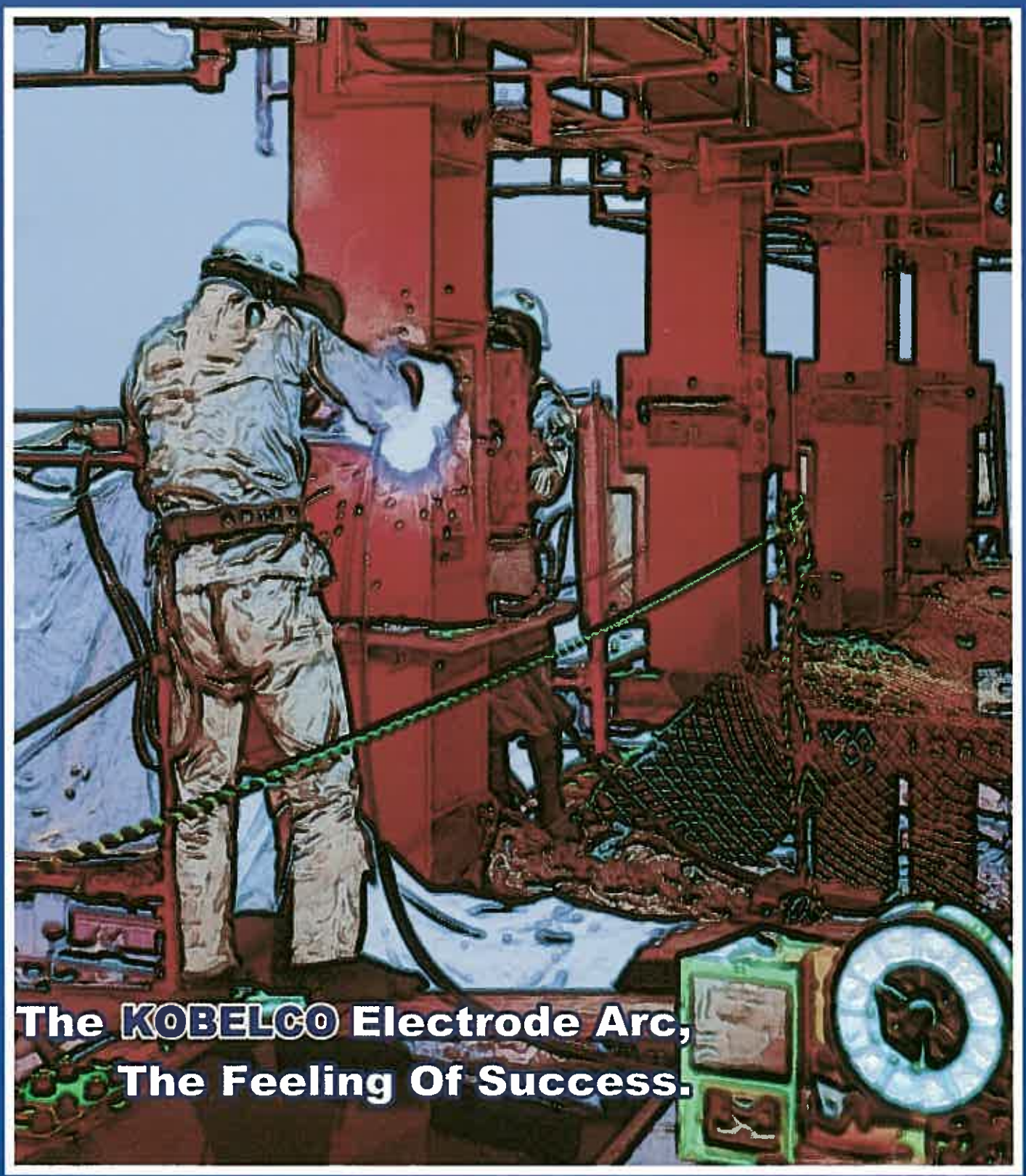
KOBELCO WELDING TODAY

January 2000
Vol.3 (No.1)



The Largest Shipyard in Thailand is Hot in Quality Assurance Activities Targeting A Big Stride in the 21st Century

Placing particular importance on delivering products to high international quality standards, Unithai Shipyard and Engineering (UTSE) has independent Quality Assurance and Quality Control Departments. Having developed and implemented quality assurance systems conforming to ISO 9002, UTSE's Quality Management System was certified in 1999. UTSE is on its continuous implementation of the established quality assurance system, encouraging its 700 employees to abide by its slogan:

•KNOW YOUR JOB, KNOW YOUR CUSTOMER!
•THINK QUALITY BE A QUALITY WORKER!
•DO IT RIGHT THE FIRST TIME, EVERY TIME!

