AGC

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What is AGC Plibrico

Pioneer of Monolithic Refractories

"**Monolithic Refractory**", developed in the U.S.A. at the beginning of the 20th century as an innovative alternative to fire brick, was first introduced in Japan by **AGC Plibrico**, leading to an epoch-making revolution in the refractory field. As the pioneer of monolithic refractories, Plibrico Japan has since been engaged in the production, development of installation methods and designing of furnace walls for various facilities. AGC Plibrico enjoys a high reputation as a unique company with comprehensive technical capabilities, in a vast range of fields including key industries such as steel, cement, oil, chemical and power generation sectors.

Taking advantage of its know-how acquired in the refractory business over the years, AGC Plibrico has also been developing the environmental business, providing high performance incinerators and related equipments.

AGC Plibrico keeps its basic stance of the continual improvement and advancement for the full reliance and satisfaction of the customers.

As a "system engineer of fire and heat protection", AGC Plibrico contributes widely to the society by offering products and services that meet the needs of our customers.

Corporate Philosophy

1. Contribute extensively to the society through system engineering of fire and heat protection.
2. Build up high-spirited and active company based on reliance.
3. Pursue one's own growth and happiness through job execution.
4. Contribute environmental protection as global citizen.

Quality Statement

Re-build-up slim and robust quality assurance system and enhance reliance of our customers.

Environmental Statement

Compliance with laws and regulations, and all employees work on environmental conservation.

ISO 9001: 2000 = JISQ 9001:2000

Scope of Applicable Products and Services
1. Design and production of monolithic refractories.
2. Production and sales of incinerators and accessory equipment.
3. Design and construction of refractory linings for industrial furnace.

ISO 14001: 2004 = JISQ 14001:2004

This Certificate is valid for the following product or service ranges:

Research & Development, Design & Product Development, Engineering,
Purchase & Logistics, Production, and Sales & Marketing of following products:
Ceramics and Industrial Furnaces.

Refractory Products

AGC Plibrico has been developing various products, installation methods and machinery to enhance its total product leadership in the field of monolithic refractory. We have always responded promptly to the feedbacks from our customers as well as our employees to promote developments and improvements that are in line with the times. We will continue to make unlimited efforts to provide the best possible quality to our customers.

Accomplishing the impossible!

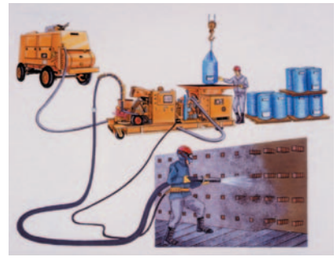
Leading the world with its unique technology and products

AGC Plibrico's technical capabilities and creativity has brought various innovative developments. Let us introduce two of our outstanding developments:

HyRATE (product and installation method) has successfully realized the gunning installation of plastic refractories, which was thought to be impossible. The HyRATE installation method is several times faster than conventional ramming installation. It is a unique installation method with many advantages such as easy installation of complex shaped furnace walls and longer service life of linings.

PLIFLOW is a free-flow castable refractory that generates flowability with low water content. Being among the first in the industry to develop this product, we have realized an effective installation of high-strength furnace walls.

Both developments are highly acclaimed as innovative products and installation methods pioneered by Plibrico Japan.



1954 1960 1970 1980 1990 2000

Plastic

PLASTIC REFRACTORIES

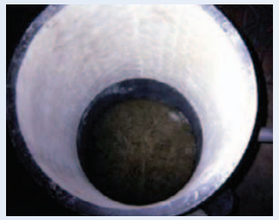
Furnace walls are built using formwork by carefully air ramming each slice.

PATCHING REFRACTORIES

Easy-to-use soft clay-like refractories used for repairs.

PLIRAM CYCLONE MIX

Plastic refractories with high abrasion resistance. Ideal for cyclones and transfer pipes of the FCC unit.



Gunning Plastic

PLIBRICO HyRATE

Innovative gunnable plastic refractories and installation method developed by AGC Plibrico, allowing short installation period, which is 3-8 times faster than the standard ramming installation.

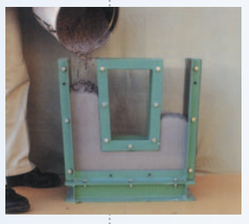
Castable

PLICAST

Castable refractories that can be mixed with water and poured into formwork at the site to construct furnace walls. Wide range of products including basic, oxidation-resistant, SiC and heat-resistant types are available.

PLICAST SUPER HyMOR

Plibrico's unique and highstrength castable refractories for vibration installation.



PLIFLOW

Free-flow castable refractories that generate flowability with low water content. Excels in strength and abrasion resistance.

