Effects of Specimen Compaction on Performance Characteristics:

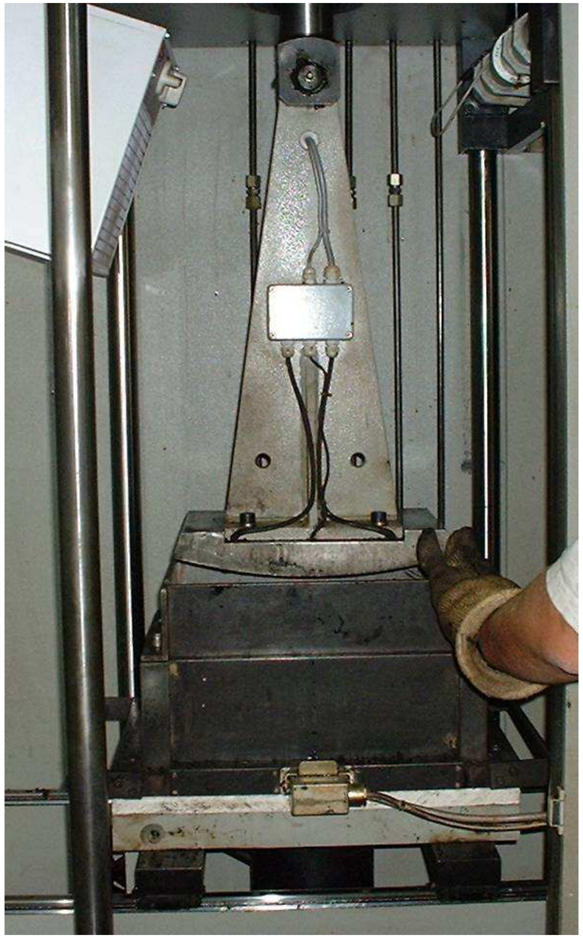
Results of Triaxial tests on AC

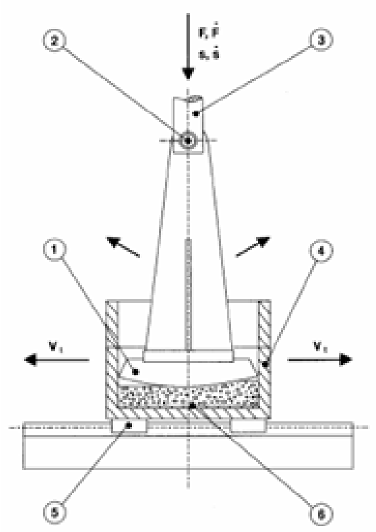
Update of progress at ISBS

Konrad Mollenhauer

Compaction methods at ISBS

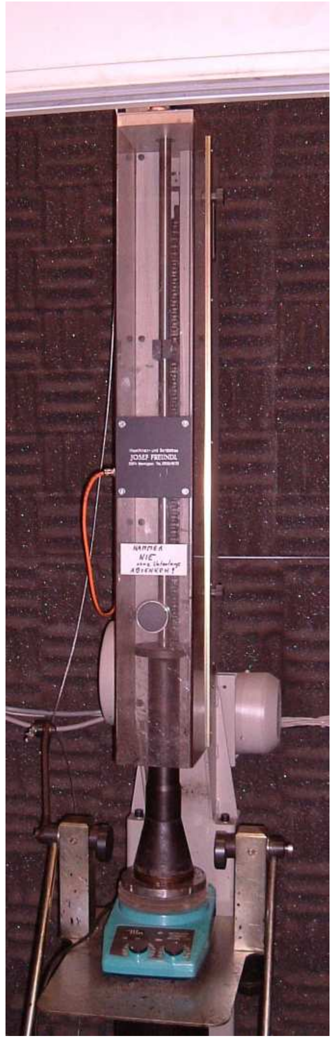
Roller Sector



