Roads Pavement Forum

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SABITA: Manual 19

Guidelines for the design, manufacture and construction of bitumen-rubber asphalt wearing courses

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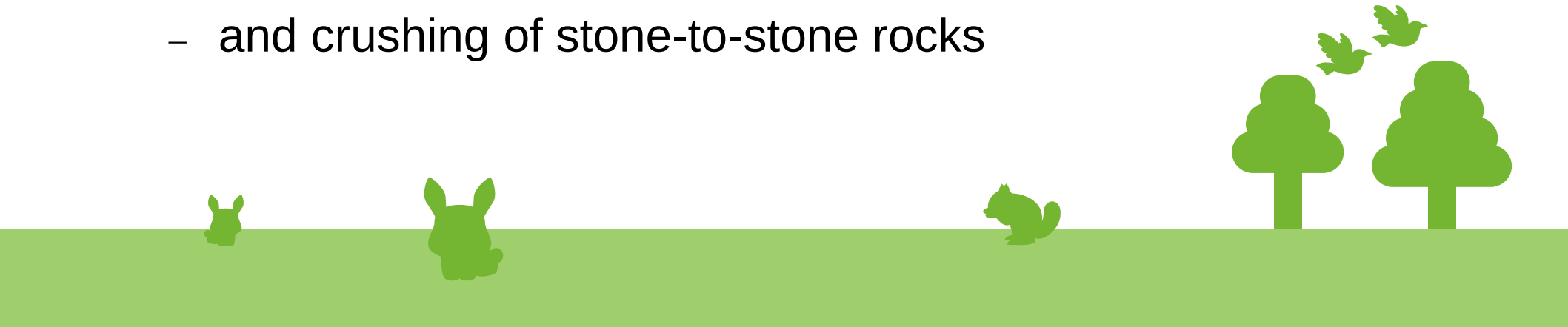
What does **Manual 19** address?

- **B**itumen-**R**ubber **A**sphalt (the ***BRA*** part)
- Continuously graded mixes (**BRACG**)
- Gap-graded asphalt (**BRAGG**)
- Open-graded asphalt (**BRAOG**)
- **S**emi-**O**pen-BRA (**BRASO**)
- **BR U**ltra-**T**hin **P**orous **S**urfacings (**BRUTPS**)
- What else??

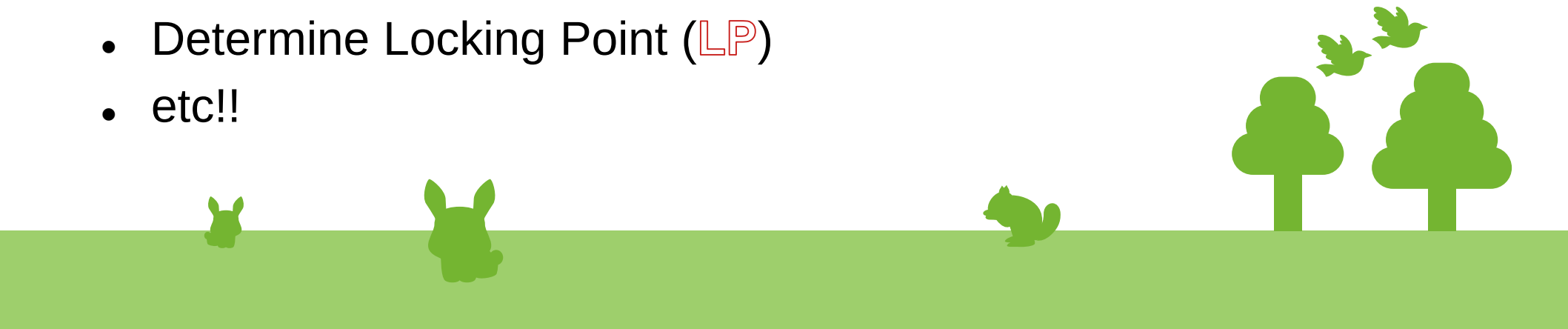
Current design

- Marshall compaction and design method
  - No direct translation to gyratory!!
  - How to measure density: Direct != SSD != Corelock
- Is it adequate?
- How does compaction relate to locking point
  - and crushing of stone-to-stone rocks



