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Technical Recommendation SYSTEM 3E S.A. No RT 2023/03/01

Name of Product	**Aggregate concrete masonry units for load-bearing walls, columns, and partition walls. Masonry elements made in SYSTEM 3E EKO+ technology.**
Manufacturer	**SYSTEM 3E S.A.** **ul. 1 Rondo ONZ** **00-124 Warszawa**
Production Plant	**ul. Krasickiego 63/71** **97-500 Radomsko**
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Warsaw 01 March 2023

1. NATURE AND PURPOSE OF RECOMMENDATIONS

Technical Recommendation is a voluntary document confirming preliminary tests performed on walls made of construction elements in SYSTEM 3E EKO+ technology and confirming the suitability of those elements for use in general construction and their compliance with the principles of technical knowledge.

2. SUBJECT OF THE TECHNICAL RECOMMENDATION

The subject of this technical recommendation is a system of prefabricated structural elements made in SYSTEM 3E EKO+ technology. The elements are intended for erecting load-bearing and non-bearing structures in single- and multi-family dwellings. Structural elements are made of lightweight concrete in shapes and dimensions according to technical drawings available in technical documentation regarding the product of interest: Declaration of Performance S3E EKO+ [1-70].

The system comprises of 70 types of elements grouped according to their purpose [71-72], including:

- lower elements: S0 200 WP, S0 200 W, S0/2 200 W, S0/2 200 P, S0 250 WP, S0 250 W, S0/2 250 W, S0/2 250 P, S0 300 WP, S0 300 W, S0/2 300 W, S0/2 300 P
- basic elements: S1 WP, S1 W, S1/2 W, S1/2 P
- upper elements: SZ/EO WP, SZ/EO W, SZ/2 W, SZ/2 P, SZ/EO 200 WP, SZ/EO 200 W, SZ/2 200 W, SZ/2 200 P, EWN WPL, EWN WL, EWN WPP, EWN WP
- lintel/window elements: EN WP, EN W, EN/2 W, EN/2 P, EPN WPP, EPN WP, EPN WPL, EPN WL, EO/2 WPL, EO/2 WPP, EO/2 WP, EO/2 200 WPL, EO/2 200 WPP, EO/2 200 WP
- corner elements: SNL, SNL/2, SNP, SNP/2, ENP, ENL, SZL, SZP, EWNL, EWNP, EO/2 PT, EO/2 PL, EO/2 LT, EO/2 LP, EO/2 200 PT, EO/2 200 PL, EO/2 200 LT, EO/2 200 LP
- complementary elements: ST W, ST P, EU 200 WP, EU 200 W, EU/2 200 W, EU/2 200 P, EU 150 WP, EU 150 W, EU/2 150 W, EU/2 150 P

3. PURPOSE, SCOPE AND CONDITIONS OF USE

3.1. Purpose

SYSTEM 3E EKO+ elements are standardised as aggregate concrete masonry units (with lightweight aggregates) according to the European standard EN 771-3:2011+A1:2015 [79]. S3E elements are intended for the construction of internal and external building partitions and for the construction of load-bearing structures and non-bearing structures.

3.2 Scope of application

SYSTEM 3E is designed for construction of wall structures in single-family, multi-family and collective residential buildings, public utility buildings and industrial buildings.

3.3 Conditions of use

SYSTEM 3E structural elements should be used in accordance with the Technical Product Data Sheet [71] and on the basis of the design documentation for the given building developed taking into account the applicable national standards and regulations. Design and static calculations of structures from SYSTEM 3E EKO+ elements should be carried out in accordance with the set of Eurocode 6 standards and/or their national interpretations and attachments, using the technical parameters listed in Sections 4 and 5.

4. PERFORMANCE CHARACTERISTICS

The performance of structural elements in SYSTEM 3E technology is given in Table 1. The following values are available in the Declaration of Performance DoP/I/01/21 [1-70].

Table 1. Declared performance for finished product of category I of the DoP/I/01/21 [1-70].