UTSE is centrally located in the Asian region and easily accessible from major shipping routes. Positioned to offer a competitive service in the region, UTSE's internationally experienced management team leads a highly skilled workforce, with a track record demonstrating attention to quality, efficiency, safety and on-time performance. UTSE owns and operates the largest shipyard in Thailand, located in the deep-sea port of Laem Chabang on the eastern seaboard on the Gulf of Thailand. The yard is developed on 500,000 m² of reclaimed prime water frontage adjacent to the main port area. As a member of the Unithai Group of Companies, UTSE provides services of a complete range of ship repair, modification and conversion capabilities, and general heavy fabrication activities.

Fig.1 – Unithai 1: a floating dock with a docking capacity of 140,000 dwt vessels contains a ship under repair.

Since the first ship was dry-docked for repair in September 1993, the size and complexity of repair contracts undertaken have grown to the extent that UTSE can provide a complete range of ship repair services. The main facilities are:

- Docks: a floating dock, "Unithai 1", with a lifting capacity of 40,000 tonnes is capable of docking cape-size ships up to 140,000 dead-weight tonnes. In addition, UTSE has a plan to expand its ship repair capacity by employing a new floating dock in the near future.
- Berths: a 390-m quay wall for afloat-repair, UTSE has a plan to expand repair quay capacity by constructing an additional quay.

Fig. 2 – Heavy steel structures are fabricated by using SAW, GMAW, and SMAW processes

The Heavy Fabrication Division of UTSE has completed projects in the infrastructure development, chemical, oil, gas, and power industries of Thailand and South East Asia. The Division is geared for a steel throughput of over 20,000 tonnes per year, expanding its throughput in order to cope with an increasing demand in steel fabrication.

The deep-sea port location of the heavy fabrication facilities provides the unique capability to directly load materials and equipment to and from vessels. UTSE, therefore, can produce very heavy load-out structures that can be transferred directly from their production position onto vessels, or floated from the slipway for transportation by sea to projects throughout South East Asia.

In ship repair, E6019 and E7016 are the main types of electrodes. While, in heavy fabrication, E7016, E8016-C3, ER70S-6, E71T-1, and F7A2-EH14 are the main types of welding consumables including Kobelco's quality products: MG-51T, LB-52, LB-52U and LBW-588.

(Reported by S. Yamamoto, KWT editorial staff)

Message from the Editor

General Manager
International Operations Department
Welding Company
Kobe Steel, Ltd.

To our dearest readers of Kobelco Welding Today: I am very happy to share with you the joy of hailing the year 2000, the last milestone to a new era.

About 110 years have elapsed since arc welding was invented. It goes without saying that arc welding made a great contribution to the progress of heavy industries around the world this century. Its long life as a basic technology has been supported by unceasing and strenuous researches on welding materials and developments of new welding processes. The era of the 21st century, I believe, will see further development in welding technologies along with technical innovations in steel materials. As a leading manufacturer, we the Kobelco Welding Group, are firmly determined to continue to study new welding consumables and develop new welding procedures worthy of the new epoch that will contribute to prosperity of our customers.

As we head towards the new millennium, let me wish you, your family, and your friends all the happiness and prosperity.

Tetsuo (Tom) Konohira
Editorial Chairman

Contents

KOBELCO PARTNERS

"Kim Chong Hin had imported RB-26 from Japan for sale in Thailand's market since 1959. As the sales volume and popularity of RB-26 increased, Kobe Steel, Kanematsu Gosho, and Kim Chong Hin forged a partnership to establish Thai-Kobe Welding in 1968. With a business relationship of over 40 years, we know Thai-Kobe is able to overcome any economic burden; the key reason is the strong unity of Thai Shinyokai Sales Network. Although it was introduced to Thai market only nine years ago, its function works well even during an economic crisis. We have built up good understanding and cooperation to achieve the sales target of Thai-Kobe. It requires good teamwork and achieving this is therefore a challenge to every member for fruitful 2000."

Kim Chong Hin Import Export Co., Ltd., Thailand
Mathee Jirabovonvisut, General Manager

DW-200

(AWS A5.20 E70T-1)

DW-200: A highly efficient slag-type flux-cored wire used, particularly, in shipbuilding and bridge construction. DW-200 offers large leg length one-pass fillet welds in horizontal and flat welding of mild steel and 490-N/mm² high-strength steel, using CO_2 shielding gas.

Under Proper Welding Conditions DW-200 Provides Large Leg Lengths

Fillet weld leg length can vary because of welding currents and welding speeds when the wire diameter is constant, as shown in **Fig. 1**. In order to assure a leg length of 9 mm or lager, the proper welding speed should be around 20 cm/min, using welding currents in the range of 280-310 Amp. In contrast, a conventional E70T-1 flux-cored wire (1.2 mmϕ) would result in a maximum leg length of 7.3 mm at a minimum welding speed of 30 cm/min.

