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Adhesives — Guidelines for the fabrication of adhesively bonded structures and reporting procedures suitable for the risk evaluation of such structures

Adhésifs — Lignes directrices pour les procédures de fabrication et de rapport pour l'évaluation des risques liés aux structures collées par adhésifs

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Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 21368 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

Introduction

Adhesive bonding technology is widely used to fabricate many of the structures in the manufacturing industry, and in some companies it is the key feature to production. Such structures may range from microelectronic encapsulation to the structure and reinforcement of aircraft wings and bridges. Adhesive bonding technology is attractive to industry because it allows flexibility in the selection of materials, product design and product manufacture through to final assembly. As such, adhesive bonding technology exerts a profound influence on the cost of fabrication and the quality of the product, thus allowing significant production savings and a competitive advantage in comparison with traditional methods of manufacture. It is important, therefore, to ensure that adhesive bonding technology is carried out in the most effective way and that appropriate control is exercised over all aspects of the operation.

Within the ISO 9000 series of standards for quality systems, adhesive bonding technology is to be treated as a “special process” since bonds cannot be fully verified by subsequent inspection and testing of the product to ensure the required quality standards have been met.

Quality cannot be inspected into a product, it has to be built in. Even the most extensive and sophisticated non-destructive testing does not improve the quality of bonds.

For adhesively bonded structures to be effective and fit for purpose in service, it is necessary to provide controls, from the design phase, through material selection, into fabrication and subsequent inspection. Poor design for adhesive bonding will create serious risks and costly difficulties in the workshop, on site or in service. Inadequate consideration of the materials to be bonded and the choice of adhesive may result in bonding problems such as lack of adhesion or inadequate gap-filling of the structure. Adhesive bonding procedures have to be correctly formulated and approved to avoid imperfections. There must be supervision to ensure that the specified quality will be achieved.

To ensure the quality of adhesively bonded structures, management needs to appreciate potential sources of trouble and to introduce appropriate quality procedures.

Adhesives — Guidelines for the fabrication of adhesively bonded structures and reporting procedures suitable for the risk evaluation of such structures

1 Scope

This International Standard provides guidelines describing the adhesive bonding quality requirements suitable for use by manufacturers utilizing adhesive bonding as a means of fabrication. In particular, the guidelines define various approaches to meeting quality requirements for fabrication and reporting procedures, both in workshops and on site. These guidelines aim to convey the importance of maintaining quality standards in fabrication and reporting procedures, keeping records and thus enabling documentation to provide the basis for risk evaluation of adhesively bonded structures in service and in use.

These guidelines have been prepared such that:

a) they are independent of the type of adhesively bonded structure;

b) they are independent of adhesive manufacturers' and suppliers' product recommendations;

c) they define the quality requirements for adhesive bonding in terms of fabrication and reporting procedures, both in workshops and on site;

d) they may be used as the basis for risk evaluation of adhesively bonded structures in service and in use;

e) they may be used as a basis for assessing a fabricator's capability to produce adhesively bonded structures fulfilling specified quality requirements when they are detailed in one or more of the following:

   — a contract between the parties involved,

   — an application standard,

   — a regulatory statement.

The guidelines contained within this International Standard may be adopted in full or selectively chosen by the manufacturer to suit the structure concerned. The guidelines provide a flexible framework for the control of adhesive bonding activities in the following cases:

Case 1

The provision of specific requirements for adhesive bonding in contracts which require the manufacturer to have a quality system other than ISO 9001.

Case 2

The provision of specific requirements for adhesive bonding as guidance to a manufacturer developing a quality system.

Case 3

The provision of specific requirements for references in application standards which uses adhesive bonding as part of its requirements or in a contract between relevant parties.

Case 4

The provision of a framework for fabrication and reporting procedures to a quality standard, suitable in particular as a basis for the risk evaluation of adhesively bonded structures.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8502-4, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 4: Guidance on the estimation of the probability of condensation prior to paint application*

ISO 8504-1, *Preparation of steel substrates before application of paints and related products — Surface preparation methods — Part 1: General principles*

ISO 17212, *Structural adhesives — Guidelines for the surface preparation of metals and plastics prior to adhesive bonding*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
contract
agreed requirements for structure(s) ordered by a specific purchaser

or

a fabricator's basic specification for structure(s) manufactured in series for purchasers unknown to the fabricator at the time of design and production

NOTE The contract is assumed to include reference to all regulatory requirements.