Gunning Castable

PLIGUN

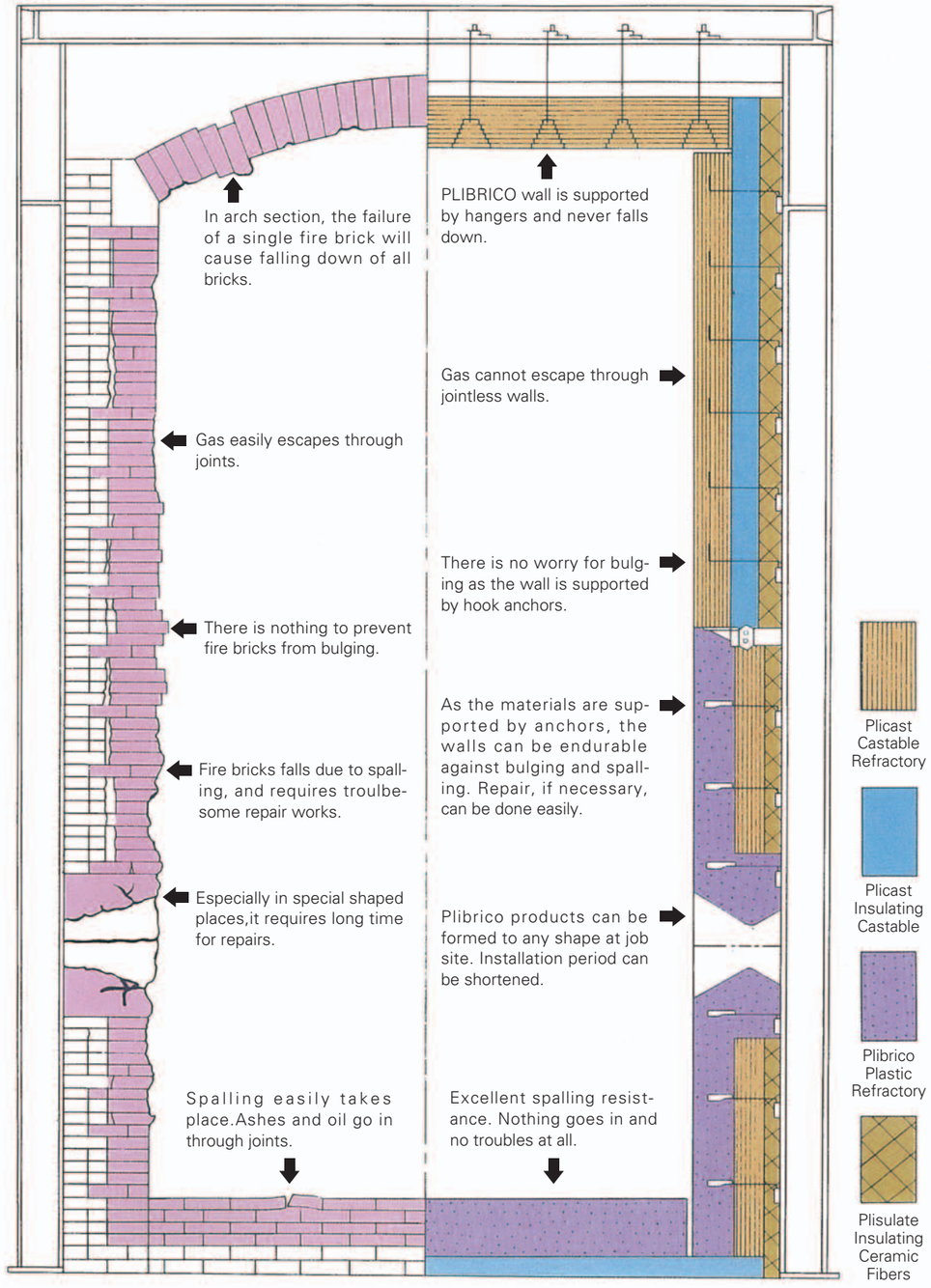
Gunning castable refractories for dry and semi-dry gunning installation.

Wide range of products including basic, oxidation-resistant, SiC and heat-resistant types are available.

PETGUN

Gunning castable refractories for PET (wet gunning method) that generate minimal dust, achieve low rebound loss and higher compressive strength.

Makes Walls Tough and Economical



OTHER MERITS

In addition to advantages shown in the picture, Plibrico refractory materials offer following merits.

* As the materials are ready for use to any shape, there is no need for customers to stockpile fire bricks.
* It requires less time for baking and makes the job faster and economical.
* Prompt delivery.
* No need to be worried about breakage during transportation than fire brick.
* Easy to install and less skill is required.
* If required, the materials can be precasted to designed shapes beforehand for ready to install at job site.

Company Operation

Refractories must not only withstand heat but also have enough strength and resistance to chemical corrosion. Various factors must therefore be reviewed from different perspectives, such as operation conditions and gas atmosphere inside the furnace, in order to select the type of refractories that best meet the particular application.

Supported by elite Engineering, Research, Technical Development and Construction Divisions, AGC Plibrico supervises comprehensive services from design to construction. Here are some of our approaches in various industrial fields.

Oil and Pertrochemical

AGC Plibrico also has an extensive track record in the oil and petrochemical industry at home and abroad, with many products nominated in the specifications of process licensers. Our group of knowledgeable engineers provides lining design and installation optimum to each facility. We also contribute to reduce workloads and total cost of the customers through blanket services from product supply to design and construction work.

Iron and Steel

Our approach to the steel industry is field-oriented. By comprehending the customer's facilities and focusing on their needs from various angles, we provide optimum products, design, and installation to achieve total cost reduction for the customer's benefit. We respond to our customer's needs through prompt development of new products that meet the requirement of each facility.

Cement

AGC Plibrico boasts high-quality products with proven track records in the cement industry. We support our customer's operations in various ways by providing well thought out and field-oriented services such as carrying out lining inspections and installation supervision during the shutdown period. We are prepared for prompt response to our customers through quick product delivery.

Municipal Incinerator

AGC Plibrico boasts an extensive track record also in the municipal incinerator field inside and outside Japan. Our reliable product lines enable us to respond promptly to our customer's needs with short delivery time. We support our customers comprehensively throug propositions of efficient designs and installation methods of furnace linings.

