

**The Use and Application of CFD in the Air
Conditioning and Fire Protection Industry**

Case Studies on Displacement Ventilation

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achieving
recognition



Advanced Environmental

What does CFD give us?

- § Specific passive design solutions
- § Risk management for designs with tight tolerance requirements on internal conditions
- § Air change effectiveness calculations
- § Another design tool that fine tuens the performance characteristics by giving more accurate predictions of how design solutions will perform

Introduction

- Two case studies where CFD allowed us to go beyond the ordinary
- Perimeter loads in a retrofitted displacement solution in an office
- Painting zone condition in a gallery requiring AAA conditions



http://www.travelideas.com.au/uploaded_images/melbourne-cbd-ariel-view-748678.jpg

Bay windows in the GBCA Fit-out

- § High solar load in the bay windows on the east perimeter
- § Retrofitted displacement solution with a raised floor
- § Design solution to **exhaust** the load, not **condition** the load
- § Light shelf solution that channels hot air into a perimeter bulk head passively, from which it is exhausted



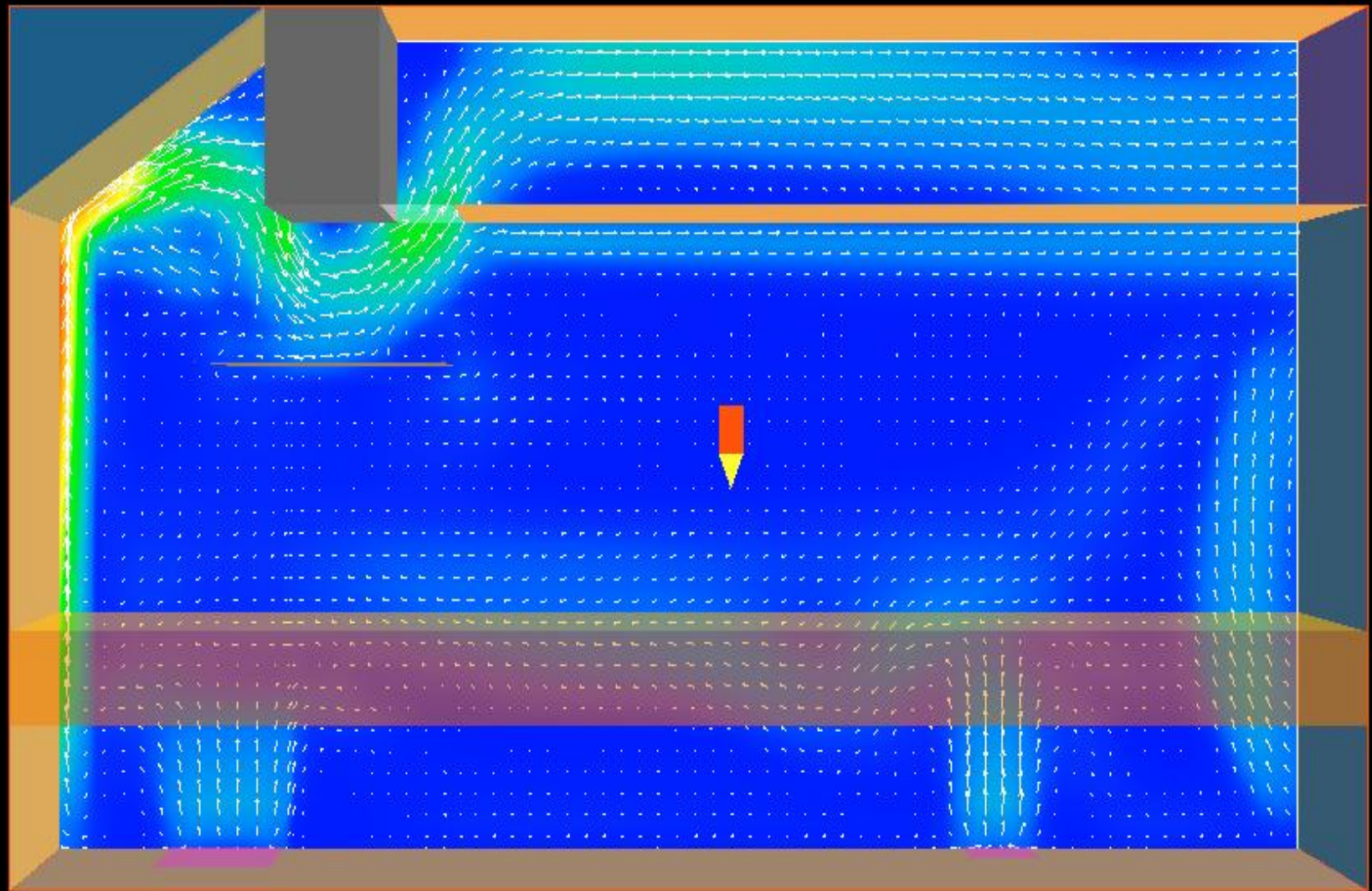
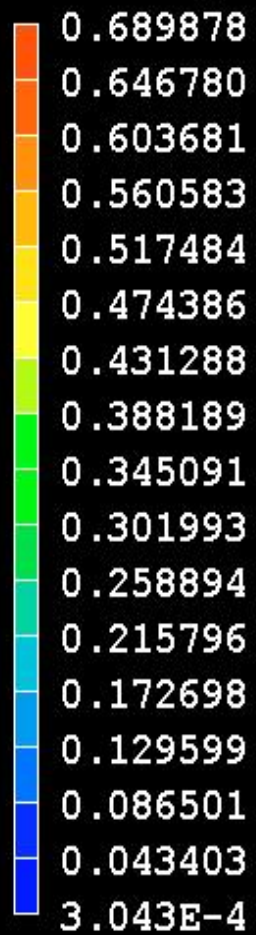
Velocity, m/s

