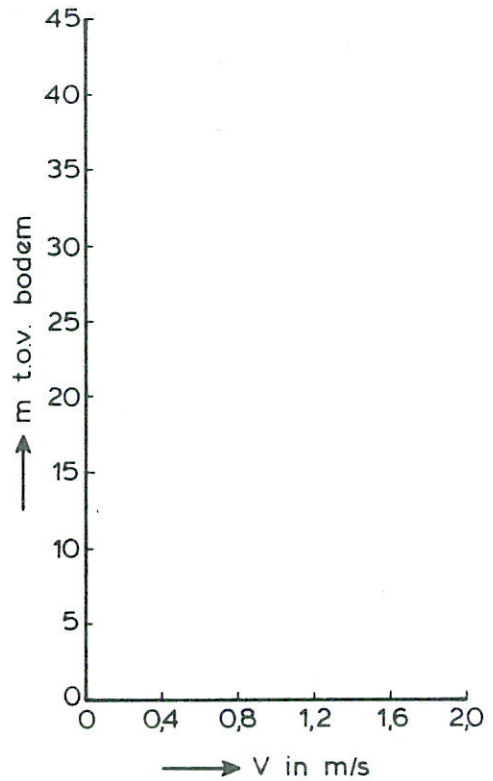
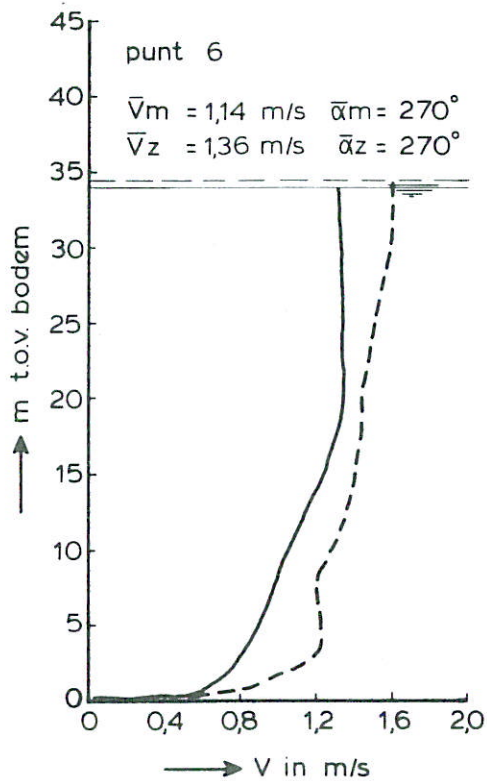
— met cunet
 - - - zonder cunet



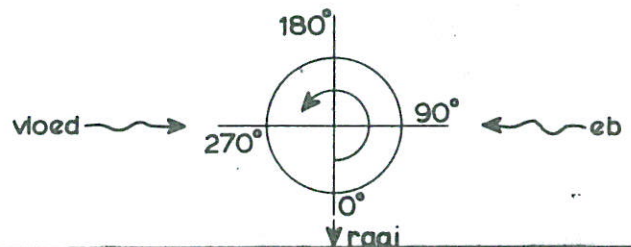
SNELHEIDSVERTIKALEN

ROOMPOT EB

RAAI D



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

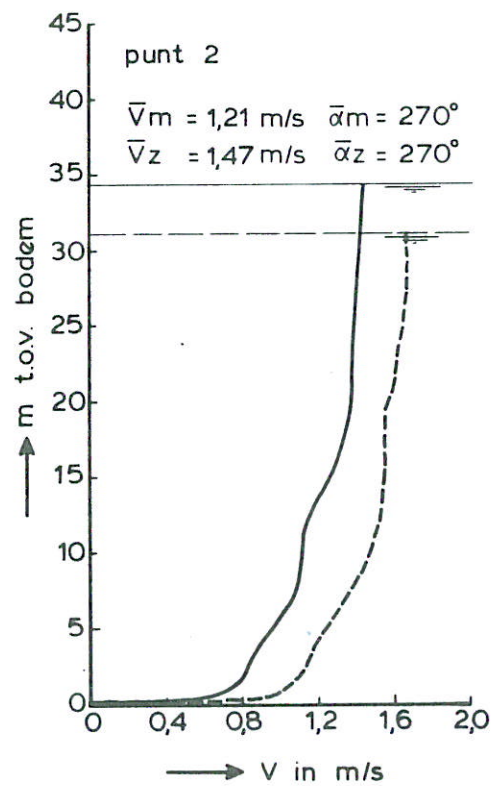
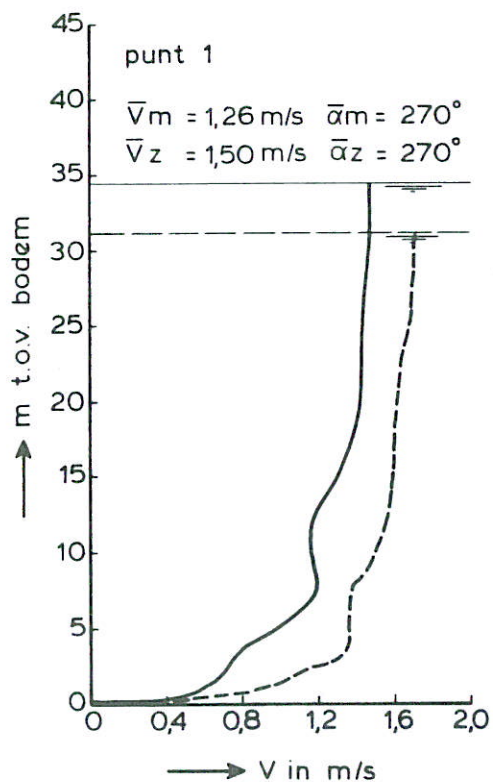
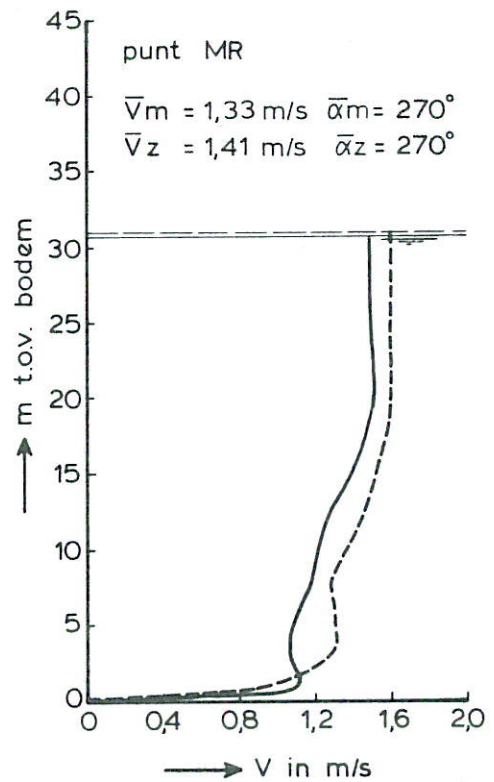
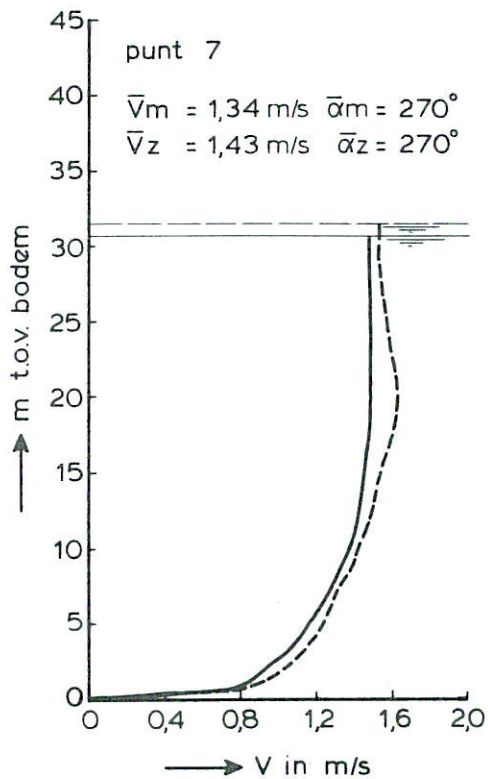
EB

RAAI D

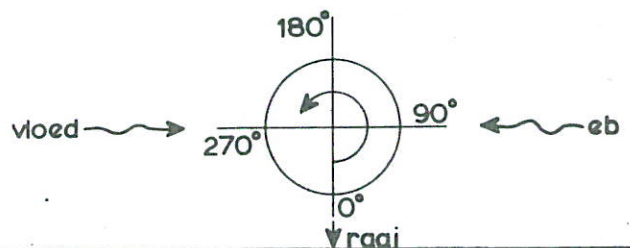
WATERLOOPKUNDIG LABORATORIUM

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FIG. 19 c



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

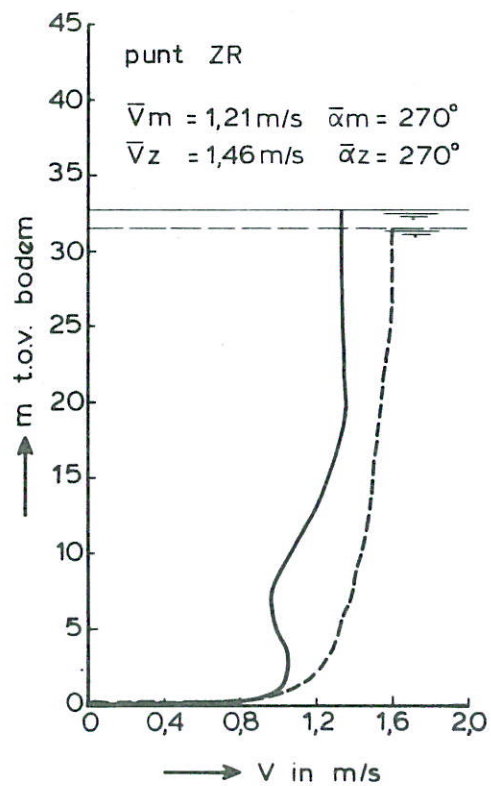
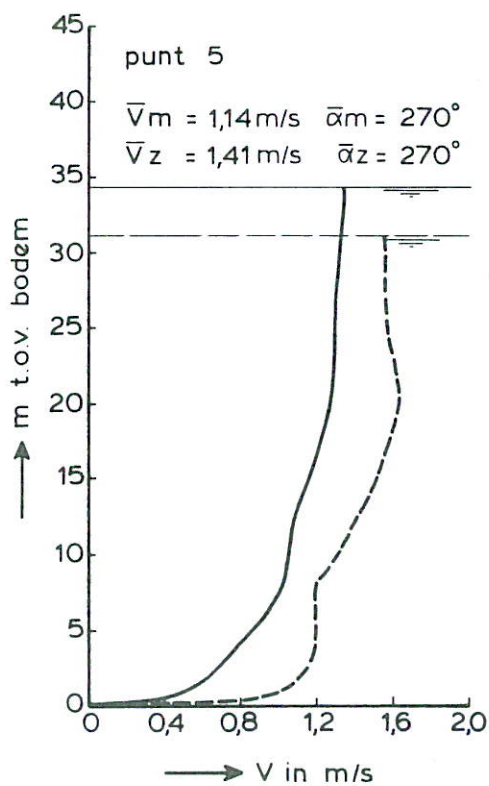
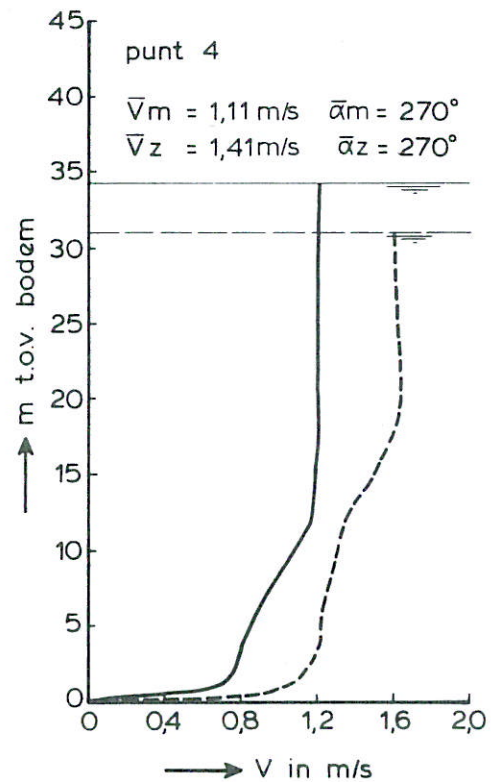
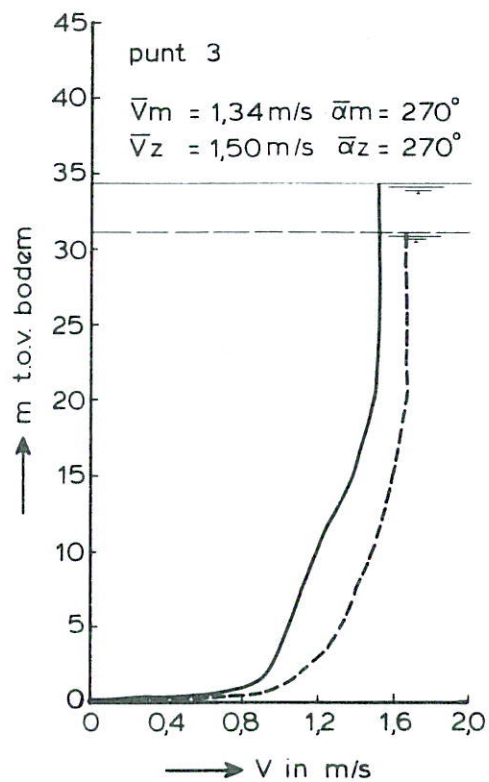
EB

RAAI E

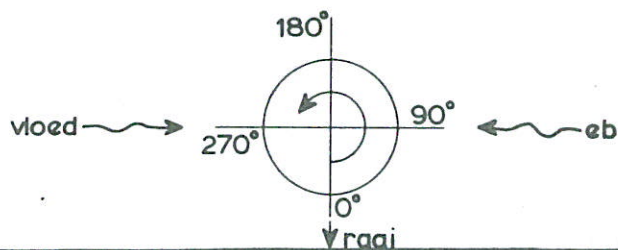
WATERLOOPKUNDIG LABORATORIUM

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FIG. 20a



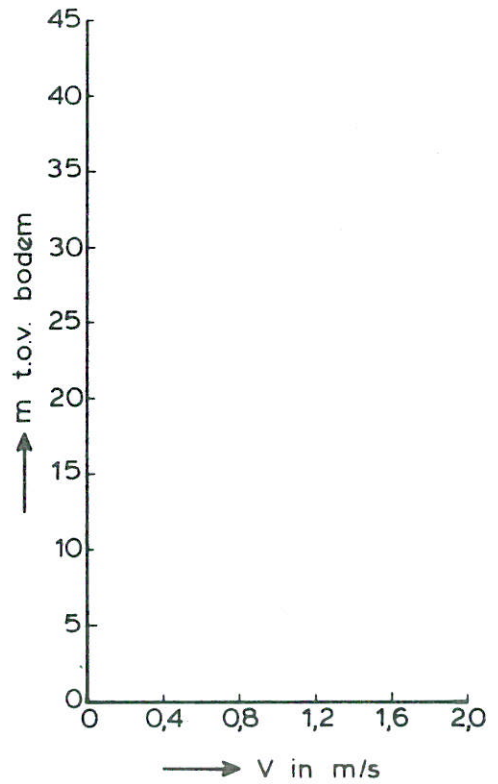
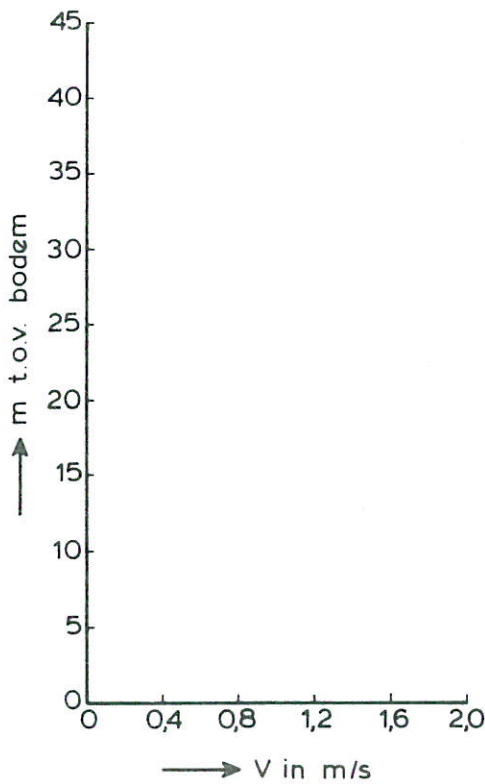
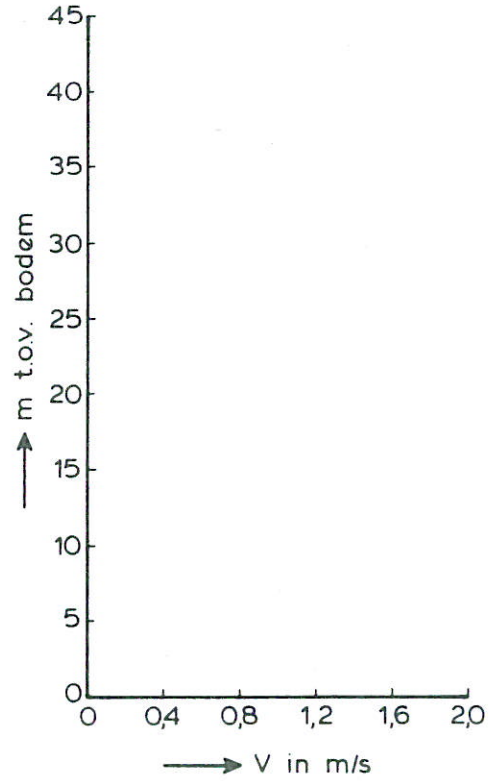
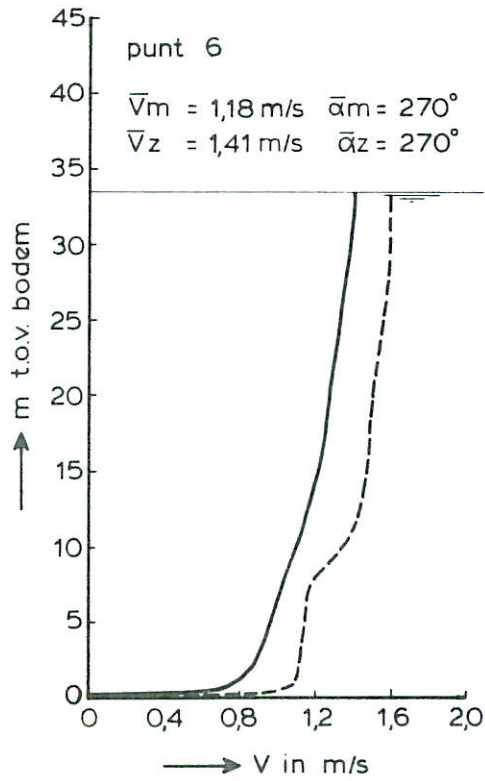
— met cunet
 - - - zonder cunet



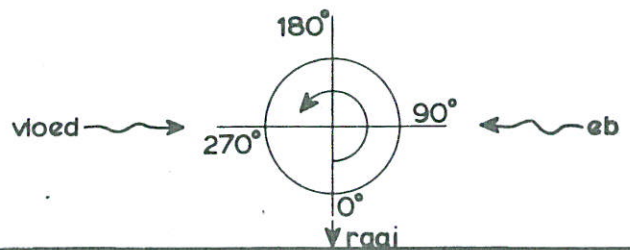
SNELHEIDSVERTIKALEN

ROOMPOT EB

RAAI E



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

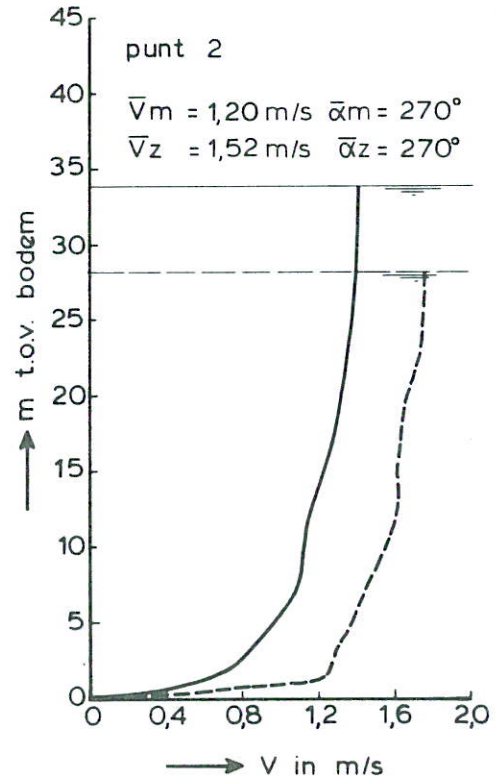
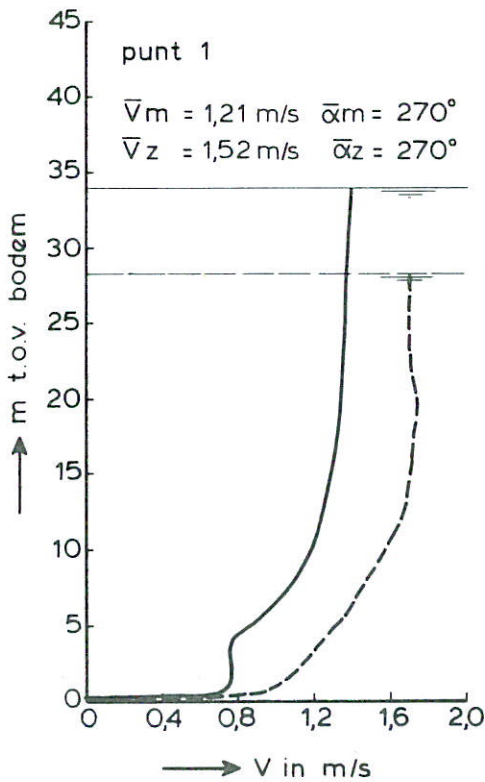
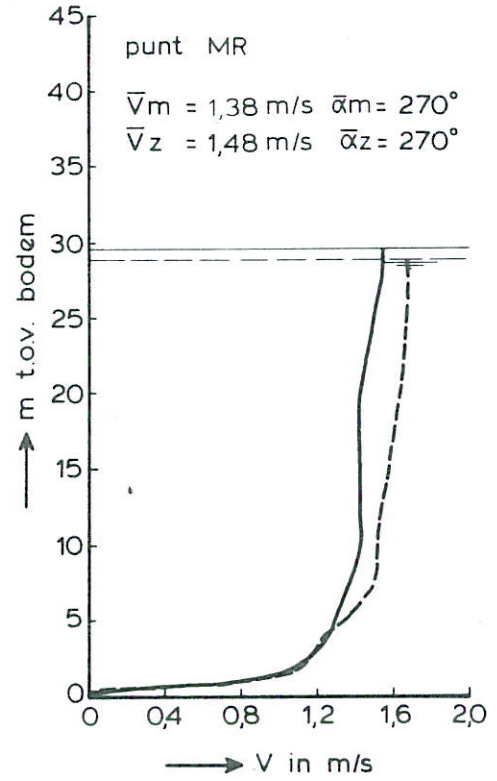
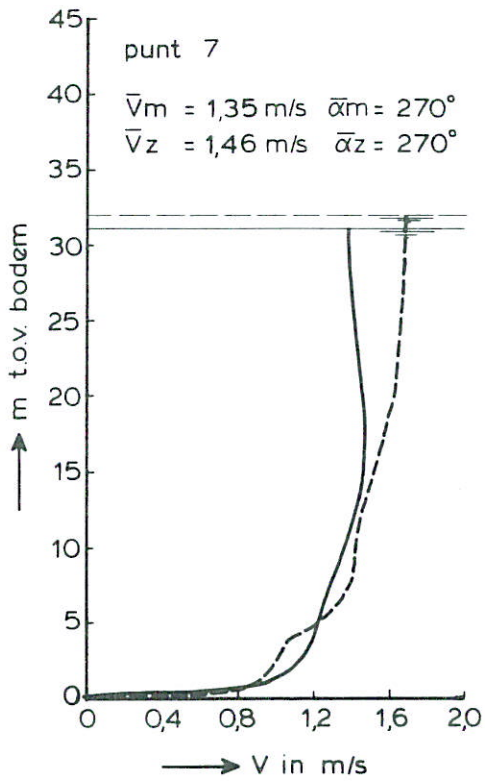
EB

RAAI E

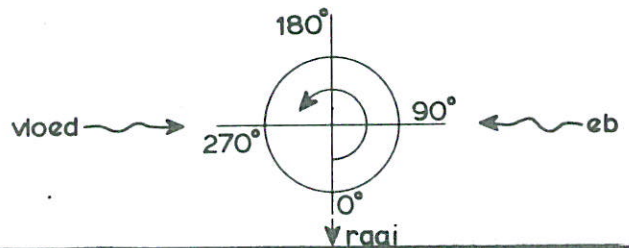
WATERLOOPKUNDIG LABORATORIUM

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FIG. 20c



— met cunet
 - - - zonder cunet

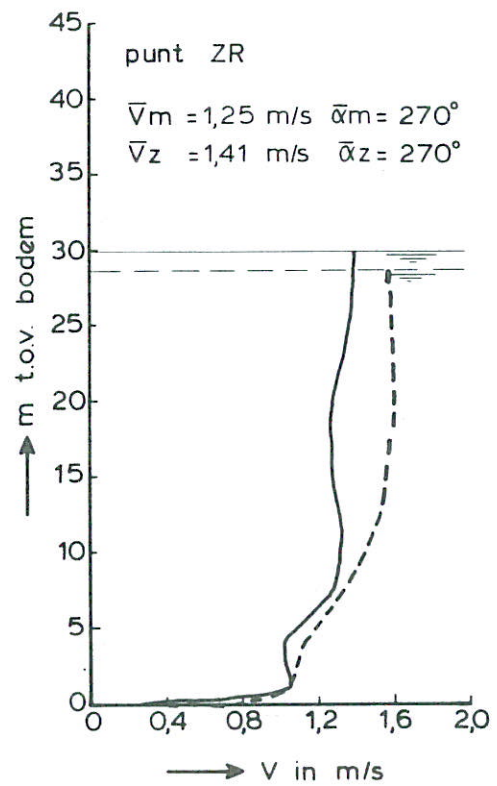
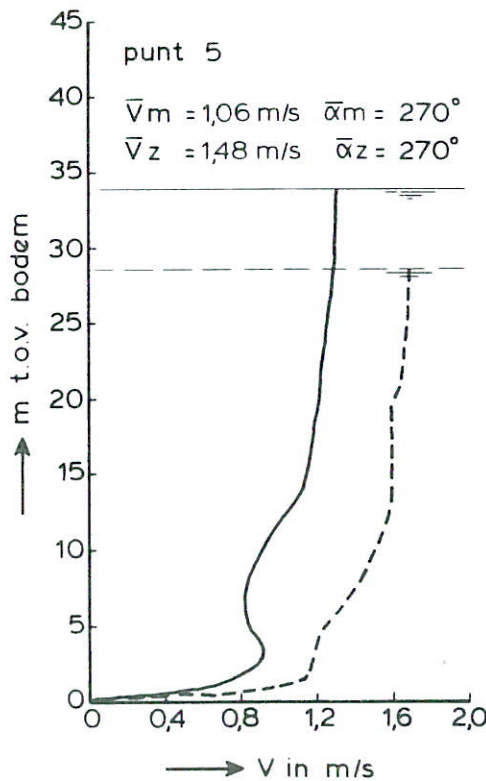
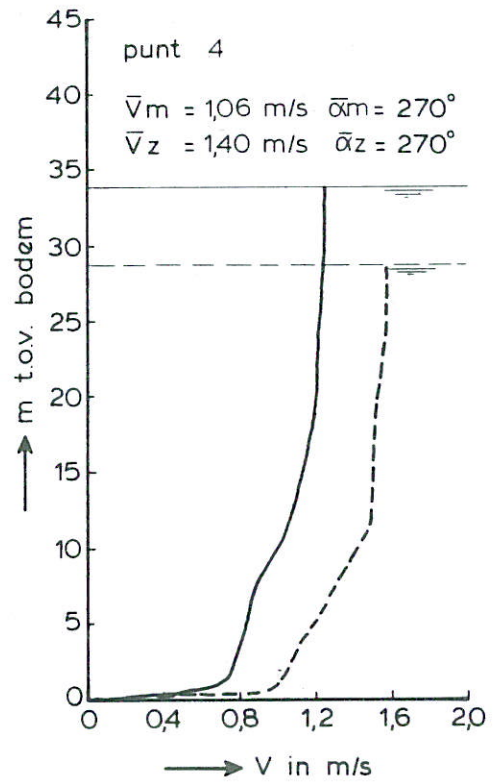
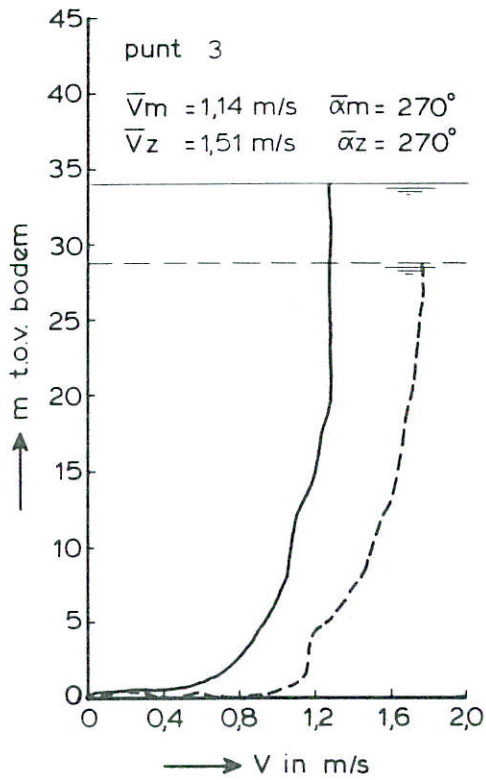


SNELHEIDSVERTIKALEN

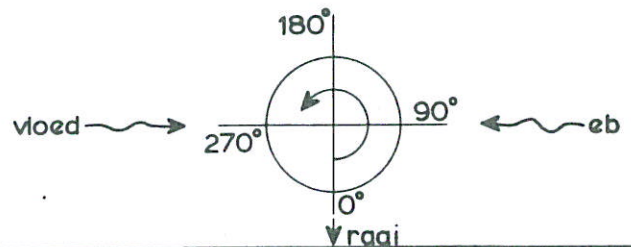
ROOMPOT

EB

RAAI F



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

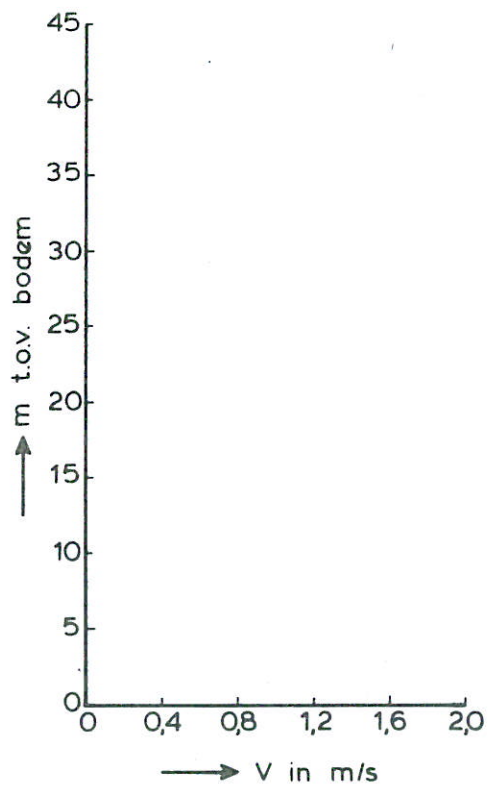
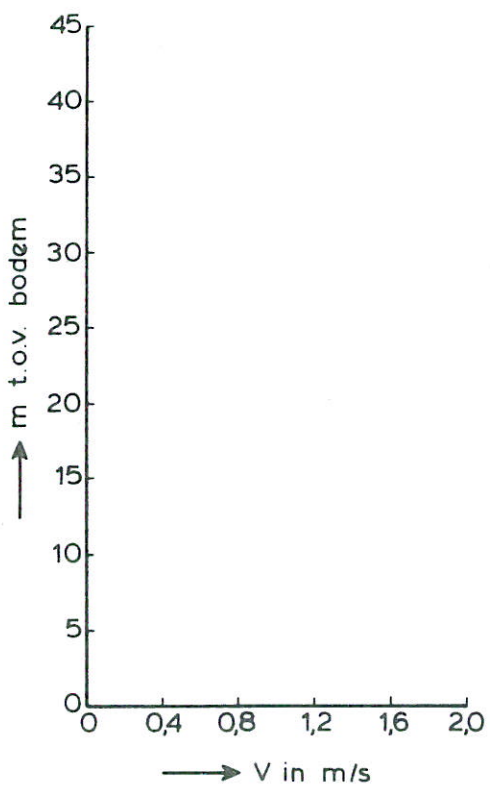
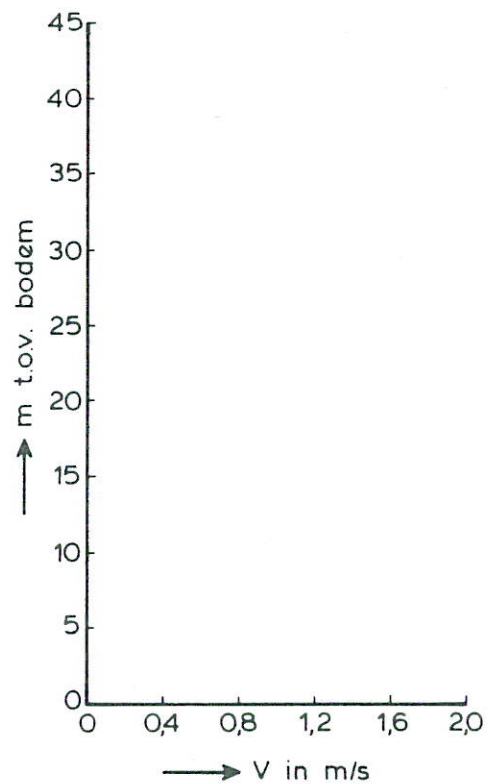
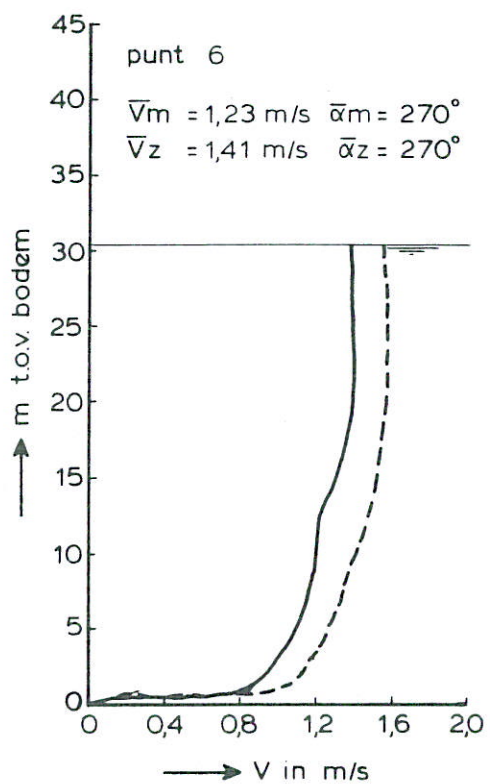
EB