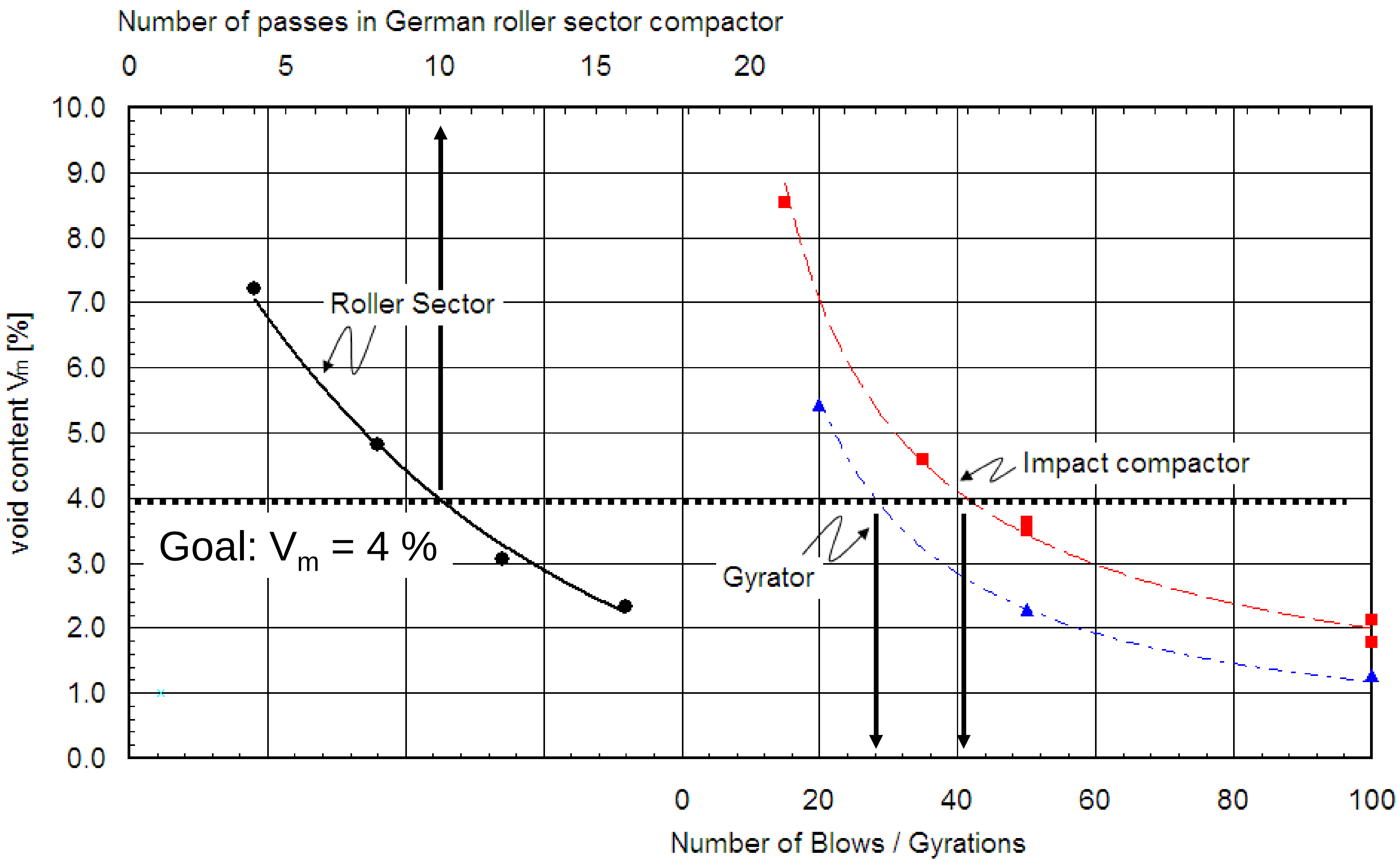


Gyratory

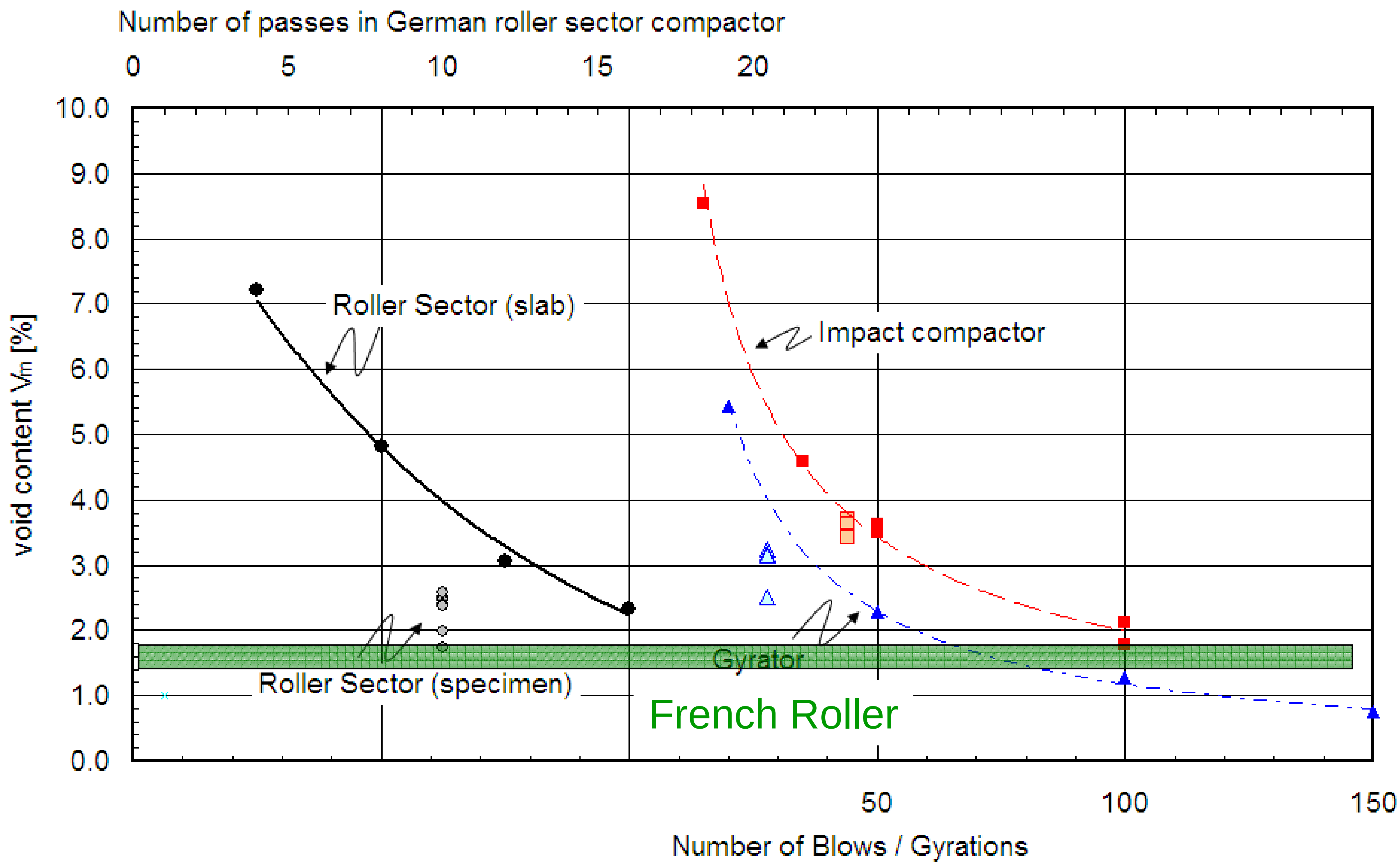
Marshall



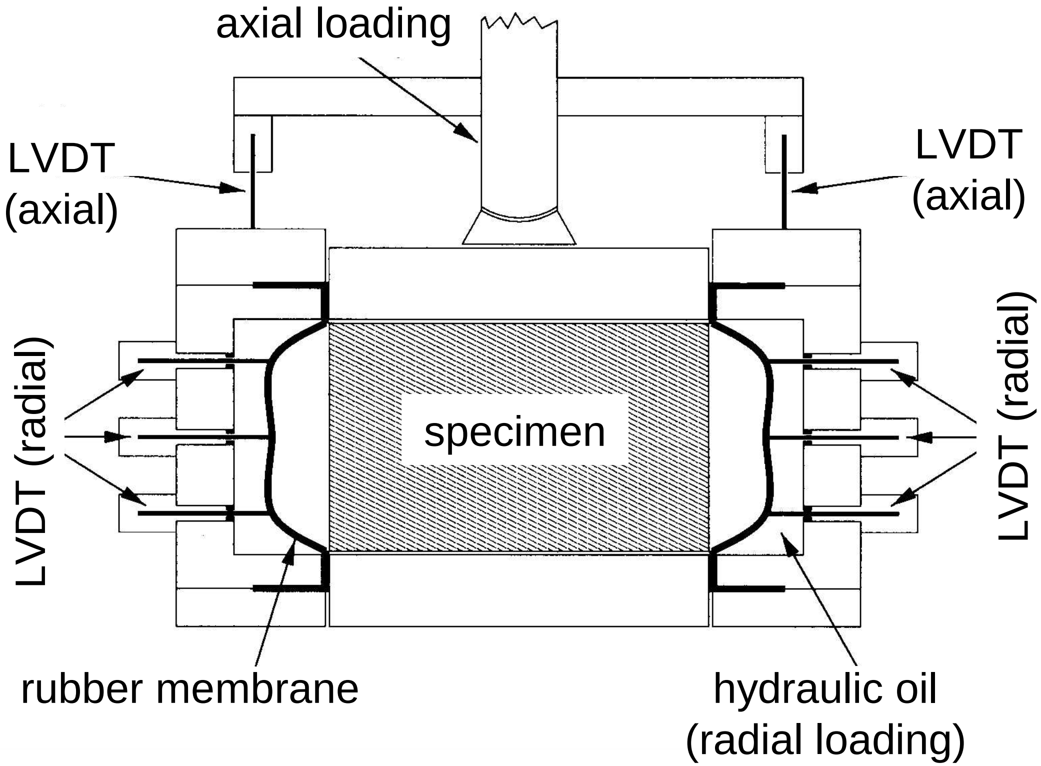
Compaction of Asphalt mix



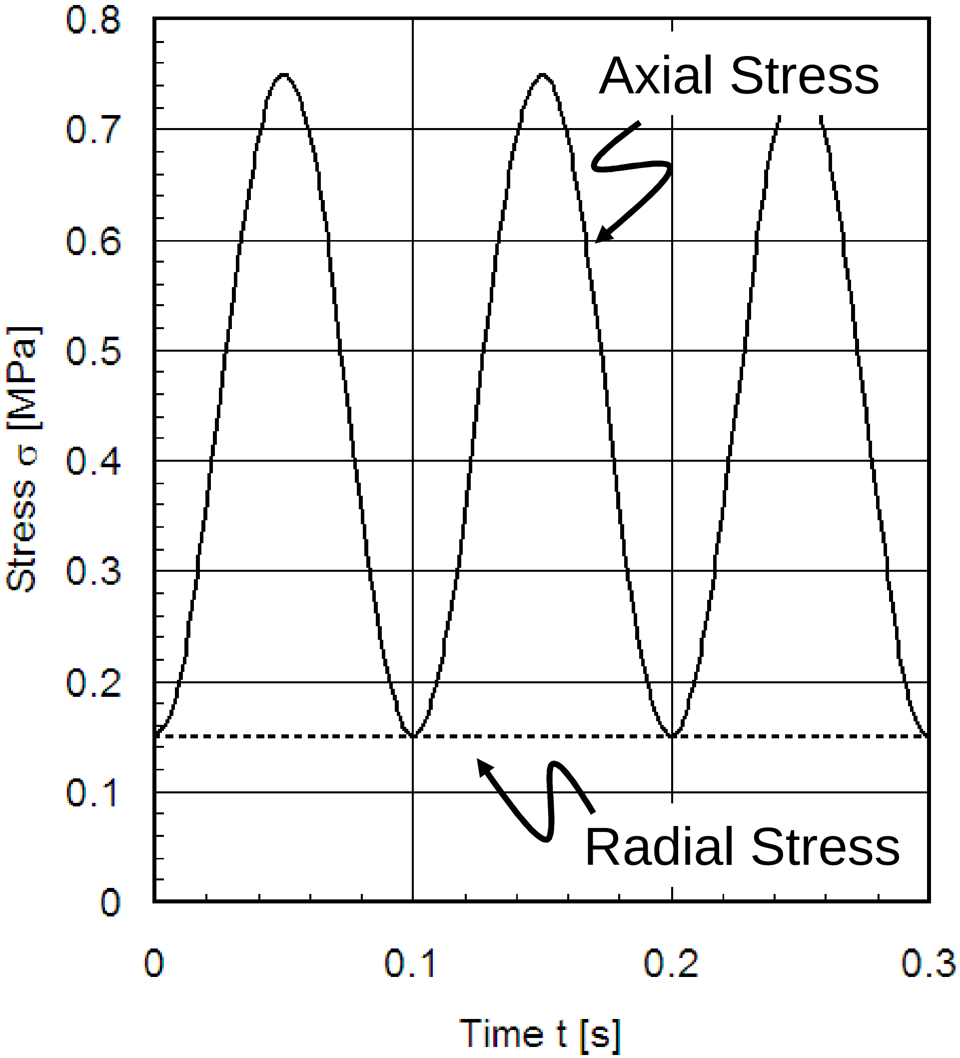
Preparation of specimens

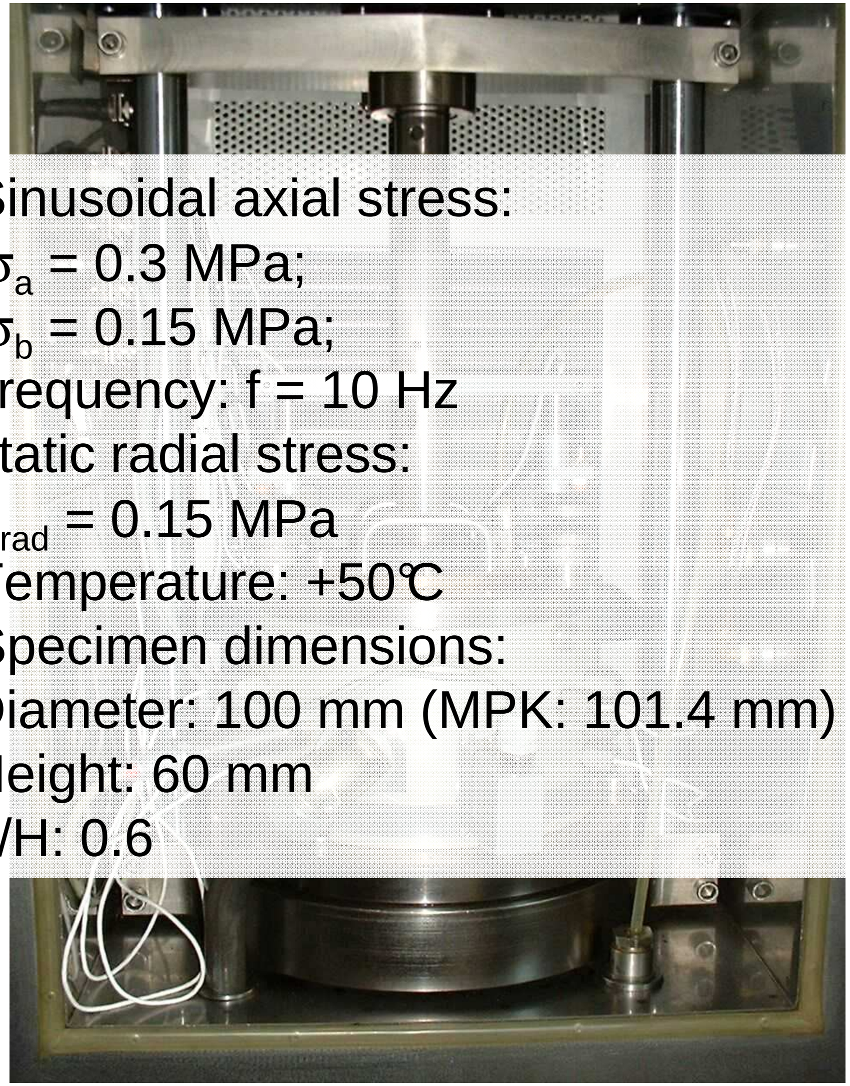


Triaxial Tests: Equipment