Probe value

0.019385

Average value

0.074521



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GBCA perimeter

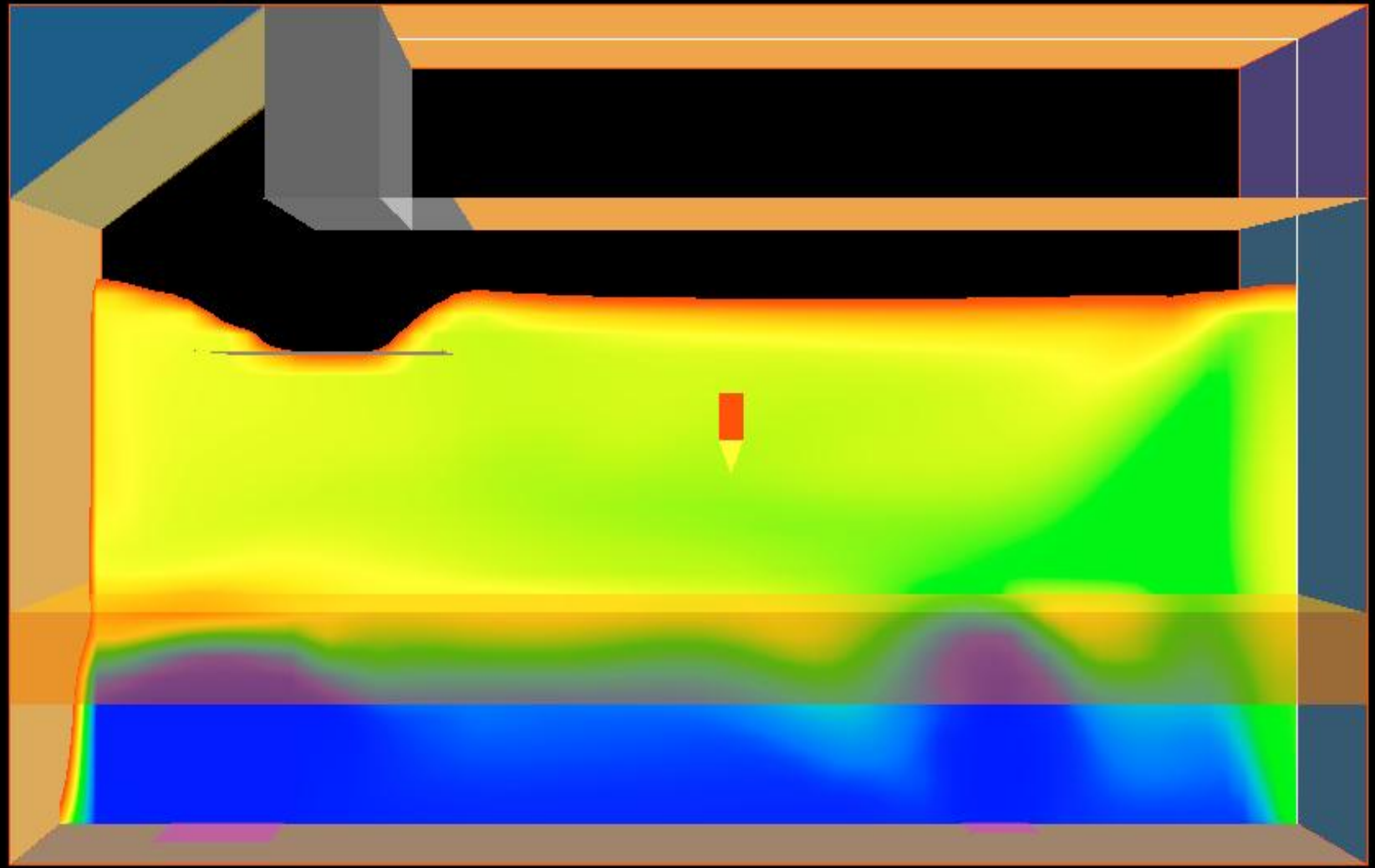
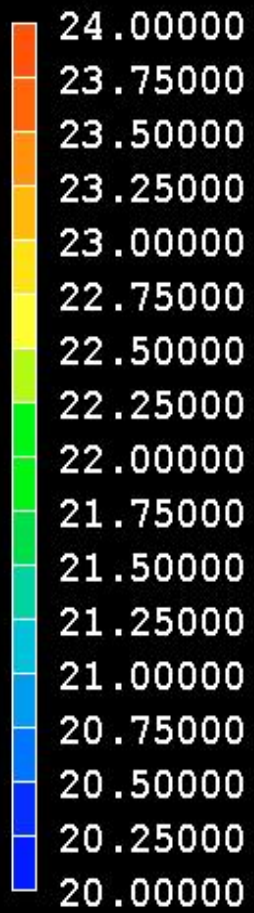
Temperature, °C

