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BCA (Chaplin) Abrasion Tester

Instruction Manual March 2005



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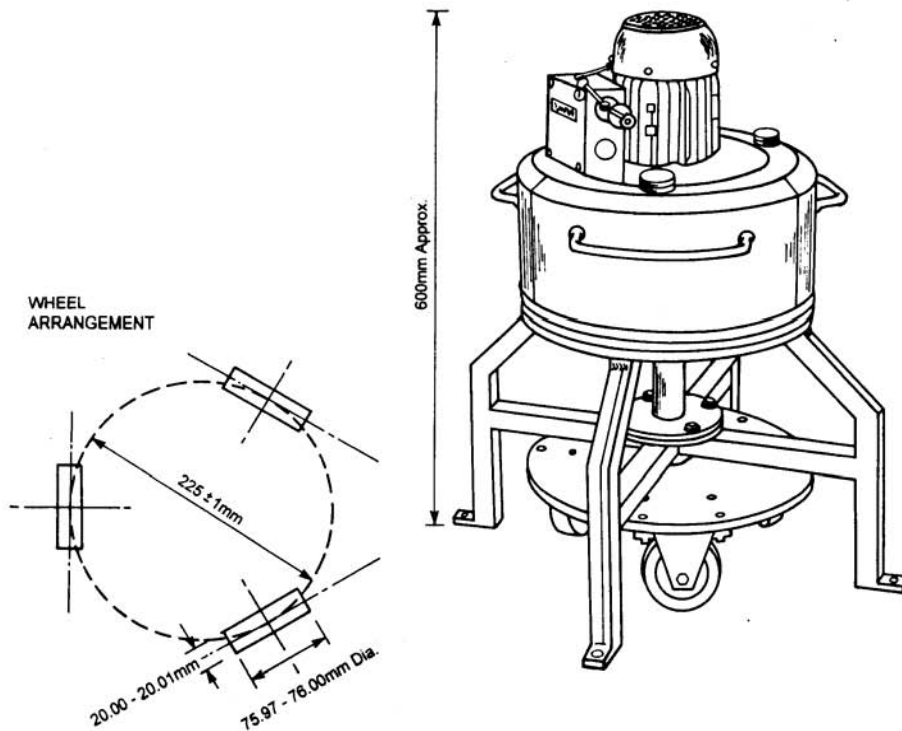
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Introduction

The BCA (Chaplin) Abrasion Tester gives a guide to the abrasion resistance of concrete floors. It can also be used to test the effectiveness of surface treatments used to protect or up-grade sub-standard floors. The depth of wear in the concrete floor brought about by the action of 75mm diameter by 20mm wide hardened steel wheels by 20mm wide hardened steel wheels, is used as a guide to the abrasion resistance. The abrasion apparatus is suitable for compliance testing to the requirements of BS 8204 : 1987 : Part 2 and EN 13892-4.



The tester consists of three 75mm diameter hardened steel wheels mounted tangentially on a circular steel carrier plate. The wheels are fitted such that they are free to rotate but not castor. The carrier plate is connected to a single phase electric motor, which runs at approximately 190 rpm. mounted in a steel frame. To provide a safety enclosure to the tester, and to reduce the operating noise level, a purpose made housing covers the machine during the test. Safety switches fitted at the base of the housing will switch off the electricity supply if the housing is lifted during the abrasion test. An umbilical cable connects the electric motor to a die-cast aluminium box mounted on the safety housing and a further umbilical cable connects from this box to a small control box, which monitors the number of revolutions executed by the shaft of the motor. At the end of a preset number of revolutions, a counter in the control box switches off the power to the electric motor.