No	Essential characteristics		Performance characteristics	Reference method according to
1	Dimensions	Dimensions	as in DoP	EN 772-16
		Tolerance category	D4	
2	Flatness of bed faces		≤ 1.0 mm	EN 772-20
3	Plane parallelism of bed faces		≤ 1.0 mm	EN 772-16
4	Shape and features		as in DoP	PN-EN 772-2, PN-EN 772-16, PN-EN 772-20
5	Density		310±10% kg/m^3	EN 772-13
6	Characteristic unit compressive mechanical strength (⊥ to the laying surface)		≥ 1.5 N/mm^2	PN-EN 772-1, PN-EN 772-6

7	Water absorption	after 10': ≤40 g/m^2 * s$^{0.5}$	EN 772-11
8	Moisture movement	≤ 0.30 mm/m	EN 772-14
9	Reaction to fire	A1	EN 13501-1
10	Thermal conductivity coefficient (λ)	0.072±0.003 W/m·K	PN ISO 8301 to EN 1745
11	Water vapour permeability (μ)	≤ 15	PN-EN ISO 12572
12	Freeze/thaw resistance (20 cycles)	No damage	EN 772-18

Source: Declaration of Performance No. DoP S3E EKO+

5. TECHNICAL SPECIFICATIONS

Characteristic technical parameters have been collected on the basis of tests carried out for model structures in S3E technology [73-78] and using valid European test standards [79-83]. Below are the recommended technical parameters to be used in the design and static calculations of structures in reference to European standards, including Eurocode 0: Basis of Structural Design [84], Eurocode 6: Design of masonry structures [85], Eurocode 8: Design of structures for earthquake resistance [86] and their national interpretations with attachments in the country of use.

5.1. Compressive strength for S3E EKO+ construction

The following values of technical parameters, determined experimentally according to PN EN 1051-1 test standard [73, 80], should be adopted for the calculation of the compressive strength of masonry:

- average compressive strength of masonry: **$f_{m,v}$= 1,06 N/mm^2**
- characteristic compressive strength of masonry: **f_k = 1,00 N/mm^2**

The value of the characteristic compressive strength (f_k) given above should be used to determine the design strength of the masonry (f_d).

In addition, the partial material factor of γ_M equal to 2.0 when the masonry work is carried out by a properly trained team under supervision and the quality of the work is controlled by a suitably qualified person independent of the contractor, or 2.2 when the above conditions are not fulfilled. In the case of structures extending up to 10 cm beyond the outline of the foundations, the values of average and characteristic strength specified above must be taken.

- Poisson's ratio: ν_{mv} **= 0,35**
- average modulus of elasticity of masonry: E_{mv} **= 193 N/mm²**
- elasticity characteristic of masonry: K_E **= 193 N/mm²**

The average modulus of elasticity (E_{mv}) and the elasticity characteristic (K_E) were determined according to PN EN 1052-1 [80] based on 1/3 of the compressive strength of a given test wall element. The adopted assessment methodology does not provide for the actual loading conditions of the structure, which in the case of S3E technology results in additional vertical deformations caused by the mutual fit of the stacked elements. In the case of loaded masonry structures (ceiling, reinforced concrete tie beam, additional storeys, roof structure), which are the main purpose of the S3E EKO+ technology, the modulus of elasticity of masonry should be determined from the formula characteristic for cellular concrete masonry or other masonry elements made on mortar at f_m < 5 MPa [80], according to the following formula:

$$E = 600\, f_k$$

5.2. Bending strength of construction using S3E EKO+ technology

The following values of technical parameters, determined experimentally according to PN EN 1052-2 test standard [74, 81], should be taken for the calculation of the bending strength of masonry:

- characteristic value of the tensile strength (when the upper edge is restrained) at bending in the case of failure in the perpendicular plane: $F_{xk\perp}$ **= 0,11 N/mm²**
- characteristic value of the tensile strength (when the upper edge is restrained) at bending in the case of failure in the parallel plane: F_{xkII} **= 0,31 N/mm²**

