

APPENDIX I

GLOSSARY

- ACC**— Air carbon arc cutting.
- ARC BLOW**— The tendency for an arc to wander or whip from its normal course during arc welding.
- ASME**— American Society of Mechanical Engineers.
- AWS**— American Welding Society.
- BACKFIRE**— Momentary burning back of the flame into the torch tip during welding or cutting.
- BACKHAND WELDING**— Welding in the direction opposite the direction the gas flame is pointing.
- BURR**— The sharp edge remaining on metal after cutting.
- CARBURIZING FLAME**— Produced by burning an excess of fuel gas.
- CHAMFER**— Bevel angling the metal edge where welding is to take place.
- COMPRESSION STRESSES**— The stresses developed within a material when forces tend to compress or crush the material.
- DCRP**— Direct current reverse polarity.
- DCSP**— Direct current straight polarity.
- DISTORTION**— The warping of a structure.
- DUCTILITY**— The property that enables a material to withstand extensive permanent deformation due to tension.
- ELASTICITY**— The ability of a material to return to its original form after deformation.
- FATIGUE**— The tendency of a material to fail after repeated stressing at the same point.
- FATIGUE STRENGTH**— The ability of a material to resist various kinds of rapidly alternating stresses.
- FERROUS**— Denotes the family of metals in which iron is the major ingredient.
- FLASHBACK**— The flame burning in or beyond the torch mixing chamber during welding or cutting.
- FLUX**— A chemical used to promote fusion of metals during the welding process.
- FOREHAND WELDING**— Welding in the same direction as the torch flame points.
- FUSION**— The melting together of metals.
- GMAW**— Gas metal arc welding.
- GTAW**— Gas tungsten arc welding.
- IMPACT STRENGTH**— The ability of a metal to resist suddenly applied loads; measured in foot-pounds of force.
- KERF**— The narrow slit formed in metal as cutting progresses.
- LAYOUT**— The process of measuring and marking materials for cutting, bending, drilling, or welding.
- MALLEABILITY**— The property that enables a material to withstand permanent deformation caused by compression.
- MAPP**— A stabilized methyl acetylene-propadiene fuel gas. A Dow Chemical Company product.
- METALLOID**— A nonmetal that can combine with a metal to form an alloy.
- METALLURGY**— The science and technology of metals.
- MIG**— A term used to describe gas metal arc welding (metal inert gas).
- NEUTRAL FLAME**— Produced when equal amounts of oxygen and fuel gas are burned.
- NORMALIZING**— A heat-treating operation involving the heating of an iron-base alloy above its critical temperature range and cooling it in still air for the purpose of removing stresses.
- NONFERROUS**— Metals containing no iron.
- OFW**— Oxyfuel welding.
- OXIDIZING FLAME**— Produced by burning about twice as much oxygen as fuel gas.
- PASS**— A single progression of a welding operation along a joint or weld deposit. The result of a pass is a weld bead.

PLASTICITY— The ability of a material to permanently deform without breaking or rupturing.

POROSITY— The presence of gas pockets or voids in metal.

QUENCHING— The process of rapid cooling from an elevated temperature by contact with fluids or gases.

QUENCHING MEDIUM— The oil, water, brine, or other medium used for rapid cooling.

RSW— Resistance spot welding.

RW— Resistance welding.

SEIZE— To bind securely the end of a wire rope or strand with seizing wire.

SHEARING STRESSES— The stresses developed within a material when external forces are applied along parallel lines in opposite directions.

SMAW— Shielded metal arc welding.

SOAKING— Holding a metal at a required temperature for a specified time to obtain even temperature throughout the section.

STINGER— An electrode holder; a clamping device for holding the electrode securely in any position.

STRESS— External or internal force applied to an object.

TENSILE STRENGTH— The resistance to being pulled apart.

TENSION STRESSES— The stresses developed when a material is subjected to a pulling load.

TIG— A term used to describe gas tungsten arc welding (tungsten inert gas).

TINNING— A term applied to soldering where the metals to be soldered together are first given a coat of the soldering metal.

WELD— To join metals by heating them to a melting temperature and causing the molten metal to flow together.

WELDMENT— An assembly whose parts are joined by welding.

ULTIMATE STRENGTH— The maximum strain that a material is capable of withstanding.

APPENDIX II

REFERENCES USED TO DEVELOP THE TRAMAN

<u>References</u>	<u>Chapters</u>
Althouse, Andrew D., Carl H. Turnquist, and William A. Bowditch, <i>Modern Welding</i> , Goodheart-Wilcox Co. Inc., 1970.	1 - 8
Bennet, A. E., and Louis J. Sky, <i>Blueprint Reading for Welders</i> , 3d ed., Delmar Publishers Inc., 1983.	3
<i>Blueprint Reading and Sketching</i> , NAVEDTRA 10077-F1, Naval Education and Training Program Management Support Activity, Pensacola, Fla., 1988.	3
<i>Equipment Operator 3</i> , NAVEDTRA 10392, Naval Education and Training Program Management Support Activity, Pensacola, Fla., 1990.	7
Giachino and Weeks, <i>Welding Skills</i> , American Technical Publishers Inc., 1985.	1 - 8
<i>Heat Treatment and Inspection of Metals</i> , ATC Manual 52-5, Air Training Command, Scott Air Force Base, Ill., 1963.	2
<i>Naval Construction Force Welding Materials Handbook</i> , P-433, Naval Facilities Engineering Command, Department of the Navy, Washington D. C., 1991.	3,6
<i>The Oxy-Acetylene Handbook</i> , 2d ed., Linde Company, Union Carbide Corporation, 270 Park Avenue, New York, 1960.	3 - 5 , 6
<i>Safety and Health Requirements Manual</i> , EM 385-1, U.S. Army Corps of Engineers, United States Government Printing Office, Washington, D. C., 1987.	4, 5, 8
Smith, David, <i>Welding Skills and Technology</i> , Gregg Division, McGraw-Hill, 1984.	3 - 8
<i>Welding Theory and Application</i> , TM 9-237, Department of the Army Technical Manual, Headquarters, Department of the Army, Washington D.C., 1976.	1-8

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