

TERMORTAR TESTING

PROJECT NO. A / 367 B

by

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TERMORTAR TESTING

1. INTRODUCTION

1.1 Mortar Properties

The main requirements for a masonry mortar are suitable workability in its plastic state, durability in its hardened state, and achievement of effective bond between mortar and brick. The compressive strength of the mortar itself is also of some interest, although the strength obtained from tests on samples taken in a steel mould will be different to that of the mortar in the joint itself, because some of its water have been removed by brick suction.

There are standard procedures in the Australian Masonry Code AS3700 to evaluate the mortar durability. “Durability of masonry mortar is primarily determined by the mortar ingredients and the mixing process, but it is also influenced by the masonry units and workmanship factors. The measurement of a durability index in situ as provided by the mechanical test is therefore preferable if the durability of a mortar in particular circumstances is to be assessed. The mechanical test is based on a controlled scratching of the mortar surface. The penetration into the mortar is then measured and is called the scratch index.” (AS3700 – 2001).

1.2 Masonry Properties

The important masonry strength parameters which are influenced by the mortar are its compressive strength and its flexural strength. These are influenced by both the mortar and brick properties and will vary for different brick – mortar combinations depending on the achievement of an effective match between the brick suction and the ability of the mortar to retain its water. There are standard procedures in the Australian Masonry Code AS3700 to evaluate the compressive and bond strengths, and these have been used in this investigation.

2. TESTING PROGRAM

This report describes an investigation to determine whether Termortar – a special purpose mortar will achieve acceptable strength and durability in accordance with AS 3700. Dry pressed bricks were used to build masonry prisms. A summary of the testing program is given in Table 1.

TABLE 1. Summary of Testing Program

Mortar Type	Brick Type	Compressive Strength Test	Flexural Strength Test	Scratch Index (7 days)
Termortar	Dry Pressed	yes	yes	yes

3. BRICKWORK TESTS

3.1 Brickwork Compressive Strength

A series of tests were performed to determine the compressive strength of the brickwork. The standard procedures outlined in AS3700, Appendix C were followed. Five four high stack bonded prisms were constructed by the client, delivered to the testing laboratory and tested following the procedures outlined in the AS3700. At an age of seven days, the prisms were loaded in uniaxial compression to failure. From the results, the mean strength was determined and the characteristic strength estimated using the AS3700 procedure.

The results of the compression test are given in the *Test Results* section of the report. The characteristic unconfined compressive strength is presented in the Table 2.

3.2 Brickwork Flexural Tensile (Bond) Strength

A series of tests were performed to determine the flexural tensile strength of the brickwork. The standard procedures outlined in AS3700, Appendix D were followed. Two six high stack bonded prisms were constructed by the client, delivered to the testing laboratory and tested following the procedures outlined in the AS3700. At an age of seven days each joint was tested using a bond wrench to determine its flexural tensile strength. From the results, the mean strength was determined and the characteristic strength estimated using the AS3700 procedure.

The results for the bond tests are given in the *Test Results* section of the report. The characteristic flexural strength is presented in the Table 2.

3.3 Durability of Brickwork

A series of tests were performed to determine the durability of the brickwork. The standard procedures outlined in AS3700, Appendix FA were followed. The specimens built for the brickwork compressive strength were used to determine the durability. At an age of seven days five separate measurements were taken from each prism and the average of these five measurements was recorded as a scratch index.

The results of the scratch tests are given in the *Test Results* section of the report. The scratch index value is presented in the Table 2.

4. TEST RESULTS

4.1 Brickwork Compressive Strength

The value of the characteristic unconfined compressive strength for Termortar with dry pressed bricks is shown in the Table 2. Termortar with dry pressed bricks achieved the characteristic unconfined compressive strength of 6.3 MPa.

4.2 Brickwork Flexural Tensile (Bond) Strength

The value of the characteristic flexural tensile strength of masonry (f'_{mt}) assumed by AS3700 without confirmatory testing is 0.20 MPa. It is therefore desirable that all bond strengths should exceed this minimum value.