1 PLASTIC REFRACTORIES/PATCHING REFRACTORIES/HIGH STRENGTH CASTABLE REFRACTORIES/PUMPING CASTABLE

	ITEM / PRODUCT	MAXIMUM SERVICE TEMPERATURE(℃)	MINIMUM TIME BEFORE FIRING	SETTING CHARACTERISTICS	WEIGHT TO PLACE (t/㎥)	BULK DENSITY (g/㎤) 110℃	CHEMICAL COMPOSITION (mass%) Al_2O_3	CHEMICAL COMPOSITION (mass%) SiO_2
PLASTIC REFRACTORIES	PLITAB RAM MIX	1920	IMMEDIATELY AFTER REMOVAL OF FORM	HEAT	3.00	(350℃) 2.95	92	—
	PLIRAM #90AB	1850	ANYTIME AFTER INSTALLATION	AIR AND HEAT	3.05	2.95	87	10
	PLIRAM #85AB	1800	〃	〃	2.95	2.85	80	15
	PLIRAM #80AB	1750	〃	〃	2.80	2.70	75	16
	PLIRAM #720	1700	IMMEDIATELY AFTER REMOVAL OF FORM	HEAT	2.85	(350℃) 2.70	73	15
	PLIBRICO SUPER ALX AB ※1	1750	ANYTIME AFTER INSTALLATION	AIR AND HEAT	2.70	2.60	73	16
	PLIBRICO SUPER AL AB ※1	1700	〃	〃	2.50	2.35	58	30
	PLIBRICO SUPER F AB ※1	1600	〃	〃	2.30	2.15	40	49
	PLIBRICO SUPER AB ※1	1550	〃	〃	2.20	2.10	39	51
	PLIRAM CYCLONE MIX	1700	24 HOURS	CHEMICAL	2.90	2.85	89	1
PATCHING REFRACTORIES	PLITAB SR MIX ※2	1900	IMMEDIATELY AFTER RAMMING	HEAT	3.00	(350℃) 2.90	90	5
	PLIRAM #515 ※2	1700	〃	〃	2.85	(350℃) 2.75	80	10
	PLIRAM #187A ※2	1600	〃	〃	2.10	(350℃) 2.00	44	47
CASTABLE REFRACTORIES	PLICAST SUPER Hy MOR 1800 KK	1800	24 HOURS	HYDRAULIC	3.05	3.10	92	6
	PLICAST SUPER Hy MOR 1700 KK	1700	〃	〃	2.85	2.90	82	10
	PLICAST SUPER Hy MOR 1650 KK	1650	〃	〃	2.55	2.60	62	32
	PLICAST SUPER Hy MOR 1600 KK	1550	〃	〃	2.40	2.45	48	47
	PLICAST SUPER Hy MOR 1500 KK	1450	〃	〃	2.25	2.30	40	55
PUMPING CASTABLE	PECO 1700	1700	24 HOURS	HYDRAULIC	2.55	2.58	83	10
	PECO 1650	1650	〃	〃	2.33	2.36	62	33
	PECO 1600	1600	〃	〃	2.08	2.10	46	47
	PECO TUFF MIX D	1400	〃	〃	1.88	2.00	47	41
	PECO HYDRO MIX	1370	〃	〃	1.90	2.05	33	44
	PECO #27	1370	〃	〃	1.85	2.00	36	51
	PECO LW-1600	1600	〃	〃	1.38	1.48	43	48
	PECO LW-1400	1400	〃	〃	1.35	1.44	48	42
	PECO LW-1350	1350	〃	〃	1.25	1.40	40	40
	PECO LW-1200	1200	〃	〃	1.20	1.31	29	50
	PECO VERILITE S	1000	〃	〃	0.75	0.85	—	—
	PECO VERILITE	820	48 HOURS	〃	0.75	0.85	—	—
	PECO AIRLITE S	1000	24 HOURS	〃	0.45	0.53	—	—

MODULUS OF RUPTURE(MPa) 110℃	1000℃	1300℃	1500℃	LINEAR CHANGE(%) 110℃	1000℃	1300℃	THERMAL EXPANSION (×10⁻⁶PER℃) (FIRED BASE)	THERMAL CONDUCTIVITY (W/m.K) (FIRED BASE) 500℃	1000℃	PACKING	AMOUNT OF WATER (%)	STORAGE LIFE (MONTH)	INSTALLATION
(350℃) 29.4	24.5	21.6	21.6	(350℃) -0.1	-0.1	-0.1	9.0	1.512	1.686	25kg CARTON	—	6	RAMMING
5.39	5.88	9.32	7.85	-1.1	-1.3	-1.3	8.0	1.279	1.419	〃	—	6	〃
3.43	3.92	5.88	4.91	-0.9	-1.0	-1.1	9.0	1.279	1.419	〃	—	6	〃
2.45	2.94	3.92	3.43	-0.9	-0.9	-1.0	8.5	1.023	1.151	〃	—	6	〃
(350℃) 6.86	7.85	11.8	11.8	(350℃) -0.8	-0.8	-0.3	9.5	1.279	1.419	〃	—	2	〃
3.0	3.5	4.5	5.0	-1.2	-1.3	-1.4	8.0	1.023	1.151	〃	—	6	〃
2.0	3.0	4.5	5.5	-1.5	-1.7	-2.0	6.5	0.788	0.986	〃	—	6	〃
2.5	3.0	5.0	5.5	-1.4	-1.5	-1.8	5.7	0.766	0.958	〃	—	6	〃
2.0	2.5	4.5	5.0	-1.4	-1.5	-2.0	5.7	0.744	0.930	〃	—	6	〃
20.0	30.0	40.0	—	-0.2	-0.5	-1.6	9.0	1.977	2.209	25kg BAG	5.5～6.5	12	HAND-PACKING OR RAMMING
(350℃) 9.81	17.70	27.50	27.50	(350℃) -1.1	-1.2	-1.4	9.0	1.279	1.419	25kg CARTON	—	3	PATCHING
(350℃) 6.86	6.86	11.80	10.80	(350℃) -1.4	-1.4	-1.3	9.0	1.198	1.360	〃	—	3	〃
(350℃) 5.88	7.85	10.80	10.80	(350℃) -1.0	-1.2	-1.8	6.5	0.744	0.930	20kg CARTON	—	3	〃
15.7	17.7	19.6	24.5	-0.05	-0.15	-0.15	9.6	1.977	2.209	25kg BAG	4.0～5.5	9	VIBRATING
16.7	16.7	16.7	13.7	-0.05	-0.20	-0.10	7.9	1.744	1.977	〃	5.0～6.5	9	〃
12.8	14.7	17.7	17.7	-0.05	-0.25	-0.25	7.0	1.454	1.628	〃	4.5～6.0	9	〃
14.7	14.7	16.7	14.7	-0.05	-0.25	-0.20	5.5	1.279	1.454	〃	5.0～6.5	9	〃
11.8	10.8	10.8	—	-0.05	-0.20	-0.30	6.0	1.163	1.454	〃	5.0～6.5	9	〃
6.0	10.0	11.0	10.0	-0.10	-0.60	-0.60	8.2	1.70	1.90	25kg BAG	8～9	9	PM-1	POMPING
5.0	15.0	18.0	18.0	-0.10	-0.60	-0.70	7.0	1.40	1.60	〃	8～9	9	〃	〃
3.0	2.5	3.5	10.0	-0.10	-0.30	-0.20	6.5	0.68	0.825	〃	12～14	9	〃	〃
7.0	4.5	7.0	—	-0.10	-0.35	-0.20	6.0	0.68	0.83	〃	14～17	12	PM-3	〃
6.0	3.5	6.0	—	-0.10	-0.40	-1.00	6.0	0.66	0.81	〃	17～19	12	〃	〃
4.0	2.0	5.0	—	-0.10	-0.20	+0.10	6.0	0.65	0.80	〃	17～20	12	〃	〃
0.5	1.0	2.0	4.0	-0.30	-0.50	-1.50	8.4	0.535	0.58	〃	28～32	9	PM-10	〃
3.0	1.5	2.0	—	-0.20	-0.50	-0.80	6.0	0.47	0.54	〃	33～39	9	PM-1	〃
3.0	1.5	2.0	—	-0.10	-0.50	-1.50	5.5	0.36	0.42	〃	36～44	12	PM-3	〃
1.5	1.5	—	—	-0.20	-1.00	—	6.0	0.27	(800℃) 0.305	〃	36～44	12	〃	〃
0.5	(800℃) 0.4	—	—	-0.40	(800℃) -1.5	—	6.0	0.20	(800℃) 0.22	20kg BAG	85～105	12	〃	〃
1.4	(800℃) 0.8	—	—	-0.40	(800℃) -2.00	—	6.0	0.20	(800℃) 0.22	〃	85～105	12	PM-4	〃
0.2	(800℃) 0.2	—	—	-0.30	(800℃) -0.50	—	6.0	0.15	(800℃) 0.17	10kg BAG	120～150	12	PM-3	〃

