

WCM411 Calibration

September 2016

Basics

- every WCM411 sensor must be calibrated for one material
- calibration values for the material are stored in the sensor parameters
 - Vipunet software can calibrate many materials, but the sensor contains only parameters for one material

Calibration parameters: 4 & 6

- “Esc” Press “Esc”-button
- **open** Write “open” and press “Enter”
- **>conf** listing of all sensor parameters

1 coef_A: Scaling factor of the second signal

2 coef_B: Offset of the second signal

3 filter_len: Determines the sensor response time

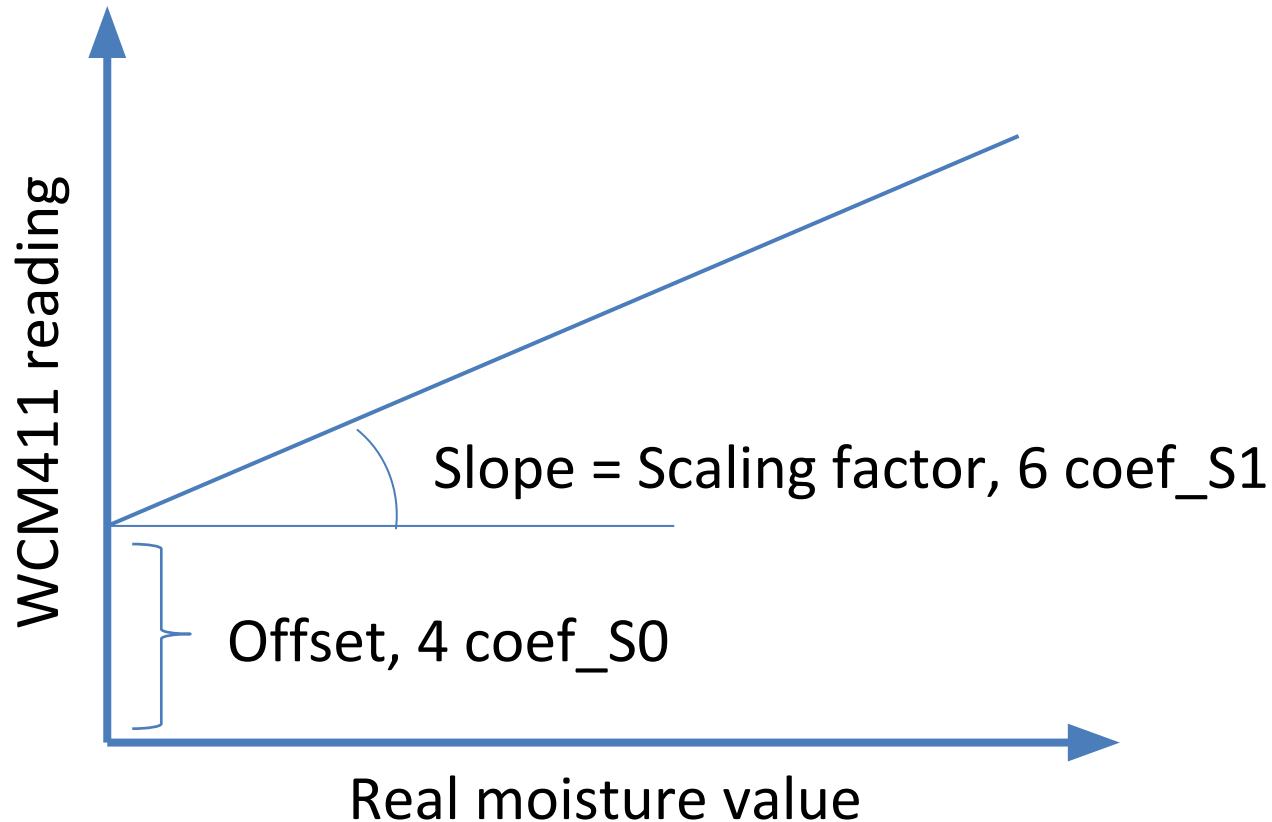
4 **coef_S0: Offset of moisture, look at *Calibration***

5 coef_S1: Not in use

6 **coef_S2: Scaling of moisture, look at *Calibration***

... ..

