National Concrete Pavement Technology Center

Tech Center

Vibrating Kelly ball (V-Kelly) Test Procedure

For additional information, Reference AASHTO T129

Static Test:

1. Sample fresh concrete according to AASHTO R 60 – Sampling Freshly Mixed Concrete.
2. Place concrete in the rubber tub and create a level surface. Do not consolidate the concrete.
3. Pull out the pin holding the graduated shaft while holding the shaft to prevent it from dropping.
4. Gently lower the ball until it touches the surface of the concrete.
5. Record the initial reading on the graduated scale to the nearest 2.5 mm (0.1 in.).
6. Allow the ball sink to on its own weight by releasing the shaft.

Figure 1- Depth of Penetration under Static Load

7. As the ball comes to rest, record the static depth to the nearest 2.5 mm (0.1 in.).

Dynamic test

1. After completion of static test, turn on the vibrator and simultaneously start the timer. Use low speed, 8000 vpm vibrator such as CSV-1 or equivalent

2. Record the depth readings on the graduated shaft every 6 s up to 36 s. Stop the test if the top of the ball reaches the surface of the concrete.

   Note 1- One way to collect data is to use a video recorder to monitor the graduated scale for the duration of the test. Alternatively, a digital laser measurer (Bosch Professional GLM 40 or similar) can be installed on the top bar to help record the ball penetration depth during vibration.

3. In the lab, remix the concrete in a mixer for about 30 s then repeat the test.
   In the field, repeat the test using fresh concrete from the same sample load.

Figure 2- Depth of Penetration under Dynamic Load

4. Take a minimum of three individual sets of readings. Individual readings should agree within 12.5 mm (0.5 in.) of penetration at any given time.

Calculation

1. Static load- Calculate the depth of penetration for the three repeats, and determine an average. Multiply by 2 (Koehler and Fowler, 2003) to obtain the slump equivalent (VKelly slump) and report to the nearest 5 mm (1/4 in.). This acts as a measure of consistency.

2. Dynamic load- Calculate the average depth of penetration after three repeats. Plot the penetration in inches (millimeters) againste th square root of time in seconds. Draw a best fit line.

   $D = V \sqrt{t} + C$
   Where,

D= penetration depth at time t,
t= elapsed time of vibration (s),
c= constant (non zero), and
V= Vkelly Index

The slope of the best fit line is the VKelly Index. Vkelly Index of 0.8-1.2in/√s (2-3 cm/√s) is considered good.

Sample Calculation

		PENETRATION DEPTH, INCH				VKELLY SLUMP
STATIC	STATUS	FIRST	SECOND	THIRD	AVERAGE	
	At contact	0.5	0.6	0.7	0.6	1.9
	At weight	1.5	1.6	1.5	1.5	

Figure 3- Static slump calculation

	TIME, s	SQUARE ROOT OF TIME, √s	PENETRATION DEPTH, INCH				INCREMENT, IN.	VKELLY INDEX (Slope)
			FIRST	SECOND	THIRD	AVERAGE		
DYNAMIC	0	0.0	1.5	1.6	1.5	1.5		0.99
	6	2.4	2.4	2.4	2.3	2.4	0.83	
	12	3.5	3.1	3.3	3.3	3.2	1.70	
	18	4.2	4.1	4.2	4.1	4.1	2.60	
	24	4.9	4.8	4.8	4.7	4.8	3.23	
	30	5.5	5.3	5.3	5.4	5.3	3.80	
	36	6.0	5.8	5.8	5.9	5.8	4.30	

Figure 4- Vkelly Index Calculation table

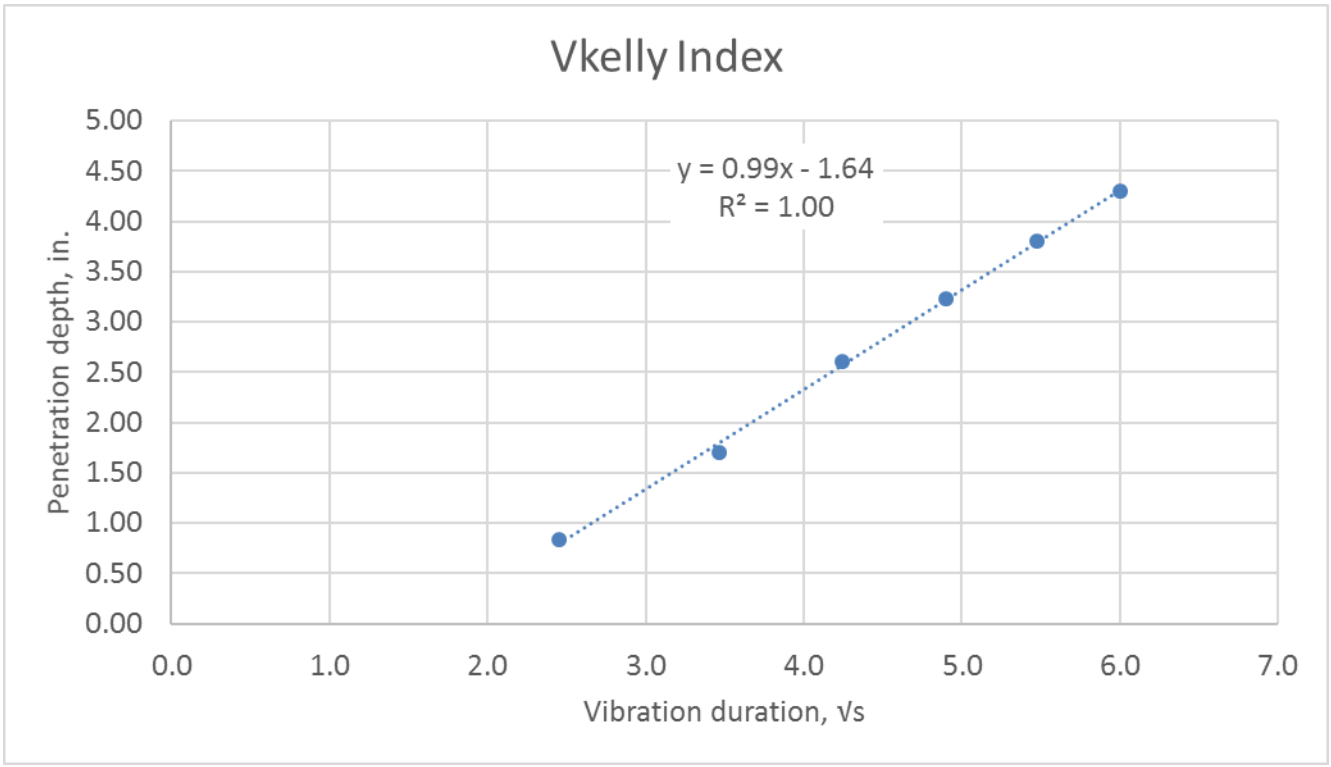

Figure 5- VKelly Index Calculation Plot