Simulation of Compaction in Asphaltic Mixtures,

Part I: Gyratory Compactor

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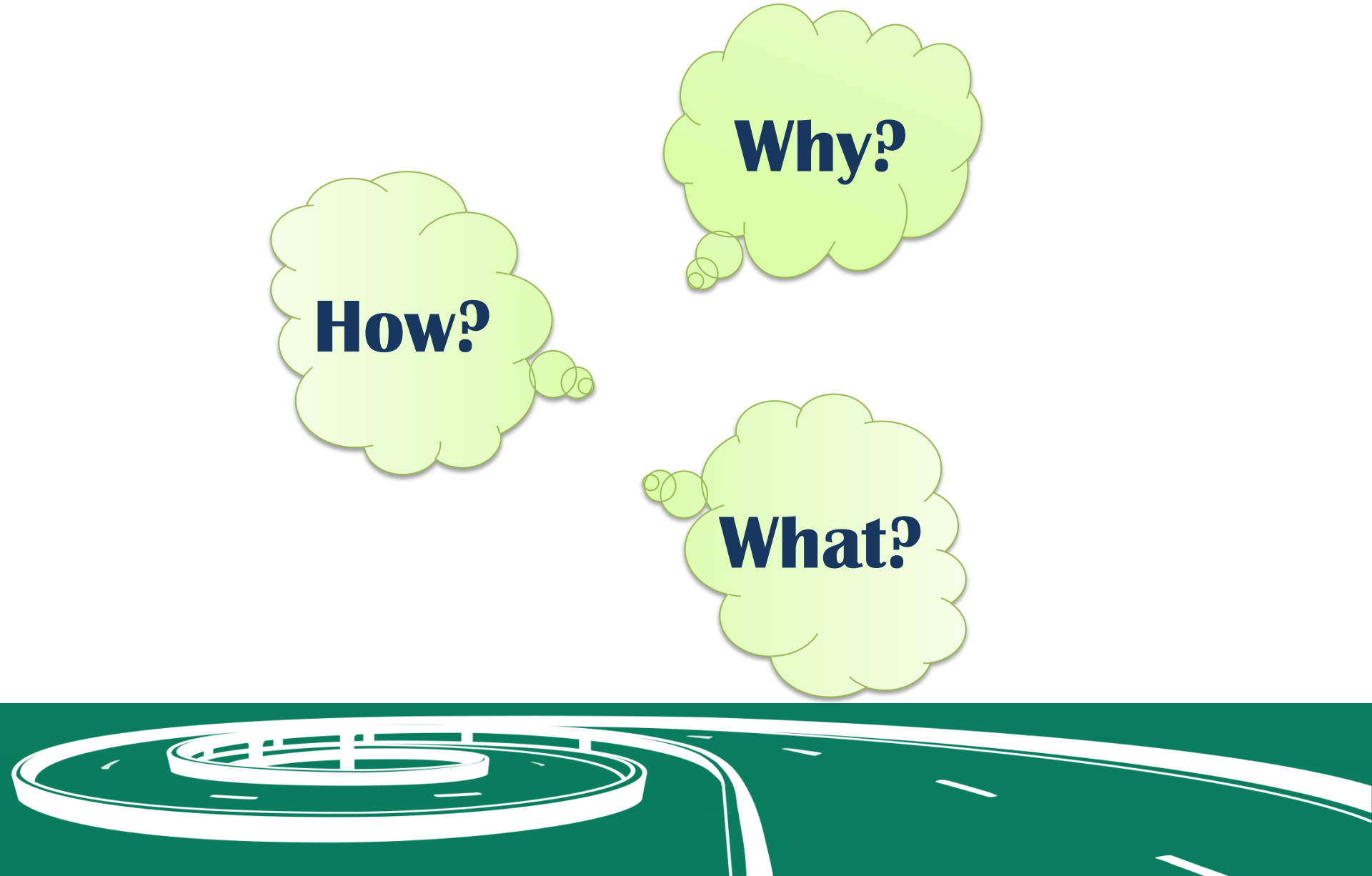


Why?