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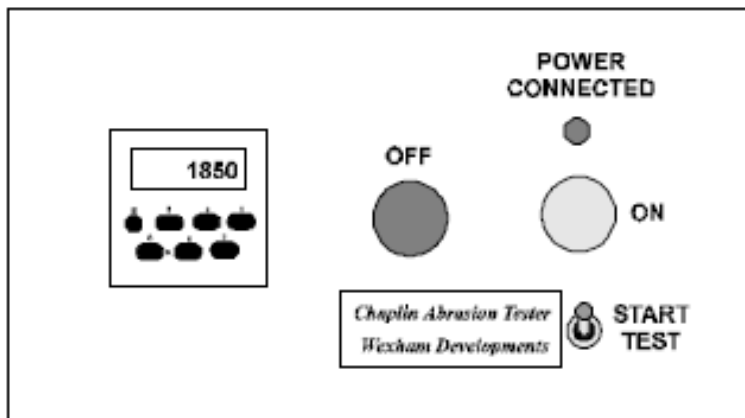
Installation

The electronic control box is supplied without a mains electrical plug. A 240V mains plug, suitable for the country of use, should be attached to the end of the cable by a competent electrician. This plug should be capable of carrying a current of 10A.

The umbilical control / power cables are all fitted with different sized plugs or sockets so it is impossible to connect them incorrectly, Each multi pin plug is held in place by rotating the knurled outer ring to 'snap' it into place.

Control Box

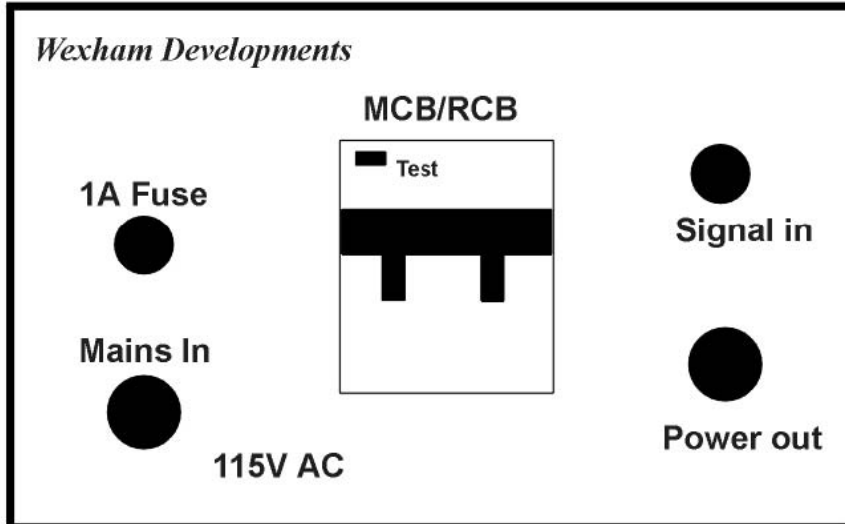
The control box has three switches mounted on its front panel.



When the control box is connected to the electrical supply, the red neon light will illuminate to show that power is available. When the green push switch is pressed, the control box is energised and the electronic counter will display the current count level.