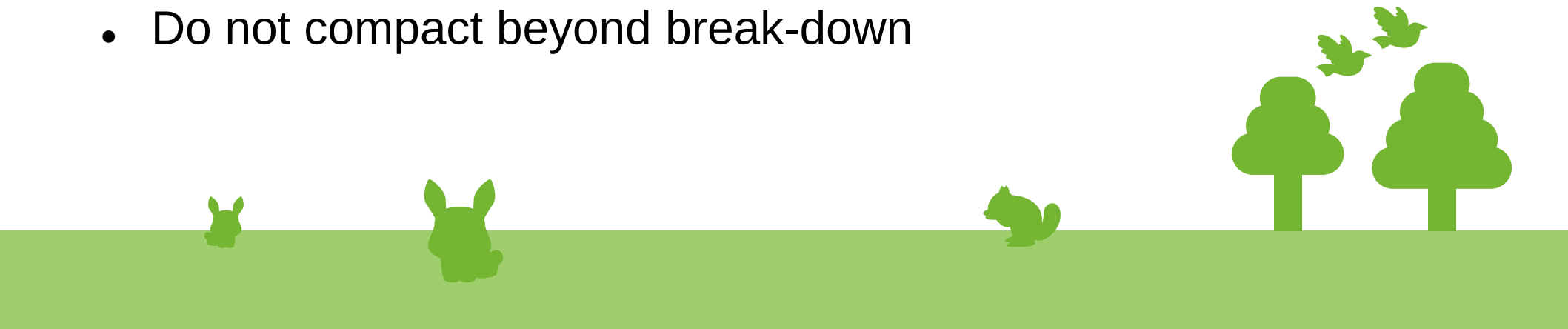
New (updated) Design Method

- It is not “*rock*”-et science
- Current load design levels very high
  - Are traffic levels in slow lane realistic?
  - What is maximum no of trucks (E80’s) in a slow lane?
    - NOT Man19 discussion – but take note
- Environmental requirements (noise, drainage, etc)
- Determine Locking Point (LP)
- etc!!

