FIRELAB

TITLE	:	Report on the Large-scale Fire Resistance Properties of the **CAPCO FireShield Ceiling System**
REQUESTED BY	:	**CAPCO (Pty) Ltd** PO Box 4203 **RIVERHORSE VALLEY EAST** Durban 4017
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SCOPE

This report classifies the Fire Resistance Properties of the **CAPCO FireShield Ceiling System** when tested and classified in accordance with the **SANS 10177 – 2** test protocol.

Section 1: Detailed information on the specimen construction

Section 2: Test protocol used for classification

Section 3: Observations made, temperatures recorded with photographs taken before, during and after the **SANS 10177 – 2** test

Section 4: Discussion of results

Section 5: Conclusion

Annexure "A": Company information

Annexures "B": System information and detailed drawing supplied by **CAPCO**

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1. SYSTEM DESCRIPTION

CAPCO installed the **CAPCO FireShield Ceiling System** into **FIRELAB**'s Horizontal **SANS 10177 – 2** test facility.

Description of the ceiling system:

System:	**CAPCO FireShield Ceiling System**
System Abbr. name:	**FireShield Ceiling**
Proposed Application:	Fire Rated Ceiling

System make up:

Board:	CAPCO Fire Shield Boards (Gypsum Board)
Plaster:	N/A
Length (per board):	3.0 m
Width (per board):	1.2 m
Total Thickness	120 mm

Product Composition:

Grid 1:	T38/35G Tee Grid System
Layer 1:	15 mm FireShield Board
Layer 2:	15 mm FireShield Board
Grid 2:	25/75G Omega Furring Channel
Layer 3:	15 mm FireShield Board
Layer 4:	15 mm FireShield Board

Joints:

Sealant:	Capco Joining Compound & 50 mm Fibre Tape
Cover Strips:	100 x 0.5 mm Galvanised sheet covering all joints on board layer 1 and 3
Type:	Tapered
Fasteners:	Drywall Screws at 150 mm Centres

Support:

Main T's:	T38/35G Main Tees at 1 200 mm Centres
Secondary T's:	T38/35G 1 200 mm Cross Tees at 300 mm Centres
Secondary:	Furring Channel Grid at 300 mm Centres
Hangers:	25 x 25 x 0.6 Galvanised @ 750 mm Centres
Clips:	N/A (Hangers are fixed with screws)

The test specimen is shown from the exposed and unexposed sides in Figures 1.1 and 1.2 prior to commencement of the test.

*Figure 1.1: The **FireShield Ceiling** system from the unexposed side prior to the test*

*Figure 1.2: The **FireShield Ceiling** system from the exposed side*

2. FIRE RESISTANCE: SANS 10177 – PART 2:2005

2.1. TEST PROCEDURE

The nominal 3 meter wide by 6 meter long system was tested for fire resistance in the large-scale horizontal air-aspirated diesel furnace. The furnace temperature was controlled to follow the **ISO standard time-temperature curve** as stipulated in **SANS 10177 – 2**.

The **Fire Resistance Rating** (**FRR**) of the system is determined based on the following criteria:

- ***Stability (R):*** The system may not collapse or fail structurally during the test.
- ***Integrity (E):*** The system is deemed to have failed should flames be observed on the unexposed side or an opening larger than 6 mm wide or 150 mm long is noted.
- ***Insulation (I):*** The temperature on the unexposed surface may not exceed 140 °C plus ambient temperature on average or 180 °C plus ambient maximum at any of the measured surface positions.

*The **Stability** and **Integrity*** criteria are evaluated through observations which are noted in Table 3.1.

Insulation was measured using 5 thermocouples (TC 1 – TC 5) placed in a grid of equal area onto the surface of the specimen. An additional two thermocouples were used to measure the surface joints (TC 6 & TC 7).

2.2. TEST EQUIPMENT

- Data logging equipment c/w controller
- Stopwatch
- Type K thermocouples
- **SANS 10177 – 2** Horizontal Test Facility

3. TEST RESULTS

The specimen was tested on 07 September 2020. The average ambient temperature during the test was 23.06 °C.

CAPCO – FireShield Ceiling

OBSERVATIONS DURING THE **SANS 10177 – 2** TEST

TIME (hh:mm:ss)	**DESCRIPTION**
00:00:00	**– Test Started –**
00:07:40	Smoke release on the middle of the right perimeter
00:08:20	Steam release on the front perimeter
00:10:35	Charring on the smoke release areas
00:33:20	Pin-hole forming in the board between TC 4 & 5
00:40:00	Pin-hole forming in the board behind TC 3
01:02:30	First layer of the boards is starting to collapse
01:17:20	Smoke release from the right joint near the middle
01:22:15	Smoke release from the left joint near the middle
01:25:00	Second layer of boards draping
01:31:30	Smoke release increase on the right joint
01:36:30	Smoke release along the lateral joint on the right
01:40:00	Second layer of boards dropping off and draping
01:52:45	Smoke release increase on the lateral joint
01:53:30	Charring and light cracking on the front left corner
01:55:00	Crack forming near the left side
02:03:00	Hot spot near the middle measured to be approximately 185 °C
02:04:30	Large cracks formed in the middle between TC 4 & 5
02:05:00	**– Test Concluded –**

Note(s): The peripheral cracking was caused by viewports in the furnace walls, which would not be present in an installation in practice. Thus, the peripheral cracking can be disregarded

