

# INOSSIDABILE

Edited and published by Centro Inox



## Summary

For more detailed information please contact directly the names indicated at the end of each notification

### COVER/PAGES 3/4/5

#### STONE AND STAINLESS STEEL FOR THE NEW "SAINT PIO OF PIETRELCINA" CHURCH (Pietra e acciaio inossidabile per la nuova chiesa di San Pio da Pietrelcina)

The new Liturgical Hall called "Saint Pio of Pietrelcina", located in San Giovanni Rotondo (Foggia, Italy), was inaugurated on the 1<sup>st</sup> of July 2004. Because of its complexity, the project, which was begun in 1989, encountered numerous difficulties over the years. However, also thanks to the use of stainless steel and the application of new work methods, the building was completed using safe and technically impeccable design solutions.

Two series of arches, independent from each other, departing from a fixed point (fig. 1), provide all necessary support for the light roofing in wood. The series of internal arches reaches spans of more than 45 m, rising to maximum heights of 16 m, and sustaining the highest part of the roofing. The arches along the perimeter with smaller spans, in their turn sustain the outermost surfaces of the roof. The material used for building the arches is an extremely compact calcareous stone. The stone segments were glued in series of five or six, so as to construct larger elements called "maxi-segments", which were then transported and laid on a supporting coomb in metal.

A layer of mortar reinforced with long, amorphous stainless steel fibre, which is stable over time, is not subject to aggression from chlorides, does not oxidise and is capable of dissipating the energy produced by earthquakes, was interposed between each pair of "maxi-segments" (fig. 2).

A number of plates in EN 1.4404 (AISI 316 L) stainless steel were placed inside this energy-dissipating mortar, to which 165 struts in stainless steel were subsequently fixed. These struts receive the loads transmitted from the roofing, transmit them to the arches and then to the ground (fig. 3). The struts were made in EN 1.4404 (AISI 316 L) stainless steel and were obtained by welding shaped sheets (fig. 4 and 5).

As well as being dictated by its excellent properties, the choice of stainless steel for these elements also lightened the visual impact of the roofing, which is made up of a trellis of glue-laminated beams.

The transparency and lightness of the large window façade were made possible by the use of vertical beams in EN 1.4404 (AISI 316 L) stainless steel that reach the maximum height of 15 m, made using H-profiles measuring 94x160 mm (Fig. 6 and 7).

The choice of stainless steel made it possible to construct an unprecedented work, elegantly resolving a statically-demanding situation and opening up new prospects for using stone in structural applications of a substantial size.

Architecture: Renzo Piano Building Workshop, Genova, www.rpbw.com

Structures: (First phase, 1991-1996) Ove Arup & Partners + Co.Re. Ingegneria / (Second phase, 1997-2004) Favero & Milan Ingegneria - Via Varotara 57, Zianigo - I-30030 Mirano VE - Phone +39 041 5785711, fax +39 041 5785700, fm@favero.milan.com, www.favero.milan.com

Final inspection: Ing. Danilo Campagna - MSC Associati  
Reassessment of structural calculation: Prof. Ing. Antonio Migliacci - MSC Associati Srl - Via Cialdini 37 - I-20161 Milano MI - Phone +39 02 66204155, milano@msassociati.it, www.msassociati.it

Contractor: Fabbrica Della Chiesa s.c.a.r.l with Intergroup Italia Srl, Parma (Stainless structures for roof and frames)

Photos 1, 6, 7 and 8: Michel Denancé - Photos 2, 3 and 5: Favero & Milan Ingegneria - Photo 4: Giorgio Grandi

### PAGES 6/7

#### FROM OUR MEMBERS

#### OLARRA. The production of the "Roda" Group stainless steels

(Dalle Associate. Olarra - La produzione degli acciai inossidabili del Gruppo "Roda")

Aceros Inoxidables Olarra, situated in Bilbao (Spain), is a steelworks that was built in 1965 specialising in "long" stainless steel products; in 1994, it became a member company of the Roda Group, though maintaining its own individual-

ity from the production and commercial points of view. The plant's high technological level and guarantee of constant quality have made it possible to produce a wide range of stainless steels, including most of the austenitic steels, also of the molybdenum type, the duplex, ferritic, martensitic steels, and heat-resistant steels. At the end of the '80's, Olarra began developing steels with improved machinability, affirming itself with the MECAMAX line of products.