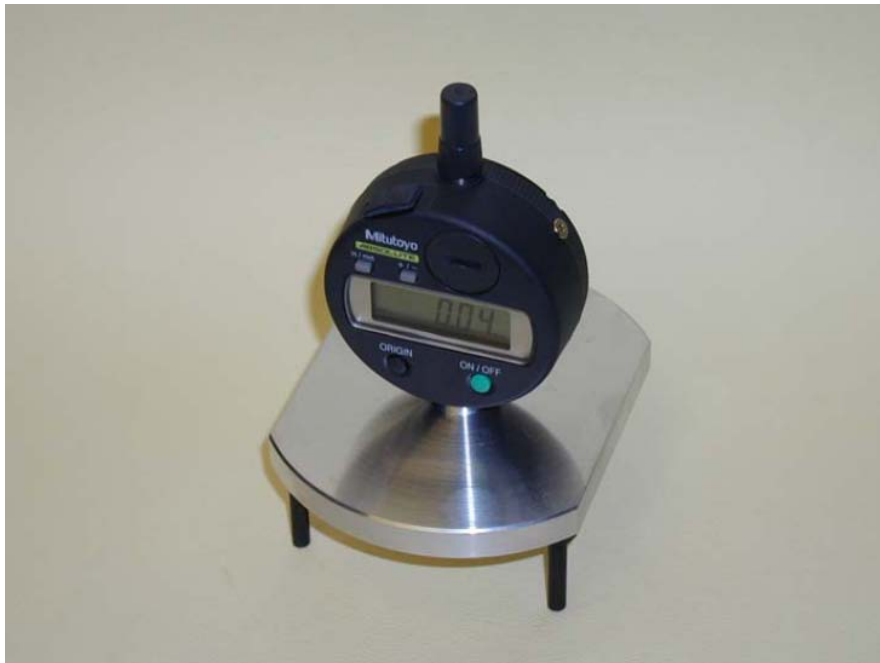
At the start of the test, this number can be re-set to count to the pre-set value, by pressing simultaneously both of the re-set keys outlined in red on the counter. To start the test, the chrome plated switch is pressed and held momentarily until the abrasion tester starts to turn. To stop the test in an emergency, press either the red push switch on the panel front, or the identical push switch on the die-cast aluminium box mounted on the housing. As the abrasion tester runs, each revolution is added until the pre-set value is reached at which point the tester switches off. If the power is switched off during a test, the counter retains the current value of revolutions performed. If the power is re-applied and the green and chrome switches again operated, the test will carry on from where it left off. Explicit instructions on how to change the pre-set counter value are given in Appendix 1. Should an electrical problem occur within the abrasion tester, the miniature circuit breaker / residual current device (RCB / MCB) mounted on the rear panel of the control box (see next page) will isolate the incoming power. The orange test button on the RCB should be pressed before starting any test to ensure that the RCB is working correctly. A 1A fuse in a holder mounted on the rear panel protects the electronic counter itself from damage.

Rear view of Electronic Control Box



Note: 115V model shown, the supplied Control Box is 240V, 50Hz, 1ph

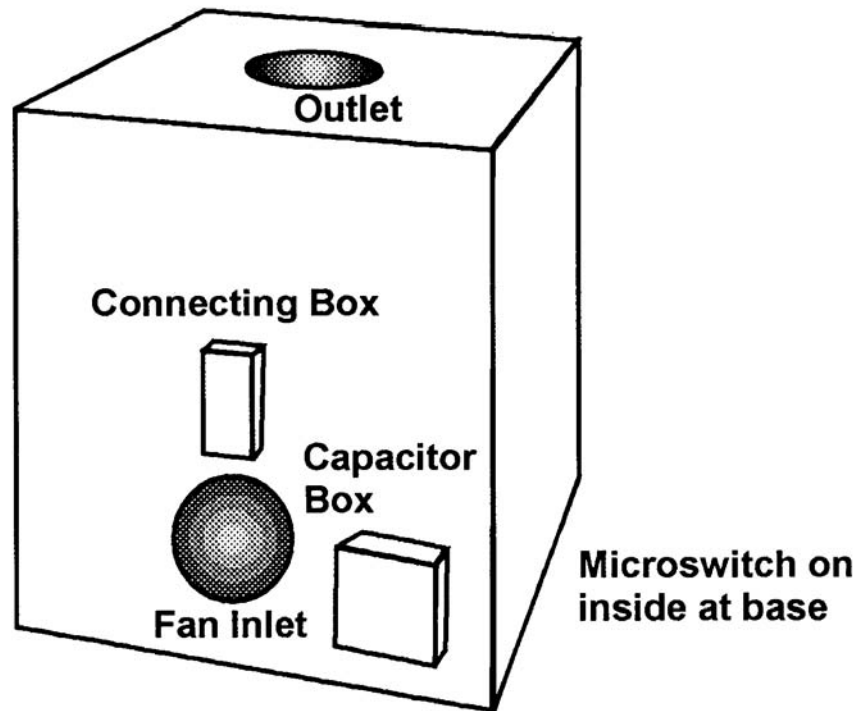
Indentation



The depth of wear in the concrete surface is measured with a battery operated, Mitutoyo electronic LCD depth gauge which is mounted on a tripod base.