RAAI F

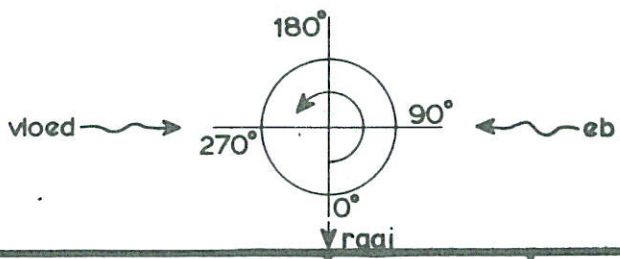
WATERLOOPKUNDIG LABORATORIUM

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FIG. 21b



— met cunet
 - - - zonder cunet



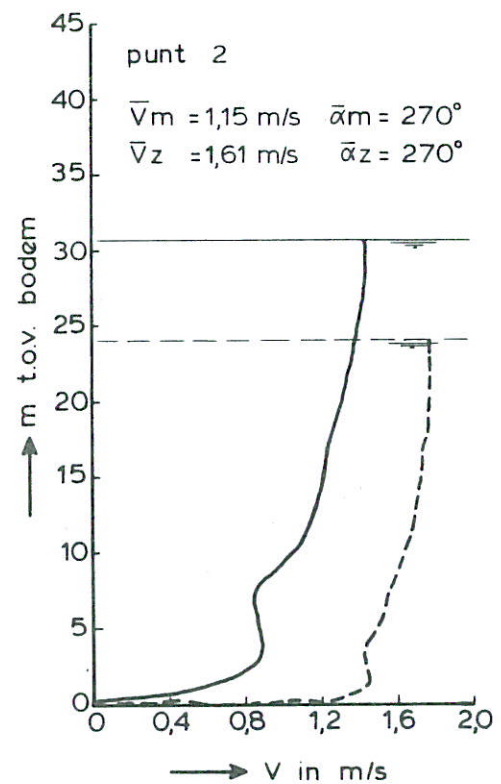
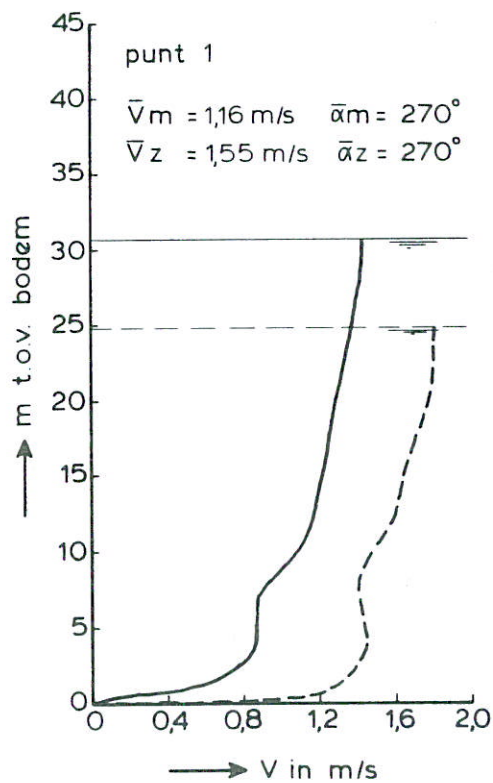
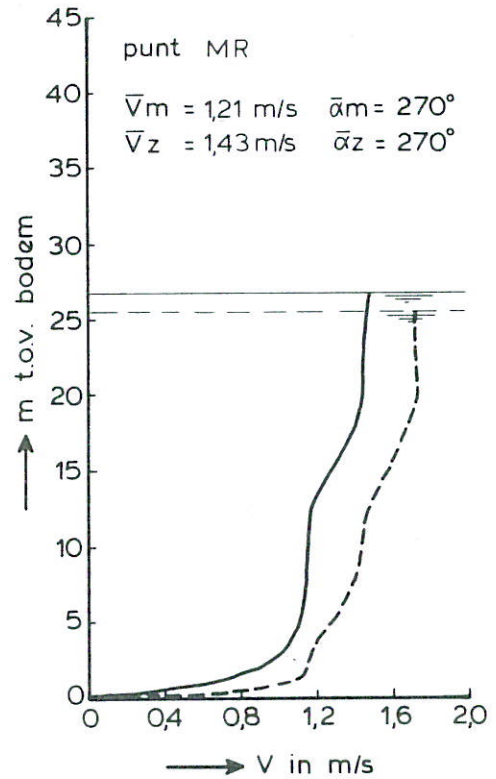
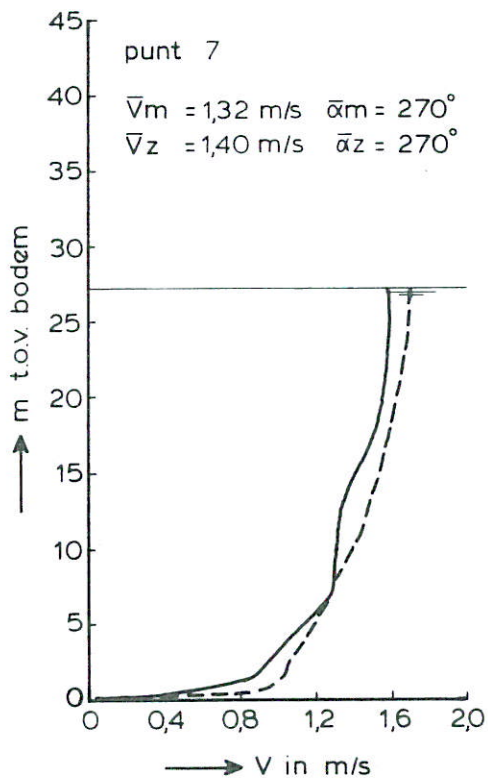
SNELHEIDSVERTIKALEN

ROOMPOT EB

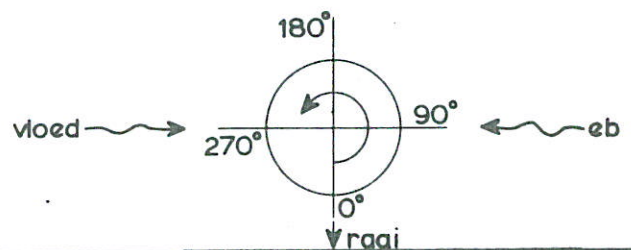
RAAI F

WATERLOOPKUNDIG LABORATORIUM

M 1001 FIG. 21c



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

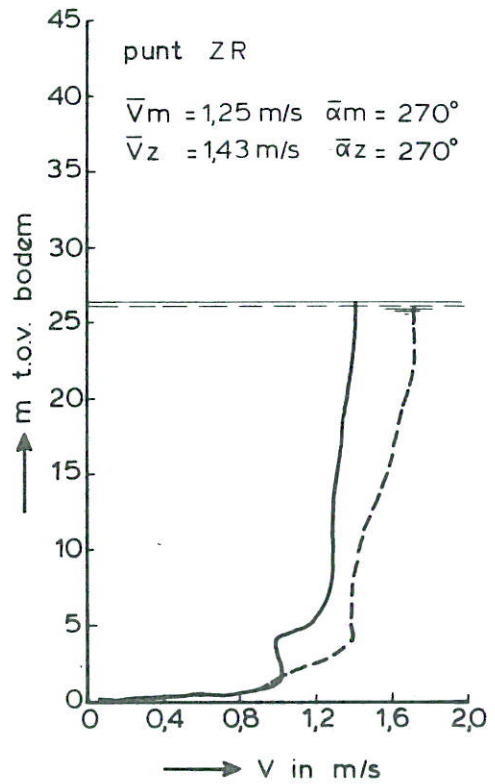
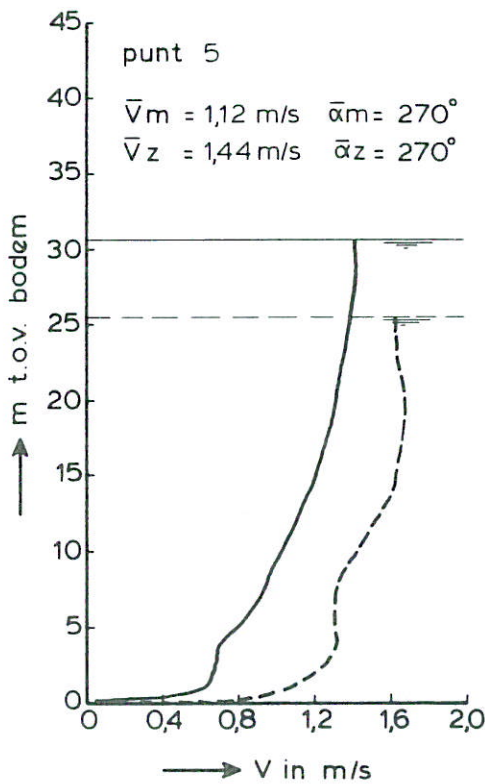
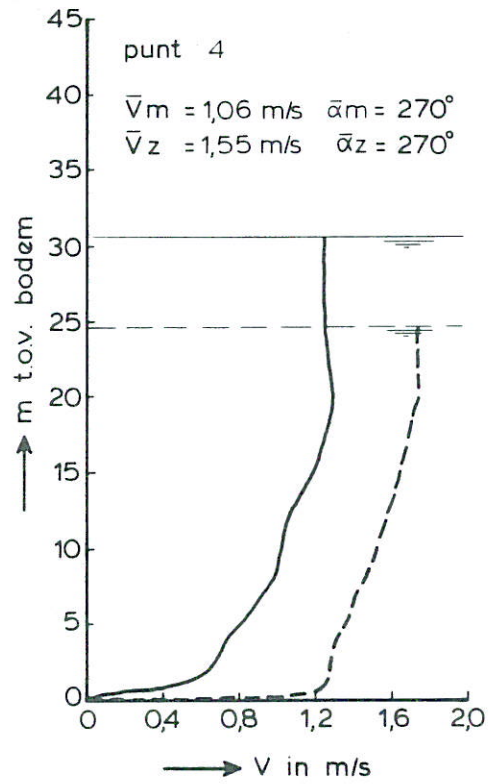
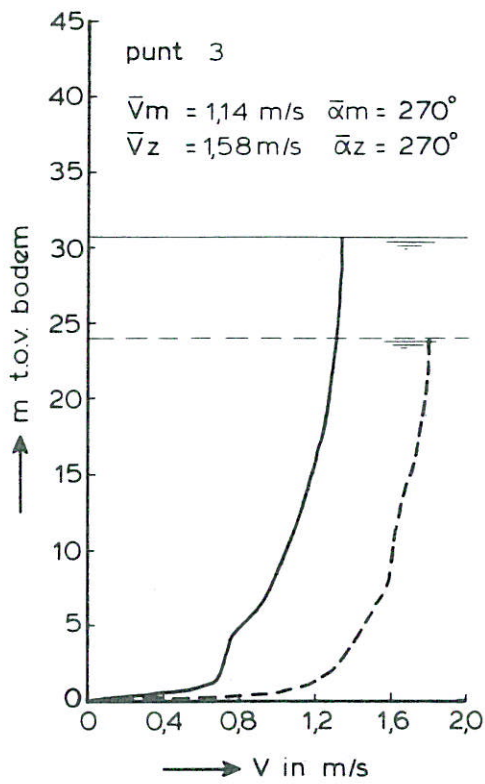
EB

RAAI G

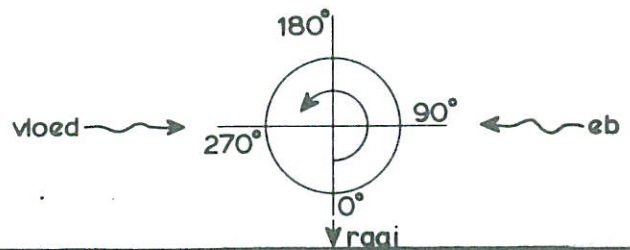
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FIG. 22a



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

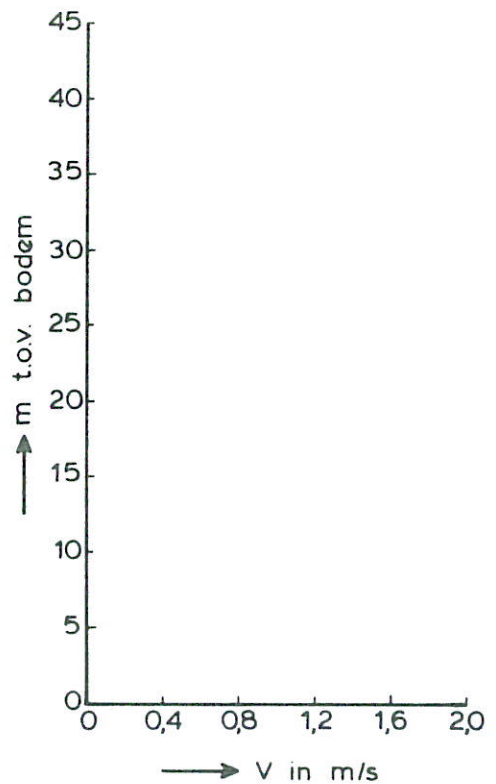
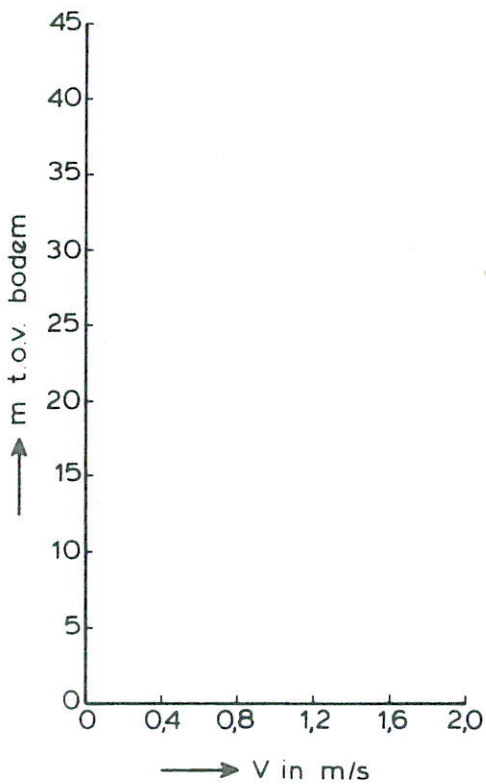
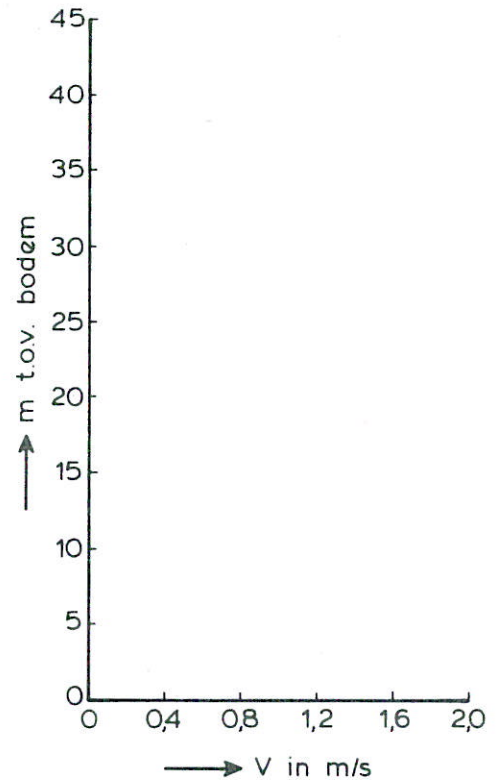
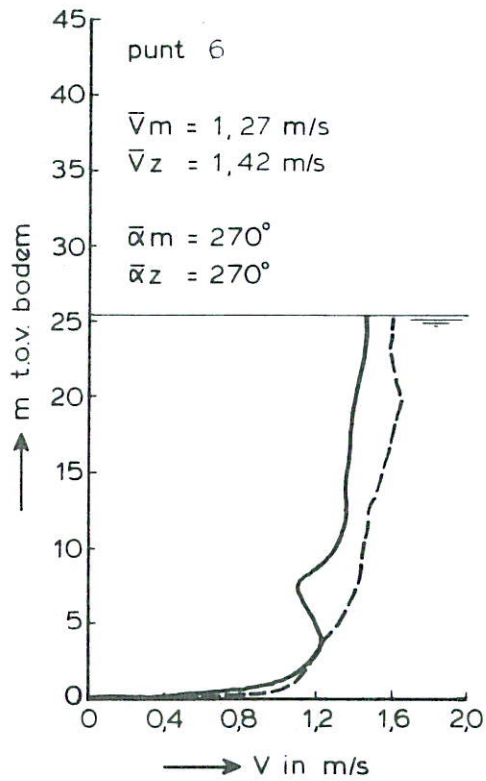
EB

RAAI G

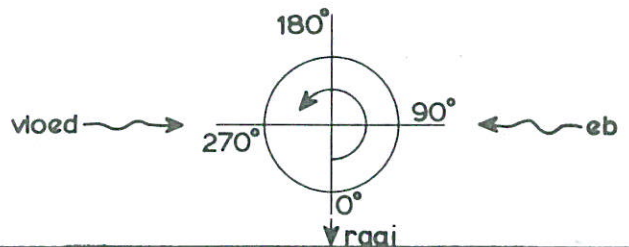
WATERLOOPKUNDIG LABORATORIUM

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FIG. 22 b



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

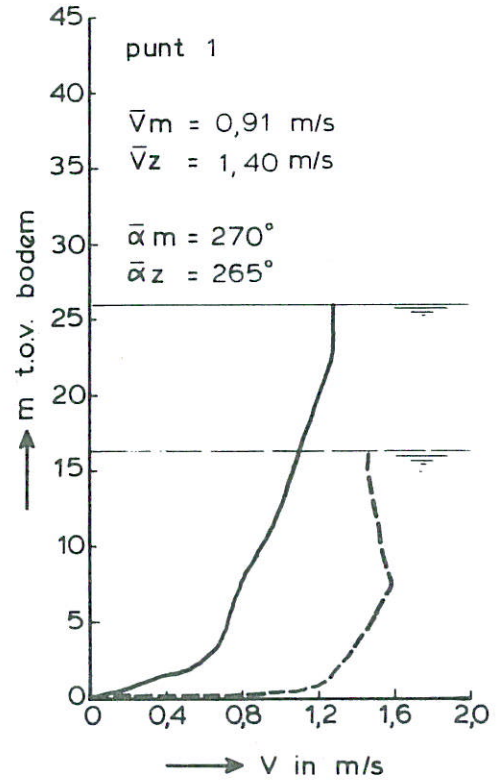
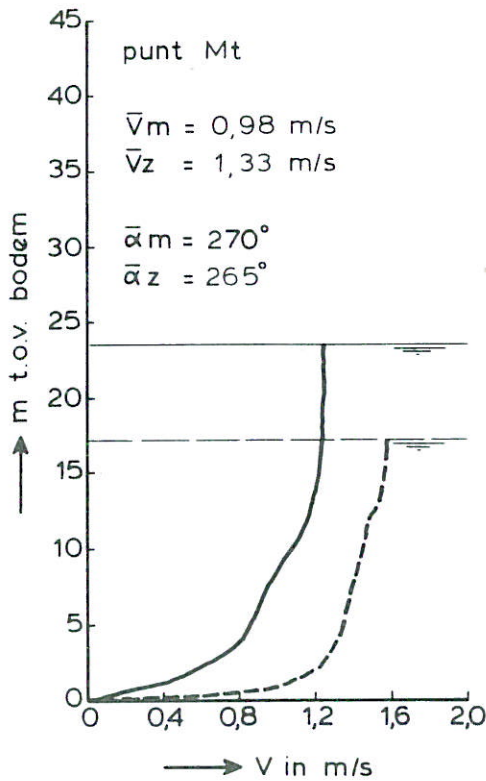
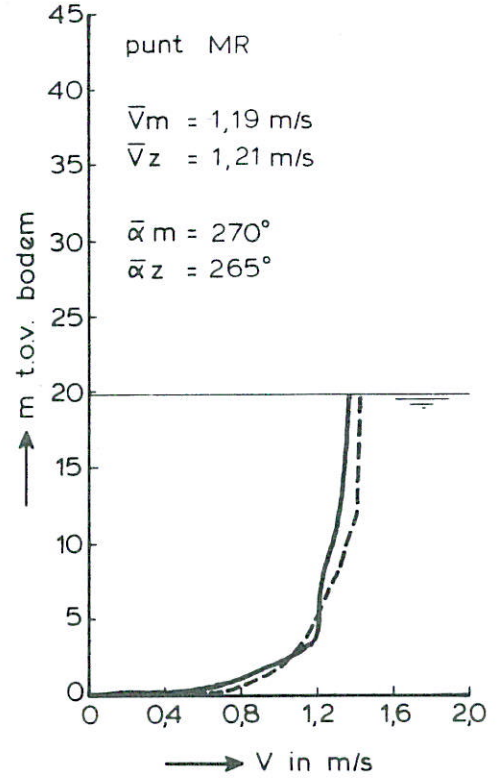
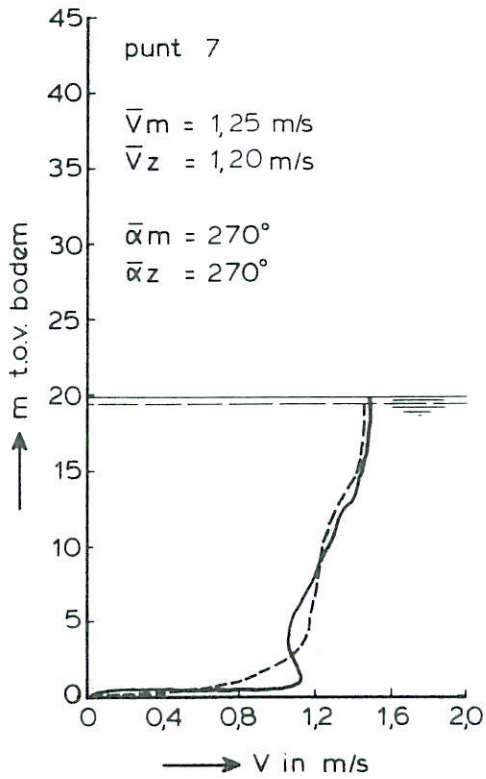
EB

RAAI G

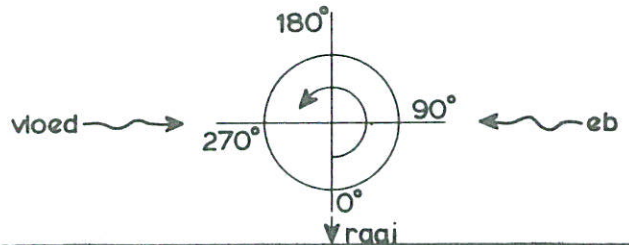
WATERLOOPKUNDIG LABORATORIUM

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FIG. 22c



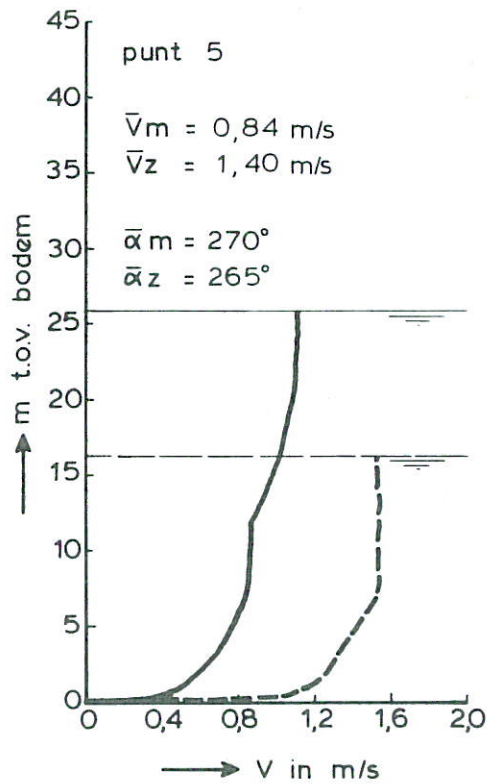
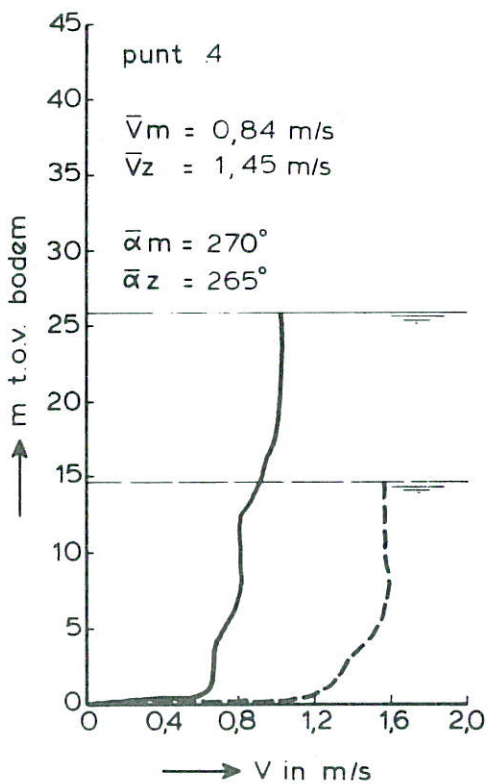
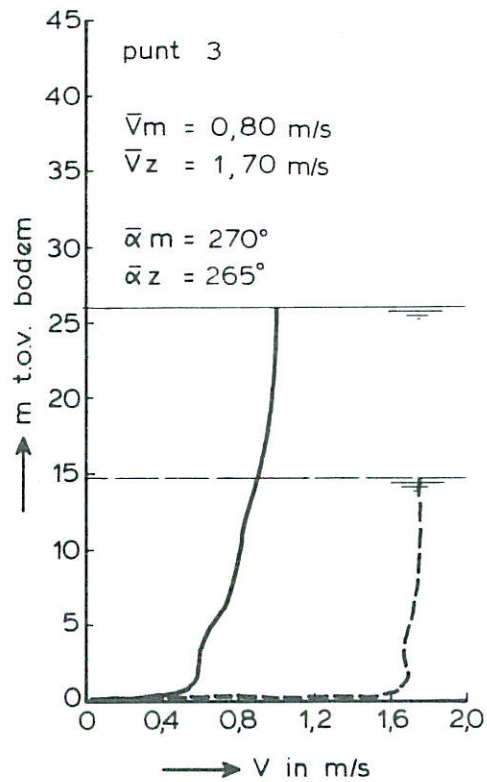
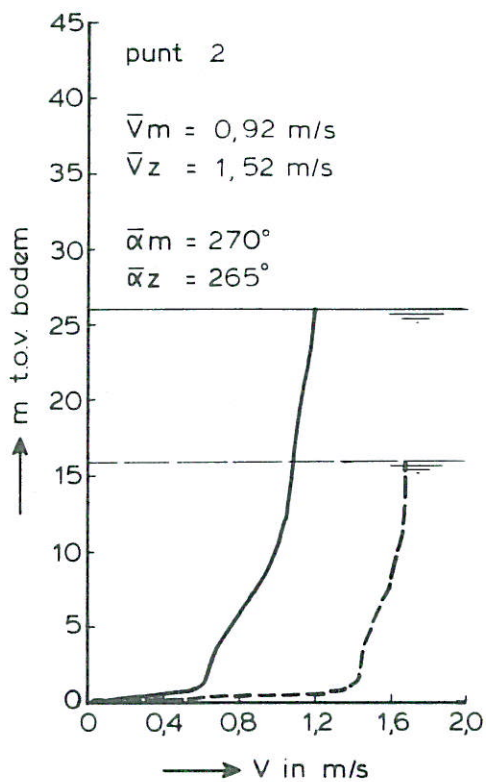
— met cunet
 - - - zonder cunet



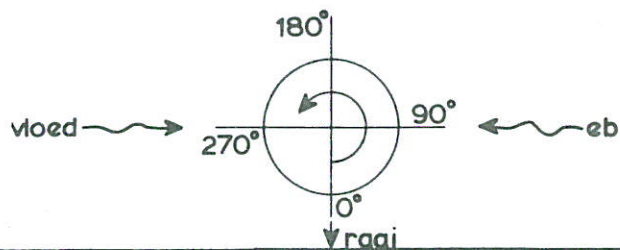
SNELHEIDSVERTIKALEN

ROOMPOT EB

RAAI H



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

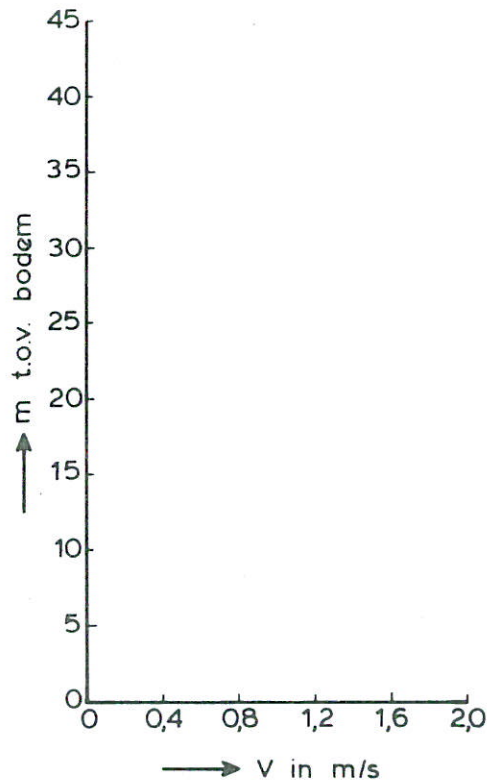
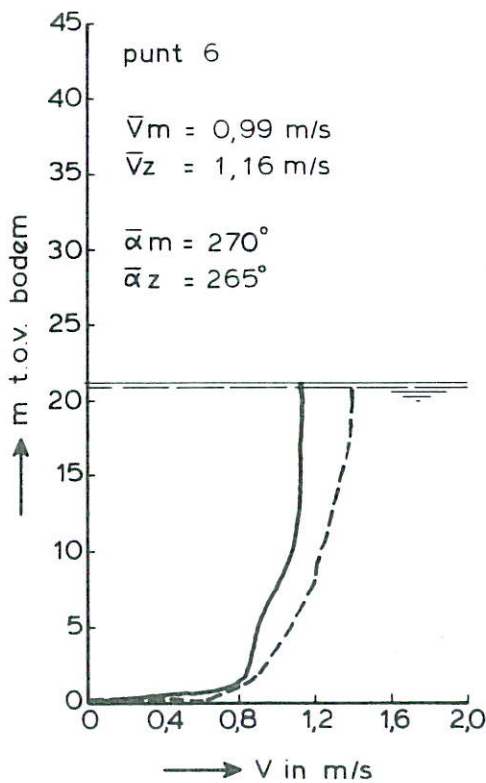
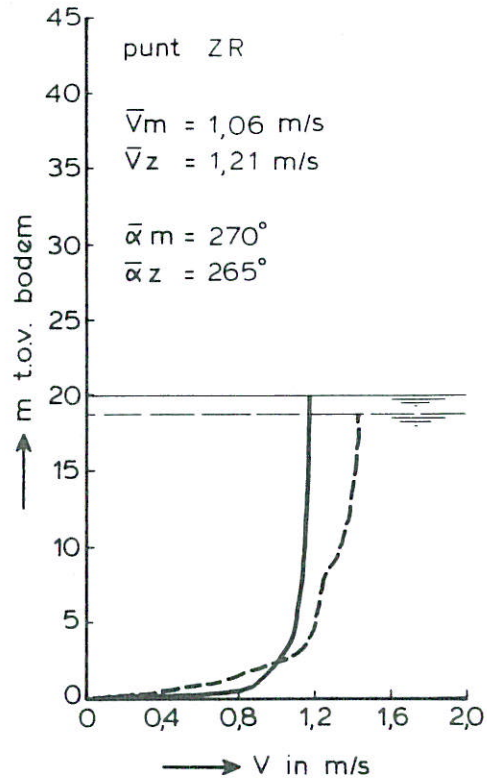
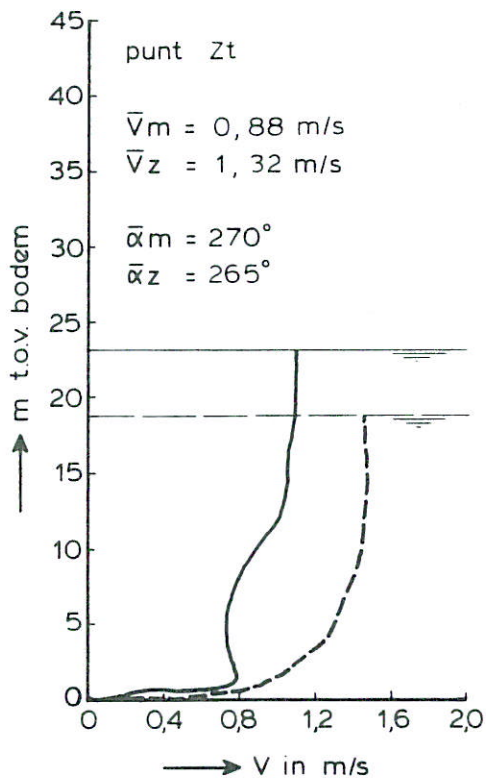
EB

