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and types of construction

Bautechnisches Prüfamt

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European Technical Assessment

ETA-05/0090
of 10 September 2018

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General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

DURISOL - shuttering blocks made of wood-chip concrete

Product family
to which the construction product belongs

Non-load bearing permanent shuttering kit "DURISOL"
based on shuttering blocks of wood-chip concrete

Manufacturer

Leier Baustoffe GmbH & Co KG
Johannesgasse 46
A-7312 HORITSCHON
ÖSTERREICH

Manufacturing plant

T1
T2

This European Technical Assessment
contains

16 pages including 7 annexes which form an integral part
of this assessment

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

ETAG 009,
used as EAD according to Article 66 Paragraph 3 of
Regulation (EU) No 305/2011.

This version replaces

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Specific Part

1 Technical description of the product

1.1 Definition of construction product

The shuttering system "DURISOL" is a non-loadbearing permanent shuttering kit based on standard shuttering blocks and ancillary shuttering blocks according to EN 15498, sections 3.1.1 to 3.1.4, applicable as shuttering for plain and reinforced concrete walls cast in-situ.

The shuttering blocks consist of shuttering leaves and webs of wood-chip concrete.

The shuttering blocks are generally used for non-loadbearing as well as load-bearing internal and external walls.

Finishes are not part of the shuttering system "DURISOL".

1.2 Shuttering elements

1.2.1 Standard shuttering elements

The standard shuttering blocks consist of inner and outer shuttering leaves and webs of mineral bonded wood-chips (wood-chip concrete) according to EN 14474. The standard shuttering blocks off wood-chip concrete are precast concrete products and may include factory installed thermal insulation according to the relevant harmonised European standards or European Assessment Documents (EADs) to improve the thermal resistance (see Figures 1 and 2), which are inserted into the shuttering blocks without additional gluing.

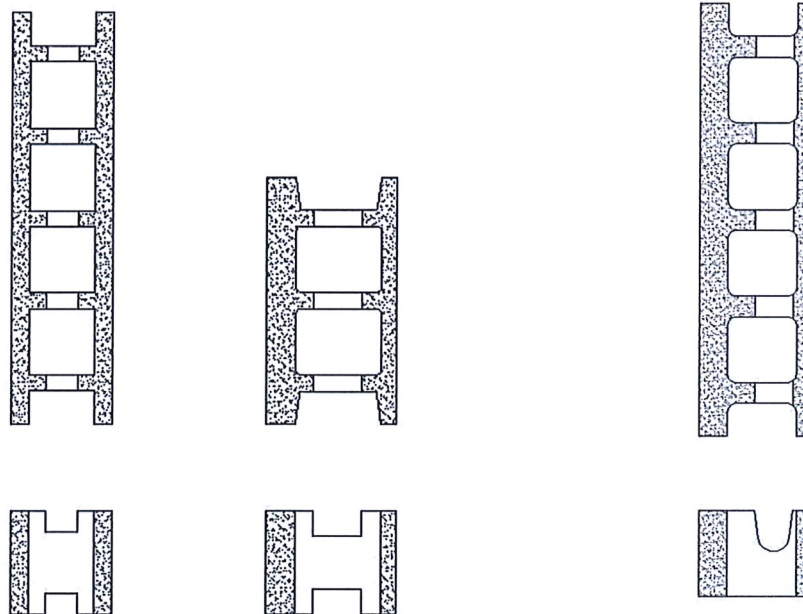


Figure 1: Examples for standard shuttering blocks off wood-chip concrete without supplementary thermal insulation

