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ASSESSMENT ON FIRE RESISTANCE OF GYPSUM BLOCK WALL WITH 100 mm THICK

Introduction

We are requested by Fujian Jumbo New Material Corporation Limited to provide an assessment for variations of non-loadbearing gypsum block wall with 100 mm thick. This report presents an appraisal of fire resistance performance of non-loadbearing gypsum block wall using "Jumbo" gypsum blocks at the particular supporting structure as tested and recorded in the testing reports numbered IT16-186. The proposed gypsum block wall is required to achieve a performance of 240 minutes integrity and insulation in according to BS EN 1364-1:1999 or BS 476: Part 22: 1987, subjected to stated conditions.

1. Assumptions and Limitations

It is assumed that the proposed assembly will be installed to a suitable fire resisting structure, such as a masonry or reinforced concrete structure, which can provide the required supporting fire resistance period. The materials and constituents of the proposed assembly are in a similar manner and quality as tested or otherwise appraised by Forte Testing and Consultants Company Limited (FORTE). This assessment may only be reproduced in full by the applicant.

2. Background

2.1 FORTE Test Report No. IT16-186

A fire resistance test was conducted by FORTE in accordance with BS EN 1364-1: 1999 on a non-loadbearing gypsum block wall with "Jumbo" blocks of overall size 3000 mm (width) x 3040 mm (height), to determine its fire resistance performance. The test sponsor was Fujian Jumbo New Material Corporation Limited. Each "Jumbo" gypsum block was overall sized 600 mm (w) x 500 mm (h) x 80 mm (thick) with two tongue sides and two groove sides. All the blocks were joined by "Jumbo" premixed gypsum bonding adhesive, which was premixed bonding powder, of nominally 3-5 mm (t). The blocks were laid up to 3040 mm height with overlapping staggered joints. The gypsum block wall system was supported on three sides. The wall was tested with freedom of movement (Free edge) along one of its vertical edge. The 40 mm gap of free edge between the specimen and the support frame was sealed with mineral fibre. The specimen satisfied the integrity and insulation of 241 minutes. The test was terminated after the heating period of 242 minutes. Full constructions details of the specimen and the test results were recorded in the FORTE test report numbered IT16-186.

3. Analysis

3.1 Gypsum block wall system with 240 minutes integrity and insulation

It is proposed that the “Jumbo” gypsum block wall system, construction by 600 mm (w) by 500 mm (h) by 100 mm (t) “Jumbo” gypsum blocks, will fulfill these requirements and acquire a fire resistance period of not less than 240 minutes in accordance with integrity and insulation criteria of BS EN 1364-1: 1999, when a fire attack on either side of the wall system. The details of the main components for proposed “Jumbo” gypsum block wall system are:

- 1) 600 mm (w) by 500 mm (h) “Jumbo” gypsum blocks with thickness of 100 mm. The size of tongue and groove at the edges of the block shall be same as tested blocks.
- 2) “Jumbo” premixed gypsum bonding adhesive - As adhesive/structural mortar for “Jumbo” gypsum blocks with joint size: 3 - 5 mm.
- 3) The nominal density of Jumbo gypsum blocks can be from 1100 kg/m³ to 1200 kg/m³ with tolerance \pm 5%.

The tested wall system in the FORTE fire resistance test report numbered IT16-186 was the “Jumbo” gypsum block wall system with 80 mm thick can provide not less than 240 minutes integrity and insulation performance in accordance with BS EN 1364-1: 1999.

It is importance to know that the “Jumbo” gypsum block wall system with 100 mm thick can be satisfied the integrity and insulation requirements in accordance with BS EN 1364-1: 1999. The proposed system will use 100 mm thick “Jumbo” gypsum blocks with “Jumbo” premixed gypsum bonding adhesive as adhesive and structural mortar. There was no failure of integrity and insulation at the “Jumbo” gypsum block wall system with 80 mm thick during the fire period of not less than 240 minutes based on report numbered IT16-186. Refer to the above data, when “Jumbo” gypsum blocks have increased the thickness from 80 mm up to 100 mm together with the density increase to 1200 kg/m³ \pm 5%, the certain the integrity and insulation protection for proposed wall system will be not less than tested system. The test results can represent for wall with blocks having the same or higher declared value of the gross density. The certain integrity and insulation protection for the proposed wall system will not be less than tested type. As long as the construction details and the quality of the materials for the proposed “Jumbo” gypsum block wall system are same as that of the fire-tested type, such as the material used and the tongue & groove’s sizes of the block etc., the performance of the proposed system will not be affected when the those “Jumbo” gypsum blocks jointed by the “Jumbo” gypsum plaster as tested and it’s fire performance can be maintain as tested – not less than 240 minutes integrity and insulation in according to BS EN 1364-1: 1999.

