Review of Bending Beam Fatigue Test – AASHTO and ASTM methods

Task Force

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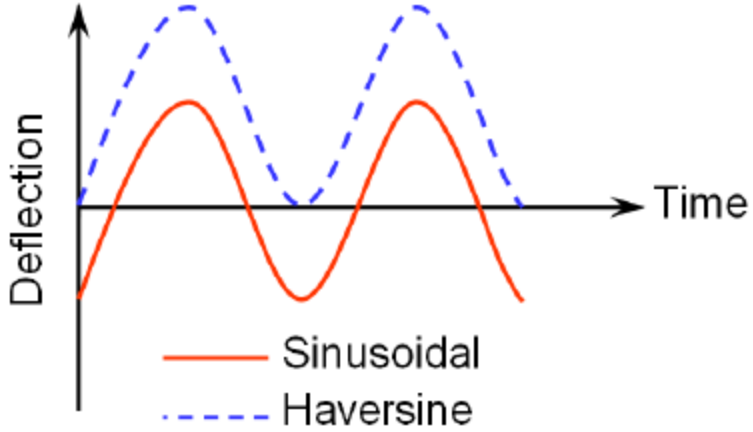
Mix ETG Update – September 2014

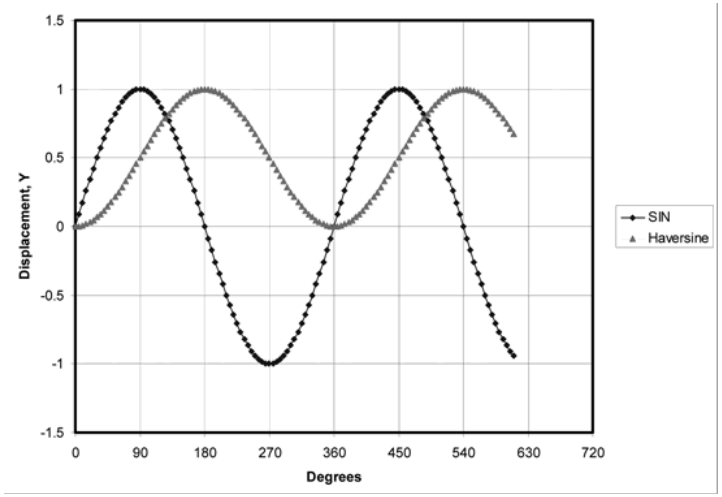
Wave form discussion

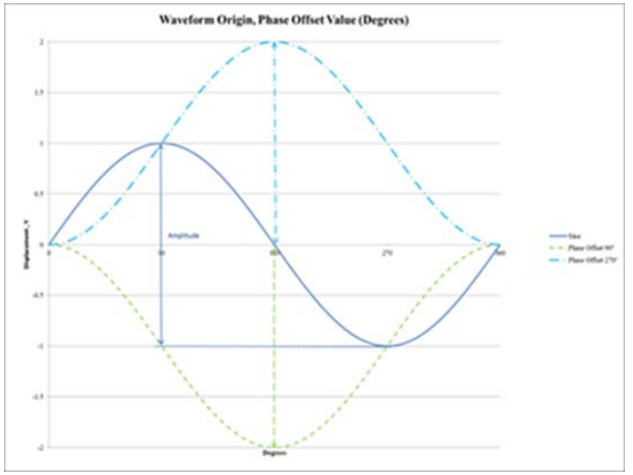
- On going – some changes to ASTM method have been proposed
- Issues on how tensile strain is applied in test



Recommended Changes In ASTM D7460

- Change haversine to sinusoidal & include Phase Offset for origin start location on any type of wave.
- Update graphs to better represent the equipment response





Sinusoidal Waveforms @ 90° & 270° Phase Offsets Comparison Fixed vs. Floating Reference Points

