

WELDING MATERIALS

NOTE: All Standard AWS sizes are included for each material unless otherwise noted. This QPL includes welding materials for both field and shop fabrication.

Welding of A588 steel using Shielded Metal Arc Welding(SMAW) shall be performed using E8018-C1,C2,C3 electrodes except that single pass fillet welds up to 6 mm (1/4") max. & 6 mm (1/4") groove welds made with a single pass or a single pass on each side, may be made using an E70## low hydrogen electrode.

Electrodes in AWS Class E60## and meeting AWS Specification A5.1 are not low hydrogen electrodes and ***are not*** approved for welding on bridge steel or to bridge steel.

| <i>MANUFACTURER'S CLASS (BRAND)</i> | <i>AWS CLASS</i> | <i>AWS SPEC.</i> |
|--|----------------------|----------------------|
| The ESAB Group, Inc. Alloy Rods 1500 Karen Lane Hanover, PA 17331 (717) 637-8911 | | |
| Atom Arc 7018-1 | E7018-1 | A5.1 |
| Atom Arc 7018 | E7018 | A5.1 |
| Spoolarc 72 | F7A2-EM12K | A5.17 |
| Spoolarc 78 | F6A2-EL12 | A5.17 |
| Spoolarc 85 | ER70S-3 | A5.18 |
| Spoolarc 88 | ER70S-6 | A5.18 |
| Coreweld 70 | E70T-1 | A5.20 |
| Dual Shield T-62 | E70T-1 | A5.20 |
| Dual Shield R-70 | E70T-1 | A5.20 |
| Dual Shield II-70 | E70T-1 | A5.20 |
| Dual Shield 111AC | E70T-1 | A5.20 |
| Dual Shield 7000 | E70T-1 | A5.20 |
| Dual Shield 7100 ULTRA | E70T-1 | A5.20 |
| Dual Shield T-75 | E70T-5 | A5.20 |
| Dual Shield II-71 | E71T-1 | A5.20 |
| Dual Shield 8100W | E80T1-W | A5.29 |
| Dual Shield II 80Nil | E81T1-Nil | A5.29 |
| Dual Shield 88W | E80T1-W | A5.29 |

Hobart Brothers Company
600 West Main Street
Troy, OH 45373
(513) 339-6000

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|----------------------|-----------|-------|
| Hobart 18AC | E7018 | A5.1 |
| Hobart 418 | E7018 | A5.1 |
| Hobart 718 | E7018 | A5.1 |
| Hobart 718C | E7018 | A5.1 |
| Hobart 718MC | E7018 | A5.1 |
| Hobart 728 | E7028 | A5.1 |
| Hobart BR-3 | ER70S-3 | A5.18 |
| Hobart HB-25 | ER70S-3 | A5.18 |
| Hobart HB-33 | ER70S-3 | A5.18 |
| Hobart HB-28 | ER70S-6 | A5.18 |
| Hobart BR-6 | ER70S-6 | A5.18 |
| Hobart Formula XL525 | E71T-1 | A5.20 |
| Hobart Formula XL550 | E71T-1 | A5.20 |
| Hobart Fabco RXR | E70T-1 | A5.20 |
| Hobart Fabco 81 | E70T-1 | A5.20 |
| Hobart Fabcor 86 | E70T-1 | A5.20 |
| Hobart Fabco 90 | E70T-1 | A5.20 |
| Hobart Fabco 91 | E70T-1 | A5.20 |
| Hobart Fabco 802 | E71T-1 | A5.20 |
| Hobart Fabco 825 | E70T-1 | A5.20 |
| Hobart Fabco 85 | E70T-5 | A5.20 |
| Hobart Fabshield 32 | E70T-6 | A5.20 |
| Hobart Fabshield 3 | E71T-8 | A5.20 |
| Hobart HB-18 | ER80S-D2 | A5.28 |
| Hobart Fabco 83 | E80T1-W | A5.29 |
| Hobart Fabco 115 | E110T5-K4 | A5.29 |
| Hoballoy 8018C1 | E8018-C1 | A5.5 |
| Hoballoy 8018C2 | E8018-C2 | A5.5 |
| Hoballoy 8018C3 | E8018-C3 | A5.5 |

