

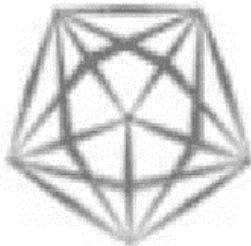


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# AIR POLLUTION ABATEMENT WITH INNOVATIVE PHOTOCATALYTIC COVERING TECHNIQUES

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ATREUS





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# Introduction

- ❑ In urban areas the levels of gaseous pollutants are relatively high due to increased emissions.
- ❑ The problem is particularly intense especially in urban hotspots like street canyons.
- ❑ Pollution has a negative effect on human health and results in the aesthetic degradation of the urban environment.

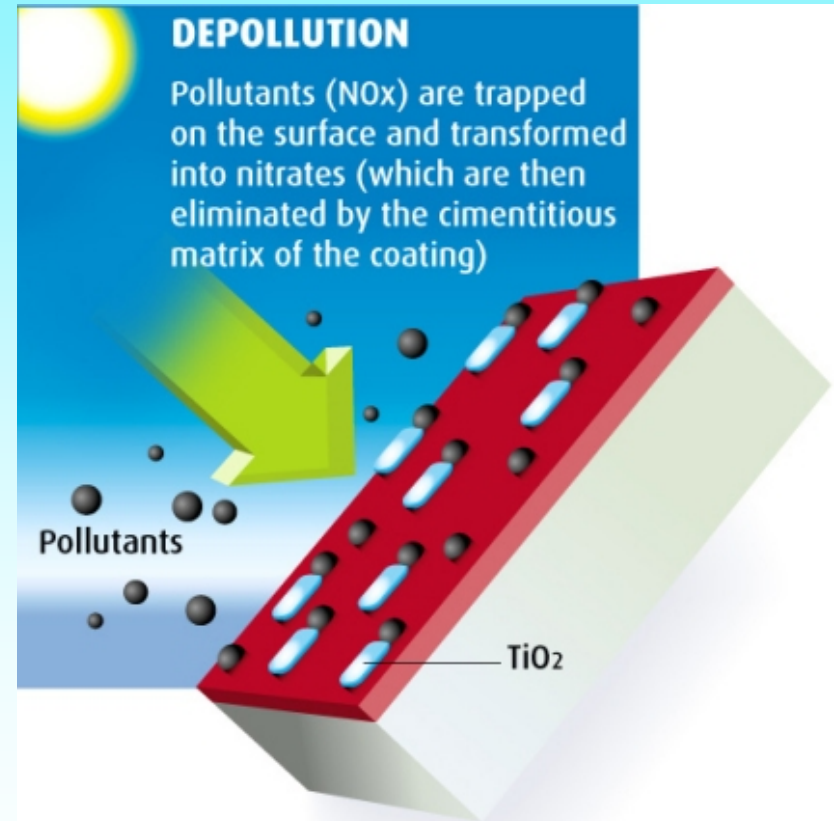


# Photocatalytic Innovative Coverings (1/4)

## Depollution

The addition of  $\text{TiO}_2$  into the façade coverings results into increased pollutant absorption:

