



TECHNICAL SPECIFICATION FOR GRC PRODUCTION

MUTASYON PRECAST

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SCOPE

This section describes the properties of the elements specified in Mutasyon Glassfiber Reinforced Concrete (GRC) projects and drawings.

DESCRIPTION

RELATED DOCUMENTS:

Specification for the manufacture, curing and testing of GRC products. All productions to be made regarding Mutasyon GRC shall be produced and tested in accordance with the product specifications GRC specification and TS EN 1169, TS EN 1170 / 1-8 (1 to 8) and GRCA standards and shall meet the performance values related to Spray Production in TS EN 15191 Standard for the classification of GRC Products.

STEEL FRAME

It is the frame system used in the cladding system and used to connect the cladding to the building, which provides the resistance of the cladding against external loads. This steel frame is the carcass that carries the Mutasyon GRC and will be connected with the appropriate anchorage system to be formed where the element will be connected to the reinforced concrete and/or structural steel, which is the carrier of the main structure, and does not include the calculations and manufacturing of the structural steel part that will be required for any additional connection between the anchorage element of the Mutasyon GRC element and the reinforced concrete connection point in case the main structure carrier is structural steel or reinforced concrete.

MUTASYON GRC (GLASSFIBER REINFORCED CONCRETE) PRECAST

Unless otherwise stated, "Glassfiber Reinforced Concrete Cladding Panels" used in this specification is a cladding system consisting of a 15-20 mm (about 0.79 in) thick Mutasyon GRC shell and a carrier steel frame based on the shell static calculation and an anchorage system of the required design.

In each system, anchorage systems, joint gaskets and fillings and, where necessary, glass-joinery assembly details are available. Window jambs shall be made as monobloc single-piece frames when transport dimensions are available.

The term "Glassfiber Reinforced Concrete" used in this specification defines the Architectural and Engineering features of the product, the materials and properties that make up the product, the technical, Fire and Earthquake properties of the product, the production and manufacturer conditions and their specifications for the products included in the special unit price tariffs, and defines the compulsory work, test and control procedures that must be carried out at each stage of the structure.

COMPONENTS

CEMENT

Known quick-setting Portland and white cement shall be obtained from an approved, TSE certified source. The manufacturer shall specify the type of cement to be used throughout the work.

GLASSFIBER

It will be a special alkali-resistant (AR - Alkali Resistance) that will last as long as the life of the concrete in the concrete. The fiber shall be glass fiber and shall have alkali resistance. The manufacturer shall prove that the glass fiber has these properties by submitting the documents received from the fiber manufacturer to the CONTRACTOR at the material approval stage. (MSDS and CE certificates will be submitted, and a guarantee will be given that this fiber is used in all work).

This record will show that the criteria in accordance with international standards are met by the test results. AR glass fiber shall be supplied from a fiber manufacturer approved by GRCA. (The fiber brand shall be Cem-Fil or Neg ARG brand, approved by GRCA "International Glassfiber Reinforced Concrete Association ", and no other brands of glass fiber shall be used).

ADDITIVES

A suitable super-hyper plasticizer shall be used in the concrete mix to increase workability, reduce curing time, achieve high strength and good concrete quality. We shall also use suitable admixtures for curing. (Admixtures shall be YKS BASF) or equivalent)

SAND

It must be clean, dry and ready for use, containing more than 90% silica in the required granulometry.

ACRYLIC POLYMER

Acrylic Polymers to be used for curing and durability purposes shall be purchased from a known source with the specifications specified in the GRC specification and their technical specifications shall be approved by the Contractor. The polymer usage rate shall not be less than 4%.

PHYSICAL PROPERTIES

At the end of 28 days of setting, the Mutation FTB shell shall have the following values. This result will be sought in the tests to be performed.