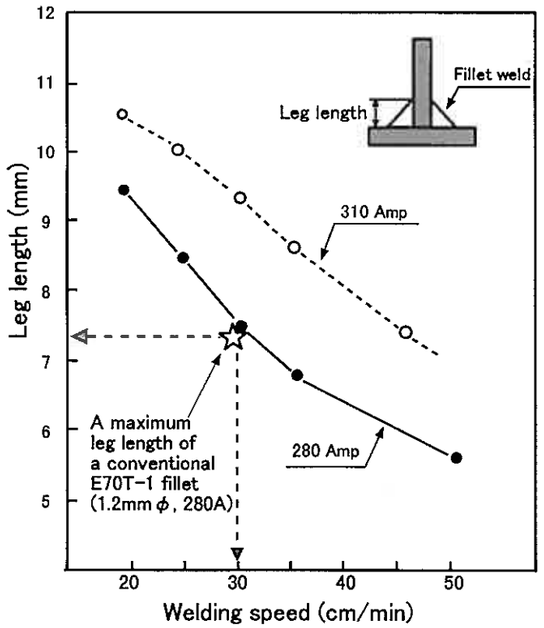


Fig. 1 — Relationship between leg lengths of fillet welds and welding speeds (DW-200, 1.2 mmϕ)

Fig. 2 shows smooth, uniform bead profiles of DW-200 fillet welds having a vertical leg of 9.5 mm and a horizontal leg of 10.5 mm.

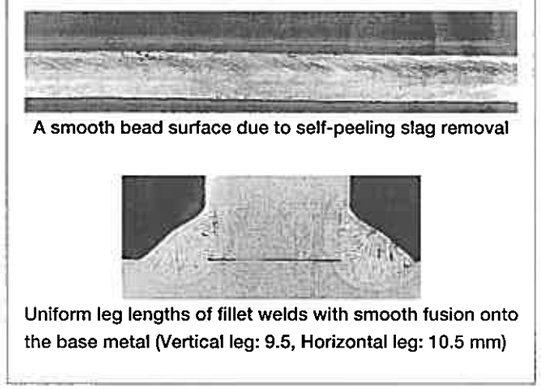


Fig. 2 — A smooth, uniform bead appearance and cross sectional profile of DW-200 horizontal fillet weld (Wire size: 1.4 mmϕ, Welding current: 330Amp, Arc voltage: 33Volt, Welding speed: 30 cm/min)

Excellent Mechanical Properties and Extra-Low Hydrogen Assure Reliable Fillet Welds

DW-200 has excellent mechanical properties and the deposited metal has extra-low hydrogen, as shown in Table 1.

Table 1 — Typical mechanical and chemical properties and diffusible hydrogen of DW-200 deposited metal (Wire dia: 1.2 mmϕ, CO_2 shielding)

Tensile properties				Impact values (J)	
0.2% Proof Strength (N/mm²)	Tensile Strength (N/mm²)	Elongation (%)	Reduction of area (%)	0℃	-10℃
480	570	29	69	92	60

Chemical composition (%)					Diffusible hydrogen
C	Si	Mn	P	S	
0.06	0.49	1.38	0.012	0.009	4.9(1)

Note (1) An average value of four specimens measured by the gas-chromatographic method

In What Applications Does DW-200 Shine?

Typical applications of DW-200 are seen in bridge construction and shipbuilding. In the construction of box girder bridges, the fabrication of box girders uses DW-200 for welding flange-to-rib joints. **Fig. 3** shows a highway bridge using box girders. **Fig. 4** shows a cross sectional structure of a box girder, which consists of several components including flange plates (upper and lower) and ribs (upper and lower) where DW-200 is used for fillet welding with one-pass, large leg lengths. **Fig.5** shows a cross sectional hull structure of a tanker, which includes shell-plate-to-transverse joints where DW-200 is used for fillet welding with one-pass, large leg lengths.

Fig. 3 — DW-200 welds sustain the structures of box-girder highway bridges

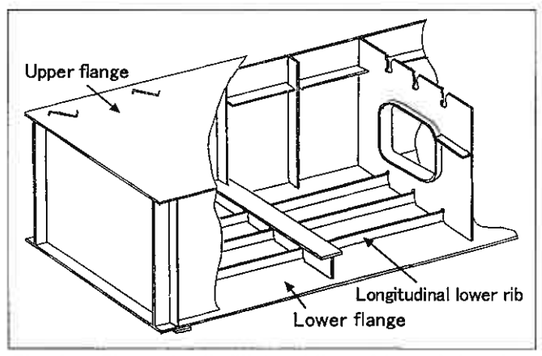


Fig. 4 — Flange-to-rib fillet welding of box girders is a typical application of DW-200.

