

# European technical approval (ETA) for straw bales



# Straw bales in european building codes

Do we want to get a technical approval for straw bales?

What are the necessary steps?

What are the main challenges?

Who is gonna be doing what?



Fachverband Strohballenbau  
Deutschland e.V.

*<http://www.fasba.de>*



german project:

## „Strohballenbau in der Altmark“

Focus: *regional development of straw bale building*

Building codes: german certification as a building material is running

**Bale size:** length: 50 to 100 cm, width: 46 to 50 cm, height: 36 to 40 cm;

**Gross density:** upper and lower limit: 90 kg/m<sup>3</sup> to 130 kg/m<sup>3</sup>;

**Straw moisture content:** < 15 %;

**Thermal conductivity:** in fibre-direction:  $\lambda = 0.04$  W/mk; against fibre-direction:  $\lambda = 0.065$  W/mk

**Fire behaviour:** B2;

**Resistance against the impact of biologic agents:** class 2-3.

**Resistance against fire:** F-30 up to F-90.

studies about:

- Producing small strawbales on the field/ out of big round bales
- Fibred clay plaster on straw bales (from Burkard Rüger)
- The take away from straw out of organic farming
- Different compressing methods
- Construction of a three-storey straw bale building
- Resistance against biologic agents





# code approved straw bales

## research + development

### producing „building-bales“

> reliable quality



What does the process look like?

### Verification of suitability

> resistance against biol. Influence > class 2

> ignitability/ flammability > E/ B2

> fire resistance > F-30

> Hygrothermal behaviour

> loadbearing use/ mechanical properties

### loadbearing / post and beam

- points for development

- Building requirements

- technical possibilities



-Design

- costs

- ecological aspects



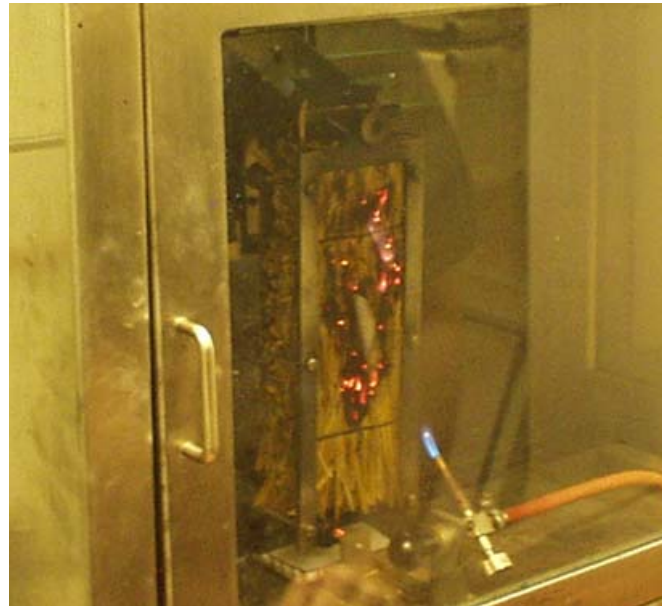
# Brennbarkeit / ignitability

## Test nach EN ISO 11925-2

Brandverhaltensklassen / classification of ignitability

Klasse / class

A1	A2	B	C	D	<b>E</b>	F
nicht brennbar		schwer entflammbar		normal entflammbar		leicht entflammbar

