COMPOSITE YARN – DIRECT SIZE YARNS- FOR STRUCTURAL REINFORCEMENT

I. DESCRIPTION

Fiberglass yarn is a natural, lustrous, white, continuous filament yarn that is twisted on supply packages. The yarns are smooth, non-cellular and generally cylindrical in form. The yarns are made of glass of high stability and durability and are, with the exception of sizing ingredients, inorganic, incombustible and will neither expand nor contract with moisture changes. The glass composition meets the certification for "E" glass as defined by ASTM's D 578-00 Standards Specification for Glass Fiber Strands. The individual glass fibers do not tend to absorb moisture and are extremely flexible. The silane sizes are permanent and specifically designed for good wet-out, good adhesion to both epoxy and polyester resins and has excellent abrasion resistance resulting in low broken filaments during handling and processing.

II. USE

Yarns with 603 sizing are used primarily for structural braiding, but also may be used for further fabrication, plying, winding, coating and impregnating of sleeving and tubings and banding tapes. They are useable for braiding and serving on wire and cable and magnet wire and other miscellaneous electrical applications.

Yarns with 517 sizing are used for pultrusion or weaving processes for applications in telecommunication cable reinforcement and recreational product reinforcements.

III. YARN NOMENCLATURE

Example Product Name (US Customary System)	Example Product Name (SI System)
ECG75 1/0 1.0Z	EC9-68 1x0 Z40
E - Electrical glass formulation	E - Electrical glass formulation
C - Continuous filaments	C - Continuous filaments
G - Filament diameter (See Table 1)	9- Filament diameter (See Table 1)
75- Yards per pound divided by 100	68- grams per 1000 meters of yarn
1/0- Single yarn end	1x0 - Single yarn end
1.0Z - Turns per inch (TPI), twist (Z or S)	Z40 - Turns per meter (TPM), twist (Z or S)

Throughout history, the actual yardage or tex of yarn products has often been shifted from the actual yield provided in the product name. Therefore, the yarn name is only used as a descriptor. The table in Section V must be utilized to obtain the actual bare glass yield of a yarn product.

IV. GENERAL INFORMATION

Reference Textiles Fibers For Industry for more information

Filament Designation		Range for Filament Diameter Average *			
US Units (letter)	SI Units (microns)	Minimum (inches)	Maximum (inches)	Minimum (microns)	Maximum (microns)
G	9.0	0.00035	0.000399	8.89	10.15
K	13.0	0.00050	0.000549	12.70	13.94

The yarns are twisted onto plastic single flange bobbins with a milk bottle type build, which is suitable for over-end removal only. The bobbins are designed to provide a smooth runout, and their geometry is controlled to maintain the desired runout performance. The package build will not extend past the edge of the base. Maximum allowable undercut at the base is 3/16" (5MM). The bobbins have no defects on the nose, which would interfere with the smooth removal of the yarn.

* Filament diameter is for reference purposes. Yarns are controlled according to yield/tex.

V. AVAILABLE PRODUCTS AND BARE GLASS PROPERTIES

Product Name*	Tex Designation*	Sizing	Bare Glass Yield**						
			Nom. Yds/Lb	Min Yds/Lb	Max Yds/Lb	Nom. Tex	Min. Tex	Max. Tex	Typical Cv***
ECG 37 1/0 0.5Z	EC9-134 1X0 Z20	517	3700	3427	3973	134	124.7	145.0	2.5
ECG 37 1/0 0.7Z	EC9-134 1X0 Z28	603	3700	3427	3973	134	124.7	145.0	2.5
ECG 75 1/0 0.7Z	EC9-68 1X0 Z28	517	7300	6754	7846	68	63.2	73.4	2.0
ECG 75 1/0 0.7Z	EC9-68 1X0 Z28	603	7300	6754	7846	68	63.2	73.4	2.0
ECK 18 1/0 0.5Z	EC13-275 1X0 Z20	517	1800	1668	1932	275	256.7	297.4	2.0
ECK 75 1/0 0.7Z	EC13-68 1X0 Z28	517	7300	6754	7846	68	63.2	73.4	2.0

* Nomenclature used for identification purposes only. Nomenclature may not indicate true yield.
** Maximum and minimum yardage/tex limits based on ± 3 times the typical standard deviation.