Probe value

22.38158

Average value

23.98785



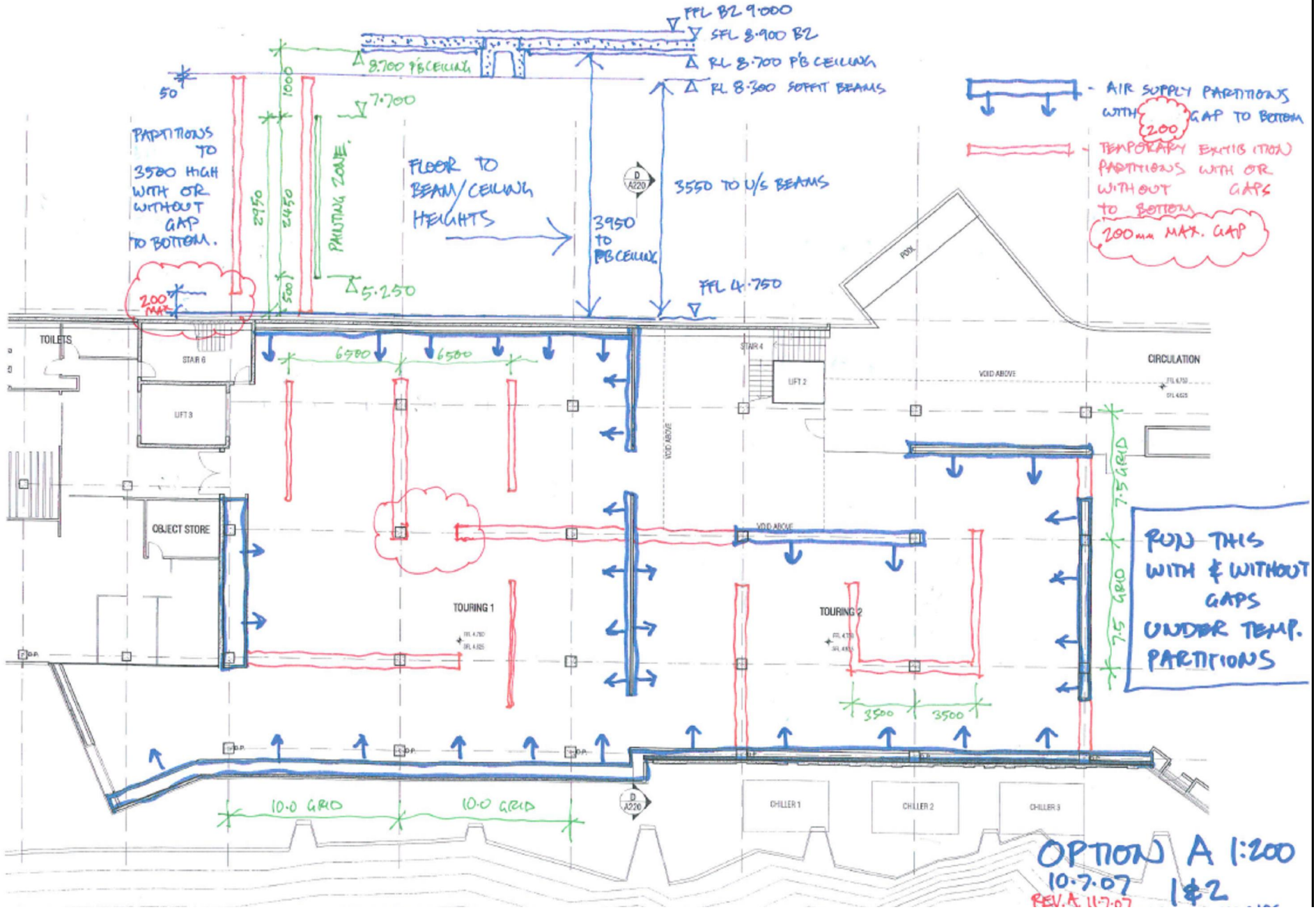
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GBCA perimeter

Moorilla Art Gallery

- § Private gallery in Tasmania
- § International touring gallery requiring AAA conditions
 - Temp difference 2°C across the painting zone
 - Restriction of air velocities to less than 0.35 m/s
- § Displacement Ventilation, with different supply options