RAAI H

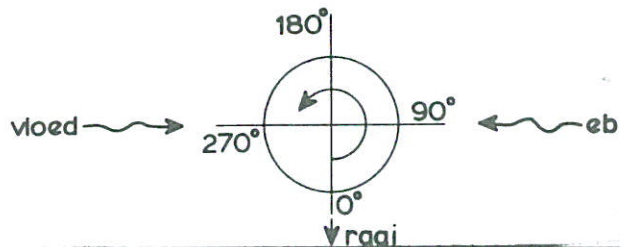
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FIG. 23 b



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

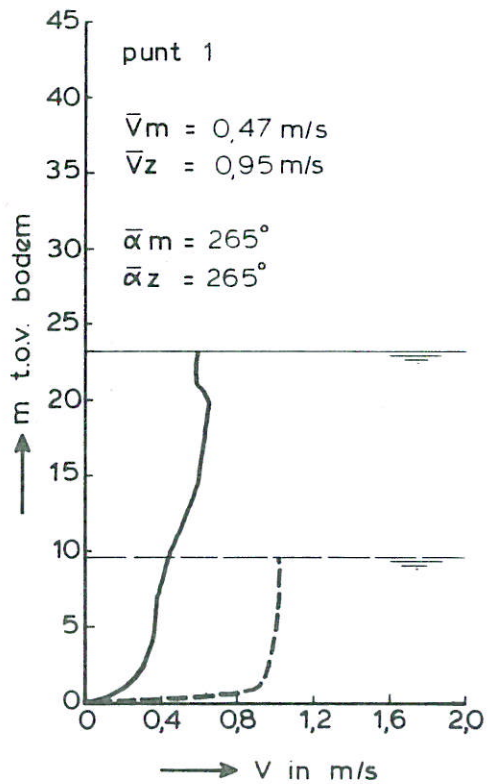
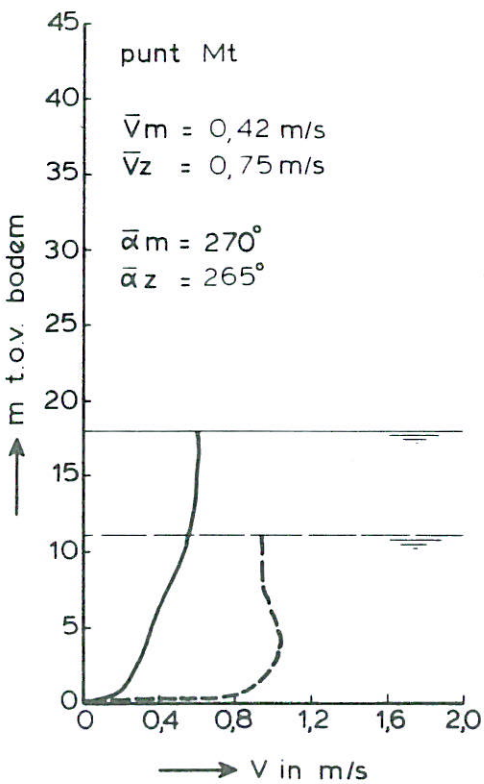
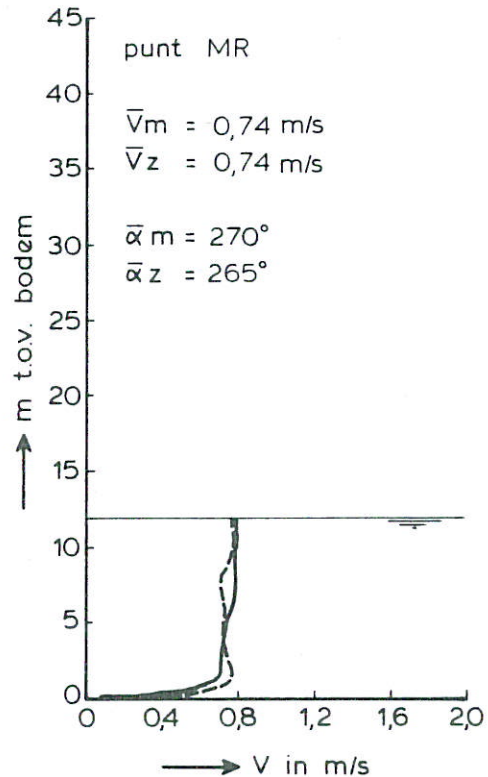
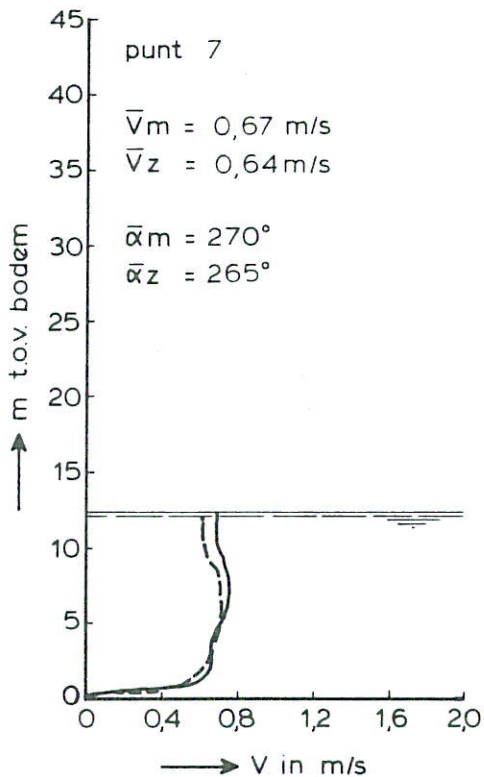
EB

RAAI H

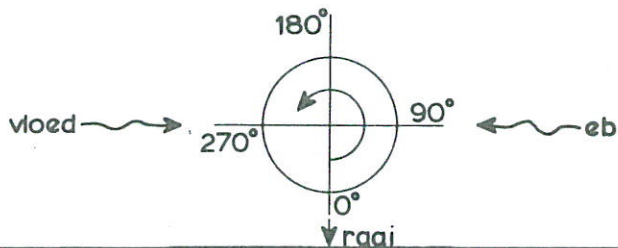
WATERLOOPKUNDIG LABORATORIUM

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FIG. 23c



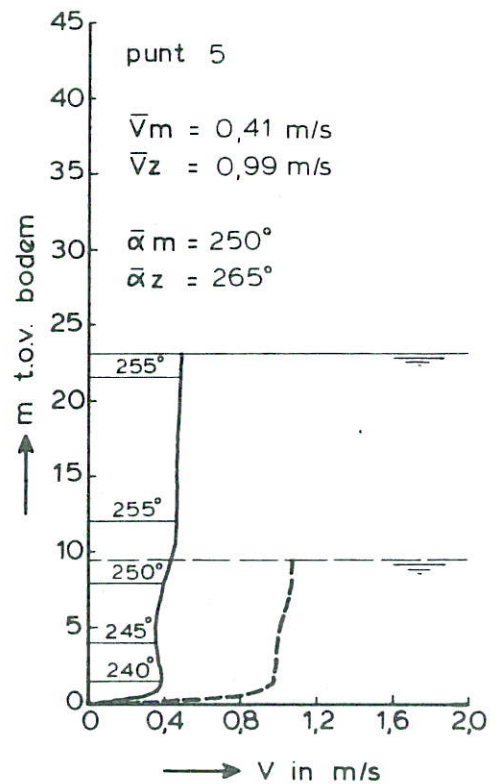
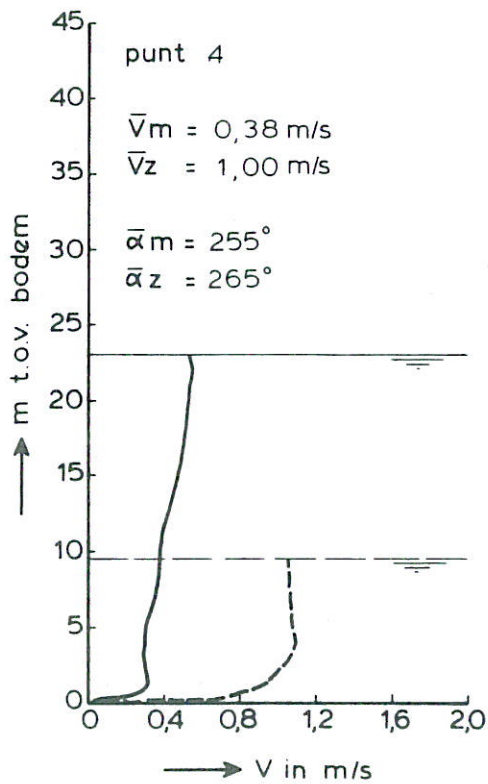
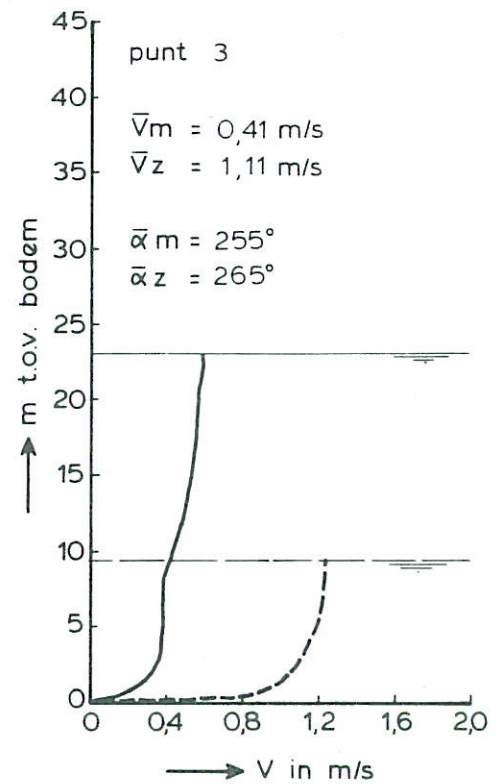
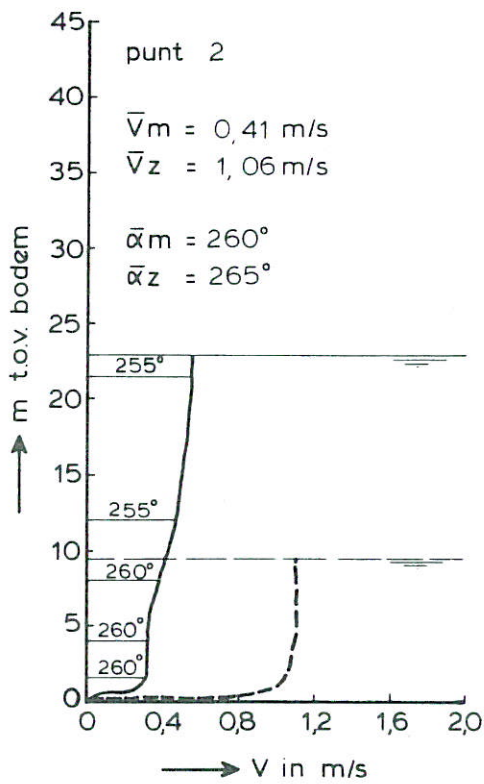
— met cunet
 - - - zonder cunet



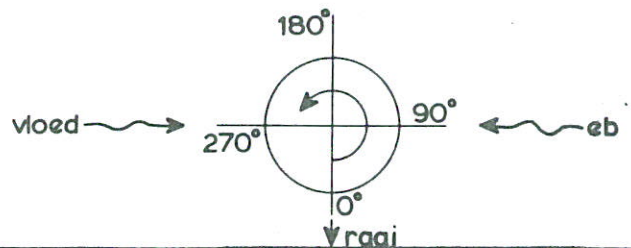
SNELHEIDSVERTIKALEN

ROOMPOT EB

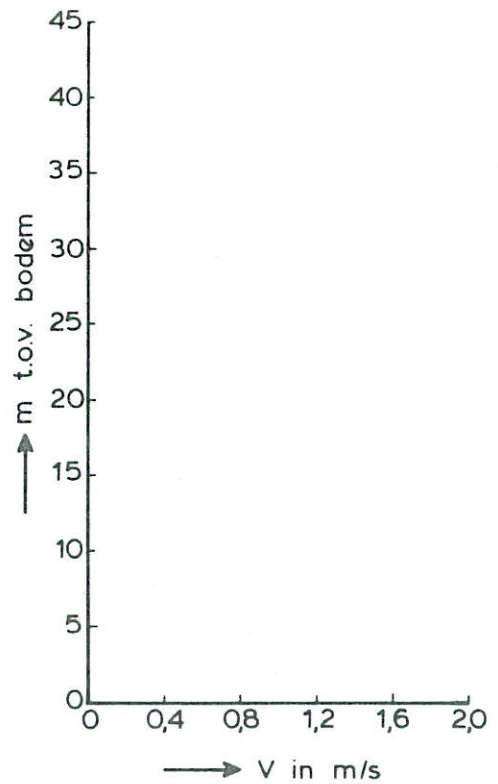
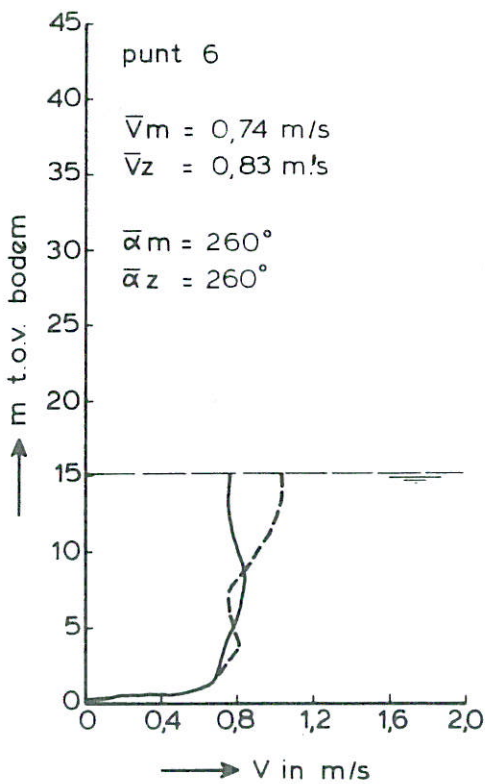
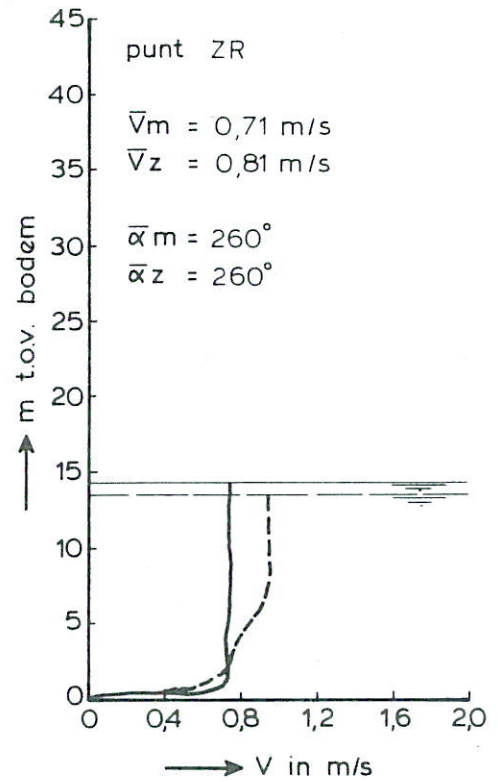
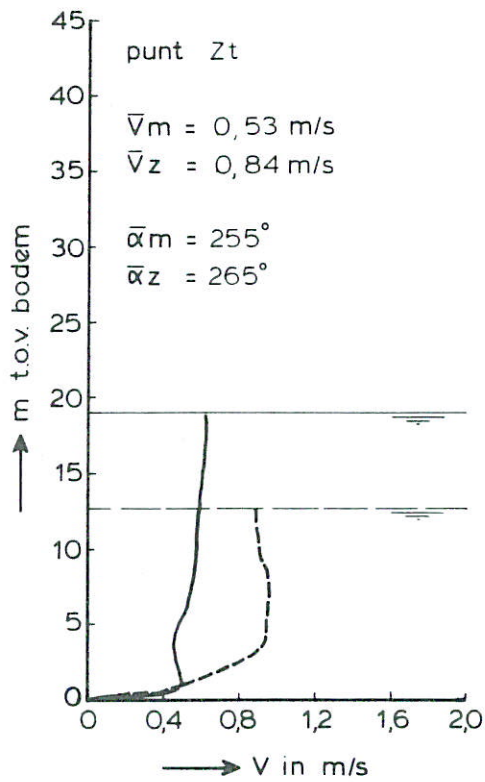
RAAI I



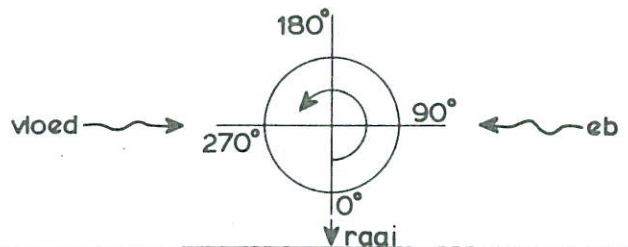
— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN	ROOMPOT	EB
	RAAI I	
WATERLOOPKUNDIG LABORATORIUM	M 1001	FIG. 24 b



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

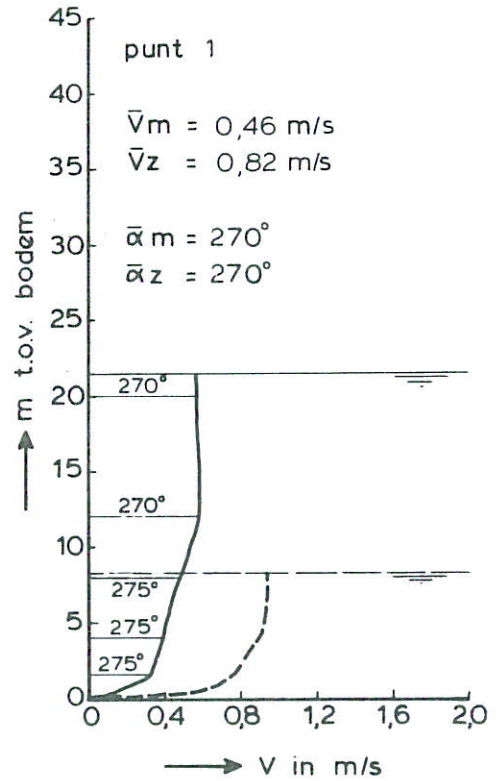
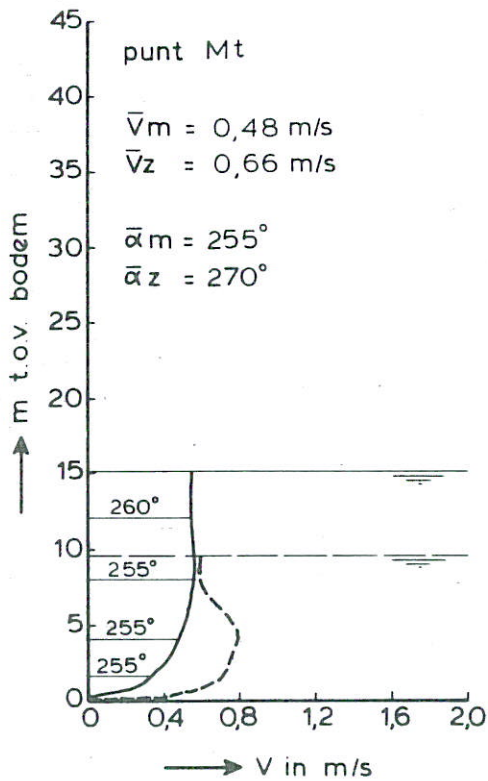
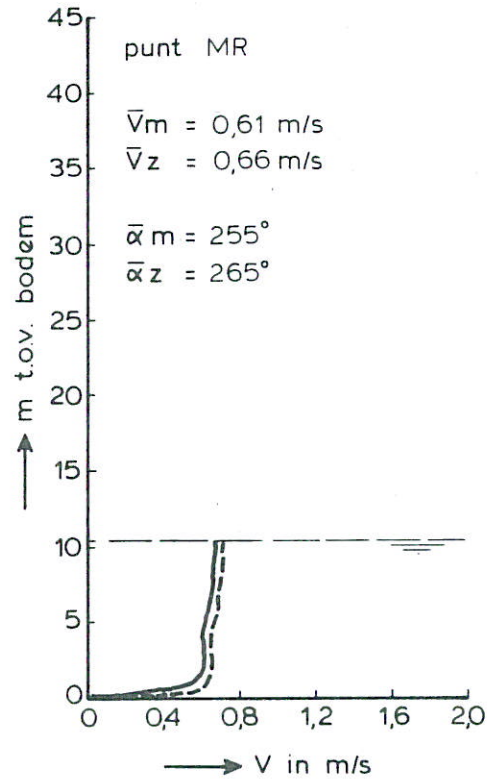
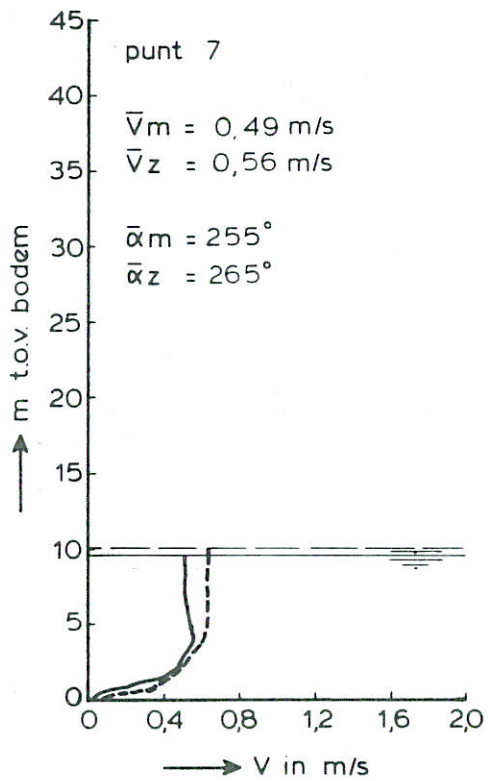
ROOMPOT EB

RAAI I

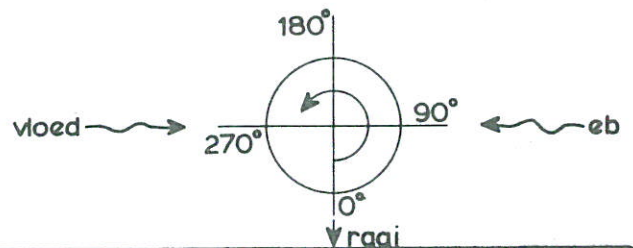
WATERLOOPKUNDIG LABORATORIUM

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FIG. 24c



— met cunet
 - - - zonder cunet



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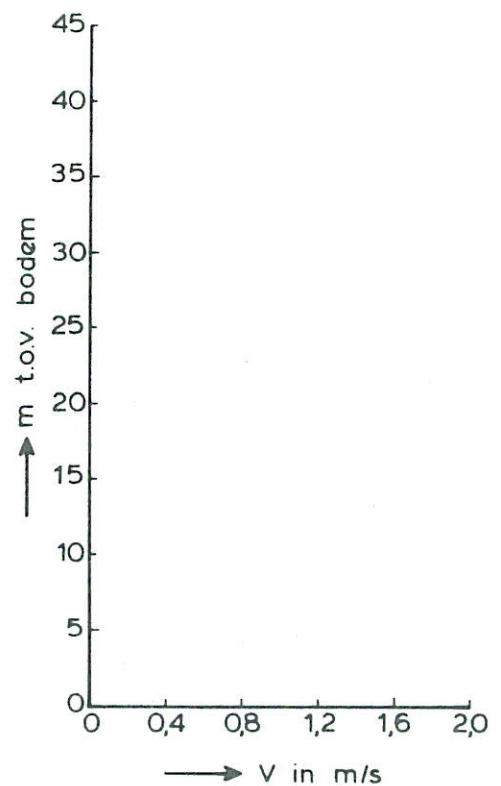
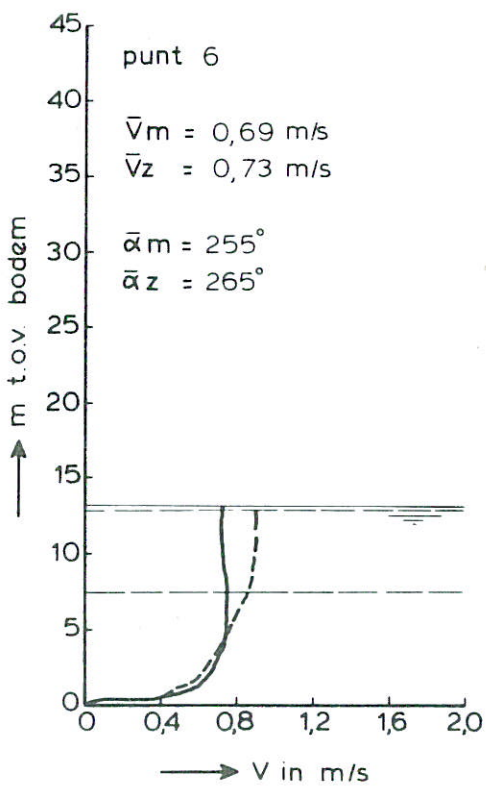
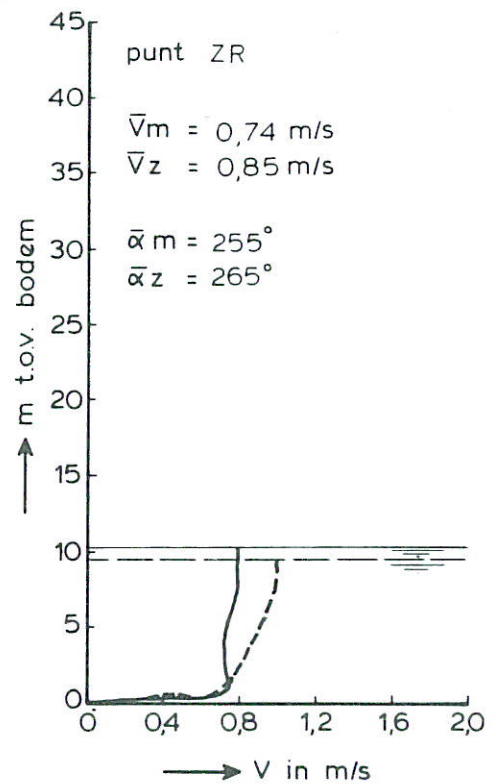
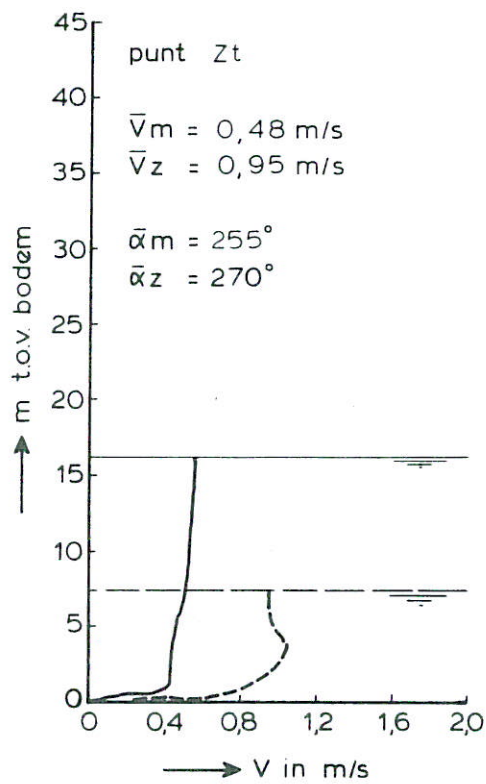
ROOMPOT EB

RAAI J

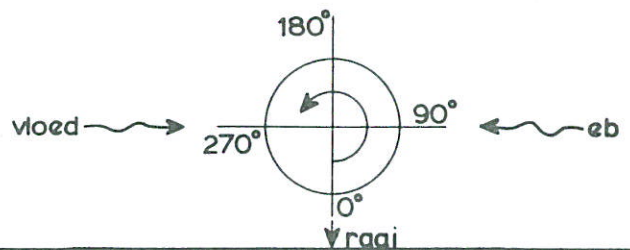
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 25a



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

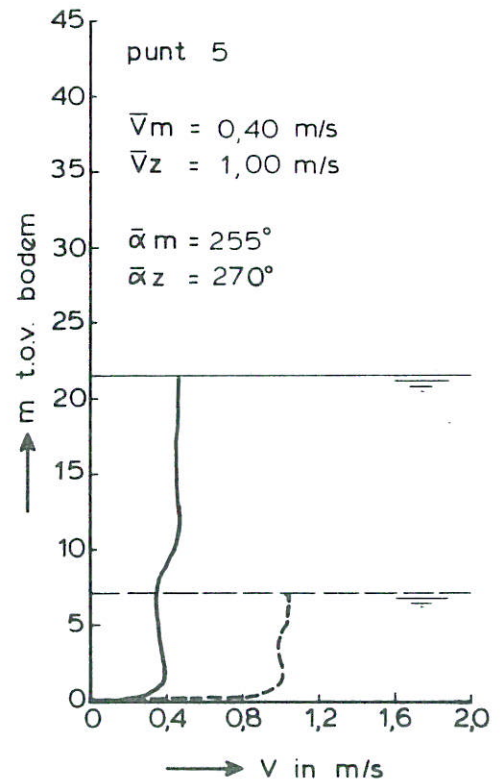
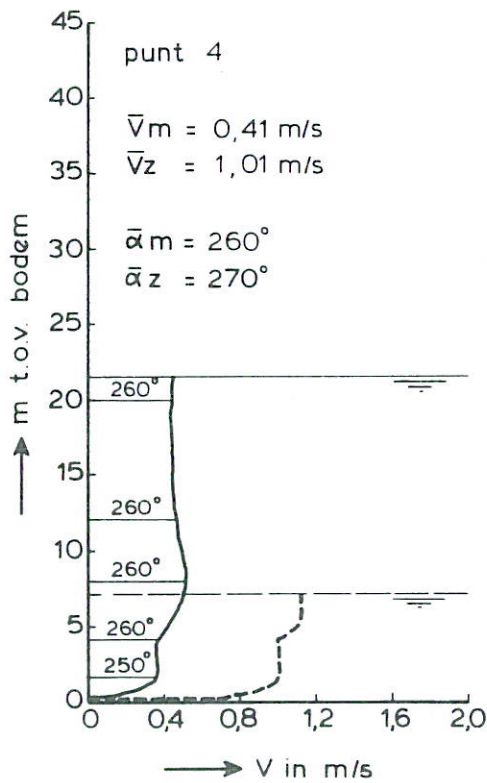
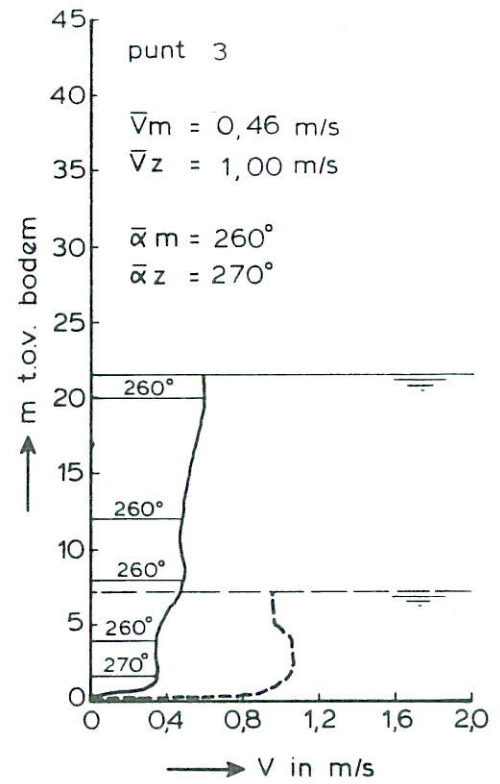
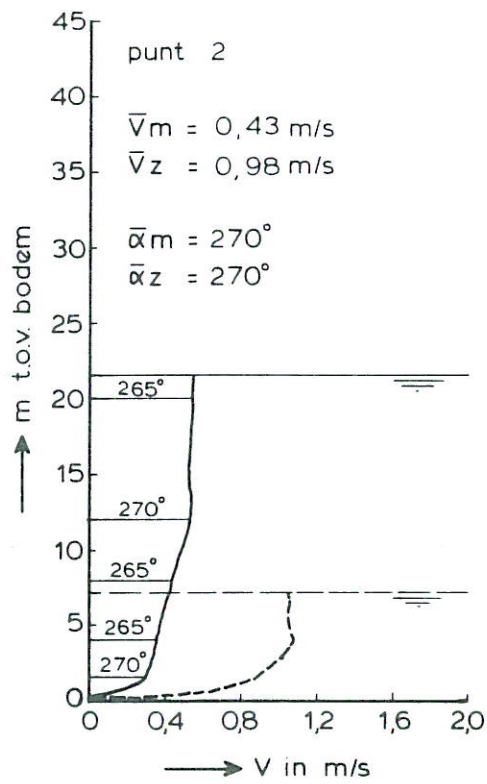
EB

