



GS 118-4

STORAGE AND CONTROL OF WELDING CONSUMABLES

August 1997

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SCOPE AND PURPOSE This specification specifies BP general requirements for the receipt, storage and control of welding consumables held under shop and site conditions and has two principal objectives: a) The provision of a high degree of assurance that the specified consumables are employed in any given joint. b) The prevention of damage or deterioration of the consumables at all stages from receipt through to welding.											
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FOREWORD

Introduction to BP Group Recommended Practices and Specifications for Engineering

The Introductory Volume contains a series of documents that provide an introduction to the BP Group Recommended Practices and Specifications for Engineering (RPSEs). In particular, the 'General Foreword' sets out the philosophy of the RPSEs. Other documents in the Introductory Volume provide general guidance on using the RPSEs and background information to Engineering Standards in BP. There are also recommendations for specific definitions and requirements.

Value of this Guidance for Specification

This Guidance for Specification provides the fabricator with guidelines which indicate the anticipated contents of the fabricators welding consumable control procedures.

Application

This Guidance for Specification is intended to guide the purchaser in controlling the welding activity in a manner that reduces the likelihood of problems arising from the application of incorrect or unsuitable welding consumables.

Any text in italics is Commentary. The Commentary provides background information which supports the requirements of the Specification, and may discuss alternative options.

This document may refer to certain local, national or international regulations but the responsibility to ensure compliance with legislation and any other statutory requirements lies with the user. The user should adapt or supplement this document to ensure compliance for the specific application.

Principal Changes from Previous Edition

This edition of BP Group GS 118-4, formerly BP Std. 165, has been amended to reflect current expectation with regard to custom and practice within the fabrication industry. The amendments are general in nature and do not consist of any major technical changes.

Feedback and Further Information

Users are invited to feed back any comments and to detail experiences in the application of BP RPSE's, to assist in the process of their continuous improvement.

For feedback and further information, please contact Standards Group, BP International or the Custodian. See Quarterly Status List for contacts.



1. INTRODUCTION

1.1 Scope and Purpose

This specification defines the general BP requirements for the receipt, storage and control of welding consumables held under shop and site conditions and has two principal objectives:

- a) The provision of a high degree of assurance that the specified consumables are employed in any given joint.
- b) The prevention of damage or deterioration of the consumables at all stages from receipt through to welding.

This specification applies to all fabrications where a design code is used, and is not restricted to pressure containing components. The principles outlined apply to all welded fabrications.

This specification will not be used to impose additional constraints on existing procedures which embody the principles of storage and control outlined.

2. GENERAL

2.1 Application of this Specification

The application of this specification is self-limiting by the number of welding consumable types used, i.e. the fewer, the simpler the control system required.

2.2 Storage and Control

Weld metal composition is generally controlled within specific limits to achieve the required levels of strength, toughness or corrosion resistance. Since a variety of consumables may be in use at any given manufacturing location, strict control shall be exercised to prevent loss of identification or the use of incorrect weld metal.

The control of welding consumables shall be in accordance with fully documented procedures.

All welding consumables shall be stored such as to prevent damage or deterioration or loss of identity.



3. QUALITY ASSURANCE

3.1 Procedures

A fabricator's welding consumable control procedures shall form an integral part of a quality system based on [ISO 9002](#) or an equivalent document approved by BP.

Detailed written procedures shall be established for the systematic receipt, storage, issue and control of welding consumables and the attendant recording of these actions.

These procedures shall define the personnel responsible for the efficient operation of the consumable control procedures at management and shop floor supervisory level.

Copies of the procedures shall be readily available and referenced in the fabricator's quality plan.

The implementation of procedures will be audited as necessary by BP or its authorised representative during the fabrication programme. BP shall be advised of the corrective actions taken by the fabricator as a result of any Non Conformance Reports issued by any such audit.

4. CONSUMABLE STORAGE AND CONTROL

4.1 Basic Requirements

Written procedures are a pre-requisite for any control system. Potential problems with the practicalities of consumable control may be minimised by applying the following principles.