※1 The data represent typical properties of Plibrico (Dalian) Industries Co., Ltd.'s product.
※2 The data represent typical properties in consistency when test pieces are formed.
＊ PLITAB, PLIRAM, PLIBRICO, PLICAST, PECO are registered trademark of AGC Plibrico Co., Ltd.

Note: All figures are "averaged" results of laboratory tests and reasonable variations can be expected.
※Test pieces are formed in the workability suitable to make specimen.

2 DENSE CASTABLE REFRACTORIES/FREE FLOW CASTABLE REFRACTORIES/ SILICON CARBIDE CASTABLES

	PRODUCT \ ITEM	MAXIMUM SERVICE TEMPERATURE(℃)	MINIMUM TIME BEFORE FIRING	SETTING CHARACTERISTICS	WEIGHT TO PLACE (t/㎥)	BULK DENSITY (g/㎤) 110℃	CHEMICAL COMPOSITION (mass%) Al_2O_3	CHEMICAL COMPOSITION (mass%) SiO_2
DENSE CASTABLE REFRACTORIES	PLICAST #40	1800	24 HOURS	HYDRAULIC	2.60～2.70	2.75～2.85	95	—
	PLICAST #38	1750	〃	〃	2.75～2.85	2.80～2.95	94	—
	PLICAST #36	1700	〃	〃	2.35～2.45	2.35～2.50	70	22
	PLICAST KL MIX	1650	〃	〃	2.10～2.20	2.20～2.30	56	37
	PLICAST #34	1650	〃	〃	2.00～2.10	2.05～2.15	51	43
	PLICAST ABREST KK	1600	〃	〃	2.35	2.37	56	36
	PLICAST TP MIX #55	1600	〃	〃	2.10～2.30	2.20～2.40	54	39
	PLICAST #33	1580	〃	〃	2.10～2.20	2.15～2.25	57	34
	PLICAST #31	1540	〃	〃	1.95～2.05	2.05～2.15	48	40
	PLICAST #31TROWL	1540	〃	〃	1.65～1.80	1.80～1.95	42	50
	PLICAST #27	1370	〃	〃	1.95～2.05	2.05～2.20	36	51
	PLICAST TUFF MIX A	1420	〃	〃	1.90～2.05	1.95～2.10	45	46
	PLICAST TUFF MIX D	1400	〃	〃	1.80～1.95	1.90～2.05	47	41
	PLICAST TUFF MIX	1320	〃	〃	1.90～2.00	1.95～2.10	38	42
	PLICAST HYDRO MIX	1370	〃	〃	1.95～2.05	2.00～2.15	33	44
	PLICAST HYDRO MIX TROWL	1350	〃	〃	1.80～1.95	1.90～2.05	32	43
	PLICAST PETRO MIX	1370	〃	〃	1.95～2.05	2.00～2.20	45	40
	PLICAST TROWL MIX	1350	〃	〃	1.60～1.70	1.75～1.85	40	45
FREE FLOW CASTABLE REFRACTORIES	PLIFLOW 1700 KK	1700	24 HOURS	HYDRAULIC	2.80	2.82	83	10
	PLIFLOW 1650 KK	1650	〃	〃	2.45	2.48	62	33
	PLIFLOW 1600 KK	1600	〃	〃	2.35	2.37	52	44
	PLIFLOW ABREST SUPER KK	1650	〃	〃	2.50	2.55	60	33
	PLIFLOW ABREST KK	1600	〃	〃	2.35	2.40	51	42
SILICON CARBIDE CASTABLES	PLICAST SIC 80 KK	—	24 HOURS	HYDRAULIC	2.50	2.54	9	SiC 80
	PLICAST SIC 60 KK	—	〃	〃	2.35	2.43	18	SiC 60
	PLICAST SIC 50 KK	—	〃	〃	2.25	2.37	19	SiC 50
	PLICAST SIC 40 KK	—	〃	〃	2.20	2.32	25	SiC 40
	PLIFLOW SIC 60 KK	—	〃	〃	2.27	2.30	16	57
	PLIFLOW SIC 50 KK	—	〃	〃	2.25	2.28	20	48