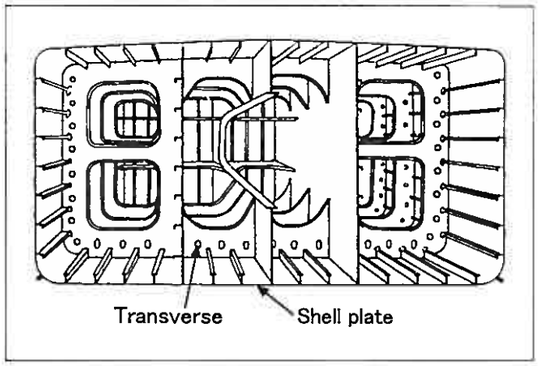


Fig. 5 — Shell-plate-to-transverse fillet welding is a typical application of DW-200 in shipbuilding

In bridge construction and shipbuilding, the welding processes have been mechanized and automated in order to increase welding efficiency and thereby decrease the welding costs, by employing potable welding carriages, line welders, and welding robots. In this innovation, gas shielded metal arc welding using flux-cored wires and solid wires has taken a great role because of high deposition rates and efficiency. **Fig. 6** shows a typical automation process for fillet welding employing line welders using DW-200. Some fillet joints use quite large leg lengths (9-12 mm) because of greater applied stresses. In those cases, conventional flux-cored wires need multi-pass fillet welds, while DW-200 can complete the fillet welds with one pass. One-pass welding is more beneficial than the multi-pass due to higher efficiency and less distortion.

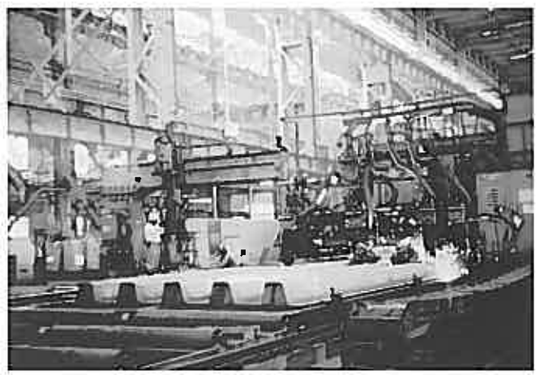


Fig. 6 — A typical automation of fillet welding by employing line welders for U-rib-to-flange joints of box girders, using DW-200

KOBELCO WELDING TODAY

LB-62

(AWS A5.5 E9016-G)

LB-62: An unsurpassed covered electrode for welding storage tanks, pressure vessels, and penstocks using 550-610N/mm² high-strength steel, offering moisture-resistance and extra-low hydrogen.

Moisture-Resistant LB-62 Can Reduce the Need of Redry

The coatings of covered electrodes naturally pick up moisture from the air because of the nature of their raw materials (fluxes). How much moisture is absorbed, however, varies depending on the ingredients in the fluxes. The coating of LB-62 picks up less moisture because the flux is more resistant to moisture when compared with conventional covered electrodes - **Fig. 1**.

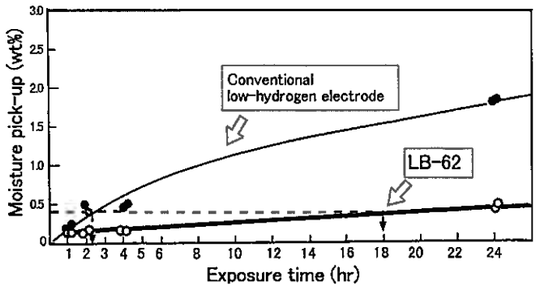


Fig. 1 — Test results of LB-62 and a conventional low-hydrogen electrode in terms of moisture pick-up under the controlled atmosphere: 30℃ × 80%RH.

When a welding job requires that the maximum allowable moisture content of low-hydrogen electrode coatings must be 0.4% by weight, conventional electrodes must be redried approximately every two hours, In contrast, LB-62 can be used longer in a temperature-relative humidity condition of 30℃× 80% RH, as shown in Fig. 1. The temperature-relative humidity combination predominantly affects the rate of moisture pick-up. This superior resistance to moisture makes quality control easier and more economical by reducing the frequency of redrying at fabrication and construction sites, particularly, in such humid job sites as penstocks construction sites.

Extra-Low Hydrogen LB-62 Minimizes the Preheating Temperature

LB-62 is designed and produced so that the deposited metal contains less diffusible hydrogen in comparison with conventional low-hydrogen electrodes. **Fig. 2** shows test results of diffusible hydrogen as functions of moisture pick-up and temperature-relative humidity conditions of the testing atmosphere. The figure illustrates that in LB-62 deposited metal much less diffusible hydrogen evolves than with conventional low-hydrogen electrodes in both as-redried and 4-hour-exposed conditions. In addition, the 4-hour-exposure to the testing atmosphere of 30℃ × 80%RH causes a slight increase of diffusible hydrogen compared with the as-redried condition in the case of moisture-resistant LB-62, while a conventional electrode causes a pronounced increase of diffusible hydrogen.