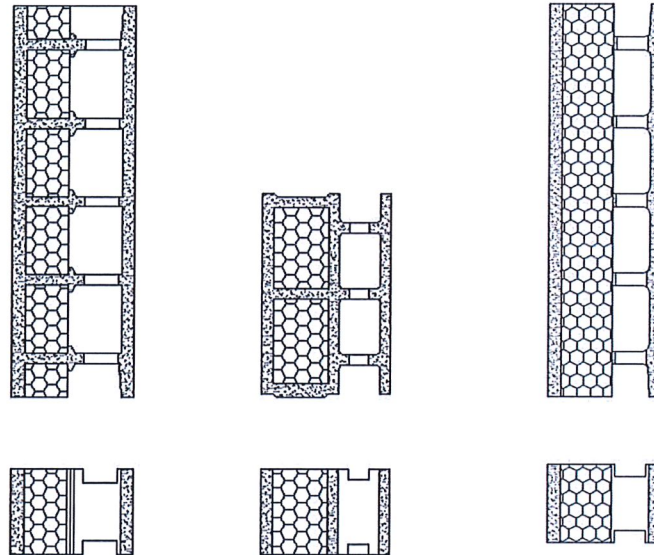


Figure 2: Examples for standard shuttering blocks off wood-chip concrete with supplementary thermal insulation

The shuttering leaves of wood-chip concrete are one-layered and are connected by webs of wood-chip concrete (see Figures 1 and 2). The main dimensions are in the following range:

thickness of the concrete core	90 to 220 mm
thickness of the whole wall without rendering	150 to 450 mm
thickness of the inner shuttering leave	25 to 45 mm
thickness of the middle shuttering leave (only for blocks with insulation chambers, see middle picture in fig. 2)	25 to 45 mm
thickness of the outer shuttering leave	25 to 100 mm
thickness of the supplementary thermal insulation	50 to 250 mm
length of the standard shuttering blocks	500 to 1000 mm
height of the standard shuttering blocks	250 mm

The shuttering blocks shall always have openings at the connecting webs which always have at least 6 cm opening width in each direction perpendicular to the wall.

The vertical ends of the standard shuttering blocks are either smooth or tongue and groove joints, depending on the type of standard shuttering blocks and form a tight joint. The top and bottom of each shuttering leave do not provide an interlocking arrangement to form a tight joint but the static friction between the top and the bottom surfaces ensure an adequate positional stability when building up the standard shuttering blocks and while placing the concrete.

It is possible to manufacture factory-prefabricated, storey-high wall elements (panels) from the standard shuttering blocks by gluing the standard shuttering blocks together in a bandage to form panels. The length of these panels is maximum 6 m and the height is maximum 3,50m (see Annex A2). The adhesive used for this purpose is deposited with the DIBt.

1.2.2 Ancillary shuttering blocks

The ancillary blocks are specially shaped shuttering blocks for the execution of constructional details, such as corners, reveals, lintels, etc.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The kit is intended to be used for construction of internal walls as well as external walls above or below ground which are load-bearing (structural) or non-load-bearing (nonstructural), including those which are subjected to fire regulations.

When using this type of construction below ground a waterproofing according to applicable national rules shall be provided depending on whether water not exerting pressure or water exerting pressure is to be dealt with. The waterproofing shall be protected from mechanical damage by a smash-resistant protective layer.

According to EOTA TR 034 the following use categories apply:

- Category IA 2: Product with indirect contact to indoor air (e. g. covered by permeable products).
- Category S/W 3: Product with no contact to soil water, ground- and surface water.

The performances given in Section 3 are only valid if the shuttering elements are used in compliance with the specifications and conditions given by the applicant.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the shuttering kit of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

3.1.1 Resulting structural pattern

In end use conditions walls made with shuttering blocks "DURISOL" are walls of a grid type according to ETAG 009, clause 2.2.

3.1.2 Efficiency of filling

Considering the installation guide of the manufacturer an efficient filling without bursting of the shuttering and without voids or any uncovered reinforcement in the concrete columns is possible.

The requirements according to ETAG 009, clause 6.1.2 are met.

3.1.3 Possibility of steel reinforcement

The instructions according in the installation guide of the manufacturer are appropriate to install steel reinforcement for walls according to EN 1992-1-1 or corresponding national rules.