3.2
special processes
processes within ISO 9001 quality systems, the result of which cannot be fully verified by subsequent inspection and testing of the product and where, for example, processing deficiencies may become apparent only after the product is in use

NOTE Continuous monitoring and/or compliance with documented procedures is required to ensure that the specified requirements are met.

3.3
fabricator
all adhesive bonding workshops and/or sites under the same technical and quality management

3.4
qualified personnel
personnel approved and qualified in accordance with EWF guidelines or guidelines that can be demonstrated as equivalent

NOTE See the Bibliography.

3.5
structure
semi-finished or fully finished adhesively bonded component or assembly, or any other form of adhesively bonded item

3.6
quality plan
plan to define and document how customer requirements are to be met

4 Contract, design review and quality plan

The fabricator shall review the contractual requirements and the design data provided by the purchaser or in-house data for structures designed by the fabricator. All information necessary to carry out the fabrication operations shall be available prior to the commencement of work.

The fabricator shall demonstrate the capability to meet the contractual requirements for adhesively bonded structures by the preparation of a quality plan detailing materials, methods, work instructions, and inspection and quality assurance (QA) procedures. Where relevant, national and international standards shall be incorporated for definition, processing, inspection and testing procedures. Where standards are not available, the fabricator shall specify suitable procedures and methods allowing compliance with the contractual requirements.

It is necessary to provide a quality plan resulting from the contract and design reviews between fabricator and customer.

The quality plan shall define and document how customer requirements shall be met, and shall define all relevant aspects of

— materials;

— methods;

— production plans;

— work instructions;

— inspection and test;

— QA procedures;

— health and safety measures;

— disposal and environmental protection measures.

National statutory obligations as to health and safety requirements and environmental protection measures shall be incorporated.

The quality plan shall not be accepted for use until mutually agreed and confirmed in writing between customer and fabricator, where appropriate.

An example of a quality plan is given in Annex A.

Issues relating to good joint design shall be included in the procurement specification issued to the fabricator.

5 Outsourcing

When a fabricator intends to outsource (e.g. for adhesive bonding, inspection or non-destructive testing), all relevant specifications and requirements shall be supplied by the fabricator to the outsource supplier. The fabricator shall require outsource suppliers to provide a quality plan and such records and documentation of their work as may be specified by the fabricator.

The fabricator shall ensure that outsource suppliers can comply with the quality requirements of the contract.

The information to be provided by the fabricator to the outsource supplier shall include all relevant data from the contract and design review. Additional requirements may need to be specified if any design aspects of the structure are to be outsourced.

6 Personnel

6.1 Qualifications

The fabricator shall ensure that personnel involved in inspection and testing are qualified and are competent to perform their respective tasks.

NOTE EWF guidelines are considered adequate for such qualification and certification.

6.2 Process management and audit

The fabricator shall have appropriately qualified personnel such that all specified processing requirements can be fulfilled throughout the fabrication process.

The fabricator shall ensure that all necessary procedural and recording documentation and safety and personnel protection equipment is available during all phases of fabrication.

The fabricator shall ensure that procedures are in place for internal and external audits. Audits shall be carried out by relevantly qualified personnel within the fabricator's quality organization.

6.3 Inspection and testing

The fabricator shall ensure that the personnel involved in inspection and testing are suitably qualified and are competent to perform their respective tasks.

NOTE Personnel certificated to ISO 9712 or EN 473 would be considered adequate.

7 Equipment

7.1 Production equipment

The following equipment shall be available when necessary:

— appropriate storage facilities;

— relevant safety and personnel protection equipment;

— dispensing, mixing and application equipment for adhesives;

— jigs, fixtures, clamping and pressure application devices/systems;

— surface cleaning/degreasing agents;

— heating systems for elevated-temperature curing of adhesives;

— appropriate facilities for waste disposal.

7.2 Testing equipment

Access to the following shall be possible:

— destructive testing equipment;

— non-destructive testing equipment.

Where appropriate, equipment shall be calibrated or verified at specified intervals, or prior to use, against measurement standards traceable to international or national measurement standards; where no such standards exist, the basis used for calibration or verification shall be recorded.