As well as billets, which are also transformed by Rodacciai, Olarra also produces rounds, hexagons, squares and hot- and cold-finished flats.

The majority of Olarra's production is exported (up to 90%) to more than 40 countries world over. The product development and automatic control systems ensure a degree of quality that fulfils the requirements of each of its clients.

Already in 1990, as one of the first, Olarra achieved certification of its quality control system in accordance with ISO 9002, today ISO 9001, from Lloyd's Register Quality Assurance (LRQA). Subsequently, the company's awareness of the increasing importance of ecological-environmental issues led to the creation of an internal work group in 1997 which, in 2001, was awarded ISO 14001 certification, again by LRQA. Lastly, in order to enter the Japanese market, certification in accordance with the Japanese standards JIS G 4303 and 4318 was also obtained.

Customer satisfaction is the engine that drives all the product design and production phases.

#### RODACCIAI. The transformation and finishing of steels (Rodacciai - La trasformazione e la finitura degli acciai)

Rodacciai, founded in 1956, operates through two plants: once hot-rolling plant in Sirono and one cold-finishing plant in Bosio Parini, near Lecco. For decades, Rodacciai has been the leader in the field of cold-finished "long" products, particularly steels with improved machinability: its union with Olarra, in 1994, expanded its capacities to create and market finished products in stainless steel.

The tradition of steels with improved machinability by chip removal, for which Rodacciai has always been renowned in the field of automatic steels, underwent a decisive boost in the stainless steel sector thanks to its synergy with Olarra. The range of steel products has been enlarged by the austenitic, ferritic, martensitic and duplex steels. In the field of coils and drawn wires, the most developed sectors are those for household objects and cold-forging. Lastly, the production of welding materials in stainless steel has taken on increased importance (TIG, MIG, electrode core wire, submerged arc).

The special steels in the range include: hardened and tempered, case hardened, surface hardened steels, both alloyed and carbon steel, all of which are frequently produced in variations and work-methods that increase their machinability by chip removal.

The heat-treatment departments include annealing furnaces (for machinability, isothermal, spheroidal), normalisation, stress relieving, quenching and hardening (both traditional and by induction).

The products in bars have round, hexagonal and square profiles, and are supplied hot rolled, drawn h9, h10, h11, smooth turned h9, h10, h11, ground h7, h8, h9. The products in coils are supplied in their drawn, annealed or in various work-hardened states, as well as bright or coated to facilitate cold-forming.

Equipment for testing surface integrity, using eddy currents, is installed on all the bar drawing and peeling lines, whereas laser equipment for dimensional tests is mounted throughout the peeling and grinding lines. The test laboratory is fully equipped to carry out all the metallographic, chemical and mechanical tests.

The Rodacciai quality system has been certified in accordance with ISO 9002, ISO 9001 and other dedicated institutions such as TÜV (for pressure vessels, for welding materials and for building products).

Aceros Inoxidables Olarra S.A. - C.M. Larrabarri 1 - ES-48180 Loiu (Vizcaya) Spain - Phone +34.944711517, fax +34 944531636, aiosa@olarra.com, www.olarra.com

Rodacciai S.p.a. - Via G. Leopardi 1 - I-23842 Bosio Parini LC - Phone +39 031 878111, fax +39 031 878312, info@rodacciai.com, www.rodacciai.com

### PAGES 8/9/10

#### UNI EN ISO 3506: STAINLESS STEEL SCREWS, BOLTS AND NUTS TO STANDARD

(UNI EN ISO 3506: viteria e bulloneria inox a norma)

The efficiency of a component or a machine in stainless steel is also greatly dependent on the appropriate choice of the type of steel used, based on the environment in which it will operate. This is particularly true if the parts in question are bolts, screws and nuts.