VI. AVAILABLE PRODUCTS AND ADDITIONAL PHYSICAL PROPERTIES

Product Name	Tex Designation	Sizing	Strand Solids			Minimum Tensile		Average Tensile *	
			Percent Strand Solids	Minimum Percent Strand Solids	Maximum Percent Strand Solids	Lbs	Newtons	Lbs	Newtons
ECG 37 1/0 0.5Z	EC9-134 1X0 Z20	517	0.55	0.33	0.73	17.0	75.6	22.7	101.0
ECG 37 1/0 0.7Z	EC9-134 1X0 Z28	603	0.60	0.45	0.75	17.0	75.6	23.7	105.4
ECG 75 1/0 0.7Z	EC9-68 1X0 Z28	517	0.55	0.33	0.73	8.3	36.9	11.0	48.9
ECG 75 1/0 0.7Z	EC9-68 1X0 Z28	603	0.70	0.55	0.85	9.0	36.9	12.0	53.4
ECK 18 1/0 0.5Z	EC13-275 1X0 Z20	517	0.40	0.30	0.70	32.9	155.8	43.9	195.3
ECK 75 1/0 0.7Z	EC13-68 1X0 Z28	517	0.55	0.33	0.73	8.4	42.7	11.3	50.3

- Breaking Strength - The strength is expressed in pounds (Newtons) per end. The minimum strengths will be the average of four breaks per package.
- Moisture - The maximum moisture for individual packages is 0.75%.

TEST METHODS FOR PHYSICAL PROPERTIES

The physical properties as listed in this specification shall be tested according to the methods as specified in the reference listed below:

1. Yards per Pound (Linear Density - TEX) - W-07Ea-T*
2. Ignition Loss - W-07Ea-T*
3. Filament Diameter - D-02C and D-02Ca-T*
4. Breaking Strength - S-01Gd* and S-01Fm-T**
5. Twist per Inch (per Meter) - D-15A-T*.

* Owens Corning Test Methods. Copies available upon request.
** Owens Corning Test Methods for fine yarns (45,000 yield/11 tex or finer glass).

Note - Physical test methods will soon be changed to ASTM Methods where applicable.

VII. AVAILABLE PRODUCTS AND VISUAL PROPERTIES

Product Nomenclature		Sizing	Max. Broken Filaments (360° Count)	Filament Count*	Approx. Yarn Diameter		Twist Tolerance	
US Customary System	Tex/Metric System (SI)				In.	mm	TPI	TPM
ECG 37 1/0 0.5Z	EC9-134 1X0 Z20	517	10	816	0.0156	0.396	± 0.15	± 6
ECG 37 1/0 0.7Z	**EC9-134 1X0 Z28**	**603**	**10**	**816**	**0.0156**	**0.396**	**± 0.21**	**± 8**
ECG 75 1/0 0.7Z	EC9-68 1X0 Z28	517	10	408	0.0106	0.269	± 0.21	± 8
ECG 75 1/0 0.7Z	**EC9-68 1X0 Z28**	**603**	**10**	**408**	**0.0106**	**0.269**	**± 0.21**	**± 8**
ECK 18 1/0 0.5Z	EC13-275 1X0 Z20	517	10	816	0.0206	0.523	± 0.15	± 6
ECK 75 1/0 0.7Z	**EC13-68 1X0 Z28**	**517**	**10**	**204**	**0.0106**	**0.269**	**±0.21**	**± 8**

* The number of filaments, nominal filament diameter and yarn diameter are for reference purposes only. Yarns are controlled according to yards per pound (linear density-TEX).

A. The product shall be free of the following internal or external (depending where found) characteristics.

Entrapped Waste	Dirt, Grease or Oil
Ends Out	Mixed Yarns
Damaged Yarn	Cut Tubes
Unbalanced Yarn	Cracked Tubes
Sloughed Yarn	Protruding Ends - start up
Bad Builds	Loops
Water Spots	Broken Filaments (fuzz)

*AGY accepts no responsibility for any damaged or sloughed material that is contained in a carton that shows any evidence of physical abuse. Any carton showing evidence of having been opened from the bottom will be considered as having been mishandled by the customer. Such damage or questions of damage is the responsibility of the carrier as, according to AGY terms of sale, delivery to the carrier constitutes delivery to the customer. AGY accepts no responsibility for any damage occurring in a customer's plant.