8 Adhesive bonding activities

8.1 Production plan

The fabricator shall carry out adequate production planning, compatible with the facilities detailed in 7.1 and the quality plan in Annex A. This shall include

— specification of the sequence by which the structure shall be manufactured, e.g. single parts, sub-assemblies, and the order of subsequent final assembly;

— identification of the adhesive bonding and associated processes required to manufacture the structure, and reference to the appropriate bonding procedure specification;

— specification of inspection and testing procedures, including the involvement of any independent inspection body.

8.2 Bonding procedure

8.2.1 Health and safety and environmental protection

Procedures and operations shall comply with national statutory obligations at all times. The supplier instructions and safety data sheets for the correct use, and any subsequent disposal, of products shall be followed. If a deviation from the established procedures is found to be necessary, the fabricator shall consult with the adhesive supplier as to the suitability of the proposed changes to the procedures, prior to implementing such a deviation. Records of deviations shall be maintained.

8.2.2 Work instructions

Bonding procedures (including surface preparation, post-bonding finishing, etc.) shall comply with the quality plan.

The fabricator may use the bonding procedure specification directly in the workshop for the purposes of instructing the adhesive bonding personnel. Alternatively, the fabricator may use dedicated work instructions. Dedicated work instructions shall be prepared from an approved bonding procedure and do not require separate approval.

8.2.3 Materials

All materials shall be certified by the adhesives supplier as conforming to national or other agreed standards or shall otherwise be shown to conform to purchasing requirements.

Visual examination of materials shall be carried out to ensure conformity to purchasing requirements. The expiry dates of all adhesive, paint and primer materials shall be checked and recorded.

Any materials not conforming to requirements, either by being defective or otherwise unsuitable, shall be quarantined to prevent them entering the fabrication system and disposed of in an appropriate manner.

All materials shall be stored in accordance with the material supplier's recommendations given in the product data and safety data sheets.

Documentation for each batch of material shall cover all the necessary requirements for inspection, recording, release for use, quarantine and storage. These documents shall be retained for record purposes and a recording system ensuring full traceability of materials shall be used.

8.2.4 Bonding conditions

Adhesive bonding shall only be carried out under environmental conditions compatible with the production of satisfactory joints.

Ambient air temperature, substrate temperature and humidity during bonding shall be within the limits specified in the fabricator's quality plan or work procedures. Particular attention shall be paid to the dew point.

NOTE ISO 8502-4 gives a procedure for the measurement of the dew point.

The dew point shall be recorded in accordance with the design guidelines and reported on the job history sheet. If the conditions are such that the working temperature is less than the dew point, bonding shall not be undertaken. Heating may be necessary to maintain the required air and substrate temperature in low-temperature conditions. When necessary, the joint area shall be protected from wet-weather conditions during the bonding process.

Adequate ventilation and light shall be maintained at all times. Adhesive bonding in confined areas or areas with restricted access shall be avoided unless suitable measures have been taken to improve the situation, such as the use of portable fume extraction units and/or masks. All relevant statutory health and safety regulations shall be complied with.

8.2.5 Fit-up of parts

Before the pretreatment stage, components for adhesive bonding shall be dry-fitted to ensure that subsequent glue-line thicknesses are within the limits recommended for the chosen application. If the thicknesses are outside the limits, joints shall not be made unless corrective action, or re-siting of the components, ensures glue-line thickness compliance.

8.2.6 Surface preparation

8.2.6.1 General

The surfaces to be bonded shall be clean, sound, dry, free from oil or grease and other such surface contaminants, and with gaps and flatness within the tolerances specified in the quality plan. The fabricator shall ensure that the correct surface preparation procedure and materials have been selected for the application as specified in ISO 8504-1 and recorded in the quality plan along with any additional information provided by the adhesive manufacturer relating to primers or other surface conditioning systems.

The specific details of surface preparation, relating to quality assurance, shall be recorded on a job history sheet for the specific joint.

NOTE Annex B is an example of such a job history sheet.

8.2.6.2 Degreasing only

Only degreasing agents/solvents which are approved by the technical and health and safety departments of the fabricator shall be used. The degreasing agent/solvent shall be applied using a clean, lint-free cloth. The safety data sheet for each product shall be consulted for specific details regarding handling, storage and use. Operators shall wear suitable protective equipment and any area where degreasing agents/solvents are used shall be adequately ventilated. In confined spaces, positive extraction shall be used. Avoid industrial cleaning rags with soluble fibres which can contaminate surfaces.