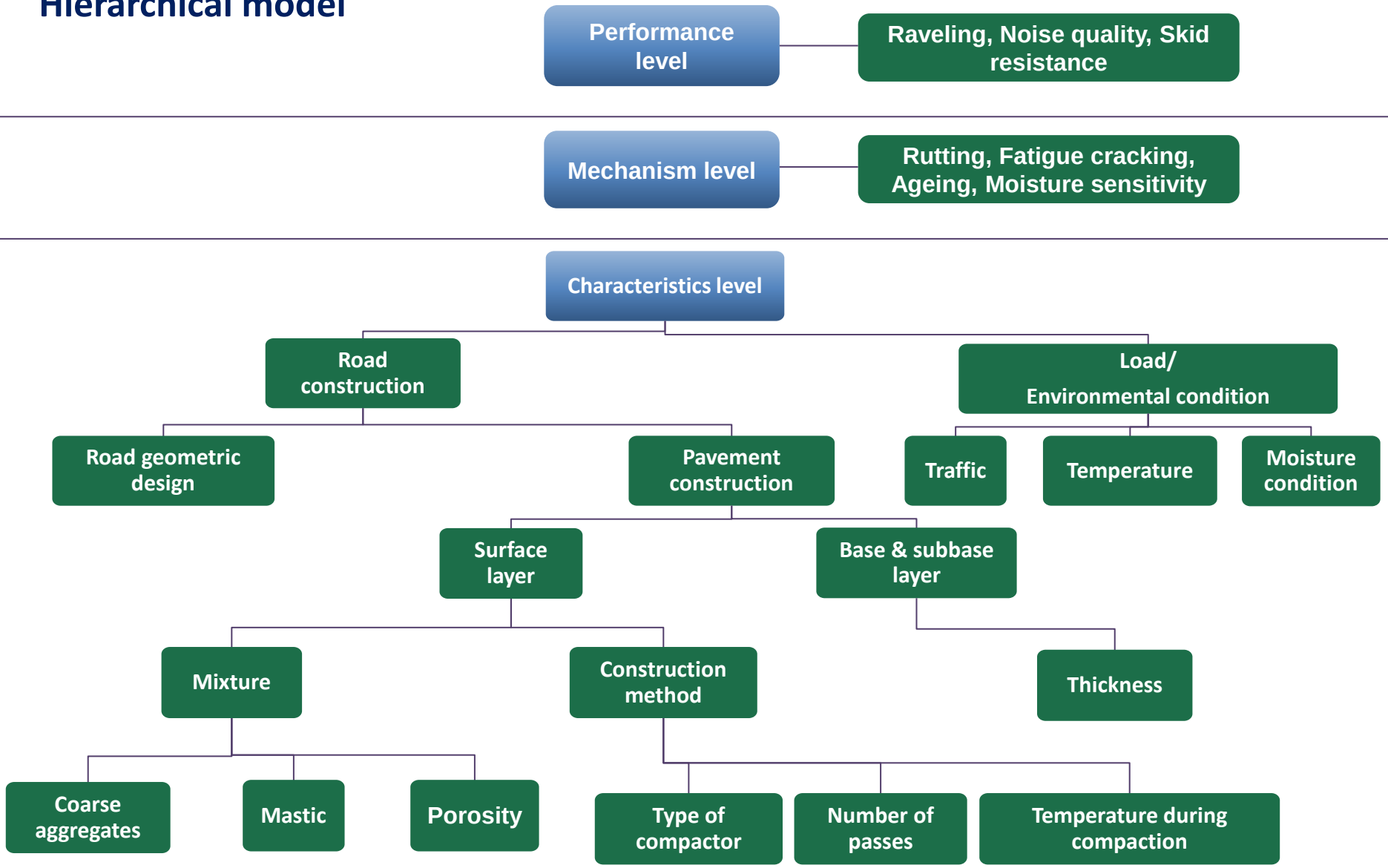
- ✓ Modernize manufacturing, mobility and logistic
- ✓ Use energy efficiently

Smart infrastructure

- ✓ Innovative strategies
- ✓ Design
- ✓ Construction
- ✓ Maintenance
- ✓ Renovation

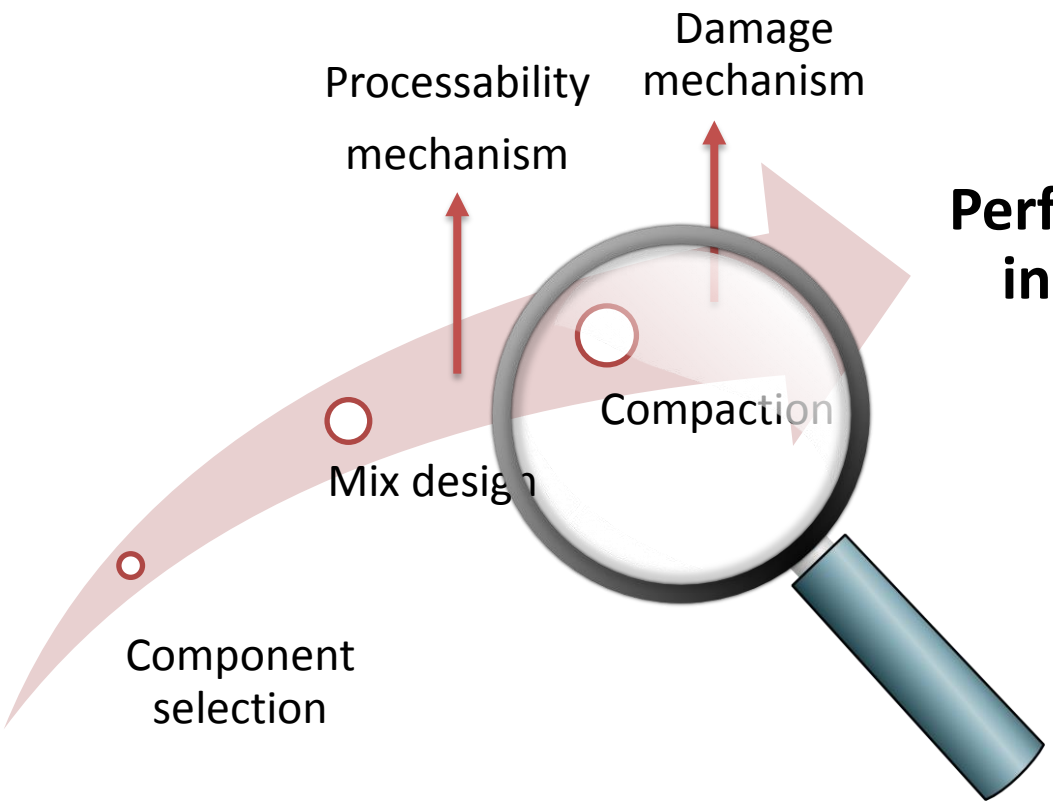
How?