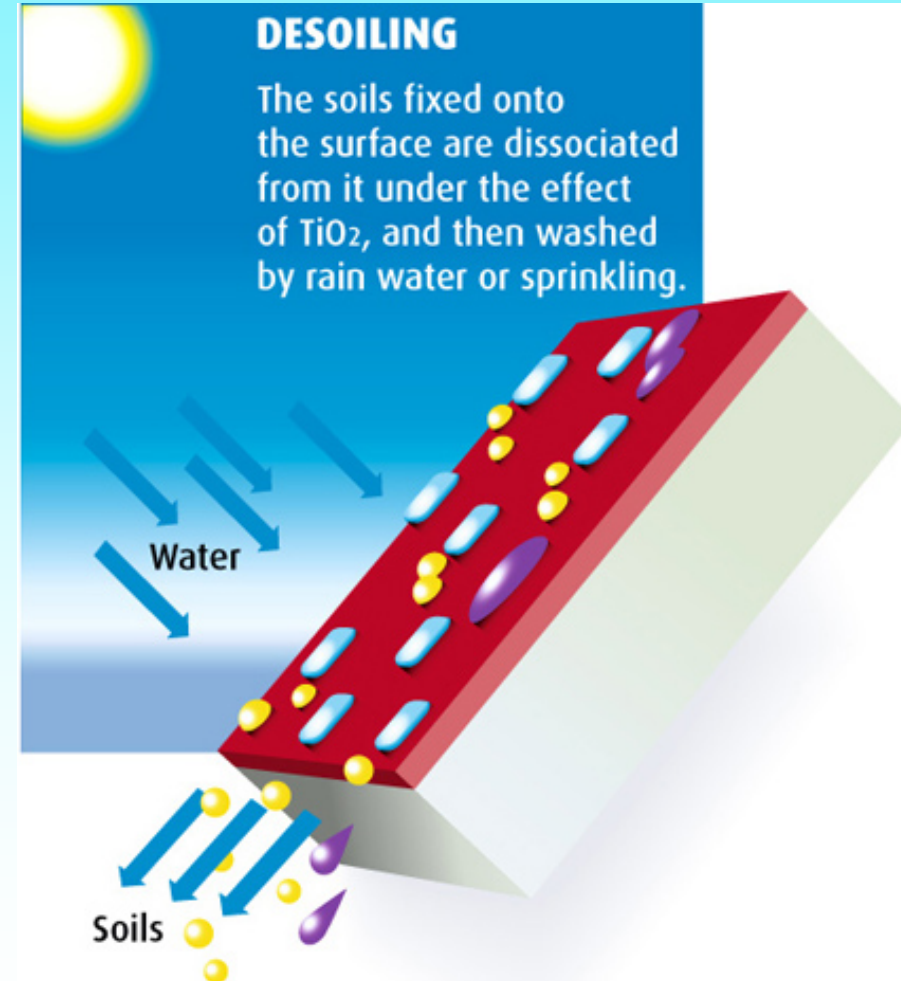
- $\text{NO}_x$
- VOC's
- PM
- $\text{O}_3$



## Desoiling

The surface will keep clean from urban classical soiling factors

- Bacteria
- Algae
- Organic compounds





# Photocatalytic Innovative Coverings (3/4)

PICADA led to 3 different products: a mortar, a cementitious coating and a translucent coating.

Experimental application of the products:

- ❑ Conclusion regarding the correct method of application.
- ❑ Quality assurance plan.