TECHNICAL SPECIFICATION OF GRC PRECAST ELEMENTS

Characteristics	Symbol	Unit	Premix System Grade 10p	Spray System Grade 18p
Compression Strength	fc	N/mm ²	40 - 60	40 - 60
Tensile Strength	ft	N/mm ²	5 - 10	5 - 10
Limit of Proportionality	LOP	N/mm ²	5-7	6 - 10
Modulus of Rupture	MOR	N/mm ²	8-12	15 - 25
Expansion Limit	Water	%	0.5 - 4	0.5 - 4
Toughness	-	Nmm/mm ²	10 - 15	10 - 25
Modulus of Elasticity	E	kN/mm ²	10 - 20	10 - 20
Density	r	kg/dm ³	1.9 - 2.1	1.9 - 2.2
Coefficient of Thermal Expansion	aT	/C	(1.0 -1.5) x 10-5	(1.0 -1.5) x 10-5
Thermal Conductivity	2	W/mK	0.8 -1.2	0.8 -1.2
Fire Resistance (DIN4102)	-	-	A1	A1
Shrinkage Rate	Scs	mm/m	1.0 - 2.0	1.0 - 2.0
Expansion Rate	K	mm/m	0.5 - 1.0	0.5 - 1.0
Water Absorption	-	%	3 - 15	3 - 15
Water Vapor Diffusion	0	-	50 - 200	50 - 200

All units will be produced with A1 class fire resistance. Mutation FTB precast elements will have a low water/cement ratio and will not contain capillary gaps so as not to be damaged in the freeze-thaw cycle. Among the products specified in the GRC specification for decorative products, Spray system productions will be in Grade 18p, and Premix productions will be in Grade 10p quality and technical specifications.

APPLICATION PRINCIPLES

All manufacturing works shall be in accordance with the Regulation on Buildings to be Built in Earthquake Zones (DBYBHY-2007) of the Ministry of Environment and Urbanization of the Republic of Turkey, TS EN 1991-1-4 2005 Wind Loads, TS EN 1991-1-3 Snow Loads, TS500 Regulation on the Design, Calculation and Construction

Principles of Steel Structures 2016 and TS 9967 Regulation on the calculation of prefabricated concrete elements and the current Building Materials Regulation.

The productions shall be tested in accordance with TS EN 1169, TS EN 1170-1, TS EN 1170-3, TS EN 1170-4, TS EN 1170-5, TS EN 1170-6, TS EN 1170-7, TS EN 1170-8 standards and presented to the Contractor when requested. (TS EN 1170 1/8 Precast concrete products - Test methods for glass fiber reinforced cement)

The manufacturer shall have the GRCA Certificate of Full Membership.

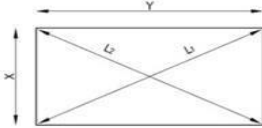
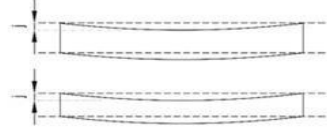
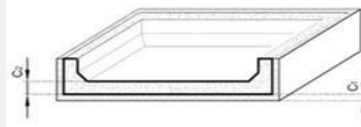
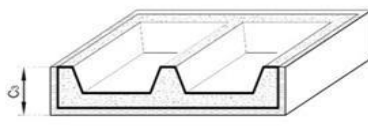
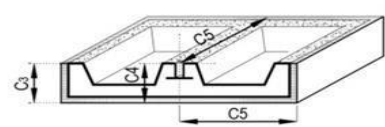
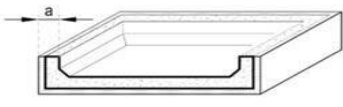
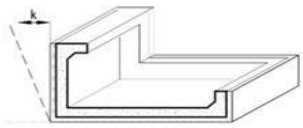
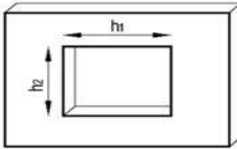
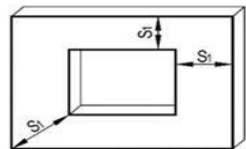
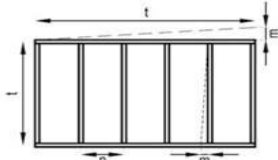
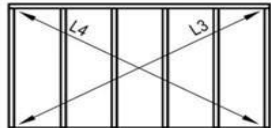
Units manufactured with Mutasyon GRC (Glassfiber Reinforced Concrete) shall maintain their initial properties against all possible temperature, humidity, wind and rain conditions at the place of use. The units shall be self-supporting within the limits shown in the drawings and shall safely withstand all loads. The colors shall not fade, the profiles, especially the reliefs, shall not wear out and the surface shall not crumble after the initial dusting. The manufacturer shall be subject to strict quality control. The quality of the work (within specified tolerances) in terms of strength, composition and dimensional conformity shall be the responsibility of the manufacturer.