Hierarchical model



How?

Durable, Safe and Accessible road

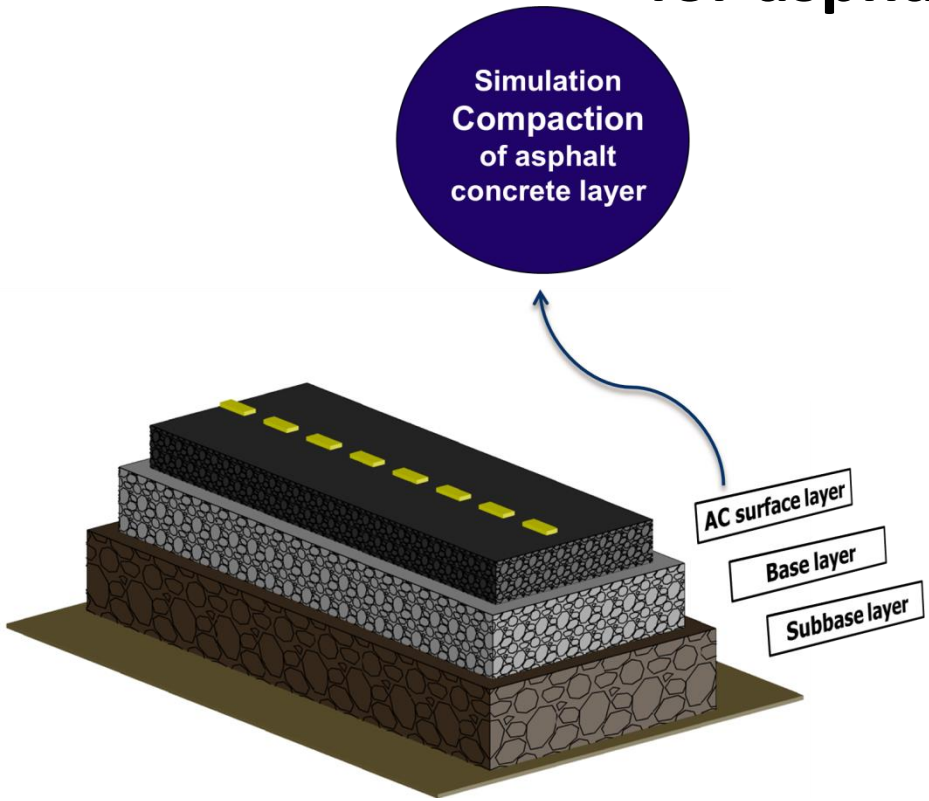


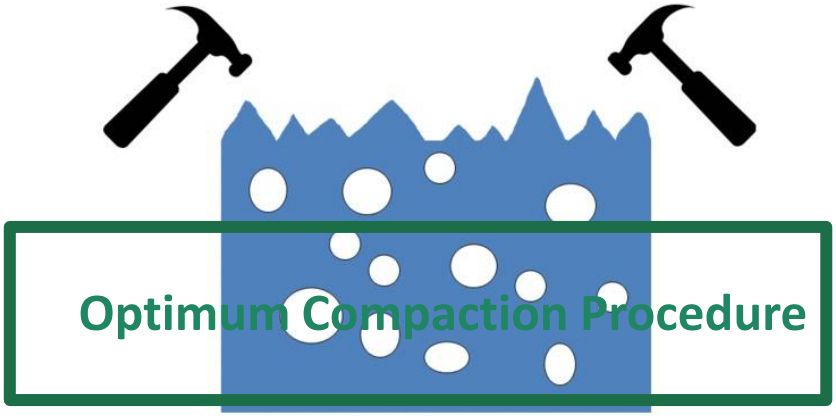
Performance indicator

- **Ravelling**
- **Skid resistance**
- **Noise quality**

How?

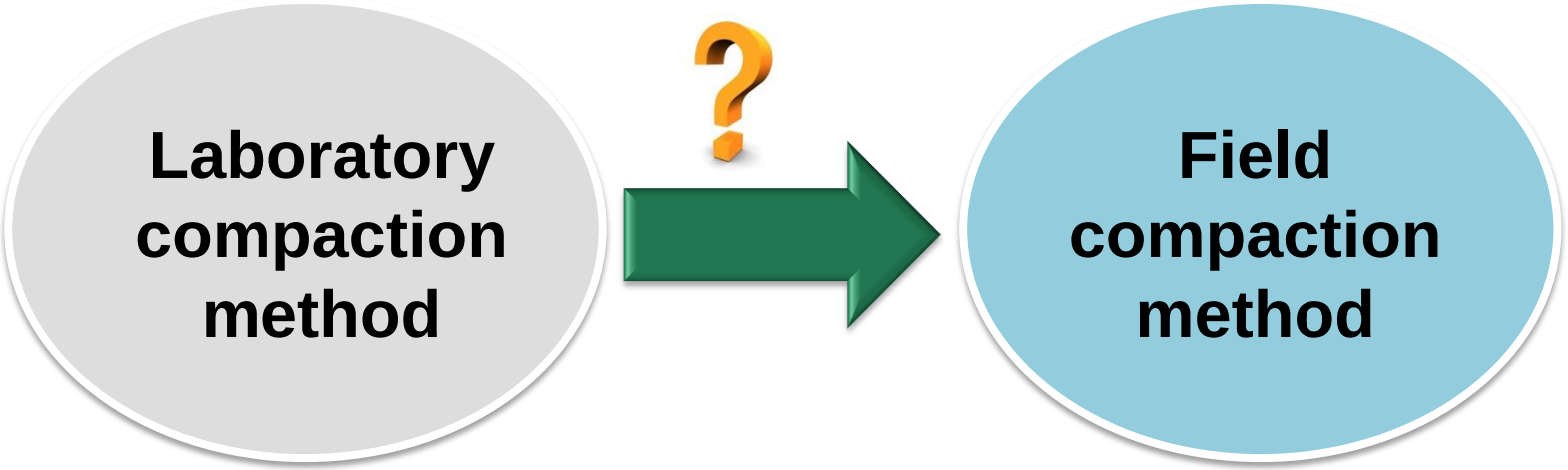
Developing a compaction model for asphaltic mixtures