The requirements according to ETAG 009, clause 6.1.3 are met.

3.2 Safety in case of fire (BWR 2)

3.2.1 Reaction to fire

- a) Shuttering blocks "DURISOL" made off wood-chip concrete without supplementary thermal insulation according to Figure 1 meet the requirements of class A2-s1, d0 according to EN 13501-1. This classification applies to formwork bricks made of wood chip concrete in accordance with the material data sheet deposited at Deutsches Institut für Bautechnik with gross densities of between 500 and 1000 kg/m³ and a minimum wall thickness of 25 mm.
- b) Storey-high wall elements (panels) glued together of shuttering blocks without supplementary thermal insulation (see Annex A2) fulfil the requirements B-s1, d0 according to DIN EN 13501-1 under the following conditions
 - density of wood chip concrete $\geq 480 \text{ kg/m}^3$,
 - thickness of the shuttering leaves $\geq 30 \text{ mm}$,

- Application quantity of the adhesive for the connection of the shuttering blocks $\leq 300 \text{ g/m}^2$ wall surface.
- c) Shuttering blocks "DURISOL" made off wood-chip concrete with supplementary thermal insulation according to Figure 2 as well as storey-high wall elements made of them fulfil the reaction to fire class B-s1, d0 according to EN 13501-1 under the following conditions:
 - The insulation insert is made of EPS of at least reaction to fire class E, a density of $15 \text{ kg/m}^3 \pm 10\%$ and a thickness of at most 165 mm.
 - The minimum thickness of the shuttering leave of the shuttering block "DURISOL" is at least 30 mm, the density of the wood chip concrete is at least 480 kg/m^3 .
 - Application quantity of the adhesive for the connection of the shuttering blocks $\leq 300 \text{ g/m}^2$ wall surface.
- d) Shuttering blocks "DURISOL" made off wood-chip concrete with supplementary thermal insulation according to Figure 2, the dimensions of which are in the ranges specified in section 1.2.1 and which are not covered by 3.2.1 c), meet the requirements of the reaction to fire class of the respective insulation material. Shuttering blocks with supplementary thermal insulation (see Figure 2) of reaction to fire class A1 meet the requirements of Class A2-s1, d0, wherein for the shuttering blocks the requirements according to 3.2.1 a) with respect to wall thickness and density of wood-chip concrete shall be complied with.

3.3 Hygiene, health and the environment (BWR 3)

3.3.1 Release of dangerous substances

Composition	Result
Material data sheet deposited with DIBt	BWR 3 not relevant

3.3.2 Water vapour permeability

The values of the water vapour resistance factor of wood-chip concrete are $\mu = 2$ (wet conditions) respectively $\mu = 8$ (dry conditions).

The values of the water vapour resistance factor of concrete columns depending on type and density and of the materials of supplementary thermal insulation are tabulated values in EN ISO 10456.

Using these values the verification of the annual moisture balance or the maximum amount of interstitial condensation according to EN ISO 13788 is on the safe side.

3.3.3 Water absorption

The requirements according to ETAG 009, clause 6.3.3 are met.

3.3.4 Watertightness

Because finishes are not part of the shuttering system "DURISOL" the "No performance assessed" option in ETAG 009, Table 3 is used.

3.4 Safety and accessibility in use (BWR 4)

3.4.1 Bond strength between the shuttering leaves and the concrete core as well as resistance against impact

The bond strength is at least equal to the resistance of the shuttering blocks against the pressure of fresh concrete, see clause 3.4.2.

Concrete walls (without consideration of the finishes), constructed with shuttering system "DURISOL" and designed according EN 1992-1-1 respectively according to national design rules, lead to the assumption that concrete columns insures an adequate resistance of the complete wall under normal used impact loads.

The requirements according to ETAG 009, clause 6.4.1 are met.