Once clean, bonding surfaces shall not be touched or handled except by clean gloved hands as natural oils on the skin will cause contamination. Bonding shall commence as soon as possible after residual solvent has evaporated from the surface, to avoid recontamination.

The solvent type, operator's identity and completion time shall be recorded. Store waste solvents in closed, sealed containers and dispose of in accordance with local-authority requirements.

8.2.6.3 Degreasing and grit blasting

Surface preparation shall be in accordance with ISO 17212. Blasted mating surfaces should be re-checked for compliance with gap and flatness tolerances.

Remove any loose or adhering dust on the treated surface either by oil-free air blast or approved degreasing agent/solvent, using a clean lint-free cloth.

Prepared surfaces shall not be touched or handled except when wearing clean gloves.

Ensure any solvent is fully evaporated from the surface before applying adhesive.

For any solvent degreasing or grit-blasting operations, suitable fume/dust extraction facilities shall be provided.

Where surface primers or conditioners are specified by the adhesive manufacturer, these shall be applied in accordance with the manufacturer's instructions and in accordance with any additional information specified in relevant fabricator procedure documents or in the quality plan.

The operator's identity, grit type, grit size, blasting pressure, primer type, solvent type and completion times shall be recorded.

8.2.7 Assembly

8.2.7.1 General

The fabricator shall ensure that the correct procedures, raw materials and processes have been selected for the application, following the quality plan. This information shall be specified on the job history sheet, on separate work instruction sheets or in a combined document, provided all relevant information is available.

8.2.7.2 Application of adhesive

The adhesive data and safety data sheet shall be followed, together with any requirements detailed in the quality plan or work instruction sheets when using the specified adhesive.

In the case of adhesive films and pressure-sensitive adhesives, apply the tape, in accordance with the manufacturer’s instructions, to one of the mating surfaces, ensuring that no air is trapped. If any air is trapped, it shall be removed by cutting or piercing the tape.

In the case of paste adhesives, apply the adhesive as recommended by the manufacturer. For two-component or multi-component adhesive systems, it is recommended that only integral static or dynamic mixing systems from pre-filled containers or cartridges are used to ensure accurate mixing ratios. To ensure good mixing, the

homogeneity of the mix shall be checked by its visual appearance. Hand-weighing and hand-mixing shall not be used.

Apply a uniform layer or bead of adhesive to each mating surface (or as recommended by the manufacturer) to ensure a filled joint when the parts are mated.

8.2.7.3 Joint assembly

Ensure all protective foils are removed from the tape adhesive before joint closure. The joint shall be made directly after removal of the protective foil. Care shall be taken not to contaminate exposed adhesive or pretreated surfaces.

Close the joint, avoiding air entrapment. On closure, apply pressure over the joint area to ensure contact between the mating surfaces.

Tape adhesives do not allow for position adjustment after joint closure, and any necessary re-positioning may require the joint to be reworked as specified in the quality plan.

Check the assembled joint for any gaps or disbonds around the periphery, reworking to quality plan requirements if necessary.

8.2.7.4 Clamping and curing

After assembly, ensure intimate contact of all mating surfaces by application of pressure on the joint area. With simple joints and relatively thin, flexible materials, a hand roller (or similar device) can be used to apply the necessary pressure. For more rigid materials, a clamping device may be necessary.

Joints shall not be loaded within the handling, or working, time specified by the manufacturer, and any clamping device used shall be left in place for the specified time.

The type of clamping device (if any), the clamping load, the times at which the clamping load was applied and removed, and the operator's identity shall be recorded.

The joint shall be closed as soon as possible after adhesive application. Apply the recommended compressive clamping load to the joint, and check the periphery for even adhesive squeeze-out.

If there is no squeeze-out, or if gaps or voids are visible, separate the joint and check that sufficient adhesive was used. Provided the adhesive is within the manufacturer's stated pot life, additional adhesive may be added to one or more of the mating surfaces. If the adhesive is outside the stated pot life, or has started to gel, remove the adhesive, clean the mating surfaces and apply fresh adhesive, as stated in the quality plan.

Remake the joint and apply the clamping pressure. Check for joint edge squeeze-out and make an adhesive fillet on the joint edge with a suitable hand tool, removing excess adhesive.