Triaxial Test: Loading (EN 12697-25)

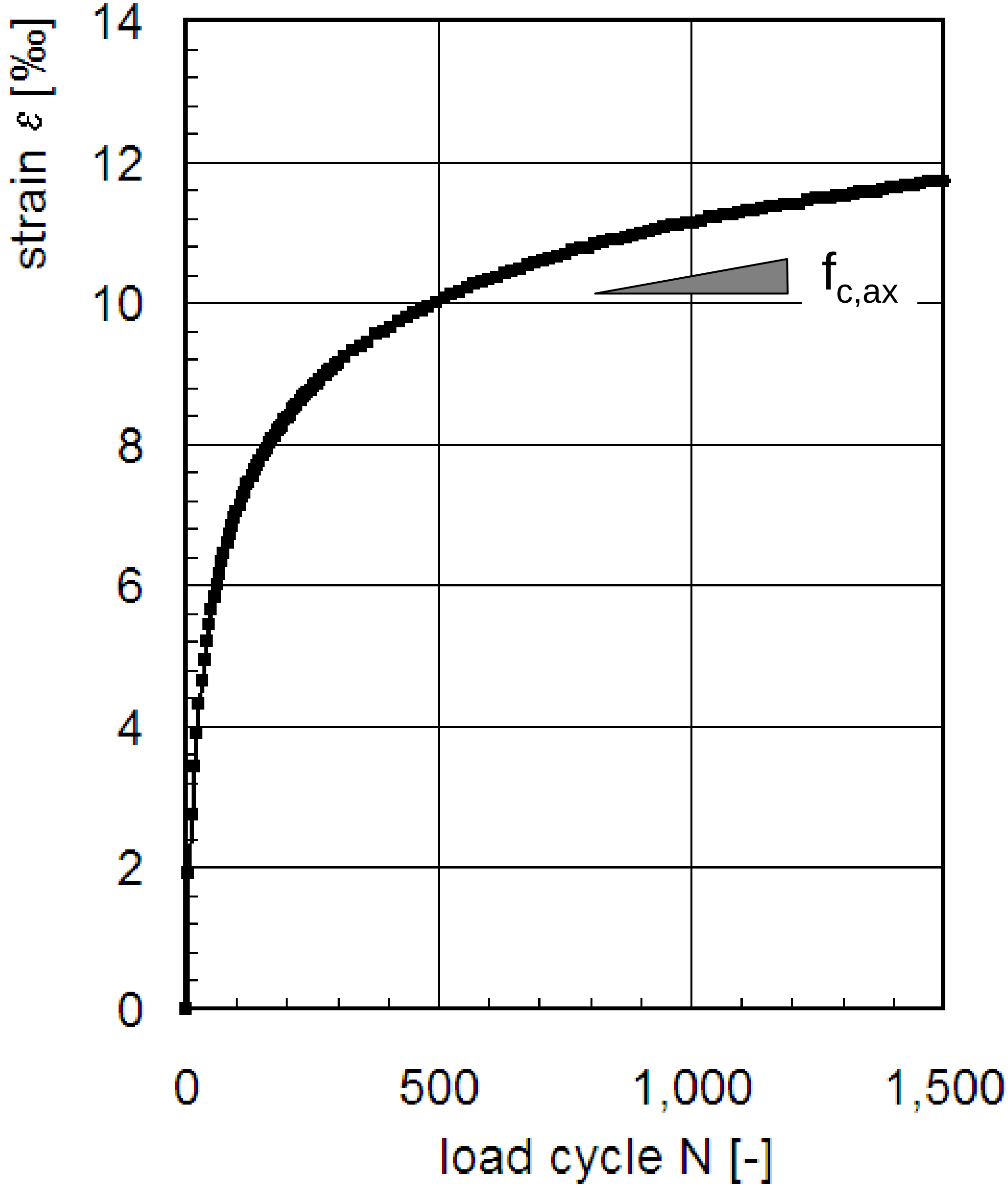




- Sinusoidal axial stress:
  σ_a = 0.3 MPa;
  σ_b = 0.15 MPa;
  frequency: f = 10 Hz
- static radial stress:
  σ_{rad} = 0.15 MPa
- Temperature: +50℃
- Specimen dimensions:
  Diameter: 100 mm (MPK: 101.4 mm)
  Height: 60 mm
  d/H: 0.6

