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HYUNDAI WELDING

WELDING SOLUTIONS FOR STRUCTURAL ENGINEERING

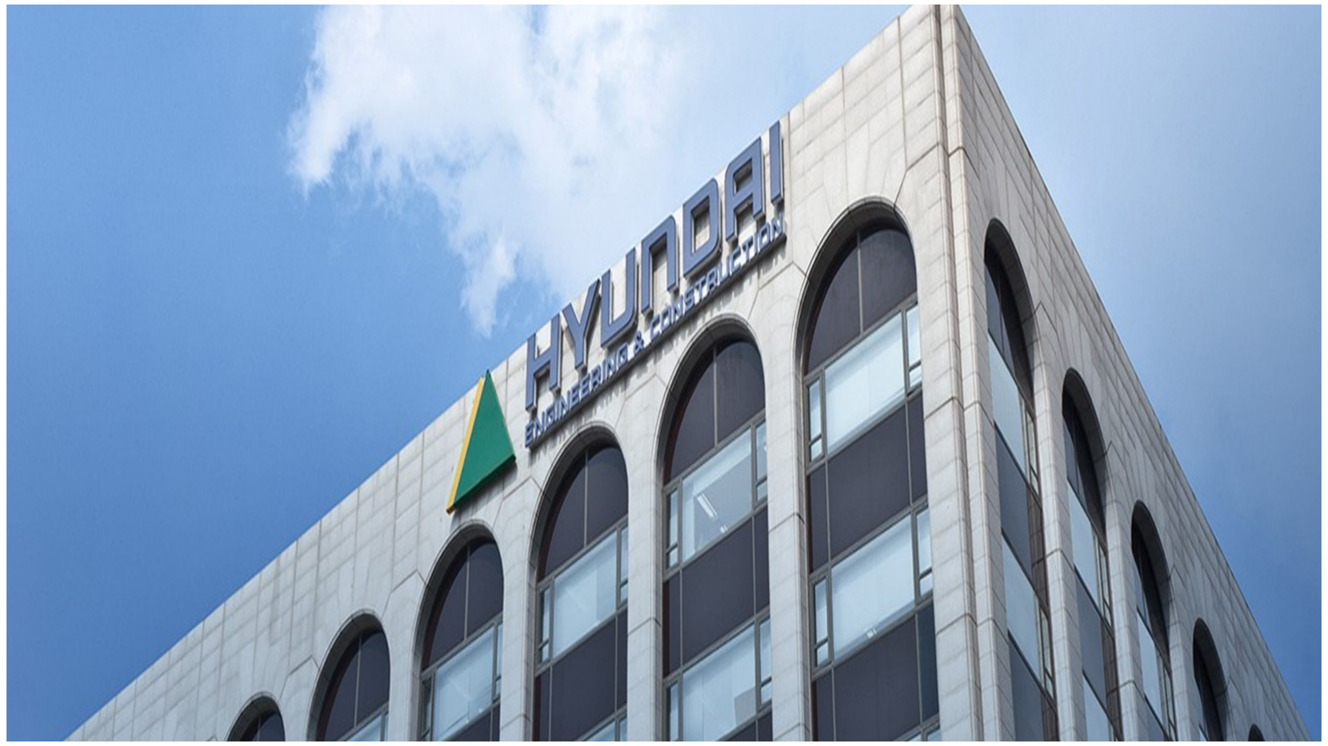
CONTENTS

HYUNDAI WELDING PREFERRED PARTNER FOR CONSTRUCTION PROJECTS

The construction sector's significance extends beyond physical structures only. It reflects economic progress, societal development and job creation and, as such, plays a paramount role in improving people's living standards. The sector can be roughly divided into four main sectors distinguished by the kind of structures they fabricate; public constructions, industrial constructions, infrastructure and civil engineering. Well-managed, these can durably sustain a major part of a country's gross domestic product and even transform entire economies and international trading, as in the case of the Panama and Suez canals. In terms of civil engineering, the many hydropower plants in operation and planned across the world are elementary in the generation of green energy to counteract global warming, while sea defences like the Dutch Delta Works, will be increasingly needed to cope with the rising sea level.

Concrete is the primary building material used throughout the construction sector, but in many projects steel frames are used to provide the primary support. Apartment flats, railway stations, sport stadiums, bridges and distribution centres would be unthinkable without their frames made from columns, beams, trusses and other steel components bolted, riveted or welded together.

Welding in the construction industry is subjected to ensuring proper techniques, quality control and adherence to safety standards. As a sister company of Hyundai Engineering & Construction within the Hyundai conglomerate, Hyundai Welding has been involved in many construction projects. In fact, Hyundai E&C was the first Korean construction company to expand its activities overseas to the Middle East and beyond, to which Hyundai Welding responded with the development of a vast range of dedicated welding consumables for steel structures.

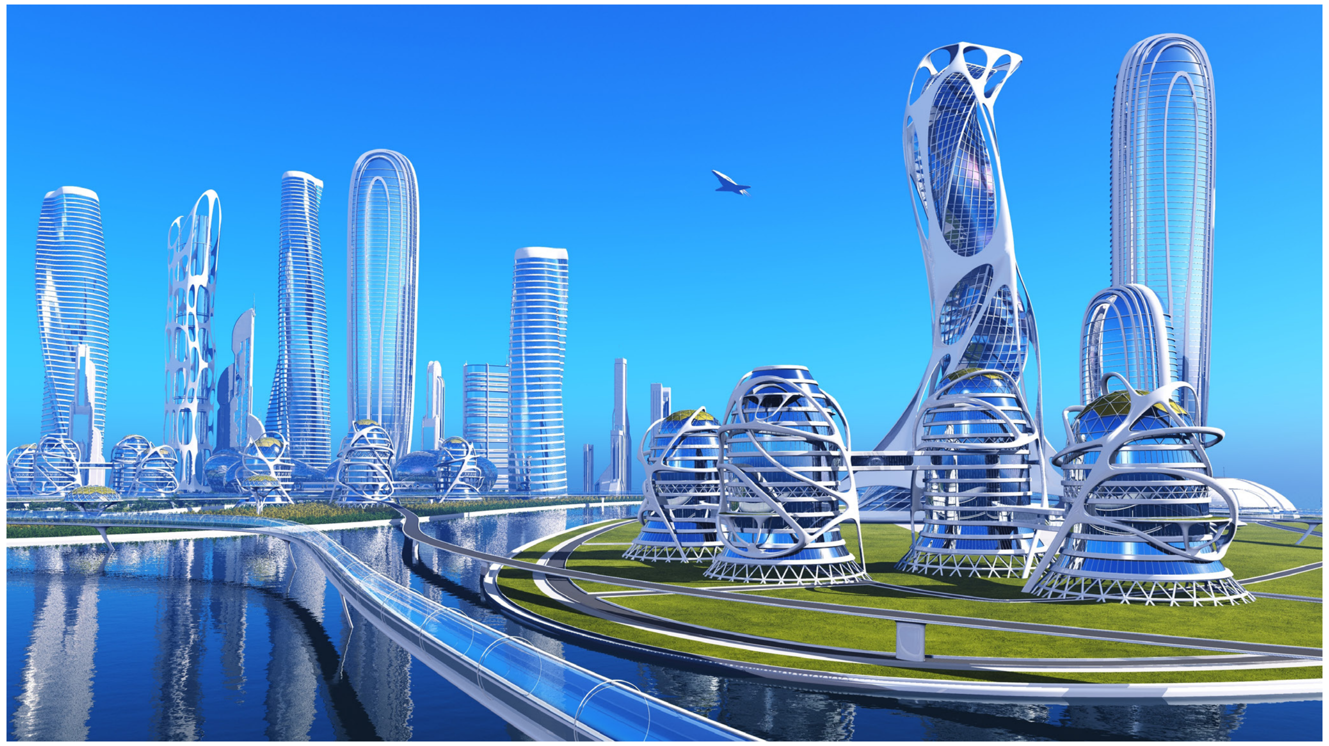


NEW CHALLENGES AHEAD FOR THE CONSTRUCTION INDUSTRY

Demand for modern structures is driven by factors such as a growing world population, economic development and urbanization. Changing societal needs, sustainability goals and technological advances require new thinking and visionary solutions. Governments, private sector entities and international organisations do address these diverse goals, which require careful planning, financing, and collaboration among stakeholders to ensure that projects are sustainable, efficient and aligned with the needs of communities and societies.