RAAI J

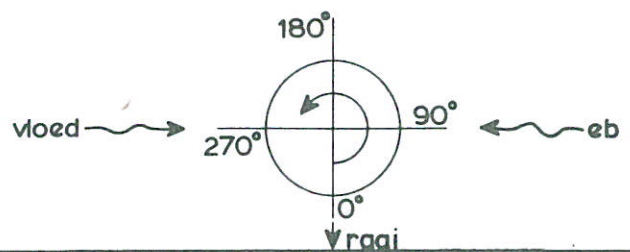
WATERLOOPKUNDIG LABORATORIUM

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FIG. 25 b



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

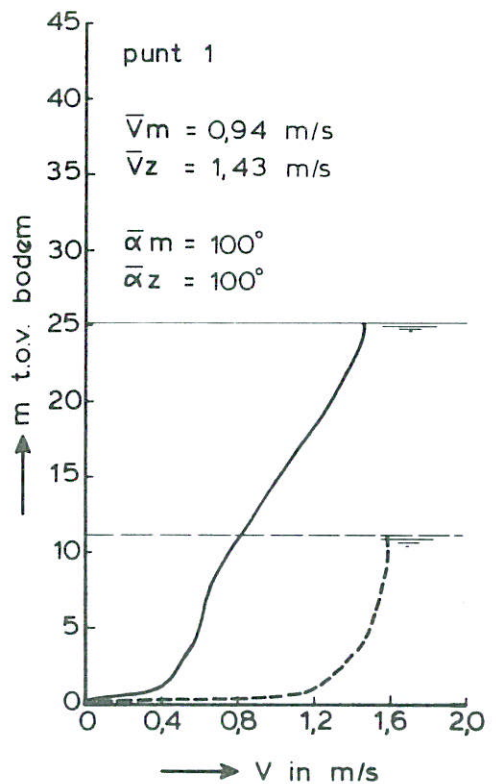
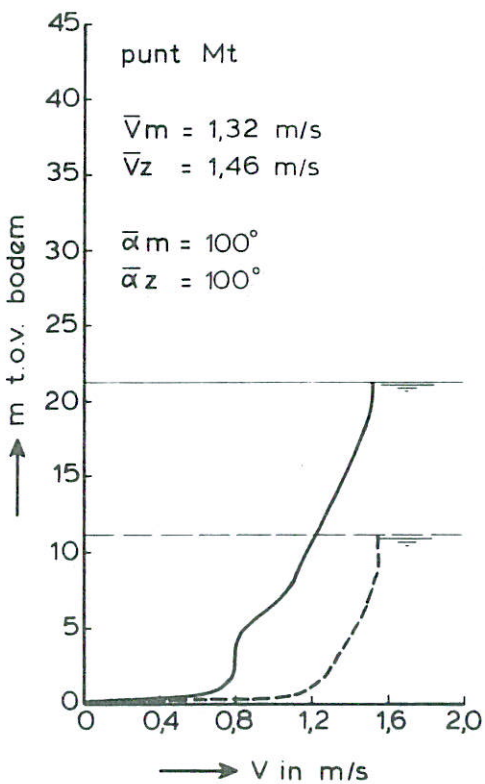
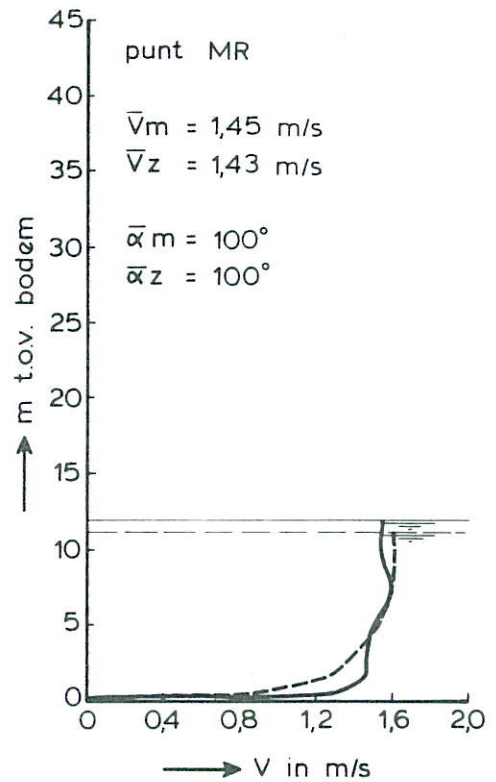
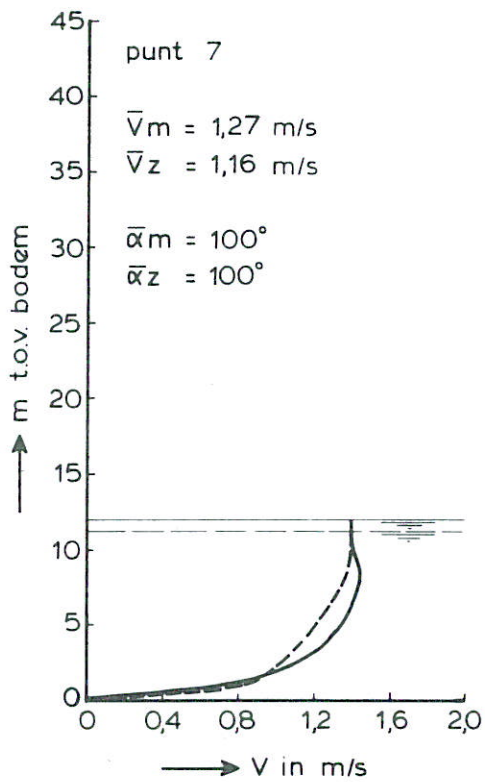
EB

RAAI J

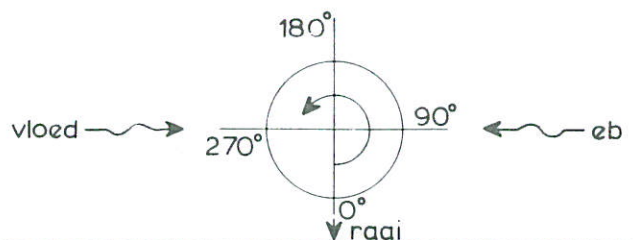
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 25c



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

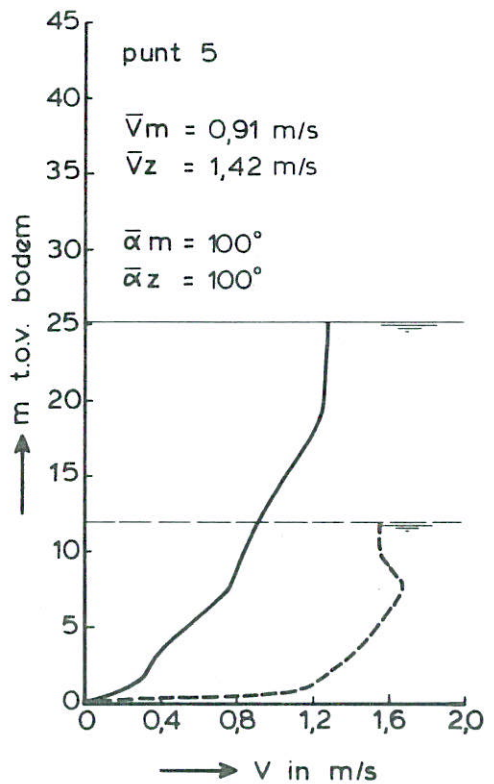
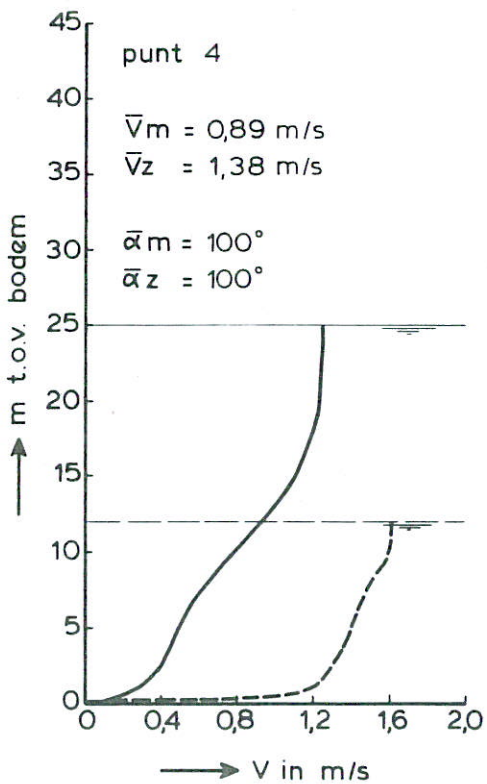
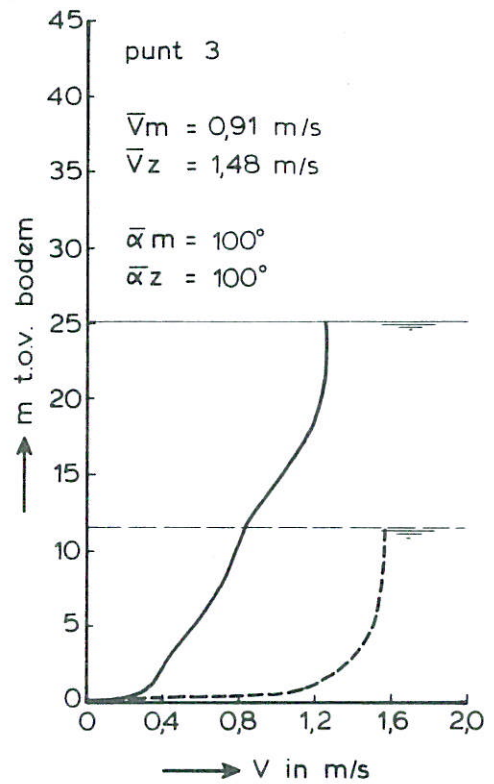
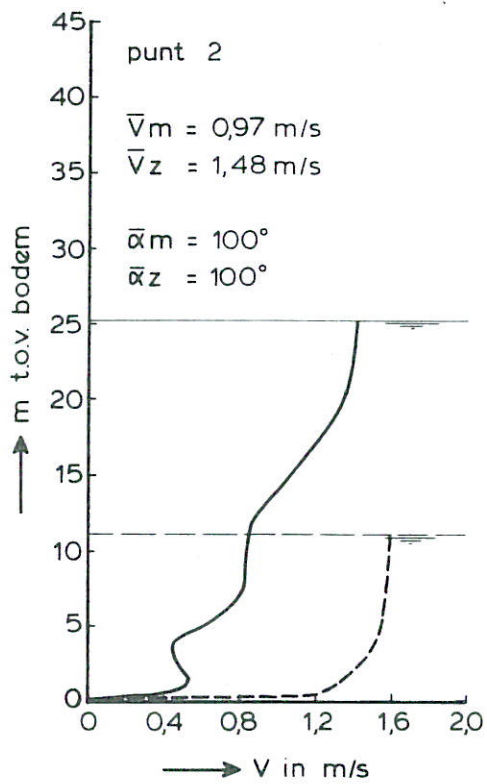
ROOMPOT VLOED

RAAI A

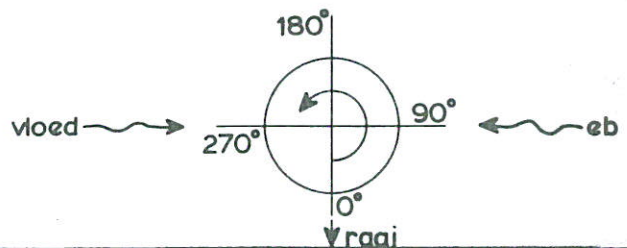
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 26a



— met cunet
 - - - zonder cunet



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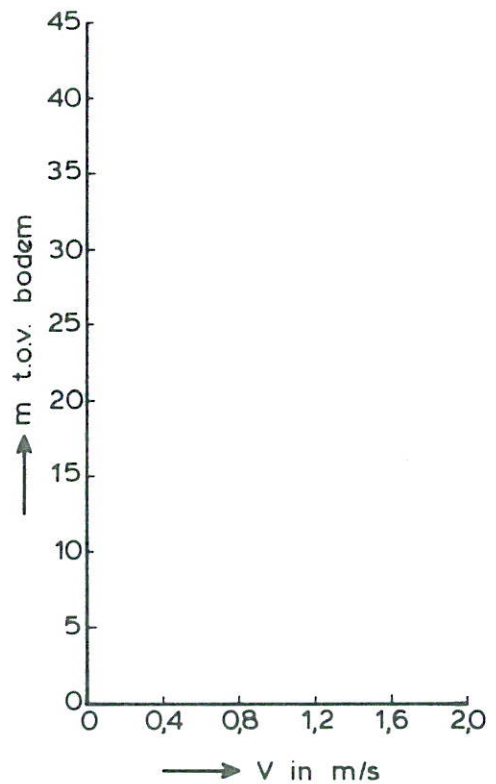
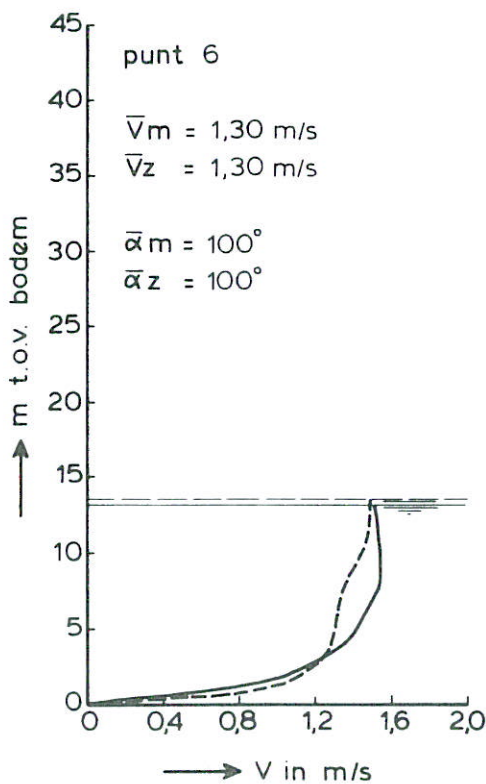
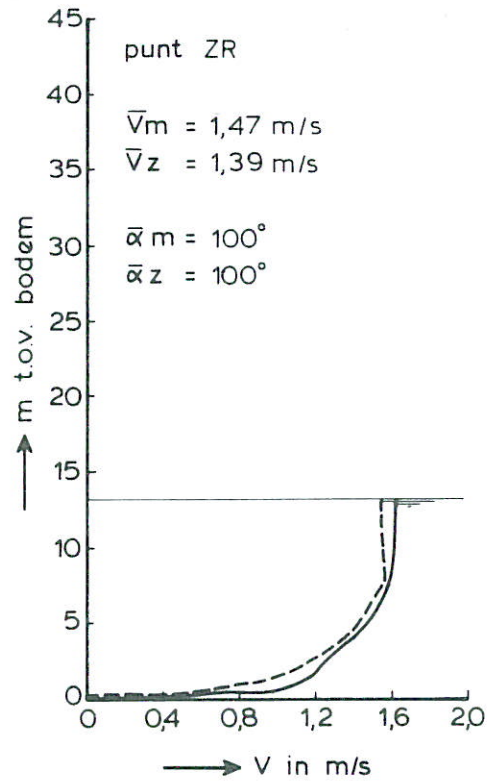
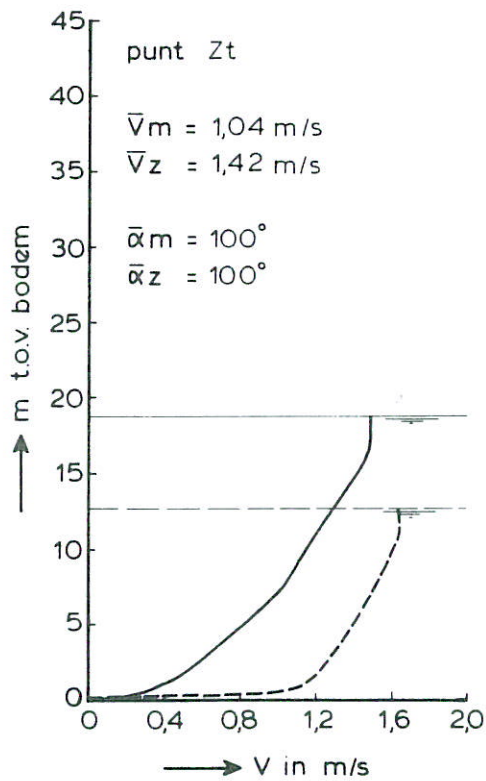
ROOMPOT VLOED

RAAI A

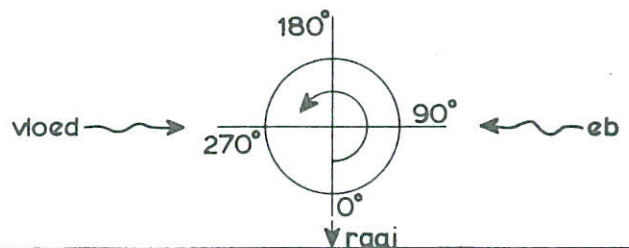
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 26 b



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

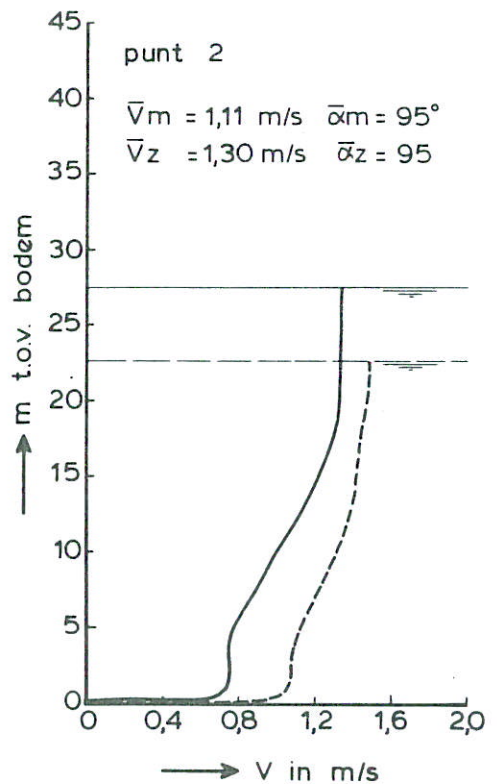
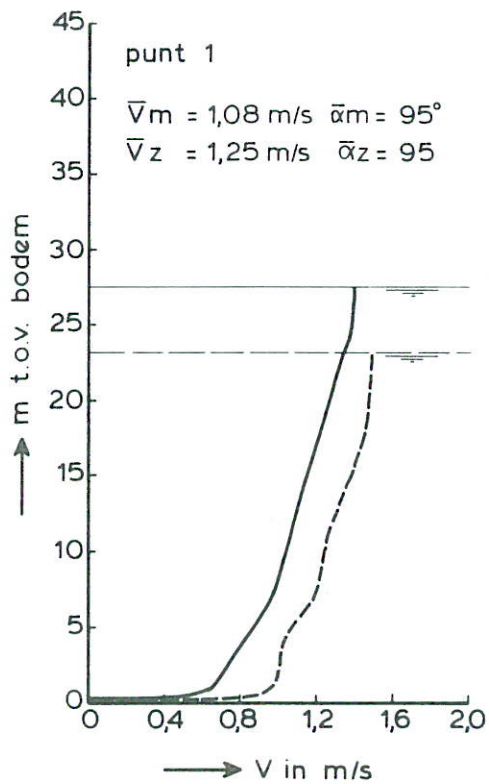
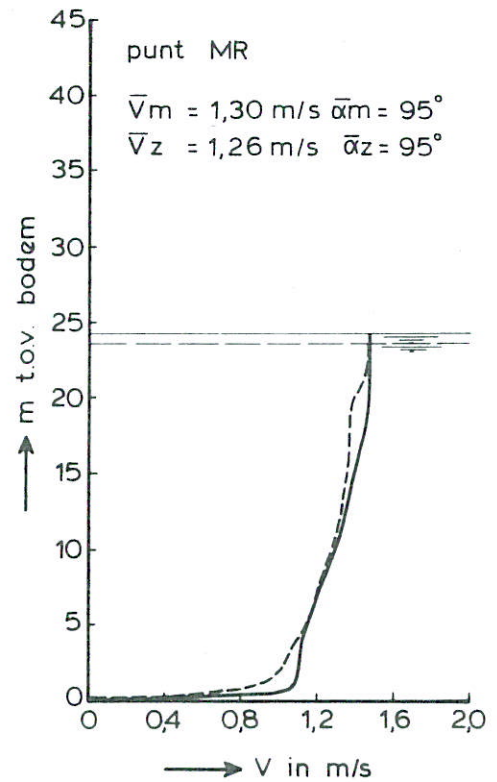
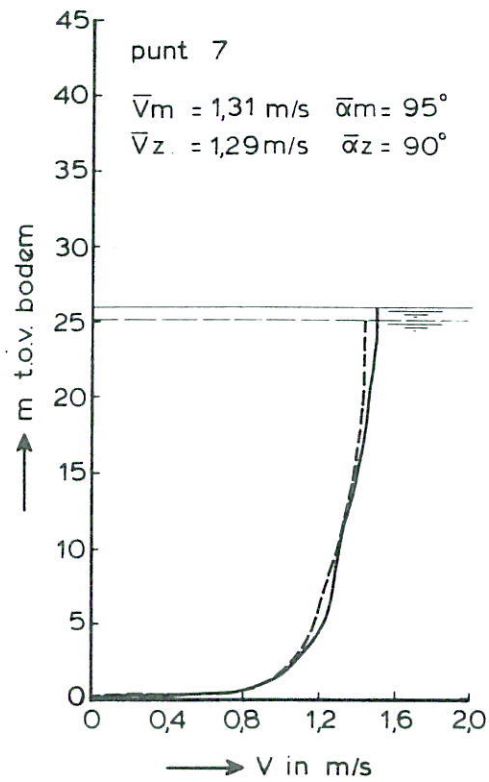
ROOMPOT VLOED

RAAI A

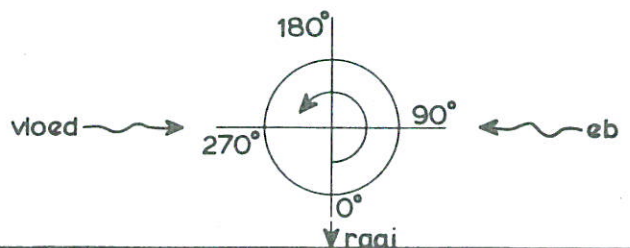
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 26 c



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

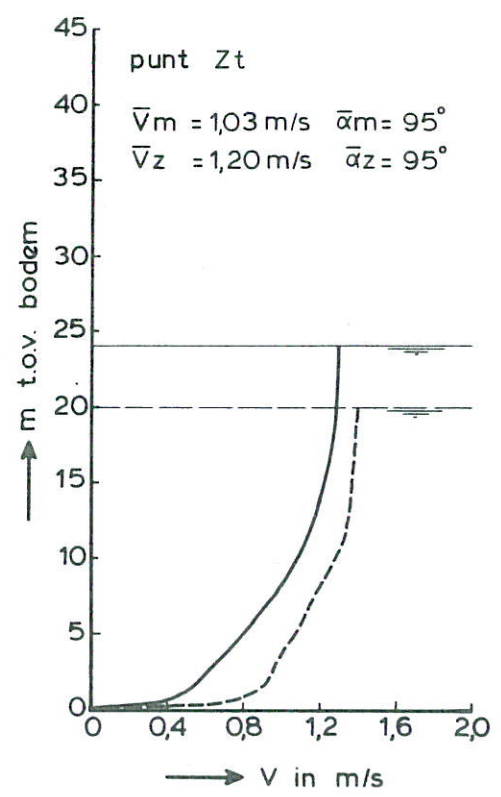
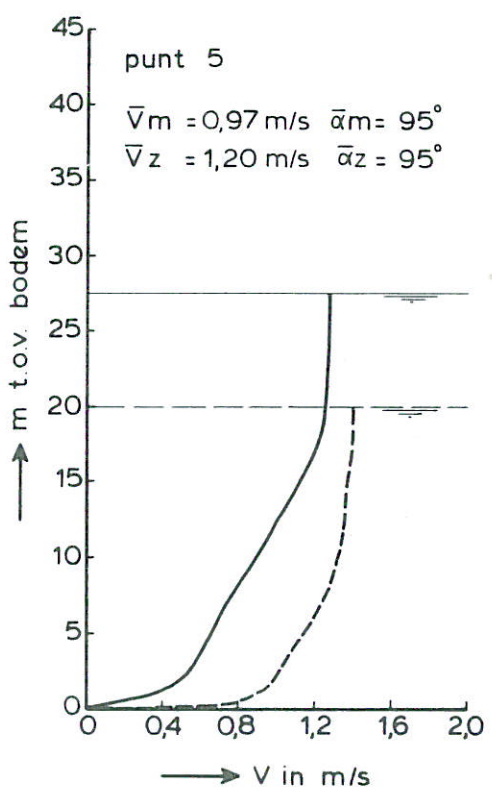
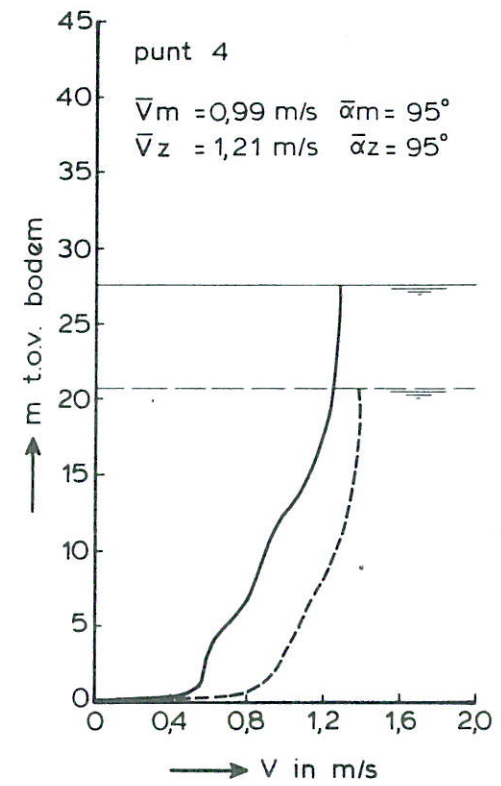
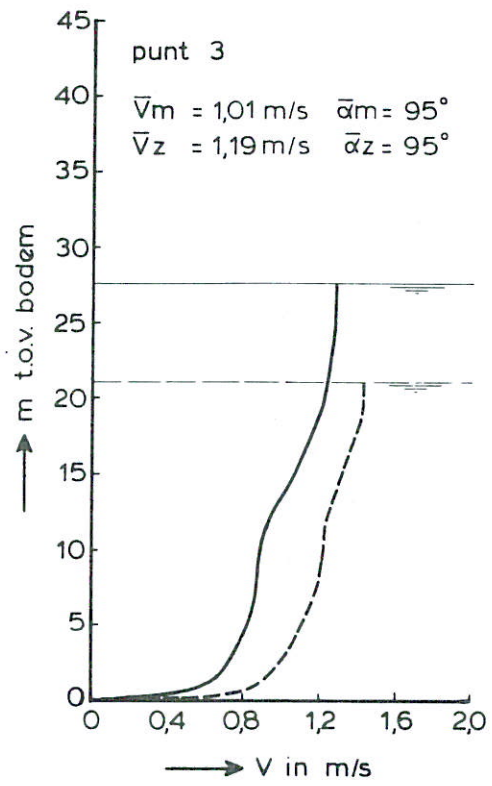
VLOED

RAAI B

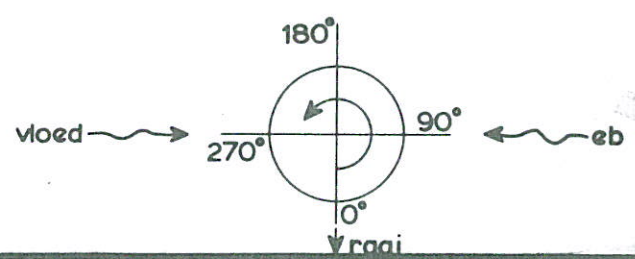
WATERLOOPKUNDIG LABORATORIUM

M 1001

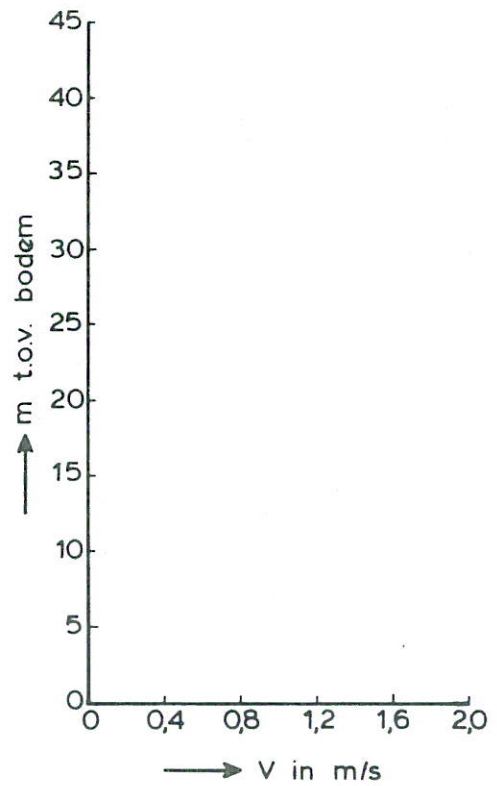
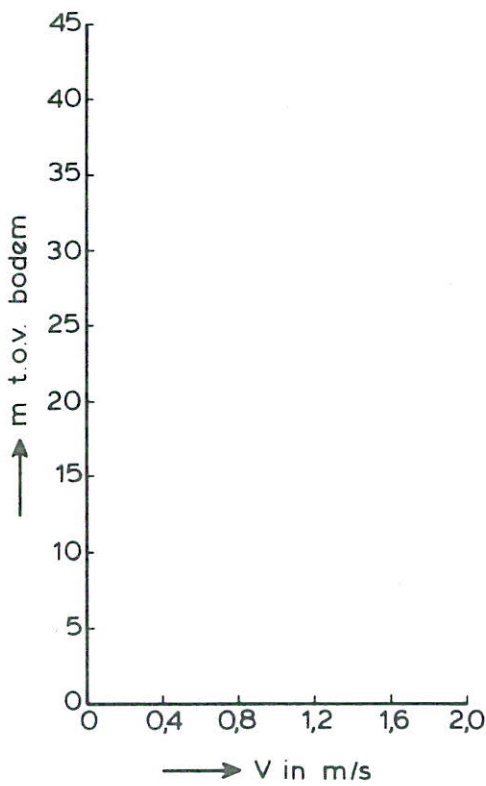
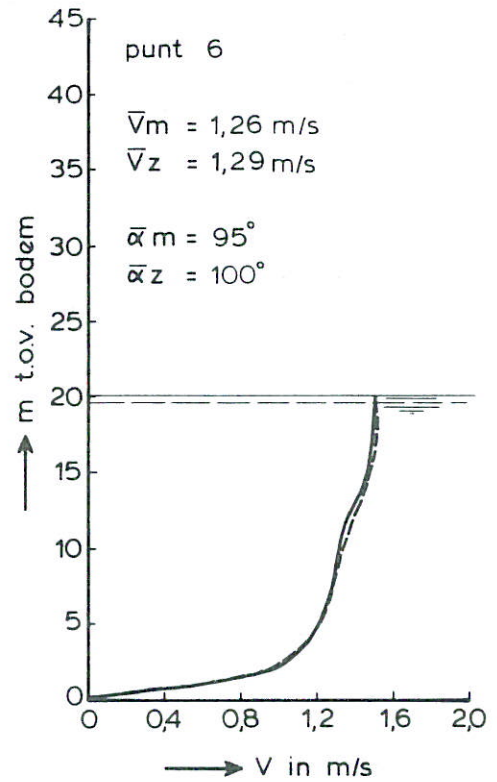
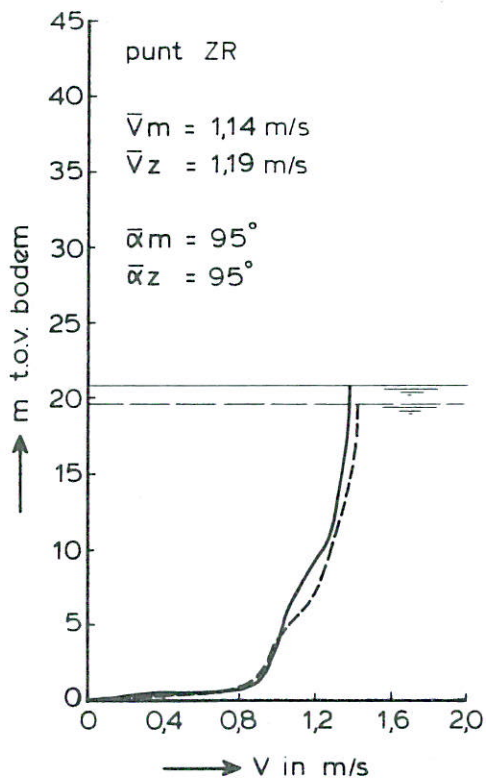
FIG. 27a



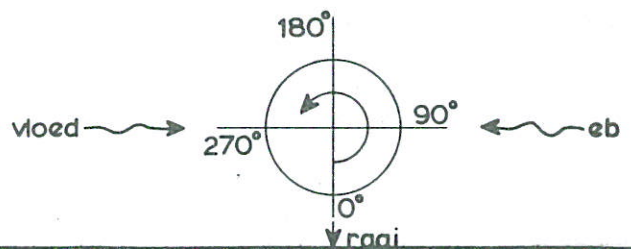
— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN	ROOMPOT	VLOED
	RAAI B	
WATERLOOPKUNDIG LABORATORIUM	M 1001	FIG. 27b