In addition, the manufacturer shall submit all precast architectural projects and details of the proposed system to the Contracting Authority for the approval of the architect. The accuracy of the drawings based on the installation site measurements is the responsibility of the manufacturer.

The employer may request special tests in accordance with applicable standards and regulations. However, if such a test is requested, it shall be clearly stated before the tender.

Hilti, Fischer or equivalent brand dowels shall be used for calculations and installation.

MUTASYON GRC ELEMENTS MEASUREMENT TOLERANCE

		LIMITS ; SINIR DEĞERLER	
Lenght - Width; Boy-En (X-Y)	Less than 3m; 3m'den Az		±3mm
	3m and over; 3m ve üzeri		±3mm/3m; ±6mm max
Squareness (Difference in two diagonal measurements) /Köşe dikliği (iki köşegen arasındaki ölçü boyunda) (L ₁ -L ₂)	All; Tümü		3mm per 2m or 6mm max; whichever is greater; Her 2m için 3mm yada maks. 6mm değerlerinden hangisi büyük ise
Bowing; Eğrilik (j)	All; Tümü		±Gage length/250; ±Ölçü boyu/250
 			
Thicknesses; Döküm kalınlıkları	Facing thickness; Yüzey kaplama (buğu) kalınlığı (C ₁)	All; Tümü	±3mm
	Backing mix thickness; Arka kaplama (C ₂)	All; Tümü	+5mm / -0mm
	Depths of integral ribs; İç Omurga (C ₃)	All; Tümü	+10mm / -5mm
	Depths of integral rib with socket; Soketli iç omurga (C ₄)	All; Tümü	±2.5mm
	Socket size; Soket Yerleşim Ölçüsü (C ₅)	All; Tümü	±2.5mm
  			
Edge returns; Kenar dönüşler	Edge returns; Kenar dönüşler (a)	All; Tümü	+12mm / -0mm
	Angular variation of side moulds; Köşe dönüşlerinde açılmal sapma (k)	All; Tümü	±1 mm in 75 mm; Her 75mm için ±1mm
 			
Openings; İç boşluk ya da açıklıklar	Opening within panel face; Panel yüzündeki açıklık (h ₁ ; h ₂)	All; Tümü	±5mm
	Location of opening within panel; Açıklığın panel üzerindeki konumu (S ₁)	All; Tümü	±3mm
 			
Frame; Karkas	Vertical and Horizontal Lengths alignments; Düşey ve Yatay uzunluklar (m)	All; Tümü	6mm in 3m; 3m için 6mm
	Spacing of Members; Eleman aralıkları (n)	All; Tümü	±10mm
	Overall Lenght of Frame; Toplam Karkas Boyu (t)	All; Tümü	±10mm
	Squareness (difference in two diagonal); Köşe dikliği (köşegenler arasındaki fark) (L ₄ -L ₃)	All; Tümü	10mm
	Frame Depth from Panel Face ; Karkas Derinliği (U)	All; Tümü	+10mm / -6mm
  			

- 1) "Practical Fixing Guide for Glassfibre Reinforced Concrete (GRC)", The International Glassfibre Reinforced Concrete Association (GRCA), 2018, Page 63-64.
- 2) "Manual for Quality Control for Plants and Production of Glass Fiber Reinforced Concrete Products , 2nd Edition" Precast/Prestressed Concrete Institute (PCI), 2009, Page 107-109.

MUTASYON GRC PRODUCTION METHOD

In shell production, the mixture shall be adjusted by the manufacturer so that its properties ensure proper performance and quality control requirements.