Neom, a new city planned in Saudi-Arabia, gives an insight in what city life may eventually become in the 21st century. It is a mega structure project projected across 170 km from the Mountains of Neom to the Red Sea. It towers 500 m above sea level, but is only a land-saving 200 m wide. People's health and well-being will be prioritised over transportation and infrastructure. It will run on 100% renewable energy and - apart from a high speed train with an end-to-end transit of 20 minutes - there will be no roads, cars or emissions. Residents will have access to all daily essentials within a five-minute walk.

Mega projects like these will expand and shape the urban landscape, spearheaded by Asia and the Middle East, and its spending will undoubtedly exceed the total of the preceding four centuries. Material science will pave the way for stronger, lighter and more enduring construction materials. Engineers will be able to design structures that can withstand harsh conditions and last for long periods of time using high-performance concrete and self-healing materials, including the recycling of plastics. Project conceptualization and execution will be improved by the use of building information modelling and 3D printing and through the use of artificial intelligence. A future of challenges lies ahead for the construction industry.



TYPES OF FACILITIES & STRUCTURES

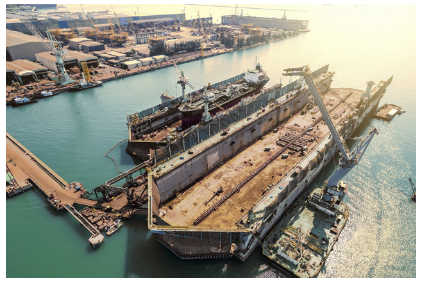

Skyscraper


Long Span Bridge


Stadium


Airport


Railway Station


Shipyard


Industrial Facility


Tunnel


Power Plant


Dam


Tower


Government Building

TYPES OF STEEL STRUCTURES USED IN CONSTRUCTION

Truss structures are characterised by their relative large span and little depth. A truss consists of an outer frame in any desired form which is reinforced by thinner, triangle shaped components. A truss converts weight into tension and compression forces and distributes them over the entire structure, while utilizing less material than a beam with the same load bearing capacity. Trusses are most commonly used for roofs of buildings and bridges.

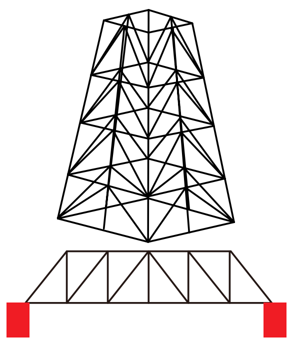
Framed structures are composed of beams that are connected to columns. The loads of roofs, floors (slabs) and panel walls are supported by the beams which transmit these loads to the columns and ultimately to the foundation. The rectangular areas of a structural frame are often braced by diagonal bars to make them better resist lateral forces (wind). Framed structures are commonly used for building, often combined with truss structures for the roofs.

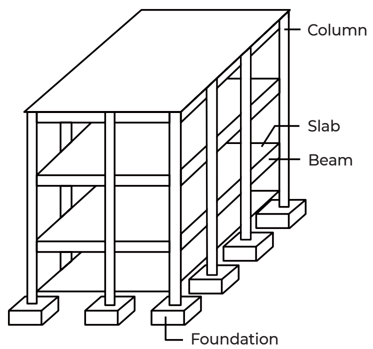
Arch structures are curved vertical structures spanning an open space underneath. The arch supports the load above it by accommodating its compression forces. Arch structures are common in bridge building, but are also used for other purposes such as the roofs of buildings. Classic railway stations are an appealing example of their use.

Cable and arch structures are used in situations where trusses or arches alone are not feasible, using the rigidity of arches and the flexibility of cables. They are essentially structures stabilized through the cables by tension rather than by compression. Long spans are supported by cables attached to arches, to pylons or to both. Cable and arch constructions are commonly, but not exclusively, used for long span bridges, due to their efficiency.

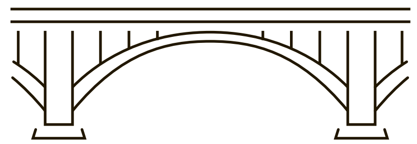
Pre-engineered structures are buildings systems that are designed and manufactured off-site in a factory before being transported to the construction site for assembly. It is a cost-effective and time-efficient alternative to traditional construction methods.

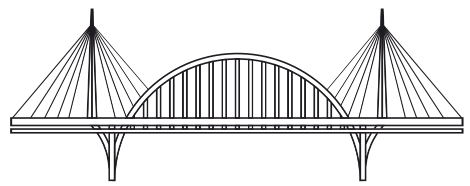
Composite structure is a structure in which different materials such as timber, steel, concrete, and masonry are used together for construction. The most common type of composite construction is the use of steel and concrete to form structures.


Truss structure



Frame structure


Arch structure


Cable and arch structure

STEEL GRADES USED IN BRIDGE BUILDING

Designers have a wide variety of structural forms available for bridges, but essentially they fall into one of four groups: beam bridges, arch bridges, cable stayed bridges and suspension bridges.

Amongst bridge materials, steel has the best strength qualities enabling bridges with the longest spans. Often it is combined with concrete for pylons. Arches, when applied, can be made out of concrete, but for longer bridges steel is preferred using a box or a truss structure. Ordinary carbon steels with a guaranteed yield strength of 235 and 275 MPa, such as ASTM A36 and EN grade 235 and 275, are still widely used.

Modern TMCP (thermo-mechanical control process) steel grades with an elevated strength level up to respectively 460 MPa and good weldability - such as EN 10025: S460ML - are getting more commonplace and even QT (quenched and tempered) grades with a strength level up to 690 MPa – such as EN 690QL - are nowadays pioneered for smaller bridges.

Use of weathering steels is the latest worldwide trend in bridge building. Using moderate alloying with elements such as chromium and copper, the steel develops a patina of protective oxides that delays atmospheric corrosion significantly, when exposed to the weather.

Weathering steels may be more expensive than normal carbon steels, but this is compensated for by a higher design lifetime and savings on painting, maintenance and inspection of bridges. Their use is most profound in the USA, where a special bridge grade was developed in the 90-s: ASTM A709 Grade HPS 70-W. It is produced up to 100mm thickness with a minimum yield stress of 100 ksi (485MPa), has good fracture toughness properties and good weldability. Similar grades in use in Europe are EN 10025-5: S420J2W and S420K2W.

Austenitic and duplex stainless steel is occasionally used for design footbridges in cities and for bearings and other bridge components that require anti-corrosion properties. They combine excellent resistance to general and localized corrosion with high strength and a nice cosmetic appeal.

Weathering Steel Bridge

Cable Stayed Bridge

A number of important welding applications are discussed using the example of a steel arch bridge. Elements such as beams and trusses, however, are applied throughout the structural fabrication segment, as are the methods to weld them together on-site.

Structural fabrication is characterised by a high degree of pre-fabrication, where transportation size beams, trusses, arch & pylon sections and deck sections are welded in workshops with varying degrees of automation. Profiles for beams and stiffeners may be purchased from steel mills or composed in required dimensions by welding steel sheet.

In bridge pre-fabrication, submerged arc welding (SAW) is by far the most applied welding process. It accounts for up to 90% of the deposited weld metal. Its high deposition rate, profound weld penetration and its ease of mechanisation, make it the ideal welding method for the many long, uninterrupted butt and fillet welds in the fabrication of deck sections and pylon & arch segments. Welded in the down hand position (1G/PA/2F/PB) – using welding tractors, booms or gantries - full advantage can be taken of the high SAW welding economy.

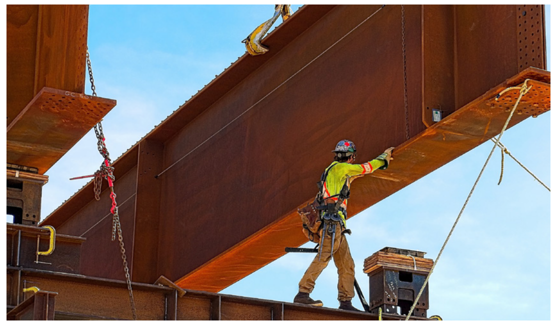
Fabrication of trusses forms another important application in structural fabrication as a whole. They are composed from cords and web reinforcements with round, square or other cross sections and the nodes where they meet involve short welds in a variety of welding positions; often with small included angles. These have traditionally been the domain of the manual welding methods GTAW, SMAW, GMAW, FCAW and MCAW.

