



Wind Tower Fabrication

Consumable Selection Guide

CUSTOMER ASSISTANCE POLICY

The business of The Lincoln Electric Company is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for information or advice about their use of our products. Our employees respond to inquiries to the best of their ability based on information provided to them by the customers and the knowledge they may have concerning the application. Our employees, however, are not in a position to verify the information provided or to evaluate the engineering requirements for the particular weldment. Accordingly, Lincoln Electric does not warrant or guarantee or assume any liability with respect to such information or advice. Moreover, the provision of such information or advice does not create, expand, or alter any warranty on our products. Any express or implied warranty that might arise from the information or advice, including any implied warranty of merchantability or any warranty of fitness for any customers' particular purpose is specifically disclaimed.

Lincoln Electric is a responsive manufacturer, but the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric affect the results obtained in applying these types of fabrication methods and service requirements.

Subject to Change – This information is accurate to the best of our knowledge at the time of printing. Please refer to www.lincolnelectric.com for any updated information.



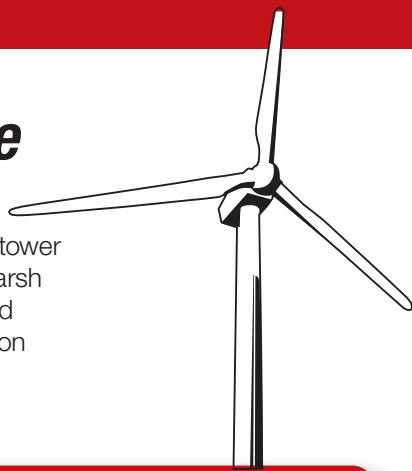
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Wind Tower Consumable Selection Guide

Lincoln Electric has over 70 years of experience in submerged arc consumable design and manufacture, which helps make Lincolnweld® flux and electrode the industry leader in wind tower welding solutions. Wind tower fabrication demands welds with high impact toughness in harsh environments. The Lincolnweld® family of submerged arc consumables has over 10 flux and electrode combinations capable of exceeding these requirements. For a consumable solution designed specifically for high quality, consistency and performance in wind tower welding applications – choose Lincolnweld®.



Lincolnweld® Flux and Electrode Selection Guide

Wind Tower Joint Preparation	Two-Run			Multi-Pass			Narrow Gap	
CVN Temp	-18° C (0° F)	-29° C (-20° F)	-40° C (-40° F)	-29° C (-20° F)	-40° C (-40° F)	-46° C (-50° F)	-40° C (-40° F)	-46° C (-50° F)
	WTX™ / L-61							
Flux / Electrode Combination	960 / L-61	WTX™ / L-70	995N / LA-81	P223 / L-61	P223 / L-S3	888™ / L-S3	888™ / L-S3	888™ / LA-85
	761 / L-61	761 / L-70						

NOTE: Base material dilution is typically 60 - 70% in Two-Run applications, so the Charpy V-Notch (CVN) values will vary significantly with changes in the base metal chemical composition.

Lincolnweld® Flux / Electrode Combinations AWS Classifications

WTX™ / L-61 – F7A8-EM12K-H8	P223 / L-61 – F7A4-EM12K
WTX™ / L-70 – F8A4-EA1-A3-H8	P223 / L-S3 – F7A8-EH12K-H8
761 / L-61 – F7A2-EM12K-H8	995N / LA-81 – F9A2-EG-G
761 / L-70 – F9A0-EA1-G	888™ / L-S3 – F7A8-EH12K-H4
960 / L-61 – F7A2-EM12K-H8	888™ / LA-85 – F8A6-ENi5-Ni5-H4

Choose Lincoln Electric for wind tower fabrication solutions. For more information, please contact your local Lincoln Electric Sales Representative or visit us on the web at www.lincolnelectric.com.

Lincolnweld® Wind Tower Solutions

Lincolnweld® Submerged Arc Electrode

Lincolnweld® L-61 – AWS EM12K

Lincolnweld® L-61 is a low carbon, medium manganese, low silicon general purpose electrode. This product is a popular low-cost choice for wind tower applications.

Lincolnweld® L-S3 – AWS EH12K

Lincolnweld® L-S3 is a low carbon, high manganese, medium silicon electrode designed for use with the Lincolnweld® 800 series of neutral fluxes. It is capable of producing impact properties exceeding 27 J (20 ft•lbf) at -62° C (-80° F) when used with Lincolnweld® 888™ neutral flux.

Lincolnweld® LA-85 – AWS ENi5

Lincolnweld® LA-85 is a nickel-bearing electrode with 0.2% molybdenum designed for use on wind tower applications. It is capable of exceeding 480-550 MPa (70-80 ksi) tensile strength in the as-welded and stress-relieved conditions with Lincolnweld® 888™.

Lincolnweld® L-70 – AWS EA1

Lincolnweld® L-70 is a low carbon, medium manganese, low silicon, 0.5% molybdenum electrode used for single or multiple pass welds. This electrode is a standard choice for two-run or limited pass wind tower welding applications.

Lincolnweld® LA-81 – EG

Lincolnweld® LA-81 is a low carbon, medium manganese, low silicon, 0.5% molybdenum electrode containing small additions of titanium and boron for improved fracture toughness. It is generally used in two pass applications or as a back bead on multiple pass welds. For critical two-run welds in the most demanding tower applications – choose Lincolnweld® LA-81.

Lincolnweld® Submerged Arc Flux

Lincolnweld® WTX™

Lincolnweld® WTX™ is a neutral flux designed to meet the specific requirements of wind tower welding applications. It is recommended for use with Lincolnweld® L-61 electrode on both longitudinal and circumferential seam welds. The combination of Lincolnweld® L-61 and WTX™ is capable of exceeding the mechanical property requirements specified for cold weather wind tower applications.

Lincolnweld® 761

Lincolnweld® 761 is a manganese alloying and carbon reducing flux designed to provide superior crack resistance. It is recommended for limited pass welding with Lincolnweld® solid electrodes. For a flux capable of producing excellent bead appearance with Charpy V-Notch results exceeding 27 J (20 ft•lbf) at -29° C (-20° F) – choose Lincolnweld® 761.

Lincolnweld® 960

Lincolnweld® 960 is a low cost, general purpose flux designed for single pass butt welds, such as longitudinal and spiral seams on pipe. It is recommended for automatic and semiautomatic submerged arc welding. For a versatile, cost-effective flux – choose Lincolnweld® 960.

Lincolnweld® P223

Lincolnweld® P223 is an industry standard for welding wind towers. It is recommended for two-run welding applications, but can also be used in multiple pass welding because it is neutral. For fast freezing slag characteristics ideal for welding wind towers – choose Lincolnweld® P223.

Lincolnweld® 995N

Lincolnweld® 995N provides outstanding operability on single-pass butt welds such as longitudinal and spiral seams on pipe. For wind tower applications requiring the capability to exceed impact toughness of 27 J (20 ft•lbf) at -40° C (-40° F) – choose Lincolnweld® 995N.

Lincolnweld® 888™

Lincolnweld® 888™ is a basic flux designed for use in critical wind tower applications. It is recommended for joining mild steel and low alloy steels in as-welded and stress-relieved applications, typical of the offshore wind tower and structural fabrication industries. For a flux capable of low diffusible hydrogen levels and exceptional deep groove slag removal – choose Lincolnweld® 888™.



* The terms “low,” “medium” and “high” are used in the context of the AWS classifications stated.