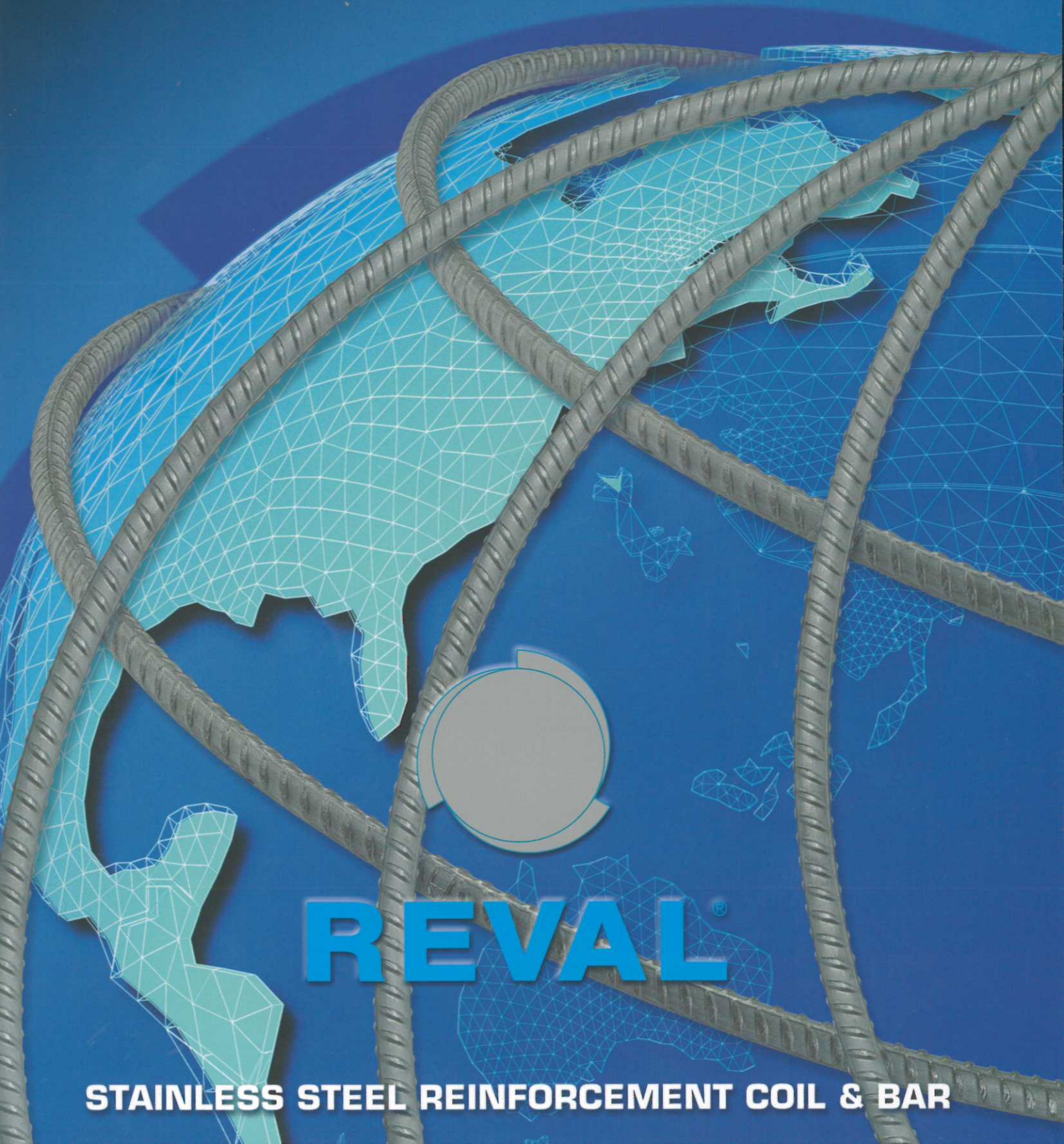


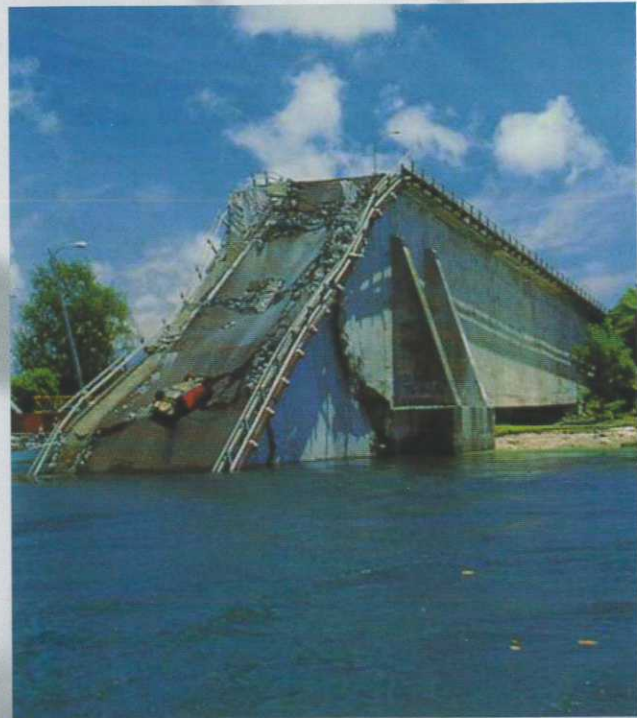


ACCIAIERIE
Valbruna



REVAL®

STAINLESS STEEL REINFORCEMENT COIL & BAR



WHY RISK ?

“REVAL® is the ultimate solution
against risks from chloride attack
on roads, bridges and
constructions”



REVAL®: A PERMANENT SOLUTION

THE BENEFITS OF USING REVAL® IN ROADS, BRIDGES AND BUILDINGS

- Excellent corrosion resistance to chlorides
- More than 100 years of expected service life in concrete
- Higher strength levels
- Better self healing to handling damage and abrasion when compared to galvanized or epoxy coated steel
- Low life cycle cost
- High ductility and strength
- Longer storage and service life
- Better resistance to localized corrosion mechanisms
- Low magnetic permeability
- Better fire and heat resistance comparable to black bar
- Resistant to seismic loading
- Save and easy use with black steel by lapping or coupling



REVAL® ...RESISTANT TO CORROSION

REVAL® = DURABILITY

During their life, structures should resist to:

- Atmospheric and meteorological agents
- Aggressive environmental attacks
- Dynamic and static forces
- Abnormal and unforeseeable factors such as fire, earthquakes and floods.