The Lincoln Electric Company
 22801 St. Clair Avenue
 Cleveland, Ohio 44117

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|--------------------------------|-----------------|-------|
| Jetweld LH-73 | E7018 | A5.1 |
| Jetweld LH-75MR | E7018 | A5.1 |
| Jet LH-78MR | E7018 | A5.1 |
| Jetweld LH-3800 | E7028 | A5.1 |
| Lincolnweld 761/L-60 | F7A2-EL12 | A5.17 |
| Lincolnweld 780/L-61 | F7A2-EM12K | A5.17 |
| Lincolnweld 860/L-50 | F7A2-EM13K | A5.17 |
| Lincolnweld 860/LA-61 | F7A2-EM12K | A5.17 |
| Lincolnweld 880/LA-71 | F7A4-EM14K | A5.17 |
| Lincolnweld 880M/LA-71 | F7A6-EM14K | A5.17 |
| Lincolnweld L-50 | ER70S-3 | A5.18 |
| Lincolnweld L-56 | ER70S-6 | A5.18 |
| Outershield 70 | E70T-1 | A5.20 |
| Innershield NR-203MP | E71T-8 | A5.20 |
| Innershield NR-232 | E71T-8 | A5.20 |
| Lincoln 761/L-70 | F9A0-EA1-G | A5.23 |
| Lincolnweld 860/L-70 | F7P2-EA1-A2 | A5.23 |
| | F7A2-EA1-A2 | A5.23 |
| Lincolnweld 880/LA-75 | F7A6-ENiKNil | A5.23 |
| Lincolnweld 880/LA-90 | F9A4-EA3K-A4 | A5.23 |
| Lincolnweld 880M/LA-100 | F9A6-EM2-M2 | A5.23 |
| Lincolnweld 880M/LA-100 | F9P2-ECB2-B2 | A5.23 |
| Lincolnweld 880M/LAC Ni2 | F7A10-ECNi2-Ni2 | A5.23 |
| | F7P10-ECNi2-Ni2 | A5.23 |
| Lincolnweld 882/LAC Ni2 | F8P4-ECNi2-Ni2 | A5.23 |
| Lincolnweld 980/LA-75 | F7A2-ENiK-NiI | A5.23 |
| Lincolnweld 980/LAC-Ni2 | F8A2-ECNi2-Ni2 | A5.23 |
| Lincolnweld AXXX10/L-61 | F7A4-EM12K-NiI | A5.23 |
| Lincolnweld LA-75 | ER80S-NiI | A5.28 |
| Lincolnweld LA-90 | ER80S-D2 | A5.28 |
| Innershield NR-203 Nickel (1%) | E71T8-NiI | A5.29 |
| Jet-LH 8018-C1 MR | E8018-C1 | A5.5 |
| Jet-LH 8018-C3 MR | E8018-C3 | A5.5 |

L-TEC Welding & Cutting Systems
 Welding Materials
 P. O. Box 710
 Ashtabula, OH 44004

L-TEC Electrode

| | | | |
|--------|----------------|---------|------|
| 7018 | 5/32" Diameter | E7018 | A5.1 |
| 7018 | 3/16" Diameter | E7018 | A5.1 |
| 7018 | 1/4" Diameter | E7018 | A5.1 |
| 7018-1 | 3/16" Diameter | E7018-1 | A5.1 |
| 7018-1 | 1/4" Diameter | E7018-1 | A5.1 |

L-TEC Electrode-Flux

| | | | |
|-----|-------|------------------------|-------|
| 29 | 50 | F6A2-EM12K, F7A2-EM12K | A5.17 |
| 29 | 80 | F7A2-EM12K | A5.17 |
| 29 | 231 | F7A2-EM12K | A5.17 |
| 29S | 35c | F7A2-EM13K | A5.17 |
| 29S | 656 | F7A6-EM13K | A5.17 |
| 29 | 350 | F7A2-EM12K | A5.17 |
| 29 | 429 | F7A2-EM12K | A5.17 |
| 29 | 585 | F7A2-EM12K | A5.17 |
| 36 | 50 | F6A2-EH14, F7A2-EH14 | A5.17 |
| 36 | 80 | F7A2-EH14 | A5.17 |
| 36 | 124 | F6A2-EH14, F7A2-EH14 | A5.17 |
| 36 | 585 | F7A2-EH14 | A5.17 |
| 53 | 429 | F7A4-EH12K | A5.17 |
| 53 | 656 | F7A8-EH12K | A5.17 |
| 80 | 80 | F6A2-EL12 | A5.17 |
| 80 | 350 | F6A2-EL12, F7A2-EL12 | A5.17 |
| 81 | 50 | F6A2-EM12K, F7A2-EM12K | A5.17 |
| 81 | 80 | F7A2-EM12K | A5.17 |
| 81 | 231 | F7A2-EM12K | A5.17 |
| 81 | 350 | F7A2-EM12K | A5.17 |
| 81 | 429 | F7A2-EM12K | A5.17 |
| 81 | 439 | F7A4-EM12K | A5.17 |
| 81 | 585 | F7A2-EM12K | A5.17 |
| 81 | 651VF | F7A6-EM12K | A5.17 |
| 81 | 656 | F6A6, F7A6-EM12K | A5.17 |

L-TEC Welding & Cutting Systems(continued)