*Table 3.1: Observations recorded during the **SANS 10177 – 2** test*

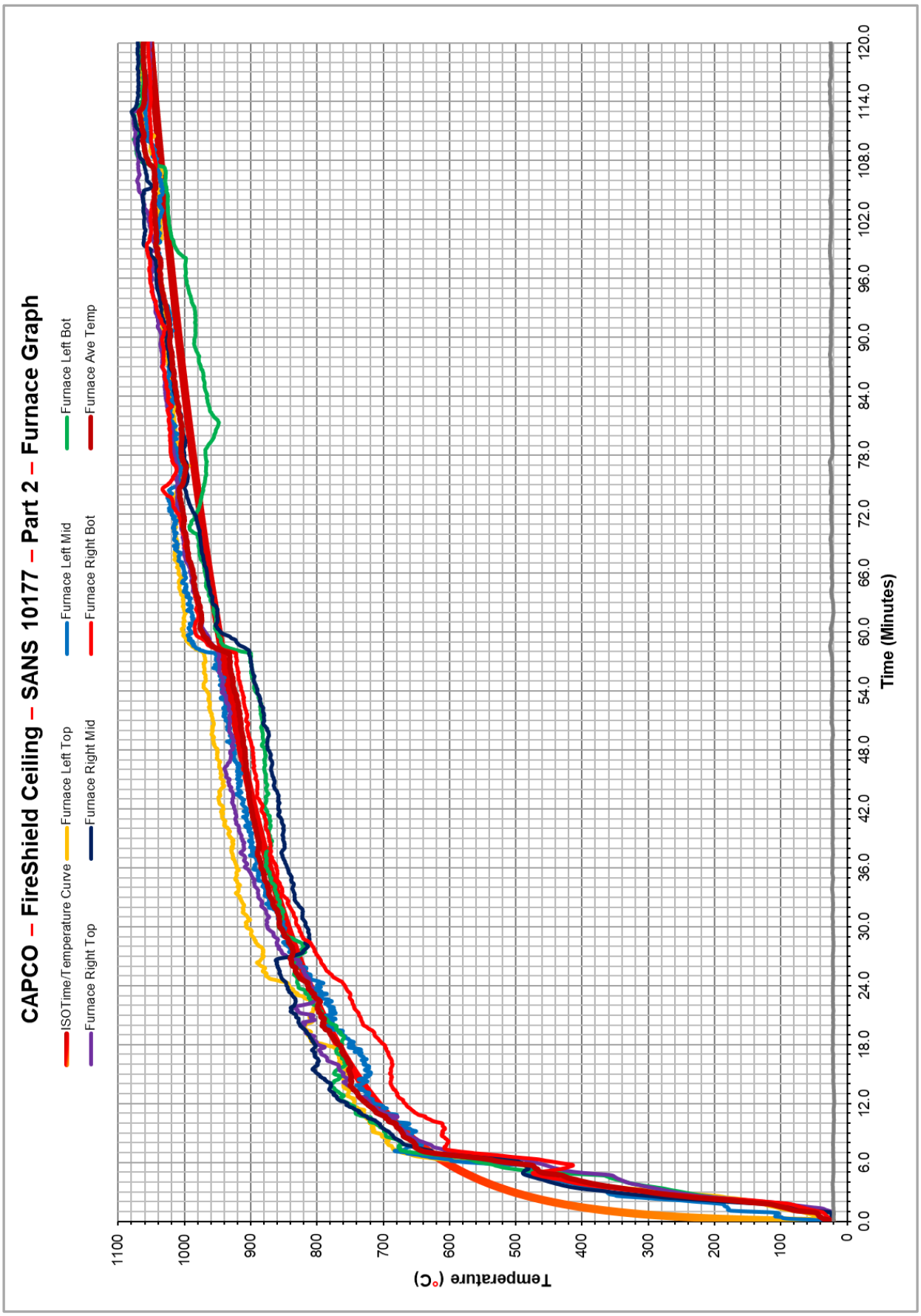

*Figure 3.1: Furnace temperatures recorded during the large-scale **FR** test*

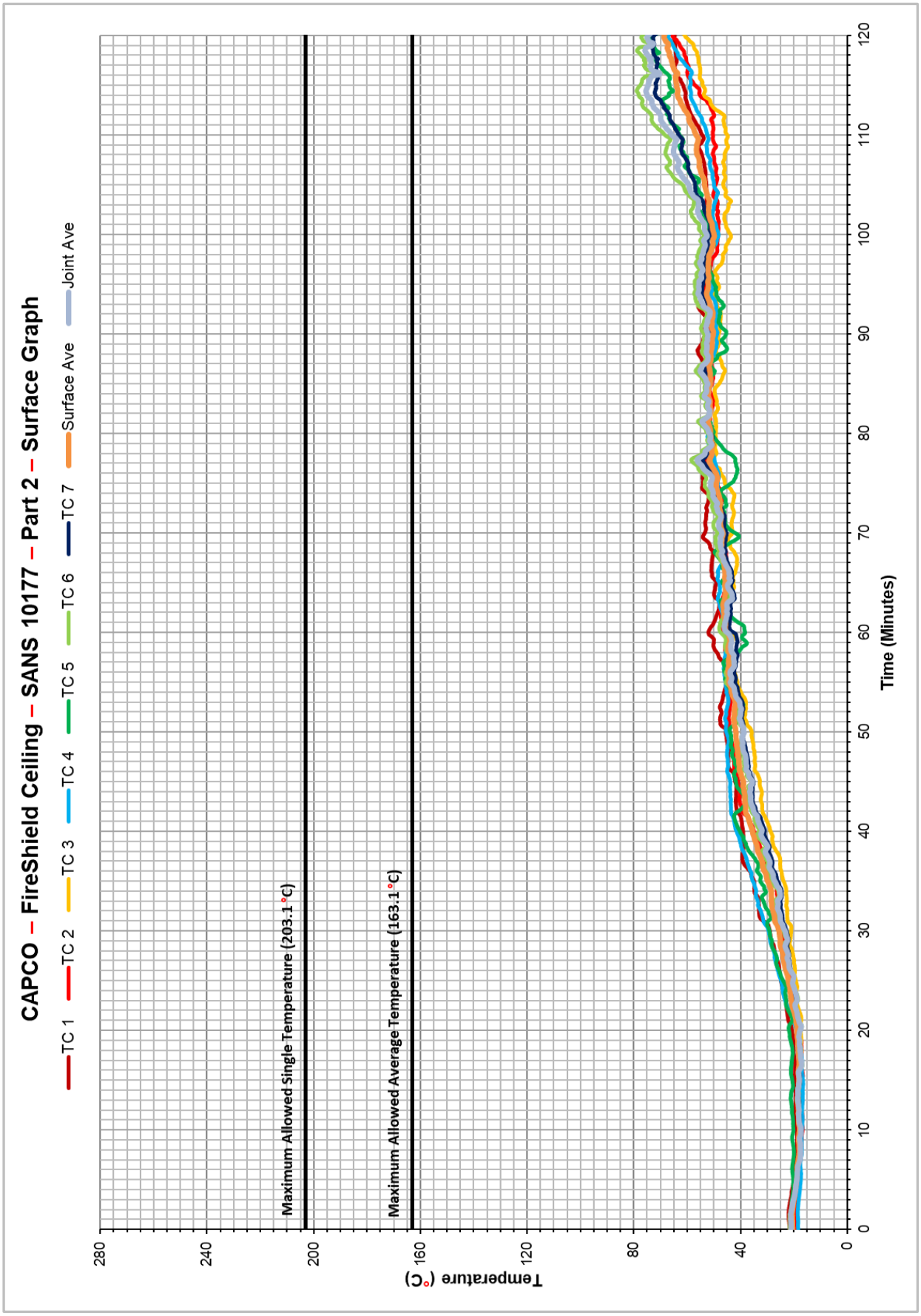

Figure 3.2: Temperatures recorded on the surface of the specimen

Figure 3.3: Charring and slight buckling of the perimeter fixing

Figure 3.4: Smoke release on the perimeter

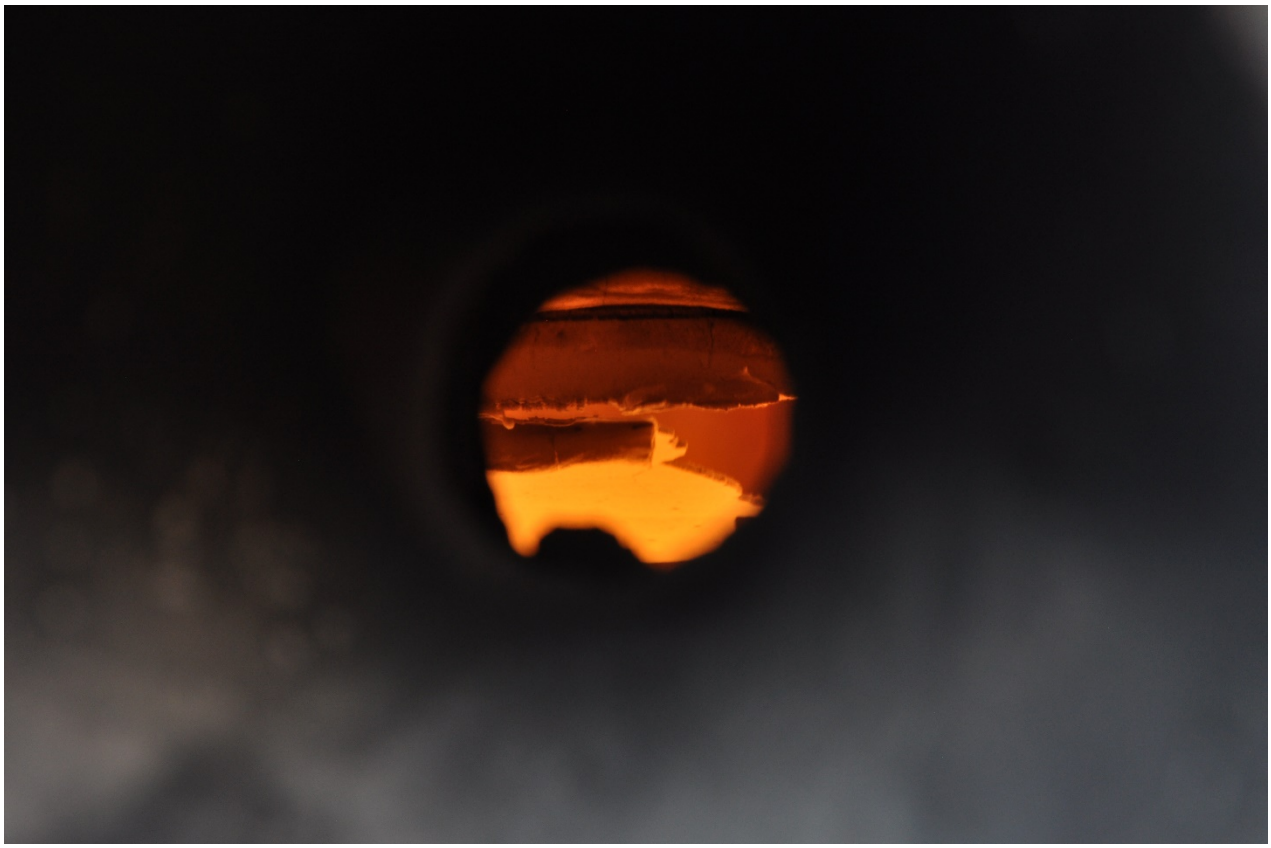

Figure 3.5: Bottom board fragmenting (mid-section of specimen)

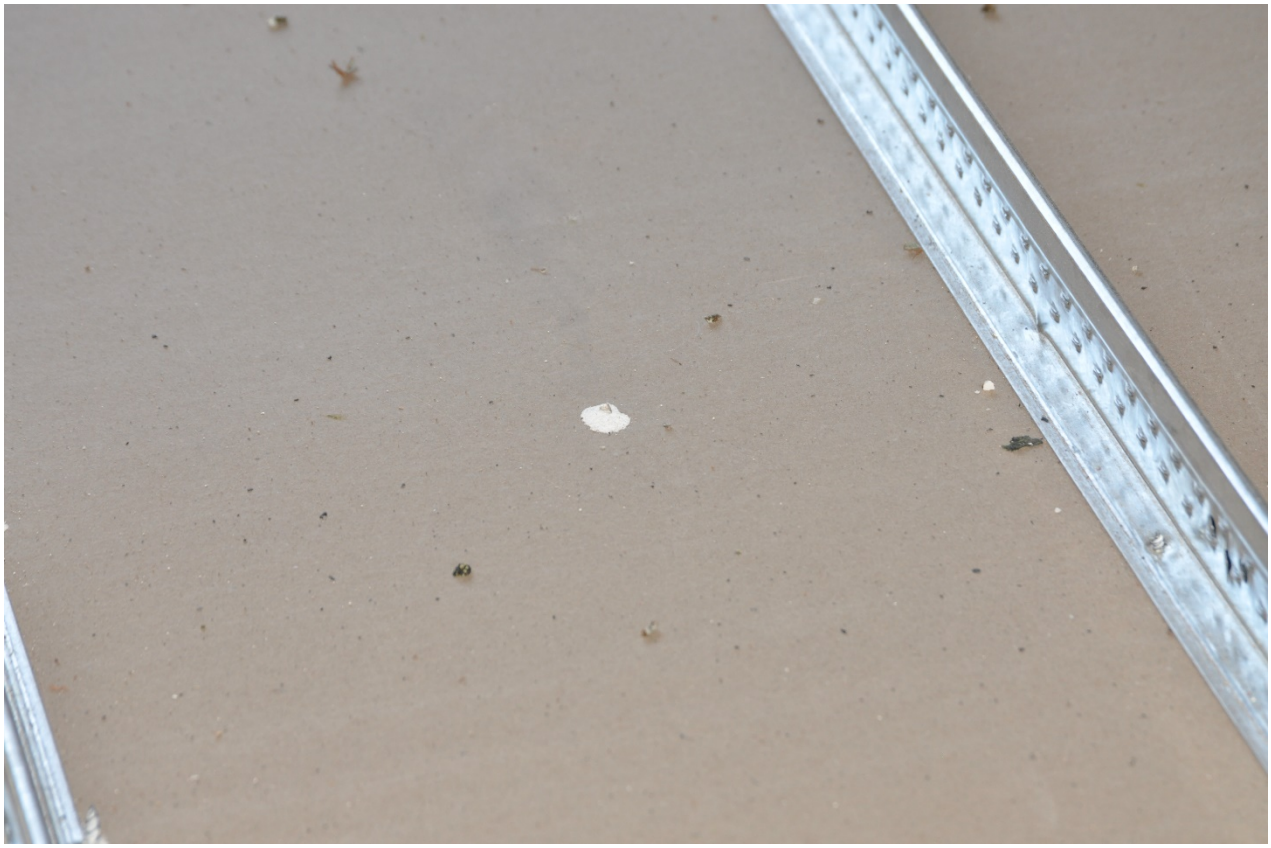

Figure 3.6: Pin hole formed in the specimen

Figure 3.7: Discolouration visible (mid-section joint of specimen)

Figure 3.8: Unexposed side of specimen after conclusion of the test

Figure 3.9: Exposed side of specimen after conclusion of the test

4. DISCUSSION OF RESULTS

The **Fire Resistance** requirements in terms of **SANS 10177 – 2**, were achieved as follows:

- ***Stability (R):*** The specimen did not collapse.

  Stability satisfied for 120 minutes

- ***Integrity (E):*** No significant straight through gaps or flaming occurred. There were small pin holes and small cracks observed, but was within allowable limits.

  Integrity satisfied for 120 minutes

- ***Insulation (I):*** TC 6 reached the maximum allowed single temperature after 2 hours 6 minutes and 30 seconds.

  Insulation satisfied for 120 minutes

5. CONCLUSION

The **CAPCO FireShield Ceiling System** was tested for a **Fire Resistance Rating** (**FRR**) in accordance with the **SANS 10177 – 2** test protocol and the exposed side was classified as follows:

- **SANS 10177 – 2 » FR120**
  - **Stability (R) » 120 minutes**
  - **Integrity (E) » 120 minutes**
  - **Insulation (I) » 120 minutes**

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Compiled by: **J. Vogel**

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Approved by: **J.S. Strydom**

ANNEXURE "A"

– Company Information –	FIRELAB
Company Name:	CAPCO (PTY) LTD
Company Trading Name:	CAPCO
Company Registration Nr.:	2019/574495/07
Company VAT Nr.:	4600104667
Core Business Activities:	DISTRIBUTORS OF CEILING & PARTITION MATERIALS
Postal Address:	PO BOX 4203 RIVERHORSE VALLEY EAST, DURBAN, 4017.
Physical Address:	2 COROBRIK PLACE, RIVERHORSE VALLEY BUSINESS ESTATE, DURBAN, 4017.
Company contact number:	(031) 569 6090
Direct Contact Details	
Technical (name):	BARRY GOULD
Cell phone number:	083 272 1871
Email address:	barry@capco.co.za
Financial (name):	BRAD Mc LEARY
Cell phone number:	083 856 6447
Email address:	brad@capco.co.za
– Test & Sample Information –	
Test Required:	2 HOUR FIRE-RATED CEILING
Sample/Product name:	CAPCO FIRESHIELD BOARD
Intended Use:	CEILINGS - FIRE-RATED
Sample/Product Description: *(Short description of sample or product submitted for testing, and type of material to be tested)*	6,000 x 3,000 m MILD STEEL FRAMED COVERED TEE SYSTEM USING T38/35G GALVANISED STEEL GRID WITH 2 x 15 mm FIRESHIELD BOARDS THEN G.M.S FURRING CHANNELS AND 2 x 15 mm FIRESHIELD BOARDS BELOW.