3.4.2 Resistance to filling pressure

To resist the pressure of fresh concrete according to EN 15498, Annex A the average value of tensile strength of the webs of wood-chip concrete $f_{t,m}$ according to EN 15498, B4.3 shall be higher than the design value of the tensile strength of the webs $f_{t,min}$ according to EN 15498, section B4.2 and the average value of bending tensile strength of the shuttering leaves of wood-chip concrete $f_{f,m}$ according to EN 15498, clause C4.3 shall be higher than the design value of bending tensile strength according to EN 15498, clause C4.2. The minimum value of tensile strength of the shuttering leaves of wood-chip concrete perpendicular to the surface f_{tp} shall be at least 0,15 MPa.

As supplementary insulation for the shuttering blocks according to Figure 2 only insulation materials according to harmonized European product standards or European Assessment Documents (EADs) may be used.

In addition, the compressive stress at 10 % compression strain or/and the compressive strength (if both are specified, the smallest value is decisive) shall not be less than 80 kPa. In addition, the fresh concrete shall not penetrate into the integrated thermal insulation, so that the thermal conductivity is not reduced.

If this is not guaranteed, a waterproof film must be applied to the inside of the integrated thermal insulation in such a way that it prevents the fresh concrete from penetrating into the integrated thermal insulation during concreting

The requirements according to ETAG 009, clause 6.4.2 are met.

3.4.3 Safety against personal injury by contact

Delivered on site the shuttering blocks do not have sharp or cutting edges.

Because of a certain risk of abrasion or of cutting people on rough surfaces of the shuttering blocks handling on site shall be done with gloves.

3.5 Protection against noise (BWR 5)

3.5.1 Airborne sound insulation

The "No performance assessed" option in ETAG 009, Table 3 is used.

3.5.2 Sound absorption

The "No performance assessed" option in ETAG 009, Table 3 is used.

3.6 Energy economy and heat retention (BWR 6)

3.6.1 Declared value of thermal conductivity

The declared value of the thermal conductivity λ_D of the wood-chip concrete of the shuttering blocks determined in accordance with EN ISO 10456, Annex B.2 is given in Table 1 as a function of the dry bulk density ρ_{dry}

Table 1: The declared value of the thermal conductivity λ_D of wood-chip concrete as a function of the dry bulk density ρ_{dry}

Dry bulk density ρ_{dry} [kg/m ³]	Declared value of the thermal conductivity λ_D [W/(m × K)]
475	0,100
550	0,114
650	0,123
800	0,200
1000	0,370

3.6.2 Influence of moisture transfer on insulating capacity of the wall

Using the values of clause 3.3.2 the verification of the annual moisture balance or the maximum amount of interstitial condensation according to EN ISO 13788 is on the safe side.

3.6.3 Heat capacity

The value of the heat capacity c of the shuttering blocks of wood-chip concrete is $c = 1,50 \text{ kJ}/(\text{kg} \times \text{K})$ according to EN 15498, clause 5.2.8.2.

The values of the heat capacity c of the concrete columns and of the materials of supplementary thermal insulation are tabulated values in EN ISO 10456.

3.7 General Aspects

3.7.1 Resistance to deterioration

Physical agent

Since the thermal expansion coefficient of wood-chip concrete is not higher than of normal weight concrete the relative changes of the shuttering blocks in length, width and thickness under specified temperature and humidity conditions shall not exceed 0,07 % after exposing them for 48 h at 70°C.

The requirements according to ETAG 009, clause 6.7.1.1 are met.

Chemical agent

The shuttering blocks are made of wood-chip concrete. There is no corrosion of the wood-chip concrete webs in concrete.

The finishes of the wall are not part of the ETA. Determination of the cleaning agent of the surface is not possible.

The requirements according to ETAG 009, clause 6.7.1.2 are met.

Biological agent

The application of wood-chip concrete as thermal insulation material for decades has shown that it is sufficiently protected against fungi, bacteria, algae and insects.

Wood-chip concrete and the supplementary thermal insulation do not provide a food value and in general it does not contain voids suitable for habitation by vermin.