REVAL® 304L, 316L and especially 318-duplex show an exceptional resistance to high temperatures and to different pH levels in the concrete.

REVAL® offers economic advantages in the medium and long run.

The initial cost of REVAL® is outweighed by saving all maintenance costs.

Consultants, designers and builders of roads and bridges see the benefit of stainless steel reinforcement for cost saving and reduced disruption to traffic.

That has been understood by governments.

The Highway Agency in the UK has issued the "Design Manual for Roads and Bridges" Volume 1, Section 3, part 15, BA 84/02, in which it recommends the use of stainless steel instead of normal carbon steel to eliminate traffic disruption.

AGGRESSIVE ENVIRONMENT

ENVIRONMENT	CAUSE OF CORROSION	STEEL SUGGESTED
Mildly aggressive	Low chloride content	304L/1.4162
Aggressive	High chloride content	316L/1.4362
Very aggressive	Carbonation and chloride penetration, high temperature and/or temperature fluctuations	316L/1.4462



Aleghero's Bridge - Italy

REVAL

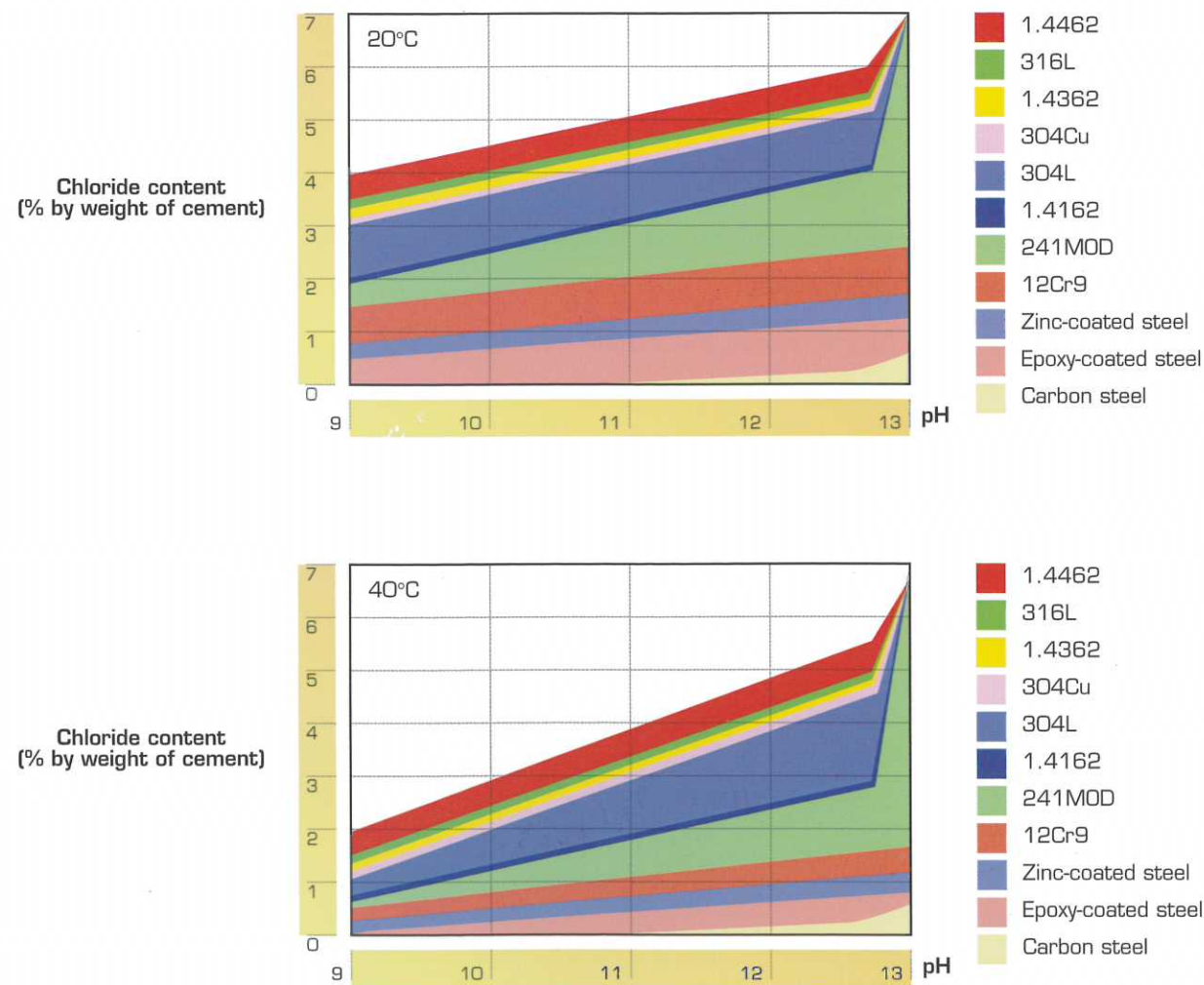
3

"REVAL® offers the best available solution against corrosion"

... RESISTANT TO PITTING

The type of corrosive attack, due to the presence of chlorides, that stainless steel sunk in concrete meets is called PITTING.

The resistance to pitting depends upon the composition of stainless steel; the PRE (Pitting Equivalent Resistance) shows the more resistant steel to chloride attack.



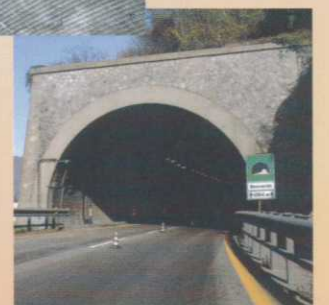
Schematic representation of fields of applicability of stainless steel bars in both alkaline (i.e. with pH around 13) and carbonated (i.e. with pH around 9) chloride contaminated concrete, at 20°C and 40°C. The threshold levels are indicative only.

... RESISTANT TO STRAY CURRENTS

Stainless steel performs best in chloride contaminated or carbonated concrete structures which are affected by stray currents, because it maintains its passivity. REVAL® in reinforced concrete is highly recommended where there are possible stray currents, such as in train tunnels, underground and steelworks.



Extension Melting Shop, Qatar

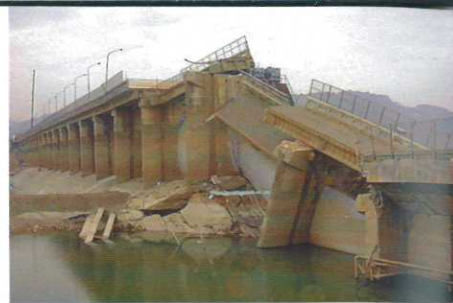


REVAL®

SEISMIC PROPERTIES

REVAL® = HIGH DUCTILITY AND TOUGHNESS SUPERIOR TO BLACK STEEL

REVAL® 304L and 316L, due to their high content of nickel, a mineral of great toughness, are the most suitable steels for reinforcing structures operating in seismic areas.