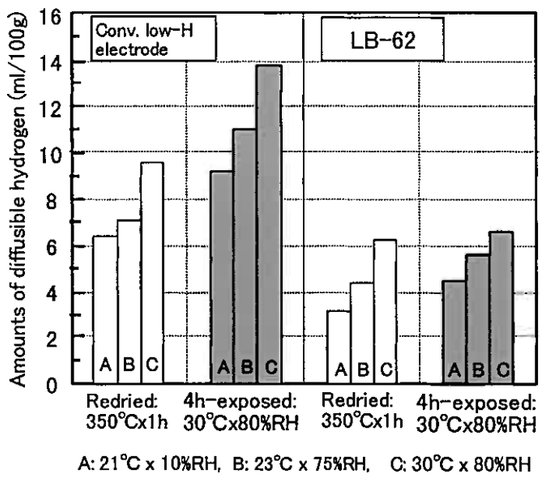


Fig. 2 — A comparison between LB-62 and a conventional low-hydrogen electrode on amounts of diffusible hydrogen evolved from deposited metal

When chemical composition and thickness of the base metal are constant, cold crack susceptibility of welds is increased by diffusible hydrogen in the weld metal. Extra-low hydrogen LB-62, therefore, can decrease crack susceptibility, or it can lower the minimum preheating temperature to prevent cold cracking. It is recommended to preheat work at a temperature range of 50-100℃ depending on chemical composition and thickness of the base metal.

Field-Proven LB-62 Assures Persistent High Quality with a Long History of Reliability in Welding Thick-Section Work

Since it was launched in 1958, LB-62 has seen its features refined and its markets expanded. Nowadays, the main applications of LB-62 are seen in the fabrication of storage tanks, pressure vessels, and penstocks (**Fig. 3**). In order to cope with strict requirements needed in the fabrication of such equipment, Kobe Steel pursues keen quality control.

Fig. 3 — The construction of penstocks for hydraulic power generation requires the welding procedures be strictly controlled, because the welding circumstances are very severe in terms of humid welding atmosphere, and confined welding spaces.

The strict requirements in the construction of penstocks include persistent tensile strength and impact value of the welds in the all-position welding of thick-section work. **Figs. 4** and **5** show tensile test results and Charpy impact test results of LB-62 weld metals respectively. The tensile test results show stable tensile strength and 0.2% proof strength being affected little by postweld heat treatment over a range of temper parameters. The impact test results show stable absorbed energies with little scattering over a range of testing temperatures both in as-welded and postweld heat treated conditions.

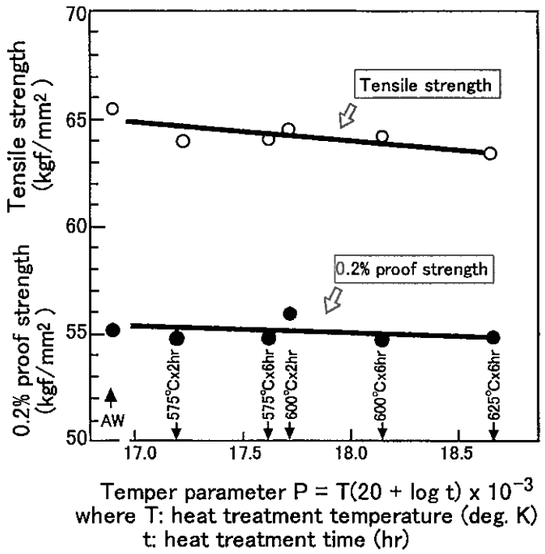


Fig. 4 — Stable tensile properties of LB-62 deposited metals being affected little by postweld heat treatment over a range of temper parameters

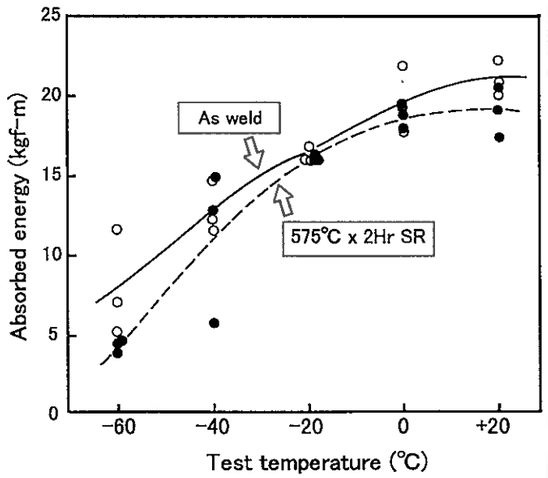


Fig. 5 — Stable impact properties of LB-62 deposited metals with little scattering over a range of testing temperatures both in as-welded and postweld heat treated (SR) conditions

Fillet Weld Legs Determine Size and Throat of Fillet Welds

In heavy machinery, ships, and buildings, extensive frameworks and intricate angles may be composed of many kilometers of welded joints. Among them, fillet welds are used to join corners, Ts, and lap joints because they are more economical than groove welds. That is, fillet welded joints are simple to prepare from the standpoint of edge preparation and fit-up.