# Photocatalytic Innovative Coverings (4/4)

## Our contributions to PICADA

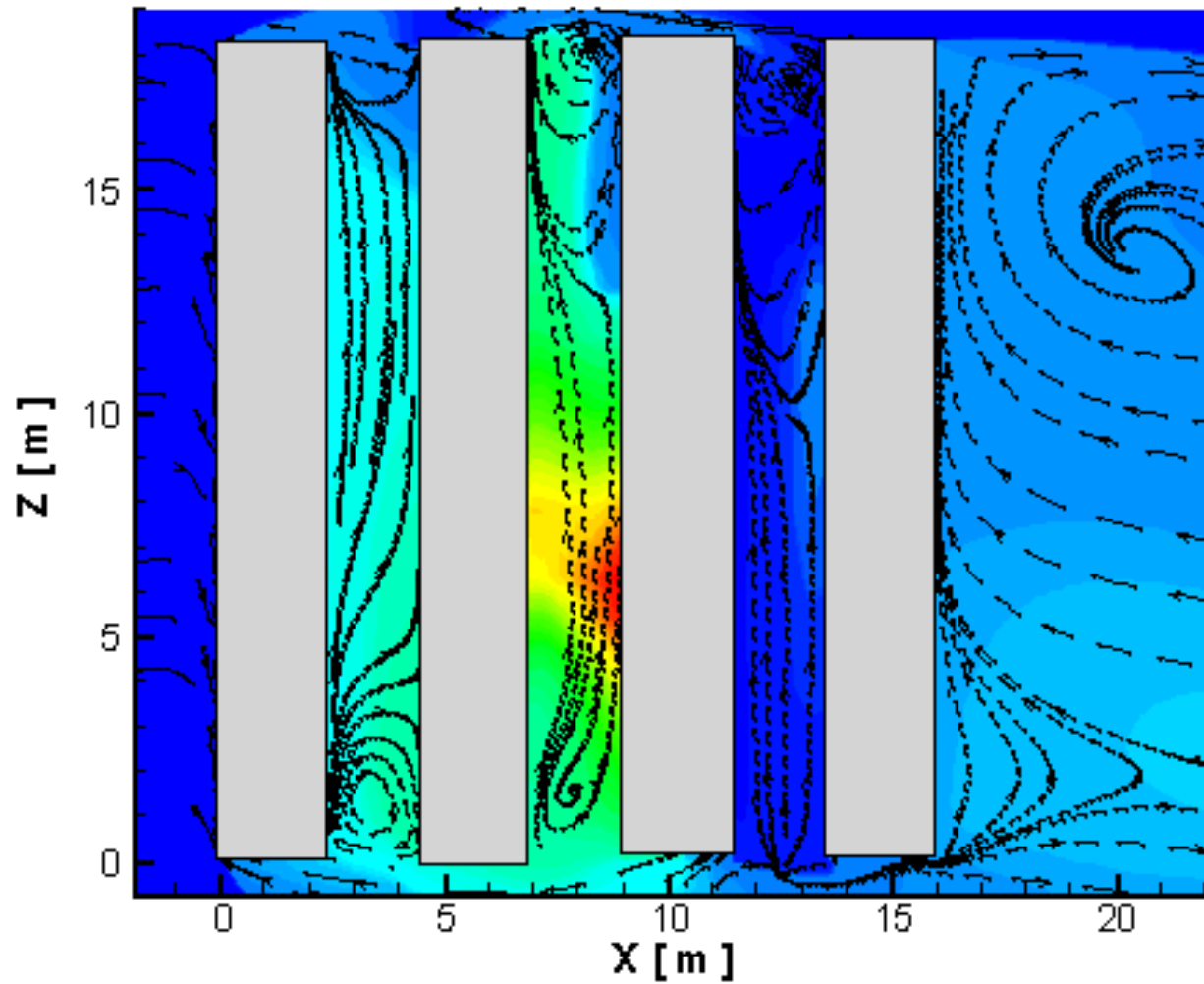
The Laboratory of Heat Transfer and Environmental Engineering was responsible for assessing the depollution potential of the PICADA products via:

- ❑ The participation in international coordinated experimental activities including
  - in situ measurements in field campaigns and
  - laboratory activities (physical modelling with the use of wind tunnel measurements).
- ❑ Numerical simulations with the CFD code MIMO.