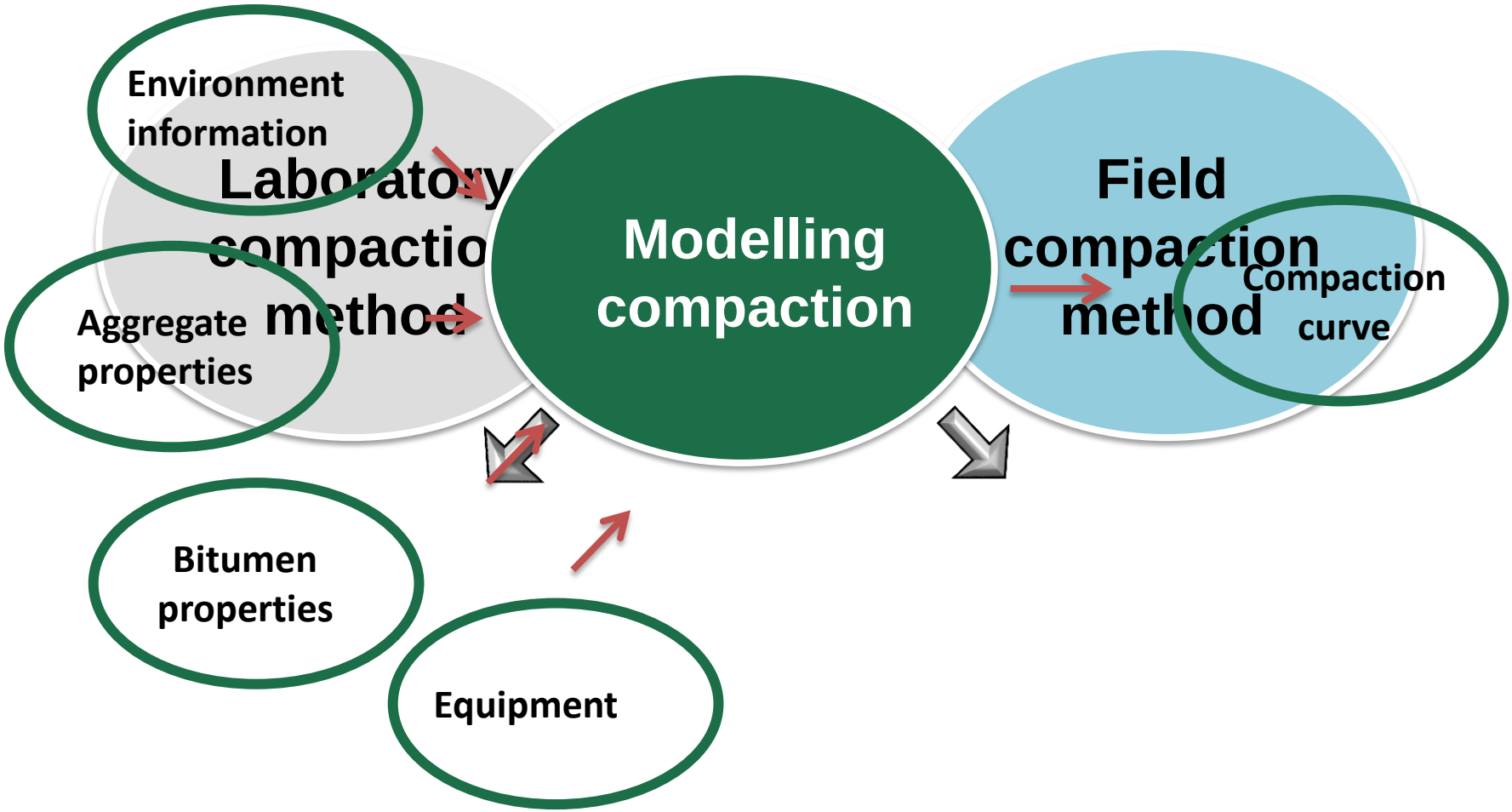
How?

Methods of compaction in laboratory



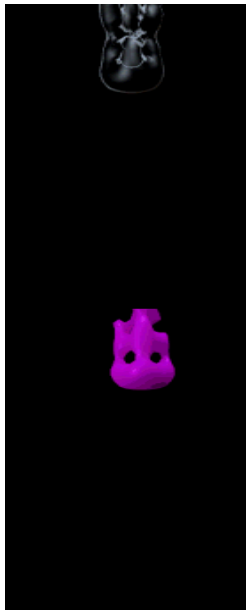
How?