The strength of a fillet weld is based, in the design, on the product (effective area of the weld: T × W) of the theoretical throat (design throat thickness) and effective weld length as shown in **Fig. 1**. Fillet weld legs determine fillet weld sizes. Fillet weld sizes are measured by the length of the legs of the largest right triangle that may be inscribed within the fillet weld cross section.

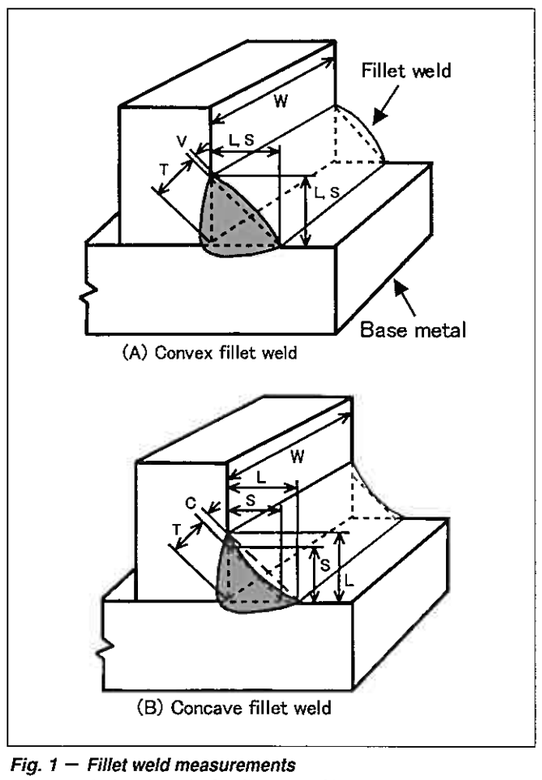


Fig. 1 — Fillet weld measurements
L: Leg length, S: Fillet weld Size, T: Theoretical throat, V: Convexity, C: Concavity, W: Effective weld length

Fillet weld sizes determine theoretical throat. The product of the size and cos45°in case where an isosceles right triangle may inscribe within the fillet weld cross section: S × cos45°= 0.7S, as shown in **Fig. 2**.

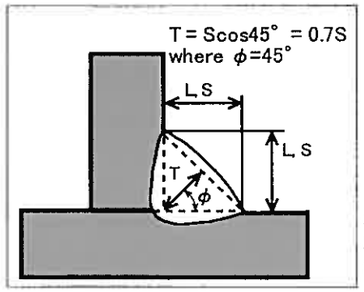


Fig. 2 — How to calculate theoretical throat

Fillet weld sizes must be large enough to carry the applied load, but the specified fillet weld size should not be excessive to minimize welding distortion and costs. AWS D1.1 (Structural Welding Code — Steel) specifies the minimum fillet weld size for each base metal thickness: e.g. 6-mm size for thickness over 12.7 up to 19.0 mm. AWS D1.1 also specifies the maximum convexity, because excessive convexity may cause stress concentration at the toes of the fillet weld, which may result in premature failure of the joint. In quality control of fillet welds on actual work, leg or size, throat, convexity, and concavity are inspected by using several types of welding gages. **Fig. 3** shows a multipurpose gage measuring a fillet weld leg.

