

MORTARCHECK II

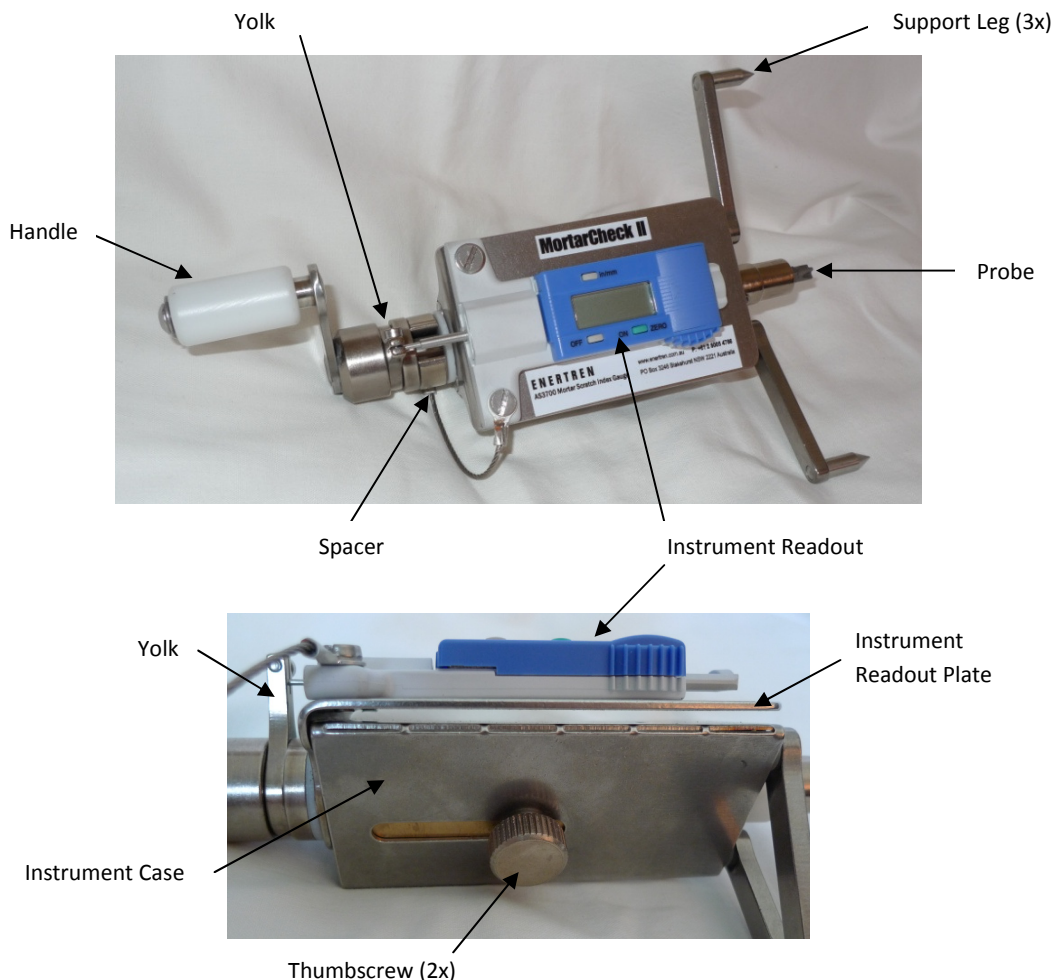
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Mortar Durability Test Instrument



Instructions

Operating Procedure

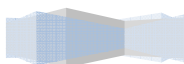
The test procedure is set out in Australian Standard AS 3700–2011 Masonry Structures Appendix E (Appendix FA in AS 3700–2001). The following procedure is provided to assist in operating the **MortarCheck II** instrument when carrying out tests in accordance with the standard.

1. Unfold the support legs to an even spacing around the probe.
2. Set the instrument readout to the inch scale for maximum precision (displaying 3 places after the decimal point).
3. Retract the spring and insert the spacer.
4. Align the handle at the bottom so that the notch lines up with the top of the yoke.
5. Loosen the two thumbscrews.
6. Slide the instrument within its case until the probe rests lightly on the joint at the test location, while all three legs rest on the adjacent masonry units. Adjust legs as required to provide the most stable support.
7. Tighten the thumbscrews to lock the instrument to its case.
8. Remove the spacer to allow the spring to press the probe against the joint. This procedure ensures that there is 10mm spring compression at the commencement of the test.
9. Hold the case firmly at the base around the thumbscrews. Do not hold or put pressure on the instrument readout plate.
10. Give the probe 2 full turns, being careful not to exert any axial force on the probe.
11. Zero the readout.
12. Maintain the same firm hold on the case and give the probe 5 full turns as required by AS 3700.
13. Record the reading for this location.
14. Repeat for a total of five tests and average the results to obtain the Scratch Index.
15. If required, convert the reading from inches to millimetres by either:
 - a. multiplying by 25.4
 - b. using the table given on the reverse
 - c. Excel spreadsheet available from www.mortarcheck.com.au
16. Use the table on page 4 to record each scratch index result (comprising five tests), and change the probe after 40 results obtained ($5 \times 40 = 200$).
17. To change probes, simply pull the existing one from the bit where it is secured magnetically and replace with a new one.