L-TEC Electrode Gas

| | | | |
|------------|------|--------------------------|-------|
| 29S | CO2 | ER70S-3 | A5.18 |
| 65 | CO2 | ER70S-2 | A5.18 |
| 82 | CO2 | ER70S-3 | A5.18 |
| 86 | CO2 | ER70S-6 | A5.18 |
| 87HP | CO2 | ER70S-7 | A5.18 |
| FC-72 | CO2 | E70T-1 | A5.20 |
| FC-702 | CO2 | E70T-1 | A5.20 |
| FC-703 | CO2 | E70T-1 | A5.20 |
| FC-707 | CO2 | E71T-1 | A5.20 |
| FC-715 | CO2 | E71T-1 | A5.20 |
| FC-717 | CO2 | E71T-1 | A5.20 |
| FC-719 | CO2 | E71T-1 | A5.20 |
| MC-716 | C-25 | E70T-1 | A5.20 |
| MC720 | C-25 | E70T-1 | A5.20 |
| WS-429 | | F7A2-EW-WH8, F8A2-EW-WH8 | A5.23 |
| WS-439 | | F7A4,F8A4-EW-WH8 | A5.23 |
| WS-656 | | F7A5-EW-WH4 | A5.23 |
| WS 709-5 | | F7A2, F8A2-EW-W | A5.23 |
| ENi4 429 | | F9A4, ENi4-Ni4 | A5.23 |
| ENi4 656 | | F8A8, F9A8-ENi4-Ni4 | A5.23 |
| ENi4 709-5 | | F7A4, F8A4-ENi4-Ni4 | A5.23 |
| ENi4 651VF | | F8A8, F9A8,ENi4-Ni4 | A5.23 |
| 95 656 | | F9A6, EM2-M2H4 | A5.23 |
| 95 709-5 | | F9A6, EM2-M2H8 | A5.23 |
| 100 709-5 | | F11A4-EF5-F5 | A5.23 |
| 83 | CO2 | ER80S-D2 | A5.28 |
| HI-84 | CO2 | ER80S-D2 | A5.28 |
| FC727 | CO2 | E81T1-Ni2 | A5.29 |
| FC115 | C-25 | E110T5-K4 | A5.29 |

McKay Division
Hobart Brothers Company
101 Trade Square East
Troy, OH 45373
(800) 424-1543

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|-----------------------|--------|-------|
| McKay 7018 XLM | E7018 | A5.1 |
| McKay Speed-Alloy 71V | E70T-1 | A5.20 |
| McKay Speed-Alloy 75 | E70T-5 | A5.20 |

METHOD OF DOCUMENTATION OF ACCEPTANCE: By AWS classification and specification markings. Resident Engineer records in diary. The brand and manufacturer if not listed above must be approved prior to use.

Method of Approval for Materials to be added to this Qualified Products List: Qualification of welding materials is based on the submittal of the manufacturer's certified yearly tests in accordance with AWS.

Electrode Information & Usage: Bridge field welding will generally be by Shielded Metal Arc Welding Type (SMAW) which meets AWS specification A5.1 and A5.5. The electrode will have a designation E####-x. The code for this designation is:

| | |
|-----------------|---|
| <u>E</u> ####-x | E Electrode |
| <u>E</u> ####-x | Minimum tensile strength in 1000 psi--For bridge welding must be 70 or greater |
| <u>E</u> ####-x | Approved welding position; 1,2 or 4; 1-all positions, 2-flat position & horizontal fillet welds, 4-vertical-down welding & flat, overhead, horizontal |
| <u>E</u> ####-x | Type coating, 0-8; also shows approved current type |
| <u>E</u> ####-x | Chemical composition of weld metal deposit. |

All E70## and E80## SMAW electrodes shall be stored in unopened hermetically sealed containers or in holding ovens at 120°C (250°F). If not taken from a sealed container or a holding oven:

AWS 5.1 electrodes must be dried at least 2 hours at 230°C - 260°C (450°-500°F)(Max exposure time is 4 hrs.)

AWS 5.5 electrodes must be dried at least 1 hour at 370°C - 430°C (700°-800°F)(Max exposure time is 4 hrs. for E70## & 2 hrs. for E80##)

If during use electrodes are exposed for less than the max. exposure time electrodes may be redried once at min of 120°C (250° F). for 4 hours.

If during use electrodes are exposed for more than the max. exposure time electrodes may be redried once at min of 230°C - 260°C (450°-500°F) for 2 hours.

Electrodes that have been wet shall not be used.

Other electrodes listed and meeting AWS codes AWS 5.17, A5.18, A5.20, A5.23, A5.28, A5.29 are for use with Submerged Arc Welding (SAW-A5.17 & A5.23), Flux Cored Arc Welding (FCAW- A5.20 & A5.29), or Gas Metal Arc Welding (GMAW- A5.18 & A5.28). These are normally shop fabrication techniques.