– SANS 10177 Part 2 – – Ceiling Specimen Description –	FIRELAB
Ceiling system description:	
System name:	CAPCO FIRESHIELD
System type:	COVERED TEE CEILING SYSTEM
Proposed Usage:	FIRE-RATED CEILING
System make up:	
Board:	CAPCO FIRESHIELD BOARDS
Plaster:	CAPCO JOINTING COMPOUND
Length (per board):	3,000 m
Width (per board):	1,200 m
Overall Thickness:	120 mm
Product composition (includes skin coat & coating):	
Layer 1:	15mm FIRESHIELD BOARD
Layer 2:	15mm FIRESHIELD BOARD
Layer 3:	15mm FIRESHIELD BOARD
Layer 4:	15mm FIRESHIELD BOARD
GMS COVER STRIPS:	100 x 0.5 mm GMS SHEET TO COVER ALL JOINTS ON 1ST AND 3RD LAYERS.
Support:	
T's:	TEE 38 x 35 x 0.35 mm GMS TEES m/TEES @ 1,200 m CENTRES CROSS TEES @ 300m CENTRES.
Hangers:	25 x 25 x 0.6 mm GALVANISED ANGLE HANGERS.
GYPSUM BOARD FIXINGS:	25mm DRYWALL SCREWS - LAYER 1 45mm DRYWALL SCREWS - LAYER 2
GYPSUM BOARD FIXINGS:	25mm DRYWALL SCREWS - LAYER 3 45mm DRYWALL SCREWS - LAYER 4
PERIMETER FASTENERS:	5/6/36 WALL ANCHORS.
FURRING CHANNELS:	22 x 75 mm FURRING CHANNELS FIXED TO PRIMARY TEES THROUGH LAYERS 1 AND 2.
JOINTS:	ALL TAPERED EDGES OF BOARDS FIXED
	WITH 50 mm SELF ADHESIVE FIBRE TAPE
	AND FLUSH JOINTED.

MAY 2016

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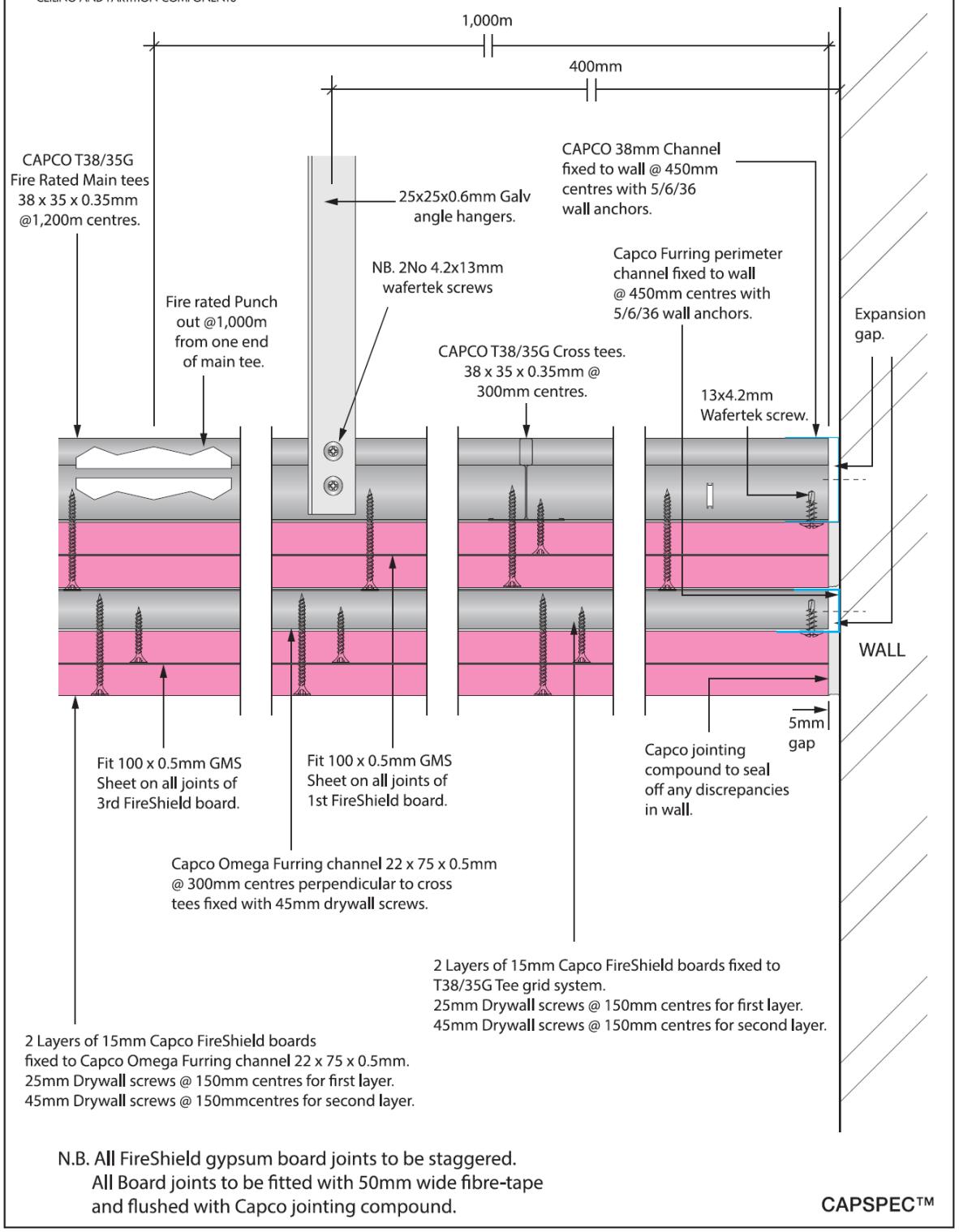
CEILING AND PARTITION COMPONENTS

CAPCO: TESTING. STANDARD OPERATING PROCEDURE

120 MINUTE FIRE RATED CEILING SYSTEM : 6,000M X 3,000M (FIRESHIELD)



N.B. All FireShield gypsum board joints to be staggered.
All Board joints to be fitted with 50mm wide fibre-tape and flushed with Capco jointing compound.