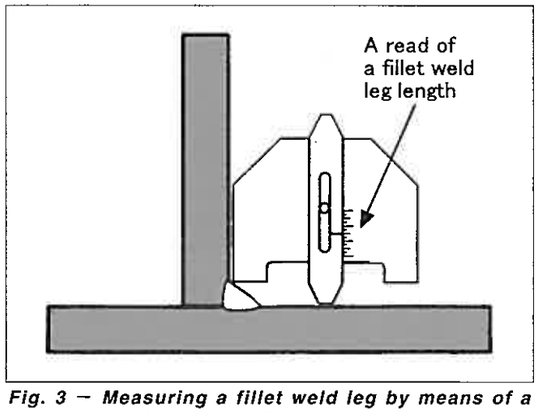
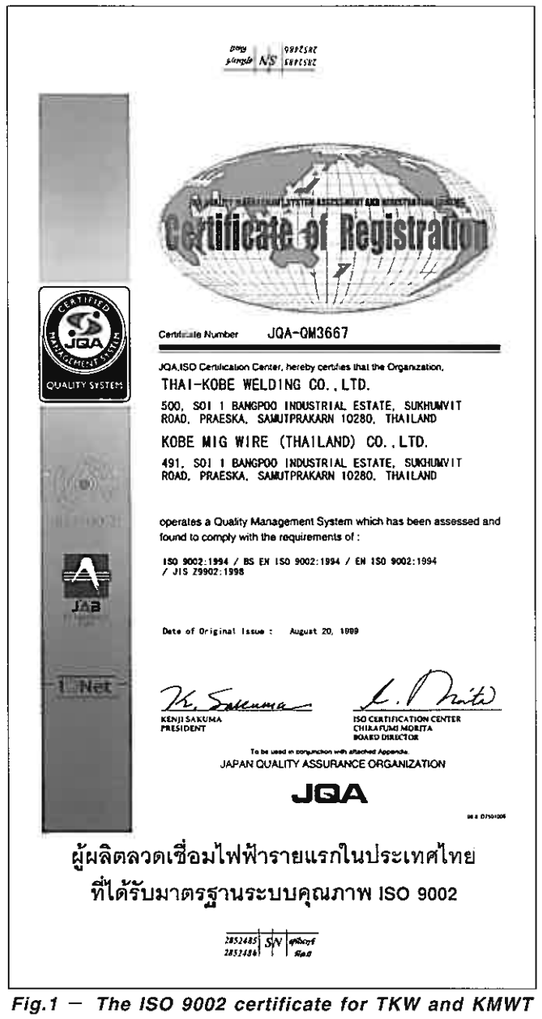


Fig. 3 — Measuring a fillet weld leg by means of a multipurpose welding gage

ISO 9002 Certificate Encourages Persistent QC and QA Activities for Upgrading Quality at TKW

Thai-Kobe Welding (TKW) is a covered electrode manufacturer established in 1968. Its sister company, Kobe MIG Wire (Thailand) (KMWT), is a solid wire manufacture established in 1988. Both companies make their products under license from Kobe Steel. We pursue keen quality control of the products for upgrading the quality by means of our own quality management system.


Certificate of Registration

Certificate Number JQA-QM3667

JQA,ISO Certification Center, hereby certifies that the Organization,

THAI-KOBE WELDING CO., LTD.

500, SOI 1 BANGPOO INDUSTRIAL ESTATE, SUKHUMVIT ROAD, PRAESKA, SAMUTPRAKARN 10280, THAILAND

KOBE MIG WIRE (THAILAND) CO., LTD.

491, SOI 1 BANGPOO INDUSTRIAL ESTATE, SUKHUMVIT ROAD, PRAESKA, SAMUTPRAKARN 10280, THAILAND

operates a Quality Management System which has been assessed and found to comply with the requirements of :

ISO 9002:1994 / BS EN ISO 9002:1994 / EN ISO 9002:1994 / JIS Z9902:1998

Date of Original Issue : August 20, 1999

KENJI SAKUMA
PRESIDENT

ISO CERTIFICATION CENTER
CHIKAFUMI MORITA
BOARD DIRECTOR

To be used in conjunction with attached Appendix.

JAPAN QUALITY ASSURANCE ORGANIZATION

JQA

ผู้ผลิตลวดเชื่อมไฟฟ้ารายแรกในประเทศไทย
ที่ได้รับมาตรฐานระบบคุณภาพ ISO 9002

Fig.1 — The ISO 9002 certificate for TKW and KMWT certified by Japan Quality Assurance Organization (JQA)

Fig.2 — The project team feeling relieved from the stressful work of preparing for the audit by the Quality Management System as per ISO 9000 (From front-center to right: Takagi, MD, Nakamura, GM)

Our routine activities of QC and QA, in accordance with Kobelco's QTQ slogan, worked effectively for the preparation of the Quality Management System as per ISO 9000. Both TKW and KMWT, however, had to work harder in the acquisition activities for the ISO certificate in 1998-1999. On August 20, 1999, our Quality Management System was assessed as sufficiently in compliance with the requirements of the ISO 9002 standard; then we could get the certificate from the Japan Quality Assurance Organization (JQA) that is a member body of the International Certification Network (IQNet).

TKW and KMWT are the first welding consumable manufacturers in Thailand to be certified by the ISO 9002 standard. In that sense, we are now leaders in the Thai welding market in terms of quality assurance activities, too. At the same time, we have joined the companies certified by the ISO standard, within Kobelco Welding Group. Our entry to the ISO-certified companies will work effectively to strengthen the Group, we hope.

Reported by
Surachai Sangthian
Q&T Manager, TKW/KMWT

Singapore Welding Arcs Highlight the Way of Economic Recovery

The Essen Welding Fair Asia ran at the Singapore Expo from October 19 through 21, 1999. The Fair was held under the auspices of Messer Essen which holds the world's biggest welding fair every four years in Germany. Co-sponsors were Tube Singapore and Wire Singapore.