The gauge can be set to measure in mm (to 0.01mm) or inches (to .0005 ins.) by pressing the small Inch/mm button on the front face of the gauge. To use the gauge with the abrasion tester, place it on a flat surface and zero the reading by pressing the 'ORIGIN' button. Mark out the eight gauge measuring points using the large template. If there are any projections on the surface of the concrete, in these measuring areas, then remove them using a suitable abrasion stone. Place the depth gauge over each measuring point in turn and record the gauge reading. Carry out the abrasion test and then take readings at each of the eight measuring points using the method described in the previous two paragraphs. If the variation in the datums was small, then subtracting the datum average from the final reading average will give you the average indentation produced by the abrasion test.

Safety Enclosure



Because the whole test depends on abrasion of a concrete surface, the abrasion tester generates a high noise level during testing.

To reduce this noise to a more acceptable level, and to provide a safety enclosure to prevent accidents during use, the tester is covered by a safety housing or enclosure during testing.

This enclosure helps to reduce the noise level but the ear-protectors provided with the equipment should be worn by the operator using the Abrasion tester.



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Two micro-switches fitted to the bottom of the enclosure are connected in series with the STOP switch fitted in the electronic box, and a second STOP switch is fitted on the safety enclosure (on top of the die-cast aluminium box connecting box). Unless these micro-switches are set, by the weight of the enclosure pressing onto the concrete surface, the electric motor will not operate.

To provide cooling to the electric motor, a 150mm diameter cooling fan draws clean air into the box through one side and expels air through the grill on the top of the box.

Abrasion Test Method

- 1 Select the area of floor to be tested.**
- 2 Using the template provided, mark the holes for the two locating pins.**
- 3 Drill the two 10mm diameter locating holes, and clean away any material removed.**
- 4 Re-locate the template using the pins and mark the positions for the tripod legs of the indentation gauge.**
- 5 Sit the indentation gauge on a flat surface and zero the reading.**
- 6 Using the indentation gauge, take initial readings at each of the eight measuring points, recording the values on the results sheet.**
- 7 Position the abrasion tester over the test area using the locating pins.**
- 8 Position the safety housing centrally over the abrasion tester and connect up the umbilical cables from the abrasion tester.**
- 9 Connect the umbilical cables from the electronic control box to the safety housing.**
- 10 Connect the mains inlet cable to the mains electrical supply.**
- 11 Press the green push switch and check that the display is showing zero If not then press the reset buttons (4 + 6) on the counter.**
- 12 Press the Chrome START BUTTON to start the test.**

Note Very occasionally the electric motor driving the abrasion head will have stopped at a 'dead' point which means that it may not start rotating. If this occurs then switch off the mains power, lift one side of the Safety Enclosure and turn the abrasion head a small amount. Replace the Safety Enclosure, re-energise the power supply and start the test.



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- 13 **When the required number of rotations has been achieved, the motor will stop.**
- 14 **Check the Main LCD display to ensure that it has counted up to the preset value, and that the motor has not stopped turning due to a loss of main electrical supply.**
- 15 **Switch off the mains electrical supply and remove the safety housing and the abrasion tester.**
- 16 **Again using the indentation gauge, take the final readings at each of the eight measuring points and record these on the results sheet.**
- 17 **Subtract the values to obtain the depth of wear induced by the test and record the maximum and average values.**

Table 7 from R G Chaplins paper is printed on the next page, this gives a guide as to the depths of wear one would expect for different grades of concrete.