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

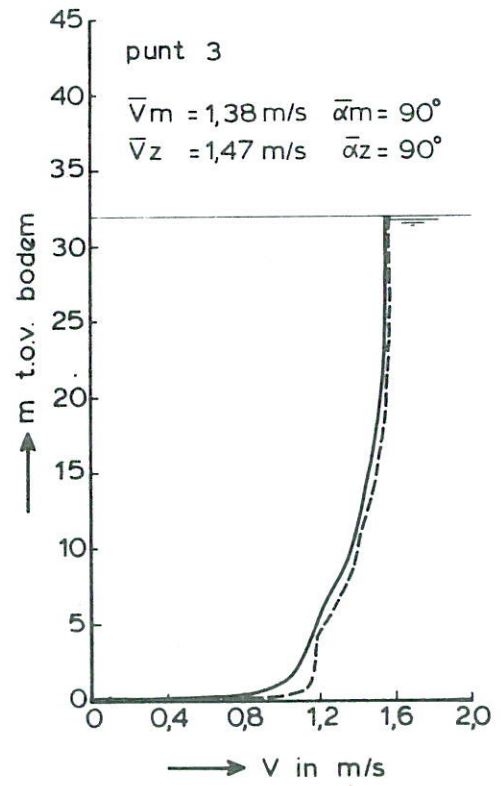
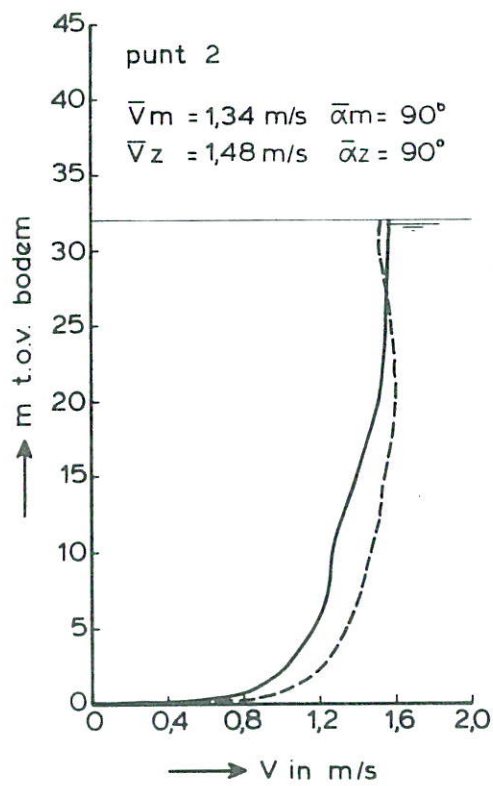
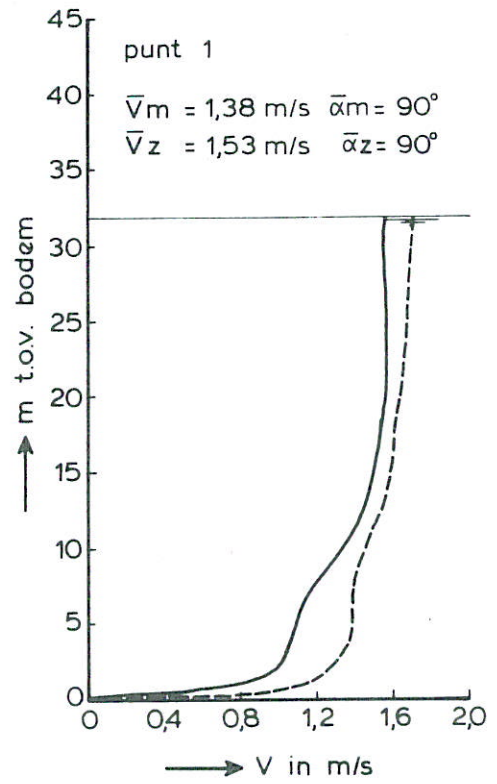
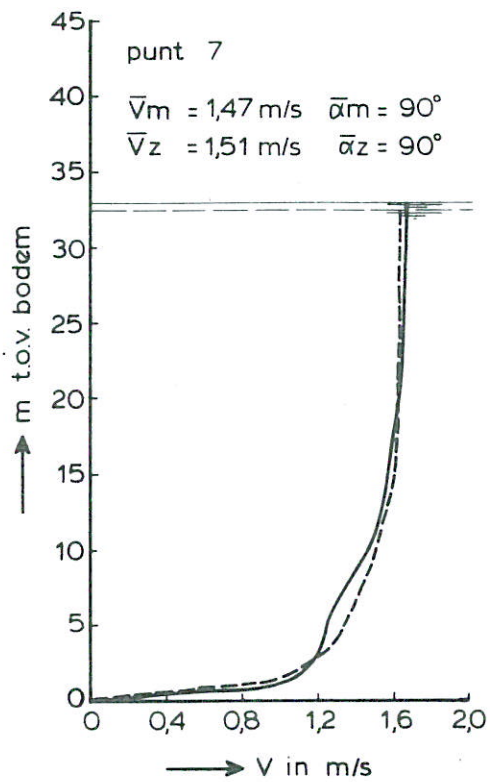
ROOMPOT VLOED

RAAI B

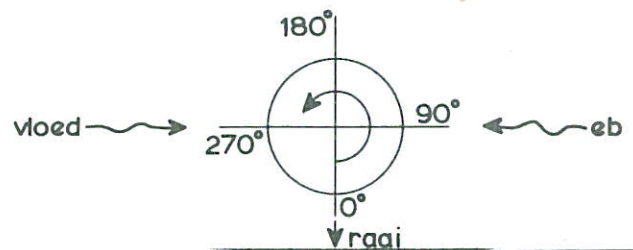
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 27c



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

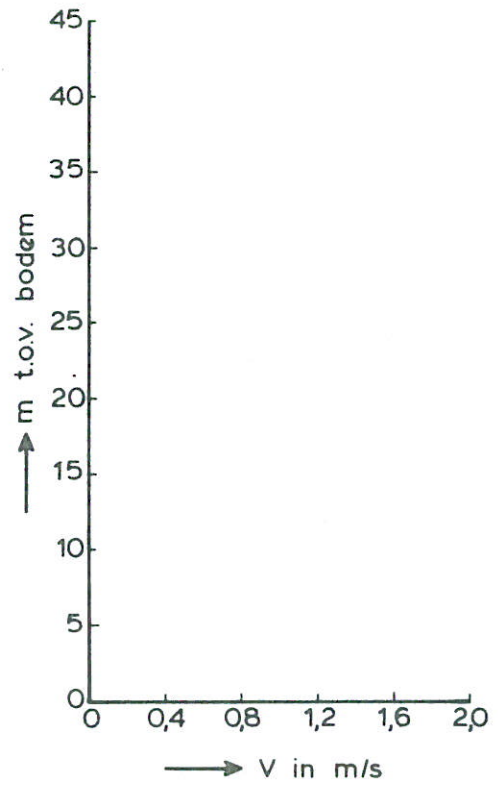
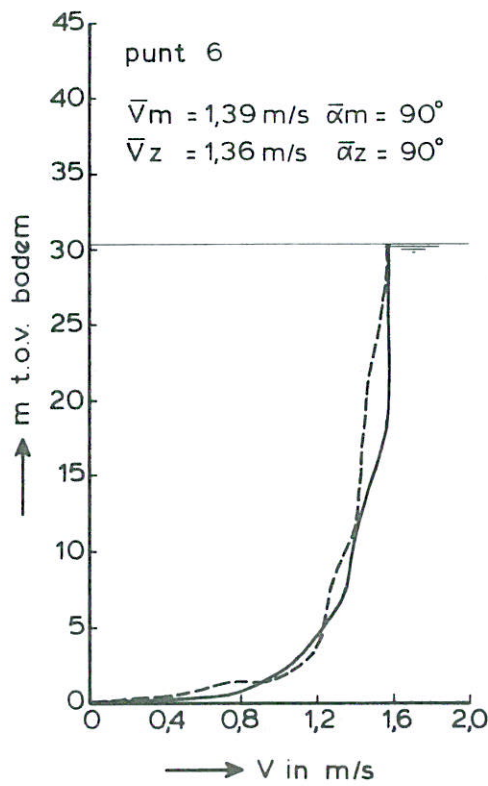
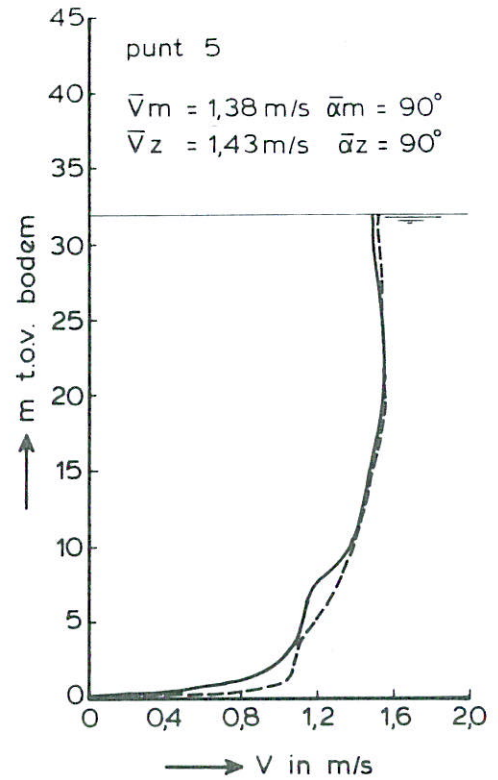
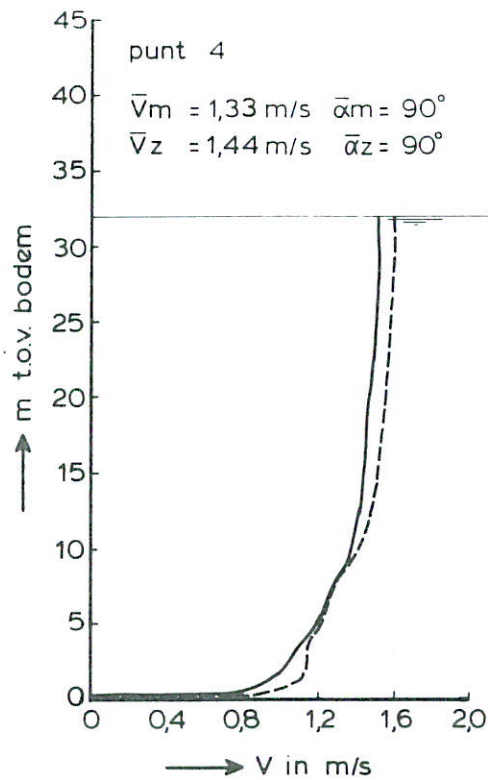
ROOMPOT VLOED

RAAI C

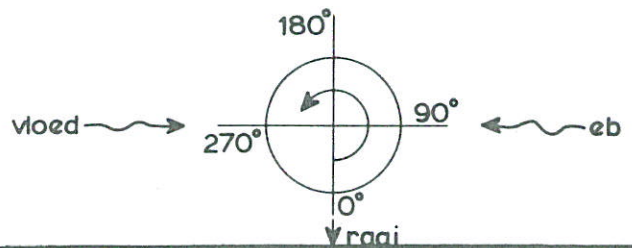
WATERLOOPKUNDIG LABORATORIUM

M 1001

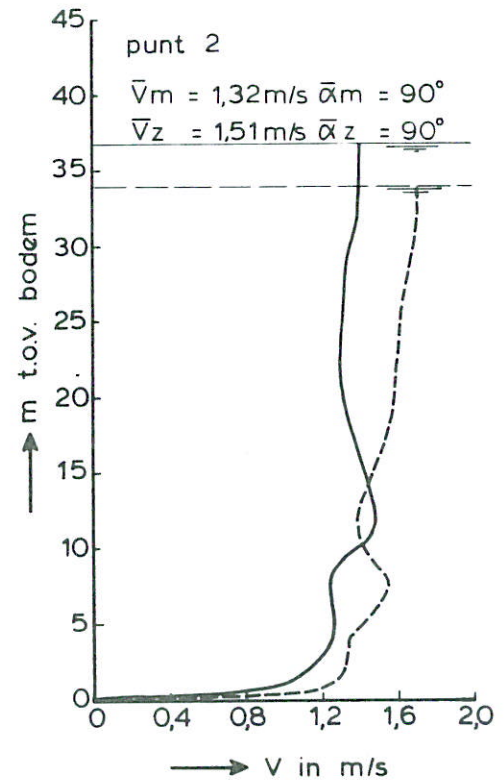
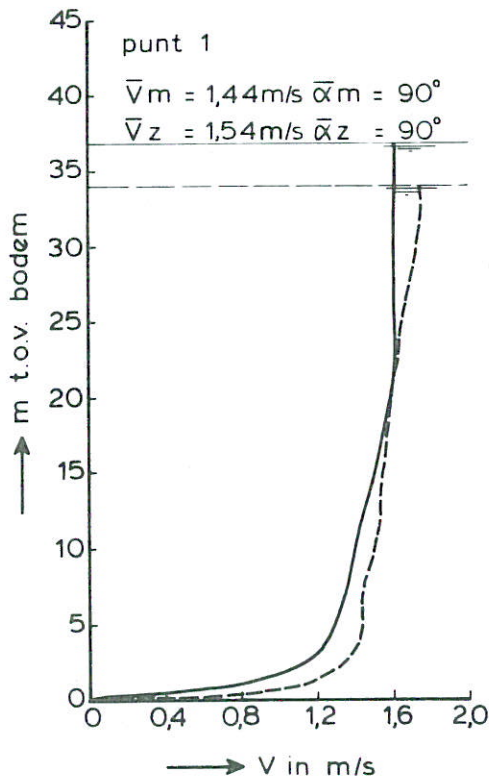
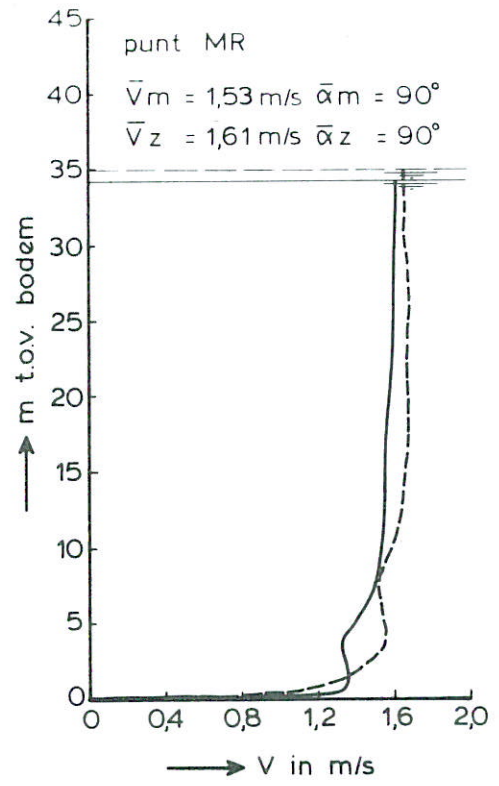
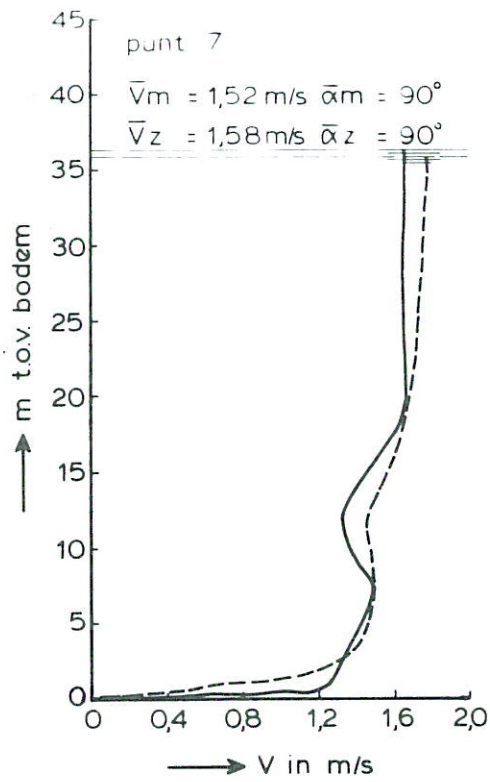
FIG. 28 a



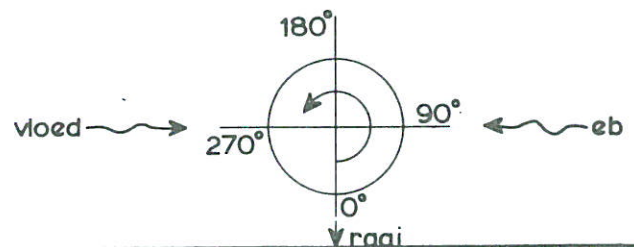
— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN	ROOMPOT	VLOED
	RAAI C	
WATERLOOPKUNDIG LABORATORIUM	M 1001	FIG. 28 b



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

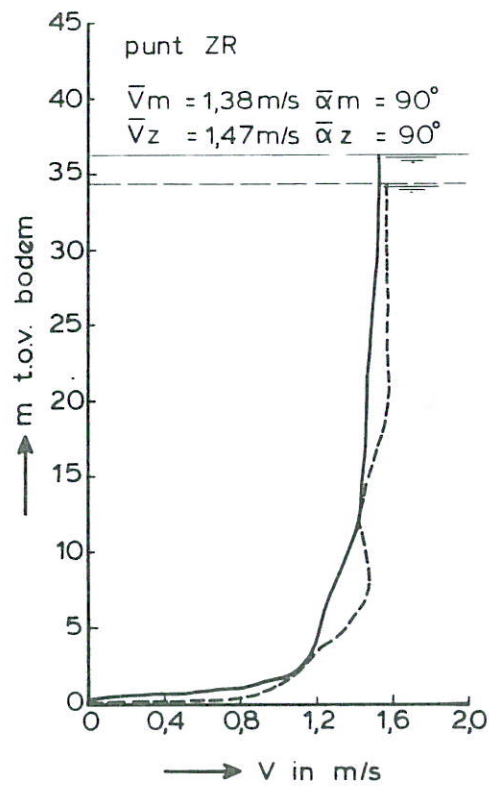
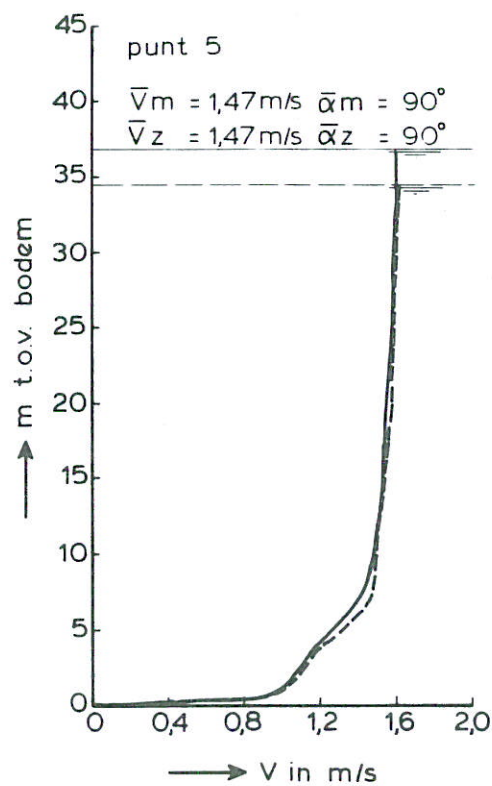
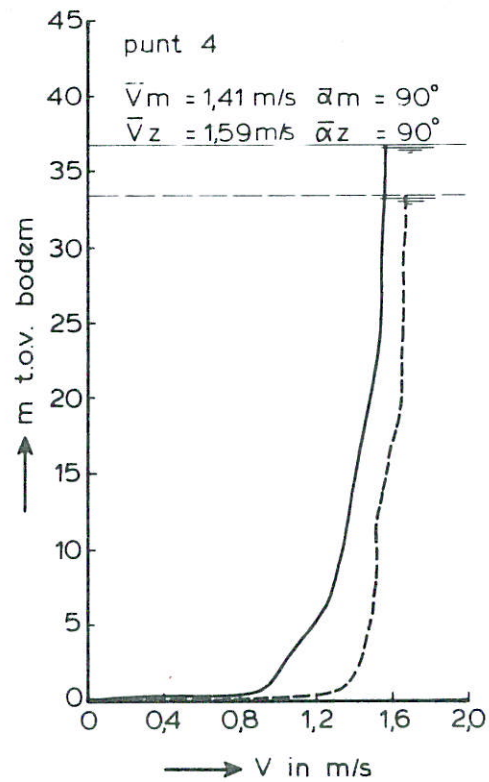
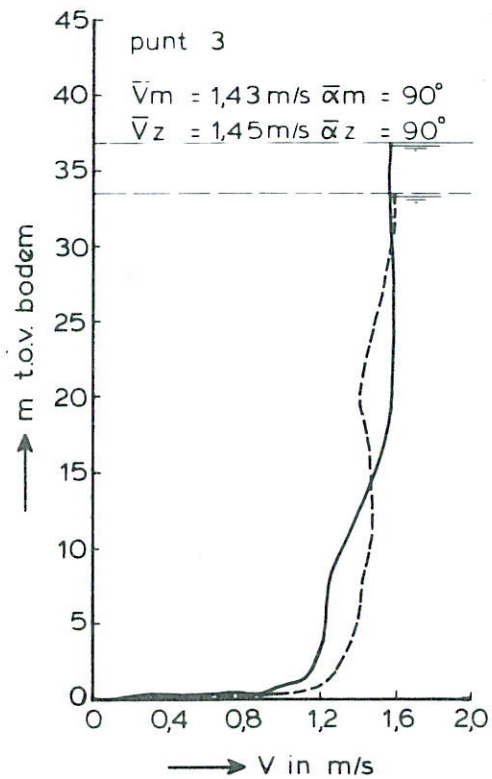
ROOMPOT VLOED

RAAI D

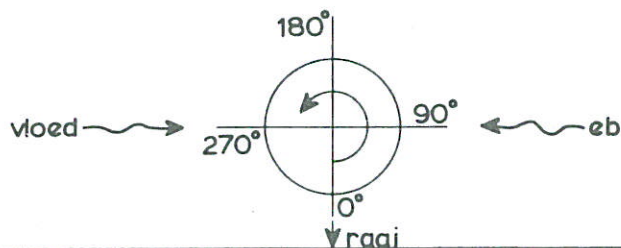
WATERLOOPKUNDIG LABORATORIUM

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FIG. 29a



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

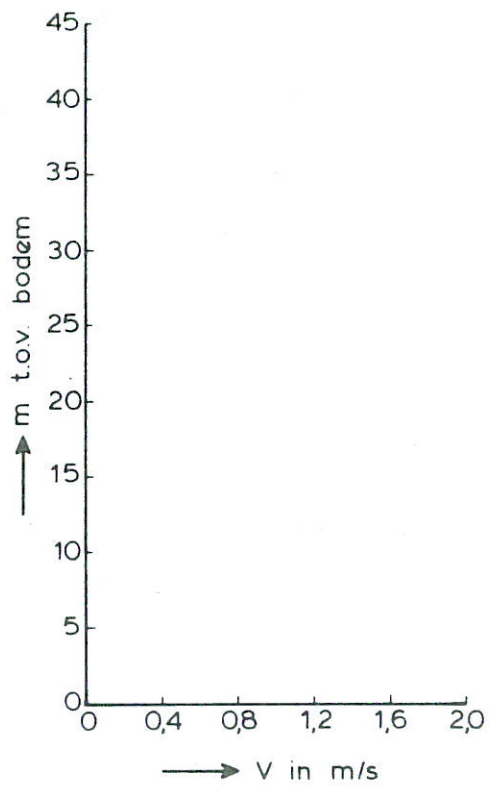
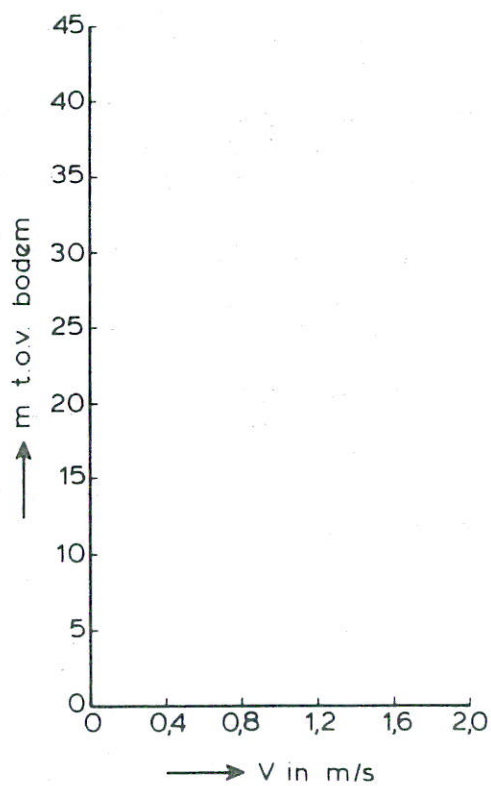
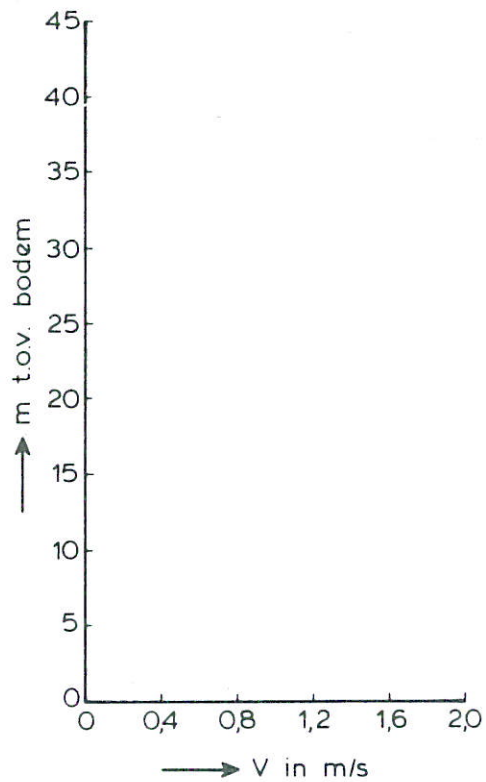
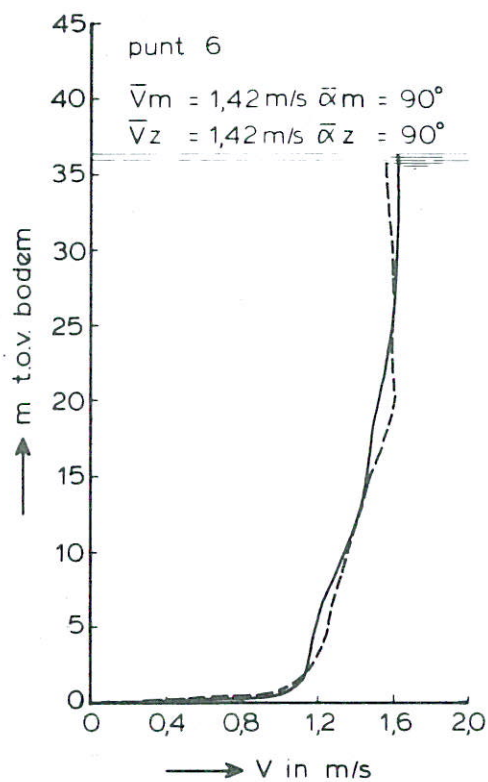
ROOMPOT VLOED

RAAI D

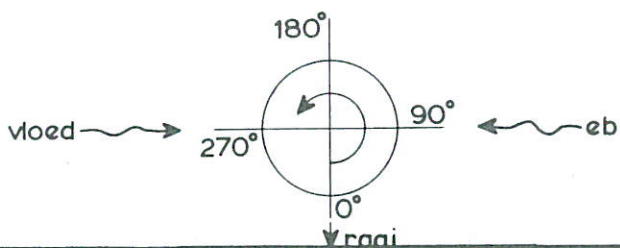
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 29b



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

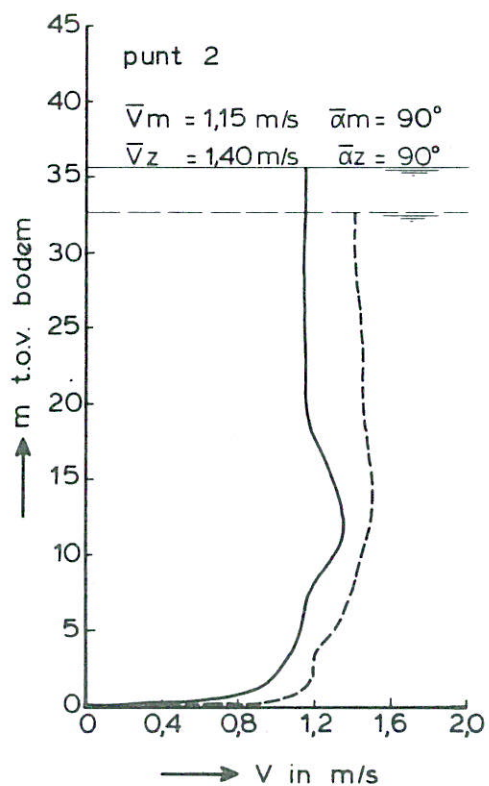
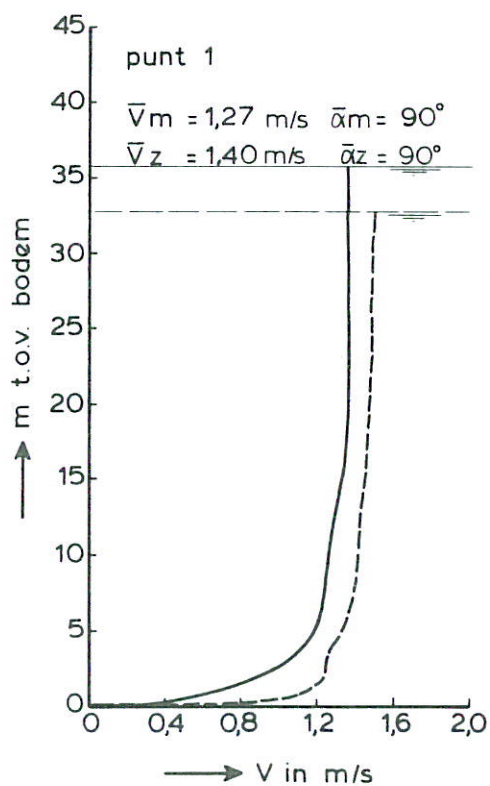
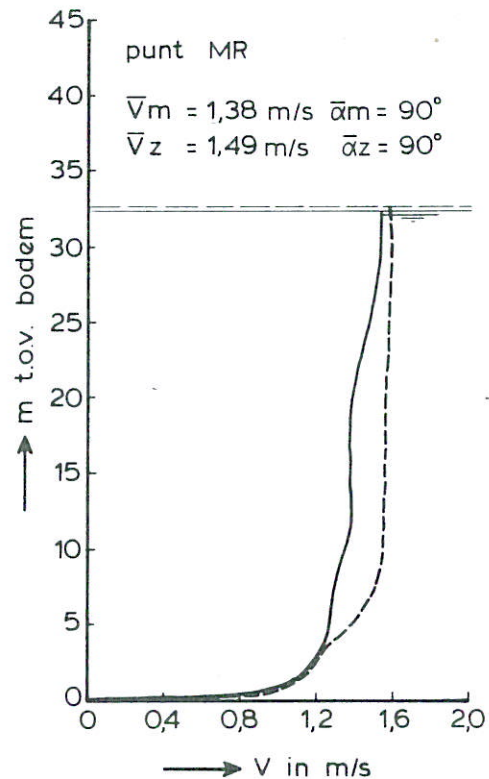
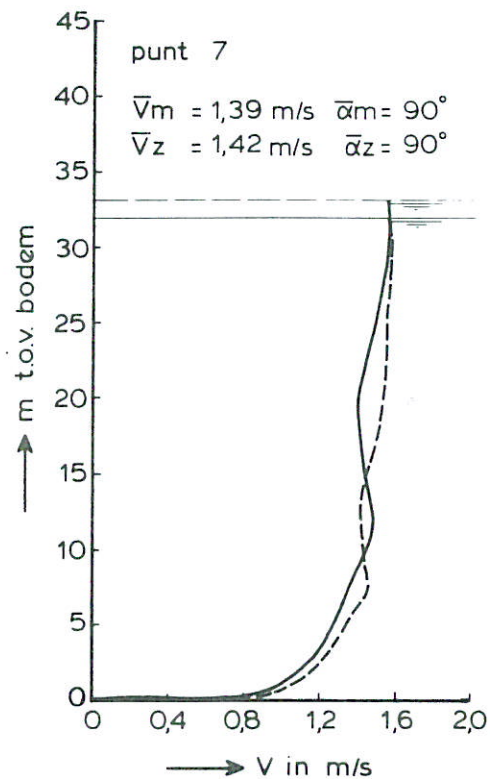
ROOMPOT VLOED

RAAI D

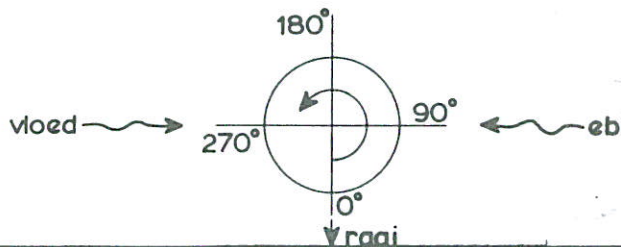
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 29c