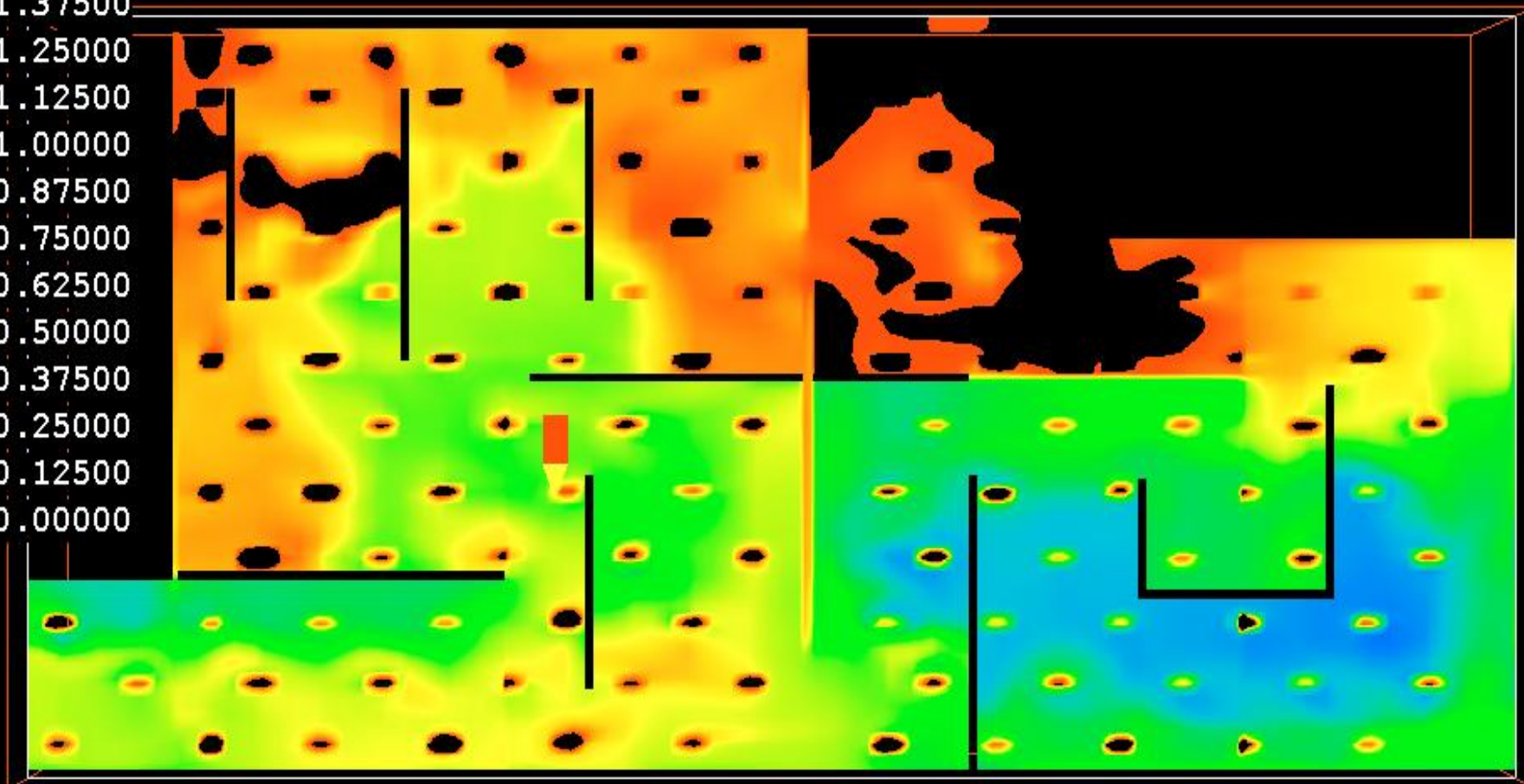
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Temperature, °C

Probe value

22.00000
21.87500
21.75000
21.62500
21.50000
21.37500
21.25000
21.12500
21.00000
20.87500
20.75000
20.62500
20.50000
20.37500
20.25000
20.12500
20.00000