5.3. Shear strength of S3E EKO+ construction

The following values of technical parameters determined experimentally according to PN EN 1052-3 test standard [75, 82] should be adopted for the calculation of the shear strength of masonry:

- determined shear strength of masonry units: F_{vo} **= 0.09 N/mm²**
- characteristic shear strength of masonry: F_{vk}**= 0.07 N/mm²**

5.4. Acoustic properties

SYSTEM 3E EKO+ elements can be used in accordance with the requirements concerning acoustic insulation in buildings and in dependence on the national provisions and regulation. Acoustic parameters characteristic for partitions made in SYSTEM 3E EKO+ technology have been determined experimentally [76, 77, 83]. Based on the research, single-weighted sound insulation index R_w, spectral adaptation indices C and C_{tr} were determined, these results were used later to calculate single-weighted assessment indices of sound insulation $R_{A.1}$ and $R_{A.2}$. The values are summarised in Table 2. In the case when a wall is not plastered (1) and covered with traditional cement-lime plastering with 1 cm thickness on both sides (2).

Table 2. acoustic insulation properties of a partition made of S3E elements with a thickness of S3E elements with a thickness of 35.2 cm based on laboratory tests.

No	**Specific sound insulation, frequency range 100-5000 Hz**		
	Rw (C, Ctr), dB	$R_{A,1}$, dB	$R_{A,2}$, dB
1	**45 (-1;-4)**	**44**	**41**
2	**45 (-1;-4)**	**44**	**41**

Source: Sound insulation determined in accordance with EN ISO 10140-2:2011 [76, 77]

5.5 Fire resistance class

Fire resistance of load-bearing walls made in SYSTEM 3E EKO+ technology was determined according to EN 1365-1 test standard at 100% calculated load (ca. 170 kN/m). Partitions in S3E technology were classified according to the fire classification scheme below [78]:

REI 240 + M

(R - fire load bearing, E - fire integrity, I - fire insulation and M - mechanical resistance)

The design of partitions with adequate fire resistance class should be carried out in accordance with the national requirements for fire resistance class of fire separation elements in the country in use.

REPORTS, STANDARDS AND DOCUMENTS USED

6.1 Documents and test reports

[1] Declaration of Performance **S3E EKO+/S0 200 WP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S0 200 WP

[2] Declaration of Performance **S3E EKO+/S0 200 W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S0 200 W

[3] Declaration of Performance **S3E EKO+/S0.2 200 W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S0/2 200 W

[4] Declaration of Performance **S3E EKO+/S0.2 200 P/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S0/2 200 P

[5] Declaration of Performance **S3E EKO+/S0 250 WP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S0 250 WP

[6] Declaration of Performance **S3E EKO+/S0 250 W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S0 250 W

[7] Declaration of Performance **S3E EKO+/S0.2 250 W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S0/2 250 W

[8] Declaration of Performance **S3E EKO+/S0.2 250 P/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S0/2 250 P

[9] Declaration of Performance **S3E EKO+/S0 300 WP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S0 300 WP

[10] Declaration of Performance **S3E EKO+/S0 300 W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S0 300 W

[11] Declaration of Performance **S3E EKO+/S0.2 300 W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S0/2 300 W

[12] Declaration of Performance **S3E EKO+/S0.2 300 P/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S0/2 300 P

[13] Declaration of Performance **S3E EKO+/S1 WP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S1 WP

[14] Declaration of Performance **S3E EKO+/S1 W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S1 W

[15] Declaration of Performance **S3E EKO+/S1.2 W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S1/2 W

[16] Declaration of Performance **S3E EKO+/S1.2 P/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: S1/2 P

[17] Declaration of Performance **S3E EKO+/SZ.EO WP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: SZ/EO WP

[18] Declaration of Performance **S3E EKO+/SZ.EO W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: SZ/EO W

[19] Declaration of Performance **S3E EKO+/SZ.2 W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: SZ/2 W