The advent of robotised welding solutions and, lately, the use of artificial intelligence (AI), is bringing along great changes in the pre-fabrication of components for structural engineering. Digital power sources with possibilities to influence the arc behaviour of the GMAW process in any possible way and apply, for instance pulsed arc welding, took away traditional concerns regarding the integrity of welds. Associated software enables the storage and selection of pre-programmed welding sequences to execute the various steps in the robotised welding of trusses. Specialised robot line designers and integrators nowadays design, install and test complete robot lines for the fabrication of trusses, but also for columns, beams and entire sections. The latest robot equipment uses AI to scan the weld path and dimensions to automatically generate optimal welding parameters for the object to be welded. The self-learning character of these robot welding lines enables fabricators to perform non-serial production with greater flexibility.

Welding on-site is a completely different game. Some elements in the erection of structures are suited for mechanised welding, for instance, the joining of deck plates of bridge sections with SAW tractors or the connection of big pipes in arches or suspended roofs with FCAW orbital welders within welding tents. Very often, though, it involves manual welding with stick electrodes or self-shielded cored wires, executed outdoors with no or minimal wind protection and in all positions. Welding equipment must be light and easily transportable from platform to platform, with long cable assemblies and liners to allow the actual welding site to be reached. Use of a shielding gas is often inconvenient, because the gas shielding is prone to wind shear and requires rather heavy equipment.

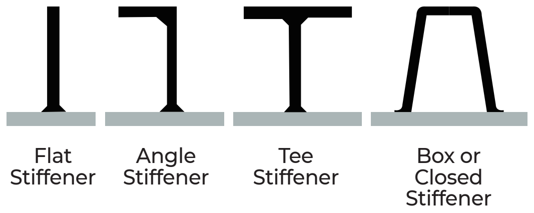
Prefabrication / Girders & stiffeners

Large H or T-profiles with flanges welded to standing leg (web plate) with double sided fillet welds. Welding preferably performed in 2F position with a single or multiple run deposited one side at a time or two sides simultaneously. Welding processes used are SAW, GMAW, FCAW and MCAW. May be mechanised with tractors or gantries or automated with welding robots. SMAW used for fit-up work.



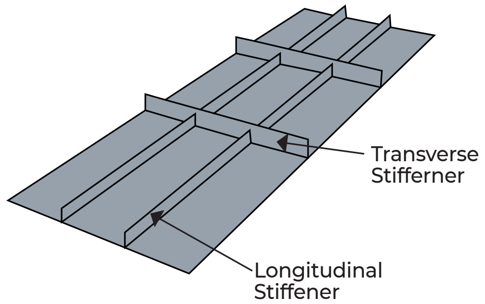
Prefabrication / Longitudinal stiffeners to deck plates

Plate reinforcement with flat, angle, tee or box stiffeners. Welding performed in 2F position with mostly a single run deposited one side at a time or two sides simultaneously. Welding processes used are SAW, GMAW, FCAW and MCAW. Can be mechanised with tractors or gantries or automated with welding robots. SMAW used for fit-up work and shorter weld lengths.



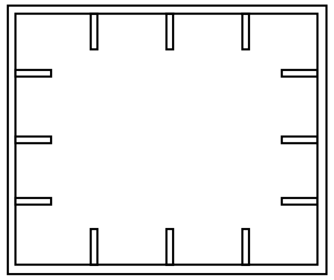
Prefabrication / Transverse stiffeners

Plate reinforcement with tee or angle stiffeners. Porches are cut to suit the stiffener type. Involves welding of mostly single-run fillet welds in all positions. Welding processes used are SAW, GMAW, FCAW and MCAW. Down-hand welds may be mechanised with tractors or gantries or automated with welding robots. SMAW used for fit-up work and shorter weld lengths.



Prefabrication / Arch sections

Arch box section constructed from plates reinforced with stiffeners. Involves welding of mostly single run fillet welds and through thickness butt corner welds. Welding processes used are SAW, GMAW, FCAW and MCAW. Can be mechanised with tractors or gantries or automated with welding robots. SMAW used for fit-up work and shorter weld lengths.



On site / Joining of deck sections and arches

1. On-site joining of deck sessions of a bridge. Deck plates involve through-thickness welds, often joined using an SAW welding tractor. Root passes common on ceramic weld metal support. 2. Troughs to troughs welded in overhead position with SMAW or self-shielded FCAW. 3. Girders to girders welded in all positions (through-thickness welds) with SMAW or self-shielded FCAW. Roots on ceramic backing commonly applied. Welded (& bolted) splices commonly used. 4. Arch boxes welded in all positions with SMAW or self-shielded FCAW. Welded (& bolted) splices commonly applied.

Prefabrication / Beams

Beams with a variety of cross sections. Welding preferably performed in 2F position with a single or multiple run deposited one side at a time or two sides simultaneously. Welding processes used are SAW, GMAW, FCAW and MCAW. May be mechanised with tractors or gantries or automated with welding robots. SMAW used for fit-up work.

Prefabrication / Trusses

Constructions composed from cords and web reinforcements with round, square or other cross sections and the nodes where they meet involve short welds in a variety of welding positions; often with small included angles. Welding processes used are manual GTAW, SMAW, GMAW, FCAW and MCAW. Increasingly production lines with welding robots are utilized, using GMAW.

On site / Joining of beams or tubes

Beams or tubes nodes may be prefabricated indoor, as component of trusses, or on-site. Proper welding techniques and quality control measures are essential to ensure the integrity and performance of the welded joints. On-site, nodes are welded in all positions using GTAW or SMAW for the root pass and SMAW or self-shielded FCAW for filling.

Process	Product Name		Welding Application											Steel Type				Shielding Gas	
			Bridge							Frame Structure Building									
			Workshop				On-site			Workshop		On-site							
			1	2	3	4	5	6		7	8	9	10						
			Girders or Stiffeners Production	Deck sections (from girders, beams etc.)	Trusses	Pylon & Arch Boxes	Deck section to deck section	Steel pylon or arch erection		Column or Beam Production	Trusses	Column to Beam Beam to Beam	Tube to Tube	min. 275 MPa YS	min. 355 MPa YS	min. 460 MPa YS	Weather Resistant (Corten)	CO_2	Ar+20%CO_2
			2F/PB	2F/PB & 3F/PG	All positions	2F/PB	All Positions	All Positions		2F/PB	All positions	All Positions	All Positions						
			Robotic/ mechanised	Robotic/ mechanised	Robotic/ mechanised/ manual	Robotic/ mechanised	Mechanised/ manual	Manual		Robotic/ mechanised	Robotic/ mechanised/ manual	Manual	Manual						
SMAW*	S-7016.H				△		O	O		△	△	O	O	O	O				
	S-7018.G				△		O	O		△	△	O	O	O	O				
	S-7018.1H				△		O	O		△	△	O	O		O	△			
	S-8018.G				△		O	O		△	△	O	O		O	△			
	S-9016.G				△		O	O		△	△	O	O			O			
	S-7018.W				△		O	O		△	△	O	O	O	O		O		
	S-8018.W				△		O	O		△	△	O	O		O	△	O		
GMAW	SM-70		△		△	△				△	△			O	O			●	●
	SM-70EN		△		△	△				△	△			O	O			●	●
	SM-70G		△		△	△				△	△			O	O			●	●
FCAW-MCAW	SF-71	Rutile	O	O	O	O	△	△		O	O	△	△	O	O			●	
	Supercored 71	Rutile	O	O	O	O	△	△		O	O	△	△	O	O			●	
	SC-71MJ	Rutile	O	O	O	O	△	△		O	O	△	△	O	O				●
	SF-71MC	Rutile	O	O	O	O	△	△		O	O	△	△	O	O			●	●
	SC-420MC	Rutile	O	O	O	O	△	△		O	O	△	△	O	O			●	●
	Supercored 81MAG	Rutile	O	O	O	O	△	△		O	O	△	△		O	△	△		●
	SC-81M	Rutile	O	O	O	O	△	△		O	O	△	△		O	△	△		●
	SC-91	Rutile	O	O	O	O	△	△		O	O	△	△			O	△	●	
	Supercored 81-K2	Rutile	O	O	O	O	△	△		O	O	△	△		O	△	△	●	
	SF-70MX	Semi-metal	O	△(only 2F/PB)		O				O				O	O			●	
	Supercored 70MXH	Semi-metal	O	△(only 2F/PB)		O				O				O	O			●	
	SC-70ML	Metal-cored	O	△(only 2F/PB)		O				O				O	O				●
	SC-80K2	Semi-metal	O	△(only 2F/PB)		O				O					O	△		●	
	SC-90	Semi-metal	O	△(only 2F/PB)		O				O					O	O		●	
	SF-70W	Rutile	O	O	O	O	△	△		O	O	△	△	O	O		O	●	
	SF-80W	Rutile	O	O	O	O	△	△		O	O	△	△		O	△	O	●	
	SC-81WM	Rutile	O	O	O	O	△	△		O	O	△	△		O	△	O		●
	Supershield 11	Self-shielded					O	O				O	O	O	O				
	Supershield 71-T8	Self-shielded					O	O				O	O	O	O				
SAW	S-777MX / H-14		△	△(only 2F/PB)		△				△				O	O				
	S-777MXH / H-14		O	O (only 2F/PB)		O				O				O	O				
	Superflux 600 / H-14		△	△(only 2F/PB)		△	O			△				O	O				
	S-777MXH / A-3		O	O (only 2F/PB)		O				O					O	△			
	Superflux 600 / A-3		△	△(only 2F/PB)		△	O			△					O	O			