The European standard of reference for the base material is UNI EN 10263-5 (Steel rod, bars and steel wire for cold heading and cold extrusion - Part 5: Technical delivery conditions for stainless steels), whereas that for finished components is UNI EN ISO 3506. The standard is the official version, in Italian, of the international standard ISO 3506, previously acknowledged by CEN (the European Standardization Committee), as EN ISO 3506. Acknowledgement by UNI was granted in 2000, ratifying the expiry of the old Italian standard UNI 7323-8.

The UNI EN 3506 standard is divided into three parts, more specifically: Part 1: "UNI EN ISO 3506-1: Mechanical properties of corrosion-resistant stainless steel fasteners - Bolts, screws and studs" - Part 2: "UNI EN ISO 3506-2: Mechanical properties of corrosion-resistant stainless steel fasteners - Nuts" - Part 3: "UNI EN ISO 3506-3: Mechanical properties of corrosion-resistant stainless steel fasteners - Set screws and similar fasteners not under tensile stress"

The first and second parts are relating to corrosion-resistant austenitic, martensitic and ferritic stainless steel, tested at an ambient temperature between 15°C and 25°C. The third part, on the other hand, covers only austenitic stainless steel, tested at an ambient temperature between 15°C and 25°C.

Figure 1 indicates the designation system provided for by the first and second part of the UNI EN ISO 3506 standard. The product is identified by a code made up of two parts. The first part, alphanumeric, specifies the type of stainless steel (austenitic, ferritic, martensitic) and its chemical composition (see table in figure 2 also drawn from part 1 of the standard); the second part, which is purely numerical, represents 1/10 of the ultimate tensile stress value of the component, expressed in N/mm<sup>2</sup>. Stainless steels with a low carbon content (0.03% max.) may be further designated (and marked) with an "L" (for example A2L/70).

Table 2 (drawn from UNI EN 3506-1) is indicated in figure 3, in which the mechanical characteristics of screws and studs of the austenitic group are found.

A connecting element can be marked in accordance with the designation system only if all the requirements of the standard are satisfied. Marking may be placed directly on the component but, in all cases, all the packages must indicate the designation, as well as the manufacturer's trademark.

The growing competition in the fasteners field is pushing some producers towards materials which, as well as not having the same performance in terms of the corrosion resistance of classic A2 and A4 screws, bolts and nuts, also do not meet the requirements regarding the chemical composition of the base material provided for by the above-mentioned standard and, therefore, absolutely cannot be identified with the criteria illustrated above.

The marking of screws, studs and nuts must include the quality of the steel used, its class of resistance and the manufacturer's trademark. The standard also establishes where the marking must be positioned (figure 4).

The super-austenitic and duplex-type steels listed in the standard (figure 5) ensure a high degree of resistance to stress-corrosion phenomena caused by chlorides.

Photographs: courtesy of Europressvit (Buccinasco MI, www.europressvit.com) and of Bulnava (Suello LC, www.bulnava.com)



**STAINLESS STEEL BLADES FOR SLICING MACHINES (Lame inox per affettatrici)**

Very often, the blades of slicers for foodstuffs are made of low-alloyed, chromium plated steels.

With time, due to their being in constant contact with salted foods, these blades are subject to corrosion; they need to be regularly cleaned and repeatedly sharpened.

On the other hand, the austenitic stainless steels have mechanical characteristics that are not suited for the production of sharp blades. That is why the fact of having found the way to use stainless steel in this sector represents an innovative application for it. The rotating blades of these slicers are obtained from martensitic stainless steel which, by means of saline mist tests, has been proven to have a resistance to corrosion from 10 to 20 times higher than low-alloy steel, and which has such a high degree of hardness that the blade itself is actually self-sharpening; it is also non-stick, with a performance similar to Teflon.

The base of the slicer is made using austenitic stainless steel EN 1.4301 (AISI 304), both because of its decisively attractive appearance and especially because it complies with the laws that regulate the use of materials in contact with foodstuffs.