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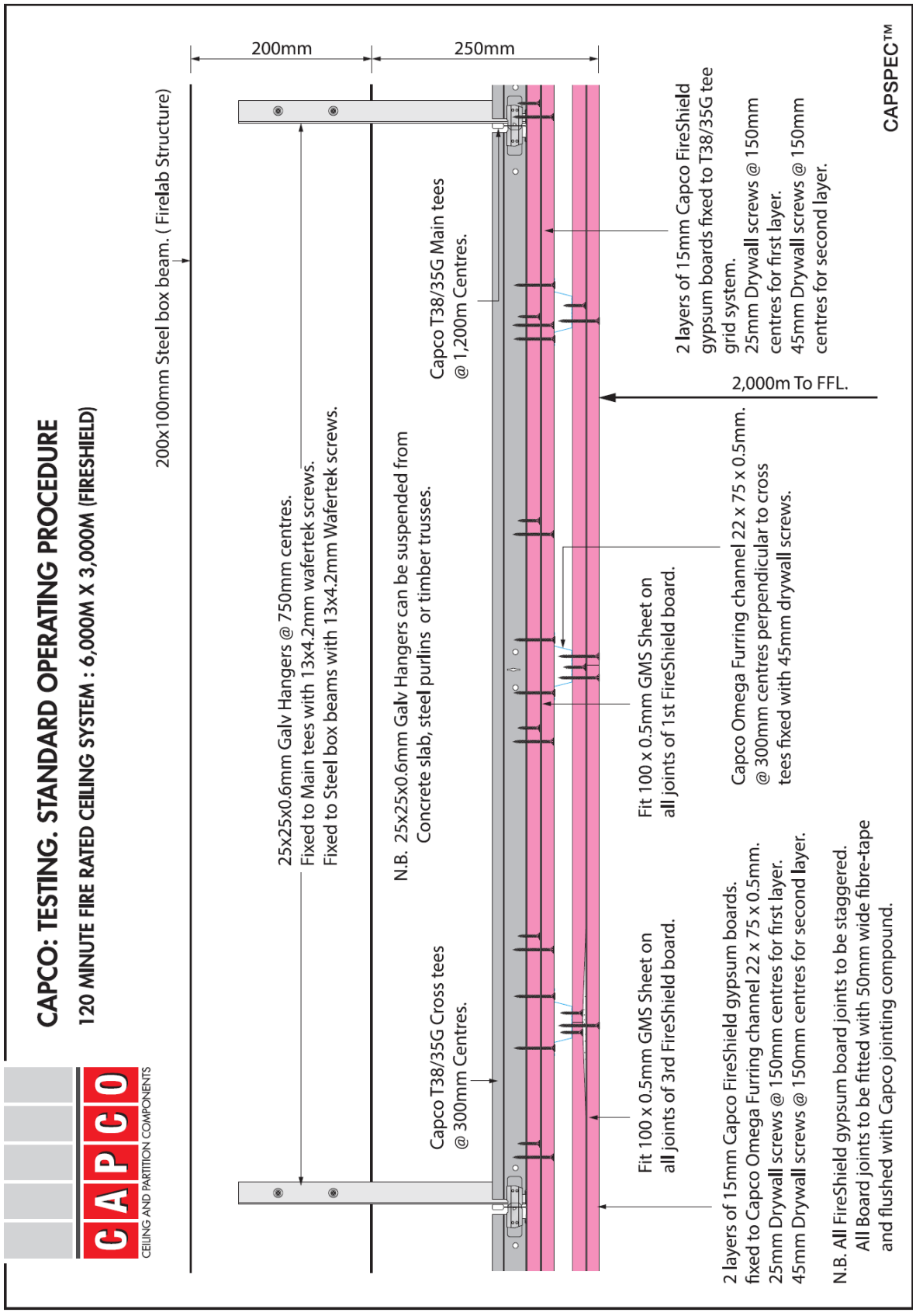