The clamped joint shall be left for the time specified by the adhesive manufacturer to generate handling strength (at specified ambient temperatures) or left until full adhesive strength is achieved. Manufacturer's instructions will generally specify strength generation rates at given ambient temperatures.

After the specified cure period, remove any clamping devices. Record the type of clamping device used, the times at which the clamping load was applied and removed and the operator's identity.

NOTE Pressure-sensitive tapes develop their full strength at times beyond the initial tack strength.

9 Post-bonding operations

Following any specified inspection procedures during and on completion of the bonding process, any protective barrier scheme (paint, elastomeric coating, etc.) specified for adhesive joint edge protection shall be

applied in accordance with the manufacturer's instructions, as detailed in the quality plan. The finished protective barrier shall be inspected for compliance with the specified requirements as detailed in the quality plan.

10 Storage and handling of bonding materials

The fabricator shall provide and implement procedures for the identification, storage, handling and use of bonding materials as specified by the supplier and in compliance with any applicable national health and safety regulations.

NOTE Annex C shows an example of a material log sheet for QA purposes.

11 Storage and handling of adherends

Storage and handling procedures shall be such that materials will not be adversely affected by damage or contamination. Identification shall be maintained at all times during storage.

12 Post-bonding finishing

The fabricator shall be responsible for the specification of post-bonding finishing. The processes and materials shall be compatible with the adherends, the surface conditions and the adhesive used, and shall be in accordance with any specifications detailed in the quality plan.

A record of any finishing operation shall be made.

13 Inspection and testing

13.1 General

All adhesive bonding stages and all finished bonds shall be inspected to the specific requirements of the quality plan.

The customer’s inspectors shall have free access to the fabricator's and the agreed outsource supplier's plant at all times. The inspectors shall be at liberty to inspect work at any stage and reject any materials or work not conforming to the quality plan.

Inspection and testing shall be carried out at appropriate points in the manufacturing process to ensure conformity with the contractual requirements and the quality plan. The location and frequency of such inspection and/or testing will depend on the contract and/or application standard, the bonding process and the type of structure.

Test coupons, where specified in the quality plan, may be used to validate

— adhesive batch performance;

— adherend pretreatment quality;

— adhesive cure state;

— overall bonding process performance.

Test coupons may

— validate any stage in the bonding procedure;

— represent the bonded component and be processed concurrently with the component;

— represent the bonded component and be processed separately;

— conform to a national or international standard for adhesive testing.

The fabricator may carry out any additional tests without restriction. Reporting of such tests shall be in accordance with requirements of the quality plan.

13.2 Inspection and testing before bonding

Before the start of bonding, the following shall be checked by appropriate personnel:

— the bonding personnel's approval certificates;

— the suitability of the bonding procedure;

— the identity of the adherends (including test coupons, if required);

— the identity and suitability of the adhesive;

— the data sheet for the adhesive;

— the adhesive expiry date and storage temperature;

— the condition of the adherends e.g. flatness, cleanliness;

— the fit-up accuracy of the parts to be bonded, i.e. dry assembly to check gaps and the general fit;

— the surface preparation requirements (including test coupons, if required);

— any special requirements in the bonding procedure, e.g. the maximum time allowed for the bonding operation;

— the suitability of the equipment and environment for bonding.

13.3 Inspection and testing during bonding and curing

During the bonding process, the following shall be determined/inspected and the results recorded for both components and any test coupons required:

— the ambient temperature and humidity;

— the adherend pretreatment quality (comparison against a standard);

— the adherend temperature;

— the adhesive temperature;

— mixing of the adhesive;

— application of the adhesive;

— part assembly/location;

— the application of pressure and the value of the pressure used, if relevant;

— adhesive squeeze-out at the joint edges;

— the adhesive glue-line temperature and the cure period;

— test coupon preparation/processing;

— the operator's identity.

13.4 Inspection and testing of finished components

Following completion of the bonding process, including post-bonding operations, compliance with acceptance criteria detailed in the quality plan shall be verified. Appropriate inspection tests include

— visual inspection;

— conformance with dimensional requirements as indicated by drawings;

— non-destructive testing;

— coupon testing.

14 Non-conformance and corrective action

Components, including test coupons, not conforming to the specified requirements following inspection and testing shall be clearly identified and quarantined.