MODULUS OF RUPTURE(MPa) 110℃	1000℃	1300℃	1500℃	LINEAR CHANGE(%) 110℃	1000℃	1300℃	THERMAL EXPANSION (×10⁻⁶PER ℃) (FIRED BASE)	THERMAL CONDUCTIVITY (W/m.K) (FIRED BASE) 500℃	1000℃	PACKING	AMOUNT OF WATER (%)	STORAGE LIFE (MONTH)	INSTALLATION
8.34	6.86	5.88	10.8	-0.1	-0.2	-0.3	8.5	1.256	1.500	25kg BAG	9.5～10.5	9	POURING
7.00	7.00	8.00	10.0	-0.1	-0.2	-0.4	8.5	1.260	1.500	〃	8.5～10.0	9	〃
5.88	4.41	3.92	8.83	-0.1	-0.2	-0.3	7.0	0.744	0.930	〃	9.5～10.5	9	〃
6.37	3.92	4.91	9.81	-0.1	-0.3	-0.3	6.0	0.686	0.837	〃	10.0～12.0	9	〃
3.43	1.96	1.96	5.88	-0.2	-0.3	-0.3	6.0	0.686	0.837	〃	13.0～15.0	9	〃
9.81	6.86	9.81	—	-0.1	-0.4	-0.1	6.5	1.140	1.360	〃	8.0～9.0	9	VIBRATING
6.37	4.41	6.37	9.81	-0.1	-0.2	+0.4	6.5	0.744	0.930	〃	9.0～13.0	9	TROWELLING
4.91	2.94	3.92	—	-0.1	-0.2	-0.4	6.0	0.686	0.837	〃	11.5～12.5	12	POURING
4.0	2.5	4.0	—	-0.1	-0.3	-0.5	6.0	0.686	0.837	〃	13.0～15.5	12	〃
2.45	1.47	2.45	—	-0.1	-0.3	-0.6	6.0	0.686	0.837	〃	17.0～21.0	12	TROWELLING
6.0	3.5	4.5	—	-0.1	-0.3	-0.6	6.0	0.651	0.802	〃	12.5～15.0	12	POURING
6.86	6.37	7.85	—	-0.1	-0.3	-0.9	6.5	0.686	0.837	〃	10.0～13.0	9	〃
6.86	3.92	6.86	—	-0.1	-0.35	-0.2	6.0	0.686	0.837	〃	13.0～16.0	12	〃
5.39	2.45	4.41	—	-0.1	-0.3	-0.8	6.0	0.686	0.837	〃	14.0～16.0	12	〃
5.88	2.94	4.41	—	-0.1	-0.3	-1.5	6.0	0.651	0.802	〃	14.0～16.0	12	〃
4.90	2.45	4.90	—	-0.1	-0.3	-1.5	6.0	0.651	0.802	〃	16.0～18.0	12	TROWELLING
5.39	2.94	7.36	—	-0.1	-0.2	+0.2	6.0	0.651	0.802	〃	13.0～17.0	12	POURING
2.45	1.47	3.92	—	-0.1	-0.5	-0.9	6.0	0.651	0.802	〃	18.0～22.0	12	TROWELLING
10.8	12.8	11.8	11.8	-0.05	-0.3	-0.2	—	1.744	1.977	25kg BAG	7.0～8.0	9	POURING
9.81	17.7	19.6	19.6	-0.05	-0.4	-0.4	—	1.454	1.628	〃	6.5～8.0	9	〃
8.83	12.8	14.7	14.7	-0.1	-0.3	-0.3	—	1.279	1.454	〃	7.0～8.0	9	〃
14.0	12.0	14.0	14.0	-0.05	-0.5	-0.5	—	1.455	1.628	〃	5.7～6.7	9	〃
13.7	10.8	14.7	14.7	-0.05	-0.4	-0.4	—	1.209	1.442	〃	6.2～6.7	9	〃
7.36	11.8	14.7	24.5	-0.1	-0.2	-0.2	5.5	5.035	8.012	25kg BAG	6.0～7.5	9	VIBRATING
7.36	5.88	6.37	11.8	-0.1	-0.4	-0.4	5.5	2.704	4.186	〃	7.0～8.5	9	〃
9.32	5.88	5.39	11.8	-0.1	-0.4	-0.4	5.5	2.587	4.070	〃	11.5～13.5	9	〃
9.32	6.37	5.39	11.8	-0.1	-0.3	-0.3	6.0	2.529	4.012	〃	9.5～11.0	9	〃
12.0	11.0	11.0	18.0	-0.1	-0.5	-0.5	—	3.459	4.942	〃	10.0～11.0	9	POURING
13.0	12.0	12.0	20.0	-0.1	-0.4	-0.5	—	3.277	4.709	〃	10.0～11.0	9	〃

＊ PLICAST, PLIFLOW are registered trademark of AGC Plibrico Co., Ltd.

Note: All figures are "averaged" results of laboratory tests and reasonable variations can be expected.

3 INSULATING CASTABLE REFRACTORIES/ACID RESISTANT REFRACTORIES /MORTAR

	ITEM / PRODUCT	MAXIMUM SERVICE TEMPERATURE(℃)	MINIMUM TIME BEFORE FIRING	SETTING CHARACTERISTICS	WEIGHT TO PLACE (t/㎥)	BULK DENSITY (g/㎤) 110℃	CHEMICAL COMPOSITION (mass%) Al_2O_3	CHEMICAL COMPOSITION (mass%) SiO_2
INSULATING CASTABLE REFRACTORIES	PLICAST LWI-606	1700	24 HOURS	HYDRAULIC	1.45～1.60	1.55～1.70	95	—
	PLICAST LWI-26	1400	〃	〃	1.30～1.40	1.35～1.45	48	42
	PLICAST LWI-24	1350	〃	〃	1.20～1.30	1.30～1.45	40	40
	PLICAST LWI-24 TROWL	1350	〃	〃	1.20～1.30	1.30～1.40	39	42
	PLICAST LWI-24A	1350	〃	〃	1.30～1.40	1.35～1.45	48	42
	PLICAST TUFFLITE	1320	〃	〃	1.35～1.45	1.40～1.55	30	45
	PLICAST LWI-22	1200	〃	〃	1.05～1.15	1.10～1.25	35	44
	PLICAST LWI-22 TROWL	1200	〃	〃	1.05～1.20	1.15～1.30	39	42
	PLICAST LWI-20	1100	〃	〃	0.85～0.95	0.90～1.00	26	50
	PLICAST LWI-20A	1100	〃	〃	0.85～0.95	0.90～1.00	50	37
	PLICAST LWI-20S	1100	〃	〃	1.05～1.15	1.15～1.25	30	44
	PLICAST VERILITE S	1000	〃	〃	0.70～0.80	0.75～0.85	—	—
	PLICAST VERILITE	820 BACK UP 980	48 HOURS	〃	0.70～0.80	0.75～0.85	—	—
	PLICAST AIRLITE	820 BACK UP 980	〃	〃	0.30～0.36	0.33～0.40	—	—
	PLICAST AIRLITE TROWL	820 BACK UP 980	〃	〃	0.45～0.55	0.45～0.55	—	—
	PLICAST ASTROLITE	800	〃	〃	0.29～0.32	0.29～0.33	—	—
ACID RESISTANT REFRACTORIES	PLIGUN AR-500	500	48 HOURS	HYDRAULIC	1.80～1.95	1.85～2.00	15	58
	PLIGUN AR-941	500	〃	〃	1.80～1.90	1.85～2.00	9	66
	PLIGUN LAR-500	500	〃	〃	0.90～1.05	0.95～1.10	—	—
MORTAR	DEMON AIR SET #40 (D)	1800	24 HOURS	HEAT AFTER AIR DRYING	—	—	78	16
	DEMON AIR SET #36 (D)	1700	〃	〃	—	—	49	40
	DEMON AIR SET #34 (D)	1500	〃	〃	—	—	35	53
	DEMON AIR SET #30 (D)	1400	〃	〃	—	—	5	85