FRM-006
Beam Fatigue Testing Summary
10 Hz, 15 C

Beam	Air Voids (%)	Level of Micro Strain	Initial Beam Stiffness (MPa)	Target Amplitude Calculated (mm)	Actual Amplitude at 50th Cycle (mm)	Report Amplitude at 50th Cycle (mm)	Test Termination (cycles)	Normalized Modulus Failure Point (cycles)
(FRM-006D) UTM (Down)Fixed Ref-Point				L (357)	L (357)	L (357)		
1	5.1	2000	1928	1.0721	1.0721	N/A	980,000	646,160
2	4.6	2000	1928	1.0949	1.0949	N/A	1,300,000	848,920
3	4.7	2000	1804	1.0888	1.0888	N/A	1,900,000	421,720
4	3.6	2000	1851	1.0766	1.0766	N/A	560,000	348,320
5	3.2	2000	1866	1.0784	1.0784	N/A	1,100,000	757,640
6	3.5	2000	1295	1.0776	1.0776	N/A	640,000	456,680
Average	4.1		1779	1.0814	1.0814			
(FRM-006E) UTM (Up)-Fixed Ref-Point				L (357)	L (357)	L (357)		
1	2.9	2000	2004	1.0607	1.0607	N/A	920,000	646,880
2	3.1	2000	1942	1.075	1.075	N/A	1,600,000	882,560
3	3.1	2000	1940	1.0748	1.0748	N/A	920,000	738,120
4	3.6	2000	1933	1.0883	1.0883	N/A	560,000	347,240
5	3.5	2000	1886	1.0896	1.0896	N/A	1,500,000	926,640
6	3.3	2000	1915	1.0706	1.0706	N/A	800,000	429,880
Average	3.3		1937	1.0765	1.0765			
				δx►Target	**δx=½δc**	**δc**		
(FRM-006G) Floating Ref-Point (UP)				L/6 (237)	L/6 (237)	L (Calc)		
1	3.9	2000	1606	0.5357	0.5372	1.0743	2,521,550	1,634,300
2	3.2	2000	1220	0.5377	0.5356	1.0712	2,304,000	1,278,390
3	3.1	2000	1682	0.5344	0.5335	1.067	1,426,130	901,570
4	3.6	2000	1875	0.5357	0.5366	1.0731	2,134,080	633,380
5	3.4	2000	1916	0.5356	0.534	1.0681	1,749,220	1,220,860
6	3.4	2000	1841	0.538	0.5385	1.0769	1,849,460	1,107,750
Average	3.4		1690	0.5362	0.5359	1.0718		

(FRM-006D) UTM (Down)Fixed Ref-Point

Mean	Stand Dev	COV
570,550	158,993	28

Removed the high and low values

(FRM-006E) UTM (Up)-Fixed Ref-Point

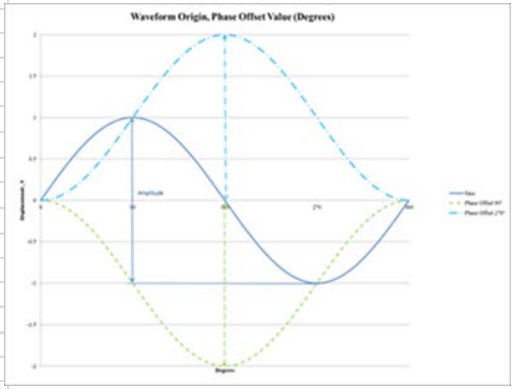
Mean	Stand Dev	COV
674,360	189,682	28

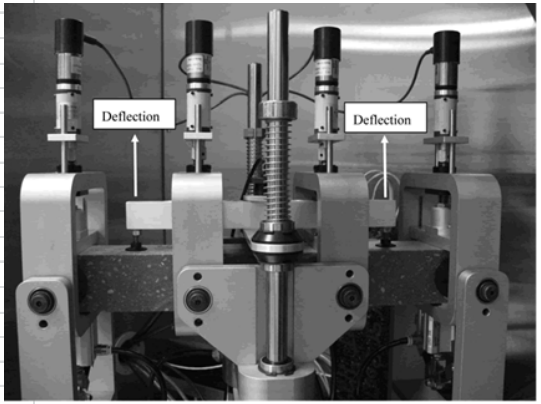
Removed the high and low values

(FRM-006G) Floating Ref-Point (UP)

Mean	Stand Dev	COV
1,127,143	166,251	15

Removed the high and low values





Ongoing needs

- Continue discussions with group on unification of methods
  - Work being conducted by ASU
  - More changes likely needed within ASTM method
  - Will need to revisit equipment control issues to make sure that all equipment is controlling in equivalent way