- a) All welding consumables shall meet the requirements of the welding procedure specifications and have been manufactured to an internationally accepted standard.
- b) The number of different welding consumables in use on a particular fabrication or in a specific fabrication area should be minimised.
- c) All welding consumables should be marked or colour-coded for easy recognition. Colour coding should be to a system developed by the fabricator and agreed with BP.
- d) All materials should be segregated during fabrication. Thus, specific areas for the fabrication of carbon, low-alloy or stainless steels should be established.



Where various grades of carbon steel, such as those for normal ambient and low temperature duties, are fabricated simultaneously, they should also be segregated.

- e) All welding consumables shall be stored indoors in specific storage areas.
 - Non-hygroscopic electrodes and fluxes shall be stored in labelled containers in the storage areas.
 - Hygroscopic electrodes and fluxes shall be stored in hermetically sealed containers or in heated holding ovens once the containers have been opened.
 - Drying of hygroscopic electrodes and fluxes in heated drying ovens to achieve the required hydrogen levels shall be in accordance with the manufacturer's instructions. These instructions shall form part of the Quality Assurance system and be available for use of the supervisor responsible.
- f) Hydrogen controlled electrodes which have been dried to achieve specific hydrogen levels in weld metal, as required by some design codes, or which were originally supplied in hermetically sealed vacuum packed containers shall not be re-dried unless such a treatment is specifically recommended by the consumable manufacturer. Electrodes of either of these types which are returned to the electrode store and are not re-dried shall be removed from the BP worksite.

4.2 Detailed Procedures

A fabricator's consumable control procedure should be established to suit his own specific operations. However, all consumable control procedures should conform to the checklist in 4.3. This covers the principal points that would be found in an acceptable system and will form the basis of any audit undertaken by BP.

A flow chart for a typical consumable control procedure is shown in Figure 1.



4.3 Procedure Checklist

- 4.3.1 Preference should be given to manufacturers supplying premarked and clearly identified products with covered electrodes and straight lengths of wire individually identified. This requirement is met by consumables manufactured to [ASME Section II](#), Part C except that straight lengths of wire are not required to be marked by that standard.
- 4.3.2 Where unmarked electrodes or wire lengths are purchased, each consumable shall be marked at one end in accordance with an identification system established by the fabricator. Marking shall take place under the control of the fabricator's welding supervisory staff, immediately the packaging seal is broken.
- 4.3.3 On receipt, all welding consumables shall be held in a quarantine area until compliance with the purchase order has been verified, full details (including supplier, manufacturer, brand name, batch number, quantity received and delivery date) recorded and certificates filed. BP requirements shall be given in the schedule of documentation requirements. Any further checks required shall be undertaken before the consumables are transferred to the storage area. The storage area shall be dry, i.e. continually maintained with a relative humidity equal to or less than 60%, and at a minimum temperature of 20°C.
- 4.3.4 Consumables shall be transferred to the workshop or other secondary storage areas only as they are required for use. This transfer shall take place at the request of the fabricator's welding supervisory staff and full details of each transfer shall be recorded in both of the storage areas concerned. All secondary storage areas shall be maintained dry and warm as required in 4.3.3.
- 4.3.5 It is the fabricator's responsibility to ensure that all hydrogen-controlled consumables produce the weld metal hydrogen level required by the fabrication specification.
- The fabricator's welding supervisory staff shall issue drying instructions based on the manufacturer's recommendations for all submerged arc fluxes and SMAW electrodes as required.
- 4.3.6 Drying and elevated temperature storage (holding) shall be performed in purpose-built, thermostatically-controlled ovens located within the secondary storage area. These ovens shall be fitted with a temperature indicator and should also be equipped with a temperature recorder and calibrated regularly.



4.3.7 Ovens should not be overloaded. Where oven shelves are loaded with electrodes more than three layers deep, the control thermocouple should be placed between the layers to ensure that electrodes at the centre of the burden receive the correct thermal cycle.