BIO-BUILDING:
Al Sole Building, GR - Italy

MAGNETIC PROPERTIES

REVAL® is a paramagnetic steel, due to its low magnetic permeability.

It is used successfully in structures where disturbing strong magnetic fields have to be avoided, such as in airports, military bases, broadcasting stations, banks, meteorological stations, hospitals etc.



STABILITY AT LOW TEMPERATURES

REVAL®'s austenitic structure remains stable up to temperatures of -196°C suggesting its use in the coldest environments.

Several countries have already made compulsory the use of stainless steel in precast panels.

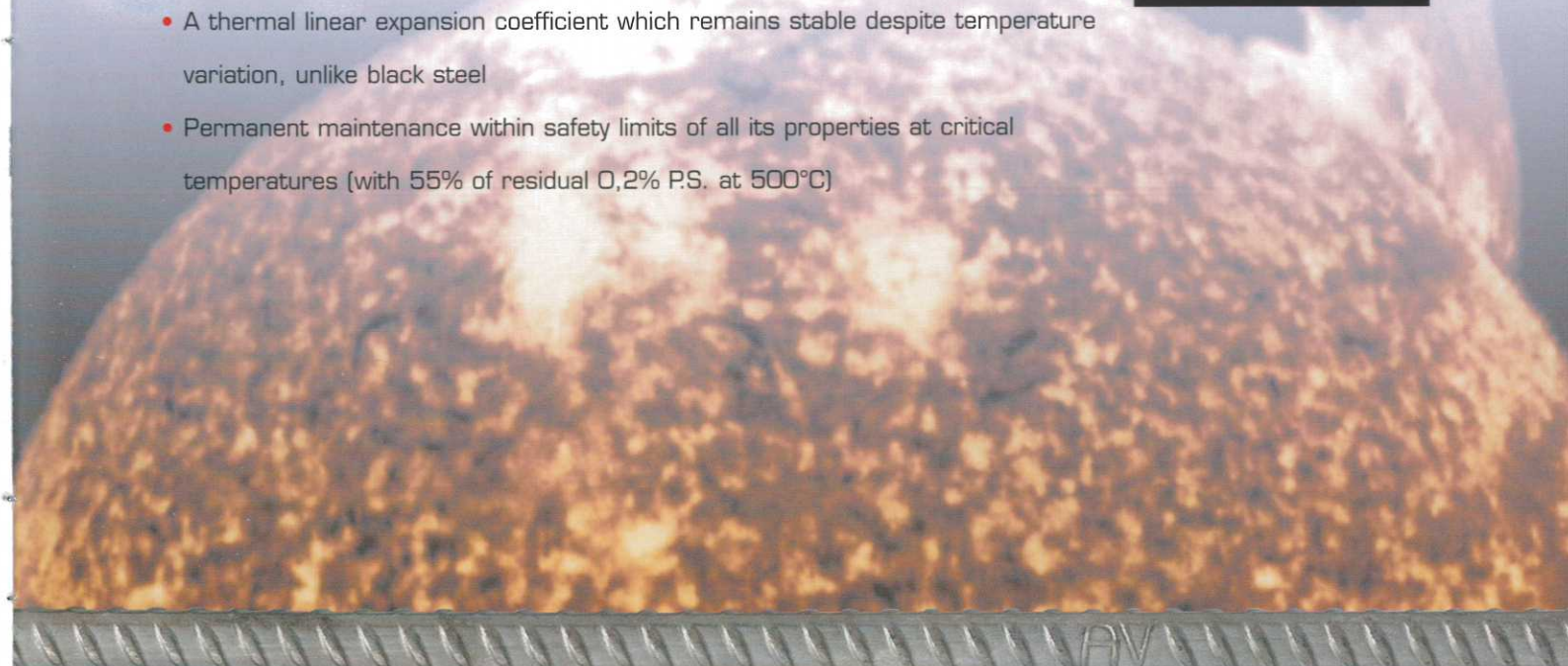


BEHAVIOUR IN PRESENCE OF FIRE

REVAL®, being an austenitic steel shows an excellent resistance to high temperature.

Its characteristics are:

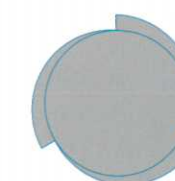
- Low thermal conductivity
- A thermal linear expansion coefficient which remains stable despite temperature variation, unlike black steel
- Permanent maintenance within safety limits of all its properties at critical temperatures (with 55% of residual O, 2% P.S. at 500°C)



JOINING STAINLESS STEEL TO BLACK STEEL

REVAL® can be easily and safely joined, by lapping or coupling, to black steel.

Extended laboratory research has proved that corrosion is contained when stainless steel is electrically connected to black steel.



REVAL® 7

"the use of REVAL® guarantees the safety of concrete structures"

REVAL®: = NO REPAIR

REVAL® = LOW LIFE CYCLE COST

Thanks to the complete absence of maintenance costs, the initial cost of REVAL®, is largely recovered.

Also traffic disruption, so familiar and sometimes unpopular to the general public in case of frequent repairs, is removed.

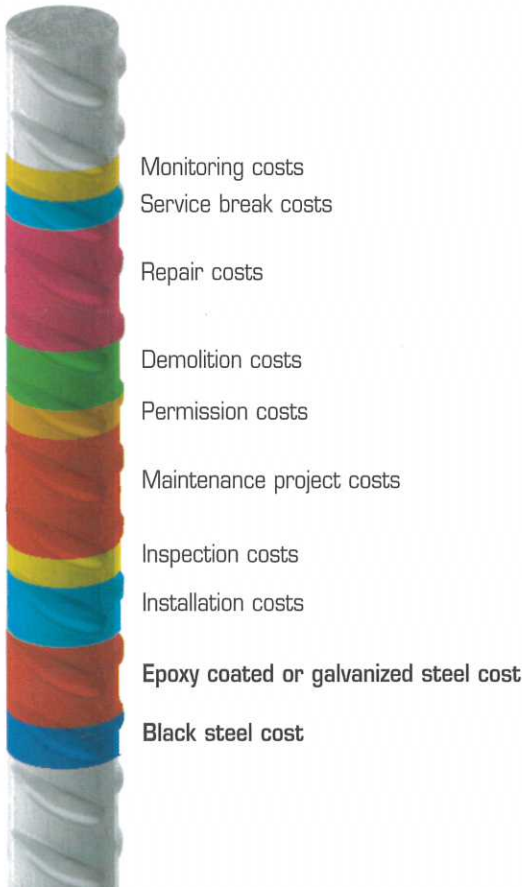
From the point of view of costs, a greater cost reduction in construction can be obtained considering the following economic motivations, when suitable to the design:

- Fewer tons used (up to 10% of the reinforcement's weight) = lighter structures
- Smaller concrete cover thickness
- No concrete inhibitors against corrosion
- Higher stainless steel scrap value than the scrap iron (up to 5 times higher)

STAINLESS STEEL REINFORCING



OTHER REINFORCINGS

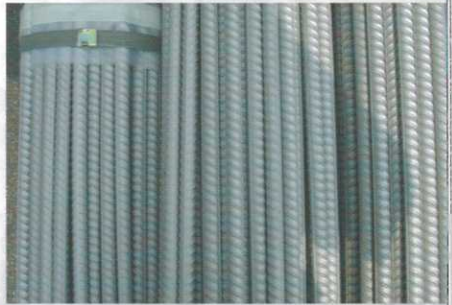


REVAL® = HIGH QUALITY

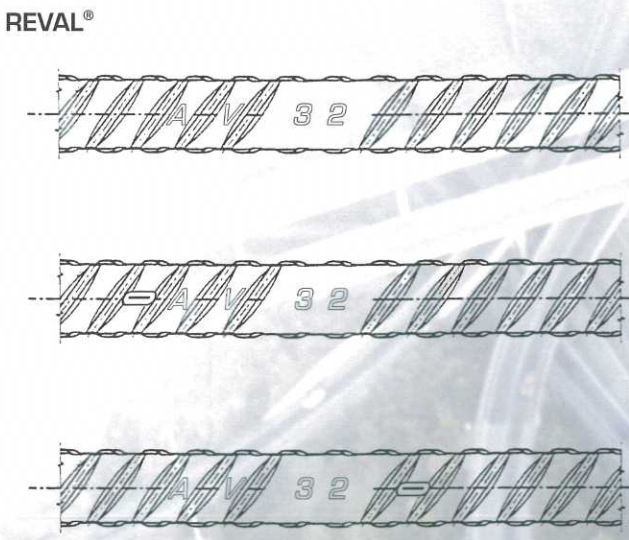
REVAL® = DURABILITY

The quality of REVAL® is guaranteed by a manufacturing process approved by Lloyd's Register Quality Assurance ISO 9001:2008 and AS9100 Revision B (Aerospace Standard).

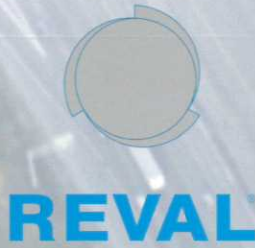
It is carried out completely in house, from melting to distributing, assuring full traceability at each stage of production.



REVAL® bar and coil are identified by the logo AV stamped on the bars as follows:



The logo AV is followed by the dia. (In this case dia. 32 mm)



MAJOR PROJECTS USING REVAL®

Villastellone Viaduct - Italy



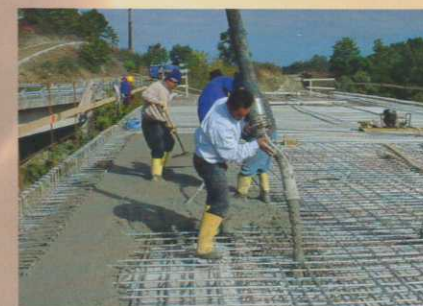
Shenzhen Western Corridor
Hong Kong



The project



Highway 87/88 Tammaro - Italy



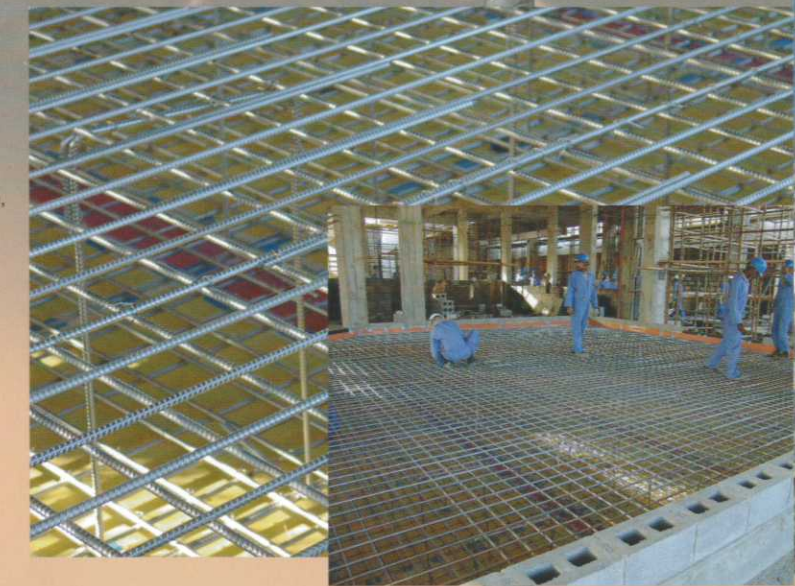
New Guest Complex
Muscat - Oman



Driscoll Bridge on the
Garden State Parkway
Woodbridge, NJ - USA



Rail Viaduct
Venezia-Padova,
Italy



Royal Hospital
Muscat - Oman

Nuclear Waste - France



REVAL®

11

REVAL® makes your structures safer

10

MAJOR PROJECTS USING REVAL®



Napoli Harbour
Graving Dock
Italy



Trapani Harbour - Italy



The Pearl, Doha - Qatar



Mose, Venezia - Italy



Business Bay - Creek Extension
Dubai - U.A.E.



Blackpool sea wall defence
UK



STAINLESS STEEL

Stainless steel is the name given to a group of corrosion resistant steel alloys. The families are distinguished by their microstructure, and their properties:

• AUSTENITIC • FERRITIC • MARTENSITIC • DUPLEX STAINLESS STEEL

Corrosion resistance is enhanced by decreasing the carbon content, and increasing the nitrogen, chromium, nickel and molybdenum contents. Only austenitic and duplex stainless steel are recommended as reinforcement to concrete because of their high corrosion resistance.