Safety

The support legs have sharp points, so handle the unit carefully, facing the legs away from your body and other people, and take care when altering their position.

The user should prepare their own safe work method statements as required.



Conversion Table (inches to mm)

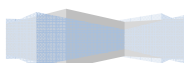
Note: The leftmost column shows the first 2 digits after the decimal point and the number in the top row is the third digit after the decimal point. For example, 0.016 inches = 0.406 mm.

		Third decimal place on readout										
		0	1	2	3	4	5	6	7	8	9	
Inches		0.00	0.000	0.025	0.051	0.076	0.102	0.127	0.152	0.178	0.203	0.229
		0.01	0.254	0.279	0.305	0.330	0.356	0.381	0.406	0.432	0.457	0.483
		0.02	0.508	0.533	0.559	0.584	0.610	0.635	0.660	0.686	0.711	0.737
		0.03	0.762	0.787	0.813	0.838	0.864	0.889	0.914	0.940	0.965	0.991
		0.04	1.016	1.041	1.067	1.092	1.118	1.143	1.168	1.194	1.219	1.245
		0.05	1.270	1.295	1.321	1.346	1.372	1.397	1.422	1.448	1.473	1.499
		0.06	1.524	1.549	1.575	1.600	1.626	1.651	1.676	1.702	1.727	1.753
		0.07	1.778	1.803	1.829	1.854	1.880	1.905	1.930	1.956	1.981	2.007
		0.08	2.032	2.057	2.083	2.108	2.134	2.159	2.184	2.210	2.235	2.261
		0.09	2.286	2.311	2.337	2.362	2.388	2.413	2.438	2.464	2.489	2.515
		0.10	2.540	2.565	2.591	2.616	2.642	2.667	2.692	2.718	2.743	2.769
		0.11	2.794	2.819	2.845	2.870	2.896	2.921	2.946	2.972	2.997	3.023
		0.12	3.048	3.073	3.099	3.124	3.150	3.175	3.200	3.226	3.251	3.277
		0.13	3.302	3.327	3.353	3.378	3.404	3.429	3.454	3.480	3.505	3.531
		0.14	3.556	3.581	3.607	3.632	3.658	3.683	3.708	3.734	3.759	3.785
		0.15	3.810	3.835	3.861	3.886	3.912	3.937	3.962	3.988	4.013	4.039
		0.16	4.064	4.089	4.115	4.140	4.166	4.191	4.216	4.242	4.267	4.293
		0.17	4.318	4.343	4.369	4.394	4.420	4.445	4.470	4.496	4.521	4.547
		0.18	4.572	4.597	4.623	4.648	4.674	4.699	4.724	4.750	4.775	4.801
		0.19	4.826	4.851	4.877	4.902	4.928	4.953	4.978	5.004	5.029	5.055
		0.20	5.080	5.105	5.131	5.156	5.182	5.207	5.232	5.258	5.283	5.309
		0.21	5.334	5.359	5.385	5.410	5.436	5.461	5.486	5.512	5.537	5.563
		0.22	5.588	5.613	5.639	5.664	5.690	5.715	5.740	5.766	5.791	5.817
		0.23	5.842	5.867	5.893	5.918	5.944	5.969	5.994	6.020	6.045	6.071
		0.24	6.096	6.121	6.147	6.172	6.198	6.223	6.248	6.274	6.299	6.325
		0.25	6.350	6.375	6.401	6.426	6.452	6.477	6.502	6.528	6.553	6.579
		0.26	6.604	6.629	6.655	6.680	6.706	6.731	6.756	6.782	6.807	6.833
		0.27	6.858	6.883	6.909	6.934	6.960	6.985	7.010	7.036	7.061	7.087
		0.28	7.112	7.137	7.163	7.188	7.214	7.239	7.264	7.290	7.315	7.341
		0.29	7.366	7.391	7.417	7.442	7.468	7.493	7.518	7.544	7.569	7.595
		0.30	7.620	7.645	7.671	7.696	7.722	7.747	7.772	7.798	7.823	7.849
		0.31	7.874	7.899	7.925	7.950	7.976	8.001	8.026	8.052	8.077	8.103
		0.32	8.128	8.153	8.179	8.204	8.230	8.255	8.280	8.306	8.331	8.357
		0.33	8.382	8.407	8.433	8.458	8.484	8.509	8.534	8.560	8.585	8.611
		0.34	8.636	8.661	8.687	8.712	8.738	8.763	8.788	8.814	8.839	8.865
		0.35	8.890	8.915	8.941	8.966	8.992	9.017	9.042	9.068	9.093	9.119
		0.36	9.144	9.169	9.195	9.220	9.246	9.271	9.296	9.322	9.347	9.373
		0.37	9.398	9.423	9.449	9.474	9.500	9.525	9.550	9.576	9.601	9.627
		0.38	9.652	9.677	9.703	9.728	9.754	9.779	9.804	9.830	9.855	9.881
		0.39	9.906	9.931	9.957	9.982	10.008	10.033	10.058	10.084	10.109	10.135

Probe Test Record

Use the following table to record each scratch index result (comprising five tests), and change the probe after 40 results obtained (5 x 40 = 200).