Methods of measuring compaction



How? Important parameters in compaction

1. Composition of asphalt mixture (characteristic level)

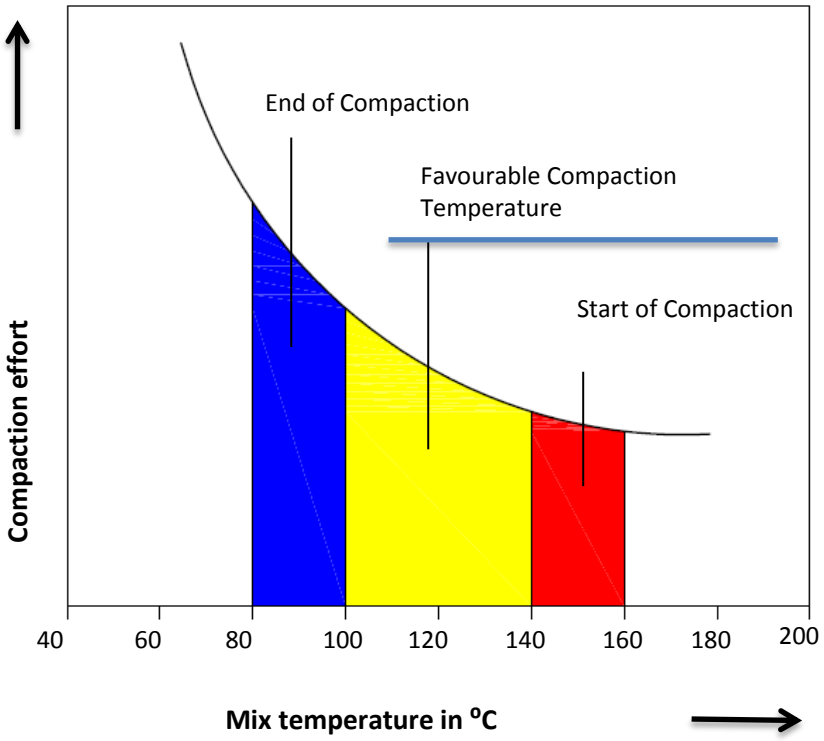


- Mixture with high volume of natural sand and soft bitumen

- Mixture with high volume of crushed aggregates and stiff bitumen

How? Important parameters in compaction

2. Temperature (characteristic level)



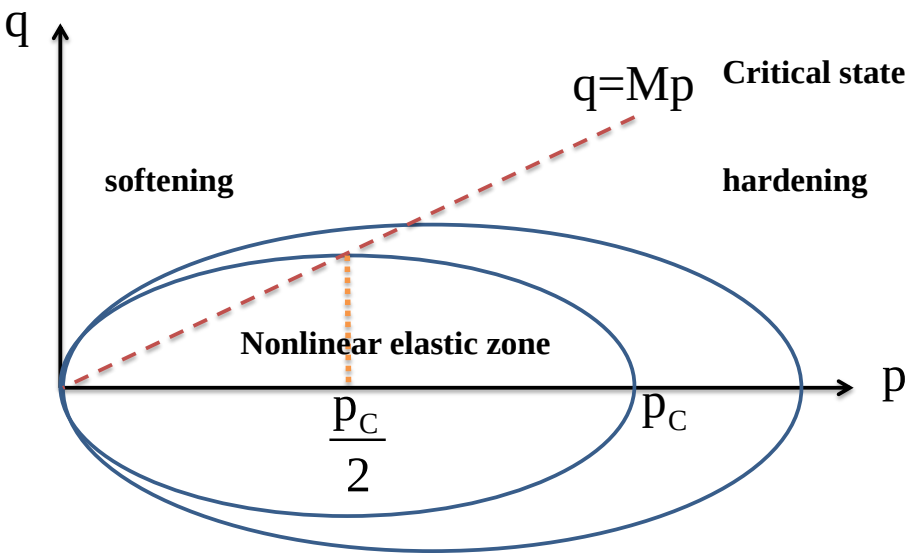
- ✓ Initial mixture temperature
- ✓ Base temperature
- ✓ Air temperature
- ✓ Wind speed
- ✓ Layer thickness