*SMAW is used for fit-up work which is required for robotic & mechanised welding   O Highly Recommended   △ Recommended

TYPICAL MECHANICAL PROPERTIES AND CHEMICAL COMPOSITION (%) OF ALL-WELD METAL

Process	Product Name	AWS	EN ISO	Typical Chemical Composition of All-Weld Metal(%)										Typical Mechanical Properties of All-Weld Metal				
				C	Si	Mn	P	S	Ni	Cr	Mo	Al	Cu	YS	TS	EL	Impact ISO-V	
														MPa(lbs/in²)	MPa(lbs/in²)	(%)	°C (°F)	J (ft·lbs)
SMAW	S-7016.H	A5.1 E7016	2560-A E42 2 B 1 2	0.08	0.62	1.22	0.017	0.011	-	-	-	-	-	560 (81,300)	620 (90,700)	28.5	-30 (-22)	80 (59)
	S-7018.G	A5.1 E7018	ISO 2560-A E42 3 B 1 2	0.06	0.50	1.20	0.017	0.011	-	-	-	-	-	504 (73,200)	572 (83,100)	29.8	-30 (-22)	111 (82)
	S-7018.1H	A5.1 E7018-1 H4R	ISO 2560-A E42 4 B 3 2 H5	0.06	0.25	1.35	0.014	0.005	-	-	-	-	-	493 (71,500)	566 (82,100)	30.8	-45 (-49)	152 (112)
	S-8018.G	A5.5 E8018-G	ISO 2560-A E46 2 1Ni B 3 2	0.07	0.06	1.29	0.016	0.012	0.83	-	-	-	-	542 (78,700)	622 (90,300)	30.2	-20 (-4)	103 (76)
	S-9016.G	A5.5 E9016-G	ISO 2560-A E50 2 B 1 2	0.06	0.52	1.09	0.016	0.010	0.56	-	0.23	-	-	570 (82,800)	655 (95,100)	27.2	-20 (-4)	78 (58)
	S-7018.W	A5.5 E7018-W1	ISO 2560-A E42 2 B 3 2	0.05	0.56	0.62	0.015	0.013	0.23	0.24	-	-	0.37	505 (73,300)	573 (83,200)	31.3	-20 (-4)	100 (74)
	S-8018.W	A5.5 E8018-W2	ISO 2560-A E50 2 B 3 2	0.06	0.54	0.95	0.014	0.011	0.57	0.56	-	-	0.38	604 (87,700)	648 (94,100)	27.4	-20 (-4)	117 (87)
GMAW	SM-70 ** / *	A5.18 ER70S-6	ISO 14341-A G 42 2 C1 3Si1	0.07	0.58	1.15	0.010	0.010	-	-	-	-	-	467 (67,732)	566 (82,091)	28	-30 (-22)	71 (52)
			ISO 14341-A G 42 5 M21 3Si1	0.07	0.64	1.24	0.010	0.010	-	-	-	-	-	472 (68,457)	569 (82,526)	26	-50 (-58)	60 (44)
	SM-70EN ** / *	A5.18 ER70S-6	ISO 14341-A G 42 2 C1 4Si1	0.09	0.56	1.06	0.015	0.012	-	-	-	-	-	461 (66,862)	560 (81,221)	29	-20 (-4)	95 (70)
		A5.18 ER70S-6	ISO 14341-A G 46 5 M21 4Si1	0.09	0.68	1.26	0.015	0.012	-	-	-	-	-	524 (76,000)	617 (89,488)	27	-50 (-58)	61 (45)
	SM-70G ** / *	A5.18 ER70S-G	ISO 14341-B G 49A 3 C1 S11	0.07	0.52	1.07	0.015	0.009	-	-	-	-	-	460 (66,717)	560 (81,221)	29	-30 (-22)	90 (66)
			ISO 14341-B G 55A 3 M21 S11	0.06	0.61	1.20	0.015	0.009	-	-	-	-	-	470 (68,168)	570 (82,671)	27	-30 (-22)	70 (52)
FCAW-MCAW	SF-71 **	A5.20 E71T-1C	ISO 17632-A T 42 0 P C1 1	0.04	0.49	1.29	0.010	0.009	-	-	-	-	-	548 (79,600)	582 (84,500)	28	-20 (-4)	45 (33)
	Supercored 71 **	A5.20 E71T-1C	ISO 17632-A T 42 2 P C1 1	0.03	0.51	1.26	0.010	0.011	-	-	-	-	-	545 (79,100)	572 (83,100)	28	-20 (-4)	70 (52)
	SC-71MJ *	A5.20 E71T-9M-J	ISO 17632-A T 46 4 P M21 1 H5	0.06	0.30	1.10	0.012	0.011	0.42	-	-	-	-	545 (79,100)	583 (84,500)	25	-40 (-40)	80 (59)
	SF-71MC ** / *	A5.20 E71T-1C/-9C/-12C	ISO 17632-A T 46 2 P C1 1	0.04	0.40	1.20	0.010	0.012	-	-	-	-	-	510 (74,000)	550 (80,000)	28	-29 (-20)	75(55)
		A5.20 E71T-1M/-9M/-12C	ISO 17632-A T46 3 P M21 1 H1	0.04	0.50	1.41	0.010	0.014	-	-	-	-	-	540 (78,000)	605 (88,000)	28	-29 (-20)	90(66)
	SC-420MC ** / *	A5.20 E71T-1C/-9C H4	ISO 17632-A T 46 3 P C1 1 H5	0.03	0.45	1.15	0.010	0.006	-	-	-	-	-	520 (75,400)	570 (82,700)	28	-30 (-22)	50 (37)
		A5.20 E71T-1M/-9M H8	ISO 17632-A T 46 3 P M21 1 H5	0.04	0.60	1.35	0.010	0.006	-	-	-	-	-	575 (83,400)	630 (91,400)	26	-30 (-22)	60 (44)
	Supercored 81MAG *	A5.29 E81T1-Ni1M H4	ISO 17632-A T 50 6 1Ni P M21 2 H5	0.05	0.28	1.20	0.008	0.012	0.93	-	-	-	-	550 (79,900)	590 (85,700)	26	-60 (-76)	60 (44)
	SC-81M *	A5.29 E81T1-Ni1M-J H4	ISO 17632-A T 50 6 1Ni P M21 1 H5	0.04	0.34	1.15	0.008	0.008	0.91	-	-	-	-	550 (79,900)	590 (85,700)	26	-60 (-76)	60 (44)
	SC-91 **	A5.29 E91T1-GC	ISO 17632-A-T 50 2 1Ni P C 1	0.06	0.55	1.20	0.013	0.013	0.85	-	-	-	-	645 (93,600)	660 (95,800)	24	-20 (-4)	70 (52)
	Supercored 81-K2 **	A5.29 E81T1-K2C H4	ISO 17632-A T 46 6 1.5Ni P C 1 H5	0.04	0.35	1.35	0.012	0.011	1.50	-	-	-	-	540 (78,400)	620 (90,000)	28	-60 (-76)	60 (44)
	SF-70MX **	A5.20 E70T-1C	ISO 17632-A T 42 0 R C1 3	0.05	0.50	1.5	0.011	0.013	-	-	-	-	-	560 (81,300)	590 (85,700)	28	-20 (-4)	50 (37)
	Supercored 70MXH **	A5.20 E70T-9C	ISO 17632-A T 42 2 R C1 H5	0.05	0.55	1.65	0.013	0.010	-	-	-	-	-	540 (78,400)	620 (90,000)	28	-30 (-22)	54 (40)
	SC-70ML *	A5.18 E70C-6M	ISO 17632-A T 46 4 M M21 2 H5	0.04	0.56	1.57	0.011	0.014	0.35	-	-	-	-	476 (73,950)	553 (81,200)	27	-40 (-40)	75 (55)
	SC-80K2 **	A5.29 E80T1-K2C	ISO 17632-A T 46 6 1.5Ni R C1 3 H5	0.06	0.43	1.45	0.011	0.008	1.57	-	-	-	-	575 (83,375)	635 (92,075)	26	-60 (-76)	60 (44)
	SC-90 **	A5.29 E90T1-GC	ISO 17632-A T 50 2 R C1 3	0.08	0.55	1.75	0.014	0.014	0.35	-	0.12	-	-	600 (87,100)	660 (95,800)	22.5	-20 (-4)	60 (44)
	SF-70W **	-	EN ISO 17632-B T49 2 T1-1 C1 A-NCC	0.04	0.45	1.05	0.017	0.011	0.35	0.50	-	-	0.40	510 (74,000)	580 (84,200)	28	-20 (-4)	46 (34)
	SF-80W **	A5.29 E81T1-W2C	ISO 17632-B T 55 3 T1-1 C1 A-NCC1	0.04	0.40	0.92	0.016	0.012	0.50	0.50	-	-	0.40	530 (77,000)	610 (88,600)	26	-30 (-22)	40 (30)
	SC-81WM *	A5.29: E81T1-W2M	ISO 17632-A T 50 2 ZCrNiCu P M21 1 H10	0.04	0.38	1.04	0.005	0.004	0.55	0.54	-	-	0.43	590 (85,600)	650 (94,300)	24.9	-30 (-22)	45 (33)
	Supershield 11	A5.20 E71T-11	ISO 17632-A-T 42 Z Z NO 1	0.18	0.34	0.50	0.012	0.006	-	-	-	1.55	-	510 (74,000)	580 (84,100)	24	-	-
	Supershield 71-T8	A5.20 E71T-8 H8	ISO 17632-A-T 42 3 Y NO 2 H10	0.16	0.15	0.63	0.003	0.003	-	-	-	0.48	-	447 (64,800)	565 (82,000)	32	-30 (-22)	65 (48)
SAW	S-777MX / H-14	A5.17 F7A0-EH14	ISO 14174-S A AR 1 / ISO 14171-A-S4	0.08	0.53	0.94	0.021	0.014	-	-	-	-	-	560 (81,200)	620 (89,900)	27	-18 (0)	48 (35)
	S-777MXH / H-14	A5.17 F7A(P)2-EH1	ISO 14174-S A AB 1 / ISO 14171-A-S4	0.07	0.30	1.37	0.028	0.021	-	-	-	-	-	520 (75,500)	570 (87,700)	30	-29 (-20)	120 (88)
	Superflux 600 / H-14	A5.17 F7A(P)6-EH14	ISO 14174-S A AB 1 / ISO 14171-A-S4	0.08	0.20	1.50	0.02	0.006	-	-	-	-	-	516 (74,800)	558 (80,900)	31	-51 (-60)	150 (111)
	S-777MXH / A-3	A5.23 F8A4-EA3-A3	ISO 14174-S A AB 1 / ISO 14171-A-S4Mo	0.04	0.28	1.30	0.025	0.015	-	-	0.50	-	-	630 (91,500)	660 (95,900)	26	-40 (-40)	40 (30)
	Superflux 600 / A-3	A5.23 F8A(P)4-EA3-G	ISO 14174-S A AB 1 / EN ISO 14171-A-S4Mo	0.07	0.21	1.45	0.018	0.006	-	-	0.45	-	-	621 (90,100)	660 (95,900)	27	-40 (-40)	120 (89)