21.22116
Average value
21.77536



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Moorilla Touring

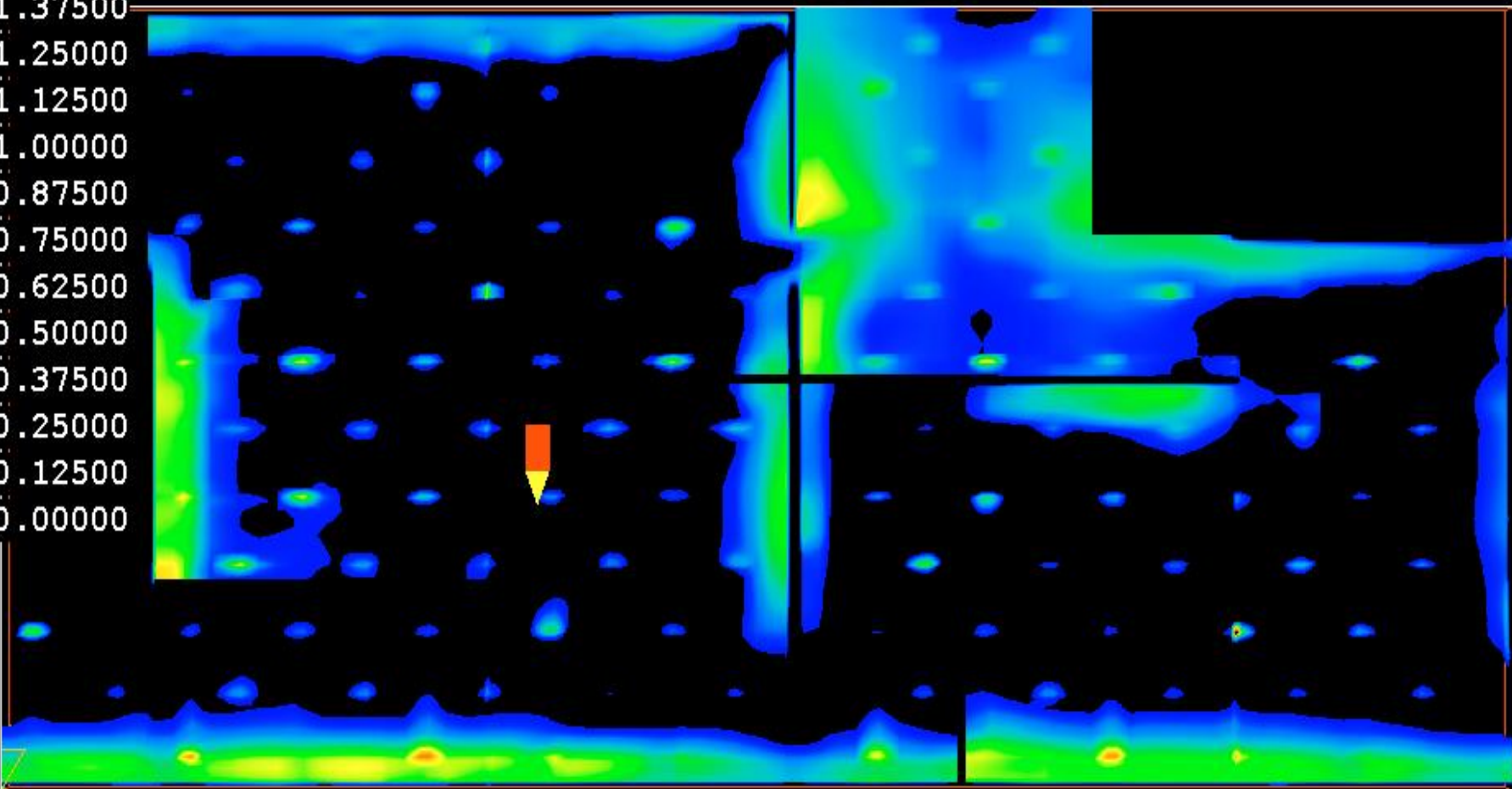
Temperature, °C