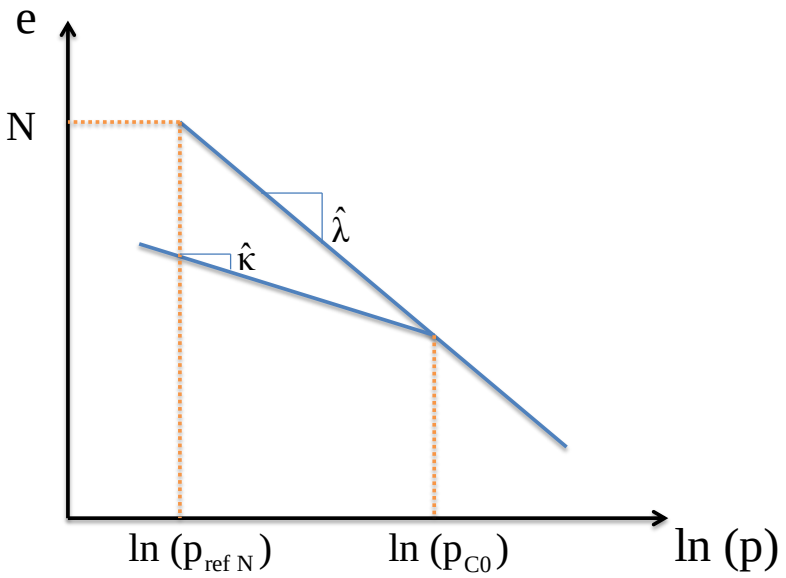
How? Important parameters in compaction

3. Type and magnitude of applied load (Characteristic level)

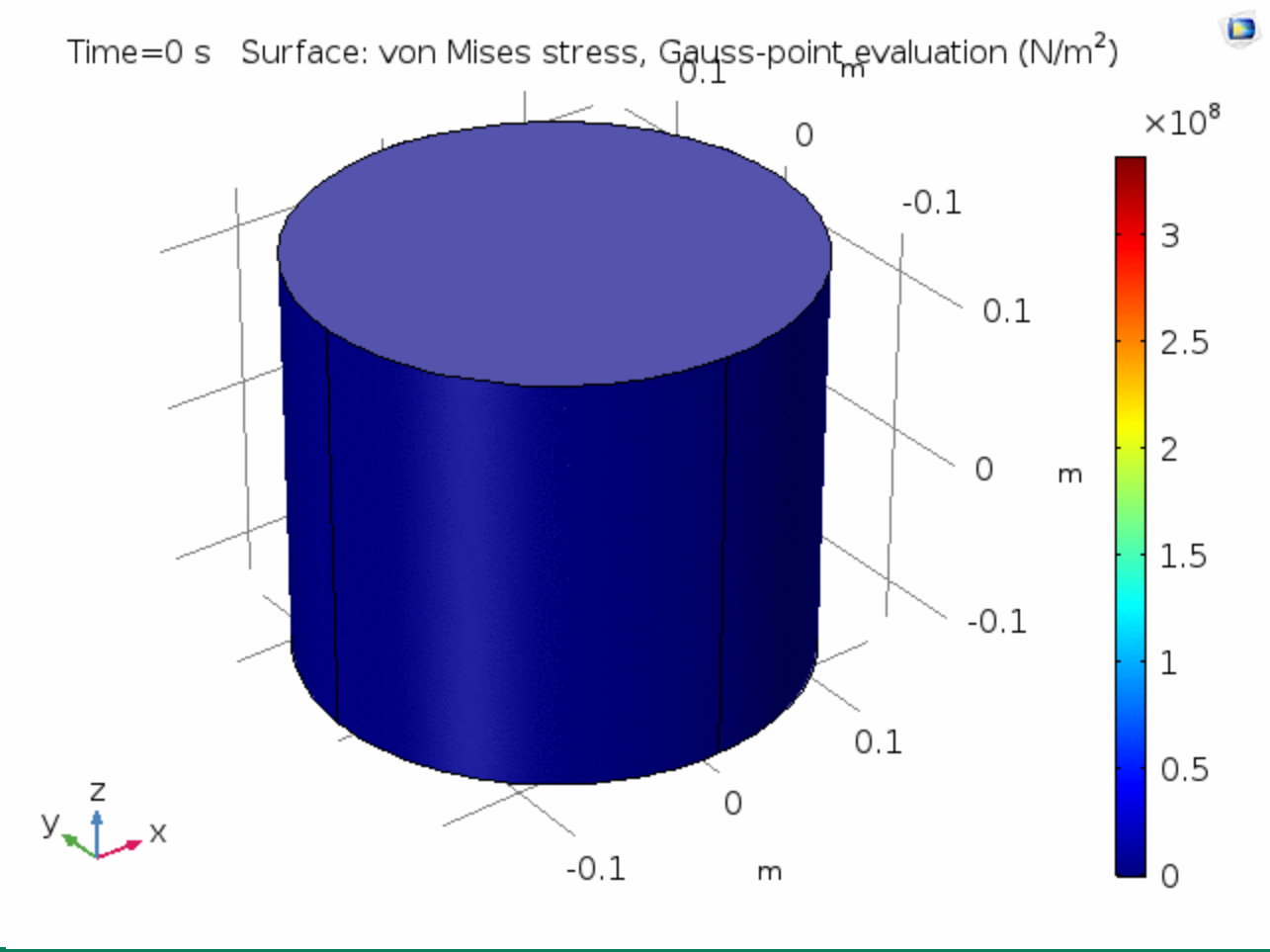
- ✓ Static compaction
  - ✓ Tandem rollers
  - ✓ Pneumatic tired rollers
- ✓ Vibratory compaction

How?