[20] Declaration of Performance **S3E EKO+/SZ.2 P/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: SZ/2 P

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[21] Declaration of Performance **S3E EKO+/SZ.EO 200 WP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: SZ/EO 200 WP

[22] Declaration of Performance **S3E EKO+/SZ.EO 200 W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: SZ/EO 200W

[23] Declaration of Performance **S3E EKO+/SZ.2 200 W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: SZ/2 200 W

[24] Declaration of Performance **S3E EKO+/SZ.2 200 P/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: SZ/2 200 P

[25] Declaration of Performance **S3E EKO+/EN WP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EN WP

[26] Declaration of Performance **S3E EKO+/EN W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EN W

[27] Declaration of Performance **S3E EKO+/EN.2 W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EN/2 W

[28] Declaration of Performance **S3E EKO+/EN.2 P/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EN/2 P

[29] Declaration of Performance **S3E EKO+/EPN WPP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EPN WPP

[30] Declaration of Performance **S3E EKO+/EPN WP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EPN WP

[31] Declaration of Performance **S3E EKO+/EPN WPL/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EPN WPL

[32] Declaration of Performance **S3E EKO+/EPN WL/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EPN WL

[33] Declaration of Performance **S3E EKO+/EWN WPP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EWN WPP

[34] Declaration of Performance **S3E EKO+/EWN WP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EWN WP

[35] Declaration of Performance **S3E EKO+/EWN WPL/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EWN WPL

[36] Declaration of Performance **S3E EKO+/EWN WL/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EWN WL

[37] Declaration of Performance **S3E EKO+/EO.2 WPP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EO/2 WPP

[38] Declaration of Performance **S3E EKO+/EO.2 WPL/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EO/2 WPL

[39] Declaration of Performance **S3E EKO+/EO.2 WP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EO/2 WP

[40] Declaration of Performance **S3E EKO+/EO.2 200 WPP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EO/2 200 WPP

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[41] Declaration of Performance **S3E EKO+/EO.2 200 WPL/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EO/2 200 WPL

[42] Declaration of Performance **S3E EKO+/EO.2 200 WP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EO/2 200 WP

[43] Declaration of Performance **S3E EKO+/SNL/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: SNL

[44] Declaration of Performance **S3E EKO+/SNL.2/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: SNL/2

[45] Declaration of Performance **S3E EKO+/SNP/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: SNP

[46] Declaration of Performance **S3E EKO+/SNP.2/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: SNP/2

[47] Declaration of Performance **S3E EKO+/SZL/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: SZL

[48] Declaration of Performance **S3E EKO+/SZP/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: SZP

[49] Declaration of Performance **S3E EKO+/ENP/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: ENP

[50] Declaration of Performance **S3E EKO+/ENL/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: ENL

[51] Declaration of Performance **S3E EKO+/EWNP/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EWNP

[52] Declaration of Performance **S3E EKO+/EWNL/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EWNL

[53] Declaration of Performance **S3E EKO+/EO.2 PT/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EO/2 PT

[54] Declaration of Performance **S3E EKO+/EO.2 PP/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EO/2 PP

[55] Declaration of Performance **S3E EKO+/EO.2 LT/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EO/2 LT

[56] Declaration of Performance S3E **S3E EKO+/EO.2 LP/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EO/2 LP

[57] Declaration of Performance **S3E EKO+/EO.2 PT 200/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EO/2 PT 200

[58] Declaration of Performance **S3E EKO+/EO.2 PP 200/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EO/2 PP 200

[59] Declaration of Performance **S3E EKO+/EO.2 LT 200/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EO/2 LT 200

[60] Declaration of Performance **S3E EKO+/EO.2 LP 200/I/01/21**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EO/2 LP 200

[61] Declaration of Performance **S3E EKO+/ST P/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: ST P