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

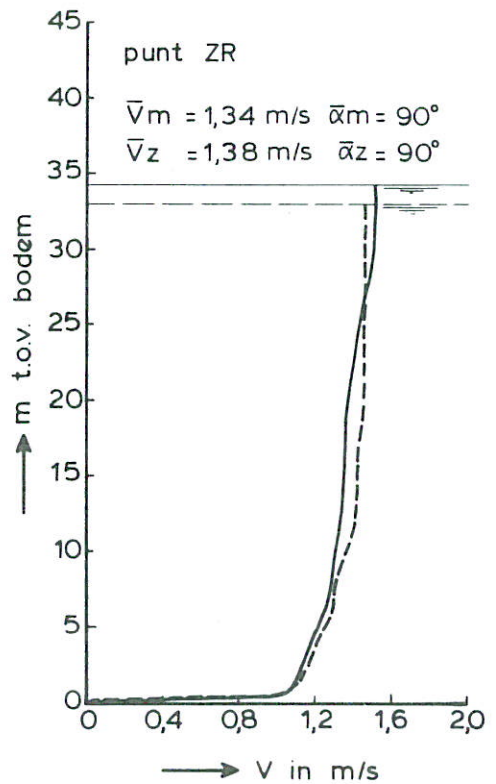
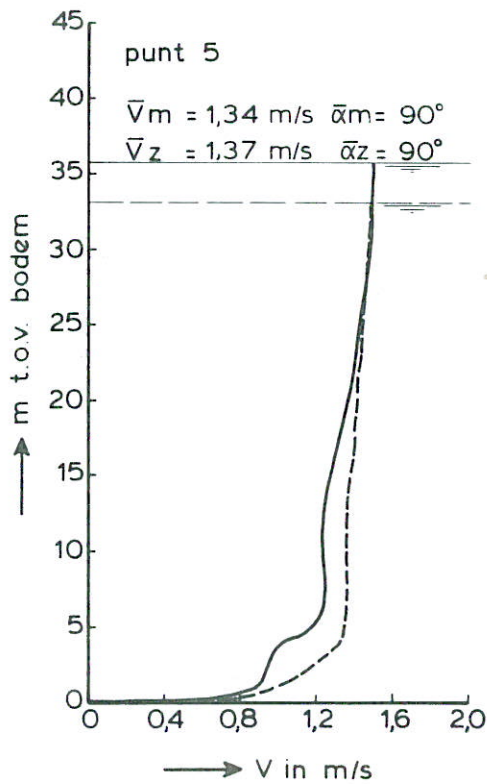
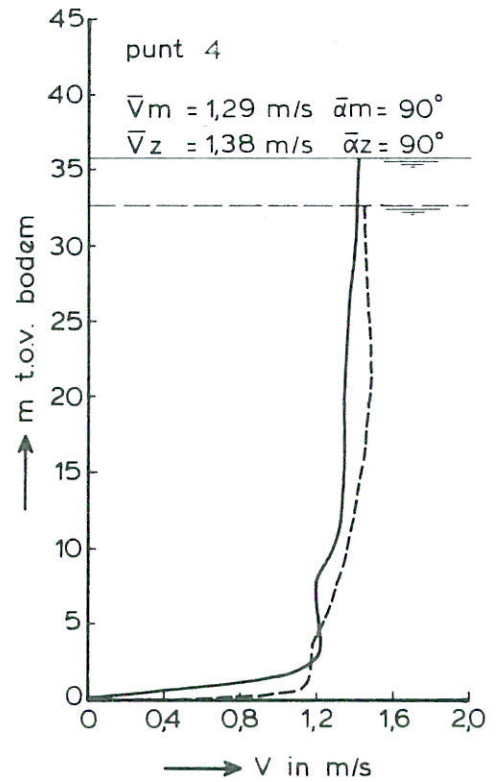
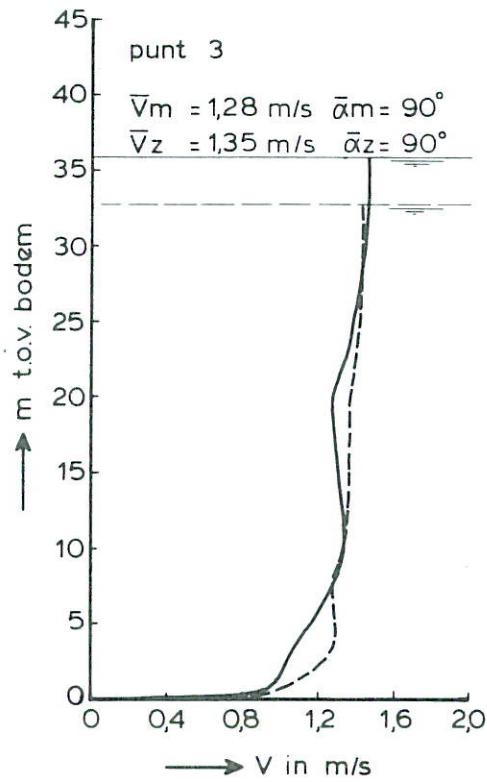
ROOMPOT VLOED

RAAI E

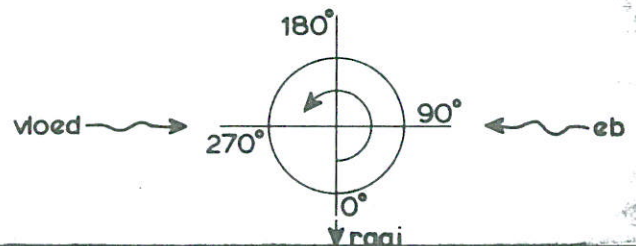
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 30a



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

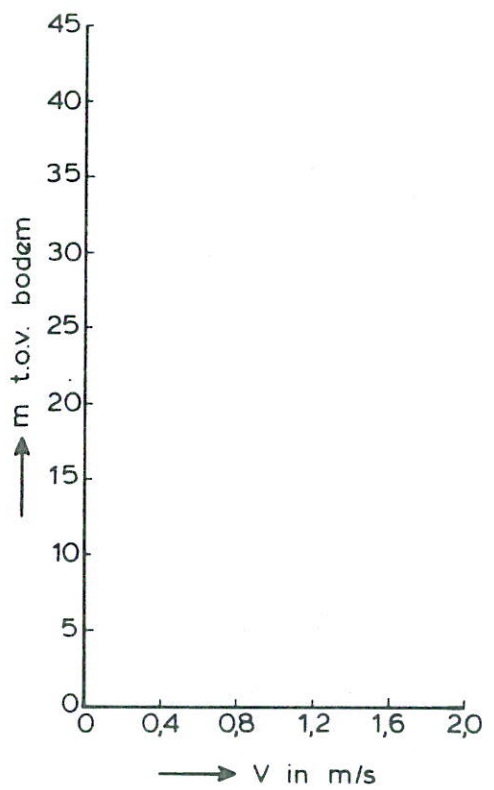
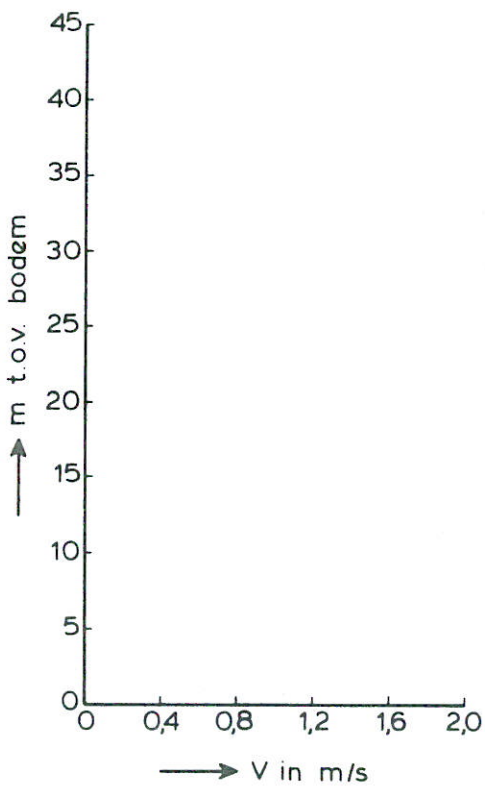
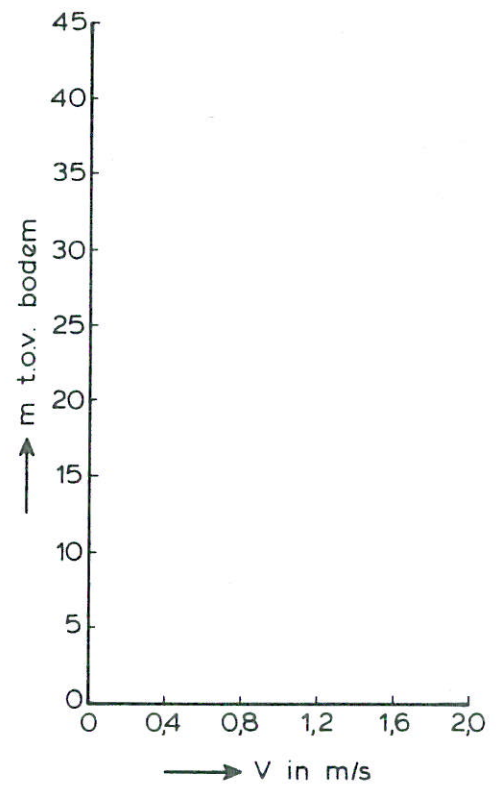
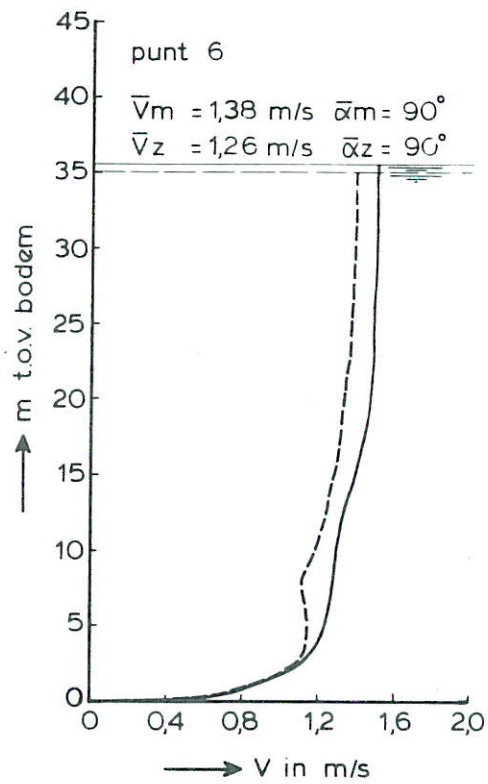
ROOMPOT VLOED

RAAI E

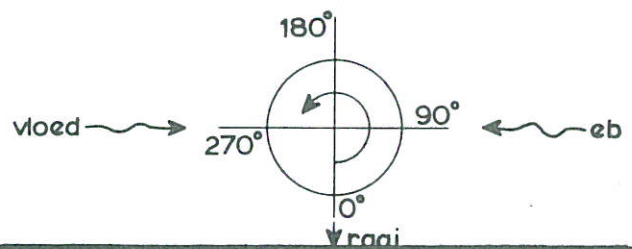
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 30 b



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

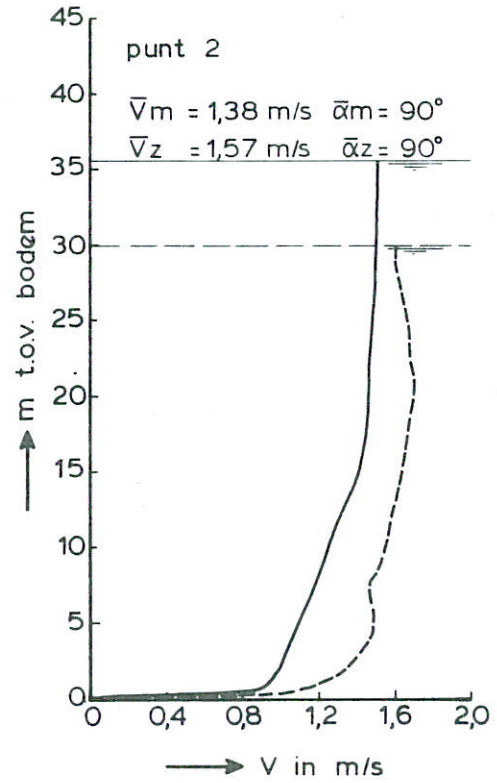
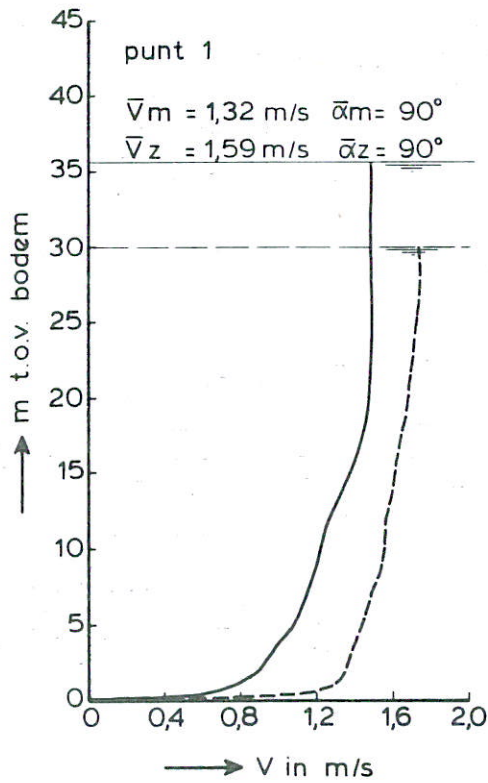
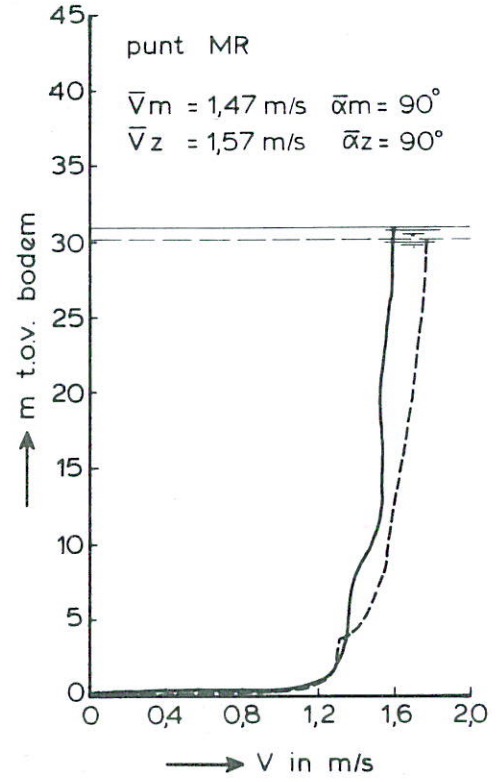
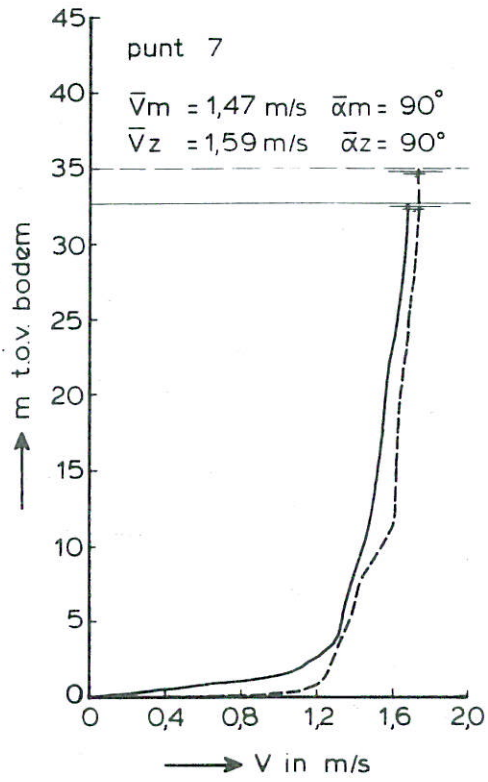
ROOMPOT VLOED

RAAI E

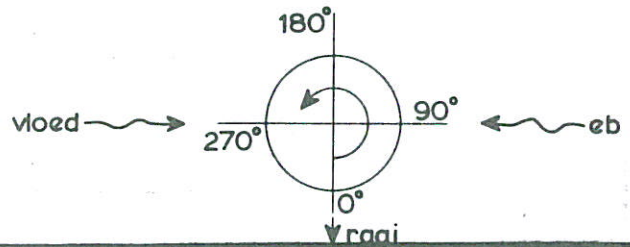
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 30 c



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

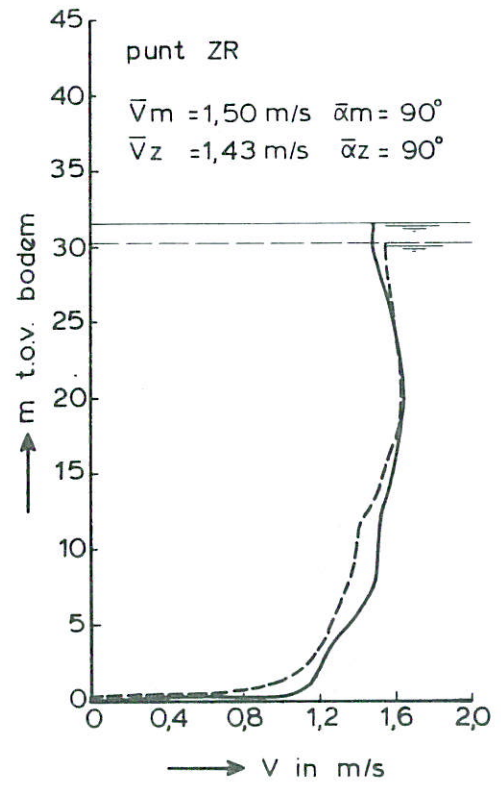
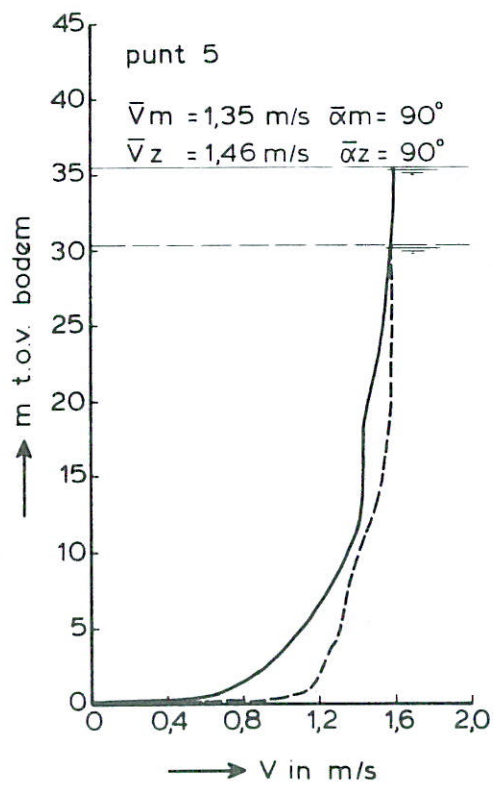
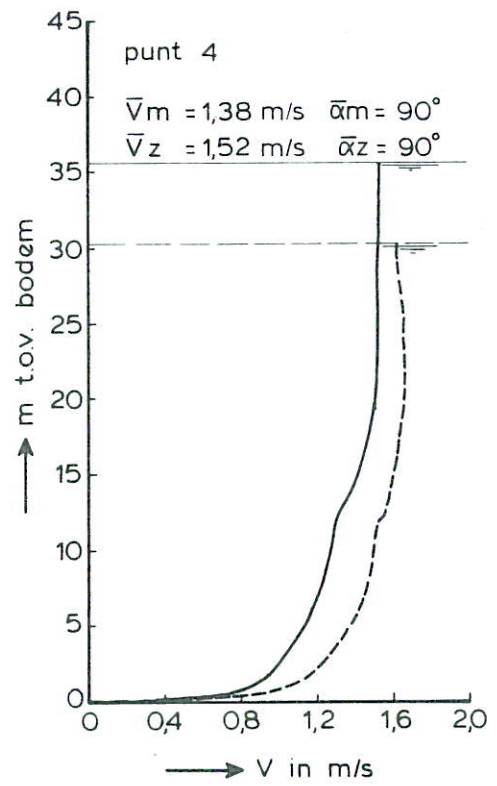
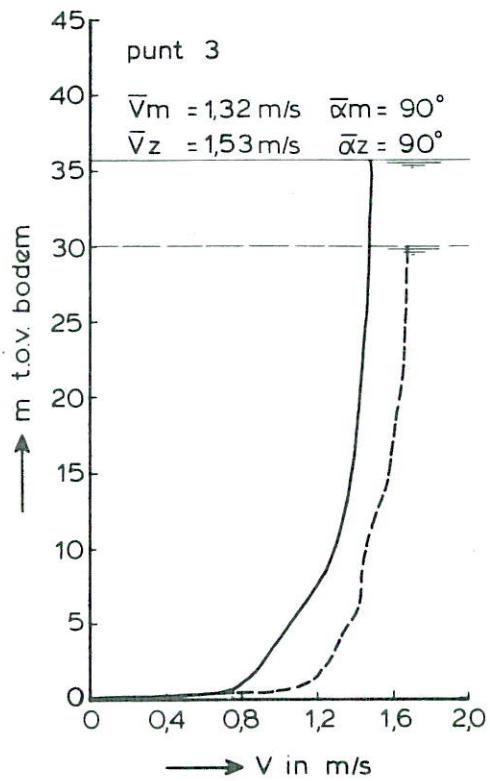
ROOMPOT VLOED

RAAI F

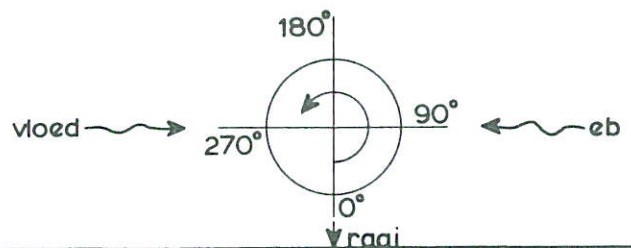
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 31a



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

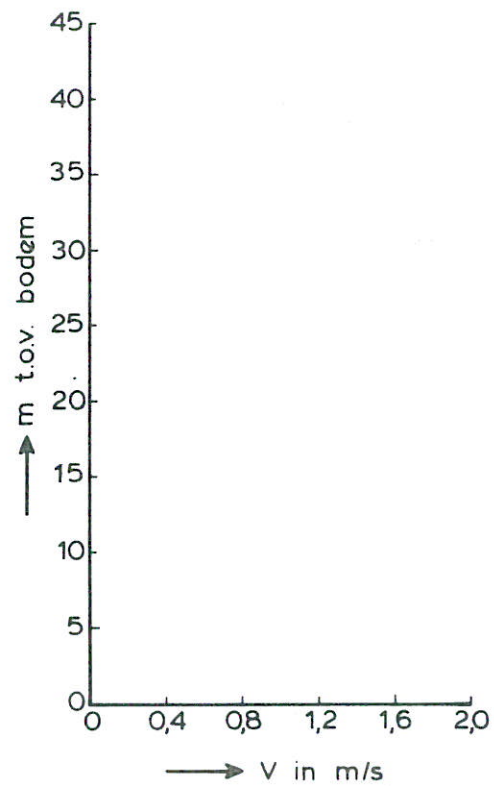
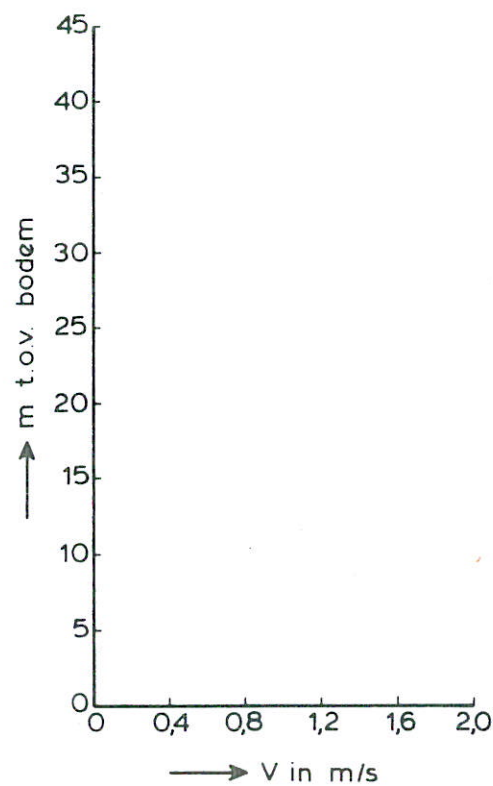
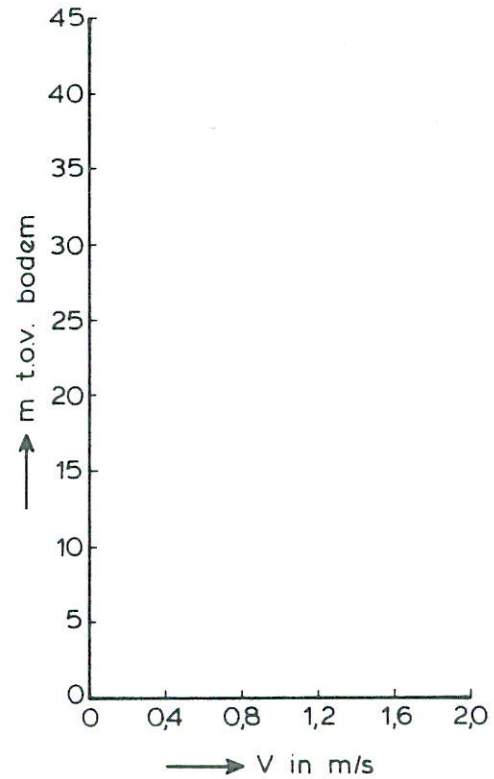
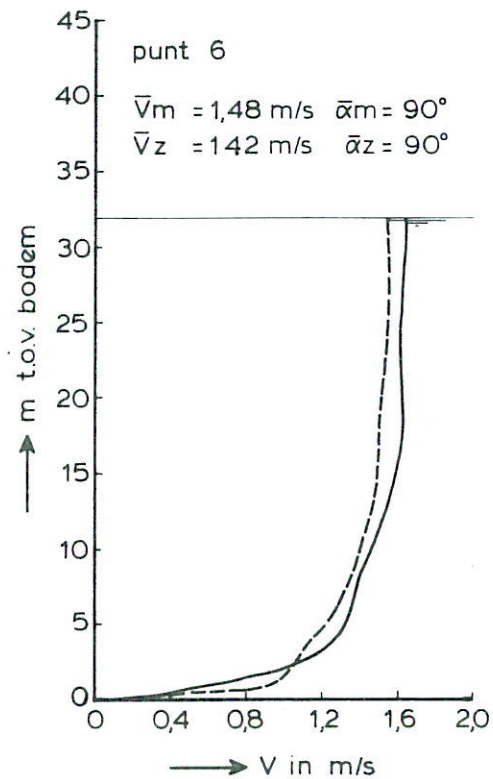
ROOMPOT VLOED

RAAI F

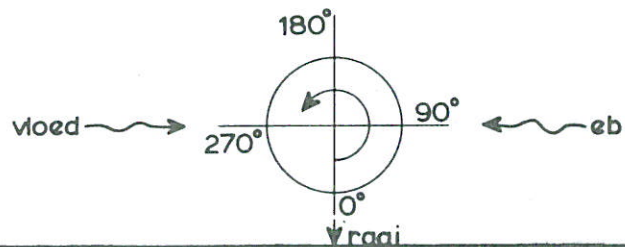
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 31b



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

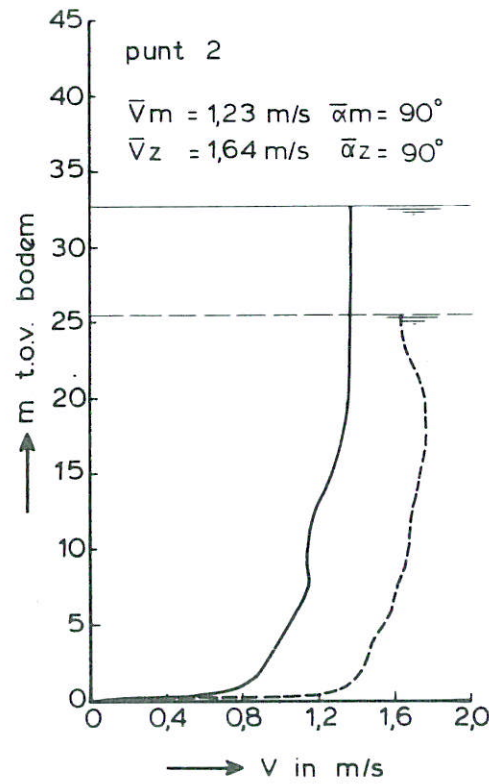
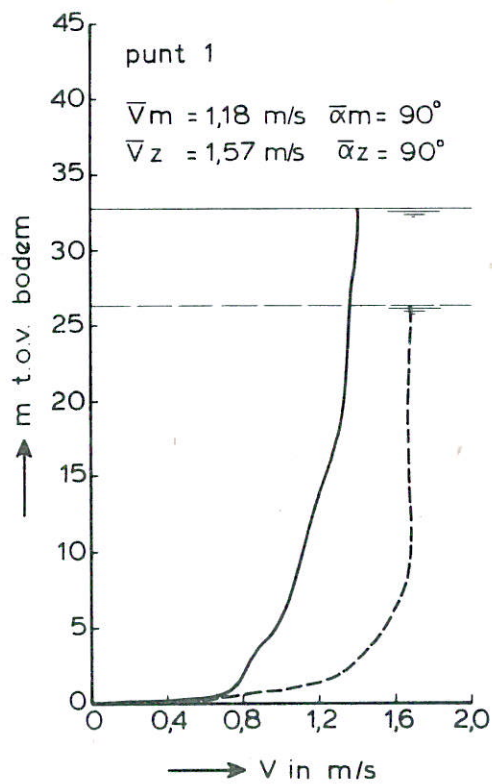
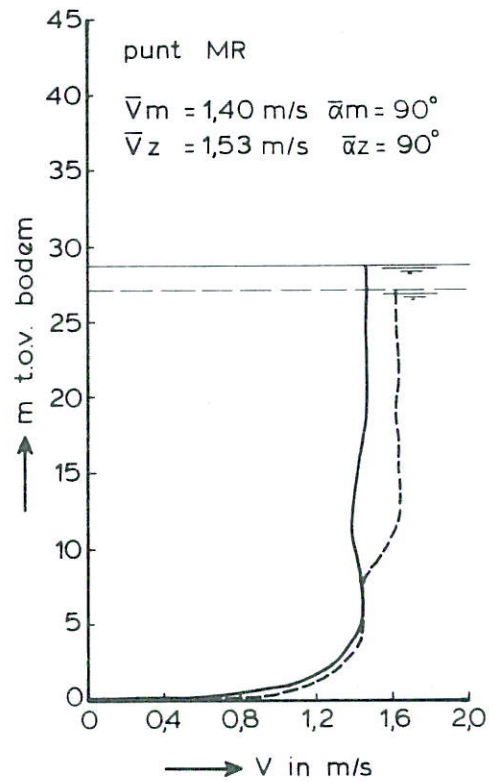
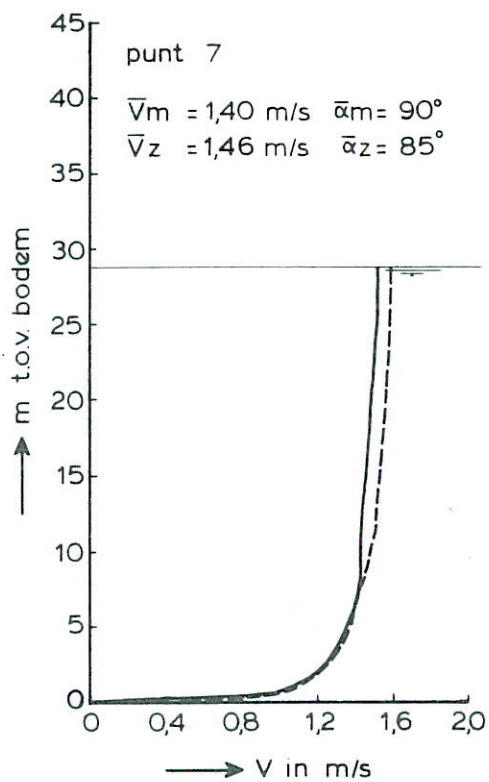
ROOMPOT VLOED

RAAI F

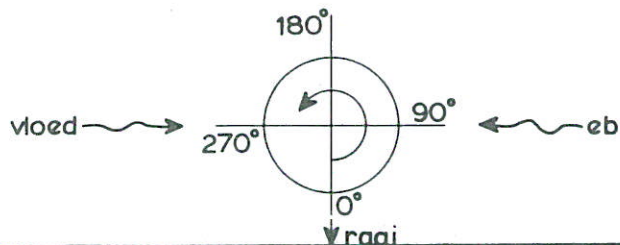
WATERLOOPKUNDIG LABORATORIUM

M 1001

FIG. 31c



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

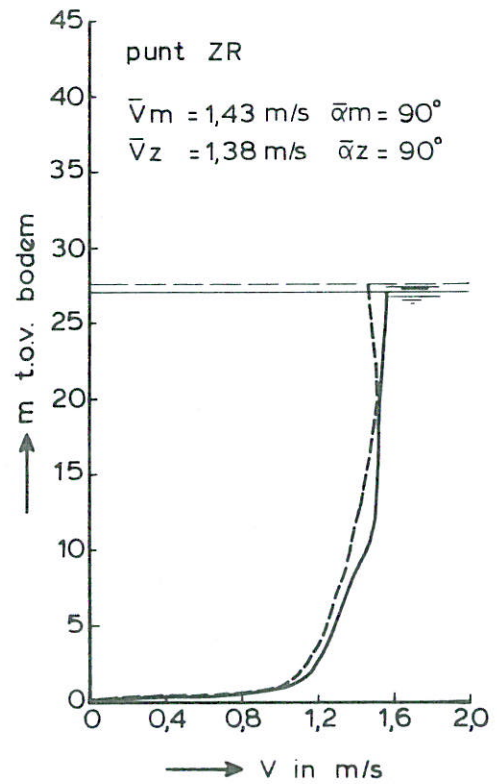
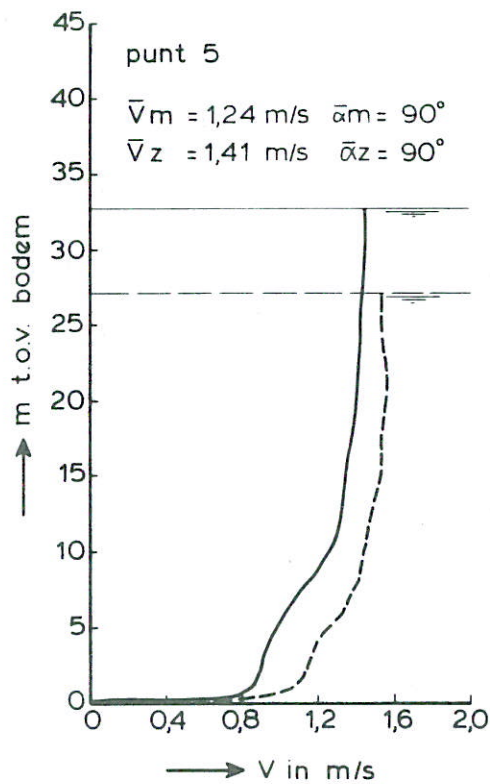
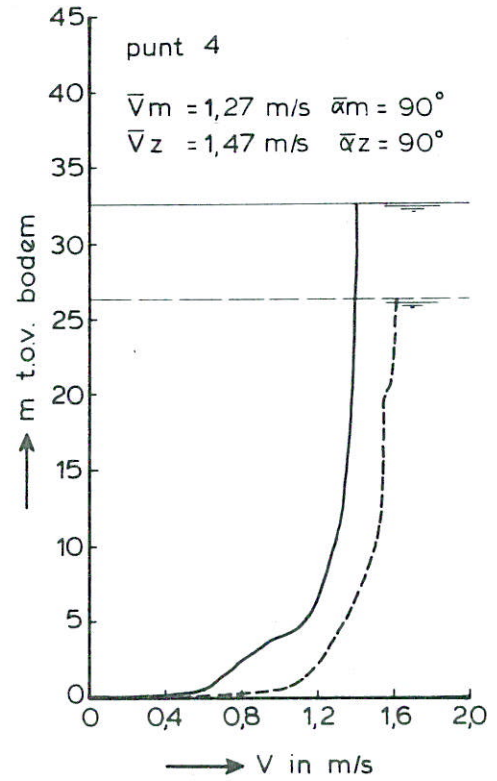
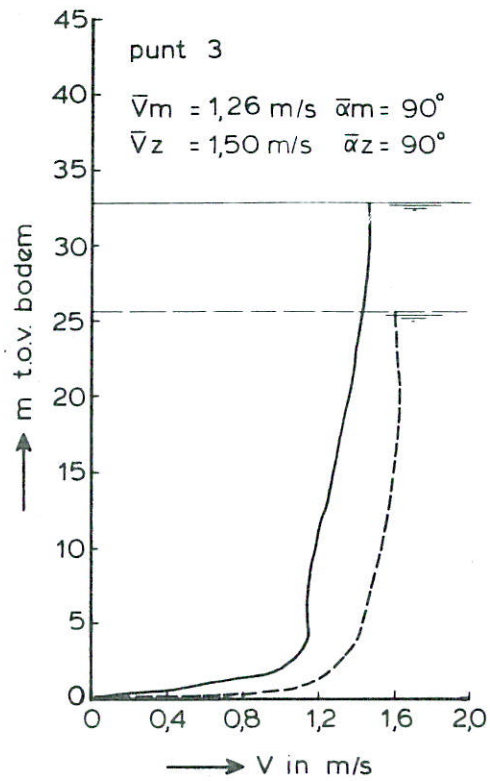
ROOMPOT VLOED