However, the amount of fiber added to the mixture in the manufacture of Mutasyon GRC shells shall not be less than 3.7% (three-point seven percent) of the total mortar weight.

The Glassfiber used in the mixture shall be Alkali Resistant as described in the specification and supplied from the specified manufacturers.

Unless there are very special difficulties, the productions will be made by Spray Production technique and the cut fiber dimensions will not be less than 28 mm (about 1.1 in).

STEEL FRAME AND ANCHORAGE SYSTEM

The steel frames to be used inside the Mutasyon GRC elements will be designed to withstand the loads on the panel before and after assembly. Steel frames and anchors will also meet the stresses that will occur in the shell in humidity and thermal differences with flexible systems so as not to create stress on the surface and prevent damage to the Mutasyon GRC shell. Steel frame anchorage calculations and calculation principles shall be submitted to the contractor together with the panel manufacturing drawings and will be approved. All steel frame and anchorage calculations shall be made in accordance with the Regulation on Design, Calculation and Construction Principles of Steel Structures (2016).

Depending on the carcass design loads to be used in the panel system, it should be made of ST37 type, minimum 2 mm (about 0.08 in) thick box profile or 3 mm (about 0.12 in) thick c profile.

Pad hooks along the panel shall be made of ST37, min. Ø 8 mm (about 0.31 in).

All anchors, anchor fasteners and frames shall be galvanized.

CURING

The acrylic polymer placed in the mixture during manufacturing shall be cured with chemical curing agents or stored in special curing rooms at 90% humidity for 7 days. According to TS-EN 1170-1, polymer-based curing material will be added to the mixture or aqueous curing will be done in specially designed curing rooms. The produced products shall be kept in the closed production area for at least 7 (seven) days to ensure strength and color homogeneity. According to the production speed, it will be examined and approved by the contractor that the production area of the manufacturer meets this condition.

TRANSPORT AND ASSEMBLY

The produced materials will be protected against breakage while being transported to the assembly area after curing is completed.

Installation shall be made with anchorage systems in accordance with the calculations and as specified in the projects.

Isolation will be provided at the joints at the end of installation by using Sika brand one-component elastic joint sealant.

PRODUCTION FACILITY

The production facility will have a laboratory equipped to supervise production. In addition, all production, transport and assembly will be carried out with a system that will not confuse the definitions of the products and ensure traceability.

TESTS

In the lab

- Glassfiber Reinforced Concrete (GRC) production, curing and testing specification (All productions related to Mutasyon GRC product technical specifications GRC specification)
- TS EN 1169 Prefabricated concrete products - General rules for factory production control of Glassfiber reinforced cements
- TS EN 1170-1 Precast concrete products - Glassfiber reinforced cement test method - Part 1: Measurement of matrix consistency, "slump test" method
- TS EN 1170-2 Precast concrete products - Glassfiber reinforced cement test method - Part 2: Measurement of fiber content in fresh GRC "washing test"
- TS EN 1170-3 Precast concrete products - Glassfiber reinforced cement test method - Part 3: Measurement of fiber content of sprayed GRC
- TS EN 1170-4 Prefabricated concrete products - Glassfiber reinforced cement test method - Part 4: Determination of flexural strength "simple bending test" method
- TS EN 1170-5 Prefabricated concrete products - Glassfiber reinforced cement test method - Part 5: Determination of flexural strength "full bending test" method
- TS EN 1170-6 Precast concrete products - Glassfiber reinforced cement test method - Part 6: Determination of water absorption and dry density by immersion in water
- TS EN 1170-7 Prefabricated concrete products - Glassfiber reinforced cement test method - Part 7: Measurement of the largest dimensional changes due to moisture

- TS EN 1170-8 Test method for Glassfiber reinforced cement - Part 8: Repeated weathering type test

All products shall be manufactured and tested in accordance with their standards and shall provide the technical values given in this specification. The manufacturer's tests shall be carried out during the manufacturing phase for the quantities defined by the standards and at any time requested by the contractor. If tests above the GRCA requirements are requested in projects with a production amount of more than 1000 m², the Employer shall cover the extra test costs. The manufacturer shall have the laboratory, team, equipment and knowledge to perform all these tests during the production stages without the need for an independent test laboratory.