Determine Scaling and Offset

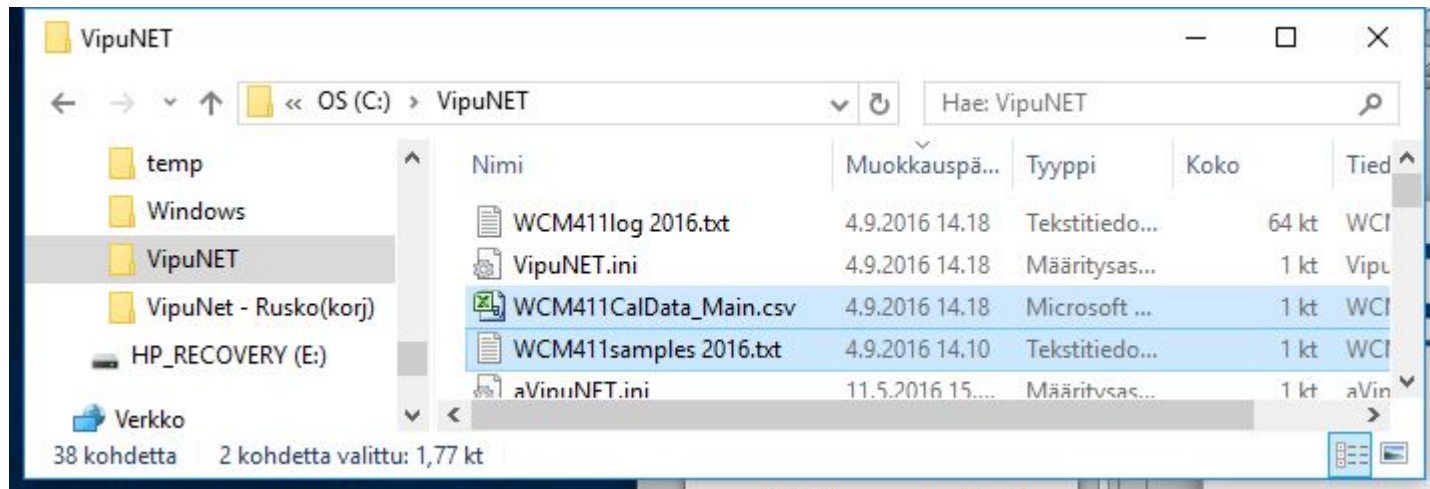


Changing parameter values

- Manually (not recommended)
 - `“Esc”` Press “Esc”-button
 - open** Write “open” and press “Enter”
 - `>conf` listing of all sensor parameters
 - `>conf 4 -1.0` changes offset to -1.0 (% of moisture)
- By Vipunet calibration support
 - recommended

Vipunet

- Windows PC application, directory C:\Vipunet
- For a **fresh start of calibration** rename or save to another location the highlighted old calibration files:



Differences in Samples files

```

WCM411samples 2016.txt - Muistio
Tiedosto Muokkaa Muotoile Näytä Ohje
2016-09-03;13:39:10; WCM411; 100.000;0.000; Main; user;1.000;0.000; moisture; 3.34;3.34;3.34;3.27;3.26;3.26;3.26;3.26;3.27;3.27; comment; Sample 1
2016-09-03;13:43:37; WCM411; 100.000;0.000; Main; user;1.000;0.000; moisture; 3.76;3.76;3.76;3.76;3.63;3.76;3.90;3.76;3.75;3.75; comment; Sample 2
2016-09-03;13:55:12; WCM411; 100.000;0.000; Main; user;1.000;0.000; moisture; 5.63;5.57;5.57;5.57;5.44;5.44;5.44;5.44;5.44; comment; Sample 3
2016-09-03;14:08:36; WCM411; 100.000;0.000; Main; user;1.000;0.000; moisture; 6.87;6.87;6.87;6.87;6.87;6.87;6.30;6.30;5.77;6.30; comment; Sample 4
2016-09-03;14:21:51; WCM411; 100.000;0.000; Main; user;1.000;0.000; moisture; 7.66;7.80;7.76;7.76;7.66;7.42;7.66;7.71;7.71;7.71; comment; Sample 5
2016-09-03;14:42:45; WCM411; 100.000;0.000; Main; user;1.000;0.000; moisture; 6.45;6.74;6.99;6.99;6.99;6.99;6.74;7.02;7.02;7.02; comment; Sample 6
    
```