RAAI G

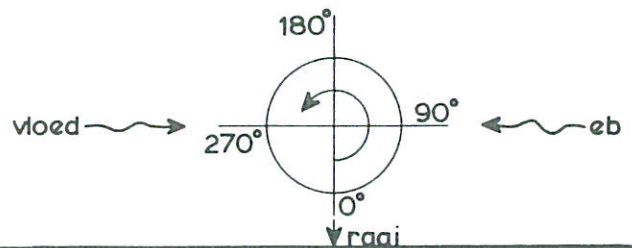
WATERLOOPKUNDIG LABORATORIUM

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FIG. 32a



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

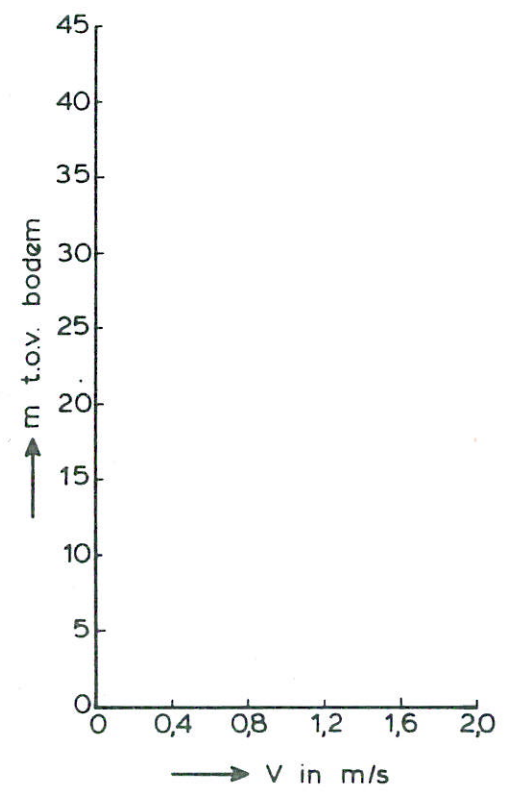
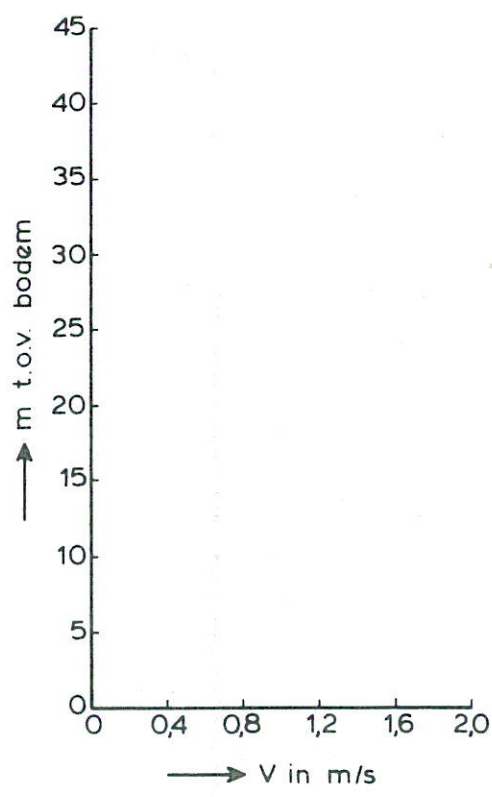
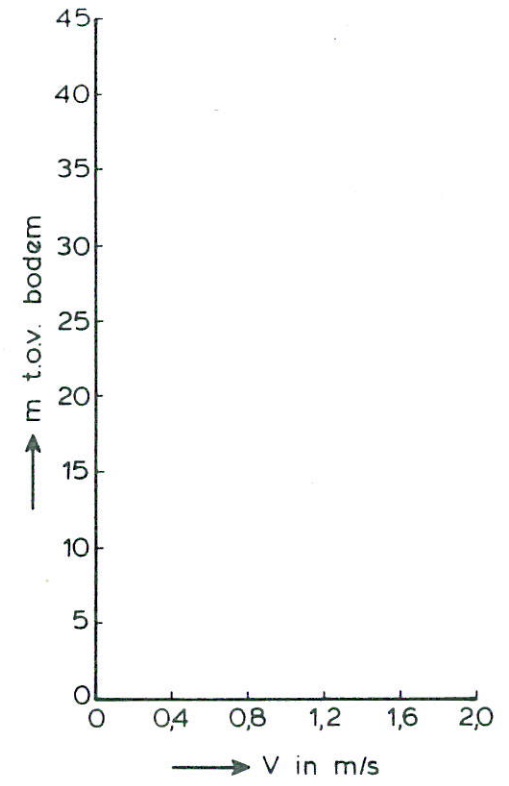
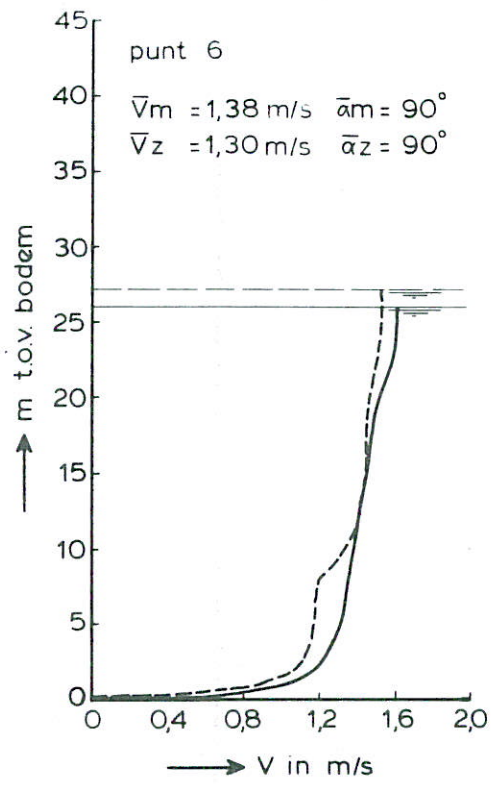
ROOMPOT VLOED

RAAI G

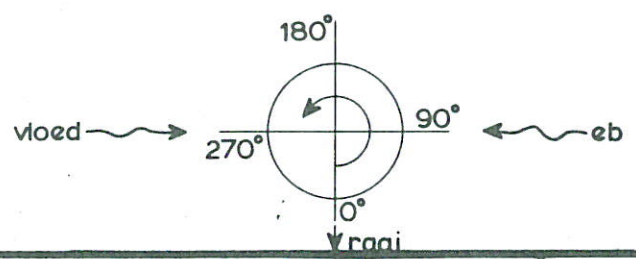
WATERLOOPKUNDIG LABORATORIUM

M 1001

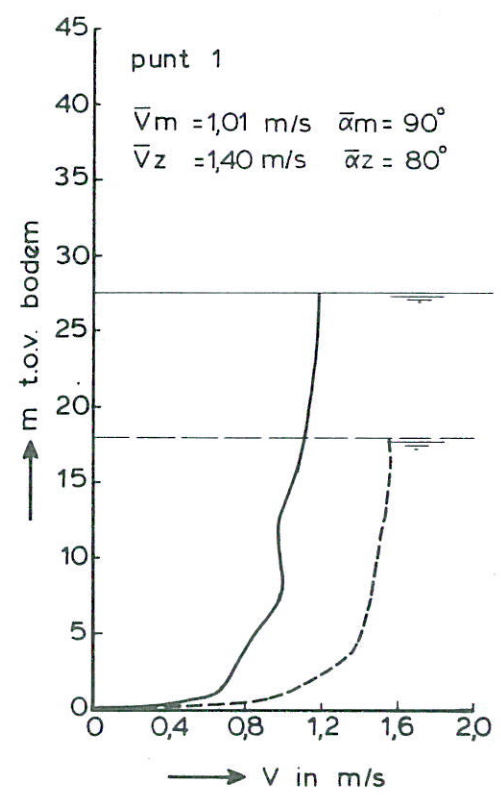
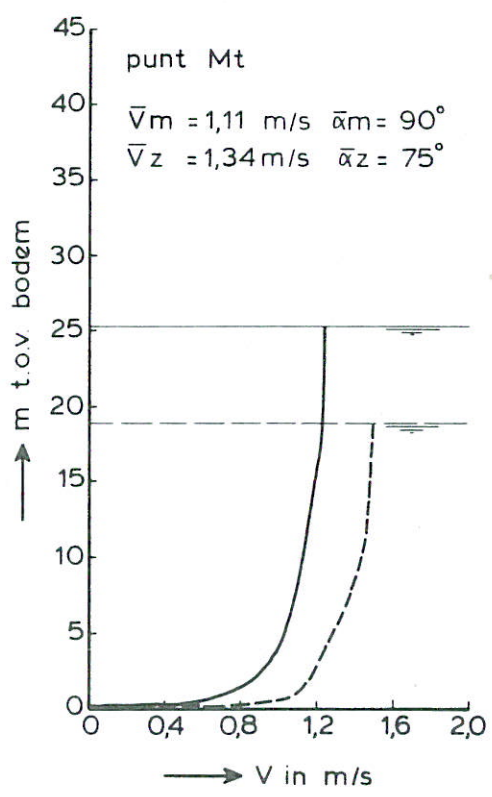
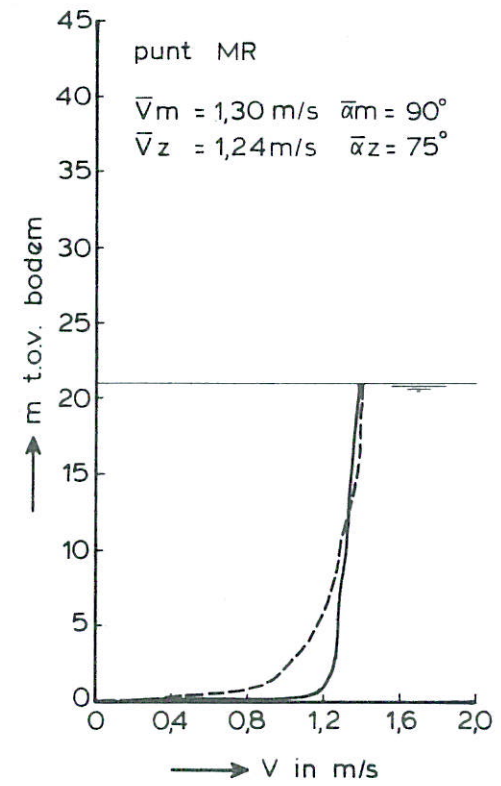
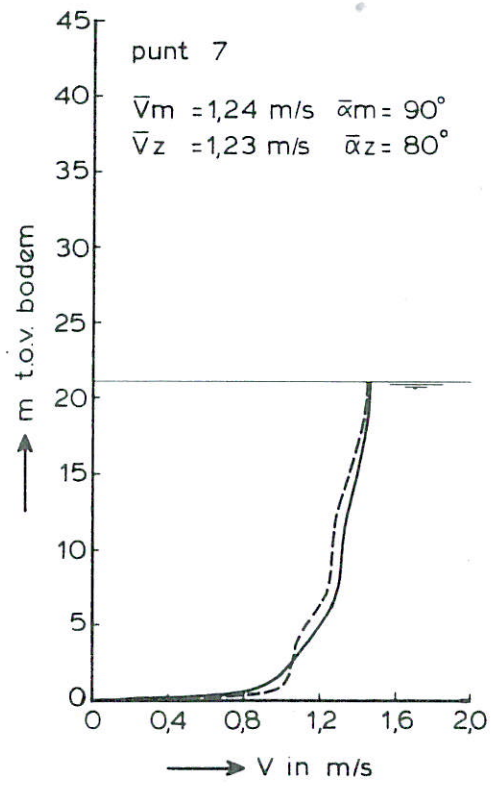
FIG. 32 b



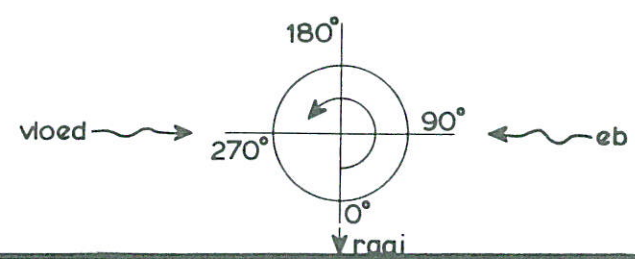
— met cunet
 - - - zonder cunet



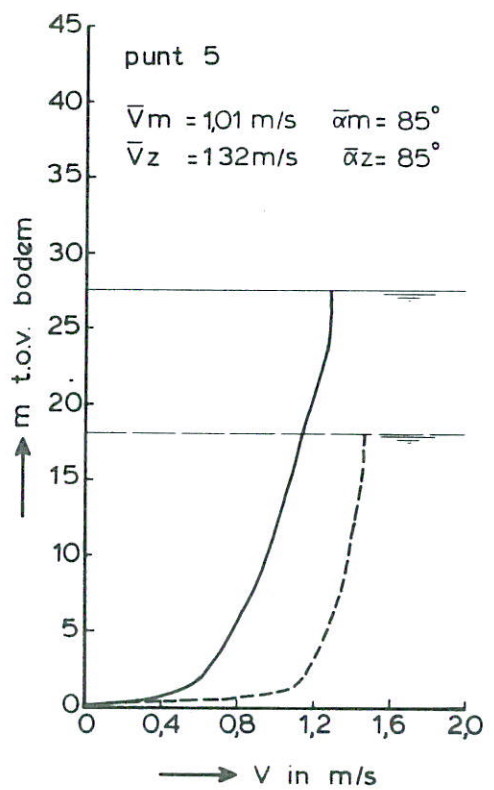
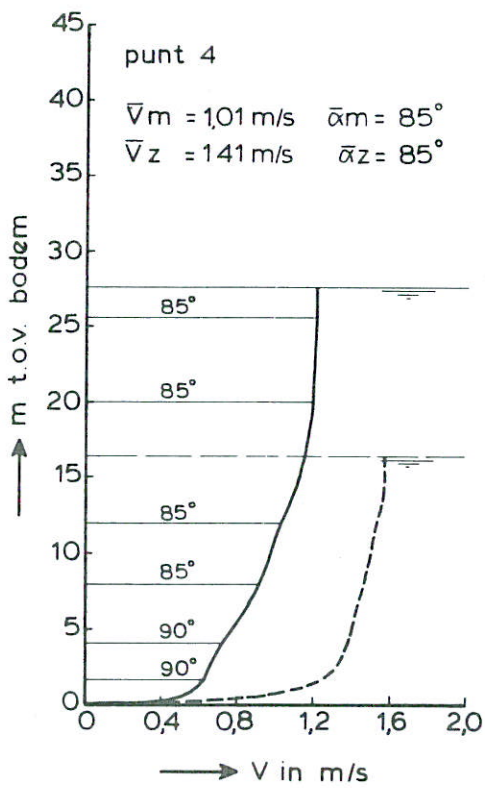
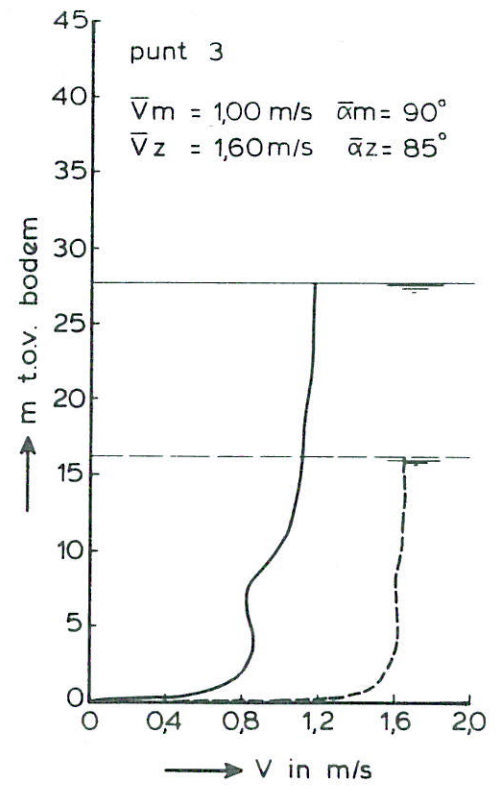
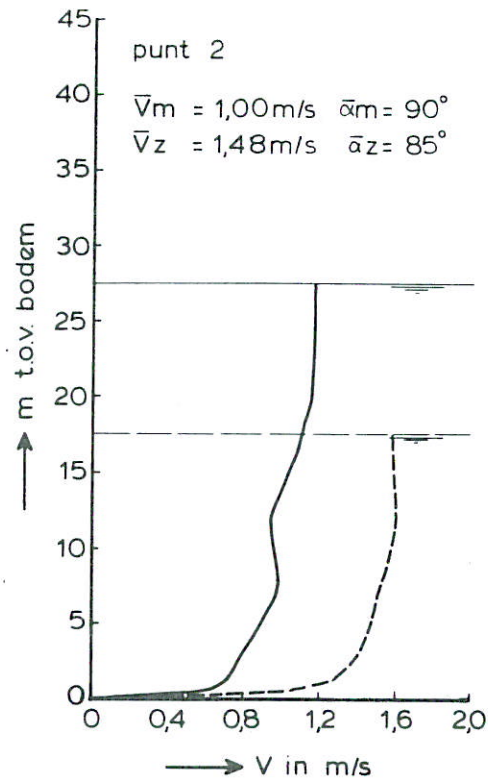
SNELHEIDSVERTIKALEN	ROOMPOT	VLOED
	RAAI G	
WATERLOOPKUNDIG LABORATORIUM	M 1001	FIG. 32 c



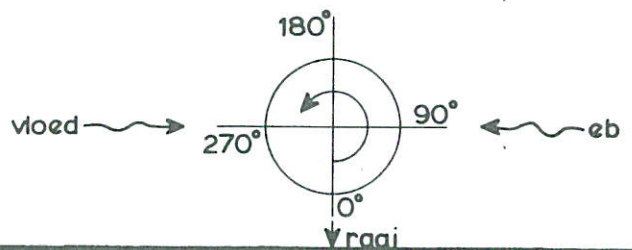
— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN	ROOMPOT	VLOED
	RAAI H	
WATERLOOPKUNDIG LABORATORIUM	M 1001	FIG. 33a



— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

ROOMPOT

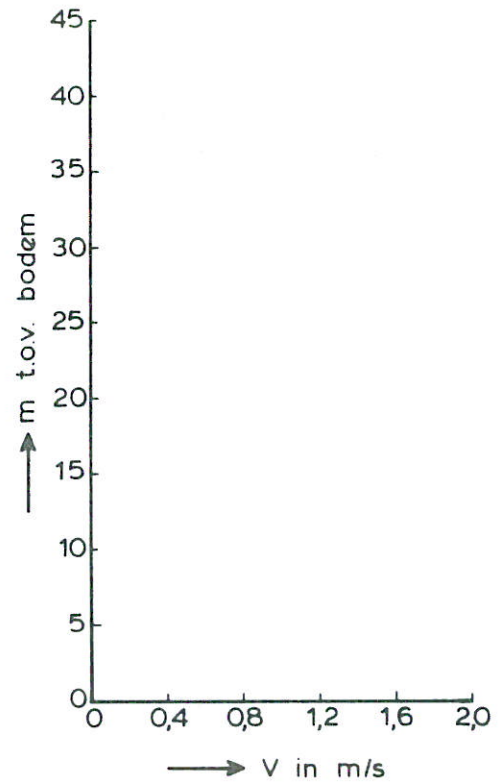
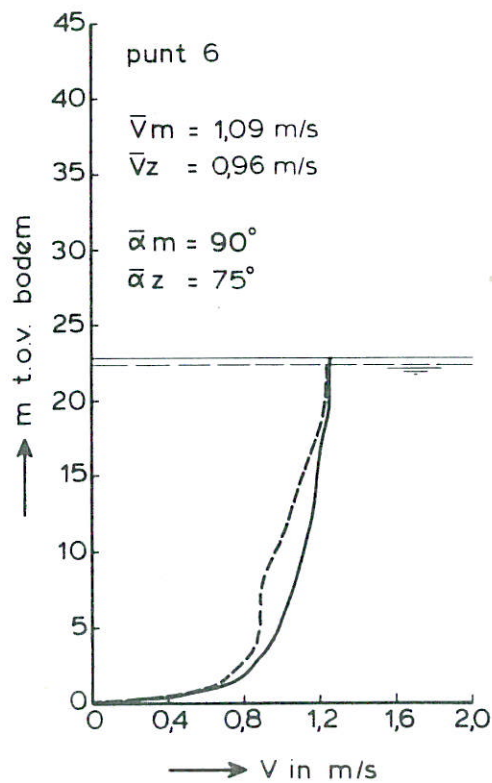
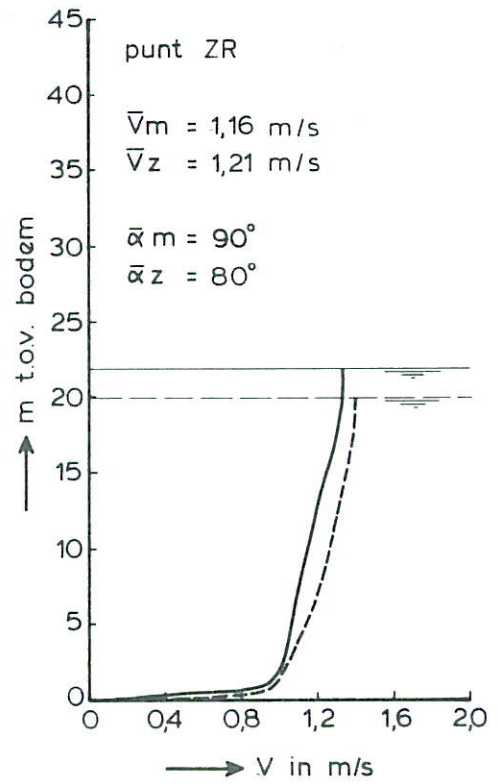
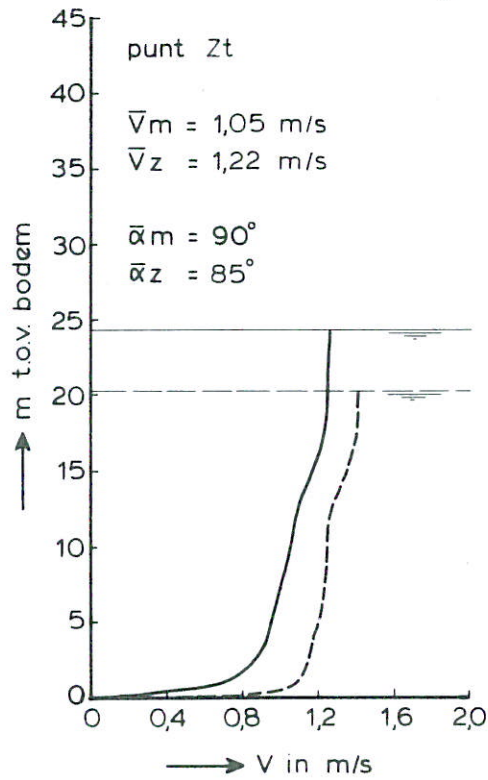
VLOED

RAAI H

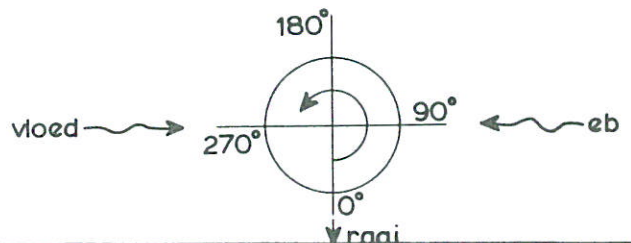
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FIG. 33b



— met cunet
 - - - zonder cunet



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ROOMPOT

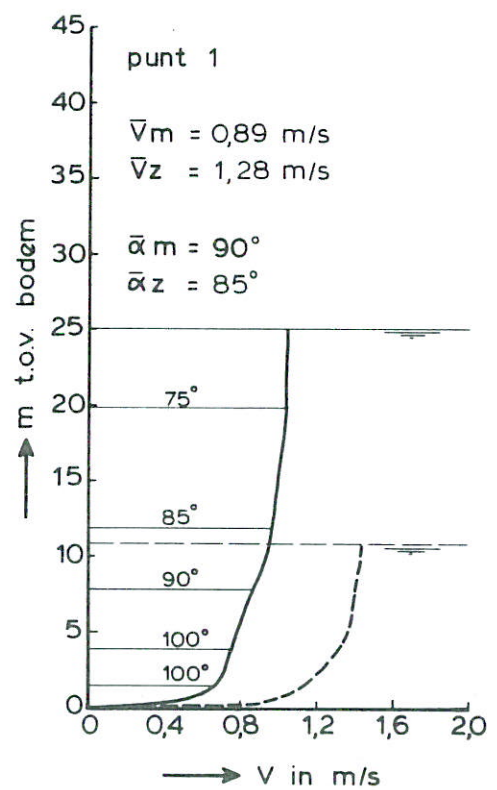
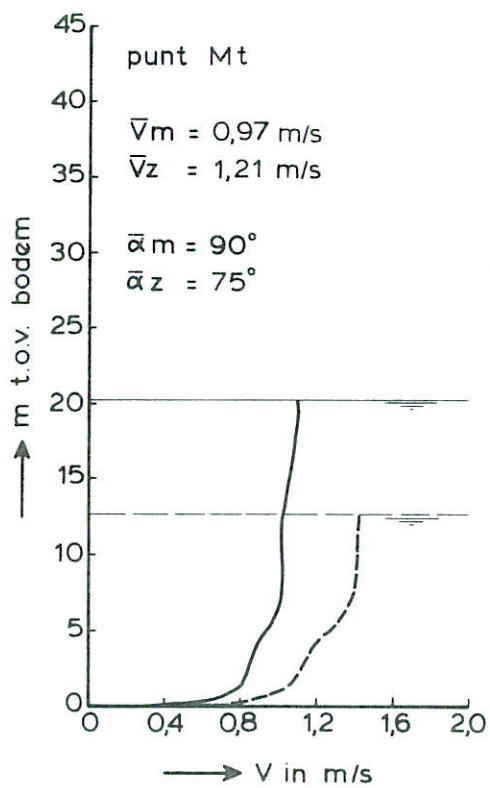
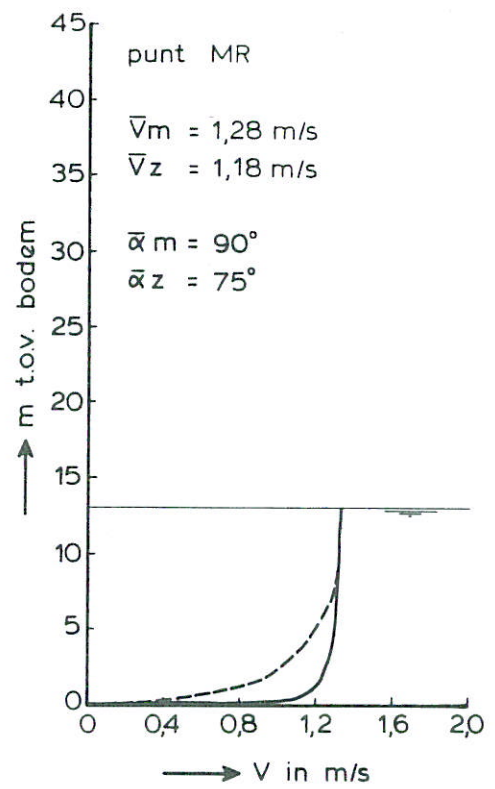
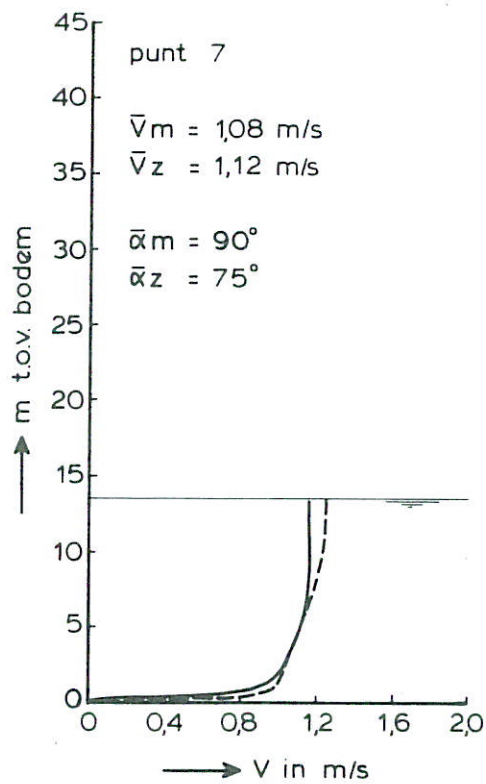
VLOED

RAAI H

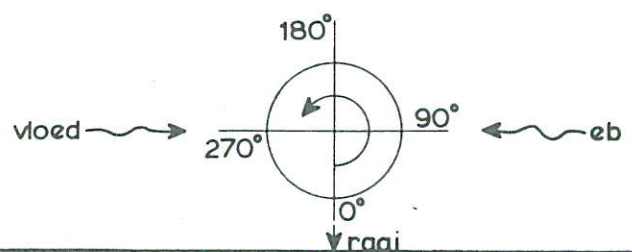
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FIG. 33c