Probe value

19.87261

Average value

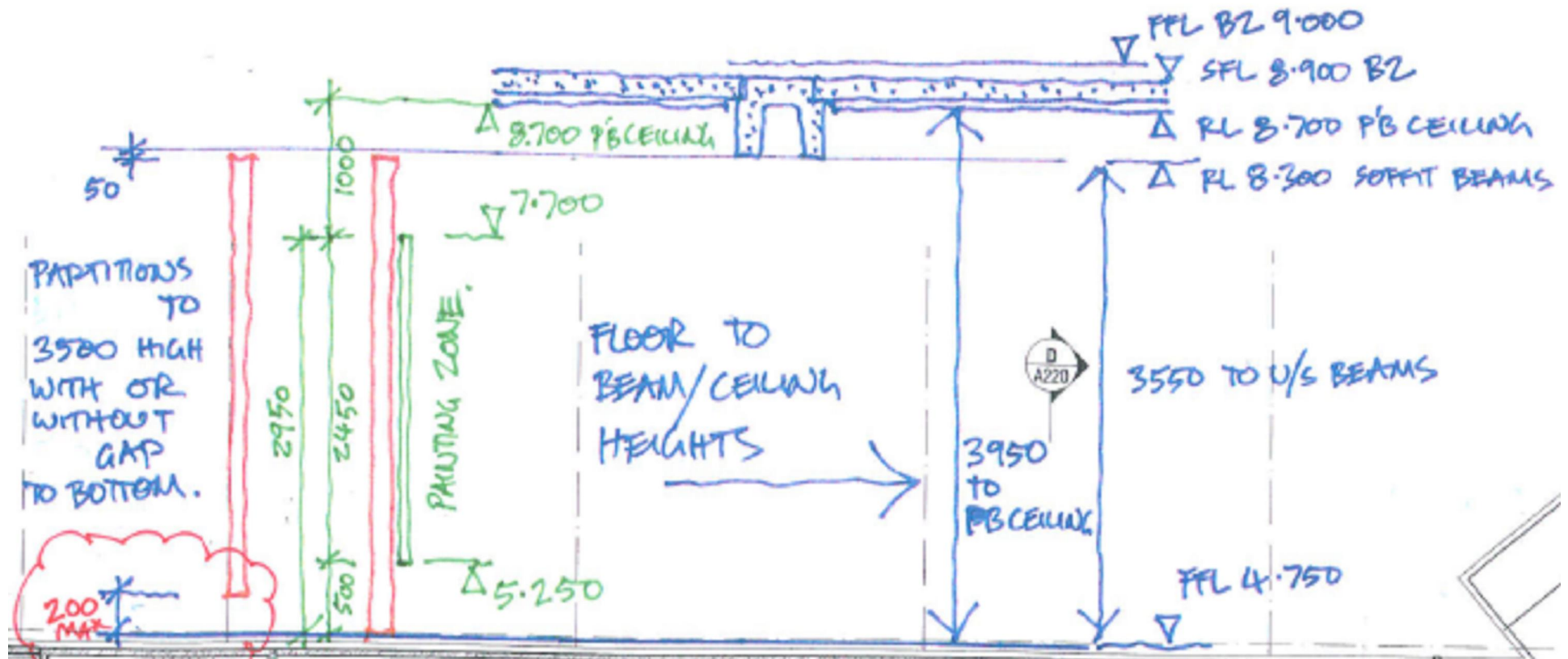
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Moorilla Touring