*** With M21 Shielding Gas** **** With C1 Shielding Gas**

APPROVALS

Process	Product Name	AWS	EN	CWB	TÜV	DB	CE	NAKS		KR	ABS	LR	BV	DNV	NK	RS	RINA	CCS	CRS
SMAW	S-7016.H	A5.1 E7016	2560-A E42 2 B 1 2	✓	-	-	✓	-		3H10,3YH10	3H10,3Y	3Y H15	3YHH	3YH10	KMW53HH	3YH10	-	-	-
	S-7018.G	A5.1 E7018	ISO 2560-A E42 3 B 1 2	✓	✓	✓	✓	-		3H10,3Y H10	3H10,3Y AWS A5.1:2012 E7018	3Y H15	3YHH	3YH10	KMW53HH	-	-	-	-
	S-7018.1H	A5.1 E7018-1 H4R	ISO 2560-A E42 4 B 3 2 H5	✓	-	-	✓	-		-	3H10,3Y	3Y H15	3Y HH	3YH10	-	-	3Y H10	-	-
	S-9016.G	A5.5 E9016-G	ISO 2560-A E50 2 B 1 2	-	-	-	-	-		-	AWS A5.5 E9016-G	-	-	-	-	-	-	-	-
GMAW	SM-70	A5.18 ER70S-6	ISO 14341-A G 42 2 C1 3Si1 ISO 14341-A G 42 5 M21 3Si1	✓	✓	✓	✓	✓		3SG, 3YSG(C), 3YSG(M2), 3YMG(M2)	3SA, 3YSA	3YS, 3YM	SA3, SA3YM	IIIYMS	KSW53G(C), KSW53G(M2), KSW53MG(M2)	3YSM	3YS	-	-
	SM-70EN	A5.18 ER70S-6	ISO 14341-A G 42 2 C1 4Si1 ISO 14341-A G 46 5 M21 4Si1	-	✓	✓	✓	-		-	-	-	-	IIIY40MS (C1) IVY40MS (M21)	-	-	-	-	-
	SM-70G	A5.18 ER70S-G	ISO 14341-B G 49A 3 C1 S11 ISO 14341-B G 55A 3 M21 S11	-	-	-	-	-		3SG, 3YSG 3MG, 3YMG (C1)	3SA,3YSA	3YS H15	SA3,3YM	IIIYMS	KSW53G, KAW53MG(C)	-	-	-	-
FCAW-MCAW	SF-71	A5.20 E71T-1C	ISO 17632-A T 42 0 P C1 1	✓	✓	-	✓	-		2SMG, 2YSMG(C) H10	2SA, 2YSA H10, 2Y400SA	2S, 2YS H10	SA2M, SA2YM HH, A2M, A2YM HH	IIY40MS H10	KSW52G(C) H10 KSW52Y40G(C) H10	2, 2YS H10	2YS H10	2SM, 2YSM H10	2HS, 2YHS
	Supercored 71	A5.20 E71T-1C	ISO 17632-A T 42 2 P C1 1	✓	✓	✓	✓	-		3SMG, 3YSMG(C) H10	3SAH10, 3YSA	3YS H10	SA3M, SA3YM, A3M, A3YM HH	IIIYMS H10	KSW53Y40G(C) H10	3YSM H10	3YS H10	-	3YS H10
	SC-71MJ	A5.20 E71T-9M-J	ISO 17632-A T 46 4 P M21 1 H5	-	-	-	-	-		-	4YSA, 4Y400SA H5	4Y40S H5	SA4Y, SA4Y40 HHH	IVY40MS (H5)	-	-	-	-	-
	SF-71MC	A5.20 E71T-1C/-9C/-12C	ISO 17632-A T 46 2 P C1 1 ISO 17632-A T46 3 P M21 1 H1	✓	✓	✓	✓	-		-	3YSA H10	3YS H10	SA3YMHH	IIIYMS H10	-	-	-	-	-
	SC-420MC	A5.20 E71T-1C/-9C H4	ISO 17632-A T 46 3 P C1 1 H5 ISO 17632-A T 46 3 P M21 1 H5	-	✓	✓	✓	-		-	-	3YS H5	SA3YM HHH	IIIYMS H5	-	-	3YS H5	-	-
	Supercored 81MAG	A5.29 E81T1-Ni1M H4	ISO 17632-A T 46 6 1Ni P M21 2 H5	✓	✓	✓	✓	-		-	5Y400SA H5	5Y40S H5	SA5Y40M HHH	VY40MS H5	-	5Y42SM H5	5Y40S H5	-	-
	SC-81M	A5.29 E81T1-Ni1M-J H4	ISO 17632-A T 50 6 1Ni P M21 1 H5	-	-	-	✓	-		-	-	-	-	-	-	-	-	-	-
	Supercored 81-K2	A5.29 E81T1-K2C H4	ISO 17632-A T 46 6 1.5Ni P C 1 H5	✓	-	-	✓	-		5Y40SG(C) H5, L3SG(C) H5	5Y400SA H5	5Y40S H5	SA5Y40 HHH	VY40MS H5, NV2-4L, 4-4L	KSWL3SG(C) H5 KSW54Y40G(C)H5	5Y40SM H5	5YS H10	5Y40S H5	-
	SF-70MX	A5.20 E70T-1C	ISO 17632-A T 42 0 R C1 3	✓	-	-	✓	-		2SG, 2YSG (C1) H10, 2MG, 2YMG(C1) H10	2SA, 2YSAH10, 2Y400SA	2S, 2YS H10	SA2YM HH	IIY40MS H10	KSW2G, KSW52Y40G(C) H10 KAW2MG, KAW52MG(C) H10	-	2YS H10	2YSM H10	2HSM, 2YHSM
	Supercored 70MXH	A5.20 E70T-9C	ISO 17632-A T 42 2 R C1 H5	-	-	-	-	-		3YSG(C) H5, 3YMG(C) H5	3SA H5, 3YSA	3YS H5	SA3YM, A3YM HHH	IIIYMS H5	KSW53G(C) H5 KAW53MG(C) H5	-	3YS H5	3YSM H5	-
	SC-70ML	A5.18 E70C-6M	ISO 17632-A T 46 4 M M21 2 H5	✓	✓	✓	✓	-		-	4Y400SA H5	4Y40S H5	SA4Y40M HHH	IVY40MS H5	-	-	-	-	-
	SC-80K2	A5.29 E80T1-K2C	ISO 17632-A T 46 6 1.5Ni R C1 3 H5	-	-	-	-	-		4Y40SG(C) H5, 4Y40MG(C)	5Y400SA H5	5Y40S H5, 5Y40M H5	SA5Y40 HHH	VY40MS H5, NV4-4L	KAW54Y40MG(C), KSW54Y40MG(C)H5	5Y40S H5	-	-	-
SAW	S-777MX / H-14	A5.17 F7A0-EH14	ISO 14174-S A AR 1 / ISO 14171-A-S4	-	-	-	✓	-		2M,2YM	2M,2YM	2M,2YM	A2M,A2YM	IIYM	KAW2M,KAW52M	-	-	2YM	-
	S-777MXH / H-14	A5.17 F7A(P)2-EH1	ISO 14174-S A AB 1 / ISO 14171-A-S4	✓	-	-	-	-		2T,2YT,3M,3YM	2T,2YT,3M,3YM	2T, 2YT, 3M, 3YM	A2T,A2YT,A3M,A3YM	IIYTH10, IIIYM H10	KAW3M,KAW53M KAW2T,KAW52T	-	-	-	-