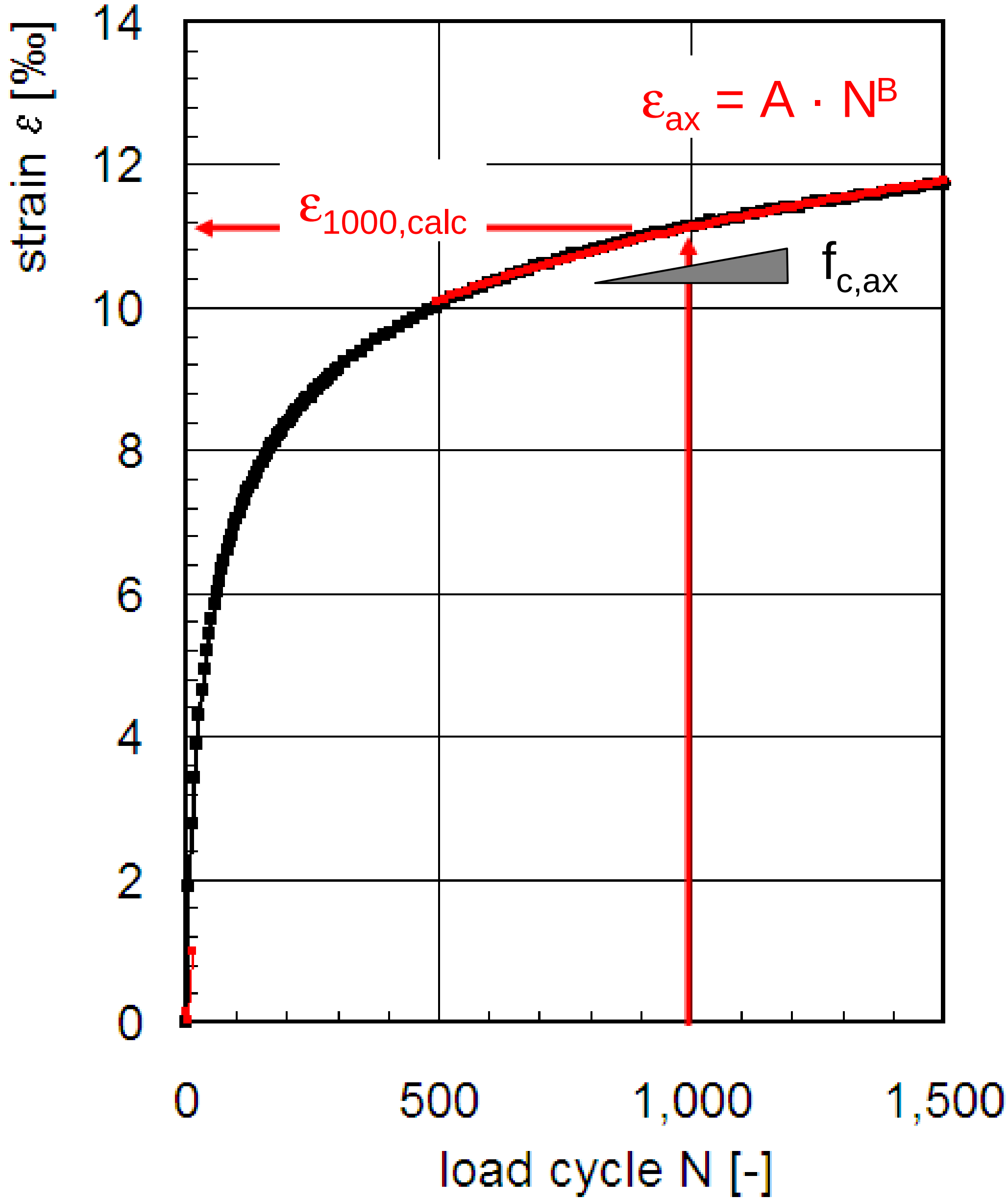
Triaxial test: Results

- Course of cumulated axial strain $\varepsilon_{ax}(N)$:
- creep rate $f_{c,ax}(N=1,000)$



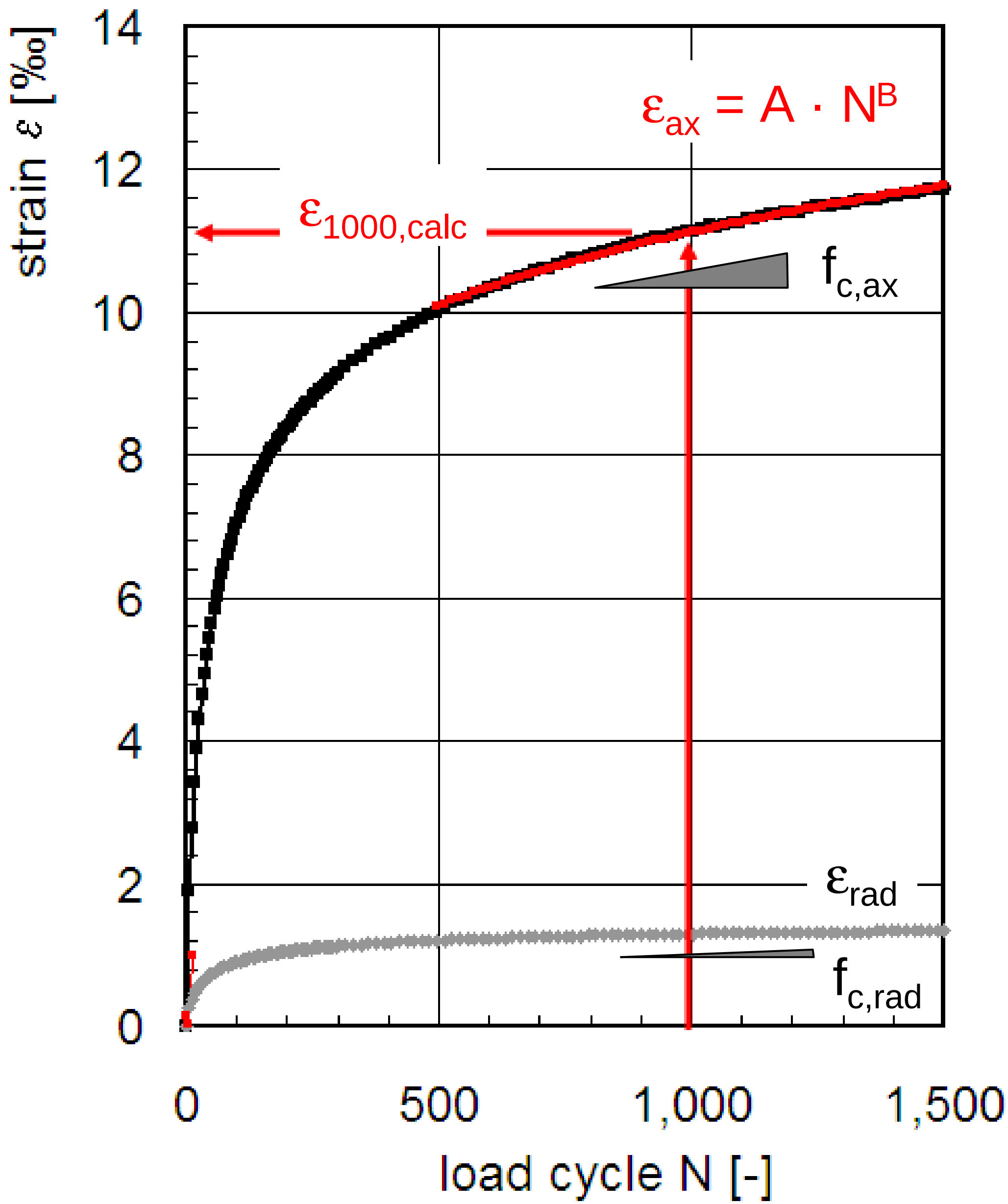
Triaxial test: Results

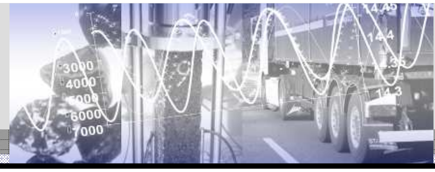
- Course of cumulated axial strain $\varepsilon_{ax}(N)$:
- creep rate $f_{c,ax}(N=1{,}000)$
  B
  $\varepsilon_{1000,calc}$



Triaxial test: Results

- Course of cumulated axial strain $\varepsilon_{ax}(N)$:
- creep rate $f_{c,ax}(N=1{,}000)$ $\varepsilon_{1000,calc}$
- Course of cumulated radial strain $\varepsilon_{rad}(N)$: $f_{c,rad}(N=1{,}000)$