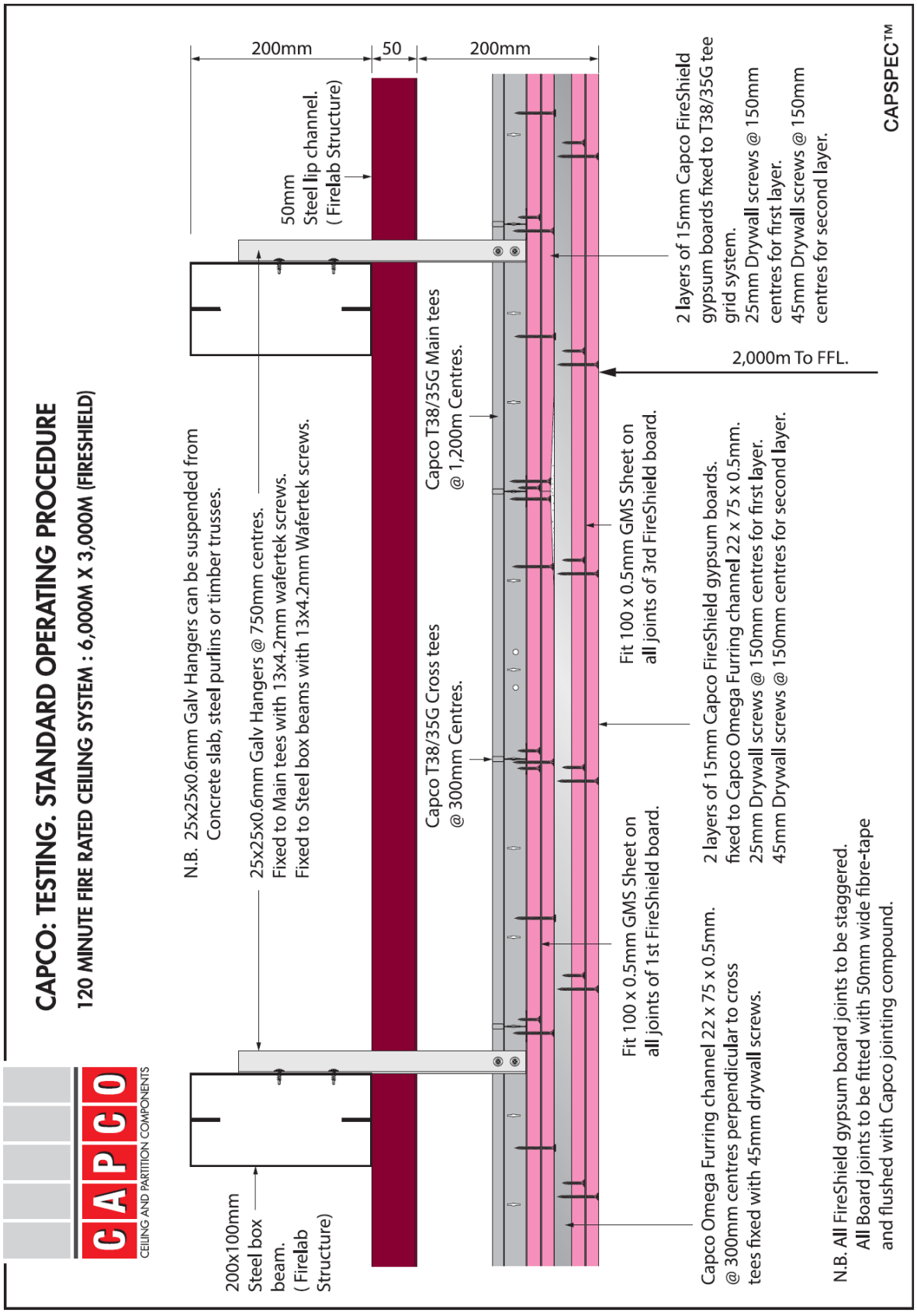

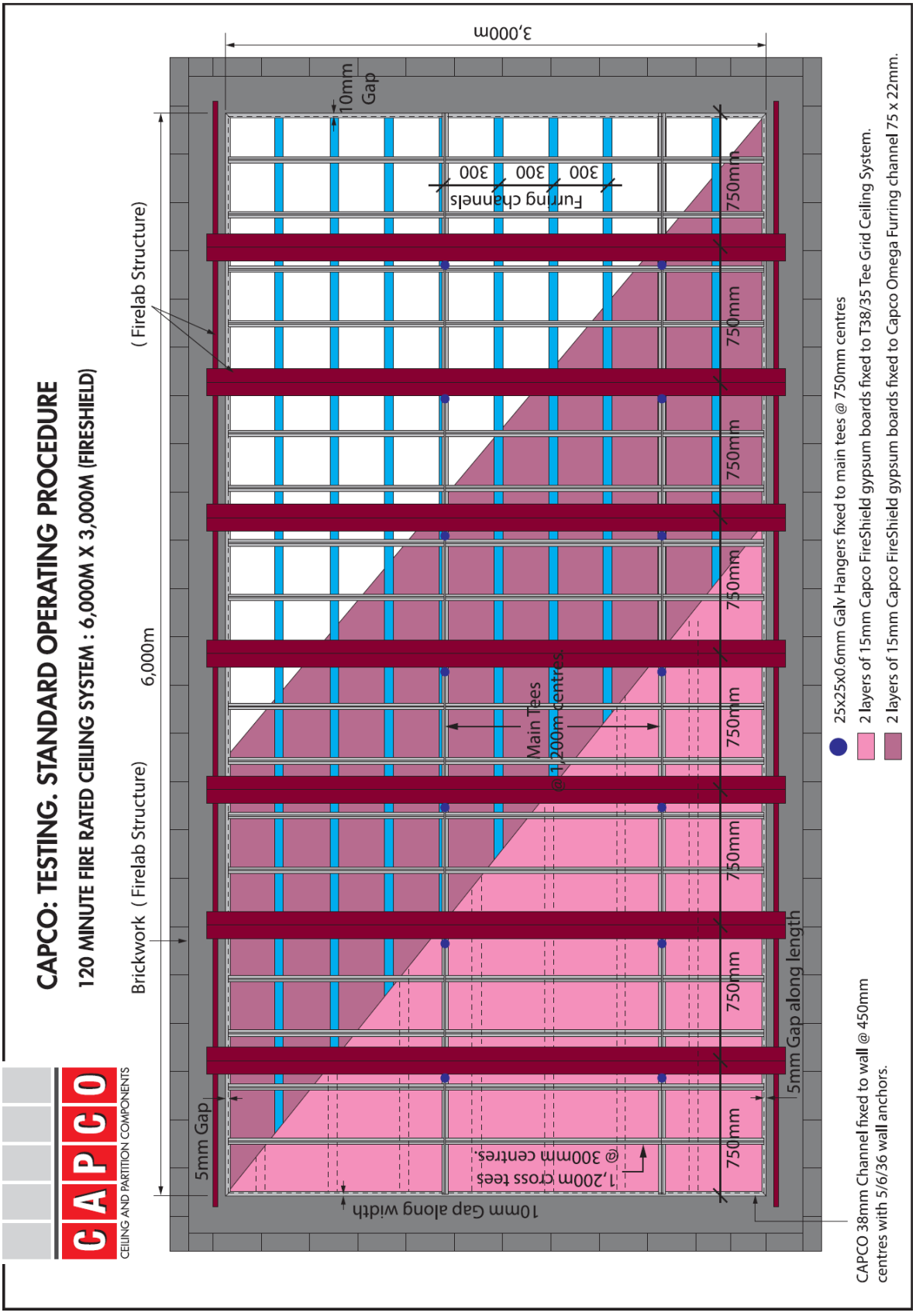

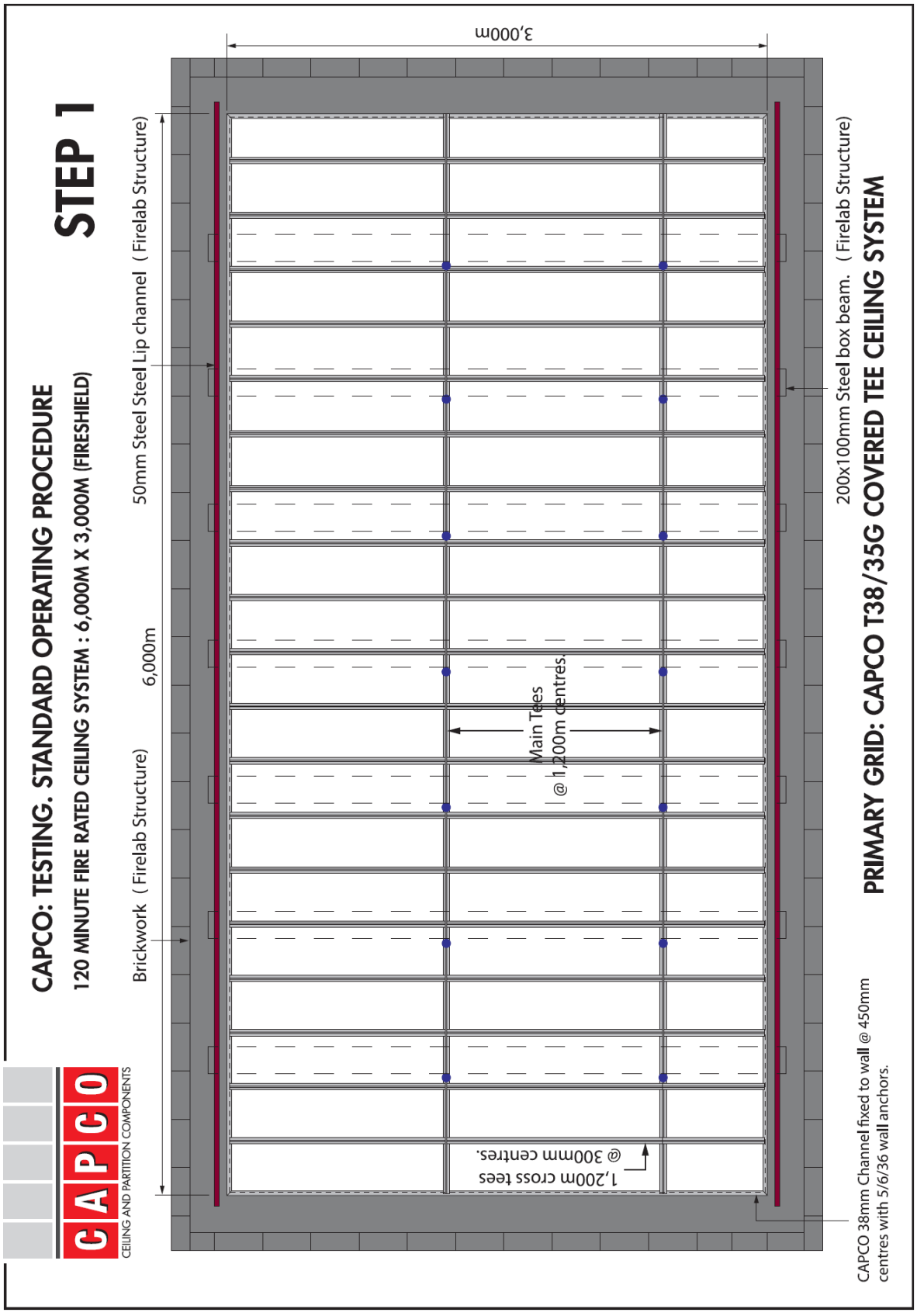
CAPCO: TESTING. STANDARD OPERATING PROCEDURE
120 MINUTE FIRE RATED CEILING SYSTEM : 6,000M X 3,000M (FIRESHIELD)
STEP 1
3,000m
50mm Steel Steel Lip channel (Firelab Structure)