— met cunet
 - - - zonder cunet



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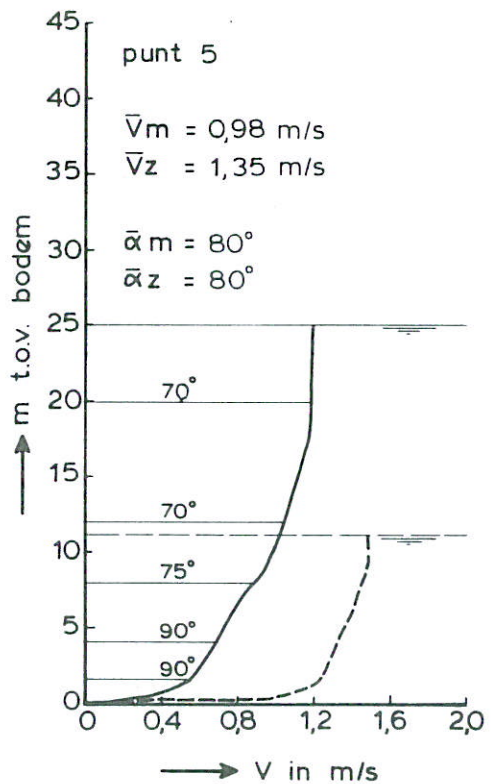
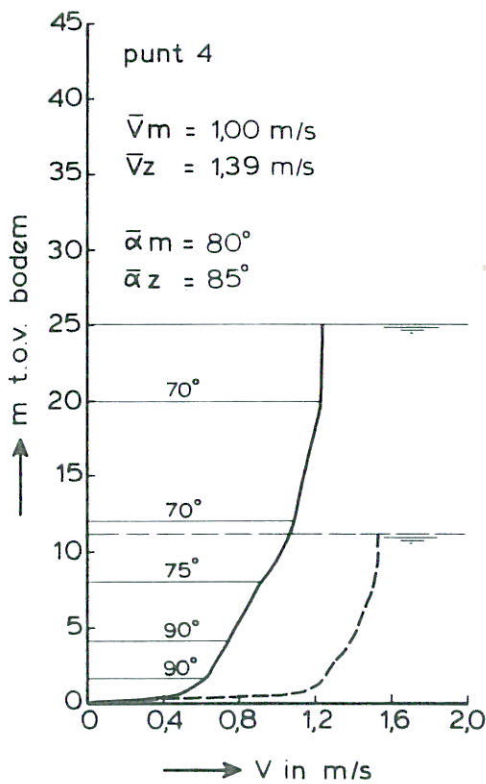
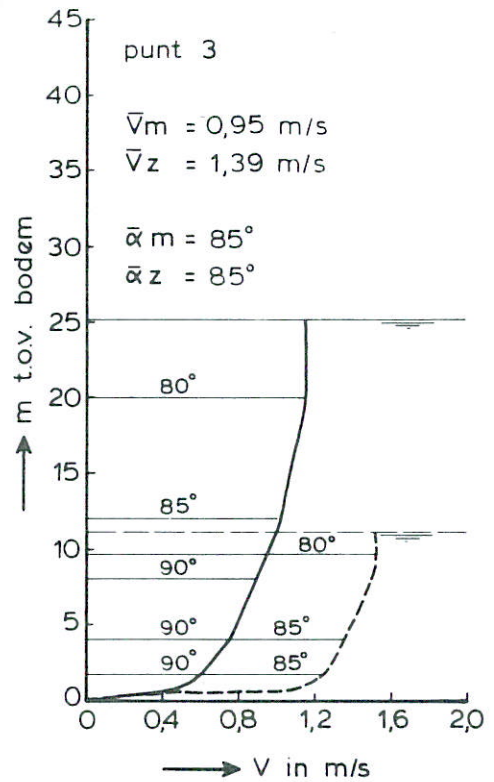
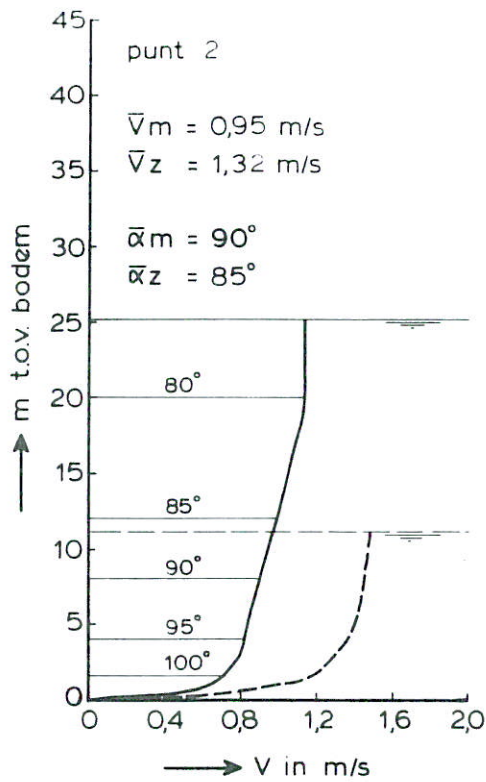
ROOMPOT VLOED

RAAI I

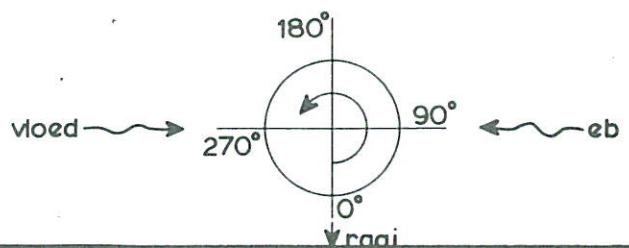
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FIG. 34a



— met cunet
 - - - zonder cunet



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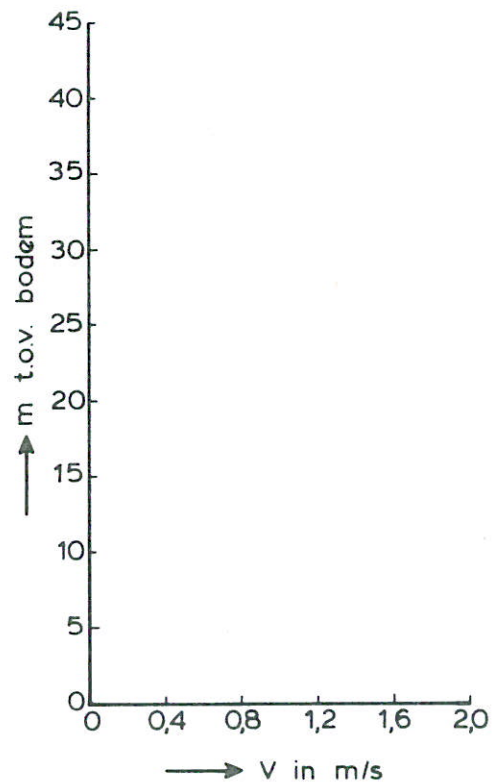
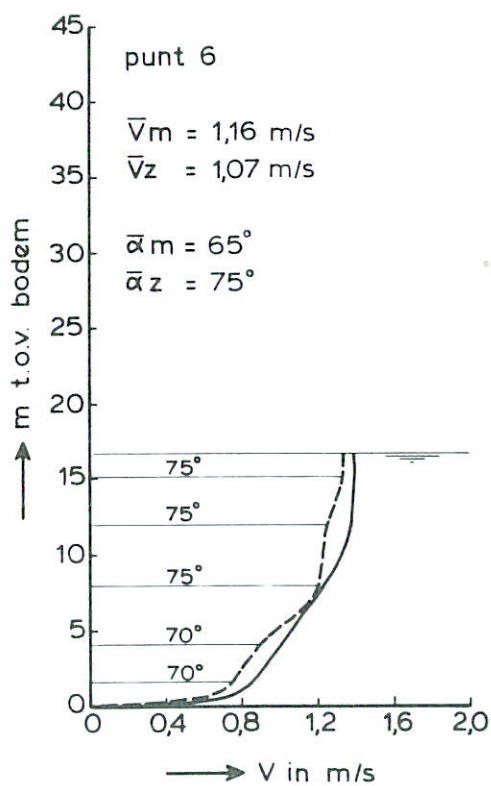
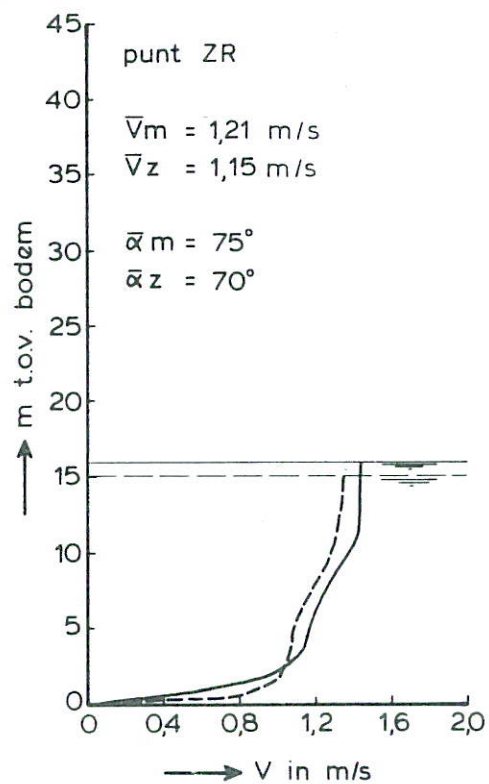
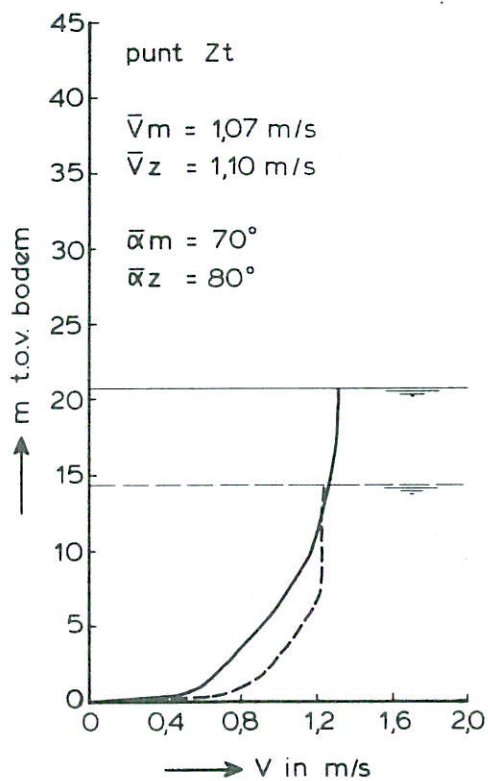
ROOMPOT VLOED

RAAI I

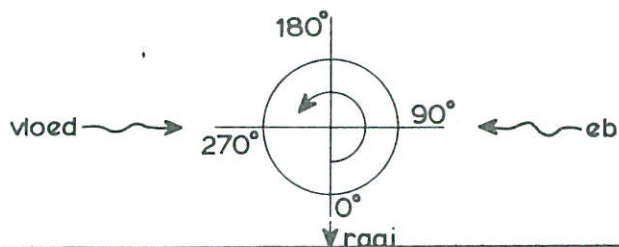
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FIG. 34 b



— met cunet
 - - - zonder cunet



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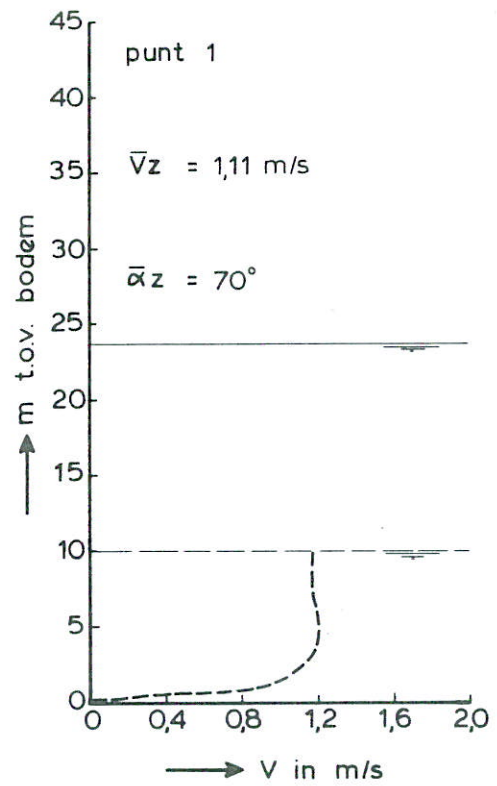
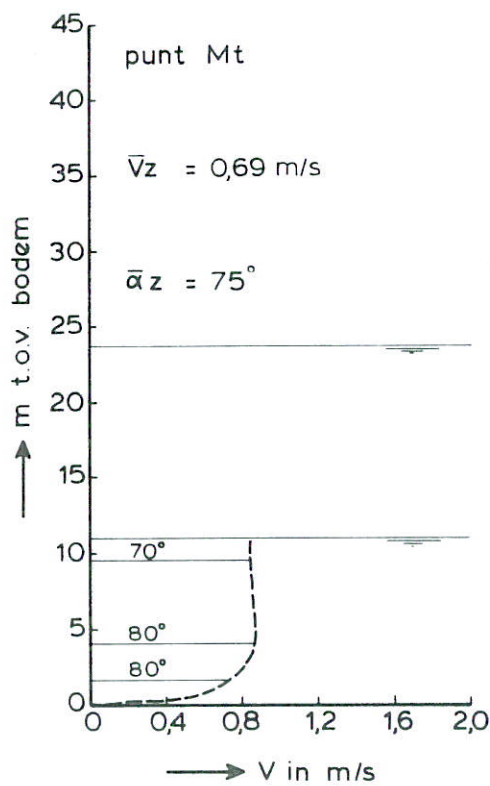
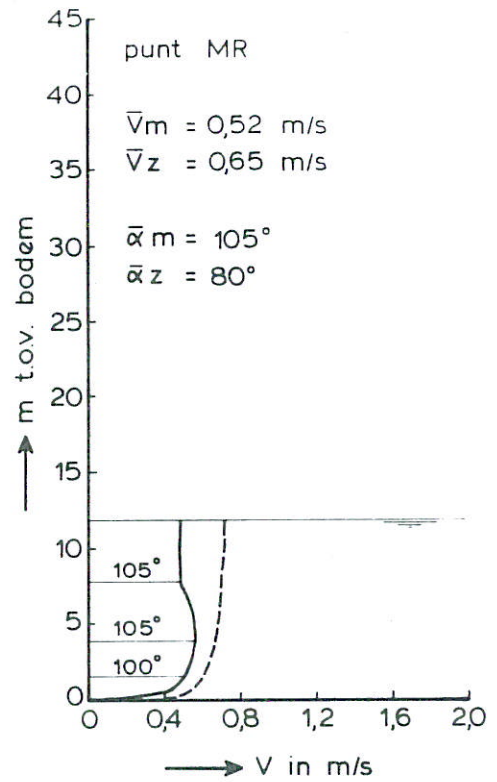
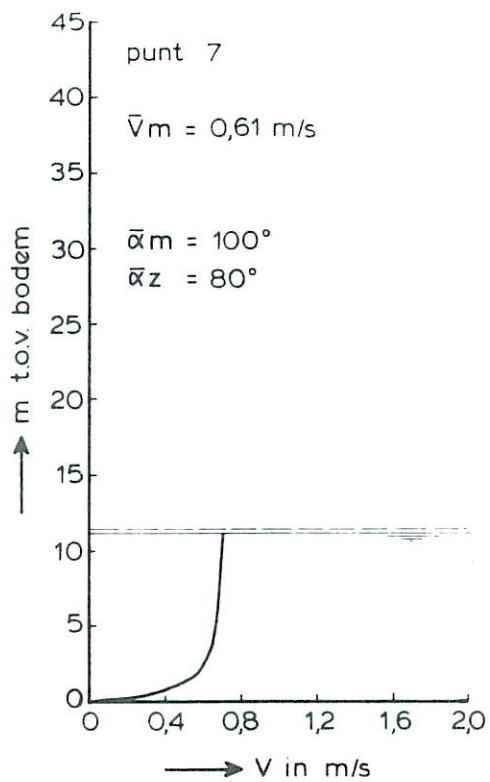
ROOMPOT VLOED

RAAI I

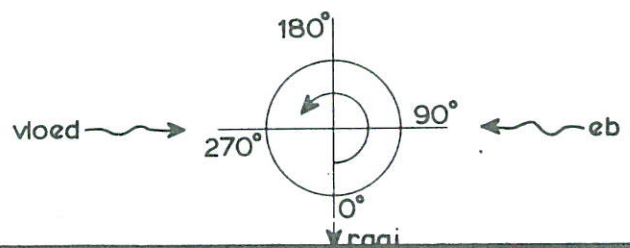
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FIG. 34c



— met cunet
 - - - zonder cunet



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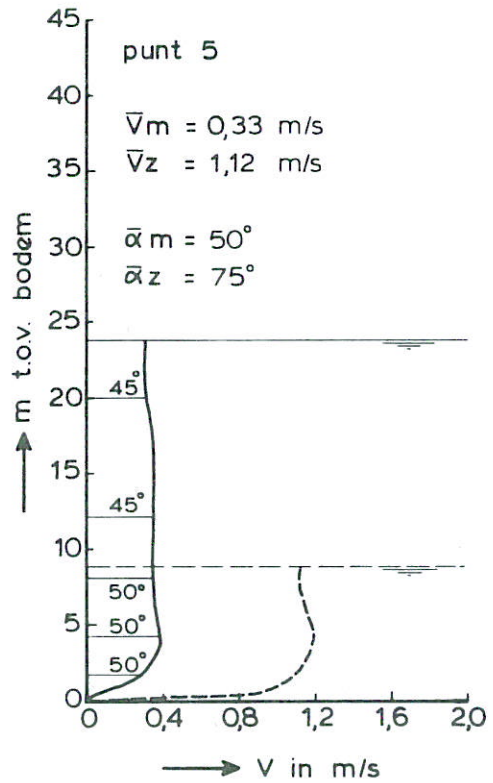
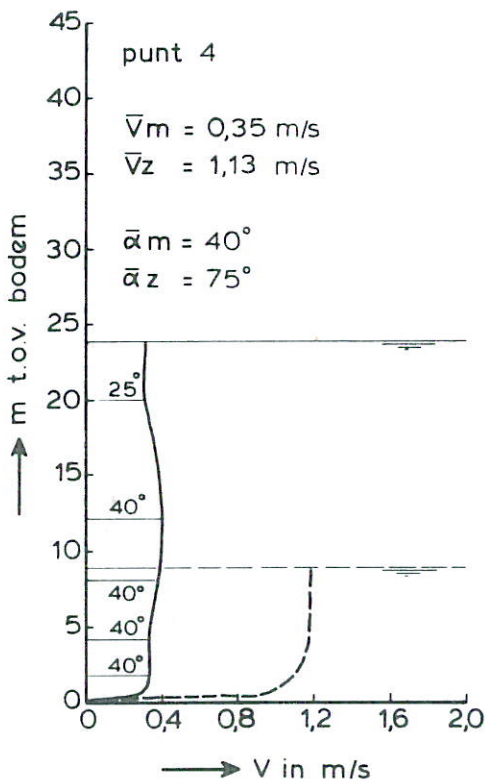
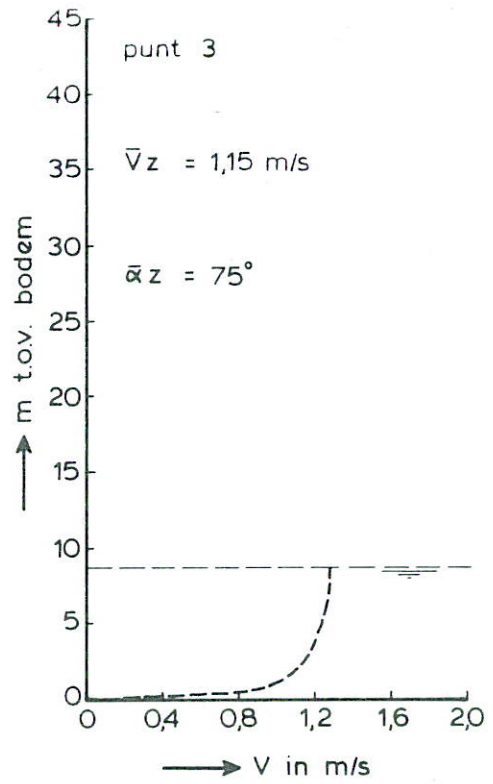
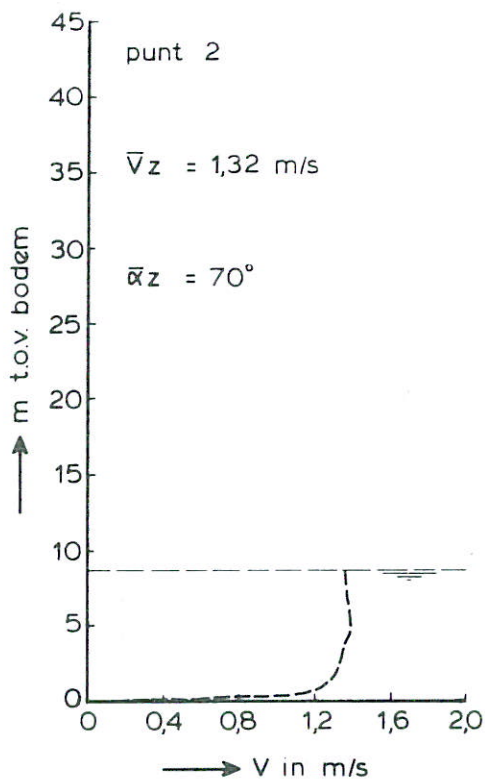
ROOMPOT VLOED

RAAI J

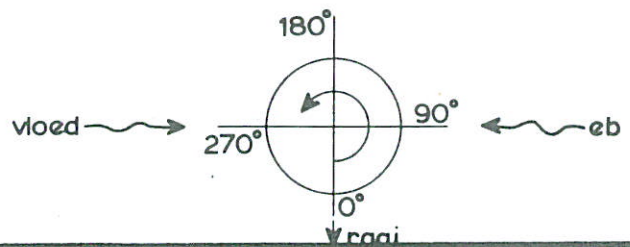
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FIG. 35a



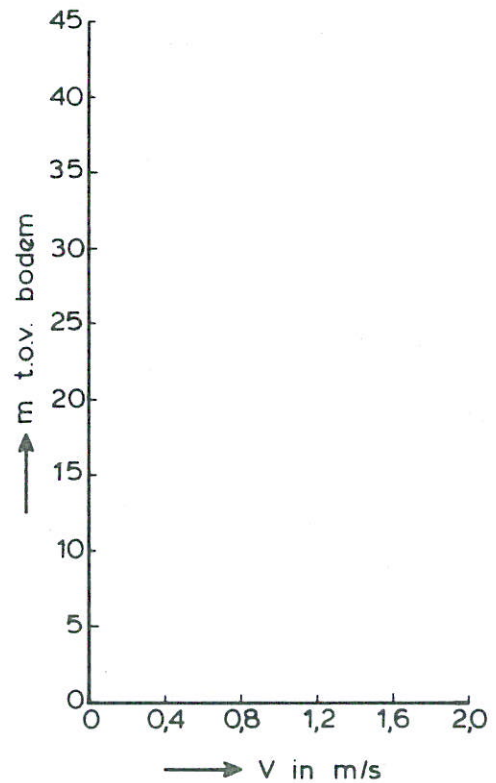
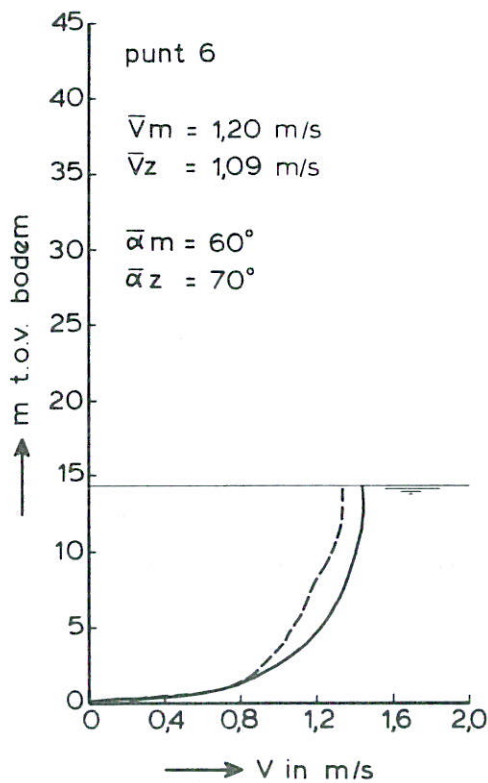
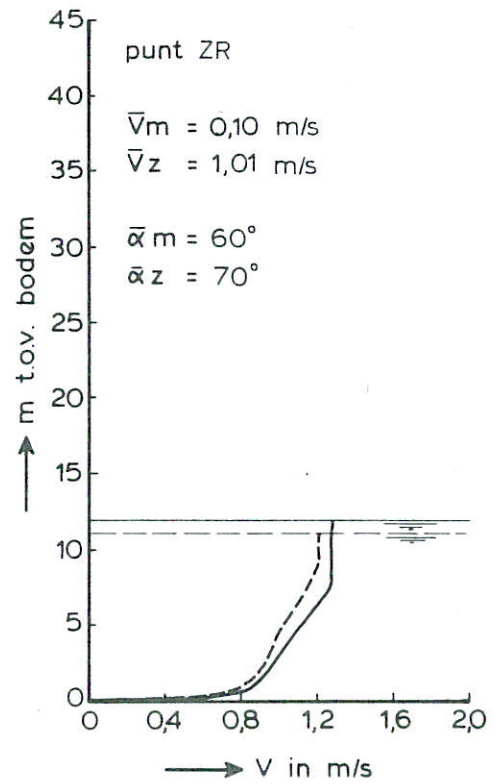
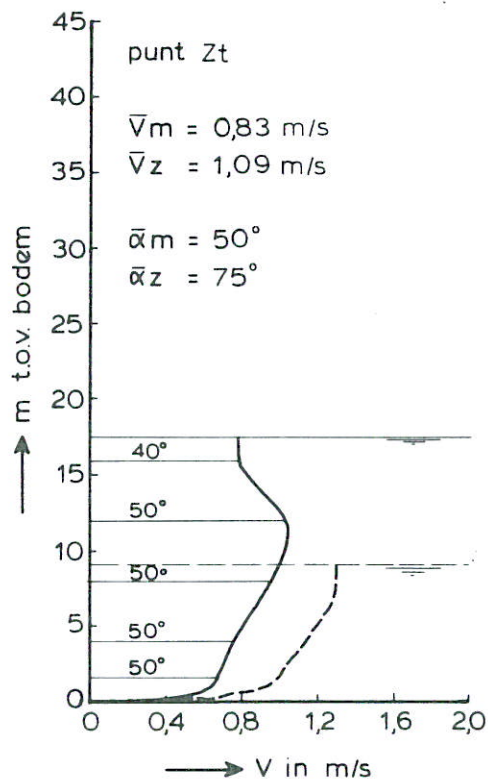
— met cunet
 - - - zonder cunet



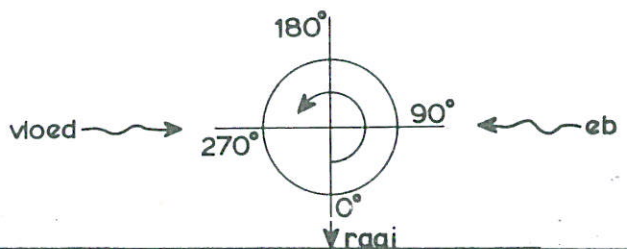
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— met cunet
 - - - zonder cunet



SNELHEIDSVERTIKALEN

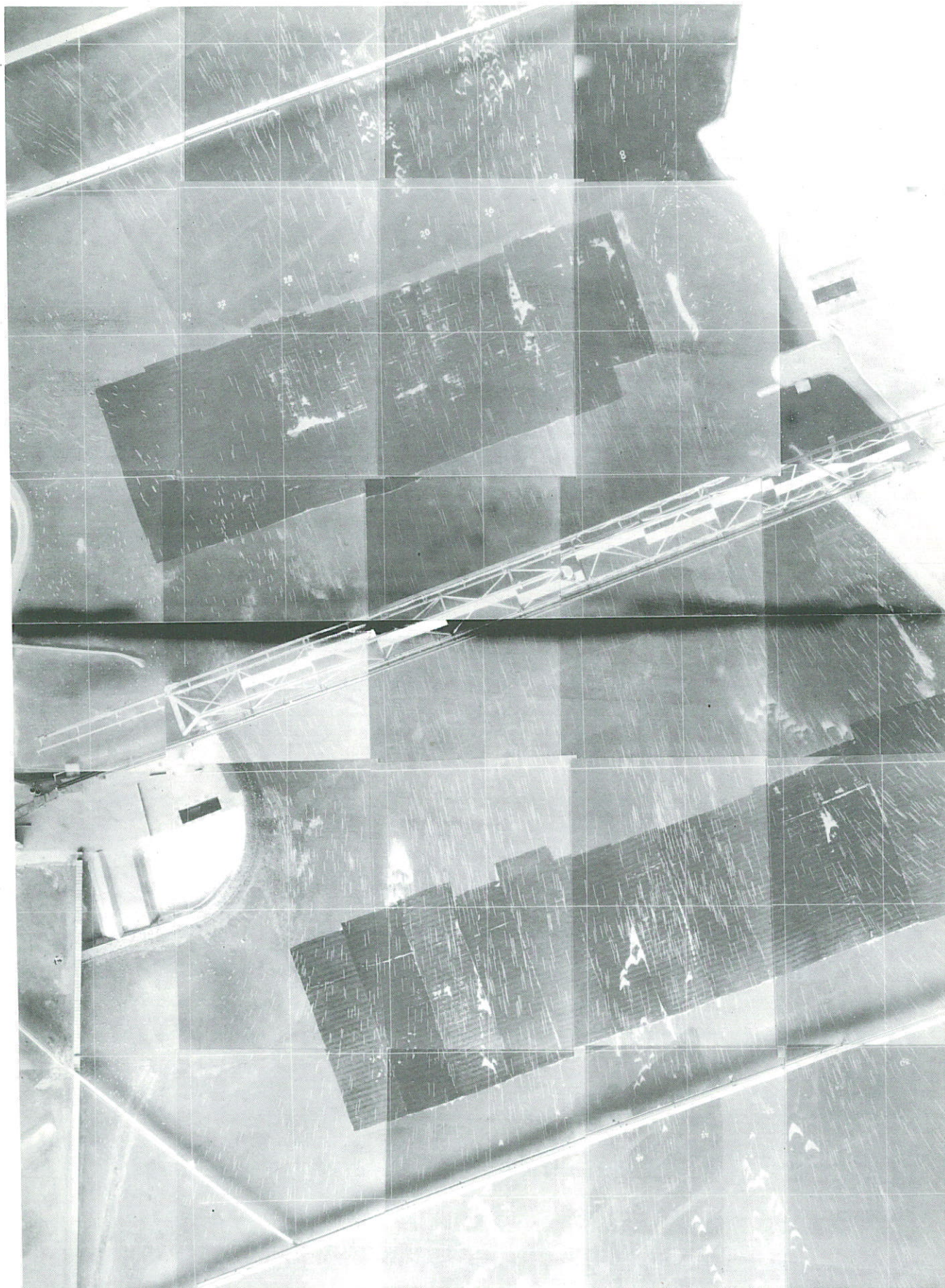
ROOMPOT VLOED

RAAI J

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FIG. 35 c



1 Roompot, eb, kaal sluitgat zonder cunet
 $Q = 54.443 \text{ m}^3/\text{s}$, benedenwaterstand N.A.P. $-0,20 \text{ m}$
schaal 1 : 15.000 1 cm $\hat{=}$ 5,6 m/s



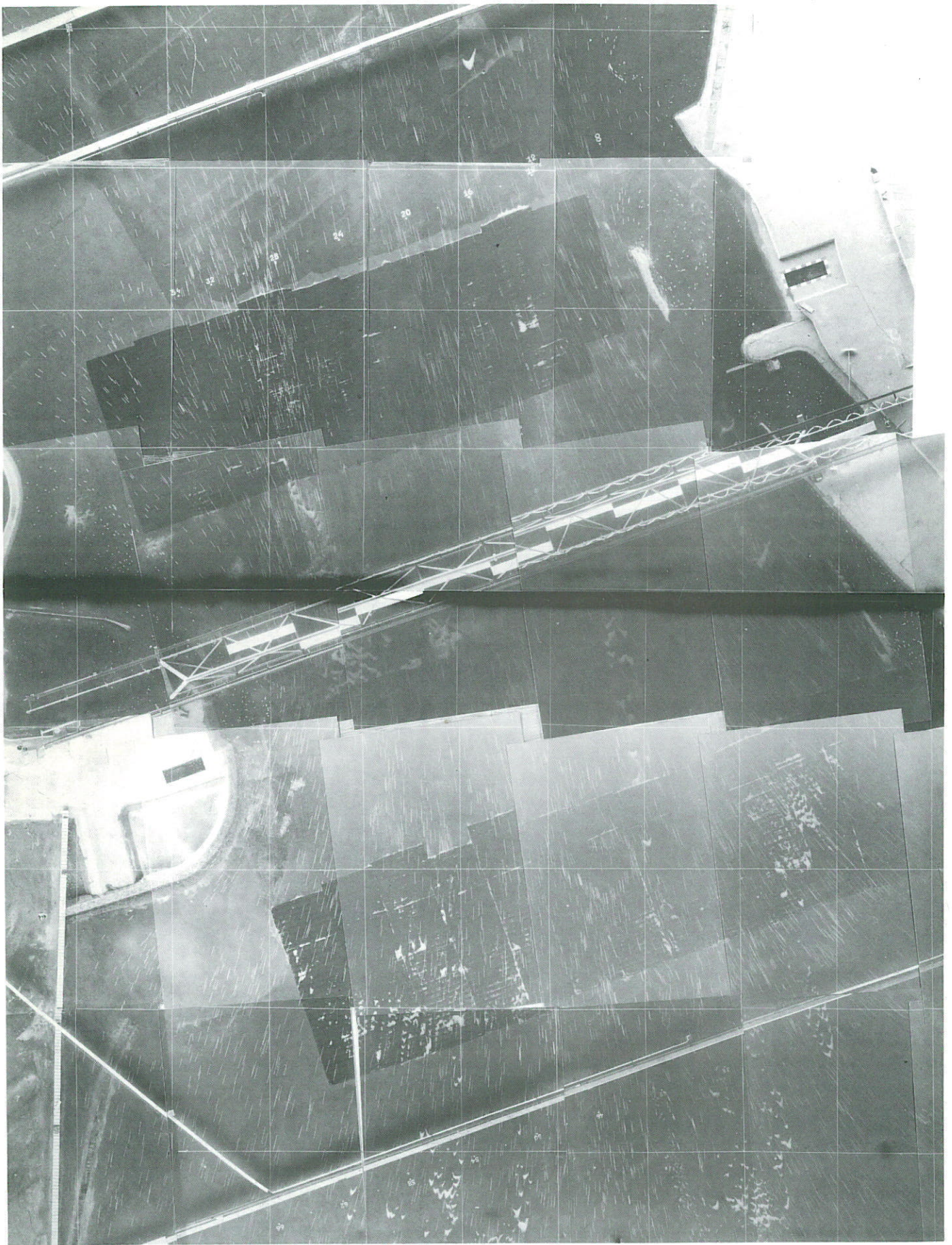
2 Roompot, vloed, kaal sluitgat zonder cunet
 $Q = 61.260 \text{ m}^3/\text{s}$, benedenwaterstand N.A.P. $+1,40 \text{ m}$
schaal 1 : 15.000 1 cm $\hat{=}$ 5,6



3 Roompot, eb, kaal sluitgat met cunet

$Q = 54,443 \text{ m}^3/\text{s}$, benedenwaterstand N.A.P. $-0,20 \text{ m}$

schaal 1 : 15.000 $1 \text{ cm} \hat{=} 5,6 \text{ m/s}$



4 Roompot, vloed, kaal sluitgat met cunet
 $Q = 61.260 \text{ m}^3/\text{s}$, benedenwaterstand N.A.P. + 1,40 m
schaal 1 : 15.000 1 cm $\hat{=}$ 5,6 m/s