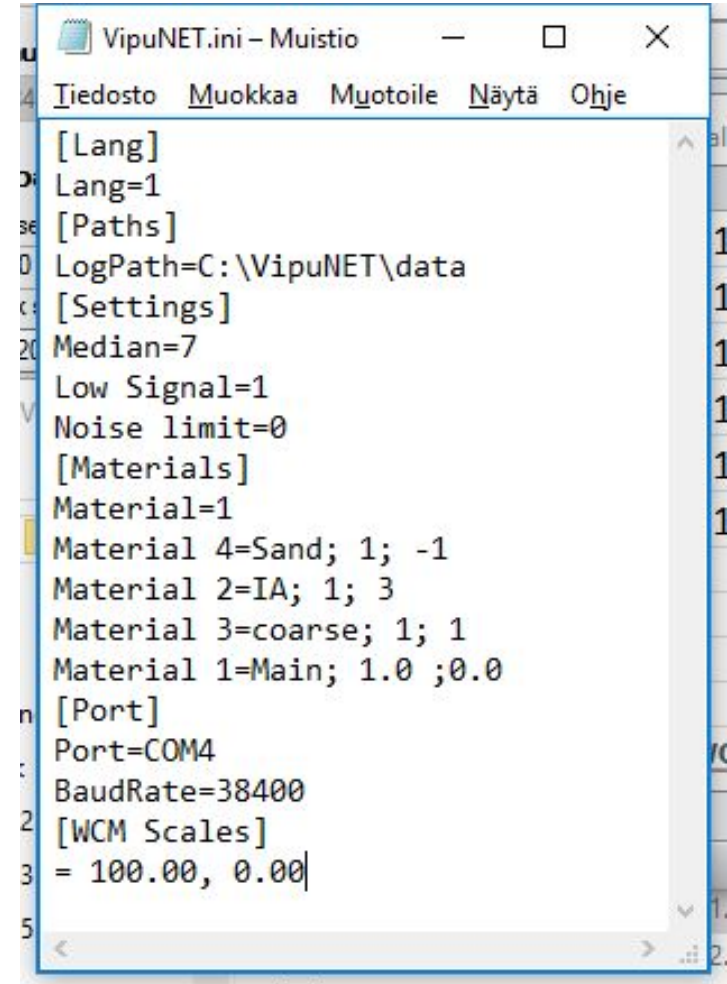
Microsoft Excel

WCM411CalData_Main.csv

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	3.9.2016	13:39:10	WCM411	100	0	Main	user	1	0	moisture	3.34	3.34	3.34	3.27	3.26	3.26	3.26	3.26	3.27	3.27	comment	Sample	3	3.29
2	3.9.2016	13:43:37	WCM411	100	0	Main	user	1	0	moisture	3.76	3.76	3.76	3.76	3.63	3.76	3.9	3.76	3.75	3.75	comment	Sample	4	3.76
3	3.9.2016	13:55:12	WCM411	100	0	Main	user	1	0	moisture	5.63	5.57	5.57	5.57	5.44	5.44	5.44	5.44	5.44	5.44	comment	Sample	5	5.5
4	3.9.2016	14:08:36	WCM411	100	0	Main	user	1	0	moisture	6.87	6.87	6.87	6.87	6.87	6.87	6.3	6.3	5.77	6.3	comment	Sample	6	6.59
5	3.9.2016	14:21:51	WCM411	100	0	Main	user	1	0	moisture	7.66	7.8	7.76	7.76	7.66	7.42	7.66	7.71	7.71	7.71	comment	Sample	8	7.68
6	3.9.2016	14:42:45	WCM411	100	0	Main	user	1	0	moisture	6.45	6.74	6.99	6.99	6.99	6.99	6.74	7.02	7.02	7.02	comment	Sample	7	6.89
7																								
8																								
9																								
10																								

VipUNET.ini

- Check Vipunet.ini
 - If you find lines like:
 [WCM Scales]
 = 56.20, -0.53
 - remove them, save the file and restart Vipunet
 - this avoids confusion about current calibration values



```
VipUNET.ini - Muistio
Tiedosto Muokkaa Muotoile Näytä Ohje
[Lang]
Lang=1
[Paths]
LogPath=C:\VipUNET\data
[Settings]
Median=7
Low Signal=1
Noise limit=0
[Materials]
Material=1
Material 4=Sand; 1; -1
Material 2=IA; 1; 3
Material 3=coarse; 1; 1
Material 1=Main; 1.0 ;0.0
[Port]
Port=COM4
BaudRate=38400
[WCM Scales]
= 100.00, 0.00
```


Calibration

Three different procedures:

1. Calibrate in the lab

- measure two samples, e.g. about 2 and 5 % by Vipunet Sample button, then CAL -button and finally Calibrate WCM –button
- check offset at final sensor location