GAS SHIELDED CORED WIRES FOR WEATHERING STEEL

Weathering steels are widely used in structural fabrication. Their good resistance to atmospheric corrosion, high strength and artistic appeal makes them a popular choice for not only aesthetic design elements, but for entire load bearing constructions in structural engineering. Bridges are a good example, but weathering steels are also commonly applied in domestic housing, railway stations, factories, warehouses, distribution centres and many more.

Weathering steels derive their resistance to atmospheric corrosion from the alloying of small amounts of copper, chromium, nickel and silicon. Phosphorus may also be deliberately added to achieve even better corrosion resistance, although this goes at the expense of impact toughness and weldability. Types without phosphorus, so with good toughness and welding properties, are widely available as structural steels for load-bearing structures in different yield strength classes from 345 up to 960 MPa.

The selection of the appropriate welding consumable depends on various factors:
- Local design requirements, welding code and specifications such as AWS D1.1 and D1.5
- The required strength and toughness levels
- Joint geometry and weld size
- Location of the weld and whether it will be painted
- Necessity of colour match.

Very often welding consumables alloyed with 1 or 2% nickel and no further alloying are used for the various welding processes, as these provide the required weld metal strength and toughness along with acceptable corrosion resistance. The more expensive consumables with weathering steel matching composition (W designation) are almost exclusively used in applications where an immediate colour match with the base material is required for aesthetic reasons. Another commonly used method is to use W designated consumables for the cap layers only.

Hyundai Welding offers a range of all-positional rutile cored wires with matching weld metal composition (W-designation) and excellent weldability. These are an excellent choice for both automated and manual welding in structural fabrication. They operate in the spray arc mode over a wide range of applicable welding parameters and are virtually spatter-free. The fast-freezing, brittle slag is easily removed and welds are smooth with a nice tie-in onto the plate edges. Weld penetration is round and deep. Weldments require limited post weld labour and the high weld quality counteracts the occurrence of fatigue cracking. Types with CO_2 shielding gas can also be used outdoor for highly productive, all-positional welding in the erection of constructions.

Weathering steel grades	Product Name	AWS classification	EN ISO classification	Shielding gas
EN 10025 part 5 - S235 J0W, S235 J2W, S355 J0WP, S355 J2WP, S355 J0W, S355 J2W, S355 K2W **ASTM A242** - Type 1 **ASTM A588** - Grade A, B, C **ASTM A595** - All weather resistant steels **ASTM A709** - Grade HPS 50W & HPS 70W **ISO 5952 HSA** - 235W, 245W, 355W1, 355W2, 365W **Trademark Steel Grades:** Cor-Ten®, Patinax®-F, Patinax®-37	SF-70W	-	EN ISO 17632-B T49 2 T1-1 C1 A-NCC	CO_2
	SF-80W	A5.29: E81T1: W2C	17632-B: T55 3 T1-1 C1 A-NCC1	CO_2
	SC-81WM	A5.29: E81T1-W2M	17632-A T 50 2 ZCrNiCu P M21 1 H10	Mixed gas

SELF-SHIELDED CORED WIRES FOR OUTDOOR USE

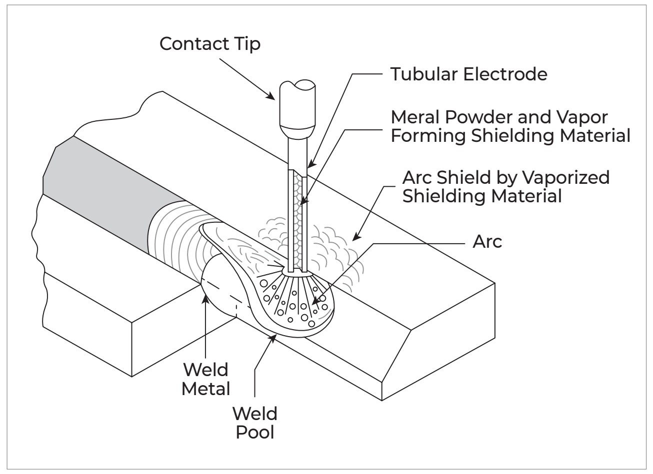
Traditionally, manual welding with stick electrodes (SMAW) has been very popular for outdoor, on-site welding jobs in structural fabrication. It does not need any supply of shielding gas or wire feeders, can be used in any welding position and many welders are familiar with the process. A disadvantage, though, is its relatively low duty cycle, because the process needs to be interrupted frequently to replace used electrodes.

The flux-cored arc welding process with self-shielded cored wires (FCAW-S) offers the same versatility as SMAW, but is more productive because the supply of filler metal is much more continuous. Since there is no need of shielding gas supply, the welding equipment can be much lighter and any welding spot on-site can be reached using portable wire feeders. Just like stick electrodes, self-shielded cored wires produce their own dependable gas shielding and there is no need to place any wind screens or tents. With modern filler metal formulations, the process has grown mature and many fabricators in the structural segment are adopting it to increase their welding economy and thereby their competitive edge.

Hyundai Welding offers two multi-purpose self-shielded cored wires, the **Supershield 11** and **Supershield 71-T8**. Both can be used in all welding positions for steel grades with a guaranteed yield strength up to 490MPa. They are available on spools with a standard filling weight, and Supershield 11 is also available on smaller spools with 5 or even 1kg of wire to facilitate use with small portable (yard) feeders.

Supershield 11 is classified E71T-11 according AWS A5.20. It is a versatile, all-round cored wire intended for single and multi-pass welding of lighter constructions with no CVN weld metal toughness requirements. It is welder-friendly, with a smooth and stable arc and low-spatter. The slag is fully covering the weld surface and easily released. It is welded on DC- polarity, but its use is easy to learn for welders familiar with DC+ welding with gas-shielded cored wires.

Supershield 71-T8 is classified E71T-8 H8 according to AWS A5.20. It is intended for single and multi-pass welding of heavier constructions in structural fabrication, with CVN toughness requirements down to -30°C. It meets the requirements of the AWS D1.8 Structural Welding Code -seismic supplement, so that it can be used in areas prone to seismic activity. It has excellent welding characteristics, but proper training of welders is required to achieve the required high weld quality.