**In the event that AGY or the customer has reason to suspect that a shipment may contain MIXED YARN, the party first suspecting such condition will notify the other, and AGY assumes responsibility for initiating appropriate action. The use of the suspect material should be discontinued pending an investigation of the facts.

VII. PACKAGING WEIGHT AND METERING DATA

A. Average package weight is for information only.
B. All packages are completely splice-free.
C. Products sold as metered and non-metered (full/not-full) are packed separately.

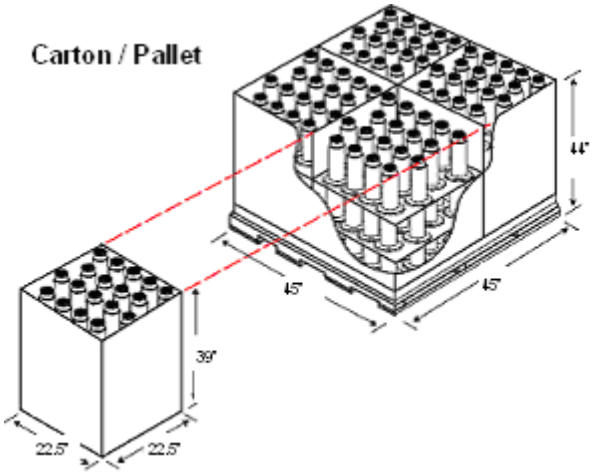
Product Nomenclature		Sizing	Bobbin	Avg. Pkg. Weight		Shipment Makeup		Comments
US Customary System	Tex/Metric System (SI)		Type	Lb.	Kg	Ratio	Description	
ECG 37 1/0 0.5Z	EC9-134 1X0 Z20	517	8542	8.0	3.6	80%	Mtd. 29,769 yd (27,090 m)	Note 1,3
				6.3	2.8	20%	2.0# (0.91kg) to full	
ECG 37 1/0 0.7Z	**EC9-134 1X0 Z28**	**603**	**8542**	**8.0**	**3.6**	**80%**	**Mtd. 29,769 yd (27,090 m)**	**Note 1,3**
				6.3	**2.8**	**20%**	**2.0# (0.91kg) to full**	
ECG 75 1/0 0.7Z	EC9-68 1X0 Z28	517	8542	7.9	3.6	70%	Mtd. 57,460 yd (52,289 m)	Note 1,3
				6.3	2.8	30%	2.0# (0.91kg) to full	
ECG 75 1/0 0.7Z	**EC9-68 1X0 Z28**	**603**	**8542**	**7.9**	**3.6**	**70%**	**Mtd. 57,460 yd (52,289 m)**	**Note 1,3**
				6.3	**2.8**	**30%**	**2.0# (0.91kg) to full**	
ECK 18 1/0 0.5Z	EC13-275 1X0 Z20	517	8542	8.3	3.8	80%	Mtd. 13,779 yd (12,539 m)	Note 1,3
				6.3	2.8	20%	2.0# (0.91kg) to full	
ECK 75 1/0 0.7Z	**EC13-68 1X0 Z28**	**517**	**8542**	**7.4**	**3.4**	**--**	**2.0# (0.91 kg) to full**	**Note 3**

Notes:
1. Metering tolerance ± 3%
2. Metered/non-metered (or full connected/not-full) mix ratio is always run-of-mill.
3. Products are provided with transfer tails.

VIII. PACKAGE DESCRIPTION

A. See *AGY* packaging document AGY – PD1 for more information.

B. The primary form of packaging utilizes a wooden pallet system as shown.



IX. PREPARATION FOR SHIPMENT

A. Package Identification

1. An identification disc will identify each package.
2. The discs for the various yarn constructions will be per the system of identification set up by AGY.

B. The packages shall be packed in a container suitable to insure adequate protection in transit and stores.

C. A content label shall adequately identify each carton.

Document history

Date	Description of Change	Author
2/09/10	Changed solids target from 0.55 to 0.70 on G75 517 and K75 517.	W. Aston
3/28/10	Changed solids target from 0.70 to 0.55 on K75 517.	W. Aston
6/08/10	Changed solids target from 0.70 to 0.55 on G75 517.	W. Aston