Production: C.EL.ME Srl – Viale Montenero 1 – I-20060 Truccazzano MI - Phone +39 02 9583157 / 515, fax +39 02 9583436, info@celme.com, www.celme.com

**COLLECTION KNIVES (Coltelli da collezione)**

For all those who venture in this sector, be they hobbyists or professionals, it is important to be able to count on a supplier from whom the stainless steels that are typically used in quality knife-making can easily be found, such as the martensitic steels EN 1.4109 (AISI 440/A), EN 1.4125 (AISI 440/C), EN 1.4005 (AISI 416), EN 1.4116, ATS 34, as well as the so-called sintered "Damascus" steels. It is also important to be able to find accessories, work tools, assistance and advice. Another advantage that a centre such as this provides is the opportunity to use a professional furnace for hardening the blades in a controlled atmosphere.

The pictures show some creations made by a knife-maker who has nurtured a passion for knives since he was young and who perfected his art without any guidance from a teacher. After eight years as a hobbyist, he made a profession of his art, participating in all of the most important Italian, European and North American competitions.

Fig. 1 – "Ideal-dritto", liner-lock knife with blade in stainless steel ATS 34 and scales in EN 1.4005 (AISI 416), with chisel engraving and interface in mammoth fossil.

Figs. 2 and 3 – "Premium", liner-lock prototype with screened micro-ball bearing on the blade movement. This is in "Damascus" stainless steel, as are the scales, with interference in black mother-of-pearl and liner in titanium.

Materials supplier: Fapa Acciai – Via Fleming 11 - I-26837 Mulazzano LO - Phone +39 02 9896351, fax +39 02 9896270, info@fapacciai.com, www.fapacciai.com

Knives production: Claudio Riboni – Via L. da Vinci 80 - I-20060 Truccazzano MI - Phone e fax +39 02 95309010, clriboni@inwind.it, www.riboni-knives.com

**PAGES 12/13****STAINLESS STEEL FOR TWO- AND FOUR-WHEELS: SPECIAL AIR FILTERS FOR ENGINES**

**(Acciaio inox per le quattro e le due ruote: filtri aria speciali per motori)**

In order for an engine to function properly, especially high-performance ones, even the air filters are extremely important. Those of the Tecnifilter® series, that we are presenting, are made using EN 1.4301 (AISI 304) and EN 1.4306 (AISI 304L) stainless steel nets and always ensure high efficiency, limited consumption and minimal maintenance over time.

The exclusive rigid support structure guarantees total mechanical seal and a high degree of resistance to air flows, whereas the particular netting conformation of the internal stainless steel surface ensures constant filtering action over time, with high levels of performance even under the most extreme working conditions. Thanks to their resistance to corrosive agents and to thermal loads, as well as their fire resistance, the life of these filters is practically infinite and, being "dry", they do not require any substantial maintenance to be performed: it is sufficient to clean them with compressed air, passing a light film of oil over them if desired. These filters are also available for the sports sector.

Fig. 1 – "Eco line" line, conceived for injection, mono-injection or carburettor standard cars in petrol or diesel versions, and for micro-cars.

Fig. 2 – "Moto-line" line for standard or sports motor bikes.

Fig. 3 – "History" line for vintage cars and other, with direct-intake filters. By favouring the flow of clean air to the engine, they reduce the consumption of fuel and the emission of polluting particles during the final phase.

Production: Colombo Angelo Snc – Via Statale 6 - I-

22045 Lambrugo CO - Phone +39 031 607309, fax +39 031 608248, info@colomboangelo.it, www.colomboangelo.it

**STAINLESS STEEL TAPS: WHEN DESIGN BLENDS WITH HYGIENE**

**(Rubinetti inox: quando il design si sposa con l'igiene)**

Mention has already been made in Inossidabile 157 (September 2004) of the new Ministerial Decree dated April 6<sup>th</sup> 2004, no. 174, regarding "... the materials and objects that can be used in fixed systems for collecting, treating, feeding and distributing water destined for human consumption" which, in Enclosure 1 of Article 5, quotes the metallic materials best suited for the purpose. These also include all the kinds of stainless steels that were already allowed to be in contact with foodstuffs in accordance with the Ministerial Decree dated March 21<sup>st</sup> 1973.