S-777MXH

Productive agglomerated flux for submerged arc welding of girders, stiffeners, columns and beams

S-777MXH is a neutral agglomerated flux for use with AC or DC+ polarity, with a basicity index of 0.9 according the Boniszewski formula. It is especially suited for the productive welding of fillet welds in 1F&2F position, using welding tractors or other means of mechanisation, as in the fabrication of girders and stiffeners onto plates as well as column or beam production. It combines high travel speeds with good slag detachability and can be used for single and multi-pass welding, using single-wire, twin-wire and tandem-wire heads.

It is tolerant to remainders of mill scale, rust oil and other impurities in the weld area and shows a good resistance to the formation of porosity. Flux consumption is low, making S-777MXH economic in use. In combination with the solid wires H-14 and A-3, it covers construction steel with a minimum yield strength up to 470 MPa. and CVN impact toughness requirements down to -40°C. Both combinations are tested in the as welded and stress relieved conditions. For hydrogen critical applications, the flux can be re-dried at 300-350°C for 1 hour prior to use.

Consumables	PWHT Condition	Mechanical Properties				
		YS	TS	EL	Impact ISO-V	
		MPa (lbs/in²)	MPa (lbs/in²)	(%)	°C (°F)	J (ft-lbs)
S-777MXH /H-14	As welded	590 (85,570)	610 (88,500)	28	-29 (-20)	82 (60)
	620°C (1148°F)x1hr	538 (78,000)	593 (86,000)	30		100 (74)
AWS A5.17 F7A(P)2-EH14	-	≥400 (58,000)	490 (71,100)- 660 (95,700)	≥ 22		≥27 (20)
S-777MXH /A-3	As welded	643 (93,250)	643 (93,300)	26	-40 (-40)	55 (40)
	620°C (1148°F)x1hr	550 (79,700) - 690 (100,000)	680 (98,600)	25	-18 (0)	60 (44)
AWS A5.23 F8P0-EA3-A3	-	≥470 (68,200)	550 (79,700) - 690 (100,000)	≥ 22	-	-

SUPERFLUX 600

Agglomerated Flux for joining bridge deck sections

Superflux600 is a aluminate-basic agglomerated flux with a basicity index of 1.9 according to the Boniszewski formula. It is used for the multi-pass welding of structures with high demands on weld metal toughness and crack resistance, such as the joints in deck sections of bridges. It supplies a weld metal with a low level of impurities and high CVN impact toughness. It is tolerant to rust and dirt on all base metal and has better resistance to pockmarks and pits.

Together with high impact value of the weld metal, it provides good bead appearance, and better slag removal. As the consumption of flux is low, it is very economical. Superflux600 can be used for the deposition of single and multi-layer butt welds, using welding tractors and single-wire, twin-wire or tandem-wire heads. Productive, high quality root passes can be deposited on ceramic weld metal support. In combination with solid wire H-14, it covers construction steel with a minimum yield strength up to 470 MPa. and CVN impact toughness requirements down to -50°C, in both the as welded and stress relieved conditions. For hydrogen critical applications, the flux can be brought back in its original condition by re-drying it at 300-350°C for 1 hour prior to use.

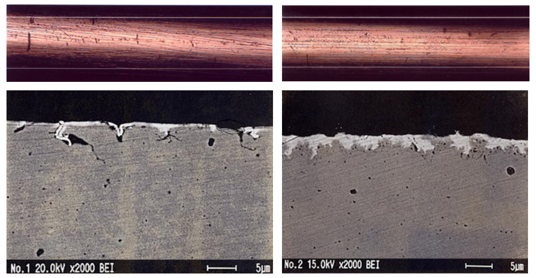
Consumables	PWHT Condition	Tensile Test			Impact ISO-V	
		YS	TS	EL		
		MPa (lbs/in²)	MPa (lbs/in²)	(%)	°C (°F)	J (ft-lbs)
Superflux 600 /H-14	As welded	516 (74,800)	558 (80,900)	30.6	-51 (-60)	189 (139)
	620°C x 1hr	456 (66,100)	528 (76,600)	32.6		179 (132)
AWS A5.17 F7A(P)6-EH14	-	≥400 (≥58,000)	480 (69,600)- 660 (95,700)	≥ 22		≥27 (20)
Superflux 600 /A-3	As welded	611 (88,600)	661 (95,800)	26.2	-40 (-40)	161 (119)
	620°C x 1hr	568 (82,400)	615 (89,200)	27.4		145 (107)
AWS A5.23 F8A(P)4-EA3-G	-	≥470 (68,200)	550 (79,700) - 690 (100,000)	≥ 20		≥27 (20)

SM-70 AND SM-70EN FOR ROBOTIC GMAW

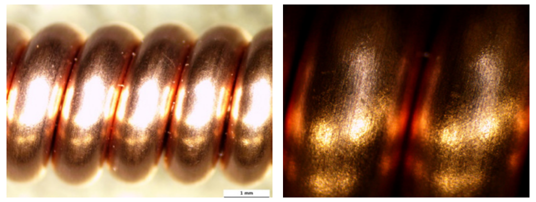
SM-70 and SM-70EN are two multi-purpose solid wires from the E-Line range developed for GMAW in structural fabrication. SM-70 is suited for welding in both 100% CO_2 shielding gas and Ar/CO_2 mixed gas. SM-70EN has been developed for the European market and is intended for use with mixed gas only. Having E-line welding characteristics (see later), these wires are the perfect welding consumables for robot lines used for the fabrication of trusses, columns, beams and sections.

They are multi-purpose wires covering all applications in structural fabrication and therefore perfect for fabricators who wish to standardise on one wire type only. The wires are dependable consumables for they welding of long single or multi-layer fillet welds, but also for shorter, but more frequent welds requiring many starts & stops. In addition, the can be used for the manual (pulse) welding of remaining joints that do not qualify for mechanisation.

A problem-free and stable GMAW process is essential for uninterrupted welding and for the quality of the weldments. The main challenge is the avoidance of spatter and post weld cleaning. For these demanding applications, HYUNDAI WELDING introduces E-Line – a unique electrically copper-coated wire with a thinner, more homogeneous and better adhering coating than with any chemically copper-coated wire available on the market. The presence of less copper with a stronger adhesion results in a reduced risk of liner clogging by copper flaking. This contributes highly to a stable GMAW process for longer periods of time in structural engineering welding applications and may lengthen intervals of operation between maintenance of the welding equipment.



Note: Chemically, with copper sulphate coated wire (left) and electrically coated wire (E-Line). The copper coating of E-Line wires fills up the natural imperfections from the drawing process and adheres better to the wire surface.



Note: Electrically copper-coated wire after extreme deformation showing perfect adhesion of copper on the E-Line surface. It reduces the risk of liner clogging by copper flaking. Visually the colour is brighter than chemically copper coating.

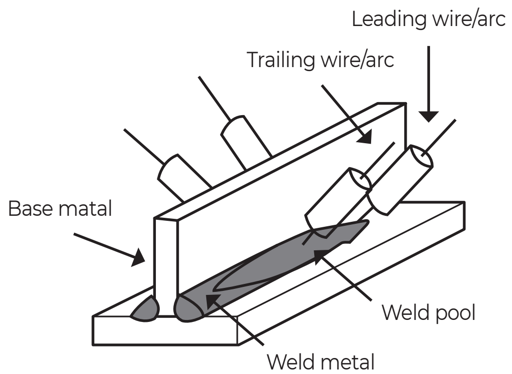
E-Line characteristics and benefits

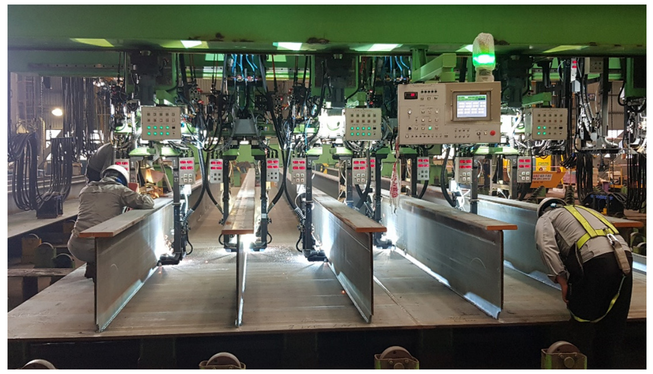
1. Low feeding force, superior arc stability	Regular welds with a nice appearance
2. Strong adhesion of copper	Reduced copper flaking, reduced feeding irregularities and less downtime for maintenance
3. Low spatter	Less post weld cleaning
4. Improved start behaviour	Less start failures in robotic welding

SUPERCORED 70MXH

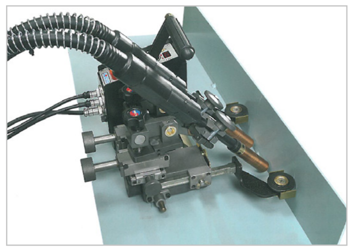
HYUNDAI WELDING has developed a tandem head solution for the double-sided welding of longitudinal stiffeners on deck plates. It uses an innovative “semi metal-cored” wire, the Supercored 70MXH, for welding T-fillets. In comparison with single head welding, the welding speed increases from 40 to 100 cpm for an a=6 fillet weld (+ 150%). Supercored 70MXH is specially designed for tandem FCAW.

