AASHTO TP 107: AMPT Cyclic Fatigue
Proposed Revisions

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Specifically for the AMPT

❑ Figures updated for the AMPT

❑ Sample preparation and test setup information updated to be clearer for AMPT users

❑ Removed Appendix X7 (strain selection to target specific N_f) from 2014 version to alleviate confusion on strain selection

    o Specific N_f is not as important as range of N_f for this process

Example of Updated Figures

New Version
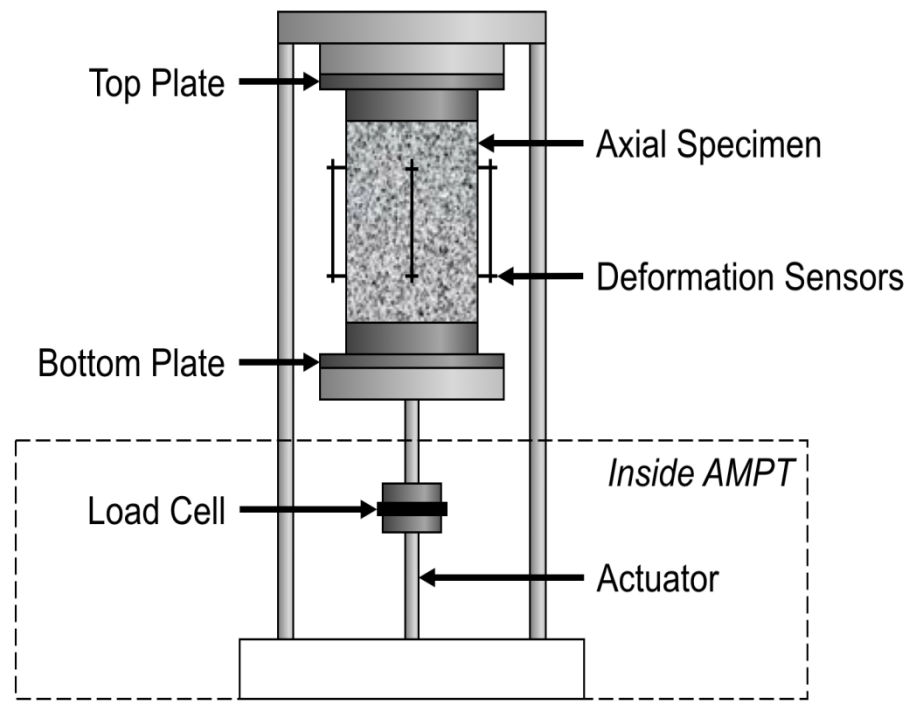
2014 Version
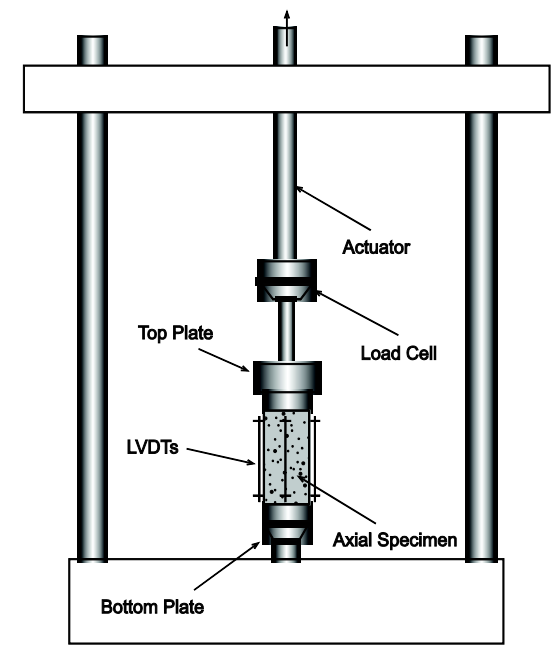
New Strain Selection Appendix

- ❑ Family of curves method

- ❑ Allows simpler estimation of AMPT input "target on-specimen strain"

- ❑ Run initial test at a strain specified by fingerprint dynamic modulus

- ❑ Use included table to reach an approximate N_f for subsequent specimens

Strain Selection Procedure

Case (units in MPa)	ε_{os1}
$8{,}800 < |E^*|_{\text{fingerprint}}$	300
$4{,}400 < |E^*|_{\text{fingerprint}} < 8{,}800$	500
$|E^*|_{\text{fingerprint}} < 4{,}400$	800

1. $|E^*|_{fingerprint} = 7{,}500$ MPa
2. $\varepsilon_{os1} = 500 \; \boldsymbol{\mu\varepsilon}$
3. $N_{f1} = 4{,}900$ cycles
4. $\varepsilon_{os2} = 450 \; \boldsymbol{\mu\varepsilon}$
5. $\varepsilon_{os3} = 550 \; \boldsymbol{\mu\varepsilon}$
6. $\varepsilon_{os4} = 400 \; \boldsymbol{\mu\varepsilon}$

Target On-Specimen Microstrain	If $8{,}800 > |E^*|_{\text{fingerprint}} > 4{,}400$ MPa, select 500 microstrain as the first specimen's strain				
200	-	-	-	-	-
250	145,856	314,972	-	-	-
300	31,468	77,539	179,856	-	-
350	8,605	23,704	60,744	144,799	-
400	2,798	8,491	*23,721*	61,010	144,466
450	1,039	3,433	*10,350*	28,465	71,421
500	**428**	**1,527**	***4,929***	**14,392**	**38,032**
550	-	734	*2,519*	7,766	21,507
600	-	-	1,365	4,422	12,781
650	-	-	777	2,634	7,919