CHEMICAL COMPOSITION

STEEL TYPES	C	Si	Mn	S	Cr	Ni	Mo	P	N	Cu	Others
	max	max	max	max				max			
XM-28 - S24100	0.15	1.0	11.0/14.0	0.030	16.5/19.0	0.5/2.5	-	0.060	0.20/0.45	-	-
304/304L/304LN 1.4301/1.4307	0.03	1.0	2.0	0.030	18.0/19.5	8.0/10.0	-	0.045	≤ 0.22	-	-
316/316L - 1.4404	0.03	1.0	2.0	0.030	16.5/18.5	10.0/13.0	2.0/2.5	0.045	≤ 0.11	-	-
316LN - 1.4429	0.03	1.0	2.0	0.015	16.5/18.5	11.0/14.0	2.5/3.0	0.045	0.12/0.22	-	-
316LN - 1.4436	0.05	1.0	2.0	0.015	16.5/18.5	10.5/13.0	2.5/3.0	0.045	≤ 0.22	-	-
1.4571	0.08	1.0	2.0	0.030	16.5/18.5	10.5/13.5	2.0/2.5	0.045	-	-	Ti: 5 X C to 0.70
321 - 1.4541	0.08	1.0	2.0	0.030	17.0/19.0	9.0/12.0	-	0.045	-	-	Ti: 5 X C to 0.70
1.4162	0.04	1.0	4.0/6.0	0.030	21.0/22.0	1.35/1.70	0.10/0.80	0.040	0.20/0.25	0.10/0.80	-
1.4362	0.03	1.0	2.0	0.015	22.0/24.0	3.50/5.50	0.10/0.60	0.035	0.05/0.20	0.10/0.60	-
318 - 1.4462	0.03	1.0	2.0	0.015	21.0/23.0	4.5/6.5	2.5/3.5	0.035	0.10/0.22	-	-
1.4529	0.02	0.5	1.0	0.010	19.0/21.0	24.0/26.0	6.0/7.0	0.030	0.15/0.25	-	-

STEEL TYPES

AUSTENITIC		DUPLEX	SUPERAUSTENITIC
XM-28	316/316L	1.4162	1.4529
S24100	S31600	*LDX2101®	
S30400	S31603	1.4362	
1.4301	1.4404	318	
304/304L	316S33	S31803	
S30403	316LN	1.4462	
1.4307	1.4429	318S13	
304S31	1.4436		
304LN	S31653		
S30453	1.4571		
321			
1.4541			

*Outokumpu registered trademark

REVAL®

MEET THE FOLLOWING INTERNATIONAL STANDARDS

ASTM A955M

TENSILE REQUIREMENTS	Grade 420 min	Grade 520 min
Tensile strength, (MPa)	620	690
Yield strength, (MPa)	420	520
Elongation in 200 mm, (%)	20	20

UNE 36-067

TENSILE REQUIREMENTS				
Grade	R _{p 0.2} (MPa) min	R _m (MPa) min	A (%) min	R _m /R _{p 0.2} min
B 500 T INOX	500	600	18	1.10
B 600 T INOX	600	700	18	1.10

DIN 488

TENSILE REQUIREMENTS		
Abbreviation	BSt 500 S	BSt 500 M
Symbol	IV S min	IV M min
0.2% proof stress R _{p 0.2} (N/mm²)	500	500
Tensile strength R _m (N/mm²)	550	550
Elongation after fracture A ₁₀ (%)	10	8

AFNOR A 35-016

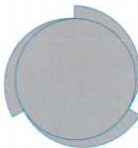
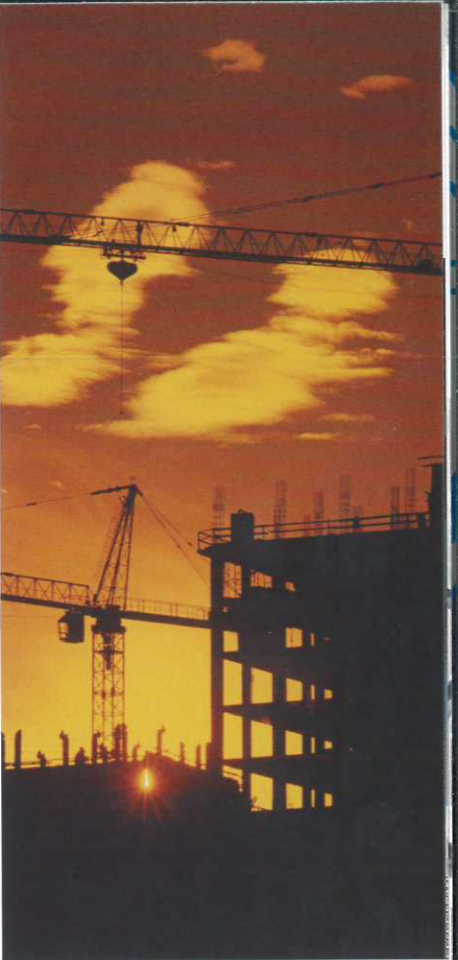
TENSILE REQUIREMENTS			
Grade	Yield strength ReH min	Ratio R _m /ReH min	Total elongation at maximum force, A _{gt} min
FeE500-2	500	1.03	2.5
FeE500-3	500	1.08	5.0

BS 6744

TENSILE PROPERTIES				
Grade	0.2% proof strength R _{p 0.2} (MPa) min	Stress ratio R _m /R _{p 0.2} min	Elongation at fracture A ₅ (%) min	Total elongation at maximum force, A _{gt} (%) min
500	500	1.10	14	5

D.M. 14 JANUARY 2008

TENSILE REQUIREMENTS	
Grade	B450C
Characteristic yield strength f _{yk} (N/mm²)	≥ 450
Characteristic tensile strength f _{tk} (N/mm²)	≥ 540
(f _t /f _y) _k	≥ 1.15 < 1.35
(f _y /f _{ynom}) _k	≤ 1.25
Elongation (A _{gt}) _k %	≥ 7.5



REVAL® 15

COIL WEIGHT - BAR LENGTH

Coil	From 3 to 20 mm dia.	700 Kg - 1500 Kg
Bar	From 3 to 50 mm dia.	12 meters max

NOMINAL CROSS-SECTIONAL AREA AND NOMINAL MASS PER METRE RUN

NOMINAL SIZE	NOMINAL CROSS-SECTIONAL AREA	NOMINAL MASS PER METRE RUN		
		STEEL DESIGNATION		
mm	mm²	304L/304LN	316L/316LN	318 - duplex
3	7.1	0.056	0.057	0.055
4	12.6	0.100	0.101	0.098
5	19.6	0.155	0.157	0.153
6	28.3	0.224	0.226	0.221
7	38.5	0.304	0.308	0.300
8	50.3	0.397	0.402	0.392
10	78.5	0.620	0.628	0.612
12	113.1	0.893	0.905	0.882
14	153.9	1.216	1.231	1.200
16	201.1	1.589	1.609	1.569
20	314.2	2.482	2.514	2.451
25	490.9	3.878	3.927	3.829
30	706.9	5.585	5.655	5.513
32	804.2	6.353	6.434	6.273
35	962.1	7.601	7.697	7.504
40	1256.6	9.927	10.053	9.802
50	1963.5	15.512	15.708	15.315