The shuttering system "DURISOL" does not contain any biocides.

The requirements according to ETAG 009, clause 6.7.1.3 are met.

3.7.2 Resistance to normal use damage

Normal use impacts

Concrete walls (without consideration of the finishes), constructed with shuttering system "DURISOL" and designed according EN 1992-1-1 respectively according national design rules, lead to the assumption that concrete columns insures an adequate resistance of the complete wall under normal used impact loads.

The requirements according to ETAG 009, clause 6.7.2.1 are met.

Incorporation of ducts

The instructions in the installation guide of the manufacturer are appropriate to produce horizontal perforations through the walls, which are necessary for passing through ducts, see clause 4.2.4.

The requirements according to ETAG 009, clause 6.7.2.2 are met.

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with guideline for European technical approval ETAG 009, June 2002, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011, the applicable European legal act is: [98/279/EC], as amended by European legal act [2001/596/EC].

With regard to the reaction to fire, system 1 should be used for the shuttering blocks classified in A2-s1, d0 or B-s1, d0, since the requirements in the footnote (*) according to Decision 1998/279/EC, as amended by Decision 2001/596/EC, are met (limitation of the content of organic substances).

In all other cases the system 2+ shall be used.

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 10 September 2018 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Dr.-Ing. R. Alex

Charakteristics of product

The shuttering kit "DURISOL" consists of the following shuttering blocks:

- standard shuttering blocks and
 - ancillary shuttering blocks,
- see clauses 1. and 2.

1. Standard shuttering blocks

The standard shuttering blocks (composed of shuttering leaves and webs of wood-chip concrete) correspond to the information and drawings according to section 1.2.1.

The requirements of the standard shuttering blocks regarding to geometric characteristics are given in EN 15498, clauses 4.2.1 and 5.2.1.

Only wood chip concrete according to EN 14474 shall be used according to the material data sheet deposited with DIBt for the production of wood chip concrete shuttering blocks.

The material oven dry density ρ_{dry} of wood-chip concrete of the standard shuttering blocks is between 480 and 1000 kg/m³.

The mean material oven dry density shall deviate by not more than $\pm 10 \%$ from the declared value according to EN 15498, clauses 4.2.2 and 5.2.2.

Only thermal insulation inserts according to harmonized European standards or European Assessment Documents (EADs) may be used.

2. Ancillary shuttering blocks

The ancillary shuttering blocks are:

- stopper blocks / corner blocks / universal blocks and
- lintel blocks.

Ancillary shuttering blocks are designed in the same manner as the standard shuttering blocks described above, see clause 1.2.2.

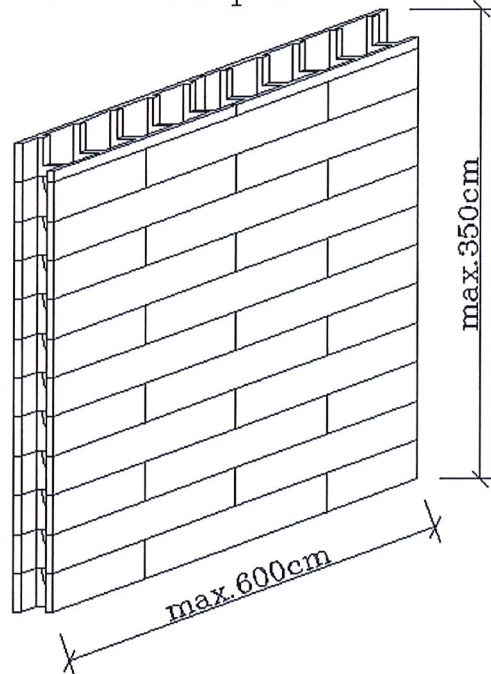
The ancillary shuttering blocks consist of shuttering leaves and webs of mineral bonded wood-chips (wood-chip concrete), it is the same material used for standard shuttering blocks specified in clause 1.2.1. Also the ancillary shuttering blocks may contain factory installed thermal insulation.