About 400 enterprises from 36 countries around the world participated. 44 of these companies representing 16 countries operate in the area of welding and thermal cutting, and, among this group, 28 companies from 10 countries came from Europe and America From Asia, where many countries have been suffering from ailing economies brought on by currency crises, there were seven companies from China, Taiwan, Korea, as well as Singapore, home to the Fair, and neighboring Malaysia.

Kobe Steel and Kobe Welding Singapore (KWS) took part in the Fair jointly with their booth, bigger than the others and built in front of the main entrance. The focus of the exhibits was placed on the flux-cored wires that are used more and more in such fields as shipbuilding and fabrication of chemical engineering machinery. A wide line-up was introduced from DW-100, now a synonym for the flux-cored wire for carbon steel, to wires for low-temperature steel and stainless steel. Exhibition of the welding consumables for Cr-Mo steel, long used with a high reputation in various parts of the world, drew a great deal of interest, and visitors asked question after question about the usage.

Fig.1 — During the welding demonstration of DW-100 and DW-308L, visitors looked fascinated by soft sound of welding with little spattering and the beautiful weld bead.

(Reported by K. Harada, KSL)

Thai-Kobe Welding Seminar: Welcomed in Myanmar

Fig.1 — All the participants are concentrating on a rare chance to learn advanced welding technologies

Thai-Kobe Welding implemented a welding seminar at the Myanma Shipyards in Yangon city in Myanmar from September 27 to October 1, 1999. This welding seminar was organized by the Association for Overseas Technical Scholarship (AOTS) of Japan, Thai-Kobe Welding, and Daihen Asia. Local cooperative organizations also contributed to the success of the seminar. In particular, we were grateful to have the cooperation of the Foreign Economic Related Department of Myanmar, Nissho Iwai Yangon Office, and the Myanma Shipyards.

At the opening ceremony of the seminar, Mr. Araki, M.D. of JETRO Yangon, stressed the importance of welding technology as a fundamental part of engineering for steel fabrication and construction in his opening remarks in front of a lot of guests and participants. All 33 participants were from the government sectors involved with the industry.

The lecture program contained a wide range of subjects: (1) Welding processes and equipment, (2) Welding robots and advanced welding equipment, (3) Welding consumables, and (4) Welding design and fabrication. In addition to the lectures, all the participants practiced SMAW, GMAW, and maintenance of welding power sources. After the completion of the seminar, all the participants expressed a desire for repetition of this program in the future.

(Reported by K. Suzuki, TKW)

In the US, KWAI is the nation wide supplier of "the spool of excellence"

North America's largest annual metal forming and fabricating exposition and conference was held in Chicago, Illinois in US. This FABTECH International '99 was the largest show in its history. More than 900 exhibitors from around the world, including Korea, Taiwan and Japan, occupied more than 400,000 square feet to show the industry's latest technologies from Nov. 14-18. As the industry's most complete display of technologies, it featured equipment for bending, folding, cutting, roll forming, coil processing, stamping, tube and pipe producing and fabricating, and welding.

Kobelco Welding of America (KWAI) was there to introduce KOBELCO's welding consumables, such as DW-100V and DWA-55ESR, and demonstrated how well KOBELCO's wire worked. KWAI also announced their new catch phrase "the spool of excellence" for their flux cored wire products. This phrase tells you everything you need to know about KOBELCO's wire: beautiful bead appearance, less spatter, less fume, better welding characteristics.

Fig,1 — The KWAI booth reflects the new catch phrase "the spool of excellence" for their flux cored wire products.

As you can imagine, so many visitors looking for equipment would be customers for welding consumables as well, and they engaged us at our booth during the show. We are sure that they left the show with knowledge that would maximize their operation's efficiency and productivity. KWAI will be right there to serve its customers at anytime with its excellent welding consumables, solid technical support and well-organized delivery system.

(Reported by Y. Nakai, KSL)

Editorial Postscript

SOJOM 2000 Exhibition, a Symposium of Joining of Materials, was held in Tiruchirappalli in the south of India during January 20-23. This event enhanced the partnership between Kobe Steel, Nikko Boeki Kaisha, and Weldwell Speciality through a corporate exhibition, which will be detailed in the next issue.

You may have been to the Japan International Welding Show, a biannual event in Japan. You will have another chance to visit this show at Intec Osaka during April 12-15, 2000. The main theme of the Show is "the welding and joining key technologies that will open the door to the 21st century."

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WELDING CONSUMABLE

KOBELCO

THE WORLDWIDE MANUFACTURER

Landmark Tower In Japan

GLOBAL MANUFACTURING AND SALES BASES

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