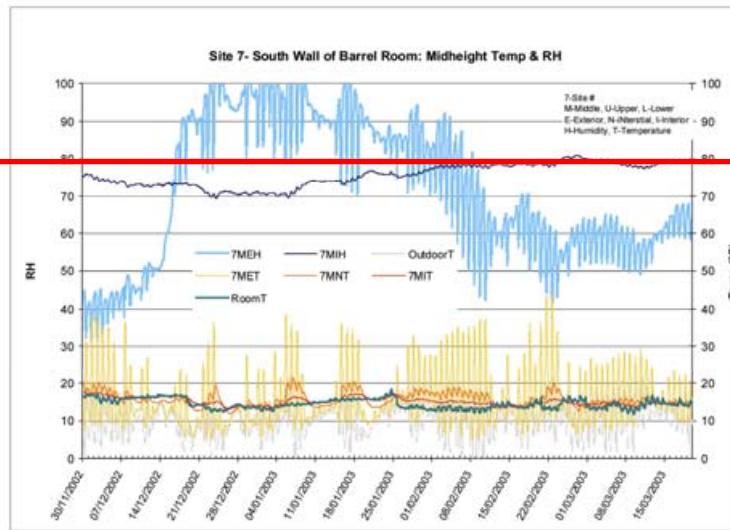


Procedure according to EN ISO 11925-2 / *The Single Flame Source Test*

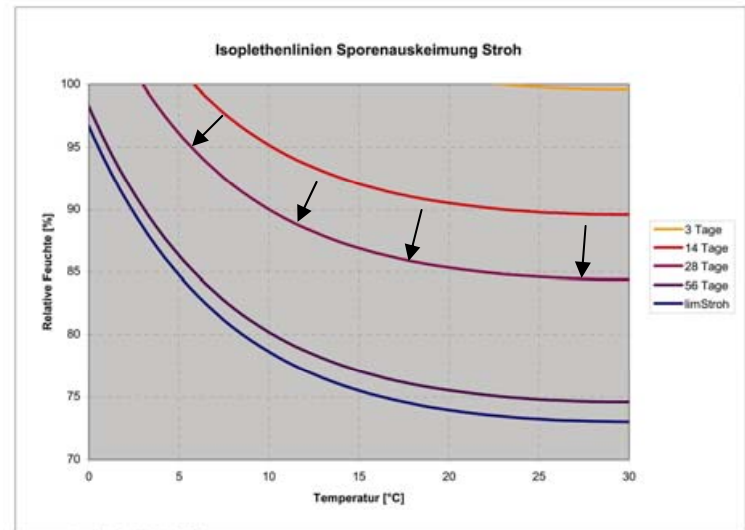
# resistance against biological influence

Test according to *ÖN 6010 / DIN EN ISO 846 EOTA CUAP*

- < 15% moisture, related to the bale-weight