SOIL MIXTURE SYSTEM

Production mortar batching system will be an automatic system.

In the automatic batching system, dry material sand and cement will flow into the weighing system by different conveyors.

Water supply, polymer and pigment tanks will be separated. Weighing will function separately from the dry weighing system for liquid systems.

Mixing system will be an automatic system.

The system shall have a control system to minimize operator intervention and allow control and recording of material quantities and critical mixing times. The production facility shall have an open stacking area to stack at least ¼ of the work quantity. The manufacturer will have to prove that it can provide this capacity with its technical explanation or with the work documents it has completed in the past.

PRODUCER COMPETENCE

The manufacturing companies that will carry out the project, engineering and production will have sufficient experience and technical knowledge. The manufacturing companies shall have completed and delivered at least 50% of the amount of work in the technical specifications of the poses included in the project for the products in the relevant poses in Turkey and abroad at one time and separately for each of them, and in total, at least the amount of work included in the project on time and in full. References related to these works shall be submitted and approved by the Contractor.

In addition to this, the manufacturer companies will have their own know-how and patent usage rights and will have a high level of technical knowledge, references and work completion will be at a sufficient level. The manufacturer shall have sufficient experience and production history in the desired type and type of production and shall have **at least 10 years** of experience in the production and assembly of the material in

question. Manufacturers must have a current ISO 9001:2008 certificate related to production and must produce accordingly.

The manufacturer company shall have GRCA Certificate of Full Membership (GRCA Approved Full Membership Certificate). The company shall certify its production capacity and experience in the annex to these documents and confirm that its products are suitable for the project in terms of lifetime.

FIRE RESISTANCE

Fiber reinforced concrete facade cladding material shall have "A1" class non-flammability certificate according to EN 13501 - 1:2007 code numbered test.

Test Method	Parameter	Number of Tests	Results	
			Mean continuous parameter (m)	Compliance Parameter
TS EN ISO 1182	DT(°C)	5	4,0	(-)
	Dm (%) t1	5	9,2	(-)
	(s)	5	0,0	(-)
TS EN ISO 1716	PCS (MJ/kg)	3	-1,55*	(-)
(-): Not applicable *: Negative values (-) indicate that the material behaves endothermically (heat sink) during combustion.				

Test Method	Parameter	Parameter	Compliance Parameter
TS EN ISO 1182	DT(°C)	4,0	≤30(A1)
	Dm (%) t1 (s)	9,2	≤50(A1)
		0,0	= 0 (A1)
TS EN ISO 1716	PCS (MJ/kg)	-1,55*	≤ 2 (A1)

SPECIAL SURFACE TREATMENTS

GRC SURFACE FORMATION WITH SURFACE PROTECTOR:

Mutasyon GRC products will be optionally painted externally with Jotun brand paint to obtain protection against contamination. In the application of surface protector to Mutasyon GRC products produced as described in this specification, the subject of painting on the facade after assembly is explained.

CERTIFICATES



CERTIFICATE OF GRCA FULL MEMBERSHIP

This is to certify that the GRC manufacturing plant of:

MUTASYON YAPI

at: **Aydinli Mh. Istanbul AYOSB. 4 SK. No:4 TUZLA/İSTANBUL**

has been independently assessed on behalf of:

**The International
Glassfibre Reinforced Concrete
Association (GRCA)**

in accordance with the GRCA Full Member Regulations, and
Myasyon Yapi has been accepted in to the:

FULL MEMBER grade of GRCA Membership
for: **Sprayed GRC & Premix GRC**

GRCA Full Membership Number: 1168/FM

Certificate Valid for the Period:
6th October 2022 to 31st March 2023

Approved by:

A stylized signature in black ink, likely belonging to the Chair of the GRCA Council.