Section



Temperature, °C

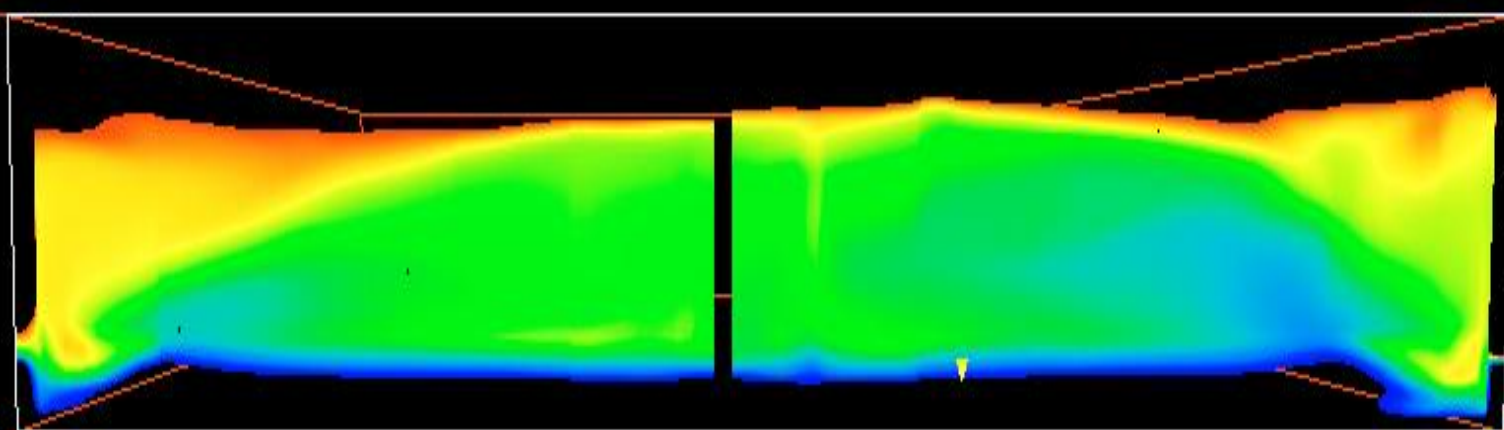


Probe value

19.81397

Average value

22.54908



Results

	Average Temperature at bottom of painting zone	Average Temperature at top of painting zone	Average Temperature across painting zone	Maximum Velocity 100mm above the floor
	° C	° C	° C	m/s
Option A-1	20.02	21.62	1.6	0.34
Option A-2	19.96	21.59	1.63	0.34
Option A-1-1	20.04	21.77	1.73	0.35

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