Scratch Index Test Result	Probe 1	Probe 2	Probe 3	Probe 4	Probe 5	Probe 6
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
Replaced?						



AS 3700–2011 Testing Protocol

The requirements for mortar durability to satisfy Table 5.1 are provided in Clause 11.4.3. Mortars which do not comply with the deemed-to-satisfy requirements of Table 11.1 must be tested for durability in accordance with Appendix E Durability Testing. The **MortarCheck II Mortar Durability Testing Instrument** complies with Appendix E.

The table below is an extract from AS 3700–2011 Section 11 Materials, Tables 11.1 and 11.2 and shows the Scratch Index and the most common deemed-to-comply masonry mortar mix proportions for each of the relevant mortar classes.

Mortar Class	Scratch Index (mm)	Deemed to Satisfy Mix Proportions by Volume		
		GB/GP Cement	Building Lime	Sand
M2	0.5	1	2	9
M3	0.3	1	1	6
		1	0	5
M4	0.1	1	0.5	4.5
		1	0	4
		1	0-0.25	3

Refer to the standard for notes on applicable units, use of water thickener and masonry cement.

Test Procedure

The test procedure is outlined in detail in AS 3700–2011 Appendix E. The two purposes and different requirements for each are summarised below.

The **Scratch Index**, or **Result**, is an average of the measurements recorded for 5 individual tests performed in the same mortar joint and spaced at least 10mm apart.

To satisfy Clause 11.4.3

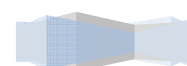
for mortars that have a different composition to those provided in AS 3700 – 2011 Table 11.1

- The age of the masonry mortar must be greater than 7 days, or greater than 21 days in cold climates (eg. less than 10°C), and less than 12 months.
- Randomly select a minimum of 3 locations in the subject masonry construction. The masonry construction being evaluated must be of the same mortar composition, masonry units and joint finishing.
- Perform 5 tests, recording the value of each one, at each location.
- Obtain a scratch index result at each location.
- Repeat for every different type of masonry construction.
- Prepare a report as detailed on the following page.

To satisfy Clause 12.6.3

for the purpose of verifying properties when there is a concern about the quality of the masonry construction

1. The age of the masonry mortar must be greater than 7 days plus the following time periods as applicable, to a maximum of 12 months:

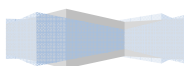


- a. for chemically retarded mortar, the unexpired period for which it was retarded
 - b. the full amount of time during which the air temperature was less than 4°C)
 - c. half the amount of time during which the air temperature was between 4°C and 10°C.
2. If the masonry is to be cleaned, it must be done prior to testing.
3. Identify the distinct areas of masonry. These are areas where the properties of the masonry are different and easily identifiable. The differences include differences in any or all of the following:
 - a. mortar composition including different proportions
 - b. masonry unit types
 - c. mortar joint finishing
4. Agree between all parties on the number of scratch index results for each area. The area for a single scratch index must be within the following range:
 - a. $\geq 0.5 \text{ m}^2$
 - b. $\leq 10 \text{ m}^2$
5. Randomly select within each area the location of each scratch index sites.
6. Perform the 5 tests at each location and determine the scratch index. The result is applicable to that area only.
7. Repeat for each area of masonry to be tested.
8. Prepare a report as detailed below.

Test Report

The following information must be provided in the test report:

1. Date testing was conducted.
2. Date that the masonry being tested was constructed.
3. Location of the masonry construction being tested.
4. Identification and location of each joint of the masonry construction tested for a scratch index, including:
 - a. identification and location of the five individual measurements within the joint
 - b. scratch tool measurement for each of the five tests
 - c. the resultant scratch index, calculated as the average of the five measurements.



References

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Durability of Masonry Mortar, CCAA Technical Note 67, March 2007

<http://www.concrete.net.au/publications/pdf/TN67.pdf>

Constructing Durable Masonry, CCAA Data Sheet, April 2008

<http://www.concrete.net.au/publications/pdf/Construcdurable.pdf>

Durable Masonry Specification Checklist, CCAA Data Sheet, April 2008

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Industry Reference Guide, Part 2: Mortar, November 2009

http://www.thinkbrick.com.au/assets/documents/technical_information/materials/IRG-v5-Pt-2-Mortar.pdf

Brick Mortar Estimator, April 2008

http://www.thinkbrick.com.au/assets/documents/technical_information/brickwork/Brick-Mortar-Estimator.pdf

The literature references below provide details of the background research to the Mortar Durability Scratch Test used in AS 3700–2011.

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2. Lawrence, S. and W. Samarasinghe (2000). Assessing the durability of masonry mortars. Proceedings of the 12th International Brick/Block Masonry Conference: pp.1053-1062.
3. Samarasinghe, W. and S. Lawrence (2002). Standardisation of durability assessment of mortar. Proceedings of the 7th International Seminar on Structural Masonry for Developing Countries. Belo Horizonte, Brazil: pp.439-444.
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