6,000m
Brickwork (Firelab Structure)
200x100mm Steel box beam. (Firelab Structure)
Main Tees
@ 1,200m centres.
1,200m cross tees
@ 300mm centres.
PRIMARY GRID: CAPCO T38/35G COVERED TEE CEILING SYSTEM
CAPCO 38mm Channel fixed to wall @ 450mm centres with 5/6/36 wall anchors.
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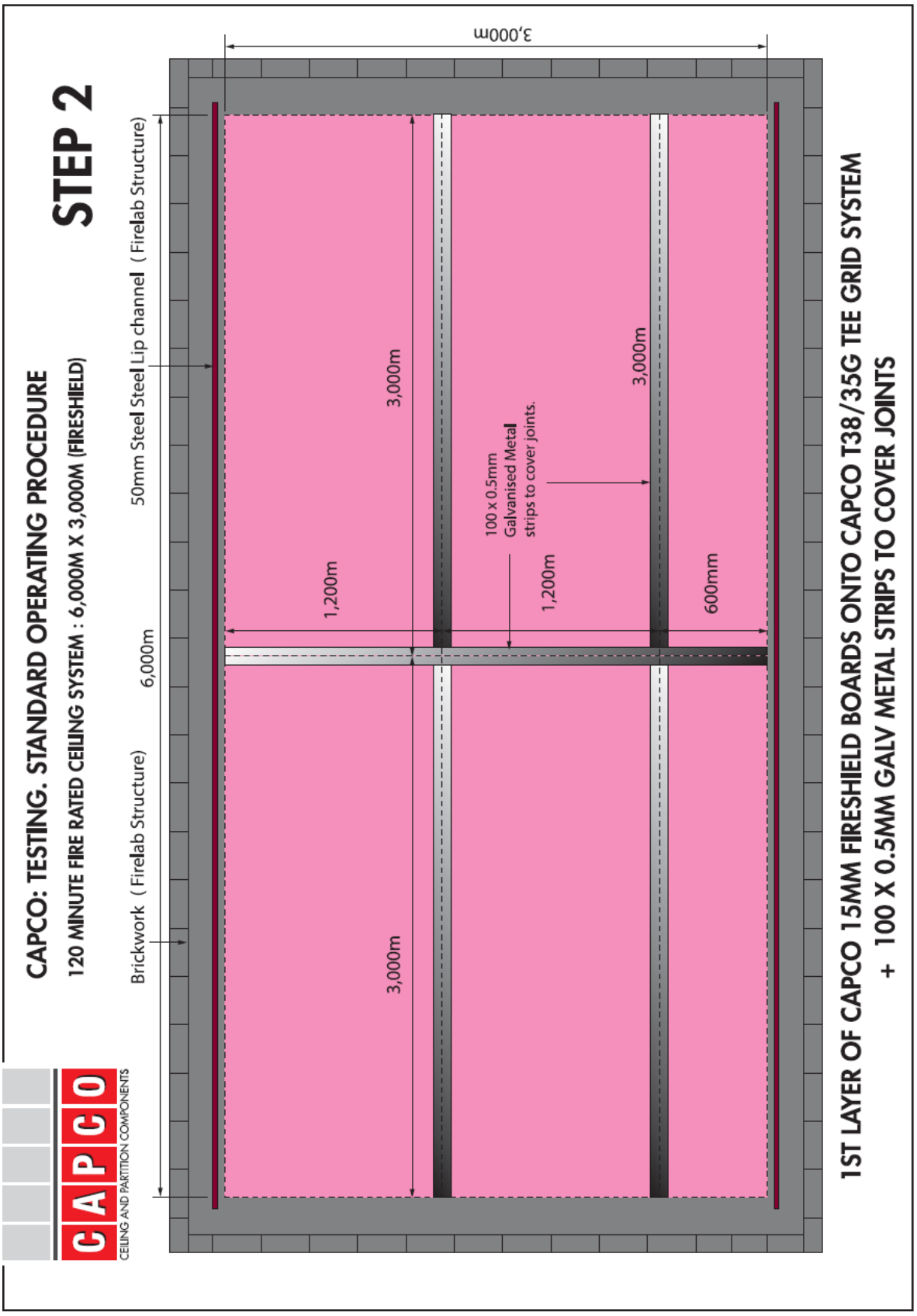
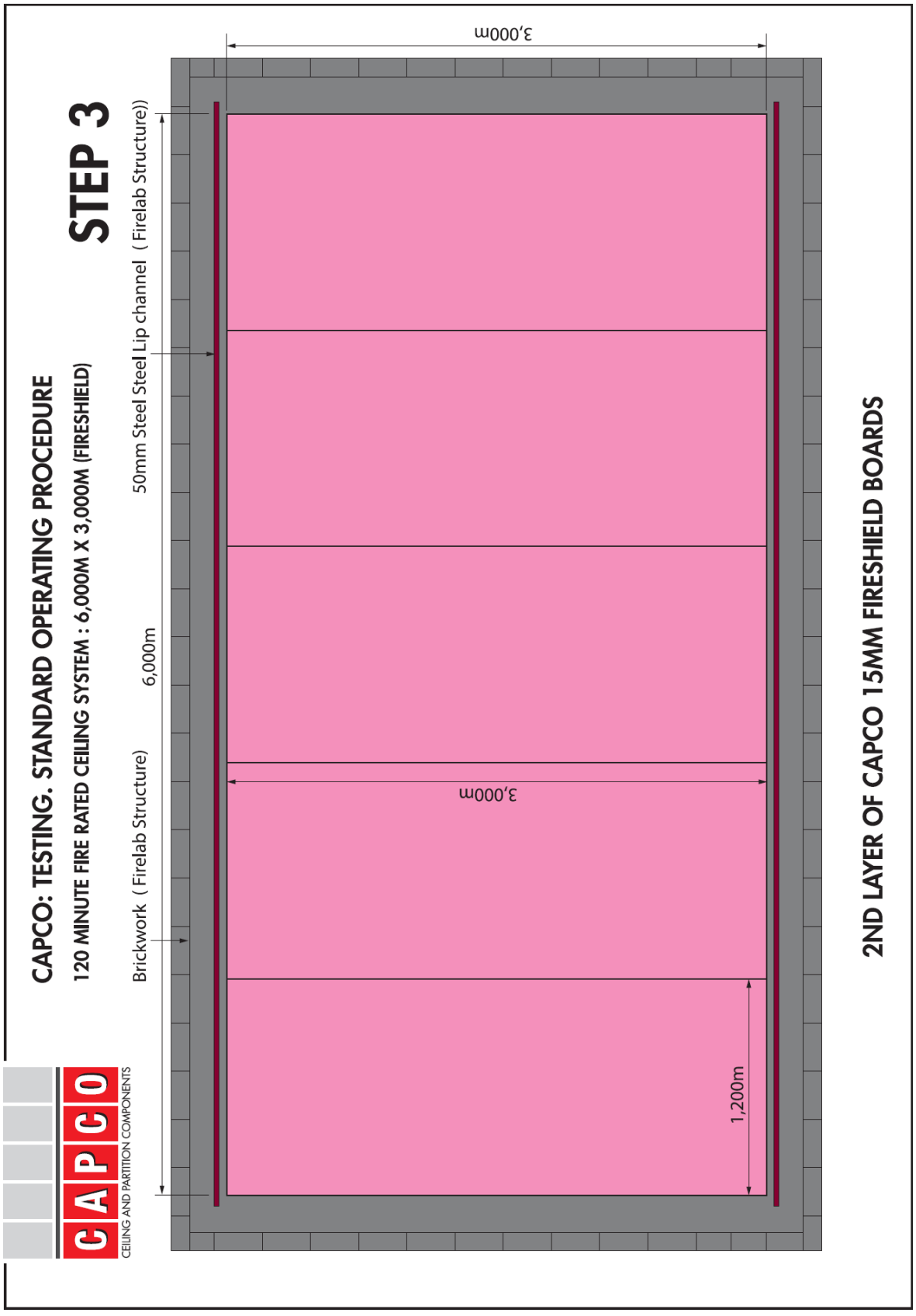
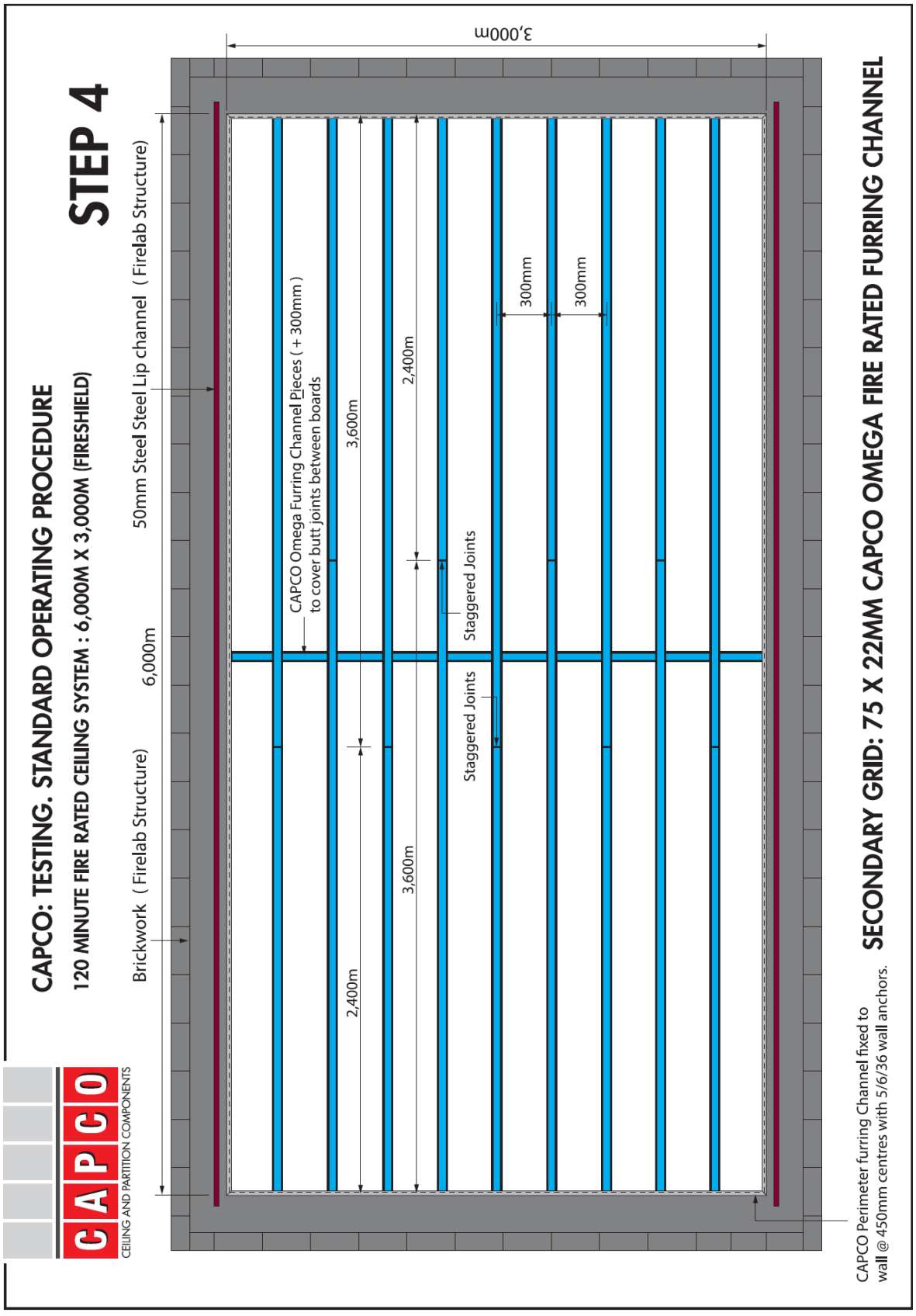
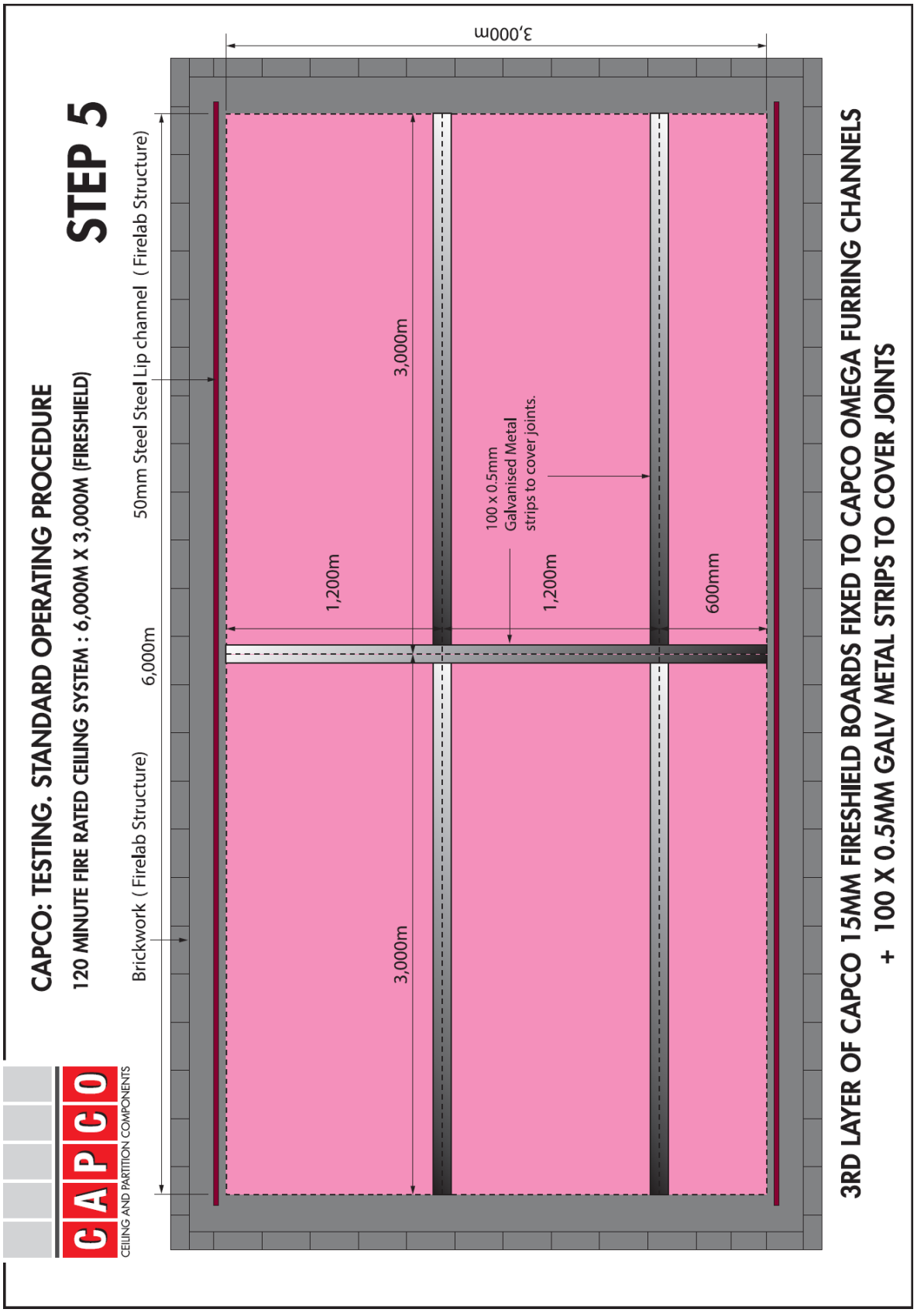
CEILING AND PARTITION COMPONENTS