DURISOL - shuttering blocks made of wood-chip concrete

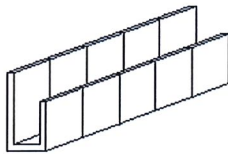
Characteristics of product

Annex A1

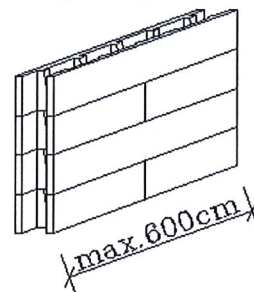
Standard panel



Lintel panel



Parapet panel



DURISOL - shuttering blocks made of wood-chip concrete

Panels made by pre-assembling the shuttering blocks

Annex A2

standards and guidelines		issue	title
EN	206	2013+A1:2016	Concrete – Specification, performance, production and conformity
EN	1992-1-1	2004+AC:2010	Eurocode 2: Design of concrete structures. – Part 1-1: General rules and rules for buildings
EN	13162	2012+A1:2015	Thermal insulation products for buildings – Factory made mineral wool (MW) products – Specification
EN	13163	2012+A2:2016	Thermal insulation products for buildings – Factory made products of expanded polystyrene (EPS) – Specification
EN	13164	2012+A1:2015	Thermal insulation products for buildings – Factory made extruded polystyrene foam (XPS) products – Specification
EN	13165	2012+A2:2016	Thermal insulation products for buildings – Factory made rigid polyurethane foam (PUR) products – Specification
EN	13170	2012+A1:2015	Thermal insulation products for buildings – Factory made products of expanded cork (ICB) – Specification
EN	13171	2012+A1:2015	Thermal insulation products for buildings – Factory made wood fibre (WF) – Specification
EN	13501-1	2007 + A1:2009	Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire tests
EN	13501-2	2016	Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation services
EN	14474	2004	Precast concrete products - Concrete with wood-chips as aggregate - Requirements and test methods
EN	15498	2008	Precast concrete products – Wood-chip concrete shuttering blocks – Product properties and performance
EN ISO	6946	2017	Building components and building elements – Thermal resistance and thermal transmittance – Calculation method
EN ISO	10211	2007	Thermal bridges in building construction - Heat flows and surface temperatures - Detailed calculations
EN ISO	10456	2007 + AC:2009	Building materials and products – Hygrothermal properties – Tabulated design values and procedures for determining declared and design thermal values
EN ISO	13788	2001	Hygrothermal performance of building components and building elements – Internal surface temperature to avoid critical surface humidity and interstitial condensation – Calculation methods
ETAG	004	2013-06	Guideline for European technical approval of "External thermal insulation composite systems with rendering"
ETAG	009	2002-06	Guideline for European technical approval of "Non load bearing permanent shuttering kits/systems based on hollow blocks or panels of insulating materials and sometimes concrete"
DURISOL - shuttering blocks made of wood-chip concrete			Annex B1
List of standards and guidelines			

Instructions for determining the fire resistance under end use conditions

The walls are exposed to the fire only on one side.

The fire resistance of non-load-bearing walls constructed with the shuttering blocks "DURISOL" may be determined under the following conditions according to EN 1992-1-2, Table 5.3 in conjunction with national annexes in force at the place of use:

- The reaction to fire class according to 3.1.6 of the shuttering blocks "DURISOL" corresponds to at least B-s1, d0.
- The concrete of the concrete core meets at least the concrete strength class C16/20.
- As wall thickness according to EN 1992-1-2, Table 5.3 is used the thickness of the concrete core.
- All requirements according to EN 1992-1-2, sections 5.1 and 5.2 with the national annexes in force at the place of use are fulfilled.