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Abrasion resistance class	CP 204 class	Duty	Application	Maxm depth of wear mm	Type of concrete	Concrete grade N/mm ²	Minimum cement content kg/m ³	Type of coarse aggregate	Type of fine aggregate	Finishing process	Curing type and duration
Extremely high	Special	Severe abrasion and impact	Very heavy duty engineering workshops etc.	0.05	Special mixes proprietary apronite finishes	Special mixes see below					
Very high	AR 1	Very high abrasion steel wheel traffic and impact	Heavy duty industrial workshops, special commercial etc.	0.1	High strength epoxies, traditional granolithic and other special mixes	CBs or proportion mixes such as:- 1 : 1 : 2	475	Aggregates complying with - Jones of BS 882 Table 3 for Heavy duty floor finishes	Natural sand complying with BS 882 grade M or grade C other than soft limestone,	Trowelling 3 times or more	Surface wetting on the day after casting then closely covered with polythene
High	AR 2	High abrasion, steel or hard plastic wheel traffic	Medium duty industrial and commercial	0.2	Direct finished concrete	C50	400	Aggregates complying with BS 882 other than soft limestone,	sandstone or other poor quality aggregates	Trowelling 3 times or more	bleeding for 7 days minimum or if no other surface treatment
Good	AR 3	Moderate abrasion, rubber tyred traffic	Light duty industrial and commercial	0.4	Direct finished concrete	C40	325	sandstone or other poor quality aggregates	Natural sand complying with BS 882 or other suitable approved aggregate	Trowelling 3 times or more lines or early age grinding	Is to be applied use a 90% efficiency resin based curing
Nominal	-	Low abrasion foot and pneumatic tyred traffic	Very light duty industrial and commercial	0.8	Direct finished concrete	C40	325	Any suitable approved aggregate	Any suitable approved aggregate	Trowelling twice or more lines or early age grinding	compound complying with the Department of Transport spec. applied immediately after final trowelling

Note Special Mixes and proprietary sprinkle finishes cannot be classified by strength grade or minimum cement content and may contain aggregates which do not meet the specific requirements of CP 204 or BS 882. Special finishing techniques may be used. Although a limiting value of 0.05mm depth of wear is suggested, the suitability of concrete flooring in this class should be established with the manufacturer or contractor and where appropriate using other more severe abrasion tests.

Table7 from The influence of ggbs and pfa additions on the abrasion resistance of industrial concrete floors by R. G. Chaplin



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Appendix 1 . Changing the Pre-set Counter

As supplied, the counter has a pre-set value of 2850 revolutions. To change this value, press counter buttons E and 1 simultaneously, the red LED display will change to show the old pre-set value which can then be altered by pressing the blue buttons on the face of the counter. Each of the 6 LCD digits is controlled separately by the numbered buttons. Pressing and holding the number 1 button will cause the display to increase by 1 digit at a time until the number reaches 9 when it reverts to 1 again. ALL the buttons work in a similar manner so that the maximum number of revolutions programmable is 999999. When the number has been correctly set, press and hold the E button until the counter re-sets to the counting mode (hold for at least 5 secs.) This operation is described in more detail in the following sections.

RESULTS SHEET

A blank results sheet appears on the next page. Enclosed with this manual is a second sheet on thicker paper for photo-copying.

A Williams



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Chaplin Abrasion Tester Results Sheet

Project Number _____ Date _____

Machine Reference No: _____

Depth Indicator No: _____ Temperature _____

Location Tested _____ Time duration _____ mins

Description of Floor or Component : _____

Location of test areas			
Position No.	Zero Reading mm	Final Reading mm	Depth of Wear mm
1			
2			
3			
4			
5			
6			
7			
8			
Total Depth of Wear mm			
Mean Depth of Wear mm			

Specimen Details :

Date cast :

Curing details :

Concrete characteristics : _____



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Default Settings for Hengstler Counter

To change or modify any of the following settings, press keys E and 5 when switching on the power to the counter.

F0 0
F1 0
F3 0 F4 1 F6 On
F9 0
F10 0
F11 1
F12 0
F14 0
F15 etc. 0

To change the pre-set level press E and key 1 at the same time then press the individual keys.