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# Numerical simulations

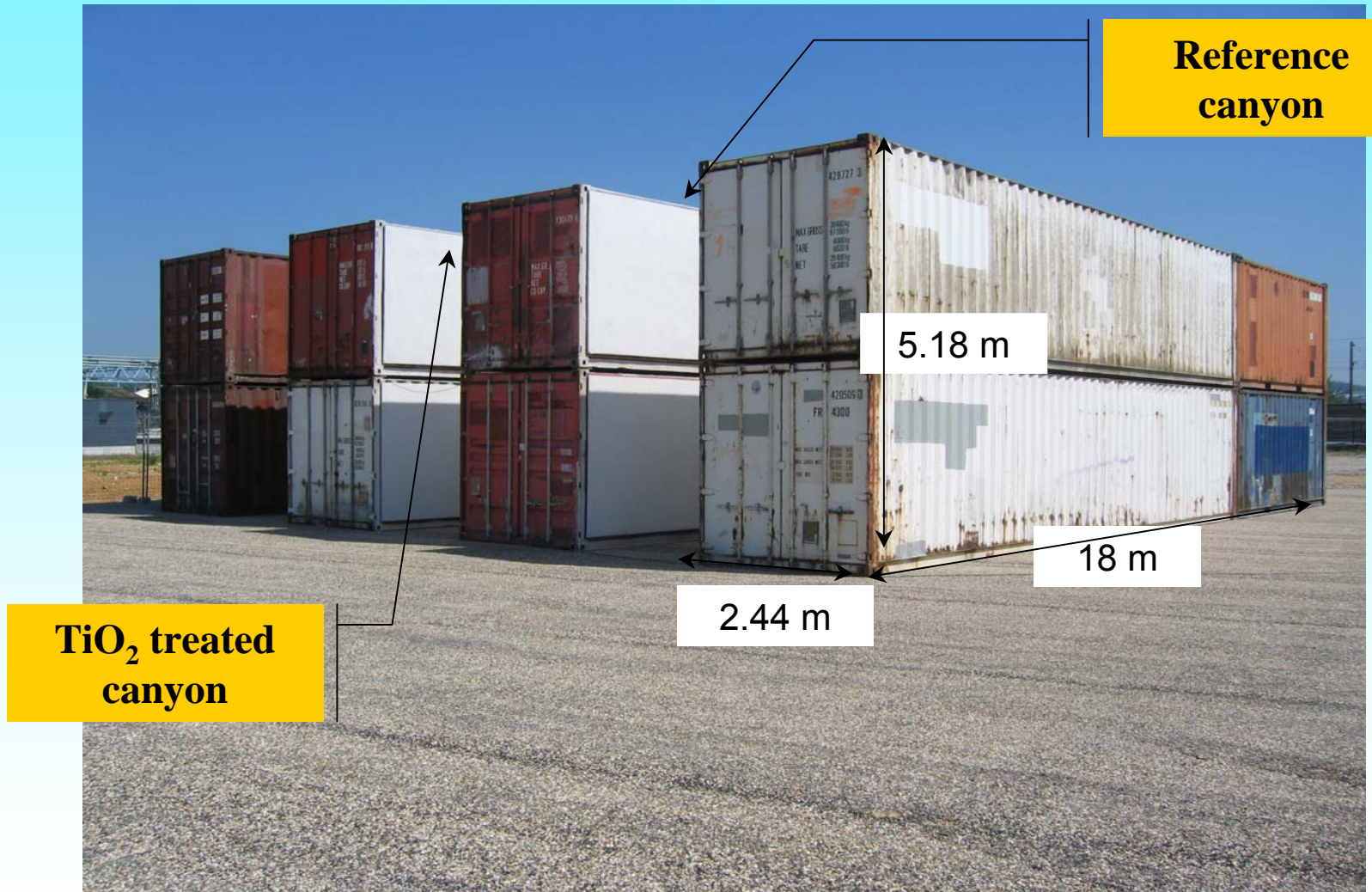






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# Guerville experimental field campaign (1/2)





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# Guerville experimental field campaign (2/2)



- ❑ The photocatalytic surface is an effective “trap” for air pollutants.
- ❑ The use of the specific sample led to a pollution reduction by 50-60 %.
- ❑ Numerical simulation results agree very well with the experimental measurements