3.2 Gypsum block wall system with 240 minutes integrity and insulation in accordance with BS 476: Part 22

The proposed “Jumbo” gypsum block wall system with 80 mm thick can provide not less than 240 minutes integrity and insulation performance in accordance with BS 476: Part 22: 1987.

After detailed review of the test methods, BS 476: Part 22 and BS EN 1364-1, a summary of the primary differences of the test method is presented in Table 1.

Table 1- Gap Analysis between BS 476: Part 22 and BS EN 1364-1

Item	BS 476: Part 22	BS EN 1364-1
Furnace Thermocouple	Metal sheathed thermocouple	Plate thermocouple
Furnace pressure	Neutral pressure plane at 1000 mm	Neutral pressure plane at 500 mm
INTEGRITY:		
Sustained flaming	Not less than 10 seconds	More than 10 seconds
Cotton pad	Applied for 10 – 15 seconds	Applied for 30 seconds
Gap gauges	Employed after 5 minutes : 6 mm X 150 mm (other than at sill level); and 25 mm dia. for any gap	Employed after 5 minutes : 6 mm X 150 mm (other than at sill level); and 25 mm dia. for any gap
Deflection measurement	Monitor lateral deflection.	Deformation measurements to be made at specified locations.
Direct field of application	Not included.	Included.
Insulation	A failure of the specimen to maintain insulation shall be deemed when: a) mean unexposed face temperature increases by more than 140°C above its initial value; or b) the temperature recorded at any position on the unexposed surface by thermocouples is in excess of 180°C above the initial mean unexposed face temperature; or c) integrity failure occurs.	A failure of the specimen to maintain insulation shall be deemed when: a) mean unexposed face temperature increases be more than 140°C above its initial value; or b) the temperature recorded at any position on the unexposed surface by thermocouples is in excess of 180°C above the initial mean unexposed face temperature; or c) integrity failure occurs.

The basic test specifications and failure criteria for both BS 476 and BS EN 1364-1 are shown in table 1. The time/temperature relationship is the same for both test standards; however, the EN test is controlled using plate thermometers that, due to their slow response, result in the EN test being more severe than the BS test during the early stages of a test. Moreover, there is the requirement at the EN test standard that more fixed thermocouples located on the unexposed side of the wall during the test. For example, the thermocouples shall locate 15 mm away the vertical and horizontal joints to monitor the insulation performance of the wall system. If the gypsum block wall has passed the integrity and insulation in according to BS EN 1364-1 for 240 minutes heating period, it would be capable of achieving the fire resisting period of not less than 240 minutes in accordance with BS 476: Part 22: 1987 in terms of the integrity and insulation.

4. Assessment/Conclusion

It is concluded that the “Jumbo” gypsum block wall system with 100 mm thick with the density up to $1200\text{kg/m}^3 \pm 5\%$, as shown detailed in Section 3 of this report will also achieve the fire resistance of not less than 240 minutes integrity and insulation if test in accordance with BS EN 1364-1: 1999 or BS 476: Part 22:1987, subjected to stated conditions.

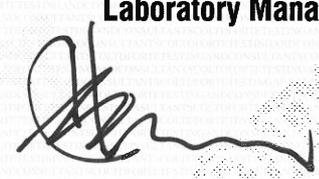
5. Term of validity

This assessment is issued on the basis of test data and information to hand at the time of issue, and is valid only if presented with proper test evidence(s) and all noted supporting data. If contradictory evidence becomes available to FORTE, the assessment will be unconditionally withdrawn and the applicant will be notified in writing. Similarly the assessment is invalidated if the assessed construction is subsequently tested since actual test data is deemed to take precedence over an expressed opinion. This assessment will expire on 12 October 2021, which time it is recommended that it will be submitted to FORTE for re-appraisal. This assessment is not valid unless it incorporates the declaration duly signed by the applicant.

For and on behalf of FORTE Testing and Consultants Company Limited:



CHENG San Mei, Sammi
Laboratory Manager



Ir Prof CHAN Yuk Kit, James, MH, RPE (Fire)
Managing Director

6. Declaration by the applicant

- We the undersigned confirm that we have read and complied with the obligations placed on us by this guide on undertaking assessments.
- We confirm that the component or element of structure, which is the subject of this assessment, has not to our knowledge been subjected to a fire test to the standard against which this assessment is being made.
- We agree to withdraw this assessment from circulation should the component or element of structure be the subject of a fire test to the standard against which this assessment is being made.
- We are not aware of any information that could affect the conclusions of this assessment.
- If we subsequently become aware of any such information we agree to ask FORTE to withdraw the assessment.

Name: _____

Signed: _____

For and on behalf of : _____