2. Calibrate during production

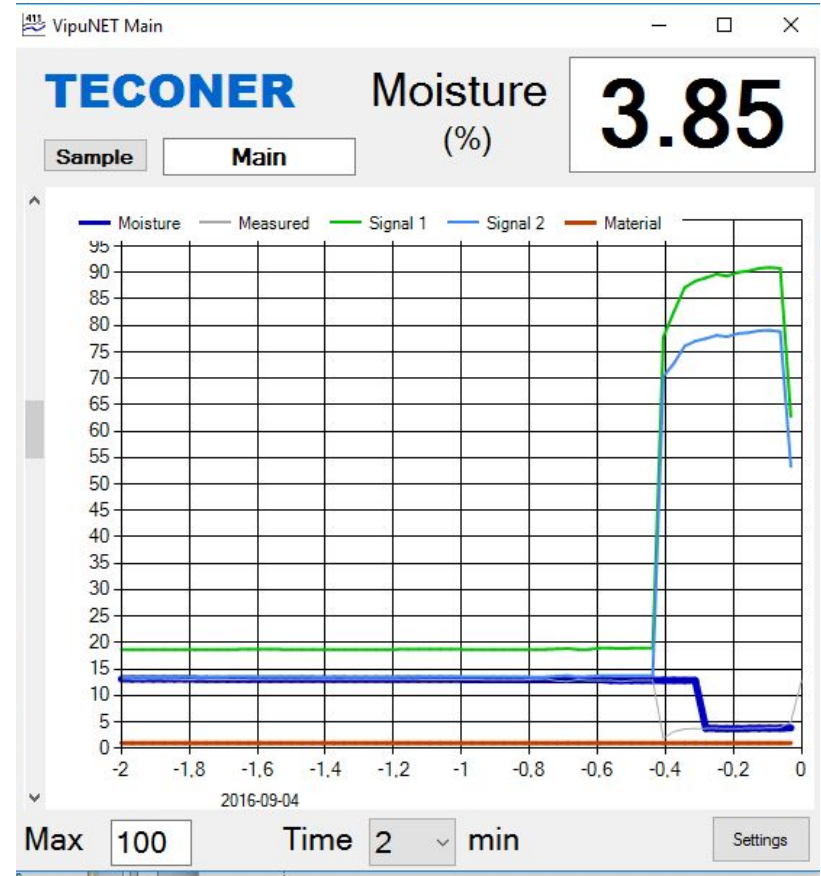
- this procedure may take long time

3. Use table values for Scale (6 coef_S1)

- determine offset (4 coef_S0) at final sensor location

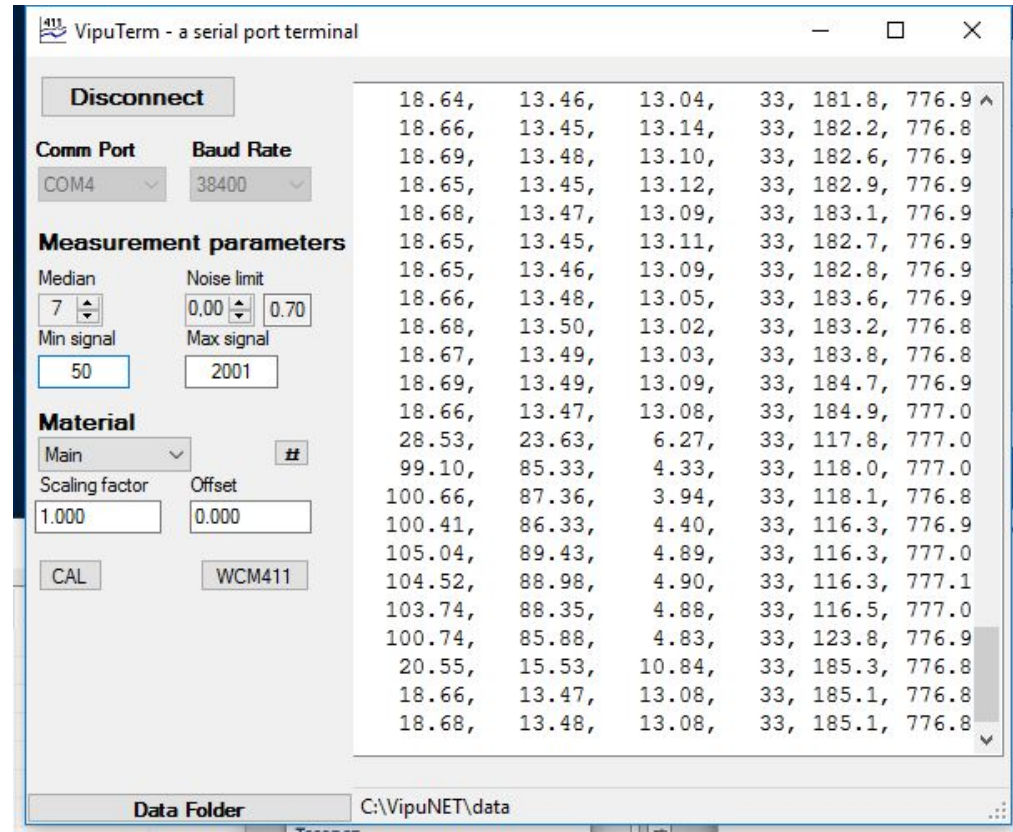
Vipunet Sample Button

- When pressing Sample button, be sure that the reading, in this case 3.85, corresponds to your bake out sample
 - Hint: adjust “Min signal” to cause graphing to stop, while silo door is closed.
 - Setting “Noise limit” may do the same, when measuring over a belt feeder.