MODULUS OF RUPTURE(MPa) 110℃	1000℃	1300℃	1500℃	LINEAR CHANGE(%) 110℃	1000℃	1300℃	THERMAL EXPANSION (×10⁻⁶PER ℃) (FIRED BASE)	THERMAL CONDUCTIVITY (W/m.K) 500℃	1000℃	PACKING	AMOUNT OF WATER (%)	STORAGE LIFE (MONTH)	INSTALLATION
3.92	3.43	3.92	5.39	-0.1	-0.3	-0.4	7.5	1.081	1.221	25kg BAG	14.0～18.0	9	POURING
1.96	1.47	1.96	—	-0.1	-0.4	-1.3	6.0	0.384	0.442	〃	33.0～38.0	9	〃
2.45	1.47	3.43	—	-0.1	-0.4	-0.8	5.5	0.360	0.419	〃	35.0～40.0	12	〃
1.77	1.08	2.94	—	-0.1	-0.5	-0.8	5.5	0.360	0.419	〃	34.0～40.0	12	TROWELLING
1.96	1.47	2.45	—	-0.1	-0.4	-1.1	6.0	0.384	0.442	〃	32.0～37.0	9	POURING
2.94	1.77	3.43	—	-0.1	-0.4	-1.1	6.0	0.384	0.442	〃	35.0～40.0	12	〃
1.28	0.98	—	—	-0.15	-0.8	—	6.0	0.267	(800℃) 0.302	〃	40.0～45.0	12	〃
1.47	0.78	—	—	-0.15	-0.8	—	5.5	0.267	(800℃) 0.302	〃	40.0～44.0	12	TROWELLING
1.18	0.88	—	—	-0.15	-1.2	—	5.3	0.233	(800℃) 0.256	20kg BAG	46.0～53.0	12	POURING
1.18	0.88	—	—	-0.2	-1.5	—	5.5	0.221	(800℃) 0.244	〃	50.0～54.0	9	〃
1.96	1.37	—	—	-0.15	-1.0	—	5.5	0.244	(800℃) 0.267	25kg BAG	40.0～44.0	12	〃
1.68	(800℃) 0.78	—	—	-0.3	(800℃) -0.8	—	6.0	0.198	(800℃) 0.221	20kg BAG	70.0～85.0	12	〃
1.96	(500℃) 1.18	—	—	-0.3	(500℃) -1.0	—	6.0	0.198	(800℃) 0.221	〃	70.0～85.0	12	〃
0.29	(500℃) 0.2	—	—	-0.3	(500℃) -1.2	—	6.0	0.128	(800℃) 0.151	10kg BAG	150～170	12	〃
0.49	(500℃) 0.29	—	—	-0.4	(500℃) -1.2	—	6.0	0.151	(800℃) 0.174	〃	80.0～110	12	TROWELLING
0.10	(500℃) 0.08	—	—	-0.6	(500℃) -1.0	—	6.0	(300℃) 0.106	(500℃) 0.122	〃	210～240	12	POURING
10.8	(500℃) 5.88	—	—	-0.1	(500℃) -0.4	—	9.5	(300℃) 0.640	(500℃) 0.686	25kg BAG	NOZZLE MIXING	9	GUNNING
7.85	(500℃) 2.94	—	—	-0.1	(500℃) -0.2	—	9.5	(300℃) 0.640	(500℃) 0.686	〃	NOZZLE MIXING	12	〃
1.47	(500℃) 1.18	—	—	-0.2	(500℃) -0.5	—	6.0	(300℃) 0.355	(500℃) 0.366	〃	NOZZLE MIXING	12	〃
2.94	3.92	3.92	3.92	—	—	—	—	—	—	25kg BAG	16.0～23.0	6	TROWELLING
2.94	2.45	3.92	3.92	—	—	—	—	—	—	〃	20.0～30.0	6	〃
2.45	2.94	2.94	—	—	—	—	—	—	—	〃	20.0～30.0	6	〃
2.45	1.96	2.45	—	—	—	—	—	—	—	〃	18.0～25.0	6	〃

＊ PLICAST, PLIGUN, DEMON are registered trademark of AGC Plibrico Co., Ltd.

Note: All figures are "averaged" results of laboratory tests and reasonable variations can be expected.