4.3.8 Each type and size of consumable shall be clearly marked and segregated within the drying and storage (holding) ovens.

The contents of each oven shall be clearly marked on the door.

4.3.9 Manual welding consumables shall be issued to welders only on production of a work card, endorsed by the fabricator's welding supervisory staff on at least a daily basis. This card shall list full details of the job, including application and joint number when appropriate, consumable type and quantity required for the work period, i.e. one shift maximum. Electrodes shall be issued directly into special containers or, in the case of hydrogen-controlled electrodes, quivers heated to 70°C to 100°C.

Where the usage of manual electrodes is low, or the location of the work is unsuitable for the use of heated quivers, consideration should be given to the use of hermetically sealed, vacuum packed, low hydrogen electrodes. However, it remains the fabricator's responsibility to ensure that the moisture level in such consumables remains within acceptable limits.

4.3.10 In the case of submerged arc and other semi-automatic or mechanised welding processes, the welding operator shall present a machine card when drawing consumables. This card shall be endorsed by the fabricator's welding supervisory staff and specify all relevant details as required on the work card above.

4.3.11 Only consumables for one welding procedure shall be issued to a welder or welding operator at any given time, and a record of all consumables issued shall be maintained in the secondary storage area.

4.3.12 All manual consumables remaining at the end of a work period shall be returned to the store. All returns shall be recorded and put into holding ovens or, if necessary, re-dried in accordance with the manufacturer's recommendations prior to re-issue. However, hydrogen controlled electrodes which have been dried to achieve specific hydrogen levels in weld metal as required by some design codes shall not be re-dried and shall be removed from the BP worksite.

Part used or stub ends of electrodes and wire shall be collected at the end of each shift or on completion of the job, whichever is sooner and deposited in scrap bins.



- 4.3.13 Procedures shall be in force which prevent deterioration of submerged arc welding fluxes when the machines are not in use. Submerged arc fluxes shall be recovered and recycled in accordance with the manufacturer's instructions.
- 4.3.14 Any non-identified contaminated or otherwise damaged consumables, including those suspected of being damp, found in any storage or fabrication area shall be immediately destroyed under the control of the fabricator's welding supervisory staff.
- 4.3.15 All records concerned with consumable control, including all work/machine cards and stores records, shall be audited as a matter of routine by the fabricator's quality control staff.

5. Supporting Facilities

5.1 Supporting Staff

Welding supervisory staff, such as welding engineers, foremen and storemen, are generally required to ensure the continuity of a fabricator's welding operations. While such personnel may provide feedback on the effectiveness of consumable control procedures, one member of the Quality Control staff should have specific responsibility for monitoring these procedures.

5.2 Support Services

For specialised welding activities, it is recommended that the fabricator has access to basic metallographic and portable analytical equipment to confirm the effectiveness of the consumable control procedures. Such techniques are particularly valuable in the fabrication of highly alloyed or exotic materials, the deposition of weld overlays and the production of equipment and piping for low temperature applications.