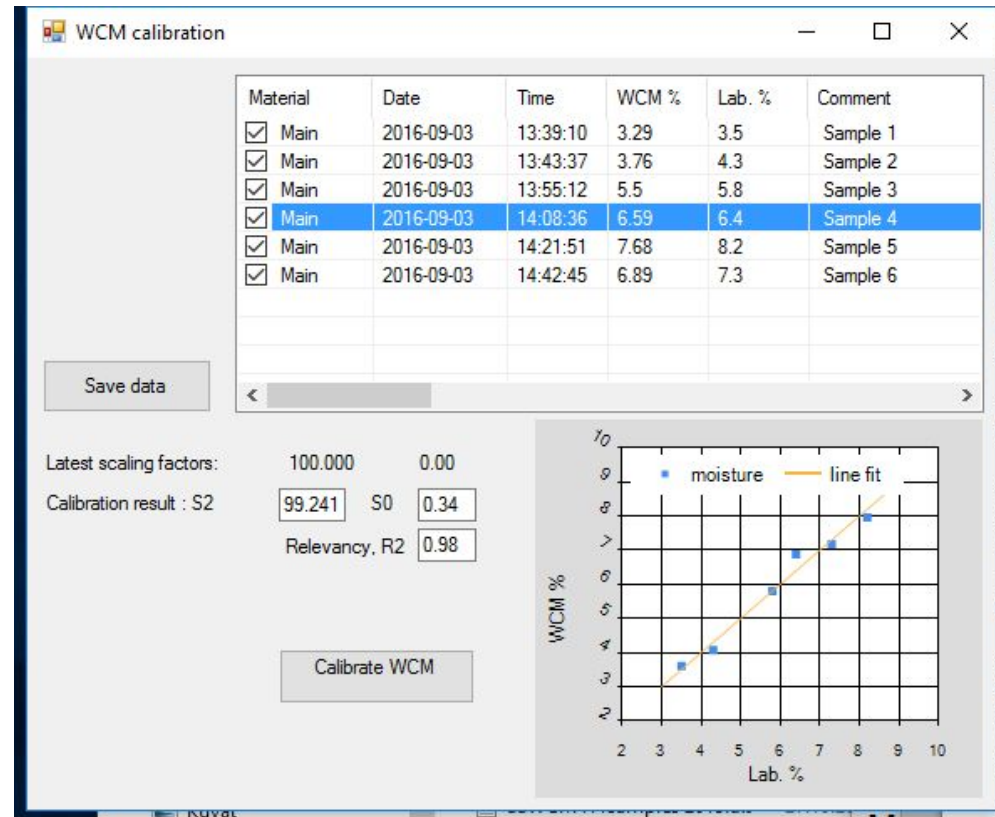
Vipunet Settings Window

- “Min signal” 50 is used here to set on recording, while silo door is open.
- Observe CAL button!
- WCM411 installs a new firmware.
- for other details consult the User’s Guide



Vipunet CAL Window

- Six samples of material “Main” with bake out (Lab %) values
- Calibration values in the sensor are 100.000 and 0.00, calibration result is:
 - 99.241 for 6 coef_S1 and
 - 0.34 for 4 coef_S0
- To calibrate press “Calibrate WCM” button



Check your numbers!

- Prior to calibration check the samples file, that there are no accidental bad readings, which can change the average value of the sample.

Microsoft Excel

WCM411CalData_Main.csv

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	3.9.2016	13:39:10	WCM411	100	0	Main	user	1	0	moisture	3.34	3.34	3.34	3.27	3.26	3.26	3.26	3.26	3.27	3.27	comment	Sample	3	3.29
2	3.9.2016	13:43:37	WCM411	100	0	Main	user	1	0	moisture	3.76	3.76	3.76	3.76	3.63	3.76	3.9	3.76	3.75	3.75	comment	Sample	4	3.76
3	3.9.2016	13:55:12	WCM411	100	0	Main	user	1	0	moisture	5.63	5.57	5.57	5.57	5.44	5.44	5.44	5.44	5.44	5.44	comment	Sample	5	5.5
4	3.9.2016	14:08:36	WCM411	100	0	Main	user	1	0	moisture	6.87	6.87	6.87	6.87	6.87	6.87	6.3	6.3	5.77	6.3	comment	Sample	6	6.59
5	3.9.2016	14:21:51	WCM411	100	0	Main	user	1	0	moisture	7.66	7.8	7.76	7.76	7.66	7.42	7.66	7.71	7.71	7.71	comment	Sample	8	7.68
6	3.9.2016	14:42:45	WCM411	100	0	Main	user	1	0	moisture	6.45	6.74	6.99	6.99	6.99	6.99	6.74	7.02	7.02	7.02	comment	Sample	7	6.89
7																								
8																								
9																								
10																								