4 GUNNING CASTABLE REFRACTORIES/WET GUNNING CASTABLE REFRACTORIES/INJECTION REFRACTORIES

	PRODUCT \ ITEM	MAXIMUM SERVICE TEMPERATURE(℃)	MINIMUM TIME BEFORE FIRING	SETTING CHARACTERISTICS	WEIGHT TO PLACE (t/㎥)	BULK DENSITY (g/㎤) 110℃	CHEMICAL COMPOSITION (mass%) Al_2O_3	CHEMICAL COMPOSITION (mass%) SiO_2
GUNNING CASTABLE REFRACTORIES	PLIGUN #80	1800	24 HOURS	HYDRAULIC	2.50～2.60	2.55～2.65	78	13
	PLIGUN MIX #901	1700	〃	〃	2.25～2.40	2.35～2.50	65	26
	PLIGUN TP MIX #55	1600	〃	〃	2.20～2.40	2.20～2.40	54	39
	PLIGUN ABREST KK	1400	〃	〃	2.15～2.25	2.25～2.40	58	27
	PLIGUN MIX #932	1400	〃	〃	1.90～2.10	1.90～2.10	32	55
	PLIGUN PETRO MIX	1370	〃	〃	1.85～2.05	2.00～2.20	34	48
	PLIGUN HYDRO MIX	1350	〃	〃	1.95～2.05	1.95～2.10	30	52
	PLIGUN BF MIX	1300	〃	〃	1.90～2.05	1.95～2.15	36	48
	PLIGUN LWI-26	1400	〃	〃	1.40～1.55	1.42～1.57	43	47
	PLIGUN LWI-24	1350	〃	〃	1.30～1.40	1.40～1.50	40	40
	PLIGUN LWI-24A	1350	〃	〃	1.35～1.50	1.35～1.55	43	46
	PLIGUN TUFFLITE	1320	〃	〃	1.35～1.50	1.45～1.60	35	40
	PLIGUN LWI-22	1200	〃	〃	1.10～1.20	1.10～1.25	24	54
	PLIGUN LWI-20	1100	〃	〃	0.98～1.13	1.00～1.15	23	57
	PLIGUN LWI-20A	1100	〃	〃	1.00～1.15	1.05～1.18	45	42
	PLIGUN LWI-20S	1100	〃	〃	1.15～1.30	1.20～1.35	29	45
	PLICAST VERILITE S	1000	〃	〃	0.75～0.90	0.85～1.00	—	—
	PLICAST VERILITE	820 BACK UP980	48 HOURS	〃	0.95～1.10	1.00～1.15	—	—
	PLICAST AIRLITE	820 BACK UP980	〃	〃	0.50～0.60	0.55～0.65	—	—
	PLICAST ASTROLITE	800	〃	〃	0.43～0.47	0.42～0.46	—	—
GUNNING CASTABLE REFRACTORIES	PLIGUN SIC 80	—	24 HOURS	HYDRAULIC	2.30～2.40	2.35～2.45	8	SiC 82
	PLIGUN SIC 60	—	〃	〃	2.20～2.30	2.25～2.40	17	SiC 63
	PLIGUN SIC 50	—	〃	〃	2.00～2.10	2.05～2.20	19	SiC 50
	PLIGUN SIC 40	—	〃	〃	2.00～2.10	2.05～2.20	24	SiC 41
WET GUNNING CASTABLE REFRACTORIES	PETGUN 1800	1800	24 HOURS	HYDRAULIC	2.87	2.90	90	8
	PETGUN 1700	1700	〃	〃	2.78	2.80	80	14
	PETGUN 1650	1650	〃	〃	2.43	2.46	62	33
	PETGUN 1600	1600	〃	〃	2.25	2.27	54	41
	PETGUN SIC 60	—	〃	〃	2.30	2.32	18	SiC 60
	PETGUN SIC 50	—	〃	〃	2.25	2.28	22	SiC 52
INJECTION REFRACTORIES	PLISTIX BF MIX SUPER	1700	ANYTIME AFTER INSTALLATION	HEAT	2.20～2.40	—	81	13
	PLISTIX BF MIX	1700	〃	〃	2.15～2.35	—	78	15
	PLISTIX BF MIX F	1600	〃	〃	1.70～2.10	—	63	30

MODULUS OF RUPTURE(MPa) 110℃	1000℃	1300℃	1500℃	LINEAR CHANGE(%) 110℃	1000℃	1300℃	THERMAL EXPANSION (×10⁻⁶PER ℃) (FIRED BASE)	THERMAL CONDUCTIVITY (W/m.K) (FIRED BASE) 500℃	1000℃	PACKING	AMOUNT OF WATER (%)	STORAGE LIFE (MONTH)	INSTALLATION
8.83	9.32	10.8	14.8	-0.1	-0.4	+0.1	8.0	1.256	1.500	25kg BAG	NOZZLE MIXING	9	GUNNING
9.81	5.88	8.83	12.8	-0.1	-0.2	-0.2	7.0	1.256	1.442	〃	〃	9	〃
6.37	4.41	6.37	9.81	-0.1	-0.2	+0.4	6.0	0.744	0.930	〃	〃	9	〃
9.81	6.37	7.85	—	-0.1	-0.2	-0.6	6.7	0.988	1.186	〃	〃	9	〃
9.81	6.86	9.81	—	-0.1	-0.3	+0.2	6.5	0.744	0.907	〃	〃	9	〃
4.90	2.94	5.88	—	-0.1	-0.3	+0.2	6.0	0.686	0.837	〃	〃	12	〃
5.88	4.90	7.85	—	-0.1	-0.3	+1.0	6.5	0.744	0.907	〃	〃	12	〃
5.88	3.43	4.91	—	-0.1	-0.4	-1.0	6.0	0.744	0.907	〃	〃	12	〃
2.45	1.96	2.45	—	-0.15	-0.4	-1.3	6.0	0.465	0.523	〃	〃	9	〃
2.94	2.45	3.92	—	-0.1	-0.3	+0.3	6.5	0.407	0.465	〃	〃	12	〃
2.94	1.77	2.45	—	-0.1	-0.5	-1.4	6.0	0.465	0.523	〃	〃	9	〃
3.92	2.45	3.43	—	-0.1	-0.3	-0.8	6.0	0.465	0.523	〃	〃	12	〃
1.57	1.37	—	—	-0.15	-1.0	—	6.0	0.349	(800℃) 0.384	〃	〃	12	〃
1.18	0.88	—	—	-0.15	-1.2	—	5.3	0.267	(800℃) 0.291	20kg BAG	〃	12	〃
1.47	0.98	—	—	-0.2	-1.3	—	5.5	0.267	(800℃) 0.291	〃	〃	9	〃
2.16	1.47	—	—	-0.15	-0.9	—	5.5	0.291	(800℃) 0.326	25kg BAG	〃	12	〃
1.96	(800℃) 1.28	—	—	-0.2	(800℃) -0.75	—	6.0	0.244	(800℃) 0.267	20kg BAG	〃	12	〃
2.45	(500℃) 1.28	—	—	-0.2	(500℃) -0.9	—	6.0	0.244	(800℃) 0.267	〃	〃	12	〃
0.49	(500℃) 0.39	—	—	-0.3	(500℃) -1.0	—	6.0	0.198	(800℃) 0.221	10kg BAG	〃	12	〃
0.49	(500℃) 0.39	—	—	-0.4	(500℃) -0.8	—	6.0	(300℃) -0.166	(500℃) 0.180	〃	〃	12	〃
5.88	7.85	9.81	—	-0.1	-0.3	-0.3	5.5	2.907	3.488	25kg BAG	NOZZLE MIXING	9	GUNNING
8.34	6.86	7.85	14.7	-0.1	-0.2	-0.15	5.5	2.326	3.140	〃	〃	9	〃
6.86	5.39	4.91	11.8	-0.1	-0.25	-0.3	5.5	2.267	3.081	〃	〃	9	〃
6.86	5.39	4.91	11.8	-0.1	-0.25	-0.3	6.0	1.977	2.442	〃	〃	9	〃
9.5	17.0	20.0	25.0	-0.1	-0.4	-0.5	9.6	1.977	2.209	25kg BAG	6.5～7.5	9	WET GUNNING
9.0	12.0	12.0	10.0	-0.1	-0.4	-0.5	8.2	1.744	1.977	〃	7.0～8.5	9	〃
10.0	18.0	18.0	18.0	-0.1	-0.5	-0.5	8.0	1.454	1.628	〃	7.0～8.5	9	〃
9.0	12.0	16.0	16.0	-0.1	-0.5	-0.7	6.0	1.279	1.454	〃	7.5～9.0	9	〃
9.0	8.0	11.0	17.0	-0.1	-0.4	-0.1	5.5	3.459	4.942	〃	8.5～10.0	9	〃
9.0	8.0	9.5	17.0	-0.1	-0.4	-0.1	5.5	3.227	4.709	〃	9.0～12.0	9	〃
—	—	—	—	—	—	—	—	—	—	25kg BAG	15.0～20.0	6	INJECTION
—	—	—	—	—	—	—	—	—	—	〃	16.0～20.0	6	〃
—	—	—	—	—	—	—	—	—	—	〃	28.0～33.0	6	〃