Chair of GRCA Council

(To check the current validity of this certificate please visit the GRCA website at www.grca.online)

The International Glassfibre Reinforced Concrete Association
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SERTİFİKA

**Mutasyon Yapı Tasarım İnşaat Mühendislik
Reklamcılık Sanayi ve Ticaret Ltd. Şti.**

**Aydınlı Mah. İstanbul AYOSB. 4 Sk. No: 4 Tuzla İstanbul
Türkiye**

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ISO 9001:2015

Kalite Yönetim Sistemi

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IAF/EA Kodu: 28



ACCREDITED
Management Systems
Certification Body
MSCB-166



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Sertifika Yayın Tarihi : 04.08.2022

Sert. Son Bazen Tarihi : 04.08.2022

Sert. Geçerlilik Tarihi : 03.08.2023

Sert. Periyodu Bldy Tar. : 03.08.2025

Sertifika No : IF6595822540

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Director

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FR25 / 01.09.2018 / 04.08.2019 / 02

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SERTİFİKA / CERTIFICATE
MUTASYON YAPI TASARIM İNŞAAT MÜHENDİSLİK
REKLAMCILIK SANAYİ VE TİCARET LİMİTED ŞİRKETİ
AYDINLI MAH. İSTANBUL AYOSB. 4 SOK. NO: 4 TUZLA / İSTANBUL / TURKEY

Denetlenmiş ve aşağıdaki standardın gerekliliklerine uygunluğu görülmüştür:

Has been assessed and found to Comply with the Requirements of:

ISO 14001:2015
ÇEVRE YÖNETİM SİSTEMİ
Environmental Management System

Kuruluşunun "İKAMET AMAÇLI BİNALARIN İNŞAATI (MÜSTAKİL KONUTLAR, BİRDEN ÇOK AİLENİN OTURDUĞU BİNALAR, GÖKDELENLER VB. NİN İNŞAATI) (AHŞAP BİNALARIN İNŞAATI HARİÇ)" Kapsamı için
For scope "CONSTRUCTION OF BUILDINGS FOR RESIDENTIAL PURPOSE (CONSTRUCTION OF DETACHED HOUSINGS, MULTIPLE FAMILY BUILDINGS, SKRISKS ETC) (EXCEPT THE CONSTRUCTION OF WOODEN BUILDINGS)"

Sertifika Numarası / Certificate Number
İlk Yayın Tarihi / Certificate Issue Date
Sertifika Geçerlilik Tarihi / Certificate Validity Date
Sertifika Periyodu / Certificate Period

: NVA-EM-22080301
: 03.08.2022
: 03.08.2023
: 1 Yıl / 1 Year



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SERTİFİKA / CERTIFICATE

MUTASYON YAPI TASARIM İNŞAAT MÜHENDİSLİK REKLAMCILIK
SANAYİ VE TİCARET LİMİTED ŞİRKETİ

AYDINLI MAH. İSTANBUL AYOSB. 4 SOK. NO: 4 TUZLA / İSTANBUL / TURKEY

Denetlenmiş ve aşağıdaki standardın gerekliliklerine uygunluğu görülmüştür:

Has been assessed and found to Comply with the Requirements of:

ISO 45001:2018

İŞ SAĞLIĞI VE GÜVENLİĞİ YÖNETİM SİSTEMİ
Occupational Health and
Safety Management System

Kuruluşunun "İKAMET AMAÇLI BİNALARIN İNŞAATI (MÜSTAKİL KONUTLAR, BİRDEN ÇOK AİLENİN OTURDUĞU
BİNALAR, GÖKDELENLER VB. NİN İNŞAATI) (AHŞAP BİNALARIN İNŞAATI HARİÇ)" Kapsamı için

For scope "CONSTRUCTION OF BUILDINGS FOR RESIDENTIAL PURPOSE (CONSTRUCTION OF DETACHED
HOUSINGS, MULTIPLE FAMILY BUILDINGS, SKRISKS ETC) (EXCEPT THE CONSTRUCTION OF WOODEN BUILDINGS)"

Sertifika Numarası / Certificate Number
İlk Yayın Tarihi / Certificate Issue Date
Sertifika Geçerlilik Tarihi / Certificate Validity Date
Sertifika Periyodu / Certificate Period

: NVA-OS-22080301
: 03.08.2022
: 03.08.2023
: 1 Yıl / 1 Year



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