Non-conforming components shall be reviewed in accordance with the quality plan. They may be

— accepted by the customer with or without repair by concession;

— rejected and scrapped;

— re-worked to meet the specified requirements.

The quality plan shall be used to determine the appropriate action. Procedures shall be in place to ensure that reasons for non-conformance are promptly identified and corrected.

15 Identification and traceablity

Identification and traceability shall be maintained throughout the adhesive bonding/fabrication process by suitable documented systems.

Annex B shows an example of a job history sheet, suitable for recording all relevant information and data; any other form of record documentation, in whole or part, shall be as extensive.

Keeping such records does not mean that other data and information records required by the quality plan, the fabricator's general quality procedures or statutory requirements need not be kept.

16 Quality records

Quality records, in accordance with the contract requirements, shall include

— the contract or order number;

— the material certificate release numbers;

— the adhesive batch numbers and batch expiry dates;

— the bonding procedure reference number and quality plan reference;

— non-destructive and/or destructive testing procedures and reports;

— the bonding personnel's approval certificate numbers;

— the non-destructive testing personnel's certificate numbers;

— records of repairs and other non-conformity reports.

Quality records shall be retained for a minimum period of 5 years in the absence of any other specified length of time.

Annex A
(informative)

Example of a quality plan

Quality plan/inspection checklist No.:

Adhesive bonding application:

Inspecting authority:

CONTROL DOCUMENTS

CTL/DOC/... Control methods and instructions

RCD/DOC/... Records, instructions and location

Operation	Control doc.	Required by	Records
RECEIPT OF MATERIAL	CTL/DOC10/00		
Adherends	CTL/DOC10/01		
Consumables	CTL/DOC10/20		
Adhesives	CTL/DOC10/50		
MANUFACTURING PROCESS	CTL/DOC20/00		RCD/DOC20/00
Prefitting	CTL/DOC20/10	Client/inspector	RCD/DOC20/10
Surface preparation	CTL/DOC20/20	Client/inspector	RCD/DOC20/20
Adhesive application	CTL/DOC20/30	Client/inspector	RCD/DOC20/30
Bonding	CTL/DOC20/40	Client/inspector	RCD/DOC20/40
Cure	CTL/DOC20/50	Client/inspector	RCD/DOC20/50
Final inspection	CTL/DOC20/60	Client/inspector	RCD/DOC20/60
Storage and service	CTL/DOC20/70	Client/inspector	RCD/DOC20/70

Annex B
(informative)

Example of a job history sheet

Contractor/order No.:

Drawing No.:

Component description:

Joint identification No.:

Dew point:

Date:

Quality plan:

Production plan:

Work instructions:

Ambient air temperature:

Relative humidity:

Adherend surface temperature:

Surface preparation

Type of preparation:

Solvent type:

Grit type:

Grit size:

Blasting pressure:

Completion time:

Application of primer:

Type:

Batch No.:

Operator's identification No.:

Application of adhesive

Adhesive type:

Batch No.:

Expiry date:

Completion time:

Operator's identification No.:

Assembly

Completion time:

Details of rework:

Operator's identification No.:

Clamping and curing

Type of device:

Clamping load:

Time load applied:

Time load removed:

Adhesive hardness at load removal:

Operator's identification No.:

Finishing

Paint/primer type:

Batch No.:

Expiry date:

Completion time:

Date:

Operator's identification No.:

Inspection record		
Date	**Inspector's ID**	**Pass/fail**

Annex C
(informative)

Adhesives material log

	Description	Signature
Material number		
Date log last updated		
Original date received		
Logged in by		
Initial job/project No.		
F.T.I.R. analysis if available		
Subsequent job/project No.		
General details		
Tradename		
Dyes or fillers present		
Material type		
Supplier		
Manufacturer		
Price		
Date in		
Expiry date		
Storage temp., °C		
Life at storage temp. (months)		
Material status		
In use		
Disposal date		
Disposal location		
Quantity		
Additional information		

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1) TWI = Formerly The Welding Institute, Granta Park, Great Abington, Cambridge, CB1 6AL, United Kingdom.

2) EWF = European Federation for Welding Joining and Cutting, Secretariat: Instituto de Soldadura e Qualidade, Av. Prof. Dr. Cavaco Silva, 33 TagusPark — Apartado 012, CTT Porto Salvo P-2780-994 Porto Salvo, Portugal.

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