＊ PLIGUN, PLICAST, PLISTIX are registered trademark of AGC Plibrico Co., Ltd.

Note: All figures are "averaged" results of laboratory tests and reasonable variations can be expected.

How To Install PLIBRICO 【PLASTIC REFRACTORY】

1 Prior to installing PLIBRICO, hooks are welded to the casing, and then the material is placed.
PLIBRICO is packed in a carton consisting of 5pcs of 50mm thick slabs for convenience to install.

2 Wooden frames are formed, and a row of PLIBRICO slabs is placed with full thickness of the furnace wall in wooden frames, and then material is pounded by air rammer.

3 When a first row of slabs is pounded, the surface is trimmed by scraper.The next row of slabs is placed on the first row of slabs, and then the pounding is continued in the same manner.

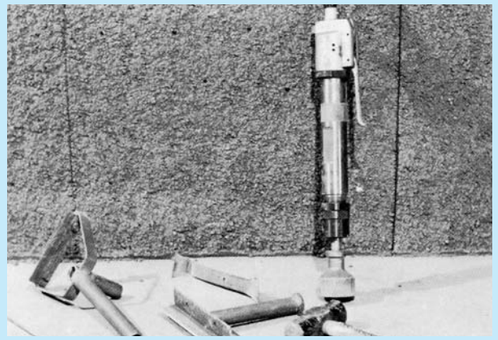
4 When PLIBRICO wall reaches to the height of hooks, anchors are hooked to hooks, and then anchors are embedded into the PLIBRICO refractory wall by hammer.

5 When the pounding is completes, frames are removed, and the lining is trimmed down to a smooth surface and the specified thickness.

6 After PLIBRICO wall has been trimmed, expansion joints are cut into the surface of wall. This should be a slight cut of about 30~50mm in depth and placed in every 900 ～ 1200mm pitch.

7 Finally, ventilation holes of 3~4mm ϕ are placed on whole surface in 100 ～ 150mm pitch.

8 The finished monolithic PLIBRICO lining and the tools used are shown.



Plastic refractories are more porous than castable refractory. Moreover, in plastic refractory, there is no water of crystallization due to hydration and most water is present as free water. As a result, lining made of plastic refractory are not as liable to vapor explosion as those made of castable refractory. Therefore, plastic refractory lining allows somewhat faster heating rate than castables and are easier to handle. However, a sudden rise in temperature will evaporate the water in plastic refractory linings, causing it to collect at the surface and weaken it. At times this causes the surface to fall off.Considering this, heat up rates are maintained at 50℃/h for plastic refractory linings(Fig. 1). Note that some plastic refractories reqire heating immediately after installation and some allow it to be carried out later. The minimum time allowed before heating by the various varieties must not be forgotten.

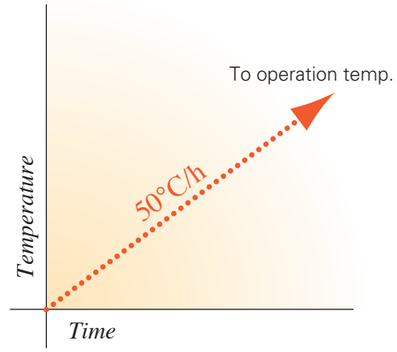


Fig. 1 Heat-up rate for a plastic refractory lining

GENERAL NOTES ON PLASTIC REFRACTORY INSTALLATION

1. Never allowed to contact with water (such as rain water) during or following installation of plastic refractory.
2. When temporarily halting work,cut the finished area at vertical against casing angles to the shell and cover with a vinyl sheet to prevent from drying. If jointing the lining, trim the jointing surface of lining already formed.
3. When applying castable refractory on a plastic refractory lining already placed, waterproof the plastic lining adequately like covering with a vinyl sheet or applying waterproof paint.
4. Remove ceiling forms to facilitate natural drying as much as possible from completion to apply plastic refractory to start operation. However, at intervals of 1200~1500mm, place about 300mm wide plates which edges are on the score lines, supported by square bars.

How To Install PLICAST【CASTABLE REFRACTORY】

PLICAST is hydraulic castable refractory and hardens at room temperature.

As PLICAST contains alumina cement, similar method of cement installation is applicable.

However, various grades of PLICAST for wide applications are available and each grade has an individual setting characteristics and proper conditions for installations. Therefore, please refer details to our separate catalog, "How to install PLICAST (CASTABLES)".

1. Material needs to be stored under roof in dry condition.

2. Frames should be made solid and water-proofed to avoid the leakage of material.

3. Only clean and correct amount of water shall be used for mixing, and the material is well mixed before and after adding water.

4. Material is placed immediately after being mixed with water, and should not be used with any material which has already started hardening.

5. As poured, it is puddled with a paddler or vibrator to prevent any void is made.

6. Proper expansion joints shall be placed.

7. PLIBRICO's accessories designed and manufactured based on our abundant experience shall be used.

8. For water curing, it is required to keep proper time. Material should be kept moist by either covering wet mats or spraying water to prevent the surface from drying.

9. For heat drying, the temperature shall be raised slowly according to our standard dryout curve.

MEMO

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