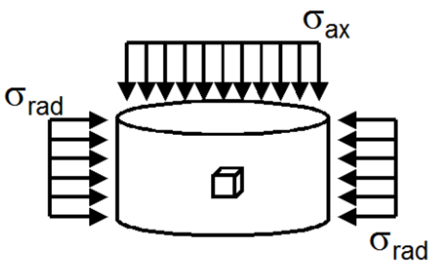


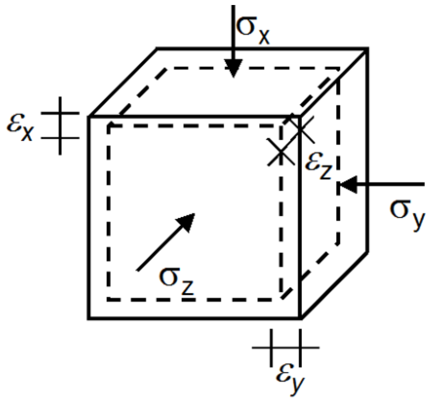


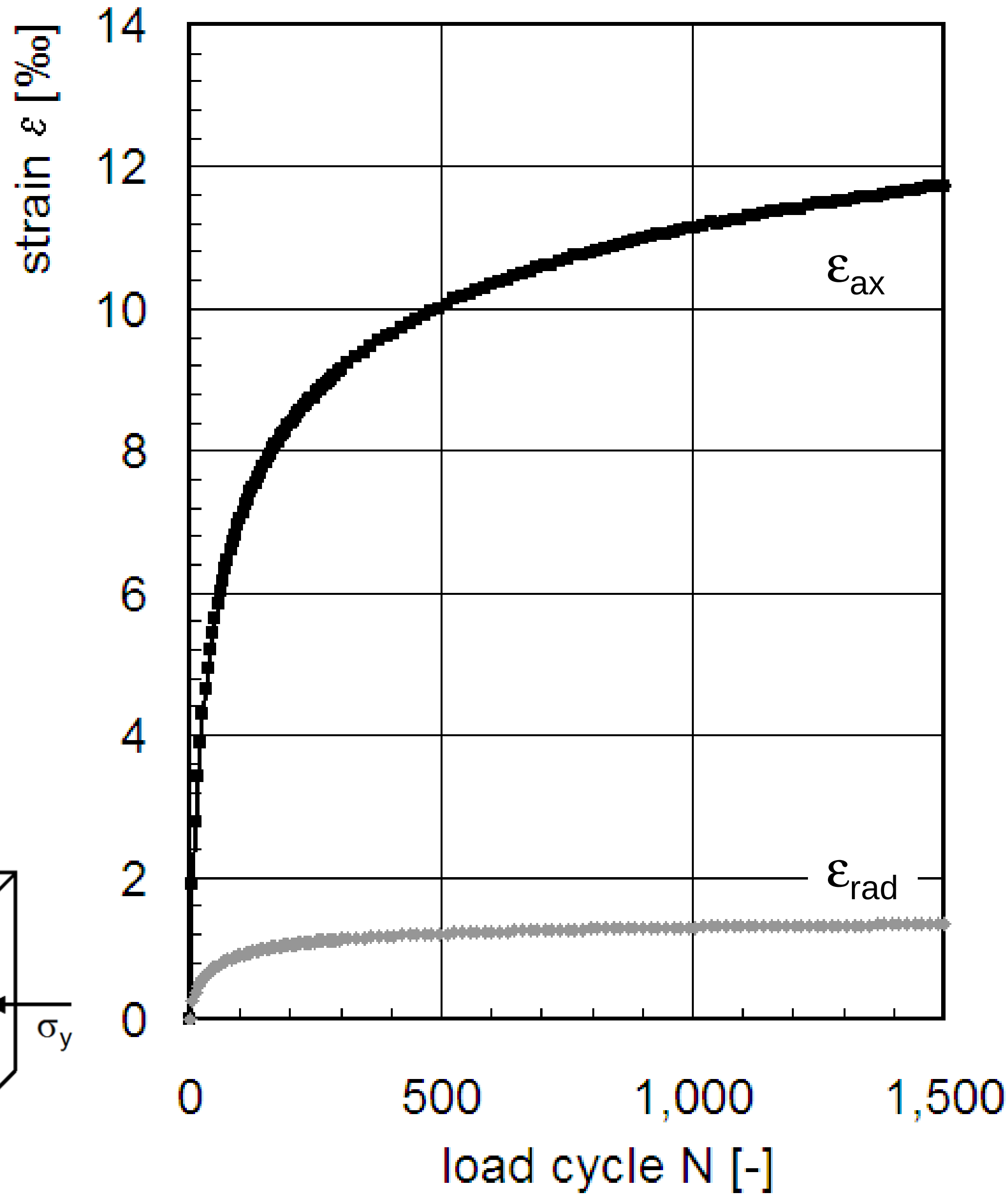
Triaxial Test: Results

$$\mu = \frac{\sigma_{ax} \cdot \varepsilon_{rad} - \sigma_{rad} \cdot \varepsilon_{ax}}{\sigma_{rad} \cdot (2 \cdot \varepsilon_{rad} - \varepsilon_{ax}) - \sigma_{ax} \cdot \varepsilon_{ax}}$$

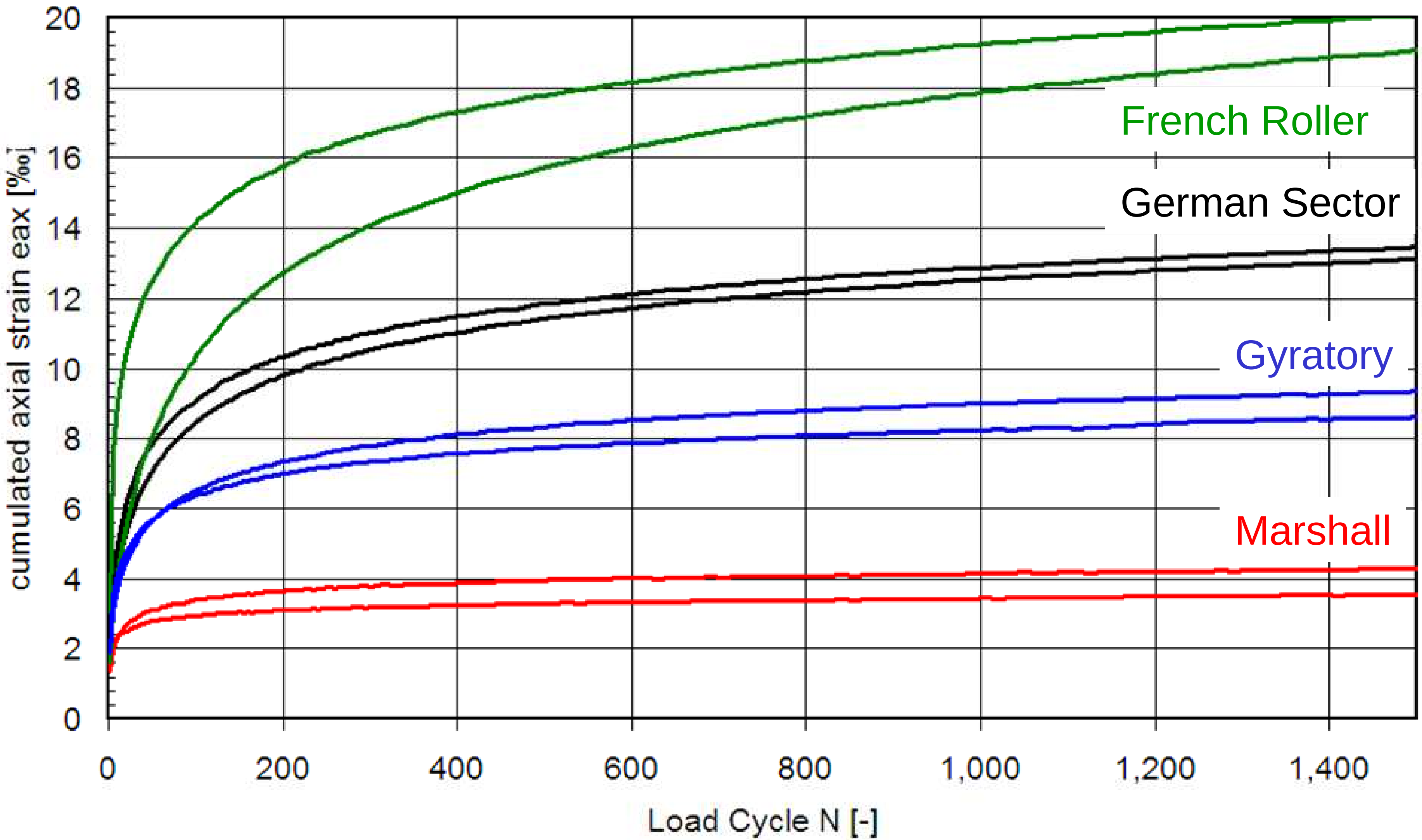
here:
σ_{ax}: axial mean stress
σ_c: radial (confining) stress
ε_{ax}: $f_{c,ax}$
ε_{rad}: $f_{c,rad}$