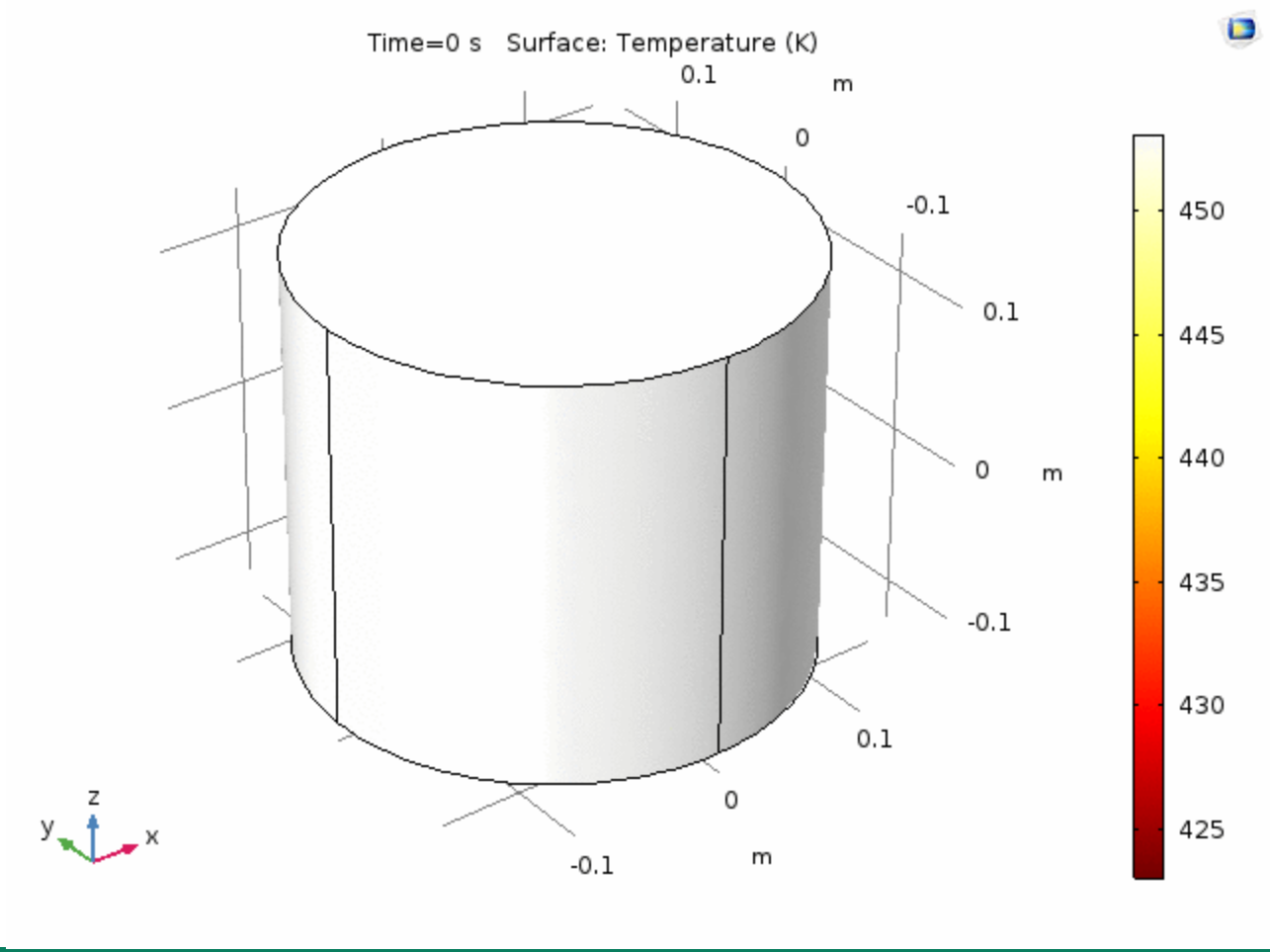

q
q=Mp
Critical state line
softening
hardening
Nonlinear elastic zone
p
$\frac{p_C}{2}$
p_C


e
N
$\hat{\lambda}$
$\hat{\kappa}$
ln ($p_{ref\ N}$)
ln (p_{C0})
ln (p)