The fire resistance of load-bearing walls constructed with the shuttering blocks "DURISOL" may be determined under the following conditions according to EN 1992-1-2, Table 5.4, columns "wall exposed on one side" in conjunction with national annexes in force at the place of use:

- The reaction to fire class according to 3.1.6 of the shuttering blocks "DURISOL" corresponds to at least B-s1, d0.
- The wall was designed in accordance with EN 1992-1-1 only taking into account the load-bearing effect of the concrete or reinforced concrete.
- The concrete of the concrete core meets at least the concrete strength class C16/20.
- As wall thickness according to EN 1992-1-2, Table 5.4 is used the thickness of the concrete core
- All requirements according to EN 1992-1-2, sections 5.1 and 5.2 with the national annexes in force at the place of use are fulfilled.

If the class of reaction to fire according to 3.1.6 of the used "DURISOL" shuttering blocks is lower than B-s1, d0, the fire resistance of the therewith erected walls may be determined with regard to stability (structural safety criterion R) under the following conditions according to EN 1992-1-2, Table 5.4, columns "Wall exposed on two sides" in conjunction with national annexes in force at the place of use:

- The wall was designed in accordance with EN 1992-1-1 only taking into account the load-bearing effect of the concrete or reinforced concrete.
- The concrete of the concrete core meets at least the concrete strength class C16/20.
- As wall thickness according to EN 1992-1-2, Table 5.4 is used the thickness of the concrete core.
- All requirements according to EN 1992-1-2, sections 5.1 and 5.2 with the national annexes in force at the place of use are fulfilled.
- The fulfilment of the thermal insulation criterion I and integrity criterion E of such walls is not detectable in this case without additional investigations.

The preconditions for this classification are:

- The design of the building has to take into consideration the secondary effects of fire. Especially constraints, introduced by thermal strain, should be sufficiently low and appropriate building joints should be foreseen. The rules, valid in place of use, govern. Structural requirements on work in normal conditions, valid in the place of use, may require larger dimensions. Concrete cover for the reinforcement has to be observed according to the rules valid in the place of use.

DURISOL - shuttering blocks made of wood-chip concrete

Instructions for determining the fire resistance under end use conditions

Annex B2
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- A normal weight concrete as defined in EN 206 shall be used. As far as European standards EN 206 is not in force, an equivalent concrete according to national rules, valid in the place of use, is acceptable. The strength class of concrete shall be between C16/20 and C50/60 according to EN 206.
- The shuttering blocks shall on both sides either be plastered/rendered or at least the joints on both sides shall be sealed with plastering/rendering mortar. The mortar for plastering/rendering or for sealing shall be based on inorganic aggregates, gypsum, cement or lime or on suitable combinations of these three binders.

Note: The classification of walls constructed with the shuttering system "DURISOL" regarding to fire resistance are valid only for walls without openings (for windows or doors for examples).

DURISOL - shuttering blocks made of wood-chip concrete

Instructions for determining the fire resistance under end use conditions

Annex B2
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Instructions for determining the thermal resistance under end use conditions

The declared value of thermal resistance $R_{D,wall}$ of walls made of shuttering blocks of wood-chip concrete in end use conditions (shuttering blocks with concrete columns and maybe thermal insulation inserts but without rendering) is the sum of the declared value of thermal resistance of the shuttering blocks of wood-chip concrete $R_{D,block}$, the concrete columns $R_{D,concrete}$ and maybe the thermal insulation inserts $R_{D,insulation}$. The declared value of thermal resistance of the shuttering blocks of wood-chip concrete $R_{D,block}$ shall be calculated in accordance with EN ISO 6946 with a declared value of thermal conductivity λ_D of the shuttering blocks of wood-chip concrete depending on the material oven dry density ρ_{dry} according to of section 3.6.1, Table 1 of the "Special part". The declared value of thermal resistance of the concrete columns $R_{D,concrete}$ shall be calculated in accordance with EN ISO 6946 with a value of thermal conductivity λ of the concrete columns depending on the density ρ tabulated in EN ISO 10456. The declared value of thermal resistance of thermal insulation inserts $R_{D,insulation}$ shall be calculated in accordance with EN ISO 6946 with a declared value of thermal conductivity λ_D according to the declaration of performance of the used thermal insulation inserts.