This confirmation, that comes from the law, cannot but encourage all the enterprises involved in the whole drinking-water cycle. Moreover, in addition to its characteristics of neutrality and hygiene, stainless steel also possesses machinability properties that allow designers to experiment with a vast range of solutions in shape and in size.

These examples were made using EN 1.4404 (AISI 316L) stainless steel elements obtained by turning and assembled using TIG welding and are available in three types of surface finish: brushed, satinised and polished.

Fig. 1 – "Sea" model, clean, simple and small. Figs. 2 and 3 – Mechanical taps with timer "Egg" and "Fly", ideal for public places.

Figs. 4 and 5 – "Scar Mono" and "Scar Mix" models, both reclining, therefore ideal for use in limited spaces.

Fig. 6 – The "Fly" model, set on a stainless steel basin.

Taps production: Inox Tap – Via dell'Edera 7 - I-28021 Borgomanero NO - Phone +39 0322 831276, fax +39 0322 868350, info@inoxtap.it, www.inoxtap.com

Stainless steel washbasin: Spainox – Lungobisagno Iстриa 23/B/R - I-16141 Genova GE - Phone +39 010 873228 / 883473, fax +39 010 886928, spainox@tin.it

**PAGE 14****THE "NORTH-WEST THROUGH-ROAD" (Il "Passante a Nord Ovest")**

The "North-West through-road", or the longest city tunnel in Europe, which passes under the Monte Mario hill, was opened in Rome on December 22<sup>nd</sup> 2004.

More than 300 tonnes of VERNEST® pre-painted polychrome stainless steel were installed along the approximately 6-km long route, in a sequence of shades of colour and of luminescence, thus helping drivers' eyes to get accustomed to changing degrees of light. The particular environmental conditions inside road tunnels induce corrosion phenomena on the metal substrata. The sheets used possess: greater stability against corrosion in a pH-range that is far greater than other metal substrata; the absence of rust drippings; the absence of paint flaking as a result of "cathode detachment" phenomena.

The metal linings contribute towards improving safety in the tunnels: they convey dripping water, maintain a good degree of luminosity, facilitate the application of signs and notices.

Moreover, in the event of fire, the structural resistance of stainless steels as temperature increases is far higher than aluminium, deteriorating less rapidly even compared to carbon steels. The minimal thickness of the organic coating of the VERNEST® panels (<25µm) does not contribute to the spread of fire (Class 0 in accordance with M.D. dated 26.06.84), and the density of the smoke produced is absolutely negligible with respect to commonly-accepted safety limits.

The high degree of ductility of the stainless steel substrata and of the VERNEST® coatings makes it possible to carry out operations of forming and drilling on site or on already-installed panels, without reducing the corrosion resistance of the panel itself.

The panels have a low degree of dirt retention and can easily be washed without scraping off the outer coating that, in the event of surface damage, can easily be repaired.

For painting its stainless steels, ThyssenKrupp Acciai Speciali Terni, the owner of the VERNEST® trademark, as a practice uses chrome-free primers and polyester top-coats with pigments free from heavy metals; the aim of this choice is that of eliminating toxic substances and practically zeroing out dangerous fumes in the event of a fire.

VERNEST® materials are supplied by: ThyssenKrupp Acciai Speciali Terni S.p.A. - Viale Benedetto Brin 218 - I-05100 Terni; Sales: Ing. M. Moriconi, phone 335.7296256, m.moriconi@acciaiatermi.it; Marketing: Dr.ssa V. Fontana - phone 0744.490867, fax 0744.490879, marketing@acciaiatermi.it, www.acciaiatermi.it

Realisation: S.P.A.I. Srl - Via Guido d'Arezzo 15 - I-20145 Milano MI / Technical Spa - Via Ugo La Malfa 76 - I-25050 Provaglio d'Iseo BS - Phone +39 030 9883191, fax +39 030.9882599, protec@numerca.it