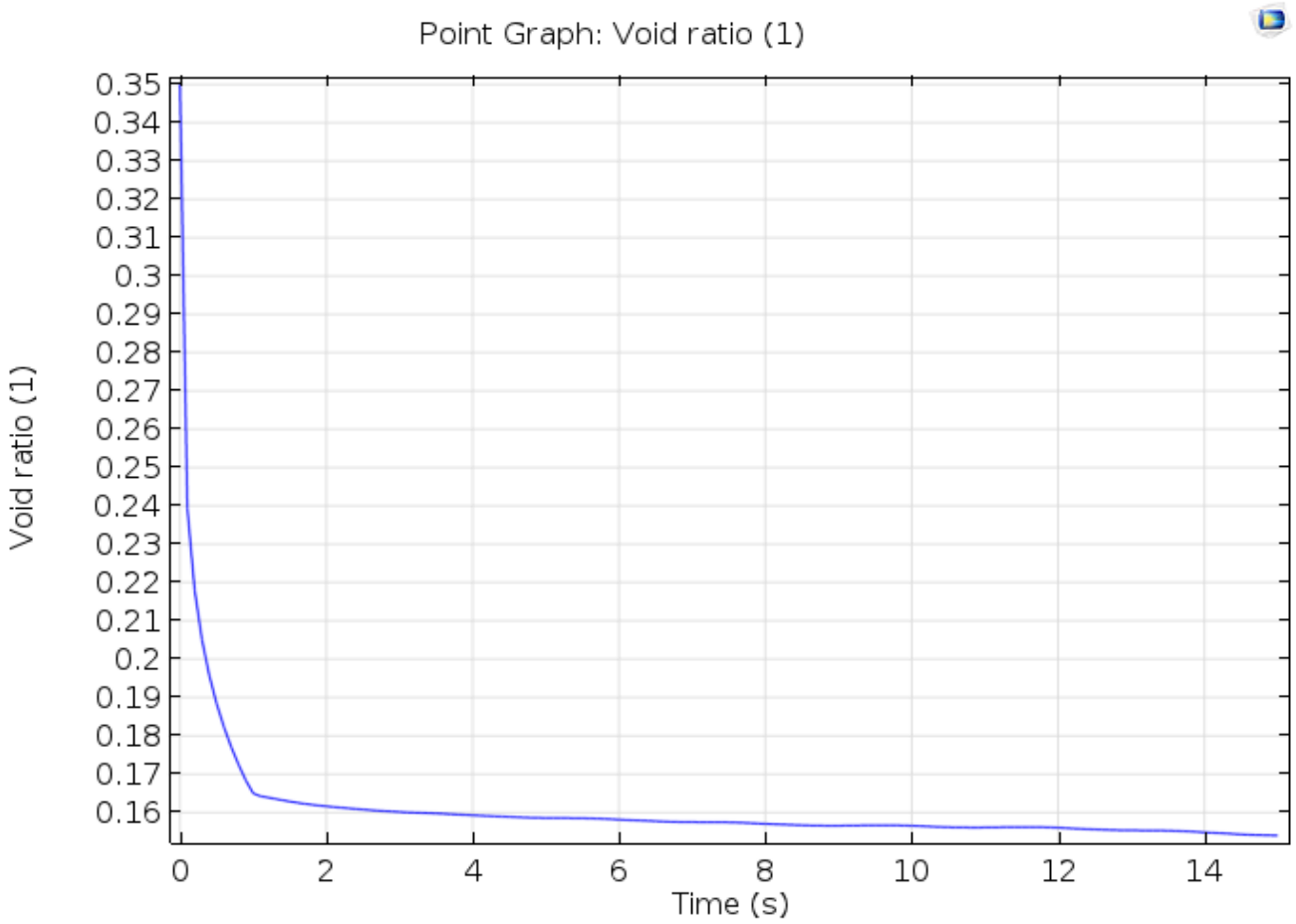
What?


Time=0 s Surface: von Mises stress, Gauss-point evaluation (N/m²)
0.1
m
0
-0.1
0.1
0
-0.1
0.1
0
-0.1
m
×10⁸
3
2.5
2
1.5
1
0.5
0
z
y
x

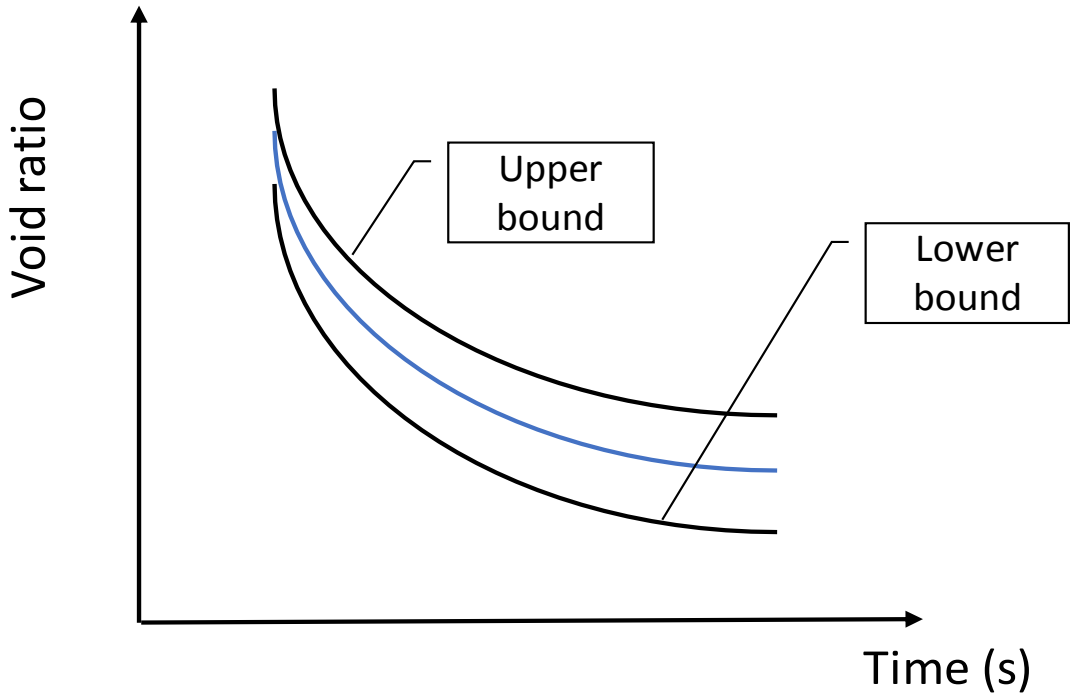
What?


Time=0 s Surface: Temperature (K)
0.1
m
0
-0.1
0.1
0
m
-0.1
0.1
0
-0.1
m
z
y
x
450
445
440
435
430
425

What?


Point Graph: Void ratio (1)
Void ratio (1)
0.35
0.34
0.33
0.32
0.31
0.3
0.29
0.28
0.27
0.26
0.25
0.24
0.23
0.22
0.21
0.2
0.19
0.18
0.17
0.16
0
2
4
6
8
10
12
14
Time (s)

What?



Questions?

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