TOLERANCES ON MASS PER METRE RUN

NOMINAL SIZE	TOLERANCES ON MASS PER METRE RUN
mm	%
3 to 8	+/- 6.0
over 8	+/- 4.5

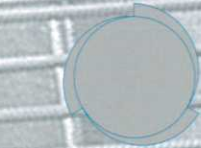


REVAL® REINFORCEMENT COUPLERS

Valbruna can supply metric threaded couplers for REVAL® reinforcement for bar diameters 12 mm to 40 mm.

The couplers are manufactured from either grade 316 or Duplex.

REVAL® BAR DIA (mm)	THREAD SIZE AND PITCH (mm)	THREAD LENGTH (mm)	COUPLERS SIZES			
			DIA (mm)	LENGTH (mm)	THICKNESS (mm)	WEIGHT (kg)
12	M12 x 1,75	15	19	29	3,5	0,04
16	M16 x 2	19	25	37	4,5	0,08
20	M20 x 2,5	23	29	45	4,5	0,12
25	M24 x 3	27	35	53	5,5	0,21
32	M30 x 3,5	33	43	65	6,5	0,38
40	M36 x 4	39	52	77	8,0	0,67



REVAL® ...WIRE MESH AND TYING WIRE

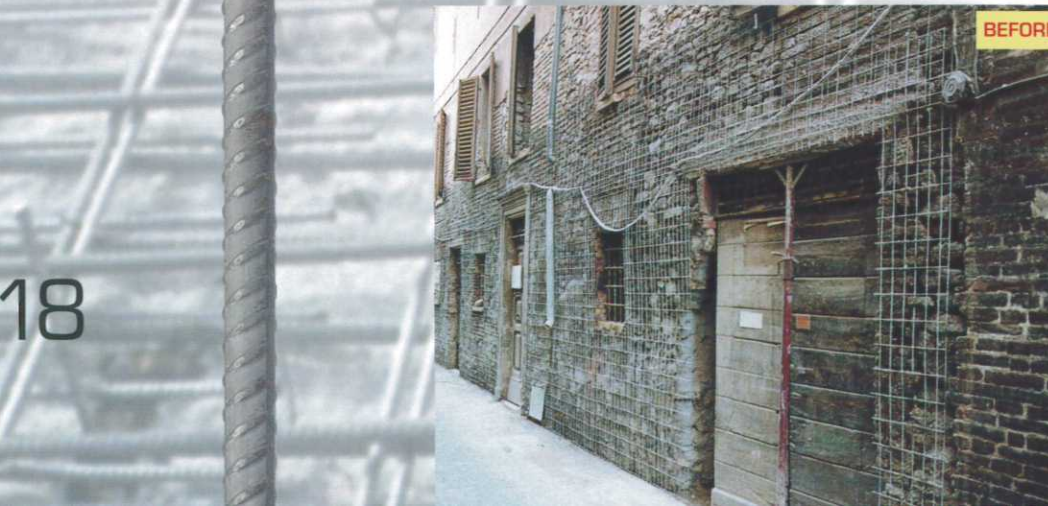


STAINLESS STEEL MESH PANELS

Valbruna manufactures stainless steel mesh that are typically used where the concrete cover to the steel is minimal, or where chloride concentrations are considered to be a threat to the overall structural durability.

They also find their use in aesthetic situations where rust spots on the concrete surface are not acceptable.

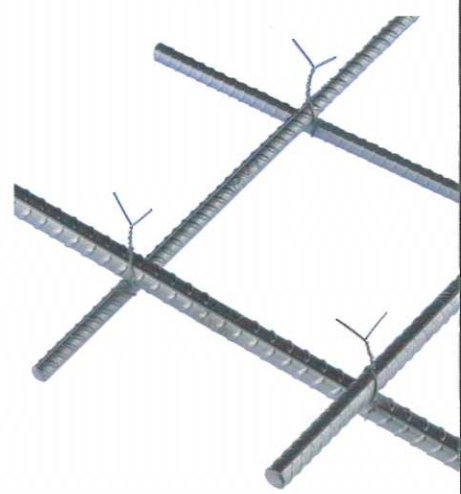
Stainless Steel mesh with REVAL® is used in roads, bridges, tunnels, viaducts and aqueducts.



STAINLESS STEEL TYING WIRE

In general it is a sensible practice to always use stainless steel tying wire with stainless steel reinforcing bar, this to ensure that if the tying wire encroaches too close to the surface of the concrete cover, the chances of any rust staining are eliminated.

For building and housing, our tying wire is manufactured in AISI 304, 304L, 316 and 316L. It is supplied soft annealed.



DIA mm	TOL
1 ÷ 1,60	h9

STAINLESS STEEL TYING WIRE

GRADE	AISI	W.N.	BS	UTS N/mm²
AISR	304/304L	1.4301/1.4307	304S11	680 max
APMR	316/316L	1.4401/1.4404	316S11	680 max

STANDARD PACKAGING

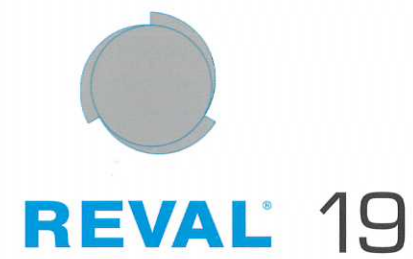
Bundles from 25 to 30 kg



Drum of 75 lt
dia 500 mm
height 395 mm



Drum of 235 lt
dia 570 mm
height 920 mm



"our products change with you..."