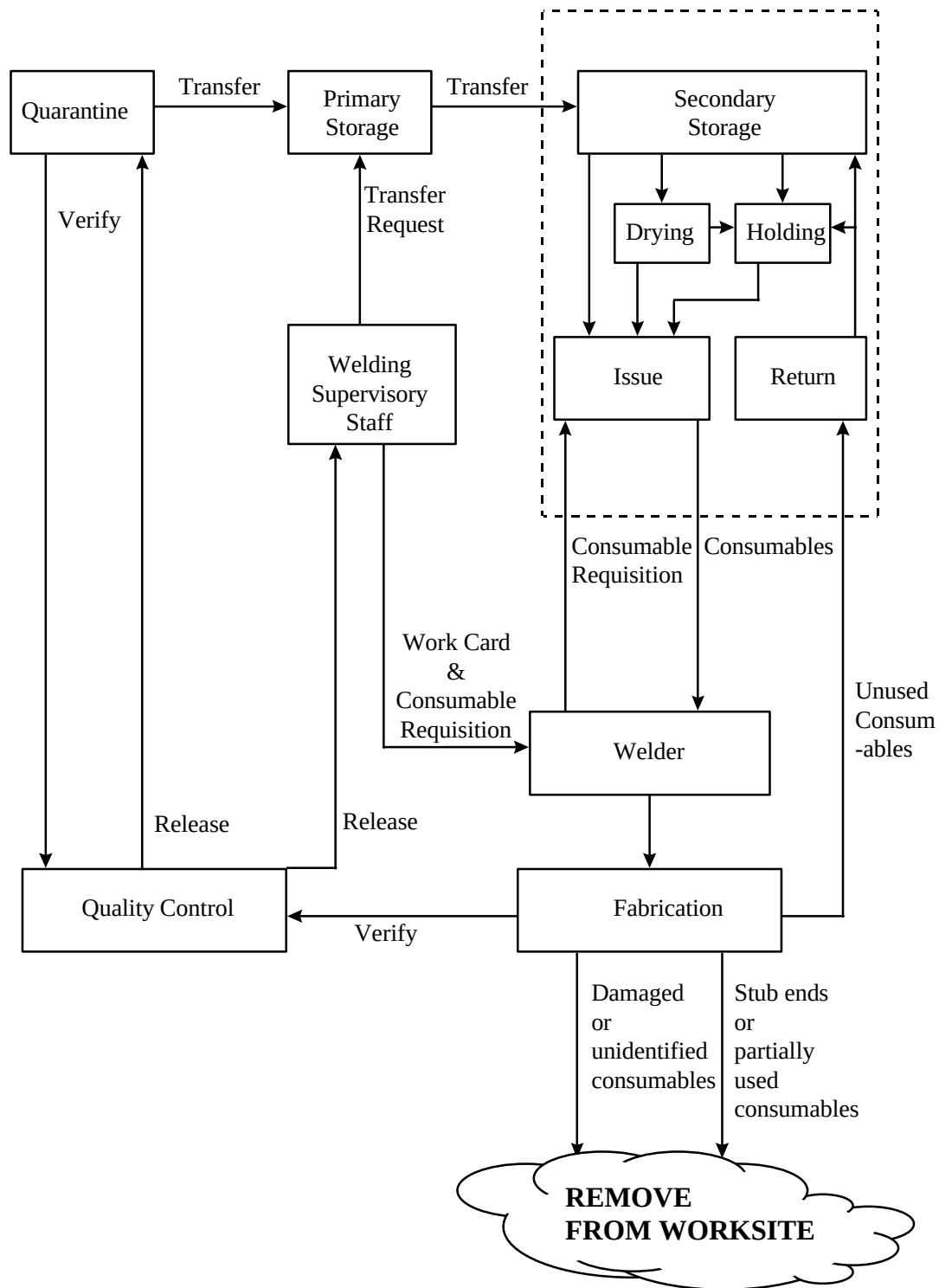


FIGURE 1

FLOW CHART FOR TYPICAL CONSUMABLE CONTROL PROCEDURE



DEFINITIONS AND ABBREVIATIONS

Definitions

Standardised definitions may be found in the BP Group RPSEs Introductory volume.

Abbreviations

ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
BS	British Standard
BSI	British Standards Institute
SMAW	Shielded Metal Arc Welding



LIST OF REFERENCED DOCUMENTS

A reference invokes the latest published issue or amendment unless stated otherwise.

Referenced standards may be replaced by equivalent standards that are internationally or otherwise recognised provided that it can be shown to the satisfaction of the purchaser's professional engineer that they meet or exceed the requirements of the referenced standards.

Note: This is a list of Codes and Standards referred to in this BP Guidance for Specification. Any reference to these documents invokes the latest published issue or amendment.

International Standards

[ISO 9002](#) Quality Systems - Model for Quality Assurance in Production and Installation

American Standards

[ASME](#) Boiler and Pressure Vessel Code Section II Material Specifications - Part C Welding Rods, Electrodes and Filler Metals.