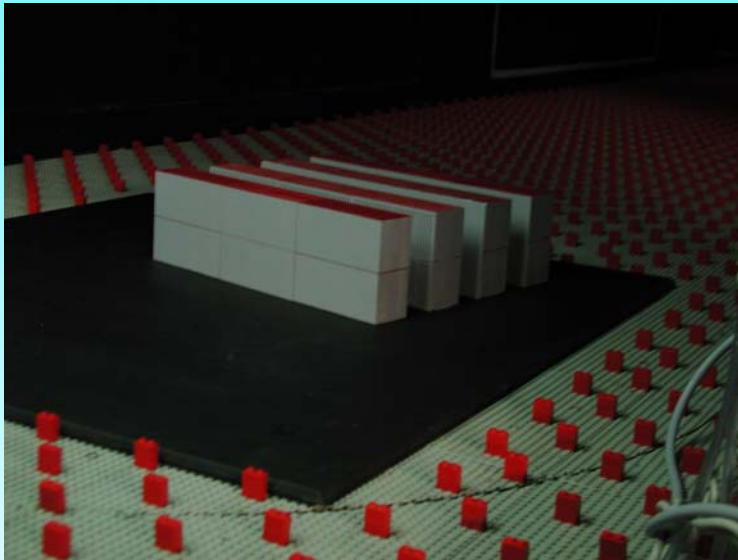


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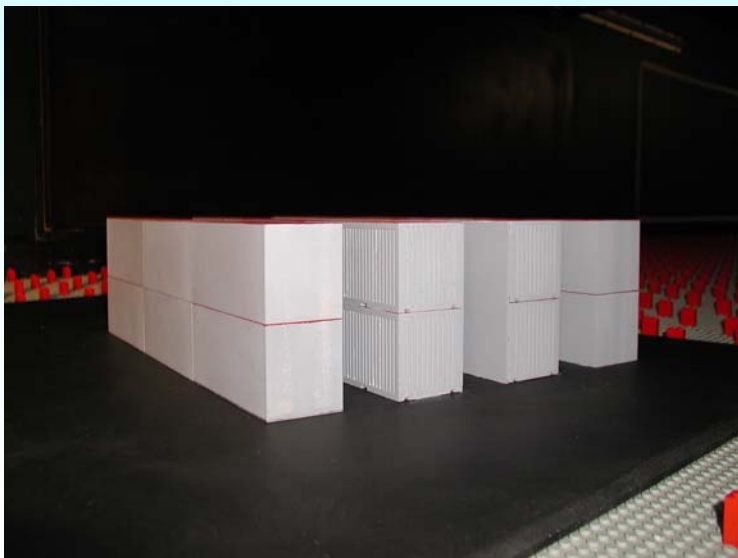
# Wind tunnel campaign (1/2)

## Field site model (scale 1/50)

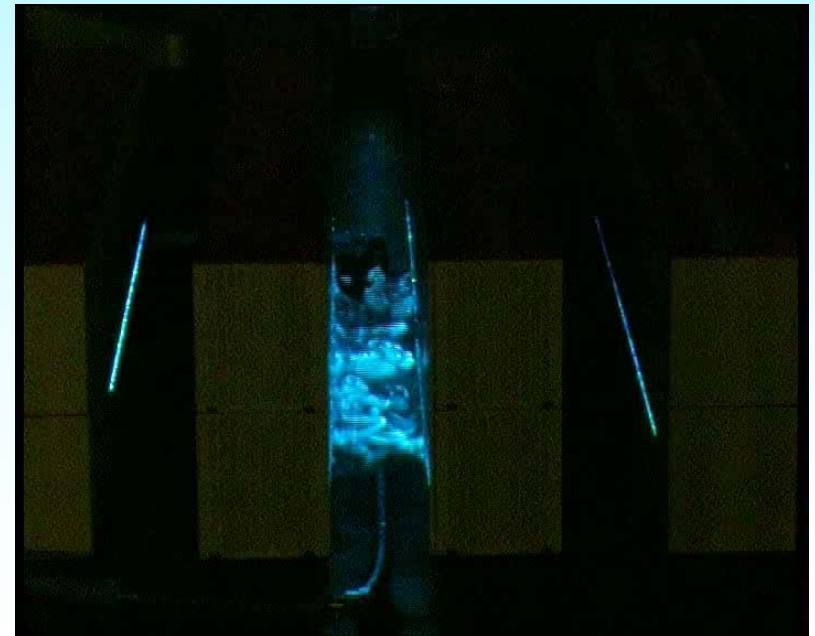
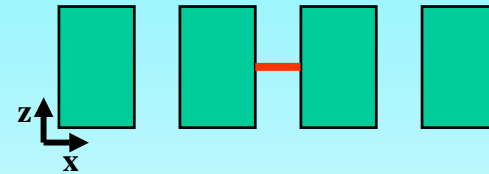
Downstream