Walls made of shuttering blocks consist of thermally homogenous and thermally inhomogeneous layers according to EN ISO 6946. The declared value of thermal resistance $R_{D,wall}$ of walls made of shuttering blocks of wood-chip concrete in end use conditions (shuttering blocks with concrete columns and maybe thermal insulation inserts but without rendering) shall be calculated according to one of the three following methods:

1. Determination of the wall as three thermally homogeneous layers according to EN ISO 6946, clause 6.1 without considering the webs:
 - inner shuttering leave of wood-chip concrete,
 - concrete column and
 - outer shuttering leave of wood-chip concrete.

This calculation leads to the minimum declared value of thermal resistance $R_{D,wall}$ of walls made of shuttering blocks of wood-chip concrete.

2. Determination of the wall as thermally homogenous and thermally inhomogeneous layers parallel to the surface of the wall according to EN ISO 6946, clause 6.2. For a simplified calculation it is possible to replace the real horizontal concrete ribs A_R (web recess areas) between the chambers of the concrete columns by modelled rectangular areas A_R , see the following Figure 1.
3. Determination by calculation methods according to EN ISO 10211.

In case of shuttering blocks with thermal insulation inserts (see Figure 2 of the "Specific part"), the second or the third method has to be used.

DURISOL - shuttering blocks made of wood-chip concrete

Instructions for determining the thermal resistance under end use conditions

Annex B3
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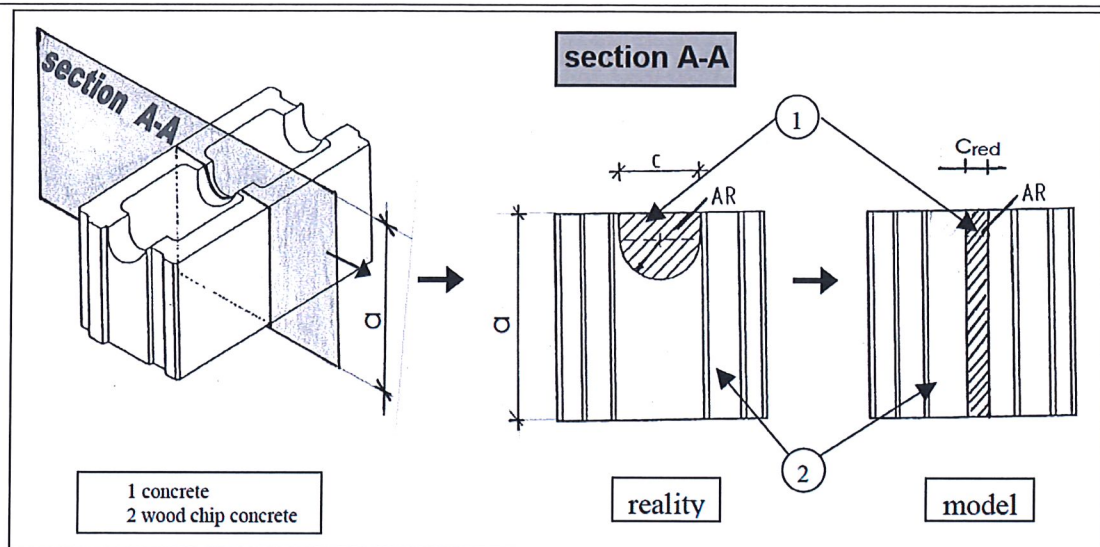


Figure 1: Replacing of the real horizontal concrete ribs A_R (web recess areas) between the chambers of the concrete columns by modelled rectangular areas A_R

DURISOL - shuttering blocks made of wood-chip concrete

Instructions for determining the thermal resistance under end use conditions

Annex B3
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