- < 75% relative humidity



John Straube / Chris Schumacher



Quelle: Fa. IBO GmbH.

quantifying of fungus growth

class

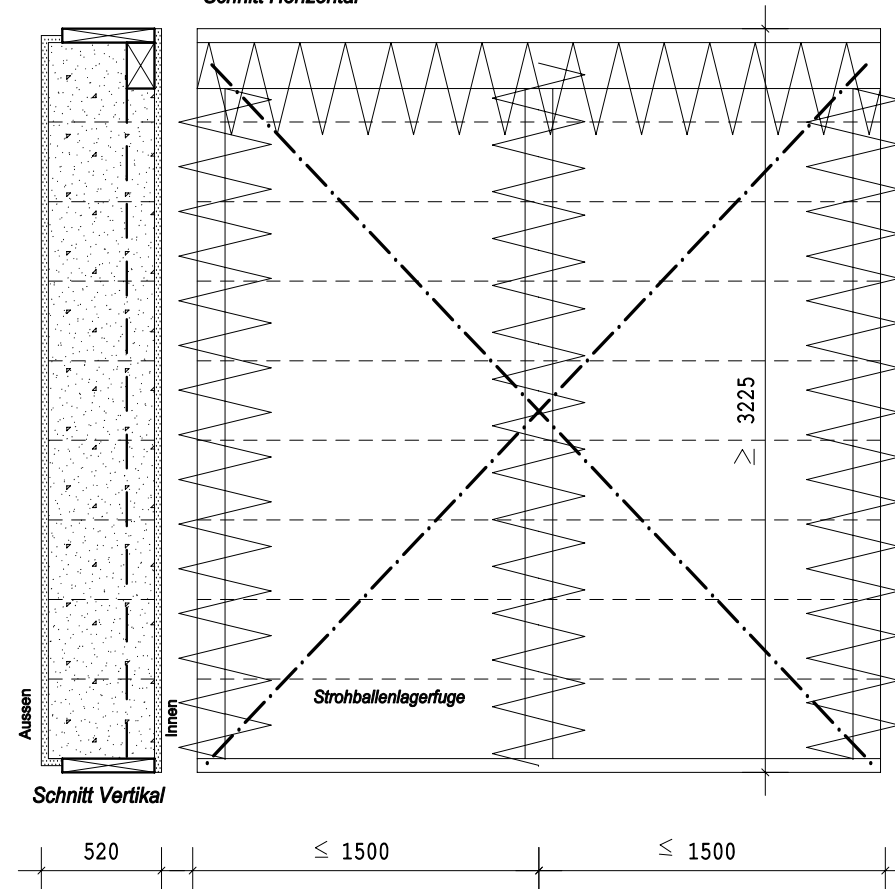
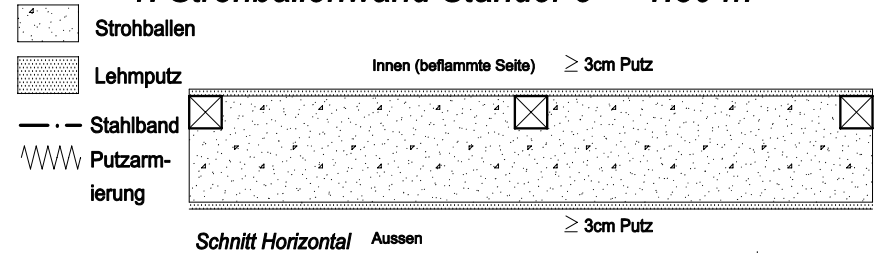
0	1	2	3	4	5
no growth	microscopic	25% the specimen	50% the specimen	>50% the specimen	100%