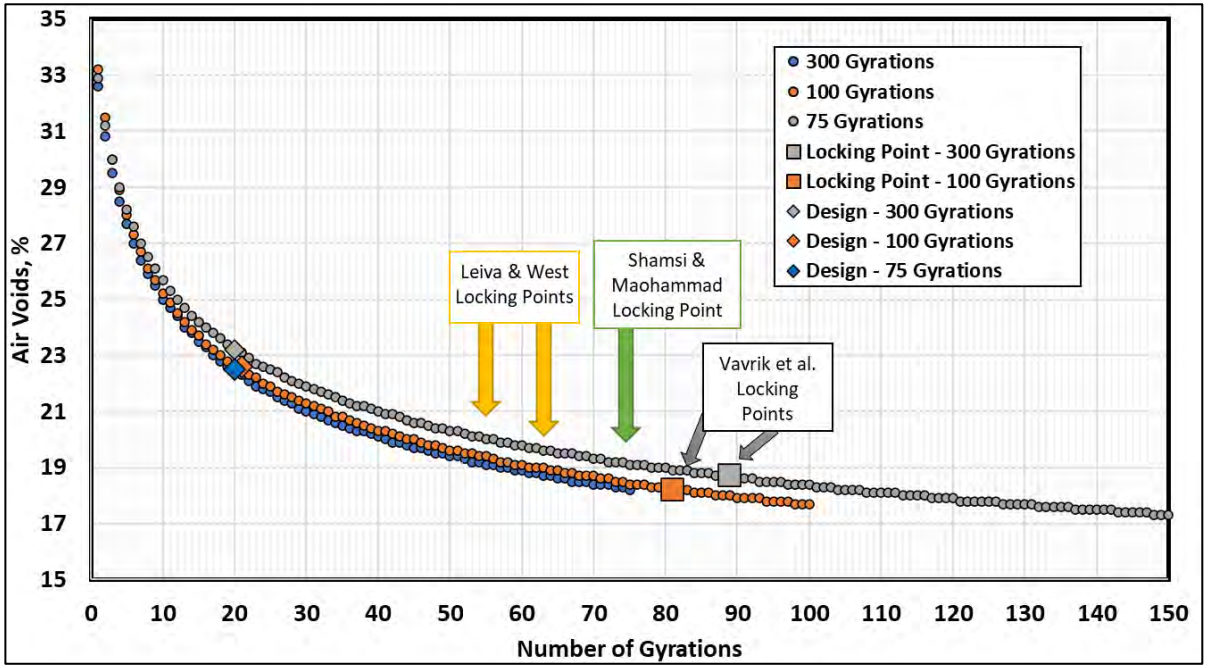


What is Locking Point (**LP**)

- Various definitions – we use Varvik
  - Gyrations = ±90 at LP
- LP important for stone-to-stone contact mixes
  - *BRAGG, BRASO, BRAOG, BRUTPS*
- Where does stone break-down start – perhaps 50 gyrations?
- Do not compact beyond break-down



Locking Point

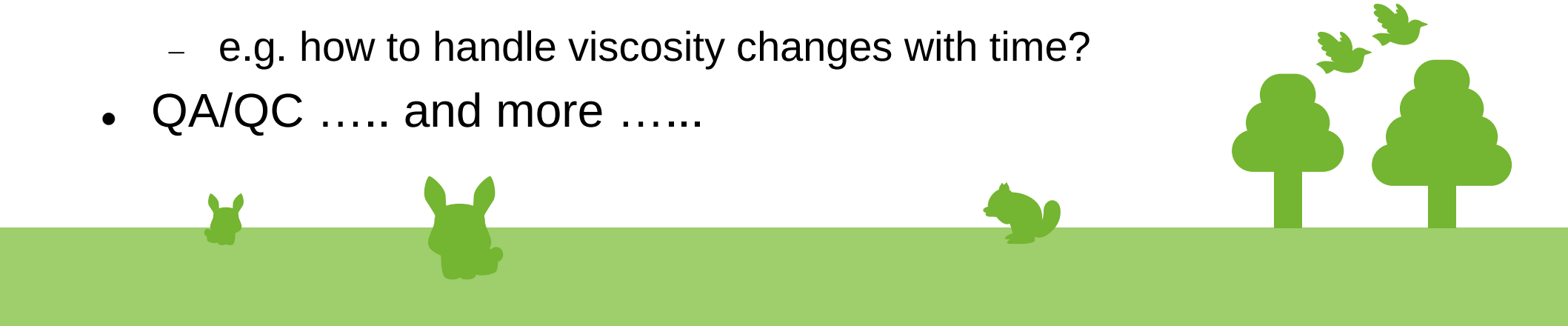


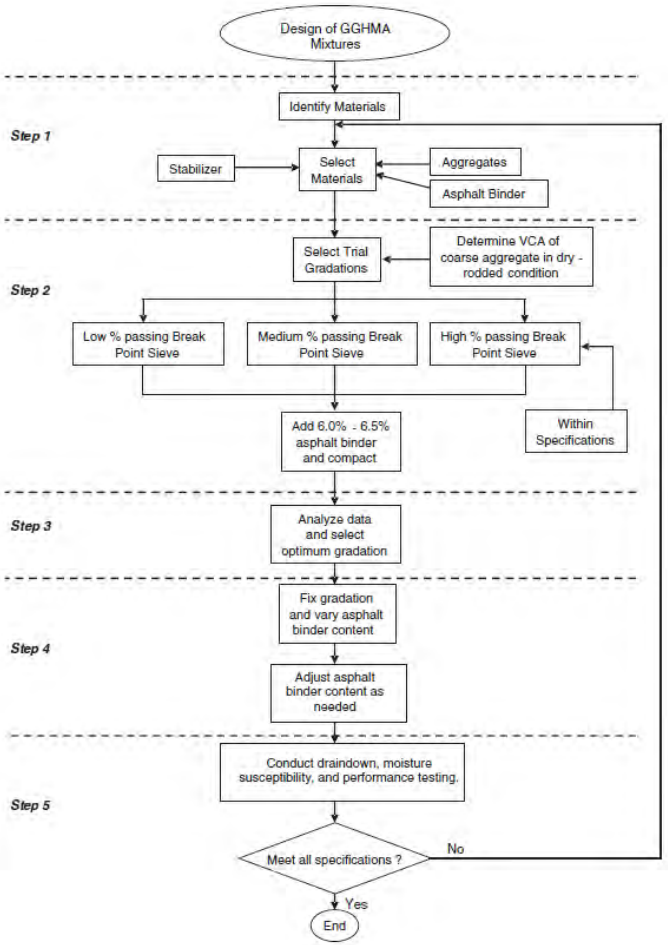
Vavrik LP is first gyration at which the specimen sample height remains the same for <u>three consecutive gyrations</u>