Clarified Number of Specimens

❑ Material Ranking or Index Property

- Minimum of 3 strain levels

❑ Pavement Performance Analysis

- Minimum of 4 strain levels

- Better extrapolation of G^R vs. N_f curve in log-log scale

Platen Size & Gluing Jig

❑ Platens - Changed the size limits

- Old: 100 ± 0.5 mm
  New: 100 < x < 105 mm
  With a recommendation for diameters closer to the sample diameter to improve alignment

❑ Gluing Jigs - Allowed for gluing jigs to hold a small weight (no greater than 10 lbs) on the sample without holding a fixed height

Ball Joint vs. Ball Bearings

❑ The *"ball joint"* language caused confusion

- Only meant for non-AMPT machines
- Is now removed in AMPT-specific standard

❑ Some users placed a *"ball bearing"* between the upper platen and the machine.

❑ Ball bearing is not recommended because there is a potential to tighten the upper platen unevenly and damage the sample.

Terminology and Calculations

- ❑ Added calculations for the energy based failure criteria (G^R)
  - • Also required for the report
- ❑ Added dynamic modulus ratio (DMR) to terminology
- ❑ Added tensile strain-based fatigue model coefficients (K_1, K_2, K_3) to terminology

Calculating Alpha Value

❑ Changed the method to calculate the $\boldsymbol{\alpha}$ term to a simpler and more stable method based on the tangential slope of E(t) vs. time in log-log scale
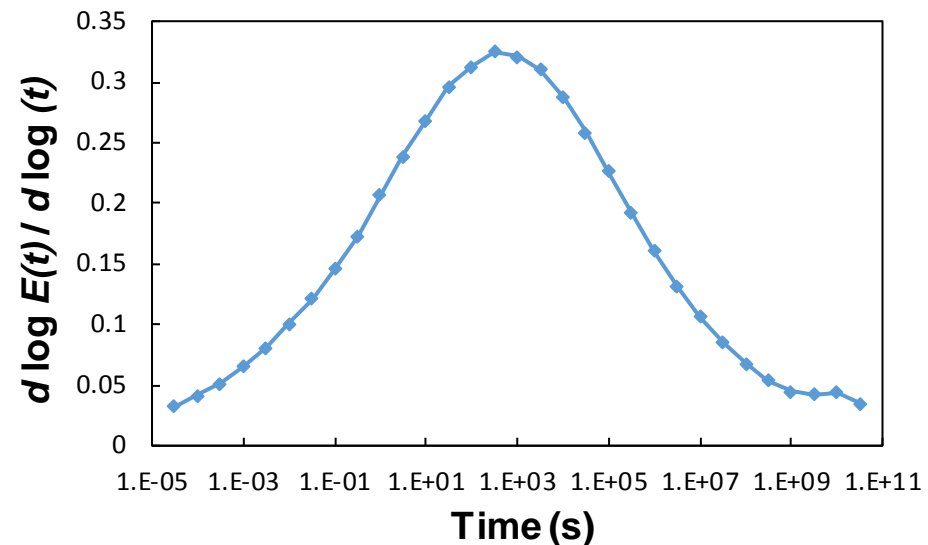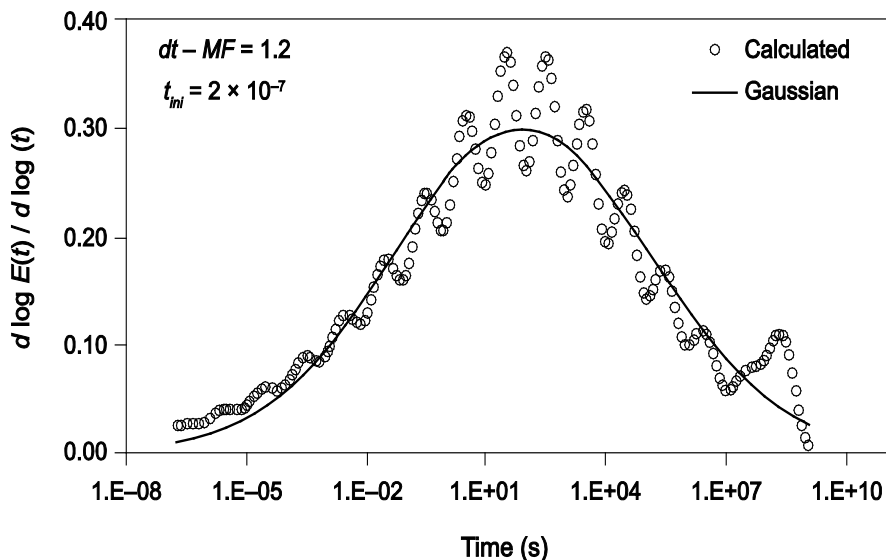
Small Specimen Testing

❑ Added appendix to include small specimen testing possibility

   • Mirrors AASHTO TP 79-15

❑ Open doors to testing field cores and more specimens from one gyratory specimen

THANK YOU

- ❑ Due date for comments: September 25th
- ❑ Comments sent to Dave Mensching (FHWA): david.mensching@dot.gov