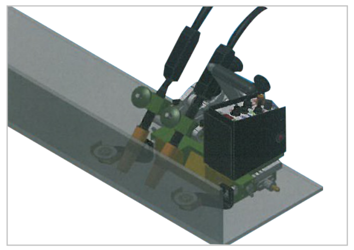
It shows the excellent welding characteristics of a rutile flux-cored wire, but combines this with a very low slag production and is therefore labelled “semi metal-cored”. The remaining minimal slag is easily removed from an extremely smooth weld surface. Mechanical properties of the weld are excellent. Supercored 70MXH can be used on zinc-primed or rusty plate, reducing the risk of porosity.

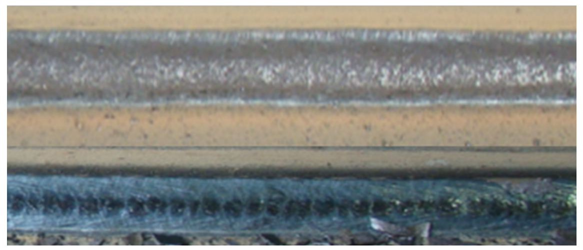




At around 90%, the weld metal recovery is higher than with standard rutile flux-cored wires. It is welded in 100% CO_2 shielding gas giving the deep and round weld penetration which is favourable for obtaining fillet welds free of fusion defects. The remaining minimal slag is easily removed from an extremely smooth weld surface. Mechanical properties of the weld are excellent. The diffusible hydrogen content of the weld metal is below 5ml/100g. Supercored 70MXH can be used on zinc-primed or rusty plate, reducing the risk of porosity. Welding speed up to 100 cpm can be reached for an a=6 size fillet weld.

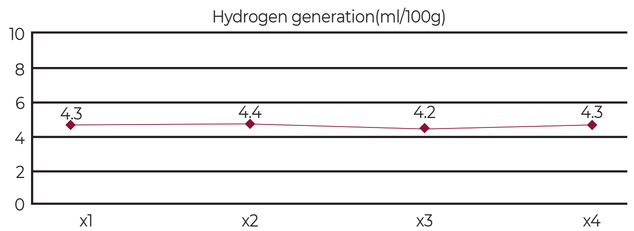






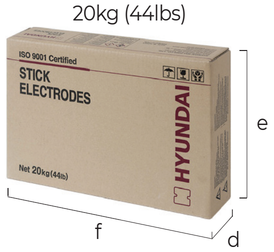
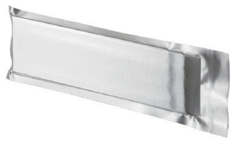
Hydrogen Generation Using Gas Chromatograph Method

Diameter	1.6mm (1/16 in)
Welding Speed	30 cm/min (11.8 in/min)
Gas Flow	C1 (100% CO_2)
Stick-out	20-25 mm (0.79-0.98in)
Parameters	330A / 32V

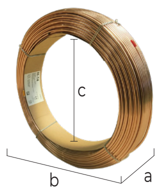
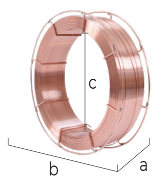


PACKAGING SPECIFICATIONS

SMAW Electrodes

Type	Packet	Carton	Carton Size mm (in)	
STANDARD	5kg (11lbs) 	20kg (44lbs) 	d	82 (3.2)
	5kg (11lbs) 		e	180-275 (7.1-10.8)
			f	312-562 (12.3-22.1)
ALUMINUM VACUUM PACK	1.5kg (3.3lbs) 	15kg (33lbs) 	d	96 (3.8)
			e	260 (10.2)
			f	470-570 (18.5-22.4)

Subarc Wire

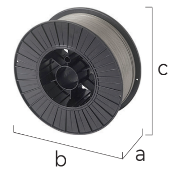
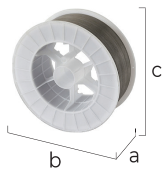
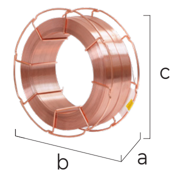
Type	Wire	Size mm (in) Wire	a	b	c
Coil Type		25kg (55lbs)	75/100 (3.0/3.9)	410/420 (16.1/16.5)	305/315 (12.0/12.4)
		30kg (66lbs)	95 (3.7)	400 (15.7)	305 (12.0)
		100kg (220lbs)	90/100 (3.5/3.9)	760 (29.9)	630 (24.8)
Basket Spool		150kg (330lbs)	90 (3.5)	790 (31.1)	630 (24.8)
		25kg (55lbs)	103 (4.1)	413-419 (16.3-16.5)	297-303 (11.7-11.9)

* Other coil sizes available upon request

Subarc Flux

Packaging		
TIN CAN	PE BAG	PAPER BAG
		
15kg, 20kg (33lbs, 44lbs)	20kg, 25kg (44lbs, 55lbs)	20kg, 25kg (44lbs, 55lbs)

GMAW / MIG and Flux Cored Wires

Type	Spool			
Spool Type	Plastic Spool (GMAW / MIG wires Flux Cored wires)	12.5kg (27.6lbs) / 15kg (33lbs)	Basket Spool (GMAW MIG wires)	15kg (33lbs)
				

Spool Size mm (in)	Plastic Spool (GMAW / MIG wires Flux Cored wires)	Basket Spool (GMAW MIG wires)
a	110 (4.3)	98 (3.9)
b	270-280 (10.6-11.0)	298 (11.7)
c	270-280 (10.6-11.0)	298 (11.7)

GMAW/MIG and Flux Cored Wires – Drum Solutions

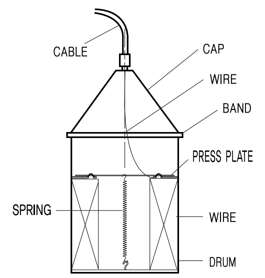
Ball pac

HYUNDAI WELDING's Ball pac® is a new and improved version of our original Pail pack. Our patented 'marble' system, acts as a 'non-static' resistance on top of the wire.

ECO PLUS

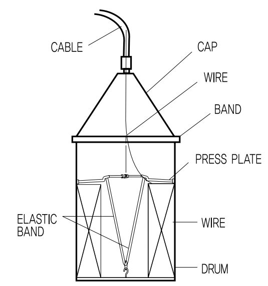
The ECO PLUS drums are made of 100% recyclable cardboard.

RiNG PAK



RiNG PAK is an effective system to avoid tangling of the wire during pay-off. It uses a press and a spring to keep the remaining wire in place. It guarantees regular, low force feeding resulting in straight welds with good penetration along the intended welding line.

MAX PAK



MAX PAK is an effective system to avoid tangling of the wire during pay-off. It uses a press plate and elastic band to keep the remaining wire in place. It guarantees regular, low force feeding resulting in straight welds with good penetration along the intended welding line. It is easy to see when the drum is almost empty and needs to be replaced.

REFERENCES

HYUNDAI WELDING is a global manufacturer of welding consumables and equipment. As the top leading manufacturer of welding consumables in Korea, and with a global network of sales, distribution and manufacturing plants, HYUNDAI WELDING has developed into a key player in the international welding industry.

Our company is fully committed to the ever-changing needs of our customers and has evolved in just under 50 years to provide welding expertise and breakthroughs in welding technology. HYUNDAI WELDING understands customer needs and offers customers world-class products and world-class solutions.

HYUNDAI WELDING's structural engineering welding solutions meet customer requirements for structure construction backed with a superior customer service and support. By using high quality consumables and equipment portfolio of HYUNDAI WELDING, our customers experience improved productivity and competitiveness in the market.

HYUNDAI WELDING is a world-class manufacturer that specializes in providing optimum welding solutions to its customers, by supplying top-notch welding consumables and equipment. HYUNDAI WELDING has contributed to the development and success of the global welding industry for more than 40 years since its foundation in 1975.

For more information on HYUNDAI WELDING, please visit www.hyundaiwelding.com

E-book

HYUNDAI WELDING

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