Valmis

100%

Table values for scaling factor S1

Aggregate	S1 (Scaling)	Comment
Fine (Filler)	100	0-2 mm
Intermediate	50	0-8 mm
Coarse	25	8-16 mm
Very coarse	12.5	16-32 mm

- Use these scaling factors, if you cannot calibrate initially and check only the offset with one sample.
- When getting more samples, continue calibration.

Bake Out Samples

- Take sample aggregate from different parts of a batch measured by WCM411, mix them thoroughly and determine moisture by bake out.
- Use a microwave oven with low power not to overheat aggregate
 - No need to exceed water boiling point!

Water Absorption of Coarse Aggregates

<http://www.engineeringcivil.com/water-absorption-of-aggregates.html>

WATER ABSORPTION

This test helps to determine the water absorption of coarse aggregates as per IS: 2386 (Part III) – 1963. For this test a sample not less than 2000g should be used. The apparatus used for this test are :-

Wire basket – perforated, electroplated or plastic coated with wire hangers for suspending it from the balance, Water-tight container for suspending the basket, Dry soft absorbent cloth – 75cm x 45cm (2 nos.), Shallow tray of minimum 650 sq.cm area, Air-tight container of a capacity similar to the basket and Oven.

Procedure to determine water absorption of Aggregates.

i) The sample should be thoroughly washed to remove finer particles and dust, drained and then placed in the wire basket and immersed in distilled water at a temperature between 22 and 32°C.

ii) After immersion, the entrapped air should be removed by lifting the basket and allowing it to drop 25 times in 25 seconds. The basket and sample should remain immersed for a period of 24 + ½ hrs afterwards.

iii) The basket and aggregates should then be removed from the water, allowed to drain for a few minutes, after which the aggregates should be gently emptied from the basket on to one of the dry clothes and gently surface-dried with the cloth, transferring it to a second dry cloth when the first would remove no further moisture. The aggregates should be spread on the second cloth and exposed to the atmosphere away from direct sunlight till it appears to be completely surface-dry. The aggregates should be weighed (Weight 'A').

iv) The aggregates should then be placed in an oven at a temperature of 100 to 110°C for 24hrs. It should then be removed from the oven, cooled and weighed (Weight 'B').

Formula used is Water absorption = [(A – B)/B] x 100%.

Two such tests should be done and the individual and mean results should be reported. A sample proforma for the record of the test is

WATER ABSORPTION OF COARSE AGGREGATES

S.No.	Determination No.	I	II	III
1	Weight of saturated surface-dried sample in g (A)	2409	2380	2491
2	Weight of oven-dried sample in g (B)	2404	2375	2486
3	Water absorption $= \frac{A - B}{B} \times 100\%$	$\frac{5}{2404} \times 100 = 0.208\%$	$\frac{5}{2375} \times 100 = 0.210\%$	$\frac{5}{2486} \times 100 = 0.201\%$
Average value		0.206%		

www.engineeringcivil.com

Note: The figures given in the above table are for illustration purpose only.

Taking Laboratory Samples

- Put your sample on a rotating plate, use Sample button
 - avoid surface drying, be fast
 - thick enough layer of sample aggregate not to see through
 - first sample near 2 % moisture level
 - second sample near 5 %
 - determine the slope, i.e. scaling factor by Vipunet
- Final offset check with a production sample!