Side 1



Horizontal plane,  $Z = 0.5H$





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# Wind tunnel campaign (2/2)

## Conclusions

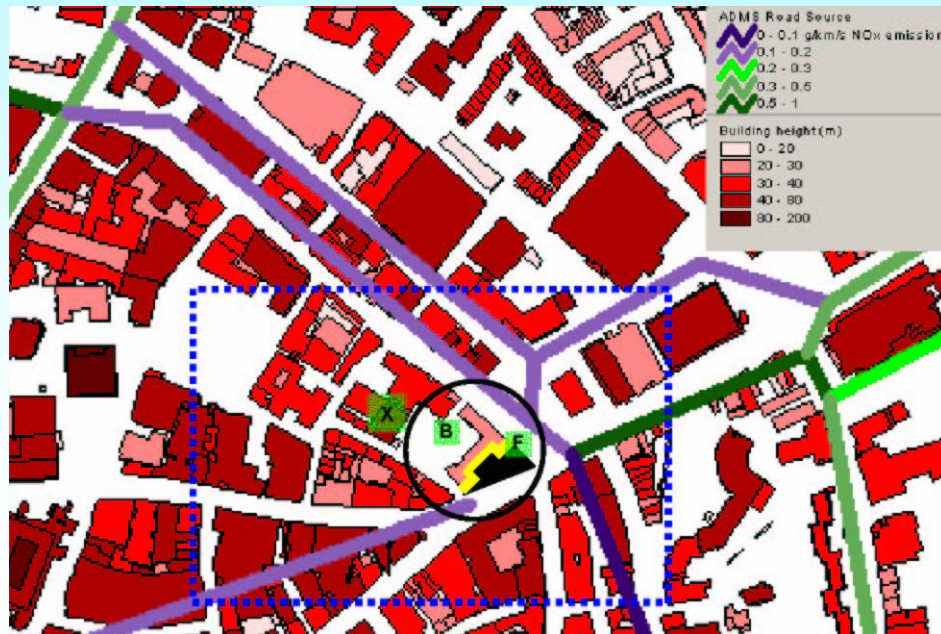
- WD 90°: Pollution accumulated at the mid cross section; at even small deviations from WD 90°, flushing via one canyon side is enforced.
- Concentrations highest at the low levels.
- For WD 90°, street canyon ventilated mainly via the roof top.
- The wind tunnel measurements prove the validity of the numerical model results.



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# Application examples (1/2)