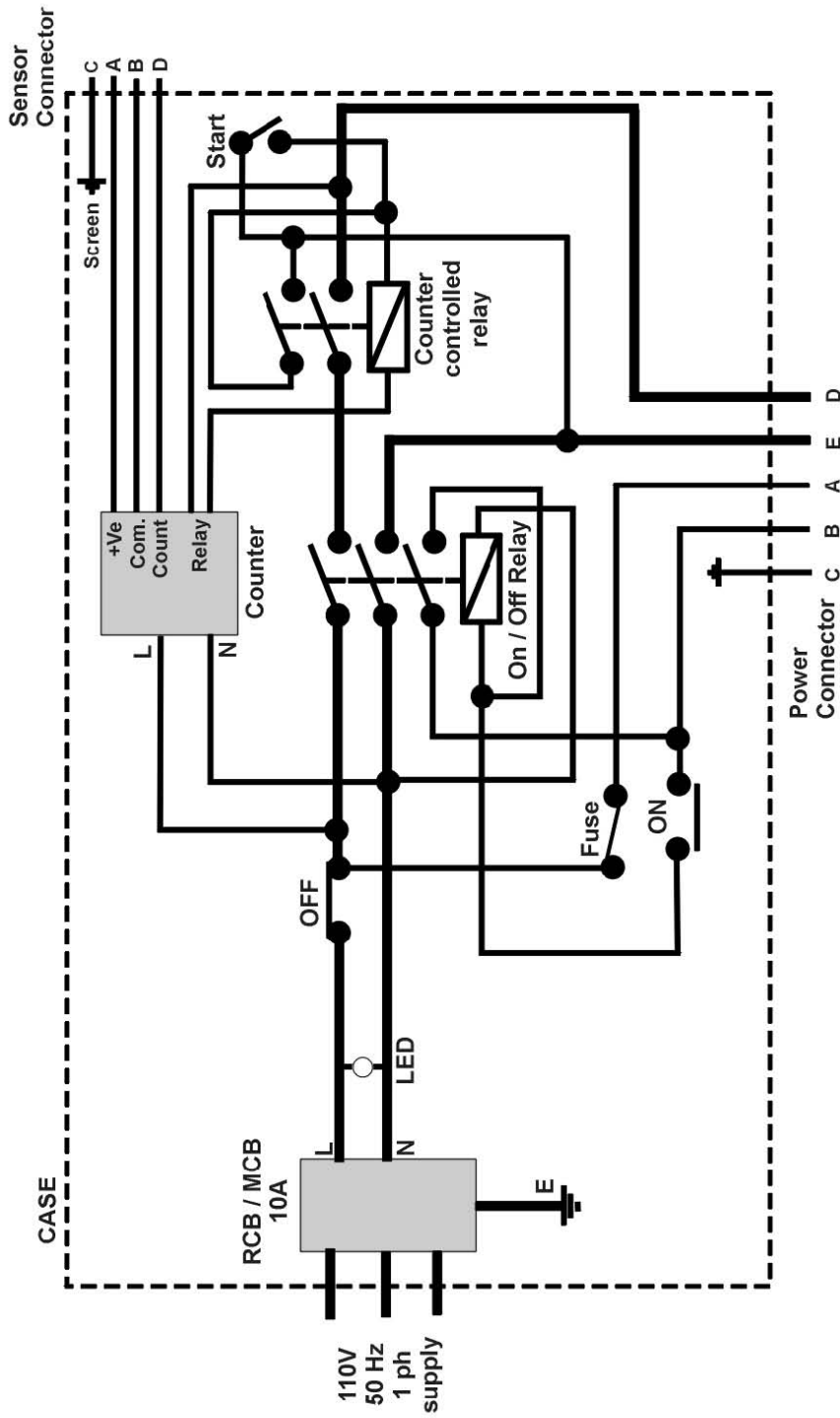


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Wexham Developments Unit 8 Youngs Industrial Estate Paices Hill, Aldermaston, Reading RG7 4PW Tel 0118 9810411 Fax 0118 9810811	Title Chaplin Abrasion Tester Control Box Circuit		DrawingRef. ABR001	
	Drawn by AW	Checked by AW	Date Jan 2002	Scale