**Meeting****STRUCTURAL USES OF STAINLESS STEELS**

**(Impieghi strutturali degli acciai inossidabili)**

Udine, Thursday, 19<sup>th</sup> May 2005 - 9.00 a.m. - Centro Convegni Palazzo delle Professioni

The meeting is organized by Centro Inox and Centro Convegni Palazzo delle Professioni. Stainless steel has been traditionally used in the building sector because of its properties of corrosion resistant material. Recently, the interest of design engineers has considerably grown in all those applications in which stainless steel is used also for its structural properties (fire resistance, anti-seismic features, etc.). The meeting language is Italian.

**Programme:**

9.00 Registration

**Welcoming address** - Prof. Andrea Stella - Dean of the Engineering Faculty, Università degli Studi di Udine

**Introduction** - P.i. Paolo Querini - President, Centro Convegni Palazzo delle Professioni, Udine; Ing. Fausto Capelli - Managing Director, Centro Inox, Milano

**Structural stainless steels for the building industry: standards, eurocodes and examples of applications** - Ing. Vittorio Boneschi - Centro Inox, Milano

**Fire resistance and potentialities in seismic areas** - Dr. Massimo Barteri - Centro Sviluppo Materiali, Roma

Coffee break

**Stainless steel market in the building industry. Presentation of the "Design manual for structural stainless steels"** - Ing. Paolo Viganò - Centro Inox, Milano

Debate and Lunch break

**The behaviour of stainless steels towards corrosion** - Prof. Pietro Pedeferrì - Full Professor of Materials Corrosion and Protection, Department of Chemistry, Materials and Chemical Engineering "Giulio Natta" - Politecnico di Milano

**Application examples: the experience of the Italian technology** - Ing. Marzio Perin, Ing. Olindo De Luca - Permasteelisa Spa, Vittorio Veneto TV

For registration and information:

CENTRO INOX - eventi@centroinox.it - www.centroinox.it

**PAGE 16****STAINLESS STEEL GIVES VOICE TO POWER (L'inossidabile dà voce alla potenza)**

One of the problems that technicians had to face while developing the hulls that took part in the Class 1 World Championship was that of cooling the engines and compartments in which they are housed. The solution to this problem lies in the use of sea water: after passing through the oil cooler exchanger, the engine and finally the exhaust-pipe interspace, sea water makes it possible for the excess heat produced by the propulsor to be dispersed. It is important, however, to choose the most appropriate materials for this purpose: the combination of high temperatures and sea water, in fact, create an extremely corrosive environment.

Thanks to its high corrosion-resistant properties, stainless steel made it possible to construct the exhaust system. Made up of four manifolds and four mufflers, this system has a particular interspace, with an average height of 2.5 mm, for the passage of cooling water. The inner part of the exhaust is made from a flattened sheet of Inconel (an alloy with a large percentage of nickel), subsequently welded, whereas the outer side is made using an EN 1.4301 (AISI 304) austenitic stainless steel pipe, with a diameter of 60 mm and thickness of 1.5 mm. The part is then welded using the TIG (Tungsten Inert Gas) welding process in an argon atmosphere, first on the inner joints and then on the outer ones.

The cooling manifold is also made from EN 1.4301, as are the flanges connected to the cylinder head and the muffler.

Marine engines: Motori Marini Lamborghini Spa - Via Modena 12 - I-40019 Sant'Agata Bolognese BO - Phone +39 051 6817741, fax +39 051 6817753, www.lamborghini.com

Exhaust systems: Tubi Style Srl - Via Taruffi 16 - I-41053 Maranello MO - Phone +39 0536 1844100, fax +39 0536 1844101, info@tubistyle.it, www.tubistyle.it

Stainless pipes: Ilta Inox Spa - S.S. 45 bis km 13 - I-26010 Robecco d'Oglio CR - Phone +39 0372 9801, fax +39 0372 921538, sales.ilta@arvedi.it, www.arvedi.it/ilta

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