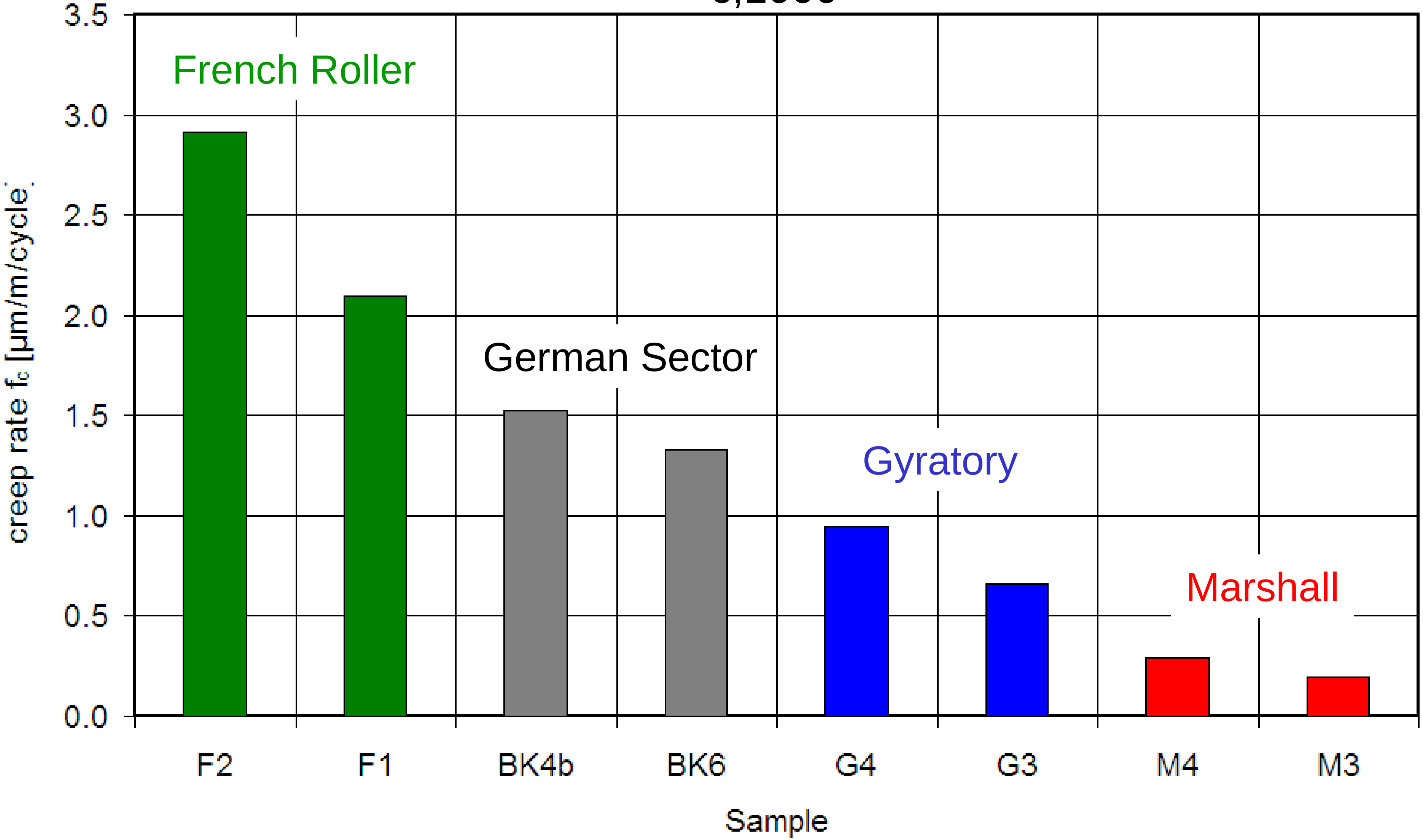




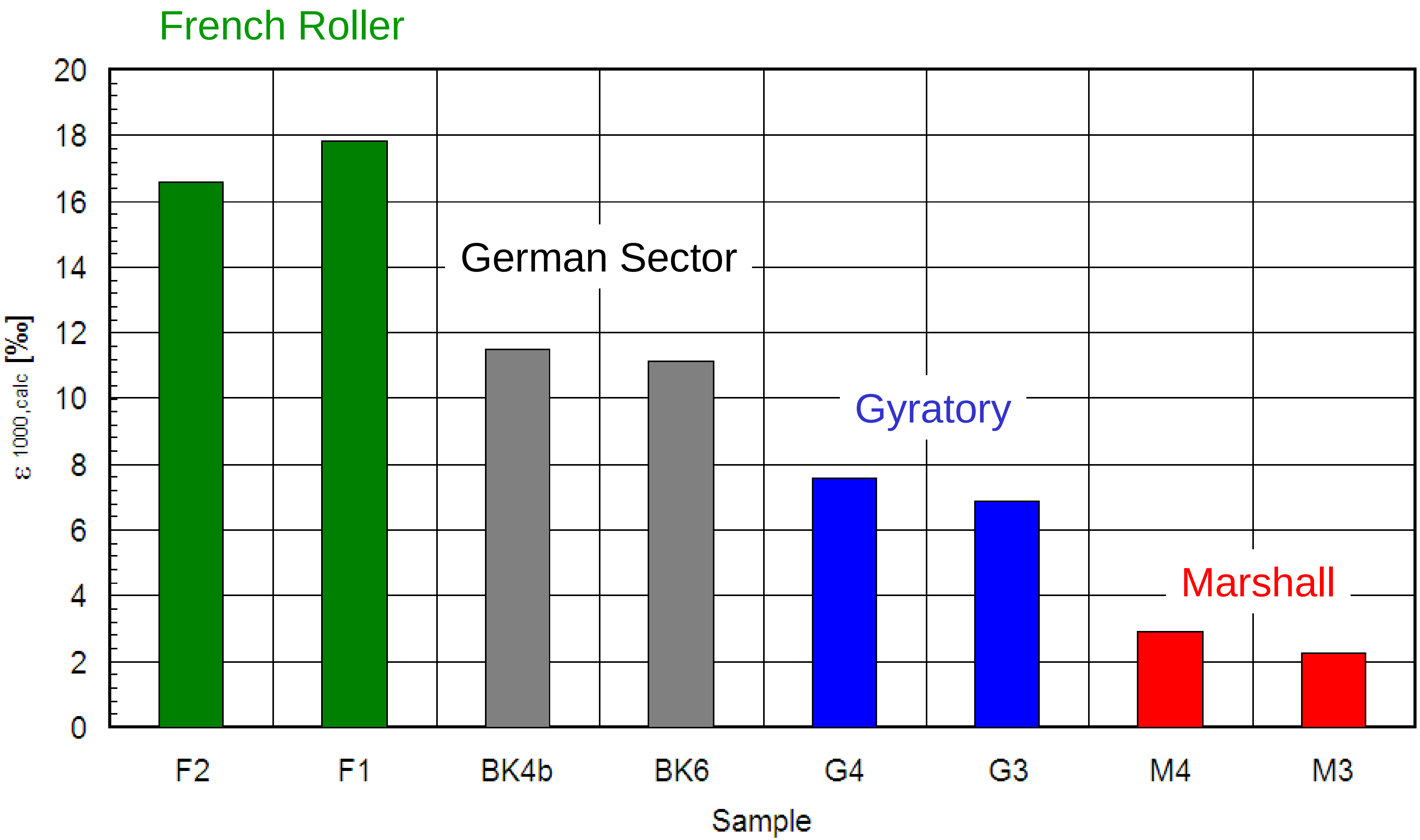
Triaxial Tests: cumulated axial strains



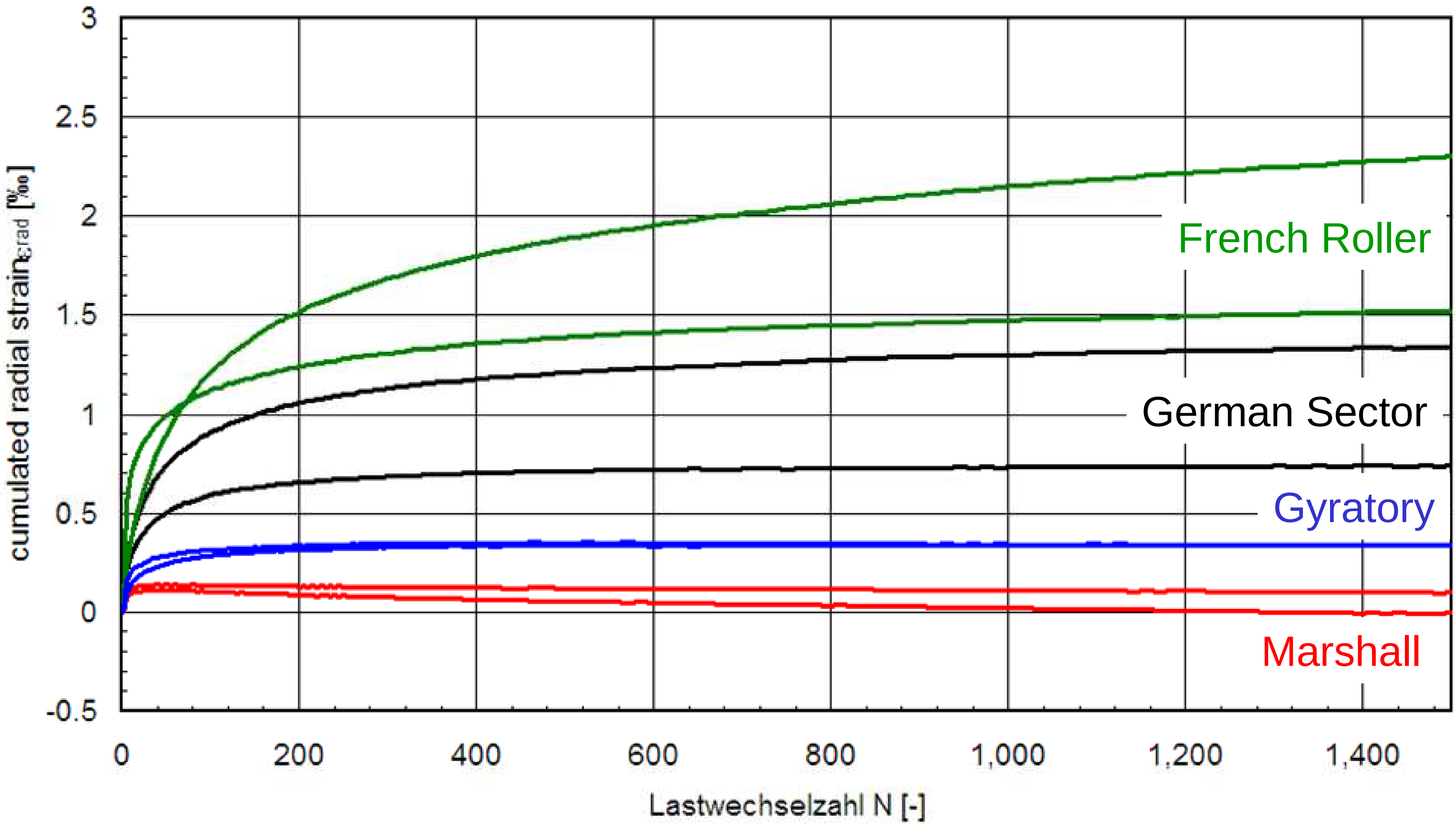
Triaxial Test: creep rate $f_{c,1000}$



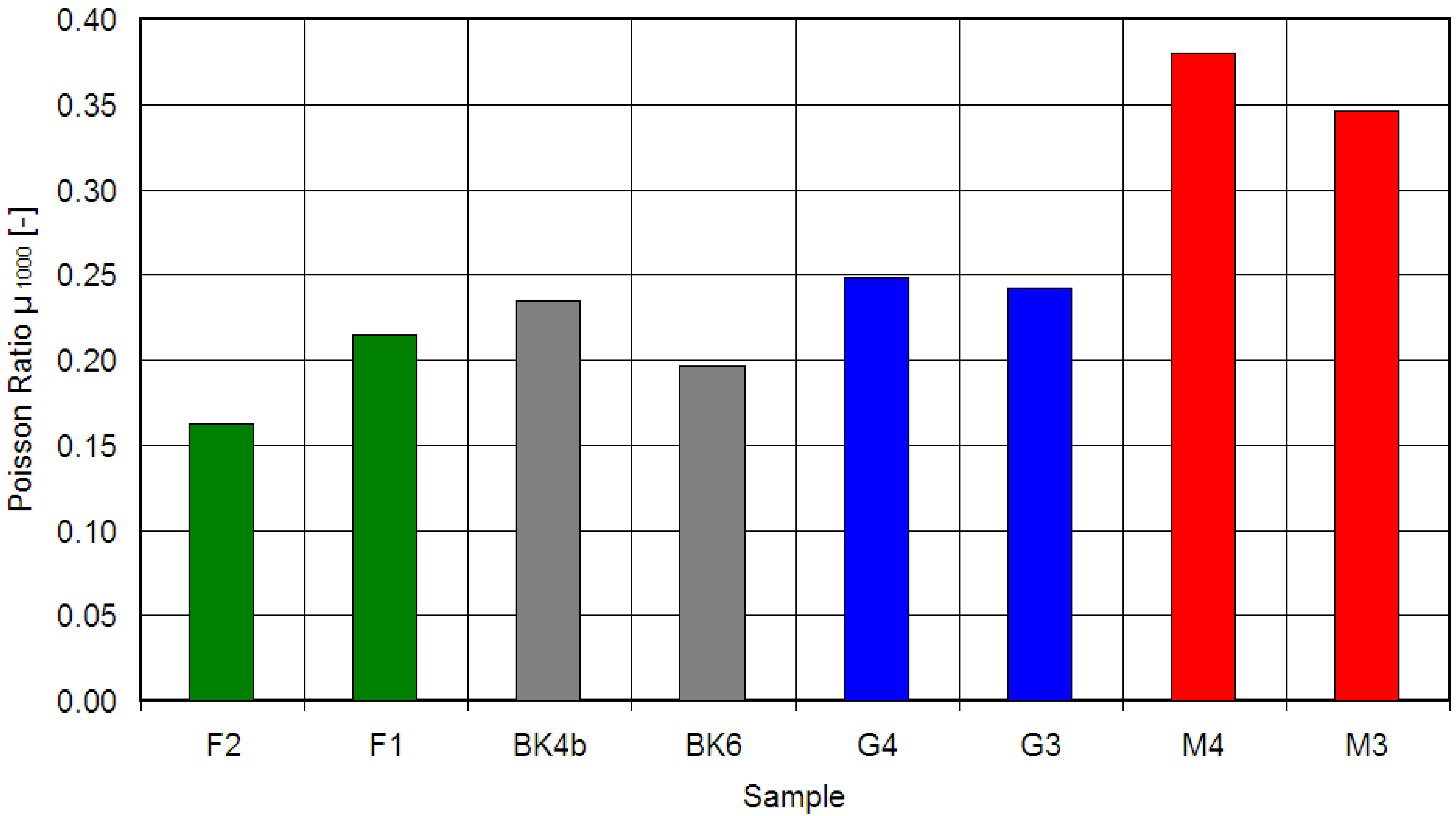