[62] Declaration of Performance **S3E EKO+/ST W/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: ST W
[63] Declaration of Performance **S3E EKO+/EU 150 WP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EU 150 WP
[64] Declaration of Performance **S3E EKO+/EU 150 W/I/01/23** Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EU 150 W
[65] Declaration of Performance **S3E EKO+/EU.2 150 W/I/01/23** Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EU/2 150 W
[66] Declaration of Performance **S3E EKO+/EU.2 150 P/I/01/23** Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EU/2 150 P
[67] Declaration of Performance **S3E EKO+/EU 200 WP/I/01/23**. Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EU 200 WP
[68] Declaration of Performance **S3E EKO+/EU 200 W/I/01/23** Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EU 200 W
[69] Declaration of Performance **S3E EKO+/EU.2 200 W/I/01/23** Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EU/2 200 W
[70] Declaration of Performance **S3E EKO+/EU.2 200 P/I/01/23** Masonry element from aggregated concrete (with lightweight aggregates) in SYSTEM 3E EKO+ technology, category I. Type: EU/2 200 P
[71] Product Data Sheet, SYSTEM 3E EKO+ structural element, SYSTEM 3E S.A. Warsaw, March 2023.
[72] SYSTEM 3E Technical Catalogue, System 3E S.A. Warsaw, June 2019.
[73] Badania na ściskanie zgodne z normą PN-EN 1052-1 konstrukcji ściennych wykonanych w technologii 3E (NB-17/RB-2/2021), Politechnika Śląska, Gliwice, Luty 2021.
[74] Sprawozdanie z badań Nr 4/K/WT/2021 z badań elementów murowych z elementów w Technologii S3E, Laboratorium Badawcze Oddziału Ceramiki i Betonów w Warszawie, Warszawa, 02.03.2021.
[75] Raport z badań NR KMiKB-019/2021, Wydział Budownictwa i Inżynierii Środowiska, Katedra Inżynierii Budowlanej, Szkoła Główna Gospodarstwa Wiejskiego w Warszawie, Warszawa, 28.01.2021.
[76] Raport z badania Nr RS-2021/B-208, Badanie izolacyjności akustycznej od dźwięków powietrznych Ściany z elementów murowych z betonu kruszywowego w technologii SYSTEM 3E EKO+ produkcji SYSTEM 3E, CTO S.A. Zespół Laboratoriów Badań Środowiskowych, Laboratorium Badań Wibroakustycznych, Gdańsk, 30.03.2021.
[77] Raport z badania Nr RS-2021/B-209, Badanie izolacyjności akustycznej od dźwięków powietrznych Ściany z elementów murowych z betonu kruszywowego w technologii SYSTEM 3E EKO+ produkcji SYSTEM 3E – z tynkiem, CTO S.A. Zespół Laboratoriów Badań Środowiskowych, Laboratorium Badań Wibroakustycznych, Gdańsk, 30.03.2021.
[78] Fire Resistance Test Report Pr-21-2.093-En, SYSTEM 3E EKO+ Loadbearing wall, PAVUS, a.s. Czech Republic, 09.06.2021.

6.2 Standards and other Documents

[79] PN-EN 771-3 +A1:2015-10: wymagania dotyczące elementów murowych – Część 3: elementy murowe z betonu kruszywowego (z kruszywami lekkimi).
[80] PN-EN 1052-1:2000: Metody badań murów. Określenie wytrzymałości na ściskanie.
[81] PN-EN 1052-2:2016-06: Metody badań murów—Część2: Określenie wytrzymałości na zginanie

[82] PN-EN 1052-3:2004/A1:2009: Metody badań murów – Część 3: Określenie początkowej wytrzymałości muru na ścinanie.
[83] PN-B-02151-3:2015-10: Akustyka budowlana – Ochrona przed hałasem – Część 3: Wymagania dotyczące izolacyjności akustycznej przegród w budynkach i elementach budowlanych.
[84] EN 1990 Eurocode 0: Basis of Structural Design.
[85] EN 1996 Eurocode 6: Design of Masonry Structures.
[86] EN 1998 Eurocode 8: Design of Structures for Earthquake Resistance.