ATTESTATO DI QUALIFICAZIONE

04/10-CA

In conformità al D.M. 14.01.2008 "Norme tecniche per le costruzioni", si attesta che il prodotto da costruzione:

ACCIAIO PER CEMENTO ARMATO LAMINATO A CALDO

B450C, saldabile in rotoli inox laminato a caldo nei diametri da 6 a 16 mm.



prodotto

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CONSIGLIO SUPERIORE DEI LAVORI PUBBLICI
DELL'ART. 10 DEL D.P.R. 246/93
CONSIGLIO DI RENDICONTI
CONSIGLIO DI RENDICONTI



CERTIFICATE OF APPROVAL

This is to certify that the Quality Management System of:

Acciaierie Valbruna S.p.A.
Via della Scienza, 25 - 36100 Vicenza - Italy
Via A. Volta, 4 - 39100 Bolzano - Italy

has been approved by Lloyd's Register Quality Assurance
to the following Quality Management System Standards:

ISO 9001:2008

The Quality Management System is applicable to:

Manufacture and sales of stainless steel, alloy steel, nickel alloy
titanium, carbon steel, in ingots, billets, rolled bars, forged bars,
wires, wire rods, threaded bars, stainless steel for concrete
reinforcing bars and forgings as per client specification. The Quality
Management System supports
of Pressure Equipment

Approval
Certificate No: LRC 0160080/QMS



Issued by

UK Certification Authority for Reinforcing Steels

Certificate of Approval

Technical Approval Certification

This is to certify that
Acciaierie Valbruna S.p.A.

UK Certification Authority for Reinforcing Steels

Certificate of Approval

Product Conformity Certification

This is to certify that
Acciaierie Valbruna S.p.A.

at its establishment at
Vicenza

has satisfied the Authority that it operates a Quality System that complies with the requirements of BS EN ISO 9001
2008 and the relevant CARES Quality and Operations Assessment Schedules. Where appropriate, and as listed below, it
has further satisfied the Authority that it manufactures and/or supplies products that conform with the stated product
standards and is entitled to use the CARES marks on its products.

Production of BS 6744 bar and coil as follows:

Grade 200 and 500 Bar:
Hot Rolled Plain and Ribbed Bar 14 - 50mm
(L4301, L4436 and L4462)
Grade 200, 500 and 650 Coil:
Cold Drawn Plain and Ribbed Coil 6 - 12mm
(L4301, L4436 and L4462)
Grade 200 and 500 Coil:
Hot Rolled Plain and Ribbed Coil 8 - 16mm
(L4301, L4436 and L4429)

using the processes and procedures registered with the Authority.

This Certificate is the property of the Authority and is issued subject to the Regulations of the Authority.

The Certificate Number is: 030802

Issue Date: 01-January-2010

Expiry Date: 31-December-2010

Signed on behalf of the Board of Management

Executive Director

The use of the Accreditation Mark indicates accreditation in respect
of those activities covered by the accreditation certificate number 002.

UK Certification Authority for Reinforcing Steels
Pembroke House, 21 Pembroke Road, Sevenoaks, Kent, TN13 1XR, UK. www.ukares.com

Cont. Ref: AHC12010 393 186



ATTESTATO DI QUALIFICAZIONE

041/08-CA

In conformità al D.M. 14.01.2008 "Norme tecniche per le costruzioni", si attesta che il prodotto da costruzione:

ACCIAIO PER CEMENTO ARMATO LAMINATO A CALDO

Acciaio inossidabile con caratteristiche meccaniche del B450C,
impiegabile anche come FeB44k, saldabile, in barre, con struttura
austenitica o austeno-ferritica, nei diametri da 6 a 32 mm

Marchio di laminazione



CERTIFICATE OF APPROVAL

This is to certify that the Quality Management System of:

Acciaierie Valbruna S.p.A.
Via della Scienza, 25 - 36100 Vicenza - Italy
Via A. Volta, 4 - 39100 Bolzano - Italy

has been approved by Lloyd's Register Quality Assurance Limited, Coventry,
UK, to the following Quality Management System Standards:

ISO 9001:2008
AS9100 Revision B

ance with the requirements

s applicable to:

loy steel, nickel alloy and
rolled bars, forged bars,
client specification.

roval: 10th August 1993

roval: 3rd March 2009

ate: 3rd March 2009

Reinforcing Steels

Technical Approval
Certification

lies with the requirements of

inforcement of concrete
ed bar and bar
authority.
ogulations of the Authority.