Triaxial Test: strain after 1000 cycles $\varepsilon_{1000,calc}$



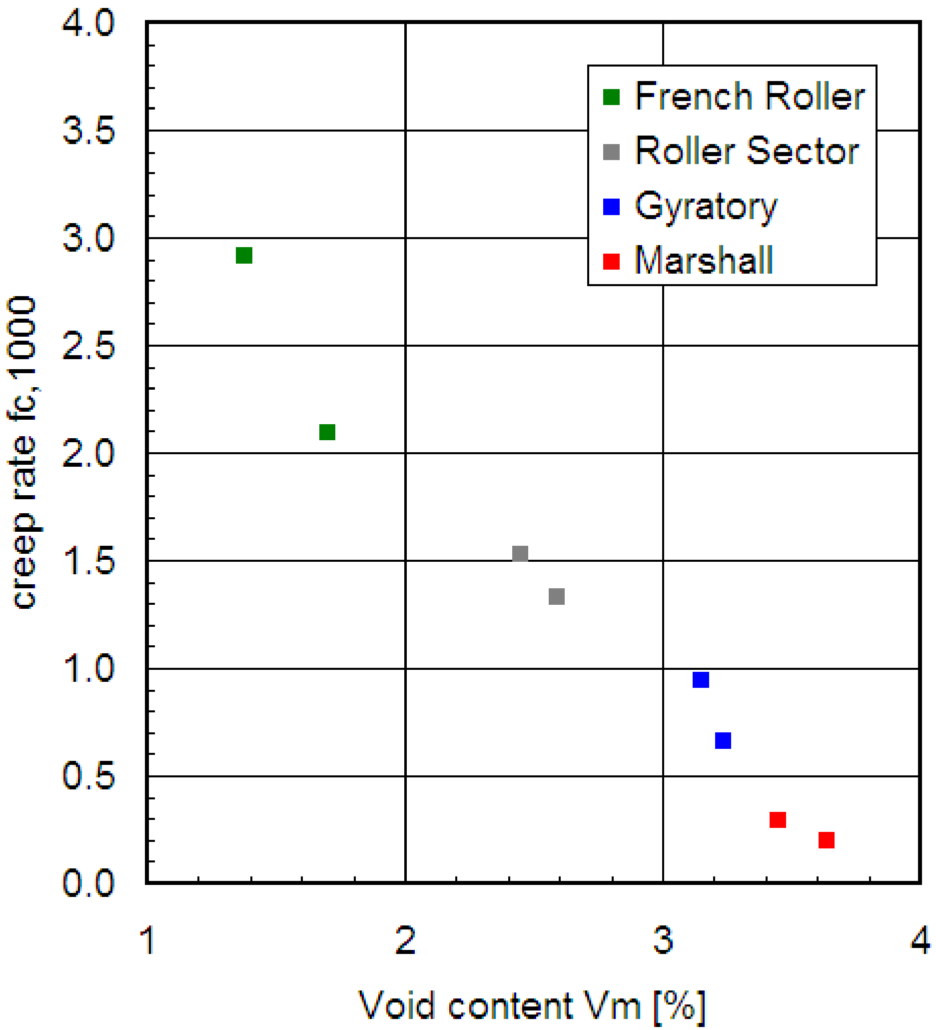
Triaxial Tests: cumulated radial strains



Poisson‘s ratio µ



Compaction method or void content?