CAPCO: TESTING. STANDARD OPERATING PROCEDURE
120 MINUTE FIRE RATED CEILING SYSTEM : 6,000M X 3,000M (FIRESHIELD)
STEP 4
SECONDARY GRID: 75 X 22MM CAPCO OMEGA FIRE RATED FURRING CHANNEL
CAPCO
CEILING AND PARTITION COMPONENTS
Brickwork (Firelab Structure)
6,000m
50mm Steel Steel Lip channel (Firelab Structure)
3,000m
CAPCO Omega Furring Channel Pieces (+ 300mm) to cover butt joints between boards
Staggered Joints
Staggered Joints
2,400m
3,600m
3,600m
2,400m
300mm
300mm
CAPCO Perimeter furring Channel fixed to wall @ 450mm centres with 5/6/36 wall anchors.


CAPCO: TESTING. STANDARD OPERATING PROCEDURE
120 MINUTE FIRE RATED CEILING SYSTEM : 6,000M X 3,000M (FIRESHIELD)
STEP 5
50mm Steel Steel Lip channel (Firelab Structure)
Brickwork (Firelab Structure)
6,000m
3,000m
3,000m
1,200m
100 x 0.5mm Galvanised Metal strips to cover joints.
1,200m
600mm
3RD LAYER OF CAPCO 15MM FIRESHIELD BOARDS FIXED TO CAPCO OMEGA FURRING CHANNELS
+ 100 X 0.5MM GALV METAL STRIPS TO COVER JOINTS
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CEILING AND PARTITION COMPONENTS