L&W locking point considerably lower

What needs updating?

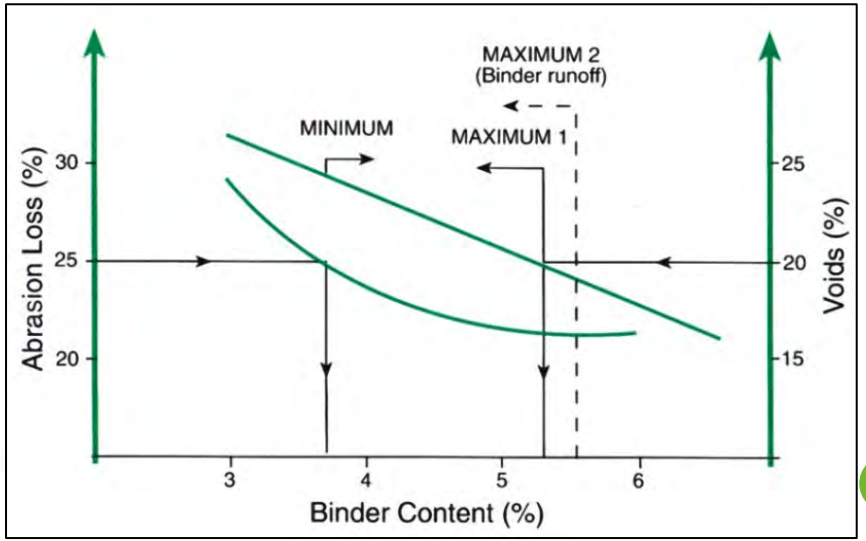
- Bitumen-rubber binder – constituency and behaviour
  - A-R1 vs A-R2
- Mix design
  - Absorption of rubber with time (digestion in SA)
  - Differences between A-R1 and A-R2
- Construction
  - e.g. how to handle viscosity changes with time?
- QA/QC ….. and more ……





Mix Design

- Follow principles in NCHRP 673
- And NAPA documentation



end

Cracking parameters and implementation thoughts in SA consider in Black Space

- Low temperature (PAV)
  - BBR parameters converted to G* and phase angle, 111 MPa and 26.2°
  - R at ΔTc = 0 is 1.9
- Durability cracking
  - ΔTc -5 limit on PAV
  - This limits R to be greater than about 3.0 (depends how determine R)
  - Excludes lower part of Black Space (higher part of Black Space – not practical binders)
- Combination of these parameters limit region in Black space that binders must fall into (green area) – *not considering PmB*
- Intermediate area
  - Need to be below G-R and orginal fatigue line – effectively controlled by aging ratio
  - G* is typically about 7MPa (R=2.2 when Gg=9GPa, $\delta \approx 44.5$) for most practical binders at intermediate temperature when $G^*.\sin\delta = 5MPa$
  - Effectively controlled by aging limits on orginal to PAV (aging control also on orginal to PAV)
  - Note – tests at different frequencies – accounts in part for where on curve