## Sir John Cass Primary School, London

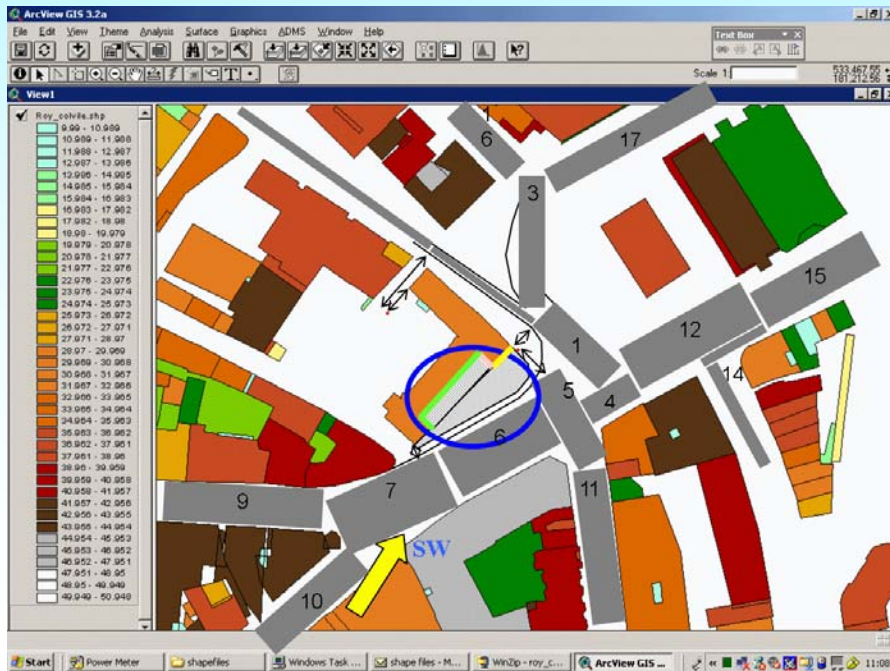
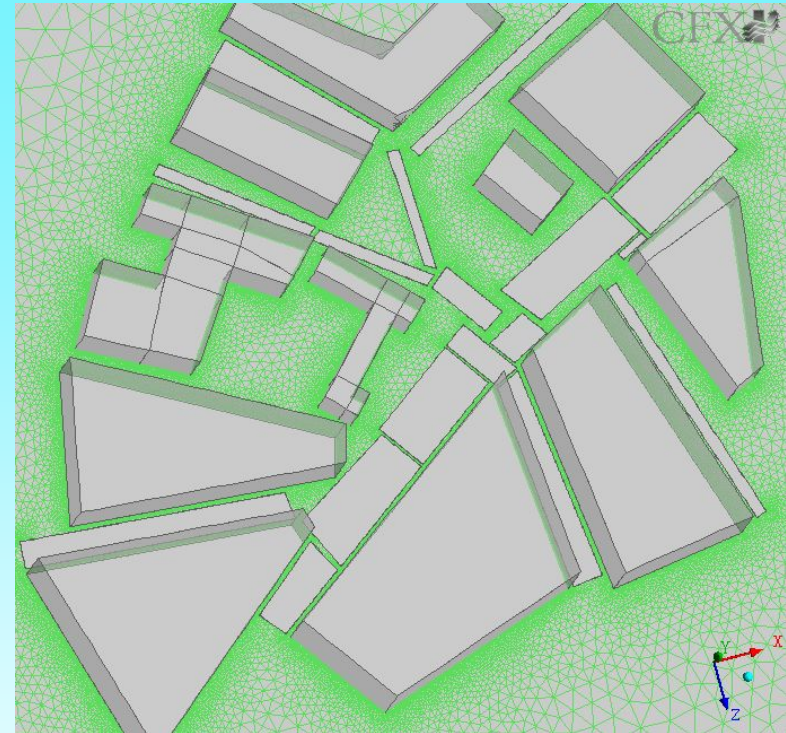
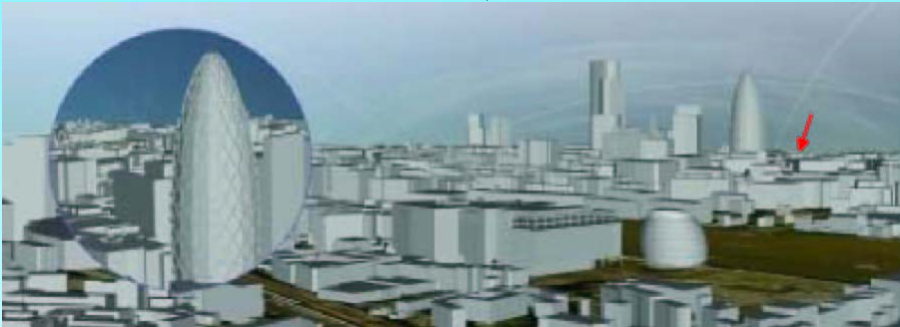




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# Application examples (1/2)

## Sir John Cass School, London





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# Application examples (2/2)

## Road Tunnel in Rome

