


AWS G1.10M:2001
An American National Standard



Guide for the Evaluation of Hot Gas, Hot Gas Extrusion, and Heated Tool Butt Thermoplastic Welds



American Welding Society



Key Words—Hot gas welding, thermoplastics,
heated tool butt welding, joints,
evaluation, testing, hot gas extrusion

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Approved by
American National Standards Institute
February 21, 2001

Guide for the Evaluation of Hot Gas, Hot Gas Extrusion, and Heated Tool Butt Thermoplastic Welds

Prepared by
AWS G1 Committee on Joining Plastics and Composites

Under the Direction of
AWS Technical Activities Committee

Approved by
AWS Board of Directors

Abstract

This standard lists and describes defects in hot gas, hot gas extrusion, and heated tool butt welded joints in thermoplastics. Its intent is to make possible a generally valid evaluation giving consideration to graded quality requirements. This standard encompasses the classification, requirements, testing, evaluation, and acceptance of the welds. Details in recording engineering data are described. Tables illustrating cracks, voids, solid inclusions, lack of fusion, defects of shape, and other defects in thermoplastic welds are included. Defect features with descriptions and illustrations are compiled into tables to aid in the evaluation of welds.



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International Standard Book Number: 0-87171-615-1

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The subcommittee would like to thank Dr. Detlef Van Hofe of DVS for his contributions to this standard.

Foreword

(This Foreword is not part of AWS G1.10M:2001, *Guide for the Evaluation of Hot Gas, Hot Gas Extrusion, and Heated Tool Butt Thermoplastic Welds*, but is included for information purposes only.)

The purpose of plastics welding inspection is to determine if a plastics weldment meets the acceptance criteria of a specific code, other standard, or other document. The plastics welding inspector must be thoroughly familiar with plastics welding processes, plastics welding procedures, plastics welder qualifications, materials, the limitation of plastics weld testing, be able to read drawings, prepare and keep records, prepare and make reports and make responsible judgments. For plastics welding inspectors to be effective, the activities performed should be consistent with the requirements, and technical and ethical principles.

The AWS G1 Committee on Joining Plastics and Composites was formed in 1989 by industry and academic experts interested in providing process information and test standards for rating the weldability of plastic and composite materials. The G1A Subcommittee on Hot Gas Welding and Extrusion Welding was formed in 1993 to create standards for the qualification of hot gas and heated tool plastic welding personnel. DVS 2202-1, Imperfections in thermoplastic welding joints; features, descriptions, evaluation, was used extensively in the creation of this standard.

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS G1 Committee on Joining of Plastics and Composites, American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

Official interpretations of any of the technical requirements of this standard may be obtained by sending a request, in writing, to the Managing Director, Technical Services Division, American Welding Society (see Annex C). A formal reply will be issued after it has been reviewed by the appropriate personnel following established procedures.

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Guide for the Evaluation of Hot Gas, Hot Gas Extrusion, and Heated Tool Butt Thermoplastic Welds

1. Scope, Purpose, and Range of Application

1.1 These guidelines list and describe defects in welded joints in thermoplastic materials. The objective is to make possible a generally valid evaluation giving consideration to graded quality requirements.

1.2 By classification into one of the evaluation groups in 4.1, specific defects can be excluded or kept within limits when welded joints are produced.

1.3 The application of these guidelines and the measures through which they can be met may be included in contractual specification or form part of the generally recognized specifications.

1.4 Welding Processes. Defects produced by the following welding processes are addressed. This guide applies to the following processes:

	<u>Abbreviation</u>	<u>Annex</u>
Hot gas fan (rod) welding	WF	VII
Hot gas speed welding	WZ	VII
Hot gas extrusion welding	WE	VIII
Heated tool butt welding	HS	IX

1.5 Materials. These guidelines apply to welded joints on components and systems made from the engineering thermoplastics listed below:

<u>Abbreviation</u>	<u>Material Description</u>
ECTFE	Ethylene chlorotrifluoroethylene
ETFE	Ethylene tetrafluoroethylene
FEP	Fluorinated ethylene-propylene
MFA	Perfluoromethylvinylether
M PTFE	PFA modified PTFE
PE-HD	High density polyethylene (rigid PE)
PFA	Perfluoroalkoxy
PP-B	Polypropylene block copolymer
PP-H	Polypropylene homopolymer
PP-R	Polypropylene random copolymer
PTFE	Polytetrafluoroethylene
PVC-C	Chlorinated polyvinyl chloride

<u>Abbreviation</u>	<u>Material Description</u>
PVC-HI	High-impact polyvinyl chloride
PVC-U	Unplasticized polyvinyl chloride (rigid PVC)
PVDF	Polyvinylidene fluoride
PVDF/HFP	Polyvinylidene fluoride/hexafluoropropylene

1.6 The use of these guidelines for welding other thermoplastic materials must be agreed upon between the customer and the fabricator.

1.7 This standard makes use of the International System of Units (SI).

1.8 Safety. The activities described in this document may bring the user of this standard in contact with processes and materials that may be hazardous to the user's health. Safety precautions mandated by OSHA and recommendations for material handling in MSDS sheets should be observed. The fabricator's operating manual and safety instructions should always be carefully studied and complied with when operating equipment.

Note: This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user to establish appropriate safety and health practices. The user should determine the applicability of any regulatory limitations prior to use.

2. Referenced Documents

Reference should be made to the latest edition of the following documents:

ASTM C 904 Standard Terminology Relating to Chemical-Resistant Nonmetallic Materials¹

1. ASTM documents are published by the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.