Further Tests necessary:

- Further specimens available:
  Marshall: V_m = 2,0 %
  Gyratory: V_m = 1,6 %
- New specimens
  - Roller Sector (V_m: 1.5 & 3.5)
    (2 new slabs: 25 kg mix)
  - French Roller with varied compaction energy?

Comparative test program „Segment Roller Compaction"

Scope:

- Roller Sector Compactor Devices are commonly used Europe-wide
- Compaction Procedure varies considerably

Objective:

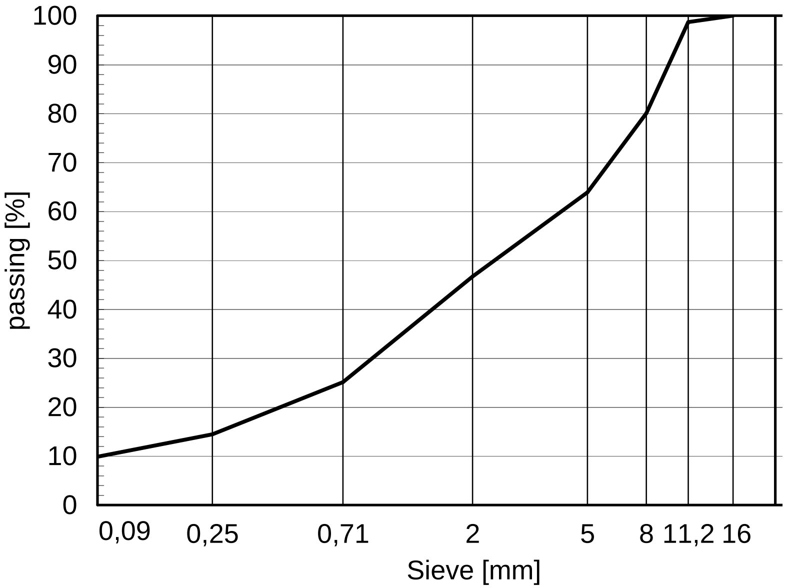
- Analysation of impact of given compaction procedure on mechanical properties of asphalt specimens
- Evaluation of reproducibility of Roller Sector compaction

Participants:

ISBS (Germany), ISTU (Austria), TUDD (Germany),
UVT (Hungary); ifbGauer (Germany); TUD (Netherlands)

Comparative test program „Segment Roller Compaction”

Asphalt Mixture: AC11

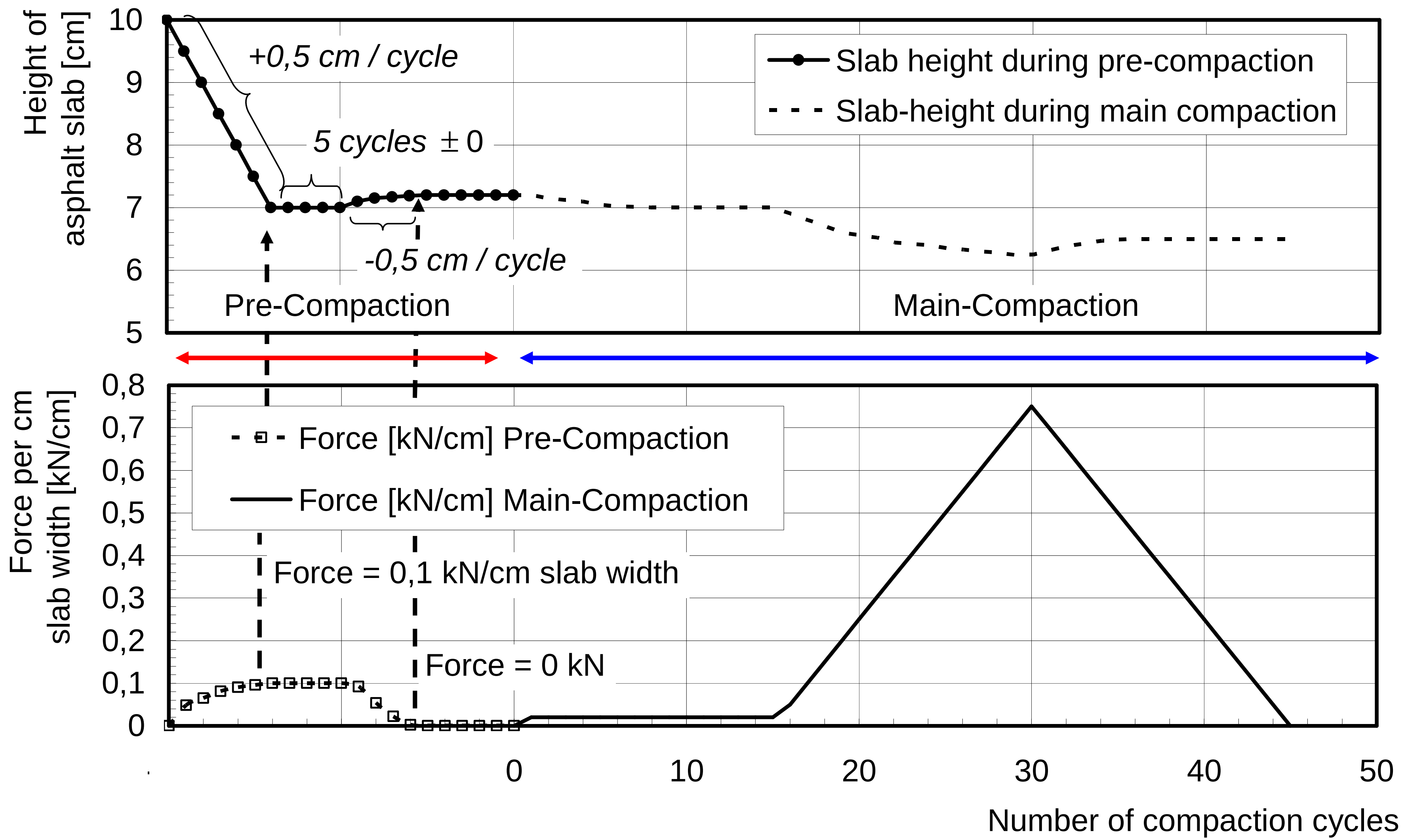


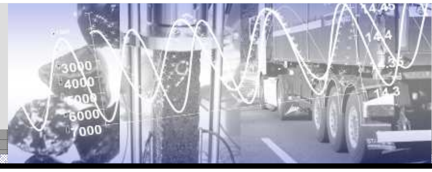
maximum aggregate density [g/cm³]		2.698
[%]	< 0.09 mm	9.5 %
	> 0,09 mm & < 2.0 mm	37.5 %
	> 2.0 mm	53.0 %
content of crushed aggregate		$C_{90/1}$
binder type		50/70
softening point Ring & Ball [°C]		52
binder content [mass-%]		6.0
maximum density [g/cm³]		2.476

Each laboratory uses 2 compaction procedures:

1. Common procedure (according German Standard)
2. Laboratory standard procedure

German Standard Compaction Procedure





Comparative test program „Segment Roller Compaction”

Test program:

• Slab compaction:	January/February
• Specimen preparation (cores)	February/March
• Mechanical Tests (Triaxial tests)	March/April
• Presentation of Results:	May

ATCBM pre-conference workshop

Laboratory compaction of asphalt mixtures for the preparation of specimens for performance-based test methods

Topics:

Impact of specimen compaction
- on aggregate structure
- on performance properties

Comparability with site compacted asphalt

ATCBM pre-conference workshop

Laboratory compaction of asphalt mixtures for the preparation of specimens for performance-based test methods

Tuesday, May 26th
8 presentations about 20 min (selection according submitted 2 page abstract)

Deadline for abstract submission: February 15th
Notice of Acceptance until March 31st