Expiry Date: 31-December-2010



03

Management

Expiry Date: 31-December-2010

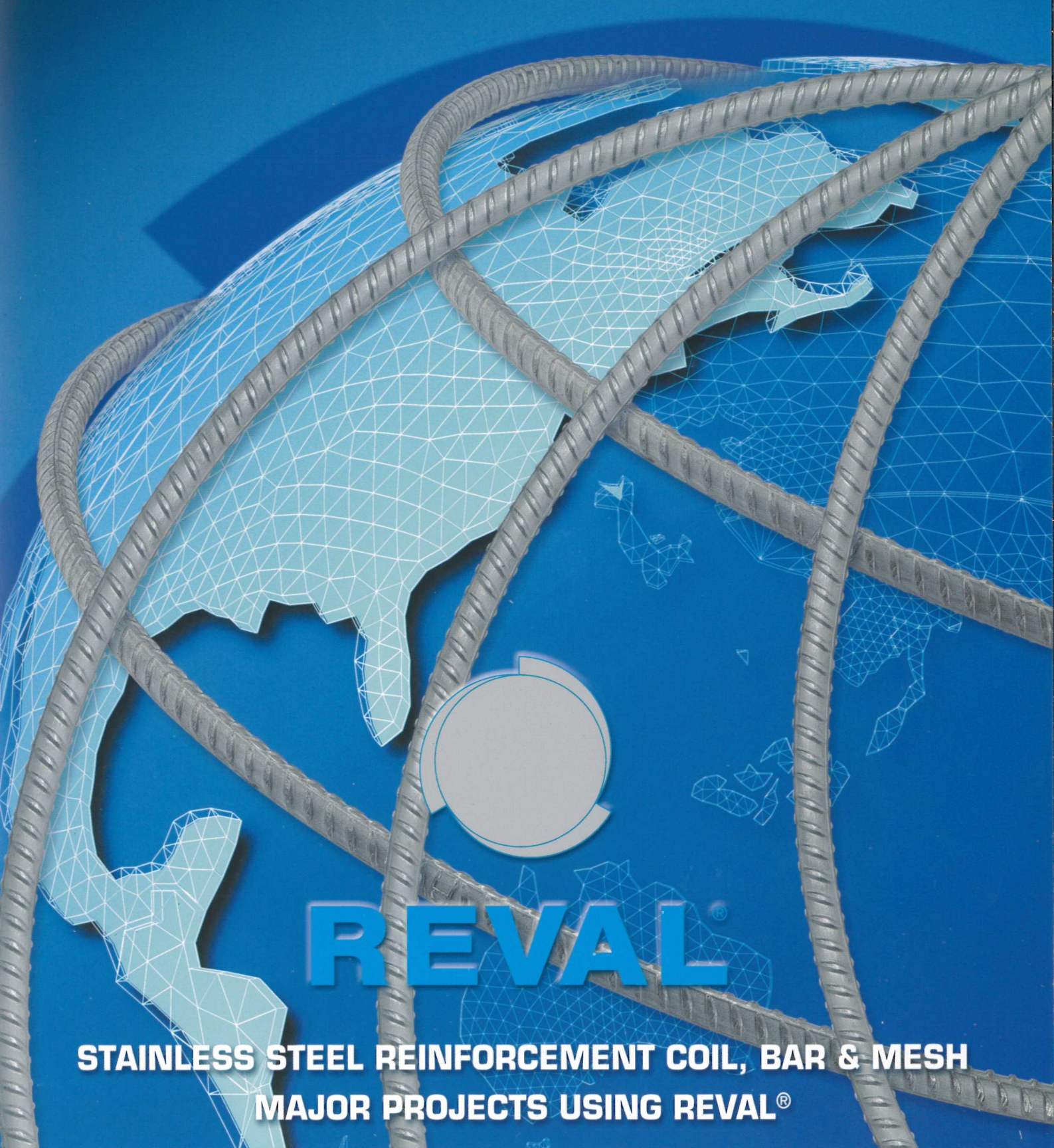


ediation in respect
of certificate number 002.

eds
s, Kent, TN13 1XR, UK. www.ukares.com



ACCIAIERIE
Valbruna



REVAL®

STAINLESS STEEL REINFORCEMENT COIL, BAR & MESH
MAJOR PROJECTS USING REVAL®

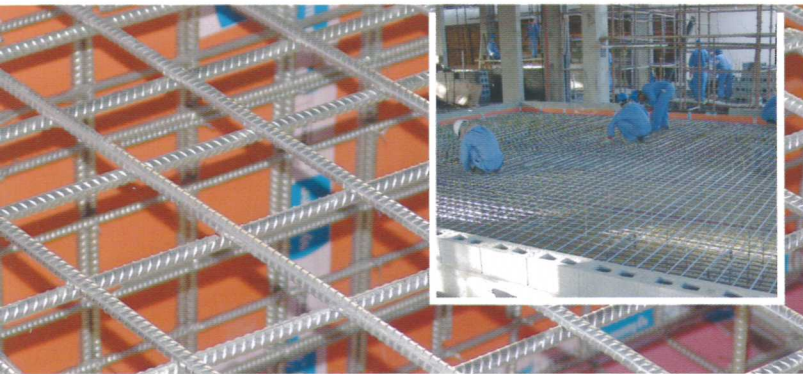
REVAL[®]

MAJOR PROJECTS USING AISI 304L

RAIL VIADUCT VENEZIA - PADOVA
ITALY

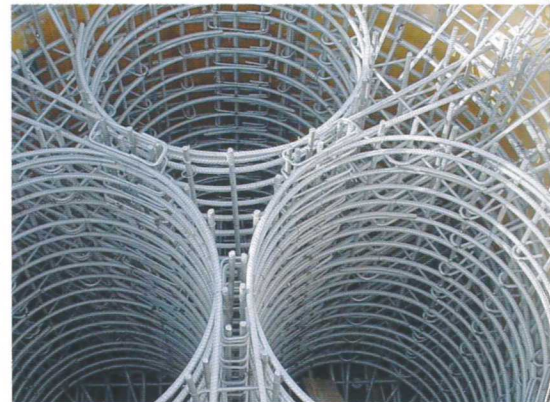


ROYAL HOSPITAL, MUSCAT
OMAN



NUCLEAR WASTE - FRANCE

EXTENSION MELTING SHOP
QATAR



COWSIDE BRIDGE,
NORTH YORKSHIRE - UK



BARTON BRIDGE
NORTH YORKSHIRE - UK

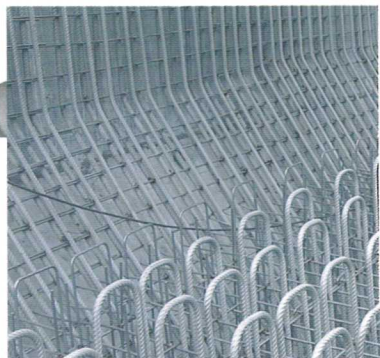


Others Projects: Highway 410, Sandalwood Parkway (Canada) • Road 87/88 Tamma
Queensland (Australia) • Viaduct Sieve, Firenze (Italy) • Guildhall, London (UK) • Colosse

REVAL®

MAJOR PROJECTS USING AISI 316L

**BUSINESS BAY
CREEK EXTENSION
DUBAI - U.A.E.**



**BRIDGE IN THE
CZECH REPUBLIC**



**TRAPANI HARBOUR
ITALY**

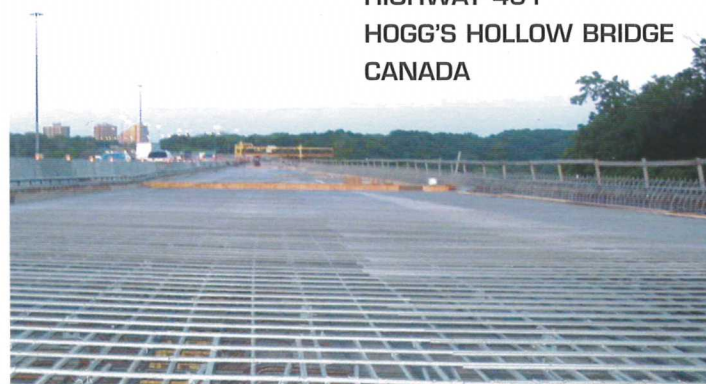


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REVAL®

MAJOR PROJECTS USING AISI 318

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"REVAL[®] is the ultimate solution against risks from chloride attack on roads, bridges and constructions"

Compared to other construction materials, stainless steels have many unique properties that are advantageous not only from a corrosion standpoint, but from a strength and safety view-point as well.

Corrosion of steel reinforcement bar everywhere in the world is the most important cause of deterioration in reinforced concrete structures.

REVAL[®] is the material of choice for structures subject to corrosive environments.

Most projects follows British Standard BS 6744:2001 and the ASTM A955.

Valbruna is certified ISO 9001:2008 & AS9100 revision B, TÜV, DET NORSKE VERITAS and CARES (UK).

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- All sizes and grades in accordance with the most important Standard.
- Inventory of stainless rebars allowing us to be responsive to the needs of customers.
- The whole production cycle, from casting to finish product means high quality.
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