The value of the characteristic flexural tensile strengths is shown in the Table 2. Termortar with dry pressed bricks achieved the characteristic flexural tensile strength of 0.29 MPa.

4.3 Durability of Brickwork

The criteria for mortar durability are specified in the AS3700, Table 10.2 and they are:

- for M3 mortar the maximum allowable scratch index is 0.3 mm
- for M4 mortar the maximum allowable scratch index is 0.1 mm

The value of the scratch index of 0.05 was achieved and is presented in the Table 2. The scratch index result satisfies criteria for the M4 mortar classification.

TABLE 2: TEST RESULTS - SUMMARY

TEST METHOD	TEST IN ACCORDANCE WITH	BRICK TYPE	VALUE	MORTAR TYPE
				Termortar
Compressive Strength Of Masonry Prisms	AS3700-2001 Appendix C	Dry Pressed	Characteristic Unconfined Compressive Strength	6.3 MPa
Flexural Strength By Bond Wrench	AS3700-2001 Appendix D	Dry Pressed	Characteristic Flexural Strength	0.29 MPa
Durability Testing	AS3700-2001 Appendix FA	Dry Pressed	Scratch Index	0.05

COMPRESSIVE STRENGTH OF MASONRY PRISMS

(AS 3700 - 2001)

Spec. No.	Gross Area (mm ²)	Ultimate Load (kN)	Aspect Ratio Factor	Compressive Strength (MPa)	Unconfined Compressive Strength (MPa)
1	25300	242	0.85	9.6	8.1
2	25300	251	0.85	9.9	8.4
3	25300	318	0.85	12.6	10.7
4	25300	258	0.85	10.2	8.7
5	25300	242	0.85	9.6	8.1

Test in Accordance With:

AS 3700 - 2001 (Appendix C)

Brick Type:

230 x 110 x 76 (L x W x H)

Dry Pressed

Prism Dimensions:

230 x 110 x 340 (L x W x H), 4 units high

Mortar Type:

Termortar

Date of Construction of Test Specimen:

22/06/2005

Date of Test:

29/06/2005

Mean Unconfined Compressive Strength:

8.8 MPa

Standard Deviation:

1.1 MPa

Coefficient of Variation:

15.00 % (12.2%)

Characteristic Strength Factor K:

0.78

Characteristic Unconfined Compressive Strength:

6.3 MPa

FLEXURAL STRENGTH BY BOND WRENCH TEST

Test in Accordance With: AS 3700 - 2001 (Appendix D)
Brick Type: 230 x 110 x 76 (L x W x H)
Dry Pressed
Number of Units Forming Each Prism: 6
Mortar Type: **Termortar**
Date of Construction of Test Specimen: 23/05/2005
Date of Test: 31/05/2005

Specimen No.	Flexural Strength (MPa)
1	0.42
2	1.17
3	1.71
4	0.88
5	1.03
6	0.62
7	1.25
8	1.09
9	0.76
10	0.44
11	1.16
12	1.47

Mean Flexural Strength: 1.00 MPa
Standard Deviation: 0.40 MPa
Coefficient of Variation: 40 %
Characteristic Strength Factor K: 0.68
Characteristic Flexural Strength: 0.29 MPa

Scratch Test Results For Compressive Strength Prisms: Termortar

Pier Identification	Scratch Test Results	Scratch Index
Pier 1	0.04	0.06
	0.01	
	0.07	
	0.09	
	0.08	
Pier 2	0.02	0.04
	0.04	
	0.02	
	0.06	
	0.04	
Pier 3	0.07	0.06
	0.03	
	0.06	
	0.07	
	0.05	
Pier 4	0.02	0.05
	0.07	
	0.02	
	0.08	
	0.08	
Pier 5	0.02	0.04
	0.01	
	0.03	
	0.05	
	0.09	
	Average	0.05
	Std Dev	0.01

Note: the middle bed joints of each pier were tested

The scratch Index is the average of the five individual scratch results