According to EN 1365-01 and EN 1363-1

Test done at 04.07.2003  
**More than 90 min.**

Allg. bauaufsichtl. Prüfzeugnis  
(AbP) F-30B in Vorbereitung

## 1. Strohballenwand Ständer $e \leq 1.50 \text{ m}$





*fire test specimen*



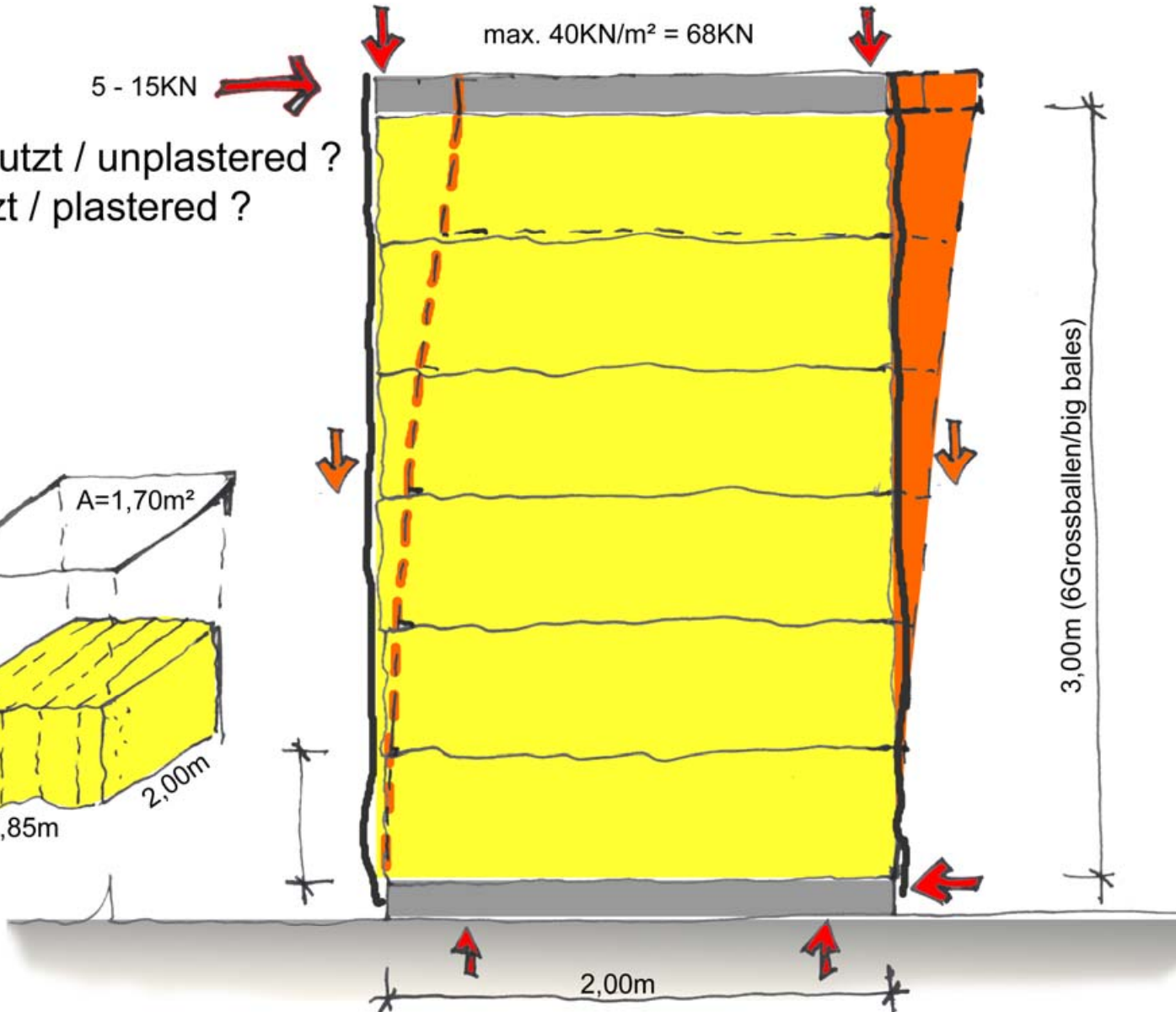
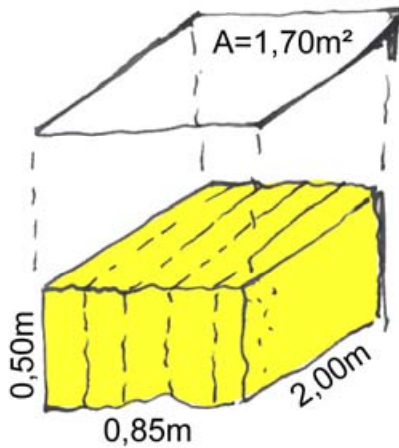




# lasttragend / loadbearing

5 - 15kN

unverputzt / unplastered ?  
verputzt / plastered ?



Focus: *Mainstream* market with straw-insulated prefabricated walls.

Building codes: The registration of small size bale straw insulants on EC-level is feasible.

The certification of bale straw insulants is presently being prepared. Certified straw bales will meet the following properties and quality criteria:

**Bale size:** length: 60 to 90 cm, width: 46 to 50 cm, height: 36 to 40 cm;

**Gross density:** upper and lower limit: 80 kg/m<sup>3</sup> to 90 kg/m<sup>3</sup>;

**Straw moisture content:** < 15 %;

**Pest plant growth:** < 0.5 wt. %;

**Residual grain ratio:** < 0.4 wt. %;

**Thermal conductivity:**  $\lambda_D (23/50) = 0.046$ ;

**Fire behaviour:** B2;

**Flow resistance:** 0.43 kPa s/m<sup>2</sup>;

**Water absorption:** 4.3 kg/m<sup>2</sup>;

**Settlement within the component:** max. 2.3 %;

**Resistance against the impact of biologic agents:** class 3.



Calculated simulations: Although straw is a comparatively favourable medium for mould growth, small bale straw insulants applied under proper workmanship in the investigated wall constructions are safe from fungal attack and, thus, protected from health-hazardous MVOC-emissions.

Further product development regarding achievable bale densities and the fabrication of small bales from large and round bales will be required. Further research is indicated, in particular, regarding hygrothermal conditions at various component junctions and co-operation potentials in marketing and supply of bale straw insulants.